



Datasheet

FibeAir IP-20A

REV. B.01 | November 2018

High-availability, split-mount, modular multicore aggregation node

Designed uniquely for the North American market, FibeAir IP-20A is a highly-flexible aggregation node that delivers multi-Gbps radio capacity at a very large scale. Now available with multicore technology and new radio units, IP-20A features high modularity and flexibility and supports up to 8 radio links with an exceptionally wide variety of line interfaces via pluggable modules, in a wide range of network topologies - making it the preferred node for your transport network's aggregation sites.

The FibeAir IP-20A operates within the entire microwave and millimeter-wave spectrum, offering high spectral efficiency across licensed and license-exempt frequency bands (4-86 GHz). It also supports all high-speed data interfaces (10GE/1GE/FE) and a wide variety of TDM interfaces (DS1, OC-3); operates with a wide variety of multicore, standard and high power radios; and accommodates various network configurations including 1x 8+0, 4x 2+0, and 8x 1+0.

Note: For exact feature availability, contact your Ceragon representative. In case of discrepancy between this Datasheet and the Technical Description for the product, the Technical Description prevails.

General

Assembly options

1RU Chassis – 5x Universal slots;

2RU Chassis – 10x Universal slots

Redundant TCC slots (2RU chassis only)

Radio

Supported Frequency Range

Standard Power: 6-42 GHz, 71-76 GHz, 81-86 GHz

High Power: 4-11 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-S – High-capacity radio

RFU-C – High-capacity radio

RFU-A – High-capacity, high-power radio

1500HP/RFU-HP – High-capacity, high-power radio

Typical Radio Configurations

N+0 (up to N=8), 1x 8+0, 2x 4+0, 4x 2+0, 8x 1+0, 1+1, 2+2

Split Mount (Standard Power, High Power)

All Indoor (High Power)

Radio Features

Multi-Carrier Adaptive Bandwidth Control (up to 8+0)

Protection and Diversity: HSB, SD (BBS)

High spectral utilization: BPSK to 4096 QAM w/ACM

Channel bandwidth:

- 4-42 GHz: up to 112 MHz
- E-Band: up to 500 MHz

Note: 112 and 500 MHz channels are planned for future release.

XPIC

LoS 4x4 MIMO*

Advanced Frequency Reuse (AFR)*

Advanced Space Diversity (ASD)*

Field Replaceable Diplexers/ Field Replaceable Channel Filters

Ethernet

Ethernet Interfaces

1RU/2RU Traffic Interfaces - Up to 10 x 1000Base-T (RJ-45) or 1000base-X (SFP)

Up to 2 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)

Ethernet Features

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

4K VLANs

VLAN add/remove/translate

MSTP, ERP (ITU-T G.8032)

Frame Cut Through – controlled latency and PDV for delay sensitive applications

Header DeDuplication – Capacity boosting by eliminating inefficiency in all layers (L2,MPLS, L3,L4, Tunneling – GTP for LTE, GRE)

Y.1731 Ethernet OAM

* Planned for future release.

TDM

TDM Interfaces

1RU Chassis: 80 x DS1s; 5 x ch-OC-3s, 4 x OC-3s

2RU Chassis: 160 x DS1s; 10 x ch-OC-3s, 8 x OC-3s

TDM Features

Native TDM services and TDM PWE using the same hardware

Integrated ch-OC-3 MUX (VC11)

XC capacity – 512 VCs

Timing options – Loop timing, system clock, recovered clock

1+1 / 1:1 path protection

Clear-channel OC-3 (RST)

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

IEEE-1588 TC

IEEE-1588 BC

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

Supported DS1 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

Standards Compliance

Radio Spectral Efficiency: EN 302 217-2-2

EMC: EN 301 489-4, EN 301 489-1, FCC 47 CFR, part 15, class B

Safety: EN 60950-1, IEC 60950-1, UL 60950-1, CSA-C22.2

No.60950-1, EN 60950-22, UL 60950-22, CSA C22.2.60950-22

Ingress Protection: IEC 60529 IP56

Storage: ETSI EN 300 019-1-1 Class 1.2

Transportation: ETSI EN 300 019-1-2 Class 2.3

Technical Specifications

Mechanical Specifications

1RU Chassis – 1.8”(H), 17.5”(W), 9.6”(D), 6.6 lbs. (empty);
 2RU Chassis – 3.46”(H), 17.5”(W), 9.6”(D), 13.2 lbs. (empty)
 Plugin Card Weights: 0.66 – 3.3 lbs.
 RFU-D – 9.05”(H), 9.17”(W), 3.85”(D), 14.33 lbs.
 RFU-D-HP – 12.56”(H), 11.26”(W), 4.21”(D), 26.5 lbs.
 RFU-E – 8.66”(H), 7.8”(W), 3”(D), 6.6 lbs.
 RFU-S – 8.54”(H), 8.27”(W), 3.35”(D), 8.82 lbs.
 RFU-C – 7.87”(H), 7.87”(W), 3.35”(D), 9 lbs.
 RFU-A – 1.8”(H), 19”(W), 13.18”(D), 26.45 lbs.
 1500HP/RFU-HP – 19”(H), 6”(W), 11”(D), 15 lbs. (excluding Branching)
 1500HP/RFU-HP OCB Branching (Split Mount and Compact All-Indoor) – 16.5”(H), 4.33”(W), 15”(D), 15 lbs. per carrier

Environmental Specifications

IDU: +23° to +131°F (-13°C to +149°F extended);
 RFU: -27°C to +131°F (-49°C to +140°F extended)

Power Input Specifications

IDU Standard Input: -48 VDC
 IDU DC Input range: -40 to -60 VDC, with maximum current of up to 15A (1RU chassis) or 30A (2RU chassis)
 Dual-feed power support

Power Consumption Specifications

TCC – 25W; RMC – 17W; RIC-D – 12W; 1X10GE 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 – 75W
 RFU-D-HP – 130W/180W
 RFU-E – 43W
 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
 1500HP – Max Bias: 85W; Mid Bias: 72W; Mute: 29W

* In Power Consumption Saving mode.

Product Images

IDU

IP-20A 1RU CHASSIS



IP-20A 2RU CHASSIS



Modules

RADIO MODEM CARDS (RMCs)



RADIO INTERFACE CARDS (RICs)



TRAFFIC CONTROL CARDS (TCCs)



ETHERNET LIC WITH 1 COMBO AND 3 ELECTRICAL OR OPTICAL INTERFACES



ETHERNET LIC WITH A SINGLE 10GE OPTICAL INTERFACE



TDM LICs



Radio Units

RFU-E



RFU-D



RFU-D-HP



RFU-S



RFU-C



RFU-A



1500HP/RFU-HP



Radio Specifications

Capacity and Maximum Number of DS1s – Microwave Bands

Notes: 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.

	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
Modulation	5 MHz			10 MHz			20 MHz		
BPSK	1-2	2-4	1	7-9	7-15	3	12-15	12-48	6
QPSK	3-4	4-13	2	13-15	13-48	6	28-34	29-105	14
8 QAM	5-7	6-25	3	19-23	20-73	10	42-51	44-158	21
16 QAM	8-10	9-32	4	26-32	28-100	13	57-70	60-217	29
32 QAM	11-14	12-43	6	35-43	37-133	18	75-92	79-286	38
64 QAM	14-17	15-54	7	43-53	45-164	22	92-113	97-352	47
128 QAM	17-21	18-65	9	52-63	54-196	26	112-136	117-424	57
256 QAM	19-24	20-74	10	59-72	62-225	30	126-155	133-481	64
512 QAM	21-27	22-84	11	65-79	68-247	33	138-169	145-526	70
1024 QAM Strong	23-30	24-94	12	68-83	72-260	34	147-180	154-559	75
1024 QAM Light	–	–	–	73-89	76-276	37	156-191	164-593	80
2048 QAM	25-33	26-104	13	78-95	80-290	40	166-203	175-633	85
4096 QAM	27-36	28-114	14	83-100	83-305	42	176-215	180-670	90
	25 MHz			30 MHz			40MHz		
BPSK	17-21	18-67	10	21-25	22-81	12	28-35	30-111	17
QPSK	35-43	37-139	21	43-52	45-167	25	58-70	61-226	34
8 QAM	53-65	56-207	31	62-76	65-243	36	86-105	90-337	50
16 QAM	72-88	76-283	42	87-107	92-342	51	117-143	123-459	68
32 QAM	95-117	100-374	56	115-140	121-450	67	154-189	162-605	90
64 QAM	117-143	123-459	68	141-173	149-554	83	190-232	199-743	111
128 QAM	141-173	149-554	82	170-208	179-667	99	229-280	241-899	134
256 QAM	161-197	169-631	94	196-239	206-767	114	247-301	259-966	144
512 QAM	178-217	187-697	104	209-255	219-818	122	270-330	284-1059	157
1024 QAM Strong	189-231	199-740	110	228-278	239-892	133	306-375	322-1201	179
1024 QAM Light	201-245	211-786	117	241-295	253-945	141	325-398	342-1275	190
2048 QAM	215-263	226-843	125	263-321	276-1031	153	352-430	370-1379	205
4096 QAM	233-285	245-913	136	280-342	294-1097	163	369-451	388-1445	215
	50 MHz			60 MHz			80 MHz		
BPSK	38-40	39-130	18	46-53	41-140	21	57-69	59-222	24
QPSK	70-86	74-267	35	87-106	91-331	44	114-140	120-448	48
8 QAM	109-133	114-415	55	127-155	133-482	65	162-198	171-636	69
16 QAM	148-181	155-563	75	176-215	185-670	90	231-283	243-906	98
32 QAM	186-227	195-707	95	232-283	243-881	118	304-371	319-1190	128
64 QAM	240-293	252-913	123	284-348	299-1000	1455	371-454	390-1456	157
128 QAM	280-342	294-1000	143	344-420	361-1000	176	439-536	461-1720	186
256 QAM	332-406	348-1000	170	397-485	416-1000	203	505-618	531-1980	214
512 QAM	360-440	378-1000	184	427-521	448-1000	218	555-679	583-2000	235
1024 QAM Strong	392-479	411-1000	201	464-567	487-1000	237	604-738	635-2000	255
1024 QAM Light	416-509	437-1000	213	493-602	517-1000	252	641-784	674-2000	271
2048 QAM	449-548	471-1000	230	534-653	561-1000	273	679-829	713-2000	287
4096 QAM	465-568	483-1000	238	558-685	570-1000	286	–	–	–

Capacity and Maximum Number of DS1s – RFU-E

	Capacity (Mbps)	Capacity De-Dup	Max. No. of DS1s	Capacity (Mbps)	Capacity De-Dup	Max. No. of DS1s
Modulation	62.5 MHz			125 MHz		
BPSK	42-51	44-160	19	90-110	94-341	41
QPSK	93-114	98-355	42	188-230	197-715	85
8 QAM	139-170	146-528	63	279-341	293-1062	127
16 QAM	188-230	198-716	85	379-463	398-1443	172
32 QAM	247-302	259-939	112	499-610	524-1898	227
64 QAM	301-368	316-1145	137	612-748	643-2329	278
128 QAM	362-442	380-1377	165	737-900	774-2500	335
256 QAM	412-504	433-1569	187	838-1025	880-2500	381
512 QAM	453-554	476-1724	206	923-1128	969-2500	420
1024 QAM	505-617	530-1920	230	-	-	-
Modulation	250 MHz			500 MHz		
BPSK	180-221	189-687	82	362-442	-	165
QPSK	377-461	396-1435	171	755-923	-	343
8 QAM	559-683	587-2128	254	1119-1368	-	509
16 QAM	759-928	797-2500	345	1520-1858	-	512
32 QAM	998-1220	1048-2500	454	1998-2442	-	512
64 QAM	1225-1497	1286-2500	512	2451-2500	-	512
128 QAM	1474-1802	1548-2500	512	-	-	-
256 QAM	1653-2021	1736-2500	512	-	-	-

Note: 500 MHz is planned for future release.

Transmit Power – Microwave Bands

RFU-D

Modulation	Frequency (GHz)	6	7	8	11	13	15	18	23	24	26	28-38
BPSK - 8 PSK		28	28	28	29	27	24	22	25	0	21	18
16 QAM		28	27	27	29	26	24	22	25	0	20	17
32 QAM		27	27	26	29	25	24	22	24	0	19	16
64 QAM		27	26	26	27	24	24	22	22	0	19	16
128 QAM		27	26	26	26	23	24	22	21	0	19	16
256 QAM		27	26	26	25	22	22	20	18	0	17	14
512 QAM		25	25	24	25	22	22	20	18	0	17	14
1024 QAM		25	24	24	24	20	20	20	17	0	16	13
2048 QAM		23	23	22	23	19	20	18	16	0	15	12
4096 QAM		21	21	20	21	17	18	16	13	0	13	10

RFU-D-HP

Modulation	Frequency	4-5	6	7	8	11
BPSK – 64 QAM		35	36	34	32	33
128 QAM		32	36	34	32	33
256 QAM		32	35	33	31	32
512 QAM		31	34	33	31	31
1024 QAM		30	32	32	31	30
2048 QAM		30	32	32	30	30
4096 QAM		30	31	31	28	30

RFU-S

Modulation	Frequency (GHz)	6	7	8	11	13	15	18	23	24	26	28-38
BPSK - 8 PSK		28	28	28	28	27	24	22	25	0	21	18
16 QAM		28	27	27	28	26	24	22	25	0	20	17
32 QAM		27	26	26	28	25	24	22	24	0	19	16
64 QAM		27	26	26	27	24	23	21	22	0	19	16
128 QAM		27	26	26	27	23	23	21	21	0	19	16
256 QAM		27	26	24	27	22	22	20	18	0	17	14
512 QAM		25	24	24	27	22	22	19	18	0	17	14
1024 QAM		25	24	24	25	20	20	18	17	0	16	13
2048 QAM		23	22	22	24	19	20	17	16	0	15	12
4096 QAM		21	20	20	22	17	18	15	13	0	13	10

RFU-C

Transmit Power (dBm)	Frequency (GHz)	6-8	11-15	18-23	24	26	28	31	32	36
QPSK/8 PSK		26	24	22	0	21	14	16	18	12
16 QAM		25	23	21	0	20	14	15	17	11
32 QAM		24	22	20	0	19	14	14	16	10
64 QAM		24	22	20	0	19	14	14	16	10
128 QAM		24	22	20	0	19	14	14	16	10
256 QAM		22	20	18	0	17	12	12	14	8
512 QAM		22	20	18	-1	17	9	12	14	10
1024 QAM		21	19	17	-3	16	8	11	13	9
2048 QAM		19	17	15	0	14	6	9	11	7

RFU-A

Modulation	Frequency	6L&H	7	8	11
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

RFU-Ae

6L&H	7	8	11
33	32	32	30
33	31	31	30
33	31	31	30
33	32	32	29
32	31	31	28
29	29	29	26
29	29	29	26

RFU-Aep

Modulation	Frequency	6L&H	7	8	11
QPSK – 16 QAM		35	34	34	32
32 QAM		35	33	33	32
64 QAM		35	33	33	32
128 QAM		34	33	33	32
256 QAM		34	33	33	32
512 QAM		33	32	32	31
1024 QAM		32	31	31	30
2048 QAM		30	29	29	28

RFU-HP 1RX

Modulation	Frequency (GHz)	6L&H	7	8	11
QPSK – 16 QAM		33	33	33	30
32 QAM		33	33	33	29
64 QAM		32	32	32	29
128 QAM		31	31	31	29
256 QAM		30	30	30	27
512 QAM		28	28	28	25
1024 QAM		27	27	27	24
2048 QAM		25	25	25	22

RFU-HP 2RX (1500HP)

6L&H	7	8	11
33	33	33	30
33	33	33	29
32	32	32	29
32	32	32	29
30	30	30	27
28	28	28	25
27	27	27	24
25	25	25	22

Transmit Power – RFU-E

Modulation	Channel Bandwidth (MHz)	62.5	125	250	500
BPSK		18	18	18	15
QPSK		18	18	18	15
8 QAM		18	18	16	11
16 QAM		17	17	15	10
32 QAM		17	17	15	10
64 QAM		16	16	14	9
128 QAM		16	16	14	–
256 QAM		15	15	13	–
512 QAM		14	14	–	–
1024 QAM		13	–	–	–

Note: 500 MHz is planned for future release.

Receiver Threshold (RSL) – Microwave Bands

Notes: BPSK and 4096 QAM modulations require RFU-D, RFU-D-HP, or RFU-S-UHP.

RFU-D and RFU-S

20 MHz	Frequency (GHz)	6	7-8	10	11	13	15	18	23	24	26	28-31	32	38
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
2048 QAM		-60.0	-60.0	-59.5	-60.5	-59.0	-58.5	-60.0	-59.0	-55.5	-58.5	-58.5	-58.0	-57.5
4096 QAM		-56.5	-56.5	-56.5	-57.5	-56.0	-55.5	-56.5	-56.0	-52.0	-55.5	-55.0	-55.0	-54.5
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	-54.0	-50.5	-53.5	-53.5	-53.0	-52.5
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	-53.5	-50.0	-53.0	-53.0	-53.0	-52.5

40 MHz	Frequency (GHz)	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	-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	-53.5	-49.5	-53.0	-52.5	-52.5	-52.0
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	-53.0	-52.0	-48.5	-52.0	-51.5	-51.5	-51.0
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	-51.5	-50.5	-50.0	-50.5	-50.0	-50.0	-49.5

80 MHz	Frequency (GHz)	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	-53.0

RFU-D-HP

	20 MHz			25 MHz			30 MHz			40 MHz		
Frequency (GHz)	4-5	6-8	11	4-6	7-8	11	4-6	7-8	11	4-6	7-8	11
BPSK	-94.5	-92.5	-92.5	-88.5	-87.5	-88.0	-88.5	-88.0	-88.5	-86.5	-85.5	-86.0
QPSK	-92.0	-90.0	-90.0	-87.5	-86.5	-87.0	-87.5	-87.0	-87.5	-85.5	-84.5	-85.0
8 PSK	-86.5	-84.5	-84.5	-82.5	-82.0	-82.5	-82.5	-81.5	-82.5	-80.0	-79.5	-80.0
16 QAM	-85.0	-83.5	-83.5	-80.5	-80.0	-80.5	-81.0	-80.0	-80.5	-78.5	-77.5	-78.0
32 QAM	-81.5	-79.5	-79.5	-77.5	-77.0	-77.5	-77.0	-76.5	-77.0	-74.5	-74.0	-74.5
64 QAM	-78.5	-76.5	-76.5	-74.5	-74.0	-74.5	-74.5	-73.5	-74.0	-71.5	-70.5	-71.5
128 QAM	-75.5	-73.5	-73.5	-71.5	-71.0	-71.5	-71.0	-70.5	-71.0	-68.5	-68.0	-68.5
256 QAM	-72.5	-70.5	-70.5	-68.5	-67.5	-68.5	-68.0	-67.5	-68.0	-66.0	-65.0	-66.0
512 QAM	-70.0	-68.0	-68.0	-66.0	-65.0	-66.0	-66.0	-65.5	-66.0	-63.5	-63.0	-63.5
1024 QAM	-67.5	-65.5	-65.5	-63.0	-62.5	-63.0	-63.0	-62.0	-62.5	-60.0	-59.5	-60.0
2048 QAM	-63.0	-61.0	-61.0	-58.5	-58.0	-58.5	-58.0	-57.5	-58.0	-57.0	-56.0	-56.5
4096 QAM	-60.0	-58.0	-58.0	-55.5	-55.0	-55.5	-55.0	-54.5	-55.0	-54.0	-53.0	-53.5
	50 MHz			60 MHz			80 MHz					
Frequency (GHz)	4-6	7-8	11	4-6	7-8	11	4-5	6-8	11			
BPSK	-86.5	-85.5	-86.0	-85.5	-84.5	-85.0	-88.0	-86.0	-86.0			
QPSK	-85.5	-84.5	-85.0	-84.5	-83.5	-84.0	-86.0	-84.0	-84.0			
8 PSK	-80.0	-79.5	-80.0	-79.0	-78.5	-79.0	-82.0	-80.0	-80.0			
16 QAM	-78.5	-77.5	-78.0	-77.5	-76.5	-77.0	-79.0	-77.0	-77.0			
32 QAM	-74.5	-74.0	-74.5	-73.5	-73.0	-73.5	-75.5	-73.5	-73.5			
64 QAM	-71.5	-70.5	-71.5	-70.5	-69.5	-70.5	-72.5	-70.5	-70.5			
128 QAM	-68.5	-68.0	-68.5	-67.5	-67.0	-67.5	-69.5	-67.5	-67.5			
256 QAM	-66.0	-65.0	-66.0	-65.0	-64.0	-65.0	-66.5	-64.5	-64.5			
512 QAM	-63.5	-63.0	-63.5	-62.5	-62.0	-62.5	-64.5	-62.5	-62.5			
1024 QAM	-60.0	-59.5	-60.0	-59.0	-58.5	-59.0	-61.0	-59.5	-59.5			
2048 QAM	-57.0	-56.0	-56.5	-56.0	-55.0	-55.5	-58.0	-56.0	-56.0			
4096 QAM	-54.0	-53.0	-53.5	-53.0	-52.0	-52.5	-54.0	-52.0	-52.0			

RFU-C

5 MHz	Frequency (GHz)	6	7-10	11-15	18	23	24	26	28	31-38
5 MHz										
QPSK		-98.0	-97.5	-98.0	-97.0	-96.5	-91.0	-95.5	-93.5	-94.5
16 QAM		-91.5	-91.0	-91.5	-90.5	-90.0	-84.5	-89.0	-87.0	-88.0
32 QAM		-88.0	-87.5	-88.0	-87.0	-86.5	-81.0	-85.5	-83.5	-84.5
64 QAM		-84.5	-84.0	-84.5	-83.5	-83.0	-77.5	-82.0	-80.0	-81.0
128 QAM		-81.0	-80.5	-81.0	-80.0	-79.5	-74.0	-78.5	-76.5	-77.5
256 QAM		-78.0	-77.5	-78.0	-77.0	-76.5	-71.0	-75.5	-73.5	-74.5
10 MHz										
QPSK		-93.5	-93.0	-93.5	-92.5	-92.0	-89.0	-91.0	-89.0	-90.0
8 PSK		-88.5	-88.0	-88.5	-87.5	-87.0	-84.0	-86.0	-84.0	-85.0
16 QAM		-87.5	-87.0	-87.5	-86.5	-86.0	-83.0	-85.0	-83.0	-84.0
32 QAM		-84.0	-83.5	-84.0	-83.0	-82.5	-79.5	-81.5	-79.5	-80.5
64 QAM		-80.5	-80.0	-80.5	-79.5	-79.0	-76.0	-78.0	-76.0	-77.0
128 QAM		-77.5	-77.0	-77.5	-76.5	-76.0	-73.0	-75.0	-73.0	-74.0
256 QAM		-74.5	-74.0	-74.5	-73.5	-73.0	-70.0	-72.0	-70.0	-71.0
512 QAM		-72.0	-71.5	-72.0	-71.0	-70.5	-67.5	-69.5	-67.5	-68.5
1024 QAM Strong		-69.0	-68.5	-69.0	-68.0	-67.5	-64.5	-66.5	-64.5	-65.5
1024 QAM Light		-68.0	-67.5	-68.0	-67.0	-66.5	-63.5	-65.5	-63.5	-64.5
20 MHz										
QPSK		-90.5	-90.0	-90.5	-89.5	-89.0	-86.0	-88.0	-86.0	-87.0
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		-61.5	-61.0	-61.5	-60.5	-60.0	-57.0	-59.0	-57.0	-58.0
25 MHz										
QPSK		-90.0	-89.5	-90.0	-89.0	-88.5	-83.0	-87.5	-85.5	-86.5
8 PSK		-84.5	-84.0	-84.5	-83.5	-83.0	-77.5	-82.0	-80.0	-81.0
16 QAM		-83.0	-82.5	-83.0	-82.0	-81.5	-76.0	-80.5	-78.5	-79.5
32 QAM		-79.5	-79.0	-79.5	-78.5	-78.0	-72.5	-77.0	-75.0	-76.0
64 QAM		-76.5	-76.0	-76.5	-75.5	-75.0	-69.5	-74.0	-72.0	-73.0
128 QAM		-73.5	-73.0	-73.5	-72.5	-72.0	-66.5	-71.0	-69.0	-70.0
256 QAM		-70.5	-70.0	-70.5	-69.5	-69.0	-63.5	-68.0	-66.0	-67.0
512 QAM		-68.0	-67.5	-68.0	-67.0	-66.5	-61.0	-65.5	-63.5	-64.5
1024 QAM Strong		-65.0	-64.5	-65.0	-64.0	-63.5	-58.0	-62.5	-60.5	-61.5
1024 QAM Light		-64.5	-64.0	-64.5	-63.5	-63.0	-57.5	-62.0	-60.0	-61.0
2048 QAM		-60.5	-60.0	-60.5	-59.5	-59.0	-53.5	-58.0	-56.0	-57.0

30 MHz	Frequency (GHz)	6	7-10	11-15	18	23	24	26	28	31-38
QPSK		-89.0	-88.5	-89.0	-88.0	-87.5	-82.0	-86.5	-84.5	-85.5
8 PSK		-83.5	-83.0	-83.5	-82.5	-82.0	-76.5	-81.0	-79.0	-80.0
16 QAM		-82.0	-81.5	-82.0	-81.0	-80.5	-75.0	-79.5	-77.5	-78.5
32 QAM		-78.5	-78.0	-78.5	-77.5	-77.0	-71.5	-76.0	-74.0	-75.0
64 QAM		-75.5	-75.0	-75.5	-74.5	-74.0	-68.5	-73.0	-71.0	-72.0
128 QAM		-72.5	-72.0	-72.5	-71.5	-71.0	-65.5	-70.0	-68.0	-69.0
256 QAM		-69.5	-69.0	-69.5	-68.5	-68.0	-62.5	-67.0	-65.0	-66.0
512 QAM		-67.5	-67.0	-67.5	-66.5	-66.0	-60.5	-65.0	-63.0	-64.0
1024 QAM Strong		-64.0	-63.5	-64.0	-63.0	-62.5	-57.0	-61.5	-59.5	-60.5
1024 QAM Light		-63.0	-62.5	-63.0	-62.0	-61.5	-56.0	-60.5	-58.5	-59.5
2048 QAM		-59.5	-59.0	-59.5	-58.5	-58.0	-55.0	-57.0	-55.0	-56.0
40 MHz										
QPSK		-87.5	-87.0	-87.5	-86.5	-86.0	-80.5	-85.0	-83.0	-84.0
8 PSK		-82.5	-82.0	-82.5	-81.5	-81.0	-75.5	-80.0	-78.0	-79.0
16 QAM		-81.0	-80.5	-81.0	-80.0	-79.5	-74.0	-78.5	-76.5	-77.5
32 QAM		-77.5	-77.0	-77.5	-76.5	-76.0	-70.5	-75.0	-73.0	-74.0
64 QAM		-74.5	-74.0	-74.5	-73.5	-73.0	-67.5	-72.0	-70.0	-71.0
128 QAM		-71.5	-71.0	-71.5	-70.5	-70.0	-64.5	-69.0	-67.0	-68.0
256 QAM		-69.0	-68.5	-69.0	-68.0	-67.5	-62.0	-66.5	-64.5	-65.5
512 QAM		-66.5	-66.0	-66.5	-65.5	-65.0	-59.5	-64.0	-62.0	-63.0
1024 QAM Strong		-63.5	-63.0	-63.5	-62.5	-62.0	-56.5	-61.0	-59.0	-60.0
1024 QAM Light		-62.5	-62.0	-62.5	-61.5	-61.0	-55.5	-60.0	-58.0	-59.0
2048 QAM		-59.0	-58.5	-59.0	-58.0	-57.5	-52.0	-56.5	-54.5	-55.5
50 MHz										
QPSK		-87.0	-86.5	-87.0	-86.0	-85.5	-80.0	-84.5	-82.5	-83.5
8 PSK		-81.5	-81.0	-81.5	-80.5	-80.0	-74.5	-79.0	-77.0	-78.0
16 QAM		-80.0	-79.5	-80.0	-79.0	-78.5	-73.0	-77.5	-75.5	-76.5
32 QAM		-76.5	-76.0	-76.5	-75.5	-75.0	-69.5	-74.0	-72.0	-73.0
64 QAM		-73.0	-72.5	-73.0	-72.0	-71.5	-66.0	-70.5	-68.5	-69.5
128 QAM		-71.0	-70.5	-71.0	-70.0	-69.5	-64.0	-68.5	-66.5	-67.5
256 QAM		-67.5	-67.0	-67.5	-66.5	-66.0	-60.5	-65.0	-63.0	-64.0
512 QAM		-65.0	-64.5	-65.0	-64.0	-63.5	-58.0	-62.5	-60.5	-61.5
1024 QAM Strong		-62.0	-61.5	-62.0	-61.0	-60.5	-55.0	-59.5	-57.5	-58.5
1024 QAM Light		-61.0	-60.5	-61.0	-60.0	-59.5	-54.0	-58.5	-56.5	-57.5
2048 QAM		-57.5	-57.0	-57.5	-56.5	-56.0	-50.5	-55.0	-53.0	-54.0
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	-65.5	-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	-59.5	-64.0	-62.0	-63.0
512 QAM		-64.5	-64.0	-64.5	-63.5	-63.0	-57.5	-62.0	-60.0	-61.0
1024 QAM Strong		-61.0	-60.5	-61.0	-60.0	-59.5	-54.0	-58.5	-56.5	-57.5
1024 QAM Light		-61.0	-60.5	-61.0	-60.0	-59.5	-54.0	-58.5	-56.5	-57.5
2048 QAM		-57.0	-56.5	-57.0	-56.0	-55.5	-50.0	-54.5	-52.5	-53.5

RFU-HP

Frequency (GHz)	5 MHz			10 MHz			20 MHz			25 MHz			30 MHz		
	4-6	7-8	11	4-6	7-8	11	4-6	7-8	11	4-6	7-8	11	4-6	7-8	11
QPSK	-97.5	-97.0	-96.5	-93.0	-92.5	-92.5	-90.0	-89.5	-89.5	-89.5	-89.0	-89.0	-88.5	-88.0	-88.0
8 PSK	-	-	-	-88.0	-87.5	-87.5	-85.0	-84.5	-84.5	-84.0	-83.5	-83.5	-83.5	-83.0	-83.0
16 QAM	-91.0	-90.5	-90.0	-86.5	-86.0	-86.0	-83.5	-83.0	-83.0	-82.5	-82.0	-82.0	-81.5	-81.0	-81.0
32 QAM	-87.5	-87.0	-86.5	-83.0	-82.5	-82.5	-80.0	-79.5	-79.5	-79.0	-78.5	-78.5	-78.0	-77.5	-77.5
64 QAM	-84.0	-83.5	-83.0	-80.0	-79.5	-79.5	-77.0	-76.5	-76.5	-76.0	-75.5	-75.5	-75.0	-74.5	-74.5
128 QAM	-80.5	-80.0	-79.5	-76.5	-76.0	-76.0	-74.0	-73.5	-73.5	-73.0	-72.5	-72.5	-72.0	-71.5	-71.5
256 QAM	-77.5	-77.0	-76.5	-73.5	-73.0	-73.0	-71.0	-70.5	-70.5	-70.0	-69.5	-69.5	-69.0	-68.5	-68.5
512 QAM	-	-	-	-71.0	-70.5	-70.5	-68.5	-68.0	-68.0	-67.5	-67.0	-67.0	-67.0	-66.5	-66.5
1024 QAM Strong	-	-	-	-68.0	-67.5	-67.5	-65.5	-65.0	-65.0	-64.5	-64.0	-64.0	-63.5	-63.0	-63.0
1024 QAM Light	-	-	-	-67.5	-67.0	-67.0	-64.5	-64.0	-64.0	-64.0	-63.5	-63.5	-63.0	-62.5	-62.5
2048 QAM	-	-	-	-	-	-	-61.0	-60.5	-60.5	-60.0	-59.5	-59.5	-59.5	-59.0	-59.0
Frequency (GHz)	40 MHz			50 MHz			60 MHz								
	4-6	7-8	11	4-6	7-8	11	4-6	7-8	11	4-6	7-8	11	4-6	7-8	11
QPSK	-87.0	-86.5	-86.5	-86.5	-86.0	-	-85.5	-85.0	-	-	-	-	-	-	-
8 PSK	-82.0	-81.5	-81.5	-81.0	-80.5	-	-81.0	-80.5	-	-	-	-	-	-	-
16 QAM	-80.5	-80.0	-80.0	-79.5	-79.0	-	-78.5	-78.0	-	-	-	-	-	-	-
32 QAM	-77.0	-76.5	-76.5	-76.0	-75.5	-	-75.0	-74.5	-	-	-	-	-	-	-
64 QAM	-74.0	-73.5	-73.5	-72.5	-72.0	-	-72.0	-71.5	-	-	-	-	-	-	-
128 QAM	-71.0	-70.5	-70.5	-70.5	-70.0	-	-69.0	-68.5	-	-	-	-	-	-	-
256 QAM	-68.5	-68.0	-68.0	-67.0	-66.5	-	-66.0	-65.5	-	-	-	-	-	-	-
512 QAM	-66.0	-65.5	-65.5	-64.5	-64.0	-	-64.0	-63.5	-	-	-	-	-	-	-
1024 QAM Strong	-63.0	-62.5	-62.5	-61.5	-61.0	-	-60.5	-60.0	-	-	-	-	-	-	-
1024 QAM Light	-62.0	-61.5	-61.5	-60.5	-60.0	-	-60.5	-60.0	-	-	-	-	-	-	-
2048 QAM	-58.5	-58.0	-58.0	-57.0	-56.5	-	-56.5	-56.0	-	-	-	-	-	-	-

1500HP

Frequency (GHz)	10 MHz			20 MHz			25 MHz			30 MHz			40 MHz		
	4-6	7-8	11	4-6	7-8	11	4-6	7-8	11	4-6	7-8	11	4-6	7-8	11
QPSK	-92.5	-92.5	-92.5	-89.5	-89.5	-89.5	-89.0	-89.0	-89.0	-88.0	-88.0	-88.0	-86.5	-86.5	-86.5
8 PSK	-87.5	-87.5	-87.5	-84.5	-84.5	-84.5	-83.5	-83.5	-83.5	-83.0	-83.0	-83.0	-81.5	-81.5	-81.5
16 QAM	-86.0	-86.0	-86.0	-83.0	-83.0	-83.0	-82.0	-82.0	-82.0	-81.0	-81.0	-81.0	-80.0	-80.0	-80.0
32 QAM	-82.5	-82.5	-82.5	-79.5	-79.5	-79.5	-78.5	-78.5	-78.5	-77.5	-77.5	-77.5	-76.5	-76.5	-76.5
64 QAM	-79.5	-79.5	-79.5	-76.5	-76.5	-76.5	-75.5	-75.5	-75.5	-74.5	-74.5	-74.5	-73.5	-73.5	-73.5
128 QAM	-76.0	-76.0	-76.0	-73.5	-73.5	-73.5	-72.5	-72.5	-72.5	-71.5	-71.5	-71.5	-70.5	-70.5	-70.5
256 QAM	-73.0	-73.0	-73.0	-70.5	-70.5	-70.5	-69.5	-69.5	-69.5	-68.5	-68.5	-68.5	-68.0	-68.0	-68.0
512 QAM	-70.5	-70.5	-70.5	-68.0	-68.0	-68.0	-67.0	-67.0	-67.0	-66.5	-66.5	-66.5	-65.5	-65.5	-65.5
1024 QAM Strong	-67.5	-67.5	-67.5	-65.0	-65.0	-65.0	-64.0	-64.0	-64.0	-63.0	-63.0	-63.0	-62.5	-62.5	-62.5
1024 QAM Light	-67.0	-67.0	-67.0	-64.0	-64.0	-64.0	-63.5	-63.5	-63.5	-62.5	-62.5	-62.5	-61.5	-61.5	-61.5
2048 QAM	-	-	-	-60.5	-60.5	-60.5	-59.5	-59.5	-59.5	-59.0	-59.0	-59.0	-58.0	-58.0	-58.0

RFU-A, RFU-Ae, RFU-Aep

	5 MHz			10 MHz			20 MHz			25 MHz		
Frequency (GHz)	5.8	6	7-11	5.8	6	7-11	5.8	6	7-11	5.8	6	7-11
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
	30 MHz			40 MHz			50 MHz			60 MHz		
Frequency (GHz)	5.8	6	7-11	5.8	6	7-11	5.8	6	7-11	5.8	6	7-11
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

Receiver Threshold (RSL) – RFU-E

Channel Bandwidth (MHz)	62.5	125	250	500
BPSK	-83.0	-80.0	-77.0	-74.0
QPSK	-79.5	-76.5	-73.5	-70.5
8 QAM	-75.5	-72.5	-70.0	-67.0
16 QAM	-73.0	-69.5	-67.0	-64.0
32 QAM	-69.0	-66.0	-63.0	-60.0
64 QAM	-66.0	-63.0	-60.0	-57.0
128 QAM	-63.0	-60.0	-57.0	-
256 QAM	-59.5	-57.0	-54.0	-
512 QAM	-57.0	-54.0	-	-
1024 QAM	-54.0	-	-	-

Note: 500 MHz is planned for future release.

Feature availability and specifications are subject to change without prior notification.