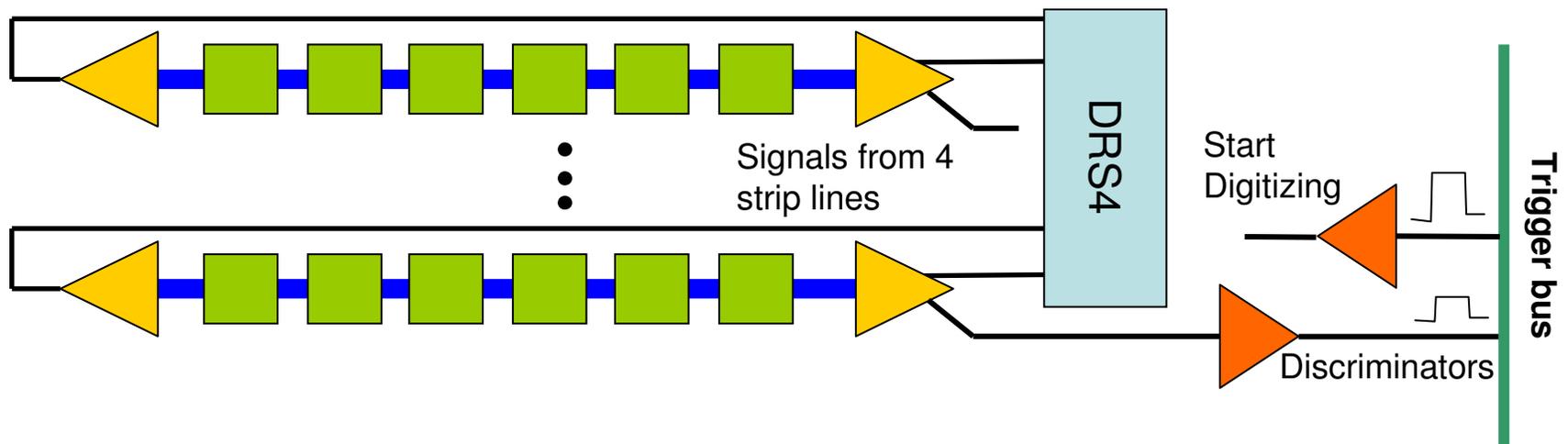


PET-TOF Readout

- Distributed DAQ configuration is based on local processing, and serial readout, similar to what **Sten Hansen** was developing, and using for more than a decade
 - Strongly recommend to ask him on board as a DAQ hardware designer
- Several changes, and new ideas in outline since previous presentation
 - Readout transmission line is linear, rather than U-shaped
 - Signals shared between SiPMs in two legs of the line will be impossible to attribute
 - Signals at both ends of the transmission line are terminated, and amplified
 - Amplified signal from the far end is send back to the DRS4 side
 - Number of SiPM columns per detector “plank” is a multiple of x4
 - DRS4 has 8 channels, 2 channels per strip line
 - Distributed analog trigger for any number of the detector “planks”
 - Each “plank” generates a trigger (or several) based on signal amplitude
 - Trigger signal is applied to a TRIGGER bus line
 - DRS4 is stopped, and digitized if there is another trigger on the line at the same time (based amplitude)



May 02, 2012

Sergey Los / Fermilab

DAQ

- **Electronics on a detector plank includes**
 - DRS4
 - ADC
 - Buffer memory
 - Data processing logic (FPGA)
 - Serial interface
- **For system synchronization we'll use**
 - Global clock with a counter on each plank
 - External reset
 - Common Trigger bus line
- **Data processing & transmission**
 - ADC digitizes as many of the DRS4 cells as required
 - The following can be done in FPGA to reduce data traffic
 - Zero suppression
 - Pedestal correction
 - Charge integration
 - Timing calculations
 - Results with a time stamp are sent to a PC via a serial interface
- **Max/Min data flow**
 - 100 kHz of trigger rate
 - Event occupies up to 3 strip lines on each side in case of Compton or light cross-talk
 - 24 kB in case no processing is done locally
 - 5 words (plank#, counter, signal time, signal location, charge) in case everything is processed locally
 - Overall data rate can be decreased from 2.4 GBPS to 1 MBPS
- **Required real estate, processing, and power budgets should be estimated**
 - Input about TOF algorithms is required