RAY is the high-speed point-to-point microwave link developed and completely manufactured by RACOM, a global leader in the development and production of high performance, industrial grade wireless equipment. Benefiting from customer feedback, collected from thousands of units sold, RAY is continually being enhanced and further improved.

The concept of RAY technology, based on excellent sensitivity and interference resistance, allows the user to build links with high capacity over long distances, while maintaining maximum link availability.

Supporting a broad range of options and with an excellent reliability and price/performance ratio, RAY is your perfect product of choice for every application.

### Technical parameters

**Parameter**
- **10 GHz**
- **11 GHz**
- **17 GHz / 24 GHz**
- **18 GHz** * 

**Frequency range (approx.)**
- 10.300 – 10.600 GHz
- 10.700 – 11.700 GHz
- License-free band
- 17.700 – 19.700 GHz

**Sub-band**
- Lower (GHz)
- Upper (GHz)
- Lower (GHz)
- Upper (GHz)
- Lower (GHz)
- Upper (GHz)
- Lower (GHz)
- Upper (GHz)

**Channel spacing**
- 1.75, 3.5, 7, 14, 20*, 28, 56 MHz

**Modulation**
- QPSK, 16, 32, 64, 128 QAM, hitless ACM

**User data speed**
- 2.5 – 360 Mbps

**Channel duplex spacing**
- min. 56 MHz

**Data sensitivity @BER 10e-6**
- QPSK
- 16 QAM
- 32 QAM
- 64 QAM
- 128 QAM
- 256 QAM

**Output power**
- -10 to +13 dBm

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### Management

- **Configuration & management**
  - HTTPS, SSH, Telnet
- **Real time monitoring**
  - RSS, SNR, BER
- **Diagnostic tools**
  - Spectrum analyzer, pinger, constellation diagram
- **History charts**
  - Temperature, power supply, RSS, SNR, BER, data rate, output power
- **Statistics**
  - RMON counters for all interfaces
- **Installation**
  - RSM voltage output
- **Network management**
  - SNMP vers. 2c including configurable TRAPs

### Antennas

- **Various suppliers**
  - Class 2.3: Direct mounting to 30 – 120 cm parabolic antennas, mounting via flexible waveguide also possible

### Standards

- **Radio parameters**
  - ETSI EN 302 217-2-2 V2.1.1
  - ETSI EN 301 489-4 V2.1.1, ETSI EN 301 489-1 V1.9.2
  - Safety
  - EN 60 950-1:2006

### Microwave link

- **FREE & licensed bands**
- **Interference & obstacle tolerant**
- **Maximum distances & reliability**
- **Narrow channels from 1.75 MHz**
- **ACM, ATPC**
- **Optical + metallic Ethernet**
- **IPTV optimized**
- **PoE or DC (20 - 60 V)**
- **Low power consumption**
- **Climate chamber tested**

**Applications**

- **LAN Extension**
- **Internet providers**
- **SCADA**

www.connectdata.fr +33 1 60 13 70 10

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*Technical parameters are subject to change without prior notification.*
**Interfaces**
- Ethernet: 1x optical, 1x metallic port configurable as:
  - 2 independent user ports, in-band management
  - 1 user + 1 management port
- Power: PoE, DC (20 – 60 V)
- USB: Management via USB / ETH or USB / WiFi

**FREE & licensed bands**
- Supports both **FREE & LICENSED** bands
- 17 & 24 GHz: Fulfilling SRD standards. Identical unit type at both ends of link offers lower distribution and storage costs
- Widely configurable channel duplex spacing eases sourcing of available channels

**Radio parameters**
- High radio receiver robustness against unwanted interference
- Narrow channels (from 1.75 MHz)
- SW selectable modulation: QPSK, 16, 32, 128, 256 QAM
- Hitless ACM (Adaptive Coding and Modulation)
- ATPC (Automatic Transmit Power Control)

**Reliability**
- Heavy-duty industrial components
- Built-in surge protection
- Operating temperature range from -30 to +55 °C certified
  - Every single unit is thoroughly tested in a climatic chamber
- Quality manufacturing results in exceptional reliability
- Rugged input filter with no adjustable components

**Solution for any application**
- High sensitivity together with wide channel width and modulation enables optimized links for distance and performance
- MTU 10240 B, MPLS transparent
- Packet buffer & QoS optimized for IPTV (multicasts, uncasts)

**Installation in minutes**
- Full outdoor unit with aluminium casing
- HW reset button for factory and customers settings
- Simple signal polarization change by unit’s rotation
- RSS voltage output for antenna alignment
- Direct mounting to parabolic antennas

**LAN extension**
- Corporate clients
- Fiber line replacement
- Building to building interconnectivity

**Internet providers**
- Backbone and high-priority last-mile
- Heavy traffic with multiple TCP streams

**SCADA**
- Maximise emphasis on reliability and response time requirements
- High speed backbone
- Small data packets have to be processed as fast as possible

**Security & Standards**
- Configuration via HTTPS and SSH for secured access
- Compliance to all relevant international standards
- Key parameters measured and confirmed by certified laboratory
- SFP modules, NMS and power supplies have no proprietary restrictions

**Advanced diagnostics**
- Intuitive web interface
  - Temperature, power supply, RSS, SNR, BER, data rate, output power status and history avail. as text or charts
  - SNMP (Including generation of TRAPs)
  - Built-in spectrum analyzer for free channel search
  - Automatic detection of unit polarization
  - Constellation diagram of the received signal

**Typical Applications**
- Corporate clients
- Fiber line replacement
- Building to building interconnectivity

**Ray**
- Low and constant latency < 0.1 ms
- Two user ports available
- Ethernet, layer L2 transparent
- Excellent resistance to interference

**References**
- RAY microwave links are successfully installed in all types of environmental and climatic conditions in dozens of countries from Europe through Middle East to Tropical areas.

The excellent reliability of RACOM’s microwave link is appreciated by numerous types of clients:

- global mobile operators: Vodafone, O2
- corporate networks operators
- cable TV providers: UPC
- government authorities: Czech National Customs Office

Based on RACOM’s experience in the field of **SCADA and Telemetry**, RAY microwave links are also used in SCADA networks, both as a backhaul solution or as a link for surveillance IP cameras.