

# Directional Adaptive Borehole Radar

## 85 mm Borehole Tool

### Method

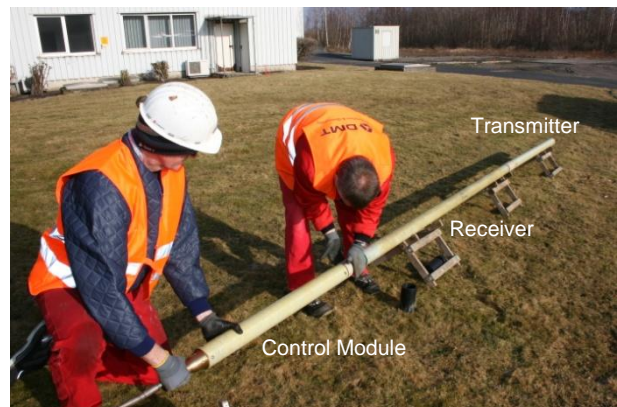
- Radar (GPR)
- Reflection of electromagnetic waves (EMR)
- Directional analysis (3D location of reflectors)

### Targets

- Boundary of salt layer
- Neighbouring caverns
- Bedrock structures (faults, layers)
- Karst formation (cavities)
- Faults

### Requirements

- Open borehole (vertical / horizontal)
- High resistive filling (oil, gas, air)
- High resistive medium (salt / bedrock)
- Small amount of impurities

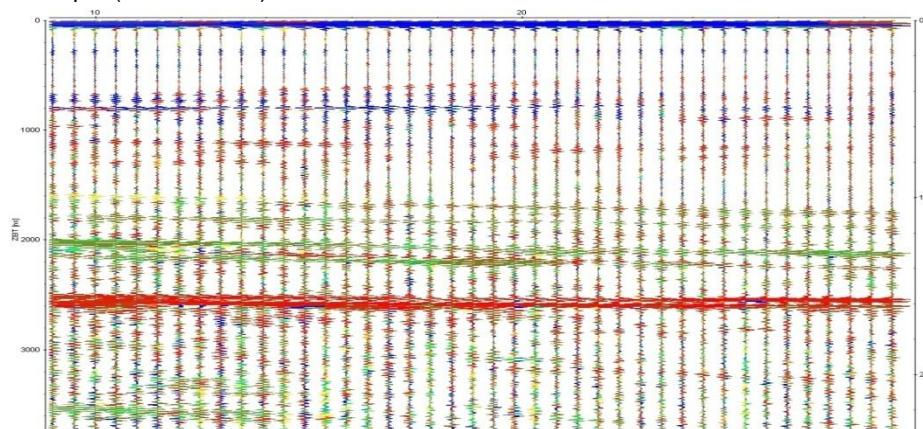


System components

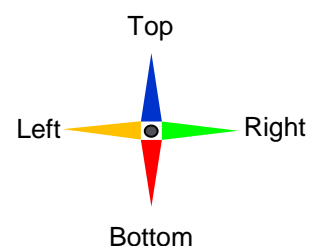


Complete system in progress

Depth (Tool Position) >>



Horizontal Layered Structure Radargram



Technical Data	
Frequency	50 MHz / 100 MHz / 250 MHz ( $v=125 \text{ m}/\mu\text{s}$ )
Diameter	85 mm
Length	6 – 12 m
Max. Temperature	< 75°C
Max. Pressure	100 Bar / 1428 psi
Max. Operating Depths	1000 m (depends on specific mud weight)
Azimuthal Resolution	+/- 10 Degree
Exploration Distance	up to 1000 m
Weight	Approx. 60 - 120 kg

Subject to technical changes

References (130 mm system)		
Since 2002	NWKG, Wilhelmshaven, Germany	Cavern Storage Sites Rüstringen and Sottorf Determination of salt heterogeneities for 3D geological model improvement
Since 2003	IVG, Friedeburg, Germany	Cavern Storage Site Etzel Determination of salt heterogeneities for 3D geological model improvement
Since 2009	Solino, Poland	Cavern Storage Sites Mogilno and Gora Determination of salt heterogeneities for 3D geological model improvement
2009 - 2010	Gasunie, The Netherlands	Cavern Storage Site Zuidwending Determination of salt heterogeneities for 3D geological model improvement

## Publications

Kleinefeld, B., Petrat, L. (2005): *Optimized Cavern Field Development and Cavern Remediation using enhanced geological Interpretation methods and Ground-Penetrating (GPR)-measurements*, Proceedings of 10th Int. Salt Symposium – Quo Vadis Sal, in Ciechocinek, Poland.

Petrat, L., Gaulke, K., Kleinefeld, B., Behlau, J., Siever, K. (2005): *Das Bohrloch- und Kavernenradar zur geologischen und geotechnischen Erkundung im Salzkavernenbau*, bergbau – Zeitschrift für Rohstoffgewinnung, Energie, Umwelt, 8/2005, Published by RDB e.V., Essen, Germany.

Petrat, L., Kleinefeld, B., Elsen, R. (2006): *Directional Borehole Radar System – a Review on Technique and Experience*, SMRI Meeting, Brussels, Belgium.

Elsen, R., Siever, K., Uchtmann, S. (2010): *Optimisation of Solution Mining*, SMRI Meeting, Leipzig, Germany.

**DMT GmbH & Co. KG**  
Exploration & Geosurvey

Am Technologiepark 1  
45307 Essen, Germany

Phone +49 201 172-1970  
Fax +49 201 172-1971  
exploration@dmr.de  
www.dmr.de

Member of TÜV NORD Group

