



MMWAVE DFP 06.04.01.00 Release Notes

1 Introduction

TI mmWave Device Firmware Package (DFP) enables the development of millimeter wave (mmWave) radar applications using xWR6243 Device/EVM. It includes necessary components which will facilitate end users to integrate xWR6243 SOC with their choice of processor. The user is expected to use mmWaveStudio to measure RF and key system performance on TI mmWave Radar devices.

In addition, DFP provides mmWaveLink framework and example application which will serve as a guide for integrating the xWR6243 with external processor.

2 Release Overview

2.1 Platform and Device Support

The device and platforms supported with this release include:

Supported Devices	Release Status
xWR6243 ES1.1	Release for Production

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
RadarSS Firmware	RAM: 6.4.1.13	Binary
MSS Firmware	ROM: 2.2.1.7 PATCH: 2.6.0.3	Binary
mmWaveLink Framework	2.2.3.2	Source and Library
Docs	Release Notes Interface Control Document mmWaveLink Programmer's guide	PDF PDF Doxygen HTML

2.3 Directory Structure

Directory Name	Content
Docs	mmWave-Radar-Interface-Control.pdf mmwave_dfp_release_notes.pdf
Firmware	RadarSS and Master SS firmware binary files in RPRC format metalmage binary (xwr62xx_metalmage.bin) for xWR6243 ES1.1 for boot over Flash metalmage header file (xwr62xx_metalmage.h) for xWR6243 ES1.1 for boot over SPI mmwave_radarss_release_notes.pdf
ti	mmWaveLink framework and example source code mmWaveLink Programmer's guide
rf_eval	RF evaluation firmware

2.4 Component Descriptions

2.4.1 RadarSS Firmware

Refer to Radar SS firmware release notes (mmwave_radarss_release_notes.pdf) in firmware\radarss folder.

2.4.2 MasterSS Firmware

The main software components of the MasterSS (MSS) firmware are

- System services – provides infrastructure services (error handling, mmWaveLink Host communication protocol manager) used by the functional firmware.
- Functional firmware – Is responsible for the external host API communication, RadarSS API handshake, data path control.

2.4.3 mmWaveLink framework

RadarSS is a closed subsystem whose internal blocks are configurable using messages coming over mailbox.

TI mmWaveLink framework acts as driver for RadarSS and MSS, and exposes services of mmWave Radar. It includes APIs to configure HW blocks of RadarSS/MSS and provides communication protocol for message transfer between external processor and AWR2243/xWR6243

- Link between application and RadarSS/MSS
- Platform and OS independent which means it can be ported into any processor which provides communication interface such as SPI and basic OS routines. The mmWaveLink framework can also run in single threaded environment
- The LDRA tool v9.7.6 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 `mmwave_dfp_manifest.html`, which outlines the licensing information for mmWave DFP package.

3 Release Contents

3.1 xWR6243 RAM contents

3.1.1 Features and enhancements (DFP 6.4.1 - Compared to DFP 2.2.3/AWR2243)

- xWR6243 is TI's second generation 60GHz RF CMOS Front End Radar, features supported in this firmware release are:
 - The MSS ROM/Patch release is derived from AWR2243 DFP2.2.3 release baseline and backward compatible to DFP 2.2.3 supported APIs.
 - Synthesizer RF frequency supported 57 – 64GHz
 - VCO1: 57 – 60.75GHz
 - VCO2: 60 – 64GHz
 - Supports 20MHz IF bandwidth
 - Supports 250MHz/us max slope
 - Supports New programmable filter
 - New advance waveform chirp configuration API
 - 20GHz LO cascade configuration improvements
 - Supports power save mode of operation

- Features boot-time and run-time calibrations to ensure that the Analog/RF components are always operating at their optimal regions.
- Boot-time and periodic digital and analog monitors are supported for ensuring safe operation of the application.
- Refer mmWave-Radar-Interface-Control.pdf (ICD) for more information on xWR6243 API details.

3.2 Feature/Changes List by Components

3.2.1 RadarSS firmware

Refer to RadarSS firmware release notes (mmwave_radarss_release_notes.pdf) in firmware\radarss folder

3.2.2 Master SS firmware (DFP 6.4.1 – compared to DFP2.2.3/AWR2243)

The MSS component is reused from AWR2243 ES1.1. MSS ROM and Patch binary is identical to AWR2243 ES1.1 Device, with the exception of the below enhancements

Type	Key	Description
Enhancement	MMWAVE_DFP-1724	Support low power mode of operation in MSS.
Enhancement	MMWAVE_DFP-1775	Clock gate HSI before entering power save mode

3.2.3 mmWaveLink framework (DFP 6.4.1 – compared to DFP2.2.3/AWR2243)

Type	Key	Description
Enhancement	MMWL-376	Support low power mode of operation in MSS and updates based on ICD changes
Enhancement	MMWL-385	Minor updates to ICD
Enhancement	MMWL-389	Updates to ICD

4 Unsupported features and APIs (applicable to all DFP releases)

Refer to RadarSS firmware release notes in firmware\radarss folder for radarSS APIs.

The following device MSS APIs and features are not 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 Functional APIs

API	Feature	Description
The SPI transfer (option 2) in DATA_INTF_SEL in AWR_DEV_RX_DATA_PATH_CONFIG_SET_SB	ADC data transfer over SPI	This API is not validated at system level. It is recommended not to use the same.

4.2 Debug APIs

API	Feature	Description
AWR_DEV_RX_CONTSTREAMING_MODE_CONFIG_SET_SB	Continuous streaming mode	Continuous streaming mode is not supported in functional mode, recommended to use only for debug.
AWR_DEV_TESTPATTERN_GENERATION_SET_SB	Data path test pattern generation	Pattern generation is not supported in functional mode, recommended to use only for debug.
AWR_DEV_RF_DEBUG_SIGNAL_SELECTION_SET_SB	Debug signal bring out	Pin-mux to bring out debug signals for the chirp cycle.

5 Known Issues (applicable to all DFP releases)

5.1 RadarSS firmware known Issues:

Refer to RadarSS firmware release notes (mmwave_radarss_release_notes.pdf) in firmware\radarss folder.

5.2 MasterSS firmware known Issues:

Key	Severity	Description
MMWAVE_DFP-207	S2-Major	In case of checksum failure for the command received by MSS, the SPI buffer DMA synchronization will be lost with HOST/mmWaveLink. Workaround: Use 4 bytes CRC for commands and AE messages.
MMWAVE_DFP-233	S3-Minor	Occasionally MSS ATCM and BTCM self-tests generating a data abort in a long tracking stress test, which is looping Latent fault API infinite times with all digital monitoring tests enabled. Workaround: Disable MSS ATCM and BTCM parity, Single bit (SB) and Double Bit (DB) ECC self-tests in AWR_MSS_LATENTFAULT_TEST_CONFIG_SET_SB API. The MSS latent self-tests are destructive tests, which would cause corruption in ongoing SPI/mailbox transactions and may generate N-Error signals while performing ESM G2 error checks. It is recommended not to run these self-tests in functional mode of operation.

6 Migration Guide

This section explains the steps to migrate from AWR2243 (DFP2.2.1) release to this package

Impact	Change list
HIGH	Added new fields txPow OffsetValRF1, txPow OffsetValRF2 and txPow OffsetValRF3 in rITxPow MonConf_t structure.
HIGH	Added new fields monStartFreqConst and txPow BackOff in rITxBallbreakMonConf_t structure.
MEDIUM	Bit 3 is changed from reserved to SYNTH_VCO3_VCTRL in signalEnables field of rIPIConrVoltMonConf_t structure.
LOW	Added new API - rISetPowerSaveModeConfig
HIGH	Bit 1 and 2 belongs to VCO_SEL in pfVcoSelect field of rIProfileCfg_t structure. Bit 1 and 2 belongs to VCO_SEL in vcoSelect field of rIContModeCfg_t structure.
MEDIUM	Bit 0 in calValidStatus field is changed from reserved to SYNTH_VCO3 tuning in rICalibrationData_t structure.
HIGH	Bits 32 to 47 is changed from reserved to TX2 digital frequency shift in digTxFreqShift field of rIInterRxGainPhConf_t structure.
HIGH	Observed phase shift corresponding to each desired phase shift mapping in observedPhShiftData field of rIPhShiftCalibrationStore_t structure has been updated.
HIGH	Added new fields aplRzTrimVco and aplRzTrimLpf instead of aplRzTrim field in rIRfApIISynthBwControl_t structure. Updated typical APLL and Synth BW settings for xWR6x43.
LOW	Added new error codes 319 - RL_RET_CODE_INVLD_MON_START_FREQ (Invalid monitoring start frequency), 320 - RL_RET_CODE_VCO3_MONITOR_UNSUPPORTED_DEV (Synth VCO3 not supported for the device issued),
HIGH	Bit 0 in calibStatus field is changed from reserved to SYNTH_VCO3 tuning in rIRfInitComplete_t structure. Bit 0 in calibErrorFlag and calibUpdateStatus field is changed from reserved to SYNTH_VCO3 tuning in rIRfRunTimeCalibReport_t structure
HIGH	Bit 7 and 8 in statusFlags field is changed from reserved to STATUS_SYNTH_VCO3_VCTRL_MAX_FREQ and STATUS_SYNTH_VCO3_VCTRL_MIN_FREQ in rIMonPIConVoltRep_t structure. Added new field pllContVoltVal2 in rIMonPIConVoltRep_t structure.
HIGH	Added a new API rIDevicePowerSaveModeConf for power save mode support.
HIGH	Deprecated API: rISetPowerSaveModeConfig.

7 Notes

7.1 File Formats

The file format of the image downloaded/loaded, to the SFLASH/over the SPI, has been updated and unified with the entire range of mmWave sensors. Hence, a multicore image (metalImage) needs to be downloaded to the SFLASH or loaded over the SPI interface.

Device	File Format	
xWR6243 ES 1.1 device	Multicore image to be downloaded over SFLASH/SPI	
	SFLASH	mmwave_dfp_06_04_01_00\firmware\xw_r62xx_metalImage.bin
	SPI	mmwave_dfp_06_04_01_00\firmware\xw_r62xx_metalImage.h (This is hex format conversion of MetalImage binary file to embed within the Host application source code.)

7.2 Serial Data FLASH Supported

For further information on supported SFLASH variants, please refer [SPRACH9](#).