

# RN00110

## NXP Wireless SoC Features and Release Notes for Android

Rev. 12 — 12 April 2024

Release notes

### Document information

Information	Content
Keywords	PCIe, UART, SDIO, Bluetooth, Bluetooth LE, coexistence, Host platform, release, version, package, certification, Wi-Fi throughput, EU conformance tests, bug fixes, Known issues, feature enhancement, 88W9098, 88W8987, 88W8997, IW416, IW61x
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

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

This is a consolidated release that has been tested with Android BSP version 14.0.0\_1.0.0, 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 14.0.0\_1.0.0 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 [\[2\]](#).

## 2.2 Wi-Fi driver source and firmware

To download the release for the Wi-Fi driver and wireless firmware, refer to [3].

For example, go to 88W8997 product page on NXP website, and look for the documentation section:

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

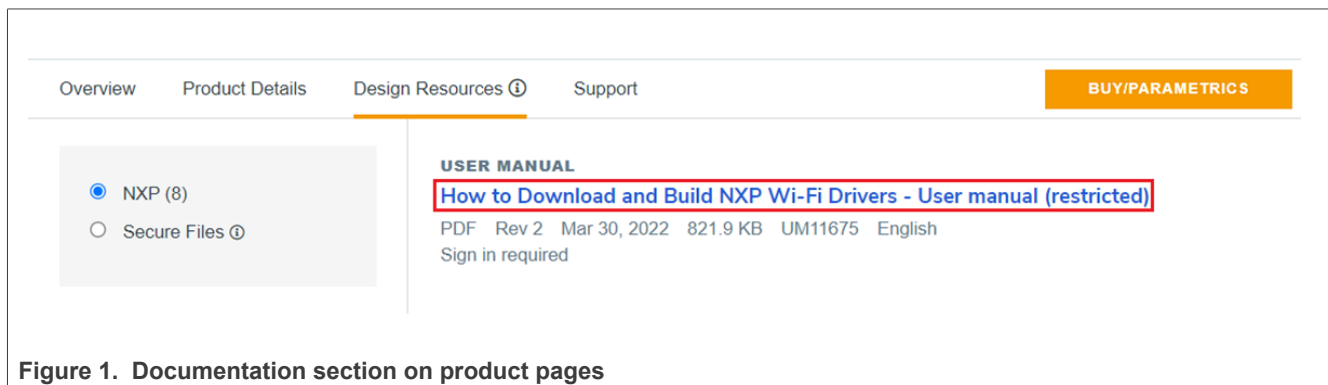


Figure 1. Documentation section on product pages

#### Note:

- UART driver source code is open source and part of the Linux kernel source.
- UART driver source code used for Bluetooth is NOT part of the release package. Download the code from [kernel.org](https://kernel.org).

### 2.3 Wi-Fi patch

Intermediate releases are published on [4].

The screenshot shows the 'Android OS for i.MX Applications Processors' web page. At the top, there is a search bar and navigation tabs for 'Overview', 'Software Details', 'Design Resources', and 'Support'. A 'DOWNLOADS' button is visible on the right. The 'Current Release' section highlights 'Android 12.0.0\_1.0.0 (Linux 5.10.72 kernel)' with a list of documentation links and links to source packages and IDEs. Below this is the 'Past Releases' section, which includes a 'Show 10 entries' dropdown and a search field. A table lists previous releases, with columns for 'Release', 'Build Sources and Documentation', 'Supported Platforms/Demo Images', and 'Incremental Releases'. The 'Incremental Releases' column is highlighted with a red box. The table shows 'Android 11.0.0\_2.6.0 (Linux 5.10.72 kernel)' with links to documentation and source packages, and lists supported platforms like i.MX 8M Plus EVK and i.MX 8M Mini EVK.

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

### 3 Feature lists

#### 3.1 Wi-Fi radio

##### 3.1.1 Client mode

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

Features	Sub features	PCIe-UART		SD-UART				
		8997	9098	9098	IW61x	8997	8987	IW416
802.11n - High Throughput	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 <sup>[1]</sup>	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
	11n data rates – Up to 72 Mbit/s (MCS 0 to MCS 7)	Y	Y	Y	Y	Y	Y	Y
	11n data rates – Up to 150 Mbit/s (MCS 0 to MCS 7)	Y	Y	Y	Y	Y	Y	Y
	11n data rates - Up to 300 Mbit/s (MCS 0 to MCS 15)	Y	Y	Y	Y	Y	N	N
	1 spatial stream (1x1)	Y	Y	Y	Y	Y	Y	Y
	2 spatial stream (2x2)	Y	Y	Y	N	Y	N	N
	HT protection mechanisms	Y	Y	Y	Y	Y	Y	Y
	Explicit Beamformee	Y	Y	Y	Y	Y	N	N
	Aggregated MAC Protocol Data Unit(AMPDU) Rx support	Y	Y	Y	Y	Y	Y	Y
	Aggregated MAC Service Data Unit(AMSDU) -4k Rx support	Y	Y	Y	Y	Y	Y	Y
	20/40 MHz Coexistence	Y	Y	Y	Y	Y	N	N
	Tx MCS rate adaptation (BGN)	Y	Y	Y	Y	Y	Y	Y
	RX and TX Space time block coding (STBC)	Y	Y	Y	N	Y	N	N
Rx Low Density Parity Check (LDPC)	Y	Y	Y	Y	Y	Y	N	
AMSDU over AMPDU support	Y	Y	Y	Y	Y	Y	Y	

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

Features	Sub features	PCIe-UART		SD-UART				
		8997	9098	9098	IW61x	8997	8987	IW416
802.11 ac - Very High Throughput	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
	11ac data rates - Up to 433.3 Mbps (MCS 0 to MCS 9) -1x1	Y	Y	Y	Y	Y	Y	N
	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	Y	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
256 QAM Modulation – MCS 8 and MCS9	Y	Y	Y	Y	Y	Y	Y	

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

Features	Sub features	PCIe-UART		SD-UART				
		8997	9098	9098	IW61x	8997	8987	IW416
802.11 ax -High Efficiency	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
	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
	1024 QAM	N	Y	Y	Y	N	N	N
	SU beamforming	N	N	N	Y	N	N	N
	TWT	N	Y	Y	Y	N	N	N
	Spatial reuse	N	Y	Y	Y	N	N	N
	OFDMA (ul/dl, 484 RU)	N	Y	Y	Y	N	N	N
	BSS coloring	N	Y	Y	Y	N	N	N
802.11 a/b/g Features	11 b/g data rates – Up to 54 Mbit/s	Y	Y	Y	Y	Y	Y	Y
	11 a 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
802.11 a/b/g Features	ERP protection, slot time, preamble	Y	Y	Y	Y	Y	Y	Y
	Tx rate adaptation (BG)	Y	Y	Y	Y	Y	Y	Y



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

Features	Sub features	PCIe-UART		SD-UART				
		8997	9098	9098	IW61x	8997	8987	IW416
802.11d and 802.11h	802.11d – Regulatory Domain/Operating Class/ Country Info	Y	Y	Y	Y	Y	Y	Y
	Per-path regulatory power table <sup>[1]</sup>	N	N	N	Y	N	Y	N
	802.11h – Dynamic Frequency Selection (DFS)	Y	Y	Y	Y	Y	Y	Y
	DFS Radar Detection in Peripheral Mode (Follow AP)	Y	Y	Y	Y	Y	Y	Y
802.11e -QoS	EDCA [Enhanced Distributed Channel Access] / WMM (Wireless Multi-Media)	Y	Y	Y	Y	Y	Y	Y
802.11i -Security	Open and Shared Authentication	Y	Y	Y	Y	Y	Y	Y
	WPA2-PSK Security (AES-CCMP Encryption)	Y	Y	Y	Y	Y	Y	Y
	WPA + WPA2 mixed mode	Y	Y	Y	Y	Y	Y	Y
	Opensource WPA supplicant	Y	Y	Y	Y	Y	Y	Y
	WPA2 Enterprise Security	Y	Y	Y	Y	Y	Y	Y
	Transient Security Network (TSN)	Y	Y	Y	Y	Y	Y	Y
802.11mc	Wi-Fi location <sup>[1]</sup>	N	Y	Y	Y	N	N	N
WPA3 SAE (R3) Security	Simultaneous Authentication of Equals (SAE)	Y	Y	Y	Y	Y	Y	Y
	SAE Connectivity and PMK Caching	Y	Y	Y	Y	Y	Y	Y
	WPA2 Personal Compatibility	Y	Y	Y	Y	Y	Y	Y
	Anti-Clogging	Y	Y	Y	Y	Y	Y	Y
	SAE Finite Cyclic Group – Group-19, Group 20, Goup-21	Y	Y	Y	Y	Y	Y	Y
	Reflection Attack	Y	Y	Y	Y	Y	Y	Y
	Suite B – 192-bit Security ECC p384	Y	Y	Y	Y	Y	Y	N
	Suite B – 192-bit Security RSA 3K	Y	Y	Y	Y	Y	Y	N
	Wi-Fi Enhanced Open	Y	Y	Y	Y	Y	Y	Y
	WPA3 host-based	Y	Y	Y	Y	Y	Y	Y
802.11r - Fast BSS Transition (FT)	FT over Air and over DS (Distribution System) (Open, WPA2-PSK)	Y	Y	Y	Y	Y	Y	Y
802.11k	802.11k	Y	Y	Y	Y	Y	Y	Y

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

Features	Sub features	PCIe-UART		SD-UART				
		8997	9098	9098	IW61x	8997	8987	IW416
802.11v	802.11v	Y	Y	Y	Y	Y	Y	Y
802.11z	802.11z (Host based TDLS)	N	Y	Y	Y	N	Y	N
802.11az	New generation Wi-Fi Location <sup>[1]</sup>	N	N	N	Y	N	N	N
DPP Functionality	Wi-Fi Easy Connect	Y	Y	Y	N	Y	Y	Y
FIPS	FIPS support <sup>[2]</sup>	Y	Y	Y	Y	Y	Y	Y
802.11w - PMF (Protected Management Frames)	PMF require and capable	Y	Y	Y	Y	Y	Y	Y
	Unicast management frames - Encryption/decryption - using CCMP	Y	Y	Y	Y	Y	Y	Y
	Broadcast management frames - Encryption/decryption - using BIP	Y	Y	Y	Y	Y	Y	Y
	SA query request/response	Y	Y	Y	Y	Y	Y	Y
	PMF Support using Opensource WPA	Y	Y	Y	Y	Y	Y	Y
Power Save Mode	Deep sleep	Y	Y	Y	Y	Y	Y	Y
	IEEE power save	Y	Y	Y	Y	Y	Y	Y
	Host Sleep/Wowlan	Y	Y	Y	Y	Y	Y	Y

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

Features	Sub features	PCIe-UART		SD-UART				
		8997	9098	9098	IW61x	8997	8987	IW416
General features	EU adaptivity support	Y	Y	Y	Y	Y	Y	Y
	Wake on Wireless (WoW)	Y	Y	Y	Y	Y	Y	Y
	Auto Tx <sup>[1]</sup>	Y	Y	Y	Y	Y	Y	Y
	MAC Address randomization(in Scan)	Y	Y	Y	Y	Y	Y	Y
	Host based MLME <sup>[3]</sup>	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 <sup>[2]</sup>	N	Y	Y	Y	N	Y	N
	mDNS (Bonjour) Offload	Y	N	N	Y	Y	Y	Y
	Extended Range <sup>[1]</sup>	N	Y	Y	Y	N	N	N
	Clock sync <sup>[2]</sup>	N	Y	Y	Y	N	N	N
	IPv6 offload	Y	N	N	Y	Y	Y	Y
	Wi-Fi Agile Multiband	N	N	N	Y	N	N	Y
	Auto Reconnect	N	N	N	Y	N	N	N
	Independent reset (In-band)	Y	Y	Y	Y	Y	Y	Y
	Cloud keep alive <sup>[2]</sup>	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
Vendor Specific IE (Custom IE)	Y	Y	Y	Y	Y	Y	Y	
CSI <sup>[1]</sup>	Y	Y	Y	Y	Y	N	N	
802.11n - High Throughput	2.4 GHz band supported channel bandwidths: 20 MHz	Y	Y	Y	Y	Y	Y	Y
	2.4 GHz band supported channel bandwidths: 40 MHz <sup>[1]</sup>	Y	Y	Y	Y	Y	Y	Y
	1 spatial stream (1x1)	Y	Y	Y	Y	Y	Y	Y
	2 spatial stream (2x2)	Y	Y	Y	N	Y	N	N
	Explicit Beamformer	Y	Y	Y	Y	Y	N	N

[1] Contact your support representative to use this feature.  
 [2] Not Validated using Android BSP. Contact your NXP representative for more details.  
 [3] Features are enabled by default in the software.

3.1.2 AP mode

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

Features	Sub features	PCIe-UART		SD-UART				
		8997	9098	9098	IW61x	8997	8987	IW416
802.11n - High Throughput	Short/long guard interval (400 ns/800 ns)	Y	Y	Y	Y	Y	Y	Y
	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
	11n data rates – Up to 150 Mbit/s (MCS0 to MCS7)	Y	Y	Y	Y	Y	Y	Y
	11n data rates - Up to 300 Mbit/s (MCS0 to MCS15)	Y	Y	Y	Y	Y	N	N
	Tx MCS rate adaptation (BGN)	Y	Y	Y	Y	Y	Y	Y
	20/40 MHz Coexistence	Y	Y	Y	Y	Y	N	N
	Aggregated MAC Protocol Data Unit(AMPDU) Tx and Rx support	Y	Y	Y	Y	Y	Y	Y
	Aggregated MAC Service Data Unit(AMSDU) - 4k Rx support	Y	Y	Y	Y	Y	Y	Y
	HT protection mechanisms	Y	Y	Y	Y	Y	Y	Y
	RX and TX Space time block coding (STBC)	Y	Y	Y	N	Y	N	N
	RX Low Density Parity Check(LDPC)	Y	Y	Y	Y	Y	Y	N
	HT Duplicate mode (MCS32)	Y	Y	Y	Y	Y	Y	Y
802.11 b/g Features	11 b/g data rates – Up to 54 Mbit/s	Y	Y	Y	Y	Y	Y	Y
	Tx rate adaptation (BG)	Y	Y	Y	Y	Y	Y	Y
	ERP protection, slot time, preamble	Y	Y	Y	Y	Y	Y	Y
	Handling of associated STAs with IEEE PS - null data	Y	Y	Y	Y	Y	Y	Y

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

Features	Sub features	PCIe-UART		SD-UART				
		8997	9098	9098	IW61x	8997	8987	IW416
802.11 ac - Very High Throughput	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: 80MHz	Y	Y	Y	Y	Y	Y	N
	Short/Long Guard Interval (400ns/800ns)	Y	Y	Y	Y	Y	Y	N
	11ac Data rates – Up to 433.3 Mbps (MCS 0 to MCS 9)	Y	Y	Y	Y	Y	Y	N
	11ac Data rates - Up to 866.7 Mbps (MCS 0 to MCS 9)	Y	Y	Y	Y	Y	N	N
	Single User- Aggregated MAC Protocol Data Unit (SU-AMPDU) Aggregation	Y	Y	Y	Y	Y	Y	N
	RTS/CTS with BW Signaling	Y	Y	Y	Y	Y	Y	N
	Backward Compatibility with non-VHT devices	Y	Y	Y	Y	Y	Y	N
	Tx VHT MCS Rate Adaptation	Y	Y	Y	Y	Y	Y	N
	Operation Mode Notification	Y	Y	Y	Y	Y	Y	N
	Explicit Beamformer	Y	Y	Y	N	Y	N	N
	SU-Beamformee	Y	Y	Y	Y	Y	Y	N
256 QAM Modulation - MCS8 and MCS9	Y	Y	Y	Y	Y	Y	Y	
802.11 ax -High Efficiency	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
	1024 QAM	N	Y	Y	Y	N	N	N
	SU beamforming	N	N	N	Y	N	N	N
802.11d	802.11d - Regulatory Domain/Operating Class/Country Info	Y	Y	Y	Y	Y	Y	Y
802.11h	802.11h – Dynamic Frequency Selection (DFS)	Y	Y	Y	Y	Y	Y	Y
	Zero Wait DFS	N	Y	Y	N	N	N	N
	DFS Radar Detection in Master Mode	Y	Y	Y	Y	Y	Y	Y

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

Features	Sub features	PCIe-UART		SD-UART				
		8997	9098	9098	IW61x	8997	8987	IW416
802.11e -QoS	EDCA [Enhanced Distributed Channel Access] / WMM (Wireless Multi-Media)	Y	Y	Y	Y	Y	Y	Y
802.11i - Security	Open security	Y	Y	Y	Y	Y	Y	Y
	WPA2-PSK security (AES-CCMP encryption)	Y	Y	Y	Y	Y	Y	Y
	WPA + WPA2 mixed mode	Y	Y	Y	Y	Y	Y	Y
	WAPI Support <sup>[1]</sup>	N	N	N	Y	N	N	N
	Open-source Hostapd	Y	Y	Y	Y	Y	Y	Y
	Group Key Refresh (Rekeying GTK)	Y	Y	Y	Y	Y	Y	Y
WPA3 SAE (R3) Security	Simultaneous Authentication of Equals (SAE)	Y	Y	Y	Y	Y	Y	Y
	SAE Connectivity and PMK Caching	Y	Y	Y	Y	Y	Y	Y
	Wi-Fi Enhanced Open	Y	Y	Y	N	Y	Y	N
	WPA3 Enterprise Suite-B Host (host based)	Y	Y	Y	Y	Y	Y	N
802.11w - Protected Management Frames (PMF)	PMF require and capable	Y	Y	Y	Y	Y	Y	Y
	Unicast management frames - Encryption/decryption - using CCMP	Y	Y	Y	Y	Y	Y	Y
	Support using Hostapd	Y	Y	Y	Y	Y	Y	Y
	Broadcast management frames - Encryption/decryption - using BIP	Y	Y	Y	Y	Y	Y	Y
	SA query request/response	Y	Y	Y	Y	Y	Y	Y

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

Features	Sub features	PCIe-UART		SD-UART				
		8997	9098	9098	IW61x	8997	8987	IW416
General features	EU adaptivity support	Y	Y	Y	Y	Y	Y	Y
	Automatic channel selection (ACS)	Y	Y	Y	Y	Y	Y	Y
	Host-based MLME <sup>[2]</sup>	Y	Y	Y	Y	Y	Y	Y
	Extended channel switch announcement (ECSA)	Y	Y	Y	Y	Y	Y	Y
	Max supported stations (up to 8)	Y	Y	Y	N	Y	Y	Y
	Max supported stations (up to 64)	N	Y	Y	Y	N	N	N
	Independent reset (In-band)	Y	Y	Y	Y	Y	Y	Y
	uAPSD/PPS <sup>[3]</sup>	Y	Y	Y	Y	Y	Y	Y
	Hidden SSID (Broadcast SSID Disabled)	Y	Y	Y	Y	Y	Y	Y
	MAC Address Filter (Allowed/Denied List)	Y	Y	Y	Y	Y	Y	Y
	STA Age out Feature for Associated clients	Y	Y	Y	Y	Y	Y	Y
	Configurable Retry Limit <sup>[1]</sup>	Y	Y	Y	Y	Y	Y	Y
	Configurable Unicast Data Rate <sup>[1]</sup>	Y	Y	Y	Y	Y	Y	Y
	Configurable Broadcast/Multicast Data Rate <sup>[1]</sup>	Y	Y	Y	Y	Y	Y	Y
	uAP Events <sup>[1]</sup>	Y	Y	Y	Y	Y	Y	Y
	Vendor Specific IE (Custom IE) <sup>[1]</sup>	Y	Y	Y	Y	Y	Y	Y
Vendor defined txpowerConfig(Txpower Config V3)	Y	Y	Y	Y	Y	Y	Y	

[1] Contact your support representative to use this feature.  
 [2] Features are enabled by default in the software.  
 [3] Not Validated using Android BSP. Contact your NXP representative for more details.

### 3.1.3 Wi-Fi direct/P2P

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

Features	Sub features	PCIe-UART		SD-UART				
		8997	9098	9098	IW61x	8997	8987	IW416
P2P basic functionality	Autonomous GO mode	Y	Y	Y	Y	Y	Y	Y
	WFD client mode	Y	Y	Y	Y	Y	Y	Y
	P2P device mode	Y	Y	Y	Y	Y	Y	Y

### 3.1.4 AP/STA mode

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

Features	Sub features	PCIe-UART		SD-UART				
		8997	9098	9098	IW61x	8997	8987	IW416
Software antennadiversity	Software antenna diversity <sup>[1]</sup>	N	N	N	Y	N	Y	Y
RF test mode	RF test mode functionality	Y	Y	Y	Y	Y	Y	Y
TX power config	TX power config	Y	Y	Y	Y	Y	Y	Y
Simultaneous AP-STA operation	AP-STA functionality (same channel)	Y	Y	Y	Y	Y	Y	Y
Auto FW recovery	Auto firmware recovery on fatal error	N	Y	Y	N	N	N	Y
Auto ARP and Ping	Auto ARP and ping support	N	N	N	Y	N	Y	N
Secure boot	Secure boot	N	N	N	Y	N	N	N

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



### 3.2 Bluetooth

#### 3.2.1 Bluetooth classic

Table 6. Feature list for Bluetooth radio

Features	Sub features	PCIe-UART		SD-UART				
		8997	9098	9098	8997	8987	IW416	IW61x
General Features	Bluetooth Class 1.5 and Class 2 support	Y	Y	Y	Y	Y	Y	Y
	Scatternet support	Y	Y	Y	Y	Y	Y	Y
	Maximum of seven simultaneous ACL connections	Y	Y	Y	Y	Y	Y	Y
	Automatic Packet Type Selection	Y	Y	Y	Y	Y	Y	Y
	Bluetooth - 2.1 to 5.0 Specification Support	Y	Y	Y	Y	Y	Y	Y
	Independent reset (In-band & OOB <sup>[1],[2]</sup> )	N	Y	Y	N	Y	N	Y
	Low power sniff	Y	Y	Y	Y	Y	Y	Y
	Bluetooth Truncated Paging	Y	Y	Y	Y	Y	Y	Y
	Erroneous Data Reporting	Y	Y	Y	Y	Y	Y	Y
	Encryption Pause and Resume	Y	Y	Y	Y	Y	Y	Y
	Extended Inquiry Response	Y	Y	Y	Y	Y	Y	Y
	Link Supervision Timeout Changed Event	Y	Y	Y	Y	Y	Y	Y
	Non-Automatically-Flushable Packet Boundary Flag	Y	Y	Y	Y	Y	Y	Y
	Sniff Sub rating	Y	Y	Y	Y	Y	Y	Y
	AES Encryption <sup>[1]</sup>	N	Y	Y	N	N	Y	Y
	Enhanced Power Control	Y	Y	Y	Y	Y	Y	Y
	HCI Read Encryption Key Size command	Y	Y	Y	Y	Y	Y	Y
	Payload – 27bytes to 234 bytes	Y	Y	Y	Y	Y	Y	Y
	Enhancements to L2CAP for Low Energy	Y	Y	Y	Y	Y	Y	Y
	PCM Loopback Mode	Y	Y	Y	Y	Y	Y	Y
Enhancements to GAP for Low Energy	Y	Y	Y	Y	Y	Y	Y	
SCO/eSCO over PCM	Y	Y	Y	Y	Y	Y	Y	
APCF Feature support	Y	Y	Y	Y	Y	Y	Y	

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

Features	Sub features	PCIe-UART		SD-UART				
		8997	9098	9098	8997	8987	IW416	IW61x
Bluetooth Packet Type Supported	ACL (DM1, DH1, DM3, DH3, DM5, DH5, 2-DH1, 2-DH3, 2-DH5, 3-DH1, 3-DH3, 3-DH5)	Y	Y	Y	Y	Y	Y	Y
	SCO (HV1, HV3)	Y	Y	Y	Y	Y	Y	Y
	eSCO (EV3, EV4, EV5, 2EV3, 3EV3, 2EV5, 3EV5)	Y	Y	Y	Y	Y	Y	Y
Bluetooth Profiles Supported	A2DP Source/Sink	Y	Y	Y	Y	Y	Y	Y
	AVRCP Target/Controller	Y	Y	Y	Y	Y	Y	Y
	HFP Gateway	Y	Y	Y	Y	Y	Y	Y
	OPP Server/Client	Y	Y	Y	Y	Y	Y	Y
	SPP	Y	Y	Y	Y	Y	Y	Y
	HID	Y	Y	Y	Y	Y	Y	Y
	GAP	Y	Y	Y	Y	Y	Y	Y
	HFP Dev <sup>[1]</sup>	Y	Y	Y	Y	Y	Y	Y
	PAN <sup>[1]</sup>	Y	Y	Y	Y	Y	Y	Y
Bluetooth Dual Profiles Supported <sup>[1]</sup>	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 <sup>[1]</sup>	N	Y	Y	N	N	N	N
Generic Features	Maximum 16 Bluetooth LE connections(Central role)	Y	Y	Y	Y	Y	Y	Y

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

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

**Note:** Additional Vendor Specific Command is required to support the PCM WBS for IW61x.

3.2.2 Bluetooth LE

Table 7. Feature list for Bluetooth LE radio

Features	Sub features	PCIe-UART		SD-UART				
		8997	9098	9098	8997	8987	IW416	IW61x
Bluetooth Profile Support	Bluetooth LE GATT	Y	Y	Y	Y	Y	Y	Y
	Bluetooth LE HOGP	Y	Y	Y	Y	Y	Y	Y
	Bluetooth LE GAP	Y	Y	Y	Y	Y	Y	Y
	Low Energy Physical Layer	Y	Y	Y	Y	Y	Y	Y
	Low Energy Link Layer	Y	Y	Y	Y	Y	Y	Y
Bluetooth LE 4.0 Support	Enhancements to HCI for Low Energy	Y	Y	Y	Y	Y	Y	Y
	Low Energy Direct Test Mode	Y	Y	Y	Y	Y	Y	Y
	Bluetooth LE - 1Mbit/s support	Y	Y	Y	Y	Y	Y	Y
Bluetooth 4.1 Support	Low duty Cycle Directed Advertising	Y	Y	Y	Y	Y	Y	Y
	Bluetooth LE Dual Mode Topology	Y	Y	Y	Y	Y	Y	Y
	Bluetooth LE Privacy v1.1	Y	Y	Y	Y	Y	Y	Y
	Bluetooth LE Link Layer Topology	Y	Y	Y	Y	Y	Y	Y
Bluetooth 4.2 Support	Bluetooth LE secure connection	Y	Y	Y	Y	Y	Y	Y
	Bluetooth LE Link Layer Privacy v1.2	Y	Y	Y	Y	Y	Y	Y
	Bluetooth LE Data Length Extension	Y	Y	Y	Y	Y	Y	Y
	Link Layer Extended Scanner Filter Policies	Y	Y	Y	Y	Y	Y	Y
Bluetooth 5.0 Support	Bluetooth LE 2 Mbps Support	Y	Y	Y	Y	Y	Y	Y
	Bluetooth LE Multiple Advertisement (4 or 6*) Sets <sup>[1]</sup>	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 <sup>[1]</sup>	N	N	N	N	N	N	Y

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

Features	Sub features	PCIe-UART		SD-UART				
		8997	9098	9098	8997	8987	IW416	IW61x
Bluetooth 5.2 Support	Bluetooth LE Power Control <sup>[1]</sup>	N	N	N	N	N	N	Y
	Isochronous Channel <sup>[1]</sup>	N	N	N	N	N	N	Y
BCA-TDM Mode (Shared Antenna)	STA + Bluetooth Coex	Y	N	N	Y	Y	Y	Y
	STA + Bluetooth LE Coex	Y	N	N	Y	Y	Y	Y
	STA + Bluetooth + Bluetooth LE Coex	Y	N	N	Y	Y	Y	Y
	AP + Bluetooth Coex	Y	N	N	Y	Y	Y	Y
	AP + Bluetooth LE Coex	Y	N	N	Y	Y	Y	Y

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

3.3 Coexistence

3.3.1 Wi-Fi and Bluetooth coexistence

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

Features	Sub features	PCIe-UART		SD-UART				
		8997	9098	9098	8997	8987	IW416	IW61x
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 <sup>[1]</sup>
	STA + Bluetooth LE Coex	N	Y	Y	N	N	N	Y <sup>[1]</sup>
	STA + Bluetooth + Bluetooth LE Coex	N	Y	Y	N	N	N	Y <sup>[1]</sup>
	AP + Bluetooth Coex	N	Y	Y	N	N	N	Y <sup>[1]</sup>
	AP + Bluetooth LE Coex	N	Y	Y	N	N	N	Y <sup>[1]</sup>
	AP + Bluetooth + Bluetooth LE Coex	N	Y	Y	N	N	N	Y <sup>[1]</sup>
	P2P + Bluetooth Coex	N	Y	Y	N	N	N	Y <sup>[1]</sup>
	P2P + Bluetooth LE Coex	N	Y	Y	N	N	N	Y <sup>[1]</sup>
	P2P + Bluetooth + Bluetooth LE Coex	N	Y	Y	N	N	N	Y <sup>[1]</sup>
	AP(5GHz) + AP(5GHz) + Bluetooth Coex	N	Y	Y	N	N	N	Y <sup>[1]</sup>
	AP(5GHz) + AP(5GHz) + Bluetooth LE Coex	N	Y	Y	N	N	N	Y <sup>[1]</sup>
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

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### 4.1 PCIe-UART 88W8997

#### 4.1.1 Package information

- Android BSP version: 14.0.0\_1.0.0
- Wi-Fi and Bluetooth/Bluetooth LE Firmware version: 16.92.21.p119.3
- Driver version: MM6X16437.p8-GPL

#### 4.1.2 Version information

- Wireless SoC: 88W8997
- Wi-Fi and Bluetooth/Bluetooth LE Firmware Version: 16.92.21.p119.3
  - 16 - Major revision
  - 92 - Feature pack
  - 21 - Release version
  - p119.3 - Patch number
- Driver Version: MM6X16437.p8-GPL
  - 6X - Linux 6.x Kernel
  - 16437 - Release version
  - p8 - Patch number
  - GPL - General Public License v2

#### 4.1.3 Host platform

- MCIMX8M-EVK platform running Android
- Interface used
  - Wi-Fi over PCIE
  - Bluetooth/Bluetooth LE over UART
- Test Tools
  - iperf3
  - wpa\_supplicant (version 2.10)
  - hostapd (version 2.10)
  - Wi-Fi Vendor HAL (version M009.014\_M009.024\_Android\_14)

#### 4.1.4 Wi-Fi and Bluetooth certification

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

##### 4.1.4.1 Wi-Fi pre-certifications

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

**Note:**

- Download Labtool application for RF test mode, refer to the URL: [88W8997-MANUFACTURING-RELEASE-P207](#)
- Download Sigma tool, refer to the URL: [NXP-WTS-DUT-AGENT-Release-R2-0](#)
- Download QTT Agent, refer to the URL: [NXP\\_QTT\\_AGENT\\_Source-R2.2\\_Android\\_RTOS](#)

##### 4.1.4.2 Bluetooth controller certification

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



## 4.1.5 Wi-Fi throughput

### 4.1.5.1 Throughput test setup

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

```
fw_name=nxp/pcieuart8997_combo_v4.bin, cal_data_cfg=none, cfg80211_wext=0xf,  
host_mlme=1, amsdu_deaggr=1, net_rx=1, tx_skb_clone=1, tx_work=1
```

- iPerf commands:

TCP server:

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

TCP client:

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

UDP server:

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

UDP client:

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

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

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

4.1.5.2 STA throughput

External AP: Asus RT-AX88U

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

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
Open Security	114	118	123	120
WPA2-AES	112	117	119	121
WPA3-SAE	113	119	126	123

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

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
Open Security	219	238	228	249
WPA2-AES	227	223	220	232
WPA3-SAE	223	239	234	247

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

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
Open Security	110	119	120	127
WPA2-AES	111	118	119	122
WPA3-SAE	110	118	121	122

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

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
Open Security	191	245	223	250
WPA2-AES	194	246	224	252
WPA3-SAE	194	246	225	248

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

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
Open Security	133	151	151	158
WPA2-AES	131	150	142	155
WPA3-SAE	133	151	145	150

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

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
Open Security	293	336	324	352
WPA2-AES	283	335	324	350
WPA3-SAE	300	330	337	351

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

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
Open Security	473	477	386	469
WPA2-AES	526	632	405	671
WPA3-SAE	525	618	405	666

**4.1.5.3 P2P-GO throughput**

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

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
WPA2-AES	106	116	107	123

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

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
WPA2-AES	596	364	599	486

**4.1.5.4 P2P-GC throughput**

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

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
WPA2-AES	105	120	105	120

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

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
WPA2-AES	590	360	590	482

**4.1.5.5 Mobile AP throughput**

External client: NXP IW620 PCIe-UART

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

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
Open Security	111	112	116	120
WPA2-AES	112	116	116	122
WPA3-SAE	108	119	116	124

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

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
Open Security	223	250	228	245
WPA2-AES	228	245	230	240
WPA3-SAE	230	250	232	248

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

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
Open Security	117	120	123	128
WPA2-AES	117	120	123	128
WPA3-SAE	118	121	123	128

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

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
Open Security	218	248	237	258
WPA2-AES	219	247	237	258
WPA3-SAE	219	247	237	256

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

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
Open Security	139	144	151	152
WPA2-AES	139	143	149	155
WPA3-SAE	139	146	145	156

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

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
Open Security	320	340	328	363
WPA2-AES	320	325	330	355
WPA3-SAE	311	335	334	361

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

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
Open Security	610	359	463	492
WPA2-AES	553	364	476	469
WPA3-SAE	553	363	474	497

**4.1.6 EU conformance tests**

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

**4.1.7 Bug fixes/feature enhancements**

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

Table 27.

Component	Description
--	NA

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

Component	Description
—	NA

**4.1.7.2 Firmware version: From 16.92.21.p55.3 to 17.92.1.p76.2**

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

**4.1.7.3 Firmware version: From 17.92.1.p76.2 to 16.92.21.p84.4**

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

**4.1.7.4 Firmware version: From 17.92.21.p84.4 to 16.92.21.p119.3**

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

**4.1.8 Known issues**

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

## 4.2 PCIe-UART 88W9098

### 4.2.1 Package information

- Android BSP version: 14.0.0\_1.0.0
- Wi-Fi and Bluetooth/Bluetooth LE Firmware version: 17.92.1.p149.131
- Driver version: MM6X17437.p8-GPL

### 4.2.2 Version information

- Wireless SoC: 88W9098
- Wi-Fi and Bluetooth/Bluetooth LE Firmware Version: 17.92.1.p149.131
  - 17 - Major revision
  - 92 - Feature pack
  - 1 - Release version
  - p149.131 - Patch number
- Driver Version: MM6X17437.p8-GPL
  - 6X - Linux 6.x Kernel
  - 17437 - Release version
  - p8 - Patch number
  - GPL - General Public License v2

### 4.2.3 Host platform

- MCIMX8M-EVK platform running Android
- Interface used
  - Wi-Fi over PCIE
  - Bluetooth/Bluetooth LE over UART
- Test Tools
  - iperf3
  - wpa\_supplicant (version 2.10)
  - hostapd (version 2.10)
  - Wi-Fi Vendor HAL (version M009.014\_M009.024\_Android\_14)

#### 4.2.4 Wi-Fi and Bluetooth certification

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

##### 4.2.4.1 Wi-Fi pre-certifications

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

**Note:**

- Download Labtool application for RF test mode, refer to the URL: [88W8997-MANUFACTURING-RELEASE-P207](#)
- Download Sigma tool, refer to the URL: [NXP-WTS-DUT-AGENT-Release-R2-0](#)
- Download QTT Agent, refer to the URL: [NXP\\_QTT\\_AGENT\\_Source-R2.2\\_Android\\_RTOS](#)

##### 4.2.4.2 Bluetooth controller certification

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



## 4.2.5 Wi-Fi throughput

### 4.2.5.1 Throughput test setup

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

```
fw_name=nxp/pcieuart9098_combo_v1.bin, cal_data_cfg=none, cfg80211_wext=0xf,  
host_mlme=1, amsdu_deaggr=1, net_rx=1, tx_skb_clone=1, tx_work=1
```

- iPerf commands:

TCP server:

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

TCP client:

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

UDP server:

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

UDP client:

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

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

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

4.2.5.2 STA throughput

External AP: Netgear RAX200

Table 28. STA Mode Throughput - BGN Mode | 2.4 GHz Band | 20 MHz

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
Open Security	114	110	119	121
WPA2-AES	115	109	114	119
WPA3-SAE	116	115	115	117

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

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
Open Security	118	111	127	120
WPA2-AES	117	110	125	121
WPA3-SAE	121	123	127	125

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

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
Open Security	222	232	247	250
WPA2-AES	223	230	247	251
WPA3-SAE	238	245	233	257

Table 31. STA Mode Throughput - AC Mode | 5 GHz Band | 20 MHz (VHT)

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
Open Security	144	141	148	148
WPA2-AES	142	140	151	149
WPA3-SAE	143	150	145	156

Table 32. STA Mode Throughput - AC Mode | 5 GHz Band | 40 MHz (VHT)

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
Open Security	322	312	350	348
WPA2-AES	333	316	255	344
WPA3-SAE	336	320	335	331

Table 33. STA Mode Throughput - AC Mode | 5 GHz Band | 80 MHz (VHT)

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
Open Security	670	667	740	720
WPA2-AES	678	669	740	750
WPA3-SAE	685	670	747	740

Table 34. STA Mode Throughput - AX Mode | MAC2 | 2.4 GHz Band | 20 MHz (HE)

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
Open Security	176	165	180	186
WPA2-AES	178	168	185	188
WPA3-SAE	175	176	180	191

Table 35. STA Mode Throughput - AX Mode | MAC1 | 5 GHz Band | 20 MHz (HE)

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
Open Security	232	215	245	244
WPA2-AES	232	216	249	239
WPA3-SAE	233	223	250	233

Table 36. STA Mode Throughput - AX Mode | MAC1 | 5 GHz Band | 40 MHz (HE)

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
Open Security	440	436	488	480
WPA2-AES	444	430	470	480
WPA3-SAE	440	440	460	487

Table 37. STA Mode Throughput - AX Mode | MAC1 | 5 GHz Band | 80 MHz (HE)

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
Open Security	716	735	880	780
WPA2-AES	745	740	860	815
WPA3-SAE	760	805	850	810

**4.2.5.3 P2P-GO throughput**

**Table 38. P2P - GO Mode Throughput - BGN Mode | 2.4 GHz Band | 20MHz**

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
WPA2-AES	145	143	146	152

**Table 39. P2P - GO Mode Throughput - AN Mode | MAC1 | 5 GHz Band | 40 MHz**

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
WPA2-AES	245	243	256	255

**Table 40. P2P - GO Mode Throughput - AC Mode | 5 GHz Band | 80 MHz**

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
WPA2-AES	672	444	735	508

**4.2.5.4 P2P-GC throughput**

**Table 41. P2P - GC Mode Throughput - BGN Mode | 2.4 GHz Band | 20MHz**

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
WPA2-AES	124	123	123	122

**Table 42. P2P - GC Mode Throughput - AN Mode | MAC1 | 5 GHz Band | 40 MHz**

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
WPA2-AES	247	232	252	252

**Table 43. P2P - GC Mode Throughput - AC Mode | 5 GHz Band | 80 MHz**

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
WPA2-AES	677	388	710	488

4.2.5.5 Mobile AP throughput

External client: NXP 88W9098 PCIe-UART

Table 44. Mobile AP Mode Throughput - BGN Mode | 2.4 GHz Band | 20MHz

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
Open Security	119	117	120	120
WPA2-AES	119	121	124	123
WPA3-SAE	125	117	124	124

Table 45. Mobile AP Mode Throughput - AN Mode | 5 GHz Band | 20 MHz

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
Open Security	123	120	127	128
WPA2-AES	125	125	126	125
WPA3-SAE	123	119	127	128

Table 46. Mobile AP Mode Throughput - AN Mode | 5 GHz Band | 40 MHz

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
Open Security	122	119	124	127
WPA2-AES	122	121	122	124
WPA3-SAE	122	118	126	127

Table 47. Mobile AP Mode Throughput - AC Mode | 5 GHz Band | 20 MHz

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
Open Security	147	144	156	154
WPA2-AES	143	144	153	154
WPA3-SAE	145	143	151	154

Table 48. Mobile AP Mode Throughput - AC Mode | 5 GHz Band | 40 MHz

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	Tx	Rx	Tx	Rx
Open Security	345	332	358	354
WPA2-AES	343	332	356	355
WPA3-SAE	340	333	350	352

Table 49. Mobile AP Mode Throughput - AC Mode | 5 GHz Band | 80 MHz

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	Tx	Rx	Tx	Rx
Open Security	657	395	744	555
WPA2-AES	666	423	748	624
WPA3-SAE	680	400	740	600

Table 50. Mobile AP Mode Throughput - AX Mode | MAC2 | 2.4 GHz Band | 20 MHz (HE)

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	Tx	Rx	Tx	Rx
Open Security	174	179	176	188
WPA2-AES	174	178	182	188
WPA3-SAE	176	180	177	185

Table 51. Mobile AP Mode Throughput - AX Mode | MAC1 | 5 GHz Band | 20 MHz (HE)

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	Tx	Rx	Tx	Rx
Open Security	238	221	253	245
WPA2-AES	235	220	252	232
WPA3-SAE	238	217	250	240

Table 52. Mobile AP Mode Throughput - AX Mode | MAC1 | 5 GHz Band | 40 MHz (HE)

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	Tx	Rx	Tx	Rx
Open Security	470	432	480	463
WPA2-AES	468	444	483	460
WPA3-SAE	463	445	493	465

Table 53. Mobile AP Mode Throughput - AX Mode | MAC1 | 5 GHz Band | 80 MHz (HE)

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
Open Security	820	533	813	602
WPA2-AES	816	595	820	616
WPA3-SAE	825	625	822	624

4.2.6 EU conformance tests

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

4.2.7 Bug fixes/feature enhancements

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

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

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

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

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

Component	Description
—	—

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

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

4.2.8 Known issues

Component	Description
Bluetooth	When Bluetooth firmware is downloaded on in band reset, after that sometimes FW fails to respond to HCI reset and not able to bring up Bluetooth interface.

## 4.3 SD-UART 88W8987

### 4.3.1 Package information

- Android BSP version: 14.0.0\_1.0.0
- Wi-Fi and Bluetooth/Bluetooth LE Firmware version: 16.92.21.p119.3
- Driver version: MM6X16437.p8-GPL

### 4.3.2 Version information

- Wireless SoC: 88W8987
- Wi-Fi and Bluetooth/Bluetooth LE Firmware Version: 16.92.21.p119.3
  - 16 - Major revision
  - 92 - Feature pack
  - 21 - Release version
  - p119.3 - Patch number
- Driver Version: MM6X16437.p8-GPL
  - 6X - Linux 6.x Kernel
  - 16437 - Release version
  - p8 - Patch number
  - GPL - General Public License v2

### 4.3.3 Host platform

- MCIMX8QM-EVK platform running Android
- Interface used
  - Wi-Fi over SDIO (SDIO 3.0 support, Clock speed: 200 MHz)
  - Bluetooth/Bluetooth LE over UART
- Test Tools
  - iperf3
  - wpa\_supplicant (version 2.10)
  - hostapd (version 2.10)
  - Wi-Fi Vendor HAL (version M009.014\_M009.024\_Android\_14)



#### 4.3.4 Wi-Fi and Bluetooth certification

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

##### 4.3.4.1 WFA Certifications

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

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

**Note:**

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

##### 4.3.4.2 Bluetooth controller certification

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

### 4.3.5 Wi-Fi throughput

#### 4.3.5.1 Throughput test setup

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

```
fw_name=nxp/sdiouart8987_combo_v0.bin, cal_data_cfg=none, cfg80211_wext=0xf,  
host_mlme=1, amsdu_deaggr=1, net_rx=1, tx_skb_clone=1, tx_work=1
```

- iPerf commands:

TCP server:

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

TCP client:

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

UDP server:

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

UDP client:

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

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

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

4.3.5.2 STA throughput

External AP: Asus RT-AX88U

Table 54. STA Mode Throughput - BGN Mode | 2.4 GHz Band | 20 MHz

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
Open Security	50	50	50	55
WPA2-AES	49	50	53	54
WPA3-SAE	50	51	52	54

Table 55. STA Mode Throughput - AN Mode | 5 GHz Band | 20 MHz (HT)

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
Open Security	54	58	62	61
WPA2-AES	54	57	62	61
WPA3-SAE	54	57	62	61

Table 56. STA Mode Throughput - AN Mode | 5 GHz Band | 40 MHz (HT)

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
Open Security	109	106	124	114
WPA2-AES	107	108	122	115
WPA3-SAE	107	106	122	112

Table 57. STA Mode Throughput - AC Mode | 5 GHz Band | 20 MHz (VHT)

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

Table 58. STA Mode Throughput - AC Mode | 5 GHz Band | 40 MHz (VHT)

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

**Table 59. STA Mode Throughput - AC Mode | 5 GHz Band | 80 MHz (VHT)**

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
Open Security	219	325	255	358
WPA2-AES	196	307	239	352
WPA3-SAE	194	300	239	350

**4.3.5.3 P2P-GO throughput**

**Table 60. P2P - GO Mode Throughput - BGN Mode | 2.4 GHz Band | 20MHz**

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
WPA2-AES	51	52	59	52

**Table 61. P2P - GO Mode Throughput - AC Mode | 5 GHz Band | 80 MHz**

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
WPA2-AES	209	295	232	326

**4.3.5.4 P2P-GC throughput**

**Table 62. P2P - GC Mode Throughput - BGN Mode | 2.4 GHz Band | 20 MHz**

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
WPA2-AES	56	54	61	60

**Table 63. P2P - GC Mode Throughput - AC Mode | 5 GHz Band | 80 MHz**

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
WPA2-AES	171	274	231	308

4.3.5.5 Mobile AP throughput

External client: NXP 88W8987 SD-UART

Table 64. Mobile AP Mode Throughput - BGN Mode | 2.4 GHz Band | 20 MHz

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
Open Security	55	51	60	63
WPA2-AES	53	52	58	57
WPA3-SAE	52	49	59	61

Table 65. Mobile AP Mode Throughput - AN Mode | 5 GHz Band | 20 MHz

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
Open Security	58	56	58	65
WPA2-AES	53	52	63	61
WPA3-SAE	58	56	60	65

Table 66. Mobile AP Mode Throughput - AN Mode | 5 GHz Band | 40 MHz

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
Open Security	117	122	122	133
WPA2-AES	116	111	124	125
WPA3-SAE	114	105	124	132

Table 67. Mobile AP Mode Throughput - AC Mode | 5 GHz Band | 20 MHz

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

Table 68. Mobile AP Mode Throughput - AC Mode | 5 GHz Band | 40 MHz

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

Table 69. Mobile AP Mode Throughput - AC Mode | 5 GHz Band | 80 MHz

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
Open Security	234	317	265	355
WPA2-AES	222	293	255	345
WPA3-SAE	225	316	254	358

4.3.6 EU conformance tests

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

4.3.7 Bug fixes/feature enhancements

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

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

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

Component	Description
—	NA

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

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

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

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

**4.3.7.5 Firmware version: From 16.92.21.p69.3 to 16.92.21.p76.2**

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

**4.3.7.6 Firmware version: From 16.92.21.p76.2 to 16.92.21.p76.5**

Component	Description
—	NA

**4.3.7.7 Firmware version: From 16.92.21.p76.5 to 16.92.21.p99.2**

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

**4.3.7.8 Firmware version: From 16.92.21.p99.2 to 16.92.21.p119.3**

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

**4.3.8 Known issues**

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

## 4.4 SD-UART IW416

### 4.4.1 Package information

- Android BSP version: 14.0.0\_1.0.0
- Wi-Fi and Bluetooth/Bluetooth LE Firmware version: 16.92.21.p119.3
- Driver version: MM5X16437.p8-GPL

### 4.4.2 Version information

- Wireless SoC: IW416
- Wi-Fi and Bluetooth/Bluetooth LE Firmware Version: 16.92.21.p119.3
  - 16 - Major revision
  - 92 - Feature pack
  - 21 - Release version
  - p119.3 - Patch number
- Driver Version: MM5X16437.p8-GPL
  - 5X - Linux 5.x Kernel
  - 16437 - Release version
  - p8 - Patch number
  - GPL - General Public License v2

### 4.4.3 Host platform

- MCIMX8QM-EVK platform running Android
- Interface used
  - Wi-Fi over SDIO (SDIO 3.0 support, Clock speed: 200 MHz)
  - Bluetooth/Bluetooth LE over UART
- Test Tools
  - iperf3
  - wpa\_supplicant (version 2.10)
  - hostapd (version 2.10)
  - Wi-Fi Vendor HAL (version M009.014\_M009.024\_Android\_14)



#### 4.4.4 Wi-Fi and Bluetooth certification

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

##### 4.4.4.1 WFA Certifications

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

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

**Note:**

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

##### 4.4.4.2 Bluetooth controller certification

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

## 4.4.5 Wi-Fi throughput

### 4.4.5.1 Throughput test setup

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

```
fw_name=nxp/sdiouartiw416_combo_v0.bin, cal_data_cfg=none, cfg80211_wext=0xf,  
host_mlme=1, amsdu_deaggr=1, net_rx=1, tx_skb_clone=1, tx_work=1
```

- iPerf commands:

TCP server:

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

TCP client:

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

UDP server:

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

UDP client:

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

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

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

**4.4.5.2 STA throughput**

External AP: Asus RT-AX88U

**Table 70. STA Mode Throughput - BGN Mode | 2.4 GHz Band | 20 MHz**

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
Open Security	53	54	58	59
WPA2-AES	52	53	57	59
WPA3-SAE	52	52	57	59

**Table 71. STA Mode Throughput - BGN Mode | 2.4 GHz Band | 40 MHz**

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
Open Security	108	110	116	114
WPA2-AES	106	108	110	111
WPA3-SAE	106	108	111	112

**Table 72. STA Mode Throughput - AN Mode | 5 GHz Band | 20 MHz (HT)**

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
Open Security	54	56	59	61
WPA2-AES	54	57	60	61
WPA3-SAE	52	58	59	61

**Table 73. STA Mode Throughput - AN Mode | 5 GHz Band | 40 MHz (HT)**

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
Open Security	106	118	120	126
WPA2-AES	108	116	118	124
WPA3-SAE	108	114	116	124

**4.4.5.3 P2P-GO throughput**

**Table 74. P2P - GO Mode Throughput - BGN Mode | 2.4 GHz Band | 20 MHz**

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
WPA2-AES	54	54	58	57

**Table 75. P2P - GO Mode Throughput - AN Mode | 5 GHz Band | 40 MHz**

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
WPA2-AES	105	112	116	126

**4.4.5.4 P2P-GC throughput**

**Table 76. P2P - GC Mode Throughput - BGN Mode | 2.4 GHz Band | 20 MHz**

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
WPA2-AES	58	55	59	58

**Table 77. P2P - GC Mode Throughput - AN Mode | 5 GHz Band | 40 MHz**

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
WPA2-AES	102	112	119	129

#### 4.4.5.5 Mobile AP throughput

External client: NXP IW620 PCIe-UART

Table 78. Mobile AP Mode Throughput - BGN Mode | 2.4 GHz Band | 20 MHz

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
Open Security	54	53	59	61
WPA2-AES	52	52	59	58
WPA3-SAE	53	54	59	57

Table 79. Mobile AP Mode Throughput - BGN Mode | 2.4 GHz Band | 40MHz

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
Open Security	110	112	120	128
WPA2-AES	108	109	119	127
WPA3-SAE	108	109	119	126

Table 80. Mobile AP Mode Throughput - AN Mode | 5 GHz Band | 20 MHz

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
Open Security	55	58	60	63
WPA2-AES	56	56	60	60
WPA3-SAE	56	55	61	59

Table 81. Mobile AP Mode Throughput - AN Mode | 5 GHz Band | 40 MHz

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
Open Security	114	116	124	129
WPA2-AES	112	114	122	130
WPA3-SAE	112	114	123	129

#### 4.4.6 EU conformance tests

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

**4.4.7 Bug fixes/feature enhancements**

**4.4.7.1 Firmware version: from 16.92.21.p11.2 to 16.92.21.p41.1**

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

**4.4.7.2 Firmware version: from 16.92.21.p41.1 to 16.92.21.p55.3**

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

**4.4.7.3 Firmware version: from 16.92.21.p55.3 to 16.92.21.p76.3**

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

**4.4.7.4 Firmware version: from 16.92.21.p76.3 to 16.92.21.p84.3**

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

**4.4.7.5 Firmware version: from 16.92.21.p84.3 to 16.92.21.p84.128**

Component	Description
—	—

**4.4.7.6 Firmware version: from 16.92.21.p84.128 to 16.92.21.p119.3**

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

**4.4.8 Known issues**

Component	Description
Wi-Fi	When ed-mac is enabled, probe responses are transmitted during interference signal.

## 4.5 SD-UART 88W8997

### 4.5.1 Package information

- Android BSP version: 14.0.0\_1.0.0
- Wi-Fi and Bluetooth/Bluetooth LE Firmware version: 16.92.21.p119.3
- Driver version: MM6X17437.p8-GPL

### 4.5.2 Version information

- Wireless SoC: 88W8997
- Wi-Fi and Bluetooth/Bluetooth LE Firmware Version: 16.92.21.p119.3
  - 16 - Major revision
  - 92 - Feature pack
  - 21 - Release version
  - p119.3 - Patch number
- Driver Version: MM6X17437.p8-GPL
  - 6X - Linux 6.x Kernel
  - 17437 - Release version
  - p8 - Patch number
  - GPL - General Public License v2

### 4.5.3 Host platform

- MCIMX8M-EVK platform running Android
- Interface used
  - Wi-Fi over SDIO 3.0
  - Bluetooth/Bluetooth LE over UART
- Test Tools
  - iperf3
  - wpa\_supplicant (version 2.10)
  - hostapd (version 2.10)
  - Wi-Fi Vendor HAL (version M009.014\_M009.024\_Android\_14)

#### 4.5.4 Wi-Fi and Bluetooth certification

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

##### 4.5.4.1 Wi-Fi pre-certifications

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

**Note:**

- Download Labtool application for RF test mode, refer to the URL: [88W8997-MANUFACTURING-RELEASE-P207](#)
- Download Sigma tool, refer to the URL: [NXP-WTS-DUT-AGENT-Release-R2-0](#)
- Download QTT Agent, refer to the URL: [NXP\\_QTT\\_AGENT\\_Source-R2.2\\_Android\\_RTOS](#)

##### 4.5.4.2 Bluetooth controller certification

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



## 4.5.5 Wi-Fi throughput

### 4.5.5.1 Throughput test setup

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

```
fw_name=nxp/sdiouart8997_combo_v4.bin, cal_data_cfg=none, cfg80211_wext=0xf, host_mlme=1,
amsdu_deaggr=1, net_rx=1, tx_skb_clone=1, tx_work=1
```

- iPerf commands:

TCP server:

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

TCP client:

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

UDP server:

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

UDP client:

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

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

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

4.5.5.2 STA throughput

External AP: Asus RT-AX88U

Table 82. STA Mode Throughput - BGN Mode | 2.4 GHz Band | 20 MHz (HT)

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
Open Security	107	116	122	122
WPA2-AES	108	116	122	122
WPA3-SAE	107	115	120	121

Table 83. STA Mode Throughput - AN Mode | 5 GHz Band | 20 MHz (HT)

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
Open Security	109	122	122	124
WPA2-AES	109	122	122	125
WPA3-SAE	108	118	121	125

Table 84. STA Mode Throughput - AN Mode | 5 GHz Band | 40 MHz (HT)

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
Open Security	200	247	233	257
WPA2-AES	199	245	232	257
WPA3-SAE	199	245	233	256

Table 85. STA Mode Throughput - AC Mode | 5 GHz Band | 20 MHz (VHT)

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
Open Security	134	147	146	157
WPA2-AES	133	148	145	154
WPA3-SAE	133	148	145	154

Table 86. STA Mode Throughput - AC Mode | 5 GHz Band | 40 MHz (VHT)

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
Open Security	256	335	326	351
WPA2-AES	255	335	325	351
WPA3-SAE	251	333	322	351

**Table 87. STA Mode Throughput - AC Mode | 5 GHz Band | 80 MHz (VHT)**

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	Tx	Rx	Tx	Rx
Open Security	336	401	425	421
WPA2-AES	333	401	422	420
WPA3-SAE	325	401	422	422

**4.5.5.3 P2P-GO throughput**

**Table 88. P2P - GO Mode Throughput - BGN Mode | 2.4 GHz Band | 20 MHz**

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

**Table 89. P2P - GO Mode Throughput - AN Mode | 5 GHz Band | 40 MHz**

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	Tx	Rx	Tx	Rx
WPA2-AES	214	247	235	258

**Table 90. P2P - GO Mode Throughput - AC Mode | 5 GHz Band | 80 MHz**

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	Tx	Rx	Tx	Rx
WPA2-AES	329	421	434	458

**4.5.5.4 P2P-GC throughput**

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

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	Tx	Rx	Tx	Rx
WPA2-AES	112	117	116	124

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

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

**Table 93. P2P - GC Mode Throughput - AC Mode | 5 GHz Band | 80 MHz**

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	Tx	Rx	Tx	Rx
WPA2-AES	300	401	415	455

4.5.5.5 Mobile AP throughput

External Client: NXP IW620 PCIe-UART

Table 94. Mobile AP Mode Throughput - BGN Mode | 2.4 GHz Band | 20 MHz

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
Open Security	110	116	122	124
WPA2-AES	111	115	121	125
WPA3-SAE	110	116	121	124

Table 95. Mobile AP Mode Throughput - BGN Mode | 2.4 GHz Band | 40 MHz

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
Open Security	210	240	232	250
WPA2-AES	210	240	232	250
WPA3-SAE	209	240	231	250

Table 96. Mobile AP Mode Throughput - AN Mode | 5 GHz Band | 20 MHz

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
Open Security	115	120	123	126
WPA2-AES	115	122	121	126
WPA3-SAE	115	122	123	126

Table 97. Mobile AP Mode Throughput - AN Mode | 5 GHz Band | 40 MHz

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
Open Security	215	245	235	256
WPA2-AES	215	245	235	256
WPA3-SAE	214	245	235	256

Table 98. Mobile AP Mode Throughput - AC Mode | 5 GHz Band | 20 MHz

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
Open Security	141	145	146	153
WPA2-AES	140	145	146	153
WPA3-SAE	140	145	146	153

**Table 99. Mobile AP Mode Throughput - AC Mode | 5 GHz Band | 40 MHz**

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	Tx	Rx	Tx	Rx
Open Security	270	322	337	351
WPA2-AES	271	321	338	351
WPA3-SAE	271	325	338	351

**Table 100. Mobile AP Mode Throughput - AC Mode | 5 GHz Band | 80 MHz**

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	Tx	Rx	Tx	Rx
Open Security	330	401	437	461
WPA2-AES	330	405	437	461
WPA3-SAE	331	401	436	461

**4.5.6 EU conformance tests**

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

#### 4.5.7 Bug fixes/feature enhancements

##### 4.5.7.1 Firmware version: from 16.92.10.p218 to 16.92.10.p219.3

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

##### 4.5.7.2 Firmware version: from 16.92.10.p219.3 to 16.92.21.p219.5

Component	Description
—	NA

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

Component	Description
—	NA

##### 4.5.7.4 Firmware version: from 16.92.21.p41 to 16.92.21.p55.3

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

##### 4.5.7.5 Firmware version: from 16.92.21.p55.3 to 16.92.21.p76.2

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

##### 4.5.7.6 Firmware version: from 16.92.21.p76.2 to 16.92.21.p84.4

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

##### 4.5.7.7 Firmware version: from 16.92.21.p84.4 to 16.92.21.p119.3

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

**4.5.8 Known issues**

Component	Description
—	—



## 4.6 SD-UART 88W9098

### 4.6.1 Package information

- Android BSP version: 14.0.0\_1.0.0
- Wi-Fi and Bluetooth/Bluetooth LE Firmware version: 17.92.1.p149.131
- Driver version: MM6X17437.p8-GPL

### 4.6.2 Version information

- Wireless SoC: 88W9098
- Wi-Fi and Bluetooth/Bluetooth LE Firmware Version: 17.92.21.p149.131
  - 17 - Major revision
  - 92 - Feature pack
  - 21 - Release version
  - p149.131 - Patch number
- Driver Version: MM6X17437.p8-GPL
  - 6X - Linux 6.x Kernel
  - 17437 - Release version
  - p8 - Patch number
  - GPL - General Public License v2

### 4.6.3 Host platform

- MCIMX8M-EVK platform running Android
- Interface used
  - Wi-Fi over SDIO 3.0
  - Bluetooth/Bluetooth LE over UART
- Test Tools
  - iperf3
  - wpa\_supplicant (version 2.10)
  - hostapd (version 2.10)
  - Wi-Fi Vendor HAL (version M009.014\_M009.024\_Android\_14)

#### 4.6.4 Wi-Fi and Bluetooth certification

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

##### 4.6.4.1 Wi-Fi pre-certifications

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

**Note:**

- Download Labtool application for RF test mode, refer to the URL: [88W8997-MANUFACTURING-RELEASE-P207](#)
- Download Sigma tool, refer to the URL: [NXP-WTS-DUT-AGENT-Release-R2-0](#)
- Download QTT Agent, refer to the URL: [NXP\\_QTT\\_AGENT\\_Source-R2.2\\_Android\\_RTOS](#)

##### 4.6.4.2 Bluetooth controller certification

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

## 4.6.5 Wi-Fi throughput

### 4.6.5.1 Throughput test setup

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

```
fw_name=nxp/sdiouart9098_combo_v4.bin, cal_data_cfg=none, cfg80211_wext=0xf,  
host_mlme=1, amsdu_deaggr=1, net_rx=1, tx_skb_clone=1, tx_work=1
```

- iPerf commands:

TCP server:

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

TCP client:

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

UDP server:

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

UDP client:

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

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

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

4.6.5.2 STA throughput

External AP: Netgear RAX200

Table 101. STA Mode Throughput - BGN Mode | 2.4 GHz Band | 20 MHz (HT)

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
Open Security	117	121	123	126
WPA2-AES	115	122	121	125
WPA3-SAE	117	120	122	124

Table 102. STA Mode Throughput - AN Mode | 5 GHz Band | 20 MHz (HT)

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
Open Security	120	115	122	124
WPA2-AES	121	118	121	122
WPA3-SAE	120	117	122	124

Table 103. STA Mode Throughput - AN Mode | 5 GHz Band | 40 MHz (HT)

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
Open Security	240	235	254	256
WPA2-AES	241	234	250	253
WPA3-SAE	238	230	248	256

Table 104. STA Mode Throughput - AC Mode | 5 GHz Band | 20 MHz (VHT)

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
Open Security	144	147	152	155
WPA2-AES	143	145	150	154
WPA3-SAE	142	146	154	156

Table 105. STA Mode Throughput - AC Mode | 5 GHz Band | 40 MHz (VHT)

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
Open Security	274	316	350	310
WPA2-AES	276	314	351	308
WPA3-SAE	277	312	250	304

Table 106. STA Mode Throughput - AC Mode | 5 GHz Band | 80 MHz (VHT)

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
Open Security	298	312	418	314
WPA2-AES	297	310	416	312
WPA3-SAE	296	308	412	316

Table 107. STA Mode Throughput - AX Mode | MAC2 | 2.4 GHz Band | 20 MHz (HE)

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
Open Security	179	177	187	189
WPA2-AES	176	175	186	190
WPA3-SAE	177	176	188	189

Table 108. STA Mode Throughput - AX Mode | MAC1 | 5 GHz Band | 20 MHz (HE)

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
Open Security	208	226	235	252
WPA2-AES	205	227	236	254
WPA3-SAE	206	231	242	252

Table 109. STA Mode Throughput - AX Mode | MAC1 | 5 GHz Band | 40 MHz (HE)

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
Open Security	308	295	396	308
WPA2-AES	307	296	397	306
WPA3-SAE	305	295	398	307

Table 110. STA Mode Throughput - AX Mode | MAC1 | 5 GHz Band | 80 MHz (HE)

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
Open Security	295	296	421	311
WPA2-AES	296	294	417	310
WPA3-SAE	297	293	418	308

**4.6.5.3 P2P-GO throughput**

**Table 111. P2P - GO Mode Throughput - BGN Mode | 2.4 GHz Band | 20 MHz**

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
WPA2-AES	117	118	124	117

**Table 112. P2P - GO Mode Throughput - AN Mode | 5 GHz Band | 40 MHz**

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
WPA2-AES	248	234	254	256

**Table 113. P2P - GO Mode Throughput - AC Mode | 5 GHz Band | 80 MHz**

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
WPA2-AES	340	315	417	405

**4.6.5.4 P2P-GC throughput**

**Table 114. P2P - GC Mode Throughput - BGN Mode | 2.4 GHz Band | 20 MHz**

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
WPA2-AES	118	117	125	121

**Table 115. P2P - GC Mode Throughput - AN Mode | 5 GHz Band | 40 MHz**

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
WPA2-AES	247	235	252	253

**Table 116. P2P - GC Mode Throughput - AC Mode | 5 GHz Band | 80 MHz**

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
WPA2-AES	339	312	412	400

4.6.5.5 Mobile AP throughput

External Client: NXP 88W9098 SD-UART

Table 117. Mobile AP Mode Throughput - BGN Mode | 2.4 GHz Band | 20MHz

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
Open Security	121	119	123	124
WPA2-AES	122	120	121	122
WPA3-SAE	120	121	122	123

Table 118. Mobile AP Mode Throughput - BGN Mode | 2.4 GHz Band | 40 MHz

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
Open Security	242	230	250	253
WPA2-AES	243	232	248	250
WPA3-SAE	241	229	246	248

Table 119. Mobile AP Mode Throughput - AN Mode | 5 GHz Band | 20 MHz

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
Open Security	124	120	125	127
WPA2-AES	125	122	125	126
WPA3-SAE	124	121	124	127

Table 120. Mobile AP Mode Throughput - AN Mode | 5 GHz Band | 40 MHz

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
Open Security	248	231	252	253
WPA2-AES	247	230	256	252
WPA3-SAE	245	228	253	251

Table 121. Mobile AP Mode Throughput - AC Mode | 5 GHz Band | 20 MHz

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
Open Security	148	145	157	152
WPA2-AES	147	143	157	152
WPA3-SAE	146	142	156	151

Table 122. Mobile AP Mode Throughput - AC Mode | 5 GHz Band | 40 MHz

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
Open Security	315	273	355	352
WPA2-AES	318	277	356	354
WPA3-SAE	319	276	354	353

Table 123. Mobile AP Mode Throughput - AC Mode | 5 GHz Band | 80 MHz

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
Open Security	333	308	417	380
WPA2-AES	335	307	415	379
WPA3-SAE	334	308	416	381

Table 124. Mobile AP Mode Throughput - AX Mode | MAC2 | 2.4 GHz Band | 20 MHz (HE)

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
Open Security	140	135	142	143
WPA2-AES	138	136	142	143
WPA3-SAE	140	134	140	141

Table 125. Mobile AP Mode Throughput - AX Mode | MAC1 | 5 GHz Band | 20 MHz (HE)

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
Open Security	145	142	152	151
WPA2-AES	146	141	151	150
WPA3-SAE	147	143	150	149

Table 126. Mobile AP Mode Throughput - AX Mode | MAC1 | 5 GHz Band | 40 MHz (HE)

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
Open Security	283	252	304	283
WPA2-AES	284	253	306	281
WPA3-SAE	287	252	305	284



Table 127. Mobile AP Mode Throughput - AX Mode | MAC1 | 5 GHz Band | 80 MHz (HE)

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
Open Security	334	312	413	402
WPA2-AES	336	312	416	406
WPA3-SAE	335	310	412	404

4.6.6 EU conformance tests

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

4.6.7 Bug fixes/feature enhancements

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

Component	Description
—	NA

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

Component	Description
—	NA

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

Component	Description
—	—

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

Component	Description
—	—

4.6.8 Known issues

Component	Description
Wi-Fi	Low throughput is observed in VHT/HE mode.
Bluetooth	When Bluetooth firmware is downloaded on in band reset, after that sometimes FW fails to respond to HCI reset and not able to bring up Bluetooth interface.

## 4.7 SD-UART IW61x

### 4.7.1 Package information

- Android BSP version: 14.0.0\_1.0.0
- Wi-Fi and Bluetooth/Bluetooth LE Firmware version: 18.99.2.p66.18
- Driver version: MM6X18437.p8-GPL

### 4.7.2 Version information

- Wireless SoC: IW61x
- Wi-Fi and Bluetooth/Bluetooth LE Firmware Version: 18.99.2.p66.18
  - 18 - Major revision
  - 99 - Feature pack
  - 2 - Release version
  - p66.18 - Patch number
- Driver Version: MM6X18437.p8-GPL
  - 6X - Linux 6.x Kernel
  - 18437 - Release version
  - p8 - Patch number
  - GPL - General Public License v2

### 4.7.3 Host platform

- MCIMX8M-EVK platform running Android
- Interface used
  - Wi-Fi over SDIO 3.0
  - Bluetooth/Bluetooth LE over UART
- Test Tools
  - iperf3
  - wpa\_supplicant (version 2.10)
  - hostapd (version 2.10)
  - Wi-Fi Vendor HAL (version M009.014\_M009.024\_Android\_14)

#### 4.7.4 Wi-Fi and Bluetooth certification

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

##### 4.7.4.1 Wi-Fi pre-certifications

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

**Note:**

- Download Labtool application for RF test mode, refer to the URL: [88W8997-MANUFACTURING-RELEASE-P207](#)
- Download Sigma tool, refer to the URL: [NXP-WTS-DUT-AGENT-Release-R2-0](#)
- Download QTT Agent, refer to the URL: [NXP\\_QTT\\_AGENT\\_Source-R2.2\\_Android\\_RTOS](#)

##### 4.7.4.2 Bluetooth controller certification

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

## 4.7.5 Wi-Fi throughput

### 4.7.5.1 Throughput test setup

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

```
fw_name=nxp/sduart_nw61x_v1.bin.se, cal_data_cfg=none, cfg80211_wext=0xf,  
host_mlme=1, amsdu_deaggr=1, net_rx=1, tx_skb_clone=1, tx_work=1
```

- iPerf commands:

TCP server:

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

TCP client:

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

UDP server:

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

UDP client:

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

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

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

4.7.5.2 STA throughput

External AP: Asus RT-AX88U

Table 128. STA Mode Throughput - BGN Mode | 2.4 GHz Band | 20 MHz (HT)

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
Open Security	56	55	58	59
WPA2-AES	55	55	58	58
WPA3-SAE	55	55	58	58

Table 129. STA Mode Throughput - AN Mode | 5 GHz Band | 20 MHz (HT)

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
Open Security	60	60	64	64
WPA2-AES	60	60	63	63
WPA3-SAE	59	60	64	64

Table 130. STA Mode Throughput - AN Mode | 5 GHz Band | 40 MHz (HT)

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
Open Security	119	120	134	131
WPA2-AES	118	120	133	131
WPA3-SAE	119	121	134	131

Table 131. STA Mode Throughput - AC Mode | 5 GHz Band | 20 MHz (VHT)

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
Open Security	72	75	76	78
WPA2-AES	75	77	79	70
WPA3-SAE	74	77	78	80

Table 132. STA Mode Throughput - AC Mode | 5 GHz Band | 40 MHz (VHT)

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
Open Security	167	168	180	177
WPA2-AES	166	167	179	177
WPA3-SAE	166	166	179	177

Table 133. STA Mode Throughput - AC Mode | 5 GHz Band | 80 MHz (VHT)

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
Open Security	310	327	374	376
WPA2-AES	310	326	373	376
WPA3-SAE	309	324	373	376

Table 134. STA Mode Throughput - AX Mode | MAC2 | 2.4 GHz Band | 20 MHz (HE)

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
Open Security	114	112	125	122
WPA2-AES	115	113	124	122
WPA3-SAE	113	112	124	123

Table 135. STA Mode Throughput - AX Mode | MAC1 | 5 GHz Band | 20 MHz (HE)

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
Open Security	119	116	129	126
WPA2-AES	119	115	129	127
WPA3-SAE	118	115	128	127

Table 136. STA Mode Throughput - AX Mode | MAC1 | 5 GHz Band | 40 MHz (HE)

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
Open Security	214	212	252	240
WPA2-AES	213	214	253	241
WPA3-SAE	212	214	251	241

Table 137. STA Mode Throughput - AX Mode | MAC1 | 5 GHz Band | 80 MHz (HE)

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
Open Security	352	352	417	420
WPA2-AES	351	360	411	416
WPA3-SAE	348	360	413	418

**4.7.5.3 P2P-GO throughput**

**Table 138. P2P - GO Mode Throughput - BGN Mode | 2.4 GHz Band | 20 MHz**

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
WPA2-AES	57	57	62	62

**Table 139. P2P - GO Mode Throughput - AN Mode | 5 GHz Band | 40 MHz**

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
WPA2-AES	116	117	132	133

**Table 140. P2P - GO Mode Throughput - AC Mode | 5 GHz Band | 80 MHz**

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
WPA2-AES	340	345	380	383

**4.7.5.4 P2P-GC throughput**

**Table 141. P2P - GC Mode Throughput - BGN Mode | 2.4 GHz Band | 20 MHz**

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
WPA2-AES	57	57	62	62

**Table 142. P2P - GC Mode Throughput - AN Mode | 5 GHz Band | 40 MHz**

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
WPA2-AES	114	116	132	132

**Table 143. P2P - GC Mode Throughput - AC Mode | 5 GHz Band | 80 MHz**

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
WPA2-AES	342	341	381	378

**4.7.5.5 Mobile AP throughput**

External Client: NXP IW620 PCIe-UART

**Table 144. Mobile AP Mode Throughput - BGN Mode | 2.4 GHz Band | 20MHz**

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
Open Security	56	54	59	59
WPA2-AES	56	54	58	58
WPA3-SAE	55	54	59	59

**Table 145. Mobile AP Mode Throughput - BGN Mode | 2.4 GHz Band | 40 MHz**

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
Open Security	120	115	124	125
WPA2-AES	123	117	124	126
WPA3-SAE	121	115	123	125

**Table 146. Mobile AP Mode Throughput - AN Mode | 5 GHz Band | 20 MHz**

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
Open Security	62	57	64	61
WPA2-AES	62	57	64	62
WPA3-SAE	61	56	64	62

**Table 147. Mobile AP Mode Throughput - AN Mode | 5 GHz Band | 40 MHz**

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
Open Security	113	114	130	132
WPA2-AES	113	113	132	131
WPA3-SAE	114	113	130	131



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

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	Tx	Rx	Tx	Rx
Open Security	75	69	78	75
WPA2-AES	75	69	77	75
WPA3-SAE	74	69	78	75

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

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	Tx	Rx	Tx	Rx
Open Security	174	165	181	178
WPA2-AES	173	163	181	178
WPA3-SAE	172	165	181	177

**Table 150. Mobile AP Mode Throughput - AC Mode | 5 GHz Band | 80 MHz**

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	Tx	Rx	Tx	Rx
Open Security	358	322	375	379
WPA2-AES	356	324	375	378
WPA3-SAE	356	322	373	378

**Table 151. Mobile AP Mode Throughput - AX Mode | MAC2 | 2.4 GHz Band | 20 MHz (HE)**

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	Tx	Rx	Tx	Rx
Open Security	110	115	120	121
WPA2-AES	111	114	119	118
WPA3-SAE	110	112	119	119

**Table 152. Mobile AP Mode Throughput - AX Mode | MAC1 | 5 GHz Band | 20 MHz (HE)**

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
Direction	Tx	Rx	Tx	Rx
Open Security	122	114	128	125
WPA2-AES	121	112	129	122
WPA3-SAE	122	112	129	124

**Table 153. Mobile AP Mode Throughput - AX Mode | MAC1 | 5 GHz Band | 40 MHz (HE)**

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
Open Security	226	222	250	249
WPA2-AES	225	220	248	245
WPA3-SAE	225	222	248	247

**Table 154. Mobile AP Mode Throughput - AX Mode | MAC1 | 5 GHz Band | 80 MHz (HE)**

Protocol	TCP (Mbit/s)		UDP (Mbit/s)	
	Tx	Rx	Tx	Rx
Open Security	361	334	407	410
WPA2-AES	360	333	408	410
WPA3-SAE	361	334	408	108

**4.7.6 EU conformance tests**

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

**4.7.7 Bug fixes/feature enhancements**

**4.7.7.1 Firmware version: from 18.99.2.p19.15 to 18.99.2.p66.10**

Component	Description
Wi-Fi	<ul style="list-style-type: none"> <li>• Wake-up card timeout is observed when the DUT AP changes the channels during TWT execution.</li> <li>• The DUT-STA does not stop sending the periodic null frames after executing TWT Teardown.</li> </ul>

**4.7.7.2 Firmware version: from 18.99.2.p66.10 to 18.99.2.p66.18**

Component	Description
Wi-Fi	<ul style="list-style-type: none"> <li>• The DUT-AP keeps sending RTS to the external device (in switched off state) until the age-out timer expires.</li> <li>• Firmware fatal automatic recovery failed in long run stress testing.</li> <li>• DUT wakeup interval found unexpected for successive wakeups in TWT session of specific Service period which can be more than 10 minutes.</li> <li>• In DUTSTA Command 802_11_SCAN_EXT [0x107], timeout is seen when performing scan while doing Auto-Tx.</li> </ul>
Bluetooth	<ul style="list-style-type: none"> <li>• 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).</li> <li>• Link instability in presence of multiple Bluetooth links under optimization.</li> <li>• When Bluetooth Scatternet and eSCO link run for a long time, the DUT may hang.</li> </ul>

#### 4.7.8 Known issues

Component	Description
Wi-Fi	<ul style="list-style-type: none"><li>• STAUT does not follow the configured wake up duration.</li><li>• DUTAP hang observed during youtube stress test within ~20 mins with ch 36 Open Noisy Environment.</li><li>• DUTSTA sends deauth due to unspecified reason and observed hang in disconnected state.</li><li>• In DUT STA mode, scan command timeout was observed during WPA3-FT PSK rssi based roaming test on long run.</li></ul>
Bluetooth	<ul style="list-style-type: none"><li>• While two Bluetooth ACL links are connected and HFP call is ongoing in one of these connections and DUT start scanning process, then disconnection with the second ACL link occurs.</li></ul>

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

[Table 155](#) lists the on-board chips for i.MX platforms and external wireless solutions available.

**Table 155. On-board chips and external support for Bluetooth and Wi-Fi support**

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

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

## 6 Acronyms and abbreviations

Table 156. Acronyms and abbreviations

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

## 7 Note about the source code in the document

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## 8 References

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### Application notes

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

### User manuals

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

### Web pages

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

## 9 Revision history

### Revision history

Document ID	Date	Description
RN00110 v.12	12 April 2024	<ul style="list-style-type: none"> <li>• Feature lists                             <ul style="list-style-type: none"> <li>– <a href="#">Section 3.1.2 "AP mode"</a>: updated.</li> <li>– <a href="#">Section 3.2.1 "Bluetooth classic"</a>: updated.</li> </ul> </li> <li>• PCIe-UART 88W8997                             <ul style="list-style-type: none"> <li>– <a href="#">Section 4.1.1 "Package information"</a>: updated.</li> <li>– <a href="#">Section 4.1.2 "Version information"</a>: updated.</li> <li>– <a href="#">Section 4.1.3 "Host platform"</a>: updated.</li> <li>– <a href="#">Section 4.1.4.1 "Wi-Fi pre-certifications"</a>: updated the note.</li> <li>– <a href="#">Section 4.1.5 "Wi-Fi throughput"</a>: updated.</li> <li>– <a href="#">Section 4.1.7.4 "Firmware version: From 17.92.21.p84.4 to 16.92.21.p119.3"</a>: added.</li> <li>– <a href="#">Section 4.1.8 "Known issues"</a>: updated.</li> </ul> </li> <li>• PCIe-UART 88W9098                             <ul style="list-style-type: none"> <li>– <a href="#">Section 4.2.1 "Package information"</a>: updated.</li> <li>– <a href="#">Section 4.2.2 "Version information"</a>: updated.</li> <li>– <a href="#">Section 4.2.3 "Host platform"</a>: updated.</li> <li>– <a href="#">Section 4.2.4.1 "Wi-Fi pre-certifications"</a>: updated the note.</li> <li>– <a href="#">Section 4.2.5 "Wi-Fi throughput"</a>: updated.</li> <li>– <a href="#">Section 4.2.7.4 "Firmware version: 17.92.1.p136.132 to 17.92.1.p149.131"</a>: added.</li> <li>– <a href="#">Section 4.2.8 "Known issues"</a>: updated.</li> </ul> </li> <li>• SD-UART 88W8987                             <ul style="list-style-type: none"> <li>– <a href="#">Section 4.3.1 "Package information"</a>: updated.</li> <li>– <a href="#">Section 4.3.2 "Version information"</a>: updated.</li> <li>– <a href="#">Section 4.3.3 "Host platform"</a>: updated.</li> <li>– <a href="#">Section 4.1.4.1 "Wi-Fi pre-certifications"</a>: updated the note.</li> <li>– <a href="#">Section 4.3.7.8 "Firmware version: From 16.92.21.p99.2 to 16.92.21.p119.3"</a>: added.</li> <li>– <a href="#">Section 4.3.8 "Known issues"</a>: updated.</li> </ul> </li> <li>• SD-UART IW416                             <ul style="list-style-type: none"> <li>– <a href="#">Section 4.4.1 "Package information"</a>: updated.</li> <li>– <a href="#">Section 4.4.2 "Version information"</a>: updated.</li> <li>– <a href="#">Section 4.4.3 "Host platform"</a>: updated.</li> <li>– <a href="#">Section 4.6.4.1 "Wi-Fi pre-certifications"</a>: updated the note.</li> <li>– <a href="#">Section 4.4.5 "Wi-Fi throughput"</a>: updated.</li> <li>– <a href="#">Section 4.4.7.6 "Firmware version: from 16.92.21.p84.128 to 16.92.21.p119.3"</a>: added.</li> <li>– <a href="#">Section 4.4.8 "Known issues"</a>: updated.</li> </ul> </li> </ul> <p style="text-align: center;">————— <i>Continues</i> —————</p>



Revision history...continued

Document ID	Date	Description
RN00110 v.12	03 April 2024	<p>————— <i>Continued</i> —————</p> <ul style="list-style-type: none"> <li>• SD-UART 88W8997                             <ul style="list-style-type: none"> <li>– <a href="#">Section 4.5.1 "Package information"</a>: updated.</li> <li>– <a href="#">Section 4.5.2 "Version information"</a>: updated.</li> <li>– <a href="#">Section 4.5.3 "Host platform"</a>: updated.</li> <li>– <a href="#">Section 4.1.4.1 "Wi-Fi pre-certifications"</a>: updated the note.</li> <li>– <a href="#">Section 4.5.5 "Wi-Fi throughput"</a>: updated.</li> <li>– <a href="#">Section 4.5.7.7 "Firmware version: from 16.92.21.p84.4 to 16.92.21.p119.3"</a>: added.</li> <li>– <a href="#">Section 4.5.8 "Known issues"</a>: updated.</li> </ul> </li> <li>• SD-UART 88W9098                             <ul style="list-style-type: none"> <li>– <a href="#">Section 4.6.1 "Package information"</a>: updated.</li> <li>– <a href="#">Section 4.6.2 "Version information"</a>: updated.</li> <li>– <a href="#">Section 4.6.3 "Host platform"</a>: updated.</li> <li>– <a href="#">Section 4.6.4.1 "Wi-Fi pre-certifications"</a>: updated the note.</li> <li>– <a href="#">Section 4.6.5 "Wi-Fi throughput"</a>: updated.</li> <li>– <a href="#">Section 4.6.7.4 "Firmware version: from 17.92.1.p136.132 to 17.92.1.p149.131"</a>: added.</li> </ul> </li> <li>• SD-UART IW61x                             <ul style="list-style-type: none"> <li>– <a href="#">Section 4.7.1 "Package information"</a>: updated.</li> <li>– <a href="#">Section 4.7.2 "Version information"</a>: updated.</li> <li>– <a href="#">Section 4.7.3 "Host platform"</a>: updated.</li> <li>– <a href="#">Section 4.7.4.1 "Wi-Fi pre-certifications"</a>: updated the note.</li> <li>– <a href="#">Section 4.7.5 "Wi-Fi throughput"</a>: updated.</li> <li>– <a href="#">Section 4.7.7.2 "Firmware version: from 18.99.2.p66.10 to 18.99.2.p66.18"</a>: added.</li> <li>– <a href="#">Section 4.7.8 "Known issues"</a>: updated.</li> </ul> </li> </ul>
RN00110 v.11	29 January 2024	<ul style="list-style-type: none"> <li>• Updated the release version to 14.0.0_1.0.0</li> </ul>

Revision history...continued

Document ID	Date	Description
RN00110 v.10	13 December 2023	<ul style="list-style-type: none"> <li>• Replaced IW612 with IW61x.</li> <li>• <a href="#">Section 1 "About this document"</a>: updated.</li> <li>• <a href="#">Section 2.1 "Pre-compiled Wi-Fi driver and firmware"</a>: updated.</li> <li>• Feature lists               <ul style="list-style-type: none"> <li>– <a href="#">Section 3.1.1 "Client mode"</a>: updated.</li> <li>– <a href="#">Section 3.1.2 "AP mode"</a>: updated.</li> <li>– <a href="#">Section 3.2.1 "Bluetooth classic"</a>: updated.</li> <li>– <a href="#">Section 3.2.2 "Bluetooth LE"</a>: updated.</li> </ul> </li> <li>• PCIe-UART 88W8997               <ul style="list-style-type: none"> <li>– <a href="#">Section 4.1.1 "Package information"</a>: updated.</li> <li>– <a href="#">Section 4.1.2 "Version information"</a>: updated.</li> <li>– <a href="#">Section 4.1.3 "Host platform"</a>: updated.</li> </ul> </li> <li>• PCIe-UART 88W9098               <ul style="list-style-type: none"> <li>– <a href="#">Section 4.2.1 "Package information"</a>: updated.</li> <li>– <a href="#">Section 4.2.2 "Version information"</a>: updated.</li> <li>– <a href="#">Section 4.2.3 "Host platform"</a>: updated.</li> <li>– <a href="#">Section 4.2.7.3 "Firmware version: 17.92.1.p136.131 to 17.92.1.p136.132"</a>: added.</li> </ul> </li> <li>• SD-UART 88W8987               <ul style="list-style-type: none"> <li>– <a href="#">Section 4.3.1 "Package information"</a>: updated.</li> <li>– <a href="#">Section 4.3.2 "Version information"</a>: updated.</li> <li>– <a href="#">Section 4.3.3 "Host platform"</a>: updated.</li> </ul> </li> <li>• SD-UART IW416               <ul style="list-style-type: none"> <li>– <a href="#">Section 4.4.1 "Package information"</a>: updated.</li> <li>– <a href="#">Section 4.4.2 "Version information"</a>: updated.</li> <li>– <a href="#">Section 4.4.3 "Host platform"</a>: updated.</li> <li>– <a href="#">Section 4.4.7.5 "Firmware version: from 16.92.21.p84.3 to 16.92.21.p84.128"</a>: added.</li> </ul> </li> <li>• SD-UART 88W8997               <ul style="list-style-type: none"> <li>– <a href="#">Section 4.5.1 "Package information"</a>: updated.</li> <li>– <a href="#">Section 4.5.2 "Version information"</a>: updated.</li> <li>– <a href="#">Section 4.5.3 "Host platform"</a>: updated.</li> </ul> </li> <li>• SD-UART 88W9098               <ul style="list-style-type: none"> <li>– <a href="#">Section 4.6.1 "Package information"</a>: updated.</li> <li>– <a href="#">Section 4.6.2 "Version information"</a>: updated.</li> <li>– <a href="#">Section 4.6.3 "Host platform"</a>: updated.</li> <li>– <a href="#">Section 4.6.7.3 "Firmware version: from 17.92.1.p136.131 to 17.92.1.p136.132"</a>: added.</li> </ul> </li> </ul> <p style="text-align: center;">————— <i>Continues</i> —————</p>

Revision history...continued

Document ID	Date	Description
RN00110 v.10	13 December 2023	<p>————— <i>Continued</i> —————</p> <ul style="list-style-type: none"> <li>• SD-UART IW61x                             <ul style="list-style-type: none"> <li>– <a href="#">Section 4.7.1 "Package information"</a>: updated.</li> <li>– <a href="#">Section 4.7.2 "Version information"</a>: updated.</li> <li>– <a href="#">Section 4.7.3 "Host platform"</a>: updated.</li> <li>– <a href="#">Section 4.7.5.2 "STA throughput"</a>: updated.</li> <li>– <a href="#">Section 4.7.5.3 "P2P-GO throughput"</a>: updated.</li> <li>– <a href="#">Section 4.7.5.4 "P2P-GC throughput"</a>: updated.</li> <li>– <a href="#">Section 4.7.5.5 "Mobile AP throughput"</a>: updated.</li> <li>– <a href="#">Section 4.7.7 "Bug fixes/feature enhancements"</a>: added.</li> <li>– <a href="#">Section 4.7.8 "Known issues"</a>: updated.</li> </ul> </li> <li>• <a href="#">Section 8 "References"</a>: updated.</li> </ul>
RN00110 v.9	23 October 2023	<ul style="list-style-type: none"> <li>• <a href="#">Section 4.1 "PCIe-UART 88W8997"</a>: updated the patch number for the driver in sections <i>Package information</i> and <i>Version information</i>.</li> <li>• <a href="#">Section 4.2 "PCIe-UART 88W9098"</a>:                             <ul style="list-style-type: none"> <li>– Updated the patch number for the driver in sections <i>Package information</i> and <i>Version information</i>.</li> <li>– Created a separate table for AN mode   5 GHz band   40 MHz in <a href="#">Section 4.2.5.2 "STA throughput"</a>:</li> </ul> </li> <li>• <a href="#">Section 4.3 "SD-UART 88W8987"</a>: updated the patch number for the driver in sections <i>Package information</i> and <i>Version information</i>.</li> <li>• <a href="#">Section 4.4 "SD-UART IW416"</a>: updated the patch number for the driver in sections <i>Package information</i> and <i>Version information</i>.</li> <li>• <a href="#">Section 4.5 "SD-UART 88W8997"</a>: updated the patch number for the driver in sections <i>Package information</i> and <i>Version information</i>.</li> <li>• <a href="#">Section 4.6 "SD-UART 88W9098"</a>: updated the patch number for the driver in sections <i>Package information</i> and <i>Version information</i>.</li> <li>• <a href="#">Section 4.7 "SD-UART IW61x"</a>: updated the firmware version, and the patch version for the driver in sections <i>Package information</i> and <i>Version information</i>.</li> </ul>
RN00110 v.8	12 October 2023	<p>Updated:</p> <ul style="list-style-type: none"> <li>• <a href="#">Section 1 "About this document"</a></li> <li>• <a href="#">Section 2 "Downloading the wireless driver and firmware"</a></li> <li>• <a href="#">Section 3 "Feature lists"</a></li> <li>• <a href="#">Section 4.1.1 "Package information"</a></li> <li>• <a href="#">Section 4.2.1 "Package information"</a></li> <li>• <a href="#">Section 4.2.5 "Wi-Fi throughput"</a></li> <li>• <a href="#">Section 4.2.7.2 "Firmware version: 17.92.1.p136.24 to 17.92.1.p136.131"</a></li> <li>• <a href="#">Section 4.2.8 "Known issues"</a></li> <li>• <a href="#">Section 4.3.1 "Package information"</a></li> <li>• <a href="#">Section 4.3.5 "Wi-Fi throughput"</a></li> <li>• <a href="#">Section 4.3.7.7 "Firmware version: From 16.92.21.p76.5 to 16.92.21.p99.2"</a></li> <li>• <a href="#">Section 4.3.8 "Known issues"</a></li> <li>• <a href="#">Section 4.4.1 "Package information"</a></li> <li>• <a href="#">Section 4.5.1 "Package information"</a></li> <li>• <a href="#">Section 4.6.1 "Package information"</a></li> <li>• <a href="#">Section 4.6.5.1 "Throughput test setup"</a></li> <li>• <a href="#">Section 4.7.1 "Package information"</a></li> </ul> <p>Added:</p> <ul style="list-style-type: none"> <li>• <a href="#">Section 7 "Note about the source code in the document"</a></li> </ul>

Revision history...continued

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RN00110 v.7	10 July 2023	<p>Updated:</p> <ul style="list-style-type: none"> <li>• <a href="#">Section 1 "About this document"</a></li> <li>• <a href="#">Section 2.1 "Pre-compiled Wi-Fi driver and firmware"</a></li> <li>• <a href="#">Section 3 "Feature lists"</a></li> <li>• <a href="#">Section 4.1 "PCIe-UART 88W8997"</a></li> <li>• <a href="#">Section 4.2.1 "Package information"</a></li> <li>• <a href="#">Section 4.2.4.1 "Wi-Fi pre-certifications"</a></li> <li>• <a href="#">Section 4.3 "SD-UART 88W8987"</a></li> <li>• <a href="#">Section 4.4 "SD-UART IW416"</a></li> <li>• <a href="#">Section 4.5 "SD-UART 88W8997"</a></li> <li>• <a href="#">Section 4.6.1 "Package information"</a></li> <li>• <a href="#">Section 4.6.4.1 "Wi-Fi pre-certifications"</a></li> <li>• <a href="#">Section 4.7.1 "Package information"</a></li> <li>• <a href="#">Section 4.7.4.1 "Wi-Fi pre-certifications"</a></li> </ul>
RN00110 v.6	07 Apr 2023	<p>Updated:</p> <ul style="list-style-type: none"> <li>• <a href="#">Section 2 "Downloading the wireless driver and firmware"</a></li> <li>• <a href="#">Section 3 "Feature lists"</a></li> <li>• <a href="#">Section 4.1 "PCIe-UART 88W8997"</a></li> <li>• <a href="#">Section 4.2 "PCIe-UART 88W9098"</a></li> <li>• <a href="#">Section 4.3 "SD-UART 88W8987"</a></li> <li>• <a href="#">Section 4.4 "SD-UART IW416"</a></li> <li>• <a href="#">Section 4.5 "SD-UART 88W8997"</a></li> <li>• <a href="#">Section 4.6 "SD-UART 88W9098"</a></li> </ul> <p>Added:</p> <ul style="list-style-type: none"> <li>• <a href="#">Section 4.7 "SD-UART IW61x"</a></li> </ul>
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RN00110 v.4	17 October 2022	<p>Updated:</p> <ul style="list-style-type: none"> <li>• <a href="#">Section 2 "Downloading the wireless driver and firmware"</a></li> <li>• <a href="#">Section 3 "Feature lists"</a></li> <li>• <a href="#">Section 4.1 "PCIe-UART 88W8997"</a></li> <li>• <a href="#">Section 4.4 "SD-UART IW416"</a></li> <li>• <a href="#">Section 5 "i.MX platforms on-board chips and external wireless solutions"</a></li> <li>• <a href="#">Section 6 "Acronyms and abbreviations"</a></li> </ul> <p>Added:</p> <ul style="list-style-type: none"> <li>• <a href="#">Section 4.4 "SD-UART IW416"</a></li> </ul>

## Revision history...continued

Document ID	Date	Description
RN00110 v.3	24 July 2022	<p>Updated:</p> <ul style="list-style-type: none"> <li>• <a href="#">Section 4.1.1 "Package information"</a></li> <li>• <a href="#">Section 4.1.2 "Version information"</a></li> <li>• <a href="#">Section 4.1.4 "Wi-Fi and Bluetooth certification"</a></li> <li>• <a href="#">Section 4.3.1 "Package information"</a></li> <li>• <a href="#">Section 4.3.2 "Version information"</a></li> <li>• <a href="#">Section 4.3.4 "Wi-Fi and Bluetooth certification"</a></li> <li>• <a href="#">Section 4.3.5 "Wi-Fi throughput"</a></li> </ul> <p>Added:</p> <ul style="list-style-type: none"> <li>• <a href="#">Section 4.4 "SD-UART IW416"</a></li> </ul>
RN00110 v.2	8 April 2022	<ul style="list-style-type: none"> <li>• <a href="#">Section 3 "Feature lists"</a>: added features for AP and STA.</li> </ul> <p>Updated:</p> <ul style="list-style-type: none"> <li>• <a href="#">Section 4.1.1 "Package information"</a></li> <li>• <a href="#">Section 4.1.2 "Version information"</a></li> <li>• <a href="#">Section 4.1.4 "Wi-Fi and Bluetooth certification"</a></li> <li>• <a href="#">Section 4.1.5 "Wi-Fi throughput"</a></li> <li>• <a href="#">Section 4.3.1 "Package information"</a></li> <li>• <a href="#">Section 4.3.2 "Version information"</a></li> <li>• <a href="#">Section 4.3.4 "Wi-Fi and Bluetooth certification"</a></li> <li>• <a href="#">Section 4.3.5 "Wi-Fi throughput"</a></li> </ul>
RN00110 v.1	4 January 2022	<ul style="list-style-type: none"> <li>• Initial release</li> </ul>

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