Appendix A: Bandwidth

1 Result Table

1.1 Emission Bandwidth (6 dB)

EUT Conf.	FCC&IC Emission Bandwidth (6 dB) [MHz]	FCC&IC Emission Bandwidth (6 dB) Limit	Verdict
QPSK-B	176.28	---	---
QPSK-M	173.08	---	---
QPSK-T	175.48	---	---
16QAM-B	174.68	---	---
16QAM-M	172.28	---	---
16QAM-T	175.48	---	---
32QAM-B	173.88	---	---
32QAM-M	156.25	---	---
32QAM-T	165.87	---	---

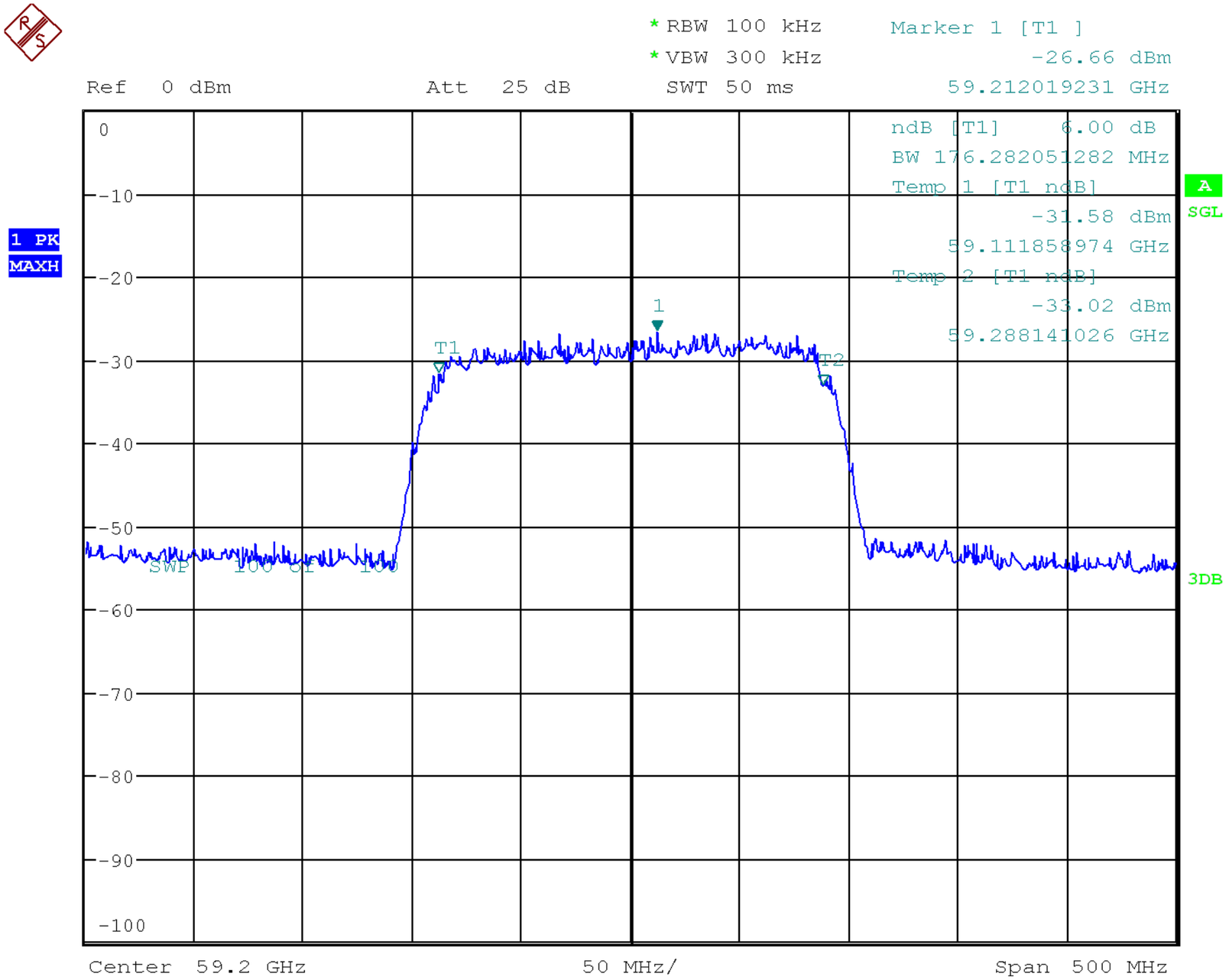
1.2 Occupied Bandwidth (99 %)

(Not applicable)

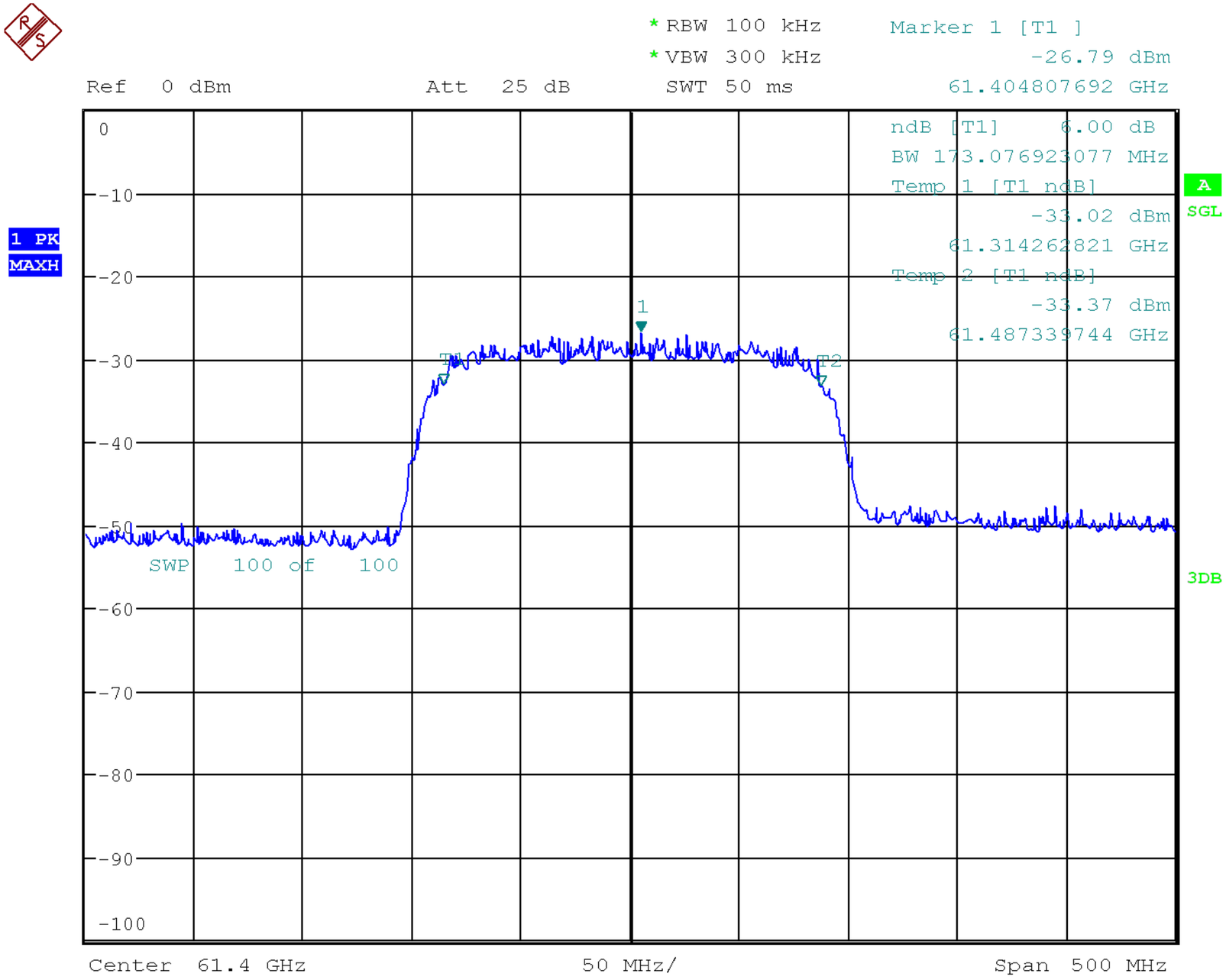
2 Test Plot

2.1 Emission Bandwidth (6 dB)

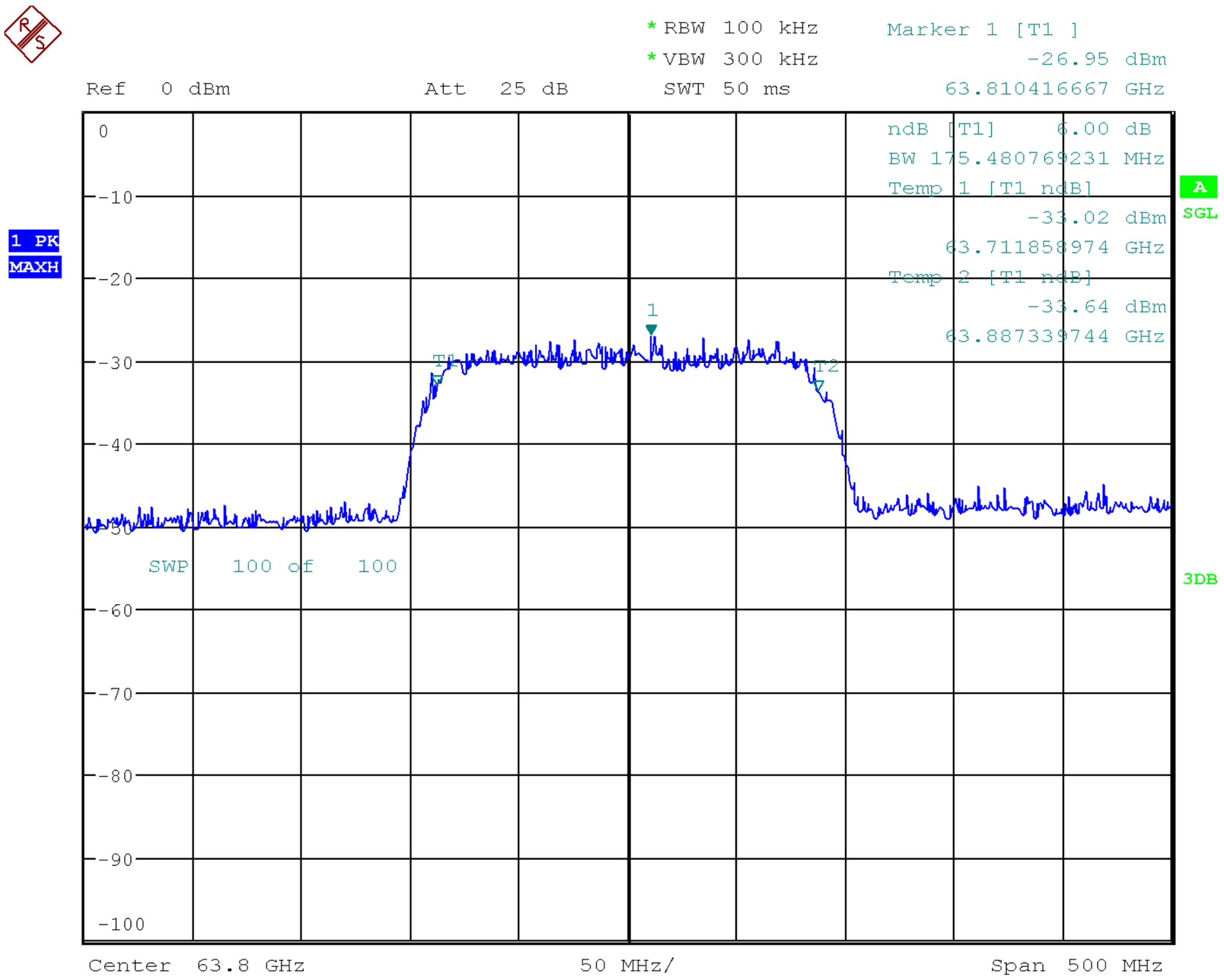
2.1.1 QPSK-B



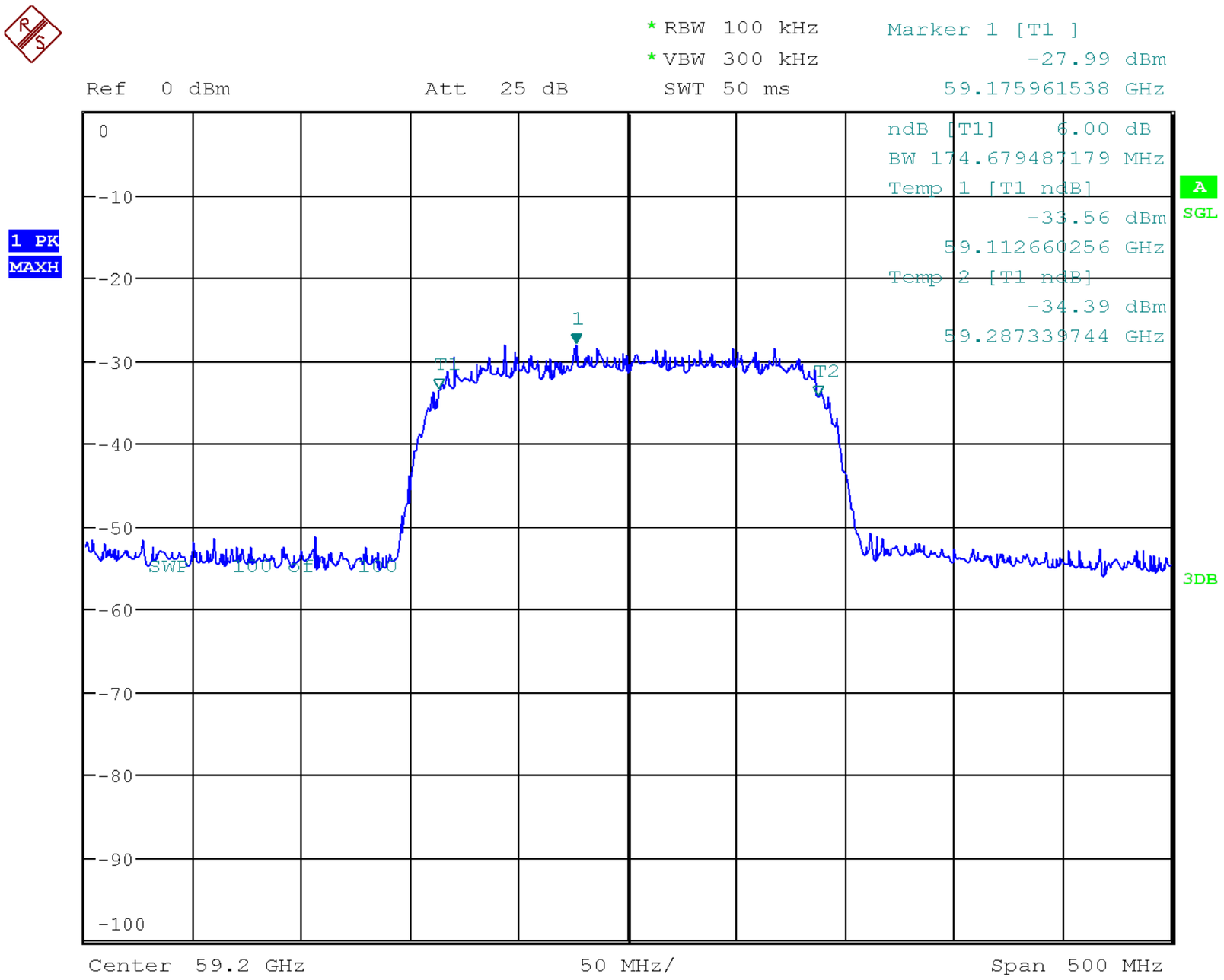
2.1.2 QPSK-M



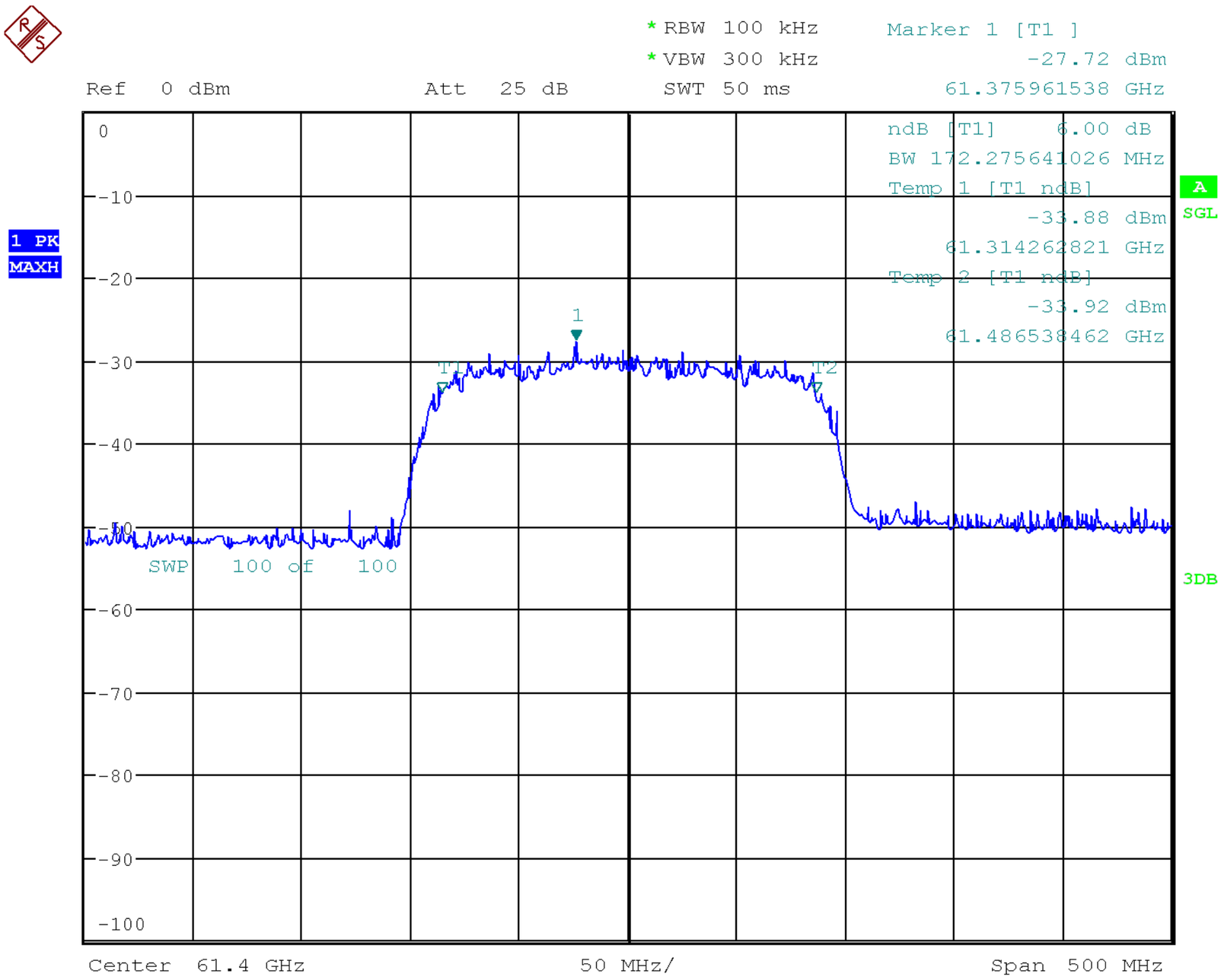
2.1.3 QPSK-T



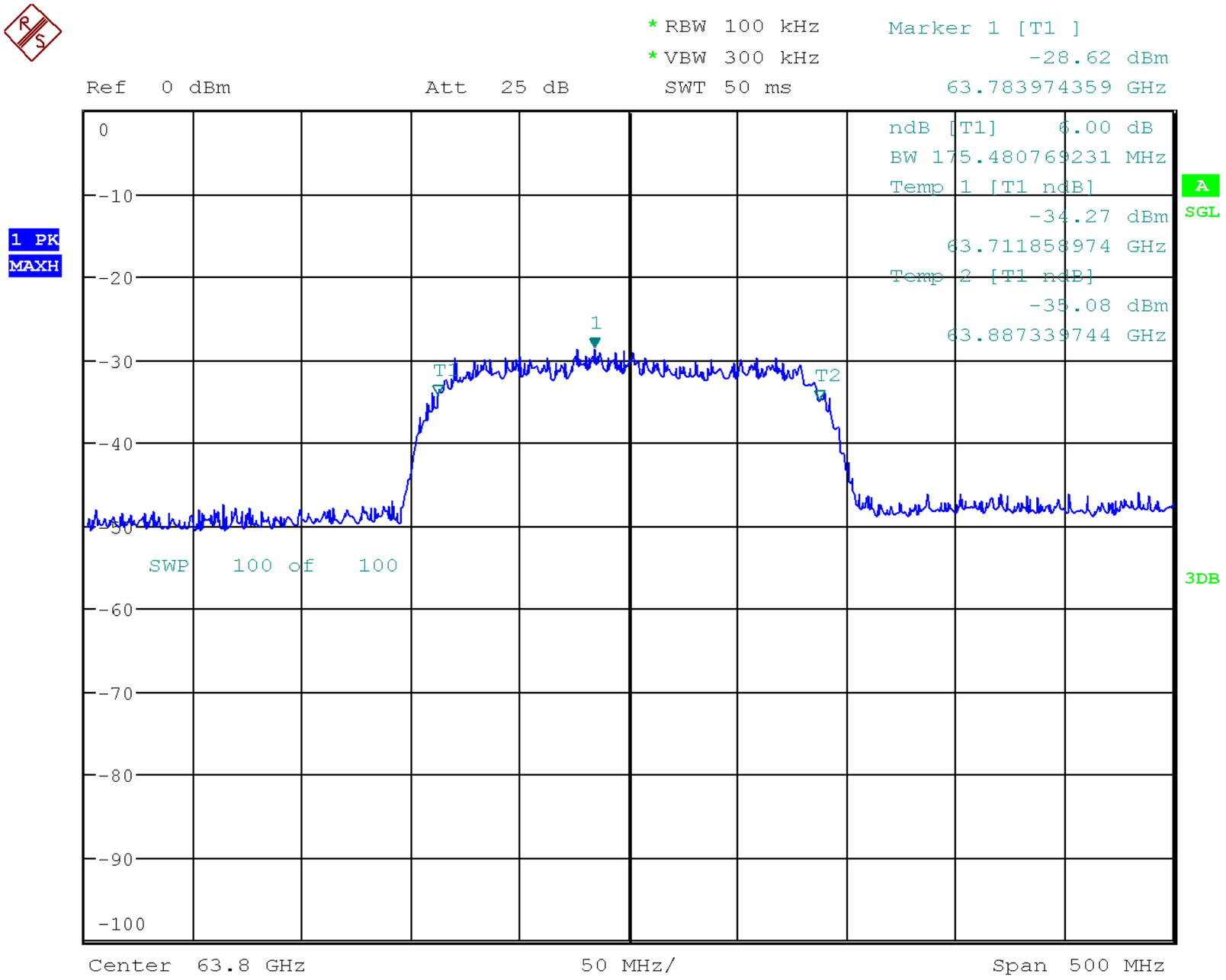
2.1.4 16QAM-B



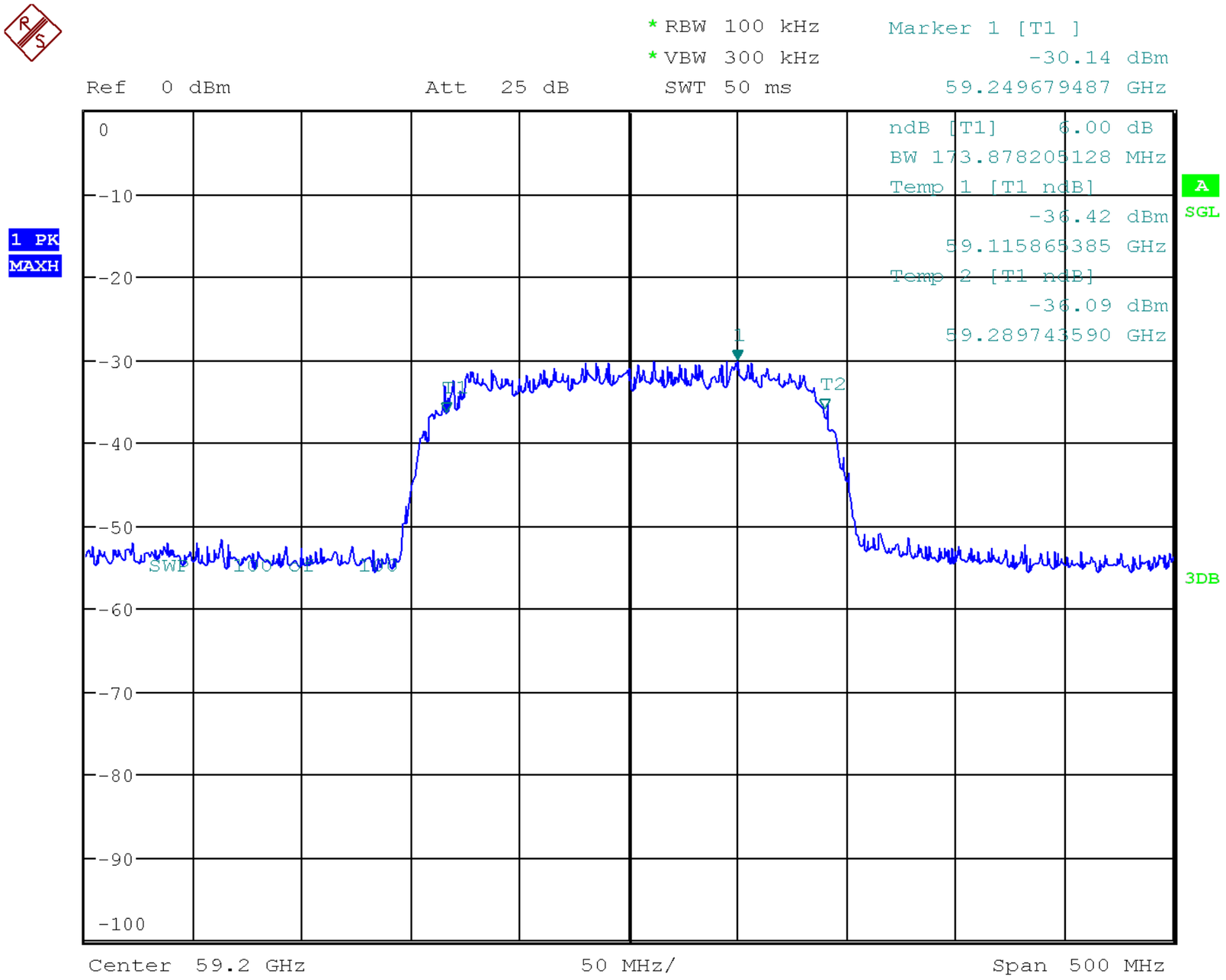
2.1.5 16QAM-M



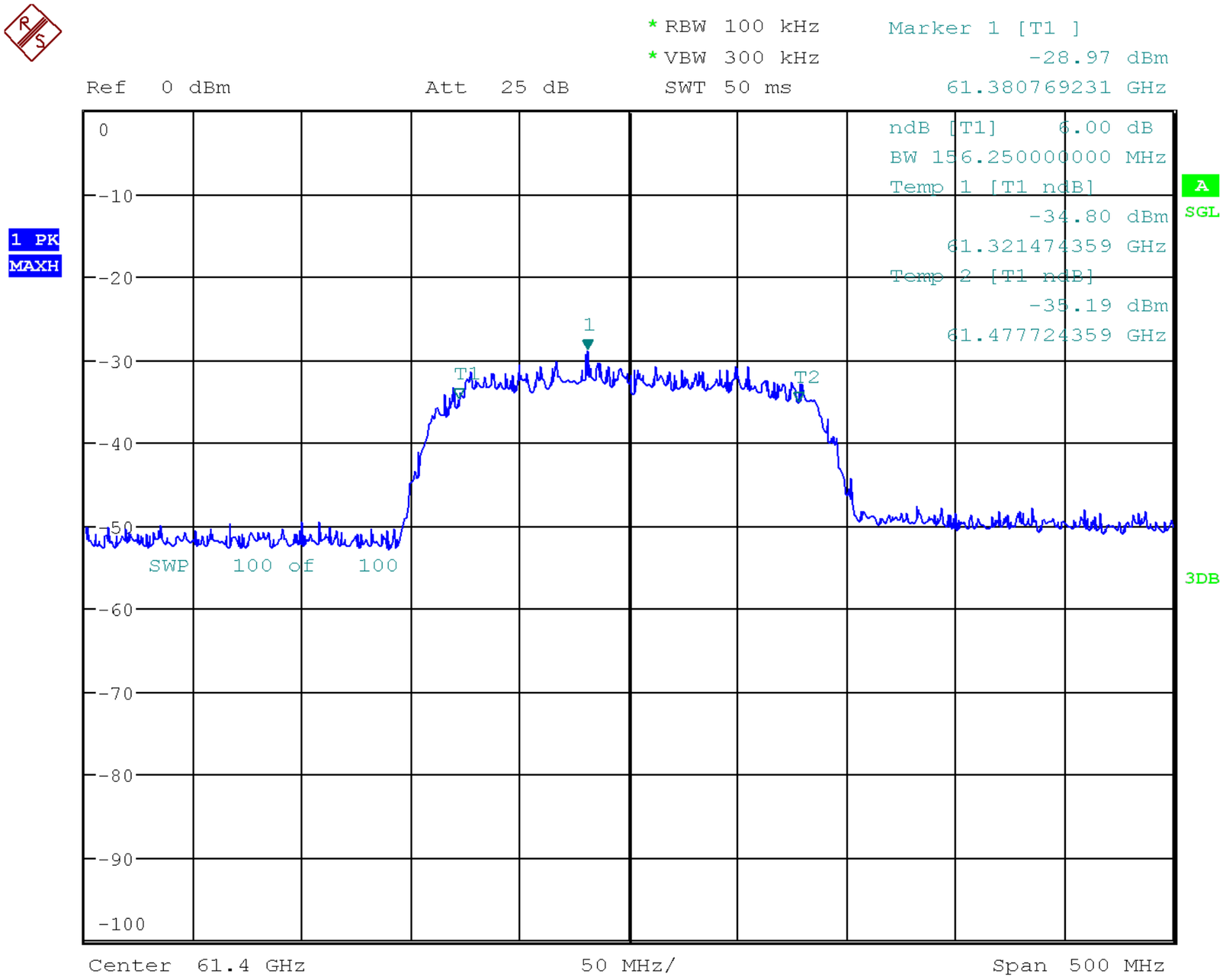
2.1.6 16QAM-T



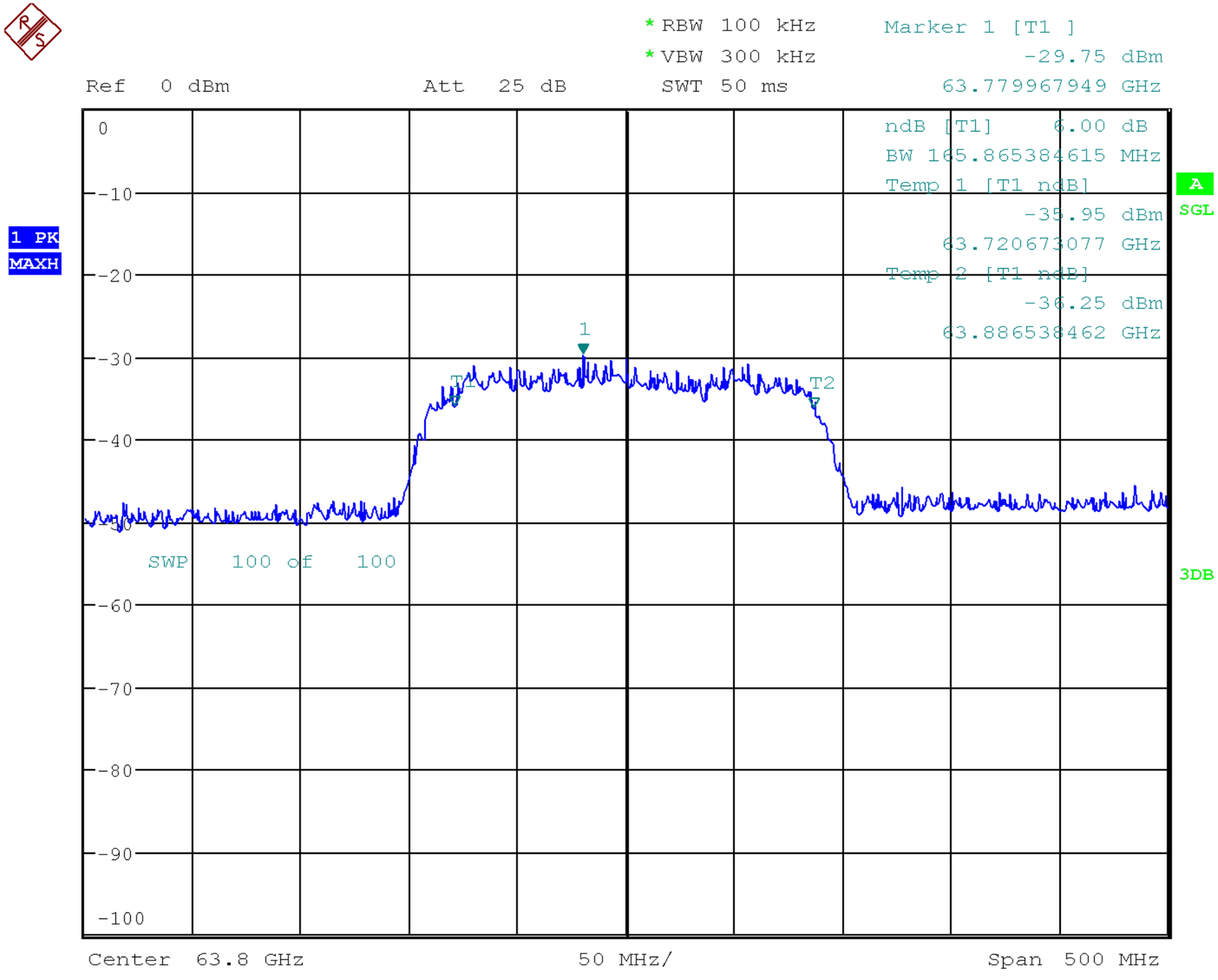
2.1.7 32QAM-B



2.1.8 32QAM-M



2.1.9 32QAM-T



2.2 Occupied Bandwidth (99 %)

(Not applicable)

Appendix B: In-Band Emission

EUT Conf.	FCC&IC Average conducted output power [dBm]	FCC&IC Peak conducted output power [dBm]	FCC&IC Peak conducted output power, limit	G [dBi]	FCC Average EIRP power [dBm]	FCC Peak EIRP power [dBm]	IC Average power density @ 3m [μW/cm^2]	IC Peak power density @ 3m [μW/cm^2]	FCC Average EIRP power / IC Average power density @ 3m, limit	FCC Peak EIRP power / IC Peak power density @ 3m, limit	Verdict
QPSK-B	3.43	7.74	≤ 500 mW (= 27 dBm)	34.5	37.93	42.24	---	---	≤ 48 dBm / ---	≤ 51 dBm / ---	Pass
QPSK-M	4.08	8.79	≤ 500 mW (= 27 dBm)	34.5	38.58	43.29	---	---	≤ 48 dBm / ---	≤ 51 dBm / ---	Pass
QPSK-T	3.23	8.32	≤ 500 mW (= 27 dBm)	34.5	37.73	42.82	---	---	≤ 48 dBm / ---	≤ 51 dBm / ---	Pass
16QAM-B	1.91	7.68	≤ 500 mW (= 27 dBm)	34.5	36.41	42.18	---	---	≤ 48 dBm / ---	≤ 51 dBm / ---	Pass
16QAM-M	2.39	8.5	≤ 500 mW (= 27 dBm)	34.5	36.89	43	---	---	≤ 48 dBm / ---	≤ 51 dBm / ---	Pass
16QAM-T	1.59	8.16	≤ 500 mW (= 27 dBm)	34.5	36.09	42.66	---	---	≤ 48 dBm / ---	≤ 51 dBm / ---	Pass
32QAM-B	-0.32	6.02	≤ 500 mW (= 27 dBm)	34.5	34.18	40.52	---	---	≤ 48 dBm / ---	≤ 51 dBm / ---	Pass
32QAM-M	0.16	6.93	≤ 500 mW (= 27 dBm)	34.5	34.66	41.43	---	---	≤ 48 dBm / ---	≤ 51 dBm / ---	Pass
32QAM-T	-0.37	6.66	≤ 500 mW (= 27 dBm)	34.5	34.13	41.16	---	---	≤ 48 dBm / ---	≤ 51 dBm / ---	Pass

Appendix C: Spurious Emissions

1 Result Table

Test Range	EUT Conf.	FCC&IC Spurious Emissions	Measurement distance	FCC&IC Spurious Emissions, Limit	Verdict
9 kHz to 30 MHz	Worst Case (QPSK-M)	< Limit	As specified	§15.209 / RSS-Gen general limit	Pass
30 MHz to 1 GHz	Worst Case (QPSK-M)	< Limit	As specified	§15.209 / RSS-Gen general limit	Pass
1 GHz to 18 GHz	Worst Case (QPSK-M)	< Limit	As specified	§15.209 / RSS-Gen general limit	Pass
18 GHz to 26.5 GHz	Worst Case (QPSK-M)	< Limit	As specified	§15.209 / RSS-Gen general limit	Pass
26.5 GHz to 40 GHz	Worst Case (QPSK-M)	< Limit	1 m	§15.209 / RSS-Gen general limit	Pass
40 GHz to 50 GHz	Worst Case (QPSK-M)	< Limit	3 m	≤ 90 pW/cm^2 @ 3m (= -10 dBm EIRP)	Pass
50 GHz to 75 GHz	Worst Case (QPSK-M)	< Limit	0.95 m	(1) 57-64GHz: fundamental emissions > spurious emissions (2) Other ranges: ≤ 90 pW/cm^2 @ 3m (= -10 dBm EIRP)	Pass
75 GHz to 110 GHz	Worst Case (QPSK-M)	< Limit	0.38 m	≤ 90 pW/cm^2 @ 3m (= -10 dBm EIRP)	Pass
110 GHz to140 GHz	Worst Case (QPSK-M)	< Limit	0.34 m	≤ 90 pW/cm^2 @ 3m (= -10 dBm EIRP)	Pass
140 GHz to 200 GHz	Worst Case (QPSK-M)	< Limit	0.07 m	≤ 90 pW/cm^2 @ 3m (= -10 dBm EIRP)	Pass

2 Result Plot

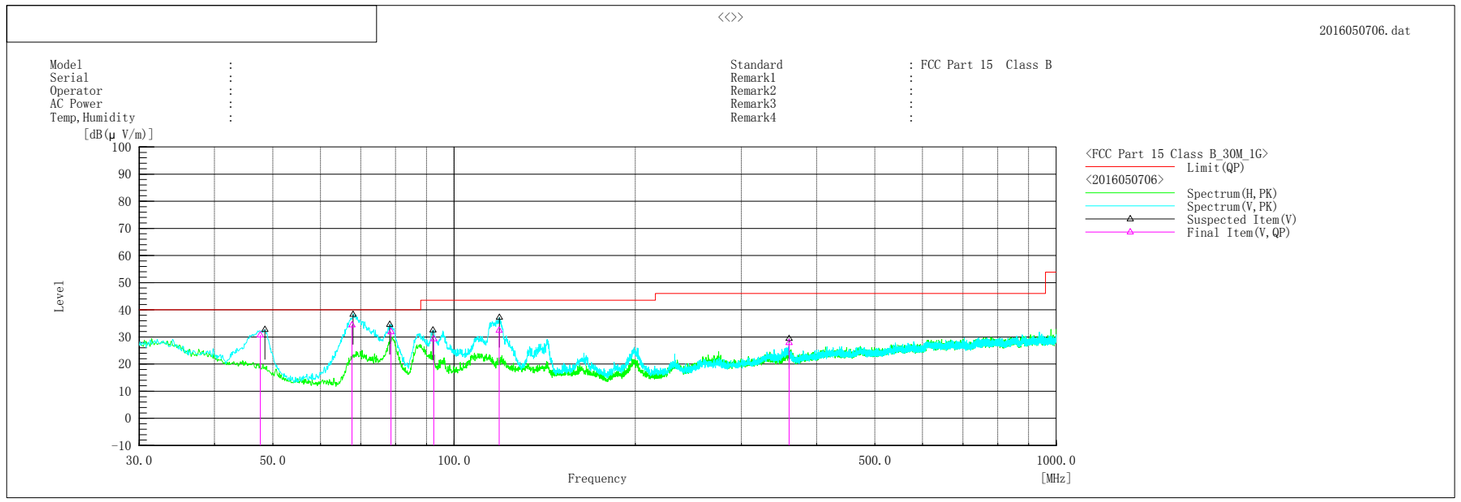
2.1 Test range of “9 kHz to 30 MHz”

2.1.1 Worst Case (QPSK-M)

(No obvious emission found)

2.2 Test range of “30 MHz to 1 GHz”

2.2.1 Worst Case (QPSK-M)



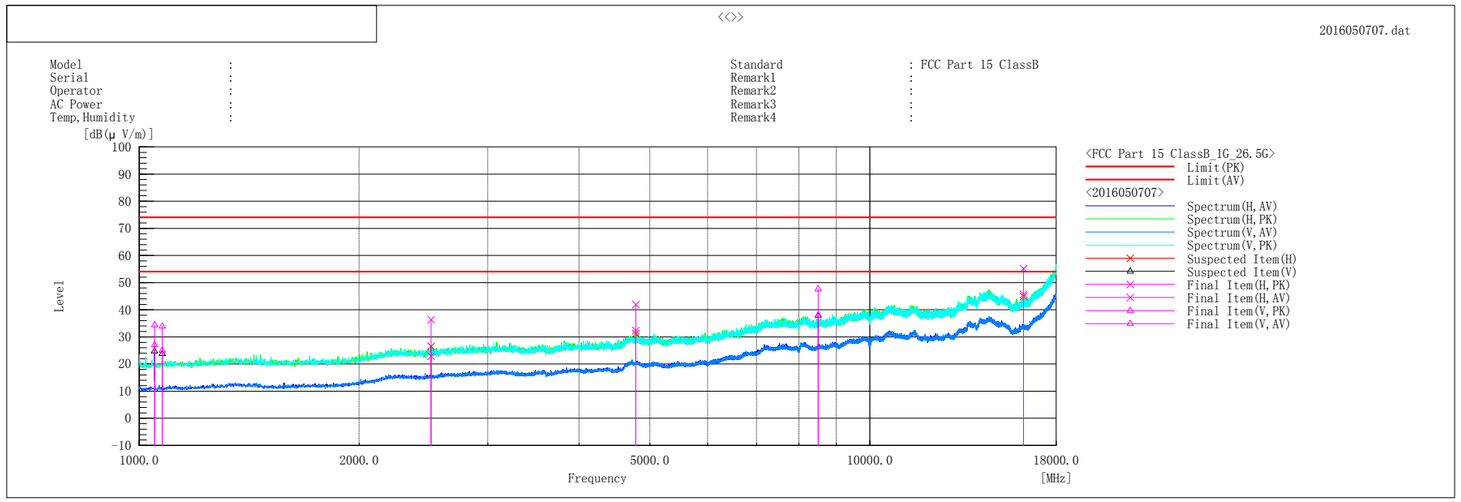
Final Result

No.	Frequency	(P)	Reading QP	c.f	Result QP	Limit QP	Margin QP	Height	Angle	Remark
	[MHz]		[dB(μV)]	[dB(1/m)]	[dB(μV/m)]	[dB(μV/m)]	[dB]	[cm]	[°]	
1	47.646	V	53.8	-23.1	30.7	40.0	9.3	102.0	75.0	
2	67.693	V	60.7	-26.4	34.3	40.0	5.7	139.0	85.0	
3	78.536	V	57.0	-25.1	31.9	40.0	8.1	174.0	88.0	
4	92.504	V	51.3	-22.1	29.2	43.5	14.3	115.0	217.0	
5	118.837	V	52.3	-19.9	32.4	43.5	11.1	100.0	108.0	
6	360.002	V	43.5	-15.6	27.9	46.0	18.1	101.0	210.0	

2.3 Test range of “1 GHz to 18 GHz”

2.3.1 Worst Case (QPSK-M)

.



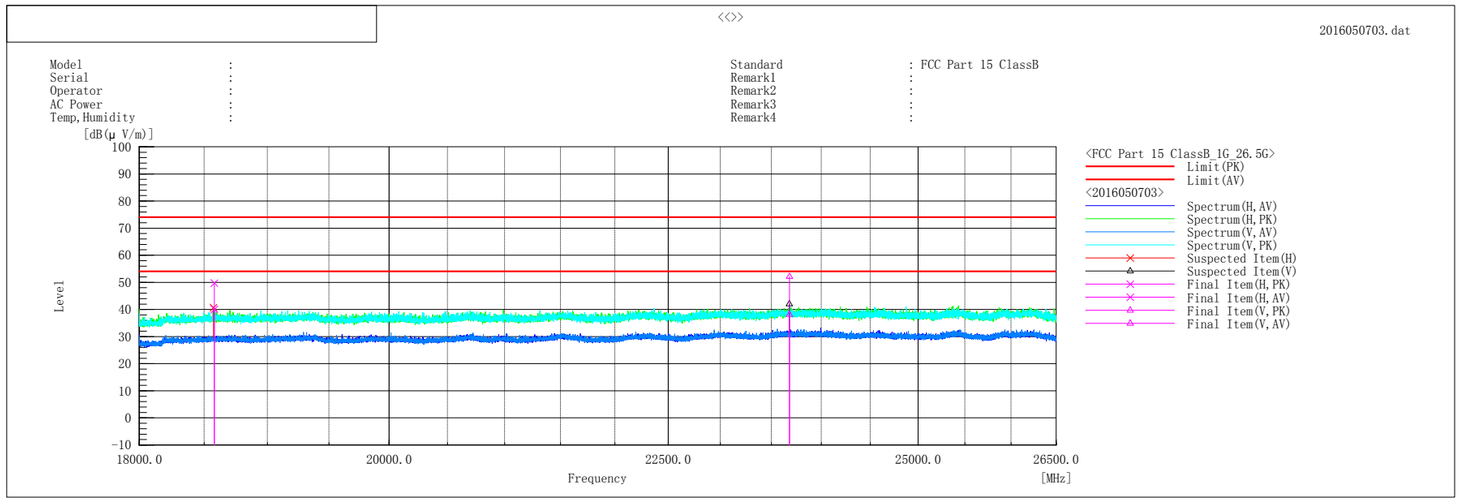
Final Result

No.	Frequency [MHz]	(P)	Reading PK [dB(μV)]	Reading AV [dB(μV)]	c.f [dB(1/m)]	Result PK [dB(μV/m)]	Result AV [dB(μV/m)]	Limit PK [dB(μV/m)]	Limit AV [dB(μV/m)]	Margin PK [dB]	Margin AV [dB]	Height [cm]	Angle [°]	Remark
1	1049.992	V	47.9	40.5	-13.5	34.4	27.0	74.0	54.0	39.6	27.0	202.0	160.0	
2	1075.189	V	47.4	38.5	-13.5	33.9	25.0	74.0	54.0	40.1	29.0	207.0	147.0	
3	2509.453	H	45.1	31.6	-8.7	36.4	22.9	74.0	54.0	37.6	31.1	109.0	18.0	
4	4781.894	H	45.8	36.2	-3.8	42.0	32.4	74.0	54.0	32.0	21.6	111.0	40.0	
5	8500.421	V	43.8	34.1	3.8	47.6	38.0	74.0	54.0	26.4	16.0	130.0	51.0	
6	16238.094	H	43.5	34.0	11.7	55.2	45.7	74.0	54.0	18.8	8.3	119.0	208.0	

2.4 Test range of “18 GHz to 26.5 GHz”

2.4.1 Worst Case (QPSK-M)

.



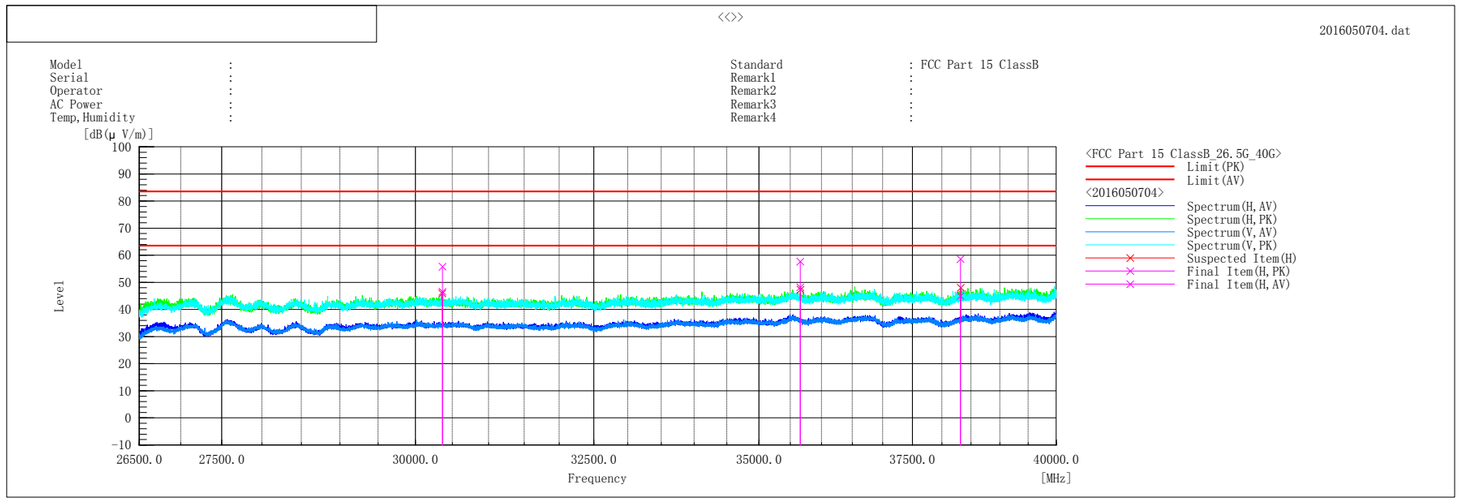
Final Result

No.	Frequency [MHz]	(P)	Reading PK [dB(μV)]	Reading AV [dB(μV)]	c.f [dB(1/m)]	Result PK [dB(μV/m)]	Result AV [dB(μV/m)]	Limit PK [dB(μV/m)]	Limit AV [dB(μV/m)]	Margin PK [dB]	Margin AV [dB]	Height [cm]	Angle [°]	Remark
1	18578.510	H	53.0	43.3	-3.2	49.8	40.1	74.0	54.0	24.2	13.9	101.0	145.0	
2	23679.780	V	52.3	38.4	-0.2	52.1	38.2	74.0	54.0	21.9	15.8	194.0	272.0	

2.5 Test range of “26.5 GHz to 40 GHz”

2.5.1 Worst Case (QPSK-M)

.

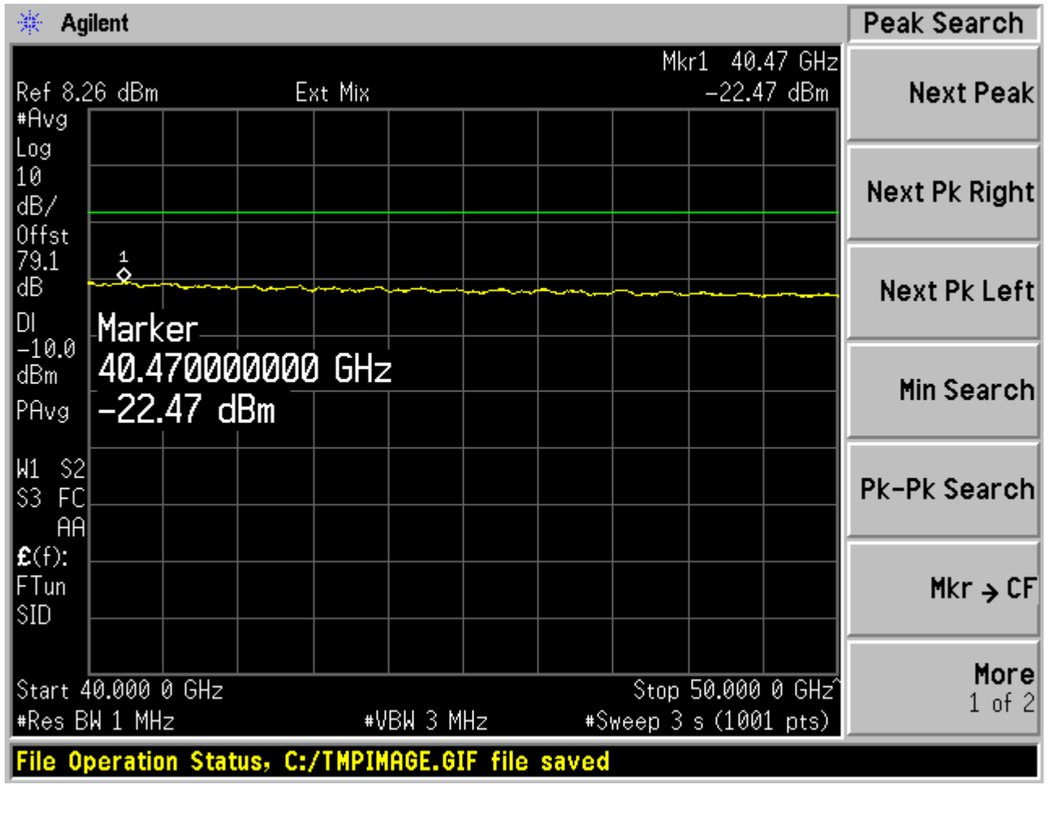


Final Result

No.	Frequency [MHz]	(P)	Reading PK [dB(μV)]	Reading AV [dB(μV)]	c.f [dB(1/m)]	Result PK [dB(μV/m)]	Result AV [dB(μV/m)]	Limit PK [dB(μV/m)]	Limit AV [dB(μV/m)]	Margin PK [dB]	Margin AV [dB]	Height [cm]	Angle [°]	Remark
1	30365.802	H	54.1	44.9	1.7	55.8	46.6	83.5	63.5	27.7	16.9	142.0	74.0	
2	35656.676	H	54.8	45.3	2.9	57.7	48.2	83.5	63.5	25.8	15.3	129.0	353.0	
3	38317.200	H	53.8	40.2	4.8	58.6	45.0	83.5	63.5	24.9	18.5	125.0	248.0	

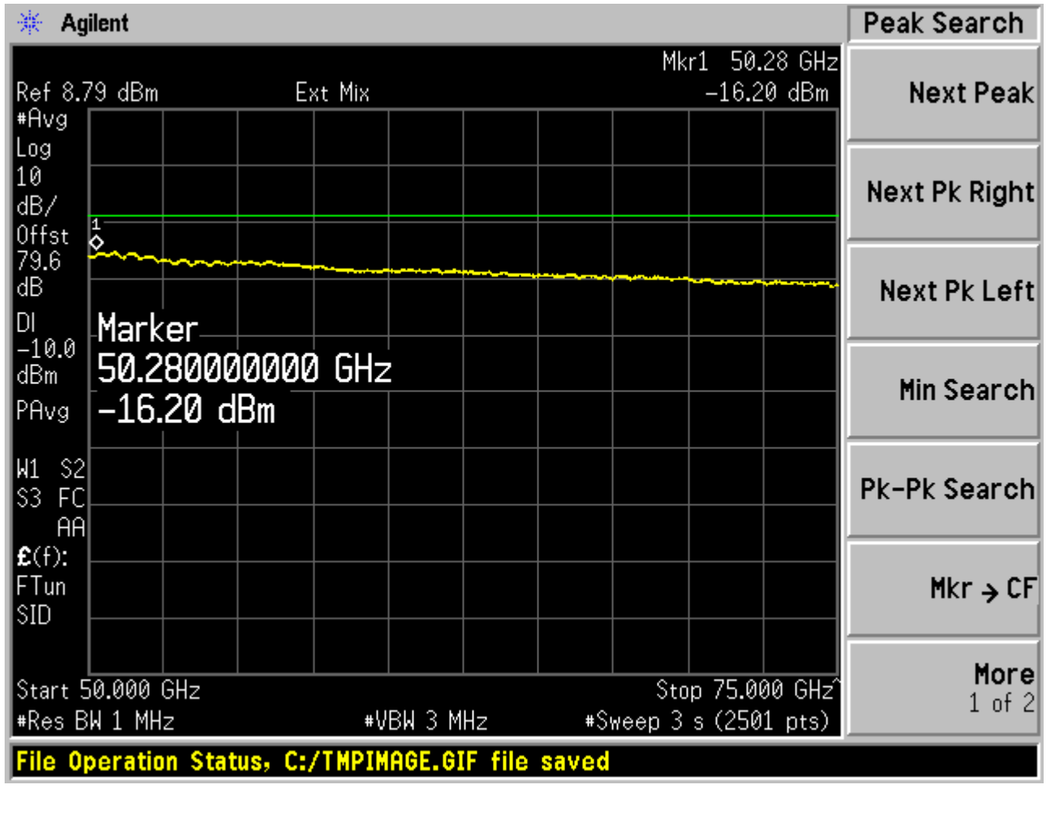
2.6 Test range of “40 GHz to 50 GHz”

2.6.1 Worst Case (QPSK-M)



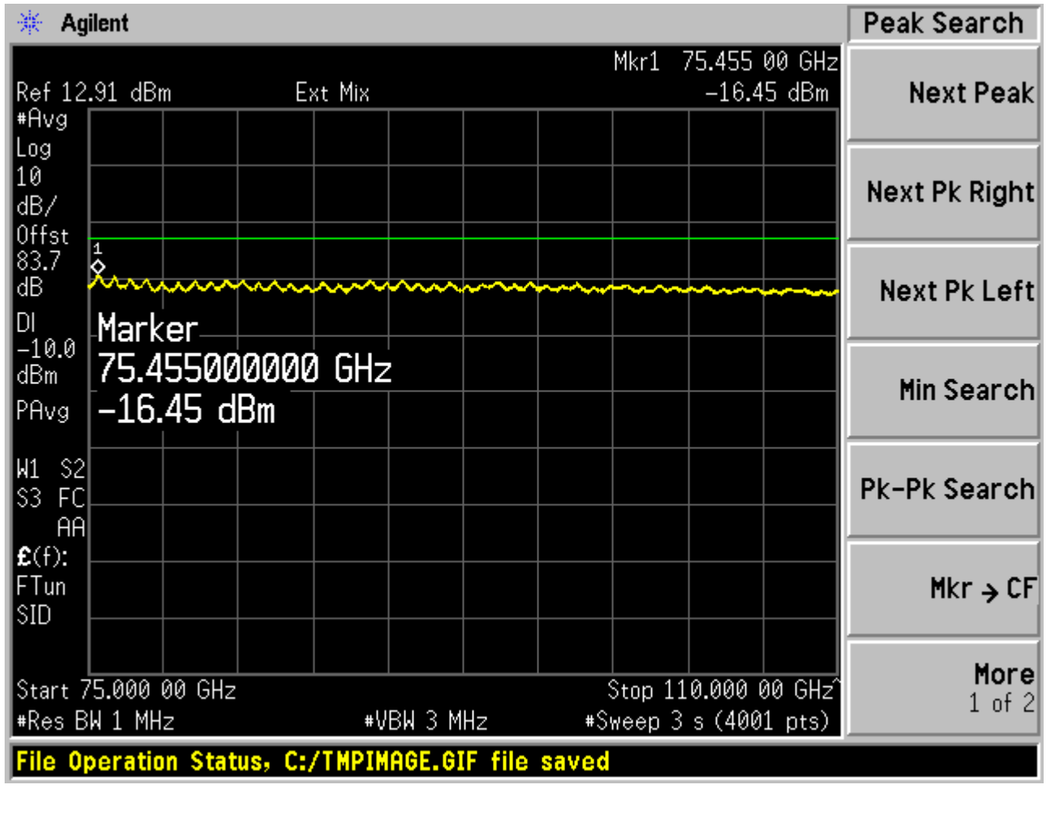
2.7 Test range of “50 GHz to 75 GHz”

2.7.1 Worst Case (QPSK-M)



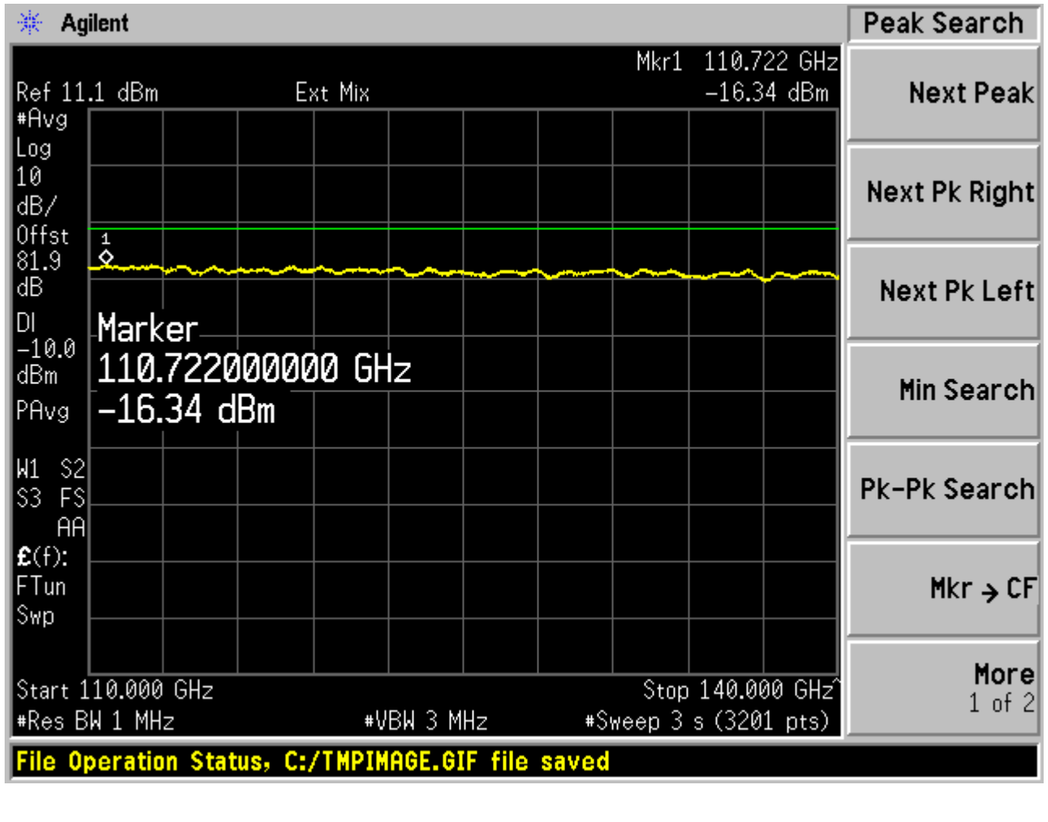
2.8 Test range of “75 GHz to 110 GHz”

2.8.1 Worst Case (QPSK-M)



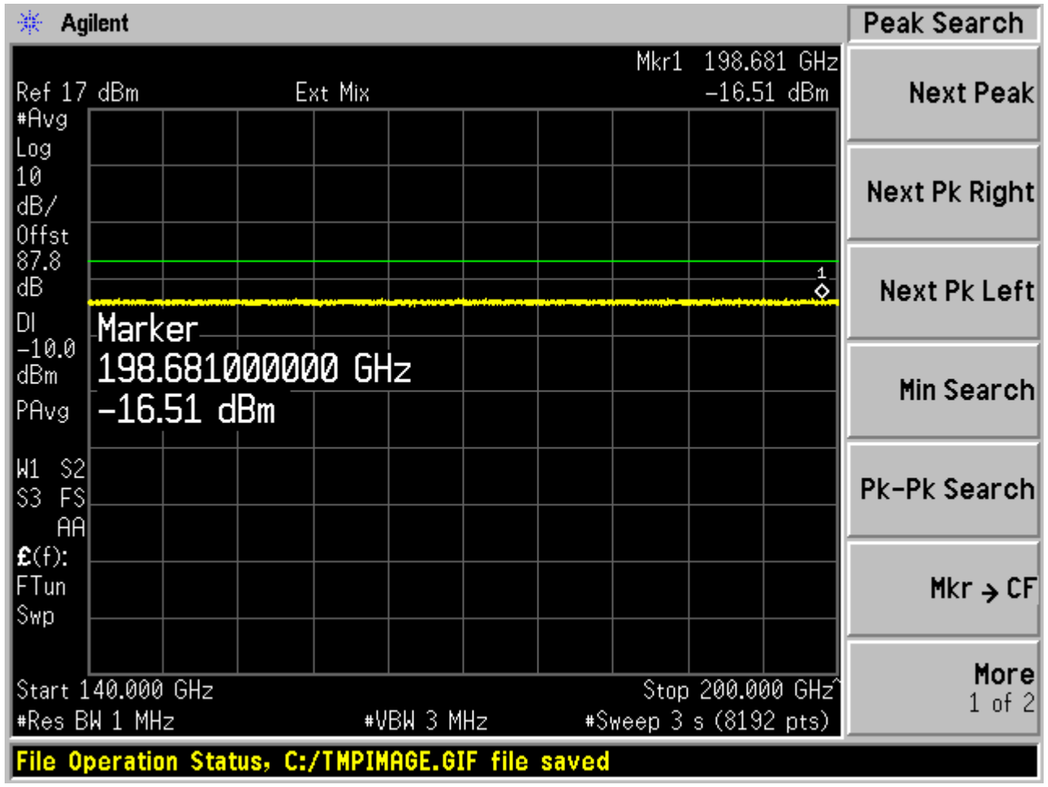
2.9 Test range of “110 GHz to 140 GHz”

2.9.1 Worst Case (QPSK-M)



2.10 Test range of “140 GHz to 200 GHz”

2.10.1 Worst Case (QPSK-M)



Appendix D: Frequency Stability

1 Result Table

1.1 FCC Requirements

EUT Conf.	Temperature	Voltage	FCC fL [GHz]	FCC fL, Limit [GHz]	FCC fH [GHz]	FCC fH, Limit [GHz]	Verdict
QPSK-B	Ambient	85 %	59.10	> 57	59.30	< 64	Pass
	Ambient	100 %	59.10	> 57	59.30	< 64	Pass
	Ambient	115 %	59.10	> 57	59.30	< 64	Pass
	-20 °C	100 %	59.10	> 57	59.30	< 64	Pass
	-10 °C	100 %	59.10	> 57	59.30	< 64	Pass
	0 °C	100 %	59.10	> 57	59.30	< 64	Pass
	+10 °C	100 %	59.10	> 57	59.30	< 64	Pass
	+20 °C	100 %	59.10	> 57	59.30	< 64	Pass
	+30 °C	100 %	59.10	> 57	59.30	< 64	Pass
	+40 °C	100 %	59.10	> 57	59.30	< 64	Pass
	+50 °C	100 %	59.10	> 57	59.30	< 64	Pass
QPSK-T	Ambient	85 %	63.70	> 57	63.90	< 64	Pass
	Ambient	100 %	63.70	> 57	63.90	< 64	Pass
	Ambient	115 %	63.70	> 57	63.90	< 64	Pass
	-20 °C	100 %	63.70	> 57	63.90	< 64	Pass
	-10 °C	100 %	63.70	> 57	63.90	< 64	Pass
	0 °C	100 %	63.70	> 57	63.90	< 64	Pass
	+10 °C	100 %	63.70	> 57	63.90	< 64	Pass
	+20 °C	100 %	63.70	> 57	63.90	< 64	Pass
	+30 °C	100 %	63.70	> 57	63.90	< 64	Pass
	+40 °C	100 %	63.70	> 57	63.90	< 64	Pass
	+50 °C	100 %	63.70	> 57	63.90	< 64	Pass
16QAM-B	Ambient	85 %	59.10	> 57	59.30	< 64	Pass
	Ambient	100 %	59.10	> 57	59.30	< 64	Pass
	Ambient	115 %	59.10	> 57	59.30	< 64	Pass
	-20 °C	100 %	59.10	> 57	59.30	< 64	Pass
	-10 °C	100 %	59.10	> 57	59.30	< 64	Pass
	0 °C	100 %	59.10	> 57	59.30	< 64	Pass
	+10 °C	100 %	59.10	> 57	59.30	< 64	Pass
	+20 °C	100 %	59.10	> 57	59.30	< 64	Pass
	+30 °C	100 %	59.10	> 57	59.30	< 64	Pass
	+40 °C	100 %	59.10	> 57	59.30	< 64	Pass
	+50 °C	100 %	59.10	> 57	59.30	< 64	Pass
16QAM-T	Ambient	85 %	63.70	> 57	63.90	< 64	Pass
	Ambient	100 %	63.70	> 57	63.90	< 64	Pass
	Ambient	115 %	63.70	> 57	63.90	< 64	Pass

EUT Conf.	Temperature	Voltage	FCC fL [GHz]	FCC fL, Limit [GHz]	FCC fH [GHz]	FCC fH, Limit [GHz]	Verdict
	-20 °C	100 %	63.70	> 57	63.90	< 64	Pass
	-10 °C	100 %	63.70	> 57	63.90	< 64	Pass
	0 °C	100 %	63.70	> 57	63.90	< 64	Pass
	+10 °C	100 %	63.70	> 57	63.90	< 64	Pass
	+20 °C	100 %	63.70	> 57	63.90	< 64	Pass
	+30 °C	100 %	63.70	> 57	63.90	< 64	Pass
	+40 °C	100 %	63.70	> 57	63.90	< 64	Pass
	+50 °C	100 %	63.70	> 57	63.90	< 64	Pass
32QAM-B	Ambient	85 %	59.10	> 57	59.30	< 64	Pass
	Ambient	100 %	59.10	> 57	59.30	< 64	Pass
	Ambient	115 %	59.10	> 57	59.30	< 64	Pass
	-20 °C	100 %	59.10	> 57	59.30	< 64	Pass
	-10 °C	100 %	59.10	> 57	59.30	< 64	Pass
	0 °C	100 %	59.10	> 57	59.30	< 64	Pass
	+10 °C	100 %	59.10	> 57	59.30	< 64	Pass
	+20 °C	100 %	59.10	> 57	59.30	< 64	Pass
	+30 °C	100 %	59.10	> 57	59.30	< 64	Pass
	+40 °C	100 %	59.10	> 57	59.30	< 64	Pass
	+50 °C	100 %	59.10	> 57	59.30	< 64	Pass
32QAM-T	Ambient	85 %	63.70	> 57	63.90	< 64	Pass
	Ambient	100 %	63.70	> 57	63.90	< 64	Pass
	Ambient	115 %	63.70	> 57	63.90	< 64	Pass
	-20 °C	100 %	63.70	> 57	63.90	< 64	Pass
	-10 °C	100 %	63.70	> 57	63.90	< 64	Pass
	0 °C	100 %	63.70	> 57	63.90	< 64	Pass
	+10 °C	100 %	63.70	> 57	63.90	< 64	Pass
	+20 °C	100 %	63.70	> 57	63.90	< 64	Pass
	+30 °C	100 %	63.70	> 57	63.90	< 64	Pass
	+40 °C	100 %	63.70	> 57	63.90	< 64	Pass
	+50 °C	100 %	63.70	> 57	63.90	< 64	Pass

1.2 IC Requirements

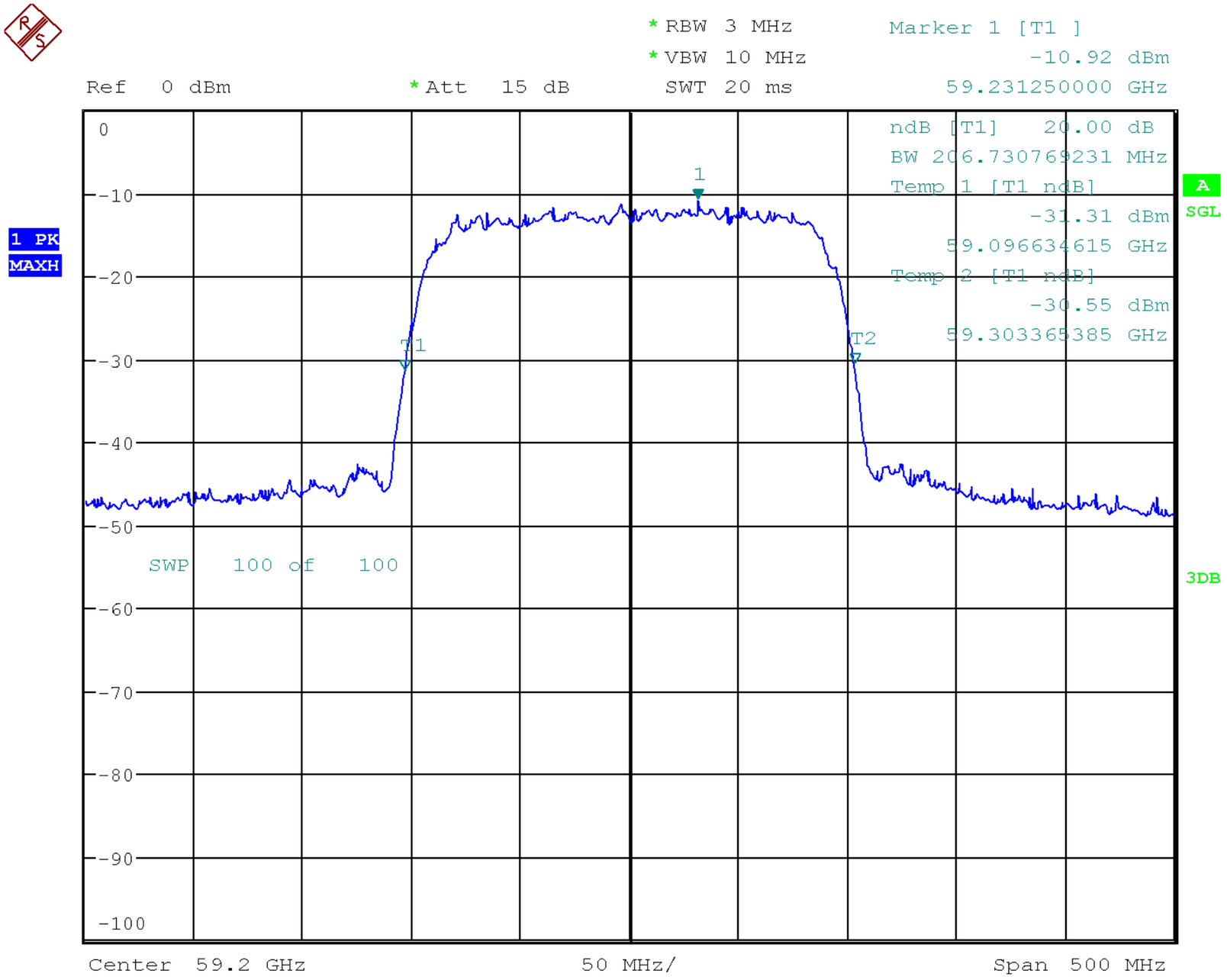
(Not applicable)

2 Test Plot

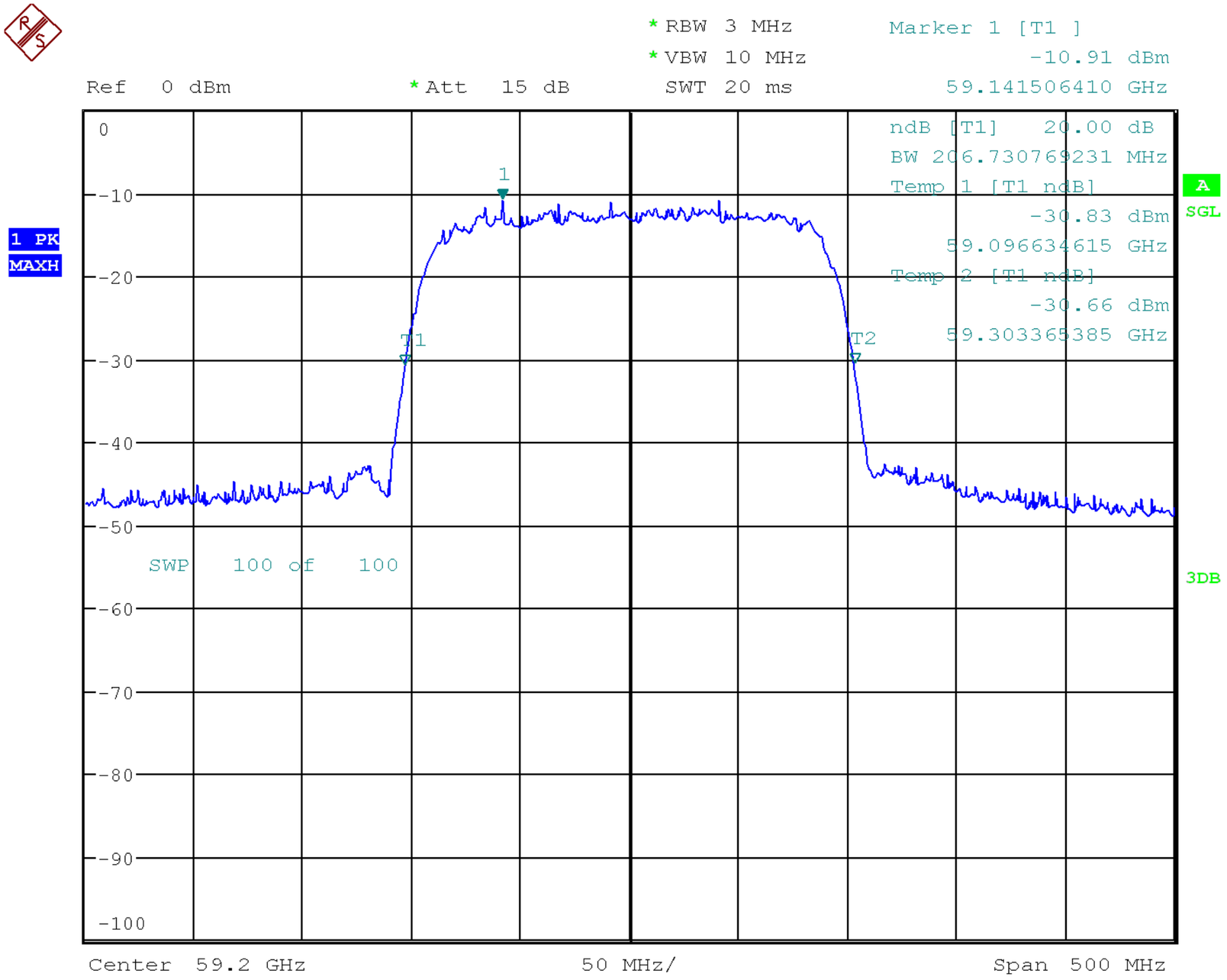
2.1 FCC Requirements

2.1.1 QPSK-B

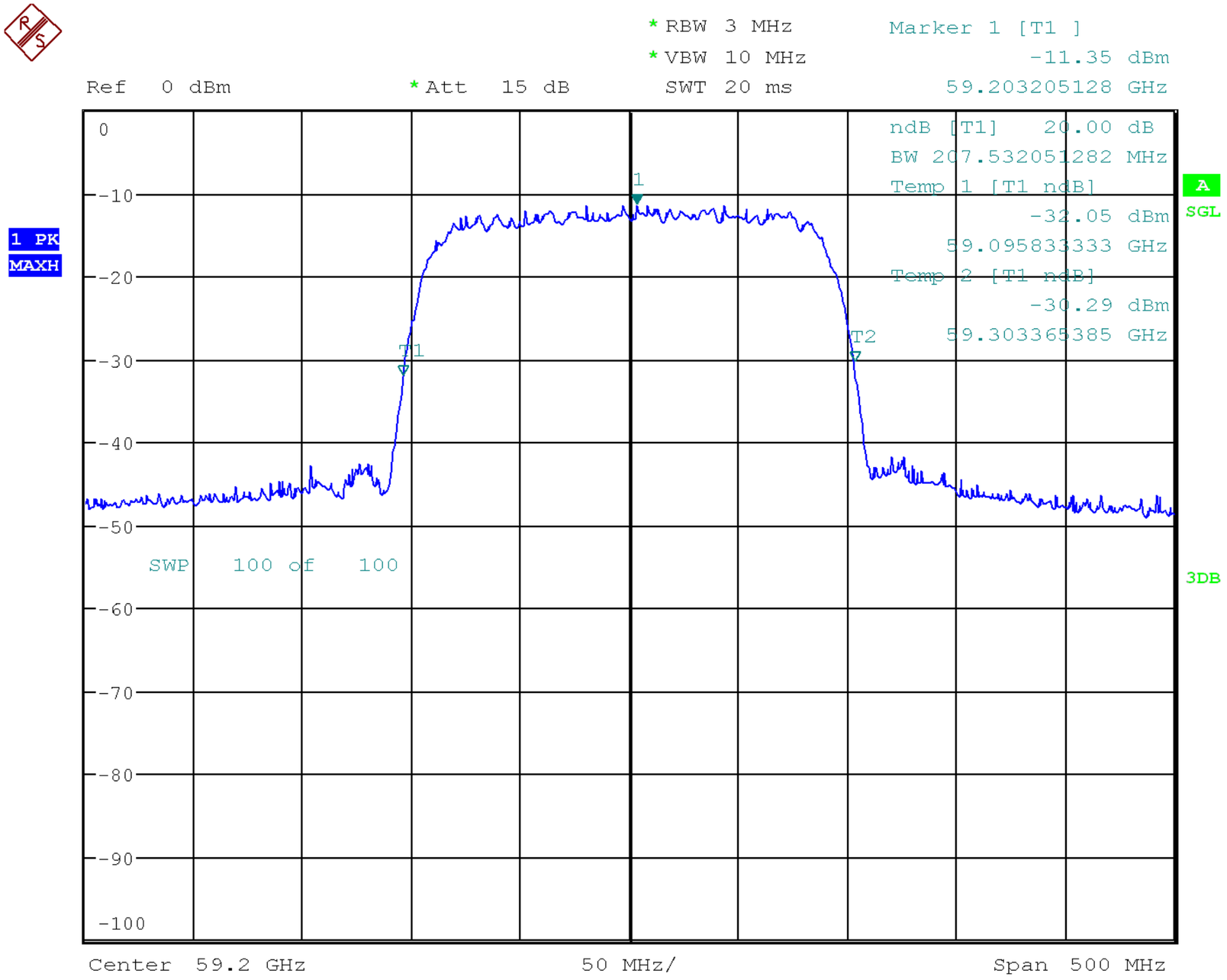
2.1.1.1 Temperature = Ambient, Voltage = 85 %



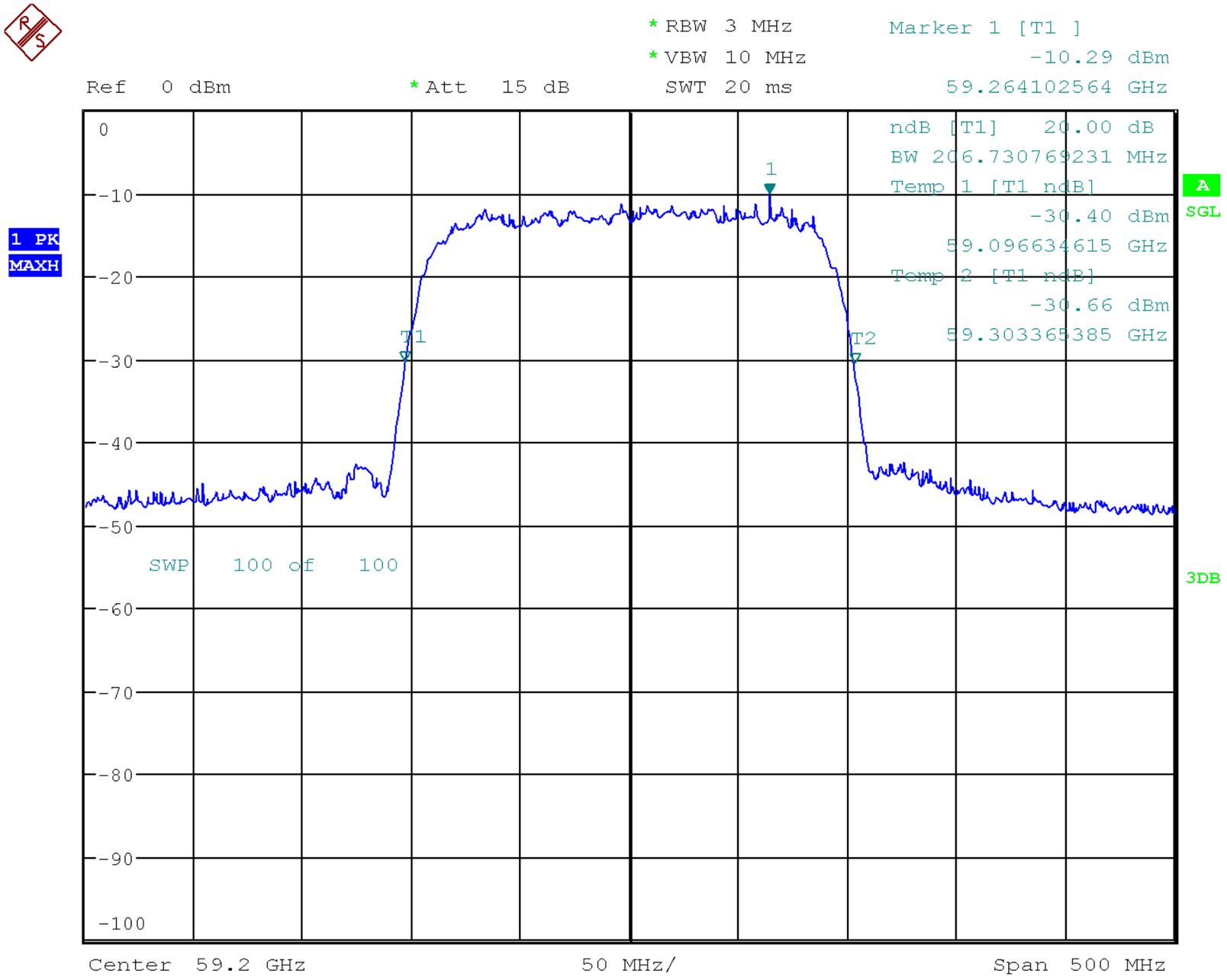
2.1.1.2 Temperature = Ambient, Voltage = 100 %



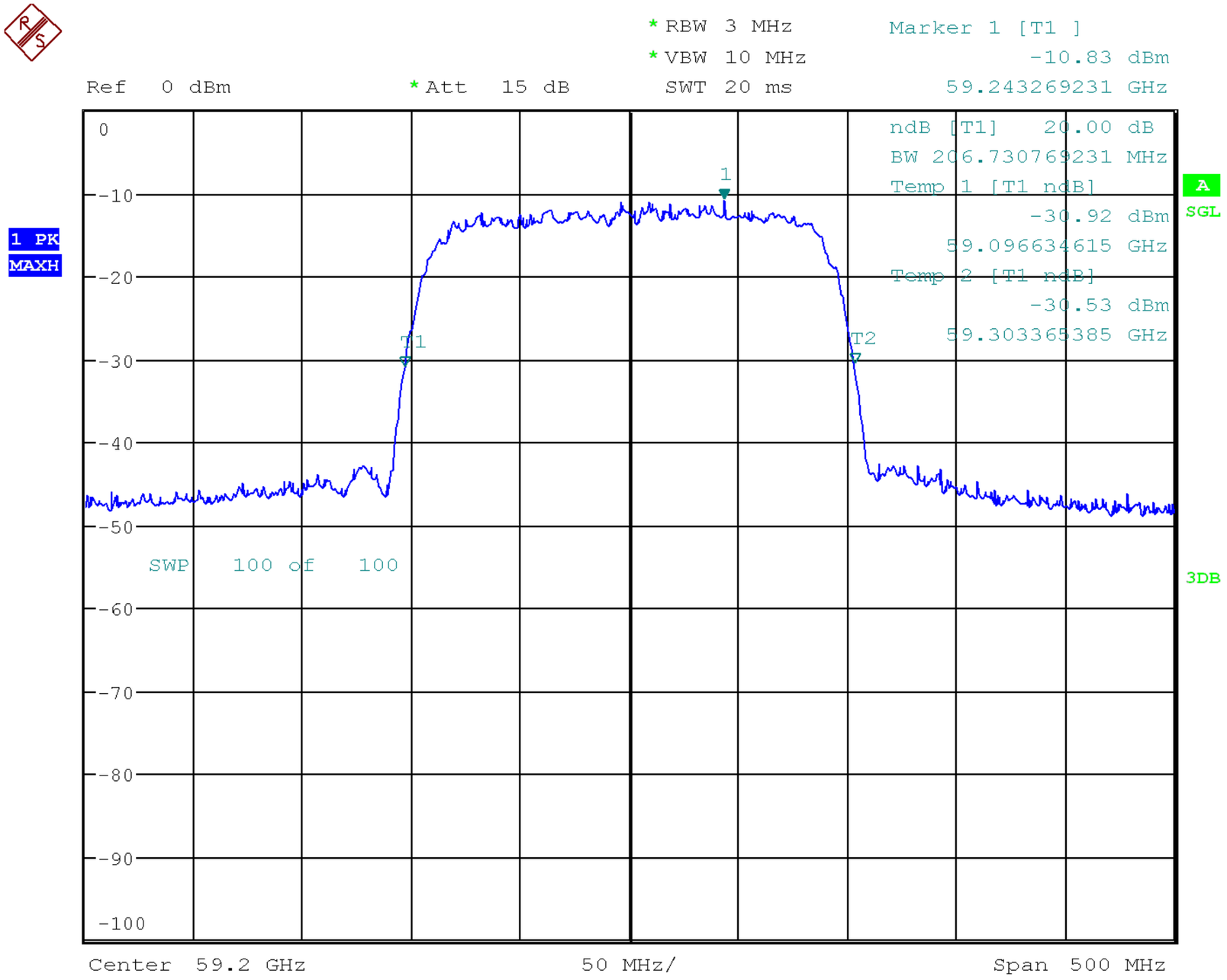
2.1.1.3 Temperature = Ambient, Voltage = 115 %



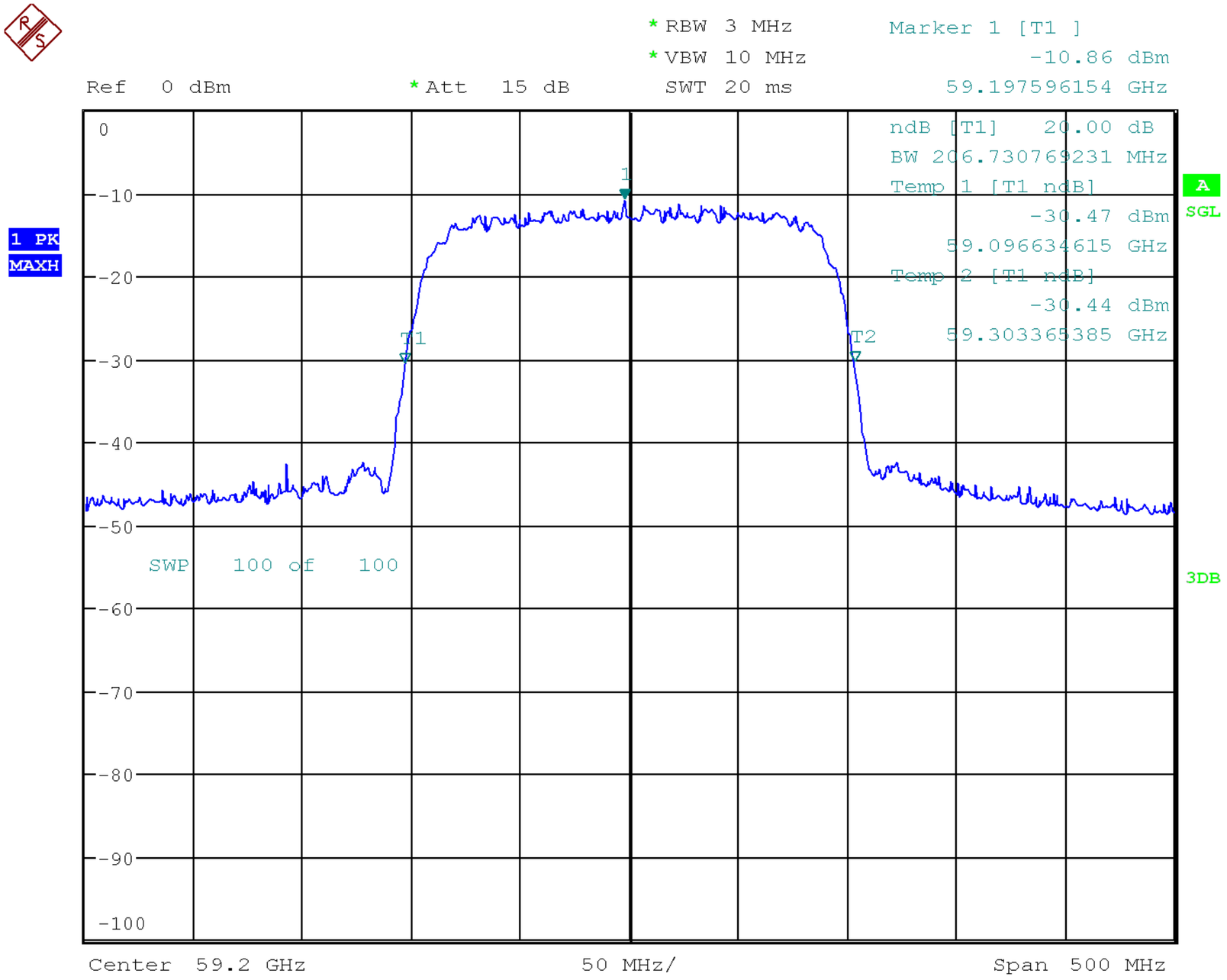
2.1.1.4 Temperature = -20 °C, Voltage = 100 %



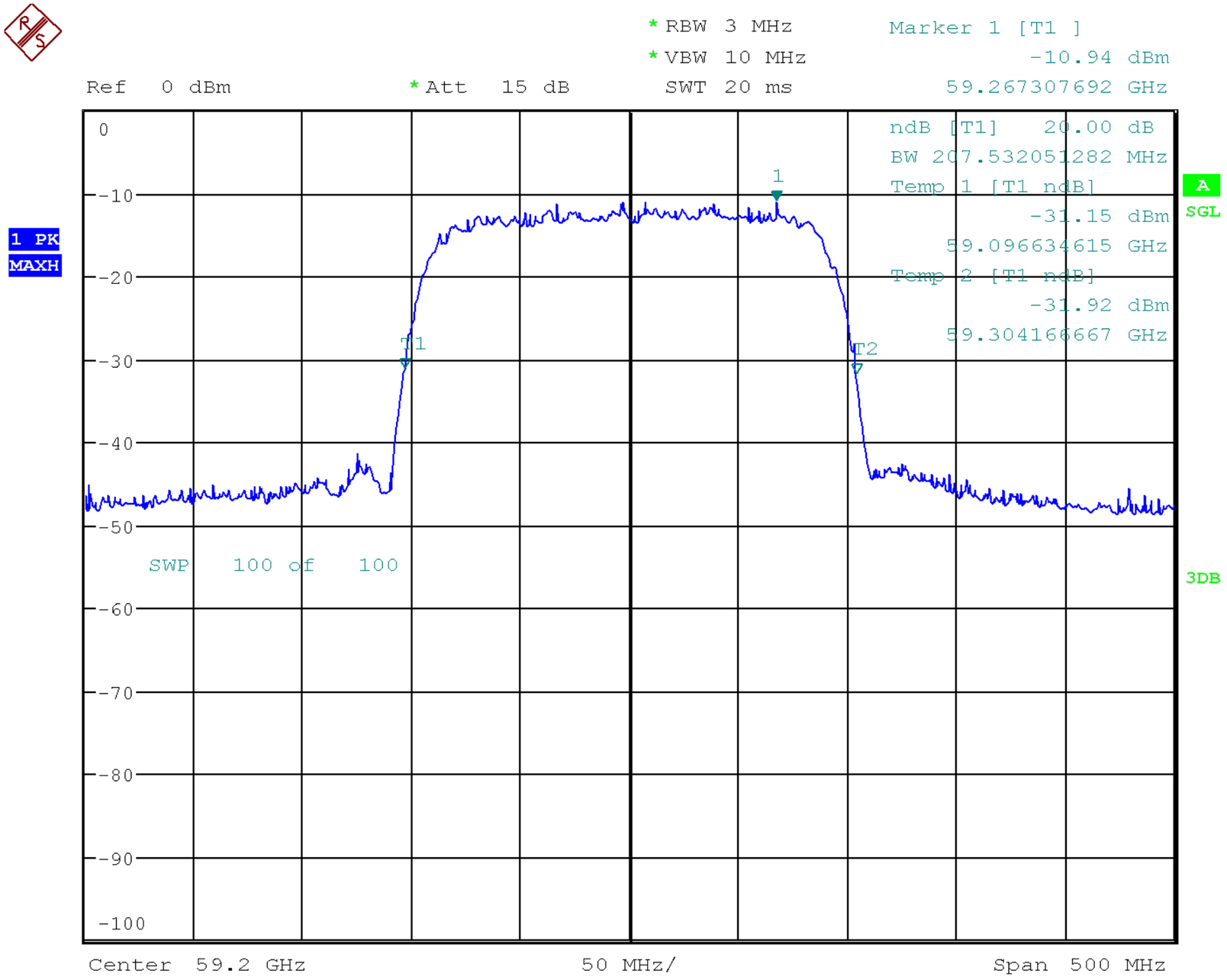
2.1.1.5 Temperature = -10 °C, Voltage = 100 %



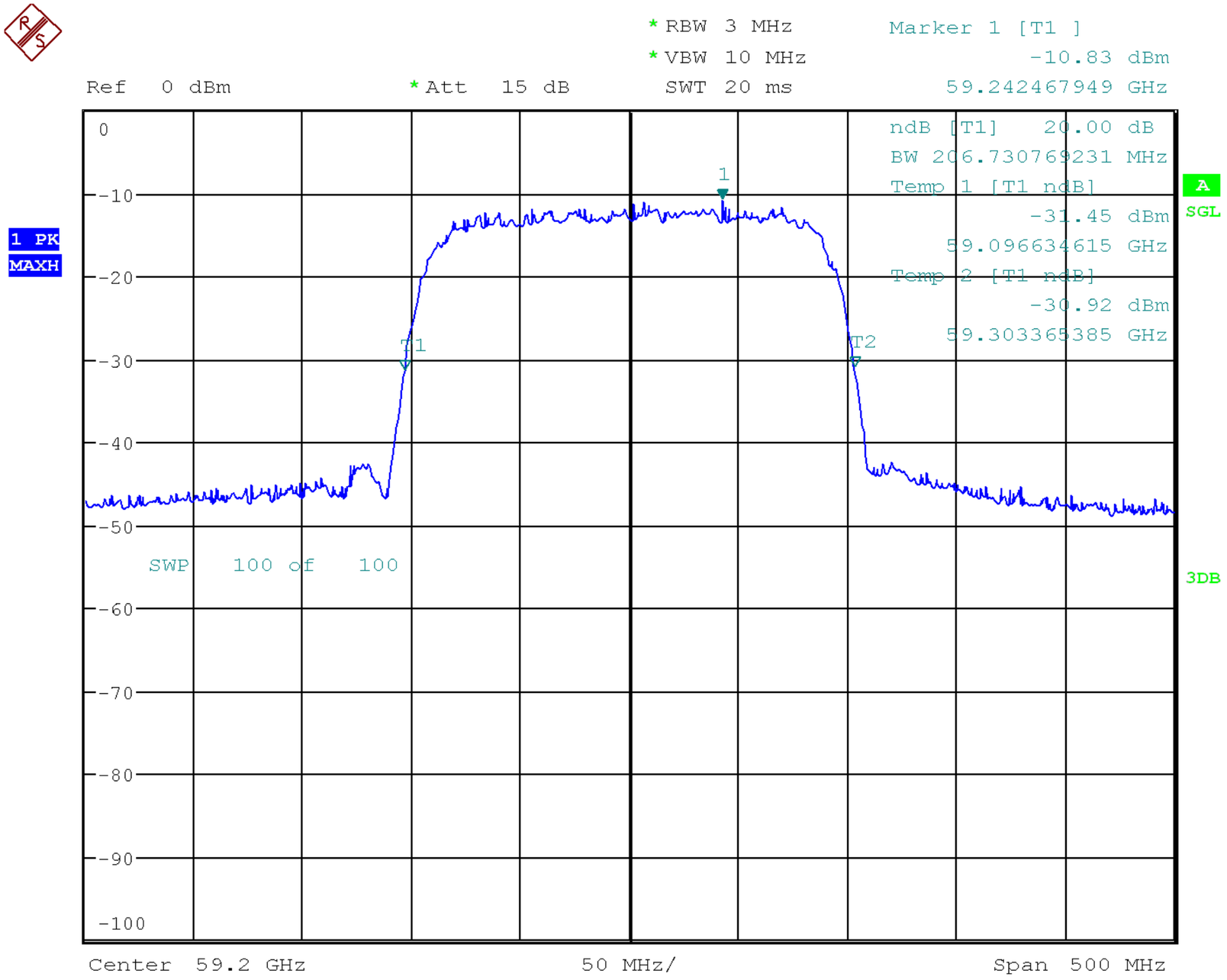
2.1.1.6 Temperature = 0 °C, Voltage = 100 %



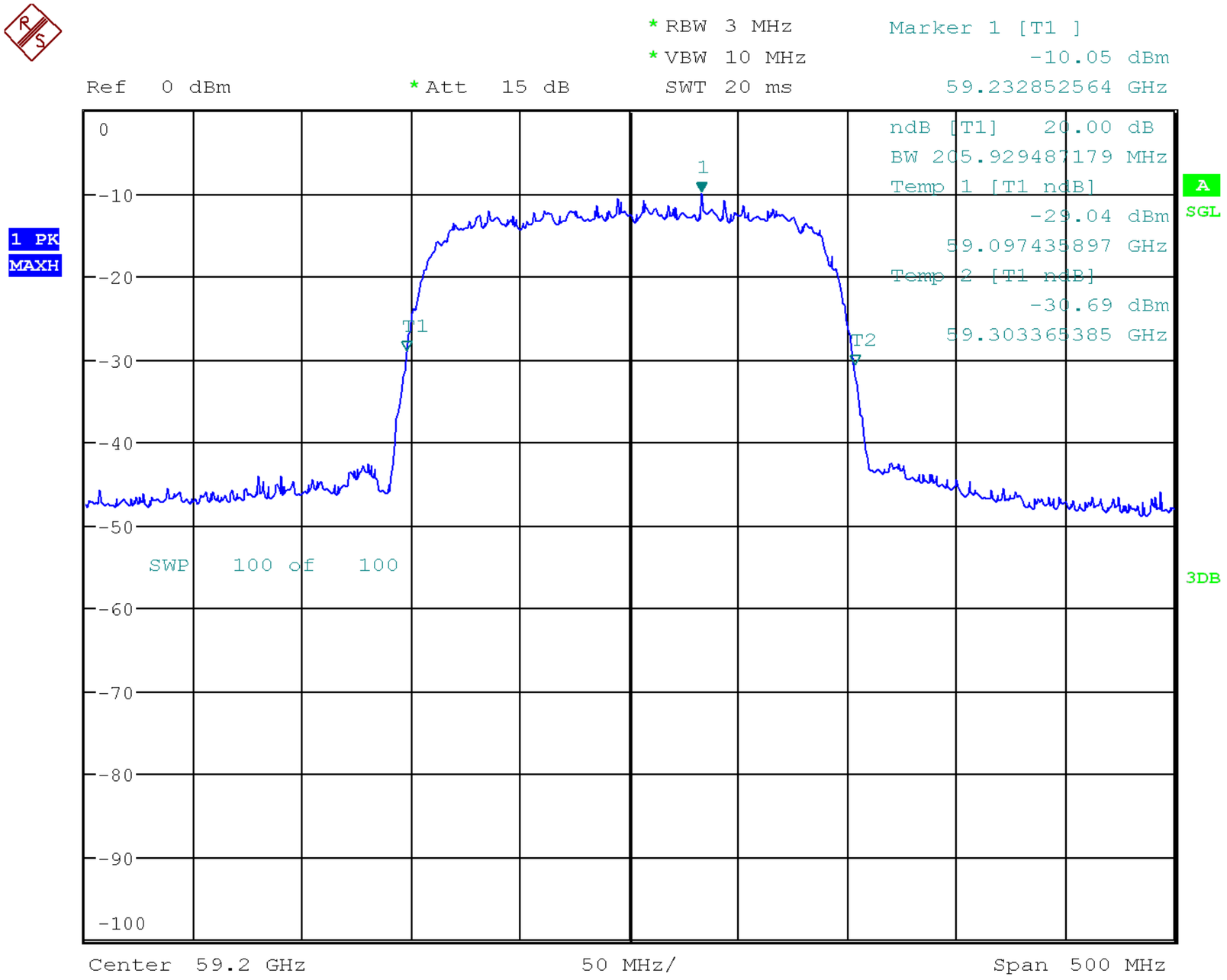
2.1.1.7 Temperature = +10 °C, Voltage = 100 %



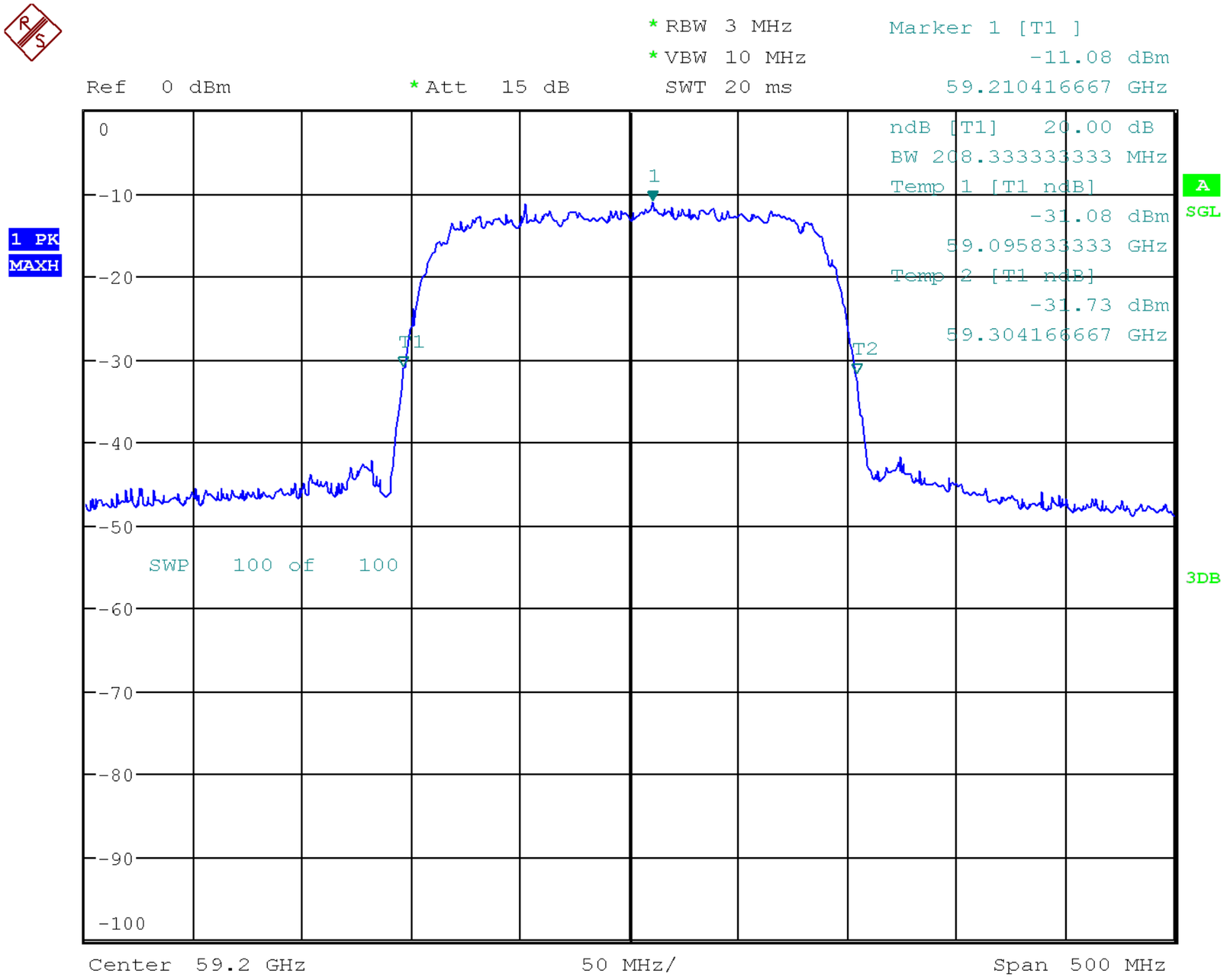
2.1.1.8 Temperature = +20 °C, Voltage = 100 %



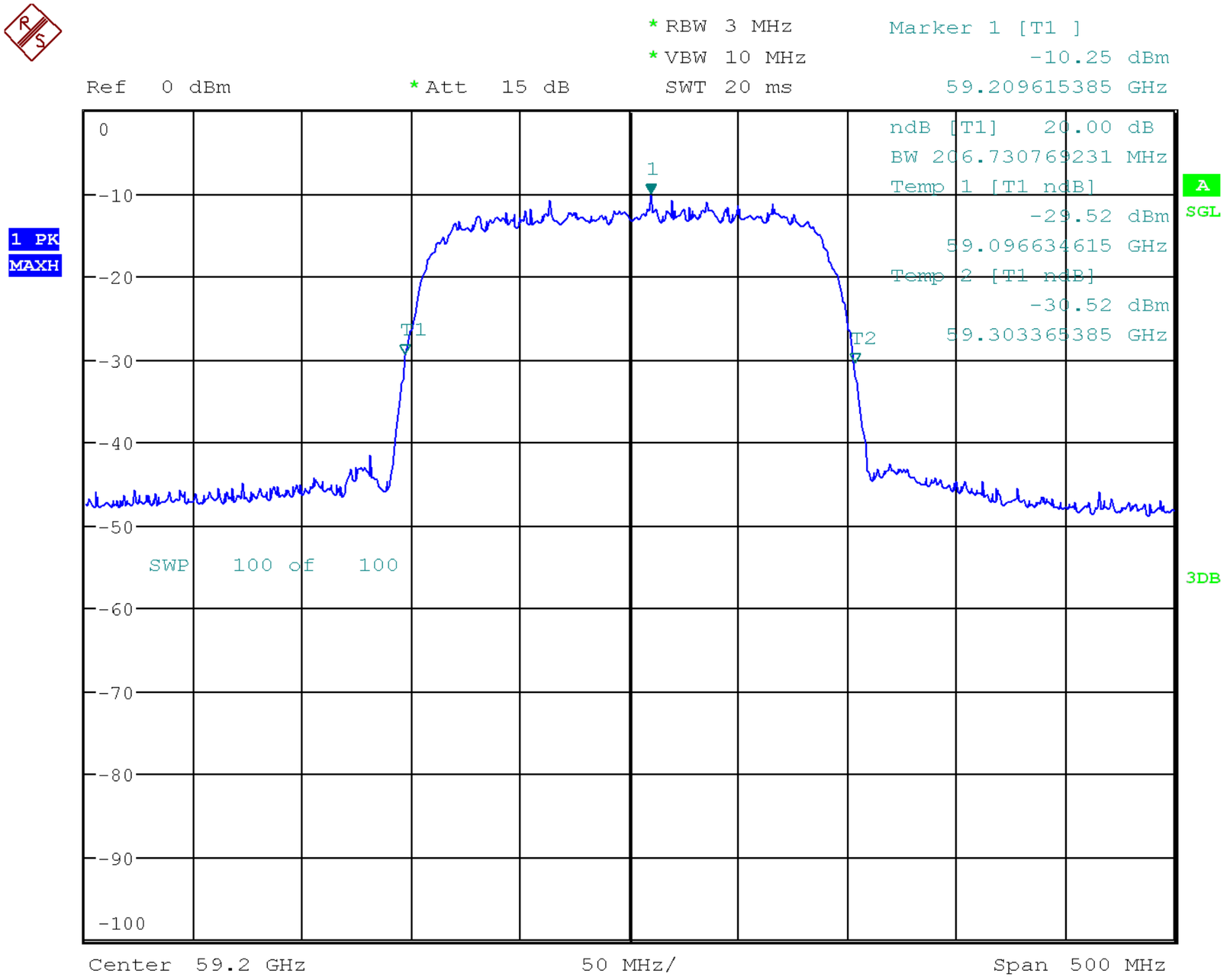
2.1.1.9 Temperature = +30 °C, Voltage = 100 %



2.1.1.10 Temperature = +40 °C, Voltage = 100 %

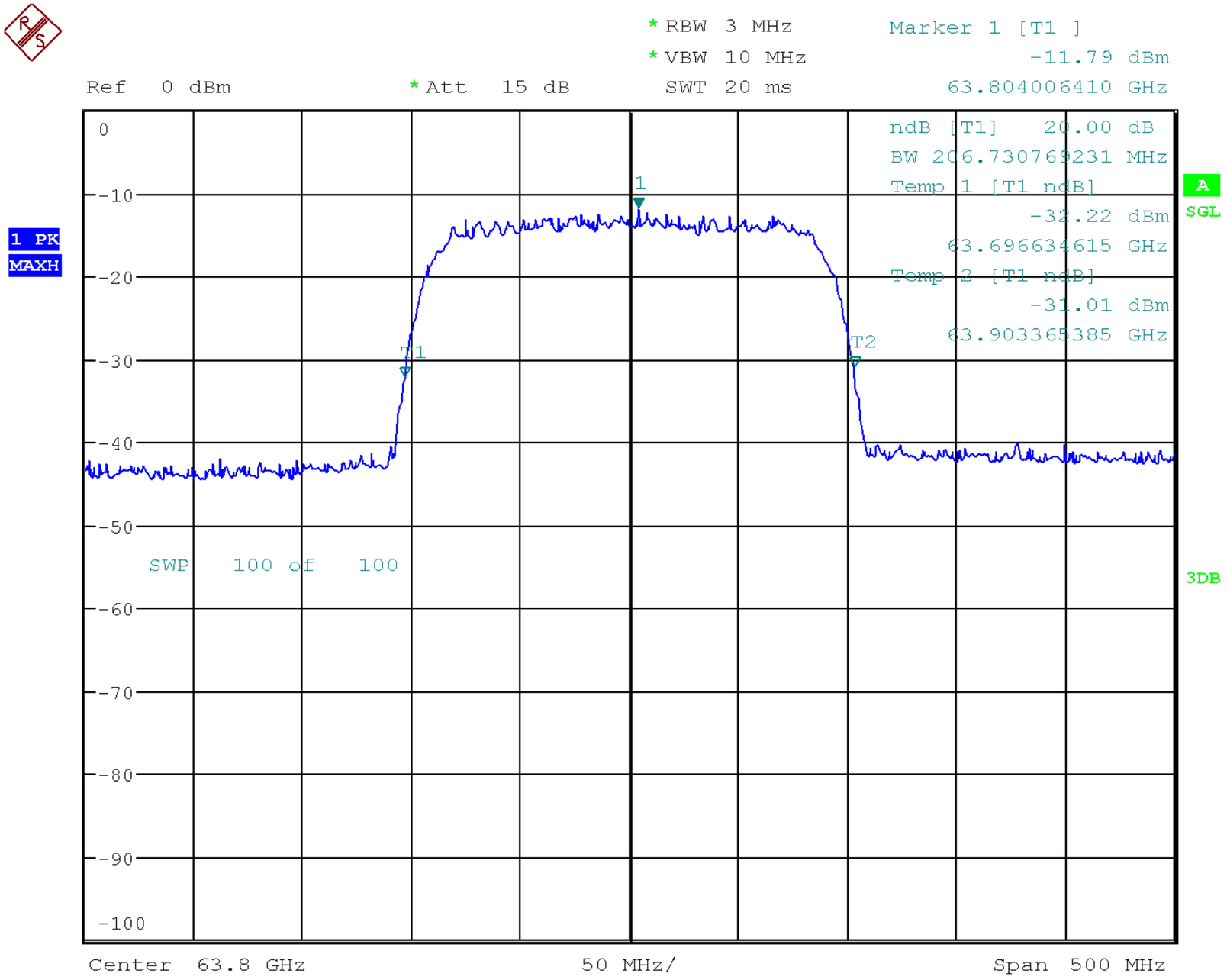


2.1.1.11 Temperature = +50 °C, Voltage = 100 %

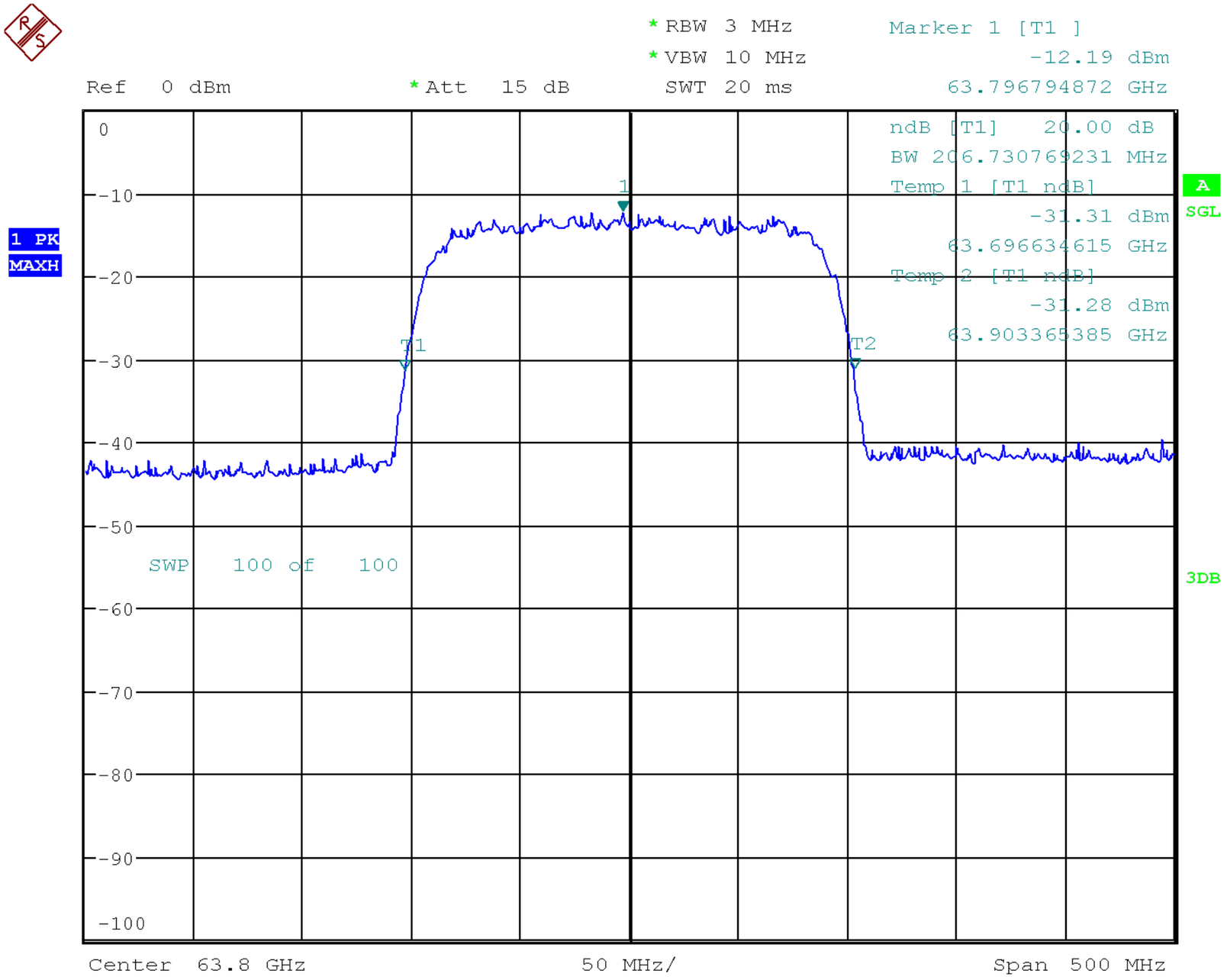


2.1.2 QPSK-T

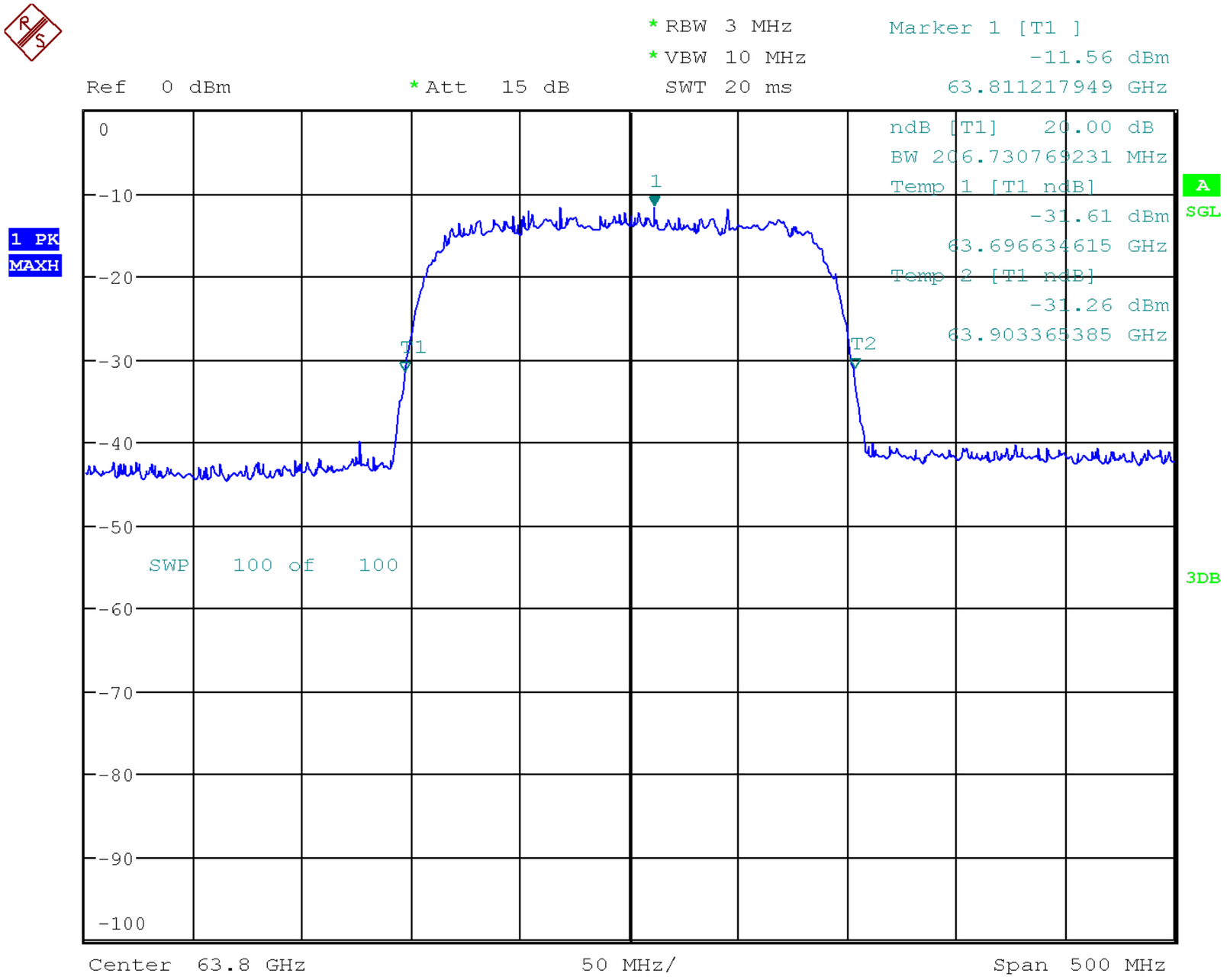
2.1.2.1 Temperature = Ambient, Voltage = 85 %



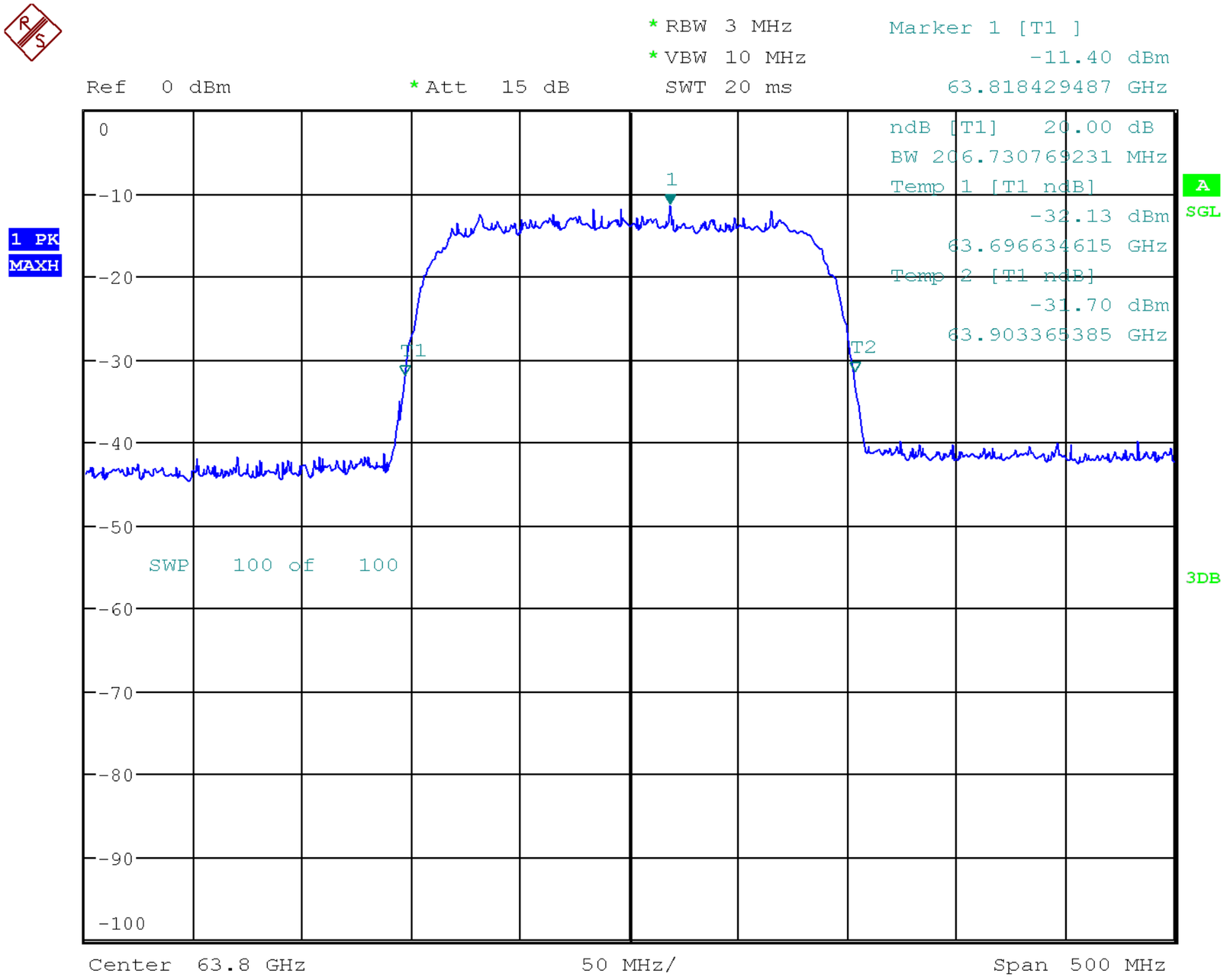
2.1.2.2 Temperature = Ambient, Voltage = 100 %



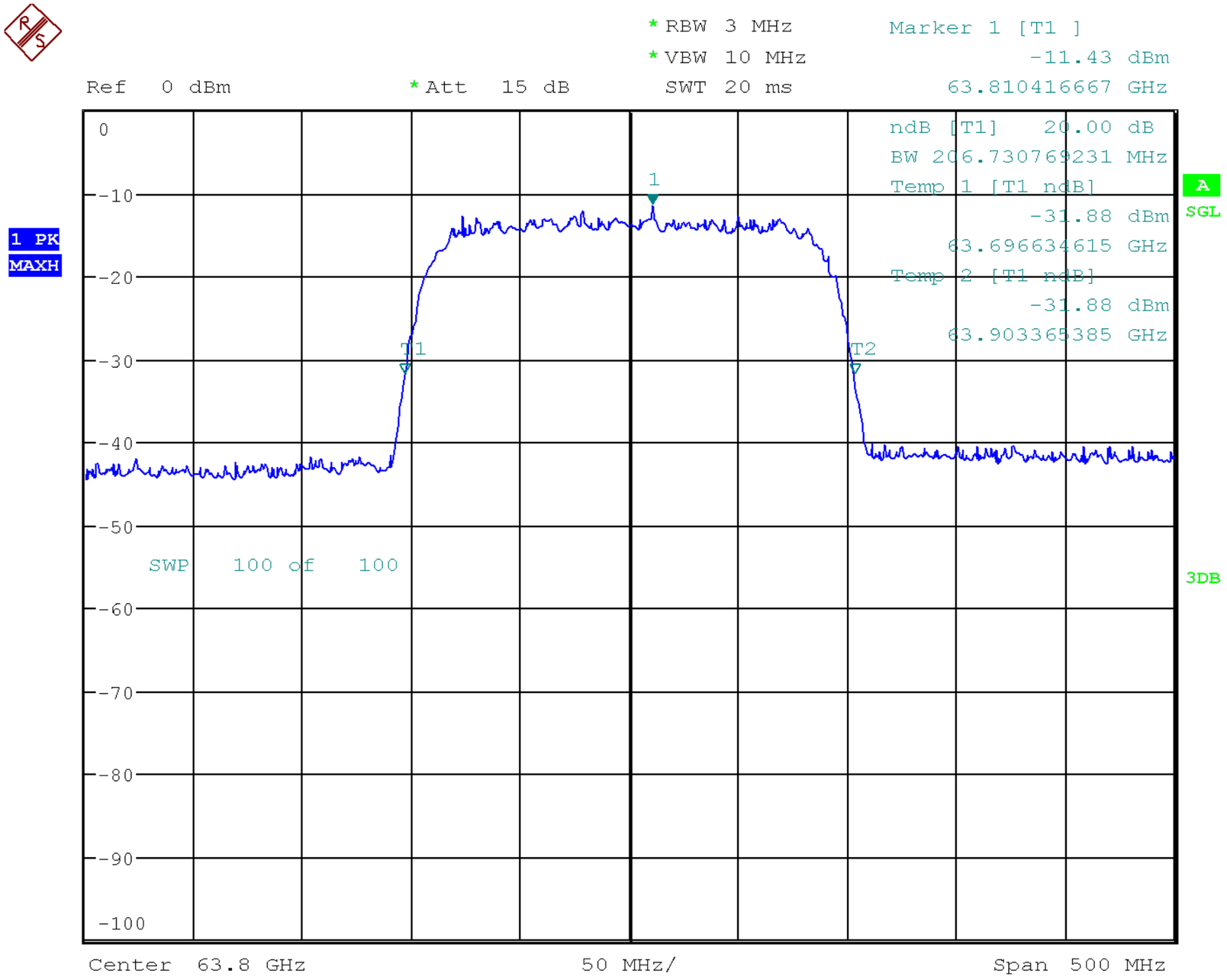
2.1.2.3 Temperature = Ambient, Voltage = 115 %



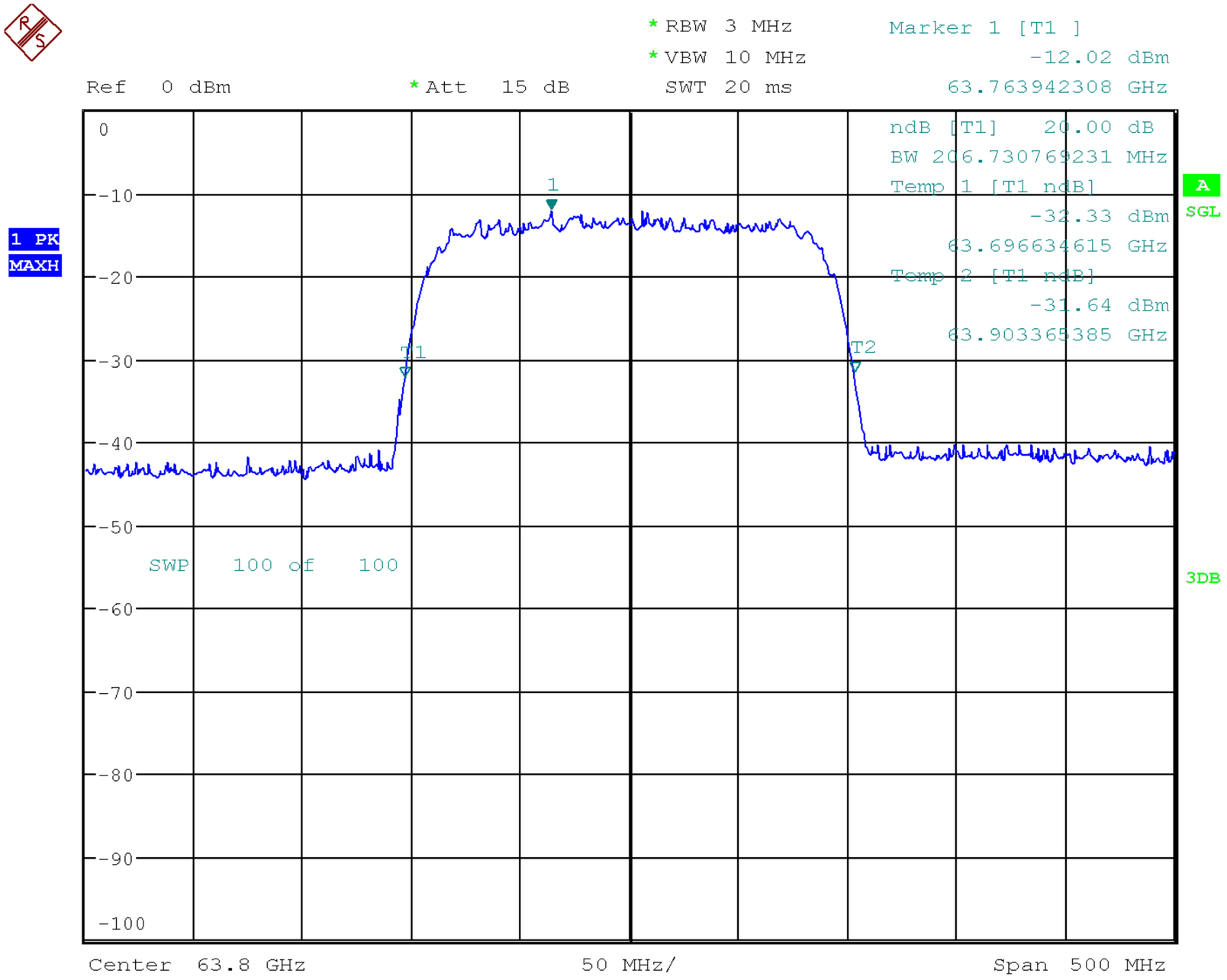
2.1.2.4 Temperature = -20 °C, Voltage = 100 %



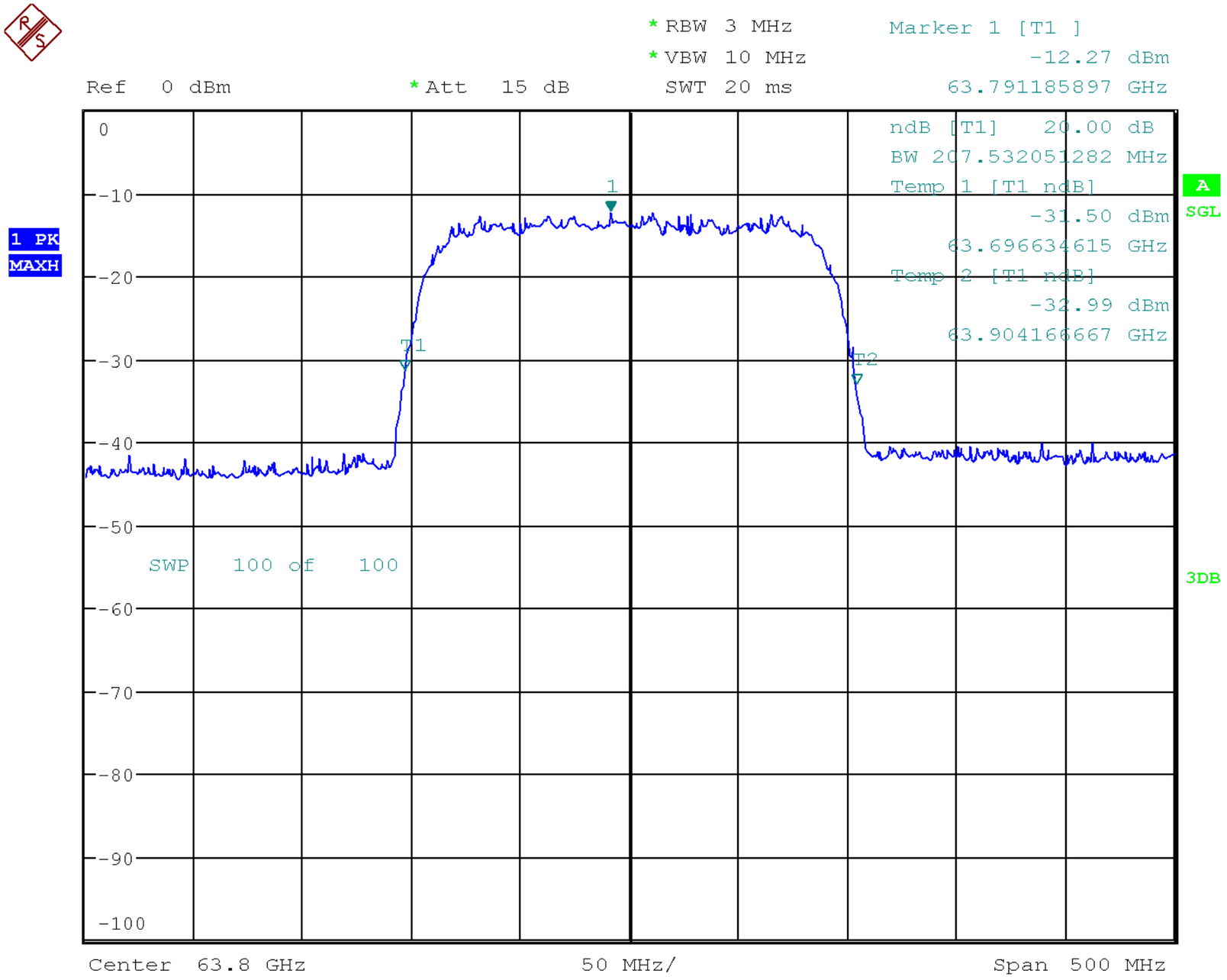
2.1.2.5 Temperature = -10 °C, Voltage = 100 %



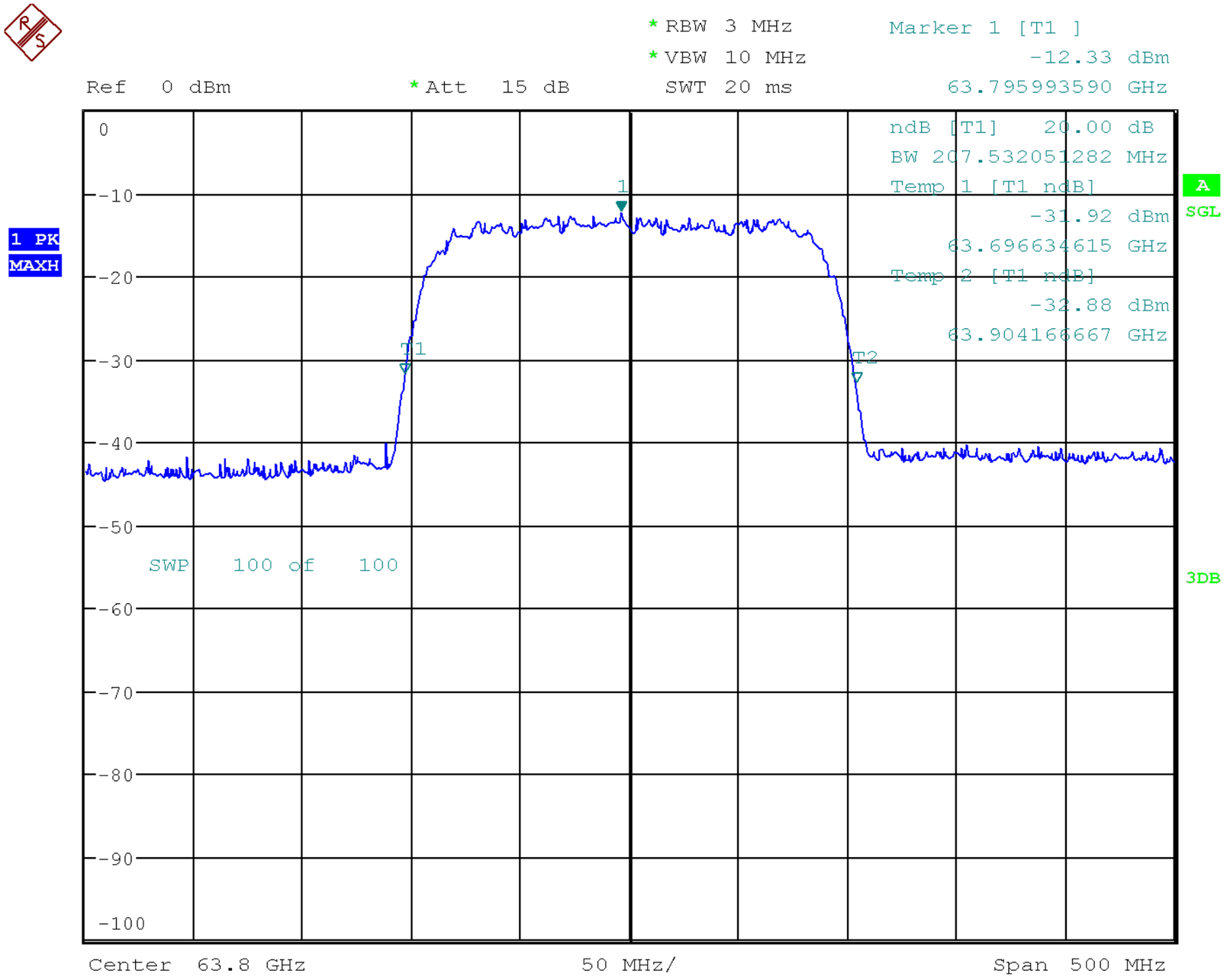
2.1.2.6 Temperature = 0 °C, Voltage = 100 %



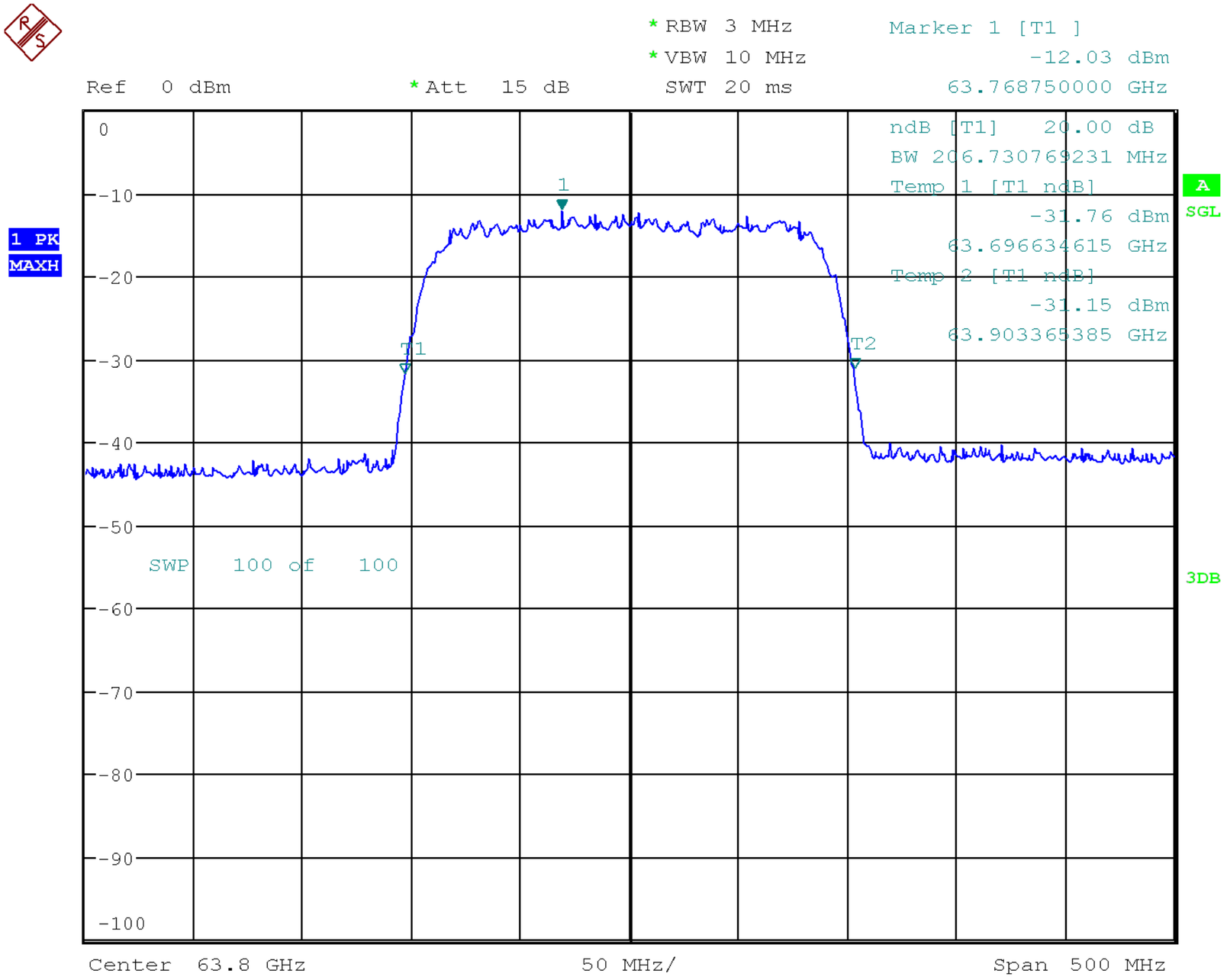
2.1.2.7 Temperature = +10 °C, Voltage = 100 %



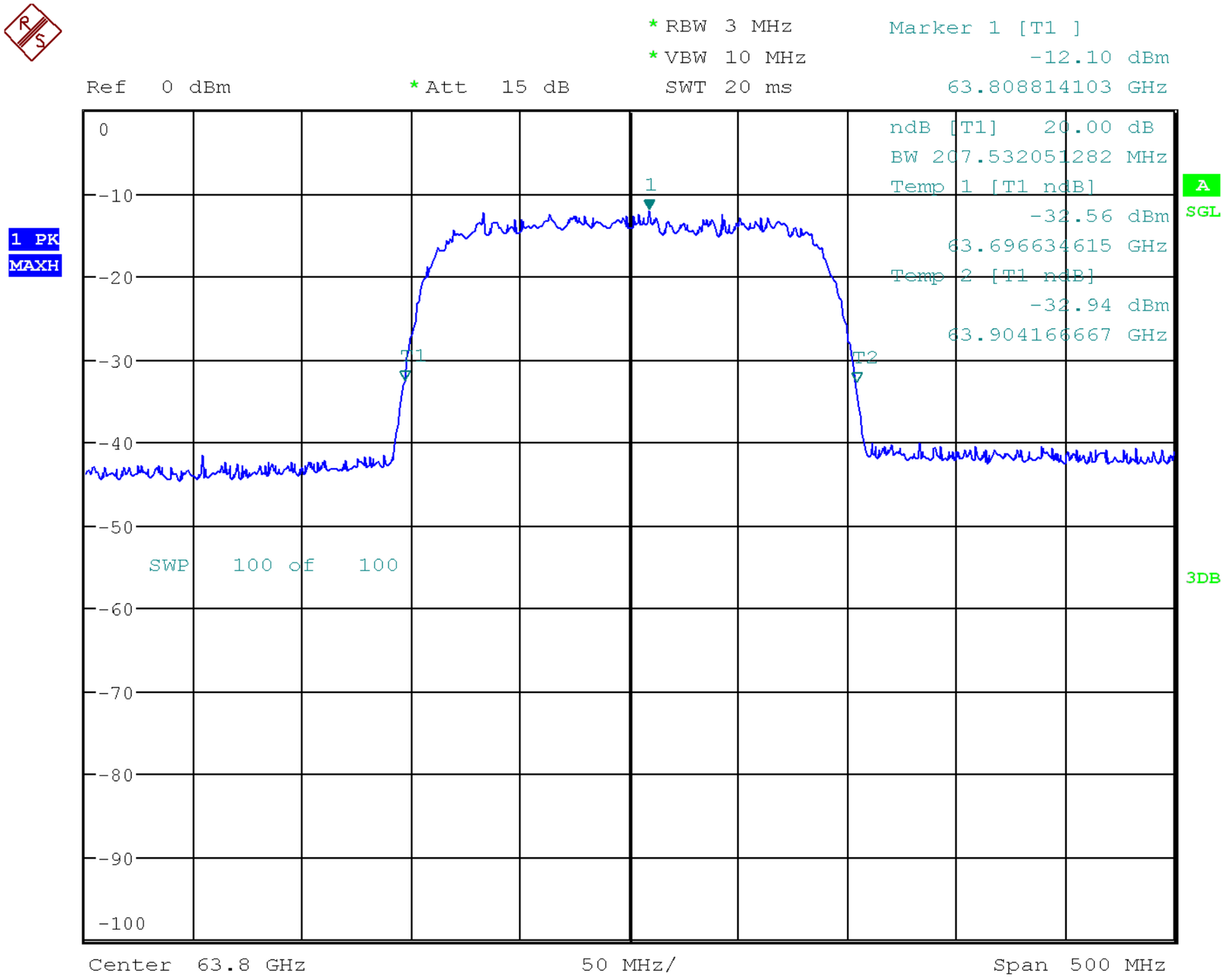
2.1.2.8 Temperature = +20 °C, Voltage = 100 %



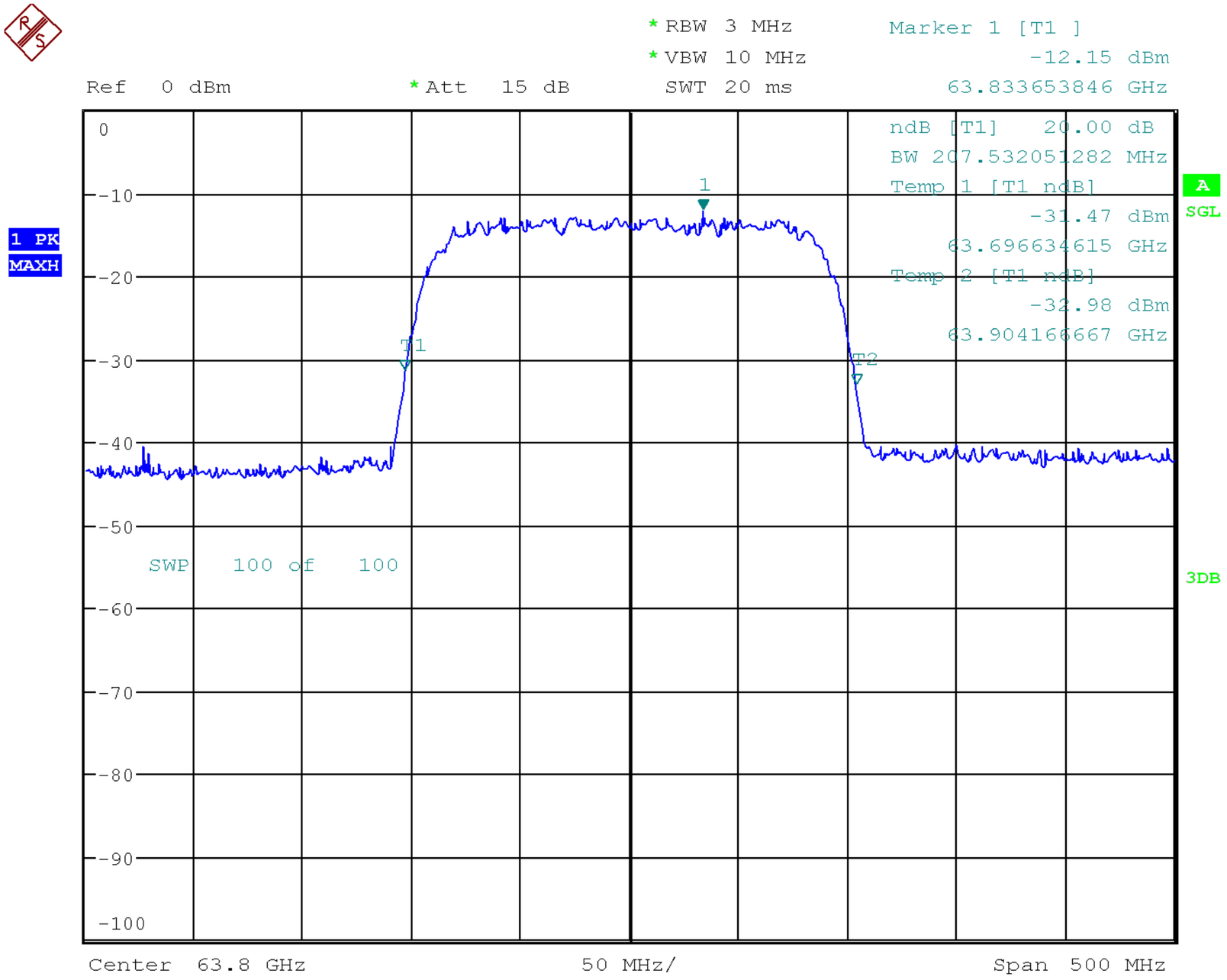
2.1.2.9 Temperature = +30 °C, Voltage = 100 %



2.1.2.10 Temperature = +40 °C, Voltage = 100 %

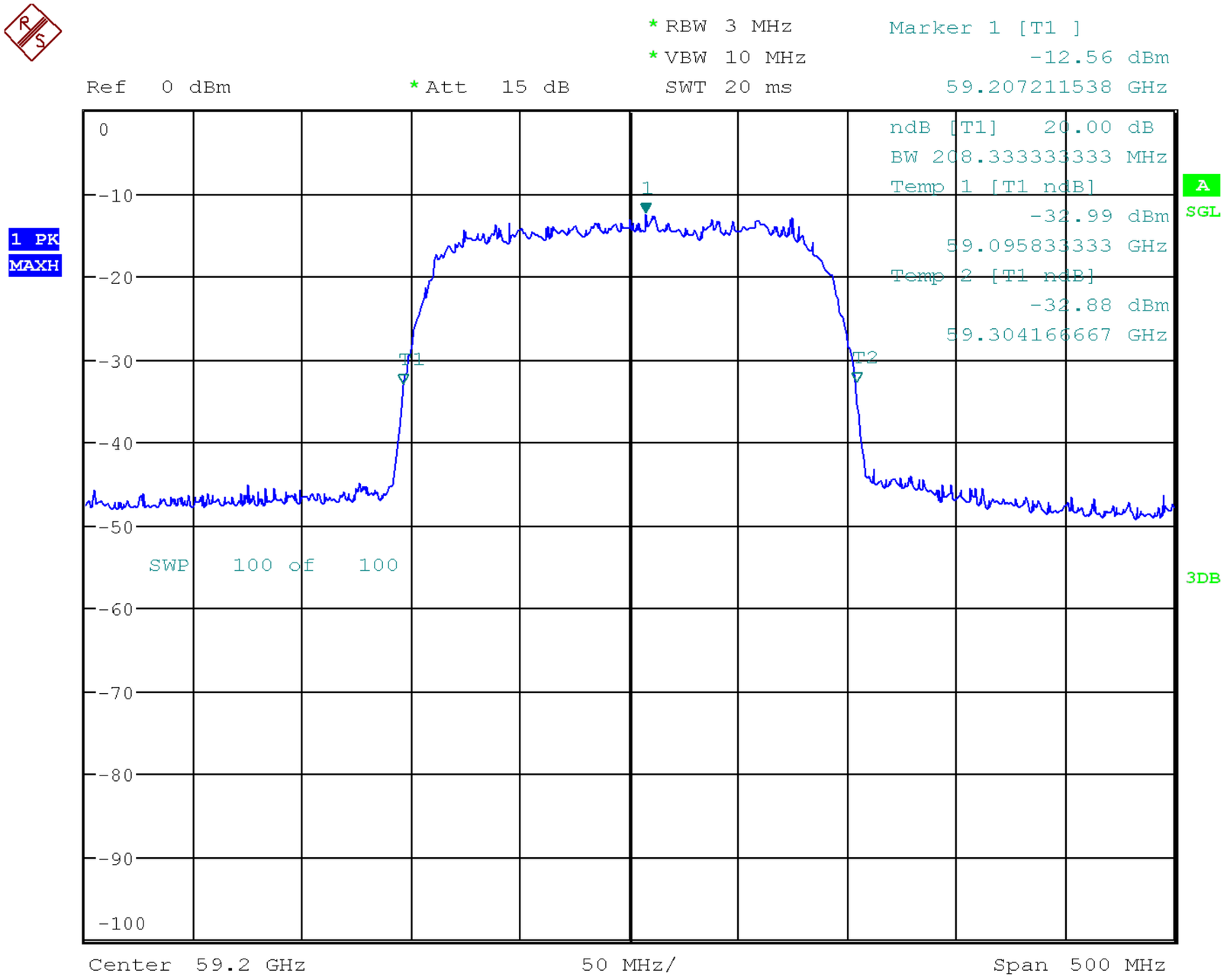


2.1.2.11 Temperature = +50 °C, Voltage = 100 %

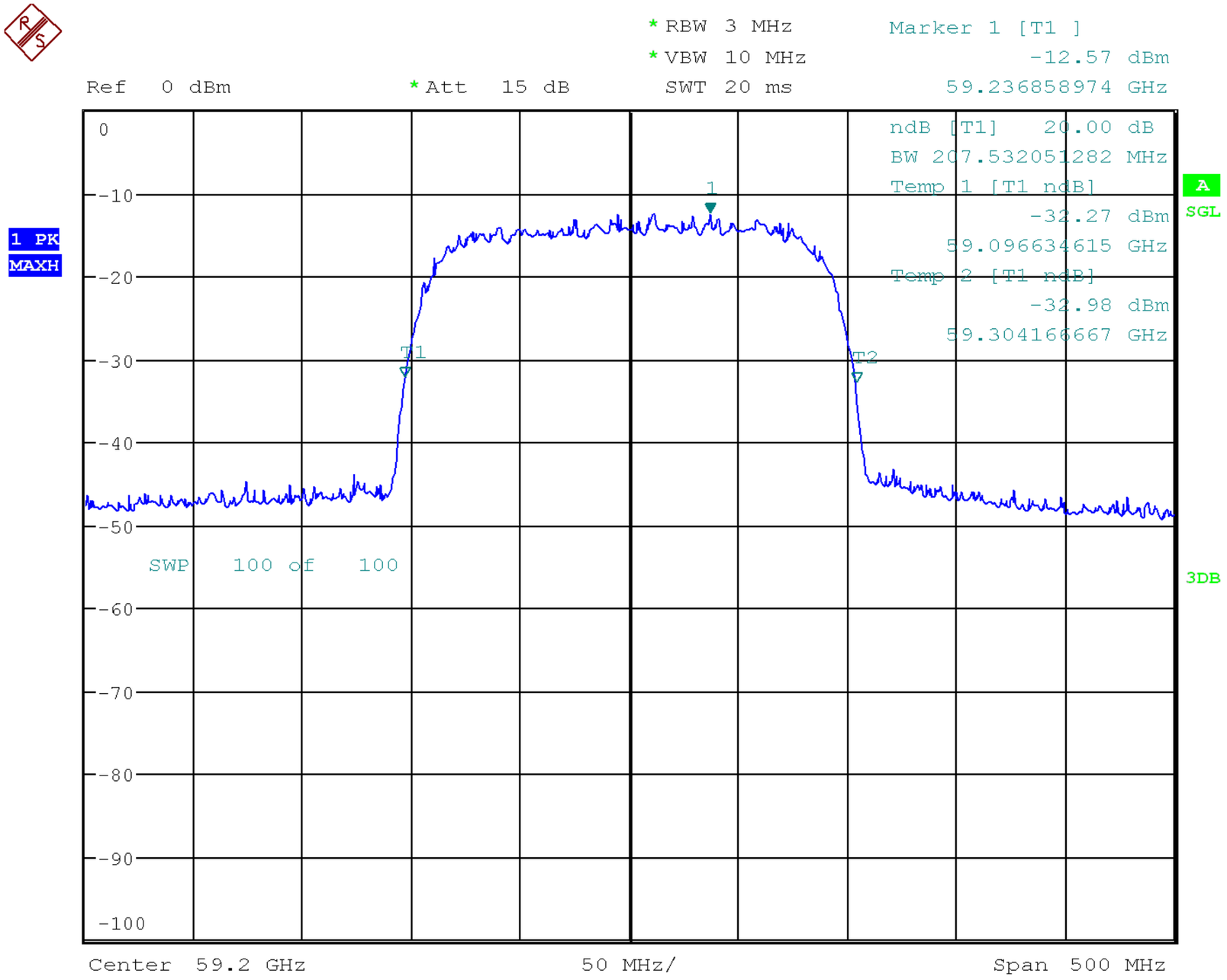


2.1.3 16QAM-B

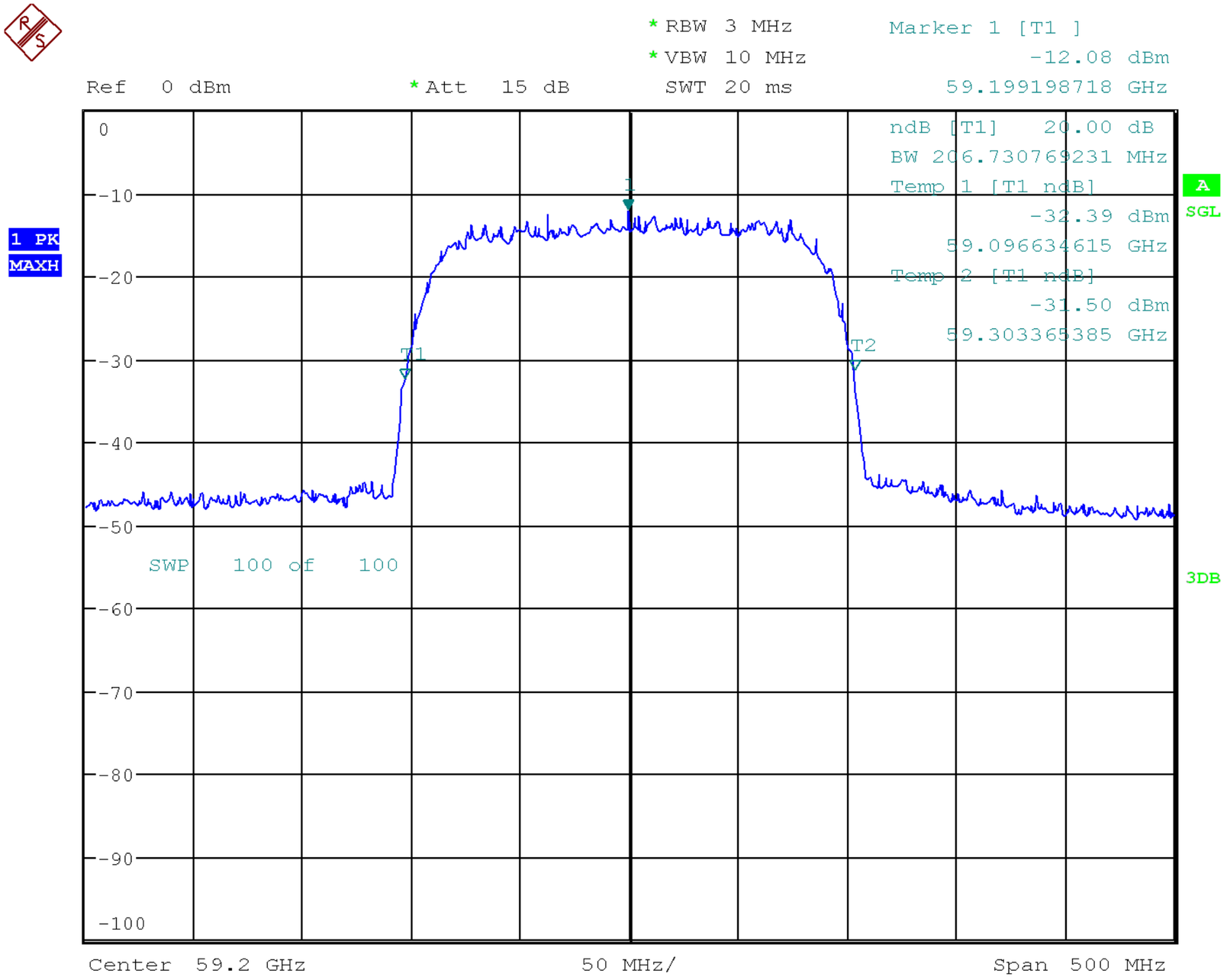
2.1.3.1 Temperature = Ambient, Voltage = 85 %



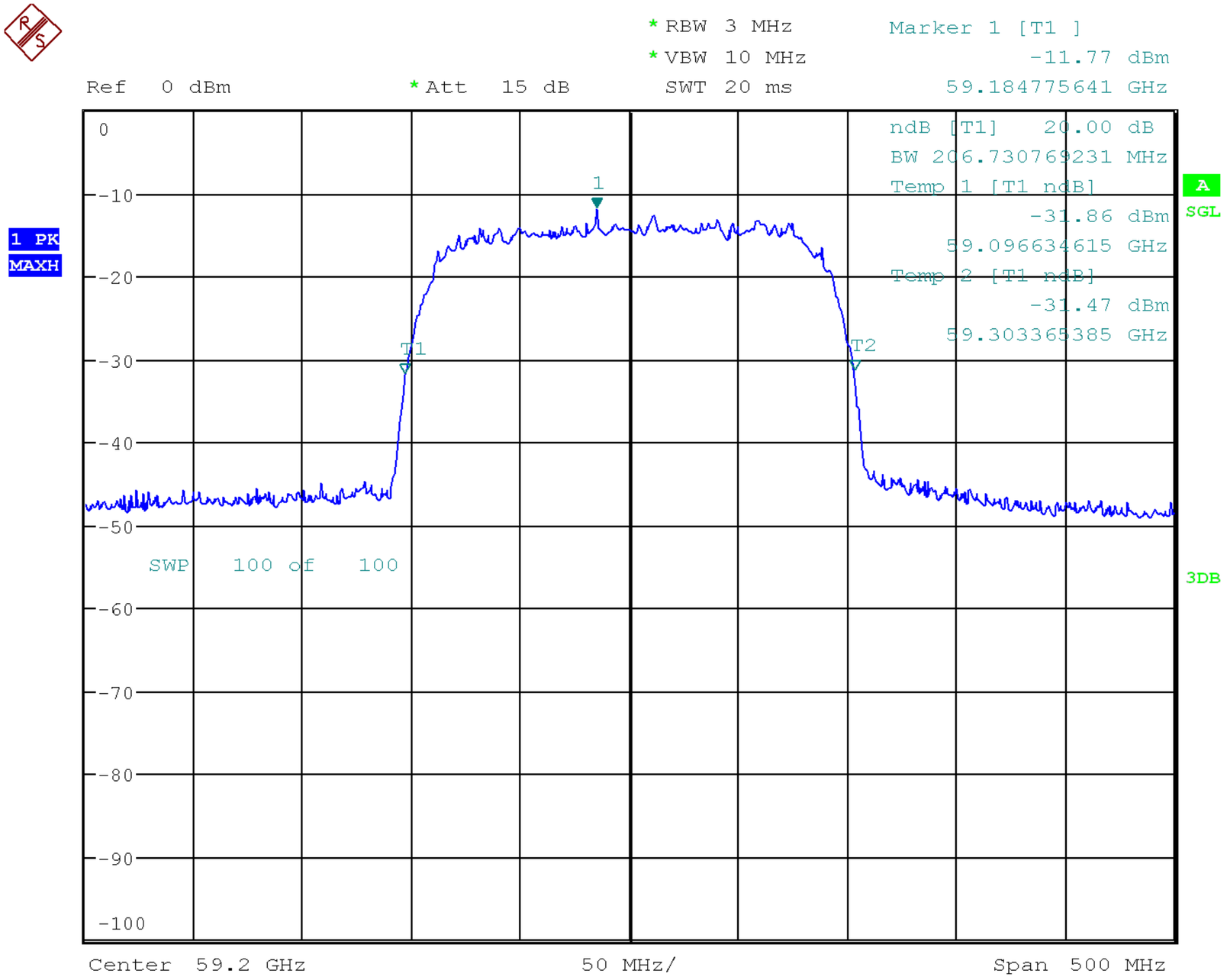
2.1.3.2 Temperature = Ambient, Voltage = 100 %



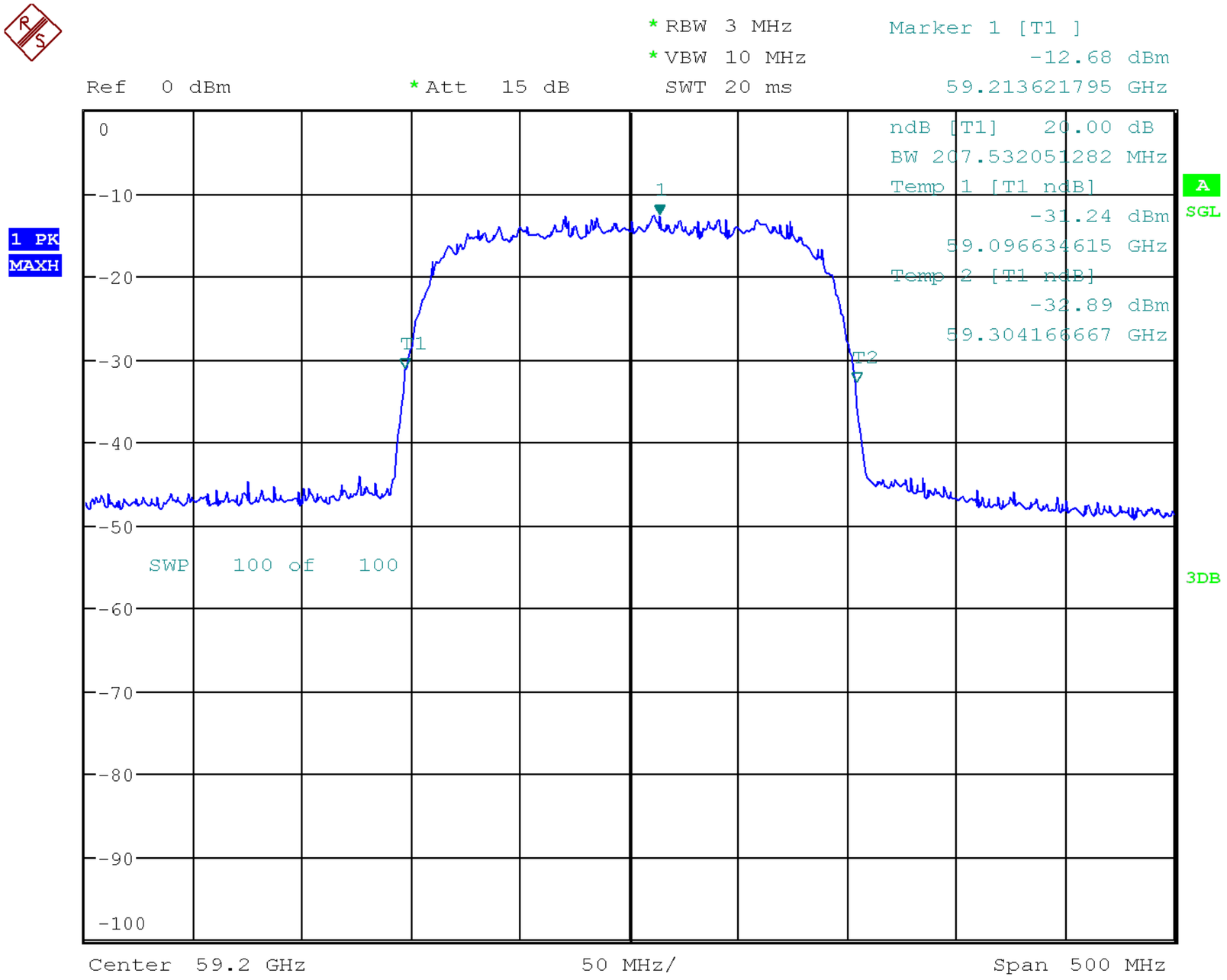
2.1.3.3 Temperature = Ambient, Voltage = 115 %



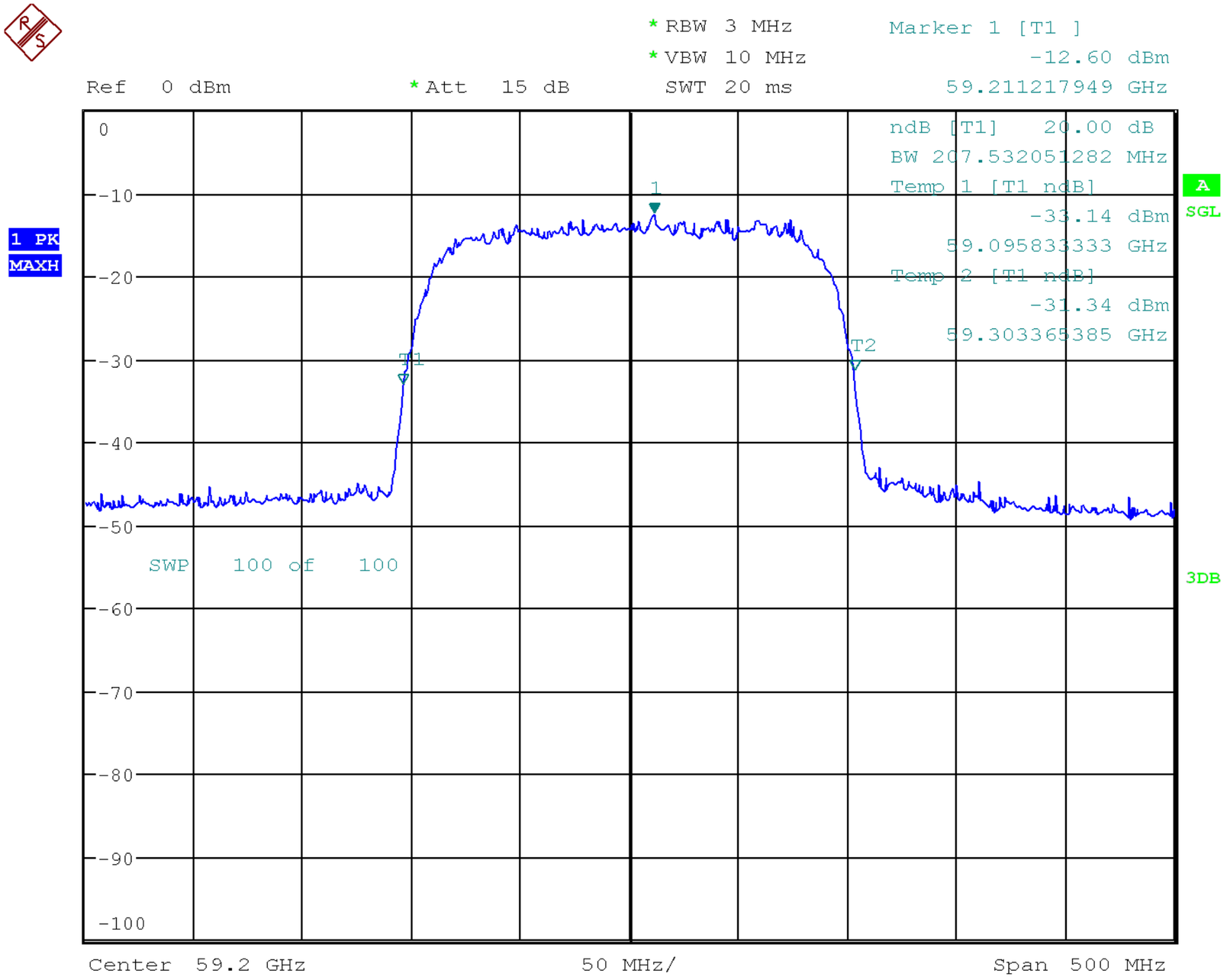
2.1.3.4 Temperature = -20 °C, Voltage = 100 %



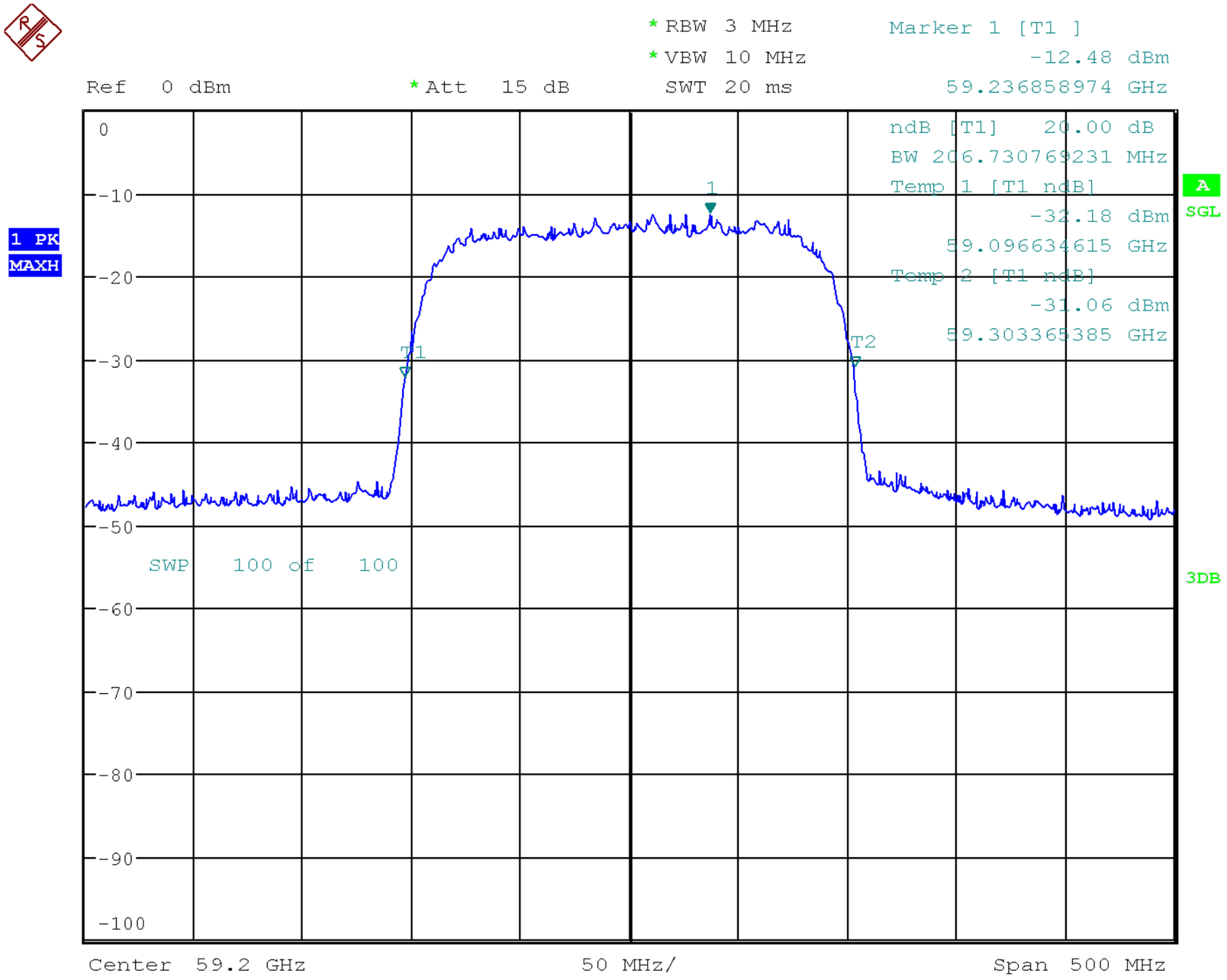
2.1.3.5 Temperature = -10 °C, Voltage = 100 %



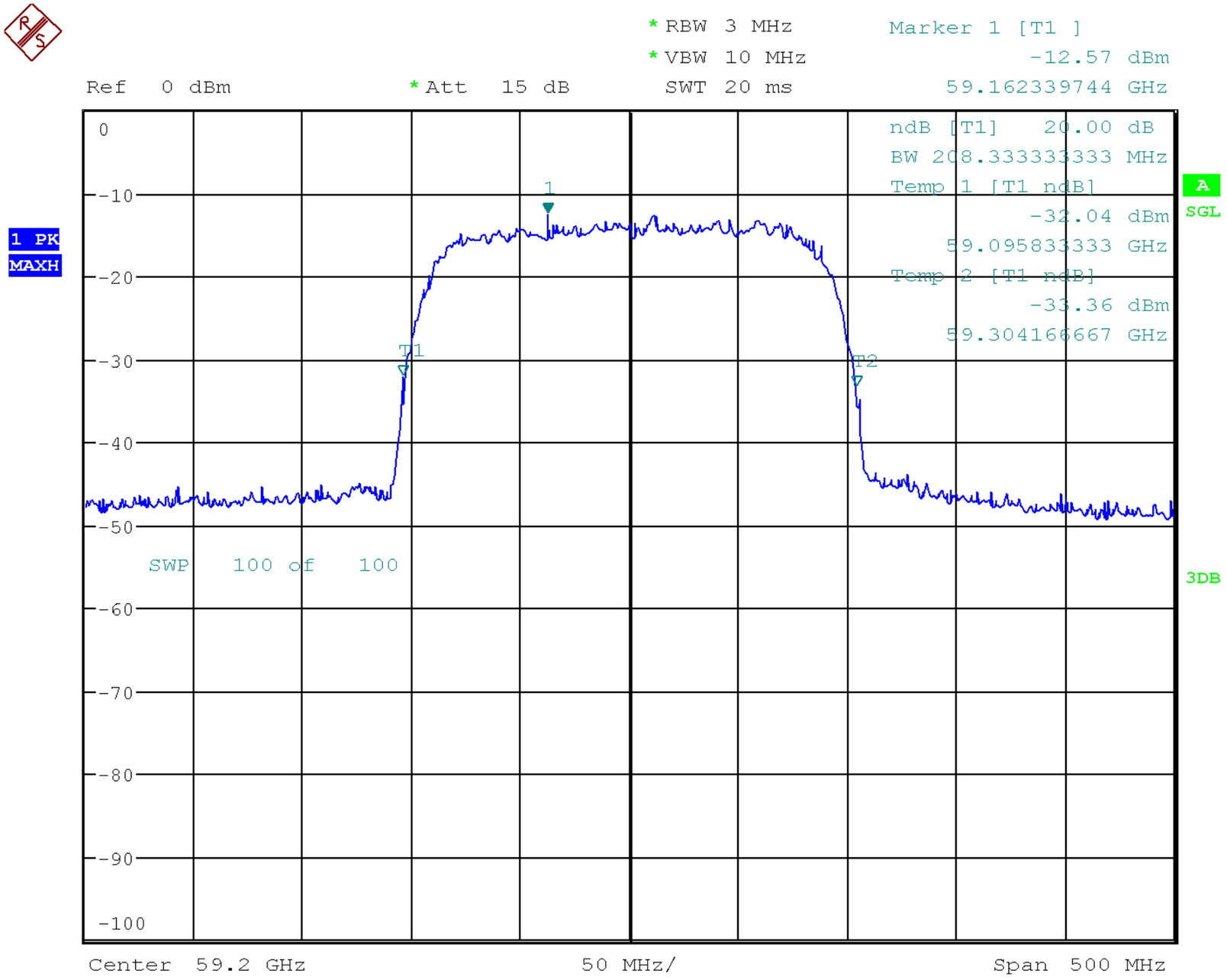
2.1.3.6 Temperature = 0 °C, Voltage = 100 %



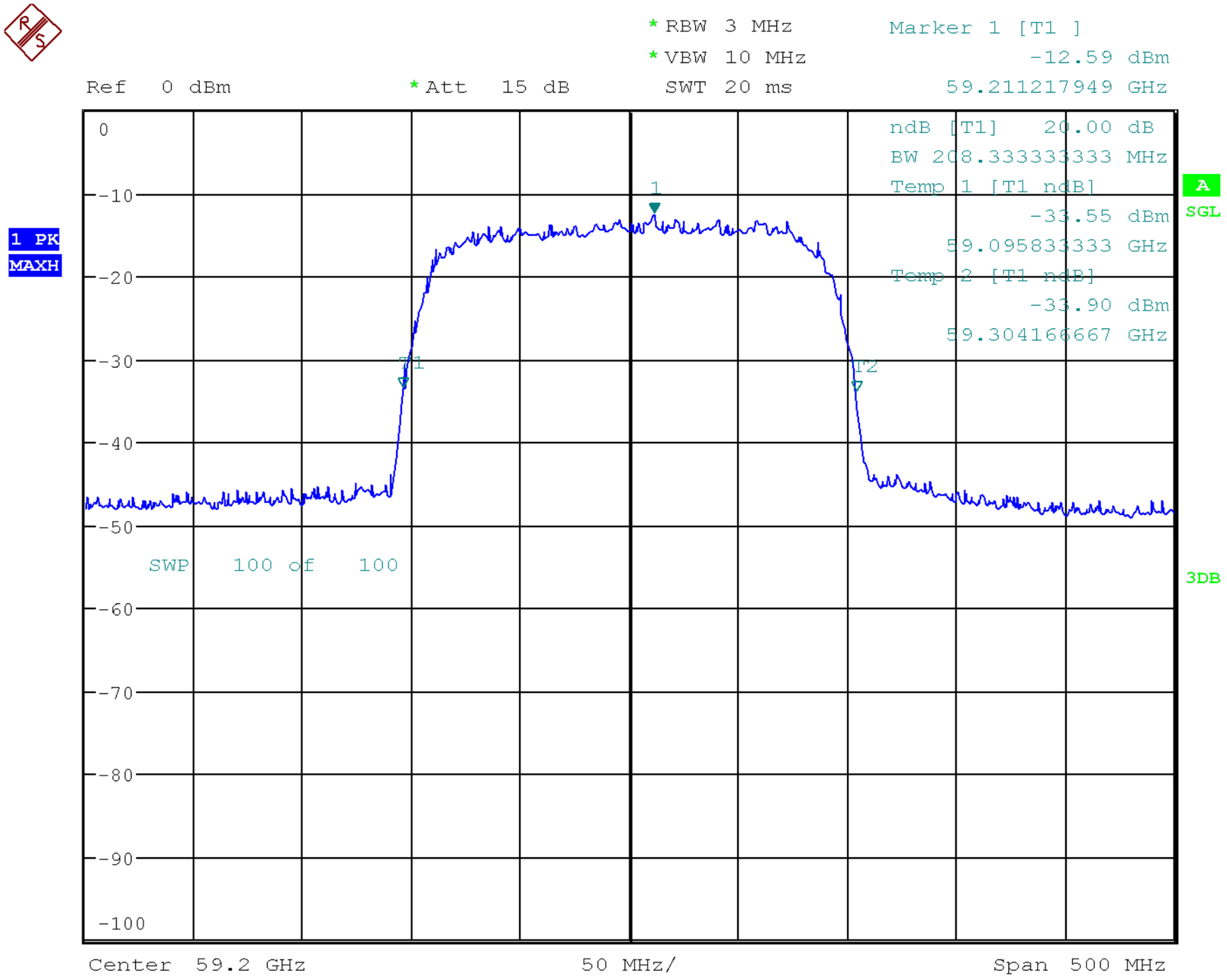
2.1.3.7 Temperature = +10 °C, Voltage = 100 %



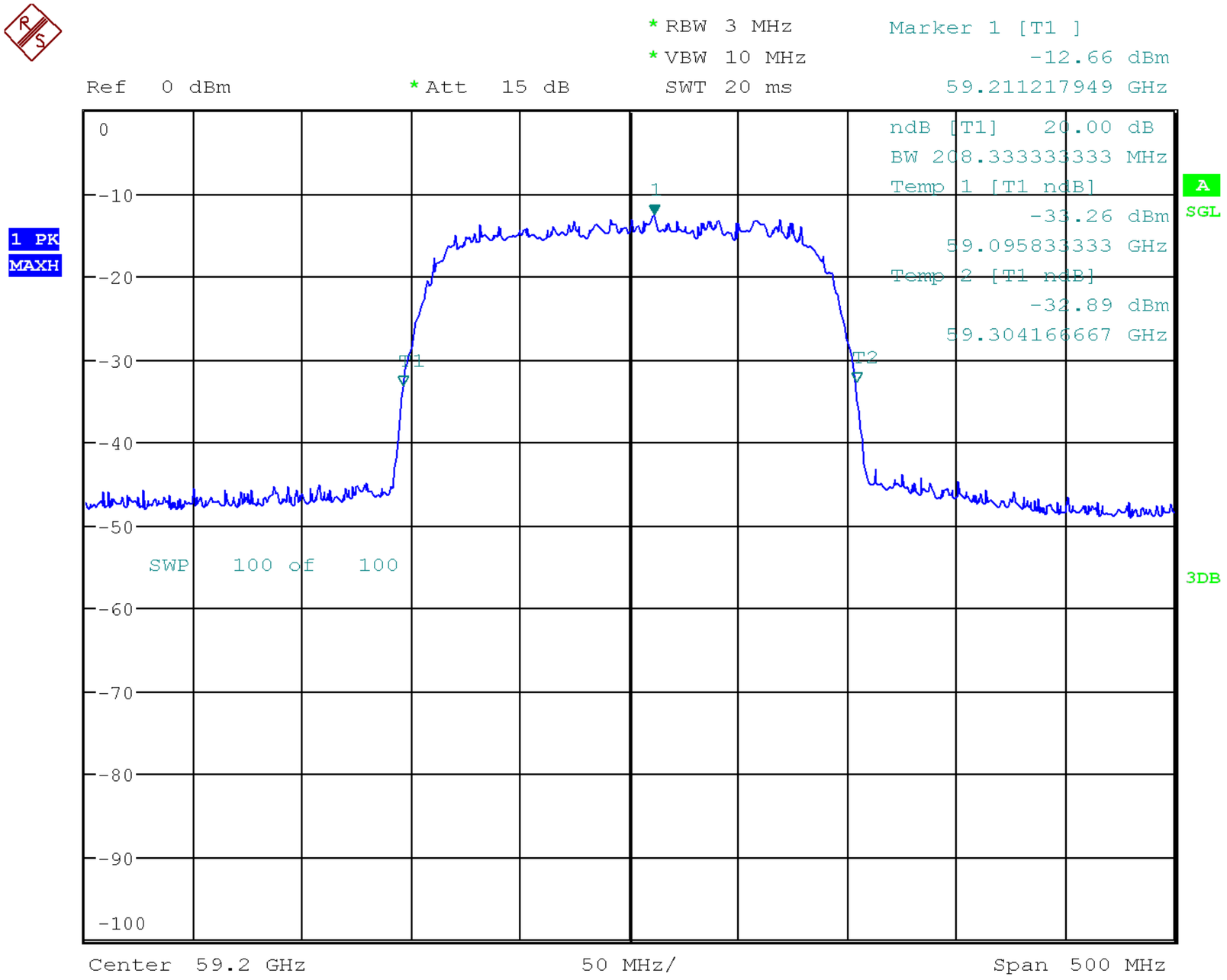
2.1.3.8 Temperature = +20 °C, Voltage = 100 %



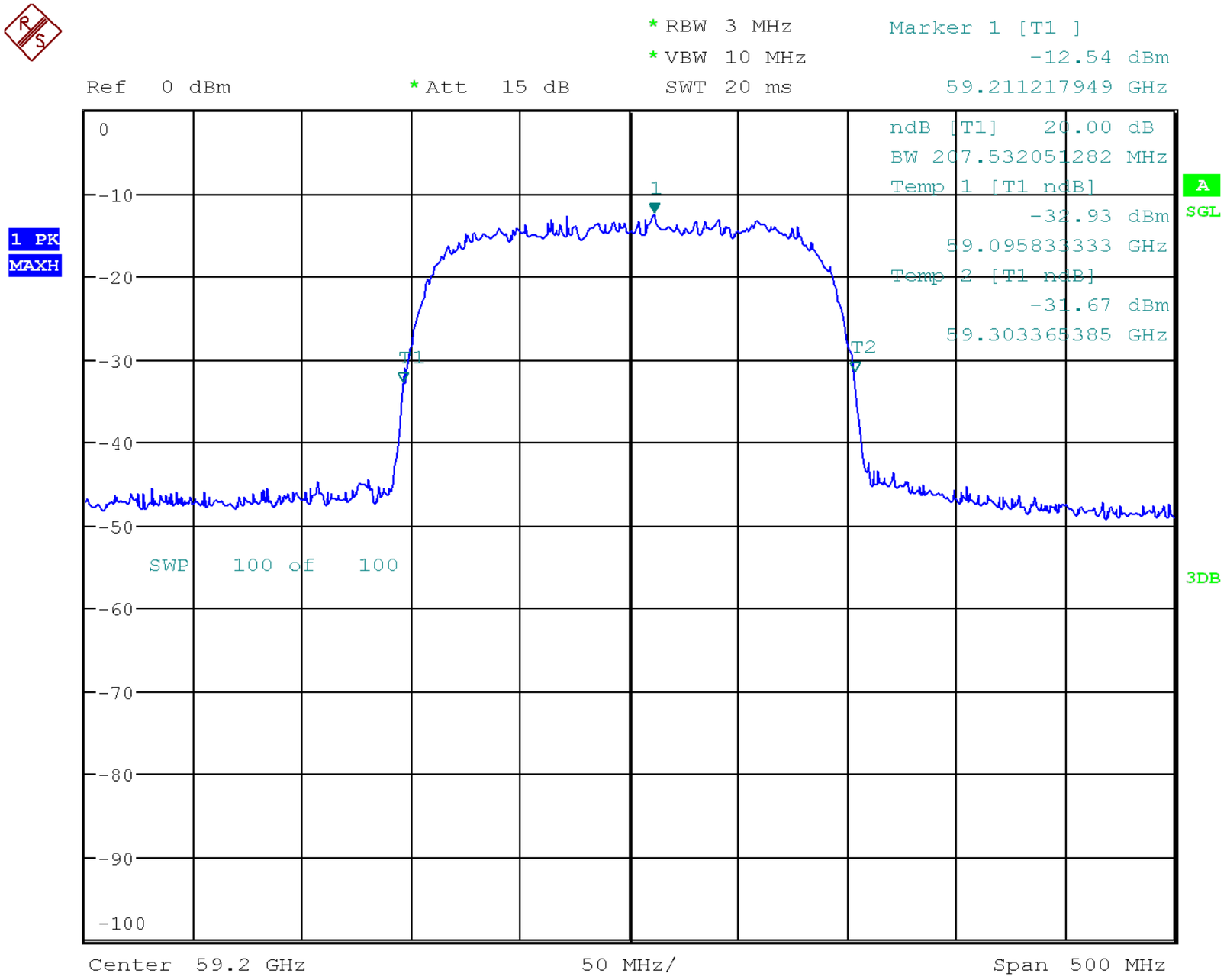
2.1.3.9 Temperature = +30 °C, Voltage = 100 %



2.1.3.10 Temperature = +40 °C, Voltage = 100 %

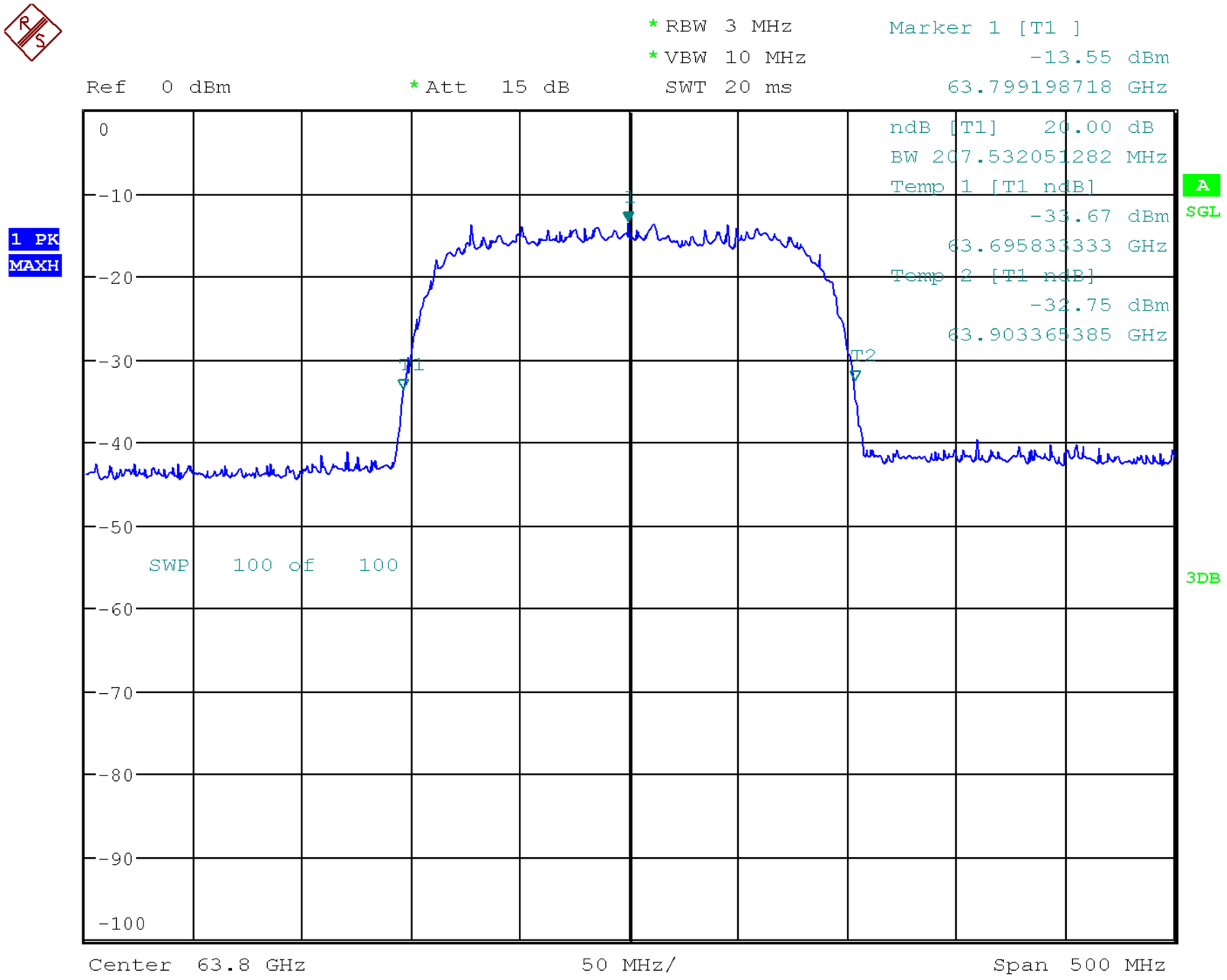


2.1.3.11 Temperature = +50 °C, Voltage = 100 %

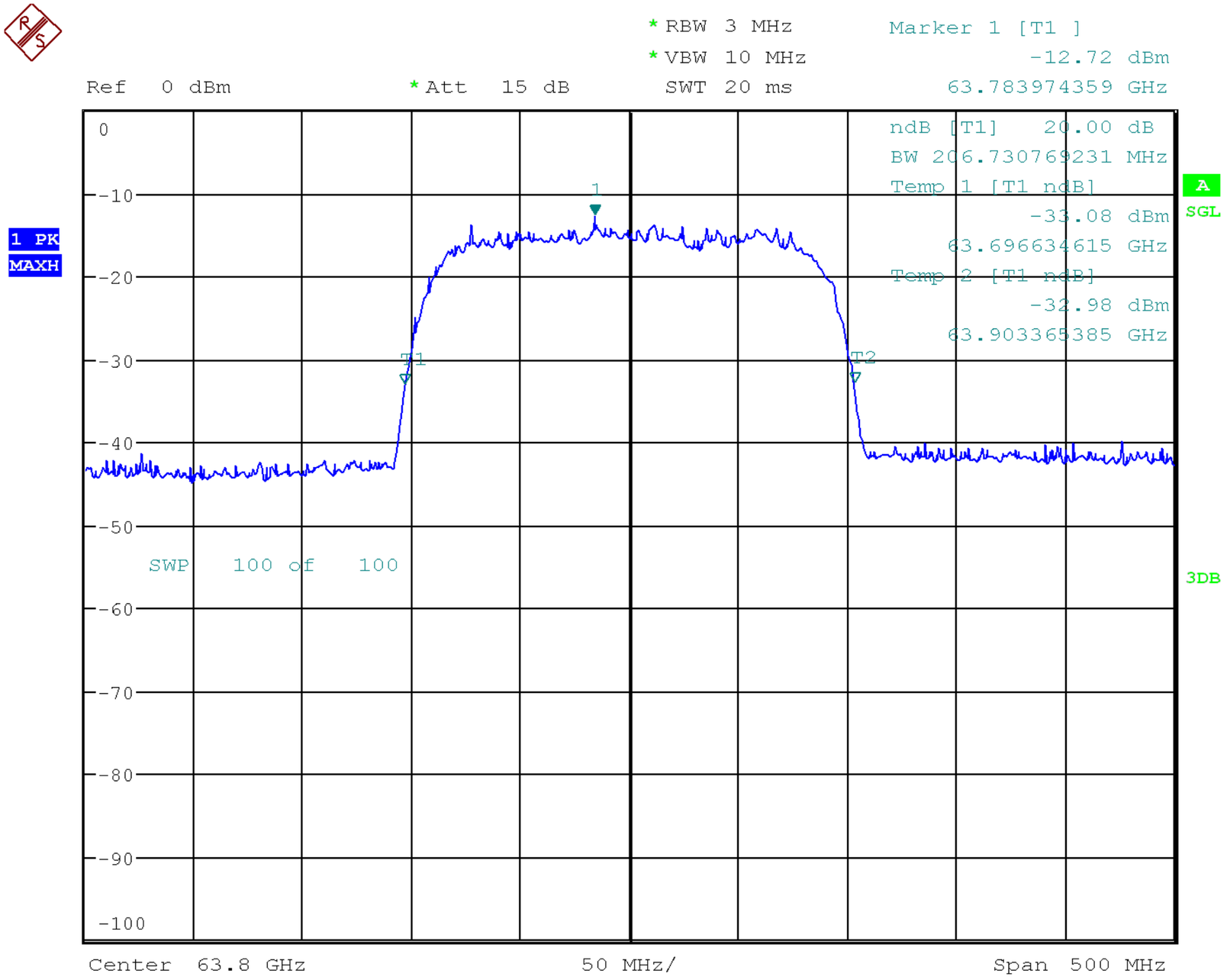


2.1.4 16QAM-T

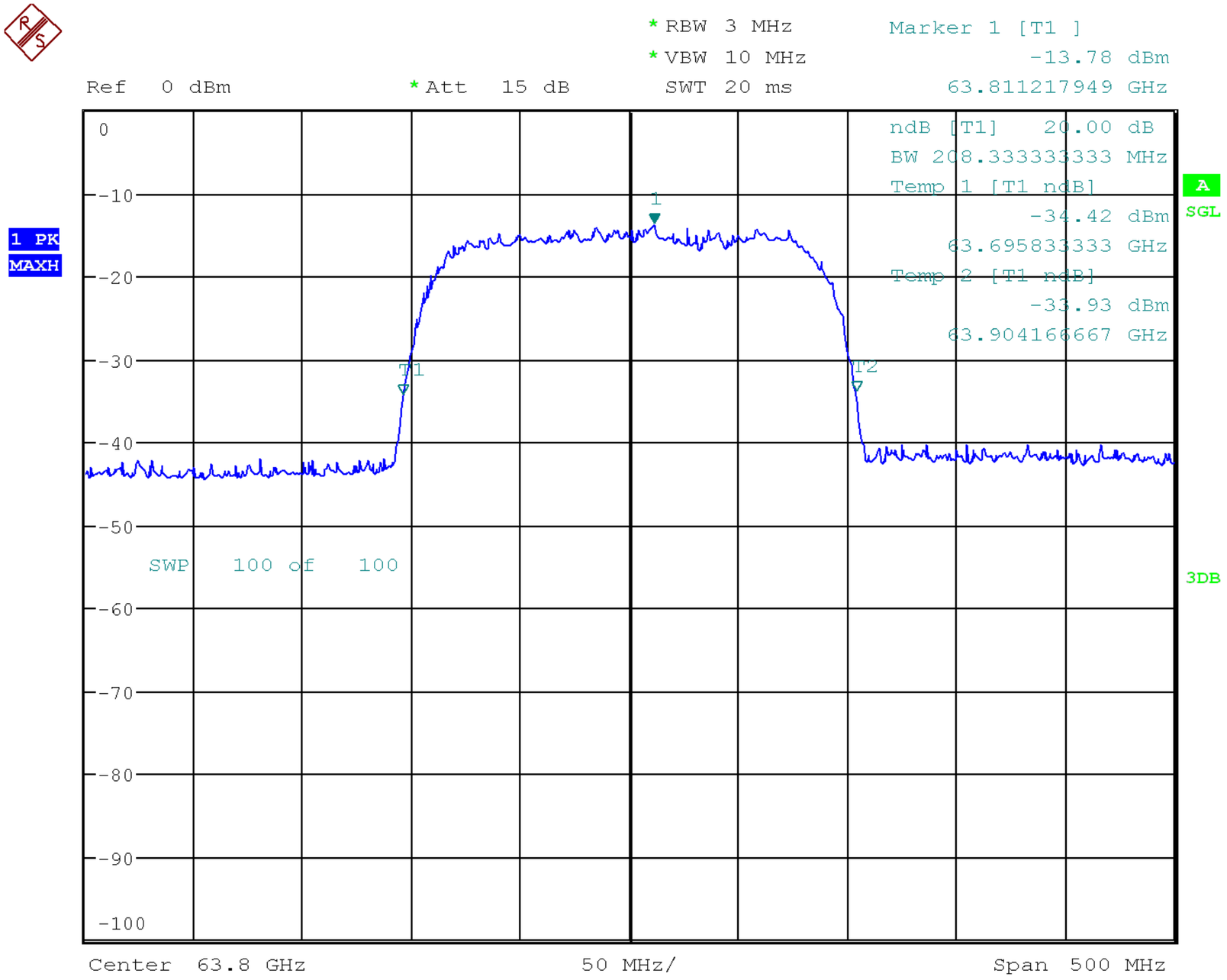
2.1.4.1 Temperature = Ambient, Voltage = 85 %



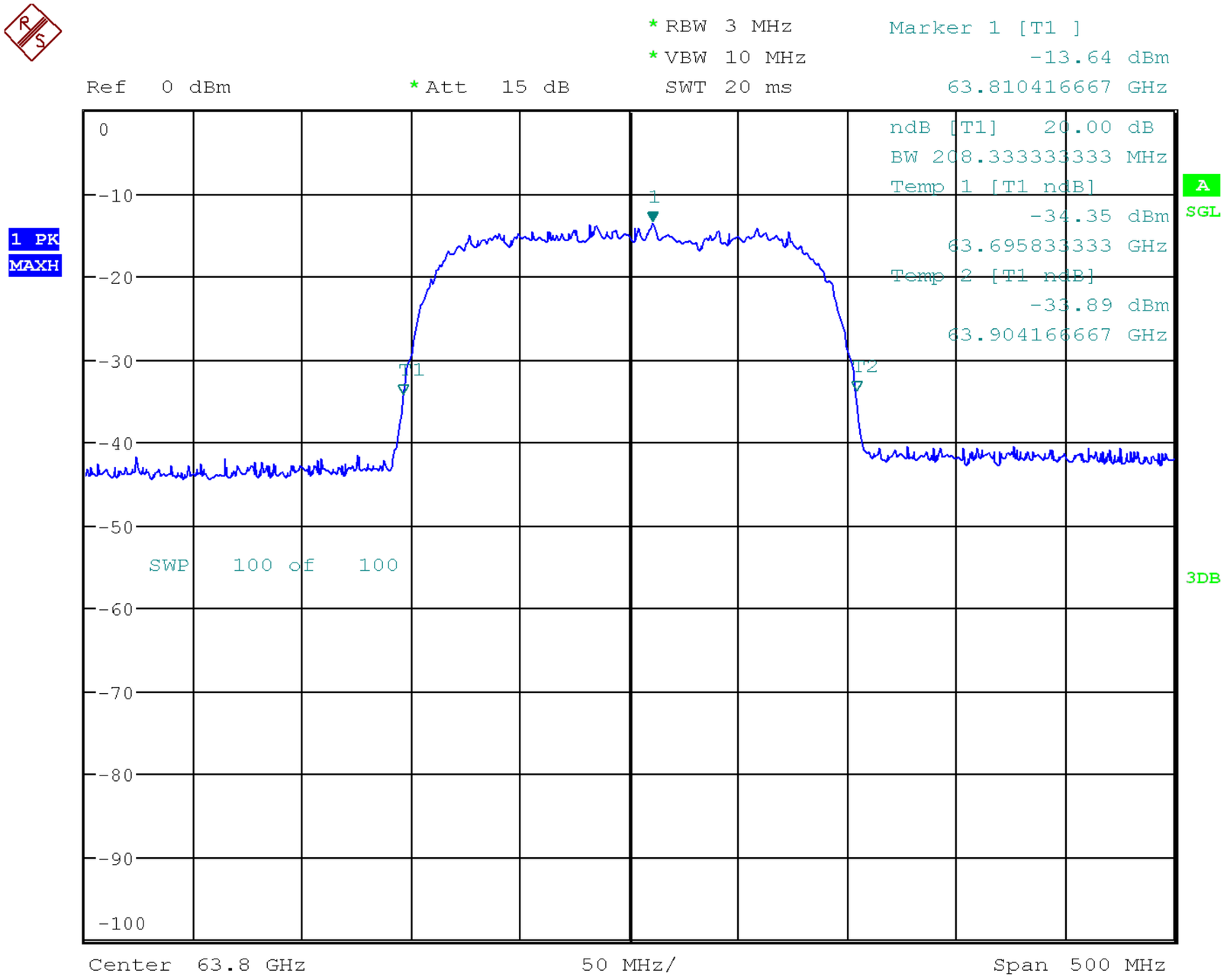
2.1.4.2 Temperature = Ambient, Voltage = 100 %



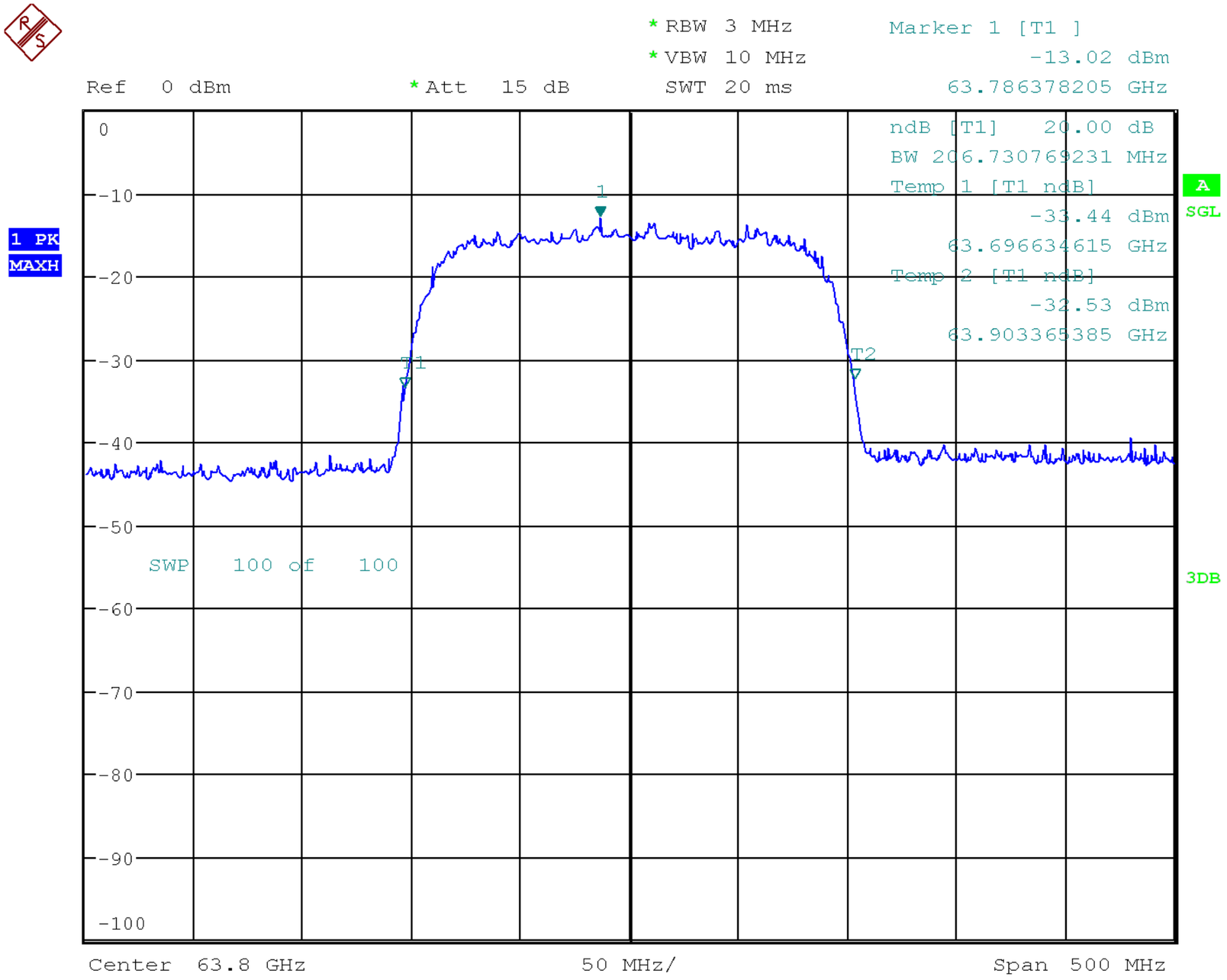
2.1.4.3 Temperature = Ambient, Voltage = 115 %



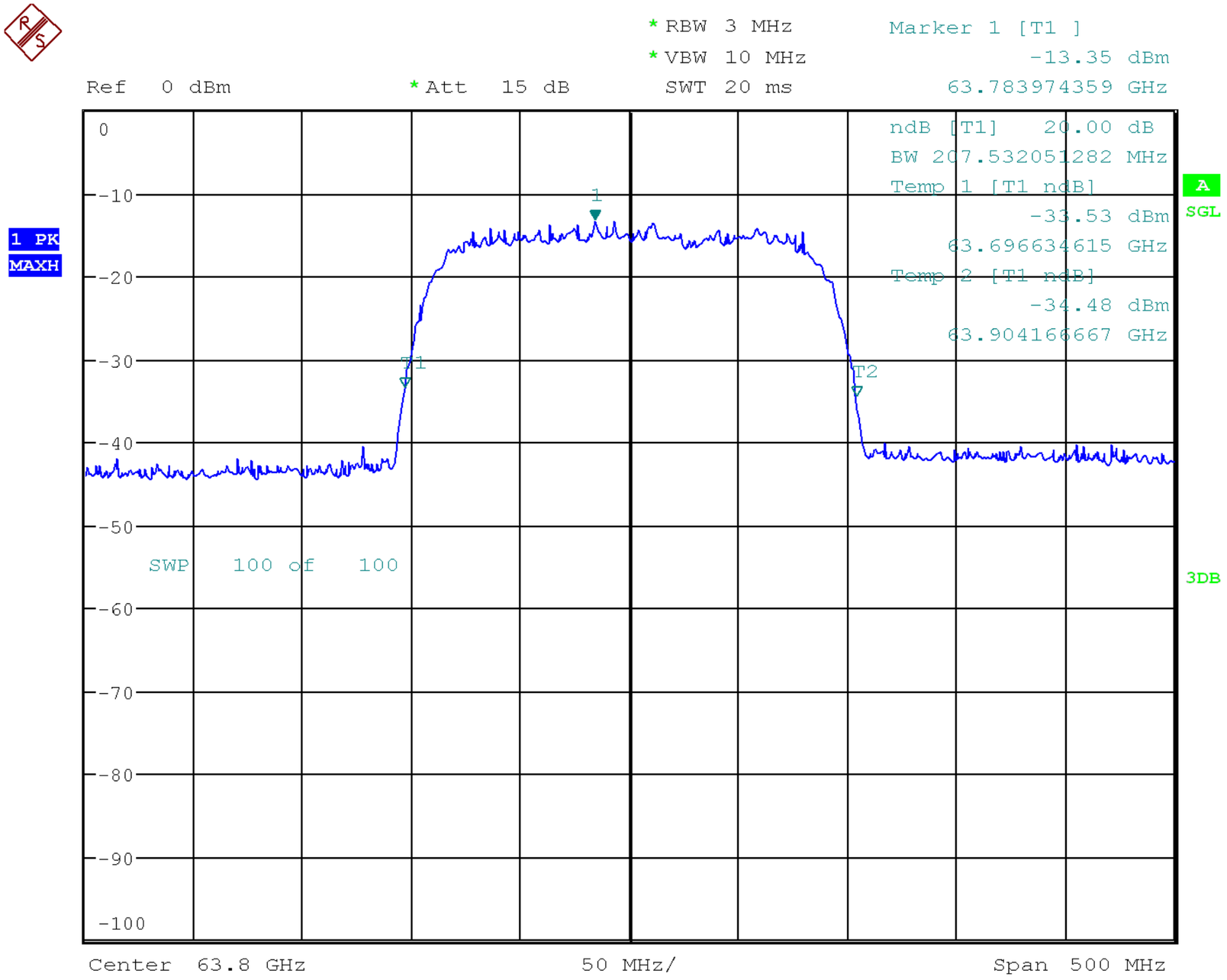
2.1.4.4 Temperature = -20 °C, Voltage = 100 %



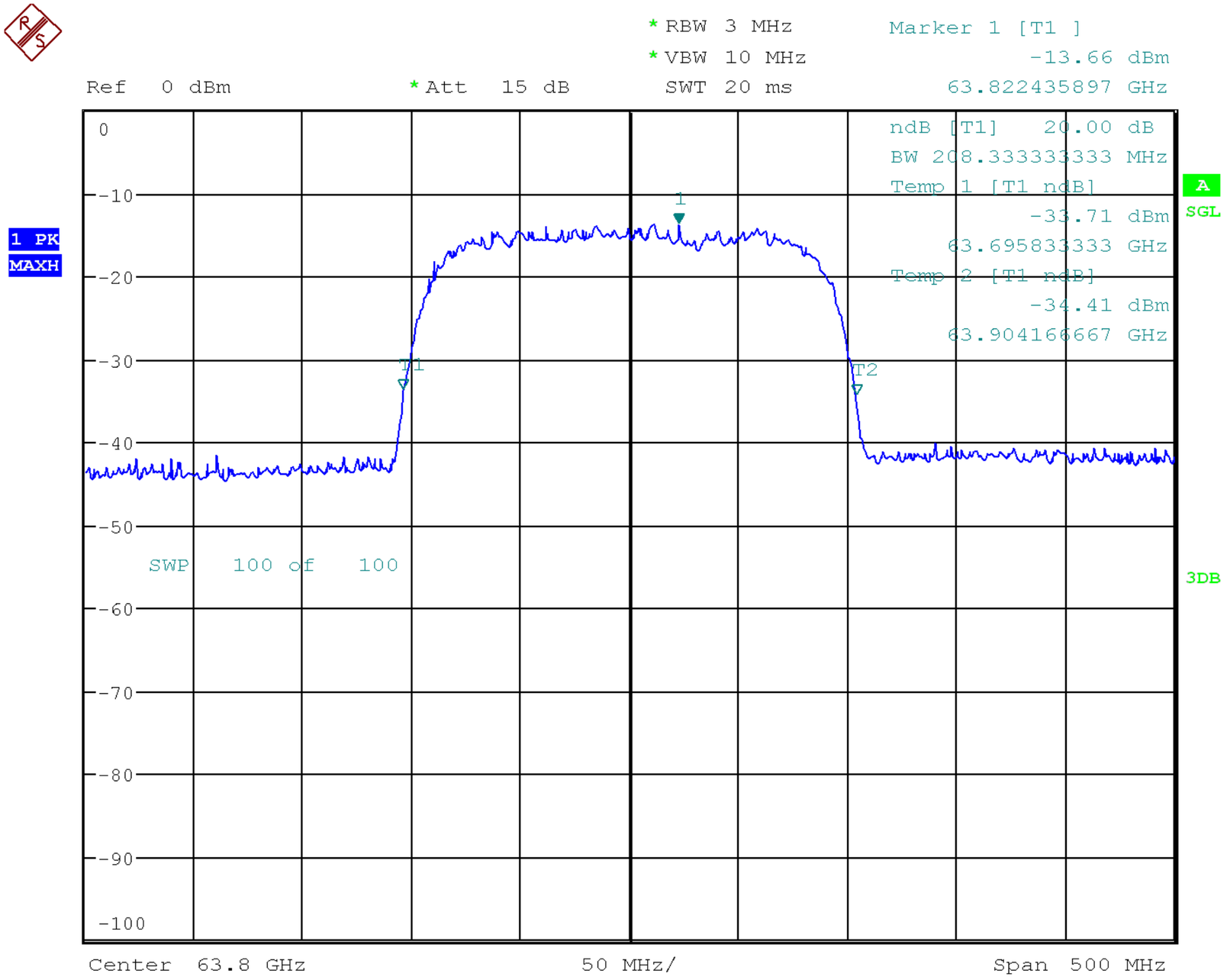
2.1.4.5 Temperature = -10 °C, Voltage = 100 %



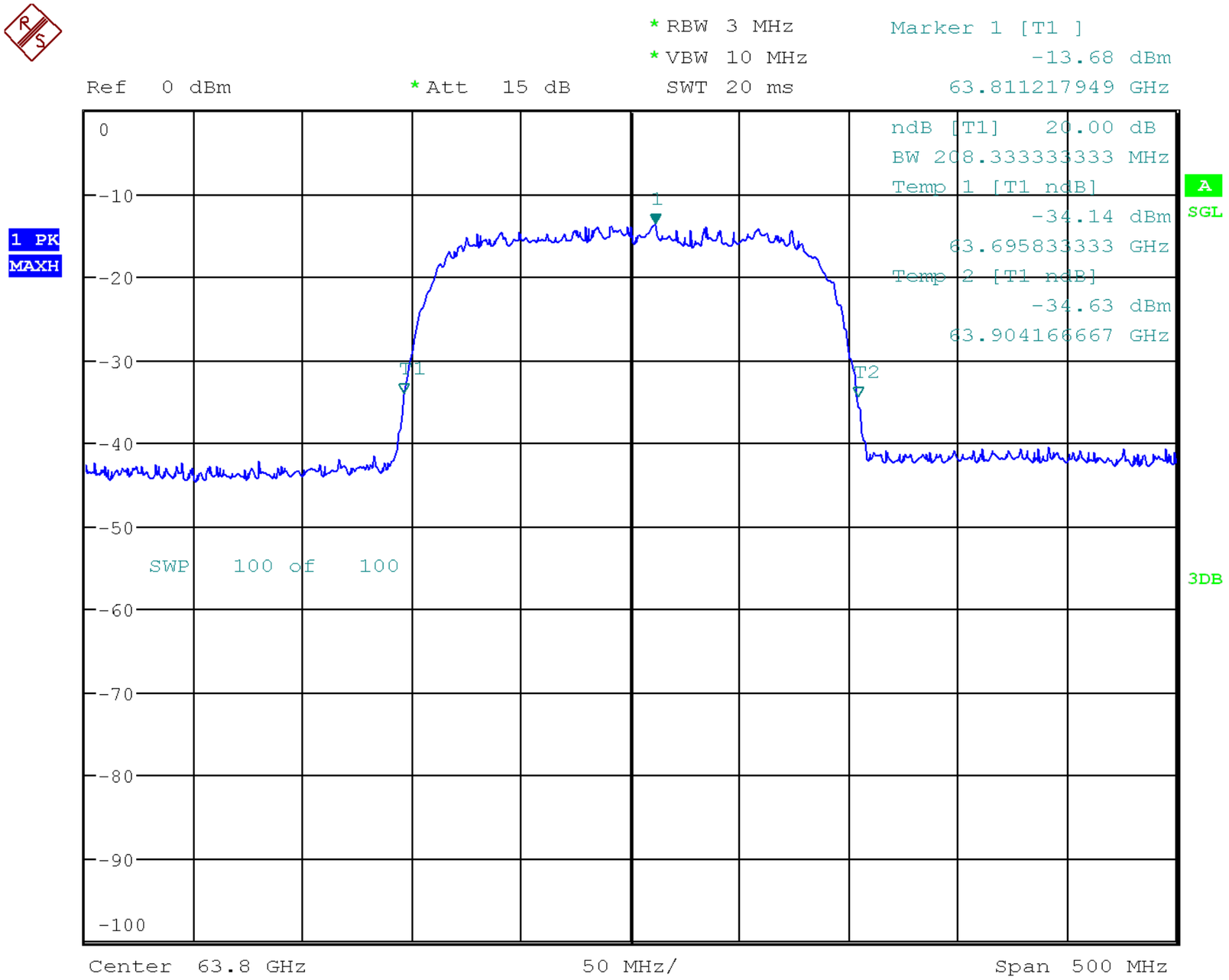
2.1.4.6 Temperature = 0 °C, Voltage = 100 %



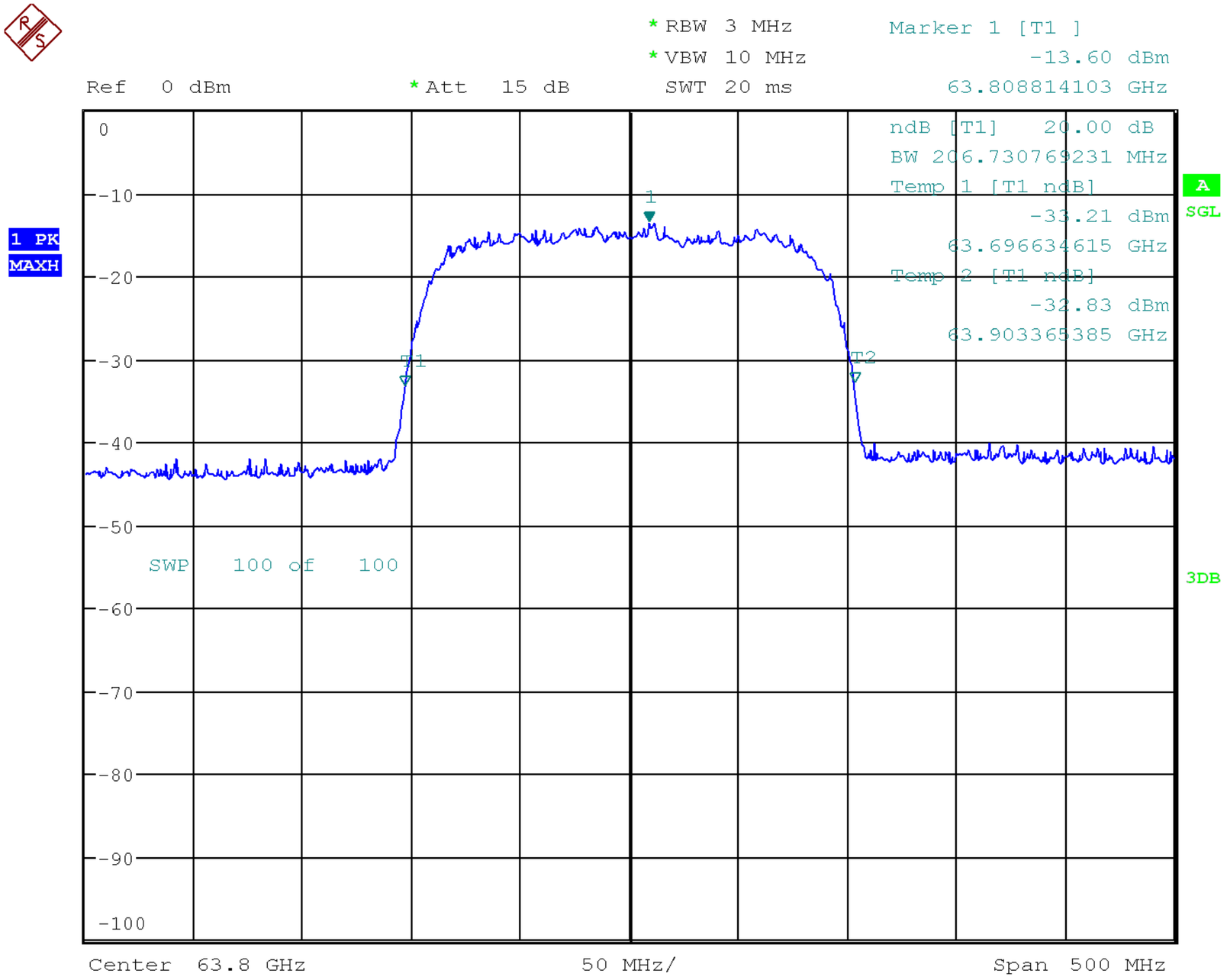
2.1.4.7 Temperature = +10 °C, Voltage = 100 %



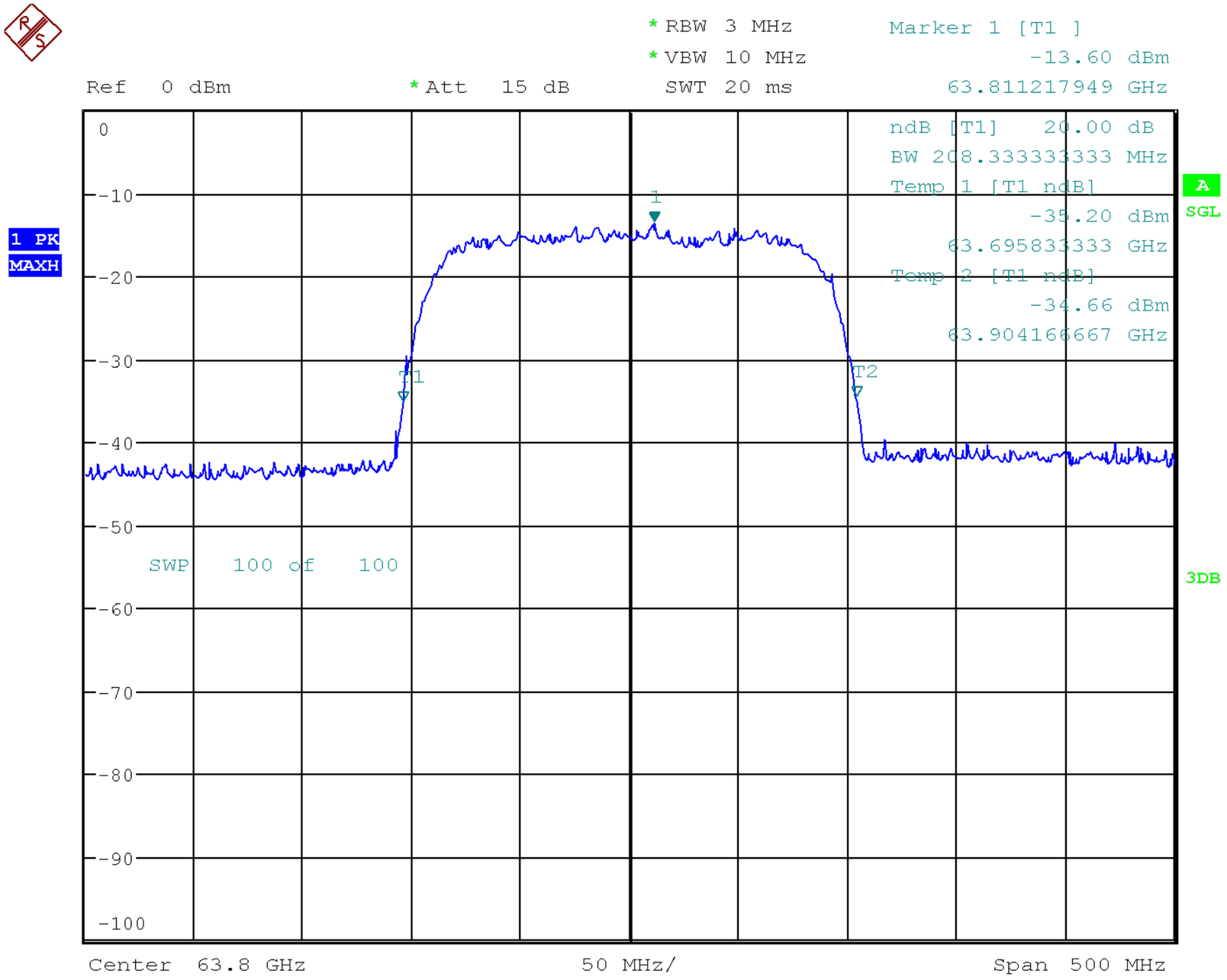
2.1.4.8 Temperature = +20 °C, Voltage = 100 %



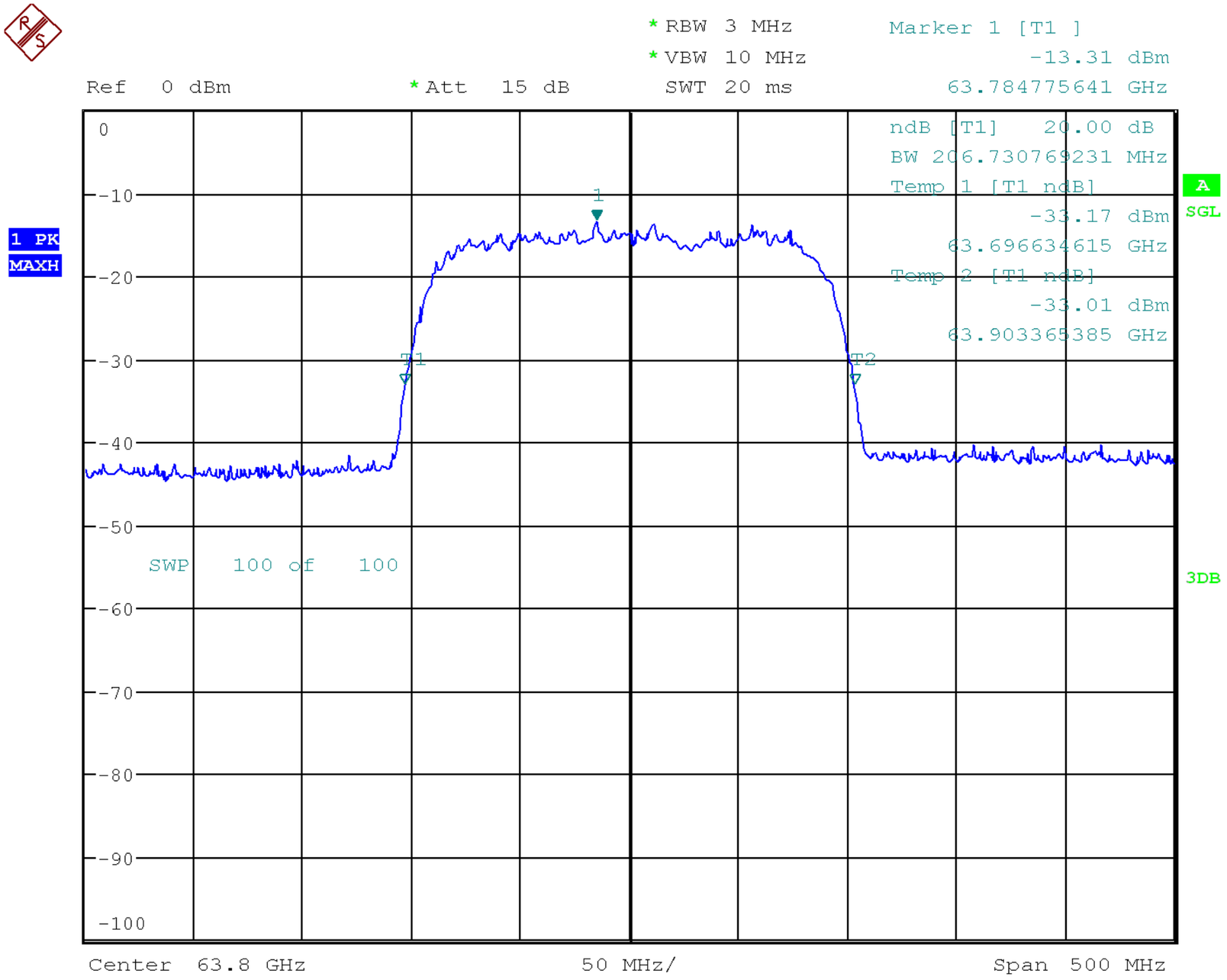
2.1.4.9 Temperature = +30 °C, Voltage = 100 %



2.1.4.10 Temperature = +40 °C, Voltage = 100 %

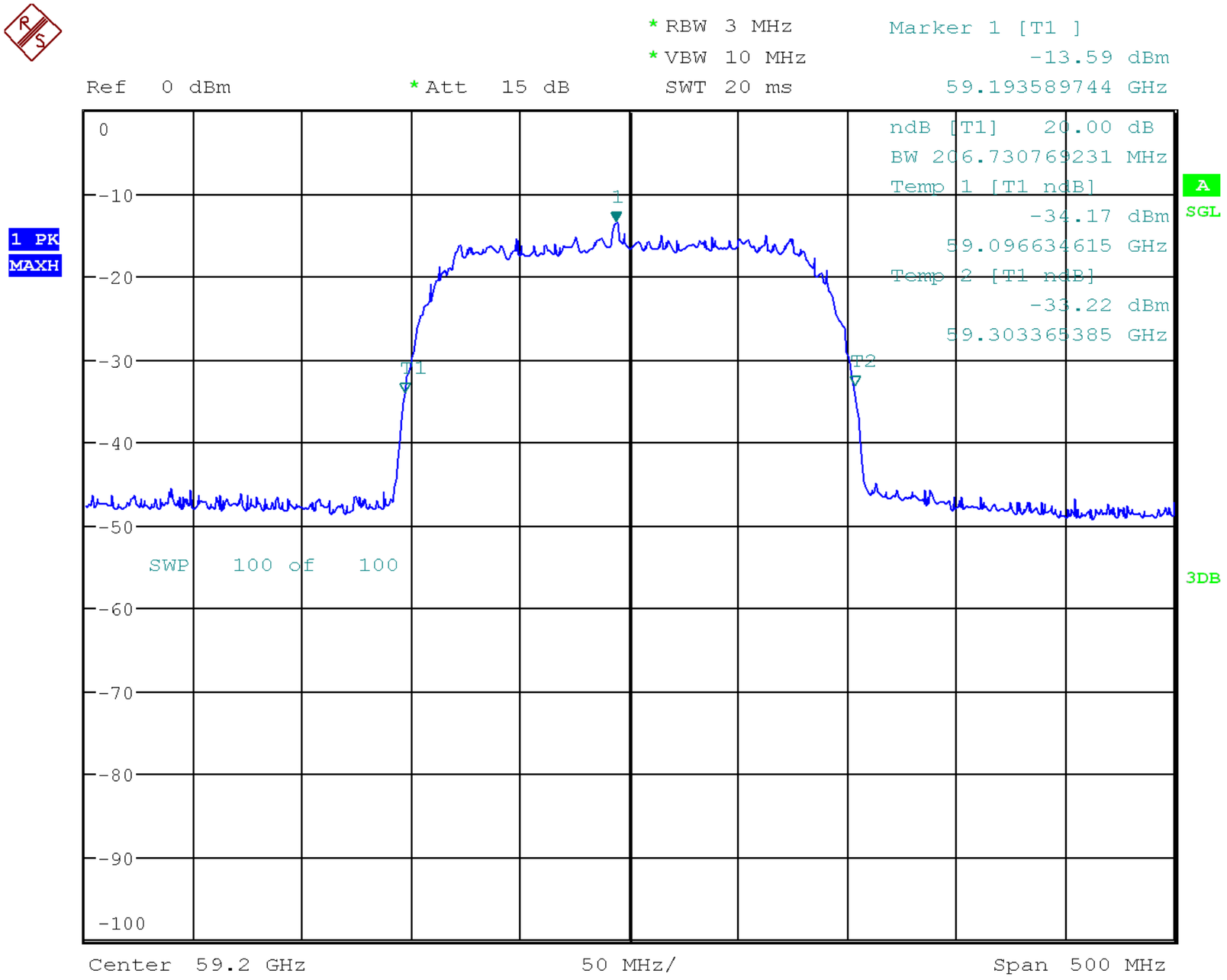


2.1.4.11 Temperature = +50 °C, Voltage = 100 %

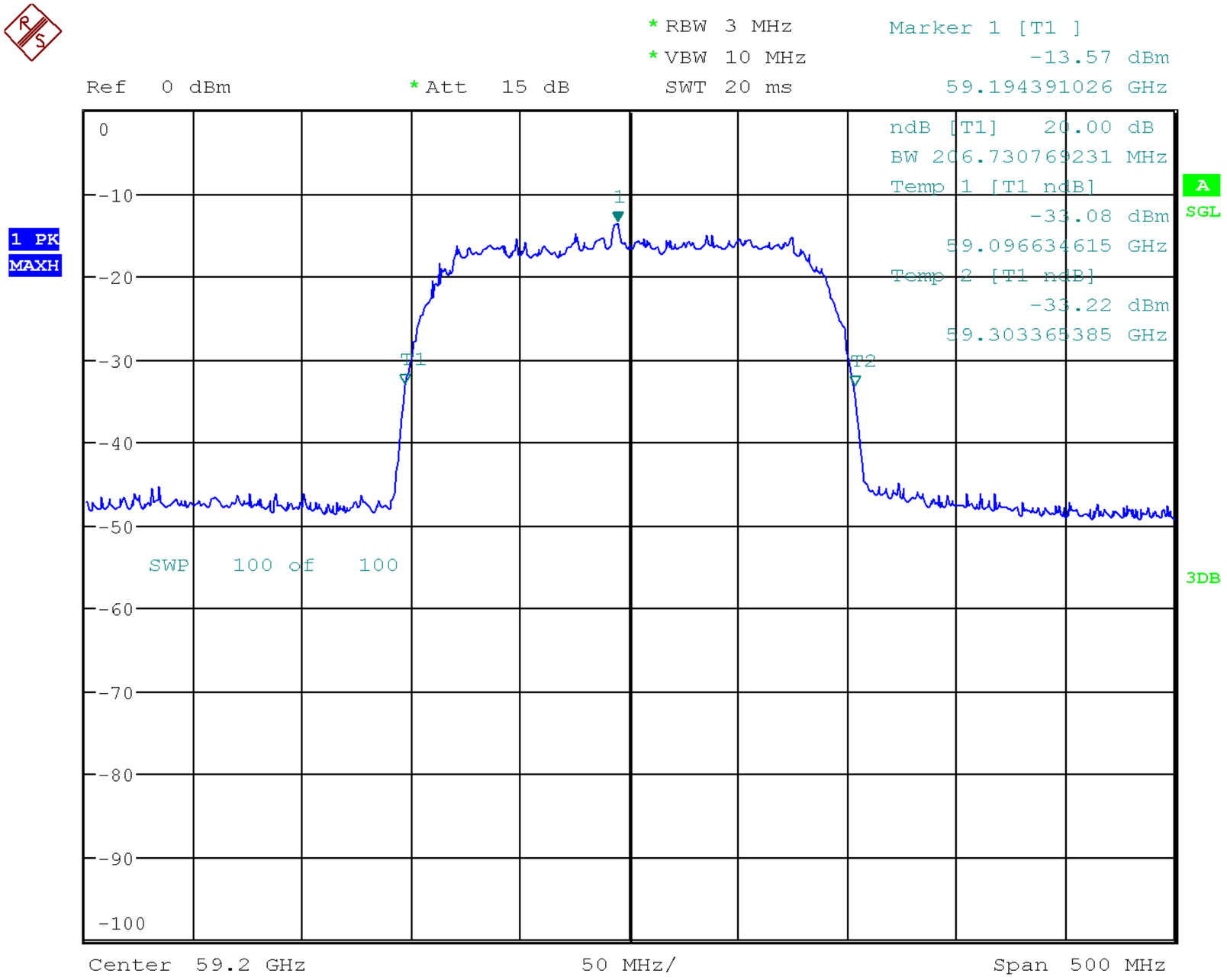


2.1.5 32QAM-B

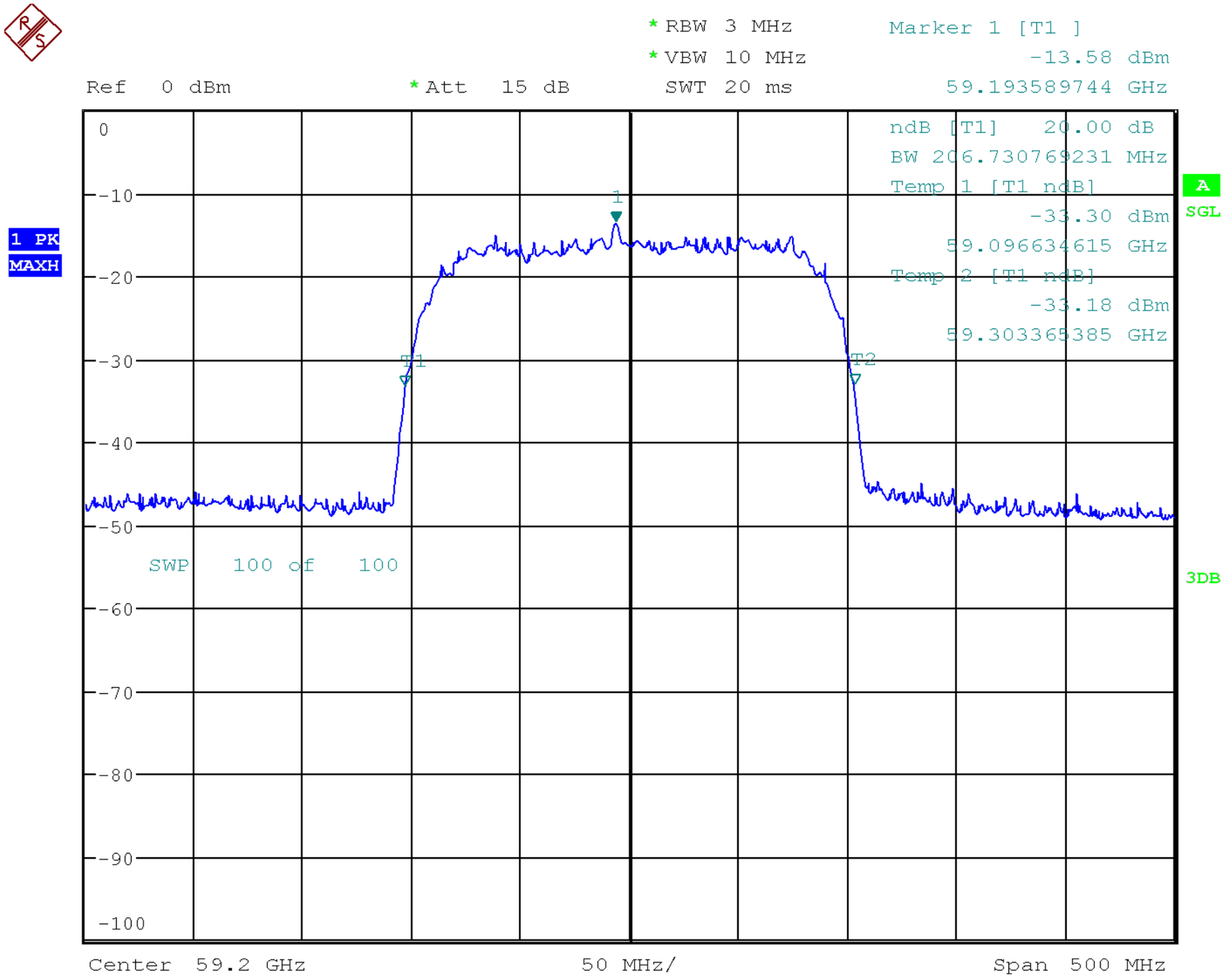
2.1.5.1 Temperature = Ambient, Voltage = 85 %



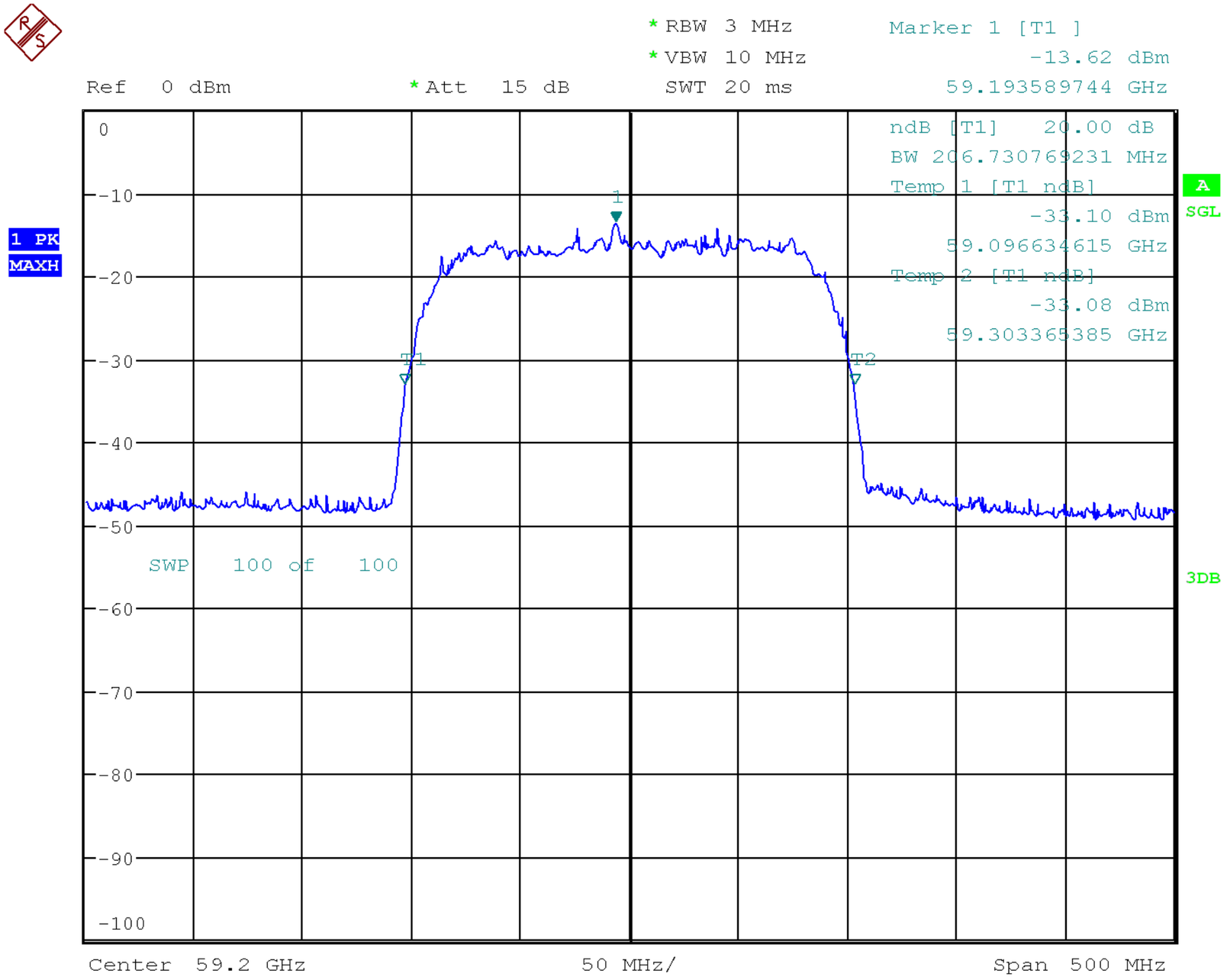
2.1.5.2 Temperature = Ambient, Voltage = 100 %



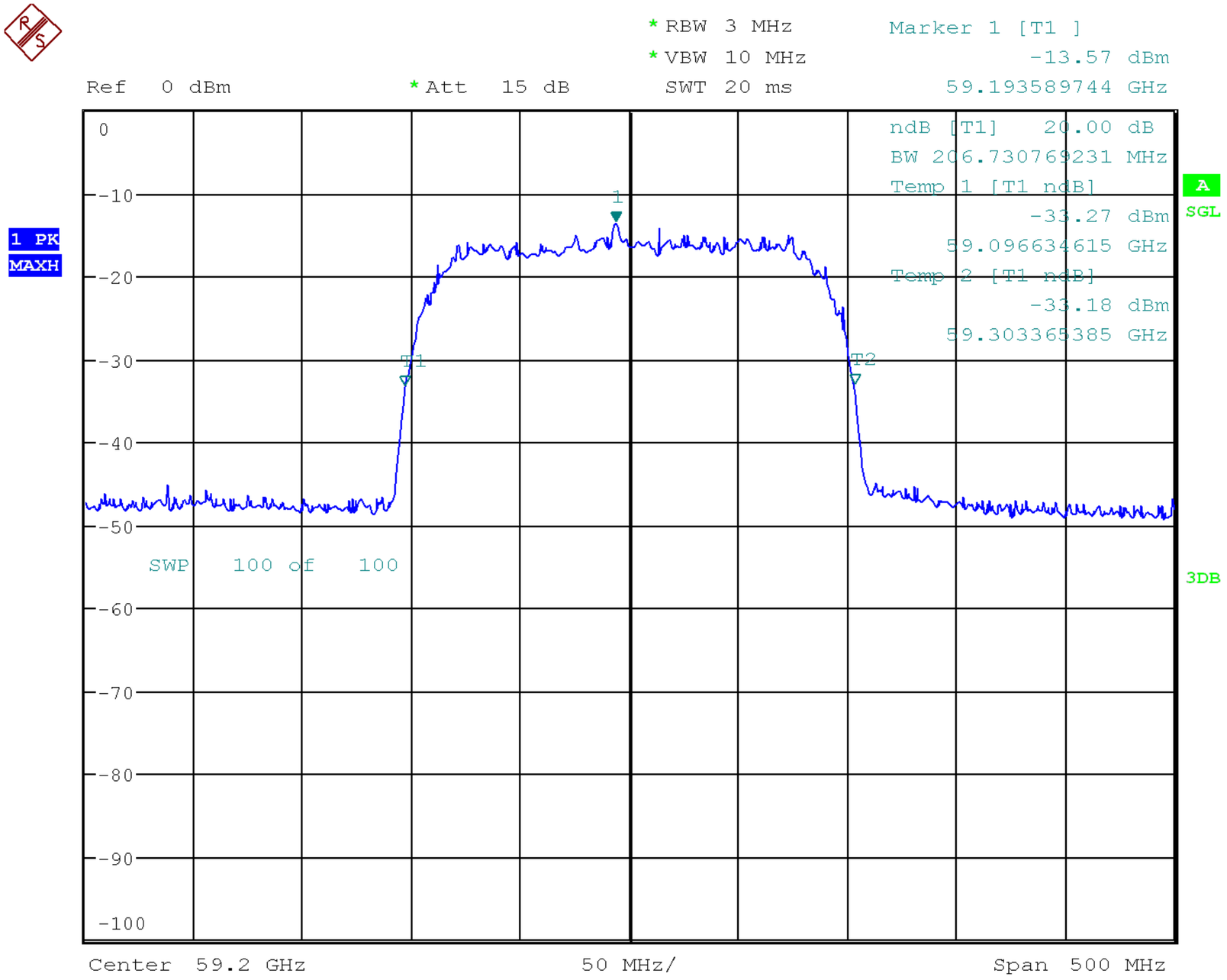
2.1.5.3 Temperature = Ambient, Voltage = 115 %



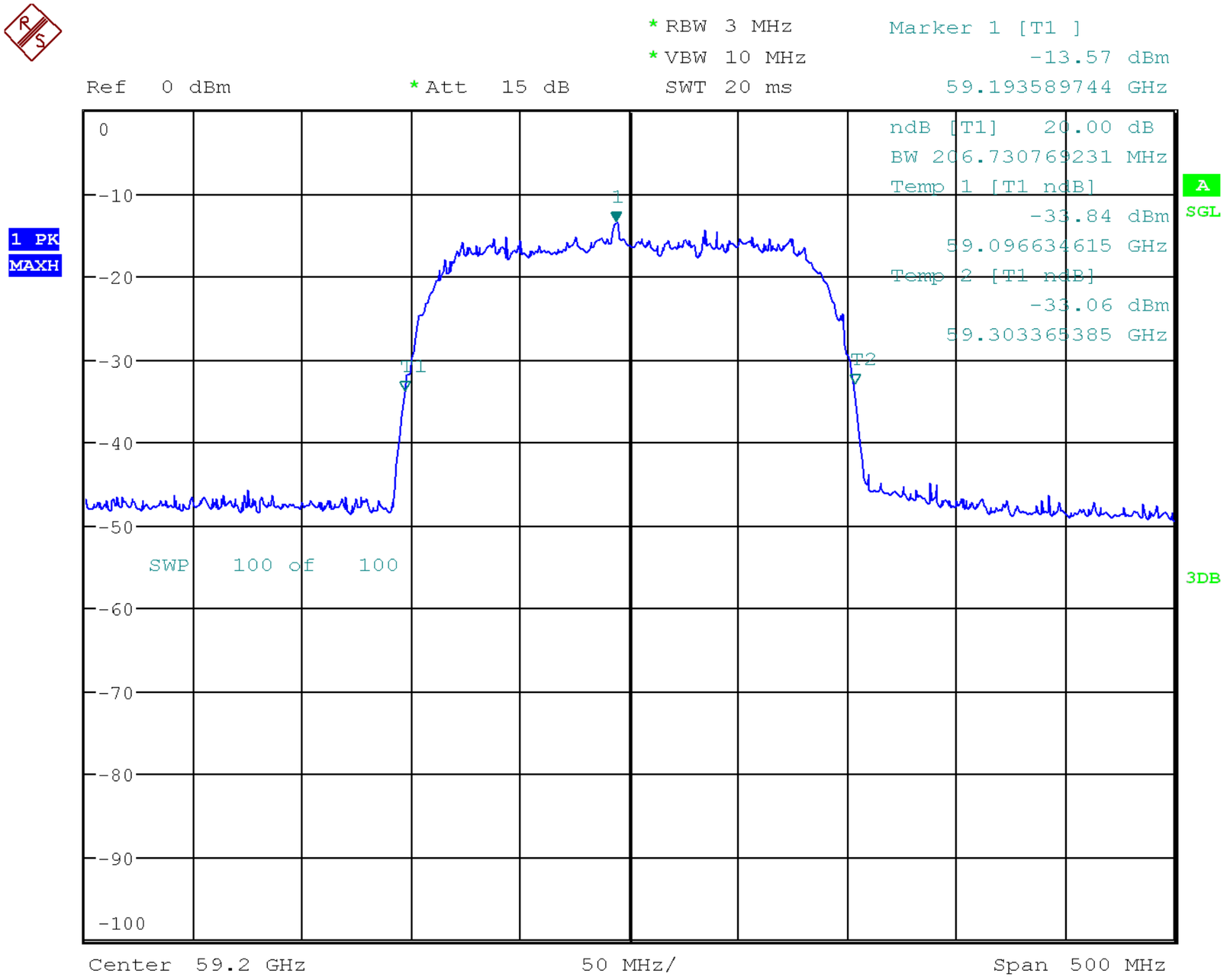
2.1.5.4 Temperature = -20 °C, Voltage = 100 %



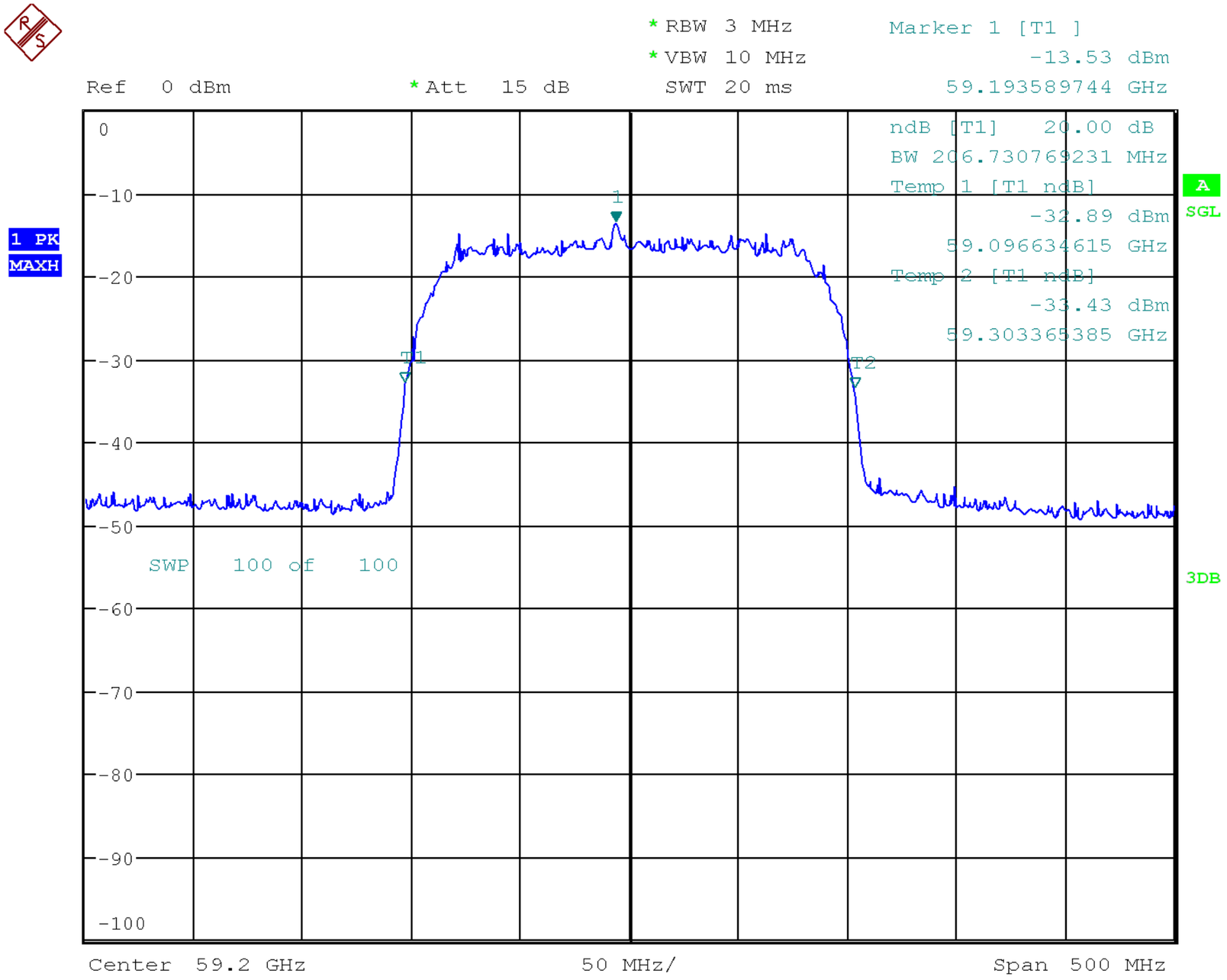
2.1.5.5 Temperature = -10 °C, Voltage = 100 %



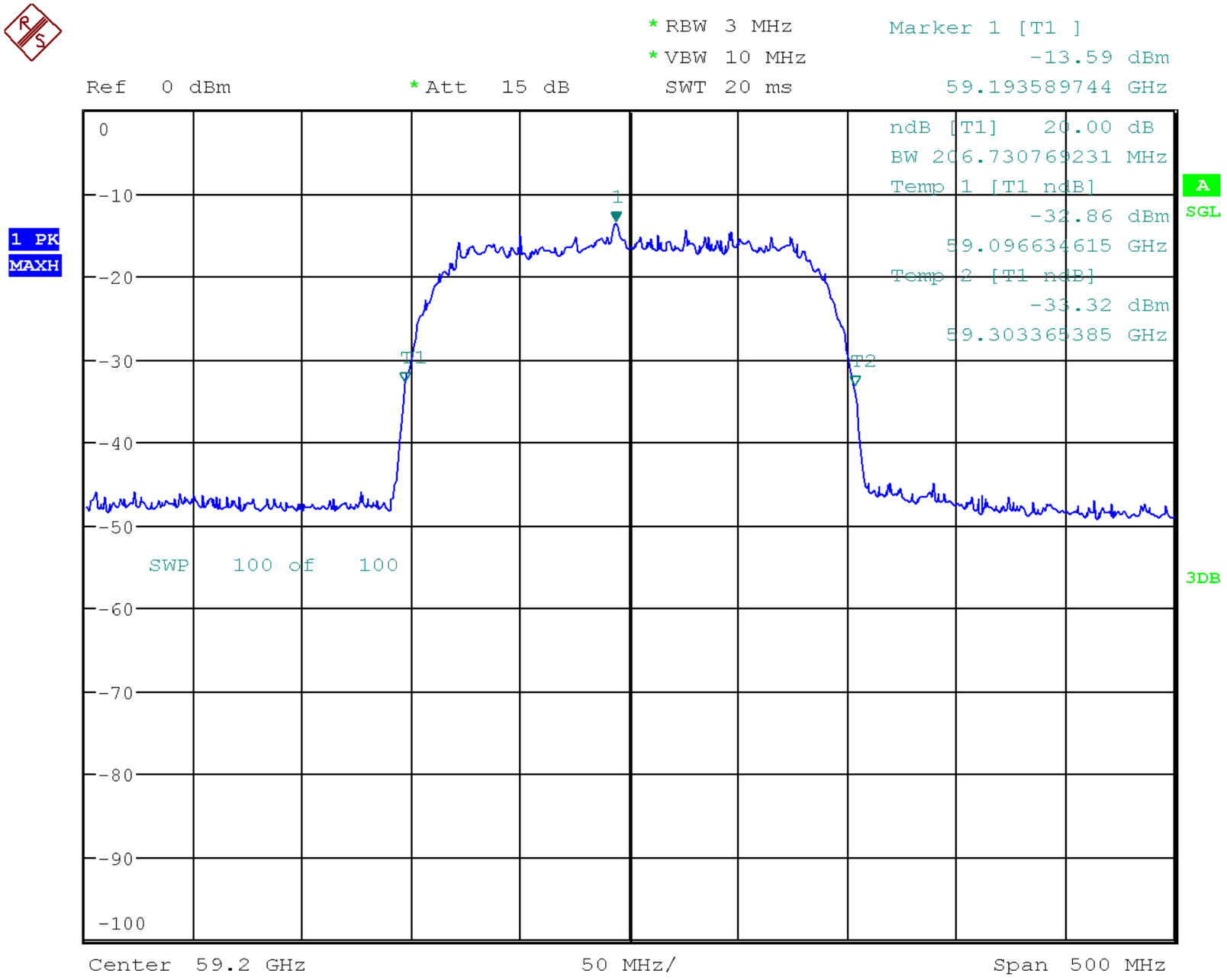
2.1.5.6 Temperature = 0 °C, Voltage = 100 %



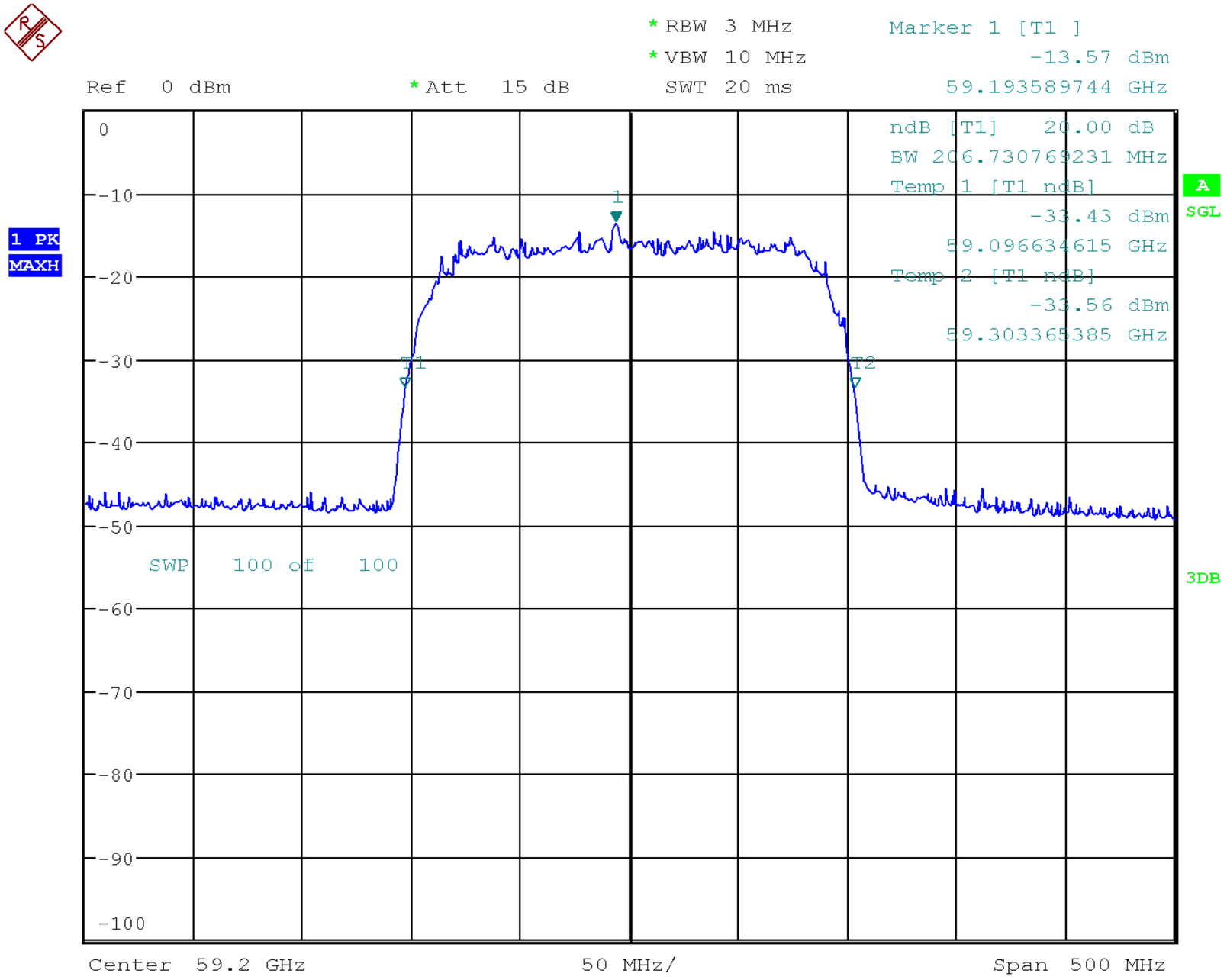
2.1.5.7 Temperature = +10 °C, Voltage = 100 %



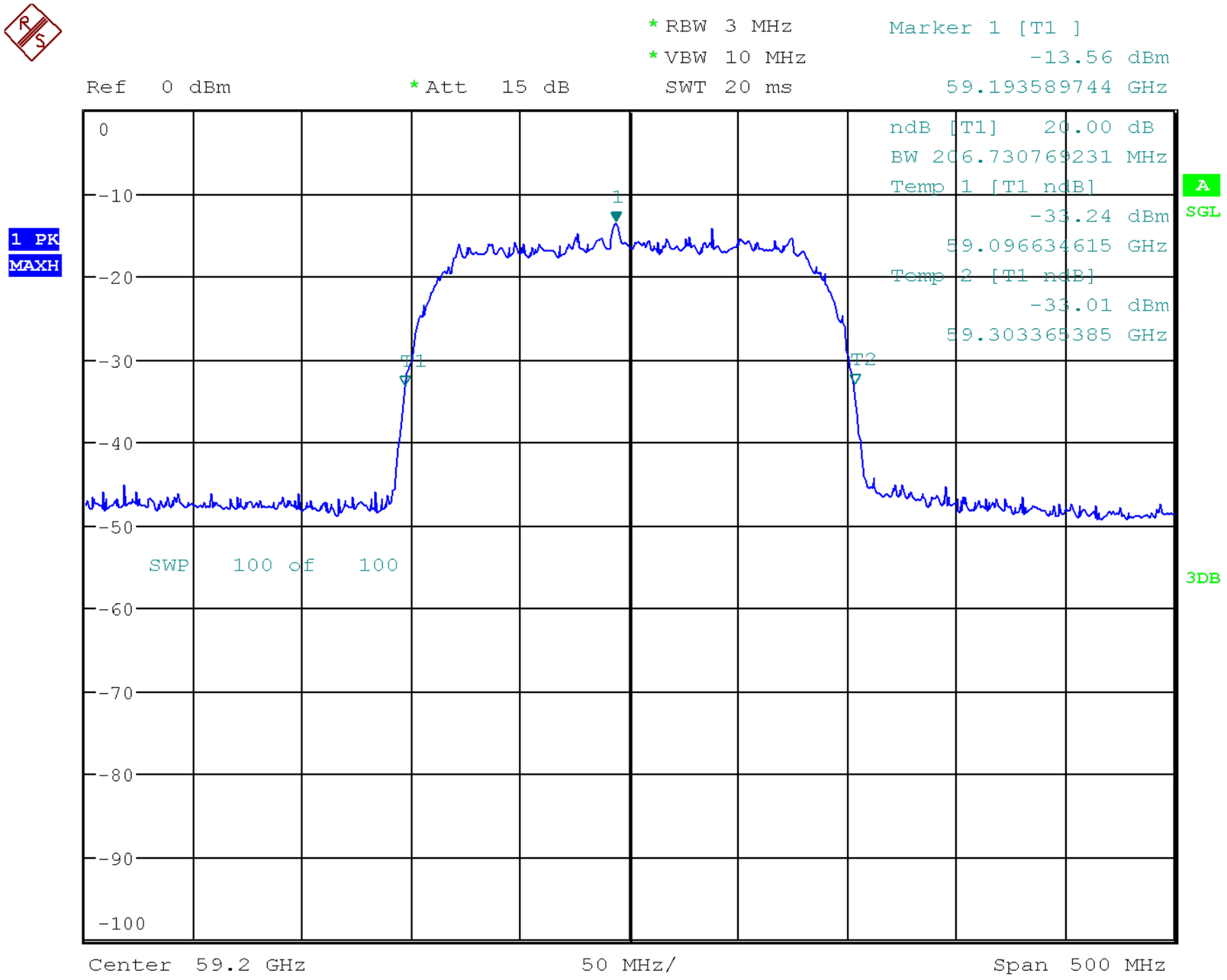
2.1.5.8 Temperature = +20 °C, Voltage = 100 %



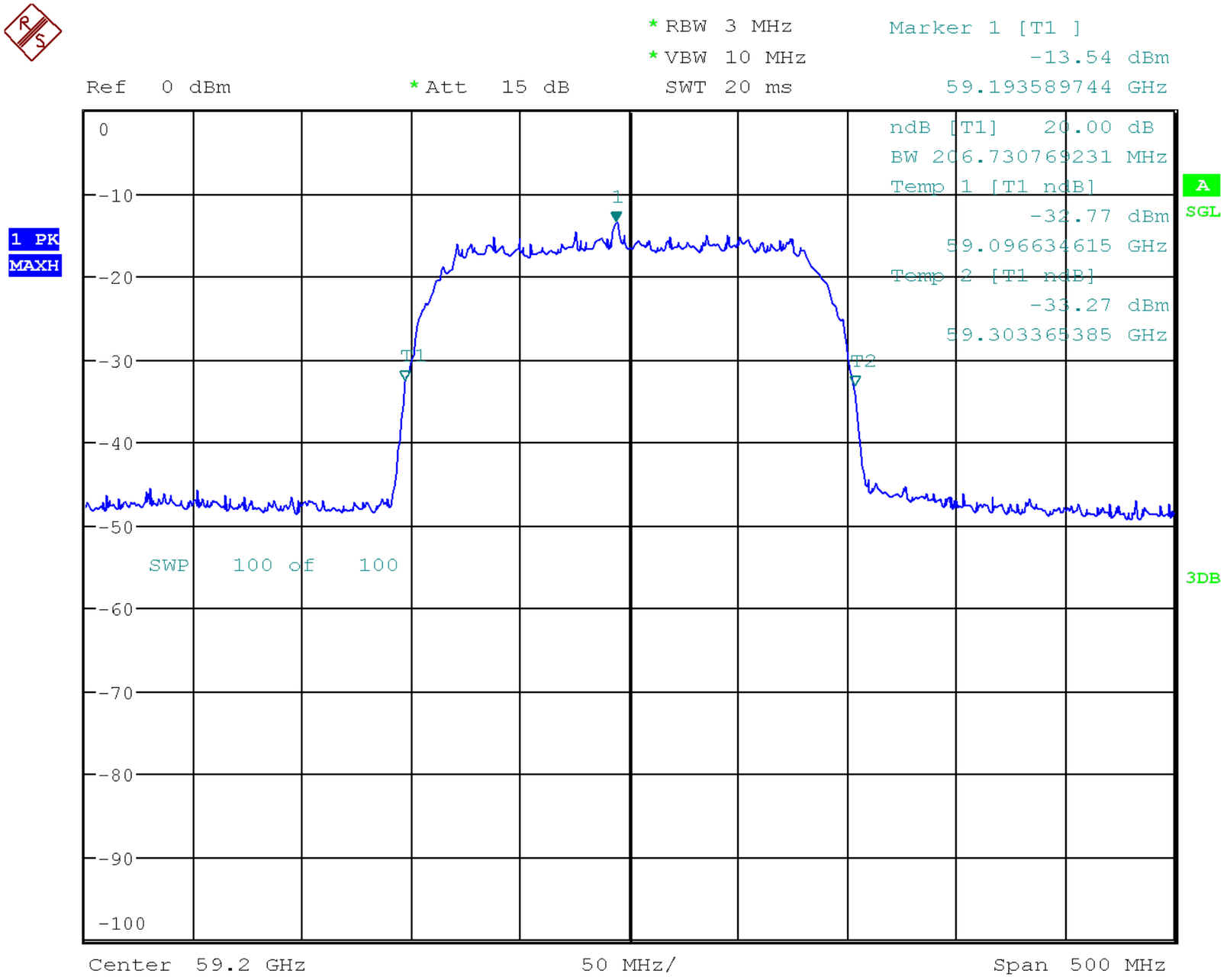
2.1.5.9 Temperature = +30 °C, Voltage = 100 %



2.1.5.10 Temperature = +40 °C, Voltage = 100 %

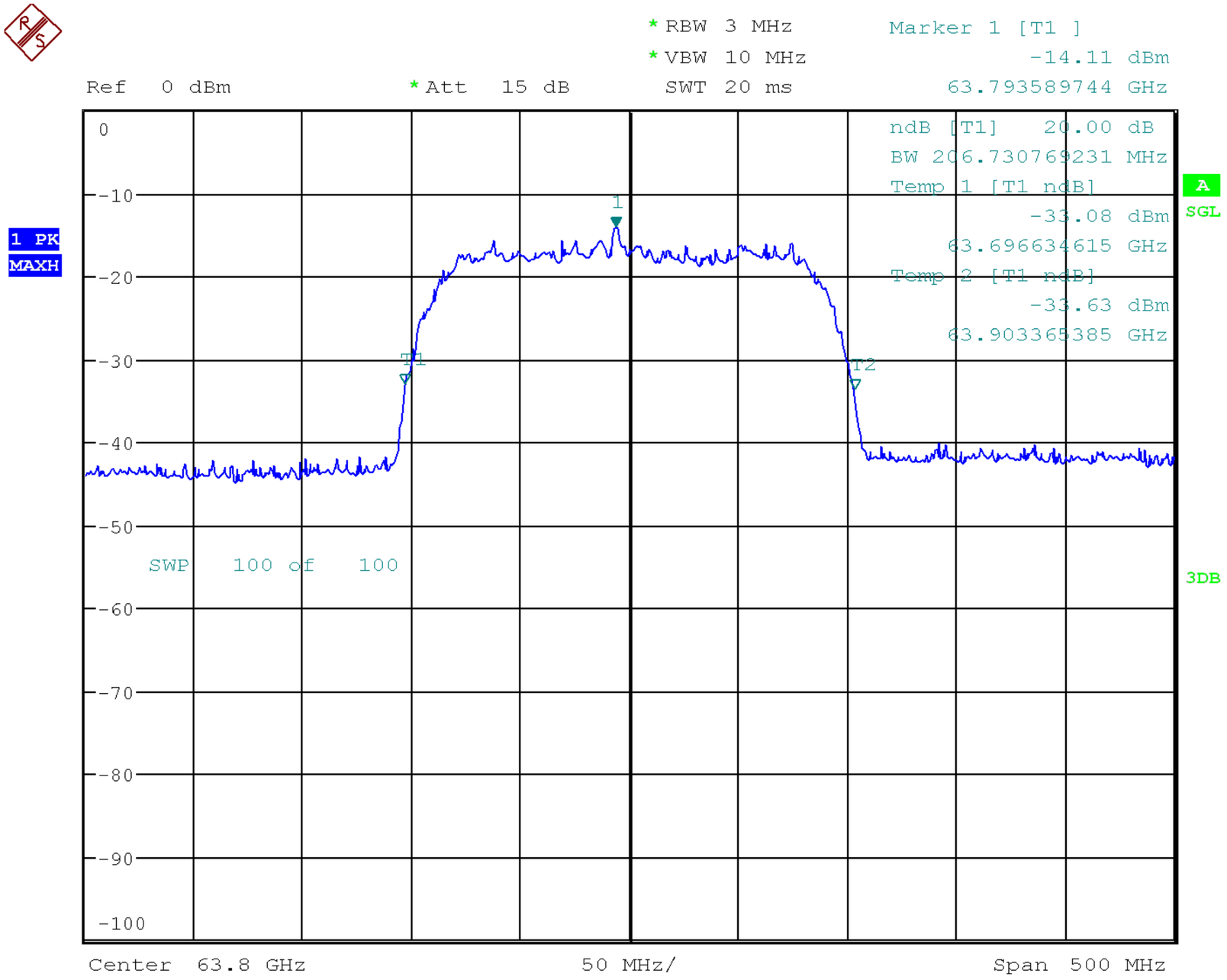


2.1.5.11 Temperature = +50 °C, Voltage = 100 %

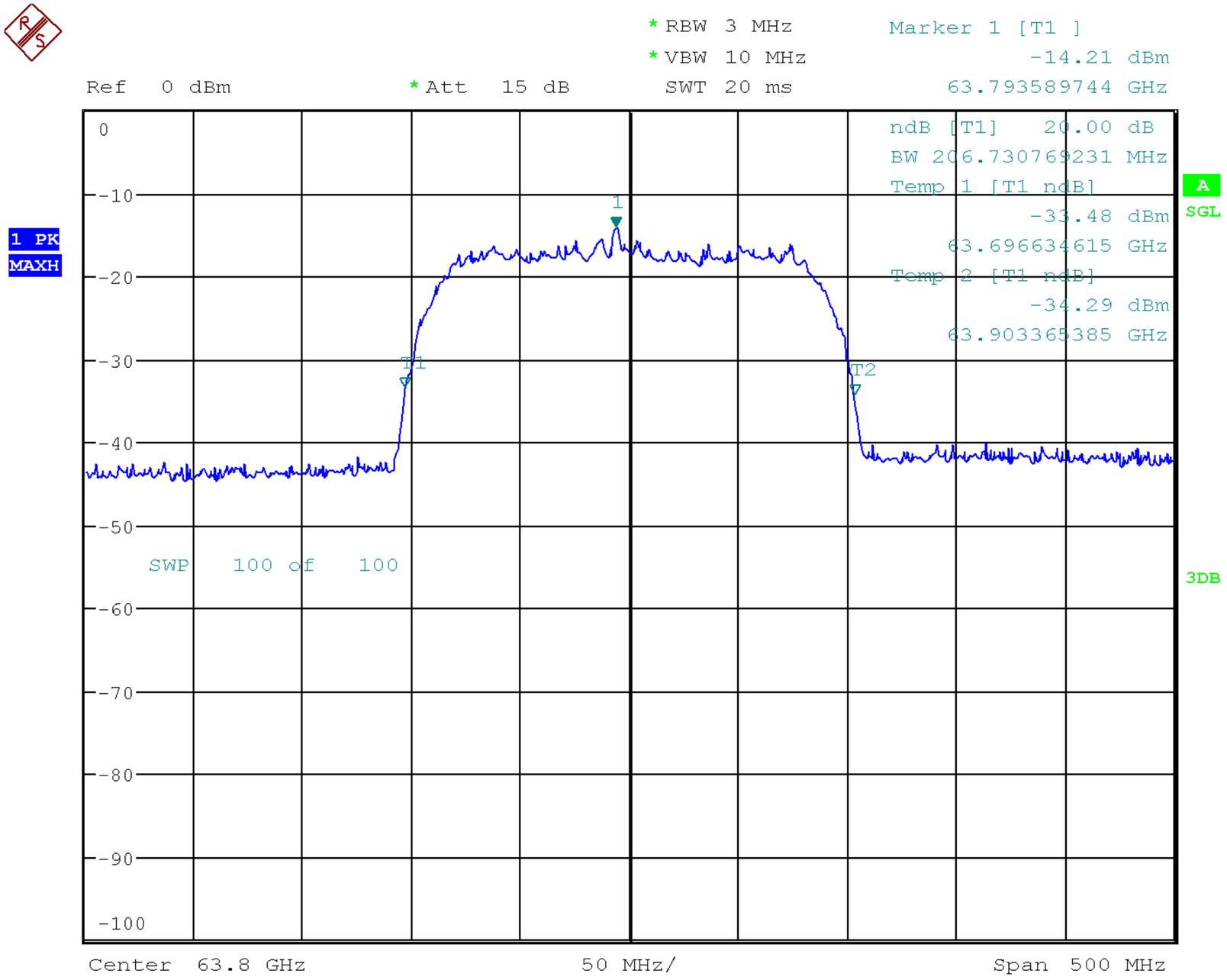


2.1.6 32QAM-T

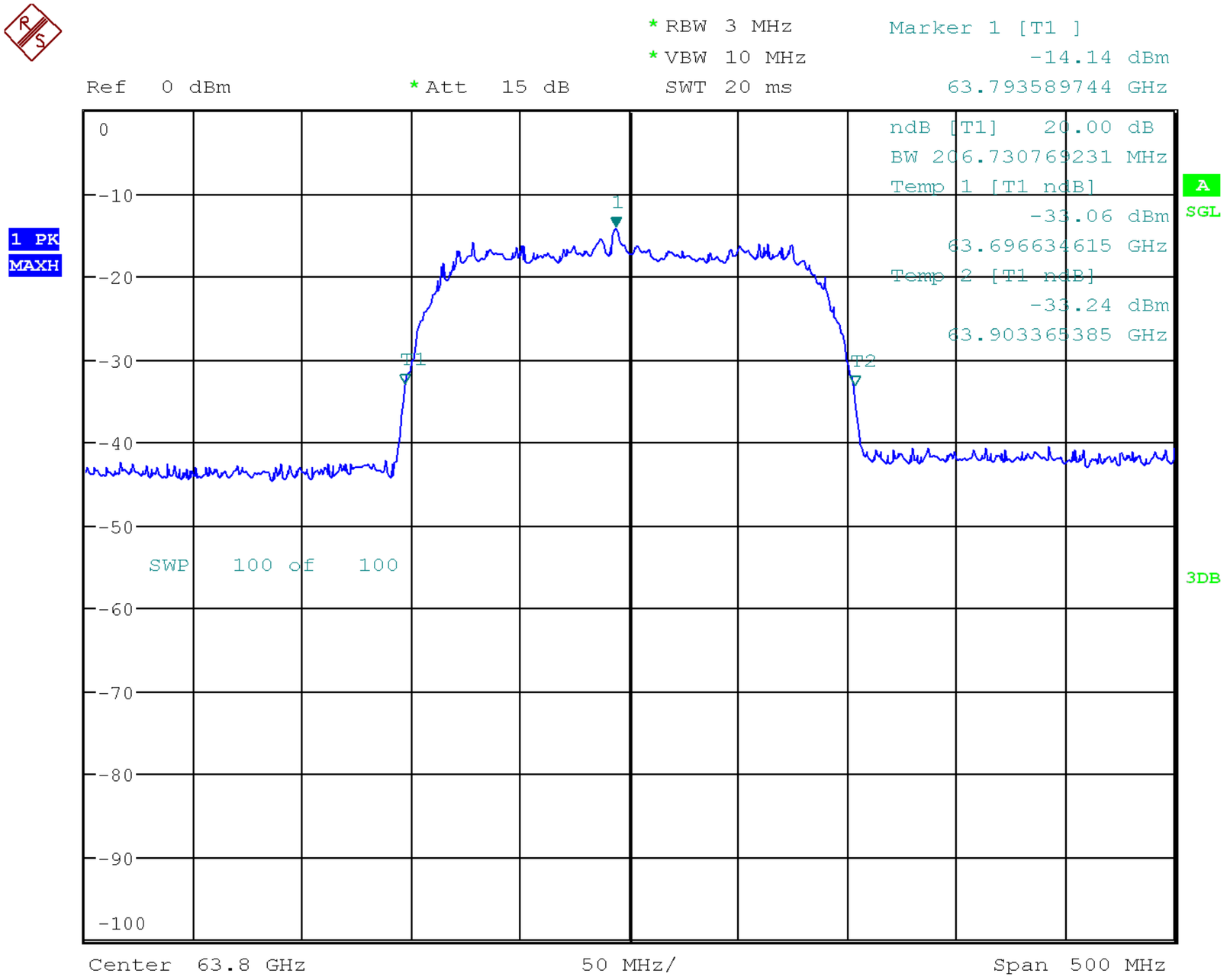
2.1.6.1 Temperature = Ambient, Voltage = 85 %



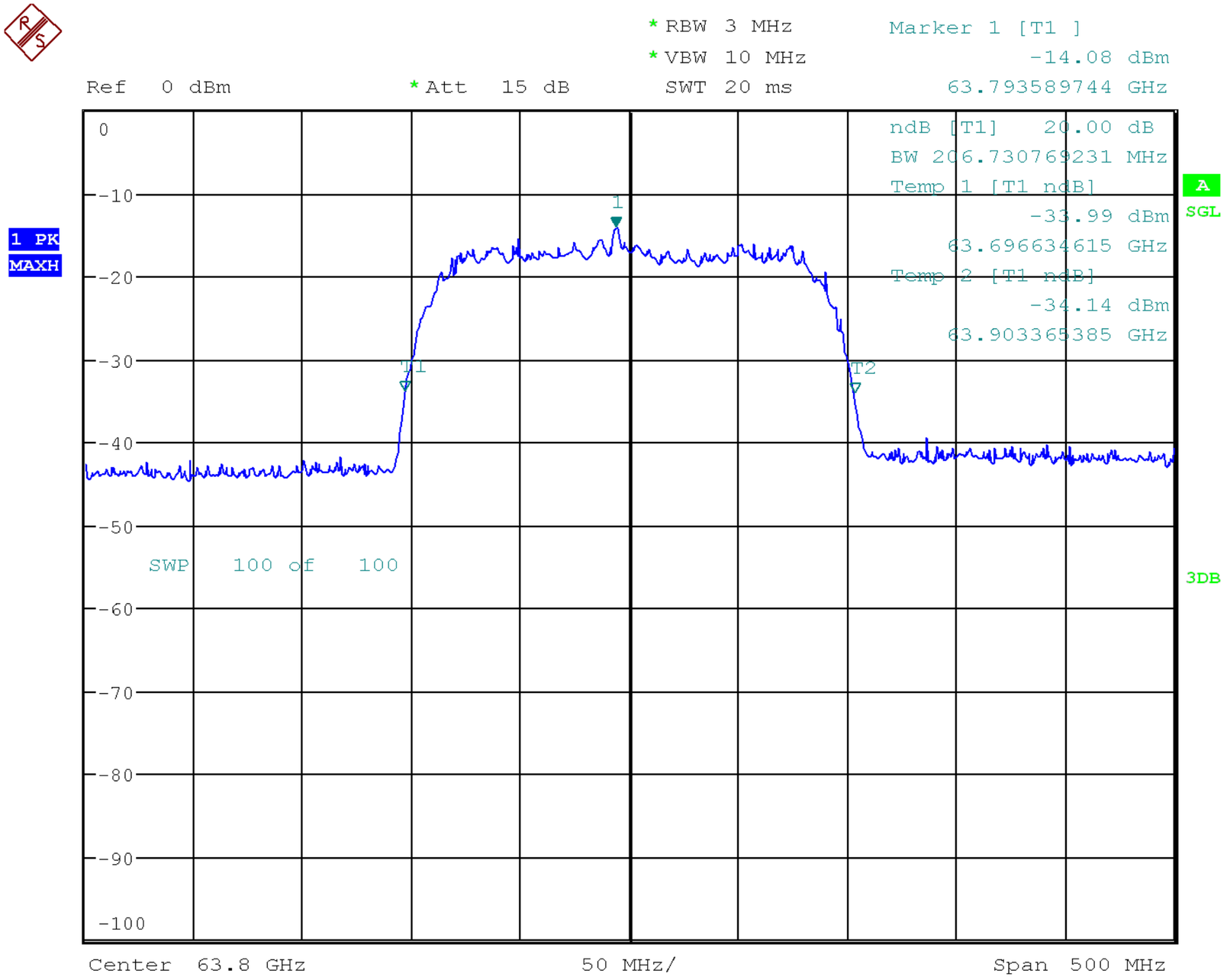
2.1.6.2 Temperature = Ambient, Voltage = 100 %



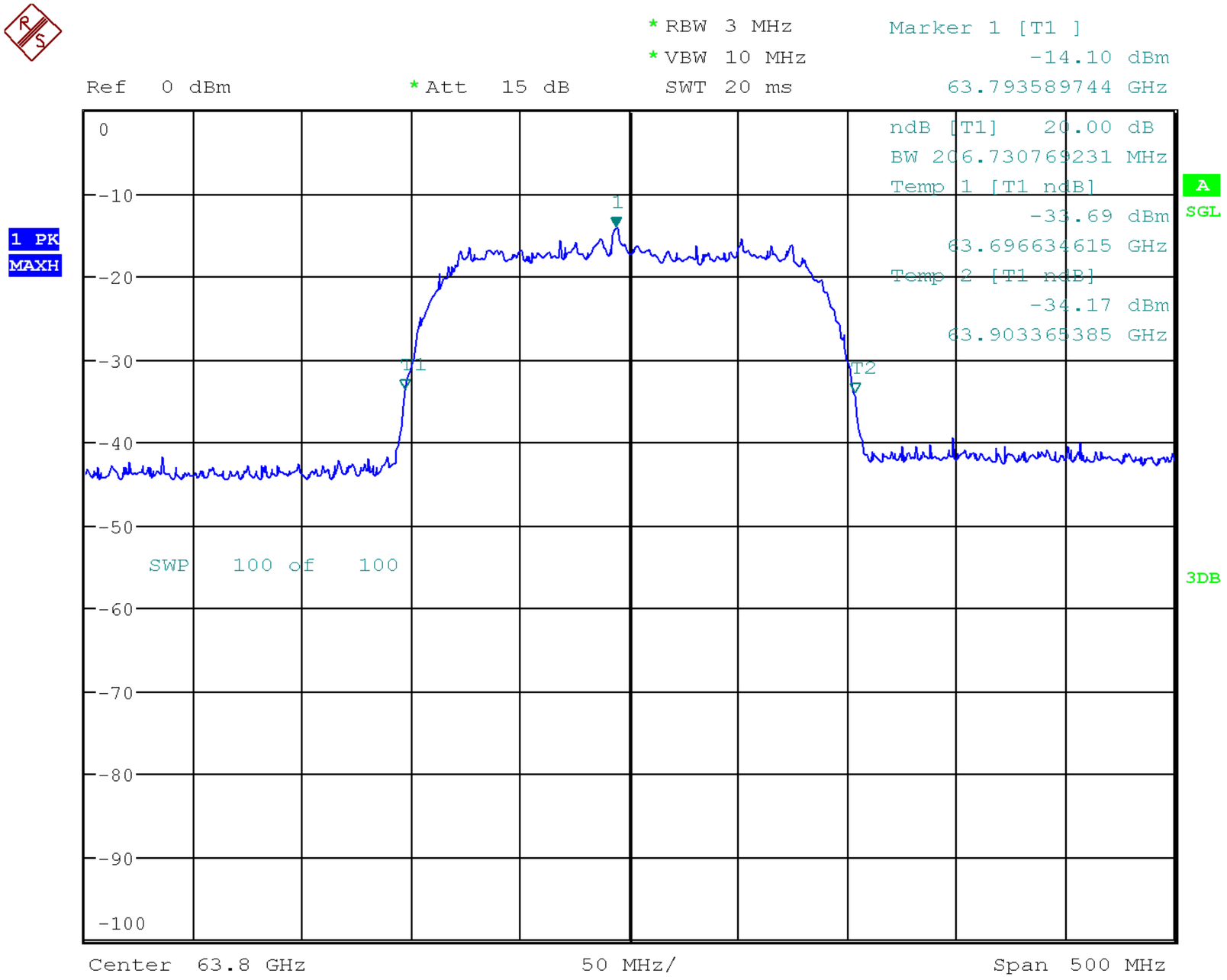
2.1.6.3 Temperature = Ambient, Voltage = 115 %



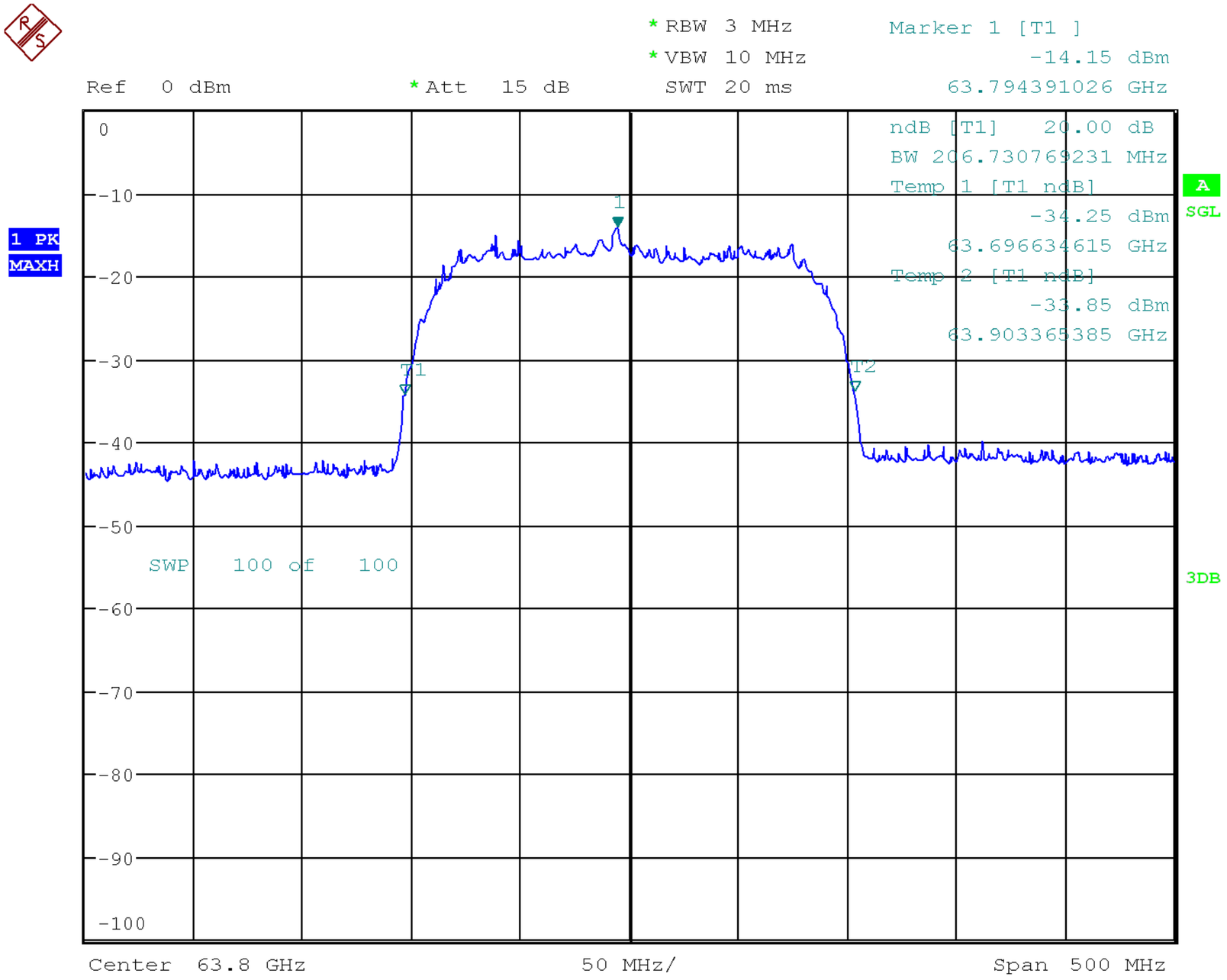
2.1.6.4 Temperature = -20 °C, Voltage = 100 %



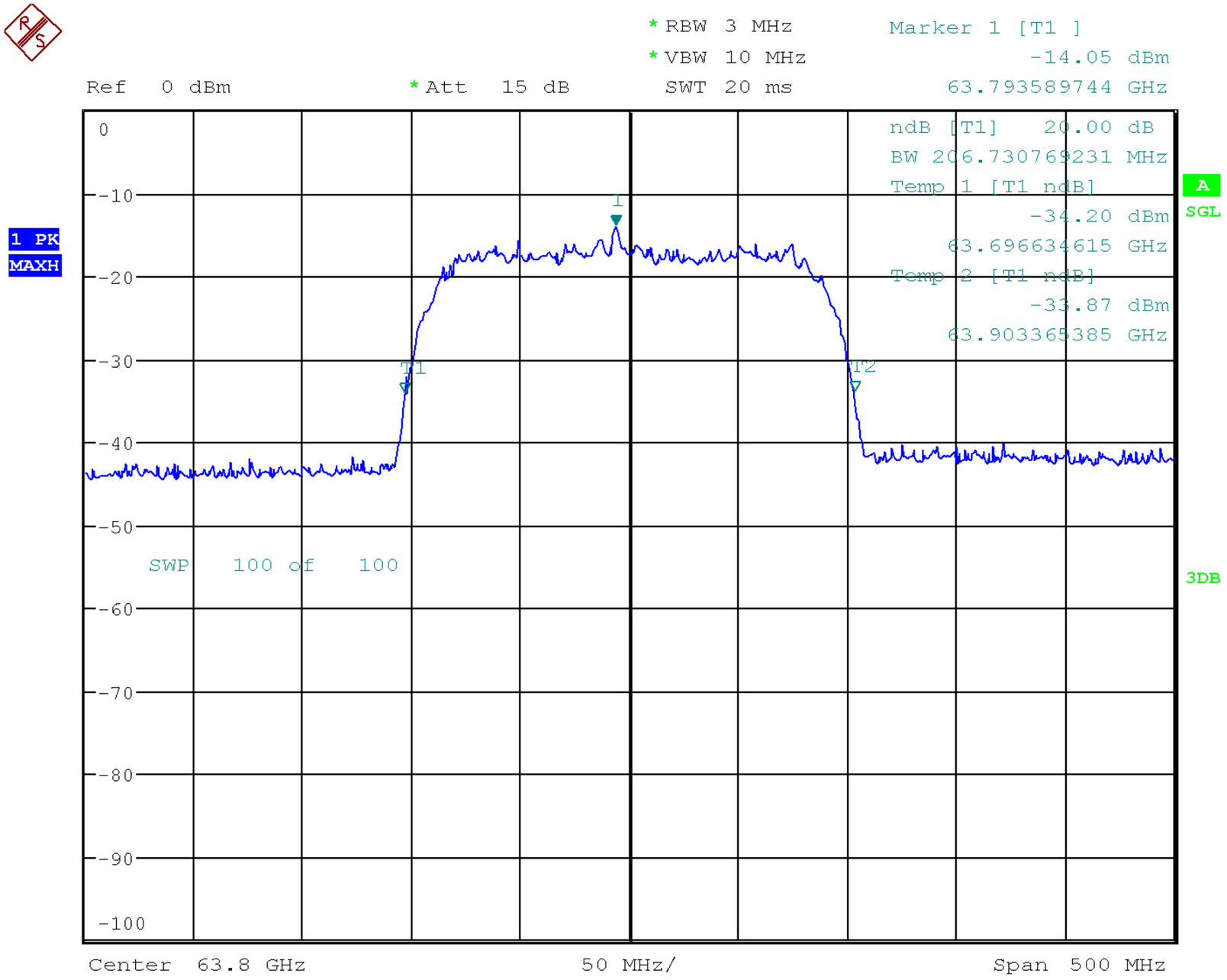
2.1.6.5 Temperature = -10 °C, Voltage = 100 %



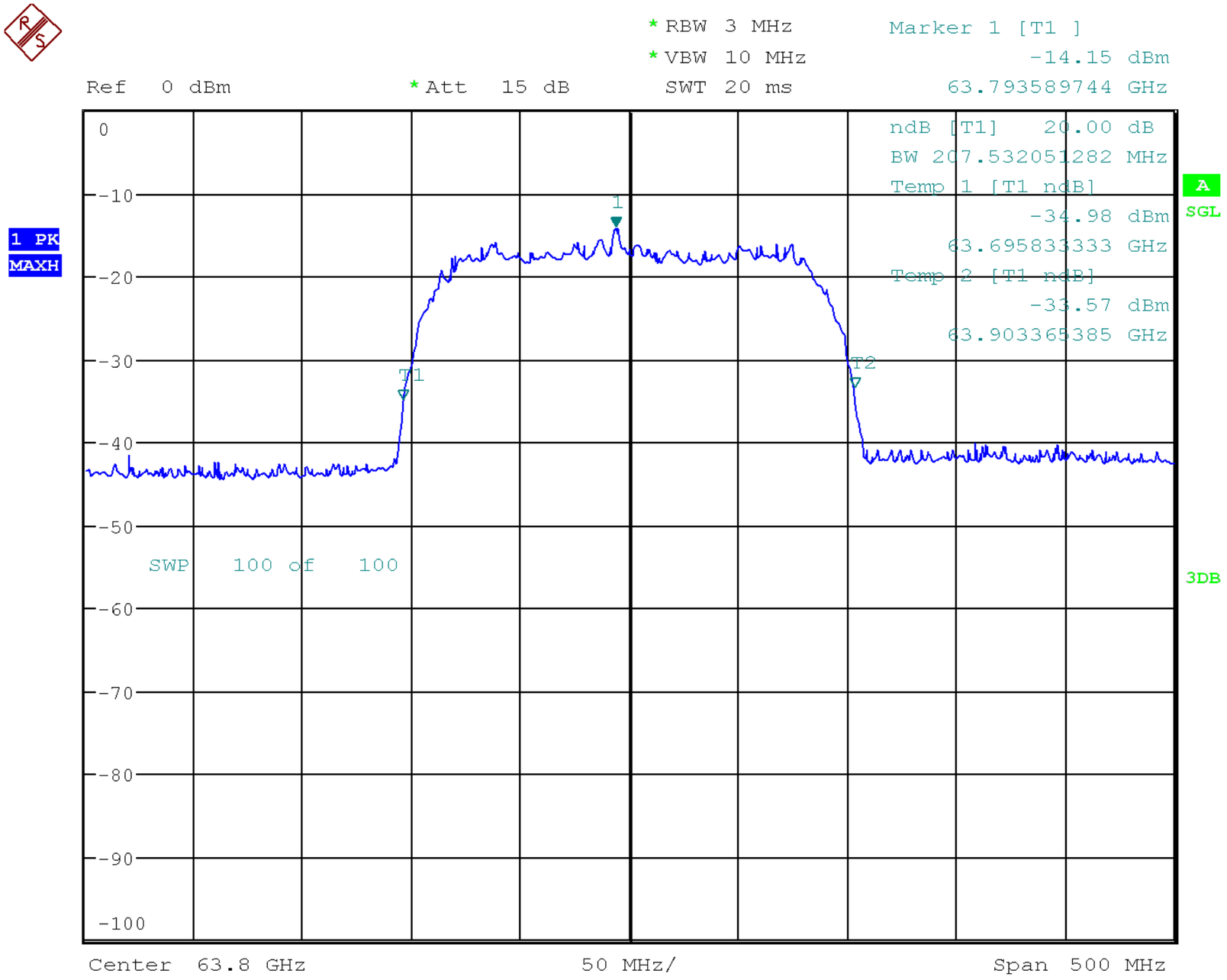
2.1.6.6 Temperature = 0 °C, Voltage = 100 %



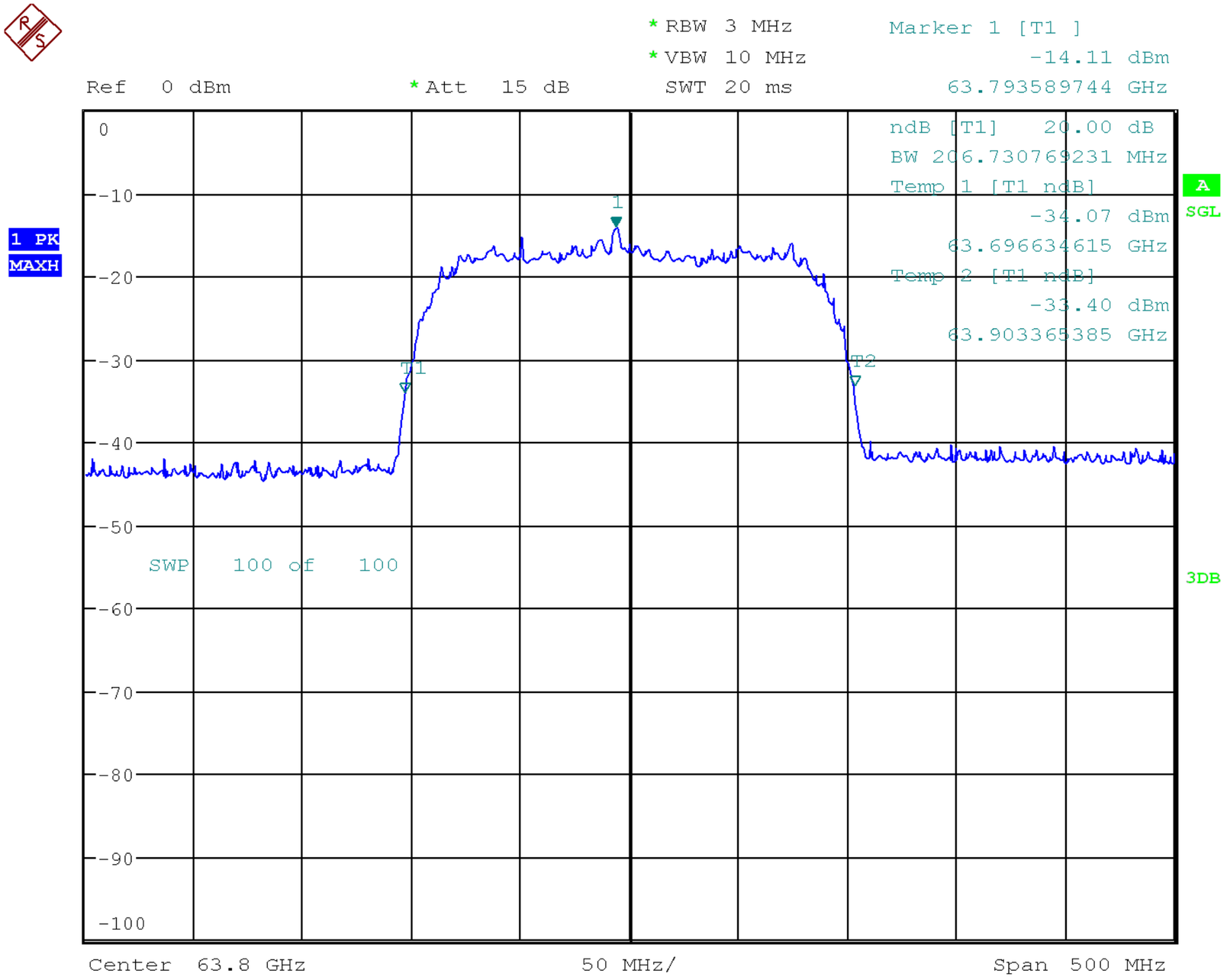
2.1.6.7 Temperature = +10 °C, Voltage = 100 %



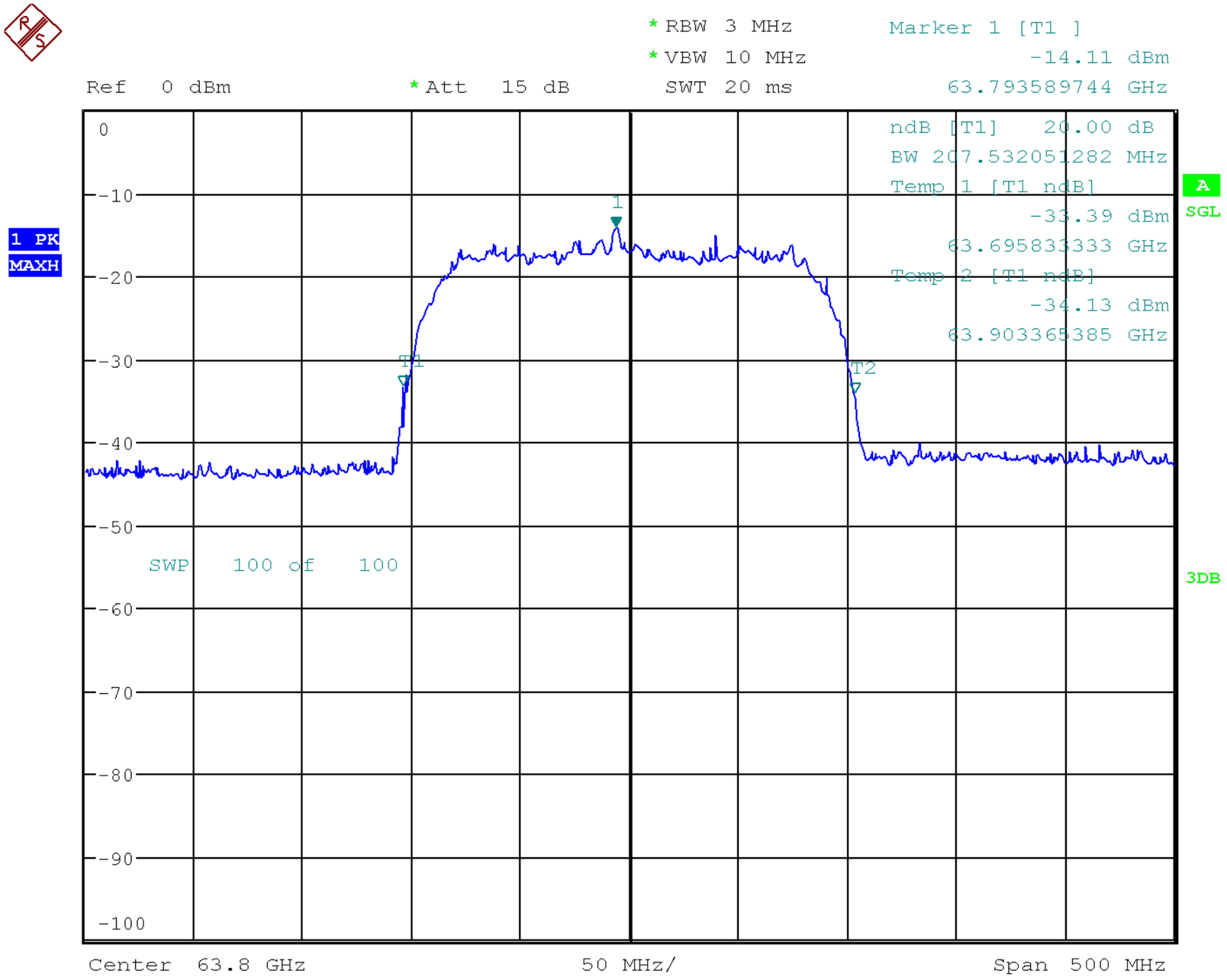
2.1.6.8 Temperature = +20 °C, Voltage = 100 %



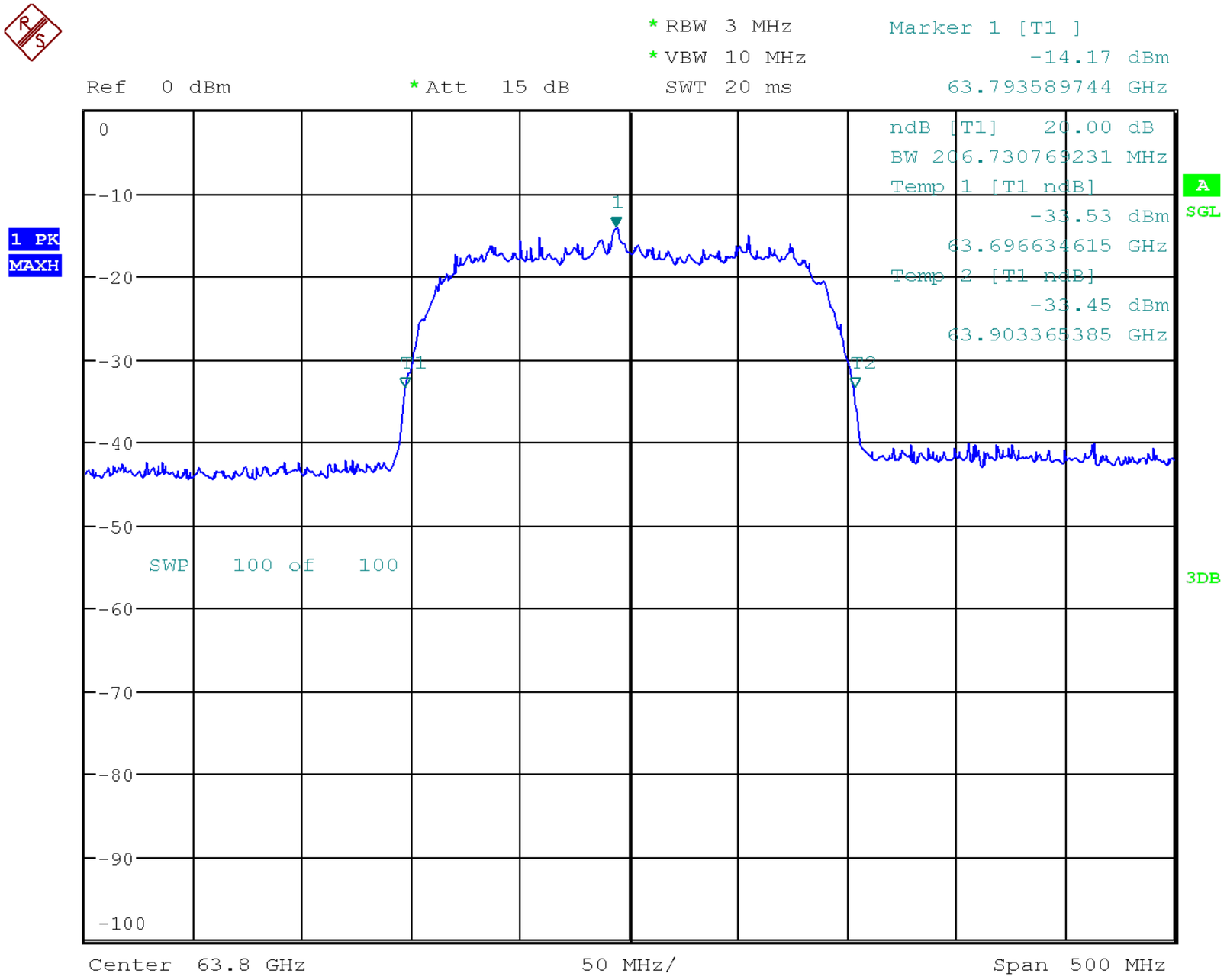
2.1.6.9 Temperature = +30 °C, Voltage = 100 %



2.1.6.10 Temperature = +40 °C, Voltage = 100 %



2.1.6.11 Temperature = +50 °C, Voltage = 100 %



2.2 IC Requirements

(Not applicable)

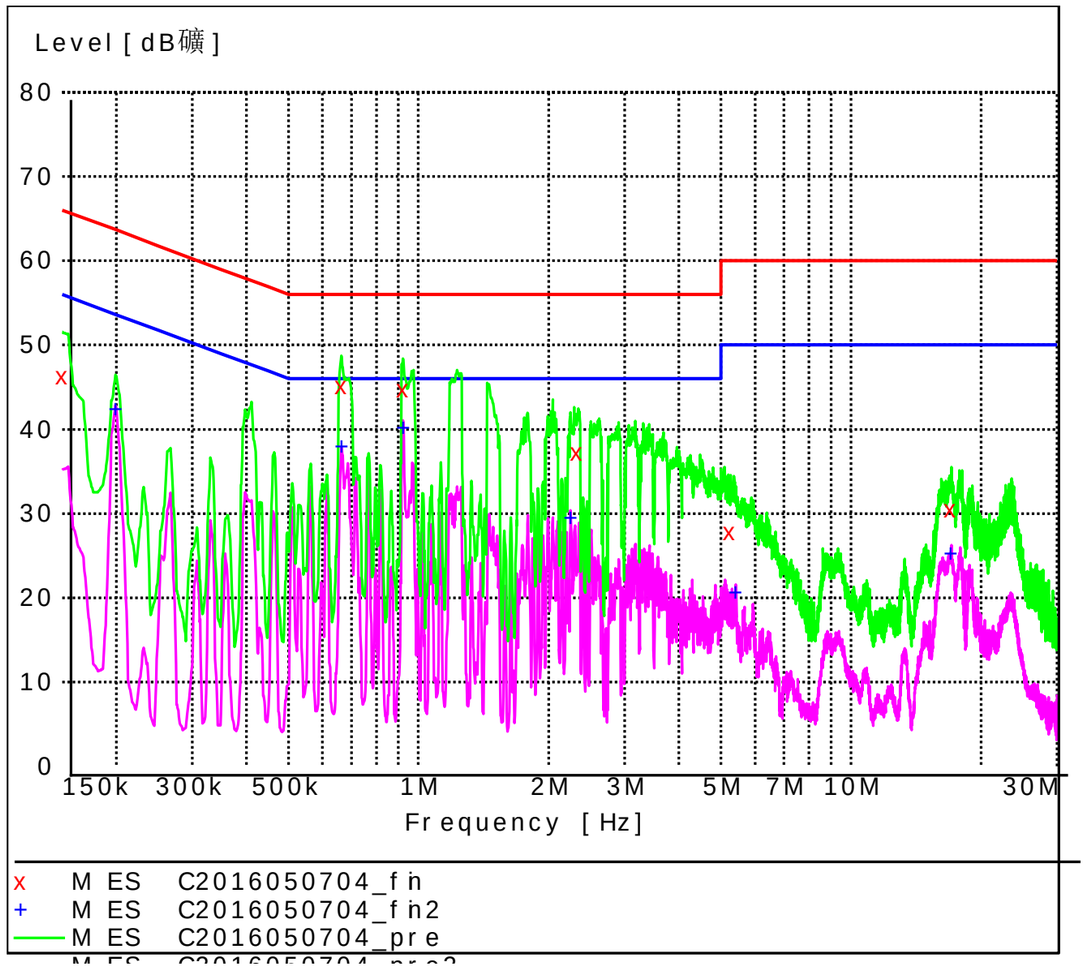
Appendix E: AC Power Line Conducted Emissions

1 Result Table

EUT Conf.	FCC&IC Emissions	FCC&IC Emissions, Limit	Verdict
Worst Case (QPSK-M)	< Limit	§15.207 / RSS-Gen §8.8 limit.	Pass

2 Result Plot

2.1 Worst Case (QPSK-M)



MEASUREMENT RESULT: "C2016050704_fin"

2016-5-7 10:26

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.150000	46.30	10.7	66	19.7	QP	N	GND
0.663000	45.20	10.3	56	10.8	QP	L3	GND
0.919500	44.70	10.3	56	11.3	QP	L3	GND
2.328000	37.20	10.3	56	18.8	QP	L3	GND

5.253000	27.80	10.3	60	32.2	QP	N	GND
17.047500	30.50	10.3	60	29.5	QP	L3	GND

MEASUREMENT RESULT: "C2016050704_fin2"

2016-5-7 10:26

Frequency	Level	Transd	Limit	Margin	Detector	Line	PE
MHz	dBµV	dB	dBµV	dB			
0.199500	42.30	10.6	54	11.3	AV	L3	GND
0.663000	37.90	10.3	46	8.1	AV	N	GND
0.919500	40.10	10.3	46	5.9	AV	L3	GND
2.251500	29.50	10.3	46	16.5	AV	N	GND
5.410500	20.60	10.3	50	29.4	AV	N	GND
17.025000	25.20	10.3	50	24.8	AV	L3	GND

END