

Status of the Super BigBite Spectrometer and upgrade BigBite at JLab Hall A

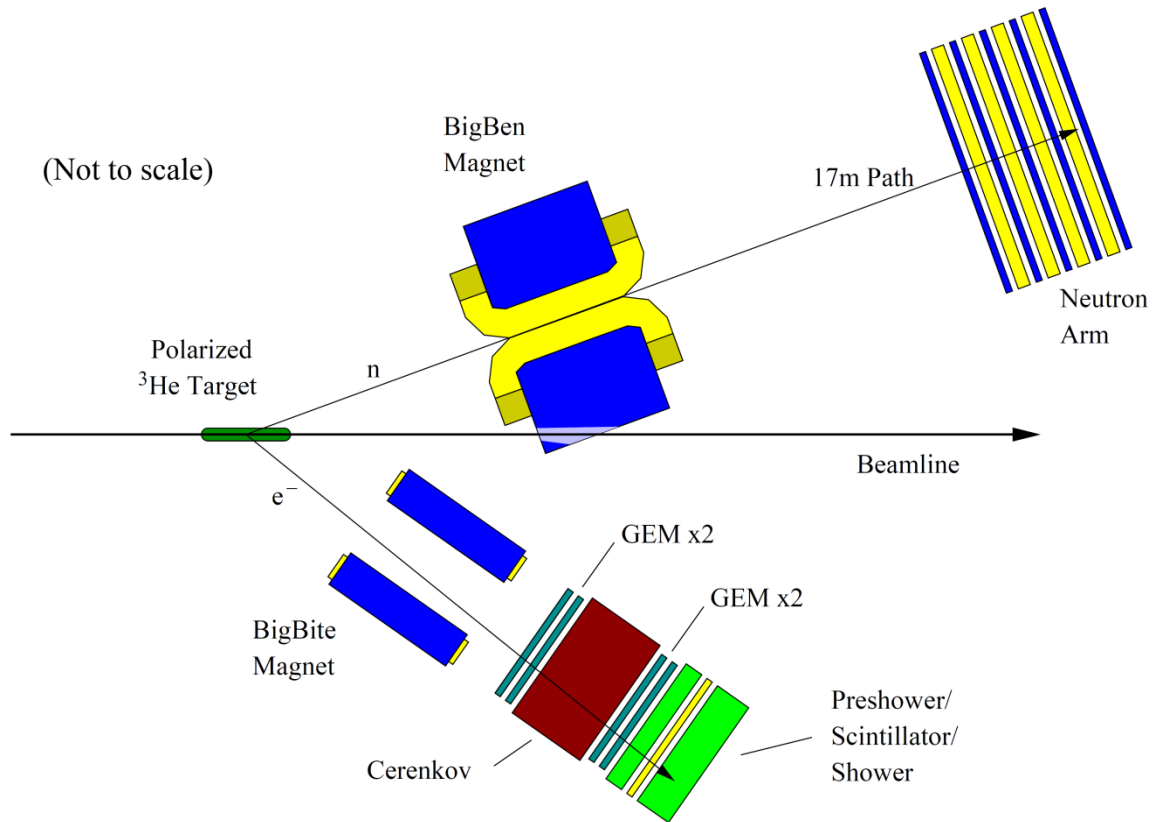
A. Shahinyan

**A.Alikhanyan National Science
Laboratory**

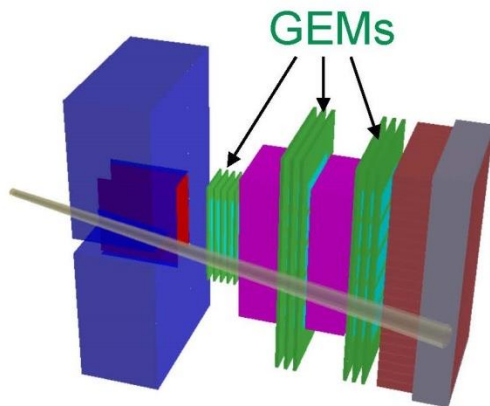
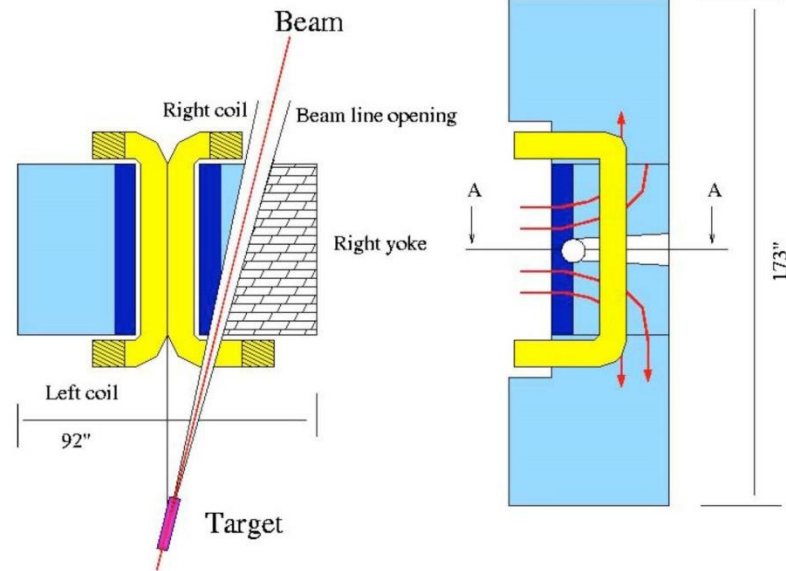
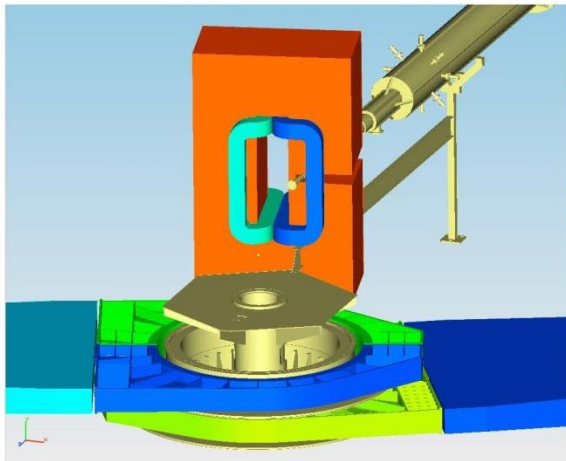
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Super BigBite Spectrometer

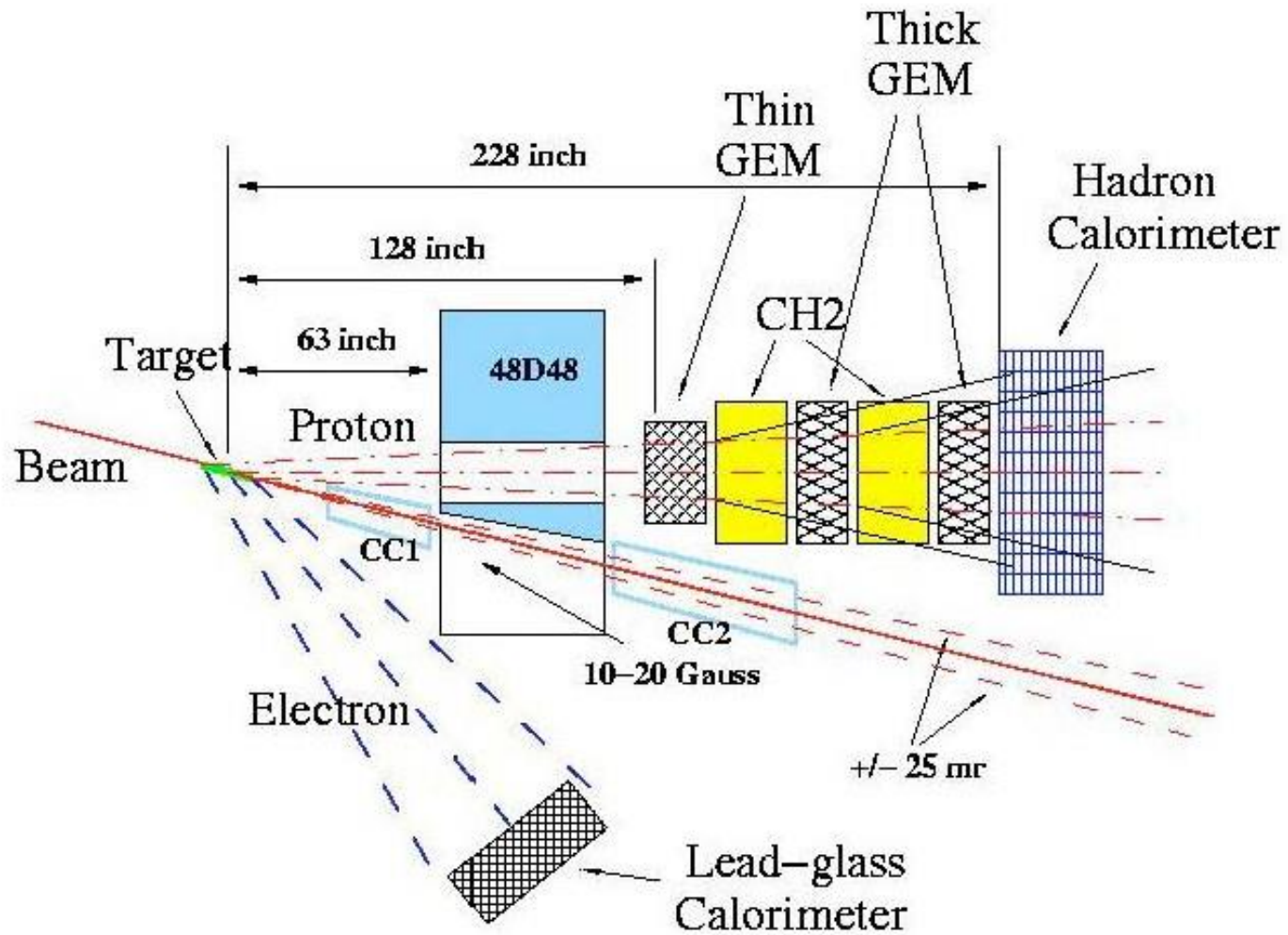


Super Bigbite Spectrometer



- Magnet: 48D48 - **46 cm gap**, 2-3 Tesla*m
- Solid angle is **70 msr** at angle 15 deg.
- GEM chambers with 70 μm resolution
- momentum resolution is **0.5% for 5 GeV/c**
- angular resolution is **0.5 mr**

SBS Layout and Parameters



Parameters of SBS

	$\theta_{central}$, degree	Ω , msr	D, meter	Hor. range, degree	Vert. range, degree
Solid angle	3.5	5	9.5	± 1.3	± 3.3
	5.0	12	5.8	± 1.9	± 4.9
	7.5	30	3.2	± 3	± 8
	15	72	1.6	± 4.8	± 12.2
	30	76	1.5	± 4.9	± 12.5

Resolution:

Momentum $\Rightarrow \frac{\sigma_p}{P} = 0.0029 + 0.0003 \times p [\text{GeV}]$

Angular $\Rightarrow \sigma_\theta = 0.14 + 1.3/p [\text{GeV}], \text{ mrad}$

Momentum acceptance $\Rightarrow P \text{ range from } 2 - 10, \text{ GeV}/c$

Experiments

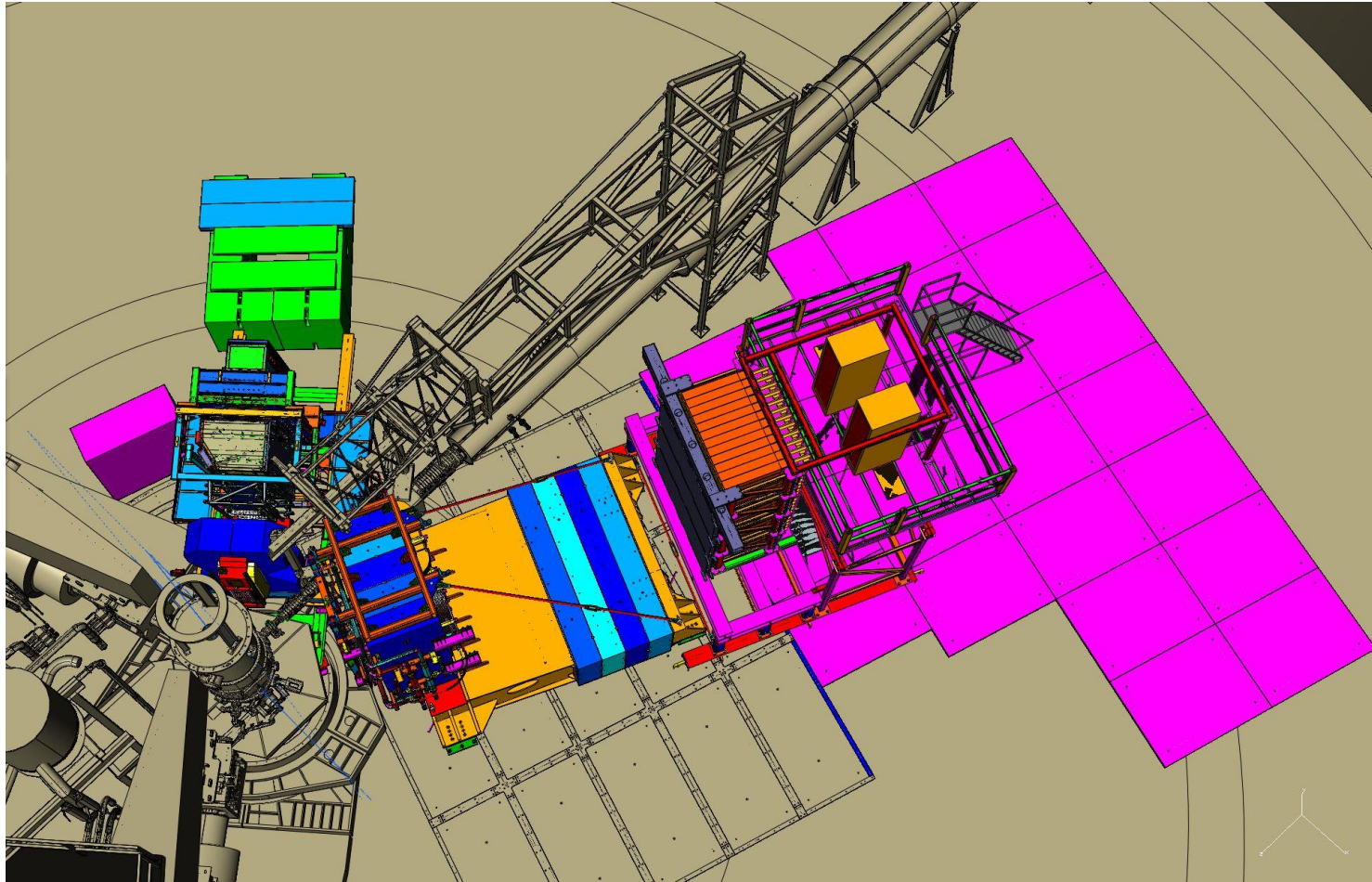
GMN - Precision Measurement of the Neutron Magnetic Form Factor up to $Q^2 = 18.0 \text{ (GeV/c)}^2$ by the Ratio Method

GEP5 - Large Acceptance Proton Form Factor Ratio Measurements at 13 and 15 $(\text{GeV/c})^2$ using Recoil Polarization Method

Transversity - Target Single-Spin Asymmetries in Semi-Inclusive Pion and Kaon Electroproduction on a Transversity Polarized ^3He Target using Super BigBite and BigBite in Hall A

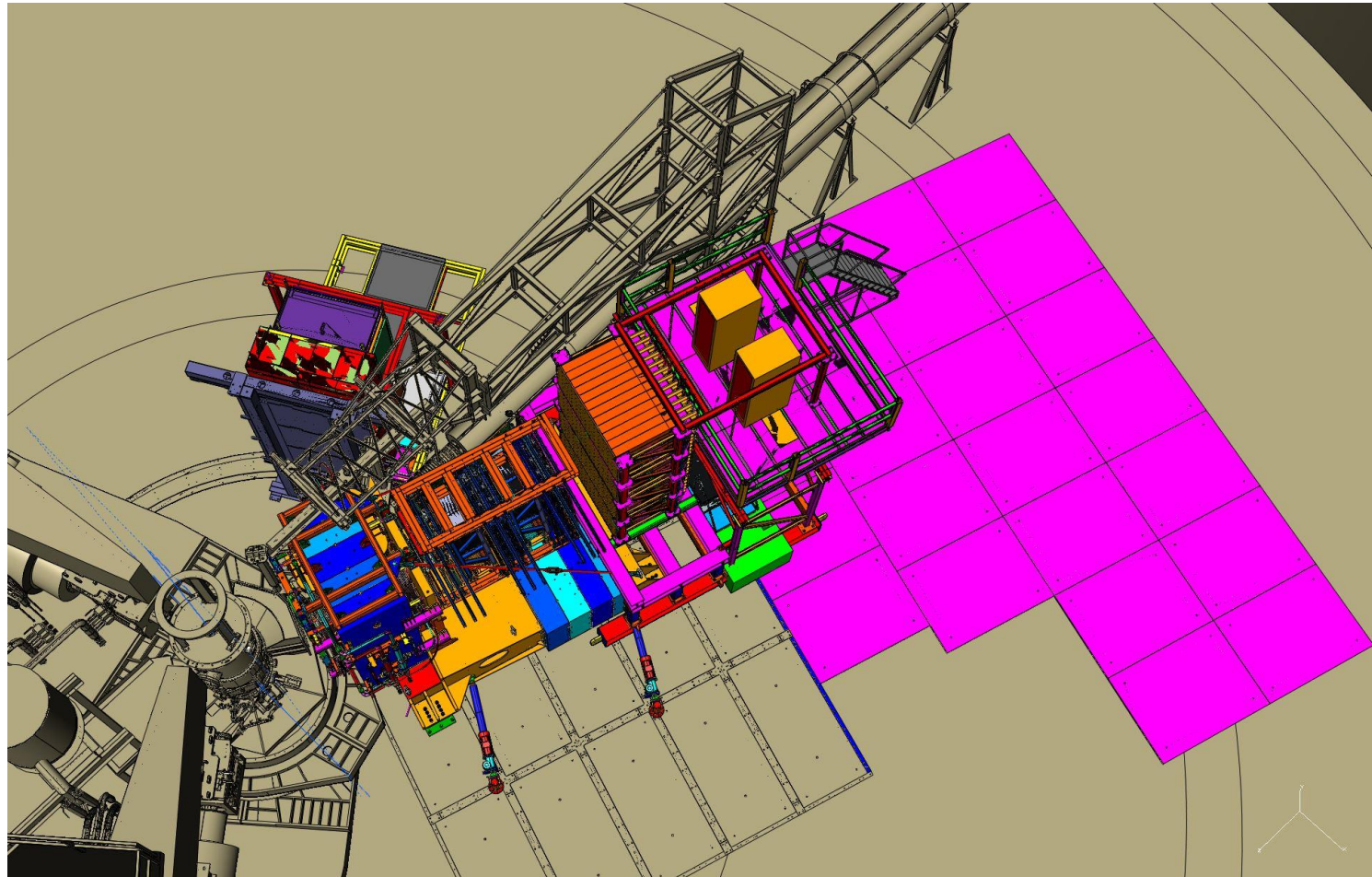
GEN2 - Measurement of the Neutron Electromagnetic Form Factor Ratio G_E^n/G_M^n at High Q^2

GMN - Precision Measurement of the Neutron Magnetic Form Factor up to $Q^2 = 18.0 \text{ (GeV/c)}^2$ by the Ratio Method



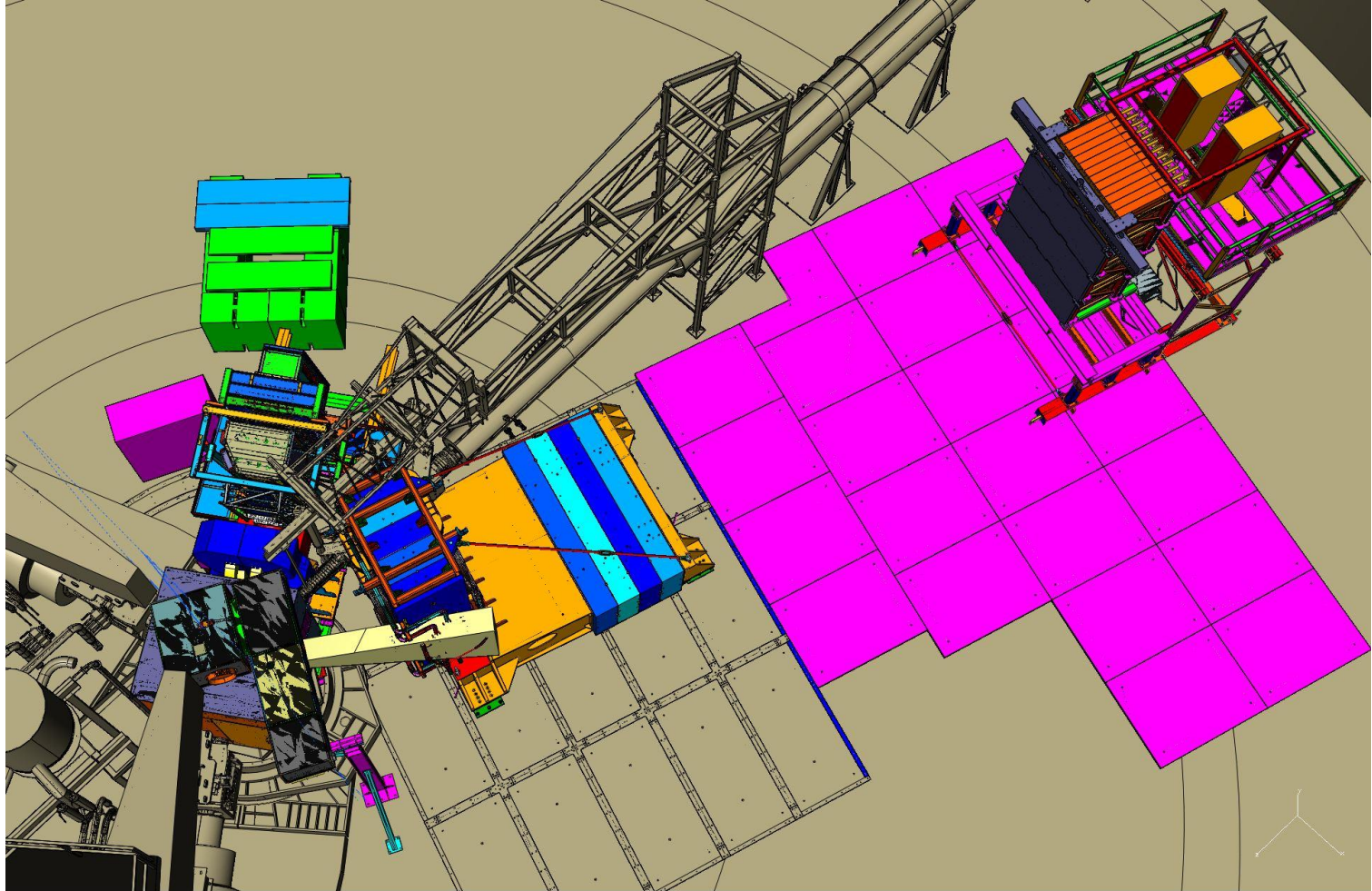
GMN Layout

GEP5 - Large Acceptance Proton Form Factor Ratio Measurements at 13 and 15 (GeV/c)² using Recoil Polarization Method



GEP5 Layout

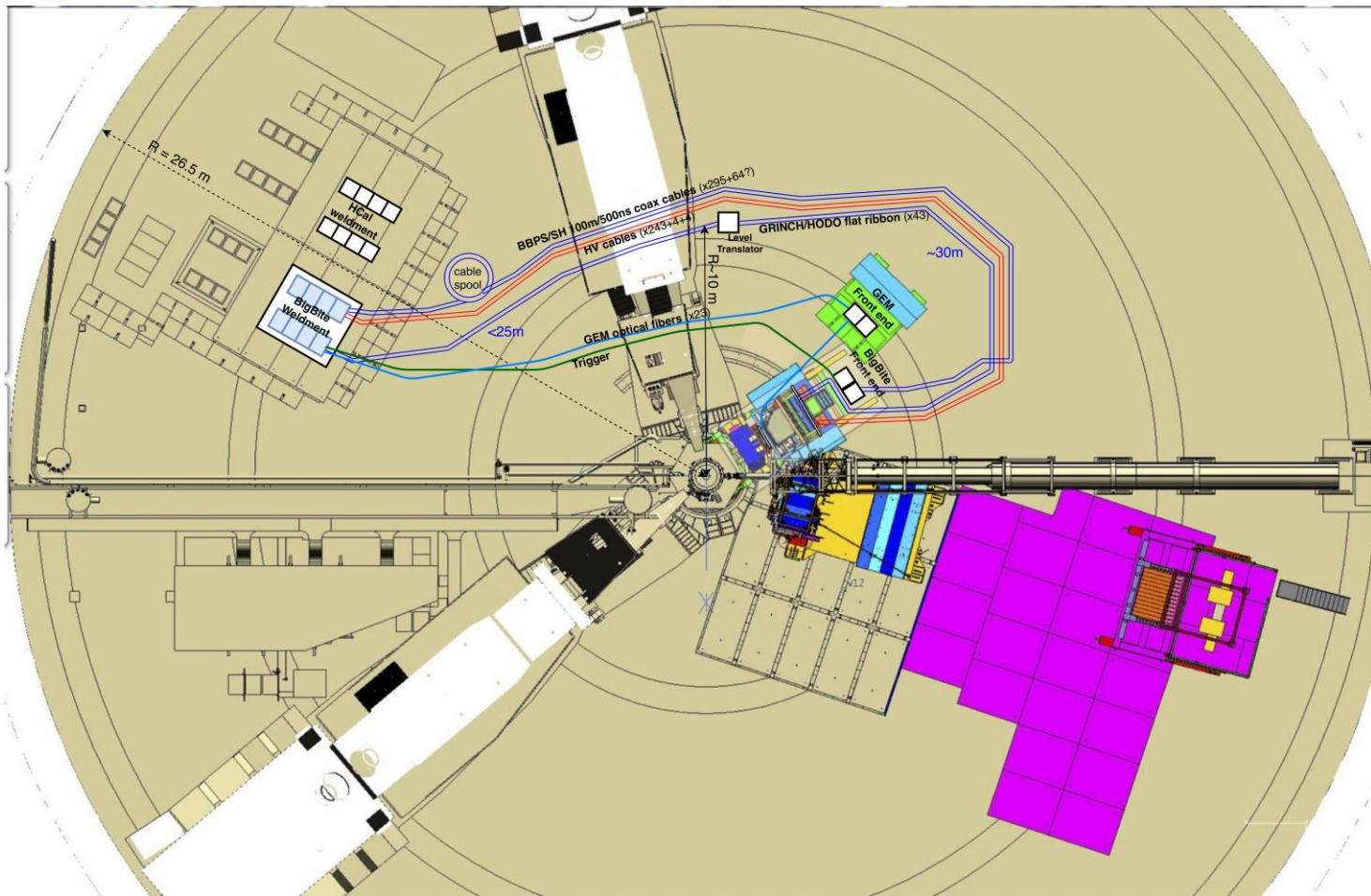
GEN2 - Measurement of the Neutron Electromagnetic Form Factor Ratio G_E^n/G_M^n at High Q^2



GEN2 Layout

Albert Shahinyan

GMN- Precision Measurement of the Neutron Magnetic Form Factor up to $Q^2 = 18.0 \text{ (GeV/c)}^2$ by the Ratio Method

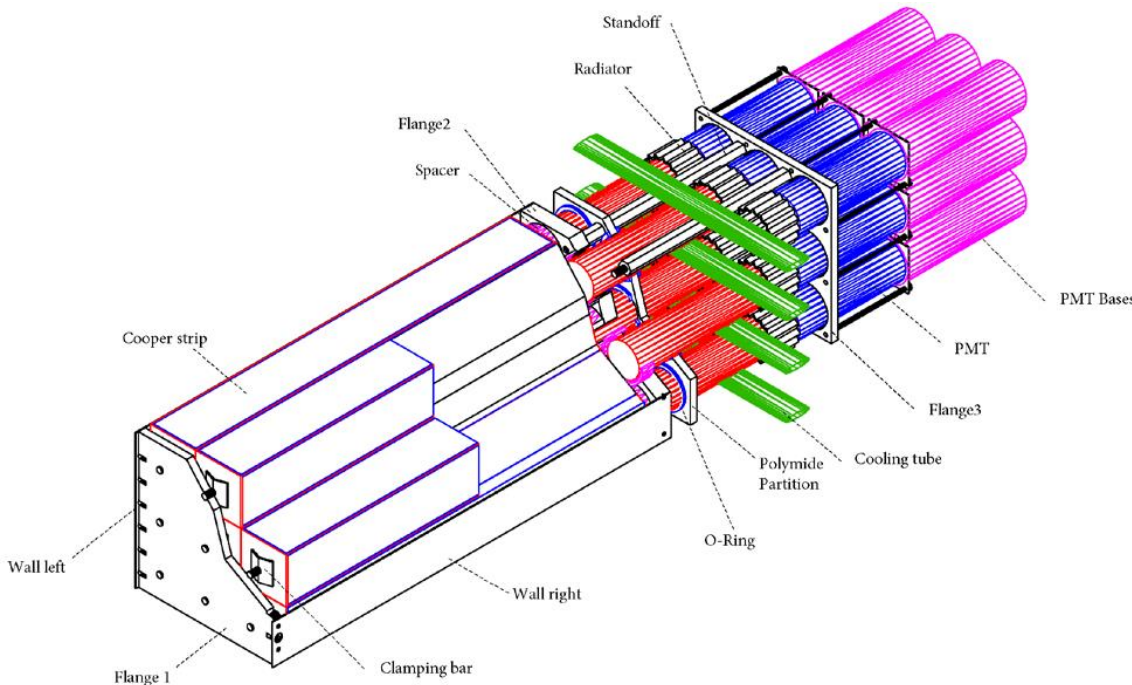


ECAL super module

Each super module is designed to contain 9 lead glass blocks and support attachment of 9 boron silicate glass light guides connected to 9 photomultiplier tube bases.

Total need 191 super module

Assembled 134 super module



Schematic View

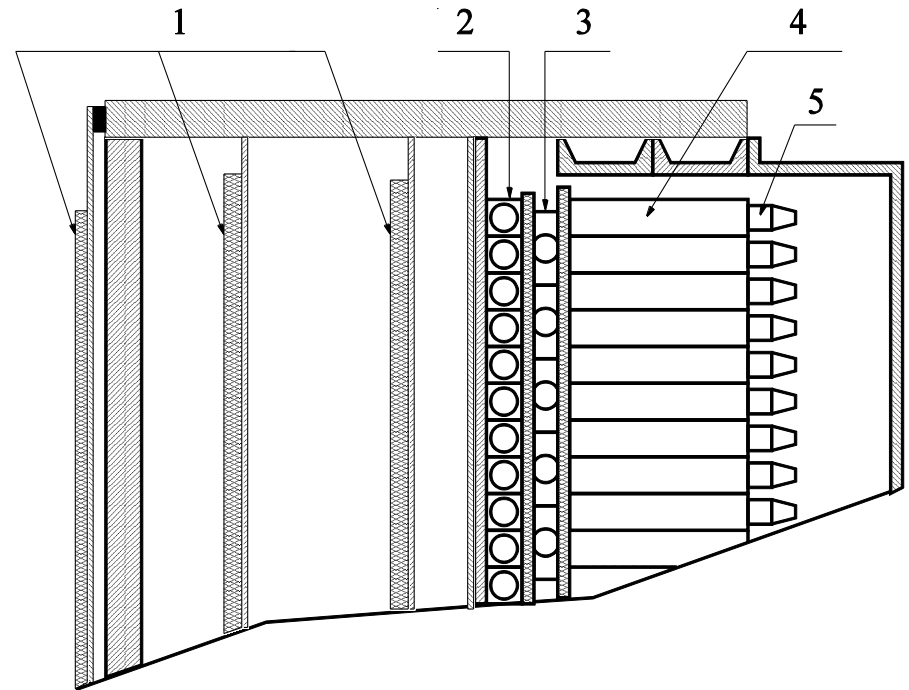
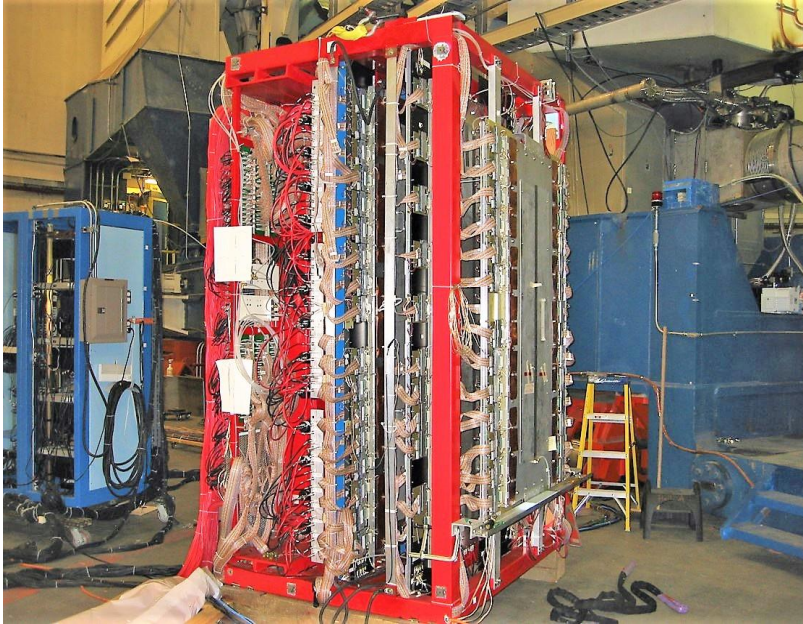


Really View

Upgrade of the BigBite Spectrometer

- Old BigBite spectrometer
- Upgraded BigBite Spectrometer

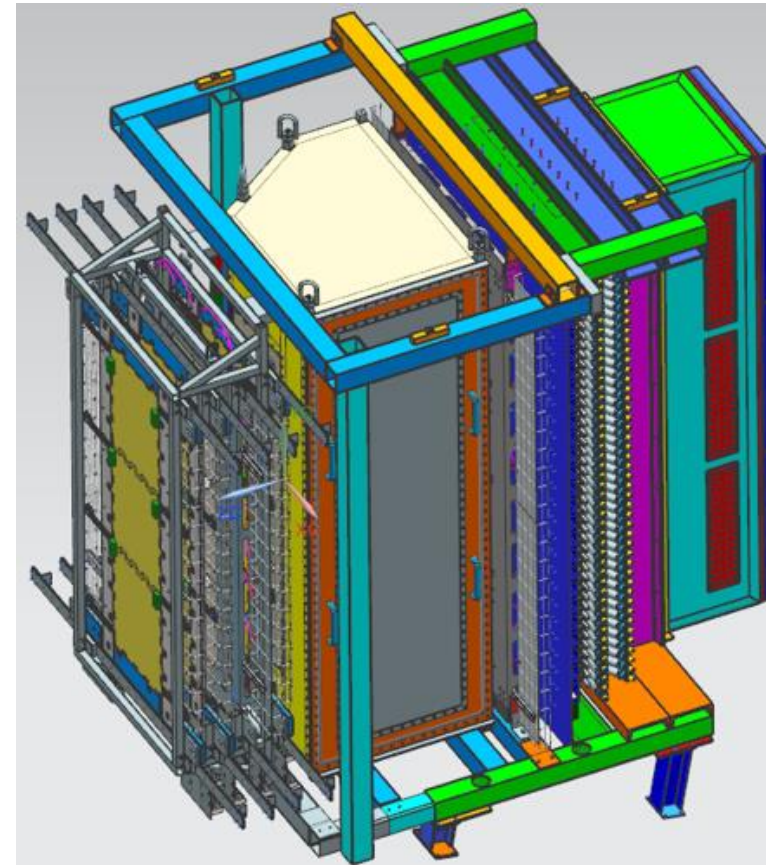
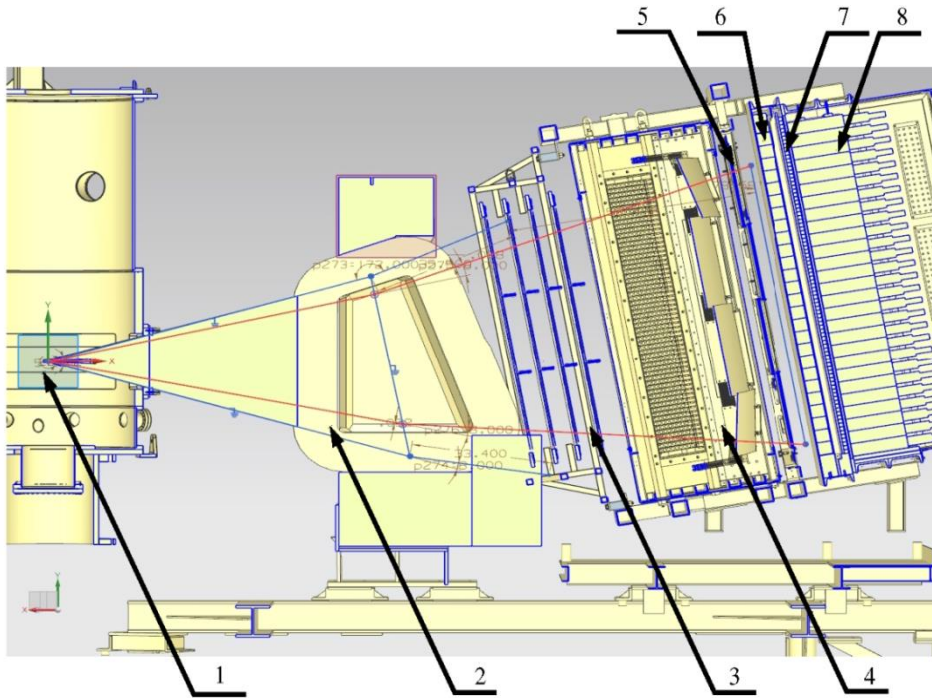
Old BigBite for GEN Experiment



**Old BigBite:
Photo**

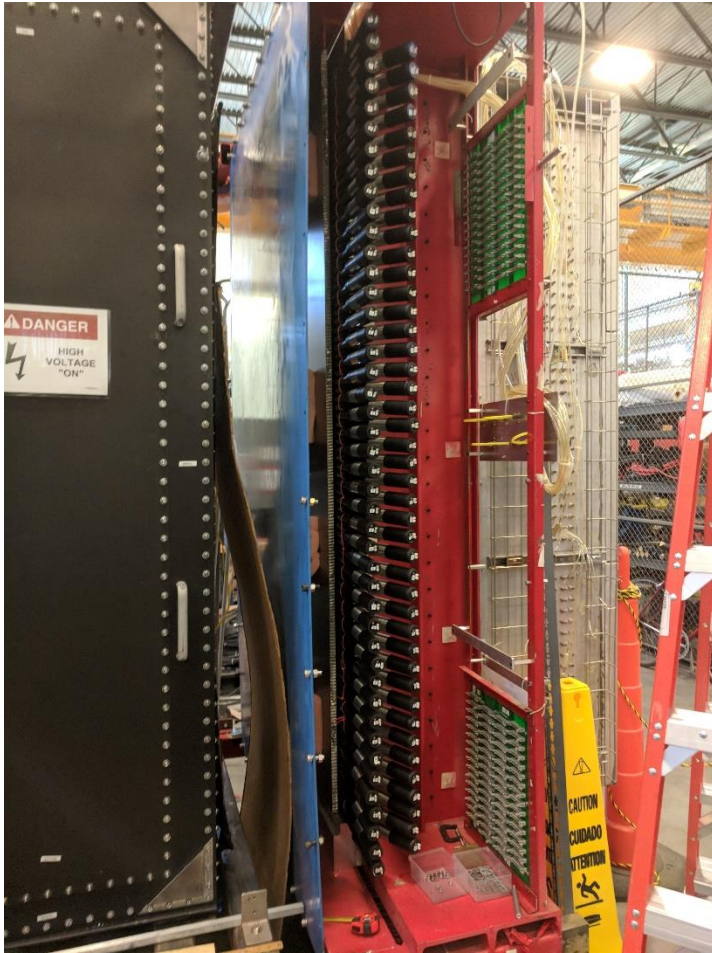
**Old BigBite Layout:
1- DC, 2 - PS, 3 – TH, 4- Shower**

Upgraded BigBite Spectrometer



1. Target, 2. BigBite Magnet, 3. GEM position, 4. Grinch,
5. GEM position, 6. Preshower, 7. Timing Hodoscope, 8. Shower

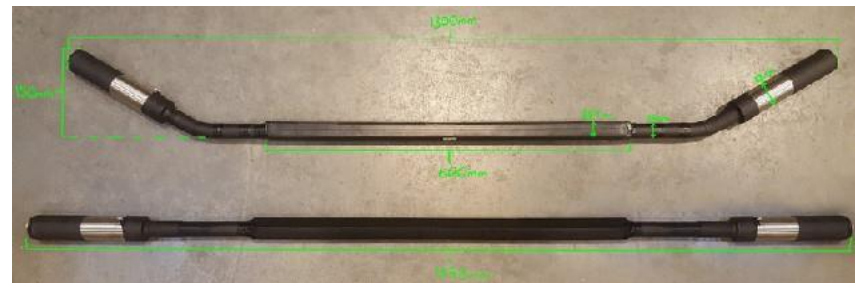
Timing Hodoscope



BB Frame with TH

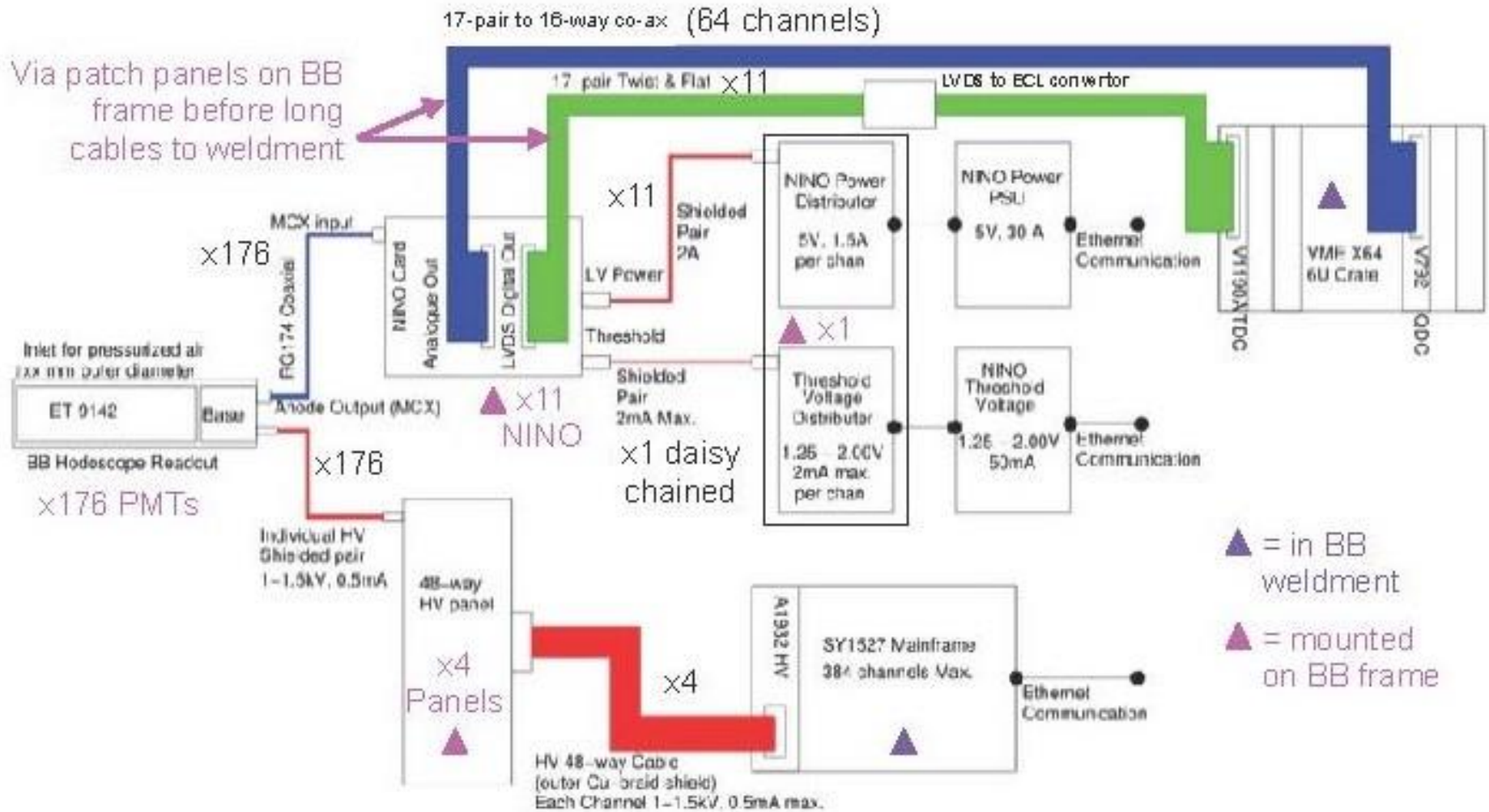
12.02.2020

**Total number of the – 90 counter
Counter – 60 x 2.5 x 2.5 cm plastic
Light guide – Dim. 25mm acrylic
PMT – ET9142**



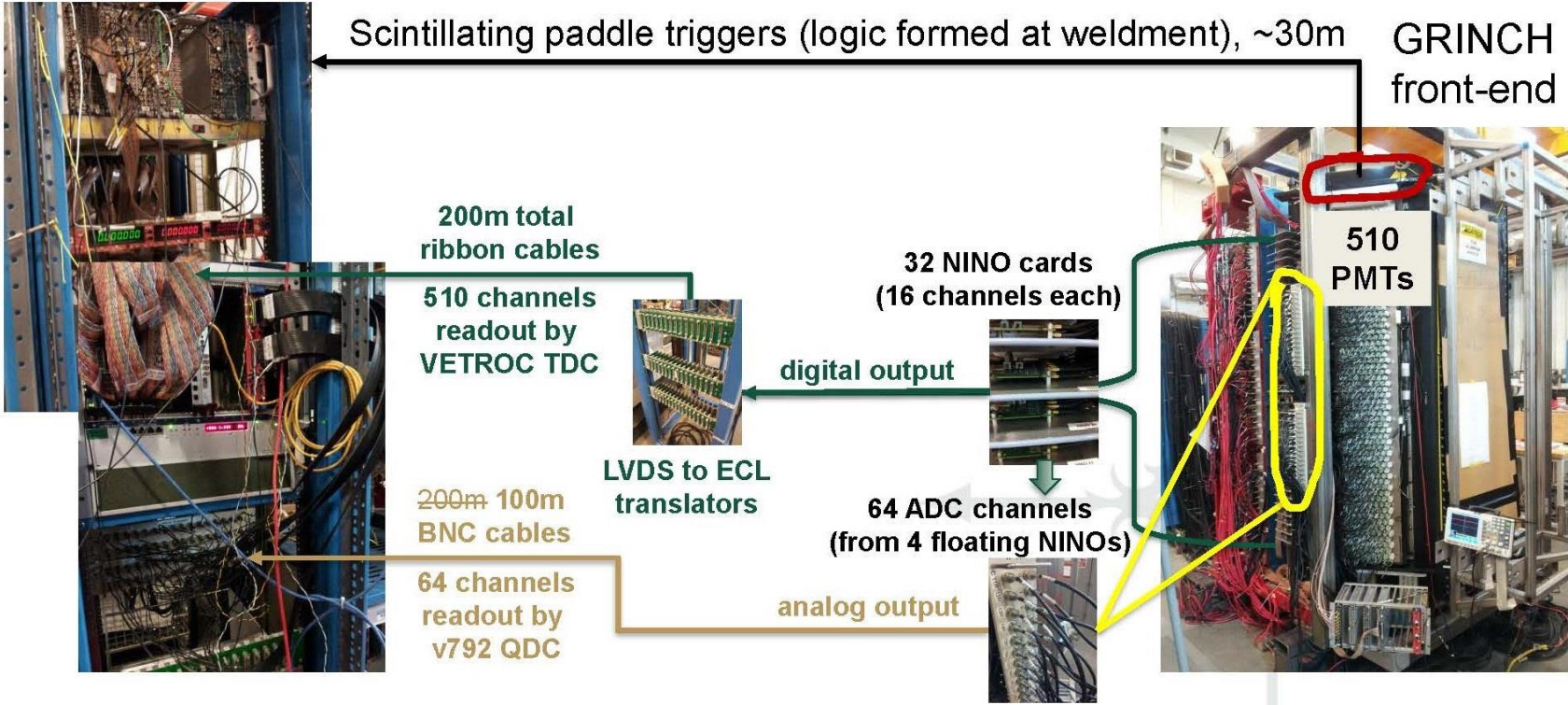
TH Individual counters

Timing Hodoscope Redout

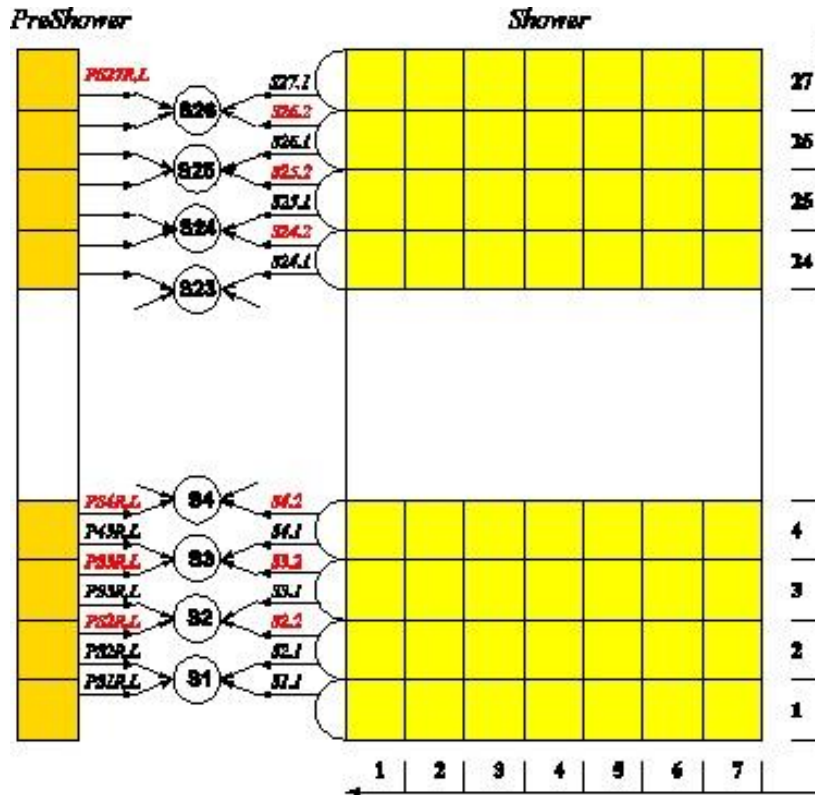


GRINCH Layout

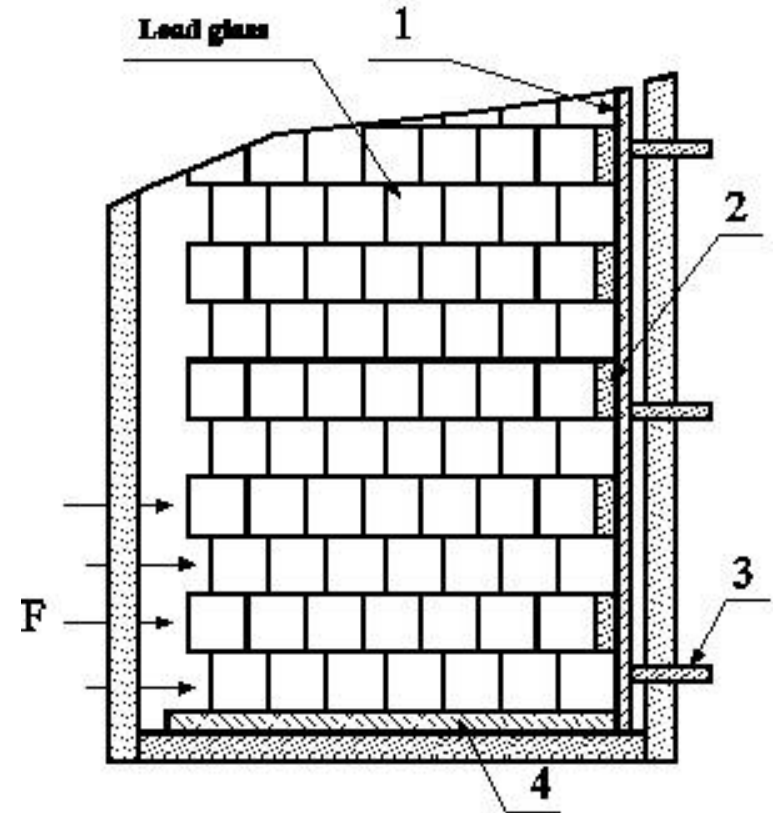
Weldment



Principle Organization Trigger for BB

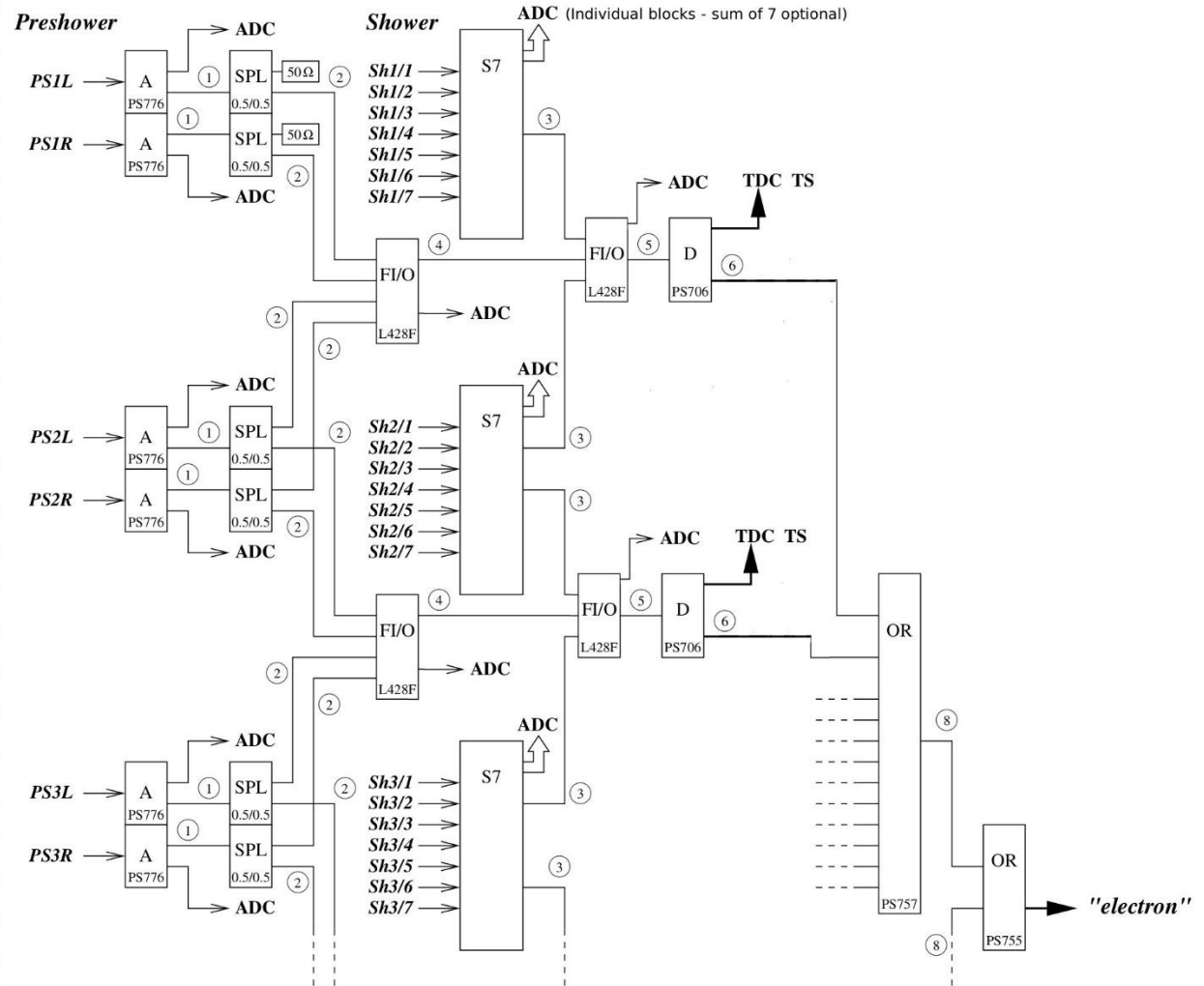
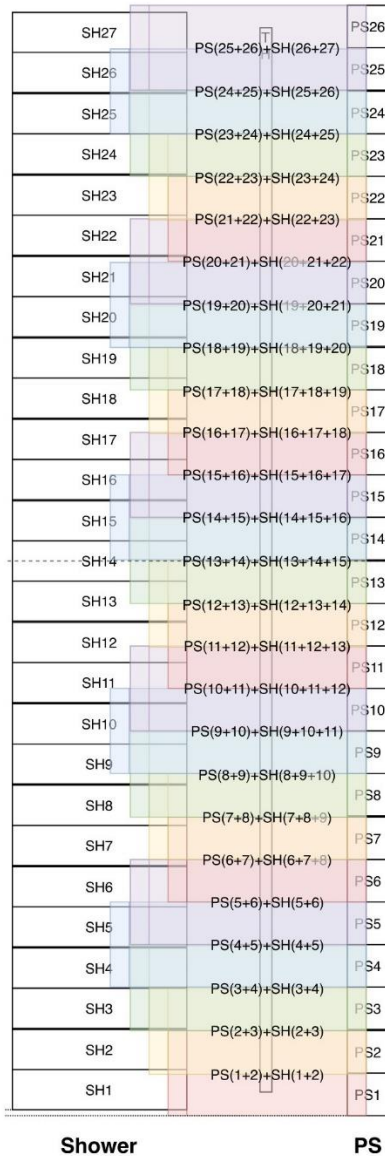


PreShower – 52 module
from Hermes LG – F101
PMT XP346



Shower – 189 module
from Selex LG – F8
PMT FEU-110

Schematic diagram of trigger for BB



Summary

- 1750 LG and Light Guide glued –completed
- 134 Super module assembled need to be assemble 57
- 52 module for Preshower - completed
- Shower – completed
- GEM – under cosmic test
- GRINCH – under test
- Timing Hodoscop – under re assembling

Schedule Experiment on 2021

- [E12-09-019](#): Precision Measurement of the Neutron Magnetic Form Factor up to $Q^2=13.5$ (GeV/c)² by the Ratio Method
- [E12-17-004](#): Measurement of the Ratio G_E^n/G_M^n by the Double-polarized $^2\text{H}(\vec{e}, e'\vec{n})$ Reaction
- [E12-20-008](#): Polarization Transfer in Wide-Angle Charged Pion Photoproduction
- [E12-20-010](#): Measurement of the Two-Photon Exchange contribution to the electron-neutron elastic scattering cross section

Thank You

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