

BPM3 moving characterization with PI actuators

thermal effects / vibrations effects
Stabilization in position / Resolution

Interferometer characterization (without mover) :

- effect of temperature, mirror on the surface table.
- mirror on the interferometer head,

Vibrations effects (using the interferometer in 'vibrometer mode') :

- on the surface table,
- effects with the lateral mover,
- on the BMP3 (5V),

BPM3 movers stabilization :

- without PI 'B' mover in lateral position,
- with PI 'B' in lateral position.

Effect of the 25m extension cable :

- BPM3 movers without extension cable (5 to 5,001V),
- PI 'B' mover with 25m extension cable (5 to 5,001V).

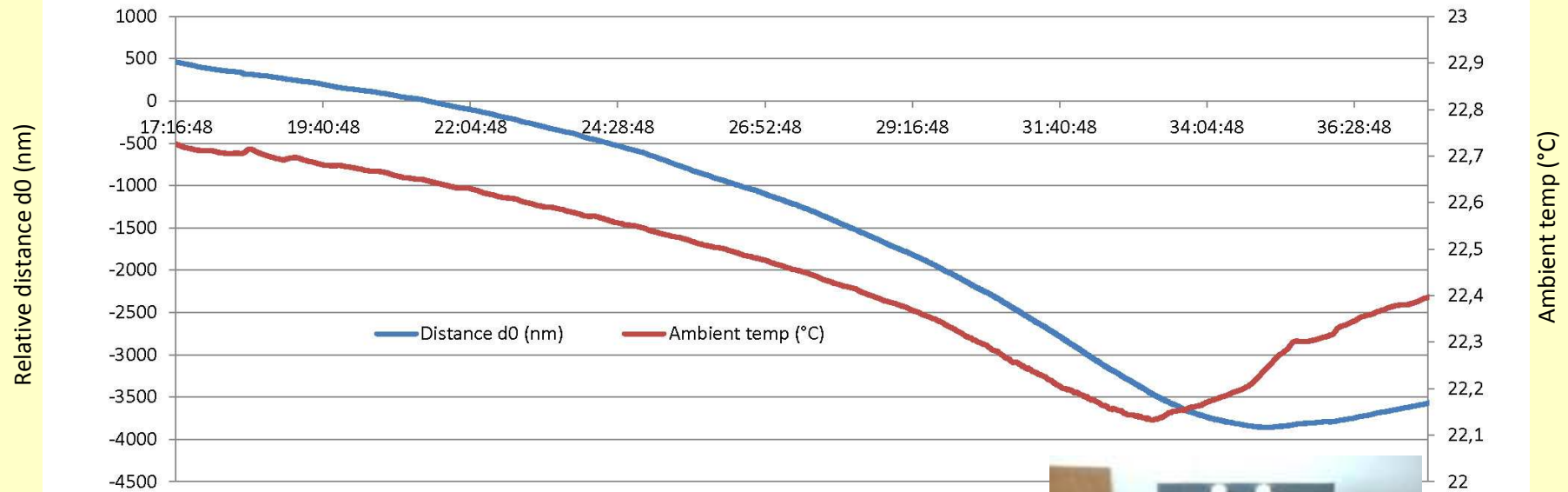
Conclusion :

Interferometer characterization (No mover / no BPM)

Effects of temperature

During approximately 20 hours, the distance between the mirror and the interferometer head is recorded.

The ambient temperature is recorded too.



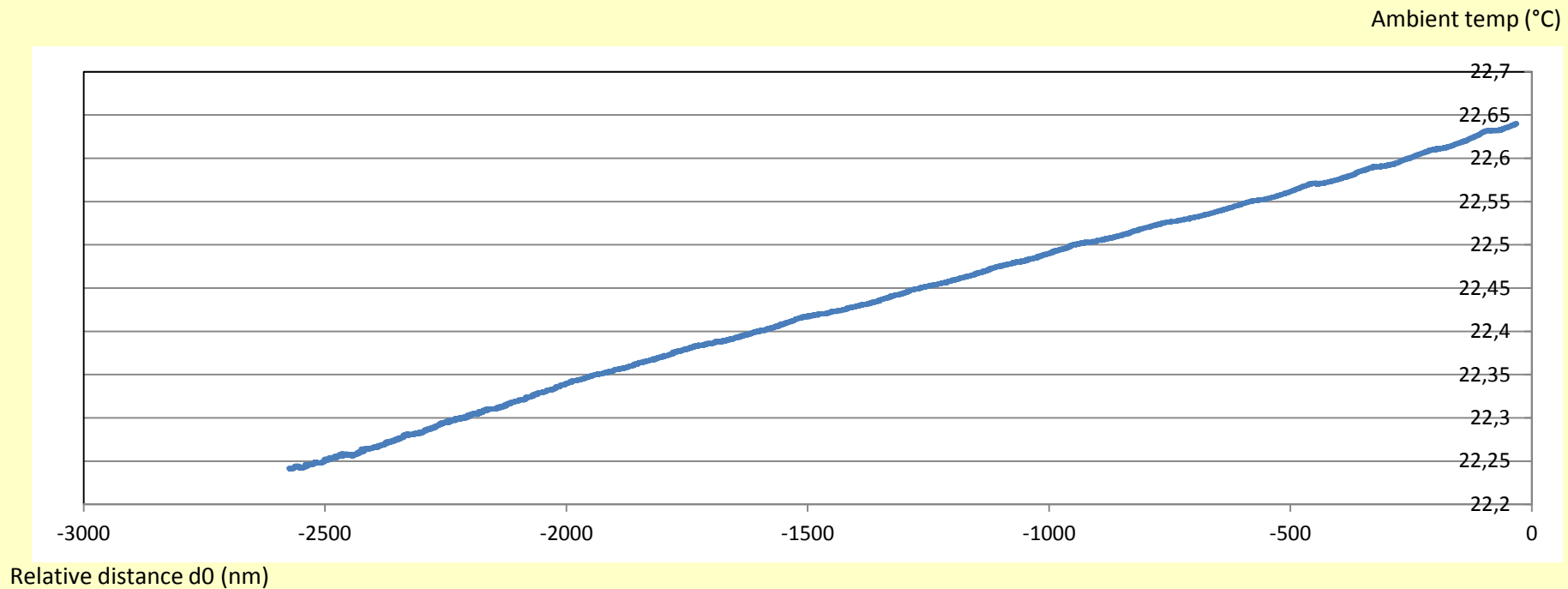
The 2 curves are similar. This shows the result of dilatation.

Mainly due to the aluminium support.



Effects of temperature

To approximate the dilatation effect, focus of the previous curve in the period 21h36 – 31h12 (10 hours approx).

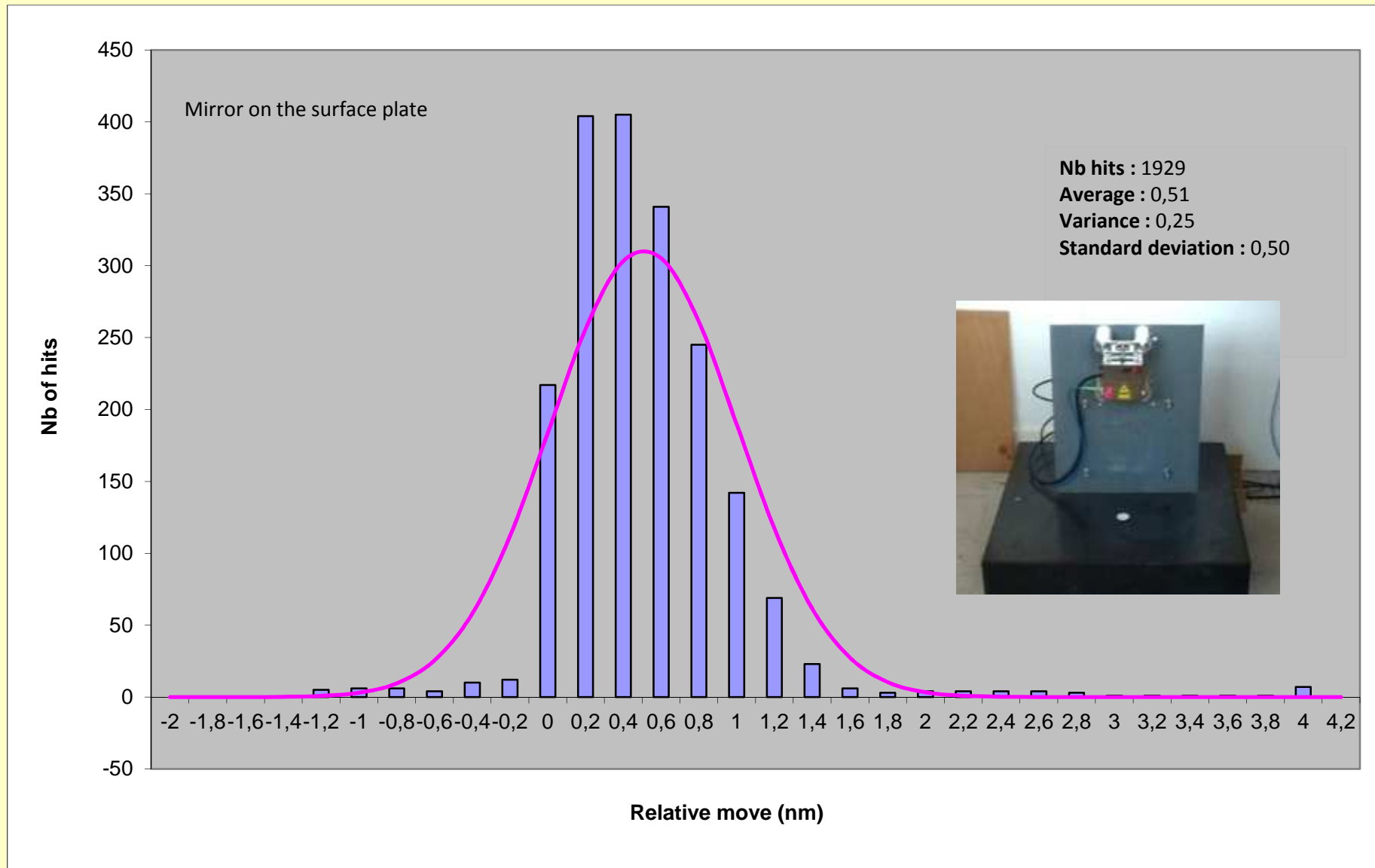


With length of the aluminium support : 280 mm

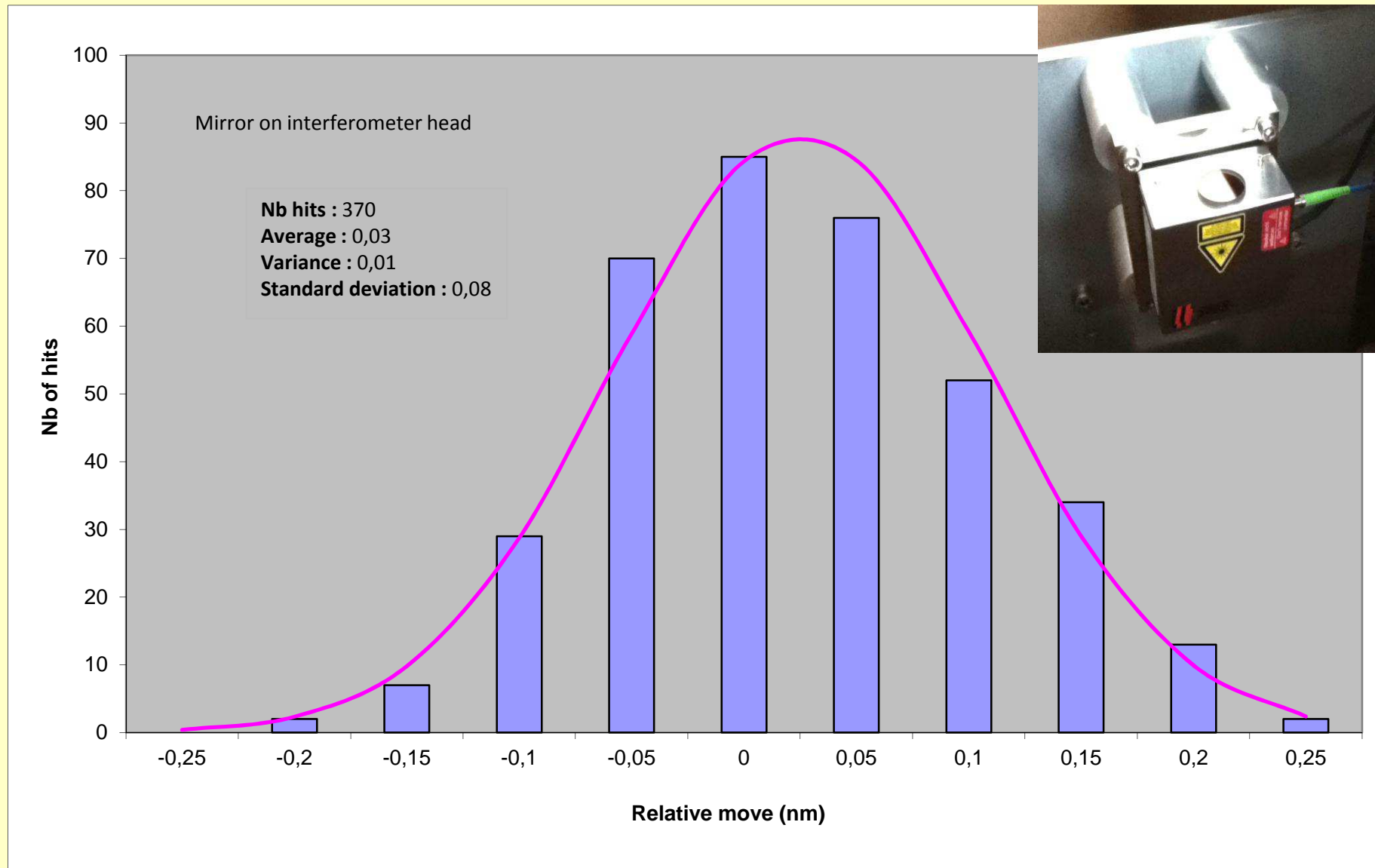
→ Measured dilatation coefficient = $(-2574+31)E-9/280E-3/(22,24-22,64) = 22E-6 /°K$

Nb : The theoretical dilatation coefficient for Aluminium is $24E-6 /°K$.

Results with mirror on the surface plate

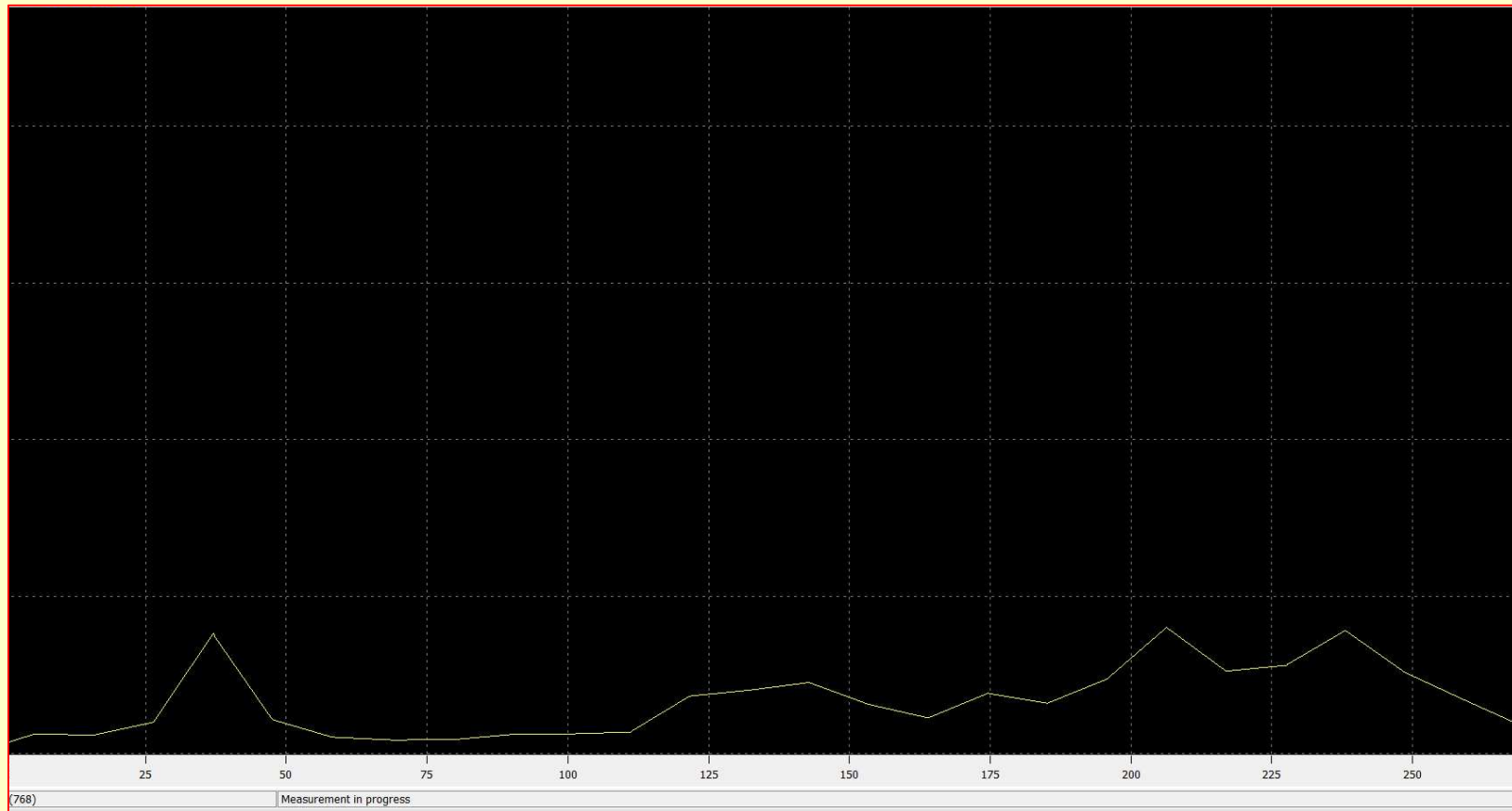


Results with mirror on the interferometer head



Vibrations effects using the 'vibrometer mode'

On the surface table

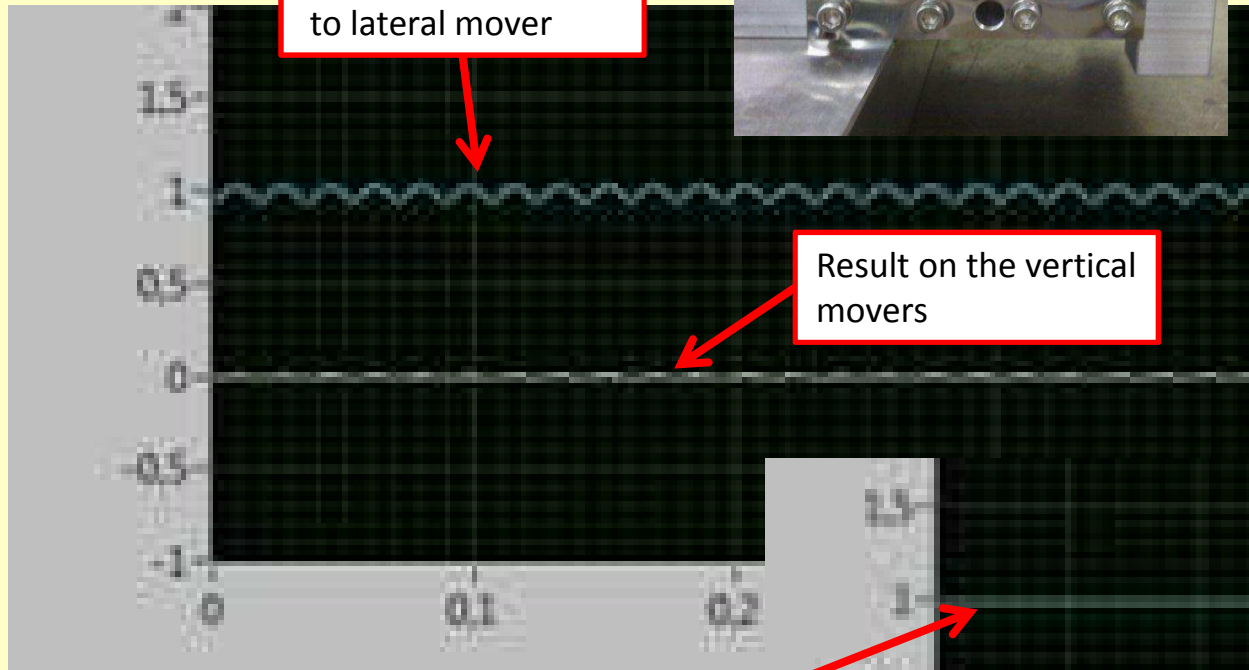


Effect of lateral mover

60Hz oscillation due to lateral mover



Result on the vertical movers



The 3 vertical movers and the lateral mover are installed.

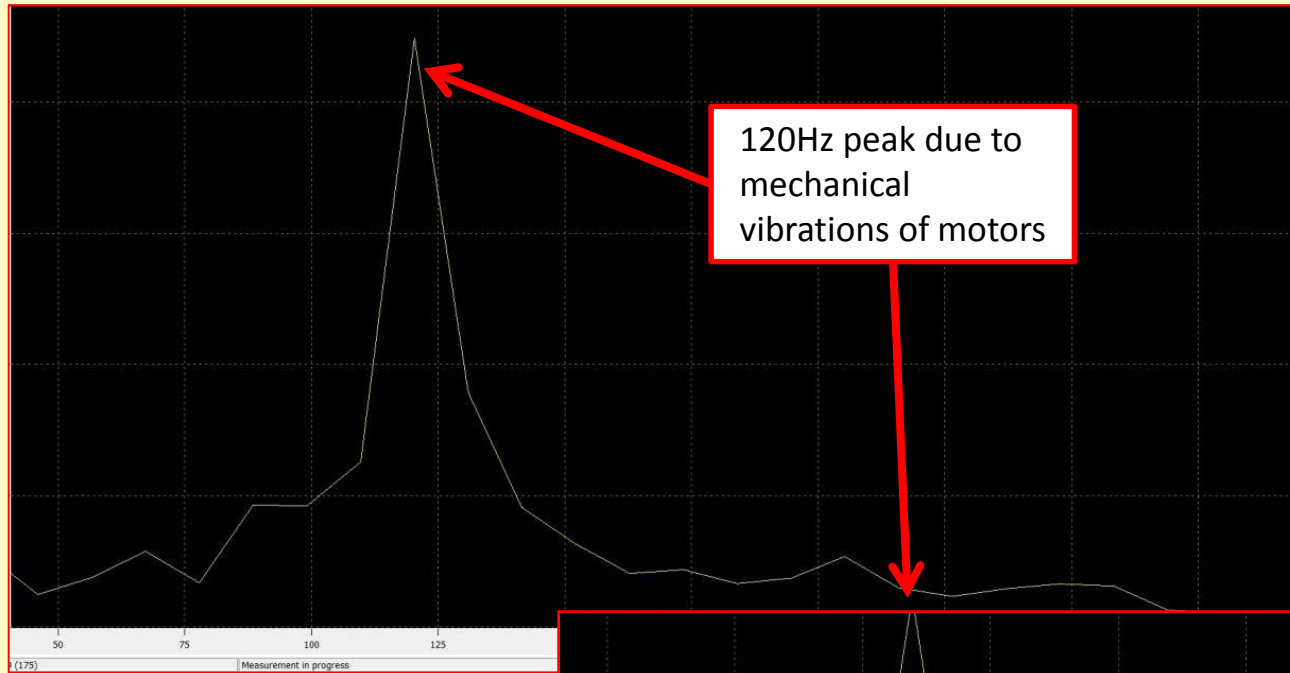
It is the complete configuration for BPM3 move.

With the modification on one hinge



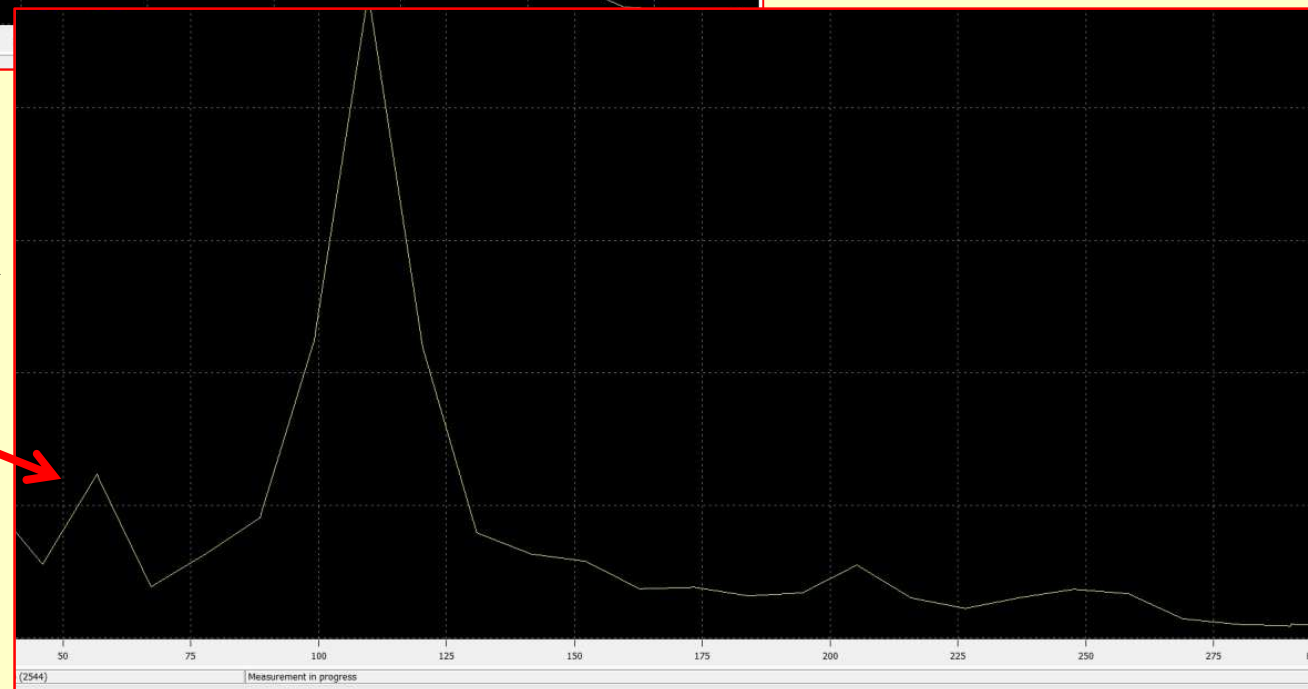
Result on the vertical movers

BPM3 – all PI movers



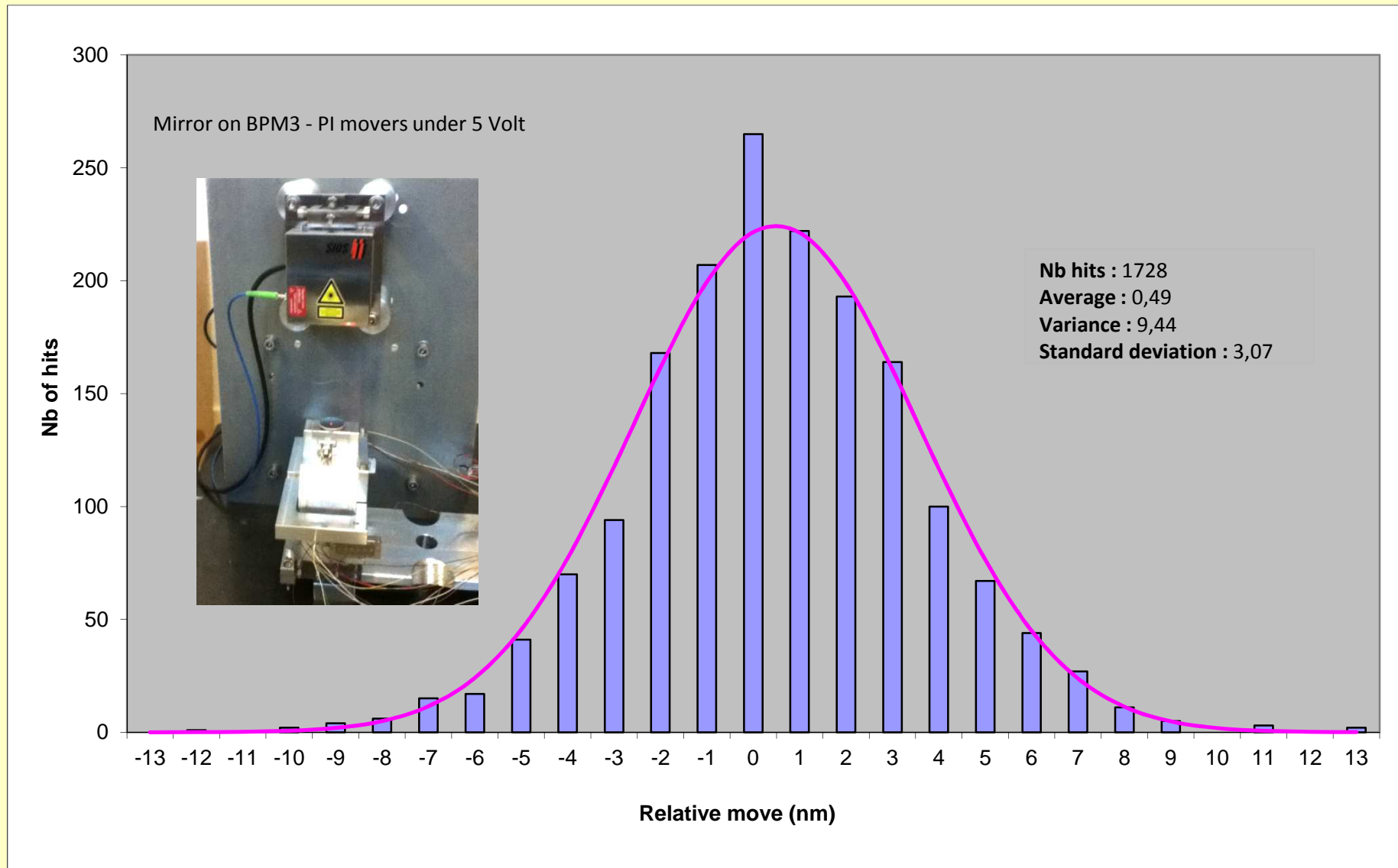
Movers with 5V

60Hz peak due to lateral mover

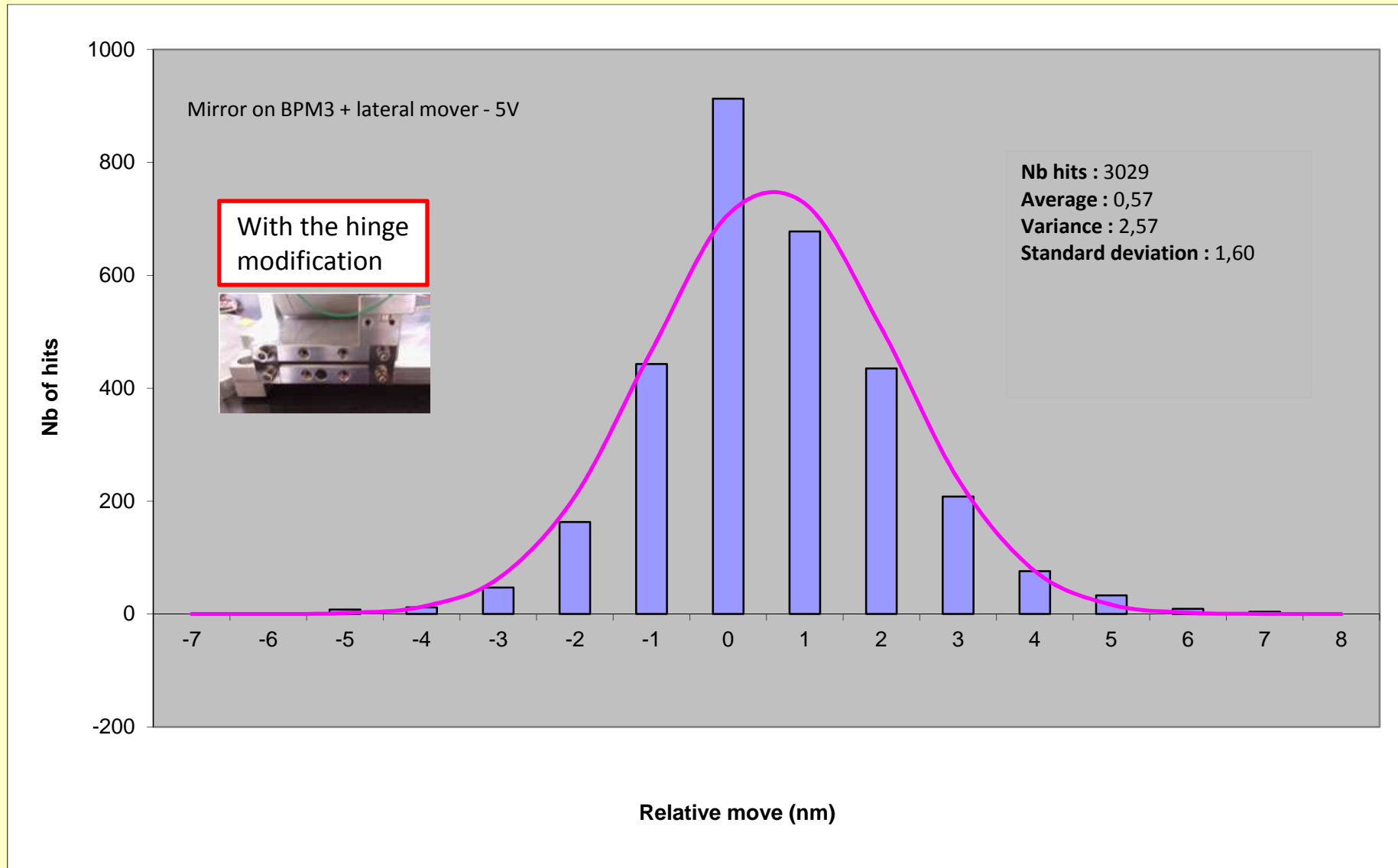


BPM3 movers stabilization

Without lateral mover

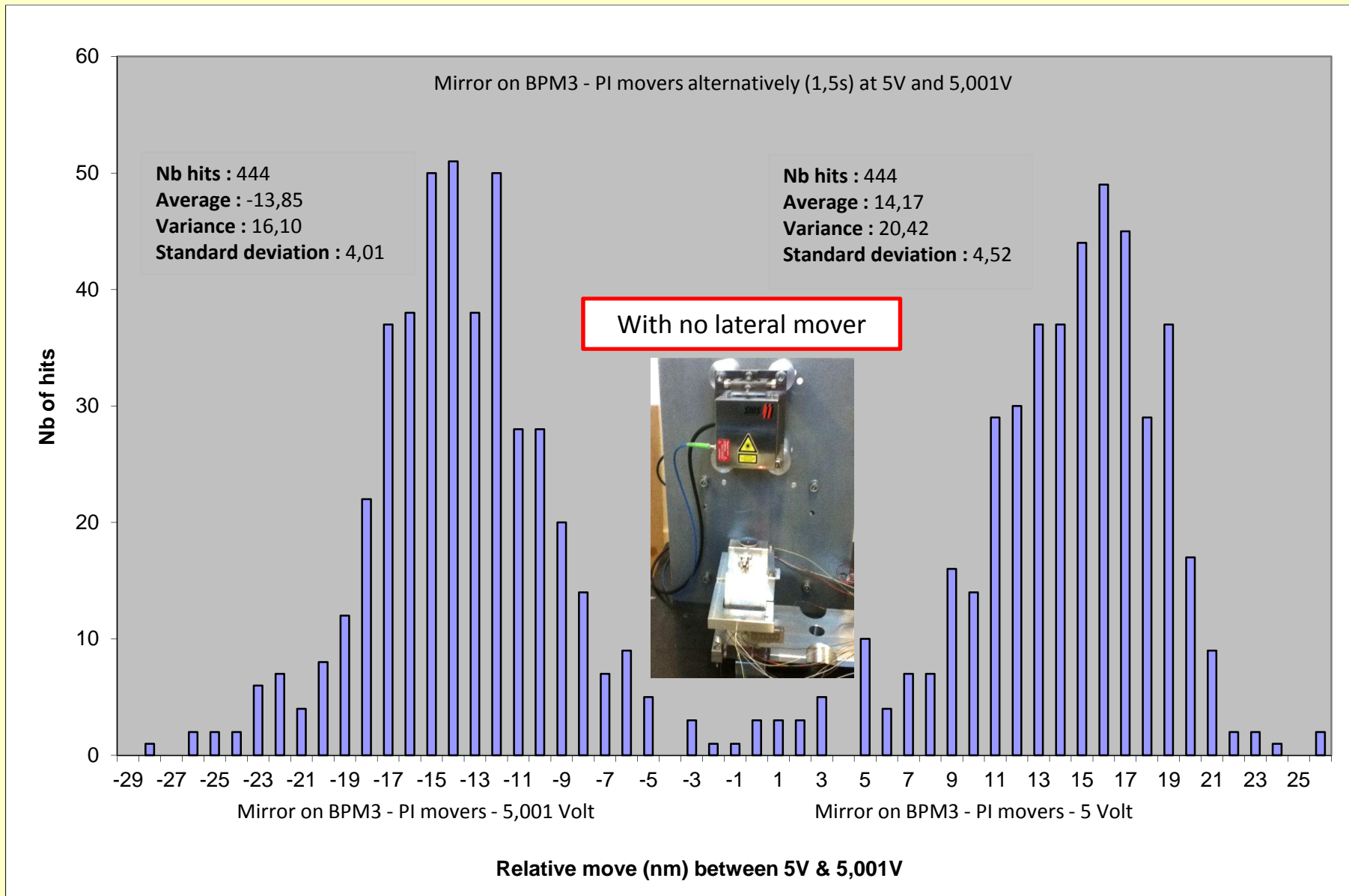


With all PI movers

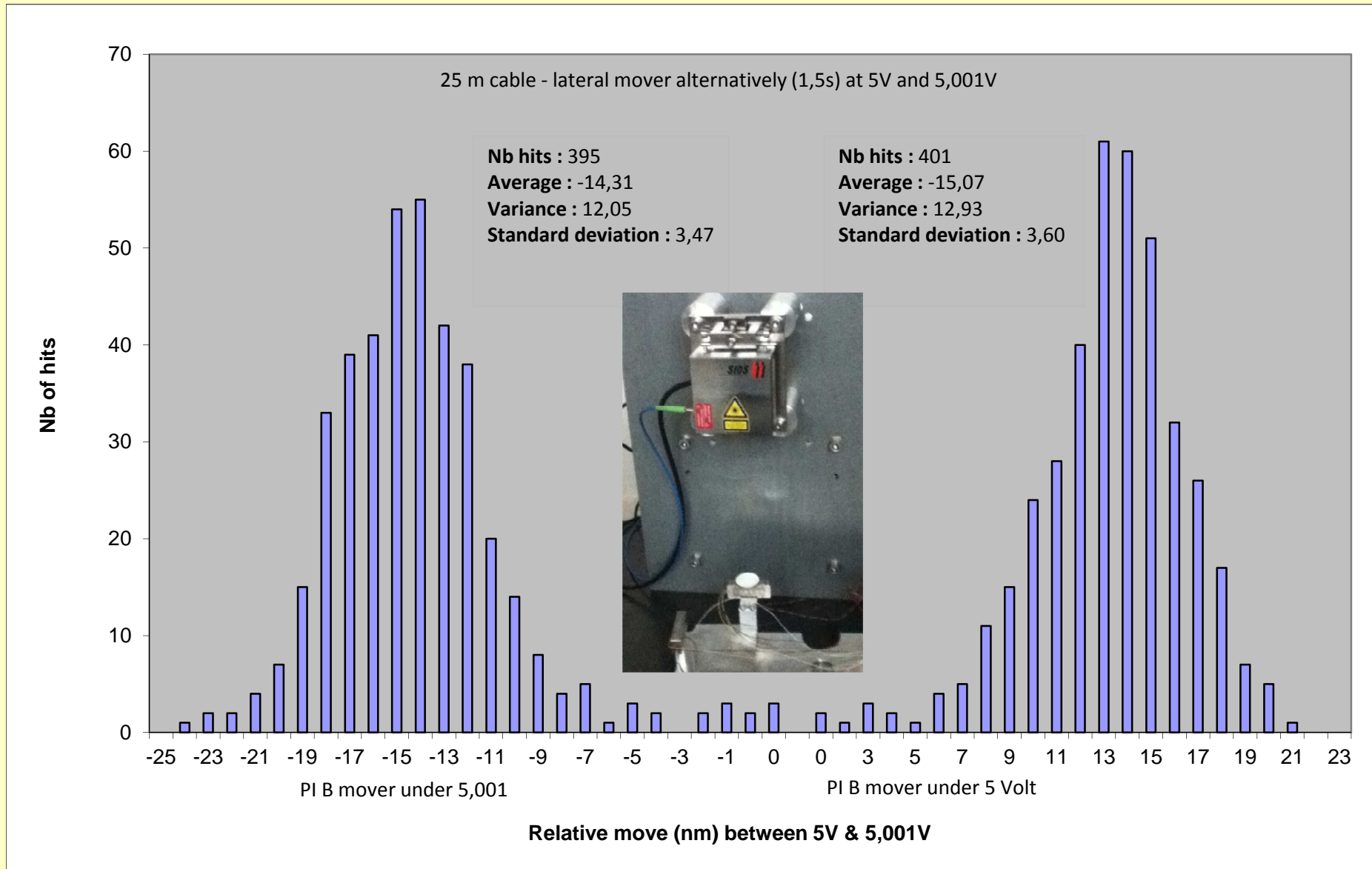


Effect of the 25m extension cable

BPM3 movers resolution



lateral mover (in vertical position) resolution



Conclusion

Interferometer alone :

- standard deviation < 0.1 nm !

Effect of temperature :

- to be corrected or regulated (by external heating).

Effect of vibrations :

- one hinge has been modified to minimize 60hz vibration (due to lateral mover).

BPM3 movers stabilization :

- with all movers, at mid stroke : standard deviation < 2nm (vertical position).

Effect of the 25m extension cable :

- no quantified difference with or without extension cable on minimum step (resolution # 30nm)

To be done, with the extension cable :

- for each mover (Cedrat & PI) : stabilization and resolution,
- for each equipped BPM (BPM3 / BPM1&2), stabilization and resolution.