

RN00110

NXP Wireless SoC Features and Release Notes for Android

Rev. 17.0 — 10 July 2025

Release notes

Document information

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



1 About this document

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

This is a consolidated release that has been tested with Android BSP version 15.0.0_2.0.0, for the wireless devices mentioned in this document.

2 Downloading the wireless driver and firmware

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

2.1 Pre-compiled Wi-Fi driver and firmware

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

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

Note: The pre built images in Android release 15.0.0_2.0.0 include the following default wireless firmware based on the i.MX 8M EVK boards. [Table 1](#) lists the possible combinations.

Table 1. Default wireless firmware support

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

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

2.2 Wi-Fi driver source and firmware

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

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

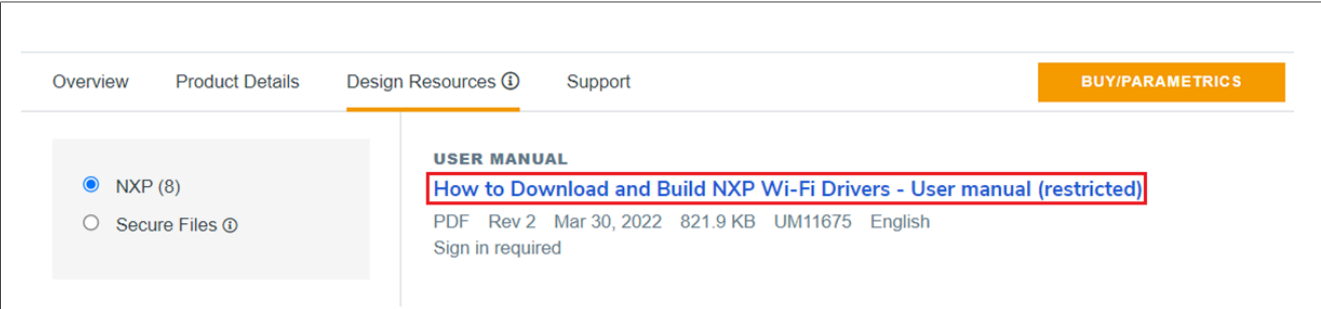


Figure 1. Documentation section on product pages

Note:

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

2.3 Wi-Fi patch

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

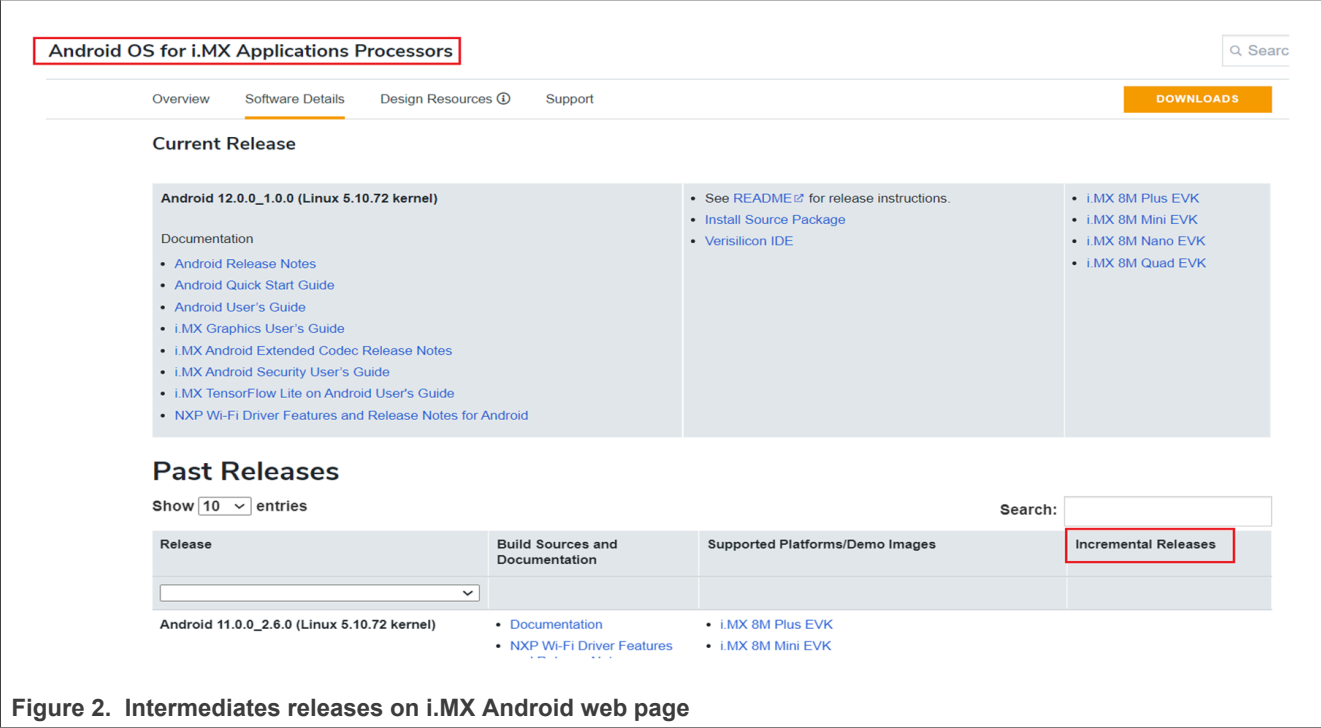


Figure 2. Intermediates releases on i.MX Android web page

3 Feature lists

3.1 Wi-Fi radio

3.1.1 Client mode

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

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

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

Features	PCIe-UART		SD-UART				
	88W8997	88W9098	88W9098	IW611/ IW612	88W8997	88W8987	IW416
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
802.11ax – High efficiency (HE)							

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

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

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

Features	PCIe-UART		SD-UART				
	88W8997	88W9098	88W9098	IW611/ IW612	88W8997	88W8987	IW416
802.11i security features							
Opensource WPA Supplicant Support	Y	Y	Y	Y	Y	Y	Y
WPA2-PSK AES WPA Supplicant	Y	Y	Y	Y	Y	Y	Y
WPA3-SAE (Simultaneous Authentication of Equals) WPA Supplicant	Y	Y	Y	Y	Y	Y	Y
WPA2+WPA3 PSK Mixed Mode (WPA3 Transition Mode) WPA Supplicant	Y	Y	Y	Y	Y	Y	Y
Wi-Fi Enhanced Open - OWE (Opportunistic Wireless Encryption) WPA Supplicant	Y	Y	Y	Y	Y	Y	Y
802.1x EAP Authentication Methods WPA Supplicant	Y	Y	Y	Y	Y	Y	Y
WPA2-Enterprise Mixed Mode WPA Supplicant	Y	Y	Y	Y	Y	Y	Y
WPA3-Enterprise (Suite-B) National Security Algorithm (CSNA) WPA Supplicant	Y	Y	Y	Y	Y	Y	N
802.11w - PMF (Protected Management Frames) WPA Supplicant	Y	Y	Y	Y	Y	Y	Y
WPA3 Enterprise	Y	Y	Y	Y	Y	Y	Y
802.11mc features							
Wi-Fi location ^[1]	N	Y	Y	Y	N	N	N
WPA3 SAE (R3) security features							
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) features							
FT over air and over distribution system (DS) (open, WPA2-PSK)	Y	Y	Y	Y	Y	Y	Y
802.11k features							
802.11k	Y	Y	Y	Y	Y	Y	Y
802.11v features							

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

Features	PCIe-UART		SD-UART				
	88W8997	88W9098	88W9098	IW611/ IW612	88W8997	88W8987	IW416
802.11v	Y	Y	Y	Y	Y	Y	Y
New generation Wi-Fi location ^[1]	N	N	N	Y	N	N	N
FIPS feature							
FIPS support ^[2]	Y	Y	Y	Y	Y	Y	Y
802.11w – Protected management frame (PMF) features							
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 features							
Deep sleep	Y	Y	Y	Y	Y	Y	Y
IEEE power save	Y	Y	Y	Y	Y	Y	Y
General features							
EU adaptivity support	Y	Y	Y	Y	Y	Y	Y
MAC address randomization (in scan)	Y	Y	Y	Y	Y	Y	Y
Host based MLME ^[3]	Y	Y	Y	Y	Y	Y	Y
Extended channel switch announcement (ECSA)	Y	Y	Y	Y	Y	Y	Y
DCM	N	Y	Y	Y	N	N	N
Wireless Android auto ^[2]	N	Y	Y	Y	N	Y	N
mDNS (Bonjour) offload	Y	Y	Y	Y	Y	Y	Y
Extended range ^[1]	N	Y	Y	Y	N	N	N
Wi-Fi agile multiband	N	Y	Y	Y	N	N	N
Auto Reconnect	N	N	N	Y	N	N	N
Independent reset (In-band) ^[4]	Y	Y	Y	Y	Y	Y	Y
Specific scan (scancfg)	Y	Y	Y	Y	Y	Y	Y
Network scan (iwlist scan)	Y	Y	Y	Y	Y	Y	Y
Cancellable scan	Y	Y	Y	Y	Y	Y	Y
Passive to active scan	Y	Y	Y	Y	Y	Y	Y

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

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

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

[4] To avoid any version mismatch, copy both the combo firmware and the standalone Wi-Fi firmware to the firmware directory (/lib/firmware/nxp/) of the host system.

3.1.2 AP mode

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

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

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

Features	PCIe-UART		SD-UART				
	88W8997	88W9098	88W9098	IW611/ IW612	88W8997	88W8987	IW416
5 GHz band supported channel bandwidths: 20 MHz	Y	Y	Y	Y	Y	Y	N
5 GHz band supported channel bandwidths: 40 MHz	Y	Y	Y	Y	Y	Y	N
5 GHz band supported channel bandwidths: 80 MHz	Y	Y	Y	Y	Y	Y	N
Short/Long Guard Interval (400ns/800ns)	Y	Y	Y	Y	Y	Y	N
802.11ac data rates – Up to 433.3 Mbps (MCS 0 to MCS 9)	Y	Y	Y	Y	Y	Y	N
802.11ac data rates - Up to 866.7 Mbps (MCS 0 to MCS 9)	Y	Y	Y	N	Y	N	N
Single user (SU)-Aggregated MAC protocol data unit (SU-AMPDU) aggregation	Y	Y	Y	Y	Y	Y	N
RTS/CTS with BW signaling	Y	Y	Y	Y	Y	Y	N
Backward Compatibility with non-VHT devices	Y	Y	Y	Y	Y	Y	N
TX VHT MCS rate adaptation	Y	Y	Y	Y	Y	Y	N
Operation Mode Notification	Y	Y	Y	Y	Y	Y	N
Explicit Beamformer	Y	Y	Y	N	Y	N	N
SU-Beamformee	Y	Y	Y	Y	Y	Y	N
256 QAM Modulation - MCS8 and MCS9	Y	Y	Y	Y	Y	Y	N
802.11ax – High efficiency (HE) features							
5 GHz band supported channel bandwidth: 20MHz	N	Y	Y	Y	N	N	N
5 GHz band supported channel bandwidth: 40 MHz	N	Y	Y	Y	N	N	N
5 GHz band supported channel bandwidth: 80 MHz	N	Y	Y	Y	N	N	N
Operating mode indication (OMI) control	N	Y	Y	Y	N	N	N
2x/4x HE-Long training field (LTF)	N	Y	Y	Y	N	N	N
256 QAM modulation – MCS8 and MCS9	N	Y	Y	Y	N	N	N
1024 QAM modulation – MCS10 and MCS11	N	Y	Y	Y	N	N	N
SU beamforming	N	Y	Y	N	N	N	N
802.11d features							
802.11d - Regulatory domain/operating class/country info	Y	Y	Y	Y	Y	Y	Y
802.11h features							
802.11h – Dynamic frequency selection (DFS)	Y	Y	Y	Y	Y	Y	Y
802.11e – QoS features							

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

Features	PCIe-UART		SD-UART				
	88W8997	88W9098	88W9098	IW611/ IW612	88W8997	88W8987	IW416
Enhanced distributed channel access (EDCA) / wireless multi-media (WMM)	Y	Y	Y	Y	Y	Y	Y
802.11i security features							
Hostapd Support	Y	Y	Y	Y	Y	Y	Y
WPA2-PSK AES hostapd	Y	Y	Y	Y	Y	Y	Y
WPA3-SAE (Simultaneous Authentication of Equals) Hostapd	Y	Y	Y	Y	Y	Y	Y
WPA2+WPA3 PSK Mixed Mode (WPA3 Transition Mode) Hostapd	Y	Y	Y	Y	Y	Y	Y
Wi-Fi Enhanced Open - OWE (Opportunistic Wireless Encryption) Hostapd	Y	Y	Y	Y	Y	Y	Y
802.1x EAP Authentication Methods Hostapd	N	N	N	N	N	N	Y
802.11w - PMF (Protected Management Frames) Hostapd	Y	Y	Y	Y	Y	Y	Y
WPA3 SAE (R3) security features							
Simultaneous authentication of equals (SAE)	Y	Y	Y	Y	Y	Y	Y
SAE connectivity and PMK caching	Y	Y	Y	Y	Y	Y	Y
Wi-Fi enhanced open	Y	Y	Y	Y	Y	Y	N
WPA3 Enterprise Suite-B Host (host based)	Y	Y	Y	Y	Y	Y	N
802.11w – Protected management frame (PMF) features							
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
General features							

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

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

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

3.1.3 Wi-Fi direct/P2P

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

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

3.1.4 AP/STA mode

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

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

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

3.2 Bluetooth

3.2.1 Bluetooth classic

Table 6. Feature list for Bluetooth radio

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

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

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

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

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

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

3.2.2 Bluetooth LE

Table 7. Feature list for Bluetooth LE radio

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

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

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

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

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

[3] IW611/IW612 firmware supported feature.

3.3 Coexistence

3.3.1 Wi-Fi and Bluetooth coexistence

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

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

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

3.3.2 Notes on coexistence

P2P-GO and STA simultaneous mode operations

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

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

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

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

How to apply changes:

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

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

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

4 Release notes for the supported SoCs

4.1 PCIe-UART 88W8997

Package information

- Android BSP version: 15.0.0_2.0.0
- Wi-Fi and Bluetooth/Bluetooth LE Firmware version: 16.92.21.p151.4
- Driver version: MM6X16537.p9-GPL

Version information

- Wireless SoC: 88W8997
- Wi-Fi and Bluetooth/Bluetooth LE Firmware Version: 16.92.21.p151.4
 - 16 - Major revision
 - 92 - Feature pack
 - 21 - Release version
 - p151.4 - Patch number
- Driver Version: MM6X16537.p9-GPL
 - 6X - Linux 6.x Kernel
 - 16537 - Release version
 - p9 - Patch number
 - GPL - General Public License v2

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 M009.020_M009.031_Android_14)

4.1.1 Wi-Fi and Bluetooth certification

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

4.1.1.1 Wi-Fi pre-certifications

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

Note:

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

4.1.1.2 Bluetooth controller certification

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

4.1.2 Wi-Fi throughput

4.1.2.1 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

4.1.2.2 STA throughput

External AP: Asus RT-AX88U

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

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

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

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

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

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

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

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

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

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

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

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

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

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

4.1.2.3 P2P-GO throughput

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

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

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

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

4.1.2.4 P2P-GC throughput

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

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

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

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

4.1.2.5 Mobile AP throughput

External client: NXP IW620 PCIe-UART

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

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

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

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

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

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

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

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

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

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

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

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

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

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

4.1.3 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)

4.1.4 Bug fixes/feature enhancements

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

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

Component	Description
—	—

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

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

Component	Description
—	NA

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

Table 29. Firmware version 16.92.21.p55.3 to 16.92.21.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.

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

Table 30. Firmware version 16.92.21.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.

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

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

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

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

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

Component	Description
—	—

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

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

Component	Description
—	—

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

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

Component	Description
—	—

4.1.4.9 Firmware version 16.92.21.p149.2 to 16.92.21.p151.4

Firmware version 16.92.21.p149.2 to 16.92.21.p151.4

Component	Description
Wi-Fi	<ul style="list-style-type: none">• In the roaming test, the DUT fails to connect back to the previous AP due to association failure.• Failure to set the MAC address with an init config file.

4.1.5 Known issues

Table 32. Known issues

Component	Description
—	—

4.2 PCIe-UART 88W9098

Package information

- Android BSP version: 15.0.0_2.0.0
- Wi-Fi and Bluetooth/Bluetooth LE Firmware version: 17.92.1.p149.70
- Driver version: MM6X17537.p9-GPL

Version information

- Wireless SoC: 88W9098
- Wi-Fi and Bluetooth/Bluetooth LE Firmware Version: 17.92.1.p149.70
 - 17 - Major revision
 - 92 - Feature pack
 - 1 - Release version
 - p149.70 - Patch number
- Driver Version: MM6X17537.p9-GPL
 - 6X - Linux 6.x Kernel
 - 17537 - Release version
 - p9 - Patch number
 - GPL - General Public License v2

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 M009.020_M009.031_Android_14)

4.2.1 Wi-Fi and Bluetooth certification

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

4.2.1.1 Wi-Fi pre-certifications

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

Note:

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

4.2.1.2 Bluetooth controller certification

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

4.2.2 Wi-Fi throughput

4.2.2.1 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

4.2.2.2 STA throughput

External AP: Netgear RAX200

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	415	420	440	470
WPA2-AES	420	430	440	460
WPA3-SAE	420	420	446	460

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

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	700	720	790	800
WPA2-AES	720	750	796	800
WPA3-SAE	720	750	780	796

4.2.2.3 P2P-GO throughput

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

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

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

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

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

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

4.2.2.4 P2P-GC throughput

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

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

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

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

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

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

4.2.2.5 Mobile AP throughput

External client: NXP 88W9098 PCIe-UART

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	737	730	750	756
WPA2-AES	738	727	760	766
WPA3-SAE	786	720	761	770

4.2.3 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)

4.2.4 Bug fixes/feature enhancements

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

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

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

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

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

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

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

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

Component	Description
—	—

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

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

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

4.2.4.5 Firmware version 17.92.1.p149.131 to 17.92.1.149.43

Firmware version 17.92.1.p149.131 to 17.92.1.149.43

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

4.2.4.6 Firmware version 17.92.1.p149.43 to 17.92.1.149.156

Firmware version 17.92.1.p149.43 to 17.92.1.149.156

Component	Description
—	—

4.2.4.7 Firmware version 17.92.1.p149.156 to 17.92.1.149.53

Firmware version 17.92.1.p149.156 to 17.92.1.149.53

Component	Description
—	—

4.2.4.8 Firmware version 17.92.1.p149.53 to 17.92.1.149.60

Firmware version 17.92.1.p149.53 to 17.92.1.149.60

Component	Description
—	—

4.2.4.9 Firmware version 17.92.1.p149.60 to 17.92.1.p149.70

Firmware version 17.92.1.p149.60 to 17.92.1.p149.70

Component	Description
Bluetooth	<ul style="list-style-type: none">During firmware initialization, any pulse on UART TX line leads to firmware initialization failureAfter braktooth attack of duplicated encapsulated payload, DUT not able to start the Page and Inquiry scan.

4.2.5 Known issues

Table 61. Known issues

Component	Description
—	—

4.3 SD-UART 88W8987

Package information

- Android BSP version: 15.0.0_2.0.0
- Wi-Fi and Bluetooth/Bluetooth LE Firmware version: 16.92.21.p151.4
- Driver version: MM6X16537.p9-GPL

Version information

- Wireless SoC: 88W8987
- Wi-Fi and Bluetooth/Bluetooth LE Firmware Version: 16.92.21.p151.4
 - 16 - Major revision
 - 92 - Feature pack
 - 21 - Release version
 - p151.4 - Patch number
- Driver Version: MM6X16537.p9-GPL
 - 6X - Linux 6.x Kernel
 - 16537 - Release version
 - p9 - Patch number
 - GPL - General Public License v2

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 M009.020_M009.031_Android_14)

4.3.1 Wi-Fi and Bluetooth certification

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

4.3.1.1 WFA Certifications

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

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

Note:

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

4.3.1.2 Bluetooth controller certification

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

4.3.2 Wi-Fi throughput

4.3.2.1 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

4.3.2.2 STA throughput

External AP: Asus RT-AX88U

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

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

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

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

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

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

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

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

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

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

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

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

4.3.2.3 P2P-GO throughput

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

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

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

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

4.3.2.4 P2P-GC throughput

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

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

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

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

4.3.2.5 Mobile AP throughput

External client: NXP 88W8987 SD-UART

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

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

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

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

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

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

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

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

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

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

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

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

4.3.3 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)

4.3.4 Bug fixes/feature enhancements

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

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

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

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

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

Component	Description
—	NA

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

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

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

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

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

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

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

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

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

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

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

Component	Description
—	—

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

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

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

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

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

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

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

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

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

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

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

Component	Description
—	—

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

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

Component	Description
—	—

4.3.4.12 Firmware version 16.92.21.p149.2 to 16.92.21.p151.4

Firmware version 16.92.21.p149.2 to 16.92.21.p151.4

Component	Description
Wi-Fi	<ul style="list-style-type: none">In P2P mode, connection failure is observed when the device is in listen state.

4.3.5 Known issues

Table 86. 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

Package information

- Android BSP version: 15.0.0_2.0.0
- Wi-Fi and Bluetooth/Bluetooth LE Firmware version: 16.92.21.p151.4
- Driver version: MM5X16537.p9-GPL

Version information

- Wireless SoC: IW416
- Wi-Fi and Bluetooth/Bluetooth LE Firmware Version: 16.92.21.p151.4
 - 16 - Major revision
 - 92 - Feature pack
 - 21 - Release version
 - p151.4 - Patch number
- Driver Version: MM5X16537.p9-GPL
 - 5X - Linux 5.x Kernel
 - 16537 - Release version
 - p9 - Patch number
 - GPL - General Public License v2

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 M009.020_M009.031_Android_14)

4.4.1 Wi-Fi and Bluetooth certification

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

4.4.1.1 WFA Certifications

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

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

Note:

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

4.4.1.2 Bluetooth controller certification

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

4.4.2 Wi-Fi throughput

4.4.2.1 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

4.4.2.2 STA throughput

External AP: Asus RT-AX88U

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

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	42	39	49	48
WPA2-AES	40	35	53	52
WPA3-SAE	40	32	50	49

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

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	68	81	90	89
WPA2-AES	65	65	93	80
WPA3-SAE	60	49	93	95

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

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	62	57	93	75
WPA2-AES	41	41	52	56
WPA3-SAE	40	40	52	54

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

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	65	73	93	100
WPA2-AES	60	61	93	97
WPA3-SAE	60	61	94	97

4.4.2.3 P2P-GO throughput

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

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
WPA2-AES	54	56	63	58

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

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
WPA2-AES	123	107	129	113

4.4.2.4 P2P-GC throughput

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

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
WPA2-AES	53	54	55	54

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

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
WPA2-AES	110	107	120	118

4.4.2.5 Mobile AP throughput

External client: NXP IW620 PCIe-UART

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

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

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

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	65	60	115	115
WPA2-AES	67	62	114	124
WPA3-SAE	65	60	114	123

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

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	56	53	63	62
WPA2-AES	56	53	60	56
WPA3-SAE	56	53	60	62

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

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	69	72	124	126
WPA2-AES	67	75	121	128
WPA3-SAE	70	72	119	127

4.4.3 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)

4.4.4 Bug fixes/feature enhancements

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Component	Description
—	—

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

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

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

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

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

Component	Description
Wi-Fi	<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>

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

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

Component	Description
—	—

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

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

Component	Description
—	—

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

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

Component	Description
—	—

4.4.4.11 Firmware version 16.92.21.p149.2 16.92.21.p151.4

Firmware version 16.92.21.p149.2 16.92.21.p151.4

Component	Description
Wi-Fi	<ul style="list-style-type: none"> When ed-mac is enabled, probe responses are transmitted during interference signal. In the roaming test, the DUT fails to connect back to the previous AP due to association failure. Failure to set the MAC address with an init config file.

4.4.5 Known issues

Table 103. Known issues

Component	Description
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

Package information

- Android BSP version: 15.0.0_2.0.0
- Wi-Fi and Bluetooth/Bluetooth LE Firmware version: 16.92.21.p151.4
- Driver version: MM6X17537.p9-GPL

Version information

- Wireless SoC: 88W8997
- Wi-Fi and Bluetooth/Bluetooth LE Firmware Version: 16.92.21.p151.4
 - 16 - Major revision
 - 92 - Feature pack
 - 21 - Release version
 - p151.4 - Patch number
- Driver Version: MM6X17537.p9-GPL
 - 6X - Linux 6.x Kernel
 - 17537 - Release version
 - p9 - Patch number
 - GPL - General Public License v2

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 M009.020_M009.031_Android_14)

4.5.1 Wi-Fi and Bluetooth certification

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

4.5.1.1 Wi-Fi pre-certifications

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

Note:

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

4.5.1.2 Bluetooth controller certification

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

4.5.2 Wi-Fi throughput

4.5.2.1 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

4.5.2.2 STA throughput

External AP: Asus RT-AX88U

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

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

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

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

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

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

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

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

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

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

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

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

4.5.2.3 P2P-GO throughput

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

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

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

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

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

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

4.5.2.4 P2P-GC throughput

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

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

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

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

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

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

4.5.2.5 Mobile AP throughput

External Client: NXP IW620 PCIe-UART

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

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

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

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

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

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

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

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

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

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

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

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

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

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

4.5.3 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)

4.5.4 Bug fixes/feature enhancements

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

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

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

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

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

Component	Description
—	NA

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

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

Component	Description
—	NA

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Component	Description
—	—

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

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

Component	Description
—	—

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

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

Component	Description
—	—

4.5.4.11 Firmware version 16.92.21.p149.2 to 16.92.21.p151.4

Firmware version 16.92.21.p149.2 to 16.92.21.p151.4

Component	Description
Wi-Fi	<ul style="list-style-type: none"> In the roaming test, the DUT fails to connect back to the previous AP due to association failure. Failure to set the MAC address with an init config file.

4.5.5 Known issues

Table 129. Known issues

Component	Description
—	—

4.6 SD-UART 88W9098

Package information

- Android BSP version: 15.0.0_2.0.0
- Wi-Fi and Bluetooth/Bluetooth LE Firmware version: 17.92.1.p149.70
- Driver version: MM6X17537.p9-GPL

Version information

- Wireless SoC: 88W9098
- Wi-Fi and Bluetooth/Bluetooth LE Firmware Version: 17.92.21.p149.70
 - 17 - Major revision
 - 92 - Feature pack
 - 21 - Release version
 - p149.70 - Patch number
- Driver Version: MM6X17537.p9-GPL
 - 6X - Linux 6.x Kernel
 - 17537 - Release version
 - p9 - Patch number
 - GPL - General Public License v2

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 M009.020_M009.031_Android_14)

4.6.1 Wi-Fi and Bluetooth certification

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

4.6.1.1 Wi-Fi pre-certifications

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

Note:

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

4.6.1.2 Bluetooth controller certification

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

4.6.2 Wi-Fi throughput

4.6.2.1 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

4.6.2.2 STA throughput

External AP: Netgear RAX200

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

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	109	115	117	118
WPA2-AES	110	114	117	118
WPA3-SAE	111	116	117	118

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

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	105	112	114	115
WPA2-AES	107	112	116	114
WPA3-SAE	108	113	116	114

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

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	182	224	233	211
WPA2-AES	189	224	233	226
WPA3-SAE	198	225	233	229

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

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	127	136	136	138
WPA2-AES	127	136	137	142
WPA3-SAE	127	137	143	141

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

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	252	294	305	318
WPA2-AES	252	290	309	306
WPA3-SAE	254	293	306	317

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

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	270	302	359	354
WPA2-AES	269	301	360	347
WPA3-SAE	268	303	359	350

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

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	165	166	180	180
WPA2-AES	167	169	180	180
WPA3-SAE	167	168	178	180

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

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	203	215	227	229
WPA2-AES	200	215	227	228
WPA3-SAE	201	217	228	230

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

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	256	272	340	333
WPA2-AES	255	275	340	317
WPA3-SAE	249	267	339	330

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

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	303	295	345	361
WPA2-AES	302	310	360	361
WPA3-SAE	302	310	361	363

4.6.2.3 P2P-GO throughput

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

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

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

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

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

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

4.6.2.4 P2P-GC throughput

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

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

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

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

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

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

4.6.2.5 Mobile AP throughput

External Client: NXP 88W9098 SD-UART

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

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

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

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

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

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

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

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

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

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

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

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

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

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	228	292	244	380
WPA2-AES	233	292	239	380
WPA3-SAE	224	287	246	382

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

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

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

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

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

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	163	207	248	223
WPA2-AES	166	214	249	229
WPA3-SAE	163	206	253	223

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

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	179	290	398	394
WPA2-AES	178	293	404	393
WPA3-SAE	179	291	403	399

4.6.3 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)

4.6.4 Bug fixes/feature enhancements

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

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

Component	Description
—	NA

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

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

Component	Description
—	NA

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

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

Component	Description
—	—

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

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

Component	Description
—	—

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

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

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

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

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

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

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

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

Component	Description
—	—

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

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

Component	Description
—	—

4.6.4.9 Firmware version 17.92.1.p149.60 to 17.92.1.p149.70

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

Component	Description
Wi-Fi	<ul style="list-style-type: none">Firmware command timeout error [0xb] observed during long-term stress testing of legacy roaming.Firmware command timeout error [0x107] observed during long-term stress testing of legacy roaming.TX timeout error observed during long-term stress testing of legacy roaming.Firmware crash observed in the long run test when AP is enabled and STA is connected to external AP.

4.6.5 Known issues

Table 159. Known issues

Component	Description
—	—

4.7 SD-UART IW611/IW612

Package information

- Android BSP version: 15.0.0_2.0.0
- Wi-Fi and Bluetooth/Bluetooth LE Firmware version: 18.99.3.p25.7
- Driver version: MM6X18537.p9-GPL

Version information

- Wireless SoC: IW611/IW612
- Wi-Fi and Bluetooth/Bluetooth LE Firmware Version: 18.99.3.p25.7
 - 18 - Major revision
 - 99 - Feature pack
 - 3 - Release version
 - p25.7 - Patch number
- Driver Version: MM6X18537.p9-GPL
 - 6X - Linux 6.x Kernel
 - 18537 - Release version
 - p9 - Patch number
 - GPL - General Public License v2

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 M009.020_M009.031_Android_14)

4.7.1 Wi-Fi and Bluetooth certification

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

4.7.1.1 Wi-Fi pre-certifications

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

Note:

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

4.7.1.2 Bluetooth controller certification

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

4.7.2 Wi-Fi throughput

4.7.2.1 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

4.7.2.2 STA throughput

External AP: Asus RT-AX88U

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

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

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

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

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

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	122	124	134	132
WPA2-AES	122	120	133	132
WPA3-SAE	121	123	134	132

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

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

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

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	168	167	177	178
WPA2-AES	167	160	173	176
WPA3-SAE	164	162	176	175

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

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	328	342	368	386
WPA2-AES	326	340	365	384
WPA3-SAE	321	340	363	385

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

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	114	110	125	124
WPA2-AES	114	110	124	122
WPA3-SAE	112	108	122	122

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

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	119	119	126	128
WPA2-AES	118	117	125	127
WPA3-SAE	118	116	126	125

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

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	230	226	252	256
WPA2-AES	228	224	250	255
WPA3-SAE	226	224	251	255

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

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	333	332	420	420
WPA2-AES	327	327	416	415
WPA3-SAE	324	324	414	419

4.7.2.3 P2P-GO throughput

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

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

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

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

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

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

4.7.2.4 P2P-GC throughput

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

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

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

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

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

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

4.7.2.5 Mobile AP throughput

External Client: NXP IW620 PCIe-UART

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

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

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

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	118	120	126	128
WPA2-AES	116	119	124	126
WPA3-SAE	119	117	125	125

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

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

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

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	119	121	134	132
WPA2-AES	116	120	131	130
WPA3-SAE	115	116	130	129

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

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	73	69	75	71
WPA2-AES	72	70	75	71
WPA3-SAE	73	69	74	71

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

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	174	172	178	180
WPA2-AES	172	171	178	176
WPA3-SAE	171	171	176	179

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

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	335	329	369	376
WPA2-AES	330	326	368	372
WPA3-SAE	331	327	367	372

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

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	111	115	125	124
WPA2-AES	110	113	124	122
WPA3-SAE	109	110	122	120

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

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	116	119	125	130
WPA2-AES	115	116	124	126
WPA3-SAE	115	118	121	127

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

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	225	229	248	249
WPA2-AES	224	225	247	245
WPA3-SAE	226	224	245	242

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

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	TX	RX	TX	RX
Open security	331	334	417	421
WPA2-AES	318	332	414	414
WPA3-SAE	328	335	415	413

4.7.3 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)

4.7.4 Bug fixes/feature enhancements

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

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

Component	Description
Wi-Fi	<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.

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

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

Component	Description
Wi-Fi	<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.

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

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

Component	Description
Wi-Fi	<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.

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

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

Component	Description
Bluetooth	<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. Sometimesthe connection timeout for CIS establishment event is observed on the second CIS link while creating all 2 CIS together.

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

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

Component	Description
Wi-Fi	<ul style="list-style-type: none"> In the DRCS test, DUT AP sent fewer beacons resulting ext. STA disconnections when the DUT-STA is already performing a scan operation. In the DRCS test, the DUT AP sent fewer beacons resulting ext. STA disconnections when the DUT-STA is already performing a scan operation. In the DRCS test, connection failures are seen when a mobile tries to associate with DUT AP and DUT-STA tries to connect with an ext AP using the wrong password. During TX power and regulatory test, kernel warning observed when <code>tx-power</code> values are not the same for 20 MHz, 40 MHz, and 80 MHz bonded channels.
Coexistence	<ul style="list-style-type: none"> Audio cuts observed while running the DUT STA coex. RVR test

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

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

Component	Description
Wi-Fi	<ul style="list-style-type: none"> Observed the DUT platform reboot issue when the external client connected to the DUT-AP is streaming, and in parallel the DUT-STA is scanning.
Coexistence	<ul style="list-style-type: none"> Wi-Fi throughput numbers degraded by 35% when LE audio stream 1-BIS is running in the background.

4.7.4.7 Firmware version 18.99.3.p23.6 to 18.99.3.p25.7

Firmware version 18.99.3.p23.6 to 18.99.3.p25.7

Component	Description
Wi-Fi	<ul style="list-style-type: none">Firmware auto recovery failures occur during long run stress test in DUT-AP mode.firmware command timeout error [0x107] observed during long-term stress testing of legacy roaming.TX timeout error was observed during long-term stress testing of legacy roaming.Firmware crash observed in the long run test when AP is enabled and STA is connected to an external AP.
Bluetooth	<ul style="list-style-type: none">DUT hang observed randomly while connected with the peer device on Bluetooth/Bluetooth LE link for a long time duration.When 251 bytes of data set as extended advertisement data, over the air data length is set as 242 bytes.
Coexistence	<ul style="list-style-type: none">DUT fails to start the mobile hotspot when Bluetooth and OpenThread traffic is ongoing.

4.7.5 Known issues

Table 187. Known issues

Component	Description
—	—

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

[Table 188](#) lists the on-board chips for i.MX platforms and external wireless solutions available.

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

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

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

6 Abbreviations

Table 189. Abbreviations

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

7 Note about the source code in the document

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8 References

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

9 Revision history

Revision history

Document ID	Date	Description
RN00110 v.17.0	10 July 2025	<ul style="list-style-type: none">• Section 1 "About this document": updated Android BSP version.• Section 2.1 "Pre-compiled Wi-Fi driver and firmware": updated Android BSP version.• Section 3.1.1 "Client mode": updated.• Section 4.1 "PCIe-UART 88W8997": updated.• Section 4.2 "PCIe-UART 88W9098": updated.• Section 4.3 "SD-UART 88W8987": updated.• Section 4.4 "SD-UART IW416": updated.• Section 4.5 "SD-UART 88W8997": updated.• Section 4.6 "SD-UART 88W9098": updated.• Section 4.7 "SD-UART IW611/IW612": updated.
RN00110 v.16.0	8 April 2025	<ul style="list-style-type: none">• Section 1 "About this document": updated the release version.• Section 4.1 "PCIe-UART 88W8997": updated.• Section 4.2 "PCIe-UART 88W9098": updated.• Section 4.3 "SD-UART 88W8987": updated.• Section 4.4 "SD-UART IW416": updated.• Section 4.5 "SD-UART 88W8997": updated.• Section 4.7 "SD-UART IW611/IW612": updated.
RN00110 v.15.0	22 January 2025	<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.• Section 3.1.1 "Client mode": updated.• Section 3.1.2 "AP mode": updated.• Section 3.1.4 "AP/STA mode": updated.• Section 3.2.1 "Bluetooth classic": updated.• Section 3.2.2 "Bluetooth LE": updated.• Section 4.1 "PCIe-UART 88W8997": updated.• Section 4.2 "PCIe-UART 88W9098": updated.• Section 4.3 "SD-UART 88W8987": updated.• Section 4.4 "SD-UART IW416": updated.• Section 4.5 "SD-UART 88W8997": updated.• Section 4.7 "SD-UART IW611/IW612": updated.• Section 8 "References": updated.

Revision history...continued

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. • Section 3.1.1 "Client mode": updated. • Section 3.1.2 "AP mode": updated. • Section 4.1 "PCIe-UART 88W8997": updated. • Section 4.2 "PCIe-UART 88W9098": updated. • Section 4.3 "SD-UART 88W8987": updated. • Section 4.4 "SD-UART IW416": updated. • Section 4.5 "SD-UART 88W8997": updated. • Section 4.6 "SD-UART 88W9098": updated. • Section 4.7 "SD-UART IW611/IW612": updated.
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Revision history...continued

Document ID	Date	Description
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RN00110 v.9.0	23 October 2023	<ul style="list-style-type: none"> Section 4.1 "PCIe-UART 88W8997": updated the patch number for the driver in sections <i>Package information</i> and <i>Version information</i>. Section 4.2 "PCIe-UART 88W9098": <ul style="list-style-type: none"> Updated the patch number for the driver in sections <i>Package information</i> and <i>Version information</i>. Created a separate table for AN mode 5 GHz band 40 MHz in Section 4.2.2.2 "STA throughput": Section 4.3 "SD-UART 88W8987": updated the patch number for the driver in sections <i>Package information</i> and <i>Version information</i>. Section 4.4 "SD-UART IW416": updated the patch number for the driver in sections <i>Package information</i> and <i>Version information</i>. Section 4.5 "SD-UART 88W8997": updated the patch number for the driver in sections <i>Package information</i> and <i>Version information</i>. Section 4.6 "SD-UART 88W9098": updated the patch number for the driver in sections <i>Package information</i> and <i>Version information</i>. Section 4.7 "SD-UART IW611/IW612": updated the firmware version, and the patch version for the driver in sections <i>Package information</i> and <i>Version information</i>.

Revision history...continued

Document ID	Date	Description
RN00110 v.8.0	12 October 2023	Updated: <ul style="list-style-type: none">• Section 1 "About this document"• Section 2 "Downloading the wireless driver and firmware"• Section 3 "Feature lists"• Section 4.1 "PCIe-UART 88W8997"• Section 4.2 "PCIe-UART 88W9098"• Section 4.3 "SD-UART 88W8987"• Section 4.4 "SD-UART IW416"• Section 4.6 "SD-UART 88W9098"• Section 4.7 "SD-UART IW611/IW612" Added: <ul style="list-style-type: none">• Section 7 "Note about the source code in the document"
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RN00110 v.6.0	07 Apr 2023	Updated: <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 4.2 "PCIe-UART 88W9098"• Section 4.3 "SD-UART 88W8987"• Section 4.4 "SD-UART IW416"• Section 4.5 "SD-UART 88W8997"• Section 4.6 "SD-UART 88W9098" Added: <ul style="list-style-type: none">• Section 4.7 "SD-UART IW611/IW612"

Revision history...continued

Document ID	Date	Description
RN00110 v.5.0	30 December 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 4.5 "SD-UART 88W8997" <p>Added:</p> <ul style="list-style-type: none"> • Section 4.2 "PCIe-UART 88W9098" • Section 4.6 "SD-UART 88W9098"
RN00110 v.4.0	17 October 2022	<ul style="list-style-type: none"> • Section 2 "Downloading the wireless driver and firmware": updated. • Section 3 "Feature lists": updated. • Section 4.1 "PCIe-UART 88W8997": updated. • Section 4.4 "SD-UART IW416": updated. • Section 5 "i.MX platforms on-board chips and external wireless solutions": updated. • Section 6 "Abbreviations": updated.
RN00110 v.3.0	24 July 2022	<ul style="list-style-type: none"> • Section 4.1 "PCIe-UART 88W8997": updated. • Section 4.3 "SD-UART 88W8987": updated. • Section 4.4 "SD-UART IW416": added.
RN00110 v.2.0	8 April 2022	<ul style="list-style-type: none"> • Section 3 "Feature lists": added features for AP and STA. <p>Updated:</p> <ul style="list-style-type: none"> • Section 4.1 "PCIe-UART 88W8997": updated. • Section 4.3 "SD-UART 88W8987": updated.
RN00110 v.1.0	4 January 2022	<ul style="list-style-type: none"> • Initial release

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