

Status of CERN Custom Components

Information source: Ken Wyllie (CERN EP-ESE)

Data transmission

GBTx, GBT-SCA, VTRx (LHC upgrade)

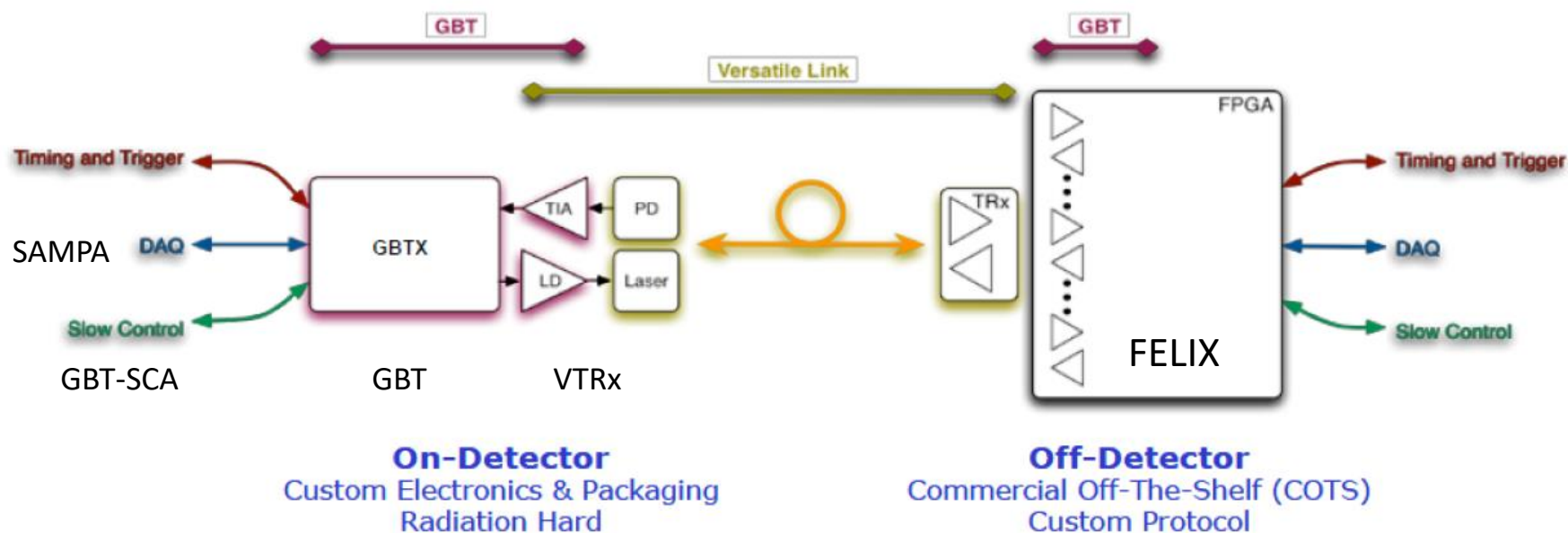
IpGBT, VTRx+ (HL LHC)

Power (DC-DC converters)

FEAST (LHC upgrade)

bPOL12V, bPOL2V5 (HL LHC)

Versatile Link (GBT link)



Single bidirectional optical link simultaneously provides data paths for:

- Timing and Trigger Control (TTC)
- Data Acquisition (DAQ)
- Slow Controls (SC) – configuration and monitoring

Fixed Latency

GBT Modes

Normal frame (uplink + downlink)

80 bit payload

80 bits x 40 MHz = **3.2 Gb/s**

32-bit Forward Error Correction field
Corrects up to 16 bit burst error

Wide frame (uplink only)

112 bit payload

112 bits x 40 MHz = **4.48 Gb/s**

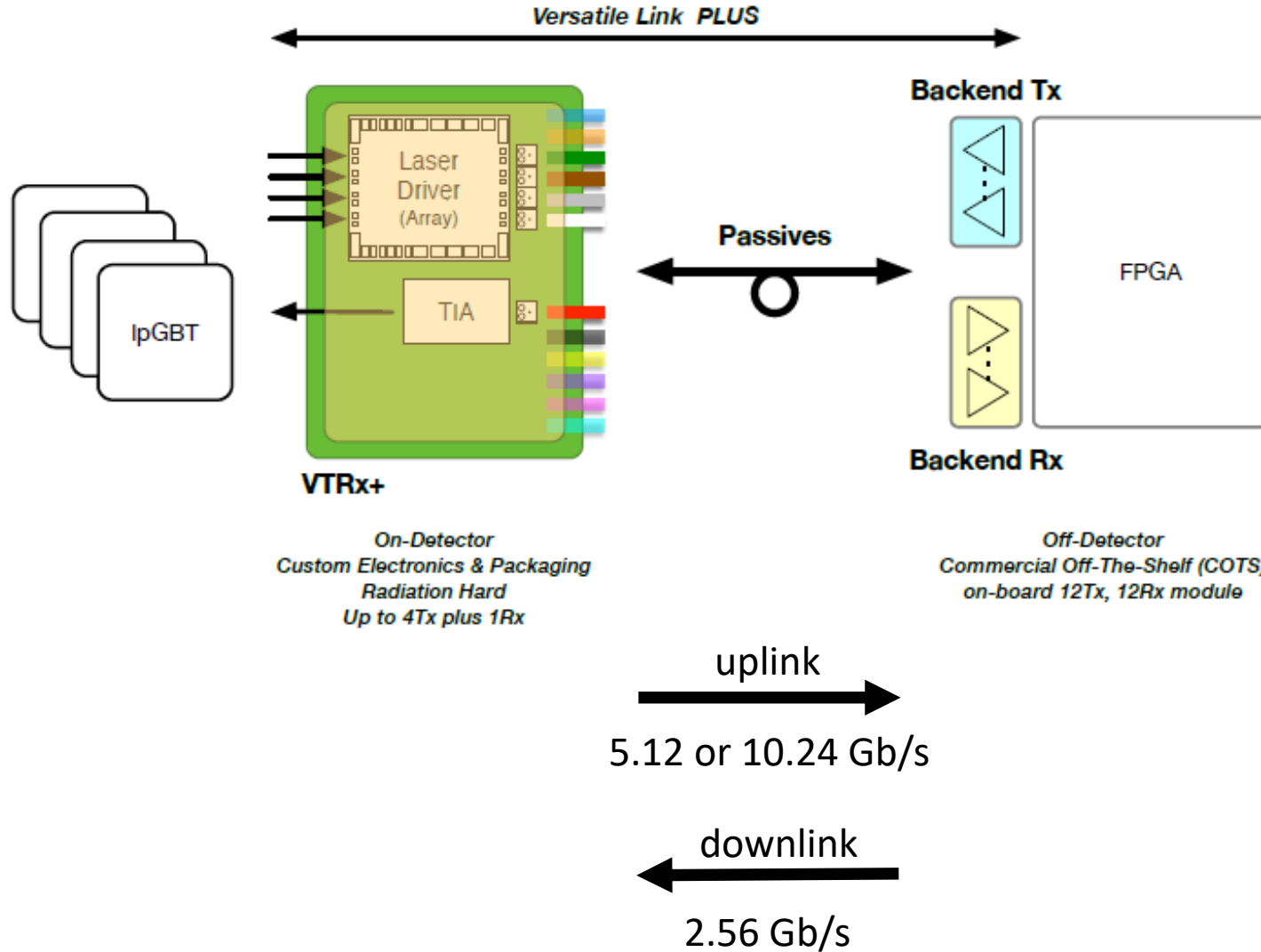
**Forward Error Correction
field used for data**

GBT-SCA - slow control adapter

- GBTx – production ended; ~200 available
- GBT-SCA – production ended; none available
- VTRx – production ended; none available

Must move to next generation products

Versatile Link+ (IpGBT)



IpGBT uplink modes

- 5.12 FEC5 – 4.48 Gb/s user data
- 5.12 FEC12 – 3.84 Gb/s user data
- 10.24 FEC5 – 8.96 Gb/s user data
- 10.24 FEC12 – 7.68 Gb/s user data

(FEC = Forward error correction)

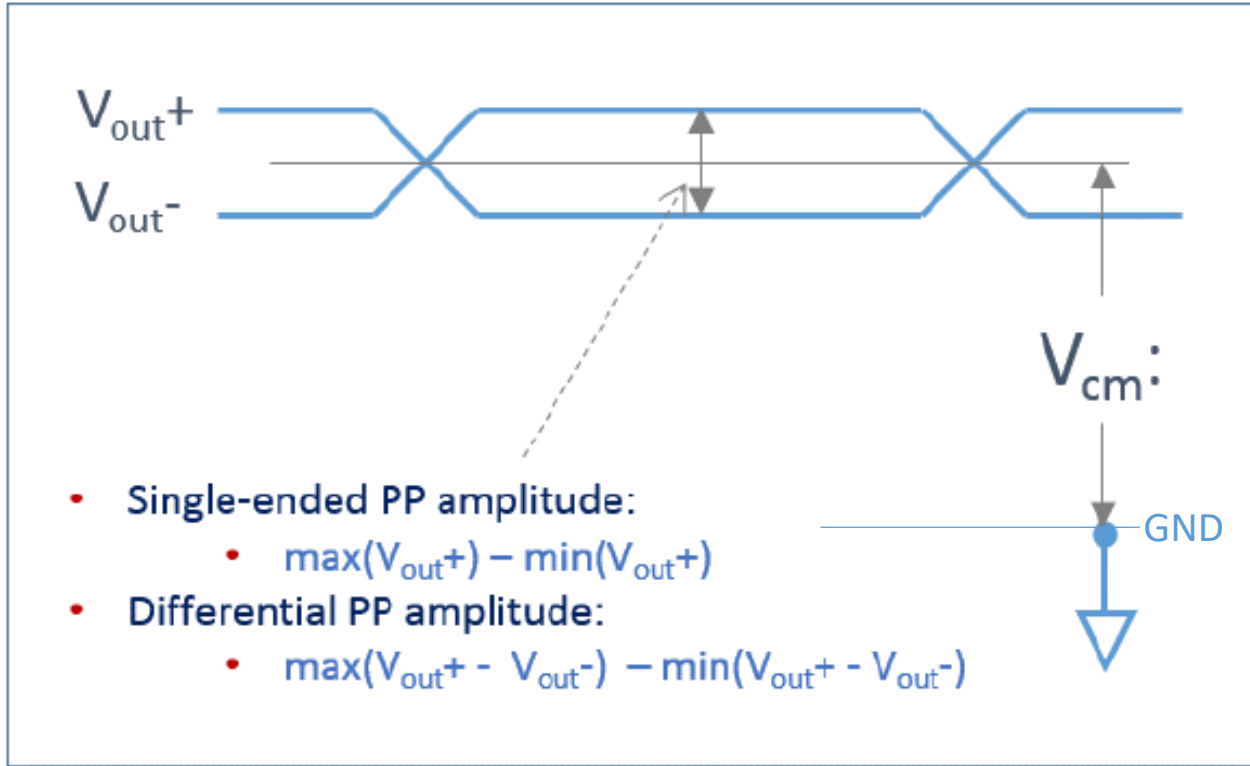
- IpGBT – includes some of GBT-SCA functionality (I2C, GPIO)
 - 35 CHF
 - Pre-series parts available in small quantities
 - Production quantities for users at beginning of 2023
- VTRx+
 - 200 CHF
 - Pre-series parts available in small quantities
 - Production in monthly batches starting 2022
 - Batches reserved for LHC experiments through 2024
 - Other users after end 2024

Power (DC-DC converters)

- FEAST – production ended; none available
- bPOL12V (5.5 - 12V input, 0.6 - 5V output @4A)
 - 10 CHF
 - Prototype quantities now
 - Large quantities in early 2022
- bPOL2V5 (2.1 – 2.5V input, 0.6 – 1.5V output @3A)
 - 10 CHF
 - Prototype quantities now
 - Large quantities in early 2022

Compatibility questions

- SAMPA, VMM3 have SLVS I/O (Scalable Low Voltage Signaling)
 - Differential with 0.2V signal swing, **0.2V** common mode voltage $[(V+ + V-)/2]$
 - (LVDS: 0.4V signal swing, 1.2V common mode voltage)
- IpGBT has CLPS I/O (CERN Low Power Signaling)
 - Differential with 0.1 - 0.4V programmable signal swing, **0.6V** common mode voltage
 - IpGBT document says accepts signals down to 0.07V common mode voltage, so O.K. for SAMPA and VMM3 outputs
 - Not sure if IpGBT outputs can be programmed to have reduced common mode voltage
 - If not, must level shift IpGBT outputs to SAMPA, VMM3 with resistor networks (will check with CERN IpGBT team)



SLVS

$V_{out+} = 0.3V$

$V_{cm} = 0.2V$

$V_{out-} = 0.1V$

CLPS

$V_{out+} = 0.65 - 0.8V$

$V_{cm} = 0.6V$

$V_{out-} = 0.55 - 0.4V$

LVDS

$V_{out+} = 1.4V$

$V_{cm} = 1.2V$

$V_{out-} = 1.0V$

Next Steps

- An optimistic note from Ken Wyllie: There are procedures in place that allow us to supply experiments outside of CERN. It will just take a little bit of time to manage the extra paperwork.
- Ken recommends that if we want parts in larger quantities we should make our requests very soon. The production schedules for the parts will be set in early 2022.
- For **TDIS** we must re-estimate the quantities based on the enhanced capabilities of the new components.
- I think it would be best to make a single request for JLab as a whole. So in the next month we should find out which other experiments (e.g. **SoLID**, etc.) are interested in using the CERN components and what quantities they need.