Preliminary Analysis of the Gyrolaser G-Pisa

G-Pisa, a middle size ringlaser, inertial sensor based on the Sagnac effect, financed by INGN CV 3 years ago, has been recently installed in Cascina (Central Building)

AIM: to measure tilts and rotations in the Central Building, and to give more precise informations on the tilts, and possibly to help the IP control
It has been possible to install G-Pisa in a very short time thanks to the support given by

publications


Thanks to Filippo Bosi engineering work finally G-Pisa has a ‘respectable’ support

Two positions available:

Horizontal derivative of Ty and Tx
Vertical derivative of Tz and Tx
First 13 days of data

Since the 25 of June the perimeter control is working. Few improvements have been done since then and will be done as soon as possible. The laser is amplitude stabilized keeping fixed one of the two modes.
Signals

- Several signals are acquired at 1 Hz, some of them are related to the control loops
  - GL_Sagnac_freq: proportional to rotation
  - GL_Sagnac_AC: is above or around 1 V when the gyrolaser is working properly

- At 20kHz are acquired the beat note (GL_SAGNAC) and the output powers of the two modes. It would be good to acquire this channel at 2kHz, since we have already checked that above 2 kHz the signal is dominated by the noise of the ADC. In Matlab to reconstruct this signal:
  ```matlab
  unwrap(angle(hilbert(filter(b,a,GL_SAGNAC))));
  ```
  The filter should be a bandpass around 107 Hz
Some preliminary analysis

- Slow channel
- Fast channel
18 hours of continuous data have been compared with some FO accelerometers.
18 hours of data
Power spectrum

[Graph showing power spectrum with 'Improved perimeter stabilization' on the y-axis and 'Hz' on the x-axis]
• G-Pisa works fine, routinely with a sensitivity higher than the one required by AdVirgo
• We will continue our work to refine the comprehension of the instrument at low frequency. To investigate effects of backscattered light etc.
• G-Pisa provides good clean signals which are potentially very powerful to investigate noises of seismic (or acoustic) origin
• we cannot guarantee our presence all August, but G-Pisa is very robust, and it should remain working all the time
• As soon as possible, but not before September, we are ready to flip it vertically: ½ day to flip, and a week of ‘soft work’ to recover stable operation of the system
• Please contact us if you are interested in using the fast channels, we can arrange a dedicated seminar this week