VTT

Upgrade your interferometer to the modern Phase Stepping Gauge Block Interferometer

beyond the obvious

VTT MIKES offers gauge block interferometer upgrades

No matter what kind of gauge block (GB) interferometer your laboratory has, VTT MIKES can upgrade it to capitalize on all available phase data by using a modern phase stepping method. This method is superior to commonly used spatial fringe analysis methods such as skeleton analysis and Fourier analysis. The key advantage phase stepping interferometry has is that it provides accurate phase information for the entire imaged interferogram for each pixel on the camera. As such, high quality flatness and length variation results are made immediately available in each measurement. Additionally, the phase stepping method is insensitive to small intensity variations and defects of the interferogram.

Several hardware improvements may be included in the upgrade: a switch to single mode fiber for better laser coupling, modernization of the environmental meters and the camera. The instrument is also equipped with an industrial grade PC, including measurement control and analysis software and a database for archiving and accessing past measurements.

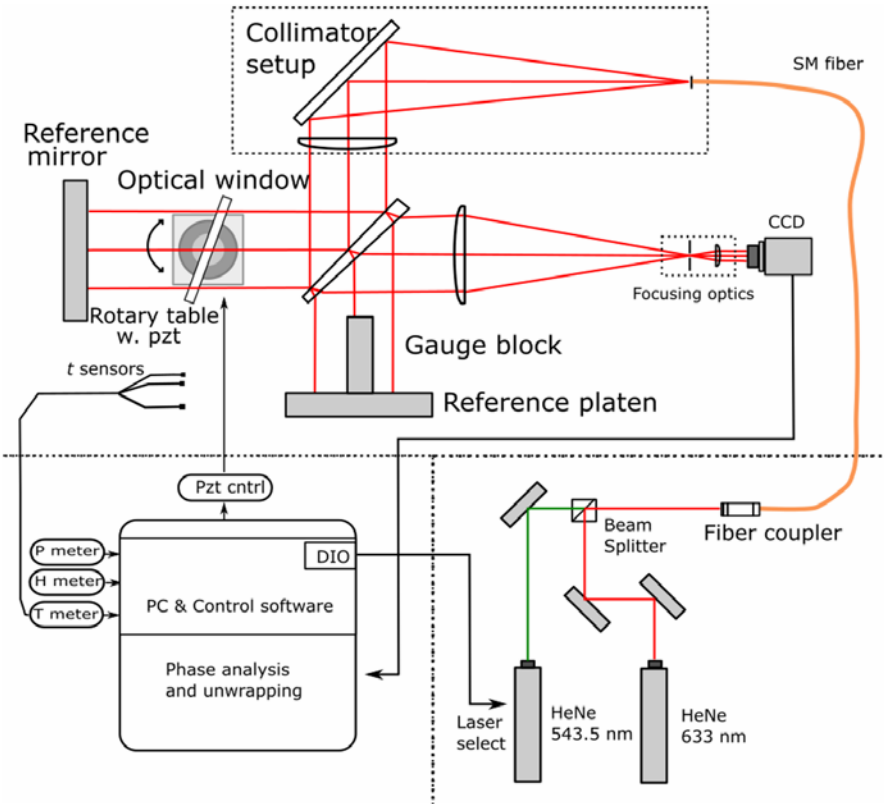

Figure 1. The VTT MIKES upgrade for Phase Stepping Gauge Block Interferometry (PSIGB), designed for NPL-TESA GBI.

Modern Phase Stepping method of VTT MIKES

The VTT MIKES solution for modern phase stepping gauge block interferometry is illustrated in Figure 1. In this case old NPL-TESA gauge block interferometer from 1995 was modernized [1]. For improved interferogram quality lasers are coupled via a single mode fiber. The optical phase modulation is done by a thick optical window on piezo driven rotary table in the reference arm of the interferometer. By rotating the optical window, the optical path length is modulated by the ratio change of in-air vs. in-glass propagation length. The recorded phase shifted interferograms are then analyzed in the control software.

The PC and control software manage all aspects of the measurement. It controls reference mirror and reference plate positions, optical window rotation, and handles data acquisition and analysis. Environmental data is continuously monitored, enabling on-line corrections of refractive index of air and thermal expansion. Phase stepping analysis uses a robust 9-step algorithm with low sensitivity to detuning error. All data and results are stored in a database managed by the control software.

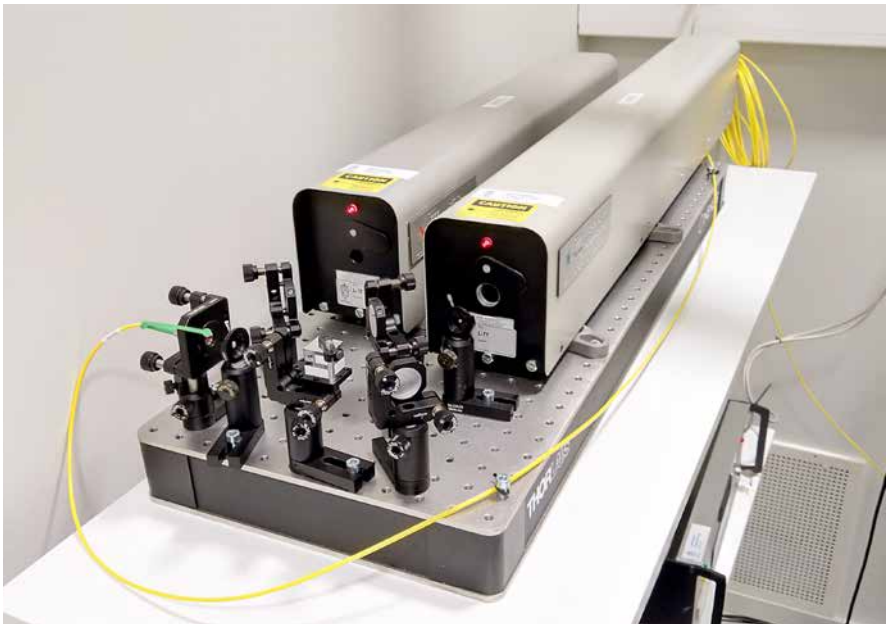

Figure 2. Optics for SM fibre coupling for lasers of an upgraded GBI.

Content of the upgrade

The content of an upgrade can be tailored to the needs of your laboratory. The upgradable components are listed in Table 1. Hardware improvements, such as camera and meters all use industrial ethernet protocols for communication.

In most cases the upgrade can be delivered as turnkey service. The installation of new components, adjustment of optics and training takes typically just 2-4 days. Overall delivery time of basic NPL-TESA upgrade with typical options is just 2-3 months. So this upgrade of your GBI is both fast and inexpensive.

Although example upgrade is for old NPL-TESA GBI, the upgrade can be done for almost any kind of gauge block interferometer.

Components included

- Phase modulation optics, electronics and hardware
- Industrial PC with Win 10 64-bit OS
- Software for GBI with phase stepping and length analysis with database for GBs and results. Source code will be provided for your own later developments
- Training

Optional components

- Single mode fibre coupling of lasers
- Industrial gigabit ethernet camera
- New temperature meter
- New pressure meter
- New humidity meter
- Adjustment of optics (req. w SMF)
- Remote control of reference mirror
- Remote control of reference plate
- Bilateral comparison

Table 1. Content and options for phase stepping upgrade of GBI.

Figure 3. Upgraded electronics cabinet and GBI software.

References

1. Byman, V., & Lassila, A. (2015) MIKES' primary phase stepping gauge block interferometer, Measurement Science and Technology, 26(8), [084009]. doi.org/10.1088/0957-0233/26/8/084009

2. Matus, M. et al. Report on key comparison EURAMET.L-K1.2011 measurement of gauge blocks by interferometry, Metrologia, 53(1A), 1-63. [04003]. doi.org/10.1088/0026-1394/53/1A/04003

3. An upgrade delivered to Justervesenet 9/2021 to update old NPL-TESA Gauge Block Interferometer.

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VTT is a visionary research, development and innovation partner for companies and the society. We bring together people, business, science and technology to solve the biggest challenges of our time. This is how we create sustainable growth, jobs and wellbeing and bring exponential hope.

We promise to always think beyond the obvious.

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