

FibeAir IP-20F

High-availability, split-mount multicore aggregation node

FibeAir IP-20F is a split-mount edge node that delivers multi-Gbps radio capacity to the transport network. It provides operators with the simplicity that comes with deploying a very compact, fixed configuration node, helping operators to meet their operational efficiency targets. The IP-20F's fixed configuration simplifies installation, spare part management and maintenance. What's more, its passive cooling design suits harsh environments, increases reliability and minimizes ambient noise.

FibeAir IP-20F operates with a variety of high capacity, multicore, standard and high power RF units, offering high spectral efficiency across licensed and license-exempt frequency bands (4-86GHz).

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.

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

Radio Interfaces

Two combo radio interfaces

An additional interface that can be configured as a radio interface or a 2.5/1 GbE interface*

Radio Configurations

1+0, 3 x 1+0, 2 x 2+0, 2 x 2+0 + 1+0, 1+1 HSB[†], 2+2 HSB[†]

2+0 Multi-Carrier ABC

Radio Features

Multi-Carrier Adaptive Bandwidth Control

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: 500 MHz channels are planned for future release.

XPIC

Diversity: HSB, SD (BBS)[†]

Field Replaceable Diplexers/ Field Replaceable Channel Filters

Ethernet

Ethernet Interfaces

Four 1 GbE combo interfaces (RJ-45/SFP)

One 2.5/1 GbE combo interface (RJ-45/SFP)*

An additional interface that can be configured as a radio interface or a 2.5/1 GbE interface*

Management Interfaces – 2 x 10/100 Base-T (RJ-45)

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

* For information on interface availability, refer to the Release Notes for the CeraOS version you are using.

† Planned for future release.

TDM

TDM Interfaces

16 x E1

TDM Features

XC capacity – 256 VCs

Timing options – Loop timing, system clock, recovered clock

1+1 / 1:1 path protection

Synchronization

Synchronization Distribution

Sync Distribution over any Ethernet traffic interface

Dedicated In/Out synch interface (E1+/2 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)

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 E1 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

TDM Pseudowire Standards

SAToP – RFC 4553

Security

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:

- RFU-D: IP67
- RFU-D-HP: IP67
- RFU-E: IP67
- RFU-S: IP67

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

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

Technical Specifications

Mechanical Specifications

IDU – 44mm(H), 482mm(W), 165mm(D), 2.4 kg

RFU-D – 230mm(H), 233mm(W), 98mm(D), 6.5kg

RFU-D-HP– 319mm(H), 286mm(W), 107mm(D), 12kg

RFU-E – 220mm(H), 198mm(W), 75mm(D), 3kg

RFU-S – 217mm(H), 210mm(W), 85mm(D), 4kg

Environmental Specifications

IDU: -5° to +55°C (-15°C to +60°C extended);

RFU: -33°C to +55°C (-45°C to +60°C extended)

Power Input Specifications

IDU Standard Input: -48 VDC

IDU DC Input range: -40 to -60 VDC

Dual-feed power support

Power Consumption Specifications

IDU: 48W maximum

RFU-D – 75W

RFU-D-HP – 130W/180W

RFU-E – 43W

RFU-S – 43W

Product Images

IDU



Radio Units

RFU-D



RFU-D-HP



RFU-E



RFU-S



Radio Specifications

Capacity and Maximum Number of E1s – Microwave Bands

Notes: 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 E1s	Capacity (Mbps)	Capacity De-Dup	Max. No. of E1s	Capacity (Mbps)	Capacity De-Dup	Max. No. of E1s
Modulation	14 MHz			28 MHz			40 MHz		
BPSK	9-11	10-36	4	21-25	22-81	9	28-35	30-111	12
QPSK	19-24	20-76	8	43-52	45-167	18	58-70	61-226	24
8 QAM	29-36	31-115	12	62-76	65-243	26	86-105	90-337	36
16 QAM	40-49	42-158	17	87-107	92-342	37	117-143	123-459	50
32 QAM	53-65	56-209	23	115-140	121-450	49	154-189	162-605	65
64 QAM	66-80	69-257	28	141-173	149-554	60	190-232	199-743	80
128 QAM	79-97	83-310	33	170-208	179-667	72	229-280	241-899	97
256 QAM	90-110	95-354	38	196-239	206-767	83	247-301	259-966	104
512 QAM	100-122	105-391	42	209-255	219-818	88	270-330	284-1059	114
1024 QAM Strong	106-129	111-414	45	228-278	239-892	96	306-375	322-1201	130
1024 QAM Light	112-137	118-439	47	241-295	253-945	102	325-398	342-1275	138
2048 QAM	–	–	–	263-321	276-1031	111	352-430	370-1379	149
4096 QAM	–	–	–	280-342	294-1097	118	369-451	388-1445	156
	56 MHz			80 MHz			112 MHz		
BPSK	43-52	45-168	18	57-69	59-222	24	83-101	87-324	35
QPSK	87-106	91-340	37	114-140	120-448	48	166-203	175-652	70
8 QAM	127-155	133-496	54	162-198	171-636	69	247-302	260-968	104
16 QAM	176-215	185-689	74	231-283	243-906	98	336-410	353-1316	142
32 QAM	232-283	243-907	98	304-371	319-1190	128	442-540	464-1731	187
64 QAM	284-348	299-1114	120	371-454	390-1456	157	542-663	570-2000	229
128 QAM	344-420	361-1347	145	439-536	461-1720	186	655-801	688-2000	277
256 QAM	397-485	417-1554	168	505-618	531-1980	214	749-915	787-2000	317
512 QAM	426-521	448-1671	180	555-679	583-2000	235	813-994	854-2000	344
1024 QAM Strong	464-567	487-1817	196	604-738	635-2000	255	882-1078	927-2000	373
1024 QAM Light	493-602	518-1931	208	641-784	674-2000	271	936-1144	984-2000	396
2048 QAM	534-653	561-2000	226	679-829	713-2000	287	1010-1234	1061-2000	427

Capacity and Maximum Number of E1s – RFU-E

	Capacity (Mbps)	Capacity De-Dup	Max. No. of E1s	Capacity (Mbps)	Capacity De-Dup	Max. No. of E1s
Modulation	14 MHz			28 MHz		
BPSK	9-11	10-36	3	20-26	21-70	8
QPSK	19-24	20-76	8	43-52	45-162	17
8 QAM	29-36	31-115	12	62-76	65-236	24
16 QAM	–	–	–	87-107	92-332	35
32 QAM	–	–	–	115-140	121-437	46
64 QAM	–	–	–	141-173	149-538	56
128 QAM	–	–	–	170-208	179-648	68
256 QAM	–	–	–	196-239	206-745	78
512 QAM	–	–	–	209-255	219-794	83
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	42
BPSK - 8 PSK		28	28	28	29	27	24	22	25	0	21	18	15
16 QAM		28	27	27	29	26	24	22	25	0	20	17	14
32 QAM		27	27	26	29	25	24	22	24	0	19	16	13
64 QAM		27	26	26	27	24	24	22	22	0	19	16	13
128 QAM		27	26	26	26	23	24	22	21	0	19	16	13
256 QAM		27	26	26	25	22	22	20	18	0	17	14	11
512 QAM		25	25	24	25	22	22	20	18	0	17	14	11
1024 QAM		25	24	24	24	20	20	20	17	0	16	13	10
2048 QAM		23	23	22	23	19	20	18	16	0	15	12	9
4096 QAM		21	21	20	21	17	18	16	–	–	–	–	–

RFU-D-HP

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

RFU-S

Modulation	Frequency (GHz)	6	7	8	11	13	15	18	23	24	26	28-38	42
BPSK - 8 PSK		28	28	28	28	27	24	22	25	0	21	18	15
16 QAM		28	27	27	28	26	24	22	25	0	20	17	14
32 QAM		27	26	26	28	25	24	22	24	0	19	16	13
64 QAM		27	26	26	27	24	23	21	22	0	19	16	13
128 QAM		27	26	26	27	23	23	21	21	0	19	16	13
256 QAM		27	26	24	27	22	22	20	18	0	17	14	11
512 QAM		25	24	24	27	22	22	19	18	0	17	14	11
1024 QAM		25	24	24	25	20	20	18	17	0	16	13	10
2048 QAM		23	22	22	24	19	20	17	16	0	15	12	9
4096 QAM		21	20	20	22	17	18	15	–	–	–	–	–

Transmit Power – RFU-E

Modulation	Channel Bandwidth (MHz)	14	28	62.5	125	250	500
BPSK - QPSK		18	18	18	18	18	15
8 QAM		18	18	18	18	16	11
16 QAM		–	17	17	17	15	10
32 QAM		–	17	17	17	15	10
64 QAM		–	16	16	16	14	9
128 QAM		–	16	16	16	14	–
256 QAM		–	15	15	15	13	–
512 QAM		–	14	14	14	–	–
1024 QAM		–	–	13	–	–	–

Note: 500 MHz is planned for future release.

Receiver Threshold (RSL) – Microwave Bands

RFU-D and RFU-S

14 MHz	Frequency (GHz)	6	7-8	10	11	13	15	18	23	24	26	28-31	32	38	42
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	-88.5
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	-87.5
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	-81.5
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	-80.5
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	-77.0
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	-74.0
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	-71.0
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	-68.0
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	-65.5
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	-62.5
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	-61.5
28 MHz															
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	-85.5
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	-84.5
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	-80.0
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	-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	-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	-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	-68.0
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	-65.0
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	-62.5
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	-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	-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	-55.5
4096 QAM		-55.5	-55.0	-54.5	-55.5	-54.0	-53.5	-55.0	–	–	–	–	–	–	–
40 MHz															
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	-84.0
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	-83.0
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	-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	-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	-72.5
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	-69.5
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	-66.5
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	-63.5
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	-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	-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	-57.5
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	-54.5
4096 QAM		-55.0	-54.0	-54.0	-55.0	-53.5	-53.0	-54.0	–	–	–	–	–	–	–

56 MHz	Frequency (GHz)	6	7-8	10	11	13	15	18	23	24	26	28-31	32	38	42
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	-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	-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	-76.5
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	-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	-70.5
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	-67.5
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	-64.5
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	-61.5
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	-59.5
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	-56.0
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	-55.0
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	-52.0
4096 QAM		-52.5	-51.5	-51.5	-52.0	-51.0	-50.5	-51.5	–	–	–	–	–	–	–
80 MHz															
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	-82.5
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	-80.0
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	-76.5
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	-73.5
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	-70.0
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	-66.5
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	-64.0
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	-61.0
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	-58.5
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	-55.5
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	-54.5
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															
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	-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	-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	-73.0
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	-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	-67.0
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	-64.0
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	-61.0
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	-58.0
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	-56.0
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	-52.5
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	-51.5
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	–	–

RFU-D-HP

	28 MHz		40 MHz		56 MHz	
Frequency (GHz)	4-6	7-11	4-6	7-11	4-6	7-11
BPSK	-92.0	-91.5	-90.5	-90.0	-88.5	-88.0
QPSK	-90.0	-89.5	-88.5	-88.0	-86.5	-86.0
8 PSK	-85.5	-85.0	-83.5	-83.0	-82.5	-82.0
16 QAM	-83.5	-83.0	-82.0	-81.5	-80.0	-79.5
32 QAM	-80.0	-79.5	-78.5	-78.0	-77.0	-76.5
64 QAM	-77.0	-76.5	-75.5	-75.0	-73.5	-73.0
128 QAM	-74.0	-73.5	-72.5	-72.0	-71.0	-70.5
256 QAM	-71.0	-70.5	-69.5	-69.0	-67.5	-67.0
512 QAM	-68.5	-68.0	-66.5	-66.0	-65.5	-65.0
1024 QAM Strong	-65.5	-65.0	-64.0	-63.5	-62.0	-61.5
1024 QAM Light	-64.5	-64.0	-63.0	-62.5	-61.0	-60.5
2048 QAM	-61.0	-60.5	-60.5	-60.0	-56.5	-56.0
4096 QAM	-59.0	-58.5	-58.5	-58.0	-54.5	-54.0

	80 MHz		112 MHz	
Frequency (GHz)	4-5	6-11	4-6	7-11
BPSK	-88.0	-86.0	-82.5	-82.0
QPSK	-86.0	-84.0	-80.5	-80.0
8 PSK	-82.0	-80.0	-76.5	-76.0
16 QAM	-79.0	-77.0	-74.0	-73.5
32 QAM	-75.5	-73.5	-71.0	-70.5
64 QAM	-72.5	-70.5	-67.5	-67.0
128 QAM	-69.5	-67.5	-65.0	-64.5
256 QAM	-66.5	-64.5	-61.5	-61.0
512 QAM	-64.5	-62.5	-59.5	-59.0
1024 QAM Strong	-61.0	-59.5	-56.0	-55.5
1024 QAM Light	-60.5	-58.5	-55.0	-54.5
2048 QAM	-58.0	-56.0	-50.5	-50.0

Receiver Threshold (RSL) – RFU-E

Channel Bandwidth (MHz)	14	28	62.5	125	250	500
BPSK	-90.5	-87.5	-83.0	-80.0	-77.0	-74.0
QPSK	-87.2	-84.6	-79.5	-76.5	-73.5	-70.5
8 QAM	-83.1	-80.6	-75.5	-72.5	-70.0	-67.0
16 QAM	–	-77.4	-73.0	-69.5	-67.0	-64.0
32 QAM	–	-73.9	-69.0	-66.0	-63.0	-60.0
64 QAM	–	-70.8	-66.0	-63.0	-60.0	-57.0
128 QAM	–	-67.6	-63.0	-60.0	-57.0	–
256 QAM	–	-64.6	-59.5	-57.0	-54.0	–
512 QAM	–	-62.4	-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.