

# SBS DAQ update

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# On going project

- Fastbus event switching
  - Bob reported a few weeks ago
  - Development of decoding
  - Deploy all Fastbus crates
  - Check synchronization with FADC and GEM
- GEM MPD optical readout
- FADC HCAL trigger

# GEM MPD readout

- SSP readout implemented in December
- 2.5 Gbit/s = link MPD to SSP
- Up to 32 SSP per MPD
- 30 KHz with 3 samples 100 MB/s for 3 APV25 ( disk / network / VME backplane limit ) expect around 10 KHz for 8 APV with 3 samples
- Ben implemented
  - 2 GB buffer on SSP
  - Working on deconvolution and zero suppression on SSP
- Possibility of parallel readout of SSP with VTP
  - Up to 10 Gbit/s = 1.25 Gbyte /s = x10 faster with 10 SSPs per VXS crate

# FADC HCAL

- VTP delivered
  - Can be used as ROC with 10 Gbit network adapter
  - More resources than GTP
  - 3 optical links : allow transfer from one crate to the other for calorimeter trigger
  - Ben will port the GTP code to VTP after he is done with MPD
  - 4x4 cluster using HPS firmware was quickly tested with GTP

# GMn readiness review

- GMn / GEn setup
- BigBite
  - Shower
  - Preshower
  - Scintillator
  - GRINCH
- Neutron detector
  - CDET
  - HCAL

# BigBite

Detector	Channels	NINO	Readout	ADC	TDC
Shower	7x27 = 189 27 sums		Fastbus	X	
Preshower	2x27 = 54		Fastbus	X	
Scintillator	200 x 2	X	VME	X	X
GRINCH	550	X	Fastbus	?	X
GEM	5 planes		VME		

About 700 ADC channels  
About 1000 TDC channels

# Neutron arm

Detector	Channels	NINO	Readout	ADC	TDC
HCAL	288	?	VME	X	X
CDET	2352	X	Fastbus		X

2652 LVDS to ECL converter from BigBite DC

# GMn trigger rates

Q <sup>2</sup> GeV <sup>2</sup>	n+p QE xsec fb	L(per atom) 10 <sup>38</sup> /cm <sup>2</sup> /s design	QE rate Hz	QE rate at max L Hz
3.5	6700	0.35	235	940
4.5	1015	0.7	70	140
5.7	97.9	1.4	13.5	13.5
8.1	47.4	1.4	6.6	6.6
10.2	31.6	0.7	1.5	3.0
12.0	5.04	1.4	0.7	0.7
13.5	6.25	1.4	0.87	0.87

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# GMn trigger rates

Q <sup>2</sup> GeV <sup>2</sup>	E' GeV	E' GeV	Threshold GeV	Rate Shower Hz
3.5	2.5	2.5	2.1	400
4.5	2.0	2.0	1.6	300
5.7	1.2	1.36	1	200
8.1	2.1	2.3	1.6	200
10.2	3.5	3.4	2.7	100
12.0	2.4	2.4	1.8	100
13.5	1.6	3.8	1.2	200

Max rate :  $400 + 940 = 1340$  Hz  
x4 = 5.6 KHz

# Fastbus configuration

- Fastbus crates
  - GEP weldment  $4 \times 3 = 12$  Fastbus crates
- 700 ADC channels = 11 ADCs
- $2352 + 550 = 2900 = 31$  TDCs
- 1 ADC per crate and 3 TDCs per crate
- 1440 bytes per event up to 14 KHz assuming 100 % occupancy and 1 hit per channel in TDC

# VME

- V1190
  - No LVDS adapter required
  - 400 channels = 4 modules
- FADC
  - 288 channels = 18 boards
- F1
  - 288 channels = 5 boards
- MPD : 5 planes = 15 x 2048 = 15 MPDs
- 1 VXS crate TS
- 2 VXS crates for FADC, TDC and SSP for GEM
- VME backplane for TDC 5 per crate
  
- Assuming VTP readout, limiting factor is VME backplane for TDC assuming all channel fire with 1 hit : 72 KHz
- If all MPD readout through VME : MPD limiting because of SSP readout at 100 MB/s backplane speed
  - 8 MPD per crate about 50 Kbytes for 1 sample = 1.5 KHz at 100 % occupancy
  - 10 % occupancy reach 15 KHz with 1 sample
  - 5 % occupancy for 10 KHz with 3 samples
- Could add VME64x crate for MPDs ( 2 available from DVCS )

# Conclusion

- Fastbus on going
- MPD SSP readout implemented, deconvolution and zero suppression being implement
- HCAL FADC trigger coming next
- GMn : trigger rates up to 7 KHz
- Use GeP without event switching
  - Up to 14 KHz possible ( more with zero suppression)
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