MMWAVE DFP 03.02.07.00 Release Notes

1   Introduction

TI mmWave Device Firmware Package (DFP) enables the development of millimeter wave (mmWave) radar applications using xWRL6432 and xWRL1432 low power Device/EVM. It includes necessary components which will facilitate end users to integrate MMIC SOC with their application software / SDK. The user is expected to use mmWaveStudio to measure RF and key system performance on TI mmWave Radar devices.

The mmWave DFP 3.x is a new lightweight package consist of 3 major components, these components closely associated with the functionality of underlying device sensor front-end hardware IPs and implementation. Refer mmwave_dfp_low_api_documentation.pdf in package for more information.

1. RF Scripter (RFS) firmware

    a. xWRL6432 (60GHz) firmware binary

    b. xWRL1432 (77GHz) firmware binary

2. FECSS Library (FECSSLib)

3. mmWaveLink Library

2 Release Overview

2.1 Platform and Device Support

The device and platforms supported with this release include:

Supported Devices	Release Status	Supported EVMs
xWRL6432 FCCSP **ES2.0+**	Production Release	xWRL6432BOOST: xWRL6432 FCCSP + DCA1000EVM
xWRL6432 WCSP **ES2.0+**	Production Release	xWRL6432WCSPEVM + DCA1000EVM
xWRL6432 AOP **ES2.0+**	Production Release	xWRL6432AOPEVM + DCA1000EVM
xWRL1432 **ES2.0+**	Production Release	xWRL1432BOOST: xWRL1432 + DCA1000EVM
Note: DFP supports the foundation components for the device mentioned in the table above. At system level, the mmWave SOC/EVM may interface with other SOCs/EVMs and software for other devices will not be a part of the DFP		

2.2 Release contents and component versions

Component	Version	Type
xWRL6432 FCCSP (60GHz) RFS Patch Firmware	RAM: 7.2.5.4 ROM: 7.1.0.4 (Not Included in the package)	.bin Rprc format Binary Functional Safety Compliant
xWRL6432 WCSP (60GHz) RFS Patch Firmware	RAM: 7.2.6.7 ROM: 7.1.0.4 (Not Included in the package)	.bin Rprc format Binary
xWRL6432 AOP (60GHz) RFS Patch Firmware	RAM: 7.2.7.1 ROM: 7.1.0.4 (Not Included in the package)	.bin Rprc format Binary
xWRL1432 (77GHz) RFS Firmware	RAM: 3.2.5.2 ROM: 3.1.6.0 (Not Included in the package)	.bin Rprc format Binary Functional Safety Compliant
FECSSLib Library and Source code	RAM: 3.1.8.1	.lib M4 CLANG compiler Library Functional Safety Compliant
mmWaveLink Library and Source code	RAM: 3.2.3.0	.lib M4 CLANG compiler Library Functional Safety Compliant
Docs	Release Notes mmWave DFP Interface Control Document Doxygen Documentation	PDF PDF Doxygen zip file
APPSS RF evaluation Firmware	RAM: 3.2.4.0	.bin Rprc format Binary

2.3   Directory Structure

Directory Name	Content
docs	mmwave_dfp_release_notes.pdf mmwave_dfp_interface_control_document.pdf mmwave_dfp_low_api_documentation.zip (Should not be referred for recommendations)
fecsslib	\lib\xWRLx432\fecss_**rom**_m4.lib – ARM M4 CLANG compiler library FECSSLib ROMed driver functions and header files (Applicable only for ES2.0+ devices) \lib\xWRLx432\fecss_**patch**_m4.lib – ARM M4 CLANG compiler library FECSSLib Patch driver functions and header files (Applicable only for ES2.0+ devices) \lib\xWRLx432\fecss_**ram**_m4.lib – ARM M4 CLANG compiler library FECSSLib driver functions and header files (Not recommended for ROMed devices ES2.0+)
mmwavelink	\lib\xWRLx432\mmwavelink_m4.lib – ARM M4 CLANG compiler library mmWaveLink API functions and header files
rfsfirmware	\xWRL6432\mmwave_rfs_**patch**_rprc.bin – xWRL6432 60GHz FCCSP device FECSS RFS patch firmware binary file in RPRC format \xWRL6432_WCSP\mmwave_rfs_**patch**_rprc.bin – xWRL6432 60GHz WCSP device FECSS RFS patch firmware binary file in RPRC format \xWRL6432_AOP\mmwave_rfs_**patch**_rprc.bin – xWRL6432 60GHz AOP device FECSS RFS patch firmware binary file in RPRC format \xWRL1432\mmwave_rfs_ **patch**_rprc.bin – xWRL1432 77GHz device FECSS RFS patch firmware binary file in RPRC format
common	mmWaveLink API data structure and user interface header files
rfevalfirmware	\appss\mmwave_plt_rfeval_rprc.bin – APPSS RF evaluation firmware for mmWave Studio SPI connection compiled with FECSS ROM Lib (Applicable only for ES2.0+ devices) \appss\mmwave_plt_rfeval_ram_rprc.bin – APPSS RF evaluation firmware for mmWave Studio SPI connection compiled with FECSS RAM Lib (Not recommended for ES2.0+ devices)

2.4 Component Descriptions

2.4.1 *RFS Firmware*

RF Scripter (RFS) firmware is a TI ROM/RAM image is responsible for configuring radar RF/analog and digital front-end as per API call. The analog calibrations and safety monitors are performed in RFS based on API call from APPSS. This enables the mm-Wave front-end to be capable of adapting to temperature and ageing effects along with safety features. The API calls are done through new lightweight mailbox interface from APPSS to RFS.

2.4.2 *FECSSLib* Library

The FECSSLib is an open-source ROM/RAM driver library is responsible for management and operation of the Radar sensor digital frontend power up/down, RFS mailbox communication and sensor waveform generation in the device. The mmWaveLink APIs internally calls these FECSSLib driver APIs to configure the FECSS.

2.4.3 *mmWaveLink Library*

mmWaveLink is an open-source, OS and device agnostic API functions for user control and configuration of the FEC sub system in the device. The mmwaveLink is the user communication API layer to the FECSS, it can be integrated with SDK(SoC)/External Host (Frontend) to get the radar frontend services.

RFS is a closed subsystem whose internal blocks are configurable using messages coming over mailbox. The mmWaveLink provides an abstracted APIs to configure FECSS and provides below features:

- Link between application and FECSS

- Platform and OS independent which means it can be ported into any processor which provides basic communication interface and OS routines. The mmWaveLink framework can also run in single threaded environment

- The Klocwork tool v2020.4 with MISRA 2012 AMD1 rule is used to perform static analysis; the TI approved waiver policy is being used to take any waiver.

2.5 Licensing

Please refer to the mcu_plus_sdk_XWRL64XX_14XX_manifest.html, which outlines the licensing information for mmWave DFP package.

3   Release Contents

3.1   Typical Features and enhancements

- xWRL6432 and xWRL1432 devices are TIs third generation 60GHz and 77GHz RF CMOS low power and low cost Radar sensors, there are significant changes to DFP firmware and API architecture in this device compared to TI first and second generation devices.
- For more information refer document mmwave_dfp_low_api_documentation.chm
- The key firmware and device features supported by DFP:

  o The brand new lightweight mmWaveLink APIs to support FECSS radar front end features (mmwavelink_m4.lib) can be easily integrated with application software / SDK (APPSS M4 core)

  o The new FECSSLib library drivers' part of DFP (open source) running on M4 APPSS Core (fecss_rom_m4.lib)

  o The new lightweight RFS firmware part of DFP (closed ROM/binary) running on M3 FECSS core (mmwave_rfs_rprc.bin)

  o The new FECSS powerup and power down low power APIs (Entry/Exit Deep Sleep)

  o The new FECSS clock control API (Entry/Exit sleep and slow clocks)

  o GPADC and temperature measurement APIs

  o The brand-new factory and runtime calibration strategy and supporting APIs

  o The new sensor configuration and sensor start/stop APIs

  o The new loopback and functional safety monitor APIs

  o Synthesizer RF frequency supported

Device	Supported RF Frequency
xWRL6432 FCCSP	57 – 64GHz
xWRL6432 WCSP	57 – 64GHz
xWRL6432 AOP	57 – 63.5GHz
xWRL1432	76 – 81GHz

  o Supports 5MHz IF bandwidth

3.2   Feature/Changes List and Known Issues by Components

Please refer device specific errata document for more information limitations and known issues in the corresponding device.

3.2.1 DFP 3.0.6 Release

- The Baseline DFP release for ES1.0 device bring-up. Only selected basic APIs are supported in this release.
- Supported only APLL and SYNTH clock calibrations, other RF calibrations are not supported.
- Supported only basic sensor configuration APIs, the per chirp configuration API is not supported.
- The loopback and monitor APIs are not supported.

3.2.1.1 RFS Firmware

- The Baseline DFP release for ES1.0 device bring-up.

3.2.1.2 FECSSLib *Library*

- The Baseline DFP release for ES1.0 device bring-up.

3.2.1.3 mmWaveLink Library

- The Baseline DFP release for ES1.0 device bring-up.

3.2.2 DFP 3.0.8 Release

- Bug fixes and performance improvements
- Added monitoring APIs
- Static analysis cleanup

3.2.2.1 xWRL6432 RFS Firmware

Issue Type	Key	Description
Improvement	MMWAVE_DFP_LOW-276	MISRA violations cleanup
Improvement	MMWAVE_DFP_LOW-268	Updated Synth and APLL bandwidth control settings
Issue Resolution	MMWAVE_DFP_LOW-236	Fixed Tx vector modulation not working below 200KHz
Issue Resolution	MMWAVE_DFP_LOW-278	Fixed Synth calibration failure at higher temperatures
Feature	MMWAVE_DFP_LOW-247	Added option to disable Tx CLPC calibration in factory calibration API
Issue Resolution	MMWAVE_DFP_LOW-214	Fixed PD calibration failing at higher temperatures

3.2.2.2 FECSSLib Library

Issue Type	Key	Description
Known Issue	MMWAVE_DFP_LOW-407	Frame timer is clock gated when FECSS is powered off.
Improvement	MMWAVE_DFP_LOW-272	MISRA violations cleanup

3.2.2.3 mmWaveLink Library

Issue Type	Key	Description
Improvement	MMWAVE_DFP_LOW-272	MISRA violations cleanup

3.2.3 DFP 3.1.5 Release

- APL Release for xWRL1432
- RFS Firmware for xWRL6432 is same as DFP 3.0.8

3.2.3.1 xWRL6432 RFS Firmware

Issue Type	Key	Description
Known Issue	MMWAVE_DFP_LOW-168	Synth bandwidth is limited to 58GHz to 62.5GHz due to ES1.0 hardware limitations (Refer device errata document)
Known Issue	MMWAVE_DFP_LOW-285	PD calibrations are not supported in this DFP release Workaround: Disable PD calibrations in both Factory and Runtime calibration APIs. **Affected APIs:** rl_fecssRfFactoryCal, rl_fecssRfRuntimeCal **Workaround:** Factory calibration shall be performed at 10C to 40C and Disable PD runtime calibrations
Known Issue	MMWAVE_DFP_LOW-260	Profile settings are not restored properly by the calibration APIs **Affected APIs:** rl_fecssRfFactoryCal, rl_fecssRfRuntimeCal **Workaround:** Reconfigure profile time configuration after running calibrations (rl_sensChirpProfTimeCfg)
Known Issue	MMWAVE_DFP_LOW-304	Per-chirp LUT controls are not disabled during factory calibration **Affected APIs:** rl_fecssRfFactoryCal, rl_sensPerChirpCtrl **Workaround:** Disable per-chirp controls before calibrations
Known Issue	MMWAVE_DFP_LOW-307	Skip Tx CLPC in factory calibration is not supported **Affected APIs:** rl_fecssRfFactoryCal **Workaround:** Keep skip Tx CLPC disabled in factory calibration
Known Issue	MMWAVE_DFP_LOW-324	Tx Runtime CLPC calibration API is not enabled **Affected APIs:** rl_fecssRlRuntimeTxClpcCal
Known Issue	MMWAVE_DFP_LOW-327	Temperature overrides are applied to Rx gain calibrations **Affected APIs:** rl_fecssRfFactoryCal **Workaround:** Disable Rx gain calibration while running Tx calibration with temperature overrides.
Known Issue	MMWAVE_DFP_LOW-339	Tx calibration fails at high backoffs
Known Issue	MMWAVE_DFP_LOW-282	Degraded Tx power flatness at high temperatures
Known Issue	MMWAVE_DFP_LOW-460	RF LDO settling issue in BoM Optimized Mode Description: DFP 3.1.5.0. and all the previous DFPs do not provide sufficient time for RF 1.8-1.2V LDO to settle in the burst start which affects RF functionality.

		Affected APIs: rl_fecssRfFactoryCal, rl_sensFrameCfg, rl_sensChirpProfTimeCfg, rl_fecssRlRuntimeTxClpcCal **Workaround:** • Ignore the results from first burst of each frame • Inter burst Idle time should be less than 5ms • In CW CZ trigger mode, there is no concept of bursts. Hence the mode should be used with large Tx start time (>200 us) • Tx runtime CLPC calibration API should not be used • Tx calibration should not be enabled without Rx calibration in the factory calibration API

3.2.3.2   xWRL1432 RFS Firmware

Issue Type	Key	Description
Feature	MMWAVE_DFP_LOW-307	Added runtime Tx CLPC API **API:** rl_fecssRlRuntimeTxClpcCal
Known Issue	MMWAVE_DFP_LOW-460	RF LDO settling issue in BoM Optimized Mode Description: DFP 3.1.5.0. and all the previous DFPs do not provide sufficient time for RF 1.8-1.2V LDO to settle in the burst start which affects RF functionality. **Affected APIs:** rl_fecssRfFactoryCal, rl_sensFrameCfg, rl_sensChirpProfTimeCfg, rl_fecssRlRuntimeTxClpcCal **Workaround:** • Ignore the results from first burst of each frame • Inter burst Idle time should be less than 5ms • In CW CZ trigger mode, there is no concept of bursts. Hence the mode should be used with large Tx start time (>200 us) • Tx runtime CLPC calibration API should not be used • Tx calibration should not be enabled without Rx calibration in the factory calibration API

3.2.3.3   FECSSLib Library

Issue Type	Key	Description
Issue Resolution	MMWAVE_DFP_LOW-407	Removed frame timer clock gate from FECSS power off API **Affected API:** rl_fecssDevPwrOff

3.2.3.4   mmWaveLink Library

Issue Type	Key	Description
Improvement	MMWAVE_DFP_LOW-383	Added new DFP examples
Unsupported	MMWAVE_DFP_LOW-418	Monitor trigger API is not supported **Affected APIs:** rl_monEnableTrig

3.2.4 DFP 3.1.7 Release

- xWRL6432 ES2.0 ECS Release
- This release supports following devices

Device	ES 1.0	ES 2.0
xWRL6432 - FCCSP	No	Yes
xWRL6432 - WCSP	No	Yes
xWRL1432 - FCCSP	Yes	No

3.2.4.1 xWRL6432 RFS Firmware

Issue Type	Key	Description
Issue Resolution	MMWAVE_DFP_LOW-168	Support for full Synth bandwidth (57GHz to 64GHz)
Issue Resolution	MMWAVE_DFP_LOW-285	Fixed PD calibrations at extreme temperatures. **Affected APIs:** rl_fecssRfFactoryCal, rl_fecssRfRuntimeCal **Impact:** Calibration can be enabled across the entire supported temperature range.
Issue Resolution	MMWAVE_DFP_LOW-260	Profile settings are correctly restored properly by the calibration APIs **Affected APIs:** rl_fecssRfFactoryCal, rl_fecssRfRuntimeCal **Impact:** Calibrations can be issued after profile configuration
Issue Resolution	MMWAVE_DFP_LOW-304	Per-chirp LUT controls are restored factory calibration **Affected APIs:** rl_fecssRfFactoryCal, rl_sensPerChirpCtrl **Impact:** Eliminates need for store-restore of per-chirp control settings for calibrations and monitors
Issue Resolution	MMWAVE_DFP_LOW-307	Added support for Skip Tx CLPC in factory calibration **Affected APIs:** rl_fecssRfFactoryCal
Issue Resolution	MMWAVE_DFP_LOW-324	Enabled Tx Runtime CLPC calibration API **Affected APIs:** rl_fecssRlRuntimeTxClpcCal
Issue Resolution	MMWAVE_DFP_LOW-327	Temperature overrides are removed from the Rx gain calibration **Affected APIs:** rl_fecssRfFactoryCal **Impact:** Temperature overrides are applicable only for Tx calibration
Issue Resolution	MMWAVE_DFP_LOW-339	Resolved Tx calibration failures at high temperatures
Issue Resolution	MMWAVE_DFP_LOW-282	Improved Tx power flatness at high temperatures

Issue Resolution	MMWAVE_DFP_LOW-460	Fixed firmware timings to provide RF LDO settling time in BoM optimized mode **Affected APIs:** rl_fecssRfFactoryCal, rl_sensFrameCfg, rl_sensChirpProfTimeCfg, rl_fecssRlRuntimeTxClpcCal **Impact:** BoM optimized mode can be used without any additional firmware restrictions
Known Issue	MMWAVE_DFP_LOW-497	Tx power calibration is inaccurate for 12 to 16dB back-offs at high temperatures. **Affected APIs:** rl_fecssRfFactoryCal, rl_fecssRlRuntimeTxClpcCal **Impact**: Using 12 to 16dB backoff range will give inaccurate Tx output power in this DFP release on xWRL6432 ES2 silicon
Feature	MMWAVE_DFP_LOW-499	Added feature to enable RDIF data scrambler to help with spur management

3.2.4.2 xWRL1432 RFS Firmware

Issue Type	Key	Description
Issue Resolution	MMWAVE_DFP_LOW-460	Fixed firmware timings to provide RF LDO settling time in BoM optimized mode **Affected APIs:** rl_fecssRfFactoryCal, rl_sensFrameCfg, rl_sensChirpProfTimeCfg, rl_fecssRlRuntimeTxClpcCal • **Impact:** BoM optimized mode can be used without any additional firmware restrictions
Feature	MMWAVE_DFP_LOW-499	Added feature to enable RDIF data scrambler to help with spur management
Known Issue	MMWAVE_DFP_LOW-521	Incorrect reference values in FECSS static register readback monitor **Affected APIs:** rl_monEnableTrig **Impact:** FECSS static register readback monitor fails **Workaround:** Disable static register readback monitor
Known Issue	MMWAVE_DFP_LOW-536	GPADC self-test may fail at higher temperatures **Impact:** FECSS static register readback monitor fails **Workaround:** Ignore GPADC self-test result
Known Issue	MMWAVE_DFP_LOW-531	Synthesizer register settings are not fully restored after FECSS warm boot **Affected APIs:** rl_fecssRfRuntimeCal **Impact:** Synthesizer control voltage drops after FECSS warm boot without calibration **Workaround:** Synth run-time calibration is required after FECSS warm boot
Known Issue	MMWAVE_DFP_LOW-540	Monitor done event is generated by monitor trigger API even with all monitors are disabled (Used typically to remove live monitor faults) **Affected APIs:** rl_monEnableTrig

		Impact: Unnecessary monitor done event is generated and the monitor run status is cleared **Workaround:** Ignore the monitor done event after the API is issued with all monitors disabled

3.2.4.3   FECSSLib Library

Issue Type	Key	Description
Improvement	MMWAVE_DFP_LOW-486	Added ROM and Patch libraries in the release for ROMed devices. **Impact:** 17kB application code space reduction because of ROMed FECSSLib functions
Known Issue	MMWAVE_DFP_LOW-518	rl_fecssDevStatusGet API triggers AppSS fault if fecss_rom_m4.lib is used **Affected APIs:** rl_fecssDevStatusGet **Workaround:** Link fecss_ram_m4.lib while building the application

3.2.4.4   mmWaveLink Library

Issue Type	Key	Description
Issue Resolution	MMWAVE_DFP_LOW-418	Monitor trigger API is supported on all SIL enabled devices **Affected APIs:** rl_monEnableTrig

3.2.5 DFP 3.1.8 Release

- xWRL6432 ES2.0 FCS Release
- This release supports following devices

Device	ES 1.0	ES 2.0
xWRL6432 - FCCSP	No	Yes
xWRL6432 - WCSP	No	Yes
xWRL1432 - FCCSP	Yes	No

3.2.5.1 xWRL6432 RFS Firmware

Issue Type	Key	Description
Issue Resolution	MMWAVE_DFP_LOW-497	**Affected APIs:** rl_fecssRfFactoryCal,rl_fecssRlRuntimeTxClpcCal **Impact**: All back-offs are supported on xWRL6432 ES2.0 devices
Known Issue	MMWAVE_DFP_LOW-521	Incorrect reference values in FECSS static register readback monitor **Affected APIs:** rl_monEnableTrig **Impact:** FECSS static register readback monitor fails **Workaround:** Disable static register readback monitor
Known Issue	MMWAVE_DFP_LOW-536	GPADC self-test may fail at higher temperatures **Impact:** FECSS static register readback monitor fails **Workaround:** Ignore GPADC self-test result
Known Issue	MMWAVE_DFP_LOW-531	Synthesizer register settings are not fully restored after FECSS warm boot **Affected APIs:** rl_fecssRfRuntimeCal **Impact:** Synthesizer control voltage drops after FECSS warm boot without calibration **Workaround:** Synth run-time calibration is required after FECSS warm boot
Known Issue	MMWAVE_DFP_LOW-540	Monitor done event is generated by monitor trigger API even with all monitors are disabled (Used typically to remove live monitor faults) **Affected APIs:** rl_monEnableTrig **Impact:** Unnecessary monitor done event is generated and the monitor run status is cleared **Workaround:** Ignore the monitor done event after the API is issued with all monitors disabled

3.2.5.2 xWRL1432 RFS Firmware

No change from DFP 3.1.7.0

3.2.5.3 FECSSLib Library

No change from DFP 3.1.7.0

3.2.5.4 mmWaveLink Library

Issue Type	Key	Description
Documentation	MMWAVE_DFP_LOW-515	• Recommendation updates for power save mode in rl_sensDynPwrSaveDis based on chirp idle time • Sampling rate and CRD slope recommendation update in rl_sensChirpProfComnCfg

3.2.6 DFP 3.2.0 Release

- xWRL6432 RTM Release
- Included PDF version of the Interface Control Document in the release package
- This release supports following devices

Device	ES 1.0	ES 2.0
xWRL6432 - FCCSP	No	Yes
xWRL6432 - WCSP	No	Yes
xWRL1432 - FCCSP	Yes	No

3.2.6.1 xWRL6432 RFS Firmware

Issue Type	Key	Description
Issue Resolution	MMWAVE_DFP_LOW-521	FECSS Static register readback monitor passes across all configurations **Affected APIs:** rl_monEnableTrig
Issue Resolution	MMWAVE_DFP_LOW-536	GPADC self-test passes across the full temperature range
Issue Resolution	MMWAVE_DFP_LOW-531	Synthesizer calibration is not needed after FECSS warm boot if device temperature remains same **Affected APIs:** rl_fecssRfRuntimeCal
Issue Resolution	MMWAVE_DFP_LOW-540	Monitor done event is not generated when the monitor trigger API is triggered with all monitors are disabled **Affected APIs:** rl_monEnableTrig
Improvement	MMWAVE_DFP_LOW-535	Incident and reflected power offsets in Tx Ball-Break monitors are updated to match Tx Power monitor **Affected APIs:** rl_monTxNBbCfg

3.2.6.2 xWRL1432 RFS Firmware

No change from DFP 3.1.7.0

3.2.6.3 FECSSLib Library

Issue Type	Key	Description
Issue Resolution	MMWAVE_DFP_LOW-518	Patched fe_fecssDevStatusGet_patch FECSSLib function **Affected APIs:** rl_fecssDevStatusGet Impact: fecss_rom_m4.lib and fecss_patch_m4.lib could be used on xWRL6432 devices

3.2.6.4 mmWaveLink Library

Issue Type	Key	Description
Documentation		• Added reference to mmWave Sensing Estimator tool • Updated warnings for live monitor results • Updated minimum chirp idle time restriction

3.2.7 DFP 3.2.1 Release

- xWRL1432 ES2.0 ECS Release
- This release supports following devices

Device	ES 1.0	ES 2.0
xWRL6432 - FCCSP	No	Yes
xWRL6432 - WCSP	No	Yes
xWRL1432 - FCCSP	No	Yes

3.2.7.1 xWRL6432 RFS Firmware

No change from DFP 3.2.0

3.2.7.2 xWRL1432 RFS Firmware

Issue Type	Key	Description
Issue Resolution	MMWAVE_DFP_LOW-536	GPADC self-test passes across the full temperature range
Issue Resolution	MMWAVE_DFP_LOW-531	Synthesizer calibration is not needed after FECSS warm boot if device temperature remains same **Affected APIs:** rl_fecssRfRuntimeCal
Issue Resolution	MMWAVE_DFP_LOW-540	Monitor done event is not generated when the monitor trigger API is triggered with all monitors are disabled **Affected APIs:** rl_monEnableTrig
Improvement	MMWAVE_DFP_LOW-535	Incident and reflected power offsets in Tx Ball-Break monitors are updated to match Tx Power monitor **Affected APIs:** rl_monTxNBbCfg
Known Issue	MMWAVE_DFP_LOW-577	Resolved gain mismatch failures reported by TxN-Rx loopback monitor at low temperatures **Affected APIs:** rl_monTxNRxLbCfg

3.2.7.3 FECSSLib Library

No change from DFP 3.2.0

3.2.7.4 mmWaveLink Library

No change from DFP 3.2.0

3.2.8   DFP 3.2.3 Release

- xWRL1432 ES2.0 FCS Release
- Included PDF version of the Interface Control Document in the release package
- This release supports following devices

Device	ES 1.0	ES 2.0
xWRL6432 - FCCSP	No	Yes
xWRL6432 - WCSP	No	Yes
xWRL6432 - AOP	No	Yes
xWRL1432 – FCCSP	No	Yes

3.2.8.1   xWRL6432 RFS Firmware

Issue Type	Key	Description
Known Issue	MMWAVE_DFP_LOW-590	Rx HPF circuit cannot handle high blocker level when using low transmit back off in platforms with limited isolation between Tx and Rx antennas like in 6432 AOP. **Affected APIs:** rl_sensChirpProfComnCfg, rl_fecssRfFactoryCal, rl_fecssRlRuntimeTxClpcCal

3.2.8.2   xWRL1432 RFS Firmware

Issue Type	Key	Description
Improvement	MMWAVE_DFP_LOW-573	Improved accuracy of TX Power Measurements. **Affected APIs:** rl_fecssRfFactoryCal, rl_fecssRlRuntimeTxClpcCal, rl_monTxNPowerCfg, rl_monTxNBbCfg, rl_monDbgTxPwrMeas
Issue Resolution	MMWAVE_DFP_LOW-577	Resolved gain mismatch failures reported by TxN-Rx loopback monitor at low temperatures **Affected APIs:** rl_monTxNRxLbCfg

3.2.8.3   FECSSLib Library

No change from DFP 3.2.0.0

3.2.8.4   mmWaveLink Library

Issue Type	Key	Description
Documentation	MMWAVE_DFP_LOW-567	- Updated Default Synth BW Control Settings for xWRL6432

3.2.9 DFP 3.2.4 Release

- xWRL1432 ES2.0 FCS Release
- Included PDF version of the Interface Control Document in the release package
- This release supports following devices

Device	ES 1.0	ES 2.0
xWRL6432 - FCCSP	No	Yes
xWRL6432 - WCSP	No	Yes
xWRL6432 - AOP	No	Yes
xWRL1432 – FCCSP	No	Yes

3.2.9.1 xWRL6432 RFS Firmware

Issue Type	Key	Description
Issue Resolution	MMWAVE_DFP_LOW-590	Allows the Rx HPF circuit to handle higher blocker level when using low transmit back off in platforms with limited isolation between Tx and Rx antennas. **Affected APIs:** rl_sensChirpProfComnCfg, rl_fecssRfFactoryCal, rl_fecssRlRuntimeTxClpcCal

3.2.9.2 xWRL1432 RFS Firmware

Issue Type	Key	Description
Improvement	MMWAVE_DFP_LOW-598 MMWAVE_DFP_LOW-600	Improved accuracy of TX Power Measurements. **Affected APIs:** rl_fecssRfFactoryCal, rl_fecssRlRuntimeTxClpcCal, rl_monTxNPowerCfg, rl_monTxNBbCfg, rl_monDbgTxPwrMeas
Improvement	MMWAVE_DFP_LOW-590	Allows the Rx HPF circuit to handle higher blocker level when using low transmit back off in platforms with limited isolation between Tx and Rx antennas. **Affected APIs:** rl_sensChirpProfComnCfg, rl_fecssRfFactoryCal, rl_fecssRlRuntimeTxClpcCal
Improvement	MMWAVE_DFP_LOW-535	Incident and reflected power offsets in Tx Ball-Break monitors are updated to match Tx Power monitor **Affected APIs:** rl_monTxNBbCfg

3.2.9.3 FECSSLib Library

No change from DFP 3.2.0.0

3.2.9.4 mmWaveLink Library

No change from DFP 3.2.3.0

3.2.10 DFP 3.2.5 Release

- xWRL1432 RTM Release
- xWRL6432 Maintenance Release
- This release supports following devices

Device	ES 1.0	ES 2.0
xWRL6432 - FCCSP	No	Yes
xWRL6432 - WCSP	No	Yes
xWRL6432 - AOP	No	Yes
xWRL1432 – FCCSP	No	Yes

3.2.10.1 xWRL6432 RFS Firmware

Issue Type	Key	Description
Improvement	MMWAVE_DFP_LOW-568	Added support to select enabled Rx channel(s) on xWRLx42x devices. The API supports Rx channel masks like 0x5 or 0x6 **Affected APIs:** rl_fecssRfPwrOnOff
Note	MMWAVE_DFP_LOW-649	Added Tx back-off range in ICD. xWRL6432 devices support [0 dB -26 dB] backoff

3.2.10.2 xWRL6432 WCSP RFS Firmware

No change from xWRL6432 RFS Firmware in this release.

3.2.10.3 xWRL1432 RFS Firmware

Issue Type	Key	Description
Improvement	MMWAVE_DFP_LOW-598 MMWAVE_DFP_LOW-600	Improved accuracy of TX Power Measurements. **Affected APIs:** rl_fecssRfFactoryCal, rl_fecssRlRuntimeTxClpcCal, rl_monTxNPowerCfg, rl_monTxNBbCfg, rl_monDbgTxPwrMeas
Improvement	MMWAVE_DFP_LOW-618	Improved accuracy of Rx gain calibration and stability across temperature range **Affected APIs:** rl_monTxNBbCfg
Improvement	MMWAVE_DFP_LOW-668	TX output power accuracy improved for high temperature bin **Affected APIs:** rl_fecssRfFactoryCal, rl_fecssRlRuntimeTxClpcCal, rl_monTxNPowerCfg, rl_monTxNBbCfg, rl_monDbgTxPwrMeas, rl_monTxNRxLbCfg
Note	MMWAVE_DFP_LOW-649	For xWRL1432, TX power back off settings more than 13 dB have not been characterized for RF performance. Safety diagnostic monitors are not supported for these back off settings. Application can configure backoff in range [0dB – 20dB]

3.2.10.4 FECSSLib Library

No change from DFP 3.2.0.0

3.2.10.5 mmWaveLink Library

No functional change from DFP 3.2.3.0

Issue Type	Key	Description
Improvement	MMWAVE_DFP_LOW-588	Added minimum ramp end time calculations in the ICD **Affected APIs:** rl_sensChirpProfComnCfg **Impact:** Suppors even stringent ramp end time based on configuration. There is no impact to the configuration based on earlier recommendations

3.2.11 DFP 3.2.6 Release

- xWRL6432 WCSP Release
- This release supports following devices

Device	ES 1.0	ES 2.0
xWRL6432 - FCCSP	No	Yes
xWRL6432 - WCSP	No	Yes
xWRL6432 - AOP	No	Yes
xWRL1432 – FCCSP	No	Yes

3.2.11.1 xWRL6432 RFS Firmware

No change from DFP 3.2.5.1

3.2.11.2 xWRL6432 WCSP RFS Firmware

Issue Type	Key	Description
Improvement	MMWAVE_DFP_LOW-651	Improved accuracy of Rx gain calibration on WCSP package. **Affected APIs:** rl_fecssRfFactoryCal, rl_monTxNRxLbCfg
Improvement	MMWAVE_DFP_LOW-656	Improved accuracy of Tx power calibration on WCSP package. **Affected APIs:** rl_fecssRfFactoryCal, rl_fecssRlRuntimeTxClpcCal, rl_monTxNPowerCfg, rl_monTxNBbCfg, rl_monDbgTxPwrMeas
Note	MMWAVE_DFP_LOW-692	For xWRL6432 WCSP, TX power back off settings more than 15 dB have not been characterized for RF performance.

3.2.11.3 xWRL6432 AOP RFS Firmware

No change from xWRL6432 RFS Firmware in this release.

3.2.11.4 xWRL1432 RFS Firmware

No change from DFP 3.2.5.1

3.2.11.5 FECSSLib Library

No change from DFP 3.2.0.0

3.2.11.6 mmWaveLink Library

No functional change from DFP 3.2.3.0

3.2.12 DFP 3.2.7 Release

- xWRL6432 AOP Release
- This release supports following devices

Device	ES 1.0	ES 2.0
xWRL6432 - FCCSP	No	Yes
xWRL6432 - WCSP	No	Yes
xWRL6432 - AOP	No	Yes
xWRL1432 – FCCSP	No	Yes

3.2.12.1 xWRL6432 RFS Firmware

No change from DFP 3.2.5.1

3.2.12.2 xWRL6432 WCSP RFS Firmware

No change from DFP 3.2.6.3

3.2.12.3 xWRL6432 AOP RFS Firmware

Issue Type	Key	Description
Issue Resolution	MMWAVE_DFP_LOW-833	Relaxed Synth Maximum Control Voltage Threshold in calibration algorithm. **Affected APIs:** rl_fecssRfFactoryCal, rl_fecssRfRuntimeCal
Note	MMWAVE_DFP_LOW-864	For xWRL6432 AOP, maximum supported frequency has been limited to 63.5GHz instead of 64GHz (corresponding frequency code in low resolution is 0xD3AA instead of 0xD555). **Affected APIs:** rl_fecssRfFactoryCal, rl_fecssRfRuntimeCal, rl_fecssRlRuntimeTxClpcCal, rl_sensChirpProfTimeCfg , rl_monPllCtrlVoltCfg, rl_monPmClkDcSigCfg, rl_monRxHpfDcSigCfg, rl_monTxNBbCfg, rl_monTxNDcSigCfg, rl_monTxNPowerCfg, rl_monTxNRxLbCfg

3.2.12.4 xWRL1432 RFS Firmware

No change from DFP 3.2.5.1

3.2.12.5 FECSSLib Library

No change from DFP 3.2.0.0

3.2.12.6 mmWaveLink Library

No functional change from DFP 3.2.3.0

4 Unsupported features and APIs

The following DFP APIs and features are not tested and validated fully at system level, it is recommended not to use these APIs in this and all previous DFP releases. This list of unsupported features is in addition to the list mentioned in known issues.

4.1 Device Control APIs

API	Feature	Description
rl_fecssRfClockBwCfg	Clock BW control	This API not supported
rl_fecssRfFactoryCal rl_fecssRlRuntimeTxClpcCal	Calibration APIs	xWRL6432: Backoffs greater then 26 dB are not supported. Backoffs greater than 15dB are not verified and not recommended for safety diagnostics for WCSP. xWRL1432: Backoffs greater than 20 dB are not supported. Backoffs greater than 13dB are not verified and not recommended for safety diagnostics.

4.2 Sensor Control APIs

API	Feature	Description
None		

4.3 Sensor Monitor APIs

API	Feature	Description
None		

4.4 Miscellaneous

Feature	Description
Debug build option in DFP libraries.	.\dfp_build.bat dfp_romlib_m4_debug Lx432 command option is not tested to log the debug prints.

5   Migration Guide

5.1.1   DFP 3.1.5 Release

- Factory calibration API: 1LSB in override temperature is 2^0C
- Minimum inter-burst and inter-frame durations have increased

Requirements	Duration
Burst power-up duration Pre-burst time required for FECSS to power-up	65 us
Burst power-down duration Post-burst time required for FECSS to power-down	50 us
Minimum Burst Idle Time	**115 us**

Requirements	Duration
Frame power-up duration Pre-frame time required for FECSS to power-up	25 us
Frame power-down duration Frame-burst time required for FECSS to power-down	15 us
Minimum Frame Idle Time	**40 us**

- Added an option to enable QPSK PD in Tx-Rx loopback monitor
- Updated supported/ recommended fault enable masks for monitors

5.1.2   DFP 3.1.6 Release

- Disable PD calibrations for higher and lower temperature bins
- Follow release specific App Notes for BoM optimized mode usage

5.1.3   DFP 3.1.7 Release

- Use mmwave_rfs_ patch_rprc.bin for xWRL6432
- Remove Synth frequency range restrictions
- Remove per-chirp disable and re-enable APIs for Calibrations and Monitors

- Enable monitors for SIL devices
- Remove workarounds added for BoM optimized LDO settling issues
- Follow latest Calibration App Note to implement the recommended calibration sequence
- Enable RDIF data scrambler to manage spurs (Refer App Notes for more details)

5.1.4 DFP 3.1.8 Release

- Review and update chirp parameters according to recommendations in rl_sensChirpProfComnCfg
- Review and update dynamic power save mode according to recommendations in rl_sensDynPwrSaveDis

5.1.5 DFP 3.2.0 Release

- TxN-Rx loopback monitors and TxN-Ballbreak monitors could be enabled on all xWRL6432 devices
- Link application with fecss_rom_m4.lib and fecss_patch_m4.lib libraries to reduce FECSS code RAM size for xWRL6432
- Verify minimum chirp idle and ramp time according to the updated recommendations

5.1.6 DFP 3.2.1 Release

- Use mmwave_rfs_ patch_rprc.bin for all xWRLx432 devices
- TxN-Rx loopback monitors and TxN-Ballbreak monitors could be enabled on all xWRLx432 devices
- Link application with fecss_rom_m4.lib and fecss_patch_m4.lib libraries to reduce FECSS code RAM size for all xWRLx432 devices

5.1.7 DFP 3.2.3 Release

- Check updated documentation for Default Synth BW Control Settings for xWRL6432.

5.1.8 DFP 3.2.4 Release

5.1.9 DFP 3.2.5 Release

- Review latest ramp end time recommendation in ICD to reduce the ramp end time further. Existing configurations are not impacted by the new recommendation.
- Review device specific Tx backoff limitations in release notes.

5.1.10 DFP 3.2.6 Release

- For xWRL6432 WCSP devices, use the RFS Patch Firmware from the WCSP folder. Loading FCCSP firmware will adversely affect the RF performance.
- Review device specific Tx backoff limitations in release notes.

5.1.11 DFP 3.2.7 Release

- For xWRL6432 AOP devices, supported Synthesizer frequency has been changed from 57-64GHz to 57-63.5GHz.
- For xWRL6432 AOP devices, use the RFS Patch Firmware from the AOP folder. Loading FCCSP or WCSP firmware will adversely affect the RF performance.