

ATLAS-CMS Joint ZDC

Upgrade test beam in 2021

Allocated for Week 36

Riccardo Longo

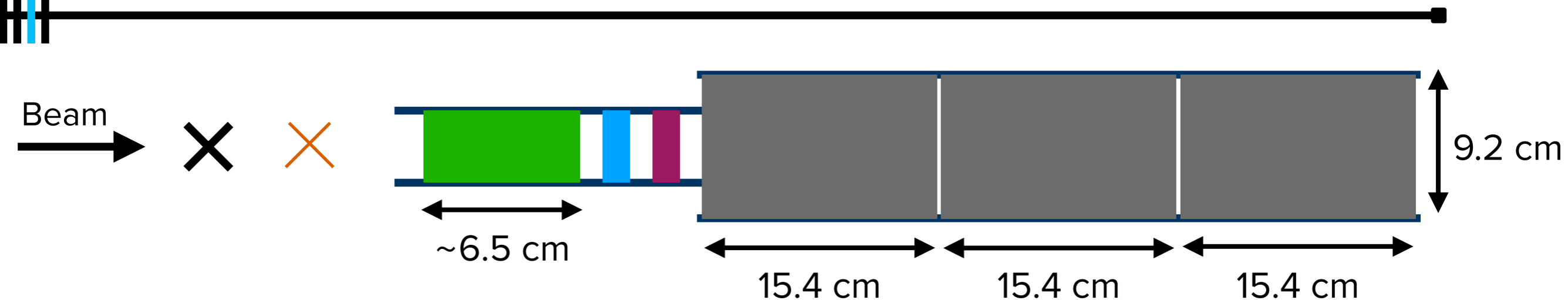
On behalf of the ZDC upgrade group

H2/H4 users meeting

20 May 2020

		Jun					Jul					Aug					Sep					Oct					Nov	
Week		24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45					
Machine																									TS1 Coldex			
North Area	T2-H2 option 2	CMS Outer Tracker 7	SPS & TT20 Setup 7	NA Setup 7	NA61 SHINE 16					FASER cal 7	ATLAS FCAL PULSE 7	STORM 7	LEVER 7	CMS HGCAL 7	NA61 SHINE 7	ATLAS ZDC 7	NA61 SHINE 7	NA65 14	CMS HGCAL 7	NA61 SHINE 33								
	T2-H4 option	SPS & TT20 Setup 7		NA Setup 7	GIF RD51 9	HERD 7	LHCb CAL 18		NA64e 28					GIF 7	LHCf 14	CMS ECAL 14	LHCb CAL 7	GIF RD51 14	HERD 7	GIF 5								
	T2-H4 req.					CMS ECAL 9																						

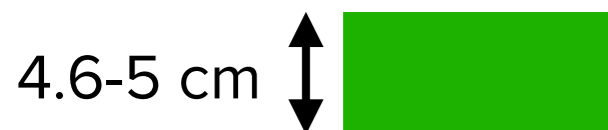
TEST BEAM SETUP



Trigger cross, 2 channels, 3x3 mm²



Second scintillator cross, 2 channels, 1x1 mm²



Run4 ZDC EM module prototype, 8 channels



Pan Flute RPD + LED calibration system (17 channels in total)



Tile RPD (9 channels)



ATLAS ZDC HAD modules (refurbished)
3 channels

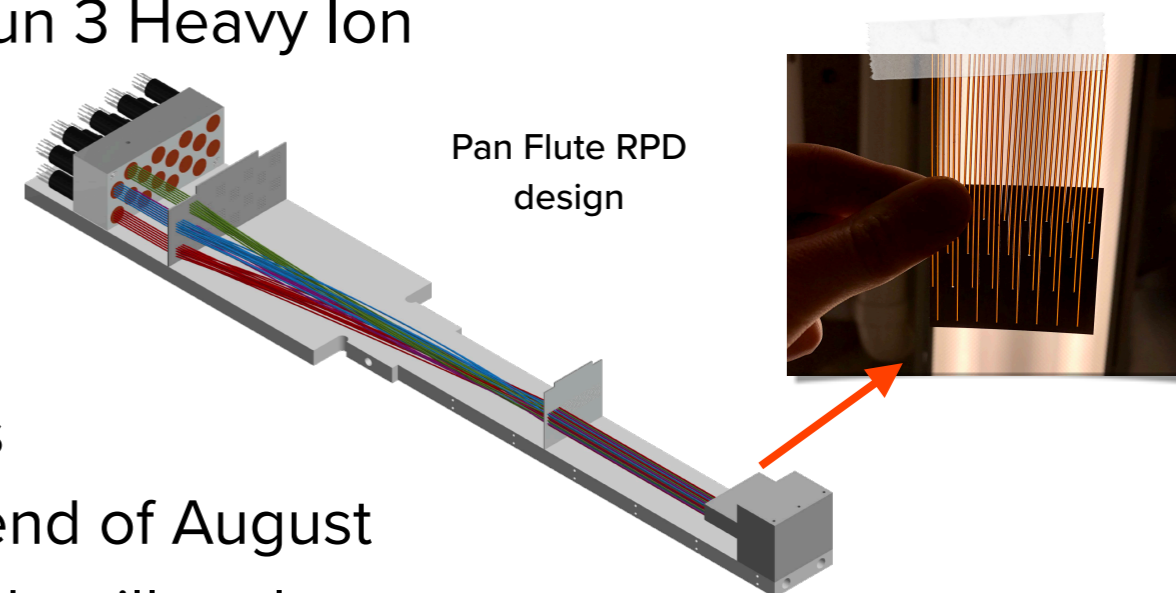
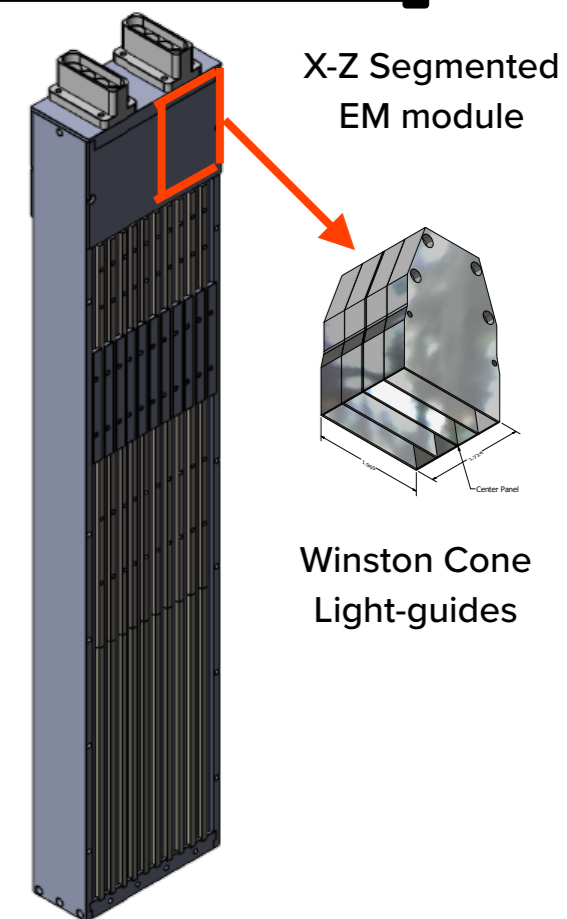
DAQ (in control room)

2x DRS4 CAEN
V1742 VME cards,
RCDAQ software



PHYSICS GOALS

- ▶ Provide key input towards the Run 4 joint ATLAS-CMS ZDC design
 - ➔ Test a new x-z segmented Electromagnetic module
 - ◆ Test different light-guides (trapezoidal vs Winston cone)
 - ◆ Evaluate detector response with both e- and p beams
 - ➔ Test existing CMS EM module as term of comparison
- ➔ Test a Pan-Flute Reaction Plane Detector with LED calibration system
 - ◆ Collect data to test novel Machine Learning reconstruction algorithms
 - ◆ Test with beam before deployment during Run 3 Heavy Ion data taking (ATLAS only)
- ➔ Test a Tile Reaction Plane Detector
- ➔ Test refurbished ATLAS ZDC Hadronic modules
 - ◆ Refurbishing campaign to take place at the end of August
 - ◆ New radiation hard H₂ doped fused silica rods will replace old GE214 quartz rods

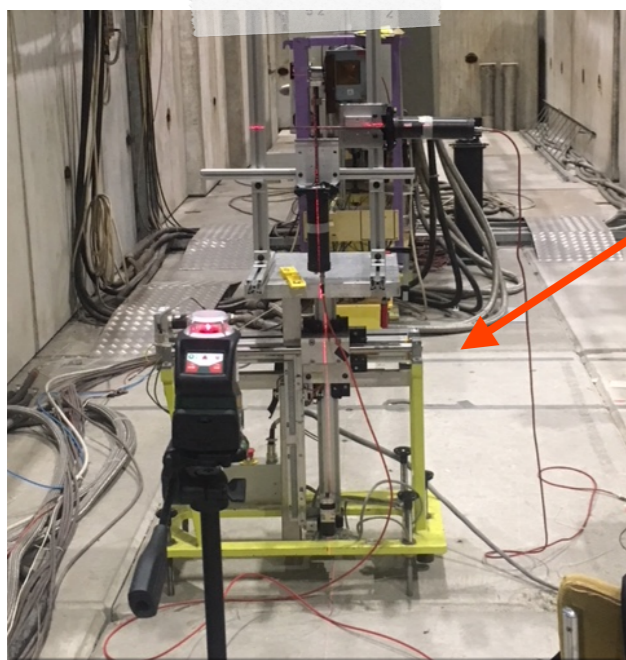
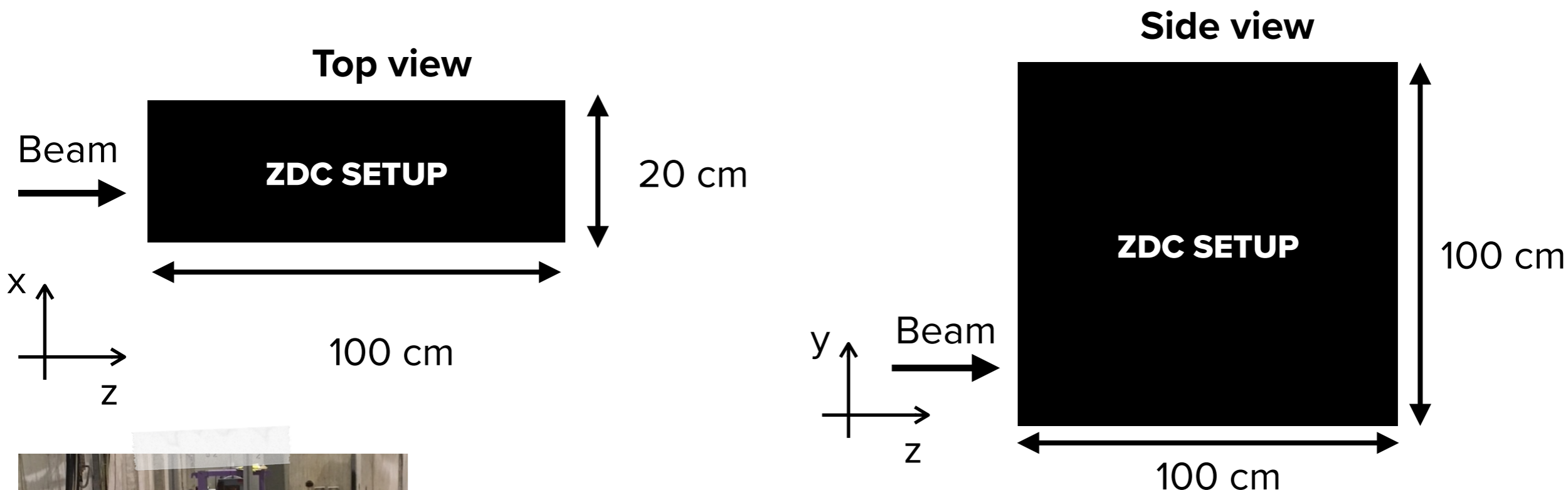


BEAM REQUIREMENTS

- ▶ We plan to take data with both proton ($\sim 1/3$) and e- beams ($\sim 2/3$)
 - ➔ e- @ 200 GeV (or higher - best compromise between high energy and purity $> 90\%$ to be determined)
 - ➔ p @ 380 GeV
- ▶ In both the cases, having a well focused beam (e.g. $3\sigma \sim 1$ cm) would help in optimizing the data taking rate
 - ➔ 3×3 mm² cross trigger + thinner 1×1 mm² cross to constrain beam position in a subset of events (for ML studies)
 - ◆ Beam position scan on the EM module with both beams
 - ◆ Sufficient statistics for each position to perform shower centroid (\Leftrightarrow beam position) determination with the RPDs
 - ◆ Dedicated simulation ongoing to determine optimal beam sharing between e- and p

INFRASTRUCTURE NEEDS

- ▶ One remotely controllable large table (DESY or equivalent) that can host our setup
 - ➔ Conservative dimensions of the setup (z = beam direction)



Trigger Setup in 2018 test beam on XSCA table

- ▶ One remotely controllable small table to position the trigger cross and the additional scintillating paddles
- ▶ Enough connections to the counting room via patch panel
- ▶ A Lab in EHN1 (close to H2) to assemble the equipment before craning in the area (available at least 7 days before our beam time)
- ▶ Geometry survey once the setup will be in place
- ▶ Migration of part to the equipment to H4 after the end of test beam for joint LHCf-ZDC test beam (see H.Menjo's presentation)

