

RN00110

NXP Wireless SoC Features and Release Notes for Android

Rev. 14.0 — 26 September 2024

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 14.0.0_2.2.0, 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 14.0.0_2.2.0 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 [\[2\]](#).

2.2 Wi-Fi driver source and firmware

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

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

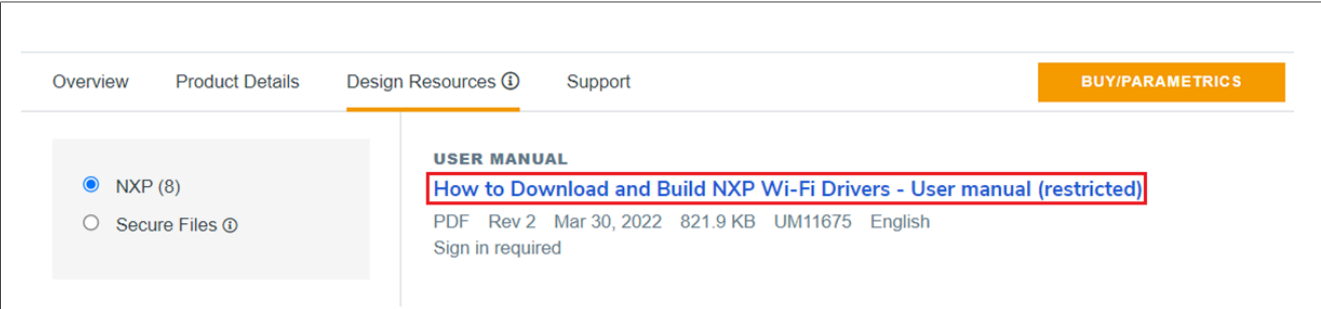


Figure 1. Documentation section on product pages

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 [4].

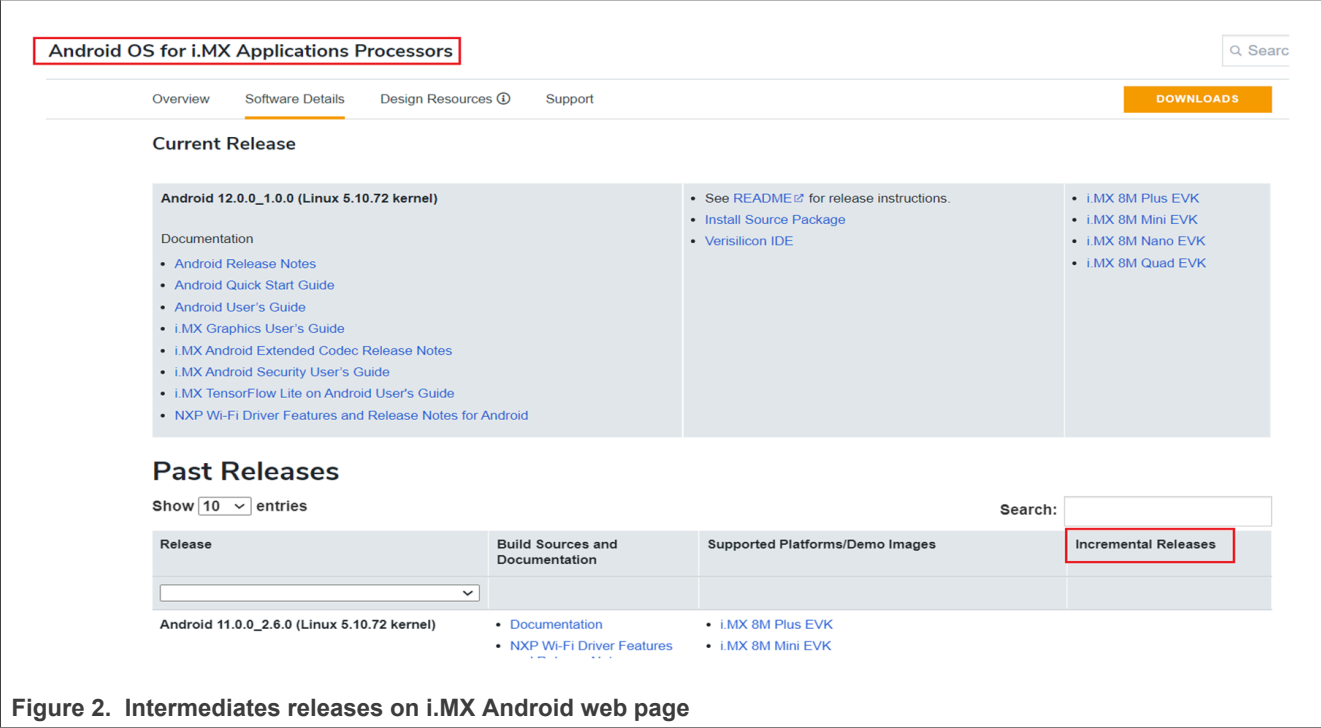


Figure 2. Intermediates releases on i.MX Android web page

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				
		8997	9098	9098	IW611/ IW612	8997	8987	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	Y	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
	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

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

Features	Sub features	PCIe-UART		SD-UART				
		8997	9098	9098	IW611/ IW612	8997	8987	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
	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				
		8997	9098	9098	IW611/ IW612	8997	8987	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	N	N	Y	N	N	N
	TWT	N	Y	Y	Y	N	N	N
	Spatial reuse	N	Y	Y	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				
		8997	9098	9098	IW611/ IW612	8997	8987	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	Open and shared authentication	Y	Y	Y	Y	Y	Y	Y
	WPA2-PSK security (AES-CCMP Encryption)	Y	Y	Y	Y	Y	Y	Y
	WPA + WPA2 mixed mode	Y	Y	Y	Y	Y	Y	Y
	Opensource WPA supplicant	Y	Y	Y	Y	Y	Y	Y
	WPA2 enterprise security	Y	Y	Y	Y	Y	Y	Y
	Transient security network (TSN)	Y	Y	Y	Y	Y	Y	Y
802.11mc	Wi-Fi location ^[1]	N	Y	Y	Y	N	N	N
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

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

Features	Sub features	PCIe-UART		SD-UART				
		8997	9098	9098	IW611/ IW612	8997	8987	IW416
802.11v	802.11v	Y	Y	Y	Y	Y	Y	Y
802.11z	802.11z (Host based TDLS)	N	Y	Y	Y	N	Y	N
802.11az	New generation Wi-Fi location ^[1]	N	N	N	Y	N	N	N
DPP functionality	Wi-Fi easy connect	Y	Y	Y	N	Y	Y	Y
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
	Host sleep/Wowlan	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				
		8997	9098	9098	IW611/ IW612	8997	8987	IW416
General features	EU adaptivity support	Y	Y	Y	Y	Y	Y	Y
	Wake on wireless (WoW) In-band (Unicast, broadcast, multicast, Mac Event, Arp Filter, WoW, auto response, MEF, magic filter, pattern byte match)	Y	Y	Y	Y	Y	Y	Y
	Wake on wireless (WoW) out-of-band (GPIO)	N	Y	Y	Y	N	N	N
	Auto TX ^[1]	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	N	N	Y	Y	Y	Y
	Extended range ^[1]	N	Y	Y	Y	N	N	N
	Clock sync ^[2]	N	Y	Y	Y	N	N	N
	IPv6 offload	Y	N	N	Y	Y	Y	Y
	Wi-Fi agile multiband	N	N	N	Y	N	N	Y
	Auto Reconnect	N	N	N	Y	N	N	N
	Independent reset (In-band)	Y	Y	Y	Y	Y	Y	Y
	Cloud keep alive (TX)	Y	Y	Y	Y	Y	Y	Y
	Cloud keep alive (RX)	N	N	N	Y	N	N	N
	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
	Vendor specific IE (Custom IE)	Y	Y	Y	Y	Y	Y	Y
	CSI ^[1]	Y	Y	Y	Y	Y	N	N

[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				
		8997	9098	9098	IW611/ IW612	8997	8987	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	Y	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 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
	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				
		8997	9098	9098	IW611/ IW612	8997	8987	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	Y	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	Y
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	N	N	Y	N	N	N
802.11d	802.11d - Regulatory domain/operating class/country info	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				
		8997	9098	9098	IW611/ IW612	8997	8987	IW416
802.11h	802.11h – Dynamic frequency selection (DFS)	Y	Y	Y	Y	Y	Y	Y
	Zero wait DFS	N	Y	Y	N	N	N	N
	DFS radar detection in controller mode	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
802.11i - Security	Open security	Y	Y	Y	Y	Y	Y	Y
	WPA2-PSK security (AES-CCMP encryption)	Y	Y	Y	Y	Y	Y	Y
	WPA + WPA2 mixed mode	Y	Y	Y	Y	Y	Y	Y
	WAPI support ^[1]	N	N	N	Y	N	N	N
	Open source hostapd	Y	Y	Y	Y	Y	Y	Y
	Group key refresh (rekeying GTK)	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	N	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				
		8997	9098	9098	IW611/ IW612	8997	8987	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 ^[2]	Y	Y	Y	Y	Y	Y	Y
	Extended channel switch announcement (ECSA)	Y	Y	Y	Y	Y	Y	Y
	Max supported stations	8	64	64	16	8	8	8
	Independent reset (In-band)	Y	Y	Y	Y	Y	Y	Y
	uAPSD/PPS ^[3]	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
	Configurable retry limit ^[1]	Y	Y	Y	Y	Y	Y	Y
	Configurable unicast data rate ^[1]	Y	Y	Y	Y	Y	Y	Y
	Configurable broadcast/multicast data rate ^[1]	Y	Y	Y	Y	Y	Y	Y
	uAP events ^[1]	Y	Y	Y	Y	Y	Y	Y
	Vendor specific IE (Custom IE) ^[1]	Y	Y	Y	Y	Y	Y	Y
	Vendor defined txpower config (txpower config V3)	Y	Y	Y	Y	Y	Y	Y
	Maximum STA MAC address filtering	16	64	64	16	16	16	16

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

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

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

3.1.3 Wi-Fi direct/P2P

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

Features	Sub features	PCIe-UART		SD-UART				
		8997	9098	9098	IW611/ IW612	8997	8987	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				
		8997	9098	9098	IW611/ IW612	8997	8987	IW416
Software antennadiversity	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	N	Y	Y	N	N	N	Y
Auto ARP and Ping	Auto ARP and ping support	N	N	N	Y	N	Y	N
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	Sub features	PCIe-UART		SD-UART				
		8997	9098	9098	8997	8987	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	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]})	N	Y	Y	N	Y	N	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

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

Features	Sub features	PCIe-UART		SD-UART				
		8997	9098	9098	8997	8987	IW416	IW611/ IW612
Bluetooth Packet Type 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]	Y	Y	Y	Y	Y	Y	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
Generic Features	Maximum 16 Bluetooth LE connections(Central role)	Y	Y	Y	Y	Y	Y	Y

[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	Sub features	PCIe-UART		SD-UART				
		8997	9098	9098	8997	8987	IW416	IW611/ IW612
Bluetooth Profile Support	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 LE 4.0 Support	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 Support	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 Support	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 Support	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	N	N	N	N	N	Y

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

Features	Sub features	PCIe-UART		SD-UART				
		8997	9098	9098	8997	8987	IW416	IW611/ IW612
Bluetooth 5.2 Support	Bluetooth LE Power Control ^[1]	N	N	N	N	N	N	Y
	Isochronous Channel ^[1]	N	N	N	N	N	N	Y
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	Sub features	PCIe-UART		SD-UART				
		8997	9098	9098	8997	8987	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: 14.0.0_2.2.0
- Wi-Fi and Bluetooth/Bluetooth LE Firmware version: 16.92.21.p137.3
- Driver version: MM6X16437.p30-GPL

4.1.2 Version information

- Wireless SoC: 88W8997
- Wi-Fi and Bluetooth/Bluetooth LE Firmware Version: 16.92.21.p137.3
 - 16 - Major revision
 - 92 - Feature pack
 - 21 - Release version
 - p137.3 - Patch number
- Driver Version: MM6X16437.p30-GPL
 - 6X - Linux 6.x Kernel
 - 16437 - Release version
 - p30 - 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 M009.016_M009.025_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, refer to the URL: [88W8997-MANUFACTURING-RELEASE-P207](#)
- Download Sigma tool, refer to the URL: [NXP-WTS-DUT-AGENT-Release-R2-0](#)
- Download QTT Agent, refer to the URL: [NXP_QTT_AGENT_Source-R2.2_Android_RTOS](#)

4.1.4.2 Bluetooth controller certification

Refer to the URL: <https://launchstudio.bluetooth.com/ListingDetails/135509>

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	115	120	123	122
WPA2-AES	116	118	120	122
WPA3-SAE	117	119	126	123

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	210	233	226	249
WPA2-AES	216	230	228	240
WPA3-SAE	218	229	230	247

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	112	124	122	128
WPA2-AES	110	124	122	128
WPA3-SAE	111	125	125	127

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	204	249	235	259
WPA2-AES	203	247	235	261
WPA3-SAE	204	247	235	260

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	132	150	144	156
WPA2-AES	132	151	150	156
WPA3-SAE	133	151	150	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	303	338	335	352
WPA2-AES	300	335	324	350
WPA3-SAE	300	338	330	350

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	551	634	667	670
WPA2-AES	551	634	667	670
WPA3-SAE	551	634	667	676

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	116	115	124	120

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	652	519	579	527

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	115	115	124	120

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	520	582	560	533

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	110	114	120	124
WPA2-AES	112	117	120	122
WPA3-SAE	110	119	119	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	208	242	225	245
WPA2-AES	210	241	226	244
WPA3-SAE	210	89	225	248

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	119	119	124	127
WPA2-AES	118	120	123	127
WPA3-SAE	120	121	124	127

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	220	246	236	256
WPA2-AES	220	244	236	256
WPA3-SAE	221	248	236	256

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	146	144	154
WPA2-AES	140	146	144	155
WPA3-SAE	140	146	144	155

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	318	339	336	360
WPA2-AES	319	335	336	360
WPA3-SAE	314	339	336	360

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	398	377	310	365
WPA2-AES	400	390	324	365
WPA3-SAE	400	399	310	365

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

1. Firmware version: From 16.92.10.p213.4 to 16.92.21.p26.1

Table 27.

Component	Description
--	NA

4.1.7.1 Firmware version: From 16.92.21.p26.1 to 16.92.21.p55.3

Component	Description
—	NA

4.1.7.2 Firmware version: From 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.

4.1.7.3 Firmware version: From 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.

4.1.7.4 Firmware version: From 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.

4.1.7.5 Firmware version: From 17.92.21.p119.3 to 16.92.21.p137.3

Component	Description
—	—

4.1.8 Known issues

Component	Description
Wi-Fi	DUT firmware hang is seen when connected Intel AX210 client sends UDP traffic with power management enabled in noisy environment.

4.2 PCIe-UART 88W9098

4.2.1 Package information

- Android BSP version: 14.0.0_2.2.0
- Wi-Fi and Bluetooth/Bluetooth LE Firmware version: 17.92.1.p149.156
- Driver version: MM6X17437.p30-GPL

4.2.2 Version information

- Wireless SoC: 88W9098
- Wi-Fi and Bluetooth/Bluetooth LE Firmware Version: 17.92.1.p149.156
 - 17 - Major revision
 - 92 - Feature pack
 - 1 - Release version
 - p149.156 - Patch number
- Driver Version: MM6X17437.p30-GPL
 - 6X - Linux 6.x Kernel
 - 17437 - Release version
 - p30 - 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 M009.016_M009.025_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, refer to the URL: [88W8997-MANUFACTURING-RELEASE-P207](#)
- Download Sigma tool, refer to the URL: [NXP-WTS-DUT-AGENT-Release-R2-0](#)
- Download QTT Agent, refer to the URL: [NXP_QTT_AGENT_Source-R2.2_Android_RTOS](#)

4.2.4.2 Bluetooth controller certification

Refer to the URL: <https://launchstudio.bluetooth.com/ListingDetails/135509>

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 28. 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	115	110	114	119
WPA2-AES	114	111	113	118
WPA3-SAE	111	116	112	119

Table 29. STA Mode Throughput - AN Mode | 5 GHz Band | 20 MHz

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	115	122	126	129
WPA2-AES	116	121	124	128
WPA3-SAE	114	122	123	128

Table 30. STA Mode Throughput - AN Mode | 5 GHz Band | 40 MHz

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	220	254	254	259
WPA2-AES	221	252	252	258
WPA3-SAE	218	253	254	258

Table 31. 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	141	149	149	155
WPA2-AES	142	148	149	154
WPA3-SAE	140	150	148	154

Table 32. 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	319	340	358	355
WPA2-AES	318	341	356	354
WPA3-SAE	321	342	357	352

Table 33. 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	656	674	700	730
WPA2-AES	655	677	710	728
WPA3-SAE	650	670	702	725

Table 34. 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	169	166	188	180
WPA2-AES	174	163	182	178
WPA3-SAE	173	169	185	181

Table 35. 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	223	237	250	246
WPA2-AES	224	234	248	244
WPA3-SAE	222	235	249	249

Table 36. 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	430	452	494	486
WPA2-AES	433	451	492	483
WPA3-SAE	430	450	489	480

Table 37. 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	725	730	820	770
WPA2-AES	740	728	812	775
WPA3-SAE	745	726	810	770

4.2.5.3 P2P-GO throughput

Table 38. 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	122	124	133	130

Table 39. 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	320	339	595	402

Table 40. 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	550	650	740	720

4.2.5.4 P2P-GC throughput

Table 41. 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	128	123	118	128

Table 42. 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	330	340	570	390

Table 43. 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	590	660	735	710

4.2.5.5 Mobile AP throughput

External client: NXP 88W9098 PCIe-UART

Table 44. 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	118	115	122	120
WPA2-AES	117	118	124	121
WPA3-SAE	116	117	125	123

Table 45. 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	125	120	124	127
WPA2-AES	121	121	125	127
WPA3-SAE	122	127	122	127

Table 46. 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	250	244	255	260
WPA2-AES	248	243	254	258
WPA3-SAE	247	239	252	256

Table 47. 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	125	136	140	145
WPA2-AES	127	136	138	144
WPA3-SAE	130	133	133	144

Table 48. 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	343	330	356	355
WPA2-AES	343	328	355	354
WPA3-SAE	344	331	350	356

Table 49. 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	440	450	450	570
WPA2-AES	430	456	454	577
WPA3-SAE	434	470	455	576

Table 50. 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	155	160	152	170
WPA2-AES	150	166	154	169
WPA3-SAE	150	158	155	168

Table 51. 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	202	223	250	236
WPA2-AES	204	226	250	233
WPA3-SAE	205	226	248	230

Table 52. 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	420	405	494	446
WPA2-AES	421	403	493	444
WPA3-SAE	418	412	490	441

Table 53. 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

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

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

Component	Description
—	—

4.2.7.4 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

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

Component	Description
—	—

4.2.8 Known issues

Component	Description
—	—

4.3 SD-UART 88W8987

4.3.1 Package information

- Android BSP version: 14.0.0_2.2.0
- Wi-Fi and Bluetooth/Bluetooth LE Firmware version: 16.92.21.p119.3
- Driver version: MM6X16437.p30-GPL

4.3.2 Version information

- Wireless SoC: 88W8987
- Wi-Fi and Bluetooth/Bluetooth LE Firmware Version: 16.92.21.p137.3
 - 16 - Major revision
 - 92 - Feature pack
 - 21 - Release version
 - p137.3 - Patch number
- Driver Version: MM6X16437.p30-GPL
 - 6X - Linux 6.x Kernel
 - 16437 - Release version
 - p30 - 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 M009.016_M009.025_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 [\[1\]](#).

Note:

- Download Labtool application for RF test mode, refer to the URL: [MFG-W8987-MF- WIFI-BT- BRG-FC-VS2013](#)
- Download Sigma tool, refer to the URL: [NXP-WTS-DUT-AGENT-Release-R2-0](#)

4.3.4.2 Bluetooth controller certification

Refer to the URL: <https://launchstudio.bluetooth.com/ListingDetails/115533>

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 54. 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	58	61	62
WPA2-AES	57	58	61	62
WPA3-SAE	57	56	61	62

Table 55. 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 56. 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	125	126	130
WPA2-AES	114	125	124	130
WPA3-SAE	113	125	123	130

Table 57. 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 58. 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 59. 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	234	307	250	374
WPA2-AES	217	290	235	334
WPA3-SAE	216	290	235	331

4.3.5.3 P2P-GO throughput

Table 60. 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	51	52	59	52

Table 61. 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	209	295	232	326

4.3.5.4 P2P-GC throughput

Table 62. 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	61	60

Table 63. 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	171	274	231	308

4.3.5.5 Mobile AP throughput

External client: NXP 88W8987 SD-UART

Table 64. 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 65. 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 66. 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 67. 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 68. 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 69. 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: From 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: From 16.92.10.p11.1 to 16.92.21.p41.3

Component	Description
—	NA

4.3.7.3 Firmware version: From 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: From 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: From 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: From 16.92.21.p76.2 to 16.92.21.p76.5

Component	Description
—	NA

4.3.7.7 Firmware version: From 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: From 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: From 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.

4.3.8 Known issues

Component	Description
Bluetooth	<ul style="list-style-type: none">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: 14.0.0_2.2.0
- Wi-Fi and Bluetooth/Bluetooth LE Firmware version: 16.92.21.p119.11
- Driver version: MM5X16437.p30-GPL

4.4.2 Version information

- Wireless SoC: IW416
- Wi-Fi and Bluetooth/Bluetooth LE Firmware Version: 16.92.21.p137.3
 - 16 - Major revision
 - 92 - Feature pack
 - 21 - Release version
 - p137.3 - Patch number
- Driver Version: MM5X16437.p30-GPL
 - 5X - Linux 5.x Kernel
 - 16437 - Release version
 - p30 - 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 M009.016_M009.025_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 [\[1\]](#).

Note:

- Download Labtool application for RF test mode, refer to the URL: [MFG-W8978-MF-WIFI-BT-BRG-FC-VS2013](#)
- Download Sigma tool, refer to the URL: [NXP-WTS-DUT-AGENT-Release-R2-0](#)

4.4.4.2 Bluetooth controller certification

Refer to the URL: <https://launchstudio.bluetooth.com/ListingDetails/108035>

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 70. 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	53	54
WPA2-AES	48	50	51	53
WPA3-SAE	48	50	52	52

Table 71. 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	101	102	106	106
WPA2-AES	100	102	108	106
WPA3-SAE	101	101	105	108

Table 72. 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	49	49	51	52
WPA2-AES	49	50	50	54
WPA3-SAE	48	49	50	54

Table 73. 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	102	108	116	118
WPA2-AES	102	109	114	116
WPA3-SAE	104	108	112	116

4.4.5.3 P2P-GO throughput

Table 74. 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	51	54	54

Table 75. 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	102	109	112	119

4.4.5.4 P2P-GC throughput

Table 76. 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	53	56	54

Table 77. 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	102	108	114	118

4.4.5.5 Mobile AP throughput

External client: NXP IW620 PCIe-UART

Table 78. 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	49	50	52	56
WPA2-AES	49	50	54	56
WPA3-SAE	50	51	54	54

Table 79. 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	104	106	109	116
WPA2-AES	106	104	110	119
WPA3-SAE	105	104	110	118

Table 80. 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	49	51	55	58
WPA2-AES	50	52	56	56
WPA3-SAE	50	50	57	56

Table 81. 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	108	109	119	122
WPA2-AES	108	110	118	121
WPA3-SAE	107	110	117	122

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: from 16.92.21.p11.2 to 16.92.21.p41.1

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

4.4.7.2 Firmware version: from 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: from 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: from 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: from 16.92.21.p84.3 to 16.92.21.p84.128

Component	Description
—	—

4.4.7.6 Firmware version: from 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: from 16.92.21.p119.3 16.92.21.p119.11

Component	Description
Wi-Fi	<p>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.</p> <p>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.</p>

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

Component	Description
—	—

4.4.8 Known issues

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

4.5 SD-UART 88W8997

4.5.1 Package information

- Android BSP version: 14.0.0_2.2.0
- Wi-Fi and Bluetooth/Bluetooth LE Firmware version: 16.92.21.p137.3
- Driver version: MM6X17437.p30-GPL

4.5.2 Version information

- Wireless SoC: 88W8997
- Wi-Fi and Bluetooth/Bluetooth LE Firmware Version: 16.92.21.p137.3
 - 16 - Major revision
 - 92 - Feature pack
 - 21 - Release version
 - p137.3 - Patch number
- Driver Version: MM6X17437.p30-GPL
 - 6X - Linux 6.x Kernel
 - 17437 - Release version
 - p30 - 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 M009.016_M009.025_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, refer to the URL: [88W8997-MANUFACTURING-RELEASE-P207](#)
- Download Sigma tool, refer to the URL: [NXP-WTS-DUT-AGENT-Release-R2-0](#)
- Download QTT Agent, refer to the URL: [NXP_QTT_AGENT_Source-R2.2_Android_RTOS](#)

4.5.4.2 Bluetooth controller certification

Refer to the URL: <https://launchstudio.bluetooth.com/ListingDetails/135509>

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 82. 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	107	116	122	122
WPA2-AES	108	116	122	122
WPA3-SAE	107	115	120	121

Table 83. 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	109	122	122	124
WPA2-AES	109	122	122	125
WPA3-SAE	108	118	121	125

Table 84. 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	247	233	257
WPA2-AES	199	245	232	257
WPA3-SAE	199	245	233	256

Table 85. 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 86. 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	285	335	326	351
WPA2-AES	289	335	325	351
WPA3-SAE	287	333	322	351

Table 87. 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	370	388	420	405
WPA2-AES	370	388	420	404
WPA3-SAE	376	386	415	400

4.5.5.3 P2P-GO throughput

Table 88. 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 89. 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	212	243	240	255

Table 90. 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	333	401	415	450

4.5.5.4 P2P-GC throughput

Table 91. 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 92. 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	214	233	235	255

Table 93. 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	310	401	415	450

4.5.5.5 Mobile AP throughput

External Client: NXP IW620 PCIe-UART

Table 94. 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	110	116	122	124
WPA2-AES	111	115	121	125
WPA3-SAE	110	116	121	124

Table 95. 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	208	230	231	249
WPA2-AES	208	234	229	250
WPA3-SAE	209	233	229	250

Table 96. 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	111	119	121	126
WPA2-AES	110	120	120	126
WPA3-SAE	112	120	120	126

Table 97. 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	216	222	235	256
WPA2-AES	214	244	237	256
WPA3-SAE	214	245	236	256

Table 98. 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	140	144	146	152
WPA2-AES	141	146	146	153
WPA3-SAE	141	145	146	152

Table 99. 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	265	315	336	351
WPA2-AES	270	320	337	351
WPA3-SAE	268	320	338	351

Table 100. 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	330	402	420	461
WPA2-AES	339	402	416	461
WPA3-SAE	331	400	416	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: from 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: from 16.92.10.p219.3 to 16.92.21.p219.5

Component	Description
—	NA

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

Component	Description
—	NA

4.5.7.4 Firmware version: from 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: from 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: from 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: from 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: from 16.92.21.p119.3 to 16.92.21.p137.3

Component	Description
—	—

4.5.8 Known issues

Component	Description
—	—

4.6 SD-UART 88W9098

4.6.1 Package information

- Android BSP version: 14.0.0_2.2.0
- Wi-Fi and Bluetooth/Bluetooth LE Firmware version: 17.92.1.p149.56
- Driver version: MM6X17437.p30-GPL

4.6.2 Version information

- Wireless SoC: 88W9098
- Wi-Fi and Bluetooth/Bluetooth LE Firmware Version: 17.92.21.p149.56
 - 17 - Major revision
 - 92 - Feature pack
 - 21 - Release version
 - p149.56 - Patch number
- Driver Version: MM6X17437.p30-GPL
 - 6X - Linux 6.x Kernel
 - 17437 - Release version
 - p30 - 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 M009.016_M009.025_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, refer to the URL: [88W8997-MANUFACTURING-RELEASE-P207](#)
- Download Sigma tool, refer to the URL: [NXP-WTS-DUT-AGENT-Release-R2-0](#)
- Download QTT Agent, refer to the URL: [NXP_QTT_AGENT_Source-R2.2_Android_RTOS](#)

4.6.4.2 Bluetooth controller certification

Refer to the URL: <https://launchstudio.bluetooth.com/ListingDetails/135509>

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 101. 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	115	110	114	119
WPA2-AES	114	111	113	118
WPA3-SAE	111	116	112	119

Table 102. 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	115	122	126	129
WPA2-AES	116	121	124	128
WPA3-SAE	114	122	123	128

Table 103. 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	220	254	254	259
WPA2-AES	221	252	252	258
WPA3-SAE	218	253	254	258

Table 104. 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	141	149	149	155
WPA2-AES	142	148	149	154
WPA3-SAE	140	150	148	154

Table 105. 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	319	340	358	355
WPA2-AES	318	341	356	354
WPA3-SAE	321	342	357	352

Table 106. 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	656	674	700	730
WPA2-AES	655	677	710	728
WPA3-SAE	650	670	702	725

Table 107. 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	169	166	188	180
WPA2-AES	174	163	182	178
WPA3-SAE	173	169	185	181

Table 108. 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	223	237	250	246
WPA2-AES	224	234	248	244
WPA3-SAE	222	235	249	249

Table 109. 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	430	452	494	486
WPA2-AES	433	451	492	483
WPA3-SAE	430	450	489	480

Table 110. 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	725	730	820	770
WPA2-AES	740	728	812	775
WPA3-SAE	745	726	810	770

4.6.5.3 P2P-GO throughput

Table 111. 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	112	122	121	122

Table 112. 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	236	326	306	381

Table 113. 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	300	305	340	387

4.6.5.4 P2P-GC throughput

Table 114. 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	110	118	120	123

Table 115. 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	240	330	302	378

Table 116. 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	298	304	362	390

4.6.5.5 Mobile AP throughput

External Client: NXP 88W9098 SD-UART

Table 117. 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	120	124	126
WPA2-AES	121	118	124	125
WPA3-SAE	120	116	122	122

Table 118. 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	235	231	250	257
WPA2-AES	238	229	246	255
WPA3-SAE	234	228	244	246

Table 119. 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	127	128
WPA2-AES	124	124	126	128
WPA3-SAE	125	121	126	127

Table 120. 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	248	228	255	260
WPA2-AES	244	225	251	259
WPA3-SAE	243	223	252	256

Table 121. 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	123	144	127	152
WPA2-AES	122	142	129	151
WPA3-SAE	125	141	131	151

Table 122. 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	290	285	333	320
WPA2-AES	289	280	335	311
WPA3-SAE	288	277	337	310

Table 123. 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	288	290	371	326
WPA2-AES	285	284	373	330
WPA3-SAE	257	286	289	331

Table 124. 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	180	166	186	188
WPA2-AES	178	168	188	187
WPA3-SAE	179	169	184	186

Table 125. 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	151	227	251	236
WPA2-AES	148	206	250	236
WPA3-SAE	152	188	250	236

Table 126. 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	230	253	372	311
WPA2-AES	231	256	373	311
WPA3-SAE	230	264	372	334

Table 127. 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	253	277	400	321
WPA2-AES	250	265	401	309
WPA3-SAE	250	260	402	303

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

Component	Description
—	NA

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

Component	Description
—	NA

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

Component	Description
—	—

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

Component	Description
—	—

4.6.7.5 Firmware version: from 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: from 17.92.1.p149.43 to 17.92.1.p149.156

4.6.8 Known issues

Component	Description
Wi-Fi	Low throughput is observed in VHT/HE mode.

4.7 SD-UART IW611/IW612

4.7.1 Package information

- Android BSP version: 14.0.0_2.2.0
- Wi-Fi and Bluetooth/Bluetooth LE Firmware version: 18.99.3.p15.10
- Driver version: MM6X18437.p30-GPL

4.7.2 Version information

- Wireless SoC: IW611/IW612
- Wi-Fi and Bluetooth/Bluetooth LE Firmware Version: 18.99.3.p15.10
 - 18 - Major revision
 - 99 - Feature pack
 - 3 - Release version
 - p15.10 - Patch number
- Driver Version: MM6X18437.p30-GPL
 - 6X - Linux 6.x Kernel
 - 18437 - Release version
 - p30 - 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 M009.016_M009.025_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, refer to the URL: [88W8997-MANUFACTURING-RELEASE-P207](#)
- Download Sigma tool, refer to the URL: [NXP-WTS-DUT-AGENT-Release-R2-0](#)
- Download QTT Agent, refer to the URL: [NXP_QTT_AGENT_Source-R2.2_Android_RTOS](#)

4.7.4.2 Bluetooth controller certification

Refer to the URL: <https://launchstudio.bluetooth.com/ListingDetails/155070>

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 128. 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	56	60	60	63
WPA2-AES	55	57	60	63
WPA3-SAE	55	59	60	62

Table 129. 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	55	61	61	64
WPA2-AES	55	60	61	63
WPA3-SAE	56	61	61	62

Table 130. 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	127	129	132
WPA2-AES	116	127	129	133
WPA3-SAE	116	129	129	134

Table 131. 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	66	74	75	77
WPA2-AES	65	74	75	77
WPA3-SAE	63	74	75	78

Table 132. 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	155	170	171	176
WPA2-AES	155	171	171	178
WPA3-SAE	156	170	172	178

Table 133. 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	342	365	378	383
WPA2-AES	342	365	376	383
WPA3-SAE	342	368	372	386

Table 134. 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	109	109	119	120
WPA2-AES	108	106	116	119
WPA3-SAE	106	107	118	117

Table 135. 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	118	120	126	128
WPA2-AES	116	116	124	126
WPA3-SAE	117	116	125	125

Table 136. 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	225	218	248	250
WPA2-AES	221	210	248	247
WPA3-SAE	222	212	246	248

Table 137. 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	355	354	408	414
WPA2-AES	351	350	401	412
WPA3-SAE	350	348	403	410

4.7.5.3 P2P-GO throughput

Table 138. 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	58	57	62	62

Table 139. 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	119	120	128	132

Table 140. 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	351	348	376	380

4.7.5.4 P2P-GC throughput

Table 141. 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	58	57	62	62

Table 142. 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	118	122	129	130

Table 143. 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	349	344	375	379

4.7.5.5 Mobile AP throughput

External Client: NXP IW620 PCIe-UART

Table 144. 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	55	55	58	57
WPA2-AES	54	55	57	57
WPA3-SAE	55	55	57	57

Table 145. 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	111	115	118	121
WPA2-AES	111	115	117	121
WPA3-SAE	111	114	117	122

Table 146. 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	57	58	59
WPA2-AES	55	57	59	59
WPA3-SAE	55	56	57	59

Table 147. 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	121	125	127	132
WPA2-AES	121	124	128	132
WPA3-SAE	121	124	127	133

Table 148. 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	68	69	73	75
WPA2-AES	67	70	73	75
WPA3-SAE	67	69	74	75

Table 149. 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	162	166	170	176
WPA2-AES	161	165	169	176
WPA3-SAE	161	166	169	176

Table 150. 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	313	355	381	381
WPA2-AES	313	356	378	379
WPA3-SAE	313	354	370	379

Table 151. 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	108	110	112	121
WPA2-AES	107	109	111	121
WPA3-SAE	106	110	110	121

Table 152. 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	109	106	125	127
WPA2-AES	107	103	122	127
WPA3-SAE	107	106	123	126

Table 153. 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	215	193	231	254
WPA2-AES	215	185	233	253
WPA3-SAE	216	187	233	254

Table 154. 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	360	367	416	416
WPA2-AES	356	361	415	416
WPA3-SAE	352	354	414	409

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: from 18.99.2.p19.15 to 18.99.2.p66.10

Component	Description
Wi-Fi	<ul style="list-style-type: none">• 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: from 18.99.2.p66.10 to 18.99.2.p66.18

Component	Description
Wi-Fi	<ul style="list-style-type: none">• 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	<ul style="list-style-type: none">• 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: from 18.99.2.p66.18 to 18.99.3.p10.1

Component	Description
Wi-Fi	<ul style="list-style-type: none">• 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: from 18.99.3.p10.1 to 18.99.3.p15.10

Component	Description
Bluetooth	<ul style="list-style-type: none">• 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	<ul style="list-style-type: none">• 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	<ul style="list-style-type: none">• 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.• Sometimes the connection timeout for CIS establishment event is observed on the second CIS link while creating all 2 CIS together.

4.7.8 Known issues

Component	Description
Wi-Fi	<ul style="list-style-type: none">• Firmware auto recovery failures seen during long run stress test in DUT-AP mode.• Wi-Fi firmware automatic recovery failures are seen during stress test in DUT-AP mode running lperf traffic..• In the DRCS test, DUT AP sent fewer beacons resulting ext. STA disconnections when DUT-STA already performing scan operation.• In the DRCS test, Firmware scan command timeout is observed when DUT-STA tries to connect with ext.AP using the wrong password and a Mobile tries to associate with DUT AP.• In the DRCS test, Connection failures are seen when a Mobile tries to associate with DUT AP and DUT-STA tries to connect with ext.AP using the wrong password.• During Tx power and regulatory test, kernel warning observed when tx-power values are not same for 20, 40 &80MHz bonded channels.
Bluetooth	<ul style="list-style-type: none">• Randomly DUT hang has been observed while connected with the peer device on BT/BLE link for long duration.

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

Table 155 lists the on-board chips for i.MX platforms and external wireless solutions available.

Table 155. 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 156. 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

Application notes

- [1] AN12976 - Wi-Fi Alliance Derivative Certification ([link](#))

User manuals

- [2] UM11558 - Getting Started with NXP-based Wireless Modules on i.MX 8M Quad EVK Running Android 13 OS ([link](#))
- [3] UM11675 - How to Download and Build NXP Wi-Fi Drivers ([link](#))

Web pages

- [4] Android OS for i.MX Applications Processors ([link](#))

9 Revision history

Revision history		
Document ID	Date	Description
RN00110 v.14.0	26 September 2924	<ul style="list-style-type: none">• 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<ul style="list-style-type: none">– Section 3.1.1 "Client mode": updated.– Section 3.1.2 "AP mode": updated.• PCIe-UART 88W8997<ul style="list-style-type: none">– Section 4.1.1 "Package information": updated.– Section 4.1.2 "Version information": updated.– Section 4.1.5 "Wi-Fi throughput": updated.• Section 4.1.7.5 "Firmware version: From 17.92.21.p119.3 to 16.92.21.p137.3": added.• PCIe-UART 88W9098<ul style="list-style-type: none">– Section 4.2.1 "Package information": updated.– Section 4.2.2 "Version information": updated.– Section 4.2.5 "Wi-Fi throughput": updated.– Section 4.2.7.6 "Firmware version: 17.92.1.p149.43 to 17.92.1.149.156": added.• SD-UART 88W8987<ul style="list-style-type: none">– Section 4.3.1 "Package information": updated.– Section 4.3.2 "Version information": updated.– Section 4.3.5 "Wi-Fi throughput": updated.– Section 4.3.7.9 "Firmware version: From 16.92.21.p119.3 to 16.92.21.p137.3": added.– Section 4.3.8 "Known issues": updated.• SD-UART IW416<ul style="list-style-type: none">– Section 4.4.1 "Package information": updated.– Section 4.4.2 "Version information": updated.– Section 4.4.7.8 "Firmware version: from 16.92.21.p119.11 16.92.21.p137.3": added.• SD-UART 88W8997<ul style="list-style-type: none">– Section 4.5.1 "Package information": updated.– Section 4.5.2 "Version information": updated.– Section 4.5.7.8 "Firmware version: from 16.92.21.p119.3 to 16.92.21.p137.3": added.• SD-UART 88W9098<ul style="list-style-type: none">– Section 4.6.1 "Package information": updated.– Section 4.6.2 "Version information": updated.– Section 4.6.7.6 "Firmware version: from 17.92.1.p149.43 to 17.92.1.p149.156": added.• SD-UART IW611/IW612<ul style="list-style-type: none">– Section 4.7.1 "Package information": updated.– Section 4.7.2 "Version information": updated.– Section 4.7.5 "Wi-Fi throughput": updated.– Section 4.7.7.4 "Firmware version: from 18.99.3.p10.1 to 18.99.3.p15.10": added.– Section 4.7.8 "Known issues": updated.

Revision history...continued

Document ID	Date	Description
RN00110 v.13.0	06 August 2024	<ul style="list-style-type: none">• 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<ul style="list-style-type: none">– Section 3.2.2 "Bluetooth LE": added Bluetooth LE audio features.• PCIe-UART 88W8997<ul style="list-style-type: none">– Section 4.1.1 "Package information": updated.– Section 4.1.2 "Version information": updated.– Section 4.1.3 "Host platform": updated.• PCIe-UART 88W9098<ul style="list-style-type: none">– 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<ul style="list-style-type: none">– Section 4.3.1 "Package information": updated.– Section 4.3.2 "Version information": updated.– Section 4.3.3 "Host platform": updated.• SD-UART IW416<ul style="list-style-type: none">– 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: from 16.92.21.p119.3 16.92.21.p119.11": added.– Section 4.4.8 "Known issues": updated.• SD-UART 88W8997<ul style="list-style-type: none">– Section 4.5.1 "Package information": updated.– Section 4.5.2 "Version information": updated.– Section 4.5.3 "Host platform": updated. <p>————— <i>Continues</i> —————</p>

Revision history...continued

Document ID	Date	Description
RN00110 v.13.0	06 August 2024	<p>———— Continued ————</p> <ul style="list-style-type: none">• SD-UART 88W9098<ul style="list-style-type: none">– 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: from 17.92.1.p149.131 to 17.92.1.p149.43": added.– Section 4.6.8 "Known issues": updated.• SD-UART IW611/IW612<ul style="list-style-type: none">– 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: from 18.99.2.p66.18 to 18.99.3.p10.1": added.– Section 4.7.8 "Known issues": updated.

Revision history...continued

Document ID	Date	Description
RN00110 v.12.0	12 April 2024	<ul style="list-style-type: none">• Feature lists<ul style="list-style-type: none">– Section 3.1.2 "AP mode": updated.– Section 3.2.1 "Bluetooth classic": updated.• PCIe-UART 88W8997<ul style="list-style-type: none">– 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 4.1.7.4 "Firmware version: From 17.92.21.p84.4 to 16.92.21.p119.3": added.– Section 4.1.8 "Known issues": updated.• PCIe-UART 88W9098<ul style="list-style-type: none">– 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<ul style="list-style-type: none">– 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: From 16.92.21.p99.2 to 16.92.21.p119.3": added.– Section 4.3.8 "Known issues": updated.• SD-UART IW416<ul style="list-style-type: none">– 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: from 16.92.21.p84.128 to 16.92.21.p119.3": added.– Section 4.4.8 "Known issues": updated. <p>————— <i>Continues</i> —————</p>

Revision history...continued

Document ID	Date	Description
RN00110 v.12.0	12 April 2024	<p>————— <i>Continued</i> —————</p> <ul style="list-style-type: none">• SD-UART 88W8997<ul style="list-style-type: none">– 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: from 16.92.21.p84.4 to 16.92.21.p119.3": added.– Section 4.5.8 "Known issues": updated.• SD-UART 88W9098<ul style="list-style-type: none">– 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: from 17.92.1.p136.132 to 17.92.1.p149.131": added.• SD-UART IW611/IW612<ul style="list-style-type: none">– 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: from 18.99.2.p66.10 to 18.99.2.p66.18": added.– Section 4.7.8 "Known issues": updated.
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Revision history...continued

Document ID	Date	Description
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Document ID	Date	Description
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Document ID	Date	Description
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RN00110 v.4.0	17 October 2022	<p>Updated:</p> <ul style="list-style-type: none"> • 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" <p>Added:</p> <ul style="list-style-type: none"> • Section 4.4 "SD-UART IW416"

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Document ID	Date	Description
RN00110 v.3.0	24 July 2022	Updated: <ul style="list-style-type: none">• 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: <ul style="list-style-type: none">• Section 4.4 "SD-UART IW416"
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