

INTRODUCTION

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On behalf of the coordination team

10 June 2020

SUMMARY OF THE MDI WORKSHOP

<https://indico.ihep.ac.cn/event/11801/>

CEPC MDI Workshop

from Thursday, 28 May 2020 at **08:00** to Friday, 29 May 2020 at **18:00** (Asia/Shanghai)
at **IHEP (C305)**

- 1.5-day workshop with over 50 participants
- Invited talks combined with [working group talks](#)
- J. Gao's [summary talk](#)

INVITED TALKS

Summary of the IAS mini-Workshop on MDI 40'

Speaker: Dr. Toshiaki TAUCHI (High Energy Accelerator Research Organization (KEK))

Material: [Slides](#)  [Slides with references](#) 

MDI Issues during Commissioning and Beyond 40'

I would like to discuss some of the starting up issues that the MDI design team needs to be prepared for and also how I expect the machine to evolve to the design parameters.

Speaker: Dr. Micheal Sullivan (SLAC)

Material: [Slides](#) 

FCC-ee MDI 30'

Speaker: Dr. Michael KORATZINOS (CERN and Massachusetts Institute of Technology)

Material: [Slides](#) 

Overview of FCAL 30'

Speaker: Dr. Maryna Borysova (DESY & Kiev Institute for Nuclear Research (KINR))

Material: [Slides](#) 

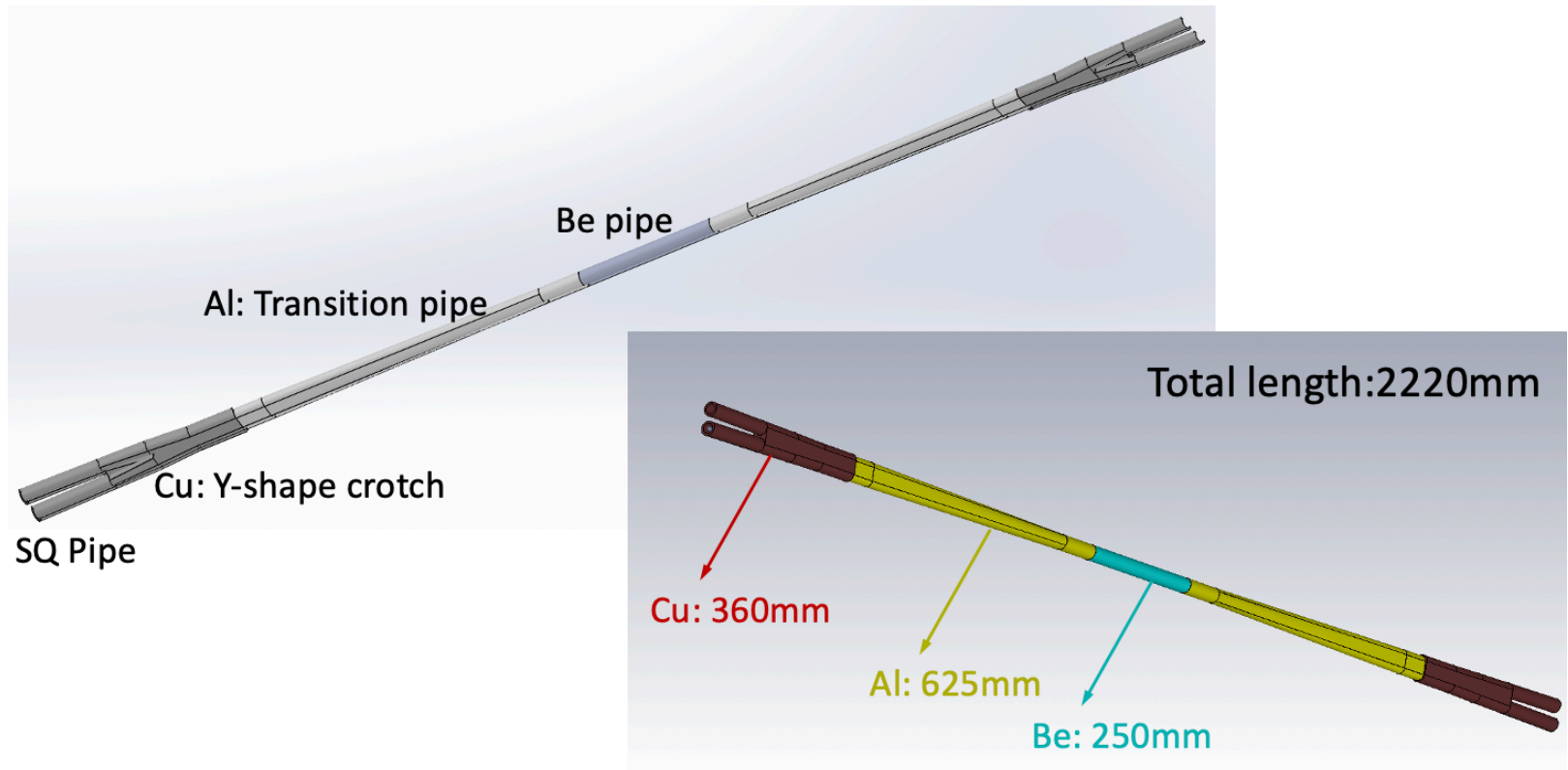
Lessons learned with the SLD Vertex Detector, relevant to a future Higgs Factory 30'

Speaker: Prof. Chris Damerell (Rutherford Appleton Laboratory)

Material: [Slides](#) 

BEAMPIPE

- Beampipe design non-trivial (cooling, mechanical structure, coating material budget), direct **impacts on physics performance**
- **ACTION:** to re-visit the central beampipe radius



HIGHER ORDER MODE (HOM) HEAT LOAD

Y. Liu

Summary on HOM heating Power for IR (CDR beam parameters)

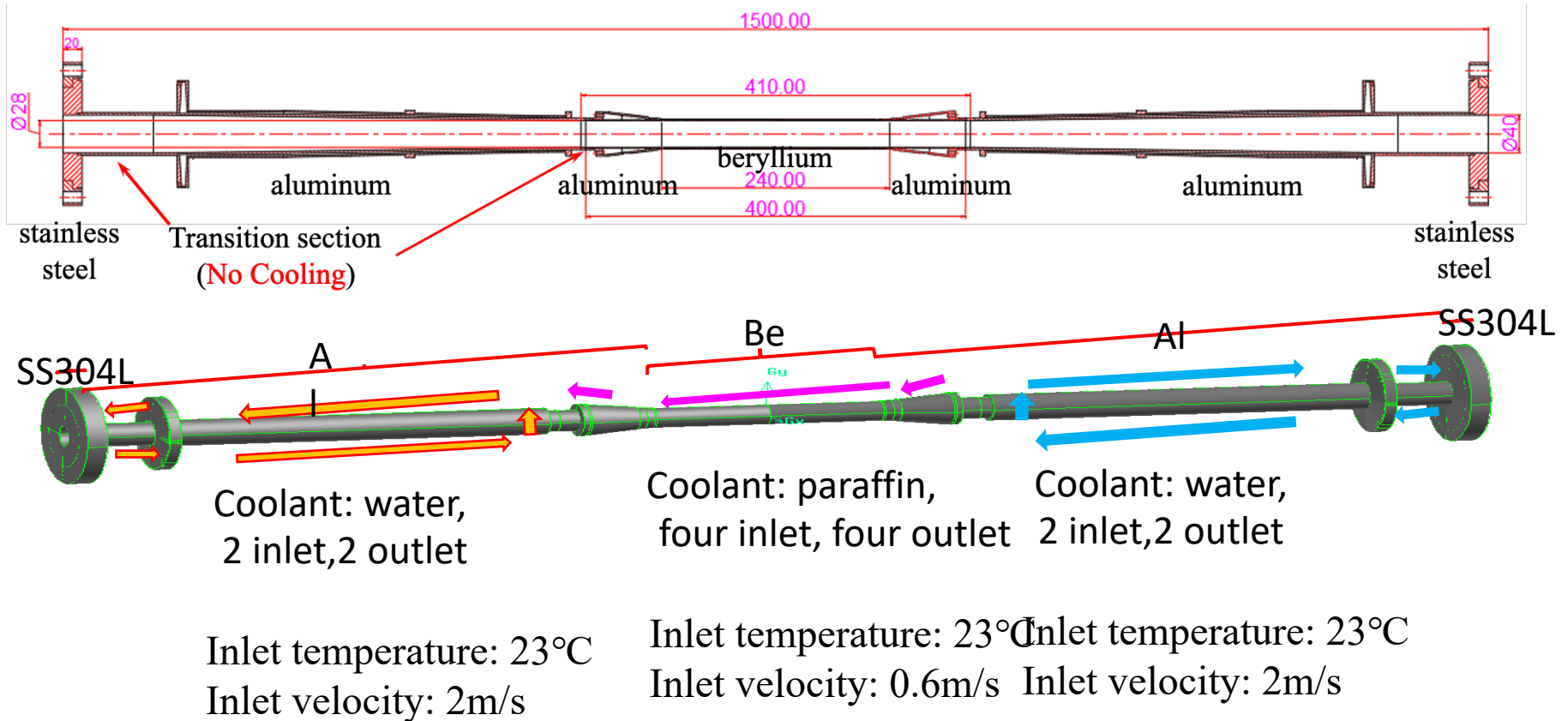
IR Model	H		W		Z	
Model 0 (28mm-28mm)	P_{trap} : 42w	P_{pro} : 26.8w	P_{trap} : 170.4w	P_{pro} : 108.6w	P_{trap} : 595.2w	P_{pro} : 379.4w
	P_{total} : 68.8w		P_{total} : 279w		P_{total} : 974.6w	
Model 1 (28mm-20mm)	P_{trap} : 12.3w	P_{pro} : 10.2w	P_{trap} : 49.8w	P_{pro} : 41.6w	P_{trap} : 174.2w	P_{pro} : 145.5w
	P_{total} : 22.5w		P_{total} : 91.4w		P_{total} : 319.7w	
Model 2 (28mm-20mm)	P_{trap} : 15w	P_{pro} : 7.1w	P_{trap} : 60.7w	P_{pro} : 28.9w	P_{trap} : 212.3w	P_{pro} : 101.2w
	P_{total} : 22.1w		P_{total} : 89.6w		P_{total} : 313.5w	
Model 3 (28mm-20mm)	P_{trap} : 14.2w	P_{pro} : 6.2w	P_{trap} : 57.5w	P_{pro} : 25w	P_{trap} : 201.1w	P_{pro} : 87.3w
	P_{total} : 20.4w		P_{total} : 82.5 w		P_{total} : 288.4w	
Model 4 (20mm-20mm)	P_{trap} : 14.5w	P_{pro} : 5.2w	P_{trap} : 58.9w	P_{pro} : 21.0w	P_{trap} : 205.9w	P_{pro} : 73.4w
	P_{total} : 19.7w		P_{total} : 79.9w		P_{total} : 279.3w	
Model 5 (28mm-11mm)	P_{trap} : 2.2kw	P_{pro} : -	P_{trap} : 9.1kw	P_{pro} : -	P_{trap} : 31.9kw	P_{pro} : -
	P_{total} : 2.2kw		P_{total} : 9.1kw		P_{total} : 31.9kw	

- Even higher HOM heat load for the high luminosity design

LATEST DESIGN

Please note we have never had a consistent beam pipe design between accelerator and detector.

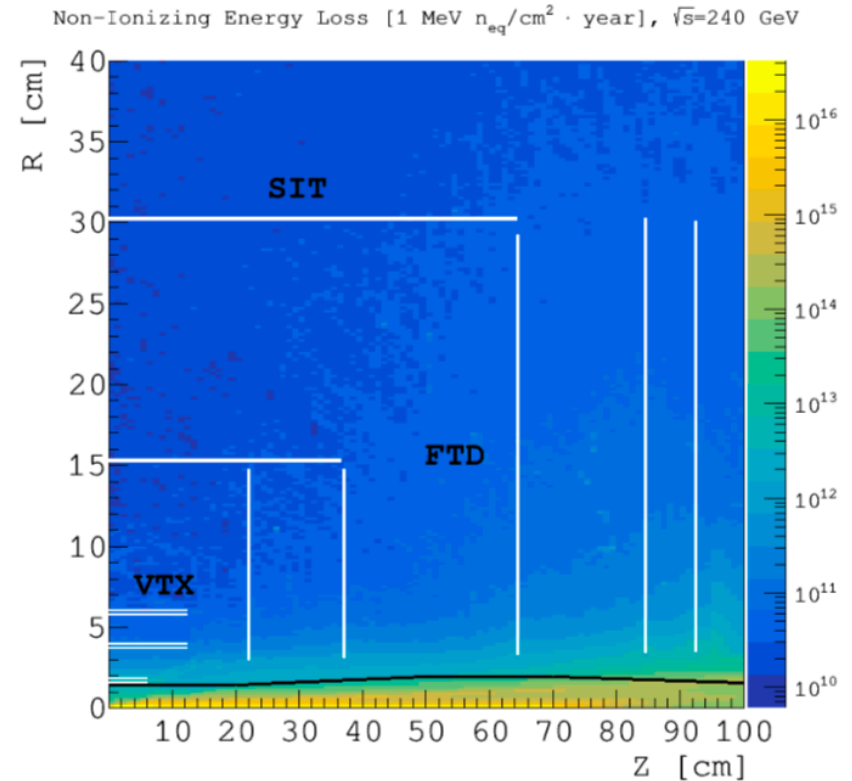
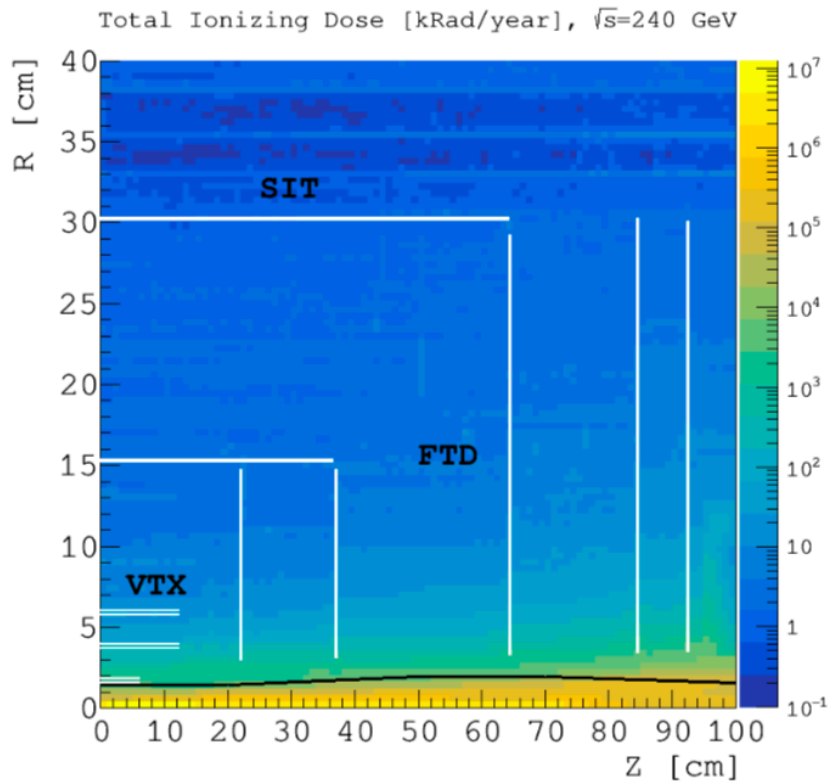
Q. Ji



- Impacts of **HOM heat load** (+ from other sources) on beampipe design that will affect other components, e.g. Vertex and LumiCal

RADIATION BACKGROUNDS

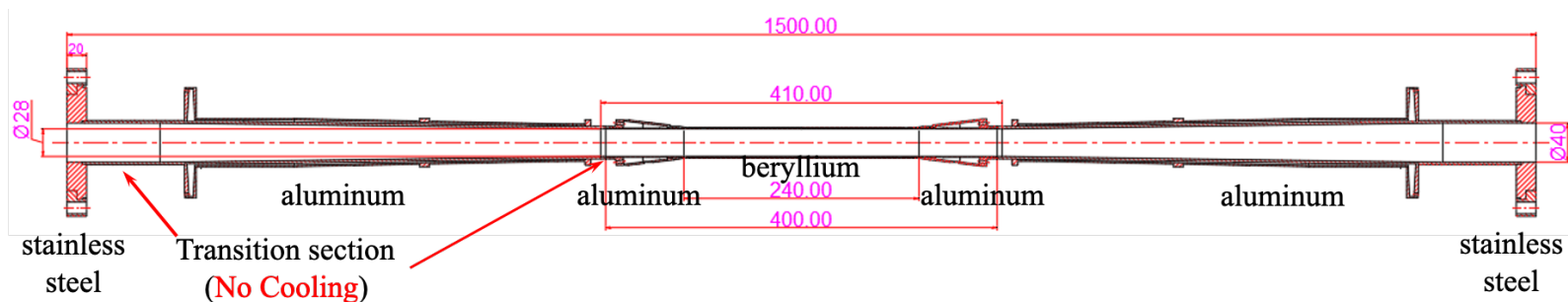
H. Shi



- Risky to push the beampipe/1st vertex detector layer too close to the interaction point, **radiation damage**

HOW TO CONVERGE ON BEAMPIPE RADIUS

- Quantify the impacts of smaller beampipe radius on HOM heat load, radiation backgrounds and tracking/vertexing performance → **caveat**: studies based on the CDR machine parameters, conclusion might have to change with the involving machine design
- Beampipe shape (central + forward) to be (re-)defined



SHORT TERM DELIVERABLES -- TO BE DISCUSSED

- A consistent design of the **interaction region** based on the CDR machine parameters in about two months
 - **Head loads** from HOM, synchrotron radiation, particle loss
 - **Beampipe (central + forward)** with cooling structures and interface to Vertex and LumiCal
 - **Background levels** (hit density, TID, NIEL) in sub-detectors (Vertex, Tracker, Calorimeter and LumiCal) + basic mitigation measures (collimators, masks, shielding, Au coating)
 - **Superconducting magnets** (compensating solenoid and quadrupoles) with optimized aperture size and protection
 - **Detector solenoid and Yoke design**
 - **Supporting structure and install scheme**
 - ...

LONGER TERM PLAN – TO BE DISCUSSED

- Iterations of **interaction region design** to cope with/benefit from the higher luminosity machine design
 - To achieve consolidated designs before carrying out serious prototyping
- Requested to list critical topics, required/available manpower, funding – to be collected and further discussed