

Millimeter-Wave Radio (MMW)

CableFree MMW Radio 70/80GHz E-Band, 10Gbps Ethernet Overview



About Wireless Excellence

Founded in 1996 and with headquarters in Oxford UK, Wireless Excellence Limited is a leading designer and supplier of outdoor and indoor Broadband Wireless communication products.

With a complete range of solutions including Radio, Microwave, Millimeter Wave, Free Space Optics, WiFi and 4G/5G/LTE, customers in over 80 countries have chosen Wireless Excellence as the “one stop shop” solution of choice for dependable wireless networking.

About Millimeter Wave

CableFree MMW links offer high performance connections using Millimeter Wave frequencies. MMW is a high frequency microwave technology offering bandwidths of up to 10Gbps Full Duplex capacity or 40Gbps.

Millimeter Wave technology is complimentary to FSO (Free Space Optics) and ideal for dense urban areas where radio spectrum is congested. Planning for Millimeter Wave is based on rainfall, giving useful transmission distances of many kilometres.

System Features

- Capacity up to 10Gbps Full Duplex
- Aggregate links up to 20Gbps and 40Gbps
- Operates in semi-licensed 70/80GHz bands
- ACM: Adaptive Coding and Modulation optional
- Range from 1.5 up to 20km*
- "Pencil beams" of 0.5 - 0.8degrees
- 10Gbps Ethernet Interfaces
- Rugged outdoor grade waterproof enclosure

Applications

- 4G/LTE Backhaul Infrastructure
- Wireless Internet Service Providers (WISP)
- Point-to-Point Wireless networking
- Corporate backbone or Telecom service provider
- Resilience for FSO or Fibre links
- Fast Roll-out & Temporary Deployment

10Gbps Ethernet using 71-76/81-86 GHz Millimeter Waves

CableFree is offering a range of high performance radios using millimeter-wave frequencies. Using high frequency microwave signals at 60GHz and above, large bandwidths of up to 10Gbps Full Duplex capacity can be provided. Using established Link Aggregation technology, links up to 40Gbps full duplex can be implemented for ultra high capacities.

Millimeter wave is a technology complimentary to Wireless Excellence established range of FSO (Free Space Optical) communication systems. Planning for Millimeter wave is based on rainfall, compared to FSO which is based on visibility, predominantly fog.

CableFree MMW-70-80-10GE are full-duplex 10-Gigabit point-to-point links especially designed according to FCC and ETSI requirements. They provides interconnection between remote LAN segments at ultra high speed and utilizes Gigabit Ethernet protocols, which is the evolving standard for switches and routers available from a variety of telecommunication equipment manufacturers.

One full-duplex Gigabit Ethernet link provides 10 gigabit-per-second connectivity between fixed end locations. The MMW-70-80-10GE product has a 10Gbps fibre optic interface connections at each end of the wireless link and operates as a transparent link. The resulting connection can replace a fibre-optic cable or leased line service offering excellent end-to-end connectivity and reliability. The Millimeter-wave Wireless Gigabit link provides fibre equivalent performance, reliability and security but with no high deployment cost associated with outdoor fibre installations.

CableFree Millimeter Wave Point-to-Point radio links have been designed with compact parabolic Cassegrain antennas of 30 and 60 cm diameters, with narrow beam widths of 0.4 and 0.9 degrees which maximises signal margin across the link and ensures lack of interference from other links or sources.

The MMW-70-80-10GE operating distances vary from 1.5 to 20 km for varying weather conditions depending of the link frequency and rain intensity. Planning for millimeter wave spectrum use must take into account the propagation characteristics of radio signals at this frequency range. While signals at lower frequency bands can propagate for many miles and penetrate more easily through buildings, millimeter wave signals can travel only a few miles or less. However, these characteristics of millimeter wave propagation are not necessarily disadvantageous. Millimeter waves can permit more densely packed communications links, thus providing very efficient spectrum utilization, and they can increase security of communication transmissions.

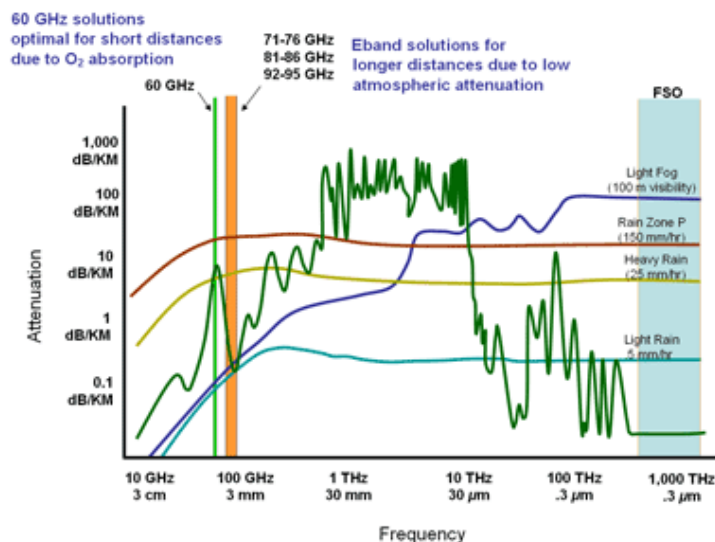
Operating distance limit for Millimeter-wave communication

The spectrum between 30 GHz and 300 GHz is referred to as the millimeter wave band because the wavelengths for these frequencies are about one to ten millimeters. Millimeter wave propagation has its own peculiarities. This bulletin reviews the characteristics of millimeter wave propagation, including free space propagation and the effects of various physical factors on propagation. It was created to provide an easy to understand reference explaining the characteristics of radio signal propagation at millimeter wave frequencies and their implications for spectrum management.

The millimeter wave spectrum at 30-300 GHz is of increasing interest to service providers and systems designers because of the wide bandwidths available for carrying communications at this frequency range. Such wide bandwidths are valuable in supporting applications such as high speed data transmission and video distribution. Planning for millimeter wave spectrum use must take into account the propagation characteristics of radio signals at this frequency range. While signals at lower frequency bands can propagate for many miles and penetrate more easily through buildings, millimeter wave signals can travel only a few miles or less.

However, these characteristics of millimeter wave propagation are not necessarily disadvantageous. Millimeter waves can permit more densely packed communications links, thus providing very efficient spectrum utilization, and they can increase security of communication transmissions.

The following graph show the major distance advantage of the “E-band” over the 60GHz in terms of the Oxygen absorption peak. E-band links offer longer distances and higher availability than 60GHz links for this reason. Conversely, 60GHz can be used for shorter links sub-1 km where dense re-use of the spectrum is intended



Product Features and Benefits

CableFree MMW products are highly robust and ruggedized for operation in harsh climates.

The highly integrated Full-Outdoor radio units are shipped with a choice of 30cm or 60cm antennas to meet customer requirements for distance and capacity.

For 10Gbps capacity the radio is comprised single integrated 10Gbps radios which combine both radios onto a single antenna. This increases resilience and flexibility in overall network design and implementation.

Inside the radio unit there are connectors for user network interface and power. The default network interface is optical SFP+ 10Gbps Multimode or Singlemode fibre interface with LC fibre optic connectors of 10Gbps. Various choices of SFP+ area available to match customer network equipment and fibre installations.

The MMW radios include advanced microwave modem technology featuring ACM (Adaptive Coding and Modulation) which allows the link to optimise uptime and capacity especially in high "fade" conditions such as rainfall. This enables service providers to offer higher availability Service Level Agreements (SLAs) and longer link lengths and higher availability. ACM acts by lowering the modulation rate during high "fade" conditions which results in lower throughput but retaining a live link. When the fade event is over, the modulation is automatically returned to the full capacity. These features can be programmed in the sophisticated Network Management console.

The links are supplied with mounting brackets to mount the units on poles which are typically installed on walls, towers or roof top locations to ensure clear Line of Sight (LOS) between the end points of the wireless link.

.Alignment of the links is achieved using simple Digital Voltmeter connection to the radio unit as common with most microwave links and takes a skilled installer team typically 5-20 minutes.

When installed the links provide "fit and forget" connectivity between the nodes on the network and can be remotely managed and monitored using a choice of Web-based NMS and SNMP Management platforms.

Product Codes

Product Code	Description
CFMMW-70/80-10GE-xx	70/80GHz E-band MMW 10Gbps Advanced Ethernet radio including IP65-rated outdoor unit, management software, Power supplies with mains 115/230Vac input. Does not include Ethernet cables.
Options: -30 or -60	Antenna sizes 30 or 60cm. Options for 90cm

Specifications

System Variant	MMW-70/80-10GE
System Parameters	
Frequency Band	E band
Bandwidth	71-76 GHz & 81-86GHz.
Capacity	Up to 10000 Mbps (10Gbps) Full duplex using 1+0 configuration. Aggregate links up to 40Gbps using 4+0
Channel Bandwidth	250 / 500 / 750 / 1000 / 1250 / 1500 / 2000 MHz
Modulation Type	QPSK up to 256QAM is supported
Rx Sensitivity	-70 to 53 dBm (@ BER 1E-6) depends on modulation (note: must allow for DPA losses)
Output Power	+10 to +20dBm (128QAM to BPSK)
Forward Error Correction (FEC)	RS(255, 239) Included, and ACM (Adaptive Coding and Modulation, non-ASK versions only)
Network Management	Web based NMS, SNMP Features
Data and Aux Interface	
Ethernet Interface	10Gbps SFP+ for 10GBase-LX/SX (singlemode & multimode fiber) and 100-BaseTX Management port
Antenna	
Antenna Type	Cassegrain type antenna with radome
Antenna Gain/beamwidth 60 cm	30cm: 45dBi, 0.9° beamwidth 60cm: 51 dBi, 0.5° beamwidth 90cm: optional available.
Power / Environment	
Power Supply AC	Input 88-264 Volts, 50/60 Hz
Power Consumption	35W typically
DC Power	36 to 72 Volts DC, PoE, External mains AC supply option available
Power Connector Ethernet	Power-over-Ethernet RJ45
Operational Temperature	-45°C to +70°C
Humidity	0 to 95%, non-condensing
Physical Dimensions	
Outdoor unit size	246 x 246 x 110 mm without antenna, 620 x 620 x 490 with 60cm, 340 x 340 x 340 with 30cm
Weight	1x Radio only: 4kg 30cm antenna: 3.6 kg 60cm antenna: 6.7kg Pole mount kit: 3.2kg

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