

RN00110

NXP Wireless SoC Features and Release Notes for Android

Rev. 16.0 — 8 April 2025

Release notes

Document information

Information	Content
Keywords	PCIe, UART, SDIO, Bluetooth, Bluetooth LE, coexistence, Host platform, release, version, package, certification, Wi-Fi throughput, EU conformance tests, bug fixes, known issues, feature enhancement, 88W9098, 88W8987, 88W8997, IW416, IW611, IW612
Abstract	Includes information about the supported features, known issues, and performance of the Wi-Fi, Bluetooth and coexistence with the mentioned release.



1 About this document

This document includes information about the supported features, known issues and performance of the Wi-Fi, Bluetooth and coexistence with the mentioned release.

This is a consolidated release that has been tested with Android BSP version 15.0.0_1.2.0, for the wireless devices mentioned in this document.

2 Downloading the wireless driver and firmware

For the latest wireless driver and firmware, refer to the following sections:

2.1 Pre-compiled Wi-Fi driver and firmware

The Android BSP image includes the wireless firmware and pre-compiled driver modules on the following paths:

- Driver modules: `/vendor/lib/modules/`
- Firmware binary: `/vendor/firmware/`

Note: The pre built images in Android release 15.0.0_1.2.0 include the following default wireless firmware based on the i.MX 8M EVK boards. [Table 1](#) lists the possible combinations.

Table 1. Default wireless firmware support

EVK board	Default wireless firmware support
i.MX 8ULP EVK board	IW416
i.MX 8M Nano/Nano UL EVK board	88W8987
i.MX 8M Mini EVK board	88W8987
i.MX 8M Plus EVK board	88W8997 PCIe - UART
i.MX 8M Quad EVK board	88W9098 PCIe - UART
i.MX 8QM/8QXP EVK board	88W9098 PCIe - UART

For non-default firmware, build the BSP image from source. For example, refer to the section *Building the image from source*, and the section *Enabling SDIO on M.2 connection in Android* in [ref.\[2\]](#).

2.2 Wi-Fi driver source and firmware

To download the release for the Wi-Fi driver and wireless firmware, refer to [ref.\[3\]](#).
For example, go to 88W8997 product page on NXP website, and look for the documentation section:

Wi-Fi® + Bluetooth® > 88W8997 > Documentation

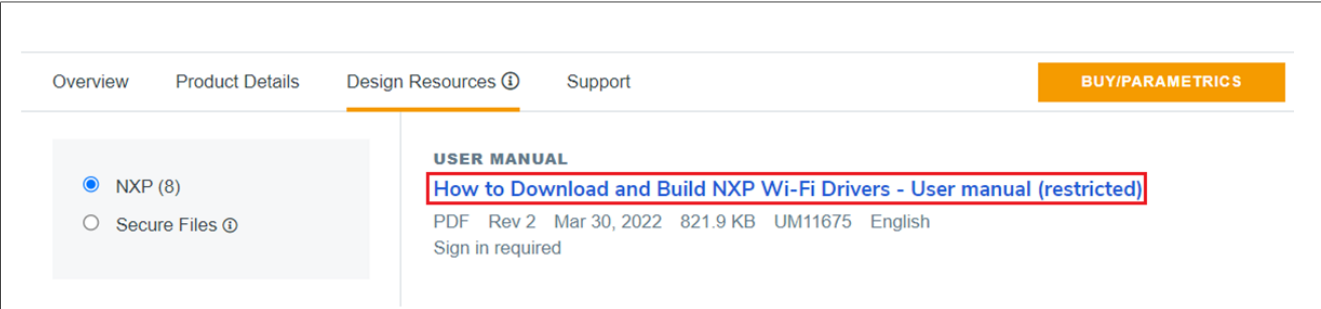


Figure 1. Documentation section on product pages

Note:

- UART driver source code is open source and part of the Linux kernel source.
- UART driver source code used for Bluetooth is NOT part of the release package. Download the code from kernel.org.

2.3 Wi-Fi patch

Intermediate releases are published on [ref.\[10\]](#).

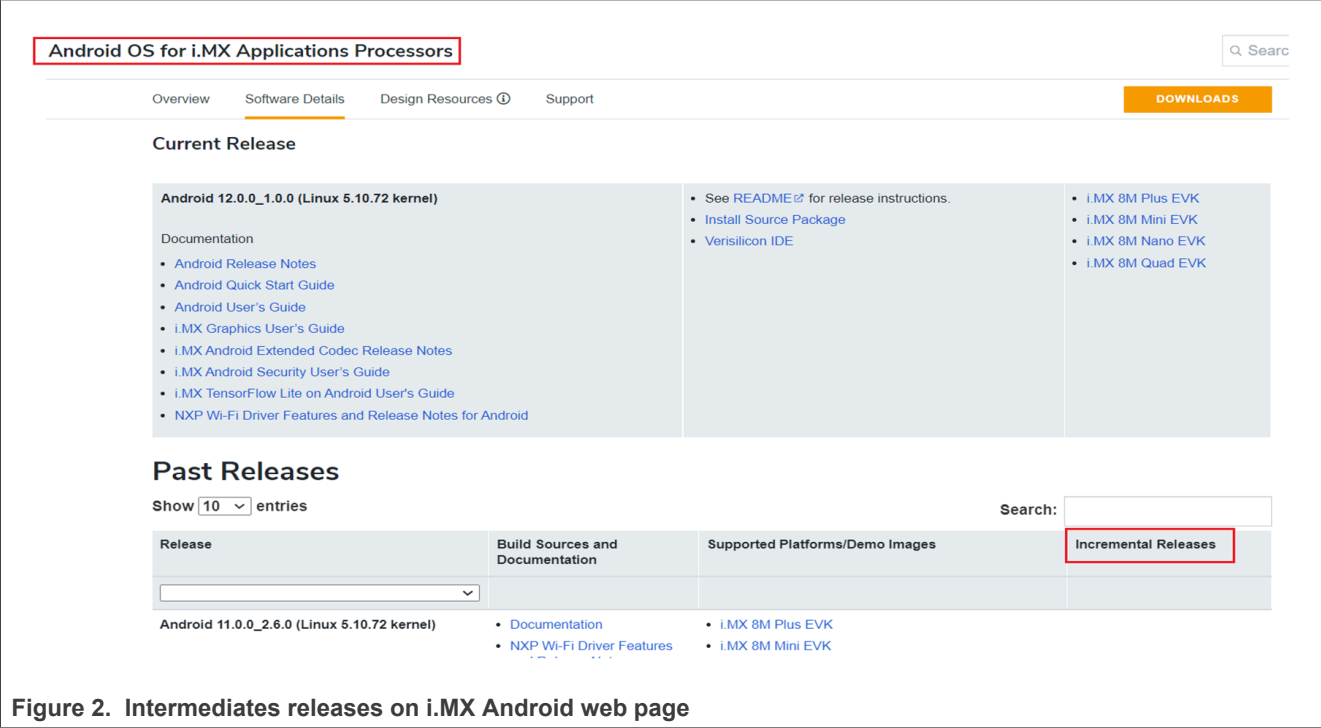


Figure 2. Intermediates releases on i.MX Android web page

3 Feature lists

3.1 Wi-Fi radio

3.1.1 Client mode

Table 2. Feature list for Wi-Fi radio and client mode

Features	Sub features	PCIe-UART		SD-UART				
		88W8997	88W9098	88W9098	IW611/ IW612	88W8997	88W8987	IW416
802.11n - High throughput (HT)	2.4 GHz band operation supported channel bandwidth: 20 MHz	Y	Y	Y	Y	Y	Y	Y
	2.4 GHz band supported channel bandwidths: 40 MHz ^[1]	Y	Y	Y	Y	Y	Y	Y
	5 GHz band supported channel bandwidths: 20 MHz	Y	Y	Y	Y	Y	Y	Y
	5 GHz band supported channel bandwidths: 40 MHz	Y	Y	Y	Y	Y	Y	Y
	Short/long guard interval (400 ns/800 ns)	Y	Y	Y	Y	Y	Y	Y
	802.11 data rates – Up to 72 Mbit/s (MCS 0 to MCS 7)	Y	Y	Y	Y	Y	Y	Y
	802.11 data rates – Up to 150 Mbit/s (MCS 0 to MCS 7)	Y	Y	Y	Y	Y	Y	Y
	802.11 data rates - Up to 300 Mbit/s (MCS 0 to MCS 15)	Y	Y	Y	N	Y	N	N
	One spatial stream (1x1)	Y	Y	Y	Y	Y	Y	Y
	Two spatial streams (2x2)	Y	Y	Y	N	Y	N	N
	HT protection mechanisms	Y	Y	Y	Y	Y	Y	Y
	Explicit Beamformee	Y	Y	Y	N	Y	N	N
	Aggregated MAC protocol data unit (AMPDU) RX support	Y	Y	Y	Y	Y	Y	Y
	Aggregated MAC service data unit (AMSDU) -4k RX support	Y	Y	Y	Y	Y	Y	Y
	20/40 MHz coexistence	Y	Y	Y	Y	Y	N	N
	TX MCS rate adaptation (BGN)	Y	Y	Y	Y	Y	Y	Y

Table 2. Feature list for Wi-Fi radio and client mode...continued

Features	Sub features	PCIe-UART		SD-UART				
		88W8997	88W9098	88W9098	IW611/ IW612	88W8997	88W8987	IW416
802.11n - High throughput (HT) (continued)	RX and TX space time block coding (STBC)	Y	Y	Y	N	Y	N	N
	RX Low Density Parity Check (LDPC)	Y	Y	Y	Y	Y	Y	N
	AMSDU over AMPDU support	Y	Y	Y	Y	Y	Y	Y
802.11ac - Very high throughput (VHT)	5 GHz band supported channel bandwidths: 20 MHz	Y	Y	Y	Y	Y	Y	N
	5 GHz band supported channel bandwidths: 40 MHz	Y	Y	Y	Y	Y	Y	N
	SU-AMPDU Aggregation	Y	Y	Y	Y	Y	Y	N
	5 GHz band supported channel bandwidths: 80 MHz	Y	Y	Y	Y	Y	Y	N
	802.11ac data rates - Up to 433.3 Mbps (MCS 0 to MCS 9) -1x1	Y	Y	Y	Y	Y	Y	N
	802.11ac Data rates - Up to 866.7 Mbps (MCS 0 to MCS 9) -2x2	Y	Y	Y	N	Y	N	N
	Short/long guard interval (400ns/800ns)	Y	Y	Y	Y	Y	Y	N
	MU-MIMO RX – Wave 2	Y	Y	Y	Y	Y	Y	N
	SU-beamformee	Y	Y	Y	Y	Y	Y	N
	MU-MIMO beamformee (explicit and implicit)	Y	Y	Y	Y	Y	Y	N
	RTS/CTS with BW signaling	Y	Y	Y	Y	Y	N	N
	Operation mode notification	Y	Y	Y	Y	Y	Y	N
	Backward compatibility with non-VHT devices	Y	Y	Y	Y	Y	Y	N
	TX VHT MCS rate adaptation	Y	Y	Y	Y	Y	Y	N

Table 2. Feature list for Wi-Fi radio and client mode...continued

Features	Sub features	PCIe-UART		SD-UART				
		88W8997	88W9098	88W9098	IW611/ IW612	88W8997	88W8987	IW416
802.11ax - High efficiency (HE)	5 GHz band supported channel bandwidth: 20MHz	N	Y	Y	Y	N	N	N
	5 GHz band supported channel bandwidth: 40 MHz	N	Y	Y	Y	N	N	N
	5 GHz band supported channel bandwidth: 80MHz	N	Y	Y	Y	N	N	N
	802.11ax data rates – Up to 1.2 Gbps (MCS 0 to MCS 11) – 2x2	N	Y	Y	N	N	N	N
	Operating mode indication (OMI) control	N	Y	Y	Y	N	N	N
	2x/4x HE-long training field (LTF)	N	Y	Y	Y	N	N	N
	UL (TX) and DL (RX) MU-MIMO	N	Y	Y	Y	N	N	N
	UL (TX) and DL (RX) OFDMA	N	Y	Y	Y	N	N	N
	256 QAM modulation – MCS 8 and MCS9	N	Y	Y	Y	N	N	N
	1024 QAM modulation – MCS 10 and MCS11	N	Y	Y	Y	N	N	N
	SU beamforming	N	Y	Y	Y	N	N	N
	TWT	N	Y	Y	Y	N	N	N
	Spatial reuse	N	N	N	Y	N	N	N
	OFDMA (ul/dl, 484 RU)	N	Y	Y	Y	N	N	N
	BSS coloring	N	Y	Y	Y	N	N	N
802.11a/b/g features	802.11b/g data rates – Up to 54 Mbit/s	Y	Y	Y	Y	Y	Y	Y
	802.11a data rates – Up to 54 Mbit/s	Y	Y	Y	Y	Y	Y	Y
	Fragmentation/ defragmentation	Y	Y	Y	Y	Y	Y	Y
	ERP Protection using mac ctrl command (RTS-CTS/ Self-CTS)	Y	Y	Y	Y	Y	Y	Y
	ERP protection, slot time, preamble	Y	Y	Y	Y	Y	Y	Y
	TX rate adaptation (BG)	Y	Y	Y	Y	Y	Y	Y

Table 2. Feature list for Wi-Fi radio and client mode...continued

Features	Sub features	PCIe-UART		SD-UART				
		88W8997	88W9098	88W9098	IW611/ IW612	88W8997	88W8987	IW416
802.11d and 802.11h	802.11d – Regulatory domain/operating class/ country info	Y	Y	Y	Y	Y	Y	Y
	Per-path regulatory power table ^[1]	N	N	N	Y	N	Y	N
	802.11h – Dynamic frequency selection (DFS)	Y	Y	Y	Y	Y	Y	Y
	DFS radar detection in peripheral mode (Follow AP)	Y	Y	Y	Y	Y	Y	Y
802.11e - QoS	EDCA [enhanced distributed channel access] / WMM (wireless multi-media)	Y	Y	Y	Y	Y	Y	Y
802.11i security	Opensource WPA Supplicant Support	Y	Y	Y	Y	Y	Y	Y
	WPA2-PSK AES WPA Supplicant	Y	Y	Y	Y	Y	Y	Y
	WPA3-SAE (Simultaneous Authentication of Equals) WPA Supplicant	Y	Y	Y	Y	Y	Y	Y
	WPA2+WPA3 PSK Mixed Mode (WPA3 Transition Mode) WPA Supplicant	Y	Y	Y	Y	Y	Y	Y
	Wi-Fi Enhanced Open - OWE (Opportunistic Wireless Encryption) WPA Supplicant	Y	Y	Y	Y	Y	Y	Y
	802.1x EAP Authentication Methods WPA Supplicant	Y	Y	Y	Y	Y	Y	Y
	WPA2-Enterprise Mixed Mode WPA Supplicant	Y	Y	Y	Y	Y	Y	Y
	WPA3-Enterprise (Suite-B) National Security Algorithm (CSNA) WPA Supplicant	Y	Y	Y	Y	Y	Y	N
	802.11w - PMF (Protected Management Frames) WPA Supplicant	Y	Y	Y	Y	Y	Y	Y
	WPA3 Enterprise	Y	Y	Y	Y	Y	Y	Y
802.11mc	Wi-Fi location ^[1]	N	Y	Y	Y	N	N	N

Table 2. Feature list for Wi-Fi radio and client mode...continued

Features	Sub features	PCIe-UART		SD-UART				
		88W8997	88W9098	88W9098	IW611/ IW612	88W8997	88W8987	IW416
WPA3 SAE (R3) security	Simultaneous authentication of equals (SAE)	Y	Y	Y	Y	Y	Y	Y
	SAE Connectivity and PMK Caching	Y	Y	Y	Y	Y	Y	Y
	WPA2 Personal Compatibility	Y	Y	Y	Y	Y	Y	Y
	Anti-Clogging	Y	Y	Y	Y	Y	Y	Y
	SAE Finite Cyclic Group – Group-19, Group 20, Group-21	Y	Y	Y	Y	Y	Y	Y
	Reflection Attack	Y	Y	Y	Y	Y	Y	Y
	Suite B – 192-bit security ECC p384	Y	Y	Y	Y	Y	Y	N
	Suite B – 192-bit security RSA 3K	Y	Y	Y	Y	Y	Y	N
	Wi-Fi enhanced open	Y	Y	Y	Y	Y	Y	Y
	WPA3 host-based	Y	Y	Y	Y	Y	Y	Y
802.11r - Fast BSS transition (FT)	FT over air and over distribution system (DS) (open, WPA2-PSK)	Y	Y	Y	Y	Y	Y	Y
802.11k	802.11k	Y	Y	Y	Y	Y	Y	Y
802.11v	802.11v	Y	Y	Y	Y	Y	Y	Y
802.11az	New generation Wi-Fi location ^[1]	N	N	N	Y	N	N	N
FIPS	FIPS support ^[2]	Y	Y	Y	Y	Y	Y	Y
802.11w - Protected management frames (PMF)	PMF require and capable	Y	Y	Y	Y	Y	Y	Y
	Unicast management frames - Encryption/decryption - using CCMP	Y	Y	Y	Y	Y	Y	Y
	Broadcast management frames - Encryption/decryption - using BIP	Y	Y	Y	Y	Y	Y	Y
	SA query request/response	Y	Y	Y	Y	Y	Y	Y
	PMF Support using Opensource WPA	Y	Y	Y	Y	Y	Y	Y
Power save mode	Deep sleep	Y	Y	Y	Y	Y	Y	Y
	IEEE power save	Y	Y	Y	Y	Y	Y	Y

Table 2. Feature list for Wi-Fi radio and client mode...continued

Features	Sub features	PCIe-UART		SD-UART				
		88W8997	88W9098	88W9098	IW611/ IW612	88W8997	88W8987	IW416
General features	EU adaptivity support	Y	Y	Y	Y	Y	Y	Y
	MAC address randomization (in scan)	Y	Y	Y	Y	Y	Y	Y
	Host based MLME ^[3]	Y	Y	Y	Y	Y	Y	Y
	Extended channel switch announcement (ECSA)	Y	Y	Y	Y	Y	Y	Y
	DCM	N	Y	Y	Y	N	N	N
	Wireless Android auto ^[2]	N	Y	Y	Y	N	Y	N
	mDNS (Bonjour) offload	Y	Y	Y	Y	Y	Y	Y
	Extended range ^[1]	N	Y	Y	Y	N	N	N
	Wi-Fi agile multiband	N	Y	Y	Y	N	N	N
	Auto Reconnect	N	N	N	Y	N	N	N
	Independent reset (In-band)	Y	Y	Y	Y	Y	Y	Y
	Specific scan (scancfg)	Y	Y	Y	Y	Y	Y	Y
	Network scan (iwlist scan)	Y	Y	Y	Y	Y	Y	Y
	Cancellable scan	Y	Y	Y	Y	Y	Y	Y
	Passive to active scan	Y	Y	Y	Y	Y	Y	Y

[1] Contact your support representative to use this feature.

[2] Not Validated using Android BSP. Contact your NXP representative for more details.

[3] Features are enabled by default in the software.

3.1.2 AP mode

Table 3. Feature list for Wi-Fi radio and AP mode

Features	Sub features	PCIe-UART		SD-UART				
		88W8997	88W9098	88W9098	IW611/ IW612	88W8997	88W8987	IW416
802.11n - High throughput (HT)	Short/long guard interval (400 ns/800 ns)	Y	Y	Y	Y	Y	Y	Y
	802.11n data rates – Up to 72 Mbit/s (MCS0 to MCS7)	Y	Y	Y	Y	Y	Y	Y
	5 GHz band supported channel bandwidths: 20 MHz	Y	Y	Y	Y	Y	Y	Y
	5 GHz band supported channel bandwidths: 40 MHz	Y	Y	Y	Y	Y	Y	Y
	802.11n data rates – Up to 150 Mbit/s (MCS0 to MCS7)	Y	Y	Y	Y	Y	Y	Y
	802.11n data rates - Up to 300 Mbit/s (MCS0 to MCS15)	Y	Y	Y	N	Y	N	N
	TX MCS rate adaptation (BGN)	Y	Y	Y	Y	Y	Y	Y
	20/40 MHz coexistence	Y	Y	Y	Y	Y	N	N
	Aggregated MAC protocol data unit (AMPDU) TX and RX support	Y	Y	Y	Y	Y	Y	Y
	Aggregated MAC service data unit (AMSDU) - 4k RX support	Y	Y	Y	Y	Y	Y	Y
	HT protection mechanisms	Y	Y	Y	Y	Y	Y	Y
	RX low density parity check (LDPC)	Y	Y	Y	Y	Y	Y	N
	HT Duplicate mode (MCS32)	Y	Y	Y	Y	Y	Y	Y
802.11b/g features	802.11b/g data rates – Up to 54 Mbit/s	Y	Y	Y	Y	Y	Y	Y
	TX rate adaptation (BG)	Y	Y	Y	Y	Y	Y	Y
	ERP protection, slot time, preamble	Y	Y	Y	Y	Y	Y	Y
	Handling of associated STAs with IEEE PS - null data	Y	Y	Y	Y	Y	Y	Y

Table 3. Feature list for Wi-Fi radio and AP mode...continued

Features	Sub features	PCIe-UART		SD-UART				
		88W8997	88W9098	88W9098	IW611/ IW612	88W8997	88W8987	IW416
802.11ac - Very high throughput (VHT)	5 GHz band supported channel bandwidths: 20 MHz	Y	Y	Y	Y	Y	Y	N
	5 GHz band supported channel bandwidths: 40 MHz	Y	Y	Y	Y	Y	Y	N
	5 GHz band supported channel bandwidths: 80 MHz	Y	Y	Y	Y	Y	Y	N
	Short/Long Guard Interval (400ns/800ns)	Y	Y	Y	Y	Y	Y	N
	802.11ac data rates – Up to 433.3 Mbps (MCS 0 to MCS 9)	Y	Y	Y	Y	Y	Y	N
	802.11ac data rates - Up to 866.7 Mbps (MCS 0 to MCS 9)	Y	Y	Y	N	Y	N	N
	Single user (SU)- Aggregated MAC protocol data unit (SU-AMPDU) aggregation	Y	Y	Y	Y	Y	Y	N
	RTS/CTS with BW signaling	Y	Y	Y	Y	Y	Y	N
	Backward Compatibility with non-VHT devices	Y	Y	Y	Y	Y	Y	N
	TX VHT MCS rate adaptation	Y	Y	Y	Y	Y	Y	N
	Operation Mode Notification	Y	Y	Y	Y	Y	Y	N
	Explicit Beamformer	Y	Y	Y	N	Y	N	N
	SU-Beamformee	Y	Y	Y	Y	Y	Y	N
	256 QAM Modulation - MCS8 and MCS9	Y	Y	Y	Y	Y	Y	N

Table 3. Feature list for Wi-Fi radio and AP mode...continued

Features	Sub features	PCIe-UART		SD-UART				
		88W8997	88W9098	88W9098	IW611/ IW612	88W8997	88W8987	IW416
802.11 ax - High efficiency (HE)	5 GHz band supported channel bandwidth: 20MHz	N	Y	Y	Y	N	N	N
	5 GHz band supported channel bandwidth: 40 MHz	N	Y	Y	Y	N	N	N
	5 GHz band supported channel bandwidth: 80 MHz	N	Y	Y	Y	N	N	N
	Operating mode indication (OMI) control	N	Y	Y	Y	N	N	N
	2x/4x HE-Long training field (LTF)	N	Y	Y	Y	N	N	N
	256 QAM modulation – MCS8 and MCS9	N	Y	Y	Y	N	N	N
	1024 QAM modulation – MCS10 and MCS11	N	Y	Y	Y	N	N	N
	SU beamforming	N	Y	Y	N	N	N	N
802.11d	802.11d - Regulatory domain/operating class/ country info	Y	Y	Y	Y	Y	Y	Y
802.11h	802.11h – Dynamic frequency selection (DFS)	Y	Y	Y	Y	Y	Y	Y
802.11e - QoS	Enhanced distributed channel access (EDCA) / wireless multi-media (WMM)	Y	Y	Y	Y	Y	Y	Y

Table 3. Feature list for Wi-Fi radio and AP mode...continued

Features	Sub features	PCIe-UART		SD-UART				
		88W8997	88W9098	88W9098	IW611/ IW612	88W8997	88W8987	IW416
802.11i security	Hostapd Support	Y	Y	Y	Y	Y	Y	Y
	WPA2-PSK AES hostapd	Y	Y	Y	Y	Y	Y	Y
	WPA3-SAE (Simultaneous Authentication of Equals) Hostapd	Y	Y	Y	Y	Y	Y	Y
	WPA2+WPA3 PSK Mixed Mode (WPA3 Transition Mode) Hostapd	Y	Y	Y	Y	Y	Y	Y
	Wi-Fi Enhanced Open - OWE (Opportunistic Wireless Encryption) Hostapd	Y	Y	Y	Y	Y	Y	Y
	802.1x EAP Authentication Methods Hostapd	N	N	N	N	N	N	Y
	802.11w - PMF (Protected Management Frames) Hostapd	Y	Y	Y	Y	Y	Y	Y
WPA3 SAE (R3) security	Simultaneous authentication of equals (SAE)	Y	Y	Y	Y	Y	Y	Y
	SAE connectivity and PMK caching	Y	Y	Y	Y	Y	Y	Y
	Wi-Fi enhanced open	Y	Y	Y	Y	Y	Y	N
	WPA3 Enterprise Suite-B Host (host based)	Y	Y	Y	Y	Y	Y	N
802.11w - Protected Management Frames (PMF)	PMF require and capable	Y	Y	Y	Y	Y	Y	Y
	Unicast management frames - Encryption/decryption - using CCMP	Y	Y	Y	Y	Y	Y	Y
	Support using Hostapd	Y	Y	Y	Y	Y	Y	Y
	Broadcast management frames - Encryption/decryption - using BIP	Y	Y	Y	Y	Y	Y	Y
	SA query request/response	Y	Y	Y	Y	Y	Y	Y

Table 3. Feature list for Wi-Fi radio and AP mode...continued

Features	Sub features	PCIe-UART		SD-UART				
		88W8997	88W9098	88W9098	IW611/ IW612	88W8997	88W8987	IW416
General features	EU adaptivity support	Y	Y	Y	Y	Y	Y	Y
	Automatic channel selection (ACS)	Y	Y	Y	Y	Y	Y	Y
	Host-based MLME ^[1]	Y	Y	Y	Y	Y	Y	Y
	Extended channel switch announcement (ECSA)	Y	Y	Y	Y	Y	Y	Y
	Max supported stations	8	16	16	16	8	8	8
	Independent reset (In-band)	Y	Y	Y	Y	Y	Y	Y
	Hidden SSID (broadcast SSID disabled)	Y	Y	Y	Y	Y	Y	Y
	MAC Address Filter (Allowed/Denied List)	Y	Y	Y	Y	Y	Y	Y
	STA age out feature for associated clients	Y	Y	Y	Y	Y	Y	Y
	Vendor defined txpower config (txpower config V3)	N	Y	Y	Y	N	N	N
	Maximum STA MAC address filtering	16	64	64	16	16	16	16

[1] Features are enabled by default in the software.

3.1.3 Wi-Fi direct/P2P

Table 4. Feature list for Wi-Fi direct/P2P

Features	Sub features	PCIe-UART		SD-UART				
		88W8997	88W9098	88W9098	IW611/ IW612	88W8997	88W8987	IW416
P2P basic functionality	Autonomous GO mode	Y	Y	Y	Y	Y	Y	Y
	WFD client mode	Y	Y	Y	Y	Y	Y	Y
	P2P device mode	Y	Y	Y	Y	Y	Y	Y

3.1.4 AP/STA mode

Table 5. Feature list for Wi-Fi direct/P2P

Features	Sub features	PCIe-UART		SD-UART				
		88W8997	88W9098	88W9098	IW611/ IW612	88W8997	88W8987	IW416
Software antenna diversity	Software antenna diversity ^[1]	N	N	N	Y	N	Y	Y
RF test mode	RF test mode functionality	Y	Y	Y	Y	Y	Y	Y
TX power config	TX power config	Y	Y	Y	Y	Y	Y	Y
Simultaneous AP-STA operation	AP-STA functionality (same channel)	Y	Y	Y	Y	Y	Y	Y
Auto FW recovery	Auto firmware recovery on fatal error	Y	Y	Y	Y	Y	N	Y
Auto ARP and Ping	Auto ARP and ping support	Y	Y	Y	Y	Y	Y	Y
Secure boot	Secure boot	N	N	N	Y	N	N	N

[1] Contact your support representative to use this feature.

3.2 Bluetooth

3.2.1 Bluetooth classic

Table 6. Feature list for Bluetooth radio

Features and sub features	PCIe-UART		SD-UART				
	88W8997	88W9098	88W9098	88W8997	88W8987	IW416	IW611/ IW612
General features							
Bluetooth Class 1.5 and Class 2 support	Y	Y	Y	Y	Y	Y	Y
Scatternet support	Y	Y	Y	Y	Y	Y	Y
Maximum of seven simultaneous ACL connections – central links	Y	Y	Y	Y	Y	Y	Y
Automatic Packet Type Selection	Y	Y	Y	Y	Y	Y	Y
Bluetooth - 2.1 to 5.0 Specification Support	Y	Y	Y	Y	Y	Y	Y
Independent reset (In-band & OOB ^[1] ^[2])	Y	Y	Y	Y	Y	Y	Y
Low power sniff	Y	Y	Y	Y	Y	Y	Y
Bluetooth Truncated Paging	Y	Y	Y	Y	Y	Y	Y
Erroneous Data Reporting	Y	Y	Y	Y	Y	Y	Y
Encryption Pause and Resume	Y	Y	Y	Y	Y	Y	Y
Extended Inquiry Response	Y	Y	Y	Y	Y	Y	Y
Link Supervision Timeout Changed Event	Y	Y	Y	Y	Y	Y	Y
Non-Automatically-Flushable Packet Boundary Flag	Y	Y	Y	Y	Y	Y	Y
Sniff Sub rating	Y	Y	Y	Y	Y	Y	Y
AES Encryption ^[1]	N	Y	Y	N	N	Y	Y
Enhanced Power Control	Y	Y	Y	Y	Y	Y	Y
HCI Read Encryption Key Size command	Y	Y	Y	Y	Y	Y	Y
Payload – 27bytes to 234 bytes	Y	Y	Y	Y	Y	Y	Y
Enhancements to L2CAP for Low Energy	Y	Y	Y	Y	Y	Y	Y
PCM Loopback Mode	Y	Y	Y	Y	Y	Y	Y
Enhancements to GAP for Low Energy	Y	Y	Y	Y	Y	Y	Y
SCO/eSCO over PCM	Y	Y	Y	Y	Y	Y	Y
APCF Feature support	Y	Y	Y	Y	Y	Y	Y
Maximum 16 Bluetooth LE connections (Central role)	Y	Y	Y	Y	Y	Y	Y

Table 6. Feature list for Bluetooth radio...continued

Features and sub features	PCIe-UART		SD-UART				
	88W8997	88W9098	88W9098	88W8997	88W8987	IW416	IW611/ IW612
Bluetooth packet types supported							
ACL (DM1, DH1, DM3, DH3, DM5, DH5, 2-DH1, 2-DH3, 2-DH5, 3-DH1, 3-DH3, 3-DH5)	Y	Y	Y	Y	Y	Y	Y
SCO (HV1, HV3)	Y	Y	Y	Y	Y	Y	Y
eSCO (EV3, EV4, EV5, 2EV3, 3EV3, 2EV5, 3EV5)	Y	Y	Y	Y	Y	Y	Y
Bluetooth Profiles Supported							
A2DP Source/Sink	Y	Y	Y	Y	Y	Y	Y
AVRCP Target/Controller	Y	Y	Y	Y	Y	Y	Y
HFP Gateway	Y	Y	Y	Y	Y	Y	Y
OPP Server/Client	Y	Y	Y	Y	Y	Y	Y
SPP	Y	Y	Y	Y	Y	Y	Y
HID	Y	Y	Y	Y	Y	Y	Y
GAP	Y	Y	Y	Y	Y	Y	Y
HFP Dev ^[1]	N	Y	Y	N	N	N	Y
PAN ^[1]	Y	Y	Y	Y	Y	Y	Y
Bluetooth dual profiles supported^[1]							
Dual A2DP (2 Source)	N	Y	Y	N	N	N	N
Dual A2DP (1 Source + 1 Sink)	N	Y	Y	N	N	N	N
Dual HFP (1 WBS/1NBS) PCM	N	Y	Y	N	N	N	N
Dual HFP (2 NBS) PCM)	N	Y	Y	N	N	N	N
Bluetooth audio features							
PCM NBS central/peripheral	Y	Y	Y	Y	Y	Y	Y
PCM WBS central/peripheral	Y	Y	Y	Y	Y	Y	Y
AAC and LDAC audio codec support ^[1]	N	Y	Y	N	N	N	N

[1] Contact your support representative to use this feature.

[2] In-band (Independent Reset)IR can directly work with M.2 based modules on i.MX but OOB IR needs the external uSD muRata adaptor board with M.2 module

Note: Additional Vendor Specific Command is required to support the PCM WBS for IW611/IW612.

3.2.2 Bluetooth LE

Table 7. Feature list for Bluetooth LE radio

Features and sub features	PCIe-UART		SD-UART				
	88W8997	88W9098	88W9098	88W8997	88W8987	IW416	IW611/ IW612
Bluetooth profiles							
Bluetooth LE GATT	Y	Y	Y	Y	Y	Y	Y
Bluetooth LE HOGP	Y	Y	Y	Y	Y	Y	Y
Bluetooth LE GAP	Y	Y	Y	Y	Y	Y	Y
Low Energy Physical Layer	Y	Y	Y	Y	Y	Y	Y
Low Energy Link Layer	Y	Y	Y	Y	Y	Y	Y
Bluetooth 4.0							
Enhancements to HCI for Low Energy	Y	Y	Y	Y	Y	Y	Y
Low Energy Direct Test Mode	Y	Y	Y	Y	Y	Y	Y
Bluetooth LE - 1Mbit/s support	Y	Y	Y	Y	Y	Y	Y
Bluetooth 4.1							
Low duty Cycle Directed Advertising	Y	Y	Y	Y	Y	Y	Y
Bluetooth LE Dual Mode Topology	Y	Y	Y	Y	Y	Y	Y
Bluetooth LE Privacy v1.1	Y	Y	Y	Y	Y	Y	Y
Bluetooth LE Link Layer Topology	Y	Y	Y	Y	Y	Y	Y
Bluetooth 4.2							
Bluetooth LE secure connection	Y	Y	Y	Y	Y	Y	Y
Bluetooth LE Link Layer Privacy v1.2	Y	Y	Y	Y	Y	Y	Y
Bluetooth LE Data Length Extension	Y	Y	Y	Y	Y	Y	Y
Link Layer Extended Scanner Filter Policies	Y	Y	Y	Y	Y	Y	Y
Bluetooth 5.0							
Bluetooth LE 2 Mbps Support	Y	Y	Y	Y	Y	Y	Y
Bluetooth LE Multiple Advertisement (4 or 6*) Sets ^[1]	Y	Y	Y	Y	Y	Y	Y*
Bluetooth LE Extended Advertisement	N	N	N	N	N	Y	Y
High Duty Cycle Directed Advertising	Y	Y	Y	Y	Y	Y	Y
Bluetooth LE Long Range ^[1]	N	Y	Y	N	N	Y	Y
Bluetooth 5.2							
Bluetooth LE Power Control ^[1]	N	N	N	N	N	N	Y
Isochronous Channel ^[1]	N	N	N	N	N	N	Y

Table 7. Feature list for Bluetooth LE radio...continued

Features and sub features	PCIe-UART		SD-UART				
	88W8997	88W9098	88W9098	88W8997	88W8987	IW416	IW611/ IW612
BCA-TDM mode (shared antenna)							
STA + Bluetooth Coex	Y	N	N	Y	Y	Y	Y
STA + Bluetooth LE Coex	Y	N	N	Y	Y	Y	Y
STA + Bluetooth + Bluetooth LE Coex	Y	N	N	Y	Y	Y	Y
AP + Bluetooth Coex	Y	N	N	Y	Y	Y	Y
AP + Bluetooth LE Coex	Y	N	N	Y	Y	Y	Y
LE audio features ^{[2][3]}							
CIS source	N	N	N	N	N	N	Y
CIS sink	N	N	N	N	N	N	Y
CIG validation	N	N	N	N	N	N	Y
Phy: 1M/2M	N	N	N	N	N	N	Y
Mono (for 1 and 2 streams) and stereo (for 1 stream)	N	N	N	N	N	N	Y
Unframed mode	N	N	N	N	N	N	Y
Sequential packing	N	N	N	N	N	N	Y
CIS encrypted audio	N	N	N	N	N	N	Y
ISO interval for LE audio: 7.5 ms, 10 ms, 20 ms, 30 ms	N	N	N	N	N	N	Y
Bit rate: up to 96 kbps	N	N	N	N	N	N	Y
1-CIS over one LE ACL and 2-CIS over two separate LE ACL	N	N	N	N	N	N	Y

[1] Not Validated using Android BSP. Contact your NXP representative for more details.

[2] Contact your support representative to use this feature.

[3] IW611/IW612 firmware supported feature.

3.3 Coexistence

3.3.1 Wi-Fi and Bluetooth coexistence

Table 8. Feature list for Wi-Fi and Bluetooth coexistence

Features and sub features	PCIe-UART		SD-UART				
	88W8997	88W9098	88W9098	88W8997	88W8987	IW416	IW611/ IW612
BCA-TDM mode (shared antenna)							
AP + Bluetooth + Bluetooth LE Coex	Y	N	N	Y	Y	Y	Y
P2P + Bluetooth Coex	Y	N	N	Y	Y	Y	Y
P2P + Bluetooth LE Coex	Y	N	N	Y	Y	Y	Y
P2P + Bluetooth + Bluetooth LE Coex	Y	N	N	Y	Y	Y	Y
AP(5GHz) + AP(5GHz) + Bluetooth Coex	Y	N	N	Y	N	N	Y
AP(5GHz) + AP(5GHz) + Bluetooth LE Coex	Y	N	N	Y	N	N	Y
BCA-TDM mode (separate antenna)							
STA + Bluetooth Coex	N	Y	Y	N	N	N	Y ^[1]
STA + Bluetooth LE Coex	N	Y	Y	N	N	N	Y ^[1]
STA + Bluetooth + Bluetooth LE Coex	N	Y	Y	N	N	N	Y ^[1]
AP + Bluetooth Coex	N	Y	Y	N	N	N	Y ^[1]
AP + Bluetooth LE Coex	N	Y	Y	N	N	N	Y ^[1]
AP + Bluetooth + Bluetooth LE Coex	N	Y	Y	N	N	N	Y ^[1]
P2P + Bluetooth Coex	N	Y	Y	N	N	N	Y ^[1]
P2P + Bluetooth LE Coex	N	Y	Y	N	N	N	Y ^[1]
P2P + Bluetooth + Bluetooth LE Coex	N	Y	Y	N	N	N	Y ^[1]
AP(5GHz) + AP(5GHz) + Bluetooth Coex	N	Y	Y	N	N	N	Y ^[1]
AP(5GHz) + AP(5GHz) + Bluetooth LE Coex	N	Y	Y	N	N	N	Y ^[1]
External coex							
External Coex (hardware interface)	N	Y	Y	N	N	Y	N

[1] Features are tested on the i.MX8M Mini Host platform with NXP reference board.

3.3.2 Notes on coexistence

P2P-GO and STA simultaneous mode operations

In this case, P2P-GO and STA modes are active simultaneously where STA has connected to an external AP. If the external-AP switches channel, the P2P-GO stops in case of i.MX Android. The Wi-Fi firmware does not support Dual Channel Radio Concurrency. It means P2P-GO and STA cannot stay on two different channels simultaneously.

In Android, there is only a single wpa_supplicant instance. It would disable the least prioritized interface (P2P) and stop the P2P. In this wpa_supplicant behavior, the firmware does not get a chance to move the P2P-GO to the same channel as STA.

Workaround: The variable `num_multichan_concurrent` can be assigned value 2 in the function `sme_send_authentication` of the file "sme.c" [filepath: `android_build/external/wpa_supplicant_8/wpa_supplicant/`] in wpa_supplicant source.

After this change, supplicant will not stop the P2P-GO and allow the firmware to move P2P-GO on the same channel as STA.

How to apply changes:

In wpa_supplicant source, the function `wiphy_info_iface_comb_process` at line 195 of file `src/drivers/driver_nl80211_capa.c`, the `num_channels` variable should be set to 2.

```
if (combination_has_p2p && combination_has_mgd) {  
    -     unsigned int num_channels =  
    -         nla_get_u32(tb_comb[NL80211_IFACE_COMB_NUM_CHANNELS]);  
    +     unsigned int num_channels = 2;  
}
```

After you have implemented the changes described above, build wpa_supplicant. Now, you can see P2P-GO on the same channel as STA when external-AP switches the channel.

4 Release notes for the supported SoCs

4.1 PCIe-UART 88W8997

4.1.1 Package information

- Android BSP version: 15.0.0_1.2.0
- Wi-Fi and Bluetooth/Bluetooth LE Firmware version: 16.92.21.p149.2
- Driver version: MM6X16505.p14-GPL

4.1.2 Version information

- Wireless SoC: 88W8997
- Wi-Fi and Bluetooth/Bluetooth LE Firmware Version: 16.92.21.p149.2
 - 16 - Major revision
 - 92 - Feature pack
 - 21 - Release version
 - p149.2 - Patch number
- Driver Version: MM6X16505.p14-GPL
 - 6X - Linux 6.x Kernel
 - 16505 - Release version
 - p14 - Patch number
 - GPL - General Public License v2

4.1.3 Host platform

- MCIMX8M-EVK platform running Android
- Interface used
 - Wi-Fi over PCIE
 - Bluetooth/Bluetooth LE over UART
- Test Tools
 - iperf3
 - wpa_supplicant (version 2.10)
 - hostapd (version 2.10)
 - Wi-Fi Vendor HAL (version M009.019_M009.030_Android_14)

4.1.4 Wi-Fi and Bluetooth certification

The Wi-Fi and Bluetooth certification is obtained with the following combinations.

4.1.4.1 Wi-Fi pre-certifications

- STA | 802.11n
- STA | 802.11ac
- STA | PMF
- STA | VU
- STA | FFD
- STA | Security Improvement
- STA | WPA-SAE R3

Note:

- Download Labtool application for RF test mode [ref.\[5\]](#).
- Download Sigma tool and QTT agent [ref.\[11\]](#).

4.1.4.2 Bluetooth controller certification

Refer to [ref.\[9\]](#).

4.1.5 Wi-Fi throughput

4.1.5.1 Throughput test setup

- Environment: Shield Room - Over the Air
- External Access Point: Asus RT-AX88U (FW-3.0.0.4.386_41700)
- DUT: 88W8997-Murata (module: **LBEE5XV1YM**) with MCIMX8M-EVK platform
 - Driver load parameters:

```
cal_data_cfg=none, cfg80211_wext=0xf, host_mlme=1, amsdu_deaggr=1, net_rx=1,  
tx_skb_clone=1, tx_work=1
```

- iPerf commands:

TCP server:

```
#iperf -s -i1 -fm -w 2M
```

TCP client:

```
# iperf -c <ip_address> -i1 -fm -w 2M -t60 -P5
```

UDP server:

```
# iperf -s -u -i1 -fm -w 2M
```

UDP client:

```
# iperf -c <ip_address> -i1 -fm -w 2M -t60 -b 800 -P5
```

Note: You can add iPerf parameters like TCP window size or parallel streams for higher throughput. The above-described iPerf parameters are an example.

- External Client: NXP IW620 PCIe-UART
- Channel: 6 | 36

4.1.5.2 STA throughput

External AP: Asus RT-AX88U

Table 9. STA Mode Throughput - BGN Mode | 2.4 GHz Band | 20 MHz

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	116	110	124	120
WPA2-AES	115	110	124	121
WPA3-SAE	114	109	124	120

Table 10. STA Mode Throughput - BGN Mode | 2.4 GHz Band | 40 MHz

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	199	222	228	248
WPA2-AES	199	226	232	241
WPA3-SAE	199	228	234	235

Table 11. STA Mode Throughput - AN Mode | 5 GHz Band | 20 MHz

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	113	125	123	130
WPA2-AES	113	124	123	126
WPA3-SAE	113	124	123	125

Table 12. STA Mode Throughput - AN Mode | 5 GHz Band | 40 MHz

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	203	240	236	255
WPA2-AES	201	245	236	259
WPA3-SAE	205	244	236	259

Table 13. STA Mode Throughput - AC Mode | 5 GHz Band | 20 MHz (VHT)

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	131	151	151	156
WPA2-AES	133	150	145	156
WPA3-SAE	129	150	142	156

Table 14. STA Mode Throughput - AC Mode | 5 GHz Band | 40 MHz (VHT)

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	300	330	335	354
WPA2-AES	299	332	338	342
WPA3-SAE	298	330	337	353

Table 15. STA Mode Throughput - AC Mode | 5 GHz Band | 80 MHz (VHT)

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	542	640	639	680
WPA2-AES	549	643	655	678
WPA3-SAE	532	650	667	679

4.1.5.3 P2P-GO throughput

Table 16. P2P - GO Mode Throughput - BGN Mode | 2.4 GHz Band | 20MHz

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
WPA2-AES	120	140	126	150

Table 17. P2P - GO Mode Throughput - AC Mode | 5 GHz Band | 80 MHz

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
WPA2-AES	590	560	550	555

4.1.5.4 P2P-GC throughput

Table 18. P2P - GC Mode Throughput - BGN Mode | 2.4 GHz Band | 20MHz

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
WPA2-AES	122	144	125	151

Table 19. P2P - GC Mode Throughput - AC Mode | 5 GHz Band | 80 MHz

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
WPA2-AES	595	555	551	554

4.1.5.5 Mobile AP throughput

External client: NXP IW620 PCIe-UART

Table 20. Mobile AP Mode Throughput - BGN Mode | 2.4 GHz Band | 20MHz

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	114	120	119	126
WPA2-AES	115	121	120	122
WPA3-SAE	117	120	122	124

Table 21. Mobile AP Mode Throughput - BGN Mode | 2.4 GHz Band | 40MHz

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	233	254	236	254
WPA2-AES	235	255	240	252
WPA3-SAE	234	252	238	255

Table 22. Mobile AP Mode Throughput - AN Mode | 5 GHz Band | 20 MHz

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	118	122	123	124
WPA2-AES	119	121	123	123
WPA3-SAE	117	124	125	126

Table 23. Mobile AP Mode Throughput - AN Mode | 5 GHz Band | 40 MHz

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	215	240	237	256
WPA2-AES	216	241	238	256
WPA3-SAE	217	240	234	257

Table 24. Mobile AP Mode Throughput - AC Mode | 5 GHz Band | 20 MHz

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	139	144	151	152
WPA2-AES	140	145	150	154
WPA3-SAE	138	142	152	153

Table 25. Mobile AP Mode Throughput - AC Mode | 5 GHz Band | 40 MHz

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	320	325	338	352
WPA2-AES	321	324	336	350
WPA3-SAE	321	320	337	352

Table 26. Mobile AP Mode Throughput - AC Mode | 5 GHz Band | 80 MHz

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	620	580	630	665
WPA2-AES	590	571	620	665
WPA3-SAE	610	577	620	665

4.1.6 EU conformance tests

- EU Adaptivity test - EN 300 328 v2.1.1 (for 2.4 GHz)
- EU Adaptivity test - EN 301 893 v2.1.1 (for 5 GHz)

4.1.7 Bug fixes/feature enhancements

4.1.7.1 Firmware version 16.92.10.p213.4 to 16.92.21.p26.1

Table 27. Firmware version 16.92.10.p213.4 to 16.92.21.p26.1

Component	Description
—	—

4.1.7.2 Firmware version 16.92.21.p26.1 to 16.92.21.p55.3

Table 28. Firmware version 16.92.21.p26.1 to 16.92.21.p55.3

Component	Description
—	NA

4.1.7.3 Firmware version 16.92.21.p55.3 to 17.92.1.p76.2

Table 29. Firmware version 16.92.21.p55.3 to 17.92.1.p76.2

Component	Description
Bluetooth	Random mute pattern observed during A2DP_SRC streaming with Ref1 when OPP_TX started with Ref2 Unknown Connection Identifier observed during connection with 2nd LE HID in presence of 1st LE-HID.

4.1.7.4 Firmware version 17.92.1.p76.2 to 16.92.21.p84.4

Table 30. Firmware version 17.92.1.p76.2 to 16.92.21.p84.4

Component	Description
Wi-Fi	Low throughput is observed in VHT80 mode for RX with all security modes.

4.1.7.5 Firmware version 17.92.21.p84.4 to 16.92.21.p119.3

Table 31. Firmware version 17.92.21.p84.4 to 16.92.21.p119.3

Component	Description
Bluetooth	After disconnecting LE link, sometime disconnect complete event is delayed by 30 seconds. So, the next re-connection is possible only after 30 seconds.

4.1.7.6 Firmware version 17.92.21.p119.3 to 16.92.21.p137.3

Firmware version 17.92.21.p119.3 to 16.92.21.p137.3

Component	Description
—	—

4.1.7.7 Firmware version 17.92.21.p137.3 to 16.92.21.p137.4

Firmware version 17.92.21.p137.3 to 16.92.21.p137.4

Component	Description
—	—

4.1.7.8 Firmware version 17.92.21.p137.4 to 16.92.21.p149.2

Firmware version 17.92.21.p137.4 to 16.92.21.p149.2

Component	Description
—	—

4.1.8 Known issues

Table 32. Known issues

Component	Description
—	—

4.2 PCIe-UART 88W9098

4.2.1 Package information

- Android BSP version: 15.0.0_1.2.0
- Wi-Fi and Bluetooth/Bluetooth LE Firmware version: 17.92.1.p149.60
- Driver version: MM6X17505.p14-GPL

4.2.2 Version information

- Wireless SoC: 88W9098
- Wi-Fi and Bluetooth/Bluetooth LE Firmware Version: 17.92.1.p149.60
 - 17 - Major revision
 - 92 - Feature pack
 - 1 - Release version
 - p149.60 - Patch number
- Driver Version: MM6X17505.p14-GPL
 - 6X - Linux 6.x Kernel
 - 17505 - Release version
 - p14 - Patch number
 - GPL - General Public License v2

4.2.3 Host platform

- MCIMX8M-EVK platform running Android
- Interface used
 - Wi-Fi over PCIE
 - Bluetooth/Bluetooth LE over UART
- Test Tools
 - iperf3
 - wpa_supplicant (version 2.10)
 - hostapd (version 2.10)
 - Wi-Fi Vendor HAL (version M009.019_M009.030_Android_14)

4.2.4 Wi-Fi and Bluetooth certification

The Wi-Fi and Bluetooth certification is obtained with the following combinations.

4.2.4.1 Wi-Fi pre-certifications

- STA | WiFi6 11ax
- STA | Wi-Fi CERTIFIED ac
- STA | Wi-Fi CERTIFIED n
- STA | PMF
- STA | VU
- STA | FFD
- STA | Security Improvement
- STA | WPA-SAE R3

Note:

- Download Labtool application for RF test mode [ref.\[6\]](#).
- Download Sigma tool and QTT agent [ref.\[11\]](#).

4.2.4.2 Bluetooth controller certification

Refer to [ref.\[9\]](#).

4.2.5 Wi-Fi throughput

4.2.5.1 Throughput test setup

- Environment: Shield Room - Over the Air
- External Access Point: Asus RT-AX88U (FW-3.0.0.4.386_49674)
- DUT: 88W9098-Murata (Module: **LBEE5ZZ1XL**) with MCIMX8M-EVK platform
 - Driver load parameters:

```
cal_data_cfg=none, cfg80211_wext=0xf, host_mlme=1, amsdu_deaggr=1, net_rx=1,  
tx_skb_clone=1, tx_work=1
```

- iPerf commands:

TCP server:

```
#iperf -s -i1 -fm -w 2M
```

TCP client:

```
# iperf -c <ip_address> -i1 -fm -w 2M -t60 -P5
```

UDP server:

```
# iperf -s -u -i1 -fm -w 2M
```

UDP client:

```
# iperf -c <ip_address> -i1 -fm -w 2M -t60 -b 800 -P5
```

Note: You can add iPerf parameters like TCP window size or parallel streams for higher throughput. The above-described iPerf parameters are an example.

- External Client: NXP 88W9098 PCIe-UART
- Channel: 6 | 36

4.2.5.2 STA throughput

External AP: Netgear RAX200

Table 33. STA Mode Throughput - BGN Mode | 2.4 GHz Band | 20 MHz

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	113	111	114	118
WPA2-AES	113	111	114	119
WPA3-SAE	113	112	113	120

Table 34. STA Mode Throughput - AN Mode | 5 GHz Band | 20 MHz

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	118	121	125	128
WPA2-AES	117	120	124	128
WPA3-SAE	116	120	124	128

Table 35. STA Mode Throughput - AN Mode | 5 GHz Band | 40 MHz

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	218	251	252	255
WPA2-AES	219	250	250	256
WPA3-SAE	218	251	250	255

Table 36. STA Mode Throughput - AC Mode | 5 GHz Band | 20 MHz (VHT)

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	142	149	148	155
WPA2-AES	141	145	149	155
WPA3-SAE	140	145	148	154

Table 37. STA Mode Throughput - AC Mode | 5 GHz Band | 40 MHz (VHT)

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	331	335	351	350
WPA2-AES	333	334	352	351
WPA3-SAE	330	334	352	350

Table 38. STA Mode Throughput - AC Mode | 5 GHz Band | 80 MHz (VHT)

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	672	656	710	747
WPA2-AES	671	645	711	748
WPA3-SAE	676	656	713	752

Table 39. STA Mode Throughput - AX Mode | MAC2 | 2.4 GHz Band | 20 MHz (HE)

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	172	166	183	185
WPA2-AES	171	167	181	183
WPA3-SAE	172	170	181	182

Table 40. STA Mode Throughput - AX Mode | MAC1 | 5 GHz Band | 20 MHz (HE)

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	233	231	246	255
WPA2-AES	219	227	246	255
WPA3-SAE	225	228	245	255

Table 41. STA Mode Throughput - AX Mode | MAC1 | 5 GHz Band | 40 MHz (HE)

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	412	446	458	498
WPA2-AES	430	442	462	500
WPA3-SAE	420	444	460	500

Table 42. STA Mode Throughput - AX Mode | MAC1 | 5 GHz Band | 80 MHz (HE)

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	742	772	826	946
WPA2-AES	756	783	820	934
WPA3-SAE	741	780	821	935

4.2.5.3 P2P-GO throughput

Table 43. P2P - GO Mode Throughput - BGN Mode | 2.4 GHz Band | 20MHz

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
WPA2-AES	116	111	115	120

Table 44. P2P - GO Mode Throughput - AN Mode | MAC1 | 5 GHz Band | 40 MHz

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
WPA2-AES	243	251	250	253

Table 45. P2P - GO Mode Throughput - AC Mode | 5 GHz Band | 80 MHz

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
WPA2-AES	683	684	736	570

4.2.5.4 P2P-GC throughput

Table 46. P2P - GC Mode Throughput - BGN Mode | 2.4 GHz Band | 20MHz

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
WPA2-AES	117	114	116	119

Table 47. P2P - GC Mode Throughput - AN Mode | MAC1 | 5 GHz Band | 40 MHz

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
WPA2-AES	215	200	249	245

Table 48. P2P - GC Mode Throughput - AC Mode | 5 GHz Band | 80 MHz

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
WPA2-AES	500	675	674	672

4.2.5.5 Mobile AP throughput

External client: NXP 88W9098 PCIe-UART

Table 49. Mobile AP Mode Throughput - BGN Mode | 2.4 GHz Band | 20MHz

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	113	113	114	119
WPA2-AES	112	114	114	119
WPA3-SAE	113	114	116	120

Table 50. Mobile AP Mode Throughput - AN Mode | 5 GHz Band | 20 MHz

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	123	120	126	126
WPA2-AES	123	120	126	126
WPA3-SAE	124	120	126	126

Table 51. Mobile AP Mode Throughput - AN Mode | 5 GHz Band | 40 MHz

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	247	242	251	254
WPA2-AES	247	242	252	254
WPA3-SAE	248	243	253	254

Table 52. Mobile AP Mode Throughput - AC Mode | 5 GHz Band | 20 MHz

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	145	142	149	149
WPA2-AES	146	142	149	149
WPA3-SAE	146	142	155	149

Table 53. Mobile AP Mode Throughput - AC Mode | 5 GHz Band | 40 MHz

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	340	330	351	353
WPA2-AES	339	330	353	352
WPA3-SAE	341	333	354	354

Table 54. Mobile AP Mode Throughput - AC Mode | 5 GHz Band | 80 MHz

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	683	687	531	729
WPA2-AES	683	687	538	729
WPA3-SAE	684	691	539	732

Table 55. Mobile AP Mode Throughput - AX Mode | MAC2 | 2.4 GHz Band | 20 MHz (HE)

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	160	160	154	170
WPA2-AES	155	166	154	169
WPA3-SAE	152	160	154	170

Table 56. Mobile AP Mode Throughput - AX Mode | MAC1 | 5 GHz Band | 20 MHz (HE)

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	237	227	249	233
WPA2-AES	237	228	248	233
WPA3-SAE	237	227	254	234

Table 57. Mobile AP Mode Throughput - AX Mode | MAC1 | 5 GHz Band | 40 MHz (HE)

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	454	429	489	441
WPA2-AES	454	430	491	442
WPA3-SAE	454	429	494	442

Table 58. Mobile AP Mode Throughput - AX Mode | MAC1 | 5 GHz Band | 80 MHz (HE)

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	770	735	780	827
WPA2-AES	760	730	775	835
WPA3-SAE	765	735	771	830

4.2.6 EU conformance tests

- EU Adaptivity test - EN 300 328 v2.1.1 (for 2.4 GHz)
- EU Adaptivity test - EN 301 893 v2.1.1 (for 5 GHz)

4.2.7 Bug fixes/feature enhancements

4.2.7.1 Firmware version 17.92.1.p136.13 to 17.92.1.p136.24

Table 59. Firmware version 17.92.1.p136.13 to 17.92.1.p136.24

Component	Description
Coex	OPP file transfer gets failed while OPP file transfer is ongoing and Wi-Fi traffic initiated with 2.4GHz external AP.

4.2.7.2 Firmware version 17.92.1.p136.24 to 17.92.1.p136.131

Table 60. Firmware version 17.92.1.p136.24 to 17.92.1.p136.131

Component	Description
Wi-Fi	Wake-up card timeout is seen when performing suspend & resume stress test with iMX8 host.

4.2.7.3 Firmware version 17.92.1.p136.131 to 17.92.1.p136.132

Firmware version 17.92.1.p136.131 to 17.92.1.p136.132

Component	Description
—	—

4.2.7.4 Firmware version 17.92.1.p136.132 to 17.92.1.p149.131

Firmware version 17.92.1.p136.132 to 17.92.1.p149.131

Component	Description
Bluetooth	A2DP Audio glitches heard while audio streaming and OPP file transfer to another reference device at the same time.

4.2.7.5 Firmware version 17.92.1.p149.131 to 17.92.1.149.43

Firmware version 17.92.1.p149.131 to 17.92.1.149.43

Component	Description
Bluetooth	After Bluetooth firmware is downloaded on in-band reset, sometimes the firmware fails to respond to HCI reset and is not able to bring up Bluetooth interface.

4.2.7.6 Firmware version 17.92.1.p149.43 to 17.92.1.149.156

Firmware version 17.92.1.p149.43 to 17.92.1.149.156

Component	Description
—	—

4.2.7.7 Firmware version 17.92.1.p149.156 to 17.92.1.149.53

Firmware version 17.92.1.p149.156 to 17.92.1.149.53

Component	Description
—	—

4.2.7.8 Firmware version 17.92.1.p149.53 to 17.92.1.149.60

Firmware version 17.92.1.p149.53 to 17.92.1.149.60

Component	Description
—	—

4.2.8 Known issues

Table 61. Known issues

Component	Description
—	—

4.3 SD-UART 88W8987

4.3.1 Package information

- Android BSP version: 15.0.0_1.2.0
- Wi-Fi and Bluetooth/Bluetooth LE Firmware version: 16.92.21.p149.2
- Driver version: MM6X16505.p14-GPL

4.3.2 Version information

- Wireless SoC: 88W8987
- Wi-Fi and Bluetooth/Bluetooth LE Firmware Version: 16.92.21.p149.2
 - 16 - Major revision
 - 92 - Feature pack
 - 21 - Release version
 - p149.2 - Patch number
- Driver Version: MM6X16505.p14-GPL
 - 6X - Linux 6.x Kernel
 - 16505 - Release version
 - p14 - Patch number
 - GPL - General Public License v2

4.3.3 Host platform

- MCIMX8QM-EVK platform running Android
- Interface used
 - Wi-Fi over SDIO (SDIO 3.0 support, Clock speed: 200 MHz)
 - Bluetooth/Bluetooth LE over UART
- Test Tools
 - iperf3
 - wpa_supplicant (version 2.10)
 - hostapd (version 2.10)
 - Wi-Fi Vendor HAL (version M009.019_M009.030_Android_14)

4.3.4 Wi-Fi and Bluetooth certification

The Wi-Fi and Bluetooth certification is obtained with the following combinations.

4.3.4.1 WFA Certifications

- STA | 802.11n
- STA | 802.11ac
- STA | PMF
- STA | FFD
- STA | Security Improvement
- STA | WPA3-R3
- STA | VU

Refer to [ref.\[1\]](#).

Note:

- Download Labtool application for RF test mode [ref.\[4\]](#).
- Download Sigma tool and QTT agent [ref.\[11\]](#).

4.3.4.2 Bluetooth controller certification

Refer to [ref.\[9\]](#).

4.3.5 Wi-Fi throughput

4.3.5.1 Throughput test setup

- Environment: Shield Room - Over the Air
- External Access Point: Asus RT-AX88U (FW-3.0.0.4.386_41700)
- DUT: 88W8987-Murata (**Module: LBEE5QD1ZM**) with MCIMX8M-EVK platform
 - Driver load parameters:

```
cal_data_cfg=none, cfg80211_wext=0xf, host_mlme=1, amsdu_deaggr=1, net_rx=1,  
tx_skb_clone=1, tx_work=1
```

- iPerf commands:

TCP server:

```
#iperf -s -i1 -fm -w 2M
```

TCP client:

```
# iperf -c <ip_address> -i1 -fm -w 2M -t60 -P5
```

UDP server:

```
# iperf -s -u -i1 -fm -w 2M
```

UDP client:

```
# iperf -c <ip_address> -i1 -fm -w 2M -t60 -b 800 -P5
```

Note: You can add iPerf parameters like TCP window size or parallel streams for higher throughput. The above-described iPerf parameters are an example.

- External Client: NXP 88W8987 SD-UART
- Channel: 6 | 36

4.3.5.2 STA throughput

External AP: Asus RT-AX88U

Table 62. STA Mode Throughput - BGN Mode | 2.4 GHz Band | 20 MHz

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	57	59	61	62
WPA2-AES	57	59	61	62
WPA3-SAE	57	59	61	62

Table 63. STA Mode Throughput - AN Mode | 5 GHz Band | 20 MHz (HT)

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	54	58	62	61
WPA2-AES	54	57	62	61
WPA3-SAE	54	57	62	61

Table 64. STA Mode Throughput - AN Mode | 5 GHz Band | 40 MHz (HT)

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	115	128	126	132
WPA2-AES	114	127	124	130
WPA3-SAE	114	128	124	130

Table 65. STA Mode Throughput - AC Mode | 5 GHz Band | 20 MHz (VHT)

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open Security	65	71	75	75
WPA2-AES	64	70	72	74
WPA3-SAE	64	70	72	74

Table 66. STA Mode Throughput - AC Mode | 5 GHz Band | 40 MHz (VHT)

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open Security	142	146	167	163
WPA2-AES	139	148	165	155
WPA3-SAE	142	148	166	154

Table 67. STA Mode Throughput - AC Mode | 5 GHz Band | 80 MHz (VHT)

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	235	339	249	378
WPA2-AES	217	318	233	333
WPA3-SAE	217	318	233	333

4.3.5.3 P2P-GO throughput

Table 68. P2P - GO Mode Throughput - BGN Mode | 2.4 GHz Band | 20MHz

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
WPA2-AES	56	58	61	62

Table 69. P2P - GO Mode Throughput - AC Mode | 5 GHz Band | 80 MHz

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
WPA2-AES	218	312	243	350

4.3.5.4 P2P-GC throughput

Table 70. P2P - GC Mode Throughput - BGN Mode | 2.4 GHz Band | 20 MHz

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
WPA2-AES	52	56	62	63

Table 71. P2P - GC Mode Throughput - AC Mode | 5 GHz Band | 80 MHz

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
WPA2-AES	218	310	240	340

4.3.5.5 Mobile AP throughput

External client: NXP 88W8987 SD-UART

Table 72. Mobile AP Mode Throughput - BGN Mode | 2.4 GHz Band | 20 MHz

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	57	58	62	63
WPA2-AES	57	58	62	63
WPA3-SAE	57	58	62	63

Table 73. Mobile AP Mode Throughput - AN Mode | 5 GHz Band | 20 MHz

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	58	56	58	65
WPA2-AES	53	52	63	61
WPA3-SAE	58	56	60	65

Table 74. Mobile AP Mode Throughput - AN Mode | 5 GHz Band | 40 MHz

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	118	125	126	133
WPA2-AES	116	124	125	131
WPA3-SAE	115	124	125	131

Table 75. Mobile AP Mode Throughput - AC Mode | 5 GHz Band | 20 MHz

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open Security	70	58	76	52
WPA2-AES	69	65	69	62
WPA3-SAE	69	65	68	58

Table 76. Mobile AP Mode Throughput - AC Mode | 5 GHz Band | 40 MHz

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open Security	147	143	161	147
WPA2-AES	146	165	160	162
WPA3-SAE	147	147	160	174

Table 77. Mobile AP Mode Throughput - AC Mode | 5 GHz Band | 80 MHz

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	240	321	270	356
WPA2-AES	226	292	252	359
WPA3-SAE	226	298	252	355

4.3.6 EU conformance tests

- EU Adaptivity test - EN 300 328 v2.1.1 (for 2.4 GHz)
- EU Adaptivity test - EN 301 893 v2.1.1 (for 5 GHz)

4.3.7 Bug fixes/feature enhancements

4.3.7.1 Firmware version 16.92.10.p208 to 16.92.21.p11.1

Table 78. Firmware version 16.92.10.p208 to 16.92.21.p11.1

Component	Description
Bluetooth	Fix for disconnect complete event getting delayed by 30 seconds, so next re-connection was possible only after 30 second

4.3.7.2 Firmware version 16.92.10.p11.1 to 16.92.21.p41.3

Table 79. Firmware version 16.92.10.p11.1 to 16.92.21.p41.3

Component	Description
—	NA

4.3.7.3 Firmware version 16.92.10.p41.3 to 16.92.21.p41.4

Table 80. Firmware version 16.92.10.p41.3 to 16.92.21.p41.4

Component	Description
Bluetooth	DUT as peripheral and DUT as central starts connection for LE link simultaneously, if link with DUT as peripheral gets connected before link with DUT as central then link with DUT as central gets disconnected.

4.3.7.4 Firmware version 16.92.21.p41.4 to 16.92.21.p69.3

Table 81. Firmware version 16.92.21.p41.4 to 16.92.21.p69.3

Component	Description
Bluetooth	DUT pairing with LE HoGP remote device fails with authentication failure error. When DUT connected for HFP call and perform stress test for Bluetooth link connect disconnect then DUT firmware becomes unresponsive
Coex	Sometimes in dual A2DP mode, glitches are observed and Wi-Fi RX throughput drops.

4.3.7.5 Firmware version 16.92.21.p69.3 to 16.92.21.p76.2

Table 82. Firmware version 16.92.21.p69.3 to 16.92.21.p76.2

Component	Description
Bluetooth	When DUT A2DP streaming is ongoing and another LE device is connected with DUT and DUT is performing LE scan makes DUT firmware in bad condition for stress test. DUT is connected for OPP profile with remote device and when transfer file to remote device then Bluetooth link gets disconnected.
Coex	LE peripheral pairing gets failed with Mobile device when Wi-Fi is enabled on a single antenna device.

4.3.7.6 Firmware version 16.92.21.p76.2 to 16.92.21.p76.5

Table 83. Firmware version 16.92.21.p76.2 to 16.92.21.p76.5

Component	Description
—	—

4.3.7.7 Firmware version 16.92.21.p76.5 to 16.92.21.p99.2

Table 84. Firmware version 16.92.21.p76.5 to 16.92.21.p99.2

Component	Description
Bluetooth	When Bluetooth A2DP streaming is ongoing with first remote device then DUT failed for encryption with another LE remote device.

4.3.7.8 Firmware version 16.92.21.p99.2 to 16.92.21.p119.3

Table 85. Firmware version 16.92.21.p99.2 to 16.92.21.p119.3

Component	Description
Bluetooth	After disconnecting LE link, sometime disconnect complete event is delayed by 30 seconds. So the next re-connection is possible only after 30 seconds.

4.3.7.9 Firmware version 16.92.21.p119.3 to 16.92.21.p137.3

Firmware version 16.92.21.p119.3 to 16.92.21.p137.3

Component	Description
Bluetooth	During parallel firmware load, Bluetooth firmware fails to load if Wi-Fi firmware is loaded first, the firmware load sequence should be Bluetooth firmware followed by Wi-Fi firmware.

4.3.7.10 Firmware version 16.92.21.p137.3 to 16.92.21.p142.3

Firmware version 16.92.21.p137.3 to 16.92.21.p142.3

Component	Description
—	—

4.3.7.11 Firmware version 16.92.21.p142.3 to 16.92.21.p149.2

Firmware version 16.92.21.p142.3 to 16.92.21.p149.2

Component	Description
—	—

4.3.8 Known issues

Table 86. Known issues

Component	Description
Bluetooth	Coex cannot be well supported if dual-A2DP feature with TBS is used.

4.4 SD-UART IW416

4.4.1 Package information

- Android BSP version: 15.0.0_1.2.0
- Wi-Fi and Bluetooth/Bluetooth LE Firmware version: 16.92.21.p149.2
- Driver version: MM5X16505.p14-GPL

4.4.2 Version information

- Wireless SoC: IW416
- Wi-Fi and Bluetooth/Bluetooth LE Firmware Version: 16.92.21.p149.2
 - 16 - Major revision
 - 92 - Feature pack
 - 21 - Release version
 - p149.2 - Patch number
- Driver Version: MM5X16505.p14-GPL
 - 5X - Linux 5.x Kernel
 - 16505 - Release version
 - p14 - Patch number
 - GPL - General Public License v2

4.4.3 Host platform

- MCIMX8QM-EVK platform running Android
- Interface used
 - Wi-Fi over SDIO (SDIO 3.0 support, Clock speed: 200 MHz)
 - Bluetooth/Bluetooth LE over UART
- Test Tools
 - iperf3
 - wpa_supplicant (version 2.10)
 - hostapd (version 2.10)
 - Wi-Fi Vendor HAL (version M009.019_M009.030_Android_14)

4.4.4 Wi-Fi and Bluetooth certification

The Wi-Fi and Bluetooth certification is obtained with the following combinations.

4.4.4.1 WFA Certifications

- STA | 802.11n
- STA | PMF
- STA | FFD
- STA | Security Improvement
- STA | WPA3-R3
- STA | VU

Refer to [ref.\[1\]](#).

Note:

- Download Labtool application for RF test mode [ref.\[7\]](#).
- Download Sigma tool and QTT agent [ref.\[11\]](#).

4.4.4.2 Bluetooth controller certification

Refer to [ref.\[9\]](#).

4.4.5 Wi-Fi throughput

4.4.5.1 Throughput test setup

- Environment: Shield Room - Over the Air
- Access Point: Asus RT-AX88U (FW-3.0.0.4.386_41700)
- DUT: IW416-Murata (**Module: LBEE5CJ1XK**) with MCIMX8M-EVK platform
 - Driver load parameters:

```
cal_data_cfg=none, cfg80211_wext=0xf, host_mlme=1, amsdu_deaggr=1, net_rx=1,  
tx_skb_clone=1, tx_work=1
```

- iPerf commands:

TCP server:

```
#iperf -s -i1 -fm -w 2M
```

TCP client:

```
# iperf -c <ip_address> -i1 -fm -w 2M -t60 -P5
```

UDP server:

```
# iperf -s -u -i1 -fm -w 2M
```

UDP client:

```
# iperf -c <ip_address> -i1 -fm -w 2M -t60 -b 800 -P5
```

Note: You can add iPerf parameters like TCP window size or parallel streams for higher throughput. The above-described iPerf parameters are an example.

- External Client: NXP IW620 PCIe-UART
- Channel: 6 | 36

4.4.5.2 STA throughput

External AP: Asus RT-AX88U

Table 87. STA Mode Throughput - BGN Mode | 2.4 GHz Band | 20 MHz

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	49	49	51	56
WPA2-AES	48	51	48	54
WPA3-SAE	48	46	48	49

Table 88. STA Mode Throughput - BGN Mode | 2.4 GHz Band | 40 MHz

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	73	82	94	92
WPA2-AES	72	82	92	93
WPA3-SAE	73	82	93	91

Table 89. STA Mode Throughput - AN Mode | 5 GHz Band | 20 MHz (HT)

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	53	61	56	64
WPA2-AES	54	60	56	64
WPA3-SAE	54	61	57	64

Table 90. STA Mode Throughput - AN Mode | 5 GHz Band | 40 MHz (HT)

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	82	101	98	102
WPA2-AES	82	101	98	103
WPA3-SAE	80	102	97	102

4.4.5.3 P2P-GO throughput

Table 91. P2P - GO Mode Throughput - BGN Mode | 2.4 GHz Band | 20 MHz

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
WPA2-AES	55	53	60	57

Table 92. P2P - GO Mode Throughput - AN Mode | 5 GHz Band | 40 MHz

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
WPA2-AES	129	109	132	109

4.4.5.4 P2P-GC throughput

Table 93. P2P - GC Mode Throughput - BGN Mode | 2.4 GHz Band | 20 MHz

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
WPA2-AES	56	54	53	62

Table 94. P2P - GC Mode Throughput - AN Mode | 5 GHz Band | 40 MHz

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
WPA2-AES	105	129	115	131

4.4.5.5 Mobile AP throughput

External client: NXP IW620 PCIe-UART

Table 95. Mobile AP Mode Throughput - BGN Mode | 2.4 GHz Band | 20 MHz

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	54	51	58	59
WPA2-AES	54	51	58	59
WPA3-SAE	54	51	58	59

Table 96. Mobile AP Mode Throughput - BGN Mode | 2.4 GHz Band | 40MHz

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	105	113	116	124
WPA2-AES	103	112	114	128
WPA3-SAE	103	115	112	125

Table 97. Mobile AP Mode Throughput - AN Mode | 5 GHz Band | 20 MHz

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	57	51	62	62
WPA2-AES	56	51	60	62
WPA3-SAE	56	53	60	59

Table 98. Mobile AP Mode Throughput - AN Mode | 5 GHz Band | 40 MHz

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	112	119	119	126
WPA2-AES	111	119	118	126
WPA3-SAE	81	119	119	126

4.4.6 EU conformance tests

- EU Adaptivity test - EN 300 328 v2.1.1 (for 2.4 GHz)
- EU Adaptivity test - EN 301 893 v2.2.2 (for 5 GHz)

4.4.7 Bug fixes/feature enhancements

4.4.7.1 Firmware version 16.92.21.p11.2 to 16.92.21.p41.1

Table 99. Firmware version 16.92.10.p208 to 16.92.21.p11.1

Component	Description
Wi-Fi	Fix Channel Occupancy Time (COT) for HT20/MCS0 within 6 msec

4.4.7.2 Firmware version 16.92.21.p41.1 to 16.92.21.p55.3

Table 100. Firmware version 16.92.21.p41.1 to 16.92.21.p55.3

Component	Description
Wi-Fi	Once DUT PAN profile gets disconnection with remote device, then DUT reconnection fails for successive connection trials. DUT Bluetooth Classic & BLE RX test mode fails to receive the packets and host is failing to derive the various parameters.

4.4.7.3 Firmware version 16.92.21.p55.3 to 16.92.21.p76.3

Table 101. Firmware version 16.92.21.p55.3 to 16.92.21.p76.3

Component	Description
Bluetooth	DUT Bluetooth & BLE TX test mode fails to set the power continuously and there is a difference between configured and measured power.

4.4.7.4 Firmware version 16.92.21.p76.3 to 16.92.21.p84.3

Table 102. Firmware version 16.92.21.p76.3 to 16.92.21.p84.3

Component	Description
Bluetooth	The ACL link with iPhone is disconnected due to error code "REMOTE DEVICE TERMINATED CONNECTION DUE TO LOW RESOURCES" Random Bluetooth security link loss in concurrent Bluetooth classic and Bluetooth LE modes with AES DUT HFP link gets disconnected with Remote phone, when it starts OPP file transfer to Remote device.

4.4.7.5 Firmware version 16.92.21.p84.3 to 16.92.21.p84.128

Firmware version 16.92.21.p84.3 to 16.92.21.p84.128

Component	Description
—	—

4.4.7.6 Firmware version 16.92.21.p84.128 to 16.92.21.p119.3

Firmware version 16.92.21.p84.128 to 16.92.21.p119.3

Component	Description
Bluetooth	After disconnecting LE link, sometime disconnect complete event is delayed by 30 seconds. So the next re-connection is possible only after 30 seconds.

4.4.7.7 Firmware version 16.92.21.p119.3 16.92.21.p119.11

Firmware version 16.92.21.p119.3 16.92.21.p119.11

Component	Description
Wi-Fi	For the DRCS with P2P GO provisioning use-case, a scan timeout is observed when STA is connected to EX-AP and Ex-Client is connected to GO. With DRCS enabled, when STA is connected to the EX-AP P2P, data pause/stuck is observed. When connecting STA to Ex-AP in AP provisioning case, due to association status mismatch, failures are observed in STA connection.

4.4.7.8 Firmware version 16.92.21.p119.11 16.92.21.p137.3

Firmware version 16.92.21.p119.11 16.92.21.p137.3

Component	Description
—	—

4.4.7.9 Firmware version 16.92.21.p137.3 16.92.21.p142.3

Firmware version 16.92.21.p137.3 16.92.21.p142.3

Component	Description
—	—

4.4.7.10 Firmware version 16.92.21.p142.3 16.92.21.p149.2

Firmware version 16.92.21.p142.3 16.92.21.p149.2

Component	Description
—	—

4.4.8 Known issues

Table 103. Known issues

Component	Description
Wi-Fi	When ed-mac is enabled, probe responses are transmitted during interference signal.
Bluetooth	Random Bluetooth security link loss in concurrent Bluetooth classic and Bluetooth LE modes with AES. When Bluetooth A2DP streaming is ongoing with first remote device, the DUT shows low transmit throughput with the second remote device.

4.5 SD-UART 88W8997

4.5.1 Package information

- Android BSP version: 15.0.0_1.2.0
- Wi-Fi and Bluetooth/Bluetooth LE Firmware version: 16.92.21.p149.2
- Driver version: MM6X17505.p14-GPL

4.5.2 Version information

- Wireless SoC: 88W8997
- Wi-Fi and Bluetooth/Bluetooth LE Firmware Version: 16.92.21.p149.2
 - 16 - Major revision
 - 92 - Feature pack
 - 21 - Release version
 - p149.2 - Patch number
- Driver Version: MM6X17505.p14-GPL
 - 6X - Linux 6.x Kernel
 - 17505 - Release version
 - p14 - Patch number
 - GPL - General Public License v2

4.5.3 Host platform

- MCIMX8M-EVK platform running Android
- Interface used
 - Wi-Fi over SDIO 3.0
 - Bluetooth/Bluetooth LE over UART
- Test Tools
 - iperf3
 - wpa_supplicant (version 2.10)
 - hostapd (version 2.10)
 - Wi-Fi Vendor HAL (version M009.019_M009.030_Android_14)

4.5.4 Wi-Fi and Bluetooth certification

The Wi-Fi and Bluetooth certification is obtained with the following combinations.

4.5.4.1 Wi-Fi pre-certifications

- STA | 802.11n
- STA | 802.11ac
- STA | PMF
- STA | VU
- STA | FFD
- STA | Security Improvement
- STA | WPA-SAE R3

Note:

- Download Labtool application for RF test mode [ref.\[5\]](#).
- Download Sigma tool and QTT agent [ref.\[11\]](#).

4.5.4.2 Bluetooth controller certification

Refer to [ref.\[9\]](#).

4.5.5 Wi-Fi throughput

4.5.5.1 Throughput test setup

- Environment: Shield Room - Over the Air
- DUT: 88W8997-Murata (Module: **LBEE5XV1YM**) with MCIMX8M-EVK platform
 - Driver load parameters:

```
cal_data_cfg=none, cfg80211_wext=0xf, host_mlme=1, amsdu_deaggr=1, net_rx=1,  
tx_skb_clone=1, tx_work=1
```

- iPerf commands:

TCP server:

```
#iperf -s -i1 -fm -w 2M
```

TCP client:

```
# iperf -c <ip_address> -i1 -fm -w 2M -t60 -P5
```

UDP server:

```
# iperf -s -u -i1 -fm -w 2M
```

UDP client:

```
# iperf -c <ip_address> -i1 -fm -w 2M -t60 -b 800 -P5
```

Note: You can add iPerf parameters like TCP window size or parallel streams for higher throughput. The above-described iPerf parameters are an example.

- External Access Point: Asus RT-AX88U (FW-3.0.0.4.386_41700)
- External Client: NXP IW620 PCIe-UART
- Channel: 6 | 36

4.5.5.2 STA throughput

External AP: Asus RT-AX88U

Table 104. STA Mode Throughput - BGN Mode | 2.4 GHz Band | 20 MHz (HT)

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	109	116	122	122
WPA2-AES	108	116	122	122
WPA3-SAE	107	115	120	121

Table 105. STA Mode Throughput - AN Mode | 5 GHz Band | 20 MHz (HT)

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	110	123	122	125
WPA2-AES	111	123	122	125
WPA3-SAE	112	122	122	125

Table 106. STA Mode Throughput - AN Mode | 5 GHz Band | 40 MHz (HT)

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	200	245	233	257
WPA2-AES	201	245	236	257
WPA3-SAE	200	245	233	256

Table 107. STA Mode Throughput - AC Mode | 5 GHz Band | 20 MHz (VHT)

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	134	147	146	157
WPA2-AES	133	148	145	154
WPA3-SAE	133	148	145	154

Table 108. STA Mode Throughput - AC Mode | 5 GHz Band | 40 MHz (VHT)

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	256	336	328	350
WPA2-AES	255	336	329	351
WPA3-SAE	254	337	330	351

Table 109. STA Mode Throughput - AC Mode | 5 GHz Band | 80 MHz (VHT)

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	340	400	425	419
WPA2-AES	337	402	422	418
WPA3-SAE	338	401	422	417

4.5.5.3 P2P-GO throughput

Table 110. P2P - GO Mode Throughput - BGN Mode | 2.4 GHz Band | 20 MHz

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
WPA2-AES	113	114	121	122

Table 111. P2P - GO Mode Throughput - AN Mode | 5 GHz Band | 40 MHz

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
WPA2-AES	215	245	235	258

Table 112. P2P - GO Mode Throughput - AC Mode | 5 GHz Band | 80 MHz

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
WPA2-AES	330	419	434	458

4.5.5.4 P2P-GC throughput

Table 113. P2P - GC Mode Throughput - BGN Mode | 2.4 GHz Band | 20 MHz

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
WPA2-AES	116	120	123	126

Table 114. P2P - GC Mode Throughput - AN Mode | 5 GHz Band | 40 MHz

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
WPA2-AES	212	237	235	255

Table 115. P2P - GC Mode Throughput - AC Mode | 5 GHz Band | 80 MHz

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
WPA2-AES	320	410	434	455

4.5.5.5 Mobile AP throughput

External Client: NXP IW620 PCIe-UART

Table 116. Mobile AP Mode Throughput - BGN Mode | 2.4 GHz Band | 20 MHz

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	111	116	122	124
WPA2-AES	111	115	121	125
WPA3-SAE	111	116	121	124

Table 117. Mobile AP Mode Throughput - BGN Mode | 2.4 GHz Band | 40 MHz

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	212	240	232	250
WPA2-AES	210	240	232	250
WPA3-SAE	212	240	231	250

Table 118. Mobile AP Mode Throughput - AN Mode | 5 GHz Band | 20 MHz

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	115	120	123	126
WPA2-AES	115	122	121	126
WPA3-SAE	115	122	123	126

Table 119. Mobile AP Mode Throughput - AN Mode | 5 GHz Band | 40 MHz

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	215	245	235	256
WPA2-AES	215	245	235	256
WPA3-SAE	215	245	235	256

Table 120. Mobile AP Mode Throughput - AC Mode | 5 GHz Band | 20 MHz

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	141	145	146	153
WPA2-AES	140	145	146	153
WPA3-SAE	140	145	146	153

Table 121. Mobile AP Mode Throughput - AC Mode | 5 GHz Band | 40 MHz

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	272	325	340	351
WPA2-AES	273	322	338	351
WPA3-SAE	271	325	338	351

Table 122. Mobile AP Mode Throughput - AC Mode | 5 GHz Band | 80 MHz

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	335	401	438	461
WPA2-AES	334	402	437	461
WPA3-SAE	332	400	435	461

4.5.6 EU conformance tests

- EU Adaptivity test - EN 300 328 v2.1.1 (for 2.4 GHz)
- EU Adaptivity test - EN 301 893 v2.1.1 (for 5 GHz)

4.5.7 Bug fixes/feature enhancements

4.5.7.1 Firmware version 16.92.10.p218 to 16.92.10.p219.3

Table 123. Firmware version 16.92.10.p218 to 16.92.10.p219.3

Component	Description
Wi-Fi	Added support for 40 MHz band in 2.4 GHz BGN mode for AP and STA

4.5.7.2 Firmware version 16.92.10.p219.3 to 16.92.21.p219.5

Table 124. Firmware version 16.92.10.p219.3 to 16.92.21.p219.5

Component	Description
—	NA

4.5.7.3 Firmware version 16.92.10.p219.5 to 16.92.21.p41

Table 125. Firmware version 16.92.10.p219.5 to 16.92.21.p41

Component	Description
—	NA

4.5.7.4 Firmware version 16.92.21.p41 to 16.92.21.p55.3

Table 126. Firmware version 16.92.21.p41 to 16.92.21.p55.3

Component	Description
Wi-Fi	Added support for 40 MHz band in 2.4 GHz BGN mode for AP and STA P2P-client fails to re-connect to DUT-P2P-GO mode after internal-STA connects to external-AP on different channel. Internal-STA disconnects from external-AP shortly after starting DUT-P2P-GO mode. DUT in STA only mode fails to connect with specific hotspot.

4.5.7.5 Firmware version 16.92.21.p55.3 to 16.92.21.p76.2

Table 127. Firmware version 16.92.21.p55.3 to 16.92.21.p76.2

Component	Description
Bluetooth	DUT SPP link gets disconnected with Remote, when DUT creates A2DP SINK profile connection with Remote device.

4.5.7.6 Firmware version 16.92.21.p76.2 to 16.92.21.p84.4

Table 128. Firmware version 16.92.21.p76.2 to 16.92.21.p84.4

Component	Description
Bluetooth	DUT HFP link gets disconnected with Remote phone, when it starts OPP file transfer to Remote device.
Coex	DUT A2DP sink audio glitches observed when it starts Wi-Fi data traffic with Station device on BGN 20MHz. DUT is not able to connect with Bluetooth device and not able to sustain LE connection, when it starts receiving the Wi-Fi data traffic with Station/Access Point on BGN 20MHz.

4.5.7.7 Firmware version 16.92.21.p84.4 to 16.92.21.p119.3

Firmware version 16.92.21.p84.4 to 16.92.21.p119.3

Component	Description
Bluetooth	After disconnecting LE link, sometime disconnect complete event is delayed by 30 seconds. So the next re-connection is possible only after 30 seconds.

4.5.7.8 Firmware version 16.92.21.p119.3 to 16.92.21.p137.3

Firmware version 16.92.21.p119.3 to 16.92.21.p137.3

Component	Description
—	—

4.5.7.9 Firmware version 16.92.21.p137.3 to 16.92.21.p137.4

Firmware version 16.92.21.p137.3 to 16.92.21.p137.4

Component	Description
—	—

4.5.7.10 Firmware version 16.92.21.p137.4 to 16.92.21.p149.2

Firmware version 16.92.21.p137.4 to 16.92.21.p149.2

Component	Description
—	—

4.5.8 Known issues

Table 129. Known issues

Component	Description
—	—

4.6 SD-UART 88W9098

4.6.1 Package information

- Android BSP version: 15.0.0_1.2.0
- Wi-Fi and Bluetooth/Bluetooth LE Firmware version: 17.92.1.p149.60
- Driver version: MM6X17505.p14-GPL

4.6.2 Version information

- Wireless SoC: 88W9098
- Wi-Fi and Bluetooth/Bluetooth LE Firmware Version: 17.92.21.p149.60
 - 17 - Major revision
 - 92 - Feature pack
 - 21 - Release version
 - p149.60 - Patch number
- Driver Version: MM6X17505.p14-GPL
 - 6X - Linux 6.x Kernel
 - 17505 - Release version
 - p14 - Patch number
 - GPL - General Public License v2

4.6.3 Host platform

- MCIMX8M-EVK platform running Android
- Interface used
 - Wi-Fi over SDIO 3.0
 - Bluetooth/Bluetooth LE over UART
- Test Tools
 - iperf3
 - wpa_supplicant (version 2.10)
 - hostapd (version 2.10)
 - Wi-Fi Vendor HAL (version M009.019_M009.030_Android_14)

4.6.4 Wi-Fi and Bluetooth certification

The Wi-Fi and Bluetooth certification is obtained with the following combinations.

4.6.4.1 Wi-Fi pre-certifications

- STA | WiFi6 11ax
- STA | Wi-Fi CERTIFIED ac
- STA | Wi-Fi CERTIFIED n
- STA | PMF
- STA | VU
- STA | FFD
- STA | Security Improvement
- STA | WPA-SAE R3

Note:

- Download Labtool application for RF test mode [ref.\[6\]](#).
- Download Sigma tool and QTT agent [ref.\[11\]](#).

4.6.4.2 Bluetooth controller certification

Refer to [ref.\[9\]](#).

4.6.5 Wi-Fi throughput

4.6.5.1 Throughput test setup

- Environment: Shield Room - Over the Air
- DUT: 88W9098-Murata (Module: **LBEE5ZZ1XL**) with MCIMX8M-EVK platform
 - Driver load parameters:

```
cal_data_cfg=none, cfg80211_wext=0xf, host_mlme=1, amsdu_deaggr=1, net_rx=1,  
tx_skb_clone=1, tx_work=1
```

- iPerf commands:

TCP server:

```
#iperf -s -i1 -fm -w 2M
```

TCP client:

```
# iperf -c <ip_address> -i1 -fm -w 2M -t60 -P5
```

UDP server:

```
# iperf -s -u -i1 -fm -w 2M
```

UDP client:

```
# iperf -c <ip_address> -i1 -fm -w 2M -t60 -b 800 -P5
```

Note: You can add iPerf parameters like TCP window size or parallel streams for higher throughput. The above-described iPerf parameters are an example.

- External Access Point: Asus RT-AX88U (FW-3.0.0.4.386_49674)
- External Client: NXP 88W9098 SD-UART
- Channel: 6 | 36

4.6.5.2 STA throughput

External AP: Netgear RAX200

Table 130. STA Mode Throughput - BGN Mode | 2.4 GHz Band | 20 MHz (HT)

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	105	108	115	120
WPA2-AES	107	110	116	119
WPA3-SAE	108	106	117	118

Table 131. STA Mode Throughput - AN Mode | 5 GHz Band | 20 MHz (HT)

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	104	111	114	115
WPA2-AES	103	112	114	115
WPA3-SAE	105	113	114	115

Table 132. STA Mode Throughput - AN Mode | 5 GHz Band | 40 MHz (HT)

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	182	224	228	243
WPA2-AES	183	216	228	244
WPA3-SAE	191	215	248	242

Table 133. STA Mode Throughput - AC Mode | 5 GHz Band | 20 MHz (VHT)

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	129	136	140	142
WPA2-AES	128	136	140	141
WPA3-SAE	129	136	140	142

Table 134. STA Mode Throughput - AC Mode | 5 GHz Band | 40 MHz (VHT)

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	257	291	306	307
WPA2-AES	259	291	308	303
WPA3-SAE	259	291	309	317

Table 135. STA Mode Throughput - AC Mode | 5 GHz Band | 80 MHz (VHT)

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	283	312	359	359
WPA2-AES	283	309	362	359
WPA3-SAE	282	312	356	361

Table 136. STA Mode Throughput - AX Mode | MAC2 | 2.4 GHz Band | 20 MHz (HE)

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	170	144	183	160
WPA2-AES	171	147	183	161
WPA3-SAE	169	146	182	160

Table 137. STA Mode Throughput - AX Mode | MAC1 | 5 GHz Band | 20 MHz (HE)

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	203	223	236	248
WPA2-AES	200	221	238	249
WPA3-SAE	201	220	238	245

Table 138. STA Mode Throughput - AX Mode | MAC1 | 5 GHz Band | 40 MHz (HE)

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	290	300	371	334
WPA2-AES	290	301	360	332
WPA3-SAE	281	298	365	334

Table 139. STA Mode Throughput - AX Mode | MAC1 | 5 GHz Band | 80 MHz (HE)

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	303	348	388	335
WPA2-AES	302	348	389	337
WPA3-SAE	302	350	390	338

4.6.5.3 P2P-GO throughput

Table 140. P2P - GO Mode Throughput - BGN Mode | 2.4 GHz Band | 20 MHz

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
WPA2-AES	125	122	127	128

Table 141. P2P - GO Mode Throughput - AN Mode | 5 GHz Band | 40 MHz

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
WPA2-AES	262	240	250	255

Table 142. P2P - GO Mode Throughput - AC Mode | 5 GHz Band | 80 MHz

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
WPA2-AES	301	327	305	397

4.6.5.4 P2P-GC throughput

Table 143. P2P - GC Mode Throughput - BGN Mode | 2.4 GHz Band | 20 MHz

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
WPA2-AES	116	116	121	121

Table 144. P2P - GC Mode Throughput - AN Mode | 5 GHz Band | 40 MHz

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
WPA2-AES	210	238	250	255

Table 145. P2P - GC Mode Throughput - AC Mode | 5 GHz Band | 80 MHz

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
WPA2-AES	305	309	347	202

4.6.5.5 Mobile AP throughput

External Client: NXP 88W9098 SD-UART

Table 146. Mobile AP Mode Throughput - BGN Mode | 2.4 GHz Band | 20MHz

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	123	119	125	126
WPA2-AES	123	120	125	126
WPA3-SAE	123	120	125	126

Table 147. Mobile AP Mode Throughput - BGN Mode | 2.4 GHz Band | 40 MHz

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	247	239	251	254
WPA2-AES	247	239	252	254
WPA3-SAE	247	239	252	254

Table 148. Mobile AP Mode Throughput - AN Mode | 5 GHz Band | 20 MHz

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	126	122	128	128
WPA2-AES	126	122	128	128
WPA3-SAE	126	122	128	128

Table 149. Mobile AP Mode Throughput - AN Mode | 5 GHz Band | 40 MHz

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	252	243	256	258
WPA2-AES	252	244	256	258
WPA3-SAE	252	244	256	258

Table 150. Mobile AP Mode Throughput - AC Mode | 5 GHz Band | 20 MHz

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	148	144	150	152
WPA2-AES	148	144	150	152
WPA3-SAE	148	144	157	152

Table 151. Mobile AP Mode Throughput - AC Mode | 5 GHz Band | 40 MHz

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
OpenSecurity	328	320	347	322
WPA2-AES	329	318	348	314
WPA3-SAE	332	256	349	277

Table 152. Mobile AP Mode Throughput - AC Mode | 5 GHz Band | 80 MHz

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	356	293	405	310
WPA2-AES	350	265	406	316
WPA3-SAE	350	293	406	283

Table 153. Mobile AP Mode Throughput - AX Mode | MAC2 | 2.4 GHz Band | 20 MHz (HE)

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	184	184	190	191
WPA2-AES	184	183	190	192
WPA3-SAE	185	184	190	192

Table 154. Mobile AP Mode Throughput - AX Mode | MAC1 | 5 GHz Band | 20 MHz (HE)

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	138	234	254	238
WPA2-AES	138	233	254	238
WPA3-SAE	138	234	255	238

Table 155. Mobile AP Mode Throughput - AX Mode | MAC1 | 5 GHz Band | 40 MHz (HE)

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	163	291	380	168
WPA2-AES	166	267	380	191
WPA3-SAE	163	247	380	267

Table 156. Mobile AP Mode Throughput - AX Mode | MAC1 | 5 GHz Band | 80 MHz (HE)

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	179	297	405	310
WPA2-AES	178	270	405	338
WPA3-SAE	179	345	408	284

4.6.6 EU conformance tests

- EU Adaptivity test - EN 300 328 v2.1.1 (for 2.4 GHz)
- EU Adaptivity test - EN 301 893 v2.1.1 (for 5 GHz)

4.6.7 Bug fixes/feature enhancements

4.6.7.1 Firmware version 17.92.1.p136.13 to 17.92.1.p136.24

Table 157. Firmware version 17.92.1.p136.13 to 17.92.1.p136.24

Component	Description
—	NA

4.6.7.2 Firmware version 17.92.1.p136.24 to 17.92.1.p136.131

Table 158. Firmware version 17.92.1.p136.24 to 17.92.1.p136.131

Component	Description
—	NA

4.6.7.3 Firmware version 17.92.1.p136.131 to 17.92.1.p136.132

Firmware version 17.92.1.p136.131 to 17.92.1.p136.132

Component	Description
—	—

4.6.7.4 Firmware version 17.92.1.p136.132 to 17.92.1.p149.131

Firmware version 17.92.1.p136.132 to 17.92.1.p149.131

Component	Description
—	—

4.6.7.5 Firmware version 17.92.1.p149.131 to 17.92.1.p149.43

Firmware version 17.92.1.p149.131 to 17.92.1.p149.43

Component	Description
Bluetooth	After Bluetooth firmware is downloaded on in-band reset, sometimes the firmware fails to respond to HCI reset and is not able to bring up Bluetooth interface.

4.6.7.6 Firmware version 17.92.1.p149.43 to 17.92.1.p149.156

Firmware version 17.92.1.p149.43 to 17.92.1.p149.156

Component	Description
Bluetooth	After Bluetooth firmware is downloaded on in-band reset, sometimes the firmware fails to respond to HCI reset and is not able to bring up Bluetooth interface.

4.6.7.7 Firmware version 17.92.1.p149.156 to 17.92.1.p149.53

Firmware version 17.92.1.p149.156 to 17.92.1.p149.53

Component	Description
—	—

4.6.7.8 Firmware version 17.92.1.p149.53 to 17.92.1.p149.60

Firmware version 17.92.1.p149.53 to 17.92.1.p149.60

Component	Description
—	—

4.6.8 Known issues

Table 159. Known issues

Component	Description
—	—

4.7 SD-UART IW611/IW612

4.7.1 Package information

- Android BSP version: 15.0.0_1.2.0
- Wi-Fi and Bluetooth/Bluetooth LE Firmware version: 18.99.3.p23.6
- Driver version: MM6X18505.p14-GPL

4.7.2 Version information

- Wireless SoC: IW611/IW612
- Wi-Fi and Bluetooth/Bluetooth LE Firmware Version: 18.99.3.p23.6
 - 18 - Major revision
 - 99 - Feature pack
 - 3 - Release version
 - p23.6 - Patch number
- Driver Version: MM6X18505.p14-GPL
 - 6X - Linux 6.x Kernel
 - 18505 - Release version
 - p14 - Patch number
 - GPL - General Public License v2

4.7.3 Host platform

- MCIMX8M-EVK platform running Android
- Interface used
 - Wi-Fi over SDIO 3.0
 - Bluetooth/Bluetooth LE over UART
- Test Tools
 - iperf3
 - wpa_supplicant (version 2.10)
 - hostapd (version 2.10)
 - Wi-Fi Vendor HAL (version M009.019_M009.030_Android_14)

4.7.4 Wi-Fi and Bluetooth certification

The Wi-Fi and Bluetooth certification is obtained with the following combinations.

4.7.4.1 Wi-Fi pre-certifications

- STA | WiFi6 11ax
- STA | Wi-Fi CERTIFIED ac
- STA | Wi-Fi CERTIFIED n
- STA | PMF
- STA | VU
- STA | FFD
- STA | Security Improvement
- STA | WPA-SAE R3

Note:

- Download Labtool application for RF test mode [ref.\[8\]](#).
- Download Sigma tool and QTT agent [ref.\[11\]](#).

4.7.4.2 Bluetooth controller certification

Refer to [ref.\[9\]](#).

4.7.5 Wi-Fi throughput

4.7.5.1 Throughput test setup

- Environment: Shield Room - Over the Air
- DUT: Murata M.2 Module LBES5PL2EL with MCIMX8M-EVK platform
 - Driver load parameters:

```
cal_data_cfg=none, cfg80211_wext=0xf, host_mlme=1, amsdu_deaggr=1, net_rx=1,  
tx_skb_clone=1, tx_work=1
```

- iPerf commands:

TCP server:

```
#iperf -s -i1 -fm -w 2M
```

TCP client:

```
# iperf -c <ip_address> -i1 -fm -w 2M -t60 -P5
```

UDP server:

```
# iperf -s -u -i1 -fm -w 2M
```

UDP client:

```
# iperf -c <ip_address> -i1 -fm -w 2M -t60 -b 800 -P5
```

Note: You can add iPerf parameters like TCP window size or parallel streams for higher throughput. The above-described iPerf parameters are an example.

- External Access Point: Asus RT-AX88U (FW-3.0.0.4.386_49674)
- External Client: NXP IW620 PCIe-UART
- Channel: 6 | 36

4.7.5.2 STA throughput

External AP: Asus RT-AX88U

Table 160. STA Mode Throughput - BGN Mode | 2.4 GHz Band | 20 MHz (HT)

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	55	57	61	62
WPA2-AES	54	56	62	60
WPA3-SAE	54	56	61	61

Table 161. STA Mode Throughput - AN Mode | 5 GHz Band | 20 MHz (HT)

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	58	61	64	63
WPA2-AES	57	60	63	63
WPA3-SAE	54	60	62	63

Table 162. STA Mode Throughput - AN Mode | 5 GHz Band | 40 MHz (HT)

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	120	129	136	137
WPA2-AES	122	132	130	132
WPA3-SAE	126	130	136	133

Table 163. STA Mode Throughput - AC Mode | 5 GHz Band | 20 MHz (VHT)

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	72	74	72	79
WPA2-AES	71	72	72	79
WPA3-SAE	71	71	71	78

Table 164. STA Mode Throughput - AC Mode | 5 GHz Band | 40 MHz (VHT)

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	168	164	178	170
WPA2-AES	162	164	175	176
WPA3-SAE	167	164	177	174

Table 165. STA Mode Throughput - AC Mode | 5 GHz Band | 80 MHz (VHT)

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	346	365	379	384
WPA2-AES	343	360	382	380
WPA3-SAE	339	362	382	380

Table 166. STA Mode Throughput - AX Mode | MAC2 | 2.4 GHz Band | 20 MHz (HE)

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	108	121	123	121
WPA2-AES	108	112	127	119
WPA3-SAE	112	115	122	119

Table 167. STA Mode Throughput - AX Mode | MAC1 | 5 GHz Band | 20 MHz (HE)

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	116	121	129	133
WPA2-AES	112	118	127	128
WPA3-SAE	110	119	127	130

Table 168. STA Mode Throughput - AX Mode | MAC1 | 5 GHz Band | 40 MHz (HE)

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	219	224	251	254
WPA2-AES	217	226	247	251
WPA3-SAE	220	221	250	246

Table 169. STA Mode Throughput - AX Mode | MAC1 | 5 GHz Band | 80 MHz (HE)

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	368	370	416	418
WPA2-AES	366	368	413	417
WPA3-SAE	367	368	411	415

4.7.5.3 P2P-GO throughput

Table 170. P2P - GO Mode Throughput - BGN Mode | 2.4 GHz Band | 20 MHz

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
WPA2-AES	53	56	60	60

Table 171. P2P - GO Mode Throughput - AN Mode | 5 GHz Band | 40 MHz

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
WPA2-AES	109	116	129	129

Table 172. P2P - GO Mode Throughput - AC Mode | 5 GHz Band | 80 MHz

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
WPA2-AES	341	334	380	386

4.7.5.4 P2P-GC throughput

Table 173. P2P - GC Mode Throughput - BGN Mode | 2.4 GHz Band | 20 MHz

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
WPA2-AES	54	55	61	61

Table 174. P2P - GC Mode Throughput - AN Mode | 5 GHz Band | 40 MHz

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
WPA2-AES	112	118	130	131

Table 175. P2P - GC Mode Throughput - AC Mode | 5 GHz Band | 80 MHz

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
WPA2-AES	340	356	381	389

4.7.5.5 Mobile AP throughput

External Client: NXP IW620 PCIe-UART

Table 176. Mobile AP Mode Throughput - BGN Mode | 2.4 GHz Band | 20MHz

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	57	57	62	62
WPA2-AES	56	55	61	62
WPA3-SAE	54	53	61	62

Table 177. Mobile AP Mode Throughput - BGN Mode | 2.4 GHz Band | 40 MHz

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	121	114	127	129
WPA2-AES	118	121	126	127
WPA3-SAE	120	115	125	124

Table 178. Mobile AP Mode Throughput - AN Mode | 5 GHz Band | 20 MHz

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	63	55	62	62
WPA2-AES	57	57	62	62
WPA3-SAE	60	55	61	61

Table 179. Mobile AP Mode Throughput - AN Mode | 5 GHz Band | 40 MHz

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	126	121	133	133
WPA2-AES	129	123	130	134
WPA3-SAE	126	130	132	133

Table 180. Mobile AP Mode Throughput - AC Mode | 5 GHz Band | 20 MHz

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	70	75	75	74
WPA2-AES	77	72	76	74
WPA3-SAE	71	69	77	76

Table 181. Mobile AP Mode Throughput - AC Mode | 5 GHz Band | 40 MHz

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	170	166	178	179
WPA2-AES	177	169	181	182
WPA3-SAE	169	166	176	176

Table 182. Mobile AP Mode Throughput - AC Mode | 5 GHz Band | 80 MHz

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	340	351	384	389
WPA2-AES	337	349	385	386
WPA3-SAE	339	345	382	393

Table 183. Mobile AP Mode Throughput - AX Mode | MAC2 | 2.4 GHz Band | 20 MHz (HE)

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	110	110	124	123
WPA2-AES	112	112	119	121
WPA3-SAE	111	107	124	121

Table 184. Mobile AP Mode Throughput - AX Mode | MAC1 | 5 GHz Band | 20 MHz (HE)

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	119	116	126	128
WPA2-AES	118	111	125	125
WPA3-SAE	119	115	126	126

Table 185. Mobile AP Mode Throughput - AX Mode | MAC1 | 5 GHz Band | 40 MHz (HE)

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	236	224	254	253
WPA2-AES	234	219	249	253
WPA3-SAE	235	221	252	253

Table 186. Mobile AP Mode Throughput - AX Mode | MAC1 | 5 GHz Band | 80 MHz (HE)

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	368	380	416	421
WPA2-AES	363	378	411	416
WPA3-SAE	360	378	410	418

4.7.6 EU conformance tests

- EU Adaptivity test - EN 300 328 v2.2.2 (for 2.4 GHz)
- EU Adaptivity test - EN 301 893 v2.1.1 (for 5 GHz)

4.7.7 Bug fixes/feature enhancements

4.7.7.1 Firmware version 18.99.2.p19.15 to 18.99.2.p66.10

Firmware version 18.99.2.p19.15 to 18.99.2.p66.10

Component	Description
Wi-Fi	• Wake-up card timeout is observed when the DUT AP changes the channels during TWT execution. • The DUT-STA does not stop sending the periodic null frames after executing TWT Teardown.

4.7.7.2 Firmware version 18.99.2.p66.10 to 18.99.2.p66.18

Firmware version 18.99.2.p66.10 to 18.99.2.p66.18

Component	Description
Wi-Fi	• The DUT-AP keeps sending RTS to the external device (in switched off state) until the age-out timer expires. • Firmware fatal automatic recovery failed in long run stress testing. • DUT wakeup interval found unexpected for successive wakeups in TWT session of specific Service period which can be more than 10 minutes. • In DUTSTA Command 802_11_SCAN_EXT [0x107], timeout is seen when performing scan while doing Auto-TX.
Bluetooth	• When A2DP steaming is initiated during an ongoing HFP call, A2DP link loss is observed due to LMP response timeout (frequency of occurrence 4/5 times). • Link instability in presence of multiple Bluetooth links under optimization. • When Bluetooth Scatternet and eSCO link run for a long time, the DUT may hang.

4.7.7.3 Firmware version 18.99.2.p66.18 to 18.99.3.p10.1

Firmware version 18.99.2.p66.18 to 18.99.3.p10.1

Component	Description
Wi-Fi	- STAUT does not follow the configured wake-up duration. - DUTAP hang observed during youtube stress test within ~20 mins with ch 36 Open Noisy Environment. - DUTSTA sends deauth due to unspecified reason and observed hang in disconnected state. - In DUT STA mode, scan command timeout was observed during WPA3-FT PSK rssi-based roaming test on long run.

4.7.7.4 Firmware version 18.99.3.p10.1 to 18.99.3.p15.10

Firmware version 18.99.3.p10.1 to 18.99.3.p15.10

Component	Description
Bluetooth	Whiletwo Bluetooth ACL links are connected and HFP call is ongoing in one of these connections, and the DUT starts the scanning process, a disconnection with the second ACL link occurs.
Coex	- Audio cuts observed while running the DUT STA coex RVR test. - Wi-Fi throughput goes 60% down when DUT working as slave role is connected to mobile phone.
Bluetooth LE audio	- Instress testing of 2-CIS, collision of ISO packet and ATT data affects ISO anchor point scheduling. - DUTis generating BIG sync lost event randomly after some inactivity. - SecondCIS establishment always fails when creating 2 CIS over one ACL with interleaved packing. - Sometimesthe connection timeout for CIS establishment event is observed on the second CIS link while creating all 2 CIS together.

4.7.7.5 Firmware version 18.99.3.p15.10 to 18.99.3.p21.10

Firmware version 18.99.3.p15.10 to 18.99.3.p21.10

Component	Description
Wi-Fi	- In the DRCS test, DUT AP sent fewer beacons resulting ext. STA disconnections when the DUT-STA is already performing a scan operation. - In the DRCS test, the DUT AP sent fewer beacons resulting ext. STA disconnections when the DUT-STA is already performing a scan operation. - In the DRCS test, connection failures are seen when a mobile tries to associate with DUT AP and DUT-STA tries to connect with an ext AP using the wrong password. - During TX power and regulatory test, kernel warning observed when tx-power values are not the same for 20 MHz, 40 MHz, and 80 MHz bonded channels.
Coexistence	Audio cuts observed while running the DUT STA coex. RVR test

4.7.7.6 Firmware version 18.99.3.p21.10 to 18.99.3.p23.6

Firmware version 18.99.3.p21.10 to 18.99.3.p23.6

Component	Description
Wi-Fi	Observed the DUT platform reboot issue when the external client connected to the DUT-AP is streaming, and in parallel the DUT-STA is scanning.
Coexistence	Wi-Fi throughput numbers degraded by 35% when LE audio stream 1-BIS is running in the background.

4.7.8 Known issues

Table 187. Known issues

Component	Description
—	—

5 i.MX platforms on-board chips and external wireless solutions

Table 188 lists the on-board chips for i.MX platforms and external wireless solutions available.

Table 188. On-board chips and external support for Bluetooth and Wi-Fi support

SoC	On-board Chip	PCIe M.2 card	uSD card or SDIO M.2 card
8 QM/QXP/DX/DXL	-	NXP 88W8997 (AzureWave AW-CM276 SM/MA ^[1]) NXP 88W8997 (Murata LBEE5XV1YM ^[1])	-
8 ULP	-	-	NXP IW416 (Murata LBEE5CJ1XK ^[1])
8M Nano	NXP 88W8987 (AzureWave AW-CM358 SM/MA ^[1])	-	NXP 88W8987 (Murata M.2 LBEE5QD1ZM)
i.MX 8M Mini	NXP 88W8987 (AzureWave AW-CM358 SM/MA ^[1])	-	NXP 88W8987 (Murata M.2 LBEE5QD1ZM)
8M Plus	-	NXP 88W8997 (AzureWave AW-CM276 SM/MA ^[1])	-
i.MX 8M Quad	-	NXP 88W8997 (AzureWave AW-CM276 SM/MA ^[1]) NXP 88W8997 (Murata LBEE5XV1YM ^[1])	-

[1] Modules tested with the mentioned i.MX EVK

6 Acronyms and abbreviations

Table 189. Acronyms and abbreviations

Acronyms	Definitions
A2DP	Advanced audio distribution profile
AP	Access point
BCA-TDM	Bluetooth coexistence arbiter time division multiplexing
BW	Bandwidth
CCMP	Counter mode CBC-MAC protocol
CTS	Clear to send
ERP	Extended rate physical
GATT	Generic attribute profile
HFP	Hands free profile
HID	Human interface device
HT	High throughput
MCS	Modulation and coding scheme
MLME	Mac layer management entity
RTS	Request to send
SAE	Simultaneous authentication of equals
STA	Station
VHT	Very high throughput
WFD	Wi-Fi direct
WPA	Wi-Fi protected access
WPS	Wi-Fi protected setup
WSC	Wi-Fi simple configuration

7 Note about the source code in the document

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8 References

- [1] Application note – AN12976: Wi-Fi Alliance Derivative Certification ([link](#))
- [2] User manual – UM11558: Getting Started with NXP-based Wireless Modules on i.MX 8M Quad EVK Running Android 15 OS ([link](#))
- [3] User manual – UM11675: How to Download and Build NXP Wi-Fi Drivers ([link](#))
- [4] Software – 88W8987 Manufacturing Firmware and Windows Labtool p211 ([link](#))
- [5] Software – 88W8997 Manufacturing Firmware and Windows Labtool release p189 ([link](#))
- [6] Software – 88W9098 Manufacturing Firmware and Windows Labtool release p234 ([link](#))
- [7] Software – IW416 Manufacturing Firmware and Windows Labtool release p119 ([link](#))
- [8] Software – IW611/IW612 Manufacturing Firmware and Windows Labtool release p21.12 ([link](#))
- [9] Webpage – Bluetooth Launch Studio ([link](#))
- [10] Webpage – Android OS for i.MX Applications Processors ([link](#))
- [11] Webpage – Sigma tool and QTT Agent ([link](#))

9 Revision history

Revision history

Document ID	Date	Description
RN00110 v.16.0	8 April 2025	• Section 1 "About this document": updated the release version. • PCIe-UART 88W8997 – Section 4.1.1 "Package information": updated. – Section 4.1.2 "Version information": updated. – Section 4.1.3 "Host platform": updated the Wi-Fi Vendor HAL version. – Section 4.1.5 "Wi-Fi throughput": updated. – Section 4.1.7.8 "Firmware version 17.92.21.p137.4 to 16.92.21.p149.2": added. – Section 4.1.8 "Known issues": updated. • PCIe-UART 88W9098 – Section 4.2.1 "Package information": updated. – Section 4.2.2 "Version information": updated. – Section 4.2.3 "Host platform": updated the Wi-Fi Vendor HAL version. – Section 4.2.7.8 "Firmware version 17.92.1.p149.53 to 17.92.1.149.60": added. • SD-UART 88W8987 – Section 4.3.1 "Package information": updated. – Section 4.3.2 "Version information": updated. – Section 4.3.3 "Host platform": updated the Wi-Fi Vendor HAL version. – Section 4.3.7.11 "Firmware version 16.92.21.p142.3 to 16.92.21.p149.2": added. • SD-UART IW416 – Section 4.4.1 "Package information": updated. – Section 4.4.2 "Version information": updated. – Section 4.4.3 "Host platform": updated the Wi-Fi Vendor HAL version. – Section 4.4.5 "Wi-Fi throughput": updated. – Section 4.4.7.10 "Firmware version 16.92.21.p142.3 16.92.21.p149.2": added. • SD-UART 88W8997 – Section 4.5.1 "Package information": updated. – Section 4.5.2 "Version information": updated. – Section 4.5.3 "Host platform": updated the Wi-Fi Vendor HAL version. – Section 4.5.5 "Wi-Fi throughput": updated. – Section 4.5.7.10 "Firmware version 16.92.21.p137.4 to 16.92.21.p149.2": added. ————— Continues —————

Revision history...continued

Document ID	Date	Description
RN00110 v.16.0	8 April 2025	———— continued ———— • SD-UART 88W9098 – Section 4.6.1 "Package information": updated. – Section 4.6.2 "Version information": updated. – Section 4.6.3 "Host platform": updated the Wi-Fi Vendor HAL version. – Section 4.6.7.8 "Firmware version 17.92.1.p149.53 to 17.92.1.p149.60": added. – Section 4.6.8 "Known issues": updated. • SD-UART IW611/IW612 – Section 4.7.1 "Package information": updated. – Section 4.7.2 "Version information": updated. – Section 4.7.3 "Host platform": updated the Wi-Fi Vendor HAL version. – Section 4.7.7.6 "Firmware version 18.99.3.p21.10 to 18.99.3.p23.6 ": added. – Section 4.7.8 "Known issues ": updated.

Revision history...continued

Document ID	Date	Description
RN00110 v.15.0	22 January 2025	• Section 1 "About this document": updated the release version. • Section 2.1 "Pre-compiled Wi-Fi driver and firmware": updated the release version. • Feature lists – Section 3.1.1 "Client mode": updated. – Section 3.1.2 "AP mode": updated. – Section 3.1.4 "AP/STA mode": updated. – Section 3.2.1 "Bluetooth classic": updated. – Section 3.2.2 "Bluetooth LE": updated. • PCIe-UART 88W8997 – Section 4.1.1 "Package information": updated. – Section 4.1.2 "Version information": updated. – Section 4.1.4.1 "Wi-Fi pre-certifications": updated. – Section 4.1.7.7 "Firmware version 17.92.21.p137.3 to 16.92.21.p137.4": added. • PCIe-UART 88W9098 – Section 4.2.1 "Package information": updated. – Section 4.2.2 "Version information": updated. – Section 4.2.4.1 "Wi-Fi pre-certifications": updated. – Section 4.2.5 "Wi-Fi throughput": updated – Section 4.2.7.7 "Firmware version 17.92.1.p149.156 to 17.92.1.149.53": added. • SD-UART 88W8987 – Section 4.3.1 "Package information": updated. – Section 4.3.2 "Version information": updated. – Section 4.3.4.1 "WFA Certifications": updated. – Section 4.3.5 "Wi-Fi throughput": updated. – Section 4.3.7.10 "Firmware version 16.92.21.p137.3 to 16.92.21.p142.3": added. • SD-UART IW416 – Section 4.4.1 "Package information": updated. – Section 4.4.2 "Version information": updated. – Section 4.4.4.1 "WFA Certifications": updated. – Section 4.4.5 "Wi-Fi throughput": updated. – Section 4.4.7.9 "Firmware version 16.92.21.p137.3 16.92.21.p142.3": added. • SD-UART 88W8997 – Section 4.5.1 "Package information": updated. – Section 4.5.2 "Version information": updated. – Section 4.5.4.1 "Wi-Fi pre-certifications": updated. – Section 4.5.7.9 "Firmware version 16.92.21.p137.3 to 16.92.21.p137.4": added. ———— Continues ————

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Document ID	Date	Description
RN00110 v.15.0	22 January 2025	———— continued ———— • SD-UART 88W9098 – Section 4.6.1 "Package information": updated. – Section 4.6.2 "Version information": updated. – Section 4.6.4.1 "Wi-Fi pre-certifications": updated. – Section 4.6.5 "Wi-Fi throughput": updated. – Section 4.6.7.7 "Firmware version 17.92.1.p149.156 to 17.92.1.p149.53": added. • SD-UART IW611/IW612 – Section 4.7.1 "Package information": updated. – Section 4.7.2 "Version information": updated. – Section 4.7.4.1 "Wi-Fi pre-certifications": updated. – Section 4.7.5 "Wi-Fi throughput": updated. – Section 4.7.7.5 "Firmware version 18.99.3.p15.10 to 18.99.3.p21.10 ": added. – Section 4.7.8 "Known issues ": updated. • Section 8 "References": updated.

Revision history...continued

Document ID	Date	Description
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Revision history...continued

Document ID	Date	Description
RN00110 v.13.0	06 August 2024	• Section 1 "About this document": updated the release version. • Section 2.1 "Pre-compiled Wi-Fi driver and firmware": updated the release version. • Feature lists – Section 3.2.2 "Bluetooth LE": added Bluetooth LE audio features. • PCIe-UART 88W8997 – Section 4.1.1 "Package information": updated. – Section 4.1.2 "Version information": updated. – Section 4.1.3 "Host platform": updated. • PCIe-UART 88W9098 – Section 4.2.1 "Package information": updated. – Section 4.2.2 "Version information": updated. – Section 4.2.3 "Host platform": updated. – Section 4.2.5 "Wi-Fi throughput": updated. – Section 4.2.7.5 "Firmware version 17.92.1.p149.131 to 17.92.1.149.43": added. – Section 4.2.8 "Known issues": updated. • SD-UART 88W8987 – Section 4.3.1 "Package information": updated. – Section 4.3.2 "Version information": updated. – Section 4.3.3 "Host platform": updated. • SD-UART IW416 – Section 4.4.1 "Package information": updated. – Section 4.4.2 "Version information": updated. – Section 4.4.3 "Host platform": updated. – Section 4.4.5 "Wi-Fi throughput": updated. – Section 4.4.7.7 "Firmware version 16.92.21.p119.3 16.92.21.p119.11": added. – Section 4.4.8 "Known issues": updated. • SD-UART 88W8997 – Section 4.5.1 "Package information": updated. – Section 4.5.2 "Version information": updated. – Section 4.5.3 "Host platform": updated. ————— <i>Continues</i> —————

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RN00110 v.13.0	06 August 2024	———— Continued ———— • SD-UART 88W9098 – Section 4.6.1 "Package information": updated. – Section 4.6.2 "Version information": updated. – Section 4.6.3 "Host platform": updated. – Section 4.6.5 "Wi-Fi throughput": updated. – Section 4.6.7.5 "Firmware version 17.92.1.p149.131 to 17.92.1.p149.43": added. – Section 4.6.8 "Known issues": updated. • SD-UART IW611/IW612 – Section 4.7.1 "Package information": updated. – Section 4.7.2 "Version information": updated. – Section 4.7.3 "Host platform": updated. – Section 4.7.5 "Wi-Fi throughput": updated. – Section 4.7.7.3 "Firmware version 18.99.2.p66.18 to 18.99.3.p10.1": added. – Section 4.7.8 "Known issues ": updated.

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Document ID	Date	Description
RN00110 v.12.0	12 April 2024	• Feature lists – Section 3.1.2 "AP mode": updated. – Section 3.2.1 "Bluetooth classic": updated. • PCIe-UART 88W8997 – Section 4.1.1 "Package information": updated. – Section 4.1.2 "Version information": updated. – Section 4.1.3 "Host platform": updated. – Section 4.1.4.1 "Wi-Fi pre-certifications": updated the note. – Section 4.1.5 "Wi-Fi throughput": updated. – Section 4.1.7.5 "Firmware version 17.92.21.p84.4 to 16.92.21.p119.3": added. – Section 4.1.8 "Known issues": updated. • PCIe-UART 88W9098 – Section 4.2.1 "Package information": updated. – Section 4.2.2 "Version information": updated. – Section 4.2.3 "Host platform": updated. – Section 4.2.4.1 "Wi-Fi pre-certifications": updated the note. – Section 4.2.5 "Wi-Fi throughput": updated. – Section 4.2.7.4 "Firmware version 17.92.1.p136.132 to 17.92.1.p149.131": added. – Section 4.2.8 "Known issues": updated. • SD-UART 88W8987 – Section 4.3.1 "Package information": updated. – Section 4.3.2 "Version information": updated. – Section 4.3.3 "Host platform": updated. – Section 4.1.4.1 "Wi-Fi pre-certifications": updated the note. – Section 4.3.7.8 "Firmware version 16.92.21.p99.2 to 16.92.21.p119.3": added. – Section 4.3.8 "Known issues": updated. • SD-UART IW416 – Section 4.4.1 "Package information": updated. – Section 4.4.2 "Version information": updated. – Section 4.4.3 "Host platform": updated. – Section 4.6.4.1 "Wi-Fi pre-certifications": updated the note. – Section 4.4.5 "Wi-Fi throughput": updated. – Section 4.4.7.6 "Firmware version 16.92.21.p84.128 to 16.92.21.p119.3": added. – Section 4.4.8 "Known issues": updated. Continues

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RN00110 v.12.0	12 April 2024	———— <i>Continued</i> ———— • SD-UART 88W8997 – Section 4.5.1 "Package information": updated. – Section 4.5.2 "Version information": updated. – Section 4.5.3 "Host platform": updated. – Section 4.1.4.1 "Wi-Fi pre-certifications": updated the note. – Section 4.5.5 "Wi-Fi throughput": updated. – Section 4.5.7.7 "Firmware version 16.92.21.p84.4 to 16.92.21.p119.3": added. – Section 4.5.8 "Known issues": updated. • SD-UART 88W9098 – Section 4.6.1 "Package information": updated. – Section 4.6.2 "Version information": updated. – Section 4.6.3 "Host platform": updated. – Section 4.6.4.1 "Wi-Fi pre-certifications": updated the note. – Section 4.6.5 "Wi-Fi throughput": updated. – Section 4.6.7.4 "Firmware version 17.92.1.p136.132 to 17.92.1.p149.131": added. • SD-UART IW611/IW612 – Section 4.7.1 "Package information": updated. – Section 4.7.2 "Version information": updated. – Section 4.7.3 "Host platform": updated. – Section 4.7.4.1 "Wi-Fi pre-certifications": updated the note. – Section 4.7.5 "Wi-Fi throughput": updated. – Section 4.7.7.2 "Firmware version 18.99.2.p66.10 to 18.99.2.p66.18": added. – Section 4.7.8 "Known issues": updated.
RN00110 v.11.0	29 January 2024	• Updated the release version to 14.0.0_1.0.0

Revision history...continued

Document ID	Date	Description
RN00110 v.10.0	13 December 2023	- Replaced IW612 with IW61x. Section 1 "About this document": updated. Section 2.1 "Pre-compiled Wi-Fi driver and firmware": updated. - Feature lists Section 3.1.1 "Client mode": updated. Section 3.1.2 "AP mode": updated. Section 3.2.1 "Bluetooth classic": updated. Section 3.2.2 "Bluetooth LE": updated. - PCIe-UART 88W8997 Section 4.1.1 "Package information": updated. Section 4.1.2 "Version information": updated. Section 4.1.3 "Host platform": updated. - PCIe-UART 88W9098 Section 4.2.1 "Package information": updated. Section 4.2.2 "Version information": updated. Section 4.2.3 "Host platform": updated. Section 4.2.7.3 "Firmware version 17.92.1.p136.131 to 17.92.1.p136.132": added. - SD-UART 88W8987 Section 4.3.1 "Package information": updated. Section 4.3.2 "Version information": updated. Section 4.3.3 "Host platform": updated. - SD-UART IW416 Section 4.4.1 "Package information": updated. Section 4.4.2 "Version information": updated. Section 4.4.3 "Host platform": updated. Section 4.4.7.5 "Firmware version 16.92.21.p84.3 to 16.92.21.p84.128": added. - SD-UART 88W8997 Section 4.5.1 "Package information": updated. Section 4.5.2 "Version information": updated. Section 4.5.3 "Host platform": updated. - SD-UART 88W9098 Section 4.6.1 "Package information": updated. Section 4.6.2 "Version information": updated. Section 4.6.3 "Host platform": updated. Section 4.6.7.3 "Firmware version 17.92.1.p136.131 to 17.92.1.p136.132": added. Continues

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RN00110 v.10.0	13 December 2023	————— <i>Continued</i> ————— • SD-UART IW61x – Section 4.7.1 "Package information": updated. – Section 4.7.2 "Version information": updated. – Section 4.7.3 "Host platform": updated. – Section 4.7.5.2 "STA throughput": updated. – Section 4.7.5.3 "P2P-GO throughput": updated. – Section 4.7.5.4 "P2P-GC throughput": updated. – Section 4.7.5.5 "Mobile AP throughput": updated. – Section 4.7.7 "Bug fixes/feature enhancements": added. – Section 4.7.8 "Known issues ": updated. • Section 8 "References": updated.
RN00110 v.9.0	23 October 2023	• Section 4.1 "PCIe-UART 88W8997": updated the patch number for the driver in sections <i>Package information</i> and <i>Version information</i>. • Section 4.2 "PCIe-UART 88W9098": – Updated the patch number for the driver in sections <i>Package information</i> and <i>Version information</i>. – Created a separate table for AN mode 5 GHz band 40 MHz in Section 4.2.5.2 "STA throughput": • Section 4.3 "SD-UART 88W8987": updated the patch number for the driver in sections <i>Package information</i> and <i>Version information</i>. • Section 4.4 "SD-UART IW416": updated the patch number for the driver in sections <i>Package information</i> and <i>Version information</i>. • Section 4.5 "SD-UART 88W8997": updated the patch number for the driver in sections <i>Package information</i> and <i>Version information</i>. • Section 4.6 "SD-UART 88W9098": updated the patch number for the driver in sections <i>Package information</i> and <i>Version information</i>. • Section 4.7 "SD-UART IW611/IW612": updated the firmware version, and the patch version for the driver in sections <i>Package information</i> and <i>Version information</i>.

Revision history...continued

Document ID	Date	Description
RN00110 v.8.0	12 October 2023	Updated: • Section 1 "About this document" • Section 2 "Downloading the wireless driver and firmware" • Section 3 "Feature lists" • Section 4.1.1 "Package information" • Section 4.2.1 "Package information" • Section 4.2.5 "Wi-Fi throughput" • Section 4.2.7.2 "Firmware version 17.92.1.p136.24 to 17.92.1.p136.131" • Section 4.2.8 "Known issues" • Section 4.3.1 "Package information" • Section 4.3.5 "Wi-Fi throughput" • Section 4.3.7.7 "Firmware version 16.92.21.p76.5 to 16.92.21.p99.2" • Section 4.3.8 "Known issues" • Section 4.4.1 "Package information" • Section 4.5.1 "Package information" • Section 4.6.1 "Package information" • Section 4.6.5.1 "Throughput test setup" • Section 4.7.1 "Package information" Added: • Section 7 "Note about the source code in the document"

Revision history...continued

Document ID	Date	Description
RN00110 v.7.0	10 July 2023	Updated: • Section 1 "About this document" • Section 2.1 "Pre-compiled Wi-Fi driver and firmware" • Section 3 "Feature lists" • Section 4.1 "PCIe-UART 88W8997" • Section 4.2.1 "Package information" • Section 4.2.4.1 "Wi-Fi pre-certifications" • Section 4.3 "SD-UART 88W8987" • Section 4.4 "SD-UART IW416" • Section 4.5 "SD-UART 88W8997" • Section 4.6.1 "Package information" • Section 4.6.4.1 "Wi-Fi pre-certifications" • Section 4.7.1 "Package information" • Section 4.7.4.1 "Wi-Fi pre-certifications"
RN00110 v.6.0	07 Apr 2023	Updated: • Section 2 "Downloading the wireless driver and firmware" • Section 3 "Feature lists" • Section 4.1 "PCIe-UART 88W8997" • Section 4.2 "PCIe-UART 88W9098" • Section 4.3 "SD-UART 88W8987" • Section 4.4 "SD-UART IW416" • Section 4.5 "SD-UART 88W8997" • Section 4.6 "SD-UART 88W9098" Added: • Section 4.7 "SD-UART IW611/IW612"
RN00110 v.5.0	30 December 2022	Updated: • Section 2 "Downloading the wireless driver and firmware" • Section 3 "Feature lists" • Section 4.1 "PCIe-UART 88W8997" • Section 4.4 "SD-UART IW416" • Section 4.5 "SD-UART 88W8997" Added • Section 4.2 "PCIe-UART 88W9098" • Section 4.6 "SD-UART 88W9098"
RN00110 v.4.0	17 October 2022	Updated: • Section 2 "Downloading the wireless driver and firmware" • Section 3 "Feature lists" • Section 4.1 "PCIe-UART 88W8997" • Section 4.4 "SD-UART IW416" • Section 5 "i.MX platforms on-board chips and external wireless solutions" • Section 6 "Acronyms and abbreviations" Added: • Section 4.4 "SD-UART IW416"

Revision history...continued

Document ID	Date	Description
RN00110 v.3.0	24 July 2022	Updated: • Section 4.1.1 "Package information" • Section 4.1.2 "Version information" • Section 4.1.4 "Wi-Fi and Bluetooth certification" • Section 4.3.1 "Package information" • Section 4.3.2 "Version information" • Section 4.3.4 "Wi-Fi and Bluetooth certification" • Section 4.3.5 "Wi-Fi throughput" Added: • Section 4.4 "SD-UART IW416"
RN00110 v.2.0	8 April 2022	• Section 3 "Feature lists": added features for AP and STA. Updated: • Section 4.1.1 "Package information" • Section 4.1.2 "Version information" • Section 4.1.4 "Wi-Fi and Bluetooth certification" • Section 4.1.5 "Wi-Fi throughput" • Section 4.3.1 "Package information" • Section 4.3.2 "Version information" • Section 4.3.4 "Wi-Fi and Bluetooth certification" • Section 4.3.5 "Wi-Fi throughput"
RN00110 v.1.0	4 January 2022	• Initial release

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