Hall A/C SRO developments

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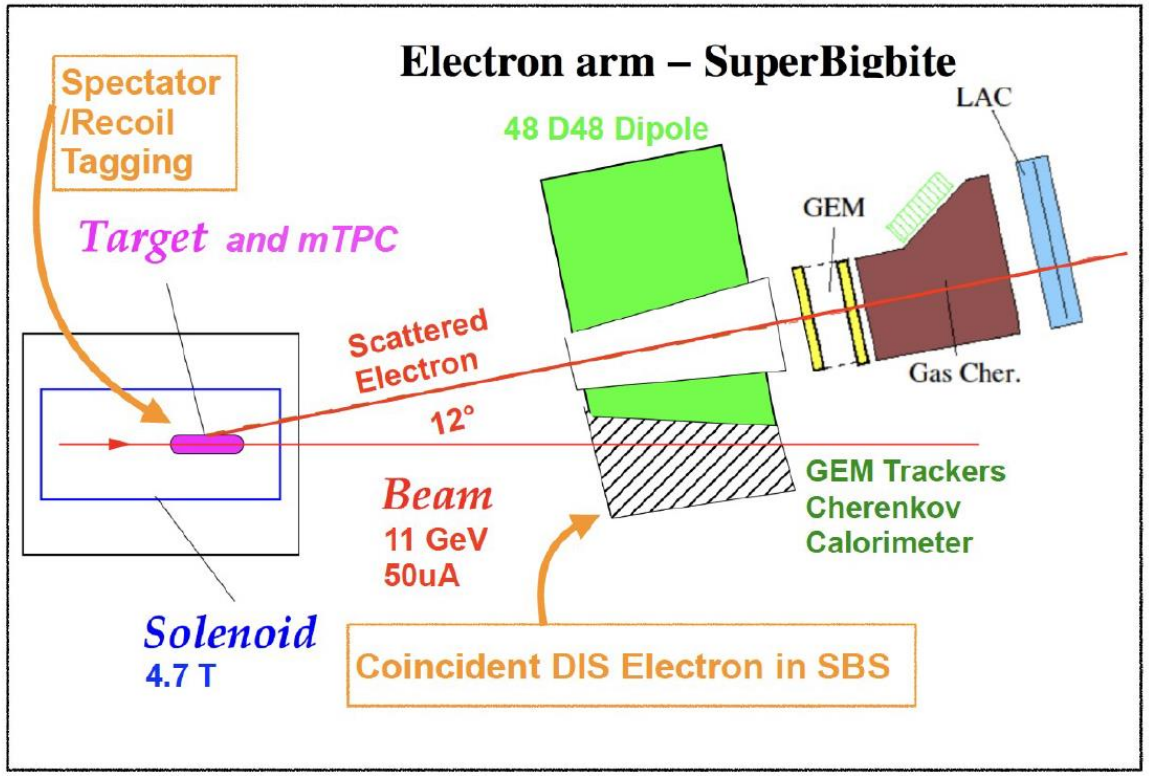
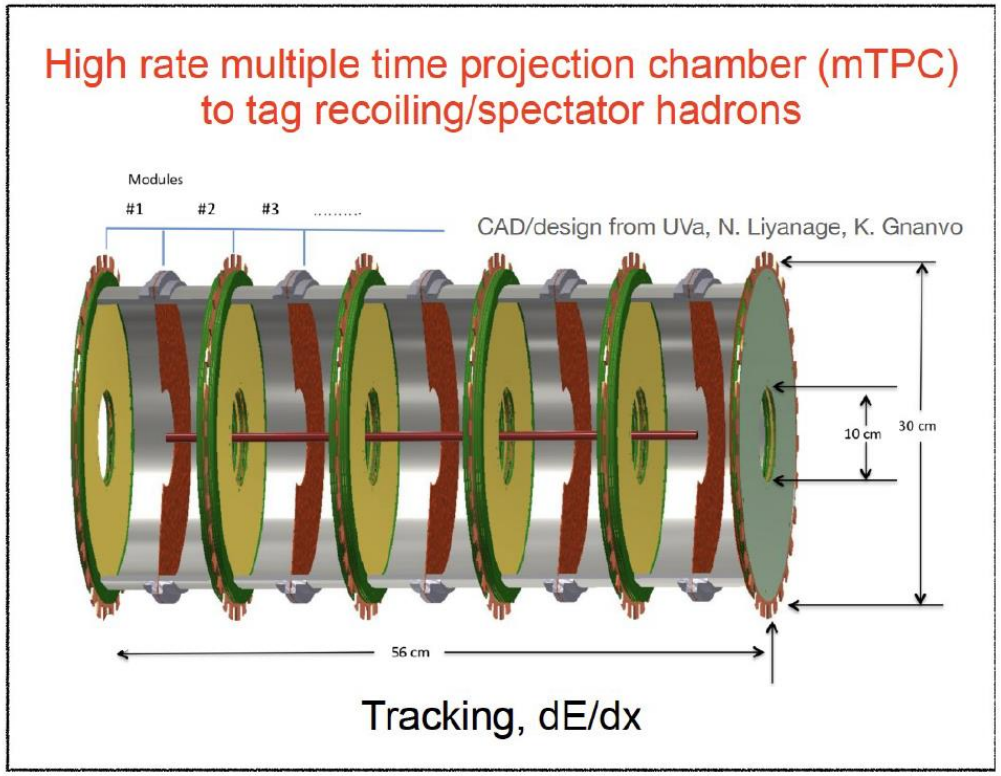
MSU-JLAB SRO DAQ discussion

Hall A/C high luminosity halls requirements

- High background several MHz per channel / high occupancy data
- High trigger rate : few kHz to 300 KHz for SoLID SIDIS – 600 KHz for PVDIS
- Radiation hard electronics typically located in Hall

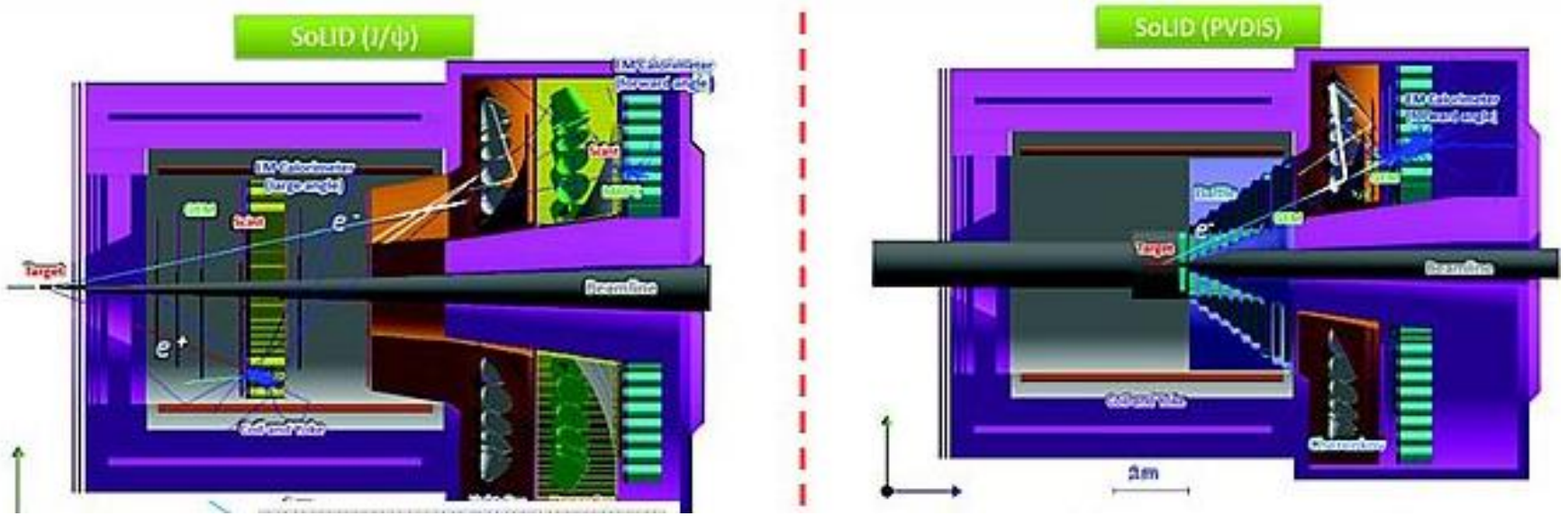
TDIS


Electron arm – SuperBigbite
Spectator /Recoil Tagging
Target and mTPC
48 D48 Dipole
LAC
GEM
Gas Cher.
Scattered Electron
12°
Beam
11 GeV
50uA
GEM Trackers
Cherenkov
Calorimeter
Solenoid
4.7 T
Coincident DIS Electron in SBS


High rate multiple time projection chamber (mTPC) to tag recoiling/spectator hadrons
Modules
#1
#2
#3
CAD/design from UVa, N. Liyanage, K. Gnanvo
10 cm
30 cm
56 cm
Tracking, dE/dx

SoLID

- 2 experimental setup :



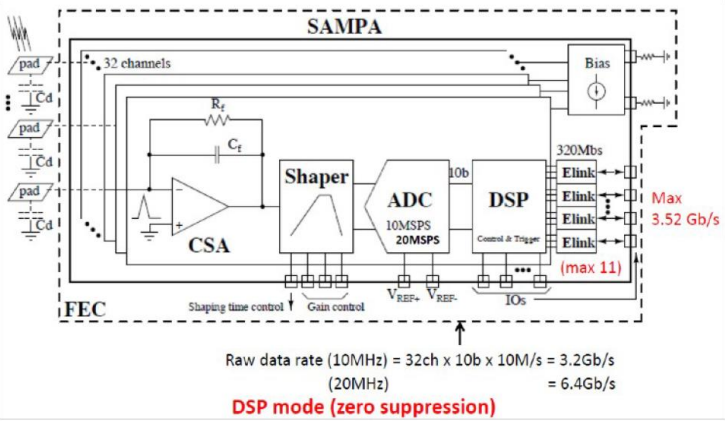
Luminosity : 10^37 $cm^{-2}.s^{-1}$
SIDIS / Jpsi : ~ 300 KHz DIS electron rate

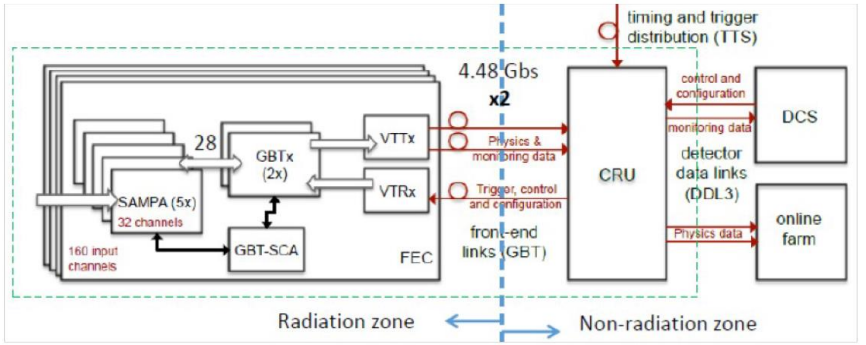
Luminosity : 2.10^38 $cm^{-2}.s^{-1}$
PVDIS : ~ 600 KHz DIS electron rate

TDIS electronics

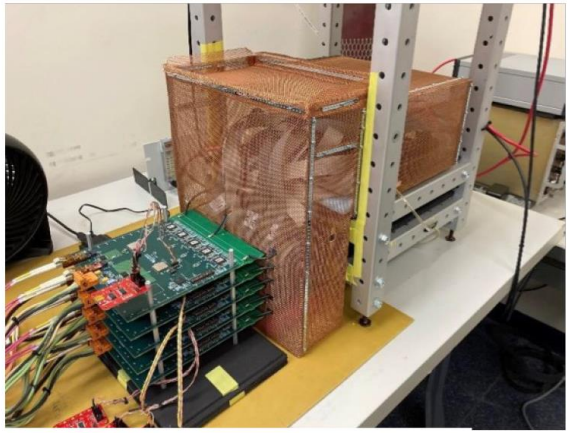
Readout for mTPC has been developed using the SAMPA chip

Effort led by E. Jastrzembski Jlab FE





FEC – Front End Card (160 ch / FEC)
CRU – Common Readout Unit (~12 FECs / CRU = ~1920 ch / CRU)
GBTx – Giga Bit Transceivers
GBT-SCA – GBT Slow Controls Adapter
VTTX, VTRx – Fiber optic tranceivers

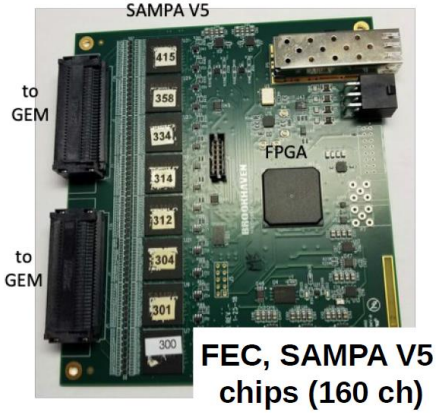


JLab Cosmics Test Stand
FEC, coupled to GEM detector

SAMPA V5 - 80 ns shaping time

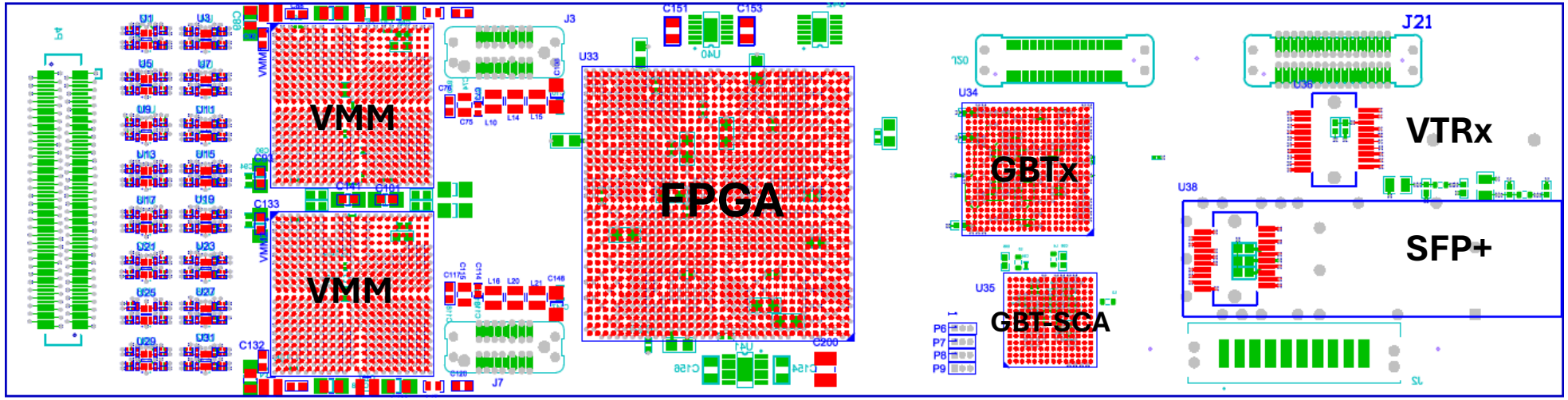
SAMPA can be used in streaming mode or triggered mode

mTPC prototype will be testing using the sPHENIX TPC Front-end card (FEC)



FEC, SAMPA V5 chips (160 ch)

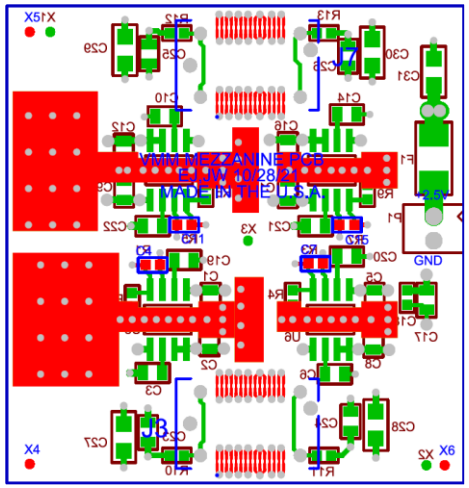
50mm

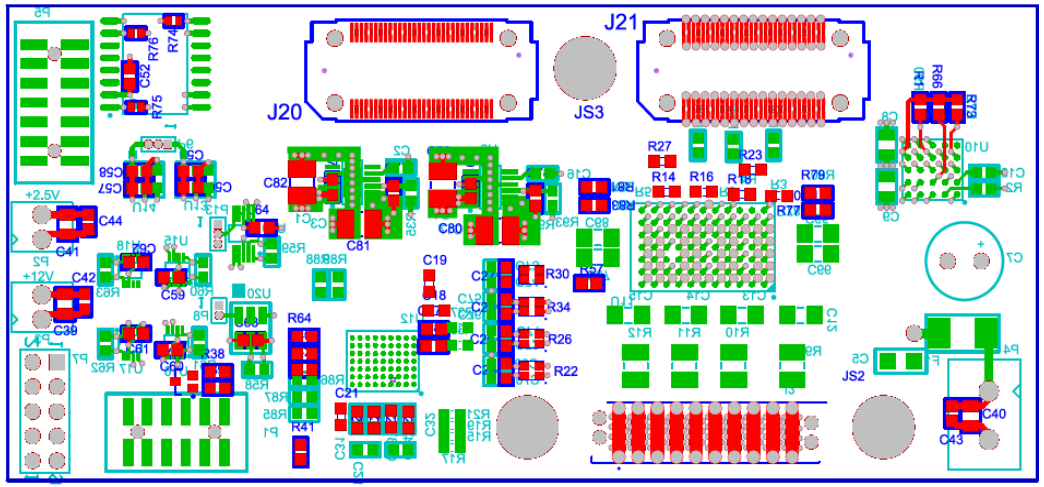


Base board

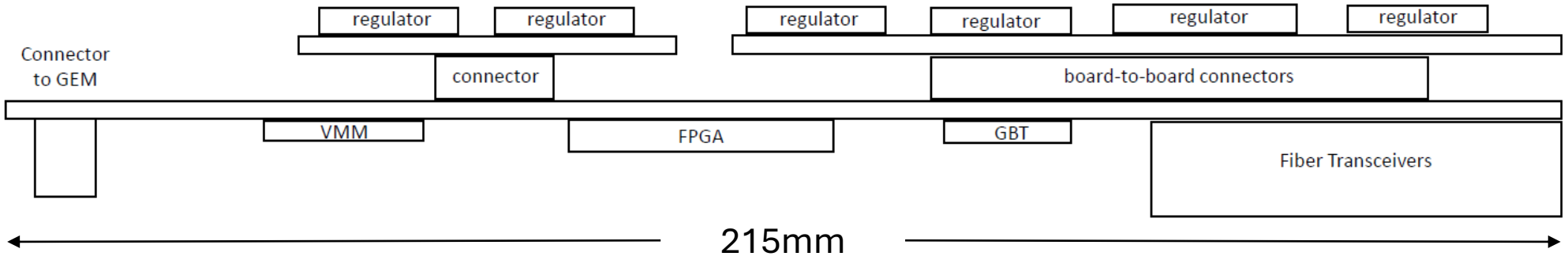
128 channel VMM prototype

VMM power mezzanine





FPGA power mezzanine



Assembly side view

Conclusion

- Some hardware developments streaming capable can be interesting for FRIB (SAMPA / VMM / future development)
- SoLID interested in EIC SRO developments but GEM streaming is challenging
  - Study of feasibility and cost for streaming for SoLID and option to choose streaming or triggered using CODA
  - Might need to rely heavily on AIML to reduce background : simulation study and testing of AIML based background filters
- More developments for GEM hardware readout coming toward streaming
- Other developments : TOF and Cerenkov readout