



Integra

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 and 1588v2 PTP 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 474 Mbps per channel/polarization.

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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Integra datasheet, v1.21, Sep 2014
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Technical specification

		Integra	Integra-S
General			
Concept / form factor		FODU with antenna integration	FODU slip-fit
Capacity		<i>up to 1Gbps throughput with header compression*</i>	
Frequency bands		15GHz, 17GHz UL, 18GHz, 23GHz, 24GHz UL, 25GHz, 26GHz, 38GHz, 42GHz <i>and more*</i>	
Modulation		From 4QAM up to 1024QAM with hitless ACM	
Configurations		1+0, 2+0 link bonding	
ATPC		Yes	
Channel bandwidth		ETSI: from 3.5 MHz up to 56MHz FCC: from 5 MHz up to 60MHz	
Ports			
Gigabit Ethernet	1x RJx45	Electrical with built-in PoE splitter	
	2x SFP	Fiber Optics	
Service ports	3.5mm	Audible alignment and RSSI	
	USB B	Terminal Access	
	LED	Power On, Link Synchronization, RSL	
Ethernet			
Ethernet		Built-in Carrier Ethernet Gigabit Network Processor	
Managed Gigabit Switch functionality		802.1Q VLANs with QoS/CoS including WRED, shaping and DWRR, Spanning Tree Protocol, Jumbo frames <i>and more*</i>	
Management		SNMP v1/2c/3, SSH, HTTPS, Serial, RADIUS, Network Time Protocol	
Performance monitoring		Performance graphs, constellation diagram, alarms, detailed counters	
Synchronization		SyncE, IEEE 1588v2 PTP*	
Carrier Ethernet functionality		Provider Bridging, MEF9&14, High Efficiency Header Compression, AES 256-bit encryption, <i>MPLS-TP*, OAM*</i>	
Max frame size		9600 bytes	
Antenna			
Sizes		0.3m / 1ft	0.6m / 2ft
Antenna		High Performance and <i>Super High Performance*</i>	
Electrical & Mechanical			
Power consumption		Typical: 20W, Max: <35W	
Power range	Integra	36 ... 57 V DC	
	PoE injector	22 V ... 60 V DC with IOATPI22 Power over Ethernet	
Temperature range		-33 ... +55 °C / -28 ... +130 °F	
Size, w/o mount		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"
Weight, w/o mount		5 kg / 11 lbs	2.9 kg / 6.4 lbs
Mount	Mount size	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	
		Mount on antenna	

* Inquire SAF representative for more information

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RSL Threshold (dBm) and Link Capacity (Mbps)

ETSI channels	3.5 MHz		7 MHz		14 MHz		20 MHz		28 MHz		40 MHz		56 MHz	
Modulation	RSL	Eth	RSL	Eth	RSL	Eth	RSL	Eth	RSL	Eth	RSL	Eth	RSL	Eth
4QAM	-97	4	-95	8	-92	17	-91	25	-90	35	-89	50	-87	72
16QAM	-91	8	-88	16	-86	33	-85	51	-84	69	-82	98	-80	145
32QAM	-87	10	-85	20	-82	44	-81	64	-80	88	-78	125	-77	183
64QAM	-85	13	-82	27	-79	56	-78	85	-77	115	-76	165	-74	241
128QAM	-81	16	-78	33	-76	67	-75	102	-74	138	-73	198	-71	289
128QAM W	-79	17	-	-	-	-	-	-	-	-	-	-	-	-
256QAM	-	-	-75	39	-73	79	-72	119	-71	161	-69	231	-68	337
256QAM W	-	-	-73	41	-	-	-	-	-	-	-	-	-	-
512QAM	-	-	-	-	-70	90	-68	136	-68	184	-66	264	-64	385
512QAM W	-	-	-	-	-66	97	-	-	-	-	-	-	-	-
1024QAM	-	-	-	-	-	-	-65	153	-64	207	-62	298	-61	433
1024QAM W	-	-	-	-	-	-	-62	163	-61	220	-60	314	-58	456

FCC channels	5 MHz		10 MHz		20 MHz		25 MHz		30 MHz		40 MHz		50 MHz		60 MHz	
Modulation	RSL	Eth	RSL	Eth	RSL	Eth	RSL	Eth	RSL	Eth	RSL	Eth	RSL	Eth	RSL	Eth
4QAM	-96	5	-94	12	-91.5	24	-90	31	-90	37	-88	51	-87	63	-86	74
16QAM	-89	10	-88	24	-85	49	-84	62	-83.5	73	-82	101	-81	127	-80	151
32QAM	-85	12	-83	30	-81	62	-80	78	-80	93	-78	129	-77	160	-76	190
64QAM	-82	17	-80	40	-78.5	82	-77	104	-76.5	123	-75	170	-74	212	-73	251
128QAM	-79	20	-77	48	-75.5	99	-74	124	-73.5	148	-72	204	-71	255	-71	301
128QAM W	-76	22	-	-	-	-	-	-	-	-	-	-	-	-	-	-
256QAM	-	-	-74	56	-72.5	115	-71	145	-70.5	173	-69	238	-68	297	-67	351
256QAM W	-	-	-71	60	-	-	-	-	-	-	-	-	-	-	-	-
512QAM	-	-	-	-	-68.5	132	-68	166	-67	197	-65.5	272	-64	340	-64	401
1024QAM	-	-	-	-	-65.5	148	-64	187	-63.5	222	-62	306	-61	382	-60	451
1024QAM W	-	-	-	-	-62.5	157	-61.5	198	-61	235	-60	323	-58	409	-58	474

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Maximum Tx Power

Modulation	Tx power, dBm			
	15, 18, 23, 25, 26 GHz	17 GHz*, 24 GHz*	38 GHz	42 GHz
4 QAM	+20	-26 ... +5	+15	+10
16 QAM	+19	-26 ... +5	+14	+9
32 QAM	+18	-26 ... +5	+14	+9
64 QAM	+17	-26 ... +5	+13	+8
128 QAM	+17	-26 ... +5	+13	+8
256 QAM	+16	-26 ... +5	+12	+7
512 QAM	+15	-26 ... +5	+11	+6
1024 QAM	+12	-26 ... +5	+10	+5

* Max Tx power settings depend on national regulatory EIRP allowance and antenna size.

High Performance integrated antenna specification

Size	Frequency, GHz	Gain, dBi	Half power beamwidth	XPD dB	F/B ratio, dB	Compliance	
						ETSI	FCC
0.3m	15	32.1	4.3°	30	58	Class 3	N/A
	17						
	18	34.2	3.3°	30	61	Class 3	B2
	23	35.3	3.0°	30	62	Class 3	A
	24						
	38						
	42						
0.6m	15	37.5	2.4°	32	62.5	Class 3	N/A
	17						
	18	39.1	1.9°	30	64.5	Class 3	A
	23	41.4	1.6°	30	66.5	Class 3	A
	24						
	38						
	42						



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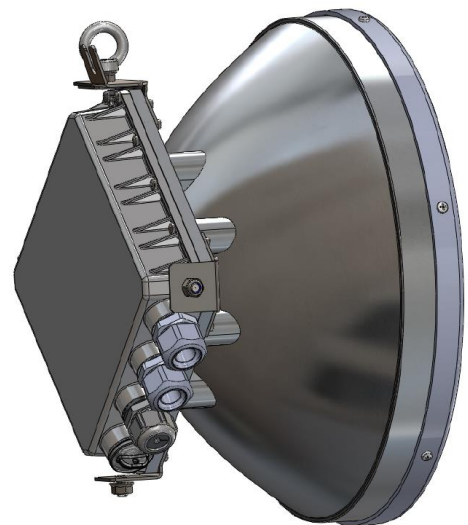


Ethernet header compression

Example shows that in 60MHz channel and 1024QAM modulation over **1Gbps** throughput can be achieved with Ethernet header compression of frame size of 64 bytes in 1+0 configuration, where link capacity is **465 Mbps**:

Frame size, bytes	Ethernet, Mbps	Throughput gain, %
64	1069.50	56.52
128	715.88	35.14
256	572.95	18.84
512	515.38	9.77
1024	489.38	4.98
1280	484.38	4.00
1518	481.27	3.38

Table shows maximum improvement achieved, when compressing IP header, QinQ VLANs headers, MAC addresses and Ethernet L1 overhead. Ethernet throughput for each frame size can be calculated for any link capacity by using calculated gain from the table. For example, at **465 Mbps** radio capacity with Ethernet compression gain of **56.52%** of 64 byte size packets can achieve **1069 Mbps** Ethernet throughput, i.e. $465 \text{ Mbps} / (1 - 56.52\%) = 1069 \text{ Mbps}$.



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