

# Unique Microwave links

# RAY

RAY is a high-speed p-t-p microwave link platform suitable for links in the most challenging conditions. It is used by Internet Service Providers as well as global Telco operators for both backbone and last-mile connections.

10 GHz

11 GHz

17 GHz

18 GHz

24 GHz



## Market leader

- Exceptional reliability over distance
- The best spectral efficiency
- Solar ready 20 – 33 W
- Wifi management, Mobile App

## Performance

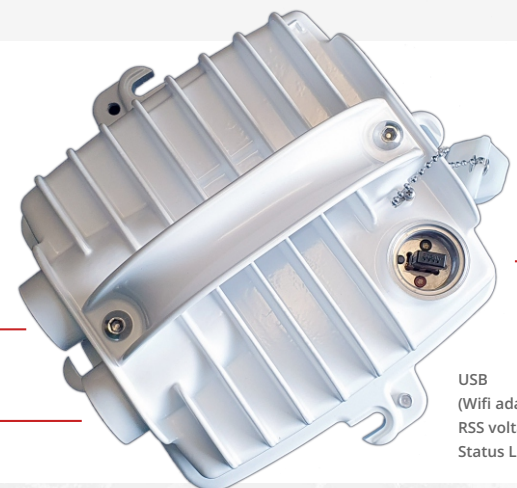
- 1 Gb/s FDD, (2 Gb/s 11 GHz)
- 3.5 – 112 MHz channels
- QPSK – 4096QAM
- 10, 11, 17, 18, 24 GHz

## Spectral efficiency

- Each piece of spectrum effectively used
- Built-in spectrum analyzer
- Ready for crowded and noisy sites
- Narrow and Asymmetric channels

## Reliability

- High sensitivity, Hitless ACM and ATPC
- Surge immunity 4 kV, ESD 8 kV
- Each unit tested in climatic chamber
- MTBF > 100 years, Made in Czechia, EU



Ethernet 1 / RJ45  
+ PoE or DC power

Ethernet 2 / SFP+

USB  
(Wifi adapter plugged)  
RSS voltage  
Status LED

# Technical parameters

| Radio parameters                 | 10 GHz   |                       | 17 GHz / 24 GHz  |                       | 11 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   |                       | 11 GHz: 10.695 – 10.989<br>18 GHz: 17.700 – 18.209   | 11 GHz: 11.199 – 11.491<br>18 GHz: 18.710 – 19.219 |
| Sub-band B                       | 10.125 – 10.325  | 10.475 – 10.675       | 17.10 – 17.30  |                       | 11 GHz: 10.905 – 11.195<br>18 GHz: 18.167 – 18.690   | 11 GHz: 11.395 – 11.699<br>18 GHz: 19.177 – 19.700 |
| Sub-band C                       | –  | –                     | 24.00 – 24.25  |                       | 18 GHz: 17.700 – 18.300  | 18 GHz: 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  |                       | 11 GHz: 5; 7; 10; 14; 20; 28; 30; 40; 56; 60; 80; 112 MHz<br>Dual channel: 2x60; 2x80; 2x112 MHz<br>18 GHz: 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<br>Sub-band B: 350 MHz                                  |                       | Flexible min. 18 MHz between channel edges;<br>location adjusted by SW                               |                       | 11 GHz: 490 MHz (ETSI) or 530 MHz @ Sub-band A, B<br>18 GHz: 1008, 1010 MHz @ Sub-band A, B<br>1560 MHz @ Sub-band C   |  |
| Gross data rate                  | 2.9 – 1010 Mb/s  |                       | 2.7 – 1002 Mb/s  |                       | 11 GHz: 2.9 – 2026 Mb/s<br>18 GHz: 4.2 – 1010 Mb/s   |  |
| FEC                              | LDPC   |                       | LDPC, RS   |                       | LDPC   |  |
| <b>Speed / Sensitivity</b>       |  |                       |  |                       |  |  |
| <b>Modulation</b>                | <b>5 MHz</b>   | <b>112 MHz</b>        | <b>3.5 MHz</b>   | <b>112 MHz</b>        | <b>5 MHz</b>   | <b>110/112 MHz</b>                                 |
| QPSK_S                           | 4.2 Mb/s @ -105.5 dBm  | 96 Mb/s @ -86.0 dBm   | 2.7 Mb/s @ -100.5 dBm  | 97 Mb/s @ -86.5 dBm   | 4.2 Mb/s @ -100.5 dBm  | 96 Mb/s @ -86.5 dBm                                |
| QPSK                             | 7.2 Mb/s @ -96.5 dBm   | 166 Mb/s @ -82.0 dBm  | 5.0 Mb/s @ -96.0 dBm   | 161 Mb/s @ -83.0 dBm  | 7.2 Mb/s @ -96.5 dBm   | 166 Mb/s @ -82.5 dBm                               |
| 16QAM                            | 12 Mb/s @ -92.0 dBm  | 287 Mb/s @ -77.0 dBm  | 9.5 Mb/s @ -90.0 dBm   | 334 Mb/s @ -76.0 dBm  | 12 Mb/s @ -92.0 dBm  | 287 Mb/s @ -77.5 dBm                               |
| 32QAM                            | 17 Mb/s @ -87.0 dBm  | 400 Mb/s @ -72.0 dBm  | 11 Mb/s @ -86.5 dBm  | 426 Mb/s @ -72.0 dBm  | 17 Mb/s @ -87.0 dBm  | 400 Mb/s @ -72.5 dBm                               |
| 64QAM                            | 22 Mb/s @ -84.0 dBm  | 513 Mb/s @ -69.5 dBm  | 15 Mb/s @ -83.5 dBm  | 536 Mb/s @ -69.0 dBm  | 22 Mb/s @ -84.0 dBm  | 513 Mb/s @ -70.0 dBm                               |
| 128QAM                           | 26 Mb/s @ -81.5 dBm  | 604 Mb/s @ -66.5 dBm  | 17 Mb/s @ -80.5 dBm  | 636 Mb/s @ -66.0 dBm  | 26 Mb/s @ -81.5 dBm  | 604 Mb/s @ -67.0 dBm                               |
| 256QAM                           | 30 Mb/s @ -78.5 dBm  | 698 Mb/s @ -63.5 dBm  | 19 Mb/s @ -77.5 dBm  | 730 Mb/s @ -63.0 dBm  | 30 Mb/s @ -78.5 dBm  | 698 Mb/s @ -64.0 dBm                               |
| 512QAM                           | 34 Mb/s @ -75.5 dBm  | 791 Mb/s @ -60.5 dBm  | 22 Mb/s @ -74.5 dBm  | 823 Mb/s @ -60.0 dBm  | 34 Mb/s @ -75.5 dBm  | 791 Mb/s @ -61.0 dBm                               |
| 1024QAM                          | 38 Mb/s @ -72.0 dBm  | 881 Mb/s @ -57.5 dBm  | 23 Mb/s @ -71.0 dBm  | 918 Mb/s @ -57.0 dBm  | 38 Mb/s @ -72.0 dBm  | 881 Mb/s @ -57.5 dBm                               |
| 2048QAM                          | 42 Mb/s @ -68.5 dBm  | 958 Mb/s @ -54.5 dBm  | -  | 1002 Mb/s @ -54.0 dBm | 42 Mb/s @ -68.5 dBm  | 958 Mb/s @ -53.5 dBm                               |
| 4096QAM                          | -  | 1010 Mb/s @ -50.5 dBm | 540 Mb/s @ -54.0 dBm @ 56 MHz  |                       | -  | 1010 Mb/s @ -49.5 dBm                              |
| ACM                              | Hitless  |                       |  |                       |  |  |
| RF Output power                  | Sub-band A: -15 to +10 dBm (+13 dBm for QPSK)<br>Sub-band B: -15 to +10 dBm                                    |                       | -30 to +10 dBm (all modulations and channels)  |                       | -1 to +23 dBm (all modulations and channels)<br>-3 to +18 dBm (Dual channel)   |  |
| ATPC                             | Yes  |                       |  |                       |  |  |
| MTU                              | 10240 B  |                       |  |                       |  |  |
| Latency (RFC 2544)               | <150 µs (66 B, 352 Mb/s); <200 µs (1518 B, 352 Mb/s)<br><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)<br>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)<br><100 µs (66 B, 1010 Mb/s); <150 µs (1518 B, 1010 Mb/s)   |  |
| Synchronization                  | Synchronous Ethernet; PTP (transparent for IEEE-1588v2)  |                       |  |                       |  |  |
| <b>Electrical</b>                |  |                       |  |                       |  |  |
| Primary power                    | PoE active, IEEE 802.3 bt (PoE++);<br>PoE passive 20 – 60 VDC; DC 20 – 60 VDC; floating                        |                       | PoE active, IEEE 802.3 at (PoE+);<br>PoE passive 20 – 60 VDC; DC 20 – 60 VDC; floating               |                       | PoE active, IEEE 802.3 bt (PoE++);<br>PoE passive 37 – 60 VDC; DC 37 – 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);<br>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 10/100/1000/2500 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  |                       | Spectrum analyzer, Pinger, Radio loopback  |                       | Spectrum analyzer, Pinger  |  |
| History charts                   | Temperature, Power voltage, RSS, MSE, BER, Data rate, RF Output power  |                       |  |                       |  |  |
| Statistics                       | RMON counters for all interfaces   |                       |  |                       |  |  |
| Antenna alignment                | RSS voltage, Mobile App (RAYTools), Web  |                       |  |                       |  |  |
| SNMP                             | v2c including configurable TRAPs   |                       |  |                       |  |  |
| <b>Security</b>                  |  |                       |  |                       |  |  |
| Management                       | Web (HTTP, HTTPS), SSH, Telnet, Mobile App (RAYTools)  |                       |  |                       |  |  |
| Access accounts                  | 3 levels (Guest, Admin, Super)   |                       |  |                       |  |  |
| Encryption                       | AES256, 192, 128   |                       |  |                       |  |  |
| <b>Standards</b>                 |  |                       |  |                       |  |  |
| Approvals                        | CE (RED), RoHS   |                       | 17 GHz CE (RED), RoHS<br>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](#).

