TEXAS INSTRUMENTS
MMWAVE RadarSS Release Notes

1. RadarSS Firmware

RadarSS firmware is responsible for configuring RF/analog and digital front-end in real-time. It also schedules temperature based calibrations. This enables the mm-Wave front-end to be autonomous and capable of adapting itself to handle temperature and ageing effects, and to enable significant ease-of-use.

Version	Type
6.2.1.5	Binary

1.1 Platform and Device Support

The device and platforms supported with this release include:

Supported Devices	Release Status	Supported EVMs
IWR6843 ES2.0	Release for Production	IWR6843 ES2.0 ISK + MMWAVEICBOOST carrier card
IWR6843 HS ES2.0	Release for Production	IWR6843 HS ES2.0 ISK + MMWAVEICBOOST carrier card
IWR6443 ES2.0	Release for Production	IWR6443 ES2.0 ISK + MMWAVEICBOOST carrier card
AWR6843 ES2.0	Release for Production	AWR6843 ES2.0 EVM + MMWAVEICBOOST carrier card
IWR6843 AOP	Evaluation release only	IWR6843 AOP EVM + MMWAVEICBOOST carrier card

1.2 Memory Requirement

The DFP 6.2.1.5 RadarSS firmware does pool 256kB L3 memory from radar cube shared memory for execution. User must allocate 256kB shared memory banks to RadarSS while flashing.

1.3   Features and enhancements (DFP 6.2.0.0)

- xWR6843/xWR6443 is TI's first generation 60GHz RF CMOS Radar. Features supported in this firmware release are:
  - Synthesizer RF frequency supported 60 – 64GHz
    - VCO2: 60 – 64GHz
  - Supports 3 Tx and 4 Rx
  - Supports 10MHz IF bandwidth
  - Supports 250MHz/us max slope
  - Supports uncalibrated TX output power control.
- Calibrations (Boot time and run time)
  - APLL
  - SYNTH 2
  - LODIST

1.4   Features and enhancements (DFP 6.2.0.7)

- Enabled all RF/Analog calibrations (Boot time)
  - APLL
  - SYNTH 2
  - LODIST
  - ADC DC
  - RX HPF
  - RX LPF
  - PD TRIM
  - TX POWER
  - RX GAIN
  - RX IQMM
  - TX PHASE
- Enabled all RF/Analog calibrations (Runtime)
  - APLL
  - SYNTH 2
  - LODIST

- o PD TRIM
- o TX POWER
- o RX GAIN

- Calibration data save/restore mechanisms now supported.

- BPM and TX phase shifters now supported in the DFP.

- Calibration/Monitoring frequency and TX power limits now supported.

- Improvements to IF stage calibrations (HPF and LPF)

- Updated RF gain targets for xWR6843/xWR6443 ES2.

1.5   Features and enhancements (DFP 6.2.1.5)

- HIS complexity and other compliance updates.

- HPF improvements.

- BPM is now implemented using the phase shifter HW module.

- SYNTH calibration updates for better performance across process and temperature corners.

1.6   Changes in DFP release 06.02.00.00

Item type	Key	Description
Enhancement	MMWAVE_DFP-140	Improved APLL calibration algorithm.
Enhancement	MMWAVE_DFP-339 MMWAVE_DFP-366	xWR6843/xWR6443 ES2.0 analog LUT updates. (LO-DIST, RX-IQGEN, TX backoff, etc.)
Enhancement	MMWAVE_DFP-337	Updated temperature/process based LUT for 20G sync module.
Enhancement	MMWAVE_DFP-345	Improved CTRIM search space for VCO1 and VCO2.
Enhancement	MMWAVE_DFP-138 MMWAVE_DFP-342	New RX linearity modes in xWR6843/xWR6443 ES2.0.
Enhancement	MMWAVE_DFP-349	Forced SDM DIV mode for VCO2.

Bug	MMWAVE_DFP-381	Incorrect time allocation for test source configuration during frames.
Bug	MMWAVE_DFP-388	Fixing the programNow option in Dynamic chirp config API

1.7   Changes in DFP release 06.02.00.07

Item type	Key	Description
Enhancement	MMWAVE_DFP-424	Remove overrides on all supported calibrations in xWR6843/xWR6443 ES2.
Enhancement	MMWAVE_DFP-436	PD calibration updates in xWR6843/xWR6443 ES2.
Enhancement	MMWAVE_DFP-445	TX power calibration updates in xWR6843/xWR6443 ES2 to improve performance at high backoffs.
Enhancement	MMWAVE_DFP-458	Updated RX gain calibration constants for xWR6843/xWR6443 ES2.
Bug	MMWAVE_DFP-263	Fix for the issues with PA and PS loopback burst configuration in advance frame config API.
Enhancement	MMWAVE_DFP-328	Improved HPF calibration and monitoring
Enhancement	MMWAVE_DFP-360	Improved LPF calibration
Enhancement	MMWAVE_DFP-361	Improvements to Rx gain runtime and IQMM boot calibration
Enhancement	MMWAVE_DFP-371	Improvements to BSS calibration and monitoring Scheduler
Enhancement	MMWAVE_DFP-438	Updated calibration and inter-burst timings.

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Bug	MMWAVE_DFP-469	Fixed an issue with PD trim reading which impacts TX output power and Rx gain calibration
Enhancement	MMWAVE_DFP-464	Clear all profile validity in RF init API, support to reset profile information.
Enhancement	MMWAVE_DFP-500	Updated Mixer bias settings for improved performance.
Bug	MMWAVE_DFP-502	Fixed the issue where process corners were incorrectly classified (weak device showing up as nominal).
Bug	MMWAVE_DFP-506	Fixed an error in AWR_CAL_MON_FREQUENCY_LIMITS API, which prevented users from setting frequencies in the 60G band.
Bug	MMWAVE_DFP-520	Fixed an error in the programmable filter configuration API.
Enhancement	MMWAVE_DFP-537	Updated power-up/down sequences of the SYNTH for better performance and stability.
Enhancement	MMWAVE_DFP-547	Disabled the power cycling of certain modules (LDOs) during the inter-burst/frame time period.
Enhancement	MMWAVE_DFP-563	The RX coupler loss constants and the RF gain targets have been updated to reflect the xWR6843/xWR6443 ES2 device more closely.
Enhancement	MMWAVE_DFP-585	RX LPF LUT updates for improving the LPF accuracy and flatness.
Enhancement	MMWAVE_DFP-584	PD-DAC IREF increased to improve TX internal power readings for strong devices at high temperatures.

1.8   Changes in DFP release 06.02.01.05

Item type	Key	Description

Enhancement	MMWAVE_DFP-481 MMWAVE_DFP-479	BPM API now implemented through using the phase shifter hardware instead of the BPM HW. This does not impact any of the BPM API configuration or performance parameters.
Bug	MMWAVE_DFP-551	Fixed an issue with WDT.
Enhancement	MMWAVE_DFP-555	Profiled chirp cycle time, pre-burst time and improved timings.
Enhancement	MMWAVE_DFP-542	Added a few new error codes for APIs.
Bug	MMWAVE_DFP-566	Updated all calibrations and monitors to conform to the cal-mon limits set in the API.
Bug	MMWAVE_DFP-635	Updated process corner criteria for SYNTH DIV LDO increase.
Enhancement	MMWAVE_DFP-637	Stop WDT and FRC when firmware hits safe state
Enhancement	MMWAVE_DFP-599 MMWAVE_DFP-633	HPF calibration updates.
Bug	MMWAVE_DFP-689	xWR6843/xWR6443 specific TX IQGEN PS settings are now being used during calibrations.
Enhancement	MMWAVE_DFP-537	Updated minimum inter-burst interval to 150us.
Enhancement	MMWAVE_DFP-640	Update Synth RTRIM in all profile registers after calibration and updated synth default BW setting
Enhancement	MMWAVE_DFP-504 MMWAVE_DFP-512 MMWAVE_DFP-521 MMWAVE_DFP-588 MMWAVE_DFP-560 MMWAVE_DFP-350 MMWAVE_DFP-587 MMWAVE_DFP-619 MMWAVE_DFP-647 MMWAVE_DFP-641 MMWAVE_DFP-649	HIS cyclomatic complexity reduction, static analysis violations and MISRA C compliance changes.
Bug	MMWAVE_DFP-603 MMWAVE_DFP-642 MMWAVE_DFP-652 MMWAVE_DFP-666 MMWAVE_DFP-569	Fixed RX IQMM / RX Gain calibration issues due to the incorrect multiplier bias setting.

Bug	MMWAVE_DFP-715	Fixed firmware bug when using non-zero TX power limits during calibrations.
Enhancement	MMWAVE_DFP-710	Improved SYNTH overshoot/undershoot behavior for low bandwidth chirps.
Bug	MMWAVE_DFP-792	Noise jumps observed in the ADC data when operating in regular mode has been fixed.
Enhancement	MMWAVE_DFP-775	VMON disabled in the BSS boot sequence to avoid issues with poor on-board power supplies.
Enhancement	MMWAVE_DFP-772 MMWAVE_DFP-781	SYNTH calibration updates for better performance across process and temperature corners.

1.9   Unsupported Features and APIs

The following APIs and features are not supported, it is recommended not to use these APIs in this DFP release. This list of unsupported features is in addition to the list mentioned in known issues.

API	Feature	Description
AWR INTERCHIRP BLOCKCONTROLS SB	Inter-chirp power saving configurations	This API is not validated at system level. It is recommended not to use the same.
AWR PROG FILT COEFF RAM SET SB AWR PROG FILT CONF SET SB	Programmable filter (xWR1642/xWR1843/xWR6843 Only)	These APIs are not validated at system level. It is recommended not to use the same.
AWR INTER RX GAIN PHASE CONTROL SB	Inter-RX gain phase configuration	This API is not supported in xWR6843/xWR6443.
AWR RF DFE STATISTICS REPORT GET SB	DFE statistics report	This API is not validated at system level. It is recommended not to use the same.
AWR RX GAIN TEMPLUT SET SB AWR TX GAIN TEMPLUT SET SB AWR RX GAIN TEMPLUT GET SB	Rx and Tx gain calibration override	The Rx and Tx gain override APIs are not validated at system level. It is recommended not to use the same.

AWR TX GAIN TEMPLUT GET SB		
CONST BPM VAL TXn TXOFF fields in AWR BPM CHIRP CONF SET SB	BPM chirp config API	The TXOFF BPM control bits for TX 0, 1 and 2 in this API are not supported.
TXx POWER BACKOFF fields in AWR CAL MON FREQUENCY TX POWER LIMITS SB	Calibration and Monitoring Frequency and TX Power limits API	These fields are not validated at a system level. It is not recommended to use the same.
Monitoring Async Events AE SBs from 0x1015 to 0x1031	Monitoring	Monitoring features are NOT supported in the current DFP.
Monitoring APIs SBs from 0x01C0 to 0x01DF **Exceptions:** 0x01DB - AWR MONITOR RX SATURATION DETECTOR CONF SB 0x01DC - AWR MONITOR SIG IMG MONITOR CONF SB	Monitoring	Monitoring features are NOT supported in the current DFP. **Exceptions:** • RX saturation detector monitor. • Signal image monitor.

1.10   Debug APIs

API	Feature	Description
AWR RF PALOOPBACK CFG SB AWR RF PSLOOPBACK CFG SB AWR RF IFLOOPBACK CFG SB	Loopback enables	PA, PS and IF loopback APIs are not supported in functional mode, recommended to use only for debug.
AWR RF TEST SOURCE CONFIG SET SB AWR RF TEST SOURCE ENABLE SET SB	Test source feature	Test source feature is not supported in functional mode, recommended to use only for debug.
AWR CONT STREAMING MODE CONF SET SB AWR CONT STREAMING MODE EN SB	Continuous streaming mode	Continuous streaming mode is not supported in functional mode, recommended to use only for debug.

1.11   Known issues

1. None of the Digital and Analog monitoring are supported in this release.

2. Test source is not characterized and tuned to 60GHz in this release.

Key	Severity	Description
MMWAVESYS-159	S2-Major	The following boot-time calibrations are susceptible to corruption by interference. The calibrations may result in false configuration of the RF analog sections due to corruption by interference during the calibration measurements. a. RX gain calibration b. TX Phase calibration c. RX IQMM calibration It is also mandated by regulatory standards that transmissions in non-ISM band are capped to -10dBm. To get the best RF performance, it is recommended that the calibrations are performed at maximum TX power in the factory and then restored on the field. **Workaround**: 1. Recommended to perform factory calibration at room temperature, store and restore the calibration data from non-volatile memory.
MMWAVE_RFANA-256	S2-Major	Phase shifter accuracy worsens when the frequency is farther away from the calibration frequency. **Workaround**: For low bandwidth chirps, set the frequency limits close to the required TX frequency using AWR CAL MON FREQUENCY LIMITS SB.
MMWAVE_DFP-770	S2-Major	Spurious noise floor jumps have been observed in the ADC data on some devices when operating in LOW POWER ADC mode. **Workaround:** Avoid using the Low power ADC mode in AWR LOWPOWERMODE CONF SET SB.