DAQ electronics for PVDIS

R. Miskimen and K. Kumar
University of Massachusetts, Amherst

Disclaimer: information based on the Dec. 2008 (!) proposal

Expert consultants: Chris Cuevas, Dave Lawrence, Sasha Somov

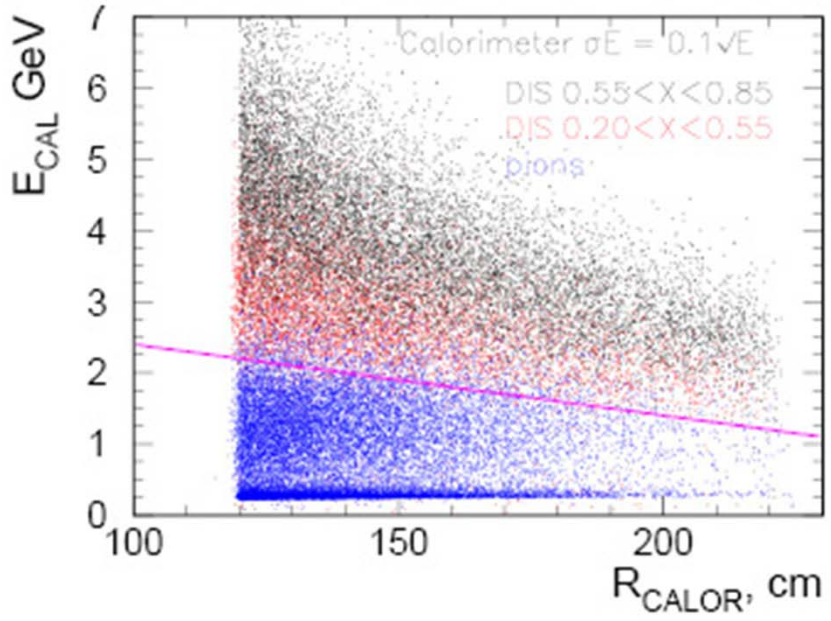


Figure 3.10: The simulated signal in the electromagnetic calorimeter, versus the radius of the hit, for DIS at $0.55 < x_{Bj} < 0.85$, DIS at $0.20 < x_{Bj} < 0.55$ and for background pions. The line indicates a threshold value, which would retain 93% of the DIS electrons accepted by the spectrometer ($x_{Bj} > 0.20$) and suppress most of the pions.

- Baffles in SOLID give 30 sectors
- The expected trigger rate in one sector is about 7 kHz
- This rate should be no problem for the pipeline electronics under development for Hall D

Proposed GEM and Calorimeter layout (from the 2008 proposal)

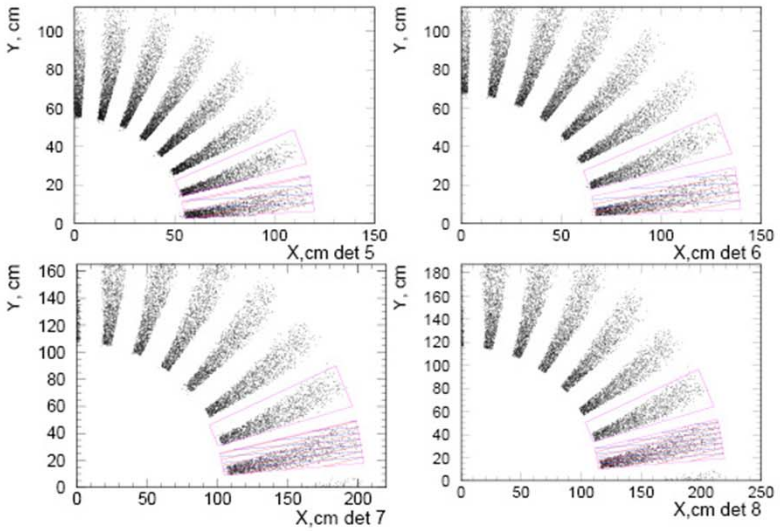


Figure B.2: The electron hit pattern in the locations 5-8, reflecting the geometry of the baffles with its 12°-pitch. The contours of detector segments are shown, along with possible directions of the anode wires or readout stripes. The angle between two readout directions depends on the width of one sector, which may be selected in a range of 9-12°, depending on the plane.

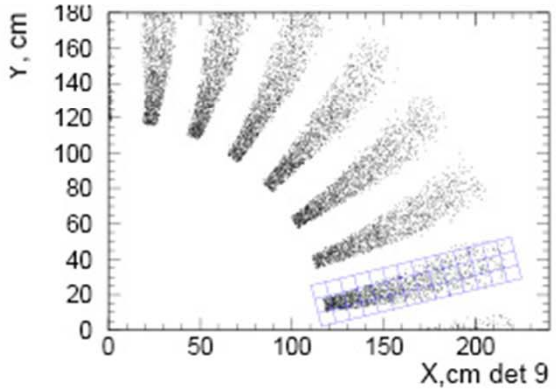


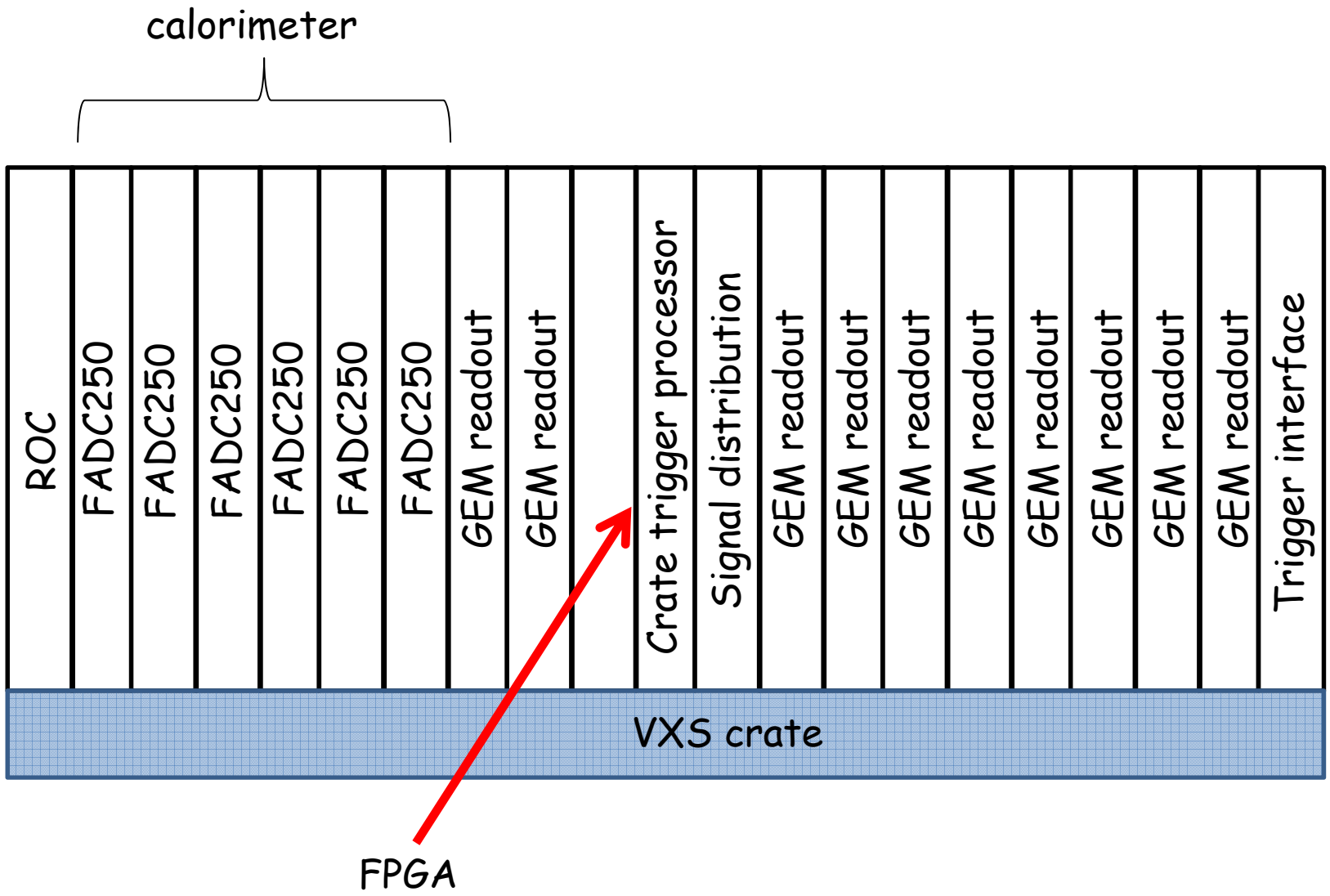
Figure B.3: The electron hit pattern in the calorimeter plane. A possible detector arrangement for one sector, with modules of 8×8 cm^2 is shown.

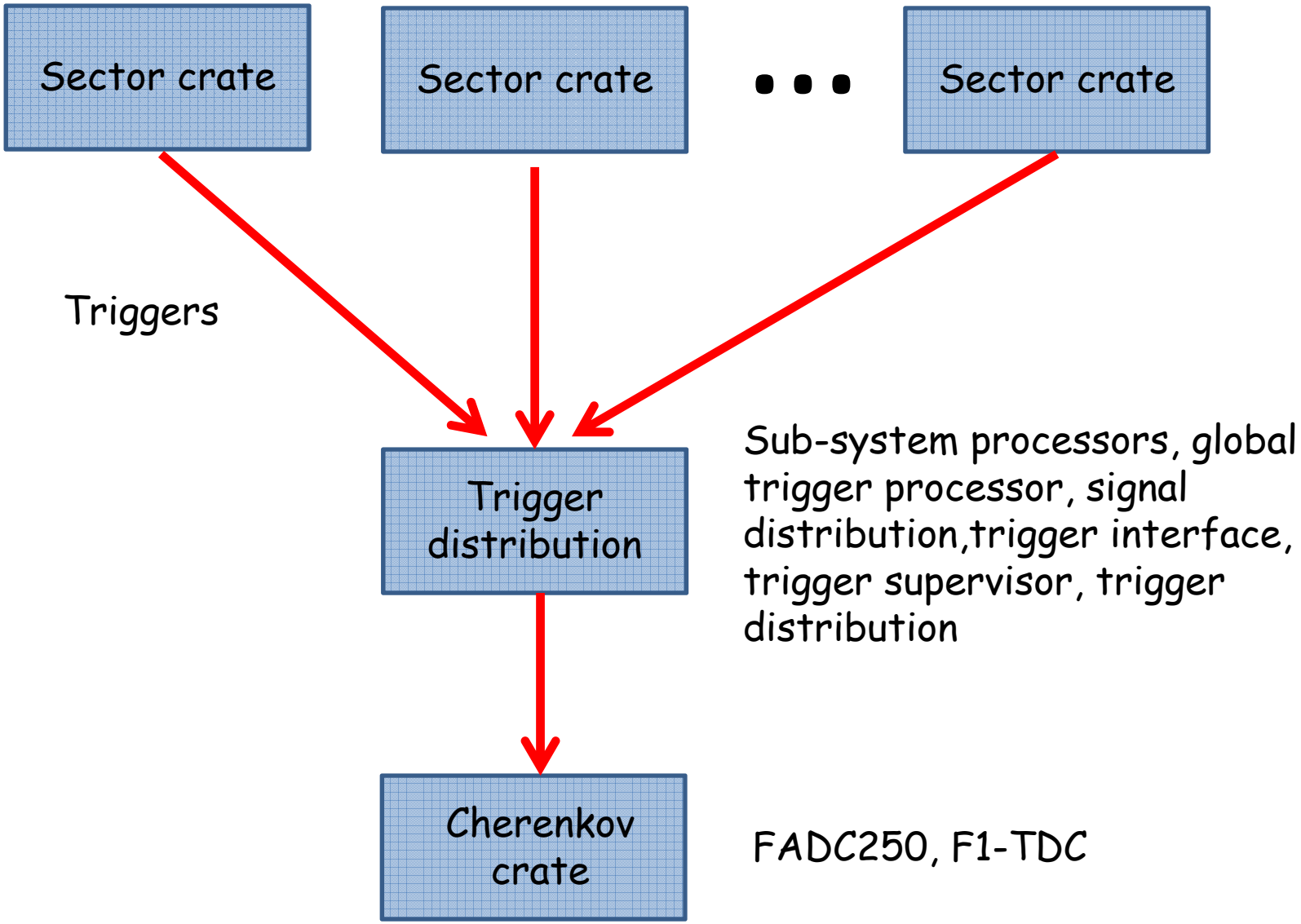
- The proposed baffle and segmentation arrangement of the GEMs and calorimeter in PVDIS, naturally suggest an arrangement of the DAQ electronics into 30 VXS crates.
- A sector trigger is formed in each VXS crate
- Crates contain FADC250's for the calorimeter, and the custom INFN VME card to readout the GEM-APV25's.
- 128 GEM channels/APV and 4 APV's/VXS board: 10 boards required for the GEMs per sector

Location	Z	Sector						Total	
		#	$\Delta\varphi$	R_{min}	R_{max}	pitch	#	surface	#
	cm			cm	cm	mm	chan	m^2	chan
5	155	30	10°	55	115	0.4	1000	2.7	30 k
6	185	30	10°	65	140	0.4	1220	4.0	36 k
7	295	30	10°	105	200	0.6	1160	7.6	35 k
8	310	30	10°	115	215	0.6	1250	8.6	38 k
total								23.0	140 k

Table B.2: The sizes and the number of readout channels in the GEM coordinate detectors.

Sector Crate




Sector crate
Sector crate
Sector crate
Triggers
Trigger distribution
Sub-system processors, global trigger processor, signal distribution,trigger interface, trigger supervisor, trigger distribution
Cherenkov crate
FADC250, F1-TDC

Summary:

- No show stoppers for the PVDIS DAQ that I can see
- Need to fix detector parameters (# channels, size, placement) so that the DAQ electronics configuration, event size, and costs can be finalized.
- UMass can work on the electronics for PVDIS and SIDIS in collaboration with Alexandre Camsonne and Yi Qiang