HALLIBURTON

BOREHOLE COMPENSATED SONIC ARRAY LOG

COMPANY	HERMAN L. LOEB LLC
WELL	LIL SPICY 1-16
FIELD/BLOCK	WILDCAT
COUNTY	KIOWA
STATE	KANSAS

COMPANY **HERMAN L. LOEB LLC**

WELL **LIL SPICY 1-16**

FIELD/BLOCK **WILDCAT**

COUNTY **KIOWA** STATE **KANSAS**

API No. 15-097-21840-00-00

Location (SHL) 1896' FNL & 2225' FWL
SW NE SE NW

Other Services:
GTET
DSNT
SDLT
BSAT
ACRT

Permanent Datum	GL	Elev. 2186.0 ft	Elev.: K.B.	2197.0 ft
Log measured from	KB	, 11.0 ft above perm. Datum	D.F.	2197.0 ft
Drilling measured from	KB		G.L.	2186.0 ft

Date		17-Jun-18				
Run No.		ONE				
Depth - Driller		4820.0 ft				
Depth - Logger		4818.0 ft				
Bottom - Logged Interval		4791.0 ft				
Top - Logged Interval		652.0 ft				
Casing - Driller		8.625 in @ 651.0 ft		@		@
Casing - Logger		652.0 ft				
Bit Size		7.875 in		@		@
Type Fluid in Hole		Water Based Mud				
Density	Viscosity	9.1 ppg	58.00 s/qt			
PH	Fluid Loss	9.00 pH	16.8 cptm			
Source of Sample		MUDPIT				
Rm @ Meas. Temperature		0.34 ohmm @ 75.00 degF		@		@
Rmf @ Meas. Temperature		0.41 ohmm @ 75.00 degF		@		@
Rmc @ Meas. Temperature		0.27 ohmm @ 75.00 degF		@		@
Source Rmf	Rmc	MEAS	MEAS			
Rm @ BHT		0.21 ohmm @ 125.0 degF		@		@
Time Since Circulation		03:23 hr				
Time on Bottom		17-Jun-18 19:27				
Max. Rec. Temperature		125.00 degF @ 4818.0 ft		@		@
Equipment	Location	12147634	EL RENO, OK			
Recorded By		SEAN WOLTEMATH				
Witnessed By		JON CHRISTENSEN		GEORGE PAYNE		

Fold here

Service Ticket No.: 904925645 API No.: 15-097-21840-00-00 PGM Version: WL INSITE R5.6.0 (Build 2)

CHANGE IN MUD TYPE OR ADDITIONAL SAMPLE

Date	Sample No.				
Depth-Driller					
Type Fluid in Hole					
Density	Viscosity				
Ph	Fluid Loss				
Source of Sample					
Rm @ Meas. Temp		@		@	
Rmf @ Meas. Temp.		@		@	
Rmc @ Meas. Temp.		@		@	
Source Rmf	Rmc				
Rm @ BHT		@		@	
Rmf @ BHT		@		@	
Rmc @ BHT		@		@	

RESISTIVITY SCALE CHANGES

Type Log	Depth	Scale Up Hole	Scale Down Hole

RESISTIVITY EQUIPMENT DATA

Run No.	Tool Type & No.	Pad Type	Tool Pos.	Other
ONE	ACRT	N/A	CENT	N/A
	I-12109517			
	S-12109515			

EQUIPMENT DATA

GAMMA		ACOUSTIC		DENSITY		NEUTRON	
Run No.	ONE	Run No.	ONE	Run No.	ONE	Run No.	ONE
Serial No.	11013114	Serial No.	10747686	Serial No.	10809130	Serial No.	10993115
Model No.	GTET	Model No.	BSAT	Model No.	SDLT	Model No.	DSNT
Diameter	3.625"	No. of Cent.	2	Diameter	5.5"	Diameter	3.625"
Detector Model No.	GTET	Spacing	EVEN	Log Type	GAM-GAM	Log Type	NEU-NEU
Type	SCINT			Source Type	Cs-137	Source Type	Am241Be
Length	8"	LSA [Y/N]		Serial No.	5471GW	Serial No.	DSN-424
Distance to Source	10'	FWDA [Y/N]		Strength	1.5 Ci	Strength	15.0 Ci

LOGGING DATA

GENERAL				GAMMA		ACOUSTIC			DENSITY			NEUTRON		
Run	Depth		Speed	Scale		Scale		Matrix	Scale		Matrix	Scale		Matrix
No.	From	To	ft/min	L	R	L	R		L	R		L	R	
ONE	TD	CSG	REC	0	150	30	-10	47.6 usec/ft	30	-10	2.71 g/cc	30	-10	LIME

ONE	TD	CSG	REC	0	150	30	-10	47.6 usec/ft	30	-10	2.71 g/cc	30	-10	LIME

DIRECTIONAL INFORMATION

Maximum Deviation	@	KOP	@

Remarks:

GTET-DSNT-SDLT RUN IN COMBINATION

GTET-BSAT-ACRT RUN IN COMBINATION

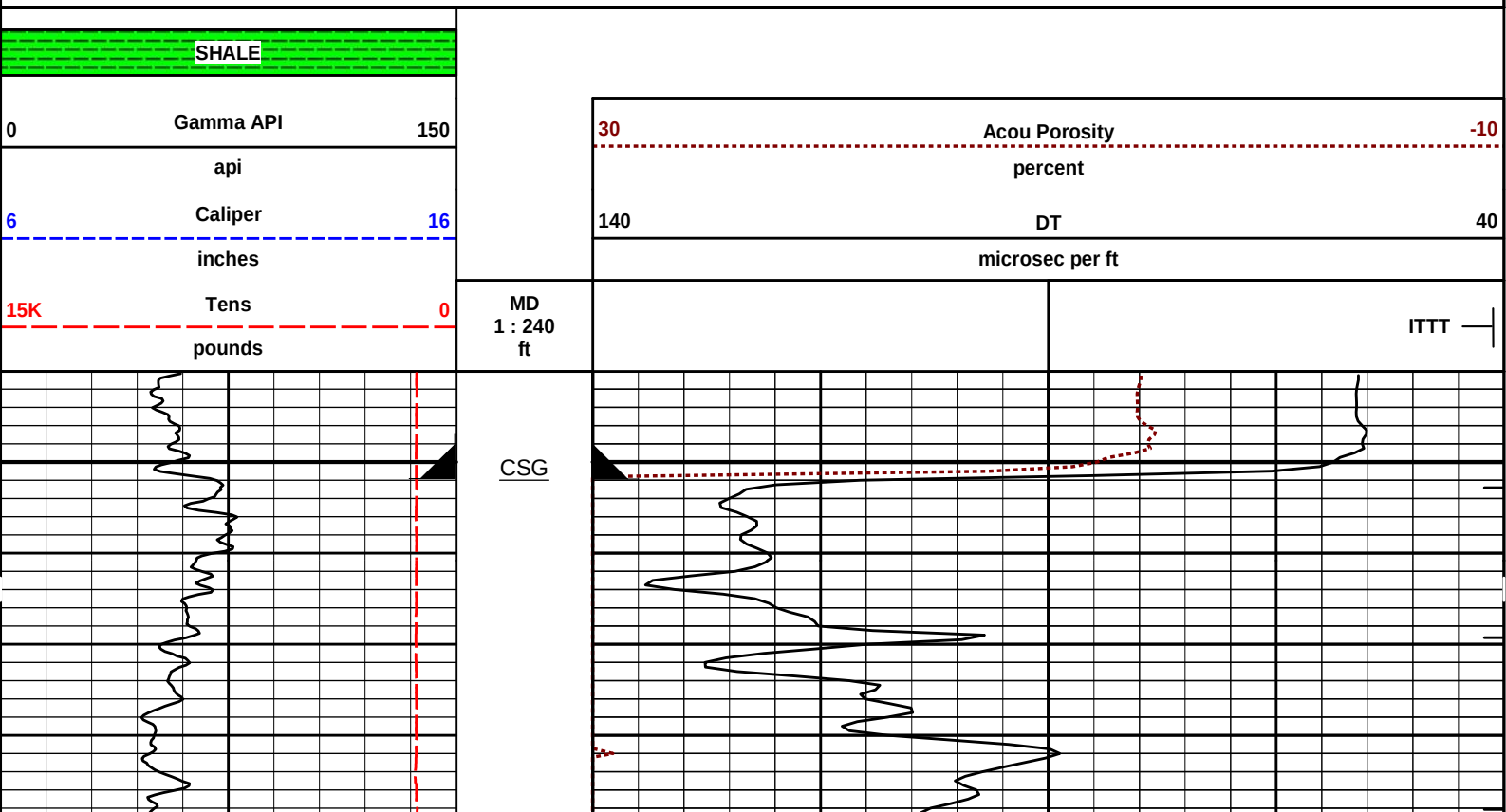
ANNULAR HOLE VOLUME CALCULATED FOR 5.5 INCH CASING

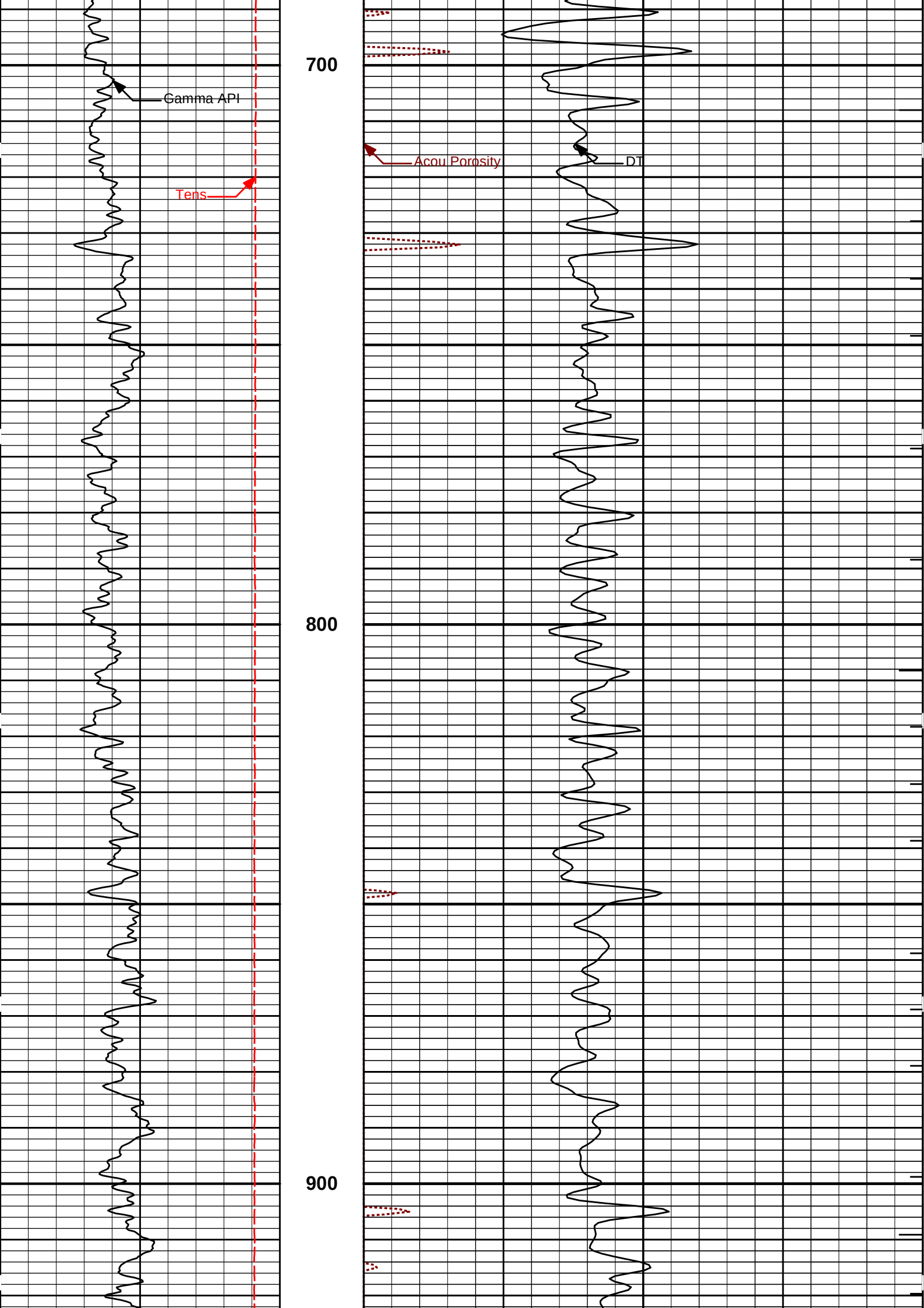
HALLIBURTON

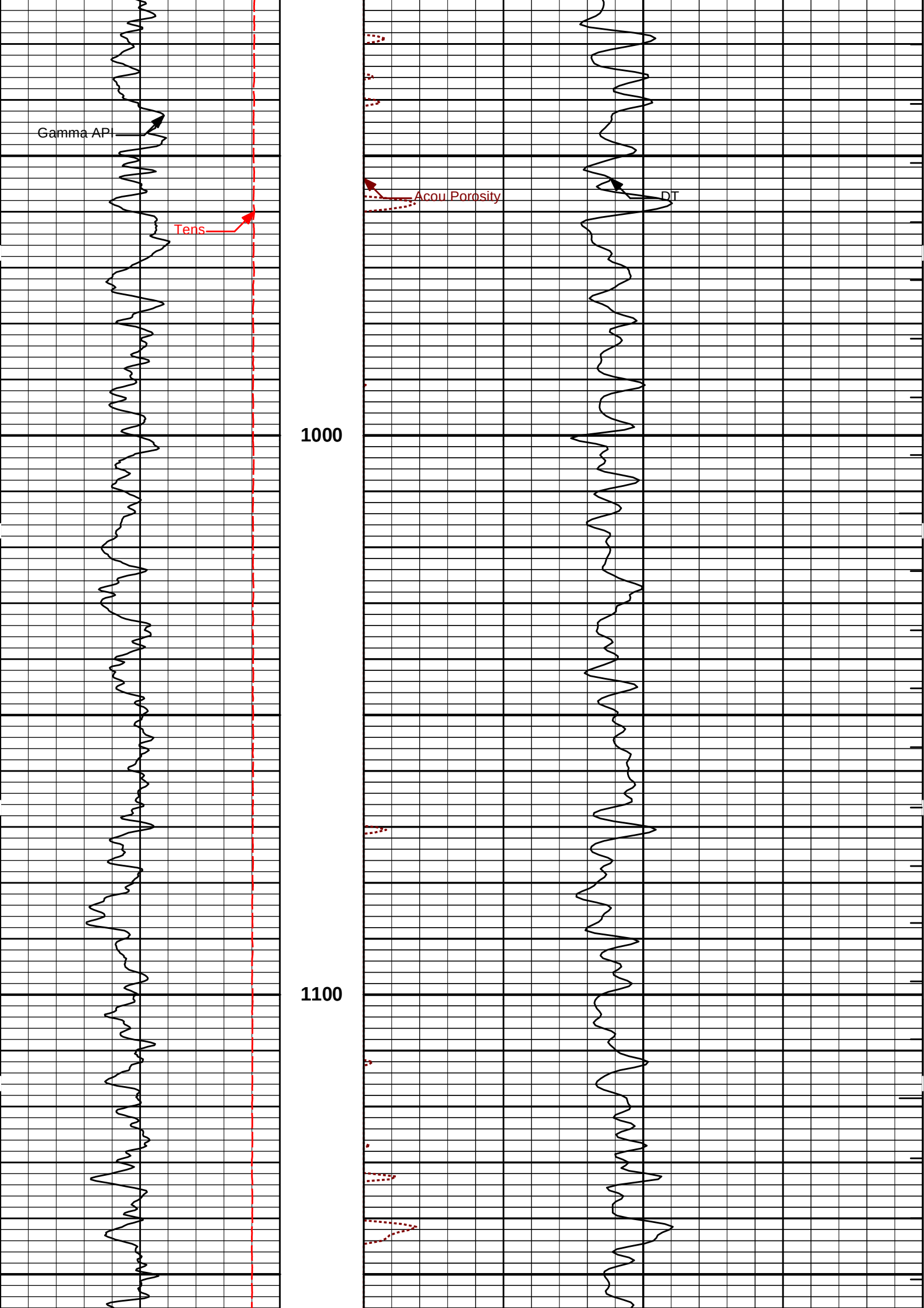
Plot Time: 17-Jun-18 23:39:31
Plot Range: 640.05 ft to 4821.55 ft
Data: HERMAN_LILSPICY\Well Based*
Plot File: \\BSAT\BSAT_5_MAIN_LIB

5 INCH MAIN LOG

5 IN = 100 FT MD
MAIN PASS




700
800
900
Gamma API
Tens
Acou Porosity
DT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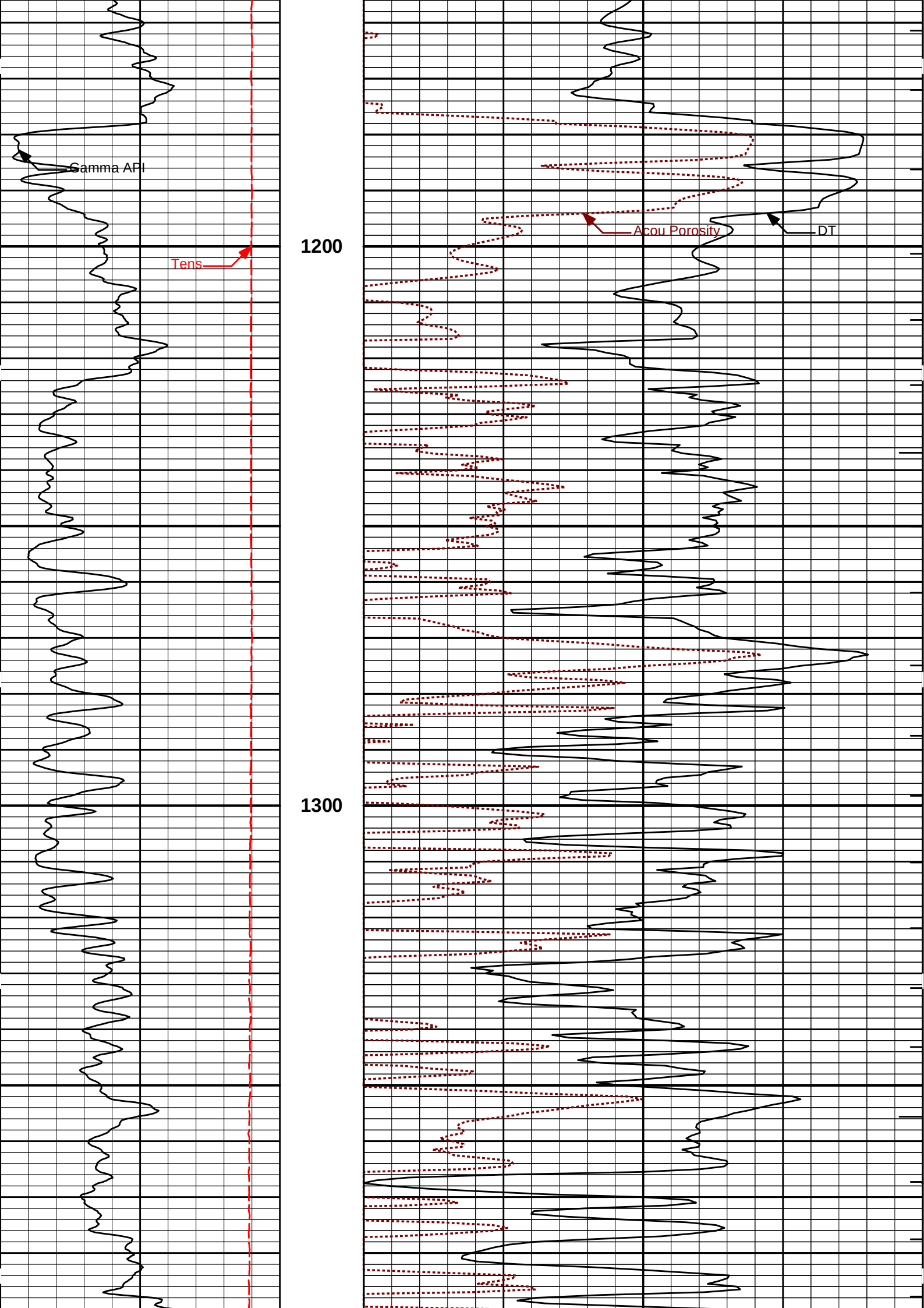
Tens
Acou Porosity
DT
1000
1100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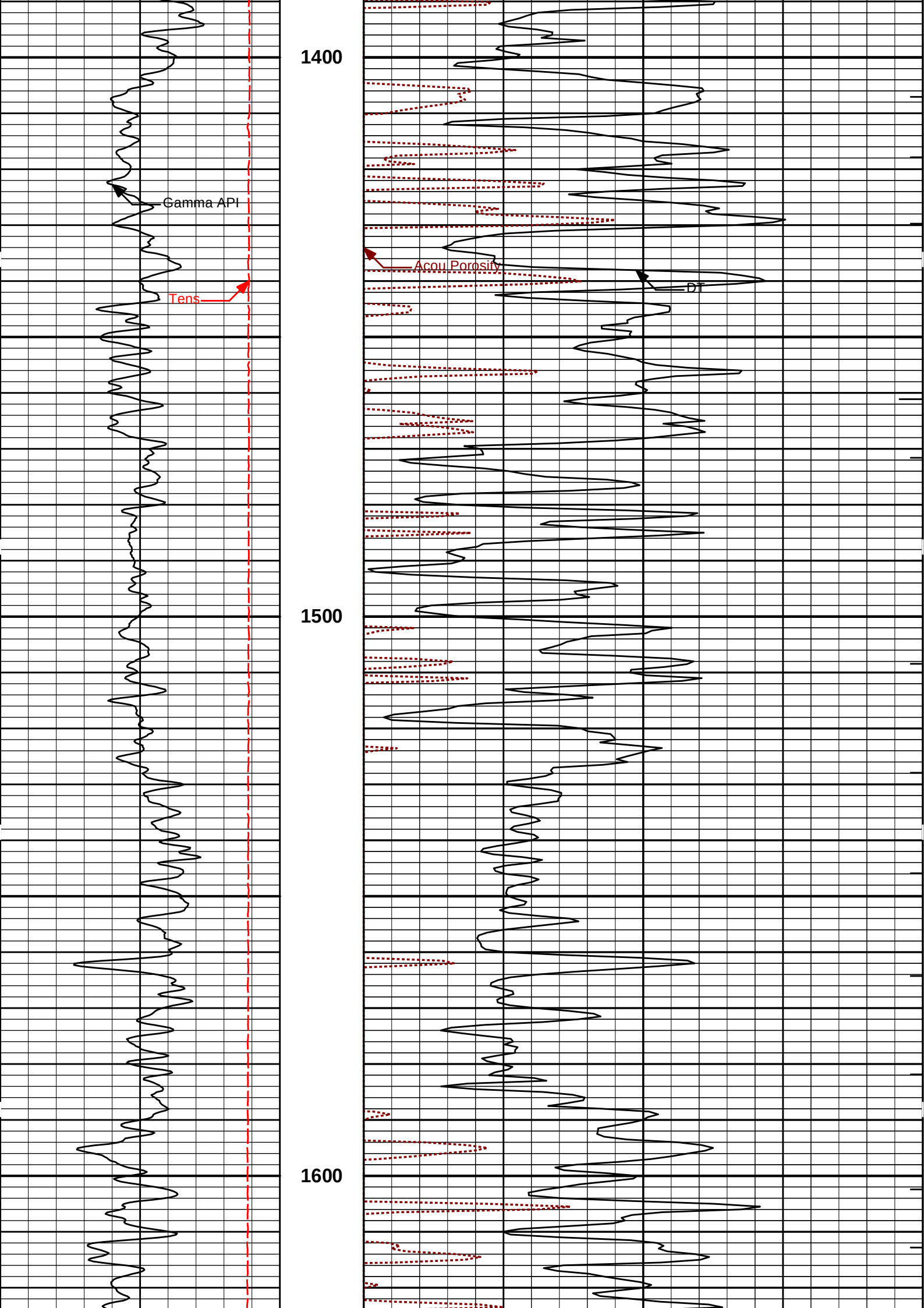
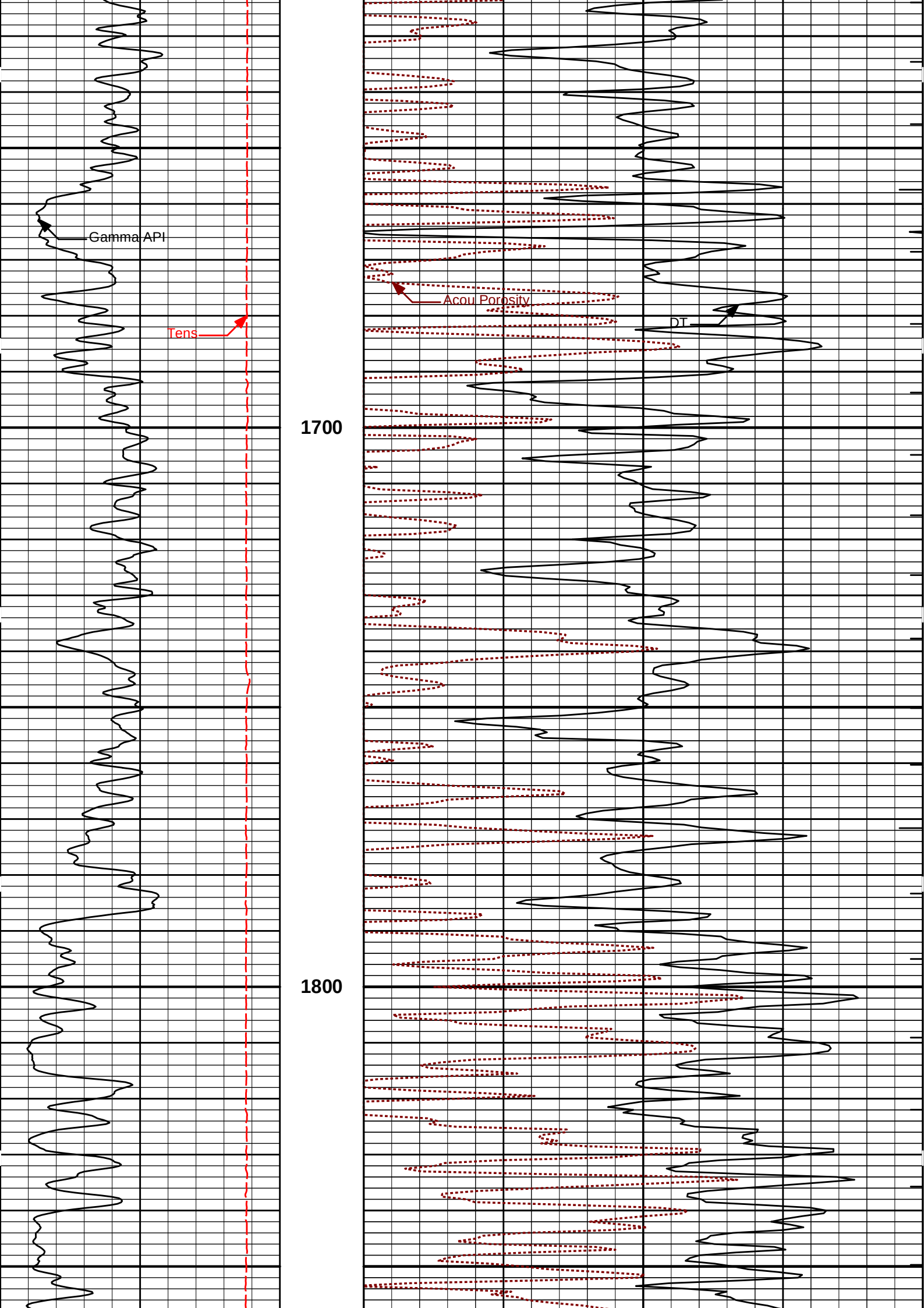
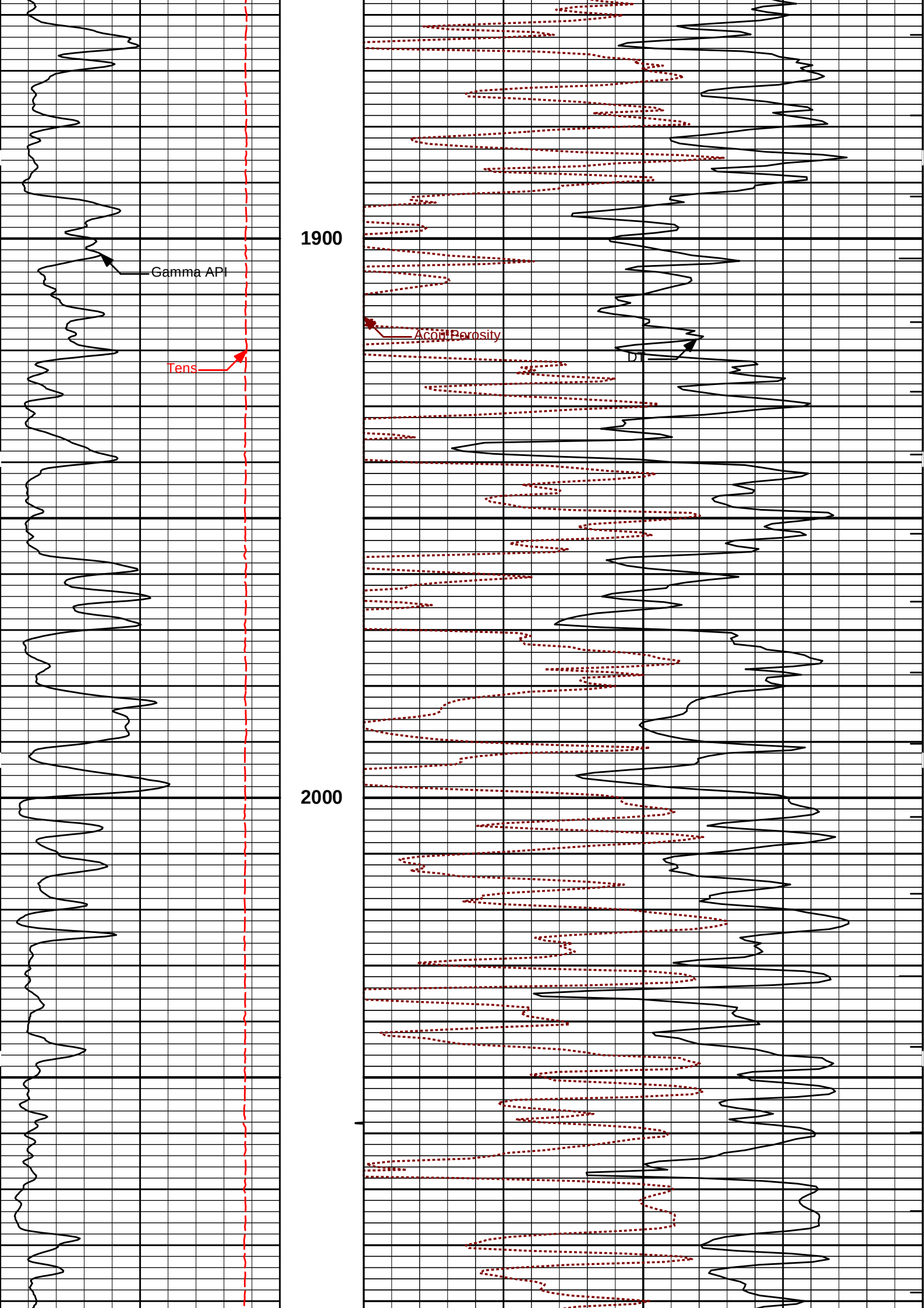
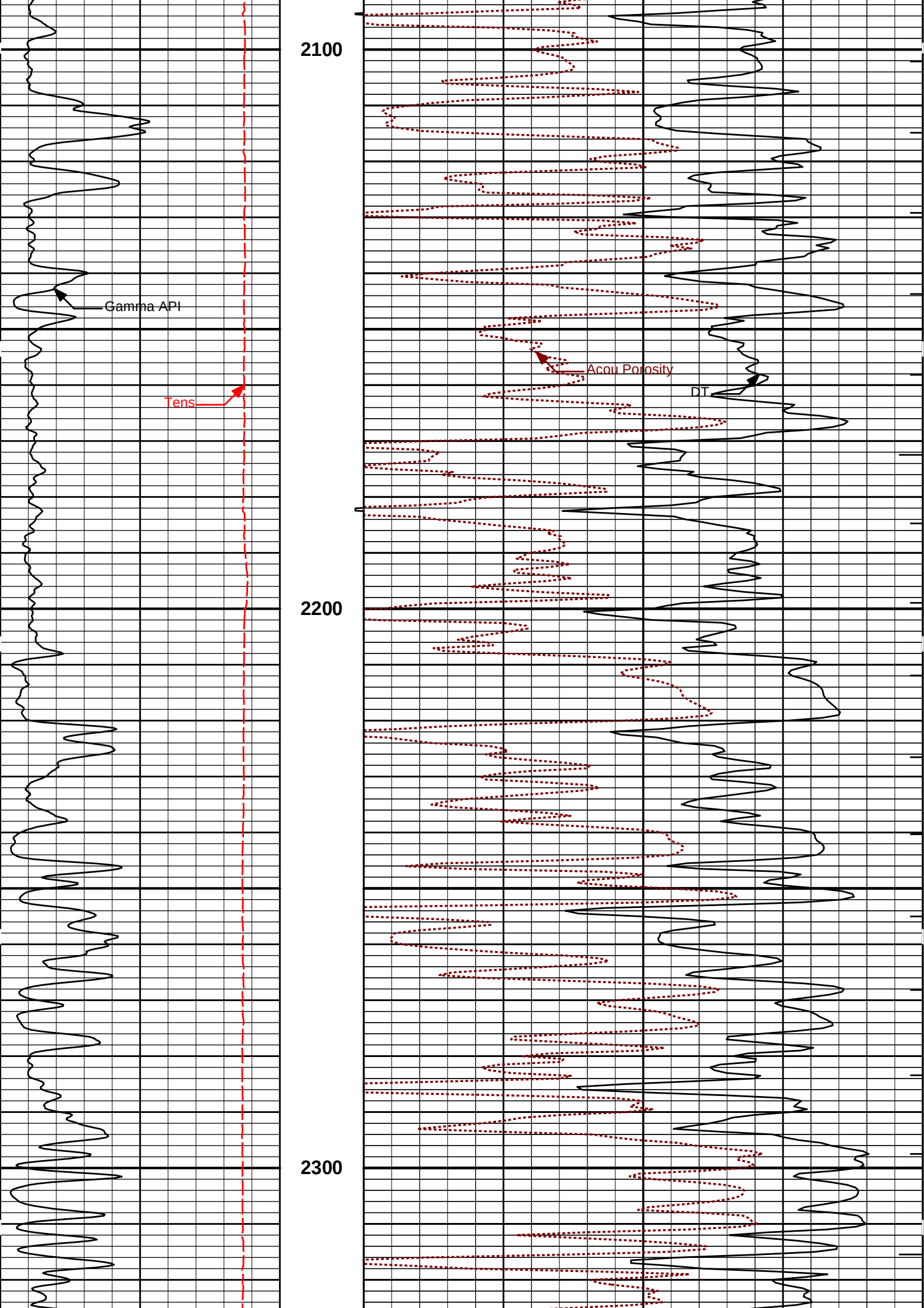
Tens
1200
Acou Porosity
DT
1300


1400
Gamma API
Acou Porosity
DT
Tens
1500
1600


Gamma API
Tens
Acou Porosity
DT
1700
1800


1900
2000
Gamma API
Tens
AcouPorosity
DT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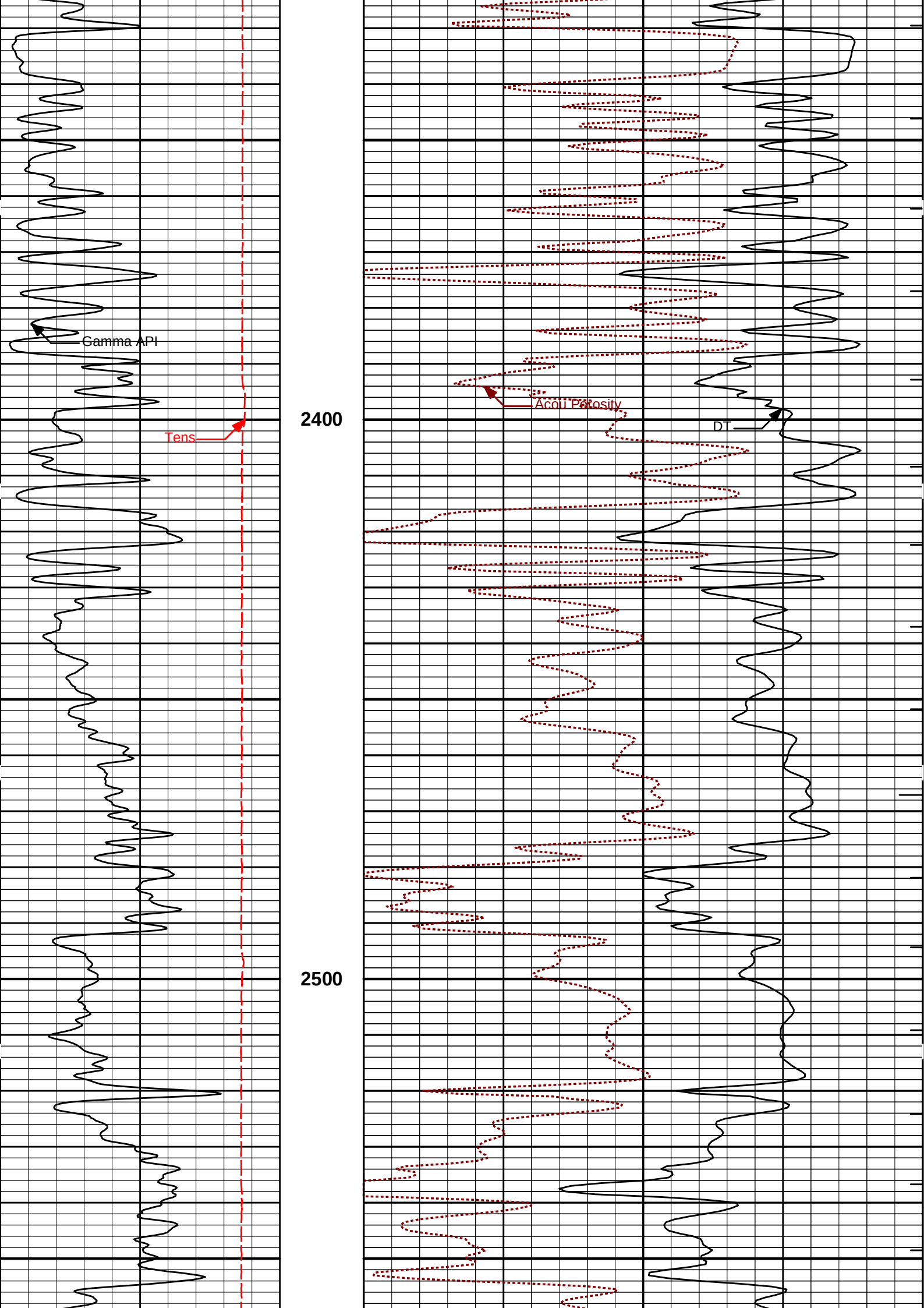
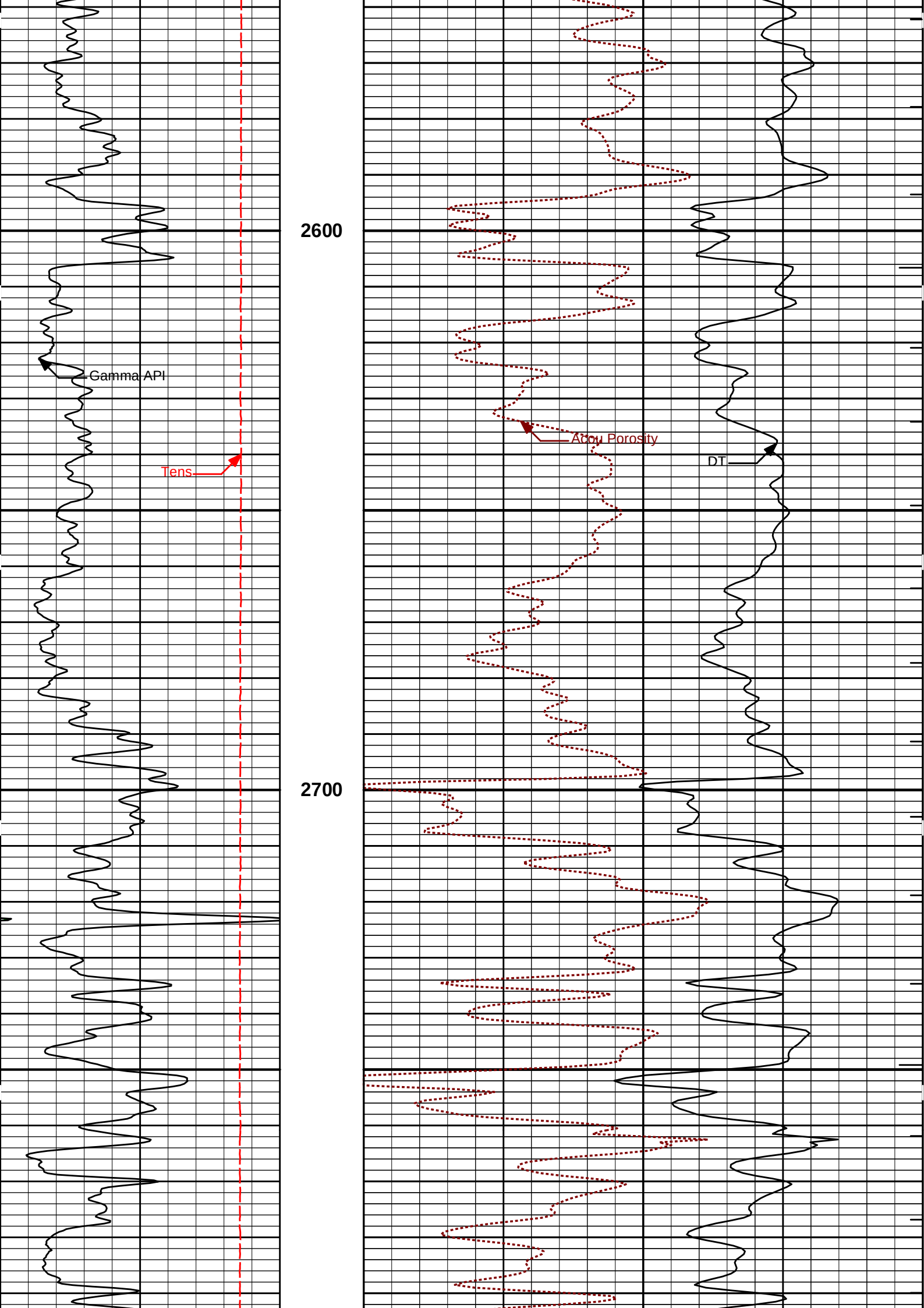
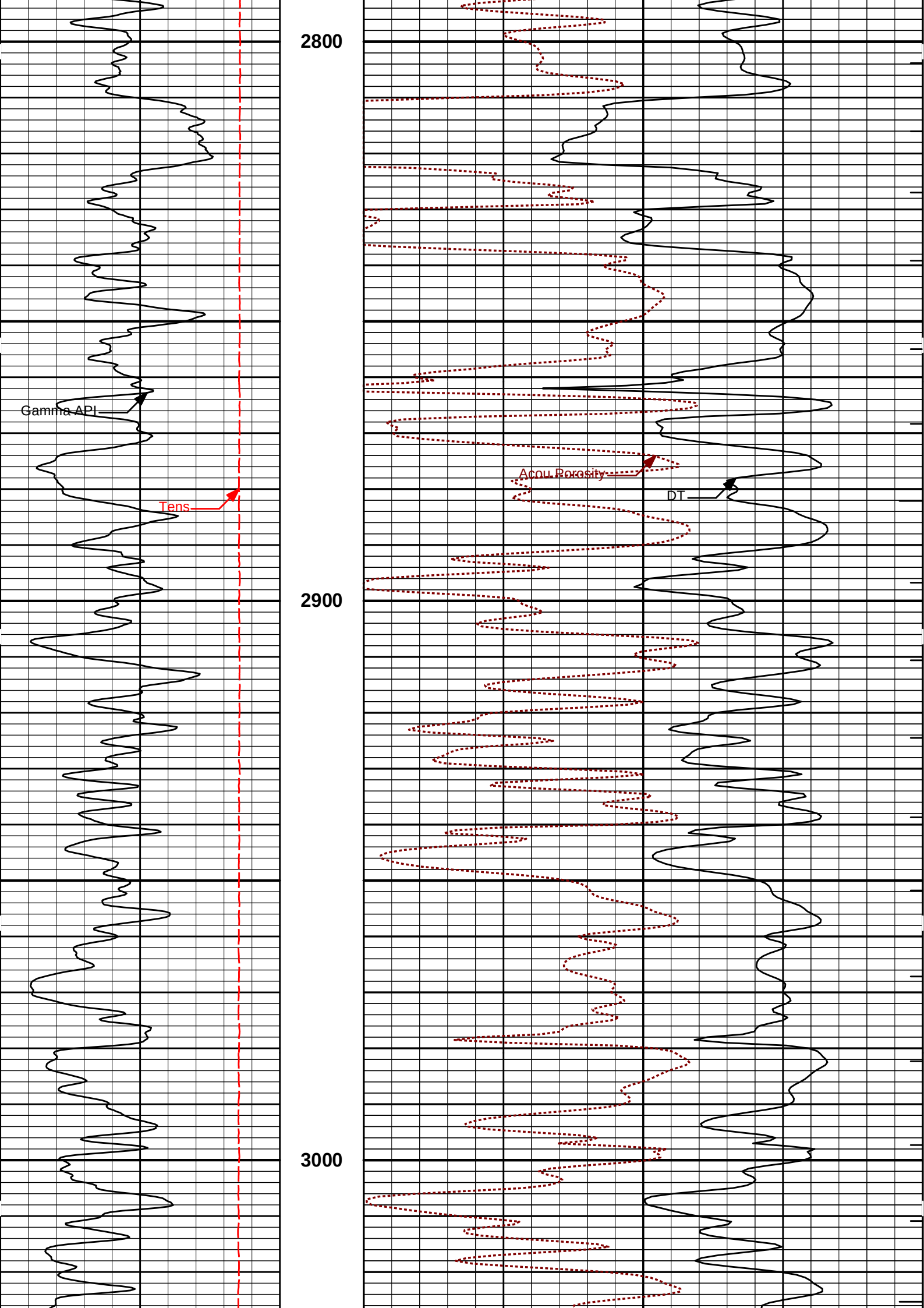
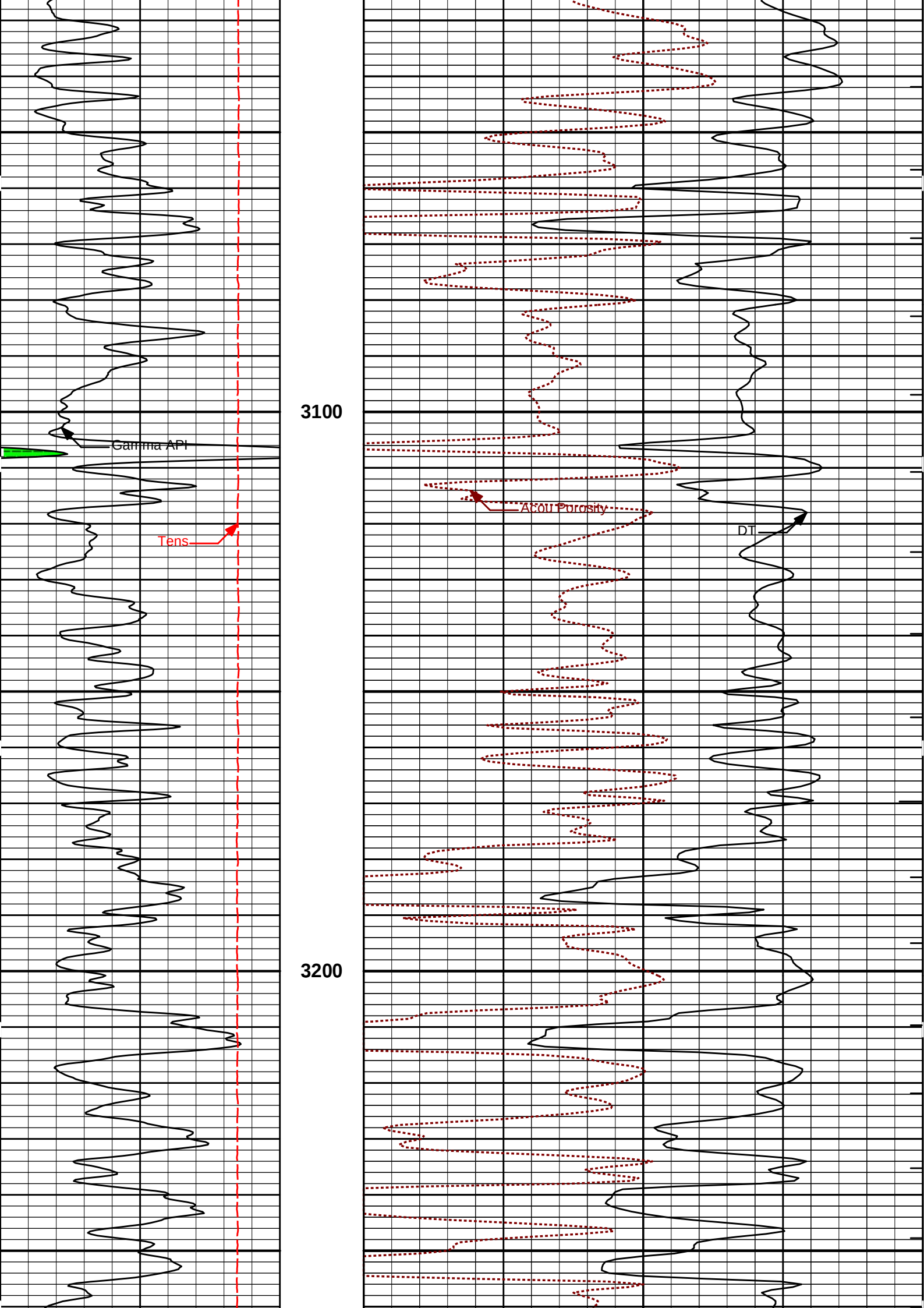
Gamma API
Tens
Acou Porosity
DT
2200
2300


Gamma API
Tens
2400
Acou Porosity
DT
2500


2600
2700
Gamma API
Tens
Adou Porosity
DT


2800
Gamma API
Tens
Acou. Porosity
DT
2900
3000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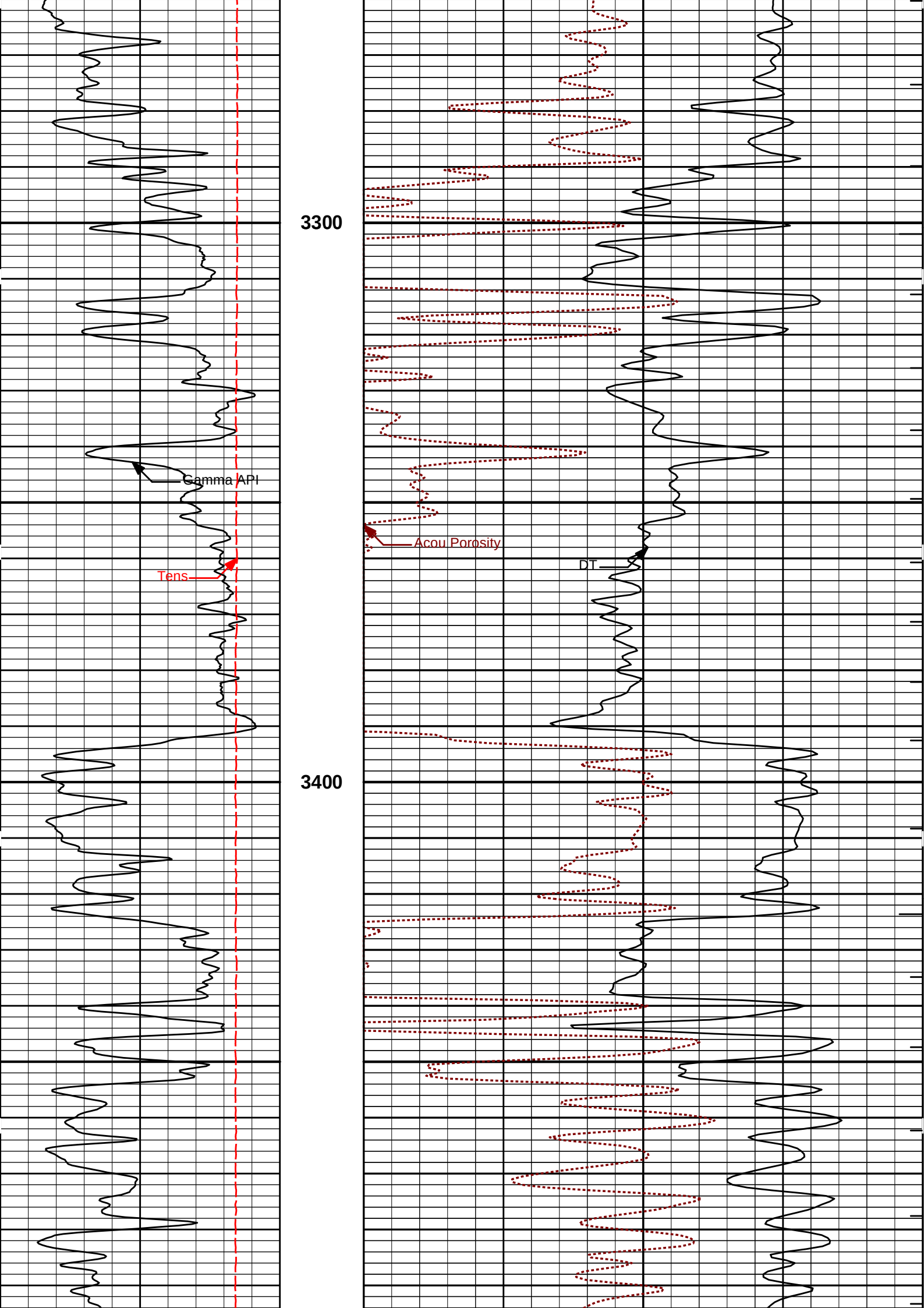
Gamma API
Tens
Acou Porosity
DT
3200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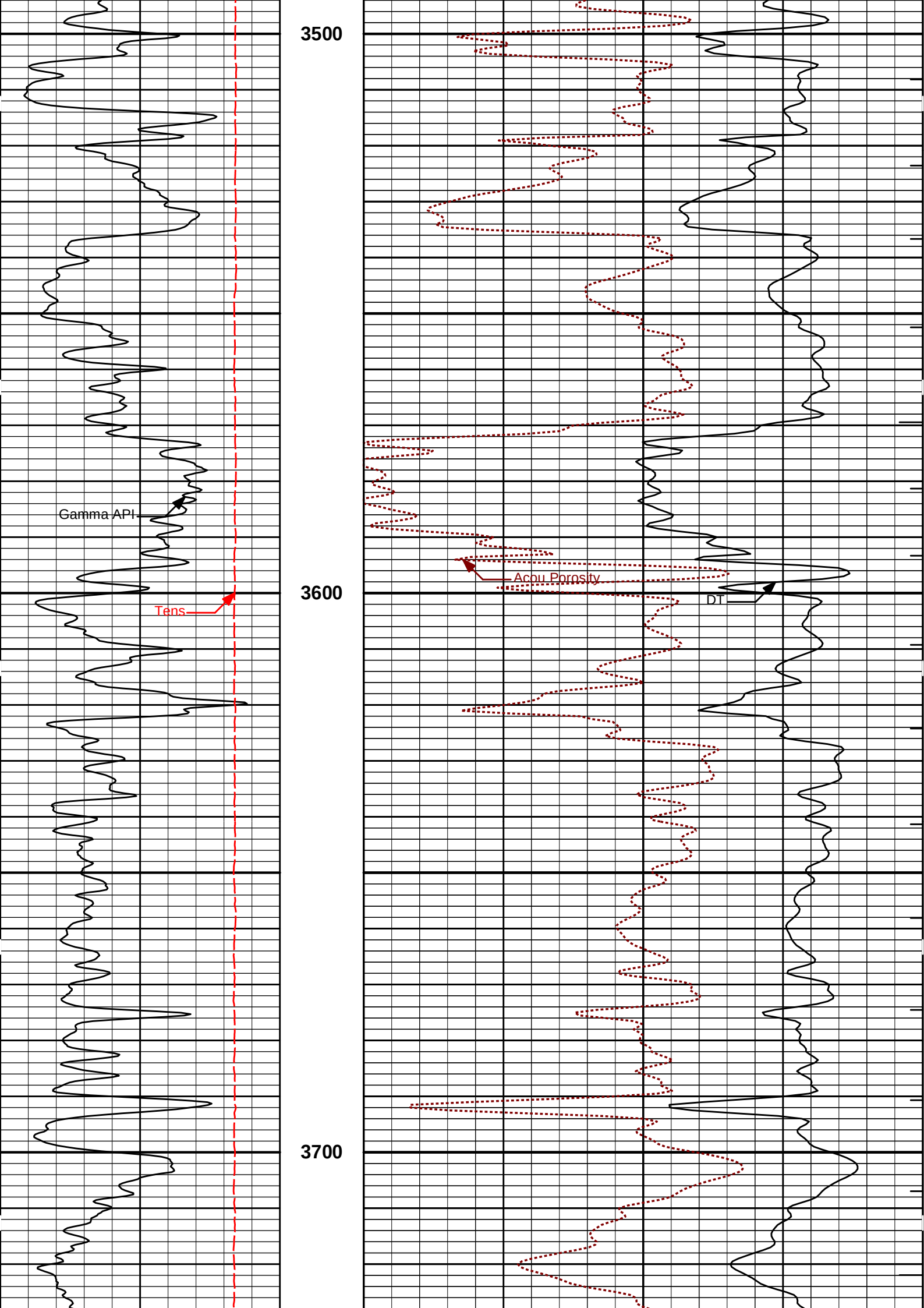
3400
Gamma API
Tens
Acou Porosity
DT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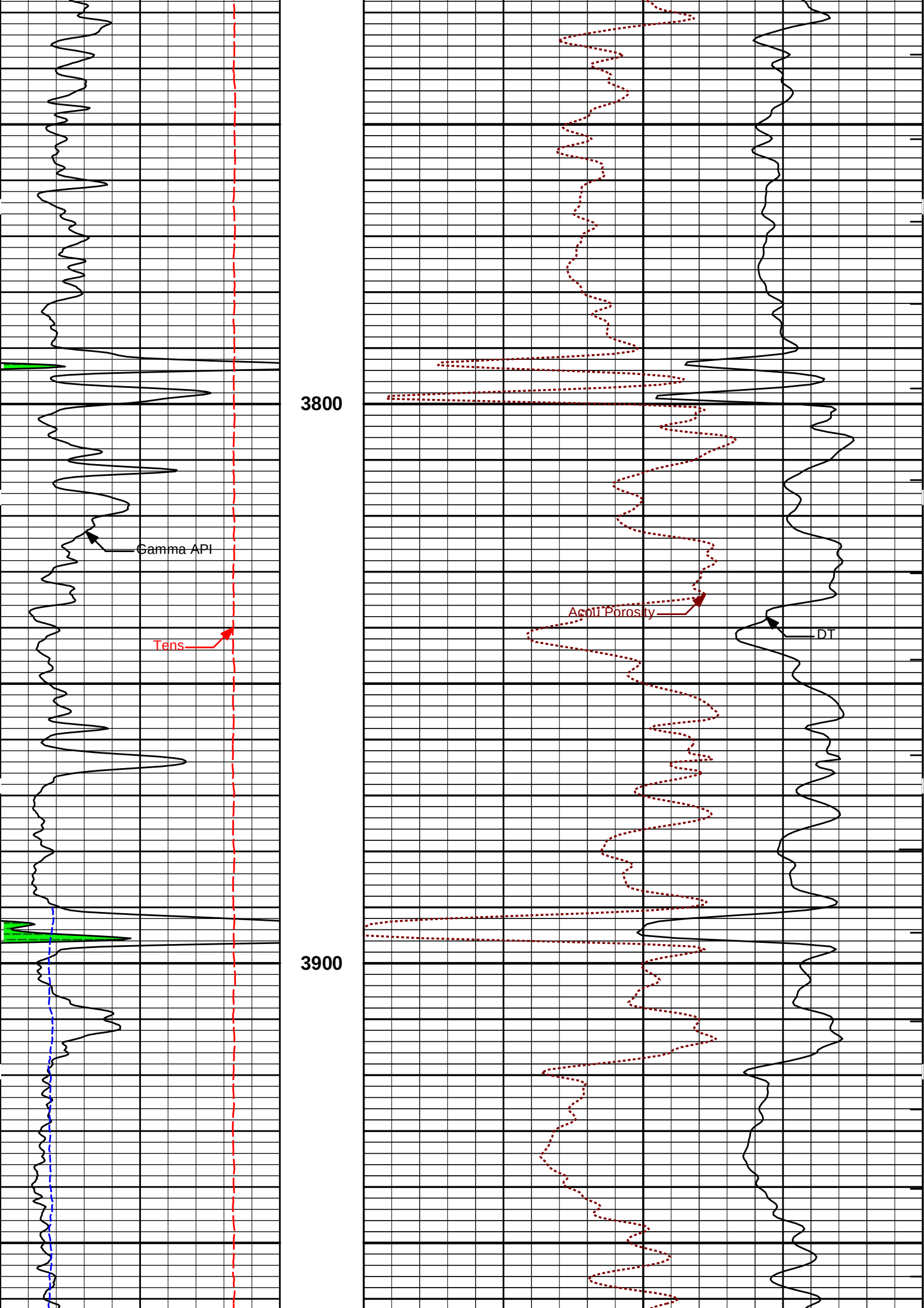
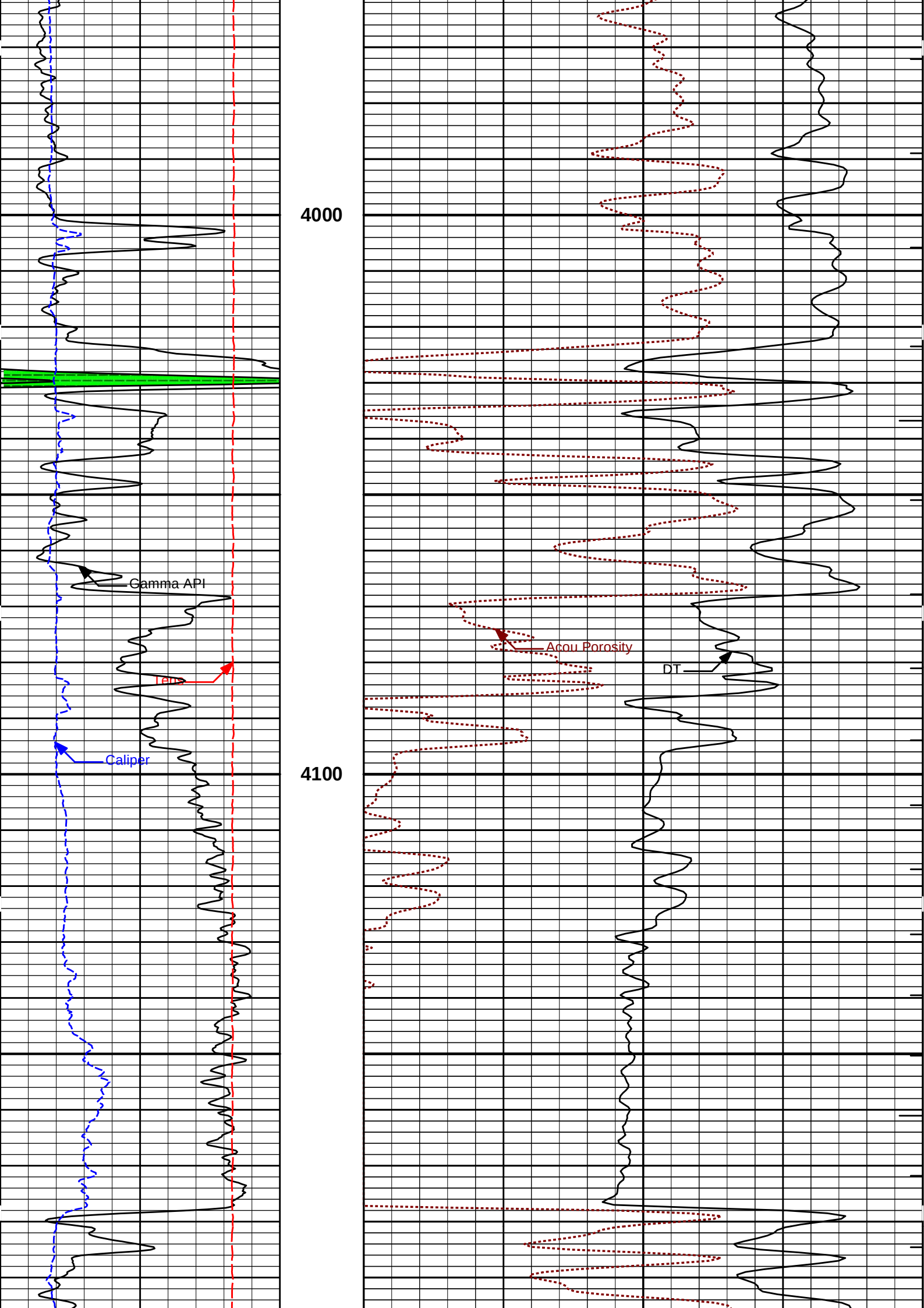
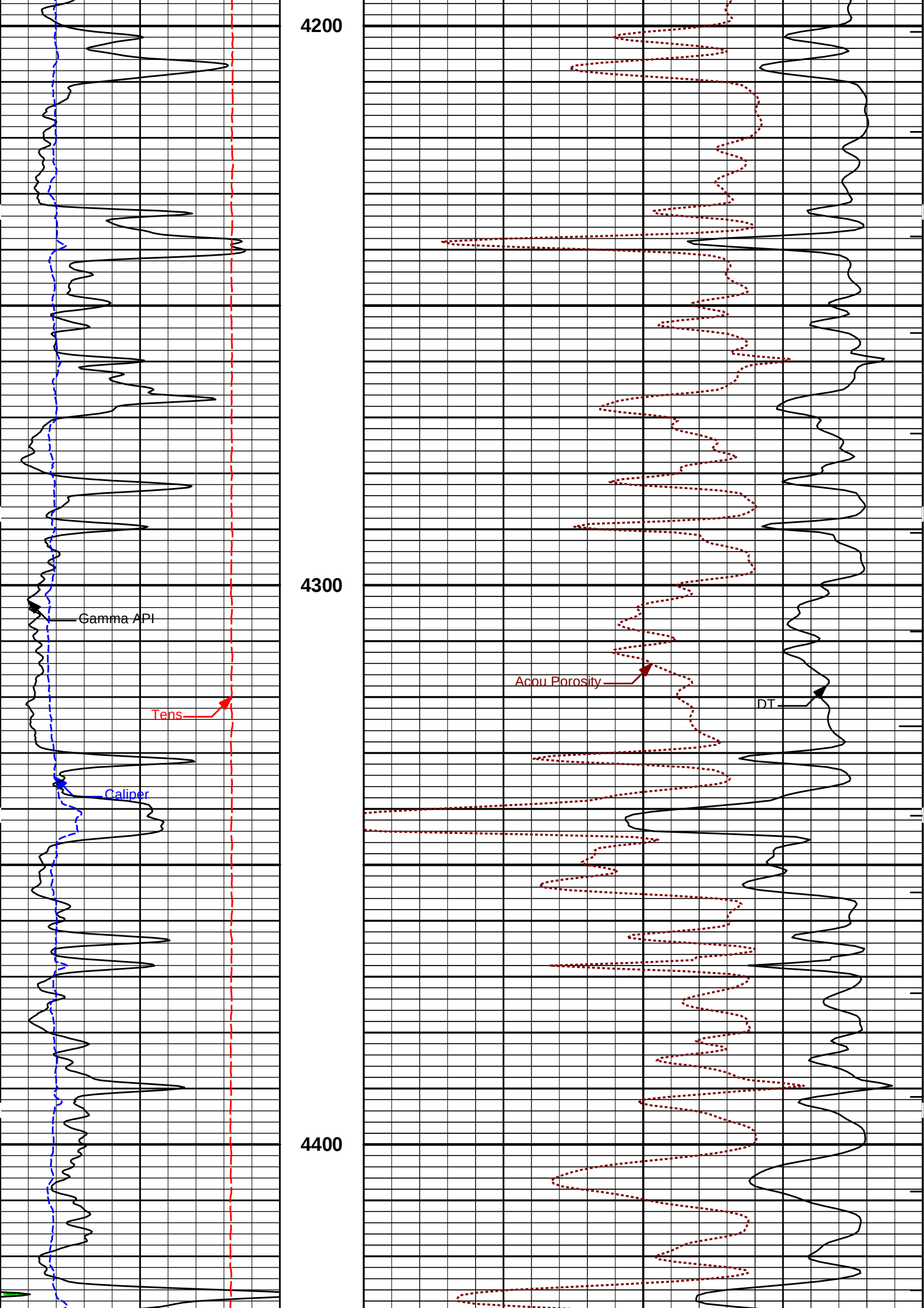
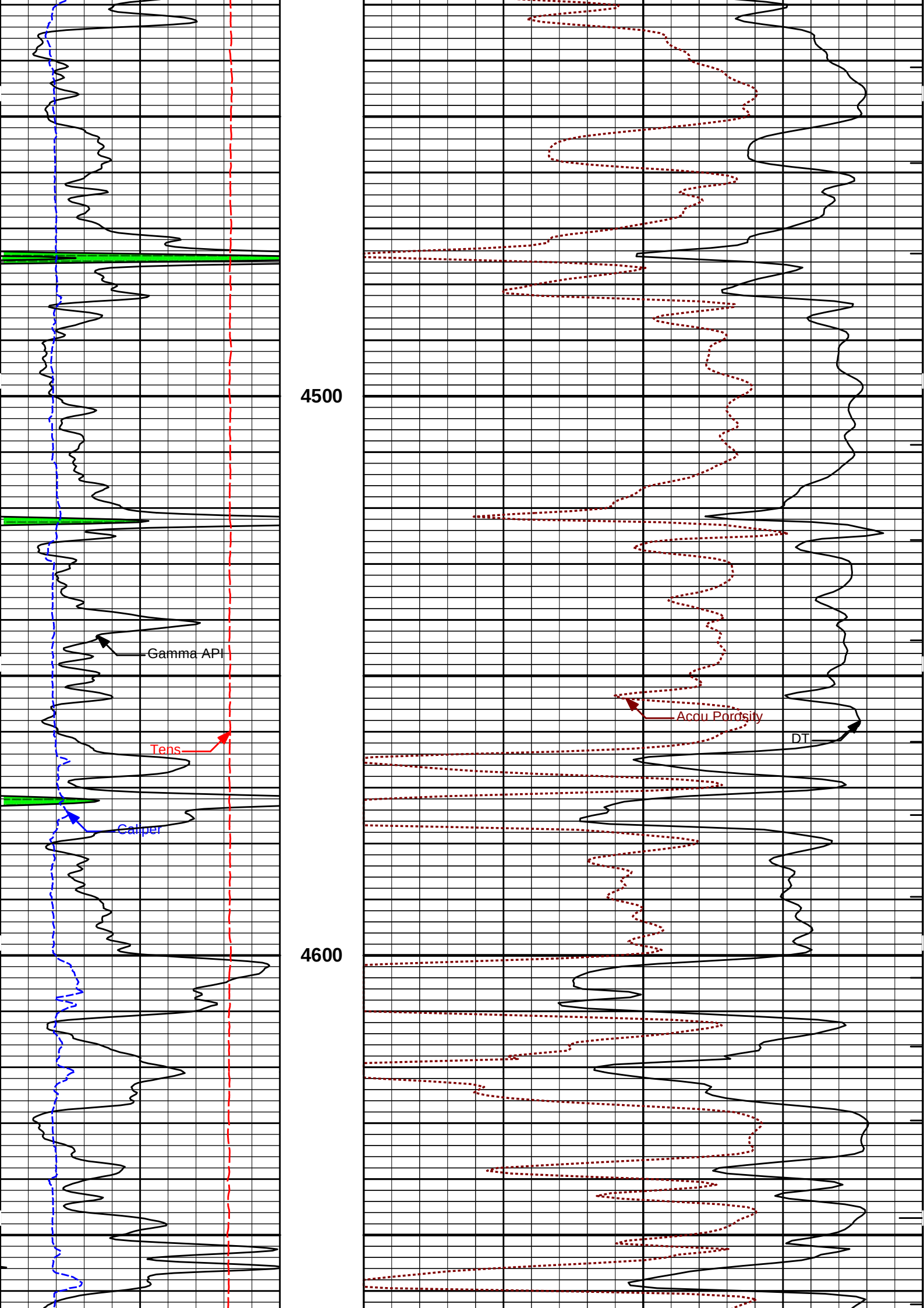
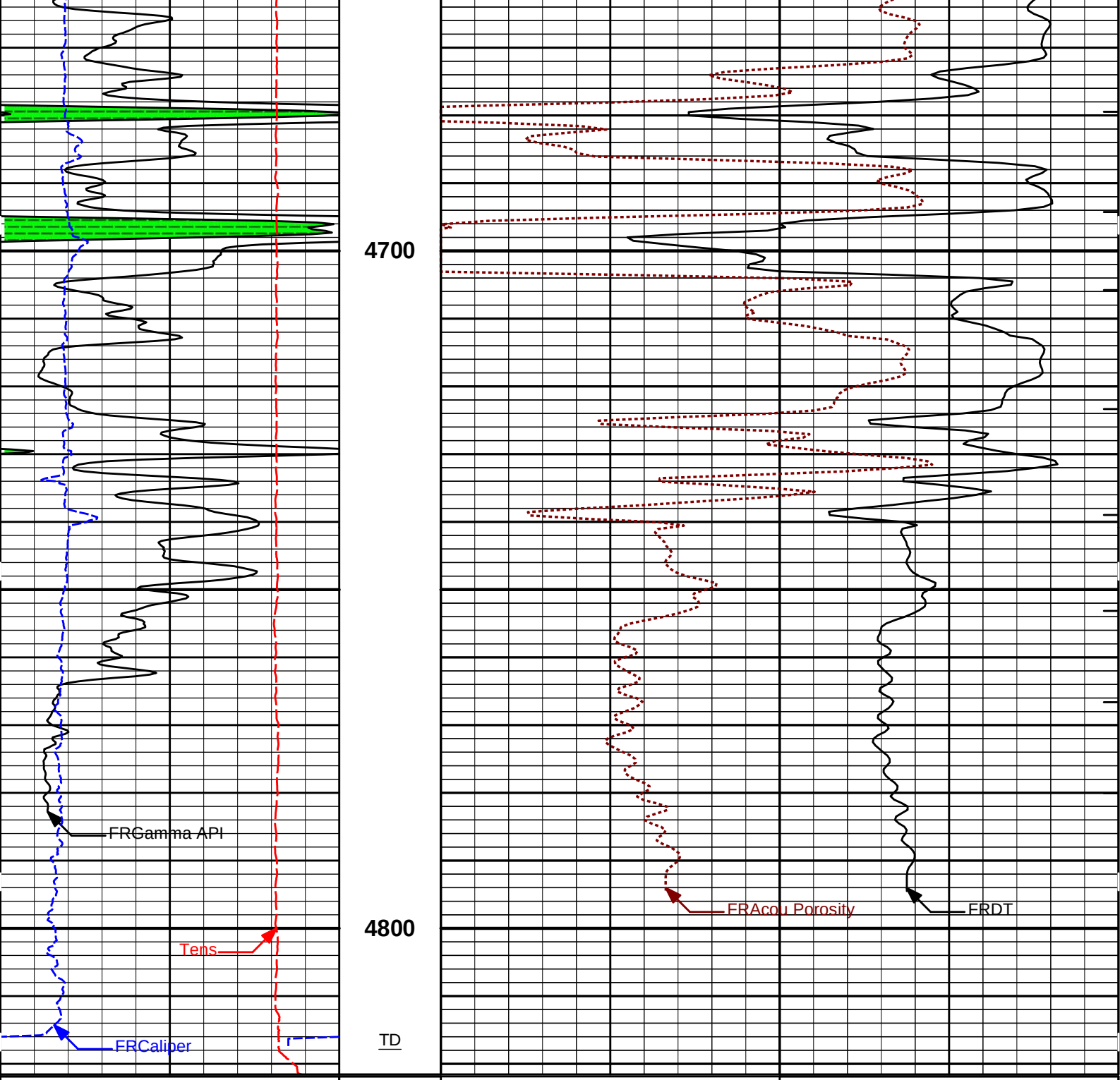
3600
3700
Gamma API
Tens
Acou Porosity
DT


3800
3900
Gamma API
Tens
Acou Porosity
DT


4000
Gamma API
Tens
Caliper
4100
Acou Porosity
DT


4200
4300
4400
Gamma API
Tens
Caliper
Acou Porosity
DT


4500
4600
Gamma API
Tens
Caliper
Acou Porosity
DT



15K Tens 0 pounds	MD 1 : 240 ft	ITTT
6 Caliper 16 inches		140 DT 40 microsec per ft
0 Gamma API 150 api		30 Acou Porosity -10 percent
SHALE		

HALLIBURTON

Plot Time: 17-Jun-18 23:39:42
Plot Range: 640.05 ft to 4821.55 ft
Data: HERMAN_LILSPICY\Well Based*\
Plot File: \\BSAT\BSAT_5_MAIN_LIB

5 INCH MAIN LOG

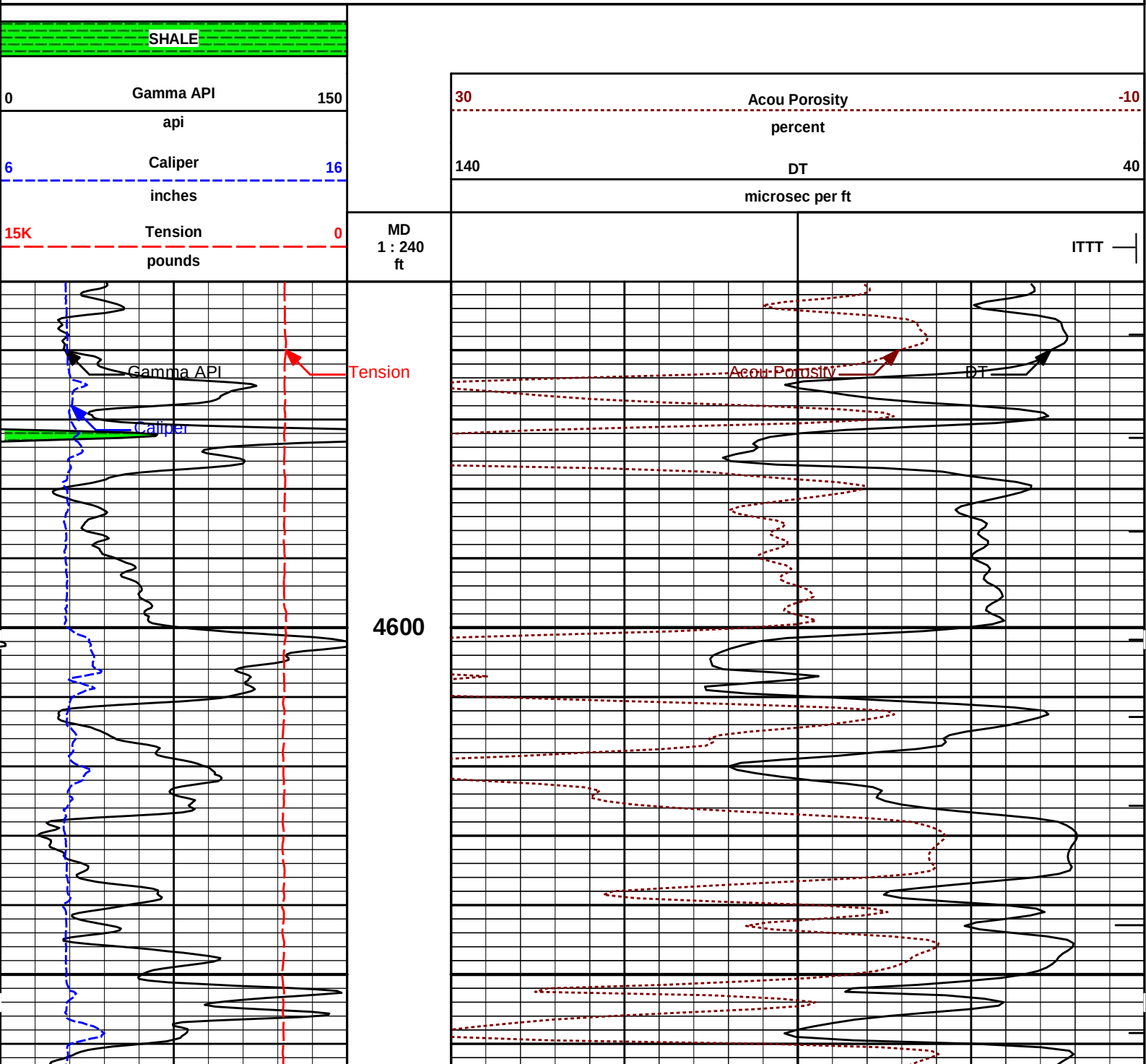
5 IN = 100 FT MD
MAIN PASS

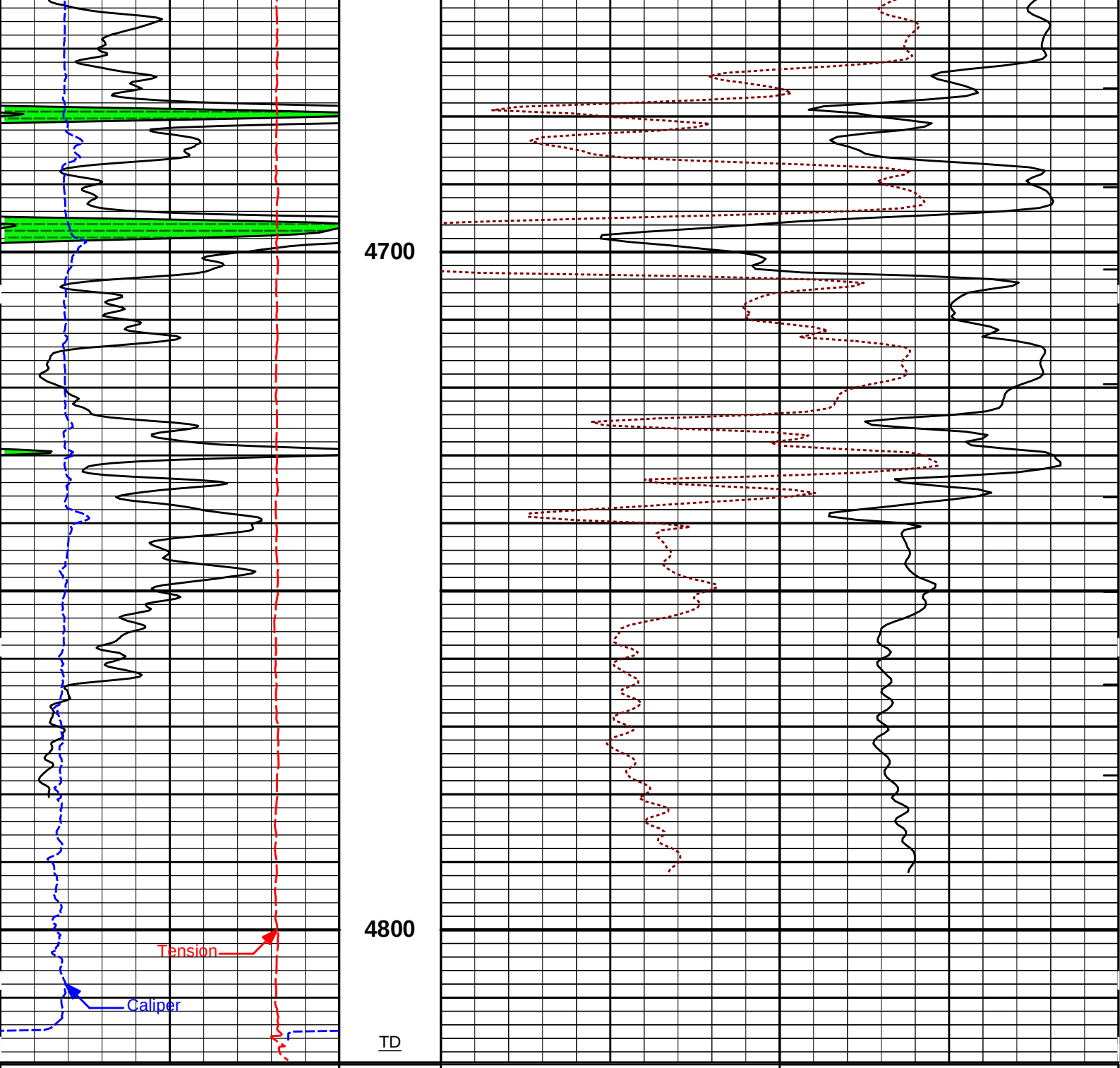
HALLIBURTON

Plot Time: 17-Jun-18 23:39:42
Plot Range: 4550.12 ft to 4819.55 ft
Data: HERMAN_LILSPICY\Well Based*\
Plot File: \\BSAT\BSAT_5_REP_LIB

5 INCH REPEAT PASS

5 IN = 100 FT MD
REPEAT PASS





15K Tension 0
pounds

6 Caliper 16
inches

0 Gamma API 150
api

SHALE

MD
1 : 240
ft

ITTT

140 DT 40
microsec per ft

30 Acou Porosity -10
percent

HALLIBURTON

Plot Time: 17-Jun-18 23:39:43
Plot Range: 4550.12 ft to 4819.55 ft
Data: HERMAN_LILSPICY\Well Based*\
Plot File: \\BSAT\BSAT_5_REP_LIB

5 INCH REPEAT PASS

5 IN = 100 FT MD

5 IN = 100 FT MD
REPEAT PASS

HALLIBURTON

PARAMETERS REPORT

Depth (ft)	Tool Name	Mnemonic	Description	Value	Units
TOP					
	SHARED	BS	Bit Size	7.875	in
	SHARED	UBS	Use Bit Size instead of Caliper for all applications.	No	
	SHARED	MDBS	Mud Base	Water	
	SHARED	MDWT	Borehole Fluid Weight	9.100	ppg
	SHARED	WAGT	Weighting Agent	Natural	
	SHARED	BSAL	Borehole salinity	0.00	ppm
	SHARED	FSAL	Formation Salinity NaCl	0.00	ppm
	SHARED	KPCT	Percent K in Mud by Weight?	0.00	%
	SHARED	RMUD	Mud Resistivity	2.000	ohmm
	SHARED	TRM	Temperature of Mud	75.0	degF
	SHARED	CSD	Logging Interval is Cased?	No	
	SHARED	ICOD	AHV Casing OD	5.500	in
	SHARED	CSTR	Compressive Strength	1000.00	psia
	SHARED	ST	Surface Temperature	75.0	degF
	SHARED	TD	Total Well Depth	4820.00	ft
	SHARED	BHT	Bottom Hole Temperature	140.0	degF
	SHARED	SVTM	Navigation and Survey Master Tool	NONE	
	SHARED	AZTM	High Res Z Accelerometer Master Tool	GTET	
	SHARED	TEMM	CBM Temperature Master Tool	GTET	
	SHARED	SOCI	Source of Casing Information	Parameters	
	SHARED	MSAL	Water-base mud filtrate salinity	0.00	ppm
	Rwa / CrossPlot	XPOK	Process Crossplot?	Yes	
	Rwa / CrossPlot	FCHO	Select Source of F	Automatic	
	Rwa / CrossPlot	AFAC	Archie A factor	0.6200	
	Rwa / CrossPlot	MFAC	Archie M factor	2.1500	
	Rwa / CrossPlot	RMFR	Rmf Reference	0.10	ohmm
	Rwa / CrossPlot	TMFR	Rmf Ref Temp	75.00	degF
	Rwa / CrossPlot	RWA	Resistivity of Formation Water	0.05	ohmm
	Rwa / CrossPlot	ADP	Use Air Porosity to calculate CrossplotPhi	No	
	Rwa / CrossPlot	BHSM	Borehole Size Source Tool	Bit Size	
	Rwa / CrossPlot	ROIN	Input for RO Calculation	Rwa	
	GTET	GROK	Process Gamma Ray?	Yes	
	GTET	GEOK	Process Gamma Ray EVR?	No	
	GTET	TPOS	Tool Position for Gamma Ray Tools.	Centered	
	GTET	BHSM	Borehole Size Source Tool	Bit Size	
	BSAT	MBOK	Compute BCAS Results?	Yes	
	BSAT	FLLO	Frequency Filter Low Pass Value?	5000	Hz
	BSAT	FLHI	Frequency Filter High Pass Value?	27000	Hz
	BSAT	DTFL	Delta -T Pore Fluid	189.00	uspf
	BSAT	DTMT	Delta -T Matrix Type	User define	
	BSAT	DTMA	Delta -T Matrix	47.60	uspf

BSAT	DTSH	Delta -T Shale	100.00	uspf
BSAT	SPEQ	Acoustic Porosity Equation	Wylie	
ACRt Sonde	RTOK	Process ACRt?	Yes	
ACRt Sonde	MNSO	Minimum Tool Standoff	1.50	in
ACRt Sonde	TCS1	Temperature Correction Source	FP Lwr & FP Upr	
ACRt Sonde	TPOS	Tool Position	Centered	
ACRt Sonde	RMOP	Rmud Source	Mud Cell	
ACRt Sonde	RMIN	Minimum Resistivity for MAP	0.20	ohmm
ACRt Sonde	RMAX	Maximum Resistivity for MAP	200.00	ohmm
ACRt Sonde	THQY	Threshold Quality	0.50	
ACRt Sonde	MRFX	Fixed mud resistivity	2000	ohmm
ACRt Sonde	BHSM	Borehole Size Source Tool	Bit Size	
ACRt Sonde	MBFL	Apply Corkscrew Effect?	No	

BOTTOM

Data: HERMAN_LILSPICY\0002 GTET-BSAT-ACRT\004 17-Jun-18 22:07 Up @4821.5f **Date: 17-Jun-18 22:16:09**

HALLIBURTON

CALIBRATION REPORT

NATURAL GAMMA RAY TOOL SHOP CALIBRATION

Tool Name:	**GTET - 11013114**	**Reference Calibration Date:**	**20-May-18 14:50:21**
Engineer:	**JORGE ORLANDO PEREZ**	**Calibration Date:**	**05-Jun-18 11:57:37**
Software Version:	**WL INSITE R5.6.0 (Build 2)**	**Calibration Version:**	**1**

Calibrator Source S/N: TB-146
Calibrator API Reference:225.00 api
Equivalent Calibrator API Reference:228.9 api

Measurement	Measured	Calibrated	Units
Background	35.2	35.7	api
Background + Calibrator	260.9	264.7	api
Calibrator	225.7	228.9	api

NATURAL GAMMA RAY TOOL FIELD CALIBRATION

Tool Name:	**GTET - 11013114**	**Reference Calibration Date:**	**05-Jun-18 11:57:37**
Engineer:	**JORGE ORLANDO PEREZ**	**Calibration Date:**	**05-Jun-18 12:00:58**
Software Version:	**WL INSITE R5.6.0 (Build 2)**	**Calibration Version:**	**1**

Calibrator Source S/N: TB-146
Calibrator API Reference:225.00 api
Equivalent Calibrator API Reference:228.9 api

Field Verification	Shop	Field	Units
Background	35.7	34.1	api
Background + Calibrator	264.7	265.7	api
Calibrator	228.9	231.6	api

Shop	Field	Difference	Tolerance
228.9	231.6	-2.7	+/- 9.00

ARRAY COMPENSATED TRUE RESISTIVITY SHOP CALIBRATION

Tool Name:	**ACRt Sonde - 12109515**	**Reference Calibration Date:**	**06-Jun-18 10:26:27**
Engineer:	**JORGE ORLANDO PEREZ**	**Calibration Date:**	**06-Jun-18 10:38:36**
Software Version:	**WL INSITE R5.6.3 (Build 4)**	**Calibration Version:**	**1**
Host Tool Name:	**ACRt Instrument - 12109517**		

TYPICAL GAIN RANGE

Subarray	R12KHz			R36KHz			R72KHz		
	Lower	(mmho/m)	Upper	Lower	(mmho/m)	Upper	Lower	(mmho/m)	Upper
A1 (80")	0.95	1.0437	1.05	0.95	1.0237	1.05	0.95	1.0174	1.05
A2 (50")	0.95	1.0457	1.05	0.95	1.0299	1.05	0.95	1.0276	1.05
A3 (29")	0.95	1.0363	1.05	0.95	1.0179	1.05	0.95	1.0133	1.05
A4 (17")	0.95	1.0304	1.05	0.95	1.0114	1.05	0.95	1.0081	1.05
A5 (10")	N/A	N/A	N/A	0.95	1.0117	1.05	0.95	1.0066	1.05
A6 (6")	N/A	N/A	N/A	0.95	0.9910	1.05	0.95	0.9865	1.05

SONDE OFFSET

Subarray	R12KHz	R36KHz	R72KHz
	(mmho/m)	(mmho/m)	(mmho/m)
A1 (80")	0.991	-4.535	-5.661
A2 (50")	-0.134	-3.921	-4.995
A3 (29")	-13.787	-4.734	-3.442
A4 (17")	-110.417	-33.771	-25.565
A5 (10")	N/A	-91.375	-40.562
A6 (6")	N/A	301.031	154.231

TRANSMITTER CURRENT GAIN

Signal	Lower	R	Upper
12K	0.6	0.94	1.3
36K	1.0	1.91	2.0
72K	1.0	1.17	2.0

R-MUD VERIFICATION

Signal	Lower (ohm-m)	Measured (ohm-m)	Upper (ohm-m)
Mud Cell	0.95	1.00	1.05

PASS/FAIL SUMMARY

GAIN RANGE CHK	PASS
SONDE OFFSET CHK	PASS

TOOL OK TO LOG

QUALITY CHECK SHOP CALIBRATION

Tool Name: ACRt Sonde - 12109515
Engineer: JORGE ORLANDO PEREZ
Software Version: WL INSITE R5.0.5 (Build 8)
Host Tool Name: ACRt Instrument - 12109517
Reference Calibration Date: 24-Jan-18 15:49:50
Calibration Date: 24-Jan-18 15:51:29
Calibration Version: 1

STANDARD DEVIATIONS

	R12KHz			R36KHz			R72KHz		
	Measured (mmho/m)	Expected (mmho/m)	Pass/Fail	Measured (mmho/m)	Expected (mmho/m)	Pass/Fail	Measured (mmho/m)	Expected (mmho/m)	Pass/Fail
A1 (80")	0.000	< 0.750	Pass	0.000	< 0.750	Pass	0.000	< 0.750	Pass
A2 (50")	0.000	< 0.750	Pass	0.000	< 0.750	Pass	0.000	< 0.750	Pass
A3 (29")	0.000	< 0.750	Pass	0.000	< 0.750	Pass	0.000	< 0.750	Pass
A4 (17")	0.000	< 0.750	Pass	0.000	< 0.750	Pass	0.000	< 0.750	Pass
A5 (10")	0.000	< 0.750	Pass	0.000	< 0.750	Pass	0.000	< 0.750	Pass
A6 (6")	0.000	< 0.750	Pass	0.000	< 0.750	Pass	0.000	< 0.750	Pass

AVERAGES

	R12KHz			R36KHz			R72KHz		
	Measured (mmho/m)	Expected (mmho/m)	Pass/Fail	Measured (mmho/m)	Expected (mmho/m)	Pass/Fail	Measured (mmho/m)	Expected (mmho/m)	Pass/Fail
A1 (80")	0.000	< 0.500	Pass	-0.001	> -0.500	Pass	-0.006	> -0.500	Pass
A2 (50")	0.000	< 0.500	Pass	-0.001	> -0.500	Pass	-0.005	> -0.500	Pass
A3 (29")	-0.000	< 0.500	Pass	-0.001	> -0.500	Pass	-0.003	> -0.500	Pass

A4 (17")	-0.003	> -0.500	Pass	-0.008	> -0.500	Pass	-0.025	> -0.500	Pass
A5 (10")	-0.012	> -0.500	Pass	-0.020	> -0.500	Pass	-0.039	> -0.500	Pass
A6 (6")	0.015	< 0.500	Pass	0.066	< 0.500	Pass	0.142	< 0.500	Pass

GAIN TOLERANCE

R12KHz

	Measured (mmho/m)	Last Month (mmho/m)	Difference (mmho/m)	Tolerance (mmho/m)	Pass/Fail
A1 (80")	-212937552.000	-212930784.000	6768.000	10646539.200	Pass
A2 (50")	-215821408.000	-215814672.000	6736.000	10790733.600	Pass
A3 (29")	-207997936.000	-207993888.000	4048.000	10399694.400	Pass
A4 (17")	-207024272.000	-207028528.000	4256.000	10351426.400	Pass
A5 (10")	-203413312.000	-203419824.000	6512.000	10170991.200	Pass
A6 (6")	-208626032.000	-208627520.000	1488.000	10431376.000	Pass

R36KHz

	Measured (mmho/m)	Last Month (mmho/m)	Difference (mmho/m)	Tolerance (mmho/m)	Pass/Fail
A1 (80")	57867232.000	57860088.000	7144.000	2893004.400	Pass
A2 (50")	54087984.000	54076796.000	11188.000	2703839.800	Pass
A3 (29")	46700524.000	46693664.000	6860.000	2334683.200	Pass
A4 (17")	36192728.000	36188108.000	4620.000	1809405.400	Pass
A5 (10")	31710086.000	31707590.000	2496.000	1585379.500	Pass
A6 (6")	36852412.000	36847564.000	4848.000	1842378.200	Pass

R72KHz

	Measured (mmho/m)	Last Month (mmho/m)	Difference (mmho/m)	Tolerance (mmho/m)	Pass/Fail
A1 (80")	-90781944.000	-90778688.000	3256.000	4538934.400	Pass
A2 (50")	-87606936.000	-87604240.000	2696.000	4380212.000	Pass
A3 (29")	-85428592.000	-85425888.000	2704.000	4271294.400	Pass
A4 (17")	-86351880.000	-86350928.000	952.000	4317546.400	Pass
A5 (10")	-87073784.000	-87072024.000	1760.000	4353601.200	Pass
A6 (6")	-86120112.000	-86115560.000	4552.000	4305778.000	Pass

PASS/FAIL SUMMARY

Std Deviation Verification	Pass
Average Verification	Pass
Gain Tolerance Verification	Pass

CALIBRATION SUMMARY

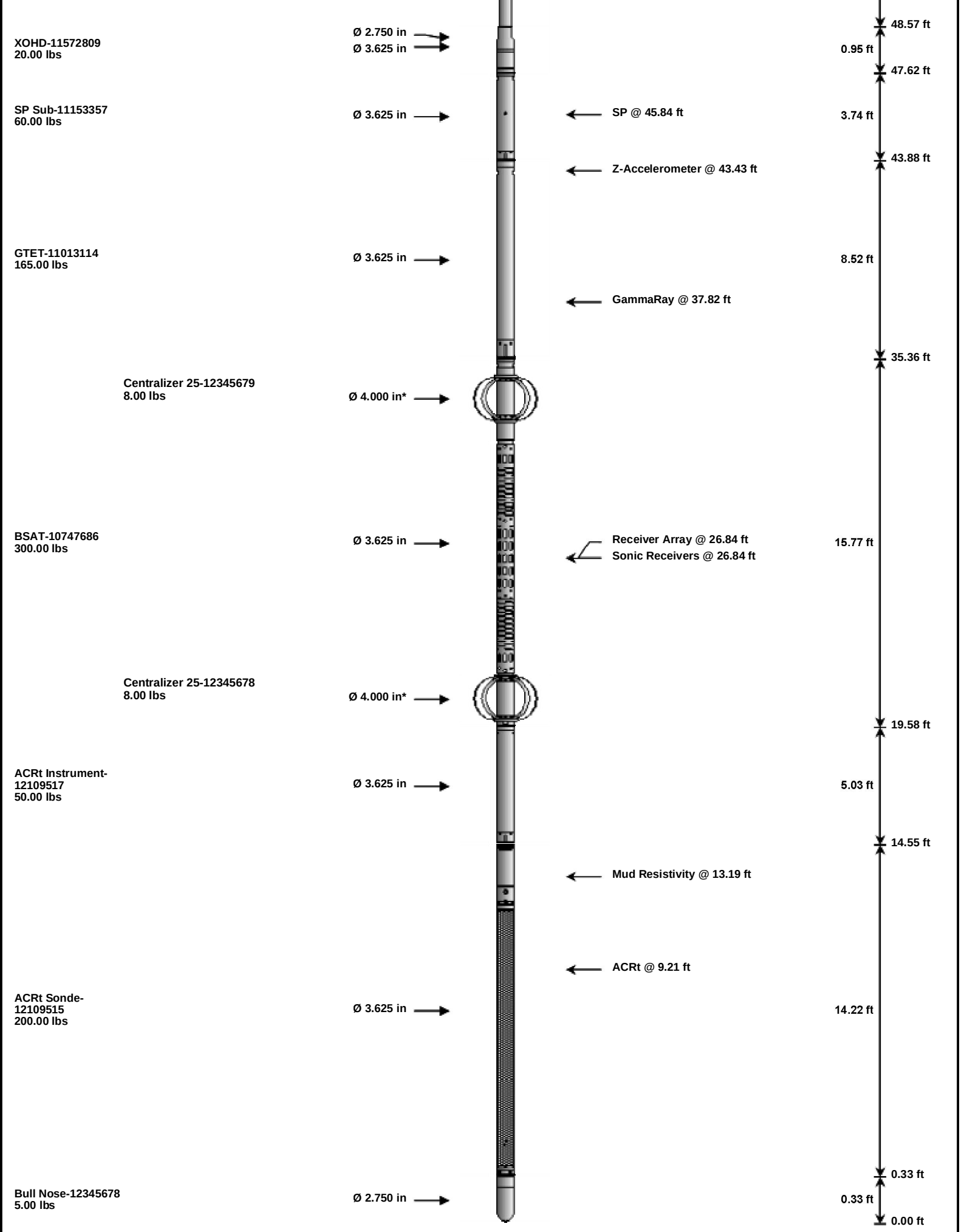
Sensor	Shop	Field	Post	Difference	Tolerance	Units
GTET-11013114						
Gamma Ray Calibrator	228.9	231.6	----------	-2.7	+/- 9.00	api
ACRt Sonde-12109515						
Mud Cell	1.00	----------	----------	0	----------	ohm-m

Data: HERMAN_LILSPICY\0002 GTET-BSAT-ACRT\IDLE **Date: 17-Jun-18 22:16:45**

HALLIBURTON

TOOL STRING DIAGRAM REPORT

Description	Overbody Description	O.D.	Diagram	Sensors @ Delays	Length	Accumulated Length
CH_HOS-11459024 37.50 lbs		Ø 2.750 in		Temperature @ 50.57 ft	3.03 ft	51.60 ft



Mnemonic	Tool Name	Serial Number	Weight (lbs)	Length (ft)	Accumulated Length (ft)	Max.Log. Speed (fpm)
CH_HOS	Hostile Cable Head with Load Cell	11459024	37.50	3.03	48.57	300.00
XOHD	Hostile to Dits Cross Over	11572809	20.00	0.95	47.62	300.00
SP	SP Sub	11153357	60.00	3.74	43.88	300.00
GTET	Gamma Telemetry Tool	11013114	165.00	8.52	35.36	60.00

BSAT	Borehole Sonic Array Tool	10747686	300.00	15.77		19.58	60.00
OBCEN	Centralizer - 25 in. Overbody	12345678	8.00	2.08	*	19.75	300.00
OBCEN	Centralizer - 25 in. Overbody	12345679	8.00	2.08	*	32.61	300.00
ACRt	Array Compensated True Resistivity Instrument Section	12109517	50.00	5.03		14.55	120.00
ACRt	Array Compensated True Resistivity Sonde Section	12109515	200.00	14.22		0.33	120.00
BLNS	Bull Nose	12345678	5.00	0.33		0.00	300.00
Total			**853.50**	**51.60**			

* Not included in Total Length and Length Accumulation.

Data: HERMAN_LILSPICY\0002 GTET-BSAT-ACRT\004 17-Jun-18 22:07 Up @4821.5f **Date: 17-Jun-18 22:14:35**

COMPANY	**HERMAN L. LOEB LLC**
WELL	**LIL SPICY 1-16**
FIELD	**WILDCAT**
COUNTY	**KIOWA** STATE **KANSAS**

HALLIBURTON

BOREHOLE COMPENSATED SONIC ARRAY LOG