



MMWAVE DFP 01.02.05.01 Release Notes

1 Introduction

TI mmWave Device Firmware Package (DFP) enables the development of millimeter wave (mmWave) radar applications using AWR1243 SOC/EVM. It includes necessary components which will facilitate end users to integrate AWR1243 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 AWR1243 with external processor.

Note: mmWave Software Development Kit (SDK) enables the development of radar applications on AWR1443, AWR1642, IWR1443, AWR1843 and IWR1642 SOCs/EVMs. The basic components of DFP are included in mmWave SDK.

2 Release Overview

2.1 Platform and Device Support

The device and platforms supported with this release include:

Supported Devices	Release Status	Supported EVMs
AWR1243 ES3.0	Production Release (DFP 1.2.5.1 contents)	AWR1243BOOST : AWR1243 ES3.0 Booster pack + MMWAVE-DEVPACK Booster pack + 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
RadarSS Firmware	ROM: 2.0.0.1, Patch: 1.2.5.2	Binary
MSS Firmware (AWR1243 ES3.0 only)	ROM: 1.10.0.20, Patch: 1.2.5.1	Binary
mmWaveLink Framework	1.2.5.16	Source and Library
Docs	Release Notes DFP user guide Interface Control Document mmWaveLink Programmer's guide	PDF PDF PDF Doxygen HTML

2.3 Directory Structure

Directory Name	Content
Docs	mmWave-Radar-Interface-Control.pdf mmwave_dfp_release_notes.pdf mmwave_dfp_user_guide.pdf
firmware	RadarSS and Master SS firmware binary files in RPRC format metalmage binary (xwr12xx_metalmage.bin) for xWR1243 ES3.0 for boot over Flash metalmage header file (xwr12xx_metalmage.h) for xWR1243 ES3.0 for boot over SPI
ti	mmWaveLink framework and example source code
rf_eval	RF evaluation firmware

2.4 Component Descriptions

2.4.1 RadarSS Firmware

Refer to Radar SS firmware release notes in firmware\radarss folder.

2.4.2 Master SS Firmware

The main software components of the 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, RADAR SS API handshake, data path control.

2.4.3 mmWaveLink framework

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

TI mmWaveLink framework acts as driver for Radar SS and exposes services of Radar SS. It includes APIs to configure HW blocks of Radar SS and provides communication protocol for message transfer between external processor and AWR1243

- Link between application and Radar SS
- 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 v9.7.1 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

3.1.1 New Additions (Compared to DFP 1.2)

- Bug fixes related to RadarSS digital monitoring and long tracking issues
- VCO calibration improvements
- Fix for Internal analog signal GPADC monitor failures
- Bug fixes related to MSS digital monitoring and reports
- Bug fixes related to SPI message protocol retry recovery on MSS
- Bug fixes related to SPI message protocol retry recovery on mmWaveLink
- Added redundant failure report for monitors in quiet reporting mode 1
- Added new dummy chirps option at the end of frame in legacy frame config API
- Added new noise power and loopback power fields in RX gain phase monitor report
- Supported calibration store and restore APIs for factory calibration
- Handled OS Interface Error when Mutex Lock callback returns Error in mmWaveLink

3.1.2 New Additions (Compared to DFP 1.2.5.0)

- Updated ICD and mmWaveLink Documents
- MSS changes for SPI msg timeouts due to CPU incorrectly waiting for more data and not processing received data.

3.2 Feature/Changes List by Components

3.2.1 Radar SS firmware

Refer to Radar SS firmware release notes in firmware\radarss folder

3.2.2 Master SS firmware (with respect to DFP 1.2)

Type	Key	Description
Enhancement	AUTORADAR-2017	Unmasked FRC lockstep fatal error reported to MSS ESM G1 and sent over AE.
Bug	AUTORADAR-1999	Updates to the code to handle additional trigger2 safety tests.
Bug	AUTORADAR-1947	Fix for initializing the reserved bits in MSS ESM Error report
Bug	AUTORADAR-2068 AUTORADAR-2070	Fixed bugs in handling retry command received from host
Bug	AUTORADAR-2035 AUTORADAR-2048	Fix for EDMA and RTI latent fault digital monitoring API
Bug	AUTORADAR-2088	Fixed an issue in MSS message parsing related to message direction
Enhancement	AUTORADAR-2130	Added redundant N-Error failure report in addition to failure AE report in case of any failure in periodic digital monitor.

3.2.3 Master SS firmware (with respect to DFP 1.2.5.0)

Type	Key	Description
Bug	AUTORADAR-2164	Fix for CPU incorrectly waiting for more data and not processing received data, depending on Host processor speed and SPI rate.
Bug	AUTORADAR-2146	Fix for occasional MSS register write-readback failures.

3.2.4 mmWaveLink framework (with respect to DFP 1.2)

Type	Key	Description
Bug	MMWL-150	Fixed an issue with No fault reported even after a CRC is corrupted
Bug	MMWL-153	Fixed MSS monitor latent fault report documentation to match with ICD
Enhancement	MMWL-155	Updated mmWaveLink Doxygen documentation as per ICD update
Bug	MMWL-166	Fixed bug in handling retry in case of NACK

Enhancement	MMWL-168	Added a new feature to report CRC failure in Async-event message to Application.
Bug	MMWL-173	Added a logic to recover from CNYS corruption scenario
Bug	MMWL-169	Fix for AE length info being reported to application upon CRC failure.
Bug	MMWL-178	Added an API to control number of retry for command
Bug	MMWL-177	Added max retry count limit in case of NACK retry
Bug	MMWL-180	Added a return in case of OS Interface Error when Mutex Lock callback returns Error.
Enhancement	MMWL-188	Provided an option to program dummy chirps in the end of frame in frame config API. This is an option to mask ADC data for few chirps in the end of frame.
Enhancement	MMWL-189 MMWL-190	RX Gain Phase Monitoring – Added more reporting fields in AE to improve interference immunity.
Enhancement	MMWL-184	Added GET API for CPU and ESM fault errors
Bug	MMWL-193	Updated doxygen comments and incorporated code inspection review comments
Enhancement	MMWL-192	Notify Host through Async-event if mutex lock fails.

3.2.5 mmWaveLink framework (with respect to DFP 1.2.5.0)

Type	Key	Description
Bug	MMWL-217	mmWaveLink update for flushing 256 + CRC Size bytes instead of 256 + CRC Size + SYNC bytes in case of ACK SYNC corrupted
Bug	MMWL-215	Test Source configuration structure changed to match the ICD definition.
Bug	MMWL-199	Updated doxygen comments and incorporated code inspection review comments
Bug	MMWL-202	Fixes for LDRA violations.

3.3 Unsupported features and APIs

Refer to Radar SS 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 DFP release. This list of unsupported features is in addition to the list mentioned in known issues.

API	Feature	Description
AWR DEV PMICCLOCK CONF SET SB	PMIC clock configuration	This API is not validated at system level. It is recommended not to use the same.
The SPI transfer (option 2) in DATA INTF SEL in AWR DEV RX DATA PATH CONF SET SB	ADC data transfer over SPI	This API is not validated at system level. It is recommended not to use the same.

3.4 Debug APIs

API	Feature	Description
AWR_DEV_RX CONTSTREAMING_MODE CONF_SET_SB	Continuous streaming mode	Continuous streaming mode is not supported in functional mode, recommended to use only for debug.
AWR_DEV_TESTPATTERN GEN_SET_SB	Data path test pattern generation	Pattern generation is not supported in functional mode, recommended to use only for debug.

3.5 Known Issues

Refer to Radar SS firmware release notes in firmware\radarss folder.

3.5.1 Master SS firmware

Key	Severity	Description
AUTORADAR-2064	S2-Major	The MSS Transmit SPI buffer access issue due to stall in DMA access, if BSS/RadarSS PCR self-test is performed in parallel through latent fault API. Workaround: Disable BSS PCR test in AWR_MONITOR_RF_DIG_LATENTFAULT_CONF_SB API (Boot time BSS PCR test is always done).
AUTORADAR-2071	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.
AUTORADAR-2066	S3-Minor	MSS DMA ESM G1 error is observed at times due to stall in DMA access, if BSS/RadarSS PCR self-test is performed in parallel through latent fault API. Workaround: Disable BSS PCR test in AWR_MONITOR_RF_DIG_LATENTFAULT_CONF_SB API (Boot time BSS PCR test is always done).
AUTORADAR-2078	S3-Minor	Occasionally MSS PCR self -test 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 PCR test in AWR_MSS_LATENTFAULT_TEST_CONF_SB API (Boot time MSS PCR test is always done).

AUTORADAR-2131	S3-Minor	<p>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.</p> <p>Workaround: Disable MSS ATCM and BTCM parity, Single bit (SB) and Double Bit (DB) ECC self-tests in AWR_MSS_LATENTFAULT_TEST_CONF_SB API (Boot time MSS ATCM and BTCM parity, SB and DB ECC self-tests are always done).</p> <p>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.</p>
AUTORADAR-2183	S2-Major	<p>A CPU fault with failure on register read-back at address 0Xff7f4dc is observed occasionally in long tracking runs.</p> <p>Workaround: This failure can be ignored and will not have an impact on functionality.</p>

4 Migration Guide

This section explains the steps to migrate from DFP 1.2.0 release to this package

Impact	Change list
MEDIUM	The ESM_MONITORING_EN flag in rIDigMonPeriodicConf_t structure have been made reserved. Application should ignore the reserved flag.
HIGH	The bit 22 nd of esmGrp1Err field in rIMssEsmFault_t structure is updated with FRC lockstep error indication. Application should handle this error as a fatal error from the mmWave Device.
HIGH	The bit 14 and 25 of esmGrp1Err field in rIBssEsmFault_t structure is updated with programmable filter parity and ECC DB fatal error indications respectively. Application should handle this error as a fatal error from the mmWave Device.
MEDIUM	The ESM_MONITORING flag in rIDigPeriodicReportData_t structure have been made reserved. Application should ignore the reserved status flags.
MEDIUM	The bit 2 of statusFlags field in rIMonTxBpmRep_t structure is updated with phase shifter monitoring status. Application should handle this status report if device supports phase shifter.
MEDIUM	New asynchronous event message ID has been added for notification of CRC/Checksum failure in the received message (Async-event) from the device. Application needs to handle this msgID RL_MMWL_ASYNC_EVENT_MSG and SBID-

	RL_MMWL_AE_MISMATCH_REPORT in the 'rAsyncEvent' callback implementation.
MEDIUM	New API rDeviceSetRetryCount has been added, where application can set retry count to zero to skip the command retry step at mmWaveLink level. This API provides an option to change the retry count from default value to customizable value which should be <=RL_API_CMD_RETRY_COUNT.

MEDIUM	Value option '0x2' for rltestPattern_t-> testPatGenCtrl is not validated and removed. So application should not use this option to generate the test pattern.
HIGH	One of reserved field of rIFrameCfg_t structure is now used as 'numDummyChirpsAtEnd' parameter to configure the dummy chirp at the end of frame. Application should aware of this parameter change while using rISetFrameConfig/rIGetFrameConfig API.
MEDIUM	In case MutexLock callback returns non-zero value in the interrupt context (reading async-event) then mmWaveLink generates internal Async-event with error code to notify the Host about this failure. Application should able to handle this error Async-event message and take appropriate action.
HIGH	Added new bit 34 in bootTestStatus in rIInitComplete_t structure to report boot time PCR self-test of MSS in AWR1243 devices
HIGH	The bits [11:8] STATUS_PWRDET_RXn in statusFlags in rIMonRxIntAnaSigRep_t structure have been made reserved as RX power detector monitoring has been disabled.
HIGH	The bit 26 PCR test enable in enMask in rIMonAnaEnables_t is made reserved as this test has been de-featured.
MEDIUM	Added a missing 4 bytes reserved field reserved1 in rIMssEsmFault_t.
HIGH	The bit 2 PCR test status in testStatusFlg2 in rIMssLatentFaultReport_t as this test has been de-featured.
HIGH	A new status 0x7 has been added errStatusFlg in rIMssRfErrStatus_t.
HIGH	The bit 26 PCR test status in digMonLatentFault in rIDigLatentFaultReportData_t is made reserved as this test has been de-featured.
HIGH	The bit 2 PCR test enable in testEn2 in rIperiodicTest_t as this test has been de-featured.
HIGH	Added new fields loopbackPowerRF1, loopbackPowerRF2, loopbackPowerRF3, rxNoisePower1 and rxNoisePower2 in rIMonRxGainPhRep_t structure.
MEDIUM	Added reportMode field in rIRxGainPhaseMonConf_t structure.
MEDIUM	Added reportMode field in rITxGainPhaseMismatchMonConf_t structure.
MEDIUM	Moved rIRfTempData_t structure from mmwavelink.h to rl_sensor.h
MEDIUM	All reserved bytes in reports are to be masked, as the values can be non-zero.
MEDIUM	Added field testStatusFlg2 in rIMssLatentFaultReport_t to match with ICD
MEDIUM	anaTxPos filed in rITestSource_t is reserved. Application should ignore the reserved field.
HIGH	Report mode 0 is not supported for the following monitoring APIs: 1. rIRfTxIntAnaSignalsMonConfig

	<ol style="list-style-type: none"> 2. rIRfRxIntAnaSignalsMonConfig, 3. rIRfPmClkLoIntAnaSignalsMonConfig, 4. rIRfGpadcIntAnaSignalsMonConfig, 5. rIRfPllContrlVoltMonConfig, 6. rIRfDualClkCompMonConfig.
MEDIUM	Bit3 - VIM Test of rIStartComplete_t status field has been de-featured.
MEDIUM	Bit3 - VIM Test of rIMonDigEnables_t enMask field has been de-featured.
MEDIUM	Bit0 - SYNTH_VCO_OPENLOOP fault injection in synthFault in rIAnaFaultInj_t has been de-featured
MEDIUM	In rIMonPllConVoltRep_t statusFlags , Bit3 - VC01 and bit6 - VC02 slope monitors have been de-featured
MEDIUM	Bit3 in statusFlags in rIMonPmclklolntAnaSigRep_t is now STATUS_LVDS_PMCLKLO to match with ICD.
MEDIUM	Bit 2 in statusFlags in rIMonGpadcIntAnaSigRep_t is now STATUS_GPADC_REF2 to match with ICD

5 Notes

5.1 File Formats

On xWR1243/xWR1443 ES3.0 devices onwards, 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 (similar to the xWR1642 range of sensors). Hence, a multicore image (metalmage) needs to be downloaded to the SFLASH or loaded over the SPI interface.

Device	File Format	
xWR1243 ES 3.0 device	Multicore image to be downloaded over SFLASH/SPI	
	SFLASH	mmwave_dfp_01_02_05_01\firmware\xwr12xx_metalmage.bin
	SPI	mmwave_dfp_01_02_05_01\firmware\xwr12xx_metalmage.h

5.2 Serial Data FLASH Supported

AWR1243 ES1.0 and ES2.0 devices

The AWR1243/xWR1443 ES1.0 and ES2.0 devices work only with Spansion and Macronix devices. In particular, the Flash variants that have been tested to work with the ROM bootloader are

Spansion S25FL256S
 Spansion S25FL132K0XNFB010
 Macronix MX25L3233F
 Macronix MX25R1635FZNIH0 (wide voltage part variants)

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