



**Weatherford**

**COMPACT PHOTO DENSITY  
COMPENSATED NEUTRON  
MICRORESISTIVITY LOG**

**COMPANY WESTERN OPERATING COMPANY**

**WELL HELFRICH #1-6**

**FIELD HELFRICH**

**PROVINCE/COUNTY HAMILTON**

**COUNTRY/STATE U.S.A. / KANSAS**

**LOCATION 1320' FSL & 1980' FEL**

**SEC TWP RGE Other Services**

6 25S 42W MAI/MFE

API Number 15-075-20865

Permanant Datum GL, Elevation 3574 feet

Log Measured From KB

Drilling Measured From KB

Date 04-JAN-2013

Run Number ONE

Service Order 3537801

Depth Driller 5400.00 feet

Depth Logger 5394.00 feet

First Reading 5375.00 feet

Last Reading 2300.00 feet

Casing Driller 843.00 feet

Casing Logger 840.00 inches

Bit Size 7.875

Hole Fluid Type CHEMICAL lb/USg

Density / Viscosity 9.50 lb/USg 53.00 CP

PH / Fluid Loss 10.00 10.00

Sample Source FLOWLINE

Rm @ Measured Temp 1.26 @ 79.0 ohm-m

Rmf @ Measured Temp 1.01 @ 79.0 ohm-m

Rmc @ Measured Temp 1.51 @ 79.0 ohm-m

Source Rmf / Rmc CALC CALC

Rm @ BHT 0.85 @121.0 ohm-m

Time Since Circulation 4 HOURS

Max Recorded Temp 121.00 deg F

Equipment / Base 13096 LIB

Elevations:  
KB 3586.00  
DF 3585.00  
GL 3574.00

**BOREHOLE RECORD**

Last Edited: 04-JAN-2013 01:25

Bit Size inches	Depth From feet	Depth To feet
7.875	843.00	5400.00

**CASING RECORD**

Type	Size inches	Depth From feet	Shoe Depth feet	Weight pounds/ft
SURFACE	8.625	0.00	843.00	24.00

**REMARKS**

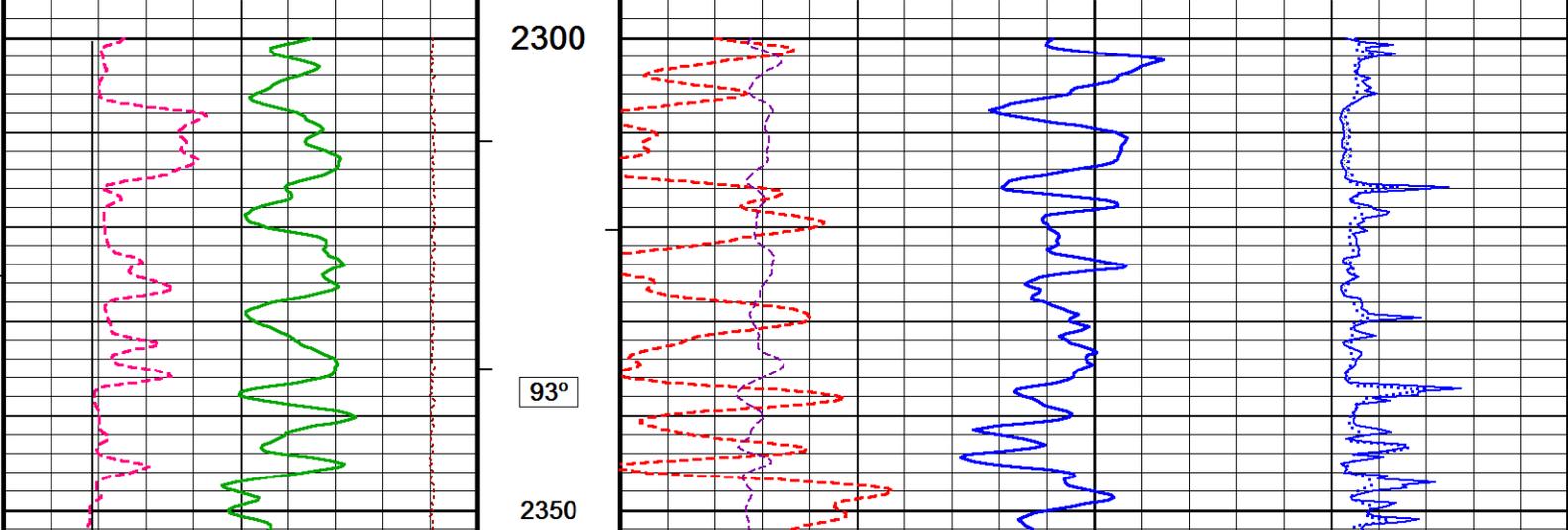
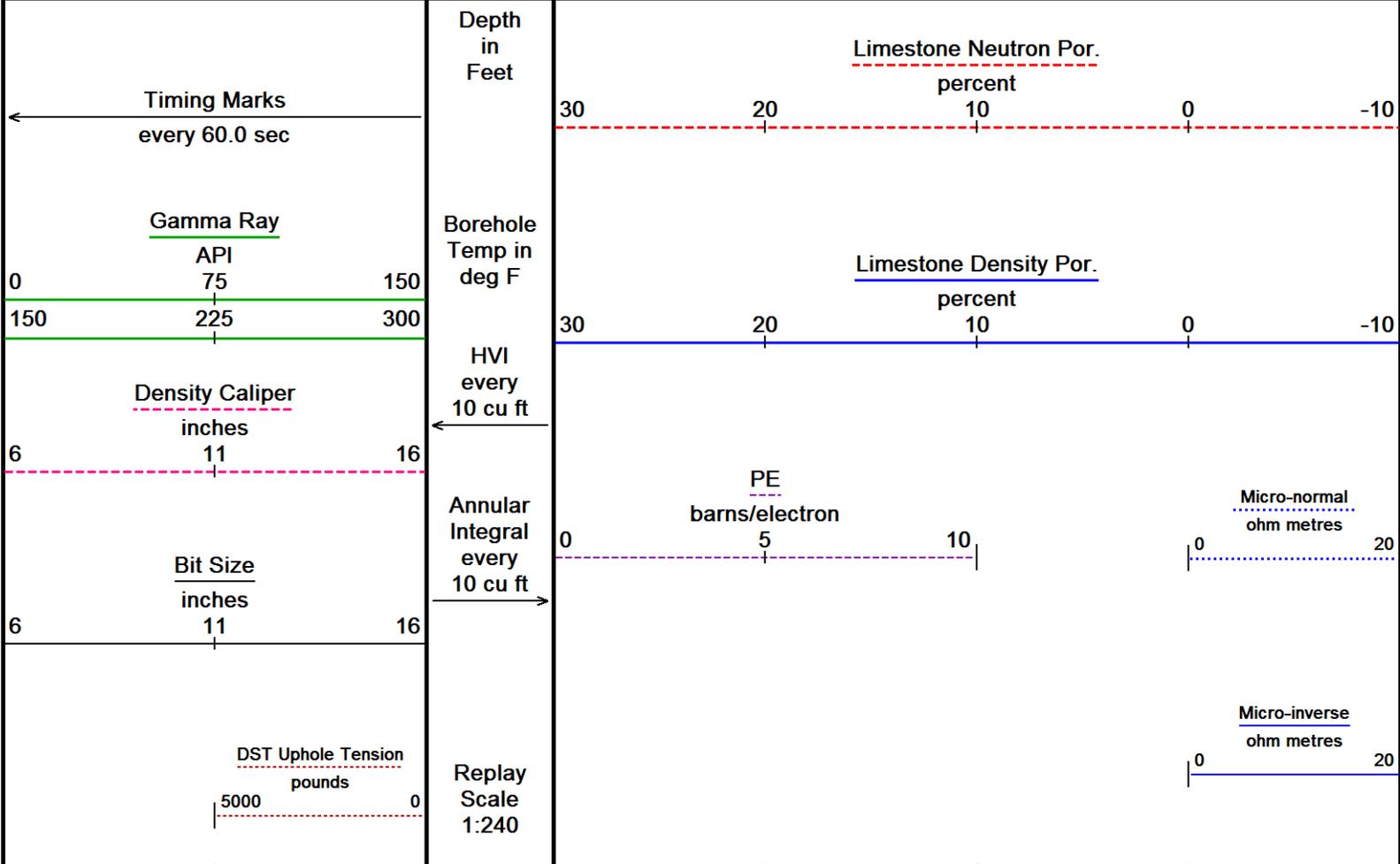
- SOFTWARE ISSUE: WLS 13.04.8492.
- MCG, MML, MDN, MPD, MFE, MAI RAN IN COMBINATION.
  - HARDWARE: DUAL BOWSPRING USED ON MDN.
  - 0.5 INCH STANDOFF USED ON MFE.
  - 0.5 INCH STANDOFF USED ON MAI.
- 2.71 G/CC LIMESTONE DENSITY MATRIX USED TO CALCULATE POROSITY.
- BOREHOLE RUGOSITY, TIGHT PULLS, AND WASHOUTS WILL AFFECT DATA QUALITY.
- ALL INTERVALS LOGGED AND SCALED PER CUSTOMER'S REQUEST.
- TOTAL HOLE VOLUME FROM TD TO SURFACE CASING: 1950 CU. FT.
- ANNULAR HOLE VOLUME WITH 5.5 INCH CASING FROM TD TO 2300 FT: 575 CU. FT.
- SERVICE ORDER # 3537801

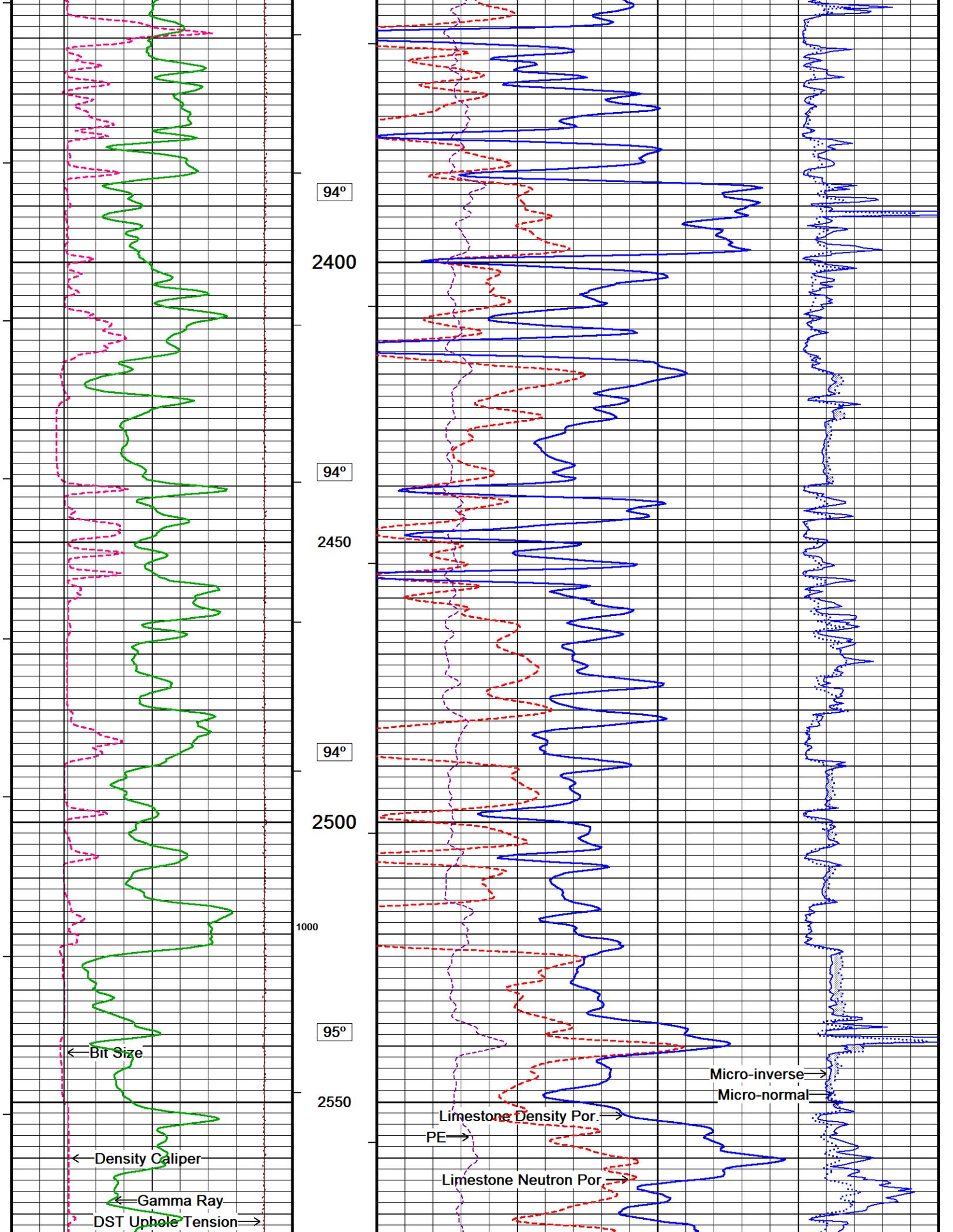
- RIG: MURFIN #25.  
 - ENGINEER: A. SILL.  
 - OPERATOR(S): M. STEGMAN.

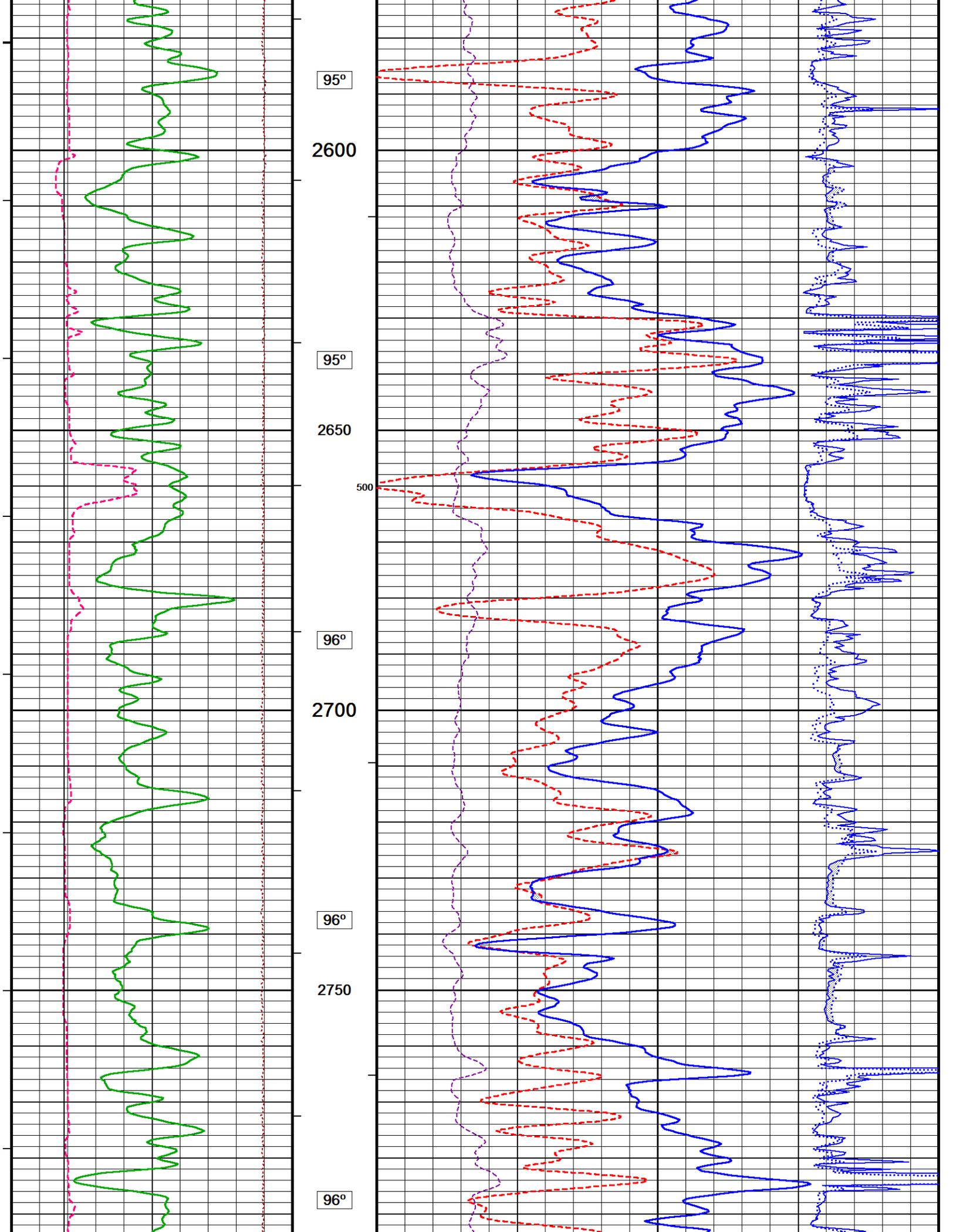
All interpretations are opinions based on inferences from electrical or other measurements and we cannot, and do not, guarantee the accuracy or correctness of any interpretations, and we shall not, except in the case of gross or wilful negligence on our part, be liable or responsible for any loss, costs, damages or expenses incurred or sustained by anyone resulting from any interpretation made by any of our officers, agents or employees. These interpretations are also subject to our general terms and conditions in our price schedule.

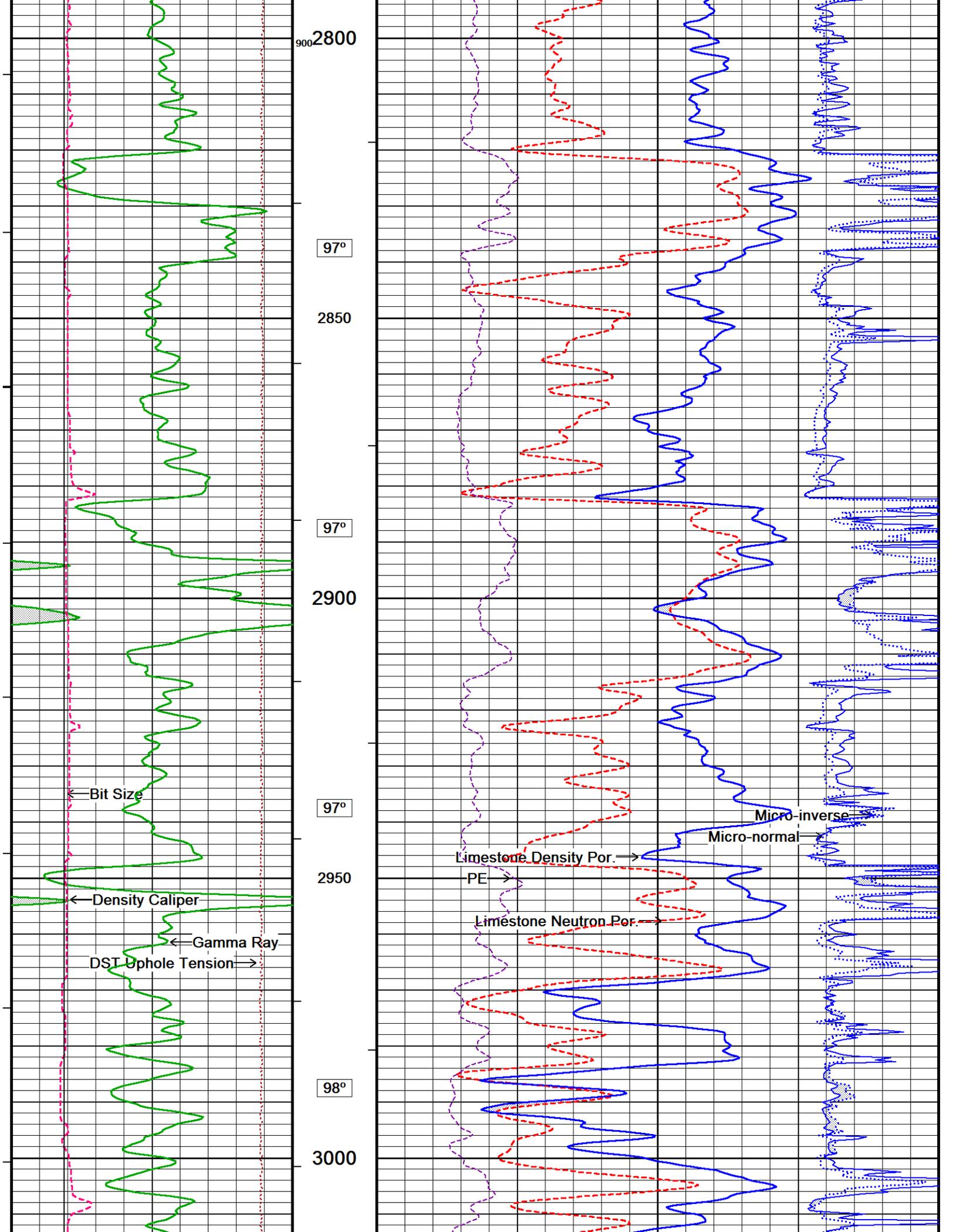
**5 INCH MAIN**

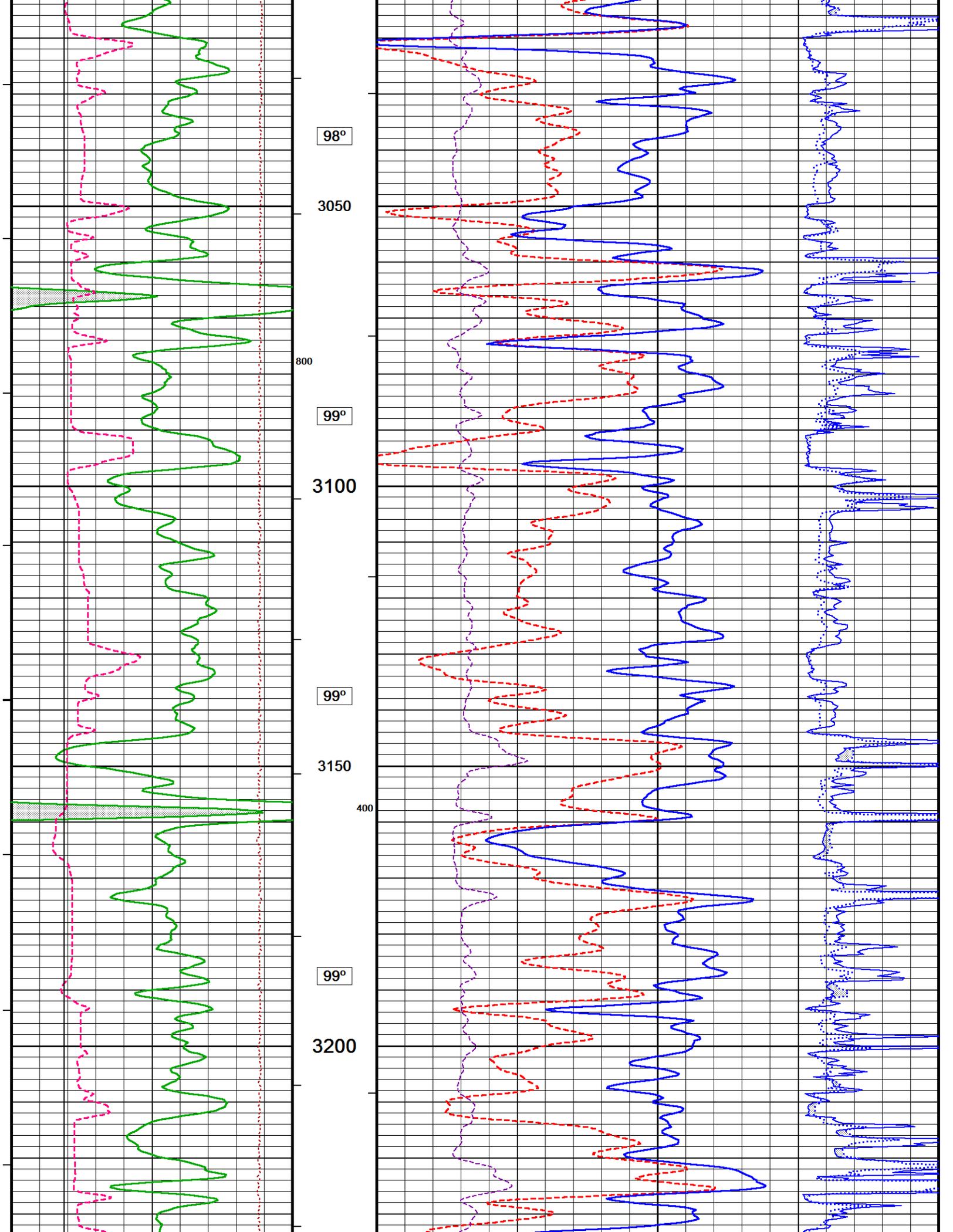
Depth Based Data - Maximum Sampling Increment 10.0cm Plotted on 10-JAN-2013 15:34  
 Filename: C:\Users\E143235\AppData\Local\Temp\Weather...\Western Operating Helfrich #1-6\_005.dta Recorded on 04-JAN-2013 07:46  
 System Versions: Logged with 13.04.8492 Plotted with 13.05.8506

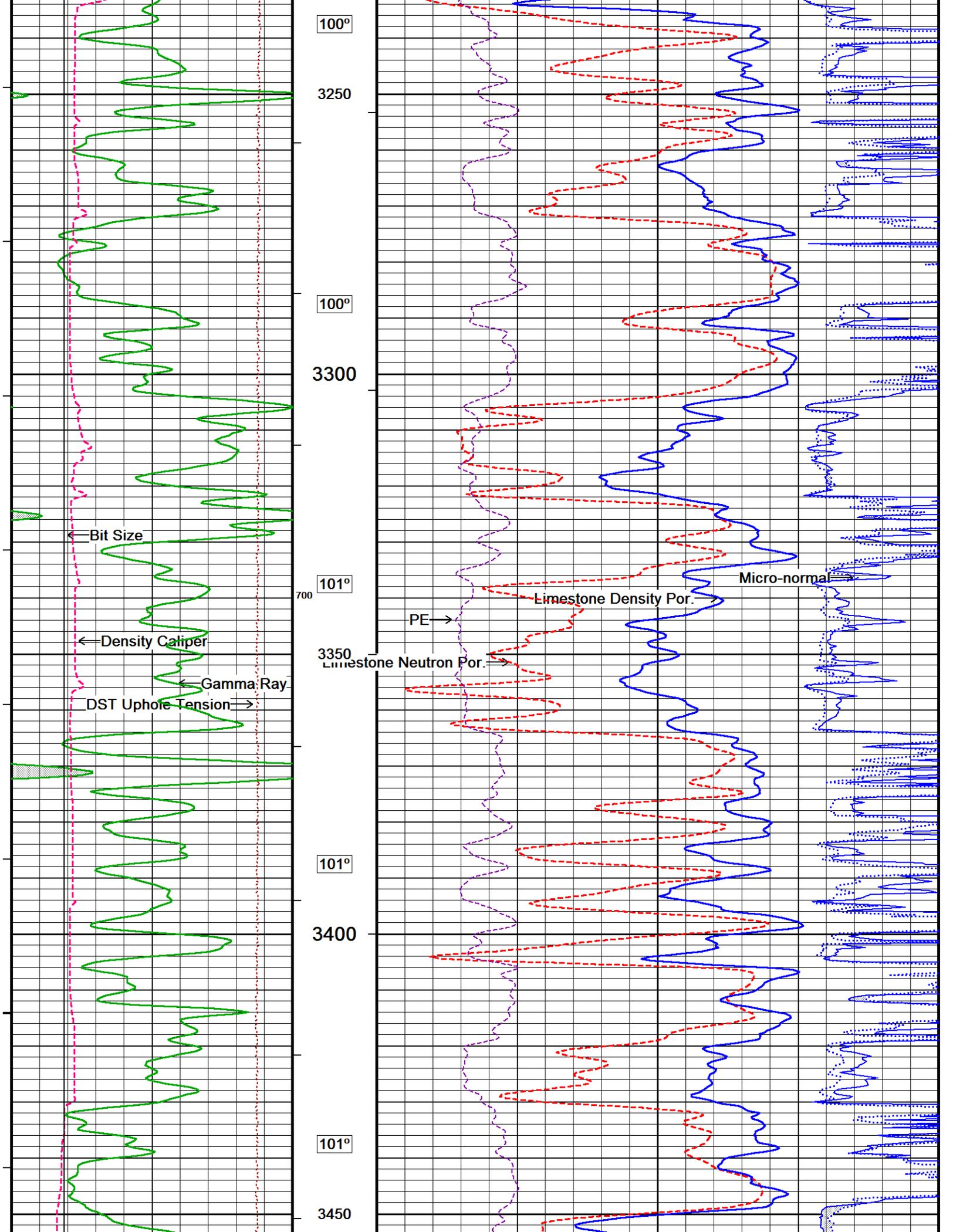


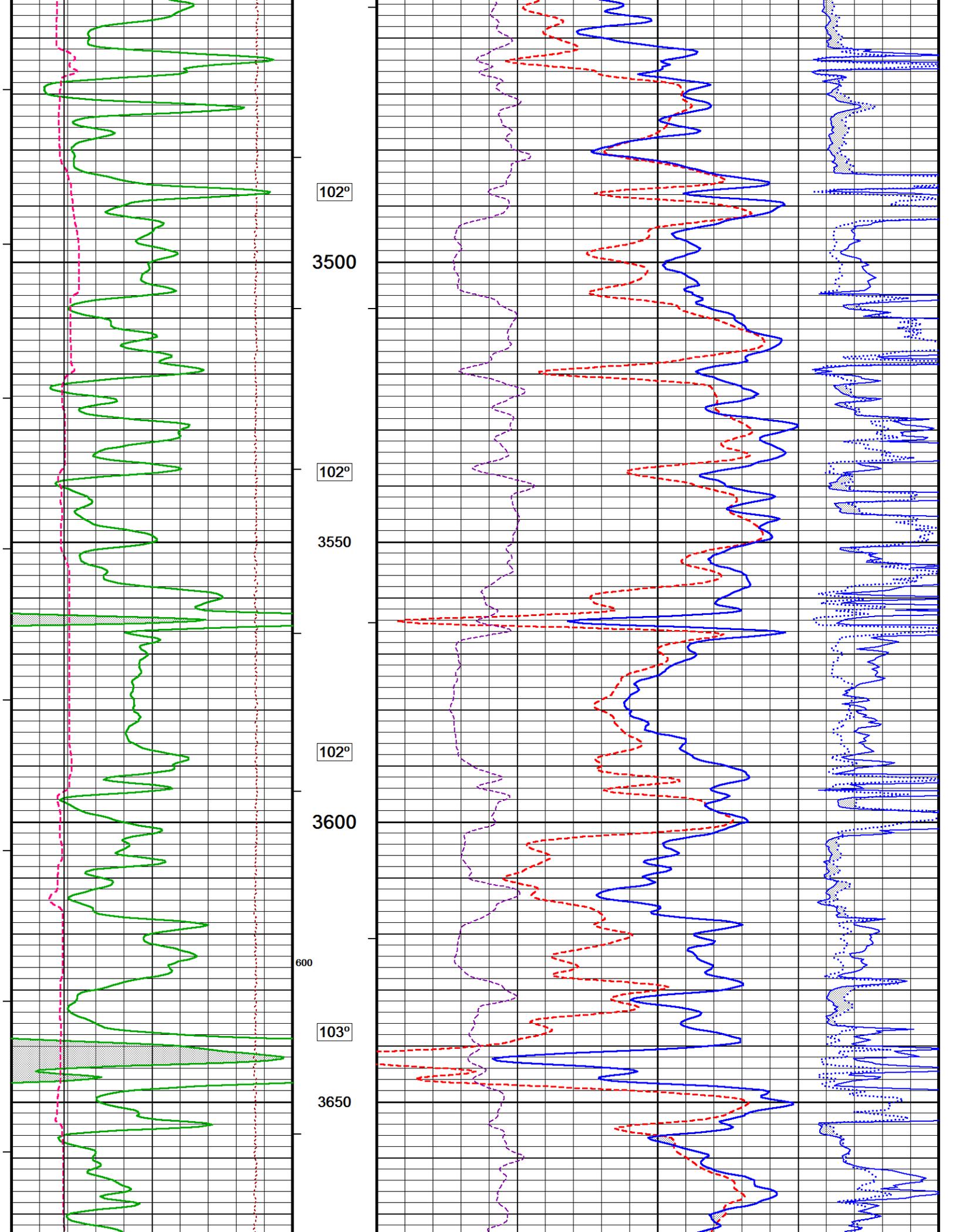


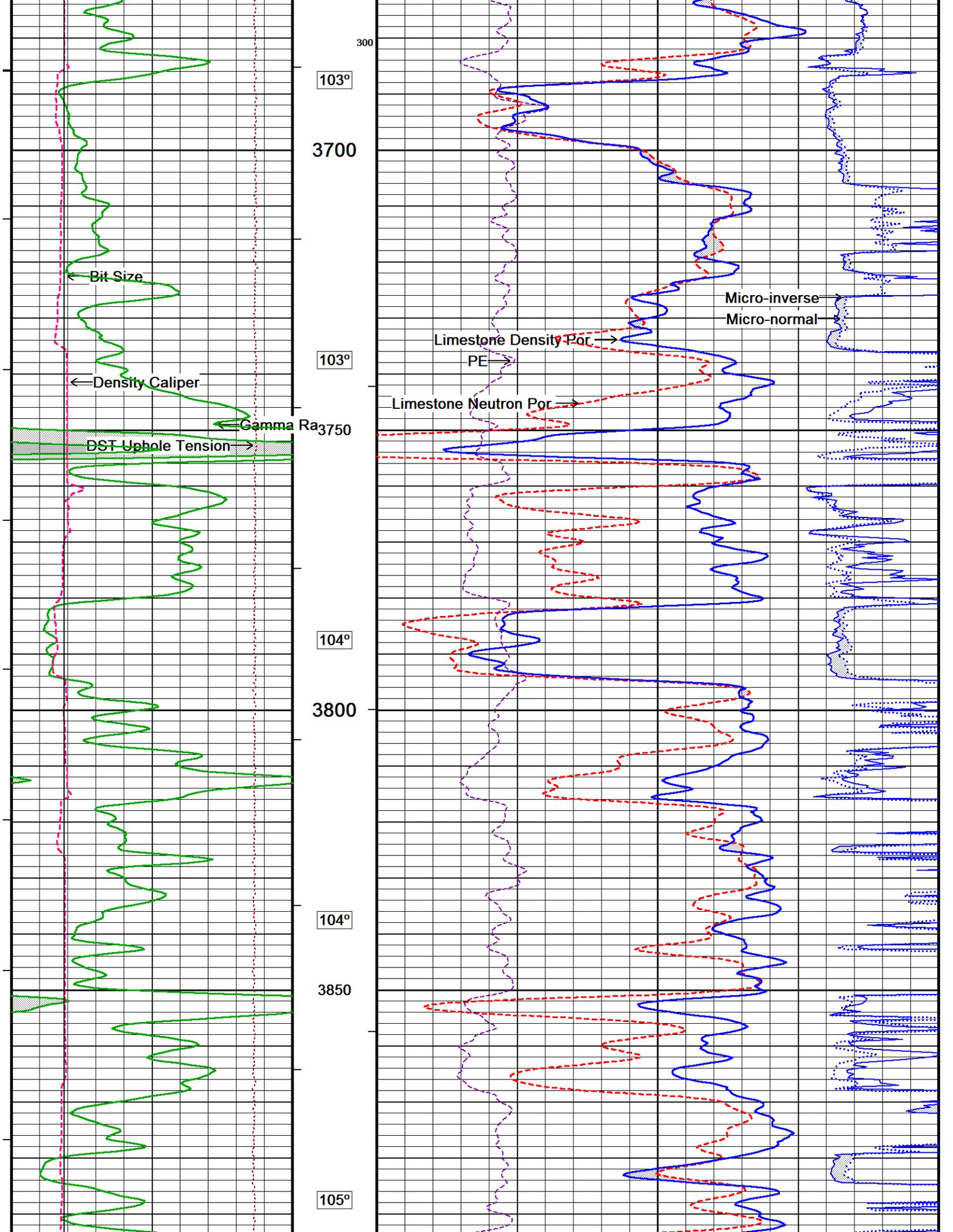


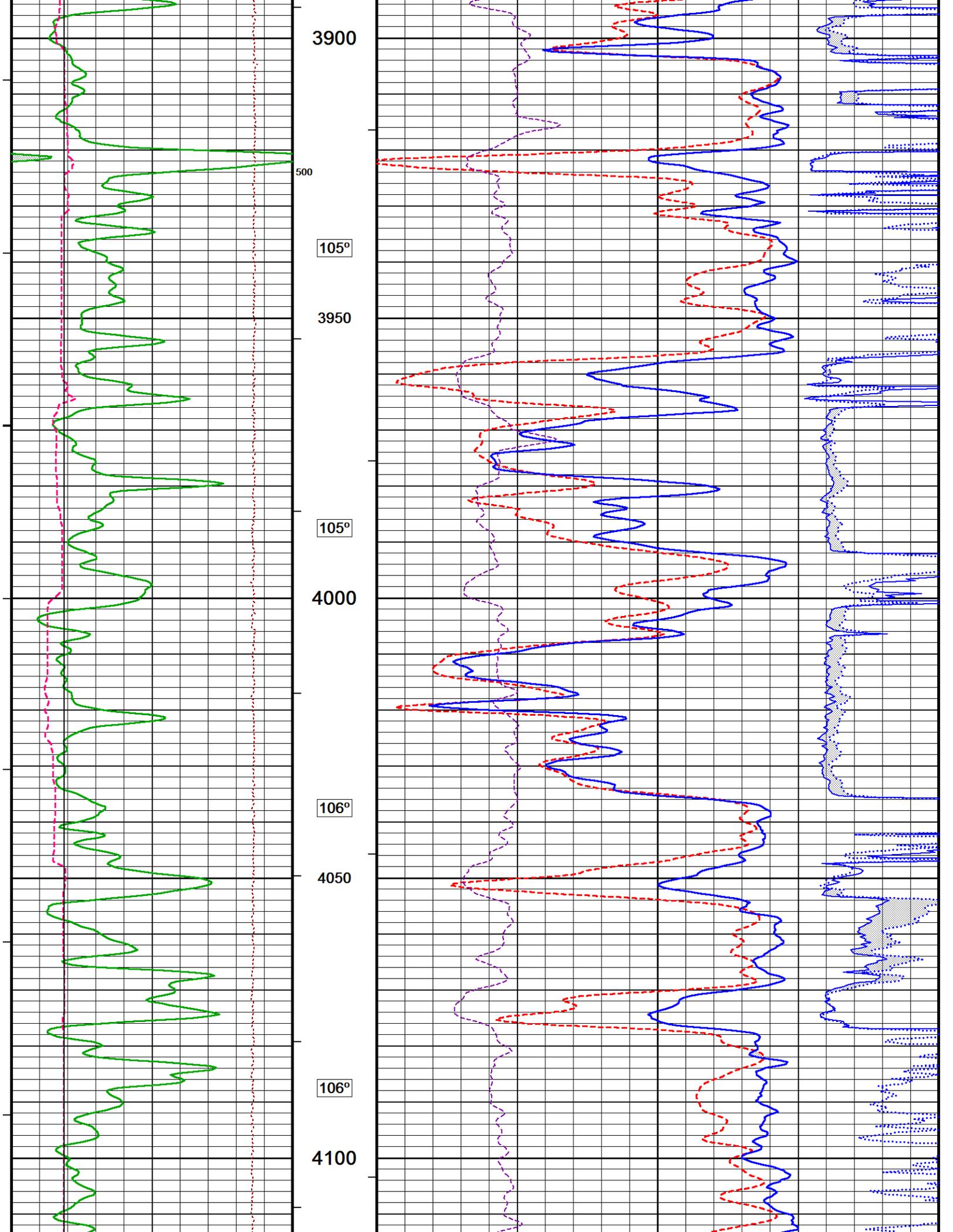


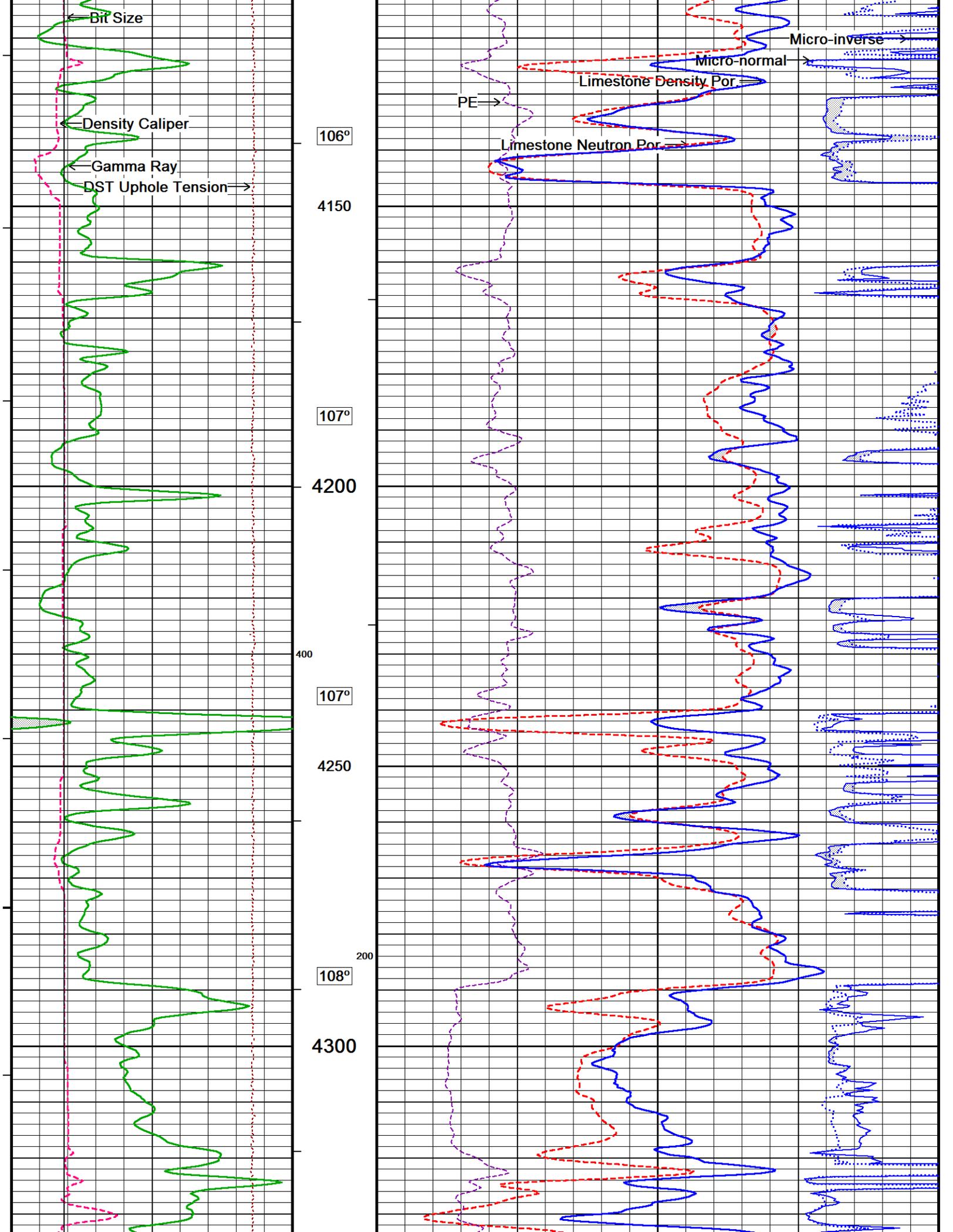


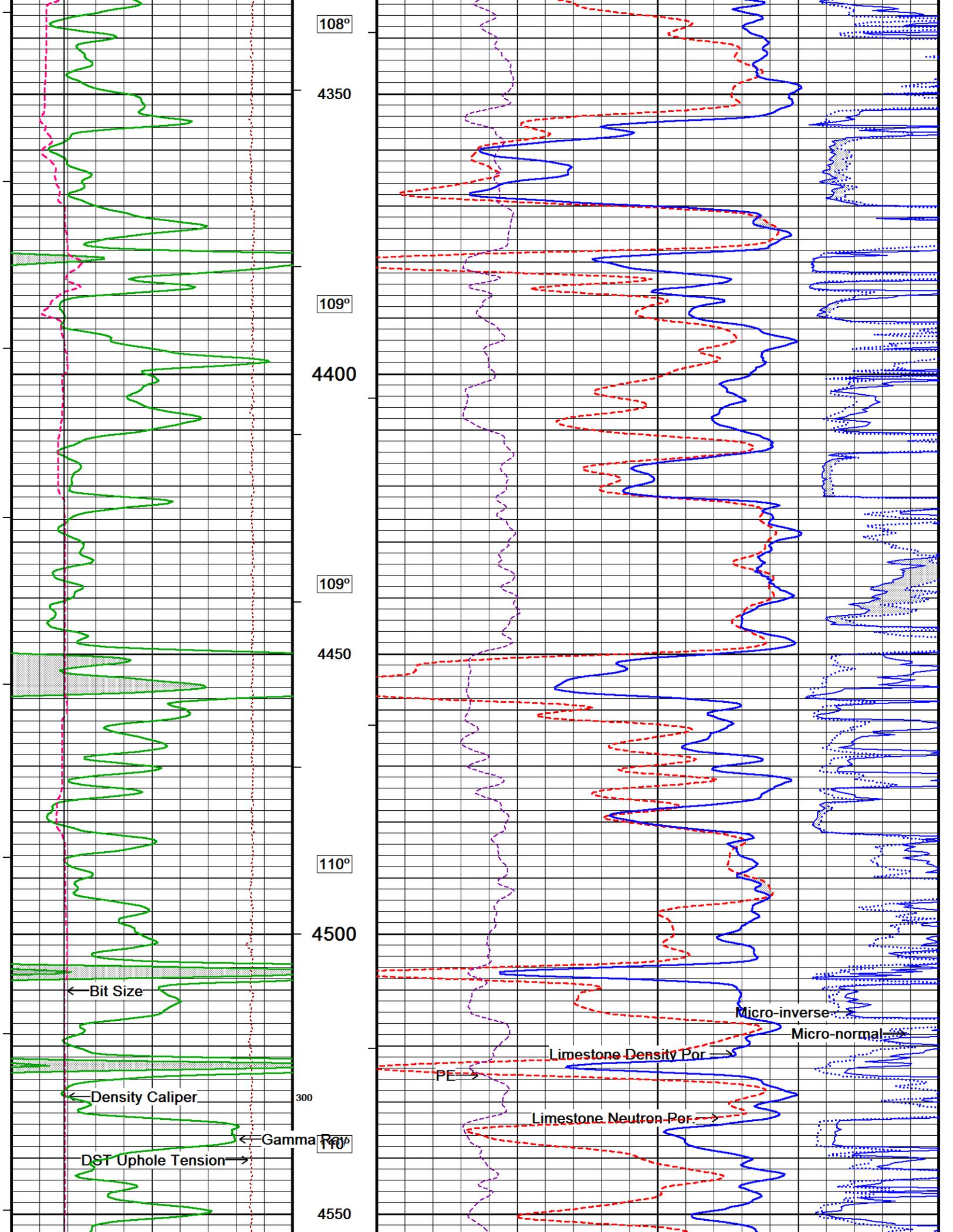


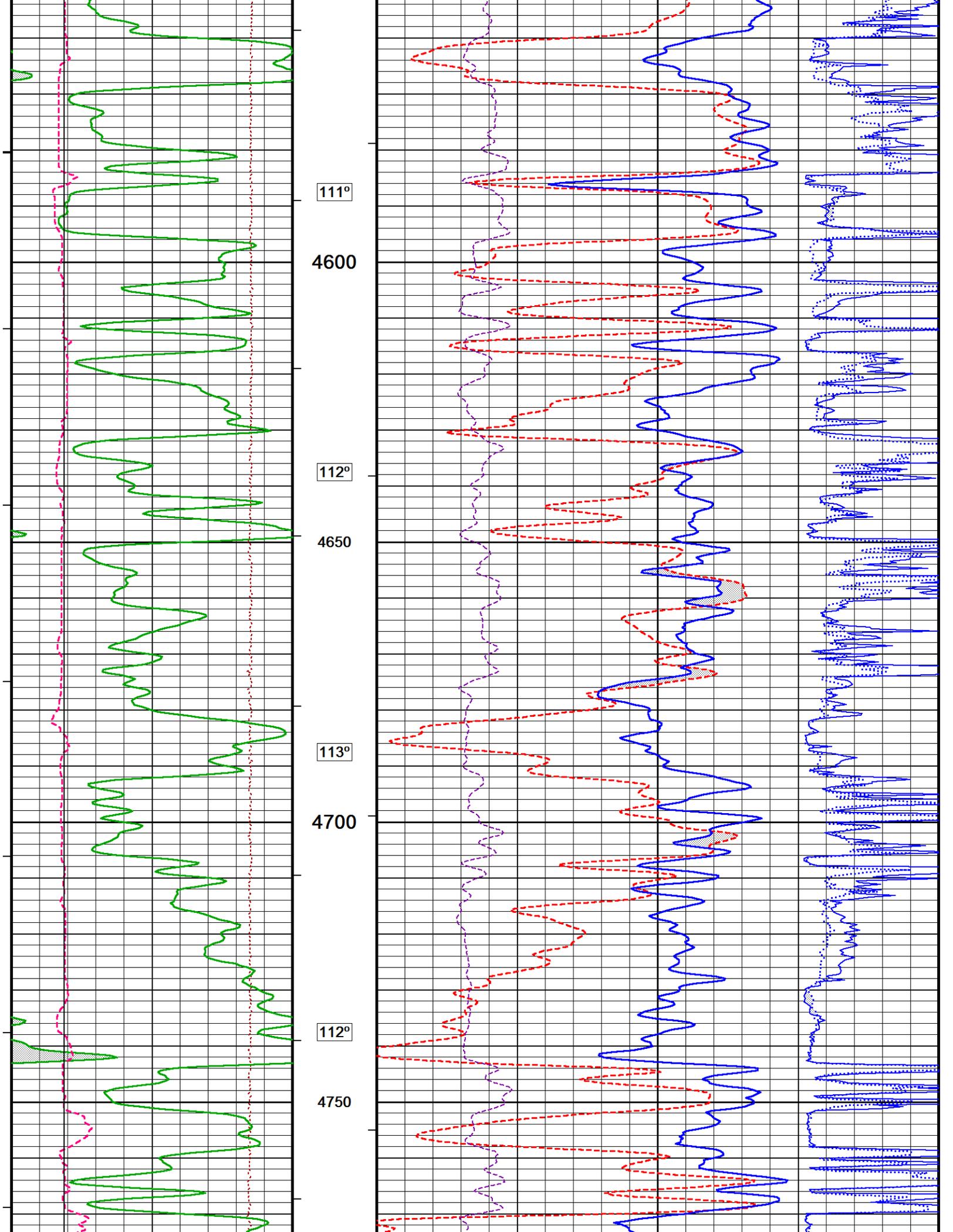


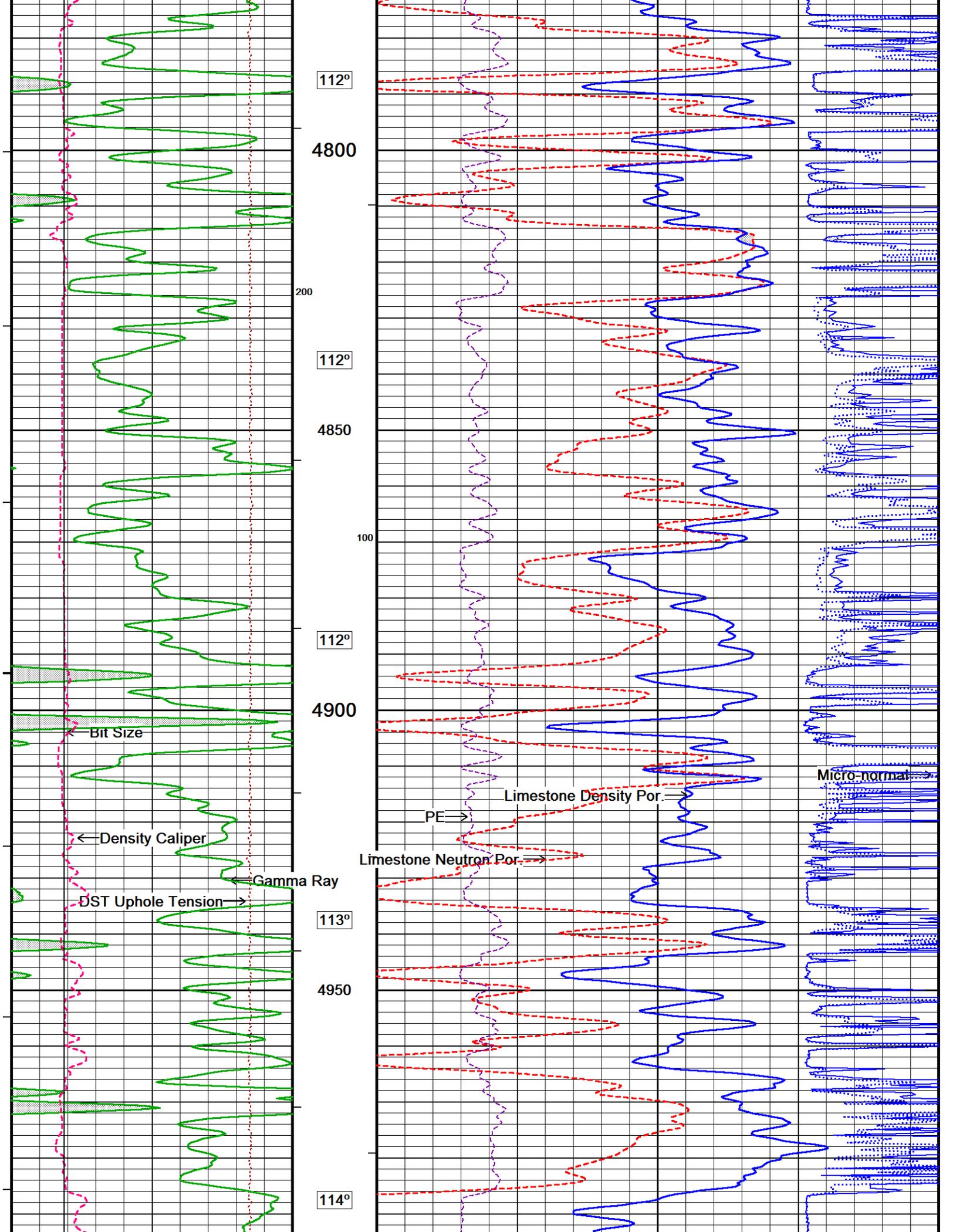


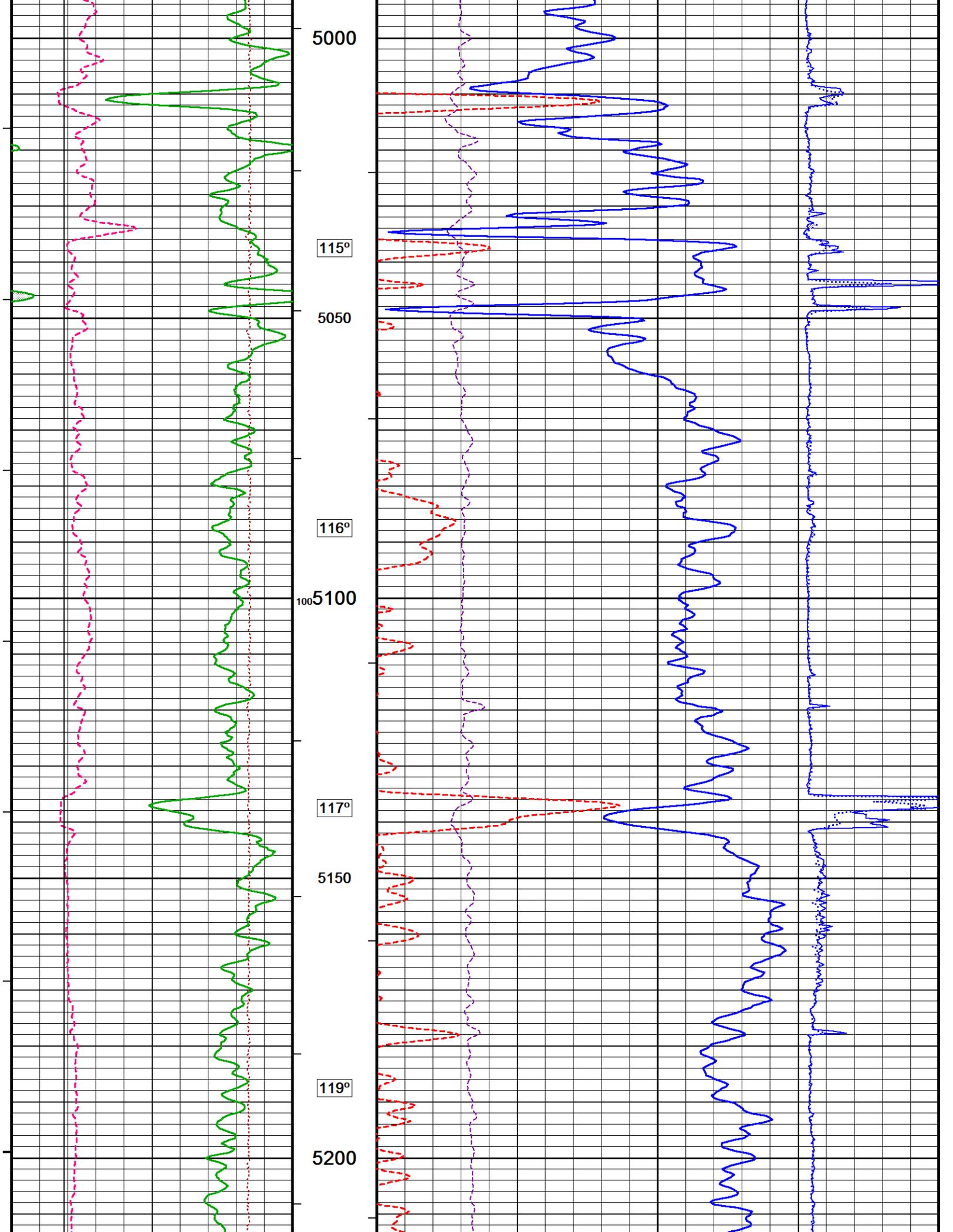


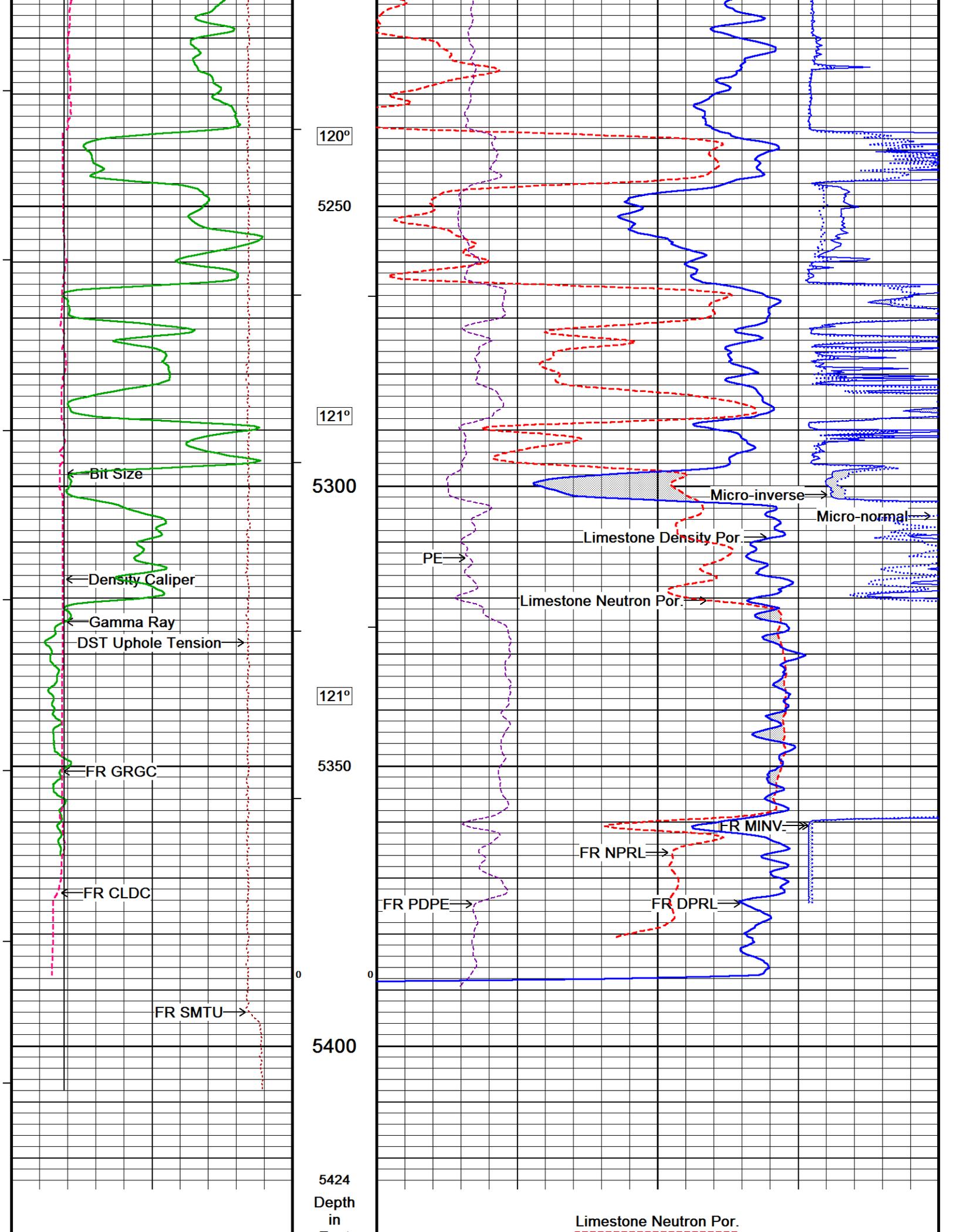












120°

5250

121°

5300

121°

5350

0

5400

5424

Depth in

← Bit Size

← Density Caliper

← Gamma Ray

DST Uphole Tension →

← FR GRGC

← FR CLDC

FR SMTU →

PE →

Limestone Density Por. →

Limestone Neutron Por. →

Micro-inverse →

Micro-normal →

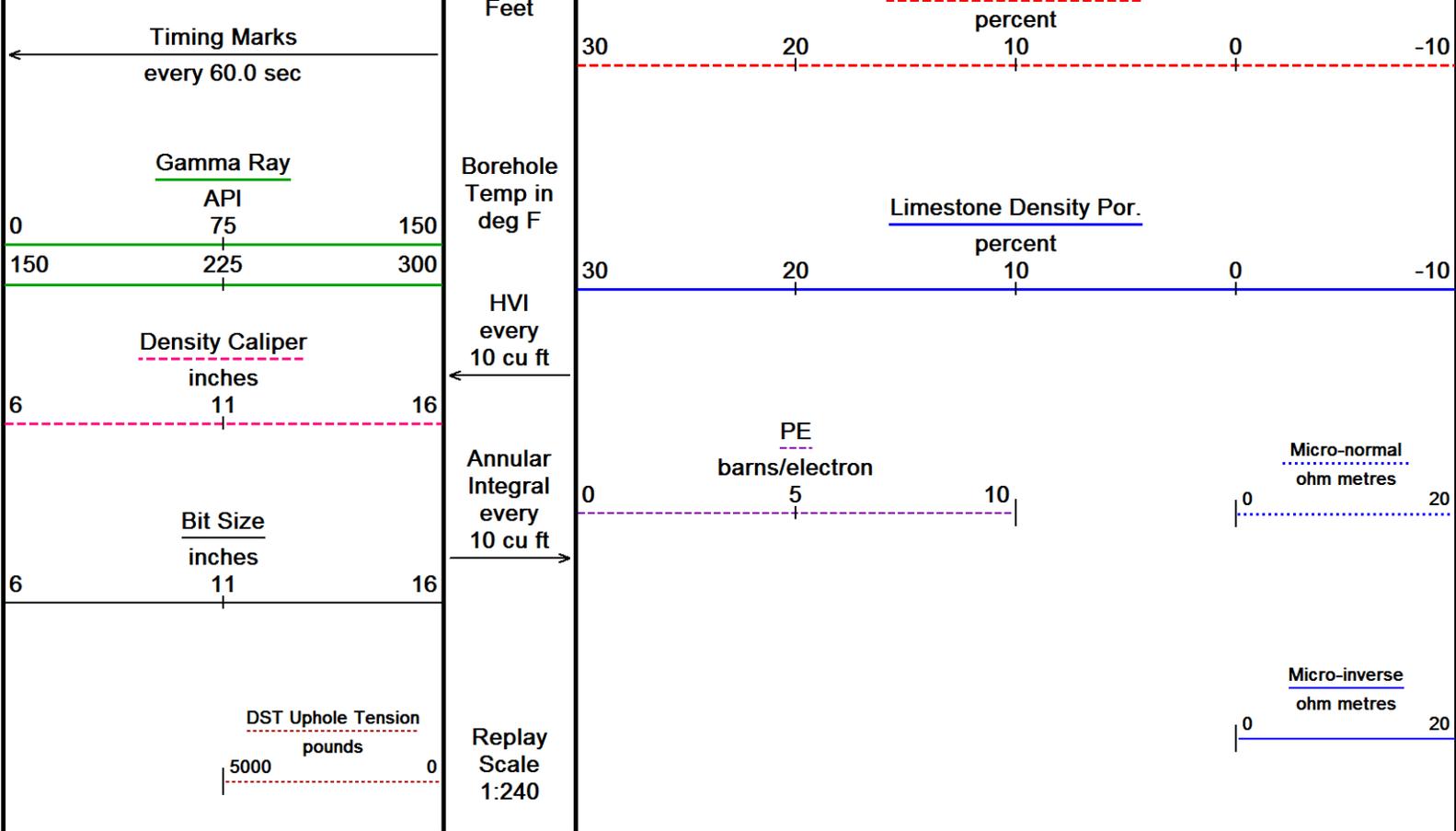
FR NPRL →

FR MINV. →

FR PDPE →

FR DPRL →

Limestone Neutron Por.

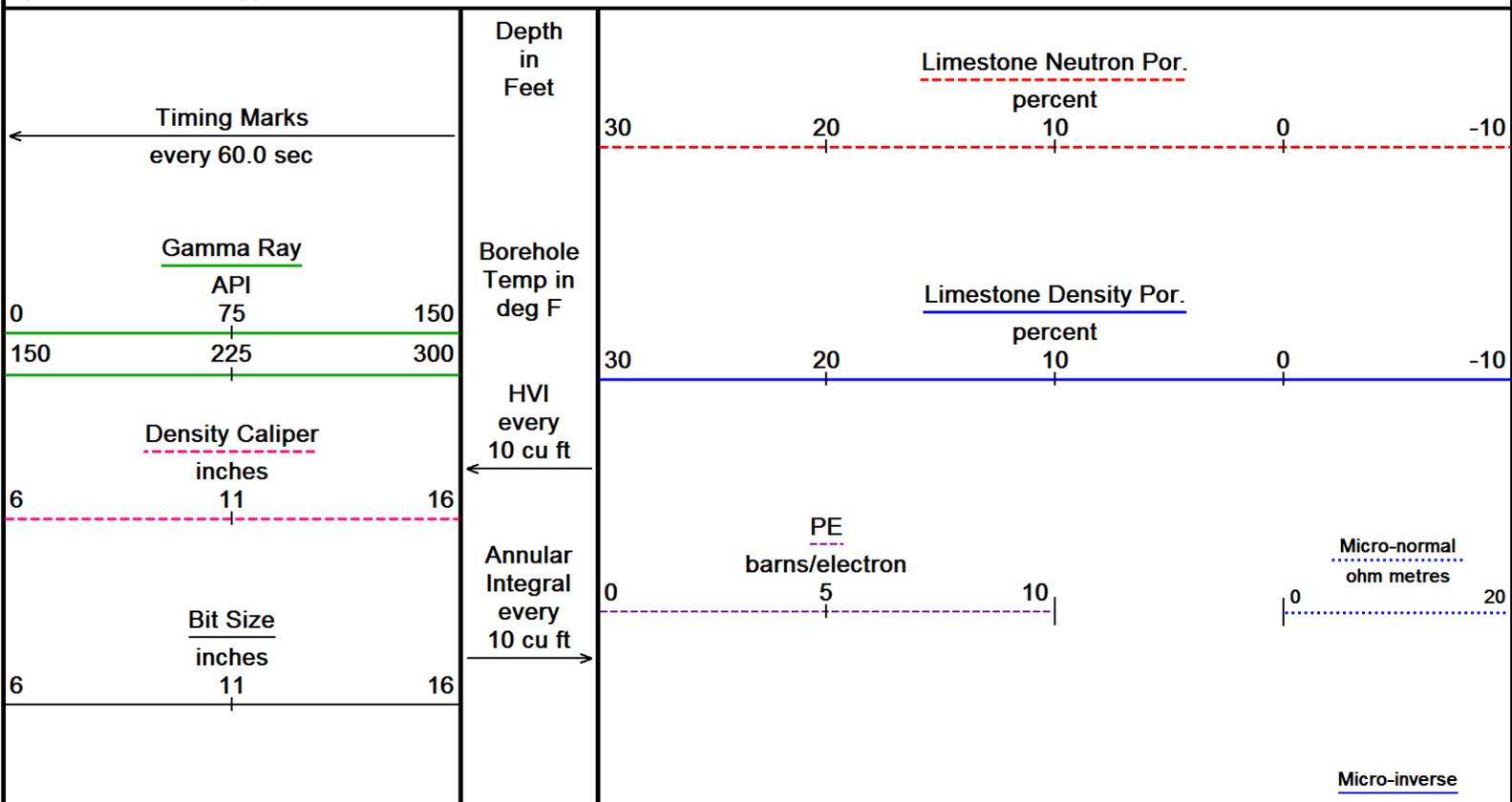


Depth Based Data - Maximum Sampling Increment 10.0cm Plotted on 10-JAN-2013 15:34  
 Filename: C:\Users\E143235\AppData\Local\Temp\Weather...\Western Operating Helfrich #1-6\_005.dta Recorded on 04-JAN-2013 07:46  
 System Versions: Logged with 13.04.8492 Plotted with 13.05.8506

↑ 5 INCH MAIN ↑

↓ REPEAT SECTION ↓

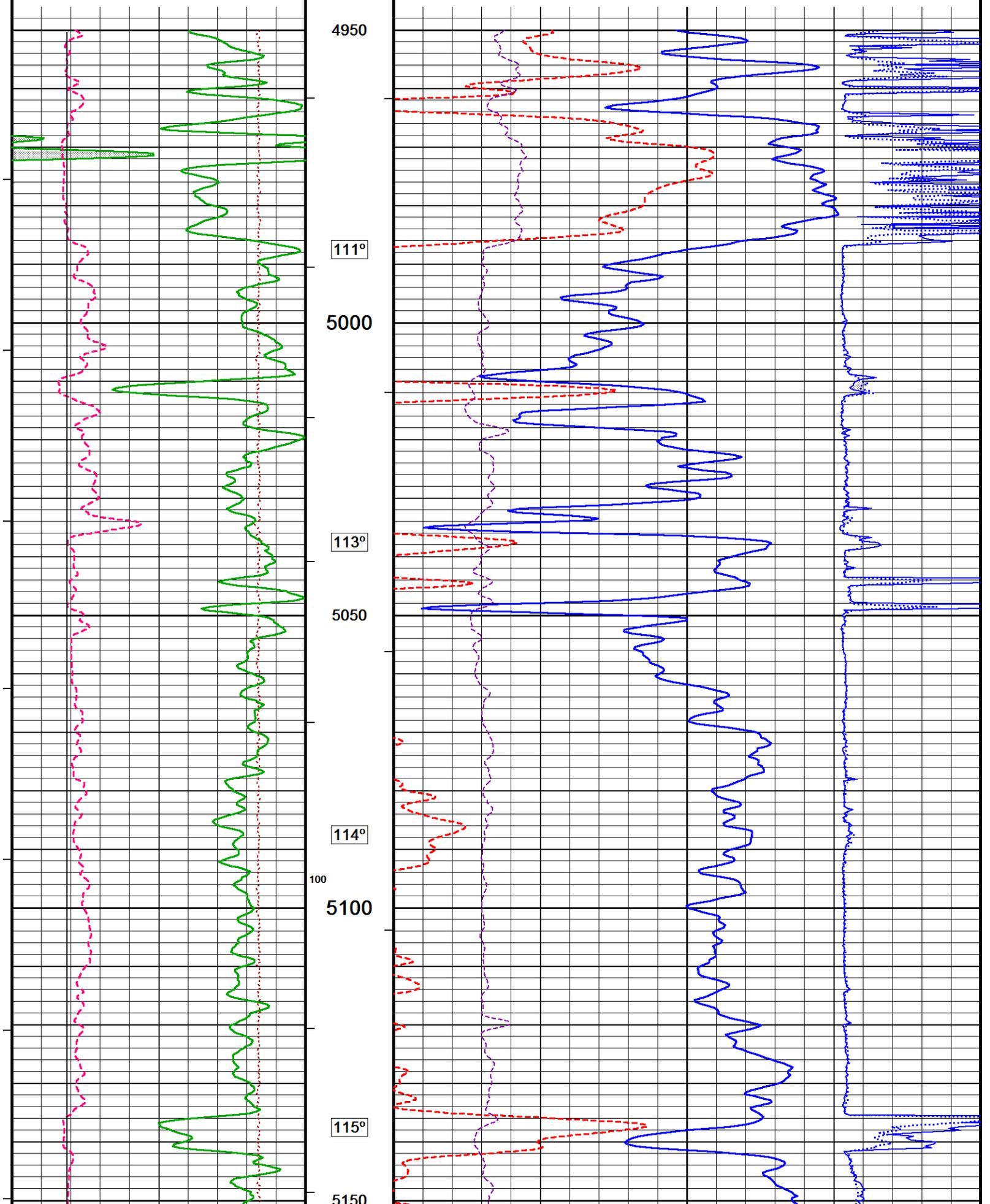
Depth Based Data - Maximum Sampling Increment 10.0cm Plotted on 10-JAN-2013 15:34  
 Filename: C:\Users\E143235\AppData\Local\Temp\Weather...\Western Operating Helfrich #1-6\_002.dta Recorded on 04-JAN-2013 06:48  
 System Versions: Logged with 13.04.8492 Plotted with 13.05.8506

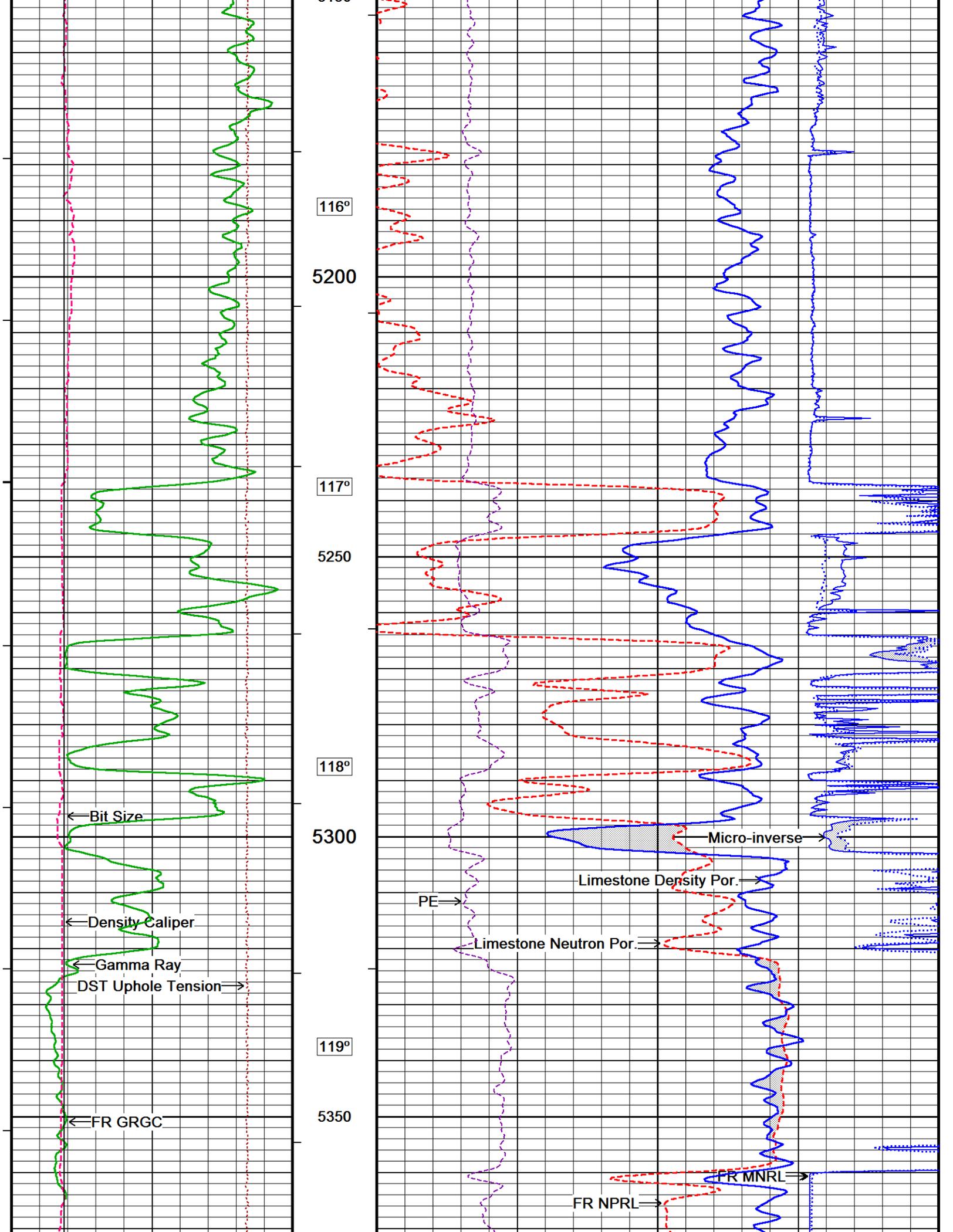


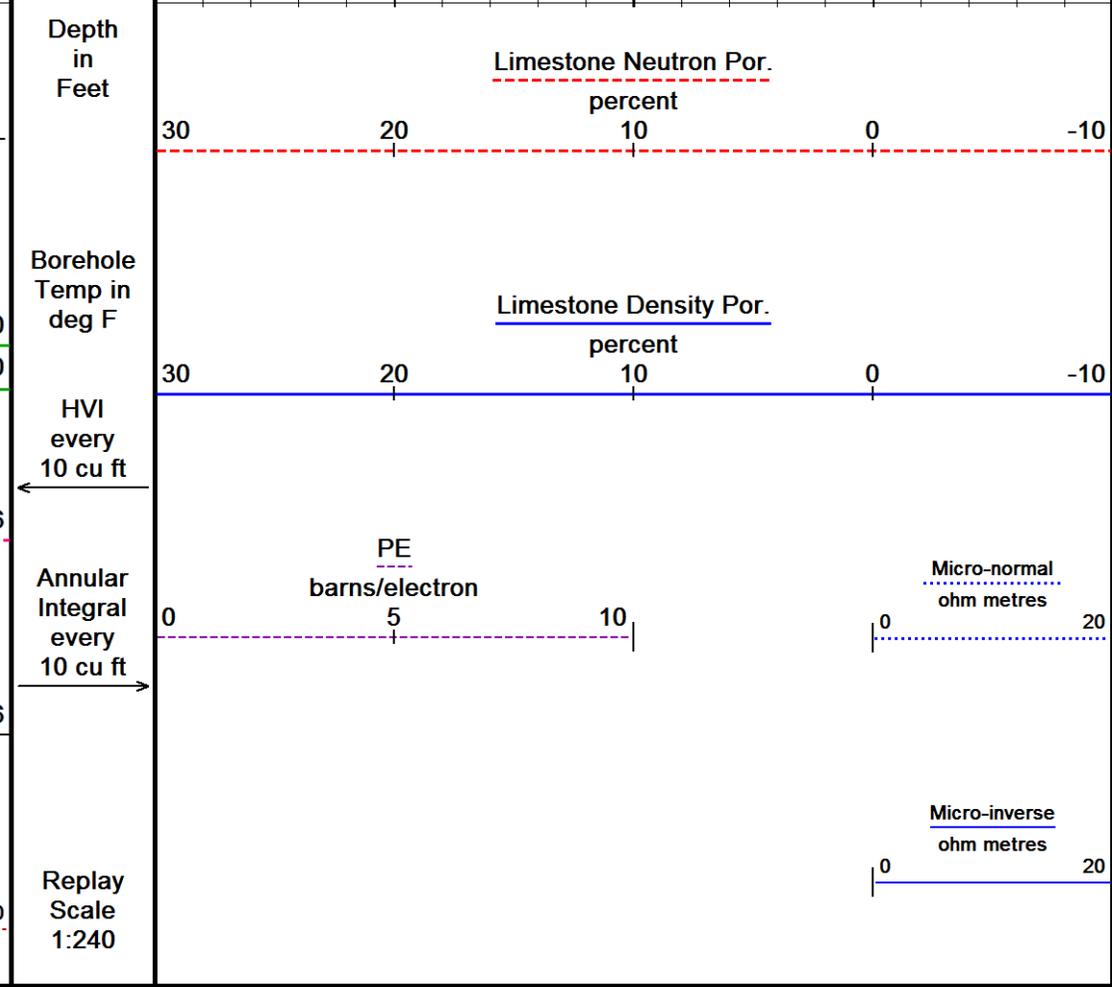
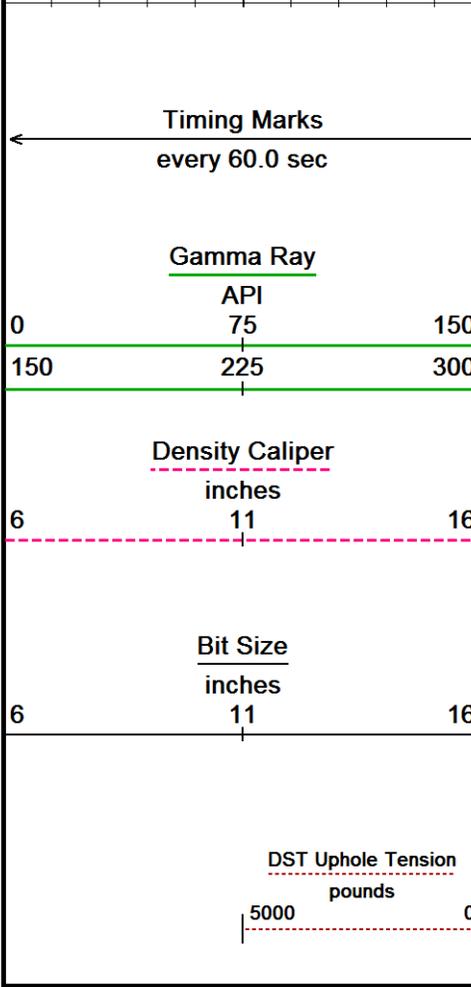
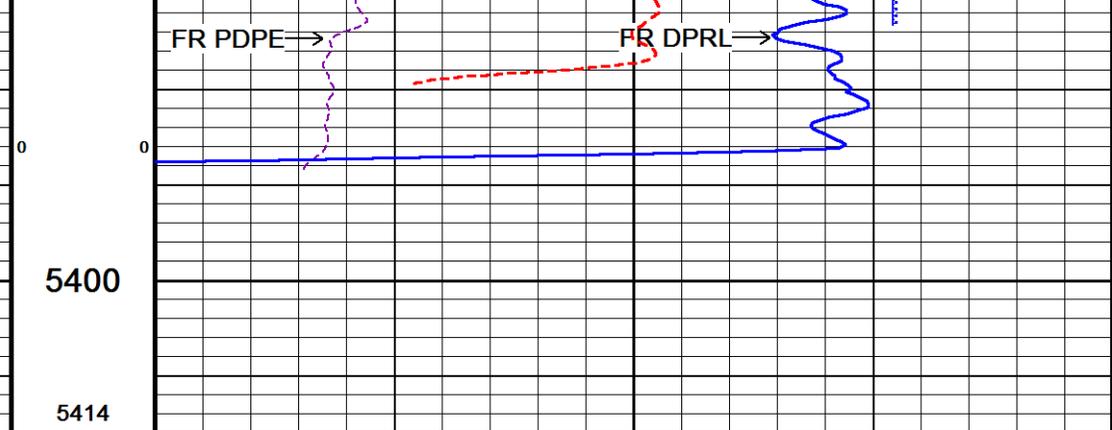
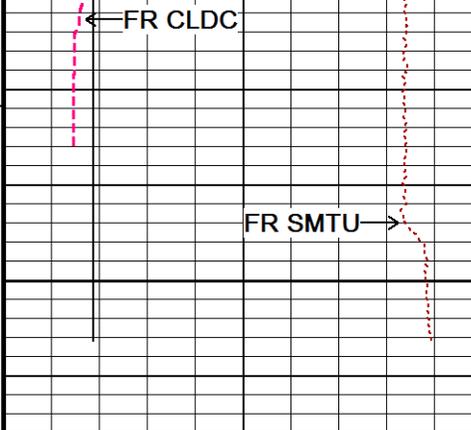
DST Uphole Tension  
pounds  
5000 0

Replay  
Scale  
1:240

0 ohm metres 20





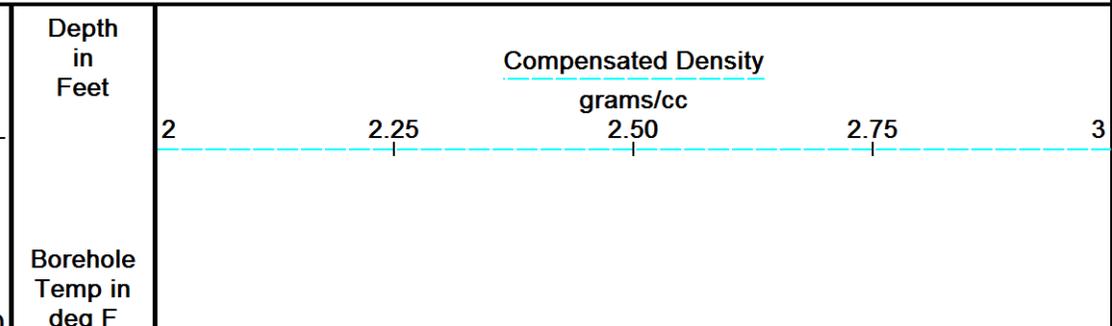
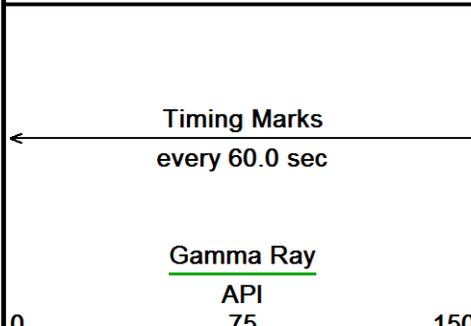


Depth Based Data - Maximum Sampling Increment 10.0cm  
 Plotted on 10-JAN-2013 15:34  
 Filename: C:\Users\E143235\AppData\Local\Temp\Weather...\Western Operating Helfrich #1-6\_002.dta  
 Recorded on 04-JAN-2013 06:48  
 System Versions: Logged with 13.04.8492 Plotted with 13.05.8506

↑ REPEAT SECTION ↑

↓ 5 INCH MAIN ↓

Depth Based Data - Maximum Sampling Increment 10.0cm  
 Plotted on 10-JAN-2013 15:34  
 Filename: C:\Users\E143235\AppData\Local\Temp\Weather...\Western Operating Helfrich #1-6\_005.dta  
 Recorded on 04-JAN-2013 07:46  
 System Versions: Logged with 13.04.8492 Plotted with 13.05.8506



150 225 300

Density Caliper  
inches  
6 11 16

Bit Size  
inches  
6 11 16

DST Uphole Tension  
pounds  
5000 0

HVI every  
10 cu ft  
Annular  
Integral every  
10 cu ft

Replay  
Scale  
1:240

Limestone Density Por.

percent

30 20 10 0 -10

PE  
barns/electron

Density Correction  
grams/cc

0 5 10 -0.50 0 0.50

2300

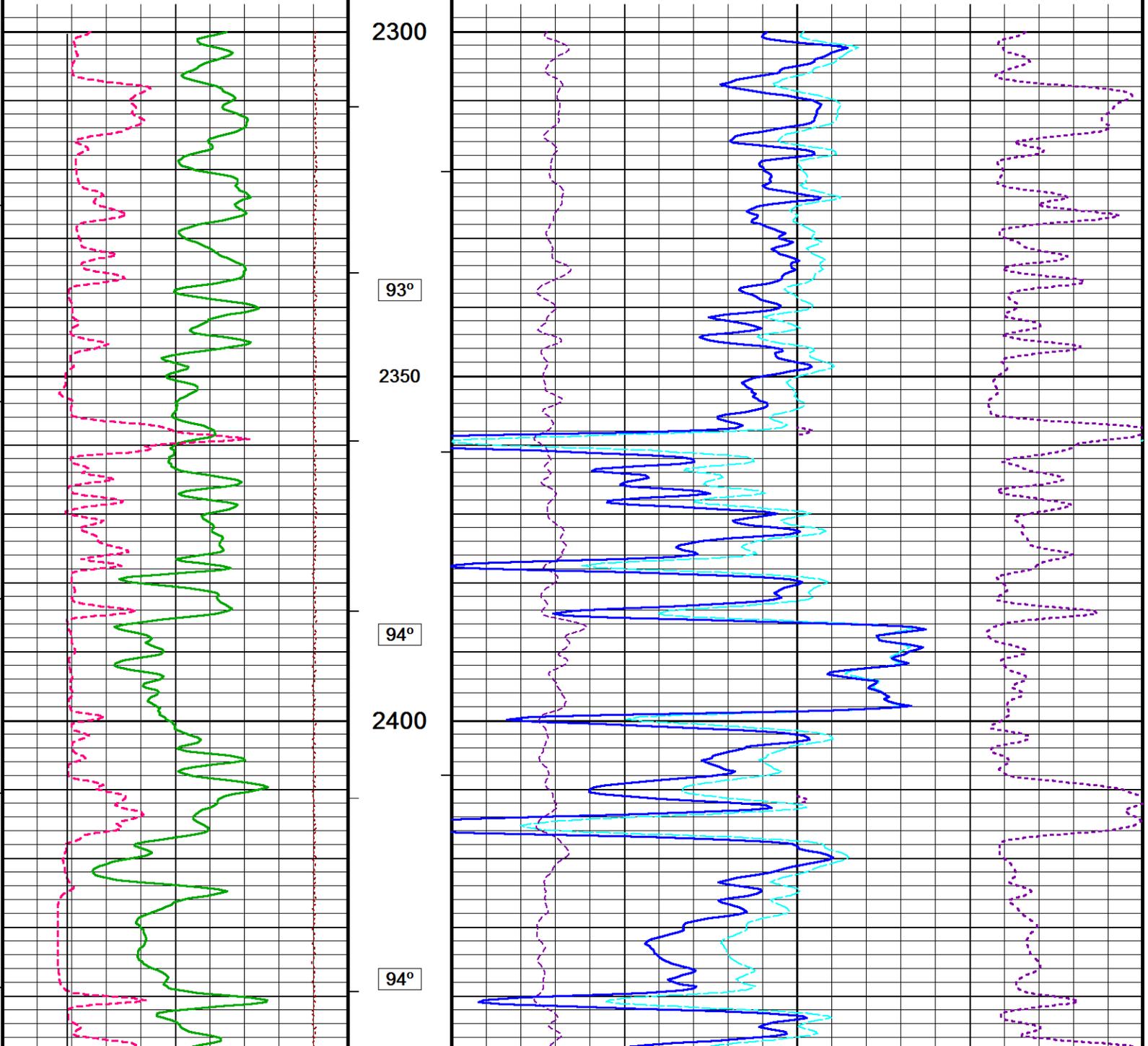
93°

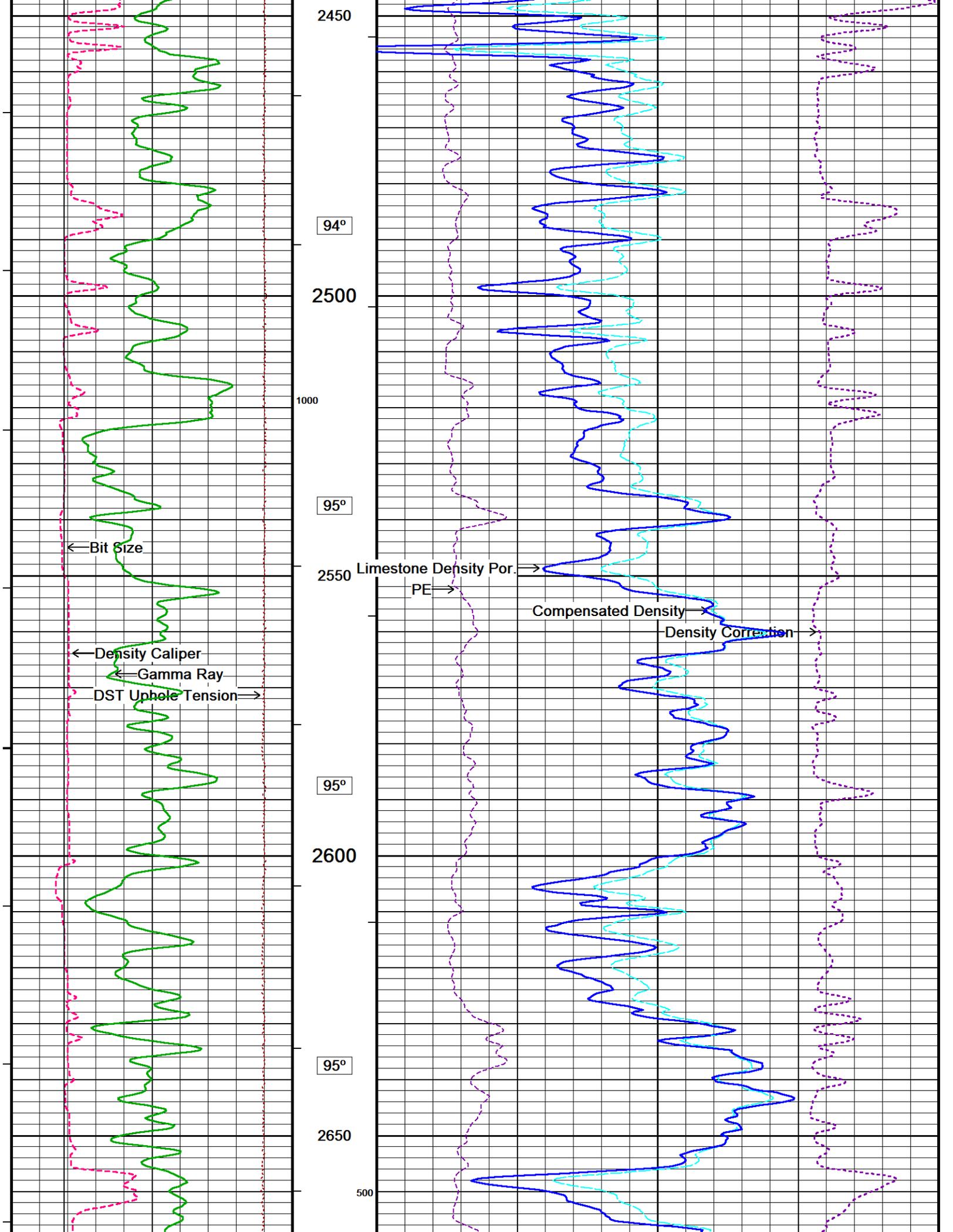
2350

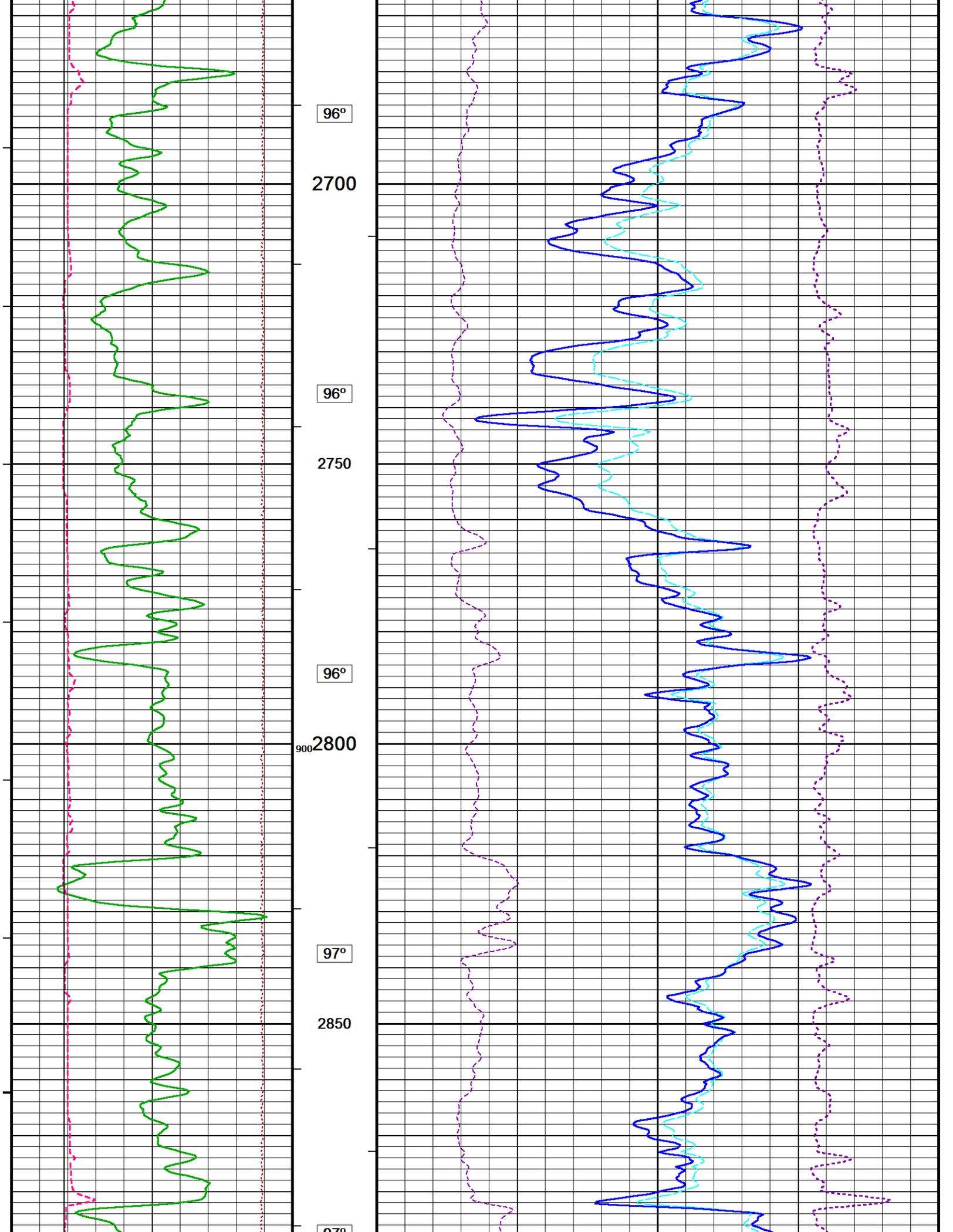
94°

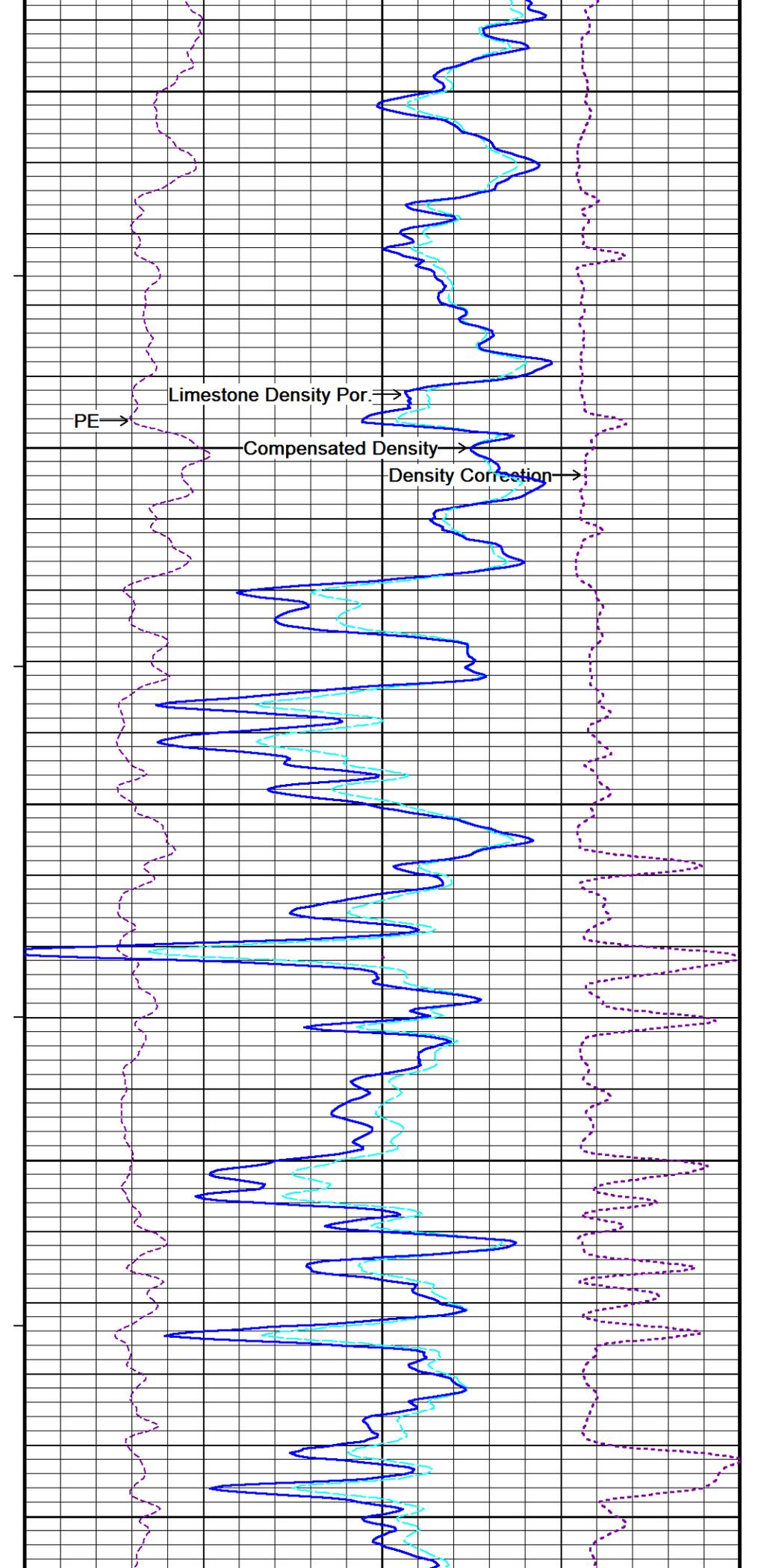
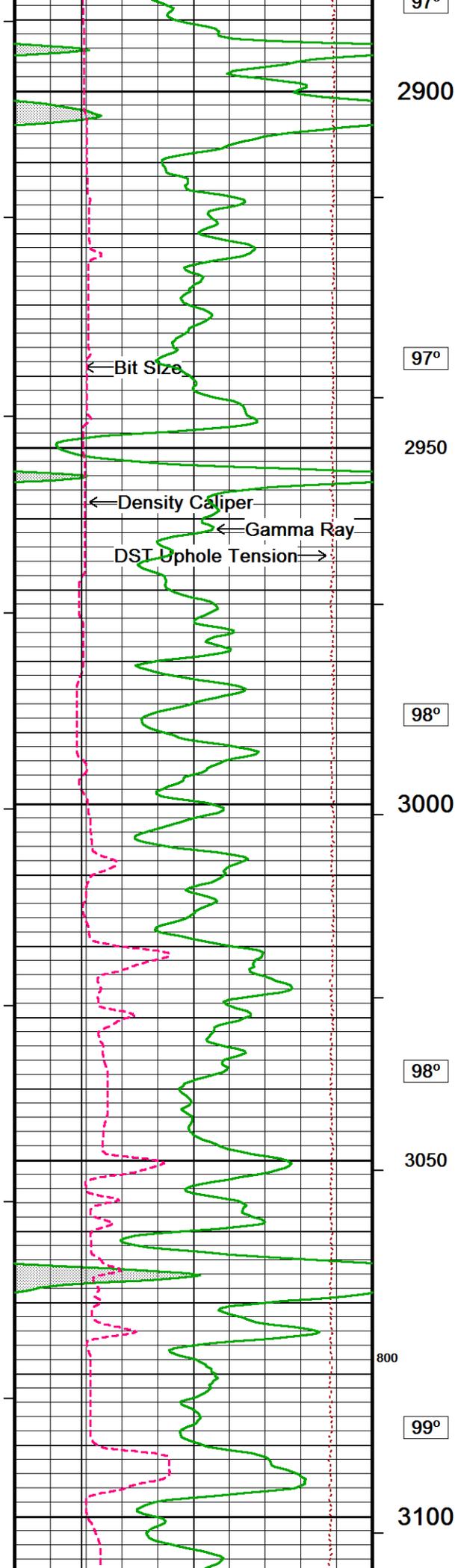
2400

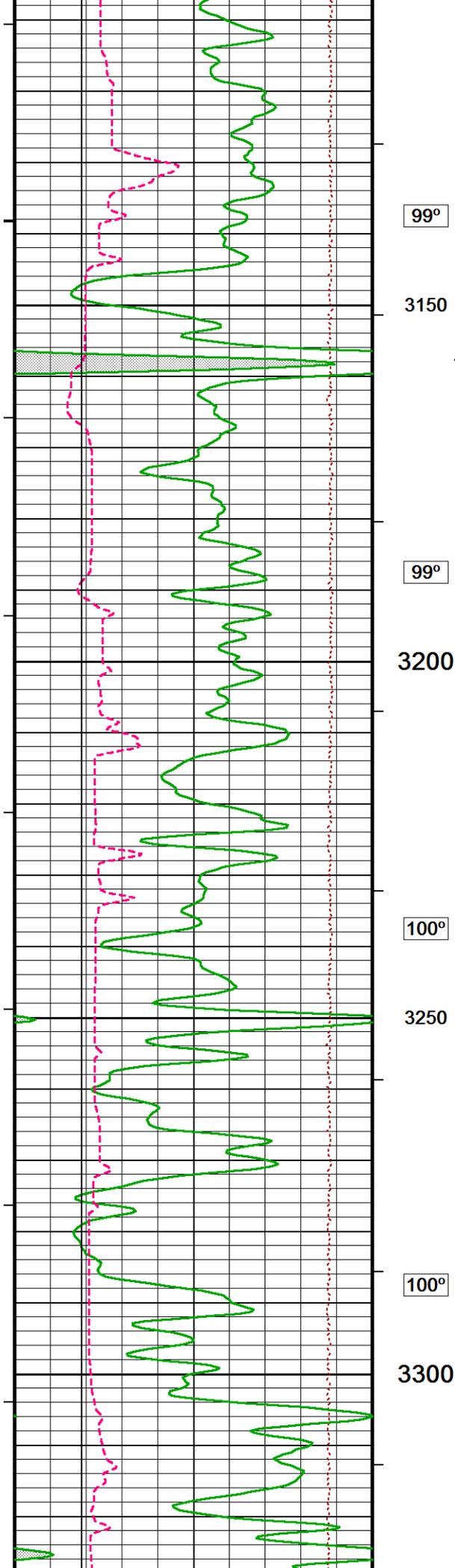
94°











$99^\circ$

3150

400

$99^\circ$

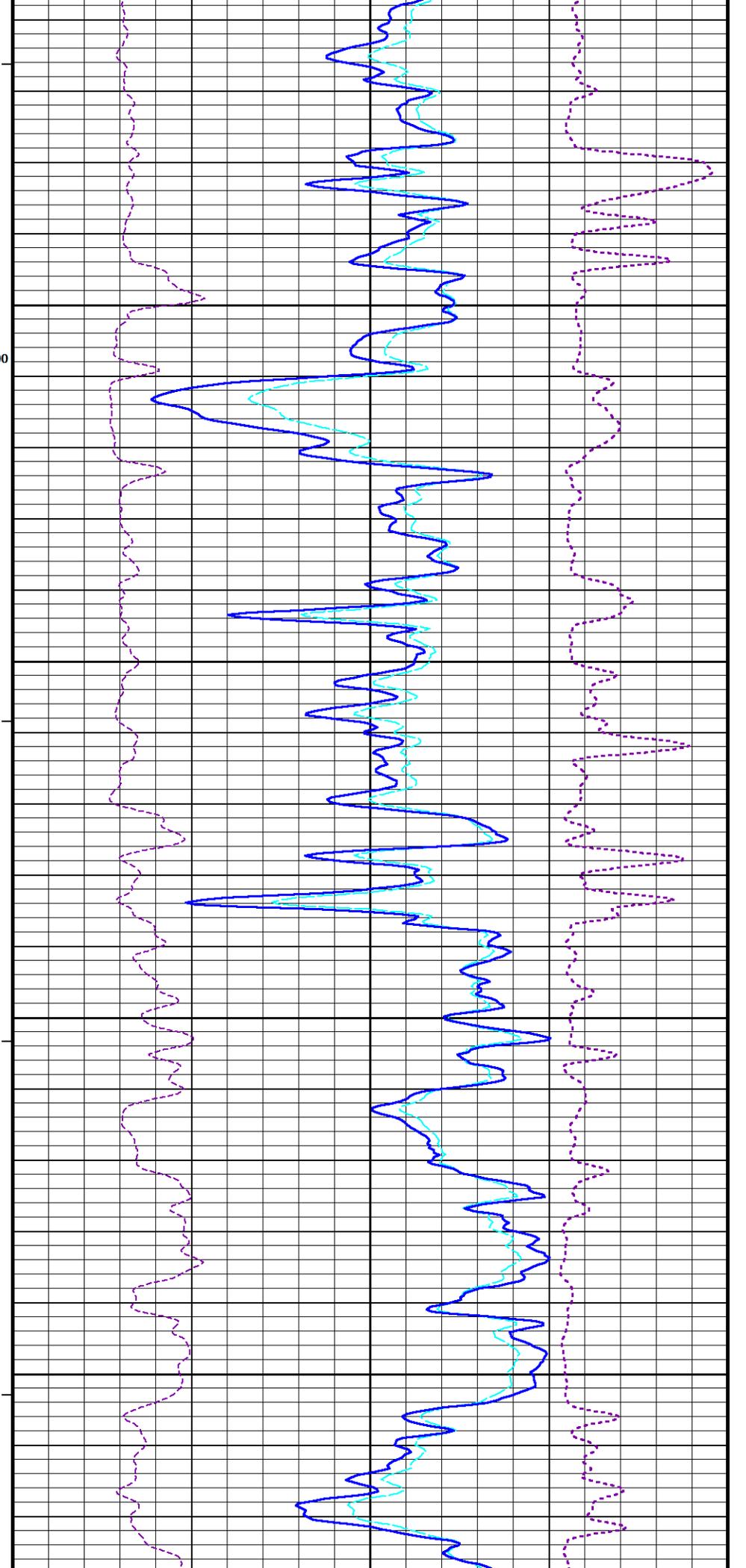
3200

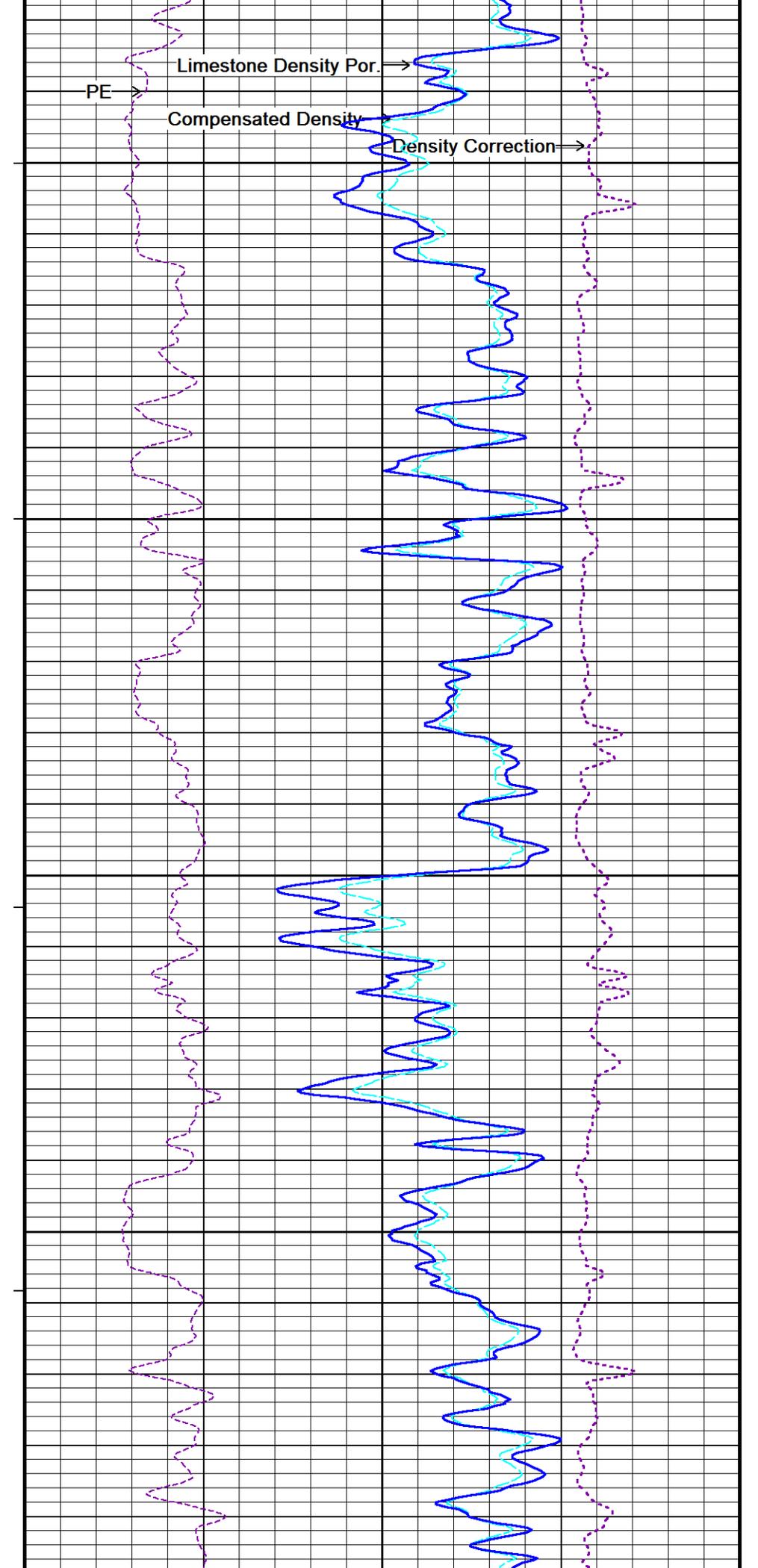
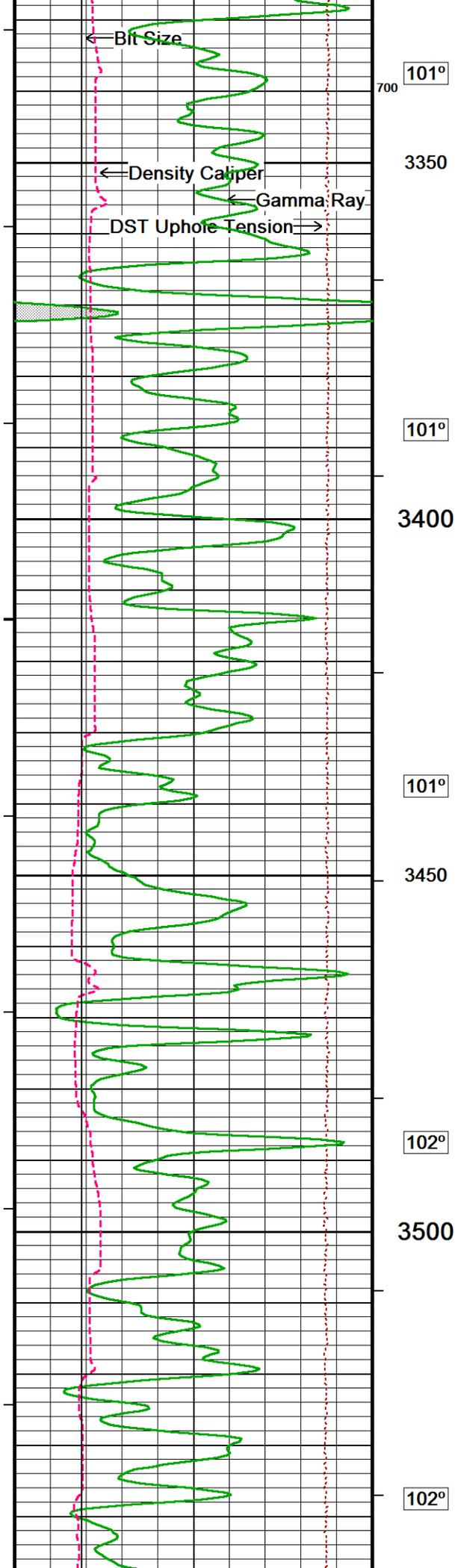
$100^\circ$

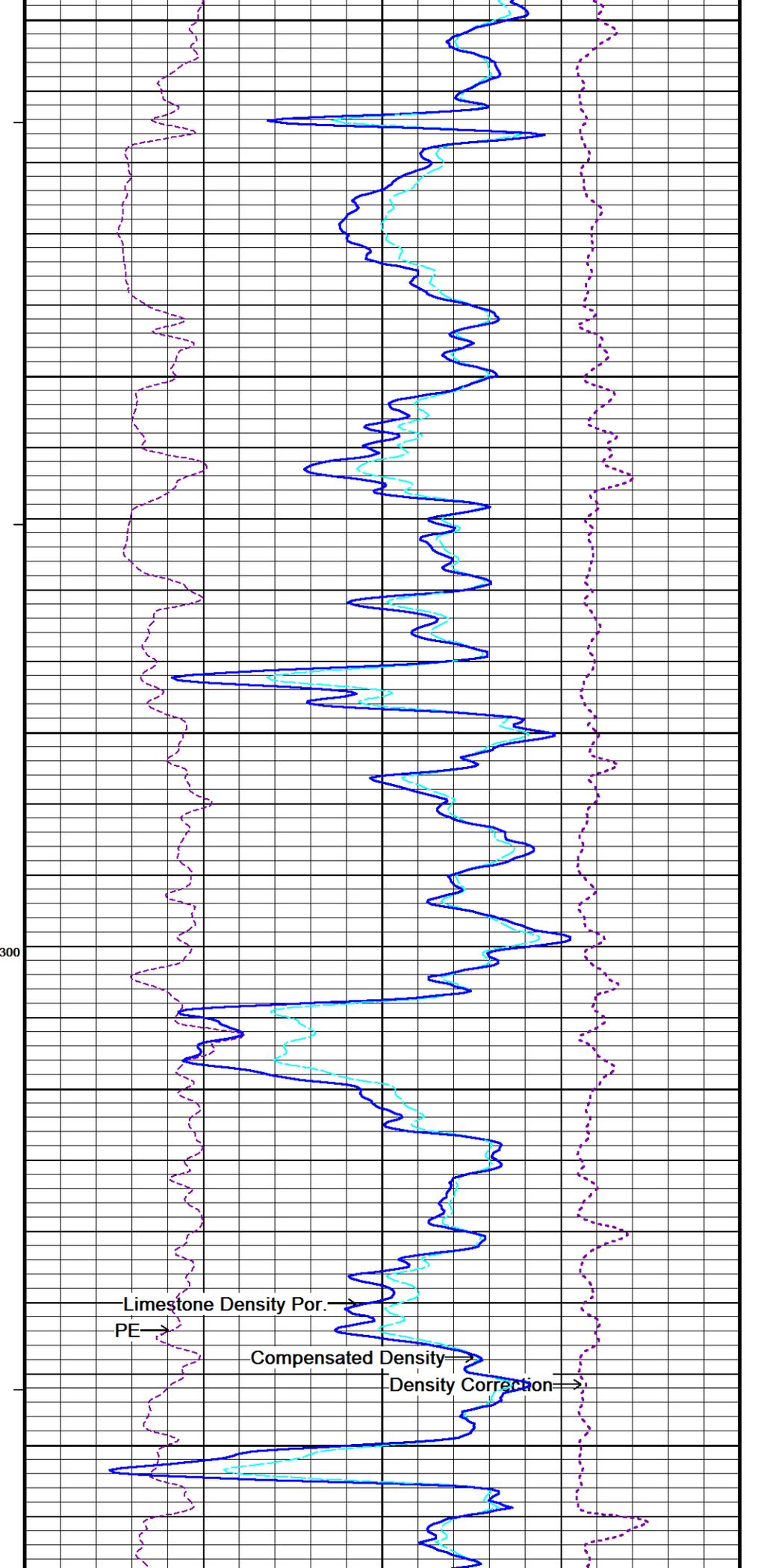
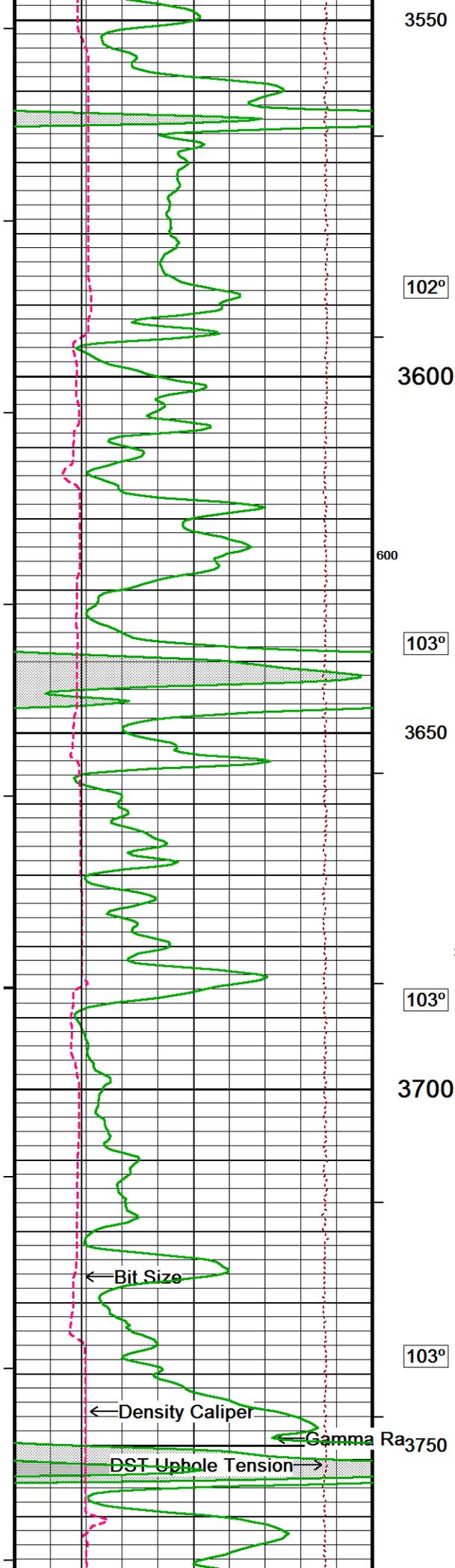
3250

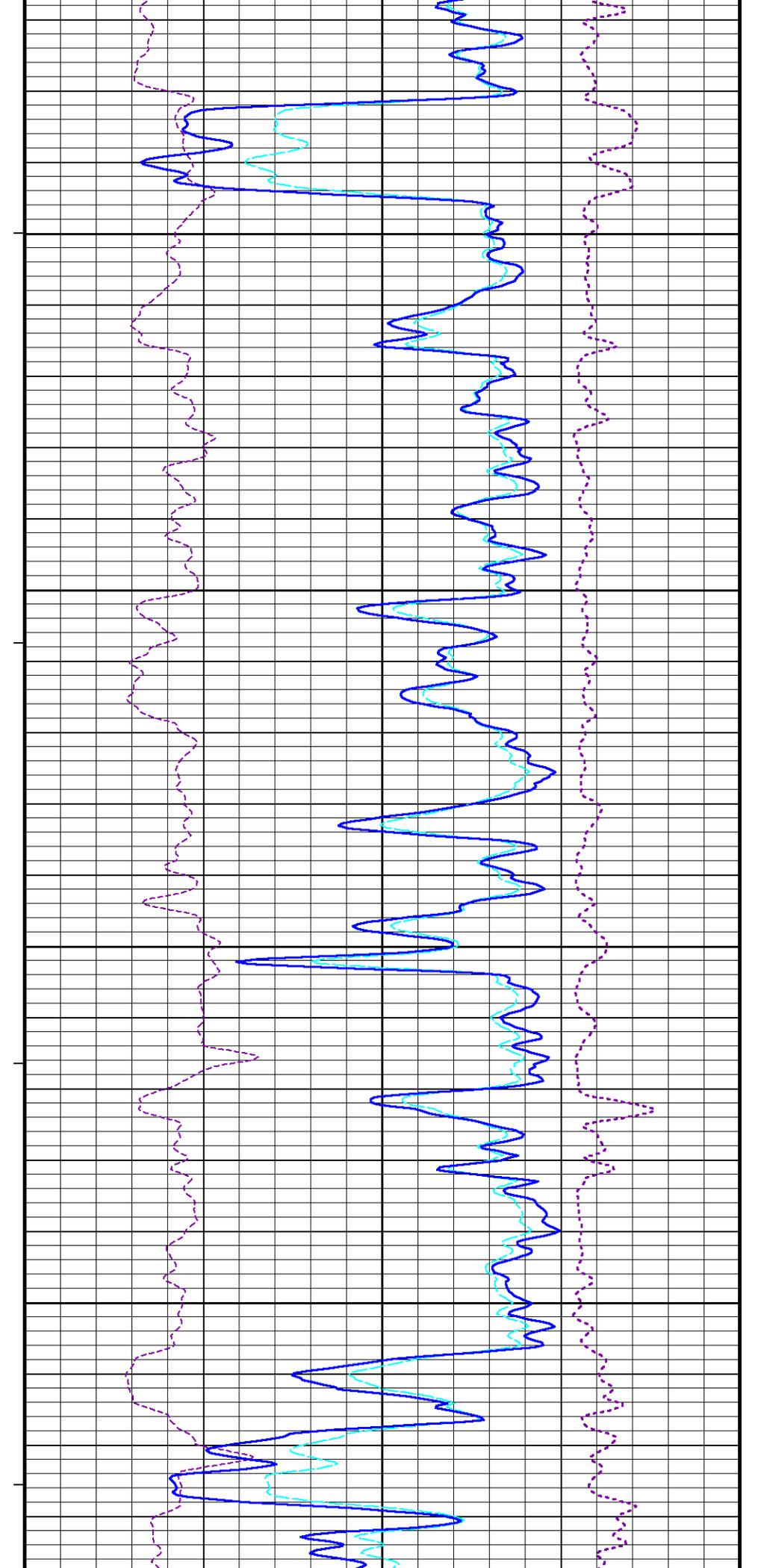
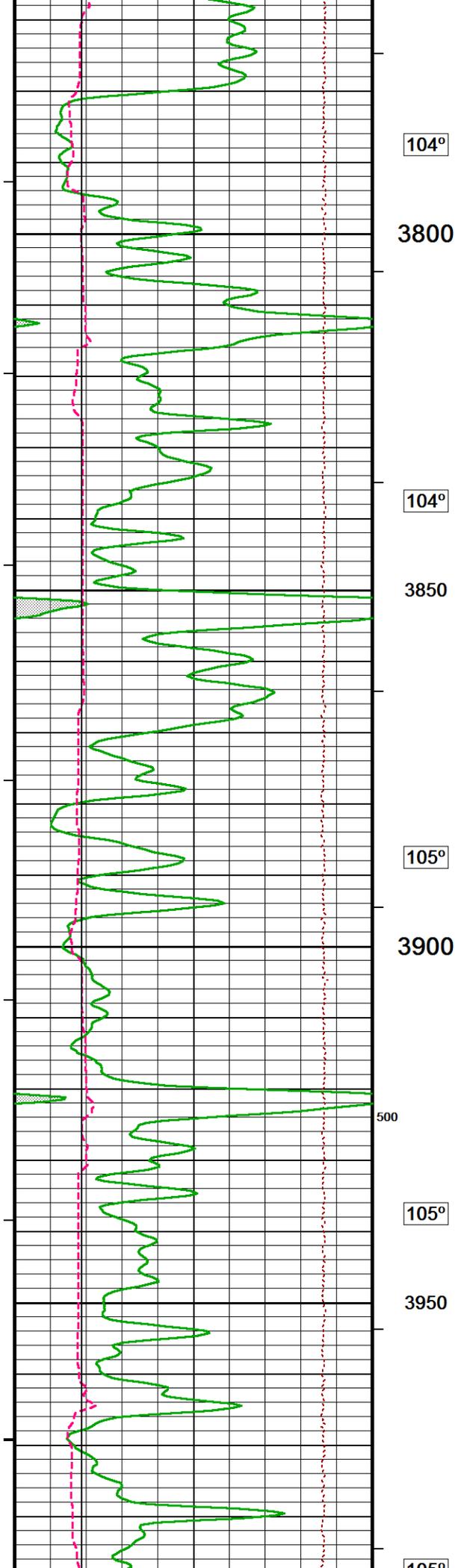
$100^\circ$

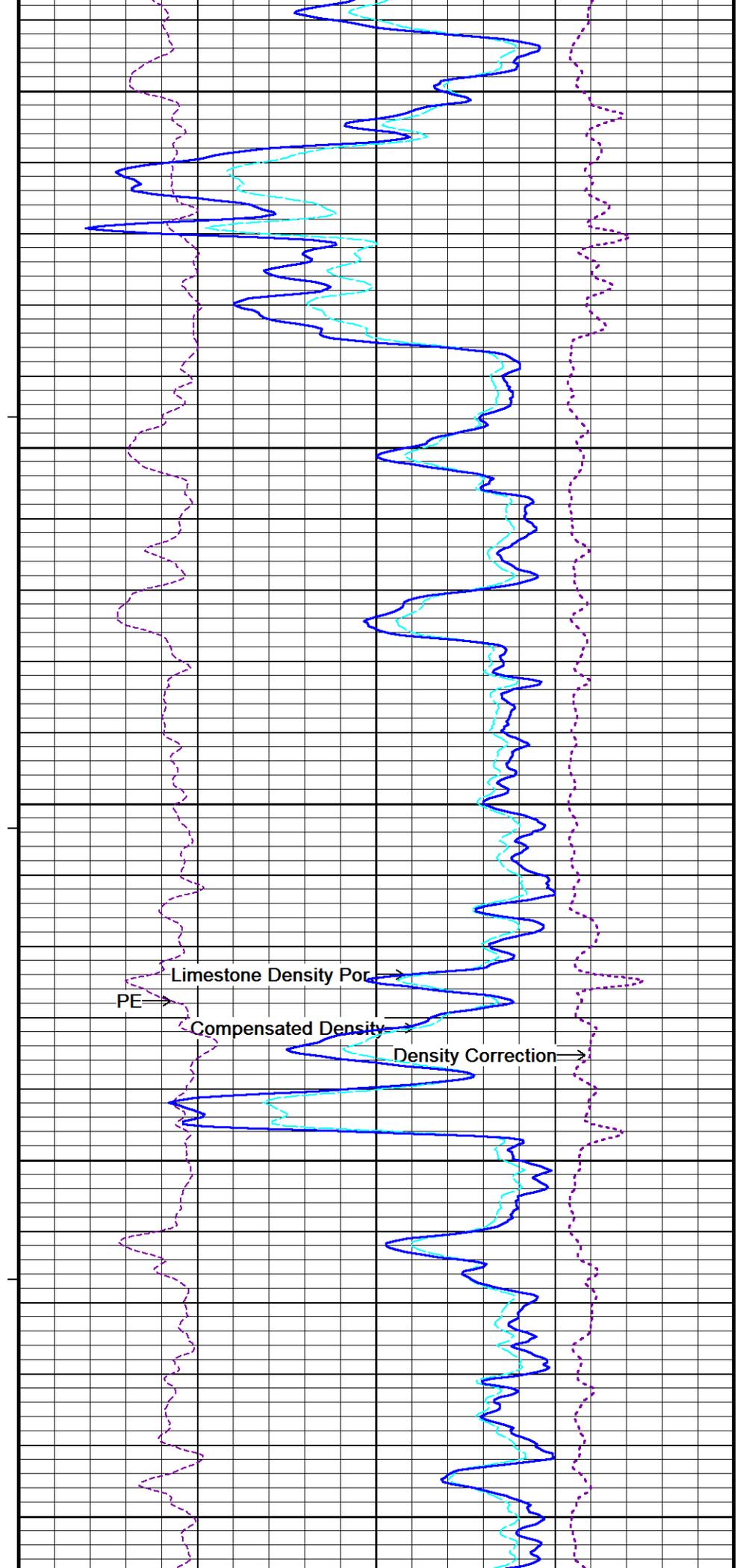
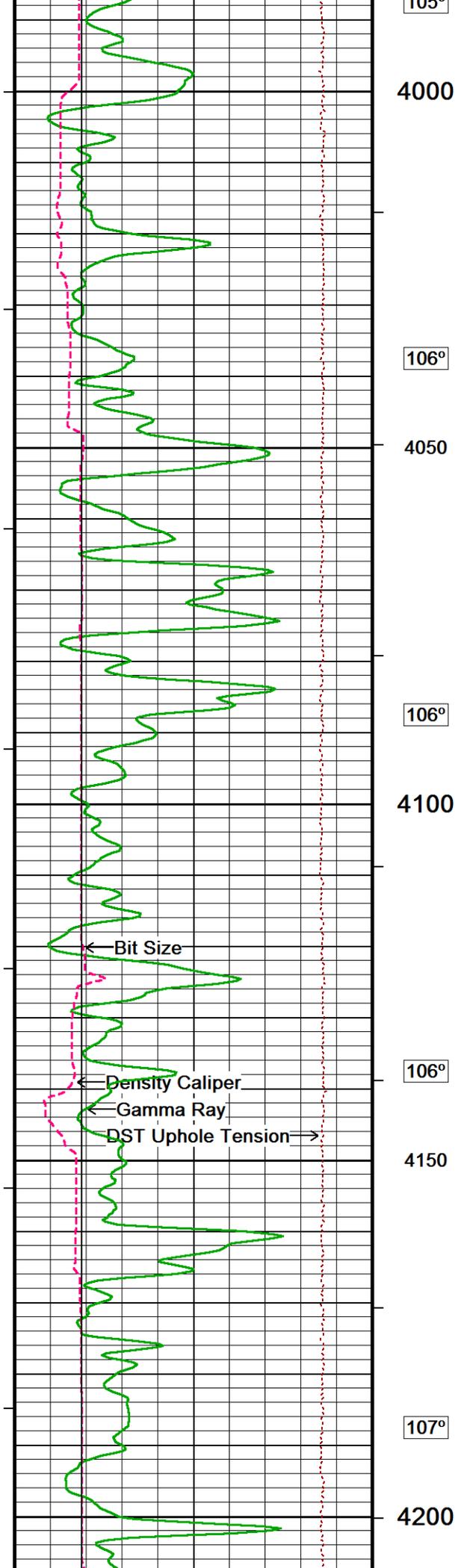
3300

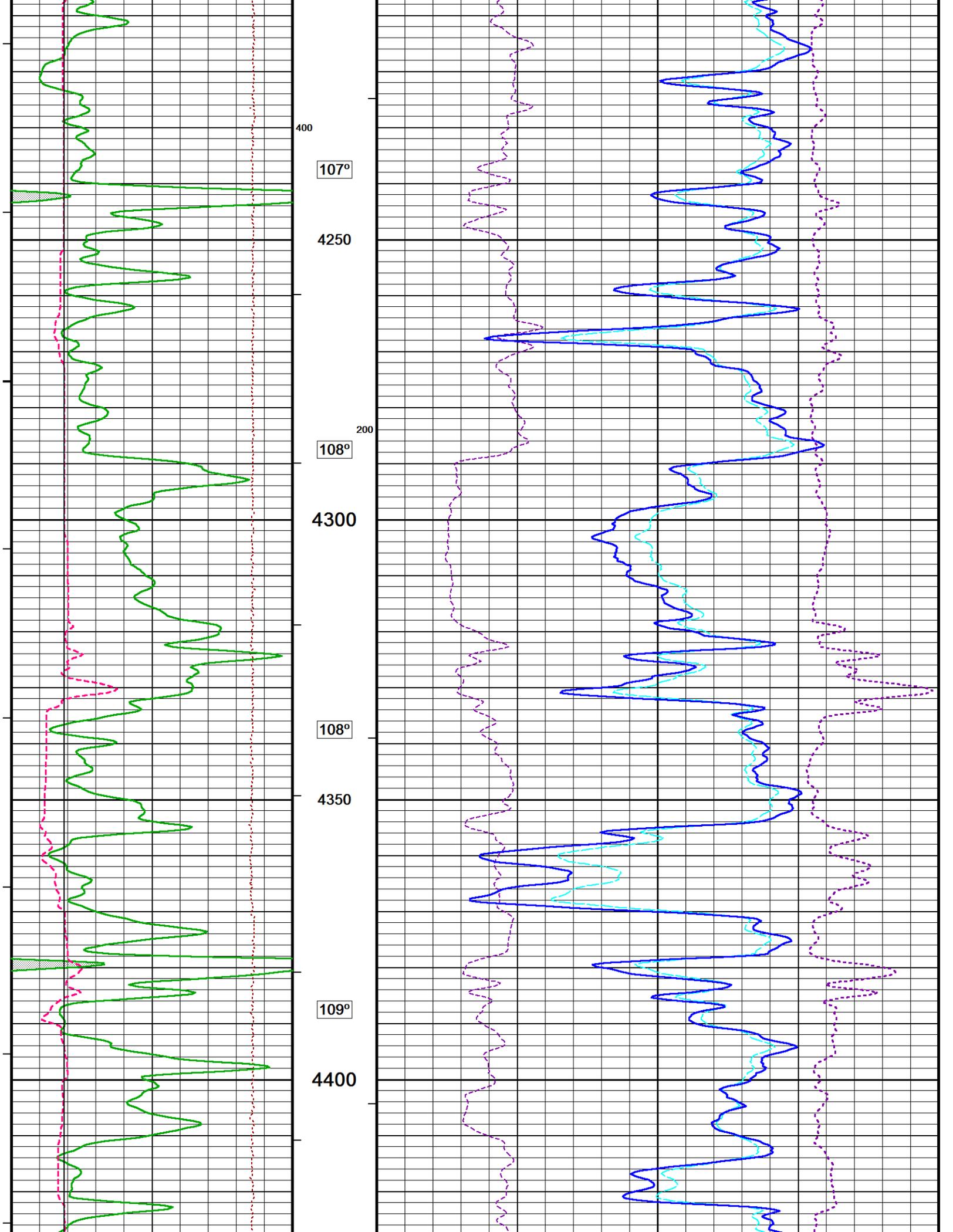


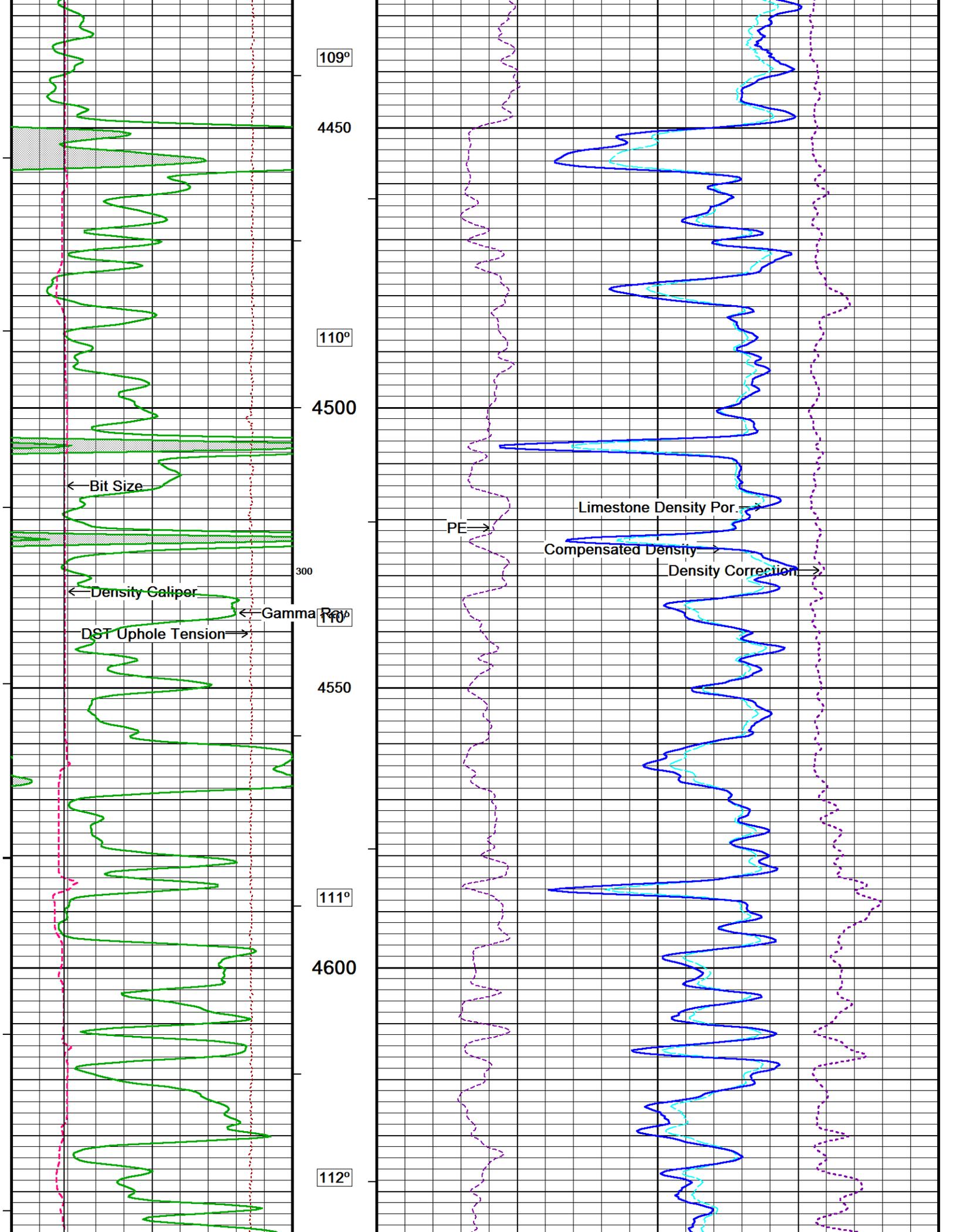


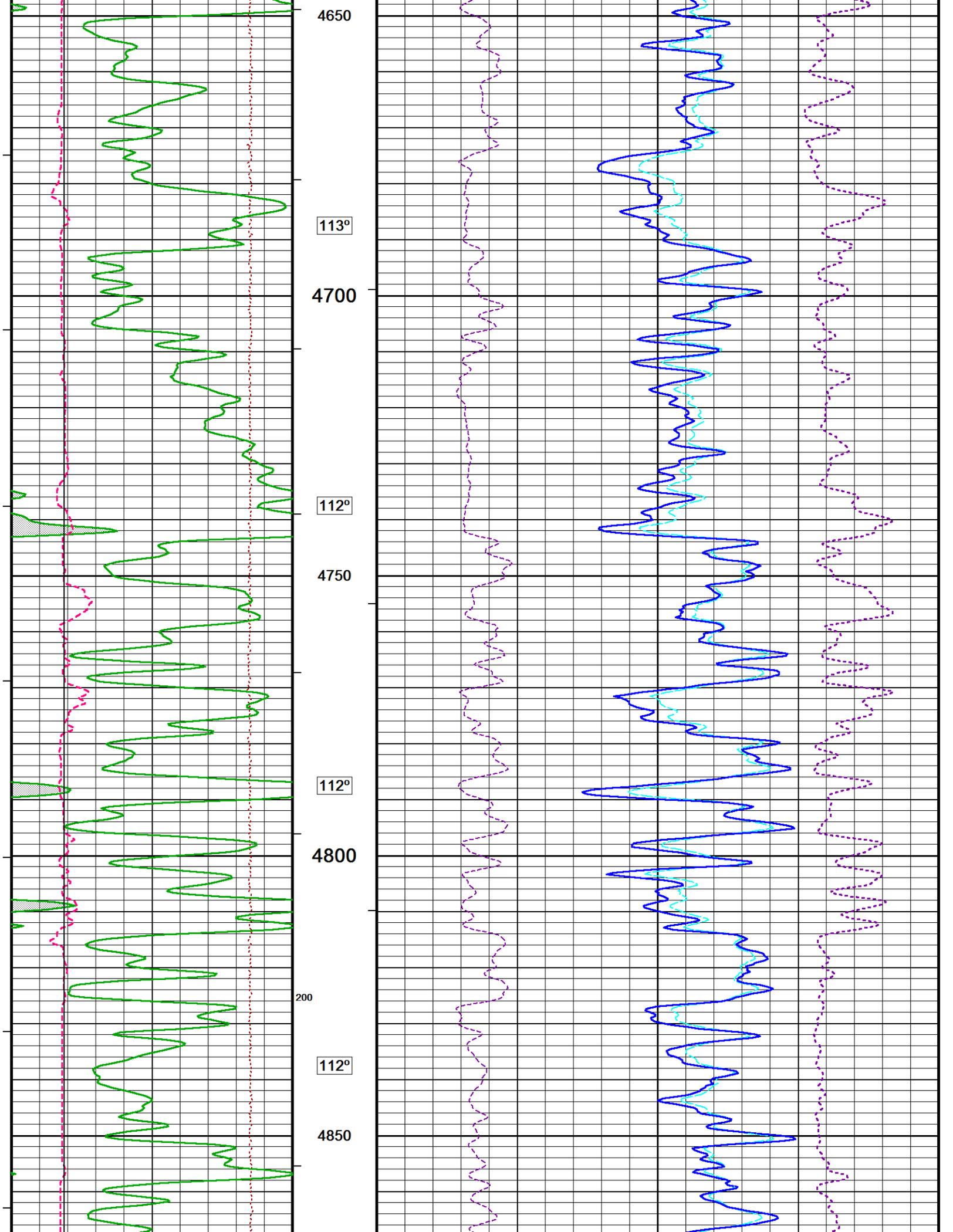


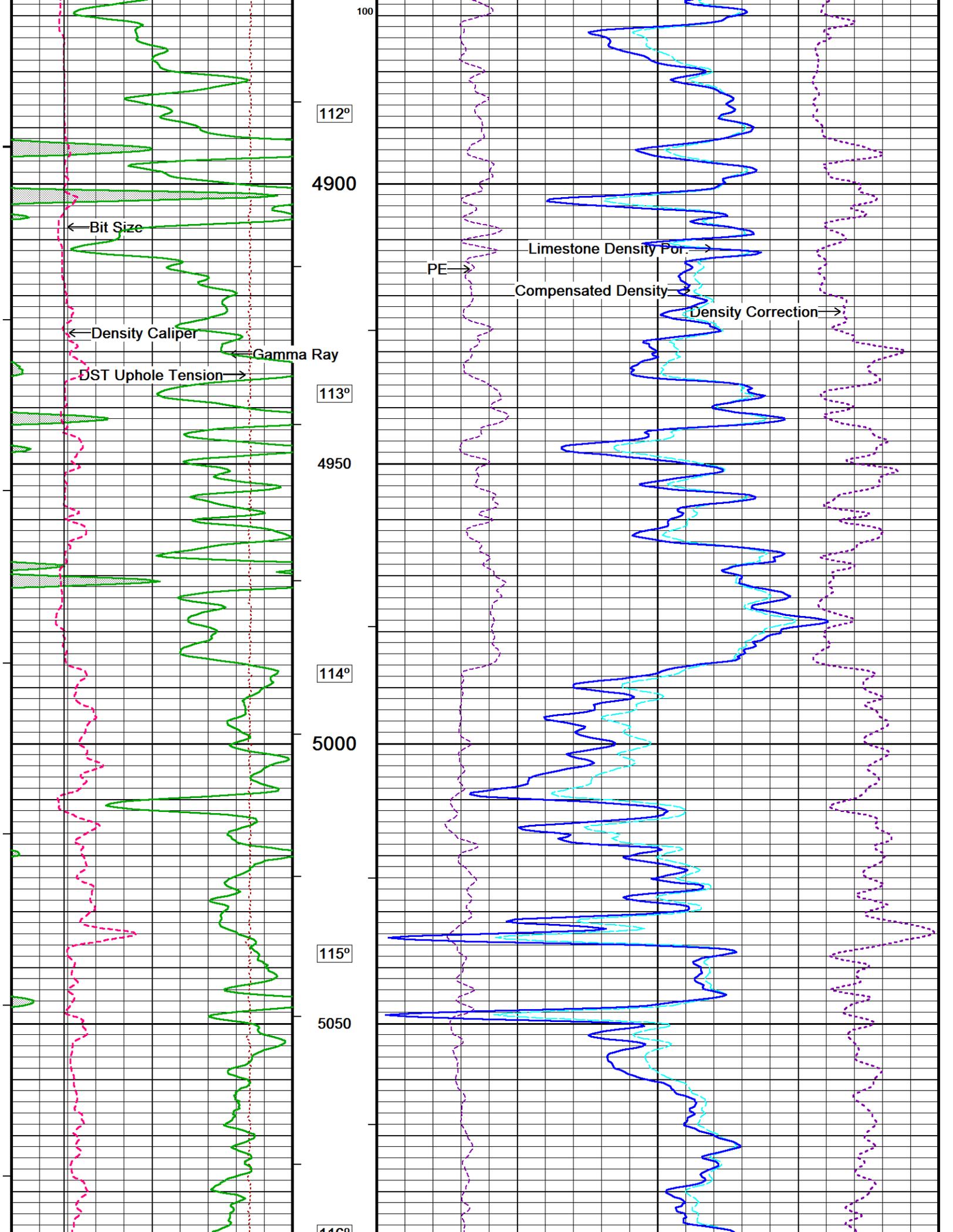


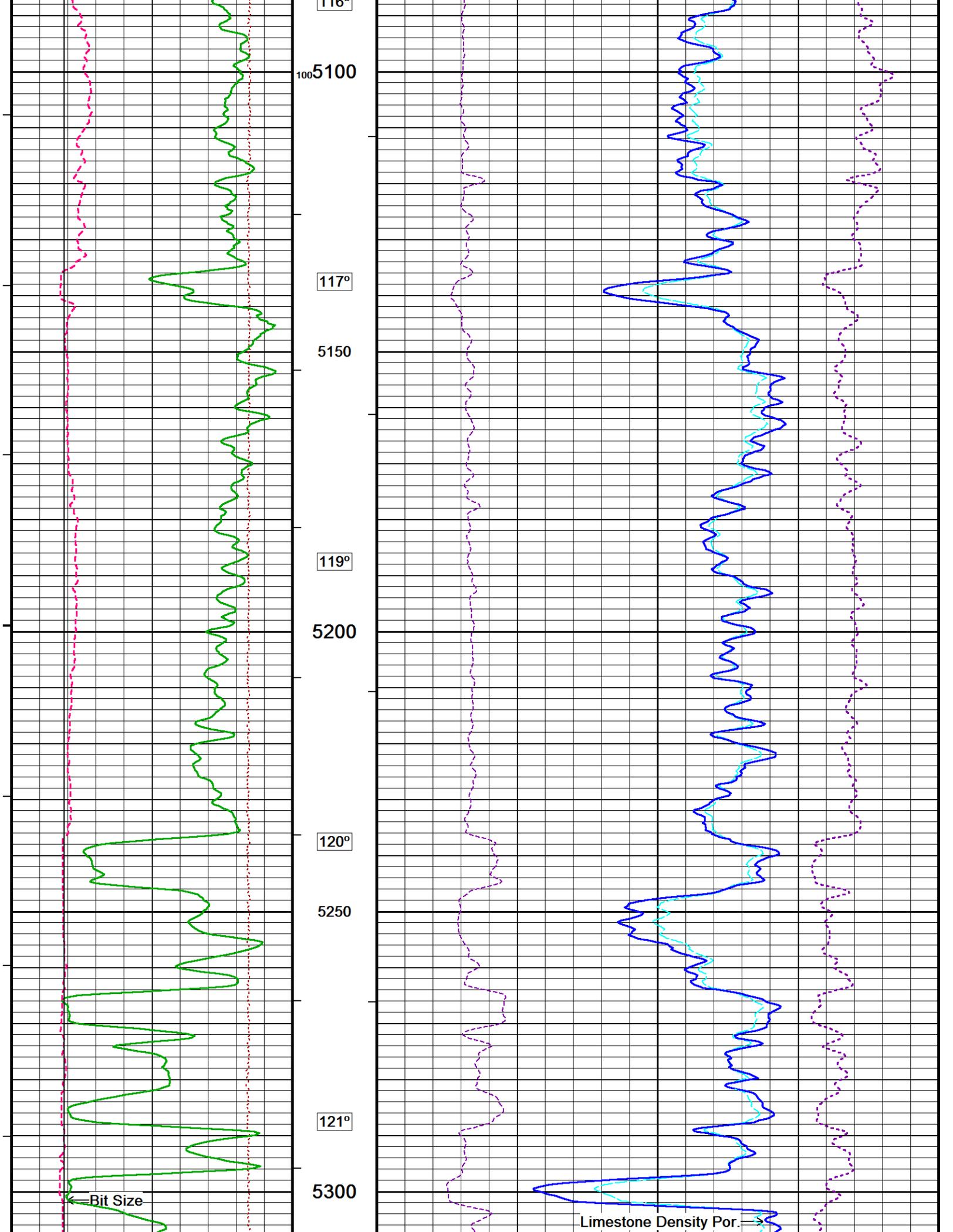


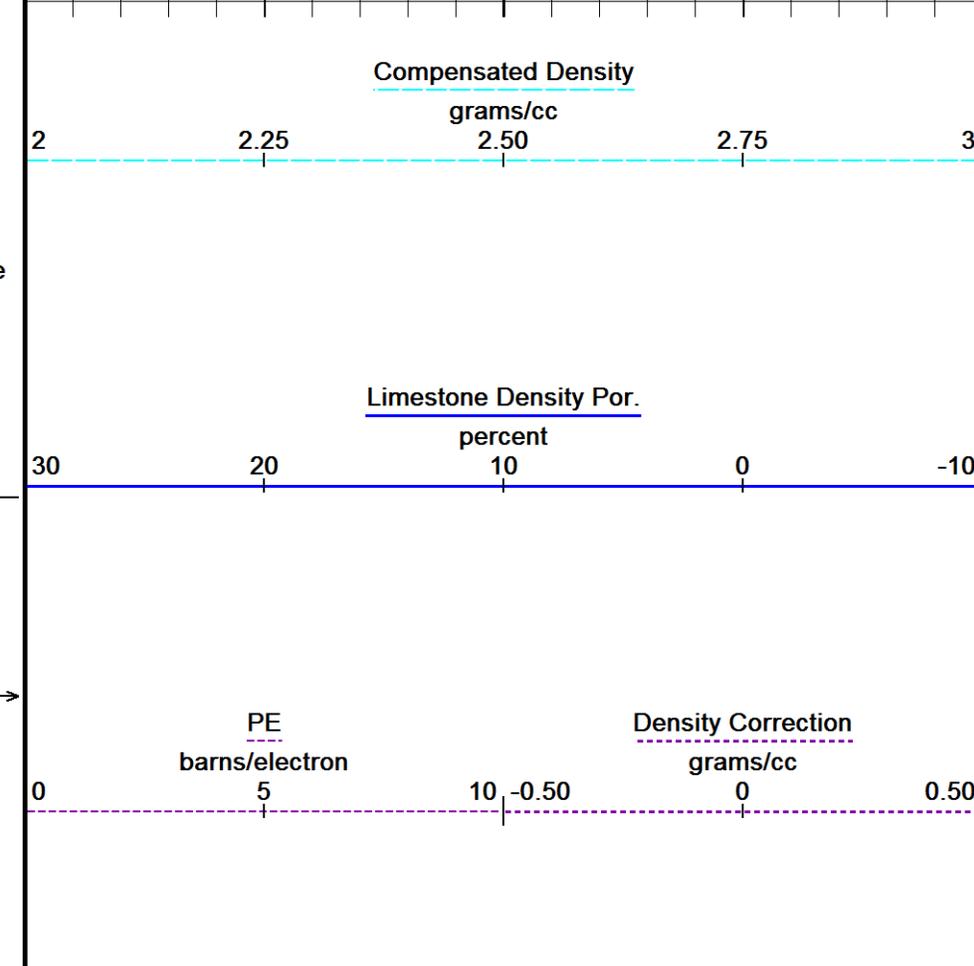
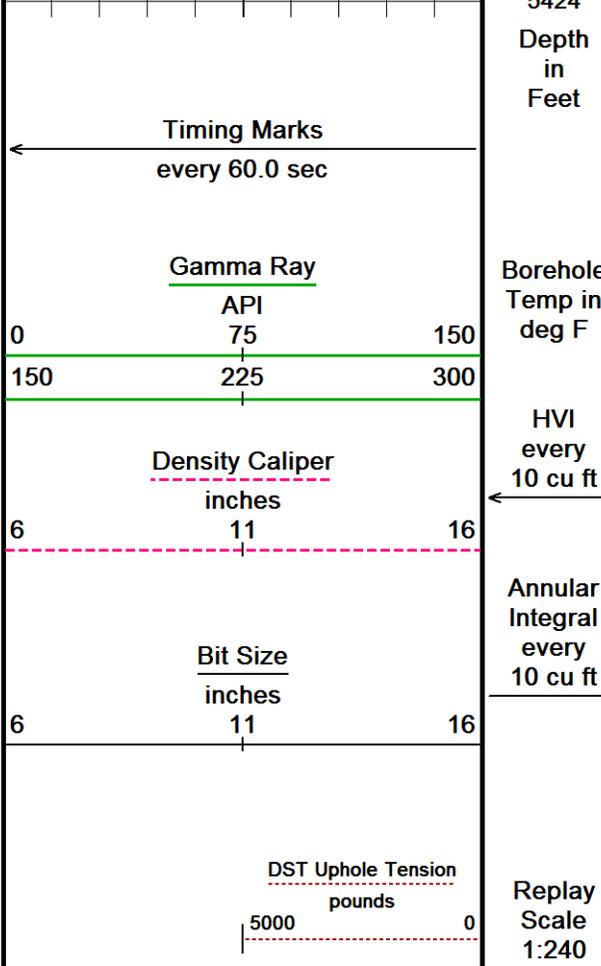
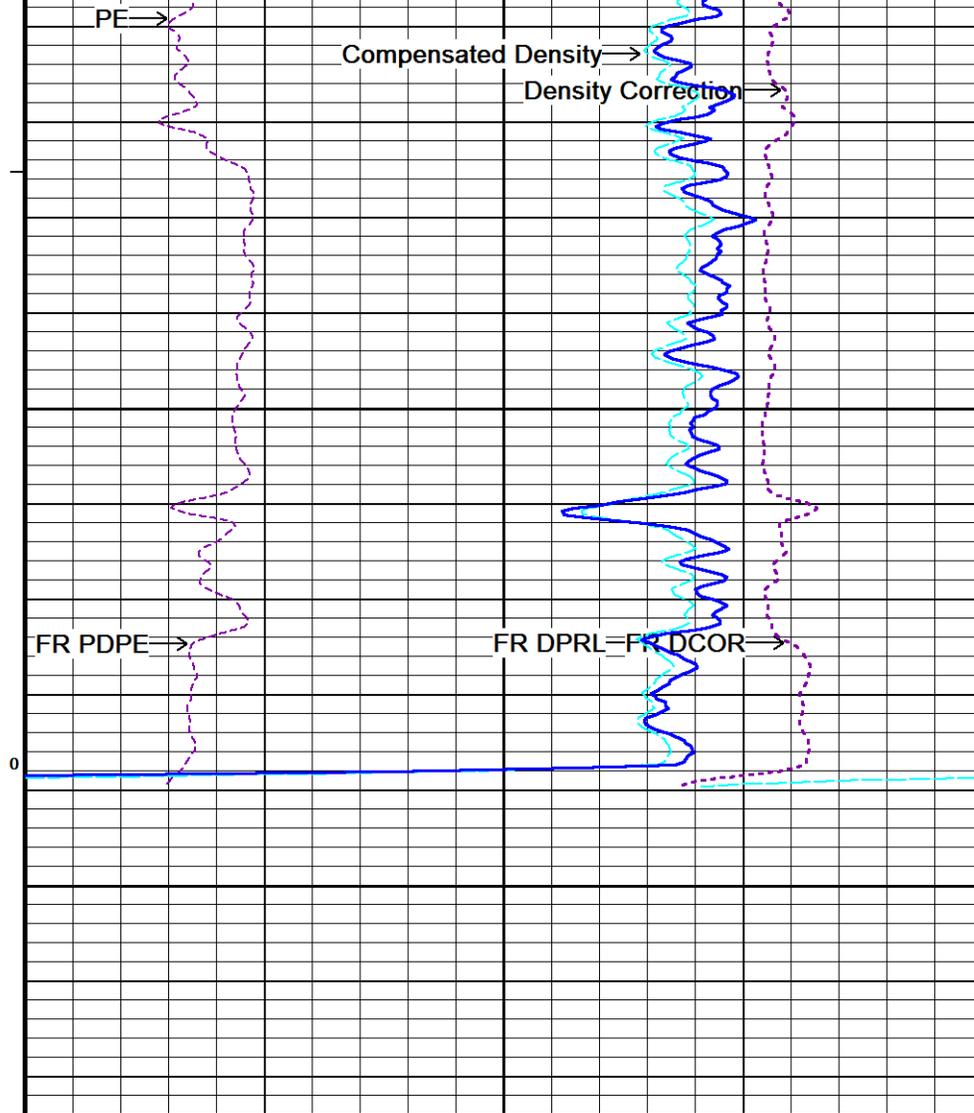
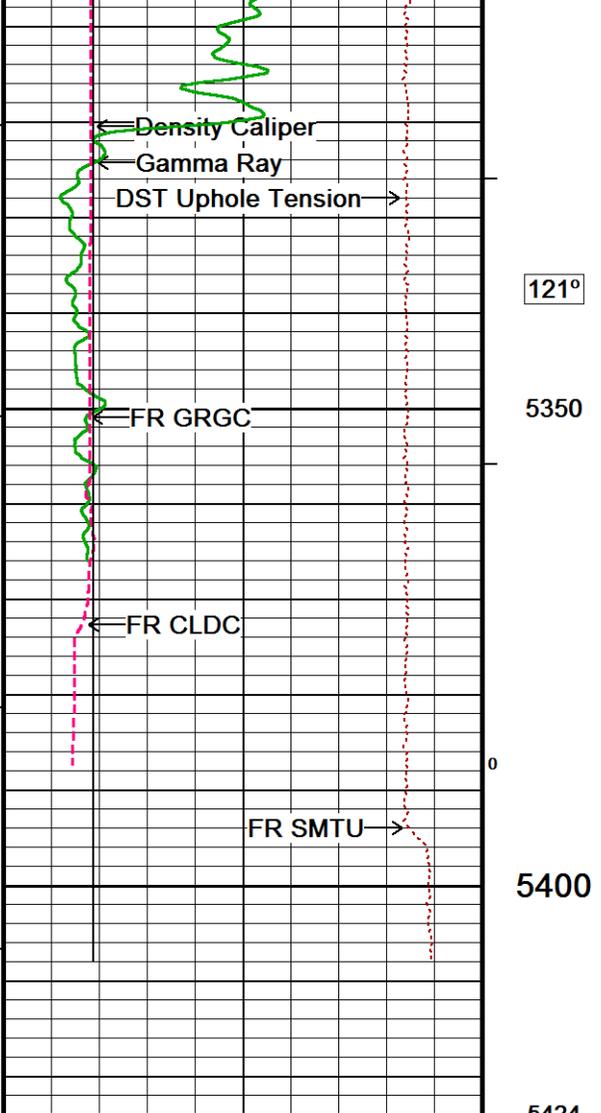












121°

5350

5400

5424

Depth in Feet

Borehole Temp in deg F

HVI every 10 cu ft

Annular Integral every 10 cu ft

Replay Scale 1:240

Compensated Density

grams/cc

2 2.25 2.50 2.75 3

Limestone Density Por.

percent

30 20 10 0 -10

PE

barns/electron

Density Correction

grams/cc

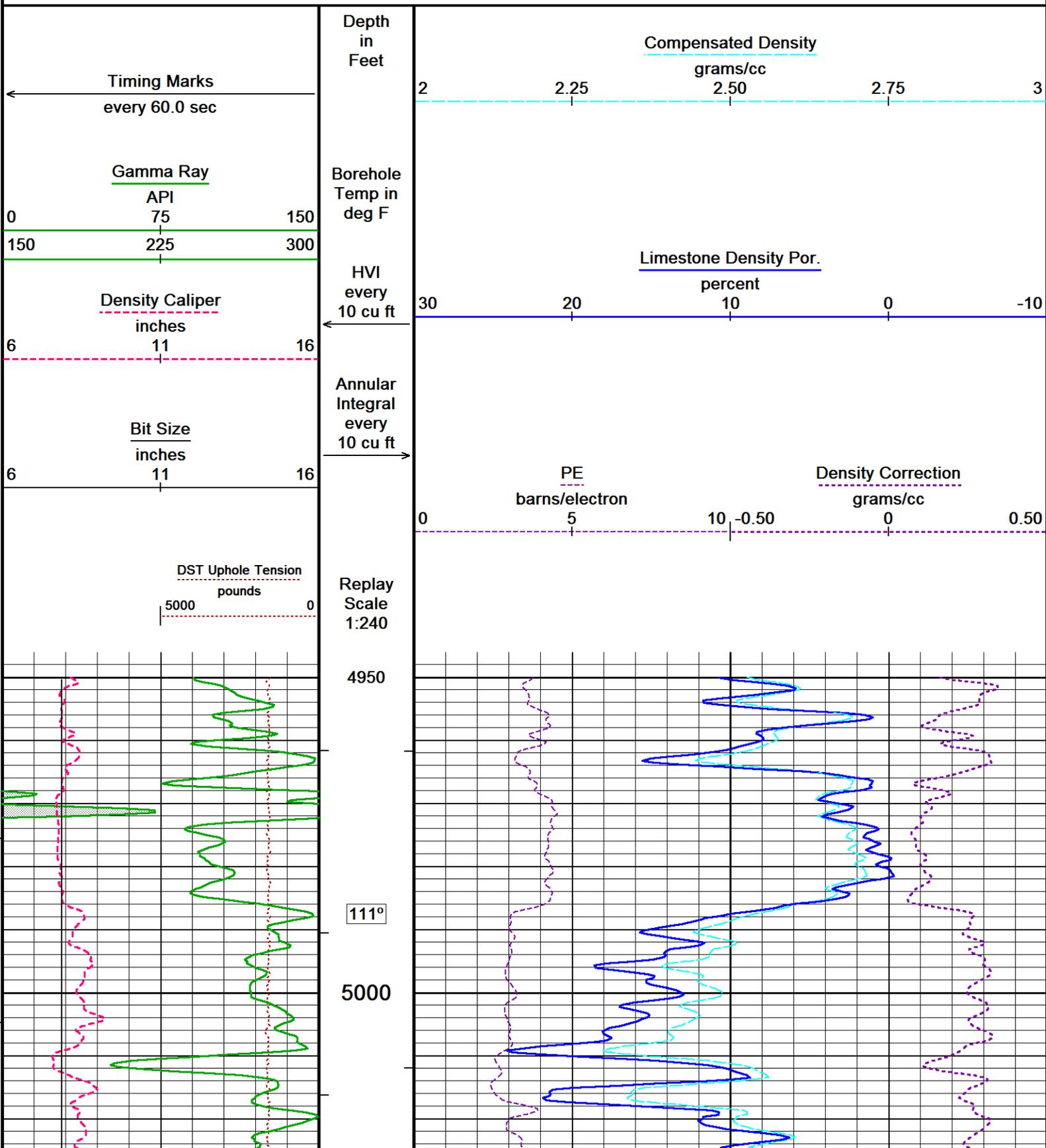
0 5 10 -0.50 0 0.50

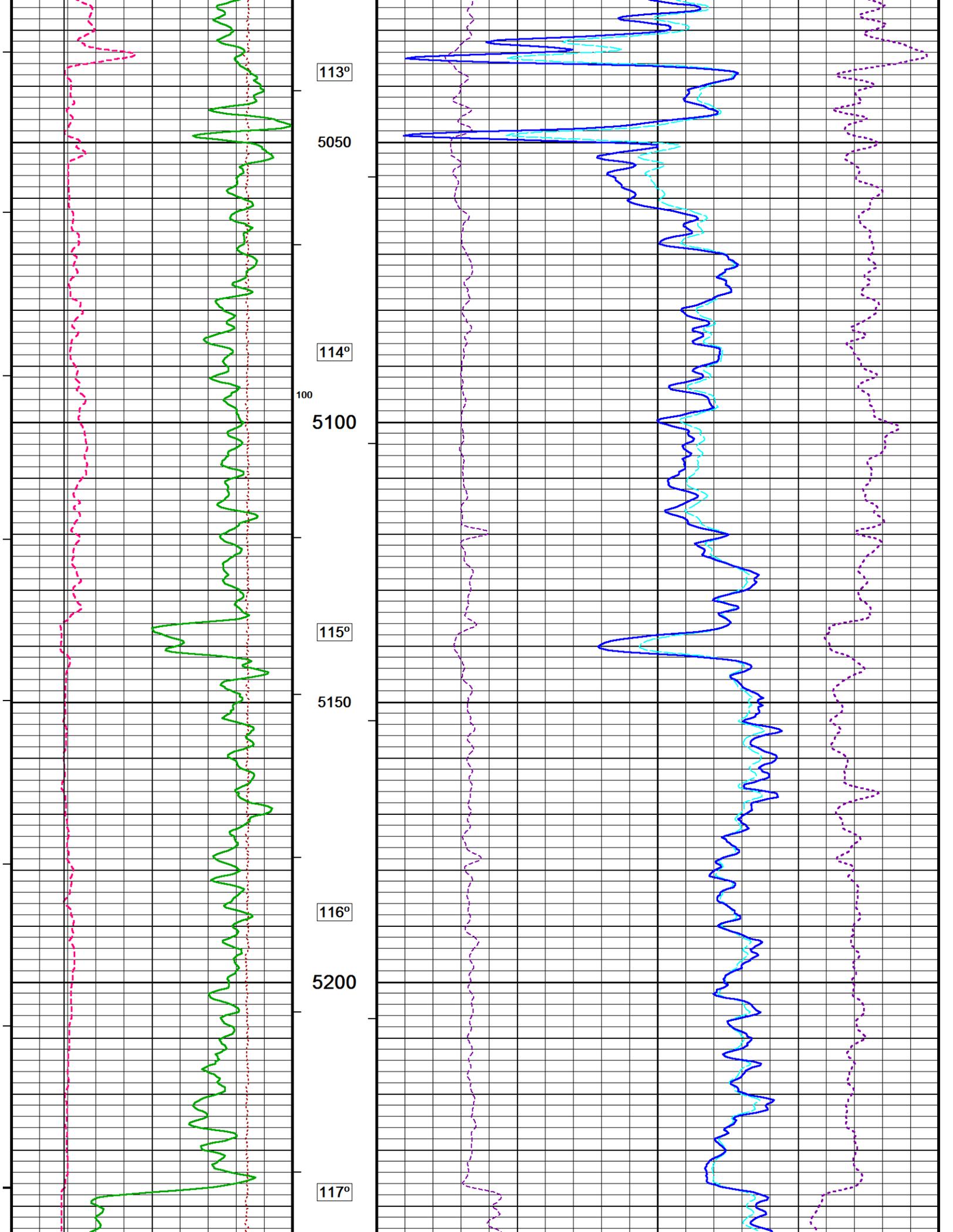


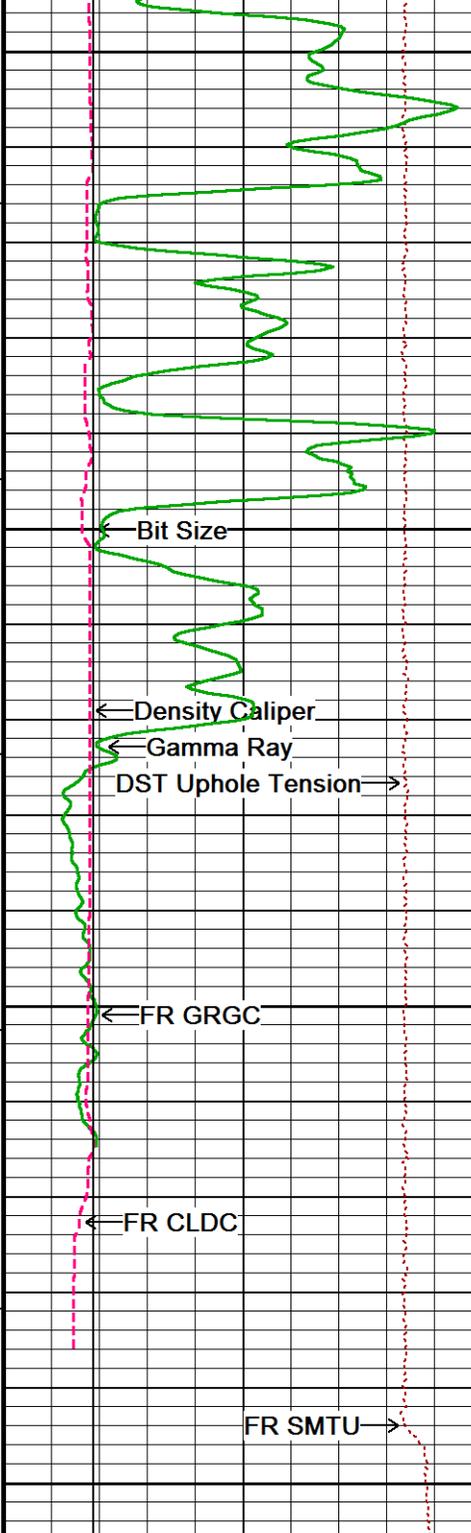
### 5 INCH MAIN



### REPEAT SECTION







5250

118°

5300

119°

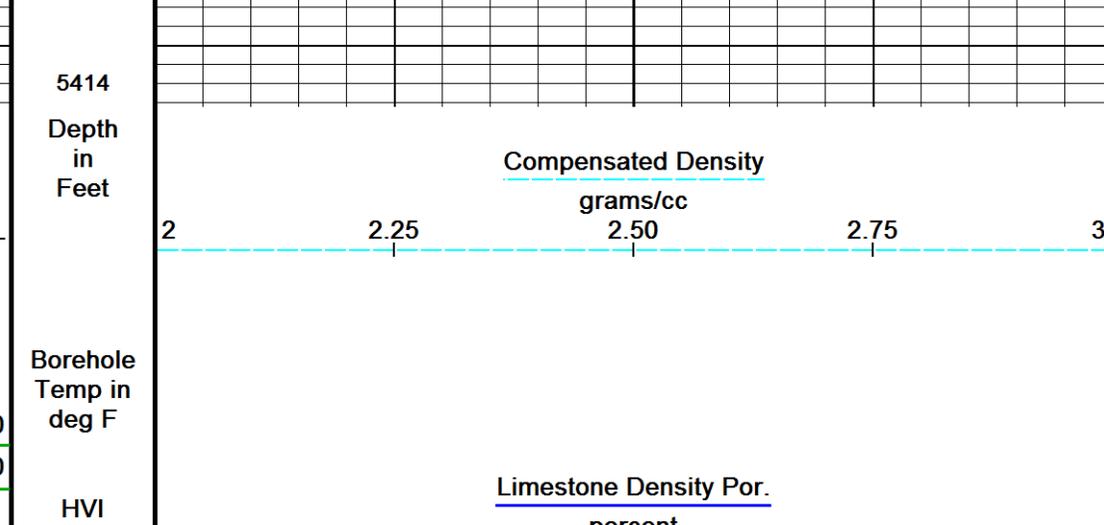
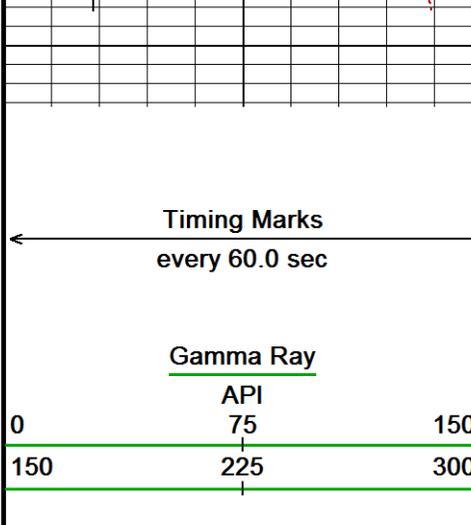
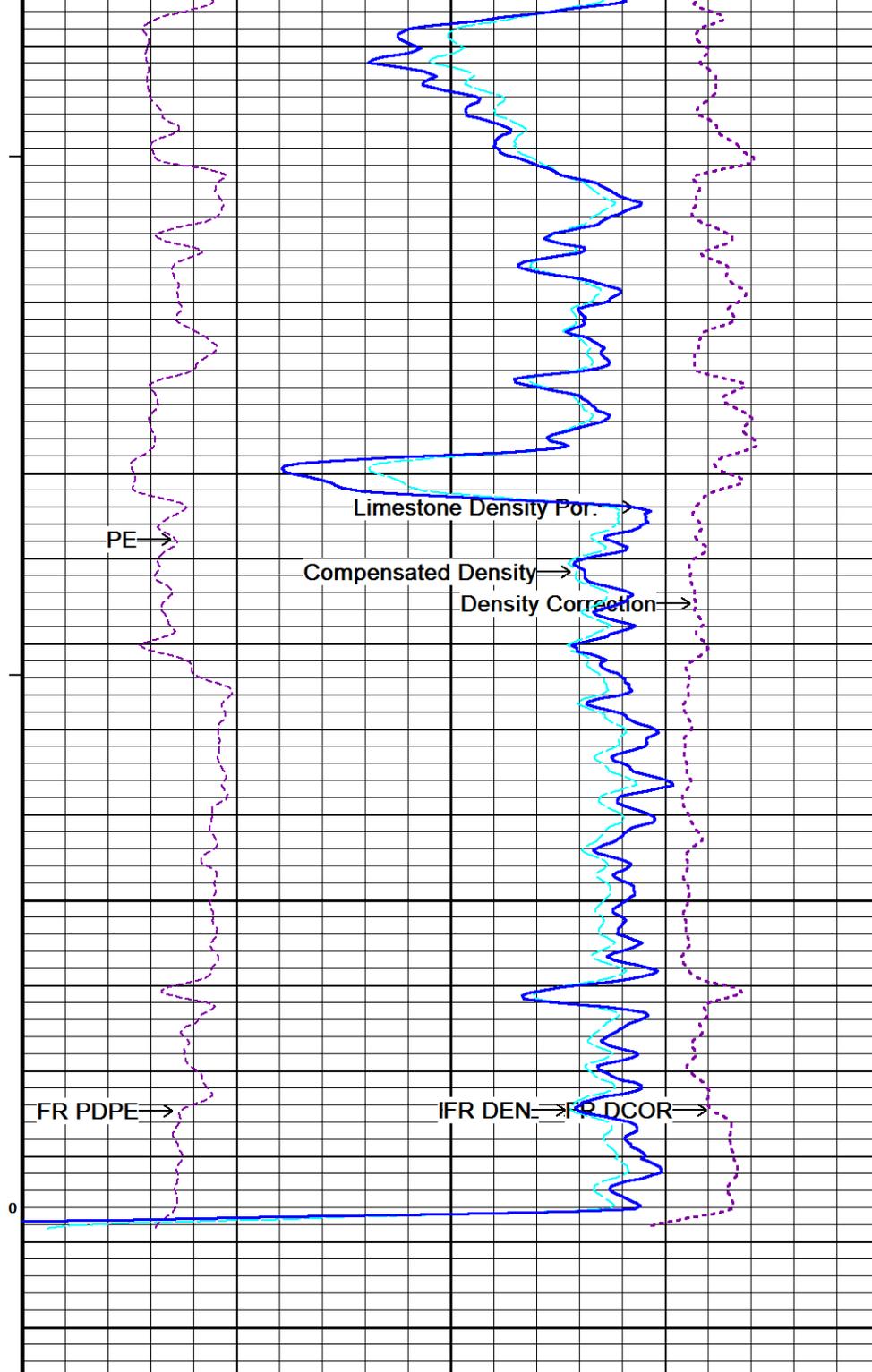
5350

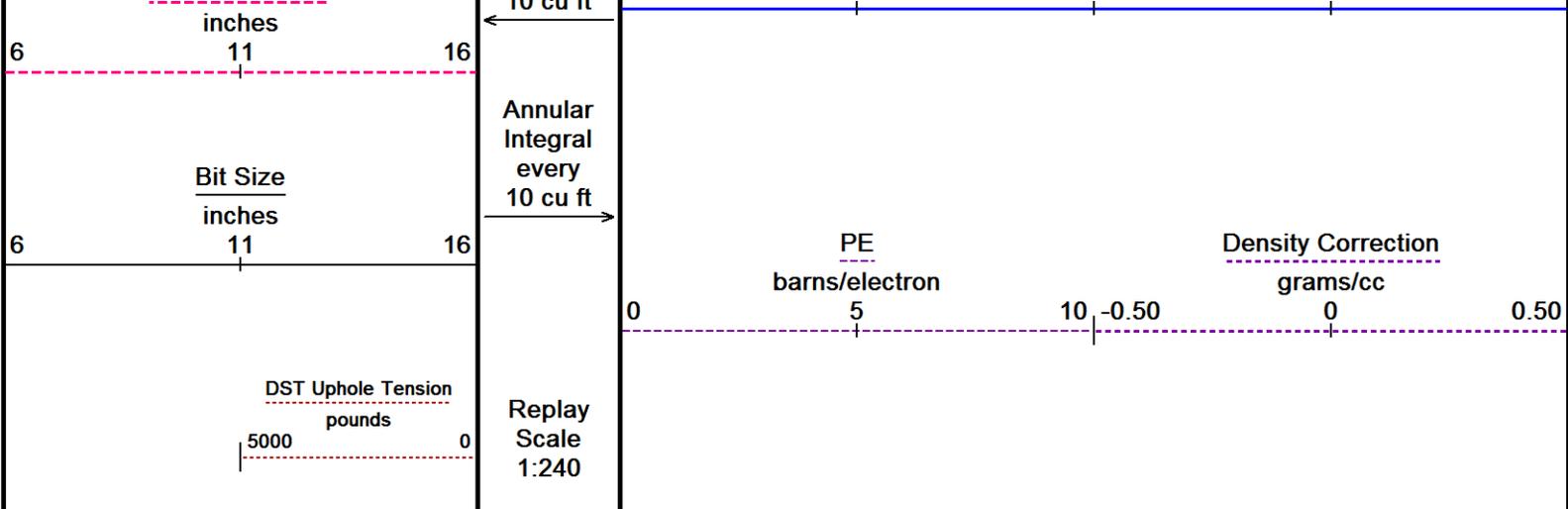
0

5400

5414

Depth in Feet





Depth Based Data - Maximum Sampling Increment 10.0cm Plotted on 10-JAN-2013 15:34  
 Filename: C:\Users\E143235\AppData\Local\Temp\Weather...\Western Operating Helfrich #1-6\_002.dta Recorded on 04-JAN-2013 06:48  
 System Versions: Logged with 13.04.8492 Plotted with 13.05.8506

↑ REPEAT SECTION ↑

**BEFORE SURVEY CALIBRATION**  
 C:\Users\E143235\AppData\Local\Temp\Weatherford PreView2\8\Western Operating Helfrich #1-6\_005.dta

General Constants All 000 Last Edited on 04-JAN-2013,01:35

<b>General Parameters</b>		
Mud Resistivity	1.260	ohm-metres
Mud Resistivity Temperature	79.000	degrees F
Water Level	0.000	feet
Borehole Fluid Processing	Wet Hole	
<b>Hole/Annular Volume and Differential Caliper Parameters</b>		
HVOL Method	Single Caliper	
HVOL Caliper 1	Density Caliper	
HVOL Caliper 2	N/A	
Annular Volume Diameter	5.500	inches
Caliper for Differential Caliper	Density Caliper	
<b>Rwa Parameters</b>		
Porosity used	Base Density Porosity	
Resistivity used	Array Ind. Four Res Rt	
RWA Constant A	1.000	
RWA Constant M	2.000	
SW/APOR Tool Source		

High Resolution Temperature Calibration MCG-B 34 Field Calibration on 08-NOV-2012,10:05

	Measured	Calibrated(Deg F)
Lower	50.00	50.00
Upper	100.00	100.00

High Resolution Temperature Constants MCG-B 34 Last Edited on 08-NOV-2012,10:04

Pre-filter Length	11
-------------------	----

Gamma Calibration MCG-B 34 Field Calibration on 03-JAN-2013 21:58

	Measured	Calibrated (API)
Background	66	45
Calibrator (Gross)	1127	770
Calibrator (Net)	1062	725

Gamma Constants MCG-B 34 Last Edited on 04-JAN-2013,01:35

Gamma Calibrator Number	GRC38	
Mud Density	1.14	gm/cc
Caliper Source for Processing	Density Caliper	



## DOWNHOLE EQUIPMENT

C:\Users\E143235\AppData\Local\Temp\Weatherford PreView2\8\Western Operating Helfrich #1-6\_005.dta

Compact Comms Gamma  
MCG-B 34 LG: 8.70 ft WT: 63.9 lb OD: 2.24 in

Compact Micro-log  
MML-A 16 LG: 7.97 ft WT: 81.6 lb OD: 2.24 in

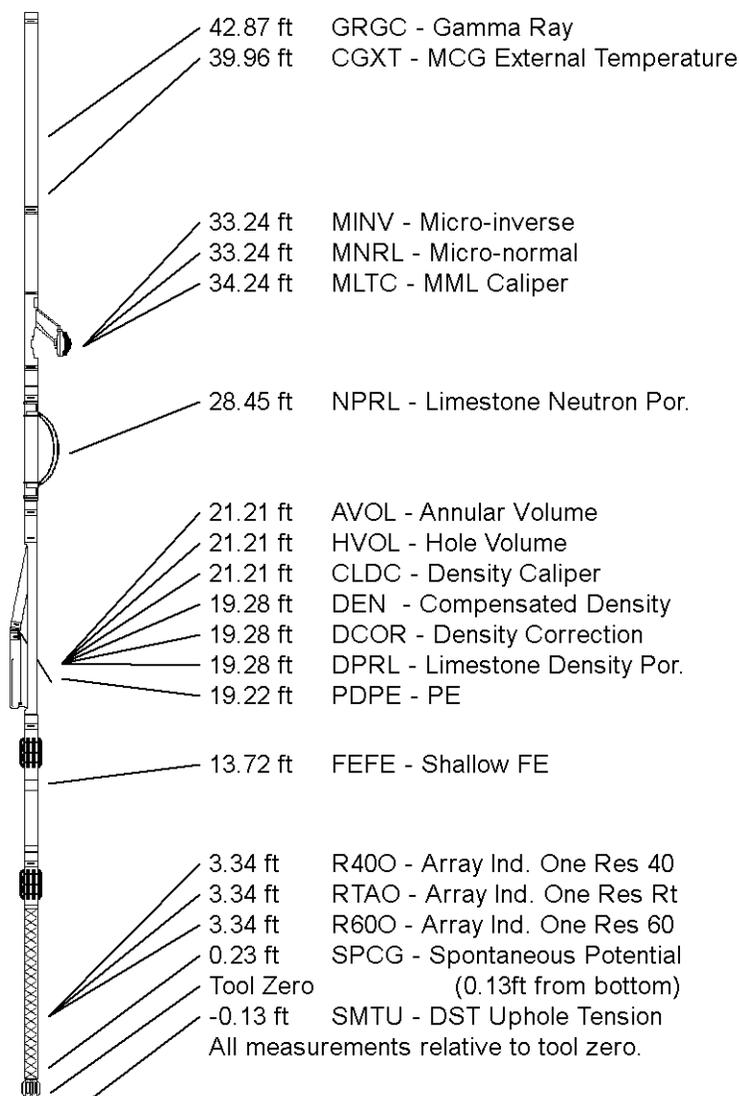
Compact Neutron  
MDN-A.B 66 LG: 5.04 ft WT: 50.7 lb OD: 2.24 in

Compact Density/Caliper  
MPD-B 64 LG: 9.59 ft WT: 90.4 lb OD: 2.45 in

Compact Focussed Electric  
MFE-B.J 353 LG: 6.05 ft WT: 48.5 lb OD: 2.24 in

Compact Induction  
MAI-A.A 167 LG: 10.81 ft WT: 48.5 lb OD: 2.24 in

Total Length: 48.16 ft Weight: 383.6 lb



COMPANY	WESTERN OPERATING COMPANY		
WELL	HELFRICH #1-6		
FIELD	HELFRICH		
PROVINCE/COUNTY	HAMILTON		
COUNTRY/STATE	U.S.A. / KANSAS		

Elevation Kelly Bushing	3586.00	feet	First Reading	5375.00	feet
Elevation Drill Floor	3585.00	feet	Depth Driller	5400.00	feet
Elevation Ground Level	3574.00	feet	Depth Logger	5394.00	feet



**Weatherford**<sup>®</sup>

COMPACT PHOTO DENSITY  
COMPENSATED NEUTRON  
MICRORESISTIVITY LOG

