

# FlexRAN Reference Solution Software

Release Notes Software v21.03

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March 2021

Revision 2.6

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# Revision History

Document #	Revision	Description	Date
575822	2.6	<p>Updated for FlexRAN Software Release v21.03 with the following changes:</p> <ul style="list-style-type: none"> <li>• Added Section 2.1, New Features in Release Software v21.03</li> <li>• Added Section 3.1, Known Issues Release Software v21.03</li> <li>• Added Section 4.1, Fixed Issues Release Software v21.03</li> <li>• Added Section 6.1, refPHY, SDK, and Framework Dependencies for Release Software v21.03 and newer</li> <li>• Added Section 6.2, refPHY, SDK, and Framework Dependencies for Release Software v20.11</li> </ul>	March 2021
575822	2.5	<p>Updated for FlexRAN Software Release v20.11 with the following changes:</p> <ul style="list-style-type: none"> <li>• Added Section 2.2, New Features in Release Software v20.11</li> <li>• Added Section 3.2, Known Issues Release Software v20.11</li> <li>• Added Section 4.2, Fixed Issues Release Software v20.11</li> <li>• Revised Table 8</li> <li>• Added Section 7.1.1, Hardware Platform Configuration for Release Software v20.11 and Newer</li> <li>• Added Section 7.2.1, Supported Operating System for Release v20.11 and Newer</li> </ul>	November 2020
575822	2.4	<p>Updated for FlexRAN Software Release v20.08 with the following changes:</p> <ul style="list-style-type: none"> <li>• Revised Section 2.1.1, Common</li> <li>• Section 2.1. 2, added introduction</li> <li>• Revised Section 2.1.3</li> <li>• Revised Section 2.1.4</li> <li>• Revised Section 2.1, through 2.5 added the following errata for tracking of Feature Developments for 5G release software v20.08:</li> </ul>	August 2020

Document #	Revision	Description	Date
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575822	2.3	<p>Updated for FlexRAN Software Release v20.04 with the following changes:</p> <ul style="list-style-type: none"> <li>• Revised Section 2.1, New Features in Release Software v20.04</li> <li>• Updated Section 2.1.2, DPDK version to v19.11</li> <li>• Revised ERRATA SCSY-33547, SCSY-33823, SCSY-33862, SCSY-33825, SCSY-2916</li> <li>• Revised Section 3.0, Known Issues: SCSY-29171, SCSY-34144</li> <li>• Revised Section 4.0, Fixed Issues: SCSY-33573, SCSY-28921, SCSY-13449</li> </ul>	April 2020
575822	2.2	Updated for FlexRAN Release v20.02	February 2020
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575822	2.0	Updated for FlexRAN Release v19.06	July 2019
575822	1.9	Updated for FlexRAN Release v19.04-ea	May 2019
575822	1.8	Updated for FlexRAN Release v19.03	April 2019
575822	1.7	Updated for FlexRAN Release v18.12	December 2018
575822	1.6	Updated for FlexRAN Release 18.09	October 2018
575822	1.5.1	Updated for FlexRAN Release 18.08-ea	September 2018
575822	1.5	Updated for FlexRAN Release 1.6.0. <ul style="list-style-type: none"> <li>• Updated Table 3.</li> <li>• Updated Section 3.1.1 RefPHY Issues in Release 1.6.0.</li> </ul> Updated Table 18.	July 2018
575822	1.4	Updated for FlexRAN Release 1.5.1.	May 2018
575822	1.3	Added Sections 7.1.1 and 7.2.1: <ul style="list-style-type: none"> <li>• Updated for FlexRAN Release 1.5.0.</li> <li>• Updated Table 1.</li> <li>• Updated Table 2.</li> <li>• Added Sections 2.1 through 2.4.</li> <li>• Added Sections 3.1 through 3.4.</li> <li>• Added Sections 4.1 through 4.4.</li> <li>• Added 4th bullet in Section 5.2.</li> <li>• Added Section 5.3.1.</li> <li>• Added Section 6.1.</li> </ul>	April 2018
575822	1.2	Updated for FlexRAN Release 1.4.2.	March 2018
575822	1.1	Updated for FlexRAN Release 1.4.1.	February 2018
575822	1.0	The new document now contains the combined release notes for the FlexRAN eNB (refPHY), BSP, Framework, and SDK, including all their histories. Supports FlexRAN Release 1.4.0.	January 2018

## 1.0 Introduction

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This document provides high-level system features, issues and limitations, and legal information for Flexible Radio Access Network (FlexRAN) Software.

To learn more about this product, see:

- New features listed in Chapter [2.0, Release Description](#).
- Reference documentation listed in [Table 2, Reference Documents and Resources](#).

### 1.1 Intended Audience

The target audiences are Telecom Equipment Manufacturers (TEMs) and operators, software developers, test and validation engineers, and system integrators.

### 1.2 Customer Support

Contact your Intel sales representatives.

### 1.3 Acronyms

The following table provides a summary of the acronyms used in this document.

**Table 1. Acronyms**

Acronym	Description
5G NR	5G New Radio
5G TF	5G Technology Forum
ARQ	Automatic Repeat Request
API	Application Programming Interface
BBU	Base Band Unit
BSP	Board Support Package
CPRI	Common Public Radio Interface
CRC	Cyclic Redundancy Check
CSI	Channel State Information
CU	Centralized Unit
DCI	Downlink Control Indicator
DFT	Discrete Fourier Transform

Acronym	Description
DL	Downlink
DPDK	Data Plane Development Kit
DMRS	Demodulation Reference Signal
DTX	Discontinuous Transmission
DU	Distributed Unit
ECC	Error Checking and Correction
eNB	E-UTRAN Node B
EPA	Enhanced Platform Awareness
FEC	Forward Error Correction
FDD	Frequency Division Duplex
FlexRAN	Flexible Radio Access Network
FO	Frequency Offset
HARQ	Hybrid ARQ
iDFT	inverse Discrete Fourier Transform
IMS	IP Multimedia Subsystem
IO	Input / Output
IP	Internet Protocol
IRC	Interference Rejection Combining
LDPC	Low-Density Parity-Check
LLR	Logarithm Likelihood Ratio
LTE	Long Term Evolution
MIMO	Multiple Input Multiple Output
MMSE	Minimum Mean Squared Error
NB-IoT	Narrow Band Internet of Things
nFAPI	Network Functional Application Program Interface – as defined in the <i>FlexRAN Reference Solution L2-L1 nFAPI Specification</i> .
NFV	Network Function Virtualization
NMM	Network Monitoring Mode
OFDMA	Orthogonal Frequency Division Multiple Access

Acronym	Description
PBCH	Physical Broadcast Channel
PCFICH	Physical Control Format Indicator Channel
PDCCH	Physical Downlink Control Channel
PDN	Public Data Network
PHICH	Physical Hybrid ARQ Indicator Channel
PDSCH	Physical Downlink Shared Channel
PRACH	Physical Random Access Channel
PUCCH	Physical Uplink Control Channel
PUSCH	Physical Uplink Shared Channel
QAM	Quadrature Amplitude Modulation
QPSK	Quadrature Phase Shift Keying
RDT	Resource Director Technology
RIU	Radio Interface Unit
ROE	Radio Over Ethernet IEEE 1914.3
RRU	Remote Radio Unit
RS	Reference Signals
RT	Real-Time
SDK	System Development Kit
SIP	Session Initiation Protocol
SISO	Single Input Single Output
SKL	Skylake
SKL-D	Skylake-D
SNR	Signal to Noise Ratio
SRS	Sounding Reference Signal
TEM	Telecom Equipment Manufacturers
TDD	Time Division Duplex
TiC5	Titanium Cloud 5
TTI	Transmission Time Interval

Acronym	Description
UE	User Equipment
UL	Uplink
VoLTE	Voice over LTE
WLS	Wireless Subsystem Interface
ZC	Zadoff Chu

## 1.4 Reference Documents and Resources

A comprehensive library of Intel® Xeon® processor reference and application documentation is available from Intel. Developers, applications engineers, and other personnel can log on and register at the Intel® Business Link to access the full range of support documentation for help with implementing, supporting, or otherwise becoming familiar with the Intel® Xeon® processor devices. For detailed information on specific devices and available features, consult your Intel representative.

**Table 2. Reference Documents and Resources**

Title	Document Number
<i>FlexRAN Reference Solution LTE eNB L2-L1 API Specification</i>	571742
<i>FlexRAN 5G New Radio Reference Solution L2-L1 API Specification</i>	603575
<i>FlexRAN 4G Reference Solution L1 User Guide</i>	570228
<i>FlexRAN 5G NR Reference Solution L1 User Guide</i>	603576
<i>FlexRAN Reference Solution L1 XML Configuration User Guide</i>	571741
<i>FlexRAN 5G New Radio FPGA User Guide</i>	603578
<i>FlexRAN Reference Solution NB-IOT User Guide</i>	575823
<i>FlexRAN Reference Solution NB-IOT L2-L1 API Specification</i>	575824
<i>FlexRAN Reference Solution Cloud-Native Setup Installation Guide</i>	575834
<i>FlexRAN Reference Solution Framework Programmer's Guide</i>	576898
<i>FlexRAN and Mobile Edge Compute (MEC) Platform Setup Guide</i>	575891
<i>FerryBridge Release Notes</i>	571743
<i>FerryBridge FPGA User Guide</i>	548166
<i>FerryBridge FPGA Programmers Guide</i>	574223
<i>FlexRAN 4G Reference Solution RefPHY (Doxygen)</i>	572318
<i>FlexRAN 5G NR Reference Solution RefPHY (Doxygen)</i>	603577

Title	Document Number
<i>FlexRAN Reference Solution Framework API (Doxygen)</i>	572007
<i>FlexRAN Software Development Kit (SDK) User Guide and API Reference (Doxygen)</i>	572002
<i>FlexRAN Reference Solution L2-L1 nFAPI Specification</i>	576423
<i>FlexRAN L1 Algorithm Description</i>	610016

## §

## 2.0 Release Description

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### 2.1 New Features in Release Software v21.03

This section is an overview of new features added for the v21.03 software release.

#### 2.1.1 New Features for 5G New Radio (NR) RefPHY in Software Release v21.03

##### Sub-6 / Sub-3:

- Add support for  $\mu=0$ , 40 MHz.
- Add support for  $\mu=1$ , 20 MHz.
- Add UCI on PUSCH for CSI part 1 and part 2.
- Add support for 16 cells.
- PDSCH support for precoding scenarios: 1x2, 1x4, and 2x4.
- PUSCH multi-TTI frequency Doppler filter.
- Frequency Offset compensation for multi-user MIMO scenario.

##### mmWave:

- No new features added specifically for mmWave in this release.

##### Massive MIMO:

- Add API to return pointer of SRS Channel Estimate for all RxAnts back to L2 in ULSRSEstStruct.
- Support 6 cells of 64x64 scenario.
- Add option to process Downlink pipeline per symbol instead of per group to improve latency.
- Enable DL compression as part of precoder to improve O-RAN latency.
- DFT code book based UL beam weight computation option.

##### UR-LLC:

- Enable xRAN interface to URLLC pipeline.
- Pipeline change to support eMBB and URLLC on the same cell instance.

##### Changes to L2 to L1 API:

- Add nPdcchPrecoderEn and nSSBPrecoderEn to DLConfigRequestStruct.
- Remove all nDL and nUL compression related fields from CONFIGREQUESTStruct.
- Add CSI Part 1 and 2 parameters to ULSCHPDUStruct to configure UCI on PUSCH.
- Add CSI Part 1 and 2 PHY to MAC fields in ULSCHUCIPDUDataStruct.
- Add SRS Channel Estimation return pointer to ULSRSEstStruct for Massive MIMO scenario only.

##### BBDEV:

- Rebase to DPDK 20.11.
- Update building procedure to use meson build and ninja. Previous building method has been deprecated.
- Mount Bryce (ACC100) enhancements to support latest PRQ (Production Readiness Quality) devices.

### Common:

- Update to latest Long Term Support (LTS) version of DPDK. **DPDK 20.11**.
- Memory optimization to allocate based on configuration coming from L2.
- PUCCH Wireless performance improvements.
  - Only 4 remaining RCT cases failing. All for Format 0.
- PUCCH Polar Decoder support for 2 code blocks
- Remove coding rate limitation for PUCCH Reed Muller Decoding
- PRACH algorithm update to match link level simulation.
- Dual Socket support.
- PDCCH and SSB Precoding option to transmit on more than 1 Tx Antenna
- Unification of Massive MIMO and standard MIMO SRS algorithms
- Support core assignments greater than 64.
- Integrate pipeline with new eBbuPool Framework.
- Support mixed numerology with new eBbuPool framework.
- Mlog library has removed mutex and replaced with atomic operations.
- WLS library changes to support the returning of the pointer SRS Channel Estimate for Massive MIMO.
  - WLS library to pass 2 sizes for WLS\_Open and WLS\_Alloc.
  - MAC Managed memory and PHY managed memory.

## 2.1.2 New Features for 4G LTE RefPHY in Software Release v21.03

- Update to DPDK 20.11
- Increase support to up to 12 cells.
- Update LTE mlog stats to look like 5G NR.
- Add testapp support for BBDEV interface to software and hardware FEC.
- Integrate pipeline with new eBbuPool framework.

## 2.1.3 New Features for System Development Kit (SDK) in Software Release v21.03

- Add frequency offset support to PUSCH channel estimation under MU-MIMO scenario.
- Support for  $\mu=0,40\text{mhz}$  and  $\mu=1,20\text{mhz}$  added to PUSCH, PUCCH and SRS channel estimation.
- Add 1440, 1536, and 1632 point DFT and iDFTs.
- Invoke 4-way scaling factor iDFT and DFT function for all sizes to improve precision.
- Add Matrix Inversion sizes:
  - 9x9 to 15x15
- Add DFT-based Uplink beamforming codebook generation.
- Add code block concatenation function.



- Add 1x2 and 1x4 precoding support.
- PRACH algorithm alignment to link level simulation.

#### 2.1.4 New Features for xRAN/ORAN in Software Release v21.03

- Update to DPDK 20.11
- Static Compression support which reduces overhead in user plane packets.
- QoS support per configure Table 3-7.
- DDP profile for O-RAN FH
- VPP like vectorization of packet handling.
- C-plane update
- Support for Measurement dummy payloads in range of 40 to 1400 bytes per user.
- CVL(ColumbiaVille) measured transport implementation includes timing parameters adjustment prior to C/U plane traffic.

#### 2.1.5 New Features for BBU Pooling Framework in Software Release v21.03

- Add new eBbuPool Framework.
  - Enabled during compilation time by "-n" option in flexran\_build.sh.
  - Or by defining #define NEW\_FRAMEWORK
  - Only eBbuPool framework will support multi-numerology scenarios.
  - Integrated into both 5G NR and LTE pipelines
- Add support to enable 24 cells in one instance of L1 application for  $\mu=0$ .
- Add support for CoreID assignment greater than 64.

#### 2.1.6 Tracking of Feature Developments for 5G NR RefPHY in Release Software v21.03

Title	RefPHY: Add support for $\mu=0$ greater than 20 MHz
Reference #	SCSY-47723
Description	Add support for $\mu=0$ , 40 MHz.
Priority	P3-Medium
Affected Versions	21.03
Components	5G NR Ref PHY, unit tests: fd/mu1_40 MHz/1->2

Title	<a href="#">RefPHY: Add UCI on PUSCH for CSI part 1 and part 2.</a>
Reference #	SCSY-47943
Description	Add API parameter and functionality to support CSI Part 1 and 2 on PUSCH.
Priority	P3-Medium
Affected Versions	21.03
Components	5G NR Ref PHY, unit tests: ul/mu1_100mhz/50->62

Title	<a href="#">RefPHY: 16 cell support.</a>
Reference #	SCSY-41335
Description	Increase capacity to 16 cells.
Priority	P3-Medium
Affected Versions	21.03
Components	5G NR Ref PHY, unit tests: fd/mu1_100mhz/16730, 16732

Title	<a href="#">RefPHY: PUSCH multi-TTI frequency doppler shift filter.</a>
Reference #	SCSY-35976
Description	Add averaging of Frequency Doppler shift calculation over multiple TTIs to filter out noise.
Priority	P3-Medium
Affected Versions	21.03
Components	5G NR Ref PHY, unit tests: ul/mu1_100mhz/650->655

Title	<a href="#">RefPHY: Frequency Offset Compensation for MU-MIMO scenario.</a>
Reference #	SCSY-48119
Description	In MU-MIMO scenario, there will be different frequency offsets calculated for each UE. Will use different measured values for each UE present in group.
Priority	P3-Medium
Affected Versions	21.03
Components	5G NR Ref PHY, unit tests: ul/mu1_100mhz/815

Title	<a href="#">RefPHY: Add API to return pointer to SRS Channel Estimate for Massive MIMO scenario.</a>
Reference #	SCSY-48133
Description	Add field to ULSRSEstStruct to support returning a pointer to the SRS channel estimation for all RxAnts in the Massive MIMO scenario to L2.
Priority	P3-Medium

Affected Versions	21.03
Components	5G NR Ref PHY, unit tests: ul/mu1_100mhz/700->702

Title	RefPHY: Support 6 cells of 64x64 Massive MIMO test scenario.
Reference #	SCSY-48147, SCSY-47638
Description	Optimize pipeline and memory usage to support 6 cells of 64x64 Massive MIMO test scenario.
Priority	P3-Medium
Affected Versions	21.03
Components	5G NR Ref PHY, customer defined test case

Title	RefPHY: Add option to process Downlink pipeline in symbols instead of users and enable DL compression as part of precoder.
Reference #	SCSY-47947
Description	Enable the OFDM symbol based task split for massiveMIMO case, both timer mode and xran mode 1)Integrate the xran compression in this split 2)Only enabled with eBbuPool now Results: in 64ant xRAN test: 3) total cycles(normal PDSCH+compression) are increased compared with previous PDSCH pipeline
Priority	P3-Medium
Affected Versions	21.03
Components	5G NR Ref PHY, cycle count performance tests, and all test mac test cases.

Title	RefPHY: DFT Codebook based UL Beam forming weight generation.
Reference #	SCSY-41328
Description	Enable DFT codebook based UL beam forming weight generation as an additional option to zero-forcing weight generation.
Priority	P3-Medium
Affected Versions	21.03
Components	5G NR Ref PHY

Title	RefPHY: Enable xRAN interface for URLLC.
Reference #	SCSY-34902
Description	Enable xRAN interface for URLLC
Priority	P3-Medium
Affected Versions	21.03

Components	5G NR Ref PHY
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Title	<a href="#">RefPHY: Remove URLLC logic cell concept. eMBB and URLLC traffic shall be managed dynamically by L2</a>
Reference #	SCSY-39721
Description	All changes to make testmac timer mode work with new scheme where only one PHY_CONFIG is sent from testmac to L1 and both sides make a virtual cell to do the URLLC work.
Priority	P3-Medium
Affected Versions	21.03
Components	5G NR Ref PHY, unit tests=all current URLLC test cases

Title	<a href="#">DPDK: Enable of Live Adaption feature on ACC100</a>
Reference #	SCSY-47907
Description	Enable Live Adaption on ACC100
Priority	P3-Medium
Affected Versions	21.03
Components	DPDK

Title	<a href="#">DPDK: ACC100 DDR controller workaround</a>
Reference #	SCSY-47407
Description	Workaround required to address bug on the ACC100 (Mt. Bryce) A1 device to make sure DDR configuration is optimal.
Priority	P3-Medium
Affected Versions	21.03
Components	DPDK

Title	<a href="#">RefPHY: Update components to DPDK 20.11</a>
Reference #	SCSY-36579, 48312, 47002
Description	Update all components and build procedures to work with DPDK 20.11. Change to meson build and ninja compiling tools for DPDK 20.11.
Priority	P3-Medium
Affected Versions	21.03
Components	5G NR Ref PHY

Title	RefPHY: Optimize memory usage per cell
Reference #	SCSY-47956
Description	Reduce overall refphy memory footprint to address narrow band test scenarios.
Priority	P3-Medium
Affected Versions	21.03
Components	5G NR Ref PHY

Title	RefPHY: PUCCH Wireless Performance
Reference #	SCSY-41065
Description	Address PUCCH RCT test failures. Reduced failing cases from 35 to 4. Only PUCCH format 0 still contains failing cases.
Priority	P3-Medium
Affected Versions	21.03
Components	5G NR Ref PHY, unit tests=all RCT PUCCH test cases.

Title	RefPHY: Support multiple code blocks for Polar Decoder
Reference #	SCSY-41292
Description	Add support for multi-code block scenario in Polar Decoder for PUCCH
Priority	P3-Medium
Affected Versions	21.03
Components	5G NR Ref PHY, unit tests=ul/mu1_100mhz/1180-1185.

Title	RefPHY: Support multiple code blocks for Polar Decoder
Reference #	SCSY-41292
Description	Add support for multi-code block scenario in Polar Decoder for PUCCH
Priority	P3-Medium
Affected Versions	21.03
Components	5G NR Ref PHY, unit tests=ul/mu1_100mhz/1180-1185.

Title	RefPHY: Remove coding rate limitation for Reed Muller Decoder
Reference #	SCSY-48179
Description	Remove current limitation in coding rate for Reed Muller Decoder.
Priority	P3-Medium
Affected Versions	21.03

Components	5G NR Ref PHY
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Title	RefPHY: Dual socket support
Reference #	SCSY-47197
Description	Add support to truly run on dual socket CPUs. DPDK memory and dynamically allocated memory will come from the proper CPU core.
Priority	P3-Medium
Affected Versions	21.03
Components	5G NR Ref PHY

Title	RefPHY: PDCCH and SSB precoding to span to all Tx Ants.
Reference #	SCSY-41055
Description	Add API and logic to support precoding of PDCCH and SSB signals so that they can span to multiple transmit antennas.
Priority	P3-Medium
Affected Versions	21.03
Components	5G NR Ref PHY, unit tests=dl/mu1_100mhz/280,281

Title	RefPHY: Unify SRS Channel estimation algorithms for Massive MIMO and standard MU-MIMO scenarios..
Reference #	SCSY-41054
Description	Add API and logic to support precoding of PDCCH and SSB signals so that they can span to multiple transmit antennas.
Priority	P3-Medium
Affected Versions	21.03
Components	5G NR Ref PHY, unit tests=ul/mu1_100mhz/217-222,700-702

Title	BSP: WLS library changes to support SRS Channel Estimate being returned to L2.
Reference #	SCSY-48133
Description	WLS library changes to support the returning of the pointer SRS Channel Estimate for Massive MIMO. <ul style="list-style-type: none"> <li>WLS library to pass 2 sizes for WLS_Open and WLS_Alloc.</li> <li>MAC Managed memory and PHY managed memory.</li> </ul>
Priority	P3-Medium
Affected Versions	21.03
Components	BSP

Title	RefPHY: Support mixed numerologies in testmac timer mode.
Reference #	SCSY-47941
Description	Add support to run mixed numerologies. Only supported with the new eBbuPool framework.
Priority	P3-Medium
Affected Versions	21.03
Components	5G NR Ref PHY

### 2.1.7 Tracking of Feature Developments for 4G LTE RefPHY in Release Software v21.03

Title	RefPHY: Integrate LTE pipeline with new eBbuPool Framework.
Reference #	SCSY-47554
Description	Integrate LTE pipeline with the new eBbuPool Framework.
Priority	P3-Medium
Affected Versions	21.03
Components	LTE Ref PHY, all unit tests

Title	RefPHY: Update components to DPDK 20.11
Reference #	SCSY-36579, 48312, 47002
Description	Update all components and build procedures to work with DPDK 20.11. Change to meson build and ninja compiling tools for DPDK 20.11.
Priority	P3-Medium
Affected Versions	21.03
Components	LTE Ref PHY

Title	RefPHY: Update LTE l1_mlog_stats to look like 5G NR.
Reference #	SCSY-47371
Description	Update l1_mlog_stats in the LTE pipeline to provide the same information as the 5G NR version
Priority	P3-Medium
Affected Versions	21.03
Components	LTE Ref PHY

## 2.1.8 Tracking of Feature Developments for System Development Kit (SDK) in Release Software v21.03

Title	SDK: Add frequency offset support to PUSCH channel estimation under MU-MIMO scenario.
Reference #	SCSY-48119
Description	lib_cestimate_5gnr: For MU-MIMO scenario, frequency offset will be calculated per UE instead of calculating a single value for all UEs.
Priority	P3-Medium
Affected Versions	21.03
Components	SDK

Title	SDK: Support for mu=0,40mhz and mu=1,20mhz added to PUSCH, PUCCH and SRS channel estimation
Reference #	SCSY-47723
Description	lib_cestimate_5gnr, bblib_pucch_cestimate_5gnr, bblib_srs_cestimate_5gnr: Add frequency averaging tables for mu=0,40mhz, mu=1,20mhz.
Priority	P3-Medium
Affected Versions	21.03
Components	SDK

Title	SDK: Add 1440, 1536, and 1632 point DFT and iDFTs.
Reference #	SCSY-41042, SCSY-47630
Description	bblib_idft_burst_fxp_avx512: Add support for 1440, 1536 and 1632 DFT/iDFT sizes. Change function to call correct versions of the iDFT/DFT to improve precisions
Priority	P3-Medium
Affected Versions	21.03
Components	SDK

Title	SDK: Add Matrix Inversion sizes, 9x9 to 15x15.
Reference #	SCSY-41330
Description	phy_matrix_inv_cholesky.cpp Moved all matrix inversion into common library so that it can be called from all SDK libraries. New matrix inversion sizes added range from 9x9 to 15x15.
Priority	P3-Medium
Affected Versions	21.03



Components	SDK
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Title	SDK: Add new UL beamforming weight generation using DFT codebook.
Reference #	SCSY-41329
Description	lib_dftcodebook_weightgen: Add new option to generate UL beamforming weights using DFT codebook.
Priority	P3-Medium
Affected Versions	21.03
Components	SDK

Title	SDK: Code block concatenation function for FEC Downlink output.
Reference #	SCSY-37877
Description	lib_fec_enc_byte_concat_soft: Code block outputs from FEC encoder may not be byte aligned. This function will shift all code blocks together to ensure continuous buffer for scrambler.
Priority	P3-Medium
Affected Versions	21.03
Components	SDK

Title	SDK: Support iFFT/FFT 512 and 2048 points
Reference #	SCSY-36032
Description	lib_fft_ifft: Add c-code reference for 512 and 2048 point iFFT/FFT functions.
Priority	P3-Medium
Affected Versions	21.03
Components	SDK

Title	SDK: Add 1x2 and 1x4 Precoder test cases.
Reference #	SCSY-41317
Description	lib_precoding_5gnr: Add new precoder scenarios 1x2 and 1x4.
Priority	P3-Medium
Affected Versions	21.03
Components	SDK

## 2.1.9 Tracking of Feature Developments for xRAN/ORAN in Release Software v21.03

Title	ORAN: Static Compression support which reduces overhead in user plane packets.
Reference #	SCSY-42270
Description	O-RAN FH: Static Compression support which reduces overhead in User Plane packets.
Priority	P3-Medium
Affected Versions	21.03
Components	xRAN/ORAN

Title	ORAN: QoS support per configure Table 3-7.
Reference #	SCSY-42271
Description	O-RAN FH: QoS support
Priority	P3-Medium
Affected Versions	21.03
Components	xRAN/ORAN

Title	ORAN: DDP profile for O-RAN FH.
Reference #	SCSY-34871
Description	Enable UL U-packets classification using DDP of CVL to reduce cycle count
Priority	P3-Medium
Affected Versions	21.03
Components	xRAN/ORAN

Title	ORAN: "VPP like" vectorization of packet handling.
Reference #	SCSY-34878
Description	Look into options to batch processing/vectorize of packets in such way to reduce over all cycle count
Priority	P3-Medium
Affected Versions	21.03
Components	xRAN/ORAN

Title	ORAN: CVL(ColumbiaVille) measured transport implementation.
Reference #	SCSY-42270
Description	CVL(ColumbiaVille) measured transport implementation includes timing parameters adjustment prior to C/U plane traffic.
Priority	P3-Medium
Affected Versions	21.03
Components	xRAN/ORAN

## 2.1.10 Tracking of Feature Developments for BBU Pooling Framework in Release Software v21.03

Title	FWK: Develop new Framework called eBbuPooling to handle future scenarios.
Reference #	SCSY-47500
Description	New eBbuPool framework developed to handle multi-numerology scenarios, increase number of cores allocated per BBU, and any future scenarios.
Priority	P3-Medium
Affected Versions	21.03
Components	Framework

Title	FWK: Fix feature of supporting more than 64 physical core IDs.
Reference #	SCSY-13136
Description	Feature to allow BBU Pooling to use physical core IDs greater than 64 was added last year. Found that feature did not work as expected. Core IDs were assigned using a single uint64_t variable so anything core ID greater than 64 would map to core 0. Instead of using single uint64_t variable, using an array of 4 uint64_t instead.
Priority	P3-Medium
Affected Versions	21.03
Components	Framework

Title	FWK: Prepare of 24 cell support
Reference #	SCSY-41335
Description	Increase capacity to support 24 cell scenario
Priority	P3-Medium
Affected Versions	21.03
Components	Framework

## 2.2 New Features in Release Software v20.11

This section is an overview of new features added for the v20.11 software release.

### 2.2.1 New Features for 5G New Radio (NR) RefPHY in Software Release v20.11

#### Sub-6 / Sub-3:

- PUSCH channel estimation time domain linear interpolation option integrated into pipeline.
  - Enable in phycfg.xml by setting PuschLinearInterpEnable = 1.
  - Set PuschLinearInterpGranularity0->11 equal to linear interpolation method.
  - Linear interpolation methods are properly described in Document #610016 - *FlexRAN L1 Algorithm Description*.
- PUSCH channel estimation Frequency offset measurement and compensation integrated into pipeline.
  - Enable in phycfg.xml by setting CEFocEnable.
- PUSCH channel estimation pre frequency interpolation correction of timing offset.
  - Enable in phycfg.xml by setting bit 1 of CEInterpMethod field.
- PUSCH Doppler Frequency estimation.
- PUSCH IRC optimization.
- PUSCH data/dmrs interleaving for DMRS Type 1.

#### mmWave:

- No new features added for mmWave in this release.

#### Massive MIMO:

- Increase Uplink buffer context from 1 to 2 for Massive MIMO 64T/64R scenario.
- PUSCH channel estimation dynamic task split based on use-case.
- PUSCH 16 stream processing.
  - Can decode up to 8 layers of PUSCH data for multiple UEs.

#### UR-LLC:

- URLLC pipeline changes to support offloading to soft and hardware based LDPC in each TTI.
- Multi-core URLLC processing support added.
- ORAN mode of testing URLLC pipeline enabled.

#### Changes to L2 to L1 API:

- Downlink and Uplink IQ compression/decompression settings added to CONFIG\_REQUEST message to allow testmac to control settings to measure cycles.
- #define MAX\_RXRU\_NUM increased from 4 to 16.

#### TestApp/ TestMAC/ BBDEVApp:

- Multi-user support added to TestApp for Wireless Performance testing.

- Each UE can have different wireless channel applied with its own sets of impairments.
- Will be used to test Multi-User MIMO test scenarios where all UEs in group can be processed together in wireless channel model to allow correlation and polarization.
- Massive MIMO SRS support added for functional unit testing to TestApp.
- Add support for Antenna Correlation and Polarization impairments to wireless channel model.
- DL Compression and UL Decompression added to Timer Mode testing for TestMAC.
- UDP traffic support added to TestMAC.
  - Bi-Directional UDP traffic flows (up to 12 per direction) can be enabled within TestMAC.

**BBDEV:**

- Tune PCIe CDR configuration at BBDEV level for MBC (ACC100).
- VC: Adding Error Enum 0xB.
- Update to the BBDEV PMDs.
- Support CRC16 in bbdev and sw implementation.
- Remove FLR timeout register for VC5G.

**Common:**

- CentOS version has been updated to 7.8.
  - As per Intel security team's feedback, Intel has upgraded to new CentOS to fix vulnerabilities.
  - Update support kernel version to:

`3.10.0-1127.19.1.rt56.1116.el7.x86_64`
- DL PDSCH multiplex with SSB feature.
- DL Compression along with PDSCH processing.
  - This optimization is to run the compression task on same core as resource element mapper task. This helps in optimization of compression module compared to previous release.
- UL Decompression task has been split by Antenna for reducing latency.
- PUCCH wireless performance enhancements.
- L1 application supports to flexibly initialize the DPDK resource shared with DU/CU when it acts as DPDK primary process.
- UL XTRAN sections for control channels (dynamic based on MACPHY API).
- Remove BBDEV configuration of FEC queues and setting up for physical and virtual functions for hardware accelerators from FlexRAN release to open source github.
  - <https://github.com/intel/pf-bb-config>.

## 2.2.2 New Features for 4G LTE RefPHY in Software Release v20.11

- No new features were developed for 4G LTE.

## 2.2.3 New Features for System Development Kit (SDK) in Software Release v20.11

- lib\_cestimate\_5gnr - PUSCH Channel Estimation
  - Added Doppler Shift estimation (used to pick the interpolation type during equalization)

- `lib_pusch_focompensation_5gnr` + `lib_pusch_foestimation_5gnr` - PUSCH Channel Estimation
  - Carrier Frequency Offset estimation and compensation
- `lib_equalization` - PUSCH Equalizer
  - Some bug fixes
  - 16 receive stream-based equalization. This is used in Massive MIMO where we have more streams of data from RU being used by DU.
  - 1x16, 2x16, 4x16, 8x16 and 16x16 SDK functions are present (Layer x Rx Stream)
- `lib_mmse_irc_mimo_5gnr` - PUSCH IRC
  - IRC was optimized. 1x2, 2x2, 2x4, 1x16, 2x16, 4x16 and 8x16 SDK functions. It also supports time domain interpolation.
- `lib_pusch_symbol_processing_5gnr` - PUSCH Symbol Processing
  - Optimized single function for MMSE Equalizer + time domain interpolation (called per symbol)
  - PUSCH data and DMRS interleaving feature
- `lib_pusch_irc_symbol_processing_5gnr` - PUSCH IRC Symbol Processing
  - Optimized single function for IRC Equalizer (called per symbol)
- `lib_pucch_cestimate_5gnr` + `lib_reed_muller` - PUCCH algorithms
  - Algorithms tuned for formats 1, 2, 3, 4 to get better Wireless performance (38.104)
  - Reed-Muller Decoder algorithm improvement for better wireless performance
- `lib_fft_ifft` - FFT / IFFT for sizes 512 and 2048
  - Used for SRS and PRACH processing
  - Increased precision of processing
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## 2.2.4 New Features for xRAN/ORAN in Software Release v20.11

- Compression added for PRACH.
- Fix prach timeoffset calculation issue in xran lib.
- Application level fragmentation with small MTU.
- Configurable MTU size support.
- Fix wrong num\_prbu set in U-Plane packets..
- Fix slot\_id indexing to be compliant with spec.
- Optimized the U-plane and C-plane with bit field using union.
- SRS configuration and compression with respect to slots and symbols.
- Cat B profiling for massive MIMO scenarios on targeted platforms.
- Ecpi 2.0 one way delay measurement support for O-RAN FHI.
- Fix xRAN mode DL CRC issue on mu1\_100 MHz.

## 2.2.5 New Features for BBU Pooling Framework in Software Release v20.11

- Increase the maximum number of BBU Cores assigned per instance from 24 to 32 to support new Massive MIMO test scenarios.
- Fix bug related to task affinity.

## 2.2.6 Tracking of Feature Developments for 5G NR RefPHY in Release Software v20.11

Title	Enable mapping of PUSCH data to the same symbol with DMRS
Reference #	SCSY-34901
Description	Complete for DMRS Type 1 only. If nNrOfCDMs is set equal to 1 in L2-L1 API, the calculation of descrambler input/output length will consider the data sub-carriers that reside in the DMRS symbol.
Priority	P3-Medium
Affected Versions	20.11
Components	5G NR Ref PHY

Title	DL PDSCH multiplex with SSB feature
Reference #	SCSY-37684
Description	Add feature to allow PDSCH and SSB to multiplex with one another. PDSCH will consider the RBs taken away by colliding with SSB allocation.
Priority	P3-Medium
Affected Versions	20.11
Components	5G NR Ref PHY

Title	DL Compression along with PDSCH processing
Reference #	SCSY-36030
Description	This optimization is to run the compression task on same core as resource element mapper task. This helps in optimization of compression module compared to previous release.
Priority	P3-Medium
Affected Versions	20.11
Components	5G NR Ref PHY

Title	UL Decompression task has been split by antenna to reduce latency
Reference #	SCSY-36030
Description	Optimization to split Uplink decompression into parallel tasks based on the number of receive antenna.
Priority	P3-Medium
Affected Versions	20.11
Components	5G NR Ref PHY

Title	PUCCH Compliance
Reference #	SCSY-35982
Description	Tune parameters to improve PUCCH Format 1,2,3,4 RCT 38.104 wireless performance results.
Priority	P3-Medium
Affected Versions	20.11
Components	5G NR Ref PHY

Title	Support flexible initialization of DPDK resource shared between DU/CU
Reference #	SCSY-38617
Description	<ul style="list-style-type: none"> <li>Support flexible shared DPDK ports configuration by xml file in L1, maximum 4 ports, the ports can be shared with DU/CU or another secondary process in the same DPDK prefix file. No impact for legacy xRAN function</li> <li>Support flexible DPDK file prefix definition</li> </ul>
Priority	P3-Medium
Affected Versions	20.11
Components	5G NR Ref PHY

Title	Add support of dynamic section allocations based on L2->L1 API,
Reference #	SCSY-34661
Description	Support UL channels: PUSCH, PUCCH, SRS Support DL channels: PDSCH, PDCCH, CSI-RS
Priority	P3-Medium
Affected Versions	20.11
Components	5G NR Ref PHY

Title	Multi-user support added to TestApp for Wireless performance testing,
Reference #	SCSY-38020
Description	<ul style="list-style-type: none"> <li>Each UE can have different wireless channel applied with its own sets of impairments.</li> <li>Will be used to test Multi-User MIMO test scenarios where all UEs in group can be processed together in wireless channel model to allow correlation and polarization.</li> <li>Add support for Antenna Correlation and Polarization impairments to wireless channel model.</li> </ul>
Priority	P3-Medium
Affected Versions	20.11
Components	5G NR Ref PHY



Title	TestApp to support Massive MIMO SRS test cases,
Reference #	SCSY-37606
Description	Complete interface to send SRS Massive MIMO buffers from test app to L1.
Priority	P3-Medium
Affected Versions	20.11
Components	5G NR Ref PHY

Title	UDP traffic support added to TestMAC,
Reference #	SCSY-36582
Description	Bi-Directional UDP traffic flows (up to 12 per direction) can be enabled within TestMAC.
Priority	P3-Medium
Affected Versions	20.11
Components	5G NR Ref PHY

Title	Move bf_bbdev_config_app to github,
Reference #	SCSY-37651
Description	Update documentation and removing the files from FlexRAN repository and move to open source github.
Priority	P3-Medium
Affected Versions	20.11
Components	5G NR Ref PHY

Title	CE RB Level task split for mmimo,
Reference #	SCSY-37833
Description	<ul style="list-style-type: none"> <li>• Enable RB task split for MMSE CE, support massiveMIMO case.</li> <li>• Remove UE&amp;layer task split because they are not feasible for MU de-occ.</li> <li>• Keep the UE group task split. Make them more flexible.</li> </ul>
Priority	P3-Medium
Affected Versions	20.11
Components	5G NR Ref PHY

Title	16 rx receiver update,
Reference #	SCSY-36005
Description	Update to add 16 Rx Stream support for PUSCH. Can decode up to 8 layers of PUSCH data per UE group.

Priority	P3-Medium
Affected Versions	20.11
Components	5G NR Ref PHY

Title	Create multi-core support for URLLC use-case,
Reference #	SCSY-36051
Description	<ul style="list-style-type: none"> <li>Add Multiple Cores for URLLC processing so single core is not blocked with lot of tasks.</li> <li>Add support for hardware offload for URLLC.</li> </ul>
Priority	P3-Medium
Affected Versions	20.11
Components	5G NR Ref PHY

Title	Enable configurable linear interpolation for tests,
Reference #	SCSY-37834, SCSY-36047
Description	<ul style="list-style-type: none"> <li>Enable xml configured linear interpolation for cell and UE specifically.</li> <li>Enable the pre-interpolation for timer mode by default.</li> </ul>
Priority	P3-Medium
Affected Versions	20.11
Components	5G NR Ref PHY

## 2.2.7 Tracking of Feature Developments for 4G NR RefPHY in Release Software v20.11

- No new features were developed for 4G LTE.

## 2.2.8 Tracking of Feature Developments for System Development Kit (SDK) in Release Software v20.11

Title	Enable mapping of PUSCH data to the same symbol with DMRS
Reference #	SCSY-34901
Description	SDK Function: lib_pusch_symbol_processing_5gnr Complete for DMRS Type 1 only. If nNrOfCDMs is set equal to 1 in L2-L1 API, the puschn symbol processing SDK library, lib_pusch_symbol_processing_5gnr, will extract data sub-carriers from DMRS symbols.
Priority	P3-Medium
Affected Versions	20.11
Components	SDK

Title	Pipeline integration: Support Frequency Offset estimation and compensation
Reference #	SCSY-36011
Description	SDK Functions: lib_pusch_focompensation_5gnr + lib_pusch_foestimation_5gnr <ul style="list-style-type: none"> <li>• FOE: Change from phase sum to phasor sum.</li> <li>• FOE: Support dual frontload DMRS use case.</li> <li>• FOE: Support negative FO value compensation.</li> <li>• Support multiple numerology, mu=0,1,3</li> </ul>
Priority	P3-Medium
Affected Versions	20.11
Components	SDK
Title	SDK: Support iFFT/FFT 512 and 2048 points
Reference #	SCSY-36032
Description	SDK Function: lib_fft_ifft Add improved precision and optimized 512 and 2048 point iFFT/FFT functions.
Priority	P3-Medium
Affected Versions	20.11
Components	SDK

Title	Symbol processing to support IRC without time domain interpolation
Reference #	SCSY-36598
Description	SDK Function: lib_pusch_irc_symbol_processing_5gnr Add optimized symbol processing function for IRC equalization.
Priority	P3-Medium
Affected Versions	20.11
Components	SDK

Title	Time domain linear interpolation in PUSCH symbol processing
Reference #	SCSY-36047
Description	SDK Function: lib_pusch_symbol_processing_5gnr Integrate time domain linear interpolation into PUSCH symbol processing.
Priority	P3-Medium
Affected Versions	20.11
Components	SDK

Title	Doppler Estimation
Reference #	SCSY-36003
Description	SDK Function: lib_cestimate_5gnr Add Doppler Estimation to PUSCH Channel Estimate
Priority	P3-Medium
Affected Versions	20.11
Components	SDK

Title	Optimization of MMSE IRC equalizer.
Reference #	SCSY-36009
Description	IRC was optimized. 1x2, 2x2, 2x4, 1x16, 2x16, 4x16 and 8x16 SDK functions. It also supports time domain interpolation.
Priority	P3-Medium
Affected Versions	20.11
Components	SDK

Title	PUCCH Compliance
Reference #	SCSY-35982
Description	SDK Function: lib_pucch_cestimate_5gnr + lib_reed_muller <ul style="list-style-type: none"> <li>Algorithms tuned for formats 1, 2, 3, 4 to get better Wireless performance (38.104)</li> <li>Reed-Muller Decoder algorithm improvement for better wireless performance</li> </ul>
Priority	P3-Medium
Affected Versions	20.11
Components	SDK

Title	Rx Stream(16) support in PUSCH
Reference #	SCSY-35978
Description	SDK Function: lib_equalization <ul style="list-style-type: none"> <li>16 receive stream-based equalization. This is used in Massive MIMO where we have more streams of data from RU being used by DU</li> <li>1x16, 2x16, 4x16, 8x16 and 16x16 SDK functions are present (Layer x Rx Stream)</li> </ul>
Priority	P3-Medium
Affected Versions	20.11
Components	SDK

## 2.2.9 Tracking of Feature Developments for xRAN/ORAN in Release Software v20.11

Title	xRAN 2020 Q2 implementation
Reference #	SCSY-34550
Description	Compression added for PRACH <ul style="list-style-type: none"> <li>Added compression / decompression for PRACH I/Q at sample app.</li> <li>Modified functions to send PRACH U-Plane with compressed I/Q.</li> </ul>
Priority	P3-Medium
Affected Versions	20.11
Components	xRAN/ORAN

Title	Fix PRACH time offset
Reference #	SCSY-37027
Description	Fix PRACH time offset measurement and fix wrong handling of prach C-plane when there are multiple occasions.
Priority	P3-Medium
Affected Versions	20.11
Components	xRAN/ORAN

Title	Application level fragmentation with small MTU
Reference #	SCSY-33831
Description	Refactoring of xran_main.c module to simplify testing <ul style="list-style-type: none"> <li>tx and rx was separated into different modules</li> <li>Call back module was added</li> <li>C-plane processing was added</li> </ul>
Priority	P3-Medium
Affected Versions	20.11
Components	xRAN/ORAN

Title	Configurable MTU Size support
Reference #	SCSY-34666
Description	MTU size changes <ul style="list-style-type: none"> <li>Memory foot print reduction</li> <li>Config files update</li> <li>Test case for M-MIMO with MTU 1500 (501)</li> </ul>
Priority	P3-Medium
Affected Versions	20.11
Components	xRAN/ORAN

Title	Fix wrong num_prbu set in U-plane packets
Reference #	SCSY-37775
Description	When number of RB is 273, it should be set to 0.
Priority	P3-Medium
Affected Versions	20.11
Components	xRAN/ORAN
Title	Fix slot_id indexing to be compliant with spec
Reference #	SCSY-37784
Description	Currently, it's assumed that slot id indexing follows ORAN spec table 5-1. However, the table 5-1 only applies when mixed-numerology is used and only applies to section type 3.
Priority	P3-Medium
Affected Versions	20.11
Components	xRAN/ORAN

Title	Optimized the U-Plane and C-Plane with bit field using unions
Reference #	SCSY-34876
Description	Use unions instead of structures to optimize access to variables.
Priority	P3-Medium
Affected Versions	20.11
Components	xRAN/ORAN

Title	SRS configuration and compression with respect to slots and symbols
Reference #	SCSY-34651
Description	<ul style="list-style-type: none"> <li>Sample app SRS init was fixed.</li> <li>Check of SRS files was fixed for master.py.</li> <li>Update SRS for 305 test case.</li> </ul>
Priority	P3-Medium
Affected Versions	20.11
Components	xRAN/ORAN

Title	Cat B profiling for scenarios on targeted platforms
Reference #	SCSY-34665
Description	Test cases has been updated: <ul style="list-style-type: none"> <li>30x - MTU 9600</li> </ul>

	<ul style="list-style-type: none"> <li>• 31X - MTU 9600 with 2xUL layer</li> <li>• 50x - MTU 1500</li> <li>• 51x - MTY 1500 with 2xUL layers</li> </ul> 3 Cells: <ul style="list-style-type: none"> <li>• 3301 - MTU 9600</li> <li>• 3311 - MTU 9600 with 2xUL layer</li> <li>• 3501 - MTU 1500</li> <li>• 3511 - MTU 1500 with 2xUL layer</li> </ul>
Priority	P3-Medium
Affected Versions	20.11
Components	xRAN/ORAN

Title	<a href="#">ECPRI 2.0 one way delay measurement support for O-RAN FHI</a>
Reference #	SCSY-37802
Description	Creation of feature development branch prior to integration. Added test cases for each of the 4 possible generation mode cases and test them with just one printf obtained one way delay results in the 6 to 12 $\mu$ s.
Priority	P3-Medium
Affected Versions	20.11
Components	xRAN/ORAN

Title	<a href="#">Fix xRAN mode DL CRC issue on mu_100Mhz with RRH</a>
Reference #	SCSY-38031
Description	Packet size for application layer fragmentation is wrong.
Priority	P3-Medium
Affected Versions	20.11
Components	xRAN/ORAN

## 2.2.10 Tracking of Feature Developments for BBU Pooling Framework in Release Software v20.11

Title	<a href="#">20.11 Test Scenario</a>
Reference #	SCSY-38616
Description	Enlarge the maximum supported cores for bbupooling to support heavy massiveMIMO case
Priority	P3-Medium
Affected Versions	20.11
Components	BBU Pooling Framework

Title	BBUPooling Task Priority setting fix
Reference #	SCSY-36573
Description	Fix the taskId idx issue if there's task affinity
Priority	P3-Medium
Affected Versions	20.11
Components	BBU Pooling Framework

## 2.3 New Features in Release Software v20.08

This section is an overview of new features added for the v20.08 software release.

### 2.3.1 New Features for 5G New Radio (NR) RefPHY in Software Release v20.08

#### Sub-6 / Sub-3:

- Add Support for running all RCT 38.104 Chapter 8 test scenarios for PUSCH and PUCCH.
- Add Support for Mount Bryce (ACC100) FEC Accelerator.
- IRC support is added, but it's disabled by default.

#### mmWave:

No new features added for mmWave in this release.

#### Massive MIMO:

- SRS processing algorithm for Massive MIMO completely redone. We are using DFT based instead of the MMSE base to reduce cycle count. Only a few sizes supported at this time.
- DL and UL beam weight calculation is now computed as one value for every two RBs.
- Massive MIMO for the Uplink pipeline was modified to add PRE tasks to do decompression.

#### UR-LLC:

- The URLLC pipeline was modified to support the ORAN mode of operation.
- SSB was added into the URLCC pipeline

#### Changes to L2 to L1 API:

- The SNR that is being reported for PUSCH and PUCCH has been changed from 1 dB steps to 1/256 dB steps. L2 divides by 256.0 to obtain reported SNR.
- API field `nNrOfCDMs` is not used to determine if data/dmrs are interleaved in dmrs symbol.
- API fields `nTxRuldx` and `nRxRuldx` are now being read for Massive MIMO scenarios to figure out which port UE is coming from or going to—currently being used for PDSCH, PDCCH, CSI-RS, and PUSCH.

#### Common:

- `Phycfg.xml` files are now split into two files.



All xRAN/ORAN related parameters have been moved to their own file to reduce complexity.

- Memory optimization for contexts was done for all channels based on use-cases.
- PDSCH, DL, CRC addition, FEC descriptor setup, and rate-matching output accumulation functions were optimized for BBDEV offload
- Support for the PDSCH data/DMRS interleaved on the same symbol.
- The added groundwork for the feature "PUSCH data/DMRS interleaved on the same symbol" - Feature not complete.
- Uplink HARQ Buffer management is upgraded to support multi-cell and multi-UE scenarios.
- 256 QAM support added to PUSCH.
- Update support kernel version to:

`3.10.0-1062.12.1.rt56.1042.el17.x86_64`

### 2.3.2 New Features for 4G LTE RefPHY in Software Release v20.08

Added Support for the Mount Bryce (ACC100) FEC Accelerator.

### 2.3.3 New Features for System Development Kit (SDK) in Software Release v20.08

- Ice Lake specific flags were added. CRC, Modulation Mapper, Scrambler, and Descrambler optimized code was also added.
- The PUSCH Channel Estimation RB Averaging tables were upgraded to support longer delay spreads and SNR ranges.
- System-level performance optimization of moving linear interpolation from CE to MMSE provided. Further enhancements are in progress, and gains will be provided in a subsequent release update.
- 256 QAM support was added to PUSCH.
- iDFT and DFT modules enhanced for SRS Channel Estimation in Massive MIMO scenario.
- DFT based SRS channel estimation added.
- Full IRC PUSCH Receiver optimized and complete.
- PUSCH MMSE Channel Estimation to support 2+2 DMRS.
- Add xRAN data formatting to DL and UL beamforming input and output.
- PUSCH MMSE Channel Estimation Algorithm improvement to enhance wireless performance
- Move IpN calculation after the 2nd round of interpolation in the PUSCH Channel estimation to enhance wireless performance.

### 2.3.4 New Features for xRAN/ORAN in Software Release v20.08

- Block floating point compression/decompression enhanced for the Ice Lake platform
- Modulation compression support added and tested with sample application-not tested in L1app pipeline
- Intel® Ethernet 800 Series (Columbiaville) support was added.

- Overhaul of the library to support many radios to many PF/VF.
  - C-plane/U-plane can be on different VFs or the same VF.
  - Each cell could be routed to a different PF VF
- Extension section Type 11 support was added for beamforming weights
- Massive MIMO 64x64 3 cell support.
- Support PDSCH (up to 16 layers), PUSCH (up to 8 layers), DL beam weights (16x64), UL beam weights (64x8), and SRS (64 Ants).
- Each O-RU can have a different configuration for RBs being used and sent, used for static C-plane configuration where the packet size and the number of RBs is pre-determined.
- Support for dynamic C-plane has been updated.
- Changes to support the URLLC test scenarios. Symbol based callback functionality was updated base on transmission/reception window configurations.

### 2.3.5 New Features for BBU Pooling Framework in Software Release v20.08

Reduce the maximum number of BBU Cores assigned per instance from 40 to 24.

### 2.3.6 Tracking of Feature Developments for 5G NR RefPHY in Release Software v20.08

Title	Wireless performance tests from 38.104
Reference #	SCSY-34645
Description	<ul style="list-style-type: none"> <li>- Modify the test_ul code to get ready to add RCT tests</li> <li>- Remove Prints from the RCT/Sweep tests</li> <li>- Remove all l1driver related code. This is now obsolete</li> <li>- Add Support for two UE Tx so that two-layer testing can begin.</li> <li>- Add results to the output file</li> <li>- Fix IQ generation issue when SNR is low. The signal was saturating. With this change, the issue is resolved, and failed tests are passing.</li> <li>- Add logic to check the UCI BLER payload for PUCCH and report DTX. Add in additional report options. Clean up Phystats for RXSDU.</li> </ul>
Priority	P3-Medium
Affected Versions	20.04
Components	5G NR Ref PHY

Title	Add Support for Mt. Bryce (ACC100) FEC Accelerator
Reference #	SCSY-34647, SCSY-35592, SCSY-29264, SCSY-35672
Description	Add Support for Mt. Bryce (ACC100) FEC Accelerator
Priority	P3-Medium

Affected Versions	20.08
Components	5G NR Ref PHY

Title	IRC integration test in pipeline
Reference #	SCSY-35632
Description	1. fix the memory align issue of IRC integration 2. modify the buffer size of Rnn 3. fix the issue of Rnn buffer allocation for different UEGroup.
Priority	P3-Medium
Affected Versions	20.08
Components	5G NR Ref PHY

Title	L1App pipeline using SRS DFT CE
Reference #	SCSY-34518
Description	Add new DFT Based Channel Estimation for SRS. The pipeline will use a new DFT based algorithm when supported DFT sizes are configured. Otherwise, the old MMSE based version will be used.
Priority	P3-Medium
Affected Versions	20.08
Components	5G NR Ref PHY

Title	Beamforming Optimization
Reference #	SCSY-35026
Description	Use SDK optimized function for beamforming.
Priority	P3-Medium
Affected Versions	20.08
Components	5G NR Ref PHY

Title	Massive MIMO Pipeline optimizations
Reference #	SCSY-34950
Description	Add CE Pre task, which does X-RAN related processing before unlocking the CE task. The CE Pre task is needed for massive MIMO where the CE task could be split into smaller tasks, and we need a single entry point to do the conversion, then start CE processing.
Priority	P3-Medium
Affected Versions	20.08
Components	5G NR Ref PHY

Title	URLLC Pipeline modified to support ORAN
Reference #	SCSY-34899
Description	Change the URLLC pipeline to take in three different types of wakeups (API/DL/UL). Add XTRAN support for URLLC Change timing for testmac and l1 for URLLC. Now the timing is just 1 mini-slot before the actual OTA symbol. Add option to disable the Control Plane for XTRAN
Priority	P3-Medium
Affected Versions	20.08
Components	5G NR Ref PHY

Title	Add SSB into URLLC pipeline
Reference #	SCSY-35651
Description	Add the SSB function to the URLLC pipeline so that the SSB can be transmitted from the URLLC Downlink pipeline.
Priority	P3-Medium
Affected Versions	20.08
Components	5G NR Ref PHY

Title	Change scaling of SNR measurement reported in PUSCH and PUCCH to L2
Reference #	SCSY-34964
Description	SNR that is being reported for PUSCH and PUCCH has been changed from 1dB steps to 1/256 dB steps. L2 will need to divide by 256.0 to obtain reported SNR
Priority	P3-Medium
Affected Versions	20.08
Components	5G NR Ref PHY

Title	Split Phycfg.xml into 2 files ( phycfg.xml and xrancfg.xml )
Reference #	SCSY-35140
Description	Separate out L1 specific information and XTRAN specific information into two files. XTRAN info is getting very complicated and requires its XML
Priority	P3-Medium
Affected Versions	20.08
Components	5G NR Ref PHY

Title	Optimize Downlink pipeline around FEC (CRC and scrambler)
Reference #	SCSY-34706, SCSY-646
Description	Replace the SDK CRC with the IPP function, remove the data copying from scrambling the path (BBDEV mode)
Priority	P3-Medium
Affected Versions	20.08
Components	5G NR Ref PHY

Title	Enable mapping of PDSCH data into the same symbol as DMRS
Reference #	SCSY-34900
Description	Check for the value of the nNrOfCDMs API field to re-calculate the number of REs available for PDSCH processing. For DMRS Type 1, a value of nNrOfCDMs = 1 means data/dmrs can be interleaved. For DMRS Type 2, values of 1 or 2 mean data/dmrs can be interleaved. Verified with test vectors that generated output can be decoded in third party software.
Priority	P3-Medium
Affected Versions	20.08
Components	5G NR Ref PHY

### 2.3.7 Tracking of Feature Development for 4G NR RefPHY in Release Software v20.08

No new features released for 4G LTE RefPHY.

Title	Add Support for Mount Bryce (ACC100) FEC Accelerator
Reference #	SCSY-34647, SCSY-35592, SCSY-29264, SCSY-35672
Description	Add Support Mount Bryce (ACC100) FEC Accelerator to 4G LTE.
Priority	P3-Medium
Affected Versions	20.08
Components	4G LTE Ref PHY

### 2.3.8 Tracking of Feature Development for SDK in Release Software v20.08

Title	Ice Lake specific flags were added. CRC, Modulation Mapper, Scrambler, and Descrambler optimized code added.
Reference #	SCSY-34690, SCSY-34682, SCSY-34673
Description	Add SNC version of CRC, Modulation Mapper, Descrambler, and Scrambler.
Priority	P3-Medium
Affected Versions	20.08
Components	SDK

Title	Performance validation for PUSCH with 38.104
Reference #	SCSY-34702
Description	Change SNR range to [-10,40), add 300ns delay spread of RB interpolation table in PUSCH Channel Estimation.
Priority	P3-Medium
Affected Versions	20.08
Components	SDK

Title	Linear interpolation in MMSE
Reference #	SCSY-35838
Description	Time interpolation of PUSCH Channel Estimation weights across different numbers of data symbols added. Support 1, 2, 3, 4, and 6 symbols interpolation. Feature not integrated into the L1APP pipeline yet.
Priority	P3-Medium
Affected Versions	20.08
Components	SDK

Title	Symbol process 256QAM demodulation
Reference #	SCSY-34513
Description	Add QAM256 demodulation to the symbol processing pipeline
Priority	P3-Medium
Affected Versions	20.08
Components	SDK

Title	DFT based SRS channel estimation added.
Reference #	SCSY-34518
Description	<ol style="list-style-type: none"> <li>1. Implement the SRS DFT CE with comb2 (64RB, 80RB, 272RB)</li> <li>2. Implement the SRS DFT CE with comb4 (64RB, 80RB, 272RB)</li> <li>3. Add test vectors with one UE, four UEs, 8UEs/Comb2, and 12UEs/Comb4 of each scenario.</li> </ol>
Priority	P3-Medium
Affected Versions	20.08
Components	SDK

Title	Full IRC PUSCH Receiver optimized and complete.
Reference #	SCSY-34631, SCSY-35008
Description	<ol style="list-style-type: none"> <li>1. make <code>irc_rnn_calculation</code> only store 1 complex per 4 RBs</li> <li>2. adjust the <code>mmse_irc</code> with the <code>rnn</code> buffer change.</li> <li>3. fix the issue of memory alignment for <code>mmse_irc</code></li> <li>4. <code>mmse_irc</code> enhancement for 1x16, 2x16, 4x16, 8x16, 4x8</li> <li>5. Add a functional case: 1/1+1dmrs 80/273 PRB</li> <li>6. Add performance case: 1/1+1dmrs 80/273 PRB</li> <li>7. change functional test criterion to -35 dB</li> <li>8. add 1dmrs case in <code>rnn</code> generation</li> </ol>
Priority	P3-Medium
Affected Versions	20.08
Components	SDK

Title	DFT/iDFT further optimization
Reference #	SCSY-34279
Description	384/192/432/216 DFT/iDFT Performance for DT
Priority	P3-Medium
Affected Versions	20.08
Components	SDK

Title	Beamforming Optimization
Reference #	SCSY-35026
Description	change format of output buffers to match to X-RAN requirements
Priority	P3-Medium
Affected Versions	20.08
Components	SDK

Title	PUSCH MMSE Channel Estimation to support 2+2 DMRS
Reference #	SCSY-34515
Description	PUSCH MMSE CE supports 2+2 DMRS

Title	PUSCH MMSE Channel Estimation to support 2+2 DMRS
Priority	P3-Medium
Affected Versions	20.08
Components	SDK

Title	Move IpN calc after 2 <sup>nd</sup> round of interpolation for better wireless performance
Reference #	SCSY-35656
Description	move IpN calc after 2nd round interpolation for better wireless performance
Priority	P3-Medium
Affected Versions	20.08
Components	SDK

### 2.3.9 Tracking of Feature Development for xRAN/ORAN in Release Software v20.08

Title	ICX Optimized BFP integration
Reference #	SCSY-34648
Description	Integrate the latest optimized version of BFP. The code is optimized for IceLake (ICX) with Sunny Cove intrinsics.
Priority	P3-Medium
Affected Versions	20.08
Components	xRAN/ORAN

Title	Adding Support of DL modulation compression.
Reference #	SCSY-34872
Description	Add DL Modulation compression to xRAN/ORAN sample app.
Priority	P3-Medium
Affected Versions	20.08
Components	xRAN/ORAN



Title	Multiple cells support for Cat B / Scalable Architecture.
Reference #	SCSY-34656
Description	Rework to be able to run multiple O-RU with multiple CC on each O-RU. Allow C-plane and U-plane to have different or the same VFs.
Priority	P3-Medium
Affected Versions	20.08
Components	xRAN/ORAN

Title	Implement support for ExtType = 11.
Reference #	SCSY-34664
Description	Add support for ExtType = 11 for flexible beamforming weights extension type.
Priority	P3-Medium
Affected Versions	20.08
Components	xRAN/ORAN

Title	ORAN FH: Customer test cases
Reference #	SCSY-34653
Description	Support customer test scenarios. 64x64, 3 cells. PDSCH (16 layers), PUSCH (8 layers), DL and UL beam weights, and SRS with BFP (64 Ants)
Priority	P3-Medium
Affected Versions	20.08
Components	xRAN/ORAN

Title	Static ORAN header preparation
Reference #	SCSY-34877
Description	Each cell can have different configs for RBs being used and sent. Used for static C-plane config where packet size and number of RBs is pre-determined
Priority	P3-Medium
Affected Versions	20.08
Components	xRAN/ORAN

Title	Support for dynamic lib build
Reference #	SCSY-35819
Description	Support for dynamic C-plane is added
Priority	P3-Medium
Affected Versions	20.08
Components	xRAN/ORAN

Title	URLLC Callback updates
Reference #	SCSY-34960
Description	Symbol Callback functionality updated. Sense of time reporting added to symbol base callbacks
Priority	P3-Medium
Affected Versions	20.08
Components	xRAN/ORAN

### 2.3.10 Tracking of Feature Development for BBU Pooling Framework in Release Software v20.08

Title	Reduce Number of BBU Cores needed per instance and increase the value of core number
Reference #	SCSY-35843
Description	Reduce the maximum numbers of cores assigned from 40 to 24. Increase the value of the core numbers, so when hyperthreading is turned on, core assignments are allowed in the 2 <sup>nd</sup> socket.
Priority	P3-Medium
Affected Versions	20.04
Components	5G NR Ref PHY

## 2.4 New Features in Release Software v20.04

This section is an overview of new features added for this release.

### 2.4.1 New Features for 5G New Radio (NR) RefPHY in Software Release v20.04

#### Sub-6 / Sub-3:

- Adjust triggering of PUSCH Channel Estimation on DMRS to improve latency by roughly 20%.
- Validate End to End testing with `sub3, mu=0`, 20 Mhz with UE test equipment in non-xRAN mode.

- Validate End to End testing with `sub6 mu=1`, 100 Mhz with commercial UE in xRAN/ORAN mode. Able to achieve attach and pass upwards of 640 mbps of data in Downlink direction and 20 mbps in Uplink direction.

#### mmWave:

- Validate End to End testing with commercial UE with xRAN/ORAN RRU.

#### Massive MIMO:

- Add Massive MIMO pipeline in Downlink direction.
- Add 32T/32R scenario for the Downlink direction.
- Add Support for 64T/64R test scenario for both directions. 4 layers per UE in DL and 2 layers per UE in UL directions. 16 total layers for DL and 8 total layers for UL.
- Increase the maximum number of UEs per group to 4 for Massive MIMO.
- Enable further tasks splitting for Channel Estimation and PUSCH symbol processing to achieve core count and latency requirements for 64T/64R.
- Add Support for DCT based channel estimation for Massive MIMO scenario into the uplink pipeline.
- For 64T/64R scenario, can support only 1 cell at nearly peak throughput. (MCS = 27 in UL)

#### UR-LLC:

- Add API to support up to 4 Mini-Slot per TTI.
- Support `mu=1` (30 kHz), TDD, 100Mhz bandwidth mini-slot

#### Changes to L2 to L1 API:

- Add `nSym` to `SNF_SlotStruct` to indicate the start symbol of the URLLC message.
- Add `nUrllcMiniSlotMask` to Config Request to indicate start symbols supported for URLLC mini-slot
- Change the definition of `nAlphaScaling` to `ULCCHUCIPDUStruct`
- Add `nChanDetected` and `nDtxDetected` fields to `ULCrcStruct`
- The change allowed range for `nNrofDLPorts` in Config Request to be 1 to 16
- Change the definition of `nTxRIdx` in `DLSCHPDUStruct` to be DL ports indexes for Massive MIMO. For the non-massive MIMO case, it should match the `nPortIndex` field.

#### Common:

- Update supported DPDK version to be the latest Long Term Support (LTS) version: DPDK 19.11
- Add 5G NR wireless channel model (tdl-a, tdl-b, tdl-c) to TestApp test coverage.
- Remove memset of the entire resource grid to save between 10% to 20% on downlink cycle count performance.
- Re-arrange pipeline to reduce bbu pooling overhead for both massive MIMO and non-massive MIMO scenarios.
- DTX detection for PUSCH and PUCCH format 0, 2.
- Add timing offset calculation and compensation for PUCCH Format 2
- Add PRACH threshold configuration through `phycfg.xml`

- Add offline Linux tool to convert from frequency domain to time domain. The application is located in misc/tools/fft\_ifft.
- Add offline Linux tool to calculate transport block size. The application is located in misc/tools/tb\_size\_5gnr.

## 2.4.2 New Features for 4G LTE RefPHY in Software Release v20.04

### Common:

- Update supported DPDK version to be the latest Long Term Support (LTS) version: DPDK v19.11.

## 2.4.3 New Features for System Development Kit (SDK) in Software Release v20.04

- Add layer-based SNR estimation to 5G NR Channel Estimation.
- Enhance channel estimation 4RB sinc interpolation method to support more delay spreads.
- Add 64x16 (for DL) and 8x64 (for UL) Zero Forcing Beam Weight Generation for Massive MIMO.
- Add PUSCH DCT Based MMSE channel estimation (8x8) for Massive MIMO
- PUCCH Format 1 and 3 Frequency offset measurement.
- Add 64 Antenna support for SRS Channel Estimate.
- Enhance SRS channel estimate to support different interpolation methods
- Add an 8x8 scenario to PUSCH Symbol Processing Function.
- Add 1728 point DFT/iDFT.

## 2.4.4 New Features for xRAN/ORAN in Software Release v20.04

- Add profile and Support for LTE.
- Add Support for the 32x32 massive MIMO scenario. Up to 2 cells demo showed with testmac
- mmWave RRH integration. Address regression from the previous release.
- Integrate block floating-point compression/decompression.
- Enhance C-plane for the Category B scenario.

## 2.4.5 Tracking of Feature Developments for 5G NR RefPHY in Release Software v20.04

Title	Module and pipeline optimization for PUSCH 64Ant processing
Reference #	SCSY-34207
Description	Adjust triggering of PUSCH channel estimation upon arrival of DMRS symbols to improve latency. Add more task splitting to utilize more cores to improve latency time.
Priority	P3-Medium
Affected Versions	20.04

Title	Module and pipeline optimization for PUSCH 64Ant processing
Components	5G NR Ref PHY

Title	Radio related fixes
Reference #	SCSY-34580
Description	Address issues found in the end to end testing for sub3, sub6, and mmWave.
Priority	P3-Medium
Affected Versions	20.04
Components	5G NR Ref PHY

Title	Pipeline for 16 layers Downlink PDSCH, Massive MIMO (4 UEs per group, 4 layers each)
Reference #	SCSY-33705
Description	Add Massive MIMO pipeline in Downlink direction. Add 32T/32R and 64T/64R scenarios. Increase the number of UEs per group to be 4.
Priority	P3-Medium
Affected Versions	20.04
Components	5G NR Ref PHY

Title	PUSCH Massive MIMO Pipeline performance optimization
Reference #	SCSY-33702
Description	Enable further tasks splitting for Channel Estimation and PUSCH symbol processing to achieve core count and latency requirements for 64T/64R.
Priority	P3-Medium
Affected Versions	20.04
Components	5G NR Ref PHY

Title	DCT based PUSCH CE for 8x8
Reference #	SCSY-34397
Description	Integrate DCT ( Discrete Cosine Transform ) channel estimation algorithm for the Massive MIMO test scenario into the PUSCH pipeline.
Priority	P3-Medium
Affected Versions	20.04
Components	5G NR Ref PHY

Title	API changes and implementation for URLLC
Reference #	SCSY-34051
Description	Add API support for up to 4 mini-slot occurrences per TTI. Add $\mu=1$ , 100 MHz mini-slot support
Priority	P3-Medium
Affected Versions	20.04
Components	5G NR Ref PHY

Title	Move FlexRAN to DPDK-19.11
Reference #	SCSY-29346
Description	Update supported DPDK version to be the latest Long Term Support (LTS) version: DPDK v19.11
Priority	P3-Medium
Affected Versions	20.04
Components	5G NR Ref PHY

Title	Enhance Wireless Performance Testing for TestAPP
Reference #	SCSY-33944
Description	Add 5G NR wireless channel model (tdl-a, tdl-b, tdl-c) to TestApp test coverage.
Priority	P3-Medium
Affected Versions	20.04
Components	5G NR Ref PHY

Title	DL Reset Optimization
Reference #	SCSY-33856
Description	Remove memset of the entire resource grid to save between 10% to 20% on downlink cycle count performance.
Priority	P3-Medium
Affected Versions	20.04
Components	5G NR Ref PHY

Title	L1 DTX Detection – Customer Request
Reference #	SCSY-33941
Description	DTX detection for PUSCH and PUCCH format 0, 2.
Priority	P3-Medium

Title	L1 DTX Detection – Customer Request
Affected Versions	v20.04
Components	5G NR Ref PHY

Title	Timing offset estimation for PUCCH Format 2
Reference #	SCSY-32455
Description	Add timing offset calculation and compensation for PUCCH Format 2
Priority	P3-Medium
Affected Versions	v20.04
Components	5G NR Ref PHY

Title	Changes in PRACH SDK to take in noise Threshold value as input
Reference #	SCSY-34440
Description	Add PRACH threshold configuration through phycfg.xml
Priority	P3-Medium
Affected Versions	v20.04
Components	5G NR Ref PHY

Title	Update 5GNR Convert fft/iff program
Reference #	SCSY-12723
Description	Add offline Linux tool to convert from frequency domain to time domain.
Priority	P3-Medium
Affected Versions	v20.04
Components	5G NR Ref PHY

Title	5GNR Test application to determine Transport block sizes
Reference #	SCSY-19393
Description	Add offline Linux tool to calculate PDSCH/PUSCH transport block size
Priority	P3-Medium
Affected Versions	v20.04
Components	5G NR Ref PHY

## 2.4.6 Tracking of Feature Development for 4G NR RefPHY in Release Software v20.04

Title	Move FlexRAN to DPDK-19.11
Reference #	SCSY-29346
Description	Update supported DPDK version to be the latest Long Term Support (LTS) version: DPDK 19.11
Priority	P3-Medium
Affected Versions	20.04
Components	4G NR Ref PHY

## 2.4.7 Tracking of Feature Development for SDK in Release Software v20.04

Title	Layer based PUSCH SNR Estimation and Channel Estimation enhancement
Reference #	SCSY-33547
Description	1. Add layer-based SNR estimation to 5G NR Channel Estimation. 2. Enhance channel estimation 4RB sinc interpolation method to support more delay spreads.
Priority	P3-Medium
Affected Versions	20.04
Components	SDK

Title	ZF Weight generation enhancement for 64 ants
Reference #	SCSY-33695
Description	Add 64x16 (for DL) and 8x64 (for UL) Zero Forcing Beam Weight Generation for Massive MIMO
Priority	P3-Medium
Affected Versions	20.04
Components	SDK

Title	DCT (Discrete Cosine Transform) based PUSCH CE for 8x8
Reference #	SCSY-34274
Description	Add PUSCH DCT Based MMSE channel estimation (8x8) for Massive MIMO
Priority	P3-Medium
Affected Versions	20.04
Components	SDK



Title	PUCCH Frequency Offset compensation for Format 1 and 3
Reference #	SCSY-33939
Description	PUCCH Format 1 and 3 Frequency offset measurement
Priority	P3-Medium
Affected Versions	20.04
Components	SDK

Title	SDK SRS Channel Estimation
Reference #	SCSY-33823
Description	1. Add 64 Antenna support for SRS Channel Estimate. 2. Enhance SRS channel estimate to support different interpolation methods
Priority	P3-Medium
Affected Versions	20.04
Components	SDK

Title	8x8 symbol processing module coding and optimization
Reference #	SCSY-33862
Description	Add an 8x8 scenario to PUSCH Symbol Processing Function.
Priority	P3-Medium
Affected Versions	20.04
Components	SDK

Title	DFT/iDFT 1728 points implementation for PUSCH
Reference #	SCSY-34376
Description	Add 1728 point DFT/iDFT.
Priority	P3-Medium
Affected Versions	20.04
Components	SDK

## 2.4.8 Tracking of Feature Development for xRAN/ORAN in Release Software v20.04

Title	ORAN FH support for LTE
Reference #	SCSY-33828
Description	Add profile and Support for LTE
Priority	P3-Medium
Affected Versions	20.04
Components	xRAN/ORAN

Title	Optimization of C-Plane for Cat B
Reference #	SCSY-33825
Description	1. Add Support for the 32x32 massive MIMO scenario. Up to 2 cells demo showed with testmac 2. Enhance C-plane for Category B scenario
Priority	P3-Medium
Affected Versions	20.04
Components	xRAN/ORAN

Title	RRH mmWave Vendor integration work (Q1)
Reference #	SCSY-29167
Description	mmWave RRH integration. Address regression from the previous release.
Priority	P3-Medium
Affected Versions	20.04
Components	xRAN/ORAN

Title	Integration and optimization of Block Floating point compression and decompression
Reference #	SCSY-13137
Description	Integrate block floating-point compression/decompression.
Priority	P3-Medium
Affected Versions	20.04
Components	xRAN/ORAN

## 2.5 New Features in Release Software v20.02

This section is an overview of new features added for this release.

### 2.5.1 New Features for 5G New Radio (NR) RefPHY in Software Release v20.02

#### Sub-6 / Sub-3:

- Support for  $\mu=1$ , 40 Mhz.
- IRC
- Support End to End integration with commercial UE with xRAN/ORAN RRU

#### mmWave:

- Support End to End integration with commercial UE with xRAN/ORAN RRU.

#### Massive MIMO:

- Massive MIMO in Uplink Direction only.
  - Support for TDD  $\mu=1$ , 100 Mhz (32T/32R), 4 layers Uplink
- Beamforming calculation through SRS
- Add a new pipeline for SRS under the Massive MIMO scenario.
- Update Uplink pipeline for Massive MIMO scenario
- Enable Multi-User MIMO for PUSCH

#### UR-LLC:

- Mini-Slot (2, 4 symbols)
- UR-LLC Priority w/ Preemption
- Support FDD, MiniSlot
- Support  $\mu=1$  (30 kHz)

#### Changes to L2 to L1 API:

- Add `nNrOfDlPorts` and `nNrOfUlPorts` to Config Request.
- Add `nPrachNrofRxRU` to Config Request
- Add `nGroupId` to `ULCCHUCIPDUstruct`
- Add `nID` field to `DCIPDUstruct`
- Add `nUllcCapable` to Config Request
- Add `nTimeStamp` to `MAC2PHY_QUEUE_EL`

#### Common:

- Support the PDSCH symbol processing split to allow us to run on more cores in parallel.
- Adding more statistics to phystats to help debug the TM500\* Network Tester and User Equipment (UE) issues.
- Add scripts to run refPHY in Docker\* containers, Kubernetes\* clusters, Multus\*, and Data Plane Development Kit-Single-Root Input/Output Visualization (DPDK-SRIOV) plugin.

- Allow Simultaneous running of Software Low-Density Parity Check (LDPC) encoder/decoder and N3000 hardware FPGA LPDC encoder/decoder through BBDEV interface.
- PUCCH Format 1 DTX Detection.
- PUCCH Intra-Slot is hopping for Format 1,3 and 4.
- The timing offset estimation and compensation for PUCCH Format 3.
- Add AWGN and LTE wireless channel testing for  $\mu=0$  scenario with Test Application.
- Integrate new BBU Pooling APIs
- Split LDPC software uplink processing to allow us to run on more cores.
- Add the NID field for PDCCH to API.

## 2.5.2 New Features for 4G LTE RefPHY in Software Release v20.02

- Increase payload length for Viterbi decoder from 92 bits to 504 bit
- Add 4G Regents Competency Test (RCT) Downlink testing to testmac

### Changes to L2 to L1 API:

- Increase the `cqi_pmi_pt` field from 8 bits to 16 bits in `RX_CQIRIHI_STATUS_EVENT`
- Increase the `status_len` field from 4 bits to 6 bits in `RX_CQIRIHI_STATUS_EVENT`
- The overall size of `RX_CQIRIHI_STATUS_EVENT` increases from 32 bits to 64 bits
- Increase `nr1CQI` and `nrg1CQI` fields from 8 bits to 16 bits in `PUSCHDED`
- The overall size of `PUSCHDED` increases from 64 bits to 96 bits

## 2.5.3 New Features for System Development Kit (SDK) in Software Release v20.02

- Downlink precoding fixed-point processing precision improvement.
- Support flexible Log-Likelihood Ratio (LLR) output scaling in PDSCH symbol processing.
- New Software LDPC Decoder implementation.
- 5G NR Timing Offset estimation and compensation for Physical Uplink Control Channel (PUCCH) Format 3.
- 5G NR Physical Uplink Shared Channel (PUSCH) Frequency offset estimation and compensation.
- Add Support for 4x4 Multi-user MIMO (2 UEs) to PUSCH symbol processing.
- Intra slot frequency hopping for PUCCH format1, format3, and format4.
- Add IRC support for 4x4, 2x4, and 1x4 scenarios.
- Improve DFT/iDFT quantization noise.
- Massive MIMO Beamforming Downlink matrix expansion.
- Extend De-rate matching function to support larger E sizes.
- Massive MIMO SRS Channel Estimation.
- Massive MIMO Zero-Forcing Enhancement

- 1 RxAnt Support for PUCCH Channel Estimation

## 2.5.4 New Features for xRAN/ORAN in Software Release v20.02

- Add scripts to run refPHY in Docker\* containers, Kubernetes\* clusters, Multus\*, and Data Plane Development Kit-Single-Root Input/Output Visualization (DPDK-SRIOV) plugin.
- Integration and optimization of block floating-point compression and decompression.
- Category B support
- Add Support for alpha and beta value when calculating SFN based on GPS time.
- Support End to End integration with commercial UE with xRAN/ORAN RRU for both mmWave and sub-6 scenarios.

## 2.5.5 New Features for BBU Pooling Framework for Release Software v20.02

- Add API to support the ability to generate multiple tasks of the same type for each subframe number.
- Add thread names for l1app and testmac so that they can easily be seen when running "top".
- Create a Destroy function so that framework can be adequately reset and restarted again.

## 2.5.6 Tracking of Feature Developments for 5G NR RefPHY in Release Software v20.02

Title	Upgrade GNB Phystats
Reference #	SCSY-30829
Description	Adding more statistics to the phystats to help to debug with TM500 and UE issues
Priority	P3-Medium
Affected Versions	19.10
Components	5G NR Ref PHY

Title	Kubernetes Setup for xRAN Lib
Reference #	SCSY-12569
Description	Create and test with Docker containers, Kubernetes cluster, Multus, and DPDK-SRIOV plugin.
Priority	P3-Medium
Affected Versions	19.10
Components	xRAN/ORAN/5G NR Ref PHY

Title	Add support for mu=1, 40 Mhz
Reference #	SCSY-30969
Description	Add Support for mu=1, 40 MHz, and add test case for validation.

Title	Add support for mu=1, 40 Mhz
Priority	P3-Medium
Affected Versions	19.10
Components	5G NR Ref PHY

Title	Integrate IRC Algorithm into 5G NR Pipeline
Reference #	SCSY-31024
Description	Integrate IRC SDK related functions and capabilities into the 5G NR RefPHY pipeline.
Priority	P3-Medium
Affected Versions	19.10
Components	5G NR Ref PHY

Title	Add AWGN Noise Model and LTE Wireless Channels into 5G NR Test Application
Reference #	SCSY-30993
Description	Add AWGN noise and LTE wireless channel models into 5G NR Test application to run wireless performance tests on mu=0 test cases.
Priority	P3-Medium
Affected Versions	19.10
Components	5G NR Ref PHY

Title	Simultaneous FPGA and Software LDPC Enqueue / Dequeue with BBDEV
Reference #	SCSY-31628
Description	Allow simultaneous running of HW FPGA and SW LPDC with the BBDEV interface.
Priority	P3-Medium
Affected Versions	19.10
Components	5G NR Ref PHY

Title	Merge Changes from ORAN Plugfest Integration with Commercial xRAN/ORAN Sub6 RRH
Reference #	SCSY-32102
Description	Support of commercial Sub6 xRAN/ORAN RRH.
Priority	P3-Medium
Affected Versions	19.10

Title	Merge Changes from ORAN Plugfest Integration with Commercial xRAN/ORAN Sub6 RRH
Components	xRAN/ORAN/5G NR Ref PHY

Title	Commercial xRAN/ORAN RRH Support for mmWave
Reference #	SCSY-29167
Description	Support for commercial mmWave xRAN/ORAN RRH
Priority	P3-Medium
Affected Versions	19.10
Components	xRAN/ORAN/5G NR Ref PHY

Title	PUCCH Format 1 DTX Detection
Reference #	SCSY-28947
Description	Add an algorithm to detect DTX for PUCCH Format 1
Priority	P3-Medium
Affected Versions	19.10
Components	5G NR Ref PHY

Title	PUCCH Intra Slot Hopping for Format 1, 3, 4
Reference #	SCSY-30777
Description	Add Support and merge PUCCH Intra Slot hopping for Format 1, 3, 4 into a pipeline
Priority	P3-Medium
Affected Versions	19.10
Components	5G NR Ref PHY

Title	Timing Offset and Compensation for PUCCH Format 3
Reference #	SCSY-13170
Description	Add Support for TA measurement and compensation for PUCCH Format 3.
Priority	P3-Medium
Affected Versions	19.10
Components	5G NR Ref PHY

Title	Integrate New BBU Pooling APIs.
Reference #	SCSY-31049
Description	New BBU Pooling APIs unlock multiple cells from a single call. This helps reduce the number of overall calls to BBUPool APIs.
Priority	P3-Medium
Affected Versions	19.10
Components	5G NR Ref PHY

Title	Split Software LDPC Encoder/Decoder BBU Task to Run on Several Cores
Reference #	SCSY-31050
Description	Split LDPC FEC encoder/decoder into more tasks so that they can be run in parallel on multiple cores.
Priority	P3-Medium
Affected Versions	19.10
Components	5G NR Ref PHY

Title	Simultaneous FPGA and Software LDPC Enqueue/Dequeue with BBDEV
Reference #	SCSY-31628
Description	Allow simultaneous running of HW FPGA and SW LPDC with the BBDEV interface.
Priority	P3-Medium
Affected Versions	19.10
Components	5G NR Ref PHY

Title	Add the NID Field to L2 to L1 API for PDCCH.
Reference #	SCSY-31608
Description	Add the NID field from the standard for PDCCH so that it is not limited to equal CellID.
Priority	P3-Medium
Affected Versions	19.10
Components	5G NR Ref PHY

Title	Add Support for Massive MIMO in the Uplink Direction
Reference #	SCSY-32220, SCSY-30931, SCSY-30934, SCSY-32443
Description	Optimize internal refphy PUSCH data structures so that they are better suited for Massive MIMO. Add fields to L2 to L1 API for Massive MIMO. Support mu=1, 100 MHz, (32T/32R), 4 layers in Uplink.



Title	Add Support for Massive MIMO in the Uplink Direction
Priority	P3-Medium
Affected Versions	19.10
Components	5G NR Ref PHY

Title	Add New Pipeline for SRS Under Massive MIMO Scenario
Reference #	SCSY-31563, SCSY-31662, SCSY-32101, SCSY-31045
Description	Create new BBU tasks for SRS under the Massive MIMO scenario. Isolate all SRS tasks to the specified core and allow up to 3 TTIs for the task to complete.
Priority	P3-Medium
Affected Versions	19.10
Components	5G NR Ref PHY

Title	Beamforming Calculations from SRS under Massive MIMO Scenario
Reference #	SCSY-31662, SCSY-32385, SCSY-31638
Description	Calculate beam weights from the SRS channel estimate and expand to the correct matrix size for the Downlink Direction.
Priority	P3-Medium
Affected Versions	19.10
Components	5G NR Ref PHY

Title	Change PUSCH Uplink Pipeline to Support Massive MIMO Scenario.
Reference #	SCSY-32393
Description	Task splitting of the PUSCH when the Massive MIMO scenario has been set.
Priority	P3-Medium
Affected Versions	19.10
Components	5G NR Ref PHY

Title	Enable Multi-User MIMO PUSCH Support in Uplink Direction (MU-MIMO)
Reference #	SCSY-31572
Description	Add Support for multi-user MIMO for PUSCH in the uplink direction. Loop through users in each group to determine which UEs are of the MU-MIMO variety.
Priority	P3-Medium

Title	Enable Multi-User MIMO PUSCH Support in Uplink Direction (MU-MIMO)
Affected Versions	19.10
Components	5G NR Ref PHY

Title	Create URLLC Thread for l1app
Reference #	SCSY-31641, SCSY-31640
Description	Add field to L2 to L1 API to indicate URLLC support. Create a separate thread to handle all URLLC processing separate from the standard refphy L1 BBU Pooling thread.
Priority	P3-Medium
Affected Versions	19.10
Components	5G NR Ref PHY

## 2.5.7 Tracking of Feature Development for 4G NR RefPHY in Release Software v20.02

Title	Upgrade Viterbi Decoder to Support Larger Payloads
Reference #	SCSY-32469
Description	Viterbi Decoder upgraded to support more than 400 bits of output
Priority	P3-Medium
Affected Versions	19.10
Components	4G NR Ref PHY

Title	Upgrade Viterbi Decoder to Support Larger Payloads
Reference #	SCSY-32469
Description	Viterbi Decoder upgraded to support more than 400 bits of output
Priority	P3-Medium
Affected Versions	19.10
Components	4G NR Ref PHY

Title	Add 4G RCT Downlink Testing to testmac
Reference #	SCSY-7673
Description	Add Downlink RCT test cases so that testmac can now run them. Allows customers to use testmac to test chapter 6 of 3GPP 36.104 and 3GPP 36.141.

Title	Add 4G RCT Downlink Testing to testmac
Priority	P3-Medium
Affected Versions	19.10
Components	4G NR Ref PHY

## 2.5.8 Tracking of Feature Development for SDK in Release Software v20.02

Title	LDPC Decoder SDK Improvement and Profiling
Reference #	SCSY-29150
Description	New SDK implementation has some throughput improvement expected. Currently, review full functional and throughput coverage in at SDK and BBDEV level. At least 20% cycle count improvement from various testmac test cases.
Priority	P3-Medium
Affected Versions	19.10
Components	SDK

Title	5G GNR Time Offset Estimation and Compensation for PUCCH Format 3
Reference #	SCSY-13170
Description	Time offset estimation and compensation in PUCCH Format 3. TO estimate should be calculated when the following conditions are met: Format 3 <ul style="list-style-type: none"> <li>• When 1 DMRS symbol is used, at least 3 PRB's are allocated</li> <li>• When 2 or 4 DMRS symbols are used, at least 2 PRB's are allocated.</li> </ul>
Priority	P3-Medium
Affected Versions	19.10
Components	SDK

Title	5G NR PUSCH FO Estimation and Compensation Based on Additional DMRS Configuration
Reference #	SCSY-13168
Description	FO estimate should be calculated when the following conditions are met: <ul style="list-style-type: none"> <li>• Single-symbol DMRS configuration used</li> <li>• DMRS-Additional Position = 1 or 2</li> <li>• At least one additional DMRS symbol available</li> </ul> FO compensation based on FO value provided as an input parameter
Priority	P2-High

Title	5G NR PUSCH FO Estimation and Compensation Based on Additional DMRS Configuration
Affected Versions	19.10
Components	SDK

Title	PUSCH Symbol Processing 4x4 MU(2UEs), Task Split by RBs, and LLR Demapping Optimization
Reference #	SCSY-31034, SCSY-31036, SCSY-31555
Description	<ul style="list-style-type: none"> <li>• Add Support for Multi-User MIMO 4x4 scenario (2UEs)</li> <li>• Support for RB level split for 4x4 MU-MIMO scenario (2UEs)</li> <li>• Make LLR demapping output symmetrical (127, -127).</li> <li>• Change LLR dynamic scaling.</li> </ul>
Priority	P2-High
Affected Versions	19.10
Components	SDK

Title	Support flexible Log-Likelihood Ratio (LLR) output scaling in PUSCH Symbol Processing
Reference #	SCSY-31033
Description	Add Support to allow output scaling of LLRs to come from phycfg.xml configuration file
Priority	P3-Medium
Affected Versions	19.10
Components	SDK

Title	Downlink precoding fixed-point processing precision improvement.
Reference #	SCSY-26570
Description	Improve dynamic range and fixed point precision of Downlink Precoder.
Priority	P2-High
Affected Versions	19.10
Components	SDK

Title	PUCCH Format 3 and 4 Intra Slot Frequency hopping
Reference #	SCSY-30777
Description	Add Support to PUCCH Channel Estimation for Intra slot frequency hopping for Format 3 and 4.
Priority	P2-High

Title	PUCCH Format 3 and 4 Intra Slot Frequency hopping
Affected Versions	19.10
Components	SDK

Title	MMSE-IRC for 1x4, 2x4 and 4x4 Scenarios
Reference #	SCSY-29149
Description	Add Support for MMSE-IRC for 1x4, 2x4, and 4x4 scenarios.
Priority	P2-High
Affected Versions	19.10
Components	SDK

Title	DFT/iDFT Quantization Noise Improvement
Reference #	SCSY-30999
Description	Improve the quantization noise of DFT/iDFT
Priority	P2-High
Affected Versions	19.10
Components	SDK

Title	Multi-User MIMO Channel Estimation (4x4) 2 UEs
Reference #	SCSY-31025
Description	Modify 5G NR channel estimation to support the Multi-User MIMO 4x4 (2UEs) scenario.
Priority	P2-High
Affected Versions	19.10
Components	SDK

Title	Beamforming Downlink Matrix Expansion. (Massive MIMO)
Reference #	SCSY-31560
Description	Expand beamforming weights found from SRS Massive MIMO scenario to the proper matrix size for the Downlink direction.
Priority	P2-High
Affected Versions	19.10
Components	SDK

Title	SRS Channel Estimate for Massive MIMO
Reference #	SCSY-12890, SCSY-31562
Description	<ul style="list-style-type: none"> <li>• New Channel Estimation algorithm for SRS in the Massive MIMO the scenario.</li> <li>• Add Resource block averaging to the SRS channel estimate.</li> </ul>
Priority	P2-High
Affected Versions	19.10
Components	SDK

Title	Enhance the ZF (Zero Forcing) Algorithm for Massive MIMO
Reference #	SCSY-29106
Description	Add Support for different layers (1 -> 8). Add scaling factor for output and separate DL and UL.
Priority	P2-High
Affected Versions	19.10
Components	SDK

Title	Add 1 RxAnt Support for PUCCH Channel Estimate
Reference #	SCSY-30841
Description	Add Support for 1 RxAnt to PUCCH channel estimate
Priority	P2-High
Affected Versions	19.10
Components	SDK

Title	Extend of De-Rate Matching Function for Larger E Size.
Reference #	SCSY-32451
Description	Update the 5GNR De-Rate matching function to support larger sizes of E. (up to 128kb).
Priority	P2-High
Affected Versions	19.10
Components	SDK

## 2.5.9 Tracking of Feature Development for xRAN/ORAN in Release Software v20.02

Title	Kubernetes Setup for xRAN lib
Reference #	SCSY-12569
Description	Create and test with Docker containers, Kubernetes cluster, Multus, and DPDK-SRIOV plugin.
Priority	P3-Medium
Affected Versions	19.10
Components	xRAN/ORAN/5G NR Ref PHY

Title	Integration and Optimization of Block Floating Point Compression and Decompression
Reference #	SCSY-13137
Description	<ul style="list-style-type: none"> <li>• Integration into U-plane</li> <li>• Optimize BFP code.</li> <li>• Support 6-9 bits as per IODT profiles.</li> </ul>
Priority	P3-Medium
Affected Versions	19.10
Components	xRAN/ORAN

Title	xRAN Category B support
Reference #	SCSY-13284
Description	Add Category B support
Priority	P3-Medium
Affected Versions	19.10
Components	xRAN/ORAN

Title	Enable Using Alpha and Beta when Calculating SFN Based on GPS Time
Reference #	SCSY-29169
Description	<ul style="list-style-type: none"> <li>• Integration into U-plane</li> <li>• Optimize BFP code.</li> <li>• Support 6-9 bits as per IODT profiles.</li> </ul>
Priority	P3-Medium
Affected Versions	19.10
Components	xRAN/ORAN

Title	xRAN Support End to End Setup with xRAN/ORAN Radio.
Reference #	SCSY-32102
Description	Add to attach to commercial UE with xRAN/ORAN RRU
Priority	P3-Medium
Affected Versions	19.10
Components	xRAN/ORAN

## 2.6 Tracking of Feature Development for BBU Pooling Framework in Release Software v20.02

Title	Single API to Generate Multiple Tasks of the Same Type in Each Subframe
Reference #	SCSY-30522
Description	Added the API to generate multiple tasks of the same type in a subframe.
Priority	P3-Medium
Affected Versions	19.10
Components	Framework

Title	Add Names of l1app and testmac Threads.
Reference #	SCSY-31574
Description	Add names to l1ap and testmac threads so that they can easily be tracked and found when running "top".
Priority	P3-Medium
Affected Versions	19.10
Components	Framework

Title	Create a Destroy Function for the bbu Pooling Framework
Reference #	SCSY-32445
Description	Create a destroy function so that BBU Pooling can be stopped and restarted without any memory leak issues. Reset all global variables to the initial state.
Priority	P3-Medium
Affected Versions	19.10
Components	Framework



## 2.7 New Features in Release Software v19.10

This section is an overview of new features added for release v19.10.

### 2.7.1 New Features for 5G New Radio (NR) RefPHY in Software Release v19.10

#### Sub-6 / Sub-3:

- The testing methodology was changed to make timer mode look more like radio mode
- Remove dynamic memory allocation and do pointer manipulation on a flat buffer instead
- Memory optimizations to reduce overall size for l1app to < 10 GB
- Pipeline task splitting into smaller jobs to better parallelization
- Improve Minimum Mean Squared Error (MMSE) and Channel Estimation algorithms for PUCCH Format 3 to match link-level simulation
- Improve Discontinuous Transmission (DTX) detection for PUCCH Format 2, 3, and 4 to match link-level simulation
- Cycle count optimization for PUCCH Format 0 and 1
- Update PUSCH LLR de-mapper scaling algorithm to match link-level simulation
- Increase the number of LDPC encoders in Terasic\* FPGA to improve overall latency
- Optimize rate matching to reduce resource utilization and latency in Terasic FEC FPGA
- Support short sequence Physical Random Access Channel (PRACH) processing with sub6 on Terasic FH FPGA
- Lte-CRS-ToMatchAround feature for  $\mu=0$ , 5 MHz, 10 MHz, 20 MHz
- Enable Vista Creek running with 5G NR test application
- Check FPGA versions to ensure the correct version is being used for this release.

#### mmWave:

No new updates made.

#### Common:

- Vista Creek 5G NR Alpha Integration
- Physical Function Control Application update for 5G NR Vista Creek
- Hybrid ARQ (HARQ) combining enabled for Vista Creek 5G NR

### 2.7.2 New Features for SDK in Software Release v19.10

- Discrete Fourier Transform/inverse Discrete Fourier Transform (DFT/iDFT) optimization for all valid uplink sizes including 1296, 1440, 1536, 1632
- Update PUSCH LLR de-mapper scaling algorithm to match link-level simulation
- Optimization of PUSCH symbol processing module
- Minimum Mean Square Error - Interference Rejection Combining (MMSE-IRC) module for 1x2 and 2x2 scenarios

- Zero Forcing Matrix Generation
- Massive Multiple Input Multiple Output (MIMO) SRS channel estimations
- 5G NR Zadoff Chu (ZC) sequence generation
- Implement AVX2 version of PDCCH ReMapping
- Optimize LDPC Encoder SDK\* module
- Enable build of all FEC modules for any build options
- Improve MMSE and Channel Estimation algorithms for PUCCH Format 3 to match link-level simulation
- Improve DTX detection for PUCCH Format 2, 3, and 4 to match link-level simulation.

### 2.7.3 New Features for xRAN/ORAN in Software Release v19.10

#### xRAN/ORAN:

- xRAN library enhancements to cover more use cases
- Move xRAN/ORAN library to open source
- Support for beam index (analog beamforming)
- C-Plane update for beamforming for Massive MIMO 32T32R
- An optimized version of BFP (Block Floating Point) (8 bits)
- Vista Creek as Front Haul integration
- O-RU integration (mmWave, Sub6-100)
- Integrated all components with Cloud Native (K8S\*/N3000/LDPC/xRAN).
- C-Plane interface to xRAN for Category A
- BBDev\* compile option now working with xRAN library.

### 2.7.4 Tracking of Feature Development for 5G NR RefPHY in Release Software v19.10

Title	Optimize Memory Usage for L1 Code
Reference #	SCSY-19447
Description	Reduce Memory Usage for L1 code
Priority	P3-Medium
Affected Versions	19.06
Components	5G NR Ref PHY

Title	Optimizing the Memory Management
Reference #	SCSY-12665
Description	Remove dynamic memory allocations and use flat buffer instead

Priority	P3-Medium
Affected Versions	19.06
Components	5G NR Ref PHY

Title	<a href="#">Change testmac Timer Mode Timing to Follow Radio Mode</a>
Reference #	SCSY-13393
Description	Change DL and UL processing for timer mode so that it resembles radio mode.
Priority	P3-Medium
Affected Versions	19.06
Components	5G NR Ref PHY

Title	<a href="#">Pipeline Optimization</a>
Reference #	SCSY-26473
Description	Optimize PUSCH and PUCCH pipeline
Priority	P3-Medium
Affected Versions	19.06
Components	5G NR Ref PHY

Title	<a href="#">Lte-CRS-ToMatchAround Feature for 5G NR</a>
Reference #	SCSY-26486
Description	Development of feature where 4G LTE Cell is being transmitted concurrently on mu=0 5G NR carrier.
Priority	P3-Medium
Affected Versions	19.06
Components	5G NR Ref PHY

Title	<a href="#">HARQ Enabling for Vista Creek</a>
Reference #	SCSY-26539
Description	Integrate HARQ combining in the uplink direction with Vista Creek
Priority	P3-Medium
Affected Versions	19.06
Components	5G NR Ref PHY

Title	<a href="#">Check the FPGA Version Numbers in FlexRAN for Correctness</a>
Reference #	SCSY-19431
Description	Check the FPGA version to make sure the correct version is being used.
Priority	P3-Medium
Affected Versions	19.06
Components	5G NR Ref PHY

Title	<a href="#">Add Format 4 Computing Performance</a>
Reference #	SCSY-13248
Description	Add PUCCH Format 4 computing performance
Priority	P3-Medium
Affected Versions	19.06
Components	5G NR Ref PHY

Title	<a href="#">Update PUCCH Algorithms</a>
Reference #	SCSY-12783
Description	Align PUCCH F0, F1, and F2 algorithm with link-level simulation.
Priority	P3-Medium
Affected Versions	19.06
Components	5G NR Ref PHY

Title	<a href="#">PUCCH Format 3 Pipeline</a>
Reference #	SCSY-13243
Description	Optimize PUCCH Format 3 processing
Priority	P3-Medium
Affected Versions	19.06
Components	5G NR Ref PHY

Title	<a href="#">Enable VC 5G NR with TestApp</a>
Reference #	SCSY-13172
Description	Changes made to make Vista Creek run with 5G NR TestApp
Priority	P3-Medium

Title	Enable VC 5G NR with TestApp
Affected Versions	19.06
Components	5G NR Ref PHY

Title	Decrease DL FEC Delay
Reference #	SCSY-19402
Description	Increase the number of LDPC Encoders in Terasic FPGA to improve overall latency. Optimize rate matching. (Sub6)
Priority	P3-Medium
Affected Versions	19.06
Components	5G NR FPGA

Title	PRACH Validation in RH with Customer RRH
Reference #	SCSY-12869
Description	Support short sequence PRACH Processing (Sub6)
Priority	P3-Medium
Affected Versions	19.06
Components	5G NR FPGA

## 2.7.5 Tracking of Feature Development for SDK in Release Software v19.10

Title	Profiling Improvement of LDPC Encoder SDK
Reference #	SCSY-12801
Description	Optimize LDPC encoder parity generation.
Priority	P3-Medium
Affected Versions	19.06
Components	SDK

Title	Enable build of forwarding Error Correction (FEC) SDK modules for Any Build Mode (LTE/5G NR)
Reference #	SCSY-13277
Description	To help with integration for DPDK SDK dependency, moving all FEC modules to be built for all modes
Priority	P3-Medium
Affected Versions	19.06

Title	Enable build of forwarding Error Correction (FEC) SDK modules for Any Build Mode (LTE/5G NR)
Components	SDK

Title	Physical Downlink Control Channel (PDCCH) ReMapping AVX2 Version
Reference #	SCSY-13468
Description	Implement the PDCCH ReMapping AVX2 version.
Priority	P3-Medium
Affected Versions	19.06
Components	SDK

Title	PUSCH LLR Improvement, Align with New Algorithm
Reference #	SCSY-13223
Description	Implement the new PUSCH LLR algorithm to match link-level simulation.
Priority	P2-High
Affected Versions	19.06
Components	SDK

Title	ZF Matrix Generation
Reference #	SCSY-19316
Description	Generate Zero Forcing Matrix for SRS Massive MIMO channel estimation.
Priority	P2-High
Affected Versions	19.06
Components	SDK

Title	MIMO Module Modification
Reference #	SCSY-19400
Description	MIMO module modification for IRC
Priority	P2-High
Affected Versions	19.06
Components	SDK

Title	Improve the DFT/iDFT Computing
Reference #	SCSY-13419
Description	Customers request high performance of DFT/iDFT modules.
Priority	P2-High
Affected Versions	19.06
Components	SDK

Title	SRS Channel Estimate for Massive MIMO
Reference #	SCSY-12890
Description	Implement new SRS Channel Estimate for Massive MIMO scenario
Priority	P2-High
Affected Versions	19.06
Components	SDK

Title	1910 MRC Benchmark and Optimization
Reference #	SCSY-26494
Description	Improve performance by manual pre-load and pre-fetch data for the H matrix.
Priority	P2-High
Affected Versions	19.06
Components	SDK

## 2.7.6 Tracking of Feature Development for xRAN/ORAN in Release Software v19.10

Title	Unit Test: Coverage for C-plane, U-plane, PRCH, Init/Eth/System Level Code
Reference #	SCSY-19468,19470,1469,19471
Description	xRAN library enhancement to cover more use cases.
Priority	P3-Medium
Affected Versions	19.06
Components	xRAN/ORAN

Title	xRAN lib Open Source Changes
Reference #	SCSY-12978

Title	xRAN lib Open Source Changes
Description	Changes need to make xRAN library Open Source compliant
Priority	P3-Medium
Affected Versions	19.06
Components	xRAN/ORAN

Title	Category A: Beamforming Functionality Support Implementation
Reference #	SCSY-8598
Description	Changes specific to support beamforming in xRAN lib and integration with refPHY
Priority	P3-Medium
Affected Versions	19.06
Components	xRAN/ORAN

Title	C-plane Update for Beamforming for Massive MIMO 32T32R
Reference #	SCSY-13292
Description	Implement C-plane changes to send beam weights via extension type 1
Priority	P3-Medium
Affected Versions	19.06
Components	xRAN/ORAN

Title	Integrate and Optimize Block Floating-Point Compression to U-plane
Reference #	SCSY-13289
Description	Integrate and optimize block floating-point compression.
Priority	P3-Medium
Affected Versions	19.06
Components	xRAN/ORAN

Title	Vista Creek with Transparent Clock Verification
Reference #	SCSY-13290
Description	Test Vista Creek RTL change with transparent clock
Priority	P3-Medium
Affected Versions	19.06



Title	Vista Creek with Transparent Clock Verification
Components	xRAN/ORAN

Title	C-plane Interface to xRAN for Category A
Reference #	SCSY-13291
Description	Design and implement code to take MAC/PHY API and populate C-plane interface
Priority	P3-Medium
Affected Versions	19.06
Components	xRAN/ORAN

Title	BBDev – xRAN Interactions
Reference #	SCSY-12572
Description	Test xRAN library with BBDev enabled.
Priority	P3-Medium
Affected Versions	19.06
Components	xRAN/ORAN

## 2.8 New Features in Release Software v19.06

### 2.8.1 New Features for 5G New Radio (NR) RefPHY

#### Sub-6 / Sub-3:

- 3G PP F40 (Dec Spec) compliant
- Support Multi-Cells (in BBU and FPGA): 4 cells – 100 MHz, 12 cells – 20 MHz/10 MHz/5 MHz
- DL Power control supported
- PDCCH channel supports three symbol feature
- Support DL codebook-based precoding dimension 1x4, 2x4 and 4x4
- Supports UCI on PUSCH larger than 11 bits HARQ-ACK
- 4x4 Singular Value Decomposition module
- All size matrix inversion, from 2x2 to 16x16
- xRAN Support on Sub6

#### mmWave:

No new updates made

**Common:**

- Intel MDS Advisory patches were applied to OS and CPU with no impact to FlexRAN performance
- DPDK based Wireless subsystem interface (WLS) is set up as the default option now
- Container support on FlexRAN was added and tested with FPGA offloads

**2.8.2 Enhancements in Release Software v19.06**

Title	Update FEC Image for 1906 Version
Reference #	SCSY-13117
Description	Some bugs found on the 1903 version, so update it for the 1906 version.
Priority	P3-Medium
Affected Versions	19.06
Components	5G NR FPGA

Title	RTL Coding
Reference #	SCSY-12957
Description	FEC Tx LBRM RTL coding
Priority	P2-High
Affected Versions	19.06
Components	5G NR FPGA

Title	FEC and FH Function in Same A10 FPGA for 4x100M w/ HARQ
Reference #	SCSY-12686
Description	FEC and FH function in same A10 FPGA for 4x100M w/ HARQ
Priority	P2-High
Affected Versions	19.06
Components	5G NR FPGA

Title	RX FEC 256QAM Feature Code Merging and Unit Testing
Reference #	SCSY-12628
Description	RX FEC 256QAM feature code merging and unit testing
Priority	P3-Medium
Affected Versions	19.06
Components	5G NR FPGA

Title	Plant 2 DDR to Support 4x100 Sub6G
Reference #	SCSY-12482
Description	Plant 2 DDR to support 4x100 Sub6G
Priority	P3-Medium
Affected Versions	19.06
Components	5G NR FPGA

Title	Provide Customer Support for FEC FPGA
Reference #	SCSY-9283
Description	Customer 100% BER issue and 1% BER issue
Priority	P3-Medium
Affected Versions	19.06
Components	5G NR FPGA

Title	Support XTRAN Interface Integration with SW
Reference #	SCSY-8565
Description	Support XTRAN interface integration with SW
Priority	P3-Medium
Affected Versions	19.03
Components	5G NR FPGA

Title	Support XTRAN Interface Integration with Driver
Reference #	SCSY-8563
Description	Support XTRAN interface integration with driver
Priority	P3-Medium
Affected Versions	19.03
Components	5G NR FPGA

Title	Support XTRAN Interface in FPGA
Reference #	SCSY-8408
Description	Support XTRAN interface in FPGA
Priority	P3-Medium

Title	Support X-RAN Interface in FPGA
Affected Versions	19.03
Components	5G NR FPGA

Title	FPGA 839 Frontend Processing Integration with SW
Reference #	SCSY-8407
Description	FPGA 839 frontend processing integration with SW
Priority	P2-High
Affected Versions	19.03
Components	5G NR FPGA

Title	FPGA 839 Frontend Processing Integration with Driver
Reference #	SCSY-8406
Description	FPGA 839 frontend processing integration with driver
Priority	P2-High
Affected Versions	19.03
Components	5G NR FPGA

Title	FPGA 839 Frontend Processing Design Unit Test
Reference #	SCSY-8405
Description	FPGA 839 front end processing design unit test
Priority	P2-High
Affected Versions	19.03
Components	5G NR FPGA

Title	Long Sequence PRACH Implementation
Reference #	SCSY-8383
Description	Long sequence PRACH implementation
Priority	P2-High
Affected Versions	19.03
Components	5G NR FPGA

Title	Port SVD Module to SDK
Reference #	SCSY-12841
Description	Modify the SVD module to SDK standard and add the unit tests
Priority	P2-High
Affected Versions	19.06
Components	5G NR Ref PHY

Title	mmWave/sub6 Review and Regression
Reference #	SCSY-12806
Description	Review the combination of mmWave/sub6 FPGA driver into a single driver and regression testing.
Priority	P2-High
Affected Versions	19.06
Components	5G NR Ref PHY

Title	Add Support for HARQ Cases When Using BBDEV
Reference #	SCSY-12780
Description	BBDEV supports HARQ combine and input/output, but this was not enabled in the refphy code yet. When SW Implementation is used, the HARQ input/output has to point to host memory. The same related offset computation can be reused for both SW/HW drivers. Also minor thing, but a few statistics counter are computed in phy_ul_bbdev_pusch_tb_func() but masked by #if 0. These should be enabled back and verified.
Priority	P3-Medium
Affected Versions	19.06
Components	5G NR Ref PHY

Title	Integration & Validation of DFT-OFDM Support
Reference #	SCSY-12774
Description	Integration & Validation of DFT-OFDM support
Priority	P2-High
Affected Versions	19.06
Components	5G NR Ref PHY

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Title	One FEC FPGA Image Regression and Validation
Reference #	SCSY-12705
Description	One FEC FPGA image regression and validation
Priority	P2-High
Affected Versions	19.06
Components	5G NR Ref PHY

Title	Support up to 12*5M/10M/20M Hz 2A/4A, FDD(done)
Reference #	SCSY-12689
Description	Support up to 12*5M/10M/20M Hz 2A/4A, FDD(done)
Priority	P2-High
Affected Versions	19.06
Components	5G NR Ref PHY

Title	PDCCH Aggregation Level Control and Power Control
Reference #	SCSY-12668
Description	PDCCH aggregation level control and power control
Priority	P2-High
Affected Versions	19.06
Components	5G NR Ref PHY

Title	CSI-RS: Power Control (Plan – Roadmap - Check)
Reference #	SCSY-12667
Description	CSI-RS: power control (Plan – Roadmap - check)
Priority	P2-High
Affected Versions	19.06
Components	5G NR Ref PHY

Title	SS/PBCH: Power Control for DM-RS and Data Symbols
Reference #	SCSY-12666
Description	SS/PBCH: power control for DM-RS and data symbols
Priority	P2-High

Affected Versions	19.06
Components	5G NR Ref PHY

Title	<a href="#">PDSCH: Power Control for DM-RS, PT-RS and Data Symbols</a>
Reference #	SCSY-12665
Description	PDSCH: power control for DM-RS, pt-rs and data symbols
Priority	P2-High
Affected Versions	19.06
Components	5G NR Ref PHY

Title	<a href="#">PDCCH: Power Control for DM-RS and Data Symbols</a>
Reference #	SCSY-12663
Description	PDCCH: power control for DM-RS and data symbols
Priority	P2-High
Affected Versions	19.06
Components	5G NR Ref PHY

Title	<a href="#">Combine mmWave and Sub6G Driver</a>
Reference #	SCSY-12653
Description	Combine mmWave and Sub6G driver
Priority	P2-High
Affected Versions	19.06
Components	5G NR Ref PHY

Title	<a href="#">DL Codebook Based Precoding to 4 Layers</a>
Reference #	SCSY-12648
Description	DL codebook based precoding to 4 layers
Priority	P2-High
Affected Versions	19.06
Components	5G NR Ref PHY

Title	First Test Case Pass with 3 Symbols PDCCH Case
Reference #	SCSY-12624
Description	Made the first test case pass with Three symbol PDCCH case
Priority	Undecided
Affected Versions	19.04-ea
Components	5G NR Ref PHY

Title	Design and Implement C-plane Interface Between PHY and xRAN
Reference #	SCSY-12573
Description	Use MAC/PHY API as input. Update status of xRAN C-plane Integrate with refPHY
Priority	P3-Medium
Affected Versions	19.06
Components	5G NR Ref PHY

Title	xRAN Configurable Numerology Support
Reference #	SCSY-12558
Description	Enable dynamic configuration for sub 6: 5 MHz, 10 MHz, 20 MHz, 100 MHz mmWave 100 MHz
Priority	P3-Medium
Affected Versions	19.06
Components	5G NR Ref PHY

Title	Application Layer Fragmentation for User-Plane messages
Reference #	SCSY-12521
Description	Implementation of the support of Application Layer fragmentation for User-plane message.
Priority	P3-Medium
Affected Versions	19.06
Components	5G NR Ref PHY

Title	4x4 SVD Matrix Decomposition Implement
Reference #	SCSY-12490



Title	4x4 SVD Matrix Decomposition Implement
Description	First need to read the algorithm and do the complexity analyze, then start to code and test
Priority	P2-High
Affected Versions	19.06
Components	5G NR Ref PHY

Title	Analyze and Implement for the Modules that Customer Asked For
Reference #	SCSY-12489
Description	A customer has asked for several implementations about matrix process, iDFT, FFT/iFFT, need to support them
Priority	P2-High
Affected Versions	19.06
Components	5G NR Ref PHY

Title	Transform Precoding Development and Integration Work
Reference #	SCSY-9182
Description	Transform precoding development and integration work
Priority	P2-High
Affected Versions	19.03
Components	5G NR Ref PHY

Title	12 cells with 20 MHz Bandwidth on 20 Cores
Reference #	SCSY-8623
Description	12 cells with 20 MHz bandwidth on 20 Cores
Priority	P2-High
Affected Versions	19.06
Components	5G NR Ref PHY

Title	Add PRACH to 5G NR Test Application.
Reference #	SCSY-7865
Description	Add PRCH processing to 5G NR Test Application.
Priority	P2-High
Affected Versions	18.09

Title	Add PRACH to 5G NR Test Application.
Components	5G NR Ref PHY

Title	DPDK Initialization for l1 Code in Radio Mode
Reference #	SCSY-13301
Description	Radio mode for LTE with Vista creek initialization
Priority	Undecided
Affected Versions	19.06
Components	LTE Ref PHY

Title	Create 4G Test Vectors to Cover All Code Block Sizes
Reference #	SCSY-12597
Description	Customer request that we create test vectors so that all 4G Downlink and Uplink FEC Code Block sizes are covered.
Priority	P2-High
Affected Versions	19.03
Components	LTE Ref PHY

Title	Remove Mutex Calls from UL Proc Function (Calling WLS)
Reference #	SCSY-12512
Description	Remove Mutex calls from UL proc function (calling WLS). Created separate buffers for each phy-instance which avoids the need for mutex
Priority	Undecided
Affected Versions	19.06
Components	LTE Ref PHY

Title	Develop C-code and AVX2 Version of Polar Encoder.
Reference #	SCSY-13178
Description	Write a C-code and AVX2 version of the Polar Encoder in FlexRAN SDK.
Priority	P2-High
Affected Versions	19.03, 19.04-ea
Components	SDK

Title	Add PUSCH-tp-pi2BPSK Option into SDK phy_rate_dematching_5gnr
Reference #	SCSY-13141
Description	For MCS table 6.1.4.1-1, it is possible to assign BPSK for PUSCH with transform precoding. These scenarios were recently added as part of SCSY-12773. This new requirement was missed during phy_rate_dematching_5gnr rewrite for v19.04. SCSY-12509
Priority	P1-Stopper
Affected Versions	19.06
Components	SDK

Title	Move to ICC 2019 for FlexRAN
Reference #	SCSY-12804
Description	The 19.06 release plan includes the transition to the newer Intel compiler version. This bug covers the corresponding activity.
Priority	P3-Medium
Affected Versions	19.06
Components	5G NR Ref PHY, LTE Ref PHY, SDK

Title	139 and 839 DFT/iDFT
Reference #	SCSY-12676
Description	Need an algorithm for implementations.
Priority	P2-High
Affected Versions	19.06
Components	SDK

Title	PUCCH F4, Move Key Function from L1 Reference Phy to SDK
Reference #	SCSY-12673
Description	PUCCH F4, Move key function from L1 reference Phy to SDK
Priority	P2-High
Affected Versions	19.06
Components	5G NR Ref PHY, SDK

Title	PUCCH F3, Move Key Function from L1 Reference Phy to SDK
Reference #	SCSY-12672

Title	PUCCH F3, Move Key Function from L1 Reference Phy to SDK
Description	PUCCH F3, Move key function from L1 reference Phy to SDK
Priority	P2-High
Affected Versions	19.06
Components	5G NR Ref PHY, SDK

Title	PUCCH CE for Format 3 and Format 4
Reference #	SCSY-6722
Description	Add PUCCH CE for format 3 and format 4 support to the SDK.
Priority	P2-High
Affected Versions	Unplanned
Components	SDK

## 2.9 New Features in Release Software v19.04-ea

This section is an overview of new features added for this release.

For assistance in determining potential product performance mapping to Intel® Xeon® and FPGA resource requirements, contact your Intel sales representative.

### 2.9.1 New Features for 5G New Radio (NR) RefPHY

- BBDEV 5G NR Integration
- Increase number of RxAnt to be 4 for PUCCH 5G NR
- Optimized the PDCCH PHY link under multiple users scenario
- Redesign Testmac test case definition to be runtime instead of compile-time

### 2.9.2 New Features for SDK in Release Software v19.04-ea

- LDPC decoder in SDK
- LDPC encoder in SDK
- Polar Decoder SDK Rework
- ReverseBitEndianness in SDK
- Rewrite of deRM 5G SDK module
- Porting PUCCH format3 CE to SDK
- MMSE optimization and enhancement

### 2.9.3 Enhancements in Release Software v19.04-ea

Title	BBDEV RefPhy 5G Integration - v19.04
Reference #	SCSY-8620
Description	<p>This Epic covers the integration and validation of BBDEV into the RefPHY for 5G FEC processing. This is first done using the BBDEV <code>baseband_sw</code> vdev (SW implementation). This covers:</p> <ul style="list-style-type: none"> <li>- BBDEV is run in code block mode; hence all TB segmentation and concatenation are done in RefPhy.</li> <li>- Integration into test app and validation: Uplink and Downlink paths</li> <li>- Integration into L1App: Uplink and Downlink paths</li> <li>- Validation of all TestMac cases (except 1 HARQ use case, see below)</li> <li>- The capture of cycles profiling (no target criteria enforced)</li> <li>- Klocwork clean for the related build option BBDEV_FEC_ACCL_NR5G</li> <li>- Code coverage capture</li> </ul> <p>It does not include based on time: Wireless performance comparison vs. FPGA, Support of HARQ feature, and use cases in RefPHY.</p>
Priority	P2-High
Affected Versions	19.03
Components	5G NR Ref PHY

Title	LDPC Decoder in SDK
Reference #	SCSY-8140
Description	<p>Implementation of LDPC decoder in SDK The LDPC decoder is generally a Layered Offset Min-Sum decoder, with a fixed offset of 0.5 in 8s4 format. This means that the decoder is optimized for 8s4 input LLRs in char/int8_t format. The decoder performs parity-checking and terminates when the parity equations result in zero for one entire iteration. In this decoder, the following LLR sign convention is used:</p> <p>Logical 0 +VE LLR Logical 1 -VE LLR</p>
Priority	P2-High
Affected Versions	19.03
Components	SDK

Title	LDPC Encoder in SDK
Reference #	SCSY-8139
Description	<p>LDPC encoder in SDK Implementation in the AVX512 to be bit-exact with the LDPC Encoder for all BG1 and 2 and all Zc as per 38.212 5.3.2.</p>
Priority	P2-High

Title	LDPC Encoder in SDK
Affected Versions	19.03
Components	SDK

Title	Increase Number of RxAnt to Be 4 for PUCCH 5G NR
Reference #	SCSY-12784
Description	Increase the number of RxAnt supported for all PUCCH format types in 5G NR.
Priority	P2-High
Affected Versions	19.03
Components	5G NR Ref PHY

Title	Update Refphy Doxygen Comments for FlexRAN v19.04-ea Release.
Reference #	SCSY-12776
Description	Update Doxygen comments to include a section regarding BBDev compilation.
Priority	P2-High
Affected Versions	19.03
Components	5G NR Ref PHY

Title	First Test Case Pass with 3 Symbols PDCCH Case
Reference #	SCSY-12624
Description	Made the first test case pass with Three symbol PDCCH case
Priority	Undecided
Affected Versions	19.03
Components	5G NR Ref PHY

Title	Optimized the PDCCH Phy Link Under Multiple Users Scenario
Reference #	SCSY-12523
Description	Optimized the PDCCH Phy link under multiple users scenario. Calculating the DMRS once for the same DMRS setting users.
Priority	Undecided
Affected Versions	19.03
Components	5G NR Ref PHY

Title	Redesign testmac Test Case Definition to be Runtime instead of Compile-Time
Reference #	SCSY-8377
Description	Redesign testmac test case definition to be runtime instead of compile-time
Priority	Undecided
Affected Versions	19.03
Components	5G NR Ref PHY

Title	Porting PUCCH Format3 CE to SDK
Reference #	SCSY-12635
Description	Porting PUCCH fomart3 CE to SDK. Merge with PUCCH format2 CE.
Priority	Undecided
Affected Versions	19.03
Components	SDK

Title	Rewrite of deRM 5G SDK Module
Reference #	SCSY-12509
Description	The deRMing module already part of SDK several corner cases bug and needed to be rewritten to support 3GPP and HARQ. Filler bits insertion is done in the LDPC decoder. Include C and AVX512 versions.
Priority	P3-Medium
Affected Versions	19.03
Components	SDK

Title	ReverseBitEndianess in SDK
Reference #	SCSY-12495
Description	Adding functionality to do reverse bits in AVX512, AVX2, C. Can then be used for the FEC functions relying on natural bit order.
Priority	P3-Medium
Affected Versions	19.03
Components	SDK

Title	Polar Decoder SDK Rework
Reference #	SCSY-9613

Title	Polar Decoder SDK Rework
Description	The work required – 1. Create separate API for list1 polar decoder 2. Create separate API for list 8 polar decoder 3. Remove FSSCML decoder 4. Create a new SDK module for rate dematching + deinterleaving 5. Create functional / performance tests 6. Integrate into Ref PHY, which needs to be done for the v19.03 release. 7. Extend list 1 to handle block size <20
Priority	P2-High
Affected Versions	Unplanned
Components	5G NR Ref PHY, SDK

Title	MMSE Optimization and Enhancement
Reference #	SCSY-8704
Description	Optimization: optimize existing codes merge the Cholesky matrix inversion enhancement: enhance MMSE to support 16Ant and 16Layer receiver, including 4x16, 8x16, and 16x16
Priority	P2-High
Affected Versions	Unplanned
Components	SDK

Title	4G and 5G New Test Cases and Optimizations for Customer
Reference #	SCSY-12797
Description	4G and 5G new test cases and other optimizations for customers
Priority	P2-High
Affected Versions	19.04-ea
Components	4G and 5G Ref PHY

## 2.10 New Features in Release Software v19.03

For assistance in determining potential product performance mapping to Intel® Xeon® and FPGA resource requirements, contact your Intel sales representative.



## 2.10.1 New Features for 5G New Radio (NR) RefPHY and FPGA in Release Software v19.03

### Sub-6 / Sub-3:

- 3GPP F30 (Sept Spec) compliant
- Support Multi-Cells (in BBU and FPGA): 2 cells – 100 MHz, 8 cells – 20 MHz, 12 cells – 10 MHz/5MHz
- HARQ function validated
- CSI-RS supported
- Support UCI on PUSCH 1 to 11 bits HARQ-ACK
- PUCCH Format 0/1/2/3/4 supported
- SRS supported
- PRACH short and long formats supported on BBU. FPGA supports only short.

### mmWave:

4 cells 100 MHz supported

### Platform:

XRAN support (in the form of sample app) functionally validated with Commscope\* RRU for mmWave

### FPGA:

- Modify the Sub-6-GHz FEC FPGA DMA buffer to support multi-cell scenarios. mmWave FPGA doesn't have this modification.
- Fix a TB parameter delivery issue between encoder modules, and encoder result may be wrong when multiple TB parameters are in 1 slot with different parameters. This bug fix is made on both Sub-6-GHz and mmWave FEC FPGA.
- Change external memory interface from DDR3 interface to DDR4 interface for Sub-6-GHz FEC FPGA
- Fix a bug in Rx scheduling module on Sub-6-GHz FEC FPGA
- Fix a bug in Rx packet header abstract on Sub-6-GHz FEC FPGA
- Fix a TB parameter delivery issue in de-rate-match processing on Sub-6-GHz FEC FPGA
- Fix a DDR write bug in decoder HARQ module on Sub-6-GHz FEC FPGA and mmWave FPGA

## 2.10.2 New Features for 4G RefPHY in Release Software v19.03

No new features were added.

## 2.10.3 New Features for Framework in Release Software v19.03

New framework features in release software v19.03 are:

- Map core Id and core Index in FWK
- Provide a method for APP to query the status of the task
- Remove the redundant code and improve the non-standard code

- Update unit test cases

## 2.10.4 New Features for SDK in Release Software v19.03

### Performance Optimizations in v19.03:

- lib\_scramble\_5gnr
- lib\_cestimate\_5gnr
- lib\_fd\_correlation
- lib\_dft\_idft

### New Modules:

- lib\_pucch\_5gnr
- lib\_dft\_idft
- lib\_prach\_5gnr

## 2.10.5 New Features for BSP in Release Software v19.03

No new features were added.

## 2.10.6 Enhancements in Release Software v19.03

Title	Rebuild SDE/IACA Process in Local Server
Reference #	SCSY-9606
Description	Rebuild the SDE/IACA process in the local server.
Priority	P2-High
Affected Versions	19.03
Components	5G NR Ref PHY, SDK

Title	Analyze IDFT 1632 Error Issue, and Sync with Karina
Reference #	SCSY-9605
Description	Analyze IDFT 1632 error issue and sync with Karina.
Priority	P2-High
Affected Versions	19.03
Components	5G NR Ref PHY, SDK

Title	Performance Review for PUCCH Format1
Reference #	SCSY-9509

Title	Performance Review for PUCCH Format1
Description	Performance review for PUCCH format1
Priority	P2-High
Affected Versions	19.03
Components	5G NR Ref PHY, SDK

Title	AVX512 Implementation of Single Symbol DFT/IDFT - size 12 -192 Performance Review
Reference #	SCSY-9453
Description	h2. Summary Performance review of single symbol implementation (sizes: 12-192) h2. Product Performance review report prepared.
Priority	P2-High
Affected Versions	18.12
Components	SDK

Title	AVX512 Implementation of Single Symbol DFT/IDFT - size 180, 192 CR
Reference #	SCSY-9452
Description	h2. Summary CR for sizes: 180, 192 h2. Product Corrections after code review done, tested, and put to Gerrit.
Priority	P2-High
Affected Versions	18.12
Components	SDK

Title	AVX512 Implementation of Single Symbol DFT/IDFT - size 96 - 192 CR
Reference #	SCSY-9451
Description	h2. Summary CR for sizes: 96, 108, 120, 144, 168, 180, 192 h2. Product Corrections after code review done, tested, and put to Gerrit.
Priority	P2-High
Affected Versions	18.12
Components	SDK

Title	AVX512 Implementation of Single Symbol DFT/IDFT - DFT_IDFT_96 Testing and Bugfixing
Reference #	SCSY-9331
Description	h2. Summary Testing implementation of single symbol DFT_IDFT_96. h2. Product Test vectors for testing in the floating-point domain added to Gerrit. Code tested, and the test is passing.
Priority	P2-High
Affected Versions	18.12
Components	SDK

Title	AVX512 Implementation of Single Symbol DFT/IDFT - size 12, 24, 36, 48, 60, 72 CR
Reference #	SCSY-9320
Description	h2. Summary CR for sizes: 12, 24, 36, 48, 60, 72 h2. Product Corrections after code review done, tested and put into Gerrit.
Priority	P2-High
Affected Versions	18.12
Components	SDK

Title	Mix to IACA Script
Reference #	SCSY-9318
Description	<p>As part of the FlexRAN SDK optimization flow, a python script was developed to take the output of running a test bench using the Intel sde mix framework, and analyze the most time-consuming code segments with the Intel IACA tool. To use the mix_to_iaca.py script:</p> <ol style="list-style-type: none"> <li>1. Ensure that Intel® SDE and Intel® IACA are installed on the machine, and are on the PATH sde64 -version iaca -v</li> <li>2. Compile an SDK test bench.</li> <li>3. Run the SDK testbench using the sde mix framework, for example: <code>sde64 -mix -- ./unittests --nb_loops=1000 --gtest_filter=\\*Perf\\*</code></li> <li>4. Pipe the mix file to iaca and inspect the output ./mix_to_iaca.py sde-mix-out.txt vi sde-mix-out.iaca</li> </ol>
Priority	P3-Medium
Affected Versions	19.03
Components	SDK

Title	AVX512 Implementation of Single Symbol DFT/IDFT - Adjust Factorization
Reference #	SCSY-9314
Description	<p>h2. Summary Adjust factorization to match factorization in 4 symbols calculations for sizes 24, 36, 48 and 72 (nFactor=2 in 4 symbol implementation). Regenerate test vectors.</p> <p>h2. Product Adjustment implemented, new test vectors added, changes put into Gerrit</p>
Priority	P2-High
Affected Versions	18.12
Components	SDK

Title	AVX512 Implementation of Single Symbol DFT/IDFT - DFT_IDFT_72 Testing and Bugfixing
Reference #	SCSY-9170
Description	<p>h2. Summary Testing implementation of single symbol <a href="#">DFT_IDFT_72</a>.</p> <p>h2. Product Test vectors for testing in the floating-point domain added into Gerrit Code tested, and the test is passing.</p>
Priority	P2-High
Affected Versions	18.12
Components	SDK

Title	AVX512 Implementation of Single Symbol DFT/IDFT - DFT_IDFT_60 Testing and Bugfixing
Reference #	SCSY-9169
Description	<p>h2. Summary Testing implementation of single symbol <a href="#">DFT_IDFT_60</a>.</p> <p>h2. Product Test vectors for testing in the floating-point domain added into Gerrit Code tested, and the test is passing.</p>
Priority	P2-High
Affected Versions	18.12
Components	SDK

Title	AVX512 Implementation of Single Symbol DFT/IDFT - DFT_IDFT_48 Testing and Bugfixing
Reference #	SCSY-9168

Title	AVX512 Implementation of Single Symbol DFT/IDFT - DFT_IDFT_48 Testing and Bugfixing
Description	h2. Summary Testing implementation of single symbol DFT_IDFT_48. h2. Product Test vectors for testing in the floating-point domain added into Gerrit Code tested, and the test is passing.
Priority	P2-High
Affected Versions	18.12
Components	SDK

Title	AVX512 Implementation of Single Symbol DFT/IDFT - DFT_IDFT_36 Testing and Bugfixing
Reference #	SCSY-9167
Description	h2. Summary Testing implementation of single symbol DFT_IDFT_36. h2. Product Test vectors for testing in the floating-point domain added into Gerrit Code tested, and the test is passing.
Priority	P2-High
Affected Versions	18.12
Components	SDK

Title	AVX512 Implementation of Single Symbol DFT/IDFT - DFT_IDFT_24 Testing and Bugfixing
Reference #	SCSY-9166
Description	h2. Summary Testing implementation of single symbol DFT_IDFT_24. h2. Product Test vectors for testing in the floating-point domain added into Gerrit Code tested, and the test is passing.
Priority	P2-High
Affected Versions	18.12
Components	SDK

Title	AVX512 Implementation of Single Symbol DFT/IDFT - DFT_IDFT_72
Reference #	SCSY-9165
Description	h2. Summary Implementing single symbol DFT IDF for 72 points (DFT_IDFT_72). Using a single symbol 12 point implementation in decomposition. Prepare output reordering function. h2. Product DFT_IDFT_72 implemented and put into Gerrit
Priority	P2-High

Title	AVX512 Implementation of Single Symbol DFT/IDFT - DFT_IDFT_72
Affected Versions	18.12
Components	SDK

Title	AVX512 Implementation of Single Symbol DFT/IDFT - DFT_IDFT_60
Reference #	SCSY-9164
Description	<p>h2. Summary Implementing single symbol DFT IDF for 60 points (DFT_IDFT_60). Using a single symbol 12 point implementation in decomposition. Prepare output reordering function.</p> <p>h2. Product DFT_IDFT_60 implemented and put into Gerrit</p>
Priority	P2-High
Affected Versions	18.12
Components	SDK

Title	AVX512 Implementation of Single Symbol DFT/IDFT - DFT_IDFT_48
Reference #	SCSY-9163
Description	<p>h2. Summary Implementing single symbol DFT IDF for 48 points (DFT_IDFT_48). Using a single symbol 12 point implementation in decomposition. Prepare output reordering function.</p> <p>h2. Product DFT_IDFT_48 implemented and put into Gerrit</p>
Priority	P2-High
Affected Versions	18.12
Components	SDK

Title	AVX512 Implementation of Single Symbol DFT/IDFT - DFT_IDFT_36
Reference #	SCSY-9162
Description	<p>h2. Summary Implementing single symbol DFT IDF for 36 points (DFT_IDFT_24). Using a single symbol 12 point implementation in decomposition. Prepare output reordering function.</p> <p>h2. Product DFT_IDFT_36 implemented and put into Gerrit</p>
Priority	P2-High
Affected Versions	18.12
Components	SDK

Title	AVX512 Implementation of Single Symbol DFT/IDFT - DFT_IDFT_24
Reference #	SCSY-9161
Description	h2. Summary Implementing single symbol DFT IDF for 24 points (DFT_IDFT_24). Using a single symbol 12 point implementation in decomposition. Prepare output reordering function. h2. Product DFT_IDFT_24 implemented and put into Gerrit
Priority	P2-High
Affected Versions	18.12
Components	SDK

Title	AVX512 Implementation of Single Symbol DFT/IDFT - DFT_IDFT_12 Testing and Bugfixing
Reference #	SCSY-9047
Description	h2. Summary Testing implementation of single symbol DFT_IDFT_12. h2. Product Test vectors for testing in the floating-point domain added into Gerrit Code tested, and the test is passing.
Priority	P2-High
Affected Versions	18.12
Components	SDK

Title	AVX512 Implementation of Single Symbol DFT/IDFT - FFT/IFFT Kernel Analysis
Reference #	SCSY-9046
Description	From emails: The specific PRBs which PUCCH format3/4 needed including: 1, 2, 3, 4, 5, 6, 8, 9, 10, 12, 14, 15, 16. For supporting PUCCH format 3/4, the points of 12, 24, 36, 48, 60, 72, 96, 108, 120, 144, 168(no 4 symbol implementation), 180, 192 are high priority since we will release them in Q1 It's hard to reuse the 4-symbol iDFT for one symbol by reordering data. You can refer the ifft SDK to implement one-symbol iDFT.  An analysis of the algorithm used in the fft/iff kernel is needed.
Priority	P2-High
Affected Versions	18.12
Components	SDK

Title	Analyze CPI Performance of MMSE and MIMO with VTune and PCM Tools
Reference #	SCSY-9038
Description	Analyze the CPI performance of MMSE and MIMO with VTune and PCM tools.



Title	<a href="#">Analyze CPI Performance of MMSE and MIMO with VTune and PCM Tools</a>
Priority	P2-High
Affected Versions	19.03
Components	SDK

Title	<a href="#">Remove Experimental Tag for Layer Demapping</a>
Reference #	SCSY-8980
Description	Remove experimental tag for layer demapping
Priority	P3-Medium
Affected Versions	19.03
Components	SDK

Title	<a href="#">Remove Experimental Tag for Polar Decoder</a>
Reference #	SCSY-8978
Description	Remove experimental tag for the polar decoder
Priority	P2-High
Affected Versions	19.03
Components	SDK

Title	<a href="#">Code / Performance Review PUCCH Format 1 (AVX2)</a>
Reference #	SCSY-8745
Description	Code and performance review AVX2 optimized version of PUCCH Format 1
Priority	P2-High
Affected Versions	Unplanned
Components	5G NR Ref PHY, SDK

Title	<a href="#">Implement PUCCH Format 1 in AVX2</a>
Reference #	SCSY-8744
Description	Create an AVX2 optimized version of PUCCH Format 1
Priority	P2-High
Affected Versions	Unplanned
Components	5G NR Ref PHY, SDK

Title	<a href="#">PUCCH Format 1 (AVX2)</a>
Reference #	SCSY-8684
Description	Create an AVX2 optimized version of PUCCH Format 1
Priority	P2-High
Affected Versions	Unplanned
Components	5G NR Ref PHY, SDK

Title	<a href="#">Profiling and Document for PUCCH Format1</a>
Reference #	SCSY-8649
Description	Profiling and document for PUCCH format1
Priority	P2-High
Affected Versions	19.03
Components	5G NR Ref PHY, SDK

Title	<a href="#">Performance Analysis (IACA / KFW) and Implementation of Optimizations</a>
Reference #	SCSY-8635
Description	<p>The main task in this epic is performance review and optimizations.</p> <p>Gains seen in v18.12 release are disappointing - for concise sequence, there were gains but not for longer sequences.</p> <p>A thorough analysis of processing bottlenecks must be done (SDE/IACA/KFW)</p> <p>Performance optimizations implemented</p>
Priority	P2-High
Affected Versions	19.03
Components	SDK

Title	<a href="#">fd_correlation - Update API, Review, Remove Experimental Tags</a>
Reference #	SCSY-8525
Description	<p>There is not too much to do here -</p> <p>FD correlation is a simple conjugate multiply and is already using BKM multiplies.</p> <p>The kernel already has c, avx2, and avx512 code and has functional tests meeting SQA targets.</p> <p>Therefore in removing the experimental tag should be to rework to follow coding standards and follow BKMs, update Doxygen, and performance optimization/review</p>
Priority	P2-High
Affected Versions	19.03

Title	<a href="#">fd_correlation - Update API, Review, Remove Experimental Tags</a>
Components	SDK

Title	<a href="#">Go through Performance Review of PUCCH Equalization 5G NR Function</a>
Reference #	SCSY-8523
Description	Go through performance review of the PUCCH equalization 5G NR function. Open code review and invite SDK members to review from a performance perspective. Go through IACA and SDE mix outputs to identify code bottlenecks and optimizations. Update Code based on the review.
Priority	P2-High
Affected Versions	18.09
Components	SDK

Title	<a href="#">Performance Report and Review Meeting for PUCCH Format0</a>
Reference #	SCSY-8517
Description	Create a performance review report for PUCCH format0, and pass the review meeting
Priority	P2-High
Affected Versions	19.03
Components	SDK

Title	<a href="#">Review and Update Code for PUCCH Format0</a>
Reference #	SCSY-8516
Description	Review and update code for PUCCH format0
Priority	P2-High
Affected Versions	19.03
Components	5G NR Ref PHY, SDK

Title	<a href="#">Put PUCCH Format1 into SDK, and Align with Test Vectors from LLS</a>
Reference #	SCSY-8514
Description	Put PUCCH format1 into SDK, and align with test vectors from LLS
Priority	P2-High
Affected Versions	19.03
Components	5G NR Ref PHY, SDK

Title	PUCCH Format1 gNB Coding
Reference #	SCSY-8512
Description	PUCCH format1 gNB coding
Priority	P2-High
Affected Versions	19.03
Components	5G NR Ref PHY, SDK

Title	PUCCH Format1 UE Coding
Reference #	SCSY-8511
Description	PUCCH format1 UE coding
Priority	P2-High
Affected Versions	19.03
Components	SDK

Title	Add 8x8 MMSE Equalization in SDK lib: Add Unit Test and Code Review
Reference #	SCSY-8462
Description	Add 8x8 MMSE equalization in SDK lib: add unit test and code review
Priority	P3-Medium
Affected Versions	19.03
Components	5G NR Ref PHY, SDK

Title	AVX512 Implementation of Single Symbol DFT/IDFT - DFT_IDFT_12
Reference #	SCSY-8369
Description	h2.Summary DFT for a single symbol is planned to be decomposed into smaller DFTs using $N=N_1 \times 4$ factors. DFT_IDFT_12 will be decomposed to $12=3 \times 4$ . After DFT size-3 multiplication by twiddle factor and reordering is needed. h2.Product DFT_IDFT_12 implemented and put into Gerrit
Priority	P2-High
Affected Versions	18.12
Components	SDK

Title	Remove Experimental Tag - lib_scramble_5gnr
Reference #	SCSY-8355
Description	<p>Performance review  Passcode and performance review with all the stakeholders.  Document in Doxygen following SDK process  Meet SDK SQA requirements  Remove the experimental tag in API.</p> <p>The main task in this epic is performance review and optimizations.  Gains seen in v18.12 release are disappointing - for concise sequence, there were gains but not for longer sequences.  A thorough analysis of processing bottlenecks must be done (SDE/IACA/KFW)  Performance optimizations implemented</p>
Priority	P2-High
Affected Versions	19.03
Components	SDK

Title	Remove Experimental Tag - lib_fd_correlation
Reference #	SCSY-8354
Description	<p>Performance review  Passcode and performance review with all the stakeholders.  Document in Doxygen following SDK process  Meet SDK SQA requirements  Remove the experimental tag in API.</p>
Priority	P2-High
Affected Versions	19.03
Components	SDK

Title	Remove Experimental Tag - lib_polar_encoder_5gnr
Reference #	SCSY-8353
Description	<p>Performance review  Passcode and performance review with all the stakeholders.  Document in Doxygen following SDK process  Meet SDK SQA requirements  Remove the experimental tag in API.</p>
Priority	P2-High
Affected Versions	19.03
Components	SDK

Title	Remove Experimental Tag - lib_pucch_5gnr (PUCCH F0)
Reference #	SCSY-8352

Title	<a href="#">Remove Experimental Tag - lib_pucch_5gnr (PUCCH F0)</a>
Description	Performance review Passcode and performance review with all the stakeholders. Document in Doxygen following SDK process Meet SDK SQA requirements Remove the experimental tag in API.
Priority	P2-High
Affected Versions	19.03
Components	SDK

Title	<a href="#">Remove Experimental Tag - lib_polar_decoder_5gnr</a>
Reference #	SCSY-8351
Description	Performance review Passcode and performance review with all the stakeholders. Document in Doxygen following SDK process Meet SDK SQA requirements Remove the experimental tag in API.
Priority	P2-High
Affected Versions	19.03
Components	SDK

Title	<a href="#">Performance Review for PUCCH Equalization</a>
Reference #	SCSY-8350
Description	Performance review for PUCCH equalization, in <a href="#">lib_pucch_equalization_5gnr</a>
Priority	P2-High
Affected Versions	19.03
Components	SDK

Title	<a href="#">Update PRACH Algorithm Based on refphy Changes in v18.12</a>
Reference #	SCSY-8349
Description	Update PRACH algorithm based on refphy changes in v18.12
Priority	P2-High
Affected Versions	19.03
Components	SDK

Title	Long PRACH Support for 839
Reference #	SCSY-8348
Description	Long PRACH developed, to support length 839
Priority	P2-High
Affected Versions	19.03
Components	SDK

Title	Update PUCCH Format 0 in SDK to Align with RefPHY
Reference #	SCSY-8182
Description	Update PUCCH format 0 in SDK to align with RefPHY
Priority	P2-High
Affected Versions	19.03
Components	SDK

Title	Integrate SDK PUCCH into Ref PHY
Reference #	SCSY-8163
Description	The Ref PHY Shall use the SDK PUCCH implementation.
Priority	P2-High
Affected Versions	19.03
Components	SDK

Title	PUCCH Format1 for 5G NR
Reference #	SCSY-8160
Description	PUCCH format1 for 5G NR
Priority	P3-Medium
Affected Versions	19.03
Components	SDK

Title	lib_equalization Supports 8 Layers
Reference #	SCSY-8148
Description	lib_equalization supports 8 layers
Priority	P2-High

Title	lib_equalization Supports 8 Layers
Affected Versions	19.03
Components	SDK

Title	Plan for SDK in Q1 2019
Reference #	SCSY-8135
Description	SDK plan in Q1 2019
Priority	P2-High
Affected Versions	19.03
Components	SDK

Title	Single Symbol Fixed Point DFT/IDFT CR
Reference #	SCSY-8039
Description	Code review for single symbol fixed point DFT/IDF
Priority	P2-High
Affected Versions	Unplanned
Components	SDK

Title	QR Decomp: Fixed Point C Implementation
Reference #	SCSY-7733
Description	Add implementation that takes a fixed point input and has fixed-point output. Output fixed point format as per accelerator input.
Priority	P2-High
Affected Versions	18.09
Components	SDK

Title	Update the Module Name in Tests to Comply with Programming Guide
Reference #	SCSY-7217
Description	The module names need to be unique. Currently, some modules use the same name for the fixed point and floating point, which causes issues when collecting all performance numbers. All module names should be unique to differentiate these tests as per the programmer's guide published in the SDK Doxygen documentation.
Priority	P2-High



Title	Update the Module Name in Tests to Comply with Programming Guide
Affected Versions	19.03
Components	SDK

Title	QR Decomp: Performance Review (AVX2/AVX512)
Reference #	SCSY-7160
Description	Assess the kernel's performance using the PMA job. Gather mix / IACA data Analyze performance Update kernel
Priority	P2-High
Affected Versions	18.12
Components	SDK

Title	QR Decomp: Code Review (AVX2/AVX512) and Optimization Rework
Reference #	SCSY-7159
Description	Code review of : - AVX2 implementation - AVX512 implementation - Unit tests additions Optimization rework
Priority	P2-High
Affected Versions	18.12
Components	SDK

Title	QR Decomp: AVX512 Implementation
Reference #	SCSY-7158
Description	Add AVX512 implementation Add to the unit test framework
Priority	P2-High
Affected Versions	18.12
Components	SDK

Title	QR Decomp: AVX2 Implementation
Reference #	SCSY-7157

Title	QR Decomp: AVX2 Implementation
Description	Add AVX2 implementation Add to unit tests
Priority	P2-High
Affected Versions	18.12
Components	SDK

Title	QR Decomp: Code Review (C)
Reference #	SCSY-7155
Description	Code review of the kernel : - C implementation - unit tests
Priority	P2-High
Affected Versions	18.12
Components	SDK

Title	QR Decomp: Add Unit Tests
Reference #	SCSY-7154
Description	- Add functional unit tests for the C implementation - Add performance unit tests for the C implementation In the coverage report: 100% functions 80%+ condition/decision
Priority	P2-High
Affected Versions	18.12
Components	SDK

Title	QR Decomp: C Implementation and SDK Framework
Reference #	SCSY-7153
Description	<ul style="list-style-type: none"> <li>• Create SDK kernel framework</li> <li>• Add C implementation floating-point implementation.</li> <li>• Floating-point inputs and outputs.</li> </ul>
Priority	P2-High
Affected Versions	18.12
Components	SDK

Title	QR Decomp: Create Kernel Interface Header
Reference #	SCSY-7152
Description	Define request/ response structures for kernel for both floating-point and 16bit fixed points—scaling TBD for fixed point.
Priority	P2-High
Affected Versions	18.12
Components	SDK

Title	Remove Experimental Tag - lib_pucch_equalization_5gnr
Reference #	SCSY-6849
Description	Go through a performance review of the PUCCH MIMO 5G NR function. Open code review and invite SDK members to review from a performance perspective. Go through IACA and SDE mix outputs to identify code bottlenecks and optimizations. Update Code based on the review. Document in Doxygen following SDK process Meet SDK SQA requirements Remove the experimental tag in API.
Priority	P2-High
Affected Versions	19.03
Components	SDK

Title	Performance Review Lib Layer Demapping
Reference #	SCSY-6750
Description	Go through performance review of Layer Demapping function. Open code review and invite SDK members to review from a performance perspective. Go through IACA and SDE mix outputs to identify code bottlenecks and optimizations. Update Code based on the review.
Priority	P3-Medium
Affected Versions	Unplanned
Components	SDK

Title	Sorted QR Decomposition (Required for TIP2 MLD HW Accelerator)
Reference #	SCSY-6723
Description	The TIP HW accelerator supports the MLD Tree search function. FlexRAN SDK needs to be updated to include the other SW functions required to complete the MLD receiver, Including QR decomposition.
Priority	P2-High
Affected Versions	18.12

Title	Sorted QR Decomposition (Required for TIP2 MLD HW Accelerator)
Components	SDK

Title	PUCCH Format 1 (AVX512)
Reference #	SCSY-6721
Description	Add support for PUCCH format 1 to the SDK and integrate it into RefPHY.
Priority	P2-High
Affected Versions	Unplanned
Components	5G NR Ref PHY, SDK

Title	DFT Optimizations
Reference #	SCSY-4201
Description	<p>DFT Optimizations Required</p> <p>Add a new API in the DFT/IDFT library that performs the interleaving of symbols internally. The input parameter takes an array of pointers.</p> <p>As the size of the DFT needed for control channels are small, it makes more sense to do more DFT in parallel rather than optimize for 128 bits (current AVX512 implementation does 128bit at a time which for smaller sizes is not applicable). So a new 8 symbol DFT and IDFT are needed.</p> <p>Also, a single symbol DFT is needed, which can process as many bits in parallel as possible but only works on a single symbol at once.</p> <p>All DFT sizes are needed, but the following DFT sizes need to be prioritized as per customer request.</p> <p>PUSCH:</p> <p>We use the IDFT-DFT approach for the multi-user MIMO decoding. Here all possible RB values as defined in the specification will be needed for PUSCH decoding.</p> <p>The IDFT&amp;DFT sizes are needed for following sizes</p> <p>12,24,36,48,60,72,96,108,120,144,180,192,216,240,288,300,324,360,384,432,480,540,576,600,648,720,768,864,900,960,972,1080,1152,1200</p> <p>PUCCH:</p> <p>For PUCCH, we need IDFT for size 12. The idea is to go the lag domain to identify users.</p> <p>SRS:</p> <p>The IDFT/DFT sizes needed for SRS is</p> <p>576,480,432,384,360,288,240,192,144,120,96,80,72,64,60,48,40,32,24,20,16,12,8,4.</p> <p>The calculation is based on the number of RBs allocated for SRS and the number of Res (half of them) used for IDFT.</p>
Priority	P2-High
Affected Versions	Unplanned
Components	SDK

Title	Optimization of SRS Channel Estimation for 5G NR
Reference #	SCSY-2181
Description	Complete performance optimization, code, and perf reviews for <code>srs_ce_5gnr</code> (AVX512).

Title	Optimization of SRS Channel Estimation for 5G NR
Priority	P2-High
Affected Versions	Unplanned
Components	SDK

## 2.11 New Features in Release Software v18.12

This section is an overview of new features added for this release.

For assistance in determining potential product performance mapping to Intel® Xeon® and FPGA resource requirements, contact your Intel sales representative.

### 2.11.1 New Features for 5G New Radio (NR) RefPHY and FPGA in Release Software v18.12

#### 5G NR mmWave Enhancements:

- Support for 3GPP June Spec – F20
- PUCCH format 0

#### 5G NR Sub-6-GHz Ref Phy Enhancements:

- Support for 3GPP June Spec – F20
- Support FDD/TDD both in 100 MHz and 20 MHz bandwidth
- Support up to 4T4R
- Support up to 8 UEs/TTI
- Support subcarrier spacing 15 kHz and 30 kHz
- Add PBCH support
- Add PUCCH format 0,2
- Support PRACH for Sub-6-GHz;
- Two symbols PDCCH
- SRS support
- Multi-UEs support for the data channel
- Module Level Soft-LDPC encoder/decoder BG1

#### Platform HW:

- SKL-SP + adding SKL-D
- Front haul option 8 supported.

#### Platform SW:

- X-RAN Library enhancements for X-RAN U-Plane and 1588 support
- Support for Sub-6-GHz in VM

- Titanium Cloud 5\* (TiC5) - Native and Container on SKX-D for Sub-6-GHz

## 2.11.2 New Features for 4G RefPHY in Release Software v18.12

No new features were added.

## 2.11.3 New Features for Framework in Release Software v18.12

- Memory Optimization for BBU pooling
- The task can be monitor when it's running

## 2.11.4 New Features for SDK in Release Software v18.12

Title	<a href="#">bblib_reed_muller_dec_conf</a> Detection Threshold
Reference #	SCSY-7791
Description	The SDK implementation of the 4G Reed-Muller Confidence detection should be updated to add an API parameter ( <a href="#">pucchF2DetThresh</a> ) to set the detection threshold.
Priority	P2-High

Title	<a href="#">lib_scramble_5gnr</a> Performance Review
Reference #	SCSY-7731
Description	This ticket tracks the performance optimization for <a href="#">lib_scramble_5gnr</a>
Priority	P3-Medium

Title	<a href="#">Update NR RE Mapping SDK to Support Two Symbol</a>
Reference #	SCSY-7484
Description	Update nr RE Mapping SDK to support two symbol
Priority	Undecided

Title	<a href="#">Reed-Muller Change enum in API to bblib_reed_muller_code_type</a>
Reference #	SCSY-7477
Description	Change API enum from <a href="#">bblib_reed_muller_op_type</a> to <a href="#">bblib_reed_muller_code_type</a> Changes need to be applied in SDK and RefPHY (LTE & 5G NR).
Priority	P3-Medium

Title	<a href="#">Include the SDK Programmer's Guide within the SDK Doxygen Document</a>
Reference #	SCSY-7299
Description	The SDK Doxygen documentation should be extended to include a programmer's guide section detailing the coding standard, naming convention, API conventions, and other rules in use within the project.

Title	Include the SDK Programmer's Guide within the SDK Doxygen Document
Priority	P3-Medium

Title	Equalization lib Supports Both LTE and 5G NR but Needs Doc and API Updated
Reference #	SCSY-7118
Description	Update the file names and the API's for the lib_equalization as this supports both LTE and 5G NR and not just 5G. Currently, it includes a 5gnr suffix, which should be removed.
Priority	Undecided

Title	Go Through Performance Review for Precoding
Reference #	SCSY-7043
Description	Performance optimization for <code>lib_precoding_5gnr</code>
Priority	Undecided

Title	Update AVX512 DFT/IDFT to Use Templates
Reference #	SCSY-6941
Description	Update AVX512 DFT/IDFT implementation to use template structure. Implementation should be based on AVX2 template added as part of SCSY-5464
Priority	Undecided

Title	AVX512 Implementation for DFT/IDFT Size 1632
Reference #	SCSY-6888
Description	Add AVX512 support for DFT/IDFT size 1632.
Priority	P2-High

Title	AVX512 Implementation for DFT/IDFT Size 816
Reference #	SCSY-6884
Description	Add AVX512 support for 816 DFT/IDFT inputs
Priority	P2-High

Title	Update DFT/IDFT to Use Templates
Reference #	SCSY-5464
Description	Update DFT/IDFT implementation to use C templates. Both AVX2 and AVX512 implementations should be updated.
Priority	Undecided

Title	Go through Performance Review for PUCCH Format 0
Reference #	SCSY-5279
Description	Go through performance review for PUCCH Format 0.
Priority	P3-Medium

Title	Reed-Muller Decoder Fixed Point Load Data
Reference #	SCSY-4889
Description	Create a fixed point AVX optimized implementation of the Reed-Muller Algorithm to be used in the fixed-point PUCCH processing chain. Should use 16bit fixed-point inputs in the 16s12 data format. Use Templates to support both AVX2 and AVX512.
Priority	P2-High

### 2.11.5 New Features for BSP in Release Software v18.12

No new features were added.

### 2.11.6 New Features in Release Software v18.09

This section is an overview of new features added for this release.

FlexRAN v18.09 is the first FlexRAN package supporting 5G, and as such, the focus is primarily on functionality enabling. Similar to how 4G FlexRAN was first built and then optimized, the 5G FlexRAN architecture and implementation will undergo a performance optimization effort alongside adding new functionality over the coming releases. For assistance in determining potential product performance mapping to Intel Xeon and FPGA resource requirements, contact your Intel sales representative.

### 2.11.7 New Features for 5G NR RefPHY and FPGA in Release Software v18.09

- Support both mmWave and Sub-6-GHz
- For mmWave:
  - Support Numerology = 3, total bandwidth = 100 MHz, fft/ift size = 1024 points
  - Supports
  - PBCH/SS and PTRS
  - Single symbol PDCCH and short PUCCH
  - PDSCH & PUSCH with synchronous HARQ
  - PRACH with sequence length 139
- For Sub-6-GHz, support PDCCH, PDSCH, PRACH and PUSCH (no HARQ support)
- Support CP-OFDM with Normal CP
- Support TDD (DDDSU and DDDS)



- Support SU-MIMO with 4 DL layers and 2 UL layers, modulations up to 64QAM
- The current 5G FPGA code is only functional. The latency performance needs further tuning.

### 2.11.8 New Features for 4G RefPHY in Release v18.09

- UL PUSCH UCI code restructuring and optimizations
- PUCCH decoder optimizations (Reed-Muller)
- PUSCH UCI decoder optimizations (Viterbi)
- DL gain calculation code unification
- BBDEV Integration
- Single Queue support for PF and VF on FLV/Niantic
- xRAN library with U-plane
- Container optimization: VPP, SRIOV, CPU manager (CPU sharing) enhancements, and NFD
- Power measurement instrumentation on bare metal using IPMI
- LTE auxlib refactoring for build and maintenance

### 2.11.9 New Features for Framework in Release Software v18.09

No new features were added.

The event\_dev was deprecated.

### 2.11.10 New Features for SDK in Release Software v18.09

**Table 3. Updated and Optimized 5G NR Modules for SDK v18.09**

Module	Details
Lib_cestimate_5gnr	New algorithm added
Lib_equalization	New MMSE algorithm added
Lib_fd_correlation	New library for PRACH
Lib_fft_ifft	New algorithm added
Lib_layerdemapping_5gnr	New library added
Lib_llr_demapping	New algorithm added
Lib_phase_noise_5gnr	New algorithm added
Lib_polar_decoder_5gnr	Merge algorithms to one library removed duplication
Lib_prach_5gnr	New library for PRACH detection
Lib_precoding_5gnr	New codebook-based precoding algorithm added
Lib_pucch_5gnr	The new library added for PUCCH format 0
Lib_pucch_cestimate_5gnr	The new library added for PUCCH format 2 channel estimation
Lib_pucch_equalization_5gnr	The new library added for PUCCH format 2 equalization
Lib_ta_compensation5gnr	The new library added for timing advanced

**Table 4. Updated and Optimized 4G Modules for SDK v18.09**

Module	Details
lib_dft_idft	Added batch mode API
lib_deinterleave	Code optimizations and updates to work on full circular buffer
lib_demodulation	It is updated to provide a polarity option on output.

### 2.11.11 New Features for BSP in Release Software v18.09

No new features were added.

## 2.12 New Features in Release Software v18.08-ea

FAPI support PUCCH format 1b with channel selection

## 2.13 New Features in Release Software v1.6.0

This section is an overview of new features added for this release.

### 2.13.1 New Features for RefPHY in Release Software v1.6.0

- PUCCH symbol level processing optimizations
- Refactoring to ensure C code is available for PRACH, PUSCH Channel Estimate, and PUCCH Channel Estimate
- PMCH Support
- Container enhancements (CPU manager, non-privileged FlexRAN, OVS and SRIOV optimizations, node discover)
- Front Haul NIC offload
- 1588 for 4G with a roadmap to 5G
- Optimizations of the current 1588 virtual PTP
- Completed Support for Intel RDT
- Hyper-threading support
- Profiles with and without HT and with and without FEC

### 2.13.2 New Features for Framework in Release Software v1.6.0

Task bypass through pre-function

### 2.13.3 New Features for SDK in Release Software v1.6.0

**Table 5. New Modules for SDK Software v1.6.0**

Features	Details
MU MIMO Equalization	Multi-user MIMO Equalization for LTE PUSCH
PUCCH Channel Estimator	Channel Estimation for LTE PUCCH

Features	Details
PUCCH Demodulation	Demodulation for LTE PUCCH
Sample Kernel	A sample kernel used as an example of how to generate an SDK kernel.
SU MIMO Equalization	Single user MIMO Equalization for LTE PUSCH

**Table 6. Updated and Optimized Modules for SDK Software v1.6.0**

Features	Details
SG Layer Mapping	It generated a fixed-point version of the code.
SG NR Precoding	It generated a fixed-point version of the code.
LLR Demapper	Added support for fixed-point inputs.
Reed-Muller	It generated a fixed-point version of the C code.
Polar Decoder SGNR	Added a List1 decoder which matches the API of the list8
CRC generation and Check	Added a version of CRC24C with initialization to 1's
Channel Deinterleaver	Bug fixes.
Matrix Inversion	Optimization of AVX512 code added support for 16x16 and interleaved inputs

### 2.13.4 New Features for BSP in Release Software v1.6.0

No new features were added.

## 2.14 New Features in Previous Releases

Details of new features in releases before software v1.6.0 are no longer being listed.

Details can be found in the release notes associated with any release.

## 3.0 Known Issues

### 3.1 Known Issues Release Software v21.03

Title	PUSCH + UCI, nScale value of Resource Calculation is wrong
Reference #	SCSY-34144
Description	The customer reports that the nAlphaScaling parameter was not calculated correctly. Fix this issue, but the L1 code is still having issues detecting signal being sent from UE. The customer is using a workaround by scheduling PUCCH + PUSCH instead. The issue will be addressed in the next release.
Priority	P3-Medium
Affected Versions	21.03
Components	5G NR RefPHY

Title	RefPHY: Pucch Wireless Format 0 Performance Issues
Reference #	SCSY-39707
Description	A total of 4 PUCCH Format 0 RCT test cases are marginally failing.
Priority	P3-Medium
Affected Versions	21.03
Components	5G NR RefPHY

Title	RefPHY: LTE Uplink test case 405 fails with BBDev interface
Reference #	SCSY-49418
Description	LTE Uplink test case 405 failing for testapp after moving to BBDEV interface with software Turbo decoder and Mt. Bryce decoder. This is a cat-m scenario where each subframe is a retransmission. This test cases passes for software turbo decoder if use non-bbdev interface where the SDK library is called directly.
Priority	P3-Medium
Affected Versions	21.03
Components	5G NR RefPHY

Title	RefPHY: Limitation in UCI CSI Part 1 and 2 on PUSCH
Reference #	SCSY-49459
Description	Not all scenarios are currently supported. Scenarios that are not supported: <ul style="list-style-type: none"> <li>• CSI Part 1 or 2 allocation colliding with ACK</li> </ul>

	<ul style="list-style-type: none"> <li>CSI Part 1 and 2 allocations colliding</li> </ul> ACK works for all scenarios. In a given PUSCH symbol, if CSI Part 1 and CSI Part 2 allocation is by itself, it will work.
Priority	P3-Medium
Affected Versions	21.03
Components	5G NR RefPHY

<b>Title</b>	<b>Tools: TTBox does not display tasks from CoreIDs &gt; 64</b>
Reference #	SCSY-37765
Description	When tasks are run on CoreIDs > 64, TTBox is not able to display them.
Priority	P3-Medium
Affected Versions	21.03
Components	Tools

<b>Title</b>	<b>TestMAC: Timer Mode Unit tests fail with "phystart 1 1 0"</b>
Reference #	SCSY-48205
Description	Many of the Timer Mode Units tests will fail if "phystart 1 1 0" is entered. Once it is changed to "phystart 1 2 0", all tests will pass.
Priority	P3-Medium
Affected Versions	21.03
Components	5G NR RefPHY

<b>Title</b>	<b>Wrong PRACH TA calculated.</b>
Reference #	SCSY-35091
Description	PRACH TA value calculated incorrectly when using customer RRU. Still investigating root cause.
Priority	P3-Medium
Affected Versions	21.03
Components	5G NR RefPHY

<b>Title</b>	<b>testmac test case with "run 2 1 100" fails on 16 cell cases</b>
Reference #	SCSY-49478
Description	When running TestMAC and running with option "run 2 1 100" which runs all mu=1, 100Mhz full duplex test cases, it will fail when 16 cell test cases are launched. When run individually with:

	run 2 10 100 16730 they will pass. Suspect some small memory leak in testmac when running in batch mode.
Priority	P3-Medium
Affected Versions	21.03
Components	5G NR RefPHY

### 3.2 Known Issues Release Software v20.11

Title	<b>PUSCH + UCI, nScale value of Resource Calculation is wrong</b>
Reference #	SCSY-34144
Description	The customer reports that the nAlphaScaling parameter was not calculated correctly. Fix this issue, but the L1 code is still having issues detecting signal being sent from UE. The customer is using a workaround by scheduling PUCCH + PUSCH instead. The issue will be addressed in the next release.
Priority	P3-Medium
Affected Versions	20.11
Components	5G NR RefPHY

Title	<b>PUCCH Wireless Performance</b>
Reference #	SCSY-39707
Description	PUCCH Format 0 RCT 38.104 test cases do not meet passing criteria. Two Format 1 test cases and many of the Format 4 test scenarios are marginally failing
Priority	P3-Medium
Affected Versions	20.11
Components	5G NR RefPHY

Title	<b>PUSCH BLER in ORAN Massive MIMO Avg. Test Scenario</b>
Reference #	SCSY-42225
Description	There is a known issue with 16 stream test in oran mode where the avg cell PUSCH show BLER when running Massive MIMO scenario. This test passes in timer mode.
Priority	P3-Medium
Affected Versions	20.11
Components	5G NR RefPHY

<b>Title</b>	<b>PDSCH could not be decoded if CellId = 1,3,5 and works for CellId = 0,2,4</b>
Reference #	SCSY-36054
Description	If CellID is set equal to 1,3,5, UE cannot decode SIB1. For CellID = 0,2,4, it can decode.
Priority	P3-Medium
Affected Versions	20.11
Components	5G NR RefPHY

<b>Title</b>	<b>Wrong PRACH TA calculated.</b>
Reference #	SCSY-35091
Description	PRACH TA value calculated incorrectly when using customer RRU. Still investigating root cause.
Priority	P3-Medium
Affected Versions	20.11
Components	5G NR RefPHY

<b>Title</b>	<b>DL Special slot CRC when 64QAM, MCS25</b>
Reference #	SCSY-38023
Description	CRC errors seen on special slots when setting 64QAM with MCS25.
Priority	P3-Medium
Affected Versions	20.11
Components	5G NR RefPHY

### 3.3 Known Issues Release Software v20.08

<b>Title</b>	<b>RCTUL 38.104 PUSCH DMRS Type 2 improvements</b>
Reference #	SCSY-35950
Description	Current test scenarios for PUSCH DMRS Type 2 with 2 layers still failing with the latest algorithm improvements.
Priority	P3-Medium
Affected Versions	20.08
Components	5G NR RefPHY

Title	<a href="#">RCTUL 38.104 PUCCH Test Scenarios</a>
Reference #	SCSY-35951
Description	Many PUCCH Test scenarios are marginally failing in the RCTUL 38.104 test suite.
Priority	P3-Medium
Affected Versions	20.08
Components	5G NR RefPHY

Title	<a href="#">DL Unit test 1305 issue with Terasic and UL Unit test 1515</a>
Reference #	SCSY-35926, SCSY-35949
Description	UL $\mu=1$ , 100 Mhz test case 1515 is failing with Terasic. This is uplink harq combining test case, so failure is as expected since Terasic does not have full Uplink harq support.
Priority	P3-Medium
Affected Versions	20.08
Components	5G NR RefPHY

Title	<a href="#">MMWave End to End with X RAN mode issues</a>
Reference #	SCSY-36049
Description	End-to-end tests with commercial UE with 20.08 in xRAN are not successful.
Priority	P3-Medium
Affected Versions	20.08
Components	5G NR RefPHY

Title	<a href="#">PUSCH + UCI, nScale value of Resource Calculation is wrong</a>
Reference #	SCSY-34144
Description	The customer reports that the nAlphaScaling parameter was not calculated correctly. Fix this issue, but the L1 code is still having issues detecting signal being sent from UE. The customer is using a workaround by scheduling PUCCH + PUSCH instead. The issue will be addressed in the next release.
Priority	P3-Medium
Affected Versions	20.08
Components	5G NR RefPHY



Title	Linear interpolation in MMSE
Reference #	SCSY-35838
Description	The feature is still being validated, and a patch update will be provided in the near term.
Priority	P3-Medium
Affected Versions	20.08
Components	SDK

Title	5gnr TestAPP running with Terasic FEC FPGA
Reference #	SCSY-34612
Description	5G NR TestAPP has removed support for running with Terasic* for this release. We will re-investigate to see if we can re-enable the next release.
Priority	P3-Medium
Affected Versions	20.08
Components	5G NR Ref PHY

### 3.4 Known Issues Release Software v20.04

Title	PUSCH + UCI, nScale value of Resource Calculation is wrong
Reference #	SCSY-34144
Description	The customer reports that the nAlphaScaling parameter was not calculated correctly. Fix this issue, but the L1 code is still having issues detecting signal being sent from UE. The customer is using a workaround by scheduling PUCCH + PUSCH instead. The issue will be addressed in the next release.
Priority	P3-Medium
Affected Versions	20.04
Components	5G NR RefPHY

Title	5gnr TestAPP running with Terasic FEC FPGA
Reference #	SCSY-34612
Description	5G NR TestAPP has removed support for running with Terasic for this release. We will re-investigate to see if we can re-enable the next release.
Priority	P3-Medium
Affected Versions	Affected Version: 20.04
Components	Components: 5G NR Ref PHYComponents: 5G NR Ref PHY

### 3.5 Known Issues Release Software v20.02

Title	5G NR PTRS Fails when TimeDensity is Not Equal to 1 in the Downlink Direction.
Reference #	SCSY-33573
Description	If TimeDensity is not equal to 1 for PTRS in the downlink direction, the remapping function does not map precoder output to the resource grid correctly.
Priority	P3-Medium
Affected Versions	19.10
Components	5G NR Ref PHY

Title	Terasic mmWave FEC FPGA Does not Return for Customer Test Case.
Reference #	SCSY-31644
Description	With customer test case, mmWave FEC FPGA does not return after enqueue
Priority	P3-Medium
Affected Versions	19.10
Components	5G NR FPGA

Title	Test case 1500 for LTE fails.
Reference #	SCSY-33549
Description	FD test case in LTE is failing with this release.
Priority	P3-Medium
Affected Versions	19.10
Components	4G LTE RefPHY

### 3.6 Known Issues Release Software v19.10

Title	Decode Failure when Test FD Case 2 and 4 ( $\mu=0, 20$ MHz) Under Scenario "testapp-sub6-HW Terasic."
Reference #	SCSY-28921
Description	FD test cases 2 and 4 for $\mu=0, 20$ MHz fails when running testApp.
Priority	P3-Medium
Affected Versions	19.10
Components	5G NR Ref PHY

Title	<a href="#">lib_precoding_5gnr Does Not Deal with Data out of AVX512 Boundary</a>
Reference #	SCSY-9289
Description	<a href="#">lib_precoding_5gnr</a> does not deal with data out of AVX512 boundary
Priority	P3-Medium
Affected Versions	19.10
Components	SDK

Title	<a href="#">lib_layermapping_5gnr Does Not Deal with Data out of AVX512 Boundary</a>
Reference #	SCSY-9288
Description	<a href="#">lib_layermapping_5gnr</a> does not deal with data out of AVX512 boundary
Priority	P3-Medium
Affected Versions	19.10
Components	SDK

Title	<a href="#">LLR Integer Representation Not Handled in SCSY-13223</a>
Reference #	SCSY-26560
Description	<a href="#">lib_precoding_5gnr</a> does not deal with data out of AVX512 boundary
Priority	P3-Medium
Affected Versions	19.10
Components	SDK

### 3.7 Known Issues Release Software v19.06

Title	<a href="#">[Vista Creek LTE Validation]: Some UL Cases Failed during the VC LTE Validation</a>
Reference #	SCSY-13449
Description	Some cases (for example, UL_205) failed because of some potential configuration issues when doing Vista Creek LTE validation. Some updates needed.
Priority	P3-Medium
Affected Versions	19.06
Components	LTE Ref PHY

Title	<a href="#">"Cleanup Queue is Full" Issue Found when Execute Some Testmac FD Case</a>
Reference #	SCSY-13212

Title	"Cleanup Queue is Full" Issue Found when Execute Some Testmac FD Case
Description	Due to some timing issue when sending PHY starts at the beginning, sometimes a little of test cases (for example, FD case 556), which is related to 5 cells and above might fail when running them in batch mode. When the Issue occurred, compliant of "Cleanup Queue is FULL" can be found in the trace log, and PHY might crash.
Priority	P3-Medium
Affected Versions	19.06
Components	LTE Ref PHY

Title	Low SE Corner Case for RMin May Cause Internal Buffer to Be Too Small
Reference #	SCSY-13276
Description	Extending the internal buffer in the <code>phy_LDPC_ratematch_5gnr</code> to handle some corner cases for ULRRRC.
Priority	P4-Low
Affected Versions	19.06
Components	SDK

Title	pCdmGrpInfo Pointer Not Accumulate in SRS Noise Task
Reference #	SCSY-12893
Description	In function <code>phy_srs_get_noise_per_symbol</code> there's a loop <pre>for (iGrp = 0; iGrp &lt; nCdmGrpNum; iGrp++)</pre> but <code>pCdmGrpInfo</code> never change
Priority	P3-Medium
Affected Versions	19.06
Components	5G NR Ref PHY

Title	srs Sequence Not Compliance with Spec
Reference #	SCSY-12892
Description	In spec, <code>q_bar=Nzc*(u+1)/31</code> , it is a float number, but in our function <code>bbLib_zc_sequence_gen_srs_c</code> , <code>q_bar</code> will be transformed to <code>int16_t</code> , then loose precision.
Priority	P3-Medium
Affected Versions	19.06
Components	5G NR Ref PHY

Title	Parameter Ktc No Init
Reference #	SCSY-12891
Description	The Ktc is not initialized before using it, in function <code>phy_srs_api_parsing</code>
Priority	P3-Medium
Affected Versions	19.06
Components	5G NR Ref PHY

Title	pCdmGrpInfo Pointer Not Accumulate in SRS Task
Reference #	SCSY-12890
Description	There will be a loop in function <code>phy_ul_srs_task</code> for <code>(iGrp = 0; iGrp &lt; nCdmGrpNum; iGrp++)</code> but the pointer <code>pCdmGrpInfo</code> never change
Priority	P2-High
Affected Versions	19.06
Components	5G NR Ref PHY

Title	BBDev Init with xRAN lib
Reference #	SCSY-13321
Description	There is potential issue compiling and running code with <code>BBDEV_FEC_ACCL_NR5G</code> where DPDK init in xRAN is not doing init of BBDev need to resolve it for VC and SW LDPC
Priority	P3-Medium
Affected Versions	19.06
Components	5G NR Ref PHY

Title	The issue with CB for Timers
Reference #	SCSY-13285
Description	If change timing change CB can be overwritten in xRAN library
Priority	P3-Medium
Affected Versions	19.06
Components	5G NR Ref PHY

Title	SRS with xRAN
Reference #	SCSY-13175

Title	SRS with xRAN
Description	Code crashes if <code>phy_xran_ul_srs_decomp_func()</code> runs, and manifests itself as a lost packet on FEC decoder. Not clear why. looks like corruption
Priority	P3-Medium
Affected Versions	19.06
Components	5G NR Ref PHY

Title	Bug in Test Case FD 520, mu=1, 100 MHz IQ Data
Reference #	SCSY-12734
Description	<p>There seems to be a bug in the test case FD 520, mu=1, 100 MHz IQ data. Looking at the <code>rxsduparse_tst520.txt</code> reference file:</p> <pre>Ue ChanId = 13 on slot 14 Shows CRC error. #type[PUSCH] fn[1] slot[14] carrier[0] chanId[13] len[2946] #ta[0] cqi[37.0] stat[0] #data[</pre> <p>All of the other data channels are working fine on all of the other slots. Since the config is the same for the U-slots and the configuration is the same for all UEs except for start RB, I think only the issue would be the input IQ data.) At least that is my guess for the moment</p>
Priority	P3-Medium
Affected Versions	19.03
Components	5G NR Ref PHY

Title	SDK Viterbi Decoder in AVX2 Fails to Decode.
Reference #	SCSY-9854
Description	SDK Viterbi decoder fails to RefPHY Uplink test cases UL 56 and UL 62. It will return all 0's instead of proper output. Will fail in <code>lte_testapp</code> mode.
Priority	P3-Medium
Affected Versions	19.03
Components	SDK

Title	lib_precoding_5gnr Does Not Deal with Data out of AVX512 Boundary
Reference #	SCSY-9289
Description	lib_precoding_5gnr does not deal with data out of AVX512 boundary
Priority	P4-Low
Affected Versions	19.03
Components	SDK

Title	<a href="#">lib_layermapping_5gnr Does Not Deal with Data out of AVX512 Boundary</a>
Reference #	SCSY-9288
Description	lib_layermapping_5gnr does not deal with data out of AVX512 boundary
Priority	P4-Low
Affected Versions	19.03
Components	SDK

Title	<a href="#">Polar Rate Dematching SDK Module Has Limitation.</a>
Reference #	SCSY-12811
Description	polar rate dematching SDK module has limitations. In the current SDK module, it only supports some special K and E, it can't work for all supported K and E, so it will make some test cases can't get correct polar rate dematching results.
Priority	Undecided
Affected Versions	19.03
Components	5G NR Ref PHY

Title	<a href="#">PUCCH F3/F4 Detection Failure</a>
Reference #	SCSY-9745
Description	PUCCH F3/F4 detection failure. The bug exists in polar de-rate matching SDK function. Polar de-rate matching SDK only support $E=16 \cdot (1 \sim 2) \cdot (1 \sim 16)$
Priority	P3-Medium
Affected Versions	19.03
Components	5G NR Ref PHY

Title	<a href="#">Installation of FlexRAN Package Fails in /root Directory</a>
Reference #	SCSY-8996
Description	Installation of the FlexRAN v18.12 package fails if extract.sh is executed in the /root folder
Priority	P3-Medium
Affected Versions	18.12
Components	5G NR Ref PHY, LTE Ref PHY

Title	<a href="#">XRAN Lib Fails to Build</a>
Reference #	SCSY-12824

Title	<a href="#">XRAN Lib Fails to Build</a>
Description	The FlexRAN xRAN lib fails to build with the -error flag in the make files as several warnings are treated as errors, and so the build fails. The workaround is to remove the -werror tag from the compiler flags. The fix should be to resolve the warnings.
Priority	P3-Medium
Affected Versions	18.12
Components	BSP

Title	<a href="#">Selecting ferryBridgeEthPort = 0 in phycfg.xml Causes Segfault</a>
Reference #	SCSY-12549
Description	When integrating on Network in a Box, by selecting <code>ferryBridgeEthPort = 0</code> in <code>phycfg.xml</code> , this causes a segfault in the LTE PHY application. I have identified the issue to the file <code>source/auxlib/phydi/dataint.c</code> function: <code>di_radio_cfg_setup()</code> ... <code>radioItf = pPhyCfgVars-&gt;ferryBridgeEthPort;</code> ... <code>i = radioItf - 1;</code> When <code>ferryBridgeEthPort</code> is 0, then I will be negative in the next loop, which seems to cause a segfault. So it appears we must always use <code>ferryBridgeEthPort = 1</code> But setting =1 and the app fails to find the DPDK port to initialize.
Priority	P3-Medium
Affected Versions	18.12, 19.03
Components	Ferry Bridge, LTE Ref PHY

Title	<a href="#">Ferry Bridge Fails to Configure SKL-D SuperMicro on Board NICs</a>
Reference #	SCSY-12548
Description	As part of the Network In Box project, it is required to use the onboard NICs for Front haul connectivity. However, the current ferry bridge lib in master does not configure the onboard NICs correctly, and the FlexRAN PHY fails to come up. The DPDK EAL system rejects the <code>dcbb</code> configuration. The <code>SuperMicro</code> SKL-D is a BKC platform and now Intel Select Solution.
Priority	P3-Medium
Affected Versions	18.12, 19.03
Components	Ferry Bridge, LTE Ref PHY

Title	<a href="#">testMAC Failures Seen when Tests Executed from Prompt rather than CFG File</a>
Reference #	SCSY-7683



Description	On the <a href="#">testMAC</a> , sets of tests can be executed in two ways: 1. A full suite of DL/UL/FD tests can be run by typing "run 0 / run 1 / run 2" on the <a href="#">testMAC</a> prompt. 2. A list of tests is provided in a config file is fed into <a href="#">testMAC</a> at startup (i.e. <code>./l2.sh - testfile=test_list.cfg</code> ). An issue is seen where tests fail when to run in method (1) but pass in method (2).
Priority	P3-Medium
Affected Versions	18.09
Components	LTE Ref PHY

Title	<a href="#">5G Precoding Is Limited to Multiple of 16 Sub Carrier Inputs.</a>
Reference #	SCSY-7789
Description	The current 5G NR precoding (non-codebook based) implementation has a constraint on the number of subcarriers as input, which must be a multiple of 16.
Priority	P4-Low
Affected Versions	18.09
Components	SDK

Title	<a href="#">PUCCH DTX Issue for Customer LTE Integration</a>
Reference #	SCSY-8927
Description	During customer E2E integration, they report an issue that the HARQ report on PUCCH format 1A/1B has an issue. Sometimes PHY cannot detect PUCCH, but UE always sends PUCCH with ACK. And even when PHY detects PUCCH, the SNR calculated is low (-10dB). IQ log is captured, and WaveJudge can decode PUCCH correctly, and SNR is high. I generated a unit test case based on IQ and configuration for further analysis.
Priority	P3-Medium
Affected Versions	18.09
Components	LTE Ref PHY

Title	<a href="#">No NbloT Verification Tests</a>
Reference #	SCSY-4173
Description	The NbloT RefPHY is included in the flexRAN release but was not validated other than build since release v1.4.0.
Priority	P3-Medium
Affected Versions	v1.6.0
Components	LTE Ref PHY

Title	Binary Libraries Included in NbloT Release Package
Reference #	SCSY-4172
Description	The following libraries are included in binary format in the NbloT release package: <pre>source/test/lldriver_nbiot/bin/libmlog.a bin/lte/l1/lte_phy_nbiot/libUsrcp.so bin/lte/testmac_nbiot/libwls.so</pre>
Priority	P3-Medium
Affected Versions	v1.6.0
Components	LTE Ref PHY

Title	EAL: WARNING When Starting SDK Unit Tests in Jenkins
Reference #	SCSY-7518
Description	When running tests with DPDK Huge Pages enabled, the following warning may be seen during EAL initialization: <b>EAL: WARNING:</b> cpu flags constant_tsc=yes nonstop_tsc=no -> using unreliable clock cycles This is a DPDK warning that the platform is configured to stop the TSC during a core C-state. In practice, it can be ignored for FlexRAN SDK test benches since the core will not be in a C-state during module measurement, and C-states are typically disabled in the BIOS for FlexRAN SDK testing.
Priority	P4-Low
Affected Versions	v1.5.0
Components	SDK

Title	mmse_MIMO_5gnr Module Configurations beyond 8 Antenna 2 Layers Are Not Optimized
Reference #	SCSY-2627
Description	Even though the mmse_MIMO_5gnr module is capable of supporting configurations up to 8 antenna and 8 layers, its compute performance was only optimized up to 8 antennae 2 layers configurations.
Priority	P3-Medium
Affected Versions	v1.4.2
Components	SDK

Title	TBCC AVX2 Performance is Worse than C Implementation
Reference #	SCSY-1457
Description	The AVX2 performance of TBCC is worse than C code implementation. Workaround to use C code implementation.
Priority	P3-Medium
Affected Versions	v1.3.0
Components	SDK

### 3.8 Known Issues Release Software v19.04-ea

Title	False Failures with bbdev Enabled
Reference #	SCSY-12786
Description	There are test vectors where there are supposed to be CRC failures. These vectors are present to do profiling only. Since LPDC decoder on FPGA will be different than LPDC decoder in software, FEC output will be different. An example: <code>mu=1, 100MHz</code> <code>TestCase = 520</code>
Priority	P3-Medium
Affected Versions	19.04-ea
Components	5G NR Ref PHY

Title	Sometimes Coredump in memset for Encoder Buffer
Reference #	SCSY-9785
Description	Sometimes the one slot DL test will have <code>coredump</code> in <code>memset((void*)pEnInHeader,0,HEADER_LEN_ENCODE_IN);</code> looks like some invalid pointer
Priority	P3-Medium
Affected Versions	19.03
Components	5G NR Ref PHY

Title	lib_precoding_5gnr Does Not Deal with Data out of AVX512 Boundary
Reference #	SCSY-9289
Description	lib_precoding_5gnr does not deal with data out of AVX512 boundary
Priority	P4-Low
Affected Versions	19.03
Components	SDK

Title	lib_layermapping_5gnr Does Not Deal with Data out of AVX512 Boundary
Reference #	SCSY-9288
Description	lib_layermapping_5gnr does not deal with data out of AVX512 boundary
Priority	P4-Low
Affected Versions	19.03

Components	SDK
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Title	Bug in Test Case FD 520, mu=1, 100 MHz IQ data
Reference #	SCSY-12734
Description	<p>There seems to be a bug in the test case FD 520, mu=1, 100 MHz IQ data. Looking at the rxsduparse_tst520.txt reference file:</p> <pre>Ue ChanId = 13 on slot 14 Shows CRC error. #type[PUSCH] fn[1] slot[14] carrier[0] chanId[13] len[2946] #ta[0] cqi[37.0] stat[0] #data[</pre> <p>All of the other data channels are working fine on all of the other slots. Since the config is the same for the U-slots and the configuration is the same for all UEs except for start RB, I think only the issue would be the input IQ data.</p>
Priority	P3-Medium
Affected Versions	19.03
Components	5G NR Ref PHY

Title	SDK Viterbi Decoder in AVX2 Fails to Decode
Reference #	SCSY-9854
Description	SDK Viterbi decoder fails to RefPHY Uplink test cases UL 56 and UL 62. It will return all 0's instead of proper output. Will fail in lte_testapp mode.
Priority	P3-Medium
Affected Versions	19.03
Components	SDK

Title	PUCCH F3/F4 Detection Failure when High Code Rate
Reference #	SCSY-9745
Description	PUCCH F3/F4 detection failure when high code rate. For example, F4, payload length=16, 4 symbol, 1 RB
Priority	P3-Medium
Affected Versions	19.03
Components	5G NR Ref PHY

Title	Installation of FlexRAN Package Fails in /root Directory
Reference #	SCSY-8996

Title	Installation of FlexRAN Package Fails in /root Directory
Description	Installation of the FlexRAN v18.12 package fails if <code>extract.sh</code> is executed in the /root folder
Priority	P3-Medium
Affected Versions	18.12
Components	5G NR Ref PHY, LTE Ref PHY

Title	Selecting <code>ferryBridgeEthPort = 0</code> in <code>phycfg.xml</code> Causes Segfault
Reference #	SCSY-12549
Description	<p>When integrating on Network in a Box, by selecting <code>ferryBridgeEthPort = 0</code> in <code>phycfg.xml</code>, this causes a <code>segfault</code> in the LTE PHY application.</p> <p>I have identified the issue to the file <code>source/auxlib/phydi/dataint.c</code> function: <code>di_radio_cfg_setup()</code></p> <pre>... radioItf = pPhyCfgVars-&gt;ferryBridgeEthPort; ...</pre> <p><code>i = radioItf - 1;</code>  When <code>ferryBridgeEthPort</code> is 0, then I will be negative in the next loop, which seems to cause a <code>segfault</code>.  So it appears we must always use <code>ferryBridgeEthPort = 1</code>  But setting <code>=1</code> and the app fails to find the DPDK port to initialize.</p>
Priority	P3-Medium
Affected Versions	18.12, 19.03
Components	Ferry Bridge, LTE Ref PHY

Title	Ferry Bridge Fails to Configure SKL-D SuperMicro on Board NICs
Reference #	SCSY-12548
Description	<p>As part of the Network In Box project, it is required to use the onboard NICs for Front haul connectivity. However, the current ferry bridge lib in master does not configure the onboard NICs correctly, and the FlexRAN PHY fails to come up.</p> <p>The DPDK EAL system rejects the dcb configuration.</p> <p>The SuperMicro SKL-D is a BKC platform and now Intel Select Solution.</p>
Priority	P3-Medium
Affected Versions	18.12, 19.03
Components	Ferry Bridge, LTE Ref PHY

Title	testMAC Failures Seen when Tests Executed from Prompt rather than cfg File
Reference #	SCSY-7683

Title	<a href="#">testMAC Failures Seen when Tests Executed from Prompt rather than cfg File</a>
Description	On the testMAC, sets of tests can be executed in two ways: 1) A full suite of DL/UL/FD tests can be run by typing "run 0 / run 1 / run 2" on the testMAC prompt. 2) A list of tests is provided in a config file is fed into testMAC at startup (i.e. <code>./l2.sh - testfile=test_list.cfg</code> ). An issue is seen where tests fail when to run in method (1) but pass in method (2).
Priority	P3-Medium
Affected Versions	18.09
Components	LTE Ref PHY

Title	<a href="#">5G Precoding is Limited to Multiple of 16 Sub Carrier Inputs.</a>
Reference #	SCSY-7789
Description	The current 5G NR precoding (non-codebook based) implementation has a constraint on the number of subcarriers as input, which must be a multiple of 16.
Priority	P4-Low
Affected Versions	18.09
Components	SDK

Title	<a href="#">PUCCH DTX Issue for Samsung LTE Integration</a>
Reference #	SCSY-8927
Description	During Samsung E2E integration, they report an issue that the HARQ report on PUCCH format 1A/1B has an issue. Sometimes PHY cannot detect PUCCH, but UE always sends PUCCH with ACK. And even when PHY detects PUCCH, the SNR calculated is low (~10dB). IQ log is captured, and <a href="#">WaveJudge</a> can decode PUCCH correctly, and SNR is high. I generated a unit test case based on IQ and configuration for further analysis.
Priority	P3-Medium
Affected Versions	18.09
Components	LTE Ref PHY

Title	<a href="#">No NbloT Verification Tests</a>
Reference #	SCSY-4173
Description	The <a href="#">NbIoT RefPHY</a> is included in the FlexRAN release but was not validated other than build since release v1.4.0.
Priority	P3-Medium
Affected Versions	v1.6.0
Components	LTE Ref PHY

Title	Binary Libraries Included in NbloT Release Package
Reference #	SCSY-4172
Description	The following libraries are included in binary format in the NbloT release package: source/test/l1driver_nbiot/bin/libmlog.a bin/lte/l1/lte_phy_nbiot/libUsrc.so bin/lte/testmac_nbiot/libwls.so
Priority	P3-Medium
Affected Versions	v1.6.0
Components	LTE Ref PHY

Title	EAL: WARNING when Starting SDK Unit Tests in Jenkins
Reference #	SCSY-7518
Description	When running tests with DPDK Huge Pages enabled, the following warning may be seen during EAL initialization: <b>EAL: WARNING:</b> cpu flags <code>constant_tsc=yes nonstop_tsc=no</code> -> using unreliable clock cycles This is a DPDK warning that the platform is configured to stop the TSC during a core C-state. In practice, it can be ignored for FlexRAN SDK test benches since the core will not be in a C-state during module measurement, and C-states are typically disabled in the BIOS for FlexRAN SDK testing.
Priority	P4-Low
Affected Versions	v1.5.0
Components	SDK

Title	mmse_MIMO_5gnr module Configurations Beyond 8 Antenna 2 Layers Are Not Optimized
Reference #	SCSY-2627
Description	Even though the <code>mmse_MIMO_5gnr</code> module is capable of supporting configurations up to 8 antenna and 8 layers, its compute performance was only optimized up to 8 antennae 2 layers configurations.
Priority	P3-Medium
Affected Versions	v1.4.2
Components	SDK

Title	TBCC AVX2 Performance Is Worse than C Implementation
Reference #	SCSY-1457
Description	The AVX2 performance of TBCC is worse than C code implementation. Workaround to use C code implementation.
Priority	P3-Medium

Affected Versions	v1.3.0
Components	SDK

### 3.9 Known Issues Release Software v19.03

Title	<a href="#">Sometimes Coredump in memset for Encoder Buffer</a>
Reference #	SCSY-9785
Description	Sometimes the one slot DL test will have <code>coredump</code> in <code>memset((void*)pEnInHeader,0,HEADER_LEN_ENCODE_IN);</code> looks like some invalid pointer
Priority	P3-Medium
Affected Versions	19.03
Components	5G NR Ref PHY

Title	<a href="#">PUCCH F3/F4 Detection Failure when High Code Rate.</a>
Reference #	SCSY-9745
Description	PUCCH F3/F4 detection failure when high code rate. For example, F4, Payload length=16, 4 Symbol, 1 RB
Priority	P3-Medium
Affected Versions	19.03
Components	5G NR Ref PHY

Title	<a href="#">lib_precoding_5gnr Does Not Deal with Data out of AVX512 Boundary</a>
Reference #	SCSY-9289
Description	<code>lib_precoding_5gnr</code> does not deal with data out of AVX512 boundary
Priority	P4-Low
Affected Versions	19.03
Components	SDK

Title	<a href="#">lib_layermapping_5gnr Does Not Deal with Data out of AVX512 Boundary</a>
Reference #	SCSY-9288
Description	<code>lib_layermapping_5gnr</code> does not deal with data out of AVX512 boundary
Priority	P4-Low



Title	<a href="#">lib_layermapping_5gnr Does Not Deal with Data out of AVX512 Boundary</a>
Affected Versions	19.03
Components	SDK

Title	<a href="#">SDK Viterbi Decoder in AVX2 Fails to Decode</a>
Reference #	SCSY-9854
Description	SDK Viterbi decoder fails to <a href="#">RefPHY</a> Uplink test cases UL 56 and UL 62. It will return all 0's instead of proper output. Will fail in <a href="#">lte_testapp</a> mode.
Priority	P3-Medium
Affected Versions	19.03
Components	SDK

Title	<a href="#">testMAC 5G NR sub6 Missing Config Files</a>
Reference #	SCSY-8774
Description	The following tests fail with missing config file: <a href="#">Test [DL500]</a> <a href="#">Test [DL504]</a> <a href="#">Test [UL500]</a> <a href="#">Test [UL504]</a>
Priority	P3-Medium
Affected Versions	18.12
Components	5G NR Ref PHY

Title	<a href="#">Building CPA: chrt: Failed to Set PID</a>
Reference #	SCSY-8581
Description	When building a CPA through the <a href="#">flexran_build.sh</a> script, the following error is reported: <a href="#">chrt</a> : failed to set <a href="#">PID X</a> 's policy: No such process The library is still built.
Priority	P3-Medium
Affected Versions	18.12
Components	5G NR Ref PHY

Title	<a href="#">Installation of FlexRAN Package Fails in /root Directory</a>
Reference #	SCSY-8996
Description	Installation of the FlexRAN v18.12 package fails if <a href="#">extract.sh</a> is executed in the <a href="#">/root</a> folder
Priority	P3-Medium

Title	Installation of FlexRAN Package Fails in /root Directory
Affected Versions	18.12
Components	5G NR Ref PHY, LTE Ref PHY

Title	testMAC Failures Seen when Tests Executed from Prompt rather than cfg File
Reference #	SCSY-7683
Description	On the testMAC, sets of tests can be executed in two ways: 1) A full suite of DL/UL/FD tests can be run by typing "run 0 / run 1 / run 2" on the testMAC prompt. 2) A list of tests is provided in a config file is fed into testMAC at startup (i.e. <code>./l2.sh - testfile=test_list.cfg</code> ). An issue is seen where tests fail when to run in method (1) but pass in method (2).
Priority	P3-Medium
Affected Versions	18.09
Components	LTE Ref PHY

Title	5G Precoding is Limited to Multiple of 16 Subcarrier Inputs
Reference #	SCSY-7789
Description	The current 5G NR precoding (non-codebook based) implementation has a constraint on the number of subcarriers as input, which must be a multiple of 16.
Priority	P4-Low
Affected Versions	18.09
Components	SDK

Title	PUCCH DTX Issue for LTE Integration
Reference #	SCSY-8927
Description	HARQ report on PUCCH format 1A/1B has an issue. Sometimes PHY cannot detect PUCCH, but UE always sends PUCCH with ACK. And even when PHY detects PUCCH, the SNR calculated is low (~10 dB). IQ log is captured, and WaveJudge can decode PUCCH correctly, and SNR is high. I generated a unit test case based on IQ and configuration for further analysis.
Priority	P3-Medium
Affected Versions	18.09
Components	LTE Ref PHY

Title	No NbloT Verification Tests
Reference #	SCSY-4173
Description	The <a href="#">NbIoT RefPHY</a> is included in the FlexRAN release but was not validated other than build since release v1.4.0.
Priority	P3-Medium
Affected Versions	v1.6.0
Components	LTE Ref PHY

Title	Binary Libraries Included in NbIoT Release Package
Reference #	SCSY-4172
Description	The following libraries are included in binary format in the <a href="#">NbIoT</a> release package: <pre>source/test/lldriver_nbiot/bin/libmlog.a bin/lte/l1/lte_phy_nbiot/libUsrcp.so bin/lte/testmac_nbiot/libwls.so</pre>
Priority	P3-Medium
Affected Versions	v1.6.0
Components	LTE Ref PHY

Title	EAL: WARNING When Starting SDK Unit Tests in Jenkins
Reference #	SCSY-7518
Description	When running tests with DPDK Huge Pages enabled, the following warning may be seen during EAL initialization: <b>EAL: WARNING:</b> cpu flags <code>constant_tsc=yes nonstop_tsc=no</code> -> using unreliable clock cycles This is a DPDK warning that the platform is configured to stop the TSC during a core C-state. In practice, it can be ignored for FlexRAN SDK test benches since the core will not be in a C-state during module measurement, and C-states are typically disabled in the BIOS for FlexRAN SDK testing.
Priority	P4-Low
Affected Versions	v1.5.0
Components	SDK

Title	<a href="#">mmse_MIMO_5gnr</a> Module Configurations beyond 8 Antenna 2 Layers Are Not Optimized
Reference #	SCSY-2627
Description	Even though the <a href="#">mmse_MIMO_5gnr</a> module is capable of supporting configurations up to 8 antenna and 8 layers, its compute performance was only optimized up to 8 antennae 2 layers configurations.
Priority	P3-Medium

Title	<a href="#">mmse_MIMO_5gnr Module Configurations beyond 8 Antenna 2 Layers Are Not Optimized</a>
Affected Versions	v1.4.2
Components	SDK

Title	<a href="#">TBCC AVX2 Performance Is Worse than C Implementation</a>
Reference #	SCSY-1457
Description	The AVX2 performance of TBCC is worse than C code implementation. Workaround to use C code implementation.
Priority	P3-Medium
Affected Versions	v1.3.0
Components	SDK

### 3.10 Known Issues Release Software v18.12

Title	<a href="#">Building CPA: chrt: Failed To Set PID</a>
Reference #	SCSY-8581
Description	When building a CPA through the <a href="#">flexran_build.sh</a> script, the following error is reported: chrt: failed to set PID X's policy: No such process The library is still built.
Priority	P3-Medium
Affected Versions	v18.12
Components	5G NR Ref PHY

Title	<a href="#">Configure Bandwidth, Numerology, FFT size, and Other Parameters from Config Request Msg.</a>
Reference #	SCSY-8159
Description	Currently, parameters that are defined in the config request API message are hardcoded and require a compile-time flag to change them. Parameters like: fft size bandwidth numerology are being passed in the config request message when L1 starts. The value should be used instead of the #define that is currently there.
Priority	P3-Medium
Affected Versions	v18.12
Components	5G NR Ref PHY

Title	testMAC Failures Seen when Tests Executed from Prompt rather than cfg File
Reference #	SCSY-7683
Description	On the testMAC, sets of tests can be executed in two ways: A full suite of DL/UL/FD tests can be run by typing "run 0 / run 1 / run 2" on the testMAC prompt. A list of tests is provided in a config file is fed into testMAC at startup (i.e. ./l2.sh - testfile=test_list.cfg). An issue is seen where tests fail when to run in method (1) but pass in method (2).
Priority	P3-Medium
Affected Versions	v18.09
Components	LTE Ref PHY

Title	LTE TestApp FD Test Failure
Reference #	SCSY-7211
Description	The following testapp FD test fails with AVX512: fdd_fd_0057
Priority	P3-Medium
Affected Versions	v18.09
Components	LTE Ref PHY

Title	AVX2/AVX512 testMAC UL Test Failures
Reference #	SCSY-7208
Description	The following tests are failing on AVX512 and AVX2 testmac testing: Test[UL405] Result: FAIL PDSCH: - PUSCH: F RXBITS: - PUCCH: - MUXSCH: - SNR: F TA: F RACH: - SRS: - RIP: - NFLOOR: - NDEMOD_CW: - Test[UL406] Result: FAIL PDSCH: - PUSCH: F RXBITS: - PUCCH: - MUXSCH: - SNR: F TA: F RACH: - SRS: - RIP: - NFLOOR: - NDEMOD_CW: - Test[UL407] Result: FAIL PDSCH: - PUSCH: - RXBITS: - PUCCH: F MUXSCH: - SNR: F TA: F RACH: - SRS: - RIP: - NFLOOR: - NDEMOD_CW: - Test[UL408] Result: FAIL PDSCH: - PUSCH: - RXBITS: - PUCCH: F MUXSCH: - SNR: F TA: F RACH: - SRS: - RIP: - NFLOOR: - NDEMOD_CW: -
Priority	P3-Medium
Affected Versions	v18.09
Components	LTE Ref PHY

Title	LTE RefPHY RCT Test Failures
Reference #	SCSY-6494
Description	The following LTE RefPHY RCT tests are failing for AVX2 and AVX512:

Title	LTE RefPHY RCT Test Failures
	rct_ul_832_3mhz_eva5hz_2a_pucch_f2_detect rct_ul_832_3mhz_etu70hz_2a_pucch_f2_detect rct_ul_832_5mhz_eva5hz_2a_pucch_f2_detect rct_ul_832_5mhz_etu70hz_2a_pucch_f2_detect rct_ul_832_10mhz_eva5hz_2a_pucch_f2_detect rct_ul_832_10mhz_etu70hz_2a_pucch_f2_detect rct_ul_catm_10mhz_pucch_F2DetACK10MHz_REP1 rct_ul_catm_10mhz_pucch_F2DetACK10MHz_REP4 rct_ul_catm_10mhz_pucch_F2ADetACK10MHz_REP1 rct_ul_catm_10mhz_pucch_F2BDetACK10MHz_REP1 rct_ul_832_15mhz_eva5hz_2a_pucch_f2_detect rct_ul_832_15mhz_etu70hz_2a_pucch_f2_detect rct_ul_832_20mhz_eva5hz_2a_pucch_f2_detect rct_ul_832_20mhz_etu70hz_2a_pucch_f2_detect rct_ul_catm_20mhz_pucch_F2DetACK20MHz_REP4 rct_ul_catm_20mhz_pucch_F2BDetACK20MHz_REP4 rct_ul_catm_20mhz_pucch_F2BDetACK20MHz_REP4_DTX rct_ul_catm_20mhz_pucch_F2BDetACK20MHz_REP4 rct_ul_catm_20mhz_pucch_F2BDetACK20MHz_REP4_DTX
Priority	P3-Medium
Affected Versions	v18.09
Components	LTE Ref PHY
Title	LTE RefPHY Testapp UL Test Failures
Reference #	SCSY-5101
Description	<p>The following testapp UL are failing on BDW / AVX2:</p> <pre>fdd_ul_0056</pre> <pre>fdd_ul_0062</pre> <p>The following testapp UL are failing on SKL / AVX512:</p> <pre>fdd_ul_0181</pre>
Priority	P3-Medium
Affected Versions	v18.09
Components	LTE Ref PHY

Title	No NbloT Verification Tests
Reference #	SCSY-4173
Description	The NbloT RefPHY is included in the FlexRAN release but was not validated other than build since release v1.4.0.
Priority	P3-Medium
Affected Versions	v1.6.0
Components	LTE Ref PHY

Title	Binary Libraries Included in NbioT Release Package
Reference #	SCSY-4172
Description	The following libraries are included in binary format in the <a href="#">NbIoT</a> release package: source/test/l1driver_nbiot/bin/libmlog.a bin/lte/l1/lte_phy_nbiot/libUsp.so bin/lte/testmac_nbiot/libwls.so
Priority	P3-Medium
Affected Versions	v1.6.0
Components	LTE Ref PHY

Title	SDK Unit Tests Do Not Compile when Setting WIRELESS_SDK_STANDARD to 5gnr
Reference #	SCSY-8682
Description	The unit tests for the pucch_cestimate_5gnr module have a dependency on <a href="#">libscramble</a> , which is an LTE module. As a result, the pucch_cestimate_5gnr will not compile when setting <a href="#">WIRELESS_SDK_STANDARD</a> to 5gnr. Until this ticket is resolved, the user should set <a href="#">WIRELESS_SDK_STANDARD</a> to all (or leave it unset, which will default to all) to build the SDK unit tests.
Priority	P4-Low
Affected Versions	v18.12
Components	SDK

Title	5G Precoding Is Limited to Multiple of 16 Subcarrier Inputs.
Reference #	SCSY-7789
Description	The current 5G NR precoding (non-codebook based) implementation has a constraint on the number of subcarriers as input, which must be a multiple of 16.
Priority	P4-Low
Affected Versions	v18.09
Components	SDK

Title	EAL: WARNING When Starting SDK Unit Tests in Jenkins
Reference #	SCSY-7518
Description	When running tests with DPK Huge Pages enabled, the following warning may be seen during EAL initialization: EAL: WARNING: CPU flags <code>constant_tsc=yes nonstop_tsc=no</code> -> using unreliable clock cycles. This is a DPK warning that the platform is configured to stop the TSC during a core C-state. In practice, it can be ignored for FlexRAN SDK test benches since the core will not be in a C-state during module measurement, and C-states are normally disabled in the BIOS for FlexRAN SDK testing.
Priority	P4-Low

Title	<a href="#">EAL: WARNING When Starting SDK Unit Tests in Jenkins</a>
Affected Versions	v1.5.0
Components	SDK

Title	<a href="#">4G LTE Rate Matching SDK Code To Support New Feature for Release 10 and Above UEs</a>
Reference #	SCSY-7312
Description	The rate matching module for 4G LTE does not correctly operate when UEs are Release 10 and above.
Priority	P3-Medium
Affected Versions	<a href="#">lte_fec-18.08-ea</a>
Components	SDK

Title	<a href="#">mmse_MIMO_5gnr Module Configurations beyond 8 Antenna 2 Layers Are Not Optimized</a>
Reference #	SCSY-2627
Description	Even though the <a href="#">mmse_MIMO_5gnr</a> module is capable of supporting configurations up to 8 antenna and 8 layers, its compute performance was only optimized up to 8 antennae 2 layers configurations.
Priority	P3-Medium
Affected Versions	v1.4.2
Components	SDK

Title	<a href="#">TBCC AVX2 Performance Is Worse than C Implementation</a>
Reference #	SCSY-1457
Description	The AVX2 performance of TBCC is worse than C code implementation. Workaround to use C code implementation.
Priority	P3-Medium
Affected Versions	v1.3.0
Components	SDK

Title	<a href="#">mmWave testMAC Case DL1008/1031 Failures – Missing Config files Need To Be Added</a>
Reference #	SCSY-8770
Description	Test[DL1008]   Result: FAIL   PDSCH: F   PUSCH: -   RXBITS: -   PUCCH: -   MUXSCH: -   SNR: -   TA: -   RACH: -   SRS: -   Test[DL1031]   Result: FAIL   PDSCH: F   PUSCH: -   RXBITS: -   PUCCH: -   MUXSCH: -   SNR: -   TA: -   RACH: -   SRS: -   Missing Config Files



Title	mmWave testMAC Case DL1008/1031 Failures – Missing Config files Need To Be Added
Priority	P3-Medium
Affected Versions	v18.12
Components	5G Ref PHI

Title	mmWave testMAC UL Case 1001/2 1062/3/4/5 Failures – Reference Files Need to Be Updated
Reference #	SCSY-8771
Description	<p>Test[UL1001]   Result: FAIL   PDSCH: -   PUSCH: F   RXBITS: -   PUCCH: -   MUXSCH: -   SNR: F   TA: -   RACH: -   SRS: -  </p> <p>Test[UL1002]   Result: FAIL   PDSCH: -   PUSCH: F   RXBITS: -   PUCCH: -   MUXSCH: -   SNR: F   TA: -   RACH: -   SRS: -  </p> <p>Test[UL1062]   Result: FAIL   PDSCH: -   PUSCH: -   RXBITS: -   PUCCH: F   MUXSCH: -   SNR: P   TA: P   RACH: -   SRS: -  </p> <p>Test[UL1063]   Result: FAIL   PDSCH: -   PUSCH: -   RXBITS: -   PUCCH: F   MUXSCH: -   SNR: P   TA: P   RACH: -   SRS: -  </p> <p>Test[UL1064]   Result: FAIL   PDSCH: -   PUSCH: -   RXBITS: -   PUCCH: F   MUXSCH: -   SNR: P   TA: P   RACH: -   SRS: -  </p> <p>Test[UL1065]   Result: FAIL   PDSCH: -   PUSCH: -   RXBITS: -   PUCCH: F   MUXSCH: -   SNR: P   TA: P   RACH: -   SRS: -  </p> <p>1062-1065 – Reference files need to be updated.</p>
Priority	P3-Medium
Affected Versions	v18.12
Components	5G Ref PHI

Title	mmWave testMAC FD Case 1001/1011 Failures
Reference #	SCSY-8772
Description	<p>Test[FD1001]   Result: FAIL   PDSCH: P   PUSCH: F   RXBITS: -   PUCCH: -   MUXSCH: -   SNR: F   TA: P   RACH: -   SRS: -  </p> <p>Test[FD1011]   Result: FAIL   PDSCH: F   PUSCH: -   RXBITS: -   PUCCH: -   MUXSCH: -   SNR: -   TA: -   RACH: -   SRS: -  </p> <p>1011 – reference files need to be updated</p>
Priority	P3-Medium
Affected Versions	v18.12
Components	5G Ref PHI

Title	5G NR sub6 testMAC Case DL500/504 UL500/50 4 Missing Configuration Files
Reference #	SCSY-8774

Title	5G NR sub6 testMAC Case DL500/504 UL500/50 4 Missing Configuration Files
Description	The following tests fail with missing configuration file: Test[DL500] Test[DL504] Test[UL500] Test[UL504]
Priority	P3-Medium
Affected Versions	v18.12
Components	5G Ref PHI

Title	5G NR sub6 testMAC Case UL1217-1222, 1310 failures – TestMAC Issue and Reference File Needs To Be Updated.
Reference #	SCSY-8775
Description	Test[UL1217]   Result: FAIL   PDSCH: -   PUSCH: -   RXBITS: -   PUCCH: -   MUXSCH: -   SNR: -   TA: -   RACH: -   SRS: F   Test[UL1218]   Result: FAIL   PDSCH: -   PUSCH: -   RXBITS: -   PUCCH: -   MUXSCH: -   SNR: -   TA: -   RACH: -   SRS: F   Test[UL1219]   Result: FAIL   PDSCH: -   PUSCH: -   RXBITS: -   PUCCH: -   MUXSCH: -   SNR: -   TA: -   RACH: -   SRS: F   Test[UL1220]   Result: FAIL   PDSCH: -   PUSCH: -   RXBITS: -   PUCCH: -   MUXSCH: -   SNR: -   TA: -   RACH: -   SRS: F   Test[UL1221]   Result: FAIL   PDSCH: -   PUSCH: -   RXBITS: -   PUCCH: -   MUXSCH: -   SNR: -   TA: -   RACH: -   SRS: F   Test[UL1222]   Result: FAIL   PDSCH: -   PUSCH: -   RXBITS: -   PUCCH: -   MUXSCH: -   SNR: -   TA: -   RACH: -   SRS: F   Test[UL1310]   Result: FAIL   PDSCH: -   PUSCH: F   RXBITS: -   PUCCH: -   MUXSCH: -   SNR: F   TA: P   RACH: -   SRS: -
Priority	P3-Medium
Affected Versions	v18.12
Components	5G Ref PHY

Title	LTE testMAC Case FD 500/801/842 Failures
Reference #	SCSY-8769
Description	Test[FD500]   Result: FAIL   PDSCH: F   PUSCH: P   RXBITS: -   PUCCH: P   MUXSCH: P   SNR: P   TA: P   RACH: -   SRS: -   RIP: -   NFLOOR: -   NDEMOC_CW: -   Test[FD801]   Result: FAIL   PDSCH: P   PUSCH: P   RXBITS: -   PUCCH: -   MUXSCH: -   SNR: P   TA: P   RACH: -   SRS: -   RIP: -   NFLOOR: -   NDEMOC_CW: -   Test[FD842]   Result: FAIL   PDSCH: P   PUSCH: P   RXBITS: -   PUCCH: -   MUXSCH: -   SNR: P   TA: P   RACH: -   SRS: -   RIP: -   NFLOOR: -   NDEMOC_CW: -
Priority	P3-Medium

Title	LTE testMAC Case FD 500/801/842 Failures
Affected Versions	v18.12
Components	LTE Ref PHI

## 3.11 Known Issues Release Software v18.09

### 3.11.1 5G NR RefPHY and FPGA Issues in Release Software v18.09

Title	testMAC Failures Seen when Tests Executed from Prompt rather than cfg File
Reference #	SCSY-7683
Description	<p>On the testMAC, sets of tests can be executed in two ways:</p> <p>A full suite of DL/UL/FD tests can be run by typing "run 0 / run 1 / run 2" on the testMAC prompt.</p> <p>A list of tests is provided in a config file is fed into testMAC at startup (i.e. <code>./l2.sh - testfile=test_list.cfg</code>).</p> <p>An issue is seen where tests fail when to run in method (1) but pass in method (2).</p>
Priority	P3-Medium
Affected Versions	v18.09
Components	5G NR Ref PHY

Title	PRACH False Detects for IODT Setup
Reference #	SCSY-7576
Description	Some PRACH false detections were observed when the UE is transmitting nothing. To work around the issue, the PRACH detection threshold in the SDK was increased.
Priority	P3-Medium
Affected Versions	v18.09
Components	5G NR Ref PHY

Title	nr5G testMAC Test DL 203 Failing (SUB6)
Reference #	SCSY-7485
Description	<p>testMAC tests failing on SUB6 DL 203:</p> <p>Files <code>/root/r18.09/tests/nr5g/dl/203/dl_iq_out_tst203.d</code> and <code>/root/r18.09/tests/nr5g/dl/203/dliq_c0.txt</code> are different</p> <p>Maximum absolute difference 1696.0, average difference 5.653</p> <p>1203 Result: <code>FAIL PDSCH: F PUSCH: - RXBITS: - PUCCH: - MUXSCH: - SNR: - TA: - RACH: - SRS:-</code></p> <p>This is due to an improper DMRS power boosting in reference output, needs a boost from 0dB to 3dB.</p>
Priority	P3-Medium

Title	nr5G testMAC Test DL 203 Failing (SUB6)
Affected Versions	v18.09
Components	5G NR Ref PHY

### 3.11.2 4G RefPHY Issues in Release v18.09

Title	FD testmac Failures
Reference #	SCSY-7601
Description	<p>The following FD tests are failing - they are advertised in the DOXYGEN test descriptions so</p> <p>Test[FD25] Result: FAIL PDSCH: P PUSCH: F RXBITS: - PUCCH: - MUXSCH: - SNR: F TA: F RACH: - SRS: - RIP: - NFLOOR: - NDEMOCW: -</p> <p>Test[FD30] Result: FAIL PDSCH: P PUSCH: F RXBITS: - PUCCH: - MUXSCH: - SNR: F TA: F RACH: - SRS: - RIP: - NFLOOR: - NDEMOCW: -</p> <p>Test[FD31] Result: FAIL PDSCH: P PUSCH: F RXBITS: - PUCCH: - MUXSCH: - SNR: F TA: F RACH: - SRS: - RIP: - NFLOOR: - NDEMOCW: -</p> <p>Test[FD32] Result: FAIL PDSCH: P PUSCH: F RXBITS: - PUCCH: - MUXSCH: - SNR: F TA: F RACH: - SRS: - RIP: - NFLOOR: - NDEMOCW: -</p> <p>Test[FD33] Result: FAIL PDSCH: P PUSCH: F RXBITS: - PUCCH: - MUXSCH: - SNR: F TA: F RACH: - SRS: - RIP: - NFLOOR: - NDEMOCW: -</p> <p>Test[FD34] Result: FAIL PDSCH: P PUSCH: F RXBITS: - PUCCH: - MUXSCH: - SNR: F TA: F RACH: - SRS: - RIP: - NFLOOR: - NDEMOCW: -Test[FD35] Result: FAIL PDSCH: P PUSCH: F RXBITS: - PUCCH: - MUXSCH: - SNR: F TA: F RACH: - SRS: - RIP: - NFLOOR: - NDEMOCW: -</p> <p>Test[FD36] Result: FAIL PDSCH: P PUSCH: F RXBITS: - PUCCH: - MUXSCH: - SNR: F TA: F RACH: - SRS: - RIP: - NFLOOR: - NDEMOCW: -</p> <p>Test[FD53] Result: FAIL PDSCH: P PUSCH: F RXBITS: - PUCCH: F MUXSCH: - SNR: F TA: F RACH: P SRS: - RIP: - NFLOOR: - NDEMOCW: -</p> <p>Test[FD54] Result: FAIL PDSCH: P PUSCH: F RXBITS: - PUCCH: F MUXSCH: - SNR: F TA: F RACH: P SRS: - RIP: - NFLOOR: - NDEMOCW: -</p> <p>Test[FD55] Result: FAIL PDSCH: P PUSCH: F RXBITS: - PUCCH: F MUXSCH: - SNR: F TA: F RACH: P SRS: - RIP: - NFLOOR: - NDEMOCW: -</p>
Priority	Undecided
Affected Versions	v18.09
Components	LTE Ref PHY

Title	LTE testmac test FD33 Failure
Reference #	SCSY-7446
Description	LTE testmac test FD33 fails on AVX2 and AVX512.
Priority	P3-Medium
Affected Versions	v18.09
Components	LTE Ref PHY

Title	FAPI Not Sending phy_reconfig_request
Reference #	SCSY-7245
Description	<a href="#">ia_fapi_handle_phy_shutdown_req</a> doesn't change the fapi state correctly, so when we try to restart PHY, there'll be an issue with sending <a href="#">phy_init_req</a> .
Priority	P3-Medium
Affected Versions	v18.09
Components	LTE Ref PHY

Title	LTE TestApp FD Test Failure
Reference #	SCSY-7211
Description	The following testapp FD test fails with AVX2 and AVX512: <code>fd fd 0057</code>
Priority	P3-Medium
Affected Versions	v18.09
Components	LTE Ref PHY

Title	AVX2/AVX512 testMAC UL Test Failures
Reference #	SCSY-7208
Description	The following tests are failing on AVX512 and AVX2 testmac testing: Test[UL405] Result: FAIL PDSCH: - PUSCH: F RXBITS: - PUCCH: - MUXSCH: - SNR: F TA: F RACH: - SRS: - RIP: - NFLOOR: - NDEMOD_CW: - Test[UL406] Result: FAIL PDSCH: - PUSCH: F RXBITS: - PUCCH: - MUXSCH: - SNR: F TA: F RACH: - SRS: - RIP: - NFLOOR: - NDEMOD_CW: - Test[UL407] Result: FAIL PDSCH: - PUSCH: - RXBITS: - PUCCH: F MUXSCH: - SNR: F TA: F RACH: - SRS: - RIP: - NFLOOR: - NDEMOD_CW: - Test[UL408] Result: FAIL PDSCH: - PUSCH: - RXBITS: - PUCCH: F MUXSCH: - SNR: F TA: F RACH: - SRS: - RIP: - NFLOOR: - NDEMOD_CW: -
Priority	P3-Medium
Affected Versions	v18.09
Components	LTE Ref PHY

Title	LTE RefPHY RCT Test Failures
Reference #	SCSY-6494
Description	The following LTE RefPHY RCT tests are failing for AVX2 and AVX512:

Title	LTE RefPHY RCT Test Failures
	rct_ul_832_3mhz_eva5hz_2a_pucch_f2_detect rct_ul_832_3mhz_etu70hz_2a_pucch_f2_detect rct_ul_832_5mhz_eva5hz_2a_pucch_f2_detect rct_ul_832_5mhz_etu70hz_2a_pucch_f2_detect rct_ul_832_10mhz_eva5hz_2a_pucch_f2_detect rct_ul_832_10mhz_etu70hz_2a_pucch_f2_detect rct_ul_catm_10mhz_pucch_F2DetACK10MHz_REP1 rct_ul_catm_10mhz_pucch_F2DetACK10MHz_REP4 rct_ul_catm_10mhz_pucch_F2ADetACK10MHz_REP1 rct_ul_catm_10mhz_pucch_F2BDetACK10MHz_REP1 rct_ul_832_15mhz_eva5hz_2a_pucch_f2_detect rct_ul_832_15mhz_etu70hz_2a_pucch_f2_detect rct_ul_832_20mhz_eva5hz_2a_pucch_f2_detect rct_ul_832_20mhz_etu70hz_2a_pucch_f2_detect rct_ul_catm_20mhz_pucch_F2DetACK20MHz_REP4 rct_ul_catm_20mhz_pucch_F2BDetACK20MHz_REP4 rct_ul_catm_20mhz_pucch_F2BDetACK20MHz_REP4_DTX rct_ul_catm_20mhz_pucch_F2BDetACK20MHz_REP4 rct_ul_catm_20mhz_pucch_F2BDetACK20MHz_REP4_DTX
Priority	P3-Medium
Affected Versions	v18.09
Components	LTE Ref PHY

Title	LTE RefPHY testapp UL Test Failures
Reference #	SCSY-5101
Description	<p>The following testapp UL are failing on BDW/AVX2:</p> <pre>fdd_ul_0056 fdd_ul_0062 fdd_ul_0181 fdd_ul_0407</pre> <p>The following testapp UL are failing on SKL / AVX512:</p> <pre>fdd_ul_018 fdd_ul_0407</pre>
Priority	P3-Medium
Affected Versions	v18.09
Components	LTE Ref PHY

Title	No NbloT Verification Tests
Reference #	SCSY-4173
Description	The NbloT RefPHY is included in the v18.09 release but was not validated other than build since release v1.4.0.
Priority	P3-Medium
Affected Versions	v1.6.0

Title	No NbloT Verification Tests
Components	LTE Ref PHY

Title	Binary Libraries Included in NbloT Release Package
Reference #	SCSY-4172
Description	The following libraries are included in binary format in the <a href="#">NbIoT</a> release package: source/test/l1driver_nbiot/bin/libmlog.a bin/lte/l1/lte_phy_nbiot/libUsrc.so bin/lte/testmac_nbiot/libwls.so
Priority	P3-Medium
Affected Versions	v1.6.0
Components	LTE Ref PHY

### 3.11.3 Framework Issues in Release Software v18.09

Title	Code Error in BBU Pooling
Reference #	SCSY-7433
Description	1. in functions <code>bbupool_sleep_create_CpuSetSem()</code> and <code>bbupool_sleep_clear_coreMask()</code> , <code>1&lt;&lt;coreId</code> should be <code>1L&lt;&lt;coreId</code>
Priority	P3-Medium
Affected Versions	v18.09
Components	BBU-Pooling

Title	Bug in Framework When Creating Background Threads
Reference #	SCSY-7430
Description	There is a bug in the framework where the background thread responsible for adding/removing cores is not placed on core 0 but random cores. It will change from run to run. This is causing instability when using FPGA 4G FEC offload because we poll from the same core as this thread.
Priority	P3-Medium
Affected Versions	v18.09
Components	BBU-Pooling

### 3.11.4 SDK Issues in Release v18.09

Title	4G Rate Matching AVX2 Implementation Introducing Errors When rV = 1, 2, 3
Reference #	SCSY-7565

Title	4G Rate Matching AVX2 Implementation Introducing Errors When rV = 1, 2, 3
Description	<p>There is a bug in the AVX2 implementation of the 4G Rate Matching function. When rV = 1, 2, 3 in certain conditions will always report CRC during retransmission, this issue has been confirmed with test vectors which are loaded into WaveJudge. During the re-transmission, it always shows that there are corrected bits.</p> <p>The SSE implementation of the Rate Matching is working correctly. If SDK calls SSE implementation, generated IQ samples are decoded correctly in WaveJudge. It shows 0 corrected bits for all re-transmissions.</p> <p>Sample <code>rate_match_request</code> parameter set:</p> <pre> r = 0 C = 7 direction = 1 Nsoft = 1827072 KMIMO = 2 MDL_Harq = 8 G = 83592 NL = 1 Qm = 6 rvidx = 2 bypass_rvidx = 0 Kidx = 179 nLen = 5636 </pre>
Priority	P3-Medium
Affected Versions	v18.09
Components	SDK

Title	lib_llr_demapping Reports Long Strings of "modulation type not supported" in SKL Performance Tests
Reference #	SCSY-7519
Description	<p>When running the <code>lib_llr_demapping</code> unit (performance) tests on SKL, the unit test framework attempts to run QAM16 modulation tests with AVX2 ISA, which causes several thousand instances of the following message to be displayed:</p> <p>"Modulation type not supported with AVX2 in this release."</p>
Priority	P4-Low
Affected Versions	v18.09
Components	SDK

Title	EAL: WARNING when Starting SDK Unit Tests in Jenkins
Reference #	SCSY-7518
Description	<p>When running tests with DPDK Huge Pages enabled, the following warning may be seen during EAL initialization:</p>



Title	<a href="#">EAL: WARNING when Starting SDK Unit Tests in Jenkins</a>
	EAL: WARNING: cpu flags <code>constant_tsc=yes nonstop_tsc=no</code> -> using unreliable clock cycles This is a DDPK warning that the platform is configured to stop the TSC during a core C-state. In practice, it can be ignored for FlexRAN SDK test benches since the core will not be in a C-state during module measurement, and C-states are normally disabled in the BIOS for FlexRAN SDK testing.
Priority	P4-Low
Affected Versions	v1.5.0
Components	SDK

Title	<a href="#">Layermapping 5G NR Fails to Build in Debug Mode</a>
Reference #	SCSY-7393
Description	When building the SDK in Debug mode, the Layermapping 5G NR kernel fails when building AVX2. Error message: <code>/root/isg_cid-wireless_sdk/source/phy/lib_layermapping_5gnr/phy_layermapping_5gnr_fxp.cpp(59): (col. 80) catastrophic error: Intrinsic parameter must be an immediate value . This issue appears to be due to a blend placed in a template function being passed a mask as part of the function call instead of the mask being included directly in the call to blend. The error is only seen in Debug mode, and the kernel will build for other modes.</code>
Priority	P3-Medium
Affected Versions	v18.09
Components	SDK

Title	<a href="#">AVX2 DFT Fails To Build in Debug Mode</a>
Reference #	SCSY-7392
Description	When building the SDK in Debug mode, the DFT kernel fails when building the updated AVX2 implementation. Error message: <code>/root/isg_cid-wireless_sdk/source/phy/lib_dft_idft/phy_dft_idft_simd.cpp(489): (col. 75) catastrophic error: Intrinsic parameter must be an immediate value This issue appears to be due to a blend placed in a template function being passed a mask as part of the function call instead of the mask being included directly in the call to blend. The error is only seen in Debug mode, and the kernel will build for other modes.</code>
Priority	P3-Medium
Affected Versions	v18.09
Components	SDK

Title	<a href="#">4G LTE Rate Matching SDK Code to Support New Feature for Release 10 and Above UEs</a>
Reference #	SCSY-7312
Description	The rate matching module for 4G LTE does not correctly operate when UEs are Release 10 and above.

Title	4G LTE Rate Matching SDK Code to Support New Feature for Release 10 and Above UEs
Priority	P3-Medium
Affected Versions	v18.09
Components	SDK

Title	LTE Rate Matching Broken for Some Code Block Sizes
Reference #	SCSY-7301
Description	The AVX2/AVX512 implementation of the rate matching has bugs on some of the code block sizes. Currently, not all code block sizes are tested, so this is not reproducible with unit tests. The issue does not affect SSE.
Priority	P3-Medium
Affected Versions	v18.09
Components	SDK

Title	Some SDK Modules Do Not Report Version Number at Startup
Reference #	SCSY-7214
Description	<p>The following SDK modules do not report their version number at startup. This is typically due to a missing constructor:</p> <pre>lib_polar_encoder_5gnr lib_scramble lib_scramble_5gnr lib_turbo lib_cestimate_5gnr lib_cestimate_fft_5gnr lib_common lib_MIMO lib_reed_muller lib_ta_compensation_5gnr (the version string in the module also incorrectly states lte) lib_tbcc</pre> <p>The following modules report incorrect version numbers at startup:</p> <pre>lib_pucch_5gnr (reports lib_sample_kernel version)</pre>
Priority	P3-Medium
Affected Versions	v18.09
Components	SDK

Title	Timing Offset Incorrect Compensation API
Reference #	SCSY-7196
Description	The Timing Offset Library is a 5G NR library, but the API has lte prefix in the name.

Title	Timing Offset Incorrect Compensation API
	This will be changed in the next release to replace lte with 5gnr to be consistent with the naming convention.
Priority	P4-Low
Affected Versions	v18.09
Components	SDK

Title	Module Name and Header File Difference in lib_equalization
Reference #	SCSY-7099
Description	In <a href="#">lib_equalization</a> , this module is integrated into 5G NR <a href="#">RefStack</a> . But it can be used in both 5G NR and LTE. While the external header file is <a href="#">phy_rx_MIMO_mmse_nr5g.h</a> , and the API uses the 5gnr also. This is misleading.
Priority	P4-Low
Affected Versions	v18.09
Components	SDK

Title	mmse_MIMO_5gnr Module Configurations beyond 8 Antenna 2 Layers Are Not Optimized
Reference #	SCSY-2627
Description	Even though the mmse_MIMO_5gnr module is capable of supporting configurations up to 8 antenna and 8 layers, its compute performance was only optimized up to 8 antennae 2 layers configurations.
Priority	P3-Medium
Affected Versions	v1.4.2
Components	SDK

Title	lib_turbo: bblib_turbo_decoder() Returns Improper Number of Iterations
Reference #	SCSY-2050
Description	bblib_turbo_decoder() returns an incorrect number of half iterations instead of full iterations, which is misleading. The workaround is to multiply the returned number by 2 to get full iterations.
Priority	P3-Medium
Affected Versions	V1.4.0
Components	SDK

Title	TBCC AVX2 Performance Is Worse than C Implementation
Reference #	SCSY-1457

Title	TBCC AVX2 Performance Is Worse than C Implementation
Description	The AVX2 performance of TBCC is worse than C code implementation. Workaround to use C code implementation.
Priority	P3-Medium
Affected Versions	v1.3.0
Components	SDK

### 3.11.5 BSP Issues in Release Software v18.09

No known issues

## 3.12 Known Issues Release Software v1.6.0 and v18.08-ea

The following are known issues with this release.

### 3.12.1 RefPHY Issues in Release Software v1.6.0

Title	No NbloT Verification Tests
Reference #	SCSY-4172
Description	libmlog.an included in release package in binary format
Priority	Medium
Affected Versions	V1.6.0
Status	Status: The mlog library libmlog. A used by the l1app_nbiot application is included in binary format in the FlexRAN release package. Instead, the library compiled from the mlog source files used by the LTE l1 app should be used.

Title	Missing RCT UL 5 MHz Tests 18 and 19
Reference #	SCSY-4156
Priority	Medium
Affected Versions	V1.6.0
Status	The following two RCT tests: RCT UL 5MHz test 18: rct_ul_823_5mhz_eva5hz_2a_a31_pusch_mux_detect RCT UL 5MHz test 19: rct_ul_823_5mhz_eva5hz_2a_a45_pusch_mux_detect are documented in the Doxygen file but commented out in the FlexRAN v1.6.0 release package.

Title	Non Bit Exact AVX512 vs. AVX2 Implementations Cause AVX512 Test Errors
Reference #	SCSY-4155
Priority	Medium

Title	Non Bit Exact AVX512 vs. AVX2 Implementations Cause AVX512 Test Errors
Affected Versions	V1.6.0
Status	The implementations of the LTE AVX2 and AVX512 L1 pipelines are not a bit equivalent. This is due to the underlying differences in the instruction set and floating-point computations. Since the testapp and testmac verification framework relies on bit-exact comparison of generated test output files with reference files, and that the reference files were produced for the AVX2 pipeline, several AVX512 tests are failing.

Title	extract.sh Script Fails To Extract RefPHY when Path Provided Is Not Default
Reference #	SCSY-3953
Priority	Low
Affected Versions	V1.6.0
Status	Using a non default path get the failure "mv: cannot stat './test/*': no such file or directory."

Title	Testapp UL Errors
Reference #	SCSY-3925
Priority	Medium
Affected Versions	V1.6.0
Status	Some testapp UL tests are reporting PASS, but are displaying an error on the console. This is visible both in AVX2 and AVX512 mode. The message is "ERROR: Cannot open config file: <code>XX/YY///...\\.channel\\awgn.cfg</code> "

Title	Potential Issue Might Cause EVM of PDSCH in Special Subframe To Be Larger Than Normal
Reference #	SCSY-1812
Priority	Medium
Affected Versions	V1.6.0
Status	Under investigation

Title	TM8 Fails on port7-8
Reference #	SCSY-1018
Priority	Medium
Affected Versions	V1.6.0
Status	Some test cases with TM8 fail on subframes with PSS/SSS. These test cases have 2 codewords where each codeword has a different modulation type, for example ( <code>cw0: qpsk, cw1: qam16</code> ). This is being investigated,

### 3.12.2 Framework Issues in Release Software v1.6.0

No known issues

### 3.12.3 SDK Issues in Release Software v1.6.0

Title	TM8 Fails on port7-8
Reference #	SCSY-4218
Priority	Medium
Affected Versions	V1.6.0
Status	Two failures are observed when running the lib_cestimate_pucch C unit tests on SKL platform UnitTest/CestimatePUCCHPart1FlpCheck.C_Check/1, where GetParam() = 1 UnitTest/CestimatePUCCHPart1FlpCheck.C_Check/2, where GetParam() = 2 These highlight a problem with using the function bblib_cestimate_pucch_part1_flp_c on SKL platforms. Using the default function bblib_cestimate_pucch_part1_flp is safe

Title	polar_decoder_5gnr Runs Slower on SKL than BDW For Some Scenarios
Reference #	SCSY-3889
Priority	Low
Affected Versions	V1.6.0
Status	They are investigating why certain use cases of <a href="#">lib_polar_decoder_5gnr</a> run slower on BDW compared to SKL.

Title	lib_layermapping_5gnr Broken SSE ISA Build
Reference #	SCSY-3885
Priority	Low
Affected Versions	V1.6.0
Status	When building the SSE4_2 variant of SDK, lib_layermapping_5gnr fails to build an error.

Title	PUCCH Demodulation AVX512 Performance
Reference #	SCSY-3806
Priority	Medium
Affected Versions	V1.6.0
Status	AVX512 implementation for PUCCH Demodulation shows worse performance compared to AVX2.

Title	<a href="#">EAL- WARNING when Starting SDK Unit Tests</a>
Reference #	SCSY-2852
Priority	Medium
Affected Versions	V1.6.0
Status	<p>When running tests with DPDK Huge Pages enabled, the following warning may be seen during EAL initialization:</p> <p>EAL: WARNING: CPU flags constant_tsc=yes nonstop_tsc=no -&gt; using unreliable clock cycles.</p> <p>This is a warning that the platform is configured to stop the TSC during a core C-state. In practice, it should be ignored since the core will not be in a C-state during module measurement, and C-states will most likely be disabled in the BIOS for hard real-time systems.</p>

Title	<a href="#">mmse_MIMO_5gnr Module Configurations beyond 8 Antenna 2 Layers Are Not Optimized</a>
Reference #	SCSY-2627
Priority	Medium
Affected Versions	V1.6.0
Status	Even though the mmse_MIMO_5gnr module is capable of supporting configurations up to 8 antenna and 8 layers, its compute performance was only optimized up to 8 antennae 2 layers configurations.

Title	<a href="#">Verified Channel Estimator, Wiener/Low Mobility, Verification Gaps</a>
Reference #	SCSY-2616
Priority	Medium
Affected Versions	V1.6.0
Status	Only Layer 1 is verified in functional tests. Additional tests will be added in a future release.

Title	<a href="#">bblib_turbo_decoder() Returns Improper Number of Iterations</a>
Reference #	SCSY-2050
Priority	Medium
Affected Versions	V1.6.0
Status	The number of iterations (NumIter) is increased twice in each loop iteration, where the loop condition depends on the value of _numMaxIter. Fix will be implemented in next release, Workaround is to divide the number by 2 in the calling function.

Title	<a href="#">TBCC AVX2 Performance Is Worse than C Implementation</a>
Reference #	SCSY-1457
Priority	Medium

Title	TBCC AVX2 Performance Is Worse than C Implementation
Affected Versions	V1.6.0
Status	The performance needs to be addressed and AVX2 to get better performance than C code

### 3.12.4 BSP Issues in Release Software v1.6.0

No known issues

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## 4.0 Fixed Issues

### 4.1 Fixed Issues Release Software v21.03

Title	SDK: DFT/iDFT optimization and calling correct function
Reference #	SCSY-47395
Description	bblib_pusch_symbol_processing: Invoke the optimized iDFT function in the pusch symbol processing function.
Priority	P3-Medium
Affected Versions	20.11
Components	SDK

Title	PUSCH BLER in ORAN Massive MIMO Avg. Test Scenario
Reference #	SCSY-42225
Description	There is a known issue with 16 stream test in oran mode where the avg cell PUSCH show BLER when running Massive MIMO scenario. This test passes in timer mode.
Priority	P3-Medium
Affected Versions	20.11
Components	5G NR RefPHY

Title	DL Special slot CRC when 64QAM, MCS25
Reference #	SCSY-38023
Description	CRC errors seen on special slots when setting 64QAM with MCS25.
Priority	P3-Medium
Affected Versions	20.11
Components	5G NR RefPHY

Title	RefPHY: 5G NR TestApp Bug Fix
Reference #	SCSY-48135
Description	Found overflow issue when converting from floating to fixed point.
Priority	P3-Medium

Affected Versions	20.11
Components	5G NR RefPHY

<b>Title</b>	<b>RefPHY: PDSCH could not be decoded if CellId = 1,3,5 and works for CellId = 0,2,4</b>
Reference #	SCSY-36054
Description	If CellID is set equal to 1,3,5, UE cannot decode SIB1. For CellID = 0,2,4, it can decode.
Priority	P3-Medium
Affected Versions	20.11
Components	5G NR RefPHY

<b>Title</b>	<b>RefPHY: PUCCH Wireless Performance</b>
Reference #	SCSY-39707
Description	PUCCH Format 0 RCT 38.104 test cases do not meet passing criteria. Two Format 1 test cases and many of the Format 4 test scenarios are marginally failing
Priority	P3-Medium
Affected Versions	20.11
Components	5G NR RefPHY

<b>Title</b>	<b>RefPHY: CDM=1 feature (data/dmrs interleave) not working with 2T2R for multi-ue scenario.</b>
Reference #	SCSY-47205
Description	When there are multi-UEs with cdm=1, it can be seen that the DMRS output buffer is corrupted by subsequent UEs. To fix, need to update precoder output for each UE instead of resetting precoder offset.
Priority	P3-Medium
Affected Versions	20.11
Components	5G NR RefPHY

<b>Title</b>	<b>BBU Pooling: Fix feature of supporting more than 64 physical core IDs.</b>
Reference #	SCSY-13136
Description	Feature to allow BBU Pooling to use physical core IDs greater than 64 was added last year. Found that feature did not work as expected. Core IDs were assigned using a single uint64_t variable so anything core ID greater than 64 would map to core 0. Instead of using single uint64_t variable, using an array of 4 uint64_t instead.
Priority	P3-Medium
Affected Versions	20.11

Components	BBU Pooling
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Title	<b>DPDK: Fix to the ACC100 DDR initialization sequence</b>
Reference #	SCSY-47515
Description	Change to only initialize DDR on bootup
Priority	P3-Medium
Affected Versions	20.11
Components	DPDK

Title	<b>DPDK: ACC100 DDR controller workaround</b>
Reference #	SCSY-47407
Description	Workaround required to address bug on the ACC100 (Mt. Bryce) A1 device to make sure DDR configuration is optimal.
Priority	P3-Medium
Affected Versions	20.11
Components	DPDK

Title	<b>DPDK: ACC100 dynamic clock gating and power impact</b>
Reference #	SCSY-47210
Description	Placeholder to expose dynamic clock gating and confirm stability at limited power
Priority	P3-Medium
Affected Versions	20.11
Components	DPDK

Title	<b>DPDK: ACC100 support HARQ index when DDR size is increased</b>
Reference #	SCSY-42244
Description	Customer reported that if DDR size increased, HARQ index became invalid. Fix added to address when DDR size allocated for HARQ buffer per VF is increased from default value (512MB to 4GB).
Priority	P3-Medium
Affected Versions	20.11
Components	DPDK

Title	<b>DPDK: ACC100 driver not support LDPC_ENC in TB mode</b>
Reference #	SCSY-38573

Description	Add TB (transport block) LPDC encoder mode to driver.
Priority	P3-Medium
Affected Versions	20.11
Components	DPDK

Title	<a href="#">DPDK: Transport Block CRC in BBDEV</a>
Reference #	SCSY-38042
Description	Add Transport Block CRC to BBDEV
Priority	P3-Medium
Affected Versions	20.11
Components	DPDK

Title	<a href="#">DPDK: test-bbdev.py doesn't expose all options</a>
Reference #	SCSY-35877
Description	Add all supported BBDEV test application options to python script.
Priority	P3-Medium
Affected Versions	20.11
Components	DPDK

## 4.2 Fixed Issues Release Software v20.11

Title	<a href="#">RCTUL 38.104 PUSCH DMRS Type 2 improvements</a>
Reference #	SCSY-35950
Description	After enabling time linear interpolation, all PUSCH RCT scenarios are now passing.
Priority	P3-Medium
Affected Versions	20.08
Components	5G NR RefPHY

Title	<a href="#">RCTUL 38.104 PUCCH Test Scenarios</a>
Reference #	SCSY-35951
Description	After some parameter tuning, nearly all PUCCH test scenarios are passing. Will create another ticket to track those issues.
Priority	P3-Medium
Affected Versions	20.08

Components	5GNR RefPHY
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Title	Linear interpolation in MMSE
Reference #	SCSY-35838
Description	Linear interpolation has been enabled and verified to be working as expected.
Priority	P3-Medium
Affected Versions	20.08
Components	SDK

Title	5gnr TestAPP running with Terasic FEC FPGA
Reference #	SCSY-34612
Description	5GNR TestAPP has removed support for running with Terasic* for this release. It has been decided that the Terasic* option will no longer be supported in upcoming releases.
Priority	P3-Medium
Affected Versions	20.08
Components	5GNR Ref PHY

### 4.3 Fixed Issues Release Software 20.08

Title	fEstSNR in Flexran seems not correct
Reference #	SCSY-34427
Description	Found that reported SNR was always roughly 3db lower than expected. The issue found that measurement did not account for the DMRS boost. When reporting SNR to L2, we will need to adjust for the DMRS so that proper value is reported.
Priority	P3-Medium
Affected Versions	20.02
Components	5GNR Ref PHY

Title	testApp EPA3 implementation
Reference #	SCSY-35145
Description	The customer found that if the number of slots is set to 10,000 in test config, testApp crashes. Add logic to not dynamically allocate input IQ samples buffers based on the number of slots to run.
Priority	P3-Medium

Affected Versions	20.02
Components	5G NR Ref PHY

Title	<a href="#">L1app crashes if &lt;phyMlog&gt; is set to 0 in phycfg.xml</a>
Reference #	SCSY-35127
Description	The customer found that if that <a href="#">phyMlog</a> is disabled in <a href="#">phycfg.xml</a> , L1app will have a segmentation fault. Add logic to branch around some new code when phyMlog is disabled.
Priority	P3-Medium
Affected Versions	20.04
Components	5G NR Ref PHY

## 4.4 Fixed Issues Release Software 20.04

Title	<a href="#">5G NR PTRS Fails when TimeDensity is Not Equal to 1 in the Downlink Direction.</a>
Reference #	SCSY-33573
Description	If TimeDensity is not equal to 1 for PTRS in the downlink direction, the remapping function does not map precoder output to the resource grid correctly. The issue has been fixed and verified with commercial UE.
Priority	P3-Medium
Affected Versions	20.02
Components	5G NR Ref PHY

Title	<a href="#">Decode Failure when Test FD Case 2 and 4 (mu=0,20 MHz) Under Scenario "testapp-sub6-HW Terasic."</a>
Reference #	SCSY-28921
Description	FD test cases 2 and 4 for mu=0, 20 MHz fails when running testApp. The issue has been fixed.
Priority	P3-Medium
Affected Versions	19.10
Components	5G NR Ref PHY

Title	<a href="#">[Vista Creek LTE Validation]: Some UL Cases Failed during the VC LTE Validation</a>
Reference #	SCSY-13449
Description	Some cases (for example, UL_205) failed because of some potential configuration issues when doing Vista Creek LTE validation. The issue has been fixed.

Priority	P3-Medium
Affected Versions	19.06
Components	LTE Ref PHY

## 4.5 Fixed Issues Release Software v20.02

Title	GNB PhyStats Clean Up
Reference #	SCSY- 30829
Description	Fix bugs in <a href="#">pdccch</a> stats and dl throughput logging.
Priority	P3-Medium
Affected Versions	19.10.2
Components	5G NR Ref PHY

Title	<a href="#">Sub6 Terasic FPGA Not Returning.</a>
Reference #	SCSY- 30990
Description	Customer reported issue where the FPGA does not return after its LDPC Decoder is queued for sub6 scenario.
Priority	P2-High
Affected Versions	19.10.2
Components	5G NR FPGA

Title	<a href="#">mmWave Terasic FPGA Not Returning.</a>
Reference #	SCSY-30991
Description	The customer reported an issue where the FPGA does not return after its LDPC Decoder is queued for the mmWave scenario.
Priority	P2-High
Affected Versions	19.10.2
Components	5G NR FPGA

Title	<a href="#">DL Reset Issue Fix for Radio Mode.</a>
Reference #	SCSY-30994
Description	Fix issue where wrong DL buffer was being reset for radio mode.
Priority	P3-Medium
Affected Versions	19.10.2

Title	DL Reset Issue Fix for Radio Mode.
Components	5G NR Ref PHY

Title	RefPHY Is Not Setting HARQ Size Dynamically from BBDEV Interface
Reference #	SCSY-28938
Description	Currently the maximum HARQ size is fixed while it should be configured from BBDEV pHarqInfo->nMaxPointerPage = MAX_HARQ_CB_NUM_IN_DDR;
Priority	P3-Medium
Affected Versions	19.10.1
Components	5G NR Ref PHY

Title	Stretching of Tasks During First Few TTIs
Reference #	SCSY-28936
Description	Make testmac stagger the start of APIs per cell being sent to L1 in xRAN mode. This is because first, many TTIs will stretch with XRAN. Easing into the throughputs helps with this. Also, fix the Harq buffer size being used by L1.
Priority	P3-Medium
Affected Versions	19.10
Components	5G NR Ref PHY

Title	5GNR PTRS fails when TimeDensity is not equal to 1 in the Uplink direction.
Reference #	SCSY- 33570
Description	When testing with commercial UE, observed that 100% BLER would occur when TimeDensity is not equal to 1.
Priority	P3-Medium
Affected Versions	19.10
Components	5G NR Ref PHY

Title	Detection issues with 4G LTE 1 bit ACK in multiplex PUSCH.
Reference #	SCSY- 30968
Description	The customer reported that when setting the number of ACK bits in multiplex, ACK = 1 always showed detection issues.
Priority	P3-Medium
Affected Versions	19.10
Components	4G LTE RefPHY



Title	<a href="#">[Vista Creek LTE Validation]: Some UL Cases Failed during the VC LTE Validation</a>
Reference #	SCSY-13449
Description	Some cases (for example, UL_205) failed because of some potential configuration issues when doing Vista Creek LTE validation. Some updates needed.
Priority	P3-Medium
Affected Versions	19.10
Components	LTE Ref PHY

Title	<a href="#">Customer Reported Failing Test Case in Polar Decoder.</a>
Reference #	SCSY- 30776
Description	The customer reported a particular test case failing in Polar Decoder.
Priority	P3-Medium
Affected Versions	19.10
Components	SDK

Title	<a href="#">Fix Viterbi Decoder Failures Under Some Configurations.</a>
Reference #	SCSY- 30964
Description	The customer reported that the Viterbi Decoder was failing some of their test cases. Linked to SCSY-9854. (SDK Viterbi decoder in AVX2 fails to decode).
Priority	P3-Medium
Affected Versions	19.10
Components	SDK

Title	<a href="#">Fix testmac UL Issues Caused by xRAN SFN Calculation using GPS Time.</a>
Reference #	SCSY- 29169
Description	The customer found an issue where testmac running with xRAN did not produce correct results due to SFN calculation.
Priority	P3-Medium
Affected Versions	19.10
Components	xRAN/ORAN

Title	<a href="#">ORAN/xRAN Integration Work</a>
Reference #	SCSY- 29167
Description	Buffer management for PRACH with xRAN fixed. Byte order swap for PUSCH fixed.

Priority	P3-Medium
Affected Versions	19.10.2
Components	xRAN/ORAN

## 4.6 Fixed Issues Release Software v19.10

Title	Changes to Make Radio Mode Tests Work with TM500 and Various Radios
Reference #	SCSY-19298
Description	Changes to make radio mode tests work with TM500 and various radios
Priority	P2-High
Affected Versions	19.06 01
Components	5G NR Ref PHY

### 4.6.1 List of Changes – SCSY-19298

These changes were made to release v19.10 for issue SCSY-19298:

- Changes to configure Vista Creek FEC and Front Haul correctly and bind with DPDK in one script
- Create separate l1.sh command inputs for different modes of operation:
  - e for timer mode
  - xRAN for xRAN mode (limited validation)
  - fb for Ferry Bridge mode (20 MHz 2x2)
  - rsub6 for Terasic card FH (100 MHz 4x4 TDD sub6 – Option 8 split)
  - rmw for Terasic card FH (100 MHz 4x4 TDD mmWave – Option 8 split)
- Create new phycfg\_xml for each of the above modes
- Add the Single queue option as the default option when building l1app.

The following is needed for Fortville NICs.

- Modify the Terasic FPGA driver to give the driver thread highest priority
- Changes into Terasic FPGA (Front Haul) for mmWave to support new FPGA image
- L1 Shutdown issues in radio mode were fixed so that graceful collection of logs happen when some crash is there
- DPDK based WIs support related changes to work with L2 partners
- IQ logging (for debugging) related buffer size changes
- Debugging prints added for PHY\_CONFIG Api from Mac to L1
- Order of UL APIs (being sent to L2) were changes based on partner's feedback

8. PUCCH\_HACK flag introduced to give ACK responses to L2 all the time.

Certain mandatory features for PUCCH needed during the attach process are not supported in this release. When running the code with UE, it is advised to enable this flag.

1. Fixes around unlocking the BBU tasks in the radio mode when packets are arriving from FH FPGA.
2. `Init_fpga` function clean up for accurate timing being used in the MMWAVE use case. There were some conditions at startup, causing startup to be flaky. This was resolved
3. Some new MLOG task IDs were added for debugging radio mode issues
4. A check of slot numbers from L2 was added so that we are in sync with slot numbers from the radio. If there were an issue, the system would crash.
5. PDCCH corset checking function had a bug. This was fixed
6. Clnit value used by scrambler and descrambler functions had a bug. This was fixed
7. Starting Frame number had an issue when the radio starts up and the first API sent to L2. This was resolved
8. Some legacy code for timing error checks were cleaned up (`rx_packet_missed_exception_process`)
9. Number of UL and DL contexts were changed to 2 and 4 for mmWave and Sub6 use cases
10. The logic was added to stop the code gracefully with some logs when the FH FPGA packets are not coming, which stops unblocking UL tasks in the task list. This was causing stops without informing users what the issue was
11. IQ sample logging for UL had some issues. This was resolved
12. PRACH unlocking logic was added for all prach config indices (using 3GPP tables) so that slots, where PRACH packet is not expected from FH FPGA, will be unlocked by this function
13. SRS task optimization flag was added to remove SRS processing when L2 API does not configure it

## 4.7 Fixed Issues Release Software v19.06

Title	<a href="#">testapp random Failed to Init FPGA when Test sub6 with and without bbdev</a>
Reference #	SCSY-13361
Description	testapp random failed to init FPGA when test sub6 with and without bbdev
Priority	P2-High
Affected Versions	19.04-ea
Components	5G NR Ref PHY

Title	<a href="#">Fix Issues when Running FD Test Cases with 5G NR TestApp</a>
Reference #	SCSY-12835
Description	Current Full-Duplex test cases will crash when running a 5G NR test application.
Priority	P2-High
Affected Versions	19.04-ea
Components	5G NR Ref PHY

Title	5G NR Test MAC Does Not Check for Boundary Conditions from Run Command
Reference #	SCSY-12800
Description	<p>In the 5G NR testmac prompt, there is a "run" command to launch test cases. Current usage is:  run A B C D  where  A = 0 for DL test, 1 for UL, 2 for FD  B = numerology (mu = 0,1,2,3,4)  C = bandwidth  D = optional for test number  There is a check in the code:  if (testmac_run_bandwidth_numerology_check(params[2].value_num, &amp;bandwidth, numerology) != SUCCESS)  {  printf("Error Numerology[%d] Bandwidth[%d] is not valid\n", numerology, bandwidth);  }  But it does not return failure and just continues. If illegal values are put in, segmentation fault happens later on since the above inputs are used as indexes to arrays.</p>
Priority	P3-Medium
Affected Versions	19.04-ea
Components	5G NR Ref PHY

Title	False Failures with bbdev Enabled
Reference #	SCSY-12786
Description	<p>There are test vectors where there are supposed to be CRC failures. These vectors are present to do profiling only. Since LPDC decoder on FPGA will be different than LPDC decoder in software, FEC output will be different. An example:  mu=1, 100 MHz  TestCase = 520</p>
Priority	P2-High
Affected Versions	19.04-ea
Components	5G NR Ref PHY

Title	Can't Run 4x100 MHz mmWave Case because of PHY State Functions
Reference #	SCSY-9813
Description	<p>Get segmentation fault when test 4 cells mmwave cases. The coredump stack shows <code>nr5g_gnb_phy_stats_add_subframe function</code> and <code>nr5g_gnb_phy_stats_hist_set_done function</code> will cause the issue.</p>
Priority	P1-Stopper
Affected Versions	19.03
Components	5G NR Ref PHY

Title	Sometimes Coredump in Memset for Encoder Buffer
Reference #	SCSY-9785
Description	Sometimes the one slot DL test will have coredump in <code>memset((void*)pEnInHeader,0,HEADER_LEN_ENCODE_IN);</code> looks like some invalid pointer
Priority	P3-Medium
Affected Versions	19.03
Components	5G NR Ref PHY

Title	Fix PDCCH Initial Memory Size
Reference #	SCSY-12937
Description	PDCCH memory initial size is not correct. It just coverage one symbol scenario. Can not sufficiently cover the Three symbols scenario
Priority	P3-Medium
Affected Versions	18.12, 19.03, 19.04-ea
Components	5G NR Ref PHY

Title	LTE FEC FPGA DL Performance Issue
Reference #	SCSY-8571
Description	In the current FPGA RTL drop, there is an issue with the DL throughput, which is not meeting LZ requirements. This was identified as an RTL issue and has been root caused. An updated RTL image will be provided with the following fixes : parallel bit processing in both rate matching and DL turbo encoder IP Increased FMAX for turbo encoder IP. When the drop is available SW must re-run validation tests and run performance test (latency and throughput) and compare against the previous implementation, making sure LZ use cases is required.
Priority	P3-Medium
Affected Versions	lte_fec-18.12-ea
Components	HW Acceleration

## 4.8 Fixed Issues Release Software v19.04

Title	5G NR RMing SDK Bug in the BitSelect Processing
Reference #	SCSY-12520
Description	Bit select logic doesn't skip the filler bits properly depending on the alignment of ni and E/Q.
Priority	P2-High

Title	5G NR RMing SDK Bug in the BitSelect Processing
Affected Versions	19.03
Components	SDK

Title	Building CPA: chrt: Failed to Set PID
Reference #	SCSY-8581
Description	When building a CPA through the flexran_build.sh script, the following error is reported: chrt: failed to set PID X's policy: No such process The library is still built.
Priority	P3-Medium
Affected Versions	18.12
Components	5G NR Ref PHY

## 4.9 Fixed Issues Release Software v19.03

Title	testMAC 5G NR sub6 UL Seg Fault
Reference #	SCSY-8776
Description	Running test UL1416 causes the l1app to segfault. This is a 16 UE test which is out of scope for flexRAN v18.12, so the segfault is expected.
Priority	P2-High
Affected Versions	18.12
Components	5G NR Ref PHY

Title	Schedule 4 TDD Mode DL tpt Only 0.5Gbps
Reference #	SCSY-8647
Description	Run schedule 4, TDD mode, MCS 27, dl only get 0.5Gbps.
Priority	P1-Stopper
Affected Versions	18.12
Components	5G NR L2/L3 Stack(in the house)

Title	Update 5G NR API Header File to Match API Release Document
Reference #	SCSY-9798
Description	Update gnb_l1_l2_api.h file to match the 5G NR API release document.
Priority	P2-High

Title	<a href="#">Update 5G NR API Header File to Match API Release Document</a>
Affected Versions	18.12
Components	5G NR Ref PHY

Title	<a href="#">5gnr l1app Timer Mode Startup Instructions Are Incorrect</a>
Reference #	SCSY-9675
Description	The FlexRAN Doxygen documentation should state that the "-e" mode of l1.sh is to be used to start l1app in timer mode when running with testmac.
Priority	P2-High
Affected Versions	18.12
Components	5G NR Ref PHY

Title	<a href="#">Fix 5G NR PHY_ONLY NR_SW Compile Option</a>
Reference #	SCSY-8784
Description	With the addition of Ferrybridge driver code into the 5gnr auxlib project, this broke the build for PHY_ONLY NR_SW compile-time option.
Priority	P3-Medium
Affected Versions	18.12
Components	5G NR Ref PHY

Title	<a href="#">testMAC 5G NR mmW FD Seg Faults</a>
Reference #	SCSY-8782
Description	Running tests FD2001 or FD3001 causes the l1app to segfault.
Priority	P2-High
Affected Versions	18.12
Components	5G NR Ref PHY

Title	<a href="#">testMAC 5G NR sub6 UL Failures</a>
Reference #	SCSY-8775
Description	Test[UL1217] Result: FAIL PDSCH: - PUSCH: - RXBITS: - PUCCH: - MUXSCH: - SNR: - TA: - RACH: - SRS: F Test[UL1218] Result: FAIL PDSCH: - PUSCH: - RXBITS: - PUCCH: - MUXSCH: - SNR: - TA: - RACH: - SRS: F Test[UL1219] Result: FAIL PDSCH: - PUSCH: - RXBITS: - PUCCH: - MUXSCH: - SNR: - TA: - RACH: - SRS: F Test[UL1220] Result: FAIL PDSCH: - PUSCH: - RXBITS: - PUCCH: - MUXSCH: - SNR: - TA: - RACH: - SRS: F Test[UL1221] Result: FAIL PDSCH: - PUSCH: - RXBITS: - PUCCH: - MUXSCH: - SNR: - TA: - RACH: - SRS: F Test[UL1222] Result: FAIL PDSCH: - PUSCH: - RXBITS: - PUCCH: - MUXSCH: - SNR: - TA: - RACH: - SRS: F Test[UL1310] Result: FAIL PDSCH: - PUSCH: F RXBITS: - PUCCH: - MUXSCH: - SNR: F TA: P RACH: - SRS: -

Title	testMAC 5G NR sub6 UL Failures
Priority	P2-High
Affected Versions	18.12
Components	5G NR Ref PHY

Title	testMAC 5G NR sub6 DL Seg Fault
Reference #	SCSY-8773
Description	Running test DL1416 causes the l1app to segfault. This is expected since 16 UE support is not in scope for flexran release v18.12.
Priority	P3-Medium
Affected Versions	18.12
Components	5G NR Ref PHY

Title	testMAC 5G NR mmW FD Failures
Reference #	SCSY-8772
Description	Test[FD1001] Result: FAIL PDSCH: P PUSCH: F RXBITS: - PUCCH: - MUXSCH: - SNR: F TA: P RACH: - SRS: - Test[FD1011] Result: FAIL PDSCH: F PUSCH: - RXBITS: - PUCCH: - MUXSCH: - SNR: - TA: - RACH: - SRS: -
Priority	P2-High
Affected Versions	18.12
Components	5G NR Ref PHY

Title	testMAC 5G NR mmW UL Failures
Reference #	SCSY-8771
Description	Test[UL1001] Result: FAIL PDSCH: - PUSCH: F RXBITS: - PUCCH: - MUXSCH: - SNR: F TA: - RACH: - SRS: - Test[UL1002] Result: FAIL PDSCH: - PUSCH: F RXBITS: - PUCCH: - MUXSCH: - SNR: F TA: - RACH: - SRS: - Test[UL1062] Result: FAIL PDSCH: - PUSCH: - RXBITS: - PUCCH: F MUXSCH: - SNR: P TA: P RACH: - SRS: - Test[UL1063] Result: FAIL PDSCH: - PUSCH: - RXBITS: - PUCCH: F MUXSCH: - SNR: P TA: P RACH: - SRS: - Test[UL1064] Result: FAIL PDSCH: - PUSCH: - RXBITS: - PUCCH: F MUXSCH: - SNR: P TA: P RACH: - SRS: - Test[UL1065] Result: FAIL PDSCH: - PUSCH: - RXBITS: - PUCCH: F MUXSCH: - SNR: P TA: P RACH: - SRS: -
Priority	P2-High
Affected Versions	18.12
Components	5G NR Ref PHY

Title	testMAC 5G NR mmW DL Failures
Reference #	SCSY-8770



Title	testMAC 5G NR mmW DL Failures
Description	Test[DL1008] Result: FAIL PDSCH: F PUSCH: - RXBITS: - PUCCH: - MUXSCH: - SNR: - TA: - RACH: - SRS: - Test[DL1031] Result: FAIL PDSCH: F PUSCH: - RXBITS: - PUCCH: - MUXSCH: - SNR: - TA: - RACH: - SRS: -
Priority	P2-High
Affected Versions	18.12
Components	5G NR Ref PHY

Title	PUCCH Format 2 SNR Measurement
Reference #	SCSY-8754
Description	Uplink Power control is a feature that has been agreed upon for the Q1 (19.03) release. For PUCCH do to power control, it needs SNR measurement. Currently, for all PUCCH formats, this is not done. I do see an SNR measurement in the PUCCH Format 2 Channel Estimate, but it is not returned. This needs to be remedied so that it can be appropriately passed to the L2. From the task spreadsheet, it currently lists all L1 development for Uplink Power Control to be complete.
Priority	P2-High
Affected Versions	18.12
Components	5G NR Ref PHY

Title	PUSCH SNR Measurement Not Accurate Enough
Reference #	SCSY-8752
Description	Uplink power control is a feature that has been assigned for Q1 (19.03) release. This requires that the SNR being reported to L2 should be correct. From experiments down by [~yuzhouzh], he saw: layer numberTransmit SNRSimulation estimated Phy estimated 12222.726 22223.732 It needs to be more accurate than this. Currently, in the code, we are using the following parameter: pCrcStruct->nSNR = pInfoCurrentUE->fEstSnr[0]; This may not be the correct measurement to use, as was stated before. This is SNR measurement for Antenna 0 only. If this is not the correct one, which one should it be? Is there another measurement where it will combine all RxAnt into a single measurement? Sending SNR for each RxAnt to L2 does not make sense. This measurement can be done correctly on the L1 side by taking total signal power from all RxAnts and dividing by the total noise power. Each UE should only have a single SNR measurement. The L1 part of the Uplink Power control says it is complete already, so something should be there.
Priority	P2-High
Affected Versions	18.12
Components	5G NR Ref PHY

Title	phy2mac API Coredump in UL 4 Antennas Test
Reference #	SCSY-8490

Title	<a href="#">phy2mac API Coredump in UL 4 Antennas Test</a>
Description	
Priority	P2-High
Affected Versions	18.12
Components	5G NR Ref PHY

Title	<a href="#">Configure Bandwidth, Numerology, FFT Size, and Other Parameters from Config Request, Msg.</a>
Reference #	SCSY-8159
Description	Currently, parameters that are defined in the config request API message are hardcoded and require a compile-time flag to change them. Parameters like: fft size bandwidth numerology Are being passed in the config request message when L1 starts. The value should be used instead of the #define that is currently there.
Priority	P2-High
Affected Versions	18.12
Components	5G NR Ref PHY

Title	<a href="#">Update SDK PRACH Documentation with Dynamic Range Limitation</a>
Reference #	SCSY-9411
Description	SCSY-8349 was closed because the AGC that precedes the PRACH is not considered part of the PRACH. If this is the case, then there is some dynamic range limitation in the PRACH implementation which needs to be documented in the SDK - otherwise, how are customers supposed to know what the SDK PRACH supports dynamic range and what their reference PHY must do to the signal before the PRACH block.
Priority	P2-High
Affected Versions	18.12
Components	SDK

Title	<a href="#">Undocumented SDK Dependencies on MKL and IPP</a>
Reference #	SCSY-8995
Description	Several SDK modules (equalization, matrix_inversion, cestimate_fft_5gnr, dft_idft, common, dmrs_gen_5gnr) have dependencies on either the Intel Math Kernel Library (MKL) or the Intel Performance Primitives (IPP). These dependencies should be listed in the SDK user guide in the system requirements and dependencies section.
Priority	P3-Medium
Affected Versions	18.12
Components	5G NR Ref PHY, SDK

Title	SDK Unit Tests Do Not Compile when Setting WIRELESS_SDK_STANDARD to 5gnr
Reference #	SCSY-8682
Description	The unit tests for the pucch_cestimate_5gnr module have a dependency on libscramble, which is an LTE module. As a result, the pucch_cestimate_5gnr will not compile when setting WIRELESS_SDK_STANDARD to 5gnr. Until this ticket is resolved, the user should set WIRELESS_SDK_STANDARD to all (or leave it unset, which will default to all), to build the SDK unit tests.
Priority	P4-Low
Affected Versions	18.12
Components	SDK

Title	LTE FEC FPGA Incorrect Number of Iterations
Reference #	SCSY-8452
Description	The current EA Release of LTE FEC FPGA seems always to report 8 turbo decoding iterations completed regardless of the SNR of the inputs. This is visible from the performance tests run by the DPDK BBDEV test application. This seems to be an RTL issue and has assigned to the RTL team to investigate.
Priority	P3-Medium
Affected Versions	LTE FEC FPGA 18.10 EA, lte_fec-18.12-ea
Components	HW Acceleration

Title	LTE TestApp FD Test Failure
Reference #	SCSY-7211
Description	The following testapp FD test fails with AVX512: fdd_fd_0057
Priority	P2-High
Affected Versions	18.09
Components	LTE Ref PHY

Title	AVX2/AVX512 testMAC UL Test Failures
Reference #	SCSY-7208
Description	The following tests are failing on AVX512 and AVX2 testmac testing: Test[UL405] Result: FAIL PDSCH: - PUSCH: F RXBITS: - PUCCH: - MUXSCH: - SNR: F TA: F RACH: - SRS: - RIP: - NFLOOR: - NDEMOD_CW: - Test[UL406] Result: FAIL PDSCH: - PUSCH: F RXBITS: - PUCCH: - MUXSCH: - SNR: F TA: F RACH: - SRS: - RIP: - NFLOOR: - NDEMOD_CW: - Test[UL407] Result: FAIL PDSCH: - PUSCH: - RXBITS: - PUCCH: F MUXSCH: - SNR: F TA: F RACH: - SRS: - RIP: - NFLOOR: - NDEMOD_CW: - Test[UL408] Result: FAIL PDSCH: - PUSCH: - RXBITS: - PUCCH: F MUXSCH: - SNR: F TA: F RACH: - SRS: - RIP: - NFLOOR: - NDEMOD_CW: -

Title	AVX2/AVX512 testMAC UL Test Failures
Priority	P2-High
Affected Versions	18.09
Components	LTE Ref PHY

Title	LTE RefPHY testapp UL Test Failures
Reference #	SCSY-5101
Description	The following testapp UL are failing on BDW / AVX2: fdd_ul_0056 fdd_ul_0062 The following testapp UL are failing on SKL / AVX512: fdd_ul_0181
Priority	P2-High
Affected Versions	18.09
Components	LTE Ref PHY

Title	4G LTE Rate Matching SDK Code to Support New Feature for Release 10 and Above UEs
Reference #	SCSY-7312
Description	The rate matching module for 4G LTE does not correctly operate when UEs are Release 10 and above.
Priority	P3-Medium
Affected Versions	lte_fec-18.08-ea
Components	SDK

Title	FAPI Buffer Free Clean Up
Reference #	SCSY-8806
Description	SS Integration Fixes: FAPI stops allocating buffers due to double free.
Priority	P1-Stopper
Affected Versions	v1.6.0
Components	LTE Ref PHY

## 4.10 Fixed Issues Release Software v18.12

Title	testMAC FD Failures
Reference #	SCSY-8769

Title	testMAC FD Failures
Description	The following TestMAC FD tests are failing: Test[FD500] Result: FAIL PDSCH: F PUSCH: P RXBITS: - PUCCH: P MUXSCH: P SNR: P TA: P RACH: - SRS: - RIP: - NFLOOR: - NDEMOCW: - Test[FD801] Result: FAIL PDSCH: P PUSCH: P RXBITS: - PUCCH: - MUXSCH: - SNR: P TA: P RACH: - SRS: - RIP: - NFLOOR: - NDEMOCW: - Test[FD842] Result: FAIL PDSCH: P PUSCH: P RXBITS: - PUCCH: - MUXSCH: - SNR: P TA: P RACH: - SRS: - RIP: - NFLOOR: - NDEMOCW: -
Priority	P2-High
Affected Versions	18.12
Components	LTE Ref PHY

Title	PRCH False Detects for IODT Setup
Reference #	SCSY-7576
Description	Some PRACH false detections were observed when the UE is transmitting nothing. To work around the issue, the PRACH detection threshold in the SDK was increased.
Priority	P3-Medium
Affected Versions	v18.09
Components	5G NR Ref PHY

Title	Code Error in BBU Pooling
Reference #	SCSY-7433
Description	1. in functions bbupool_sleep_create_CpuSetSem() and bbupool_sleep_clear_coreMask(), 1<<coreId should be 1L<<coreId
Priority	P3-Medium
Affected Versions	v18.09
Components	BBU-Pooling

Title	Bug in Framework when Creating Background Threads
Reference #	SCSY-7430
Description	There is a bug in the framework where the background thread responsible for adding/removing cores is not placed on core 0 but random cores. It will change from run to run. This is causing instability when using FPGA 4G FEC offload because we poll from the same core as this thread.
Priority	P3-Medium
Affected Versions	v18.09
Components	BBU-Pooling

Title	FD testmac Failures
Reference #	SCSY-7601
Description	<p>The following FD tests are failing - they are advertised in the DOXYGEN test descriptions so</p> <p>Test[FD25] Result: FAIL PDSCH: P PUSCH: F RXBITS: - PUCCH: - MUXSCH: - SNR: F TA: F RACH: - SRS: - RIP: - NFLOOR: - NDEMOCW: -</p> <p>Test[FD30] Result: FAIL PDSCH: P PUSCH: F RXBITS: - PUCCH: - MUXSCH: - SNR: F TA: F RACH: - SRS: - RIP: - NFLOOR: - NDEMOCW: -</p> <p>Test[FD31] Result: FAIL PDSCH: P PUSCH: F RXBITS: - PUCCH: - MUXSCH: - SNR: F TA: F RACH: - SRS: - RIP: - NFLOOR: - NDEMOCW: -</p> <p>Test[FD32] Result: FAIL PDSCH: P PUSCH: F RXBITS: - PUCCH: - MUXSCH: - SNR: F TA: F RACH: - SRS: - RIP: - NFLOOR: - NDEMOCW: -</p> <p>Test[FD33] Result: FAIL PDSCH: P PUSCH: F RXBITS: - PUCCH: - MUXSCH: - SNR: F TA: F RACH: - SRS: - RIP: - NFLOOR: - NDEMOCW: -</p> <p>Test[FD34] Result: FAIL PDSCH: P PUSCH: F RXBITS: - PUCCH: - MUXSCH: - SNR: F TA: F RACH: - SRS: - RIP: - NFLOOR: - NDEMOCW: -</p> <p>Test[FD35] Result: FAIL PDSCH: P PUSCH: F RXBITS: - PUCCH: - MUXSCH: - SNR: F TA: F RACH: - SRS: - RIP: - NFLOOR: - NDEMOCW: -</p> <p>Test[FD36] Result: FAIL PDSCH: P PUSCH: F RXBITS: - PUCCH: - MUXSCH: - SNR: F TA: F RACH: - SRS: - RIP: - NFLOOR: - NDEMOCW: -</p> <p>Test[FD53] Result: FAIL PDSCH: P PUSCH: F RXBITS: - PUCCH: F MUXSCH: - SNR: F TA: F RACH: P SRS: - RIP: - NFLOOR: - NDEMOCW: -</p> <p>Test[FD54] Result: FAIL PDSCH: P PUSCH: F RXBITS: - PUCCH: F MUXSCH: - SNR: F TA: F RACH: P SRS: - RIP: - NFLOOR: - NDEMOCW: -</p> <p>Test[FD55] Result: FAIL PDSCH: P PUSCH: F RXBITS: - PUCCH: F MUXSCH: - SNR: F TA: F RACH: P SRS: - RIP: - NFLOOR: - NDEMOCW: -</p>
Priority	P3-Medium
Affected Versions	v18.09
Components	LTE Ref PHY

Title	LTE RefPHY RCT Test Failures
Reference #	SCSY-6494
Description	<p>The following LTE RefPHY RCT tests are failing for AVX2 and AVX512:</p> <p>rct_ul_832_3mhz_eva5hz_2a_pucch_f2_detect</p> <p>rct_ul_832_3mhz_etu70hz_2a_pucch_f2_detect</p> <p>rct_ul_832_5mhz_eva5hz_2a_pucch_f2_detect</p> <p>rct_ul_832_5mhz_etu70hz_2a_pucch_f2_detect</p> <p>rct_ul_832_10mhz_eva5hz_2a_pucch_f2_detect</p> <p>rct_ul_832_10mhz_etu70hz_2a_pucch_f2_detect</p> <p>rct_ul_catm_10mhz_pucch_F2DetACK10MHz_REP1</p> <p>rct_ul_catm_10mhz_pucch_F2DetACK10MHz_REP4</p> <p>rct_ul_catm_10mhz_pucch_F2ADetACK10MHz_REP1</p> <p>rct_ul_catm_10mhz_pucch_F2BDetACK10MHz_REP1</p> <p>rct_ul_832_15mhz_eva5hz_2a_pucch_f2_detect</p> <p>rct_ul_832_15mhz_etu70hz_2a_pucch_f2_detect</p> <p>rct_ul_832_20mhz_eva5hz_2a_pucch_f2_detect</p> <p>rct_ul_832_20mhz_etu70hz_2a_pucch_f2_detect</p> <p>rct_ul_catm_20mhz_pucch_F2DetACK20MHz_REP4</p> <p>rct_ul_catm_20mhz_pucch_F2BDetACK20MHz_REP4</p> <p>rct_ul_catm_20mhz_pucch_F2BDetACK20MHz_REP4_DTX</p> <p>rct_ul_catm_20mhz_pucch_F2BDetACK20MHz_REP4</p> <p>rct_ul_catm_20mhz_pucch_F2BDetACK20MHz_REP4_DTX</p>
Priority	P2-High

Title	<a href="#">LTE RefPHY RCT Test Failures</a>
Affected Versions	v18.09
Components	LTE Ref PHY

Title	<a href="#">Non Bit Exact AVX512 vs. AVX2 Implementations Cause AVX512 Test Errors</a>
Reference #	SCSY-4155
Description	<p>The implementations of the LTE AVX2 and AVX512 L1 pipelines are not a bit equivalent. This is due to the underlying differences in the instruction set and floating-point computations.</p> <p>Because the testapp and testmac verification framework rely on bit-exact comparison of generated test output files with reference files, and that the reference files were produced for the AVX2 pipeline, several AVX512 tests are failing:</p> <p>Affected tests are (all in AVX512 mode only):</p> <p>Test UL 78</p> <p>Test UL 139</p> <p>Test UL 181</p> <p>Test FD 26</p> <p>Test FD 27</p> <p>Test FD 57</p> <p>Test RCT UL 19 20 MHz (rct_ul_823_20mhz_eva5hz_2a_a48_pusch_mux_detect)</p>
Priority	P3-Medium
Affected Versions	V1.6.0
Components	LTE Ref PHY, Validation and Testing

Title	<a href="#">bblib_reed_muller_dec_fht_avx2 Implementation Issue</a>
Reference #	SCSY-8118
Description	The SDK implementation of the bblib_reed_muller_dec_fht_avx2 (Fast Hadamard Transform) produce invalid output for nb_out=6 and nb_out=8 (number of output bits). C version of fht function produce valid output for nb_out=6 and nb_out = 8.
Priority	P3-Medium
Affected Versions	v18.09
Components	SDK

Title	<a href="#">Polar Decoder 5G NR Does Not Cover CRC Length 6 Case (Parity Bits Case)</a>
Reference #	SCSY-7698
Description	<p>Kernel function: bblib_pucch_polar_decoder_5gnr does not cover case with CRC length = 6 and parity bits. There is separate API for CRC = 6 case: bblib_pucch_parity_polar_decoder_5gnr (using list 8 parity function).</p> <p>bblib_pucch_polar_decoder_5gnr should check parameter request-&gt;nPC (length of parity bits) and if nPC is not zero - call function:</p> <ul style="list-style-type: none"> <li>- AVX2: bblib_pucch_parity_polar_decoder_5gnr</li> <li>- AVX512: bblib_polar_decoder_5gnr_fsscml + check CRC using lib_crc</li> </ul>

Title	<a href="#">Polar Decoder 5G NR Does Not Cover CRC Length 6 Case (Parity Bits Case)</a>
Priority	P1-Stopper
Affected Versions	v18.09
Components	SDK

Title	<a href="#">4G Rate Matching AVX2 Implementation Introducing Errors when rV = 1, 2, 3</a>
Reference #	SCSY-7565
Description	<p>There is a bug in the AVX2 implementation of the 4G Rate Matching function. When rV = 1, 2, 3 in certain conditions will always report CRC during retransmission. This issue has been confirmed with test vectors which are loaded into WaveJudge. During the re-transmission, it always shows that there are corrected bits.</p> <p>The SSE implementation of the Rate Matching is working correctly. If SDK calls SSE implementation, generated IQ samples are decoded correctly in WaveJudge. It shows 0 corrected bits for all re-transmissions.</p> <p>Sample rate_match_request parameter set:  r = 0  C = 7  direction = 1  Nsoft = 1827072  KMIMO = 2  MDL_Harq = 8  G = 83592  NL = 1  Qm = 6  rvidx = 2  bypass_rvidx = 0  Kidx = 179  nLen = 5636</p>
Priority	P3-Medium
Affected Versions	v18.09
Components	SDK

Title	<a href="#">lib_llr_demapping Reports Long Strings of "modulation type not supported" in SKL Performance Tests</a>
Reference #	SCSY-7519
Description	<p>When running the lib_llr_demapping unit (performance) tests on SKL, the unit test framework attempts to run QAM16 modulation tests with AVX2 ISA, which causes several thousands of instances of the following message to be displayed:</p> <p>Modulation type not supported with AVX2 in this release</p>
Priority	P4-Low
Affected Versions	v18.09
Components	SDK



Title	Layermapping 5G NR Fails to Build in Debug Mode
Reference #	SCSY-7393
Description	<p>When building the SDK in Debug mode, the Layermapping 5G NR kernel fails when building AVX2.</p> <p>Error message:</p> <pre>/root/isg_cid-wireless_sdk/source/phy/lib_layermapping_5gnr/phy_layermapping_5gnr_fxp.cpp(59): (col. 80) catastrophic error: Intrinsic parameter must be an immediate value.</pre> <p>This issue appears to be due to a blend placed in a template function being passed a mask as part of the function call instead of the mask being included directly in the call to blend. The error is only seen in Debug mode, and the kernel will build for other modes.</p>
Priority	P3-Medium
Affected Versions	v18.09
Components	SDK

Title	LTE Rate Matching Broken for Some Code Block Sizes
Reference #	SCSY-7301
Description	<p>The AVX2 / AVX512 implementation of the rate matching has bugs on some of the code block sizes. Currently, not all code block sizes are tested, so this is not reproducible with unit tests.</p> <p>The issue does not affect SSE.</p>
Priority	P3-Medium
Affected Versions	v18.09
Components	SDK

Title	Some SDK Modules Do Not Report Version Number at Startup
Reference #	SCSY-7214
Description	<p>The following SDK modules do not report their version number at startup. This is typically due to a missing constructor:</p> <pre>lib_polar_encoder_5gnr lib_scramble lib_scramble_5gnr lib_turbo lib_cestimate_5gnr lib_cestimate_fft_5gnr lib_common lib_MIMO lib_reed_muller lib_ta_compensation_5gnr (the version string in the module also incorrectly states lte) lib_tbcc</pre> <p>The following modules report incorrect version numbers at startup:</p> <pre>lib_pucch_5gnr (reports lib_sample_kernel version)</pre>
Priority	P3-Medium
Affected Versions	v18.09
Components	SDK

Title	Timing Offset Incorrect Compensation API
Reference #	SCSY-7196
Description	The Timing Offset Library is a 5G NR library, but the API has lte prefix in the name. This will be changed in the next release to replace lte with 5gnr to be consistent with the naming convention.
Priority	P4-Low
Affected Versions	v18.09
Components	SDK

Title	lib_turbo: bblib_turbo_decoder() Returns Improper Number of Iterations
Reference #	SCSY-2050
Description	bblib_turbo_decoder() returns an incorrect number of half iterations instead of full iterations, which is misleading. The workaround is to multiply the returned number by 2 to get full iterations.
Priority	P3-Medium
Affected Versions	v1.4.0
Components	SDK

## 4.11 Fixed Issues Release Software v18.09

The following issues have been fixed in this release.

### 4.11.1 4G RefPHY Fixed Issues in Release Software v18.09

- **SCSY-4156** Missing RCT UL 5 MHz tests 18 and 19
- **SCSY-4155** Non-bit-exact AVX512 vs. AVX2 implementations cause AVX512 test errors
- **SCSY-3953** The `extract.sh` script fails to extract RefPHY when path provided is not default
- **SCSY-3925** Testapp UL errors
- **SCSY-1812** Potential issue might cause EVM of PDSCH in the special subframe to be larger than normal
- **SCSY-1018** TM8 fails on port 7-8.

### 4.11.2 Framework Fixed Issues in Release Software v18.09

None.

### 4.11.3 SDK Fixed Issues in Release Software v18.09

- **SCSY-4218** lib\_cestimate\_pucch test failures on SKL platform
- **SCSY-3889** polar\_decoder\_5gnr runs slower on SKL than BDW for some scenarios

- **SCSY-3885** `lib_layermapping_5gnr` broken SSE ISA build
- **SCSY-3806** PUCCH Demodulation AVX512 Performance
- **SCSY-2616** Verified Channel estimator, Wiener/Low Mobility, verification gaps

#### 4.11.4 BSP Fixed Issues in Release Software v18.09

None.

### 4.12 Fixed Issues Release Software v18.08-ea

There is no fixed issue in this release.

### 4.13 Fixed Issues Release Software v1.6.0

The following issues have been fixed in this release.

#### 4.13.1 RefPHY Fixed Issues in Release Software v1.6.0

**SCSY-2943:** TA (Timing Advance) Failures for FD (High Priority) Test Cases

#### 4.13.2 Framework Fixed Issues in Release Software v1.6.0

None.

#### 4.13.3 SDK Fixed Issues in Release Software v 1.6.0

- **SCSY-2947:** 5G NR rate dematching code standard issues.
- **SCSY-2851:** CRC24C needs initializing with 1's
- **SCSY-2634:** Matrix Inversion AVX512 performance worse than AVX2

#### 4.13.4 BSP Fixed Issues in Release Software v 1.6.0

None.

## 5.0 Release Content

### 5.1 RefPHY Release Content

- 4G [refPHY](#)
- 5G [refPHY](#)
- NB-IOT [refPHY](#)

### 5.2 5G NR FPGA Release Content

- none

### 5.3 Framework Release Content

[Table 7](#) identifies the release content for the components in this release.

**Table 7. Release Content**

Feature	Description
<a href="#">bbupool framework lib</a>	The library of bbupool framework
<a href="#">bbupool_framework example code</a>	Examples of using this library

### 5.4 BSP Release Content

The FlexRAN BSP contains the following components:

- The WLS kernel module, which provides a communication interface for L1 and L2 modules.
- The WLS userspace library, which provides an API interface for the L2 user space application to communicate with L1.
- A test application illustrates the usage of the WLS interface.
- The patch files for the [open\\_nFAPI](#) Code.

### 5.5 SDK Release Content

[Table 8](#) identifies the release content for the components in Release software v19.10.

**Table 8. SDK Release Content for v19.10**

Component	RAT	SSE	AVX-2	AVX-512
<a href="#">lib_sample_kernel</a>	SAMPLE KERNEL	C only	YES	YES
<a href="#">lib_common</a>	LTE and 5G NR	YES	YES	YES

Component	RAT	SSE	AVX-2	AVX-512
lib_companding	LTE and 5G NR	YES	YES	YES
lib_crc	LTE and 5G NR	YES	NO	YES
lib_demodulation	LTE and 5G NR	NO	YES	YES
lib_dft_idft	LTE and 5G NR	NO	YES	YES
lib_equalization	LTE and 5G NR	NO	NO	YES
lib_fft_ifft	LTE and 5G NR	C only	YES	YES
lib_llr_demapping	LTE and 5G NR	C only	YES	YES
lib_matrix_inversion	LTE and 5G NR	YES	YES	YES
lib_modulation	LTE and 5G NR	YES	NO	YES
lib_reed_muller	LTE and 5G NR	C only	YES	YES
lib_zc_sequence_gen	LTE and 5G NR	C only	YES	YES
lib_cestimate	LTE	C only	YES	YES
lib_cestimate_pucch	LTE	NO	YES	YES
lib_deinterleave	LTE	YES	YES	YES
lib_demodulation_pucch	LTE	C only	YES	YES
lib_eigen_beamforming	LTE	C only	YES	YES
lib_mu_MIMO_equalization_lte	LTE	C only	YES	YES
lib_precoding	LTE	C only	YES	YES
lib_rate_matching	LTE	YES (DL only)	YES	YES
lib_remapping_ctrlch	LTE	C only	NO	YES
lib_remapping_pdsch	LTE	C only	NO	YES
lib_scramble	LTE	NO	YES	YES
lib_su_MIMO_equalization_lte	LTE	C only	YES	YES
lib_tbcc	LTE	C only	YES	NO
lib_turbo	LTE	YES	YES	YES
lib_viterbi	LTE	YES	YES	NO
lib_bf_dl_expand	5G NR	NO	NO	YES
lib_LDPC_ratematch_5gnr	5G NR	NO	NO	YES
lib_cestimate_5gnr	5G NR	NO	NO	YES
lib_cestimate_fft_5gnr	5G NR	NO	NO	YES
lib_dmrs_gen_5gnr	5G NR	C only	NO	YES
lib_fd_correlation	5G NR	C only	YES	YES
lib_irc_rnn_calculation_5gnr	5G NR	NO	NO	YES
lib_layerdemapping_5gnr	5G NR	C only	NO	YES

Component	RAT	SSE	AVX-2	AVX-512
lib_layermapping_5gnr	5G NR	C only	NO	YES
lib_llr_demapping	5G NR	NO	YES	YES
lib_ldpc_decoder_5gnr	5G NR	NO	YES	YES
lib_ldpc_encoder_5gnr	5G NR	NO	NO	YES
lib_mmse_irc_mimo_5gnr	5G NR	NO	NO	YES
lib_mmse_MIMO_5gnr	5G NR	C only	YES	YES
lib_phase_noise_5gnr	5G NR	NO	NO	YES
lib_polar_decoder_5gnr	5G NR	NO	YES	YES
lib_polar_encoder_5gnr	5G NR	NO	NO	YES
lib_prach_5gnr	5G NR	NO	YES	YES
lib_precoding_5gnr	5G NR	C only	YES	YES
lib_pucch_5gnr	5G NR	NO	YES	YES
lib_pucch_cestimate_5gnr	5G NR	NO	YES	YES
lib_pucch_equalization_5gnr	5G NR	NO	YES	YES
lib_pucch_focompensation_5gnr	5G NR	NO	NO	YES
lib_pusch_focompensation_5gnr	5G NR	NO	NO	YES
lib_pusch_foestimation_5gnr	5G NR	NO	NO	YES
lib_pusch_irc_symbol_processing_5gnr	5G NR	NO	NO	YES
lib_pusch_symbol_processing_5gnr	5G NR	NO	NO	YES
lib_qr_decomposition_5gnr	5G NR	C only	YES	YES
lib_rate_dematching_5gnr	5G NR	NO	NO	YES
lib_remapping_pdcch_5gnr	5G NR	NO	NO	YES
lib_scramble_5gnr	5G NR	NO	NO	YES
lib_srs_cestimate_5gnr	5G NR	NO	NO	YES
lib_ta_compensation_5gnr	5G NR	NO	NO	YES
lib_zc_sequence_gen	5G NR	NO	NO	YES
lib_zc_matrix_gen	5G NR	NO	NO	YES

## 6.0 Software Component Dependencies

The correct version of the required software components must be installed.

### 6.1 refPHY, SDK, and Framework Dependencies for Release Software v21.03 and newer

**Table 9.** refPHY, SDK and Framework Dependencies for Release Software v21.03 and newer

Component	Software Version
ICC	19.0.3.206
DPDK	20.11
GTest	1.7.0
CMake	3.9.2 or minimum 2.8.12
pf_bb_config	v21.3

### 6.2 refPHY, SDK, and Framework Dependencies for Release Software v20.11

**Table 10.** refPHY, SDK and Framework Dependencies for Release Software v20.11

Component	Software Version
ICC	19.0.3.206
DPDK	19.11
GTest	1.7.0
CMake	3.9.2 or minimum 2.8.12
pf_bb_config	v20.11

### 6.3 refPHY, SDK, and Framework Dependencies for Release Software v20.04

**Table 11.** refPHY, SDK and Framework Dependencies for Release Software v20.04

Component	Software Version
ICC	19.0.3.206
DPDK	19.11
GTest	1.7.0
CMake	3.9.2 or minimum 2.8.12

## 6.4 refPHY and Framework Dependencies for Release Software v20.02 and older

Supported versions of component software required for refPHY, SDK, and Framework.

**Table 12. refPHY and Framework Dependencies for v20.02 and older**

Component	Software Version
ICC	19.0.3.206
DPDK	18.08
Ferry Bridge	1.4.1

### 6.4.1 SDK Dependencies for Release v20.02 and Older

**Table 13. SDK Dependencies for 20.02 and Olderr**

Component	Software Version
ICC	19.0.3.206
GTest	1.7.0
CMake	3.9.2 or minimum 2.8.12
DPDK	18.08

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## 7.0 Hardware and Software Compatibility

### 7.1 Hardware Platform Configuration

The following section provides hardware platform configuration information for Release Software v20.11 and newer.

#### 7.1.1 Hardware Platform Configuration for Release Software v20.11 and Newer

The hardware configuration consists of a control node and N compute nodes. There are no specific requirements for the control node. The following are the requirements for the compute node.

**Table 14. WolfPass Server**

Item	Description	Quantity
Motherboard®	WolfPass S2600WFT server board (Part number: K40014-001)	1
Chassis	2U Rackmount Server Enclosure	1
Processor	Skylake Server Processor (6248) <a href="#">24c@2.5GHz</a>	2
System Memory	Micron 16GB DDR4 2667 MHz DIMMs	12
SATA Hard Drive	One 2.5" 2TB SATA HDD (Seagate)	1
Ethernet NIC	1x Intel® Fortville NIC X710DA4 SFP+ (PCIe* Add-in-card direct to CPU-0) 1x Intel® Dual Port 25GbE FVL XXV710-DA2 (Harbor Channel) SFP28 (PCIe Add-in-card direct to CPU-1)	1

#### 7.1.2 Hardware Platform Configuration for Release Software v19.03 to 20.08

The hardware configuration consists of a control node and N compute nodes. There are no specific requirements for the control node. The following are the requirements for the compute node.

Details on how to set up the hardware can be found in the *FlexRAN and Mobile Edge Compute (MEC) Platform Setup Guide* document (see [Table 2, Reference Documents and Resources](#)).

The *FlexRAN and Mobile Edge Compute (MEC) Platform Setup Guide* document is intended to address the cloud deployment. Cloud Deployment has specific hardware requirements. If cloud deployment is not currently intended, then continue to use the existing FlexRAN environment (the hardware platform and OS used on v1.3.0 and previous releases). For any further questions, contact your Intel field sales representative.

**Table 15. WolfPass Server**

Item	Description	Quantity
Motherboard®	WolfPass S2600WFQ server board (symmetrical Intel® QAT)	1
Chassis	2U Rackmount Server Enclosure	1
Processor	Skylake Server Processor (6148) 24c@2.4GHz	2
System Memory	Micron 16GB DDR4 2667 MHz DIMMs	12
SATA Hard Drive	One 2.5" 2TB SATA HDD (Seagate)	1

Item	Description	Quantity
Ethernet NIC	1x Intel® Fortville NIC X710DA4 SFP+ (PCIe* Add-in-card direct to CPU-0) 1x Intel® Dual Port 25GbE FVL XXV710-DA2 (Harbor Channel) SFP28 (PCIe Add-in-card direct to CPU-1)	1

## 7.2 Supported Operating Systems

This section details the supported operating systems for the releases.

### 7.2.1 Supported Operating System for Release v20.11 and Newer

#### Operating Systems for Release v20.11 and Newer

Vendor	OS Version
Wind River	OS Version: Wind River Cloud Platform - v20.06-38 Kernel: 3.10.0-1127.rt56.1093.el7.tis.2.x86_64
Bare Metal	Version: 3.10.0-1127.19.1.rt56.1116.el7.x86_64
Kubernetes	Version: 3.10.0-957.10.1.rt56.921.el7.x86_64
VMWare	OS Version: Photon OS 3.0 Kernel: 4.19.115-rt50-4.ph3-rt ESXi: 7.0.1, 16333893

### 7.2.2 Supported Operating System for Release v20.08 and Newer

**Table 16.** Operating Systems for Release v20.08 and Newer

Vendor	OS Version
Wind River	OS Version: Wind River Cloud Platform - v20.06-38 Kernel: 3.10.0-1127.rt56.1093.el7.tis.2.x86_64
Bare Metal	Version: 3.10.0-1062.12.1.rt56.1042.el7.x86_64
Kubernetes	Version: 3.10.0-957.10.1.rt56.921.el7.x86_64
VMWare	OS Version: Photon OS 3.0 Kernel: 4.19.115-rt50-4.ph3-rt ESXi: 7.0.1, 16333893



7.2.3 Supported Operating System for Release v20.04 and Older

Table 17. Operating Systems for Release v18.09 and Newer

Vendor	Version
Wind River	Host OS Version: Titanium Server 5* (16.10-b5b) 3.10.0-514.16.1.rt56.437.20.tis.el7.x86_64 Guest OS Version: CentOS Linux* release 7.2.1511 (Core) 3.10.0-514.10.2.rt56.435.21.tis.el7.x86_64
Bare Metal	3.10.0-693.2.2.rt56.623.el7.x86_64 or 3.10.0-957.10.1.rt56.921.el7.x86_64
Kubernetes	3.10.0-1062.1.2.rt56.1025.el7.x86_64

## 8.0 *Distribution*

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### 8.1 Method

Executables, source, and documentation appropriate to your license agreement are available using [My Intel](#) or contact your Intel representative.

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