



Weatherford

**CML MESSENGER SHUTTLE
COMPOSITE LOG
SANDSTONE MATRIX**

COMPANY	GREAT WESTERN OIL AND GAS		
WELL	B FARM LD 18-034HC		
FIELD	WATTENBERG		
PROVINCE/COUNTY	ADAMS		
COUNTRY/STATE	U.S.A. / COLORADO		
LOCATION	SHL: 924' FNL & 1843' FWL		
PERMIT NUMBER	401087349		
SEC 7	TWP 1N	RGE 67W	Other Services
Latitude	39.983819		
Longitude	-104.933672		
API Number	05-001-10098		
Permanent Datum GL, Elevation 5126 feet			Elevations: KB 5146.00
Log Measured From KB, 20.00 feet above Permanent Datum			DF 5146.00
Drilling Measured From KB @ 20 FEET			GL 5126.00
Date	14-JAN-2018		
Run Number	ONE		
Service Order	2938-200116070		
Depth Driller	13833.00	feet	
Depth Logger	13833.00	feet	
First Reading	13812.00	feet	
Last Reading	1719.00	feet	
Casing Driller	1718.00	feet	
Casing Logger	1719.00	feet	
Bit Size	8.500	inches	
Hole Fluid Type	OBM		
Density / Viscosity	10.40 lb/USg	52.00 CP	
PH / Fluid Loss	---	---	
Sample Source	FLOWLINE		
Rm @ Measured Temp	---		
Rmf @ Measured Temp	---		
Rmc @ Measured Temp	---		
Source Rmf / Rmc	---	---	
Rm @ BHT	---		
Time Since Circulation	24HRS		
Max Recorded Temp	241.00	deg F	
Equipment / Base	3505	CASPER	
Recorded By	ENDER GARCIA		
Witnessed By	JW COOPER		

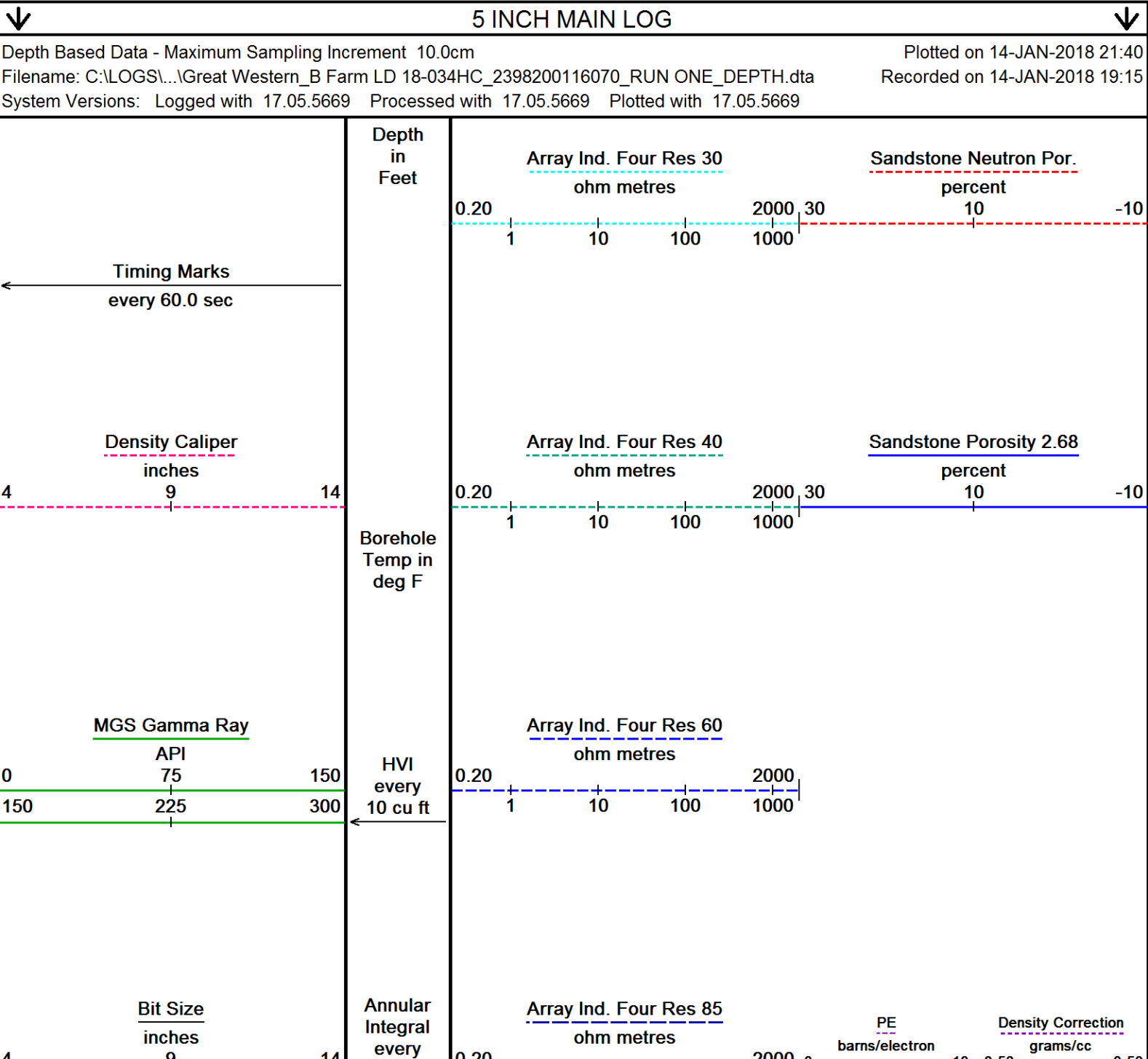
BOREHOLE RECORD			Last Edited: 14-JAN-2018 17:39	
Bit Size inches	Depth From feet		Depth To feet	
8.500	1718.00		13833.00	
CASING RECORD				
Type	Size inches	Depth From feet	Shoe Depth feet	Weight pounds/ft
SURFACE	9.625	0.00	1718.00	36.00

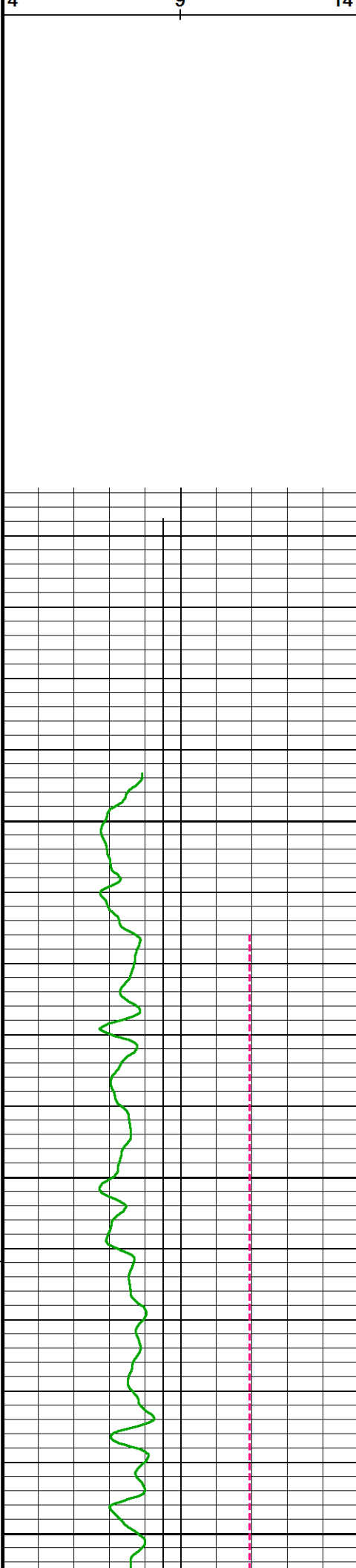
REMARKS
WLS SOFTWARE VERSION: 17.05.5669
TOOLS RUN IN COMBINATION: SRT;SHA;MBS;MMS;MTI;MGS;MCL;SKJ;SHA;MISD;MDN;MPD; MVC;SHA;SKJ;MISE;MAI.
PRIMARY DEPTH REFERENCE WAS PIPE STRAP. THIS LOG WAS THEN CORRELATED TO MWD GAMMA RAY LOG PROVIDED BY CLIENT. MWD GAMMA RAY LOGGED BY BAKER HUGHES DIRECTIONAL SERVICES DATED 13 JAN 2018
LOGGED USING MESSENGER SHUTTLE METHOD OF DEPLOYMENT.
HARDWARE USED:4 INCH PROFILE PLATE USED ON DENSITYDRILL MISD DECENTRALIZER ABOVE MDN MVC USED FOR DECENTRALIZATION BELOW MPD 0.5 INCH MISE STAND OFF ABOVE AND 0.5 INCH ISA STAND OFF BELOW INDUCTION
ANNULAR HOLE VOLUME CALCULATED FOR 5.5 INCH CASING

DRILL PIPE DEPTH AT TIME OF DEPLOYMENT: 13734'
LOGGING TOOL DEPTH AT TIME OF DEPLOYMENT: 13815.46'

PRECISION DRILLING RIG # 460

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.





10 cu ft

Replay
Scale
1:240

756

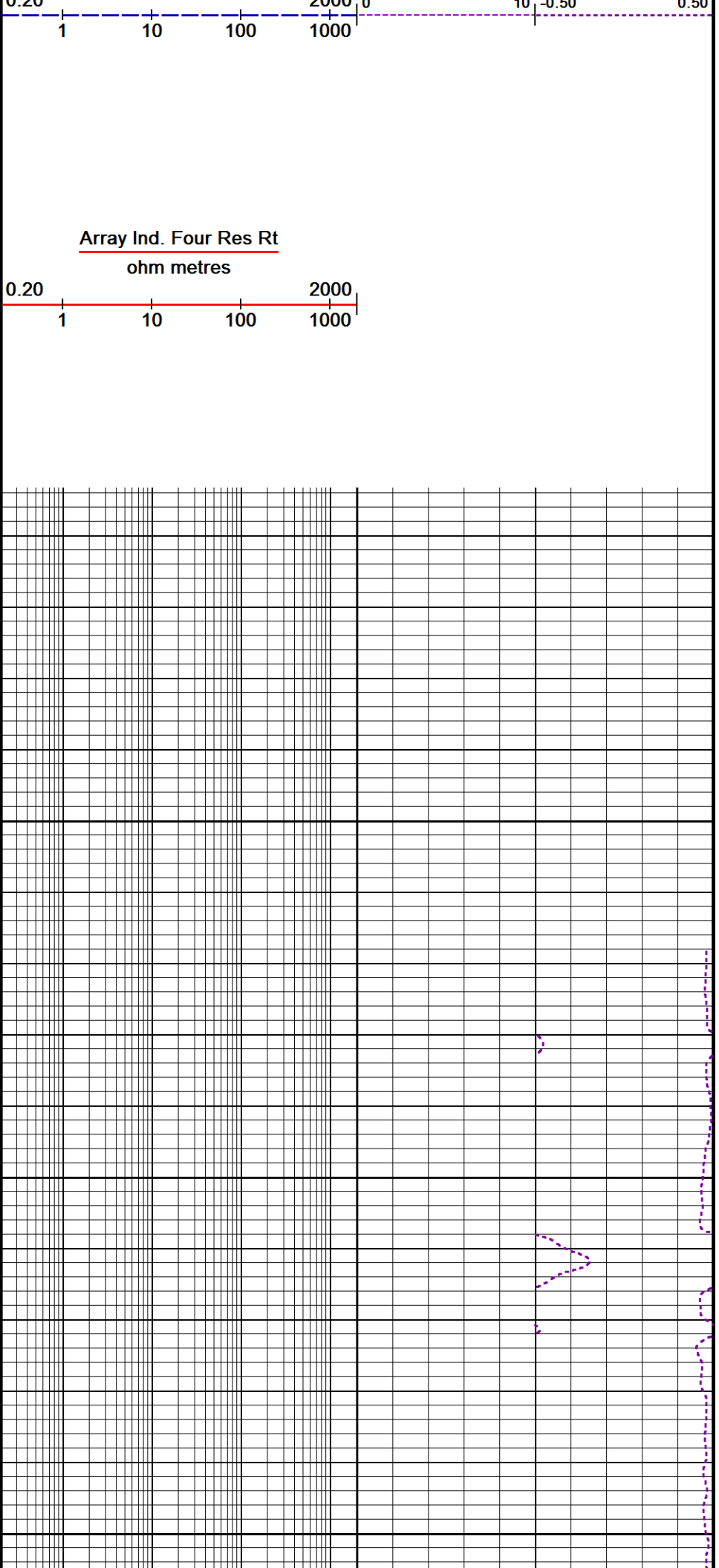
800

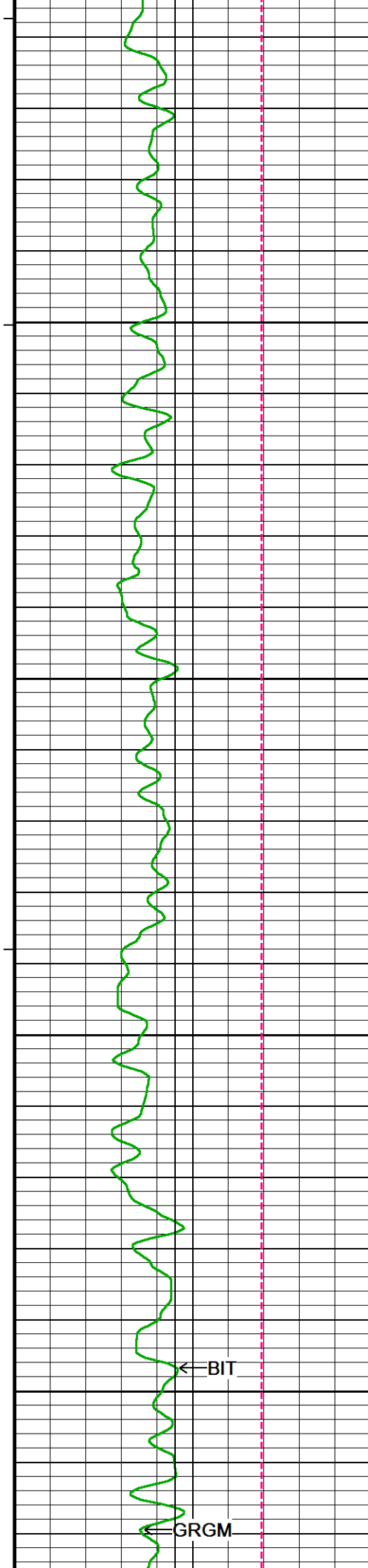
109°

850

109°

900





110°

950

111°

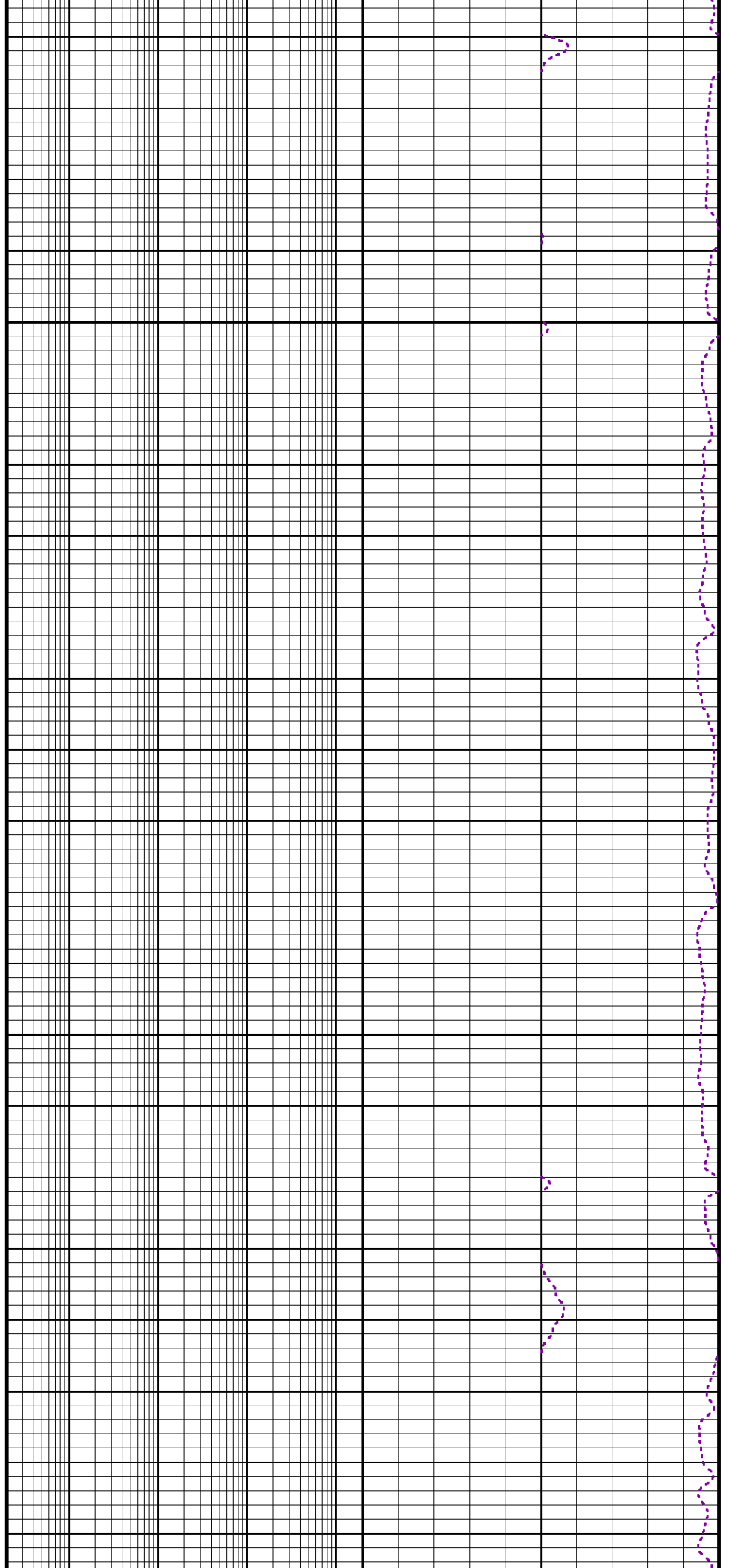
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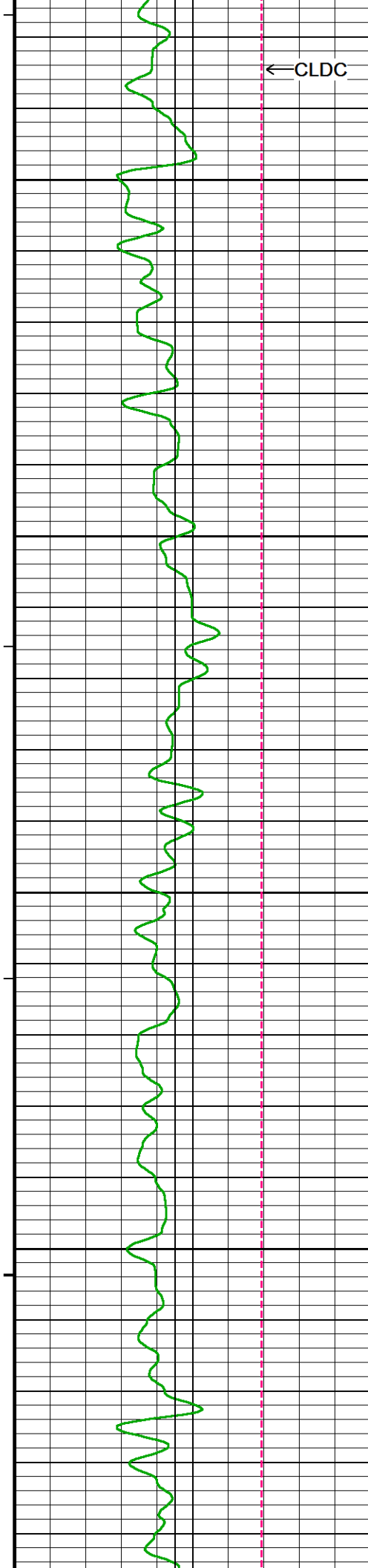
112°

1050

113°

1100





←CLDC

113°

1150

114°

1200

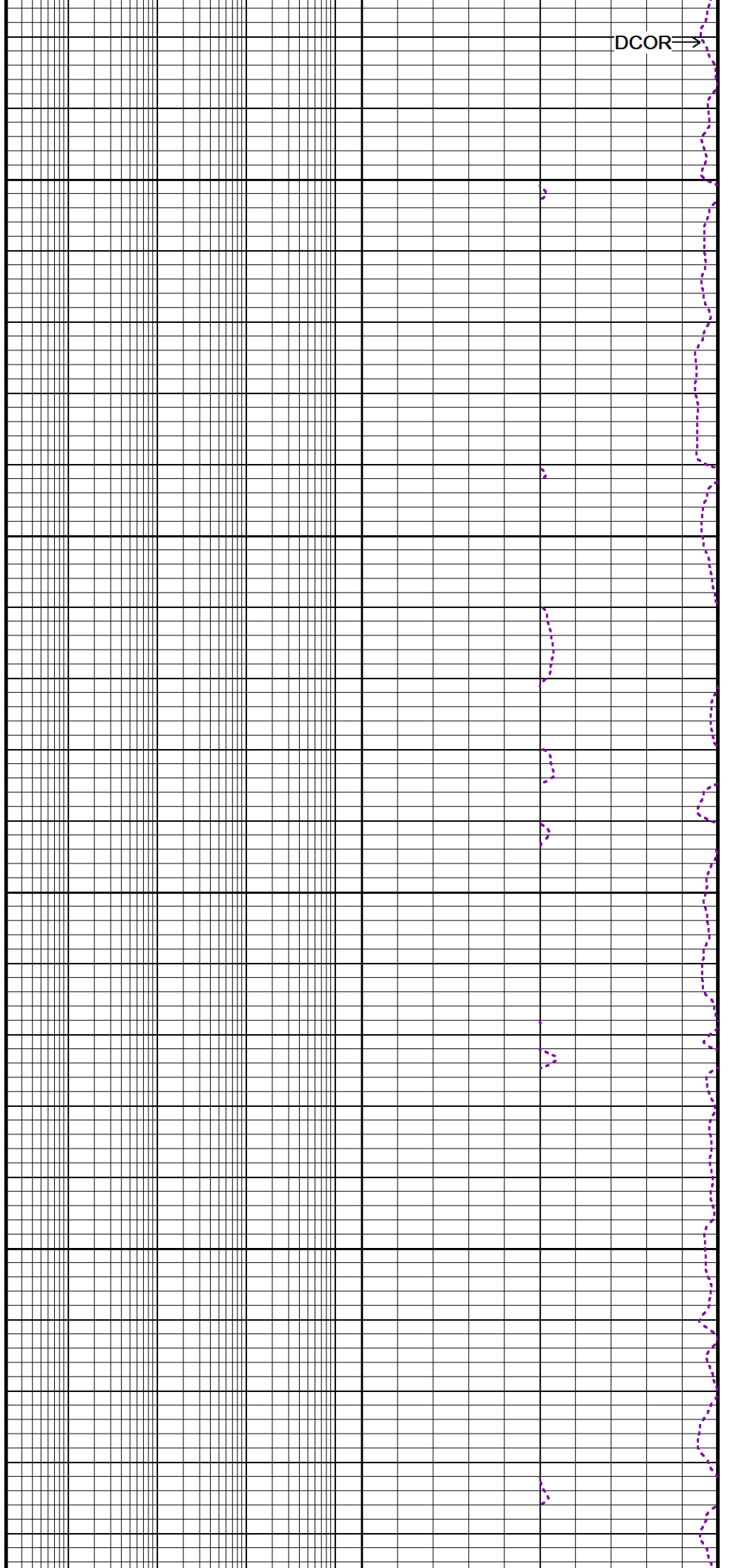
114°

1250

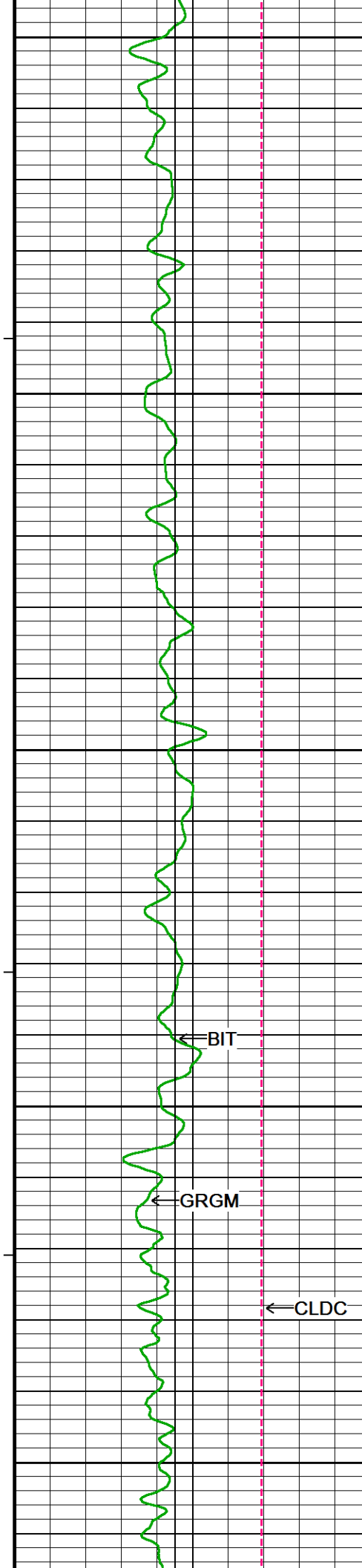
115°

1300

115°



DCOR→



1350

116°

1400

116°

1450

116°

1500

117°

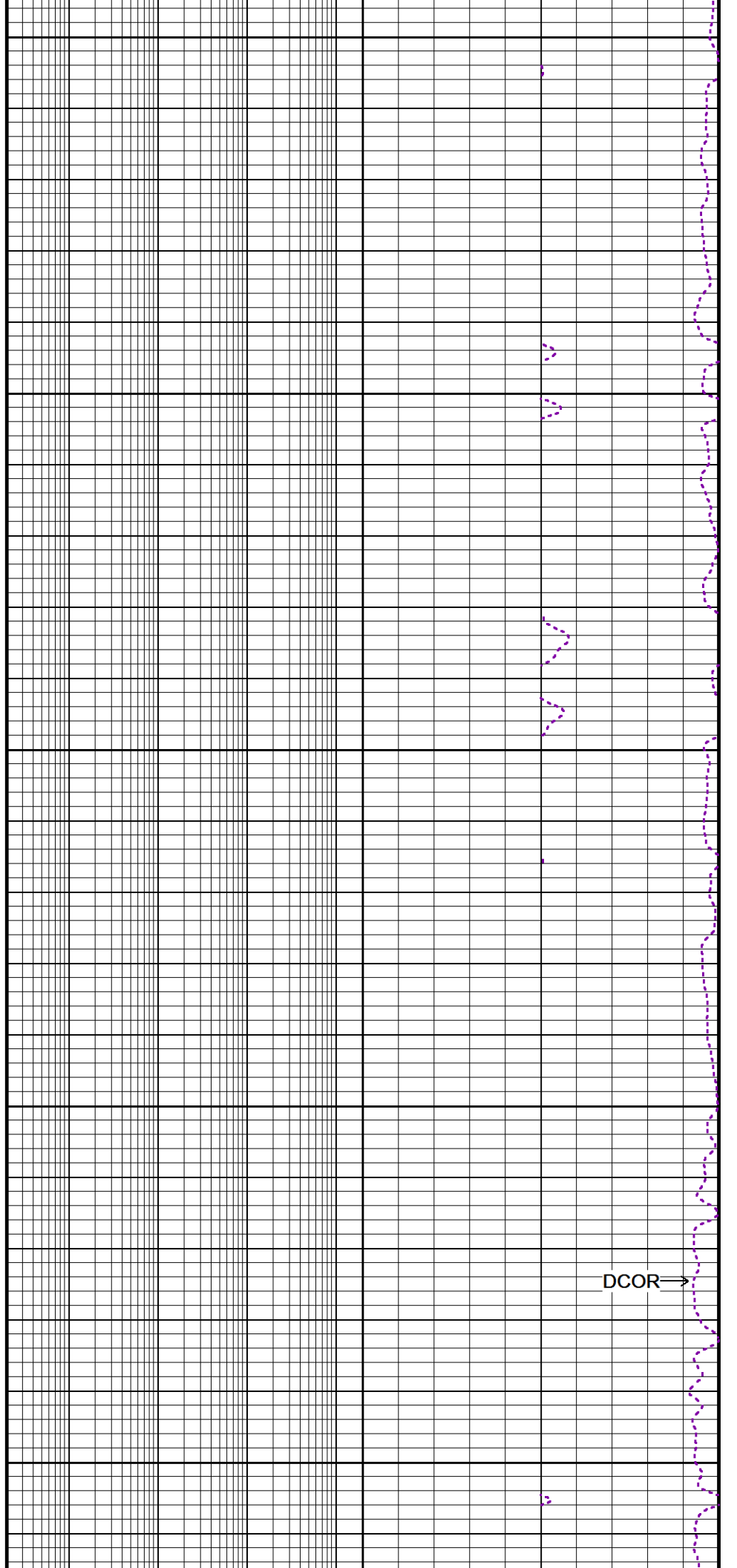
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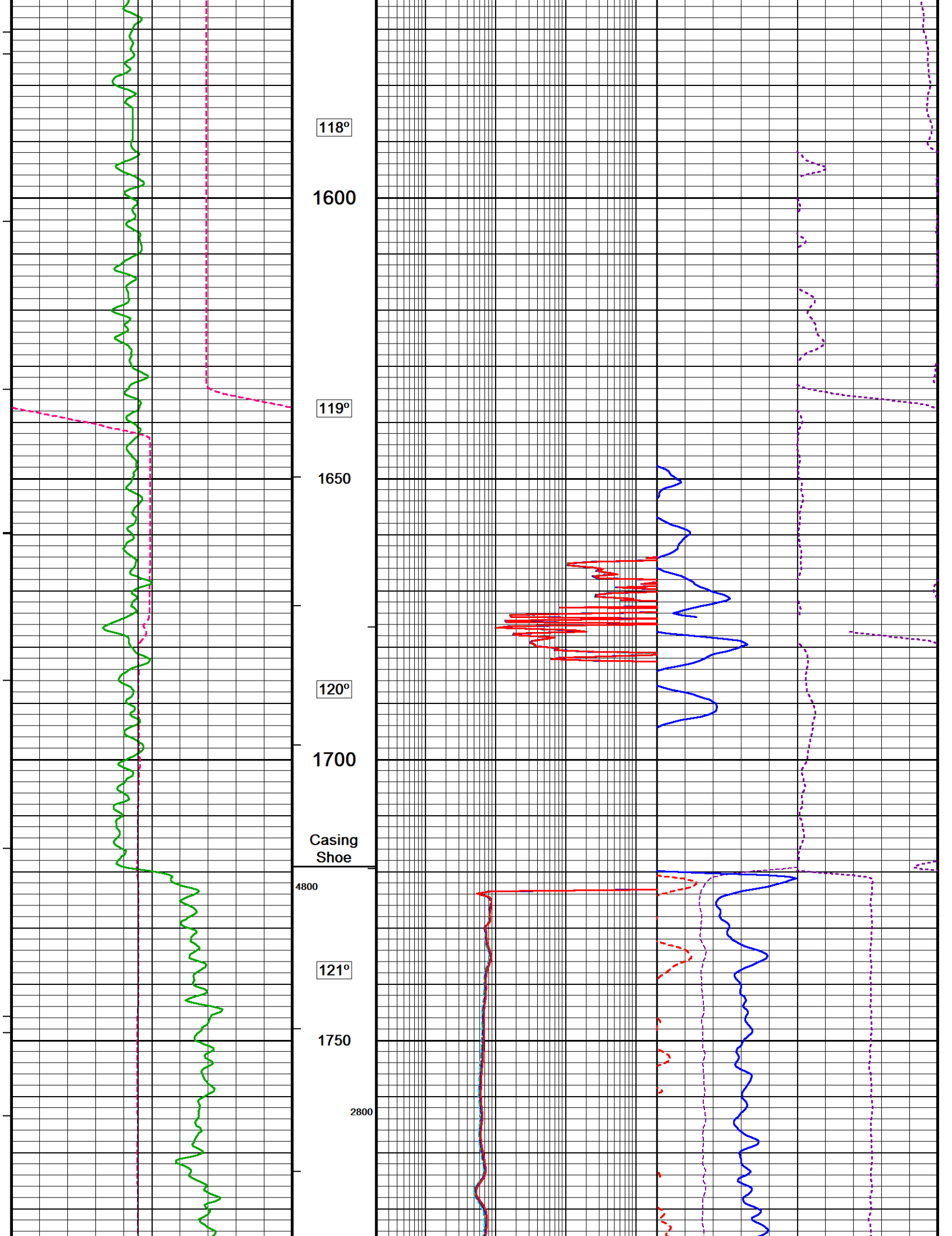
← BIT

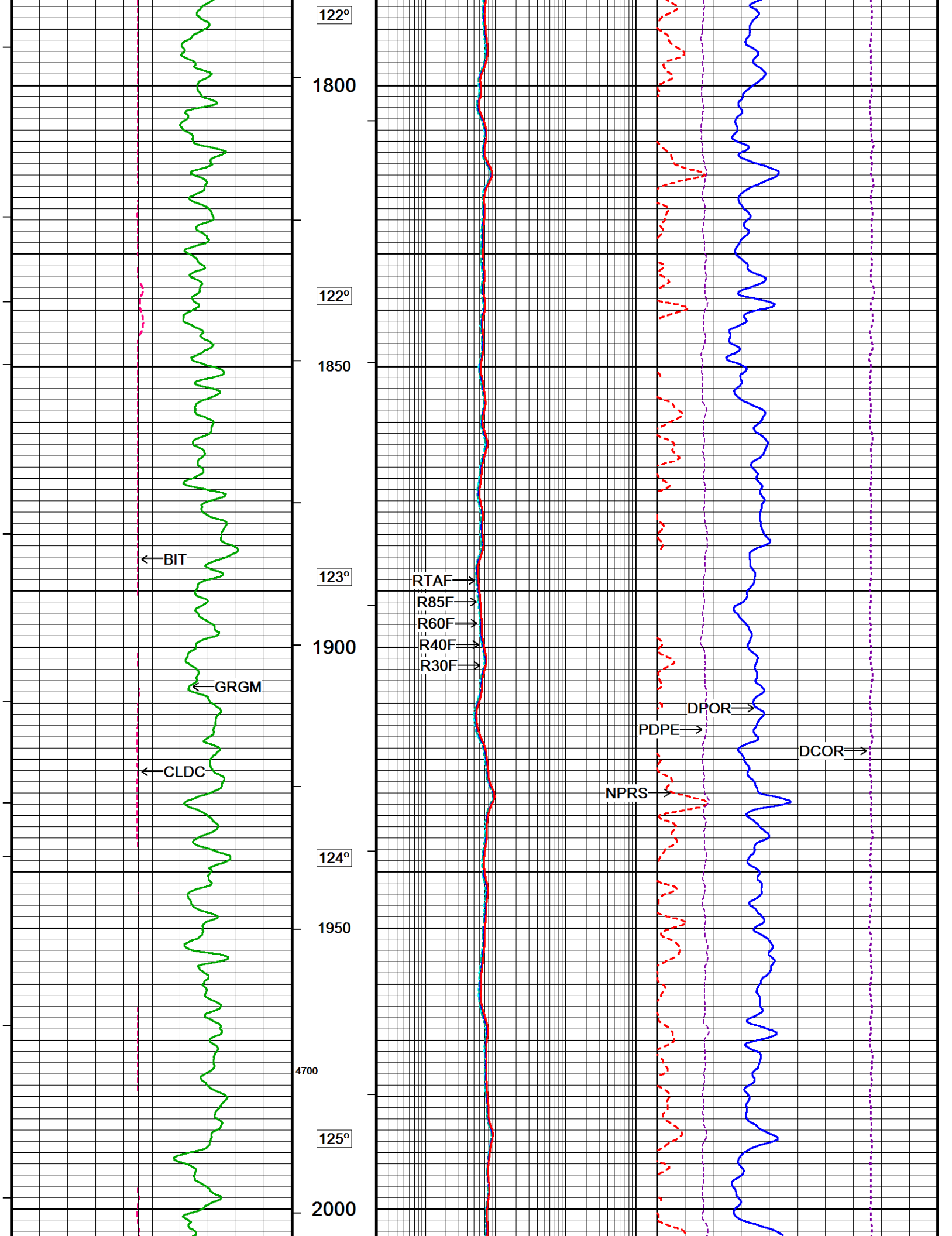
← GRGM

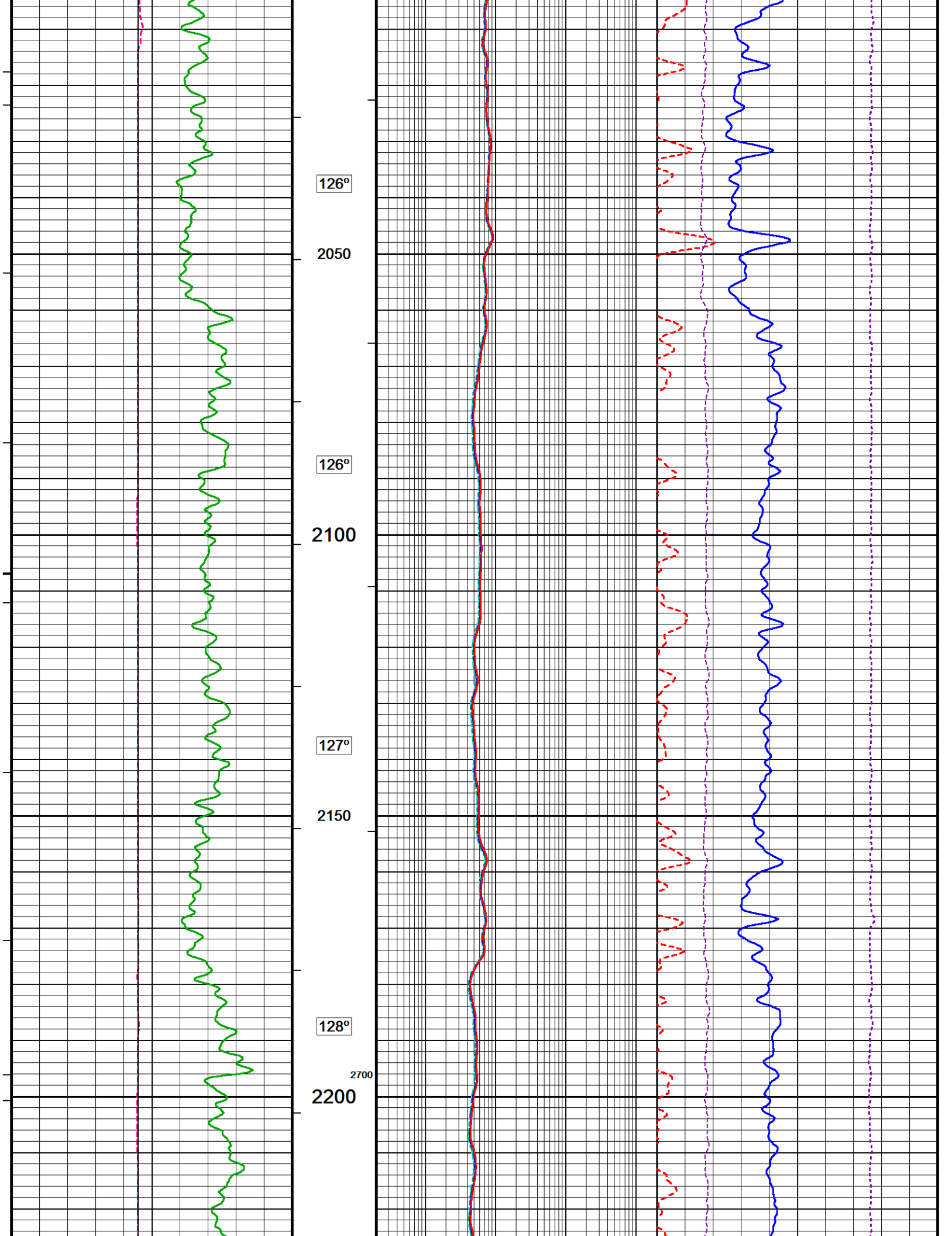
← CLDC

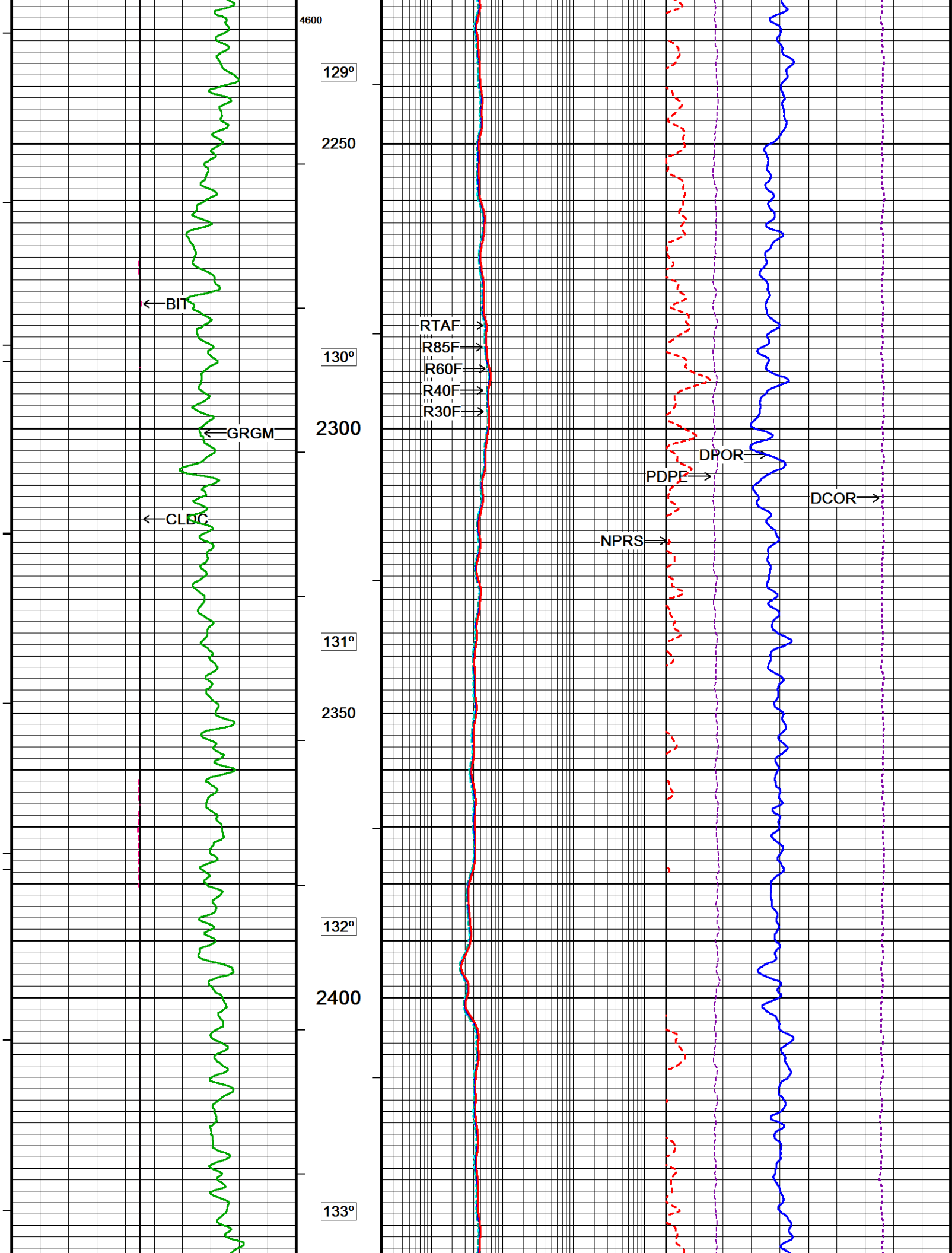
DCOR →

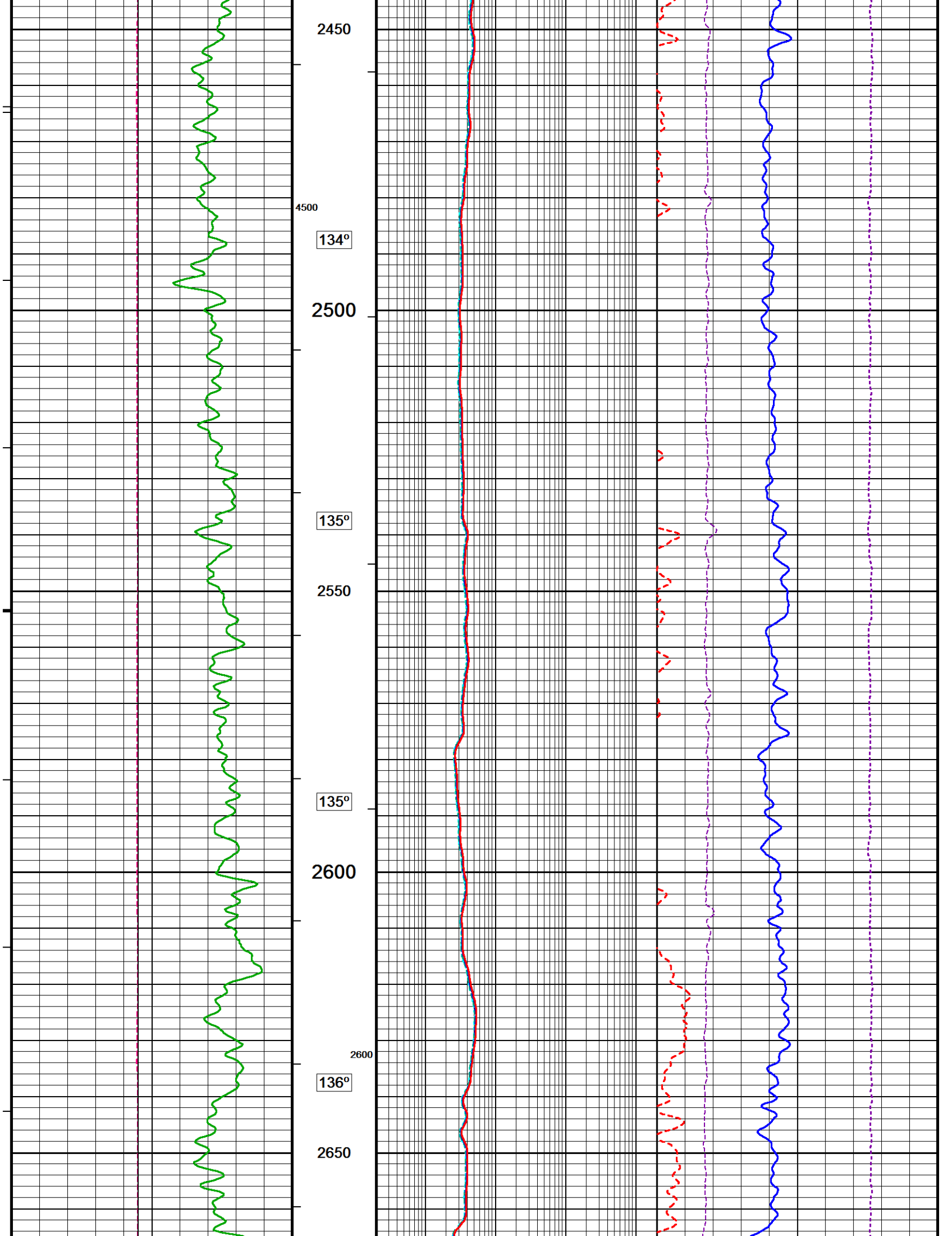


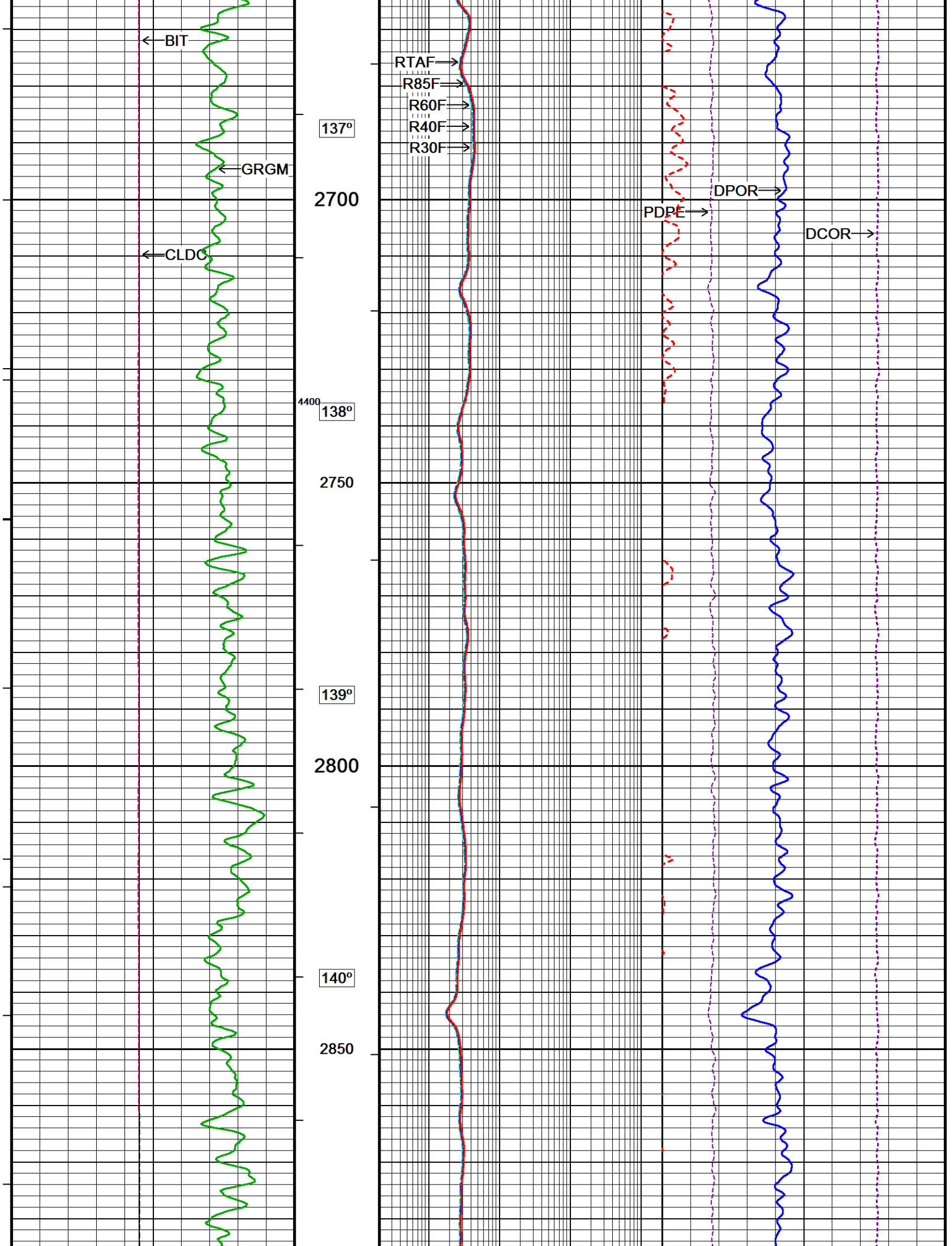


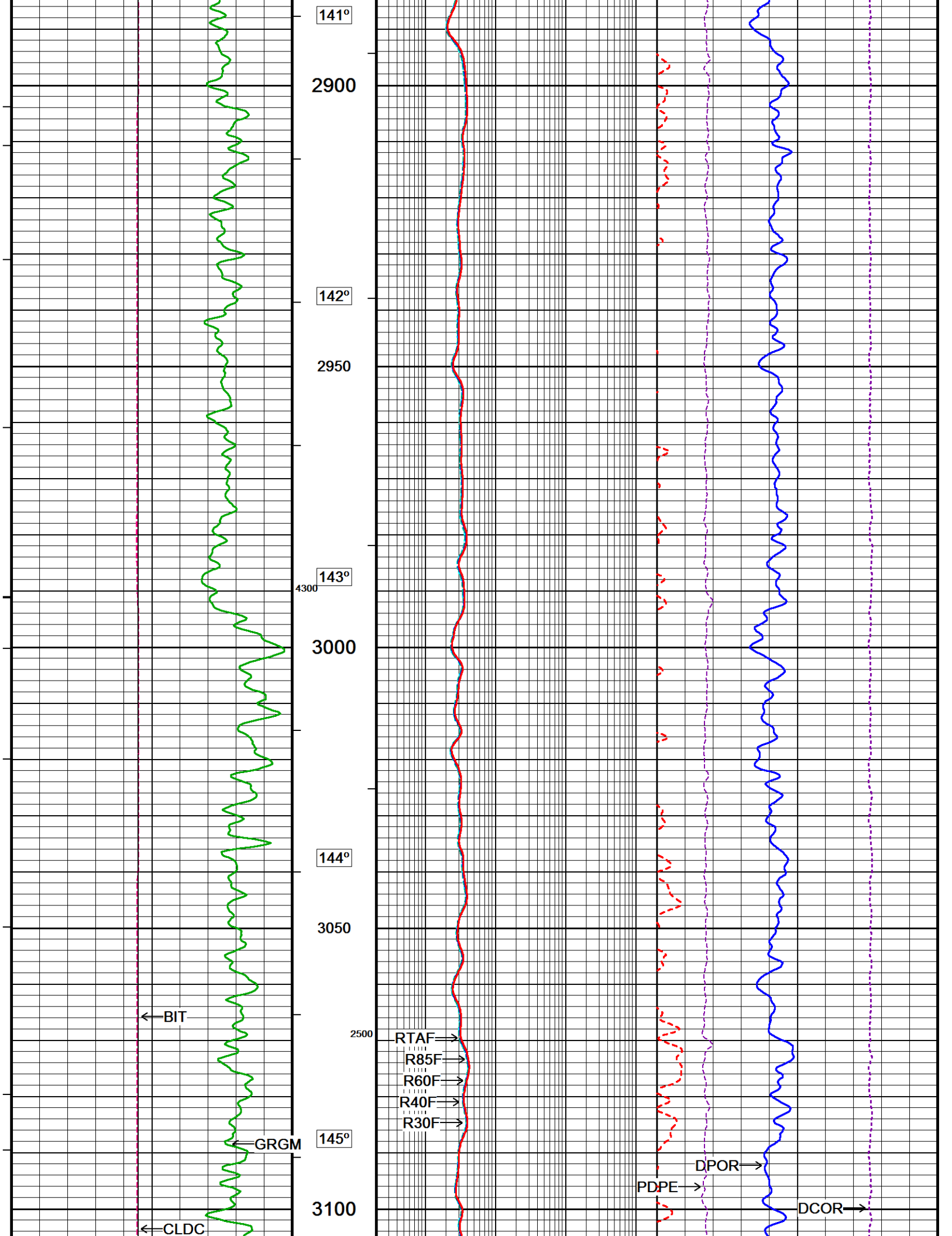


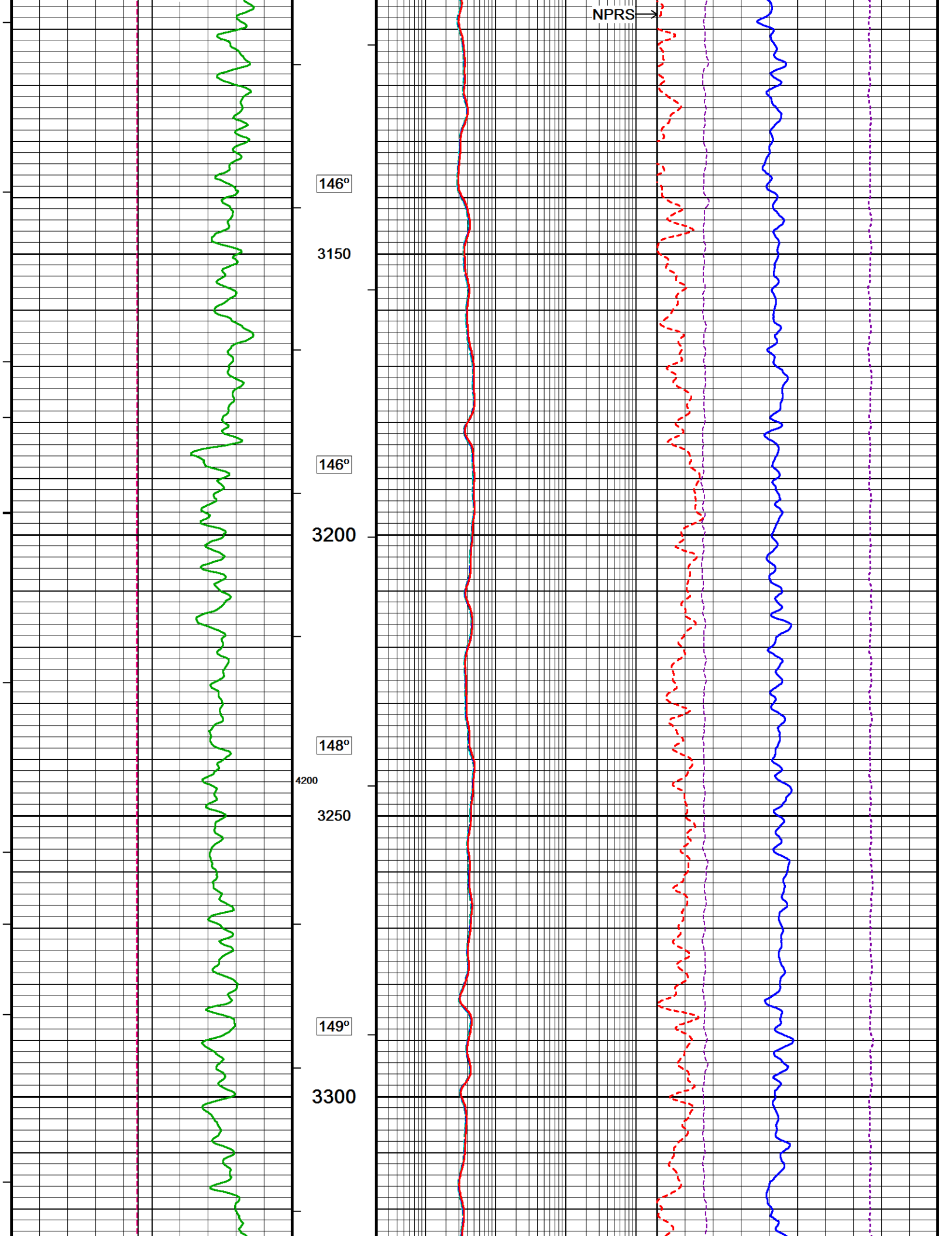


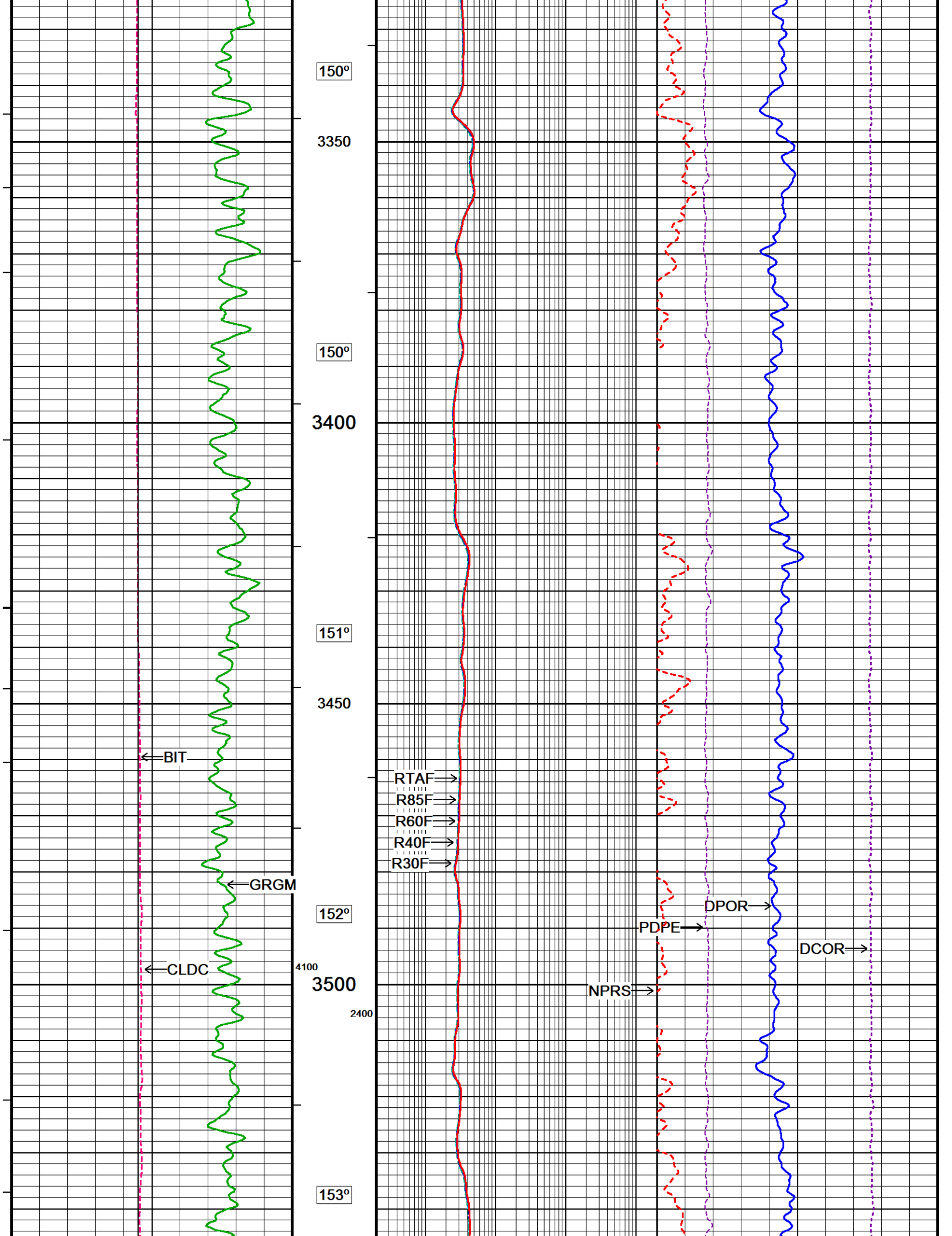


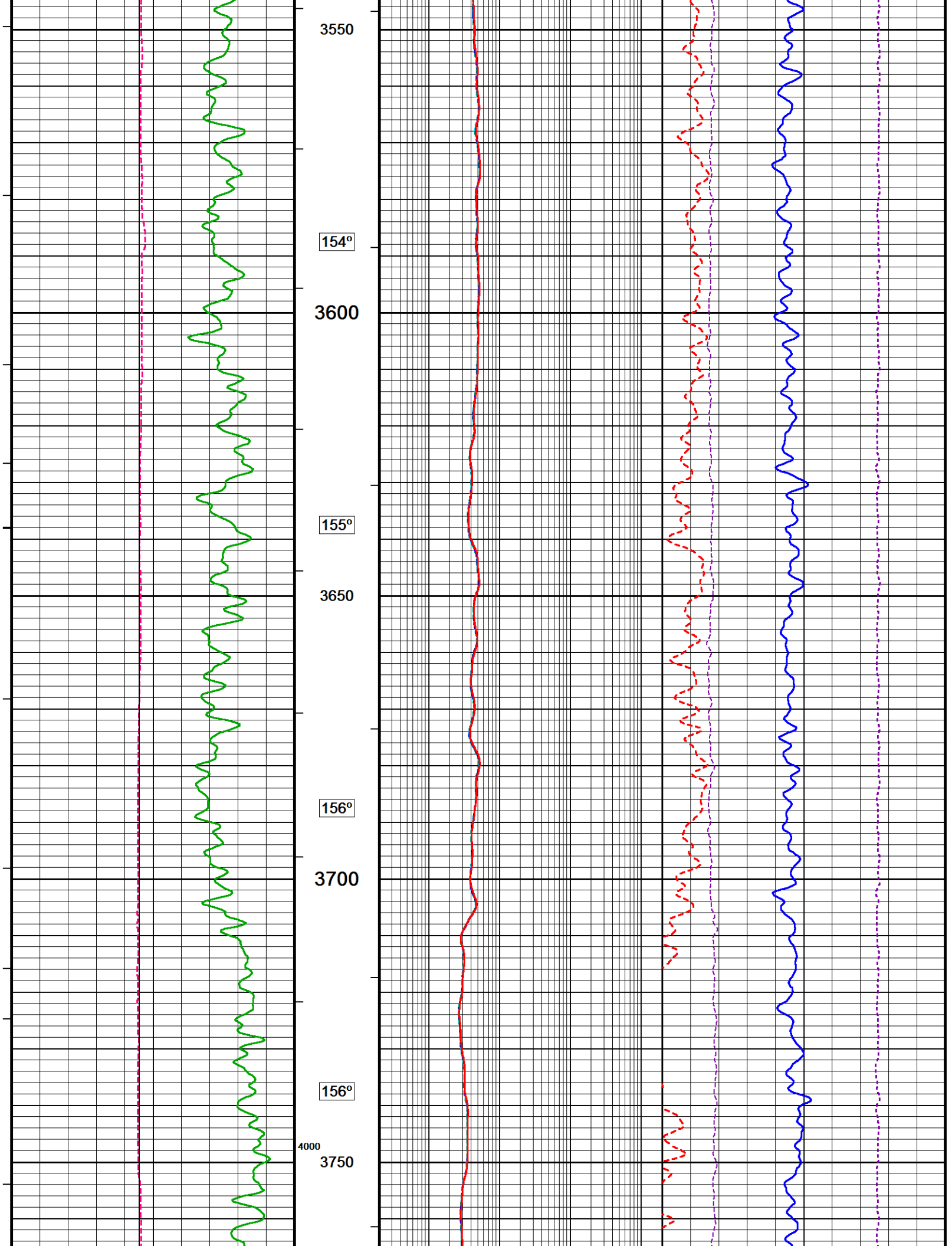


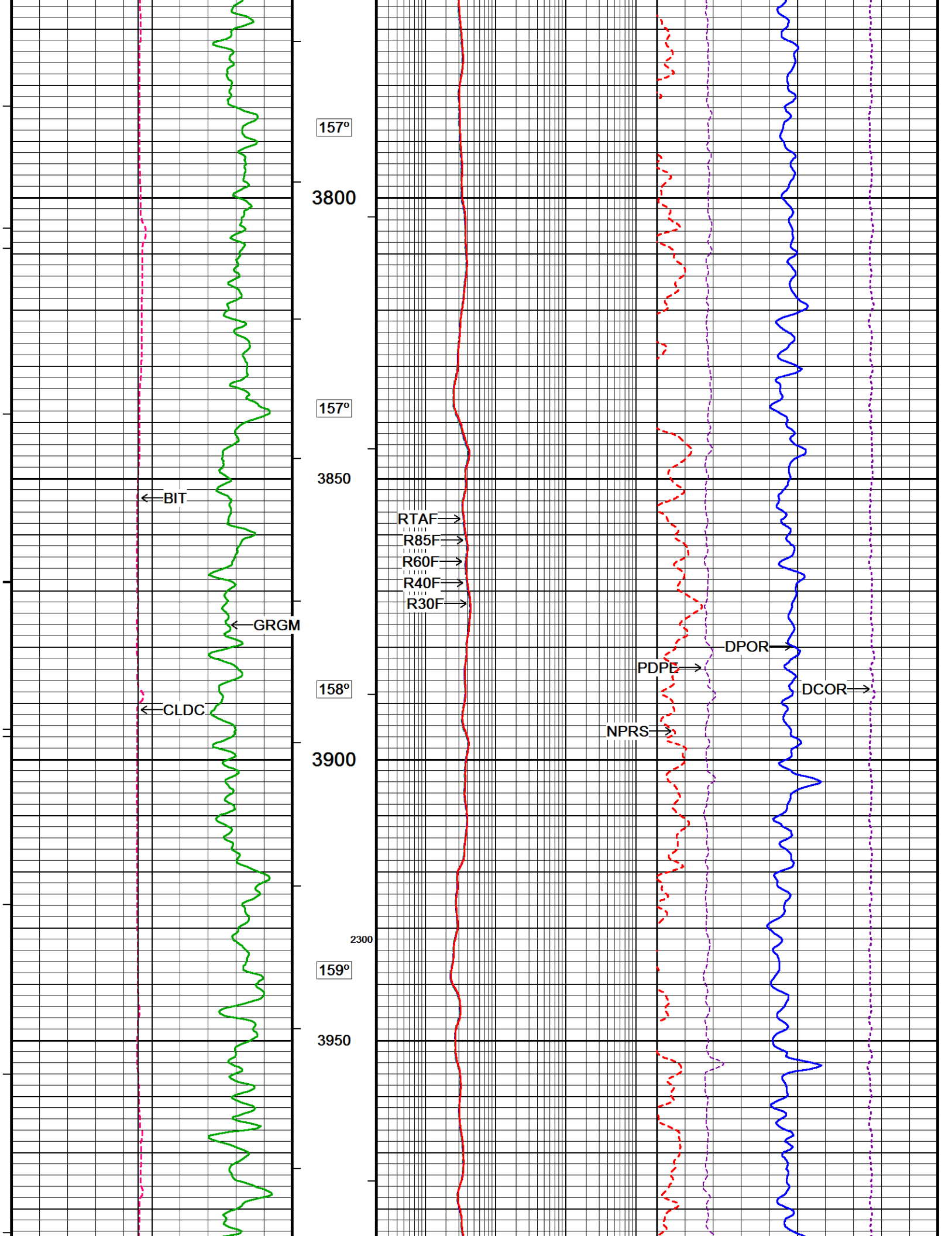


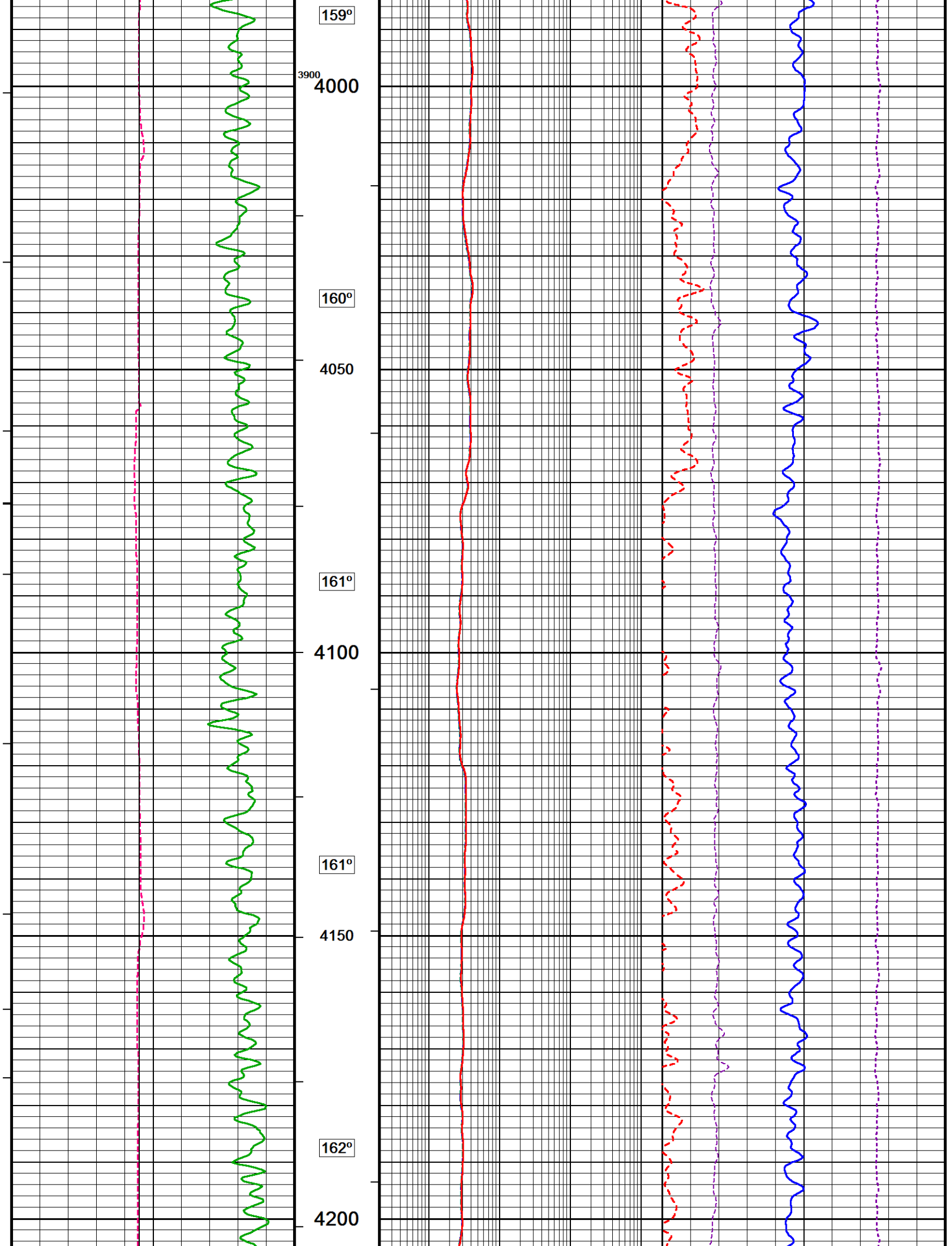


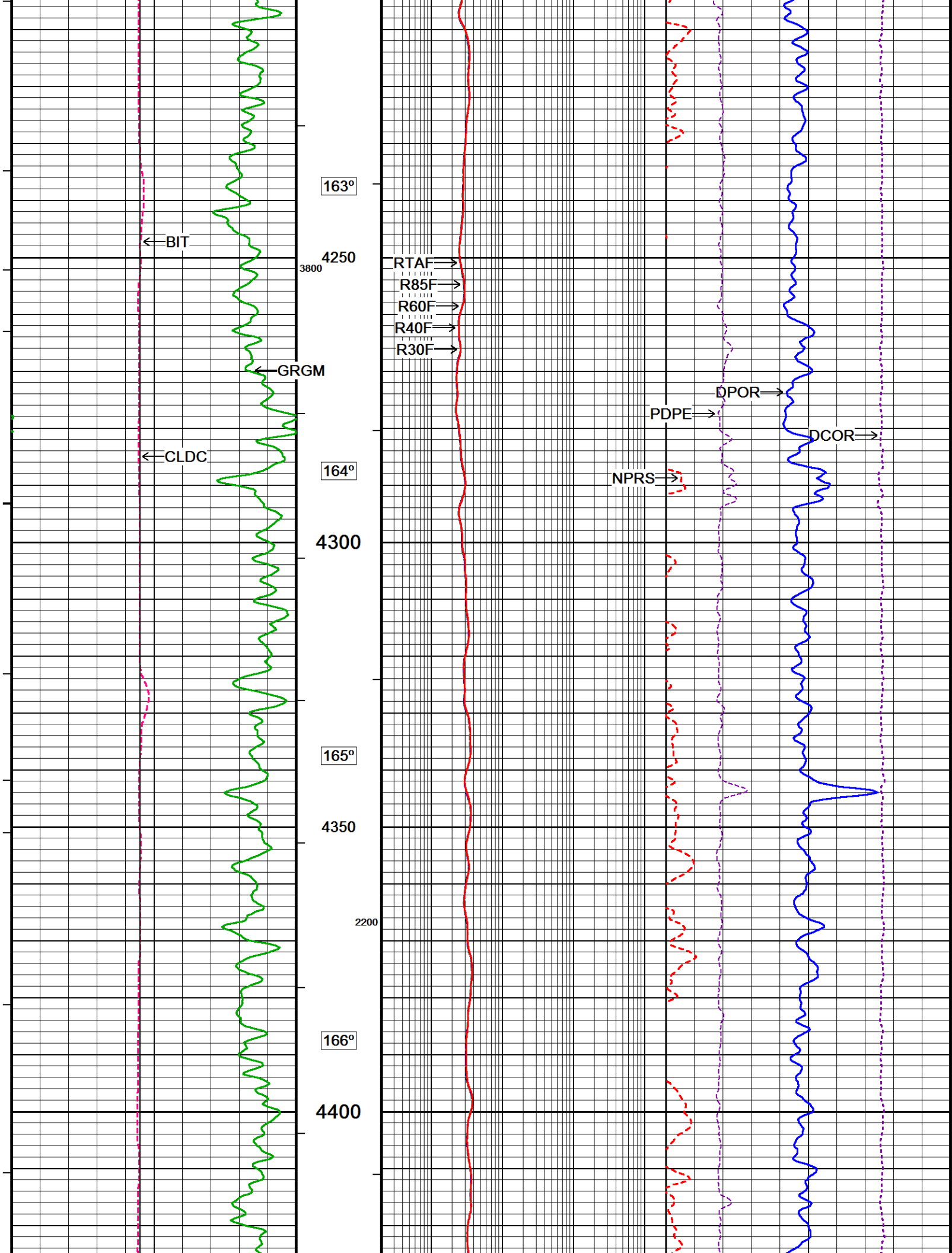


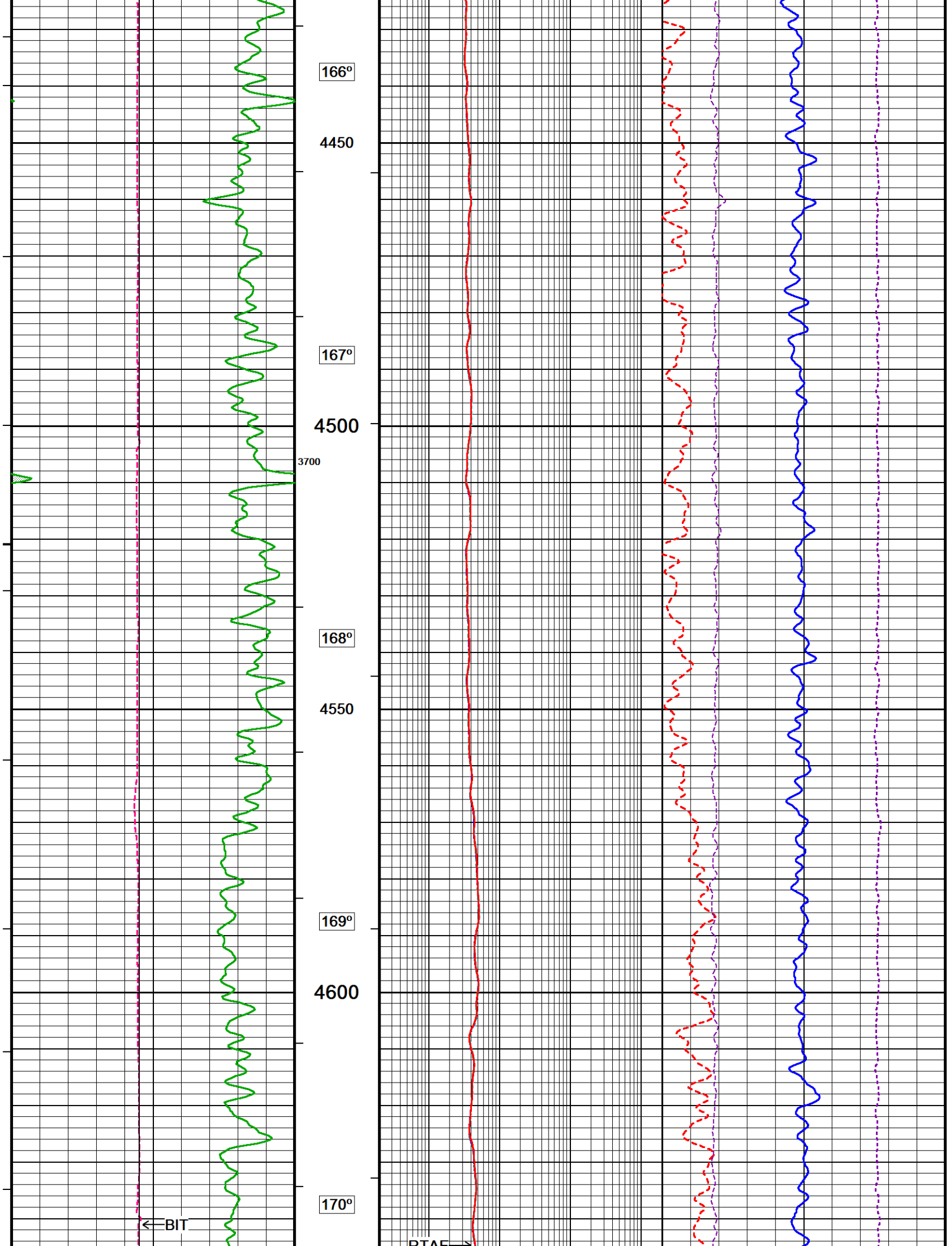


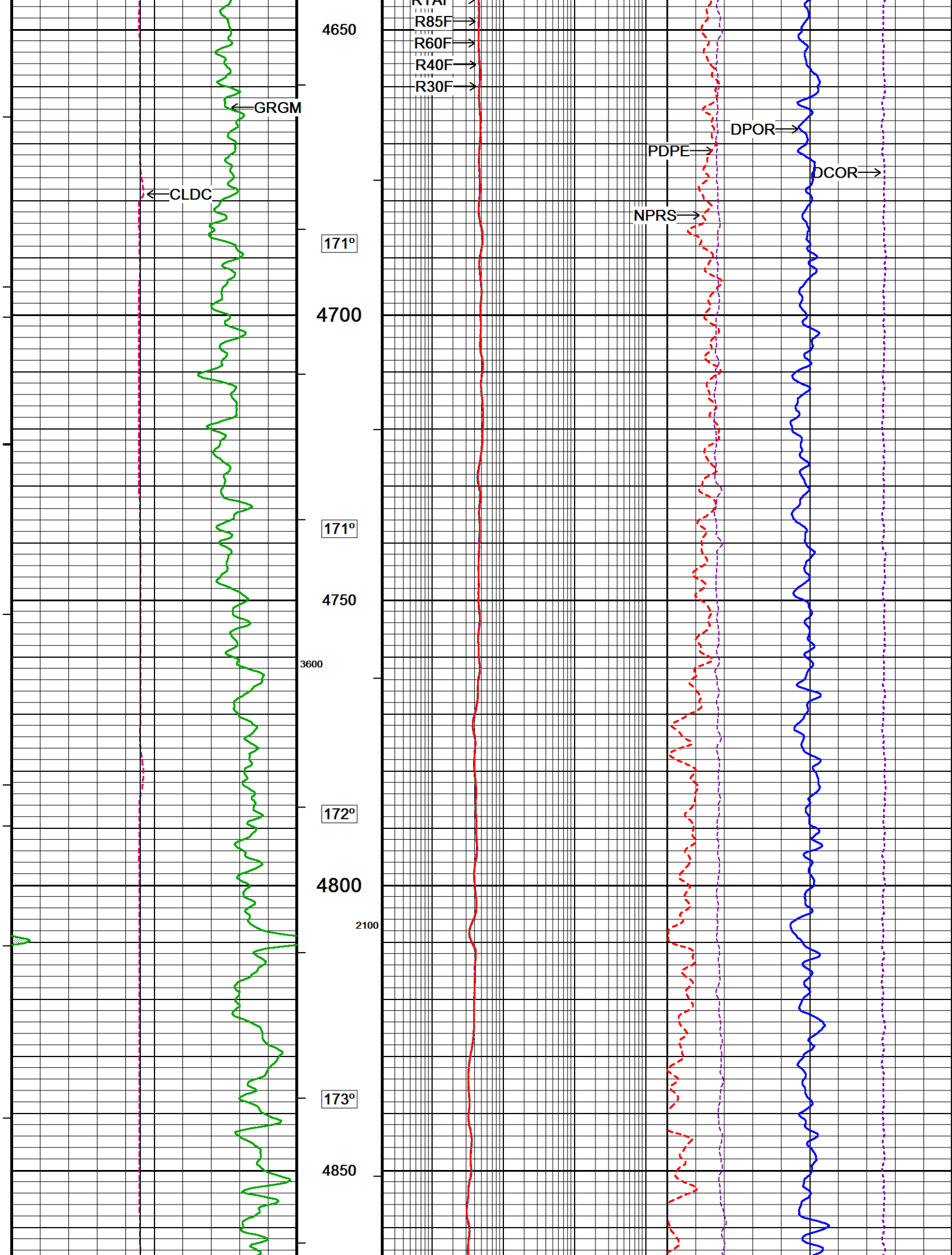


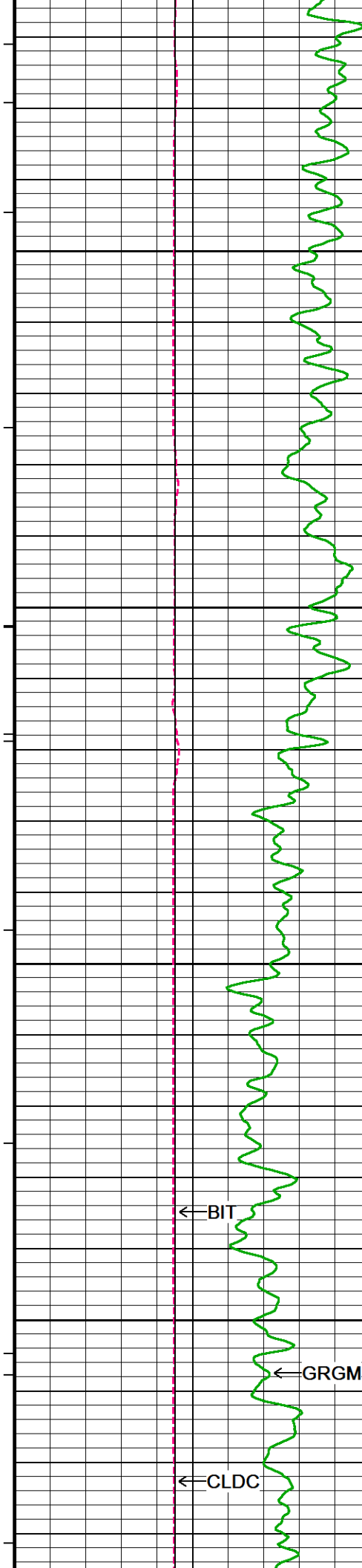




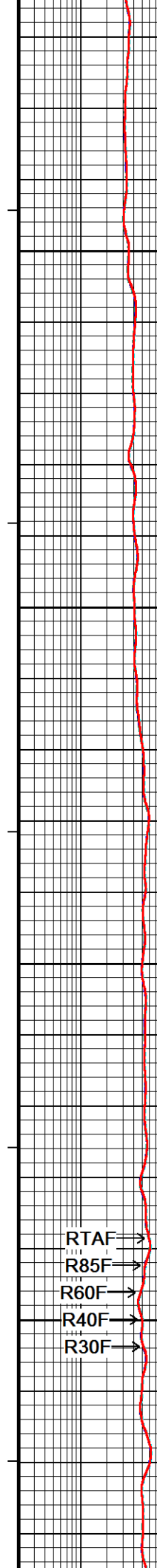




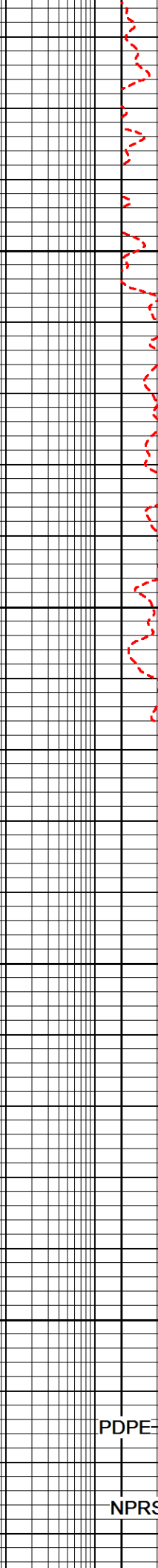




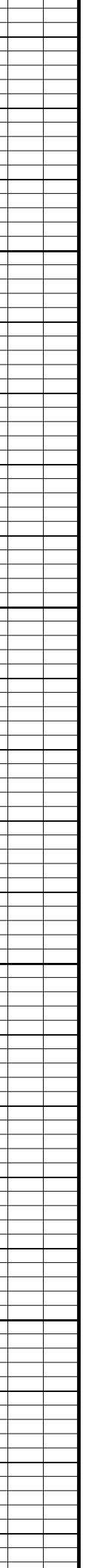
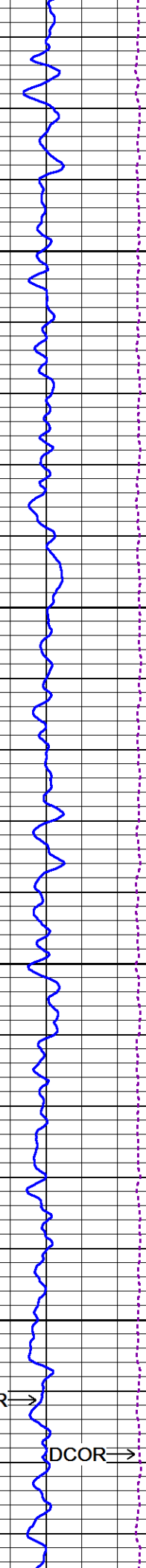
174°
4900
175°
4950
175°
5000
3500
176°
5050



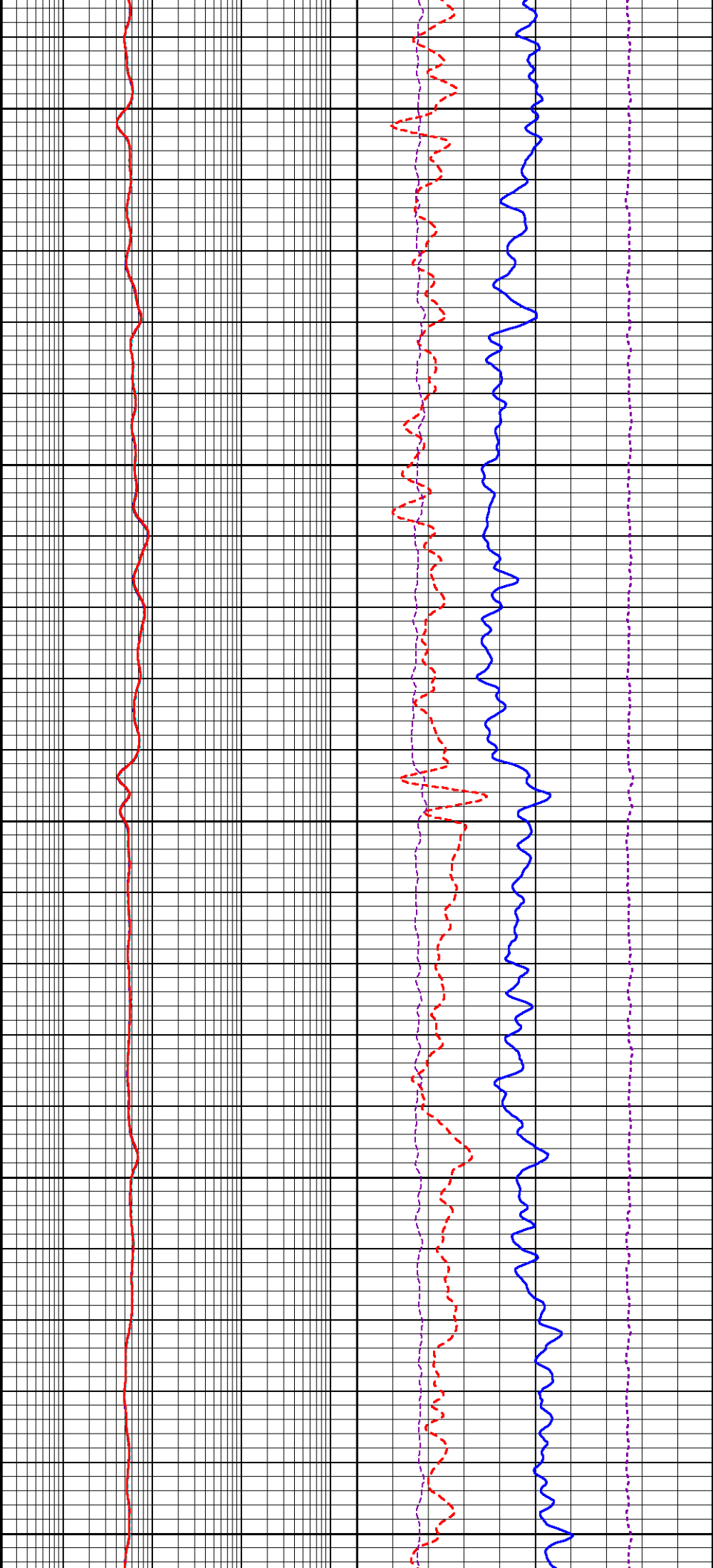
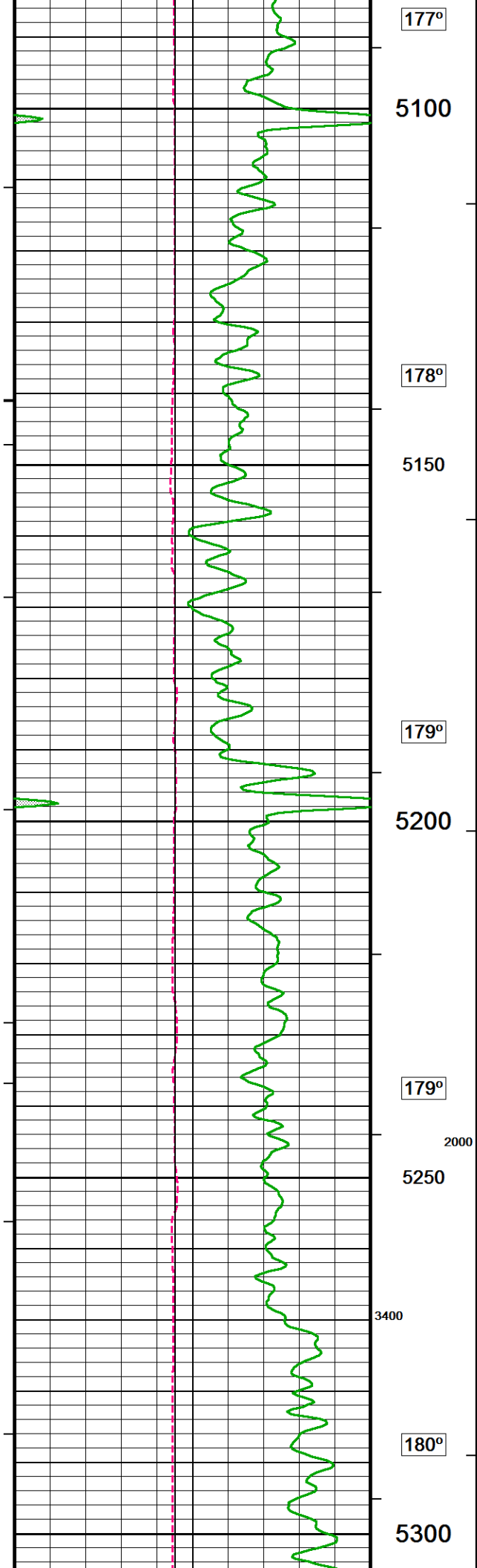
RTAF→
R85F→
R60F→
R40F→
R30F→

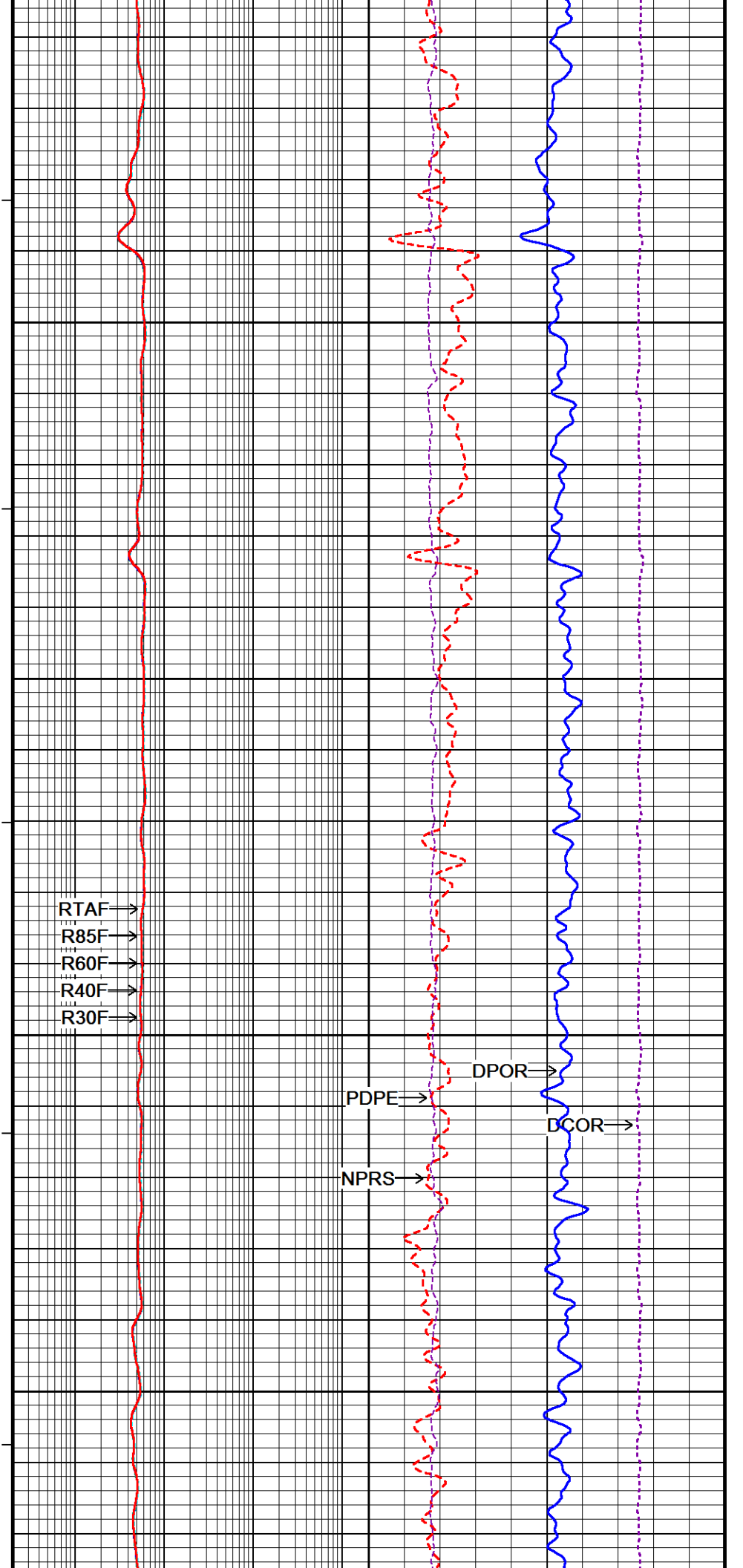
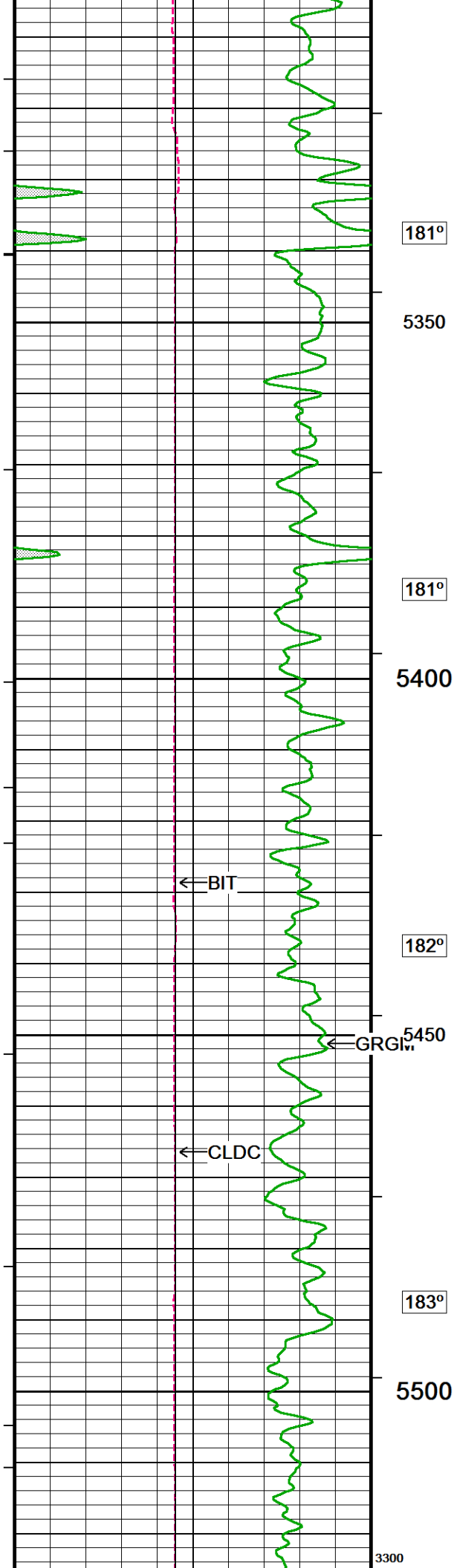


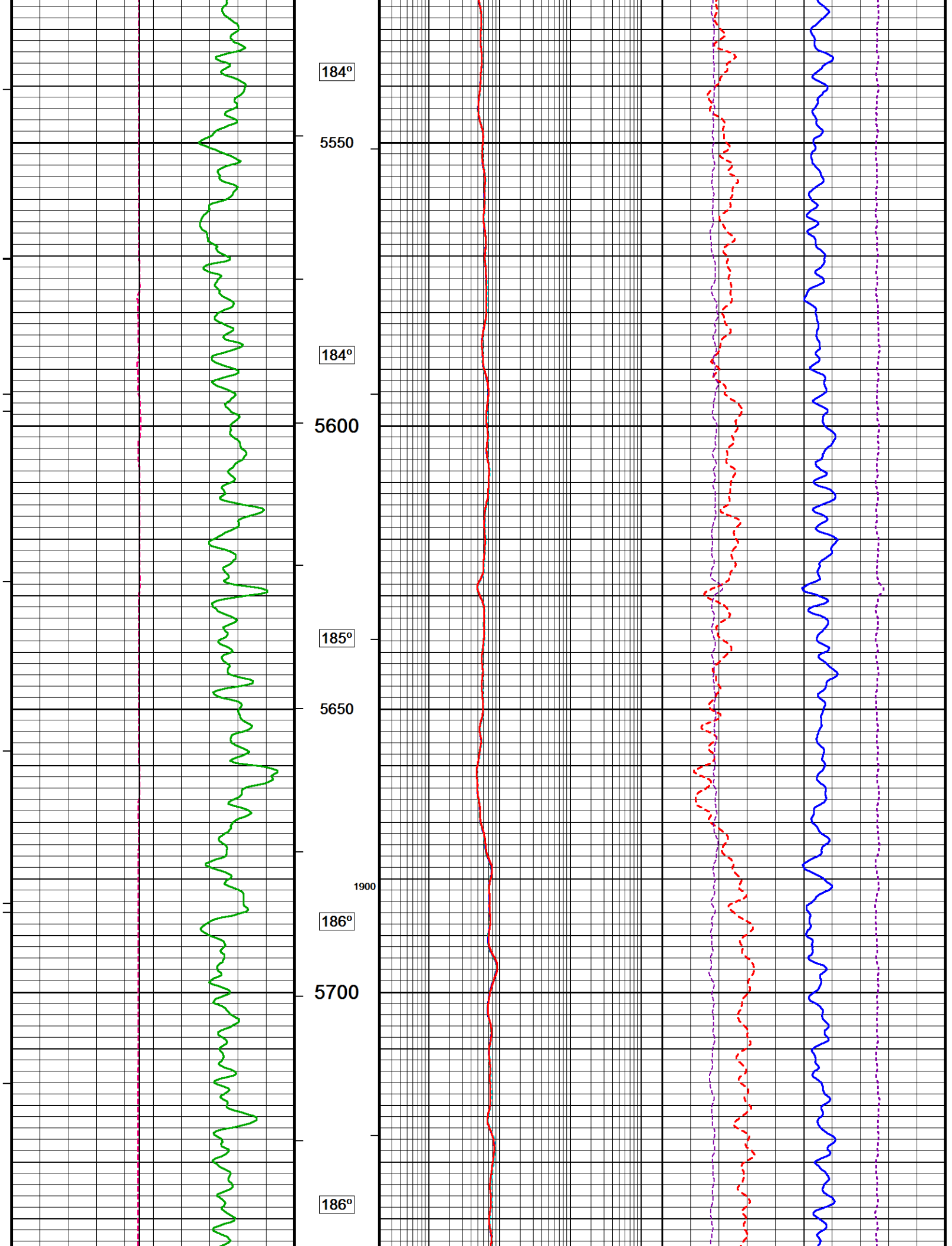
PDPE→
NPRS→

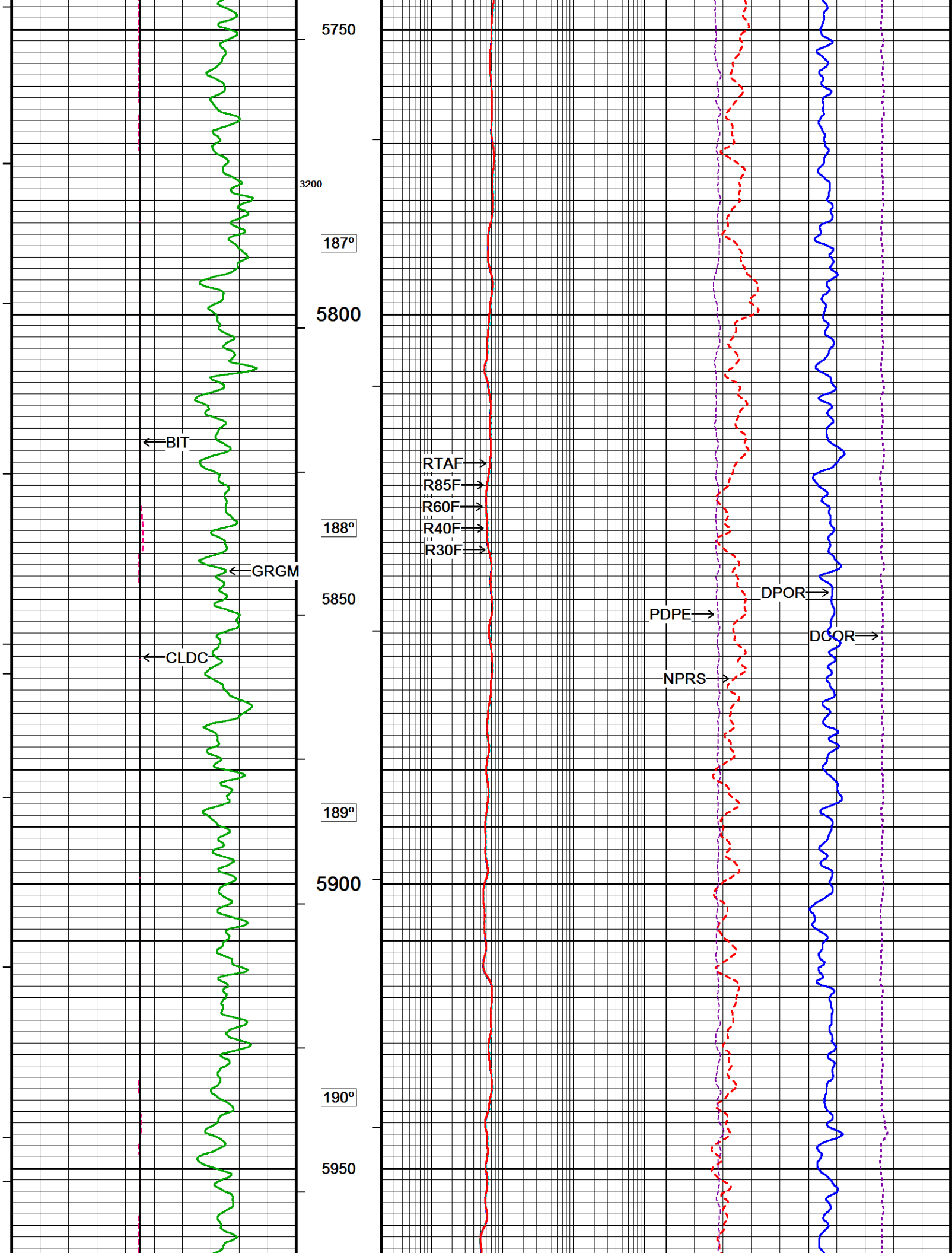


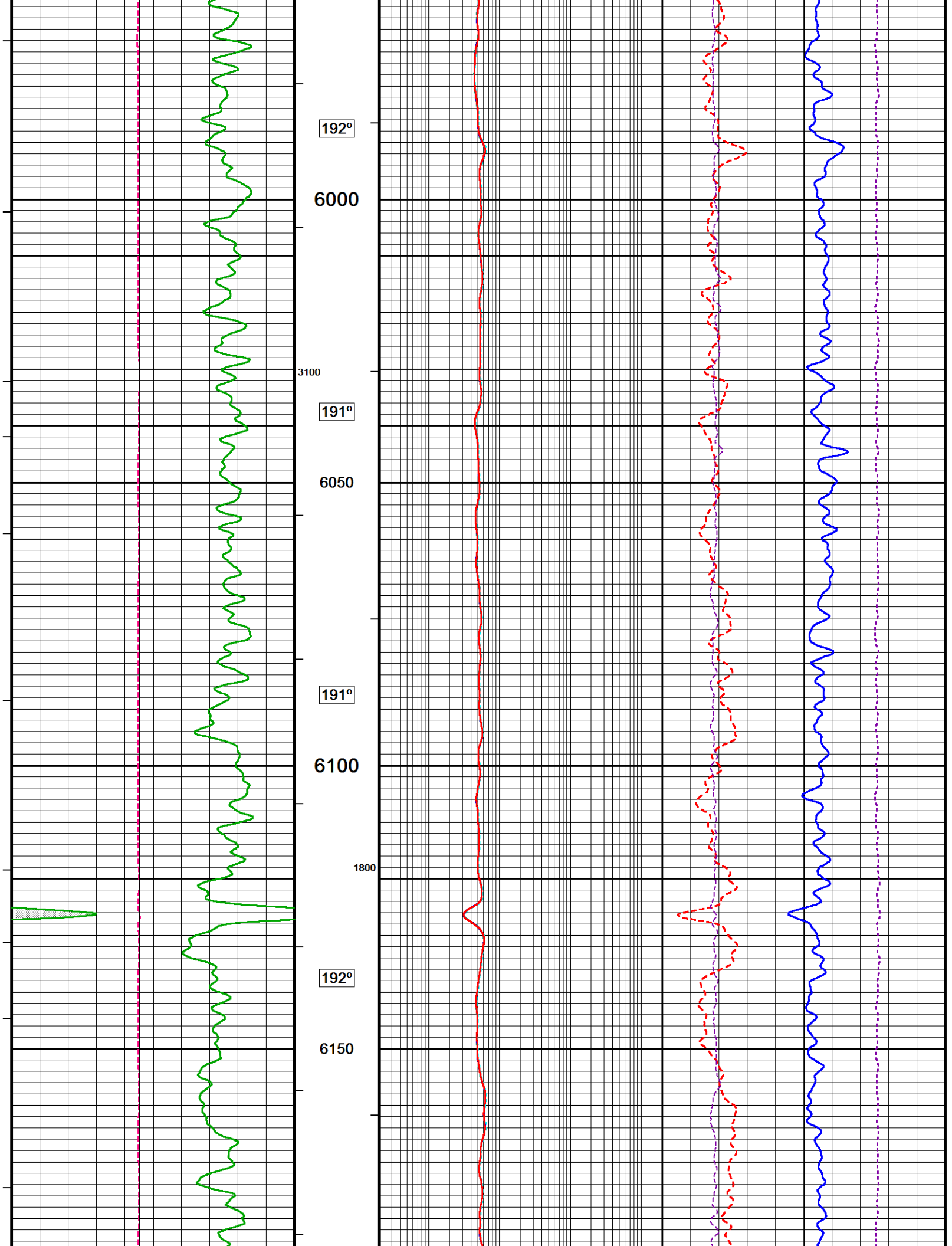
DPOR→
DCOR→

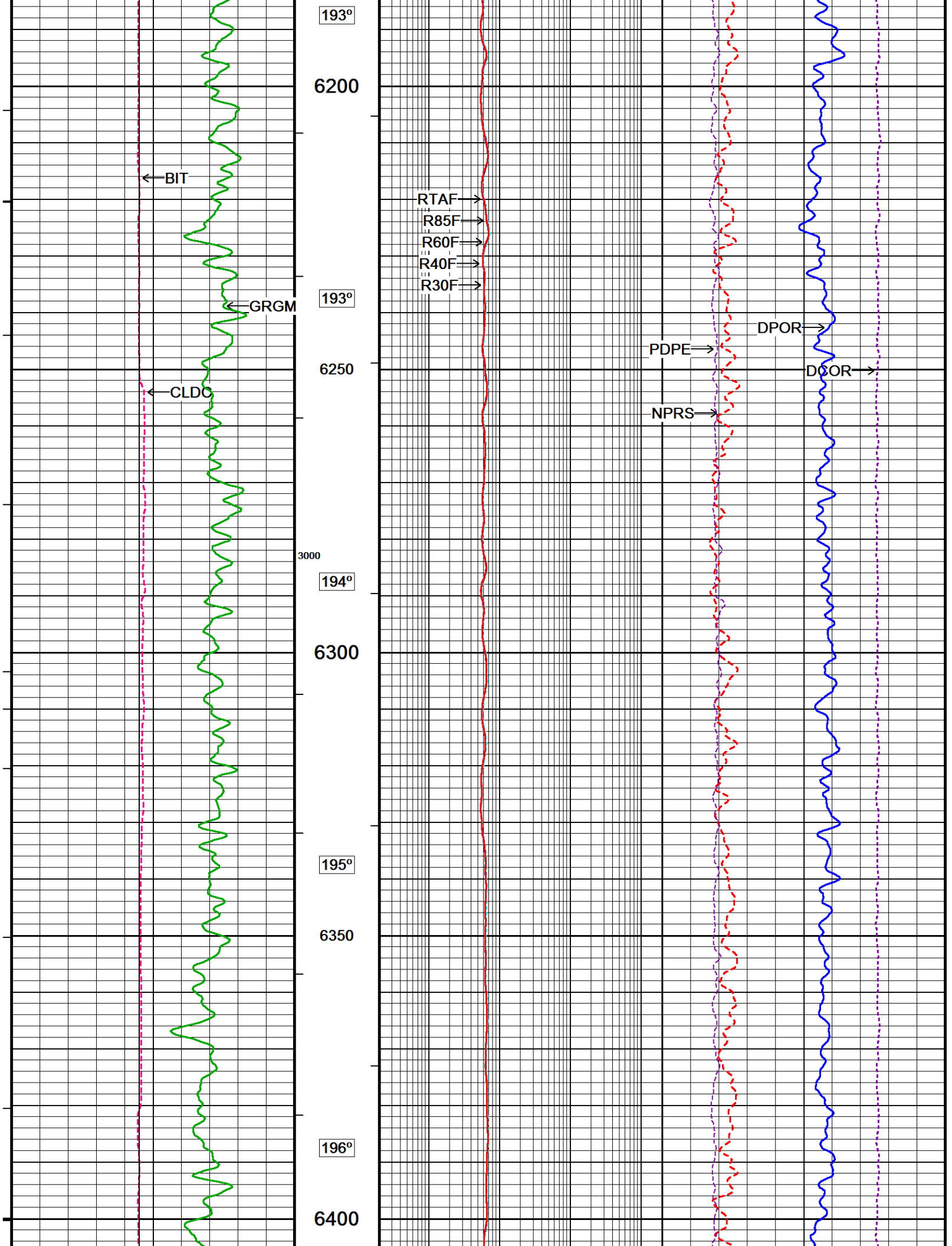


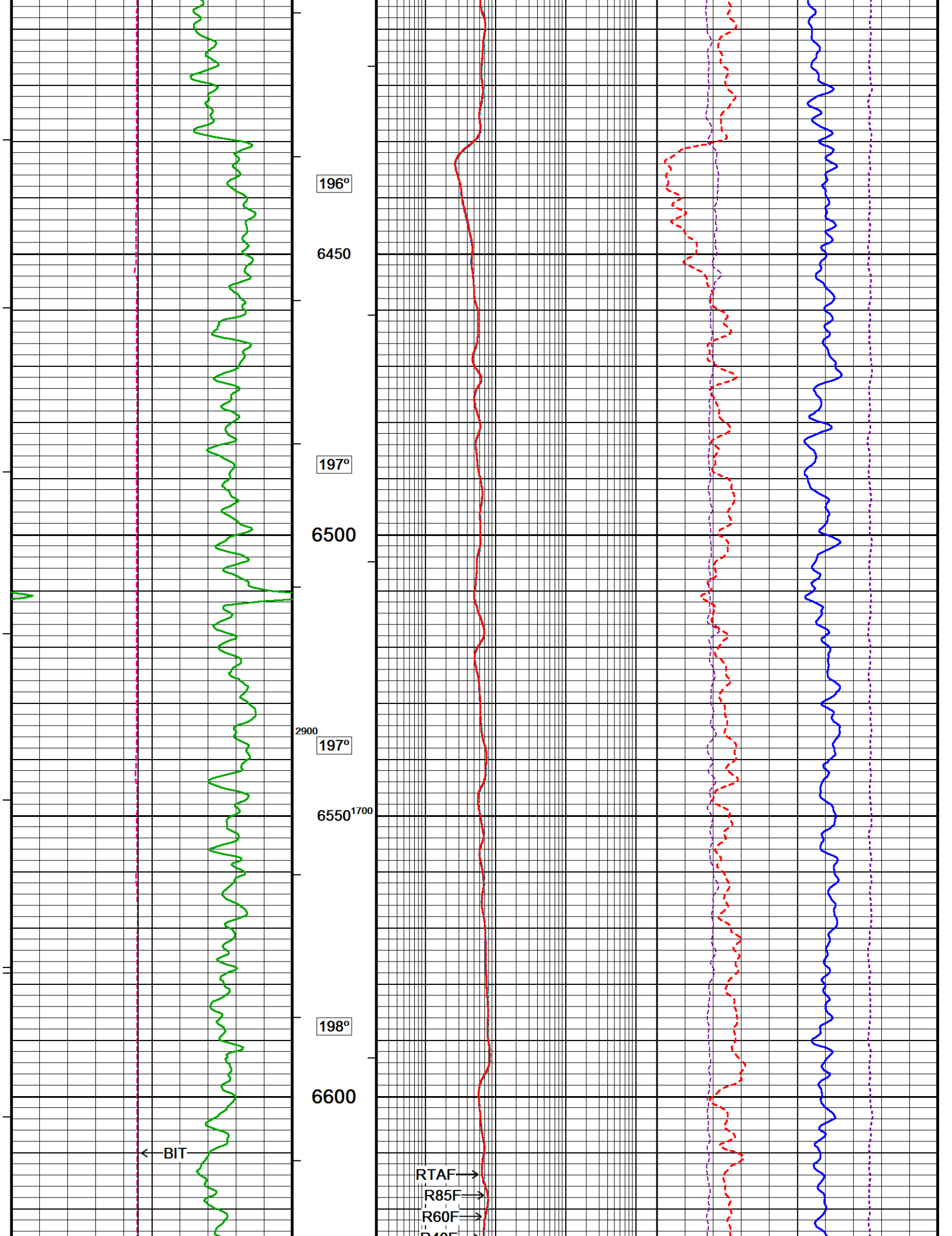


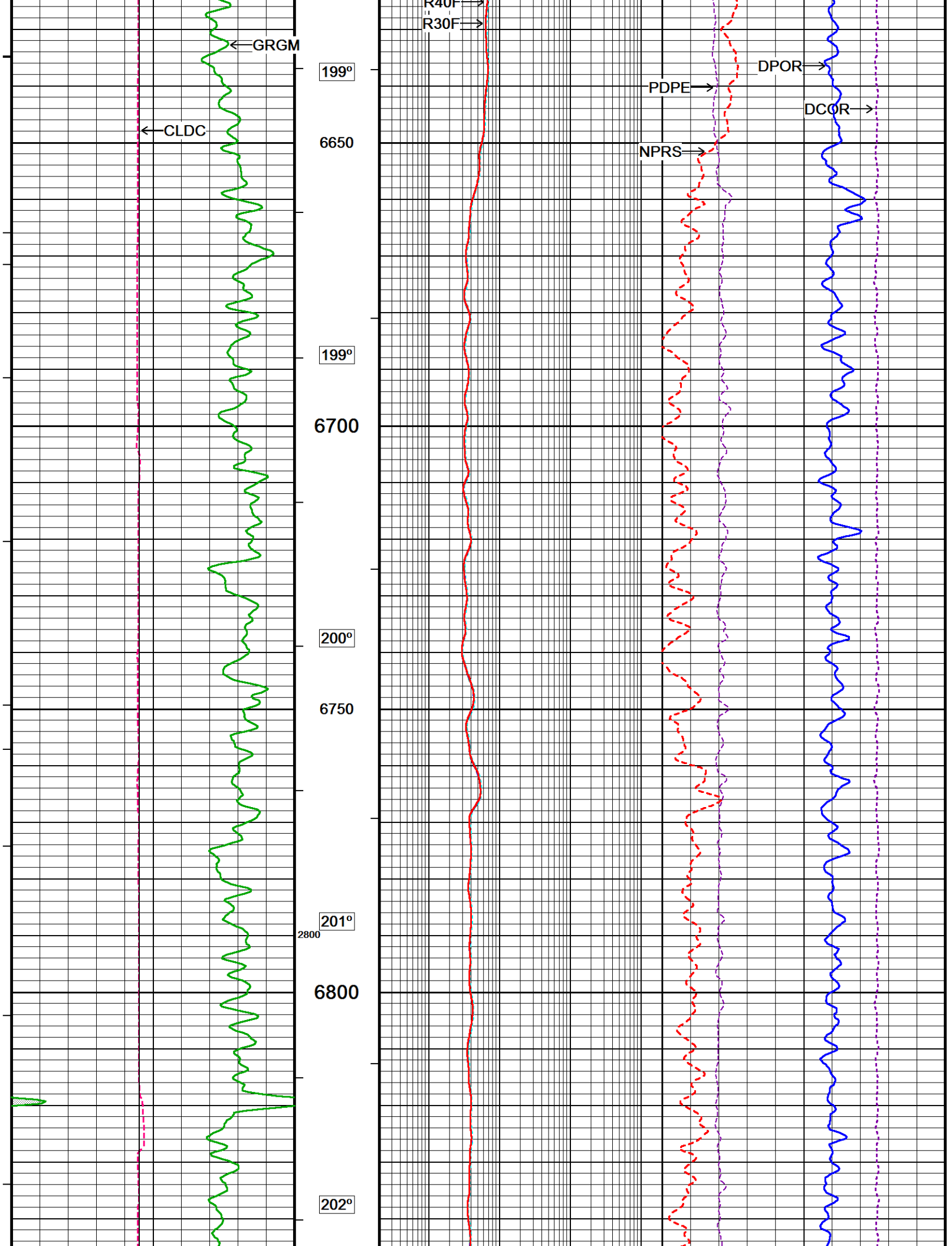


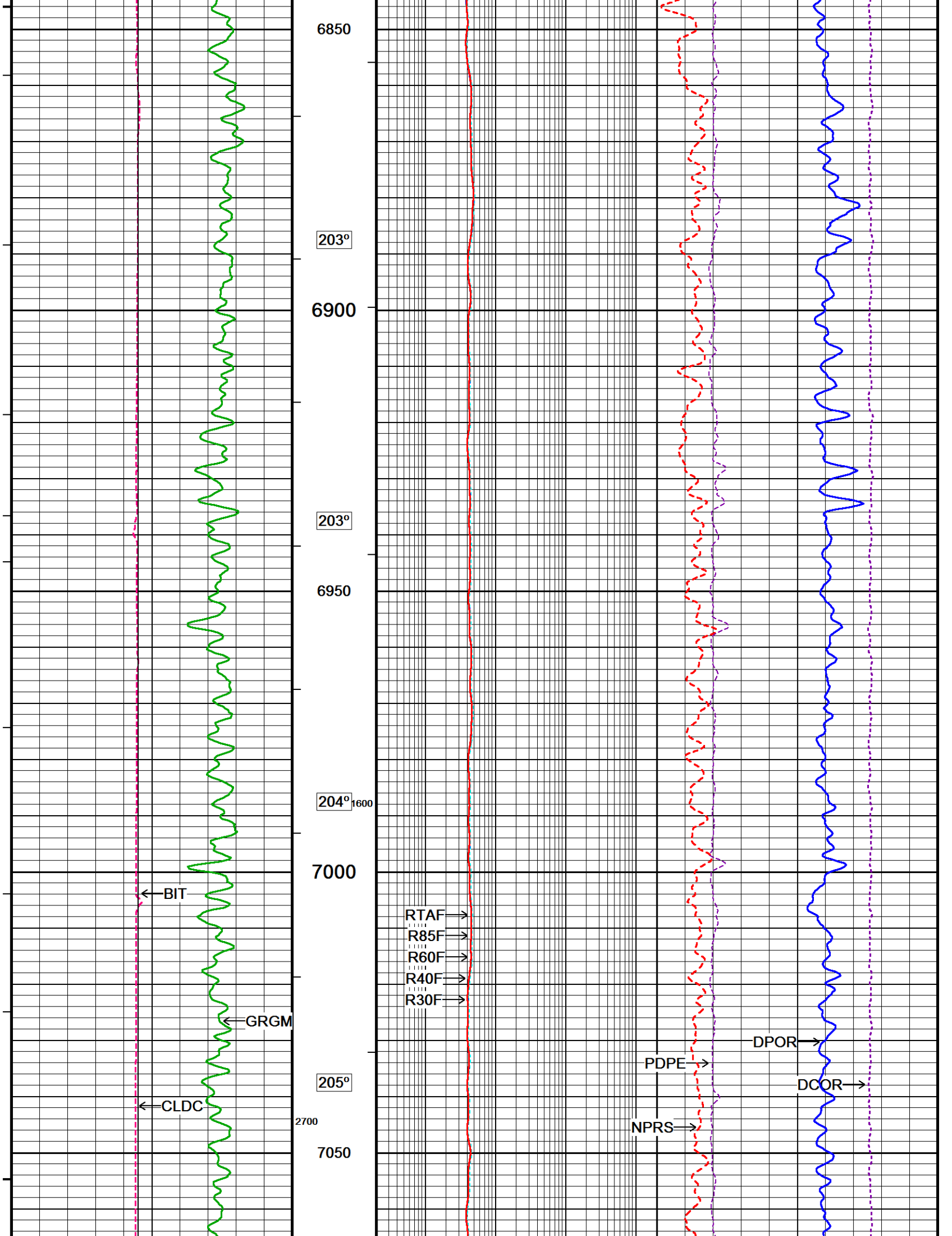


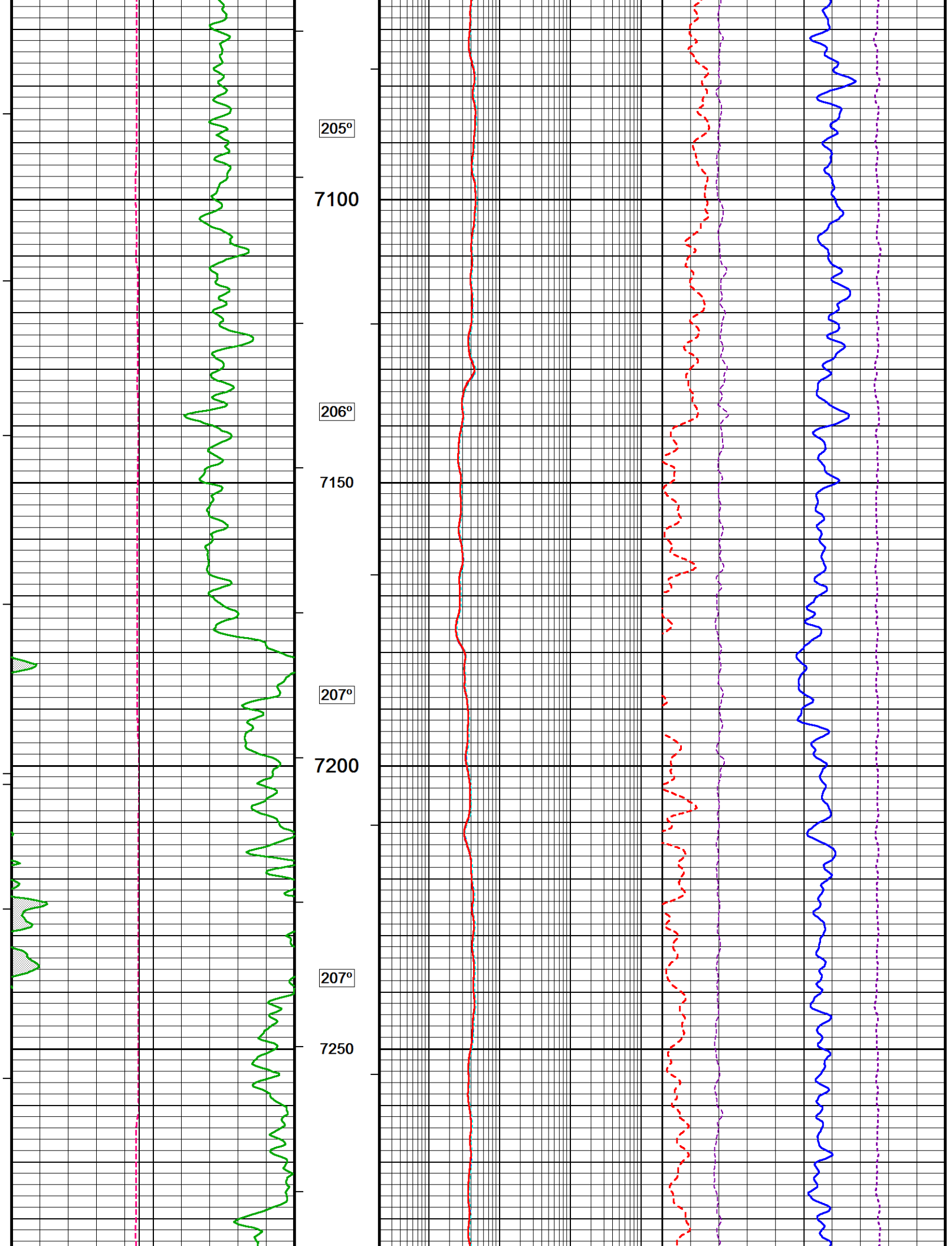


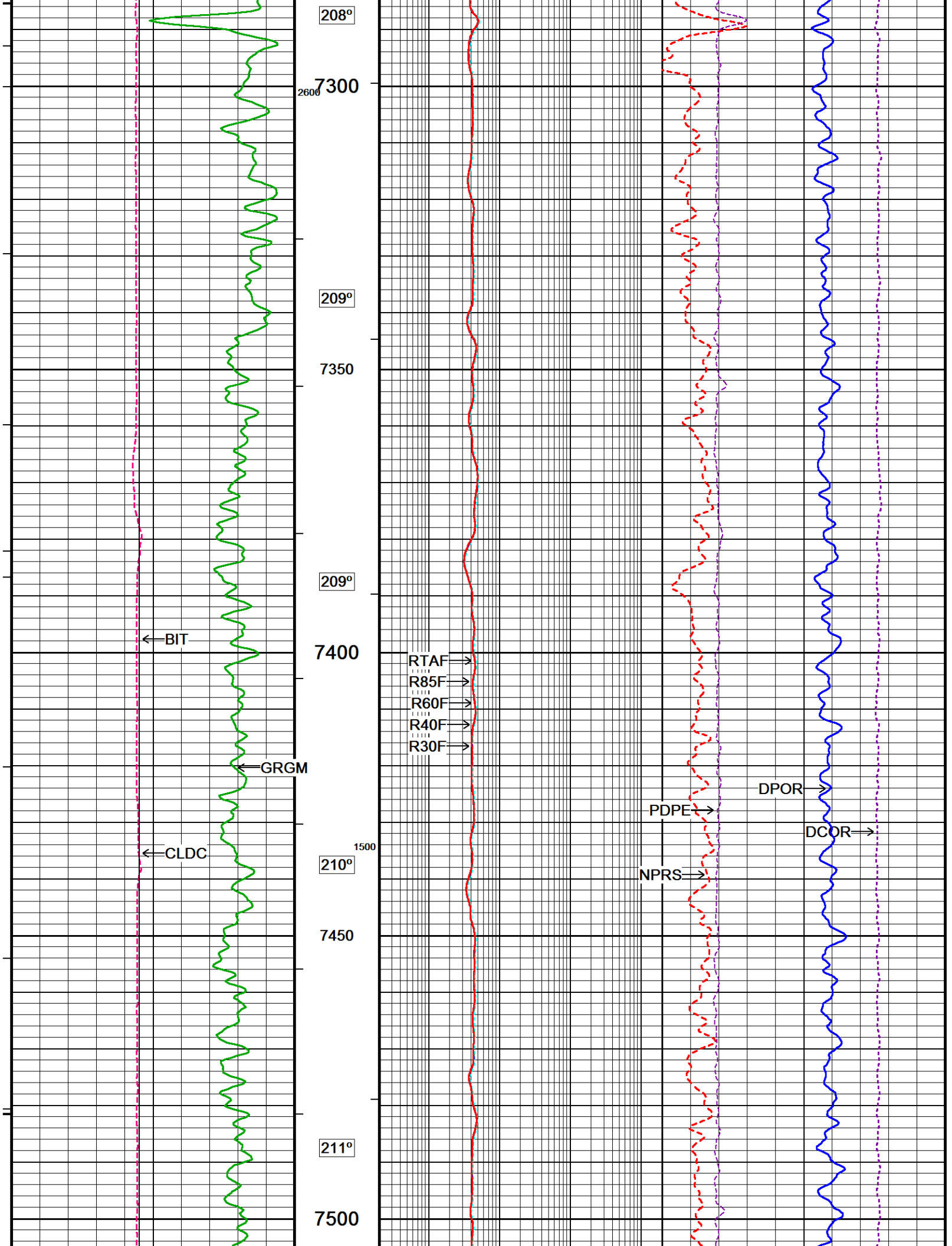


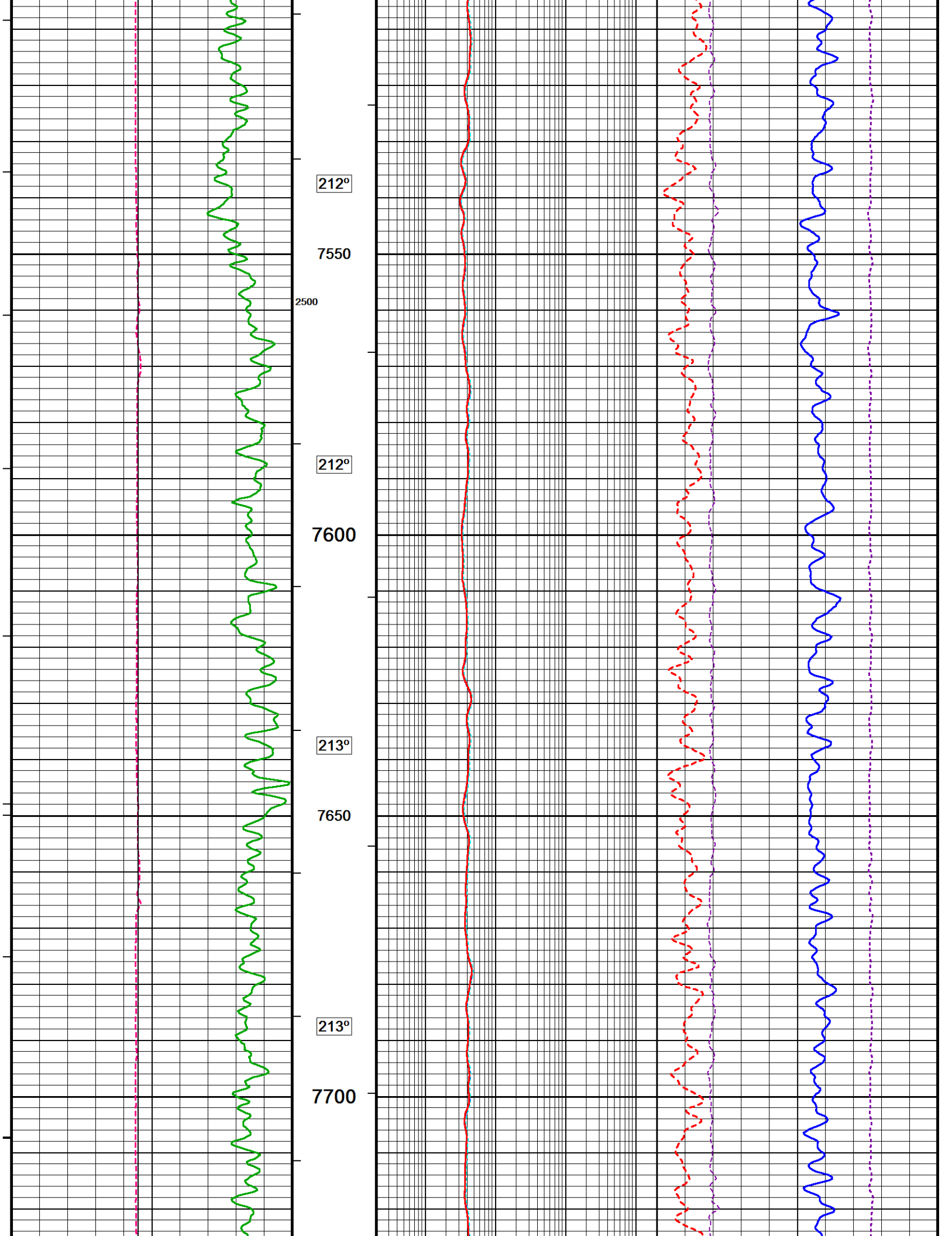


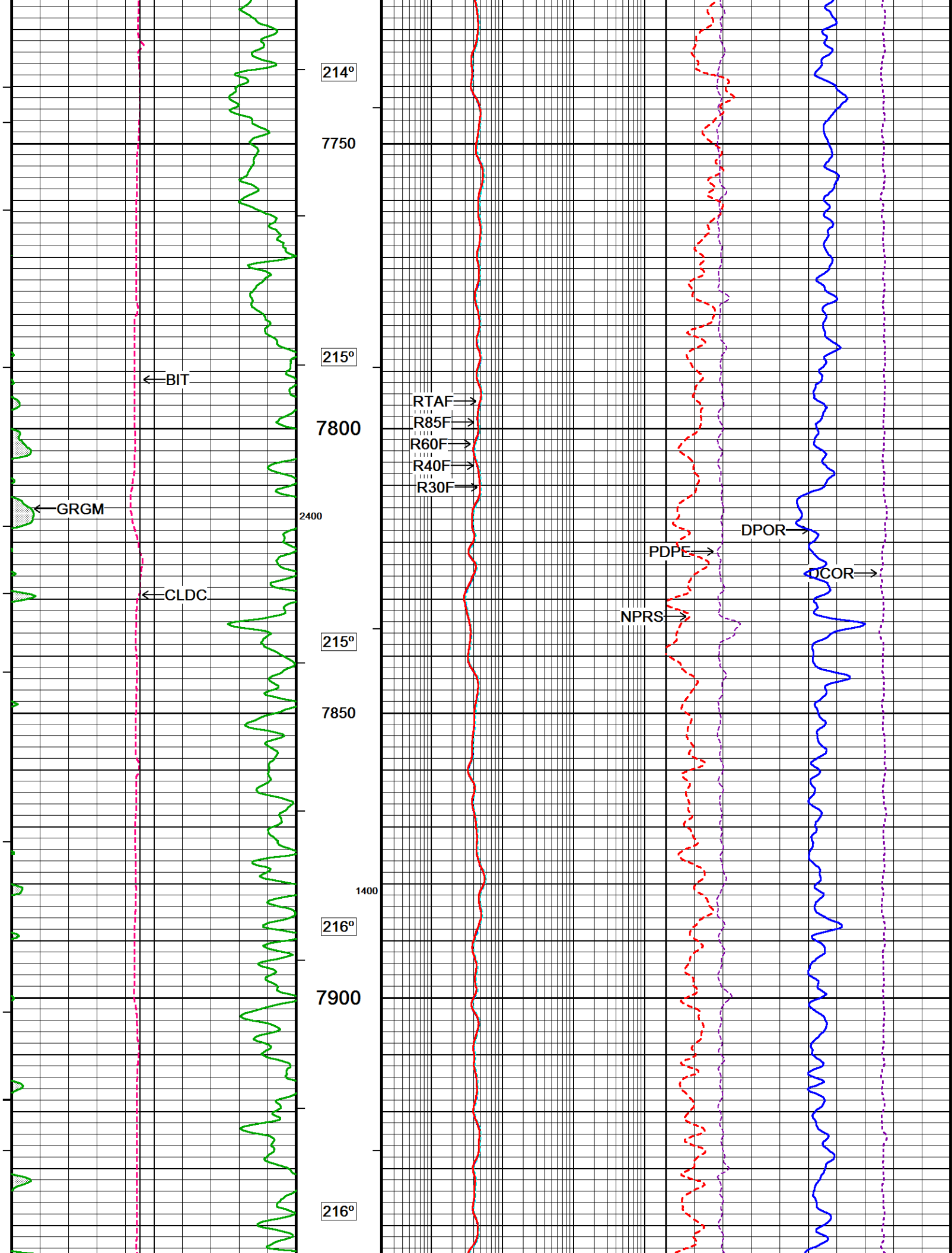


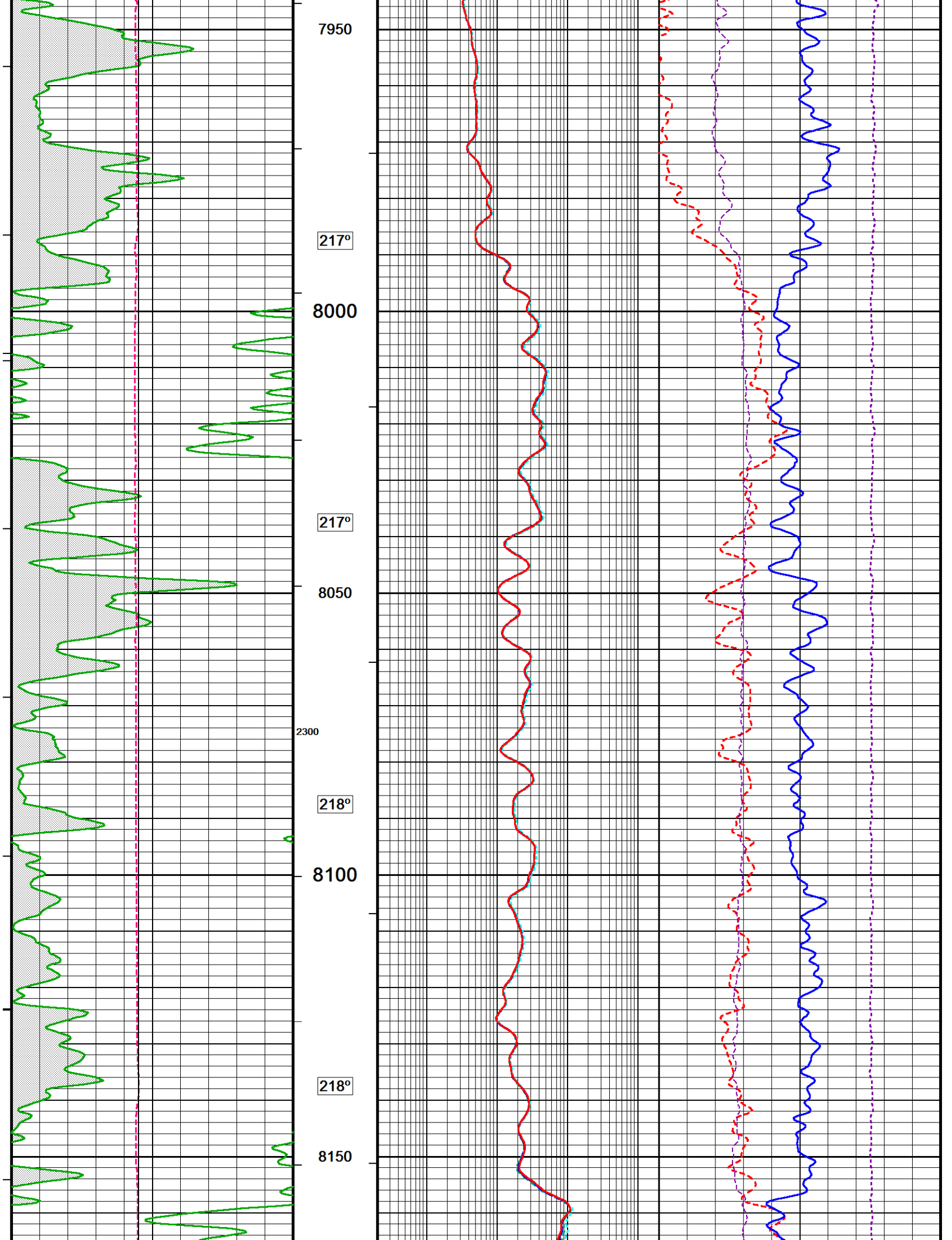


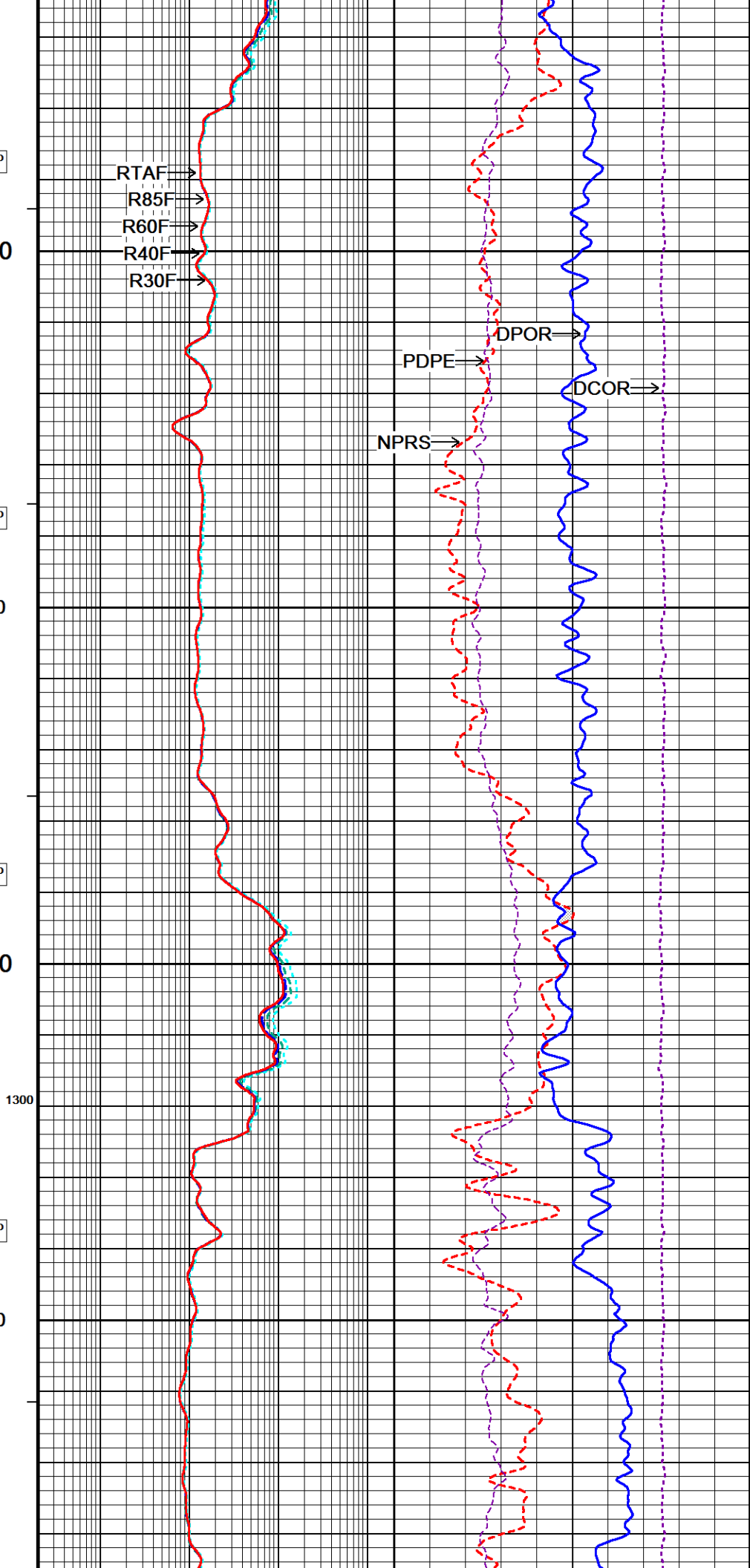
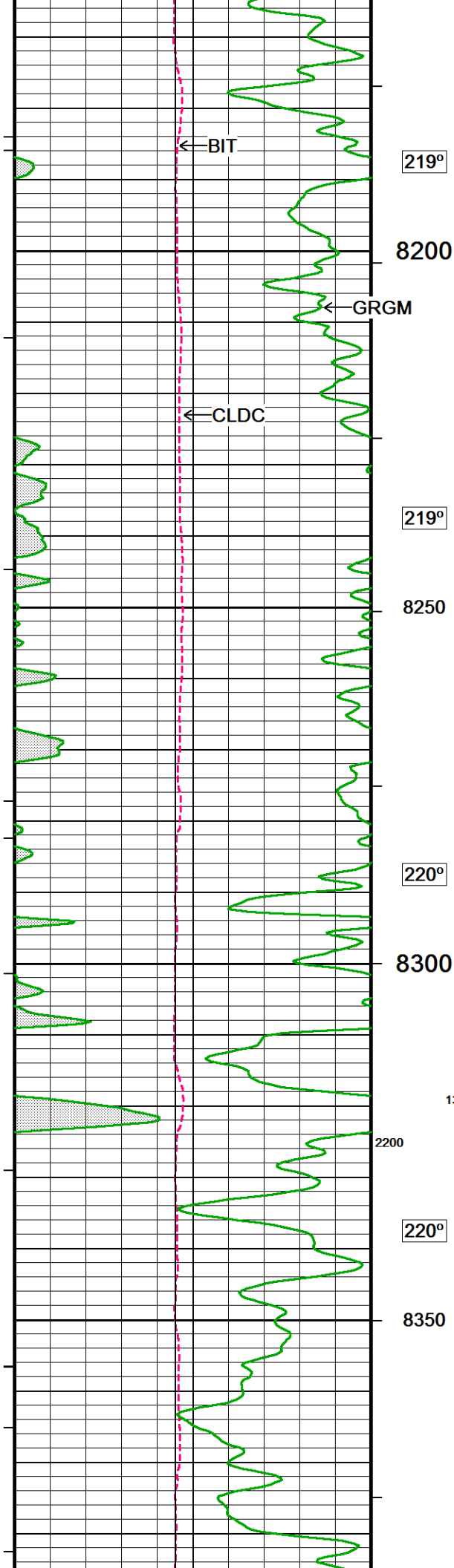


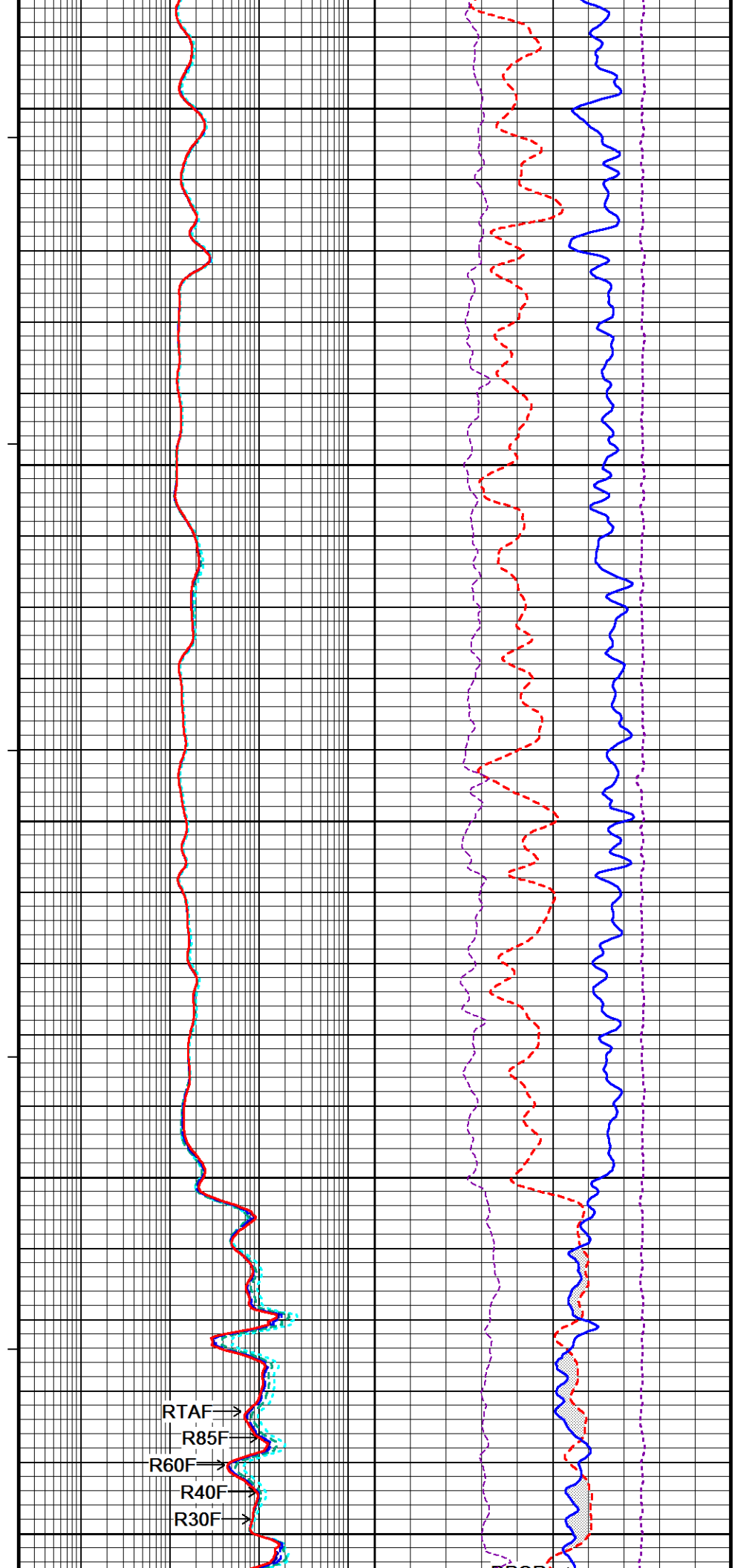
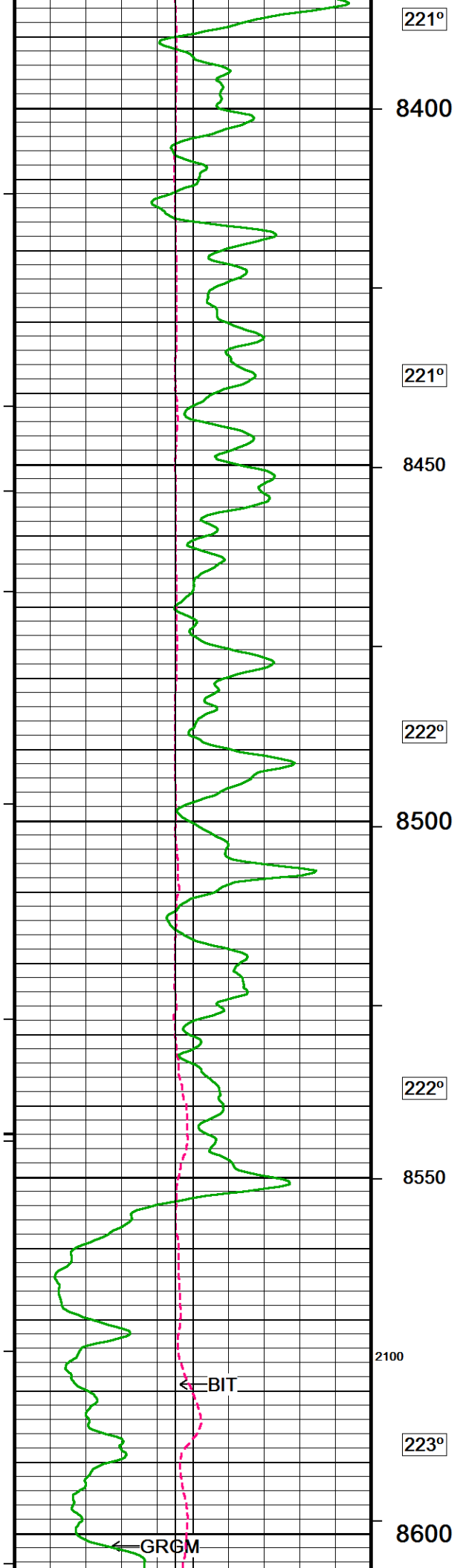


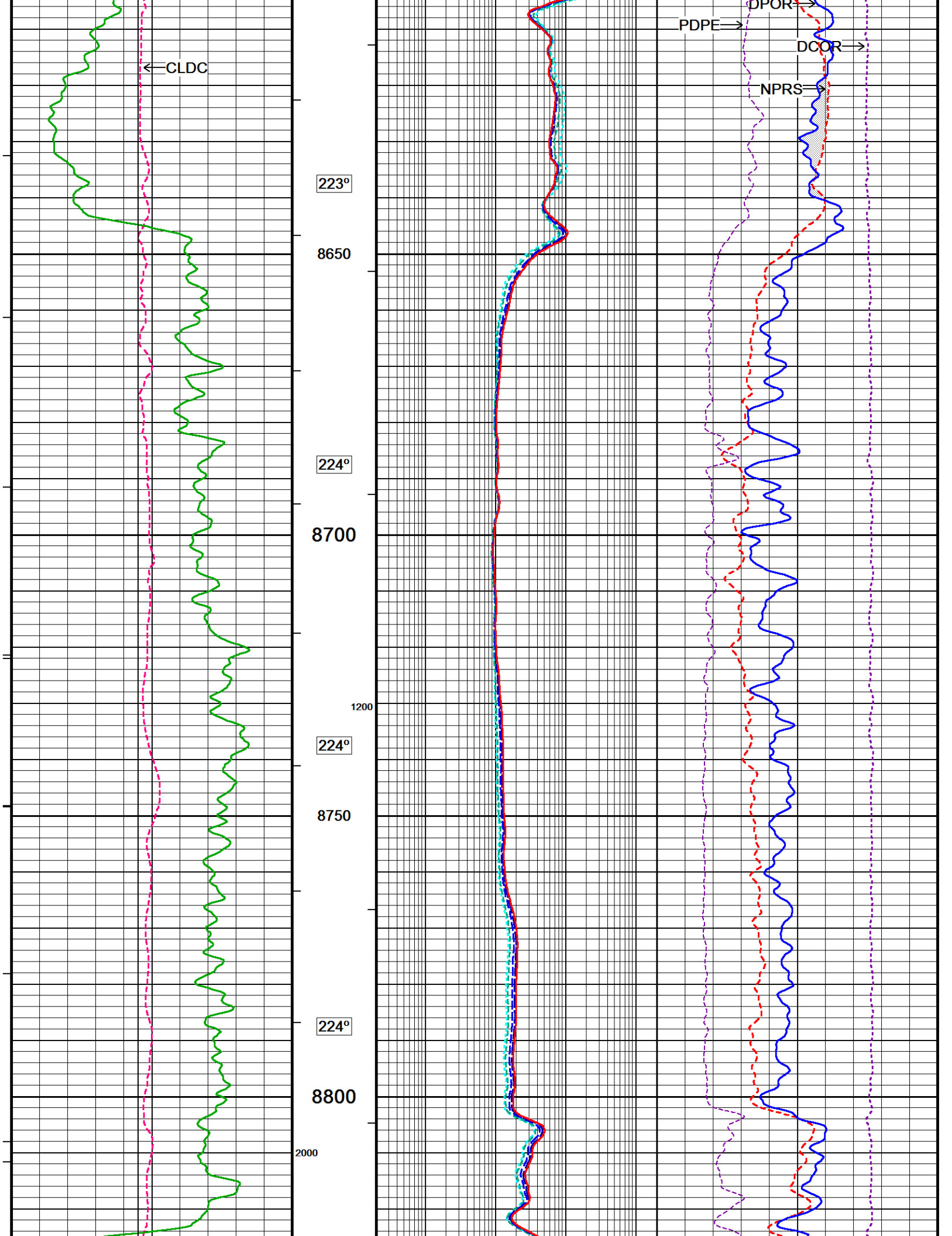


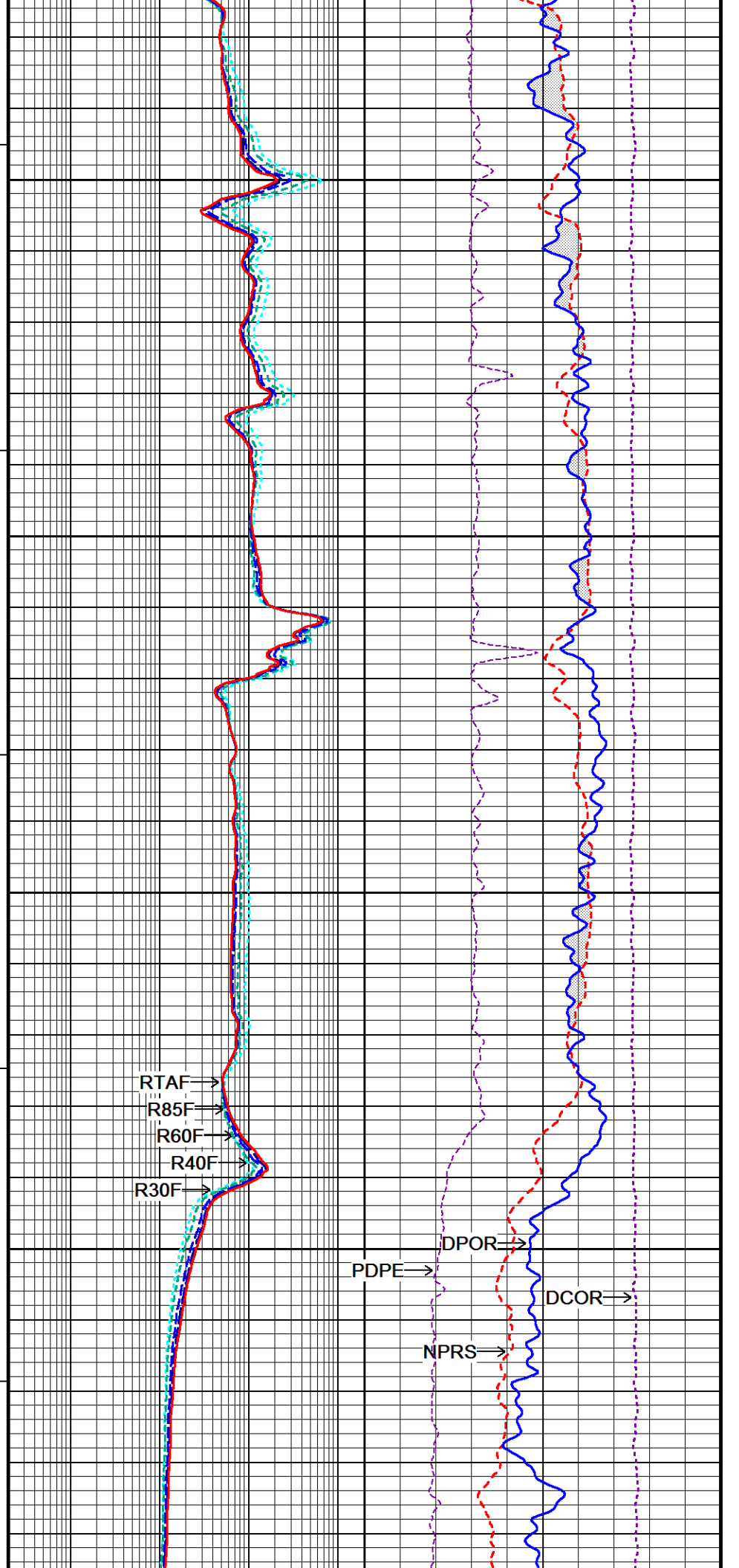
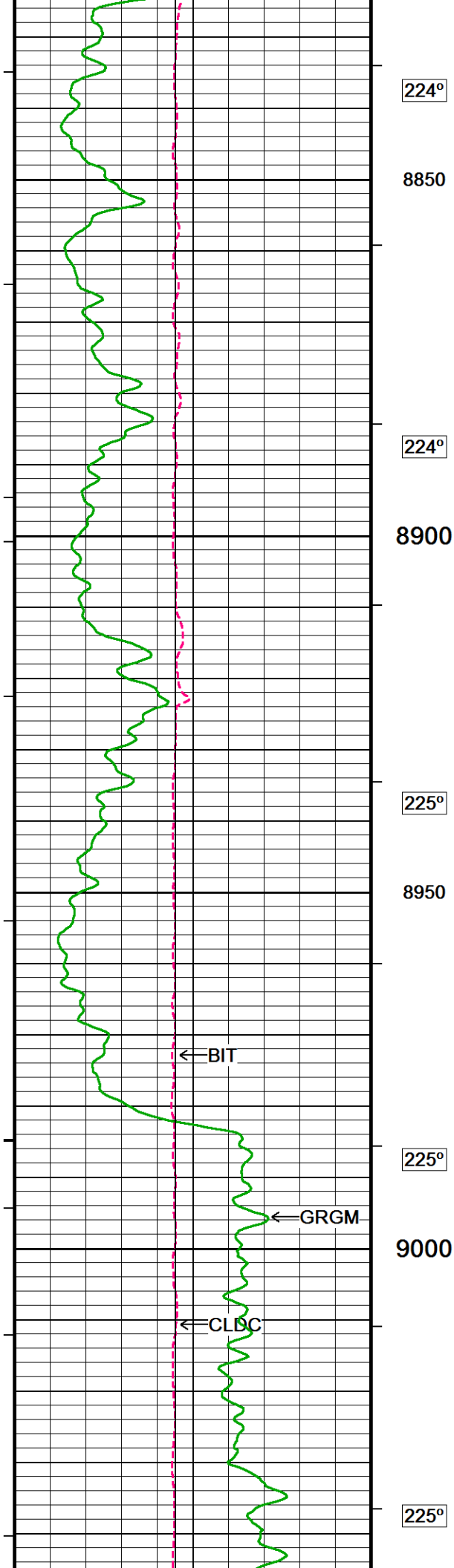


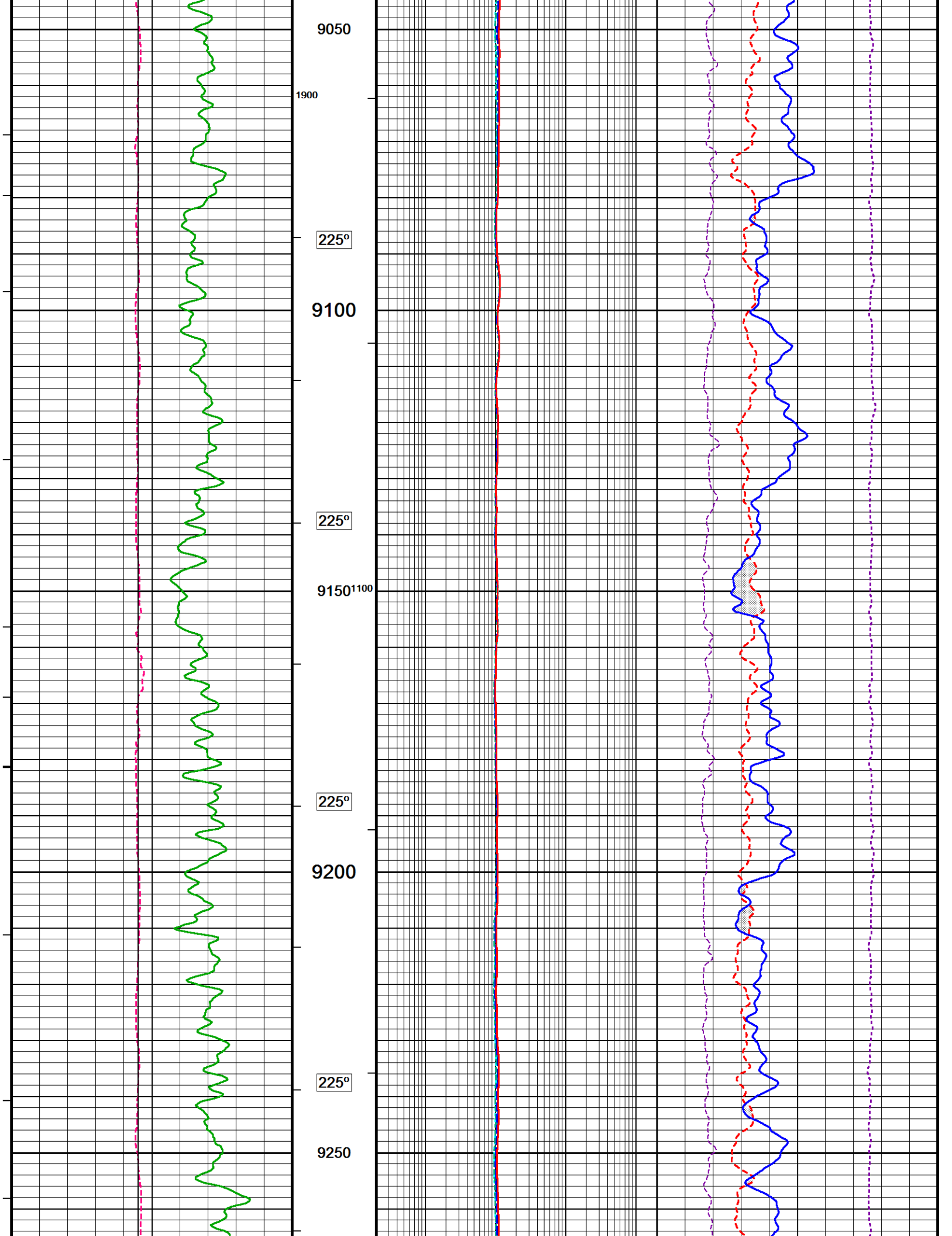


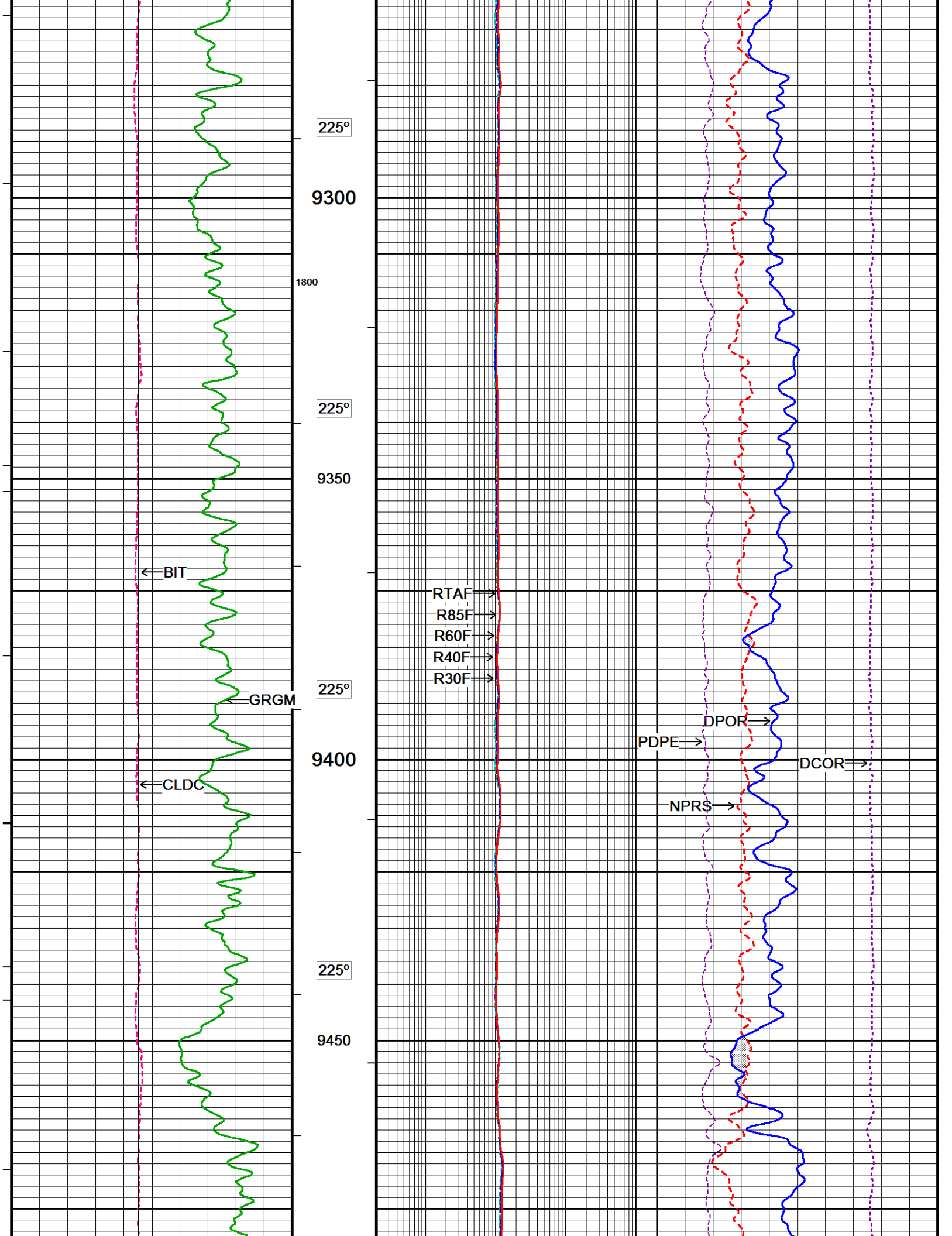


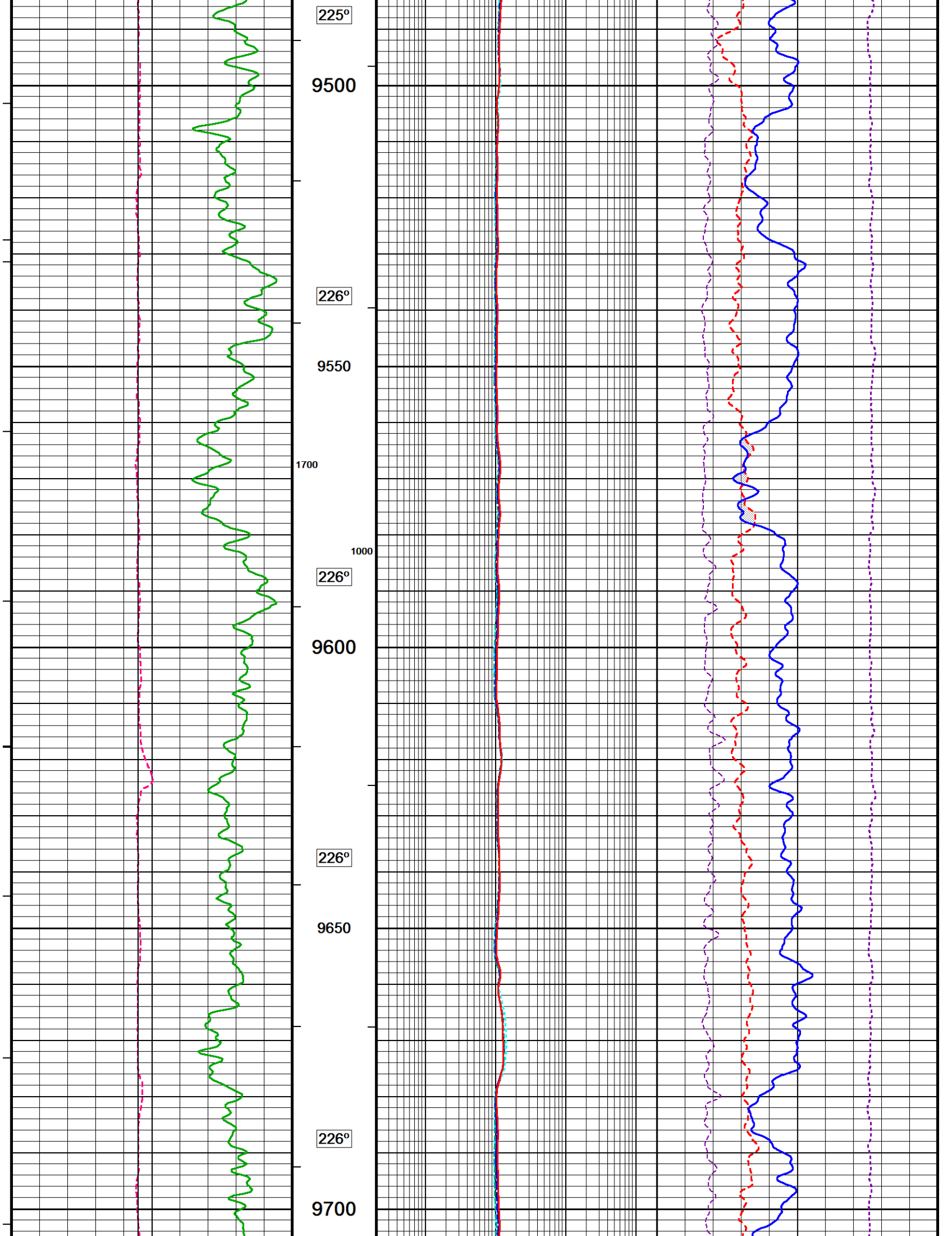


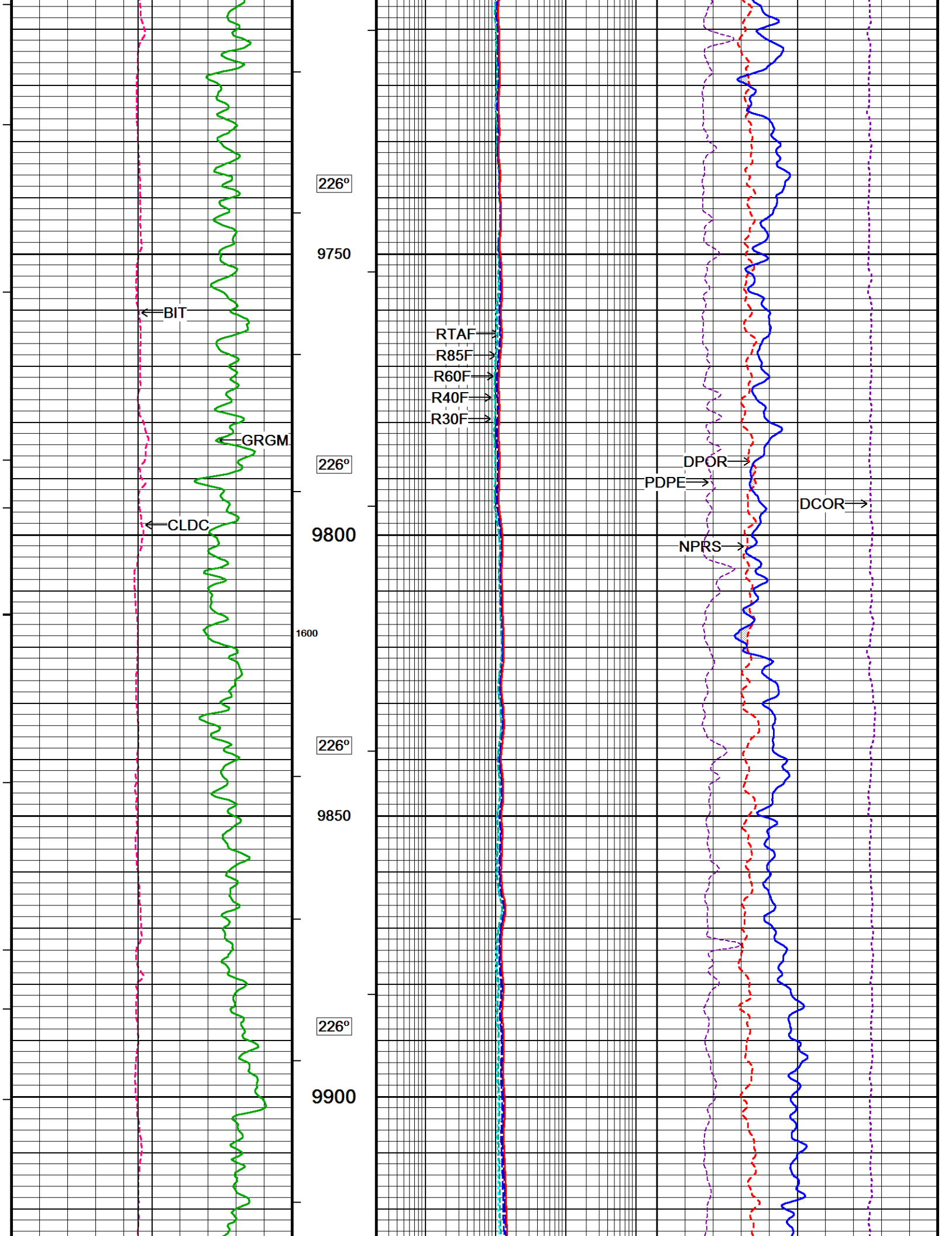


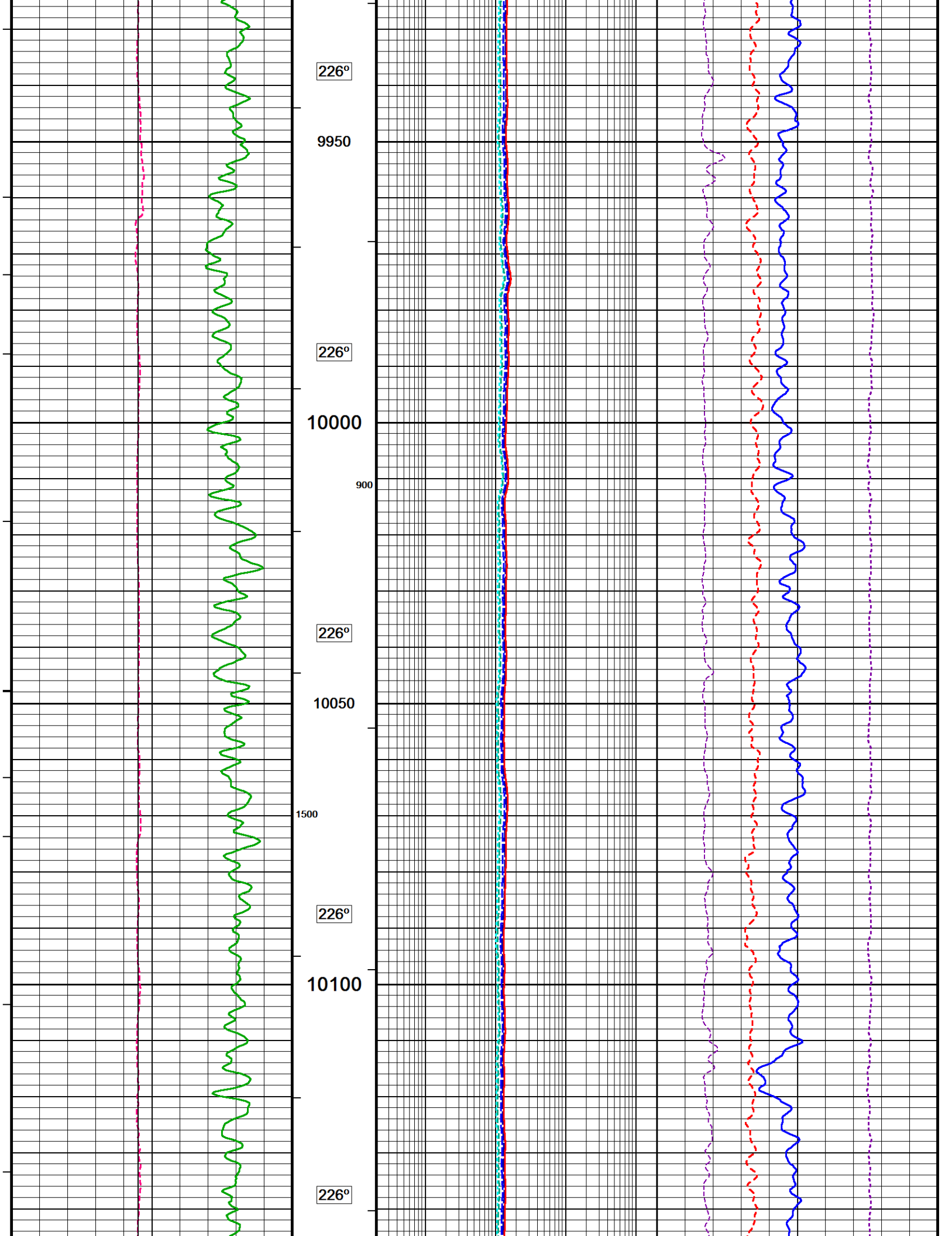


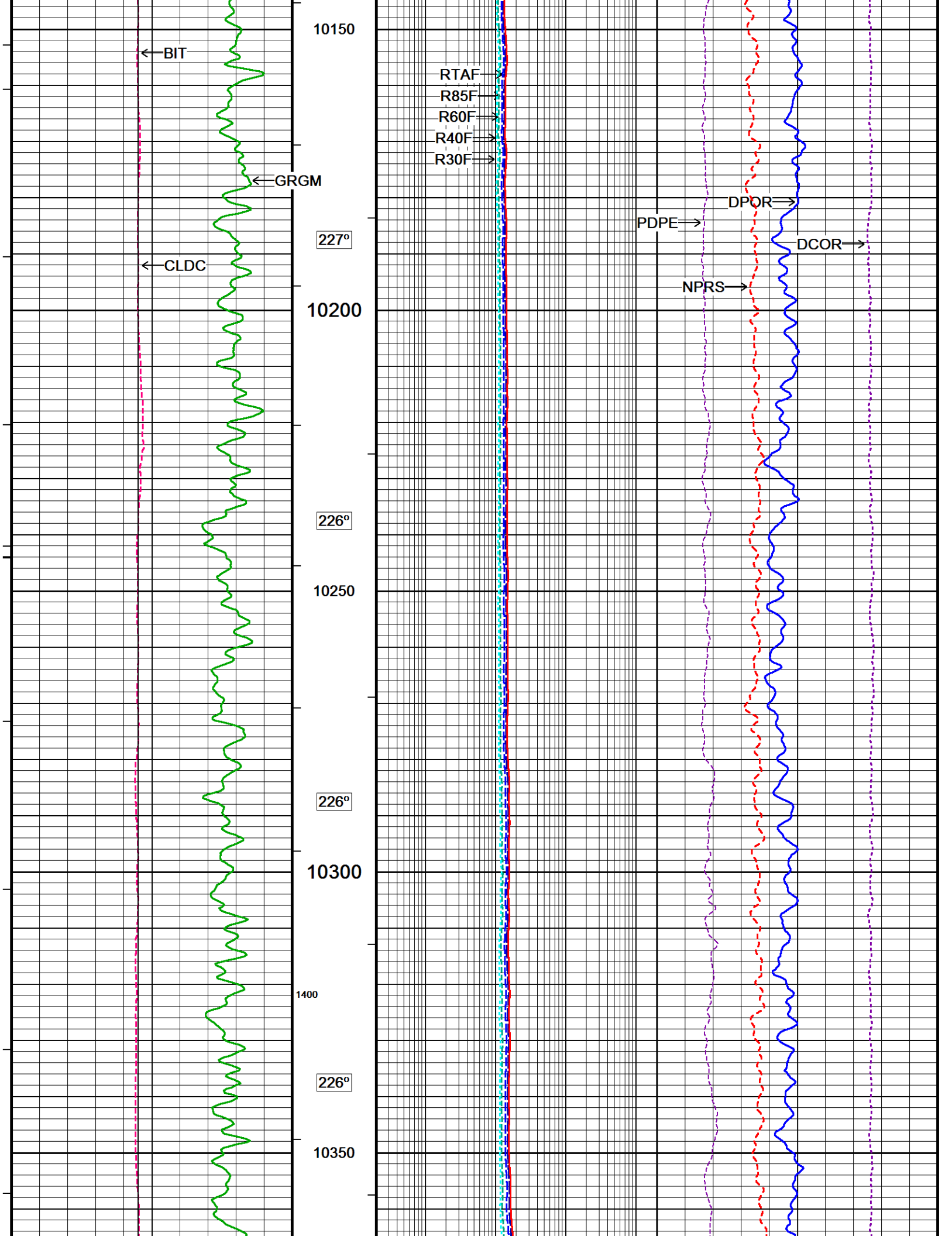


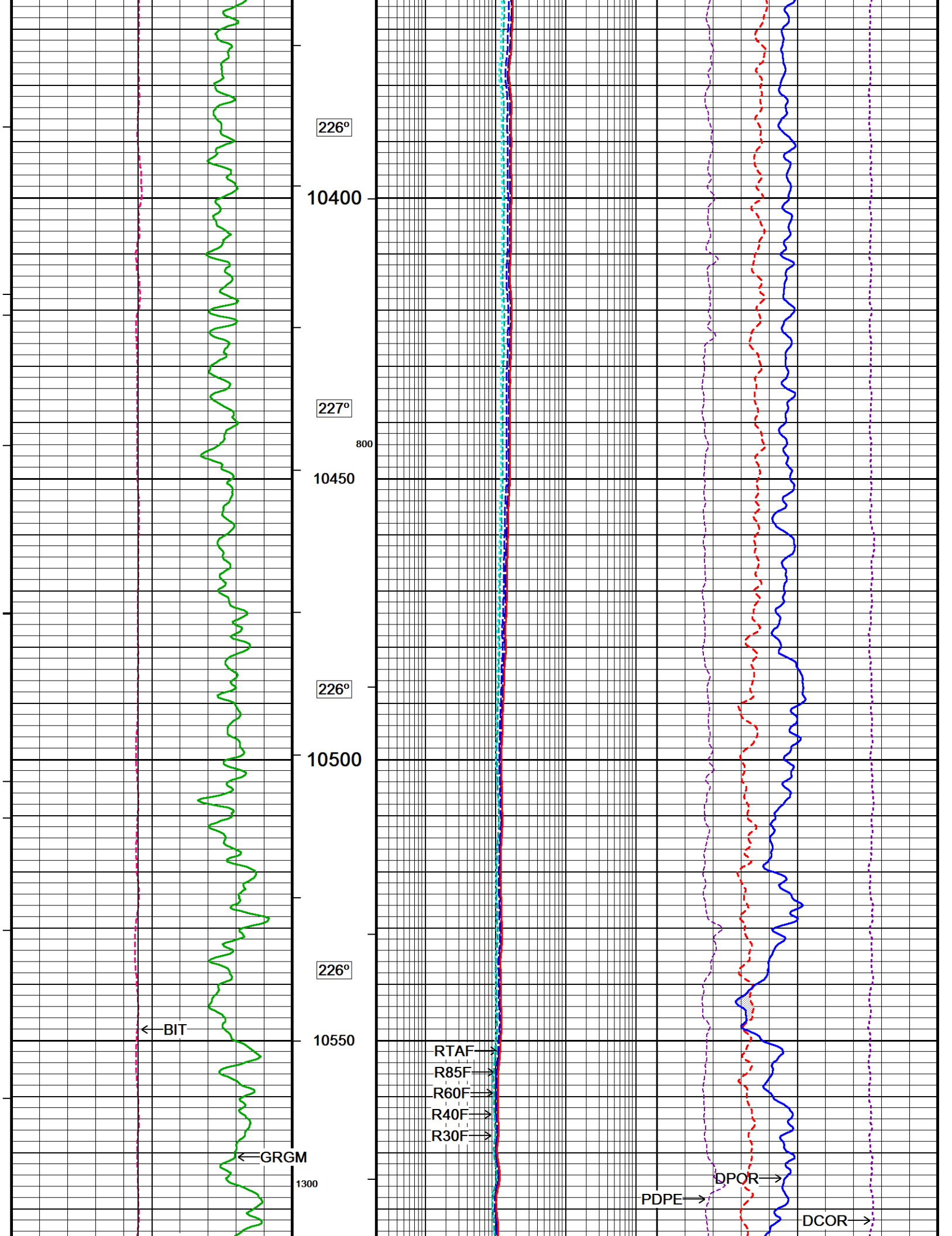


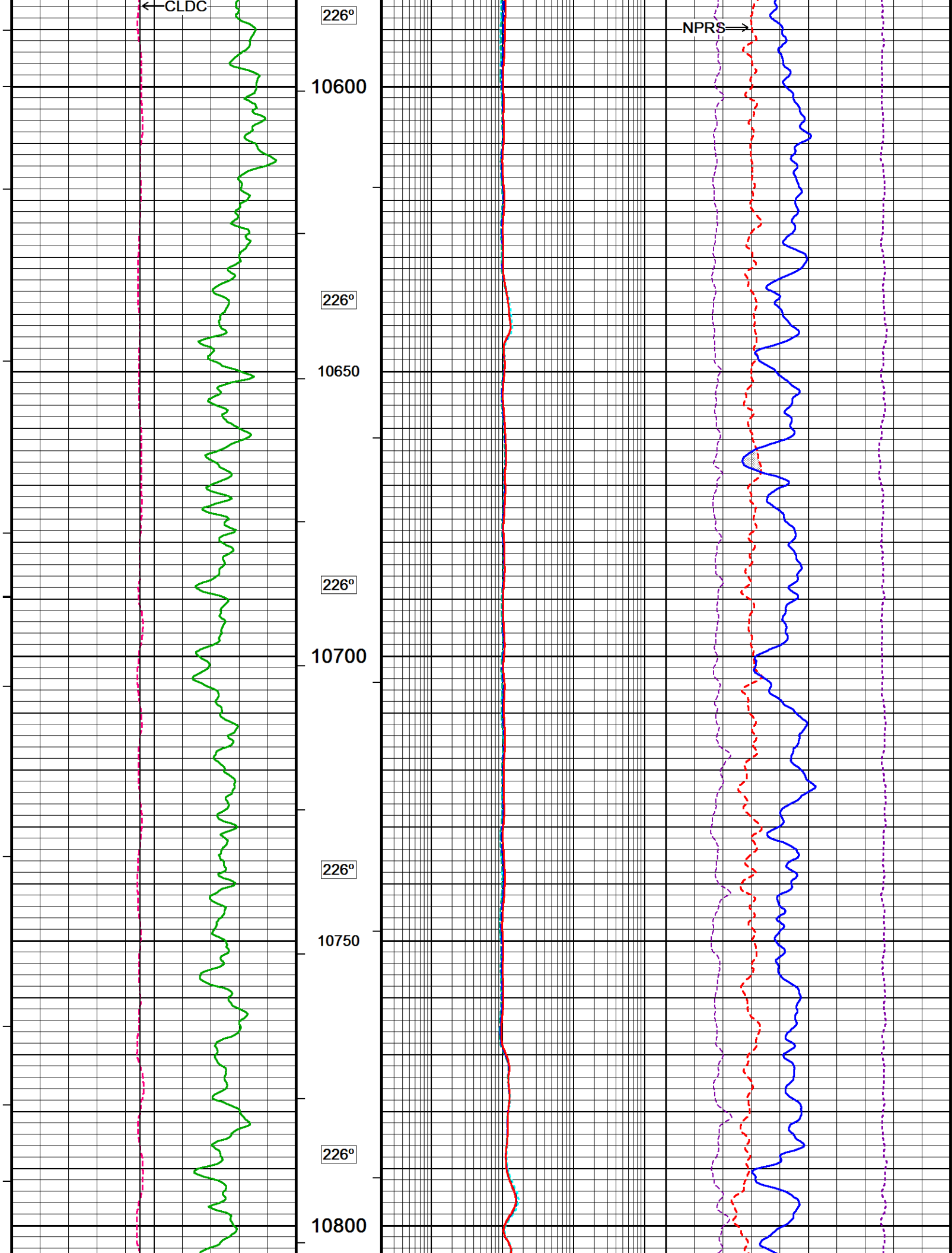


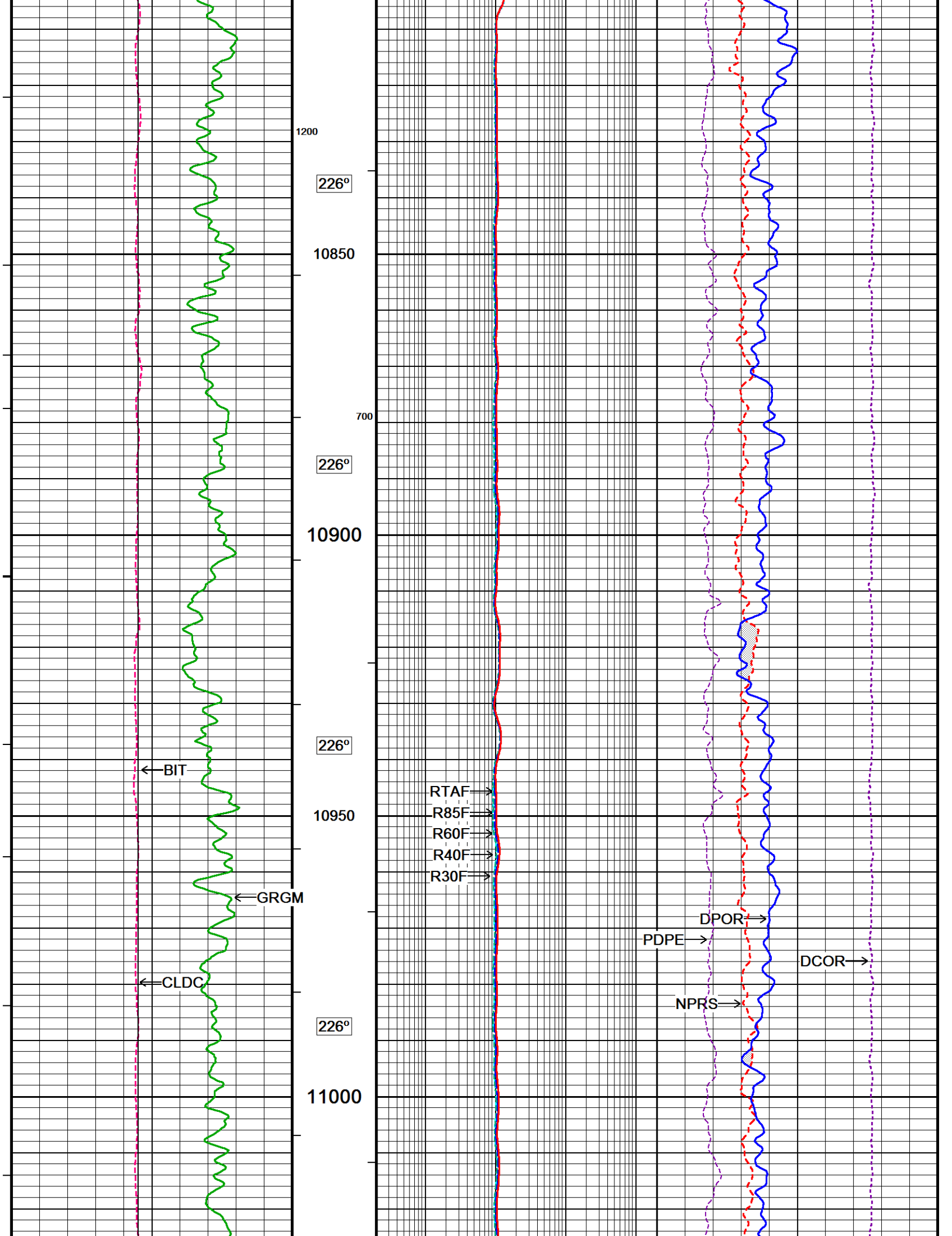


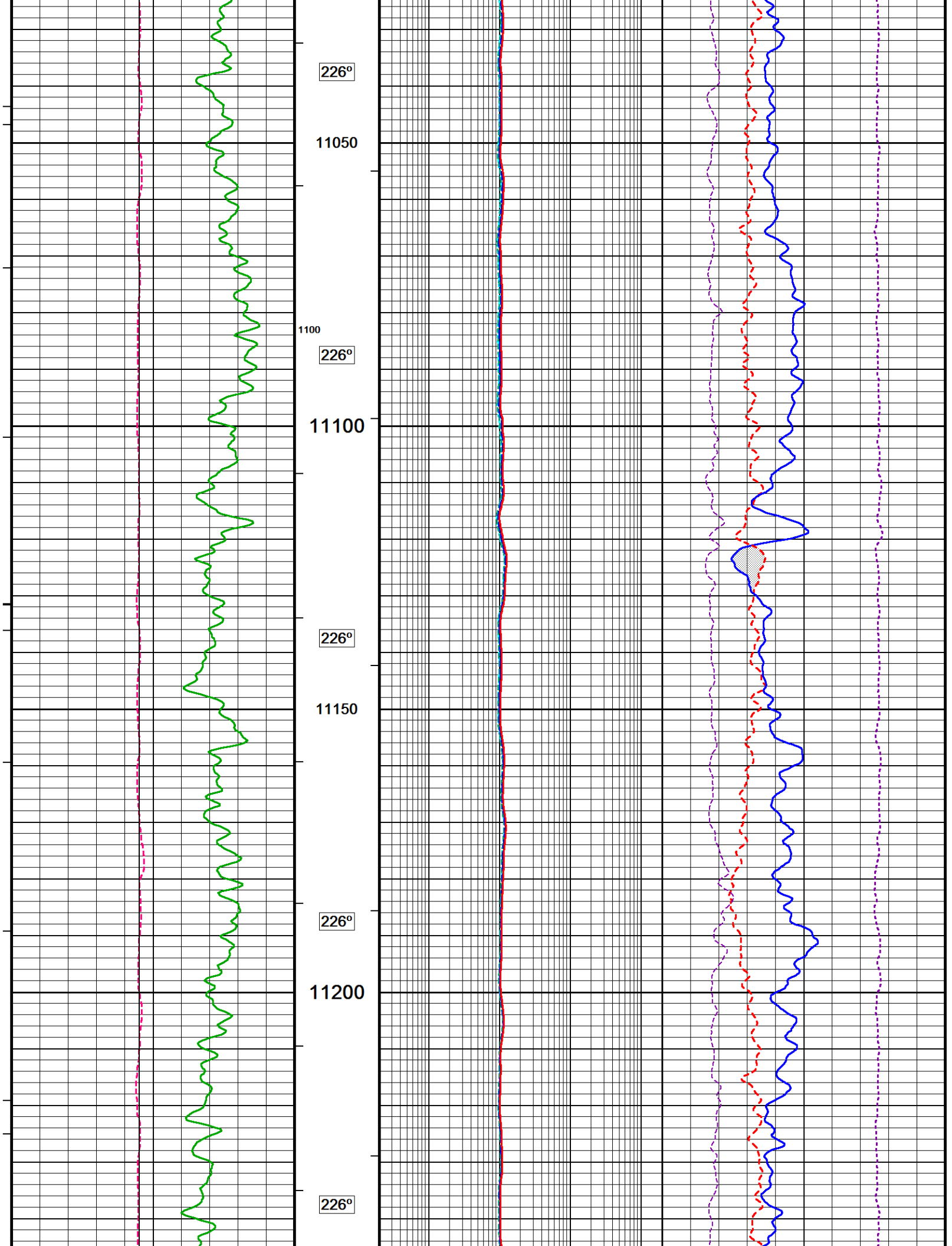


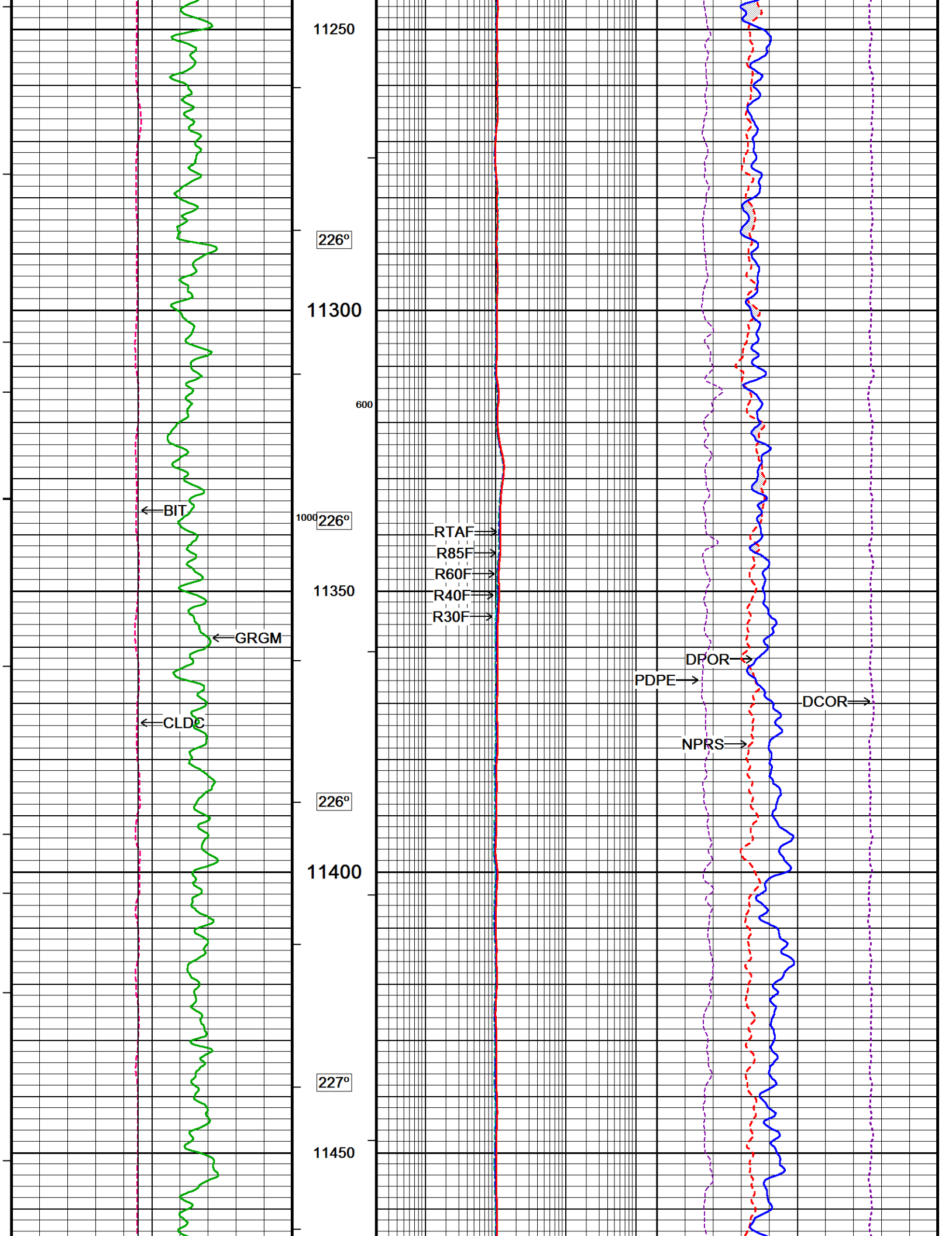


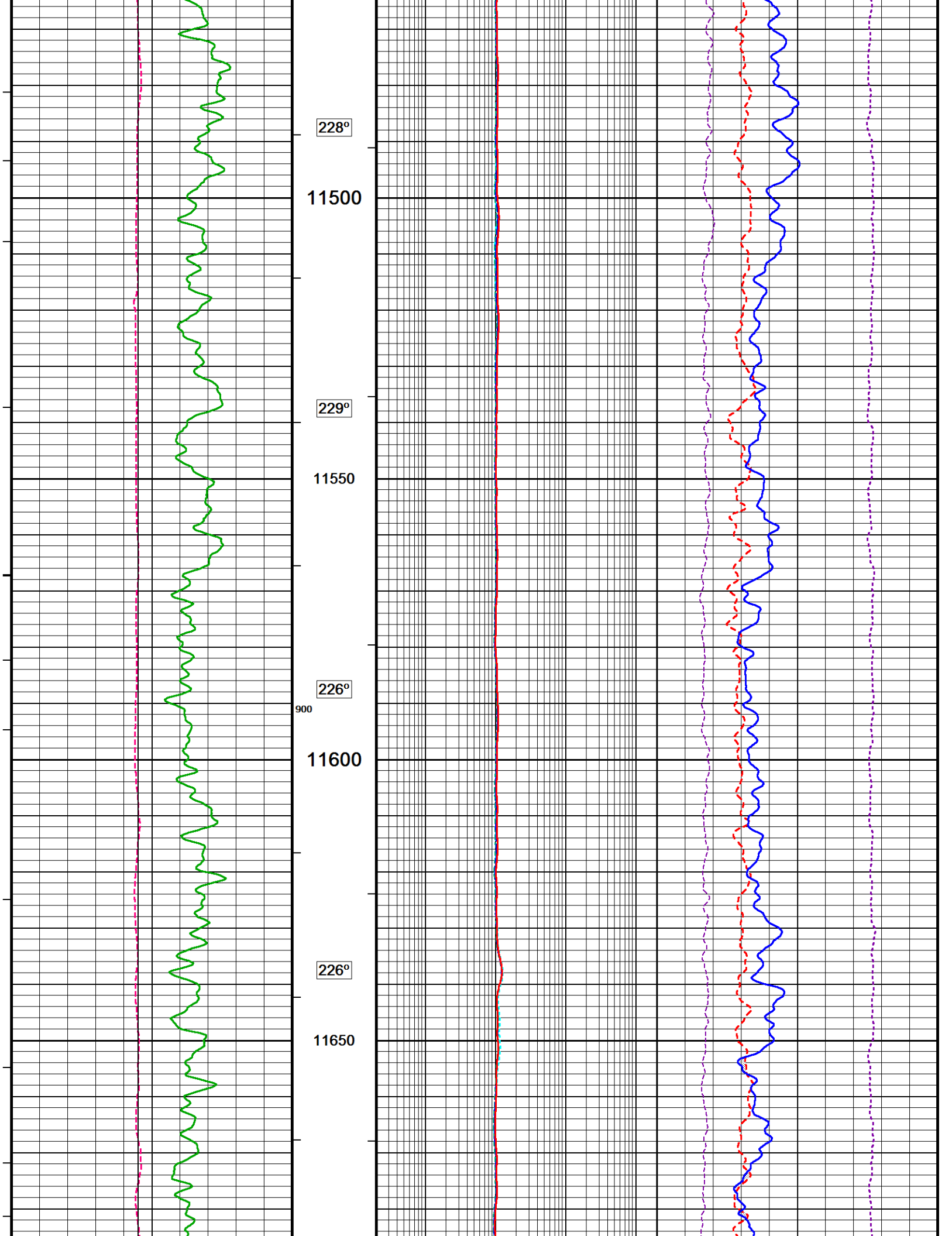


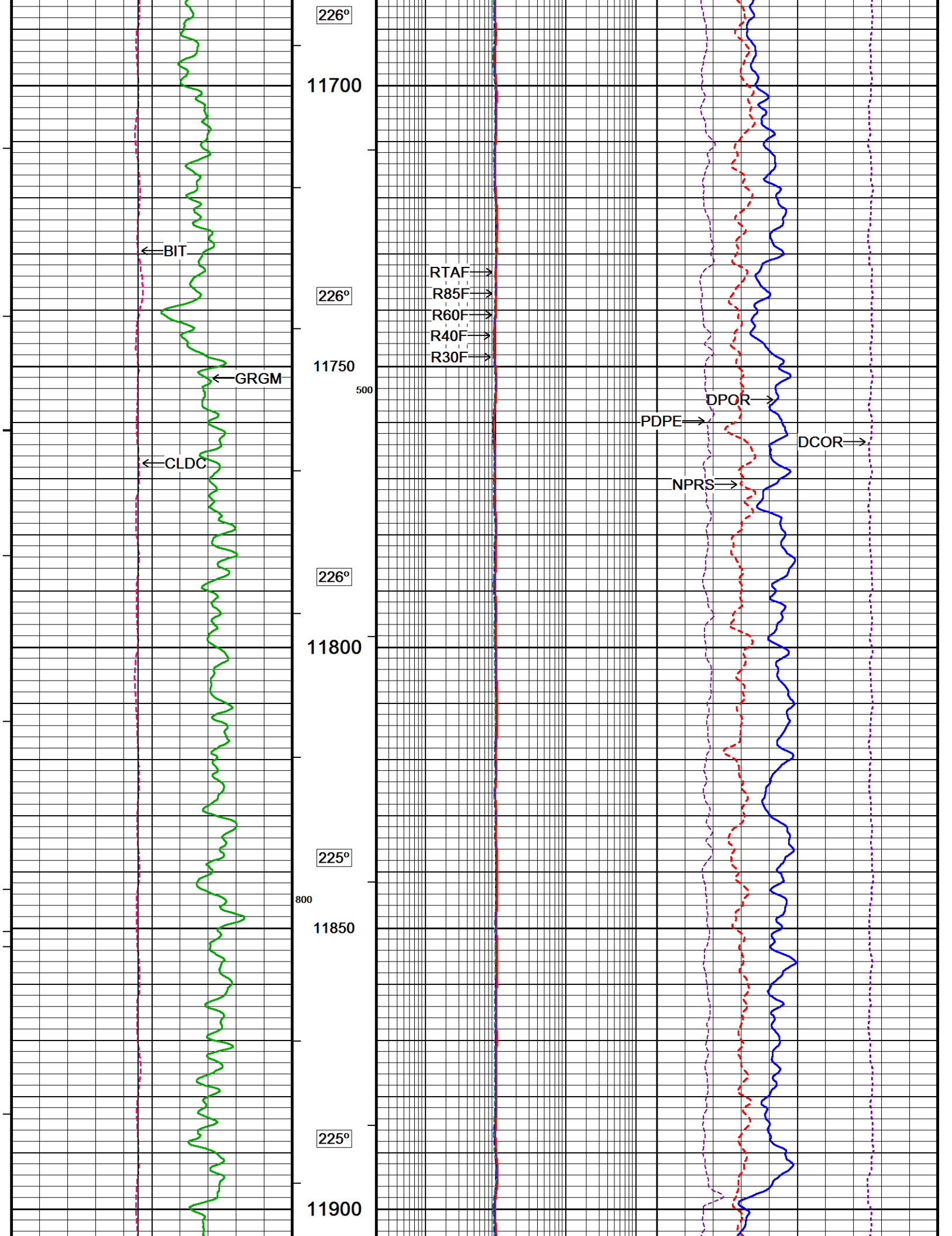


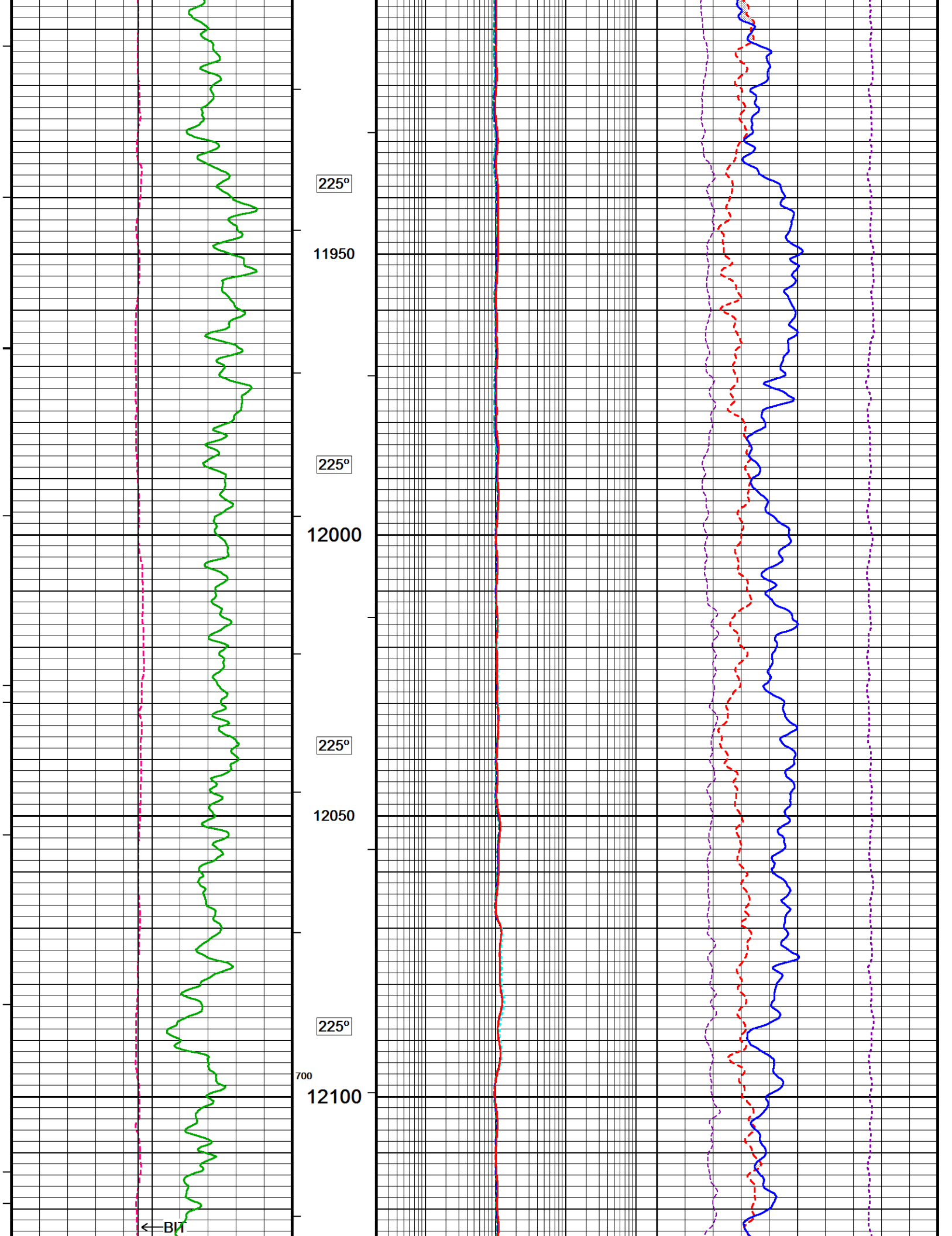


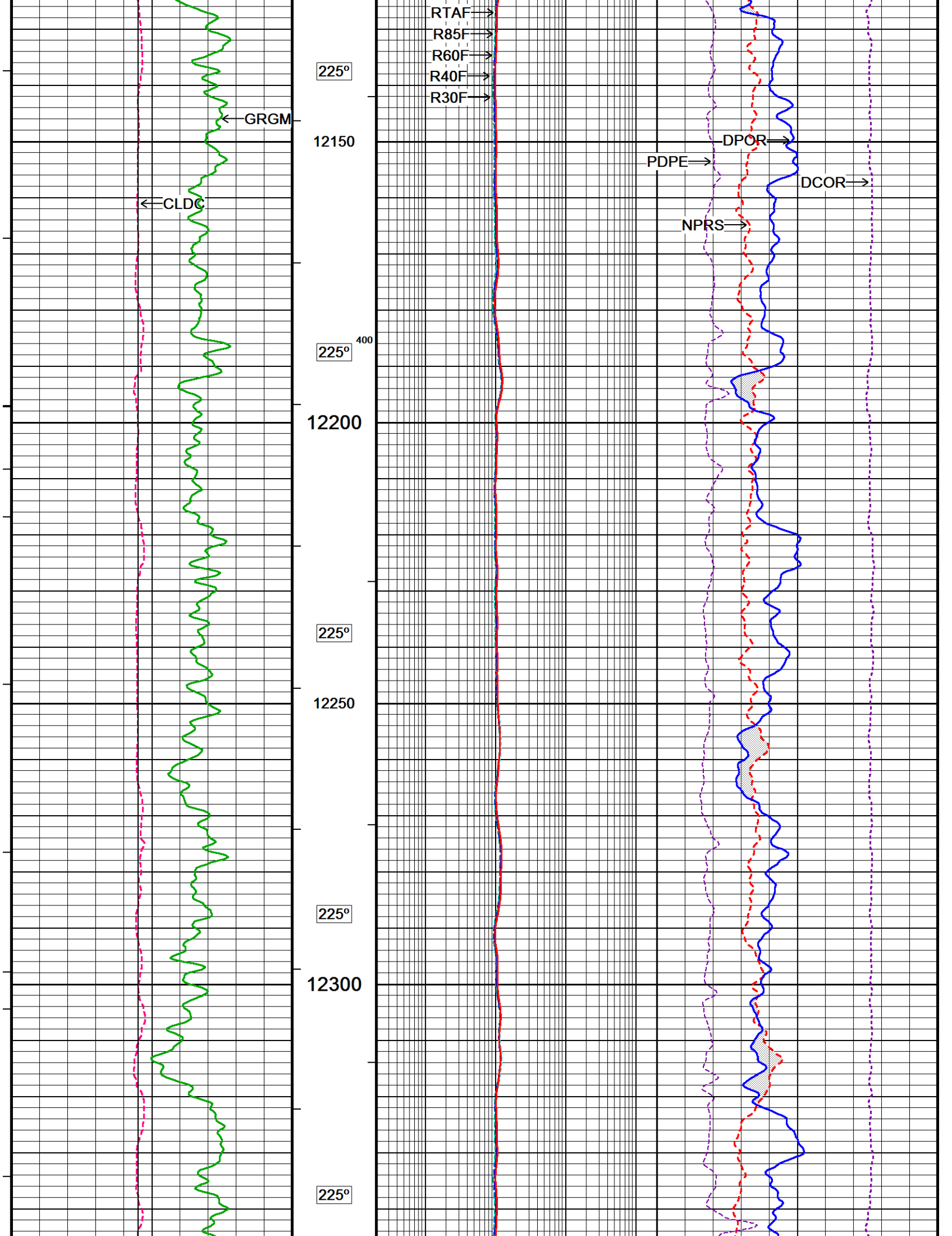


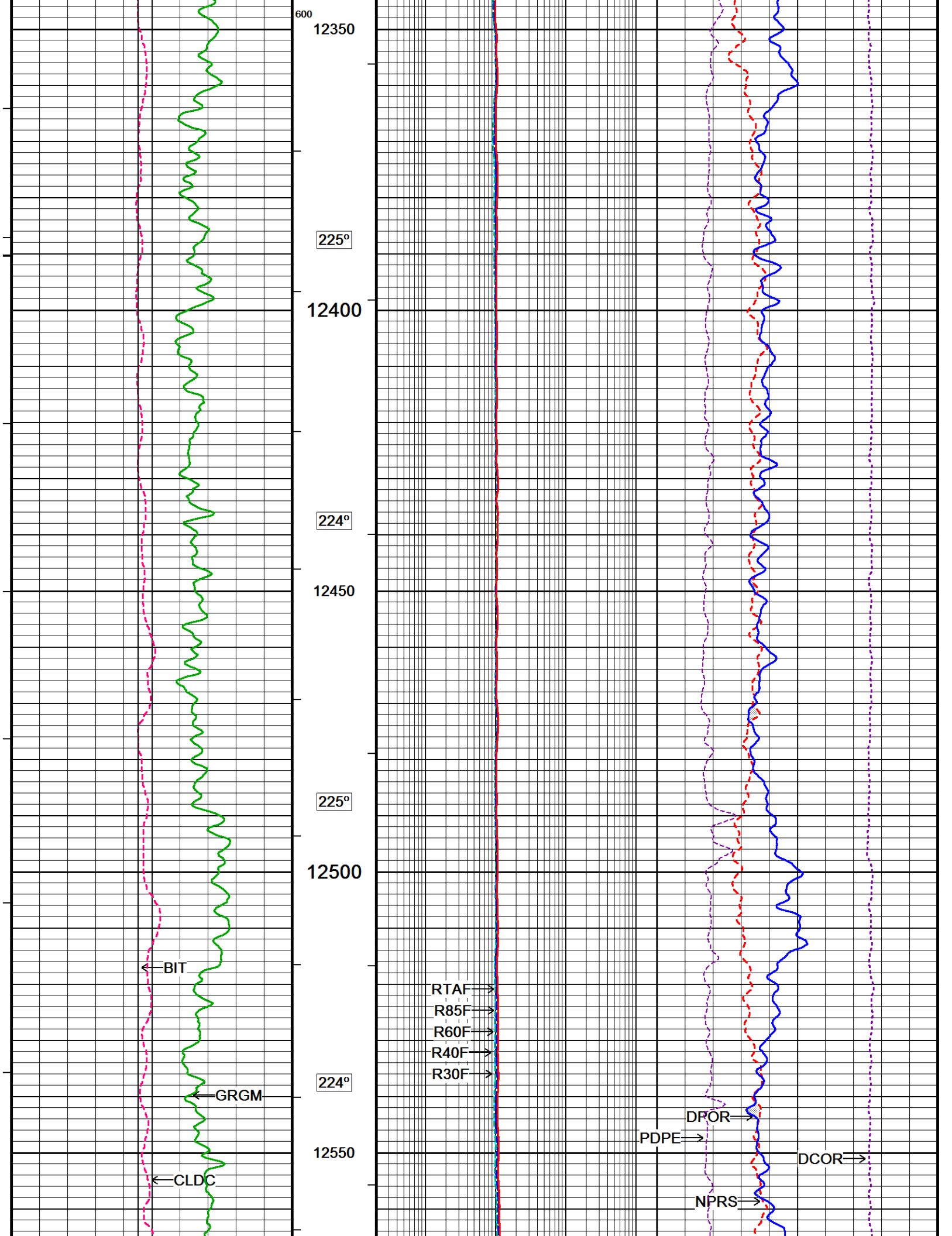


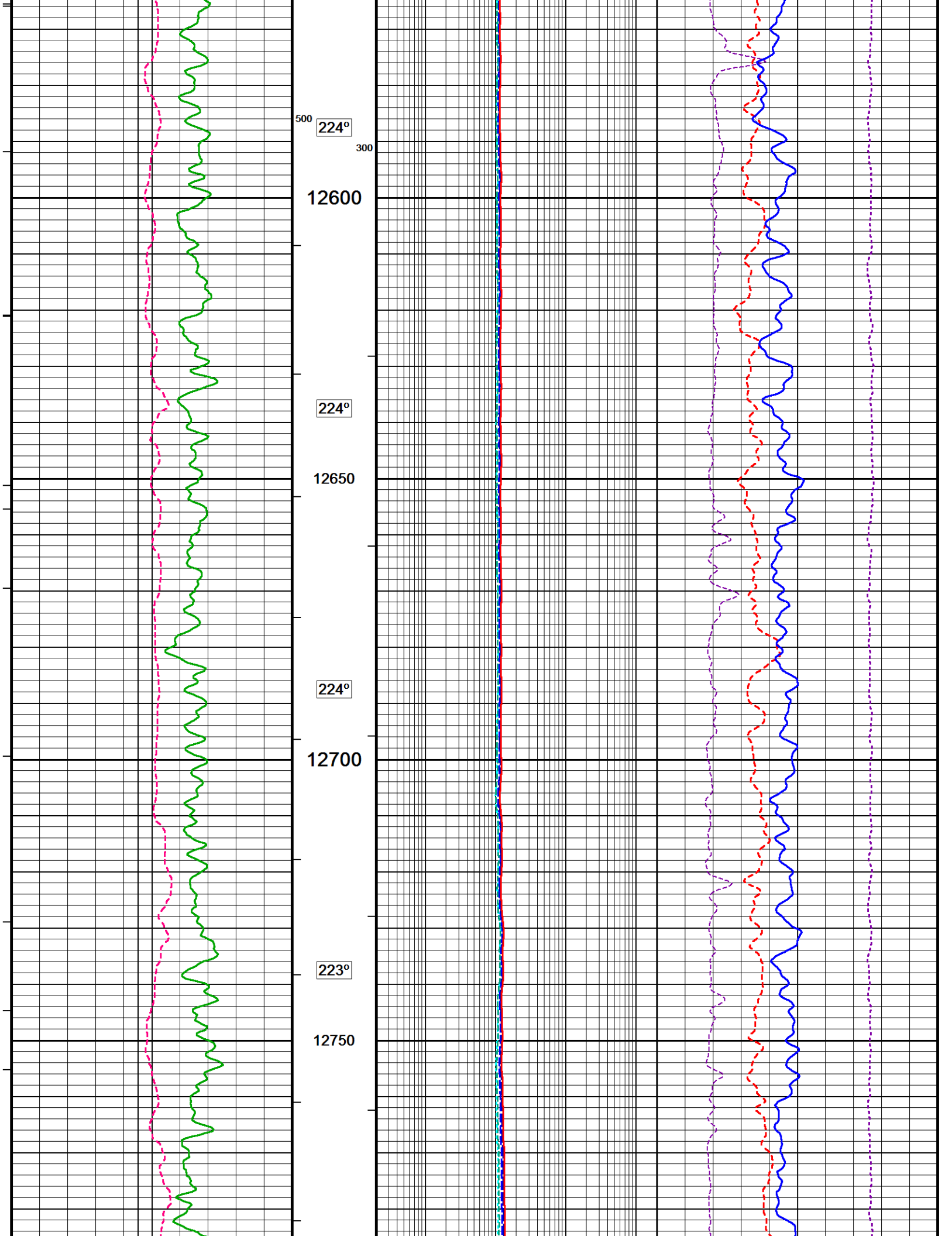


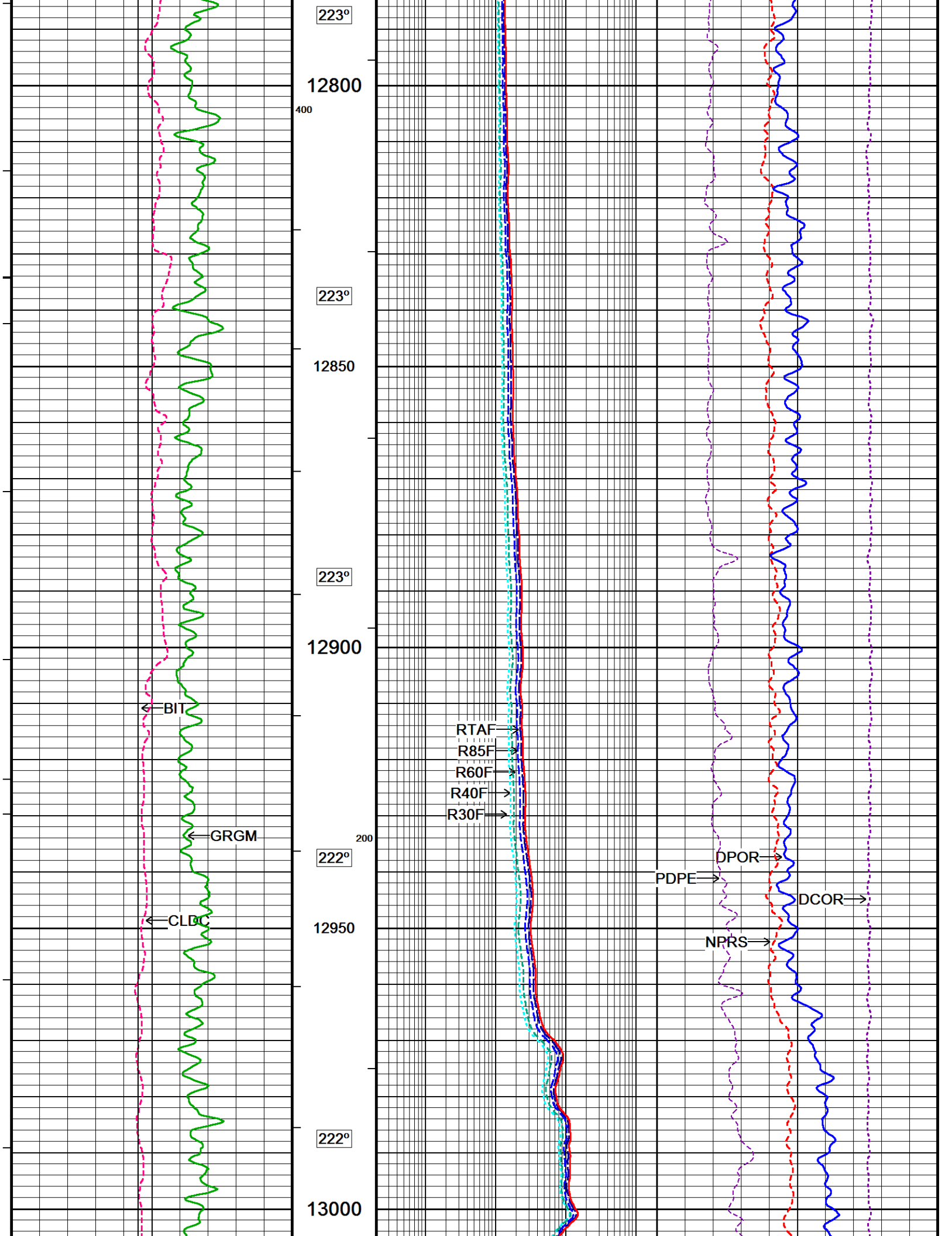


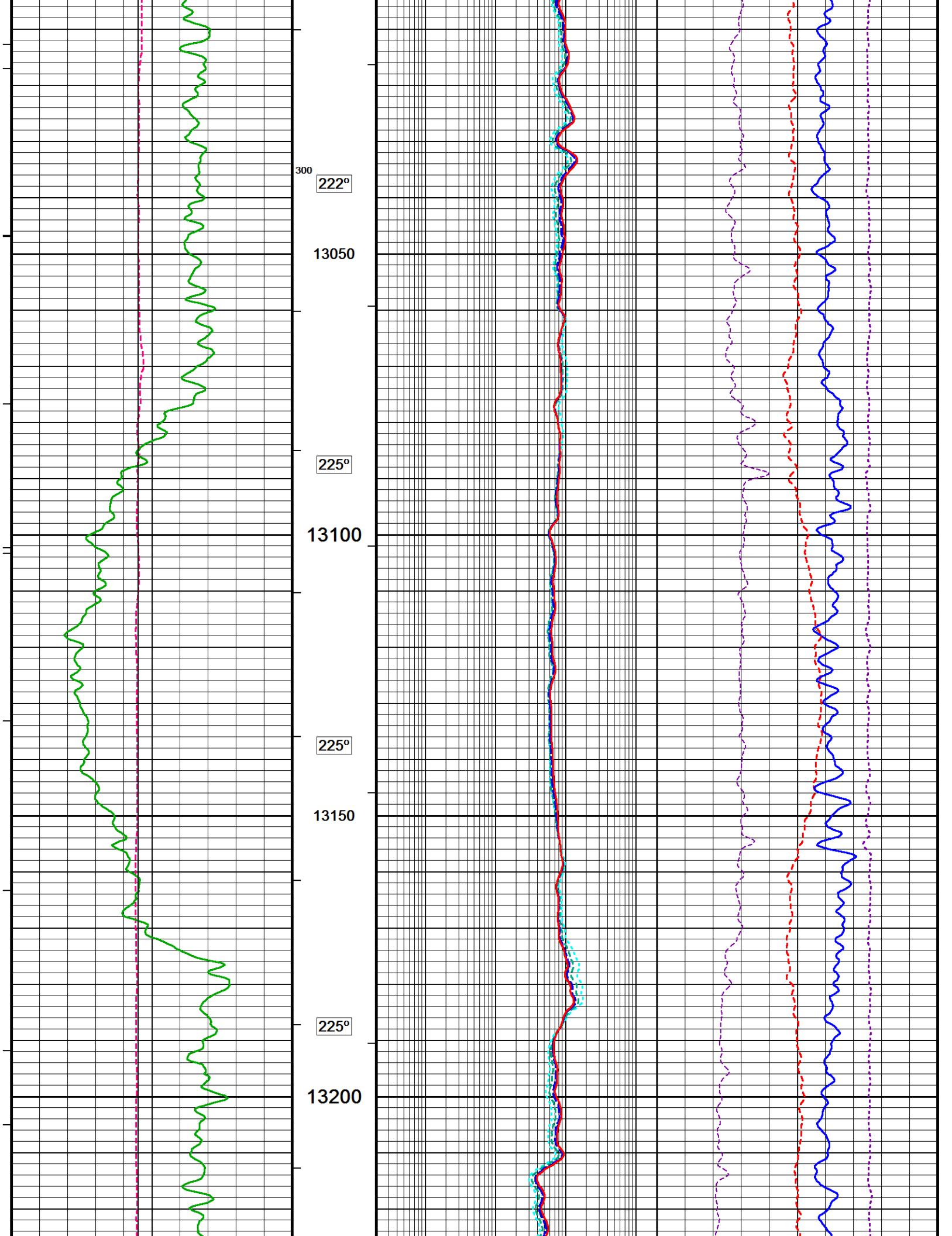


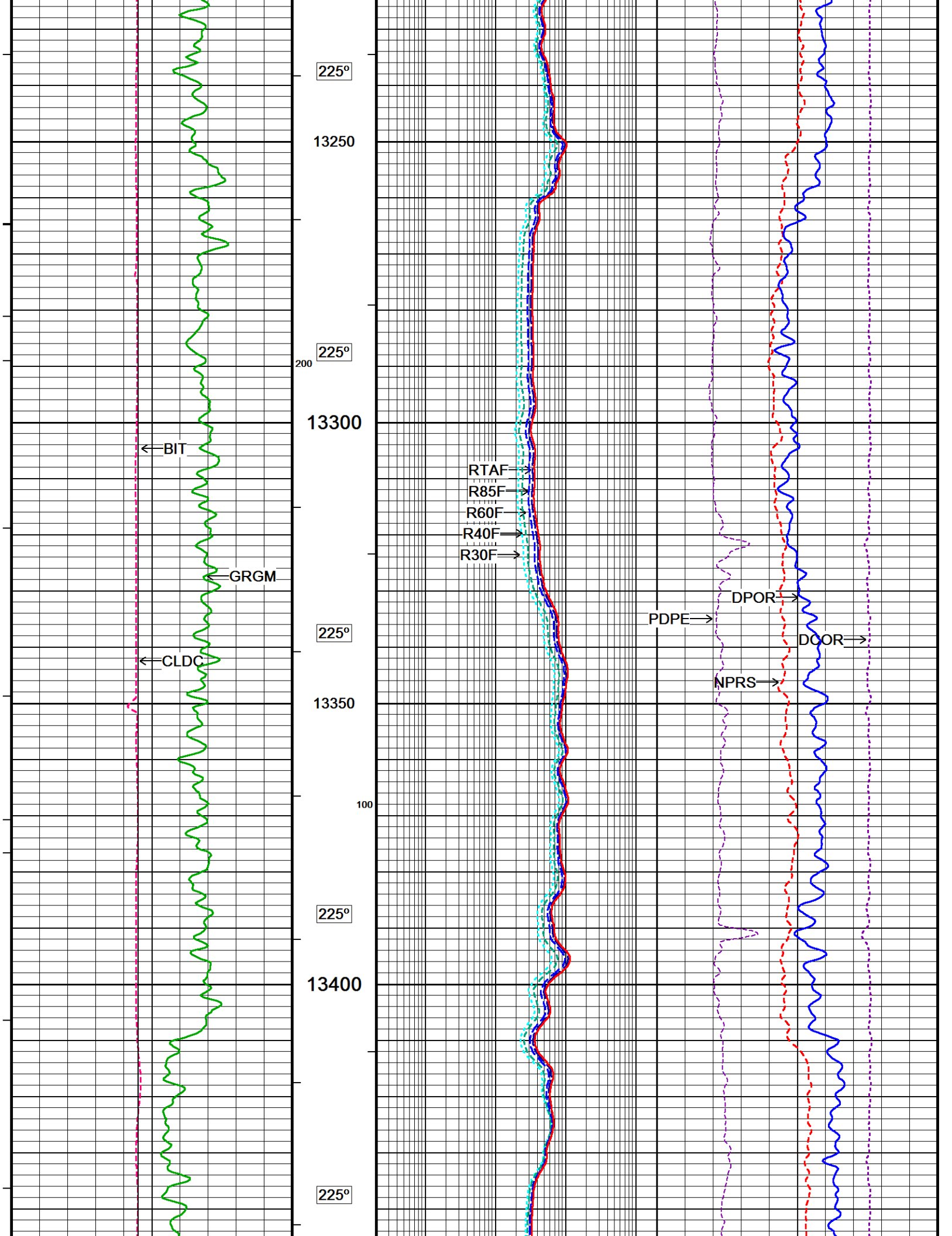


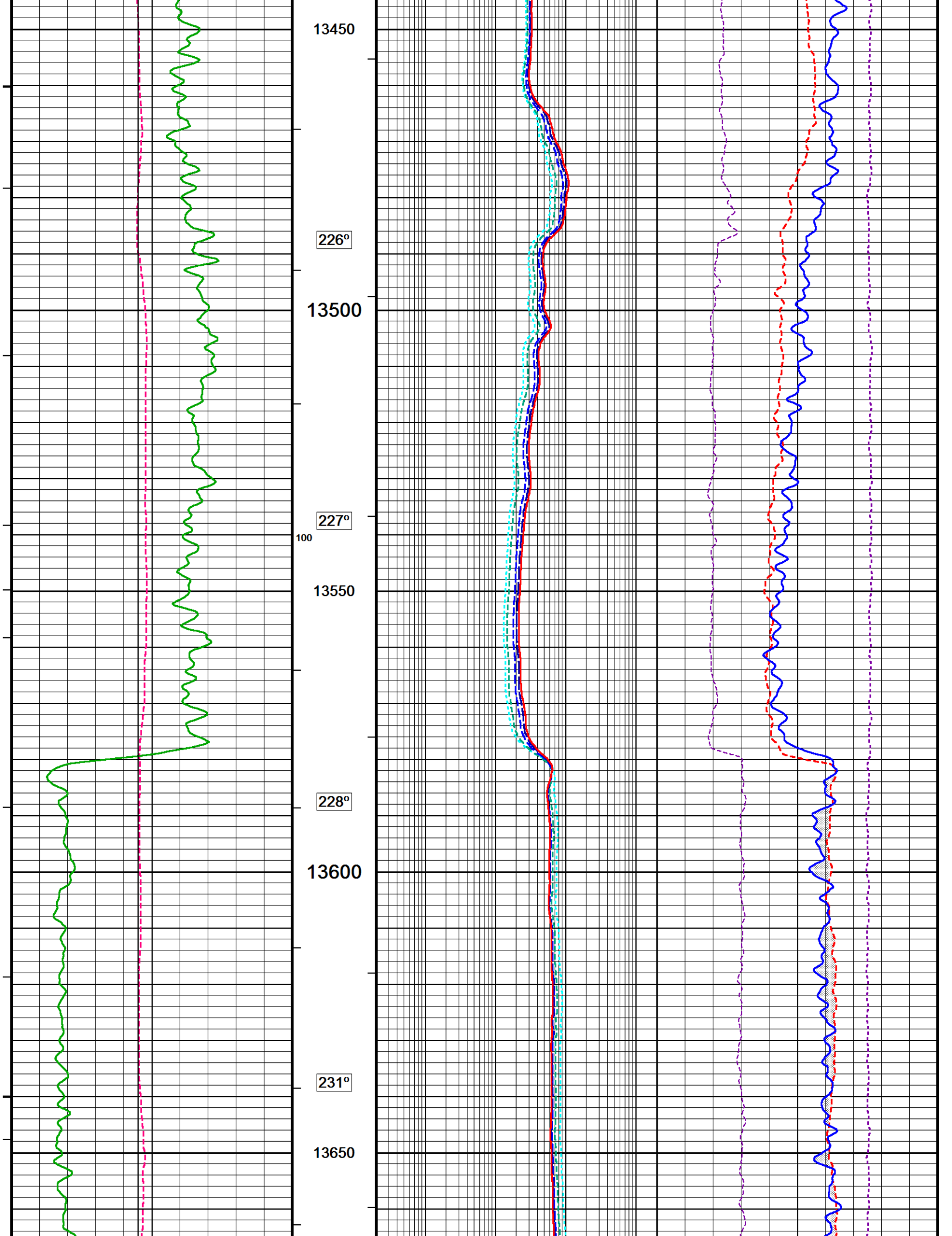


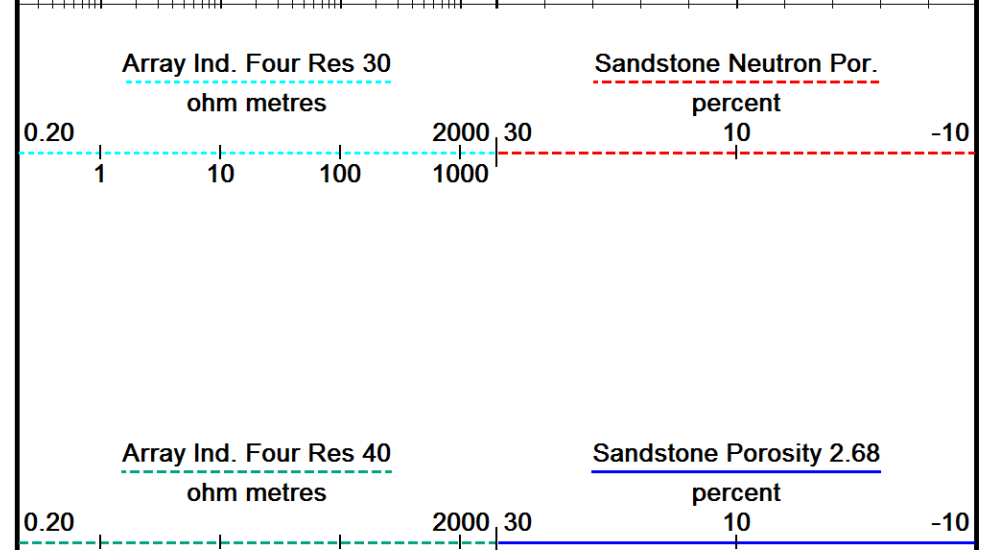
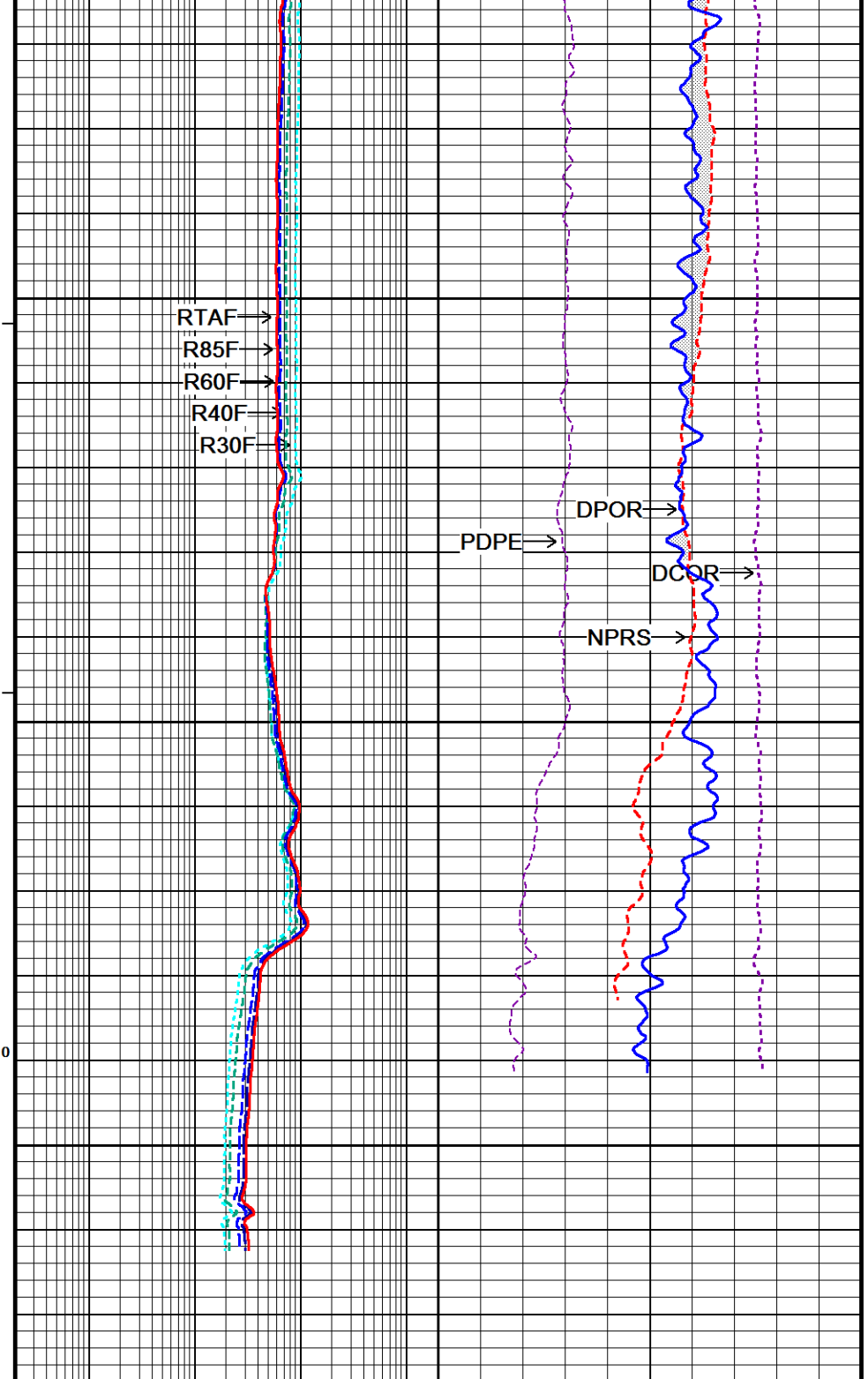
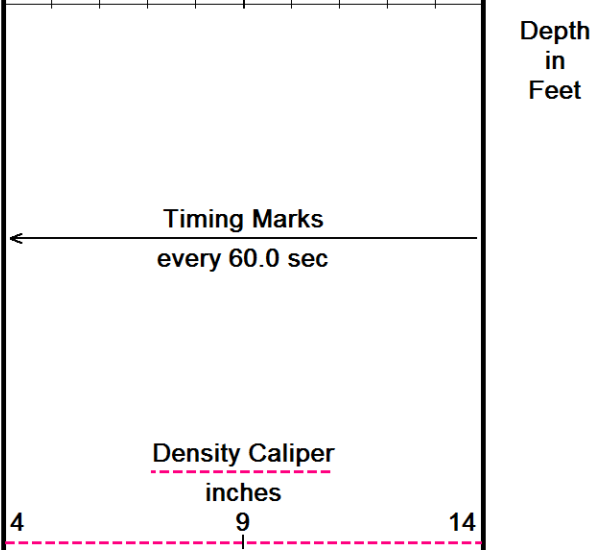
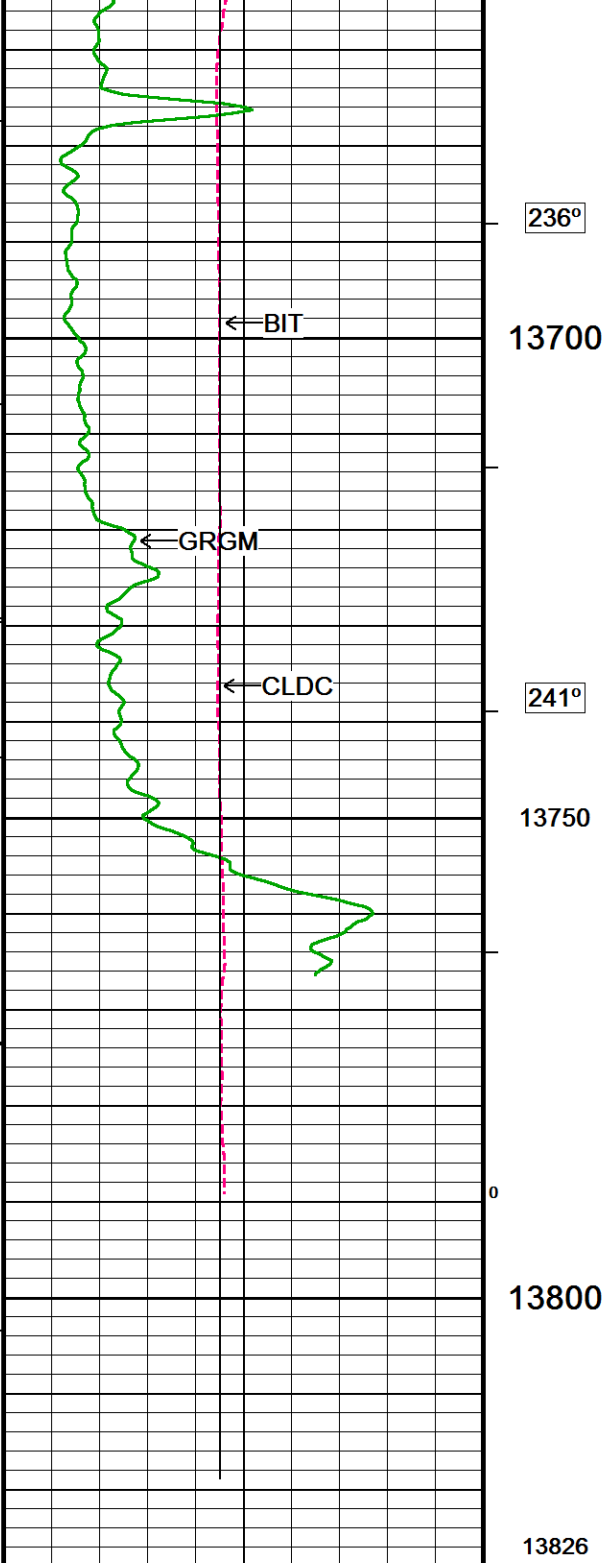












Caliper for Differential Caliper	None
Rwa Parameters	
Porosity used	Base Density Porosity
Resistivity used	Array Ind. One Res Rt
RWA Constant A	0.620
RWA Constant M	2.150
SW/APOR Tool Source	0.000

MMS Parameters MMS-F.A 249

Last Edited on 13-JAN-2018 15:59

Logging Parameters

Firmware Version	2v69	
Caliper Open On	MAI	
Caliper Open Delay		minutes
Caliper Closed On	Unknown	
Caliper Closed Delay	N/A	minutes
Sample Rate	1.00	seconds
Use Deep Sleep	No	
Delay Deep Sleep	N/A	
Deep Sleep Wake Time	N/A	minutes
Deep Sleep Wake on Temperature	N/A	
Deep Sleep Wake Temperature	N/A	degrees C
Deep Sleep Wake on Pressure	N/A	
Deep Sleep Wake Pressure	N/A	psi
MMI Pad Pressure	0.0	

Release Parameters

Pulse Duration Base Level	5.0	seconds
Pulse Duration Transition Time	30.0	seconds
Pulse Duration Status Pulse From	10.0	seconds
Pulse Duration Caliper Close From	72.0	seconds
Pulse Duration Caliper Open From	75.0	seconds
Pulse Duration Release Pulse From	107.0	seconds
Pulse Duration Release Pulse To	140.0	seconds
Pulse Release Duration	120.0	seconds
Pulse Discriminator Pressure Band	96.0	seconds
Pulse Pressure Discriminator	213.0	seconds
Use Negative Pulsing	No	
Good Status Reply Open Hole	65535.0	seconds
Good Status Reply Cased Hole	10.0	seconds
Bad Status Reply	30.0	seconds
Status Pulse To	40.0	seconds
Caliper Close To		seconds
Caliper Open To	105.0	seconds

Configuration

MMS,MGS,MDN,MPD,MPD,MVC,MAI

Gamma Calibration MGS-D.A 218

Field Calibration on 13-JAN-2018,15:15

	Measured	Calibrated (API)
Background	123	82
Calibrator (Gross)	928	616
Calibrator (Net)	805	534

Gamma Calibration Tolerances MGS-D.A 218

Ratio	1.507	<div><div></div><div></div><div></div><div></div><div></div></div>	Counts/API
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Gamma Constants MGS-D.A 218

Last Edited on 14-JAN-2018,17:41

Gamma Calibrator Number	GRCC-225	
GRC-M Calibrator Jig in Use?	NO	
Inactive Background Jig in Use?	NO	
Mud Density	1.25	gm/cc
Caliper Source for Processing	Density Caliper	
Tool Position	Centred	
Potassium Equivalence	Chloride	
K Mud Concentration	0.00	%

High Resolution Temperature Calibration MGS-D.A 218

Field Calibration on 09-JAN-2018,23:42

	Measured	Calibrated(Deg F)
Lower	50.00	50.00
Upper	212.00	212.00

High Resolution Temperature Constants MGS-D.A 218

Last Edited on 09-JAN-2018,22:14

Pre-filter Length 11

Neutron Calibration MDN-C.A 463

Base Calibration on 26-DEC-2017 12:09

Field Check on 13-JAN-2018 15:22

Base Calibration

	Measured		Calibrated (cps)	
	Near	Far	Near	Far
	3144	95	3714	110
Ratio	33.214		33.764	

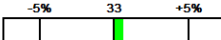
Field Calibrator at Base

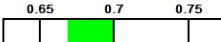
	Calibrated (cps)
	1881 2814
Ratio	0.669

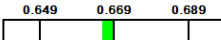
Field Check

	Calibrated (cps)
	1758 2643
Ratio	0.665

Neutron Calibration Tolerances MDN-C.A 463

Ratio 33.214 

Base Check 0.669 

Field Check 0.665 

Neutron Constants MDN-C.A 463

Last Edited on 14-JAN-2018,21:32

Neutron Source Id	P62413B
Neutron Jig Number	NJ6677
Air Hole Processing	Modified Ratio
Caliper Source for Processing	Density Caliper
Stand-off	0.00 inches
Mud Density	1.25 gm/cc
Limestone Sigma	7.10 cu
Sandstone Sigma	7.00 cu
Dolomite Sigma	4.70 cu
Formation Pressure Source	Constant Value
Formation Pressure	0.00 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

Induction Calibration MAI-C.A 456

Factory Loop Calibration 26-DEC-2017 11:12

Field Check on 13-JAN-2018 14:57

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)	16.2	452.6	9.3	966.2	2.193	-26.2
2	5.6	366.0	7.6	821.4	2.258	-5.1
3	2.9	251.0	5.2	566.0	2.260	-1.3
4 (far)	1.3	130.8	2.6	279.2	2.136	-0.1

Array Temperature 73.2 Deg F

Tool Checks

Array	Factory Reference (mmho/m)		Before Survey (mmho/m)	
	Low	High	Low	High
1 (near)	-4.4	2129.1	-4.4	2128.8
2	14.8	1960.4	14.8	1960.1
3	15.6	1677.6	15.6	1677.3
4 (far)	11.2	1123.7	11.2	1123.5
Array Temperature		44.0	39.0	Deg F

Induction Check Tolerances MAI-C.A 456

Low Array 1	-4.4	<div><div>-5.9</div><div>-4.4</div><div>-2.9</div></div>	mmho/m	High Array 1	2128.8	<div><div>-0.5%</div><div>2129.1</div><div>+0.5%</div></div>	mmho/m
Low Array 2	14.8	<div><div>13.3</div><div>14.8</div><div>16.3</div></div>	mmho/m	High Array 2	1960.1	<div><div>-0.5%</div><div>1960.4</div><div>+0.5%</div></div>	mmho/m
Low Array 3	15.6	<div><div>14.1</div><div>15.6</div><div>17.1</div></div>	mmho/m	High Array 3	1677.3	<div><div>-0.5%</div><div>1677.6</div><div>+0.5%</div></div>	mmho/m
Low Array 4	11.2	<div><div>9.7</div><div>11.2</div><div>12.7</div></div>	mmho/m	High Array 4	1123.5	<div><div>-0.5%</div><div>1123.7</div><div>+0.5%</div></div>	mmho/m

Induction Constants MAI-C.A 456

Last Edited on 14-JAN-2018,17:40

Induction Model		RtAP-NC	
Borehole Correction Constants			
Tool Centred		Yes	
Hole Size Source		Density Caliper	
Hole Size Constant Value		N/A	inches
Stand-off Type		N/A	
Stand-off		N/A	inches
Number of Fins on Stand-off		N/A	
Stand-off Fin Angle		N/A	degrees
Stand-off Fin Width		N/A	inches
Rm Source	Global Value: Temperature Corrected		
Temp. for Rm Corr.	MGS 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-D.A 478

Base Calibration on 30-DEC-2017,11:06
Field Calibration on 13-JAN-2018 15:18

Base Calibration

Reading No	Measured	Calibrator Size (in)
1	18181	4.00
2	26390	5.96
3	35012	7.98
4	43135	9.86
5	52266	11.88
6	N/A	N/A
Field Calibration		
	Measured Caliper (in)	Actual Caliper (in)
	7.89	7.98


Caliper Calibration Tolerances MPD-D.A 478			
Short Arm Field Cal.	7.89	<div> <div>7.78</div> <div>7.98</div> <div>8.18</div> </div>	in

Photo Density Calibration MPD-D.A 478					Base Calibration on 30-DEC-2017 10:24	
					Field Check on 13-JAN-2018 15:02	
Density Calibration						
Base Calibration		Measured		Calibrated (sdu)		
		Near	Far	Near	Far	
	Background	1164	1319			
	Reference 1	51806	25752	59898	31131	
	Reference 2	21006	2457	24540	2525	
Field Check at Base						
		1163.5	1319.0			
Field Check						
		1162.1	1323.8			
PE Calibration						
Base Calibration		Measured		Calibrated		
	WS	WH	Ratio	Ratio		
	Background	226	1041			
	Reference 1	23034	51624	0.451	0.369	
	Reference 2	6460	20878	0.314	0.271	
Field Check at Base						
		226.2	1041.1			
Field Check						
		224.6	1038.9			

Photo Density Calibration Tolerances MPD-D.A 478					
Near Density Ratio	2.55	<div> <div>-5%</div> <div>2.52</div> <div>+5%</div> </div>	Far Density Ratio	21.46	<div> <div>-5%</div> <div>21.00</div> <div>+5%</div> </div>
PE Calibration	0.129	<div> <div>0.089</div> <div>0.110</div> <div>0.131</div> </div>			
Near Den. Field Check	1162.1	<div> <div>-3%</div> <div>1163.5</div> <div>+3%</div> </div>	Far Den. Field Check	1323.8	<div> <div>-3%</div> <div>1319.0</div> <div>+3%</div> </div>
PE WS Field Check	224.6	<div> <div>-6%</div> <div>226.2</div> <div>+6%</div> </div>	PE WH Field Check	1038.9	<div> <div>-6%</div> <div>1041.1</div> <div>+6%</div> </div>

Density Constants MPD-D.A 478			Last Edited on 14-JAN-2018,17:40	
Density Source Id	P74825B			
Nylon Calibrator Number	DNCE631			
Aluminium Calibrator Number	DACD631			
Density Shoe Profile	4 inch			
Caliper Source for Processing	Density Caliper			
PE Correction to Density	Not Applied			
Mud Density	1.25		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)			

2.68	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

COMPANY	GREAT WESTERN OIL AND GAS				
WELL	B FARM LD 18-034HC				
FIELD	WATTENBERG				
PROVINCE/COUNTY	ADAMS				
COUNTRY/STATE	U.S.A. / COLORADO				
Elevation Kelly Bushing	5146	feet	First Reading	13812.00	feet
Elevation Drill Floor	5146	feet	Depth Driller	13833.00	feet
Elevation Ground Level	5126	feet	Depth Logger	13833.00	feet
<div><div>CML MESSENGER SHUTTLE COMPOSITE LOG SANDSTONE MATRIX</div></div>					