APPLICATION NOTE

ROBUST OPERATION OF AN OPTICAL FIBER RANGE EXTENDER WITH COSMOS CAMERAS

COSMOS cameras feature large format, powerful CMOS sensors such as the 8120 x 8120, 66-megapixel sensor in the COSMOS-8k camera. With frame rates of up to 18 fps in 14-bit readout mode, reliable and fast data transfer is crucial for camera operation. The COSMOS-8k camera uses a 4-lane CoaXPress® 2.0 interface capable of transferring up to 12.5 Gbps per lane. While the default data transfer happens through coaxial cables, often a fiber optic interface is preferred which essentially removes any restrictions on transmission line length. Here we report on our experience using a CoaXPress over fiber range extender using a COSMOS camera.

List of parts used for the test

- **Camera**: COSMOS-8k
- **Range Extender**: CoaXPress v.2.1 Range Extender over fiber (SFP+) from KAYA instruments to achieve. This device uses SFP+ (small form factor pluggable) modules, a common standard for network transceivers, to interface with optical single or multimode fibers.

Detailed list of KAYA Instruments parts that were used in this test for operation with multimode fibers:

Item	Amount	Description
KY-FEXT-II-D	1	CoaXPress 12G range extender over fiber (4 channels Device Unit)
KY-FEXT-II-H	1	CoaXPress 12G range extender over fiber (4 channels Host Unit)
KY-SFP-010 *For operation with single-mode fibers use:* KY-SFP-009	8	SFP+ module Multi-Mode SFP+ module Single-Mode
KY-FCA-D-MM-LC-LC-010.0	4	Multi-Mode Fiber Cable LC to LC - 10m
For operation with single-mode fibers use: KY-FCA-D-SM-LC-LC-010.0		Single-Mode Fiber Cable LC to LC - 10m

- Eight coaxial CoaXPress cables, Length 3m: Four cables for camera to range extender communication and four for range extender to PC communication.

- Two 24VDC, 15W power supplies purchased to match the specifications on the extender units (Digikey link)

Notes

– The range extender units are not identical. The Host unit connects to the Host-PC via coaxial cable, the device unit connects to the camera through coaxial cable.
– The optical fibers are quality OM3 or better.
– KAYA Instruments specifies range extension up to 80 km using single mode and up to 300 m using multi-mode.
– The host and device main units are configurable. The SFP+ modules for multi-mode can be switched to the SFP+ modules for single mode by the user.
– We chose to order fibers from KAYA Instruments, but FC LC-LC Duplex cables from other vendors should readily work.
– While we tested LC-LC duplex cables for all for CoaXPress channels, for operation with COSMOS only channel 1 requires a duplex fiber for communication to and from the camera.

Setup is straight forward. Care must be taken to connect the correct channels to the correct port without accidentally creating cross connections between channels.

The range extender units did not have a power jack and were equipped with a terminal block. We did not receive an adapter board from KAYA, so we stripped the cables to bare wire and connected directly. We recommend obtaining a suitable power adapter from the vendor.

Results

We found that the camera operation was normal under all operating modes including the highest transfer mode. We did not observe any lost frames or other communications issues. The interface was robust and operated well for both kinds of fibers tested single and multimode.

In a second test we set up this interface with a COSMOS-8k camera mounted on a telescope at Palomar Observatory during standard operation. In this setup we used 30 m long multimode fibers. Again, during multiple days of test and on sky observations, there were no communications issues observed using this interface.

We can recommend using this fiber optic range extender for CoaXPress 2.0 interfaces with COSMOS cameras for all situations where transmission length >15 m is required, or fiber communication is required for other operational reasons.

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