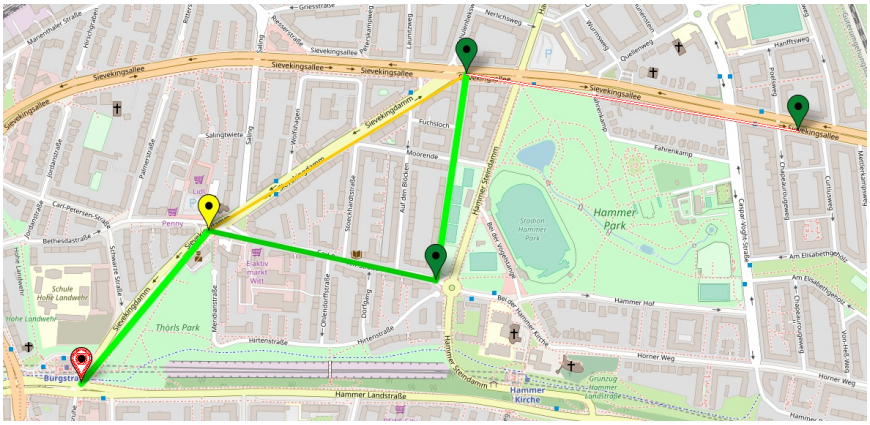
Achievable ranges between MRX routers

Effect of settings, antennas and weather influences



The range of a radio link depends on many factors. First of all, you have to ask what bandwidth you want to transmit. As the bandwidth (or data rate) increases, the maximum possible range automatically decreases. Conversely, if the range is increased, the achievable bandwidth also decreases.

The decisive factor is always the attenuation that occurs between the transmitter and receiver. The value of the attenuation is given in decibels (dB). If the radiated power of a transmitter (dBtransmitter) and the sensitivity of the receiver (dBreceiver) are known, the maximum permissible attenuation between the two nodes can be calculated.

The resulting attenuation is made up of several values, as shown in the picture below:

1. losses at the transmitter due to cables in the unit, optional lightning protection, cables between unit and antenna, etc.
2. antenna gain of the (transmitting) antenna used
3. losses in the medium (air interface) due to distance, weather, building, vegetation, weather influences
4. antenna gain of the (receiver) antenna used
5. losses at the receiver due to cable between unit and antenna, optional lightning protection, cable in the unit, etc.

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Distance/bandwidth of 2 mesh routers in different media

The possible range of a radio link depends to a large extent on the antenna and weather conditions, provided that the hardware installed in the unit is known.
In the tables below, the ranges are shown for four different antenna types and three different weather conditions each, depending on the data rate.
The transmission power is e.g. 20dBm at 5.8GHz and 2x2 MIMO. The attenuation of the lightning protection is 0.2 dB and the cable used (HDF400) has an attenuation of 0.34dB/m.
The values shown are mostly empirically determined and correspond to the theoretical considerations presented on the front page.

Omnidirectional antenna (Standard-accessories)* (9dBi)

Datarate MBit/s	Air/m	normal rain/m	heavy rain/m
10,00	2.900,00	1.800,00	1.100,00
60,00	1.100,00	700,00	500,00
100,00	1.000,00	600,00	400,00
150,00	800,00	500,00	300,00
200,00	600,00	400,00	200,00
300,00	300,00	200,00	100,00
400,00	200,00	100,00	100,00

Omnidirectional antenna (13dBi)**

Datarate MBit/s	Air/m	normal rain/m	heavy rain/m
10,00	5.500,00	3.400,00	2.100,00
60,00	3.600,00	2.200,00	1.400,00
100,00	1.900,00	1.200,00	800,00
150,00	1.600,00	1.000,00	600,00
200,00	1.100,00	700,00	500,00
300,00	700,00	400,00	300,00
400,00	400,00	200,00	100,00

Sectorantenna 90° (17dBi)**

Datarate MBit/s	Air/m	normal rain/m	heavy rain/m
10,00	>10.000	7.500,00	4.600,00
60,00	8.300,00	5.000,00	3.100,00
100,00	4.500,00	2.700,00	1.700,00
150,00	3.600,00	2.200,00	1.400,00
200,00	2.600,00	1.700,00	1.100,00
300,00	1.600,00	1.000,00	600,00
400,00	900,00	600,00	400,00

Sectorantenna 120° (16dBi)**

Datarate MBit/s	Air/m	normal rain/m	heavy rain/m
10,00	>10.000	6.100,00	3.800,00
60,00	6.800,00	4.100,00	2.600,00
100,00	3.600,00	2.200,00	1.400,00
150,00	2.900,00	1.800,00	1.200,00
200,00	2.100,00	1.300,00	900,00
300,00	1.300,00	800,00	500,00
400,00	700,00	500,00	300,00

*5.8GHz band, no lightning protection, not remote
**5.8GHz band, with lightning protection, remote with 2m HDF400 antenna cable

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