



RAY3

- 1 Gbps / 24 GHz / 250 MHz
- 713 Mbps / 17 GHz, 24 GHz / 200 MHz
- 3.5 – 112 MHz kanály
- Asymetrické kanály
- AES256, SyncEth, PTP
- 1× ETH, 1× SFP, 1× USB
- Připraveno na solární napájení – 22W
- Každá jednotka testována -30 až +55 °C
- Full outdoor, snadná instalace
- Odolnost proti rušení
- Wifi management
- RAY Tools (Android, iOS)

RAy je vysokorychlostní point-to-point mikrovlnný spoj vhodný i do nejnáročnějších podmínek.

Tyto **Full Outdoor**, Software Defined Radio jednotky s operačním systémem Linux jsou navrženy pro linky, kde je vyžadován **rychlý přenos s maximální spolehlivostí, výjimečným ziskem a odolností proti rušení**. Do výsledného řešení byly pečlivě implementovány všechny nejnovější poznatky bez kompromisů.

RAy je na trhu od roku 2009 a osvědčil se v tisících instalacích v desítkách zemí od pólů až po rovník.

Využívají jej poskytovatelé internetových služeb i globální telekomunikační operátoři pro páteřní sítě a vysokorychlostní last-mile spoje.

RAY3, třetí generace RAY, je s **1 Gbps FDD** a možností **asymetrických kanálů** špičkovým zařízením pro bezlicenční pásma.



RAY2

- 360 Mbps / 10, 11, 17, 18, 24 GHz
- 1.75 – 56 MHz kanály
- 1× ETH, 1× SFP, 1× USB
- Připraveno na solární napájení – 22W
- Každá jednotka testována -30 až +55 °C
- Full outdoor, snadná instalace
- Maximální vzdálenost & spolehlivost
- Odolnost proti rušení
- WiFi management
- RAY Tools (Android, iOS)

RAy3 technické parametry

Radio parameters	RAy3		
Frequency range	17.10 – 17.30 GHz, 24.00 – 24.25 GHz		
Channel spacing	3.5, 5, 7, 10, 14, 20, 28, 40, 56, 80, 100, 112 MHz		
Channel duplex spacing	Flexible, min.18 MHz between channel edges		
Gross data rate	2.7 – 1002 Mbps		
FEC	LDPC, RS		
	Speed / Sensitivity		
Modulation	3.5 MHz	56 MHz	112 MHz
QPSK_S	2.7 Mbps / -99.0 dBm	48 Mbps / -88.0 dBm	97 Mbps / -85.0 dBm
QPSK	5.0 Mbps / -94.5 dBm	81 Mbps / -84.5 dBm	161 Mbps / -81.5 dBm
16 QAM	9.5 Mbps / -88.5 dBm	168 Mbps / -77.5 dBm	334 Mbps / -74.5 dBm
32 QAM	11 Mbps / -85.0 dBm	213 Mbps / -73.5 dBm	426 Mbps / -70.5 dBm
64 QAM	15 Mbps / -82.0 dBm	267 Mbps / -70.5 dBm	536 Mbps / -67.5 dBm
128 QAM	17 Mbps / -79.0 dBm	319 Mbps / -67.5 dBm	636 Mbps / -64.5 dBm
256 QAM	19 Mbps / -76.0 dBm	366 Mbps / -64.5 dBm	730 Mbps / -61.5 dBm
512 QAM	22 Mbps / -73.0 dBm	413 Mbps / -61.5 dBm	823 Mbps / -58.5 dBm
1024 QAM	23 Mbps / -69.5 dBm	459 Mbps / -58.5 dBm	918 Mbps / -55.5 dBm
2048 QAM (7 - 112 MHz)	-	501 Mbps / -55.5 dBm	1002 Mbps / -52.5 dBm
4096 QAM (14 - 56 MHz)	-	540 Mbps / -52.5 dBm	-
ACM	Hitless		
RF Output power	-30 to +10 dBm		
ATPC	Yes		
MTU	10240 B		
Latency (RFC 2544)	268 µs (64B/366 Mbps); 313 µs (1518 B/366 Mbps) 173 µs (64B/1002 Mbps); 198 µs (1518 B/1002 Mbps)		
Synchronization	Synchronous Ethernet; 1588v2 transparent clock		
Electrical			
Primary power	PoE active 37 – 60 VDC, IEEE 802.3at; PoE passive 20 – 60 VDC; DC 20 – 60 VDC; floating		
Power consumption	typ. 22.5 W (w/o SFP)		
Interfaces			
Ethernet	1× 10/100/1000 Base-T Auto MDI/MDIX / RJ45		
SFP	1× 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	SYS		
Environmental			
IP Code (Ingress Protection)	IP66		
MTBF (Mean Time Between Failure)	> 750.000 hours (> 85 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		
Mechanical			
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	2.6 kg (5.7 lbs)		
Mounting	FOD, direct mounting to antenna		
Diagnostic			
Real time monitoring	RSS, MSE, BER		
Diagnostic tools	Spectrum analyzer, Pinger, Constellation diagram		
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, web		
SNMP	v2c including configurable TRAPs		
Security			
Management	HTTP, HTTPS, SSH, Telnet, RAYTools App		
Access accounts	3 levels (Guest, Admin, Super)		
Encryption	AES256, 192, 128		
Standards			
Approvals	17 GHz CE (RED), RoHS 24 GHz CE (RED), FCC, RoHS		

RAy2 technické parametry

RAy2	10 GHz		11 GHz		17 GHz / 24 GHz ⁽³⁾		18 GHz	
Radio parameters	Lower	Upper	Lower	Upper	The same HW for L/U		Lower	Upper
Sub-band A	10.300 – 10.420	10.476 – 10.588	10.695 – 10.970	11.185 – 11.460	no sub-bands		17.700 – 18.209	18.710 – 19.219
Sub-band B	10.125 – 10.325	10.475 – 10.675	10.935 – 11.195	11.425 – 11.695	17.1 – 17.3		18.167 – 18.690	19.177 – 19.700
Sub-band C	-	-	-	-	24.0 – 24.25		17.700 – 18.300	19.300 – 19.700
Channel spacing	1.75, 3.5, 7, 14, 20, 28/30, 56 MHz		1.75, 3.5, 7, 14, 28/30, 40, 56 MHz		3.5, 7, 14, 28, 40, 50, 56 MHz		1.75, 2.5, 3.5, 5, 7, 13.75, 27.5, 55 MHz	
Channel duplex spacing	min. 58 MHz		490, 530 MHz		min. 60 MHz		1008, 1010, 1560 MHz	
Gross data rate	1.4 – 360 Mbps		1.4 – 360 Mbps		4.9 – 360 Mbps		2.5 – 360 Mbps	
FEC	LDPC							
Speed / Sensitivity								
Modulation	1.75 MHz	56 MHz	1.75 MHz	56 MHz	3.5 MHz	56 MHz	1.75 MHz	55 MHz
QPSK_S ⁽¹⁾	1.4 Mbps / -103.0 dBm	-	1.4 Mbps / -102.0 dBm	-	-	-	-	-
QPSK	2.5 Mbps / -100.0 dBm	73 Mbps / -86.0 dBm	2.5 Mbps / -99.0 dBm	73 Mbps / -87.0 dBm	4.9 Mbps / -97.0 / -96.0 dBm	73 Mbps / -87.0 / -86.0 dBm	2.5 Mbps / -97.0 dBm	73 Mbps / -84.0 dBm
16 QAM	5.0 Mbps / -92.0 dBm	160 Mbps / -79.0 dBm	5.0 Mbps / -93.0 dBm	160 Mbps / -80.0 dBm	9.6 Mbps / -90.0 / -89.0 dBm	160 Mbps / -80.0 / -79.0 dBm	5.0 Mbps / -91.0 dBm	160 Mbps / -75.0 dBm
32 QAM	6.3 Mbps / -88.0 dBm	203 Mbps / -75.0 dBm	6.3 Mbps / -89.0 dBm	203 Mbps / -76.0 dBm	12 Mbps / -87.0 / -86.0 dBm	203 Mbps / -76.0 / -75.0 dBm	6.3 Mbps / -88.0 dBm	203 Mbps / -72.5 dBm
64 QAM	7.4 Mbps / -87.0 dBm	257 Mbps / -72.0 dBm	7.4 Mbps / -88.0 dBm	257 Mbps / -73.0 dBm	14 Mbps / -84.0 / -83.0 dBm	257 Mbps / -73.0 / -72.0 dBm	7.4 Mbps / -85.0 dBm	257 Mbps / -70.0 dBm
128 QAM	8.9 Mbps / -84.0 dBm	304 Mbps / -68.0 dBm	8.9 Mbps / -84.0 dBm	304 Mbps / -69.0 dBm	17 Mbps / -83.0 / -79.0 dBm	304 Mbps / -69.0 / -68.0 dBm	8.9 Mbps / -82.5 dBm	304 Mbps / -67.0 dBm
256 QAM	-	338 Mbps / -66.0 dBm	-	338 Mbps / -67.0 dBm	20 Mbps / -81.0 / -77.0 dBm	338 Mbps / -66.0 / -65.0 dBm	-	338 Mbps / -64.0 dBm
256 QAM_TO ⁽²⁾	-	359 Mbps / -63.0 dBm	-	359 Mbps / -64.0 dBm	-	359 Mbps / -64.0 / -63.0 dBm	-	359 Mbps / -63.0 dBm
ACM	Hitless							
RF Output power	-10 to +13 dBm		-15 to +24 dBm		-25 to +5 dBm / -30 to +10 dBm		-10 to +24 dBm	
ATPC	Yes							
Latency (RFC 2544)	81 µs (64 B / 358 Mbps), 234 µs (1518 B / 358 Mbps)							
Electrical								
Primary power	PoE active 40 – 60 VDC, IEEE 802.3at; DC 20 – 60 VDC; floating							
Power consumption	21 W		21 – 29 W		21 / 23 W		21 – 28 W	
Interfaces								
Ethernet	1x 10/100/1000 Base-T Auto MDI/MDIX / RJ45							
SFP	1x 1000Base-SX / 1000Base-LX (power max. 1.25 W)							
USB	USB 2.0 / Host A							
RSS voltage	Two contact sockets							
Indication LED	AIR, SYS, ETH							
Environmental								
IP Code	IP66							
MTBF	> 750.000 hours (> 85 years)							
Operating temperature	- 30 to + 55°C (ETSI EN 300019-1-4, class 4.1.)							
Operating humidity	5 to 95% non-condensing							
Surge immunity	1 kV acc. EN 61000-4-5							
ESD resistance	4 kV acc. EN 61000-4-2							
Mechanical								
Casing	Rugged die-cast aluminium							
Size	157 H x 244 W x 244 D mm (6.2 x 9.6 x 9.6 in)							
Weight	2.8 kg (6.1 lbs)		2.8 kg (6.1 lbs)		2.5 kg (5.5 lbs)		2.7 kg (5.9 lbs)	
Mounting	FOD, direct mounting to antenna							
Diagnostic								
Real time monitoring	RSS, MSE, BER							
Diagnostic tools	Spectrum analyzer, Pinger, Constellation diagram							
History charts	Temperature, Power voltage, RSS, MSE, BER, Data rate, RF Output power							
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Management	HTTP, HTTPS, SSH, Telnet, RAYTools App							
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Standards								
Approvals	10 GHz CE (RED), RoHS 11 GHz CE (RED), RoHS, FCC 17 GHz CE (RED), RoHS 18 GHz CE (RED), RoHS, FCC 24 GHz CE (RED), RoHS, FCC							

⁽¹⁾ FEC optimalizovaný na stabilitu (silnější)

⁽³⁾ RAY2-17 a RAY2-24 v nabídce do III/2021

⁽²⁾ FEC optimalizovaný na propustnost (slabší)

