



Weatherford®

CALIPER LOG

COMPANY			SHAKESPEARE OIL CO., INC		
WELL			OTTLEY 2-21		
FIELD			CHALK BUTTES		
PROVINCE/COUNTY			LOGAN		
COUNTRY/STATE			USA / KANSAS		
LOCATION			2050' FNL & 2490' FEL NW-SW-SW-NE		
SEC 21	TWP 14S	RGE 32W	Other Services		
Latitude		38.8249133	MAI/MFE		
Longitude		-100.8817901	MDN/MPD		
API Number		15-109-21551	MML		
Permanent Datum GL, Elevation 2771 feet					
Log Measured From KB, 12.00 feet above Permanent Datum					
Drilling Measured From KB					
Date	14-JUN-2018				Elevations: KB 2783.00 DF 2781.00 GL 2771.00
Run Number	ONE				
Service Order	7055-216229097				
Depth Driller	4511.00		feet		
Depth Logger	4511.00		feet		
First Reading	4480.00		feet		
Last Reading	266.00		feet		
Casing Driller	267.00		feet		
Casing Logger	266.00		feet		
Bit Size	7.875		inches		
Hole Fluid Type	WBM				
Density / Viscosity	9.40	lb/USg	59.00	sec/qt	
PH / Fluid Loss	9.50		10.00	ml/30Min	
Sample Source	MUD TANK				
Rm @ Measured Temp	0.60 @ 96.0		ohm-m		
Rmf @ Measured Temp	0.48 @ 96.0		ohm-m		
Rmc @ Measured Temp	0.72 @ 96.0		ohm-m		
Source Rmf / Rmc	CALC		CALC		
Rm @ BHT	0.50 @ 116.0		ohm-m		
Time Since Circulation	5 HOURS				
Max Recorded Temp	116.00		deg F		
Equipment / Base	13096		LIB		
Recorded By	JUSTIN HICKS				
Witnessed By	WES HANSON				

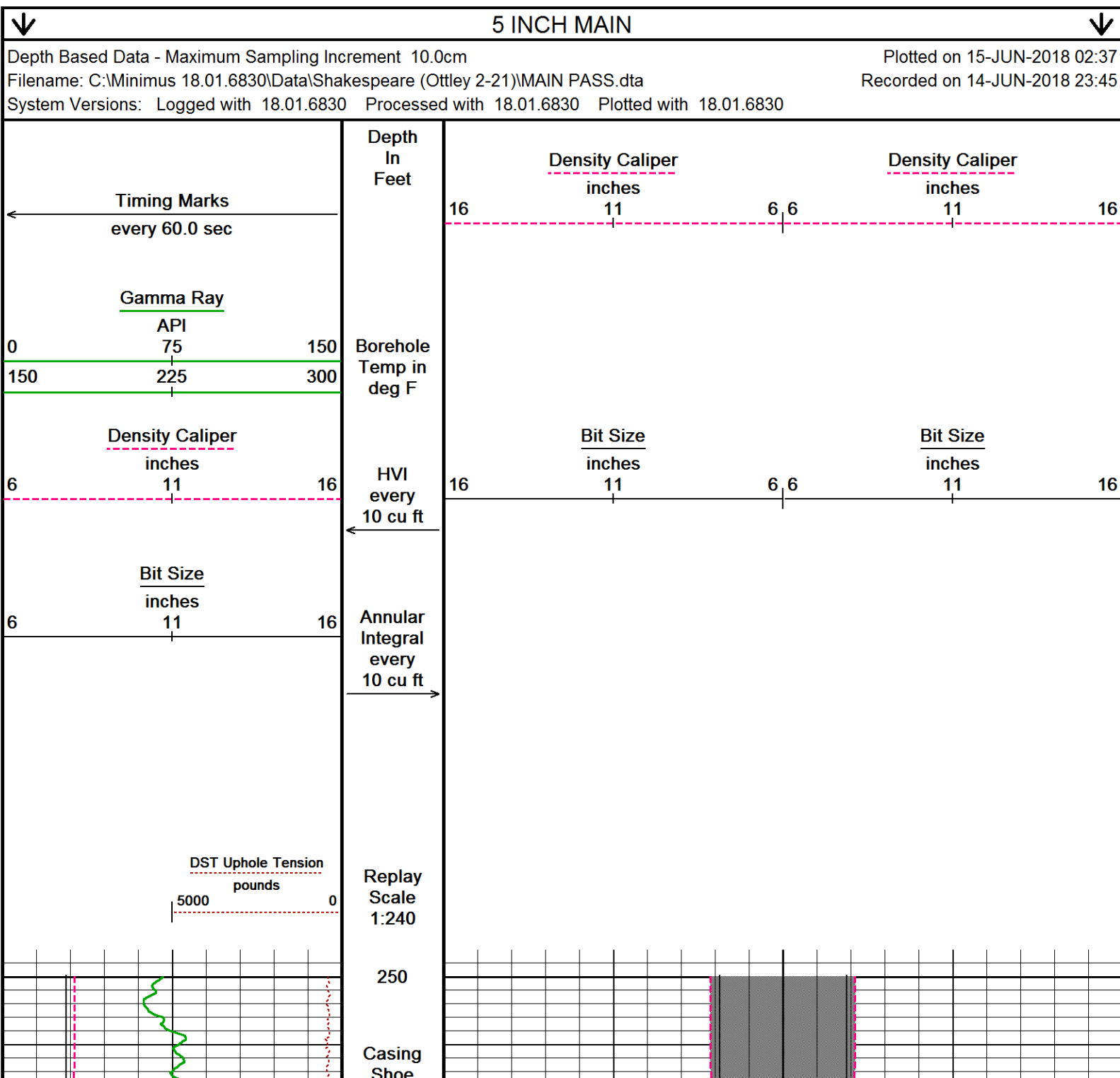
BOREHOLE RECORD					Last Edited: 14-JUN-2018 22:07
Bit Size inches		Depth From feet		Depth To feet	
7.875		267.00		4511.00	
CASING RECORD					
Type	Size inches	Depth From feet	Shoe Depth feet	Weight pounds/ft	
SURFACE	8.625	0.00	267.00	24.00	

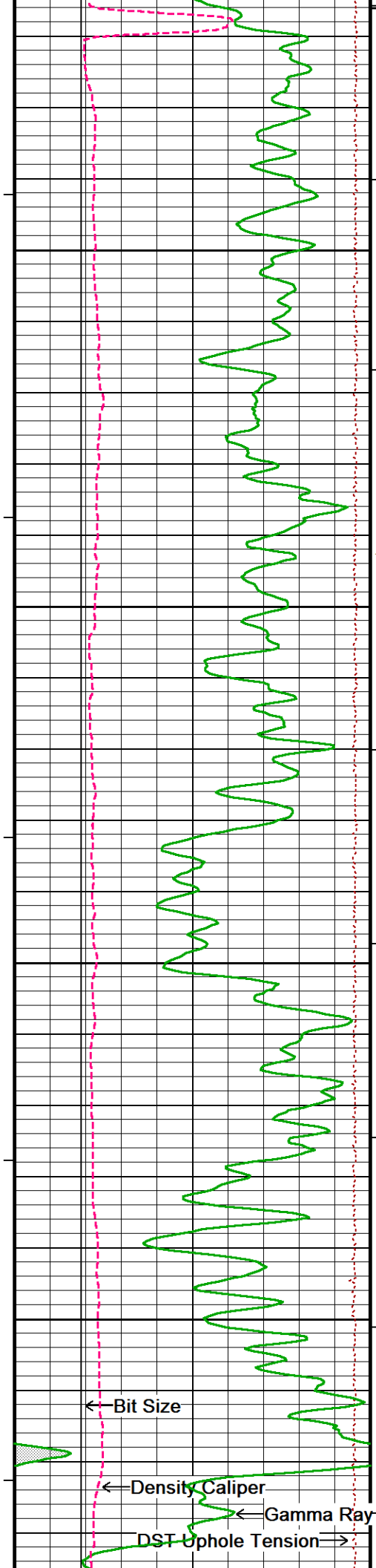
REMARKS
- RUN ONE: MCB, SHA, MCG, MML, MDN, MPD, SKJ, MFE, MSS, MAI RUN IN COMBINATION. - HARDWARE: DUAL BOWSPRING USED ON MDN. 0.5 INCH STANDOFF USED ON MFE. 0.5 INCH STANDOFF USED ON MAI.
- 2.71 G/CC LIMESTONE DENSITY MATRIX USED TO CALCULATE POROSITY.
- BOREHOLE RUGOSITY, TIGHT PULLS, AND WASHOUTS WILL AFFECT DATA QUALITY.
- ALL INTERVALS LOGGED AND SCALED PER CUSTOMER'S REQUEST.
- TOTAL HOLE VOLUME FROM TD TO SURFACE CASING: 1730 CU.FT.
- ANNULAR HOLE VOLUME WITH 4.5 INCH PRODUCTION CASING FROM TD TO SURFACE CASING: 1262 CU.FT.
- RIG: DUKE #1.

- ENGINEER: J. HICKS.

- OPERATOR: B. TOVAR, B. COPELAND.

In interpreting, communicating or providing information and/or making recommendations, either written or oral, as to logs or test or other data, type or amount of material, or Work or other service to be furnished, or manner of performance, or in predicting results to be obtained, the Contractor will give the Company the benefit of the Contractor's best judgment based on its experience and will perform all such Work in a good and workmanlike manner. Any interpretation of test or other data, and any recommendation or reservoir description based upon such interpretations, are opinions based upon inferences from measurements and empirical relationships and assumptions, which inferences and assumptions are not infallible, and with respect to which professional engineers and analysts may differ. ACCORDINGLY ANY INTERPRETATION OR RECOMMENDATION RESULTING FROM THE SERVICES WILL BE AT THE SOLE RISK OF THE COMPANY, AND THE CONTRACTOR CANNOT AND DOES NOT WARRANT THE ACCURACY, CORRECTNESS OR COMPLETENESS OF ANY SUCH INTERPRETATION OR RECOMMENDATION, WHICH INTERPRETATIONS AND RECOMMENDATIONS SHOULD NOT, THEREFORE, UNDER ANY CIRCUMSTANCES BE RELIED UPON AS THE SOLE OR MAIN BASIS FOR ANY DRILLING, COMPLETION, WELL TREATMENT, PRODUCTION OR FINANCIAL DECISION, OR ANY PROCEDURE INVOLVING ANY RISK TO THE SAFETY OF ANY DRILLING ACTIVITY, DRILLING RIG OR ITS CREW OR ANY OTHER INDIVIDUAL. THE COMPANY HAS FULL RESPONSIBILITY FOR ALL DECISIONS CONCERNING THE SERVICES.





94°

300

94°

1700

350

94°

400

94°

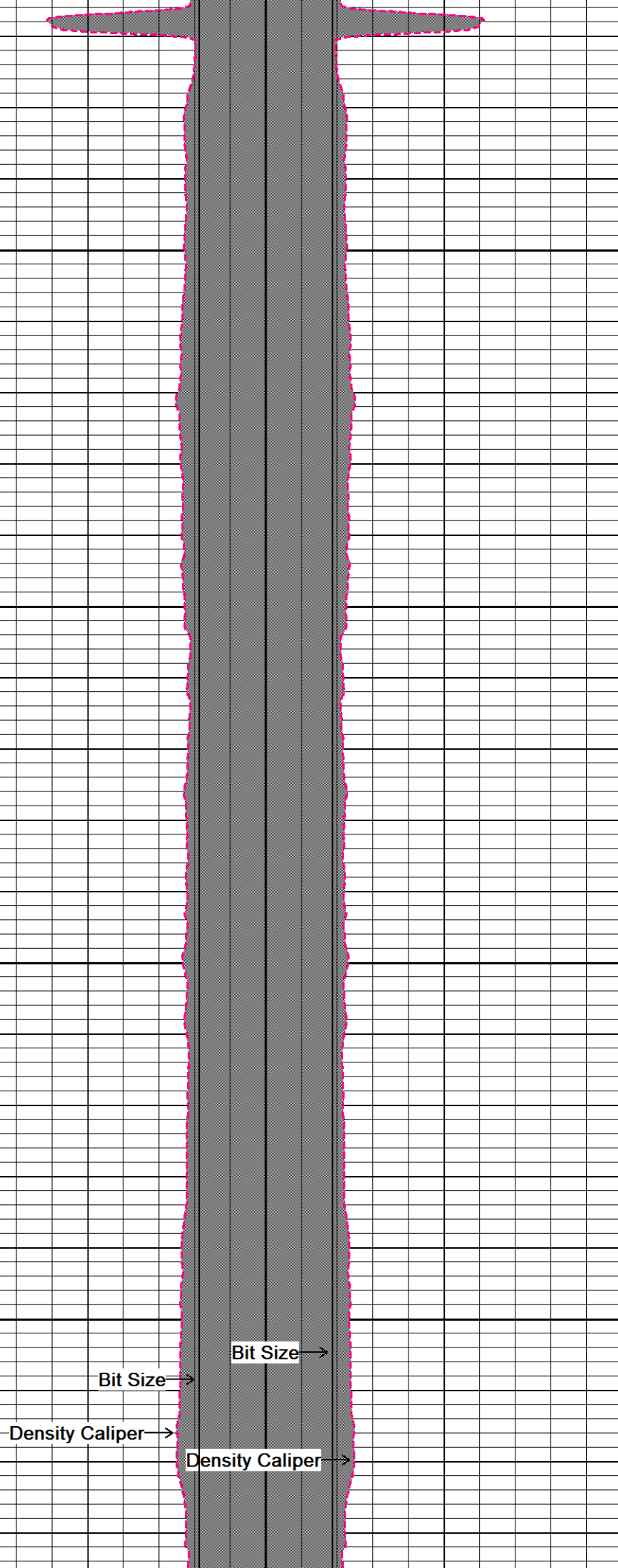
450

← Bit Size

← Density Caliper

← Gamma Ray

DST Uphole Tension →

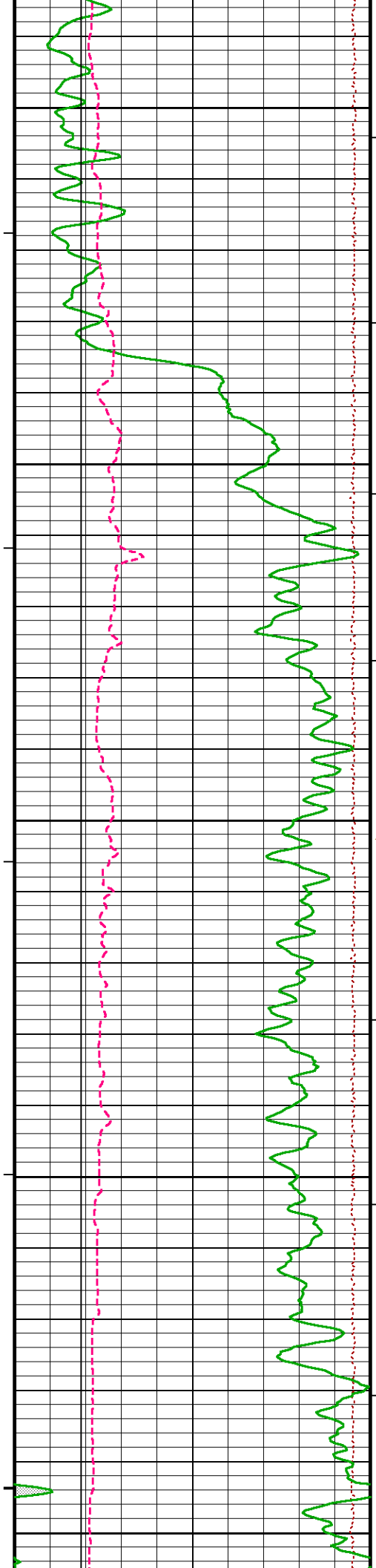


Bit Size →

Density Caliper →

Bit Size →

Density Caliper →



94°

500₁₂₀₀

95°

550

95°

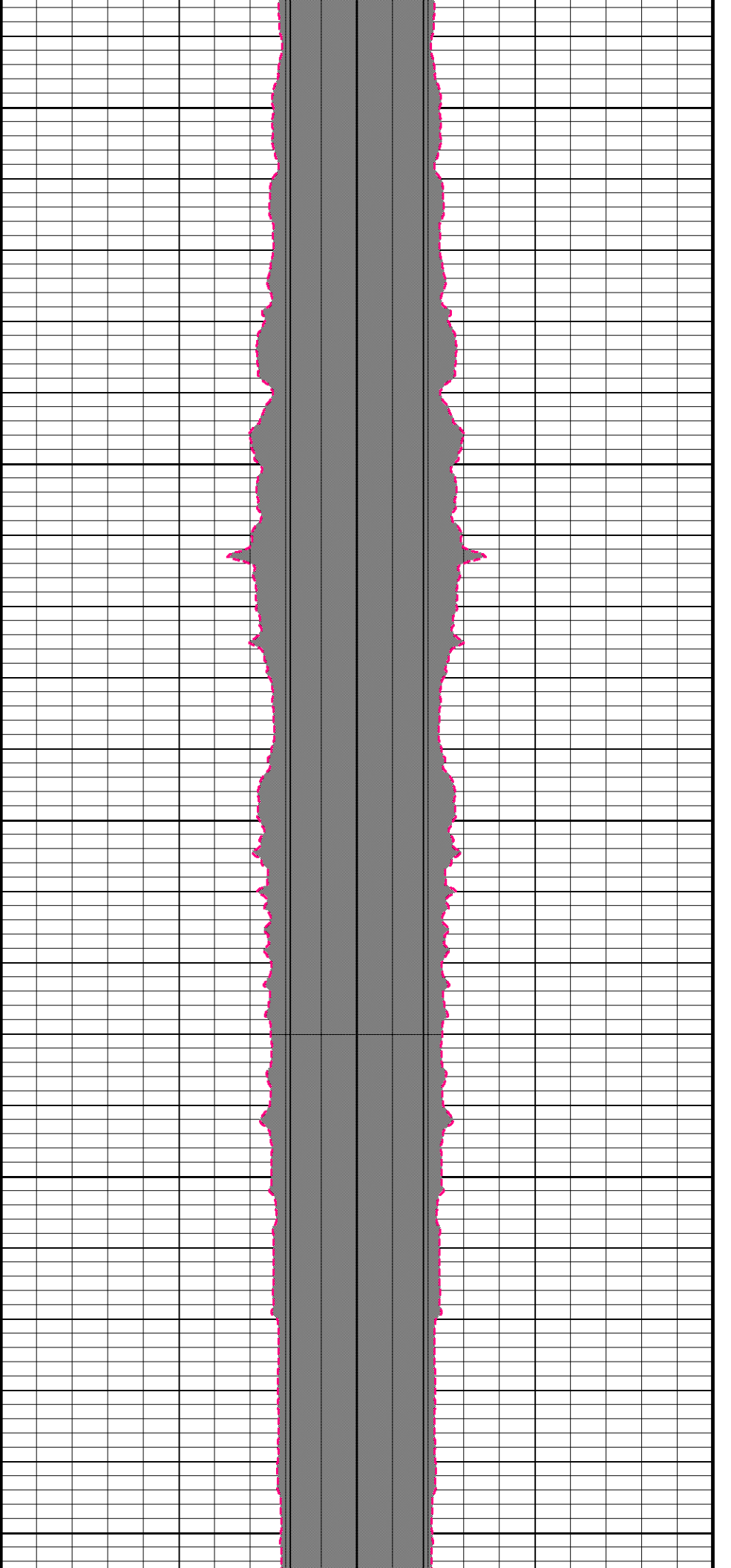
600₁₆₀₀

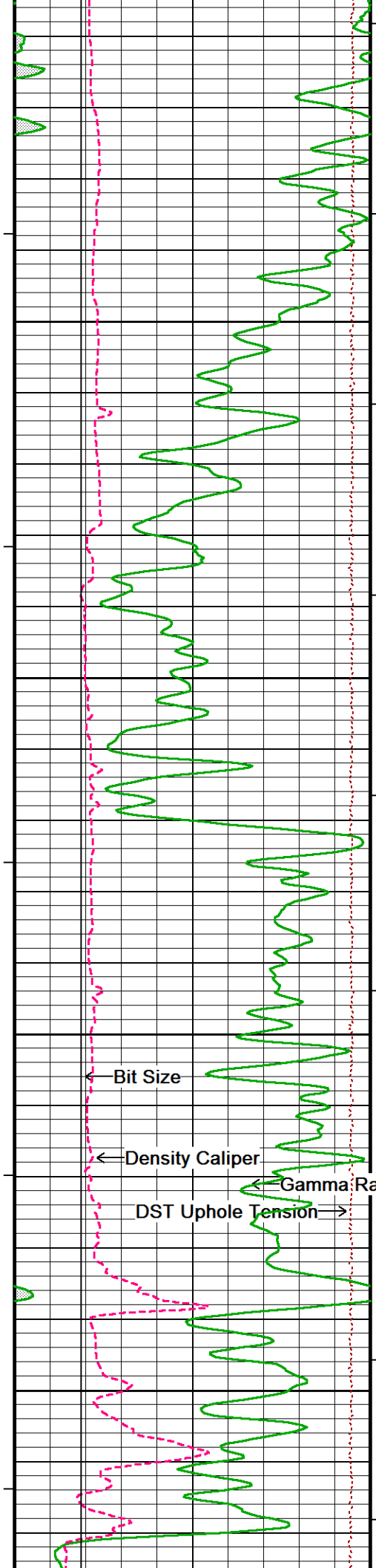
95°

650

96°

700





96°

750

97°

800

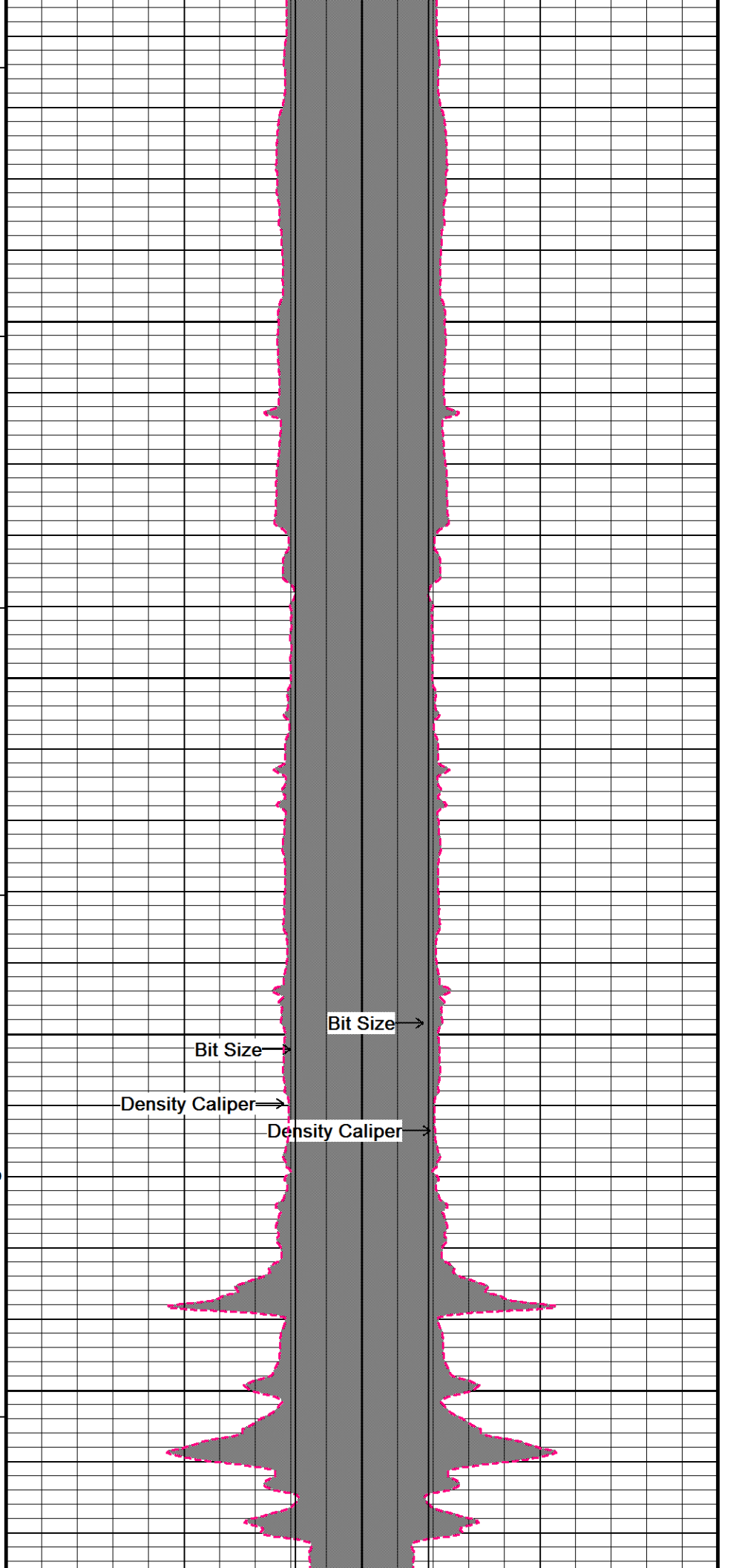
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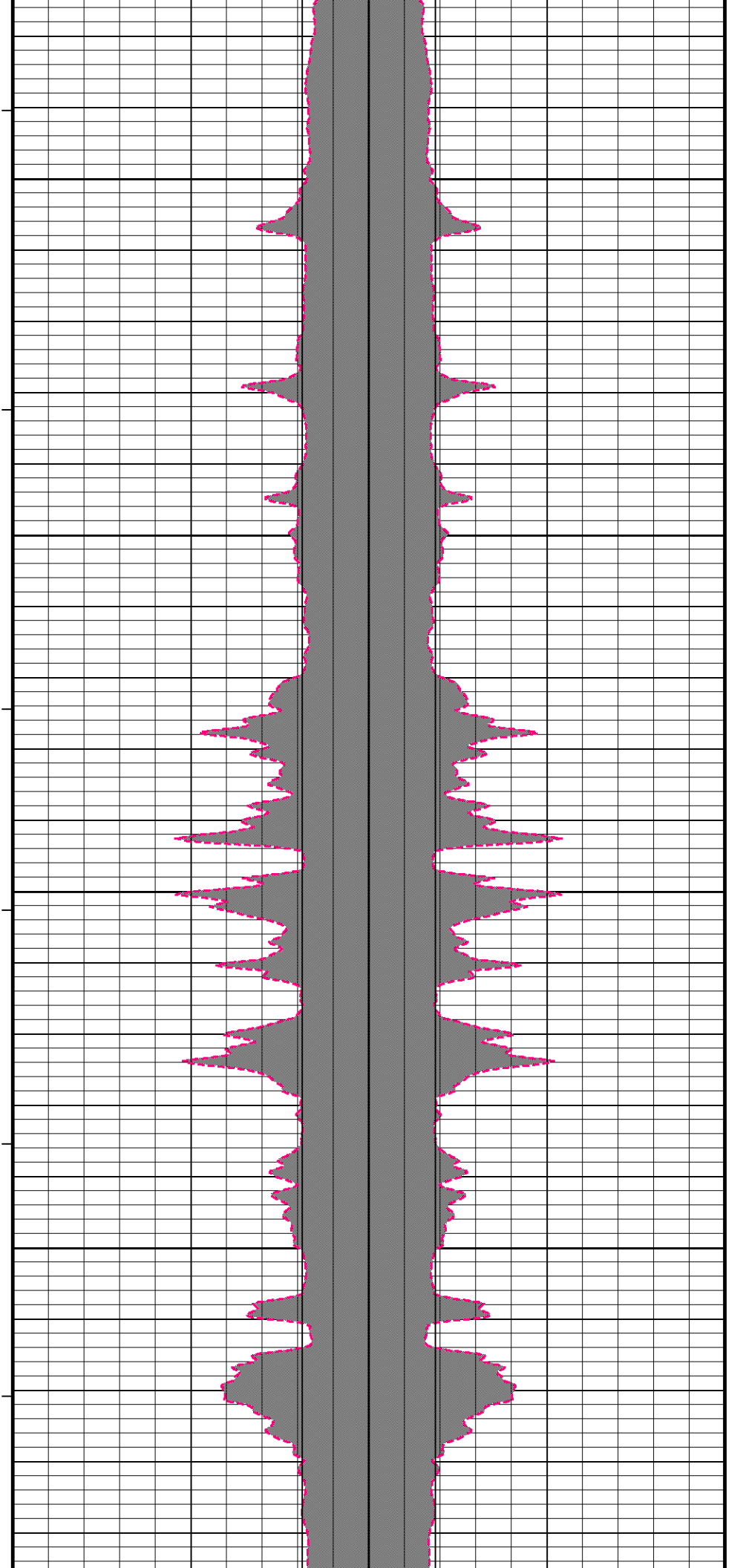
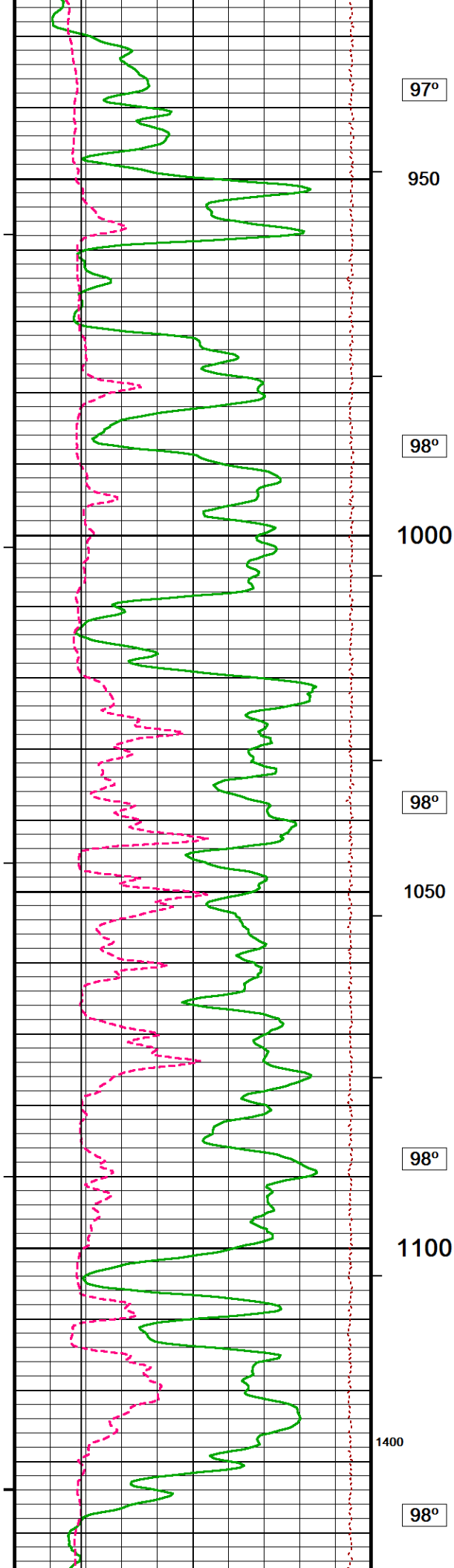
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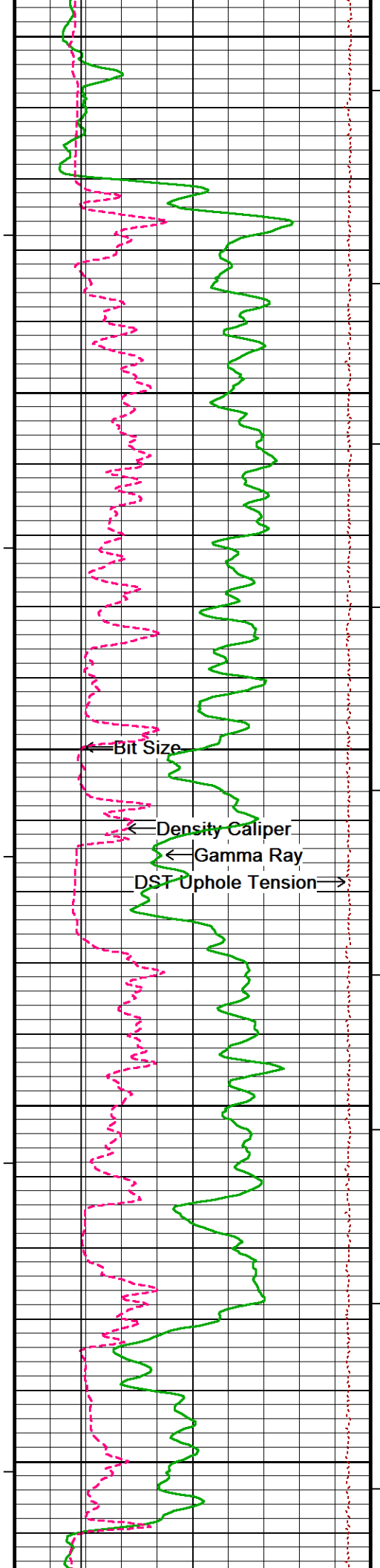
1100

97°

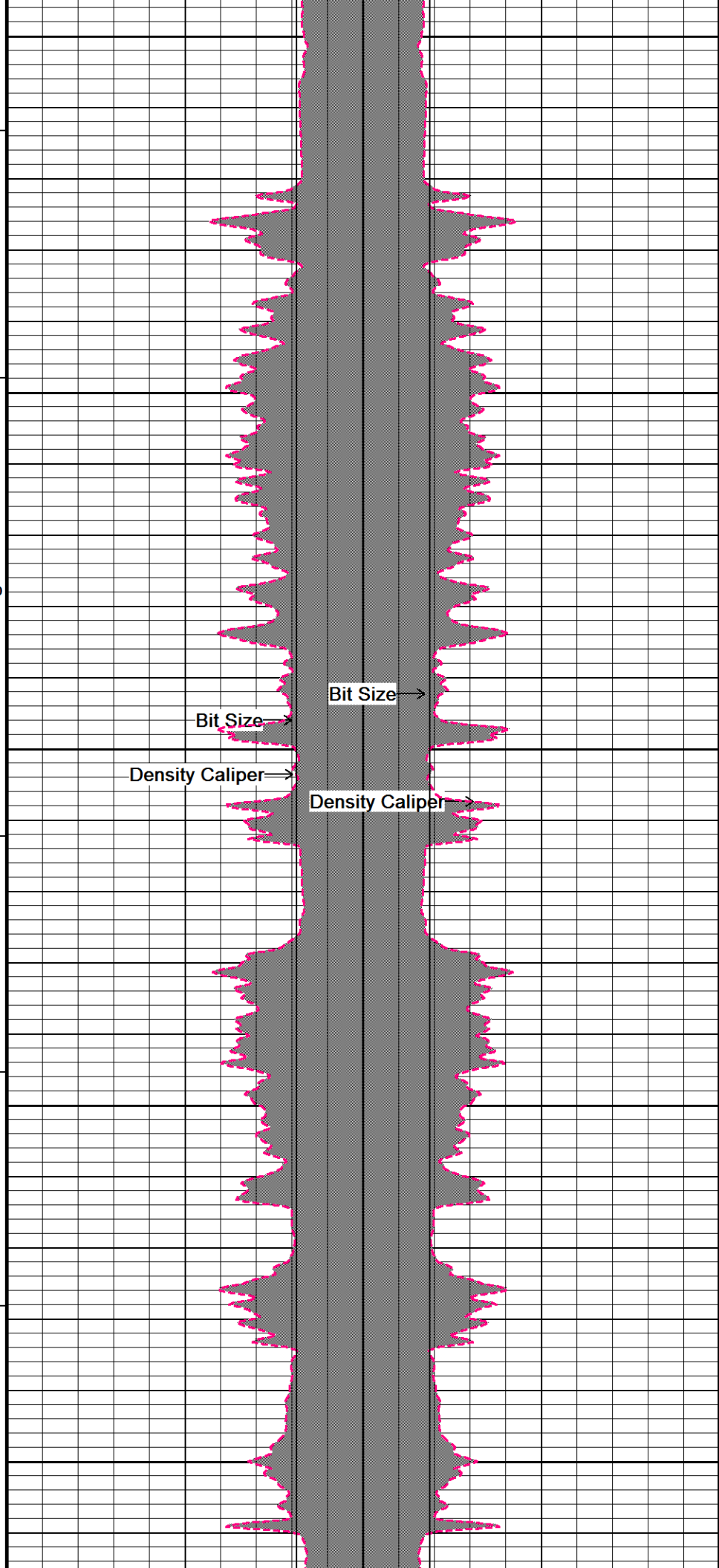
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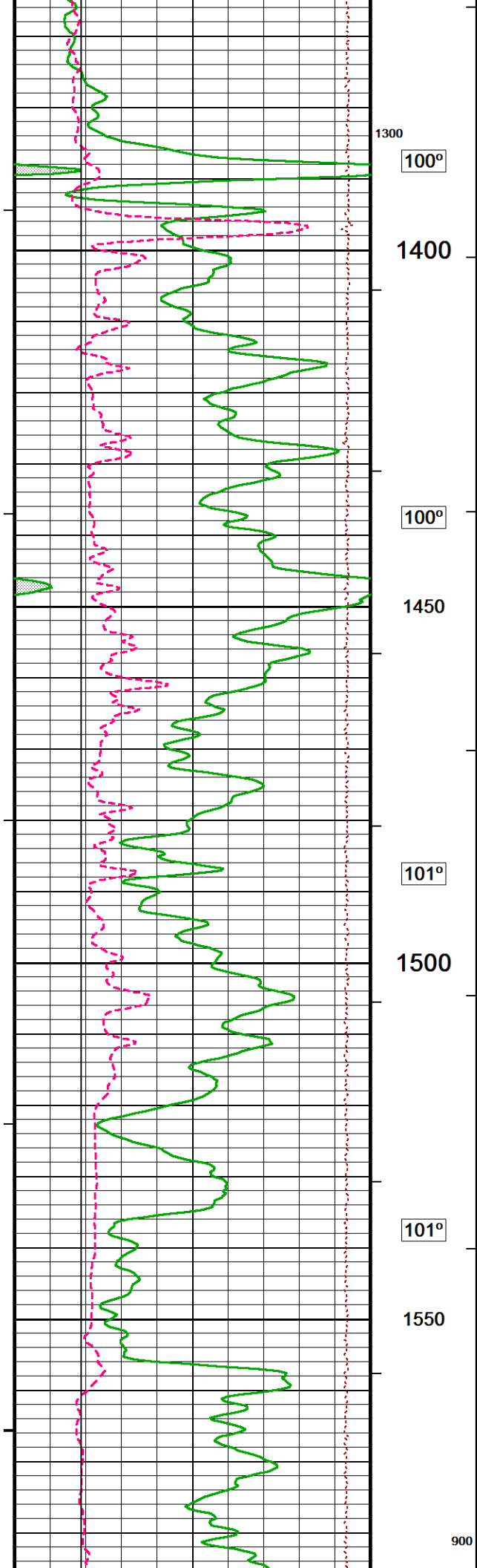






1150
99°
1200
100°
1250
100°
1300
100°
1350





100°

1400

100°

1450

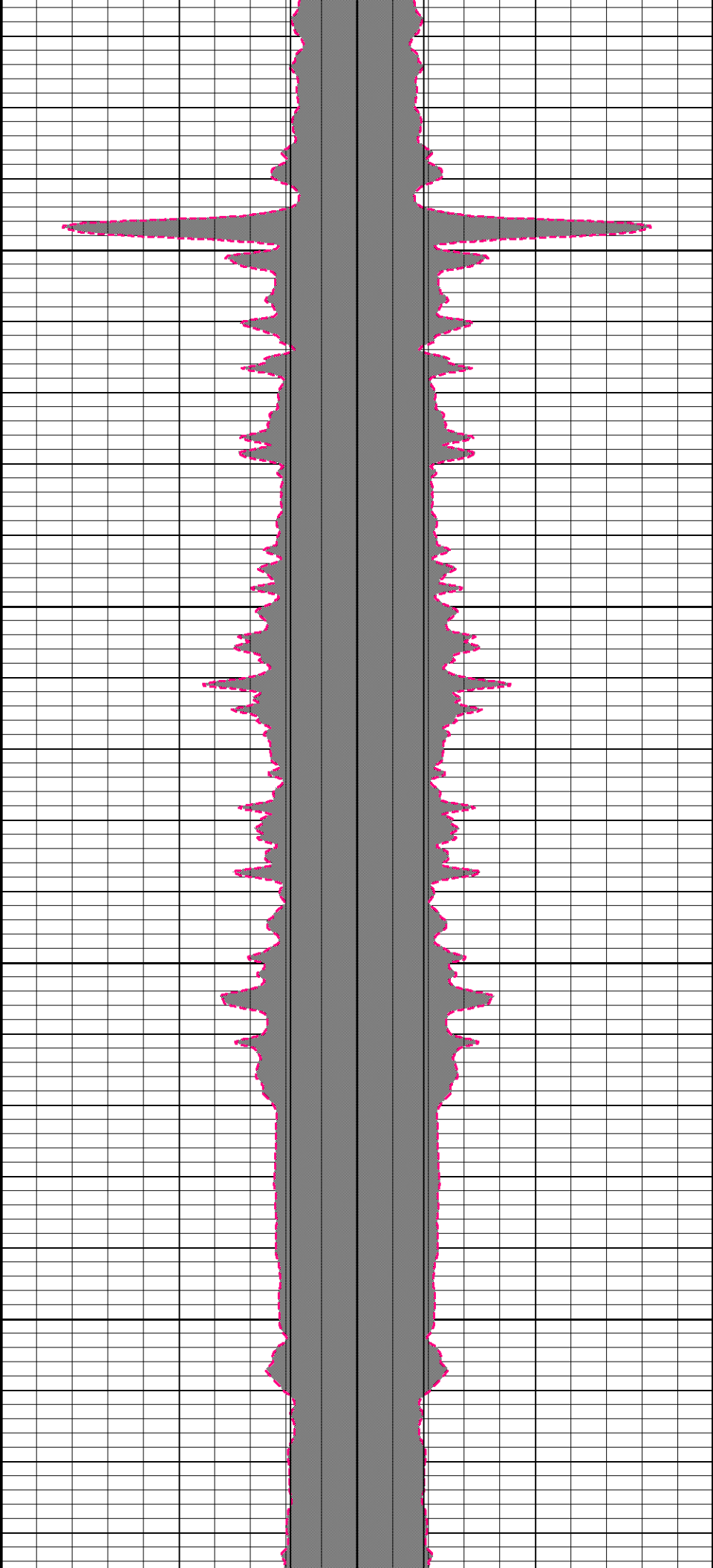
101°

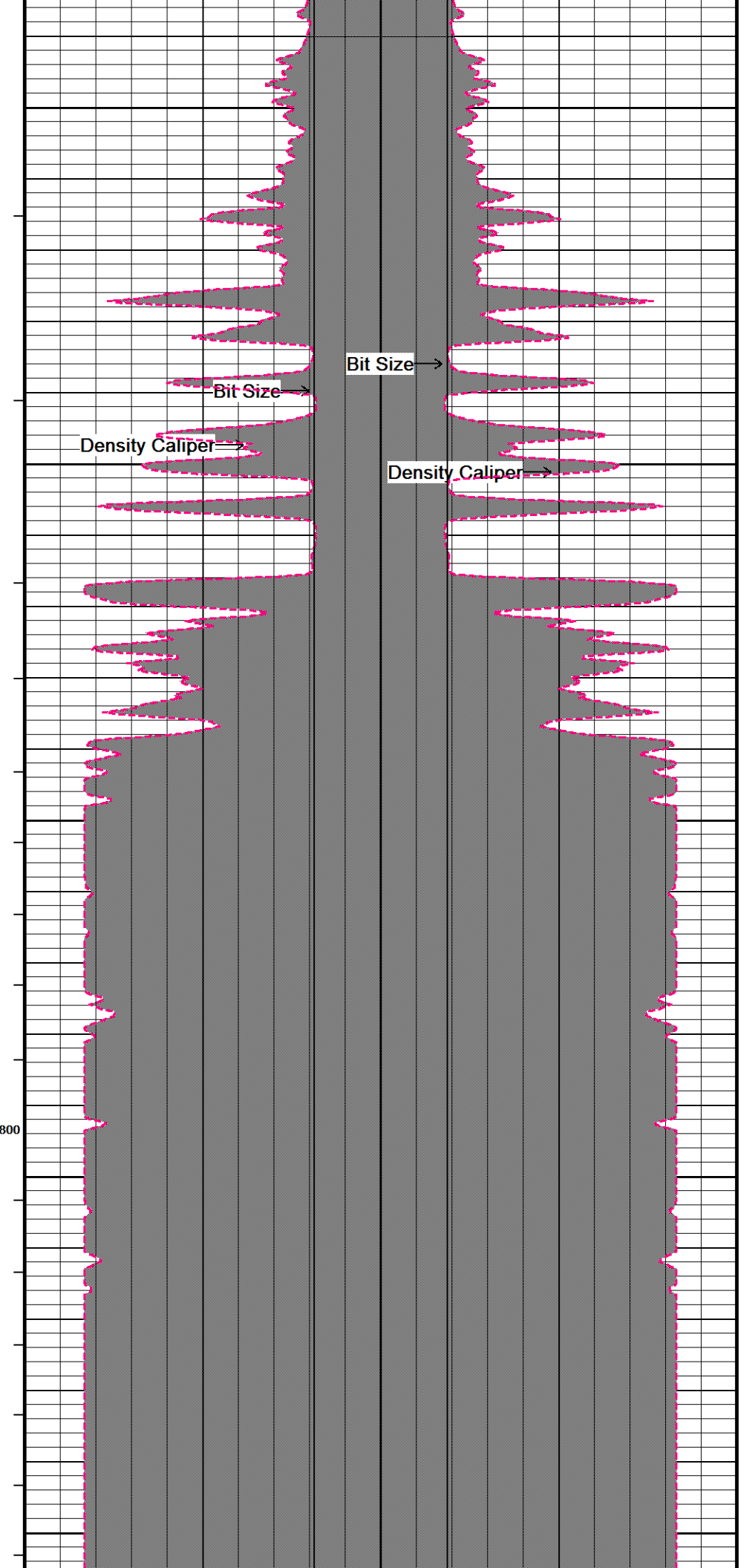
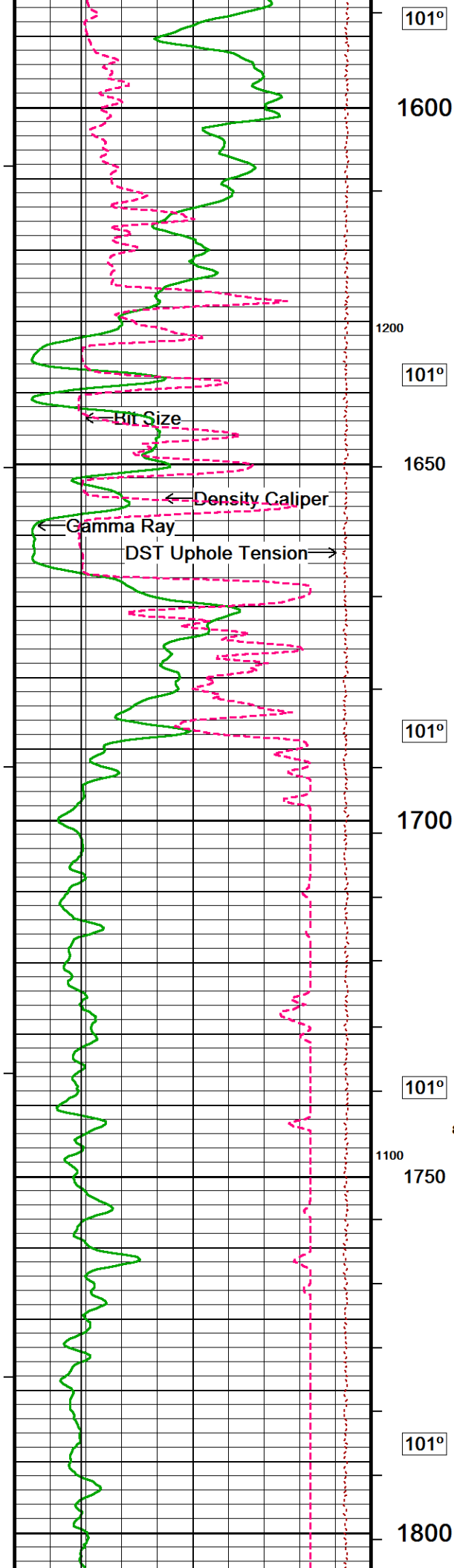
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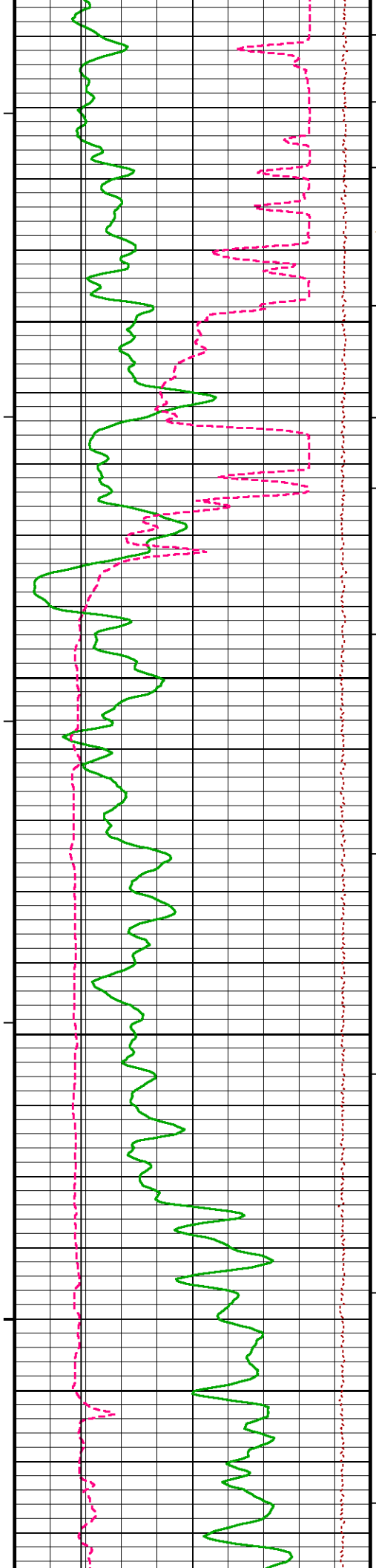
101°

1550

900







1000 102°

700

1850

102°

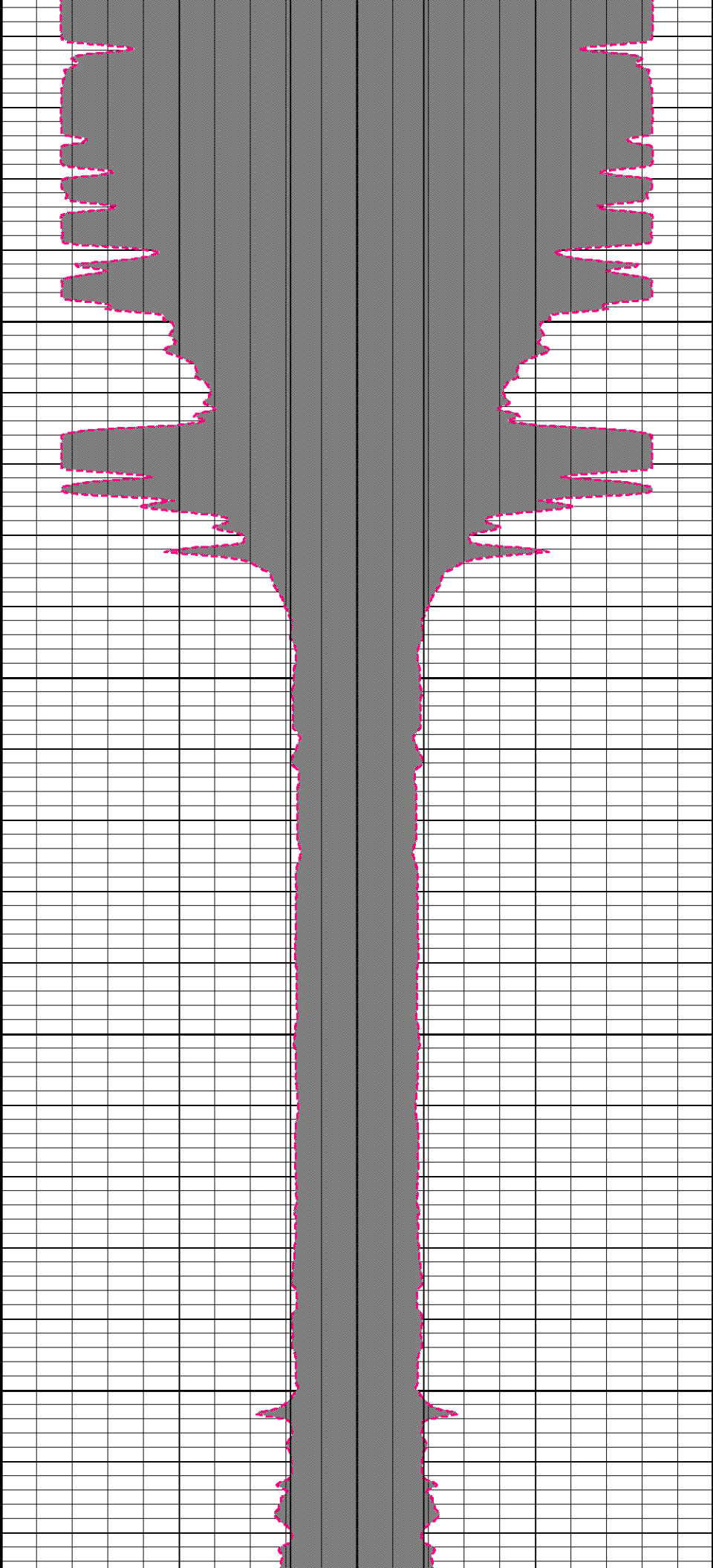
1900

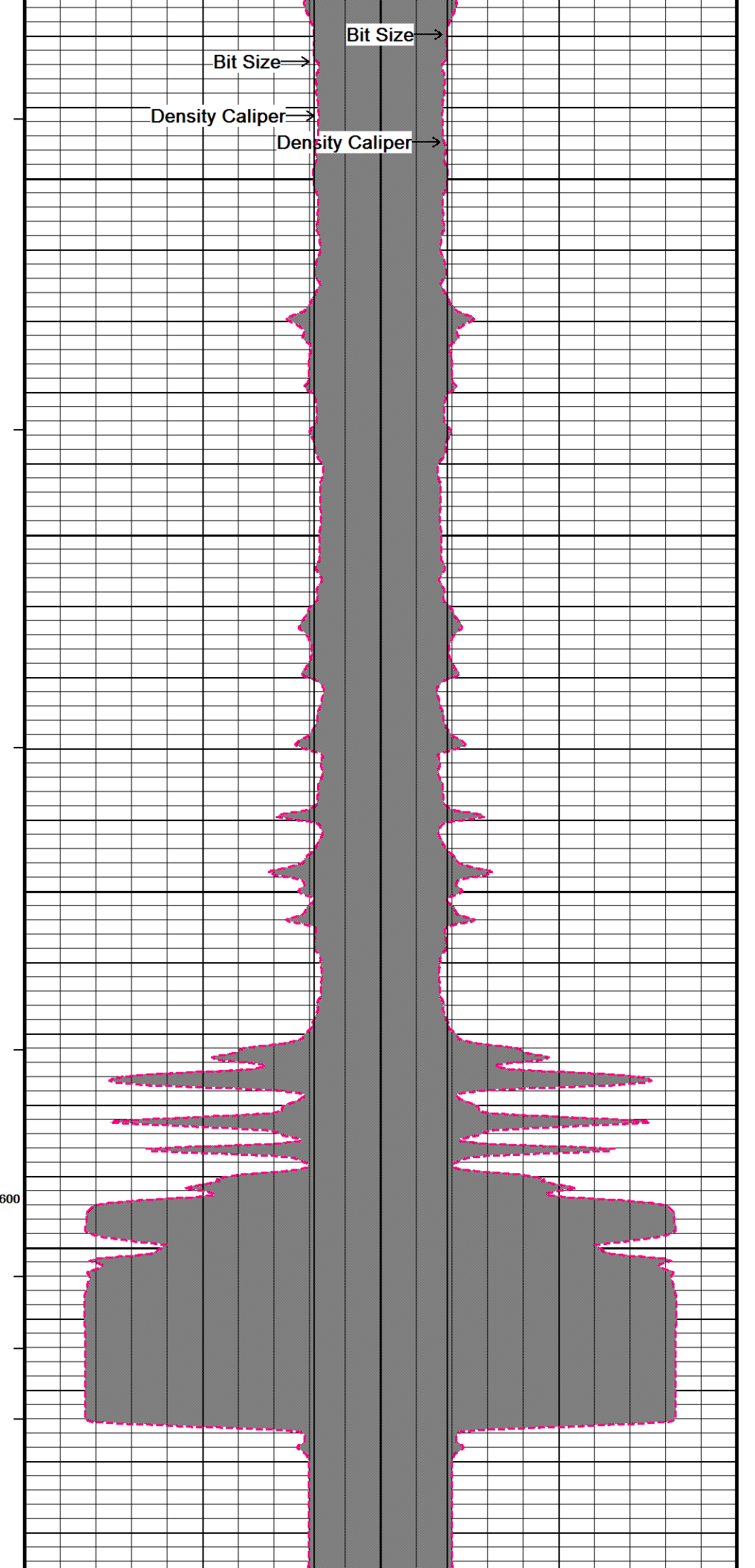
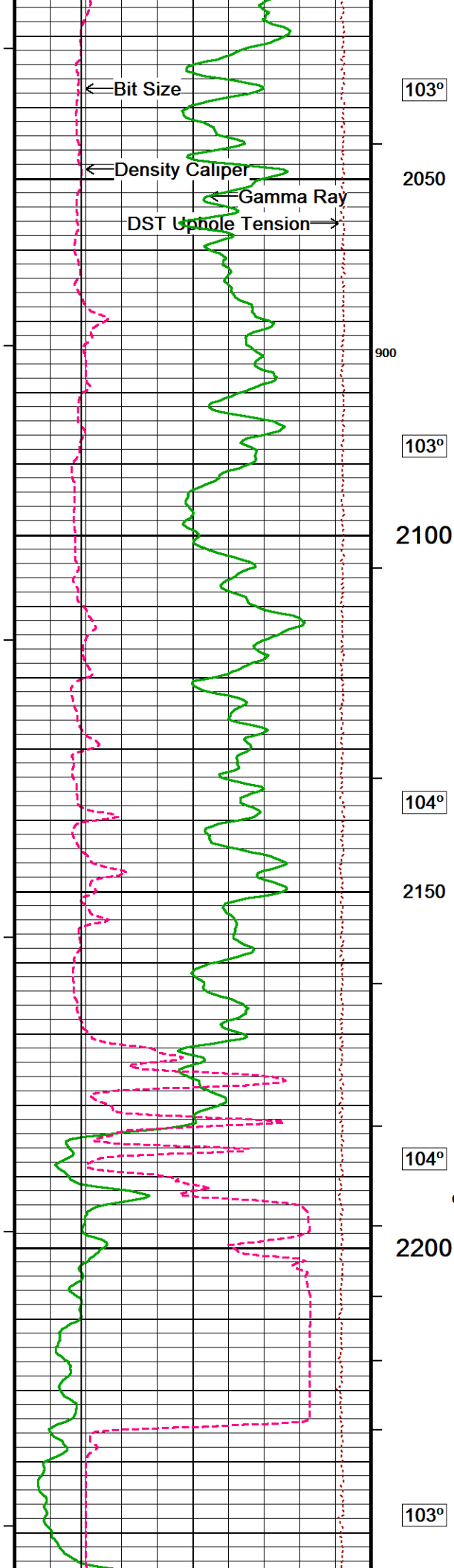
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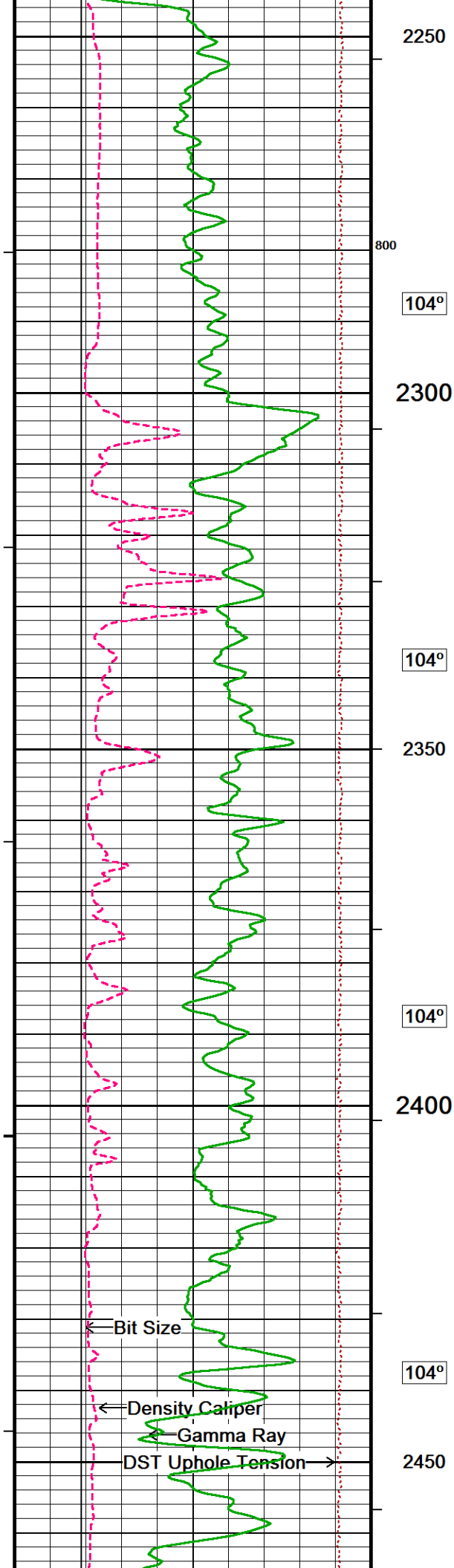
1950

103°

2000







2250

800

104°

2300

104°

2350

104°

2400

104°

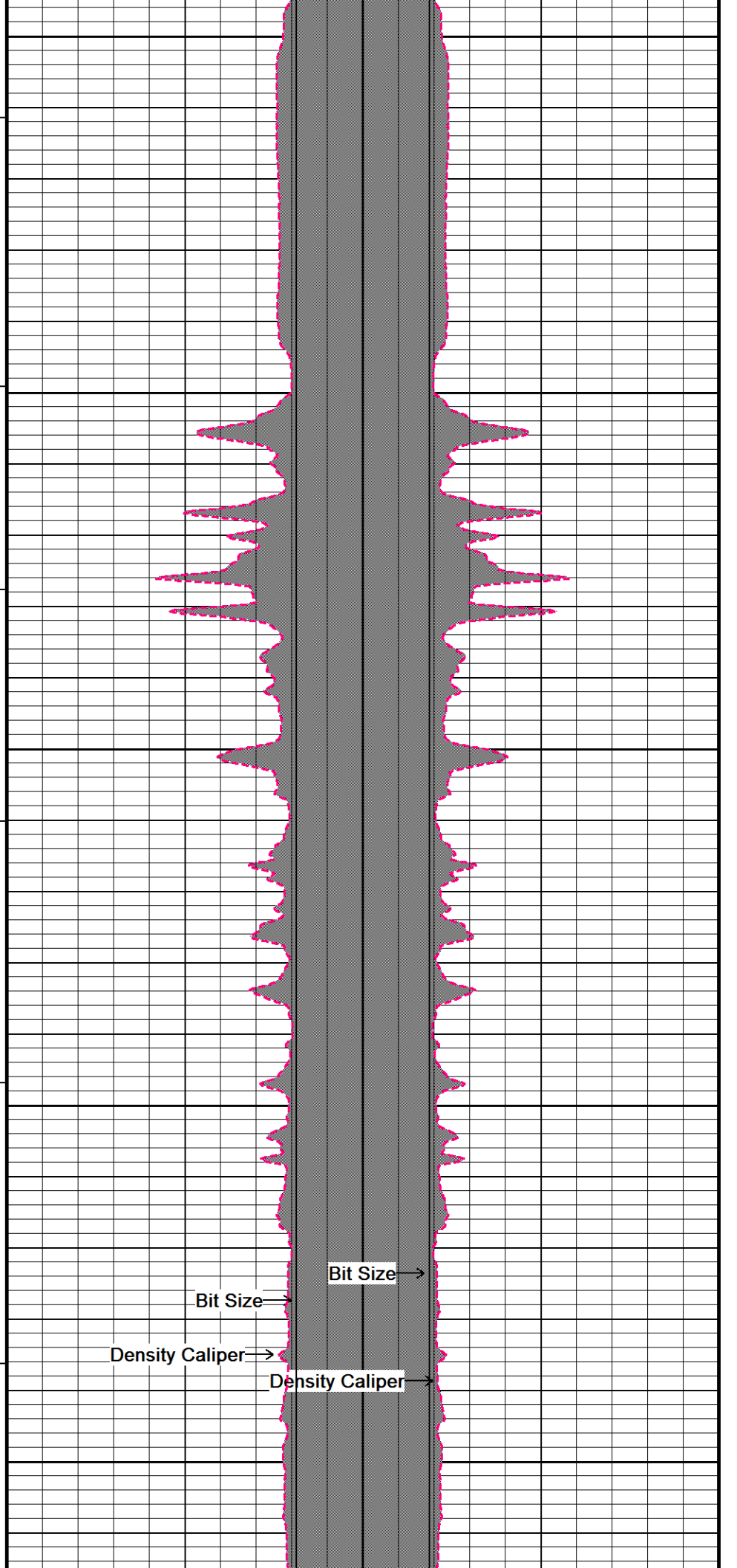
2450

Bit Size

Density Caliper

Gamma Ray

DST Uphole Tension

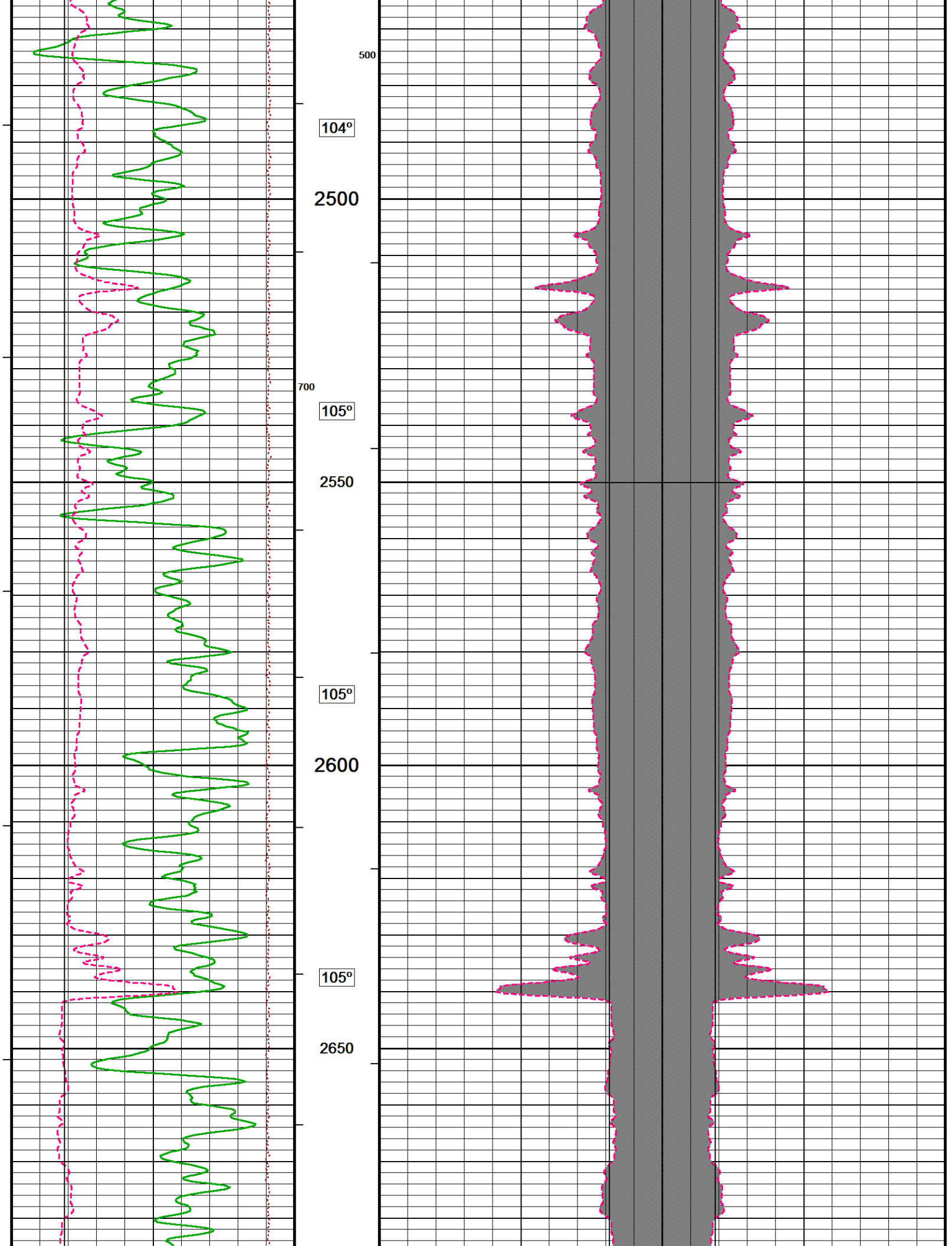


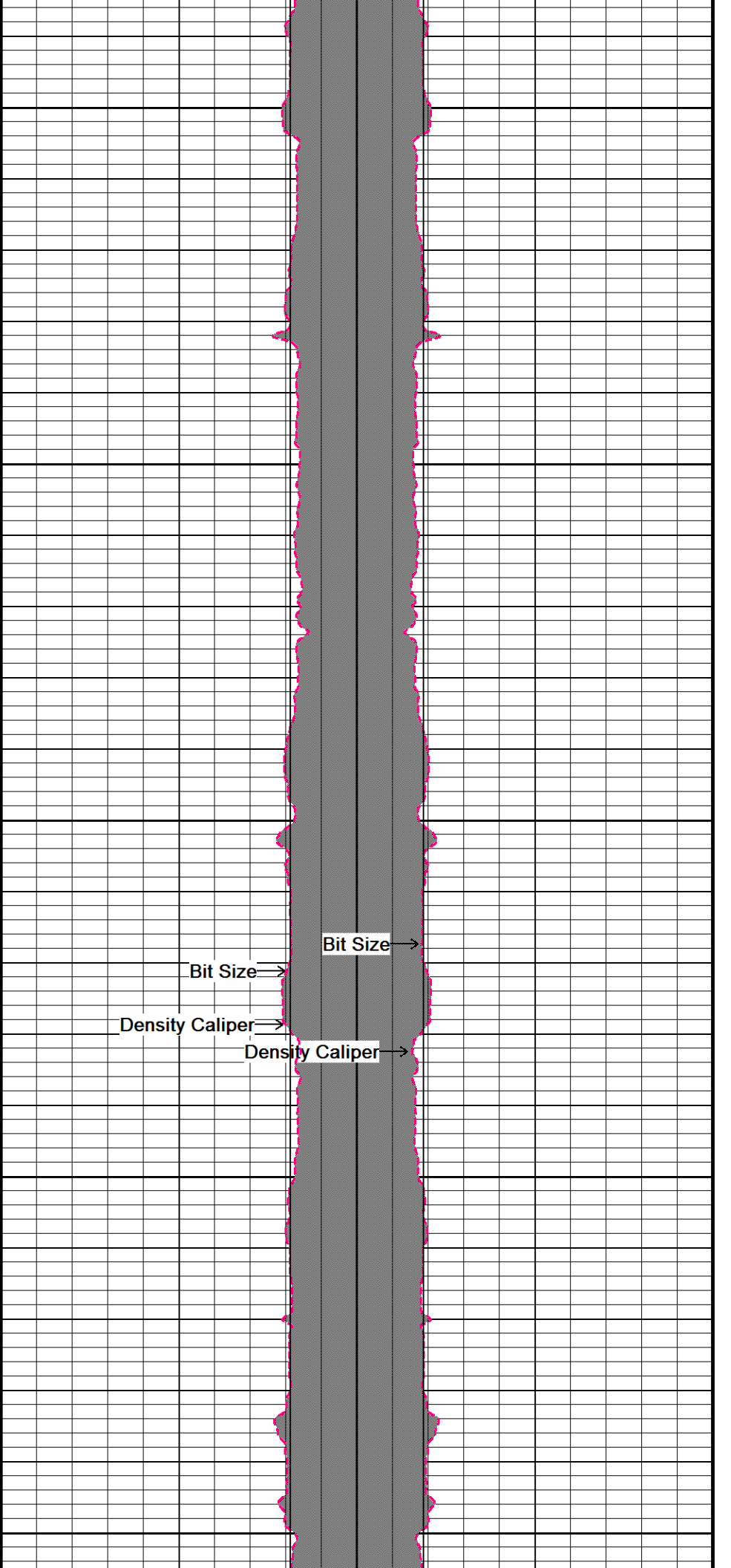
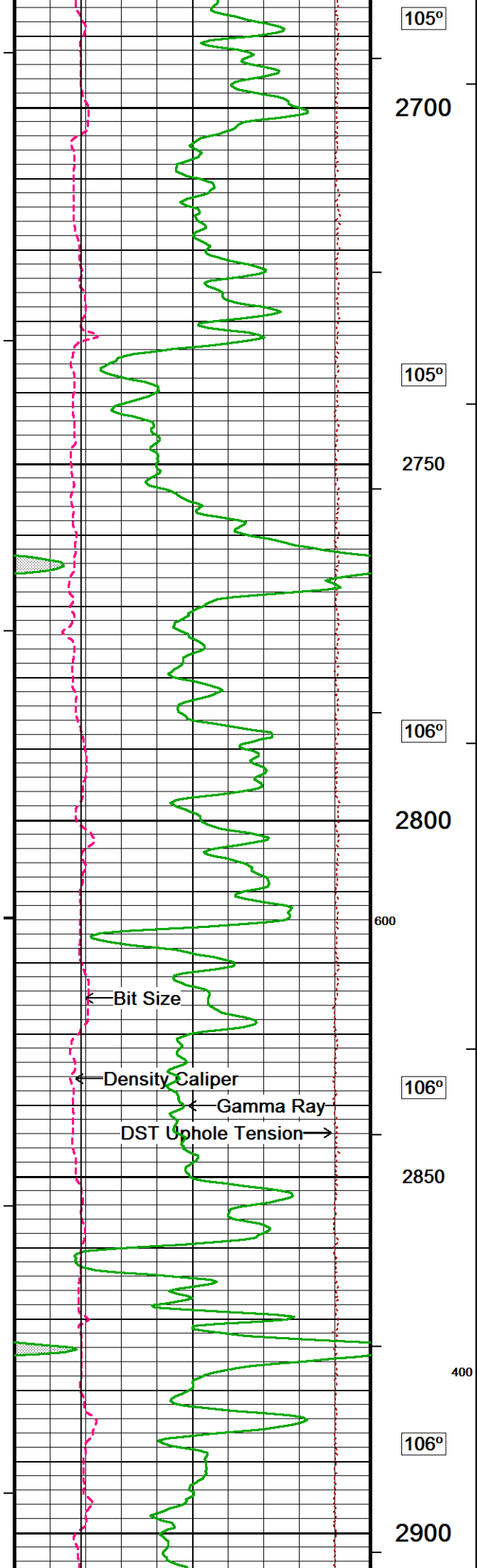
Bit Size

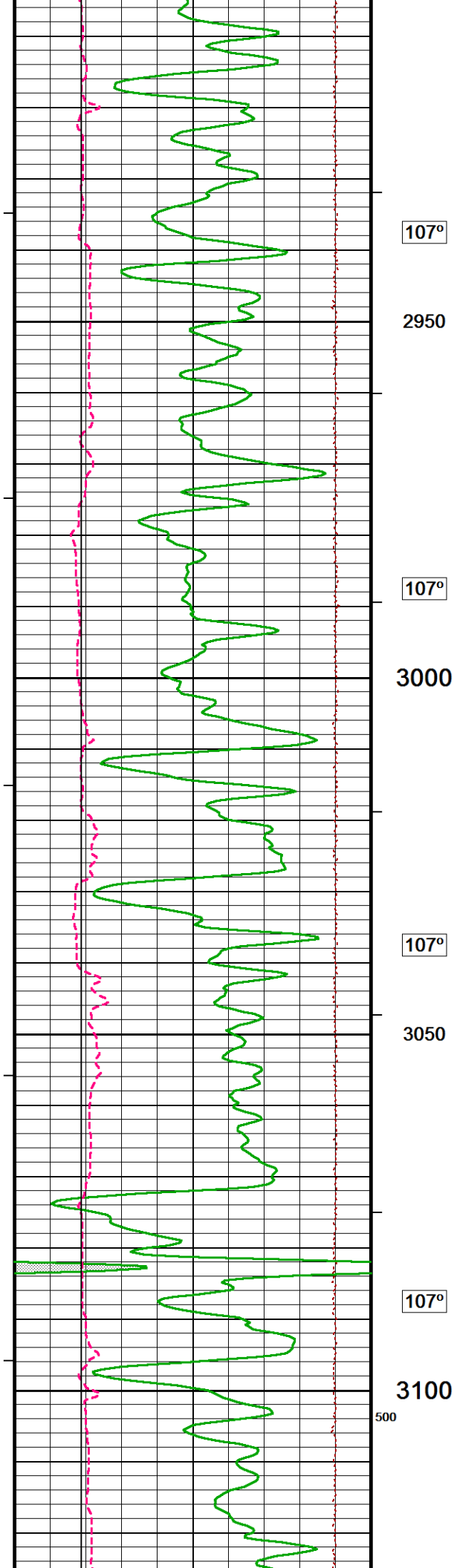
Bit Size

Density Caliper

Density Caliper







107°

2950

107°

3000

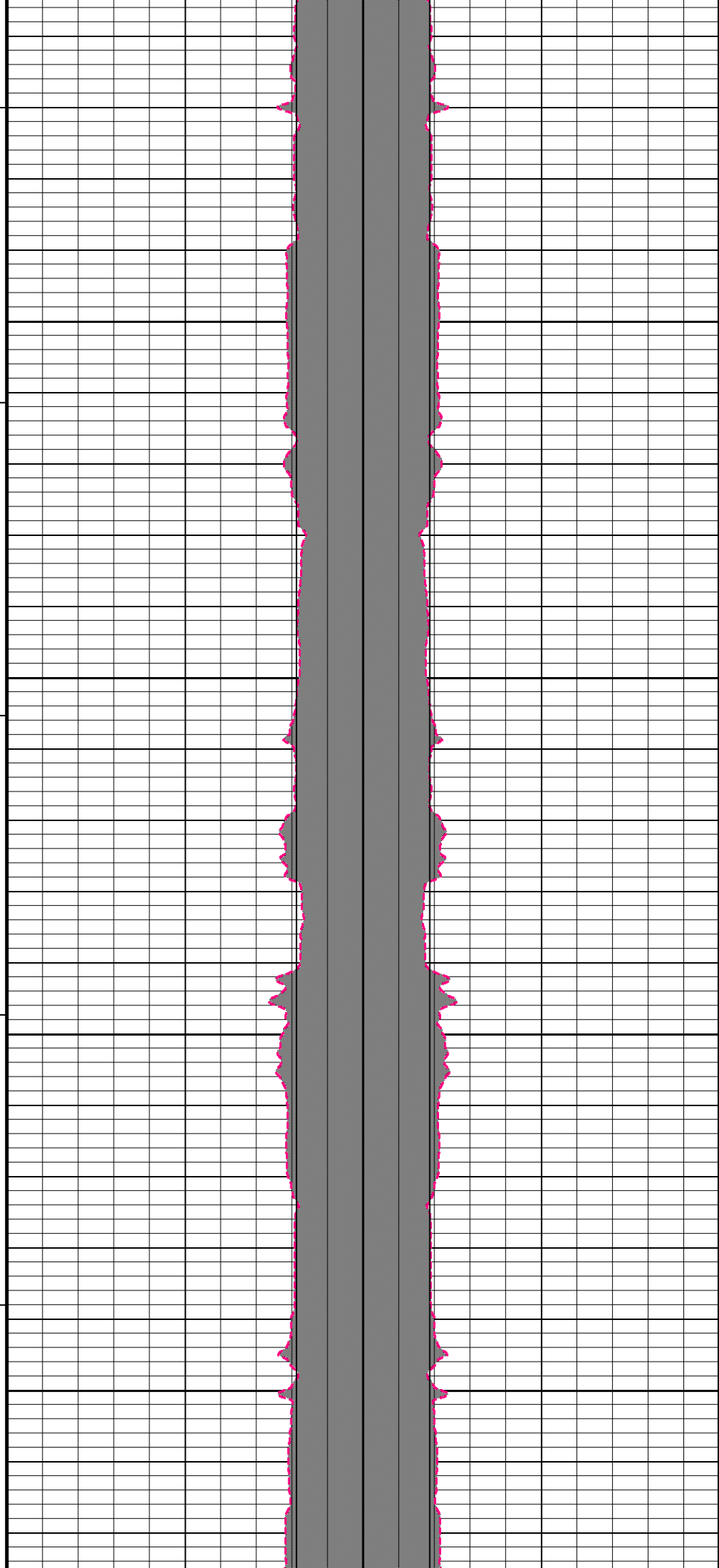
107°

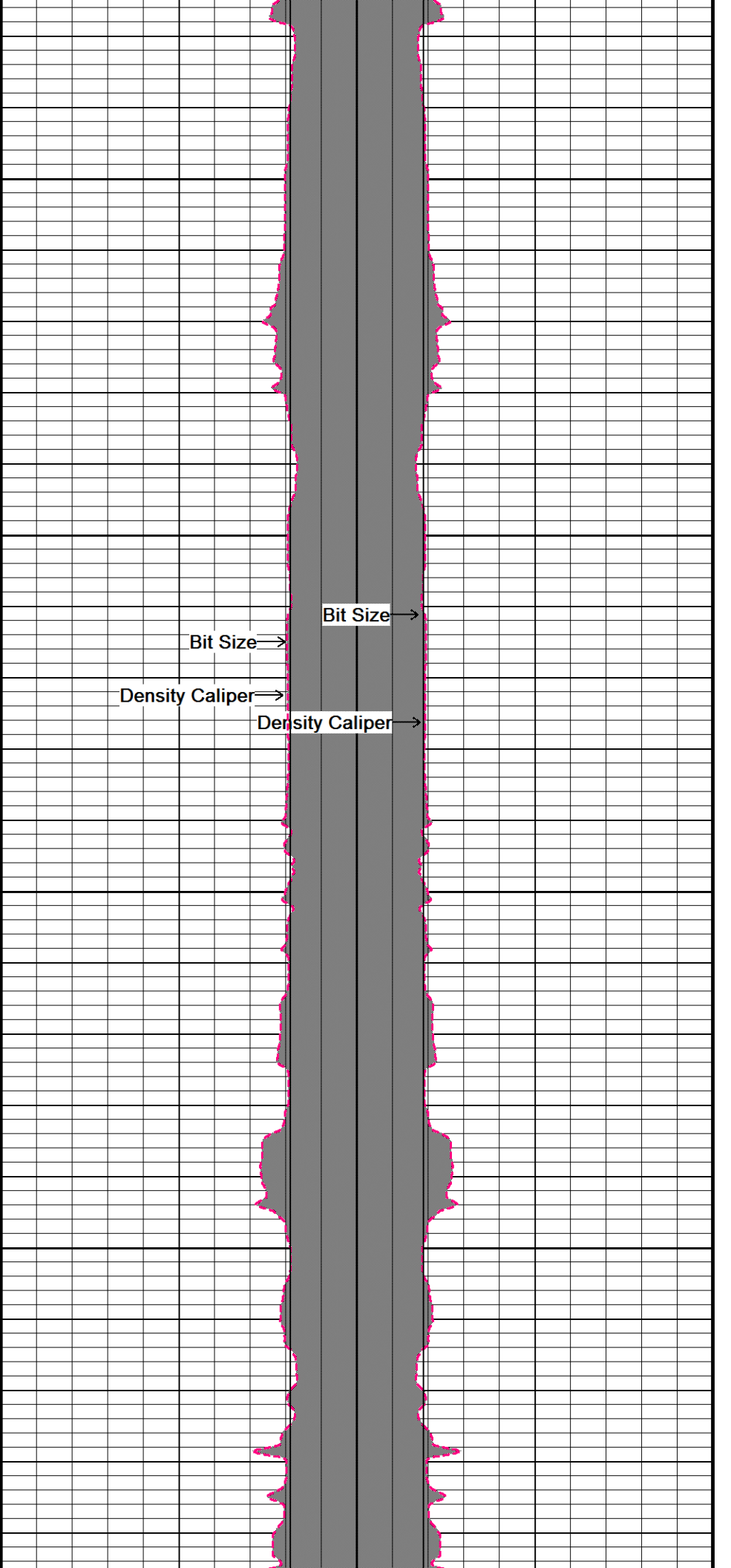
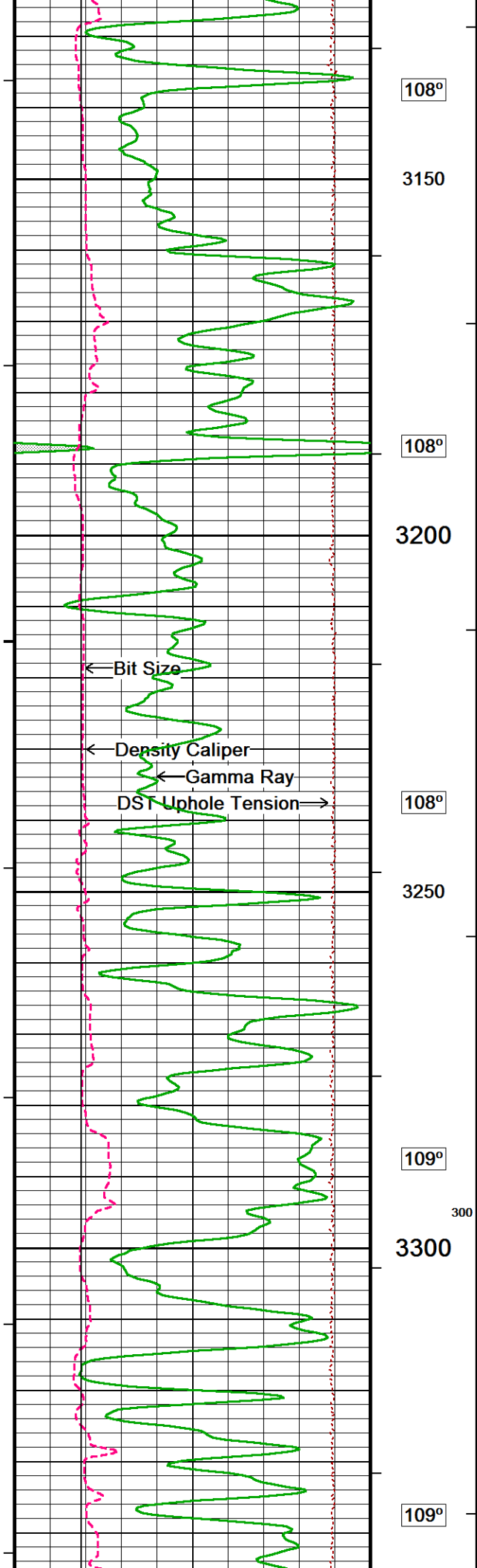
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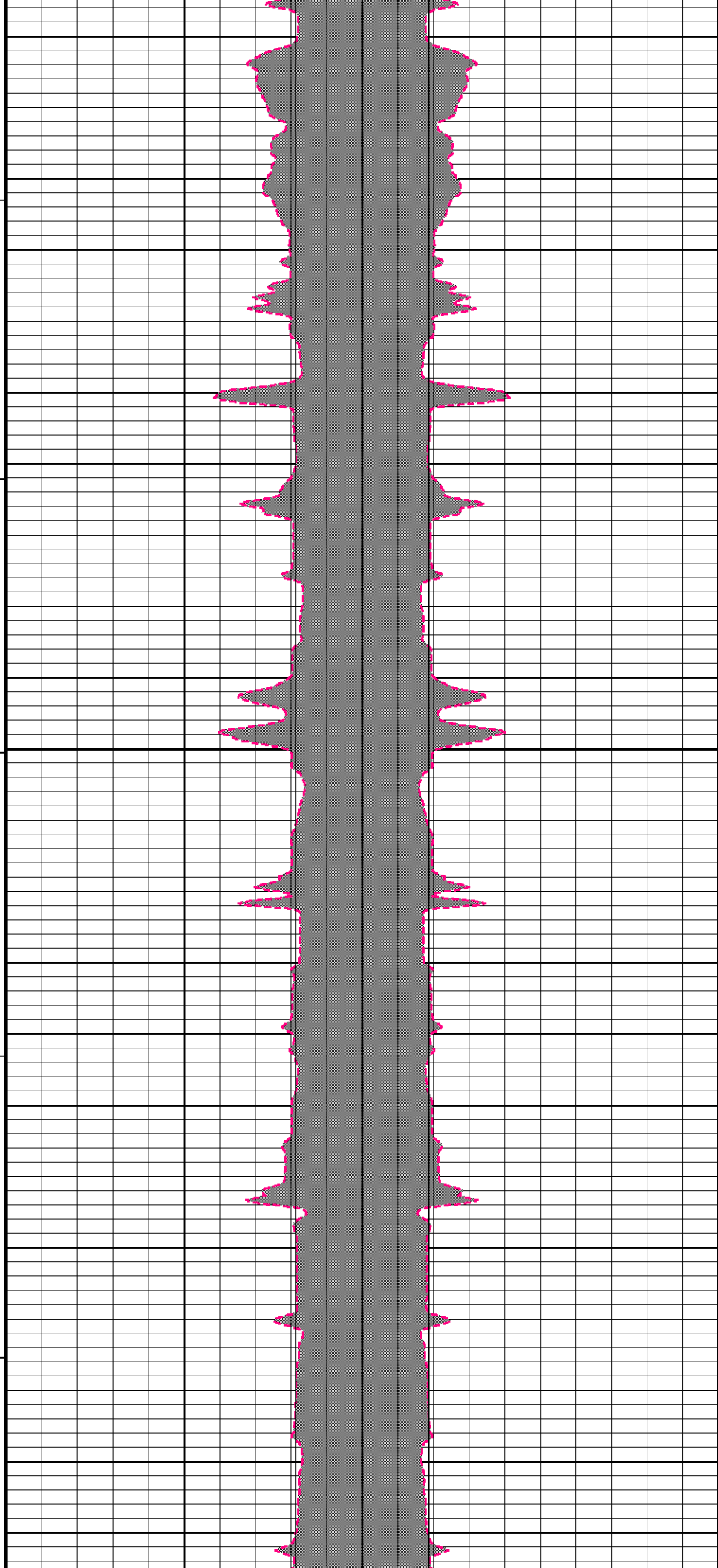
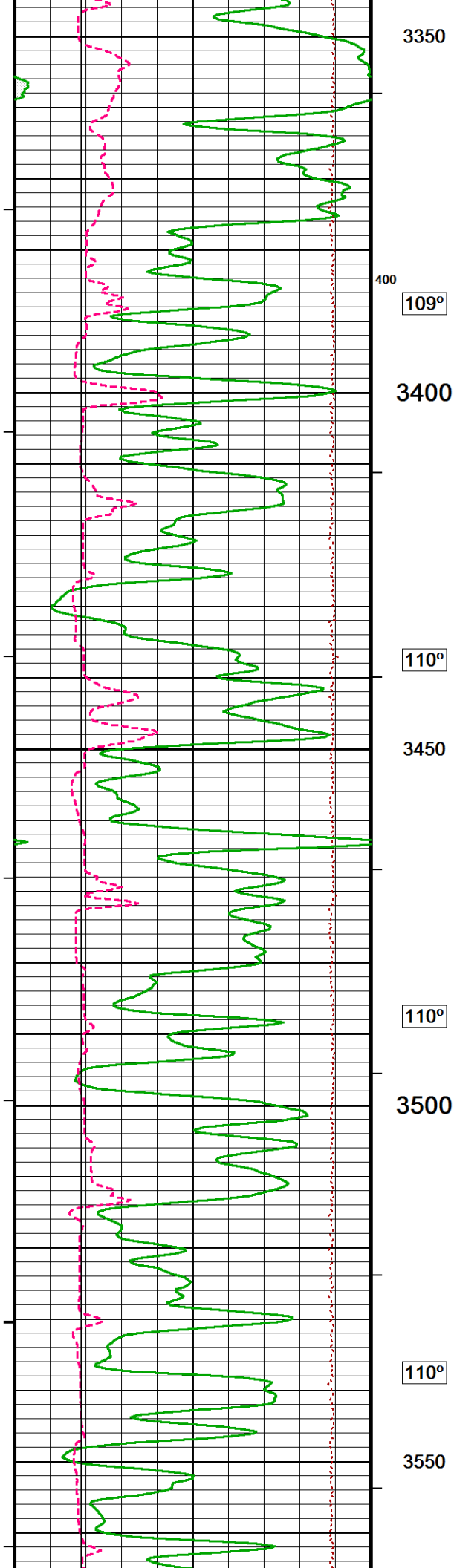
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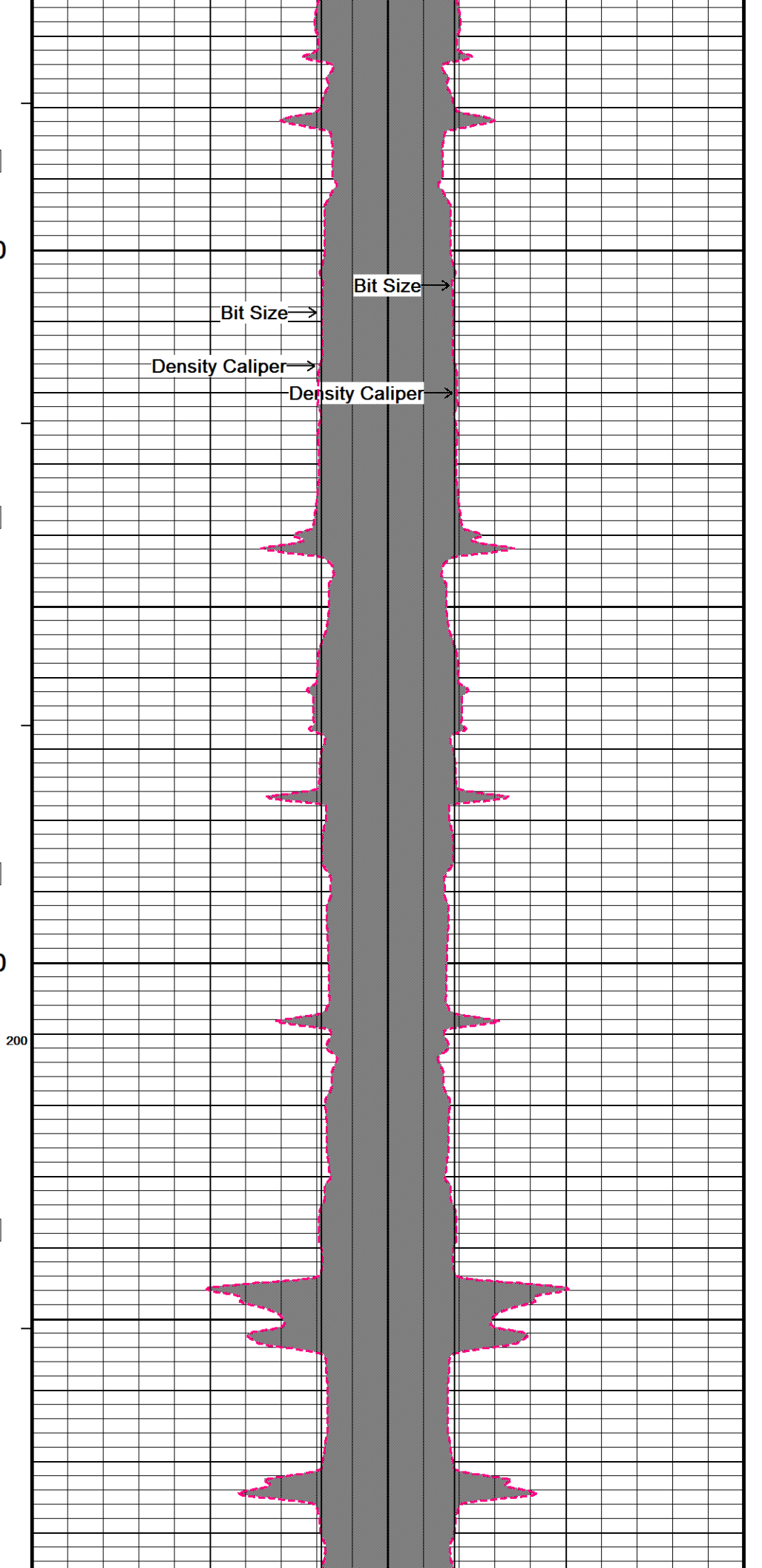
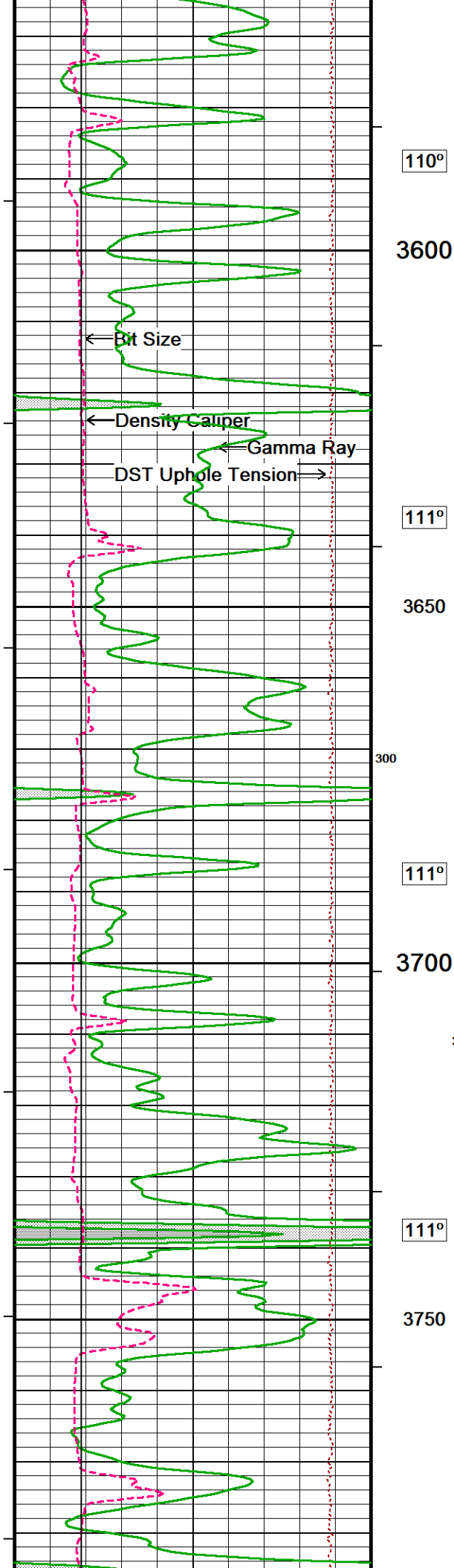
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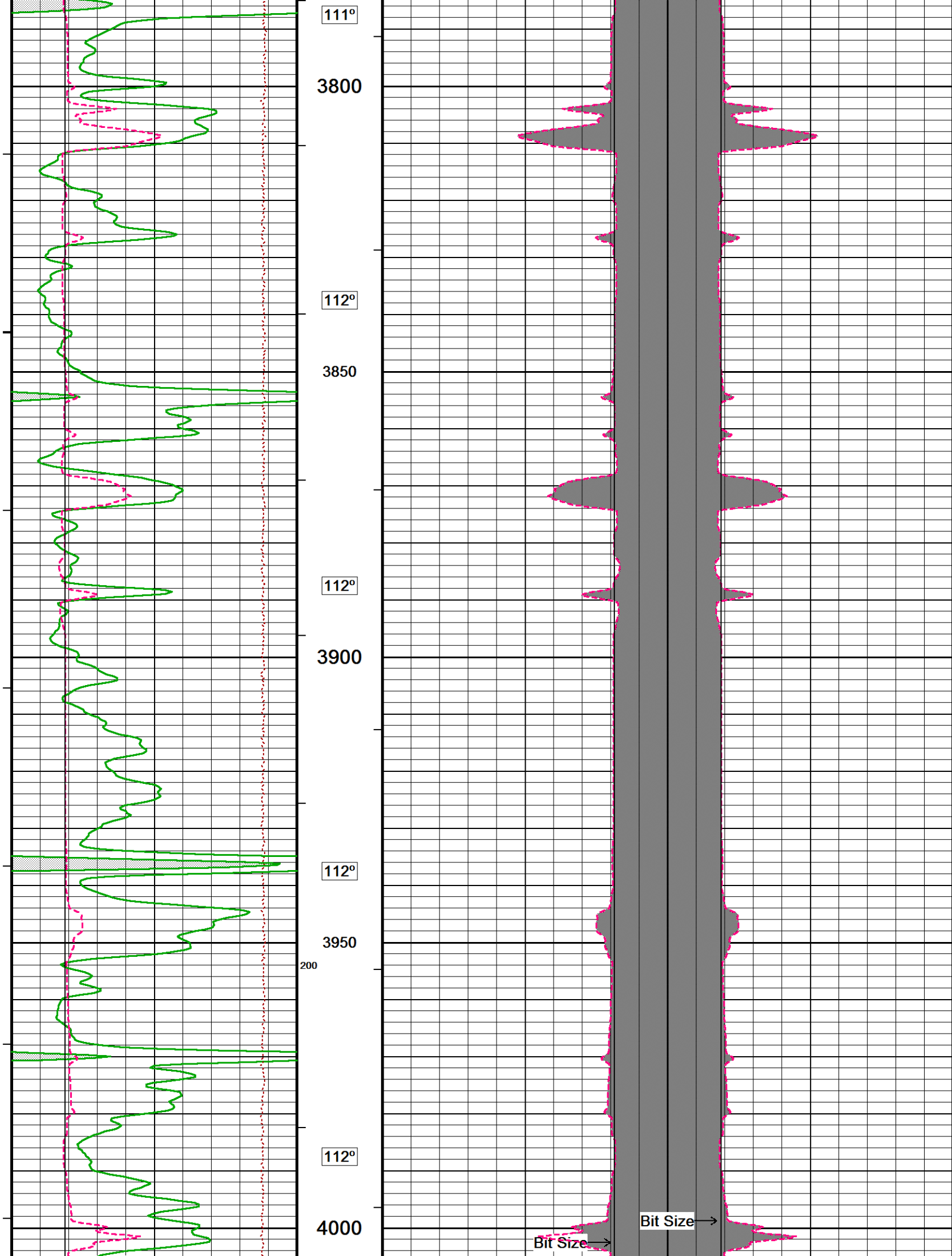
500

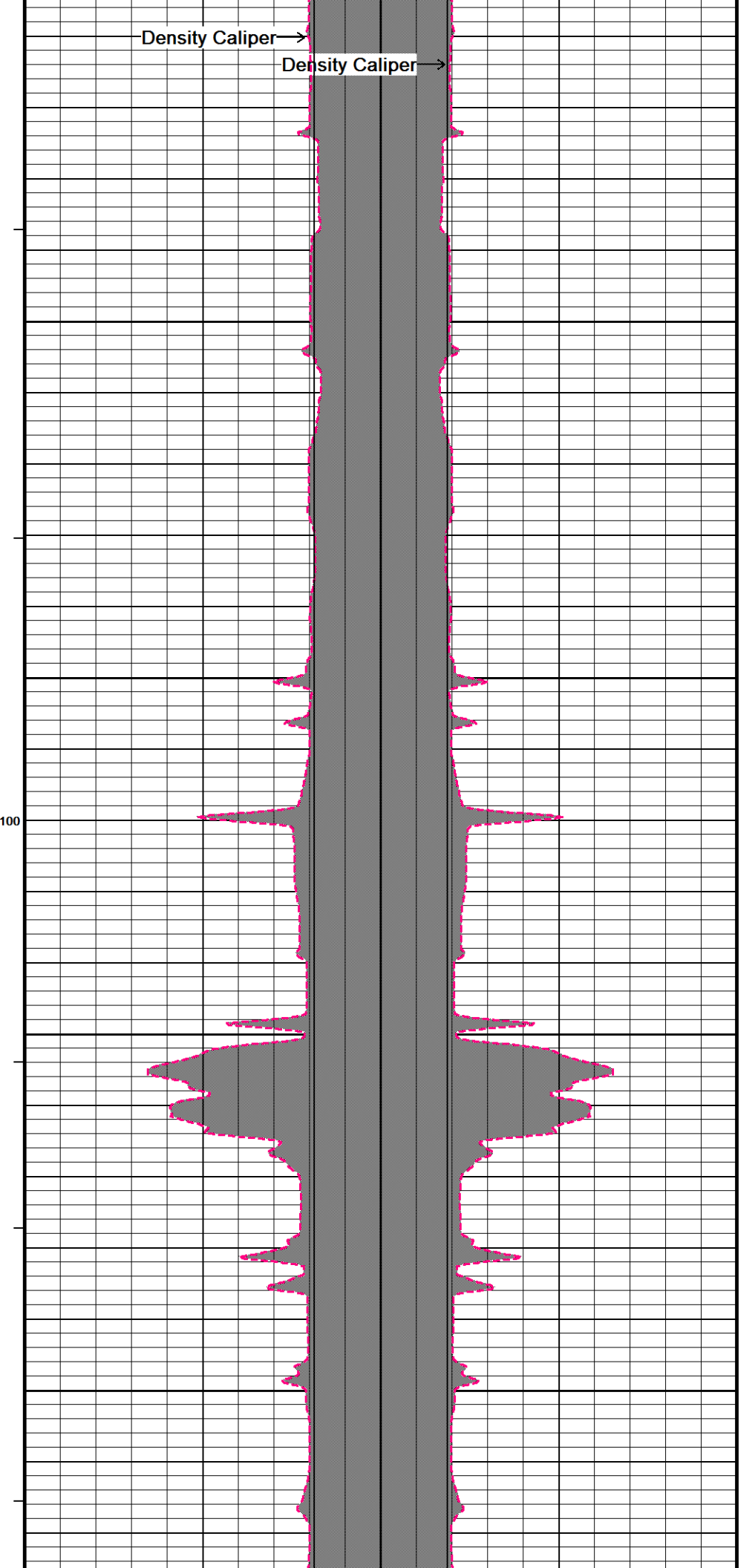
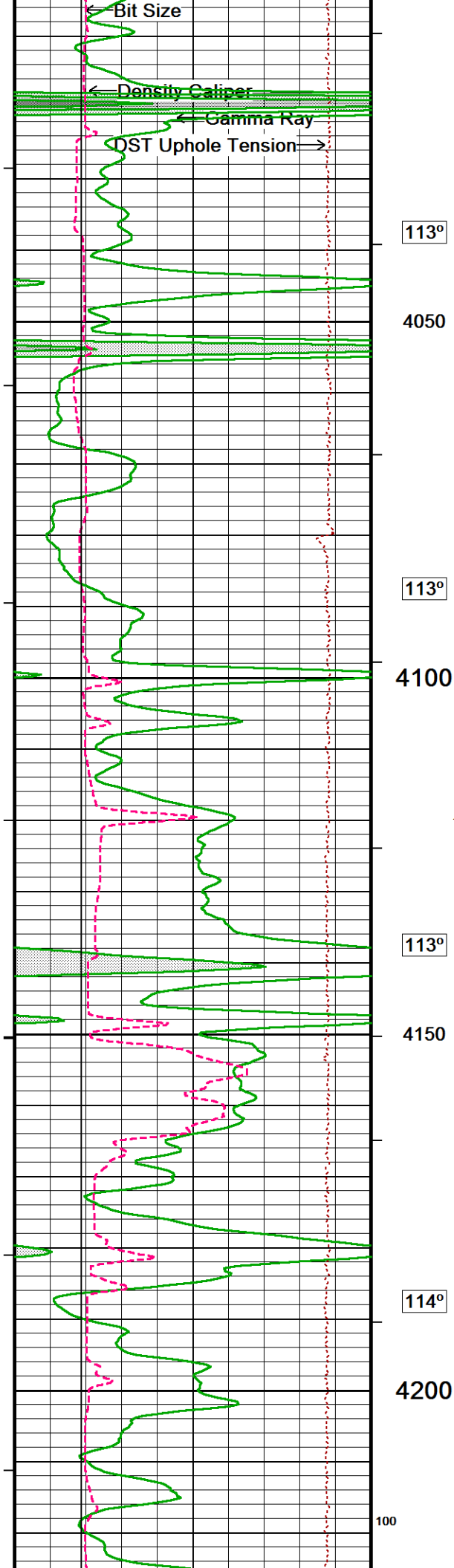


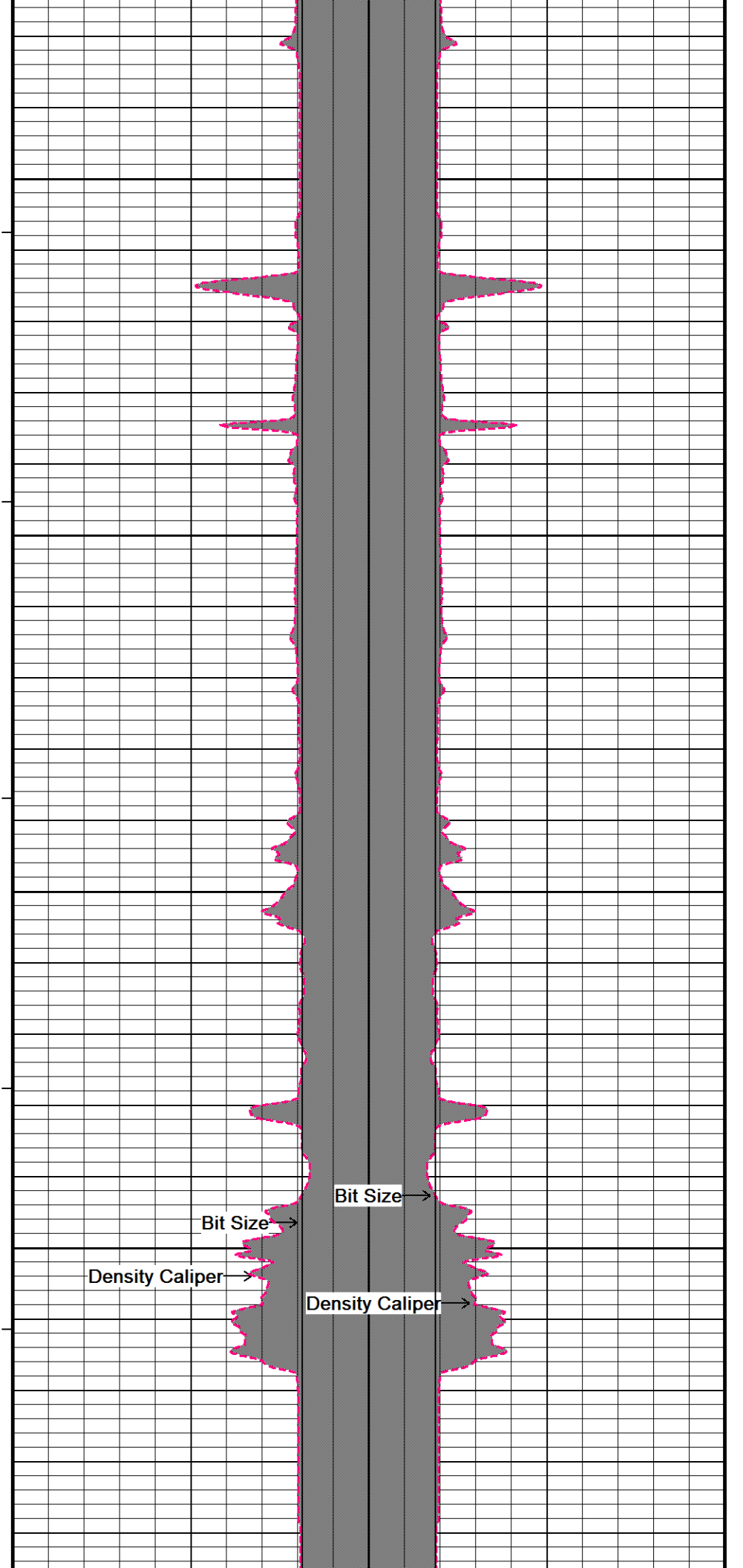
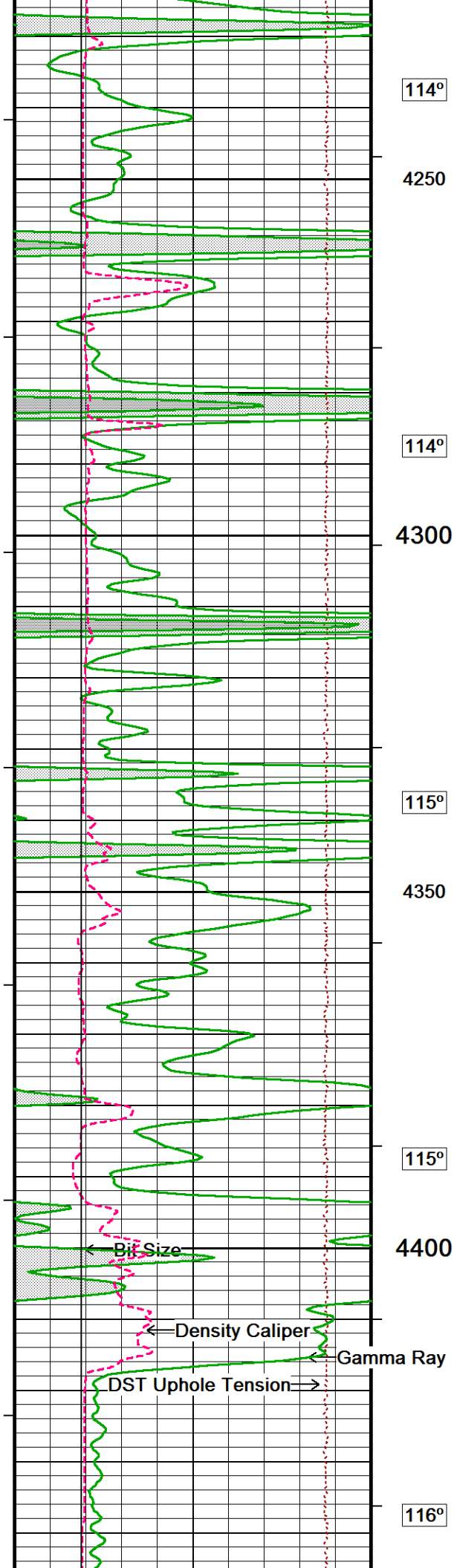


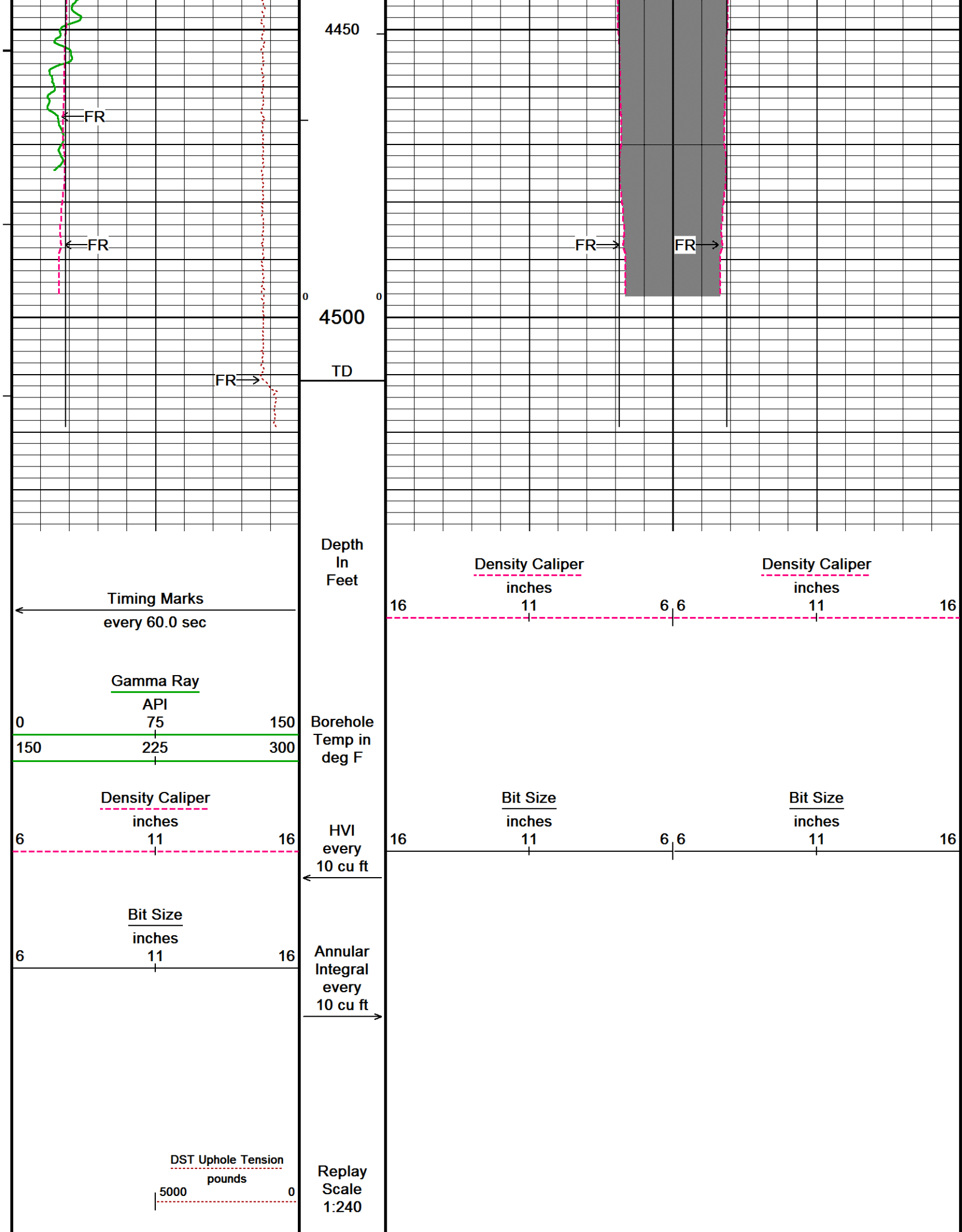












BEFORE SURVEY CALIBRATION
 C:\Minimus 18.01.6830\Data\Shakespeare (Ottley 2-21)\MAIN PASS.dta

General Constants All 000			Last Edited on 15-JUN-2018,01:35
General Parameters			
Mud Resistivity	0.600	ohm-metres	
Mud Resistivity Temperature	96.000	degrees F	
Water Level	0.000	feet	
Borehole Fluid Processing	Wet Hole		
Hole/Annular Volume and Differential Caliper Parameters			
HVOL Method	Single Caliper		
HVOL Caliper 1	Density Caliper		
HVOL Caliper 2	N/A		
Annular Volume Diameter	4.500	inches	
Caliper for Differential Caliper	Density Caliper		
Rwa Parameters			
Porosity used	Crossplot Porosity		
Resistivity used	Array Ind. Two Res Rt		
RWA Constant A	0.620		
RWA Constant M	2.150		
SW/APOR Tool Source	0.000		

Down-hole Tension Calibration SMS 0		Field Calibration on 14-JUN-2018 22:36	
Reading No	Measured	Calibrated (lbs)	
1	15468.14	0.00	
2	16556.59	454.20	

Gamma Calibration MCG-D.A 246		Field Calibration on 11-JUN-2018 15:07	
	Measured	Calibrated (API)	
Background	75	51	
Calibrator (Gross)	743	507	
Calibrator (Net)	668	456	

Gamma Calibration Tolerances MCG-D.A 246			
Ratio	1.465	1.40 1.475 1.55	Counts/API

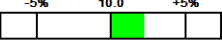
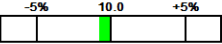
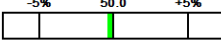
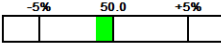
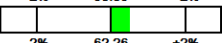
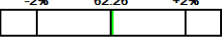
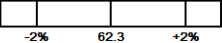
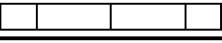
Gamma Constants MCG-D.A 246		Last Edited on 14-JUN-2018,22:06	
Gamma Calibrator Number	MCGGRCC141		
GRC-M Calibrator Jig in Use?	NO		
Inactive Background Jig in Use?	NO		
Mud Density	1.13	gm/cc	
Caliper Source for Processing	Density Caliper		
Tool Position	Eccentred		
Potassium Equivalence	Chloride		
K Mud Concentration	0.00	%	

High Resolution Temperature Calibration MCG-D.A 246		Field Calibration on 07-JUN-2018,10:42	
	Measured	Calibrated(Deg F)	
Lower	50.00	50.00	
Upper	212.00	212.00	

High Resolution Temperature Constants MCG-D.A 246		Last Edited on 07-JUN-2018,10:42	
Pre-filter Length	11		

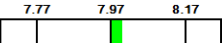
SP Calibration MCG-D.A 246		Field Calibration on 07-JUN-2018 11:07	
	Measured	Calibrated (mV)	
Reference 1	103.5	100.0	
Reference 2	96.9	100.1	

Reference 2	-90.9	-100.1
Micro Normal and Micro Inverse Calibration MMR-B.A 91		
Base Calibration on 07-JUN-2018 13:43 Field Check on 11-JUN-2018 15:37		
	Resistor 1 (ohm)	Resistor 2 (ohm)
	10.0	50.0
Base Calibration		
	Measured	Calibrated (ohm-m)
Micro Normal	10.2 49.8	5.1 25.6
Micro Inverse	9.9 49.4	3.4 16.9
Channel	Base Check (ohm-m)	Field Check (ohm-m)
Micro Normal	93.9	93.9
Micro Inverse	62.3	62.3

Micro Normal & Micro Inverse Calibration Tolerance MMR-B.A 91			
Micro Normal Res. 1	10.2		ohm
Micro Inverse Res. 1	9.9		ohm
Micro Normal Res. 2	49.8		ohm
Micro Inverse Res. 2	49.4		ohm
Micro Normal Base Check	93.9		ohm-m
Micro Inverse Base Check	62.3		ohm-m
Micro Normal Field Check	93.9		ohm-m
Micro Inverse Field Check	62.3		ohm-m

Micro Normal and Micro Inverse Constants MMR-B.A 91		
Last Edited on 13-APR-2018,05:04		
Pad Type	8-12 in Soft Rubber Inflatable 006-9011-159	
Micro Normal K Factor	0.5110	
Micro Inverse K Factor	0.3380	
Standoff Offset	0.0000	inches

Caliper Calibration MMR-B.A 91		
Base Calibration on 07-JUN-2018 13:30 Field Calibration on 11-JUN-2018 15:36		
Base Calibration		
Reading No	Measured	Calibrator Size (in)
1	13946	5.98
2	17303	7.97
3	20607	9.86
4	24616	11.92
5	0	0.00
6	N/A	N/A
Field Calibration		
	Measured Caliper (in)	Actual Caliper (in)
	8.00	7.97

Caliper Calibration Tolerances MMR-B.A 91		
Short Arm Field Cal.	8.00	

Micro-Resistivity Caliper Constants MMR-B.A 91	
Sonde Configuration	Resistivity Mode

Micro Laterolog Calibration MMR-B.A 91		
Base Calibration on 31-DEC-1999 00:00 Field Check on 31-DEC-1999 00:00		
	Resistor 1 (ohm)	Resistor 2 (ohm)
	0.0	0.0
Base Calibration		
	Measured	Calibrated (ohm-m)
Ref 1	Ref 2	Ref 1
0.0	0.0	0.0
Base Check (ohm-m)	Field Check (ohm-m)	
0.0	0.0	

Micro Laterolog Constants MMR-B.A 91	
Pad Type	6 in Solid Nylon B23059

Standoff Offset	0.0000	inches
Micro Laterolog K Factor	0.0128	
Micro Laterolog Rm K Factor	N/A	
Mudcake Thickness Correction Constants		
Mud Cake Source	Constant Value	
Mud Cake Thickness	0.4000	inches
Mud Cake Thickness Caliper		
Mud Cake Resistivity	0.1500	ohm-m
Mud Cake Resistivity Temp.	20.00	Degrees C
Mud Cake Resistivity Source	Constant Value	
Temp. for Rmc Corr.	MCG External Temperature	

Neutron Calibration MDN-B.A 292

Base Calibration on 15-MAY-2018 10:16

Field Check on 11-JUN-2018 15:13

Base Calibration

	Measured		Calibrated (cps)	
	Near	Far	Near	Far
	2945	91	3714	110
Ratio	32.304		33.764	

Field Calibrator at Base

	Calibrated (cps)
	2179 3239
Ratio	0.673

Field Check

	Calibrated (cps)
	2170 3215
Ratio	0.675

Neutron Calibration Tolerances MDN-B.A 292

Ratio	32.304	
Base Check	0.673	
Field Check	0.675	

Neutron Constants MDN-B.A 292

Last Edited on 14-JUN-2018,22:08

Neutron Source Id	P0204NN	
Neutron Jig Number	NJ5736	
Air Hole Processing	Modified Ratio	
Caliper Source for Processing	Density Caliper	
Stand-off	0.00	inches
Mud Density	1.00	gm/cc
Limestone Sigma	7.10	cu
Sandstone Sigma	4.26	cu
Dolomite Sigma	4.70	cu
Formation Pressure Source	None	
Formation Pressure	N/A	kpsi
Temperature Source	Constant Value	
Temperature	68.00	degrees F
Mud Salinity	0.00	kppm
Salinity Correction	Not Applied	
Formation Fluid Salinity Source	None	
Formation Fluid Salinity	N/A	kppm
Barite Mud Correction	Not Applied	

FE Calibration MFE-A.A 135

Base Calibration on 07-JUN-2018 13:53

Field Check on 11-JUN-2018 15:20

	Resistor 1 (ohm)	Resistor 2 (ohm)
	0.0	1000.0
Base Calibration		
	Measured	Calibrated (ohm-m)
Reference 1	0.0	0.0
Reference 2	962.0	126.8
Base Check		281.3
Field Check		281.2

FE Calibration Tolerances MFE-A.A 135

Reference 2	962.0	-3% 980.0 +3%	ohm
Base Check	281.3	-2% 277.0 +2%	ohm-m
Field Check	281.2	-2% 281.3 +2%	ohm-m

FE Constants MFE-A.A 135

Last Edited on 11-JUN-2018,15:18

Running Mode	No Sleeve
MFE K Factor	0.1268
Borehole Correction Constants	
Sonde Position	0.5 inches
Hole Size Source	Density Caliper
Hole Size Constant Value	N/A inches
Rm Source	Global Value: Temperature Corrected
Temp. for Rm Corr.	MCG External Temperature

High Resolution Temperature Calibration MAI-A.A 111

Field Calibration on 23-FEB-2018,11:15

	Measured	Calibrated(Deg F)
Lower	10.00	10.00
Upper	100.00	100.00

High Resolution Temperature Constants MAI-A.A 111

Last Edited on 26-JUN-2014,15:06

Pre-filter Length	11
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Induction Calibration MAI-A.A 111

Factory Loop Calibration 07-JUN-2018 14:52

Field Check on 11-JUN-2018 16:21

Factory Loop Calibration

High Conductivity Reference Resistor	3.3 ohm
Low Conductivity Reference Resistor	333.3 ohm

Array	Measured Signal (unitless)		Reference Conductivity (mmho/m)		Calibration	
	Low	High	Low	High	Gain	Offset
1 (near)	17.6	473.6	9.3	966.2	0.000	0.0
2	6.4	385.9	7.6	821.4	0.000	0.0
3	3.2	264.0	5.2	566.0	0.000	0.0
4 (far)	2.1	135.5	2.6	279.2	0.000	0.0
Array Temperature	23.0		Deg F			

Tool Checks

Array	Factory Reference (mmho/m)		Before Survey (mmho/m)		
	Low	High	Low	High	
1 (near)	11.4	3841.4	11.4	3842.9	
2	29.4	3499.6	29.4	3500.4	
3	28.8	2996.9	28.7	2997.4	
4 (far)	18.9	2041.5	18.9	2041.9	
Array Temperature	83.6		99.3		Deg F

Induction Check Tolerances MAI-A.A 111

Low Array 1	11.4	9.9 11.4 12.9	mmho/m	High Array 1	3842.9	-0.5% 3841.4 +0.5%	mmho/m
Low Array 2	29.4	27.9 29.4 30.9	mmho/m	High Array 2	3500.4	-0.5% 3499.6 +0.5%	mmho/m
Low Array 3	28.7	27.3 28.8 30.3	mmho/m	High Array 3	2997.4	-0.5% 2996.9 +0.5%	mmho/m
Low Array 4	18.9	17.4 18.9 20.4	mmho/m	High Array 4	2041.9	-0.5% 2041.5 +0.5%	mmho/m

Induction Constants MAI-A.A 111

Last Edited on 14-JUN-2018,22:05

Induction Model	RtAP-WBM
Borehole Correction Constants	
Tool Centred	No
Hole Size Source	Density Caliper
Hole Size Constant Value	2 500 inches

Stand-off Type	2.0000	Fins	inches
Stand-off	0.50		
Number of Fins on Stand-off	8.0000		
Stand-off Fin Angle	45.00	degrees	
Stand-off Fin Width	0.5000	inches	
Rm Source	Global Value: Temperature Corrected		
Temp. for Rm Corr.	MCG External Temperature		
Borehole Correction Method	Default		
Squasher Start	0.0020	mhos/metre	
Squasher Offset	N/A	mhos/metre	
Borehole Normalisation			
DRM1	0.0000	DRC1	0.0000
DRM2	0.0000	DRC2	0.0000
MRM1	0.0000	MRC1	0.0000
MRM2	0.0000	MRC2	0.0000
SRM1	0.0000	SRC1	0.0000
SRM2	0.0000	SRC2	0.0000
Calibration Site Corrections			
Channel 1	0.00	mmhos/metre	
Channel 2	0.00	mmhos/metre	
Channel 3	0.00	mmhos/metre	
Channel 4	0.00	mmhos/metre	
Symmetrised Receiver Gains			
Receiver 1	1.00		
Receiver 2	1.00		
Receiver 3	1.00		
Receiver 4	1.00		
Apparent Porosity and Water Saturation Constants			
Archie Constant (A)	1.00		
Cementation Exponent (M)	2.00		
Saturation Exponent (N)	2.00		
Saturation of Water for Apor	100.00	percent	
Resistivity of Water for Apor and Sw	0.05	ohm-m	
Resistivity of Mud Filtrate for Sw	0.00	ohm-m	
Source for Rt	0.00		
Source for Rxo	0.00		

Caliper Calibration MPD-C.A 216			Base Calibration on 07-JUN-2018 14:09
			Field Calibration on 11-JUN-2018 15:33
Base Calibration			
Reading No	Measured	Calibrator Size (in)	
1	14245	3.99	
2	22960	5.98	
3	31650	7.97	
4	39952	9.86	
5	49231	11.92	
6	N/A	N/A	
Field Calibration			
	Measured Caliper (in)	Actual Caliper (in)	
	7.93	7.97	

Caliper Calibration Tolerances MPD-C.A 216				
Long Arm Field Cal.	7.93	7.57 7.97 8.37	in	

Photo Density Calibration MPD-C.A 216				Base Calibration on 07-JUN-2018 14:35	
				Field Check on 11-JUN-2018 15:18	
Density Calibration					
Base Calibration		Measured		Calibrated (sdu)	
	Near	Far	Near	Far	
Background	1007	1198			
Reference 1	50088	24364	59556	30836	
Reference 2	19851	2273	24941	2541	
Field Check at Base					

Field Check at Base

1006.9

1197.8

Field Check

1004.3

1191.6

PE Calibration

Base Calibration

Measured

Calibrated

WS

WH

Ratio

Ratio

Background

184

903

Reference 1

21030

49928

0.425

0.371

Reference 2

5765

19740

0.296

0.272

Field Check at Base

184.4

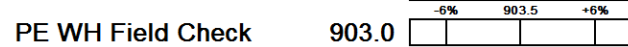
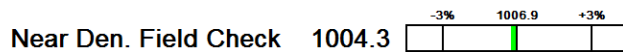
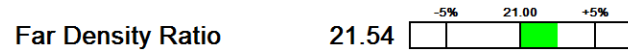
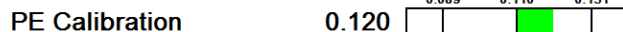
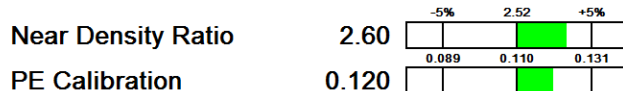
903.5

Field Check

182.8

903.0

Photo Density Calibration Tolerances MPD-C.A 216



Density Constants MPD-C.A 216

Last Edited on 14-JUN-2018,22:06

Density Source Id P50557B
 Nylon Calibrator Number DNCE695
 Aluminium Calibrator Number DACD698
 Density Shoe Profile 8 inch
 Caliper Source for Processing Density Caliper
 PE Correction to Density Not Applied
 Mud Density 1.13 gm/cc
 Mud Density Type
 Mud Filtrate Density 1.00 gm/cc
 Dry Hole Mud Filtrate Density 1.00 gm/cc
 DNCT 0.00 gm/cc
 CRCT 0.00 gm/cc
 Density Z/A Correction Hybrid
 Precision Enhanced Density Processing Not Applied

Matrix Density (gm/cc)	Depth (ft)
2.71	0.00
0.00	0.00
0.00	0.00
0.00	0.00
0.00	0.00
0.00	0.00
0.00	0.00
0.00	0.00
0.00	0.00

DOWNHOLE EQUIPMENT

C:\Minimus 18.01.6830\Data\Shakespeare (Ottley 2-21)\MAIN PASS.dta

Cablehead, 11 pin
 CBH-C 0 LG: 2.40 ft WT: 24.3 lb OD: 2.244 in

Compact Swivel Head Adaptor
 SHA-J.B 724 LG: 2.30 ft WT: 22.0 lb OD: 2.244 in

Compact Comms Gamma
 MCG-D.A 246 LG: 8.70 ft WT: 63.9 lb OD: 2.244 in



45.66 ft GRGC - MCG Gamma Ray

42.76 ft CGXT - MCG External Temperature

Compact Micro-Resistivity
MMR-B.A 91 LG: 8.59 ft WT: 81.6 lb OD: 4.882 in

Compact Neutron
MDN-B.A 292 LG: 5.04 ft WT: 50.7 lb OD: 2.244 in

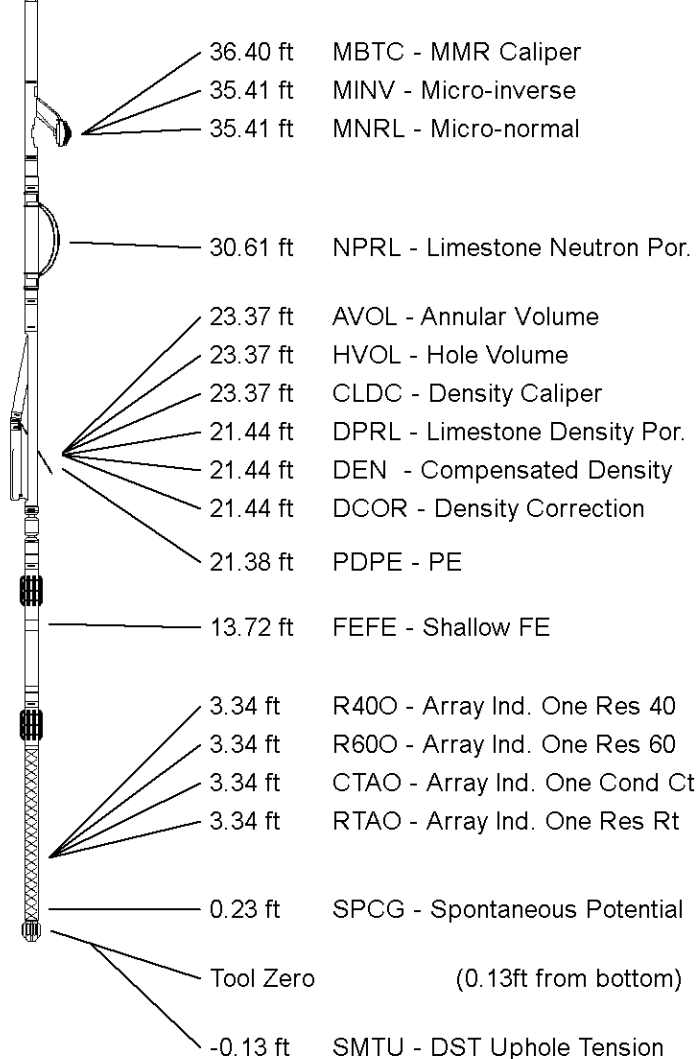
Compact Density/Caliper
MPD-C.A 216 LG: 9.59 ft WT: 90.4 lb OD: 2.913 in

Compact Knuckle Joint
SKJ-D.A 167 LG: 2.17 ft WT: 24.3 lb OD: 2.244 in

Compact Focussed Electric
MFE-A.A 135 LG: 6.05 ft WT: 48.5 lb OD: 2.244 in

Compact Induction
MAI-A.A 111 LG: 10.81 ft WT: 48.5 lb OD: 2.244 in

Total Length: 55.64 ft Weight: 454.2 lb



All measurements relative to tool zero.

COMPANY	SHAKESPEARE OIL CO., INC
WELL	OTTLEY 2-21
FIELD	CHALK BUTTES
PROVINCE/COUNTY	LOGAN
COUNTRY/STATE	USA / KANSAS

Elevation Kelly Bushing	2783	feet	First Reading	4480.00	feet
Elevation Drill Floor	2781	feet	Depth Driller	4511.00	feet
Elevation Ground Level	2771	feet	Depth Logger	4511.00	feet



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