How to calculate the maximum distance between two switches connected via a multimode cable using Fast Ethernet ports?

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First **the basics** based on standard IEEE 802.3:

Fast Ethernet uses 1300 nm wavelength for transmission.
Fast Ethernet transmits the 100 Mbit/s data stream using a 4B/5B code with 125 Mbit/s effectively.

To calculate the maximum supported distance you have to consider two parameters: attenuation and dispersion (expressed by bandwidth or bandwidth length product).

Now have a look at **the switches**. Hirschmann Fast Ethernet transmitters for multimode fibers usually offer 8 dB attenuation budget with 50 µ fiber.

For typical **fibers** you can assume an attenuation of < 1.5 dB/km at 1300 nm. Per connection (connector attenuation) you calculate additonal .5 dB.

Let's have a look at the attenuation:

8 dB budget offered by switch is reduced by .5 dB per connection. 7.5 dB / 1.5 dB/km makes 5.0 km. That's maximum distance supported for a direct link between two devices due to the attenuation. Additional patch panels between two devices reduce the distance.

Now we have to consider the bandwidth, or correct: the **B**andwidth **L**ength **P**roduct BLP.

The BLP is used to easily calculate the supported distance limited by the dispersion.
The BLP unit either is Mbit/s*km or MHz*km.

You divide the BLP by the bandwidth (speed) used and get the distance.

For example: 500 MHz*km / 125 MHz = 4 km   (use 125 MHz or Mbit/s, both fits for our purposes; the theory behind this is a lot more complex).

Hirschmann switches claim to support a distance of up to 5 km with 50 µ fiber. This is based on the above mentioned attenuation budget and an assumed fiber BLP of more than 750 MHz*km, a value exceeded by most of todays fibers.

The minimum of both calculations determines the maximum supported distance.

Now a last remark regarding the standard IEEE 802.3:
This standard demands support of at least 2 km by ports.

This means that a distance of 4 km is according to standard.
It does not mean that the 4 km are beyond the standard.