



RAY3

- 1 Gbps / 24 GHz / 250 MHz
- 713 Mbps / 17 GHz, 24 GHz / 200 MHz
- 3.5 – 112 MHz channels
- Asymmetric channels
- AES 256, SyncEth, PTP
- 1x ETH, 1x SFP, 1x USB
- Solar ready - 22W
- Each unit tested -30 to +55°C
- Full outdoor, easy installation
- Interference tolerant
- Wifi management
- RAY Tools (Android, iOS)

RAY is a high-speed point-to-point microwave link, ideal for establishing robust links in the most challenging conditions.

This **Full Outdoor** Software Defined Radio with Linux OS, is designed for **high performance links** with **maximum reliability**, **exceptional system gain** and **resistance to disturbances**. All relevant state-of-the-art concepts have been carefully implemented without compromise.

RAY is well proven within the market since 2009 in thousands of installations in tens of countries from the poles to the equator.

It is used by Internet Service Providers as well as global Telco operators for both, backbone and last-mile microwave links.

RAY3, the 3rd generation of RAY, with possibility of **asymmetric channels** and **1 Gbps FDD** is the top equipment for license free bands.



RAY2

- 360 Mbps / 10, 11, 17, 18, 24 GHz
- 1.75 – 56 MHz channels
- 1x ETH, 1x SFP, 1x USB
- Solar ready - 22W
- Each unit tested -30 to +55°C
- Full outdoor, easy installation
- Maximum distance & reliability
- Interference tolerant
- Wifi management
- RAY Tools (Android, iOS)

General overview

	RAy2	RAy3
Max. Speed	360 Mbps 256 QAM 56 MHz	1 Gbps 2048 QAM 112 MHz
Speed / 56MHz	360 Mbps 256QAM	540 Mbps 4096 QAM
Bands	10, 11, 17, 18, 24 GHz	17, 24 GHz
Asymmetric channels	No	Yes
Channel size	1.75 – 56 MHz	3.5 – 112 MHz
Modulations	QPSK 16 – 256 QAM	QPSK 16 – 4096 QAM
AES 256	No	Yes
Sync Eth, PTP	No	Yes
ESD	4 kV	8 kV
Surge immunity	1 kV	4 kV

Example: RAY3 asymmetric channels in 24 GHz band



RAY Tools Mobile App

- **Wifi** connection between unit and mobile phone
- **Link calculation**
 - fade margin for given distance
- **Antenna Alignment**
 - RSS & SNR, displayed and acoustic notification
- **Link management**
 - responsive web interface

Reliability

- Each unit **tested in a climatic chamber** and in real traffic
- **Robust** input **filter** with no adjustable components
- All our free band units meet licensed band standards
- Built-in **surge protections**
- **Heavy-duty industrial components**
- Industrial rugged die-cast aluminium case
- **- 30 to +55 °C**
- 3 year warranty

Security & Integrity

- Licensed bands available (RAY2)
- **FEC**, interleaving, proprietary **data compression**
- **Proprietary protocol** on Radio channel
- Assigned peer unit permanently monitored
- **Management** - https, ssh,
- **Unique ssh key** for each unit
- **Role-based access control** (2 levels)
- AES256 encryption (RAY3)

Long range & Data speed

- Exceptional **robustness** against **noise** and **interference**
- Hitless **ACM, ATPC**
- **Exceptional sensitivity**: up to -103 dBm
- **Narrow channels**: 3.5 – 112 MHz (RAY3)
- **Wide ranging modulation options**: QPSK – 4096 QAM (RAY3)
- **Asymmetric channels** (RAY3)
- **2+0** solution for double speed available (10, 11, 18 GHz)

Easy to install and maintain

- **Full outdoor** unit with aluminum casing
- **Direct mounting** to parabolic antennas
- Simple signal polarization change through unit rotation
- Built-in **spectrum analyzer** for free channel search
- **RSS voltage output** for antenna alignment
- 17, 24 GHz - the same HW for both, L/U units
- HW button for factory and customers settings
- RAY2 and RAY3 are mechanically compatible

Configuration & Diagnostic

- **Web interface** or CLI via SSH
- **Non-intrusive management** via USB using either ETH/USB adapter or WiFi/USB adapter with DHCP
- **SNMP** including Traps and Informs
- Automatic detection of unit polarization
- **Constellation diagram** of the received signal
- Temperature, Power voltage, RSS, MSE, BER, Data rate, Output power status and history avail. as text or charts

RAy3 technical parameters

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			

