



Group Presentation

Presentation



LIM GROUP

Presentation Overview

Since 1985, LIM Group, has been internationally recognized as a specialist in instrumentation and measurement, both during and after drilling (drilling instrumentation and borehole logging). From the beginning, technological innovation has been an integral part of the LIM group's DNA.

- Since 1985
- Around 30 peoples (Based in Europe and Americas with 3 countries : France, Luxembourg and US) including 7 engineers dedicated to R&D
- M.W.D and Logging activities



LIM GROUP

Our range of solutions



- M.W.D



- Logging equipment



- Cloud solutions for drilling



Company Vision And Mission

Field expert

Many members of LIM's staff have geological background and are in regular contact with the field to keep abreast of market needs.

Customized solutions

The technical knowledge of our teams enables us to adapt to any situation and always propose a solution.

LIM GROUP

Our range of solutions

- Measurement while drilling
Drilling parameter recorder
- Site investigation (Lugeon, Pressuremeters, Penetro, etc)
- Special Foundations
- Tunneling
- Drill & Blast





Geophysical Logging

Presentation



LIM GROUP

Our range of solutions

- Measurement after drilling
Geophysical borehole logging
- Borehole imaging Televiewers (Optical & Accoustic)
- Sonic probe
- Electrical probes
- Nuclear probe
- Borehole geometry





LIM GROUP

Our range of solutions

- Borehole imaging Televiewers (Optical & Accoustic)



OPTV 38 & 52 : Optical Televiewer

A precision wide angle lens and a CMOS camera assembly permit the **OPTV38** and **OPTV52** probes to capture a high-definition video image of the borehole wall in a variety of horizontal and vertical resolutions.

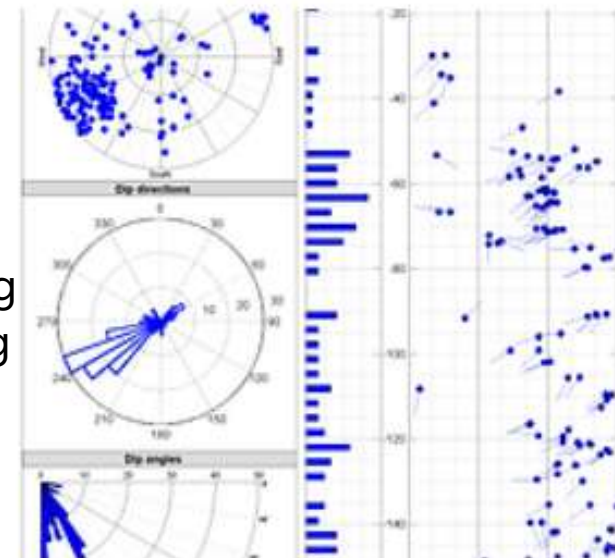
The resulting image data is digitised in the probe and combined with orientation sensor parameters for transmission to the surface.

The orientated image log provides a wealth of information relevant to a wide variety of applications. These include fracture detection and analysis, bedding or foliation dip and direction, lithological characterisation and core sample orientation.

The BHTV42CT builds on the industry-reference BHTV42 standard acoustic televiewer probe by adding a casing thickness measurement for cased-hole inspections. As well as recording the primary echo from the inner casing surface, the subsequent parts of the signal returning to the probe are analysed for the repeating signals corresponding to the energy being re-emitted after having traversed the casing itself in both the outward and inward directions.

The in-casing two-way travel time is measured and converted into a thickness value based on the propagation speed of the ultrasonic signal. The results are displayed in real-time in the form of an additional image in the acquisition software window (see below left).

Naturally, the BHTV42CT can still be used for open-hole inspections in order to obtain a wealth of detailed structural information on the geological formations.



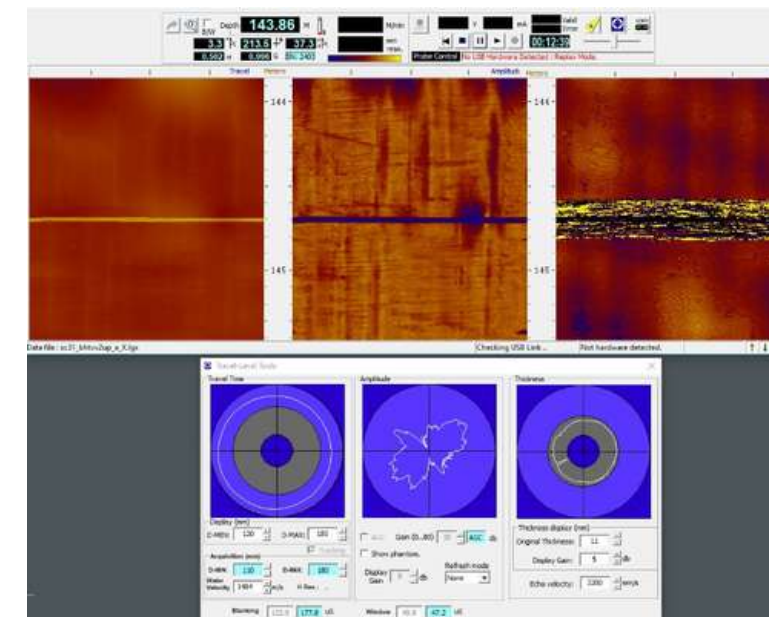
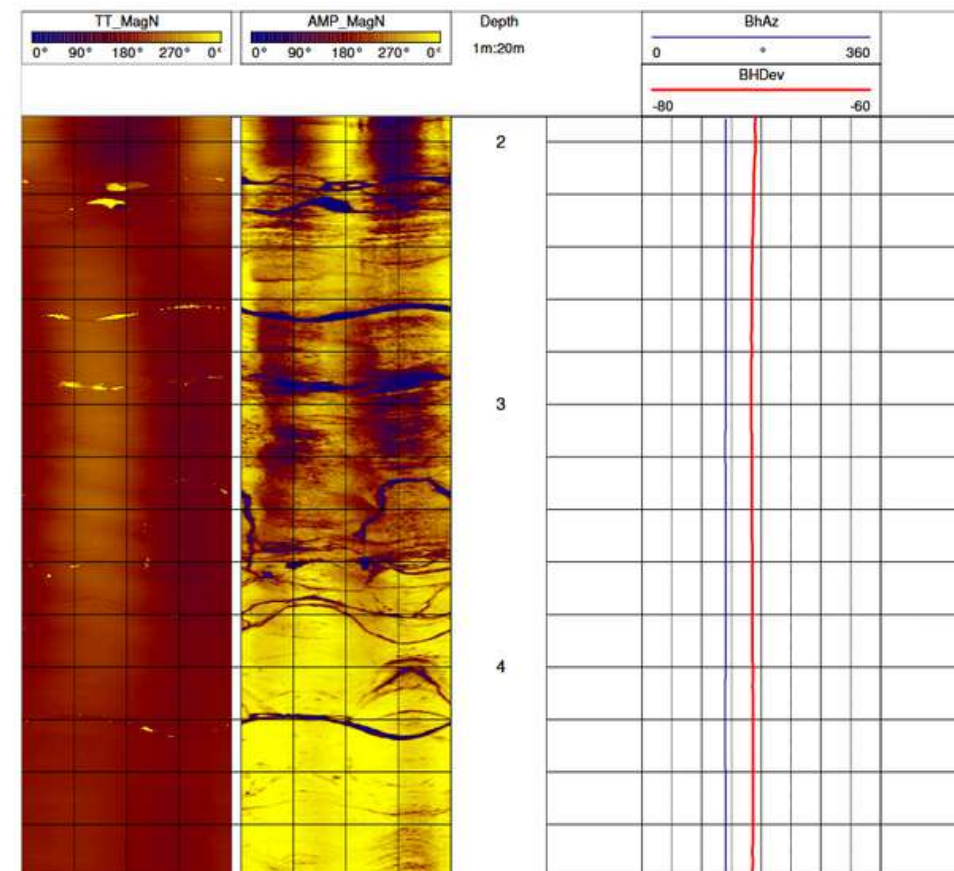
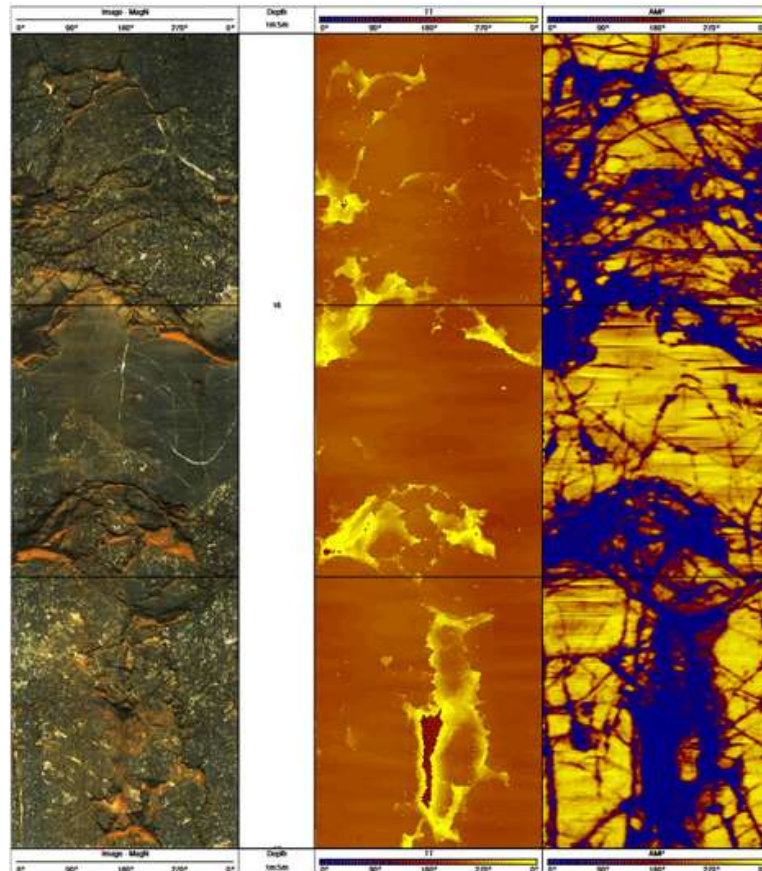
BHTV 42: Televiewer Acoustic Wall Imaging.

The **BHTV42** acoustic televiewer tool employ a rotating transducer mounted at the lower extremity of the tool to send a highly focussed ultrasonic pulse radially outwards towards the borehole wall up to 360 times per revolution, the amplitude and travel time of which are measured on its return to the probe after reflection at the borehole wall.

This information, combined with the data given by the tool's onboard orientation system, provides an extremely detailed and orientated acoustic image of the borehole wall.



We also offer a **BHTV42 Casing Thickness** to measure the thickness of the casing.



LIM GROUP

Our range of solutions

- Sonic probe
- Electrical probes
- Nuclear probe
- Borehole geometry



FWS60: Fullwave Sonic

The advantage of the **FWS60** tool is that it digitises and transmits to the surface the full sonic waveform arriving at each receiver during a user-configurable sampling window. For each receiver the user can choose one of three sampling periods to optimise the acquisition according to the application and/or formation characteristics.

The sonic waveform data provided by the **FWS60** has many applications: these include the determination of formation mechanical properties, fracture analysis, permeability and porosity estimation and cement bond assessment.

According to customer preference, the probe can be supplied with three (version 3RX) or four (version 4RX) receivers.



LIM GROUP

Our range of solutions

- Electrical probes
- Nuclear probe
- Borehole geometry





ELG46 : Electric Logging

EM25 : Slim Single Induction

DIL38 : Dual Induction

GUIP38 : Focused Electric

IP38 : Induced Polarisation

MAG38 : Magnetic Suceptibility

ELG46(+G) (fluid-filled open hole)	Formation resistivity with three electrode spacings (SPR, 16- and 64-inch). Gives lithological information and formation porosity / groundwater quality information. Three depths of investigation for assessing fluid invasion and formation permeability.
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DIL38 (+G) (will not work in steel casing)	Electrical conductivity of the geological formations – differentiate lithologies, highlights formation proposity and groundwater salinity variations.
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GUIP38 (+G) (fluid-filled open hole)	Focussed formation electrical resistivity. Gives lithological information and formation porosity / groundwater quality information. Better vertical resolution that the ELG46 probe
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IP42 (+G) (fluid-filled open hole)	Measurement of the electrical chargeability of the formations. Principally used in the context of massive sulphide ore bodies.
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MAG38 (+G) (will not work in steel casing)	Mesurement of the magnetic susceptibility of the formations. Often linked to iron (magnetite) content.
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LIM GROUP

Our range of solutions

- Nuclear probe
- Borehole geometry





GR38 & GR25 : Natural Gamma Radioactivity

GRS42 & 60 : Spectral Gamma

TRS38G : Trisonde (Density)

DTN38 : Dual Thermal Neutron

UEP42 : Uranium Exploration

PDGC50 : Photo-Electric Density

GRT38 : Natural Gamma + Temperature

GR25 / GR38	Natural gamma radioactivity measurement – gives information on lithology and formation clay content.
GRS42/60	Spectral gamma ray. Records gamma photon counts and energies. Allows to distinguish the presence of specific radio-isotopes in the geological formations (usually K, U and Th). Used for uranium prospecting and high level geological studies for eg. sedimentary depositional conditions.
TRS38G (open or cased hole, dry or fluid-filled) (!!! Radioactive source required for this method !!!)	Non-focalised density measurement (360° around the probe). Qualitative measurement of the formation compaction/density. Can be calibrated with the help of core sample density information.
DTNS38 (+G) (open or cased hole, dry or fluid-filled) (!!! Radioactive source required for this method !!!)	Measurement of the hydrogen content of the formations (generally means water content) – related to the formation porosity. This method does not distinguish between free, available water and that which is intergrated into the structure of eg. clays and certain « hydrated » minerals such as gypsum.
UEP42G (will not work in steel casing)	Probe developed specifically for the context of uranium investigation with additional Geiger detectors. Can mesure higher U concentrations than a basic gamma ray probe. Also provides formation resistivity for weathering analysis and borehole trajectory (inclination/azimuth).
PDGC50 (fluid-filled open hole) (!!! Radioactive source required for this method !!!)	Formation density for lithology and porosity information and photoelectric effect. The latter is related to the « mean » atomic number of the formation material and therefore gives information on their composition. PE measurement removes to some extent the ambiguity caused by fracturing/porosity present in the formations.



LIM GROUP

Our range of solutions

- Borehole geometry





BDV42 : Borehole Deviation

The BDV42 probe is used to determine the exact drilled trajectory of a borehole in the subterranean space. Boreholes drilled close to infrastructure such as cables or tunnels can be surveyed before reaching the critical point. Another application of this method lies in water well quality control by ensuring that well deviation and curvature criteria are met so that problems with lowering pumps and other equipment can be avoided.

The probe is based on a high-precision combination magnetometer and accelerometer sensor providing a continuous measurement of borehole inclination and azimuth. Because of the resulting magnetic disturbance, reliable azimuth data can not be obtained in steel-cased wells or in iron-rich geological formations.

By means of three spring-loaded arms maintained in contact with the borehole wall, the 3AC38 probe provides a representative measurement of the borehole diameter.

The standard probe nose section and arms provide a high-resolution measurement over the diameter range from 40 to 300 mm. If the supplied arm extensions and nose section extension tube are installed, the upper diameter limit is increased to 700 mm.

3AC38 : Three-arm caliper probe

As an indicator of enlarged zones or fractures, this log is useful both in assessing the competence of the formations and as a basis for calculating environmental corrections for other logging parameters such as fluid flow and production assessment. The basic open-hole diameter log can be integrated over depth to calculate an accurate borehole volume for cementing or gravel-packing operations.

The probe is also useful for quality control purposes, for example to verify the depth and diameter of casings and screens installed in a water well.

As an option, the probe can be supplied with a natural gamma detector to provide additional lithological information or for horizon correlation purposes.

4AC60 : Four-arm caliper probe

The 4AC60 borehole geometry probe incorporates two pairs of caliper arms giving independent, perpendicular X-Y diameter measurements, while a magnetometer/accelerometer orientation system provides the borehole azimuth, inclination and X-Y arm directions.

In a non-circular borehole, because of differing spring tensions in the two pairs of arms, the tool will rotate in the borehole until the X-Y directions coincide with the maximum and minimum diameter axes.

Where a borehole becomes ovalised or develops breakout-type features, it can provide information on stress magnitudes and directions within the geological formations.

As an option, the probe can be supplied with a natural gamma detector to provide additional lithological information or for horizon correlation purposes.



Logger & WinchLIM

eMindLogger

The **eMindLogger** logging data acquisition module is one of the most compact and reliable available on the market. It can operate without modification on single- or four-conductor logging cable and will run the full range of LIM probes including basic 6-channel, imaging probes, spectral gamma and full-wave sonic. Connection to the logging PC or laptop is via a USB port.

The individual **eMindLogger** acquisition software packages are optimised according to the type of probe, use minimal system resources and are compatible with all versions of the Microsoft Windows® environment from Windows® XP onwards.



WinchLIM 150



WINCHES

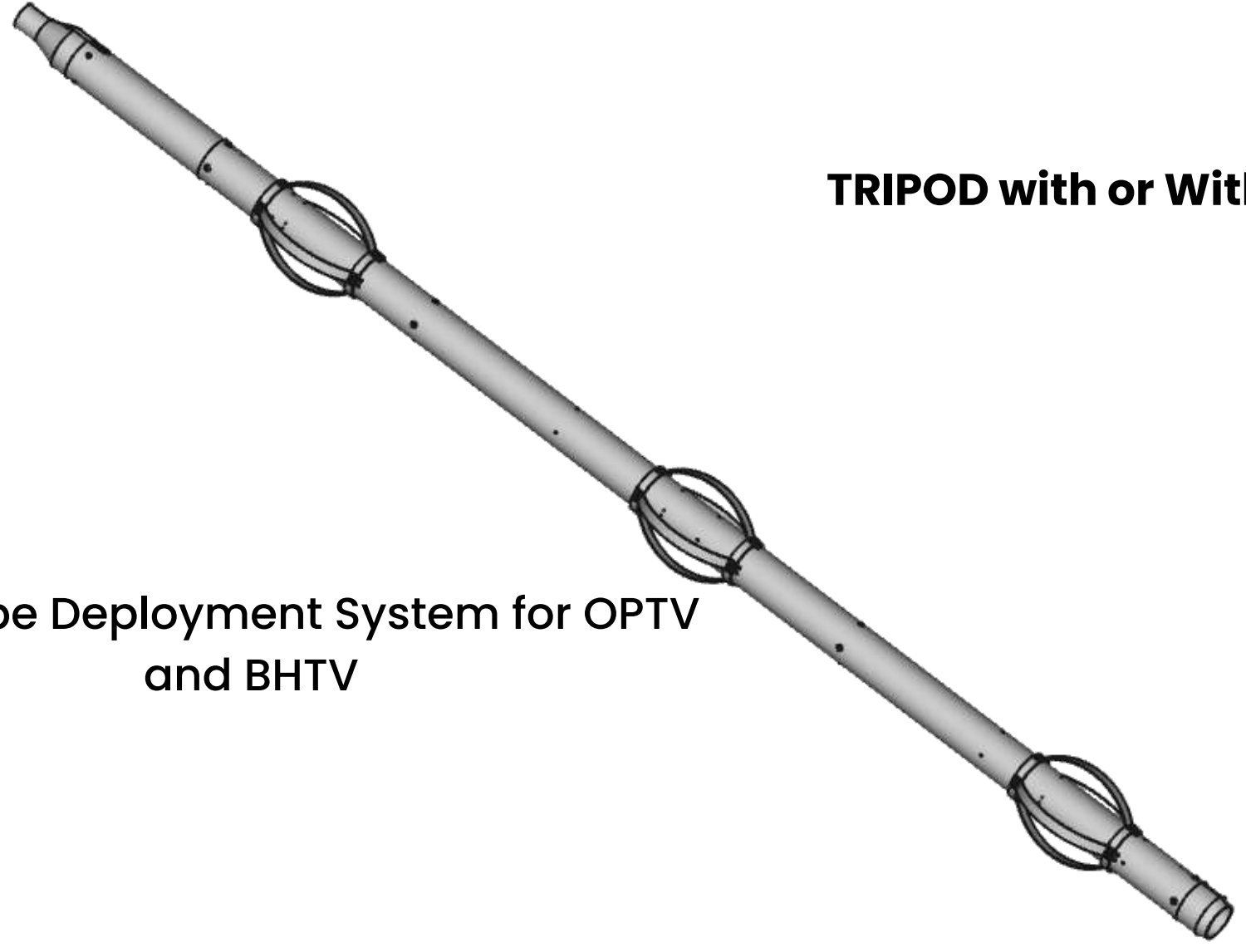
WinchLIM 300



WinchLIM 600 & 1200



Some Accessories



PDS: Probe Deployment System for OPTV
and BHTV

TRIPOD with or Without Depth Encoder



And very soon a real time wireline gyro (GYR42)

Thank You

