Status and plans of software development for forward detectors

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on behalf of the INR RAS group

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Outline

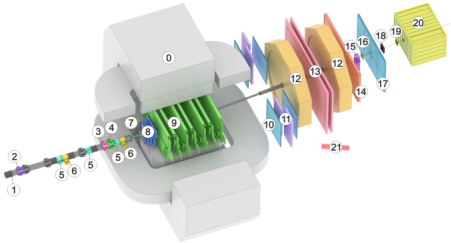
1. Outline
2. Forward Detectors of the BM@N
3. Software Status and Plans for Forward Detectors (Run 9)
4. Online Monitoring
5. Aligning Simulation & Experiment (Run 8)
   - Event Selection Criteria
   - FHCal: *Experiment vs DCM-QGSM-SMM vs URQMD-AMC*
6. Conclusions

Forward detectors of the BM@N setup

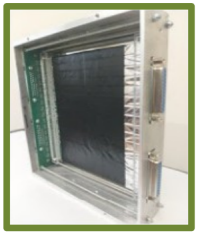
- **FHCal (F**orward **H**adron **Cal**orimeter)
- **FQH** (**F**orward **Q**uarz **H**odoscope)
- **ScWall** (**Sc**intillation **W**all)

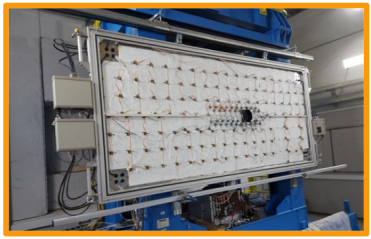
Tasks:

- centrality determination
- reaction plane orientation



- Magnet SP-41 (0)
- Vacuum Beam Pipe (1)
- BC1, VC, BC2 (2-4)
- SiBT, SiProf (5, 6)
- Triggers: BD + SiMD (7)
- FSD, GEM (8, 9)
- CSC 1x1 m^2 (10)
- TOF 400 (11)
- DCH (12)
- TOF 700 (13)
- ScWall (14)
- FD (15)
- Small GEM (16)
- CSC 2x1.5 m^2 (17)
- Beam Profilometer (18)
- FQH (19)
- FHCal (20)
- HGN (21)





Software Status and Plans for Forward Detectors (Run 9)

- **Subsystems:** FHCal, FQH, ScWall

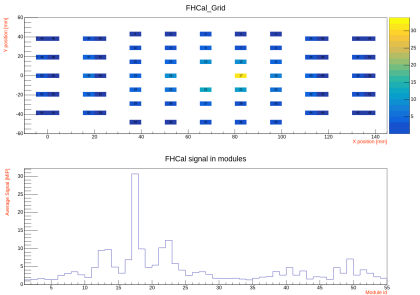
Current Software Status

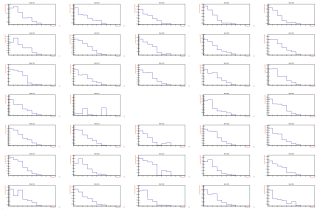
- Geometry: Ready
- Mapping: Ready
- Simulation & Digitization & Reconstruction: Ready
- Standalone Online Monitoring: Ready
- Calibration: To be revised according to Run 9 data

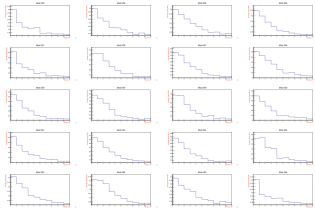
Plans for Run 9

- Develop Online Monitoring for *correlations*: FHCal : FQH, FHCal : FD, FHCal analog : FHCal reco
- Finalize FQH reconstruction chain (Nominal & Reduced HV readout)
- Complete calibration procedures post data-taking

Online Monitoring : FHCal

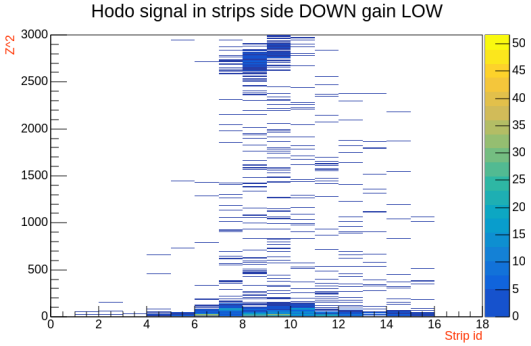


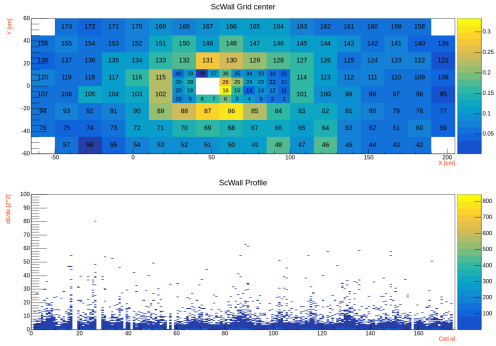




Monitoring FHCal module responses and individual sections in shower profiles

Online Monitoring : FQH and ScWall





Monitoring FQH signals in quarz strips and ScWall cells individually

Aligning Simulation & Experiment (Run 8)

Event Selection Criteria

Event selection criteria:

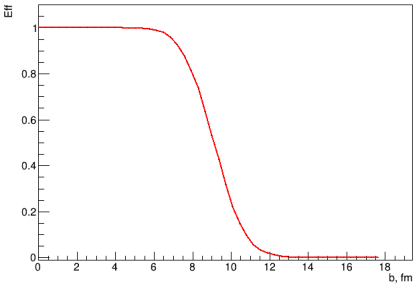
- Vertex
  - At least 2 tracks in primary vertex
  - $\chi^2/NDF < 10$
  - $|Z| < 0.1, (X^2 + Y^2) < 1$

Experiment

- Trigger selection: CCT2
- Single Xe ion in 3.6 μs: $14000 <$ BC1S integral < 40000

Simulation

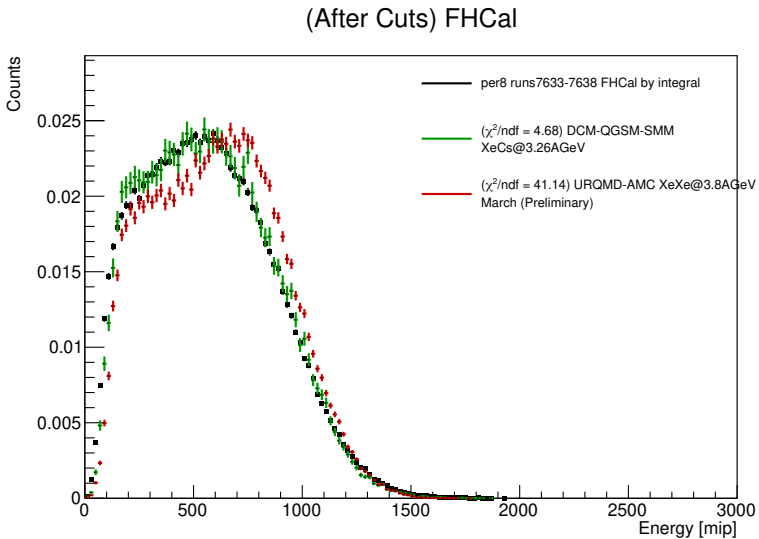
- CCT2 efficiency $\rightarrow$ *see talk by D.Idrisov*



FHCal selection criteria:

- FHCal noise threshold in section 0.5 MIP

Aligning Simulation & Experiment (Run 8)



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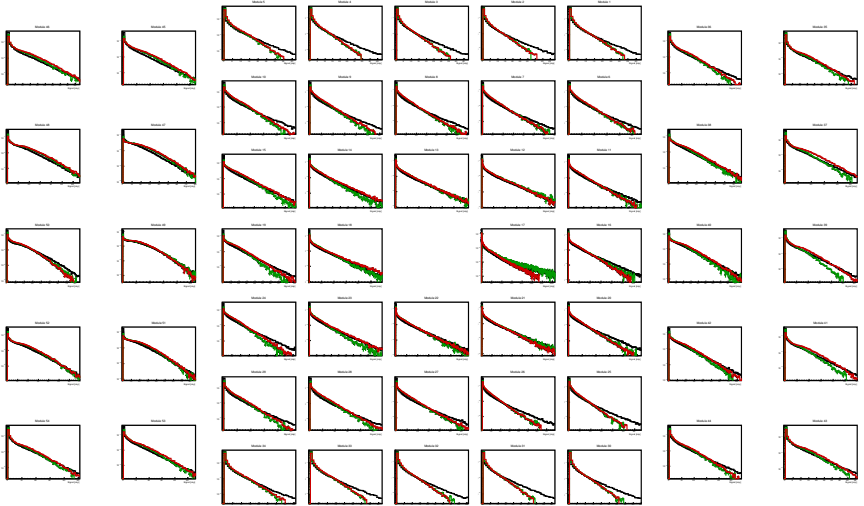

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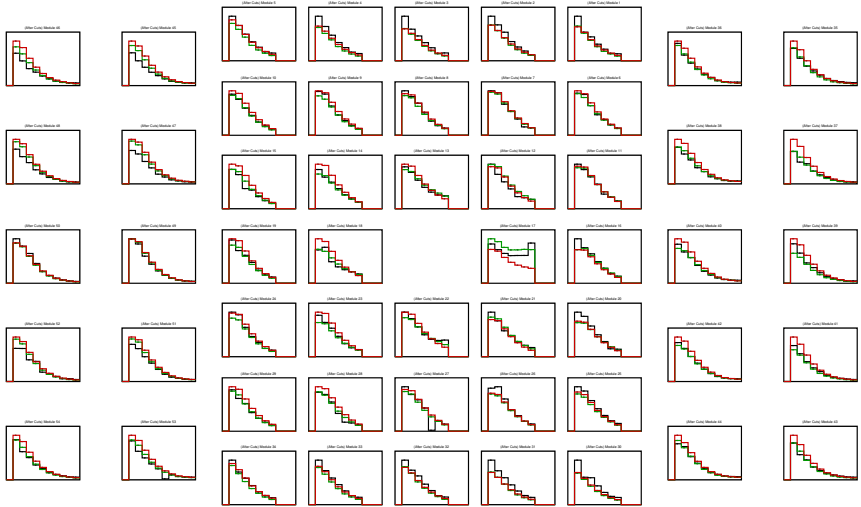


Conclusions

- **Forward-detector software is Run 9-ready.**
  Geometry, mapping, simulation–digitisation–reconstruction chain and standalone online monitoring are operational.
- **Calibration remains the final task.**
  New constants will be derived from Run 9 data and integrated into reconstruction.
- **Online monitoring is working and expanding is planned.**
  Existing dashboards cover FHCal, FQH and ScWall;
  upcoming correlation views (FHCal : FQH, FHCal : FD, FHCal analog : FHCal reco) will enhance diagnostics.
- **FHCal DCM-QGSM-SMM simulation aligns closely with Run 8 data.**
  Refactored code, MIP-based scaling and energy-integration method cut experiment–MC discrepancies.

Future Plans

- **Address residual hadron-shower profile tension.**
  Small differences remain; targeted studies planned.
- **FQH dual-gain reconstruction.**
  Nominal-HV and reduced-HV chains are planned for Run-9.

Thank You!

BACKUP

Event Selection Criteria

Event selection criteria:

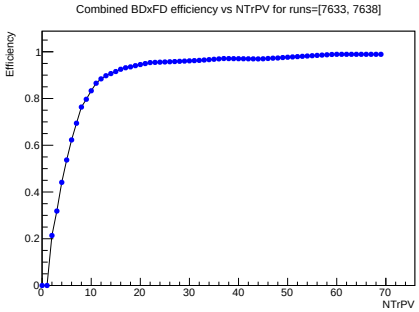
- Vertex
  - At least 2 tracks in primary vertex
  - $\chi^2/NDF < 10$
  - $|Z| < 0.1, (X^2 + Y^2) < 1$

Experiment

- Trigger selection: CCT2
- Single Xe ion in 3.6 μs: $14000 <$ BC1S integral < 40000

Simulation

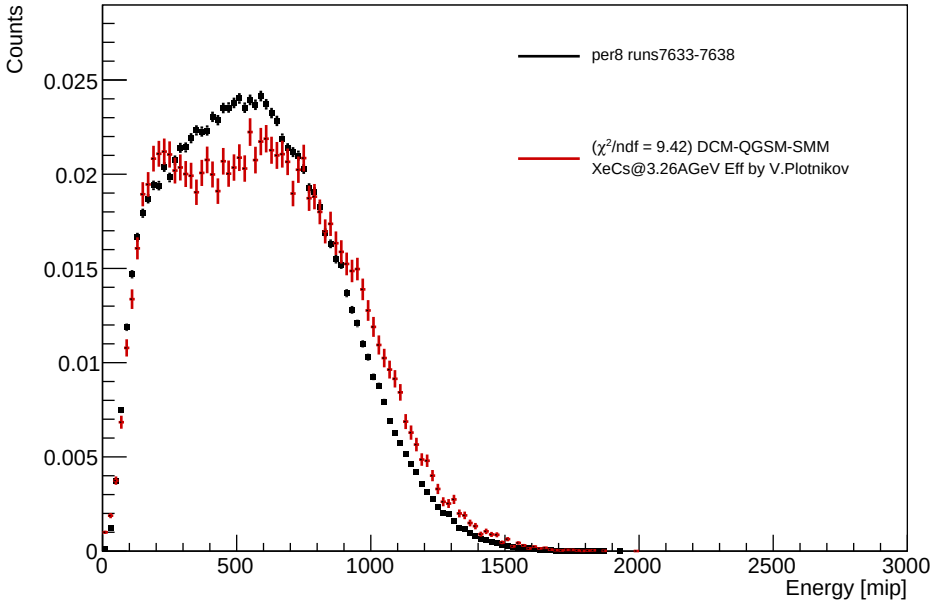
- CCT2 efficiency $\rightarrow$ V.Plotnikov



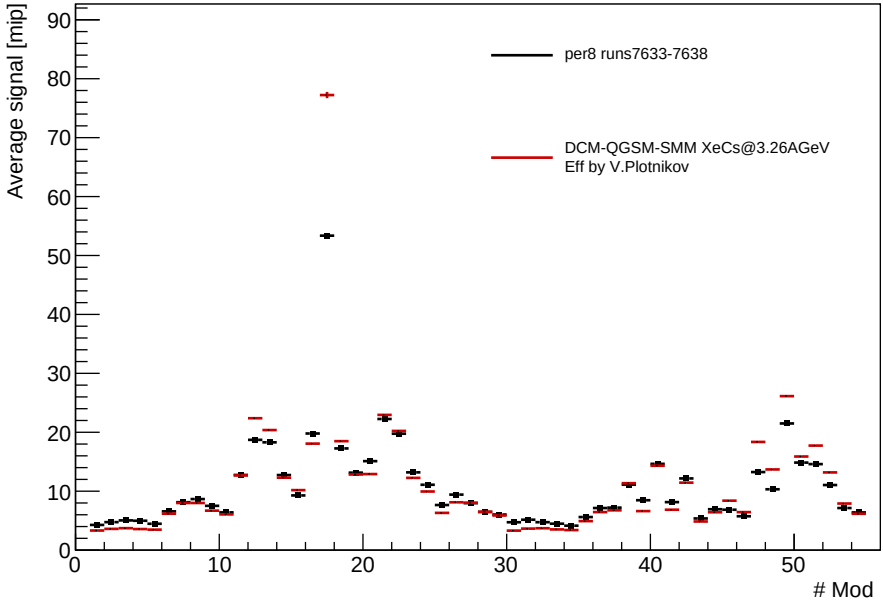
FHCal selection criteria:

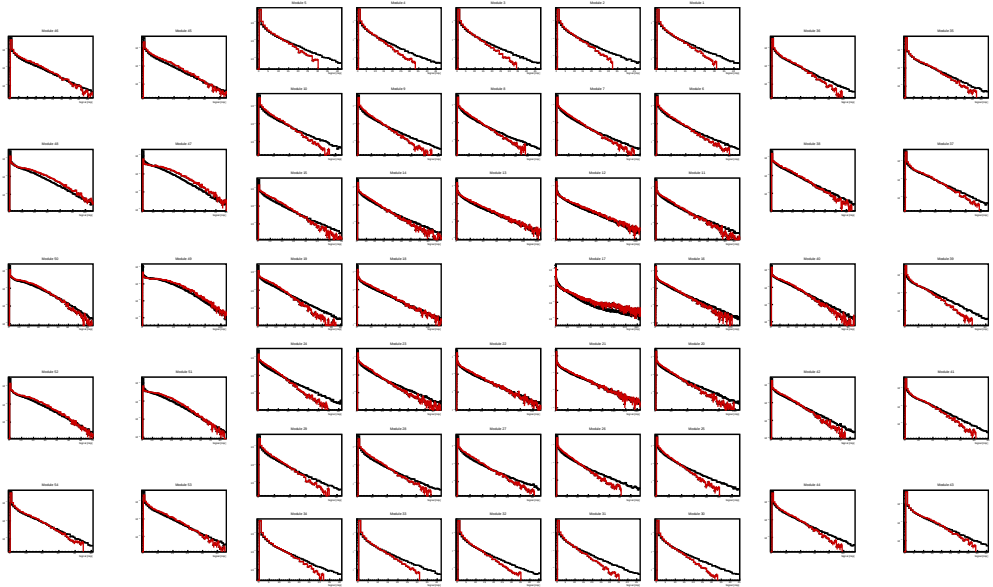
- FHCal noise threshold in section 0.5 MIP

(After Cuts) FHCal



(After Cuts) FHCalFence

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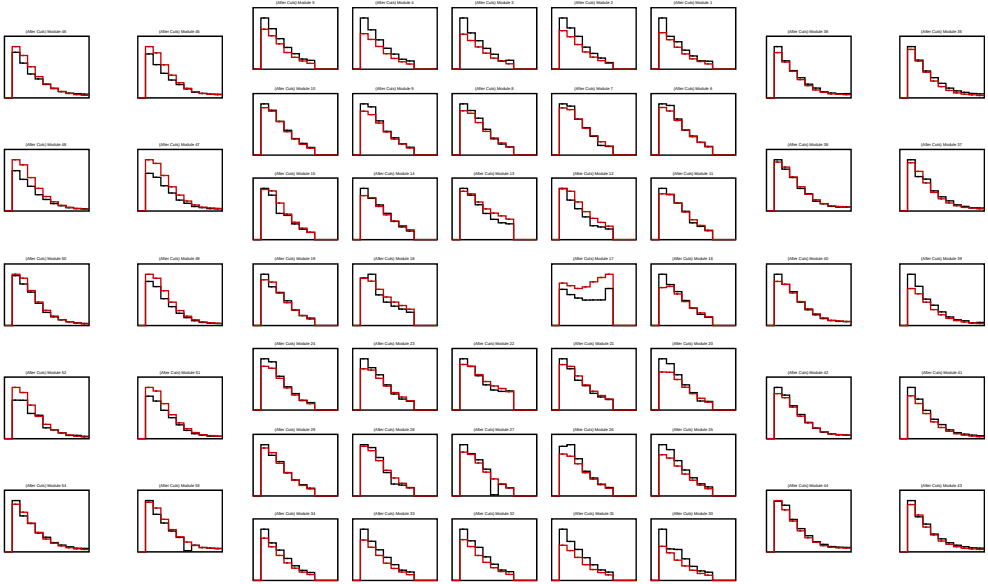
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