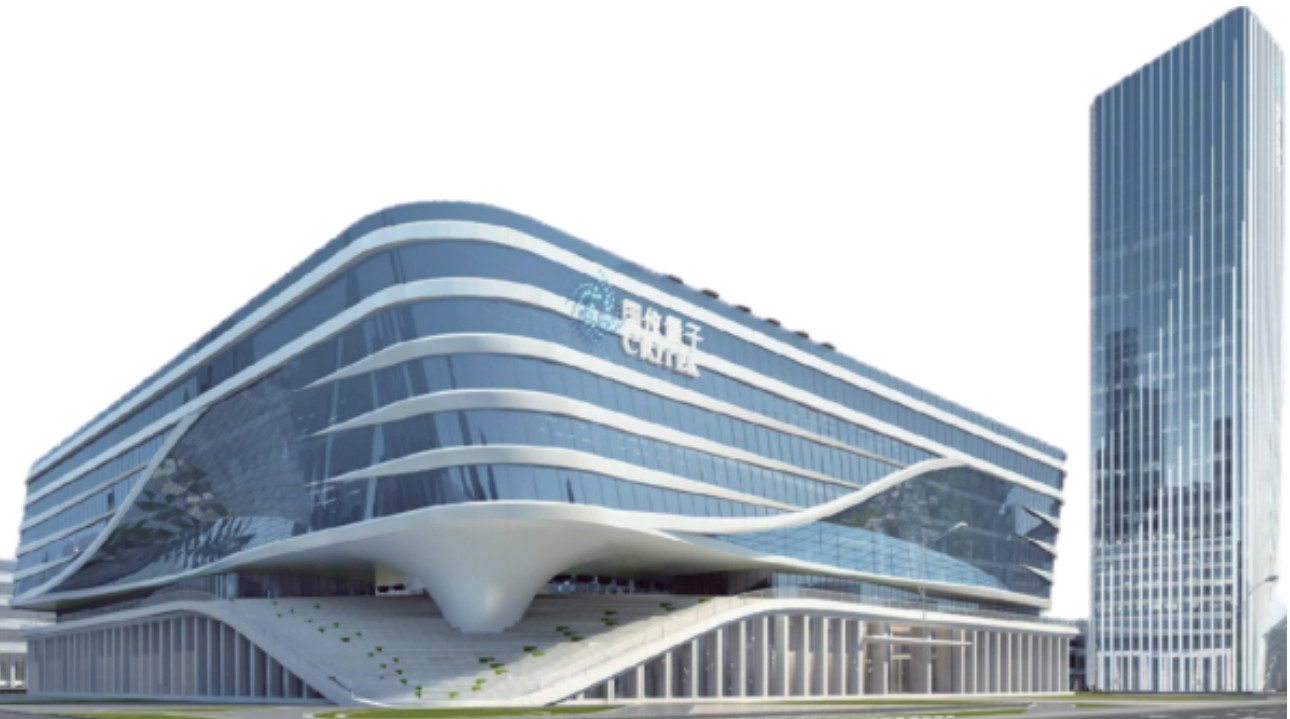


SUCCESSFUL CUSTOMERS, SUCCESSFUL COMPANIONS



FELiD SYSTEM

Formation Evaluation and Logging integrated Devices

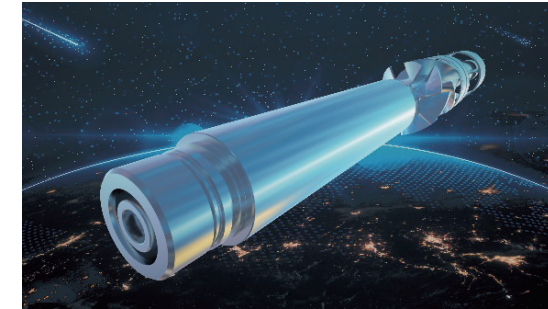
COMPANY PROFILE

Chinainstru & Quantumtech (Hefei) Co.,Ltd. (CIQTEK) is a high-tech enterprise with quantum precision measurement as the core technology. We are originated from the Key Laboratory of Micro-scale Magnetic Resonance in Chinese Academy of Sciences. It is devoted to designing & manufacturing quantum precision measurement scientific instruments, quantum computing, magnetic resonance, microscope, advanced research and education instruments for analysis and test, technical solutions, etc.

Chinainstru & Petroleum Technology (Wuxi) Co.,Ltd. (QOILTECH) as the holding subsidiary of CIQTEK with a mission of "rejuvenating the national high-end instrument industry", is committed to the research and production of Logging while drilling series products. The self-developed Drilling nuclear-Magnetic Resonance Logging Tool have reached inter national advanced level in comprehensive, make our country catch up with and surpass international commercial companies in the high-end well logging technology with drilling.



Catalog: Formation Evaluation and Logging integrated Devices



TigerLiD

Measurement While Drilling Tool

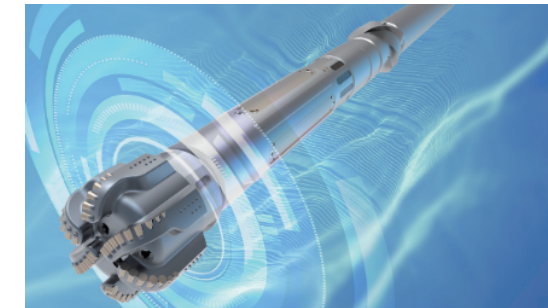
Tool type: Top-mounted & Rotary pulser

Flow range: 9.5 – 75.7 L/s

Hole size: 6" to 17 1/2"

Measurements: Inclination, azimuth and toolface for well trajectory control

Application: Mud pulse telemetry & Directional drilling



CatLiD

Near Bit 16-Sector Azimuthal Gamma Ray Tool

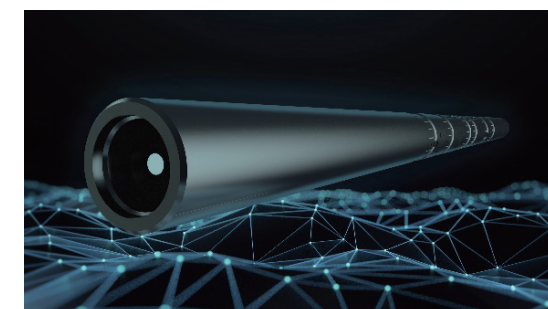
Tool type: Near bit subs

Tool size: 6.75" / 4.75" / 6"

Hole size: 6" to 9 1/2"

Measurements: Azimuthal GR (0-1000API) / At bit inclination (0-180°)

Application: Geosteering in horizontal wells for real time decision



LeoLiD

EM Resistivity Tool

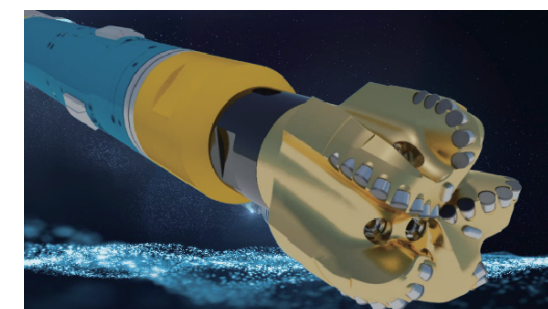
Tool type: Electromagnetic propagation

Tool size: 6.75" / 4.75" / 3.75"

Hole size: 4.5" to 9 1/2"

Measurements: Formation resistivity (0-2000 ohm.m)

Application: Oil and gas layers identification



JaguarLiD

Rotary Drilling System

Tool type: Push the bit RSS

Tool size: 6.75" / 4.75" / 6"

Hole size: 6" to 10 5/8"

Measurements: Inclination, azimuth and toolface & near bit survey

Application: Rotary drilling and drilling optimization

TigerLiD® Top-mounted Flow Tube MWD Tool

Features

- Mud pulse: Positive Pulsar
- Power: Turbine alternator for power, avoiding battery consumption
- Highly accurate azimuth and inclination data
- Hole size: 6" to 17 1/2"
- Rated to 125 degC temp, 20000psi pressure
- Gamma ray probe equipped
- Stable data decoding of surface system
- Tool string is short, reduce rig-up time in BHA assembling

Measurement Specifications

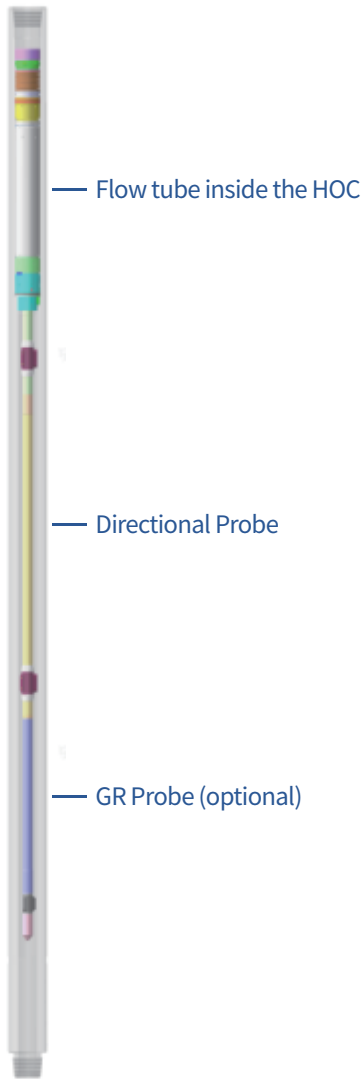
Items	Range	Accuracy
Inclination	0-180°	±0.1°
Azimuth	0-360°	±0.5°(Inc.>5°, Dip<70°)
Toolface Updates	14s/9s @ data rate 0.5Hz/0.8Hz	

Operating Specifications

Max. pressure	20000psi [137.90MPa]	Max. temp	125°C
Vibration	20 Grms, 50-1000 Hz	Shock	1000g. 0.5mSec.Half-sin

Mechanical Specifications

Series	350	650	1200	
OD	4 3/4" / 121mm	6 3/4" / 172mm	8" / 203mm	9 1/2" / 241mm
ID	2.815" / 71.44mm	3.25" / 83mm	3.25" / 83mm	3.25" / 83mm
Connection	311×310 / 3-1/2 IF	411×410 / 4-1/2 IF	631×630 / 6-5/8 REG	731×730 / 7-5/8 REG
Flow ranges	9.5-22.1 L/s	14.2-41.0 L/s	14.2-75.7 L/s	



TigerLiD® Rotary Pulsar MWD Tool

Features

- Mud pulse: Positive Pulsar
- Using battery for power, DH running hours > 200hrs
- Rated to 175 degC temp, 20000psi pressure
- Highly LCM tolerance
- Hole size: 6" to 17 1/2"
- Highly accurate azimuth and inclination data
- Simple structure, easy assembly and maintenance
- Gamma ray probe equipped

Measurement Specifications

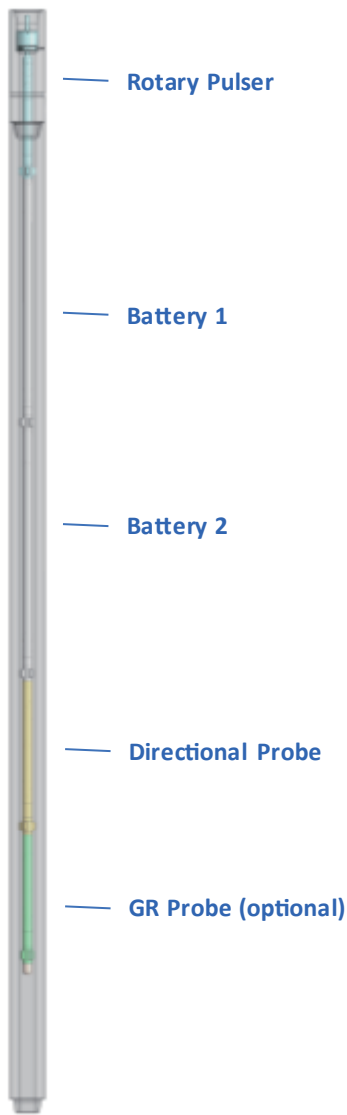
Items	Range	Accuracy
Inclination	0-180°	±0.1°
Azimuth	0-360°	±0.5°(Inc.>5°, Dip<70°)
Common pulse width	0.8-1.5s	

Operating Specifications

Max. pressure	20000psi [137.90MPa]	Max. temp	175°C
Vibration	20 Grms, 50-1000 Hz	Shock	1000g. 0.5mSec.Half-sin
Operating volt	28-40VDC	LCM tolerance	50lb/bbl medium size

Mechanical Specifications

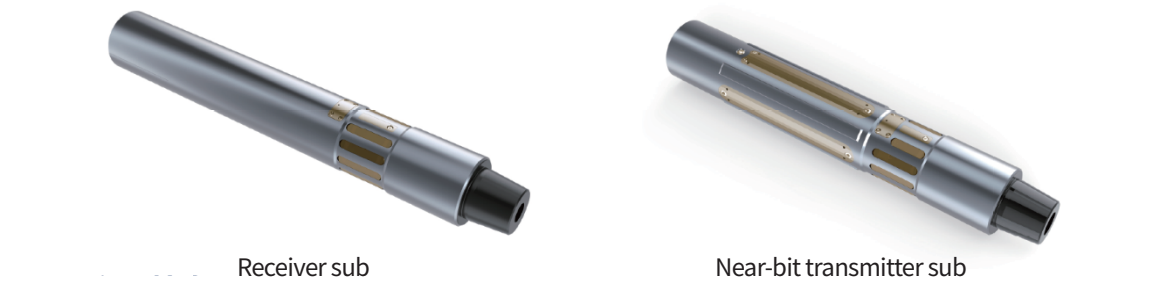
Valve size (inch)	Collar size (inch)	Hole size (inch)	Flow ranges
5.25"	8"	17.5" / 12.2"	19-69L/s
4.125"	6.75"	9.5" / 8.5"	9-47L/s
4"	6.25	7.5"	9-47L/s
3.44"	4.75	6.5" / 6"	7.9-22L/s



CatLiD® Near Bit 16-Sector Azimuthal Gamma Ray Tool

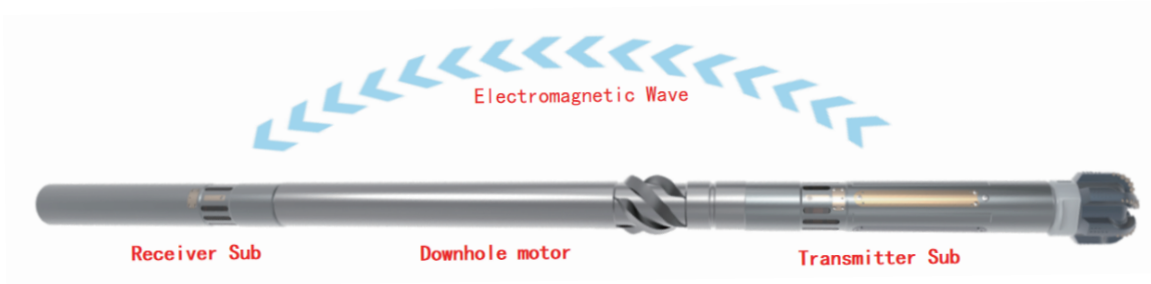
Overview

CatLiD® system contains a near-bit sub and a receiver sub. Azimuthal gamma ray measurements are in near-bit sub which connect to the drill bit, the data was sent to receiver sub via electromagnetic wireless transmission to skip mud motor. Receiver sub send measurements result to MWD systems. It has three different sizes named CatLiD-675, CatLiD-475, CatLiD-600 which designed for different wells.



Applications

- Geosteering in horizontal wells for real time decision, especially in unconventional oil and gas reservoirs
- Improve probability of reservoir penetration
- Avoid sidetrack and improve drilling efficiency



Features

- Measurement is close to bit: Distance to bit=0.37m + bit length
- High resolution azimuthal GR with 16 sectors
- Continuous at-bit inclination measurement
- Stable EM wireless transmission over 12m in downhole condition

CatLiD® Near Bit 16-Sector Azimuthal Gamma Ray Tool

Features

- Low battery consumption: Over 350h+ service time in 1 run for near-bit sub
- High reliability: Maximum footage is 2870m within 1 run in the shale gas field operations
- Vibration real time monitoring is available
- Available for oil base mud
- 175°C maximum operating temperature for all versions
- LWD compatibility: May work with EM resistivity tool in one BHA

Mechanical Specifications

Nominal size	6.75"	4.75"	6"
Collar OD, in [mm]	6.75 [171.5]	4.75 [121]	6.0 [155]
Max. collar OD, in [mm]	7.0 [178]	5.3 [135]	6.3 [160]
Near bit sub length, m	1.05m	1.05m	1.05m
Receiver sub length, m	1.17-1.23m	1.78m	1.23m
Near bit sub connection	4 ½ REG	3 ½ REG	4 ½ REG
Receiver sub connection	4 ½ IF/NC50	3 ½ IF/NC38	NC46

Measurement Specifications

Items	Range	Accuracy	Resolution
16-sector azimuthal GR	0-1000API	5%	6.0 inch [15cm] in vertical
At-bit inclination	0-180°	±0.5°	NA
Status Parameters	3-axis vibration, collar speed, power supply, temperature, etc.		
Sample rate	16s	Memory size	256MB

CatLiD® Near Bit 16-Sector Azimuthal Gamma Ray Tool

Operating Specifications

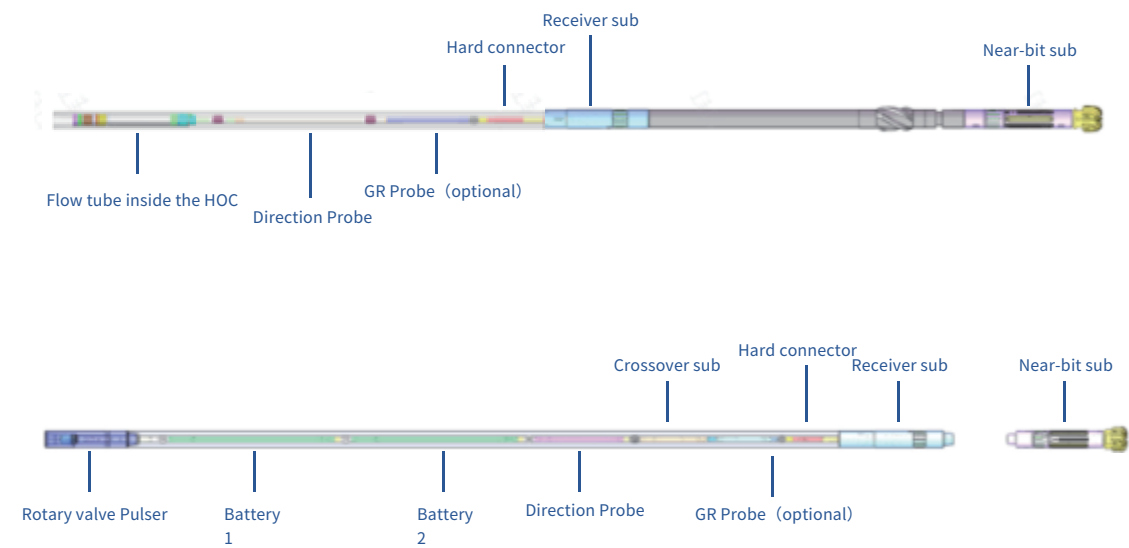
Max. pressure	20000psi [137.90MPa]	Max. temperature	175°C
Vibration	20 Grms, 50-1000 Hz	Shock	500G, 0.5ms, z 轴; 1000G, 0.5ms, Y、x

EM Wireless Transmission Specifications

Type	Electromagnetic wave	Max. distance	12m under DH condition
Coding/Decoding	FSK	Date rate	20bps

MWD compatibility

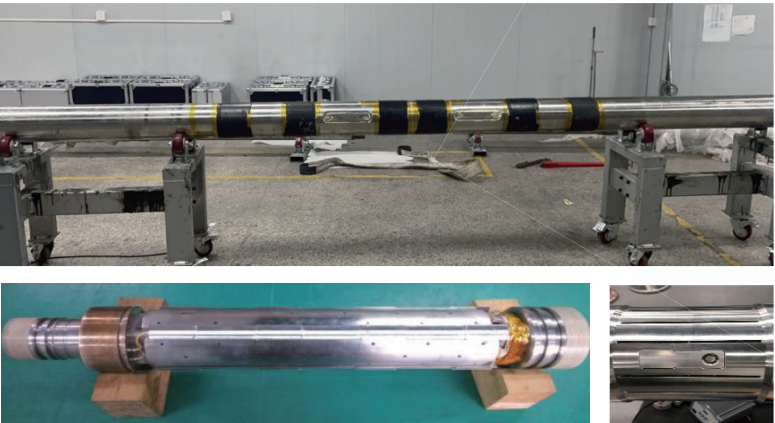
- Communication protocol inside receiver sub is 1553 bus and it can be translated to 485 bus
- The communication and mechanical connection with MWD can be customized as required
- There’ re two examples shown as follow, one is compatible with Halliburton’ s MWD system, another is compatible with APS’ s MWD system through a special crossover sub



LeoLiD® Electromagnetic Propagation Resistivity Tool

Features

- Tool type: Electromagnetic propagation
- Tool size: 6.75” /4.75” /3.75”
- Hole size: 4.5” to 9 1/2”
- Max. temp: 150°C
- Antenna: Four transmitter dual receiver (symmetrical array)
- Dual frequency: 2MHz and 400KHz
- 2 T-R distance: 584 mm & 889 mm
- Measurements: 32 original curves, 8 resistivity curves & GR
- Record interval: 10s
- Communication: 1553, upper and lower CIMhanger connection



Measurement Specifications

Measurements	GR	2MHz Phase shift	2MHz Attenuation	400KHz Phase shift	400KHz Attenuation
Range	0-1000API	0.1-2000 ohm·m	0.1-500 ohm·m	0.1-1000 ohm·m	0.1-200 ohm·m
Accuracy	5% (API)	1% (0.1-50 ohm·m)	2% (0.1-25 ohm·m)	1% (0.1-25 ohm·m)	5% (0.1-10 ohm·m)
		±0.05 mmho/m (>50 ohm·m)	±1 mmho/m (>25 ohm·m)	±1 mmho/m (>25 ohm·m)	±5 mmho/m (>10 ohm·m)
Vertical resolution	6in (15cm)	8” (20cm)	8” (20cm)	12” (30cm)	12” (30cm)

JaguarLiD® Rotary steerable system

Overview

The rotary steering system (‘Push the Bit’) consists of LCP Pulse Generator, Measurement Unit (including directional and gamma measurement) and rotary steering unit. The system optimizes wellbore placement and reservoir exposure through real-time, near-bit inclination and gamma ray measurements. Operators achieve faster and safer well delivery.

Features

- Tool size: 6.75" /4.75" /6"
- Reaches high buildup rates, up to 15°/100 ft
- Measures real-time, azimuthal gamma ray at short distance to bit
- Real-time adjustment of well deviation and azimuth, smooth well path, improve drilling rate and shorten drilling period
- High reliability based on near-bit tool develop experience
- Vibration real time monitoring is available

Applications

- Conventional and unconventional hydrocarbon development drilling
- Vertical, horizontal, and 3D directional drilling

Specifications

Tool size	6.75-in. (171 mm)	4.75-in. (120 mm)	6-in. (152 mm)
Hole size	8.375-in. to 10.625-in.	6-in. to 6.5-in.	7.5-in.
Maximum temperature	150°C	150°C	150°C
Maximum pressure	20,000 psi	20,000 psi	20,000 psi
Maximum RPM	400 rpm	400 rpm	400 rpm
Flow range	22 - 44 L/s	7.9-22L/s	9-34L/s
Max. buildup rate	15°/100 ft (30 m)	10°/100 ft (30 m)	15°/100 ft (30 m)



Field Solution: Geosteering

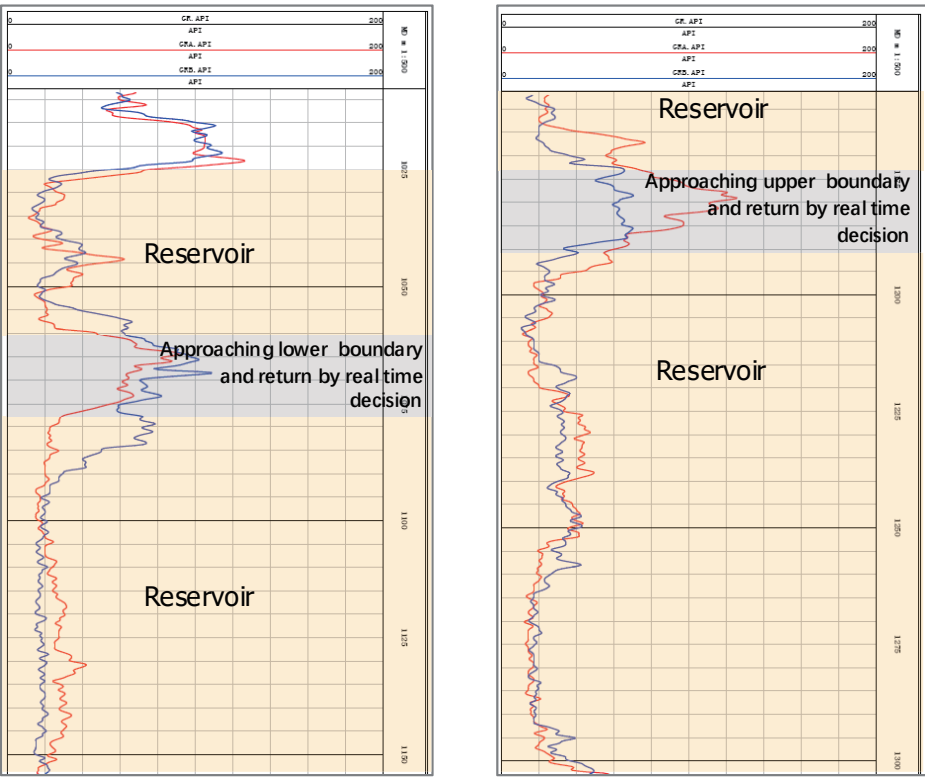
MWD + Regular GR + Near Bit Azimuthal GR



MWD + Regular GR + EM Resistivity + Near Bit Azimuthal GR

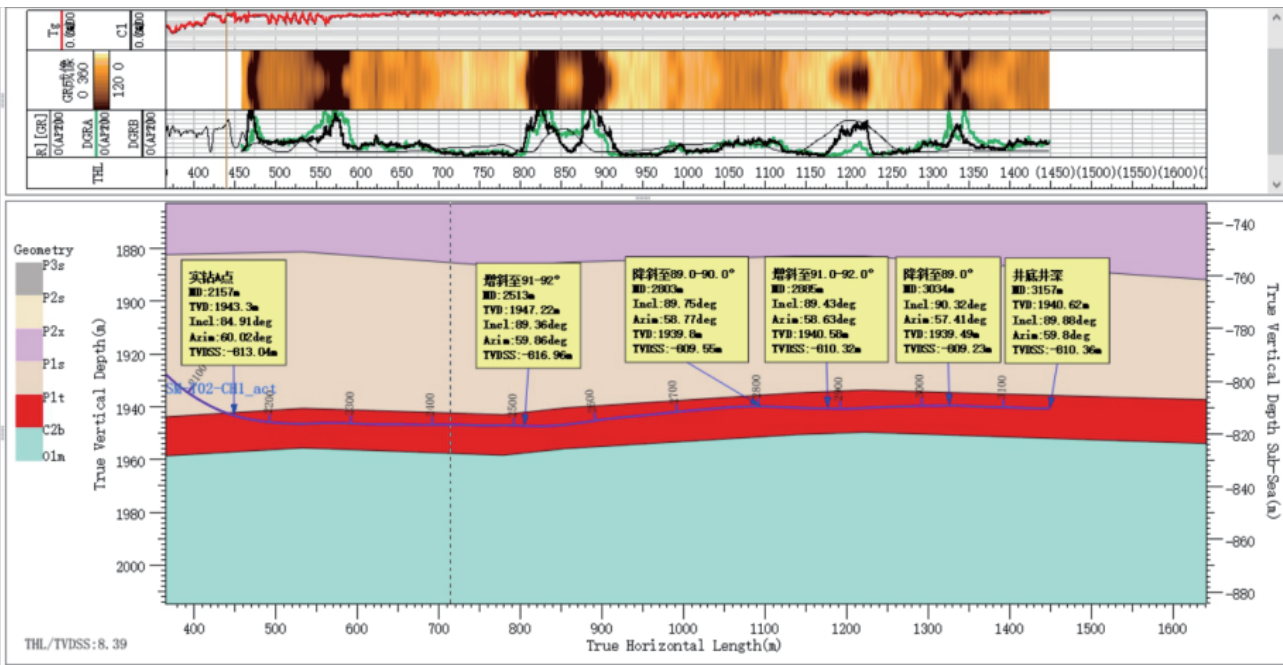


Field case: Geosteering –real time azimuthal GR curve

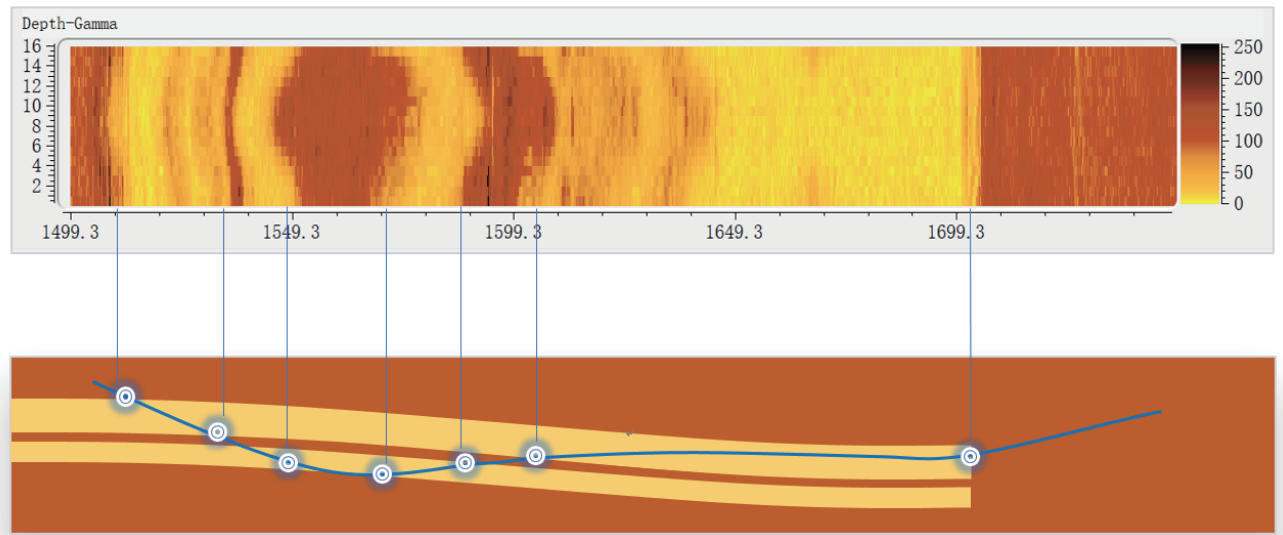


Field Solution

Field case: Geosteering results

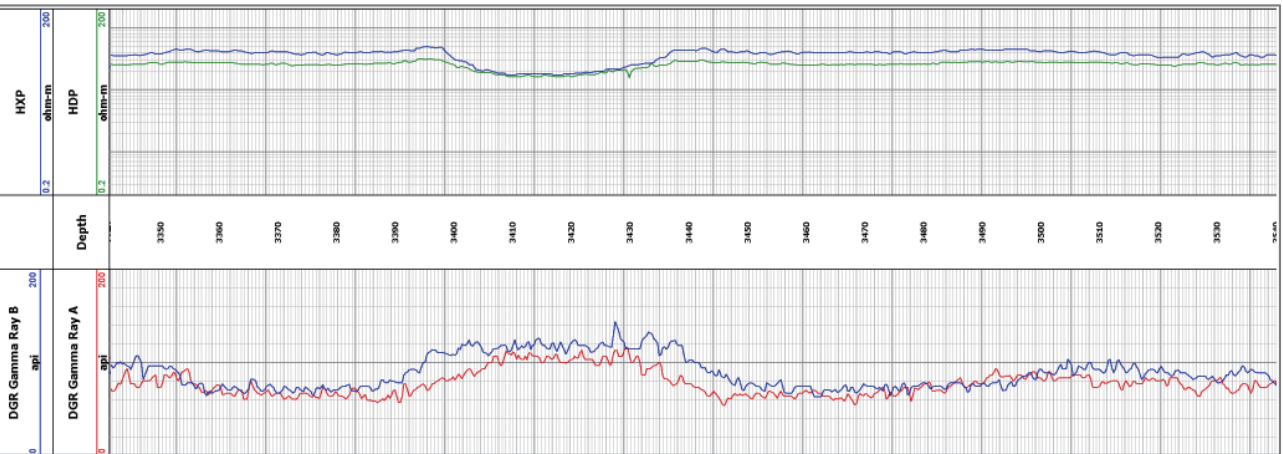


Field case: 16-sector azimuthal GR Image

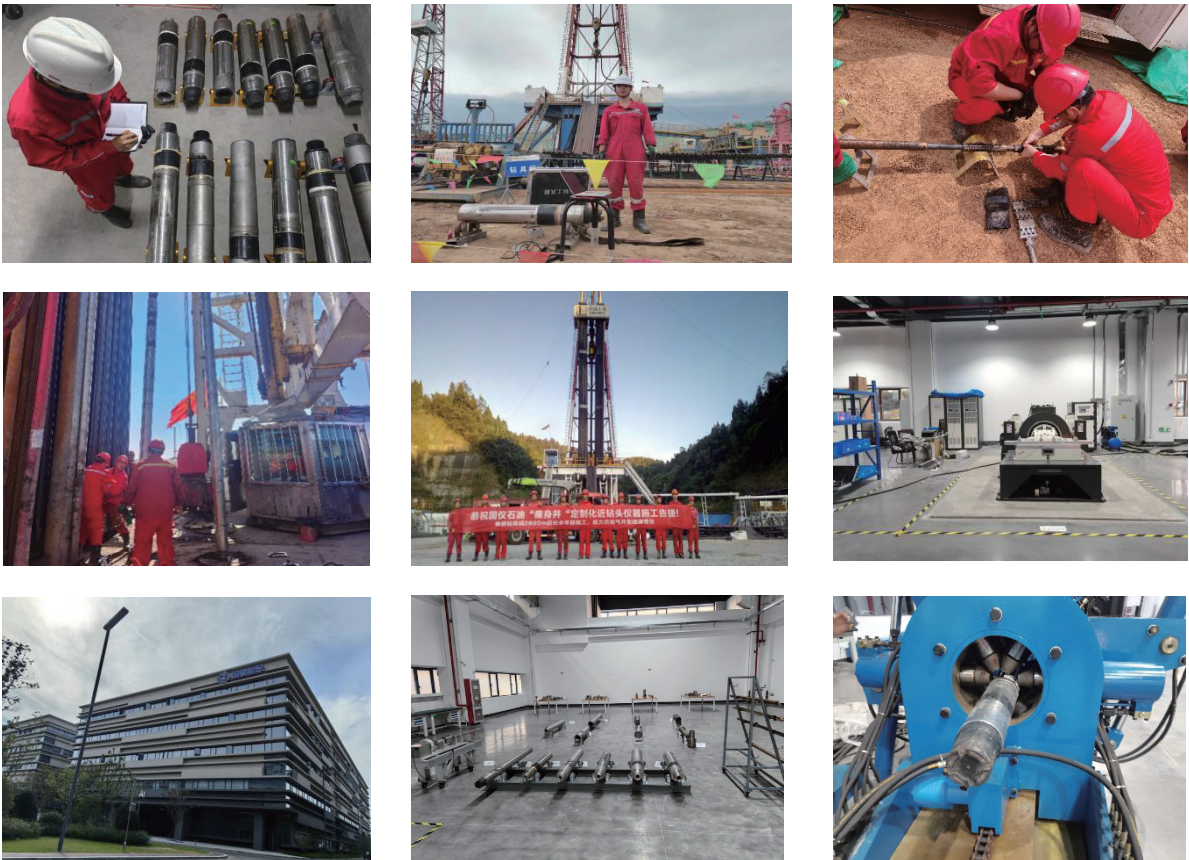


Field Solution

Field case: Resistivity+azimuthal GR Service



Field Service



Field Service Performance

500+ wells applied successfully mainly in coal bed methane/shale oil and gas/tight gas reservoir for horizontal well, overall drilling footage more than 500,000 meters



Records

MD/TVD	Temp.	DH hours for single run	Footage for single run
5580 m	130 °C	305 hrs	2827 m
4200 m			

Partial wells

LXC1-102-7H	TS41-02H1	FGC-T13-8H	LXC1-64-2H	PH65-03H2
FGC-T19-5H	LXC1-102-9H	MB04-C7-42L-04	SHBM-093-3	焦页 69-S1HF
LXC-167-4H	LXX23-18H2	PH-113H6	LXC1-102-10H	FGC-T19-3H
CJHC1-1-9H	CJHC1-1-7H	FGC-T12-7H	长平 46-2	TS30-15H3
MB04-C7-36L-12	FGC-T19-4H	FG-T31-3H	焦页 30-Z1HF	SMC-T09-7H
长平 42-1	LXC-167-3H	PH-114H4	郑 59-8-3 平 1	FG-T31-4H
安 48 平 1	TS41-02H2	TS64-01H1	PH-113H7	长平 26-2
安 13-9B-3 平 3	TS40-01H4	LXC1-65-8H	FG-T31-7H	TS-133H1
PH-113H5	SJB9-50H1	FGC-T19-2H	长平 25-3	安 13-19B-3 平 6
FGC-T12-9H	LXC-70-1H	TS40-01H5	LXC-47-8H	TS63-04H1
LXC1-64-4H	LXC-47-6H	LXC-167-8H	LXD12-6H2	LXC1-54-3H

Reference Customer

CNOOC

Sinopec

CNPC

AAGI

Huaxin Gas

Yaxin CBM

Customer Satisfaction certificates and the Letters for Praising

