

Plan for GEM-OTMB Data Format



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Fiber Links Between GEM and OTMB

- Operate the fiber links at 3.2 Gbps
 - Use **two links** per GEM
 - Operate them synchronously with LHC clock
 - Use standard 8-bit 10-bit protocol
 - Constant (minimized) latency on the links
 - Do not use the usual elastic buffers
- Net Result: four 16-bit frames per link for every BX
 - Initially using a simple structure
 - One alignment frame (comma)
 - Three trigger data frames
 - We can consider other options later
- Provides 96 data bits per BX
- ~10 different comma character possibilities
 - May be considered as 3 additional bits on each link
 - Essentially allows for 102 distinct signals from GEM every BX
 - Useful for BCO sync monitoring or additional data

GEM Trigger Frame Format

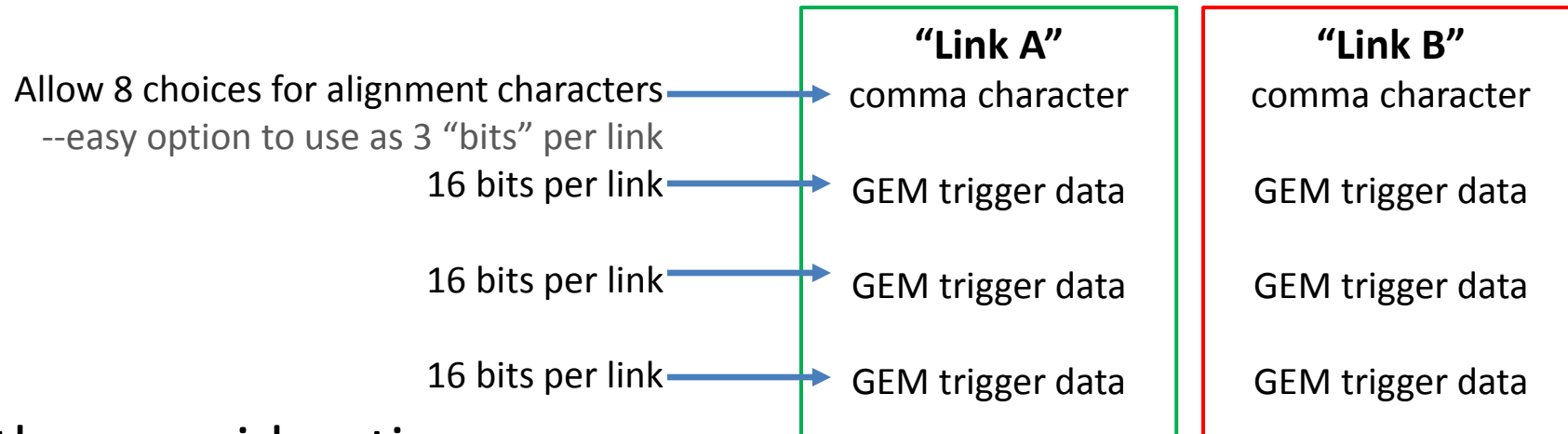
8b10b comma character
GEM trigger data
GEM trigger data
GEM trigger data

...

...

GEM-OTMB Fiber Communication Detail

- Consider two links from GEM Opto-hybrid to OTMB
 - Link “A” and Link “B”
 - Data frames are arranged like this for each BX



- Other considerations...
 - Encode a BCO signal
 - Encode an error checking mechanism?
 - Would use up to ~8 bits per BX
 - Explore other options with comma frames
 - Send them only once per orbit?
 - Send them only when there is no data present

GEM-OTMB Data Encoding

- Need to carry ID of triggered GEM strips to the OTMB
 - GEM has 3 columns in Phi, 8 sectors in Eta
 - 24 VFAT chips installed on GEM front end
 - Assign 5 bits for VFAT ID
 - Up to 64 trigger pads per VFAT chip
 - VFAT3 can be configured for 2 strips or 4 strips per trigger pad
 - Assign 6 bits for GEM Pad ID
- Up to 11 bits required for unique trigger channel ID
 - Planned fiber protocol has 102 signals available per BX
 - Can carry up to 9 GEM hits/BX without loss to OTMB