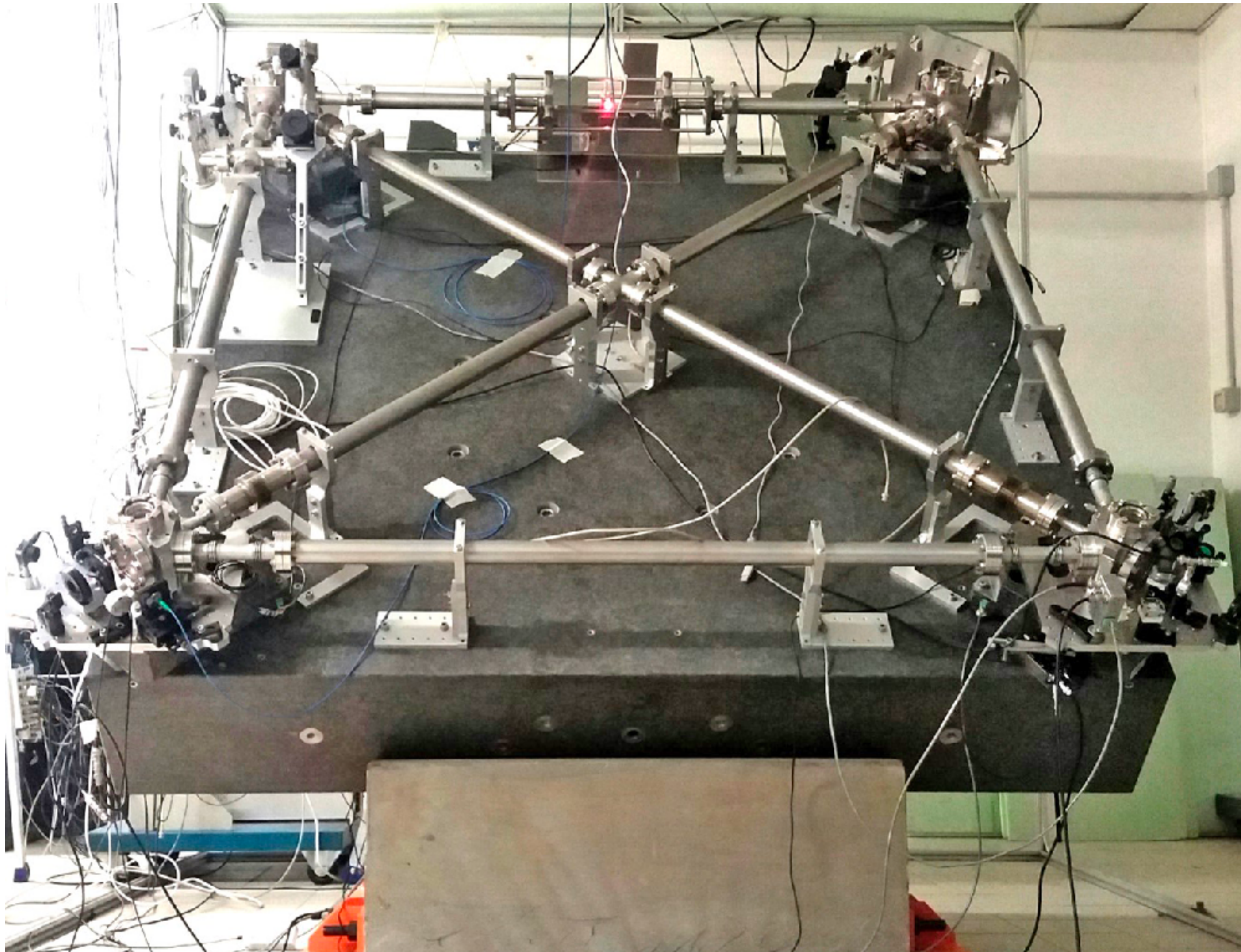




Geometry control of large frame square cavity ring laser Gyroscope

Umberto Giacomelli

GP2 Apparatus

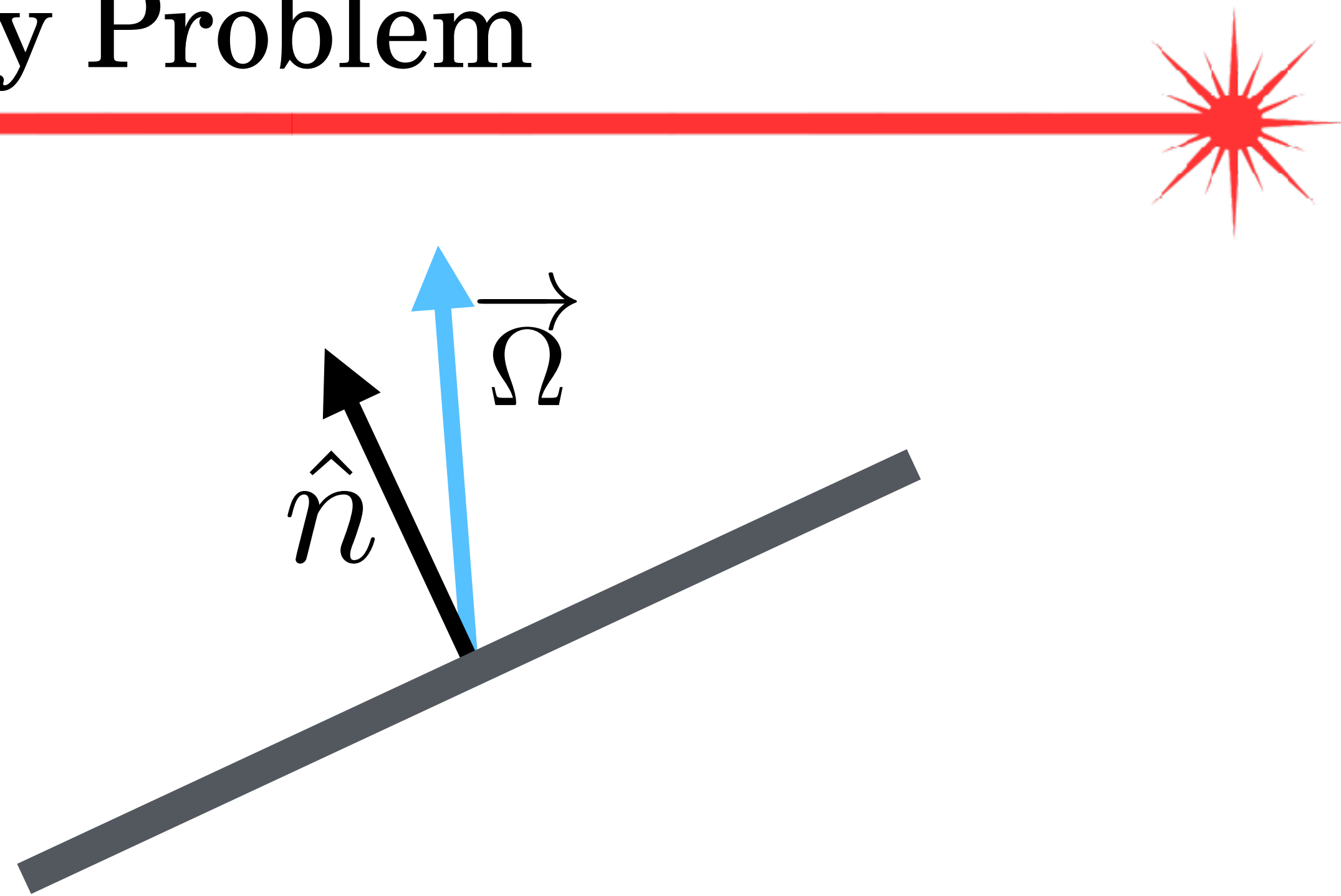


Side	1.6m
Ring cavity Q	5×10^{11}
Diagonal cavity Q	10^9
Orientation	Max Signal
Sagnac frequency	184Hz

3 mono-axial PZT
1 tri-axial PZT

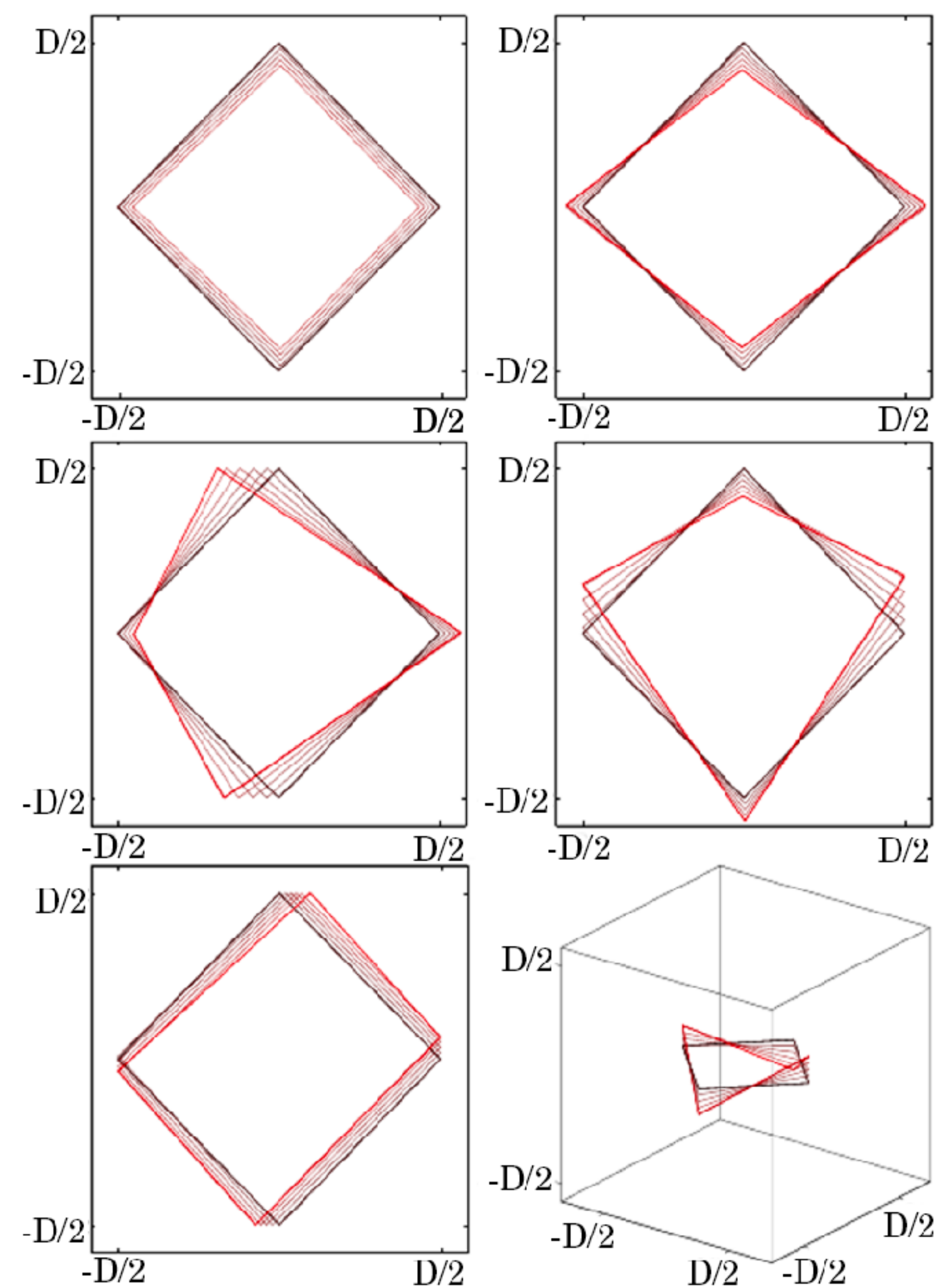
Belfi J. et al. Class. Quant. Grav. 31, (2014)

Geometry Problem



$$f_S = \frac{4A}{P_\lambda} \hat{n} \cdot \vec{\Omega}$$

RLGs are sensitive to scale factor variation

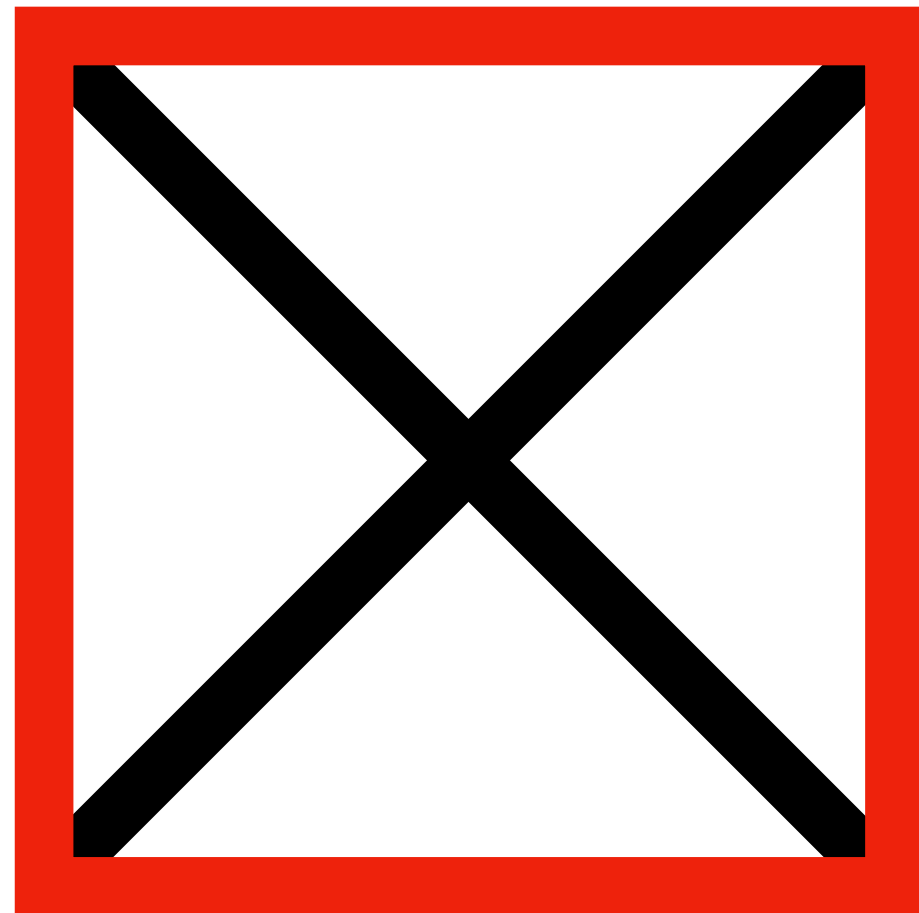


Santagata R. et al. Class. Quant. Grav. 32, (2015)

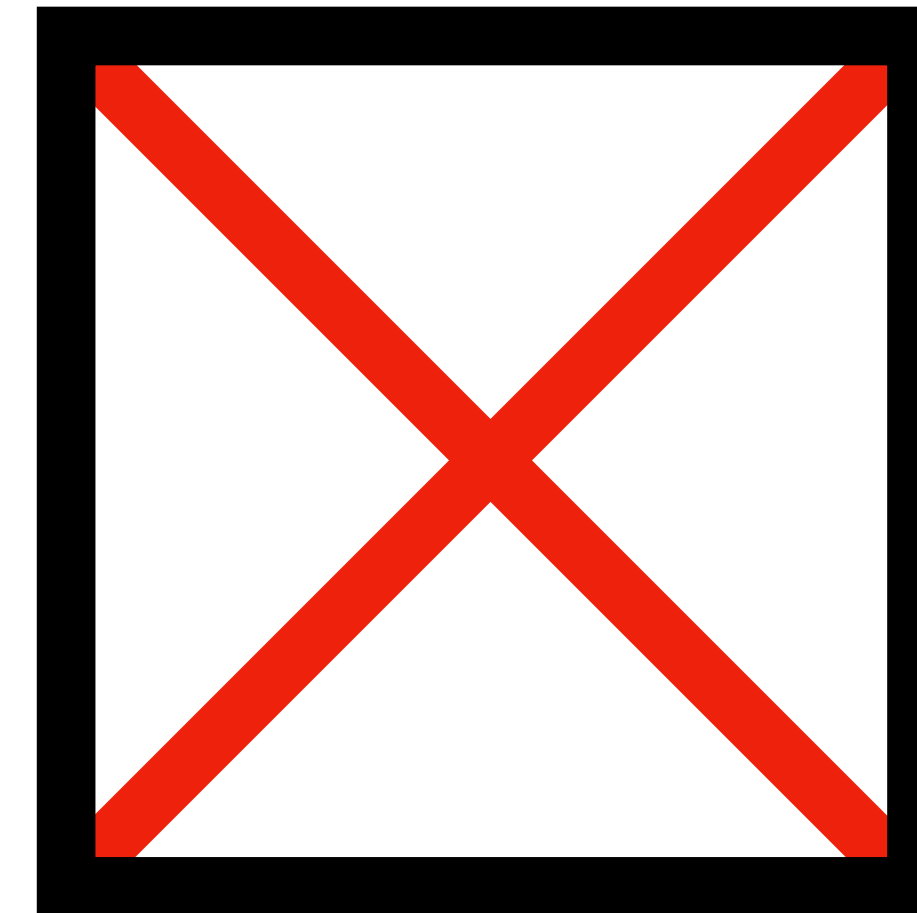
Control Idea



Final Goal: maximize and lock the scale factor



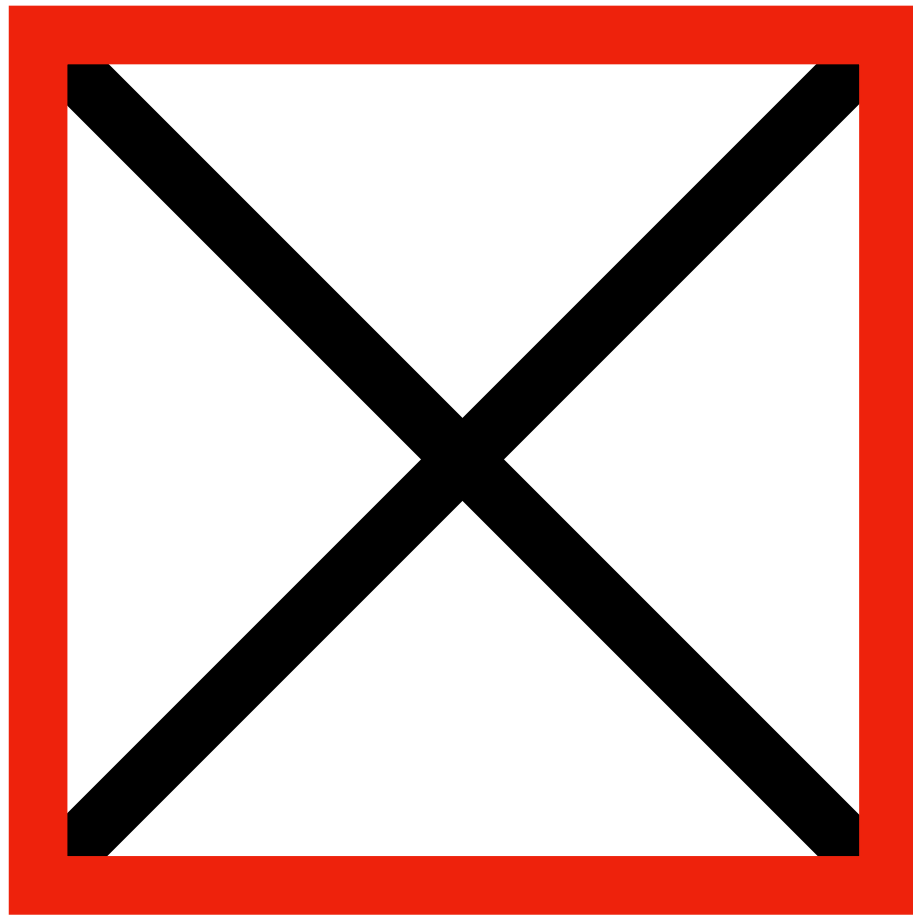
Perimeter control
via self beat note



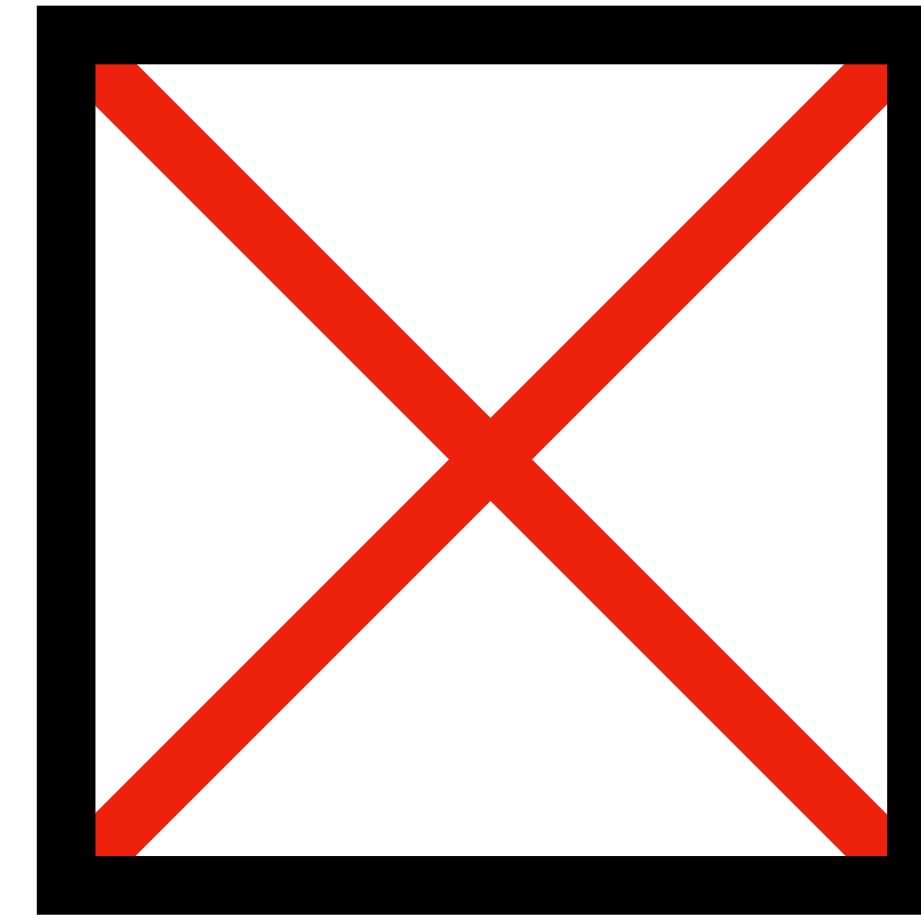
Diagonal control
via external reference

Our Recipe

II steps lock system

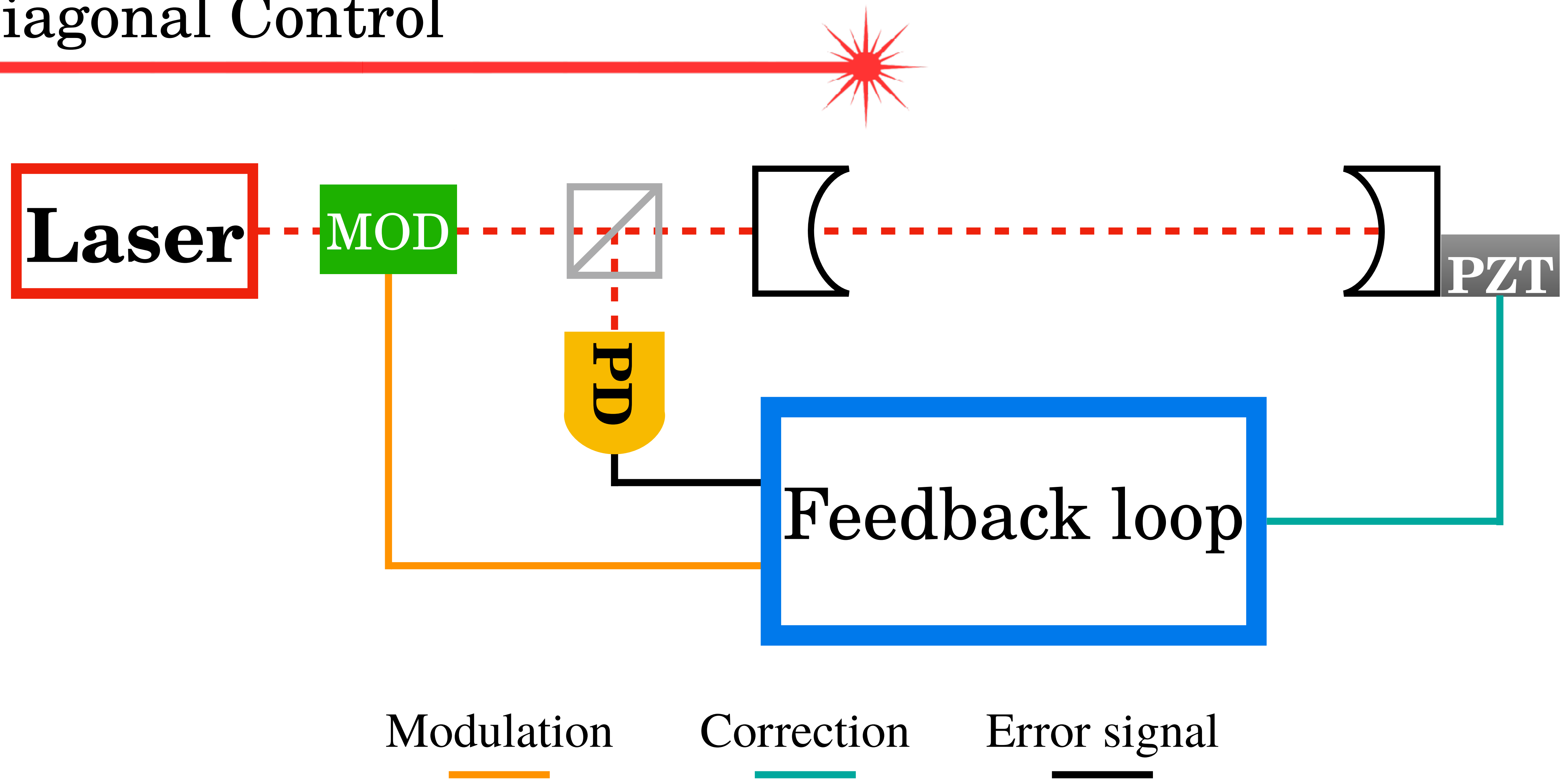


Bring the perimeter to an ideal value
Rough stage



Lock the diagonal length
Fine stage

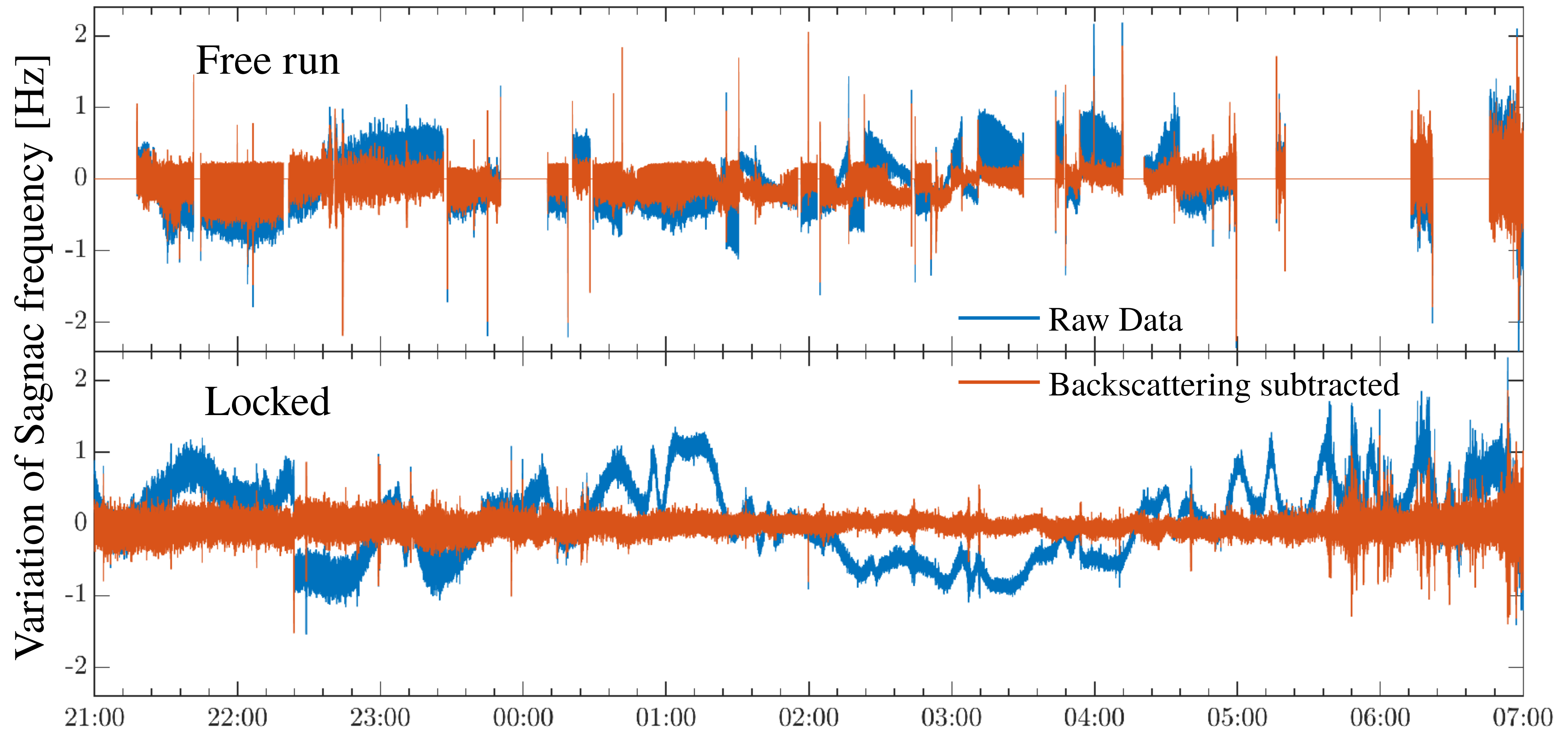
Diagonal Control



Laser must be stable in wavelength

First Results of diagonal lock

Night between 7-8 Mar (bottom) 8-9 Mar (top)

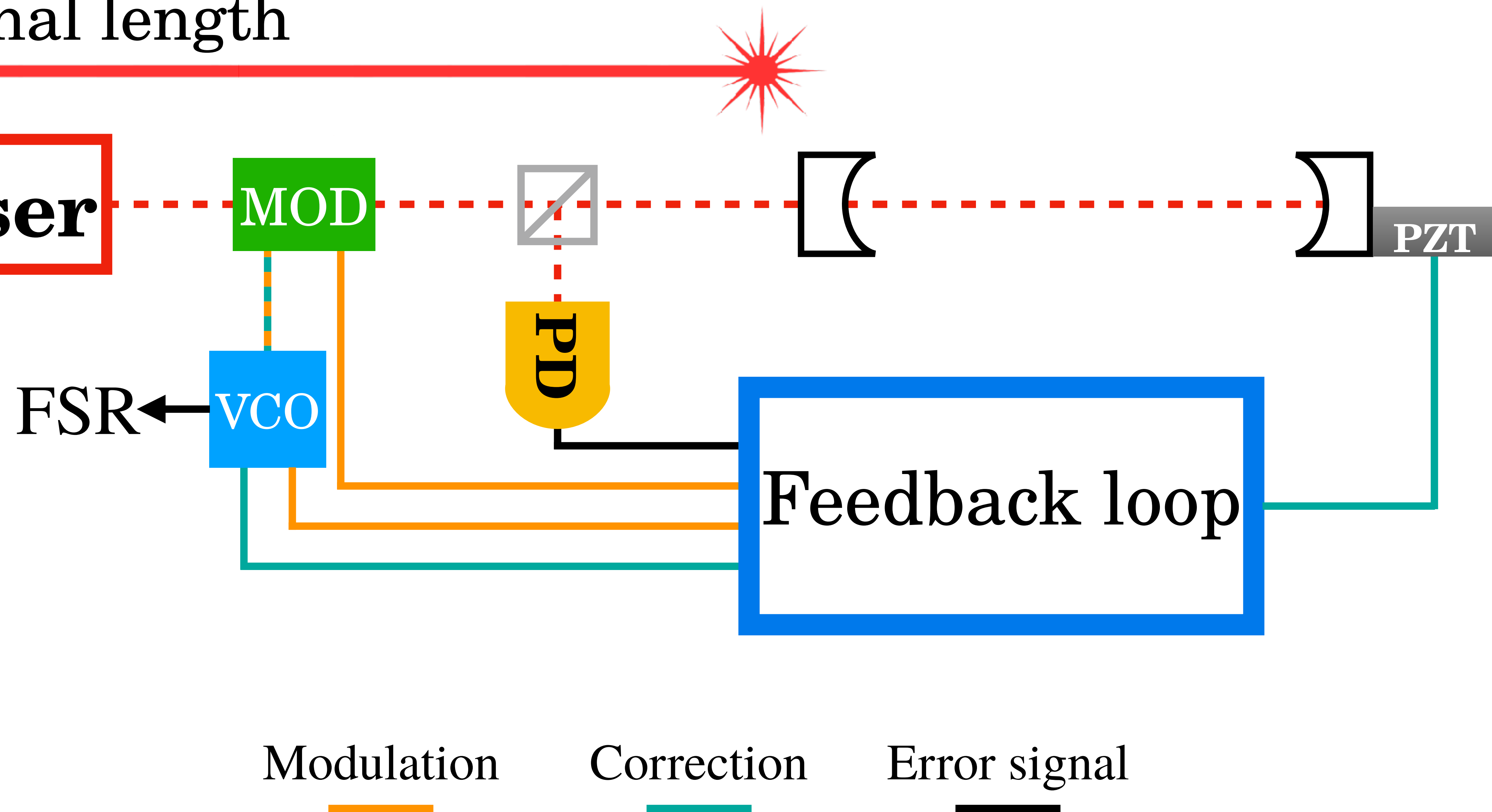


First Results of diagonal lock

Locking diagonals increase duty cycle up to 99.5%

Overall noise reduced of a factor 1.4 (during the night)

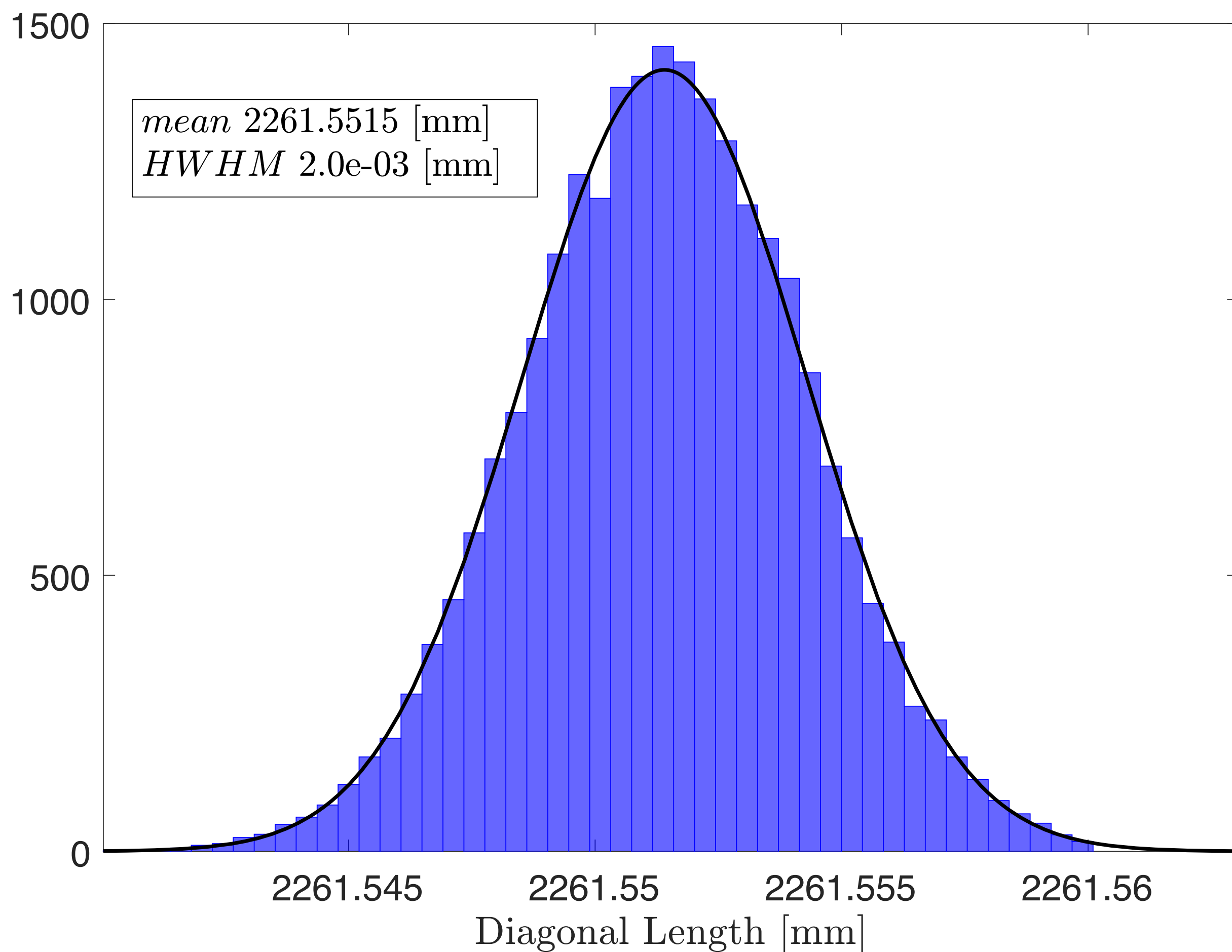
Diagonal length



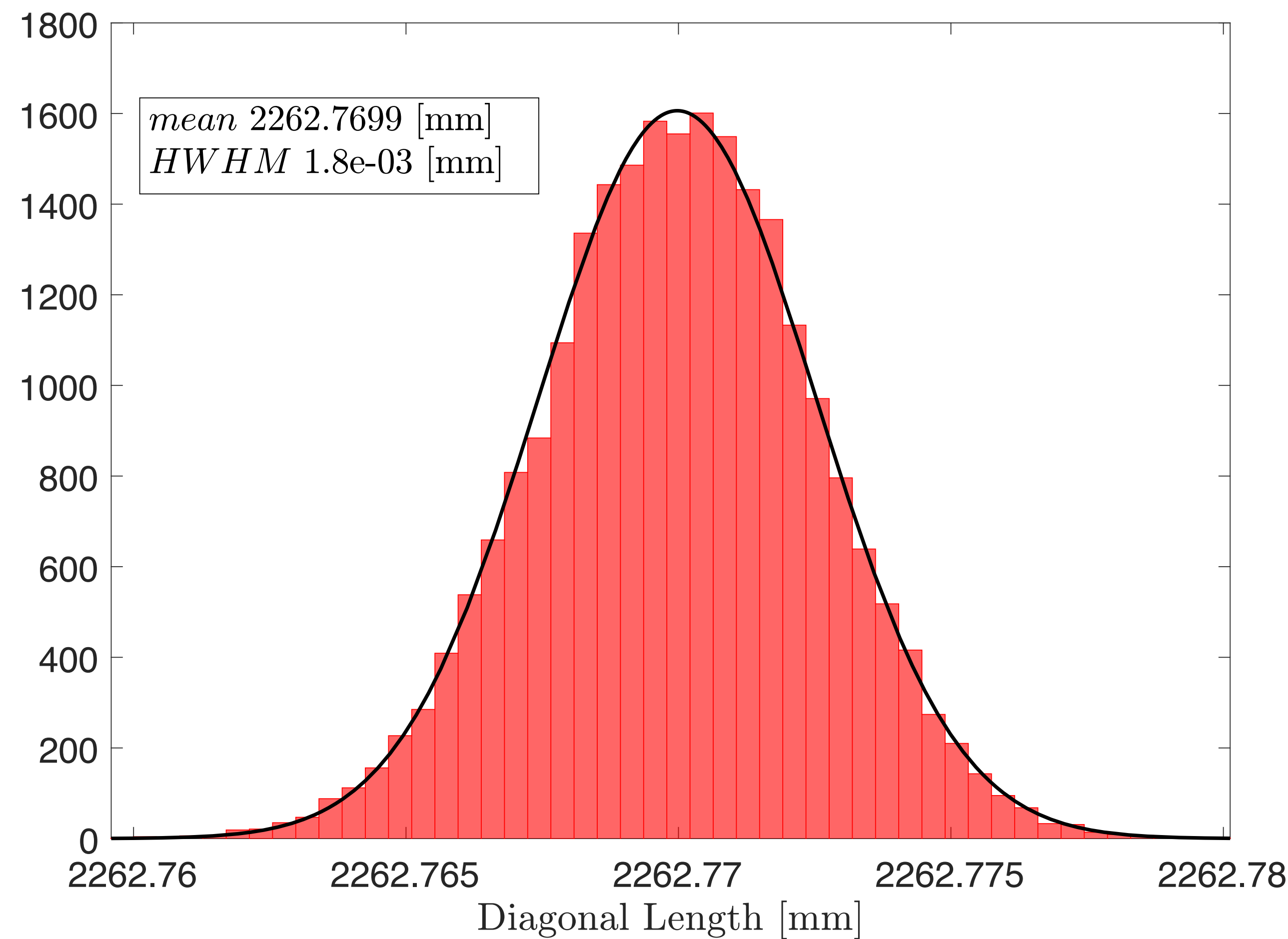
Measure of length



14 h of simultaneous length measure

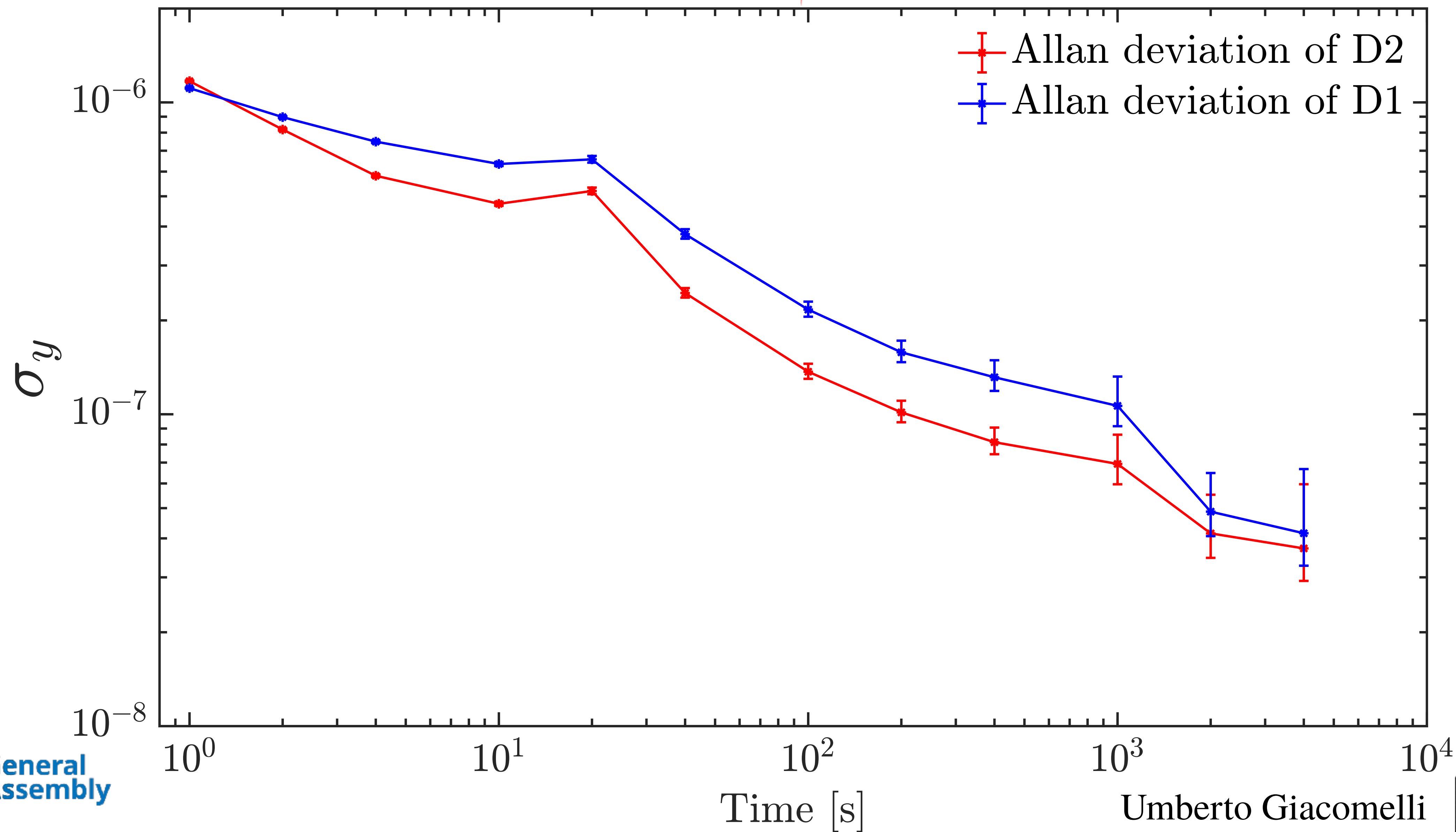


D1=2261.55154(9) mm



D2=2262.76985(8) mm

Measure of length



Conclusions and prospective



✓ Diagonal lock works

✓ Length measurement is useful to validate the control system

◆ Improve the lock system

◆ Improve on GP2

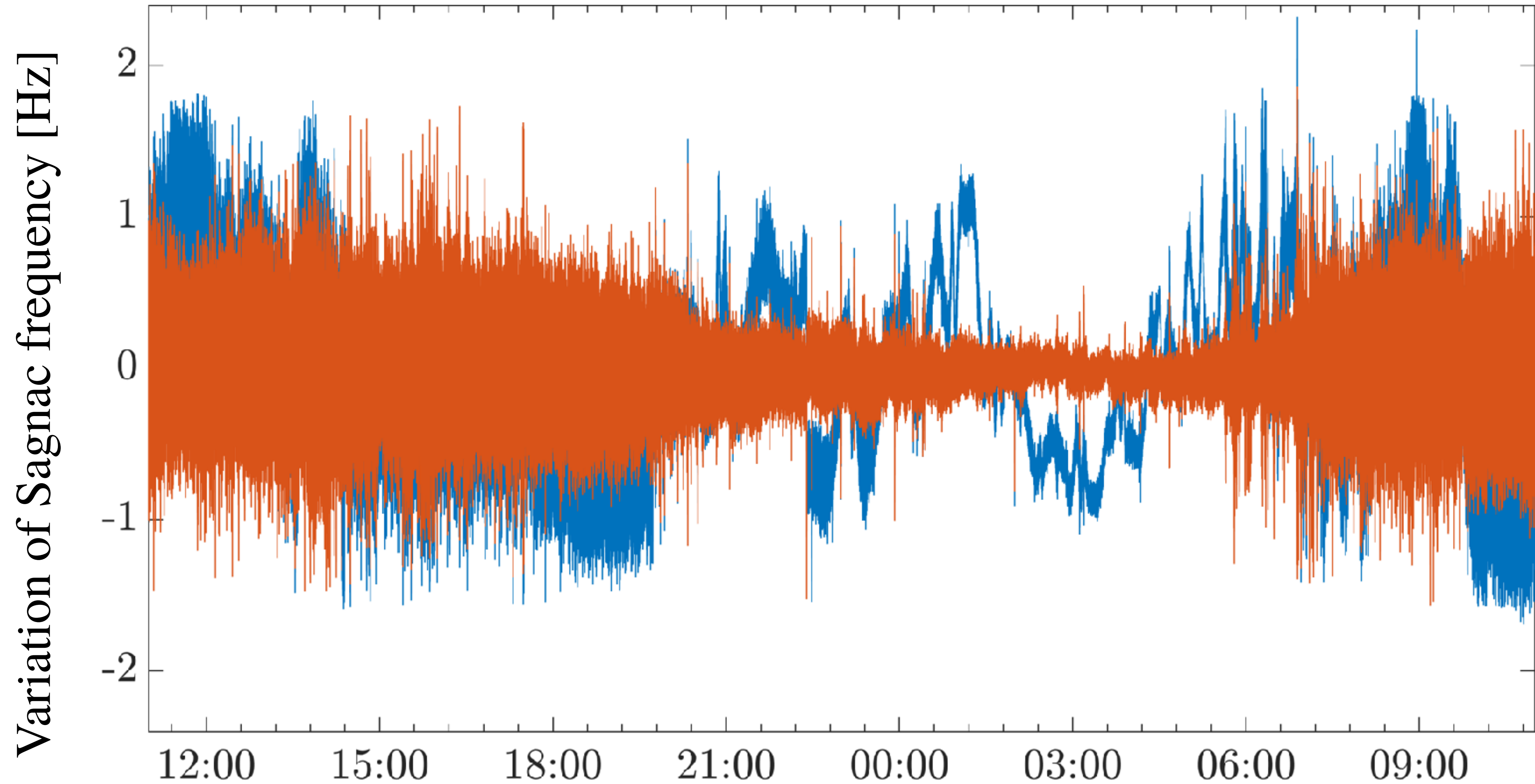


Thanks for your attention

Questions?

$$\omega_A t) + \beta$$

Full lock data



Full free run data

