

Status of WP3.2

Seismic sensor development and vibration characterisation

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Content

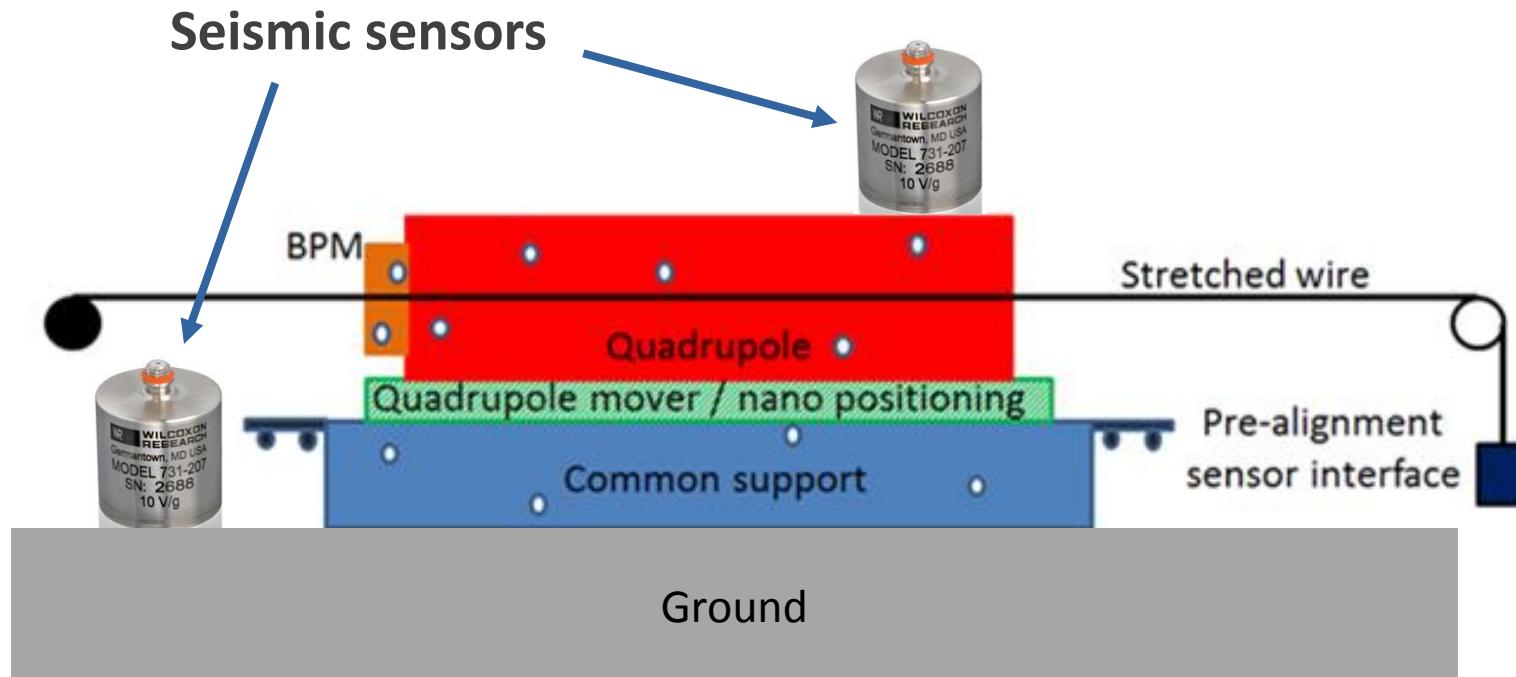
- Quick reminder.
- Sensor's resolution measurement.
- Issues of resolution measurements.
- Direct comparison of sensors.
- Status of sensor's assembly.



Reminder

Why do we need seismic sensors?

- To know how ground motion influences characterization of BPM.
- But also for stabilisation of MBQ and QD0 in linac assembly

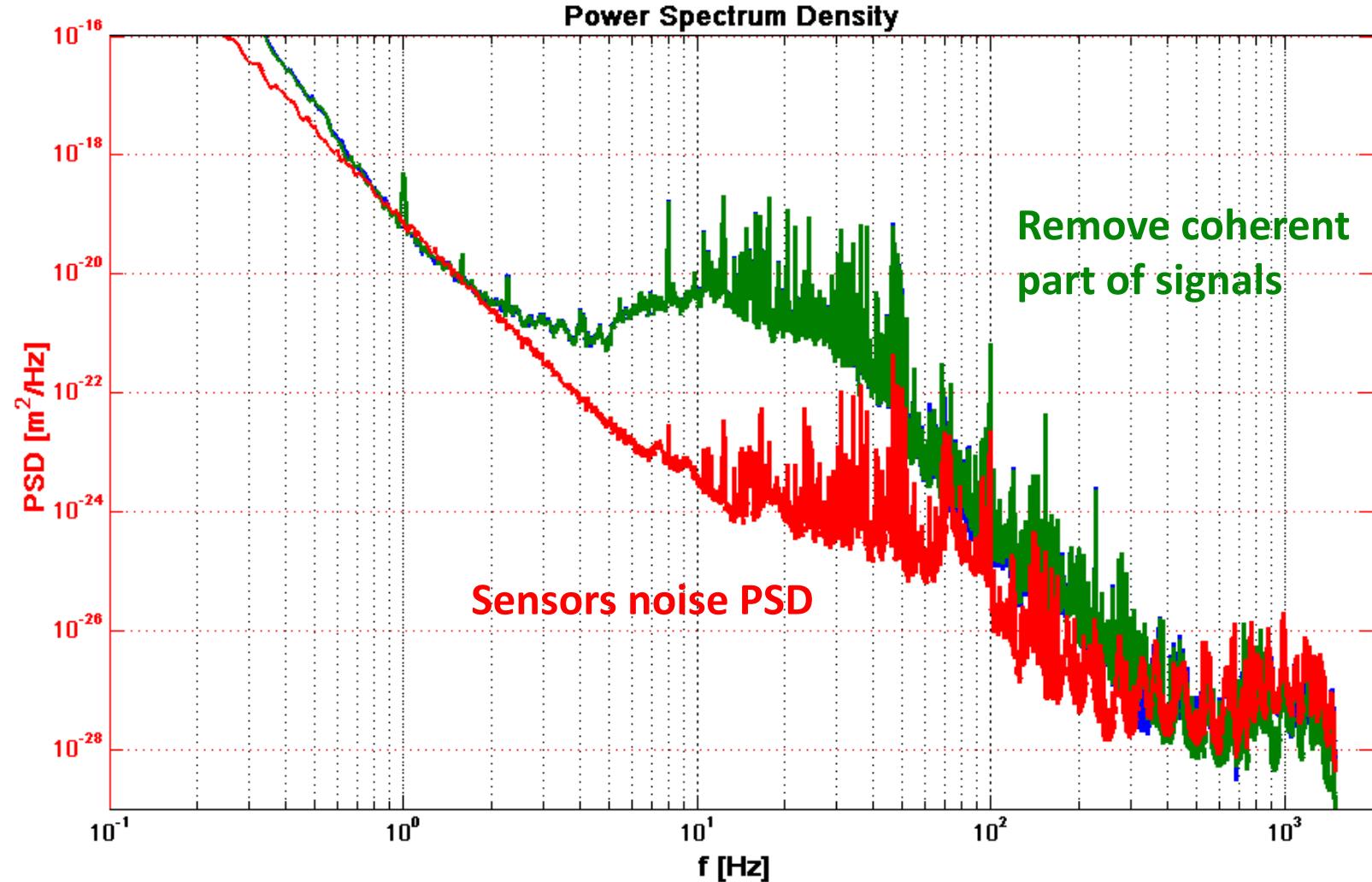


How do we measure sensor's resolution?

Note:
resolution = noise



Main problem is that perfect quiet place doesn't exist!

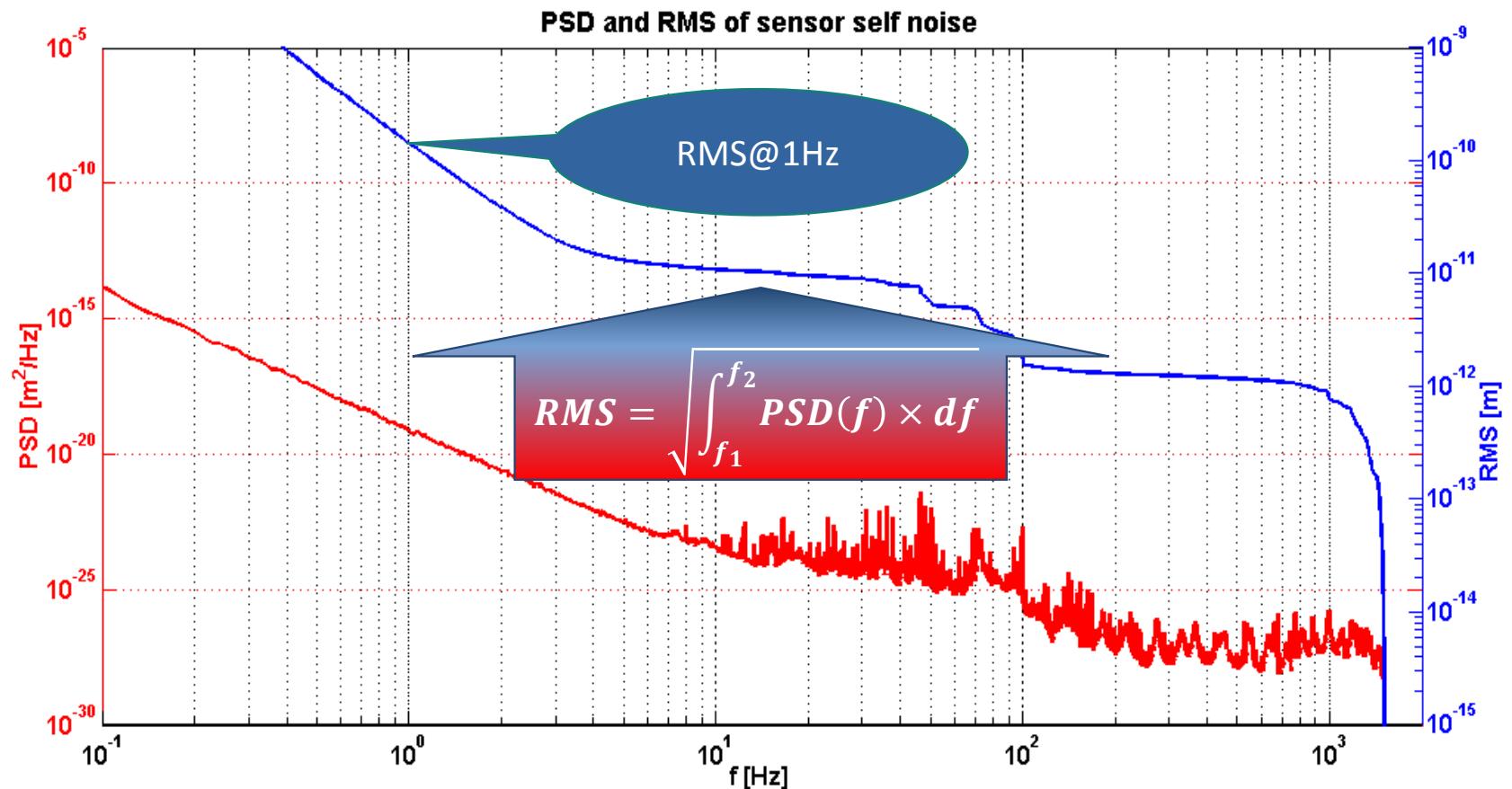


What do we understand by resolution?

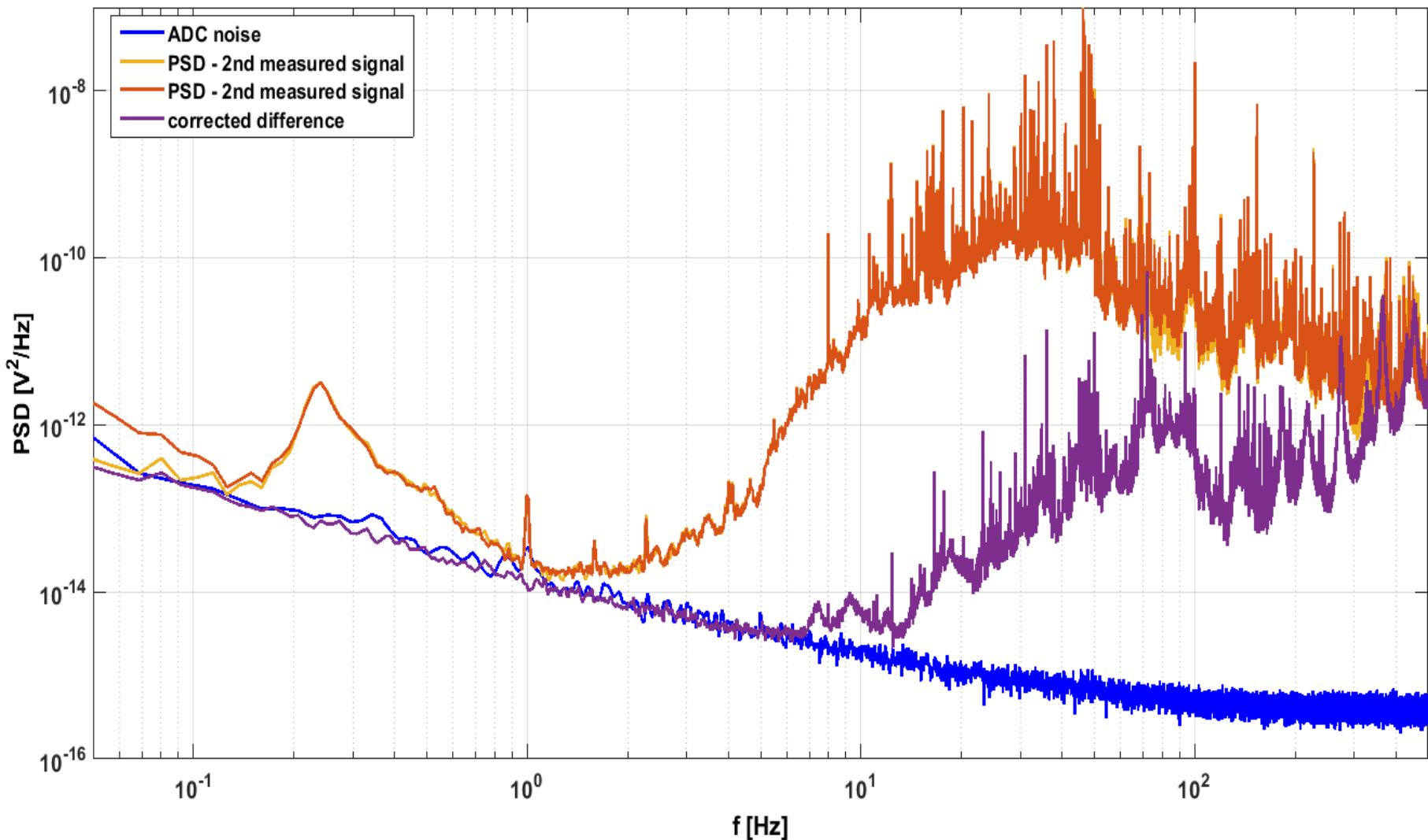
Bandwidth = $0.1 \sim 200$ Hz

Resolution $\leq 0.1\text{nm RMS@1Hz}$

RMS or “average” motion in the bandwidth of interest.



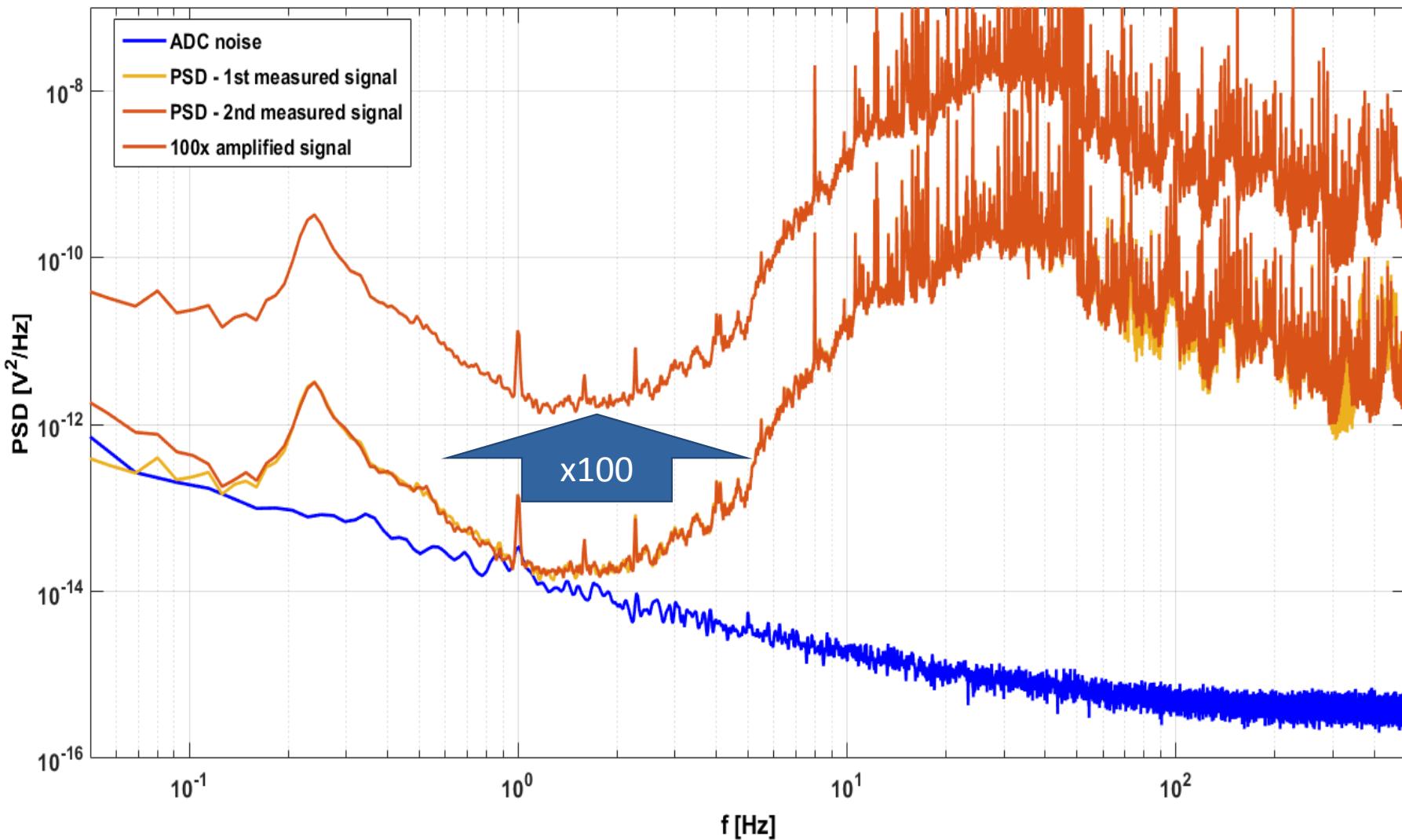
Limitations of acquisition HW



PACMAN



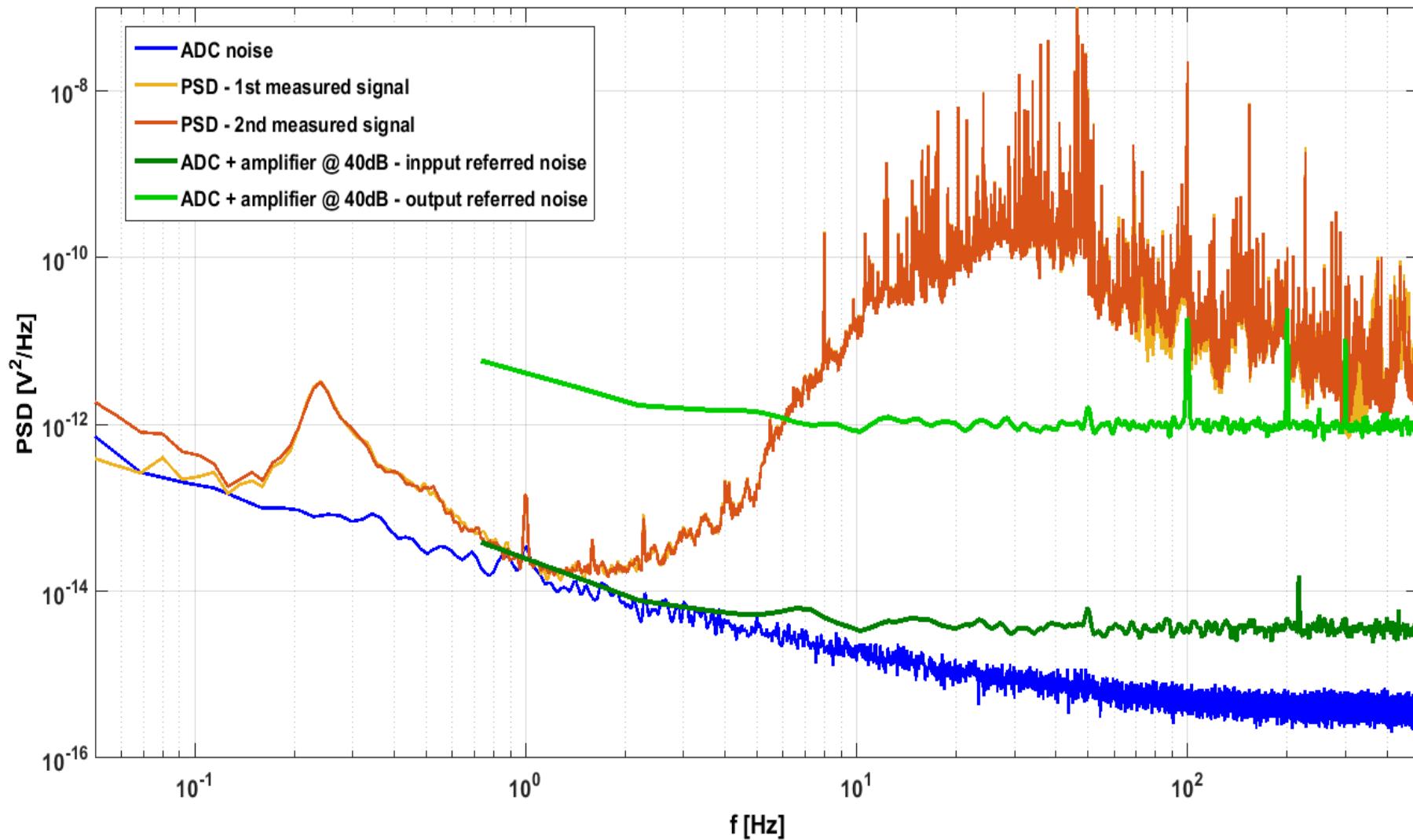
We can amplify the signal from sensors.



PACMAN



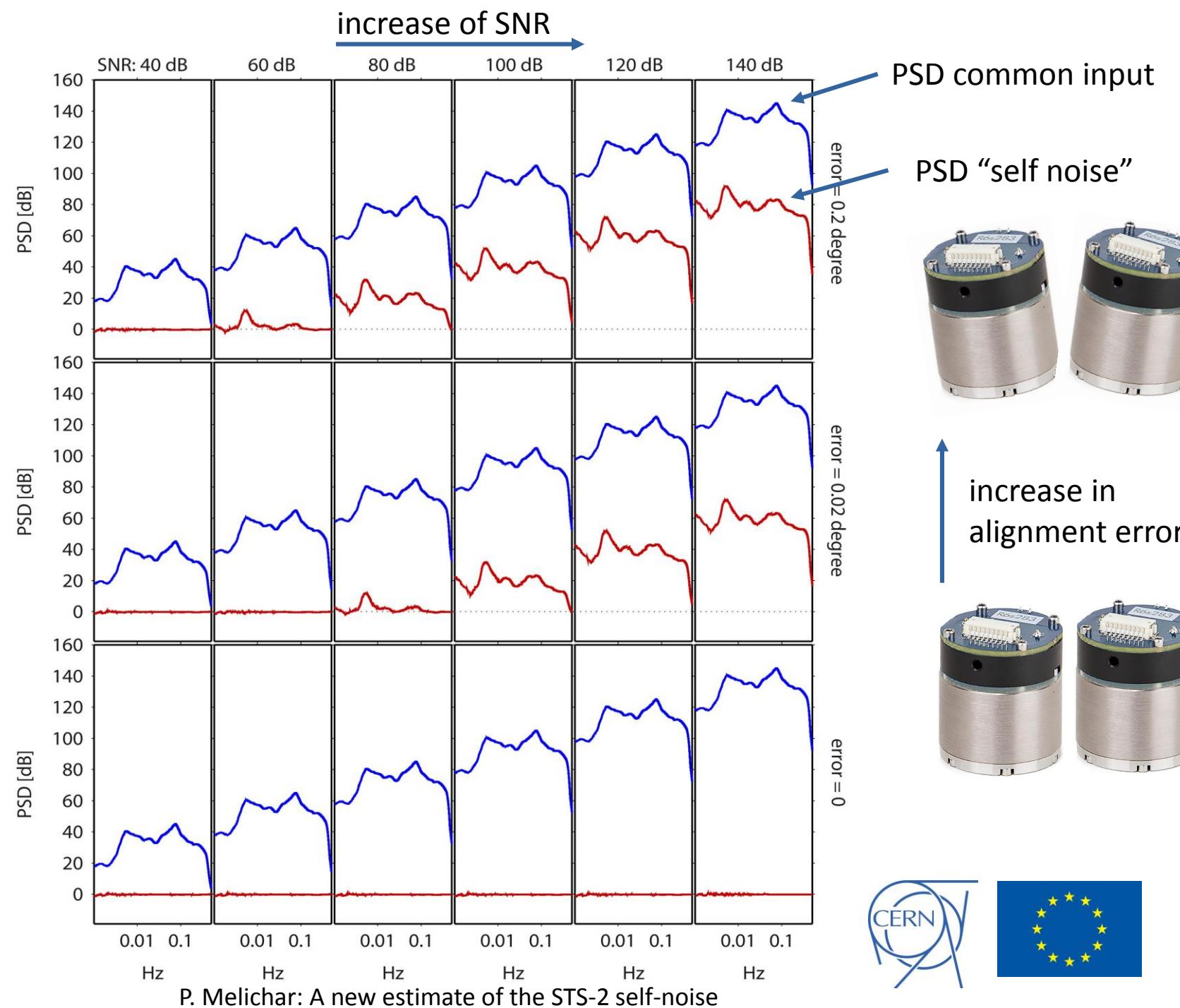
Is amplification a solution?



PACMAN



Misalignment as another cause of troubles.



Sources of data mismatch



Many factors influence the results:

- Sensors alignment
- Mechanical design
- Ambient environment (temperature, humidity, pressure, ...)
- Data acquisition hardware
- Signal processing algorithm

This makes comparison very difficult and unclear.

Common protocol for measurements is needed!



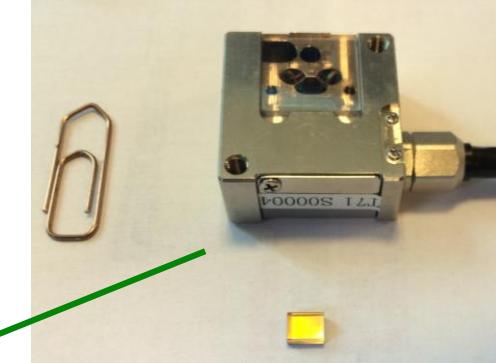
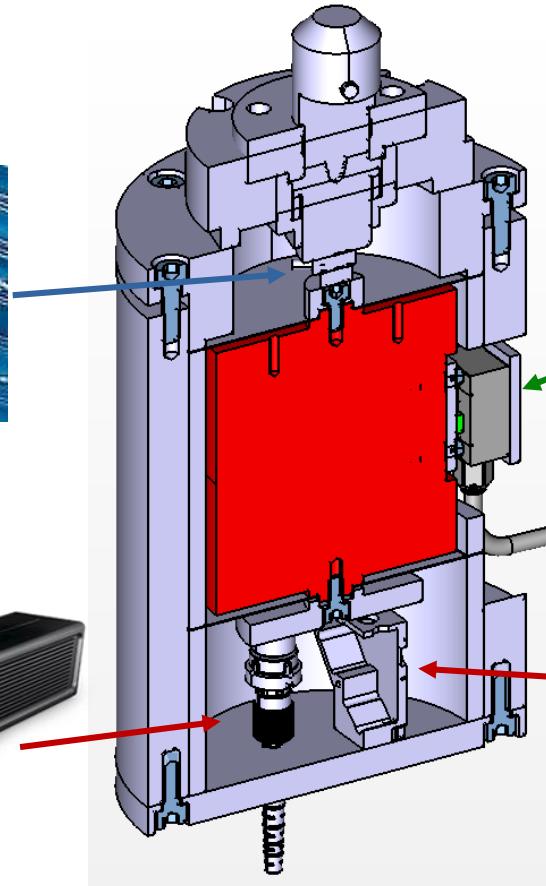
Implementation
of displacement
sensors into the
same mechanical
body

Direct comparison = no data ambiguity

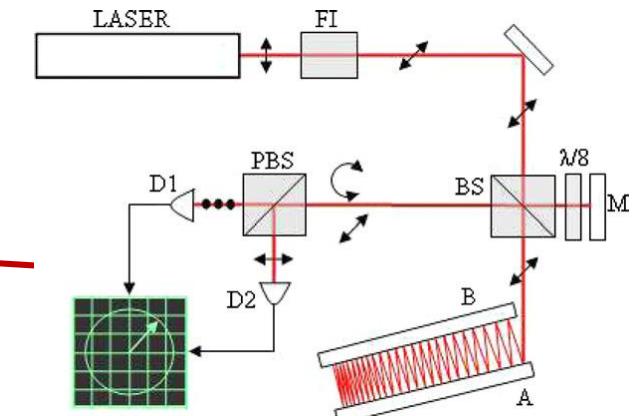
Capacitive
sensor



Reference
interferometer



Optical encoder

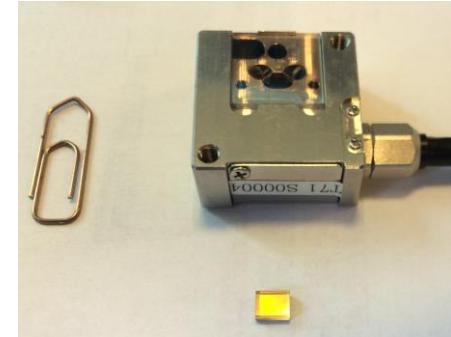


Multi-pass interferometer

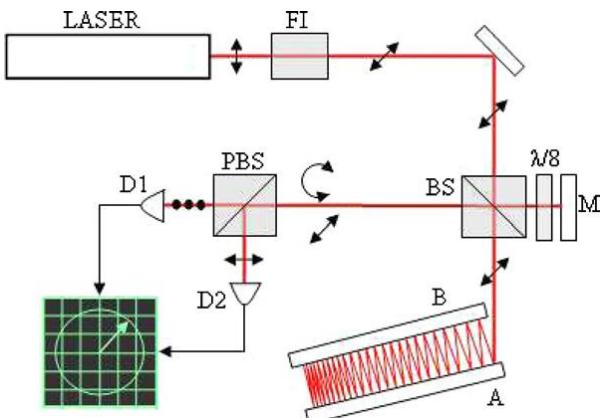
Status of sensor's assembly



Not delivered yet



Already broken
and being repaired



Testing in CZ

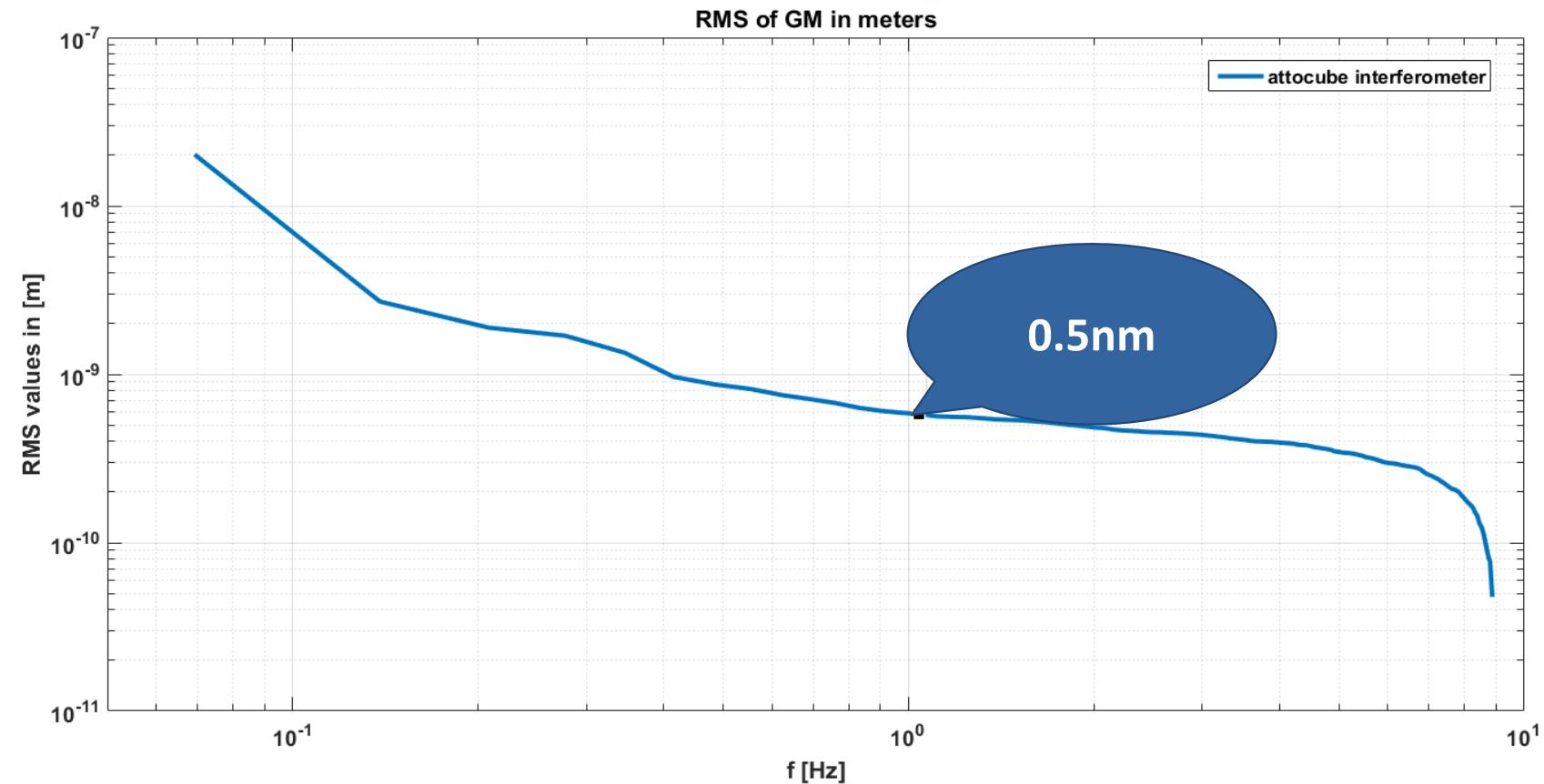


Installed and being tested

Resolution of the reference interferometer



- Fabry-Perot interferometer



Conclusions

- Resolution in a bandwidth of interest is the most important parameter and it is very difficult to measure it properly.
- In order to be able to compare data it is important to agree on resolution measurement protocol!
- Direct comparison of sub-nm displacement sensors to overcome data ambiguity.
- Status of the sensors implementation.

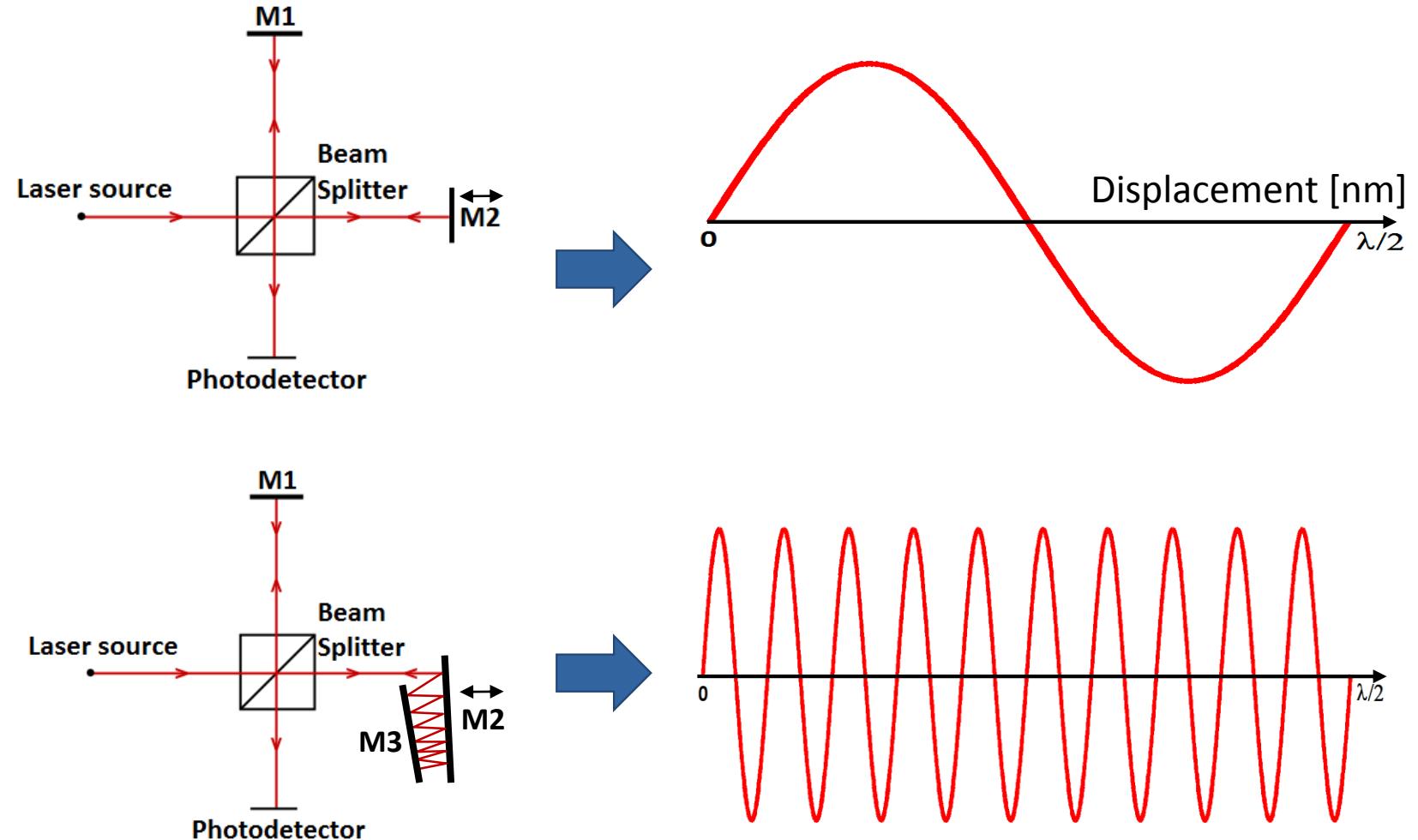


Thank you for your
attention!



Increasing
sensitivity to
improve
resolution

Implementation of multi-reflection Michelson interferometer



PSD resolution of different sensors.

