

CEPC Reference TDR Discussion

Jianchun Wang

CEPC Ref-TDR Tuesday Meeting

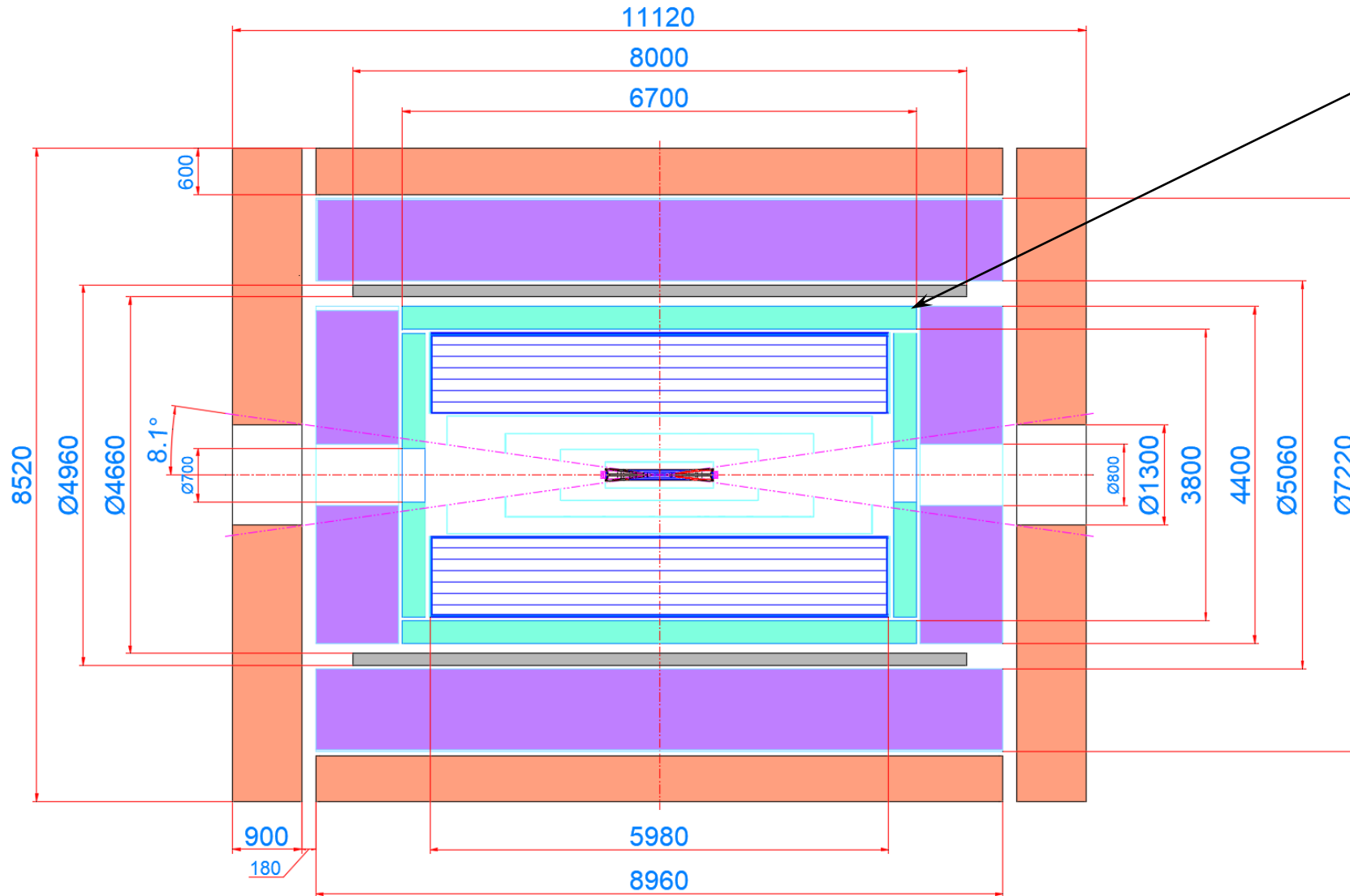
Feb 6, 2024



Manager: Jianchun Wang
 Special Adviser: Joao Guimaraes da Costa
 Co-deputy managers: Miao He, Mingshui Chen

Subsystem	L2 Leader	Topics	L3 Leader
Organizing	Miao He	Minutes of the CEPC Tuesday meetings	Zhaoru Zhang
		TDR document	Yong Liu
			Gang Li
Physics Studies	Manqi Ruan	Higgs	Yaquan Fang
		Flavor	Shanzhen Chen
		EW	Zhijun Liang
		QCD	Zhao Li
		BSM	Xuai Zhuang
Software & Simulation	Weidong Li	Simulation	Gang Li
		Software / general	Weidong Li
		Software / applications	Shengsen Sun
		Subsystem software	see subsystems
Electronics & TDAQ	Wei Wei	Common components	Wei Wei
		Subsystem electronics	see subsystems
		Trigger and DAQ	Fei Li
Mechanical & Integration	Quan Ji	General mechanical	Quan Ji
		Integration	Quan Ji
		Subsystem mechanical	see subsystems
Magnet	Feipeng Ning	HTS magnet	Feipeng Ning
		LTS magnet	Ling Zhao
		Mechanical	Junsong Zhang
MDI & LumiCal	Haoyu Shi	MDI	Haoyu Shi
		Accelerator liaison	Sha Bai
		Radiation background	Haoyu Shi
		LumiCal	Suen Hou (IPAS)
		Electronics	Lei Zhang (NJU)
		Mechanical	Quan Ji

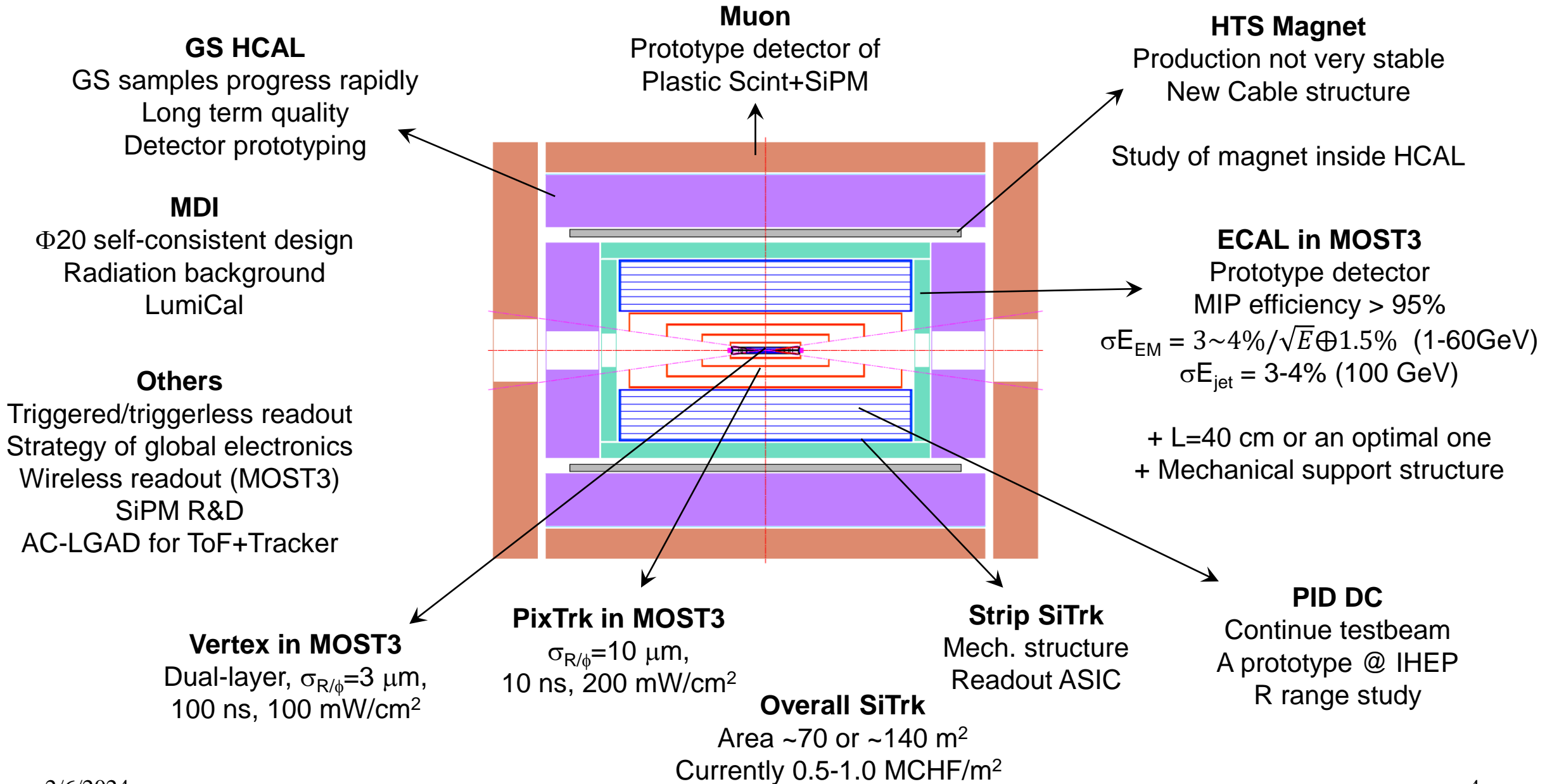
Subsystem	L2 Leader	Topics	L3 Leader
Vertex	Zhijun Liang	CMOS Pixel Vertex	Zhijun Liang
		SOI	Yunpeng Lu
		Stitching technology	Mingyi Dong
		Electronics	Jun Hu
		Mechanical	Jinyu Fu
		Software	Chengdong Fu
Tracker	Meng Wang	SPD Tracker	Yiming Li
		SSD Outer Tracker	Xin Shi
		LGAD ToF (+OTrk)	Yunyun Fan
		Pixelated TPC	Huirong Qi
		PID Drift Chamber	Mingyi Dong
		Electronics (TPC)	Zhi Deng (THU)
		Electronics (Silicon)	Xiongbo Yan
		Electronics (DC)	Yubin Zhao
		Mechanical (SiDet)	Jinyu Fu
		Mechanical (GasDet)	Quan Ji
		Software (PID)	Guang Zhao
Software (Tracking)	Yao Zhang		
Calorimeter	Jianbei Liu	4D Crystal bar ECAL	Yong Liu
		Stereo crystal ECAL	Huaqiao Zhang
		PS+SiPM+CuW ECAL	Yunlong Zhang (USTC)
		GS/PS+SiPM+Fe HCAL	Yong Liu
		RPC HCAL	Jun Guo (SJTU)
		Electronics	Jinfan Chang
		Mechanical	Shaojing Hou
		Software	Shengsen Sun
Muon	Xiaolong Wang	PS bar muon	Xiaolong Wang (FDU)
		RPC muon	Jun Guo (SJTU)
		Electronics	Qibin Zhen (USST)
		Mechanical	Quan Ji
		Software	Xiaolong Wang (FDU)



Ecal $\cos\theta \sim 0.836$

Thanks to Quan Ji and many others for the reference sizes.

Please check if your system has any problem within these geometric boundaries.





System	Technologies		
Beam pipe	Φ20 mm		
Vertex	CMOS Pixel	SOI	CMOS+Stitching
Tracker & PID	SPD ITrk		
	Pixelated TPC	PID Drift Chamber	
	SSD OTrk	SPD OTrk	AC-LGAD OTrk
	LGAD ToF		
ECAL	4D Crystal Bar	PS+SiPM+W	Stereo Crystal Bar
Magnet	HTS (location?)	LTS	
HCAL	GS+SiPM+Fe	PS+SiPM+Fe	RPC+Fe
Muon	PS Bar+SiPM	RPC	
LumiCal	SiTrk+Crystal		
TDAQ	Conventional	Software Trigger	
BE electr.	Common	Independent	



- 1) Does a pixelated TPC work properly at the Z peak luminosity?
 - Yes: Pixelated TPC as the main tracker & PID, plus silicon inner and outer trackers
 - No: Full silicon tracker as the main tracker, Drift chamber optimized for PID and partial tracker

- 2) For an area $\sim O(100) \text{ m}^2$, is a SSD tracker better than a SPD tracker (quality/cost)?
 - Yes: SSD outer tracker, SPD inner tracker
 - No: SPD outer tracker, same as the inner tracker

- 3) Do we need π/K separation at $\sim 1 \text{ GeV}$ (maybe K/p or π/p)?
 - Yes: Add a LGAD TOF detector (or other technology) outside the outer tracker
 - No: No change to (2)

- 4) If the answers to (2) & (3) are “Yes”, is AC-LGAD detector feasible and more efficient?
 - Yes: An AC-LGAD detector for both outer tracker and ToF
 - No: No change to (3)

System	Technologies		
Tracker & PID	SPD ITrk		
	Pixelated TPC	PID DC	
	SSD OTrk	SPD OTrk	AC-LGAD
	LGAD ToF		OTrk



- ❖ Milestones of Ref-TDR:
 - Start preparation in Jan 2024
 - A draft version by Dec 2024
 - Official release by Jun 30, 2025

- ❖ Expectation from the meeting today:
 - Important issues and options to be decided for each system.
 - Key specifications that can be used to compare different solutions
 - Bench mark physics topics for combined quality comparisons

- ❖ Continue to conclude alternative solutions, step by step:
 - Next meeting on Feb 20, Xiaolong Wang (FDU) & Jun Guo (SJTU) will present the two options of the Muon detector: PS bar+SiPM, and RPC. I hope that they are ready to propose the baseline technology
 - Please let us know which part you can already conclude and converge on a proposal