

# Unikátní mikrovlnné spoje

# RAY

RAY je vysokorychlostní point-to-point mikrovlnný spoj vhodný i pro nejnáročnější podmínky. Využívají jej poskytovatelé internetových služeb i globální telekomunikační operátoři pro páteřní sítě a vysokorychlostní last-mile spoje.



## Market leader

- Výjimečná spolehlivost na extrémní vzdálenosti
- Maximální využití spektra
- Minimální spotřeba energie
- Wifi management, mobilní aplikace

## Výkon

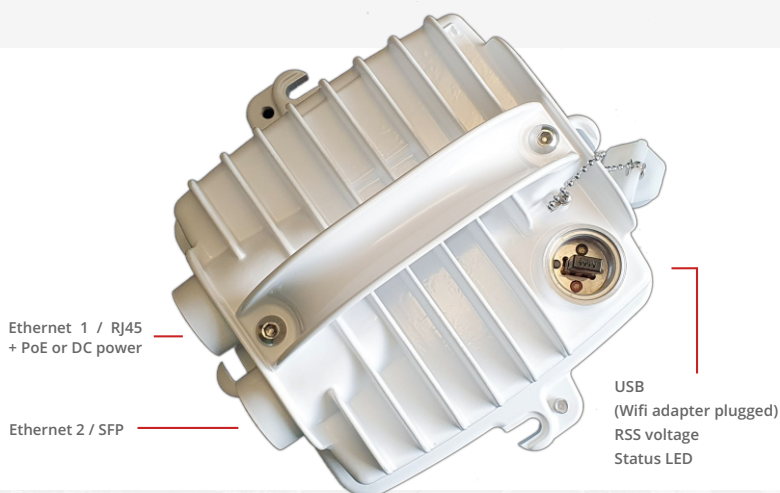
- 1 Gb/s FDD
- 3.5 – 112 MHz kanály
- QPSK – 4096 QAM
- 10, 17, 18, 24 GHz

## Efektivní využití spektra

- Každá část spektra efektivně využita
- Vestavěný analyzátor spektra
- Vhodný i pro silně zarušené lokality
- Úzké i asymetrické kanály

## Spolehlivost

- V praxi ověřená robustnost HW a FW
- Vysoká citlivost, Hitless ACM a ATPC
- Ochrana proti přepětí 4 kV, ESD 8 kV
- Každá jednotka testována v klimatické komoře



# Technické parametry

Radio parameters	10 GHz		17 GHz / 24 GHz		18 GHz	
	Lower	Upper	The same HW for L/U		Lower	Upper
Sub-band A	10.301 – 10.420	10.476 – 10.588	no sub-bands		17.700 – 18.209	18.710 – 19.219
Sub-band B	10.125 – 10.325	10.475 – 10.675	17.10 – 17.30		18.167 – 18.690	19.177 – 19.700
Sub-band C	–	–	24.00 – 24.25		17.700 – 18.300	19.300 – 19.700
Channels	3.5; 7; 14; 20; 28; 40; 56; 80; 84; 112 MHz		3.5; 5; 7; 10; 14; 20; 28; 40; 56; 80; 100; 112 MHz		5; 7; 7.5; 10; 13.75; 20; 27.5; 30; 40; 50; 55; 60; 80; 100; 110 MHz	
Duplex spacing	Sub-band A: Flexible 58 - 285 MHz; location adj. by SW Sub-band B: 350 MHz		Flexible min.18 MHz between channel edges; location adjusted by SW		1008, 1010 MHz @ Sub-band A, B 1560 MHz @ Sub-band C	
Gross data rate	2.9 – 1010 Mb/s		2.7 – 1002 Mb/s		4.2 – 1010 Mb/s	
FEC	LDPC		LDPC, RS		LDPC	
<b>Speed / Sensitivity</b>						
<b>Modulation</b>	<b>3.5 MHz</b>	<b>112 MHz</b>	<b>3.5 MHz</b>	<b>112 MHz</b>	<b>5 MHz</b>	<b>110 MHz</b>
QPSK_S	2.9 Mb/s @ -98.0 dBm	96 Mb/s @ -84.5 dBm	2.7 Mb/s @ -99.0 dBm	97 Mb/s @ -85.0 dBm	4.2 Mb/s @ -99.0 dBm	96 Mb/s @ -85.0 dBm
QPSK	5.0 Mb/s @ -94.0 dBm	166 Mb/s @ -80.5 dBm	5.0 Mb/s @ -94.5 dBm	161 Mb/s @ -81.5 dBm	7.2 Mb/s @ -95.0 dBm	166 Mb/s @ -81.0 dBm
16 QAM	8.7 Mb/s @ -90.0 dBm	287 Mb/s @ -75.5 dBm	9.5 Mb/s @ -88.5 dBm	334 Mb/s @ -74.5 dBm	12 Mb/s @ -90.5 dBm	287 Mb/s @ -76.0 dBm
32 QAM	12 Mb/s @ -86.5 dBm	400 Mb/s @ -70.5 dBm	11 Mb/s @ -85.0 dBm	426 Mb/s @ -70.5 dBm	17 Mb/s @ -85.5 dBm	400 Mb/s @ -71.0 dBm
64 QAM	16 Mb/s @ -83.5 dBm	513 Mb/s @ -68.0 dBm	15 Mb/s @ -82.0 dBm	536 Mb/s @ -67.5 dBm	22 Mb/s @ -82.5 dBm	513 Mb/s @ -68.5 dBm
128 QAM	18 Mb/s @ -80.5 dBm	604 Mb/s @ -65.0 dBm	17 Mb/s @ -79.0 dBm	636 Mb/s @ -64.5 dBm	26 Mb/s @ -80.0 dBm	604 Mb/s @ -65.5 dBm
256 QAM	21 Mb/s @ -77.5 dBm	698 Mb/s @ -62.0 dBm	19 Mb/s @ -76.0 dBm	730 Mb/s @ -61.5 dBm	30 Mb/s @ -77.0 dBm	698 Mb/s @ -62.5 dBm
512 QAM	24 Mb/s @ -74.0 dBm	791 Mb/s @ -59.0 dBm	22 Mb/s @ -73.0 dBm	823 Mb/s @ -58.5 dBm	34 Mb/s @ -74.0 dBm	791 Mb/s @ -59.5 dBm
1024 QAM	27 Mb/s @ -71.0 dBm	881 Mb/s @ -56.0 dBm	23 Mb/s @ -69.5 dBm	918 Mb/s @ -55.5 dBm	38 Mb/s @ -70.5 dBm	881 Mb/s @ -56.0 dBm
2048 QAM (7 - 112 MHz)	29 Mb/s @ -67.0 dBm	958 Mb/s @ -53.0 dBm	-	1002 Mb/s @ -52.5 dBm	42 Mb/s @ -67.0 dBm	958 Mb/s @ -52.0 dBm
4096 QAM (14 - 56 MHz)	-	1010 Mb/s @ -49.0 dBm	-	-	-	1010 Mb/s @ -48.0 dBm
ACM	Hitless					
RF Output power	-15 to +10 dBm (+13 dBm for QPSK)		-30 to +10 dBm (all modulations and channels)		-1 to +23 dBm (all modulations and channels)	
ATPC	Yes					
MTU	10240 B					
Latency (RFC 2544)	<150 µs (66 B, 352 Mb/s); <200 µs (1518 B, 352 Mb/s) <100 µs (66 B, 1010 Mb/s); <150 µs (1518 B, 1010 Mb/s)		268 µs (64B/366 Mb/s); 313 µs (1518 B/366 Mb/s) 173 µs (64B/1002 Mb/s); 198 µs (1518 B/1002 Mb/s)		<150 µs (66 B, 352 Mb/s); <200 µs (1518 B, 352 Mb/s) <100 µs (66 B, 1010 Mb/s); <150 µs (1518 B, 1010 Mb/s)	
Synchronization	Synchronous Ethernet; 1588v2 transparent clock					
<b>Electrical</b>						
Primary power	PoE active, IEEE 802.3 bt (PoE++); PoE passive 20 – 60 VDC; DC 20 – 60 VDC; floating		PoE active, IEEE 802.3 at (PoE+); PoE passive 20 – 60 VDC; DC 20 – 60 VDC; floating		PoE active, IEEE 802.3 bt (PoE++); PoE passive 20 – 60 VDC; DC 20 – 60 VDC; floating	
Power consumption	Typ. 26.5 W (w/o SFP)		Typ. 22.5 W (w/o SFP)		Typ. 30 W for Tx < +17 dBm (w/o SFP); 33 W for Tx >= +17 dBm (w/o SFP)	
<b>Interfaces</b>						
Ethernet	1x 10/100/1000 Base-T Auto MDI/MDIX / RJ45					
SFP	1x 10/100/1000 Base-T/1000Base-SX/1000Base-LX (power max. 1.25 W)					
USB	USB 2.0 / Host A					
RSS voltage	Two contact sockets					
Indication LED	System status (multicolor)					
<b>Environmental</b>						
IP Code (Ingress Protection)	IP66					
MTBF (Mean Time Between Failure)	> 1.000.000 hours (> 114 years)					
Operating temperature	- 30 to + 55°C (ETSI EN 300019-1-4, class 4.1.)					
Operating humidity	5 to 95% non-condensing					
Surge immunity	4 kV acc. EN 61000-4-5					
ESD resistance	8 kV acc. EN 61000-4-2					
<b>Mechanical</b>						
Casing	Rugged die-cast aluminium					
Size	160 H x 245 W x 245 D mm (6.3 x 9.6 x 9.6 in)					
Weight	2.8 kg (6.2 lbs)		2.6 kg (5.7 lbs)		2.9 kg (6.4 lbs)	
Mounting	FOD, direct mounting to antenna					
<b>Diagnostic</b>						
Real time monitoring	RSS, MSE, BER					
Diagnostic tools	Spectrum analyzer, Pinger, Radio loopback					
History charts	Temperature, Power voltage, RSS, MSE, BER, Data rate, RF Output power					
Statistics	RMON counters for all interfaces					
Antenna alignment	RSS voltage, RAY Tools Mobile App, Web					
SNMP	v2c including configurable TRAPs					
<b>Security</b>						
Management	HTTP, HTTPS, SSH, Telnet, RAYTools Mobile App					
Access accounts	3 levels (Guest, Admin, Super)					
Encryption	AES256, 192, 128					
<b>Standards</b>						
Approvals	CE (RED), RoHS		17 GHz CE (RED), RoHS 24 GHz CE (RED), FCC, RoHS		CE (RED), FCC 101, RoHS	

Technical parameters are subject to change without prior notification. For more details see [User manuals](#).

