ATHENA CALORIMETER WG REPORT

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ATHENA CALO WG

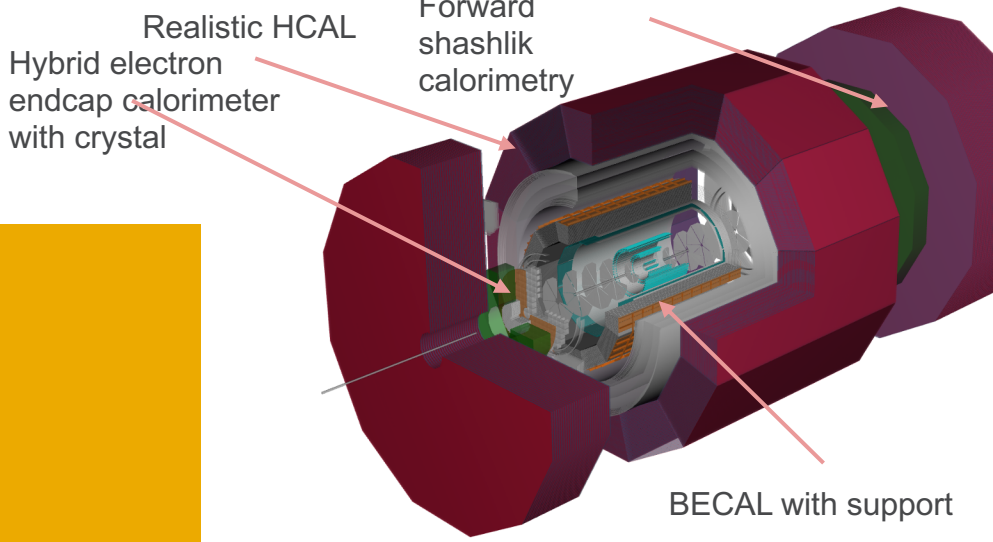
- DD4HEP implementation—next slide
- Readout survey DON'T TRY TO READ THIS-JUST AN ILLUSTRATION

29	Calorimetry																		
30		n-EMCal PWO	Cal	SiPM	1628				10/50ns	50 MeV	2.5 MeV	20 GeV	5-100k pixels	5 nF for 16 SiMPs (3x3)	10 kHz		Waveform Sampling		~40ns	14 bit	~80 MSPS	
31		n-EMCal SC Glass	Cal	SiPM	1168				10/80ns	50 MeV	2.5 MeV	20 GeV	5-100k pixels	5 nF for 16 SiMPs (3x3)	10 kHz		Waveform Sampling		~40 ns	14 bit	~80 MSPS	
32		n-Hcal (KLM type) (10 layer	Cal	SiPM	30k				3-10ns	500 MeV	300 MeV	20 GeV	10-200 pixels	60 pF (1.3 x 1.3 mm)	0.5 kHz		Waveform Sampling		~40ns	8 bit	~80 MSPS	
33		p-EMCal	Cal	SiPM	31k				3ns	100 MeV	5 MeV	100 GeV	5-60k pixels	5.2 nF 4 SiPMs (6 x6 mm	50 kHz		Waveform Sampling		~40ns	14 bit	~80 MSPS	
34		p-Hcal	Cal	SiPM	3/6/9k				10ns	500 MeV	300 MeV	100 GeV	50-20k pixels	2nF 6 SiPMs	50kHz		Waveform Sampling		~40 ns	14 bit	~80 MSPS	
35		c-Hcal (KLM Type) (5 layers	Cal	SiPM	24k				10 ns	500 MeV	300 MeV	10 GeV	10-200 pixels	60 pF (1.3 x 1.3 mm)	50 kHz		Waveform Sampling		~40ns	8 bit	~80MSPS	
36		c-Ecal (ScFI part)	Cal	SiPM	4k				3ns	50 MeV	2.5 MeV	20 GeV	90-40k pixels	5.2 nF 4 SiMPs	50kHz		Waveform Sampling		~40ns	14 bit	~80MSPS	
37		c-Ecal (Si layers)	Cal	Si Sensor	480M					50 MeV	2.5 MeV	20 GeV										

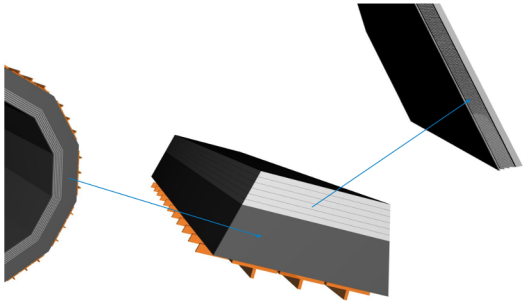
- On going discussions:
  - Barrel tracking ECal hybrid
    - Default option
    - Optimize π^0 identification
    - LGAD timing layer to help PIC
  - Barrel HCal & effect of materials from the coils
  - eECal SciGlass/PWO hybrid vs only PWO (see backup)

SLIDE MODIFIED FROM SYLVESTER JOOSTEN

CALORIMETRY WG



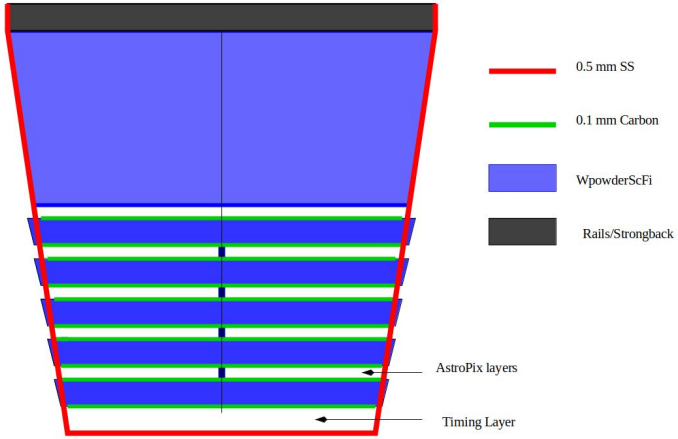
- Ready to study impact of magnet on HCAL:
  - ✅ Realistic HCAL geometry
  - ✅ Solenoid material
  - ❌ Helmholtz option to be added soon
  - ✅ HCAL clustering and energy calibration
- ECAL system well-developed:
  - Barrel ECAL:
    - ✅ Barrel SiW imaging calorimeter
    - ✅ Barrel hybrid SiW + WSciFi calorimeter
  - Electron-endcap ECAL:
    - ✅ Crystal calorimeter
    - ✅ Glass calorimeter
    - 🚧 Need decision from WG on “baseline”
  - Ion-endcap ECAL
    - 🚧 WSciFi calorimeter
  - ✅ Reconstruction (2D, 2+1D and 3D clustering)
- Geometry:
  - 🚧 Finalize geometry for “baseline” setup with longer barrel/smaller negative endcap ECAL

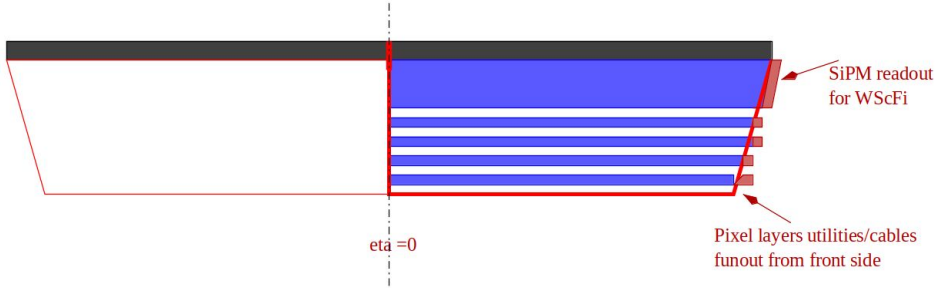


Calorimetry delegate: Vladimir Berndnikov
S&C WG contacts: Wouter Deconinck & Sylvester Joosten

BACKUP

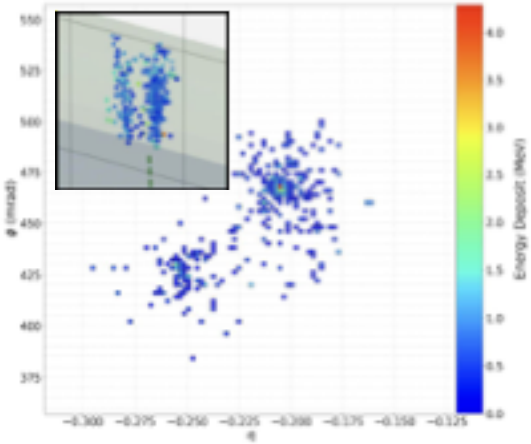
BARREL EECAL HYBRID FROM MARIA ŻUREK





Possible LGAD timing first layer to help PID

π^0/e separation with 3-D pixel



EECAL SLIDE FROM VLADIMIR BERDINKOV

Geometry

- z = -195cm
  R_in = 11 cm (eta ~ -3.5) = R_min_PWO
- R_max_PWO = 53cm (eta ~2) = R_min_Glass
- R_max_total = 100 cm (eta ~ 1.4) = R_max_Glass

Modules PWO ≈ 2200 (2 x 2 x 20 cm3)
Modules Glass ≈ 1400 (4 x 4 x 40 cm3)
All PWO for this volume: 7600 PWO modules
Weight ≈ 5000 – 6000 kg

Cost estimates:

- Hybrid ≈ 6.5M$
- All PWO ≈ 14M$
- Read-out ≈ 1.5M$

Questions:

- Cost vs Resolution
- Monolithic vs Hybrid