ThruBit
A Schlumberger Company

# ARRAY INDUCTION
# GAMMA RAY
# MEMORY LOG

| | |
|---|---|
| Company | SANDRIDGE ENERGY |
| Well | ANN 3404 2-21H |
| Field | BLUFF |
| County | SUMNER |
| State | KANSAS |

Company SANDRIDGE ENERGY
Well ANN 3404 2-21H
Field BLUFF
County SUMNER State KANSAS
Location: API # : 15-191-22709-0100
SHL: 200' FSL & 700' FWL
PBHL: 330' FNL & 1980' FWL
SEC 21 TWP 34S RGE 4W

Other Services
THRUBIT
PORTAL BIT

| | | Elevation |
|---|---|---|
| Permanent Datum | G.L. | 1409' |
| Log Measured From | K.B. 20' ABOVE PERM DATUM | K.B. 1221' |
| Drilling Measured From | K.B. | D.F. 1221' |
| | | G.L. 1201' |

| | | | |
|---|---|---|---|
| Date | 27 NOVEMBER 2013 | | |
| Run Number | ONE | | |
| Depth Driller | 10633' | | |
| Depth Logger | 10468' | | |
| Bottom Logged Interval | 10458' | | |
| Top Log Interval | 5419' | | |
| Casing Driller | 7.0" @ 5430" | | |
| Casing Logger | 5419' | | |
| Bit Size | 6.125 | | |
| Type Fluid in Hole | WBM | | |
| Density / Viscosity | 9.3 / 27 | | |
| pH / Fluid Loss | 9.0 / 60 | | |
| Source of Sample | MUD PIT | | |
| Rm @ Meas. Temp | 0.13 ohms @ 45 degf | | |
| Rmf @ Meas. Temp | 0.10 ohms @ 45 degf | | |
| Rmc @ Meas. Temp | 0.16 ohms @ 45 degf | | |
| Source of Rmf / Rmc | CALCULATED | | |
| Rm @ BHT | 0.05 ohms @ 129 degf | | |
| Time Circulation Stopped | 00:30 | | |
| Time Logger on Bottom | 01:45 | | |
| Maximum Recorded Temperature | 129 degf | | |
| Equipment Number | T011 | | |
| Location | OKC, OK | | |
| Recorded By | DENGLER | | |
| Witnessed By | CODY DAVIS | | |

<<< Fold Here >>>



## Comments

SERVICE: LEVEL 4- HORIZONTAL MEMORY PUMPDOWN - BIT DEPTH 10448' LOG TO 5419'
ALL SCALES AND PRESENTATION PER CLIENT REQUEST
LIMESTONE POROSITY , 2.71 G/CC, USED FOR POROSITY CALCULATIONS
LOG RAN WITH SWIVEL, SMALL DECENTRALIZER AND NO STANDOFFS
TBHV REPRESENTS TOTAL BOREHOLE VOLUME, FT3
ABHV REPRESENTS ANNULAR BOREHOLE VOLUME, FT3, CALCULATED FOR 4.50" CASING
RIGMINDER LITE AND PASON USED TO CREATE DEPTH LOG
LOG DEPTH CORRELATED TO MWD GR PROVIDED BY CUSTOMER
RIG HAD NO RETURNS AT TIME OF LOGGING. WAS PUMPING 300 GPM DOWN BACKSIDE WHILE LO
DATA FROM 8018 TO 8060 IS INVALID DUE TO PASON LOCKING UP WHILE PULLING PIPE.
RIG: HORIZON 15
CREW: J. DENGLER, E. PRICE, Z. HOWARD

| | | | | | |
|---|---|---|---|---|---|
| Service Ticket No. | 2338 | API No. | 15-191-22709-0100 | PGM Ver | WARRIOR 7.0 |

The Well Name, Location, Borehole Description, and / or Cementing Data Furnished by Client

EQUIPMENT DATA

| GAMMA RAY | NEUTRON | DENSITY | INDUCTION |
|---|---|---|---|

| Run No. | ONE | Run No. | ONE | Run No. | ONE | Run No. | ONE |
|---|---|---|---|---|---|---|---|
| Serial No. | PS24T | Serial No. | PS29N | Serial No. | PS43D | Serial No. | PS15R |
| Model No. | PS | Model No. | PS | Model No. | PS | Model No. | PS |
| Diameter | 2.125" | Diameter | 2.125" | Diameter | 2.125" | Diameter | 2.125" |

LOGGING DATA

General Data

| Pass | Depths | | Well Head | Speed | Logging Run Comments |
|---|---|---|---|---|---|
| No. | From | To | Pressure | Ft/Min | |
| ONE | 10468' | 5419' | 0 | 30 FPM | |
| | | | | | |

| | GAMMA RAY | | NEUTRON | | DENSITY | | INDUCTION | |
|---|---|---|---|---|---|---|---|---|
| Pass | Scale | | Scale | | Scale | | Scale | |
| No. | L | R | L | R | L | R | L | R |
| ONE | 0 API | 150 API | 30 % | -10 % | 30 % | -10 % | 0.2 OHM-M | 2000 OHM-M |
| | | | | | | | | |

DIRECTIONAL INFORMATION

| Maximum Deviation | 95.1 | deg. @ | 8460 | KOP | 3508' | |
|---|---|---|---|---|---|---|

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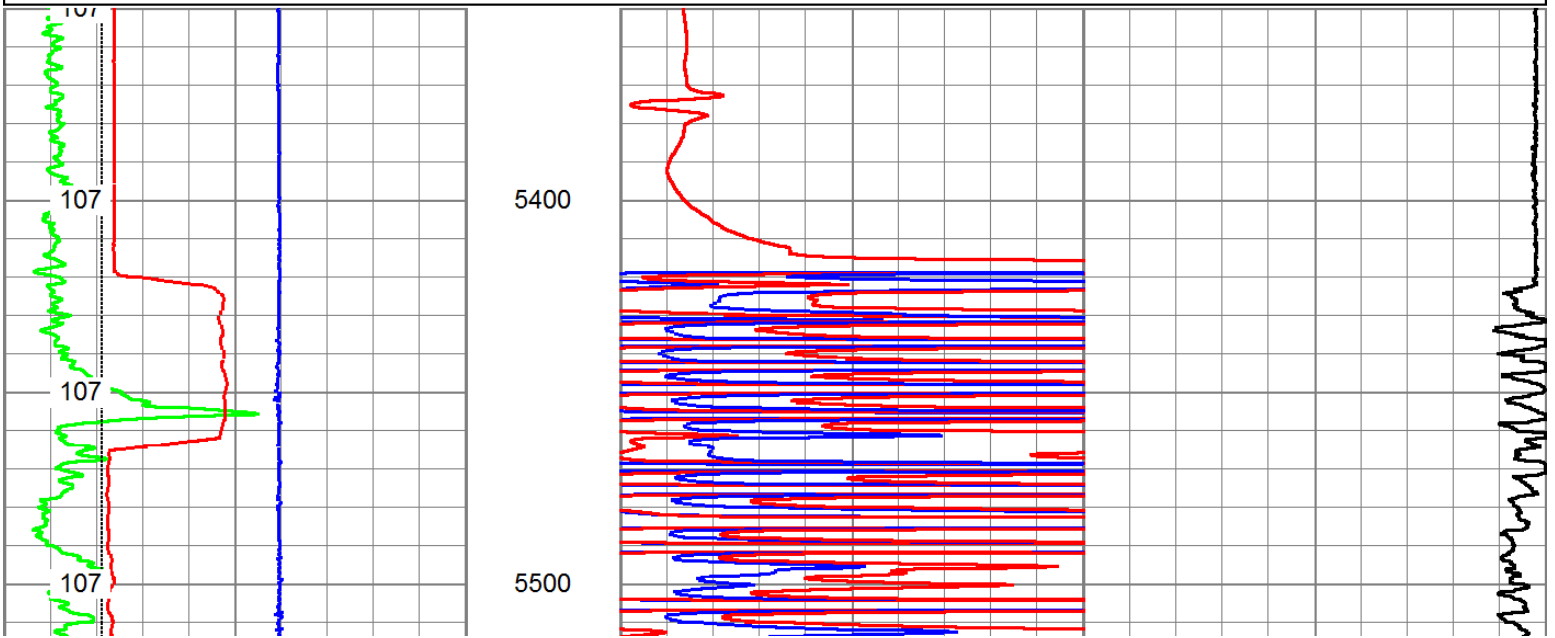
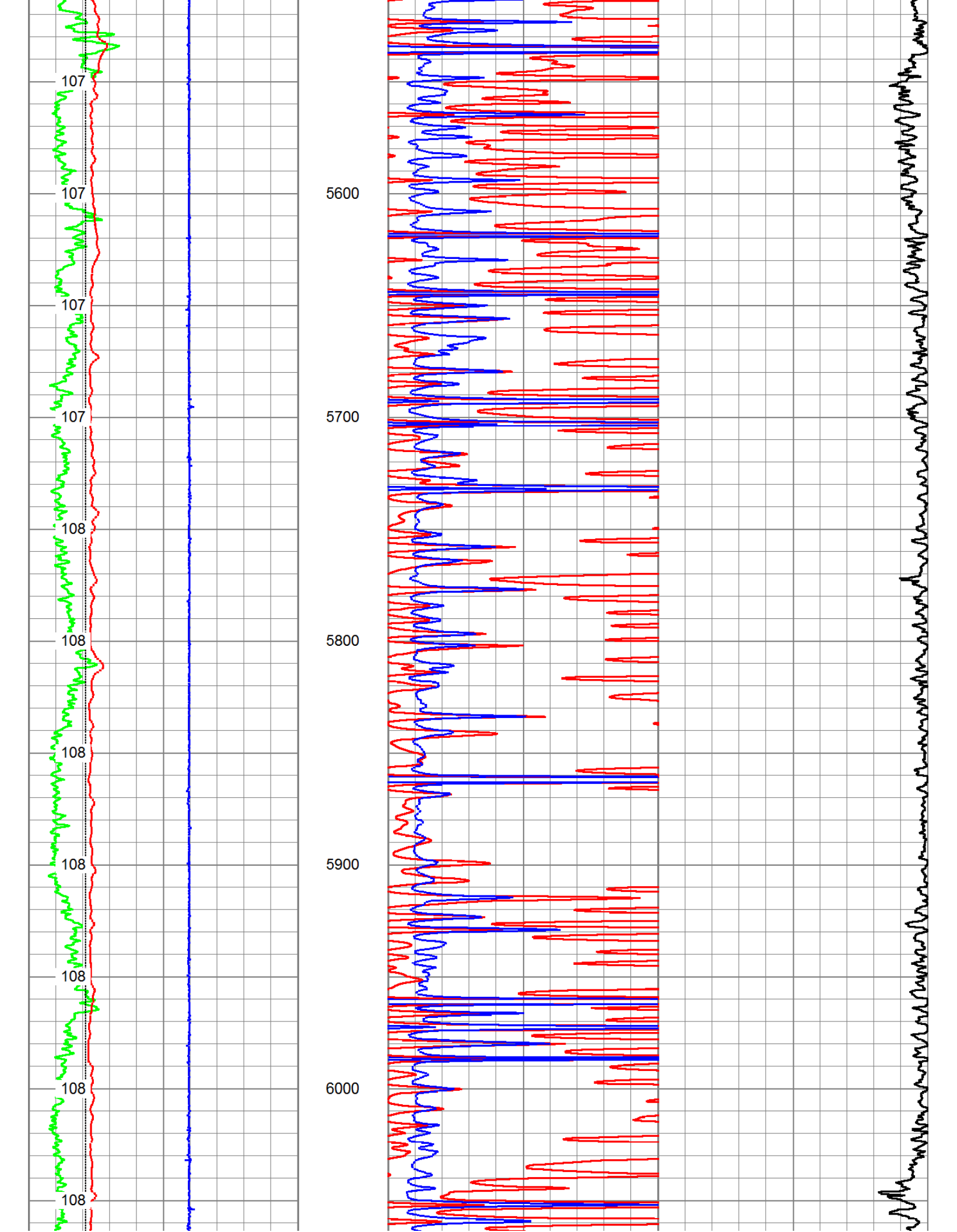
# MAIN PASS

Database File: ann_mem.db
Dataset Pathname: proc5/pass1.2
Presentation Format: 6_2r_chk
Dataset Creation: Wed Nov 27 11:55:16 2013
Charted by: Depth in Feet scaled 1:600

| | | |
|---|---|---|
| 0 | GR (GAPI) | 150 |
| 4 | DCAL (in) | 14 |
| -5 | ACCY | 5 |
| 4 | BOREID (in) | 14 |
| GRTEMP (degF) | | |

| | | |
|---|---|---|
| 50 | 20in 2ft Res (Ohm-m) | 500 |
| 50 | 90in 2ft Res (Ohm-m) | 500 |
| 1000 | DEEP COND (mmho/m) | 0 |
| 0 | 20in 2ft Res (Ohm-m) | 50 |
| 0 | 90in 2ft Res (Ohm-m) | 50 |

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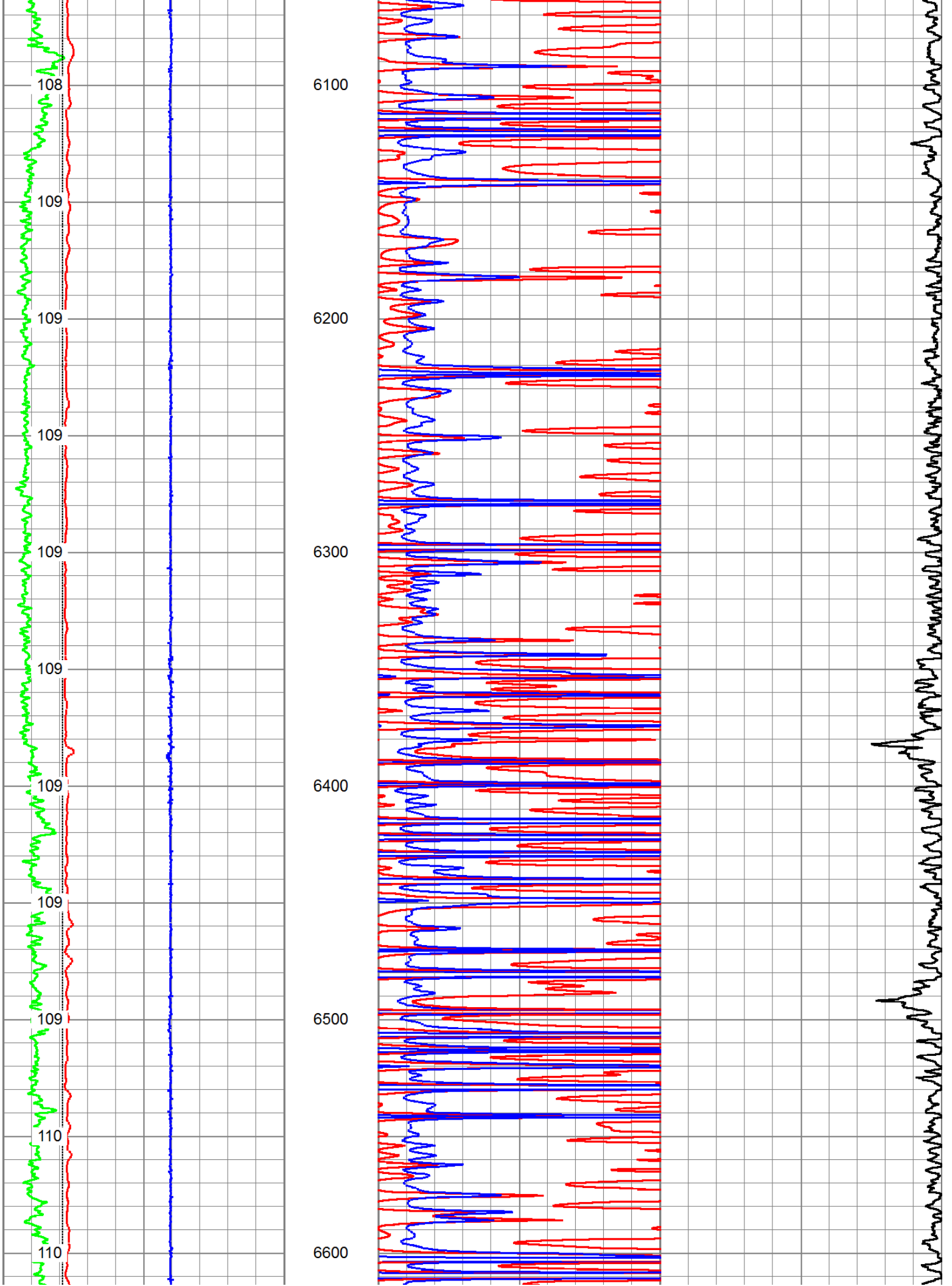
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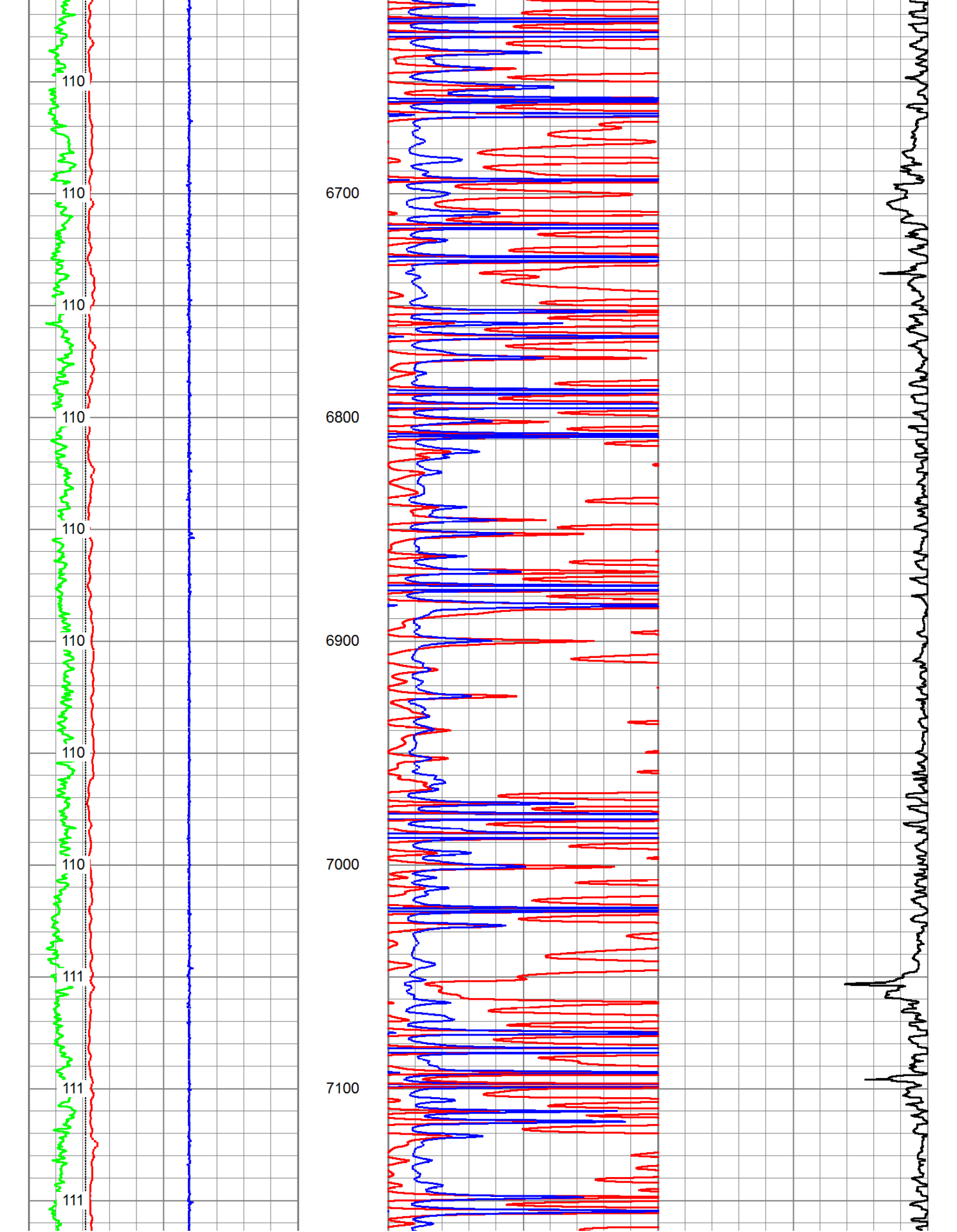
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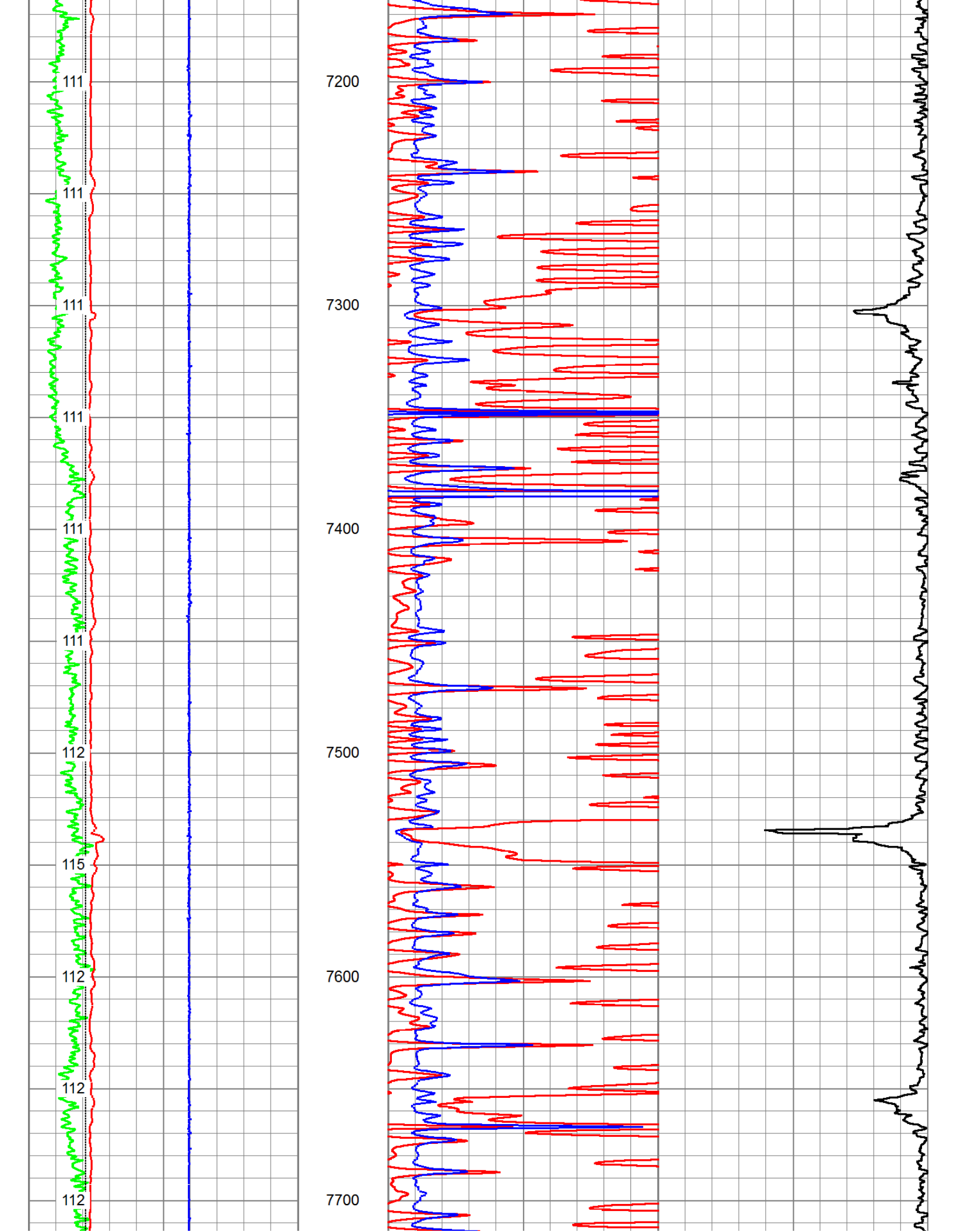
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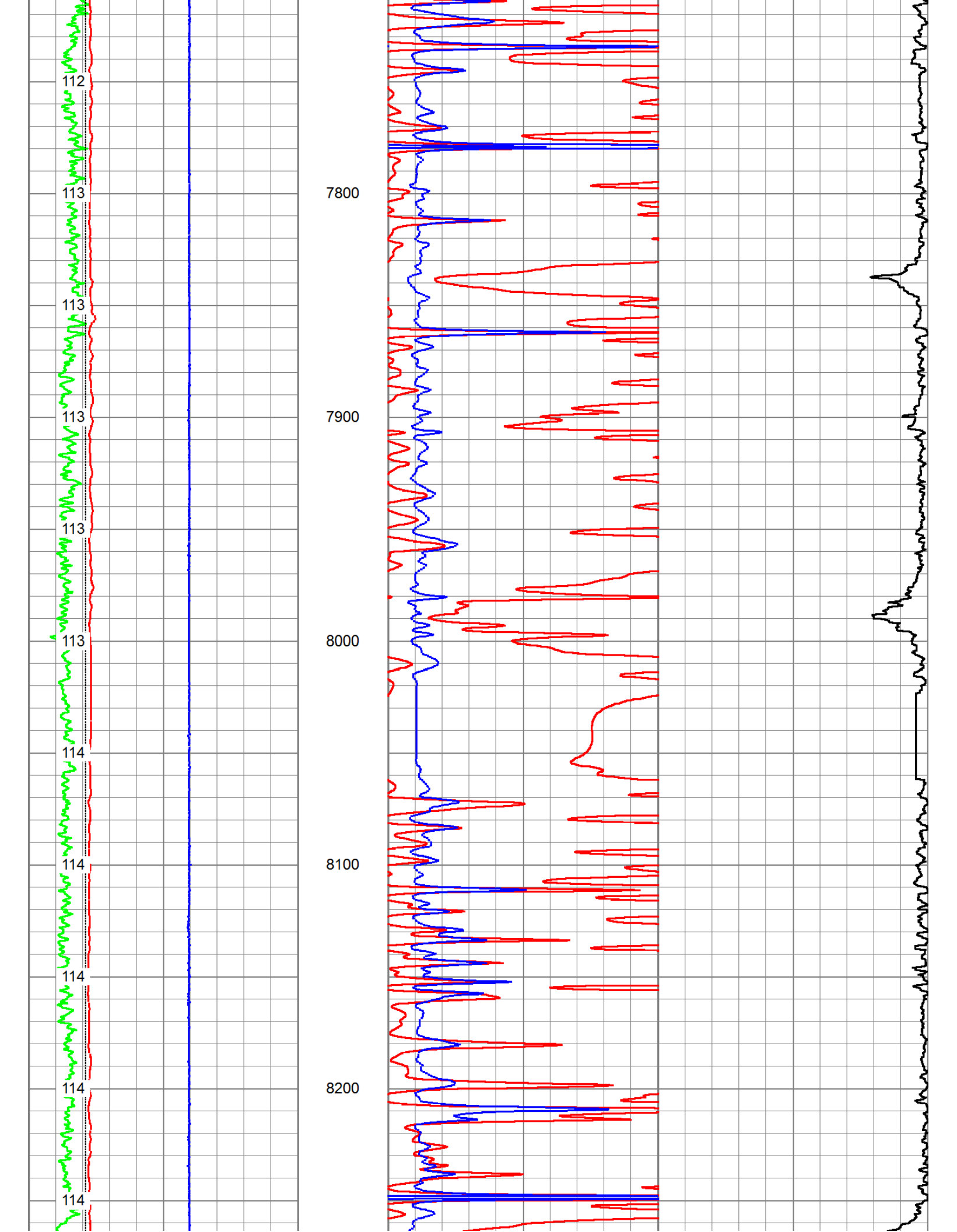
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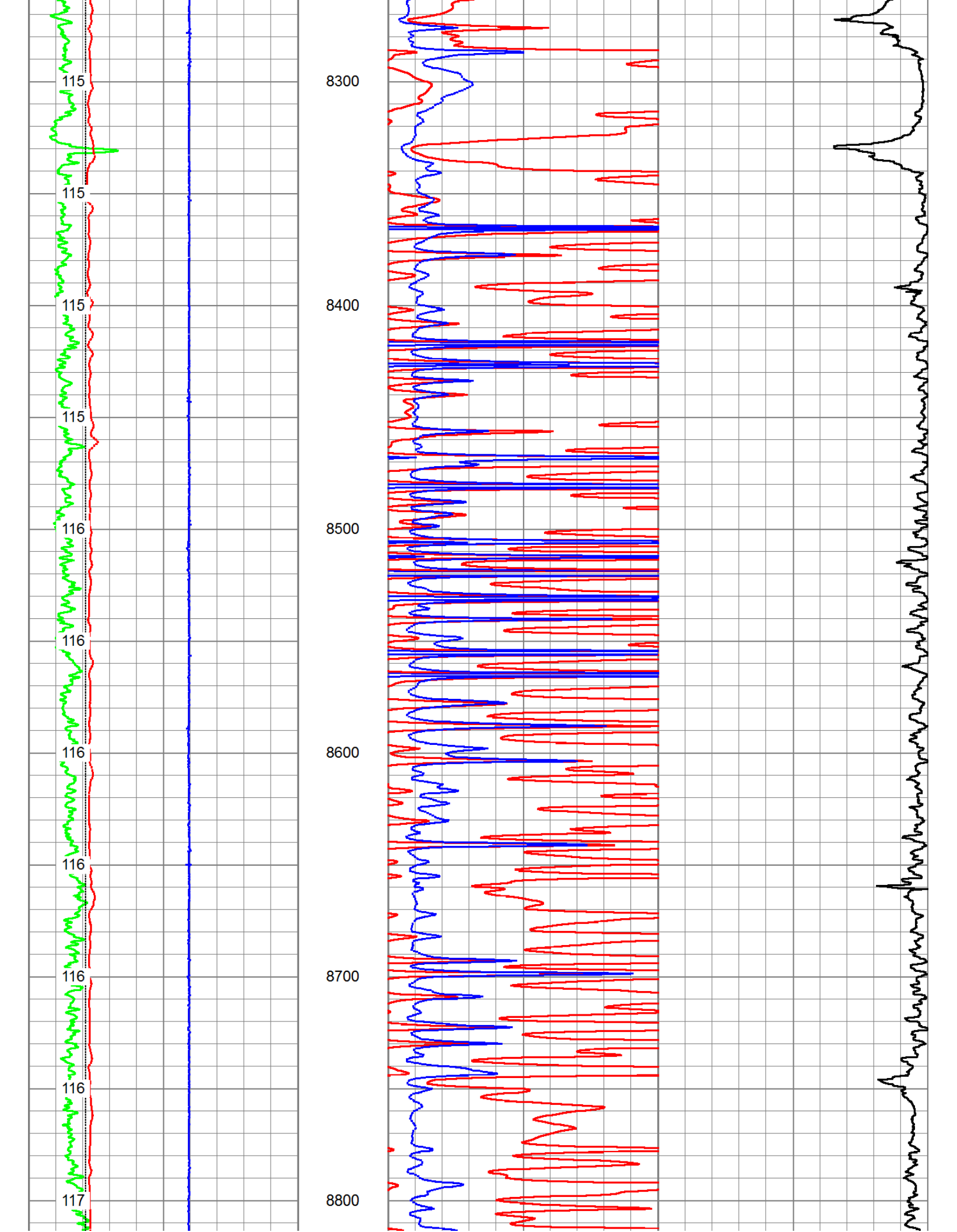
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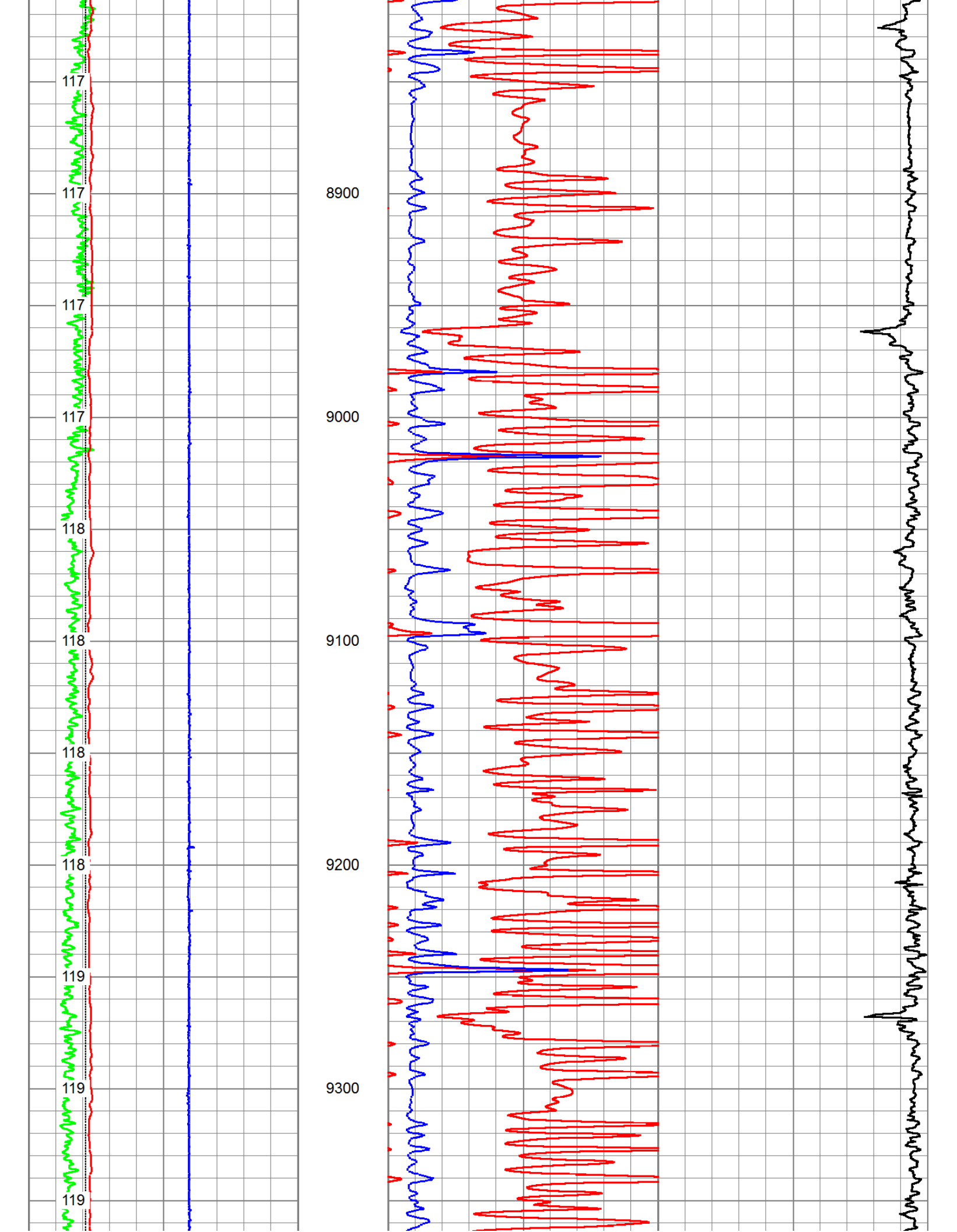
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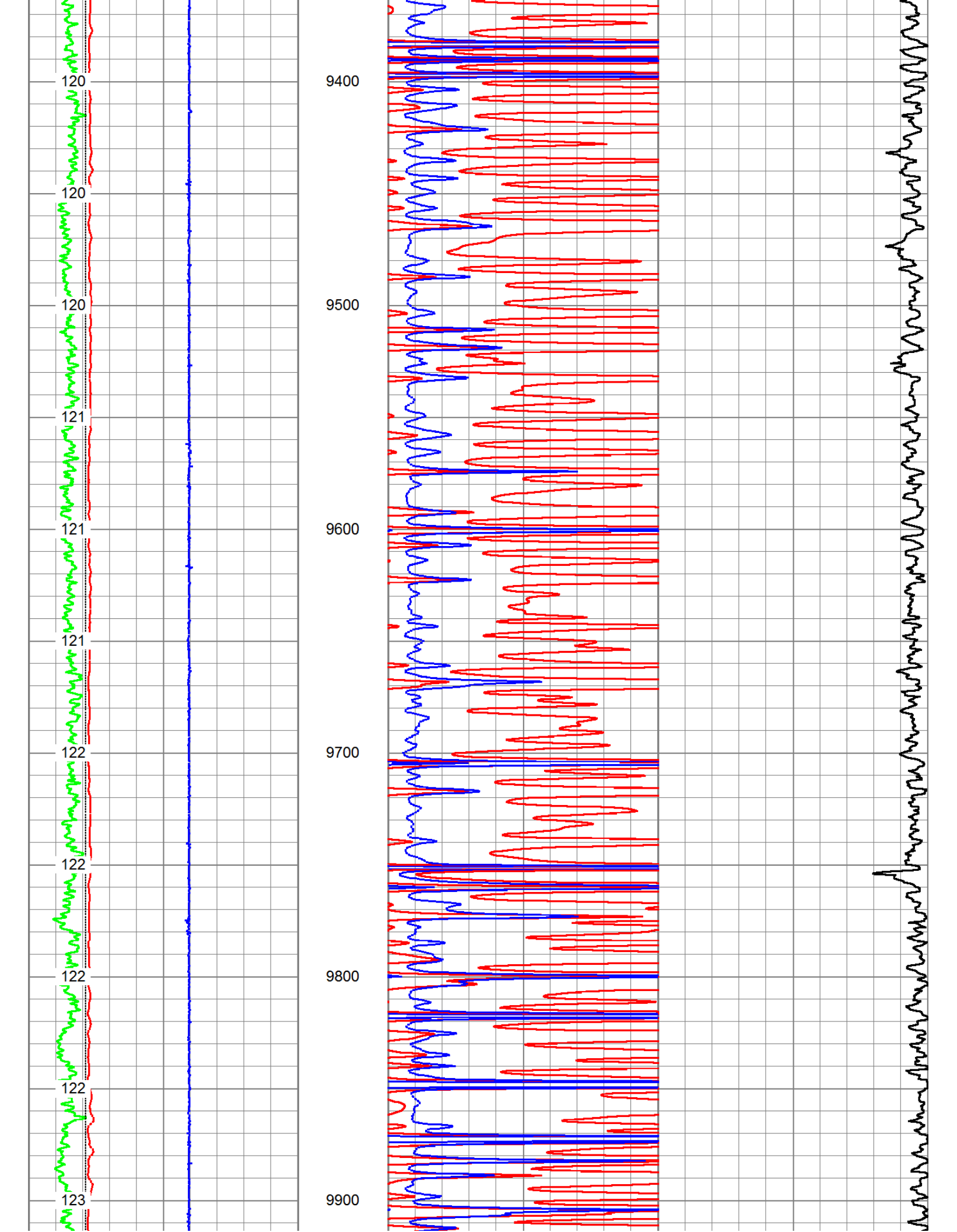
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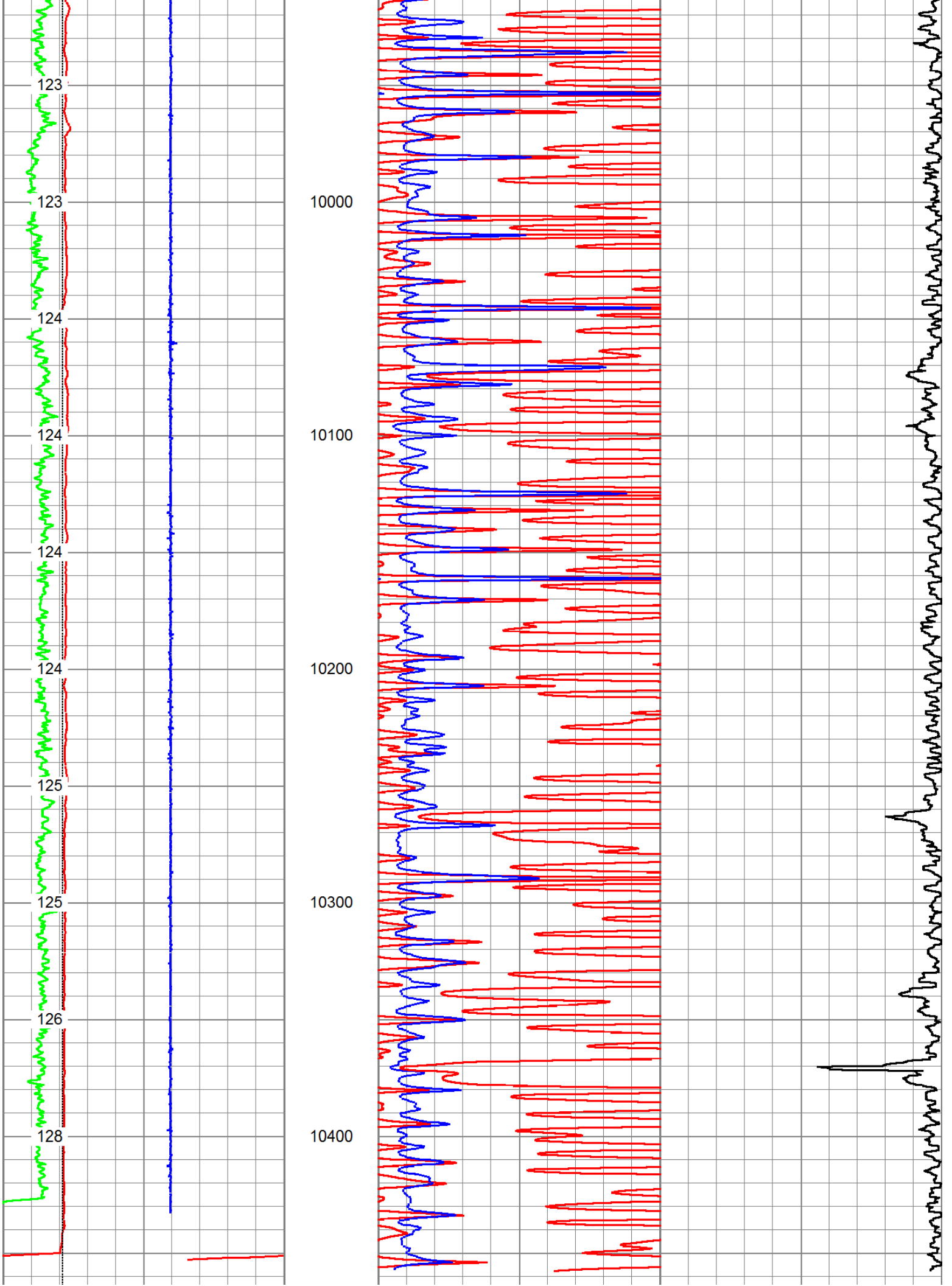
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10200
10300
10400

| | | |
|---|---|---|
| 0 | GR (GAPI) | 150 |
| 4 | DCAL (in) | 14 |
| -5 | ACCY | 5 |
| 4 | BOREID (in) | 14 |
| GRTEMP (degF) | | |

| | | |
|---|---|---|
| 50 | 20in 2ft Res (Ohm-m) | 500 |
| 50 | 90in 2ft Res (Ohm-m) | 500 |
| 1000 | DEEP COND (mmho/m) | 0 |
| 0 | 20in 2ft Res (Ohm-m) | 50 |
| 0 | 90in 2ft Res (Ohm-m) | 50 |

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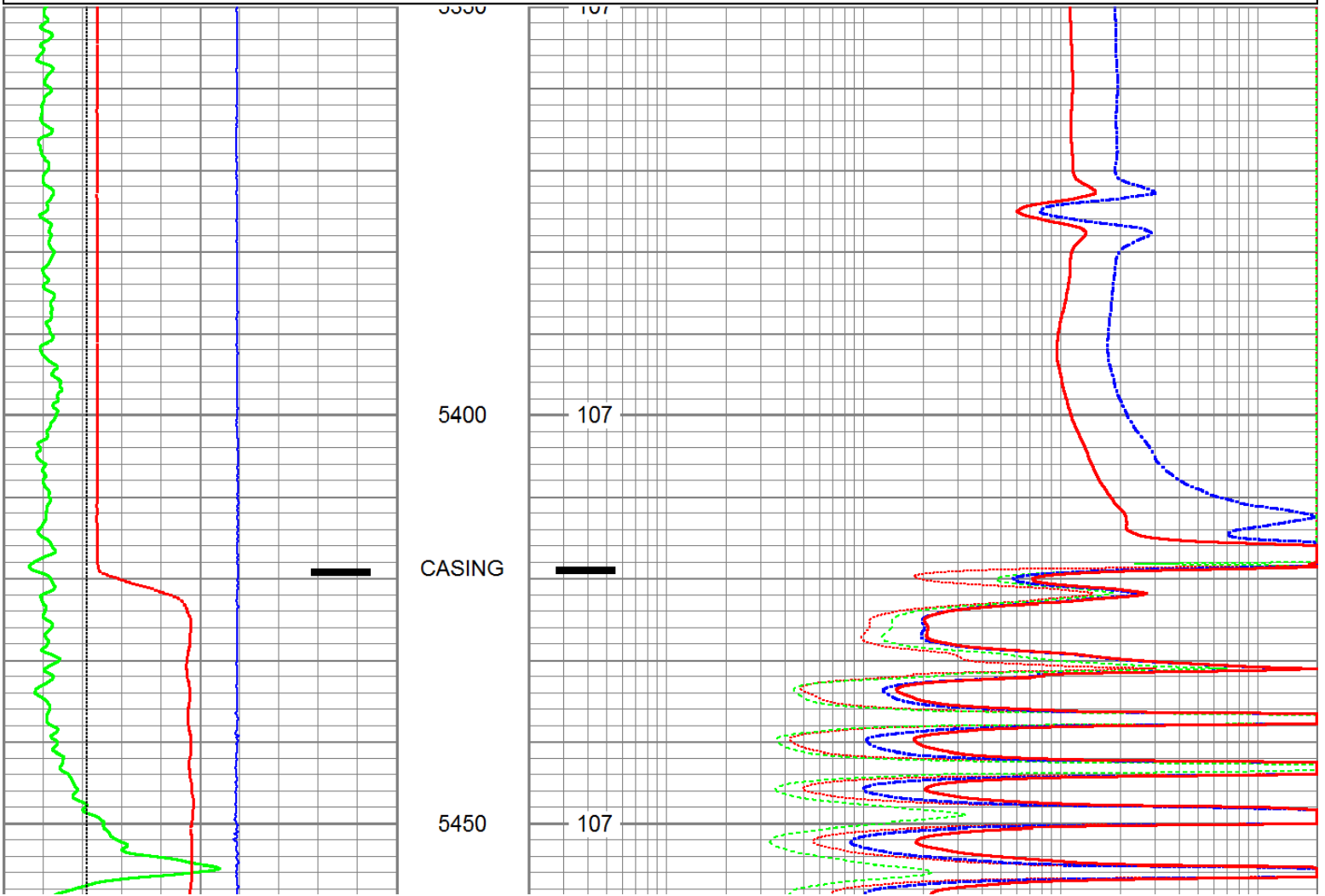
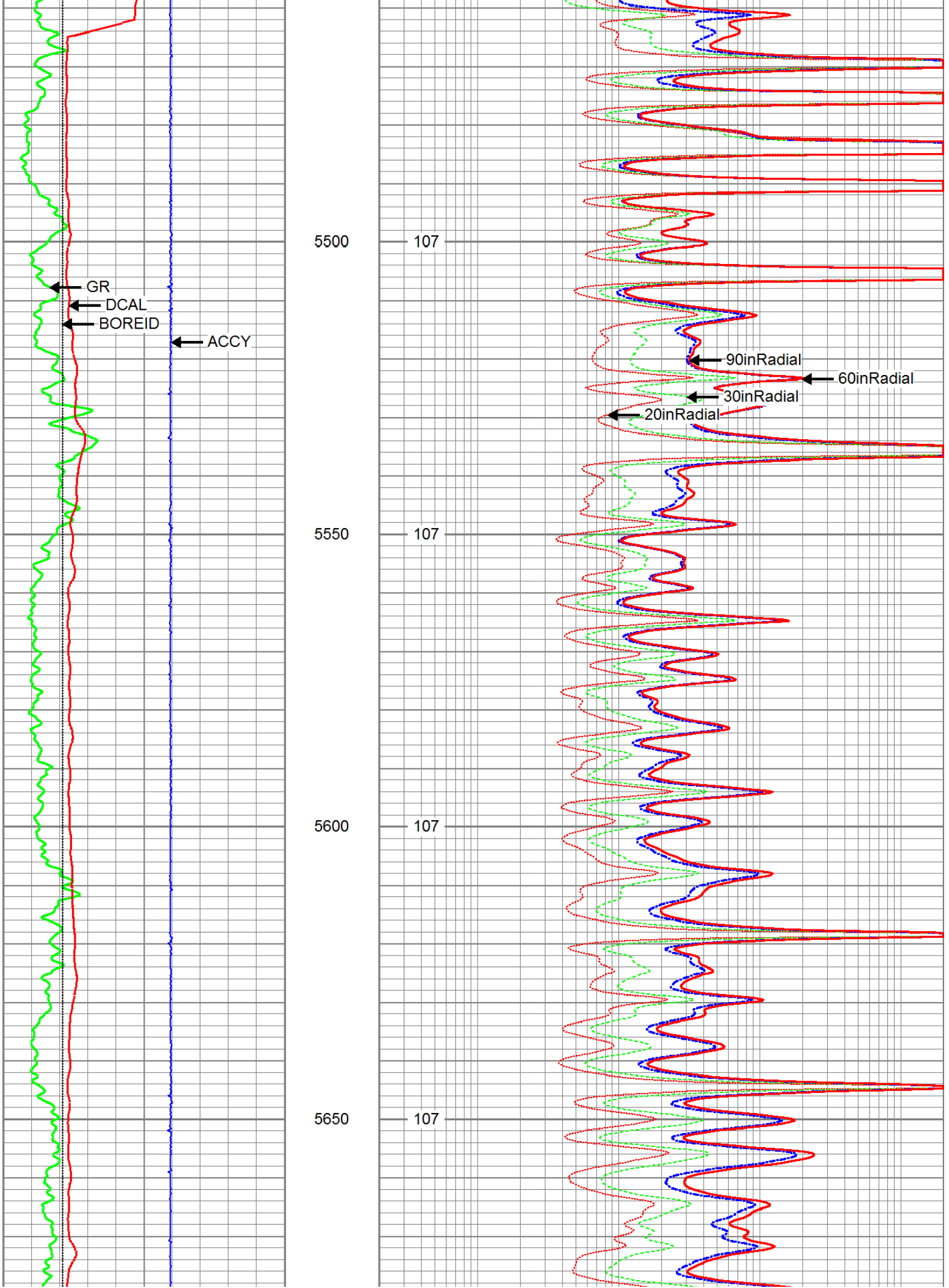
# MAIN PASS

| | |
|---|---|
| Database File: | ann_mem.db |
| Dataset Pathname: | proc5/pass1.2 |
| Presentation Format: | 6_5r10_c |
| Dataset Creation: | Wed Nov 27 11:55:16 2013 |
| Charted by: | Depth in Feet scaled 1:240 |

| | | |
|---|---|---|
| 0 | GR (GAPI) | 150 |
| 4 | BOREID (in) | 14 |
| 4 | DCAL (in) | 14 |
| -5 | ACCY | 5 |

| | | |
|---|---|---|
| 0.2 | 20inRadial (Ohm-m) | 2000 |
| 0.2 | 30inRadial (Ohm-m) | 2000 |
| 0.2 | 60inRadial (Ohm-m) | 2000 |
| 0.2 | 90inRadial (Ohm-m) | 2000 |
| GRTEMP (degF) | | |

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BOREID
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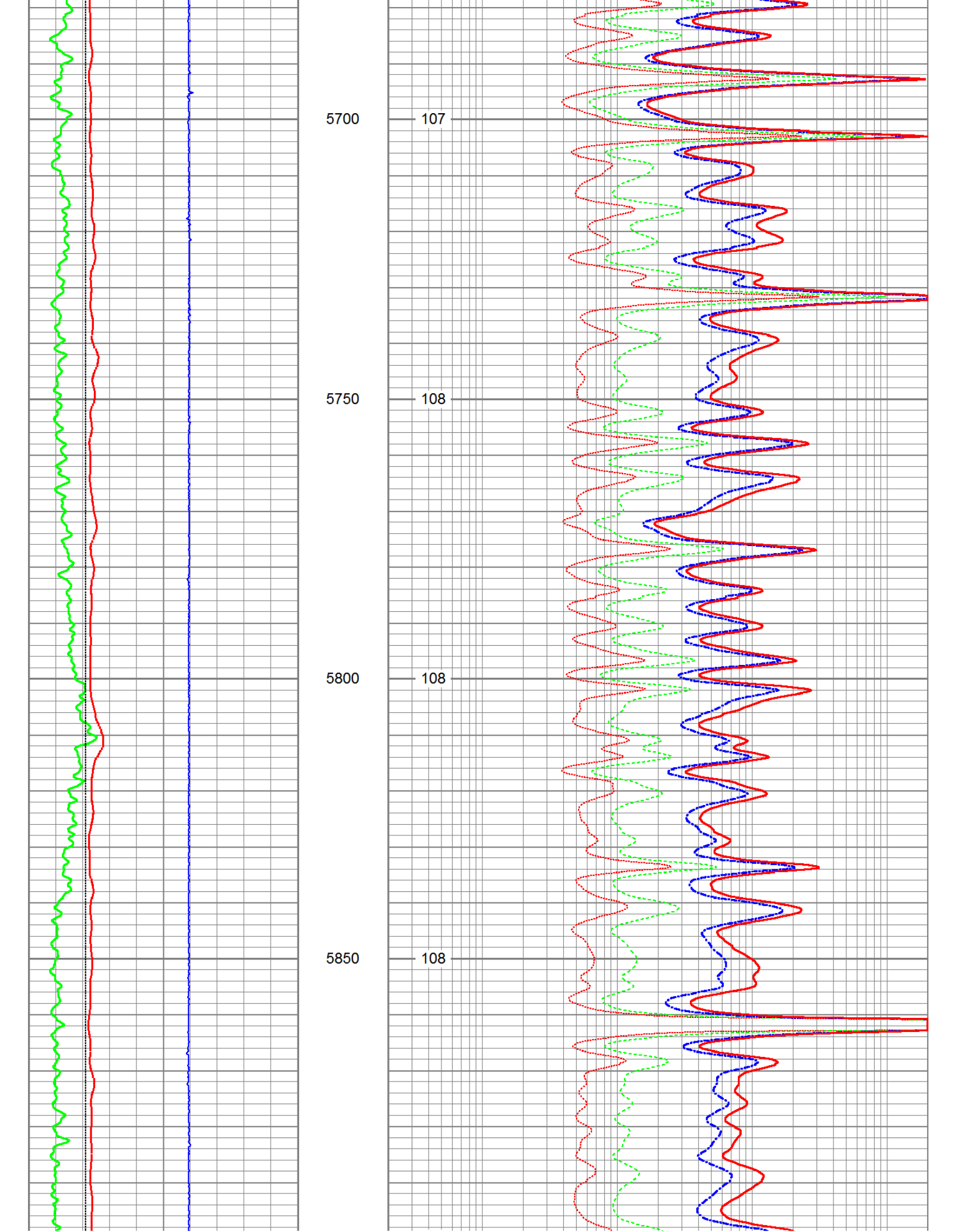
107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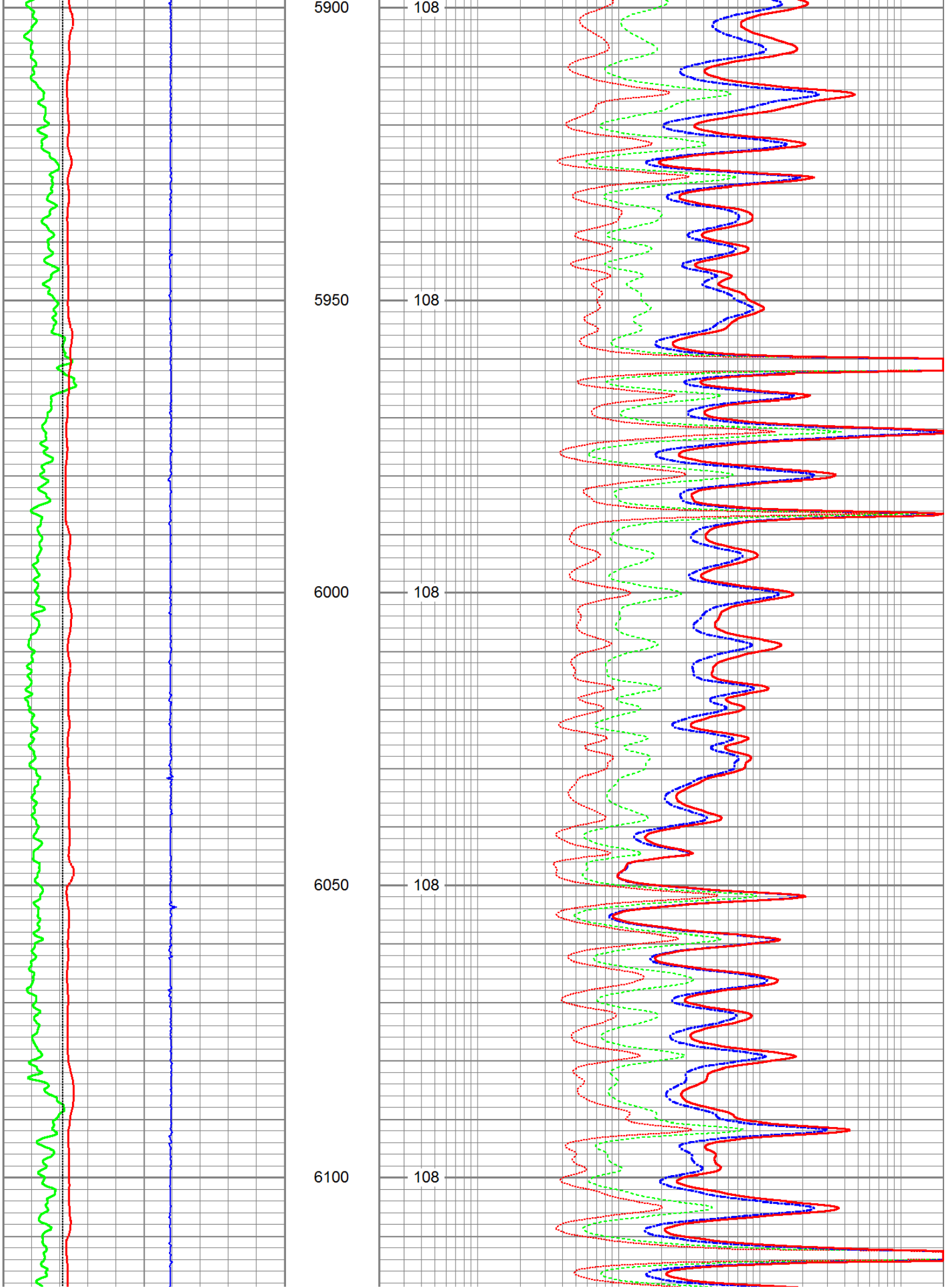
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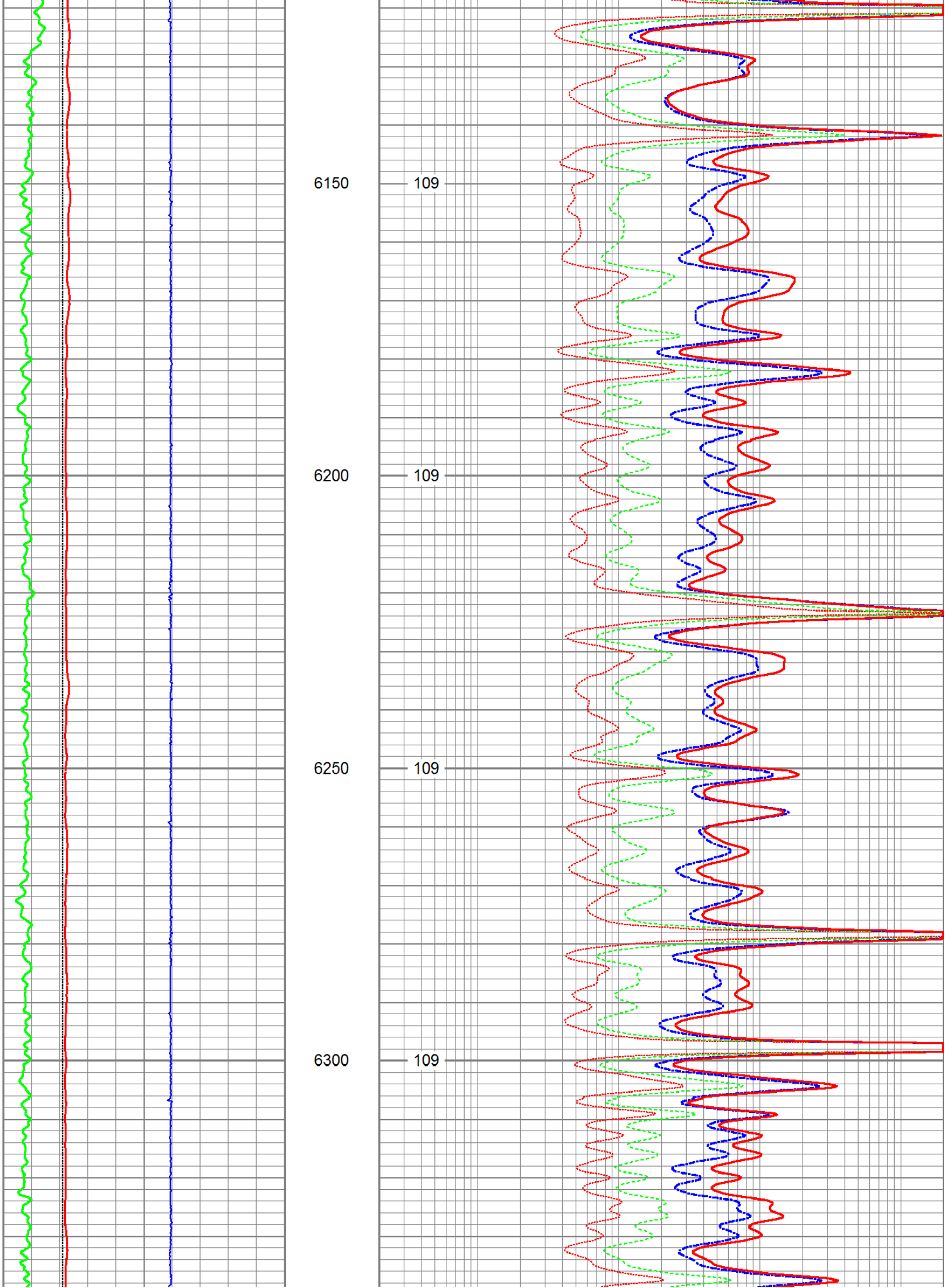
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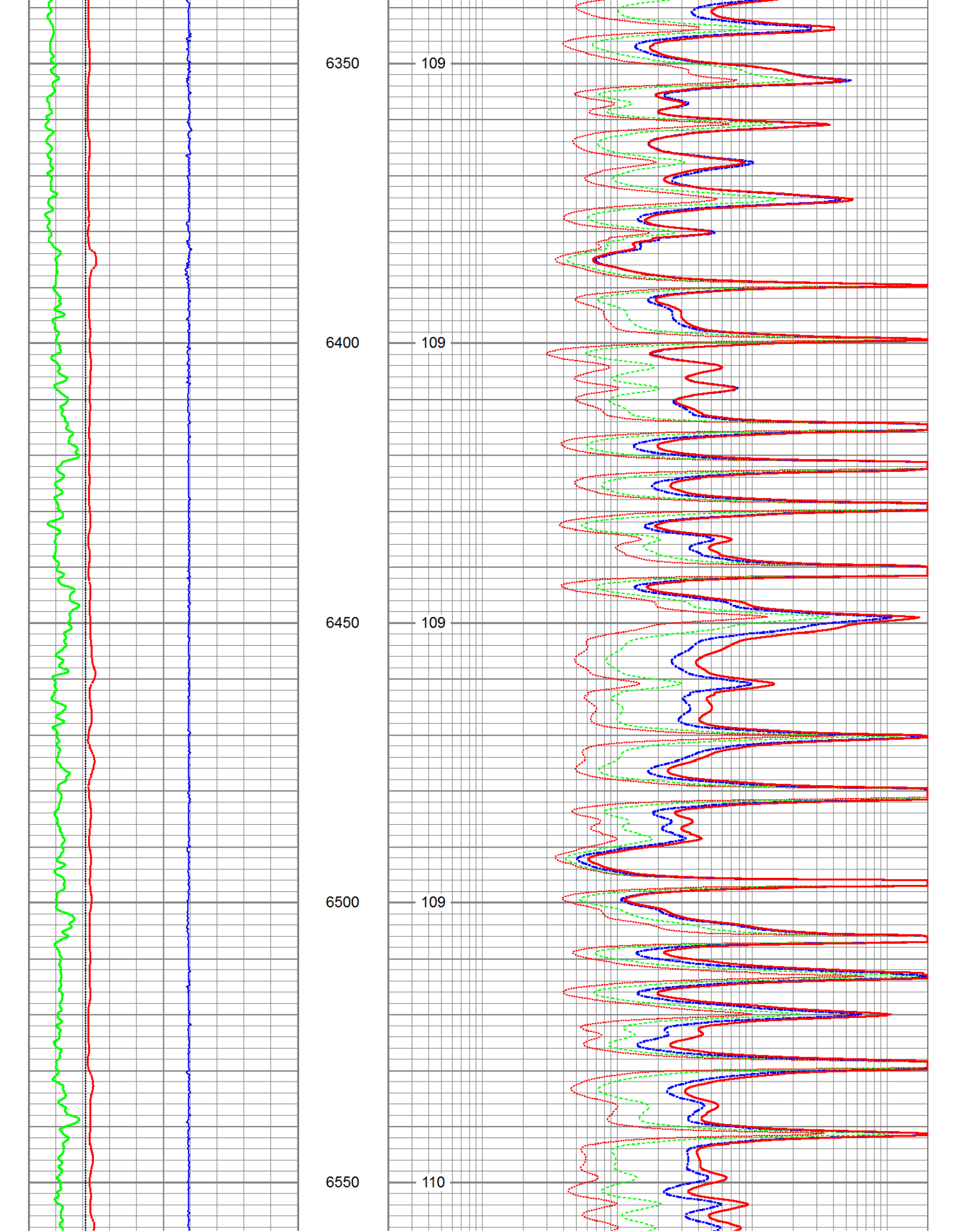
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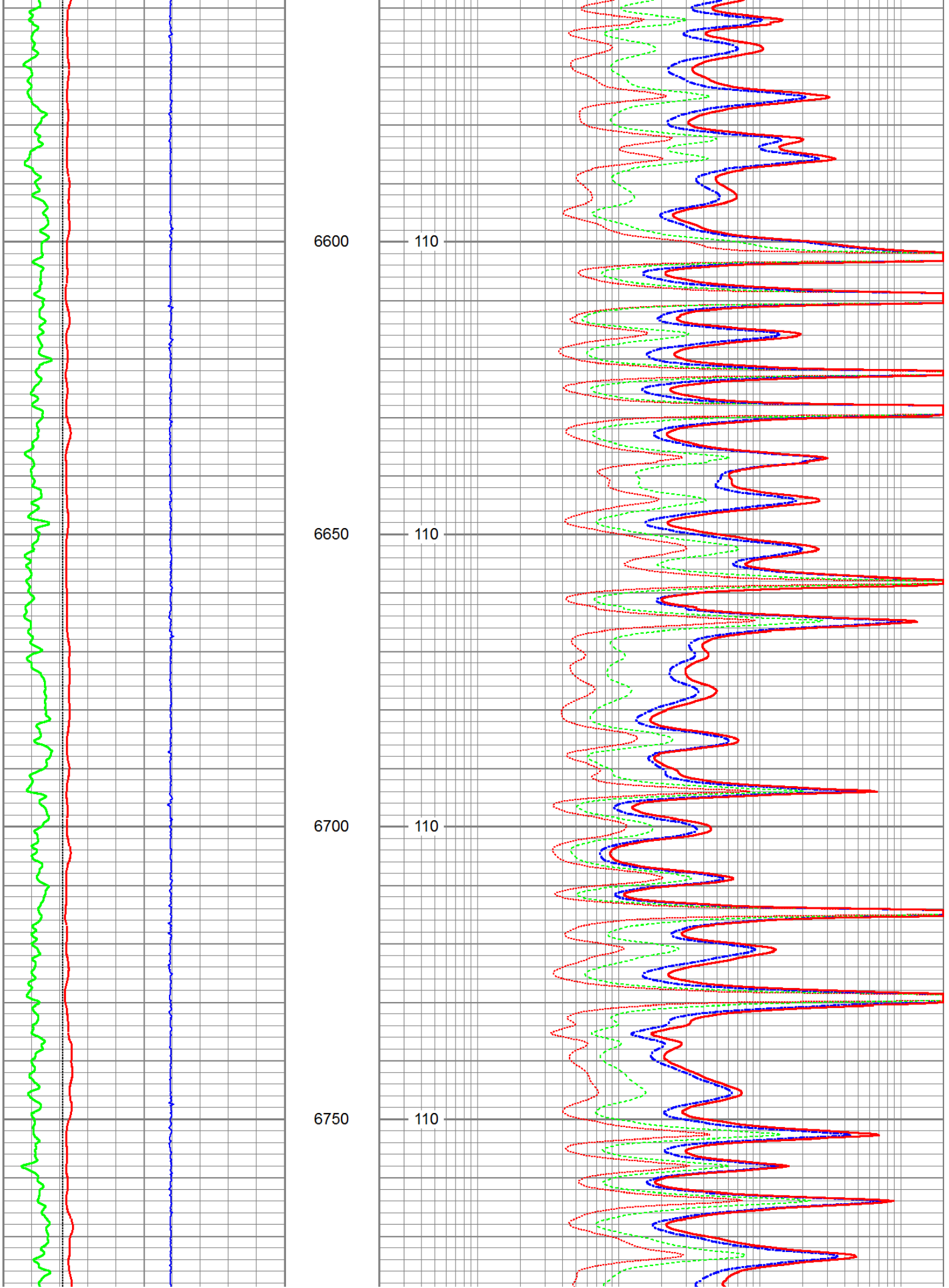
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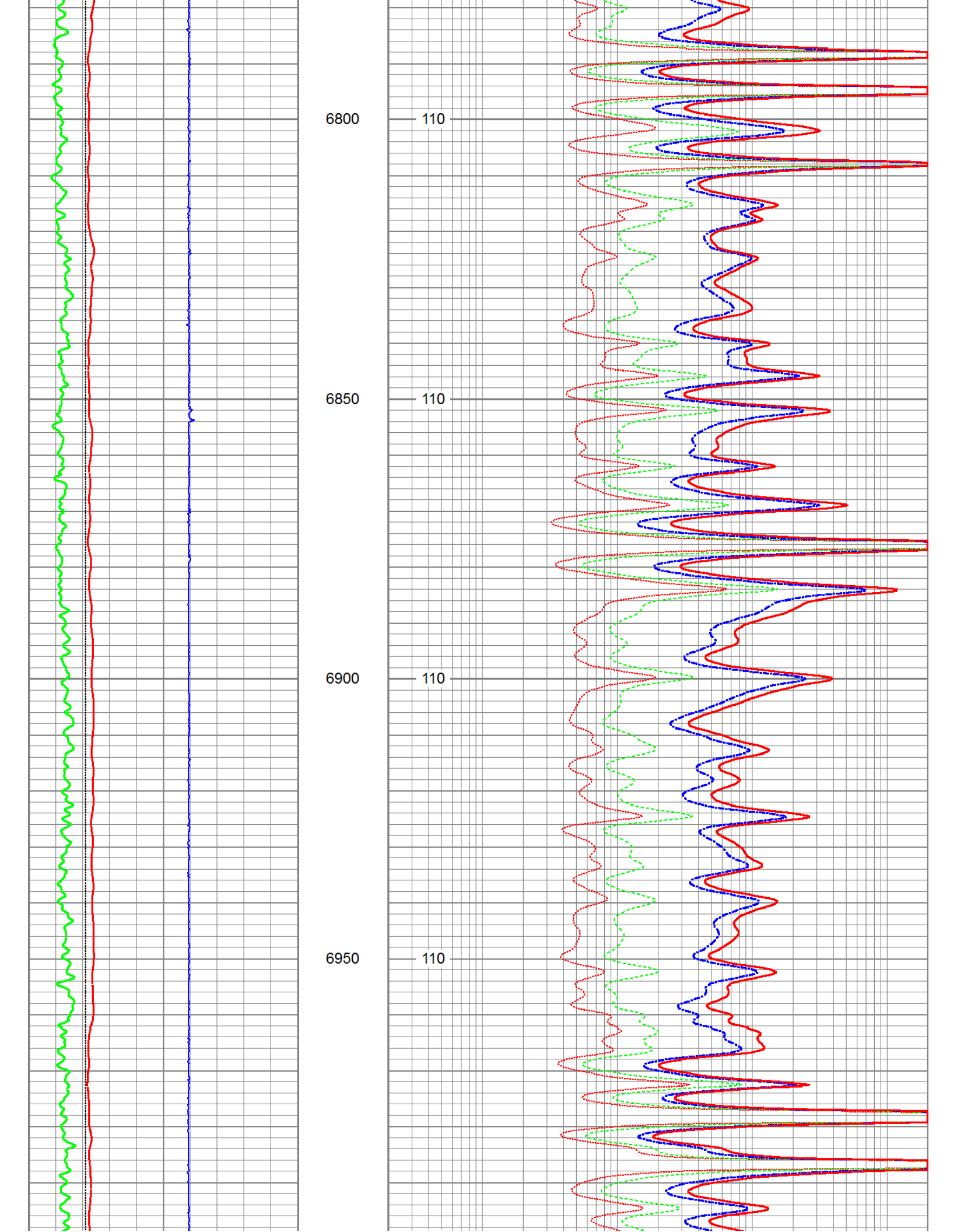
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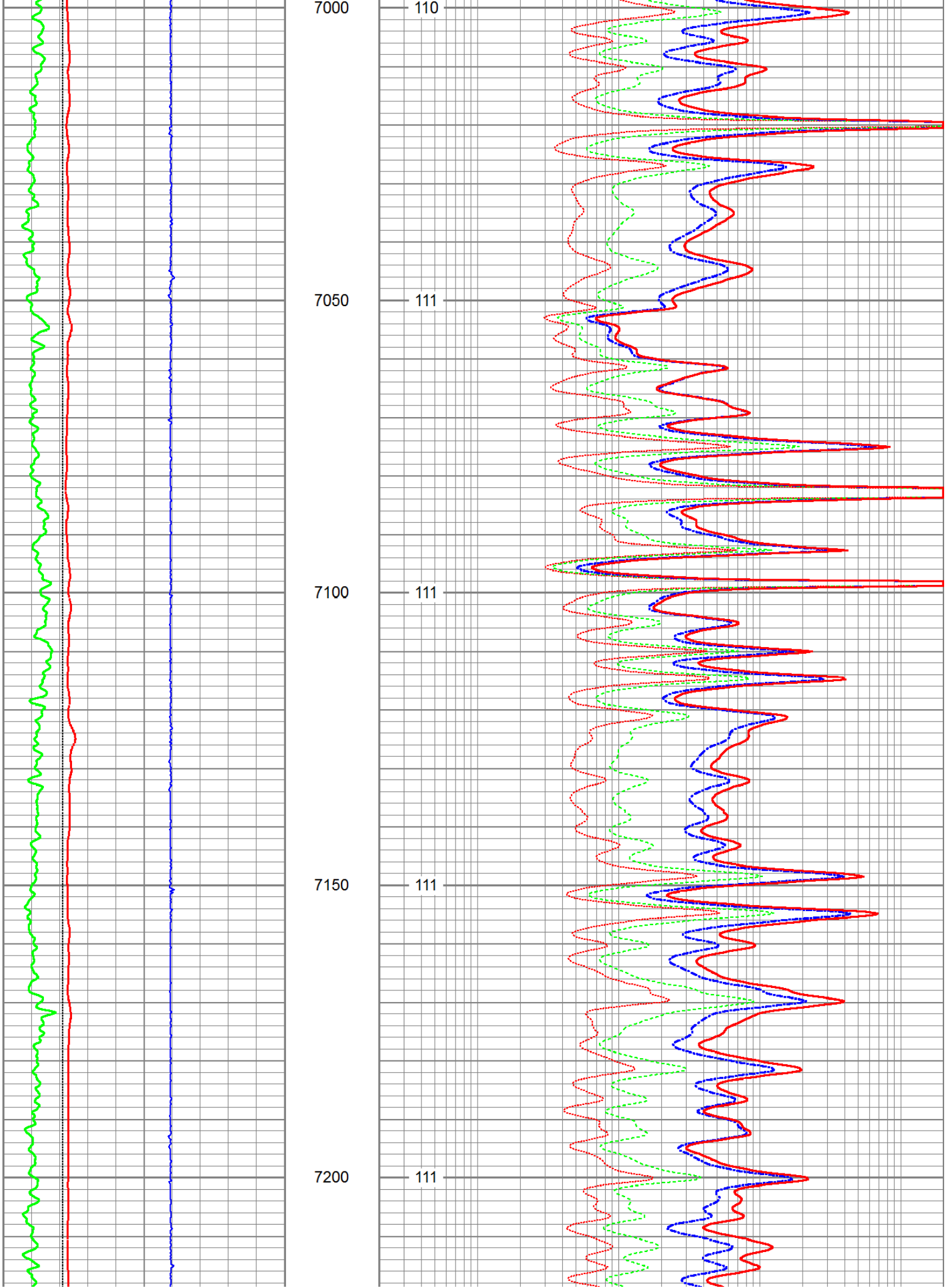
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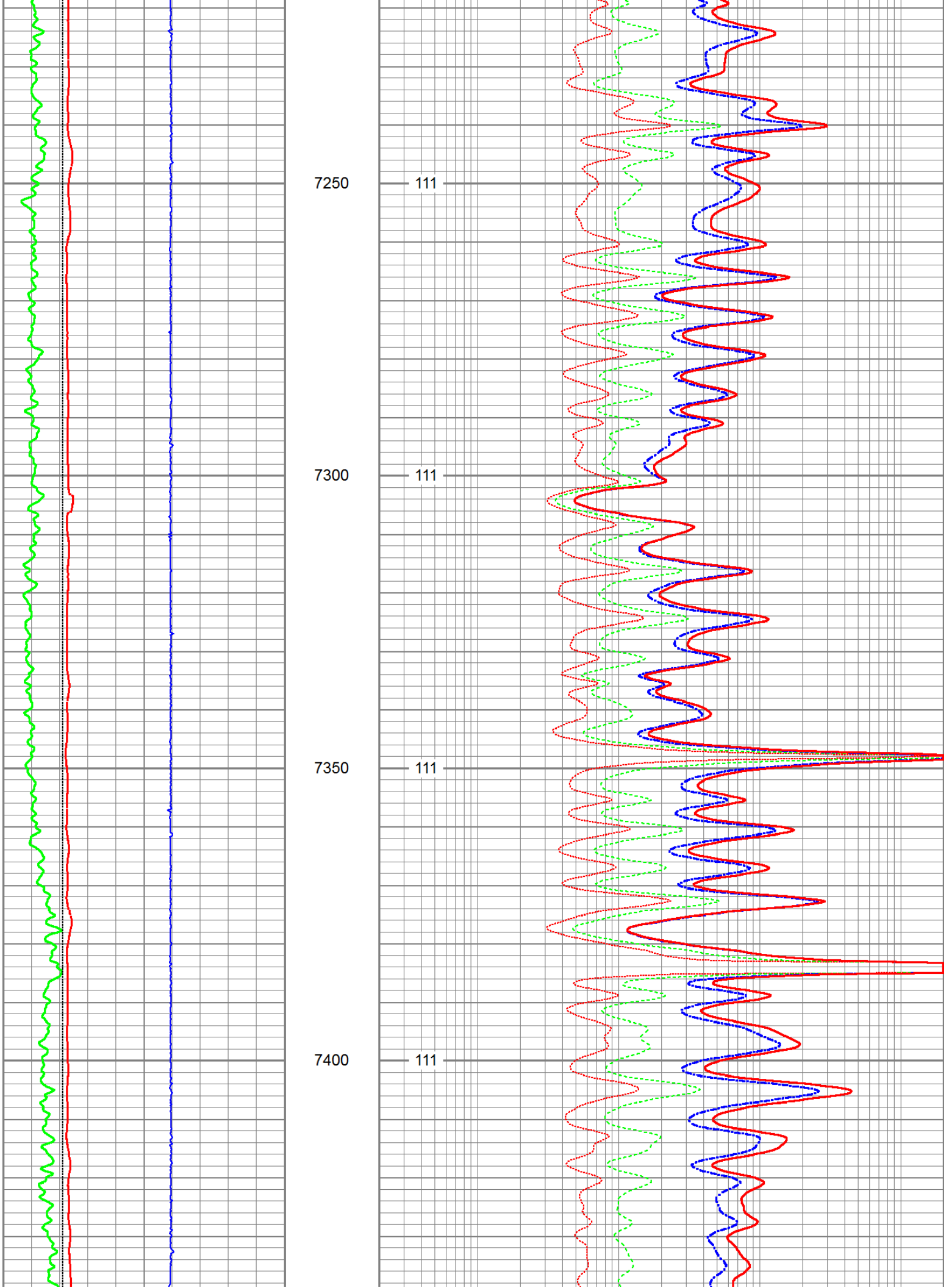
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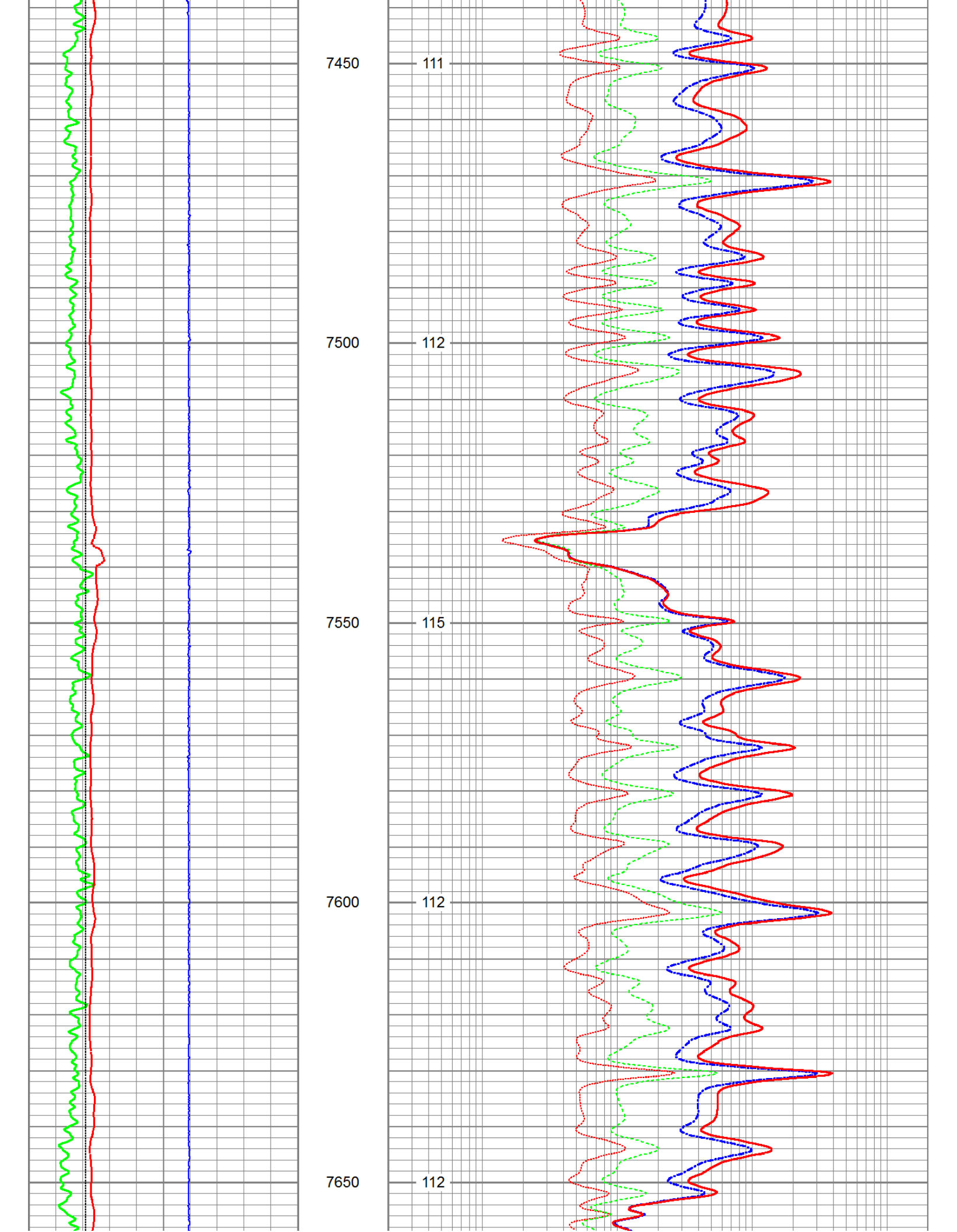
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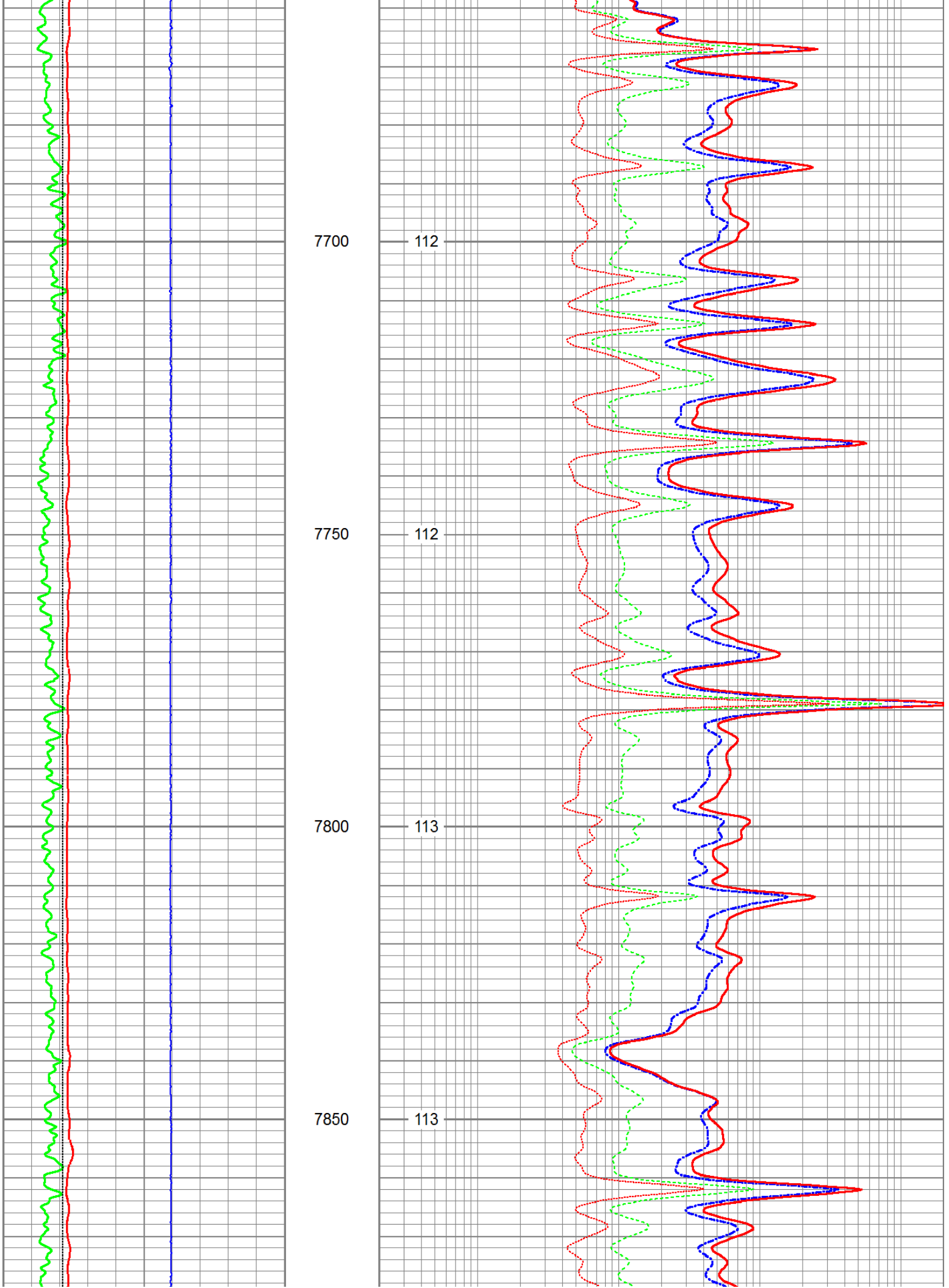
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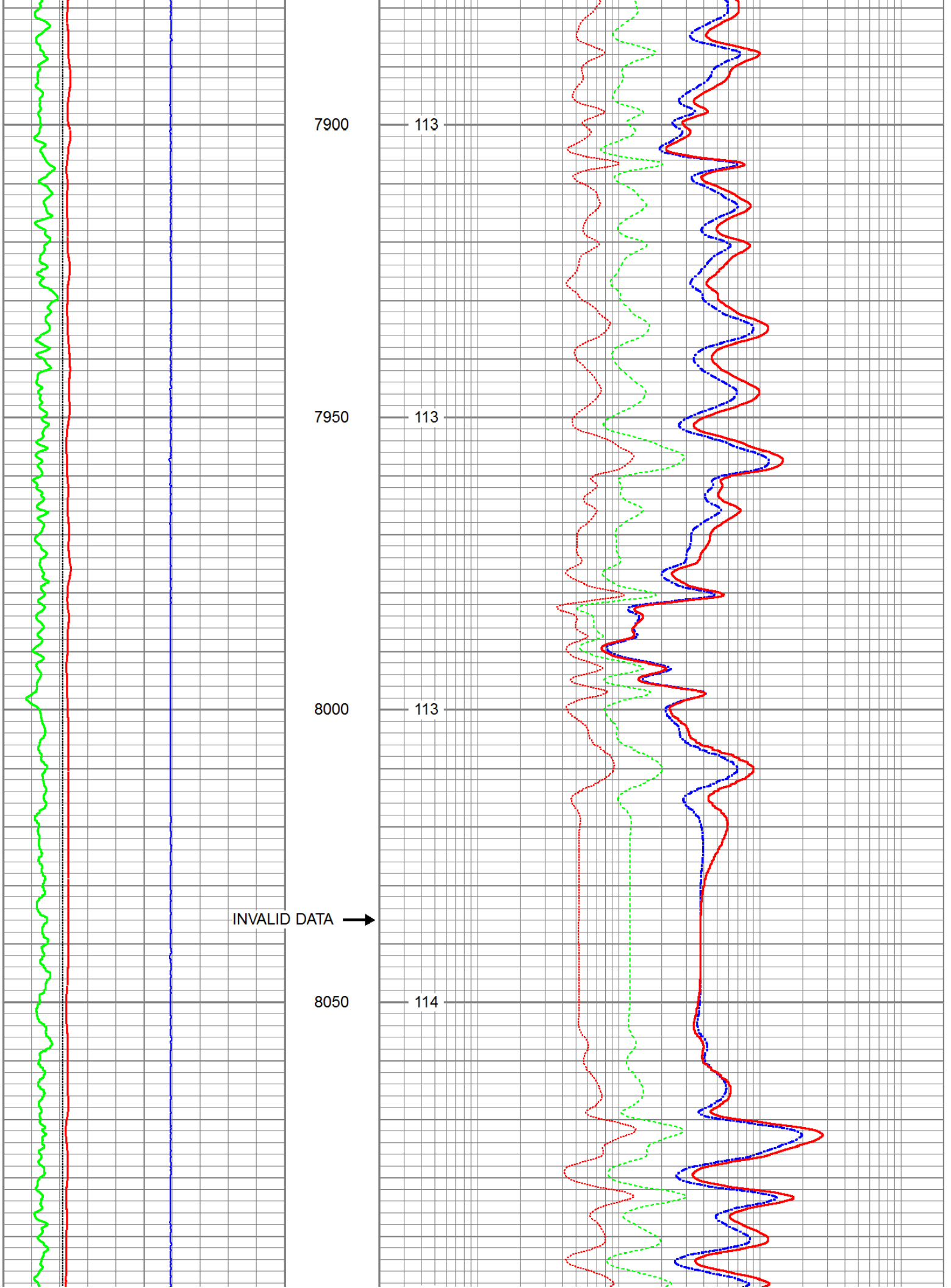
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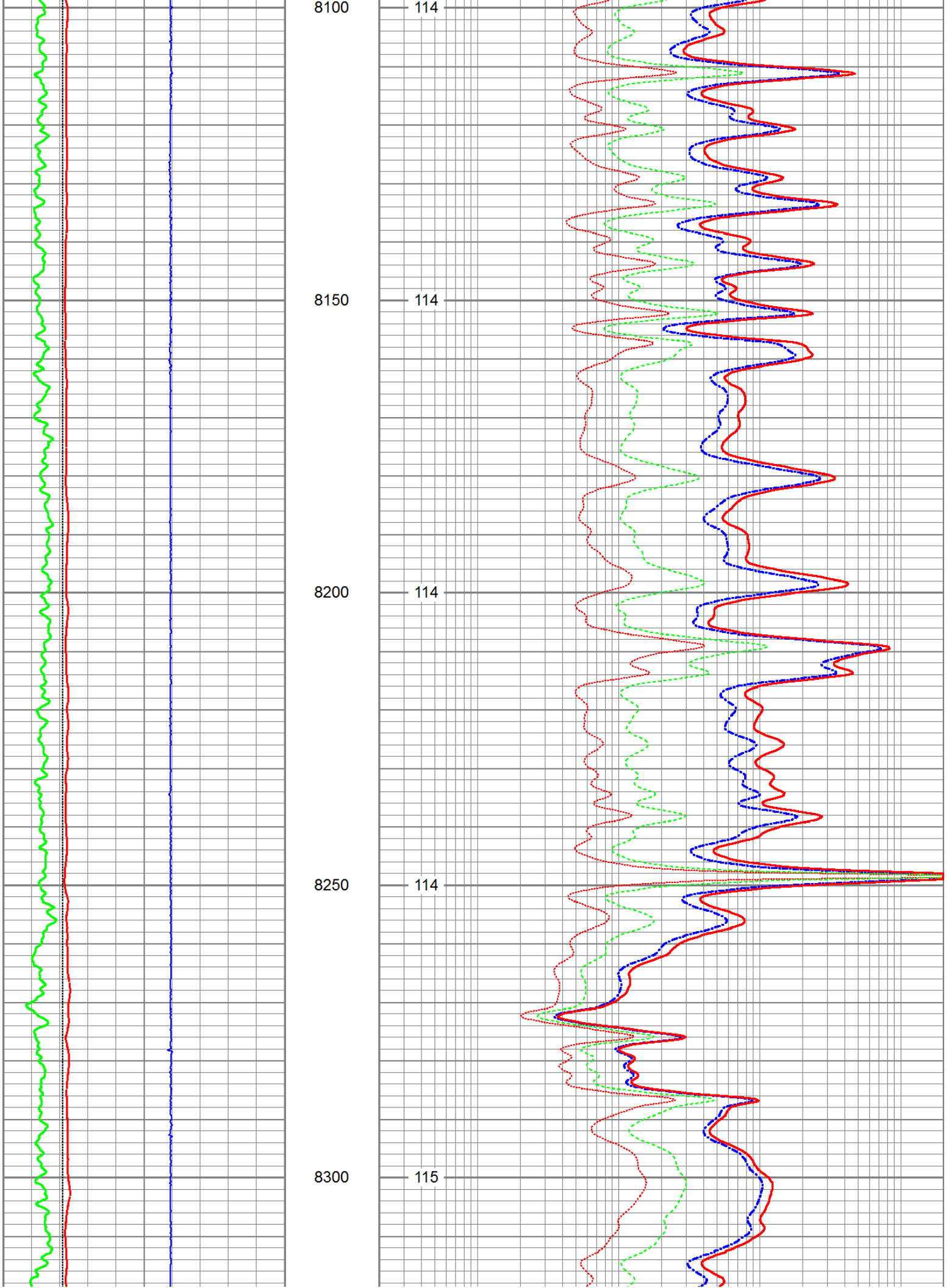
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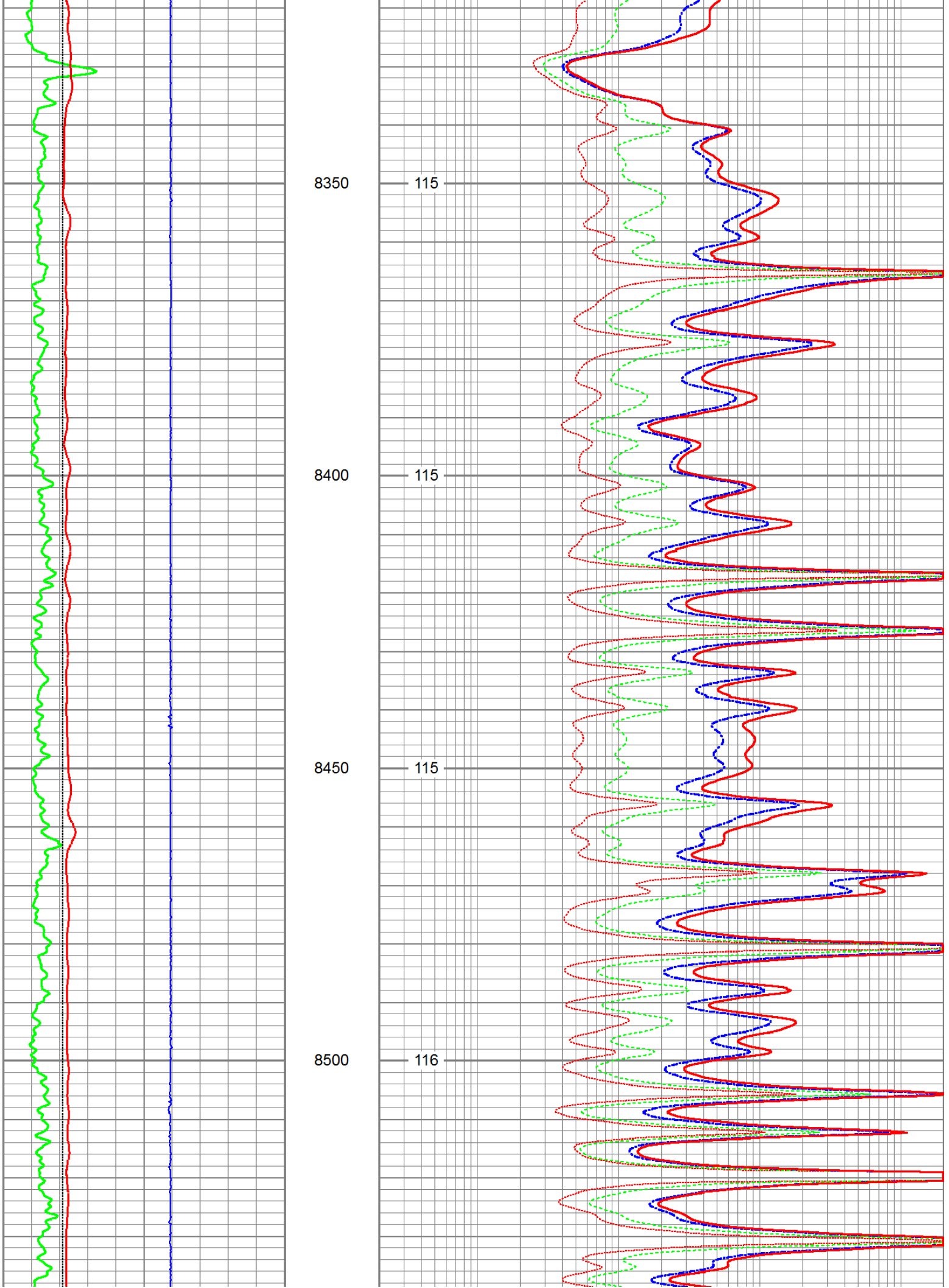
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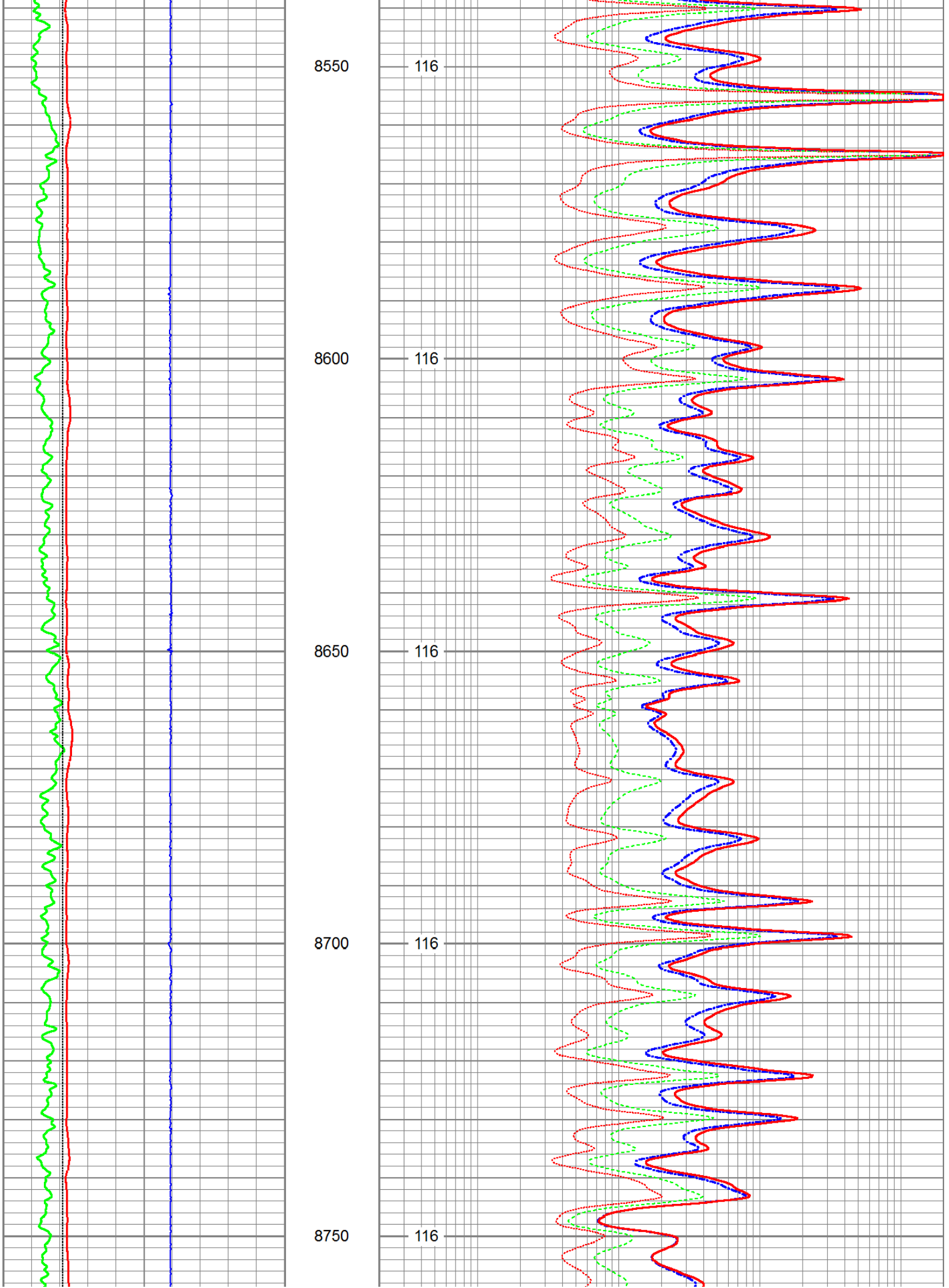
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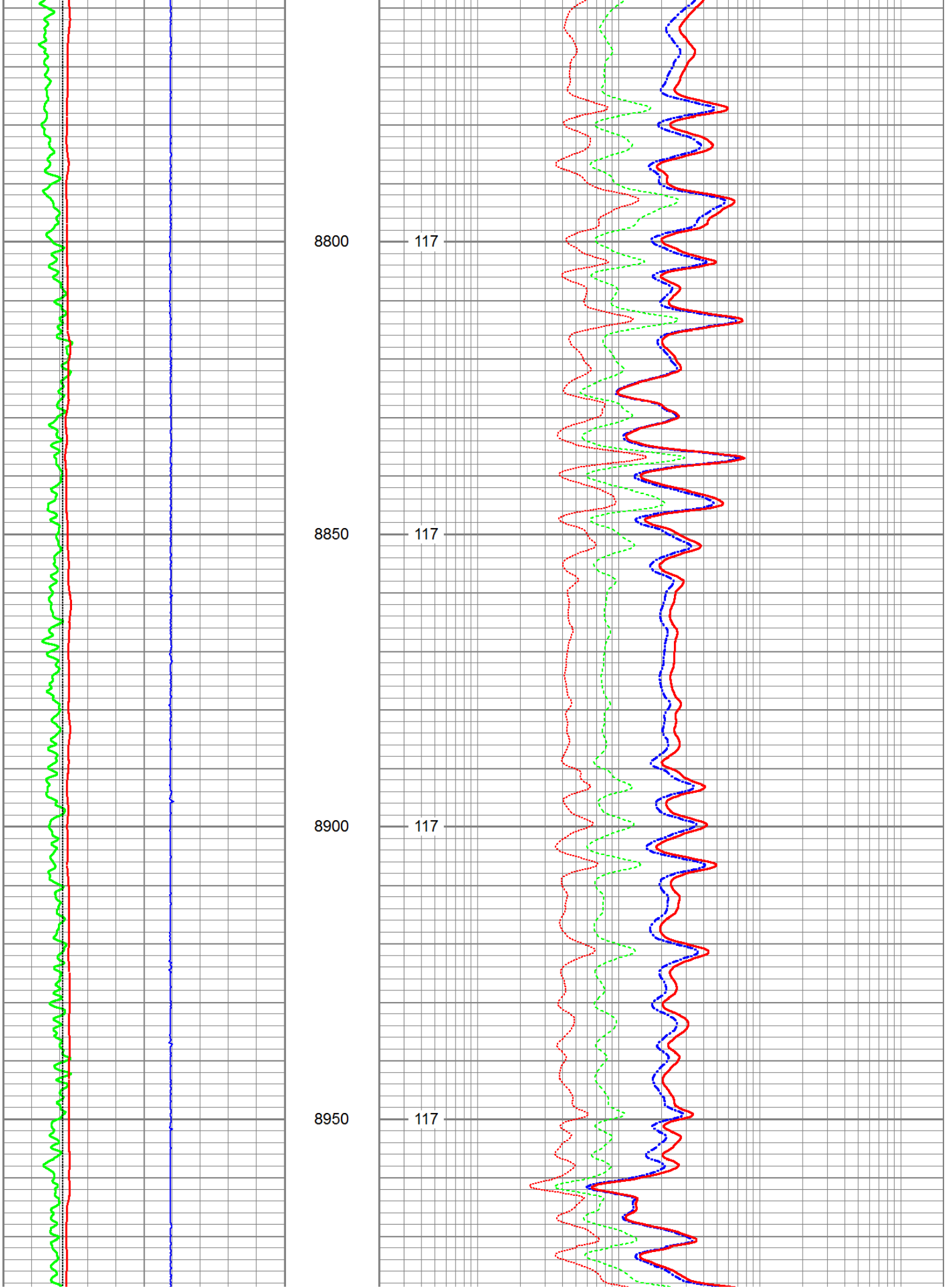
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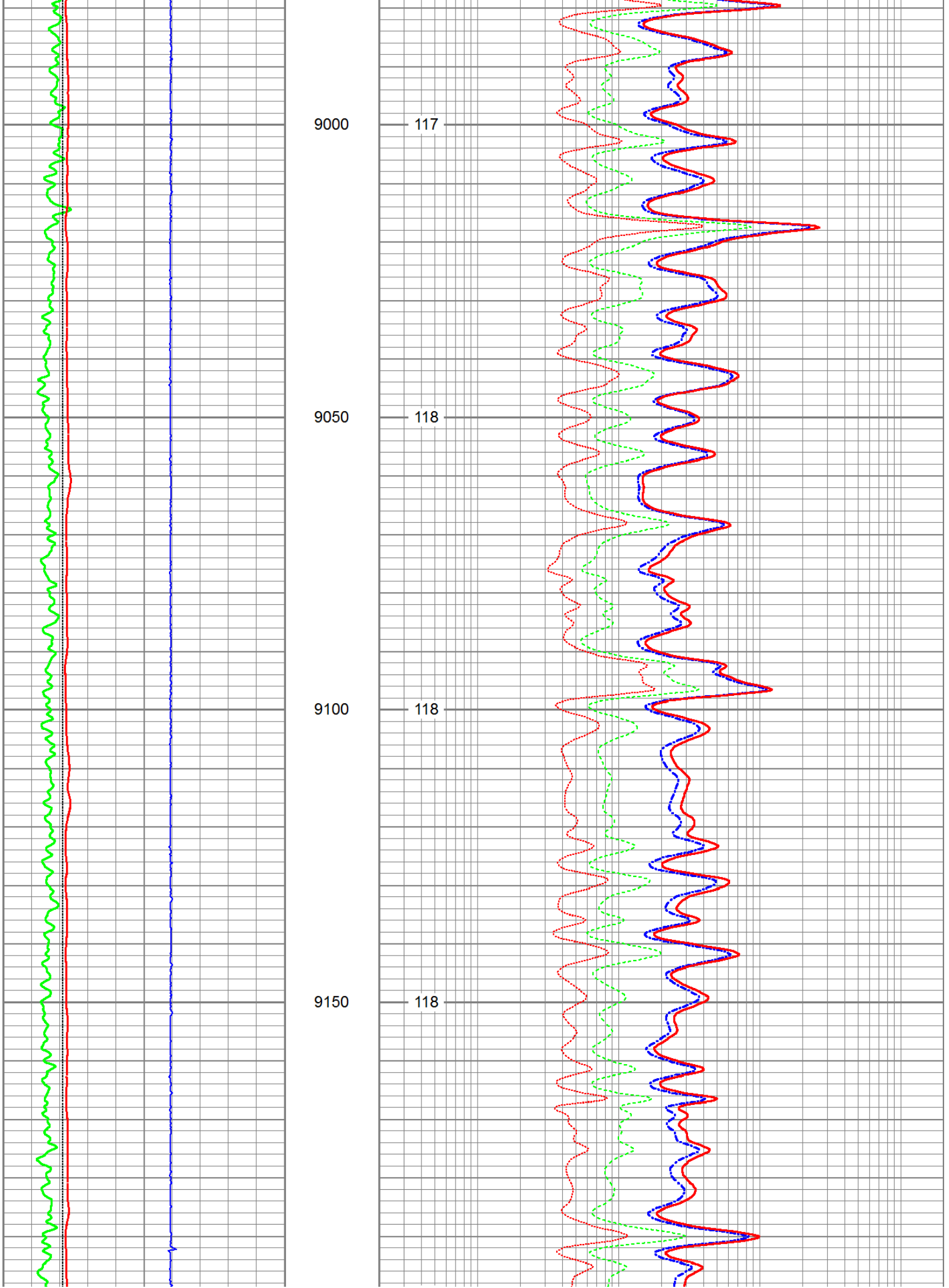
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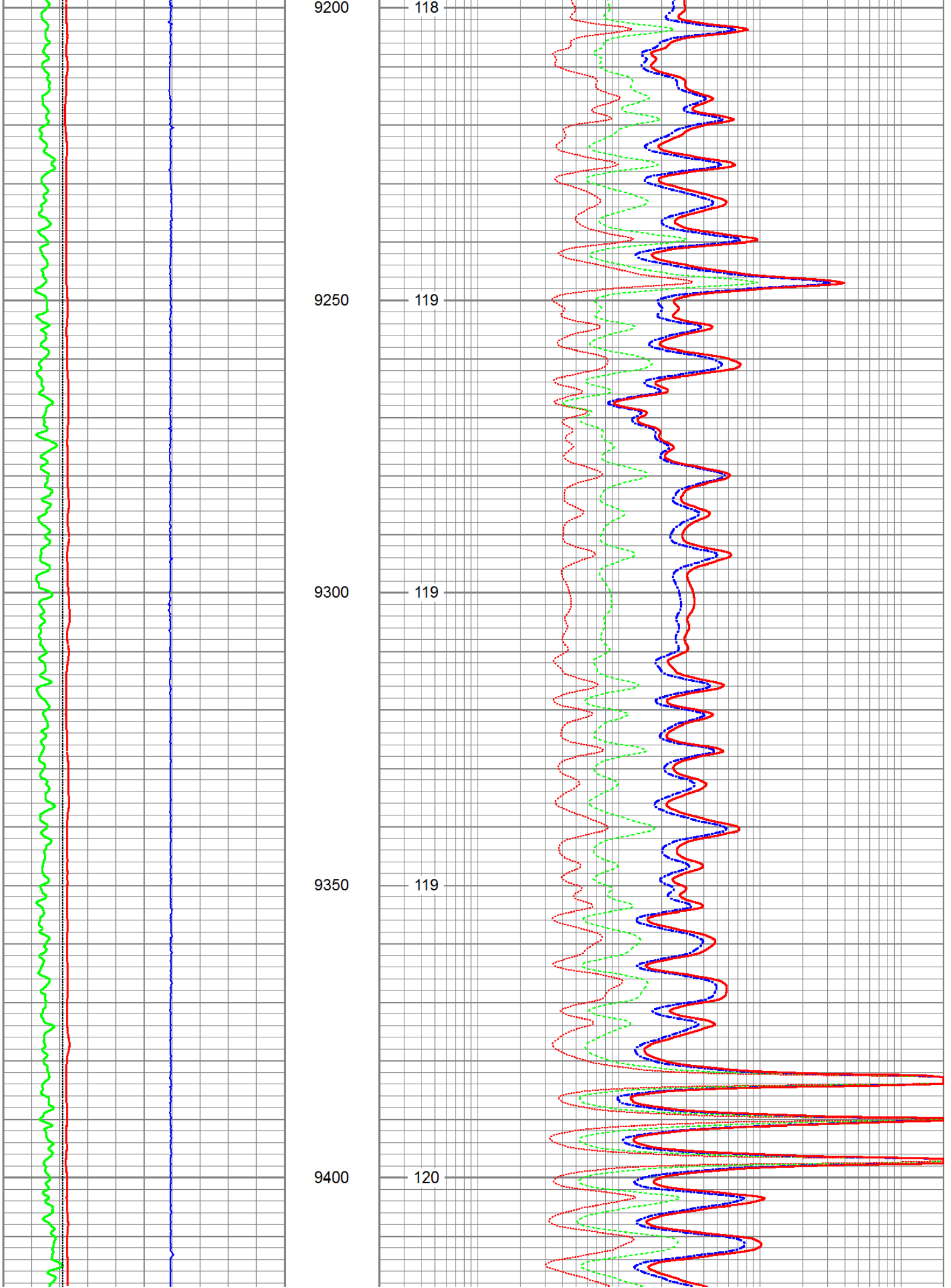
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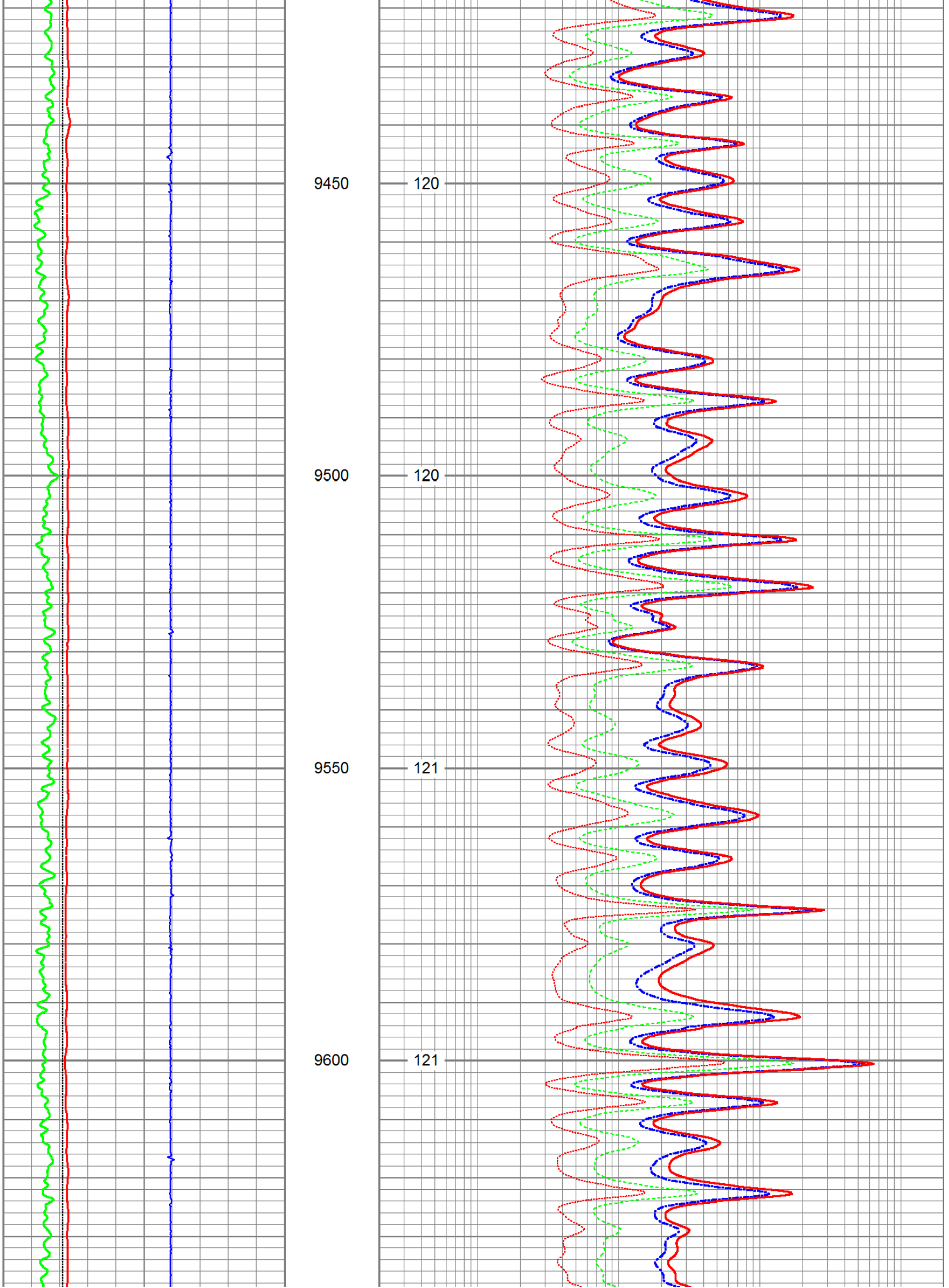
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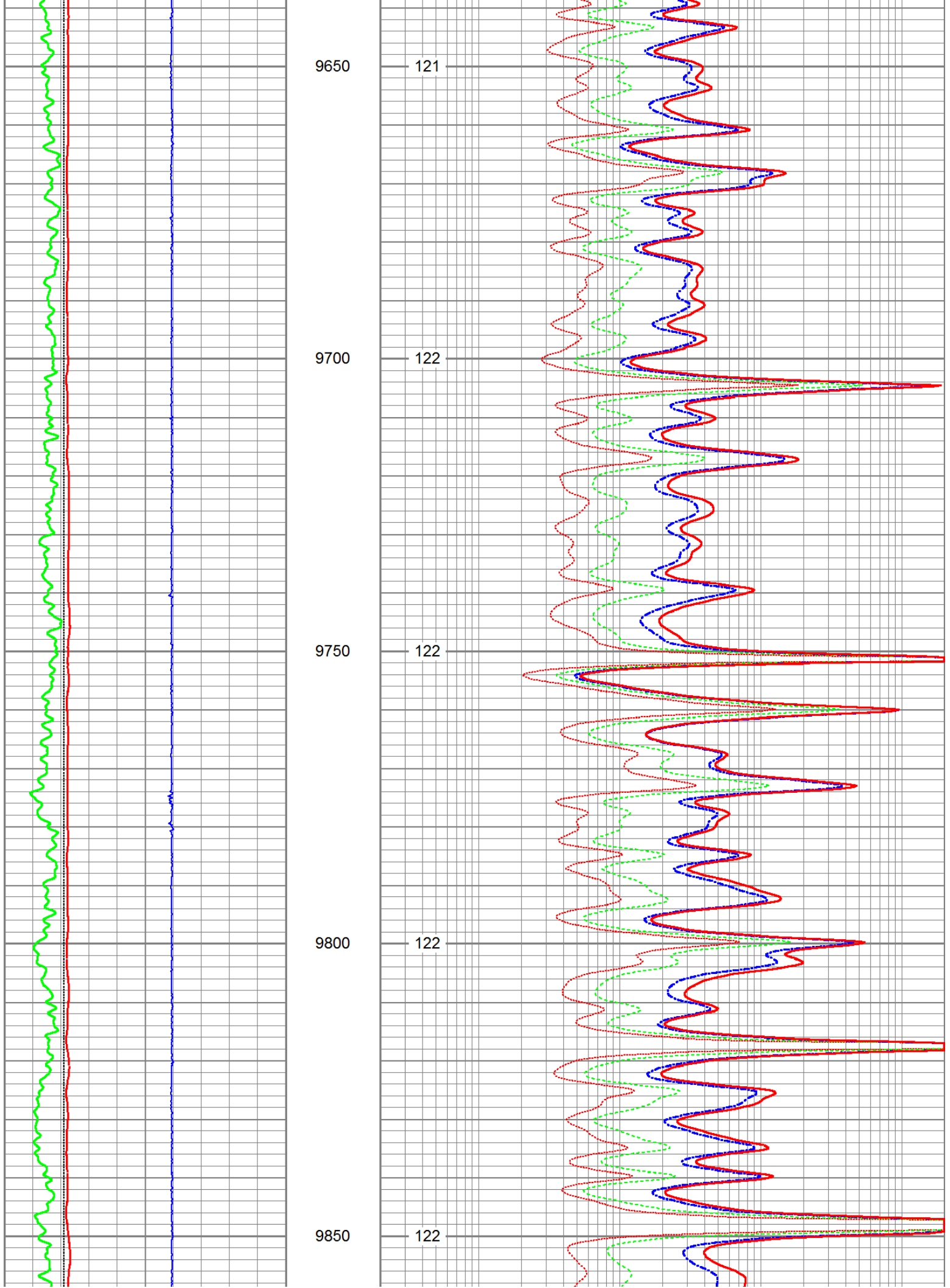
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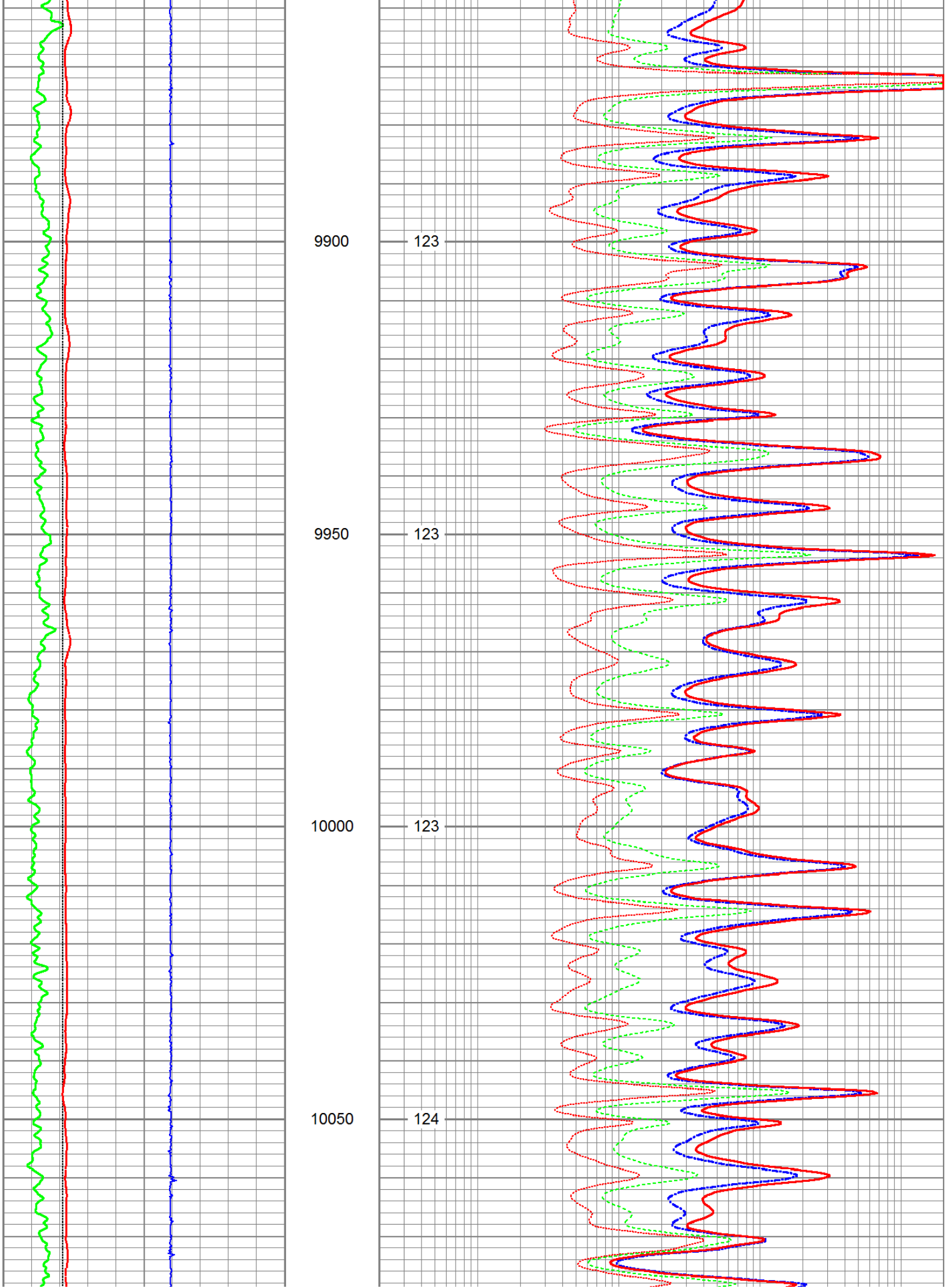
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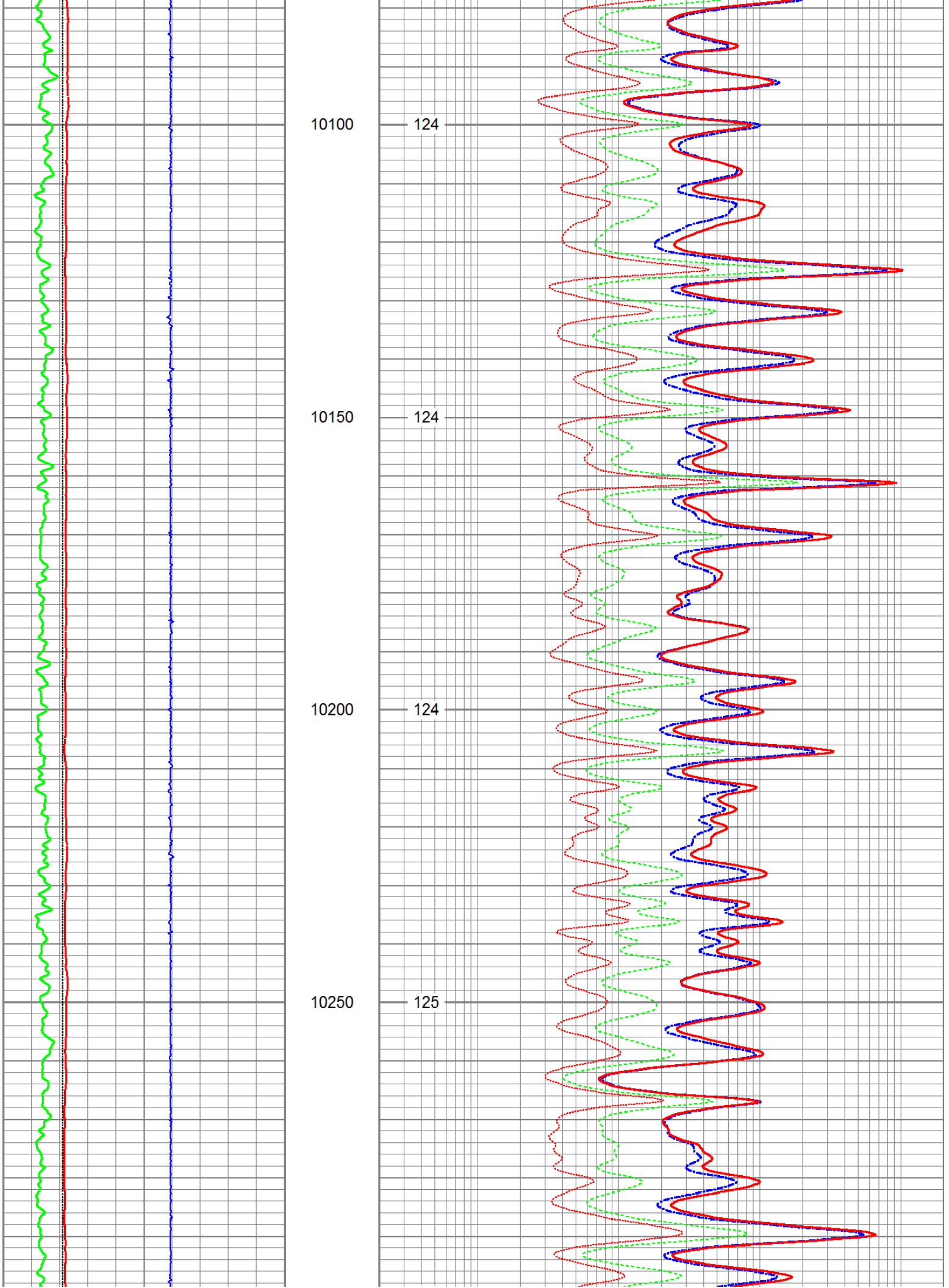
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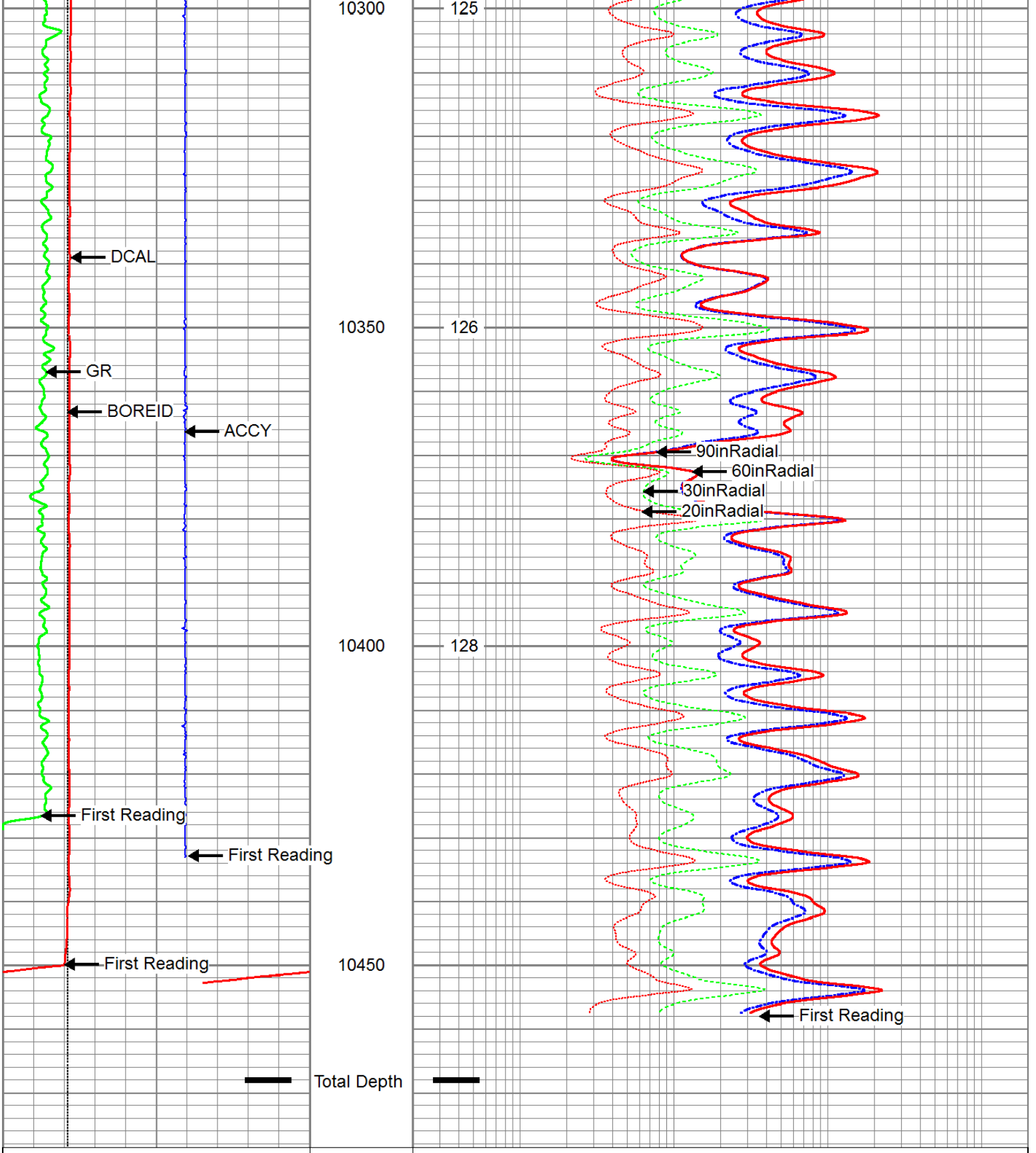



# Log Variables

Database:C:\Warrior\Data\ann_mem.db
Dataset: field/well/proc5/pass1.2

**Top - Bottom**

| A | BHCOR | BHFL_TYPE | BHFLRES Ohm-m | BHFLRESSRC | BHIDSRC | BOREID in |
|---|---|---|---|---|---|---|
| 1 | On | WBM | 1 | MUDCELL | CURVE | 6.125 |
| BOTTEMP degF | CASED? | CASEOD in | CASETHCK in | CEMWATERSA kppm | CMNTTHCK in | DNBHC? |
| 129 | No | 4.5 | 0 | 0 | 0 | NO |
| DPORSEL | FLUIDDEN g/cc | FRMSALIN kppm | LATNOR | M | MATRXDEN g/cc | MUDSALIN kppm |
| RHOB | 1 | 0 | Off | 2 | 2.71 | 7 |
| MudWgt lb/gal | NPORSEL | PEBHC? | PERFS | RESTMPSRC | SO in | SRFTEMP degF |
| 9.3 | Limestone | YES | 0 | INTERNAL | 0.5 | 65 |
| SZCOR | TDEPTH ft | TMPCOR | TOOLPOS | | | |
| On | 10633 | On | Ec-centered | | | |

Calibration Report

Database File: ann_mem.db
Dataset Pathname: proc5/pass1.2
Dataset Creation: Wed Nov 27 11:55:16 2013

ThruBit Induction Calibration Report

Tool Model-Serial Number: PS-PS15R

Shop Calibration Performed: Tue Sep 24 08:36:59 2013

BASELINE

| | R | Expected | X | Expected |
|---|---|---|---|---|
| Freq 1 | | | | |
| A1 | -446.0340 | [-500.00, -400.00] | 156.3040 | [-500.00, 500.00] |
| A2 | -152.0180 | [-180.00, -100.00] | 16.5327 | [-500.00, 500.00] |
| A3 | -35.7402 | [-50.00, -10.00] | -141.3930 | [-500.00, 500.00] |
| A4 | -15.8976 | [-30.00, -10.00] | 209.5470 | [-500.00, 500.00] |
| A5 | -13.3007 | [-30.00, -10.00] | 132.7320 | [-500.00, 500.00] |
| Freq 2 | | | | |
| A1 | -231.8750 | [-280.00, -180.00] | 68.0321 | [-500.00, 500.00] |
| A2 | -97.8308 | [-130.00, -50.00] | -19.0236 | [-500.00, 500.00] |
| A3 | -25.2110 | [-50.00, -10.00] | -146.3820 | [-500.00, 500.00] |
| A4 | -19.1524 | [-30.00, -10.00] | 53.1096 | [-500.00, 500.00] |
| A5 | -18.1899 | [-30.00, -10.00] | -6.1345 | [-500.00, 500.00] |
| Freq 3 | | | | |
| A1 | -145.5070 | [-180.00, -80.00] | -20.2509 | [-500.00, 500.00] |
| A2 | -72.8319 | [-130.00, -30.00] | -57.3178 | [-500.00, 500.00] |
| A3 | -19.6761 | [-50.00, -10.00] | -168.2330 | [-500.00, 500.00] |
| A4 | -19.9772 | [-30.00, -10.00] | -52.1516 | [-500.00, 500.00] |
| A5 | -20.0964 | [-30.00, -10.00] | -106.2330 | [-500.00, 500.00] |
| Freq 4 | | | | |
| A1 | -77.7044 | [-120.00, -40.00] | -172.1640 | [-500.00, 500.00] |
| A2 | -51.8524 | [-110.00, -10.00] | -125.2290 | [-500.00, 500.00] |
| A3 | -15.1353 | [-50.00, -10.00] | -222.2020 | [-500.00, 500.00] |
| A4 | -22.7003 | [-30.00, -10.00] | -209.4270 | [-500.00, 500.00] |
| A5 | -24.8546 | [-30.00, -10.00] | -272.1340 | [-500.00, 500.00] |

CALIBRATION COEFFICIENTS

| | R | Expected | X | Expected |
|---|---|---|---|---|
| Freq 1 | | | | |
| A1 | 0.9910 | [0.95, 1.05] | 0.0027 | [-0.05, 0.05] |
| A2 | 0.9893 | [0.95, 1.05] | 0.0026 | [-0.05, 0.05] |
| A3 | 0.9969 | [0.95, 1.05] | -0.0044 | [-0.05, 0.05] |
| A4 | 0.9865 | [0.95, 1.05] | 0.0044 | [-0.05, 0.05] |
| A5 | 0.9908 | [0.95, 1.05] | 0.0039 | [-0.05, 0.05] |
| Freq 2 | | | | |
| A1 | 0.9854 | [0.95, 1.05] | -0.0073 | [-0.05, 0.05] |
| A2 | 0.9833 | [0.95, 1.05] | -0.0071 | [-0.05, 0.05] |
| A3 | 0.9853 | [0.95, 1.05] | -0.0068 | [-0.05, 0.05] |
| A4 | 0.9804 | [0.95, 1.05] | -0.0053 | [-0.05, 0.05] |
| A5 | 0.9881 | [0.95, 1.05] | -0.0049 | [-0.05, 0.05] |
| Freq 3 | | | | |
| A1 | 0.9918 | [0.95, 1.05] | -0.0076 | [-0.05, 0.05] |
| A2 | 0.9899 | [0.95, 1.05] | -0.0072 | [-0.05, 0.05] |
| A3 | 0.9918 | [0.95, 1.05] | -0.0075 | [-0.05, 0.05] |
| A4 | 0.9836 | [0.95, 1.05] | -0.0054 | [-0.05, 0.05] |
| A5 | 0.9957 | [0.95, 1.05] | -0.0040 | [-0.05, 0.05] |
| Freq 4 | | | | |
| A1 | 0.9866 | [0.95, 1.05] | -0.0110 | [-0.05, 0.05] |
| A2 | 0.9856 | [0.95, 1.05] | -0.0101 | [-0.05, 0.05] |
| A3 | 0.9895 | [0.95, 1.05] | -0.0119 | [-0.05, 0.05] |
| A4 | 0.9745 | [0.95, 1.05] | -0.0083 | [-0.05, 0.05] |
| A5 | 1.0034 | [0.95, 1.05] | -0.0075 | [-0.05, 0.05] |
| Temperature | 27.7897 degC | | | |

ThruBit Density Calibration Report

| | |
|---|---|
| Tool Model-Serial Number: | PS-PS43D |
| Source Number: | |
| Shop Calibration Performed: | Fri Nov 08 10:57:42 2013 |

REFERENCE

| | Density | Units |
|---|---|---|
| Aluminium | 2.607 | g/cc |
| Magnesium | 1.752 | g/cc |

READINGS

| Outputs | Counts | Units | Expected |
|---|---|---|---|
| SS1 Background | 135.84 | cps | [130.00, 170.00] |
| LS1 Background | 146.41 | cps | [130.00, 170.00] |
| LS4 Background | 29.84 | cps | [27.00, 35.00] |
| SS1 Aluminium | 4478.32 | cps | [4500.00, 5500.00] |
| LS1 Aluminium | 898.25 | cps | [750.00, 950.00] |
| LS4 Aluminium | 948.42 | cps | [843.00, 1068.00] |
| SS1 Magnesium | 7466.94 | cps | [7000.00, 9000.00] |
| LS1 Magnesium | 5867.16 | cps | [5250.00, 6250.00] |
| LS1 Al + Fe | 808.16 | cps | [650.00, 800.00] |
| LS4 Al + Fe | 454.68 | cps | [382.00, 471.00] |

RESULTS

| | | |
|---|---|---|
| SS Slope | 1.63 | [1.52, 1.77] |
| LS Slope | 0.42 | [0.38, 0.45] |
| PEF K Factor | 4.655 | [3.510, 6.170] |
| PEF B Factor | -0.534 | [-0.700, -0.410] |

Caliper Shop Calibration performed: Fri Nov 08 10:57:42 2013

RESULTS

| Reference | Reading | Units |
|---|---|---|
| 12.00 | 1883.87 | in |
| 9.00 | 2044.17 | in |
| 6.00 | 2204.76 | in |

DENSITY PRE-SURVEY CHECK Performed: Sat Nov 23 12:42:10 2013

| Outputs | Counts | Units | Expected |
|---|---|---|---|
| SS1 Background | 137.54 | cps | [131.76, 139.91] |
| LS1 Background | 147.19 | cps | [142.01, 150.80] |
| LS4 Background | 29.23 | cps | [28.05, 31.63] |

CALIPER PRE-SURVEY CHECK Performed: Sat Nov 23 12:39:43 2013

| Reference | Readings | Units | Expected |
|---|---|---|---|
| 6.00 | 6.05 | in | [5.80, 6.20] |

## Compensated Neutron Calibration Report

Tool Model-Serial Number: PS-PS29N
Source Number:

Calibration Tank Temperature: 60.0 degF
Shop Calibration Performed: Fri Nov 08 09:52:11 2013

BACKGROUND MEASUREMENT

| Outputs | Measured | Units | Expected |
|---|---|---|---|
| SS Counts | 0.0 | cps | <10 |
| LS Counts | 0.1 | cps | <4 |

WATER TANK REFERENCE

| Outputs | Measured | Units | Expected |
|---|---|---|---|
| SS Counts | 2314.2 | cps | |
| LS Counts | 79.4 | cps | |
| Tank Ratio Ref | 30.9580 | SS/LS | |
| Tank Ratio | 29.1513 | SS/LS | |
| Tank Ratio Gain | 1.0620 | | [0.85, 1.15] |

ALUMINUM SLEEVE REFERENCE

| Outputs | Measured | Units | Expected |
|---|---|---|---|

| | | | |
|---|---|---|---|
| SS Counts | 27460.9 | cps | |
| LS Counts | 2600.3 | cps | |
| Al Ratio Ref | 10.797 | SS/LS | |
| Al Ratio | 11.215 | SS/LS | |
| Al Ratio Gain | 0.96 | | [0.90, 1.10] |
| Sleeve Porosity | 14.46 | pu | |

PRE-SURVEY BACKGROUND CHECK Performed: Sat Nov 23 12:47:09 2013

| Outputs | Measured | Units | Expected |
|---|---|---|---|
| SS Counts | 0.0 | cps | <10 |
| LS Counts | 0.1 | cps | <4 |

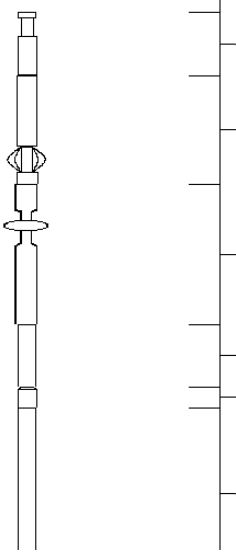
## Gamma Ray Calibration Report

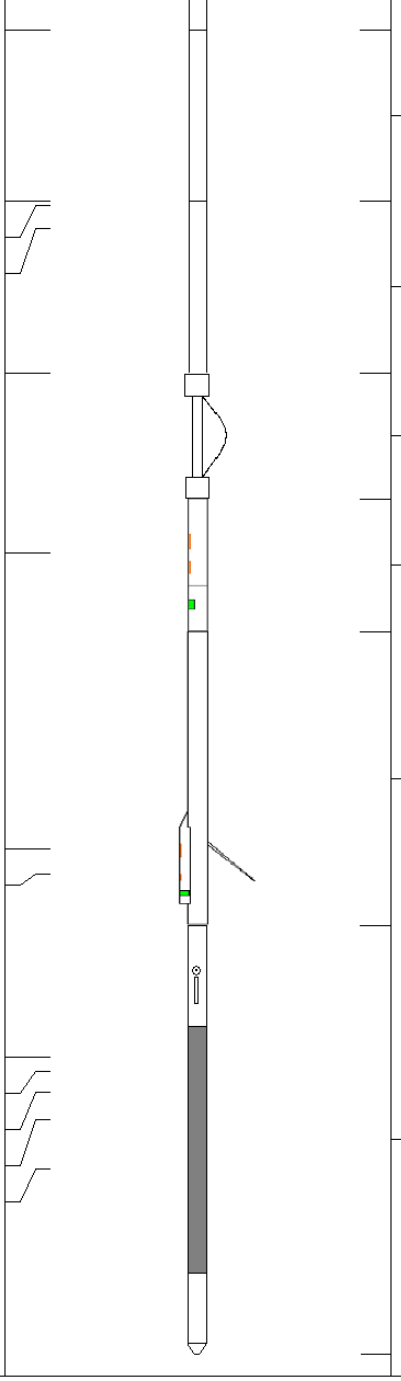
| | | |
|---|---|---|
| Tool Model-Serial Number: | PS-PS24T | |
| Performed: | Fri Nov 08 12:35:25 2013 | |
| Calibrator Value: | 162.7 | GAPI |
| Background Reading: | 65.6 | cps |
| Calibrator Reading: | 462.9 | cps |
| Sensitivity: | 0.3750 | GAPI/cps |

## Inclinometer Calibration Report

Performed: Sun Jun 13 14:33:21 1993

| | Low Read. | High Read. | Low Ref. | High Ref. | |
|---|---|---|---|---|---|
| X Accelerometer | 0.00 | 1.00 | 0.00 | 1.00 | gee |
| Y Accelerometer | 0.00 | 1.00 | 0.00 | 1.00 | gee |
| Z Accelerometer | 0.00 | 1.00 | 0.00 | 1.00 | gee |

| Sensor | Offset (ft) | Schematic | Description | Len (ft) | OD (in) | Wt (lb) |
|---|---|---|---|---|---|---|
| Thrubit | 67.59 |  | | | | |
| Thrubit | 65.28 | | Cablehead-S<br>Solid Weakpoint | 2.31 | 2.13 | 5.00 |
| | | | PSBDOT | 3.87 | 2.25 | 35.00 |
| Thrubit | 61.41 | | | | | |
| | | | HangOff_Tool | 5.00 | 2.38 | 60.00 |
| Thrubit | 56.41 | | | | | |
| | | | Swivel | 2.25 | 2.06 | 25.00 |
| Thrubit | 54.16 | | 10-1 | 0.75 | 2.13 | 3.95 |
| TBBAT | 53.41 | | | | | |
| | | | TBBAT-A (PS30B)<br>Thrubit Battery | 6.13 | 2.13 | 38.20 |

| | | | | | | |
|---|---|---|---|---|---|---|
| TBBAT2 | 47.29 |  | TBBAT2-A (PS29B)<br>Thrubit Battery | 6.13 | 2.13 | 40.00 |
| TMG | 41.16 | | | | | |
| GR | 41.04 | | | | | |
| GRTEMP | 40.20 | | TMG-PS (PS24T)<br>ThruBit Telemetry Gamma Ray | 6.13 | 2.13 | 45.00 |
| Thrubit | 35.04 | | Decentralizer<br>Decentralizer (Small) | 4.50 | 2.13 | 70.00 |
| CNLSC | 28.60 | | TBN-PS (PS29N)<br>ThruBit Neutron | 4.77 | 2.13 | 63.00 |
| | | | TBD-PS (PS43D)<br>Thrubit Density | 10.48 | 2.13 | 91.00 |
| LSW1 | 18.04 | | | | | |
| DCAL | 17.13 | | | | | |
| A1_P | 10.60 | | | | | |
| A2_P | 10.10 | | | | | |
| A3_P | 9.35 | | TBI-PS (PS15R)<br>Thrubit Induction | 15.29 | 2.13 | 94.00 |
| A4_P | 8.35 | | | | | |
| A5_P | 6.60 | | | | | |

| | |
|---|---|
| Dataset: | ann_mem.db: field/well/proc5/pass1.2 |
| Total Length: | 67.59 ft |
| Total Weight: | 570.15 lb |
| O.D. | 2.38 in |

ThruBit
A Schlumberger Company

| | |
|---|---|
| Company | SANDRIDGE ENERGY |
| Well | ANN 3404 2-21H |
| Field | BLUFF |
| County | SUMNER |
| State | KANSAS |

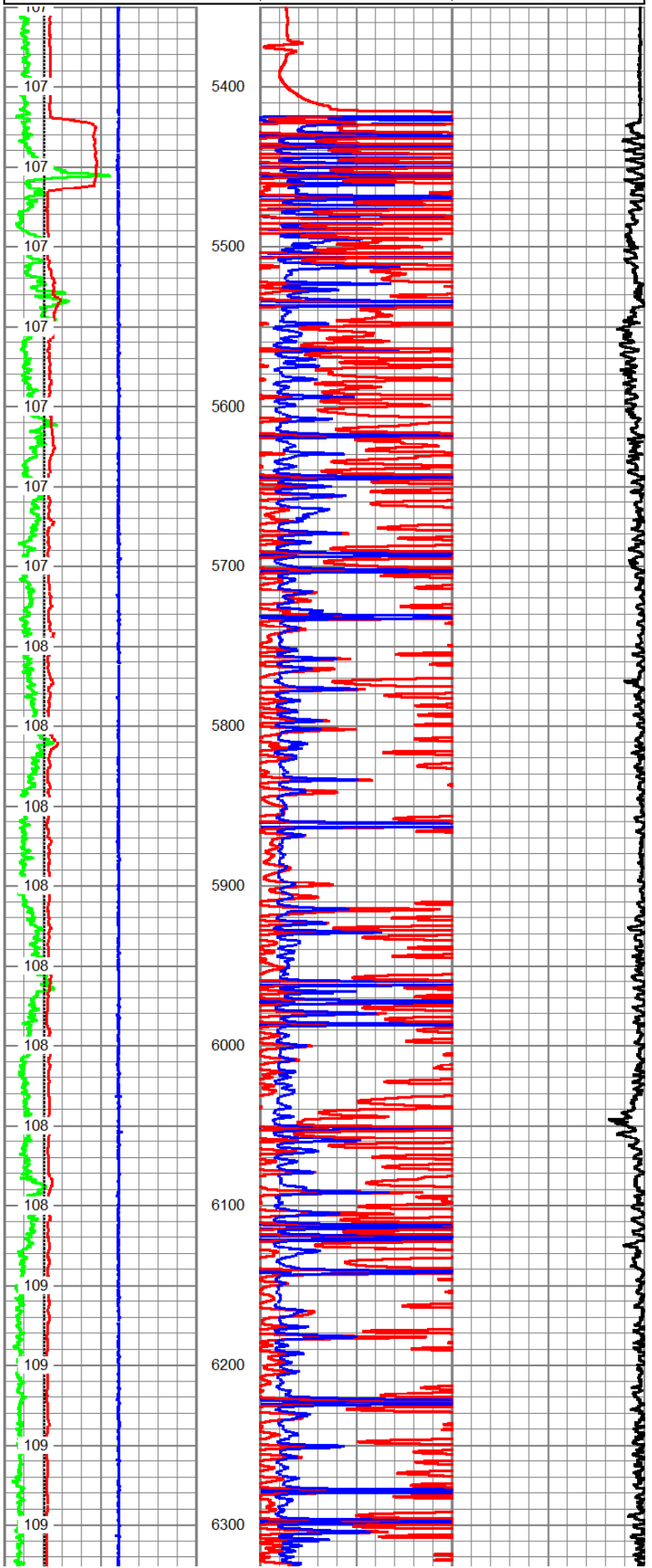
ThruBit
A Schlumberger Company

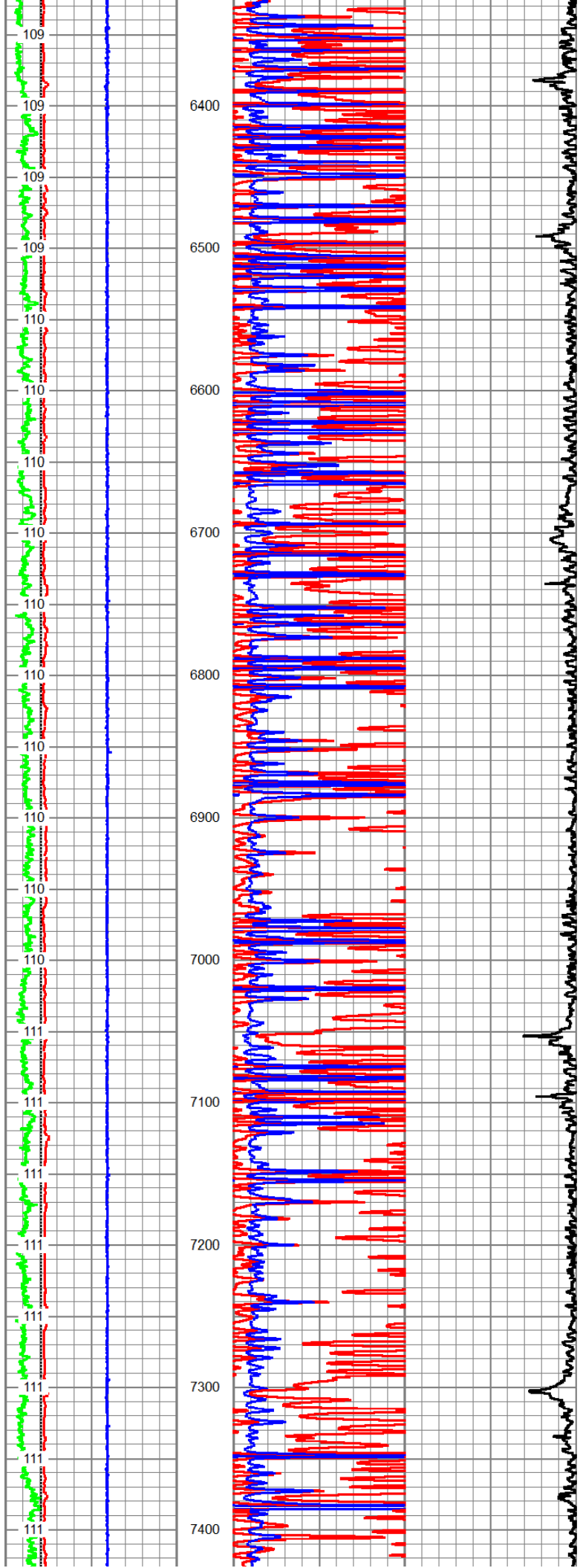
# MAIN PASS

| | |
|---|---|
| Database File: | ann_mem.db |
| Dataset Pathname: | proc5/pass1.2 |
| Presentation Format: | 6_2r_chk |
| Dataset Creation: | Wed Nov 27 11:55:16 2013 |
| Charted by: | Depth in Feet scaled 1:1200 |

| | | |
|---|---|---|
| 0 | GR (GAPI) | 150 |
| 4 | DCAL (in) | 14 |
| -5 | ACCY | 5 |
| 4 | BOREID (in) | 14 |
| GRTEMP (degF) | | |

| | | |
|---|---|---|
| | 20in 2ft Res | |
| 50 | (Ohm-m) | 500 |
| | 90in 2ft Res | |
| 50 | (Ohm-m) | 500 |
| 1000 | DEEP COND (mmho/m) | 0 |
| 0 | 20in 2ft Res (Ohm-m) | 50 |
| 0 | 90in 2ft Res (Ohm-m) | 50 |

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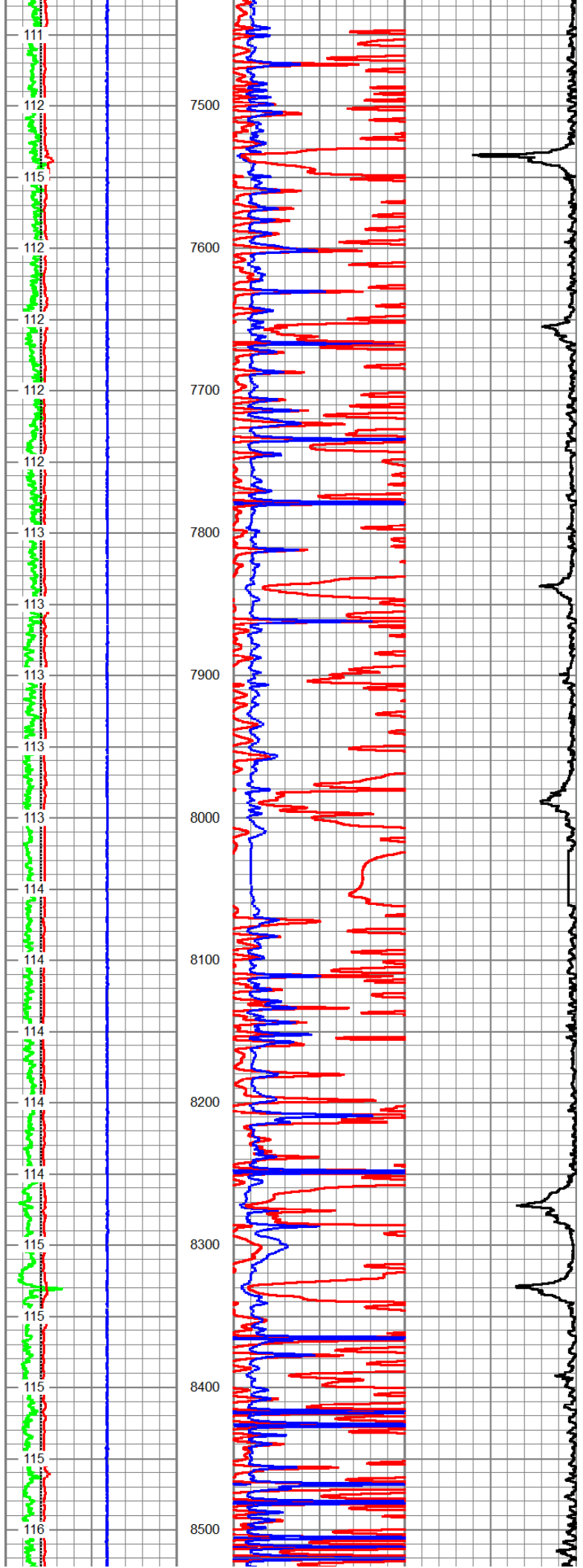
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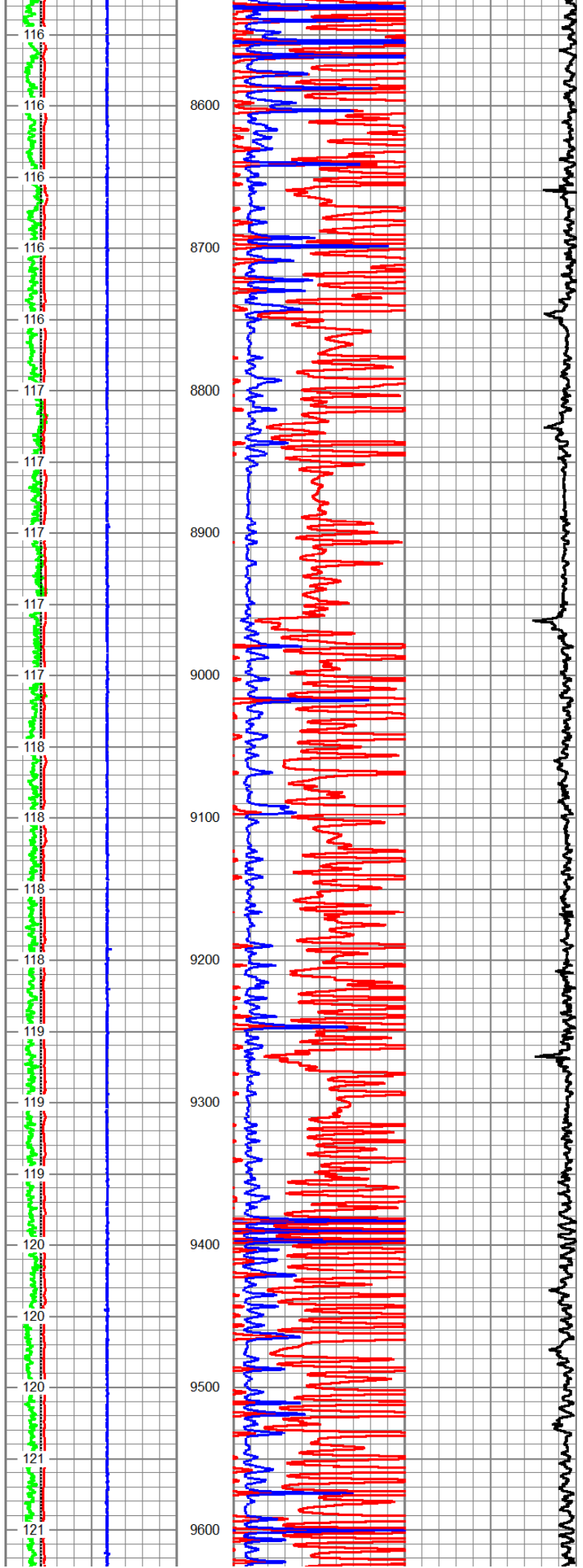
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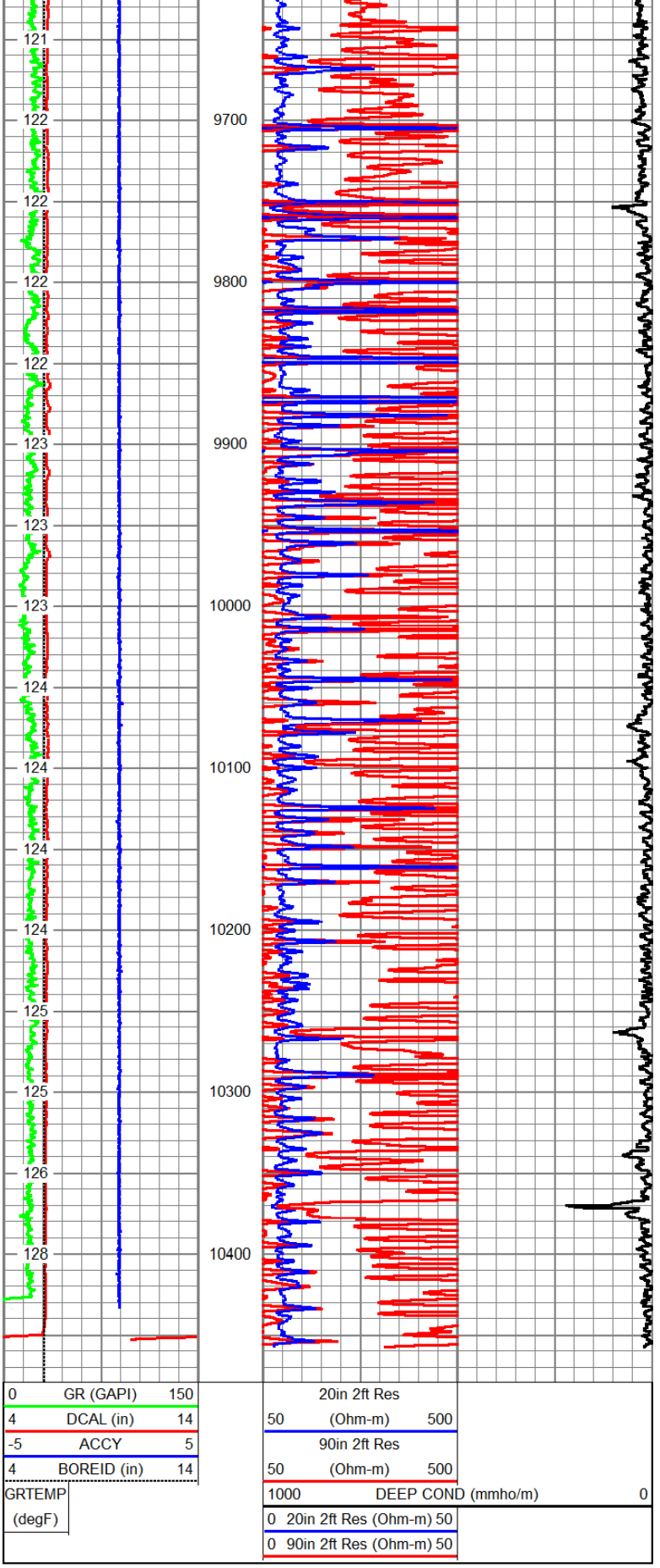
9600




| | | |
|---|---|---|
| 0 | GR (GAPI) | 150 |
| 4 | DCAL (in) | 14 |
| -5 | ACCY | 5 |
| 4 | BOREID (in) | 14 |

GRTEMP (degF)

| | | |
|---|---|---|
| | 20in 2ft Res | |
| 50 | (Ohm-m) | 500 |
| | 90in 2ft Res | |
| 50 | (Ohm-m) | 500 |
| 1000 | DEEP COND (mmho/m) | 0 |

| | | |
|---|---|---|
| 0 | 20in 2ft Res (Ohm-m) | 50 |
| 0 | 90in 2ft Res (Ohm-m) | 50 |