

Phoenix G2/G2+

DATASHEET



V.1.11

Phoenix G2 split mount system is designed to fit in a classic telecom architecture with a radio located outdoors (or indoors) and a sheltered indoor unit. It's IDU is available in modular half rack version (Phoenix G2) and full rack 2U fanless version with front panel monitor and optionally integrated ASI or E1/T1 ports (Phoenix G2+). All SAF's Phoenix G2 series radios are compatible with both G2 and G2+ IDU versions.

TECHNICAL SPECIFICATION

G2

G2+

General

Form factor	Split Mount (IDU + ODU) or Full indoor (IDU + IRFU)		
Frequency bands	2GHz, 2.3 GHz FCC, U4GHz, L6GHz, U6GHz, 7GHz, 8GHz, 11GHz, 13GHz, 15GHz 18GHz, 23GHz, 26GHz*, 38GHz		
Capacity	Up to 1 Gbps in 2+0 aggregation mode		
Max modulation	1024 QAM		
Configurations	1+0, 1+1 HSB/SD/FD, 1+0 Dual, 1+0 Star (Repeater), 2+0 (Layer 1 aggregation), 2+0 XPIC*, 2+2 aggregation/protection (with two IDUs) **		
ACM and ATPC	Yes		
Channel bandwidth	ETSI	from 3.5 MHz, up to 56 MHz	
	FCC	from 5 MHz, up to 60 MHz***	
Modifications	IDU with external extension modules (up to 4x ASI and/or E1/T1 modules)	IDU w/o extensions, IDU w 4x ASI, IDU w 8x ASI, IDU w 16E1/T1, IDU w 4x ASI and 16E1/T1. More extension modules can be added externally (two to four depending on HW modification)	

Ports

Ethernet traffic	RJ-45	3x 10/100/1000 Base-T for traffic and/or management access	
	SFP	4x 1000Base-SX/LX for traffic, 2x also work as Extension/Protection ports up to 8x unbalanced, 75 ohm native ASI channels for ASI I/O	
ASI (optional)	BNC	Available on external extension module	up to 16x G.703-E1 balanced 120ohm for E1mode; G.703-E1 unbalanced 75 ohm for E1 mode; T1.102-T1/100 ohm for T1 mode
E1/T1 (optional)	RJ-45	Available on external extension module	1x 1000Base-SX (proprietary GigE protocol) for embedded ASI and/or E1/T1 module connection
IDU <-> ASI/E1/T1 jumper connection (if applicable)	SFP	Available on external extension module	1x 1000Base-SX (proprietary GigE protocol) for additional ASI and/or E1/T1 module connection
Additional module connection (if applicable)	SFP	Available on external extension module	1x 10/100/1000Base-T
Outband Ethernet Management Access	RJ-45	1x 10/100/1000Base-T	
Serial port for configuration	USB Mini-B	USB Mini-B (alternative IP port)	
Flash memory port	USB-A	1x for log files export	
Display service port	USB Mini-B	-	1x for display maintenance
ODU port	2x N-Type Female	2x for radio connection	
DC power port	Single block 4 pole	1x for input power source connection	

*Please contact SAF sales representative for more information

**Not available with Phoenix G2 V ODU

*** 80MHz BW available on request. Please contact SAF

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Ethernet

Switch type	Managed Gigabit Ethernet Layer 2
Max frame size	64 to 2048 bytes, up to 10240 bytes for Jumbo mode
MAC table	8192 entries; automatic learning and aging
Packet buffer	0.125 MB , non-blocking store&forward
Flow control	802.3x
VLAN support	802.1Q, up to 4096 VLANs
QinQ (Double tagging)	Yes, transparent
QoS	IPv4 64 level DiffServ (DSCP) or 8 level 802.1p mapped in 4 prioritization queues with VLAN support, IPv6 Traffic Class
Synchronization	PTP 1588v2***
Encryption	AES128/256***

Management features

Protocols	via WEB GUI (HTTP****/HTTPS), CLI (Telnet/SSH), NMS (SNMP v1 (traps only)/v2c/v3), Serial interface (USB IP port)
Access	In-band (via port grouping) Out-of-band
SNMP Element	Yes, SNMP traps, MIB, SNMP v1/v2c/3
Management System (EMS)	Web based, HTTP****/HTTPS
Performance monitoring	Received signal spectrum, constellation diagram, performance graphs, counters and event logs

Mechanical and electrical

Temperature Range / Humidity	-5 °C to +45 °C / 23 °F to 113 °F / 0% to 95%	
Cooling	3-mode Fans built-in: On, Off, Auto (controlled by internal temperature)	Fanless
Dimensions: HxWxD	½ width 1U (44 x 220 x 240 mm) / (1.73 x 8.66x 9.45 in)	19" 2U (90 x 430 x 265 mm) / (3.54 x 16.93 x 10.43 in)
Weight	2.2 kg / 4.9 lb	<5.3 kg / 11.7 lb
Max power consumption	IDU only: <30W IDU + 2xODU: <180W	IDU only w/o ASI or E1/T1: <30W, 4xASI: <9W, 16xE1/T1: <9W. IDU + 2xODU: < IDU + <150W
IDU-ODU connection	Maximum permissible IF cable attenuation at frequency 350 MHz = 15dB, N-Type connectors	
DC port	Nominal voltage -48V DC (-40.5V to -57V DC, conforms to ETSI EN 300 132-2)	

***Phoenix G2/G2+ is FIPS 197 (Federal Information Processing Standards) validated and placed on validated product list, Validation No.: A3040
<https://csrc.nist.gov/projects/cryptographic-algorithm-validation-program/validation-search>. AES and PTP1588v2 are licensed features
****HTTP will be automatically redirected to HTTPS

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IDU compliance

Operation	ETSI EN 300 019, Part 1-3, Class 3.2
Storage	ETSI EN 300 019, Part 1-1, Class 1.2
Transportation	ETSI EN 300 019, Part 1-2, Class 2.3
Power	EN 300 132-2
Radio frq., IDU+ODU	EN 302 217-2
EMC	EN 301 489-1, EN 301 489-4
Safety	EN 60950-1, EN 62368-1



PHOENIX G2/G2+ IDU EXTERNAL MODULES

ASI extension module



General

4x ASI	Native ASI channels, no IP Encapsulation. Unbalanced, 75 ohm
Scalability	Cascading up to four (total) modules

Ports

IDU connection	1x SFP port 1000Base-SX (proprietary GigE protocol)
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Connection to next external module	1x SFP port 1000Base-SX (proprietary GigE protocol)
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ASI ports	4x BNC
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DC port	Industrial power connector
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Mechanical & electrical

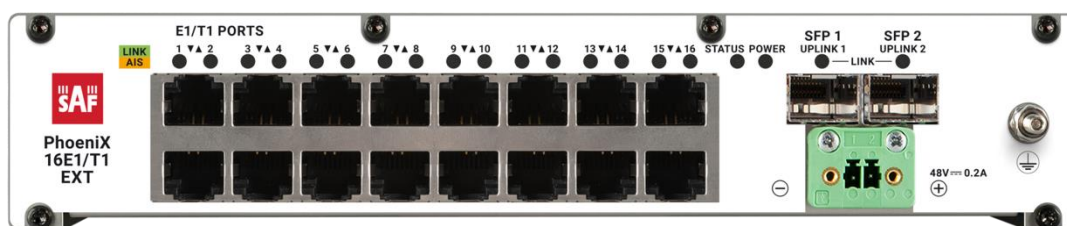
Dimensions: HxWxD	½ width 1U (45 x 210 x 240 mm) / (1.77 x 8.27 x 9.45 in)
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Weight	1.3 kg / 2.87 lb
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Max power consumption	ASI module: <9 W
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DC port	Nominal voltage: -24V DC or -48V DC (-20V to -57V DC)
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E1/T1 EXTENSION MODULE



General

16x E1/T1	G.703-E1 balanced 120 ohm for E1 mode G.703-E1 unbalanced 75 ohm for E1 mode T1.102-T1/100 ohm for T1 mode
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Scalability	Cascading up to four (total) modules
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Ports

IDU connection	1x SFP port 1000Base-SX (proprietary GigE protocol)
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Connection to next external module	1x SFP port 1000Base-SX (proprietary GigE protocol)
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E1/T1 ports	16x RJ-45
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DC port	Industrial power connector
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Mechanical & electrical

Dimensions: HxWxD	½ width 1U (45 x 210 x 240 mm) / (1.77 x 8.27 x 9.45 in)
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Weight	1.3 kg / 2.87 lb
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Max power consumption	E1/T1 module: <9 W
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DC port	Nominal voltage: -24V DC or -48V DC (-20V to -57V DC)
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PHOENIX G2 ODU AND IRFU

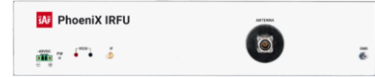
General parameters



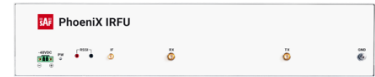
SP/HP ODU



VHP ODU



IRFU (A)



IRFU (B)

Ports	SP ODU	HP ODU	VHP ODU	IRFU
Antenna	N-Type or flange			A) N-Type or flange B) SMA Tx and Rx ports
IF to IDU	N-Type			SMA
RSSI	BNC			2-port for multi-meter
Power	Over IF port			2-pin power port (alternative to IF port)
Mechanical & Electrical				
Operational use	Conforms to ETSI EN 300 019 Class 4.1. IP67. NEMA 6		Conforms to ETSI EN 300 019 Class 4.1. IP66. NEMA 4	Conforms to ETSI EN 300 019 Class 3.1E. IP20. NEMA 1
Temperature range	-33°C to +55°C			-5°C to +55°C
Dimensions: HxWxD / weight	288x288x80 mm / 3.5 kg		280x437x110 mm / 7.5 kg	19" 2U rack 90x430x260 / 5.8 kg
IF port surge protection	Conforms to ETSI EN 301 489-1; EN 61000-4-5; IEC 61000-4-5			
Frequency stability	+/- 10 ppm			
Input DC voltage	-40.5V to -57V DC (conforms to ETSI EN 300 132-2)			
Max power consumption	13-27 W	21-39 W	39-75 W	SP: 13-27 W; HP: 21-39 W; VHP: 39-75 W

G2 ODU and IRFU waveguide flange sizes

	2 GHz	U4 GHz	L6, U6 GHz	7, 8 GHz	10, 11 GHz	13 GHz	15 GHz	18, 23 GHz	26 GHz	38 GHz
ODU SP and HP	-	N-type	N-type	SAF2R	SAF2R	SAF2R	SAF2	SAF2	SAF2	SAF2
ODUVHP	N-type		SAF2R	SAF2R	SAF2R	SAF2R	-	SAF2	-	-
IRFU (w/o diplexer)	2xSMA Rx / Tx							-	-	-
IRFU (w diplexer)	N-type			UBR84	UBR100	UBR140		-	-	-

Frequency bands

Band	Frequency range	Duplex offset*
2 GHz	1.9 – 2.37 GHz	45 MHz. 175 MHz. 189 MHz
U4 GHz	4.4 – 5.0 GHz	100 MHz. 300 MHz. 312 MHz
L6 GHz	5.725 – 6.425 GHz	95 MHz, 252.04 MHz. 266 MHz
U6 GHz	6.425 – 7.125 GHz	160 MHz. 170 MHz. 200 MHz. 340 MHz 75 MHz, 100 MHz, and 150 MHz for Full Indoor Broadcasting applications
7 GHz	7.110 – 7.900 GHz	154 MHz. 161 MHz. 168 MHz. 196 MHz. 245 MHz. 300MHz
8 GHz	7.725 – 8.5 GHz	119 MHz. 126 MHz. 151.614 MHz. 154 MHz. 160 MHz. 208 MHz. 266 MHz. 300 MHz. 310 MHz. 311.32 MHz. 525 MHz. 550 MHz
11 GHz	10.7 – 11.7 GHz	490 MHz. 500 MHz. 530 MHz
13 GHz	12.75 – 13.25 GHz	225 MHz. 266 MHz 75 MHz, 100 MHz, and 150 MHz for Full Indoor Broadcasting applications
15 GHz	14.4 – 15.35 GHz	420 MHz. 475 MHz. 490 MHz.
18 GHz	17.7 – 19.7 GHz	1008 MHz. 1010 MHz. 1560 MHz
23 GHz	21.2 – 23.6 GHz	1008 MHz. 1036 MHz. 1200 MHz. 1232 MHz
38 GHz	37.0 – 40.0 GHz	1260 MHz

*Please visit SAF Tehnika Online Radio Guide https://saftehnika.com/en/radio_guide for more information (partner login required).

Max Tx output power [dBm]

Modulation	2 GHz (VHP)	U4 GHz (HP)	L6,U6 GHz (HP/VHP)	7 GHz (HP/VHP)	8 GHz (HP/VHP)	11 GHz (HP/VHP)	13 GHz (HP/VHP)	*15 GHz (HP)	18 GHz (SP/VHP)	23 GHz (SP/VHP)	38 GHz (SP)
4QAM	+36	+33	+27/+33	+27/+32	+27/+31	+25/+29	+25/+28	+25	+19/+26	+19/24	+17
16QAM	+35	+32	+26/+32	+26/+31	+26/+30	+24/+28	+24/+27	+24	+18/+25	+18/23	+16
32QAM	+34	+31	+25/+31	+25/+30	+25/+29	+23/+27	+23/+26	+23	+17/+24	+17/22	+15
64QAM	+33	+30	+24/+30	+24/+29	+24/+28	+22/+26	+22/+25	+22	+16/+23	+16/21	+14
128QAM	+33	+30	+24/+30	+24/+29	+24/+28	+22/+26	+22/+25	+22	+16/+23	+16/21	+14
256QAM	+32	+29	+23/+29	+23/+28	+23/+27	+21/+25	+21/+24	+21	+15/+22	+15/20	+13
512QAM	+31	+28	+22/+28	+22/+27	+22/+26	+20/+24	+20/+23	+20	+14/+21	+14/19	+12
1024QAM	+28	+25	+19/+25	+19/+24	+19/+23	+17/+21	+17/+20	+17	+11/+18	+11/16	+9

Min Tx output power [dBm]

Modulation	2 GHz (VHP)	U4 GHz (HP)	L6,U6 GHz (HP/VHP)	7 GHz (HP/VHP)	8 GHz (HP/VHP)	11 GHz (HP/VHP)	13 GHz (HP/VHP)	*15 GHz (HP)	18 GHz (SP/VHP)	23 GHz (SP/VHP)	38 GHz (SP)
Min Tx power	+16	+14	+8/+13	+8/+12	+8/+11	+6/+9	+6/+8	+6	0/+6	0/+5	-3

*Preliminary data

For IRFU w/o diplexer the Tx power is 1dBm higher



Thresholds and Capacity for ETSI channels

		2GHz	U4GHz	L6GHz	U6GHz	7GHz	8GHz	11GHz	13GHz	*15GHz	18GHz	23GHz	*38GHz	Capacity, Mbps
Bandwidth, MHz	Modulation	Guaranteed RSL Threshold, dBm												
3.5	4QAM	-95	-94.5	-93	-94.5	-93.5	-93	-90.5	-91.5	-91.5	-93	-	-	5
	16QAM	-88.5	-88.5	-86	-86.5	-86	-86	-83.5	-85	-85	-86	-	-	10
	32QAM	-85.5	-85.5	-85	-82.5	-82.5	-82.5	-80.5	-80.5	-80.5	-81.5	-	-	13
	64QAM	-82	-82	-80	-79	-78.5	-79	-76	-74	-74	-78	-	-	16
7	4QAM	-92	-92	-89.5	-90.5	-87.5	-88.5	-88.5	-89	-89	-89	-90	-86	10
	16QAM	-86	-86	-82.5	-84	-82	-82	-82.5	-82	-82	-82.5	-83.5	-79.5	20
	32QAM	-83	-83	-80	-81.5	-79	-79	-79	-79	-79	-79	-80.5	-76.5	25
	64QAM	-80	-80	-77	-78	-76	-76.5	-76	-75.5	-75.5	-76	-77.5	-73.5	30
	128QAM	-77	-76.5	-74	-74.5	-73.5	-73	-73	-71	-71	-72.5	-71.5	-67	35
	256QAM	-	-70	-70	-	-69.5	-69.5	-68	-70.5	-70.5	-68	-69	-	42
12	4QAM	-90	-90	-87.5	-87.5	-88	-87	-86	-87.5	-87.5	-87	-88.5	-84.5	18
	16QAM	-83	-83.5	-81	-81.5	-81.5	-81	-79.5	-81	-81	-80	-82	-78	36
	32QAM	-80.5	-81	-78	-78.5	-78	-78	-76.5	-78	-78	-77	-78.5	-74.5	46
	64QAM	-77.5	-77.5	-75	-75.5	-75	-75	-73.5	-75	-75	-75	-75.5	-71.5	55
	128QAM	-74.5	-75	-71.5	-73	-72	-72	-70.5	-72	-72	-72	-72.5	-68.5	64
	256QAM	-71.5	-71.5	-68.5	-69.5	-69	-68.5	-68	-68.5	-68.5	-68.5	-68	-64	73
	512QAM	-	-66	-64.5	-	-63.5	-63.5	-63	-64	-64	-63	-64	-60	82
14	4QAM	-89.5	-89	-87	-87.5	-85	-87	-87	-86.5	-86.5	-87	-87.5	-83.5	21
	16QAM	-83	-82.5	-80.5	-81	-80	-79.5	-80	-80.5	-80.5	-80	-81	-77	42
	32QAM	-80	-79.5	-77.5	-78	-76.5	-77	-77	-77.5	-77.5	-77.5	-78	-74	53
	64QAM	-77	-76.5	-74.5	-75.5	-74	-74	-74	-74	-74	-74.5	-75	-71	63
	128QAM	-74.5	-73.5	-71.5	-72.5	-71	-71	-71.5	-71.5	-71.5	-71.5	-72	-68	74
	256QAM	-71	-70.5	-69	-69.5	-68.5	-67.5	-68	-68	-68.5	-68.5	-69	-65	85
	512QAM	-	-65	-64	-	-63.5	-63.5	-	-64	-64	-63	-64	-	96
20	4QAM	-86.5	-87.5	-85.5	-86	-84	-85	-85.5	-85	-85	-85	-86	-82	30
	16QAM	-81	-81.5	-79	-79.5	-79	-78	-79	-78.5	-78.5	-78.5	-79.5	-75.5	61
	32QAM	-78.5	-78.5	-76	-77	-75.5	-76	-75.5	-76	-76	-75.5	-76.5	-72.5	76
	64QAM	-75.5	-75.5	-73	-74	-72.5	-72.5	-73	-72.5	-72.5	-72.5	-73	-69	91
	128QAM	-72.5	-72	-70	-71	-69.5	-69.5	-69.5	-70	-70	-69.5	-70	-66	107
	256QAM	-69	-69	-67	-68.5	-66.5	-66.5	-66.5	-66.5	-66.5	-67	-67	-63	122
	512QAM	-66	-66	-64	-65	-63.5	-62.5	-64	-63	-63	-63.5	-63	-59	137
	1024QAM	-63	-63	-61.5	-61	-61	-59.5	-60.5	-60	-60	-59.5	-57.5	-53.5	152
28	4QAM	-86	-86	-84	-84.5	-83.5	-84	-84	-84	-84	-83.5	-84	-80	43
	16QAM	-79.5	-79.5	-77.5	-78	-78	-77	-77.5	-77	-77	-77.5	-78	-74	86
	32QAM	-77	-76.5	-74.5	-75.5	-75	-74	-74	-74	-74	-74.5	-75	-71	108
	64QAM	-74	-74	-71.5	-72.5	-72	-71	-71.5	-71.5	-71.5	-71.5	-72	-68	129
	128QAM	-71	-70.5	-69	-69.5	-69	-68	-68.5	-68.5	-68.5	-68.5	-69	-65	151
	256QAM	-68	-68	-66	-66.5	-66	-64	-65.5	-65.5	-65.5	-65.5	-66	-62	172
	512QAM	-65	-64.5	-62.5	-63.5	-62.5	-60.5	-62.5	-62	-62	-62	-62.5	-58.5	194
	1024QAM	-61	-62	-60	-60	-59.5	-58	-59	-59	-59	-59	-58.5	-54.5	216
40	4QAM	-	-84.5	-82.5	-83	-82	-82	-82	-82	-82	-82	-83	-79	61
	16QAM	-	-78	-76	-76.5	-76	-75.5	-75.5	-76	-76	-75.5	-76	-72	122
	32QAM	-	-75.5	-73	-73.5	-73	-72.5	-72.5	-73	-73	-72.5	-73	-69	152
	64QAM	-	-72.5	-70.5	-71	-70	-69.5	-69.5	-70	-70	-69.5	-70	-66	183
	128QAM	-	-69.5	-67.5	-68	-67	-66	-66.5	-67	-67	-66.5	-67.5	-63.5	214
	256QAM	-	-66.5	-64.5	-65	-64.5	-62.5	-63.5	-64	-64	-63.5	-64	-60	244
	512QAM	-	-63.5	-61	-62	-60.5	-59.5	-60.5	-60	-60	-60.5	-61	-57	275
	1024QAM	-	-60.5	-58	-58	-58	-56	-57.5	-57	-57	-57	-57.5	-53.5	305
56	4QAM	-	-83	-81	-81.5	-81	-80	-81	-80.5	-80.5	-80.5	-80.5	-76.5	87
	16QAM	-	-76.5	-74.5	-75	-74.5	-74	-74	-74	-74	-74	-74.5	-70.5	174
	32QAM	-	-74	-72	-72	-71.5	-71	-71	-71	-71	-71	-71.5	-67.5	217
	64QAM	-	-71	-69	-69	-68.5	-68	-68	-68	-68	-68.5	-68.5	-64.5	261
	128QAM	-	-68	-66	-66.5	-65.5	-64.5	-65	-65.5	-65.5	-65	-65.5	-61.5	304
	256QAM	-	-65	-63	-63.5	-63	-61	-62	-62	-62	-61.5	-62.5	-58.5	348
	512QAM	-	-61.5	-60	-60.5	-59.5	-57.5	-58.5	-58.5	-58.5	-58.5	-59	-55	392
	1024QAM	-	-58.5	-56	-56.5	-56.5	-54	-55.5	-55.5	-55.5	-55.5	-55	-51	435

*Preliminary data
All data with Strong FEC



Thresholds and Capacity for FCC channels

		2GHz	U4GHz	L6GHz	U6GHz	7GHz	8GHz	11GHz	13GHz	*15GHz	18GHz	23GHz	*38GHz	Capacity, Mbps
Bandwidth, MHz	Modulation	Guaranteed RSL Threshold, dBm												
5	4QAM	-93.5	-94.5	-92	-91.5	-91	-89	-89	-90.5	-90.5	-90.5	-92.5	-88.5	7
	16QAM	-87	-87.5	-85.5	-84.5	-84	-83	-80	-83.5	-83.5	-84.5	-85.5	-80.5	15
	32QAM	-84	-84.5	-82.5	-81.5	-80.5	-80	-78	-80	-80	-80.5	-82.5	-78.5	18
	64QAM	-81	-81.5	-78.5	-78.5	-77.5	-77	-74.5	-76	-76	-75.5	-78	-72.5	22
10	128QAM	-77	-76.5	-74.5	-	-73.5	-71	-72	-71	-71	-71.5	-	-	26
	4QAM	-90	-90.5	-88	-88.5	-88	-87	-88.5	-90.6	-90.6	-90.5	-90.5	-87.5	15
	16QAM	-83	-84.5	-82	-82.5	-82	-81	-81	-83.7	-83.7	-80.5	-83	-78.5	30
	32QAM	-80.5	-81.5	-78.5	-79.5	-78.5	-78	-77.5	-81	-81	-78.5	-80	-75.5	38
	64QAM	-77	-77.5	-75	-76.5	-76	-75	-74.5	-78	-78	-75.5	-77	-72.5	45
	128QAM	-74.5	-73.5	-72	-73.5	-72	-71	-71.5	-72.9	-72.9	-71.5	-74	-69.5	53
20	256QAM	-	-70.5	-69	-	-69	-69	-68.5	-69.5	-69.5	-68.5	-70	-64.5	61
	4QAM	-86.5	-87.5	-85.5	-86	-84	-85	-85.5	-85	-85	-85	-86	-82	30
	16QAM	-81	-81.5	-79	-79.5	-79	-78	-79	-78.5	-78.5	-78.5	-79.5	-75.5	61
	32QAM	-78.5	-78.5	-76	-77	-75.5	-76	-75.5	-76	-76	-75.5	-76.5	-72.5	76
	64QAM	-75.5	-75.5	-73	-74	-72.5	-72.5	-73	-72.5	-72.5	-72.5	-73	-69	91
	128QAM	-72.5	-72	-70	-71	-69.5	-69.5	-69.5	-70	-70	-69.5	-70	-66	107
25	256QAM	-69	-69	-67	-68.5	-66.5	-66.5	-66.5	-66.5	-66.5	-67	-67	-63	122
	512QAM	-66	-66	-64	-65	-63.5	-62.5	-64	-63	-63	-63.5	-63	-59	137
	1024QAM	-63	-63	-61.5	-61	-61	-59.5	-60.5	-60	-60	-59.5	-57.5	-53.5	152
	4QAM	-85.5	-86.5	-85	-85	-83.5	-84.5	-84.5	-84.5	-84.5	-84	-84.5	-80.5	37
	16QAM	-80	-80.5	-78	-79	-78	-78	-78	-78	-78	-78	-78	-74	74
	32QAM	-77	-77.5	-75	-75.5	-75	-75	-75.5	-75	-75	-75	-75.5	-71.5	93
30	64QAM	-74.5	-74.5	-72	-73	-72	-72	-72	-72	-72	-71.5	-72.5	-68.5	111
	128QAM	-72	-71.5	-70	-70	-69.5	-69	-69	-69	-69	-69	-69.5	-65.5	130
	256QAM	-68	-68.5	-66.5	-67	-66.5	-66.5	-64.5	-66	-66	-66	-66.5	-62.5	148
	512QAM	-65	-65.5	-63.5	-64	-63	-63	-61.5	-63	-62.5	-62.5	-63	-59	167
	1024QAM	-62.5	-62.5	-60.5	-61	-60	-58.5	-59.5	-59.5	-59.5	-59.5	-58.5	-54.5	186
	4QAM	-85.5	-85.5	-83.5	-84	-82.5	-83.5	-83	-83.5	-83.5	-83.5	-84	-80	45
40	16QAM	-79	-79.5	-77	-78	-77.5	-76.5	-76.5	-77	-77	-77	-77.5	-73.5	91
	32QAM	-76.5	-76.5	-74.5	-75	-74	-73.5	-74	-74	-74	-74.5	-74.5	-70.5	114
	64QAM	-73.5	-73.5	-71.5	-72	-71.5	-71	-71	-71	-71	-70.5	-71.5	-67.5	137
	128QAM	-71	-70.5	-68.5	-69.5	-68.5	-68	-68	-68	-68	-68	-69	-65	160
	256QAM	-67.5	-67.5	-65.5	-66	-66	-63.5	-64.5	-65	-65	-64.5	-65.5	-61.5	183
	512QAM	-65	-64.5	-62.5	-63	-61.5	-60.5	-61.5	-61.5	-61.5	-61.5	-62.5	-58.5	206
50	1024QAM	-61	-61.5	-59	-59.5	-59.5	-57.5	-58.5	-58.5	-58.5	-59	-58	-54	229
	4QAM	-	-84.5	-82.5	-83	-82	-82	-82	-82	-82	-82	-83	-79	61
	16QAM	-	-78	-76	-76.5	-76	-75.5	-75.5	-76	-76	-75.5	-76	-72	122
	32QAM	-	-75.5	-73	-73.5	-73	-72.5	-72.5	-73	-73	-72.5	-73	-69	152
	64QAM	-	-72.5	-70.5	-71	-70	-69.5	-69.5	-70	-70	-69.5	-70	-66	183
	128QAM	-	-69.5	-67.5	-68	-67	-66	-66.5	-67	-67	-66.5	-67.5	-63.5	214
60	256QAM	-	-66.5	-64.5	-65	-64.5	-62.5	-63.5	-64	-64	-63.5	-64	-60	244
	512QAM	-	-63.5	-61	-62	-60.5	-59.5	-60.5	-60	-60	-60.5	-61	-57	275
	1024QAM	-	-60.5	-58	-58	-58	-56	-57.5	-57	-57	-57	-57.5	-53.5	305
	4QAM	-	-83.5	-81.5	-82	-81.5	-81	-81	-81	-81	-81	-81.5	-77.5	75
	16QAM	-	-77.5	-75	-75.5	-75	-74.5	-74.5	-74.5	-74.5	-74.5	-75	-71	151
	32QAM	-	-74.5	-72	-73	-72	-71	-71.5	-72	-72	-71.5	-72	-68	189
80	64QAM	-	-71.5	-69.5	-70	-69	-68.5	-68.5	-69	-69	-68.5	-69	-65	227
	128QAM	-	-68.5	-66.5	-67	-66	-65	-65.5	-66	-66	-65.5	-66.5	-62.5	265
	256QAM	-	-65.5	-63.5	-64	-63.5	-61.5	-62.5	-63	-63	-62.5	-63	-59	303
	512QAM	-	-62.5	-60.5	-61	-60	-58.5	-59.5	-59.5	-59.5	-59.5	-60	-56	341
	1024QAM	-	-59.5	-57	-57	-56.5	-55	-56.5	-56	-56	-56.5	-55.5	-51.5	379
	4QAM	-	-82.5	-80.5	-81	-80.5	-79.5	-81	-80	-80	-80.5	-80.5	-76.5	90
100	16QAM	-	-76.5	-74	-74	-74	-73	-74	-73.5	-73.5	-73.5	-74	-70	180
	32QAM	-	-73.5	-71.5	-71.5	-71	-70	-71	-70	-70	-70.5	-71.5	-67.5	226
	64QAM	-	-70.5	-68.5	-68.5	-68	-67.5	-67.5	-67.5	-67.5	-68	-69	-65	271
	128QAM	-	-67.5	-65.5	-63.5	-65	-64	-64.5	-65	-65	-65	-65.5	-61.5	316
	256QAM	-	-65	-62.5	-62.5	-62.5	-60.5	-62	-61.5	-61.5	-61.5	-62.5	-58.5	361
	512QAM	-	-61.5	-59.5	-59.5	-59	-57.5	-58.5	-58	-58	-58.5	-59	-55	407
120	1024QAM	-	-58.5	-56	-56.5	-56	-53.5	-55.5	-55	-55	-55.5	-54.5	-50.5	452
	4QAM	-	-78	-81	-79.5	-78.5	-80	-77.5	-79	-79	-80	-81	-76.5	111
	16QAM	-	-71.5	-74.5	-73	-72.5	-72.5	-71.5	-72	-72	-73.5	-74	-70	222
	32QAM	-	-69	-70.5	-70.5	-69.5	-69	-68.5	-69	-69	-70.5	-71	-67	277
	64QAM	-	-66.5	-67.5	-67	-66.5	-66	-65.5	-66.5	-66.5	-67.5	-68	-64	333
	128QAM	-	-63.5	-64.5	-64.5	-63.5	-63	-62.5	-63.5	-63.5	-64.5	-65.5	-61	388
140	256QAM	-	-61.5	-60.5	-61	-60.5	-59.5	-59.5	-60.5	-60.5	-61	-62	-58	444
	512QAM	-	-57.5	-57.5	-58	-55.5	-57	-56.5	-57	-57	-58	-58.5	-54.5	500
	1024QAM	-	-	-54.5	-	-50.5	-	-	-53.5	-53.5	-	-	-	556

*Preliminary data
All data with Strong FEC

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