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
2.0.0.1	**ROM (256kB)**
1.2.6.11	**Binary (Patch – 35kB)**

1.1 Platform and Device Support

The device and platforms supported with this release include:

Supported Devices	Release Status	Supported EVMs
AWR1243 ES3.0	Release for Production	AWR1243BOOST : AWR1243 ES3.0 Booster pack + DCA1000EVM
xWR1443 ES3.0	Release for Production	xWR1443BOOST : xWR1443 ES3.0 Booster pack + DCA1000EVM
xWR1642 ES2.0	Release for Production	xWR1642BOOST : xWR1642 ES2.0 Booster pack + DCA1000EVM
xWR1843 ES1.0	Release for Production	xWR1843BOOST : xWR1843 ES1.0 Booster pack + DCA1000EVM

1.2 Memory Requirements

DFP 1.1 onwards RadarSS firmware does not pool 128kB L3 memory from radar cube shared memory for execution. The 35kB internal Patch memory is used on top of 256kB internal ROM, hence L3 memory requirement is NULL for RadarSS.

1.3 Features and Enhancements in DFP 1.2.5 (Compared to DFP 1.2)

- Improvements to digital and analog monitoring long tracking stability
- Updated Noise figure monitor algorithm to disable LNA during noise measurement to reduce interference impact
- VCO calibration improvements

  Fix for Internal analog signal GPADC monitor failures
- 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 to mitigate interference during monitoring.
- Supported calibration store and restore APIs for factory calibration

1.4 Features and Enhancements in DFP 1.2.6 (Compared to DFP 1.2.5)

- Enabled new phase shifter DAC monitor in AWR1843 device
- Improved runtime digital monitor enable sequence (FRC, DFE and Rampgen)
- Improved Synthesizer boot calibration sequence
- Updated IFA loopback power for IF stage calibrations and monitors

1.5 Changes in this release (with respect to DFP 1.2)

Item type	Key	Description
Bug	AUTORADAR-1951	Disabled ESM self-test monitoring in periodic runtime digital monitoring. The “ESM MONITORING EN” field in “AWR MONITOR RF DIG PERIODIC CONF SB” is reserved.
Bug	AUTORADAR-1943	Fixed issues with digital monitoring in “AWR MONITOR RF DIG LATENTFAULT CONF SB” API in long tracking tests.
Bug	AUTORADAR-1941 AUTORADAR-1950	Fixed issues with register read-back checks, which would cause firmware fatal error
Bug	AUTORADAR-1955	Fixed Issue with Rx Mixer power analog monitor
Bug	AUTORADAR-1971	Fixed a race condition in getting available time for calibration and monitoring chirps in inter burst/frame time, which would cause firmware fatal error

Bug	AUTORADAR-1975	Added a condition to protect BSS from data corruption when host is programming 11th segment with more than 32 chirps data in dynamic chirp config API fast mode.
Bug	AUTORADAR-1554	Fixed an issue with reporting mode 1 and 2 non-verbose mode in TX gain phase monitor
Bug	AUTORADAR-1555	Fixed an issue with reporting mode 1 and 2 non-verbose mode in RX gain phase monitor
Bug	AUTORADAR-1983	Fixed an issue with runtime forced frame stop API in Hw triggered mode.
Bug	AUTORADAR-1998 MMWAVE_SOC-58	Fixed an issue with Rampgen parity self-test monitoring
Bug	AUTORADAR-2004 AUTORADAR-2016	Fixed an issue with Phase shifter monitor threshold check and reporting
Bug	AUTORADAR-2006	Enabled Sequencer extension ECC and access continuous monitoring and reporting
Bug	AUTORADAR-2009	Fixed an issue in timing when analog monitors are enabled in fault injected mode.
Bug	AUTORADAR-2013	Fixed an issue with race condition while accessing sequencer extension RAM during chirping.
Bug	AUTORADAR-2014	Enabled Programmable filter ECC and parity continuous monitoring and reporting
Enhancement	AUTORADAR-2020	Updated Noise figure monitor algorithm to disable LNA during noise measurement to reduce interference impact
Enhancement	AUTORADAR-2029 AUTORADAR-2073 AUTORADAR-2027	Improvements to VCO1 and VCO2 calibration robustness across temperature and device corners.
Bug	AUTORADAR-1992 AUTORADAR-2028	Fix to Tx internal analog monitor failures
Bug	AUTORADAR-1994 AUTORADAR-2057	Fix to Rx internal analog monitor failures
Bug	AUTORADAR-2046	Fix to PM, LO, CLK internal analog monitor failures
Bug	AUTORADAR-1965 AUTORADAR-2052	Fix to Synthesizer frequency monitor first sample large error issue and spike in Tx power
Enhancement	AUTORADAR-2072	Updated DFE statistics memory initialization sequence to improve DFE statistics data.
Bug	AUTORADAR-2061	Fix for FRC lock step self –test failure
Bug	AUTORADAR-2055	Fix for periodic register read back monitor failure due to boot time DFE STC run.
Bug	AUTORADAR-2074	Fix for PGA gain index underflow at -40deg C
Enhancement	AUTORADAR-2110	Provided an option to program dummy chirps in the

		end of frame in frame config API. This is the option to mask ADC data for few chirps in the end of frame.
Enhancement	AUTORADAR-2108	Added a redundant failure report part of AWR AE MSS RFERROR STATUS SB in case of any failure in analog and digital monitor failure in reporting mode 1 (quiet mode)
Enhancement	AUTORADAR-2104	RX Gain Phase Monitoring – Added more reporting fields in AE to improve interference immunity
Bug	AUTORADAR-2087	Fixed an issue with calibration store and restore API, this was causing APLL control voltage monitor to fail.
Bug	AUTORADAR-2090	Fixed an issue with calibration store and restore API, this was causing API to return INVALID DATA occasionally.
Bug	AUTORADAR-2089	Fixed an issue with Tx gain phase and Rx gain phase monitor threshold check in reporting mode 1.
Bug	AUTORADAR-2093	Fixed an issue with Rx gain phase monitor reporting mode 1 and 2 if RF gain target is set to 34dB and 26dB.
Bug	AUTORADAR-2096	Fixed an issue with PA loop back option in advance frame config API loopback burst.
Bug	AUTORADAR-2118	Incorporated code inspection review comments related to dummy chirps frequency monitor
Bug	AUTORADAR-1954	Fix for RX gain calibration on one device occasionally resulted in calibration failure at very low temperature (near -40C junction). This issue has been fixed in issue key AUTORADAR-2055 (DFP 1.2.3).
Bug	AUTORADAR-2128	Fixed false alarm in RX power detector status bits in RX internal signal monitor by removing limits on this parameters. Removed status bits STATUS PWRDET RX {0, 1, 2, and 3} in AE report.

1.6 Changes in this release (with respect to DFP 1.2.5)

Item type	Key	Description
Enhancement	AUTORADAR-2182	Removed certain features/bug fixes which are not supported in this release to save patch space. 1. RX mixer power monitor bug fix (AUTORADAR-1955) 2. Programmable filter self-test logic 3. Phase shifter monitor 4. 20GHz sync monitor 5. LPF monitor 6. Noise figure monitor 7. TX gain phase monitor Please refer ICD and sec 1.7 in this doc for more info.
Bug	AUTORADAR-2163	Fix for PA LDO bias setting in regulated supply mode
Enhancement	AUTORADAR-2236	Improvements to Synthesizer boot calibration sequence based on new learnings from 2nd gen devices
Bug	AUTORADAR-2212	Fixed an issue with runtime synth duty cycle sequence

	AUTORADAR-2237	which impacts stability in long tracking runs
Enhancement	AUTORADAR-2181	Added new Phase Shifter DAC monitor for AWR1843 devices. Please refer ICD for more info.
Bug	AUTORADAR-2213 AUTORADAR-2240	Updated DFE parity, FRC lock step and Rampgen lockstep run time enable sequence based on new learnings from 2nd gen devices
Bug	AUTORADAR-2241	Disabled VMON by default in RadarSS Boot
Bug	AUTORADAR-2210	Fixed an issue with WDT enable sequence
Bug	AUTORADAR-2211	Updated calibration and monitor frequency limit API to avoid out of band emission during RF3 band monitor. Please refer ICD for more info.
Enhancement	AUTORADAR-2169	Reduced IFA loopback power by half to avoid saturation in IFA calibration and monitors
Bug	AUTORADAR-2152 AUTORADAR-2138	Removed slope threshold check in AWR_MONITOR_PLL_CONTROL_VOLTAGE_REPORT_AE_SB Refer ICD for more info.
Bug	AUTORADAR-2252	Updated one of the PM LO CLK internal signal monitor signal threshold
Bug	AUTORADAR-2269	Fixed an issue with IQMM & PS boot calibration performance at -40deg C
Enhancement	AUTORADAR-2277	Added Phase Shifter DAC monitor disable option for AWR1843 devices

1.7 Unsupported Features and APIs in DFP (applicable to all DFP)

The following 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.

API	Feature	Description
FORCE VCO SEL feature in AWR PROFILE CONF SET SB	Force VCO select	The Force VCO select in profile configuration API is not validated at system level. It is recommended not to use the same.
LOOPBACK CFG feature in AWR ADVANCED FRAME CONF SB	Loopback feature in advance frame config API	The Loopback option in advance frame config API is not validated at system level. It is recommended not to use the same.
LDO SC MONITORING EN field in AWR MONITOR ANALOG ENABLES CONF SB	Short Circuit and VMON monitor	The Short circuit protection feature is not supported. Do not enable short circuit monitor LDO SC MONITORING EN field in AWR MONITOR ANALOG ENABLES CONF SB.
RAMPGEN 100M monitor feature in AWR MONITOR DUAL CLOCK COMP CONF SB	Rampgen 100MHz clock monitor	The rampgen 100MHz clock monitor is not supported. It is recommended not to use the same.
PCR self-test feature in AWR	PCR self-test	The PCR self-test is not supported in latent fault

MONITOR RF DIG LATENTFAULT CONF SB		configuration API. It is recommended not to use the same.
RAMPGEN ECC self-test feature in AWR MONITOR RF DIG LATENTFAULT CONF SB	Rampgen ECC self-test	The Rampgen ECC self-test is not supported in latent fault configuration API. It is recommended not to use the same.
LPF CUTOFF FREQ ERROR THRESH feature in AWR MONITOR RX IFSTAGE CONF SB	LPF cutoff freq monitor	The LPF cutoff frequency monitor is not supported in IF stage monitor. It is recommended not to use the same.
AWR DYN CHIRP CONF SET SB AWR DYN PERCHIRP PHASESHIFTER CONF SET SB AWR DYN CHIRP ENABLE SB	Dynamic chirp configurations	Dynamic chirp configuration APIs are 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 AWR TX GAIN TEMPLUT GET SB	Rx and Tx gain calibration override	The Rx and Tx gain calibration override APIs are not validated at system level. It is recommended not to use the same.
AWR PERCHIRPPHASESHIFT CONF SB	Per-chirp phase shifter	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 Only) and corresponding self-test monitors	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 validated at system level. It is recommended not to use the same.
AWR LOOPBACK BURST CONF SET SB	Loopback burst configuration	This API is not validated at system level. It is recommended not to use the same.
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 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 RF GPADC CFG SET SB AWR MONITOR EXTERNAL ANALOG SIGNALS CONF SB	External signal monitoring using GPADC (xWR1642/xWR1843 Only)	This API is not validated at system level. It is recommended not to use the same.
AWR MONITOR RX NOISE	RX noise figure	RX noise figure monitor is performed with RX RF LNA disabled (to suppress external

FIGURE CONF SB	monitor	interference's influence) and reports numbers with high variations and inconsistent with full RX noise figure. It is recommended not to use the same.
AWR MONITOR TX GAIN PHASE MISMATCH CONF SB	TX gain phase monitor	Tx gain phase mismatch monitor is susceptible to corruption by interference from other radar sensors. The monitors may result in false alarms under the influence of interference. It is recommended not to use the same.
AWR MONITOR TX0 BPM CONF SB AWR MONITOR TX1 BPM CONF SB AWR MONITOR TX2 BPM CONF SB	TX BPM and phase shifter monitor	The TX BPM and phase shifter monitor is susceptible to corruption by interference from other radar sensors. The monitors may result in false alarms under the influence of interference. It is recommended not to use the same.
AWR MONITOR RX MIXER IN POWER REPORT AE SB	Rx mixer input power monitor	The RX mixer input power monitor is susceptible to corruption by interference from other radar sensors. The monitors may result in false alarms under the influence of interference, it is recommended to use only for debug.
CASCADING CFG and CASCADING PINOUTCFG in AWR CHAN CONF SET SB 20G SYNC monitor	Cascade features	The cascade features and 20GHz sync monitors are not fully validated at system level for production in this release.
SYNTH VCO1 and VCO2 SLOPE monitor status in AWR MONITOR PLL CONTROL VOLTAGE REPORT AE SB AE	PLL control voltage monitor	SYNTH VCO1 and VCO2 SLOPE monitor status in AWR MONITOR PLL CONTROL VOLTAGE REPORT AE SB AE is not accurate across temperature.
VIM test (b3) in DIG MONITORING ENABLES in AWR MONITOR RF DIG LATENTFAULT CONF SB and VIM test (b3) in BSS POWERUP BIST STATUS FLAGS in AWR AE DEV RFPOWERUPDONE SB AE	VIM self-test	VIM interrupt explicit self-test is not done in boot-up and part of latent fault API call (This is being covered by rest of the boot ESM monitoring).
RX_LO_AMP_FAULT and TX_LO_AMP_FAULT injections in AWR_ANALOG_FAULT_INJECTION_CONF_SB	Analog Fault injection API	The RX_LO_AMP_FAULT and TX_LO_AMP_FAULTs are de-featured
TXn POWER_BACKOFF fields in AWR_CAL_MON_FREQUENCY_TX_POWER_LIMITS_SB	Calibration and Monitoring Frequency and TX Power limits API	Recommended to perform factory calibration with 0dB back-off set in AWR_CAL_MON_FREQUENCY_TX_POWER_LIMITS_SB API and, store and restore the calibration data from non-volatile memory. With this option, user can set nonzero back-off option in AWR_CAL_MON_FREQUENCY_TX_POWER_LIMITS_SB API during normal runs to back-off

		monitor/calibration chirps power.

1.8 Debug APIs (applicable to all DFP)

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.

1.9 Known issues (applicable to all DFP)

The following known issues are applicable to this and all previous DFP releases.

Key	Severity	Description
AUTORADAR-2026 AUTORADAR-2262	S3-Minor	The LPF cutoff monitor is de-featured in latest DFP 1.2.6 release, the IFA monitor reports value zero for LPF. **Workaround:** Discard the LPF monitor values and flags in AWR_MONITOR_RX_IFSTAGE_REPORT_AE_SB AE.
AUTORADAR-2002	S2-Major	DCC monitoring occasionally shows failure for Rampgen clock. **Workaround**: Disable rampgen clock DCC clock monitor in AWR MONITOR DUAL CLOCK COMP CONF SB API
MMWAVE RFANA-185	S2-Major	TI production test is unstable for IQ mismatch calibration failure. **Workaround**: Recommended to perform factory calibration and store and restore the calibration data from non-volatile memory.
AUTORADAR-2067	S3-Minor	Tx gain phase mismatch monitor for TX3 reports higher than the expected values from simulation. **Workaround**: Do not use TX gain phase mismatch monitor.
AUTORADAR-2065 AUTORADAR-2159	S3-Minor	TX power accuracy and inter-channel balance may degrade at high back-off (8dB back-off or more). **Workaround**: Use 0dB back-off setting for best inter-TX matching performance.
MMWAVESYS-159	S2-Major	1. The following monitors are susceptible to corruption by interference from other radar sensors. The monitors may result in false alarms under the influence of interference. a. RX GAIN PHASE MONITOR (Can be mitigated

		through Host based Solution) b. RX NOISE FIGURE MONITOR c. TX GAIN PHASE MISMATCH MONITOR d. TX0 BPM MONITOR, TX1 BPM MONITOR, TX2 BPM MONITOR e. RX MIXER INPUT POWER MONITOR 2. 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. Enable RX gain calibration b. Enable TX Phase calibration c. Enable RX IQMM calibration **Workaround**: 1. Recommended to avoid use of the monitors which are susceptible to interference from other radars. Use RX GAIN PHASE MONITOR report to detect interference level(Host based solution). 2. Recommended to perform factory calibration, store and restore the calibration data from non-volatile memory.
MMWAVESYS-158	S3-Minor	RX noise figure monitor is susceptible to corruption by interference from other radar sensors. The monitors may result in false alarms under the influence of interference. **Workaround**: Do not use RX noise figure monitor.
AUTORADAR-2077	S3- Minor	The Rampgen memory ECC self-test is failed once in a long tracking stress test, which is looping Latent fault API calls infinite time with all digital monitoring tests enabled. **Workaround**: Disable Rampgen ECC test in AWR MONITOR RF DIG LATENTFAULT CONF SB API (Boot time rampgen ECC test is always done).
AUTORADAR-2136	S3- Minor	The RX LO AMP FAULT and TX LO AMP FAULT injection in AWR ANALOG FAULT INJECTION CONF SB are not detected by RX INTERNAL ANALOG SIGNALS monitor and TXn INTERNAL ANALOG SIGNALS monitor respectively. **Workaround**: Do not use Fault injection for TX and RX internal analog signal monitors. Refer ICD for more info.
AUTORADAR-2177	S3- Minor	The fault injected at SYNTH VCO OPENLOOP n SYNTH FAULT in AWR ANALOG FAULT INJECTION CONF SB is not detected by PLL CONTROL VOLTAGE monitor. **Workaround**: Do not use Fault injection for SYNTH VCO in PLL CONTROL VOLTAGE monitor. Refer ICD for more info.
AUTORADAR-2215 AUTORADAR-2263	S2- Major	DCC IP can exhibit intermittent failure, this would impact Synthesizer boot calibration and AWR_MONITOR_DUAL_CLOCK_COMP_REPORT_AE_SB monitor. **Workaround**: 1. Rerun Synthesizer boot calibration if any failure in factory. 2. Discard and wait for successive second measurement if any failure in DCC monitor report AWR_MONITOR_DUAL_CLOCK_COMP_REPORT_AE_SB.
AUTORADAR-2206	S2- Major	Accuracy of BPM API is ~ +/-10deg when phase shifter calibration is enabled in xWR1843 devices. **Workaround**:

		1. If only BPM is used without phase shifter then recommended to disable the boot time phase shifter calibration in RF init. 2. If both phase shifter and BPM is used then recommended to achieve BPM logic using per chirp phase shifter API instead of using BPM API
AUTORADAR-2254	S3- Minor	TX Power calibration accuracy degrades with nonzero back off setting configured in TXn_POWER_BACKOFF in AWR_CAL_MON_FREQUENCY_TX_POWER_LIMITS_SB API. **Workaround**: Recommended to perform factory calibration with 0dB back-off set in AWR_CAL_MON_FREQUENCY_TX_POWER_LIMITS_SB API and, store and restore the calibration data from non-volatile memory. With this option, user can set nonzero back-off option in AWR_CAL_MON_FREQUENCY_TX_POWER_LIMITS_SB API during normal runs to back-off monitor/calibration chirps power.
AUTORADAR-1955 AUTORADAR-2256	S3- Minor	Rx Mixer power analog monitor is de-featured in DFP and to save patch space the issue fixed in AUTORADAR-1955 in DFP 1.2.5 has been reverted back and it will impact the stability if enabled and generates CPU fault in RadarSS. **Workaround**: This monitor is de featured in DFP and recommended not to enable this in application.