Readiness of forward detectors

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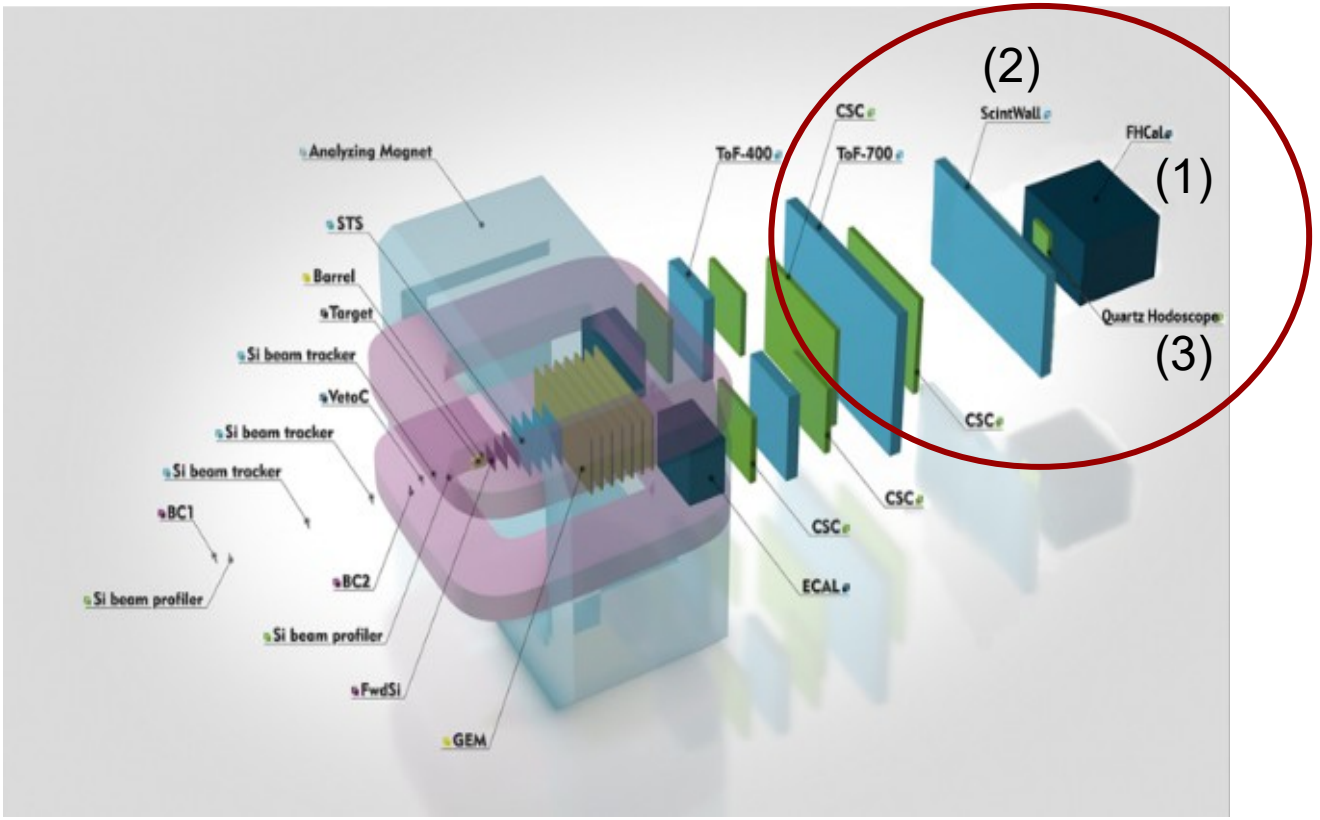
on behalf of INR RAS, Moscow

Forward detectors at BM@N:

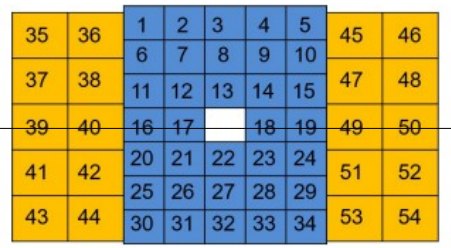
(1) FHCal (Forward **H**adron **Cal**orimeter)

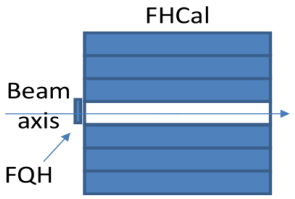
(2) ScWall (**Sc**intillation **W**all)

(3) FQH (**F**orward **Q**uarz **Hodo**scope)



Forward Hadron Calorimeter (FHCal)





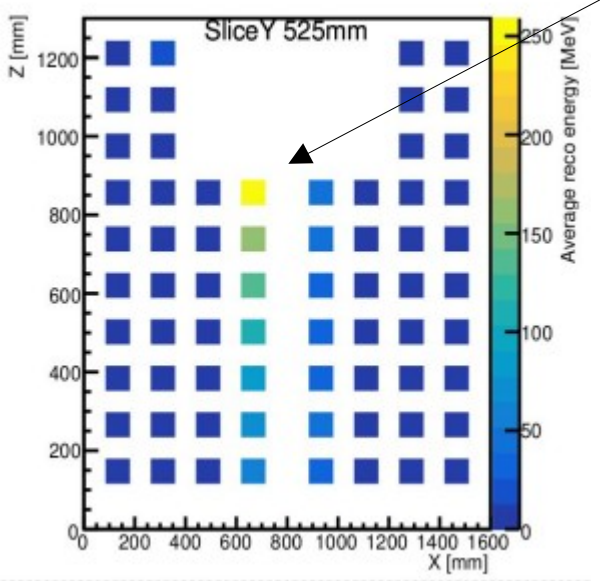
FHCal - (Forward Hadron Calorimeter):

34 modules (MPD-like) – 15x15cm^2; 7 sections; length – 4.0 λ_{int}.

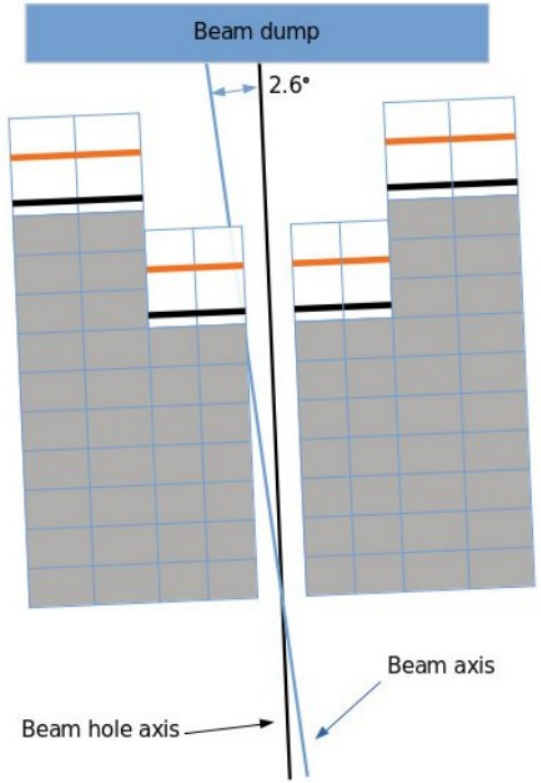
20 modules (CBM-like) – 20x20cm^2; 10 sections; length – 5.6 λ_{int}.

Hamamatsu MPPC S12572-010P, 3x3 мм^2.

434 readout channels.

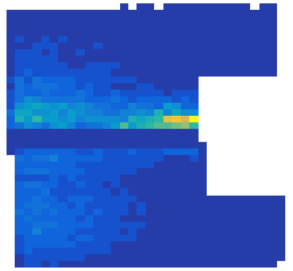


beam and
heavy fragments
hit last sections of
mod#17

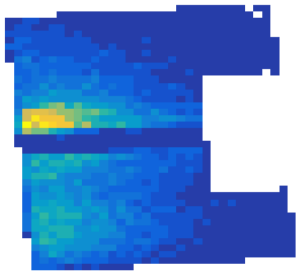


after run 8 FHCal was rotated
and is now aligned to beam axis

Check in simulation
Xe+CsI 3.8AGeV

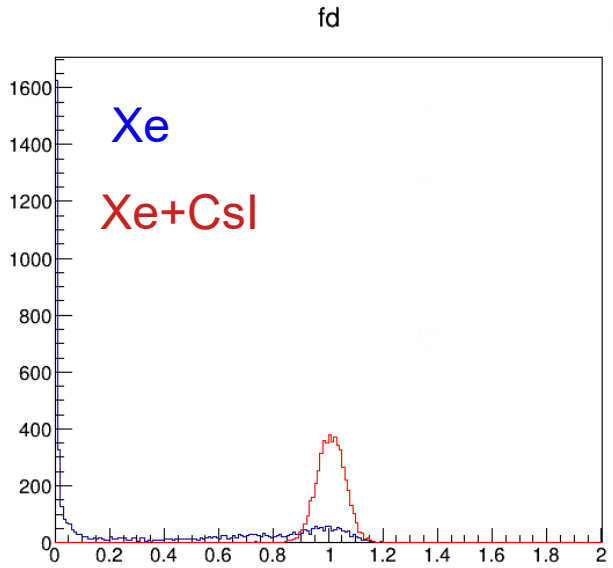


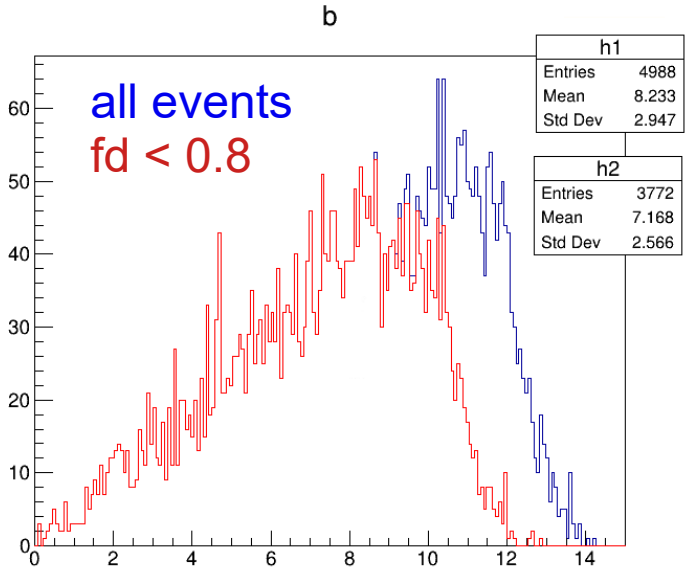
before rotation



after rotation

Forward Hadron Calorimeter (FHCal)

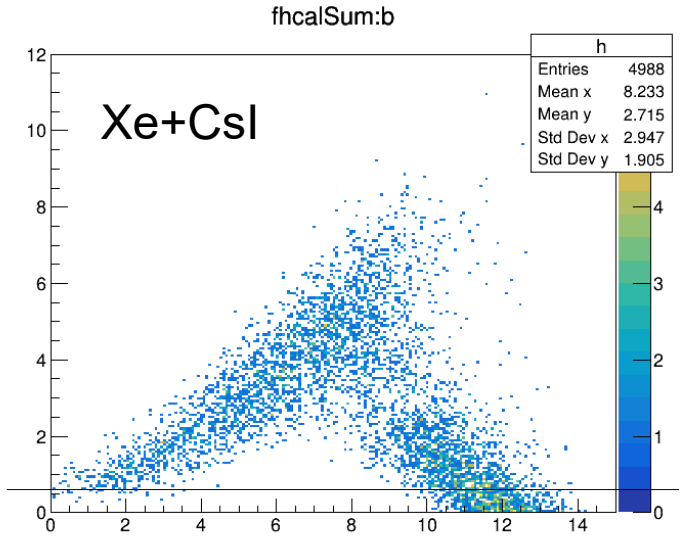


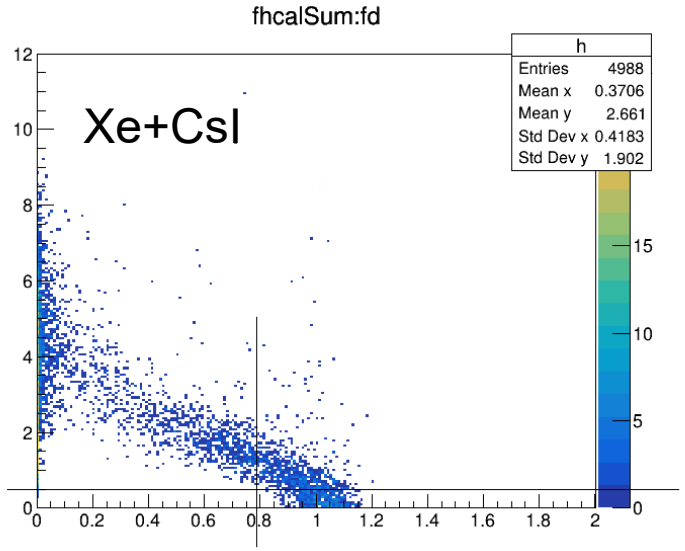


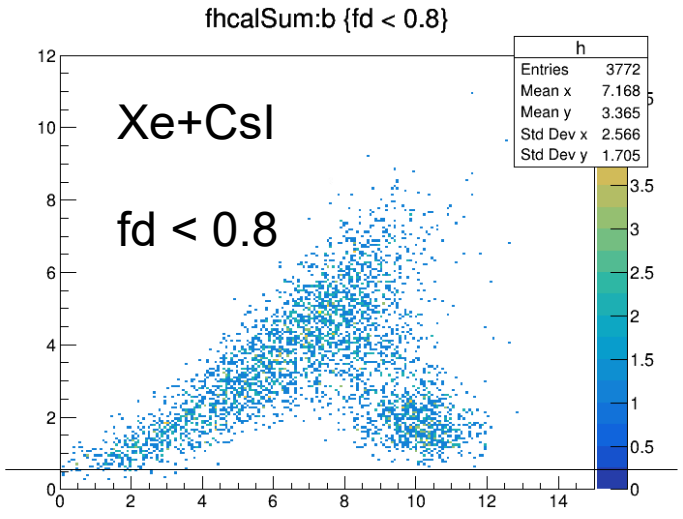
b

Using the FHCal in trigger

- FHCal has analog sum on each module and analog sum boards to combine all modules
- idea: use fast analog sum in trigger for better efficiency
- TODO: check 2.5AGeV reaction





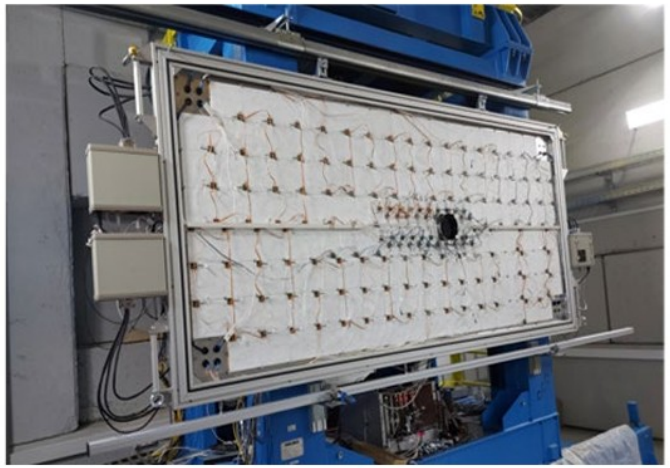


Scintillation Wall (ScWall)

ScWall view inside during production

SiPM connector PCB on a tile

ScWall mounted on FHCal frame



ScWall at BM@N now

- ScWall operation was good in run8

- new proposal upgrade is under development now (see next slide)

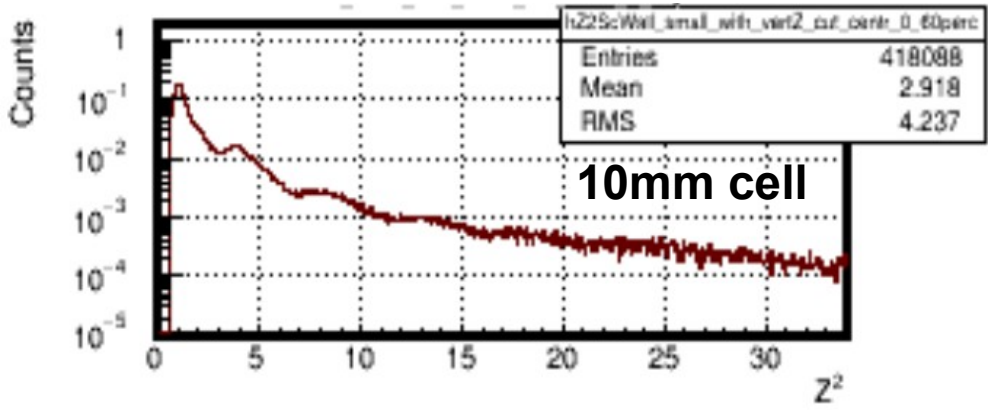
Scintillation Wall (ScWall)

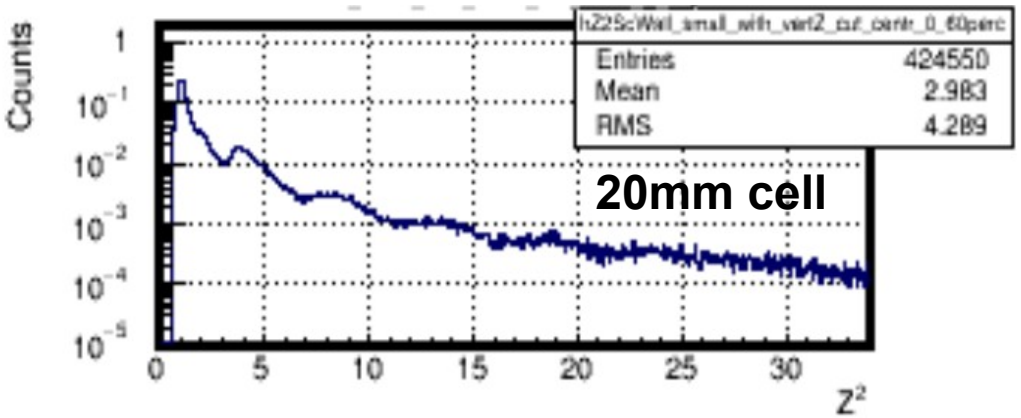
ScWall cell thickness upgrade

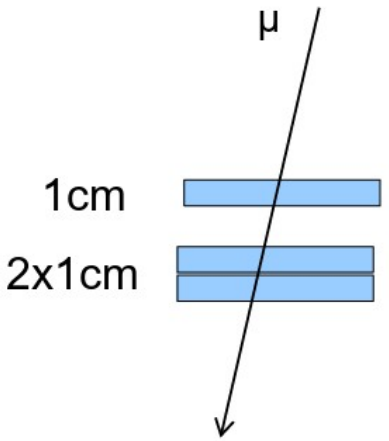
Simulation

ScWall Z^2 distributions **XeCs@3.26AGeV**

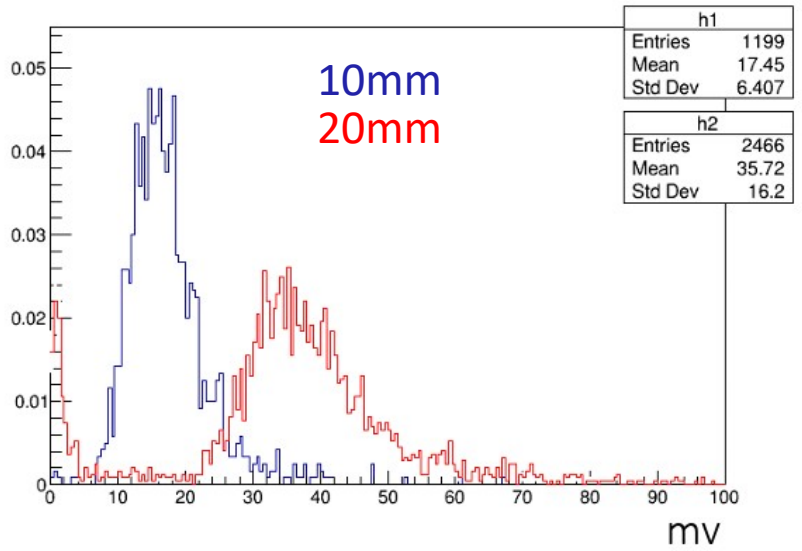
DCM-QGSM-SMM



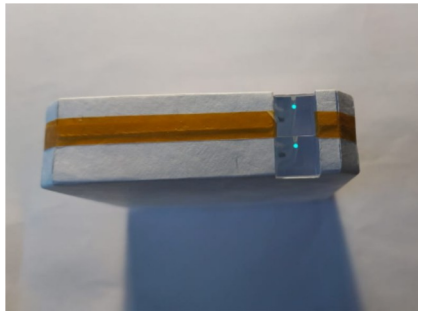


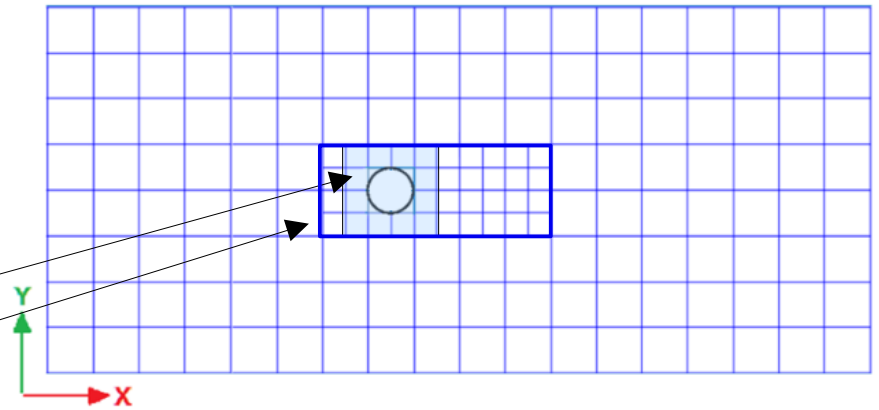


Cosmic tests



- new 20mm thickness cell (40 pc produced)

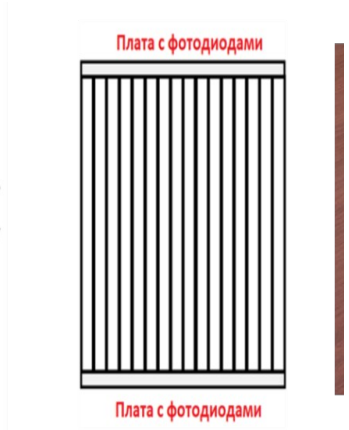


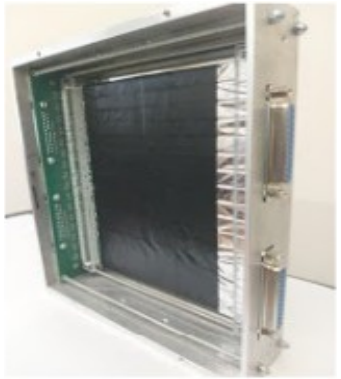


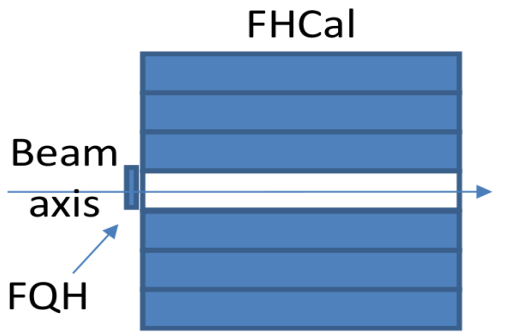
Plans:

- ScWall center (12 tiles) will be replaced in March 2025
- fully SiPM equipped tiles (40 pc) will be replaced later

Forward Quartz Hodoscope (FQH)







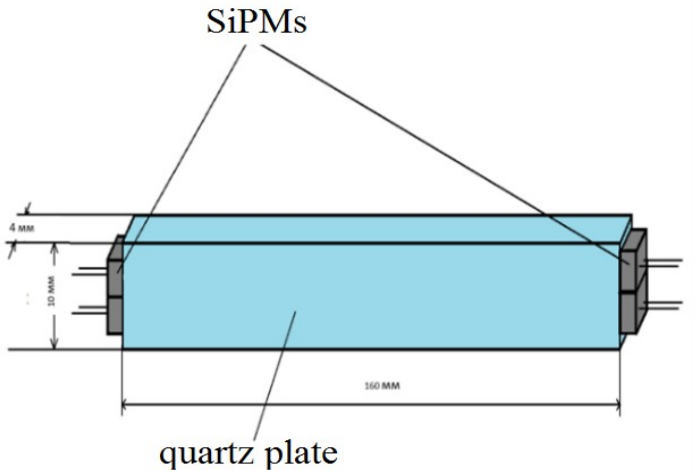
FQH - (Forward Quartz hodoscope):

16 quartz strips 160x10x4mm^3,

2+2 MPPCs per strip,

Hamamatsu MPPC S14160-3015PS, 3 x 3 мм^2,

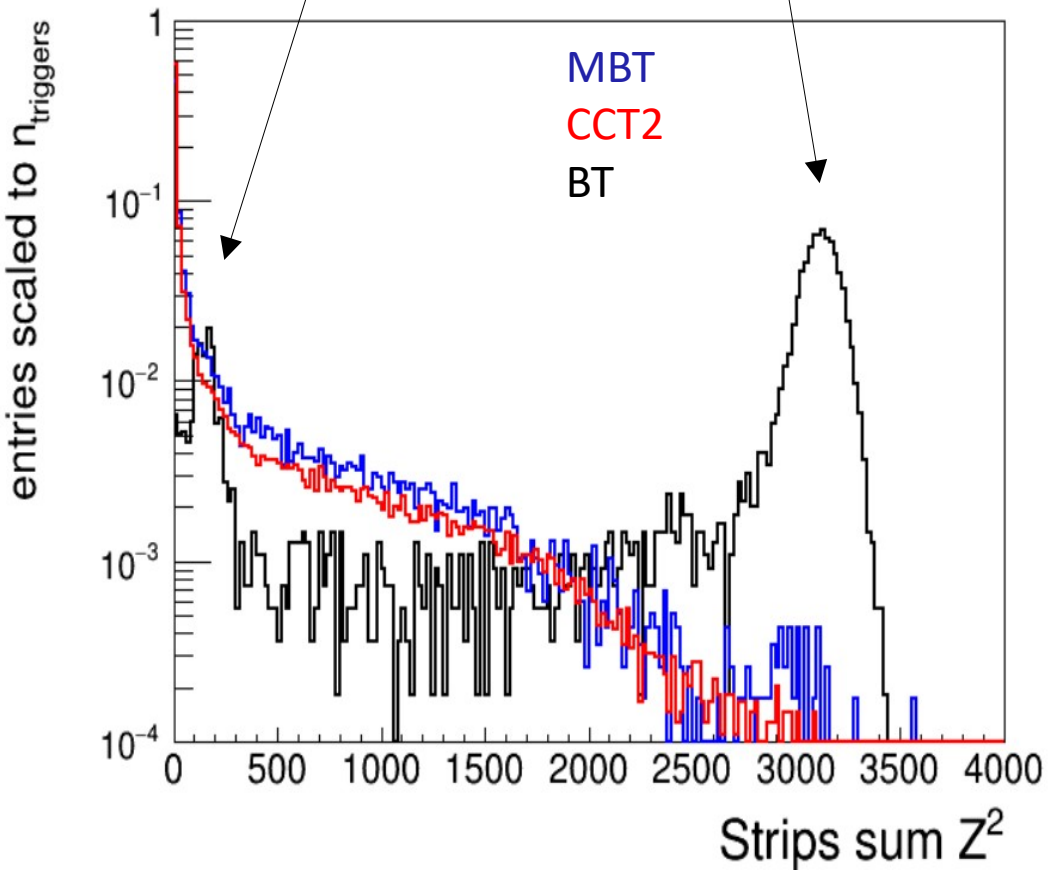
64 readout channels (low gain, high gain)



Forward Quartz Hodoscope (FQH)

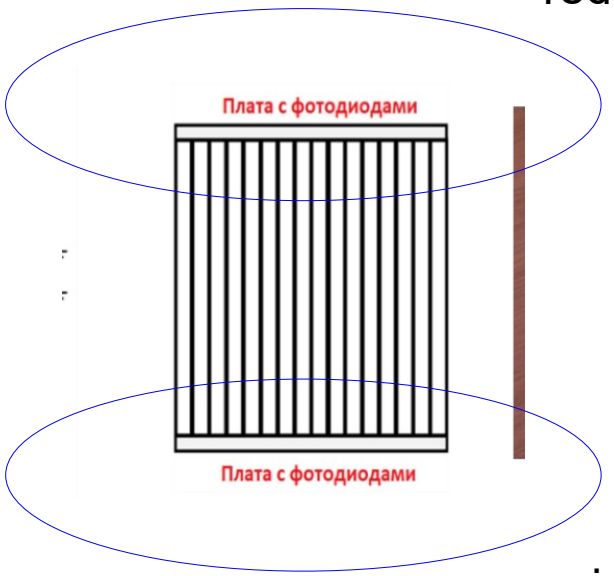
fragments with
Z < 8 are not visible

Xe peak (Z = 54)



Idea: increase dynamic range of registered Z

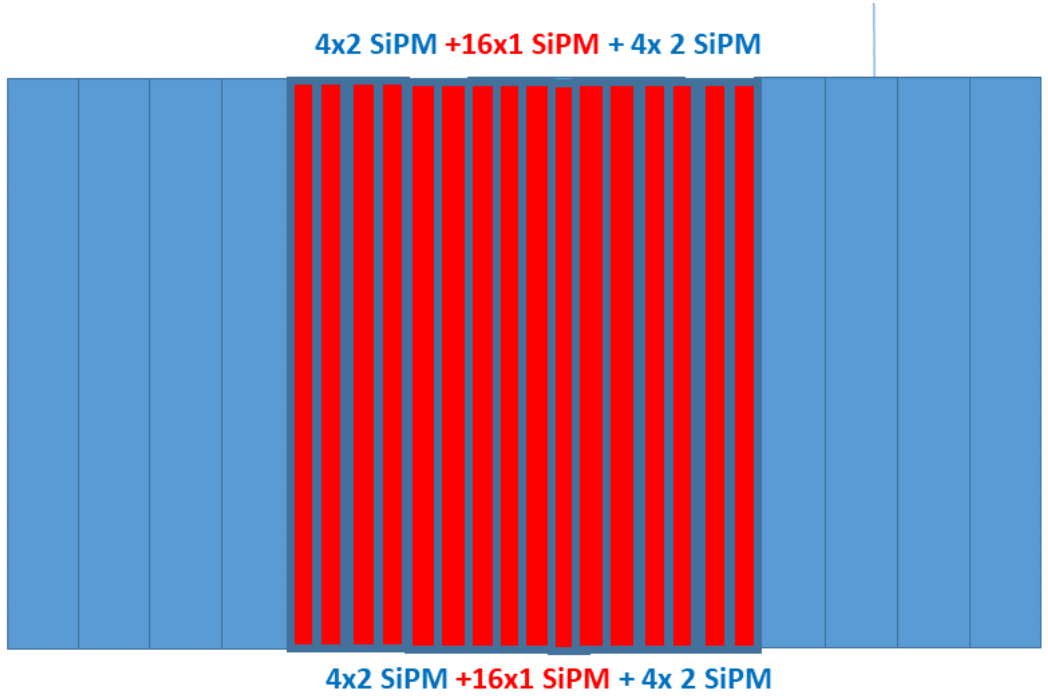
reduced HV for Xe peak



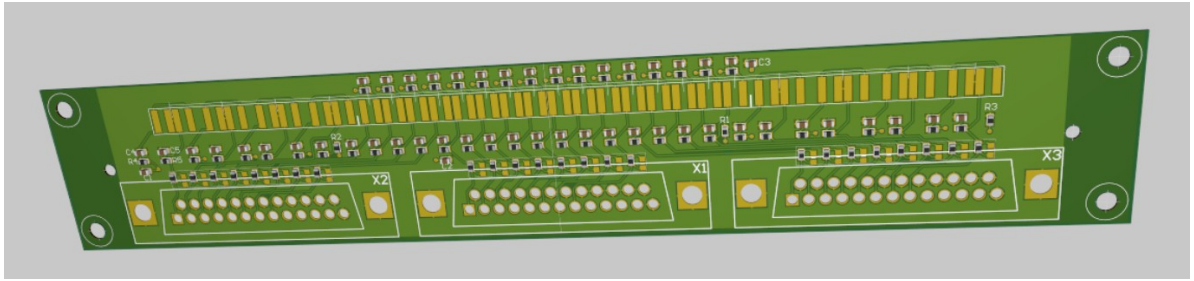
nominal HV for 1 MIP visible

Forward Quartz Hodoscope (FQH)

Future upgrade of FQH (is under development at INR RAS)



New PCB for SiPM is under production



- new PCB is designed, under production – will be ready very soon

- new SiPMs are delivered

- mechanical design is the same (we will use 2nd FQH box – which was previously used with scint. plates)

Summary:

FHCal:
- rotated to avoid beam
- analog sum signals will be used in trigger
- calibration with cosmics will be done before run period
- calibration on Xe beam is expected (time, FHCal movement..) !

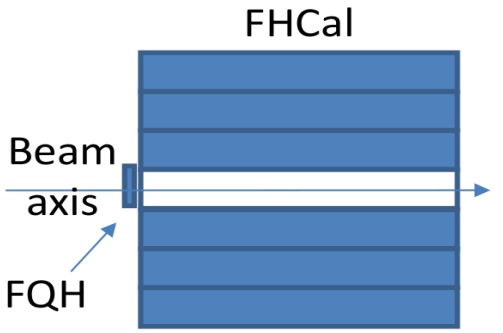
ScWall:
- new 20mm (2x10mm) thick tiles are ready (40 pc)
- 12 central tiles will be replaced now (March 2025)
- all 40 small tiles of ScWall will be replaced later (SiPMs are still under ordering and delivery)
- calibration with cosmics will be done before run period

FQH:
- reduced HV on one side and nominal HV on the other side (increase of dynamic range and make low Z fragments visible)
- new FQH with 4x4x160mm3 quartz plates is designed and under construction

DCS:
- slow control for all forward detector systems is ready, will be tested soon with central DCS

Backup slides

35	36	1	2	3	4	5	45	46
		6	7	8	9	10		
37	38	11	12	13	14	15	47	48
39	40	16	17		18	19	49	50
41	42	20	21	22	23	24	51	52
		25	26	27	28	29		
43	44	30	31	32	33	34	53	54



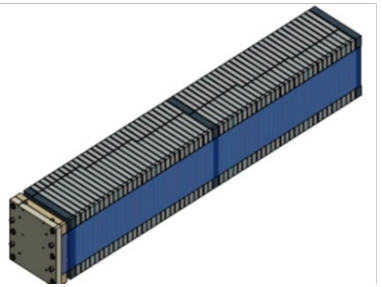
FHCal - (Forward Hadron Calorimeter):

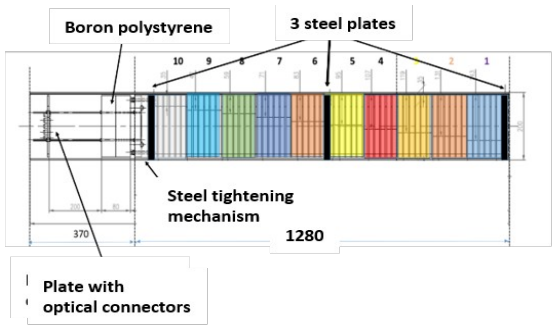
20 modules with 10 longitudinal sections (PSD CBM), transverse size 20x20cm^2, length – 5.6 λ_{int}.

34 modules with 7 longitudinal sections (FHCal MPD like) – 15x15cm^2 (– 4.0 λ_{int}).

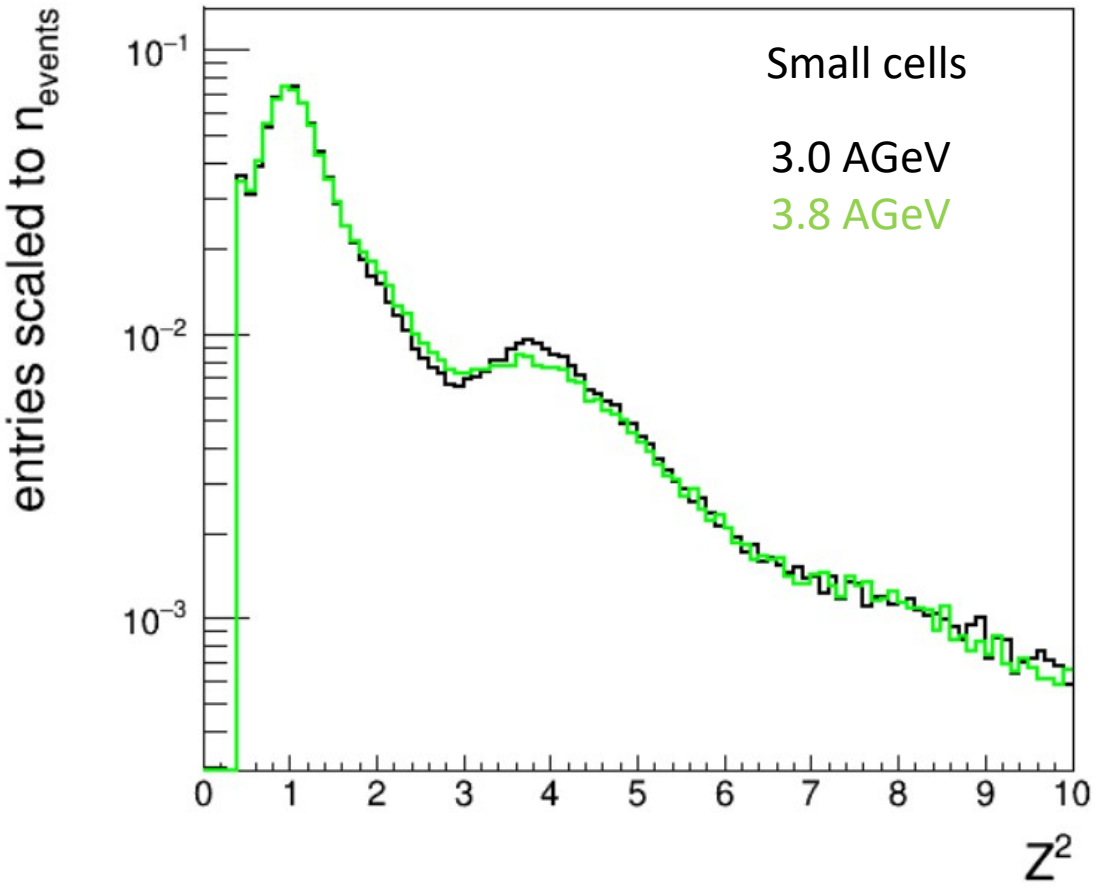
Hamamatsu MPPC S12572-010P, 3 x 3 мм^2.

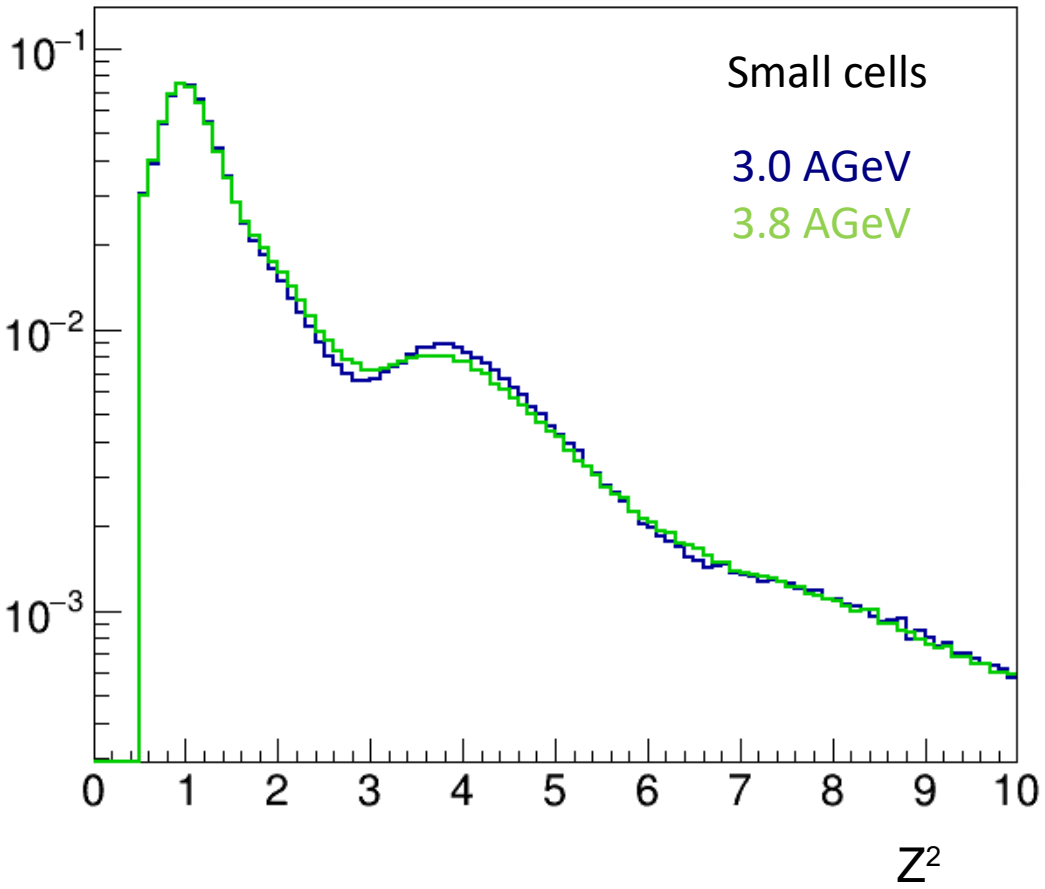
434 readout channels.





new bmnroot experimental data production train





- Comparison of the charge distributions over the scintillation wall for the two energies at 3.0 and 3.8 GeV for the CCT2 trigger.
- The two cell types (small and big) are presented separately.