

4D Caliper™

EM Borehole Imager



Description

High accuracy electro-magnetic borehole imaging tool which acquires pulse-echo measurements while rotating in oil based mud systems.

The measurement principle is electro-magnetic pulse-echo, where borehole size and shape is derived from time-of-flight, and amplitude is derived from the echo/reflection

The 4D Caliper has up to 4 pairs of transducers and receivers, which are spaced 90° apart in the same plane, allowing to obtain high-resolution 2 axis measurements for all samples.

In addition to its imaging capabilities, it captures wide-band vibration, shocks, instantaneous tool face and RPM.

The 4D Caliper has its own internal batteries, memory and sensors to determine azimuthal orientation.

The Tool Collar I.D is a straight and through bore I.D allowing it to be included in any Bottom-Hole-Assembly.

Applications

- Borehole stability over time (4D)
- Borehole shape and size
- Volume calculations
- Dip measurement
- Formation stress and stress rotation
- Formation Evaluation

Deliverables

- High-resolution amplitude image
- High-resolution radius image
- Instantaneous RPM and tool face
- Tri-axial vibration, stick-slip and whirl
- Temperature
- 3D and 4D Visualization

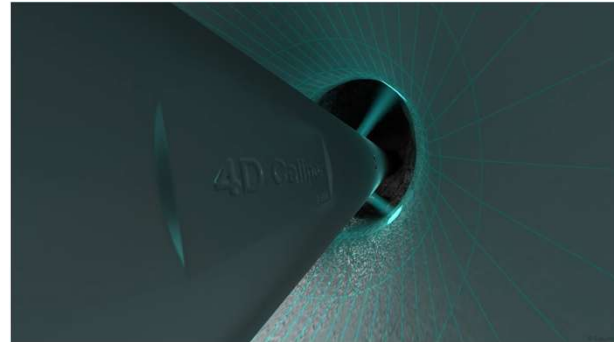
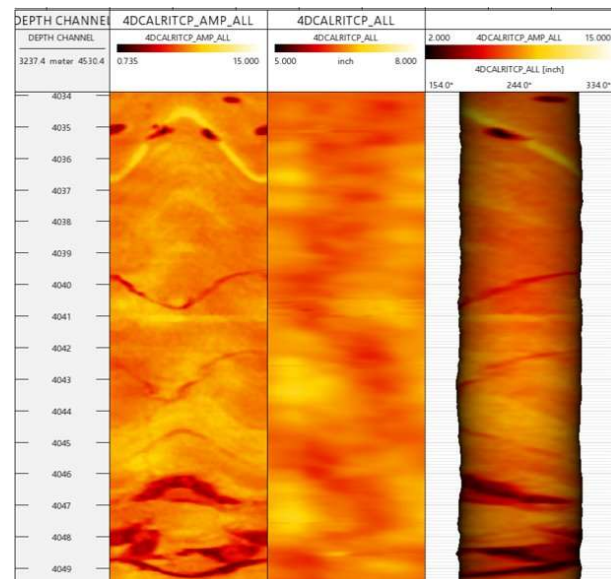
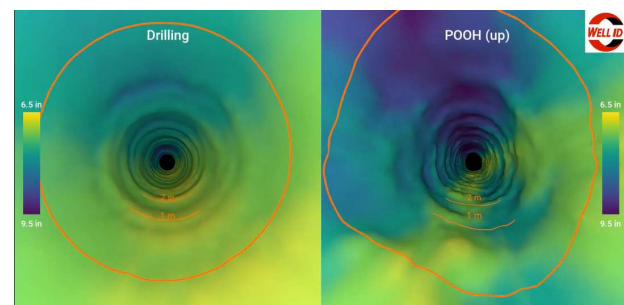


Illustration of how the 4D Caliper scans the borehole while drilling.



Log showing amplitude and radius where formation layers can be observed



Visualization of borehole shape and size while drilling vs same when rotating out of hole. Significant development in shape can be observed from the example.

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Measurement and Performance Specifications

PARAMETER	SPECIFICATIONS	
Imaging	Caliper (time-of-flight)	Amplitude (unitless)
Imaging – Orientation	Gravity High-side	Magnetic
Binning Capability	64 to 512 bins	
Caliper accuracy, in	± 0.04	
Mud system compatibility	Oil Based Mud	
Data Recording	Accelerations & RPM	500 – 1,000 sps
	Caliper & Amplitude	400 – 800 sps
Memory	Internal 128 GB	Configurable, Nom. 500 logging hours
Power Source	Internal Batteries	Configurable, Nom. 140 operational hours

Mechanical and Environmental Specifications

PARAMETER	950
Borehole Size Coverage, in	12.25 - 26
Nominal Collar O.D, in	9.50
Maximum Collar O.D, in	9.50
Nominal Collar ID, in	3.00
Collar Length, in	65.5
Connections	API REG 7-5/8 Box-Pin
Make-up Torque, ft-lb	81,000
Overpull non-rotating, Operational lbf	2,100,000
Max. RPM	250
Max. DLS rotating, deg / 100 ft	6
Max. DLS sliding, deg / 100 ft	12
Max. Temperature Operating, °F (°C)*	257° F (125° C)*
Max. Operating Pressure, psi	14,500 psi
Max. Mud Flow Rate, GPM	1,200
LCM limitations	No practical limit

* Higher temp. available upon request