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Oskarshamn site investigation

RAMAC, BIPS and deviation logging in boreholes KLX21A and KLX21B

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March 2007

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Keywords: BIPS, RAMAC, Radar, TV, Deviation logging, Flexit.

Abstract

This report includes the data gained in geophysical logging operations performed within the site investigation at Oskarshamn. The logging operations presented here includes borehole radar (RAMAC), BIPS and deviation logging in the core drilled boreholes KLX21A and KLX21B. All measurements were conducted by Malå Geoscience AB/RAYCON during January and February 2007.

The objective of the radar surveys is to achieve information on the rock mass around the borehole. Borehole radar is used to investigate the nature and the structure of the rock mass enclosing the boreholes.

The objective of the BIPS logging is to achieve information of the borehole including occurrence of rock types as well as determination of fracture distribution and orientation.

The objective of the deviation measurement is to achieve information on borehole coordinates as well as dip and azimuth along the borehole length.

This report describes the equipment used as well as the measurement procedures and data gained. For the BIPS survey, the result is presented as images. Radar data is presented in radargrams and the identified reflectors are listed. The deviation measurement is presented as a list of data.

The borehole radar data quality from KLX21A and KLX21B was satisfying to relatively good, but in parts of lower quality due to more conductive conditions. This conductive environment of course reduces the possibility to distinguish and interpret possible structures in the rock mass which otherwise could give a reflection. However, the borehole radar measurements resulted in 10 identified radar reflectors in KLX21A. In KLX21B 211 structures were identified and of these 26 were orientated (strike/dip).

In general good quality distinguish the BIPS images from KLX21A and KLX21B. In the 195 mm diameter parts of the boreholes the images in KLX21A are darker than in KLX21B. Below 700 metres in KLX21B mud that covers the lower most part of the borehole wall limits the visibility.

Sammanfattning

Denna rapport omfattar geofysiska loggningar inom platsundersökningsprogrammet för Oskarshamn. Mätningarna som presenteras här omfattar borrhålsradarmätningar (RAMAC), och BIPS-loggningar i kärnborrhålen KLX21A och KLX21B. I båda borrhålen genomfördes även avvikelsemätningar, s.k. krökningsmätningar. Alla mätningar är utförda av Malå Geoscience AB/RAYCON under januari och februari 2007.

Syftet med radarmätningarna är att samla information om bergmassan runt borrhålet. Borrhålsradar används till att karakterisera bergets egenskaper och strukturer i bergmassan närmast borrhålet.

Syftet med BIPS-loggningen är att skaffa information om borrhålet inkluderande förekommande bergarter och bestämning av sprickors fördelning och deras orientering.

Syftet med krökningsmätningarna är att mäta lutning och riktning och därmed få fram koordinater för punkter längs med borrhålet.

Rapporten beskriver utrustningen som använts liksom mätprocedurer och en beskrivning och tolkning av data som erhållits. För BIPS-loggningen presenteras data som plottar längs med borrhålet. Radardata presenteras i radargram och en lista över tolkade radarreflektorer ges. Krökningsmätningen presenteras som en lista med lägesdata.

Borrhålsradardata från KLX21A och KLX21B var tillfredställande till relativt bra, men bitvis med sämre djuppenetration troligen till stor del beroende på en konduktiv miljö. En konduktiv miljö minskar möjligheterna att identifiera strukturer från borrhålsradardata. Dock har 10 radarreflektorer identifierats i KLX21A. I KLX21B identifierades 211 strukturer och av dessa har 26 orienterats (med strykning/stupning).

BIPS bilderna är generellt av bra kvalitet i de båda borrhålen KLX21A och KLX21B. Bitvis är borrhålsväggen väldigt mörk i den 195 mm grova delen i KLX21A. För KLX21B är kvalitén mycket bra men från 700 meter ner till botten ökar gradvis mängden av suspendat på den nedre delen av väggen.

Contents

1 Introduction

This report presents the data gained in geophysical logging operations, which is one of the activities performed within the site investigation at Oskarshamn. The logging operations presented here includes borehole radar (RAMAC) and BIPS in the core drilled boreholes KLX21A and KLX21B. In both boreholes deviation measurements were also carried out.

The work was carried out in accordance with activity plans AP PS 400-06-156. In Table 1-1 the controlling documents for performing this activity are listed. Both the activity plan and method descriptions are SKB's internal controlling documents.

This report includes measurements from 0 to 71 m in KLX21A and from 0 to 852 m in KLX21B. The boreholes were core drilled with a diameter of 76 mm.

All measurements were conducted by Malå Geoscience AB/RAYCON during January and February 2006. The investigation site and location of the boreholes is shown in Figure 1-1.

The used investigation techniques comprised:

- Borehole radar measurements (Malå Geoscience AB's RAMAC system) with dipole and directional radar antennas.
- Borehole TV logging with the so-called BIP-system (Borehole Image Processing System), which is a high resolution, side viewing, colour borehole TV system.
- Borehole deviation equipment (Flexit SmartTool from Flexit AB), measuring azimuth, inclination (dip), tool face (gravity and magnetic) and magnetic dip.

The delivered raw and processed data have been inserted in the database of SKB (SICADA) and data are traceable by the activity plan number.

Table 1-1. Controlling documents for the performance of the activity (SKB's internal controlling documents).

Activity plan	Number	Version
Borrhålsradar, BIPS- och Flexit-mätning i KLX21B	AP PS 400-06-156	1.0
Tillägg till AP PS 400-06-156 med BIPS, radar och krökningsmätning med FLEXIT i KLX21A	AP PS 400-06-156	1.0
Method descriptions	**Number**	**Version**
Metodbeskrivning för TV-loggning med BIPS	SKB MD 222.006	1.0
Metodbeskrivning för borrhålsradar	SKB MD 252.020	3.0
Metodbeskrivning för krökningsmätning av hammar- och kärnborrhål	SKB MD 224.001	1.0

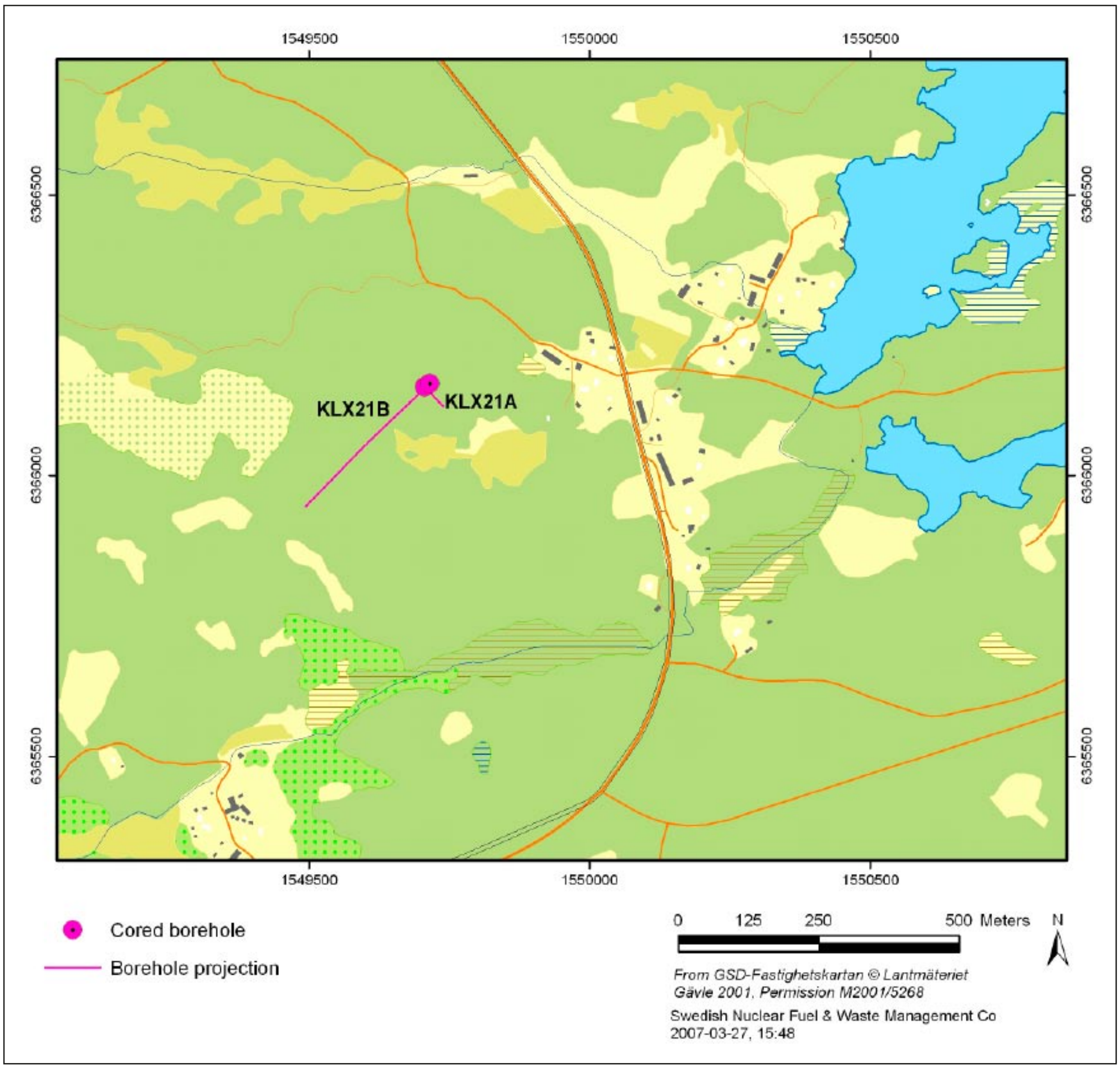


Figure 1-1. *Map of the location of the boreholes KLX21A and KLX21B in the Laxemar subarea, Oskarshamn.*

2 Objective and scope

The objective of the radar and BIPS surveys is to achieve information on the borehole conditions (borehole wall) as well as on the rock mass around the borehole. Borehole radar is engaged to investigate the nature and the structure of the rock mass enclosing the boreholes, and borehole TV for geological surveying of the borehole including determination of rock types as well as fracture distribution and orientation.

The objective of deviation logging is to achieve information of the borehole coordinates as well as dip and azimuth along the entire borehole length.

This report describes the equipment used for the radar, BIPS and deviation surveys as well as the measurement procedures and data gained. For the BIPS survey, the result is presented as images. Radar data is presented in radargrams and the identified reflectors are listed. The deviation measurements are presented as lists of data (coordinates etc).

3 Equipment

3.1 Radar measurements RAMAC

The RAMAC GPR system owned by SKB is a fully digital GPR system where emphasis has been laid on fast survey speed and easy field operation. The system operates dipole and directional antennas (see Figure 3-1). A system description is given in the SKB internal controlling document MD 252.021.

The borehole radar system consists of a transmitter and a receiver antenna. During operation an electromagnetic pulse, within the frequency range of 20 MHz up to 250 MHz, is emitted into the bedrock. Once a feature, e.g. a water-filled fracture, with sufficiently different electrical properties is encountered, the pulse is reflected back to the receiver and recorded.

3.2 TV-Camera, BIPS

The BIPS 1500 system used is owned by SKB and described in SKB internal controlling document MD 222.005. The BIPS method for borehole logging produces a digital scan of the borehole wall. In principle, a standard CCD video camera is installed in the probe in front of a conical mirror (see Figure 3-2). An acrylic window covers the mirror part and the borehole image is reflected through the window and displayed on the cone, from where it is recorded. During the measuring operation, pixel circles are grabbed with a resolution of 360 pixels/circle.

The system orientates the BIPS images according to two alternative methods, either using a compass (vertical boreholes) or with a gravity sensor (inclined boreholes).

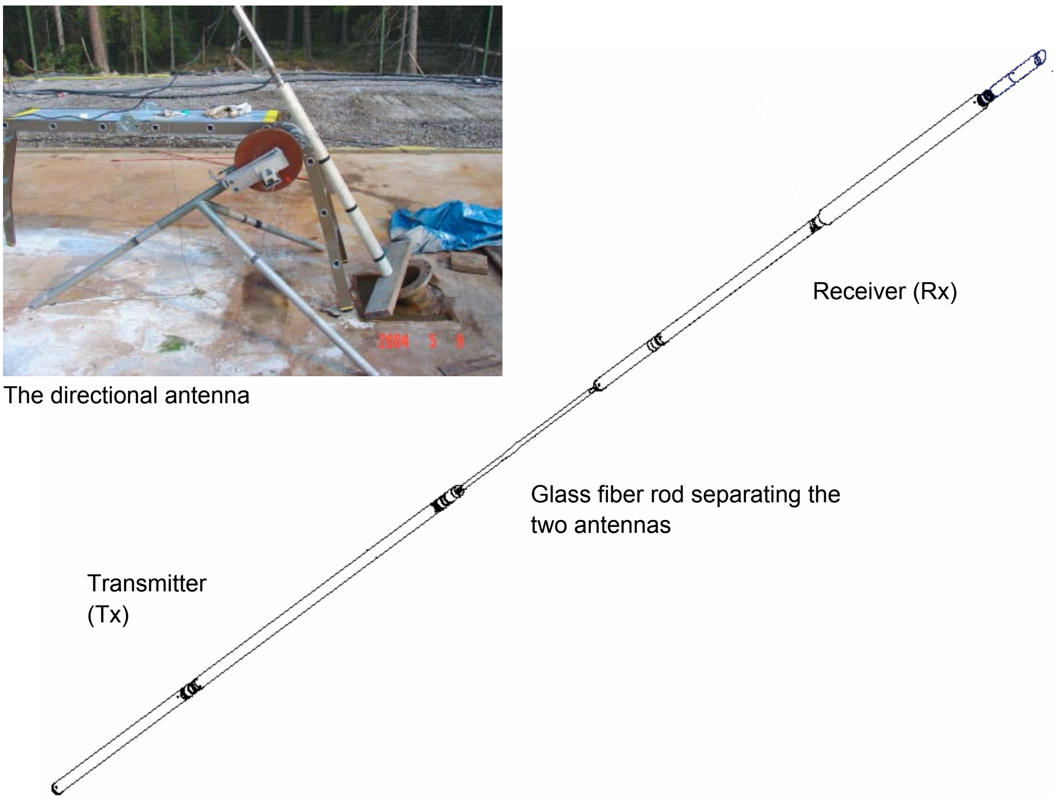


Figure 3-1. *Example of a borehole radar antenna.*

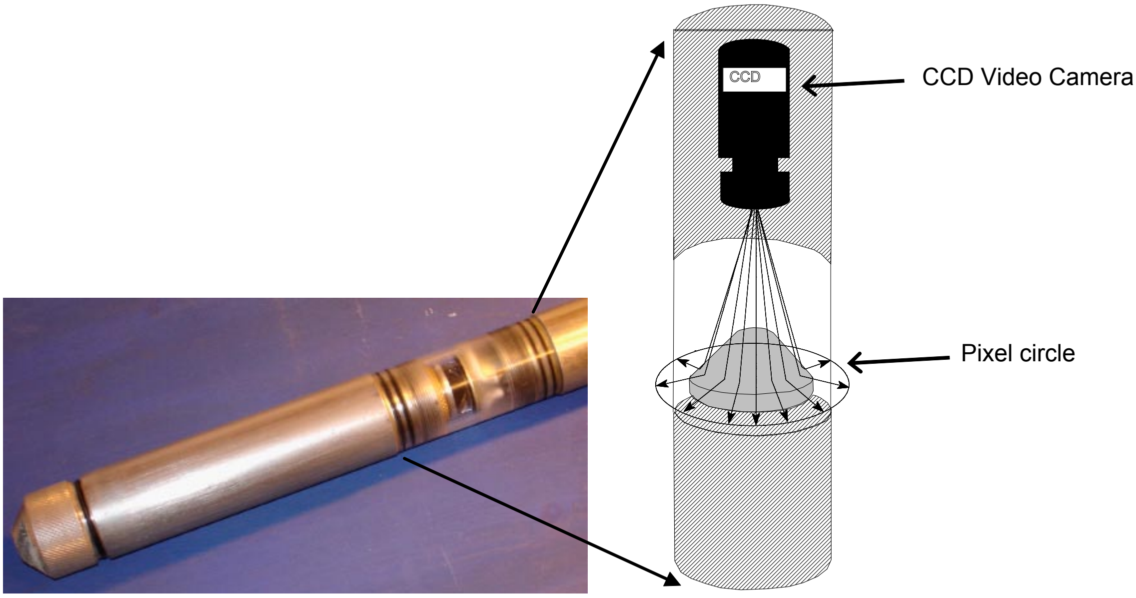


Figure 3-2. *The BIP-system. Illustration of the conical mirror scanning.*

3.3 Deviation measurements, Flexit SmartTool

The deviation measurements were carried out with the Flexit SmartTool Deviation equipment, Figure 3-3. The system is based on station readings.

The system consist of a borehole probe (SensIT) including 3-component magnetometers and accelerometers, measuring a number of different parameters. Table 3-1 describe the delivered parameters. Inside the probe the radio link is also built in were all data is downloaded after the end of the survey. The probe are controlled during the measurement either by an external PC and the software package called MeasureIT or a data pad StoreIT. For processing and reporting data the PC software MeasureIT and DisplayIT are used.

In the Flexit SmartTool system there is a magnetic integrity check to detect magnetic disturbance in the survey measurements. Magnetic disturbance results in incorrect/inaccurate azimuth values. The operator can select the average values for this parameters in the MeasureIT software and run a magnetic integrity check and if necessary change or delete azimuth values. If the azimuth value is changed the new added value by the operator is interpolated from the nearby station readings.

For more information and technical specification visit www.flexit.se.

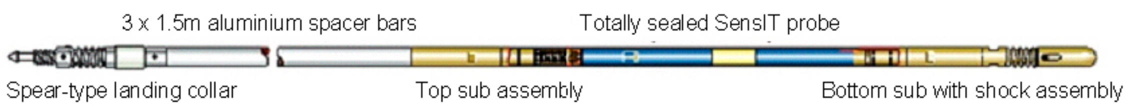


Figure 3-3. *The FlexIT SmartTool-system. Illustration of the set-up in the borehole.*

Table 3-1. Flexit SmartTool result tables.

Dip:	Inclination of the borehole at the position for reading.
Azimuth:	Direction of the borehole at the position for reading.
Easting Northing and Elevation:	Co-ordinate of the borehole at the position for reading.
Mag. Field:	Strength of earth’s magnetic field.
Mag. Dip:	Inclination of earth’s magnetic field.
Grav. Field:	Indicates if the probe was moved during recording at that station.
Status:	Indicates if the azimuth value at the reading station was disturbed or changed by the operator. If the azimuth value has been edited or the magnetic integrity check have indicated a magnetic disturbance at the reading station a symbol with more than two “hands” is visible in the status field. 
Updown:	Shows the distance the actual reading station is above or below the planned straight line for the borehole given the starting direction.
Left/Right:	Shows the distance the actual reading station is left or right the planned straight line for the borehole given the starting direction.
Short Fall:	Shows the amount the actual point falls short of the planned survey point.

4 Execution

4.1 General

4.1.1 RAMAC radar

The measurements in KLX21A and KLX21B were carried out with dipole radar antennas, with frequencies of 250, 100 and 20 MHz. In KLX21B measurements were also carried out with a directional antenna, with a central frequency of 60 MHz.

During logging the dipole antennas (transmitter and receiver) were lowered continuously into the borehole and data were recorded on a field PC along the measured interval. The measurement with the directional antenna was made step wise, with a short pause for each measurement occasion. The antennas (transmitter and receiver, both for dipole and directional) were kept at a fixed separation by glass fiber rods according to Tables 4-1 and 4-2. See also Figures 3-1 and 4-1.

All measurements were performed in accordance with the instructions and guidelines from SKB (internal document MD 252.020). All cleaning of the antennas and cable was performed according to the internal document SKB MD 600.004 before the logging operation.

The functionality of the directional antenna was tested before measurements in KLX21B. This was performed by measurements in the air, where the receiver antenna and the transmitter antenna are placed apart. While transmitting and measuring the receiver antenna is turned around and by that giving the direction from the receiver antenna to the transmitter antenna. The difference in direction is measured by compass and the result difference achieved from the directional antenna was approximately 8°. This can be considered to be satisfying due to the disturbed environment, with metallic objects etc at the test site.

For more information on system settings used in the investigation of KLX21A and KLX21B see Tables 4-1 and 4-2 below.

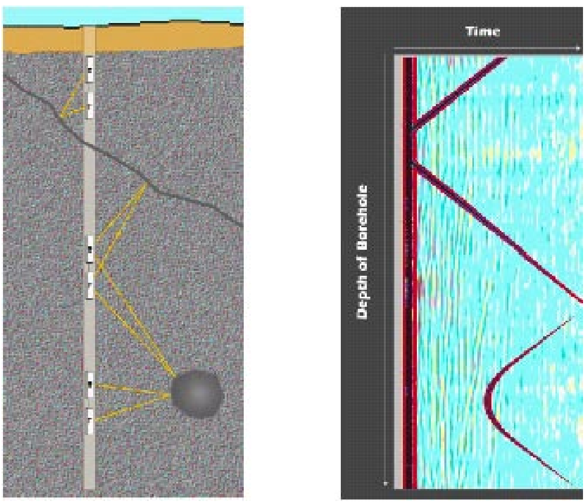


Figure 4-1. *The principle of radar borehole reflection survey and an example of result.*

Table 4-1. Radar logging information from KLX21A.

Site:	**Oskarshamn**	**Logging company:**	**MALÅ GeoScience AB/RAYCON**	
BH:	**KLX21A**	**Equipment:**	**SKB RAMAC**	
Type:	**Dipole**	**Manufacturer:**	**MALÅ GeoScience**	
Operator:	**CG**	**Antenna**		
		250 MHz	**100 MHz**	**20 MHz**
Logging date:		2007-02-01	2007-02-01	2007-02-01
Reference:		T.O.C.	T.O.C.	T.O.C.
Sampling frequency (MHz):		2,424	891	239
Number of samples:		619	518	518
Number of stacks:		Auto	Auto	Auto
Signal position:		–0.36	–0.36	–1.42
Logging from (m):		1.5	2.6	6.25
Logging to (m):		72.6	71.5	67.65
Trace interval (m):		0.1	0.2	0.25
Antenna separation (m):		2.4	3.9	10.05

Table 4-2. Radar logging information from KLX21B.

Site:	**Oskarshamn**	**Logging company:**	**Malå Geoscience AB**			
BH:	**KLX21B**	**Equipment:**	**SKB RAMAC**			
Type:	**Directional/Dipole**	**Manufacturer:**	**MALÅ Geoscience AB**			
Operator:	**CG**	**Antenna**				
		Directional	**250 MHz**	**100 MHz**	**20 MHz**	
Logging date:		2007-02-01	2007-01-03	2007-01-03	2007-01-03	
Reference:		T.O.C.	T.O.C.	T.O.C.	T.O.C.	
Sampling frequency (MHz):		615	2,424	891	239	
Number of samples:		512	619	518	518	
Number of stacks:		32	Auto	Auto	Auto	
Signal position:		410.5	–0.36	–0.36	–1.42	
Logging from (m):		105.4	1.5	2.6	6.25	
Logging to (m):		848.4	854.8	853.8	850.25	
Trace interval (m):		0.5	0.1	0.2	0.25	
Antenna separation (m):		5.73	2.4	3.9	10.05	
Logging to (m):		848.4	854.8	853.8	850.25	
Trace interval (m):		0.5	0.1	0.2	0.25	
Antenna separation (m):		5.73	2.4	3.9	10.05	

4.1.2 BIPS

All measurements were performed in accordance with the instructions and guidelines from SKB (internal document MD 222.006). All cleaning of the probe and cable was performed according to the internal document SKB MD 600.004 before the logging operation.

During the measurement, a pixel circle with a resolution of 360 pixels/circle was used and the digital circles were stored at every 1 mm on a MO-disc in the surface unit. The maximum speed during data collection was 1.5 m/minute.

A gravity sensor based on an air bulb in an alcohol liquid was used to measure the orientation of the images in the boreholes KLX21A and KLX21B.

In order to control the quality of the system, calibration measurements were performed in a test pipe before logging and after logging. Figures 4-2 and 4-3 shows the results of the test logging performed before and after the logging campaigns in January and February 2007. The results showed no difference regarding the colours and focus of the images. Results of the test loggings were included in the delivery of the raw data.

The BIPS logging information is found in the header for every single borehole presented in Appendices 3 and 4 in this report.

4.1.3 Deviation measurements

The deviation measurements were carried out according to the instructions and guidelines from SKB (internal document MD 224.001). All cleaning of the probe and cable was performed according to the internal document SKB MD 600.004 before the logging operation.

During the logging a measurement was performed for each 3 m. The logging was carried out in two directions, both from the surface measuring to the bottom of the borehole and a second run measuring from the bottom of the borehole up to the surface. For the operation in KLX21A and KLX21B the RAMAC/BIPS winch installed in the container was used together with the standard length measuring devices. For an accurate depth control the length recording was adjusted regularly for every 50 metre by the actual marks on the logging cable. Maximum depth error for the measuring wheel is 0.5%.

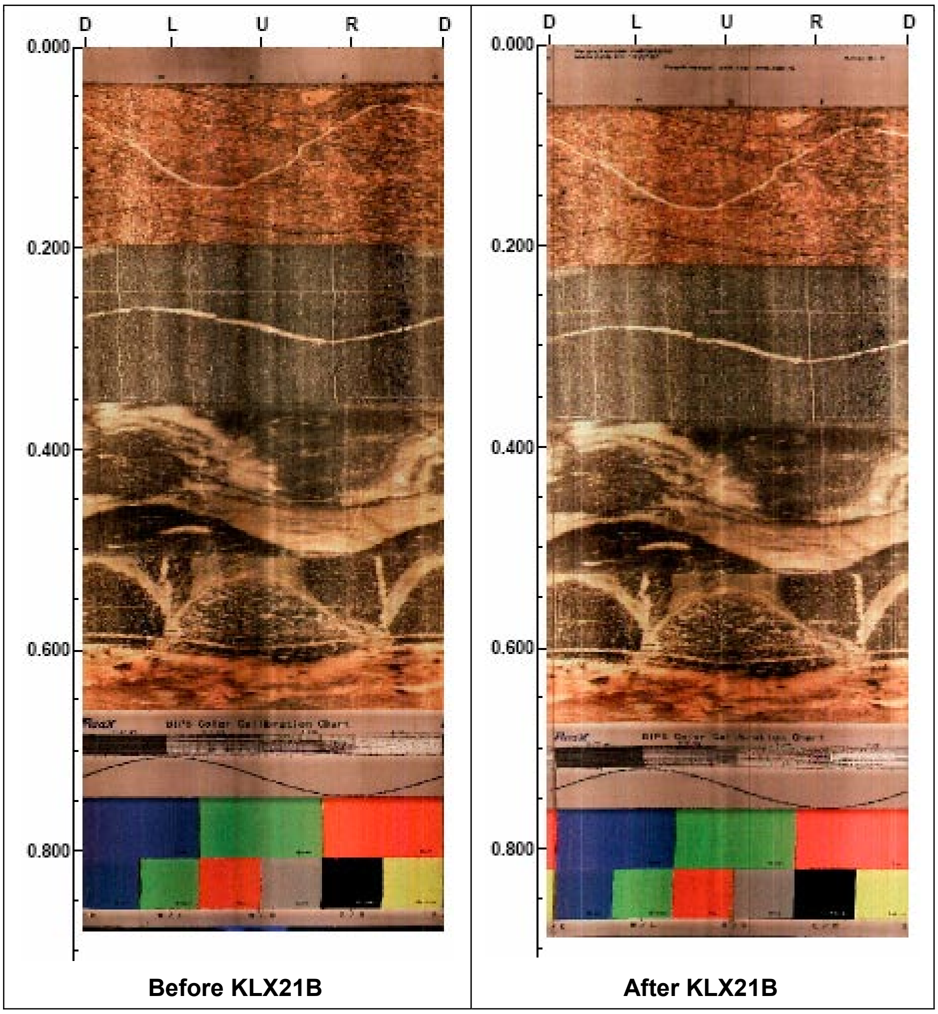


Figure 4-2. *Results from logging in the test pipe before and after the logging campaign January 2nd to 3rd, 2007.*

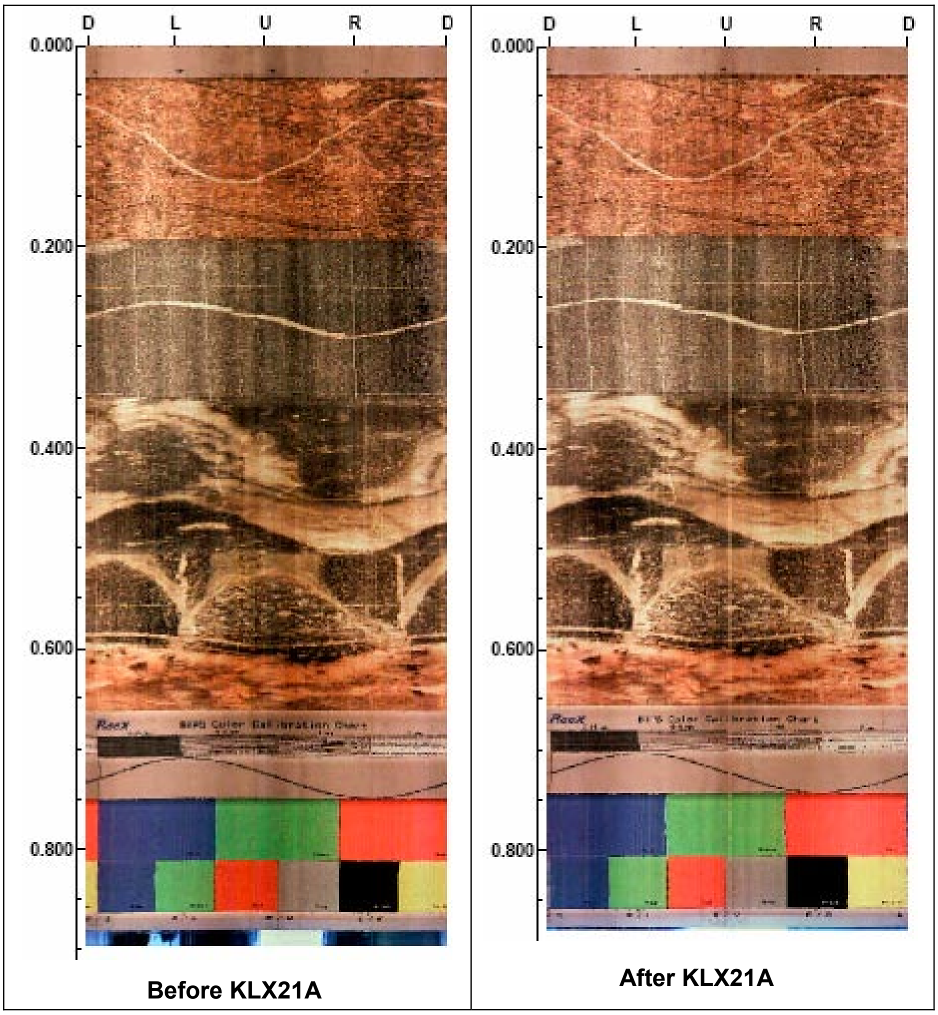


Figure 4-3. Results from logging in the test pipe before and after the logging campaign February 1st, 2007.

4.1.4 Length measurements

During logging the depth recording for the RAMAC systems is taken care of by a measuring wheel mounted on the cable winch. The logging is measured from TOC (Top of Casing). The length is adjusted to the bottom of casing when visible in the BIPS image.

During the BIPS logging in core drilled boreholes, where the reference marks in the borehole wall is visible on the image, the position where the depth mark is visible is marked with scotch tape on the logging cable. During BIPS logging the measured length was adjusted to true length according to depth mark visible in the BIPS image. The adjusted true length is marked with red in the image plot together with the non-adjusted measured length. The non-adjusted length is marked with black as seen in Appendices 3 and 4. The tape marks on the logging cable are then used for controlling the RAMAC measurement.

The experience we have from earlier measurements with dipole antennas in the core drilled boreholes in Forsmark and Oskarshamn for the radar logging is that the depth divergence is less than 100 cm in the deepest parts of a 1,000 metre deep borehole.

The depth divergence is taken into account in the resulting tables in Chapter 5.

4.2 Analyses and interpretation

4.2.1 Radar

The result from radar measurements is most often presented in the form of a radargram where the position of the probes is shown along one axis and the radar wave propagation and reflection is shown along the other axis. The amplitude of the received signal is shown in the radargram with a grey scale where black colour corresponds to large positive signals and white colour to large negative signals. Grey colour corresponds to no reflected signals.

The presented data in this report is adjusted for the measurement point of the antennas. The measurement point is defined to be the central point between the transmitter and the receiver antenna.

The two basic patterns to interpret in borehole measurements are point and plane reflectors. In the reflection mode, borehole radar essentially gives a high-resolution image of the rock mass, showing the geometry of plane structures which may or may not, intersect the borehole (contact between layers, thin marker beds, fractures) or showing the presence of local features around the borehole (cavities, lenses etc).

The distance to a reflecting object or plane is determined by measuring the difference in arrival time between the direct and the reflected pulse. The basic assumption is that the speed of propagation is the same everywhere.

There are several ways to determine the radar wave propagation velocity. Each of them has its advantages and its disadvantages. For this logging campaign the velocity determination earlier performed between KLX07A and KLX07B by keeping the transmitter fixed in one borehole while moving the receiver downwards in a nearby borehole was used. The velocity measurement was performed with the 20 MHz antennas in boreholes KLX07A and KLX07B /1/.

The result is plotted in Figure 4-4 and the calculation shows a velocity varying between 110 and 117 m/micro seconds. The lower velocities most probably represent a fracture zone in the depth interval 40 to 60 m.

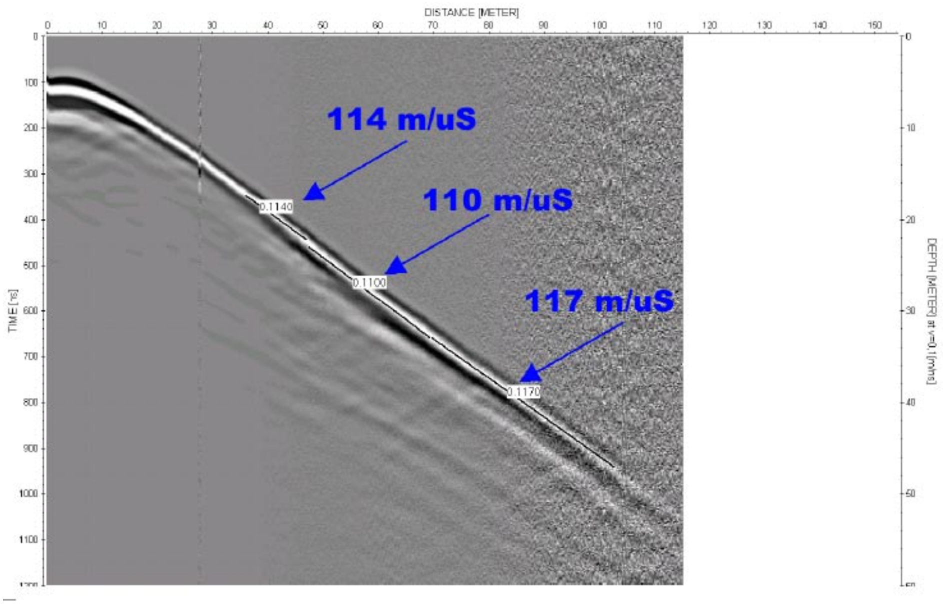


Figure 4-4. *Results from velocity measurements /1/.*

The visualization of data is made with ReflexWin, a Windows based processing software for filtering and analysis of borehole radar data. The processing steps are shown in Tables 4-3 and 4-4. It should be observed that the processing steps in Tables 4-3 and 4-4 below refer to Appendices 1 and 2 in this report. The filters applied affect the whole borehole length and are not always suitable in all parts, depending on the geological conditions and conductivity of the borehole fluid. During interpretation further processing can be done, most often in form of bandpass filtering. This filtering can be applied just in parts of the borehole, where needed.

For the interpretation of the intersection angle between the borehole axis and the planes visible on the radargrams the RadinterSKB software has been used. The interpreted intersection points and intersection angles of the detected structures are presented in the Tables 5-3 and 5-4 and are also visible on the radargrams in Appendices 1 and 2.

4.2.2 BIPS

The visualization of data is made with BDPP, a Windows based processing software for filtering, presentation and analysis of BIPS data. As no fracture mapping of the BIPS image is performed, the raw data was delivered on a CD-ROM together with printable pictures in *.pdf format before the field crew left the investigation site.

The printed results were delivered with measured length, together with adjusted length according to the length marks visible in the BIPS image. For printing of the BIPS images the printing software BIPP from RaaX was used.

Table 4-3. Processing steps for borehole radar data from KLX21A.

Site:	**Oskarshamn**	**Logging company:**	**MALÅ GeoScience AB/RAYCON**	
BH:	**KLX21A**	**Equipment:**	**SKB RAMAC**	
Type:	**Dipole**	**Manufacturer:**	**MALÅ GeoScience AB**	
Interpret:	**JG**	**Antenna**		
		250 MHz	**100 MHz**	**20 MHz**
Processing:		Move start time (–16.3)	Move start time (–27.2)	Move start time (–90)
		DC removal (190–230)	DC removal (470–530)	DC removal (1,800–2,000)
		Gain (start 8 lin 0.2 exp 1.6)	Gain (start 50 lin 0.9 exp 0.7)	Gain (start 95 lin 1.7 exp 0.2)

Table 4-4. Processing steps for borehole radar data from KLX21B.

Site:	**Oskarshamn**	**Logging company:**	**MALÅ GeoScience/RAYCON**		
BH:	**KLX21B**	**Equipment:**	**SKB RAMAC**		
Type:	**Directional/Dipole**	**Manufacturer:**	**MALÅ GeoScience AB**		
Interpret:	**JG**	**Antenna**			
		Directional	**250 MHz**	**100 MHz**	**20 MHz**
Processing:		Move start time (–42 samples)	Move start time (–18.4)	Move start time (–38.5)	Move start time (–92.7)
		DC shift (400–510)	DC shift (190–230)	DC shift (470–530)	DC shift (1,800–2,000)
		Time gain (start 76 lin 100 exp 1)	Gain (start 9 lin 1.7 exp 1.1)	Gain (start 35 lin 2.14 exp 0.6)	Gain (start 120 lin 3 exp 0.2)
		(FIR)			

4.2.3 Deviation measurements

The resulting data from the deviation measurements were corrected relatively to the magnetic North, 2.73° east of RT90 North for the presentation in Appendices 5 and 6. For delivery to SICADA the azimuth was delivered relatively to magnetic North.

4.3 Nonconformities

Due to problems with the directional antenna the logging campaign was dived into two occasions, 2nd to 4th of January and 1st of February, 2007. No video recording was performed due to that the video recorder was occupied elsewhere for quality control of earlier performed BIPS loggings.

5 Results

The results from the BIPS measurements for KLX21A and KLX21B were delivered as raw data (*.bip-files) on CD-ROM disks and MO-disks to SKB together with printable BIPS pictures in *.pdf format before the field crew left the investigation site. The information of the measurements was registered in SICADA, and the digital data and VHS tapes stored by SKB (for KLX21A).

The RAMAC radar data was delivered as raw data (file format *.rd3 (dipole antennas) or *.rd5 (directional antenna)) for KLX21A and KLX21B with corresponding information files (file format *.rad) whereas the data processing steps and results are presented in this report. Relevant information, including the interpretation presented in this report, was inserted into the SKB database SICADA.

The results from the deviation measurement were delivered to SKB in form of raw Flexit files and Excel-files, and also presented in Appendices 5 and 6 in this report. Each reading station depth are referred from T.O.C. in the appendices.

The delivered raw and processed data have been inserted in the database of SKB (SICADA) and data are traceable by the activity plan number.

5.1 RAMAC logging

The results of the interpretation of the radar measurements are presented in Tables 5-1 to 5-7. Radar data is also visualized in Appendices 1 and 2. It should be remembered that the images in Appendices 1 and 2 are only a composite picture of all events 360° around the borehole, and do not reflect the orientation of the structures.

Only the larger clearly visible structures are interpreted in RadinterSKB. An overview of the boreholes are given in Figure 5-1. A number of minor structures also exist but not interpreted as indicated in the Appendices. Often a number of structures can be noticed, but most probably lying so close to each other that it is impossible to distinguish one from the other. Larger structures parallel to the borehole, if present, are also indicated in the Appendices. It should also be pointed out that reflections interpreted will always get an intersection point with the borehole, but being located further away. They may in some cases not reach the borehole.

The data quality from KLX21A and KLX21B, (as seen in Appendices 1 and 2) is relatively good, but in parts of low quality due to more conductive conditions. This is seen in both boreholes, for example in KLX21B, 500 to 800 m. A conductive environment makes the radar wave to attenuate, which decreases the penetration. This conductive environment of course also reduces the possibility to distinguish and interpret possibly structures in the rock which otherwise could give a reflection. In parts with an increased conductivity and thereby a decreased depth penetration most often only the edges of structures can be distinguished, giving an intersection angle of 90°. This is especially seen for the 250 MHz data from KLX21A.

The effect of a conductive environment is also seen in the directional antenna for KLX21A and KLX21B, which makes it more difficult to interpret the direction to the identified structures.

Further on, depending on the size of the borehole, the conductivity and the antenna frequency, so called ringing can be achieved, which again makes the interpretation of single structures quite complicated. This is seen in the data from KLX21B, (250 and 100 MHz data) for the first 100 m, where the borehole diameter is larger. See also Figure 5-2.

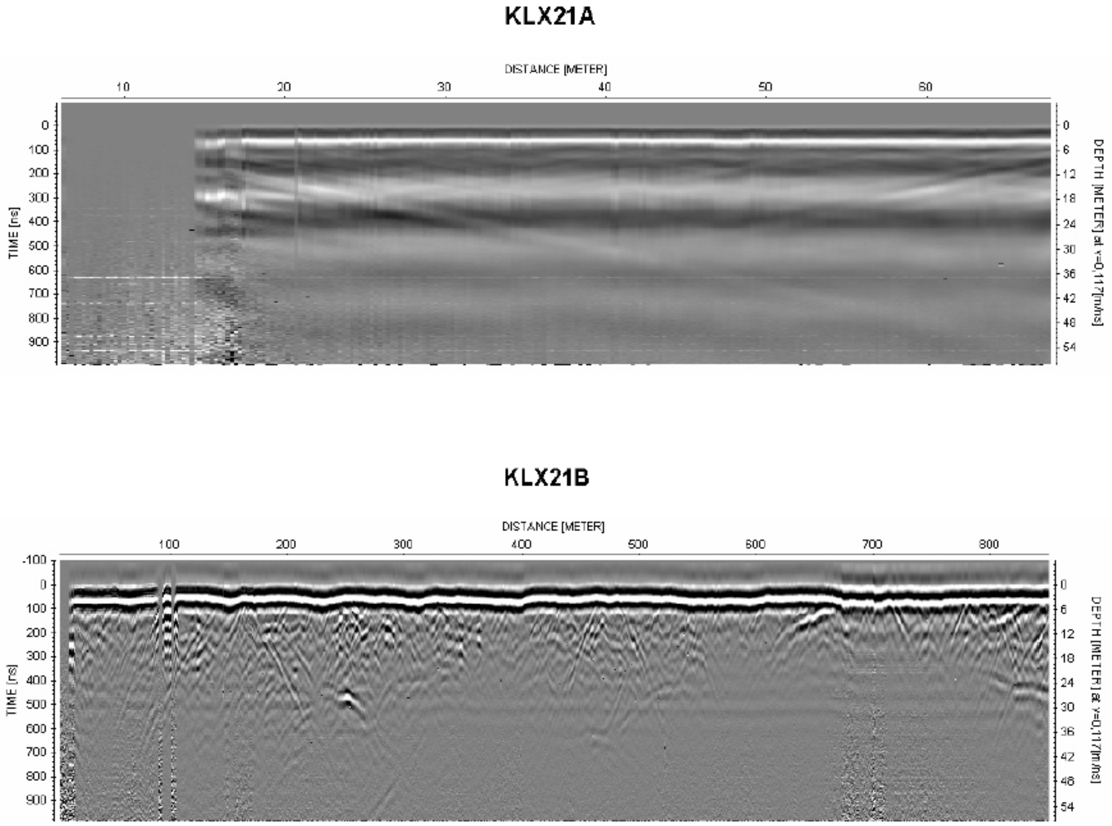


Figure 5-1. An overview (20 MHz data) of the radar data for the boreholes KLX21A and KLX21B. Observe that the length (x-scale) differs between the different boreholes.

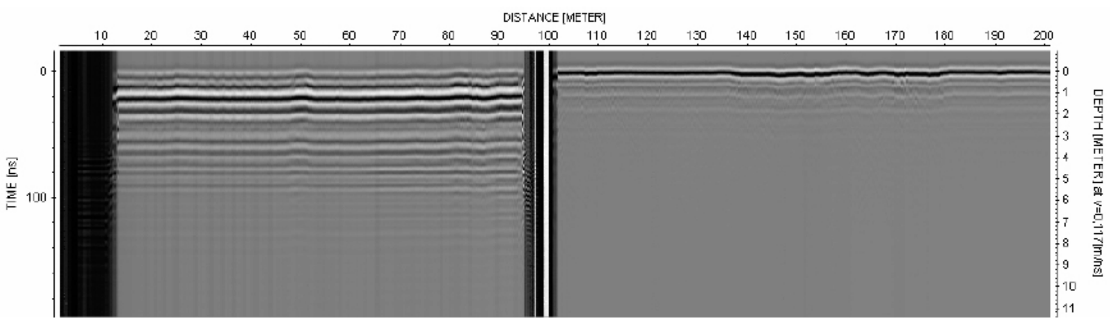


Figure 5-2. Example of raw data from KLX21B (250 MHz data). The effect of the two different borehole diameters are clearly seen, in the amount of so called ringing, in the upper part compared to the lower part of the borehole.

As also seen in Appendices 1 and 2 the resolution and penetration of radar waves depend on the antenna frequency used. Low antenna frequency gives less resolution but higher penetration depth compared to a higher frequency. If structures can be identified with all three antenna frequencies, it can probably be explained by that the structure is quite significant.

In Tables 5-1 and 5-2 below the distribution of identified structures along the borehole are listed for KLX21A and KLX21B.

Table 5-1. Identified structures as a function of depth in KLX21A.

Depth (m)	No. of structures
–20	4
20–40	–
40–60	4
60–80	1
80–	1

Table 5-2. Identified structures as a function of depth in KLX21B.

Depth (m)	No. of structures
–50	5
50–100	4
100–150	9
150–200	20
200–250	14
250–300	13
300–350	10
350–400	14
400–450	10
450–500	14
500–550	11
550–600	16
500–650	11
650–700	7
700–750	11
750–800	16
800–850	19
850–	7

Tables 5-3 and 5-4 summarises the interpretation of radar data from KLX21A and KLX21B. The direction to the reflector (object) is also given for the boreholes. As seen some radar reflectors in Table 5-4 are marked with ±, which indicates an uncertainty in the interpretation of direction. The direction can in these cases be ± 180°. The direction to the reflector (object) is defined in Figure 5-3. As the borehole inclination is less than 85° the direction to object is calculated using gravity roll. The direction to object and the intersection angle are recalculated to strike and dip, also given in Table 5-4. The plane strike is the angle between line of the plane's cross-section with the surface and the Magnetic North direction. It counts clockwise and can be between 0 and 359°. A strike of 0° implies a dip to the east while a strike of 180° implies a dip to the west. The plane dip is the angle between the plane and the surface. It can vary between 0 and 90°.

Observe that a structure can have several different angles, if the structure is undulating, and thereby also different intersection depths is given. This is seen for instance for structure 1 in Table 5-4 and Appendix 1. To this structure, most likely, also structure 1x belongs.

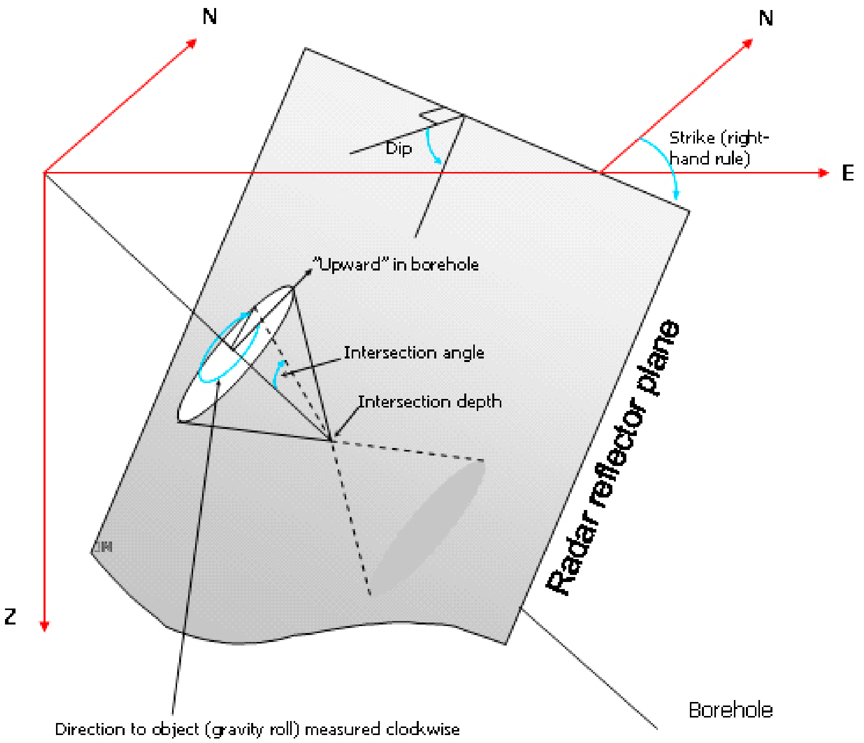


Figure 5-3. *Definition of intersection angle, direction to object using gravity roll, dip and strike using the right hand rule as presented in Table 5-4.*

Table 5-3. Interpretation of radar reflectors from the dipole antennas 250, 100 and 20 MHz in borehole KLX21A.

RADINTER MODEL INFORMATION (20, 100 and 250 MHz Dipole Antennas)			
Site:		**Oskarshamn**	
Borehole name:		**KLX21A**	
Nominal velocity (m/μs):		**117.0**	
Reflector type	**Name**	**Intersection depth**	**Intersection angle**
PLANE	1	–1.8	38
PLANE	4	10.1	58
PLANE	2	12.5	59
PLANE	3	19.4	54
PLANE	7	42.6	36
PLANE	10	43.4	46
PLANE	5	48.8	44
PLANE	6	57.0	47
PLANE	8	70.5	43
PLANE	9	84.6	49

Table 5-4. Interpretation of radar reflectors from the dipole antennas 250, 100 and 20 MHz, and the directional antenna 60 MHz in borehole KLX21B.

RADINTER MODEL INFORMATION
(Directional antenna)

Site:		**Oskarshamn**					
Borehole name:		**KLX21B**					
Nominal velocity (m/µs):		**117.0**					
Name	**Intersection depth**	**Intersection angle**	**RadInter direction to object (gravity roll)**	**Dip 1**	**Strike 1**	**Dip 2**	**Strike 2**
1x	–3.1	34					
1	–9.5	26					
4	32.9	18					
3	36.1	39					
2	40.0	27					
189	58.0	71					
5	83.4	58					
7	83.6	18					
188	85.2	53					
6	103.3	53					
8	104.9	56					
9	107.3	27					
10	111.6	62					
13	120.3	54					
12	124.3	57					
11	125.0	50					
14	138.0	63					
15	144.5	74					
16	152.0	44					
17x	152.5	32					
17	155.8	40	165 ±	31	111	71	302
18	162.4	70					
191	164.1	20	69	78	18		
23	166.9	58					
187	167.8	28					
20	169.4	31					
21	168.5	68					
180	170.6	84					
175	170.8	58					
22	171.8	67					
19	171.9	35					
27	176.1	64					
24	180.5	54					
30	181.6	43					
26	189.5	49					
25	190.5	36					
28	190.7	55					
29	199.3	32					
33	209.3	76					
31	213.5	32	168	38	118		

RADINTER MODEL INFORMATION
(Directional antenna)

Site:	**Oskarshamn**
Borehole name:	**KLX21B**
Nominal velocity (m/μs):	**117.0**

Name	Intersection depth	Intersection angle	RadInter direction to object (gravity roll)	Dip 1	Strike 1	Dip 2	Strike 2
32	213.9	39					
34	220.5	52					
35	220.8	78					
36	221.9	47	216 ±	28	193	60	342
38	224.7	56					
37	231.4	50					
199	232.2	66	333 ±	44	299	11	46
39	236.6	69					
40	241.2	63					
43	242.3	32					
41	243.6	60					
42	249.5	49					
44	253.6	66					
45	257.4	47					
46	266.4	38					
47	267.7	54					
48	269.9	53	222 ±	27	205	56	345
192	272.1	52					
49	278.9	43					
51	279.0	50					
50	279.6	46					
54	284.9	66					
56	293.6	19	219	54	181		
53	295.5	57					
52	296.3	47					
55	300.0	42					
59	303.3	13					
57	304.9	43					
58	309.5	57					
61	317.3	48					
60	321.4	65					
193	328.2	46	171 ±	22	118	65	307
62	335.3	29					
63	341.3	34					
64	343.2	53					
65	351.6	45					
69	354.8	46					
66	360.8	41					
67	364.4	27					
68	365.2	38					
181	368.5	39					
185	369.9	4					
72	386.1	43					

RADINTER MODEL INFORMATION
(Directional antenna)

Site:	**Oskarshamn**
Borehole name:	**KLX21B**
Nominal velocity (m/μs):	**117.0**

Name	Intersection depth	Intersection angle	RadInter direction to object (gravity roll)	Dip 1	Strike 1	Dip 2	Strike 2
70	386.7	27					
71	388.7	53					
73	389.9	43					
74	392.3	45					
75	394.2	58					
76	395.2	33					
78	400.6	42					
77	403.8	59					
79	406.3	70					
80	413.7	43					
82	421.3	39					
83x	433.5	33					
83	436.6	26	48	80	356		
85	437.8	50					
194	442.0	31	12	81	324		
182	445.8	53					
86	450.1	52	27 ±	61	332	24	180
89	454.0	15	234	63	193		
92	454.3	50					
93	459.2	50					
87	459.9	48					
84	460.0	8					
183	462.5	43					
88	463.0	49					
90	465.7	43					
91	465.8	51	51 ±	53	348	28	216
94	475.0	40					
95	477.5	49					
96	482.4	53					
97	483.4	46					
98	502.4	60					
99	504.9	58					
103	515.7	49					
100	517.7	54					
105	523.8	55					
186	523.8	46					
101	528.5	49	339 ±	64	296	23	94
102	532.9	64					
104	534.4	52					
106	542.7	44					
107	546.2	55					
108	551.6	63	189 ±	4	193	46	317
191x	552.0	6					

RADINTER MODEL INFORMATION
(Directional antenna)

Site:	**Oskarshamn**
Borehole name:	**KLX21B**
Nominal velocity (m/µs):	**117.0**

Name	Intersection depth	Intersection angle	RadInter direction to object (gravity roll)	Dip 1	Strike 1	Dip 2	Strike 2
109	553.4	67					
184	561.3	66					
198	565.9	64	141 ±	16	37	45	289
110	567.0	74					
111	570.4	46					
112	572.3	46					
113	574.2	42					
115	574.5	57					
114	578.2	56					
116	580.0	65					
176	581.4	63					
117	588.7	47					
118	592.8	61					
119	596.3	52					
120	604.4	49					
121	606.3	50					
177	608.2	64					
123	615.0	45	9	67	318		
122	617.6	33					
124	625.1	46					
125	632.9	51					
127	634.1	45					
190	638.7	15					
185x	638.9	9					
126	647.5	43					
129	654.2	41					
128x	660.1	24					
131	673.3	48					
197	675.9	36	24	74	331		
130	677.2	76					
132	680.5	45					
133	694.0	50					
134	705.6	33					
134x	706.9	39	123	41	54		
135	718.7	28					
128	723.5	8	51	84	182		
137	726.1	40					
136	726.4	57					
138	729.3	59					
139	736.3	38					
141	743.5	62					
140	744.4	80					
142	749.0	66					

RADINTER MODEL INFORMATION
(Directional antenna)

Site:	**Oskarshamn**
Borehole name:	**KLX21B**
Nominal velocity (m/μs):	**117.0**

Name	Intersection depth	Intersection angle	RadInter direction to object (gravity roll)	Dip 1	Strike 1	Dip 2	Strike 2
143	763.0	45					
146	768.4	47					
145	768.5	35					
144	768.7	40					
148	775.6	54					
149	776.2	26					
147	777.1	44	357	65	310		
200	783.9	45					
178	785.0	34					
150x	788.8	49	12 ±	60	321	18	158
150	789.7	40					
152	792.7	49					
151	793.2	48					
153	794.4	49					
154	798.3	62					
156	799.3	67					
155	800.0	85					
157	800.9	76					
160	803.3	70					
161	805.1	52					
179	806.8	67					
159	807.6	62					
158	810.6	71					
196	812.1	62	108 ±	29	17	40	269
162x	814.0	14					
162	814.9	19					
163	817.2	54					
165	824.1	57					
164	825.6	65	336 ±	41	300	9	29
168	828.6	65					
195	835.0		249				
169	835.7	35					
170	842.8	48					
171	846.0	53					
173	849.4	59					
172	852.1	60					
166	856.0	12	57 ±	89	7	66	196
167x	856.1	50					
174	858.3	53					
166xx	866.1	7					
167	870.0	34	147	38	86		
166x	885.6	7					

In Appendices 1 and 2, the amplitude of the first arrival is plotted against the depth, for the 250 MHz dipole antennas. The amplitude variation along the borehole indicates changes of the electrical conductivity of the volume of rock surrounding the borehole. A decrease in this amplitude may indicate fracture zones, clay or rock volumes with increases in water content, i.e. increases in electric conductivity. The decrease in amplitude is shown in Tables 5-5 and 5-6.

Finally, the structures considered as the most important (clear in the radargram, identified with several antenna frequencies, stretching out far from the borehole wall etc) are listed in Table 5-7 below.

Observe that it can be very difficult to classify different structures in an objective manner, along a borehole. This is due to the fact that the water quality (the conductivity) amongst others varies along the borehole length and by that reason affects the results of the radar logging, by for instance attenuating the radar waves differently. Also the intersection angle of the identified structures affects the amplitude on the resulting radargram. A small intersection angle will most often give an increased amplitude compared to a larger intersection angle, and by that a more clear structure.

Table 5-5. Borehole length intervals in KLX21A with decreased amplitude for the 250 MHz antenna.

Length (m)
20–25

Table 5-6. Borehole length intervals in KLX21B with decreased amplitude for the 250 MHz antenna.

Length (m)	Length (m)
0–100	435
145–160	440–450
170–175	475
215–240	530–610
290–325	670–710
335–350	740
370–410	810
430	840

Table 5-7. Some important structures in KLX21A and KLX21B.

Borehole	KLX21A	KLX21B
Structures	9	1, 1x, 7, 17, 17x, 56, 59, 83, 83x, 86, 94, 96, 123, 128, 128x, 134, 134x, 150, 150x, 166, 166x, 167, 167x, 185, 185x, 191 and 191x

5.2 BIPS logging

The BIPS pictures from KLX21A and KLX21B are presented in Appendix 3 and 4.

In order to control the quality of the system, calibration measurements were performed in a test pipe before and after the logging. The resulting images displayed with no difference regarding the colours and focus of the images. Results of the test loggings were included in the delivery of the raw data.

To get the best possible depth accuracy, the BIPS images are adjusted to the reference mark on the cable for the logging.

The error in the depth recording depends mainly on the tension of the cable and error of the depth readings from the measuring wheel. The adjusted depth is showed in red colour and the recording depth have black colour in the printouts.

In KLX21A the images are partly very dark and limits the visibility. The darker sections are probably related to some chemical reactions in the borehole. Stable water conditions and a long time after the drilling with no activity allows the reaction to take place. In KLX21B this effect is not visible, one explanation is that water have been flushed during the long drilling phase. Below 700 metres in KLX21B mud that cover the lower most part of the borehole wall limits the visibility.

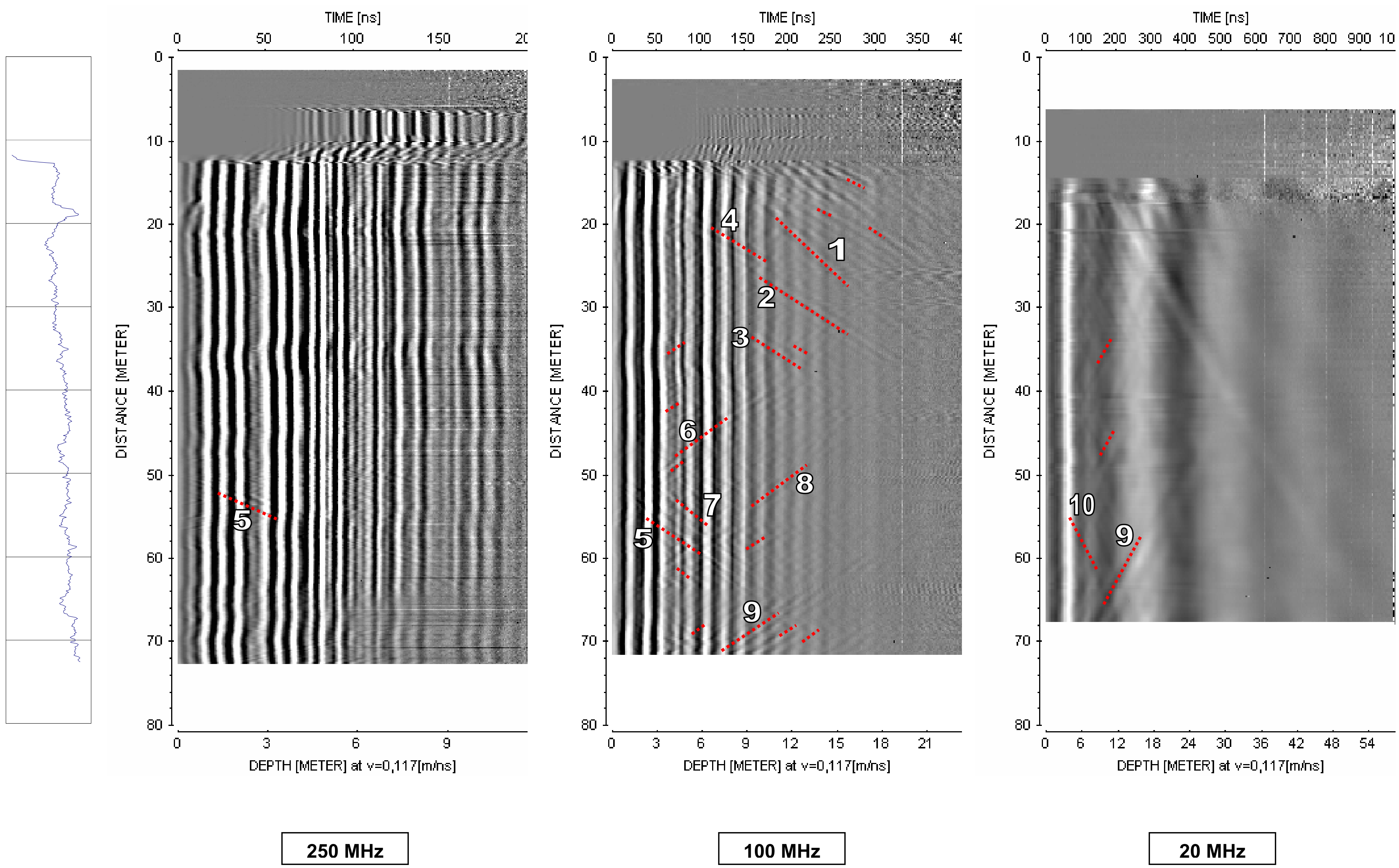
References

/1/ **Gustafsson J, Gustafsson C, 2005.** Oskarshamn site investigation. RAMAC and BIPS logging in boreholes KLX07A, KLX07B, HLX34 and HLX35 and deviation logging in boreholes KLX07B, HLX34 and HLX35. SKB P-05-231, Svensk Kärnbränslehantering AB.

Appendix 1

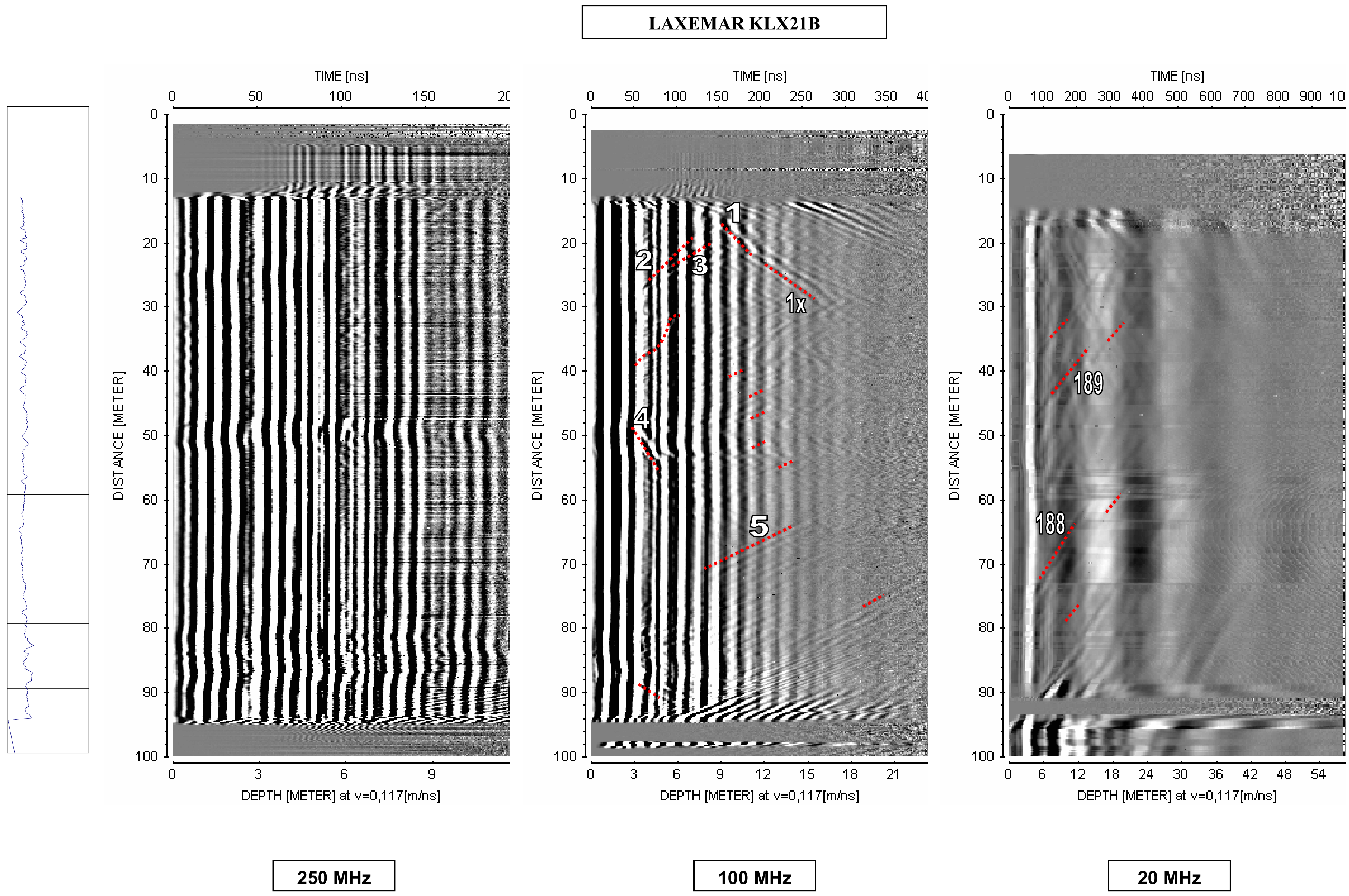
Radar logging in KLX21A, 0 to 71 m, dipole antennas 250, 100 and 20 MHz

LAXEMAR KLX21A

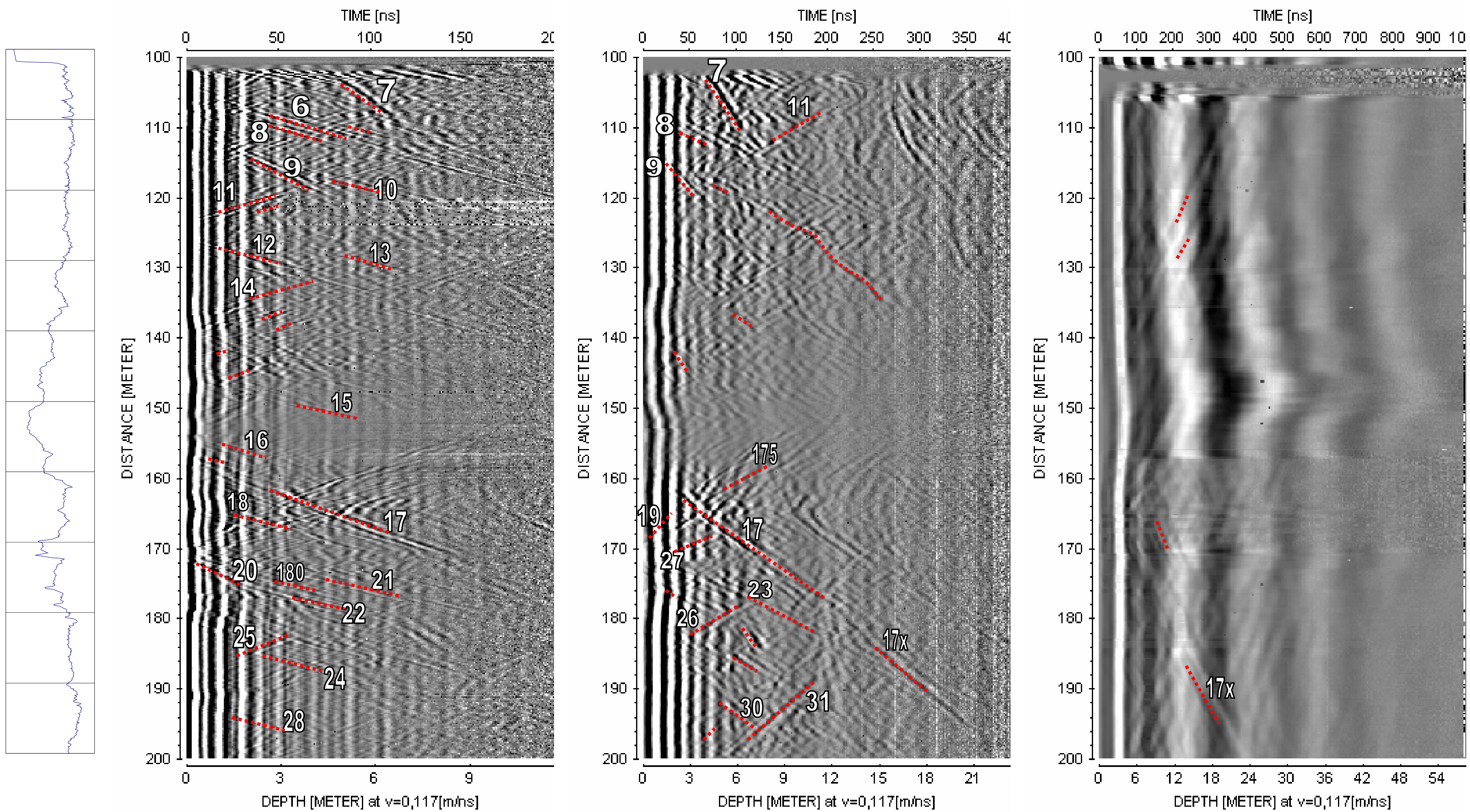


Appendix 2

Radar logging in KLX21B, 0 to 853 m, dipole antennas 250, 100 and 20 MHz


LAXEMAR KLX21B
TIME [ns]
DISTANCE [METER]
DEPTH [METER] at v=0,117[m/ns]
1
2
3
1x
4
5
189
188
250 MHz
100 MHz
20 MHz

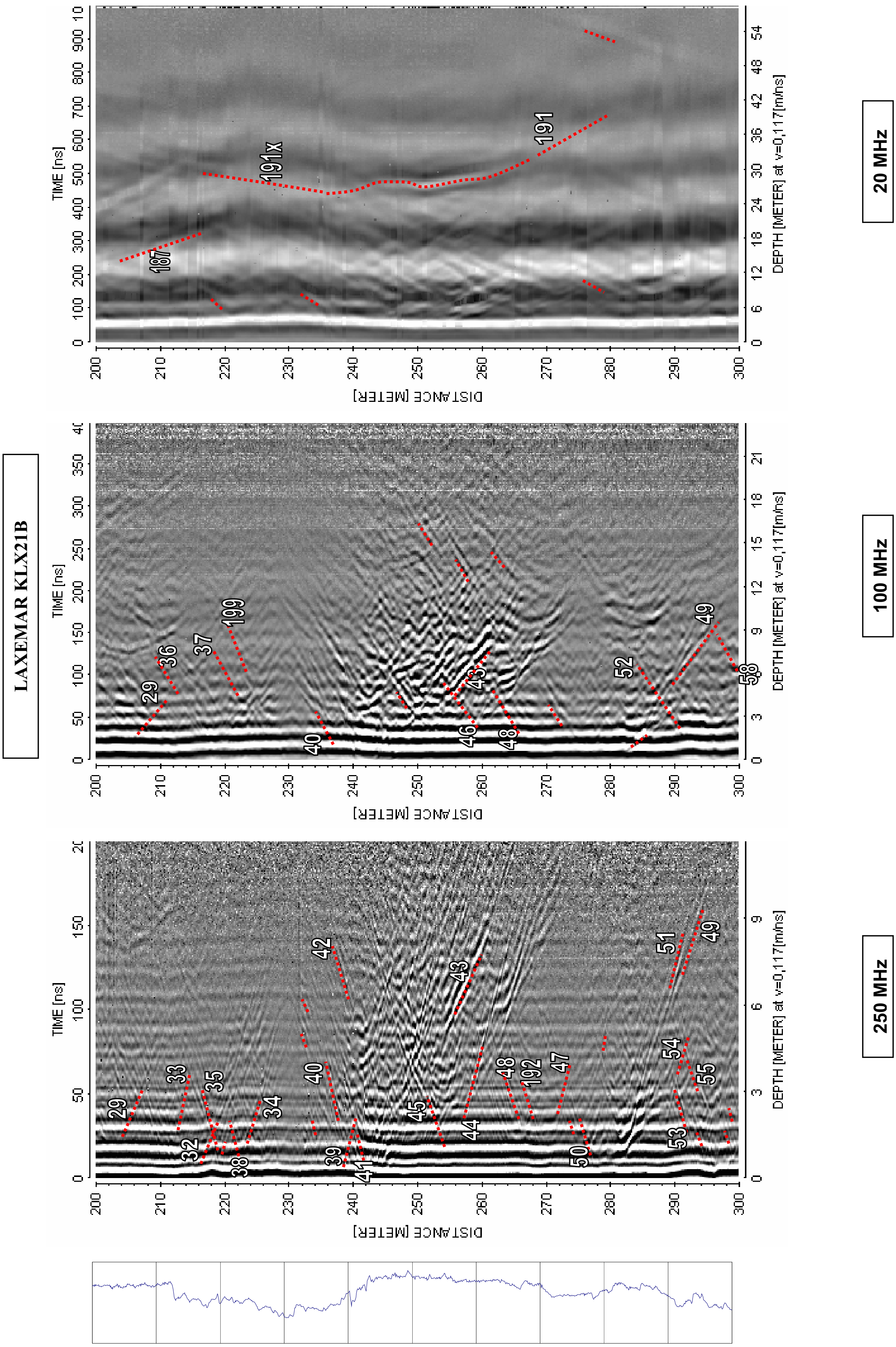
LAXEMAR KLX21B

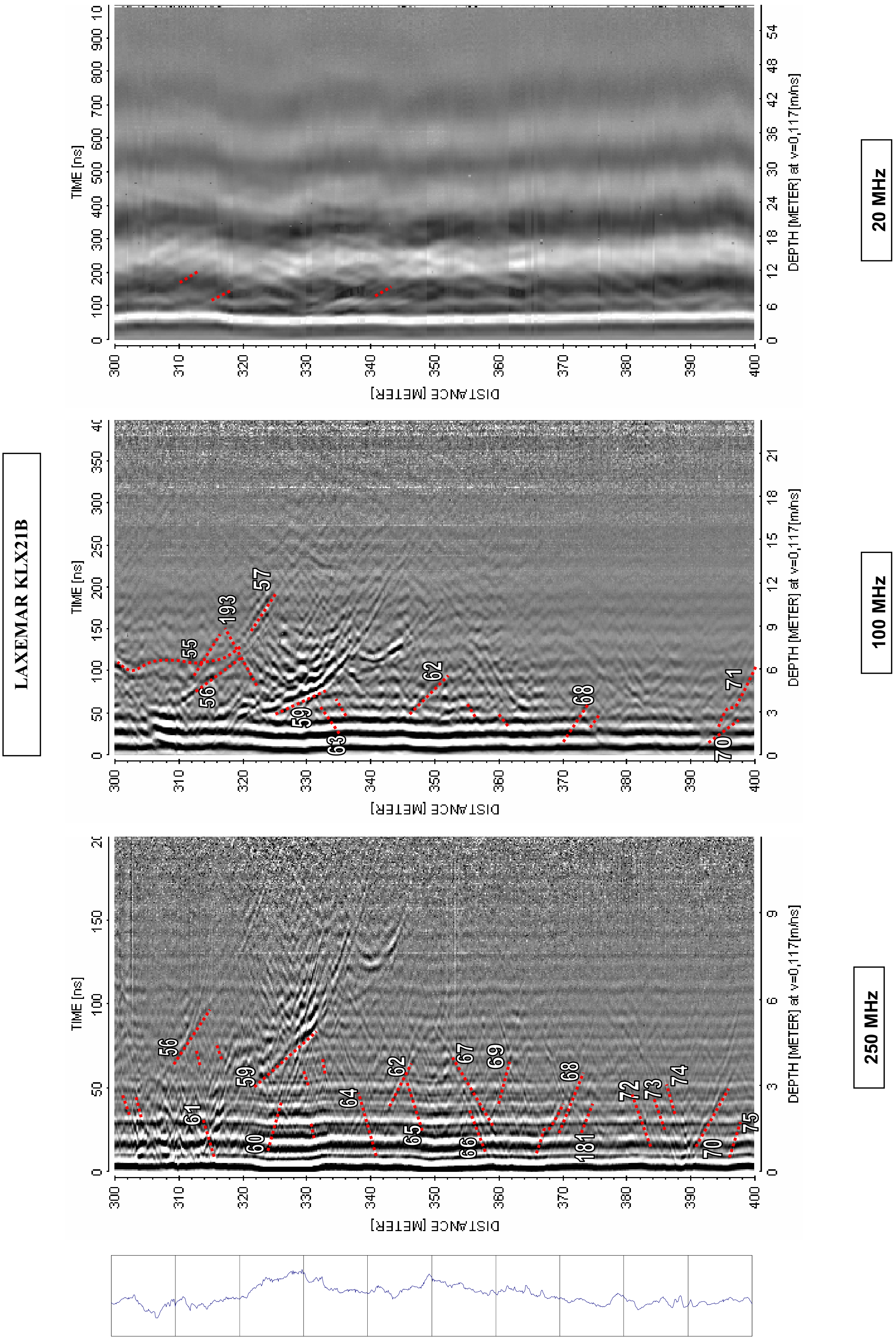


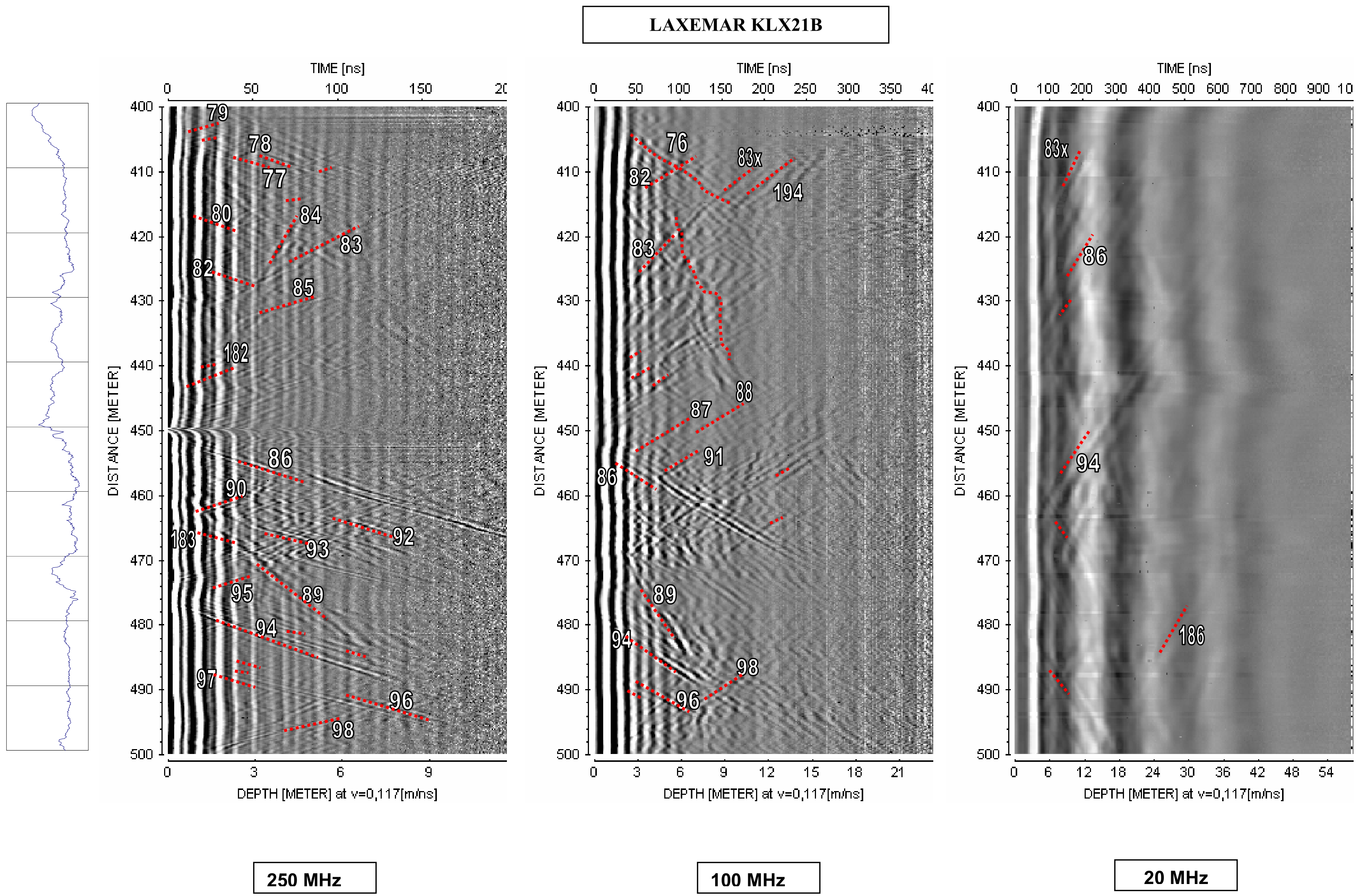
250 MHz

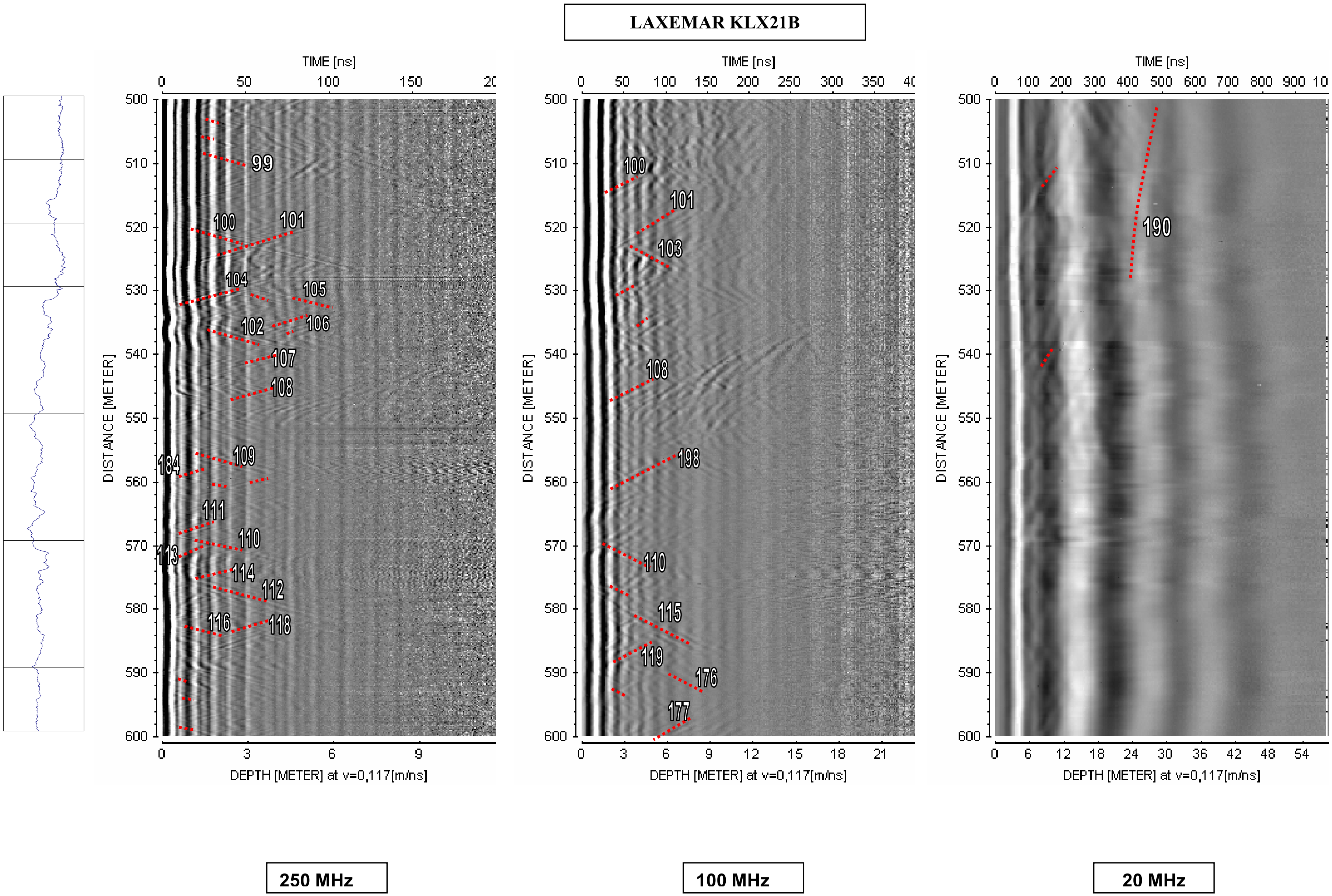
100 MHz

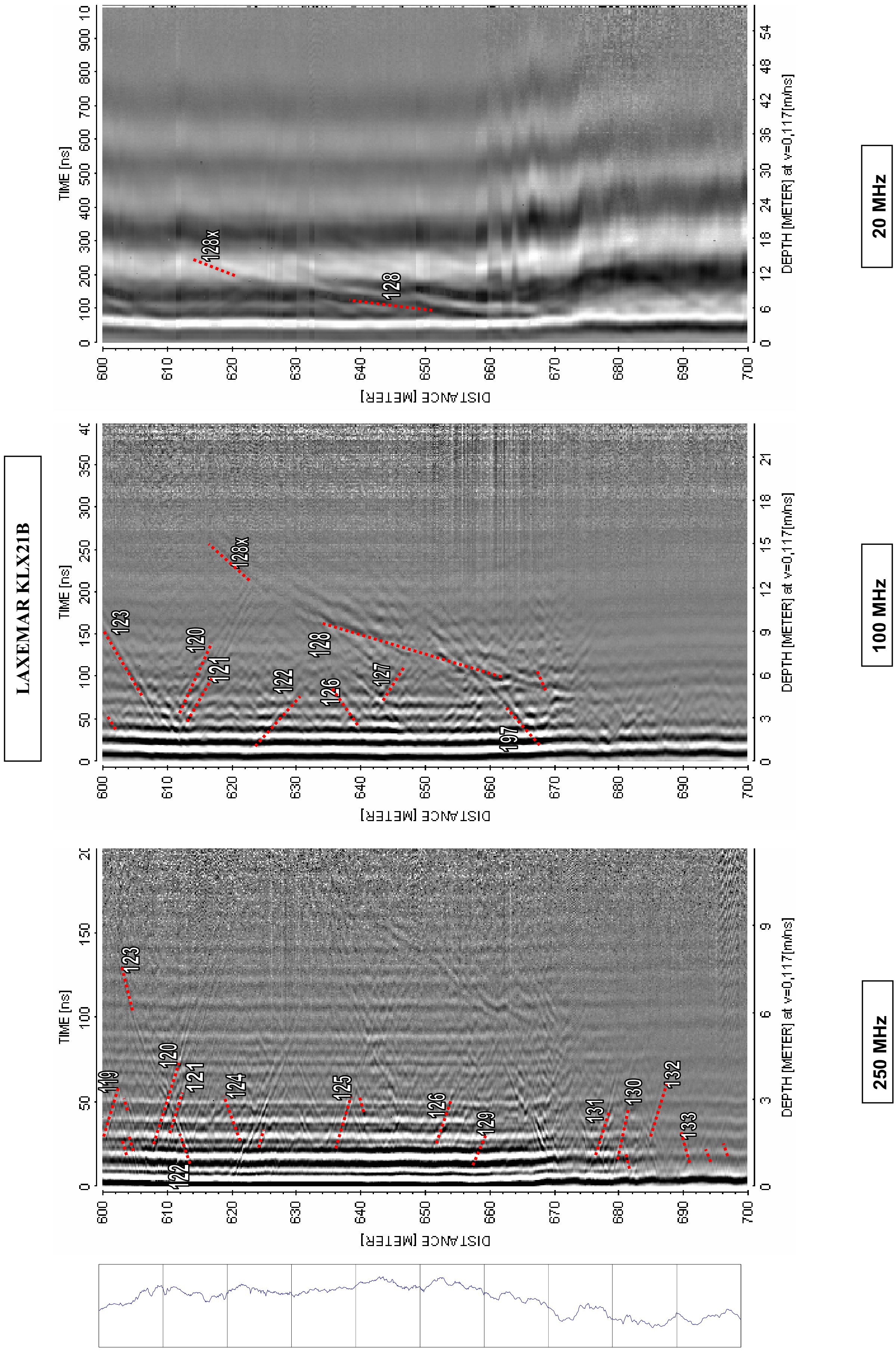
20 MHz


LAXEMAR KLX21B
250 MHz
100 MHz
20 MHz
TIME [ns]
DISTANCE [METER]
DEPTH [METER] at v=0,117[m/ns]

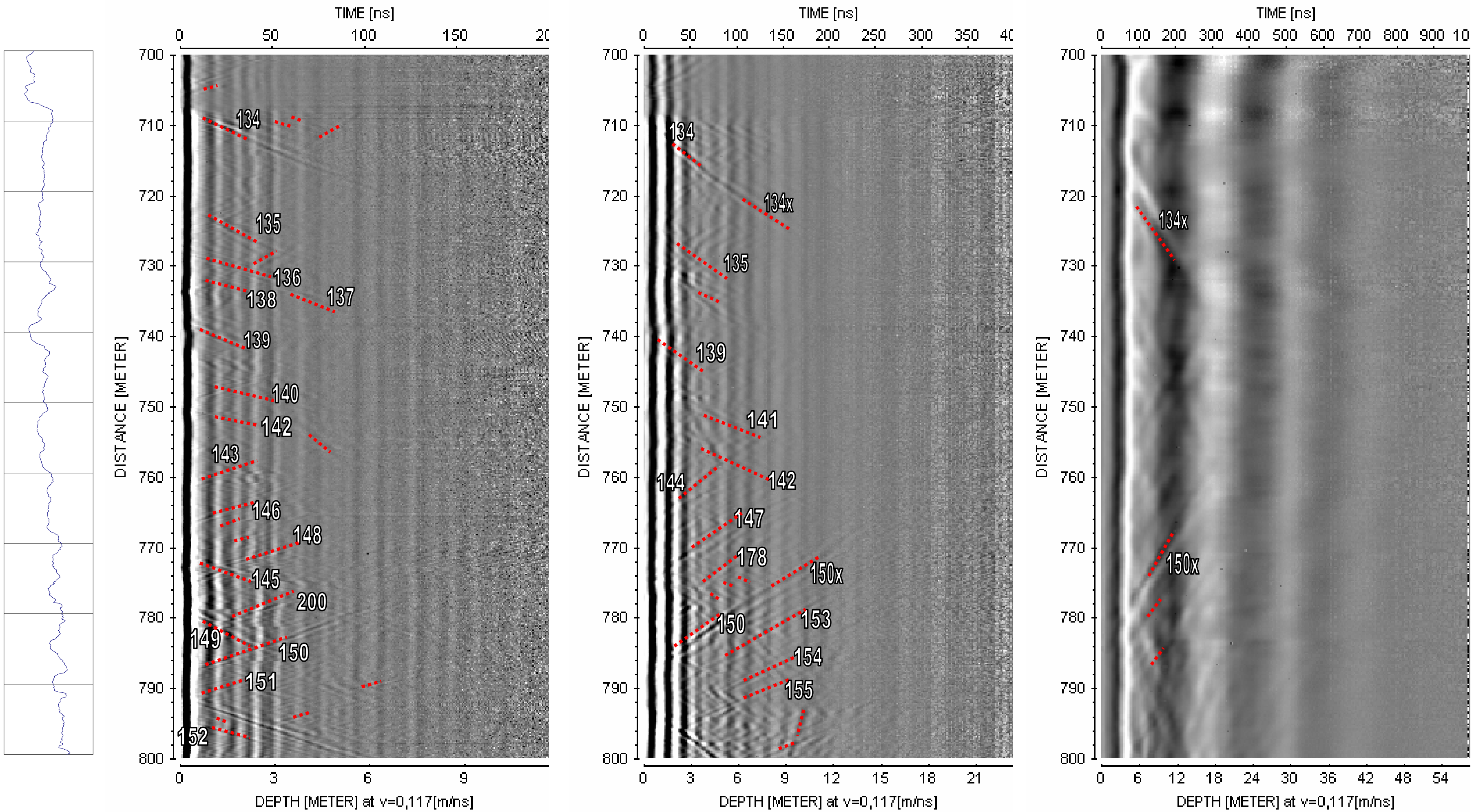

LAXEMAR KLX21B
250 MHz
100 MHz
20 MHz
TIME [ns]
DISTANCE [METER]
DEPTH [METER] at v=0,117[m/ns]


LAXEMAR KLX21B
TIME [ns]
DISTANCE [METER]
DEPTH [METER] at v=0,117[m/ns]
250 MHz
100 MHz
20 MHz


LAXEMAR KLX21B
TIME [ns]
DISTANCE [METER]
DEPTH [METER] at v=0,117[m/ns]
99
100
101
102
104
105
106
107
108
109
184
111
110
113
114
112
116
118
103
198
115
119
176
177
190
250 MHz
100 MHz
20 MHz


LAXEMAR KLX21B
250 MHz
100 MHz
20 MHz
TIME [ns]
DISTANCE [METER]
DEPTH [METER] at v=0,117[m/ns]
119
120
121
122
123
124
125
126
127
128
128x
129
130
131
132
133
197

LAXEMAR KLX21B

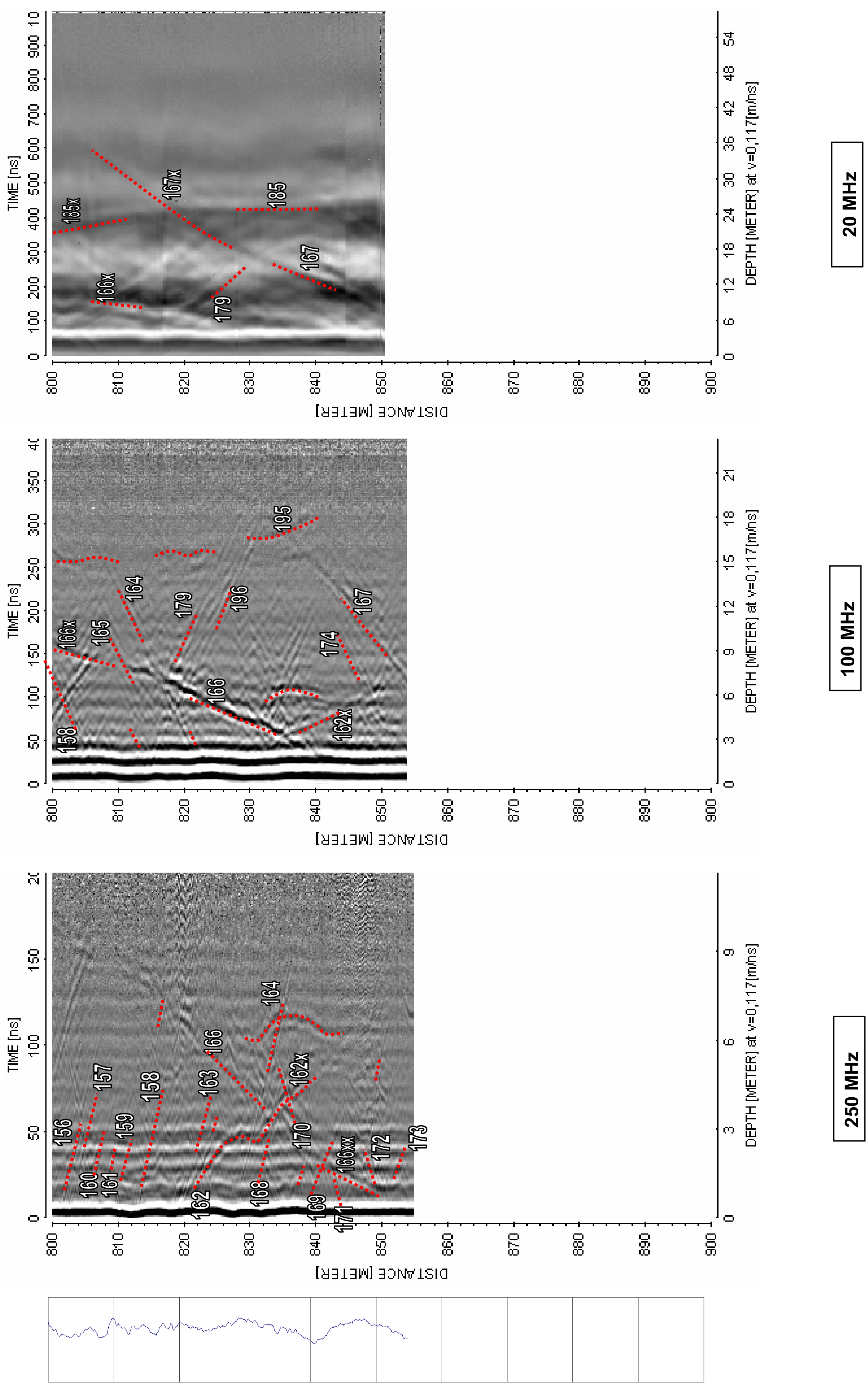


250 MHz

100 MHz

20 MHz

LAXEMAR KLX21B



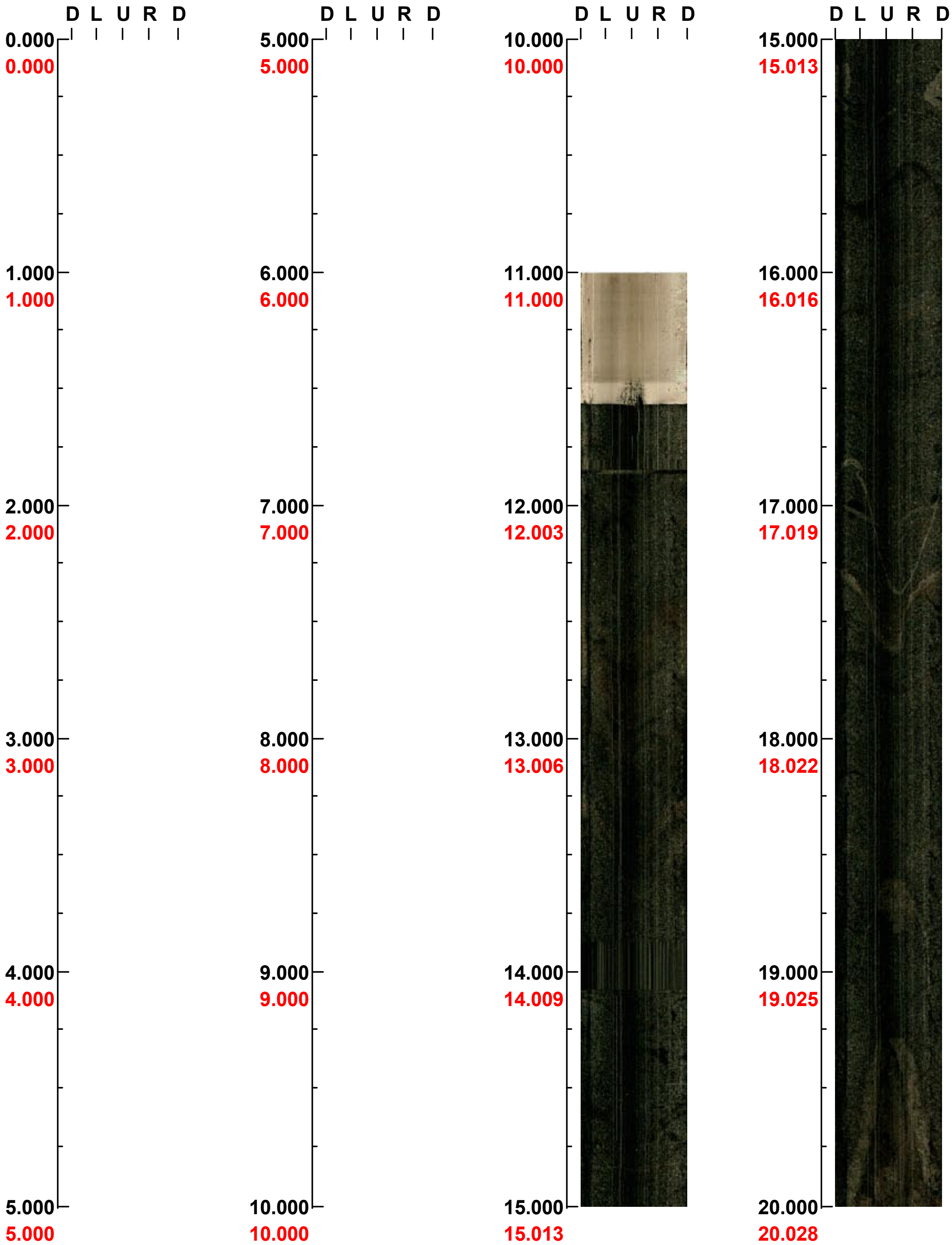
BIPS logging in KLX21A, 11 to 75 m

Project name: Laxemar

Image file	: c:\work\r5594k~1\bips\klx21a.bip
BDT file	: c:\work\r5594k~1\bips\klx21a.bdt
Locality	: LAXEMAR
Bore hole number	: KLX21A
Date	: 07/02/01
Time	: 11:11:00
Depth range	: 11.000 - 74.524 m
Azimuth	: 135
Inclination	: -51
Diameter	: 195.0 mm
Magnetic declination	: 0.0
Span	: 4
Scan interval	: 0.25
Scan direction	: To bottom
Scale	: 1/25
Aspect ratio	: 75 %
Pages	: 4
Color	: +0 +0 +0

Project name: Laxemar
Bore hole No.: KLX21A **Azimuth: 135** **Inclination: -51**

Depth range: 0.000 - 20.000 m



(1 / 4) **Scale: 1/25** **Aspect ratio: 75 %**

Project name: Laxemar
Bore hole No.: KLX21A **Azimuth: 135** **Inclination: -51**

Depth range: 20.000 - 40.000 m

(2 / 4) **Scale: 1/25** **Aspect ratio: 75 %**

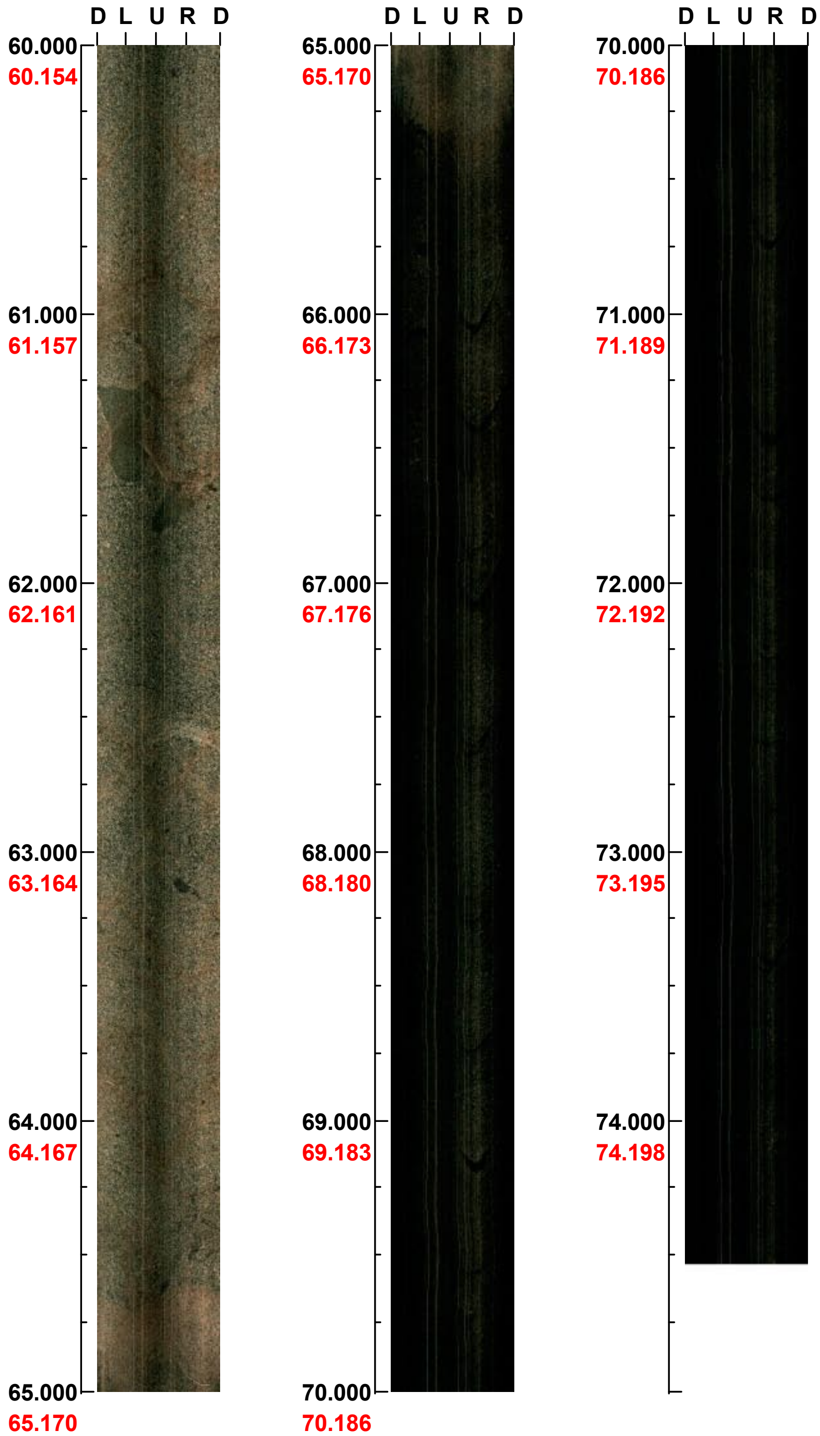
Project name: Laxemar
Bore hole No.: KLX21A **Azimuth: 135** **Inclination: -51**

Depth range: 40.000 - 60.000 m

(3 / 4) **Scale: 1/25** **Aspect ratio: 75 %**

Project name: Laxemar
Bore hole No.: KLX21A **Azimuth: 135** **Inclination: -51**

Depth range: 60.000 - 74.524 m



(4 / 4) **Scale: 1/25** **Aspect ratio: 75 %**

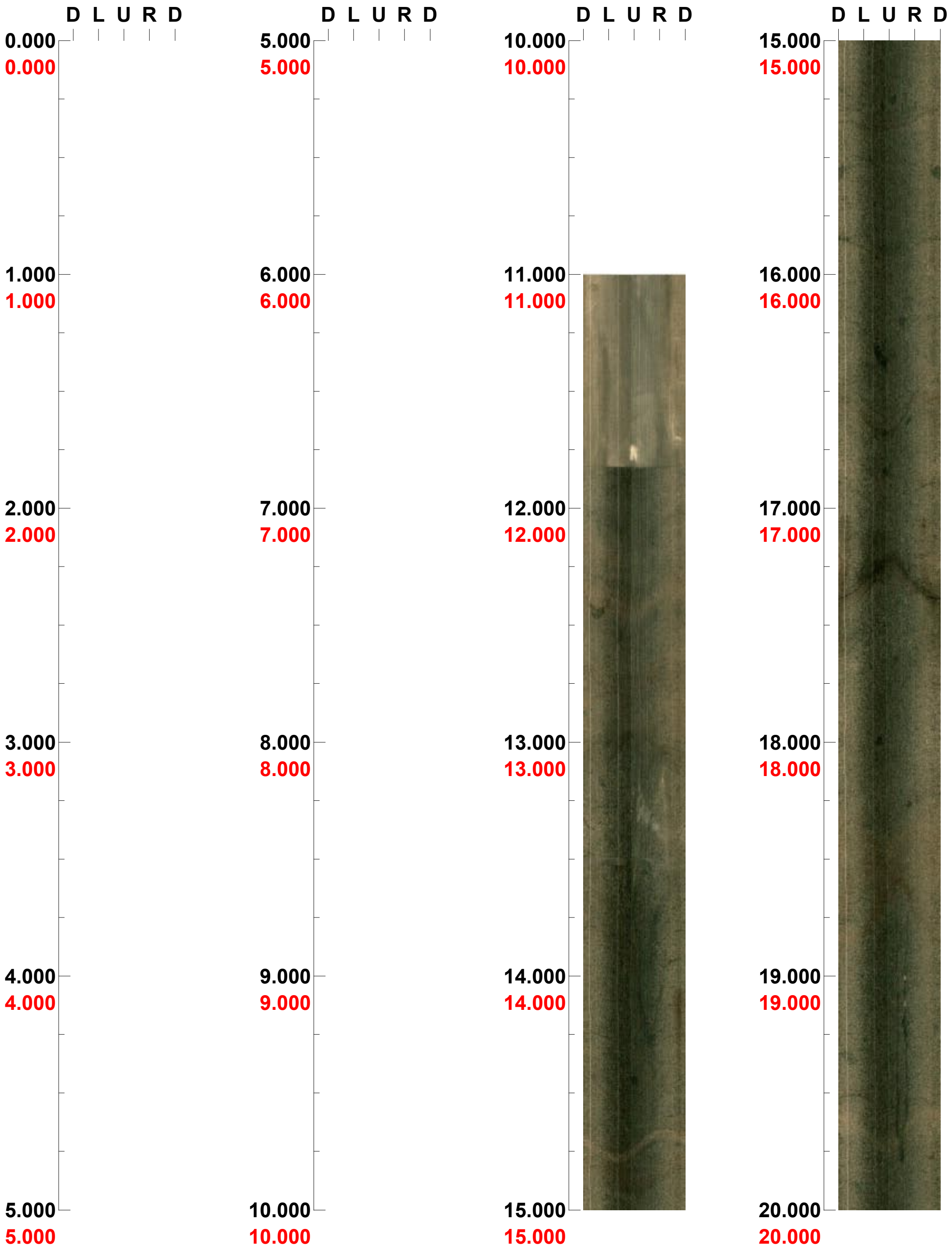
BIPS logging in KLX21B, 11 to 856 m

Project name: Laxemar

Image file	: d:\work\simpev~1\r5594a~1\klx21b_1.bip
BDT file	: d:\work\simpev~1\r5594a~1\klx21b_1.bdt
Locality	: LAXEMAR
Bore hole number	: KLX21B
Date	: 07/01/03
Time	: 10:22:00
Depth range	: 11.000 - 96.408 m
Azimuth	: 225
Inclination	: -71
Diameter	: 198.0 mm
Magnetic declination	: 0.0
Span	: 4
Scan interval	: 0.25
Scan direction	: To bottom
Scale	: 1/25
Aspect ratio	: 70 %
Pages	: 5
Color	: +0 +0 +0

Project name: Laxemar
Bore hole No.: KLX21B **Azimuth: 225** **Inclination: -71**

Depth range: 0.000 - 20.000 m



(1 / 5) **Scale: 1/25** **Aspect ratio: 70 %**

Project name: Laxemar

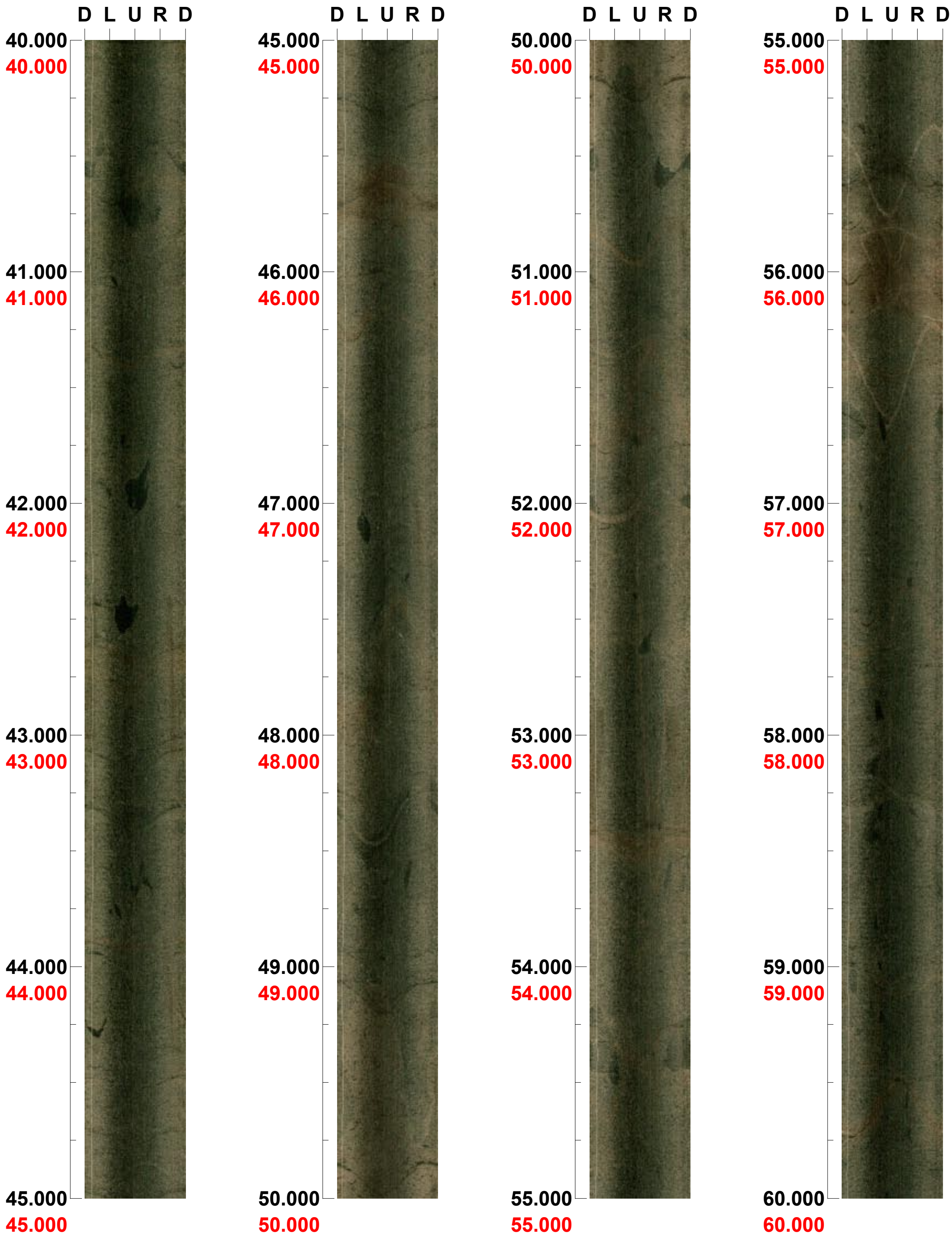
Bore hole No.: KLX21B **Azimuth: 225** **Inclination: -71**

Depth range: 20.000 - 40.000 m

(2 / 5) **Scale: 1/25** **Aspect ratio: 70 %**

Project name: Laxemar
Bore hole No.: KLX21B **Azimuth: 225** **Inclination: -71**

Depth range: 40.000 - 60.000 m



(3 / 5) **Scale: 1/25** **Aspect ratio: 70 %**

Project name: Laxemar
Bore hole No.: KLX21B **Azimuth: 225** **Inclination: -71**

Depth range: 60.000 - 80.000 m

(4 / 5) **Scale: 1/25** **Aspect ratio: 70 %**

Project name: Laxemar
Bore hole No.: KLX21B **Azimuth: 225** **Inclination: -71**

Depth range: 80.000 - 96.408 m

(5 / 5) **Scale: 1/25** **Aspect ratio: 70 %**

Project name: Laxemar

Image file	**: d:\work\simpev~1\r5594a~1\klx21b_2.bip**
BDT file	**: d:\work\simpev~1\r5594a~1\klx21b_2.bdt**
Locality	**: LAXEMAR**
Bore hole number	**: KLX21B**
Date	**: 07/01/02**
Time	**: 15:35:00**
Depth range	**: 100.000 - 856.216 m**
Azimuth	**: 225**
Inclination	**: -71**
Diameter	**: 76.0 mm**
Magnetic declination	**: 0.0**
Span	**: 4**
Scan interval	**: 0.25**
Scan direction	**: To bottom**
Scale	**: 1/25**
Aspect ratio	**: 150 %**
Pages	**: 21**
Color	**: +0 +0 +0**

Project name: Laxemar
Bore hole No.: KLX21B **Azimuth: 225** **Inclination: -71**

Depth range: 100.000 - 120.000 m

(1 / 21) Scale: 1/25 Aspect ratio: 150 %

Project name: Laxemar

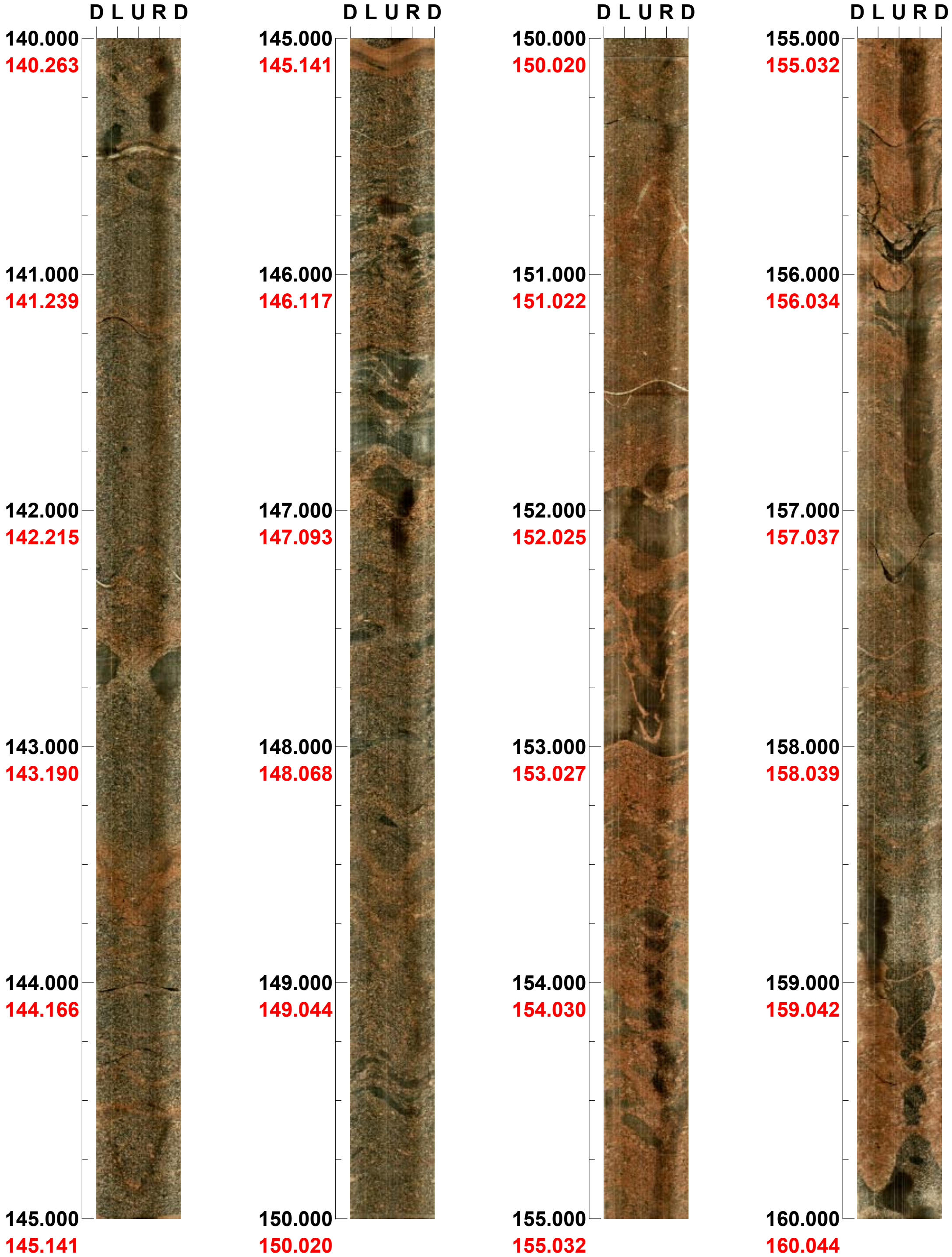
Bore hole No.: KLX21B **Azimuth: 225** **Inclination: -71**

Depth range: 120.000 - 140.000 m

(2 / 21) **Scale: 1/25** **Aspect ratio: 150 %**

Project name: Laxemar
Bore hole No.: KLX21B **Azimuth: 225** **Inclination: -71**

Depth range: 140.000 - 160.000 m



(3 / 21) **Scale: 1/25** **Aspect ratio: 150 %**

Project name: Laxemar
Bore hole No.: KLX21B Azimuth: 225 Inclination: -71

Depth range: 160.000 - 180.000 m

(4 / 21) Scale: 1/25 Aspect ratio: 150 %

Project name: Laxemar
Bore hole No.: KLX21B **Azimuth: 225** **Inclination: -71**

Depth range: 180.000 - 200.000 m

(5 / 21) **Scale: 1/25** **Aspect ratio: 150 %**

Project name: Laxemar

Bore hole No.: KLX21B **Azimuth: 225** **Inclination: -71**

Depth range: 200.000 - 220.000 m

(6 / 21) **Scale: 1/25** **Aspect ratio: 150 %**

Project name: Laxemar
Bore hole No.: KLX21B **Azimuth: 225** **Inclination: -71**

Depth range: 220.000 - 240.000 m

(7 / 21) **Scale: 1/25** **Aspect ratio: 150 %**

Project name: Laxemar
Bore hole No.: KLX21B **Azimuth: 225** **Inclination: -71**

Depth range: 240.000 - 260.000 m

(8 / 21) **Scale: 1/25** **Aspect ratio: 150 %**

Project name: Laxemar
Bore hole No.: KLX21B Azimuth: 225 Inclination: -71

Depth range: 260.000 - 280.000 m

D L U R D

260.000
260.178

261.000
261.178
262.000
262.178
263.000
263.177
264.000
264.177
265.000
265.177

D L U R D

265.000
265.177

266.000
266.177
267.000
267.177
268.000
268.176
269.000
269.176
270.000
270.176

D L U R D

270.000
270.176

271.000
271.176
272.000
272.176
273.000
273.175
274.000
274.175
275.000
275.175

D L U R D

275.000
275.175

276.000
276.175
277.000
277.175
278.000
278.174
279.000
279.174
280.000
280.174

(9 / 21) Scale: 1/25 Aspect ratio: 150 %

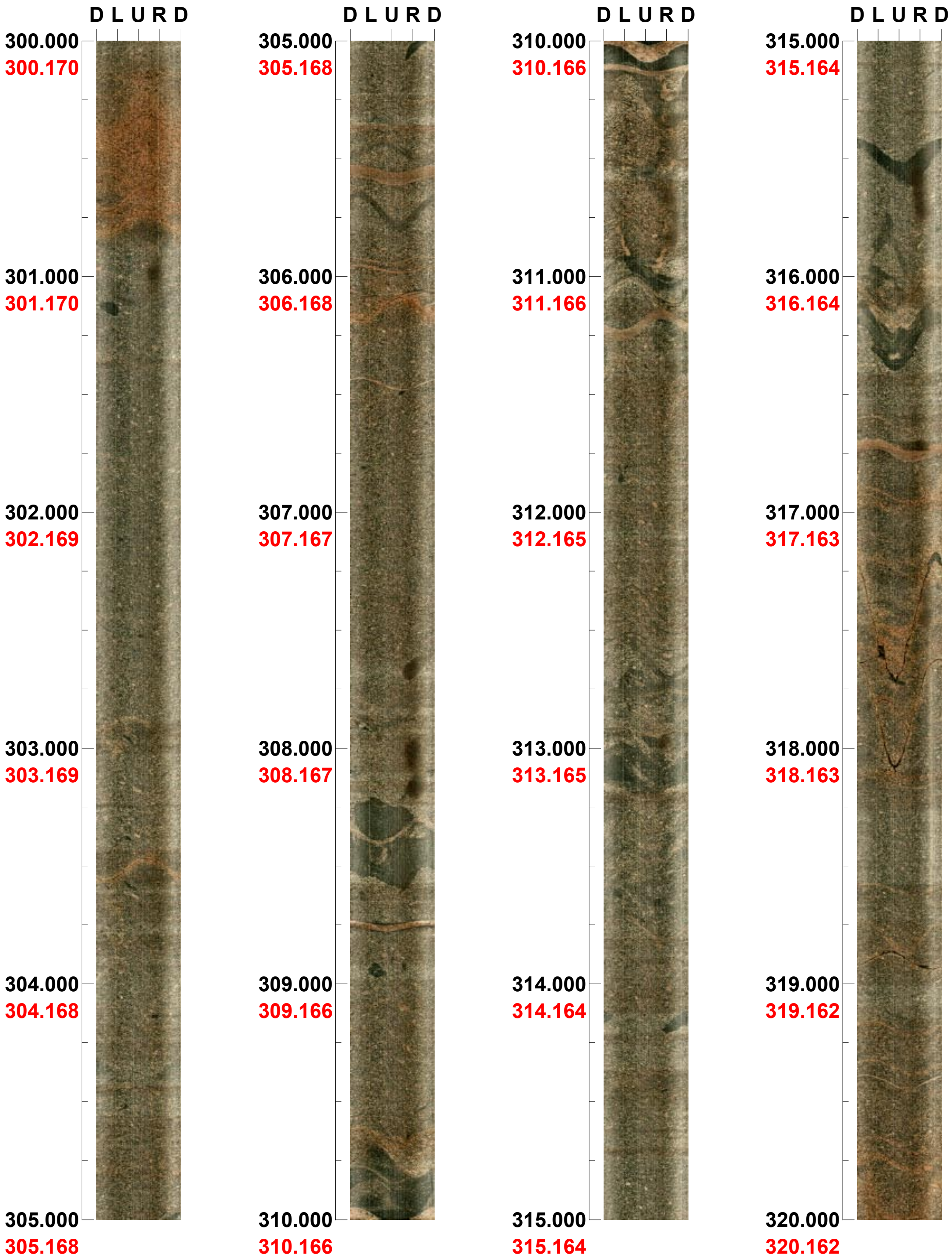
Project name: Laxemar
Bore hole No.: KLX21B **Azimuth: 225** **Inclination: -71**

Depth range: 280.000 - 300.000 m

(10 / 21) **Scale: 1/25** **Aspect ratio: 150 %**

Project name: Laxemar
Bore hole No.: KLX21B **Azimuth: 225** **Inclination: -71**

Depth range: 300.000 - 320.000 m



(11 / 21) **Scale: 1/25** **Aspect ratio: 150 %**

Project name: Laxemar
Bore hole No.: KLX21B

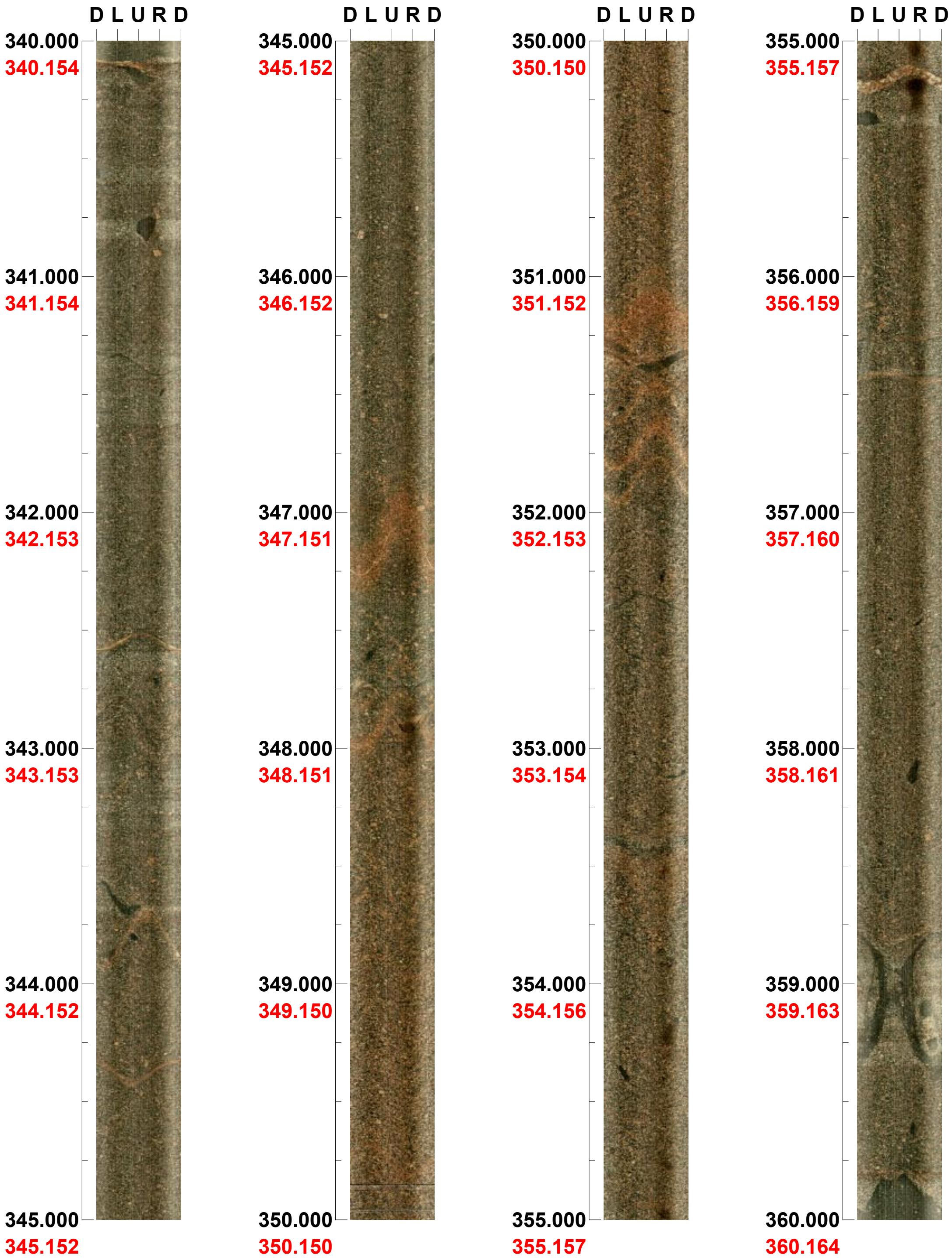
Azimuth: 225   Inclination: -71

Depth range: 320.000 - 340.000 m

(12 / 21)   Scale: 1/25   Aspect ratio: 150 %

Project name: Laxemar
Bore hole No.: KLX21B **Azimuth: 225** **Inclination: -71**

Depth range: 340.000 - 360.000 m



(13 / 21) **Scale: 1/25** **Aspect ratio: 150 %**

Project name: Laxemar
Bore hole No.: KLX21B **Azimuth: 225** **Inclination: -71**

Depth range: 360.000 - 380.000 m

(14 / 21) **Scale: 1/25** **Aspect ratio: 150 %**

Project name: Laxemar
Bore hole No.: KLX21B **Azimuth: 225** **Inclination: -71**

Depth range: 380.000 - 400.000 m

(15 / 21) **Scale: 1/25** **Aspect ratio: 150 %**

Project name: Laxemar
Bore hole No.: KLX21B Azimuth: 225 Inclination: -71

Depth range: 400.000 - 420.000 m

(16 / 21) Scale: 1/25 Aspect ratio: 150 %

Project name: Laxemar
Bore hole No.: KLX21B **Azimuth: 225** **Inclination: -71**

Depth range: 420.000 - 440.000 m

(17 / 21) **Scale: 1/25** **Aspect ratio: 150 %**

Project name: Laxemar
Bore hole No.: KLX21B   Azimuth: 225   Inclination: -71

Depth range: 440.000 - 460.000 m

(18 / 21)   Scale: 1/25   Aspect ratio: 150 %

Project name: Laxemar

Bore hole No.: KLX21B **Azimuth: 225** **Inclination: -71**

Depth range: 460.000 - 480.000 m

(19 / 21) **Scale: 1/25** **Aspect ratio: 150 %**

Project name: Laxemar
Bore hole No.: KLX21B

Azimuth: 225 Inclination: -71

Depth range: 480.000 - 500.000 m

(20 / 21) Scale: 1/25 Aspect ratio: 150 %

Project name: Laxemar
Bore hole No.: KLX21B

Azimuth: 225 Inclination: -71

Depth range: 500.000 - 520.000 m

(1 / 18) Scale: 1/25 Aspect ratio: 150 %

Project name: Laxemar
Bore hole No.: KLX21B

Azimuth: 225 Inclination: -71

Depth range: 520.000 - 540.000 m

(2 / 18) Scale: 1/25 Aspect ratio: 150 %

Project name: Laxemar
Bore hole No.: KLX21B **Azimuth: 225** **Inclination: -71**

Depth range: 540.000 - 560.000 m

(3 / 18) **Scale: 1/25** **Aspect ratio: 150 %**

Project name: Laxemar
Bore hole No.: KLX21B Azimuth: 225 Inclination: -71

Depth range: 560.000 - 580.000 m

(4 / 18) Scale: 1/25 Aspect ratio: 150 %

Project name: Laxemar
Bore hole No.: KLX21B **Azimuth: 225** **Inclination: -71**

Depth range: 580.000 - 600.000 m

(5 / 18) **Scale: 1/25** **Aspect ratio: 150 %**

Project name: Laxemar
Bore hole No.: KLX21B **Azimuth: 225** **Inclination: -71**

Depth range: 600.000 - 620.000 m

(6 / 18) **Scale: 1/25** **Aspect ratio: 150 %**

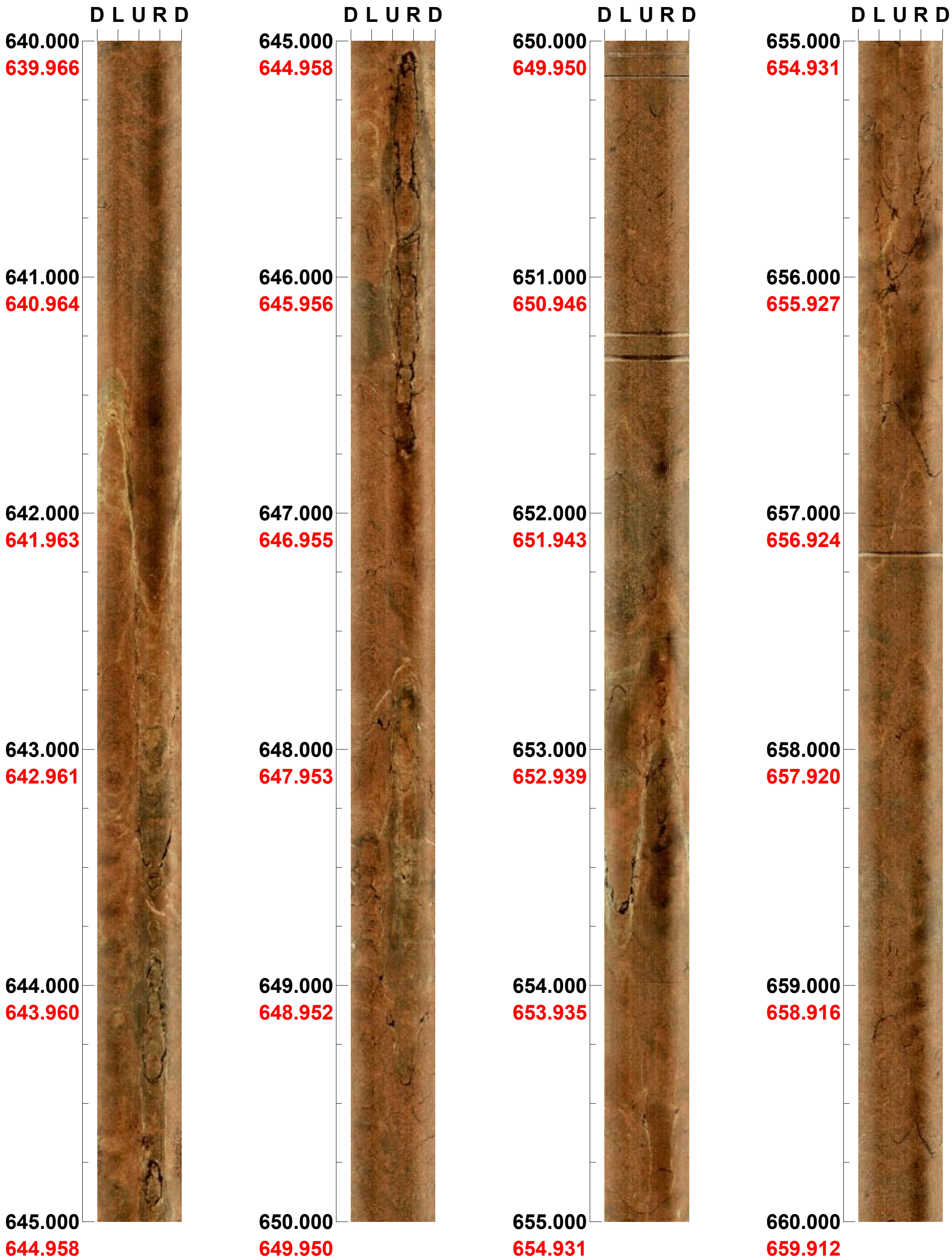
Project name: Laxemar
Bore hole No.: KLX21B **Azimuth: 225** **Inclination: -71**

Depth range: 620.000 - 640.000 m

(7 / 18) **Scale: 1/25** **Aspect ratio: 150 %**

Project name: Laxemar
Bore hole No.: KLX21B **Azimuth: 225** **Inclination: -71**

Depth range: 640.000 - 660.000 m



(8 / 18) **Scale: 1/25** **Aspect ratio: 150 %**

Project name: Laxemar
Bore hole No.: KLX21B **Azimuth: 225** **Inclination: -71**

Depth range: 660.000 - 680.000 m

(9 / 18) **Scale: 1/25** **Aspect ratio: 150 %**

Project name: Laxemar
Bore hole No.: KLX21B **Azimuth: 225** **Inclination: -71**

Depth range: 680.000 - 700.000 m

(10 / 18) **Scale: 1/25** **Aspect ratio: 150 %**

Project name: Laxemar
Bore hole No.: KLX21B **Azimuth: 225** **Inclination: -71**

Depth range: 700.000 - 720.000 m

(11 / 18) **Scale: 1/25** **Aspect ratio: 150 %**

Project name: Laxemar
Bore hole No.: KLX21B **Azimuth: 225** **Inclination: -71**

Depth range: 720.000 - 740.000 m

(12 / 18) **Scale: 1/25** **Aspect ratio: 150 %**

Project name: Laxemar
Bore hole No.: KLX21B **Azimuth: 225** **Inclination: -71**

Depth range: 740.000 - 760.000 m

(13 / 18) **Scale: 1/25** **Aspect ratio: 150 %**

Project name: Laxemar
Bore hole No.: KLX21B **Azimuth: 225** **Inclination: -71**

Depth range: 760.000 - 780.000 m

(14 / 18) **Scale: 1/25** **Aspect ratio: 150 %**

Project name: Laxemar
Bore hole No.: KLX21B **Azimuth: 225** **Inclination: -71**

Depth range: 780.000 - 800.000 m

(15 / 18) **Scale: 1/25** **Aspect ratio: 150 %**

Project name: Laxemar

Bore hole No.: KLX21B **Azimuth: 225** **Inclination: -71**

Depth range: 800.000 - 820.000 m

(16 / 18) **Scale: 1/25** **Aspect ratio: 150 %**

Project name: Laxemar

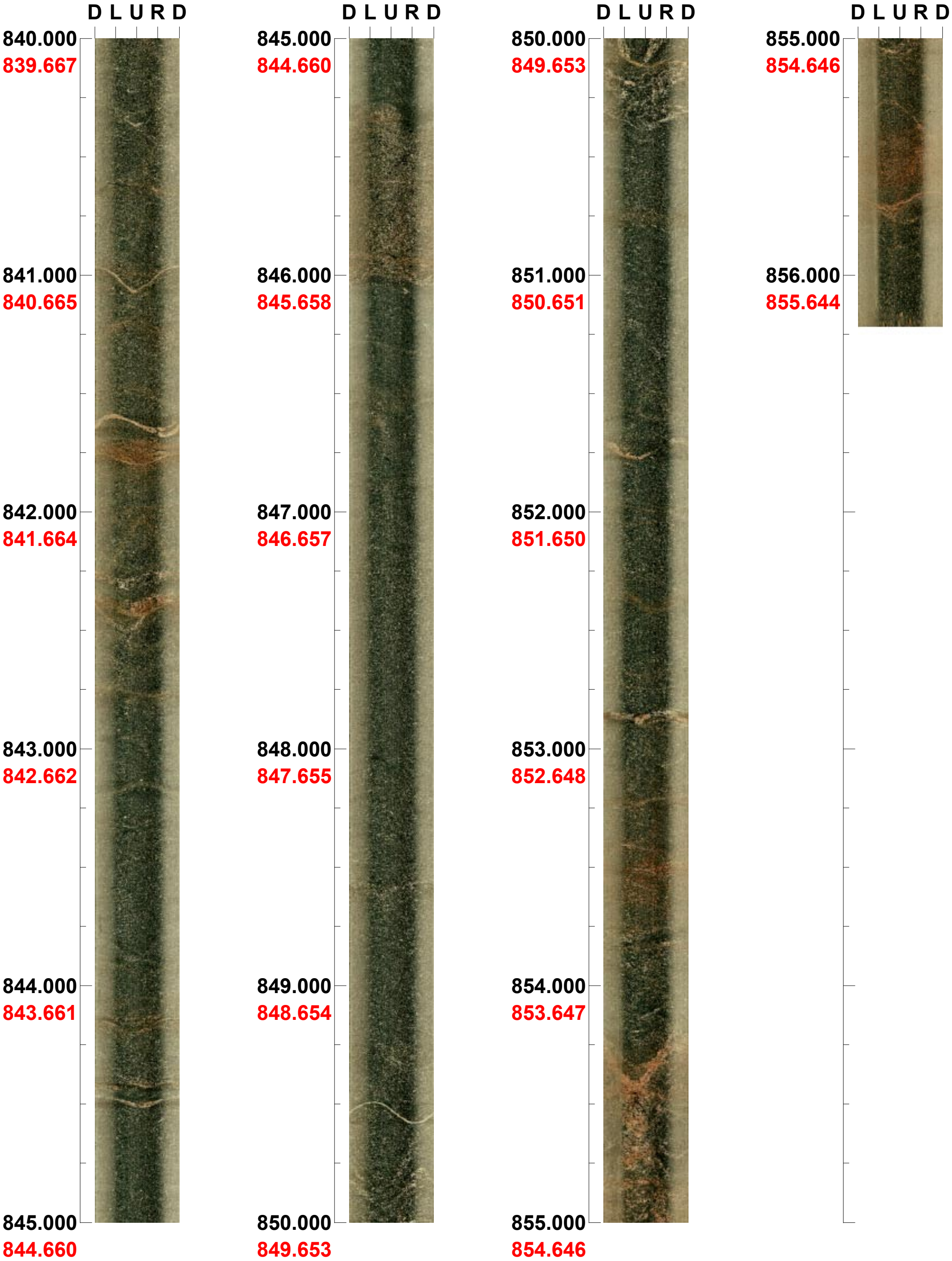
Bore hole No.: KLX21B **Azimuth: 225** **Inclination: -71**

Depth range: 820.000 - 840.000 m

(17 / 18) **Scale: 1/25** **Aspect ratio: 150 %**

Project name: Laxemar
Bore hole No.: KLX21B **Azimuth: 225** **Inclination: -71**

Depth range: 840.000 - 856.216 m



(18 / 18) **Scale: 1/25** **Aspect ratio: 150 %**

Appendix 5

Deviation logging in KLX21A, 0 to 72 m

New MeasureIT files

Survey name:	**KLX21A**
Survey date:	01/02/2007 15:53:44
Project:	PLU
Location:	Laxemar
Country:	Sweden
Survey company:	MALÅ GeoScience / RAYCON
Surveyed by:	Christer Gustafsson
Survey type:	STANDARD
Operating conditions:	
General comments:	
Client name:	SKB
Client ID number:	APPS 400-06-156
Client reference:	Leif Stenberg
Drill company:	SMOY
Drill rig:	
Drill diameter:	195 mm
Survey direction:	INTO hole
Survey run on:	Wireline
Magnetic Var.:	2.73 degrees East of North

FLEXIT

Conventions

Linear units:	Metres
Angular units:	Degrees
Temperature units:	Centigrade
Co-ordinate system:	0 North
Elevation positive	Up
Dip origin:	0 Horizontal
Dip positive:	Up

Magnetic Integrity Check (MagIC)

	Mid value	± limit	
Field strength:	49700	1000	nano Tesla
Magnetic dip:	71	1.5	Degrees

SURVEY	Actual start	End of survey	Difference
Station:	0.0	72.0	72.0
East:	1549706.23	1549737.36	31.13
North:	6366158.18	6366125.27	-32.91
Elevation:	10.69	-45.26	-55.95
Dip:	-51.16	-50.93	0.23
Azimuth:	134.83	134.38	-0.45

OFFSETS at end

Offsets relative to:
ACTUAL START

0.18 metres upwards
1.39 metres right
0.02 metres shortfall

Printed on: 2007-03-28 19:13:19

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FLEXIT: SmartTool drillhole survey result table.

Survey name : KLX21A

Survey date : 01/02/2007 15:53:44

Printed on 2007-03-28 19:13:25

Station	Dip	Azimuth	Easting	Northing	Elevation	Mag.Field	Mag.Dip	Grav.Field	Status	UpDown	LeftRight	Shortfall
Metres	Degrees	Degrees	Metres	Metres	Metres	nT	Degrees	G	*	Metres	Metres	Metres
0.0	-51.16	134.83	1549706.23	6366158.18	10.69	27019	-30.92	0.998582	✍✍✍	0.00	0.00	0.00
3.0	-51.00	135.00	1549707.56	6366156.85	8.36	72769	59.01	0.996756	✍✍✍	0.00	0.00	0.00
6.0	-51.18	135.88	1549708.89	6366155.51	6.02	49538	70.05	0.998252	✍	0.01	0.02	0.00
9.0	-51.10	135.00	1549710.21	6366154.17	3.69	50492	69.96	0.998093	✍	0.01	0.04	0.00
12.0	-50.81	135.50	1549711.54	6366152.82	1.36	50937	71.88	0.998155	✍✍	0.02	0.06	0.00
15.0	-50.86	135.73	1549712.86	6366151.47	-0.97	49806	71.03	1.001603	✍	0.04	0.08	0.00
18.0	-50.83	137.46	1549714.16	6366150.09	-3.30	50015	70.91	0.999347	✍	0.05	0.14	0.00
21.0	-50.81	137.89	1549715.44	6366148.69	-5.62	49325	71.48	0.996371	✍	0.07	0.24	0.00
24.0	-50.90	138.08	1549716.71	6366147.28	-7.95	49807	71.47	0.996424	✍	0.08	0.34	0.00
27.0	-51.01	136.35	1549717.99	6366145.90	-10.28	49920	71.29	0.997442	✍	0.09	0.42	-0.01
30.0	-50.99	137.56	1549719.28	6366144.52	-12.61	49783	71.32	0.997344	✍	0.10	0.49	-0.01
33.0	-50.88	138.72	1549720.54	6366143.11	-14.94	49381	71.28	0.997089	✍	0.11	0.60	-0.01
36.0	-51.03	137.04	1549721.81	6366141.71	-17.27	49734	72.03	0.997455	✍	0.12	0.70	-0.01
39.0	-51.07	139.14	1549723.07	6366140.31	-19.60	49519	70.99	0.997316	✍	0.12	0.81	-0.01
42.0	-51.13	139.21	1549724.30	6366138.88	-21.94	49684	70.80	0.996346	✍	0.12	0.95	-0.02
45.0	-51.07	137.79	1549725.55	6366137.47	-24.27	49288	71.24	0.997089	✍	0.12	1.07	-0.02
48.0	-50.99	136.84	1549726.83	6366136.08	-26.60	49841	71.34	0.996830	✍	0.13	1.15	-0.02
51.0	-51.04	136.59	1549728.12	6366134.71	-28.94	50025	71.69	0.996838	✍	0.13	1.21	-0.02
54.0	-51.03	135.97	1549729.43	6366133.34	-31.27	49576	71.52	0.996674	✍	0.14	1.26	-0.02
57.0	-51.11	136.34	1549730.73	6366131.99	-33.60	49678	71.37	0.996909	✍	0.14	1.30	-0.02
60.0	-51.05	137.52	1549732.02	6366130.61	-35.94	50456	70.71	0.997072	✍	0.15	1.37	-0.02
63.0	-51.01	135.90	1549733.31	6366129.24	-38.27	49571	71.22	0.997306	✍	0.15	1.43	-0.02
66.0	-51.04	134.15	1549734.65	6366127.90	-40.60	50222	71.43	0.996733	✍	0.16	1.44	-0.02
69.0	-50.96	133.80	1549736.00	6366126.59	-42.93	49953	71.79	0.997627	✍	0.17	1.41	-0.02
72.0	-50.93	134.38	1549737.36	6366125.27	-45.26	49954	70.80	0.999241	✍	0.18	1.39	-0.02

Deviation logging in KLX21B, 0 to 852 m

New MeasureIT files

FLEXIT

Survey name:	**KLX21B**
Survey date:	04/01/2007 20:13:12
Project:	PLU
Location:	Laxemar
Country:	Sweden
Survey company:	Malå GeoScience AB Raycon
Surveyed by:	Christer Gustafsson
Survey type:	STANDARD
Operating conditions:	
General comments:	
Client name:	SKB
Client ID number:	APPS 400-06-156
Client reference:	Leif Stenberg
Drill company:	SMOY
Drill rig:	
Drill diameter:	198 and 76mm
Survey direction:	INTO hole
Survey run on:	Wireline
Magnetic Var.:	2.73 degrees East of North

Conventions

Linear units:	Metres
Angular units:	Degrees
Temperature units:	Centigrade
Co-ordinate system:	0 North
Elevation positive	Up
Dip origin:	0 Horizontal
Dip positive:	Up

Magnetic Integrity Check (MagIC)

	Mid value	± limit	
Field strength:	49500	1500	nano Tesla
Magnetic dip:	71,2	1.5	Degrees

SURVEY	Actual start	End of survey	Difference
Station:	0.0	852.0	852.0
East:	1549715.10	1549487.03	-228.07
North:	6366164.00	6365955.85	-208.15
Elevation:	10.68	-783.24	-793.92
Dip:	-71.00	-68.12	2.88
Azimuth:	225.03	226.35	1.32

OFFSETS at end

Offsets relative to:
ACTUAL START

33.20 metres upwards
13.92 metres right
0.91 metres shortfall

Printed on: 2007-03-28 19:13:35

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FLEXIT: SmartTool drillhole survey result table.

Survey name : KLX21B

Survey date : 04/01/2007 20:13:12

Printed on 2007-03-28 19:13:50

Station	Dip	Azimuth	Easting	Northing	Elevation	Mag.Field	Mag.Dip	Grav.Field	Status	UpDown	LeftRight	Shortfall
Metres	Degrees	Degrees	Metres	Metres	Metres	nT	Degrees	G	*	Metres	Metres	Metres
0.0	-71.00	225.03	1549715.10	6366164.00	10.68	100371	75.47	0.998610	✍✍✍	0.00	0.00	0.00
3.0	-71.01	225.03	1549714.41	6366163.31	7.84	115802	-63.95	0.999510	✍✍✍	0.00	0.00	0.00
6.0	-70.74	225.03	1549713.71	6366162.62	5.01	49789	73.26	0.999107	✍✍	0.01	0.00	0.00
9.0	-70.57	225.03	1549713.01	6366161.91	2.18	51500	69.09	0.999292	✍✍✍	0.02	0.00	0.00
12.0	-70.56	227.00	1549712.29	6366161.22	-0.65	49310	71.79	0.999068	✍	0.05	0.02	0.00
15.0	-70.61	228.30	1549711.56	6366160.55	-3.48	49338	71.51	1.001356	✍	0.07	0.06	0.00
18.0	-70.74	228.69	1549710.81	6366159.89	-6.31	49125	71.07	0.998057	✍	0.08	0.12	0.00
21.0	-70.62	227.89	1549710.07	6366159.23	-9.14	49079	71.36	0.998720	✍	0.10	0.18	0.00
24.0	-70.54	229.66	1549709.32	6366158.57	-11.97	49045	71.91	1.001661	✍	0.12	0.24	0.00
27.0	-70.54	230.93	1549708.55	6366157.93	-14.80	49243	71.31	1.000789	✍	0.14	0.34	0.00
30.0	-70.54	229.86	1549707.78	6366157.30	-17.63	49205	71.30	1.000307	✍	0.16	0.43	-0.01
33.0	-70.44	231.85	1549707.01	6366156.66	-20.46	48935	71.81	1.001131	✍	0.18	0.53	-0.01
36.0	-70.59	228.90	1549706.23	6366156.03	-23.28	49083	71.44	0.998744	✍	0.20	0.62	-0.01
39.0	-70.47	229.23	1549705.48	6366155.37	-26.11	48805	71.73	0.997768	✍	0.22	0.69	-0.01
42.0	-70.24	230.17	1549704.71	6366154.72	-28.94	48748	71.85	1.001874	✍	0.25	0.78	-0.01
45.0	-70.22	230.91	1549703.93	6366154.07	-31.76	48809	71.90	1.001507	✍	0.29	0.87	-0.01
48.0	-70.36	227.60	1549703.16	6366153.41	-34.59	49163	70.96	0.997681	✍	0.32	0.95	-0.01
51.0	-70.16	229.55	1549702.40	6366152.74	-37.41	48866	71.97	1.001844	✍	0.36	1.01	-0.02
54.0	-70.26	226.59	1549701.65	6366152.07	-40.23	49398	71.60	0.997896	✍	0.40	1.07	-0.02
57.0	-70.18	230.03	1549700.89	6366151.39	-43.06	48771	71.53	0.999238	✍	0.44	1.12	-0.02
60.0	-70.17	229.19	1549700.11	6366150.73	-45.88	48820	71.85	0.998091	✍	0.48	1.21	-0.02
63.0	-70.11	228.70	1549699.34	6366150.06	-48.70	49116	71.39	1.000541	✍	0.52	1.27	-0.02
66.0	-70.05	230.61	1549698.57	6366149.40	-51.52	49422	71.10	1.000228	✍	0.57	1.36	-0.02
69.0	-69.95	228.78	1549697.78	6366148.74	-54.34	49198	71.62	1.001340	✍	0.62	1.44	-0.02
72.0	-69.99	227.89	1549697.02	6366148.05	-57.16	49407	71.33	1.001310	✍	0.67	1.50	-0.02
75.0	-69.87	229.85	1549696.24	6366147.38	-59.98	49271	71.54	1.000766	✍	0.72	1.57	-0.02
78.0	-70.04	226.34	1549695.47	6366146.69	-62.79	49883	71.13	0.998230	✍	0.78	1.62	-0.03
81.0	-69.78	227.95	1549694.72	6366145.99	-65.61	50010	71.47	0.979404	✍	0.83	1.66	-0.03
84.0	-69.69	228.78	1549693.94	6366145.30	-68.43	49901	71.46	1.000891	✍	0.90	1.72	-0.03
87.0	-69.50	227.89	1549693.16	6366144.60	-71.24	49829	70.83	1.001609	✍	0.97	1.78	-0.03
90.0	-69.54	227.15	1549692.39	6366143.90	-74.05	50427	71.62	1.001382	✍	1.04	1.83	-0.03
93.0	-69.53	227.75	1549691.61	6366143.19	-76.86	50060	71.46	1.001656	✍	1.12	1.87	-0.03
96.0	-69.46	227.27	1549690.84	6366142.48	-79.67	49955	70.84	0.999660	✍	1.20	1.92	-0.03
99.0	-69.45	227.86	1549690.06	6366141.77	-82.48	48604	70.92	0.999354	✍	1.28	1.96	-0.03

FLEXIT: SmartTool drillhole survey result table.

Survey name : KLX21B

Survey date : 04/01/2007 20:13:12

Printed on 2007-03-28 19:13:50

Station	Dip	Azimuth	Easting	Northing	Elevation	Mag.Field	Mag.Dip	Grav.Field	Status	UpDown	LeftRight	Shortfall
Metres	Degrees	Degrees	Metres	Metres	Metres	nT	Degrees	G	*	Metres	Metres	Metres
102.0	-69.46	229.07	1549689.27	6366141.07	-85.29	49488	71.84	0.998251	✍	1.36	2.03	-0.04
105.0	-69.29	228.14	1549688.48	6366140.37	-88.10	49208	71.98	0.999842	✍	1.44	2.09	-0.04
108.0	-69.25	229.58	1549687.68	6366139.67	-90.90	49034	71.93	0.999524	✍	1.53	2.16	-0.04
111.0	-69.22	229.87	1549686.87	6366138.98	-93.71	48996	72.04	0.999911	✍	1.62	2.25	-0.04
114.0	-69.22	228.95	1549686.06	6366138.29	-96.51	49266	71.78	0.999959	✍	1.71	2.33	-0.05
117.0	-69.22	229.08	1549685.26	6366137.59	-99.32	49040	71.99	0.999749	✍	1.80	2.41	-0.05
120.0	-69.21	228.43	1549684.46	6366136.89	-102.12	49256	72.01	0.999508	✍	1.89	2.48	-0.05
123.0	-69.20	228.40	1549683.66	6366136.18	-104.93	49257	71.83	0.999716	✍	1.98	2.54	-0.05
126.0	-69.22	228.94	1549682.86	6366135.48	-107.73	49146	71.74	0.999752	✍	2.07	2.61	-0.05
129.0	-69.20	226.98	1549682.07	6366134.77	-110.53	49484	71.56	0.999680	✍	2.17	2.66	-0.06
132.0	-69.21	228.85	1549681.28	6366134.05	-113.34	49584	71.80	0.999786	✍	2.26	2.71	-0.06
135.0	-69.17	228.52	1549680.48	6366133.35	-116.14	48926	71.99	0.999725	✍	2.35	2.78	-0.06
138.0	-69.18	228.91	1549679.68	6366132.65	-118.95	48838	72.29	0.999534	✍	2.45	2.85	-0.06
141.0	-69.20	230.13	1549678.87	6366131.95	-121.75	49050	72.00	1.000074	✍	2.54	2.93	-0.07
144.0	-69.16	231.95	1549678.04	6366131.28	-124.56	48500	72.28	0.999771	✍	2.63	3.05	-0.07
147.0	-69.17	230.01	1549677.21	6366130.61	-127.36	48443	71.92	0.999536	✍	2.72	3.16	-0.07
150.0	-69.20	226.56	1549676.42	6366129.90	-130.16	51034	70.98	0.999557	✍	2.81	3.22	-0.07
153.0	-69.21	226.93	1549675.64	6366129.17	-132.97	50900	71.01	1.000124	✍	2.90	3.25	-0.08
156.0	-69.26	230.76	1549674.84	6366128.47	-135.77	48990	72.23	1.000288	✍	2.99	3.32	-0.08
159.0	-69.16	230.97	1549674.01	6366127.80	-138.58	48981	72.30	1.000367	✍	3.08	3.43	-0.08
162.0	-69.09	232.00	1549673.18	6366127.14	-141.38	47881	72.74	0.999999	✍✍✍	3.17	3.55	-0.08
165.0	-69.09	231.30	1549672.34	6366126.47	-144.18	49338	72.08	1.000002	✍	3.27	3.67	-0.09
168.0	-69.09	232.82	1549671.49	6366125.81	-146.99	48598	72.13	0.999964	✍	3.36	3.80	-0.09
171.0	-69.07	235.20	1549670.63	6366125.18	-149.79	48174	72.28	1.000406	✍	3.45	3.97	-0.10
174.0	-69.06	232.03	1549669.76	6366124.55	-152.59	49046	71.99	1.000044	✍	3.54	4.13	-0.10
177.0	-69.03	231.61	1549668.92	6366123.88	-155.39	49312	71.88	1.000478	✍	3.63	4.26	-0.11
180.0	-69.06	229.24	1549668.09	6366123.20	-158.19	49263	71.47	1.000353	✍	3.73	4.36	-0.11
183.0	-69.04	229.10	1549667.28	6366122.50	-161.00	49148	71.58	1.000413	✍	3.83	4.43	-0.12
186.0	-69.02	229.11	1549666.47	6366121.80	-163.80	49176	71.86	1.000396	✍	3.93	4.51	-0.12
189.0	-68.98	230.72	1549665.65	6366121.10	-166.60	49144	72.21	0.999991	✍	4.03	4.60	-0.12
192.0	-68.93	228.39	1549664.83	6366120.41	-169.40	49530	71.52	1.000221	✍	4.14	4.69	-0.12
195.0	-68.94	229.01	1549664.02	6366119.69	-172.20	49388	71.63	1.000056	✍	4.24	4.76	-0.13
198.0	-68.89	227.82	1549663.21	6366118.98	-175.00	49997	71.27	1.000104	✍	4.35	4.82	-0.13
201.0	-68.89	229.35	1549662.40	6366118.26	-177.79	49629	71.52	1.000323	✍	4.46	4.89	-0.13

FLEXIT: SmartTool drillhole survey result table.

Survey name : KLX21B

Survey date : 04/01/2007 20:13:12

Printed on 2007-03-28 19:13:50

Station	Dip	Azimuth	Easting	Northing	Elevation	Mag.Field	Mag.Dip	Grav.Field	Status	UpDown	LeftRight	Shortfall
Metres	Degrees	Degrees	Metres	Metres	Metres	nT	Degrees	G	*	Metres	Metres	Metres
204.0	-68.88	227.95	1549661.59	6366117.55	-180.59	49415	71.64	0.999957	✍	4.57	4.96	-0.13
207.0	-68.85	227.78	1549660.79	6366116.82	-183.39	49864	71.40	1.000085	✍	4.68	5.01	-0.14
210.0	-68.85	226.53	1549659.99	6366116.09	-186.19	50041	71.30	1.000284	✍	4.79	5.05	-0.14
213.0	-68.86	226.45	1549659.21	6366115.34	-188.99	49938	71.32	1.000090	✍	4.90	5.08	-0.14
216.0	-68.85	229.33	1549658.41	6366114.62	-191.79	49432	71.40	1.000044	✍	5.01	5.13	-0.14
219.0	-68.85	230.23	1549657.58	6366113.92	-194.58	48895	71.81	1.000361	✍	5.12	5.22	-0.15
222.0	-68.82	230.52	1549656.74	6366113.23	-197.38	48784	71.63	1.000112	✍	5.23	5.32	-0.15
225.0	-68.82	227.47	1549655.93	6366112.52	-200.18	49511	71.27	1.000141	✍	5.34	5.40	-0.15
228.0	-68.81	229.73	1549655.11	6366111.80	-202.98	50027	71.92	1.000445	✍	5.45	5.46	-0.16
231.0	-68.77	230.17	1549654.28	6366111.10	-205.77	48895	72.11	1.000246	✍	5.57	5.56	-0.16
234.0	-68.77	229.05	1549653.46	6366110.40	-208.57	48390	71.52	1.000323	✍	5.68	5.64	-0.16
237.0	-68.76	230.53	1549652.63	6366109.70	-211.37	48602	71.80	1.000382	✍	5.79	5.73	-0.17
240.0	-68.75	229.29	1549651.79	6366109.00	-214.16	49142	71.48	1.000297	✍	5.91	5.83	-0.17
243.0	-68.75	228.68	1549650.97	6366108.28	-216.96	48897	71.54	1.000134	✍	6.02	5.90	-0.17
246.0	-68.72	228.82	1549650.16	6366107.56	-219.75	49142	71.82	1.000280	✍	6.14	5.97	-0.18
249.0	-68.71	228.85	1549649.34	6366106.85	-222.55	48776	71.94	1.000384	✍	6.25	6.04	-0.18
252.0	-68.68	226.05	1549648.53	6366106.11	-225.34	50220	71.78	1.000052	✍	6.37	6.09	-0.18
255.0	-68.69	228.85	1549647.73	6366105.37	-228.14	49181	71.72	1.000325	✍	6.49	6.14	-0.19
258.0	-68.69	228.52	1549646.91	6366104.65	-230.93	49326	71.81	1.000089	✍	6.61	6.21	-0.19
261.0	-68.69	229.47	1549646.09	6366103.94	-233.73	48977	71.88	1.000191	✍	6.73	6.28	-0.19
264.0	-68.67	229.40	1549645.26	6366103.23	-236.52	48575	71.87	1.000316	✍	6.85	6.36	-0.20
267.0	-68.68	225.72	1549644.46	6366102.49	-239.32	50272	72.13	0.999992	✍	6.97	6.41	-0.20
270.0	-68.68	227.54	1549643.66	6366101.75	-242.11	49311	71.61	1.000346	✍	7.09	6.44	-0.20
273.0	-68.66	227.25	1549642.86	6366101.01	-244.91	49559	71.62	1.000638	✍	7.21	6.49	-0.20
276.0	-68.68	227.95	1549642.05	6366100.27	-247.70	49507	71.43	1.000098	✍	7.33	6.54	-0.21
279.0	-68.68	227.33	1549641.25	6366099.54	-250.50	49502	71.54	1.000145	✍	7.45	6.59	-0.21
282.0	-68.63	227.81	1549640.44	6366098.80	-253.29	49087	71.98	1.000614	✍	7.58	6.64	-0.21
285.0	-68.62	226.83	1549639.64	6366098.06	-256.08	49892	71.73	1.000297	✍	7.70	6.68	-0.22
288.0	-68.60	227.98	1549638.83	6366097.32	-258.88	49167	71.44	1.000436	✍	7.82	6.72	-0.22
291.0	-68.59	229.18	1549638.01	6366096.59	-261.67	49081	71.98	1.000384	✍	7.95	6.79	-0.22
294.0	-68.60	228.07	1549637.19	6366095.87	-264.46	49763	71.51	1.000578	✍	8.07	6.86	-0.23
297.0	-68.57	231.92	1549636.35	6366095.17	-267.26	47339	72.57	1.000123	✍	8.19	6.96	-0.23
300.0	-68.51	231.75	1549635.49	6366094.49	-270.05	47771	72.60	1.000126	✍	8.31	7.09	-0.23
303.0	-68.48	229.25	1549634.64	6366093.79	-272.84	48811	71.94	1.000007	✍	8.44	7.19	-0.24

FLEXIT: SmartTool drillhole survey result table.

Survey name : KLX21B

Survey date : 04/01/2007 20:13:12

Printed on 2007-03-28 19:13:50

Station	Dip	Azimuth	Easting	Northing	Elevation	Mag.Field	Mag.Dip	Grav.Field	Status	UpDown	LeftRight	Shortfall
Metres	Degrees	Degrees	Metres	Metres	Metres	nT	Degrees	G	*	Metres	Metres	Metres
306.0	-68.45	229.49	1549633.80	6366093.07	-275.63	48652	71.90	1.000511	✍	8.57	7.27	-0.24
309.0	-68.47	228.19	1549632.97	6366092.35	-278.42	48786	71.48	1.000615	✍	8.70	7.35	-0.25
312.0	-68.48	231.44	1549632.13	6366091.64	-281.21	47913	72.38	1.000324	✍	8.83	7.44	-0.25
315.0	-68.49	229.05	1549631.29	6366090.93	-284.00	48702	71.81	1.000478	✍	8.96	7.54	-0.26
318.0	-68.46	227.00	1549630.47	6366090.20	-286.79	49346	71.13	1.000345	✍	9.09	7.60	-0.26
321.0	-68.45	227.43	1549629.66	6366089.45	-289.58	49496	71.94	1.000273	✍	9.22	7.64	-0.26
324.0	-68.43	226.99	1549628.85	6366088.70	-292.37	49241	71.72	1.000453	✍	9.35	7.68	-0.27
327.0	-68.45	227.10	1549628.05	6366087.95	-295.16	49219	71.67	1.000253	✍	9.49	7.72	-0.27
330.0	-68.47	231.36	1549627.21	6366087.23	-297.95	47934	72.40	1.000027	✍	9.62	7.80	-0.27
333.0	-68.44	230.55	1549626.36	6366086.53	-300.74	48296	71.97	1.000552	✍	9.74	7.91	-0.28
336.0	-68.44	230.33	1549625.51	6366085.83	-303.54	48544	72.58	1.000350	✍	9.87	8.02	-0.28
339.0	-68.43	229.78	1549624.66	6366085.12	-306.33	48496	71.97	1.000023	✍	10.00	8.11	-0.29
342.0	-68.40	229.07	1549623.82	6366084.41	-309.11	48968	71.90	1.000253	✍	10.14	8.20	-0.29
345.0	-68.42	226.12	1549623.01	6366083.66	-311.90	49571	71.21	1.000236	✍	10.27	8.25	-0.29
348.0	-68.42	227.77	1549622.20	6366082.91	-314.69	49365	71.34	1.000405	✍	10.40	8.28	-0.30
351.0	-68.42	227.77	1549621.38	6366082.17	-317.48	49121	71.44	1.000434	✍	10.54	8.34	-0.30
354.0	-68.45	227.25	1549620.57	6366081.42	-320.27	49131	71.80	1.000357	✍	10.67	8.39	-0.30
357.0	-68.46	228.33	1549619.76	6366080.68	-323.06	48660	72.46	1.000338	✍	10.80	8.44	-0.31
360.0	-68.44	227.85	1549618.94	6366079.95	-325.85	49265	71.64	1.000217	✍	10.94	8.50	-0.31
363.0	-68.44	228.15	1549618.12	6366079.21	-328.64	49295	71.53	1.000321	✍	11.07	8.55	-0.31
366.0	-68.45	227.47	1549617.30	6366078.47	-331.43	49323	71.72	1.000281	✍	11.20	8.61	-0.32
369.0	-68.46	228.98	1549616.48	6366077.74	-334.23	48447	71.51	1.000782	✍	11.33	8.67	-0.32
372.0	-68.47	227.53	1549615.66	6366077.00	-337.02	48514	72.04	1.000243	✍	11.46	8.73	-0.33
375.0	-68.49	227.32	1549614.85	6366076.26	-339.81	48798	71.98	1.000534	✍	11.59	8.78	-0.33
378.0	-68.51	226.60	1549614.04	6366075.51	-342.60	49053	71.61	1.000518	✍	11.72	8.81	-0.33
381.0	-68.52	227.78	1549613.24	6366074.76	-345.39	48786	71.72	1.000551	✍	11.85	8.86	-0.33
384.0	-68.52	228.01	1549612.42	6366074.02	-348.18	49102	71.77	1.000344	✍	11.98	8.91	-0.34
387.0	-68.55	227.48	1549611.61	6366073.29	-350.97	49975	71.33	1.000572	✍	12.11	8.96	-0.34
390.0	-68.55	228.14	1549610.80	6366072.55	-353.77	48797	71.96	1.000478	✍	12.24	9.02	-0.34
393.0	-68.55	227.05	1549609.99	6366071.81	-356.56	49001	71.45	1.000391	✍	12.37	9.06	-0.35
396.0	-68.55	227.17	1549609.18	6366071.06	-359.35	48919	71.59	1.000485	✍	12.49	9.10	-0.35
399.0	-68.56	225.97	1549608.39	6366070.31	-362.14	49149	71.13	1.000209	✍	12.62	9.13	-0.35
402.0	-68.55	227.53	1549607.59	6366069.56	-364.93	49251	71.61	1.000412	✍	12.75	9.17	-0.36
405.0	-68.53	226.99	1549606.78	6366068.81	-367.73	49308	71.59	1.000477	✍	12.88	9.21	-0.36

Survey name : KLX21B

Survey date : 04/01/2007 20:13:12

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Station	Dip	Azimuth	Easting	Northing	Elevation	Mag.Field	Mag.Dip	Grav.Field	Status	UpDown	LeftRight	Shortfall
Metres	Degrees	Degrees	Metres	Metres	Metres	nT	Degrees	G	*	Metres	Metres	Metres
408.0	-68.58	226.97	1549605.98	6366068.06	-370.52	49408	71.45	1.000582	✍	13.00	9.25	-0.36
411.0	-68.60	227.92	1549605.17	6366067.32	-373.31	49178	71.66	1.000329	✍	13.13	9.29	-0.36
414.0	-68.60	227.28	1549604.36	6366066.58	-376.10	49210	71.49	1.000444	✍	13.25	9.34	-0.37
417.0	-68.62	228.57	1549603.55	6366065.85	-378.90	48588	71.65	1.000484	✍	13.38	9.40	-0.37
420.0	-68.59	226.53	1549602.74	6366065.11	-381.69	49431	71.24	1.000416	✍	13.50	9.45	-0.37
423.0	-68.63	227.19	1549601.95	6366064.36	-384.48	49295	71.42	1.000502	✍	13.63	9.48	-0.38
426.0	-68.63	227.43	1549601.14	6366063.62	-387.28	48881	71.41	1.000292	✍	13.75	9.52	-0.38
429.0	-68.64	225.32	1549600.35	6366062.87	-390.07	49018	70.53	1.000582	✍	13.87	9.55	-0.38
432.0	-68.62	226.52	1549599.57	6366062.11	-392.87	49067	71.17	1.000654	✍	14.00	9.57	-0.38
435.0	-68.64	227.18	1549598.77	6366061.36	-395.66	49319	71.42	1.000365	✍	14.12	9.60	-0.39
438.0	-68.64	226.83	1549597.97	6366060.62	-398.45	49266	71.55	1.000792	✍	14.24	9.64	-0.39
441.0	-68.62	228.07	1549597.16	6366059.88	-401.25	49206	71.57	1.000731	✍	14.37	9.69	-0.39
444.0	-68.65	227.00	1549596.36	6366059.14	-404.04	49173	71.29	1.000456	✍	14.49	9.73	-0.40
447.0	-68.65	227.27	1549595.56	6366058.40	-406.84	49278	71.27	1.000686	✍	14.61	9.77	-0.40
450.0	-68.67	226.65	1549594.76	6366057.65	-409.63	49296	71.16	1.000504	✍	14.73	9.81	-0.40
453.0	-68.70	227.20	1549593.96	6366056.91	-412.42	49394	71.20	1.000427	✍	14.85	9.85	-0.40
456.0	-68.70	227.19	1549593.16	6366056.17	-415.22	49404	71.28	1.000168	✍	14.97	9.89	-0.41
459.0	-68.68	227.41	1549592.36	6366055.43	-418.01	49374	71.21	1.000508	✍	15.09	9.93	-0.41
462.0	-68.63	258.34	1549591.42	6366054.95	-420.82	45747	72.75	1.000377	✍✍	15.13	10.25	-0.43
465.0	-68.60	226.43	1549590.49	6366054.46	-423.62	49409	71.45	1.000510	✍	15.17	10.57	-0.45
468.0	-68.60	225.78	1549589.70	6366053.70	-426.41	49420	71.23	1.000682	✍	15.30	10.59	-0.46
471.0	-68.58	225.61	1549588.91	6366052.93	-429.21	49544	71.24	1.000584	✍	15.42	10.60	-0.46
474.0	-68.55	224.39	1549588.14	6366052.16	-432.00	50023	71.13	1.000605	✍	15.55	10.60	-0.46
477.0	-68.55	225.93	1549587.36	6366051.38	-434.79	49437	71.35	1.000715	✍	15.68	10.60	-0.46
480.0	-68.56	226.59	1549586.57	6366050.62	-437.58	49343	71.37	1.000601	✍	15.81	10.63	-0.47
483.0	-68.56	225.50	1549585.78	6366049.86	-440.38	49507	71.11	1.000559	✍	15.94	10.65	-0.47
486.0	-68.57	226.34	1549584.99	6366049.10	-443.17	49170	71.28	1.000538	✍	16.06	10.66	-0.47
489.0	-68.56	226.34	1549584.20	6366048.34	-445.96	49116	71.49	1.000772	✍	16.19	10.69	-0.48
492.0	-68.56	227.31	1549583.40	6366047.59	-448.75	48558	71.73	1.000818	✍	16.32	10.72	-0.48
495.0	-68.57	228.17	1549582.59	6366046.86	-451.55	48603	71.79	1.000319	✍	16.44	10.78	-0.48
498.0	-68.57	226.42	1549581.78	6366046.11	-454.34	48805	71.83	1.000339	✍	16.57	10.82	-0.49
501.0	-68.57	226.12	1549580.99	6366045.36	-457.13	50007	71.75	1.000500	✍	16.70	10.84	-0.49
504.0	-68.55	225.79	1549580.20	6366044.59	-459.92	49971	71.25	1.000536	✍	16.83	10.86	-0.49
507.0	-68.55	227.10	1549579.41	6366043.84	-462.72	49004	71.62	1.000764	✍	16.95	10.89	-0.49

FLEXIT: SmartTool drillhole survey result table.

Survey name : KLX21B

Survey date : 04/01/2007 20:13:12

Printed on 2007-03-28 19:13:50

Station	Dip	Azimuth	Easting	Northing	Elevation	Mag.Field	Mag.Dip	Grav.Field	Status	UpDown	LeftRight	Shortfall
Metres	Degrees	Degrees	Metres	Metres	Metres	nT	Degrees	G	*	Metres	Metres	Metres
510.0	-68.59	226.71	1549578.61	6366043.09	-465.51	49260	71.39	1.000858	✍	17.08	10.92	-0.50
513.0	-68.57	226.57	1549577.81	6366042.34	-468.30	49373	71.54	1.000946	✍	17.21	10.95	-0.50
516.0	-68.58	226.16	1549577.02	6366041.58	-471.09	49702	71.86	1.000631	✍	17.33	10.98	-0.50
519.0	-68.57	227.55	1549576.22	6366040.83	-473.89	48835	71.89	1.000263	✍	17.46	11.01	-0.50
522.0	-68.54	227.71	1549575.41	6366040.09	-476.68	48793	71.95	1.000663	✍	17.59	11.06	-0.51
525.0	-68.54	225.87	1549574.61	6366039.34	-479.47	49810	71.54	1.000661	✍	17.71	11.10	-0.51
528.0	-68.53	226.48	1549573.81	6366038.58	-482.26	49167	71.72	1.000549	✍	17.84	11.12	-0.51
531.0	-68.56	226.58	1549573.02	6366037.82	-485.05	49790	71.36	1.000581	✍	17.97	11.15	-0.52
534.0	-68.51	228.11	1549572.21	6366037.08	-487.85	48621	72.03	1.000577	✍	18.10	11.19	-0.52
537.0	-68.52	228.41	1549571.39	6366036.35	-490.64	48050	71.90	1.000468	✍	18.23	11.25	-0.52
540.0	-68.50	225.63	1549570.59	6366035.60	-493.43	48924	71.03	1.000408	✍	18.36	11.29	-0.53
543.0	-68.47	226.11	1549569.80	6366034.83	-496.22	48816	71.67	1.000778	✍	18.49	11.31	-0.53
546.0	-68.48	227.48	1549568.99	6366034.08	-499.01	48437	71.60	1.000750	✍	18.62	11.34	-0.53
549.0	-68.45	227.89	1549568.18	6366033.34	-501.80	48663	71.85	1.000729	✍	18.75	11.39	-0.54
552.0	-68.46	227.99	1549567.36	6366032.60	-504.59	47445	72.04	1.000670	✍	18.88	11.45	-0.54
555.0	-68.45	227.78	1549566.55	6366031.86	-507.38	48017	71.96	1.000482	✍	19.02	11.50	-0.54
558.0	-68.46	227.70	1549565.73	6366031.12	-510.17	46757	72.47	1.000544	✍	19.15	11.56	-0.55
561.0	-68.46	227.54	1549564.92	6366030.38	-512.96	48305	72.21	1.000667	✍	19.28	11.61	-0.55
564.0	-68.45	226.15	1549564.11	6366029.63	-515.75	48751	72.14	1.001071	✍	19.41	11.64	-0.55
567.0	-68.45	228.22	1549563.30	6366028.88	-518.54	49981	72.50	1.000652	✍	19.55	11.68	-0.56
570.0	-68.43	224.62	1549562.51	6366028.12	-521.33	49651	71.54	1.000814	✍	19.68	11.71	-0.56
573.0	-68.44	226.81	1549561.72	6366027.35	-524.12	48613	72.06	1.000933	✍	19.81	11.72	-0.56
576.0	-68.43	222.30	1549560.94	6366026.56	-526.91	49987	72.31	1.000517	✍	19.95	11.71	-0.56
579.0	-68.42	227.08	1549560.17	6366025.78	-529.70	48374	72.22	1.000663	✍	20.08	11.71	-0.57
582.0	-68.38	226.32	1549559.37	6366025.02	-532.49	48949	72.28	1.000959	✍	20.22	11.74	-0.57
585.0	-68.37	226.73	1549558.56	6366024.26	-535.28	48515	71.98	1.000699	✍	20.35	11.77	-0.57
588.0	-68.36	224.35	1549557.77	6366023.49	-538.07	49314	71.70	1.000733	✍	20.49	11.78	-0.58
591.0	-68.38	224.55	1549557.00	6366022.70	-540.86	49799	71.58	1.000698	✍	20.63	11.77	-0.58
594.0	-68.37	223.10	1549556.23	6366021.90	-543.65	49721	71.44	1.000597	✍	20.77	11.74	-0.58
597.0	-68.37	224.19	1549555.47	6366021.10	-546.44	48936	71.86	1.000462	✍	20.90	11.72	-0.59
600.0	-68.35	223.97	1549554.70	6366020.30	-549.23	49316	71.74	1.000652	✍	21.04	11.70	-0.59
603.0	-68.37	222.74	1549553.94	6366019.50	-552.01	49953	71.70	1.000499	✍	21.18	11.67	-0.59
606.0	-68.39	223.30	1549553.19	6366018.69	-554.80	50267	71.68	1.000902	✍	21.32	11.63	-0.60
609.0	-68.40	223.36	1549552.43	6366017.89	-557.59	50020	71.61	1.000822	✍	21.45	11.59	-0.60

FLEXIT: SmartTool drillhole survey result table.

Survey name : KLX21B

Survey date : 04/01/2007 20:13:12

Printed on 2007-03-28 19:13:50

Station	Dip	Azimuth	Easting	Northing	Elevation	Mag.Field	Mag.Dip	Grav.Field	Status	UpDown	LeftRight	Shortfall
Metres	Degrees	Degrees	Metres	Metres	Metres	nT	Degrees	G	*	Metres	Metres	Metres
612.0	-68.39	224.11	1549551.66	6366017.09	-560.38	50173	71.50	1.000922	✍	21.59	11.57	-0.60
615.0	-68.40	223.94	1549550.90	6366016.29	-563.17	50151	71.48	1.000708	✍	21.73	11.55	-0.61
618.0	-68.37	223.79	1549550.13	6366015.50	-565.96	50144	71.49	1.000480	✍	21.86	11.53	-0.61
621.0	-68.35	224.26	1549549.36	6366014.70	-568.75	50153	71.51	1.000649	✍	22.00	11.51	-0.61
624.0	-68.32	227.82	1549548.57	6366013.93	-571.54	50022	72.21	1.000584	✍	22.14	11.53	-0.62
627.0	-68.32	224.38	1549547.77	6366013.17	-574.32	49989	71.51	1.000871	✍	22.28	11.55	-0.62
630.0	-68.35	224.28	1549546.99	6366012.37	-577.11	50227	71.45	1.000536	✍	22.42	11.53	-0.62
633.0	-68.34	225.24	1549546.21	6366011.59	-579.90	49740	71.63	1.000880	✍	22.56	11.53	-0.63
636.0	-68.36	224.81	1549545.43	6366010.80	-582.69	49963	71.45	1.000987	✍	22.70	11.53	-0.63
639.0	-68.37	224.48	1549544.65	6366010.02	-585.48	50025	71.51	1.001136	✍	22.83	11.52	-0.63
642.0	-68.32	224.45	1549543.88	6366009.23	-588.27	50000	71.60	1.000822	✍	22.97	11.51	-0.64
645.0	-68.25	225.35	1549543.09	6366008.44	-591.05	50053	71.49	1.000726	✍	23.11	11.51	-0.64
648.0	-68.23	225.53	1549542.30	6366007.66	-593.84	50009	71.52	1.000917	✍	23.26	11.52	-0.64
651.0	-68.20	225.69	1549541.51	6366006.88	-596.63	49938	71.52	1.001079	✍	23.41	11.53	-0.65
654.0	-68.22	225.87	1549540.71	6366006.11	-599.41	50030	71.43	1.001384	✍	23.55	11.54	-0.65
657.0	-68.20	226.05	1549539.91	6366005.33	-602.20	49818	71.57	1.001081	✍	23.70	11.56	-0.65
660.0	-68.18	225.49	1549539.11	6366004.55	-604.98	49979	71.52	1.001157	✍	23.84	11.57	-0.66
663.0	-68.21	225.68	1549538.31	6366003.77	-607.77	49831	71.43	1.000925	✍	23.99	11.59	-0.66
666.0	-68.23	225.19	1549537.52	6366002.99	-610.55	49599	71.75	1.000896	✍	24.14	11.59	-0.66
669.0	-68.20	227.25	1549536.72	6366002.22	-613.34	49716	71.18	1.001043	✍	24.28	11.62	-0.67
672.0	-68.22	225.59	1549535.91	6366001.46	-616.12	50782	71.38	1.000748	✍	24.43	11.64	-0.67
675.0	-68.22	225.23	1549535.12	6366000.67	-618.91	49705	71.76	1.001178	✍	24.57	11.65	-0.68
678.0	-68.22	223.64	1549534.34	6365999.88	-621.70	50529	71.21	1.000814	✍	24.72	11.64	-0.68
681.0	-68.21	223.36	1549533.57	6365999.07	-624.48	50464	71.52	1.001228	✍	24.86	11.61	-0.68
684.0	-68.18	224.46	1549532.80	6365998.27	-627.27	50426	71.39	1.000861	✍	25.01	11.59	-0.69
687.0	-68.19	224.57	1549532.02	6365997.47	-630.05	50744	71.40	1.000893	✍	25.16	11.58	-0.69
690.0	-68.21	224.01	1549531.24	6365996.68	-632.84	50668	71.18	1.000562	✍	25.30	11.56	-0.69
693.0	-68.20	225.07	1549530.46	6365995.88	-635.62	50626	71.28	1.000813	✍	25.45	11.55	-0.70
696.0	-68.23	224.56	1549529.67	6365995.09	-638.41	50629	71.15	1.000461	✍	25.60	11.55	-0.70
699.0	-68.27	224.79	1549528.89	6365994.30	-641.20	50809	71.19	1.001035	✍	25.74	11.54	-0.70
702.0	-68.27	225.18	1549528.11	6365993.52	-643.98	50914	71.13	1.000696	✍	25.88	11.54	-0.71
705.0	-68.28	225.72	1549527.31	6365992.74	-646.77	51294	71.06	1.001068	✍	26.03	11.55	-0.71
708.0	-68.30	228.93	1549526.50	6365991.98	-649.56	48281	73.49	1.000754	✍	26.17	11.59	-0.71
711.0	-68.30	228.05	1549525.67	6365991.25	-652.34	48166	72.70	1.000550	✍	26.31	11.66	-0.72

Survey name : KLX21B

Survey date : 04/01/2007 20:13:12

Printed on 2007-03-28 19:13:50

Station	Dip	Azimuth	Easting	Northing	Elevation	Mag.Field	Mag.Dip	Grav.Field	Status	UpDown	LeftRight	Shortfall
Metres	Degrees	Degrees	Metres	Metres	Metres	nT	Degrees	G	*	Metres	Metres	Metres
714.0	-68.34	228.04	1549524.84	6365990.51	-655.13	48296	72.74	1.001040	✍	26.45	11.72	-0.72
717.0	-68.35	227.14	1549524.03	6365989.76	-657.92	48585	72.22	1.000985	✍	26.58	11.77	-0.73
720.0	-68.35	227.61	1549523.21	6365989.01	-660.71	48740	71.88	1.001116	✍	26.72	11.81	-0.73
723.0	-68.38	227.16	1549522.40	6365988.26	-663.50	48958	72.06	1.000913	✍	26.86	11.86	-0.73
726.0	-68.33	226.84	1549521.59	6365987.51	-666.28	48669	71.95	1.000983	✍	27.00	11.90	-0.74
729.0	-68.32	227.93	1549520.77	6365986.76	-669.07	49548	71.47	1.000908	✍	27.14	11.94	-0.74
732.0	-68.30	226.15	1549519.96	6365986.00	-671.86	49114	72.05	1.001098	✍	27.28	11.98	-0.74
735.0	-68.25	225.48	1549519.17	6365985.23	-674.65	49901	71.68	1.001203	✍	27.42	12.00	-0.75
738.0	-68.25	228.18	1549518.36	6365984.47	-677.43	49883	71.20	1.000729	✍	27.56	12.03	-0.75
741.0	-68.27	226.67	1549517.54	6365983.72	-680.22	48564	72.07	1.001271	✍	27.70	12.08	-0.75
744.0	-68.23	227.13	1549516.73	6365982.96	-683.01	48188	72.55	1.000804	✍	27.85	12.12	-0.76
747.0	-68.23	227.38	1549515.91	6365982.20	-685.79	48699	72.03	1.000794	✍	27.99	12.16	-0.76
750.0	-68.25	227.21	1549515.09	6365981.45	-688.58	48675	72.14	1.001019	✍	28.14	12.20	-0.77
753.0	-68.22	227.25	1549514.27	6365980.69	-691.37	48669	72.17	1.001271	✍	28.28	12.25	-0.77
756.0	-68.21	227.04	1549513.46	6365979.94	-694.15	48909	71.86	1.000938	✍	28.42	12.29	-0.77
759.0	-68.19	227.59	1549512.64	6365979.18	-696.94	48722	72.27	1.001033	✍	28.57	12.33	-0.78
762.0	-68.19	226.45	1549511.82	6365978.42	-699.72	49188	72.14	1.000710	✍	28.72	12.37	-0.78
765.0	-68.51	227.56	1549511.01	6365977.67	-702.51	48400	72.13	1.015632	✍	28.86	12.41	-0.78
768.0	-68.14	226.82	1549510.20	6365976.91	-705.30	48535	72.04	1.000866	✍	28.99	12.45	-0.79
771.0	-68.13	228.88	1549509.37	6365976.16	-708.08	48472	71.92	1.001031	✍	29.14	12.50	-0.79
774.0	-68.15	230.40	1549508.52	6365975.44	-710.87	47787	73.28	1.001299	✍✍	29.29	12.59	-0.80
777.0	-68.10	229.38	1549507.67	6365974.72	-713.65	48577	72.27	1.000600	✍	29.44	12.69	-0.80
780.0	-68.12	229.52	1549506.82	6365973.99	-716.43	47821	73.35	1.001104	✍✍	29.58	12.77	-0.81
783.0	-68.12	229.42	1549505.97	6365973.27	-719.22	48111	72.43	1.001058	✍	29.73	12.86	-0.81
786.0	-68.12	229.03	1549505.12	6365972.54	-722.00	48119	72.54	1.001097	✍	29.88	12.94	-0.82
789.0	-68.12	225.82	1549504.30	6365971.78	-724.79	49310	72.46	1.000840	✍	30.03	12.99	-0.82
792.0	-68.11	225.81	1549503.50	6365971.00	-727.57	49308	72.50	1.000828	✍	30.18	13.01	-0.82
795.0	-68.10	230.14	1549502.67	6365970.25	-730.35	48390	73.01	1.000720	✍	30.33	13.06	-0.83
798.0	-68.10	225.89	1549501.83	6365969.50	-733.14	49613	71.86	1.001017	✍	30.48	13.12	-0.83
801.0	-68.11	225.82	1549501.03	6365968.72	-735.92	51307	71.36	1.001003	✍	30.63	13.14	-0.84
804.0	-68.09	227.98	1549500.22	6365967.96	-738.70	48484	72.15	1.001153	✍	30.78	13.17	-0.84
807.0	-68.10	224.25	1549499.41	6365967.18	-741.49	51096	71.73	1.000845	✍	30.93	13.19	-0.85
810.0	-68.08	225.81	1549498.62	6365966.39	-744.27	50143	71.33	1.000748	✍	31.09	13.19	-0.85
813.0	-68.05	228.22	1549497.80	6365965.63	-747.05	47997	72.18	1.001088	✍	31.24	13.23	-0.85

FLEXIT: SmartTool drillhole survey result table.

Survey name : KLX21B

Survey date : 04/01/2007 20:13:12

Printed on 2007-03-28 19:13:51

Station	Dip	Azimuth	Easting	Northing	Elevation	Mag.Field	Mag.Dip	Grav.Field	Status	UpDown	LeftRight	Shortfall
Metres	Degrees	Degrees	Metres	Metres	Metres	nT	Degrees	G	*	Metres	Metres	Metres
816.0	-68.06	226.32	1549496.97	6365964.87	-749.84	48923	71.83	1.001233	✍	31.39	13.28	-0.86
819.0	-68.08	229.04	1549496.15	6365964.11	-752.62	48061	72.92	1.001249	✍	31.54	13.33	-0.86
822.0	-68.11	231.18	1549495.29	6365963.40	-755.40	47535	73.20	1.001184	✍✍	31.69	13.43	-0.87
825.0	-68.08	226.39	1549494.45	6365962.66	-758.19	48792	72.46	1.001010	✍	31.84	13.50	-0.87
828.0	-68.07	229.89	1549493.61	6365961.91	-760.97	47808	73.55	1.000674	✍✍	31.99	13.56	-0.88
831.0	-68.08	228.84	1549492.76	6365961.18	-763.75	48341	72.48	1.000757	✍	32.14	13.65	-0.88
834.0	-68.10	228.83	1549491.92	6365960.45	-766.54	48944	72.37	1.000778	✍	32.29	13.72	-0.89
837.0	-68.09	225.69	1549491.10	6365959.69	-769.32	50015	71.98	1.001169	✍	32.44	13.76	-0.89
840.0	-68.10	226.75	1549490.29	6365958.91	-772.10	49498	72.17	1.001298	✍	32.59	13.79	-0.89
843.0	-68.08	227.88	1549489.47	6365958.15	-774.89	49175	71.49	1.001194	✍	32.75	13.83	-0.90
846.0	-68.13	226.42	1549488.65	6365957.39	-777.67	48708	71.99	1.000840	✍	32.90	13.87	-0.90
849.0	-68.09	226.17	1549487.84	6365956.62	-780.45	49466	72.20	1.001313	✍	33.05	13.90	-0.91
852.0	-68.12	226.35	1549487.03	6365955.85	-783.24	50107	71.79	1.001020	✍	33.20	13.92	-0.91