FOSREM - Fibre-Optic System for Rotational Events&Phenomena Monitoring: construction, investigation and area of application

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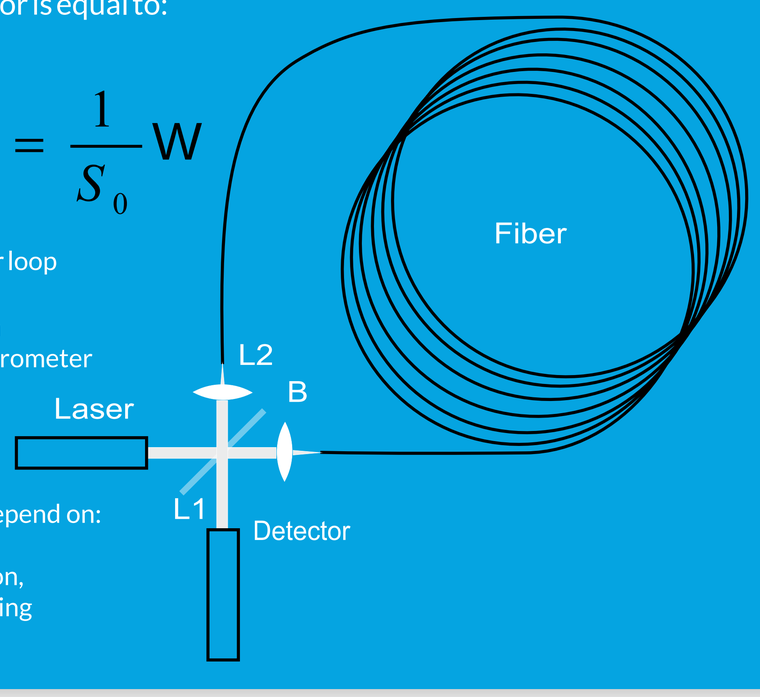
Background

Sagnac effect is result of difference between two beams propagating around closed optical path, in opposite direction. The Sagnac phase shift induced by rotational rate Ω perpendicular to plane of sensor is equal to:

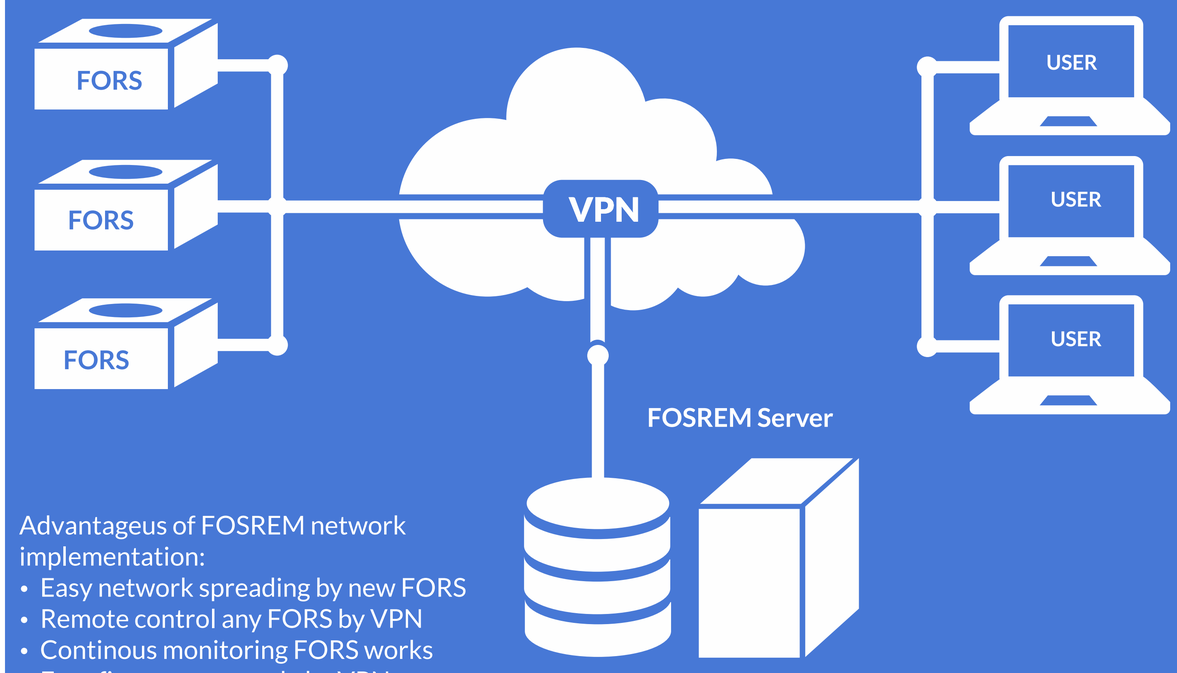
$$\Delta\varphi = \frac{4\pi LR}{\lambda c}\Omega = \frac{1}{S_0}\Omega$$

L – length of the fiber in the sensor loop
λ – wavelength of used source
c – velocity of the light in vacuum
S_0 – the optical constant of interferometer



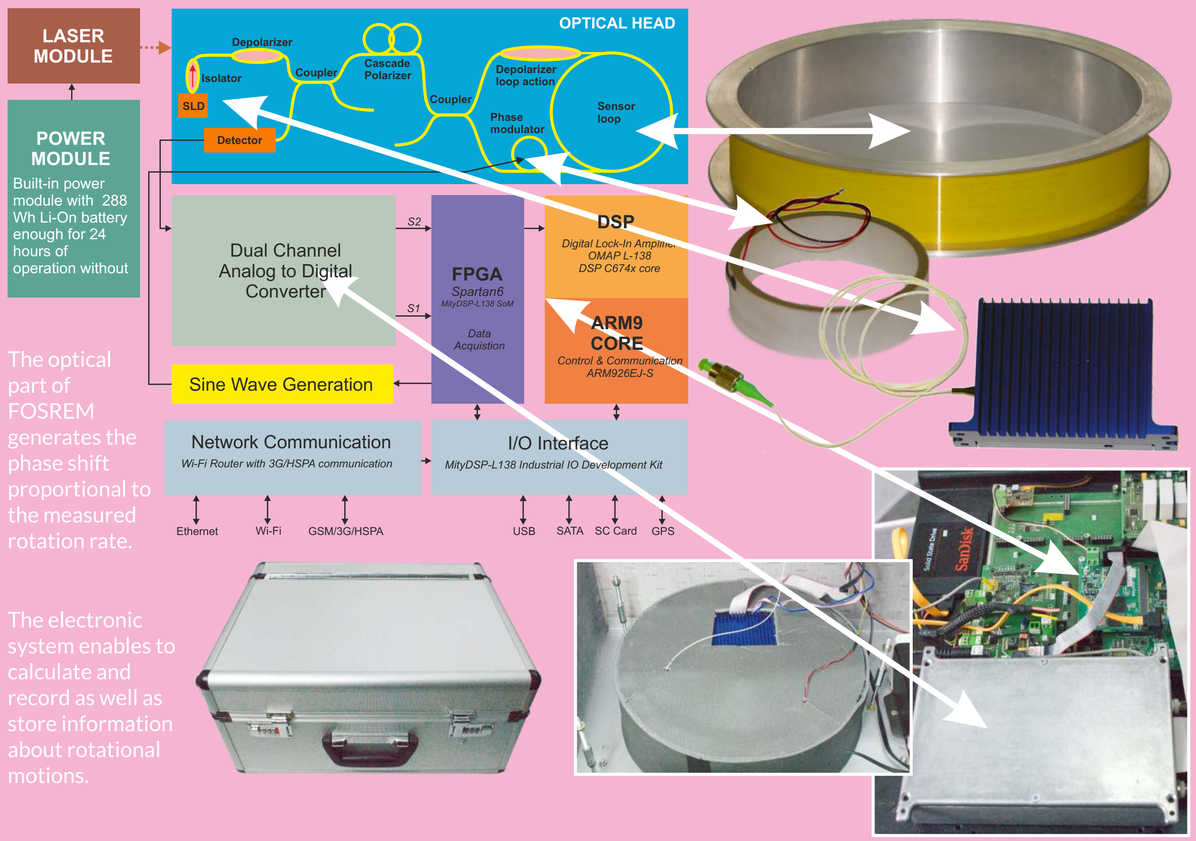
The observed fringe shift does not depend on:
- the shape of surface area S,
- the location of the center of rotation,
- the presence of a comoving refracting
- medium in the path of the beam.

Implementation



Advantageus of FOSREM network implementation:
- Easy network spreading by new FORS
- Remote control any FORS by VPN
- Continous monitoring FORS works
- Easy firmware upgrade by VPN
- Personal configuration and access for any FORS according customer requrements

Hardware

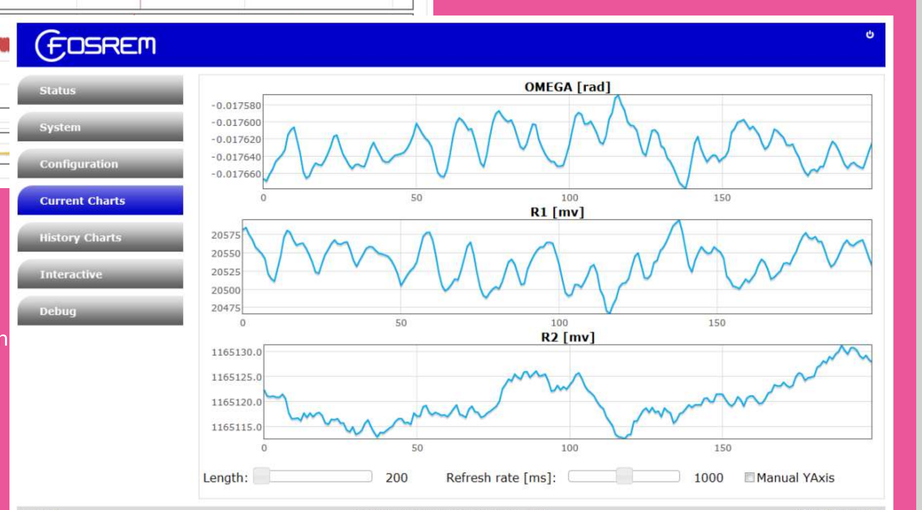


The optical part of FOSREM generates the phase shift proportional to the measured rotation rate.

The electronic system enables to calculate and record as well as store information about rotational motions.

Software

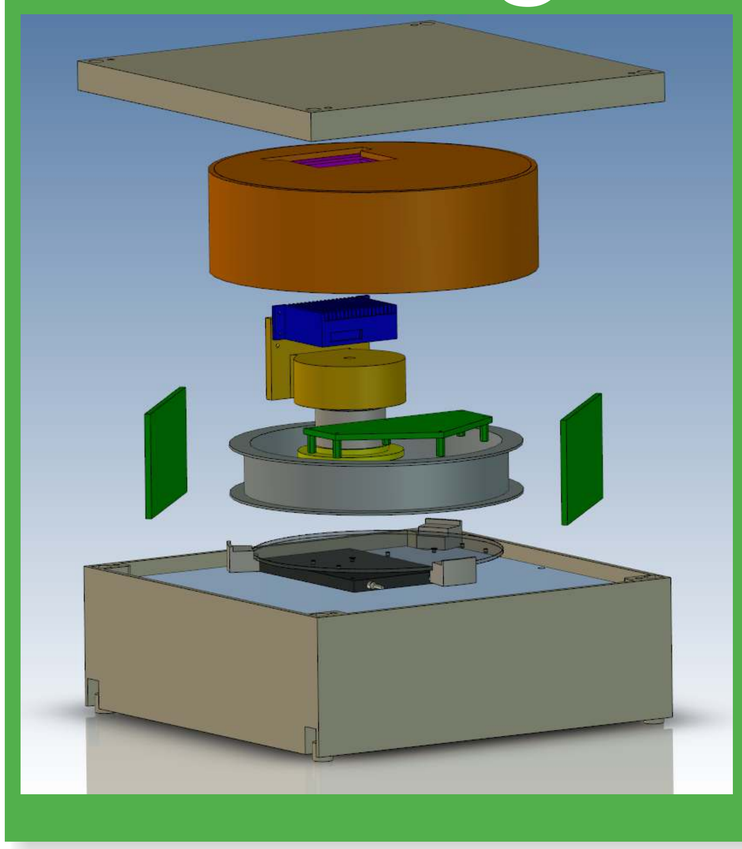
FOSREM Telemetry Server stores data from multiple devices. It allows for data analysing as well as their displaying.
The user can store information from FOSREM on his own computer.
Telemetry Server is used for remote control of the key parameters for all managing devices.



FORS - includes a built-in web server that allows you to control and measurement. Control is performed in real time through a VPN FOSREM network. All sensors are connected to a central FOSREM server that collects and analyzes data from all sensors. Dedicated program provides direct device control and setup.

FOSREM Network uses VPN connections to integration all of sensors in one system.

Comming in 2015



FOSREM2 ASPU

Next generation of FOSREM Sensor: smaller, lighter, more energy-efficient.

- Dimensions: 360 x 360 x 160 mm (prev. 470x360x230 mm)
- Weight: less than 12 kg (prev. 25kg)
- Power consumption: less than 15 W
- Conectivity: Ethernet 100 Mbps with PoE, (fiber option)
- Precise 20 bits conversion
- Powerful ARM two-core microprocesor with high speed FPGA
- Internal Access Point for device configuration
- Web-Based Management Interface
- Internal 32GB flash memory fo data storage
- Up to 24 hours autonomous operation without external power.
- Up to 30 days autonmous operation in local data storage mode.

Applications

This work has been done in 2013 under financial support of the National Centre for Research and Development, project PBS1/B3/7/2012 „Fibre-Optic Monitoring Rotational Events or/and Phenomena - FOMREPh"

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