

PTP 820A

Licensed Microwave Radio

PTP 820A Quick Look

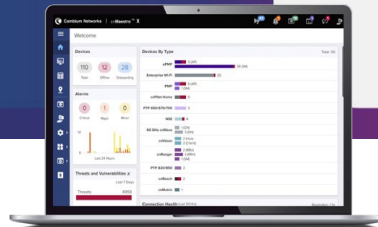
- Multicore high-availability split mount
- Modular multicore aggregation node



PTP 820A 1RU(One Radio Unit)



PTP 820A 2RU(Two Radio Unit)



Radio

1 RU Chassis	5x universal slot
2 RU Chassis	10x universal slot
Standard Power	6–38 GHz, 71–76 GHz, 81–86 GHz
High Power	6–11 GHz

Supported RFUs

RFU-D	High-capacity multicore radio
RFU-D-HP	High-capacity, high-power multicore radio
RFU-E	High-capacity E-band radio
RFU-C	High-capacity radio
RFU-A	High-capacity, high-power radio

Radio Features

Layer 1 link bonding (up to 16+0)
Layer 1 link bonding with PTP 850 and PTP 820 All-Outdoors units
Multi-carrier adaptive bandwidth control (up to 8+0)
Protection & Diversity: HSB, SD (BBC & BBS)
High Spectral Use: BPSK to 4096 QAM w/ACM
Multiband with PTP 850E
Advanced Space Diversity (ASD)
Field replaceable diplexers & channel filters

Typical Radio Configuration

N+0 (up to N=8), 1x16+0, 1x8+0, 2x4+0, 4x2+0, 8x1+0, 1+1, 2+2	
Split Mount	Standard power, high power
All Indoor	High power

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Ethernet

Ethernet Interfaces	Up to 8 x 10/100Base-T (RJ-45) Up to 10 x 1000Base-T (RJ 45) Up to 2 x 2.5GBase-T (RJ-45)	Up to 14 x 1000Base-X (SFP) Up to 8 x 10GBase-X (SFP+)
Management Interfaces	2 x 10/100 Base-T (RJ-45)	
SFP Types	Optical 1000Base-LX (1310 nm) or SX (850 nm)F	
MTU	9600 bytes	
Quality of Service	Multiple Classification criteria (VLAN ID, P-bits, IPv4 DSCP, IPv6 TC, MPLS EXP) 8 priority queues per port Deep buffering (configurable up to 64 Mbit per queue) WRED P-bit marking/remarking	
VLAN	4K VLAN add/remove	
Network Protocols	MSTP, ERP (ITU-T G.8032)	
Frame Cut-Through	Controlled latency and PDF for delay-sensitive applications	
Header Deduplication	Capacity boosting by eliminating inefficiency in all layers (L2, MPLS, L3, L4, Tunneling – GTP for LTE, GRE)	
TDM Interfaces	1RU chassis: 80 x DSIs; 5 x ch-OC-3s; 4 x OC-3s 2RU chassis: 160 x DSIs; 10 x ch-OC-3s; 8 x OC-3s	
TDM Features	Native TDM services and TDM PWE use the same hardware Integrated ch-OC-3 MUX (VC11) XC capacity – 512 VCs Timing options – Loop timing, system clock, the recovered clock 1+1 / 1:1 path protection Clear-channel OC-3 (RST)	
Management Protocols	SNMP, REST	
SDN Support	NETCONFIG/YANG	

Synchronization

Synchronization Distribution	Sync Distribution over any traffic interface (GE/FE, DS1, OC-3) Dedicated In/Out synch interface (1.5 MHz) SyncE (ITU-T G.8261, G.8262) SSM/ESMC Support for ring/mesh applications (ITU-T G.8264) SyncE Regenerator mode, providing PRC grade (ITU-T G.811) performance for smart pipe applications. IEEE-1588 Optimized Transport for reduced PDV	
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Standards

MEF	Carrier Ethernet 2.0 (CE 2.0)	
Supported Ethernet Standards	10/100/1000Base-T/X (IEEE 802.3) 10G Base-LR (802.ae) Ethernet VLANs (IEEE 802.3ac) Virtual LAN (VLAN, IEEE 802.1Q) Class of service (IEEE 802.1p) Provider bridges (QinQ – 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

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Standards, continued

Supported DSI Standards	ITU-T G.703, G.736, G.775, G.823, G.824, G.828, ITU-T I.432, ETSI ETS 300 147, ETS 300 417
Supported OC-3 Standards	ITU-T G.703, G.775, G.813, G.825, EN 300 386 V1.2.1, ES 201 468; V1.1.1 :2000-03, ES 201 468 V1.2.1 :2002-09, EN 61000 4-3
TDM Pseudowire Standards	SAToP – RFC 4553

Security

Radio Encryption	AES 256
Secured Protocols	HTTPS, SNMPv3, SSH, SFTP
Radius authentication and authorization	
TACACS+ authentication, authorization, and accounting (session-based)	

Standards Compliance

Radio Spectral Efficiency	FCC Part 101, EN 302 217-2	
EMC	EN 301 489-4, EN 301 489-1, FCC 47 CFR, part 15, subpart B, ICES-003, TEC/SD/DD/EMC-221/05/OCT-16, IEC 61000-4-29	
Safety	EN 62368-1, IEC 62368-1, UL 62368-1 CSA-C22.2 No.62368-1	
Ingress Protection	RFU-D: IP67 RFU-D-HP: IP67 RFU-S: IP67	RFU-C: IP66 RFU-HP: IP56
Storage	ETSI EN 300 019-1-1 Class 1.2	
Transportation	ETSI EN 300 019-1-2 Class 2.3	

Mechanical

1RU Chassis	1.8" (H), 17.5" (W), 9.6" (D), 6.6 lb (empty)
2RU Chassis	3.46" (H), 17.5" (W), 9.6" (D), 13.2 lb (empty)
Plugin Card Weights	0.66–3.3 lb
RFU-D	9.05" (H), 9.17" (W), 3.85" (D), 14.33 lb (includes diplexer unit)
RFU-D-HP	12.56" (H), 11.26" (W), 4.21" (D), 26.5 lb (includes diplexer or OCU unit)
RFU-S	8.54" (H), 8.27" (W), 3.35" (D), 8.82 lb
RFU-C	7.87" (H), 7.87" (W), 3.35" (D), 9 lb
RFU-A	1.8" (H), 19" (W), 13.18" (D), 26.45 lb

Environmental

IDU	+23°F to +113°F
RFU	-27°F to +131°F (-49°F to +140°F extended)

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Power Input

IDU Standard Input	-48 VDC
IDU DC Input Range	-40 to -60 VDC, with a maximum current of up to 15A (1RU chassis) or 30A (2RU chassis)

Power Consumption

TCC-U	45W; RMC – 17W; RIC-D – 12W; 1X10G LIC – 12W; 4XGE LIC – 9W; 16XDS1 LIC – 17W; ch-OC-3 LIC – 25W
OC-3	9W
Fans (1RU/2RU)	6/30W max (4/6W-25°C)
RFU-D (2+0)	6-11 GHz: 65W; 13-42 GHz: 48W
RFU-D-HP (2+0)	135W
RFU-D-HP (1+0 SD)	88W*
RFU-D-HP (2+0 SD, Rx only)	41W*
RFU-S	43W
RFU-C	6-26 GHz (1+0/1+1): 22W/39W; 28-42 GHz (1+0/1+1): 26W/43W
RFU-A (1+0)	High Level: 77W; Medium Level: 53W; Low Level: 43W; Mute: 24W
RFU-A+ (1+1 HSB/SD BBS)	High Level: 101W; Medium Level: 77W; Low Level: 67W; Mute: 48W
RFU-HP (6-8 GHz)	Max Bias: 73W; Mid Bias: 48W; Min Bias: 34W; Mute: 18W
RFU-HP (11 GHz)	Max Bias: 74W; Mid Bias: 64W; Mute: 21W

Capacity and Maximum Number of DS1s*

	Capacity (Mbps)	Capacity De-Dup	Max. No. of DS1s	Capacity (Mbps)	Capacity De-Dup	Max. No. of DS1s	Capacity (Mbps)	Capacity De-Dup	Max. No. of DS1s
Channel Size	5 MHz			10 MHz, 14 MHz			20 MHz		
Modulation									
BPSK	–	–	–	–	–	–	11-13	11-40	8
QPSK	3-4	4-13	2	13-15	13-48	6	25-30	26-94	16
8 QAM	–	–	–	19-23	20-73	10	39-47	41-148	24
16 QAM	8-10	9-32	4	26-32	28-100	13	54-66	57-206	33
32 QAM	11-14	12-43	6	35-43	37-133	18	72-88	76-275	44
64 QAM	14-17	15-54	7	43-53	45-164	22	90-109	94-340	54
128 QAM	17-21	18-65	9	52-63	54-196	26	109-133	114-413	65
256 QAM	19-24	20-74	10	59-72	62-225	30	124-151	130-470	74
512 QAM	–	–	–	65-79	68-247	33	135-165	142-515	81
1024 QAM Strong	–	–	–	68-83	72-260	34	144-176	151-548	86
1024 QAM Light	–	–	–	73-89	76-276	37	153-187	161-583	91
2048 QAM	–	–	–	–	–	–	166-203	175-633	97
	25 MHz			30 MHz			40 MHz		
BPSK	14-17	15-54	10	18-22	19-68	12	26-31	27-97	17
QPSK	33-40	34-124	21	40-49	42-152	25	55-67	58-209	34
8 QAM	50-61	53-191	31	59-72	62-225	36	83-102	87-317	50
16 QAM	69-85	73-264	42	84-103	89-321	51	114-140	120-435	68
32 QAM	93-113	97-352	56	112-137	118-426	67	152-185	159-577	90
64 QAM	114-140	120-435	68	139-170	146-527	83	187-228	196-710	111
128 QAM	138-169	145-526	82	167-205	176-637	99	227-277	238-862	134
256 QAM	158-193	166-601	94	193-236	203-734	114	244-298	256-927	144
512 QAM	175-214	184-665	104	206-251	216-782	122	267-327	281-1016	157
1024 QAM Strong	186-227	195-708	110	225-274	236-854	133	303-371	319-1154	179
1024 QAM Light	198-242	208-752	117	238-291	250-906	141	323-394	339-1227	190
2048 QAM	212-260	223-808	125	260-318	273-989	153	349-427	367-1327	205
4096 QAM	230-281	242-875	136	277-339	291-1055	163	369-451	388-1404	215

*BPSK and 4096 QAM modulations require RFU-D, RFU-D-HP, or RFU-S. For details about supported scripts, frequencies, and channels per RFU, refer to the Release Notes for the relevant CeraOS version.

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Capacity and Maximum Number of DS1s*, continued

	Capacity (Mbps)	Capacity De-Dup	Max. No. of DS1s	Capacity (Mbps)	Capacity De-Dup	Max. No. of DS1s	Capacity (Mbps)	Capacity De-Dup	Max. No. of DS1s
Channel Size	50 MHz			60 MHz			80 MHz		
Modulation									
BPSK	33-40	35-126	18	40-49	42-153	21	55-67	57-208	24
QPSK	68-83	71-257	35	84-103	88-320	44	114-139	119-432	48
8 QAM	106-130	111-403	55	124-151	130-471	65	162-198	170-617	69
16 QAM	145-177	152-552	75	173-212	182-658	90	229-280	240-870	98
32 QAM	183-224	192-696	95	229-280	240-870	118	304-371	319-1155	128
64 QAM	237-290	249-901	123	281-344	296-1071	1455	373-456	391-1418	157
128 QAM	277-339	291-1054	143	341-416	358-1296	176	448-547	470-1702	186
256 QAM	329-402	345-1251	170	394-481	414-1498	203	514-628	540-1954	214
512 QAM	357-437	375-1359	184	424-518	445-1612	218	564-690	593-2147	235
1024 QAM Strong	389-475	408-1479	201	461-564	484-1754	237	606-741	637-2306	255
1024 QAM Light	413-505	434-1571	213	490-599	515-1864	252	645-789	678-2454	271
2048 QAM	446-545	468-1695	230	531-649	558-2020	273	683-835	717-2500	287
4096 QAM	463-565	486-1759	238	547-668	574-2079	286	–	–	–

*BPSK and 4096 QAM modulations require RFU-D, RFU-D-HP, or RFU-S. For details about supported scripts, frequencies, and channels per RFU, refer to the Release Notes for the relevant CeraOS version.

RFU-D

Frequency (GHz)	6	7	8	11	13	15	18	23	26	28-32	38
Modulation											
BPSK - QPSK	28	28	28	28	24	24	22	22	21	18	22
8 QAM	28	28	28	28	24	24	22	22	21	18	22
16 QAM	28	27	27	28	23	24	22	22	20	17	21
32 QAM	28	27	26	28	23	24	22	22	19	16	21
64 QAM	28	26	26	27	23	24	22	22	19	16	20
128 QAM	27	26	26	26	22	24	22	22	19	16	20
256 QAM	27	26	26	26	21	22	20	22	17	14	19
512 QAM	27	25	24	26	21	22	20	21	17	14	19
1024 QAM	25	24	24	25	20	20	20	20	16	13	18
2048 QAM	25	23	22	24	20	20	18	19	15	12	18
4096 QAM	23	21	20	22	18	18	16	–	–	–	–

RFU-D-HP

Frequency (GHz)	4	5	6	7	8	11
Modulation						
BPSK	35	35	38	38	37	36
QPSK – 8 QAM	35	35	37	37	37	36
16 – 32 QAM	35	35	37	37	37	35
64 QAM	34	34	36	36	35	34
128 QAM	34	34	36	35	35	33
256 QAM	33	33	35	34	33	32
512 QAM	33	33	34	33	33	32
1024 QAM	32	32	33	32	32	31
2048 QAM	31	31	33	31	31	31
4096 QAM	30	30	31	29	29	29

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RFU-S

Frequency (GHz)	6	7	8	11	13	15	18	23	26	28-38
Modulation										
BPSK - 8 PSK	28	27	27	28	27	24	23	24	23	18
16 QAM	28	27	27	28	27	24	23	24	23	17
32 QAM	27	27	26	28	26	24	23	24	23	16
64 QAM	27	26	26	27	24	23	23	23	23	16
128 QAM	27	26	26	27	24	23	22	23	23	16
256 QAM	27	26	26	27	24	22	22	22	21	14
512 QAM	25	25	25	27	24	22	22	22	21	14
1024 QAM	25	24	24	25	22	20	19	21	20	13
2048 QAM	23	23	24	24	21	20	17	20	18	12
4096 QAM	21	21	22	22	19	18	15	-	-	-

RFU-C

Frequency (GHz)	6-8	11-15	18-23	26	28	36	38
Modulation							
QPSK/8 PSK	26	24	22	21	14	12	18
16 QAM	25	23	21	20	14	11	17
32 QAM	24	22	20	19	14	10	16
64 QAM	24	22	20	19	14	10	16
128 QAM	24	22	20	19	14	10	16
256 QAM	22	20	18	17	12	8	14
512 QAM	22	20	18	17	9	10	14
1024 QAM	21	19	17	16	8	9	13
2048 QAM	19	17	15	14	6	7	11

RFU-A

Frequency (GHz)	6L&H	7	8	11
Modulation				
QPSK - 16 QAM	32	32	32	29
32 QAM	31	31	31	29
64 QAM	31	31	31	28
128 QAM	30	30	30	27
256 QAM	29	29	29	26
512 QAM	27	27	27	24
1024 QAM	27	27	27	24

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Receiver Threshold (RSL) (RFU-D and RFU-S)													
Frequency (GHz)	6	7-8	10	11	13	15	18	23	24	26	28-31	32	38
Channel Size	20 MHz												
Modulation													
BPSK	-91.5	-91.5	-91.0	-92.0	-91.0	-90.0	-91.5	-90.5	-87.0	-90.0	-90.0	-89.5	-89.0
QPSK	-88.5	-88.5	-88.5	-89.5	-88.0	-87.5	-88.5	-88.0	-84.0	-87.5	-87.0	-87.0	-86.5
8 PSK	-83.5	-83.5	-83.0	-84.0	-83.0	-82.0	-83.5	-82.5	-79.0	-82.0	-82.0	-81.5	-81.0
16 QAM	-82.0	-82.0	-81.5	-82.5	-81.5	-80.5	-82.0	-81.0	-77.5	-80.5	-80.5	-80.0	-79.5
32 QAM	-78.0	-78.0	-78.0	-79.0	-77.5	-77.0	-78.0	-77.5	-73.5	-77.0	-76.5	-76.5	-76.0
64 QAM	-75.5	-75.5	-75.0	-76.0	-75.0	-74.0	-75.5	-74.5	-71.0	-74.0	-74.0	-73.5	-73.0
128 QAM	-72.5	-72.5	-72.0	-73.0	-71.5	-71.0	-72.5	-71.5	-68.0	-71.0	-71.0	-70.5	-70.0
256 QAM	-69.0	-69.0	-69.0	-70.0	-68.5	-68.0	-69.0	-68.5	-64.5	-68.0	-67.5	-67.5	-67.0
512 QAM	-67.0	-67.0	-66.5	-67.5	-66.0	-65.5	-67.0	-66.0	-62.5	-65.5	-65.5	-65.0	-64.5
1024 QAM Strong	-64.0	-64.0	-64.0	-65.0	-63.5	-63.0	-64.0	-63.5	-59.5	-63.0	-62.5	-62.5	-62.0
1024 QAM Light	-63.0	-63.0	-63.0	-64.0	-62.5	-62.0	-63.0	-62.5	-58.5	-62.0	-61.5	-61.5	-61.0
Channel Size	25 MHz												
BPSK	-88.5	-87.5	-87.5	-88.0	-87.0	-86.5	-87.5	-86.5	-83.0	-86.5	-86.0	-86.0	-85.0
QPSK	-87.5	-86.5	-86.5	-87	-86.0	-85.5	-86.5	-85.5	-82.0	-85.5	-85.0	-85.0	-84.0
8 PSK	-82.5	-82.0	-81.5	-82.5	-81.5	-80.5	-82.0	-81.0	-77.5	-80.5	-80.5	-80.0	-79.5
16 QAM	-80.5	-80.0	-79.5	-80.5	-79.5	-78.5	-80.0	-79.0	-75.5	-78.5	-78.5	-78.0	-77.5
32 QAM	-77.5	-77.0	-76.5	-77.5	-76.0	-75.5	-77.0	-76.0	-72.5	-75.5	-75.5	-75.0	-74.5
64 QAM	-74.5	-74.0	-73.5	-74.5	-73.5	-72.5	-74.0	-73.0	-69.5	-72.5	-72.5	-72.0	-71.5
128 QAM	-71.5	-71.0	-70.5	-71.5	-70.5	-69.5	-71.0	-70.0	-66.5	-69.5	-69.5	-69.0	-68.5
256 QAM	-68.5	-67.5	-67.5	-68.5	-67.0	-66.5	-67.5	-67.0	-63.0	-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	-60.5	-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	-58.0	-61.0	-61.0	-60.5	-60.0
1024 QAM Light	-62.5	-61.5	-61.5	-62.5	-61.0	-60.5	-61.5	-61.0	-57.0	-60.5	-60.0	-60.0	-59.5
2048 QAM	-58.5	-58.0	-57.5	-58.5	-57.0	-56.5	-58.0	-57.0	-53.5	-56.5	-56.5	-56.0	-55.5
4096 QAM	-55.5	-55.0	-54.5	-55.5	-54.0	-53.5	-55.0	-	-	-	-	-	-
Channel Size	30 MHz												
BPSK	-88.5	-88.0	-87.5	-88.5	-87.0	-86.5	-88.0	-87.0	-83.5	-86.5	-86.5	-86.5	-86.0
QPSK	-87.5	-87.0	-86.5	-87.5	-86.0	-85.5	-87.0	-86.0	-82.5	-85.5	-85.5	-85.5	-85.0
8 PSK	-82.5	-81.5	-81.5	-82.5	-81.0	-80.5	-81.5	-81.0	-77.0	-80.5	-80.0	-80.0	-79.5
16 QAM	-81.0	-80.0	-80.0	-80.5	-79.5	-79.0	-80.0	-79.0	-75.5	-79.0	-78.5	-78.5	-78.0
32 QAM	-77.0	-76.5	-76.0	-77.0	-76.0	-75.0	-76.5	-75.5	-72.0	-75.0	-75.0	-75.0	-74.5
64 QAM	-74.5	-73.5	-73.5	-74.0	-73.0	-72.5	-73.5	-72.5	-69.0	-72.5	-72.0	-72.0	-71.5
128 QAM	-71.0	-70.5	-70.0	-71.0	-70.0	-69.0	-70.5	-69.5	-66.0	-69.0	-69.0	-69.0	-68.5
256 QAM	-68.0	-67.5	-67.0	-68.0	-67.0	-66.0	-67.5	-66.5	-63.0	-66.0	-66.0	-66.0	-65.5
512 QAM	-66.0	-65.5	-65.0	-66.0	-64.5	-64.0	-65.5	-64.5	-61.0	-64.0	-64.0	-64.0	-63.5
1024 QAM Strong	-63.0	-62.0	-62.0	-62.5	-61.5	-61.0	-62.0	-61.0	-57.5	-61.0	-60.5	-60.5	-60.0
1024 QAM Light	-62.0	-61.0	-61.0	-62.0	-60.5	-60.0	-61.0	-60.5	-56.5	-60.0	-59.5	-59.5	-59.0
2048 QAM	-58.0	-57.5	-57.0	-58.0	-56.5	-56.0	-57.5	-56.5	-53.0	-56.0	-56.0	-56.0	-55.5
4096 QAM	-55.0	-54.5	-54.0	-55.0	-53.5	-53.0	-54.5	-	-	-	-	-	-
Channel Size	40 MHz												
BPSK	-87.0	-86.5	-86.0	-87.0	-86.0	-85.0	-86.5	-85.5	-82.0	-85.0	-85.0	-85.0	-84.5
QPSK	-86.0	-85.5	-85.0	-86.0	-85.0	-84.0	-85.5	-84.5	-81.0	-84.0	-84.0	-84.0	-83.5
8 PSK	-81.0	-80.5	-80.0	-81.0	-79.5	-79.0	-80.5	-79.5	-76.0	-79.0	-79.0	-79.0	-78.5
16 QAM	-79.5	-79.0	-78.5	-79.5	-78.0	-77.5	-79.0	-78.0	-74.5	-77.5	-77.5	-77.5	-77.0
32 QAM	-76.0	-75.0	-75.0	-75.5	-74.5	-74.0	-75.0	-74.0	-70.5	-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	-67.5	-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	-64.5	-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	-61.5	-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	-59.0	-62.0	-62.0	-62.0	-61.5
1024 QAM Strong	-61.5	-61.0	-60.5	-61.5	-60.0	-59.5	-61.0	-60.0	-56.5	-59.5	-59.5	-59.5	-59.0
1024 QAM Light	-60.5	-60.0	-59.5	-60.5	-59.5	-58.5	-60.0	-59.0	-55.5	-58.5	-58.5	-58.5	-58.0
2048 QAM	-58.0	-57.0	-57.0	-58.0	-56.5	-56.0	-57.0	-56.5	-52.5	-56.0	-55.5	-55.5	-55.0
4096 QAM	-55.0	-54.0	-54.0	-55.0	-53.5	-53.0	-54.0	-	-	-	-	-	-

*BPSK and 4096 QAM modulations require RFU-D, RFU-D-HP.

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Receiver Threshold (RSL) (RFU-D and RFU-S), continued													
Frequency (GHz)	6	7-8	10	11	13	15	18	23	24	26	28-31	32	38
Channel Size	50 MHz												
BPSK	-86.5	-85.5	-85.5	-86.0	-85.0	-84.5	-85.5	-84.5	-81.0	-84.5	-84.0	-84.0	-83.5
QPSK	-85.5	-84.5	-84.5	-85.0	-84.0	-83.5	-84.5	-83.5	-80.0	-83.5	-83.0	-83.0	-82.5
8 PSK	-80.0	-79.5	-79.0	-80.0	-79.0	-78.0	-79.5	-78.5	-75.0	-78.0	-78.0	-78.0	-77.5
16 QAM	-78.5	-77.5	-77.5	-78.0	-77.0	-76.5	-77.5	-76.5	-73.0	-76.5	-76.0	-76.0	-75.5
32 QAM	-74.5	-74.0	-73.5	-74.5	-73.5	-72.5	-74.0	-73.0	-69.5	-72.5	-72.5	-72.5	-72v
64 QAM	-71.5	-70.5	-70.5	-71.5	-70.0	-69.5	-70.5	-70.0	-66.0	-69.5	-69.0	-69.0	-68.5
128 QAM	-68.5	-68.0	-67.5	-68.5	-67.5	-66.5	-68.0	-67.0	-63.5	-66.5	-66.5	-66.5	-66.0
256 QAM	-66.0	-65.0	-65.0	-66.0	-64.5	-64.0	-65.0	-64.5	-60.5	-64.0	-63.5	-63.5	-63.0
512 QAM	-63.5	-63.0	-62.5	-63.5	-62.0	-61.5	-63.0	-62.0	-58.5	-61.5	-61.5	-61.5	-61.0
1024 QAM Strong	-60.0	-59.5	-59.0	-60.0	-58.5	-58	-59.5	-58.5	-55.0	-58.0	-58.0	-58.0	-57.5
1024 QAM Light	-59.0	-58.0	-58.0	-59.0	-57.5	-57.0	-58.0	-57.5	-53.5	-57.0	-56.5	-56.5	-56.0
2048 QAM	-57.0	-56.0	-56.0	-56.5	-55.5	-55.0	-56.0	-55.0	-51.5	-55.0	-54.5	-54.5	-54.0
4096 QAM	-54.0	-53.0	-53.0	-53.5	-52.5	-52.0	-	-	-	-	-	-	-
Channel Size	60 MHz												
BPSK	-86.0	-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	-85.0	-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	-80.5	-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	-78.0	-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	-74.5	-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	-71.5	-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	-69.0	-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	-65.5	-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	-63.5	-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	-60.0	-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	-59.0	-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	-56.5	-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	-53.5	-51.5	-51.5	-52.0	-51.0	-50.5	-	-	-	-	-	-	-

*BPSK and 4096 QAM modulations require RFU-D, RFU-D-HP.

Receiver Threshold (RSL) (RFU-D and RFU-S), continued													
Frequency (GHz)	6	7-8	10	11	13	15	18	23	24	26	28-31	32	38
Channel Size	80 MHz												
Modulation													
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	-

*BPSK and 4096 QAM modulations require RFU-D, RFU-D-HP.

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RFU-D-HP															
Frequency (GHz)	4-5	6	7	8	11	4-5	6	7	8	11	4-5	6	7	8	11
Channel	20 MHz					25 MHz					30 MHz, 40 MHz				
Modulation															
BPSK	-93.3	-93.0	-93.2	-92.6	-92.7	-92.4	-92.1	-92.3	-91.7	-91.8	-91.7	-91.4	-91.6	-91.0	-91.1
QPSK	-90.4	-90.1	-90.3	-89.7	-89.8	-89.4	-89.1	-89.3	-88.7	-88.8	-88.7	-88.4	-88.6	-88.0	-88.1
8 PSK	-86.4	-86.1	-86.3	-85.7	-85.8	-85.4	-85.1	-85.3	-84.7	-84.8	-84.7	-84.4	-84.6	-84.0	-84.1
16 QAM	-83.5	-83.2	-83.4	-82.8	-82.9	-82.5	-82.2	-82.4	-81.8	-81.9	-81.7	-81.4	-81.6	-81.0	-81.1
32 QAM	-80.1	-79.8	-80.0	-79.4	-79.5	-79.2	-78.9	-79.1	-78.5	-78.6	-78.4	-78.1	-78.3	-77.7	-77.8
64 QAM	-76.9	-76.6	-76.8	-76.2	-76.3	-76.1	-75.8	-76.0	-75.4	-75.5	-75.3	-75.0	-75.2	-74.6	-74.7
128 QAM	-73.9	-73.6	-73.8	-73.2	-73.3	-73.0	-72.7	-72.9	-72.3	-72.4	-72.3	-72.0	-72.2	-71.6	-71.7
256 QAM	-70.8	-70.5	-70.7	-70.1	-70.2	-69.9	-69.6	-69.8	-69.2	-69.3	-69.1	-68.8	-69.0	-68.4	-68.5
512 QAM	-68.0	-67.7	-67.9	-67.3	-67.4	-67.0	-66.7	-66.9	-66.3	-66.4	-66.8	-66.5	-66.7	-66.1	-66.2
1024 QAM Strong	-65.1	-64.8	-65.0	-64.4	-64.5	-64.1	-63.8	-64.0	-63.4	-63.5	-63.5	-63.2	-63.4	-62.8	-62.9
1024 QAM Light	-64.4	-64.1	-64.3	-63.7	-63.8	-63.2	-62.9	-63.1	-62.5	-62.6	-62.7	-62.4	-62.6	-62.0	-62.1
2048 QAM	-61.9	-61.6	-61.8	-61.2	-61.3	-61.1	-60.8	-61.0	-60.4	-60.5	-60.2	-59.9	-60.1	-59.5	-59.6
4096 QAM	-	-	-	-	-	-57.0	-56.7	-56.9	-56.3	-56.4	-56.5	-56.2	-56.4	-55.8	-55.9
Channel	40 MHz					50 MHz					60 MHz, 40 MHz				
BPSK	-90.6	-90.3	-90.5	-89.9	-90.0	-89.6	-89.3	-89.5	-88.9	-89.0	-88.8	-88.5	-88.7	-88.1	-88.2
QPSK	-87.4	-87.1	-87.3	-86.7	-86.8	-86.7	-86.4	-86.6	-86.0	-86.1	-85.6	-85.3	-85.5	-84.9	-85.0
8 PSK	-83.4	-83.1	-83.3	-82.7	-82.8	-82.4	-82.1	-82.3	-81.7	-81.8	-81.8	-81.5	-81.7	-81.1	-81.2
16 QAM	-80.5	-80.2	-80.4	-79.8	-79.9	-79.5	-79.2	-79.4	-78.8	-78.9	-78.6	-78.3	-78.5	-77.9	-78.0
32 QAM	-77.1	-76.8	-77.0	-76.4	-76.5	-76.5	-76.2	-76.4	-75.8	-75.9	-75.3	-75.0	-75.2	-74.6	-74.7
64 QAM	-74.0	-73.7	-73.9	-73.3	-73.4	-73.1	-72.8	-73.0	-72.4	-72.5	-72.2	-71.9	-72.1	-71.5	-71.6
128 QAM	-71.0	-70.7	-70.9	-70.3	-70.4	-70.6	-70.3	-70.5	-69.9	-70.0	-69.4	-69.1	-69.3	-68.7	-68.8
256 QAM	-68.7	-68.4	-68.6	-68.0	-68.1	-67.0	-66.7	-66.9	-66.3	-66.4	-66.2	-65.9	-66.1	-65.5	-65.6
512 QAM	-65.9	-65.6	-65.8	-65.2	-65.3	-64.5	-64.2	-64.4	-63.8	-63.9	-63.7	-63.4	-63.6	-63.0	-63.1
1024 QAM Strong	-62.4	-62.1	-62.3	-61.7	-61.8	-61.1	-60.8	-61.0	-60.4	-60.5	-60.4	-60.1	-60.3	-59.7	-59.8
1024 QAM Light	-61.7	-61.4	-61.6	-61.0	-61.1	-60.3	-60.0	-60.2	-59.6	-59.7	-59.6	-59.3	-59.5	-58.9	-59.0
2048 QAM	-59.4	-59.1	-59.3	-58.7	-58.8	-58.0	-57.7	-57.9	-57.3	-57.4	-57.3	-57.0	-57.2	-56.6	-56.7
4096 QAM	-56.3	-56.0	-56.2	-55.6	-55.7	-54.5	-54.2	-54.4	-53.8	-53.9	-53.5	-53.2	-53.4	-52.8	-52.9
Channel	80 MHz														
BPSK	-86.8	-86.5	-86.7	-86.1	-86.2										
QPSK	-84.5	-84.2	-84.4	-83.8	-83.9										
8 PSK	-80.8	-80.5	-80.7	-80.1	-80.2										
16 QAM	-77.8	-77.5	-77.7	-77.1	-77.2										
32 QAM	-74.4	-74.1	-74.3	-73.7	-73.8										
64 QAM	-71.5	-71.2	-71.4	-70.8	-70.9										
128 QAM	-68.5	-68.2	-68.4	-67.8	-67.9										
256 QAM	-65.8	-65.5	-65.7	-65.1	-65.2										
512 QAM	-63.1	-62.8	-63.0	-62.4	-62.5										
1024 QAM Strong	-59.9	-59.6	-59.8	-59.2	-59.3										
1024 QAM Light	-59.5	-59.2	-59.4	-58.8	-58.9										
2048 QAM	-56.6	-56.3	-56.5	-55.9	-56.0										

PTP 820A

RFU-C									
Frequency (GHz)	6	7-10	11-15	18	23	24	26	28	31-38
Channel Size	5 MHz								
Modulation									
QPSK	-98.0	-97.5	-98.0	-97.0	-96.5	-93.5	-95.5	-93.5	-94.5
16 QAM	-91.0	-90.5	-91.0	-90.0	-89.5	-86.5	-88.5	-86.5	-87.5
32 QAM	-87.5	-87.0	-87.5	-86.5	-86.0	-83.0	-85.0	-83.0	-84.0
64 QAM	-84.5	-84.0	-84.5	-83.5	-83.0	-80.0	-82.0	-80.0	-81.0
128 QAM	-80.5	-80.0	-80.5	-79.5	-79.0	-76.0	-78.0	-76.0	-77.0
256 QAM	-77.5	-77.0	-77.5	-76.5	-76.0	-73.0	-75.0	-73.0	-74.0
Channel Size	10 MHz								
QPSK	-90.0	-89.5	-90.0	-89.0	-88.5	-85.5	-87.5	-85.5	-86.5
8 PSK	-84.5	-84.0	-84.5	-83.5	-83.0	-80.0	-82.0	-80.0	-81.0
16 QAM	-83.0	-82.5	-83.0	-82.0	-81.5	-78.5	-80.5	-78.5	-79.5
32 QAM	-79.5	-79.0	-79.5	-78.5	-78.0	-75.0	-77.0	-75.0	-76.0
64 QAM	-76.5	-76.0	-76.5	-75.5	-75.0	-72.0	-74.0	-72.0	-73.0
128 QAM	-73.5	-73.0	-73.5	-72.5	-72.0	-69.0	-71.0	-69.0	-70.0
256 QAM	-70.5	-70.0	-70.5	-69.5	-69.0	-66.0	-68.0	-66.0	-67.0
512 QAM	-67.5	-67.0	-67.5	-66.5	-66.0	-63.0	-65.0	-63.0	-64.0
1024 QAM Strong	-65.0	-64.5	-65.0	-64.0	-63.5	-60.5	-62.5	-60.5	-61.5
1024 QAM Light	-64.0	-63.5	-64.0	-63.0	-62.5	-59.5	-61.5	-59.5	-60.5
Channel Size	20 MHz								
QPSK	-91.0	-90.5	-91.0	-90.0	-89.5	-86.5	-88.5	-86.5	-87.5
8 PSK	-85.5	-85.0	-85.5	-84.5	-84.0	-81.0	-83.0	-81.0	-82.0
16 QAM	-84.0	-83.5	-84.0	-83.0	-82.5	-79.5	-81.5	-79.5	-80.5
32 QAM	-80.5	-80.0	-80.5	-79.5	-79.0	-76.0	-78.0	-76.0	-77.0
64 QAM	-77.5	-77.0	-77.5	-76.5	-76.0	-73.0	-75.0	-73.0	-74.0
128 QAM	-74.5	-74.0	-74.5	-73.5	-73.0	-70.0	-72.0	-70.0	-71.0
256 QAM	-71.5	-71.0	-71.5	-70.5	-70.0	-67.0	-69.0	-67.0	-68.0
512 QAM	-69.0	-68.5	-69.0	-68.0	-67.5	-64.5	-66.5	-64.5	-65.5
1024 QAM Strong	-66.0	-65.5	-66.0	-65.0	-64.5	-61.5	-63.5	-61.5	-62.5
1024 QAM Light	-65.0	-64.5	-65.0	-64.0	-63.5	-60.5	-62.5	-60.5	-61.5
2048 QAM	-62.0	-61.5	-62.0	-61.0	-60.5	-57.5	-59.5	-57.5	-58.5
Channel Size	25 MHz								
QPSK	-90.0	-89.5	-90.0	-89.0	-88.5	-85.5	-87.5	-85.5	-86.5
8 PSK	-84.5	-84.0	-84.5	-83.5	-83.0	-80.0	-82.0	-80.0	-81.0
16 QAM	-83.0	-82.5	-83.0	-82.0	-81.5	-78.5	-80.5	-78.5	-79.5
32 QAM	-79.5	-79.0	-79.5	-78.5	-78.0	-75.0	-77.0	-75.0	-76.0
64 QAM	-76.5	-76.0	-76.5	-75.5	-75.0	-72.0	-74.0	-72.0	-73.0
128 QAM	-73.5	-73.0	-73.5	-72.5	-72.0	-69.0	-71.0	-69.0	-70.0
256 QAM	-70.5	-70.0	-70.5	-69.5	-69.0	-66.0	-68.0	-66.0	-67.0
512 QAM	-67.5	-67.0	-67.5	-66.5	-66.0	-63.0	-65.0	-63.0	-64.0
1024 QAM Strong	-65.0	-64.5	-65.0	-64.0	-63.5	-60.5	-62.5	-60.5	-61.5
1024 QAM Light	-64.0	-63.5	-64.0	-63.0	-62.5	-59.5	-61.5	-59.5	-60.5
2048 QAM	-61.0	-60.5	-61.0	-60.0	-59.5	-56.5	-58.5	-56.5	-57.5

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RFU-C, continued									
Frequency (GHz)	6	7–10	11–15	18	23	24	26	28	31–38
Channel Size	30 MHz								
Modulation									
QPSK	-89.0	-88.5	-89.0	-88.0	-87.5	-84.5	-86.5	-84.5	-85.5
8 PSK	-84.0	-83.5	-84.0	-83.0	-82.5	-79.5	-81.5	-79.5	-80.5
16 QAM	-82.5	-82.0	-82.5	-81.5	-81.0	-78.0	-80.0	-78.0	-79.0
32 QAM	-78.5	-78.0	-78.5	-77.5	-77.0	-74.0	-76.0	-74.0	-75.0
64 QAM	-75.5	-75.0	-75.5	-74.5	-74.0	-71.0	-73.0	-71.0	-72.0
128 QAM	-72.5	-72.0	-72.5	-71.5	-71.0	-68.0	-70.0	-68.0	-69.0
256 QAM	-69.5	-69.0	-69.5	-68.5	-68.0	-65.0	-67.0	-65.0	-66.0
512 QAM	-67.5	-67.0	-67.5	-66.5	-66.0	-63.0	-65.0	-63.0	-64.0
1024 QAM Strong	-64.0	-63.5	-64.0	-63.0	-62.5	-59.5	-61.5	-59.5	-60.5
1024 QAM Light	-63.5	-63.0	-63.5	-62.5	-62.0	-59.0	-61.0	-59.0	-60.0
2048 QAM	-60.0	-59.5	-60.0	-59.0	-58.5	-55.5	-57.5	-55.5	-56.5
Channel Size	40 MHz								
QPSK	-88.0	-87.5	-88.0	-87.0	-86.5	-83.5	-85.5	-83.5	-84.5
8 PSK	-82.5	-82.0	-82.5	-81.5	-81.0	-78.0	-80.0	-78.0	-79.0
16 QAM	-81.0	-80.5	-81.0	-80.0	-79.5	-76.5	-78.5	-76.5	-77.5
32 QAM	-77.5	-77.0	-77.5	-76.5	-76.0	-73.0	-75.0	-73.0	-74.0
64 QAM	-74.5	-74.0	-74.5	-73.5	-73.0	-70.0	-72.0	-70.0	-71.0
128 QAM	-71.5	-71.0	-71.5	-70.5	-70.0	-67.0	-69.0	-67.0	-68.0
256 QAM	-69.0	-68.5	-69.0	-68.0	-67.5	-64.5	-66.5	-64.5	-65.5
512 QAM	-66.5	-66.0	-66.5	-65.5	-65.0	-62.0	-64.0	-62.0	-63.0
1024 QAM Strong	-63.0	-62.5	-63.0	-62.0	-61.5	-58.5	-60.5	-58.5	-59.5
1024 QAM Light	-62.0	-61.5	-62.0	-61.0	-60.5	-57.5	-59.5	-57.5	-58.5
2048 QAM	-59.0	-58.5	-59.0	-58.0	-57.5	-54.5	-56.5	-54.5	-55.5
Channel Size	50 MHz								
QPSK	-87.0	-86.5	-87.0	-86.0	-85.5	-82.5	-84.5	-82.5	-83.5
8 PSK	-81.5	-81.0	-81.5	-80.5	-80.0	-77.0	-79.0	-77.0	-78.0
16 QAM	-80.0	-79.5	-80.0	-79.0	-78.5	-75.5	-77.5	-75.5	-76.5
32 QAM	-76.5	-76.0	-76.5	-75.5	-75.0	-72.0	-74.0	-72.0	-73.0
64 QAM	-73.0	-72.5	-73.0	-72.0	-71.5	-68.5	-70.5	-68.5	-69.5
128 QAM	-71.0	-70.5	-71.0	-70.0	-69.5	-66.5	-68.5	-66.5	-67.5
256 QAM	-67.5	-67.0	-67.5	-66.5	-66.0	-63.0	-65.0	-63.0	-64.0
512 QAM	-65.0	-64.5	-65.0	-64.0	-63.5	-60.5	-62.5	-60.5	-61.5
1024 QAM Strong	-61.5	-61.0	-61.5	-60.5	-60.0	-57.0	-59.0	-57.0	-58.0
1024 QAM Light	-61.0	-60.5	-61.0	-60.0	-59.5	-56.5	-58.5	-56.5	-57.5
2048 QAM	-57.5	-57.0	-57.5	-56.5	-56.0	-53.0	-55.0	-53.0	-54.0
Channel Size	60 MHz								
QPSK	-86.0	-85.5	-86.0	-85.0	-84.5	-81.5	-83.5	-81.5	-82.5
8 PSK	-81.5	-81.0	-81.5	-80.5	-80.0	-77.0	-79.0	-77.0	-78.0
16 QAM	-79.0	-78.5	-79.0	-78.0	-77.5	-74.5	-76.5	-74.5	-75.5
32 QAM	-75.5	-75.0	-75.5	-74.5	-74.0	-71.0	-73.0	-71.0	-72.0
64 QAM	-72.5	-72.0	-72.5	-71.5	-71.0	-68.0	-70.0	-68.0	-69.0
128 QAM	-69.5	-69.0	-69.5	-68.5	-68.0	-65.0	-67.0	-65.0	-66.0
256 QAM	-66.5	-66.0	-66.5	-65.5	-65.0	-62.0	-64.0	-62.0	-63.0
512 QAM	-64.0	-63.5	-64.0	-63.0	-62.5	-59.5	-61.5	-59.5	-60.5
1024 QAM Strong	-61.0	-60.5	-61.0	-60.0	-59.5	-56.5	-58.5	-56.5	-57.5
1024 QAM Light	-60.0	-59.5	-60.0	-59.0	-58.5	-55.5	-57.5	-55.5	-56.5
2048 QAM	-57.5	-57.0	-57.5	-56.5	-56.0	-53.0	-55.0	-53.0	-54.0

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RFU-A												
Frequency (GHz)	5.8	6	7-11	5.8	6	7-11	5.8	6	7-11	5.8	6	7-11
Channel Size	5 MHz			10 MHz			20 MHz			25 MHz		
Modulation												
QPSK	-95.0	-97.0	-96.5	-90.5	-92.5	-92.0	-87.5	-89.5	-89.0	-87.0	-89.0	-88.5
8 PSK	–	–	–	-85.5	-87.5	-87.0	-82.5	-84.5	-84.0	-81.5	-83.5	-83.0
16 QAM	-88.5	-90.5	-90.0	-84.0	-86.5	-86.0	-81.0	-83.0	-82.5	-80.0	-82.0	-81.5
32 QAM	-85.0	-87.0	-86.5	-80.5	-83.0	-82.5	-77.5	-79.5	-79.0	-76.5	-78.5	-78.0
64 QAM	-81.5	-83.5	-83.0	-77.5	-79.5	-79.0	-74.5	-76.5	-76.0	-73.5	-75.5	-75.0
128 QAM	-78.0	-80.0	-79.5	-74.0	-76.5	-76.0	-71.5	-73.5	-73.0	-70.5	-72.5	-72.0
256 QAM	-75.0	-77.0	-76.5	-71.0	-73.5	-73.0	-68.5	-70.5	-70.0	-67.5	-69.5	-69.0
512 QAM	–	–	–	-68.5	-71.0	-70.5	-66.0	-68.0	-67.5	-65.0	-67.0	-66.5
1024 QAM Strong	–	–	–	-65.5	-68.0	-67.5	-63.0	-65.0	-64.5	-62.0	-64.0	-63.5
1024 QAM Light	–	–	–	-65.0	-67.0	-66.5	-62.0	-64.0	-63.5	-61.5	-63.5	-63.0
2048 QAM Strong	–	–	–	–	–	–	-58.5	-60.5	-60.0	-57.5	-59.5	-59.0
Channel Size	30 MHz			40 MHz			50 MHz			60 MHz		
QPSK	-86.0	-88.0	-87.5	-84.5	-86.5	-86.0	-84.0	-86.0	-85.5	-83.0	-85.0	-84.5
8 PSK	-81.0	-83.0	-82.5	-79.5	-81.5	-81.0	-78.5	-80.5	-80.0	-78.5	-80.5	-80.0
16 QAM	-79.0	-81.0	-80.5	-78.0	-80.0	-79.5	-77.0	-79.0	-78.5	-76.0	-78.0	-77.5
32 QAM	-75.5	-77.5	-77.0	-74.5	-76.5	-76.0	-73.5	-75.5	-75.0	-72.5	-74.5	-74.0
64 QAM	-72.5	-74.5	-74.0	-71.5	-73.5	-73.0	-70.0	-72.0	-71.5	-69.5	-71.5	-71.0
128 QAM	-69.5	-71.5	-71.0	-68.5	-70.5	-70.0	-68.0	-70.0	-69.5	-66.5	-68.5	-68.0
256 QAM	-66.5	-68.5	-68.0	-66.0	-68.0	-67.5	-64.5	-66.5	-66.0	-63.5	-65.5	-65.0
512 QAM	-64.5	-66.5	-66.0	-63.5	-65.5	-65.0	-62.0	-64.0	-63.5	-61.5	-63.5	-63.0
1024 QAM Strong	-61.0	-63.0	-62.5	-60.5	-62.5	-62.0	-59.0	-61.0	-60.5	-58.0	-60.0	-59.5
1024 QAM Light	-60.5	-62.5	-62.0	-59.5	-61.5	-61.0	-58.0	-60.0	-59.5	-58.0	-60.0	-59.5
2048 QAM Strong	-57.0	-59.0	-58.5	-56.0	-58.0	-57.5	-54.5	-56.5	-56.0	-54.0	-56.0	-55.5

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