Cambium Networks™

# PTP 850S Millimeter Wave Radio

## Specifications

### RADIO

- 11-18 GHz
- 1+0, 2+0 (non-XPIC)

Ability to upgrade existing links for additional capacity with a single cable via Layer 1 Link Aggregation

Radio Features

- Protection: 1+1 HSB
- High spectral utilization: BPSK to 4096 QAM w/ACM
- Channel bandwidth: 14 to 224 MHz
- Multiband (with PTP-820E or PTP-850E)

### ETHERNET

Ethernet Interfaces

Port 1:

- Electric: 10/100/1000Base-T RJ-45
- Management and Traffic
- Ceragon-approved PoE

Port 2:

- SFP cage which supports – Regular and CSFP standards
  - Regular SFP provides Eth2
  - CSFP (Dual BiDir SFP) provides Eth2 and Eth3

Port 3:

- SFP+ cage supporting a 10G single ETH interface.

  Note: SFP+ and QSFP+ devices must be of industrial grade (-40°C to +85°C)

Ethernet Features

- MTU – 9612 Bytes
- Quality of Service
  - Multiple Classification criteria (VLAN ID, p-bits, IPv4 DSCP, IPv6 TC, MPLS EXP)
  - 8 CoS queues per port
  - Deep buffering (configurable up to 64 Mbit per queue)
  - WRED
  - P-bit marking/remarking
- 4K VLANs
- VLAN add/remove/translate
- Y.1731 Ethernet OAM
- Y.1731 Ethernet Bandwidth Notification (ETH-BN)

### MANAGEMENT

- SNMP
- REST
- SDN Support:
  - NETCONF/YANG

### SYNCHRONIZATION

- Enhanced Ethernet Equipment Clock (eEEC) Specification (G.8262.1)
- PTP Telecom Boundary Clock (T-BC) andTime Slave Clock (T-TSC) Specification (G.8273.2)
- PTP Telecom Transparent Clock (T-TC) Specification (G.8273.3)
- Enhanced SyncE Network Limits (G.8261, clause 9.2.1)
- Enhanced PTP Network Limits (G.8271.1)
- Ethernet Synchronization Messaging Channel (ESMC) (G.8264, clause 11)
- PTP Telecom Profile for Time (Full Timing Support) (G.8275.1)
- Precision Time Protocol (version 2, IEEE1588-2008)

### STANDARD

MEF

- Carrier Ethernet 2.0

Supported Ethernet Standards

- 10/100/1000base-T/X (IEEE 802.3)
- Optical 10Gbase-X (IEEE 802.3ae)
- Ethernet VLANs (IEEE 802.3ac)
- Virtual LAN (VLAN, IEEE 802.1Q)
- Class of service (IEEE 802.1p)
- Provider bridges (Q-in-Q – IEEE 802.1ad)
- Link aggregation (IEEE 802.3ad)
- Auto MDI/MDIX for 1000baseT
- RFC 1349: IPv4 TOS
- RFC 2474: IPv4 DSCP
- RFC 2460: IPv6 Traffic Classes

## SECURITY

- Secured protocols (HTTPS, SNMPV3, SSH, SFTP)
- RADIUS authentication and authorization
- TACACS+ authentication and authorization (session-based)
- AES Encryption – AES 256

## STANDARDS COMPLIANCE

- Radio Spectral Efficiency: EN 302 217-2
- Certification ordinance Article 2-1-31-5, Land Mobile Station in the 80GHz band (Japan)
- EMC: EN 301 489-1, EN 301 489-4, Class A(Europe)
  FCC 47 CFR, part 15, subpart B, class A(US)
  ICES-003, Class A(Canada)
  TEC/SD/DD/EMC-221/05
  TEC/SD/DD/EMC-221/05/OCT-16, Class A (India)
  IEC 61000-4-29
- Surge: EN61000-4-5, Class 4 (for PWR and ETH1/PoE ports)
- Safety: EN 60950-1, EN 62368-1, IEC 60950-1, IEC 62368-1, UL60950-1, UL 62368-1, CAN/CSA C22.2 NO 60950-1, CAN/CSA C22.2 NO 62368-1, EN60950-22, IEC 60950-22, UL 60950-22, CAN/CSA C22.2 NO 60950-22
- Storage: ETSI EN 300 019-1-1 Class 1.2
- Transportation: ETSI EN 300 019-1-2 Class 2.3
- Ingress Protection: IP67

## TECHNICAL SPECIFICATION

Mechanical Specifications

Dimensions (Direct Mount HW) – 217mm(H), 210mm(W), 85mm(D), 4kg
8.54(H), 8.27”(W), 3.35”(D), 8.82 lbs.

Pole Diameter Range (for Remote Mount Installation)
8.89cm – 11.43cm; 3.5” – 4.5”

## Environmental Specifications

- -33°C to +55°C (-45°C to +60°C extended); -27°F to +131°F (-49°F to +140°F extended)

Power Input Specifications

- DC Input range: -40.5 to -60 VDC

Power Consumption Specifications

Active:

- 11GHz: 45W
- 18GHz: 29W

Standby (muted):

- 11GHz: 25W
- 18GHz: 9W

*Support in future release, for availability, please check release notes

# Specifications

### THROUGHPUT CAPACITY (Mbps)

| | Capacity (Mbps) | Capacity De-Dup | Capacity (Mbps) | Capacity De-Dup | Capacity (Mbps) | Capacity De-Dup |
|---|---|---|---|---|---|---|
| Modulation | | 14 MHz | | 28 MHz | | 40 MHz |
| BPSK | 6-8 | 7-25 | 18-22 | 19-68 | 15-31 | 27-97 |
| QPSK | 16-20 | 17-63 | 40-48 | 42-152 | 54-67 | 58-209 |
| 8 QAM | 26-32 | 28-100 | 59-72 | 62-225 | 83-101 | 87-317 |
| 16 QAM | 37-46 | 39-143 | 84-102 | 89-321 | 113-139 | 120-435 |
| 32 QAM | 50-61 | 53-192 | 111-136 | 118-426 | 150-184 | 159-577 |
| 64 QAM | 62-76 | 66-238 | 138-168 | 146-527 | 185-227 | 196-710 |
| 128 QAM | 76-93 | 80-290 | 166-203 | 176-637 | 225-275 | 238-862 |
| 256 QAM | 87-106 | 92-333 | 192-234 | 203-734 | 242-296 | 256-927 |
| 512 QAM | 96-118 | 102-369 | 204-249 | 216-782 | 265-324 | 281-1016 |
| 1024 QAM Strong | 102-125 | 108-391 | 223-272 | 236-854 | 301-368 | 319-1026 |
| 1024 QAM Light | 108-132 | 115-415 | 236-289 | 250-906 | 320-391 | 339-1026 |
| 2048 QAM | – | – | 258-315 | 273-989 | 346-423 | 367-1026 |
| 4096 QAM | – | – | 275-336 | 291-1026 | 366-448 | 388-1026 |
| | | 56 MHz | | 80 MHz | | 112 MHz |
| BPSK | 40-49 | 42-153 | 54-66 | 57-208 | 79-97 | 84-303 |
| QPSK | 83-102 | 88-320 | 111-135 | 117-424 | 162-198 | 172-622 |
| 8 QAM | 123-150 | 130-471 | 158-193 | 167-606 | 242-296 | 256-929 |
| 16 QAM | 172-210 | 182-658 | 227-277 | 240-869 | 330-404 | 350-1026 |
| 32 QAM | 227-277 | 240-870 | 298-365 | 316-1026 | 435-532 | 461-1026 |
| 64 QAM | 279-341 | 296-1026 | 366-447 | 387-1026 | 535-654 | 566-1026 |
| 128 QAM | 338-413 | 358-1026 | 433-529 | 458-1026 | 647-791 | 685-1026 |
| 256 QAM | 391-478 | 414-1026 | 498-609 | 528-1026 | 740-905 | 784-1026 |
| 512 QAM | 420-514 | 445-1026 | 548-670 | 580-1026 | 804-983 | 851-1026 |
| 1024 QAM Strong | 457-559 | 484-1026 | 596-729 | 631-1026 | 872-1066 | 923-1026 |
| 1024 QAM Light | 486-594 | 515-1026 | 633-774 | 670-1026 | 926-1132 | 980-1026 |
| 2048 QAM | 527-644 | 558-1026 | 670-820 | 710-1026 | 997-1220 | 1002-1026 |
| 4096 QAM | 543-664 | 574-1026 | – | – | – | – |

### TRANSMIT POWER (dBm)

| Channel Size | 6 | 7 | 8 | 11 | 13 | 15 | 18 | 23 | 26 | 28-38 |
|---|---|---|---|---|---|---|---|---|---|---|
| BPSK - 8 PSK | 28 | 27 | 27 | 28 | 27 | 24 | 24 | 24 | 23 | 18 |
| 16 QAM | 28 | 27 | 27 | 28 | 27 | 24 | 24 | 24 | 23 | 17 |
| 32 QAM | 27 | 27 | 26 | 28 | 26 | 24 | 24 | 24 | 23 | 16 |
| 64 QAM | 27 | 26 | 26 | 27 | 24 | 23 | 23 | 23 | 23 | 16 |
| 128 QAM | 27 | 26 | 26 | 27 | 24 | 23 | 23 | 23 | 23 | 16 |
| 256 QAM | 27 | 26 | 26 | 27 | 24 | 22 | 23 | 22 | 21 | 14 |
| 512 QAM | 25 | 25 | 25 | 27 | 24 | 22 | 22 | 22 | 21 | 14 |
| 1024 QAM | 25 | 24 | 24 | 25 | 22 | 20 | 21 | 21 | 20 | 13 |
| 2048 QAM | 23 | 23 | 24 | 24 | 21 | 20 | 20 | 20 | 18 | 12 |
| 4096 QAM | 21 | 21 | 22 | 22 | 19 | 18 | 19 | – | – | – |

**RECEIVE SENSITIVITY (dBm @10E-6)**

| 14 MHz | 6 | 7-8 | 10 | 11 | 13 | 15 | 18 | 23 | 24 | 26 | 28-31 | 32 | 38 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BPSK | -91.5 | -91.0 | -90.5 | -91.5 | -90.5 | -89.5 | -91 | -90.0 | -89.5 | -89.5 | -89.5 | -89.0 | -89.0 |
| QPSK | -90.5 | -90.0 | -89.5 | -90.5 | -89.5 | -88.5 | -90 | -89.0 | -88.5 | -88.5 | -88.5 | -88.0 | -88.0 |
| 8 PSK | -84.5 | -84.0 | -83.5 | -85.5 | -83.5 | -82.5 | -84 | -83.0 | -82.5 | -82.5 | -82.5 | -82.0 | -82.0 |
| 16 QAM | -83.5 | -83.0 | -82.5 | -83.5 | -82.5 | -81.5 | -83 | -82.0 | -81.5 | -81.5 | -81.5 | -81.0 | -81.0 |
| 32 QAM | -80.5 | -79.5 | -79.5 | -80.5 | -79.0 | -78.5 | -79.5 | -79.0 | -78.5 | -78.5 | -78.0 | -78.0 | -77.5 |
| 64 QAM | -77.5 | -76.5 | -76.5 | -77.0 | -76.0 | -75.5 | -76.5 | -76.0 | -75.5 | -75.5 | -75.0 | -75.0 | -74.5 |
| 128 QAM | -74.0 | -73.5 | -73.0 | -74.0 | -73.0 | -72.0 | -73.5 | -72.5 | -72.0 | -72.0 | -72.0 | -71.5 | -71.5 |
| 256 QAM | -71.5 | -70.5 | -70.5 | -71.0 | -70.0 | -69.5 | -70.5 | -69.5 | -69.0 | -69.5 | -69.0 | -69.0 | -68.5 |
| 512 QAM | -68.5 | -68.0 | -67.5 | -68.5 | -67.5 | -66.5 | -68.0 | -67.0 | -66.5 | -66.5 | -66.5 | -66.0 | -66.0 |
| 1024 QAM Strong | -65.5 | -65.0 | -64.5 | -65.5 | -64.5 | -63.5 | -65.0 | -64.0 | -63.5 | -63.5 | -63.5 | -63.0 | -63.0 |
| 1024 QAM Light | -65.0 | -64.0 | -64.0 | -64.5 | -63.5 | -63.0 | -64.0 | -63.5 | -63.0 | -63.0 | -62.5 | -62.5 | -62.0 |
| 20 MHz | 6 | 7-8 | 10 | 11 | 13 | 15 | 18 | 23 | 24 | 26 | 28-31 | 32 | 38 |
| BPSK | -88.5 | -88.0 | -87.5 | -88.5 | -87.5 | -86.5 | -88.0 | -87.0 | -86.5 | -86.5 | -86.5 | -86.0 | -86.0 |
| QPSK | -87.5 | -87.0 | -86.5 | -87.5 | -86.5 | -85.5 | -87.0 | -86.0 | -85.5 | -85.5 | -85.5 | -85.0 | -85.0 |
| 8 PSK | -83.0 | -82.5 | -82.0 | -83.0 | -82.0 | -81.0 | -82.5 | -81.5 | -81.0 | -81.0 | -81.0 | -80.5 | -80.5 |
| 16 QAM | -81.0 | -80.5 | -80.0 | -81.0 | -79.5 | -79.0 | -80.5 | -79.5 | -79.0 | -79 | -79.0 | -78.5 | -78.0 |
| 32 QAM | -77.5 | -77.0 | -76.5 | -77.5 | -76.0 | -75.5 | -77.0 | -76.0 | -75.5 | -75.5 | -75.5 | -75.0 | -74.5 |
| 64 QAM | -74.5 | -74.0 | -73.5 | -74.5 | -73.0 | -72.5 | -74.0 | -73.0 | -72.5 | -72.5 | -72.5 | -72.0 | -71.5 |
| 128 QAM | -71.5 | -70.5 | -70.5 | -71.0 | -70.0 | -69.5 | -70.5 | -69.5 | -69.0 | -69.5 | -69.0 | -69.0 | -68.5 |
| 256 QAM | -68.5 | -67.5 | -67.5 | -68.0 | -67.0 | -66.5 | -67.5 | -66.5 | -66.0 | -66.5 | -66.0 | -66.0 | -65.5 |
| 512 QAM | -66.0 | -65.0 | -65.0 | -66.0 | -64.5 | -64.0 | -65.0 | -64.5 | -64.0 | -64.0 | -63.5 | -63.5 | -63.0 |
| 1024 QAM Strong | -63.0 | -62.5 | -62.0 | -63.0 | -61.5 | -61.0 | -62.5 | -61.5 | -61.0 | -61.0 | -61.0 | -60.5 | -60.0 |
| 1024 QAM Light | -62.0 | -61.5 | -61.0 | -62.0 | -60.5 | -60.0 | -61.5 | -60.5 | -60.0 | -60.0 | -60.0 | -59.5 | -59.0 |
| 2048 QAM | -58.5 | -58.0 | -57.5 | -58.5 | -57.0 | -56.5 | -58.0 | -57.0 | -56.5 | -56.5 | -56.5 | -56.0 | -55.5 |
| 4096 QAM | -55.5 | -55.0 | -54.5 | -55.5 | -54.0 | -53.5 | -55.0 | – | – | – | – | – | – |
| 40 MHz | 6 | 7-8 | 10 | 11 | 13 | 15 | 18 | 23 | 24 | 26 | 28-31 | 32 | 38 |
| BPSK | -87.0 | -86.5 | -86.0 | -87.0 | -86.0 | -85.0 | -86.5 | -85.5 | -85.0 | -85.0 | -85.0 | -84.5 | -84.5 |
| QPSK | -86.0 | -85.5 | -85.0 | -86.0 | -85.0 | -84.0 | -85.5 | -84.5 | -84.0 | -84.0 | -84.0 | -83.5 | -83.5 |
| 8 PSK | -81.0 | -80.5 | -80.0 | -81.0 | -79.5 | -79.0 | -80.5 | -79.5 | -79.0 | -79.0 | -79.0 | -78.5 | -78.0 |
| 16 QAM | -79.5 | -79.0 | -78.5 | -79.5 | -78.0 | -77.5 | -79.0 | -78.0 | -77.5 | -77.5 | -77.5 | -77.0 | -76.5 |
| 32 QAM | -76.0 | -75.0 | -75.0 | -75.5 | -74.5 | -74.0 | -75.0 | -74.0 | -73.5 | -74.0 | -73.5 | -73.5 | -73.0 |
| 64 QAM | -73.0 | -72.0 | -72.0 | -73.0 | -71.5 | -71.0 | -72.0 | -71.5 | -71.0 | -71.0 | -70.5 | -70.5 | -70.0 |
| 128 QAM | -70.0 | -69.0 | -69.0 | -70.0 | -68.5 | -68.0 | -69.0 | -68.5 | -68.0 | -68.0 | -67.5 | -67.5 | -67.0 |
| 256 QAM | -67.0 | -66.0 | -66.0 | -66.5 | -65.5 | -65.0 | -66.0 | -65.0 | -64.5 | -65.0 | -64.5 | -64.5 | -64.0 |
| 512 QAM | -64.0 | -63.5 | -63.0 | -64.0 | -62.5 | -62.0 | -63.5 | -62.5 | -62.0 | -62.0 | -62.0 | -61.5 | -61.0 |
| 1024 QAM Strong | -61.5 | -61.0 | -60.5 | -61.5 | -60.0 | -59.5 | -61.0 | -60.0 | -59.5 | -59.5 | -59.5 | -59.0 | -58.5 |
| 1024 QAM Light | -60.5 | -60.0 | -59.5 | -60.5 | -59.5 | -58.5 | -60.0 | -59.0 | -58.5 | -58.5 | -58.5 | -58.0 | -58.0 |
| 2048 QAM | -58.0 | -57.0 | -57.0 | -58.0 | -56.5 | -56.0 | -57.0 | -56.5 | -56.0 | -56.0 | -55.5 | -55.5 | -55.0 |
| 4096 QAM | -55.0 | -54.0 | -54.0 | -55.0 | -53.5 | -53.0 | -54.0 | – | – | – | – | – | – |
| 56 MHz | 6 | 7-8 | 10 | 11 | 13 | 15 | 18 | 23 | 24 | 26 | 28-31 | 32 | 38 |
| BPSK | -85.5 | -85.0 | -84.5 | -85.5 | -84.0 | -83.5 | -85.0 | -84.0 | -83.5 | -83.5 | -83.5 | -83.0 | -82.5 |
| QPSK | -84.5 | -84.0 | -83.5 | -84.5 | -83.0 | -82.5 | -84.0 | -83.0 | -82.5 | -82.5 | -82.5 | -82.0 | -81.5 |
| 8 PSK | -80.0 | -79.0 | -79.0 | -79.5 | -78.5 | -78.0 | -79.0 | -78.0 | -77.5 | -78.0 | -77.5 | -77.5 | -77.0 |
| 16 QAM | -77.5 | -77.0 | -76.5 | -77.5 | -76.0 | -75.5 | -77.0 | -76.0 | -75.5 | -75.5 | -75.5 | -75.0 | -74.5 |
| 32 QAM | -74.0 | -73.0 | -73.0 | -73.5 | -72.5 | -72.0 | -73.0 | -72.0 | -71.5 | -72.0 | -71.5 | -71.5 | -71.0 |
| 64 QAM | -70.5 | -70.0 | -69.5 | -70.5 | -69.5 | -68.5 | -70.0 | -69.0 | -68.5 | -68.5 | -68.5 | -68.0 | -68.0 |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 128 QAM | -68.0 | -67.0 | -67.0 | -67.5 | -66.5 | -66.0 | -67.0 | -66.0 | -65.5 | -66.0 | -65.5 | -65.5 | -65.0 |
| 256 QAM | -64.5 | -64.0 | -63.5 | -64.5 | -63.5 | -62.5 | -64.0 | -63.0 | -62.5 | -62.5 | -62.5 | -62.0 | -62.0 |
| 512 QAM | -62.5 | -62.0 | -61.5 | -62.5 | -61.5 | -60.5 | -62.0 | -61.0 | -60.5 | -60.5 | -60.5 | -60.0 | -60.0 |
| 1024 QAM Strong | -59.0 | -58.5 | -58.0 | -59.0 | -58.0 | -57.0 | -58.5 | -57.5 | -57.0 | -57.0 | -57.0 | -56.5 | -56.5 |
| 1024 QAM Light | -58.0 | -57.5 | -57.0 | -58.0 | -57.0 | -56.0 | -57.5 | -56.5 | -56.0 | -56.0 | -56.0 | -55.5 | -55.5 |
| 2048 QAM | -55.5 | -54.5 | -54.5 | -55.0 | -54.0 | -53.5 | -54.5 | -53.5 | -53.0 | -53.5 | -53.0 | -53.0 | -52.5 |
| 4096 QAM | -52.5 | -51.5 | -51.5 | -52.0 | -51.0 | -50.5 | – | – | – | – | – | – | – |
| 80 MHz | **6** | **7-8** | **10** | **11** | **13** | **15** | **18** | **23** | **24** | **26** | **28-31** | **32** | **38** |
| BPSK | -85.0 | -85.0 | -84.5 | -85.5 | -84.5 | -83.5 | -85.0 | -84.0 | -83.5 | -83.5 | -83.5 | -83.0 | -83.5 |
| QPSK | -82.5 | -82.5 | -82.5 | -83.0 | -82.0 | -81.5 | -82.5 | -81.5 | -81.0 | -81.5 | -81.0 | -81.0 | -81.0 |
| 8 PSK | -79.0 | -79.0 | -78.5 | -79.5 | -78.5 | -77.5 | -79.0 | -78.0 | -77.5 | -77.5 | -77.5 | -77.0 | -77.5 |
| 16 QAM | -76.0 | -76.0 | -75.5 | -76.5 | -75.0 | -74.5 | -76.0 | -75.0 | -74.5 | -74.5 | -74.5 | -74.0 | -74.0 |
| 32 QAM | -72.5 | -72.5 | -72.0 | -73.0 | -71.5 | -71.0 | -72.5 | -71.5 | -71.0 | -71.0 | -71.0 | -70.5 | -70.5 |
| 64 QAM | -69.0 | -69.0 | -69.0 | -70.0 | -68.5 | -68.0 | -69.0 | -68.5 | -68.0 | -68.0 | -67.5 | -67.5 | -67.5 |
| 128 QAM | -66.5 | -66.5 | -66.0 | -67.0 | -66.0 | -65.0 | -66.5 | -65.5 | -65.0 | -65.0 | -65.0 | -64.5 | -65.0 |
| 256 QAM | -63.5 | -63.5 | -63.0 | -64.0 | -63.0 | -62.0 | -63.5 | -62.5 | -62.0 | -62.0 | -62.0 | -61.5 | -62.0 |
| 512 QAM | -61.0 | -61.0 | -61.0 | -62.0 | -60.5 | -60.0 | -61.0 | -60.5 | -60.0 | -60.0 | -59.5 | -59.5 | -59.5 |
| 1024 QAM Strong | -58.0 | -58.0 | -57.5 | -58.5 | -57.5 | -56.5 | -58.0 | -57.0 | -56.5 | -56.5 | -56.5 | -56.0 | -56.5 |
| 1024 QAM Light | -57.0 | -57.0 | -57.0 | -58.0 | -56.5 | -56.0 | -57.0 | -56.5 | -56.0 | -56.0 | -55.5 | -55.5 | -55.5 |
| 2048 QAM | -54.5 | -54.5 | -54.5 | -55.5 | -54.0 | -53.5 | -54.5 | -54.0 | -53.5 | -53.5 | -53.0 | -53.0 | – |
| 112 MHz | **6** | **7-8** | **10** | **11** | **13** | **15** | **18** | **23** | **24** | **26** | **28-31** | **32** | **38** |
| BPSK | -82.0 | -81.5 | -81.0 | -82.0 | -80.5 | -80.0 | -81.5 | -80.5 | -80.0 | -80.0 | -80.0 | -79.5 | -79.0 |
| QPSK | -81.0 | -80.5 | -80.0 | -81.0 | -79.5 | -79.0 | -80.5 | -79.5 | -79.0 | -79.0 | -79.0 | -78.5 | -78.0 |
| 8 PSK | -76.5 | -75.5 | -75.5 | -76.0 | -75.0 | -74.5 | -75.5 | -74.5 | -74.0 | -74.5 | -74.0 | -74.0 | -73.5 |
| 16 QAM | -74.0 | -73.5 | -73.0 | -74.0 | -72.5 | -72.0 | -73.5 | -72.5 | -72.0 | -72.0 | -72.0 | -71.5 | -71.0 |
| 32 QAM | -70.5 | -69.5 | -69.5 | -70.0 | -69.0 | -68.5 | -69.5 | -68.5 | -68.0 | -68.5 | -68.0 | -68.0 | -67.5 |
| 64 QAM | -67.0 | -66.5 | -66.0 | -67.0 | -66.0 | -65.0 | -66.5 | -65.5 | -65.0 | -65.0 | -65.0 | -64.5 | -64.5 |
| 128 QAM | -64.5 | -63.5 | -63.5 | -64.0 | -63.0 | -62.5 | -63.5 | -62.5 | -62.0 | -62.5 | -62.0 | -62.0 | -61.5 |
| 256 QAM | -61.0 | -60.5 | -60.0 | -61.0 | -60.0 | -59.0 | -60.5 | -59.5 | -59.0 | -59.0 | -59.0 | -58.5 | -58.5 |
| 512 QAM | -59.0 | -58.5 | -58.0 | -59.0 | -58.0 | -57.0 | -58.5 | -57.5 | -57.0 | -57.0 | -57.0 | -56.5 | -56.5 |
| 1024 QAM Strong | -55.5 | -55.0 | -54.5 | -55.5 | -54.5 | -53.5 | -55.0 | -54.0 | -53.5 | -53.5 | -53.5 | -53.0 | -53.0 |
| 1024 QAM Light | -54.5 | -54.0 | -53.5 | -54.5 | -53.5 | -52.5 | -54.0 | -53.0 | -52.5 | -52.5 | -52.5 | -52.0 | -52.0 |
| 2048 QAM | -52.0 | -51.0 | -51.0 | -51.5 | -50.5 | -50.0 | -51.0 | -50.0 | -49.5 | -5.00 | -49.5 | -49.5 | – |