


# Experimental Area Vibration considerations to trigger discussion

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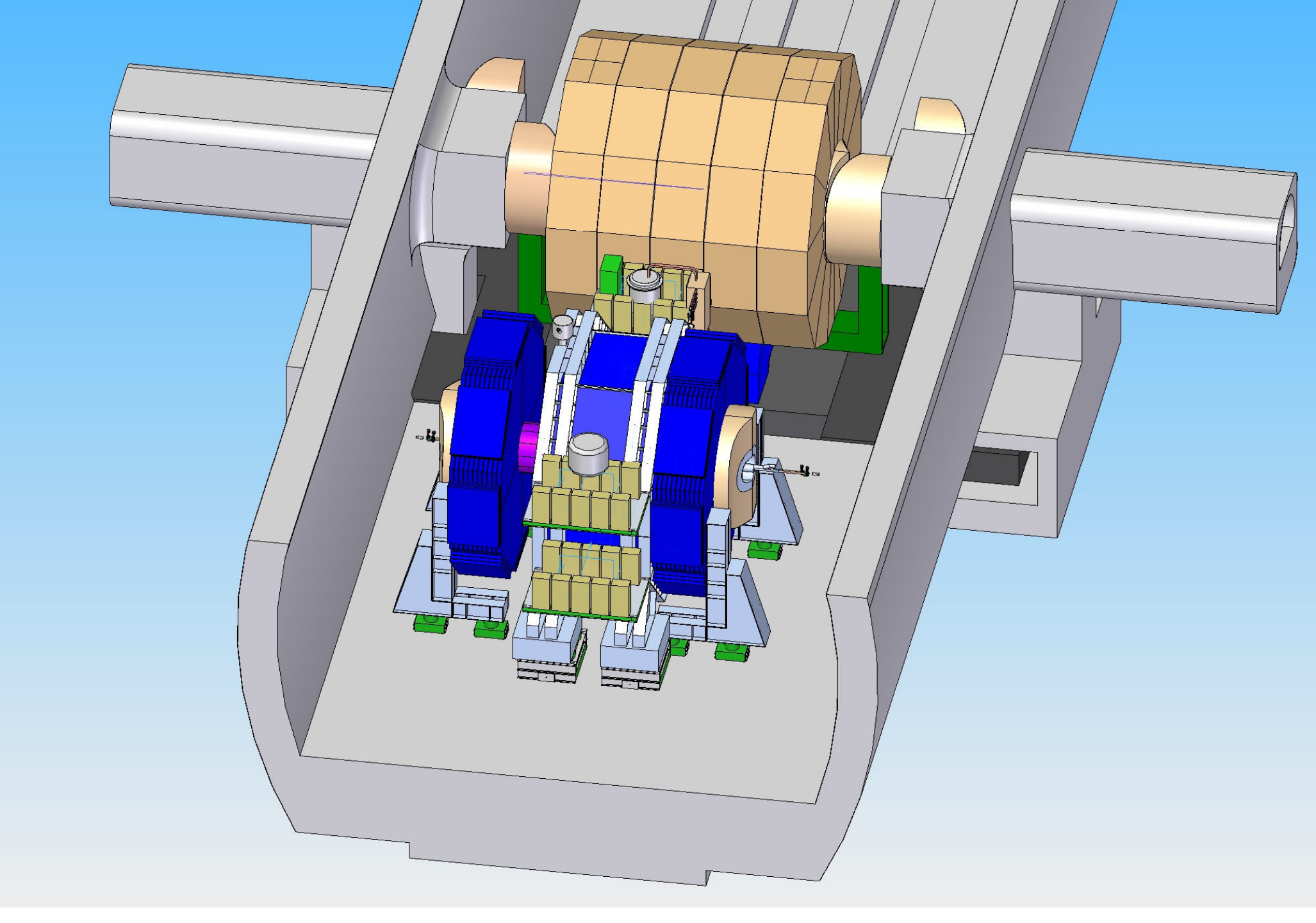
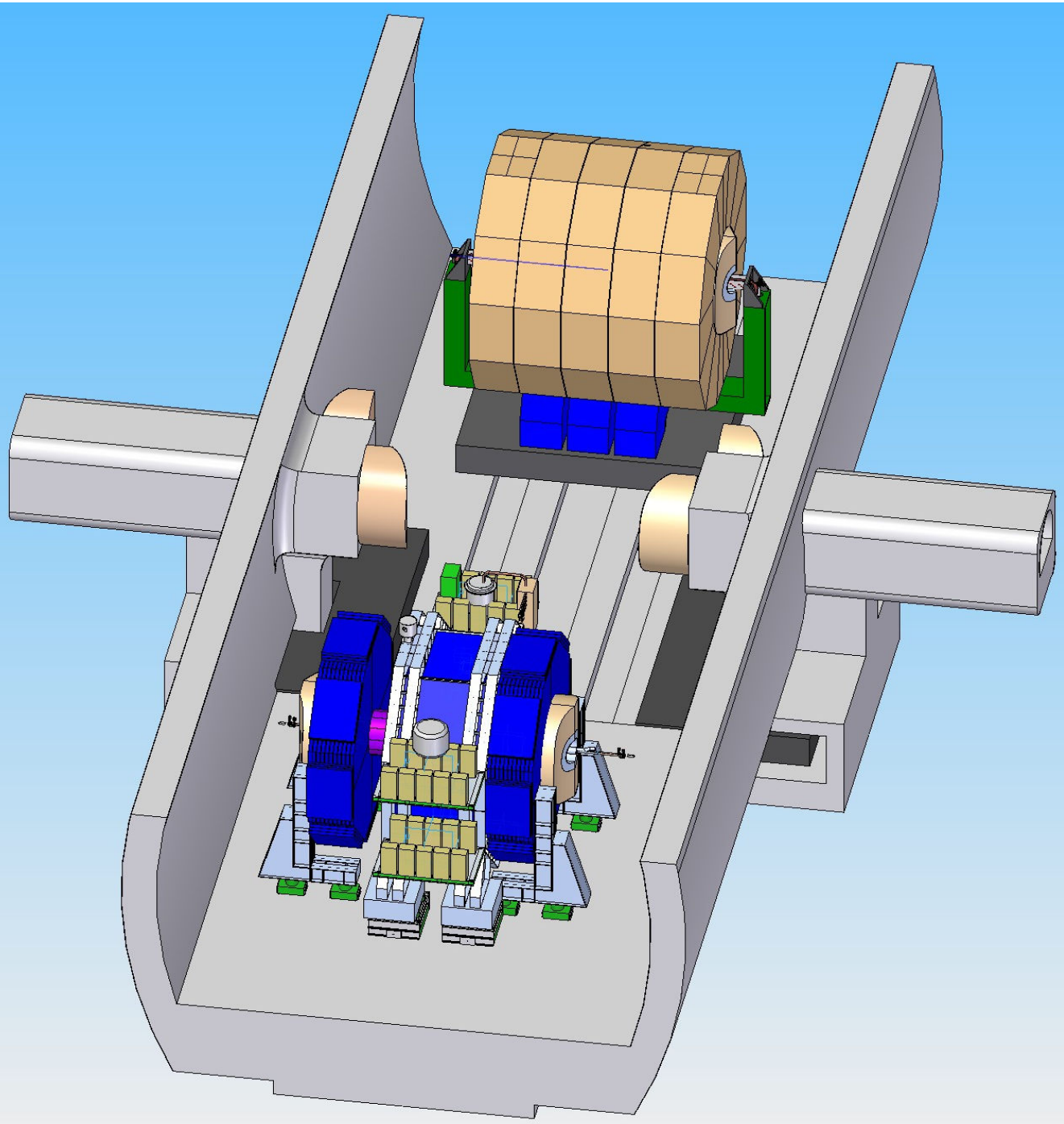
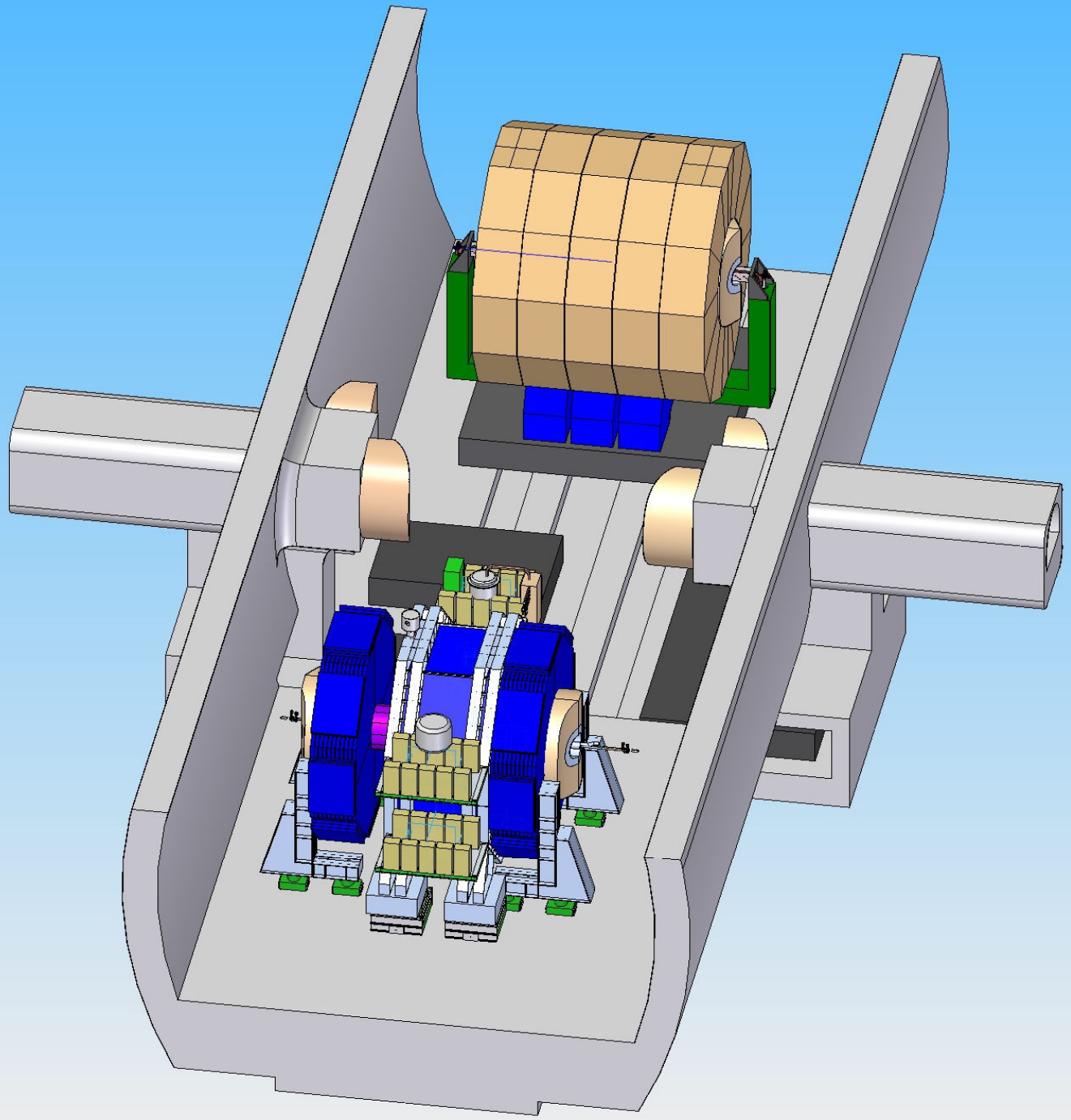
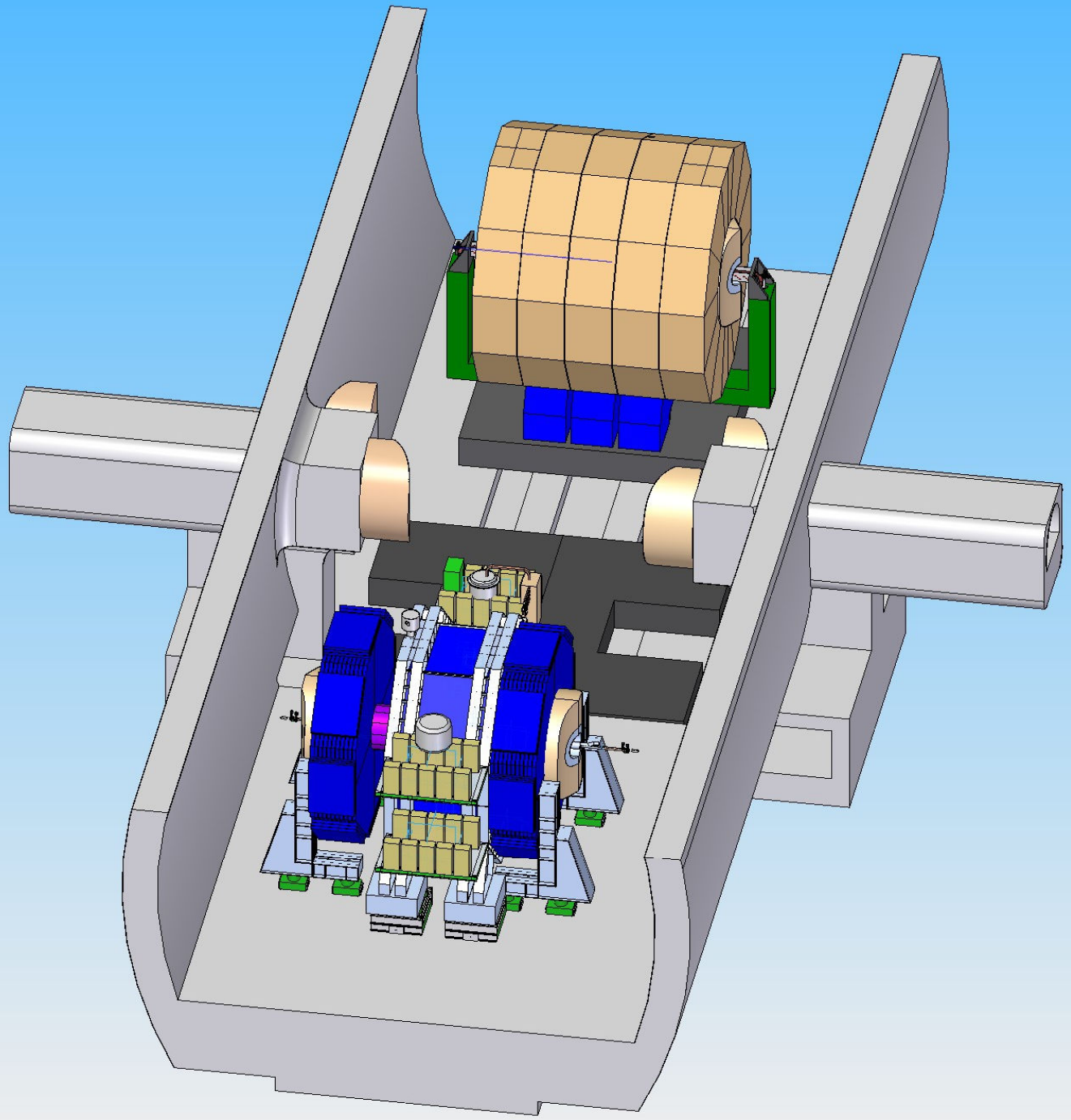
# Introduction

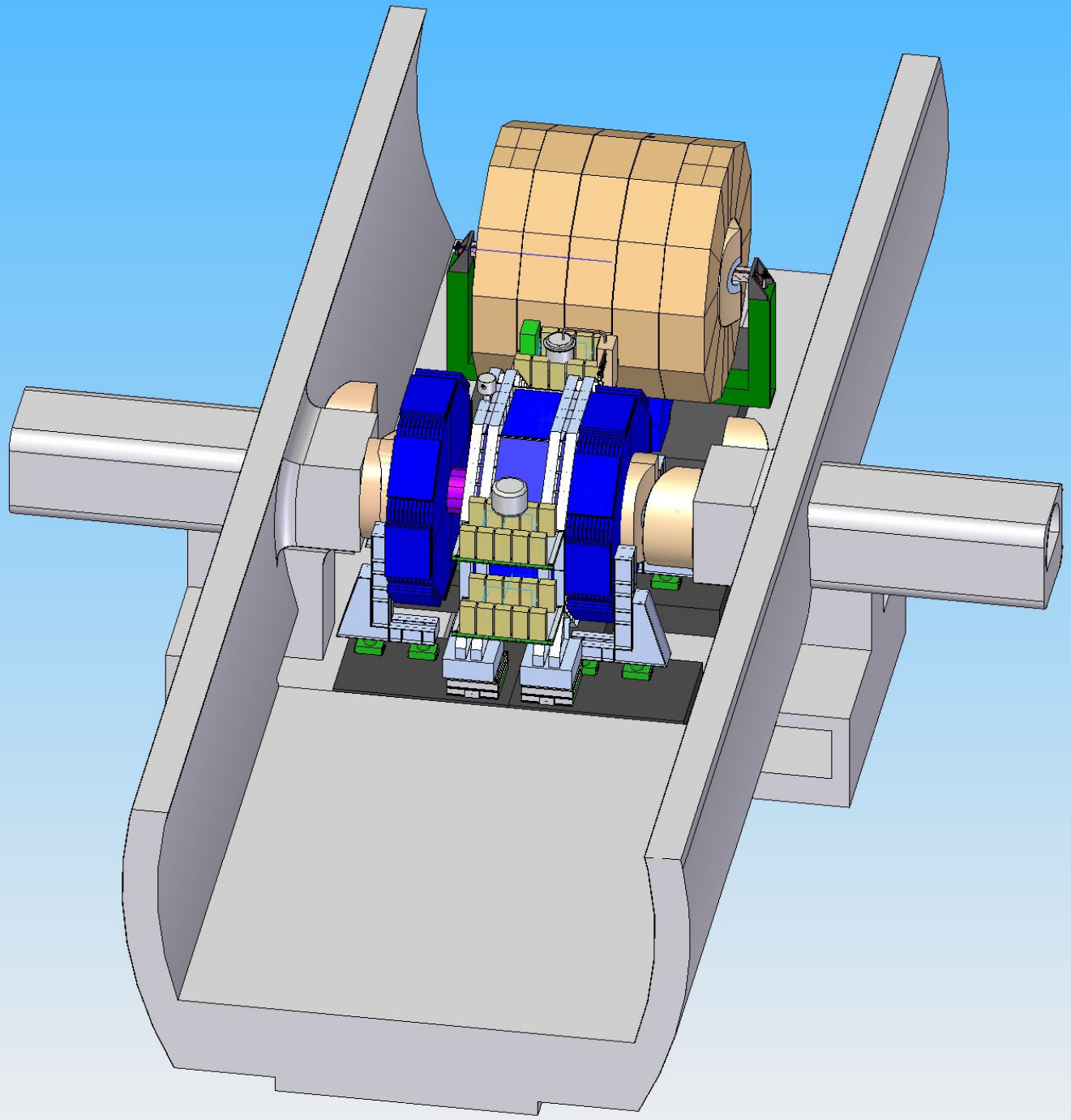
•When showing a possible solution to accommodate ILD with a platform and SiD without a platform (but with half-supports platform-like) doubts have been expressed that an intermediate platform would worsen the vibration performance of the detectors and in particular the stability of QD0.











# Introduction

- This is a valid argument and some effort has been put on this subject.

- The thoughts have been enlarged, not only to the effect of the platform but to the supporting of QD0 in general and on the effect of vibrations.

# Introduction

•In fact the three concepts support QD0 either partially (SiD & ILD) or totally (4$^{th}$) QD0 from the endcap or the cryostat.

•The vibration performance of the stack
ground + (platform) + support + experiment + support of D0
is thus an important parameter

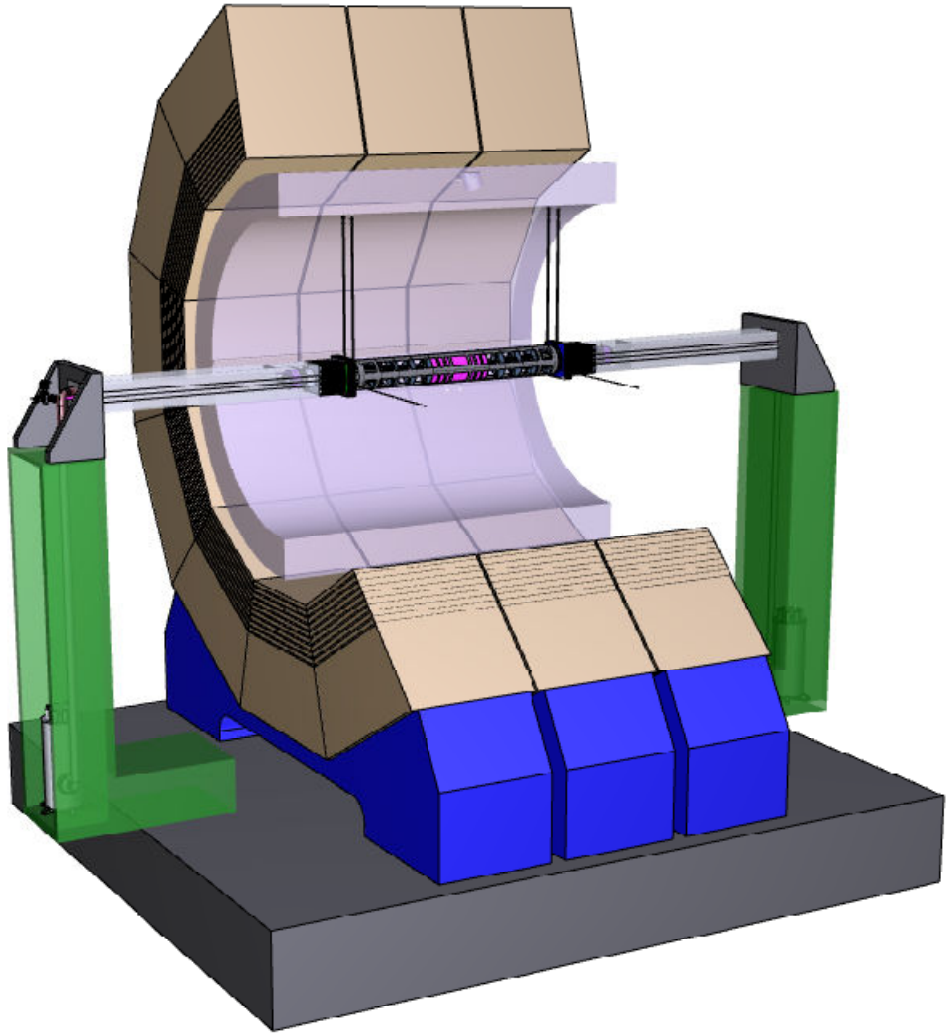
# Introduction

- In all cases the weak point seems to be the support of the experiment and the experiment structure itself

- The large mass involved and the height seem to preclude to have a large resonance frequency.

- It is thus important to understand the consequences before freezing the way QD0 is supported.

The vibration performances of the ILD scheme should be poor

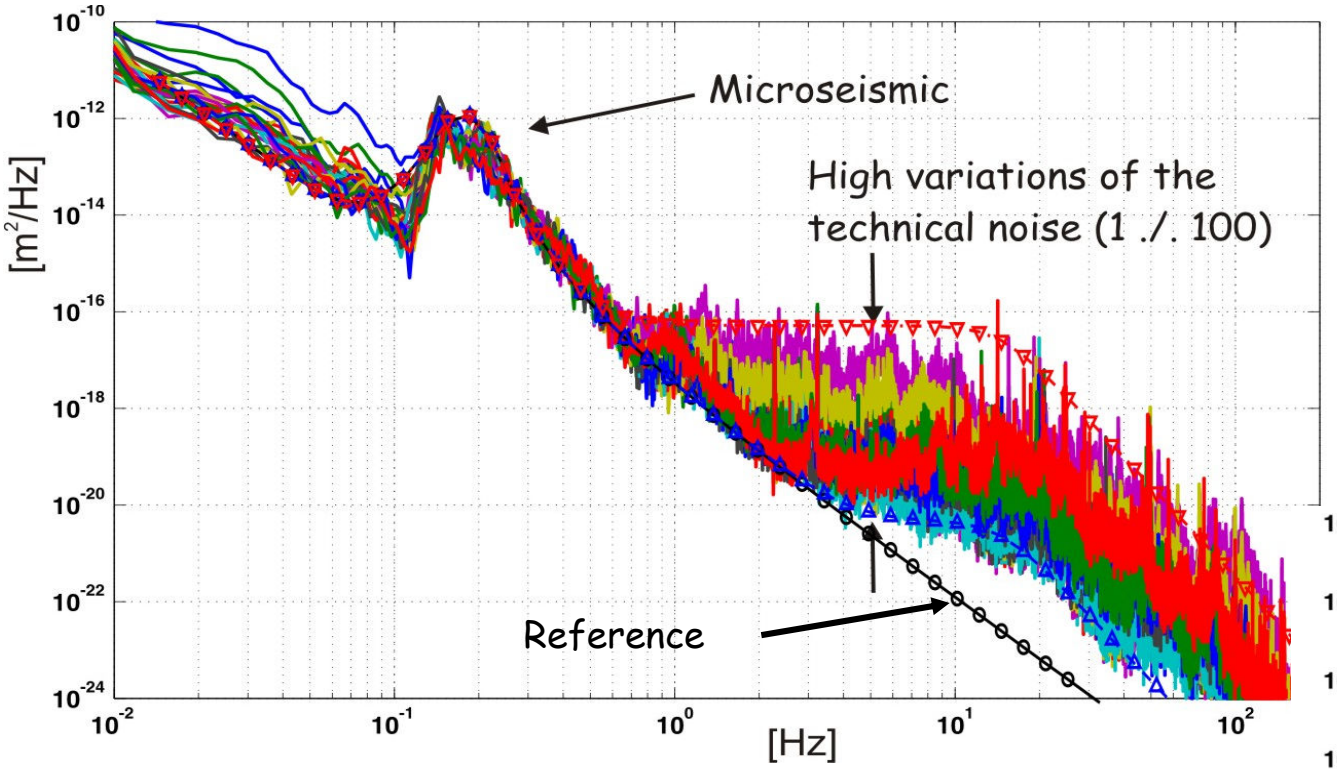


# Excitation spectrum

- There have been measurements in the past around SLD and Desy.
- There have been recent new measurements at CERN as this generic problem is even more important for CLIC.
- A paper by Hauviller (CERN) and al. (including Annecy member of SiD) on these measurements has been attached to the agenda.

# Local excitations

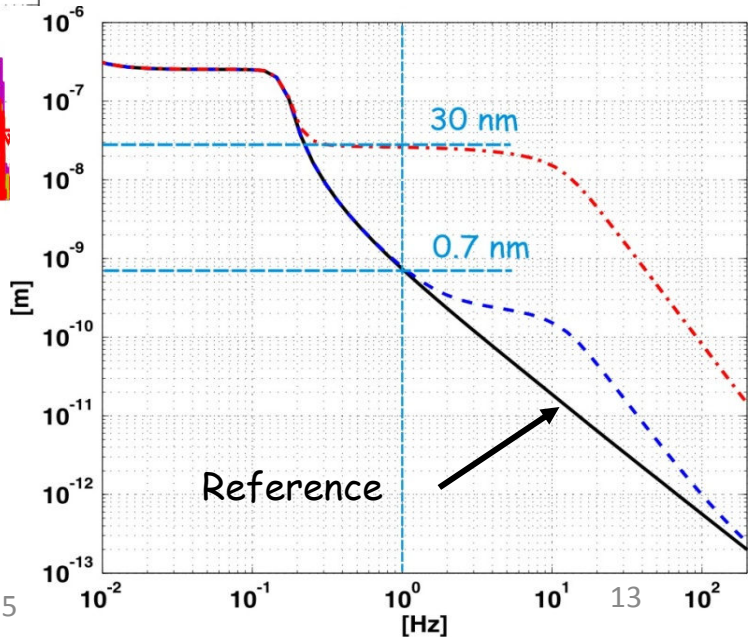
Vertical ground motion




Additional technical noise:

$$N(\omega) = \frac{N_0}{1 + (\frac{\omega}{\omega_0})^6}$$

$$f_0 = 2\pi(Hz)$$




Low technical noise: $N_0 = 5 * 10^{-3}(nm^2/Hz)$

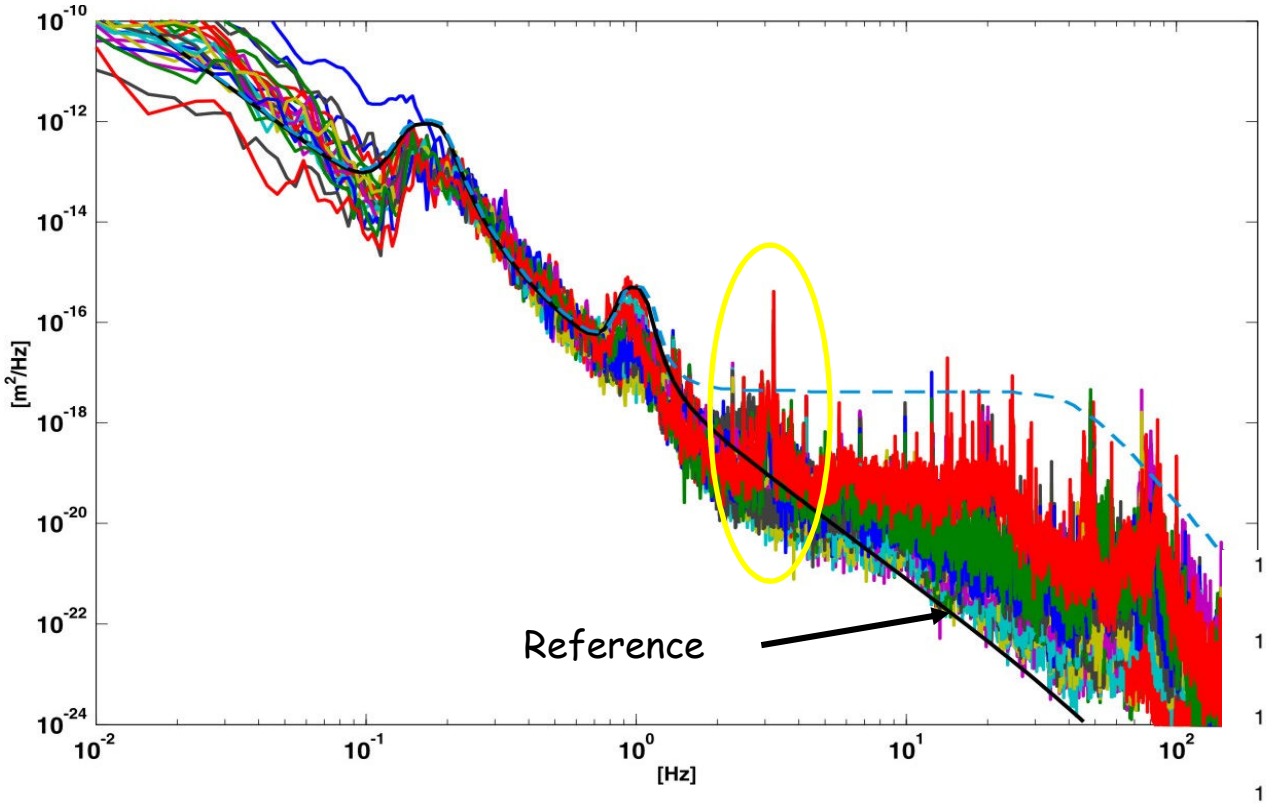
High technical noise: $N_0 = 50(nm^2/Hz)$

**Ref. :** $A = 10^{-4}\ (\mu m^2 s^{-1} m^{-1}); B = 10^{-4}\ (\mu m^2 s^{-3});$

$\omega_1 = 2\pi * 0.14\ (rad/s); d_1 = 5; a_1 = 0.1\ (\mu m^2/Hz); v_1 = 1000\ (m/s)$

# Local excitations

Lateral ground motion

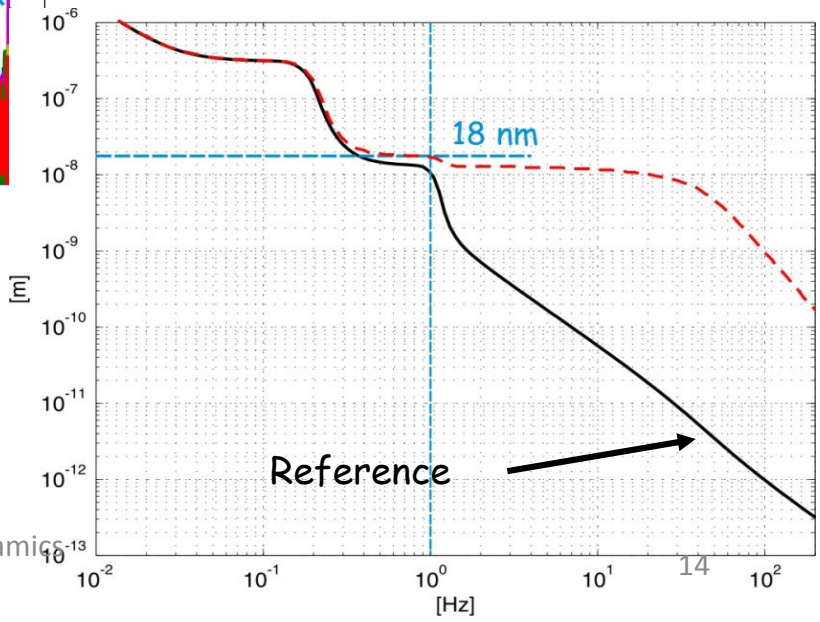



Additional technical noise:

$$N(\omega) = \frac{N_0}{1 + (\frac{\omega}{\omega_0})^6}$$

$$N_0 = 0.5(nm^2/Hz)$$

$$f_0 = 40(Hz)$$




**Ref. :** $A = 10^{-3}\ (\mu m^2 s^{-1} m^{-1}); B = 10^{-2}\ (\mu m^2 s^{-3});$

$\omega_1 = 2\pi * 0.17\ (rad/s); d_1 = 5; a_1 = 0.5\ (\mu m^2/Hz); v_1 = 1000\ (m/s)$

$\omega_2 = 2\pi * 1\ (rad/s); d_2 = 8; a_2 = 5 * 10^{-4}\ (\mu m^2/Hz); v_2 = 400\ (m/s)$

# Results of Measurements

- The coherence of the noise on fairly long distances is confirmed for noise generated far away if the slabs are ‘continuous’.
- There is a good attenuation underground, but clearly noise generated locally must be isolated.
- Equipment and people exist and it would be good to suggest complementary measurements more relevant to the QDO supporting scheme.
- A clear addition could be measurements in machine tunnel on both sides of an experimental area, and measurements around the CMS plug, and on the CMS endcap, as maybe a CLIC/ILD effort.

# Simulations

- Having some idea of the excitation spectrum then some simulations can be performed.
- I understand  that Y. Sugimoto would be ready to model the present QD0 supporting scheme.
- I thing the same simulation effort will be started in SiD.

# Then after look at the effect of the platform