# NXP-Wireless-Chipset-Release-Notes

SD-Wi-Fi-UART-BT-FP91-88W8977
SD-Wi-Fi-UART-BT-FP91-IW416
SD-Wi-Fi-UART-BT-FP91-88W8987
SD-Wi-Fi-FP91-88W8801

Release Notes

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# Revision History

Table 1: Revision History of the document

| Revision | Date | Change details |
|---|---|---|
| Rev. 1 | 24-June-2022 | Initial release with new Format |

# 1 About this document

This document contains important information about the supported features, known issues and performance of the Wi-Fi, BT and co-ex with the mentioned release.

This is a consolidated release that has been entirely tested for mentioned chipsets in this document with SDK version 2.12.0.

# 2 Feature List

Table 2: Feature List for available SoCs

| Wireless Type | Type | Features List | Sub Features List | SD-UART | | | SD |
|---|---|---|---|---|---|---|---|
| | | | | 8977 | 8987 | IW416 | 8801 |
| Wi-Fi | Client | 802.11n - High Throughput | 2.4 GHz band operation supported channel bandwidth: 20 MHz | Y | Y | Y | Y |
| | | | 2.4 GHz band supported channel bandwidths : 40 MHz | N | Y | Y | N |
| | | | 5 GHz band supported channel bandwidths : 20 MHz | Y | Y | Y | N |
| | | | 5 GHz band supported channel bandwidths : 40 MHz | Y | Y | Y | N |
| | | | Short/long guard interval (400 ns/800 ns) | Y | Y | Y | Y |
| | | | 11n data rates – Up to 72 Mbit/s (MCS 0 to MCS 7) | Y | Y | Y | Y |
| | | | 11n data rates – Up to 150 Mbit/s (MCS 0 to MCS 7) | Y | Y | Y | N |
| | | | 1 spatial stream (1x1) | Y | Y | Y | Y |
| | | | HT protection mechanisms | Y | Y | Y | Y |
| | | | Aggregated MAC Protocol Data Unit(AMPDU) Rx support | Y | Y | Y | Y |
| | | | Aggregated MAC Service Data Unit(AMSDU) -4k Rx support | Y | Y | Y | Y |
| | | | Tx MCS rate adaptation (BGN) | Y | Y | Y | Y |
| | | | Rx Low Density Parity Check (LDPC) | N | Y | N | N |

| Wireless Type | Type | Features List | Sub Features List | SD-UART | | | SD |
|---|---|---|---|---|---|---|---|
| | | | | 8977 | 8987 | IW416 | 8801 |
| Wi-Fi | Client | 802.11 ac - Very High Throughput | 2.4 GHz band supported channel bandwidths : 20MHz | N | Y | N | N |
| | | | 5 GHz band supported channel bandwidths: 20 MHz | N | Y | N | N |
| | | | 5 GHz band supported channel bandwidths: 40 MHz | N | Y | N | N |
| | | | 5 GHz band supported channel bandwidths: 80 MHz | N | Y | N | N |
| | | | 11ac data rates - Up to 433.3 Mbps (MCS 0 to MCS 9) - 2x2 | N | Y | N | N |
| | | | MU-MIMO Beamformee (Explicit and Implicit) | N | Y | N | N |
| | | | RTS/CTS with BW Signaling | N | Y | N | N |
| | | | Operation Mode Notification | N | Y | N | N |
| | | | Backward Compatibility with non-VHT devices | N | Y | N | N |
| | | | Tx VHT MCS Rate Adaptation | N | Y | N | N |
| | | 802.11 a/b/g Features | 11 b/g data rates - Up to 54 Mbit/s | Y | Y | Y | Y |
| | | | 11 a data rates - Up to 54 Mbit/s | Y | Y | Y | N |
| | | | Tx rate adaptation (BG) | Y | Y | Y | Y |
| | | | Fragmentation/defragmentation | Y | Y | Y | Y |
| | | | ERP protection, slot time, preamble | Y | Y | Y | Y |
| | | 802.11d | 802.11d - Regulatory Domain/Operating Class/Country Info | Y | Y | Y | Y |
| | | 802.11e - QoS | EDCA [Enhanced Distributed Channel Access] / WMM (Wireless Multi-Media) | N | Y | N | N |

| Wireless Type | Type | Features List | Sub Features List | SD-UART | | | SD |
|---|---|---|---|---|---|---|---|
| | | | | 8977 | 8987 | IW416 | 8801 |
| Wi-Fi | Client | 802.11i - Security | Open and Shared Authentication | Y | Y | Y | Y |
| | | | WPA2-PSK Security (AES-CCMP Encryption) | Y | Y | Y | Y |
| | | | WPA + WPA2 mixed mode | Y | Y | Y | Y |
| | | | WPA3 SAE (R3) | Y | Y | Y | Y |
| | | 802.11w - PMF (Protected Management Frames) | PMF require and capable | Y | Y | Y | Y |
| | | | Unicast management frames - Encryption/decryption - using CCMP | Y | Y | Y | Y |
| | | | Broadcast management frames - Encryption/decryption - using BIP | Y | Y | Y | Y |
| | | | SA query request/response | Y | Y | Y | Y |
| | | | PMF Support using Embedded supplicant | Y | Y | Y | Y |
| | | Power Save Mode | Deep sleep | Y | Y | Y | Y |
| | | | IEEE power save | Y | Y | Y | Y |
| | | General Features | Embedded Supplicant | Y | Y | Y | Y |
| | | | Embedded MLME | Y | Y | Y | Y |
| | | | EU adaptivity support (ETSI Cert) | Y | Y | Y | Y |
| | | | DFS Radar Detection in Slave Mode (Follow AP) | Y | Y | Y | N |
| | | | External Coex (Software interface) | N | N | N | Y |
| | | | TxPower Config V2 | Y | Y | Y | Y |
| | | | IPv6 | Y | Y | Y | Y |

| Wireless Type | Type | Features List | Sub Features List | SD-UART | | | SD |
|---|---|---|---|---|---|---|---|
| | | | | 8977 | 8987 | IW416 | 8801 |
| WiFi | AP | 802.11n - High Throughput | 2.4 GHz band operation supported channel bandwidth: 20 MHz | Y | Y | Y | Y |
| | | | 2.4 GHz band supported channel bandwidths : 40 MHz | N | Y | Y | N |
| | | | 5 GHz band supported channel bandwidths : 20 MHz | Y | Y | Y | N |
| | | | 5 GHz band supported channel bandwidths : 40 MHz | Y | Y | Y | N |
| | | | Short/long guard interval (400 ns/800 ns) | Y | Y | Y | Y |
| | | | 11n data rates – Up to 72 Mbit/s (MCS 0 to MCS 7) | Y | Y | Y | Y |
| | | | 11n data rates – Up to 150 Mbit/s (MCS 0 to MCS 7) | Y | Y | Y | N |
| | | | 1 spatial stream (1x1) | Y | Y | Y | Y |
| | | | HT protection mechanisms | Y | Y | Y | Y |
| | | | Aggregated MAC Protocol Data Unit(AMPDU) Rx support | Y | Y | Y | Y |
| | | | Aggregated MAC Service Data Unit(AMSDU) -4k Rx support | Y | Y | Y | Y |
| | | | Max client support (up to 8 devices) | Y | Y | Y | Y |
| | | | Tx MCS rate adaptation (BGN) | Y | Y | Y | Y |
| | | | Rx Low Density Parity Check (LDPC) | N | Y | N | N |

| Wireless Type | Type | Features List | Sub Features List | SD-UART | | | SD |
|---|---|---|---|---|---|---|---|
| | | | | 8977 | 8987 | IW416 | 8801 |
| WiFi | AP | 802.11d | 802.11d - Regulatory Domain/Operating Class/Country Info | Y | Y | Y | Y |
| | | 802.11e -QoS | EDCA [Enhanced Distributed Channel Access] / WMM (Wireless Multi-Media) | N | Y | N | N |
| | | 802.11i - Security | Open security | Y | Y | Y | Y |
| | | | WPA2-PSK security (AES-CCMP encryption) | Y | Y | Y | Y |
| | | | WPA2 + WPA3 (SAE) mixed mode | Y | Y | Y | Y |
| | | | WPA3 SAE (R3) | Y | Y | Y | Y |
| | | 802.11w - Protected Management Frames (PMF) | PMF require and capable | Y | Y | Y | Y |
| | | | Unicast management frames - Encryption/decryption - using CCMP | Y | Y | Y | Y |
| | | | Broadcast management frames - Encryption/decryption - using BIP | Y | Y | Y | Y |
| | | | SA query request/response | Y | Y | Y | Y |
| | | General Features | Embedded Authenticator | Y | Y | Y | Y |
| | | | Embedded MLME | Y | Y | Y | Y |
| | | | EU adaptivity support | Y | Y | Y | Y |
| | | | Automatic channel selection (ACS) | Y | Y | Y | Y |
| | | | Extended channel switch announcement (ECSA) | Y | Y | Y | Y |
| | | | External Coex (Software interface) | N | N | N | Y |
| | | | TxPower Config V2 | Y | Y | Y | Y |
| | AP-STA | Simultaneous AP-STA Operation (Same Channel) | AP-STA functionality | Y | Y | Y | Y |

| Wireless Type | Type | Features List | Sub Features List | SD-UART | |
|---|---|---|---|---|---|
| | | | | 8987 | IW416 |
| BT | Bluetooth Classic Features | General Features | BT Class 1.5 and Class 2 support | Y | Y |
| | | | Scatternet support | Y | Y |
| | | | Maximum of seven simultaneous ACL connections | Y | Y |
| | | | Automatic Packet Type Selection | Y | Y |
| | | | Bluetooth - 2.1 to 5.0 Specification Support | Y | Y |
| | | | Low power sniff | Y | Y |
| | | 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 |
| | | | SCO (HV1, HV3) | Y | Y |
| | | | eSCO (EV3, EV4, EV5, 2EV3, 3EV3, 2EV5, 3EV5) | Y | Y |
| | | Bluetooth Profiles Supported | A2DP Source/Sink | Y | Y |
| | | | AVRCP Target/Controller | Y | Y |
| | | | HFP Dev/AG | Y | Y |
| | | | OPP Server/Client | Y | Y |
| | | | SPP Server/Client | Y | Y |
| | | | HID Target/Device | Y | Y |
| | | Bluetooth Audio Features | PCM NBS Master / Slave | Y | Y |
| | | | PCM WBS Master / Slave | Y | Y |
| | Bluetooth LE Features | Generic Features | Maximum 16 Bluetooth LE connections (Master role) | Y | Y |
| | | Bluetooth Profile Support | Bluetooth LE GATT | Y | Y |
| | | | Bluetooth LE HID over GATT | Y | Y |
| | | | Bluetooth LE GAP | Y | Y |
| | | Bluetooth LE 4.0 Support | Low Energy Physical Layer | Y | Y |
| | | | Low Energy Link Layer | Y | Y |
| | | | Enhancements to HCI for Low Energy | Y | Y |
| | | | Low Energy Direct Test Mode | Y | Y |

| Wireless Type | Type | Features List | Sub Features List | SD-UART | |
|---|---|---|---|---|---|
| | | | | 8987 | IW416 |
| BT | Bluetooth LE Features | Bluetooth 4.1 Support | Low duty Cycle Directed Advertising | Y | Y |
| | | | Bluetooth LE Dual Mode Topology | Y | Y |
| | | | Bluetooth LE Privacy v1.1 | Y | Y |
| | | | Bluetooth LE Link Layer Topology | Y | Y |
| | | Bluetooth 4.2 Support | Bluetooth LE secure connection | Y | Y |
| | | | Bluetooth LE Link Layer Privacy v1.2 | Y | Y |
| | | | Bluetooth LE Data Length Extension | Y | Y |
| | | | Link Layer Extended Scanner Filter Policies | Y | Y |
| | | Bluetooth 5.0 Support | Bluetooth LE 2 Mbps Support | Y | Y |
| | | | High Duty Cycle Directed Advertising | Y | Y |
| Coex | Bluetooth + Wi-Fi Coexistence | BCA TDM Co-ex Mode (Shared Antenna) | STA + Bluetooth Coex | Y | Y |
| | | | STA + Bluetooth LE Coex | Y | Y |
| | | | STA + Bluetooth + Bluetooth LE Coex | Y | Y |
| | | | AP + Bluetooth Coex | Y | Y |
| | | | AP + Bluetooth LE Coex | Y | Y |
| | | | AP + Bluetooth + Bluetooth LE Coex | Y | Y |

# 3 Release Notes

## 3.1 SD-UART 8987

### 3.1.1 Package Information

- SDK Version: 2.12.0

### 3.1.2 Version Information

- Wireless SoC : 88W8987
- Wi-Fi and Bluetooth/Bluetooth LE Firmware Version : 16.91.21.p32.2
  - 16 - Major revision
  - 91 - Feature pack
  - 21 - Release version
  - p32.2 - Patch number

### 3.1.3 Host Platform

- All i.MX RT Platform running FreeRTOS
- Interface used
  - Wi-Fi over SDIO (SDIO 2.0 Support, SDIO clock frequency : 50 MHz)
  - Bluetooth/Bluetooth LE over UART
- Test Tools
  - iperf (version 2.0.5)

### 3.1.4 Wi-Fi and Bluetooth Certification

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

#### 3.1.4.1 Wi-Fi Pre-Certifications

- STA | 802.11n
- STA | PMF

Refer TN00066-WFA Derivative Certification Process document available in the SDK Package

#### 3.1.4.2 Bluetooth Controller Certification

QDID : https://launchstudio.bluetooth.com/ListingDetails/115533

### 3.1.5 Wi-Fi Throughput

#### 3.1.5.1 Throughput Test Setup

- Environment: Shield Room - Over the Air
- External Access Point: Netgear X4S 7800 and TP-Link AX6000
- DUT: W8987 Azurewave (Module : **AW-CM358-uSD**) with EVK-MIMXRT1060 platform
- DUT Power Source: External power supply
- External Client: Apple MacBook Air
- Channel: 6 | 36
- Wi-Fi application: wifi_cli
- Compiler used to build application: armgcc
- Compiler Version: gcc-arm-none-eabi-9-2020-q2-update
- iPerf Commands used in test:

| TCP TX | TCP RX | UDP TX | UDP RX |
|---|---|---|---|
| iperf -c <remote_ip> -t 60 | iperf -s | iperf -c <remote_ip> -t 60 -u -B <local_ip> -b 120<br>***NOTE:*** *Defaults data rate is 100mbps* | iperf -s -u -B <local_ip> |

Refer to **Section-2.3** in *UM11442-NXP Wi-Fi and Bluetooth Demo Applications User Guide for i.MX RT Platforms* to read more about the throughput test setup and topology.

#### 3.1.5.2 STA Throughput

External APs: Netgear X4S 7800 (Open/WPA2) and TP-Link AX6000 (WPA3-SAE)

| **STA Mode Throughput - BGN Mode \| 2.4 GHz Band \| 20 MHz** | | | | |
|---|---|---|---|---|
| **Protocol** | **TCP (Mbit/s)** | | **UDP (Mbit/s)** | |
| Direction | Tx | Rx | Tx | Rx |
| Open Security | 34 | 27 | 46 | 61 |
| WPA2-AES | 34 | 26 | 47 | 60 |
| WPA3-SAE | 32 | 36 | 43 | 60 |

| **STA Mode Throughput - BGN Mode \| 2.4 GHz Band \| 40 MHz** | | | | |
|---|---|---|---|---|
| **Protocol** | **TCP (Mbit/s)** | | **UDP (Mbit/s)** | |
| Direction | Tx | Rx | Tx | Rx |
| Open Security | 48 | 44 | 66 | 93 |
| WPA2-AES | 37 | 40 | 52 | 90 |
| WPA3-SAE | 40 | 45 | 56 | 94 |

| **STA Mode Throughput - AN Mode \| 5 GHz Band \| 20 MHz** | | | | |
|---|---|---|---|---|
| **Protocol** | **TCP (Mbit/s)** | | **UDP (Mbit/s)** | |
| Direction | Tx | Rx | Tx | Rx |
| Open Security | 38 | 42 | 51 | 68 |
| WPA2-AES | 37 | 42 | 50 | 68 |
| WPA3-SAE | 31 | 29 | 51 | 62 |

| STA Mode Throughput - AN Mode \| 5 GHz Band \| 40 MHz | | | | |
|---|---|---|---|---|
| **Protocol** | **TCP (Mbit/s)** | | **UDP (Mbit/s)** | |
| Direction | Tx | Rx | Tx | Rx |
| Open Security | 44.5 | 52 | 94 | 121 |
| WPA2-AES | 43.6 | 51 | 93 | 126 |
| WPA3-SAE | 33.1 | 51 | 82 | 120 |

| STA Mode Throughput - AC Mode \| 5 GHz Band \| 20 MHz ( VHT) | | | | |
|---|---|---|---|---|
| **Protocol** | **TCP (Mbit/s)** | | **UDP (Mbit/s)** | |
| Direction | Tx | Rx | Tx | Rx |
| Open Security | 36 | 40 | 47 | 72 |
| WPA2-AES | 37 | 40 | 47 | 70 |
| WPA3-SAE | 37 | 40 | 47 | 71 |

| STA Mode Throughput - AC Mode \| 5 GHz Band \| 40 MHz (VHT) | | | | |
|---|---|---|---|---|
| **Protocol** | **TCP (Mbit/s)** | | **UDP (Mbit/s)** | |
| Direction | Tx | Rx | Tx | Rx |
| Open Security | 41 | 47 | 94 | 136 |
| WPA2-AES | 41 | 47 | 94 | 123 |
| WPA3-SAE | 42 | 47 | 81 | 137 |

| 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 | 41 | 49 | 91 | 131 |
| WPA2-AES | 42 | 47 | 90 | 130 |
| WPA3-SAE | 43 | 49 | 92 | 130 |

#### 3.1.5.3 Mobile AP Throughput

External client: Apple Macbook Air

| Mobile AP Mode Throughput - BGN Mode \| 2.4 GHz Band \| 20MHz | | | | |
|---|---|---|---|---|
| **Protocol** | **TCP (Mbit/s)** | | **UDP (Mbit/s)** | |
| Direction | Tx | Rx | Tx | Rx |
| Open Security | 33 | 33 | 44 | 55 |
| WPA2-AES | 32 | 30 | 44 | 52 |
| WPA3-SAE | 27 | 35 | 44 | 58 |

| Mobile AP Mode Throughput - BGN Mode \| 2.4 GHz Band \| 40MHz | | | | |
|---|---|---|---|---|
| **Protocol** | **TCP (Mbit/s)** | | **UDP (Mbit/s)** | |
| Direction | Tx | Rx | Tx | Rx |
| Open Security | 32 | 65 | 69 | 119 |
| WPA2-AES | 32 | 65 | 69 | 119 |
| WPA3-SAE | 32 | 65 | 71 | 118 |

| Mobile AP Mode Throughput - AN Mode \| 5 GHz Band \| 20 MHz | | | | |
|---|---|---|---|---|
| **Protocol** | **TCP (Mbit/s)** | | **UDP (Mbit/s)** | |
| Direction | Tx | Rx | Tx | Rx |
| Open Security | 34 | 41 | 44 | 63 |
| WPA2-AES | 31 | 43 | 44 | 62 |
| WPA3-SAE | 32 | 40 | 43 | 59 |

| Mobile AP Mode Throughput - AN Mode \| 5 GHz Band \| 40 MHz | | | | |
|---|---|---|---|---|
| **Protocol** | **TCP (Mbit/s)** | | **UDP (Mbit/s)** | |
| Direction | Tx | Rx | Tx | Rx |
| Open Security | 35 | 50 | 82 | 110 |
| WPA2-AES | 35 | 51 | 82 | 113 |
| WPA3-SAE | 34 | 44 | 82 | 119 |

### 3.1.6 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)

### 3.1.7 Bug Fixes/Feature Enhancements

#### 3.1.7.1 FW Version : From 16.91.21.p32 to 16.91.21.p32.2

| Component | Description |
|---|---|
| - | - |

### 3.1.8 Known Issues

| Component | Description |
|---|---|
| - | - |

## 3.2 SD-UART IW416

### 3.2.1 Package Information

- SDK version : 2.12.0

### 3.2.2 Version Information

- Wireless SoC: IW416
- Wi-Fi and Bluetooth/Bluetooth LE Firmware Version : 16.91.21.p11.3
  - 16 - Major revision
  - 91 - Feature pack
  - 21 - Release version
  - p11.3 - Patch number

### 3.2.3 Host Platform

- All i.MX RT Platform running FreeRTOS
- Interface used
  - Wi-Fi over SDIO (SDIO 2.0 Support, SDIO clock frequency : 50 MHz)
  - Bluetooth/Bluetooth LE over UART
- Test Tools
  - iperf (version 2.0.5)

### 3.2.4 Wi-Fi and Bluetooth Certification

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

#### 3.2.4.1 WFA Certifications

- STA | 802.11n
- STA | PMF

Refer TN00066-WFA Derivative Certification Process document available in the SDK Package

#### 3.2.4.2 Bluetooth Controller Certification

QDID : https://launchstudio.bluetooth.com/ListingDetails/108035

### 3.2.5 Wi-Fi Throughput

#### 3.2.5.1 Throughput Test Setup

- Environment: Shield Room - Over the Air
- Access Point: linksys WRT1100AC and TP-Link Archer 6000
- DUT: IW416 Azurewave (Module : AW-AM457MA-uSD) with EVK-MIMXRT1060 platform
- DUT Power Source: External power supply
- Client: Apple MacBook Air
- Channel: 6 | 36
- Wi-Fi application: wifi_cli
- Compiler used to build application: armgcc
- Compiler Version: gcc-arm-none-eabi-9-2020-q2-update
- iPerf Commands used in test:

| TCP TX | TCP RX | UDP TX | UDP RX |
|---|---|---|---|
| iperf -c <remote_ip> -t 60 | iperf -s | iperf -c <remote_ip> -t 60 -u -B <local_ip> -b 120<br>***NOTE:*** *Defaults data rate is 100mbps* | iperf -s -u -B <local_ip> |

Refer to **Section-2.3** in *UM11442-NXP Wi-Fi and Bluetooth Demo Applications User Guide for i.MX RT Platforms* to read more about the throughput test setup and topology.

#### 3.2.5.2 STA Throughput

External AP: linksys WRT1100AC (Open/WPA2) and TP-Link Archer 6000 (WPA3-SAE)

| **STA Mode Throughput - BGN Mode \| 2.4 GHz Band \| 20 MHz** | | | | |
|---|---|---|---|---|
| **Protocol** | **TCP (Mbit/s)** | | **UDP (Mbit/s)** | |
| Direction | Tx | Rx | Tx | Rx |
| Open Security | 30 | 31 | 40 | 55 |
| WPA2-AES | 25 | 32 | 44 | 50 |
| WPA3-SAE | 32 | 37 | 43 | 55 |

| **STA Mode Throughput - BGN Mode \| 2.4 GHz Band \| 40 MHz** | | | | |
|---|---|---|---|---|
| **Protocol** | **TCP (Mbit/s)** | | **UDP (Mbit/s)** | |
| Direction | Tx | Rx | Tx | Rx |
| Open Security | 47 | 56 | 69 | 109 |
| WPA2-AES | 43 | 52 | 57 | 100 |
| WPA3-SAE | 44 | 52 | 65 | 98 |

| **STA Mode Throughput - AN Mode \| 5 GHz Band \| 20 MHz ( HT)** | | | | |
|---|---|---|---|---|
| **Protocol** | **TCP (Mbit/s)** | | **UDP (Mbit/s)** | |
| Direction | Tx | Rx | Tx | Rx |
| Open Security | 33 | 35 | 50 | 59 |
| WPA2-AES | 33 | 35 | 45 | 53 |
| WPA3-SAE | 33 | 38 | 44 | 55 |

| STA Mode Throughput - AN Mode \| 5 GHz Band \| 40 MHz (HT) | | | | |
|---|---|---|---|---|
| **Protocol** | **TCP (Mbit/s)** | | **UDP (Mbit/s)** | |
| Direction | Tx | Rx | Tx | Rx |
| Open Security | 45 | 50 | 85 | 110 |
| WPA2-AES | 45 | 47 | 94 | 107 |
| WPA3-SAE | 34 | 48 | 94 | 104 |

#### 3.2.5.3 Mobile AP Throughput

External client: Apple MacBook Air

| Mobile AP Mode Throughput - BGN Mode \| 2.4 GHz Band \| 20MHz | | | | |
|---|---|---|---|---|
| **Protocol** | **TCP (Mbit/s)** | | **UDP (Mbit/s)** | |
| Direction | Tx | Rx | Tx | Rx |
| Open Security | 22 | 29 | 42 | 60 |
| WPA2-AES | 30 | 41 | 43 | 59 |
| WPA3-SAE | 25 | 41 | 42 | 60 |

| Mobile AP Mode Throughput - BGN Mode \| 2.4 GHz Band \| 40MHz | | | | |
|---|---|---|---|---|
| **Protocol** | **TCP (Mbit/s)** | | **UDP (Mbit/s)** | |
| Direction | Tx | Rx | Tx | Rx |
| Open Security | 32 | 53 | 72 | 81 |
| WPA2-AES | 32 | 53 | 72 | 81 |
| WPA3-SAE | 28 | 51 | 74 | 82 |

| Mobile AP Mode Throughput - AN Mode \| 5 GHz Band \| 20 MHz | | | | |
|---|---|---|---|---|
| **Protocol** | **TCP (Mbit/s)** | | **UDP (Mbit/s)** | |
| Direction | Tx | Rx | Tx | Rx |
| Open Security | 26 | 35 | 43 | 64 |
| WPA2-AES | 35 | 46 | 45 | 64 |
| WPA3-SAE | 28 | 46 | 45 | 63 |

| Mobile AP Mode Throughput - AN Mode \| 5 GHz Band \| 40 MHz | | | | |
|---|---|---|---|---|
| **Protocol** | **TCP (Mbit/s)** | | **UDP (Mbit/s)** | |
| Direction | Tx | Rx | Tx | Rx |
| Open Security | 25 | 43 | 80 | 99 |
| WPA2-AES | 30 | 59 | 83 | 98 |
| WPA3-SAE | 31 | 59 | 81 | 99 |

### 3.2.6 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)

### 3.2.7 Bug Fixes/Feature Enhancements

| Component | Description |
|---|---|
| - | - |

### 3.2.8 Known Issues

| Component | Description |
|---|---|
| - | - |

## 3.3 SD-UART 8977

### 3.3.1 Package Information

- SDK Version: 2.12.0

### 3.3.2 Version Information

- Wireless SoC : 88W8977
- Wi-Fi Firmware Version : 16.91.10.p186.2
  - 16 - Major revision
  - 91 - Feature pack
  - 10 - Release version
  - p186.2 - Patch number

### 3.3.3 Host Platform

- All i.MX RT Platform running FreeRTOS
- Interface used
  - Wi-Fi over SDIO (SDIO 2.0 Support, SDIO clock frequency : 50 Mhz)
- Test Tools
  - iperf (version 2.0.5)

### 3.3.4 Wi-Fi Certification

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

#### 3.3.4.1 Wi-Fi Pre-Certifications

- STA | 802.11n
- STA | PMF

Refer TN00066-WFA Derivative Certification Process document available in the SDK Package

### 3.3.5 Wi-Fi Throughput

#### 3.3.5.1 Throughput Test Setup

- Environment: Shield Room - Over the Air
- Access Point: Netgear RAX120
- DUT: 88W8977-Panasonic (Module : PAN9026-uSD, SDIO Clock Frequency: 25 MHz) with EVK-MIMXRT1060 platform
- DUT Power Source: External power supply
- Client: OnePlus 6T
- Channel: 6 | 36
- Wi-Fi application: wifi_cli
- Compiler used to build application: armgcc
- Compiler Version: gcc-arm-none-eabi-9-2020-q2-update
- iPerf Commands used in test:

| TCP TX | TCP RX | UDP TX | UDP RX |
|---|---|---|---|
| iperf -c <remote_ip> -t 60 | iperf -s | iperf -c <remote_ip> -t 60 -u -B <local_ip> -b 120<br>***NOTE:*** *Defaults data rate is 100mbps* | iperf -s -u -B <local_ip> |

Refer to **Section-2.3** in *UM11442-NXP Wi-Fi and Bluetooth Demo Applications User Guide for i.MX RT Platforms* to read more about the throughput test setup and topology.

#### 3.3.5.2 STA Throughput

External AP: Netgear RAX120

| STA Mode Throughput - BGN Mode \| 2.4 GHz Band \| 20 MHz | | | | |
|---|---|---|---|---|
| **Protocol** | **TCP (Mbit/s)** | | **UDP (Mbit/s)** | |
| Direction | Tx | Rx | Tx | Rx |
| Open Security | 18 | 19 | 38 | 46 |
| WPA2-AES | 17 | 18 | 38 | 45 |
| WPA3-SAE | 20 | 22 | 32 | 47 |

| STA Mode Throughput - AN Mode \| 5 GHz Band \| 20 MHz | | | | |
|---|---|---|---|---|
| **Protocol** | **TCP (Mbit/s)** | | **UDP (Mbit/s)** | |
| Direction | Tx | Rx | Tx | Rx |
| Open Security | 23 | 25 | 37 | 51 |
| WPA2-AES | 22 | 25 | 35 | 50 |
| WPA3-SAE | 24 | 24 | 47 | 50 |

| STA Mode Throughput - AN Mode \| 5 GHz Band \| 40 MHz | | | | |
|---|---|---|---|---|
| **Protocol** | **TCP (Mbit/s)** | | **UDP (Mbit/s)** | |
| Direction | Tx | Rx | Tx | Rx |
| Open Security | 22 | 27 | 47 | 50 |
| WPA2-AES | 21 | 26 | 46 | 50 |
| WPA3-SAE | 28 | 26 | 46 | 49 |

#### 3.3.5.3 Mobile AP Throughput

External client: OnePlus 6T

| Mobile AP Mode Throughput - BGN Mode \| 2.4 GHz Band \| 20MHz | | | | |
|---|---|---|---|---|
| **Protocol** | **TCP (Mbit/s)** | | **UDP (Mbit/s)** | |
| Direction | Tx | Rx | Tx | Rx |
| Open Security | 22 | 25 | 37 | 45 |
| WPA2-AES | 19 | 22 | 35 | 44 |
| WPA3-SAE | 24 | 28 | 39 | 44 |

| Mobile AP Mode Throughput - AN Mode \| 5 GHz Band \| 20 MHz | | | | |
|---|---|---|---|---|
| **Protocol** | **TCP (Mbit/s)** | | **UDP (Mbit/s)** | |
| Direction | Tx | Rx | Tx | Rx |
| Open Security | 24 | 23 | 46 | 47 |
| WPA2-AES | 21 | 20 | 45 | 47 |
| WPA3-SAE | 25 | 27 | 46 | 48 |

| Mobile AP Mode Throughput - AN Mode \| 5 GHz Band \| 40 MHz | | | | |
|---|---|---|---|---|
| **Protocol** | **TCP (Mbit/s)** | | **UDP (Mbit/s)** | |
| Direction | Tx | Rx | Tx | Rx |
| Open Security | 24 | 22 | 46 | 47 |
| WPA2-AES | 23 | 21 | 46 | 46 |
| WPA3-SAE | 28 | 29 | 43 | 47 |

### 3.3.6 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)

### 3.3.7 Bug Fixes/Feature Enhancements

| Component | Description |
|---|---|
| -- | -- |

### 3.3.8 Known Issues

| Component | Description |
|---|---|
| Wi-Fi | • 40MHz is not supported in 2.4GHz |

## 3.4 SD 8801

### 3.4.1 Package Information

- SDK Version: 2.12.0

### 3.4.2 Version Information

- Wireless SoC : 88W8801
- Wi-Fi Firmware Version : 14.91.36.p177
  - 14 - Major revision
  - 91 - Feature pack
  - 36 - Release version
  - P177 - Patch number

### 3.4.3 Host Platform

- All i.MX RT Platform running FreeRTOS
- Interface used
  - Wi-Fi over SDIO (SDIO 2.0 Support, SDIO clock frequency : 50 MHz)
- Test Tools
  - iperf (version 2.0.5)

### 3.4.4 Wi-Fi Certification

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

#### 3.4.4.1 Wi-Fi Pre-Certifications

- STA | 802.11n
- STA | PMF

Refer TN00066-WFA Derivative Certification Process document available in the SDK Package

### 3.4.5 Wi-Fi Throughput

#### 3.4.5.1 Throughput Test Setup

- Environment: Shield Room - Over the Air
- External Access Point: Asus-AX88U
- DUT : W8801 AzureWave (Module: AW-NM191NF-uSD ) with EVK-MIMXRT1060 platform
- DUT Power Source: External power supply
- External Client: IW620-Kestrel
- Channel: 6
- Wi-Fi application: wifi_cli
- Compiler used to build application: armgcc
- Compiler Version: gcc-arm-none-eabi-9-2020-q2-update
- iPerf Commands used in test:

| TCP TX | TCP RX | UDP TX | UDP RX |
|---|---|---|---|
| iperf -c <remote_ip> -t 60 | iperf -s | iperf -c <remote_ip> -t 60 -u -B <local_ip> -b 120<br>***NOTE:*** *Defaults data rate is 100mbps* | iperf -s -u -B <local_ip> |

Refer to **Section-2.3** in *UM11442-NXP Wi-Fi and Bluetooth Demo Applications User Guide for i.MX RT Platforms* to read more about the throughput test setup and topology.

#### 3.4.5.2 STA Throughput

External AP: Asus-AX88U (Open/WPA2/WPA3-SAE)

| STA Mode Throughput - BGN Mode \| 2.4 GHz Band \| 20 MHz | | | | |
|---|---|---|---|---|
| **Protocol** | **TCP (Mbit/s)** | | **UDP (Mbit/s)** | |
| Direction | Tx | Rx | Tx | Rx |
| Open Security | 31 | 36 | 40 | 56 |
| WPA2-AES | 31 | 36 | 40 | 57 |
| WPA3-SAE | 31 | 36 | 40 | 56 |

#### 3.4.5.3 Mobile AP Throughput

External client: IW620-Kestrel

| Mobile AP Mode Throughput - BGN Mode \| 2.4 GHz Band \| 20MHz | | | | |
|---|---|---|---|---|
| **Protocol** | **TCP (Mbit/s)** | | **UDP (Mbit/s)** | |
| Direction | Tx | Rx | Tx | Rx |
| Open Security | 31 | 46 | 41 | 63 |
| WPA2-AES | 31 | 46 | 41 | 63 |
| WPA3-SAE | 31 | 46 | 40 | 63 |

### 3.4.6 EU Conformance Tests

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

### 3.4.7 Bug Fixes/Feature Enhancements

FW Version : From 14.91.36.p191.3 to 14.91.36.p177

| Component | Description |
|---|---|
| Wi-Fi | • Added support for External Coex (Software interface) |

### 3.4.8 Known Issues

| Component | Description |
|---|---|
| -- | -- |

# 4 Acronyms & Abbreviations

Table 3: List of Acronyms & Abbreviations

| Acronyms | Definitions |
|---|---|
| A2DP | Advanced audio distribution profile |
| AP | Access Point |
| 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 |
| WEP | Wired Equivalent Private |
| WFD | Wi-Fi Direct |
| WPA | Wi-Fi protected access |
| WPS | Wi-Fi Protected Setup |
| WSC | Wi-Fi Simple Configuration |

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