

CoaXPress Presentation November 2009

Jochem Herrmann – Adimec
Peter Helfet – EqcoLogic
Chris Beynon – Active Silicon





CoaXPress is a revolutionary new digital interface technology -

- Single coax cable
- High speed
- Long length
- Power and Control

The History of Camera Cables

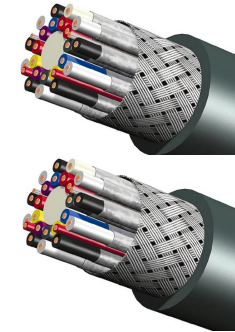
Coax for analog....

Multi-wire for digital



From Analog Coax (1950)

Digital Camera Link (2000)



The History of Camera Cables

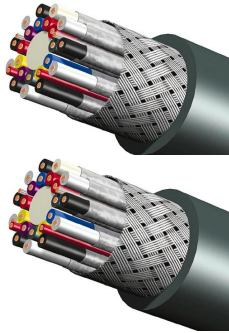
Serial communication is enabled by new technologies



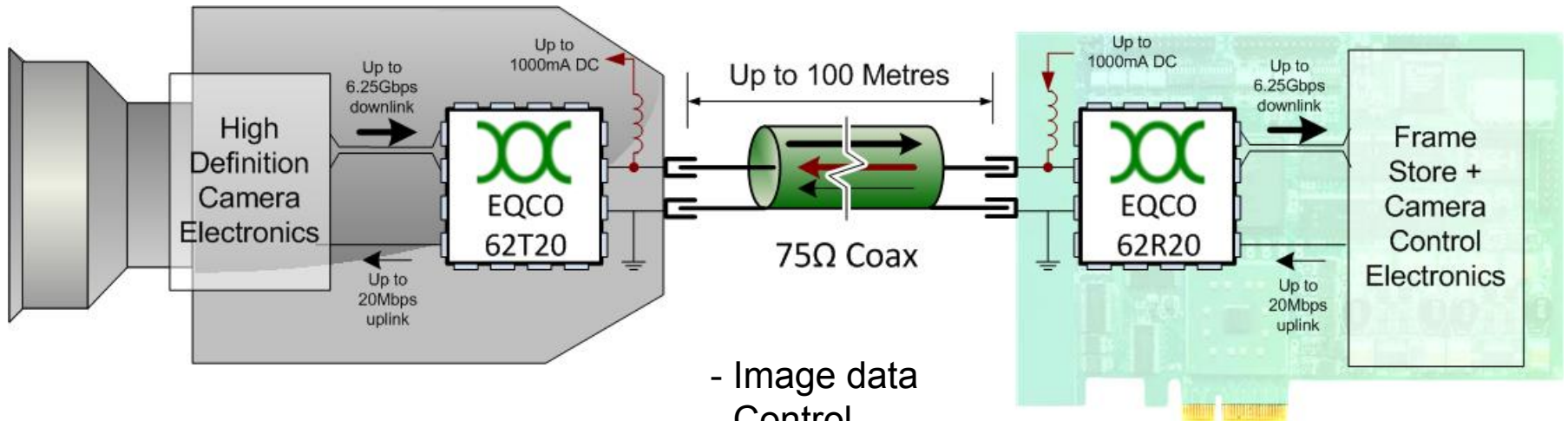
From Camera Link (2000)

to ...

Coax again! (2009)



CoaXPress Connection



- Image data
- Control
- Triggering
- GPIO
- Power (13W)

All on **one** coaxial cable!

CoaXPress versions

Scalability is a major strength of CoaXPress



CoaXPress version	Camera Link equivalent	Capability
Base	Base	3.125 Gbps 100 meters
Full	Base, Medium, Full	6.25 Gbps 40 meters
Dual Full (2 cables)		12.5 Gbps 40 meters
Quad Full (4 cables)		25 Gbps 40 meters
N cables		N * 6.25 Gbps 40 meters

CoaXPress Features & Benefits



- Digital video, control, GPIO, triggering and power over **one** cable
- Coax ease of use, flexibility and reliability
- Camera Link timing accuracy
- Camera Link speed and higher
- GigE cable length
- Support of legacy coax cables (analog systems)
- Plug and Play



CoaXPress History

Cooperation between companies works!



- European MEDEA+ project ASIC-CCD researched high speed interface options
 - Partners Adimec and EqcoLogic started working in 2007
 - Technology demonstrator at Vision Show 2008
 - Decision to bring the technology to the market
- CoaXPress consortium formed early 2009
 - Adimec (NL) Cameras
 - Active Silicon (UK) Frame Grabbers
 - EqcoLogic (BE) Transceivers
 - Components Express (US) Cable solutions
 - AVAL DATA (JP) Frame Grabbers
 - NED (JP) Line scan cameras



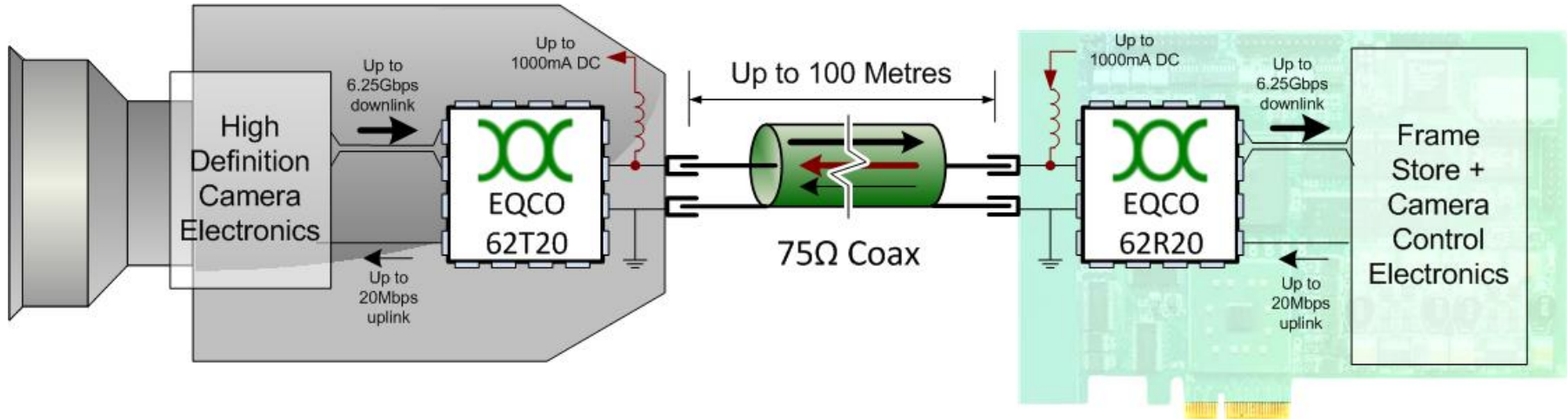
Standardization



- Goal of Consortium was to make first version of the specification and then transfer for standardization
 - In order to be successful CoaXPress needs to be a World Wide standard!
- Japan Industrial Imaging Association (JIIA) will host CoaXPress standardization
 - AIA and EMVA are invited to adopt through G3 agreement
- Formal transfer to JIIA during ITE show in Yokohama (Early December 2009)

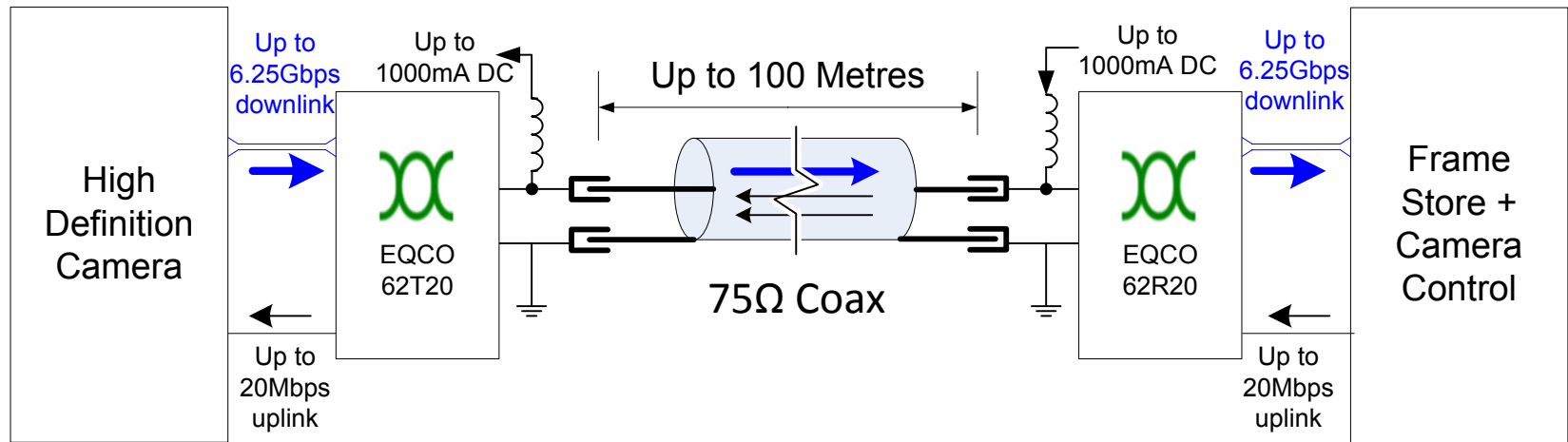


CoaXPress in more detail



- EqcoLogic EQCO62X20 chipset in standard CMOS
- EQCO62T20 = High speed cable driver with integrated low speed receiver
- EQCO62R20 = High speed receiver with integrated low speed driver
- Video data, camera control and power over single coaxial cable
- Low voltage (1.2V), low power (<70 mW) operation

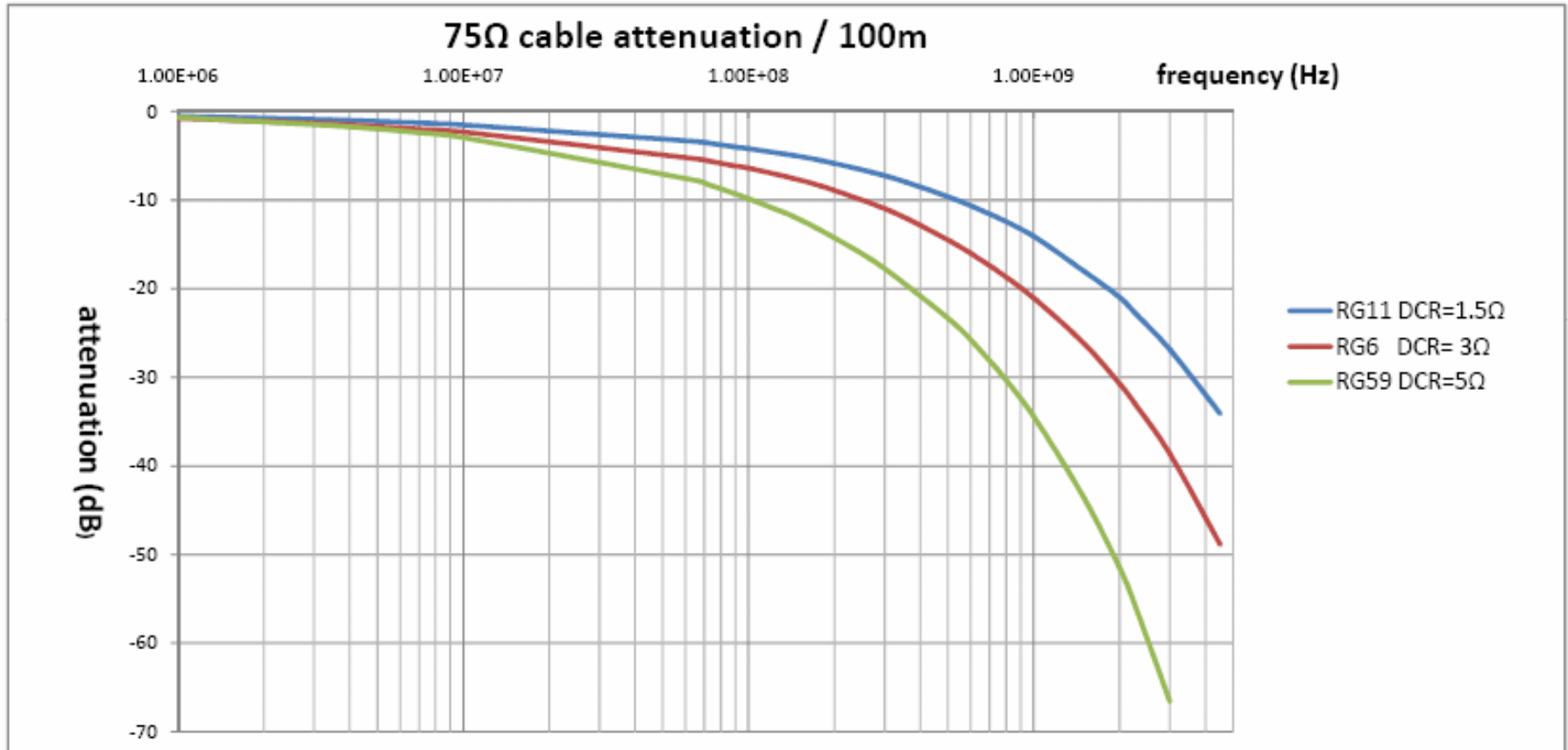
High speed channel



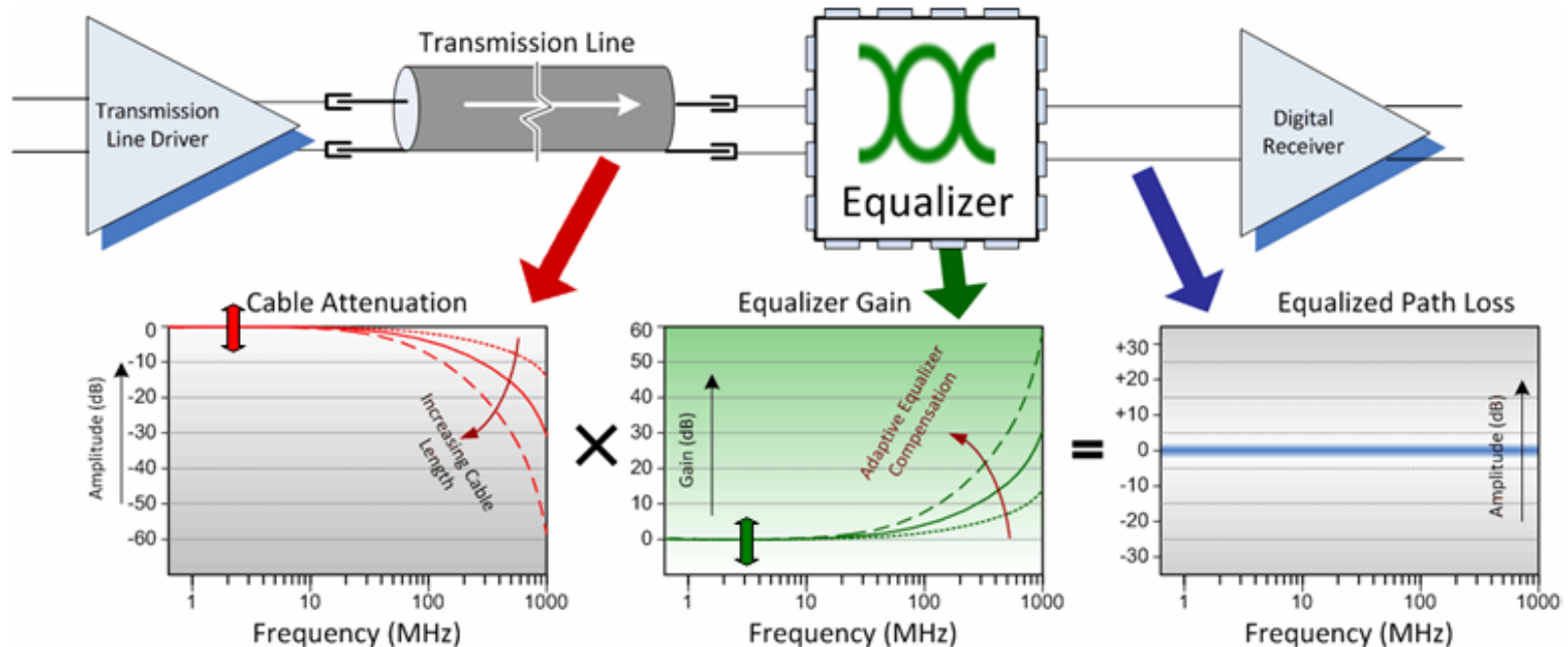
- 1.25Gb/s up to 6.25Gb/s from camera to frame grabber
- Differential input/output to FPGA in camera/frame grabber
- 8B/10B coded data
- EQCO62T20 = Coax line driver
- EQCO62R20 = Receiver with integrated auto-adaptive equalizer

Cable characteristics

Automatic equalization is a must!

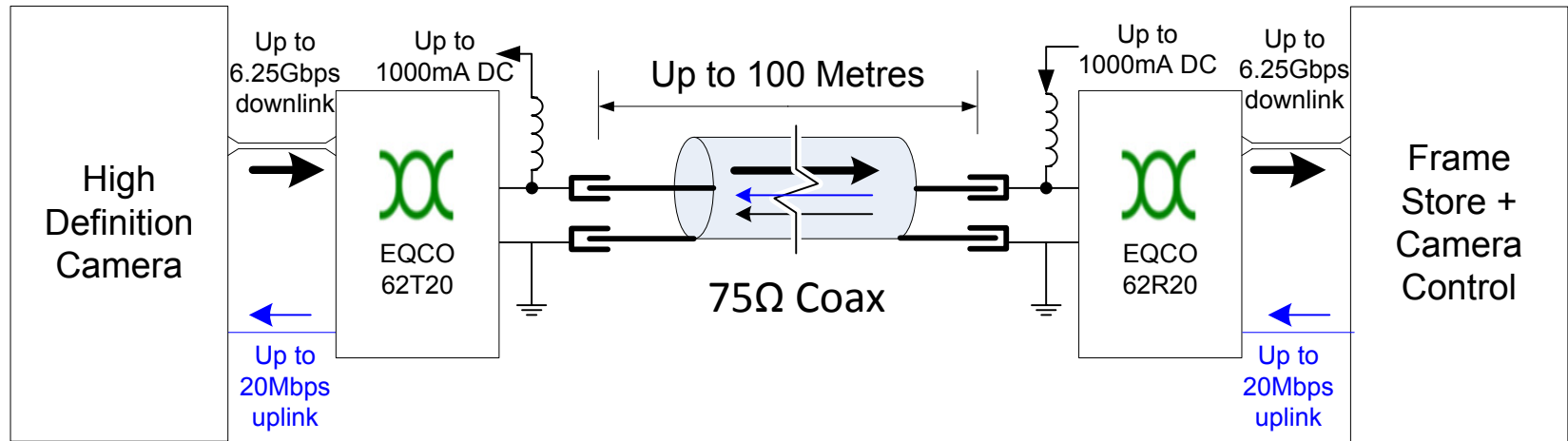


Equalizer principle



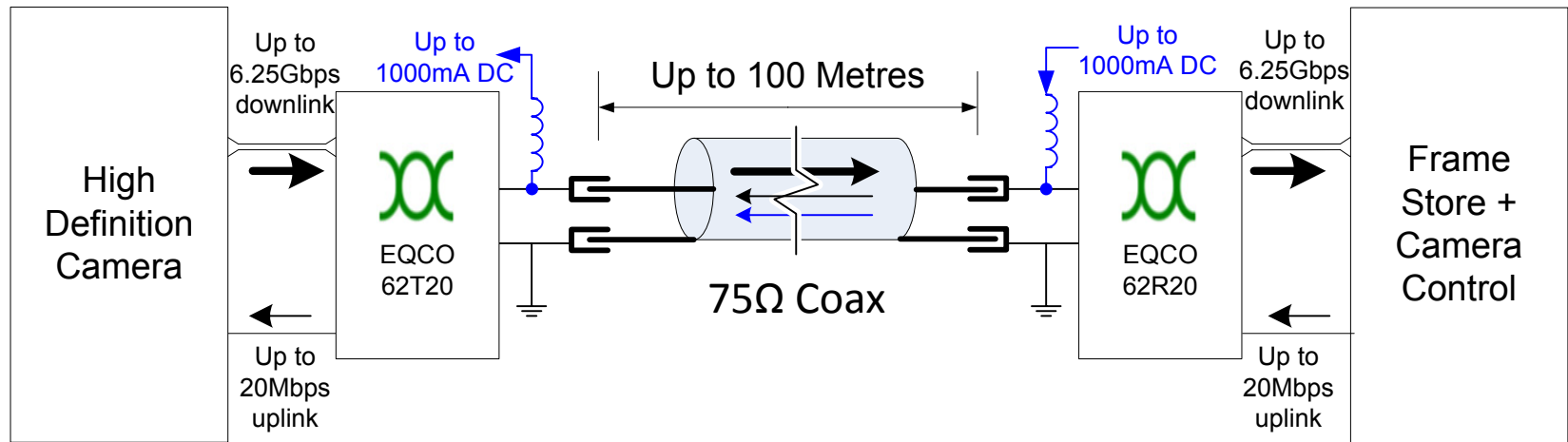
- Fully auto-adaptive operation for all types of 75Ω coax cables (RG6, RG11, RG59, ...)
- Optimal compensation for both high and low frequency attenuation
- Very robust operation (temperature, transmit amplitude,...) compared to competitors

Low speed uplink



- 0-20Mbps uplink channel from frame grabber to camera
- Single ended interface to FPGA in camera/frame grabber
- High resolution trigger with accuracy up to +/- 4 ns

Device power



- Power supply over coax cable from frame grabber to camera
- 24V, 13 Watts per cable
- Automatic detection of CoaXPress cameras
- Short circuit protection
- No need for power brick for camera

CoaXPress Protocol Highlights



- **Bitrate**
 - Base: 1.25 – 3.125 Gbps
 - Full: 1.25 – 6.25 Gbps
 - Through link aggregation: $N \times 6.25$ Gbps
- **Data integrity**
 - Redundant coding
 - CRC32
 - Link test
- **Trigger**
 - Fixed latency of 3.4 μ s, +/- 4 ns accuracy
- **Control data**
 - Down: 20 Mbps typical (at 5% of bandwidth at 3.125 Gbps)
 - Up: Maximum 20 Mbps (shared with trigger)
- **Plug & Play**
 - Auto bitrate, link setup, device detection, data packing format, bit depth, etc
 - Uses GenICam

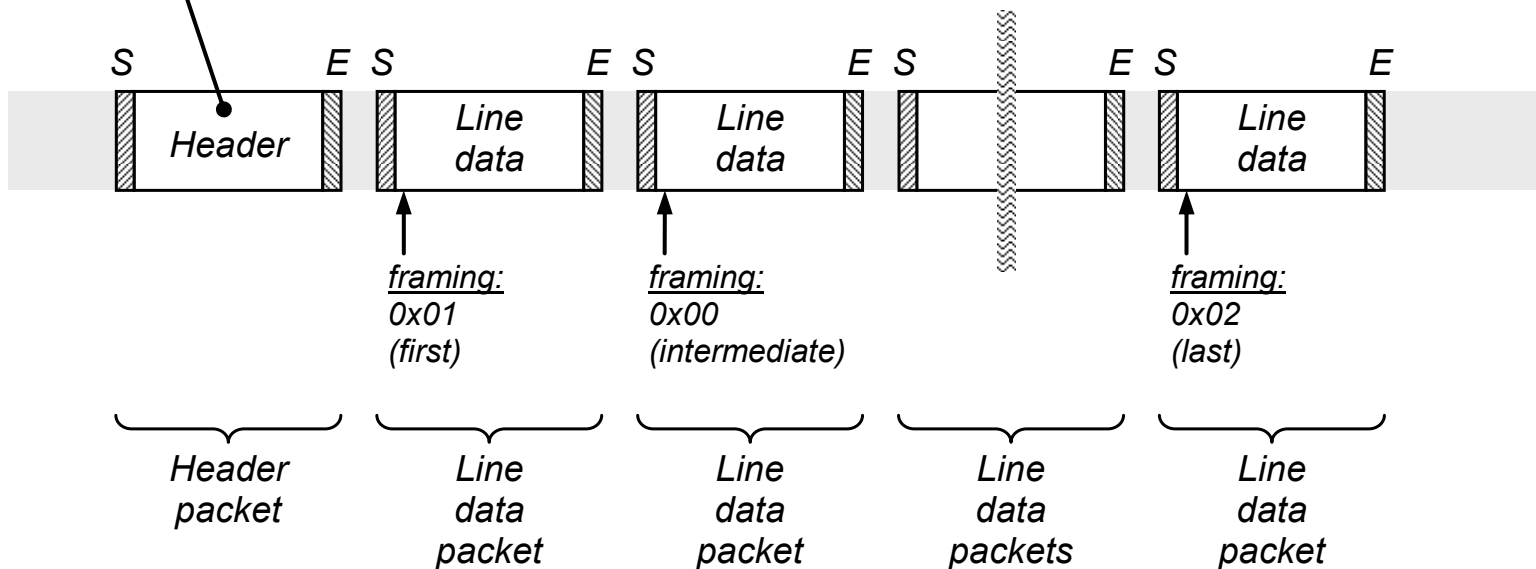


Downlink Protocol

Image transfer – packet structure

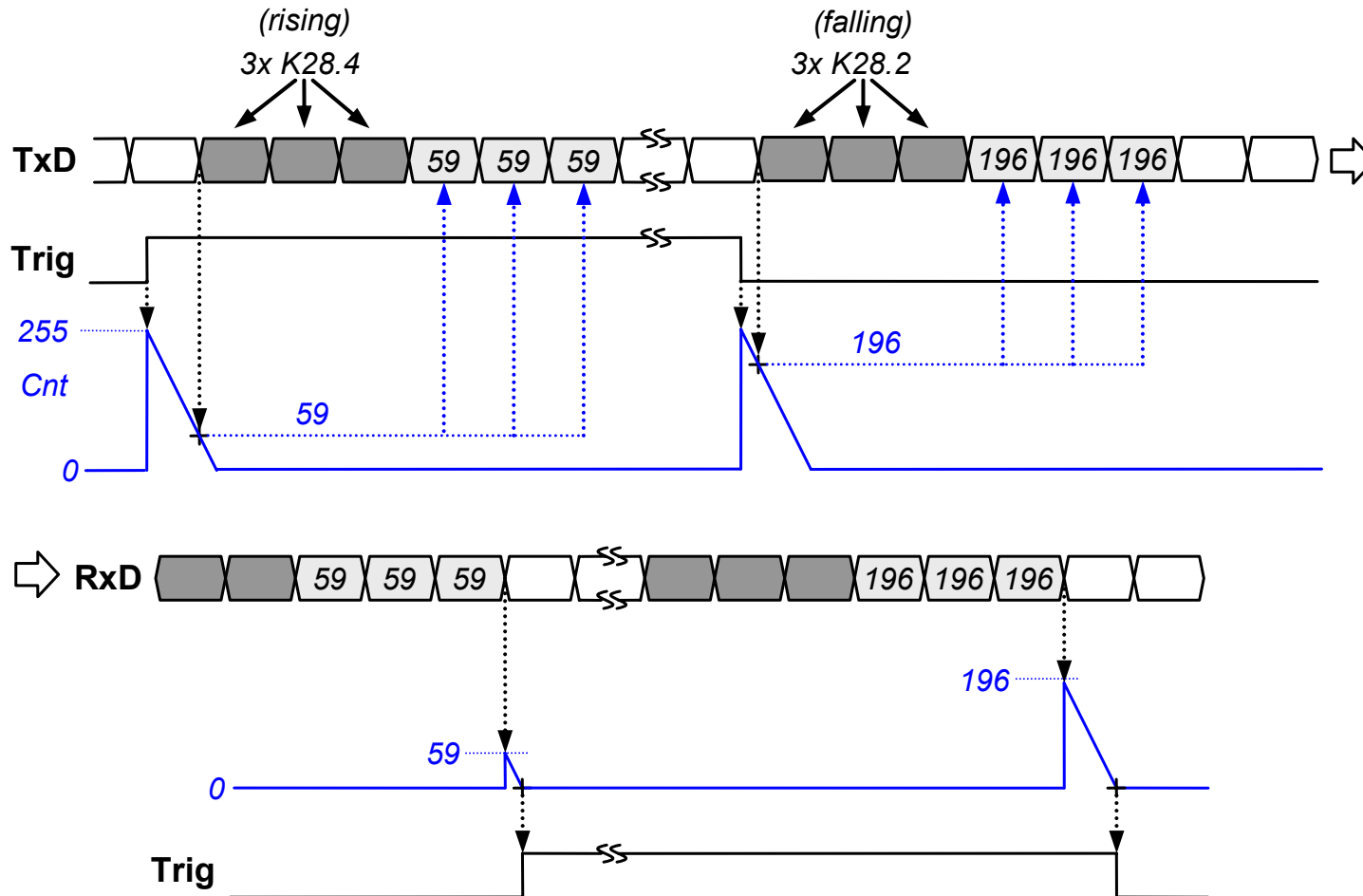


Defines the succeeding →
line data packets



Uplink protocol

Accurate trigger position



Comparison with Other Standards



	CoaXPress	Camera Link	GigE Vision	USB-3
Single Speed	3.125 Gbps 6.25 Gbps	2 Gbps (Base, 1 cable)	1 Gbps	5 Gbps
Max Speed	N x 6.25 Gbps (N cables)	6 Gbps (Full, 2 cables)	1 Gbps	5 Gbps
Cost	Low	Medium	Medium	Low
Complexity	Low	Low	High	Medium
Cabling	Coax	Custom multi-core	Cat-6	Complex, mass produced
Max Length	100m / 50m	10m / 7m	100m	3m
Data Integrity	CRC	None	CRC / Resend	CRC
Real Time Trigger	Yes, +/- 4 ns	Yes	No	No

Cable solutions

Example of different cables



Type	Diameter	Use	CoaXPress Max length at 3.125 Gbps	CoaXPress Max length at 6.25 Gbps
Gepco VHD1100	10 mm	Long distance	169 m	68 m
Gepco VSD2001	7 mm	General (long)	110 m	44 m
Gepco VPM2000	6 mm	General	86 m	35 m
Gepco VHD2000M	6 mm	Flexible	61 m	24 m
Gepco VDM230	4 mm	Thin	62 m	25 m



Example of 5 cable solution
(CXP quad + extra trigger)

CoaXPress

www.CoaXPress.com

CoaXPress Products on the market



- First products on the Vision Show now
 - Cameras
 - CoaXPress to Camera Link converters
 - Frame Grabbers
 - Cable solutions
- Q1 first production shipments
- Later in 2010 products of many companies expected
- During ITE in Yokohama (December), Japanese partners will show first products



Thank You!

CoaXPress

