SmartSonic Interrogator
for Quasi-Distributed Acoustic Sensing

Prototype SmartSonic Interrogator

- **Measure in between FBGS**
- **Retrofillable to existing FBG systems**
- **Broad bandwidth / low noise floor**
- **Tolerant of high optical attenuation**
- **Dense multiplexing capability**
- **Precise spatial resolution**
- **No noise from unwanted zones**
- **Highly remote measurement**
- **All optical sensing with Zero EMI**
- **Low cost systems**[1]

The SmartSonic interrogator is an interferometric instrument able to detect at acoustic frequencies the small changes in the lengths of fibre between selected pairs of sensors on a fibre Bragg grating (FBG) array. The high bandwidth and low noise floor of this measurement is such that the addition of a remote SmartSonic interrogator turns a FBG array into a string of sensitive optical microphone.

Unlike conventional distributed acoustic sensing (DAS), where the signal is modulated by very low intensity Rayleigh back scattered light, the SmartSonic interrogator sets up a series of virtual fabry-perot cavities between selected FBGs and then tracks the minute changes to these cavity lengths using an interferometer and advanced data processing. In effect, a quasi-distributed acoustic sensing, or Q-DAS, monitoring system, is established. The unique optical and data processing architecture of a SmartSonic Q-DAS system has certain key advantages over alternative technologies:

- the process of amplitude normalisation allows measurement from very remote sensors with highly attenuated connection to the instrument;
- low noise floor allows discrimination of features invisible to DAS
- precise knowledge of the sensing location allows for speed of sound measurements;
- the low optical power employed makes ATEX certification straightforward;
- the use of COTS telecoms components makes for a low cost interrogator

SmartSonic is a collaborative development between Smart Fibres (UK) and Optics 11 (NL).

Preliminary Specifications

Measurement and Processing	
Wavelength Range	C band (1527.2 to 1565.0 nm) & L band (1569.4 to 1608.3 nm)
Optical Sensors	Up to 100
Analysis Bandwidth	D.C. to 1MHz
Dynamic Range[2]	160dB
Noise Floor[3]	0.19 nm
Interface	LabVIEW GUI, customisable
Trigger mechanism	Customisable
Synchronisation	Customisable

Mechanical, Environmental and Electrical	
Weight kg / lbs	5 kg
Dimensions H X W x D	90 x 440 x 320 (2U)
Operating Temperature	Not tested[4]
Shock	Not tested[4]
Vibration	Not tested[4]
Comms Interface	USB2 & RS232
Optical Connector	FC/APC
Input Voltage	+12V VDC

Specifications are subject to change without notice

[1] no sensor cost delta when interrogating already installed FBG sensor arrays
[2] noise floor to fibre breaking strain
[3] to 1 std dev. 1s data at 100KHz
[4] Prototype model only at time of writing