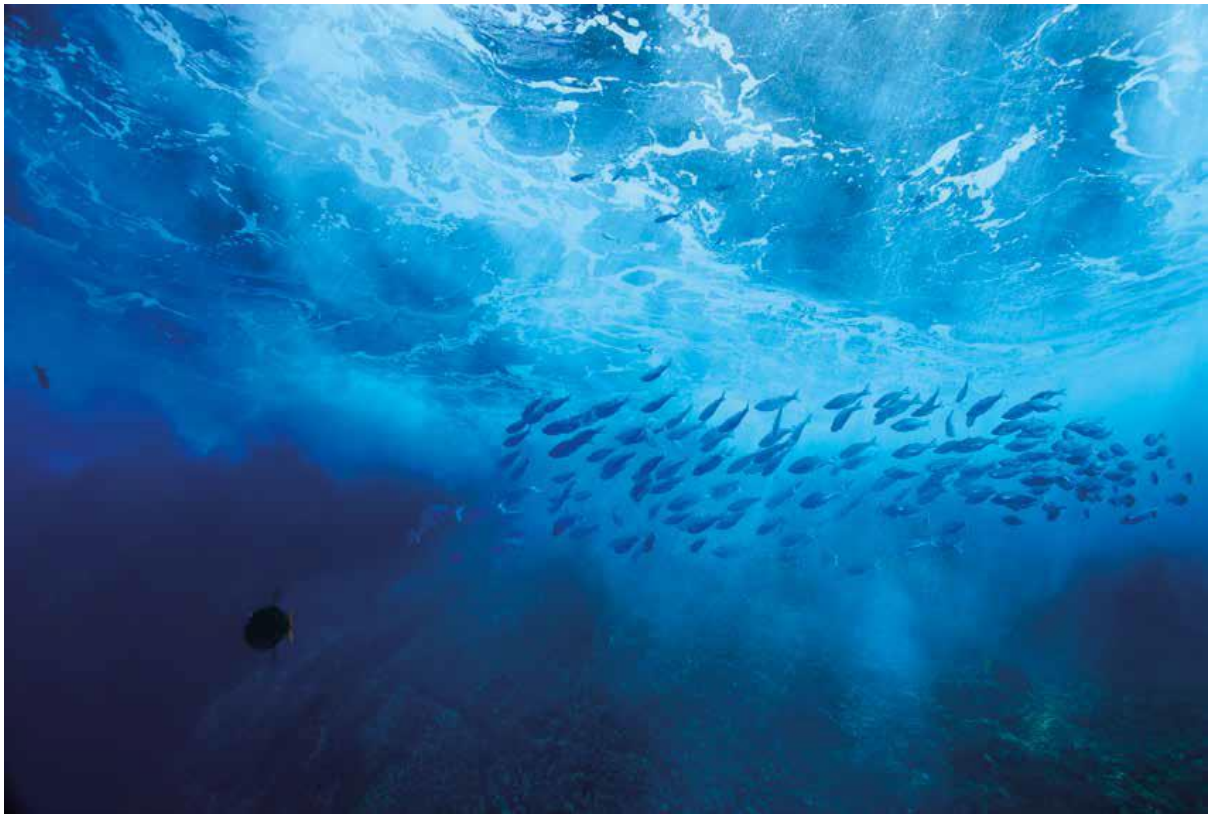
Delivering
> Agility
> Innovation
> Performance

XTERA®



Nu-Wave Line Monitoring Equipment (LME)

This document provides high level details of Xtera's Nu-Wave Line Monitoring Equipment (LME).

Please note that changes in future releases may impact features and capabilities described below and that this description does not represent a contractual commitment.

For more information:

Email: info@xtera.com

Phone: UK +44 01708 335400 / US +1 972 649 5000

The Nu-Wave LME provides a complete solution for submerged plant implementing either ‘active’ or ‘passive’ monitoring. The LME-A (LME-Active) provides the ability to interrogate Xtera submerged plant, both repeaters and BU, together with legacy submerged plant available from other Suppliers. The LME-P (LME-Passive) provides the means for monitoring submerged plant from other suppliers who implement only a ‘passive’ plant monitoring scheme.

The LME is accessible from the Nu-Wave NMS.

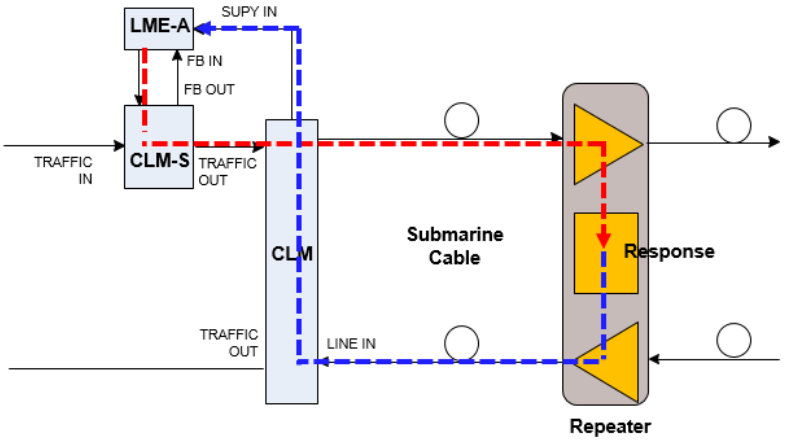
Line Monitoring Equipment – Active (LME-A)

The LME-A allows the monitoring and control of submerged plant based upon low-frequency optical signaling to the submerged plant. The modulation schemes implemented handled both Xtera submerged plant – which is binary PSK-based, and competitor submerged plant – which varies between OOK and binary PSK, which depends upon the system in question.

All submerged plant is provided with a unique address, during manufacture, which allows each repeater/BU to be interrogated or controlled on an individual basis, using a command and response protocol.

Typical monitors applicable to a repeater are optical input and output powers, optical pump currents, internal temperatures, etc. and responses are returned to the SLTE at either end of the system to be received and demodulated by the LME-A. All monitored parameters can be alarmed within the NMS to ensure that critical thresholds are not violated.

The LME-A is usually used in the following arrangement, whereby the LME-A provides its transmit signal to a CLM-S circuit pack, see below –



This allows the transmitted signal to be imposed upon the outgoing line data using Raman amplification. Such a scheme ensures little or no impact on the line signal, beyond the supervisory signaling itself, and ensures that the reliability of the LME-A does not impact upon the line data, i.e. the LME-A can be removed, for maintenance, from the SLTE without affecting traffic data.

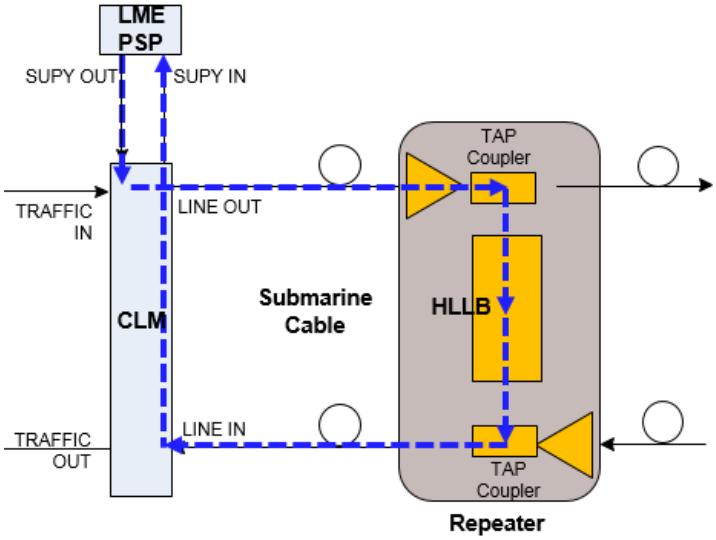
The LME-A can generate optical powers beyond Class 1M. Optical interlock is implemented between the LME-A and CLM-S to ensure that accessible optical powers are maintained within acceptable limits.

Key parameters

Transmit:	
Wavelength	*C-band (1530 – 1568nm)* *[Modulated by 1457-nm Raman pump]*
Optical Hazard Level	*1M*
Modulation Depth	*1 - 30 %*
Carrier Frequency	*48 – 500kHz*
Data rate	*1000 – 3900 bps*
Receive :	
Wavelength	*C-band (1530 – 1568nm)*
Optical Level	*-36 to -16dBm*
Modulation Depth	*1 - 30 %*
Carrier Frequency	*12.5 – 62.5kHz*
Data rate	*16 – 1100 bps*

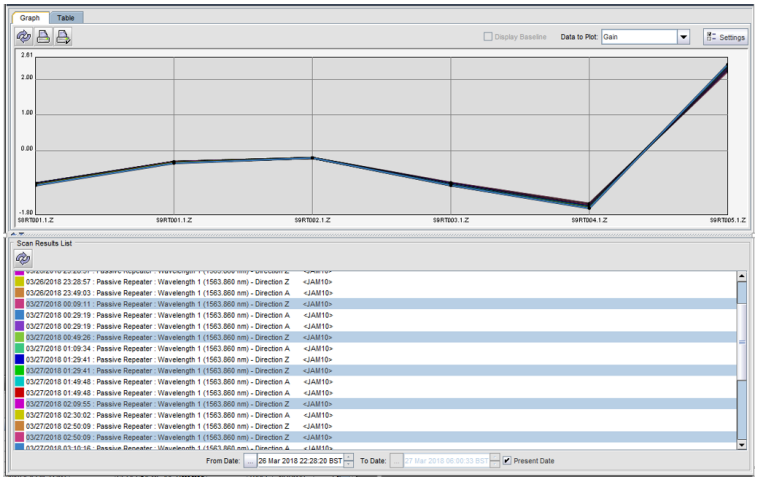
Line Monitoring Equipment – Passive (LME-P)

The LME-P allows the monitoring of submerged plant which provides no active means of interrogation or control, only passive optical loopback of transmitted signals. The loopbacks with the submerged plant are implemented as High-Loss LoopBacks (HLLB) which feeds back a portion of the 'transmit' signal onto the receive signal within a fiber-pair.



The transmitted signal traverses the cable section with portions being returned to the transmitting LME-P. The LME-P demodulates the returns from each HLLB and constructs a map of the fiber-pair which allows long-term monitoring of both the submerged plant and the interconnecting fiber.

The scans collected are passed from the LME-P up to the NMS and may be stored for future analysis. These may be compared with any of the previous measurements or against a ‘baseline’, which is a dataset collected at a specific time, e.g. after system acceptance or a system repair. Such comparisons allow the identification of variations since the ‘baseline’ capture.



Measurements over any wavelength within the C-band can be made by the LME-P with dynamic switching to up to 10 different wavelengths being possible.

The system configuration can demand varying measurement periods. These may be set from the NMS. Schedules of measurement data collection can be configured at the NME to record the submerged system state across any desired timespan.

It is usual for each fiber-pair to employ an LME-P at each end. Coordination of operation of the two LME-P’s is undertaken by the APM’s within the SLTE, via the DCN, and thus occurs transparently to the Operator.

Key parameters

Transmit / Receive:	
Wavelength	*C-band (1530 – 1568nm)*
Optical Hazard Level	*1M*
Optical Power Level	*-4 - +4dBm (at output of LME-P circuit pack)*
Modulation Depth	*100 %*
Carrier Frequency	*2.0MHz*
Scanning Period	*5 – 1200s*