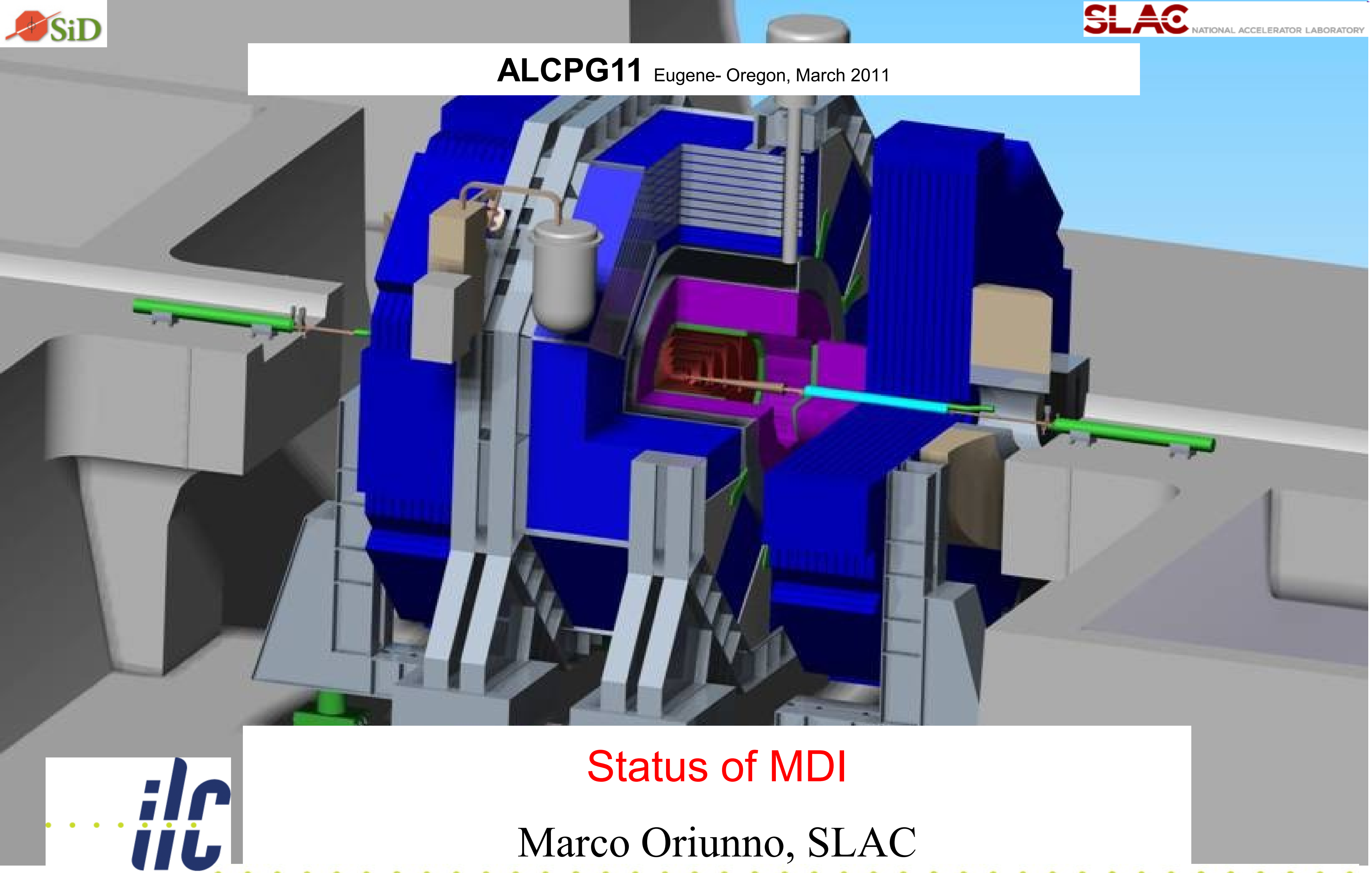


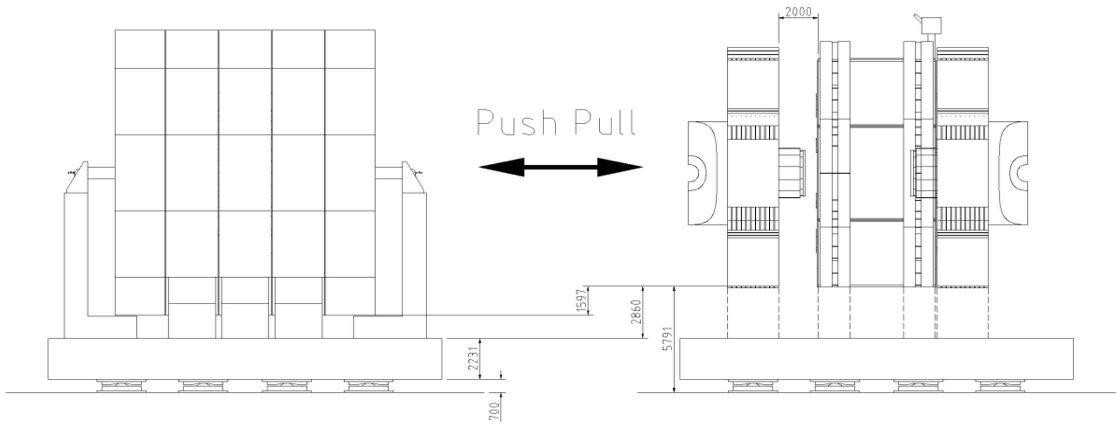
ALCPG11 Eugene- Oregon, March 2011

Status of MDI

Marco Oriunno, SLAC

SiD - MDI talks in this conference :

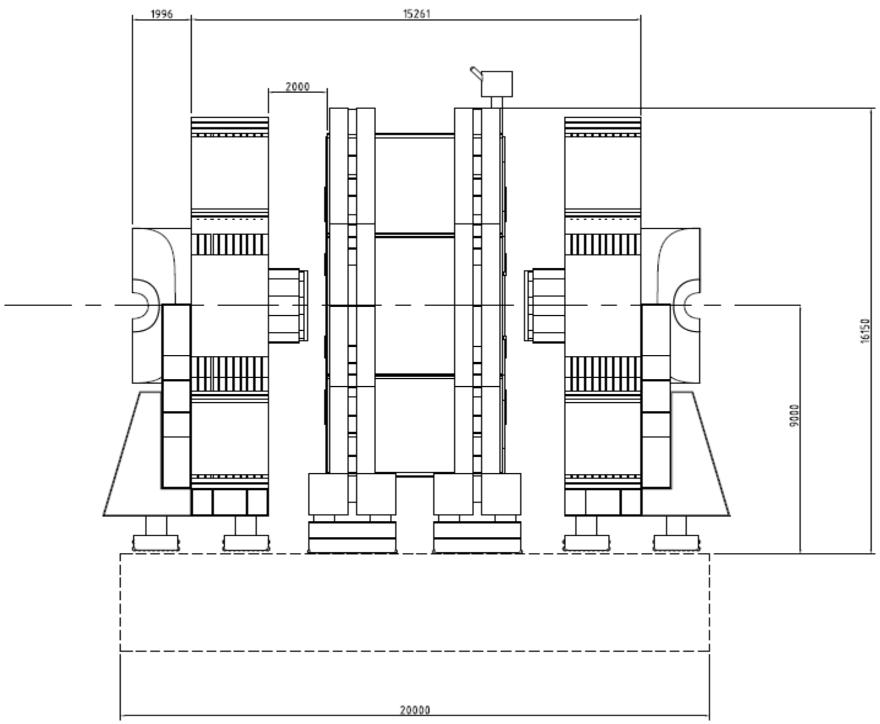
Sunday,	MDI Push Pull	M.Oriunno
Sunday,	Vibration Measurements and Transfer Functions at SLAC,	K. Bertsche
Monday,	Feedback Analysis with current xfer functions & beam parameters	G.White
Monday,	SR Update,	M. Sullivan
Monday,	HOM heating at the IP and in QD0,	A. Novohatski
Monday,	FSI Alignment,	K. Riles

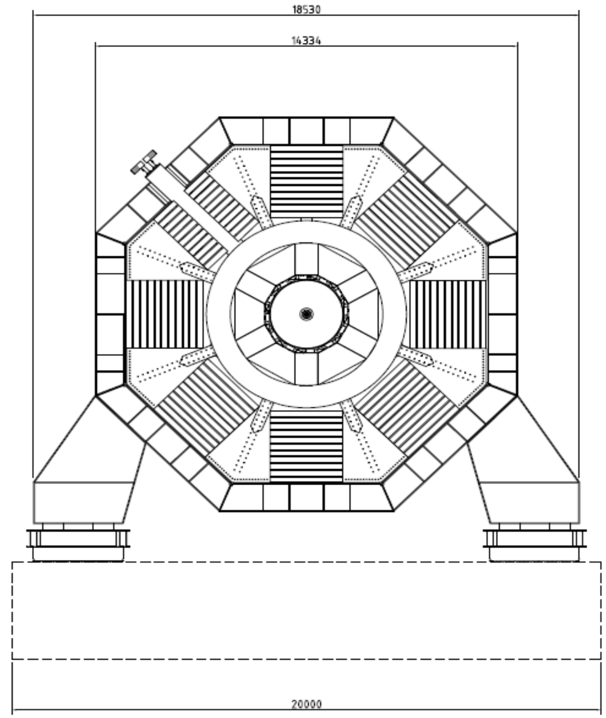


Option 3, ILD and SiD on platforms

Under Study

SiD Platform Functional Requirements





SiD nominal mass: Barrel   5000 T; (each) Door 2500 T

Dimensions:

Z = 20.0 m

X = 20.0 m

Delta Y = 9 m (Top of Platform to beamline)

Positioning Tolerance on beamline

Consider points Z=+-max, X=0. Position to + 1mm wrt references in X,Y,Z

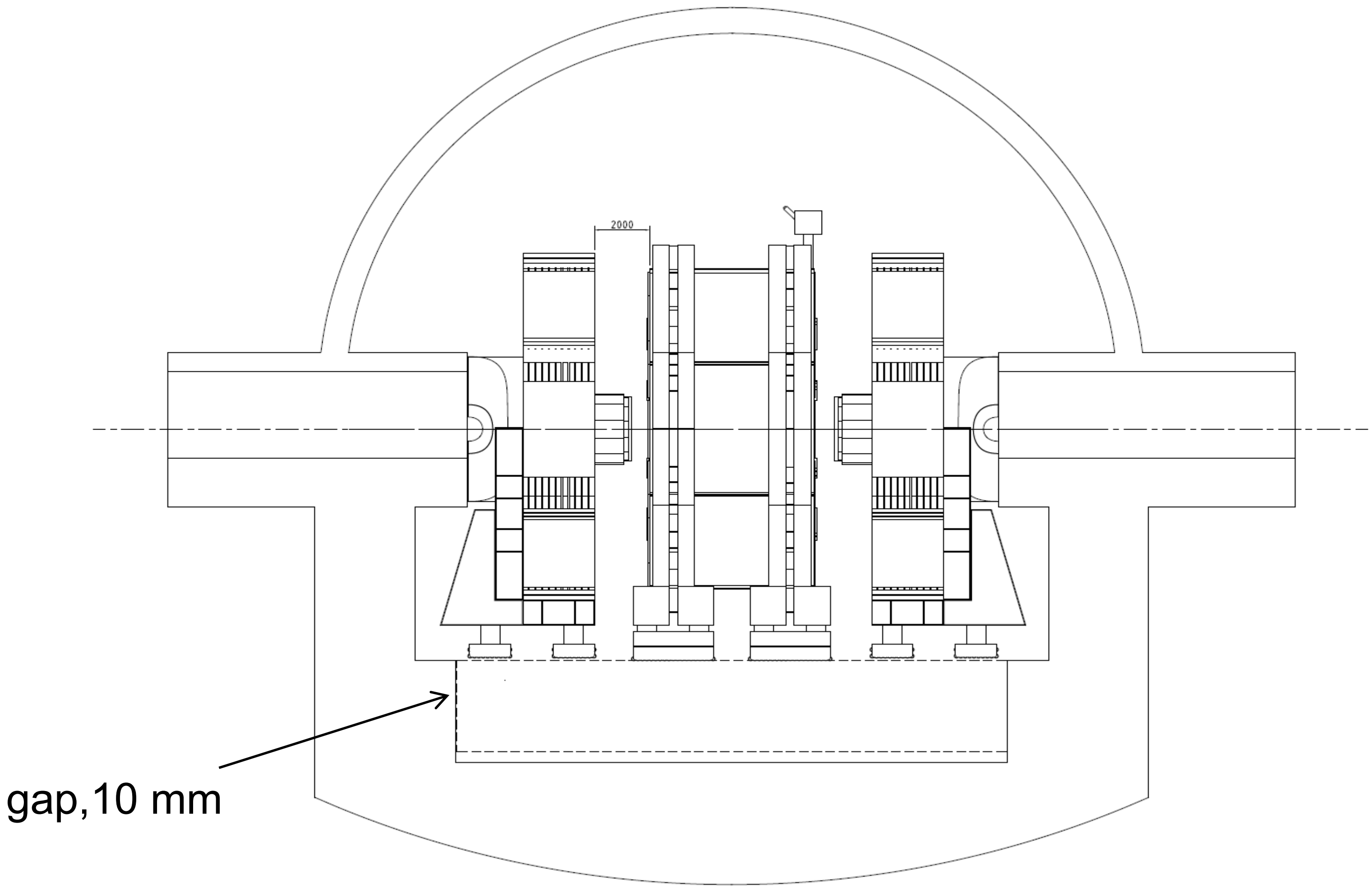
Consider points Z=+-max, X=+-max: Position to +- 1 wrt references in Y.

Static Deformations: <+-2 mm

Vibration budget < 50nm between 1 and 100 Hz, at the QD0's (relative)

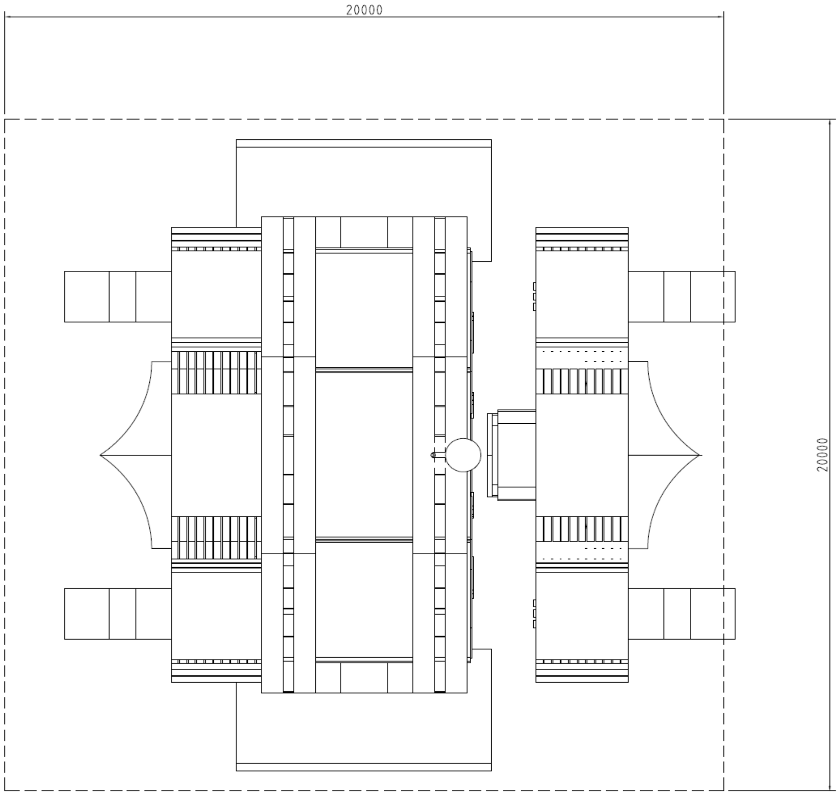
Seismic stability: Appropriate for selected site. (Beamline must be designed with sufficient compliance that VXD will survive)

SiD Platform Functional Requirements

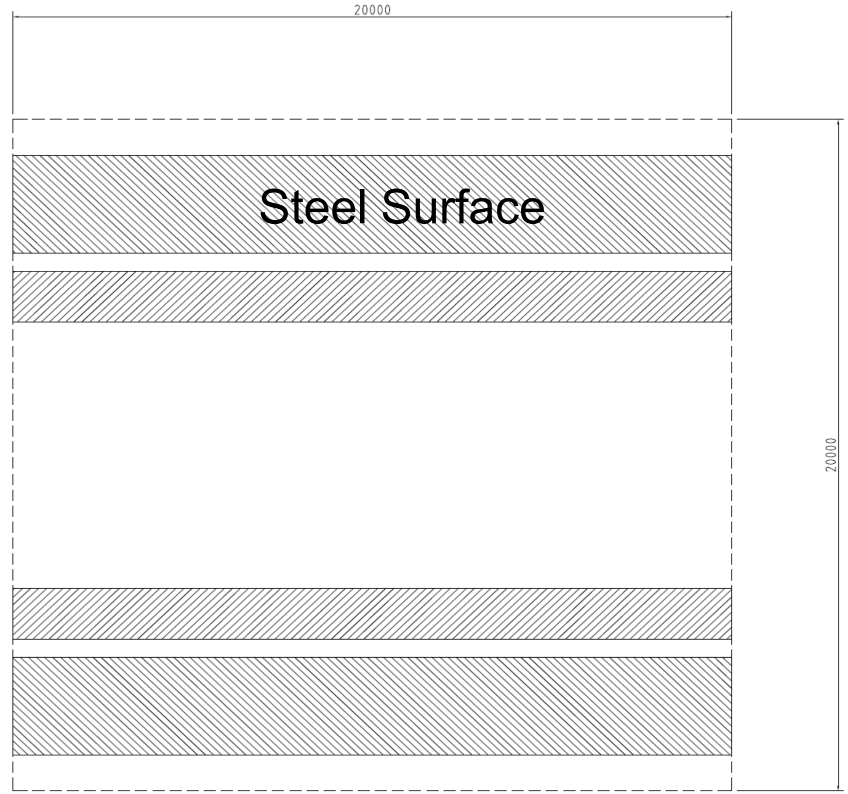


Wall clearance ~10 mm. Platform comes to side wall, there is no apron or apron matches platform elevation.

SiD Platform Functional Requirements



Detector on platform Top View

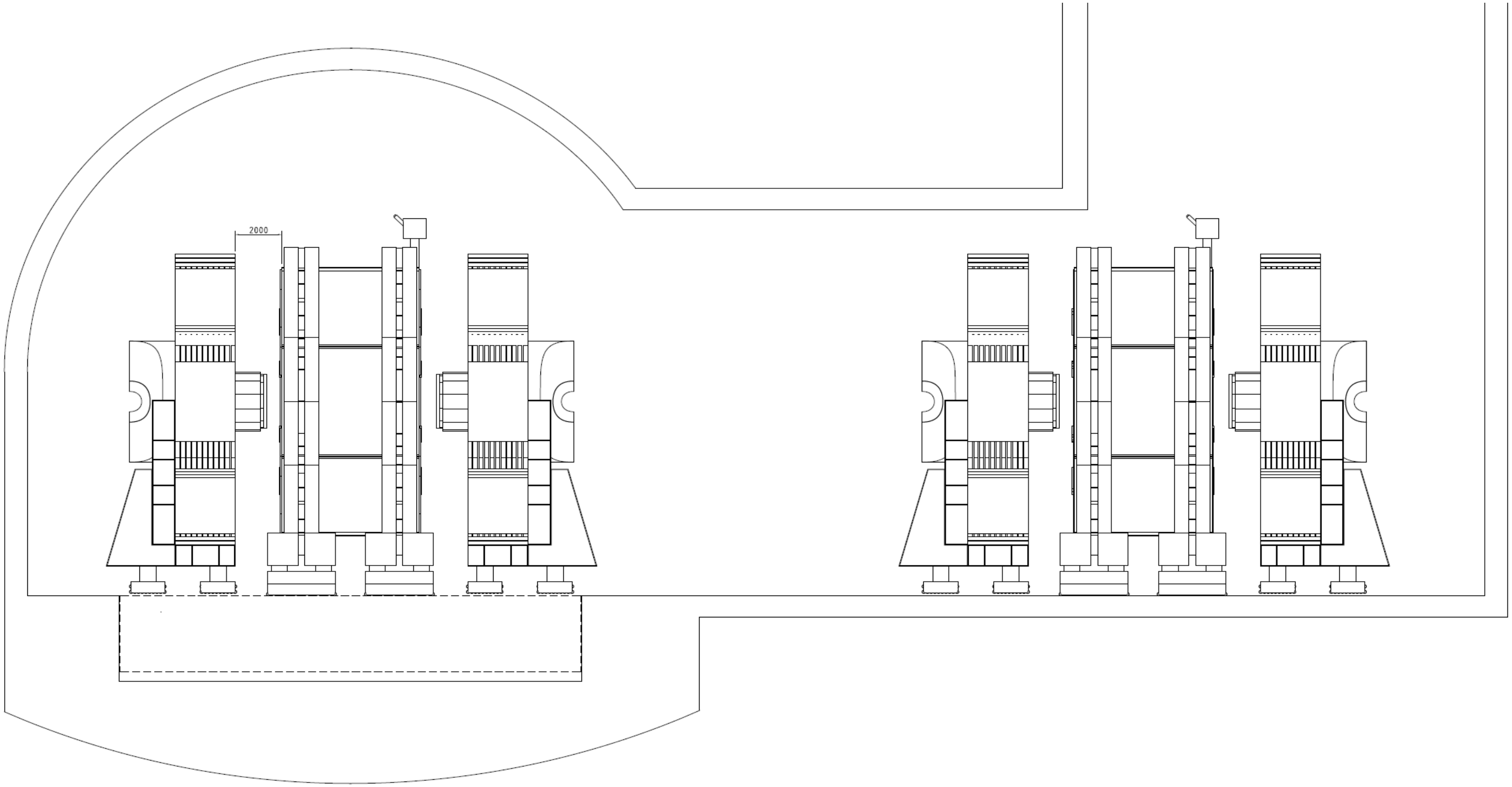


Platform Top View

Surface Features:

- Steel Surface near legs
- Steel rails for doors
- “Receptacles” for tie seismic tiedowns of SiD Barrel and Doors
- Removable Safety railings

SiD Platform Functional Requirements



Accelerations: <1 mm/s^2

Transport velocity: V>1 mm/s after acceleration

Life: 100 motion cycles.

Reliability: Transport modularity must be such that repairs/replacement/maintenance can be accomplished in garage position and within 20 elapsed days.

Any equipment required for transport shall reside below the platform surface.

Transport equipment shall not eject particulates that reach platform surface (need spec on how much)

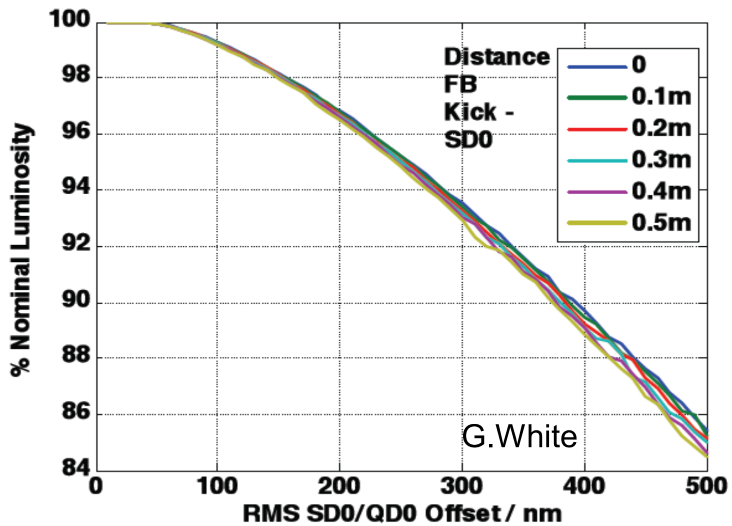
Vibrations

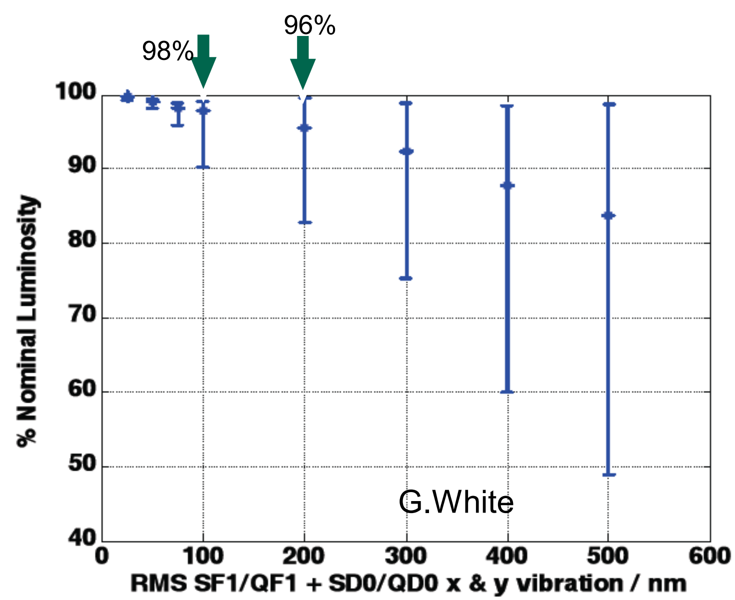
QD0 stability Requirements

Most acute luminosity loss mechanism due to relative jitter of final focusing magnet elements : Ground Motion and Mechanical vibration sources

ILC has Active Fast Feedback based on beam trajectory after collision

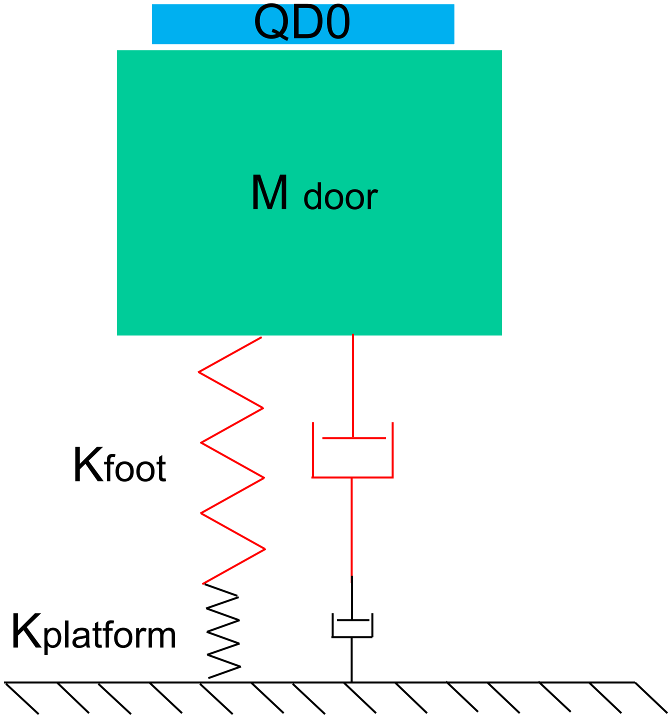
Max. Integrated displacement: 100÷200 nm > 5 Hz





Lumi loss due to beam offset in SD0 (beamsize growth) and IP misalignment of beams

SiD Vibration Model : 1 degree of freedom M,K,C oscillator



$$f_n = \sqrt{\frac{f_f^{\,2} f_p^{\,2}}{f_f^{\,2} + f_p^{\,2}}}$$ 1st mode system

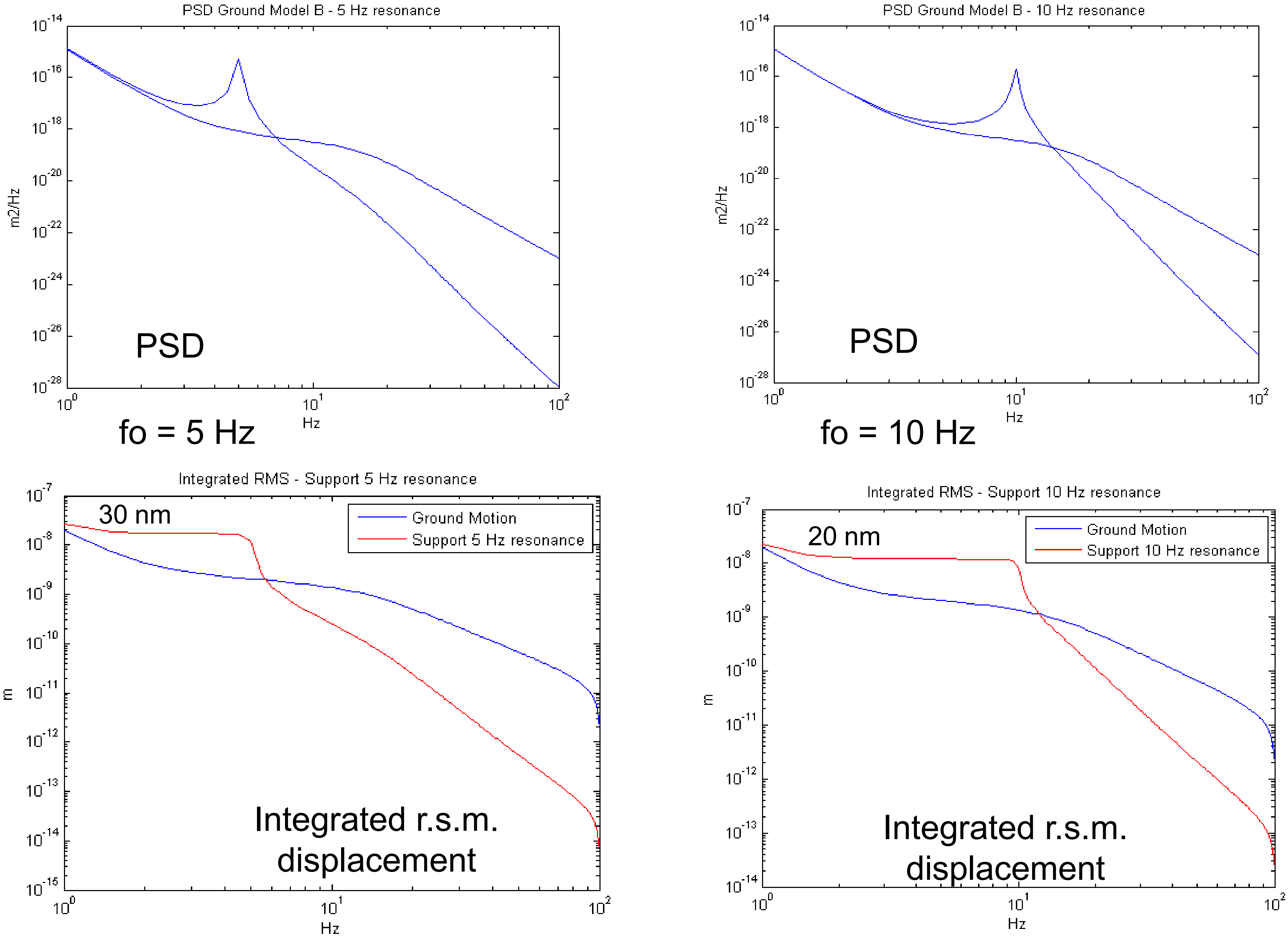
f_f = 1st mode SiD foot

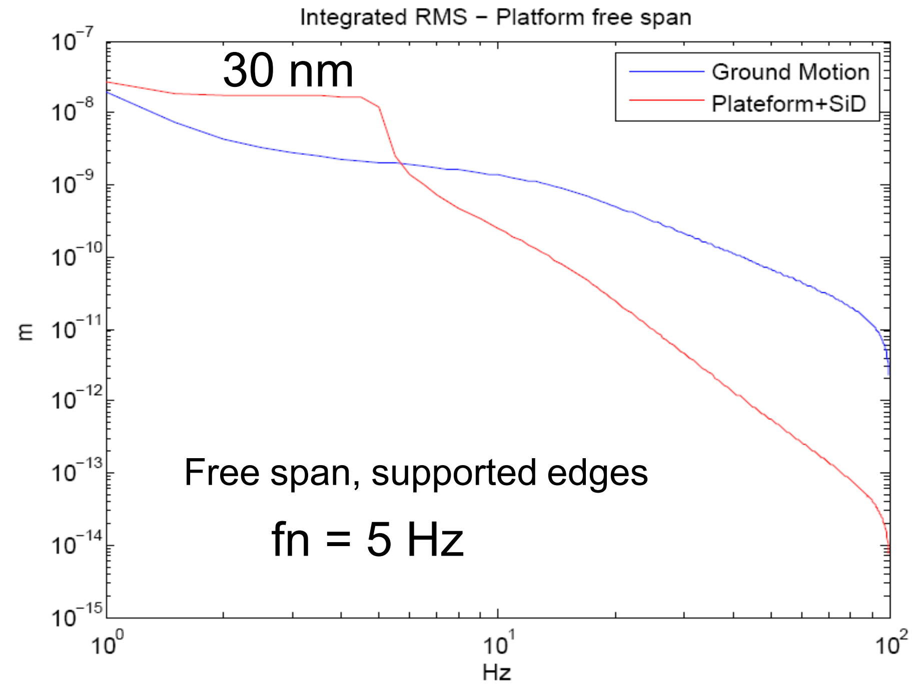
f_p = 1t mode platform

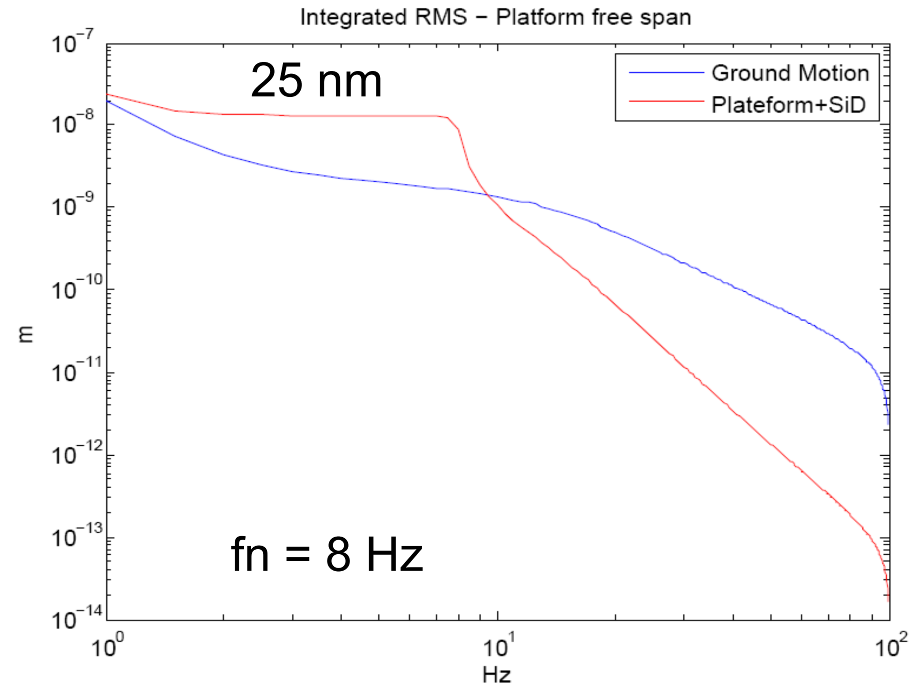
c = 2%

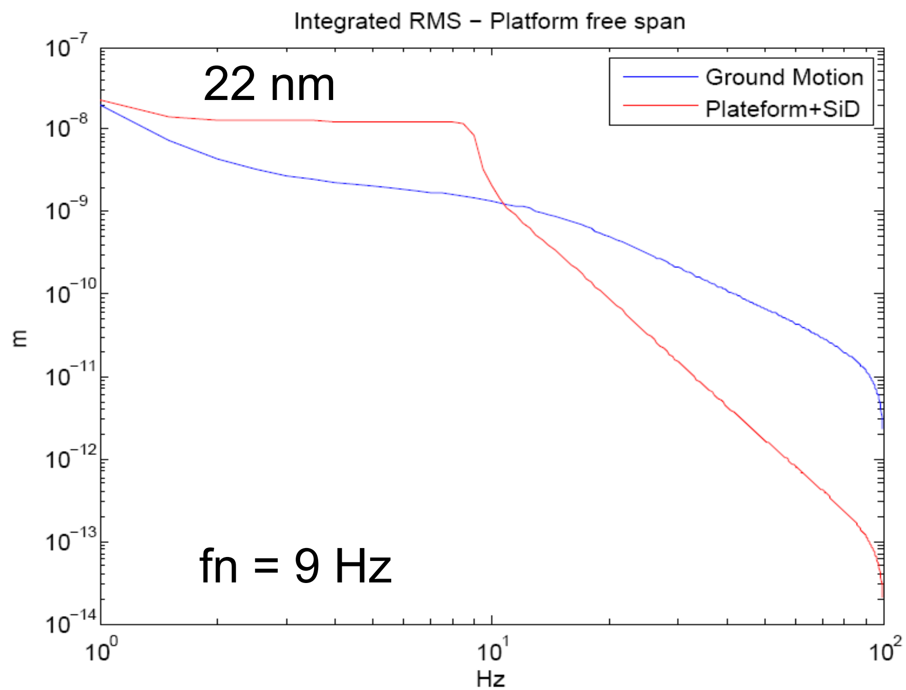
		6 Hz, supported edges	f_n = 5 Hz
f_{foot} = 10 Hz from FEA,	$f_{platform}$ =	15 Hz, int. support, door-on-platform	f_n = 8 Hz
		30 Hz, int.support, door-on-barrel	f_n = 9 Hz

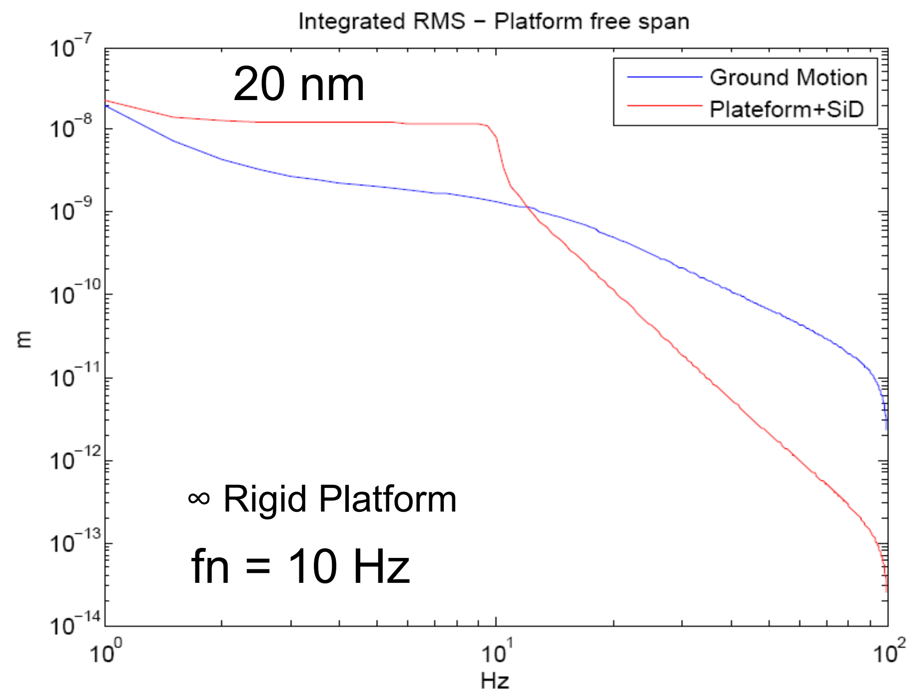
Random vibration Studies : SiD O.K. on the floor, no platform



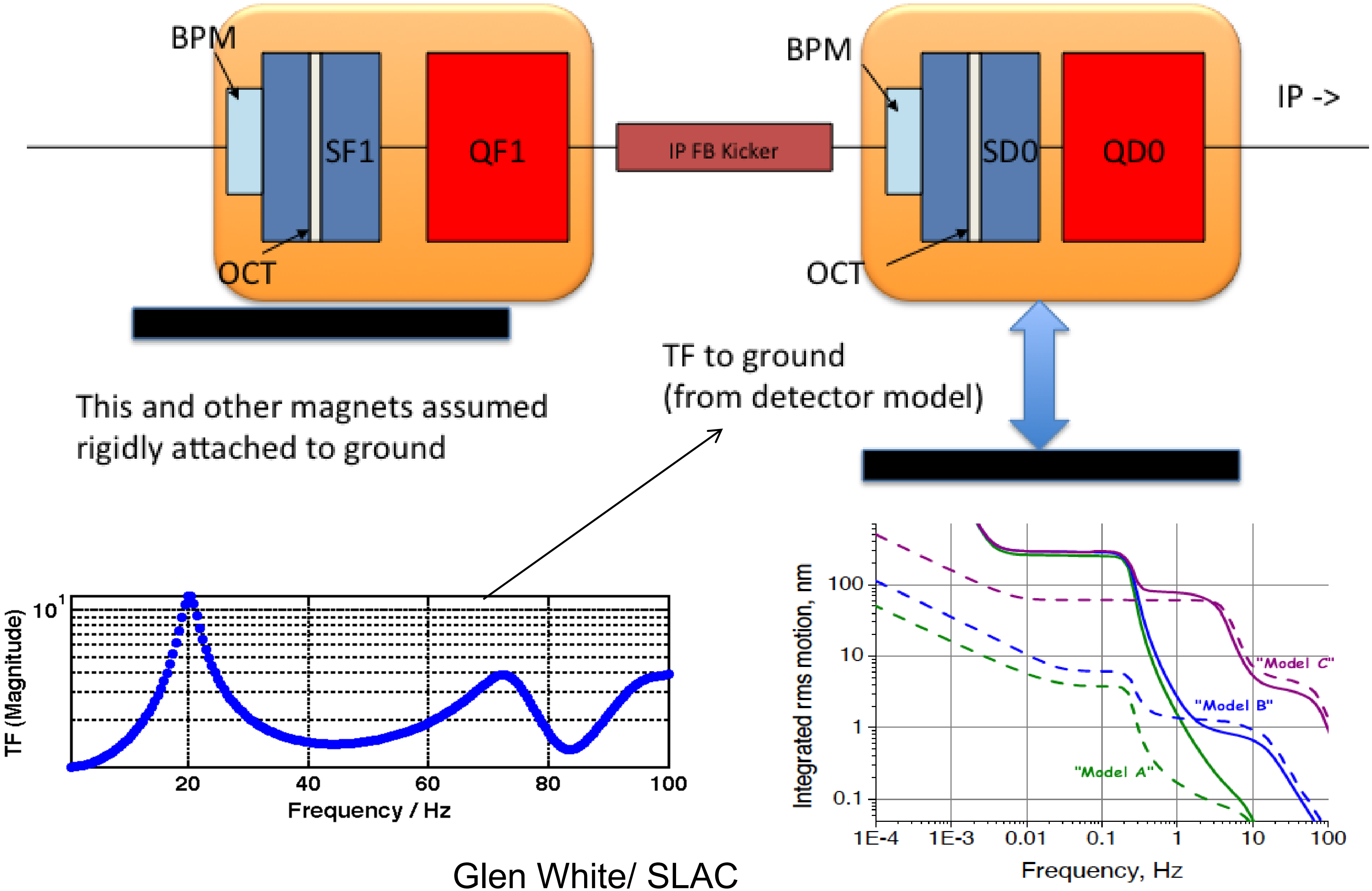

Integrated RMS – Platform free span
30 nm
Ground Motion
Plateform+SiD
Free span, supported edges
fn = 5 Hz
m
Hz
10^{-7}
10^{-8}
10^{-9}
10^{-10}
10^{-11}
10^{-12}
10^{-13}
10^{-14}
10^{-15}
10^{0}
10^{1}
10^{2}


Integrated RMS – Platform free span
25 nm
Ground Motion
Plateform+SiD
fn = 8 Hz
m
Hz
10^{-7}
10^{-8}
10^{-9}
10^{-10}
10^{-11}
10^{-12}
10^{-13}
10^{-14}
10^{0}
10^{1}
10^{2}


Integrated RMS – Platform free span
22 nm
Ground Motion
Plateform+SiD
fn = 9 Hz
m
Hz
10^{-7}
10^{-8}
10^{-9}
10^{-10}
10^{-11}
10^{-12}
10^{-13}
10^{-14}
10^{0}
10^{1}
10^{2}

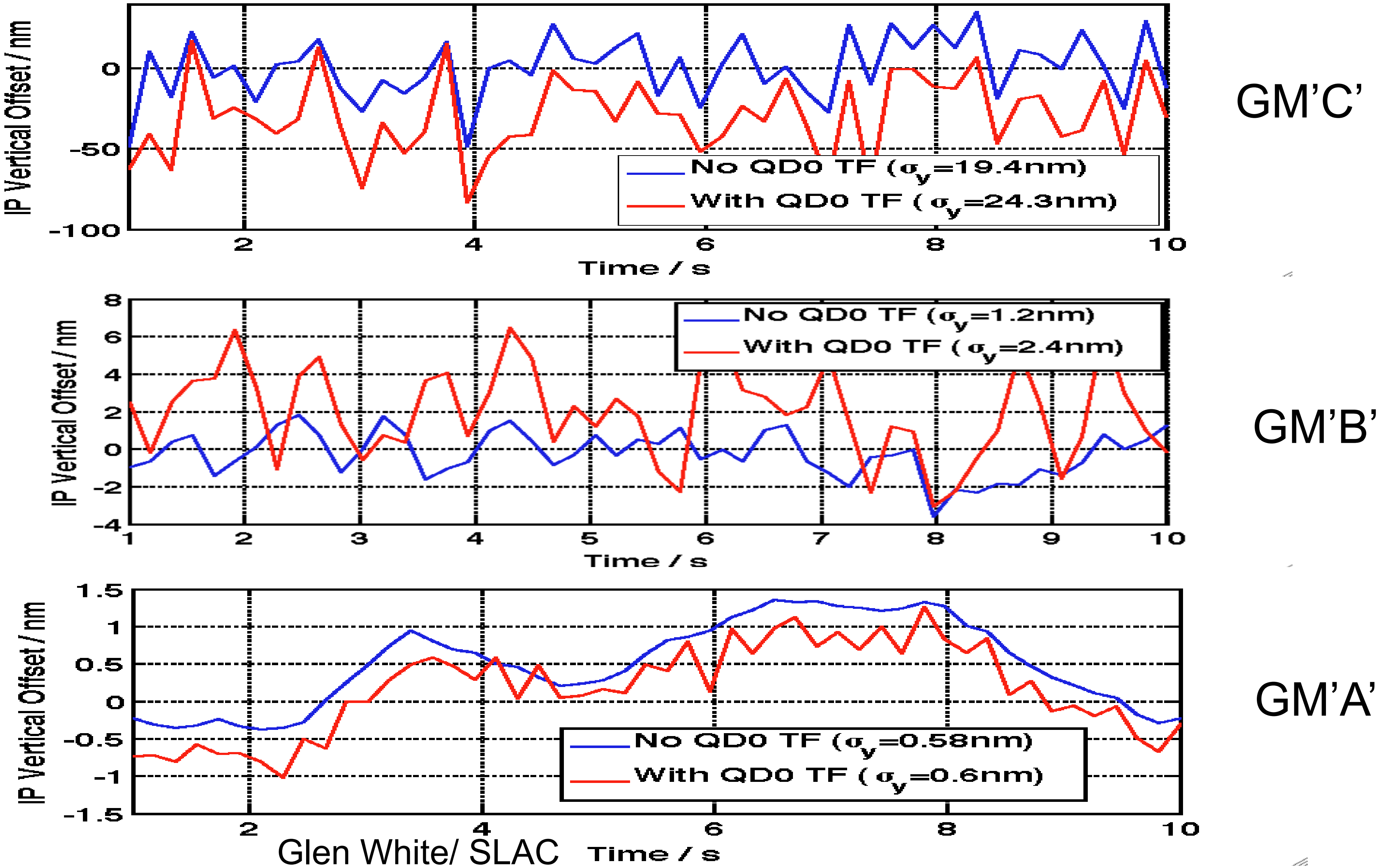

Integrated RMS – Platform free span
20 nm
Ground Motion
Plateform+SiD
∞ Rigid Platform
fn = 10 Hz
m
Hz
10^{-7}
10^{-8}
10^{-9}
10^{-10}
10^{-11}
10^{-12}
10^{-13}
10^{-14}
10^{0}
10^{1}
10^{2}

IP Region Final Doublet



Glen White/ SLAC

GM Induced Jitter @ IP (Vertical Offset between e- and e+ beams at IP) with and without QD0 TF



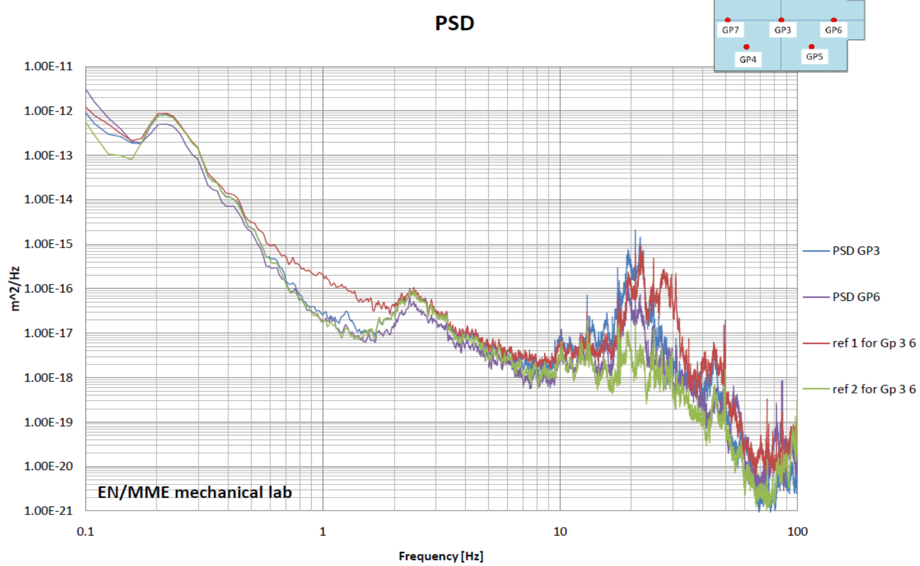
Glen White/ SLAC

Platform Simulation

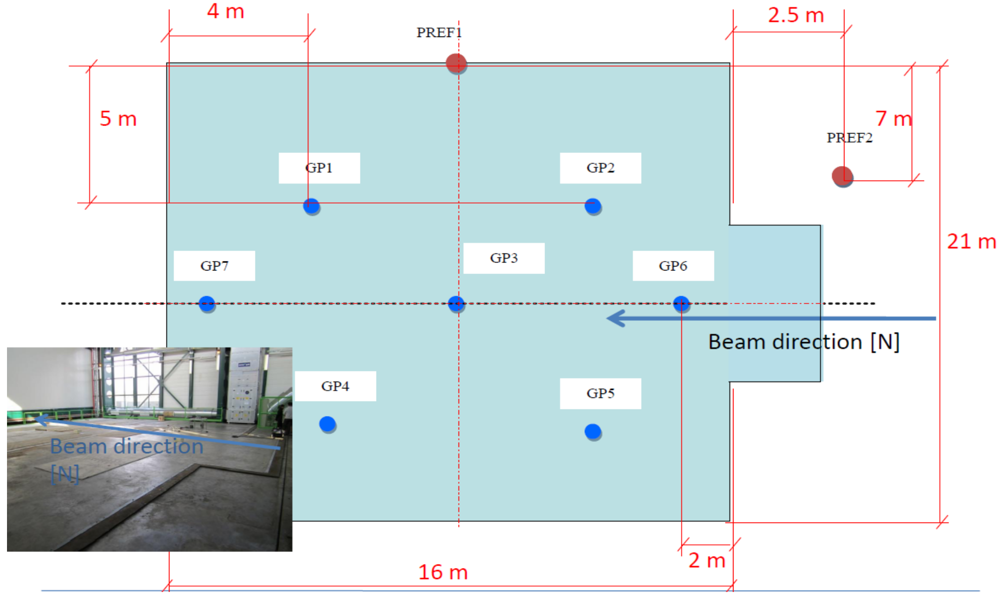
Benchmark with exp.data

Experimental Vibration measurements – CMS Plug

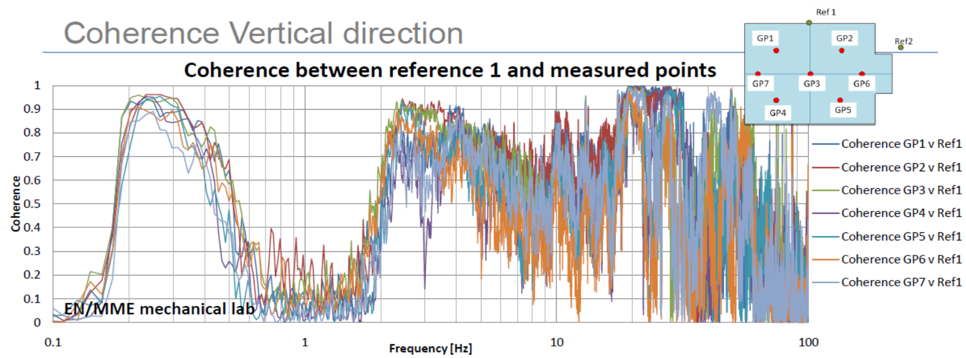
PSD for a typical measurement

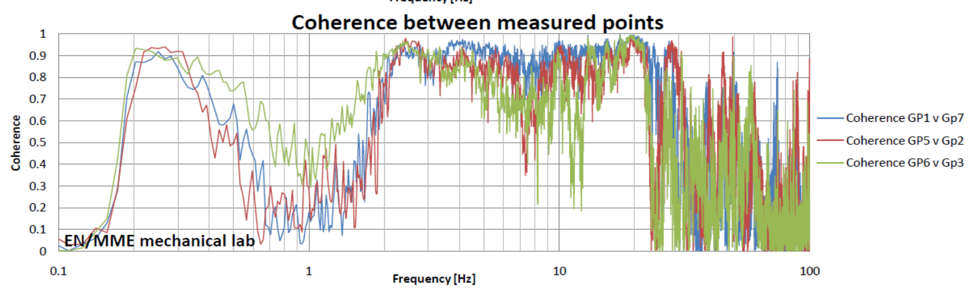


Sensor position

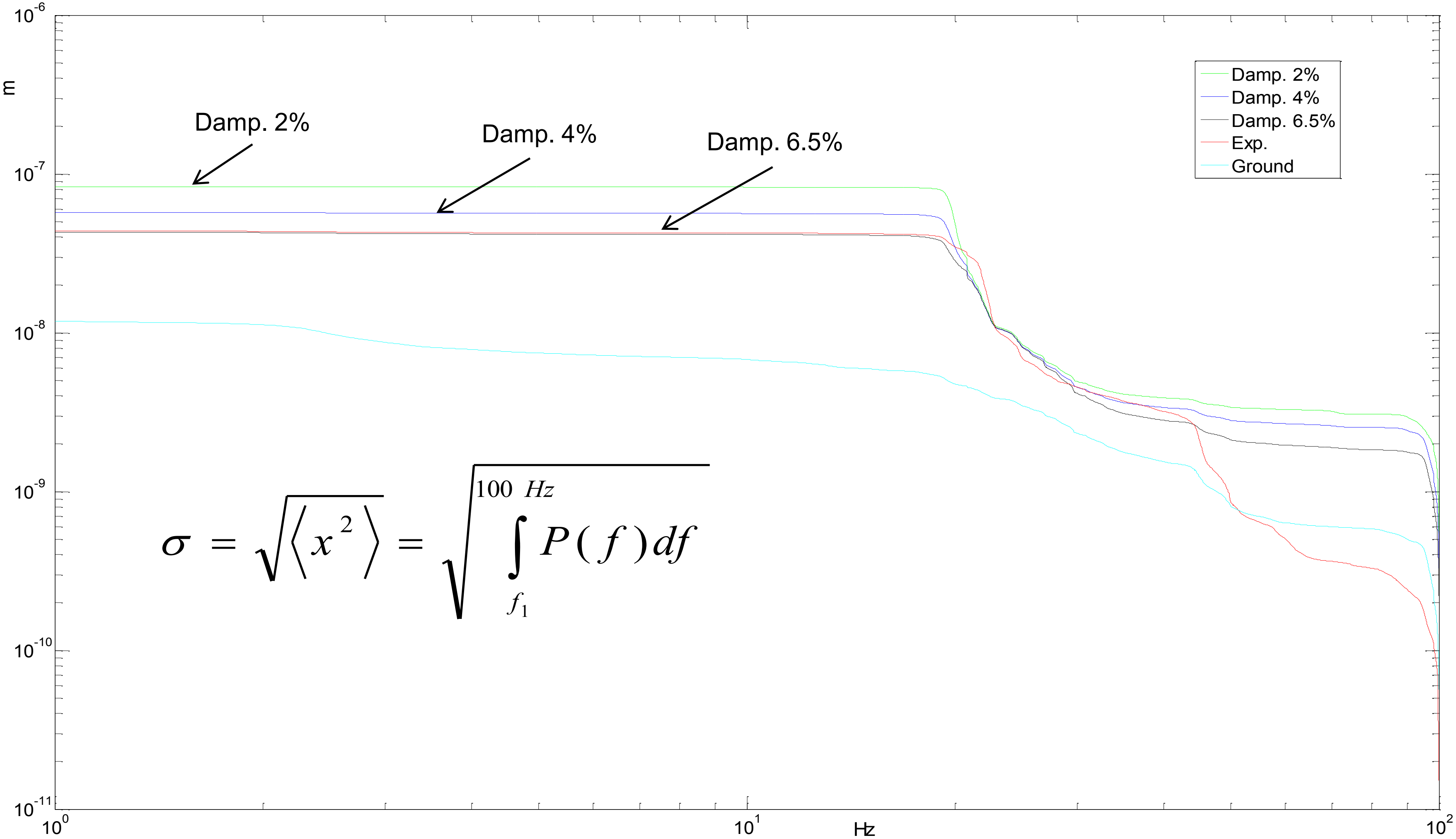


Coherence Vertical direction





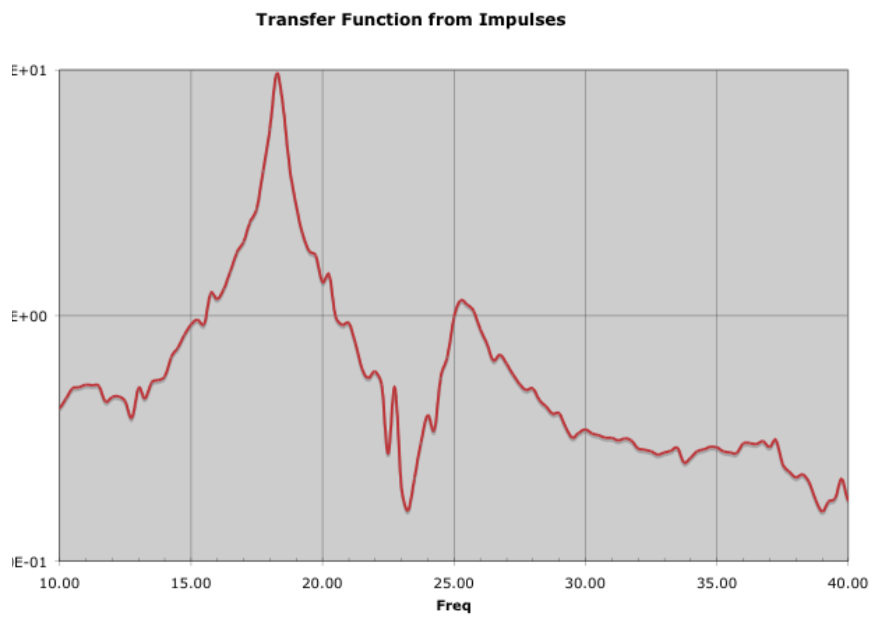
Integrated Displacement (r.m.s.)

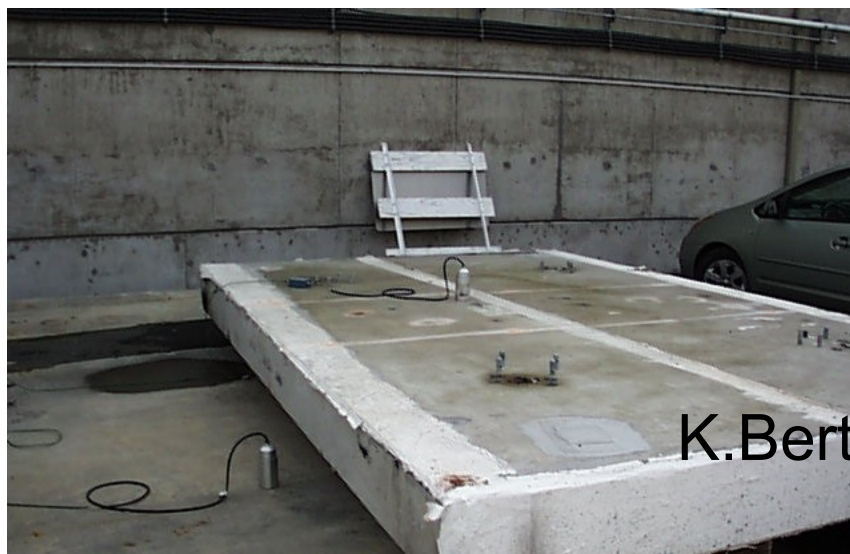


$$\sigma = \sqrt{\left\langle x^2 \right\rangle} = \sqrt{\int_{f_1}^{100\ Hz} P(f)\,df}$$

Experimental Vibration Analysis of concrete slabs

Small Shielding Block





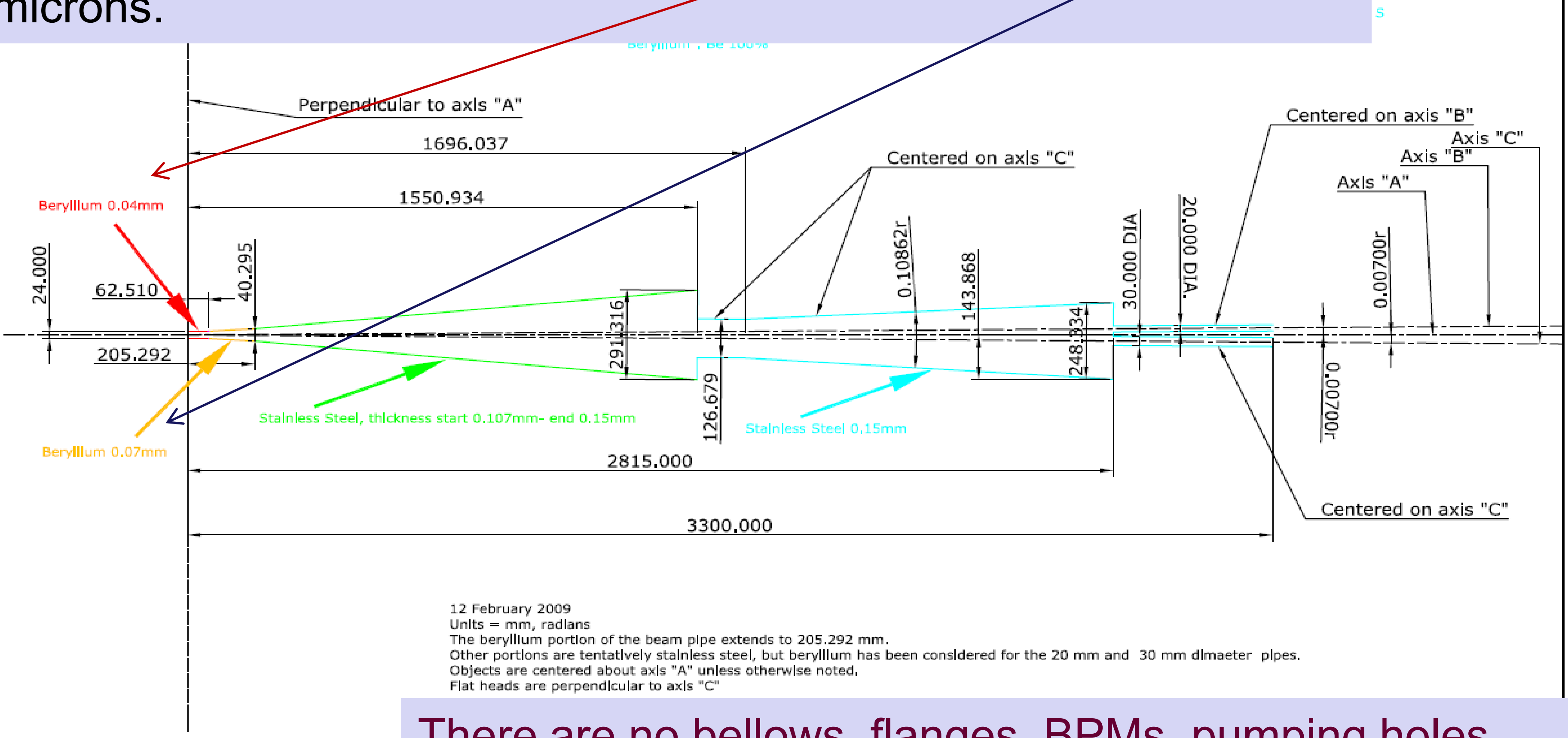
K.Bertsche

HOM heating at the IP and in QD0

Sasha Novokhatski

ILC IR geometry from Marco Oriunno

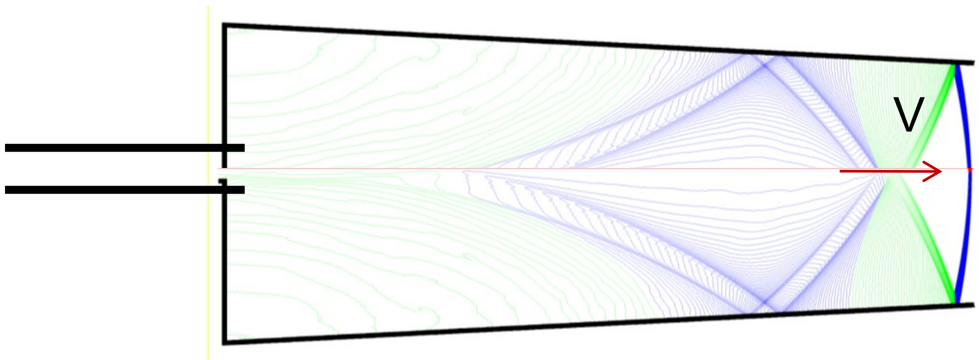
Comments from Takhashi Maruyama:
The thickness of the cylindrical beam pipe is 400 microns,
and of the conical section is 700 microns.

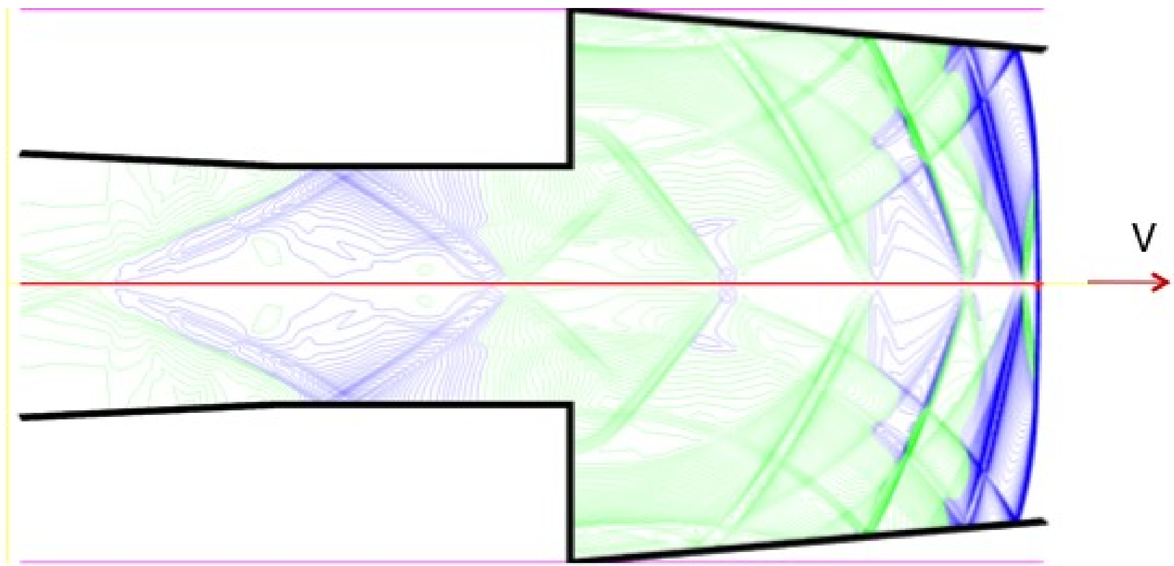


There are no bellows, flanges, BPMs, pumping holes, …

Sasha Novokhatski

Wake fields and a bunch field





Sasha Novokhatski

Wake Fields Summary

- The amount of beam energy loss in IR is almost equal to the energy loss in one accelerating cryo-module.
- Additional energy spread accumulated in the IR is very small.
- Spectrum of the wake fields is limited to 300 GHz
- Average power of the wake fields excited in IR is around 30 W for nominal parameters.
- Pulse power in this case is 6 kilowatts.

Summary

IR SR Update with a PEP-II Perspective
M.Sullivan

- All the primary sources of SR look to be under good control
- Worth looking at secondary sources again to make sure they are (still) not a problem
- Important to try to model the non-ideal startup machine

Summary
Update on Backgrounds
T.Maryuama

- The beampipe design is compatible with SB2009.
- There are 2x more VXD hits per bunch in SB2009, but #hits per train is comparable.
- There is 3x more BeamCal energy in SB2009.
  - The two-photon veto efficiency will be reduced; simulation study is in progress.
- Power load in the extraction line is comparable.
  - The power load to the cryostat from radiative Bhabhas is larger than from pairs.

Conclusions

SiD agreed to use a platform. The platform is handed to the CFS group which will be in charge of the design, construction. The cost is also not anymore on SiD.

Nevertheless, the detectors are in charge to write a set of functional requirements of the Platform.

Good progress on vibrations studies, simulation and experimental.

The beampipe design checked vs. background and wakefield : present design OK

All primary source of SR are under control. Important to model the non-ideal startup machine