

Integra series

SAF Tehnika – the pioneer of compact full outdoor microwave radio technology – is excited to take a step forward in the evolution of full outdoor packet microwave radio systems. Integra is an unbelievably light, energy efficient, carrier-grade system that exemplifies an outstanding return on smart engineering - the synergy of high competence in radio electronics and materials science. Integration of the next generation microwave radio with high and super high-performance antennas into a single unit translates into a lower total cost of ownership, as well as less time spent on the installation site, and better reliability of the link even in densely served areas.

Perfect for small-cell, RAN, and HetNet backhaul where aesthetics in a metropolitan area is key concern, Integra delivers ambitious performance in a compact package never before available in licensed microwave backhaul. Integra's embedded software takes full advantage of its cutting-edge network processor providing SyncE support for LTE network, builds Layer 2 header compression and 256-bit AES encryption for public safety, government, and enterprise networks. Thanks to a convenient design and its solid functionality Integra is an industry-unique microwave system with a superior radiation pattern and payload capacity of up to 1 Gbps.

Integra – by its form and specification – is a proper building block for a variety of modern wireless networking applications. To stay advanced and competitive in the telecom world increasingly depends on seamless integration and interoperability of synchronization-sensitive systems. It is smart to invest in technology that takes the right direction: the concept of Integra is on that path.



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Technical specification

		Integra-G		Integra-W	
General					
Concept / form factor		FODU (Full-outdoor unit), directly mounted to the antenna			
Frequency bands		6GHz, 7GHz, 8GHz, 11GHz, 13GHz, 15GHz, 17GHz UL, 18GHz, 23GHz, 24GHz UL, 25GHz, 26GHz, 28GHz, 38GHz, and more*			
Radio standards		EN 302 217-2 v3.1.1, EN 300 t+40-2 v1.4.1, FCC CFR 47 Part 101, Industry Canada RSS-GEN and relevant SRSP Specifications			
Frequency stability		± 10 ppm			
Capacity		Up to 1Gbps* with HC at 1+0 or 2+0		883 Mbps at 112 MHz 1024QAM 643 Mbps at 80 MHz 1024QAM (for Integra-W 17GHz and 24GHz)	
		474 Mbps at 60 MHz 1024QAM (legacy v.)	491 Mbps at 60 MHz 2048QAM		
Max modulation		1024QAM (legacy)	2048QAM	1024QAM	
Configurations		1+0, 2+0 link bonding, 1+1 HSB		1+0	
ACM and ATPC		Yes		Yes	
Channel bandwidth		ETSI: from 1.75* MHz, up to 56 MHz FCC: from 5 MHz, up to 60 MHz		ETSI: from 56 MHz, up to 112 MHz FCC: from 40 MHz, up to 80 MHz	
Ports					
Gigabit Ethernet		1x RJ-45	Electrical with built-in PoE splitter and surge arrester	2x RJ-45	Electrical with built-in PoE splitter and surge arrester
		2x SFP	Fiber Optics	1x SFP	Alternative to 1xRJ-45
Service ports	3.5mm	Audible alignment and RSSI			
	USB B	RS232 serial over USB B-Type			
	LED	Power On, Link Synchronization, RSL, Polarization accuracy*			
Ethernet					
Ethernet		GbE Network Processor built-in		Unmanaged Gigabit Ethernet	
MAC Table size		32K entries		-	
VLAN		802.1Q 4096 VLANs, QinQ		Transparent	
Quality of Service		8 level 802.1p, 64 level DSCP, CoS, MPLS-TP exp bit		Transparent	
Spanning Tree Prot.		802.1d-2004 RSTP		Transparent	
Synchronization		SyncE		-	
Carrier Ethernet		MEF9&14, HC, Packet Fragmentation		Transparent	
Jumbo frames		Yes, 9600 bytes		Yes, 9600 bytes	
Encryption		AES 256-bit**, licensed feature		-	
Management		SNMP v1/2c/3, SSH, Telnet, HTTPS, Serial, RADIUS, Network Time Protocol			
		In-band MNG over same ETH port		Either Out-of-band or In-band MNG, depending on PN and firmware. In-band MNG supported only if PN has suffix "S1"	
Perf. monitoring		Performance graphs, constellation diagram, alarms, detailed counters			
Electrical					
Power consumption		28...74 W depending on model and frequency band. See table below.			
Voltage range	Integra	36...57 V DC			
	PoE Injector ¹	36...60 V DC all Integra models; 22...60 V DC models with ≤50 W consumption			

* Inquire SAF representative for more information

** Integra-G is FIPS 197 (Federal Information Processing Standards) validated and placed on validated product list,

Validation No.: AES 5899: <https://csrc.nist.gov/Projects/Cryptographic-Algorithm-Validation-Program/Validation/Validation-List/AES>

¹ Voltage range using I0ATPI24 / I0ATPI44 Power over Ethernet Injector

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Mechanical & environmental specification

Integra Model		Integra-G, Integra-W		
Antenna type	External antenna (default)	0.3m / 1ft, integrated	0.6m / 2ft, integrated	
Antenna interface	SAF2R 6...13 GHz SAF2 15...38 GHz	Integrated antenna, factory assembled with radio (discontinued solution, no more available)		
Stationary use	Conforms to ETSI EN 300 019 Class 4.1, NEMA 4X			
IP class	IP66: Integra-G 6...13 GHz models and Integra-W. IP67: Integra-G 15...38 GHz			
Relative Humidity	15 to 90-100% @ 30°C			
Temperature range	-33...+55 °C / -28...+130 °F			
Size, 15GHz and higher, w/o mount	235 x 250 x 72 mm / 9.26" x 9.85" x 2.84"	378 x 378 x 227 mm / 14.9" x 14.9" x 9"	669 x 669 x 289 mm / 26.3" x 26.3" x 11.4"	
Size, Integra -W 17/24 GHz UL	235 x 250 x 111 mm / 9.26" x 9.85" x 4.37"	N/A	N/A	
Size, 6...13 GHz	280 x 437 x 100 mm / 11.02" x 17.2" x 3.9"	N/A	N/A	
Weight, w/o mount	2.9 kg / 6.4 lbs	5 kg / 11 lbs	5 kg / 11 lbs	
Weight, Integra -W 17/24 GHz UL	4.9 kg / 10.8 lbs	N/A	N/A	
Weight, 6...13 GHz	6.5 kg / 14.3 lbs	N/A	N/A	
Mount	Mount size	Mount on antenna	292 x 176 x 250 mm / 11.5" x 7" x 10" max	
	Pole size		Ø 40 – 120 mm / Ø 1.6" – 4.7"	
	Weight		2.55 kg / 5.6 lbs	

* Inquire SAF representative for more information

Power consumption and rated current at 36 – 57 V DC²

Model		L6 GHz	U6, 7, 8 GHz	11, 13 GHz	15 GHz	17 GHz	18 GHz	23 GHz	24 GHz	25, 26, 28 GHz	38 GHz
Integra-G	Power [W] @ 36–57V DC	74	69	65	40	35	45 ³	41	38	45	47
	Current [A] @ 36 V DC	2.1	1.9	1.8	1.1	1.0	1.3	1.1	1.1	1.3	1.3
	Current [A] @ 48 V DC	1.5	1.4	1.4	0.8	0.7	1.0	0.9	0.8	0.9	1.0
	Current [A] @ 57 V DC	1.3	1.2	1.1	0.7	0.6	0.8	0.7	0.7	0.8	0.8
Integra-W	Power [W] @ 36–57V DC	70	64	51	31	28	35	35	30	36	38
	Current [A] @ 36 V DC	1.9	1.8	1.4	0.9	0.8	1.0	1.0	0.8	1.0	1.1
	Current [A] @ 48 V DC	1.5	1.3	1.1	0.6	0.6	0.7	0.7	0.6	0.8	0.8
	Current [A] @ 57 V DC	1.2	1.1	0.9	0.5	0.5	0.6	0.6	0.5	0.6	0.7

² Power consumption of Integra radio shown only. For power consumption of complete system add up to 8% (at 48V DC input) for PoE in DC/DC mode, around 4W for 100m cable (depends on cable) and approx. 1W for SFP transceiver, if used.

³ Both Standard and HP product versions

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Exterior design of Integra-G and Integra-W models



Maximum Tx Power [dBm] for Integra-G

1) For all ETSI channels, and FCC 60 MHz channel in fixed and variable Tx power modes:

“Fix” – Fixed Tx power mode for all channels mentioned above, and Variable Tx power mode for ETSI ≤14 MHz channels.

“Var” - Variable Tx power mode for all ETSI channels, except 1.75, 3.5, 7 and 14 MHz, and for the FCC 60 MHz channel.

Modulation	L6, U6, 7, 8 GHz		11 GHz		15 GHz, 18 GHz HP ⁴		18, 23, 26, 28 GHz		17 GHz ⁵ , 24 GHz ⁵		38 GHz		
	Fix	Var	Fix	Var	Fix	Var	Fix	Var	Fix	Var	Fixed	Variable ≤14 MHz	Var
4 QAM	+31		+26		+23		+20		-22 ... +5		+15	+15	+15
16 QAM	+30		+25		+22		+19		-22 ... +5		+14	+14	+14
32 QAM	+29		+24		+21		+18		-22 ... +5		+14	+13	+13
64 QAM	+28		+23		+20		+17		-22 ... +5		+13	+12	+12
128 QAM	+28	+27	+23	+22	+20	+19	+17	+16	-22 ... +5		+13	+12	+11
256 QAM	+27	+25	+22	+20	+19	+17	+16	+14	-22 ... +5		+12	+11	+9
512 QAM	+26	+24	+21	+19	+18	+16	+15	+13	-22 ... +5		+11	+10	+8
1024 QAM	+23		+18		+15		+12		-22 ... +5		+10	-	+7
2048 QAM ⁶	+22		+17		+14		+11		-22 ... +5		+9	-	+6

2) For FCC 5 to 50 MHz channels in fixed Tx power mode:

Frequency band	L6, U6, 7, 8 GHz			11 GHz			13 GHz			15 GHz, 18 GHz HP ⁴			18, 23, 25, 26, 28 GHz			17 GHz ⁵ , 24 GHz ⁵	38 GHz
	BW, MHz	50	25	10	50	25	10	50	25	10	50	25	10	50	25	10	5 ... 60
Modulation	30	20	5	30	20	5	30	20	5	30	20	5	30	20	5		
4 QAM	+30	+29	+27	+25	+24	+22	+25	+24	+22	+22	+21	+19	+19	+18	+16	-22 ... +5	+15
16 QAM	+30	+29	+27	+25	+24	+22	+25	+24	+22	+22	+21	+19	+19	+18	+16	-22 ... +5	+14
32 QAM	+29	+29	+27	+24	+24	+22	+24	+24	+22	+21	+21	+19	+18	+18	+16	-22 ... +5	+14
64 QAM	+28	+28	+27	+23	+23	+22	+23	+23	+22	+20	+20	+19	+17	+17	+16	-22 ... +5	+13
128 QAM	+28	+28	+27	+23	+23	+22	+23	+23	+22	+20	+20	+19	+17	+17	+16	-22 ... +5	+13
256 QAM	+27	+27	+27	+22	+22	+22	+22	+22	+22	+19	+19	+19	+16	+16	+16	-22 ... +5	+12
512 QAM	+26	+26	-	+21	+21	-	+21	+21	-	+18	+18	-	+15	+15	-	-22 ... +5	+11
1024 QAM	+23	+23	-	+18	+18	-	+18	+18	-	+15	+15	-	+12	+12	-	-22 ... +5	+10
2048 QAM ⁶	+22	-	-	+17	-	-	+17	-	-	+14	-	-	+11	-	-	-22 ... +5	+9

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3) For FCC 5 to 60 MHz channels in variable Tx power mode:

Frequency band	L6, U6, 7, 8 GHz				11 GHz				13 GHz				15 GHz, 18 GHz HP ⁴				18, 23, 25, 26, 28 GHz				38 GHz			
BW, MHz	50	40	25	10	50	40	25	10	50	40	25	10	50	40	25	10	50	40	25	10	50	40	25	10
Modulation	60	30	20	5	60	30	20	5	60	30	20	5	60	30	20	5	60	30	20	5	60	30	20	5
4 QAM	+31	+30	+29	+27	+26	+25	+24	+22	+26	+25	+24	+22	+23	+22	+21	+19	+20	+19	+18	+16	+15	+14	+13	+11
16 QAM	+30	+30	+29	+27	+25	+25	+24	+22	+25	+25	+24	+22	+22	+22	+21	+19	+19	+19	+18	+16	+14	+14	+13	+11
32 QAM	+29	+29	+29	+27	+24	+24	+24	+22	+24	+24	+24	+22	+21	+21	+21	+19	+18	+18	+18	+16	+13	+13	+13	+11
64 QAM	+28	+28	+28	+27	+23	+23	+23	+22	+23	+23	+23	+22	+20	+20	+20	+19	+17	+17	+17	+16	+12	+12	+12	+11
128 QAM	+27	+27	+27	+27	+22	+22	+22	+22	+22	+22	+22	+22	+19	+19	+19	+19	+16	+16	+16	+16	+11	+11	+11	+11
256 QAM	+25	+25	+25	+27	+20	+20	+20	+22	+20	+20	+20	+22	+17	+17	+17	+19	+14	+14	+14	+16	+9	+9	+9	+11
512 QAM	+24	+24	+24	-	+19	+19	+19	-	+19	+19	+19	-	+16	+16	+16	-	+13	+13	+13	-	+8	+8	+8	-
1024 QAM	+23	+23	+23	-	+18	+18	+18	-	+18	+18	+18	-	+15	+15	+15	-	+12	+12	+12	-	+7	+7	+7	-
2048 QAM ⁶	+22	+22	-	-	+17	+17	-	-	+17	+17	-	-	+14	+14	-	-	+11	+11	-	-	+6	+6	-	-

³ Preliminary data

⁴ Integra-G 18 GHz HP version has 3dB higher Tx power than standard version

⁵ Max Tx power settings depend on EIRP allowed by national regulatory and antenna size.

⁶ 2048QAM modulation is available only for Integra-G. It is not supported by legacy models and 17 GHz radio.

Maximum Tx Power [dBm] for Integra-W

Modulation	Tx Power, dBm					
	L6 GHz	U6 GHz	11 GHz	15, 18, 23, 25, 26, 28 GHz	17 GHz ⁵ , 24 GHz ⁵	38 GHz
4 QAM	+33	+31	+28	+22	-26 ... +5	+17
8 QAM	+33	+31	+28	+22	-26 ... +5	+17
16 QAM	+32	+30	+27	+21	-26 ... +5	+16
32 QAM	+31	+29	+26	+21	-26 ... +5	+16
64 QAM	+30	+28	+25	+20	-26 ... +5	+15
128 QAM	+30	+28	+25	+20	-26 ... +5	+15
256 QAM	+30	+28	+25	+19	-26 ... +5	+14
512 QAM	+30	+28	+25	+19	-26 ... +5	+14
1024 QAM	+28	+26	+23	+17	-26 ... +5	+12

⁵ Max Tx power settings depend on EIRP allowed by national regulatory and antenna size.

Integra-G RSL Thresholds at BER 10⁻⁶ and Total Payload Capacity (Mbps) for ETSI channels ^{6, 7, 8}

Bandwidth, MHz	Modulation	6GHz	7GHz	8GHz	11GHz	13GHz	15GHz	17GHz	18GHz	23GHz	24GHz	26GHz	28GHz	38 GHz	Capacity, Mbps	
		Guaranteed RSL Threshold, dBm														-G modes
1.75 ⁸	4QAM StrongFEC	-100	-99	-100	-99	-99.5	-98.5	-97	-99	-99	-99.5	-98.5	-98	-95	1.9	
	16QAM StrongFEC	-93	-93.5	-93.5	-92	-93	-91.5	-90.5	-92.5	-92	-92.5	-92.5	-92	-89	3.9	
	32QAM StrongFEC	-89	-89.5	-89.5	-88	-89	-87	-86	-88.5	-87.5	-88.5	-87.5	-87	-85	4.9	
	64QAM StrongFEC	-86	-86.5	-86.5	-85.5	-86	-84.5	-83.5	-85.5	-84.5	-86	-85	-85	-82	6.6	
	128QAM StrongFEC	-84	-83.5	-83.5	-82	-83	-80.5	-79.5	-81.5	-80	-82.5	-81.5	-82	-79	7.9	
	128QAM WeakFEC	-82	-81	-79.5	-79	-81	-76.5	-78	-79.5	-78	-80.5	-79.5	-79	-77	8.6	
3.5	4QAM StrongFEC	-97	-96	-97	-96	-96.5	-95.5	-94	-96	-96	-96.5	-95.5	-95	-92	4	
	16QAM StrongFEC	-90	-90.5	-90.5	-89	-90	-88.5	-87.5	-89.5	-89	-89.5	-89.5	-89	-86	8	
	32QAM StrongFEC	-86	-86.5	-86.5	-85	-86	-84	-83	-85.5	-84.5	-85.5	-84.5	-84	-82	10	
	64QAM StrongFEC	-83.5	-83.5	-83.5	-82.5	-83	-81.5	-80.5	-82.5	-81.5	-83	-82	-82	-79	13	
	128QAM StrongFEC	-80	-80.5	-80.5	-79	-80	-77.5	-76.5	-78.5	-77	-79.5	-78.5	-79	-76	16	
128QAM WeakFEC	-77.5	-78	-76.5	-76	-78	-73.5	-75	-76.5	-75	-77.5	-76.5	-76	-74	17		

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Bandwidth, MHz	Modulation	6GHz	7GHz	8GHz	11GHz	13GHz	15GHz	17GHz	18GHz	23GHz	24GHz	26GHz	28GHz	38 GHz	Capacity, Mbps	
		Guaranteed RSL Threshold, dBm													-G modes	Legacy modes
7	4QAM StrongFEC	-94	-94.5	-94	-93	-94	-93	-91	-94	-93	-93.5	-92.5	-93	-90.5		8
	16QAM StrongFEC	-87	-87.5	-88.5	-86.5	-88	-86	-84.5	-87.5	-86	-87	-86	-86	-84		16
	32QAM StrongFEC	-84	-84.5	-84.5	-83.5	-84	-82.5	-80.5	-83.5	-82	-83.5	-82.5	-83	-80		20
	64QAM StrongFEC	-80.5	-81.5	-81.5	-80.5	-81	-80	-78	-80.5	-80	-80.5	-79	-80	-77.5		27
	128QAM StrongFEC	-77	-78	-78.5	-76.5	-77	-76	-75	-77.5	-77	-77.5	-76	-76.5	-74		33
	256QAM StrongFEC	-74	-74.5	-75	-73.5	-74.5	-73	-71	-74.5	-72	-73.5	-72.5	-73	-71		39
	256QAM WeakFEC	-72	-73	-67.5	-71.5	-72	-70	-69	-72.5	-71	-71.5	-69	-71	-69		41
14	4QAM StrongFEC	-91	-91	-92	-90.5	-91	-90	-88	-91	-87.5	-91	-90	-90	-87		17
	16QAM StrongFEC	-85	-85	-85.5	-84	-85	-83.5	-81.5	-84.5	-82	-84	-83.5	-84	-81		33
	32QAM StrongFEC	-80	-81	-81.5	-80	-80.5	-79	-77	-80.5	-78	-80	-79	-79	-77		44
	64QAM StrongFEC	-78	-78.5	-78.5	-77	-78.5	-77	-75	-78.5	-76	-78	-77	-77	-74		56
	128QAM StrongFEC	-75	-75.5	-74.5	-74	-71	-74	-72	-75.5	-73	-74.5	-73.5	-74	-71		67
	256QAM StrongFEC	-71.5	-72	-72.5	-71	-67	-71	-68.5	-71.5	-69.5	-71	-70.5	-70.5	-69		79
	512QAM StrongFEC	-68.5	-68	-69.5	-67	-63	-67	-65	-68.5	-67	-67.5	-67.5	-67	-65		90
512QAM WeakFEC	-65.5	-66	-66.5	-64.5	-61	-64	-61.5	-65.5	-63	-65	-64	-64	-62		97	
20	4QAM StrongFEC	-89	-90	-91	-88.5	-88.5	-87	-89.5	-86	-89	-89.5	-89	-86		25	
	16QAM StrongFEC	-83	-84	-84.5	-83	-81	-82.5	-80	-83.5	-81	-83	-82.5	-82.5	-79.5		51
	32QAM StrongFEC	-80	-80	-80.5	-79	-78	-78	-76.5	-79.5	-77	-79	-78.5	-79	-75.5		64
	64QAM StrongFEC	-77	-77	-77.5	-76.5	-74.5	-76	-74	-77	-75	-77	-75.5	-76	-73		85
	128QAM StrongFEC	-74	-74	-74.5	-73	-71.5	-73	-70.5	-74	-72	-73	-72.5	-73	-70		102
	256QAM StrongFEC	-70.5	-71	-71.5	-69.5	-67.5	-69.5	-68	-70.5	-68.5	-70	-70.5	-71	-67		119
	512QAM StrongFEC	-67.5	-68	-67.5	-67	-65	-66	-64.5	-67.5	-65.5	-67	-66	-66	-63.5		136
1024QAM StrongFEC	-64	-64	-64.5	-62.5	-61	-63	-60.5	-64.5	-62	-63	-62.5	-62	-60		153	
1024QAM WeakFEC	-62	-62	-60.5	-61	-58	-60	-58	-62.5	-59.5	-61	-60.5	-60	-58		163	
28	4QAM StrongFEC	-88	-89	-89	-88	-87	-87	-85	-88	-84	-88	-86.5	-87	-85	34	35
	16QAM StrongFEC	-82	-83	-83	-81.5	-79.5	-81	-79	-82.5	-79.5	-82	-81.5	-81	-78	69	69
	32QAM StrongFEC	-79	-79	-80	-77.5	-77	-77	-75	-78.5	-75.5	-78	-77.5	-77	-74	87	88
	64QAM StrongFEC	-76	-76	-76.5	-75.5	-74	-75	-72	-75.5	-73.5	-75	-74.5	-74.5	-72	114	115
	128QAM StrongFEC	-73	-73	-73.5	-71.5	-70.5	-72	-69	-72.5	-70.5	-72	-71.5	-71	-69	137	138
	256QAM StrongFEC	-70	-70	-70	-68.5	-66.5	-68	-66	-69.5	-67.5	-69	-68	-68	-65	160	161
	512QAM StrongFEC	-66.5	-66	-67	-65	-63.5	-65	-62.5	-66.5	-64	-65	-64.5	-64	-62	183	184
1024QAM StrongFEC	-63	-63	-62.5	-62	-59.5	-61.5	-59	-63.5	-61	-62	-61.5	-61	-58	206	207	
1024QAM WeakFEC	-61		-59.5	-59	-57	-60.5	-59.5	-60	-58.5	-59	-56			220		
2048QAM StrongFEC	-59	-60	-60.5	-58	-56	-58		-59	-57	-59	-58	-57	-54	226		
40	4QAM StrongFEC	-86.5	-87	-87	-85	-86	-85.5	-83	-86.5	-83	-85.5	-85	-85.5	-83	50	50
	16QAM StrongFEC	-81	-81	-82	-79.5	-78.5	-79.5	-77	-81	-78.5	-80	-79.5	-79	-76.5	98	98
	32QAM StrongFEC	-77	-77	-78	-76.5	-75.5	-75.5	-73	-77	-74.5	-76	-75.5	-75.5	-73	125	125
	64QAM StrongFEC	-74	-74	-75	-73.5	-71	-73	-71	-74	-72	-73	-73.5	-73.5	-70.5	165	165
	128QAM StrongFEC	-71	-71	-72	-70.5	-70	-70.5	-67	-71	-69	-70	-69.5	-70	-67	198	198
	256QAM StrongFEC	-68	-68	-68	-67	-65	-66.5	-64	-68	-66	-67	-66.5	-65	-63.5	231	231
	512QAM StrongFEC	-65	-65	-65.5	-64	-62	-63.5	-61	-65	-63	-63.5	-63.5	-63	-60.5	264	264
1024QAM StrongFEC	-61	-61	-61.5	-60.5	-59	-60	-57	-61.5	-59.5	-60.5	-59.5	-59	-56.5	298	298	
1024QAM WeakFEC	-59		-59	-59	-57	-55	-59	-57.5	-58.5	-58	-57.5	-55		314		
2048QAM StrongFEC	-58	-58	-58.5	-56.5	-54	-56		-57.5	-55.5	-56.5	-56	-56	-52.5	327		
56	4QAM StrongFEC	-85	-85	-86	-84	-84.5	-84	-81	-85	-82	-84	-83.5	-84	-81	71	72
	16QAM StrongFEC	-79	-79.5	-80	-78.5	-78	-78	-75	-79	-77	-78.5	-78	-78	-75	144	145
	32QAM StrongFEC	-75	-75.5	-76	-74.5	-74	-74	-71.5	-75	-73	-74.5	-73.5	-74	-72	183	183
	64QAM StrongFEC	-72	-73	-74	-72	-71	-71	-69	-72	-70	-72.5	-71	-71	-69	238	241
	128QAM StrongFEC	-70	-69.5	-70	-68.5	-68	-69	-66	-69	-67.5	-69.5	-68	-68	-65	286	289
	256QAM StrongFEC	-67	-66	-67	-65.5	-64	-65	-62	-66	-64.5	-65.5	-64.5	-65	-62	334	337
	512QAM StrongFEC	-63	-63.5	-64	-62	-61	-62	-59	-63	-61.5	-62.5	-61	-62	-59	382	385
1024QAM StrongFEC	-60	-60	-60	-58.5	-58	-58	-56	-59	-57.5	-59.5	-57.5	-58	-55	430	433	
1024QAM WeakFEC	-58		-57	-57	-55	-54	-57.5	-55.5	-55.5	-55.5	-55.5	-54		456		
2048QAM StrongFEC	-56	-57	-57	-54.5	--55	-54		-55	-53.5	-55.5	-54	-54.5	-52	472		

⁶ 2048QAM modulation is available only for Integra-G. It is not supported by legacy models and 17 GHz radio.

⁷ 1024QAM modulation with Weak FEC setting is available for legacy models or in legacy modes only.

⁸ 1.75 MHz bandwidth is available on all Integra-G models but is being tested on customized products only. RSL values are preliminary for all bands except 6 and 13 GHz. Please ask SAF representative for more information.



Integra-G RSL Thresholds at BER 10⁻⁶ and Total Payload Capacity (Mbps) for FCC channels ^{6, 7}

BW, MHz	Modulation	6GHz	7GHz	8GHz	11GHz	13GHz	15GHz	17GHz	18GHz	23GHz	24GHz	26GHz	28GHz	38 GHz	Capacity, Mbps		
		Guaranteed RSL Threshold, dBm														-G modes	Legacy modes
5	4QAM StrongFEC	-96	-96	-96.5	-95	-95.5	-94	-92.5	-95	-94	-95.5	-94.5	-95	-91		5	
	16QAM StrongFEC	-89	-89.5	-86.5	-88	-89	-87	-86.5	-88.5	-88	-89	-87.5	-88	-85		10	
	32QAM StrongFEC	-85	-85.5	-85.5	-84	-85	-83.5	-82.5	-84.5	-84	-85	-83.5	-84	-81		12	
	64QAM StrongFEC	-82.5	-82.5	-80.5	-81.5	-82	-80.5	-79.5	-81.5	-81	-82	-81	-81	-79		17	
	128QAM StrongFEC	-79	-79.5	-79.5	-78.5	-79	-77.5	-76.5	-78.5	-77.5	-79	-78	-78	-75		20	
	128QAM WeakFEC	-77	-77	-77	-76.5	-77	-74	-73.5	-76.5	-75.5	-76.5	-75.5	-75.5	-73		22	
10	4QAM StrongFEC	-92	-92.5	-94	-91	-92.5	-91	-89	-92	-90	-92	-91.5	-91.5	-89		12	
	16QAM StrongFEC	-86	-86.5	-86.5	-85	-86	-84.5	-82.5	-85.5	-84	-85.5	-84.5	-85	-82		24	
	32QAM StrongFEC	-82	-82.5	-82.5	-81.5	-82	-81	-79	-82.5	-80	-82	-81	-81	-78		30	
	64QAM StrongFEC	-79.5	-80	-80	-79	-79.5	-78	-76	-79.5	-78	-79	-78	-78	-76		40	
	128QAM StrongFEC	-76	-76.5	-76.5	-75.5	-76	-75	-73	-76.5	-75	-76	-75	-75	-73		48	
	256QAM StrongFEC	-73	-73.5	-73.5	-72	-73	-72	-69	-72.5	-71	-72.5	-71.5	-71	-70		56	
256QAM WeakFEC	-70	-70.5	-70.5	-69	-70	-69	-66.5	-70.5	-68	-69.5	-68.5	-68.5	-66		60		
20	4QAM StrongFEC	-89	-90	-91	-88.5	-88.5	-88.5	-86	-89	-86.5	-89	-88.5	-88	-86		24	
	16QAM StrongFEC	-83	-84	-84.5	-83	-81	-83	-80	-83.5	-81	-83	-82.5	-82.5	-80		49	
	32QAM StrongFEC	-80	-80	-80.5	-79	-78	-79	-76.5	-79.5	-77	-79	-78.5	-79	-77		62	
	64QAM StrongFEC	-77	-77	-77.5	-76.5	-74.5	-76	-74	-76.5	-74.5	-77	-75.5	-76	-73		82	
	128QAM StrongFEC	-74	-74	-74.5	-73	-71.5	-73	-70.5	-73.5	-71.5	-73	-72.5	-73	-71		99	
	256QAM StrongFEC	-70.5	-71	-71.5	-69.5	-67.5	-70	-67	-70.5	-68.5	-70	-69.5	-70	-67.5		115	
	512QAM StrongFEC	-67.5	-68	-67.5	-67	-65	-66	-64.5	-67.5	-65.5	-67	-66	-66	-64		132	
	1024QAM StrongFEC	-64	-64	-64.5	-62.5	-61	-63	-60.5	-64.5	-62.5	-63	-62.5	-62	-61		148	
1024QAM WeakFEC	-62	-62	-60.5	-61	-58	-60	-58	-62.5	-59.5	-61	-60.5	-60	-58		157		
25	4QAM StrongFEC	-88	-88.5	-89.5	-88	-88	-88	-85	-88	-85	-88	-87.5	-87	-85		31	
	16QAM StrongFEC	-82	-83	-83.5	-82.5	-81	-82	-79	-82.5	-80	-82	-81.5	-81.5	-79		62	
	32QAM StrongFEC	-79	-79	-79.5	-78.5	-76.5	-78	-75.5	-78.5	-77	-78.5	-77.5	-78	-75		78	
	64QAM StrongFEC	-76	-76	-76.5	-75.5	-74	-75	-73	-76.5	-73.5	-75.5	-74.5	-75	-72		104	
	128QAM StrongFEC	-73	-73	-73.5	-72.5	-70.5	-72	-70	-72.5	-70.5	-72.5	-71.5	-72	-69		124	
	256QAM StrongFEC	-70	-70	-69.5	-69.5	-65.5	-69	-66	-69.5	-68	-69	-68.5	-68	-66		145	
	512QAM StrongFEC	-66.5	-67	-66.5	-65.5	-63	-66	-63	-66.5	-65	-66	-65.5	-64.5	-63		166	
	1024QAM StrongFEC	-63	-63	-63.5	-61.5	-59	-62	-59	-63.5	-61.5	-62.5	-61.5	-61	-60		187	
1024QAM WeakFEC	-61	-61	-61.5	-59.5	-58	-58	-57	-60.5	-59.5	-60	-59.5	-59	-57		198		
30	4QAM StrongFEC	-88	-88	-89	-87	-87	-87	-85	-88	-84.5	-87	-86.5	-86.5	-84		37	
	16QAM StrongFEC	-82	-82	-83	-81.5	-79.5	-81	-78.5	-81.5	-79	-81.5	-80.5	-81	-78		73	
	32QAM StrongFEC	-78	-79	-79	-77.5	-76.5	-77	-75	-78.5	-75	-77.5	-76.5	-77	-74		93	
	64QAM StrongFEC	-76	-76	-76.5	-74.5	-74	-74	-72	-75.5	-73	-75	-74.5	-74	-71.5		123	
	128QAM StrongFEC	-72	-73	-73	-71.5	-70	-71	-69	-72.5	-70	-71.5	-71.5	-71	-69		148	
	256QAM StrongFEC	-69	-69	-69.5	-68.5	-67	-68	-66	-69	-67.5	-68.5	-67.5	-68	-65		173	
	512QAM StrongFEC	-66	-66	-66.5	-65.5	-62.5	-65	-62	-66.5	-64.5	-65	-64.5	-64	-62		197	
	1024QAM StrongFEC	-63	-62	-62.5	-61.5	-60	-61	-59	-62.5	-61.5	-61.5	-61	-60	-58		222	
	1024QAM WeakFEC	-61			-60		-58	-57	-60.5	-59.5	-60.5	-59	-58.5	-56		235	
	2048QAM StrongFEC	-59	-60	-60.5	-58	-56.5	-56		-58	-57	-58.5	-57	-57.5	-54	244		
40	4QAM StrongFEC	-86.5	-87	-87	-85	-86	-85.5	-83	-86	-83	-85.5	-85	-85.5	-82		51	
	16QAM StrongFEC	-81	-81	-82	-79.5	-78.5	-79	-77	-80.5	-78	-80	-79.5	-79	-77		101	
	32QAM StrongFEC	-77	-77	-78	-76.5	-75.5	-76	-73	-77	-74	-76	-75.5	-75.5	-73		129	
	64QAM StrongFEC	-74	-74	-75	-73.5	-71	-73	-70	-74	-72	-73	-72.5	-72.5	-70		170	
	128QAM StrongFEC	-71	-71	-72	-70.5	-70	-70	-67	-71	-69	-70	-69.5	-70	-67		204	
	256QAM StrongFEC	-68	-68	-68	-67	-65	-66.5	-64.5	-67	-66	-67	-66.5	-65.5	-64		238	
	512QAM StrongFEC	-65	-65	-65.5	-64	-62	-64	-61	-64.5	-63	-63.5	-63.5	-63	-61		272	
	1024QAM StrongFEC	-61	-61	-61.5	-60.5	-59	-58	-57.5	-61.5	-59	-60.5	-59.5	-59.5	-56.5		306	
	1024QAM WeakFEC	-60			-59		-55	-55	-59.5	-57.5	-58.5	-58	-57.5	-55.5		323	
	2048QAM StrongFEC	-58	-58	-58.5	-57	-54	-53		-57.5	-55	-56.5	-55.5	-56	-53	336		
50	4QAM StrongFEC	-85	-86	-86	-84.5	-85.5	-85	-82	-85	-82.5	-85.5	-84	-84	-81.5	63	63	
	16QAM StrongFEC	-80	-80	-80	-78.5	-78	-78	-76	-79.5	-77	-79.5	-78	-78	-76	128	130	
	32QAM StrongFEC	-76	-76	-76	-74.5	-74.5	-75	-72	-75.5	-73	-75.5	-74.5	-74.5	-72.5	163	163	
	64QAM StrongFEC	-73	-73.5	-74	-72.5	-71	-72	-69	-72	-71	-72.5	-71.5	-72	-69.5	212	216	
	128QAM StrongFEC	-70	-70	-71	-69	-68	-69	-66	-70	-68	-69.5	-68	-69	-66.5	254	258	
	256QAM StrongFEC	-67	-67	-67	-65.5	-64	-66	-63	-66	-64.5	-66.5	-65	-65	-63	297	301	
	512QAM StrongFEC	-64	-63.5	-64	-63	-61	-63	-59	-63.5	-62	-63	-62	-62	-60	339	344	
	1024QAM StrongFEC	-61	-61	-60	-60	-57	-58	-56	-60	-58.5	-59.5	-58.5	-58	-56	382	385	
	1024QAM WeakFEC	-59			-57		-55	-54	-57.5	-55.5	-57.5	-56	-56	-54	410		
	2048QAM StrongFEC	-57	-57	-57.5	-56	-55	-53		-56	-54	-56.5	-55.5	-55	-52	420		

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BW, MHz	Modulation	6GHz	7GHz	8GHz	11GHz	13GHz	15GHz	17GHz	18GHz	23GHz	24GHz	26GHz	28GHz	38 GHz	Capacity, Mbps	
		Guaranteed RSL Threshold, dBm													-G modes	Legacy modes
60	4QAM StrongFEC	-84	-85	-85.5	-83.5	-84.5	-84	-81	-85	-82	-84	-83.5	-83.5	-81	74	74
	16QAM StrongFEC	-79	-79.5	-80	-78	-77	-78	-75	-78.5	-76	-78.5	-77	-77.5	-75	149	151
	32QAM StrongFEC	-75	-75.5	-76	-74.5	-73	-74	-71	-75	-73	-74.5	-73.5	-74	-71	190	190
	64QAM StrongFEC	-72	-73	-73	-71.5	-71	-71	-69	-72	-70	-71.5	-71	-71	-69	247	251
	128QAM StrongFEC	-70	-69.5	-70	-68.5	-68	-68	-66	-69	-67	-69	-67.5	-68	-65	297	301
	256QAM StrongFEC	-66	-66	-67	-65	-64	-65	-62	-66	-64.5	-65.5	-64.5	-65	-62	347	351
	512QAM StrongFEC	-63	-63	-63	-62.5	-61	-62	-59	-62.5	-61.5	-62.5	-61	-61	-59	397	401
	1024QAM StrongFEC	-60	-59	-60	-58.5	-58	-58	-55	-59	-57.5	-58.5	-57.5	-57	-54.5	447	451
	1024QAM WeakFEC	-58			-57			-55	-53	-57	-55.5	-55.5	-55.5	-53		474
	2048QAM StrongFEC	-56	-56	-57	-54	-54	-54			-55	-53	-55.5	-54.5	-54	-51.5	491

⁶ 2048QAM modulation is available only for Integra-G. It is not supported by legacy models and 17 GHz radio

⁷ 1024QAM modulation with Weak FEC setting is available for legacy models or in legacy modes only

Integra-W RSL Thresholds at BER 10⁻⁶ and Total Payload Capacity (Mbps)⁹

BW, MHz	Modulation, Strong FEC	6L GHz	6U GHz	11GHz	15GHz	17GHz ¹⁰	18GHz	23GHz	24GHz ¹⁰	26GHz	28GHz	38 GHz	Capacity, Mbps
		Guaranteed RSL Threshold, dBm											Integra-W
40	4QAM	-82.5	-82.5	-82.5	-82	-79	-83.5	-80.5	-80	-82	-82.5	-79	63
	8QAM	-79	-79	-78	-77.5	-76	-80.5	-76.5	-75.5	-78	-78.5	-75	94
	16QAM	-76	-76	-75.5	-75	-73	-76.5	-74.5	-72.5	-75	-74.5	-72.5	126
	32QAM	-73	-73	-73	-72.5	-70	-74	-71.5	-70	-72	-72	-69.5	157
	64QAM	-70	-70	-70	-69.5	-67.5	-71.5	-69.5	-66.5	-69	-69	-66.5	189
	128QAM	-67	-67	-67	-66.5	-64.5	-68	-65.5	-64	-66	-66.5	-63.5	220
	256QAM	-64	-64	-64	-63.5	-61	-63.5	-62.5	-60.5	-63	-61.5	-60.5	252
	512QAM	-61	-61	-60	-59.5	-58	-59.5	-59.5	-57.5	-60	-59.5	-57.5	284
	1024QAM	-57	-57	-56.5	-56	-55	-55.5	-57	-54	-56	-55.5	-53	315
	50	4QAM	-82	-82	-82	-81.5	-79	-82.5	-79.5	-79	-81	-81	-78.5
8QAM		-78	-78	-77	-76.5	-75	-79	-75.5	-75	-77	-77	-74.5	118
16QAM		-75	-75	-75	-74.5	-72	-76.5	-74.5	-72	-74	-74	-72	157
32QAM		-72	-72	-72	-71.5	-69.5	-73.5	-71.5	-69	-71	-71	-69	197
64QAM		-69	-69	-69	-68.5	-66.5	-70.5	-68.5	-66	-68	-68.5	-66	236
128QAM		-66	-66	-66	-65.5	-63.5	-65.5	-65.5	-62.5	-65.5	-66.5	-64	276
256QAM		-63	-63	-63	-62.5	-60	-62.5	-61.5	-60	-62	-62	-60	315
512QAM		-60	-60	-60	-59.5	-57.5	-58.5	-58.5	-57	-59	-59	-57	355
1024QAM		-56	-56	-56	-55.5	-54	-55.5	-55.5	-53	-55	-54.5	-52.5	394
56		4QAM	-81.5	-81.5	-81	-80.5	-78.5	-82.5	-80	-78	-80	-80.5	-77.5
	8QAM	-77	-77	-76	-75.5	-74.5	-78	-75.5	-73	-76	-76.5	-73.5	134
	16QAM	-74.5	-74.5	-74	-73.5	-72	-75.5	-74	-71	-74	-74	-71	178
	32QAM	-71.5	-71.5	-71	-70.5	-69	-72.5	-70.5	-68.5	-71	-71.5	-69.5	224
	64QAM	-68.5	-68.5	-68.5	-68	-66	-68.5	-67.5	-65	-68	-68	-66	269
	128QAM	-65	-65	-65	-64.5	-63	-65.5	-65	-62	-65	-65	-62	314
	256QAM	-62.5	-62.5	-62.5	-62	-60	-61.5	-61.5	-59	-62	-62.5	-59.5	359
	512QAM	-59.5	-59.5	-59	-58.5	-57	-58.5	-58.5	-56	-58	-59	-56	404
	1024QAM	-55	-55	-55.5	-55	-53	-54.5	-55	-52.5	-55	-55.5	-52.5	449
	60	4QAM	-81	-81	-81	-80.5	-78.5	-81.5	-80.5	-78	-80	-80	-77.5
8QAM		-76.5	-76.5	-76	-75.5	-74	-78	-75.5	-74	-76	-76	-73.5	144
16QAM		-74.5	-74.5	-74	-73.5	-71.5	-75.5	-73.5	-71	-74	-74.5	-72	192
32QAM		-71.5	-71.5	-71	-70.5	-68.5	-72.5	-70.5	-68	-71	-71.5	-68.5	240
64QAM		-68.5	-68.5	-67.5	-67	-64.5	-67.5	-67.5	-65	-67	-67	-65	288
128QAM		-65	-65	-65	-64.5	-62.5	-65.5	-64.5	-62	-65	-65.5	-62.5	336
256QAM		-62.5	-62.5	-62	-61.5	-59.5	-61.5	-61.5	-59	-61	-61.5	-58.5	385
512QAM		-59	-59	-58	-57.5	-56.5	-58.5	-58.5	-55.5	-58	-58	-56	433
1024QAM		-55	-55	-55	-54.5	-53	-54.5	-55	-52	-55	-54.5	-52	481
80		4QAM	-79.5	-79.5	-79.5	-79	-77.5	-81	-78.5	-76	-79	-79	-76.5
	8QAM	-75.5	-75.5	-74	-73.5	-72.5	-77	-75	-73	-75	-75	-72.5	192
	16QAM	-72.5	-72.5	-72	-71.5	-70	-74.5	-71.5	-70	-72	-72	-69.5	257
	32QAM	-69.5	-69.5	-69	-68.5	-67.5	-71.5	-68.5	-67	-69	-69	-66.5	321
	64QAM	-66.5	-66.5	-66.5	-66	-64.5	-67.5	-65.5	-64	-66	-66	-63.5	385
	128QAM	-63.5	-63.5	-63.5	-63	-61	-64	-62.5	-61	-63	-63	-60.5	450
	256QAM	-60.5	-60.5	-60.5	-60	-58	-60.5	-59.5	-58	-60	-60	-57.5	514
	512QAM	-57.5	-57.5	-57	-56.5	-55	-57	-56.5	-54	-56.5	-56.5	-54	578
	1024QAM	-53.5	-53.5	-53.5	-53	-51.5	-53.5	-53	-51	-53.5	-53.5	-51	643

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BW, MHz	Modulation, Strong FEC	6L	6U	11GHz	15GHz	17GHz ¹⁰	18GHz	23GHz	24GHz ¹⁰	26GHz	28GHz	38 GHz	Capacity, Mbps
		GHz	GHz										
100 ⁹ FCC	4QAM	-78.5	-78.5	-79	-78.5	-	-80	-77.5	-	-78.5	-78.5	-76	168
	8QAM	-74.5	-74.5	-74	-73.5	-	-76	-73.5	-	-73.5	-73.5	-71	252
	16QAM	-71.5	-71.5	-71	-70.5	-	-73	-70.5	-	-71.5	-71.5	-69	336
	32QAM	-68.5	-68.5	-69	-68.5	-	-70	-67.5	-	-68.5	-68.5	-66	420
	64QAM	-65.5	-65.5	-65.5	-65	-	-66	-64.5	-	-65.5	-65.5	-63	504
	128QAM	-63	-63	-63	-62.5	-	-63	-61.5	-	-62.5	-62.5	-60	588
	256QAM	-59.5	-59.5	-59.5	-59	-	-60	-58.5	-	-58.5	-58.5	-56	672
	512QAM	-56	-56	-56	-55.5	-	-56	-55.5	-	-56.5	-56.5	-54	756
	1024QAM	-52	-52	-51	-50.5	-	-51.5	-52	-	-51.5	-51.5	-49	840
112 ⁹ ETSI	4QAM	-78.5	-78.5	-77.5	-77	-	-79.5	-77.5	-	-77.5	-77.5	-75	176
	8QAM	-73.5	-73.5	-73.5	-73	-	-76	-73	-	-73	-73	-70.5	265
	16QAM	-71.5	-71.5	-71	-70.5	-	-73	-70.5	-	-70.5	-70.5	-68	353
	32QAM	-68.5	-68.5	-68	-67.5	-	-70	-67.5	-	-67.5	-67.5	-65	441
	64QAM	-65	-65	-65	-64.5	-	-66	-64.5	-	-64.5	-64.5	-62	530
	128QAM	-62.5	-62.5	-62	-61.5	-	-63	-61.5	-	-61.5	-61.5	-59	618
	256QAM	-59.5	-59.5	-59	-58.5	-	-59	-58.5	-	-58.5	-58.5	-56	707
	512QAM	-54.5	-54.5	-56	-55.5	-	-56	-54.5	-	-54.5	-54.5	-52	795
	1024QAM	-52	-52	-51.5	-51	-	-51.5	-51	-	-51.5	-51.5	-49	883

⁹ 100 MHz and 112 MHz channel bandwidths are available for all Integra-W models except 17GHz and 24GHz UL.

¹⁰ Please check the availability of 17GHz and 24GHz UL Integra-W models at SAF representative before planning your network