G.S.D. Srl PISA - Italy	***Test Report n. FCC-17366***	Rev. 03

Manufacturer	**ISD GEORADAR S.r.l.**
Address	Via Enrica Calabresi, 24 56121 Pisa (PI) Italy
Test Family Name	**IBIS Sensor Ku ETH**
Testing Laboratory Name	**G.S.D. S.r.l.**
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	FCC Listed. Registration Number: 424037.
Location and Date of Issue	Pisa, 2017 July 10

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INDEX

Report Revision History

Revision details

Date	*Page No.(s)*	*Details*
2017 June 30	86	Rev. 00 First issue
2017 June 30	86	Rev. 01 Second Issue
2017 June 30	77	Rev. 02 Third Issue
2017 July 10	74	Rev. 03 Forth Issue

1. MANUFACTURER AND EUT IDENTIFICATION [1]

Manufacturer	**ISD GEORADAR S.r.l..**
Address	Via Enrica Calabresi, 24 56121 Pisa (PI) Italy
Test Family Name	**IBIS Sensor Ku ETH**
Date of reception	**2017 June 04**
Sampling	**Laboratory sample for certification**
Test Item Description	**Interferometric RADAR**
Nominal Input Voltage	**12-24 Vdc**
FCC ID	**FCC ID: UFW-IBIS-KU-ETH**

[1] A detailed documentation is preserved in the internal fascicle.

2. REFERENCE STANDARDS

Tests and measurements are performed accordingly to the reference standards given in the table below:

TEST	***STANDARD***
Spectrum Emission Mask: 90.210 (c)	FCC Rules ad Regulations, Title 47 Part 90 – Sub part F
RF Output Power: Section 2.1046	FCC Rules ad Regulations, Title 47 Part 2
Occupied Bandwidth: Section 2.1049	FCC Rules ad Regulations, Title 47 Part 2
Conducted Spurious: Section 2.1051	FCC Rules ad Regulations, Title 47 Part 2
Frequency Stability: Section 2.1055	FCC Rules ad Regulations, Title 47 Part 2
Measurements required: Field strength of spurious radiation / Spurious emissions (radiated)	FCC 47 CFR § 2.1053 § 90.210
Antenna Requirement: §15.203	FCC Rules ad Regulations, Title 47 Part 15 – Sub part C

3. RESULT, CONDITION, MEASUREMENT UNCERTAINTY

Summary of Test Results

TEST	*RESULT*
Emissions: conducted	*N/A*
Emissions: radiated *Section 90.210* *Section 2.1053*	*Pass*
RF Output Power *Section 2.1046*	*Pass*
Occupied bandwidth *Section 2.1049*	*Pass*
Spectrum Emission Mask *Section 90.210 (c)*	*Pass*
Conducted Spurious Emissions *Section 2.1051*	*Pass*
Radiated Spurious Emissions *Section 2.1053*	*Pass*
Frequency Stability *Section 2.1055*	*Pass*

Measurement uncertainty

TEST	*EXPANDED UNCERTAINTY*
Conducted Emission – 50Ω/50µH (150 kHz - 30 MHz)	± 3.5 dB
Radiated Emission – (Semianechoic Room) (30 MHz - 18 GHz)	± 4.7 dB

Climatic Conditions

PARAMETER	*VALUE*
Temperature	(293 ± 3) K
Relative humidity	(50 ± 5) %

Auxiliary apparatus

Equipment uses two differente antenna: 13.3 dBi and 22 dBi gains.

Extensions

The results refer only to the sampled EUT and under the specified conditions.

4. CONDUCTED EMISSIONS

In the following table you can find the limits established by the reference standard:

FREQUENCY RANGE (MHz)	*QUASI-PEAK LIMIT* [dB(μV)]	*AVERAGE LIMIT* [dB(μV)]
0.15 – 0.50	66 – 56 (*)	56 – 46 (*)
0.50 – 5	56	46
5 – 30	60	50

(*) Decreases with the logarithm of the frequency.

Test Equipment

EQUIPMENT	MANUFACTURER	MODEL	NEXT CALIBRATION
EMI Receiver	Agilent	E4440	01/2018
LISN	GSD	GSDA01	01/2018
Screened Room	GSD	CSC01	01/2018

Method

The EUT was switched on and allowed to warm up to its normal operating condition.
All possible modes of operation were investigated.
Only the 6 worst case emissions measured, using the correct CISPR and Average detectors, are reported. All other emissions were relatively insignificant.

Result:

Not applicable. The EUT was powered by battery.

5. RADIATED EMISSIONS

In the following table you can find the limits established by the reference standard:

FREQUENCY RANGE *(MHz)*	***Field Strength*** *QUASI-PEAK LIMITS* *[dB (µV/m)]*
0.009 – 0.490	48.15 – 13.8 @ 300m
0.490 – 1.705	33.8 – 23 @ 30m
1.705 – 30	29.5 @ 30m
30 – 88	40
88 – 216	43.5
216 – 960	46
Above 960	54

Test Equipment

EQUIPMENT	MANUFACTURER	MODEL	CAL. DUE
MXE EMI Receiver	Agilent/Keysight	N9038A	01/2018
EMI Receiver	Agilent	E4440	01/2018
Harmonic mixer	HP	11971A	01/2018
Harmonic mixer	Keysight	11970U	07/2020
EXA Signal Analyzer	Keysight	N9010B	01/2018
Waveguide Harmonic Mixer	Keysight	M1970E	11/2017
Anechoic Chamber	Comtest	CSA01	01/2018
Bilog Antenna	Schaffner	CBL6112B	01/2018
Horn Antenna	EMCO	3115	01/2018
Horn Antenna	Alpha Industries	61932500	01/2018
Standard Gain Horn Antenna	A-INFOMW	LB-19-20-A	01/2018
Standard Gain Horn Antenna	A-INFOMW	LB-12-20-A	01/2018
Controller	Deisel	HD100	01/2018
Turn Table	Deisel	MA240	01/2018
LISN	GSD	NTW06	01/2018

Test procedure: RE22R02

Notes

Azimuth position EUT-Antenna corresponding to 0° identifies the rotating table orientation (TT) in which the instrument to be tested shows the front part turned towards the antenna. Positive grades individuate clockwise rotations of TT when this one is observed from the top. For negative degrees, TT rotation is counter-clockwise.
Antenna height respect to the mass plane is conventionally individuated with: MA=XXX where XXX indicates the height (always positive and greater than 100) expressed in cm.
Antenna horizontal polarisation is indicated by POL=H.
Antenna vertical polarisation is indicated by POL=V.
EUT was tested in the three orthogonal planes.

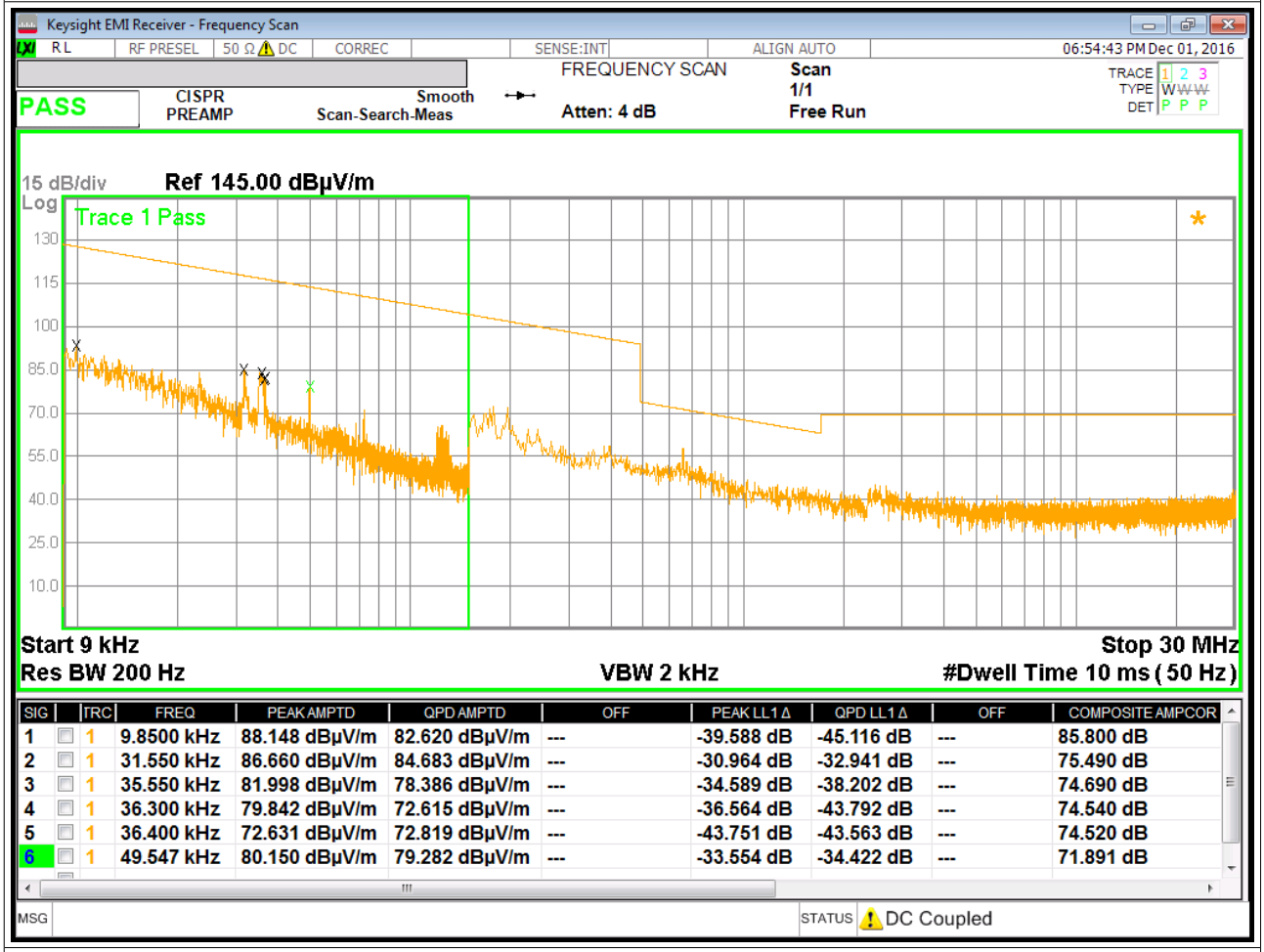
Note:

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.
In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c))

Results and conclusions

In all the operative conditions, equipment complied with the standard limits.
Graphics in following figures show the most significant registrations of the performed measurements.

Job Number	FCC-17366
Test Name	Radiated Emissions - FCC 15C
EUT Name	ISD GEORADAR S.r.l. - IBIS Sensor Ku ETH

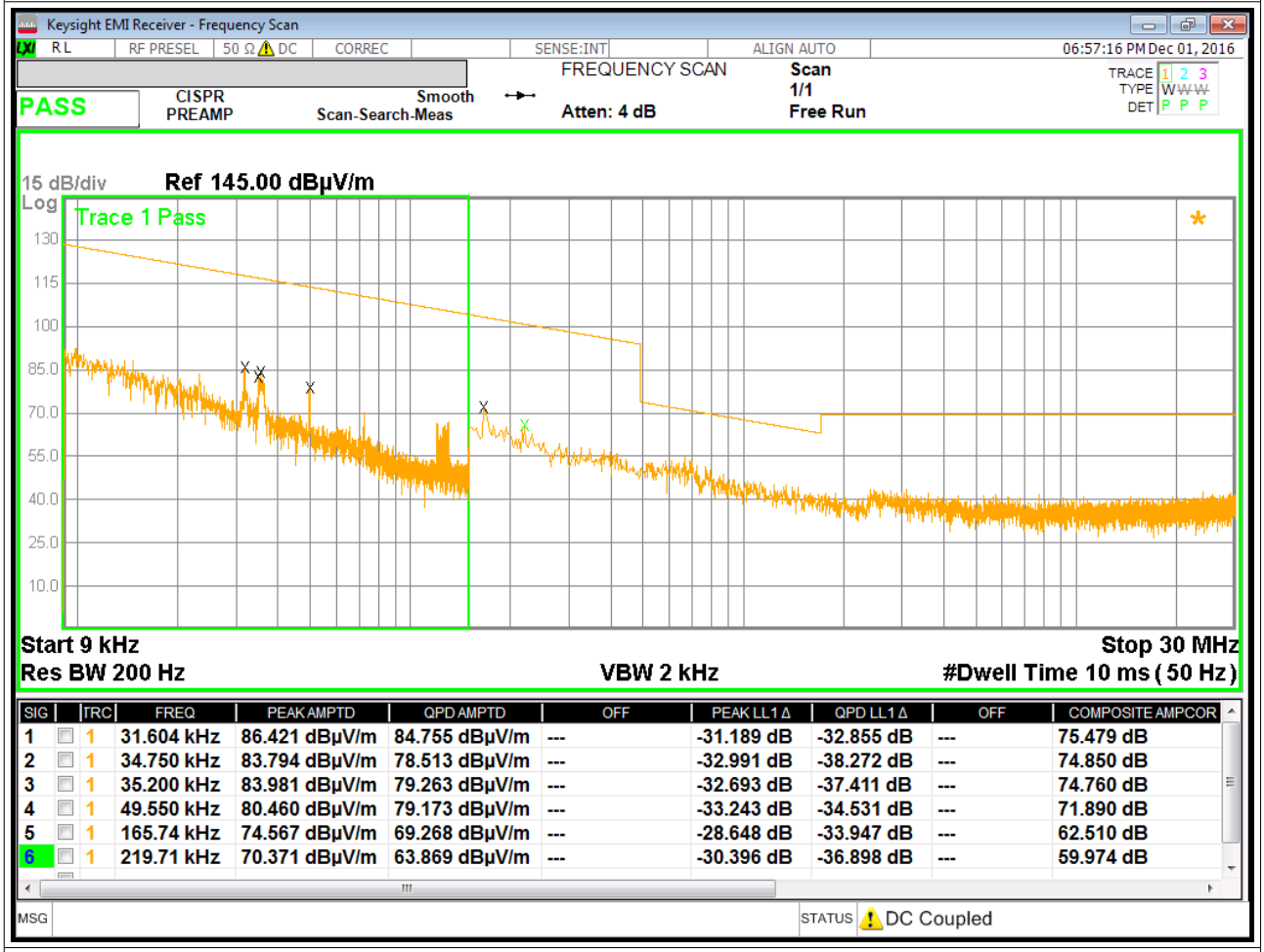


SIG	TRC	FREQ	PEAK AMPTD	QPD AMPTD	OFF	PEAK LL1 Δ	QPD LL1 Δ	OFF	COMPOSITE AMPCOR
1	1	9.8500 kHz	88.148 dBµV/m	82.620 dBµV/m	---	-39.588 dB	-45.116 dB	---	85.800 dB
2	1	31.550 kHz	86.660 dBµV/m	84.683 dBµV/m	---	-30.964 dB	-32.941 dB	---	75.490 dB
3	1	35.550 kHz	81.998 dBµV/m	78.386 dBµV/m	---	-34.589 dB	-38.202 dB	---	74.690 dB
4	1	36.300 kHz	79.842 dBµV/m	72.615 dBµV/m	---	-36.564 dB	-43.792 dB	---	74.540 dB
5	1	36.400 kHz	72.631 dBµV/m	72.819 dBµV/m	---	-43.751 dB	-43.563 dB	---	74.520 dB
6	1	49.547 kHz	80.150 dBµV/m	79.282 dBµV/m	---	-33.554 dB	-34.422 dB	---	71.891 dB

Fig. 5.1

Maximum disturbance determined in the frequency range 150 kHz – 30 MHz.
Loop Antenna Parallel Polarization

Job Number	FCC-17366
Test Name	Radiated Emissions - FCC 15C
EUT Name	ISD GEORADAR S.r.l. - IBIS Sensor Ku ETH

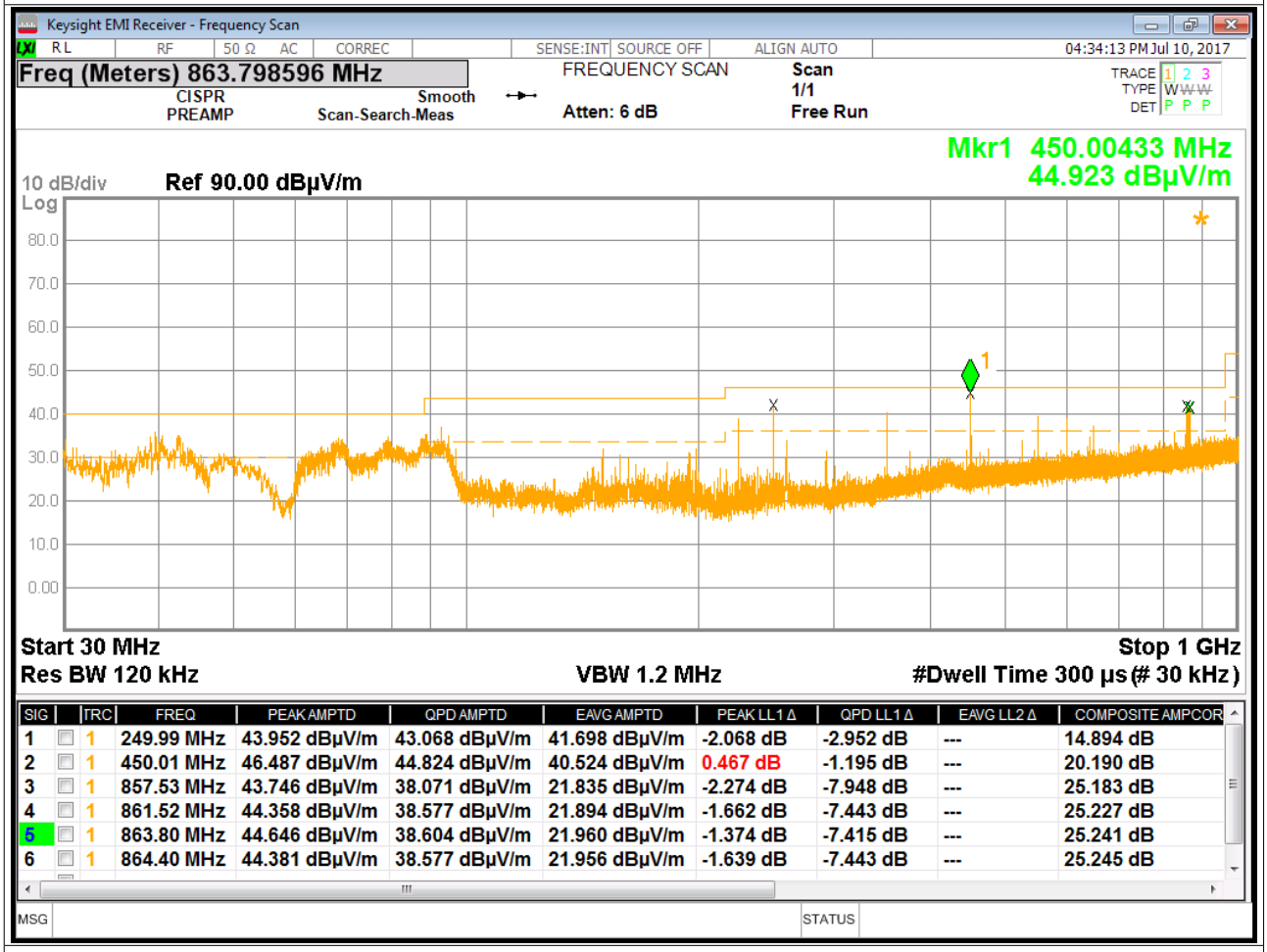


SIG	TRC	FREQ	PEAK AMPTD	QPD AMPTD	OFF	PEAK LL1 Δ	QPD LL1 Δ	OFF	COMPOSITE AMPCOR
1	1	31.604 kHz	86.421 dBµV/m	84.755 dBµV/m	---	-31.189 dB	-32.855 dB	---	75.479 dB
2	1	34.750 kHz	83.794 dBµV/m	78.513 dBµV/m	---	-32.991 dB	-38.272 dB	---	74.850 dB
3	1	35.200 kHz	83.981 dBµV/m	79.263 dBµV/m	---	-32.693 dB	-37.411 dB	---	74.760 dB
4	1	49.550 kHz	80.460 dBµV/m	79.173 dBµV/m	---	-33.243 dB	-34.531 dB	---	71.890 dB
5	1	165.74 kHz	74.567 dBµV/m	69.268 dBµV/m	---	-28.648 dB	-33.947 dB	---	62.510 dB
6	1	219.71 kHz	70.371 dBµV/m	63.869 dBµV/m	---	-30.396 dB	-36.898 dB	---	59.974 dB

Fig. 5.2

Maximum disturbance determined in the frequency range 150 kHz – 30 MHz.
Loop Antenna Orthogonal Polarization

Job Number	FCC-17366
Test Name	Radiated Emissions - FCC 15C
EUT Name	ISD GEORADAR S.r.l. - IBIS Sensor Ku ETH



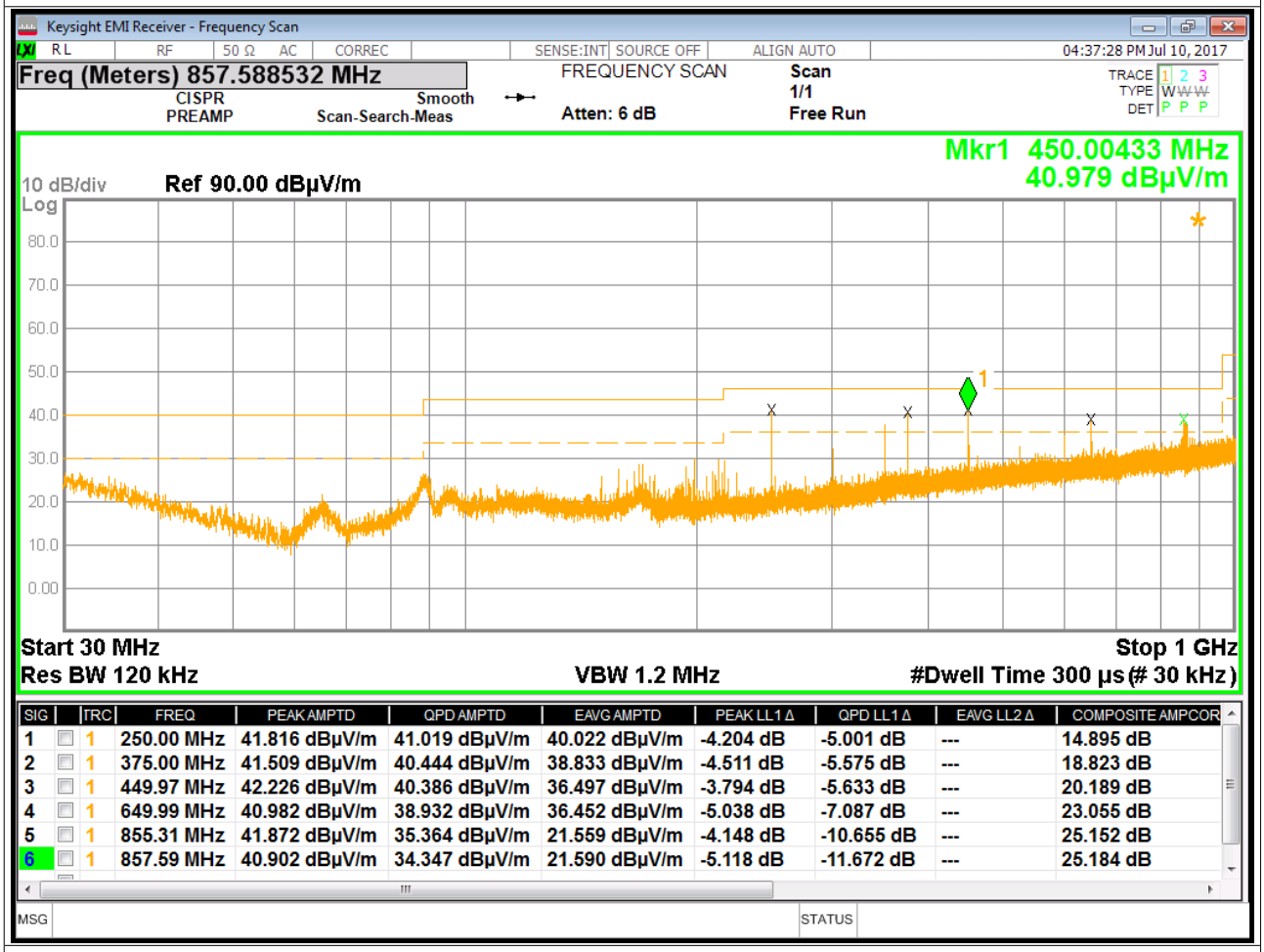
SIG	TRC	FREQ	PEAK AMPTD	QPD AMPTD	EAVG AMPTD	PEAK LL1 Δ	QPD LL1 Δ	EAVG LL2 Δ	COMPOSITE AMPCOR
1	1	249.99 MHz	43.952 dBµV/m	43.068 dBµV/m	41.698 dBµV/m	-2.068 dB	-2.952 dB	---	14.894 dB
2	1	450.01 MHz	46.487 dBµV/m	44.824 dBµV/m	40.524 dBµV/m	0.467 dB	-1.195 dB	---	20.190 dB
3	1	857.53 MHz	43.746 dBµV/m	38.071 dBµV/m	21.835 dBµV/m	-2.274 dB	-7.948 dB	---	25.183 dB
4	1	861.52 MHz	44.358 dBµV/m	38.577 dBµV/m	21.894 dBµV/m	-1.662 dB	-7.443 dB	---	25.227 dB
5	1	863.80 MHz	44.646 dBµV/m	38.604 dBµV/m	21.960 dBµV/m	-1.374 dB	-7.415 dB	---	25.241 dB
6	1	864.40 MHz	44.381 dBµV/m	38.577 dBµV/m	21.956 dBµV/m	-1.639 dB	-7.443 dB	---	25.245 dB

POL V

Fig. 5.3

Record of the measurement of radiated emissions (PK in orange, AVG in blu)
Maximum disturbance determined in the frequency range 30 MHz – 1000 MHz.

Job Number	FCC-17366
Test Name	Radiated Emissions - FCC 15C
EUT Name	ISD GEORADAR S.r.l. - IBIS Sensor Ku ETH

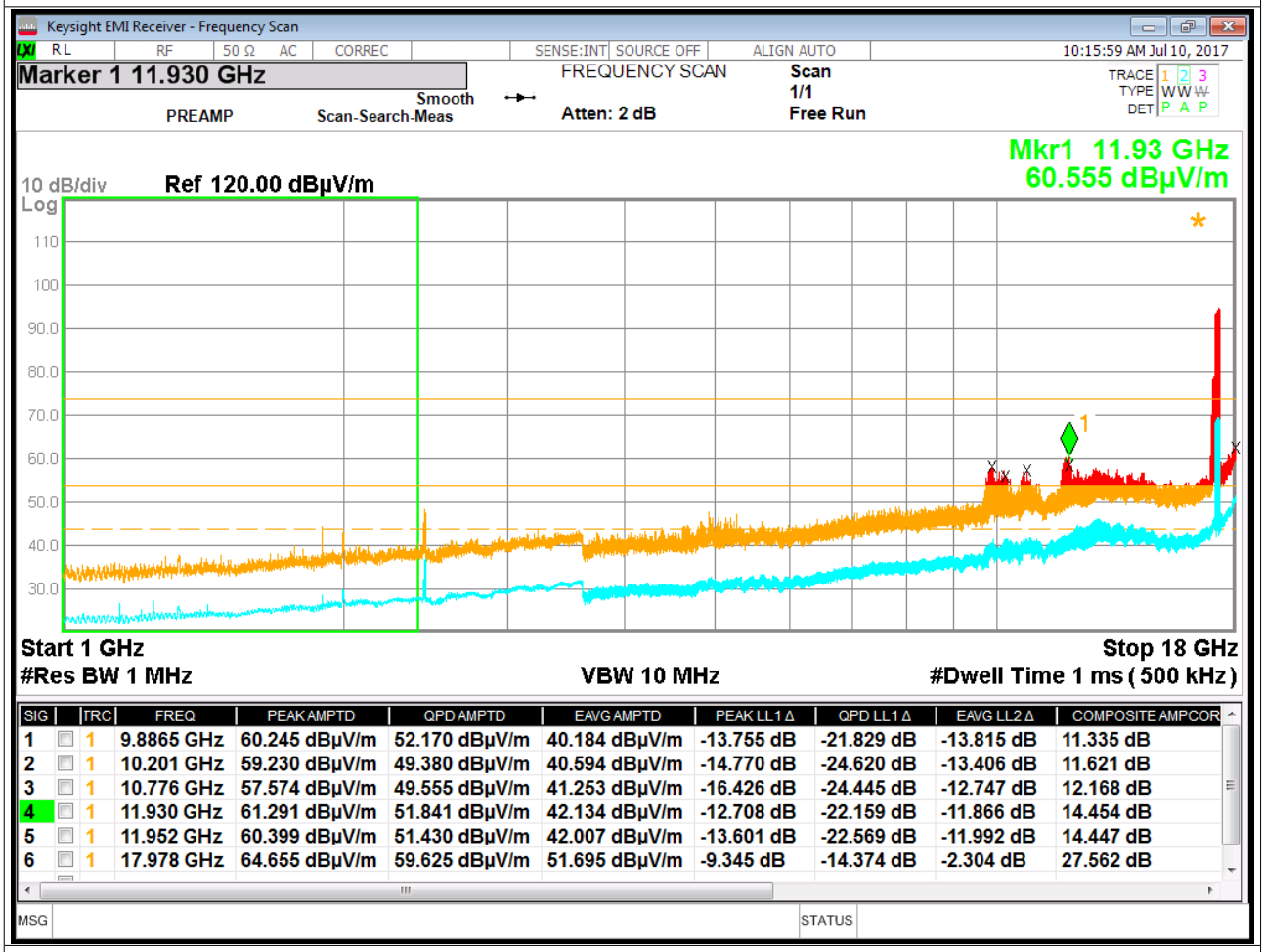


SIG	TRC	FREQ	PEAK AMPTD	QPD AMPTD	EAVG AMPTD	PEAK LL1 Δ	QPD LL1 Δ	EAVG LL2 Δ	COMPOSITE AMPCOR
1	1	250.00 MHz	41.816 dBµV/m	41.019 dBµV/m	40.022 dBµV/m	-4.204 dB	-5.001 dB	---	14.895 dB
2	1	375.00 MHz	41.509 dBµV/m	40.444 dBµV/m	38.833 dBµV/m	-4.511 dB	-5.575 dB	---	18.823 dB
3	1	449.97 MHz	42.226 dBµV/m	40.386 dBµV/m	36.497 dBµV/m	-3.794 dB	-5.633 dB	---	20.189 dB
4	1	649.99 MHz	40.982 dBµV/m	38.932 dBµV/m	36.452 dBµV/m	-5.038 dB	-7.087 dB	---	23.055 dB
5	1	855.31 MHz	41.872 dBµV/m	35.364 dBµV/m	21.559 dBµV/m	-4.148 dB	-10.655 dB	---	25.152 dB
6	1	857.59 MHz	40.902 dBµV/m	34.347 dBµV/m	21.590 dBµV/m	-5.118 dB	-11.672 dB	---	25.184 dB

POL H

Fig. 5.4

Record of the measurement of radiated emissions (PK in orange, AVG in blu)
Maximum disturbance determined in the frequency range 30 MHz – 1000 MHz.

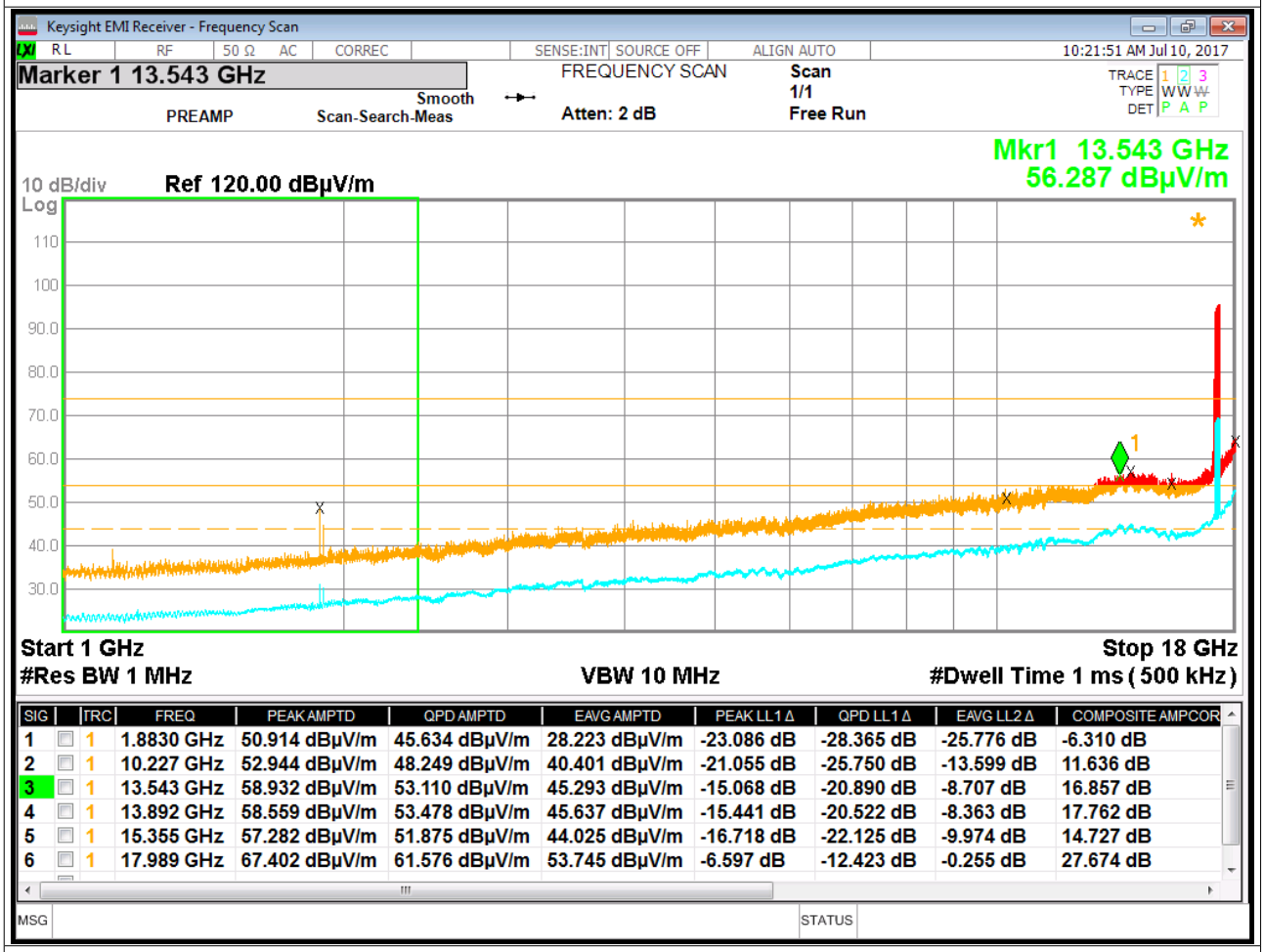


SIG		TRC	FREQ	PEAK AMPTD	QPD AMPTD	EAVG AMPTD	PEAK LL1 Δ	QPD LL1 Δ	EAVG LL2 Δ	COMPOSITE AMPCOR
1		1	9.8865 GHz	60.245 dBµV/m	52.170 dBµV/m	40.184 dBµV/m	-13.755 dB	-21.829 dB	-13.815 dB	11.335 dB
2		1	10.201 GHz	59.230 dBµV/m	49.380 dBµV/m	40.594 dBµV/m	-14.770 dB	-24.620 dB	-13.406 dB	11.621 dB
3		1	10.776 GHz	57.574 dBµV/m	49.555 dBµV/m	41.253 dBµV/m	-16.426 dB	-24.445 dB	-12.747 dB	12.168 dB
4		1	11.930 GHz	61.291 dBµV/m	51.841 dBµV/m	42.134 dBµV/m	-12.708 dB	-22.159 dB	-11.866 dB	14.454 dB
5		1	11.952 GHz	60.399 dBµV/m	51.430 dBµV/m	42.007 dBµV/m	-13.601 dB	-22.569 dB	-11.992 dB	14.447 dB
6		1	17.978 GHz	64.655 dBµV/m	59.625 dBµV/m	51.695 dBµV/m	-9.345 dB	-14.374 dB	-2.304 dB	27.562 dB

POL V

Fig. 5.5

Record of the measurement of radiated emissions (PK in orange, AVG in blu)
Maximum disturbance determined in the frequency range 1 – 18 GHz

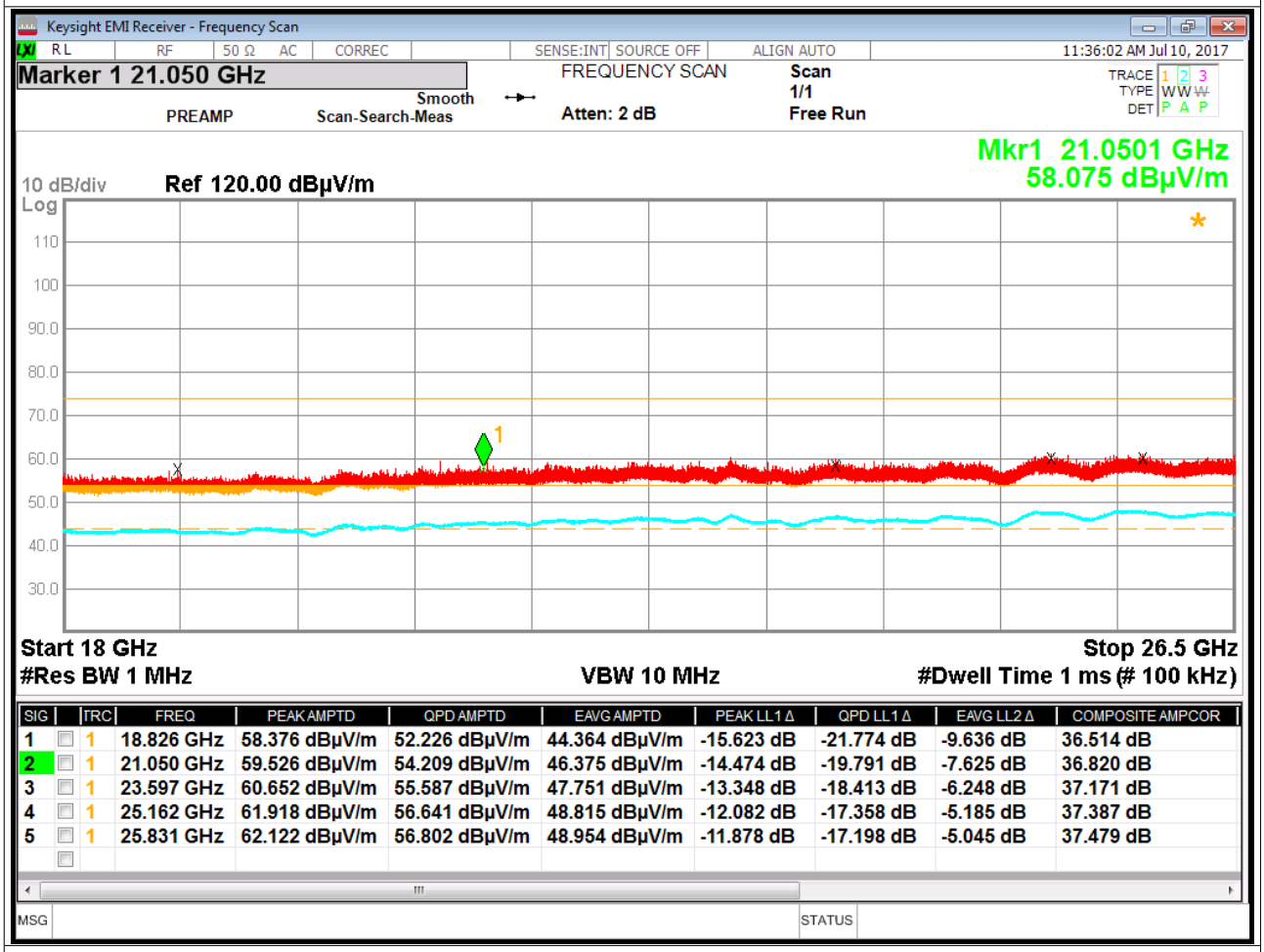


SIG		TRC	FREQ	PEAK AMPTD	QPD AMPTD	EAVG AMPTD	PEAK LL1 Δ	QPD LL1 Δ	EAVG LL2 Δ	COMPOSITE AMPCOR
1		1	1.8830 GHz	50.914 dBµV/m	45.634 dBµV/m	28.223 dBµV/m	-23.086 dB	-28.365 dB	-25.776 dB	-6.310 dB
2		1	10.227 GHz	52.944 dBµV/m	48.249 dBµV/m	40.401 dBµV/m	-21.055 dB	-25.750 dB	-13.599 dB	11.636 dB
3		1	13.543 GHz	58.932 dBµV/m	53.110 dBµV/m	45.293 dBµV/m	-15.068 dB	-20.890 dB	-8.707 dB	16.857 dB
4		1	13.892 GHz	58.559 dBµV/m	53.478 dBµV/m	45.637 dBµV/m	-15.441 dB	-20.522 dB	-8.363 dB	17.762 dB
5		1	15.355 GHz	57.282 dBµV/m	51.875 dBµV/m	44.025 dBµV/m	-16.718 dB	-22.125 dB	-9.974 dB	14.727 dB
6		1	17.989 GHz	67.402 dBµV/m	61.576 dBµV/m	53.745 dBµV/m	-6.597 dB	-12.423 dB	-0.255 dB	27.674 dB

POL H

Fig. 5.6

Record of the measurement of radiated emissions (PK in orange, AVG in blu)
Maximum disturbance determined in the frequency range 1 – 18 GHz

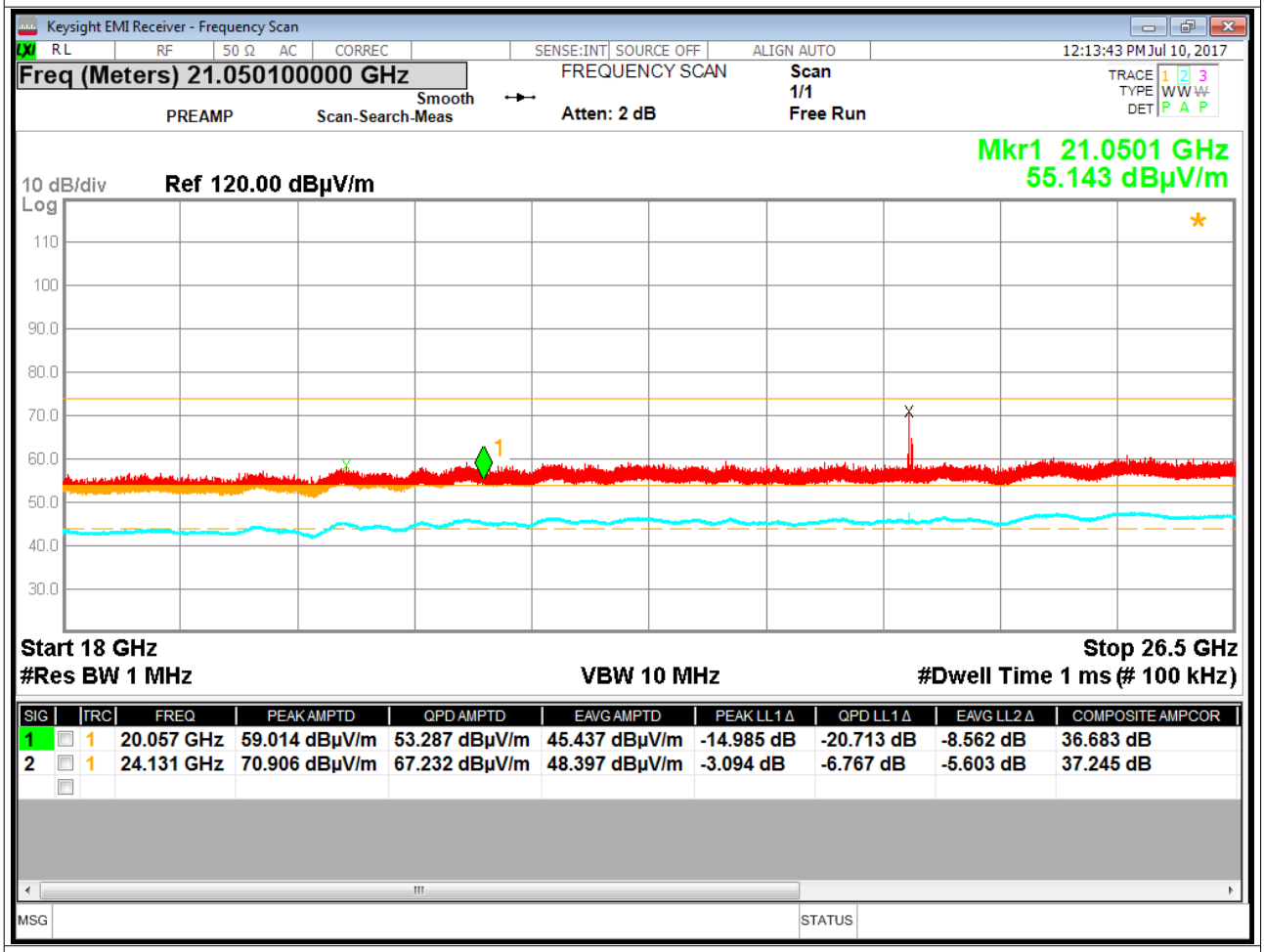


SIG	TRC	FREQ	PEAK AMPTD	QPD AMPTD	EAVG AMPTD	PEAK LL1 Δ	QPD LL1 Δ	EAVG LL2 Δ	COMPOSITE AMPCOR
1	1	18.826 GHz	58.376 dBµV/m	52.226 dBµV/m	44.364 dBµV/m	-15.623 dB	-21.774 dB	-9.636 dB	36.514 dB
2	1	21.050 GHz	59.526 dBµV/m	54.209 dBµV/m	46.375 dBµV/m	-14.474 dB	-19.791 dB	-7.625 dB	36.820 dB
3	1	23.597 GHz	60.652 dBµV/m	55.587 dBµV/m	47.751 dBµV/m	-13.348 dB	-18.413 dB	-6.248 dB	37.171 dB
4	1	25.162 GHz	61.918 dBµV/m	56.641 dBµV/m	48.815 dBµV/m	-12.082 dB	-17.358 dB	-5.185 dB	37.387 dB
5	1	25.831 GHz	62.122 dBµV/m	56.802 dBµV/m	48.954 dBµV/m	-11.878 dB	-17.198 dB	-5.045 dB	37.479 dB

POL V

Fig. 5.7

Record of the measurement of radiated emissions (PK in orange, AVG in blu)
Maximum disturbance determined in the frequency range 18 – 26.5 GHz



POL H

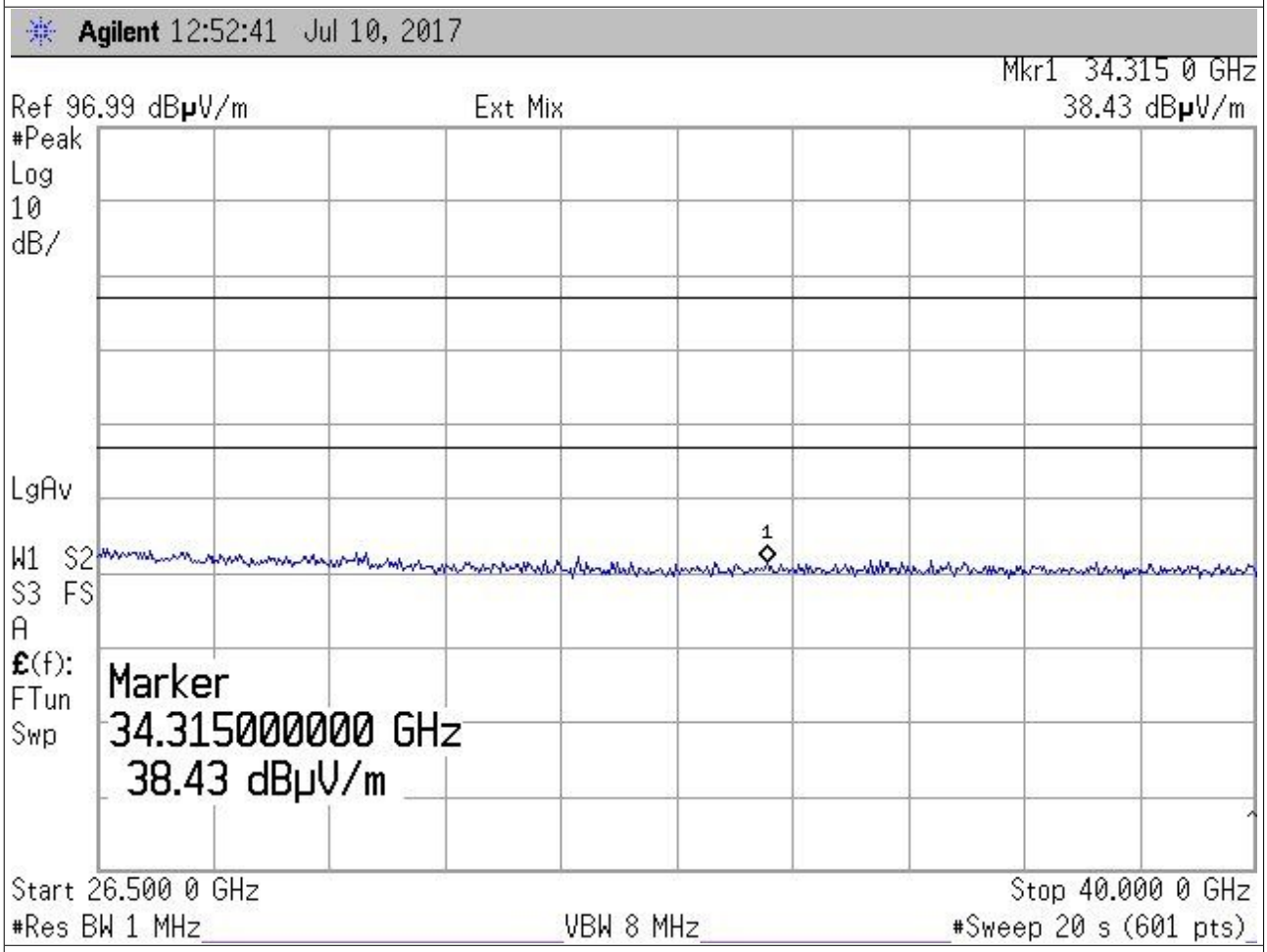
Fig. 5.8

Record of the measurement of radiated emissions (PK in orange, AVG in blu)
Maximum disturbance determined in the frequency range 18 – 26.5 GHz

POL V

Fig. 5.9

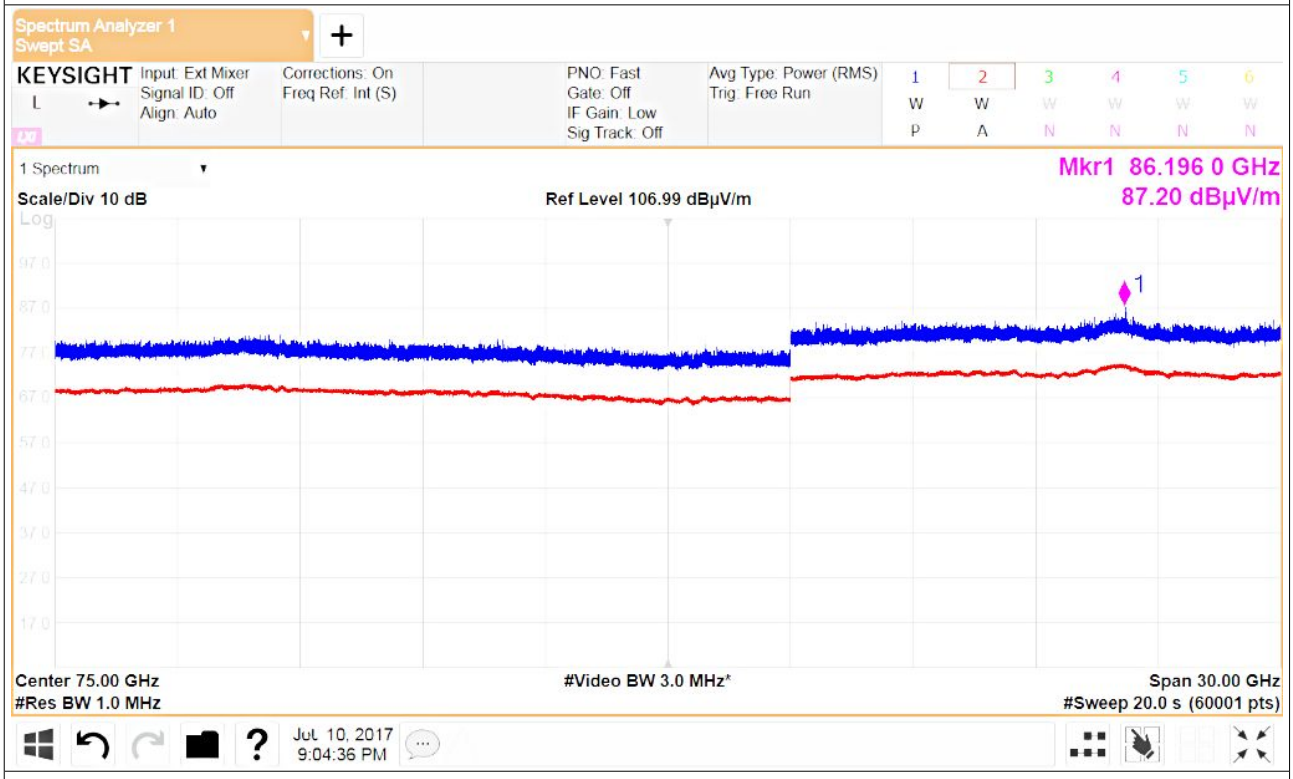
Record of the measurement of radiated emissions (PK in blu)
Maximum disturbance determined in the frequency range 26.5 – 40 GHz



POL H

Fig. 5.10

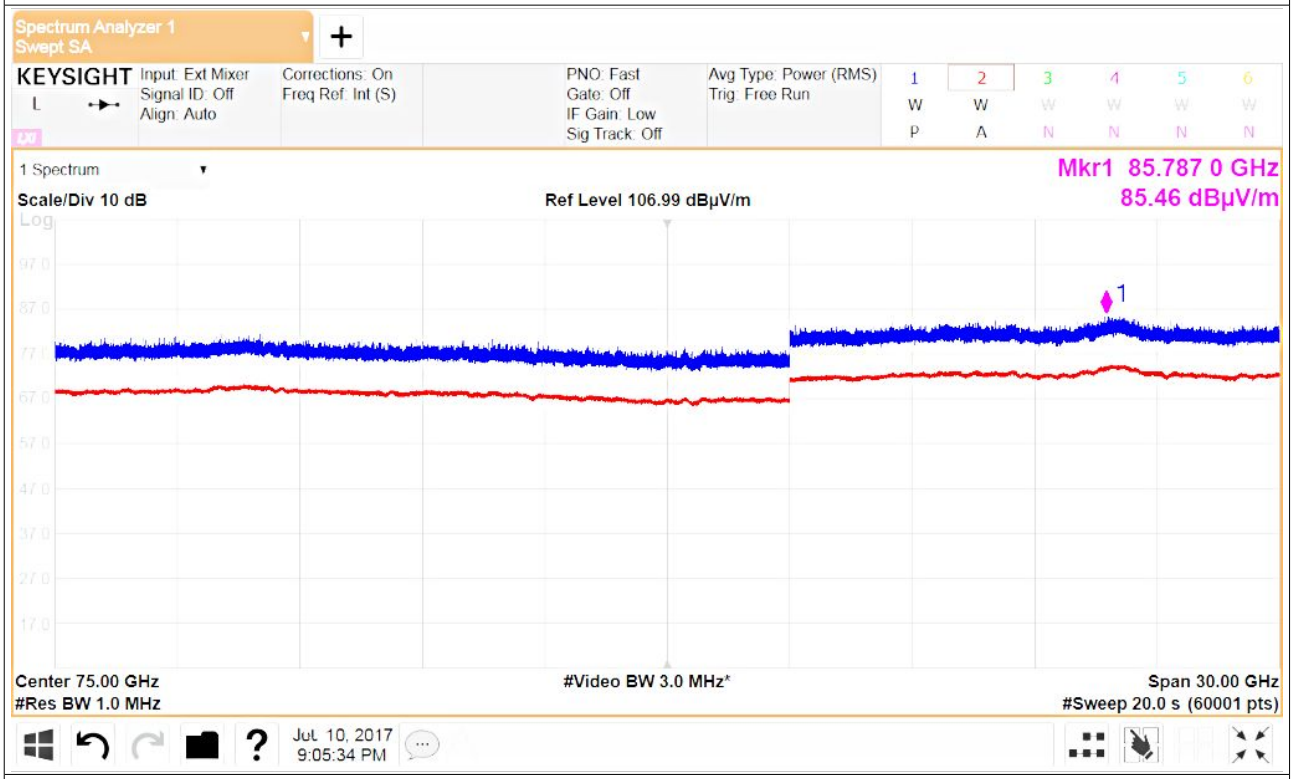
Record of the measurement of radiated emissions (PK in blu)
Maximum disturbance determined in the frequency range 26.5 – 40 GHz



POL V

Fig. 5.11

Record of the measurement of radiated emissions (PK in orange, AVG in blu)
Maximum disturbance determined in the frequency range 60 – 90 GHz



POL H

Fig. 5.12

Record of the measurement of radiated emissions (PK in orange, AVG in blu)
Maximum disturbance determined in the frequency range 60 – 90 GHz

6. TRANSMISSION REQUIREMENTS

An intentional radiator must be designed to guarantee specific requirements.

6.1. ANTENNA REQUIREMENT

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.
Antenna requirement must meet at least one of the following:

- Antenna must be permanently attached to the device.
- Antenna must use a unique type of connector to attach to the device.
- Device must be professionally installed. Installer shall be responsible for ensuring that the correct antenna is employed with the device.

Note:

Antenna use a wave guide port to attach to the device.

Result

Pass

6.2. PEAK OUTPUT POWER

EUT was set for low, mid, and high channel with modulated mode and highest RF output power. Two antennas with lowest and highest gains was imposed.
The spectrum analyzer was connected to the antenna terminal.

Measurement (conducted)

The measured values are:

Channel Output A

FREQUENCY	Output Power (dBm)	
	Low Antenna Gain (13.3 dBi)	High Antenna Gain (22 dBi)
Low (17.1 GHz)	19.9	13.6
Mid (17.2 GHz)	20.5	13.9
High (17.3 GHz)	19.1	12.3

Channel Output B

FREQUENCY	Output Power (dBm)	
	Low Antenna Gain (13.3 dBi)	High Antenna Gain (22 dBi)
Low (17.1 GHz)	20.4	13.8
Mid (17.2 GHz)	19.6	12.9
High (17.3 GHz)	19.7	12.9

Procedures:

The peak output power was measured conducted using a spectrum analyzer at low, mid, and hi frequency channels. Peak detector was set to measure the power output.
The lowest antenna gain is 13.3 dBi, and highest antenna gain is 22 dBi.

Result

Pass

Notes:

The following figures show the acquired graphics.

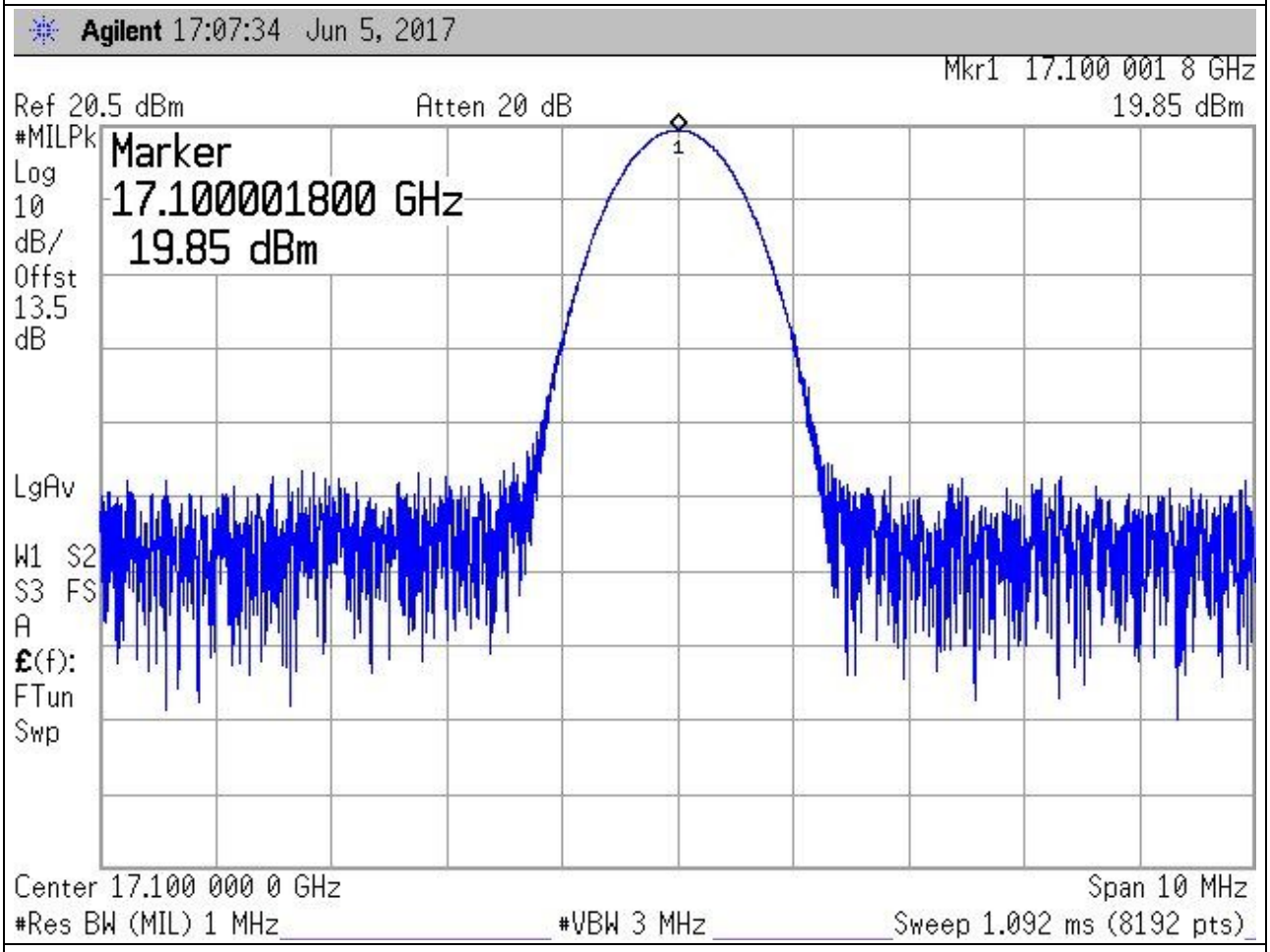


Fig. 6.1

Channel output A; Low Frequency Channels; Low Antenna Gain

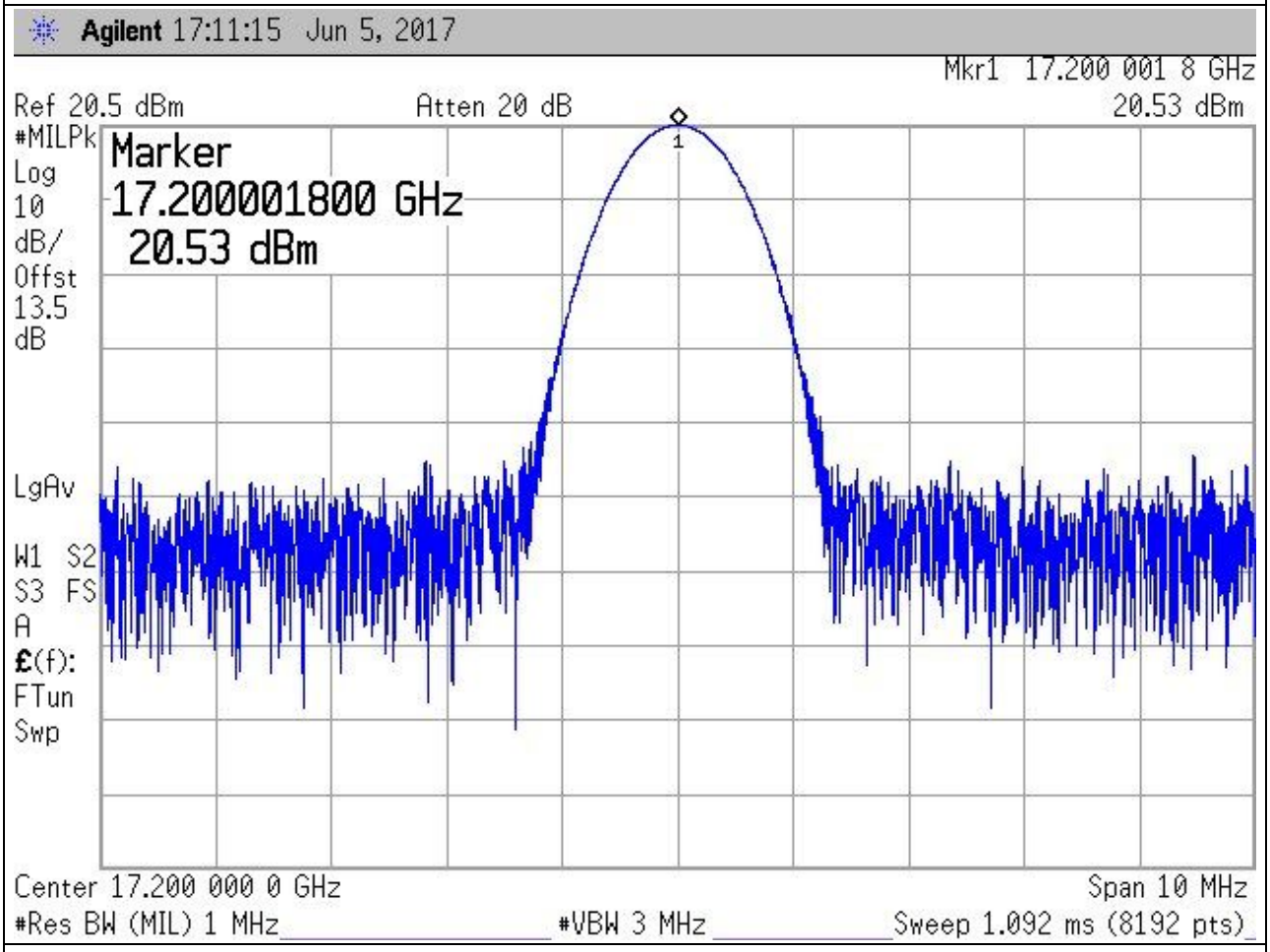


Fig. 6.2
Channel output A; Mid Frequency Channels; Low Antenna Gain

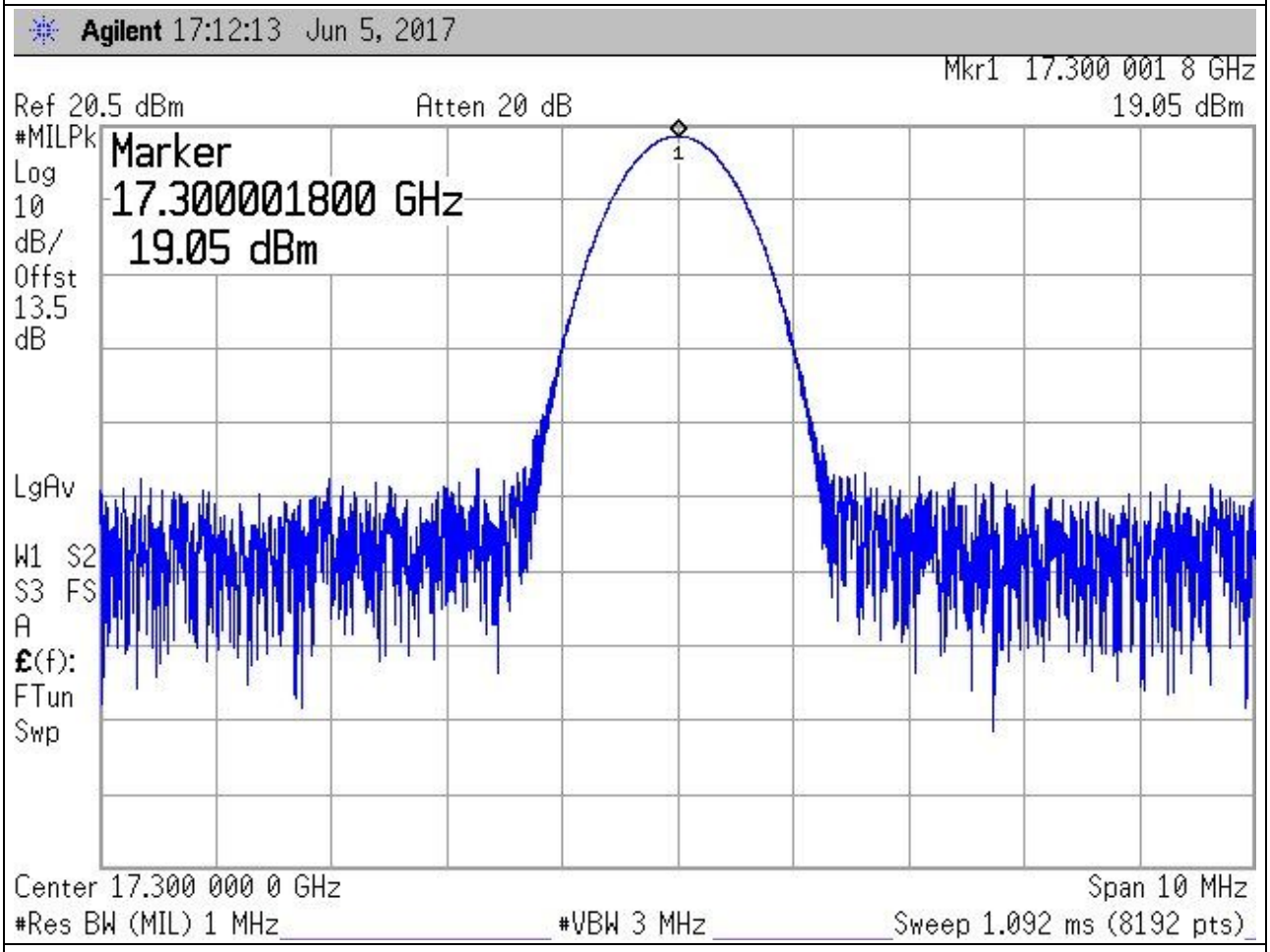


Fig. 6.3
Channel output A; Hi Frequency Channels; Low Antenna Gain

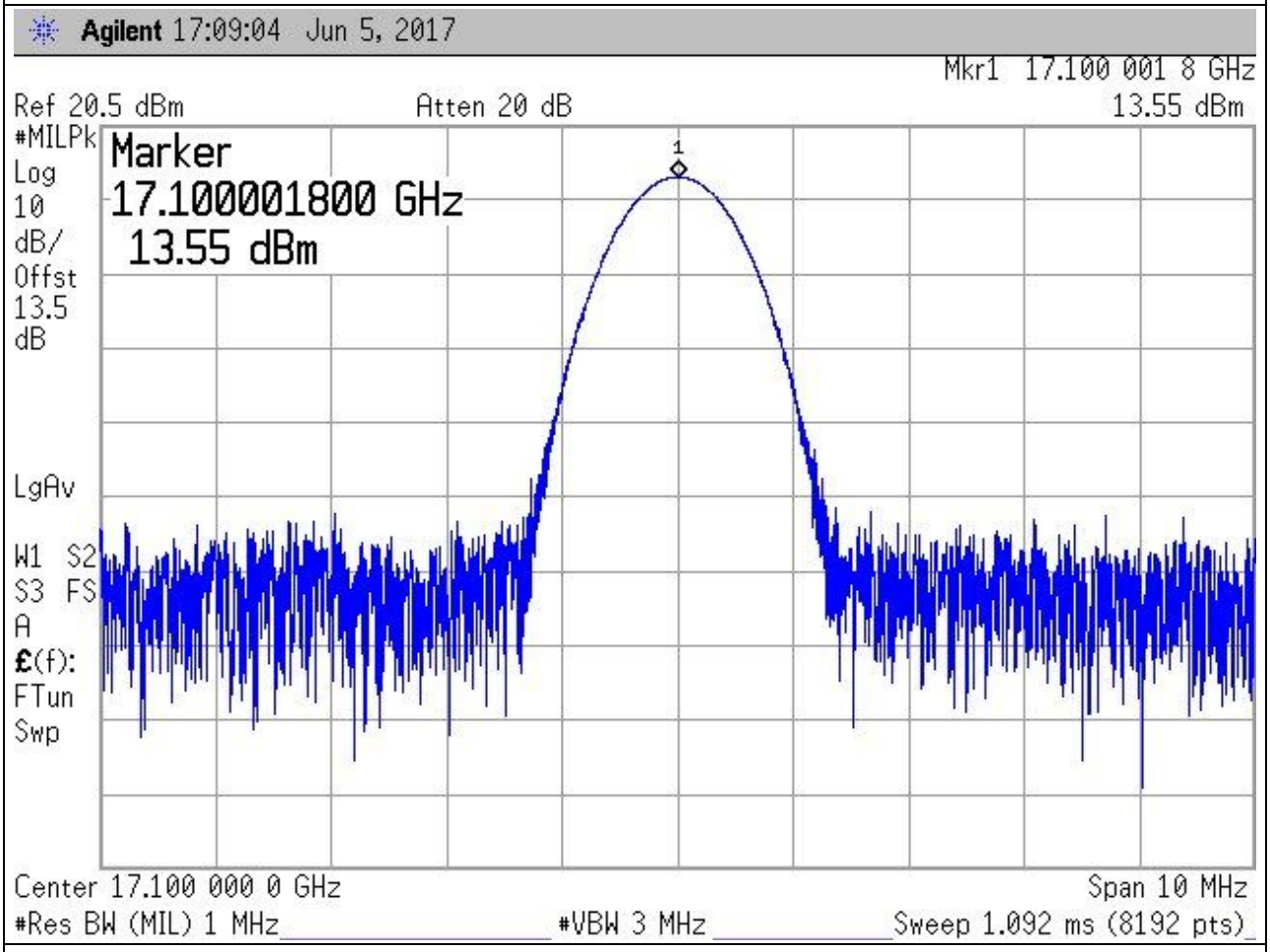


Fig. 6.4

Channel output A; Low Frequency Channels; High Antenna Gain

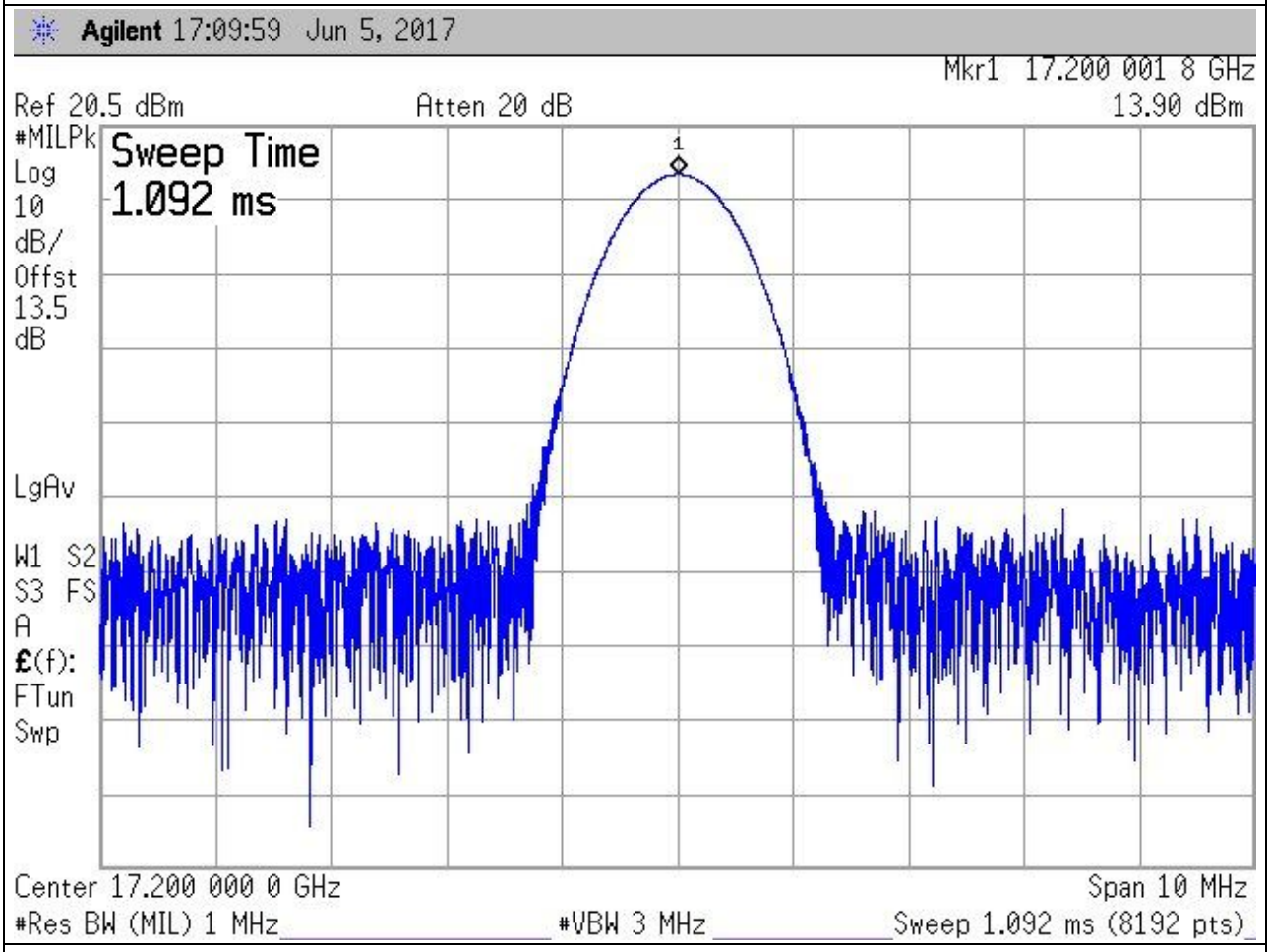


Fig. 6.5

Channel output A; Mid Frequency Channels; High Antenna Gain

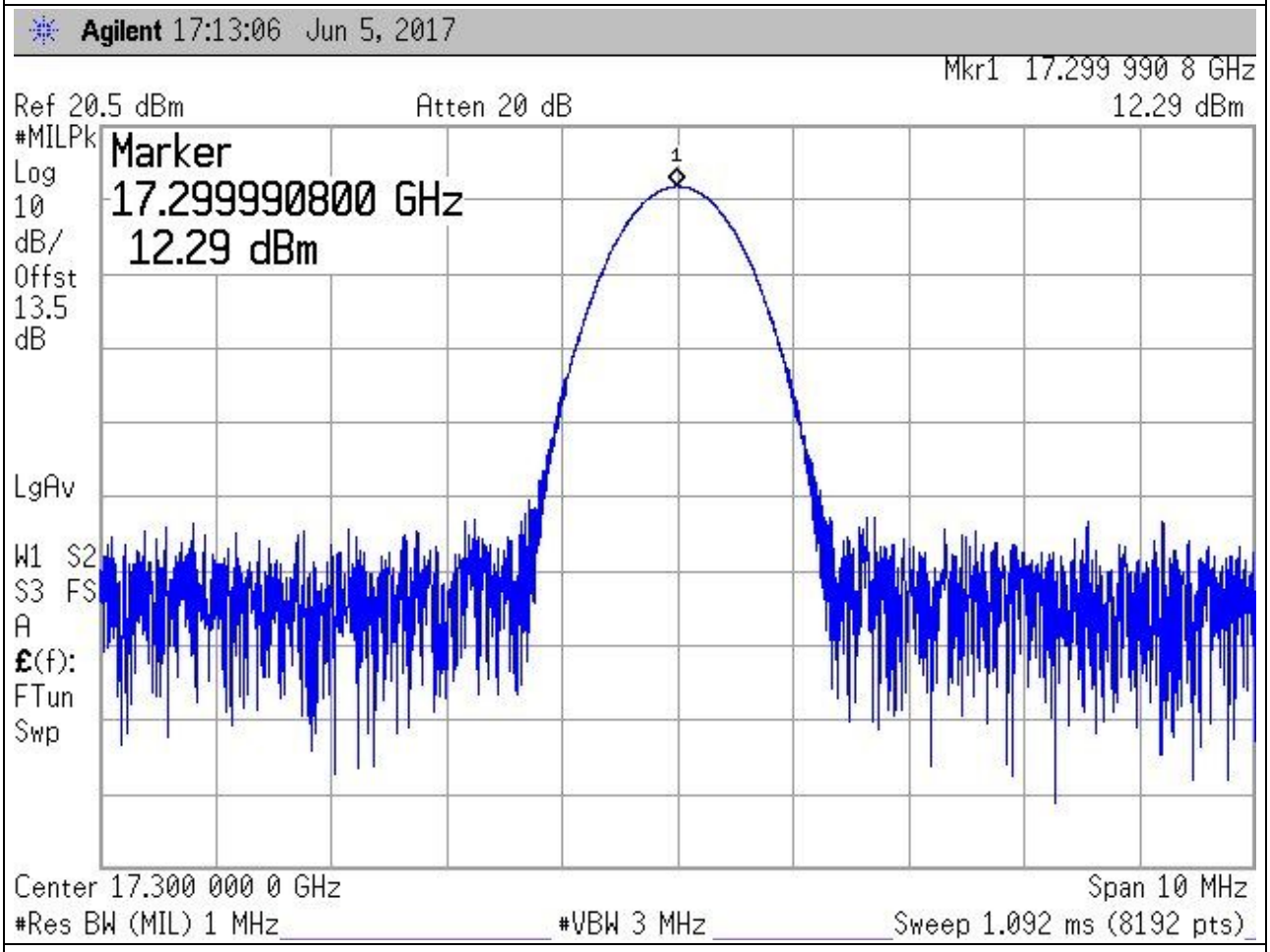


Fig. 6.6

Channel output A; Hi Frequency Channels; High Antenna Gain

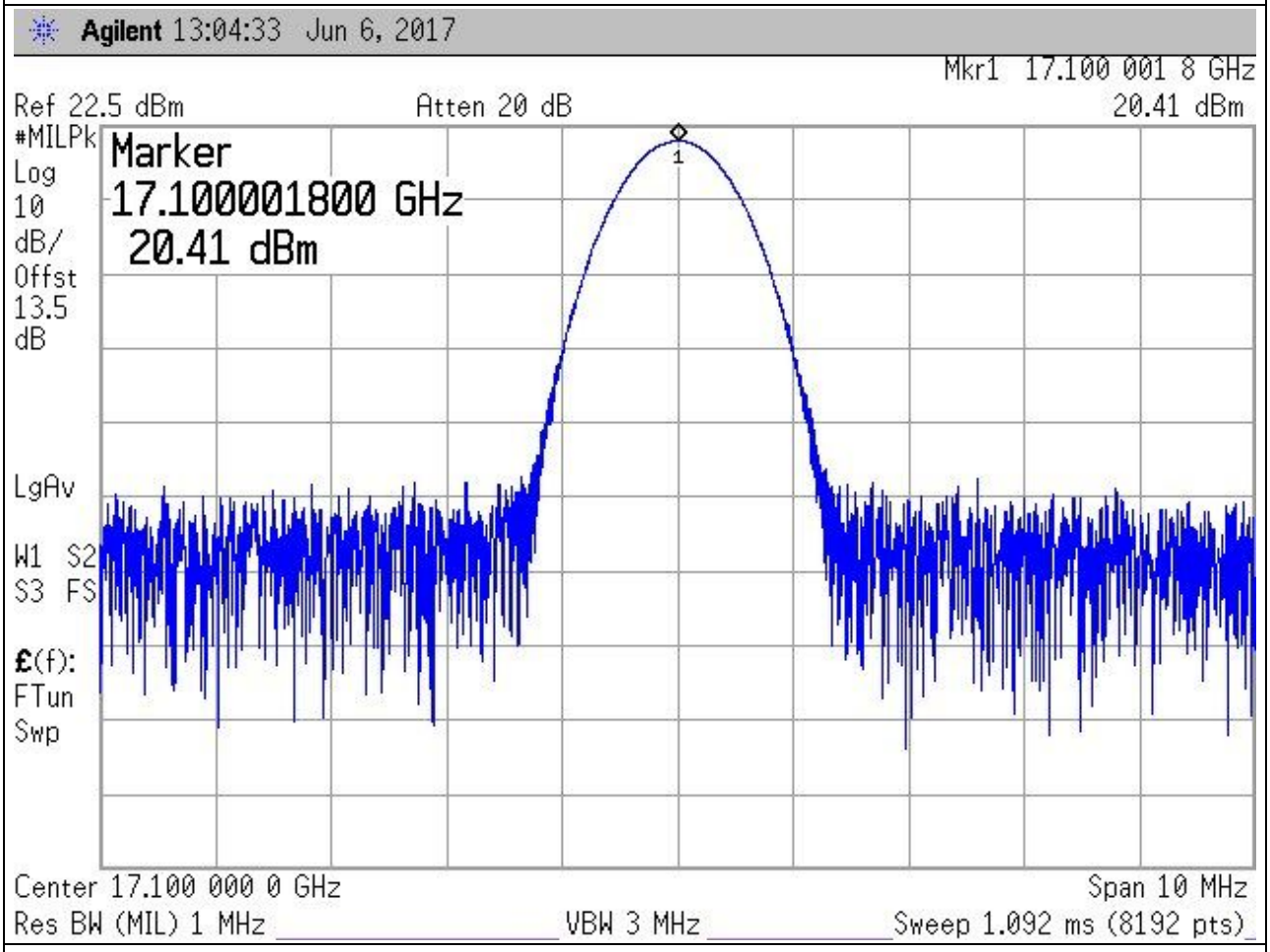


Fig. 6.7

Channel output B; Low Frequency Channels; Low Antenna Gain

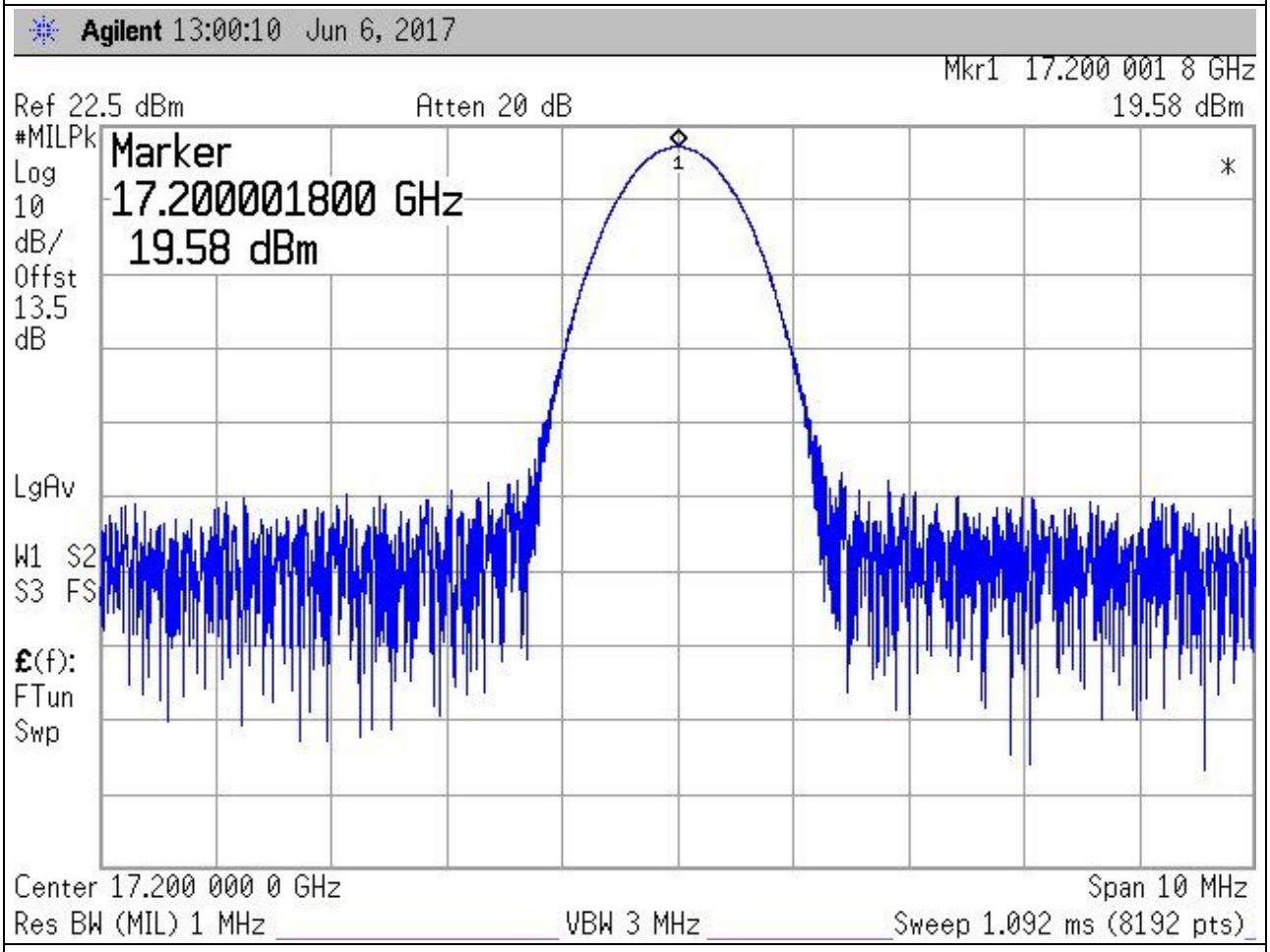


Fig. 6.8

Channel output B; Mid Frequency Channels; Low Antenna Gain

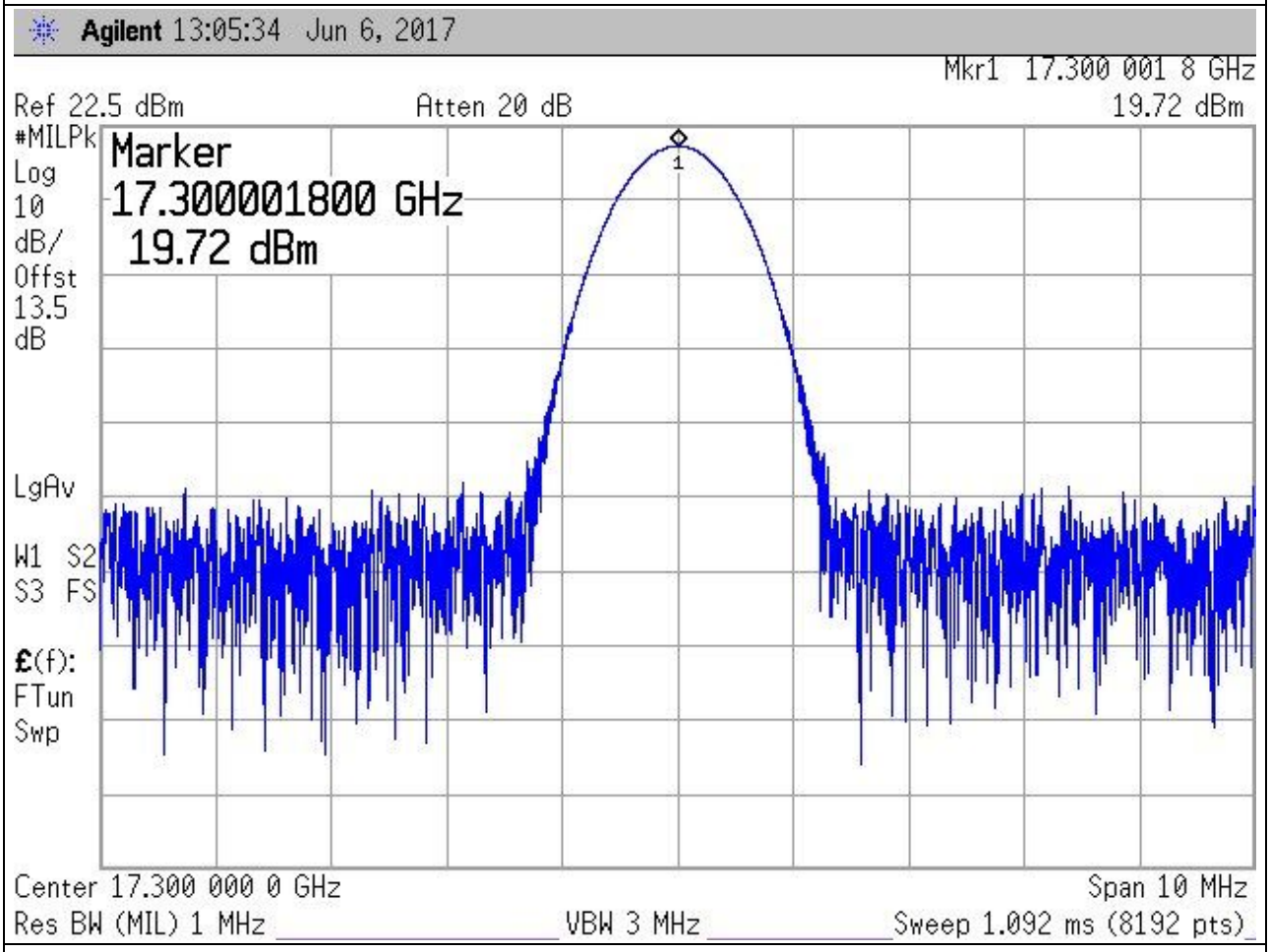


Fig. 6.9

Channel output B; Hi Frequency Channels; Low Antenna Gain

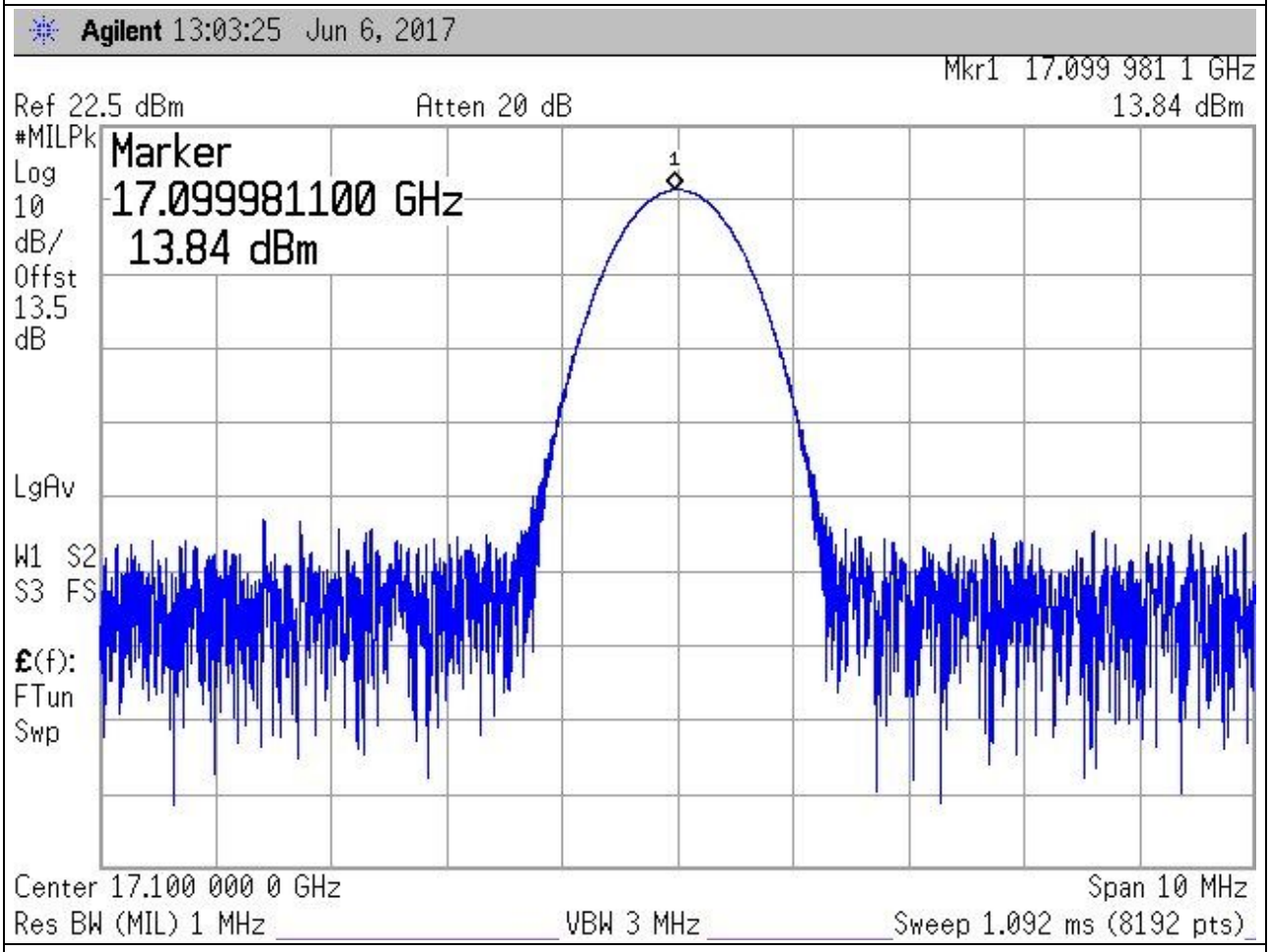


Fig. 6.10

Channel output B; Low Frequency Channels; High Antenna Gain

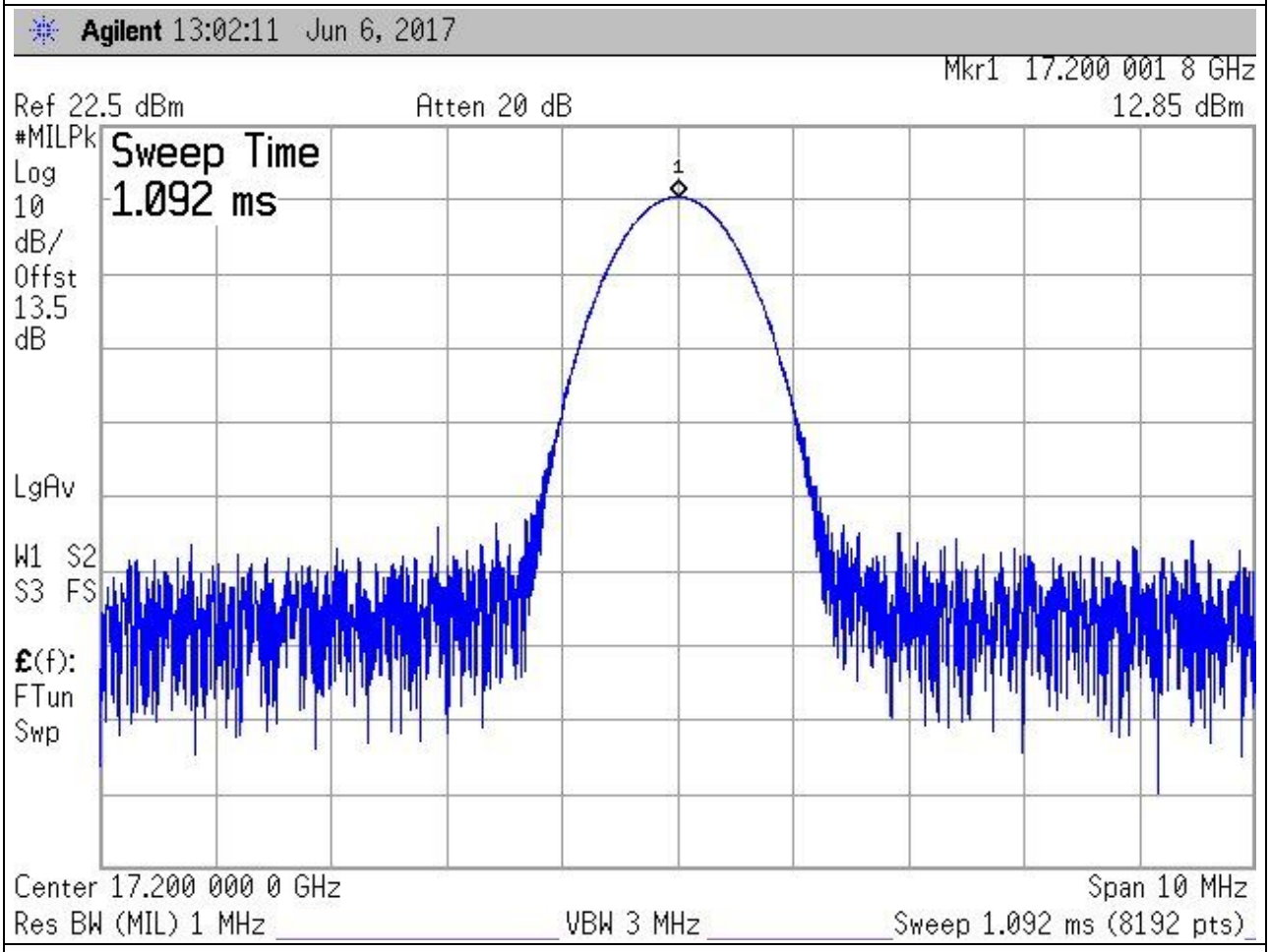


Fig. 6.11

Channel output B; Mid Frequency Channels; High Antenna Gain

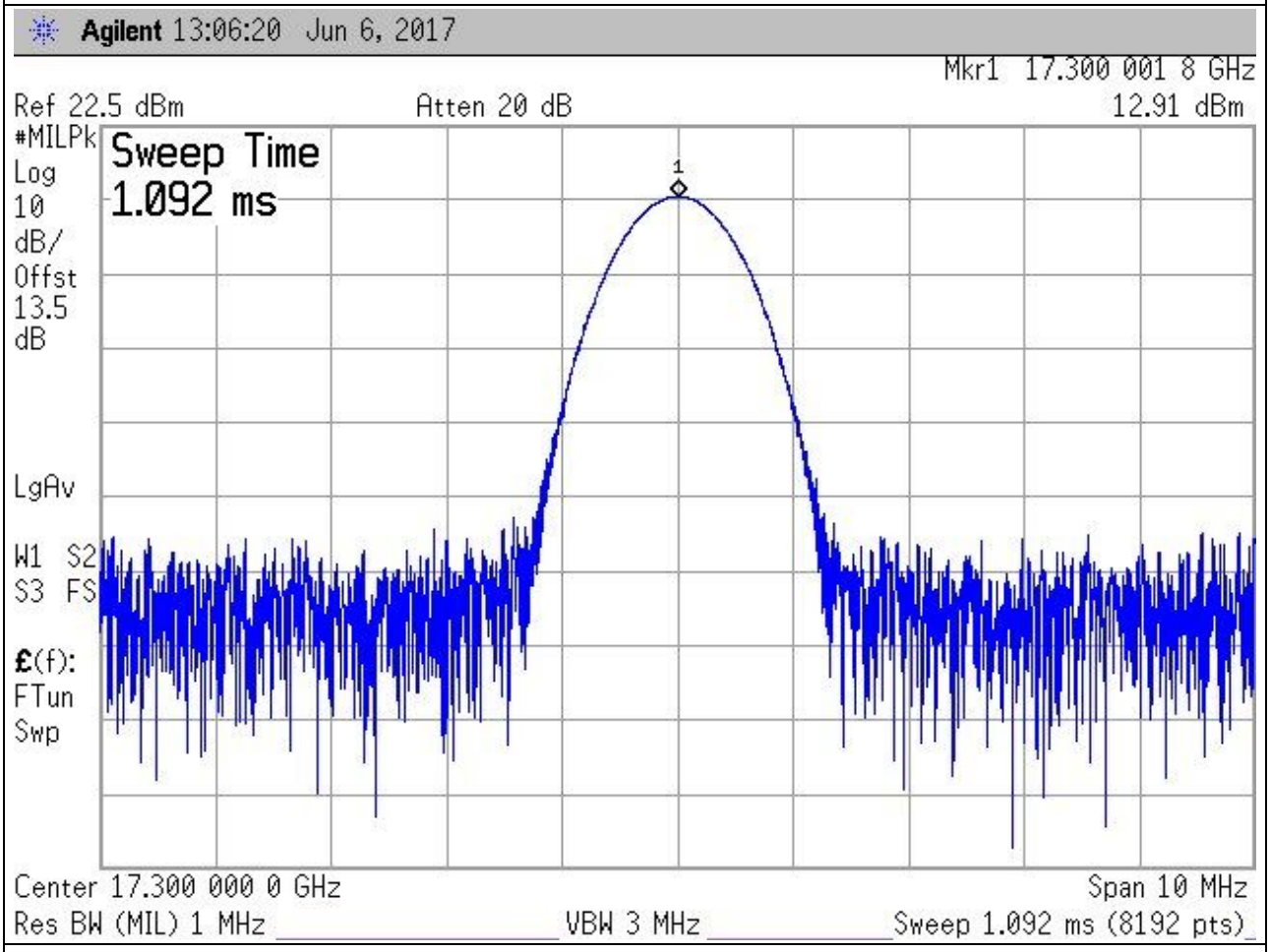


Fig. 6.12

Channel output B; Hi Frequency Channels; High Antenna Gain

6.3. 99% OCCUPIED BANDWIDTH

EUT was set for chirp sweep with modulated mode and highest RF output power.
Two antennas with lowest and highest gains was imposed.
The spectrum analyzer was connected to the antenna terminal.
The lowest antenna gain is 13.3 dBi, and highest antenna gain is 22 dBi.

The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper
frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by
a given emission shall be measured.

Measurement (conducted)

The measured values are:

CHANNELS	Bandwidth (MHz)	
	Low Antenna Gain (13.3 dBi)	High Antenna Gain (22 dBi)
Output A	198.4	198.1
Output B	198.6	198.6

Result

Pass

Notes:

The following figures show the acquired graphics.

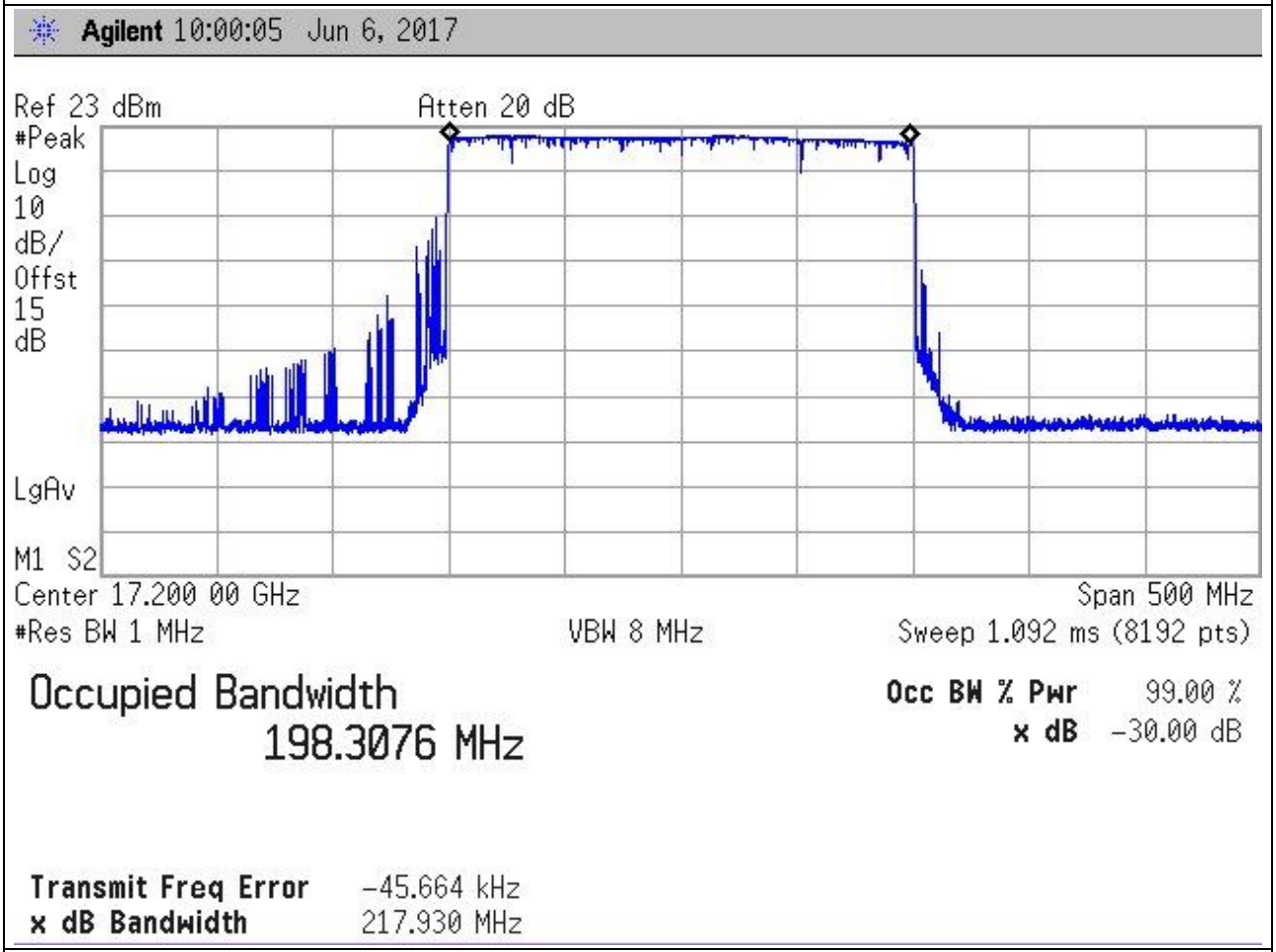


Fig. 6.13
Channel output A; Low Antenna Gain

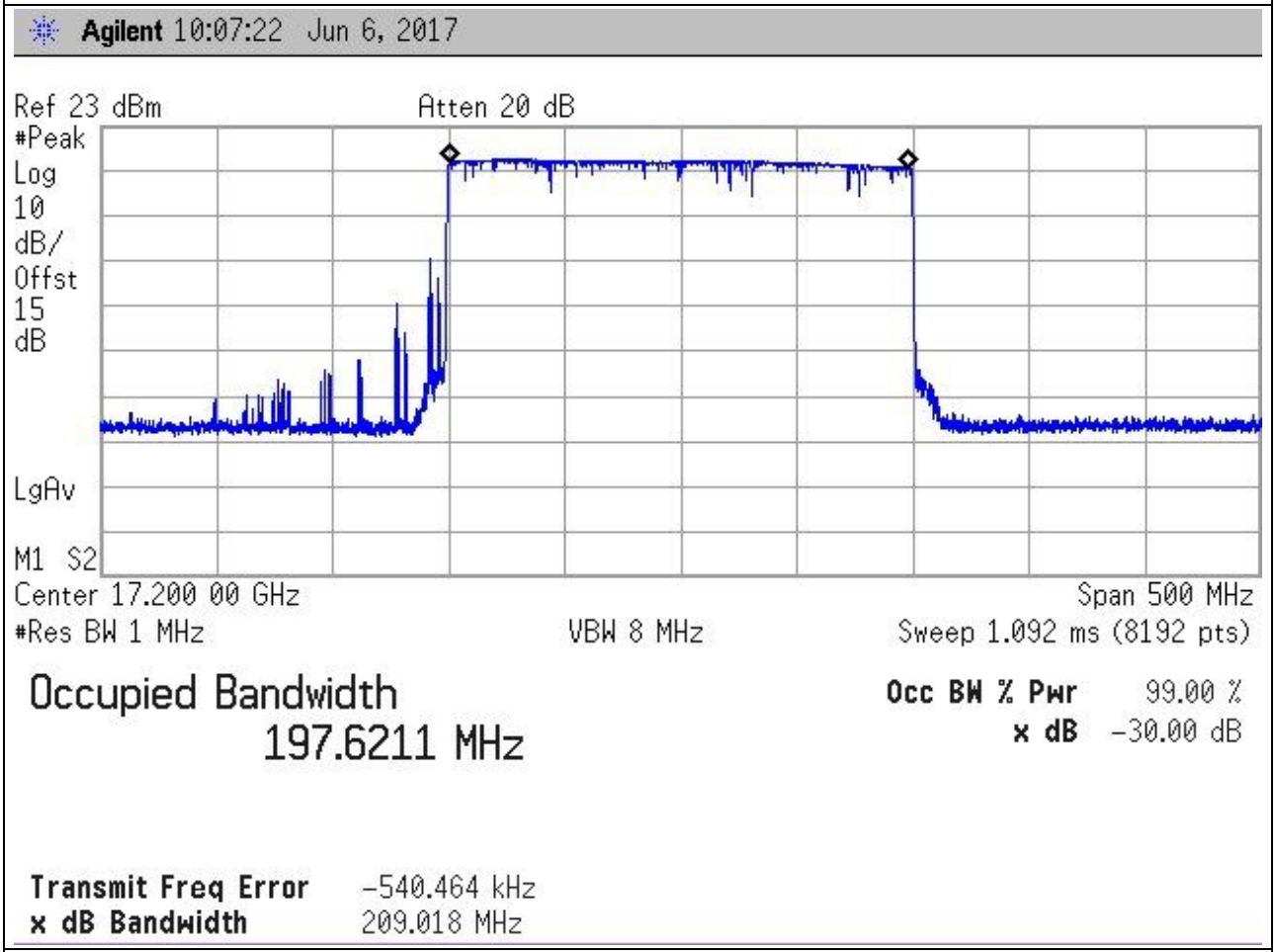


Fig. 6.14
Channel output A; High Antenna Gain

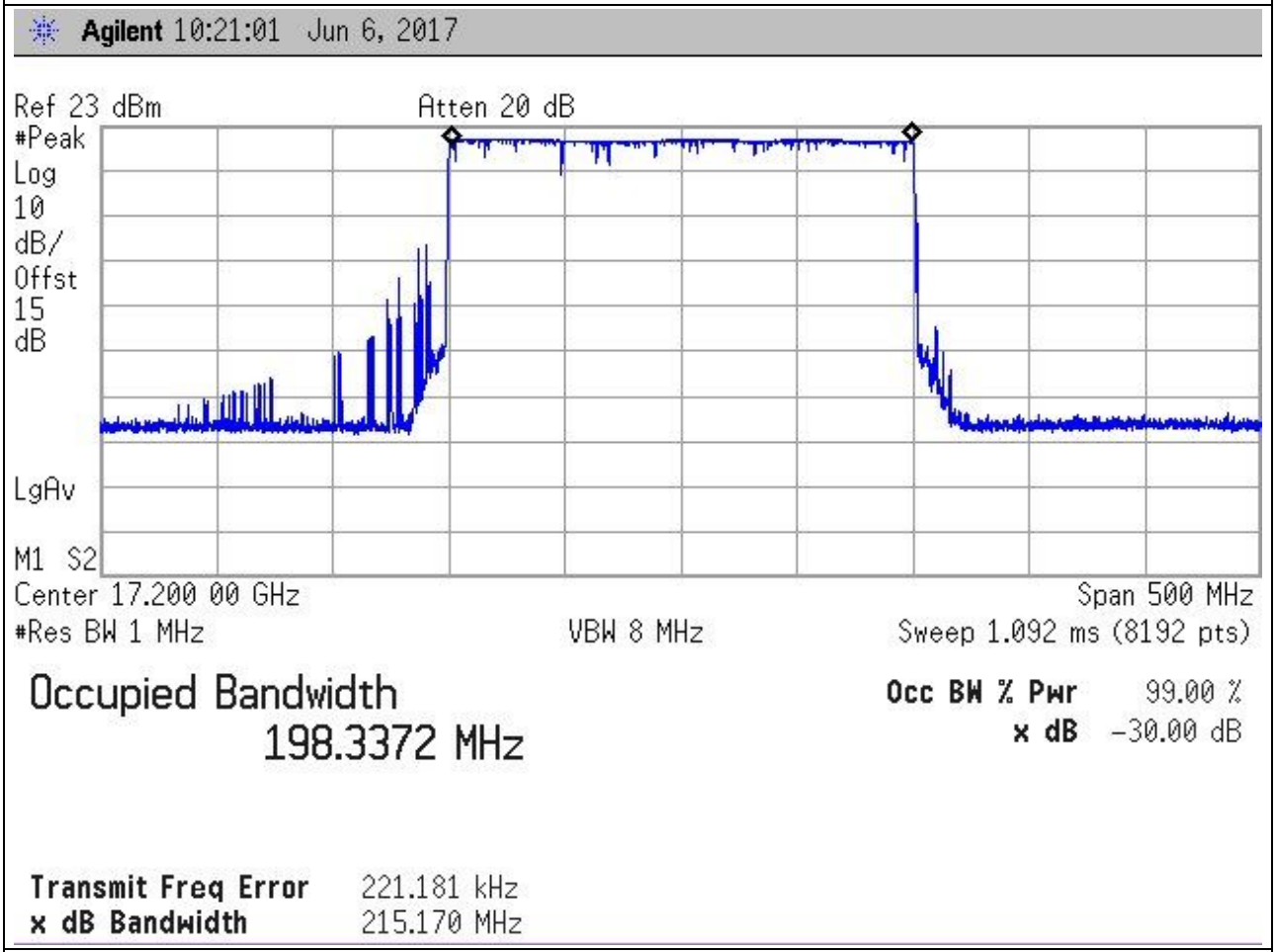


Fig. 6.15
Channel output B; Low Antenna Gain

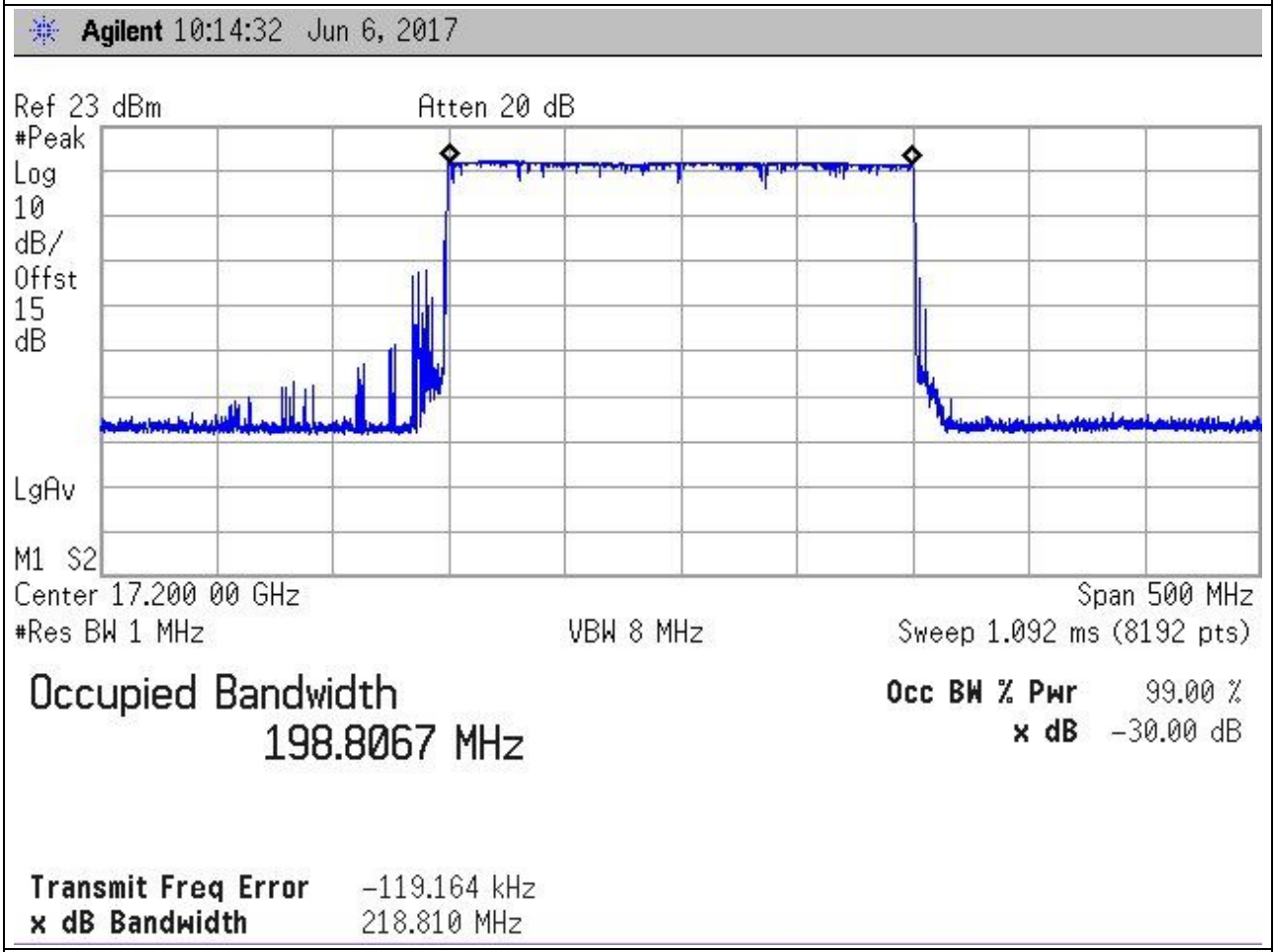


Fig. 6.16
Channel output B; High Antenna Gain

6.4. SPECTRUM EMISSION MASK

EUT was set for low, mid, high channel with modulated mode and highest RF output power
Two antennas with lowest and highest gains was imposed.
The spectrum analyzer was connected to the antenna terminal.
The lowest antenna gain is 13.3 dBi, and highest antenna gain is 22 dBi.

Requirements

For transmitters that are not equipped with an audio low-pass filter, the power of any emission must be attenuated below the unmodulated carrier output power (P) as follows:

- On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in kHz) of more than 5 kHz, but not more than 10 kHz: at least 83 log(fd/5) dB;
- On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in kHz) of more than 10 kHz, but not more than 250 percent of the authorized bandwidth: at least 29 log (fd^2/11) dB or 50 dB, whichever is the lesser attenuation;
- On any frequency removed from the center of the authorized bandwidth by more than 250 percent of the authorized bandwidth: at least 43 + 10log(P) dB.

Measurement (conducted)

The single result are:

Channel Output A

FREQUENCY		Results	
		Low Antenna Gain (13.3 dBi)	High Antenna Gain (22 dBi)
Low (17.1 GHz)		*Pass*	*Pass*
Mid (17.2 GHz)		*Pass*	*Pass*
High (17.3 GHz)		*Pass*	*Pass*

Channel Output B

FREQUENCY		Results	
		Low Antenna Gain (13.3 dBi)	High Antenna Gain (22 dBi)
Low (17.1 GHz)		*Pass*	*Pass*
Mid (17.2 GHz)		*Pass*	*Pass*
High (17.3 GHz)		*Pass*	*Pass*

Result

Pass

Notes:

The following figures show the acquired graphics.

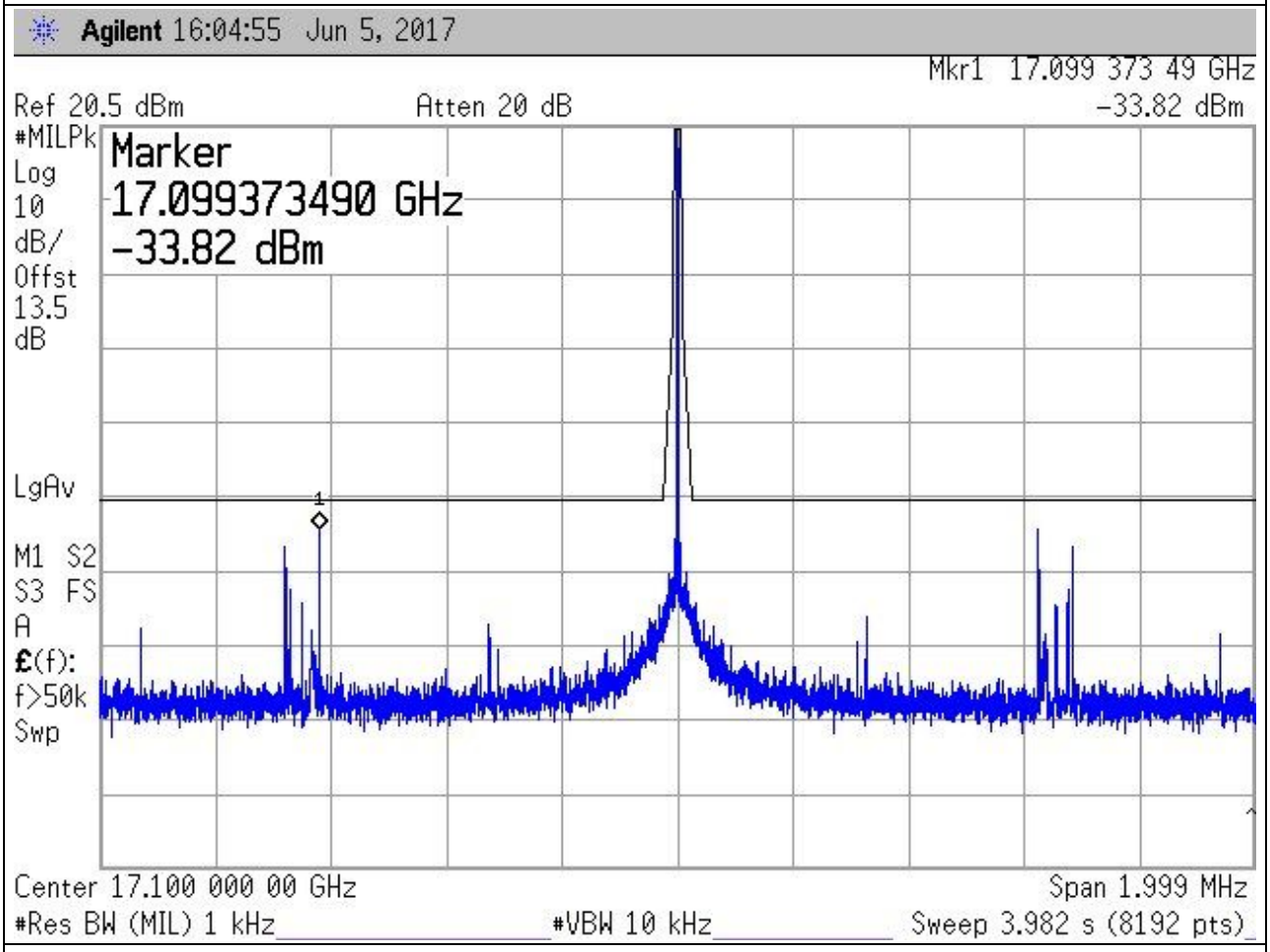


Fig. 6.17

Channel Output A; Low Frequency Channel; Low Antenna Gain

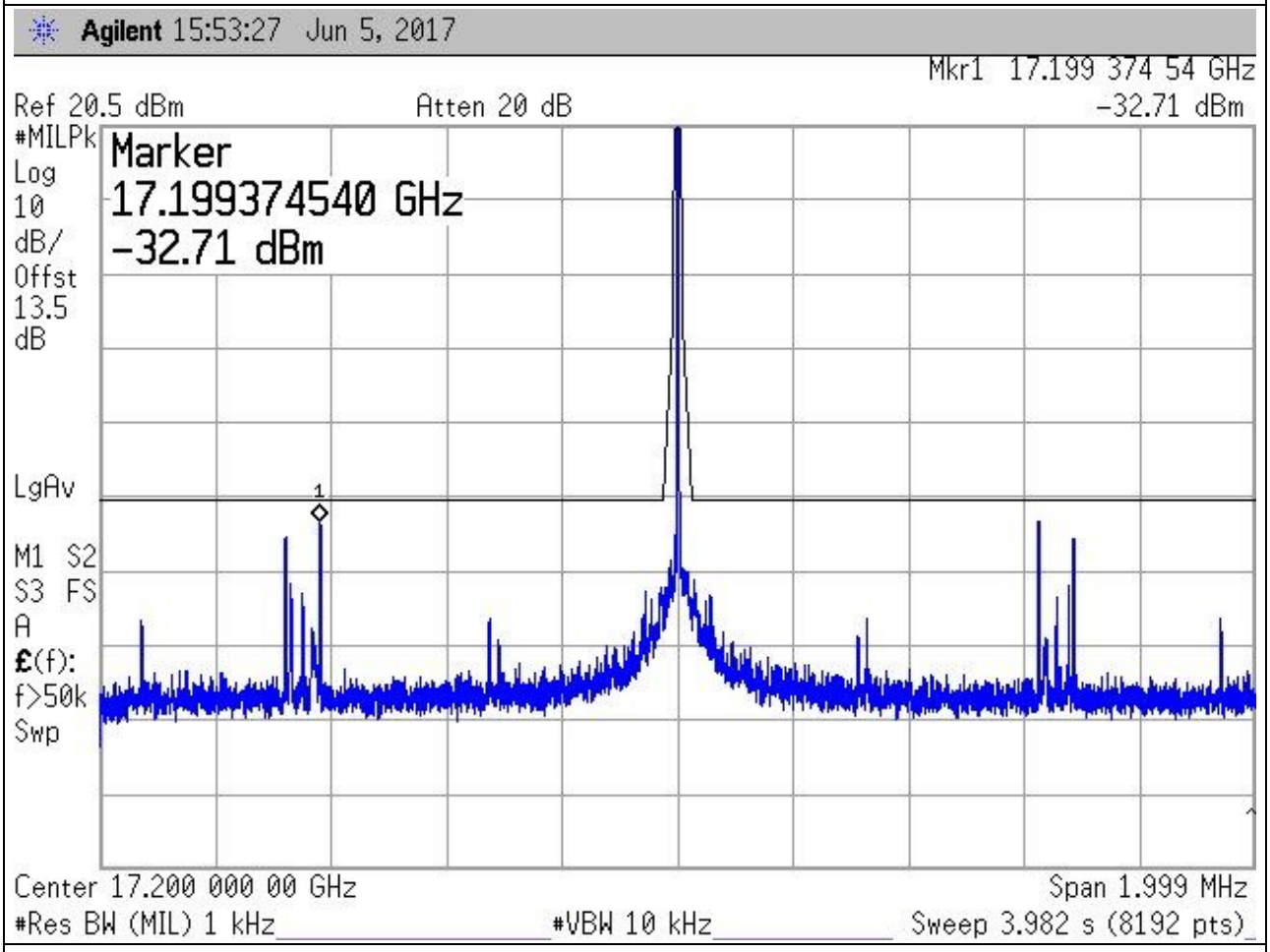


Fig. 6.18

Channel Output A; Mid Frequency Channel; Low Antenna Gain

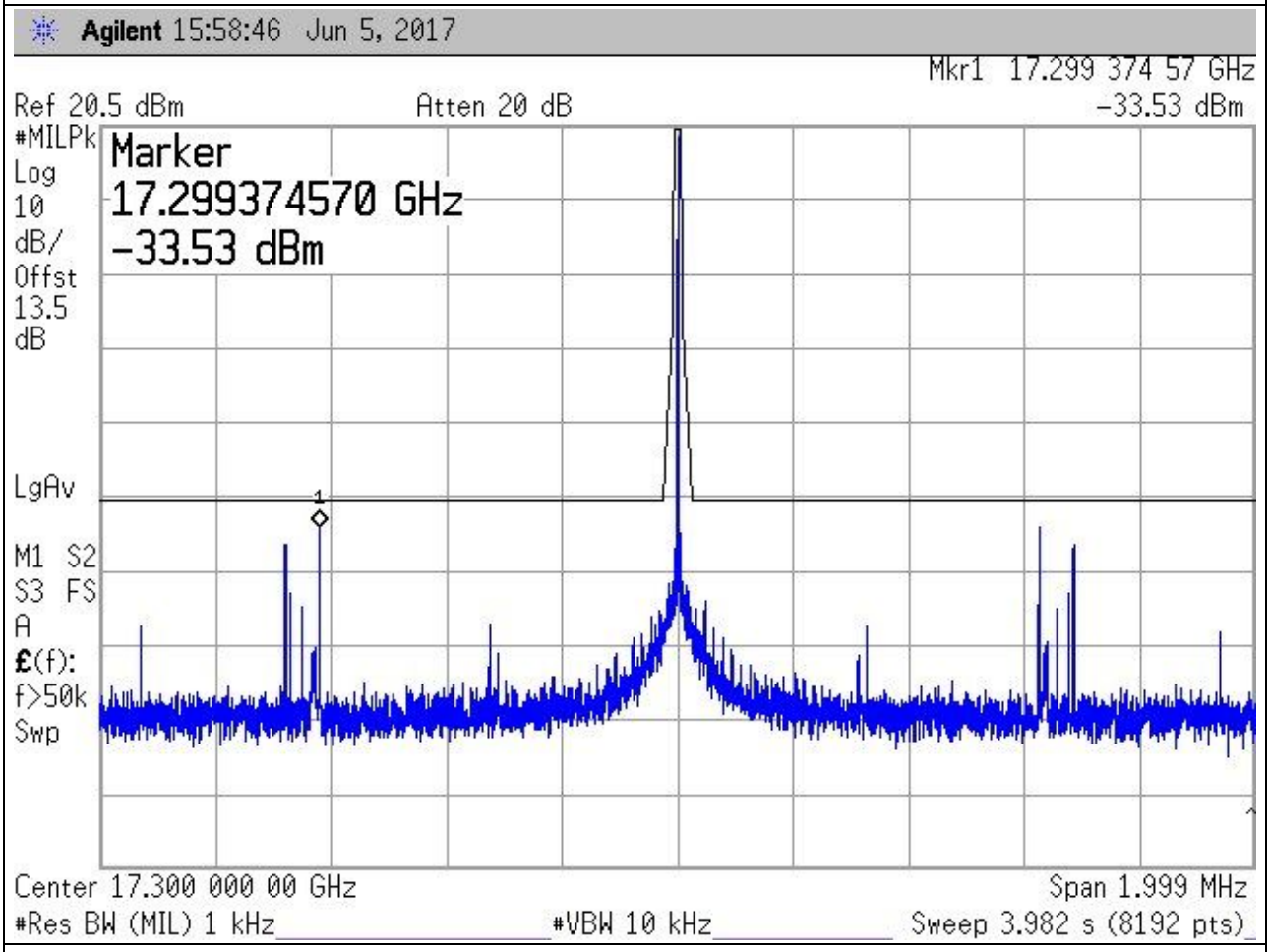


Fig. 6.19

Channel Output A; Hi Frequency Channel; Low Antenna Gain

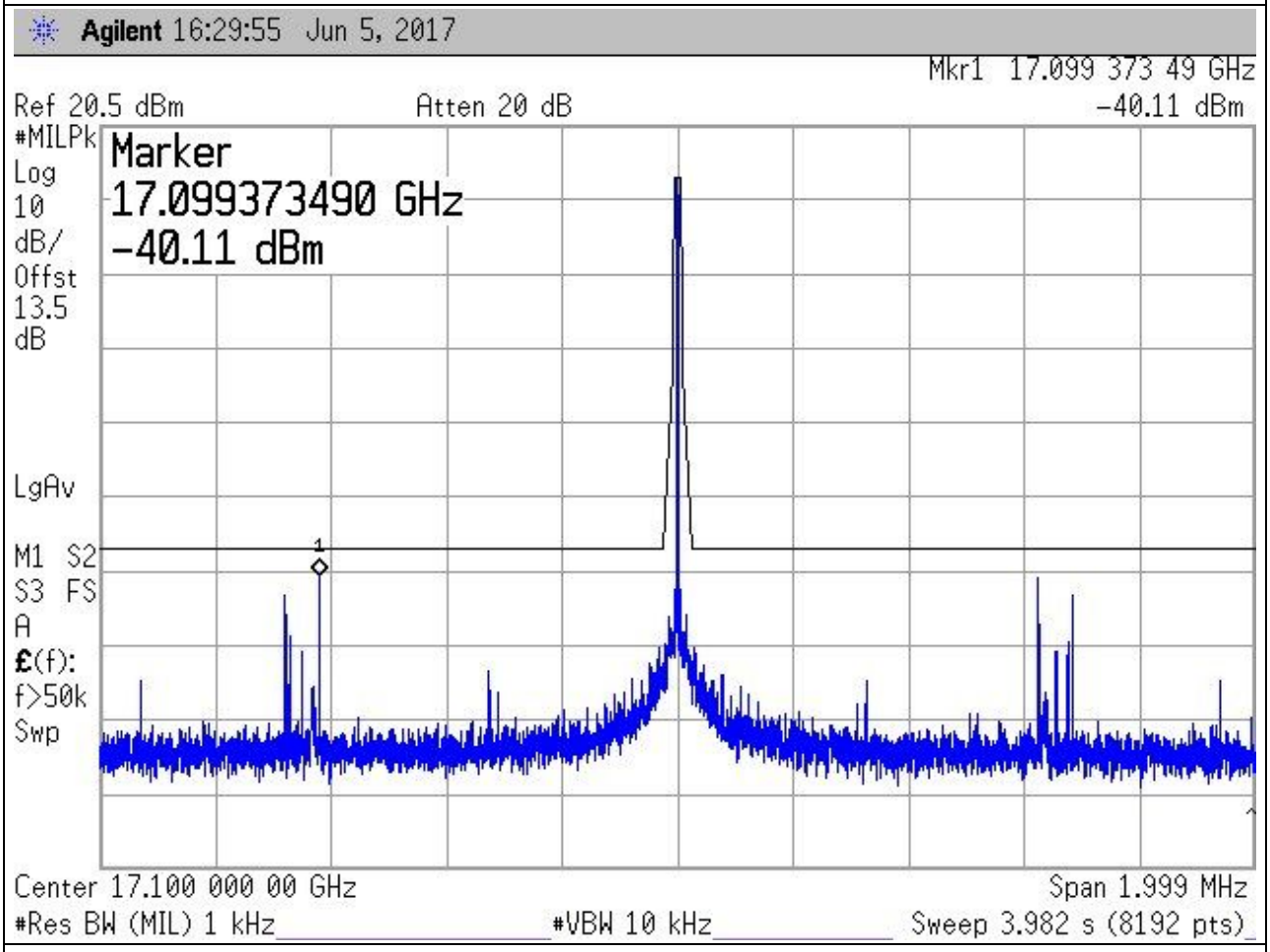


Fig. 6.20
Channel Output A; Low Frequency Channel; High Antenna Gain

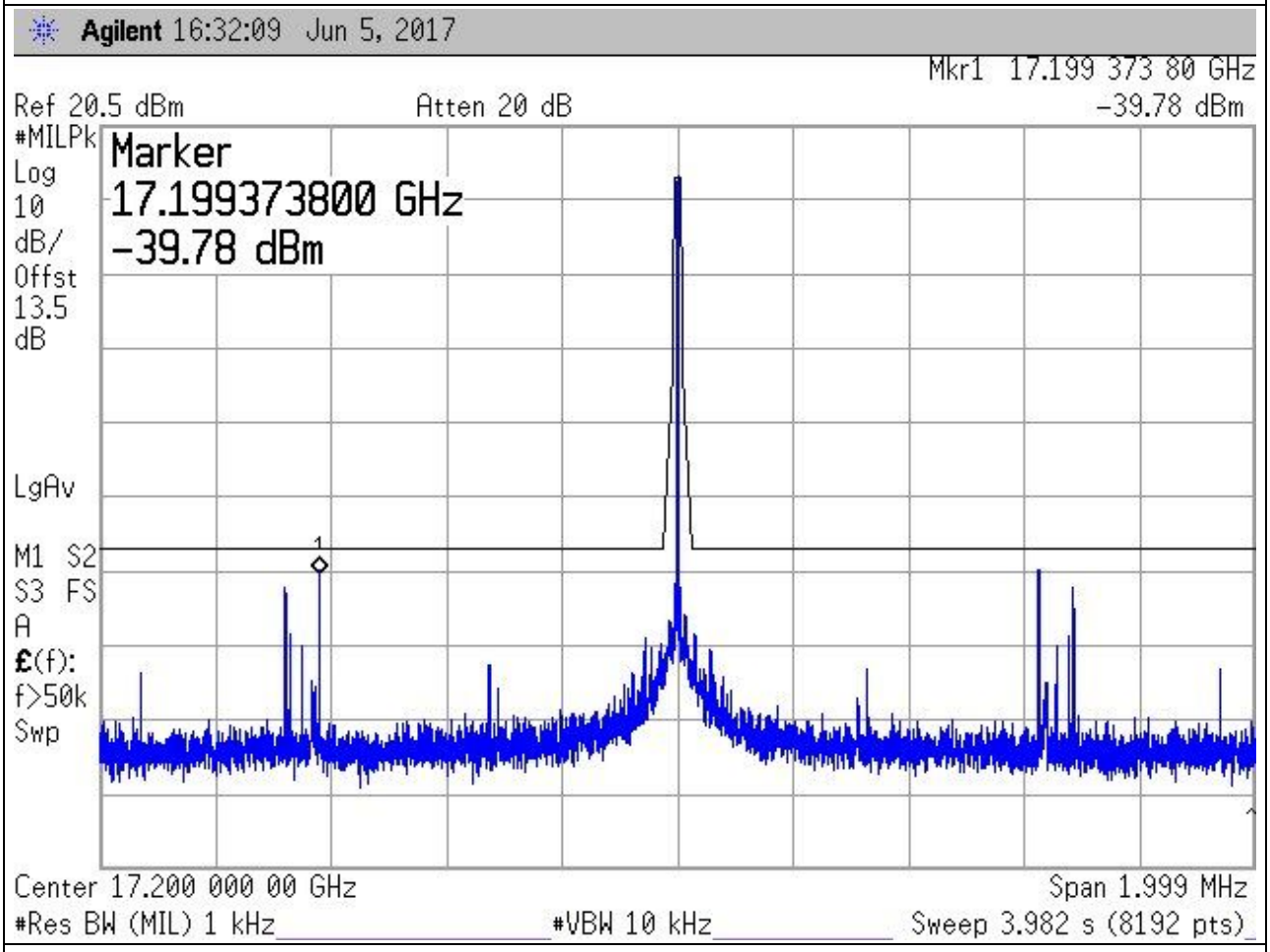


Fig. 6.21
Channel Output A; Mid Frequency Channel; High Antenna Gain

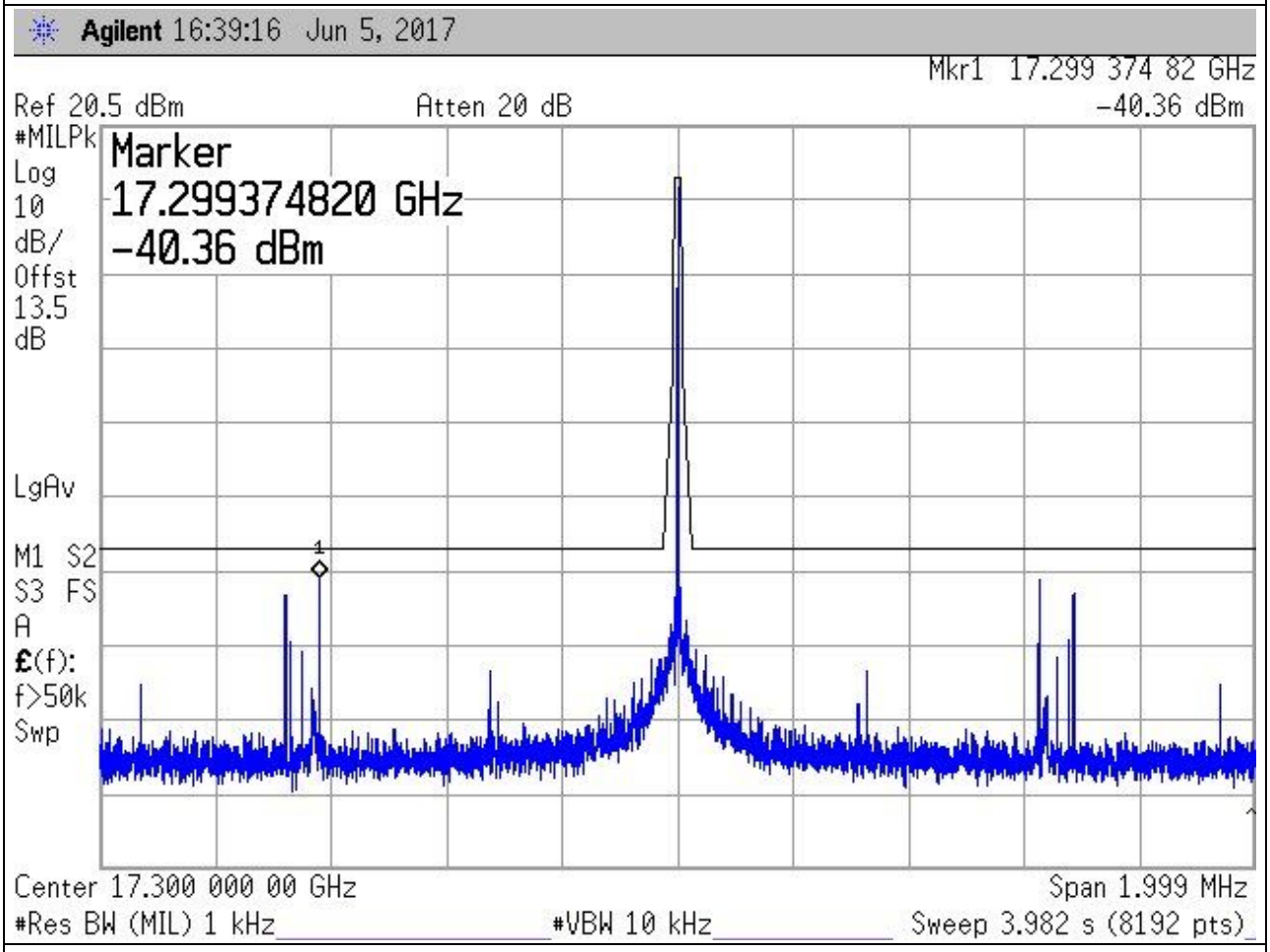


Fig. 6.22
Channel Output A; Hi Frequency Channel; High Antenna Gain

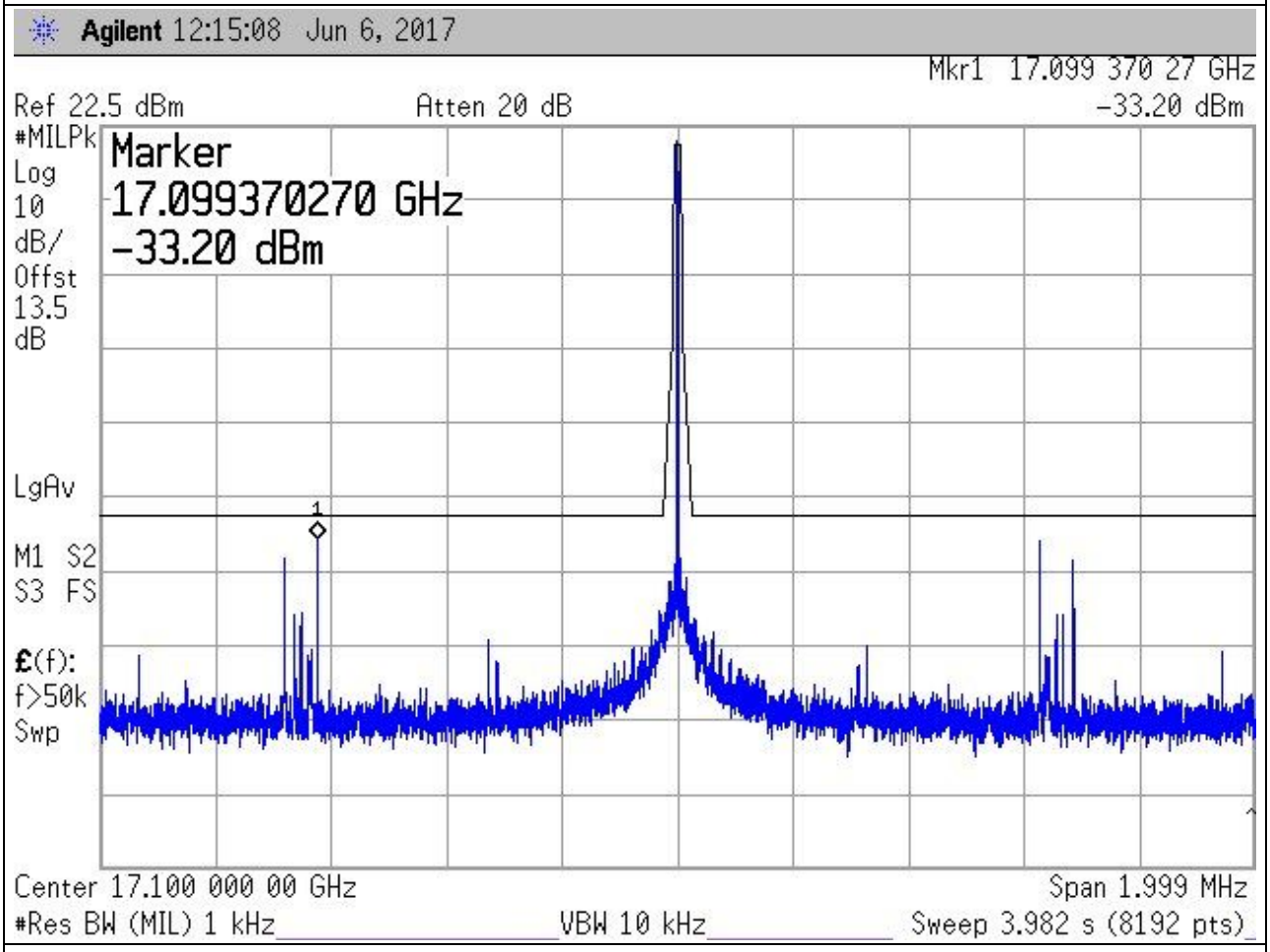


Fig. 6.23

Channel Output B; Low Frequency Channel; Low Antenna Gain

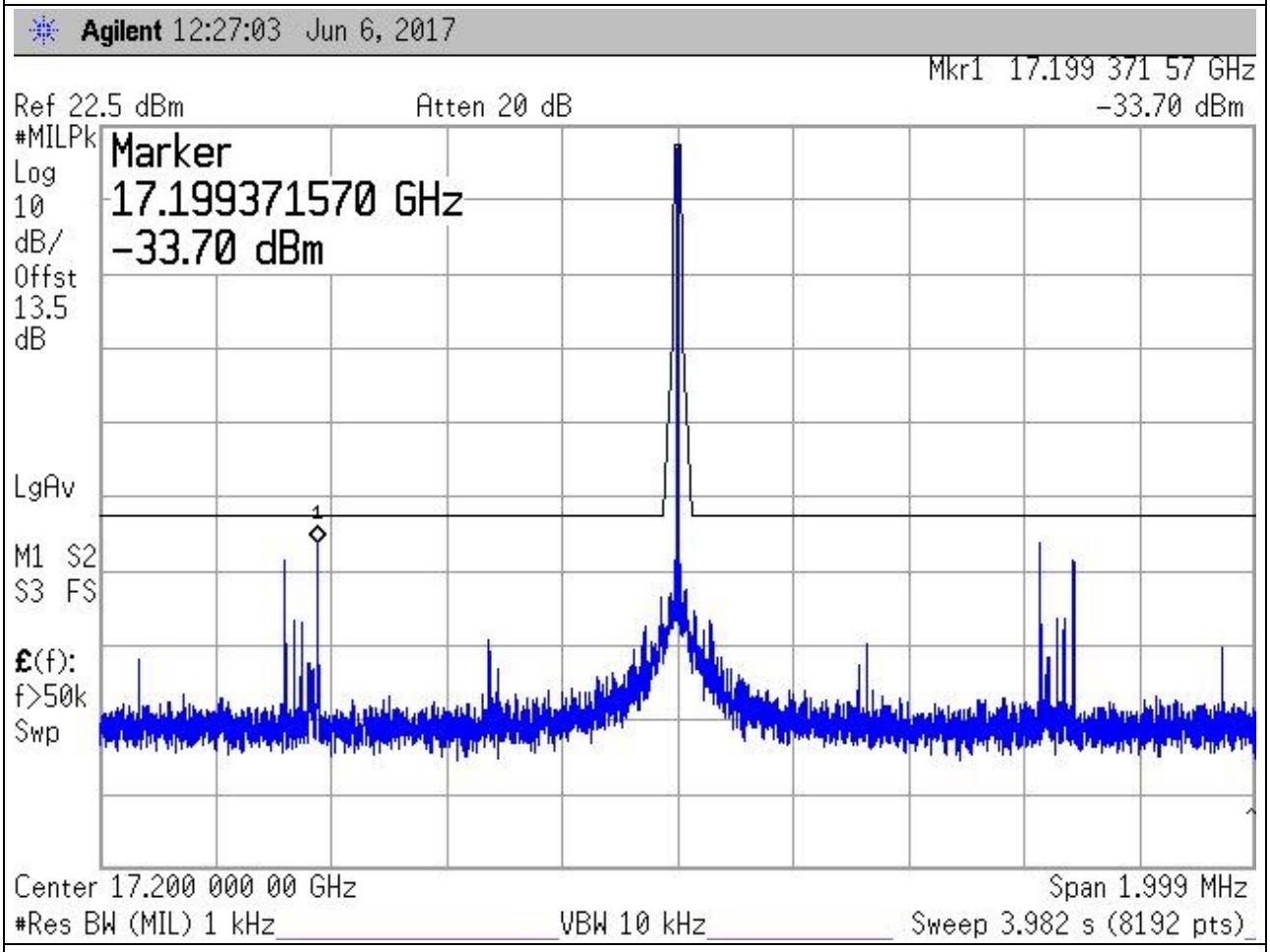


Fig. 6.24

Channel Output B; Mid Frequency Channel; Low Antenna Gain

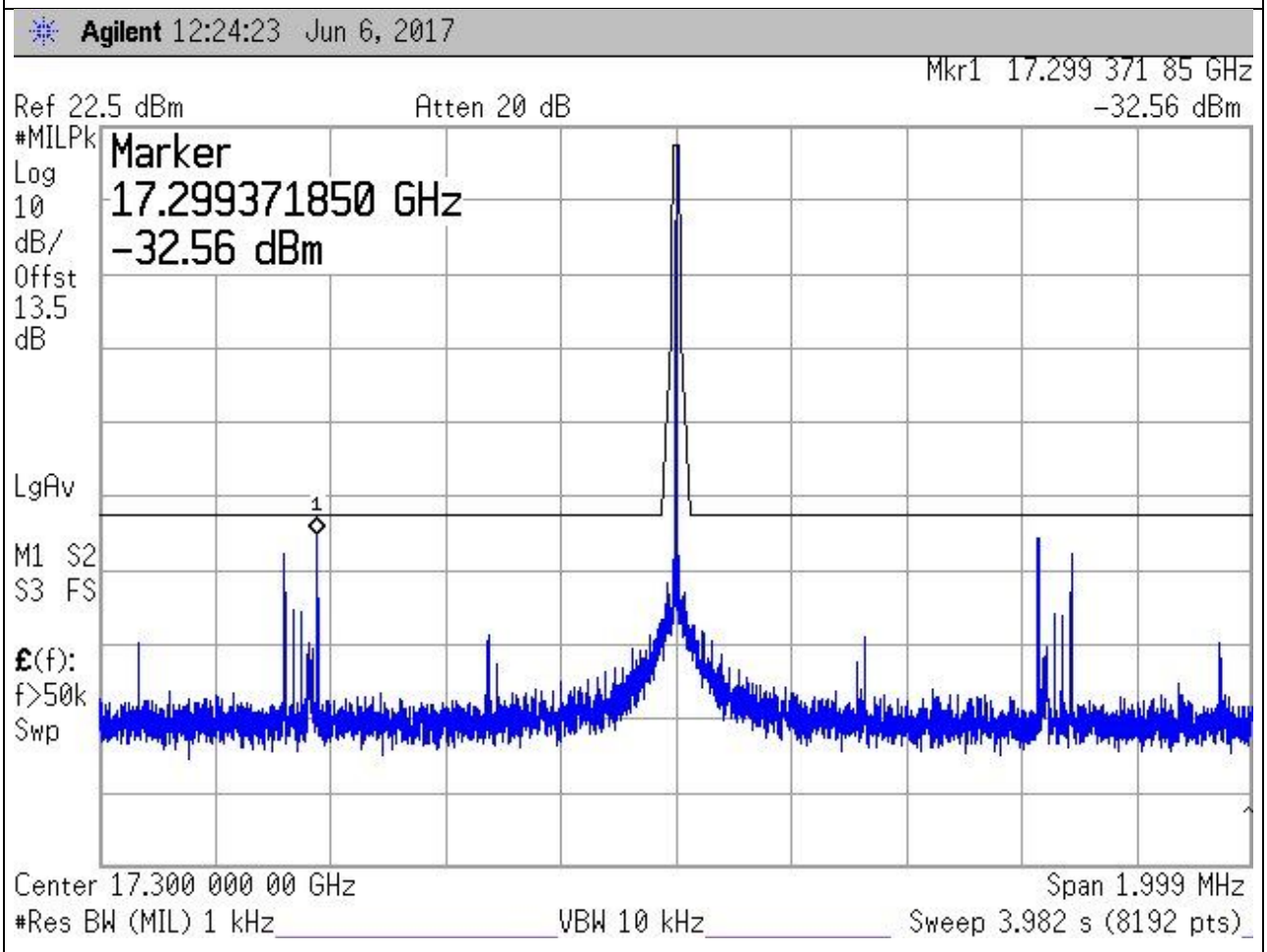


Fig. 6.25
Channel Output B; Hi Frequency Channel; Low Antenna Gain

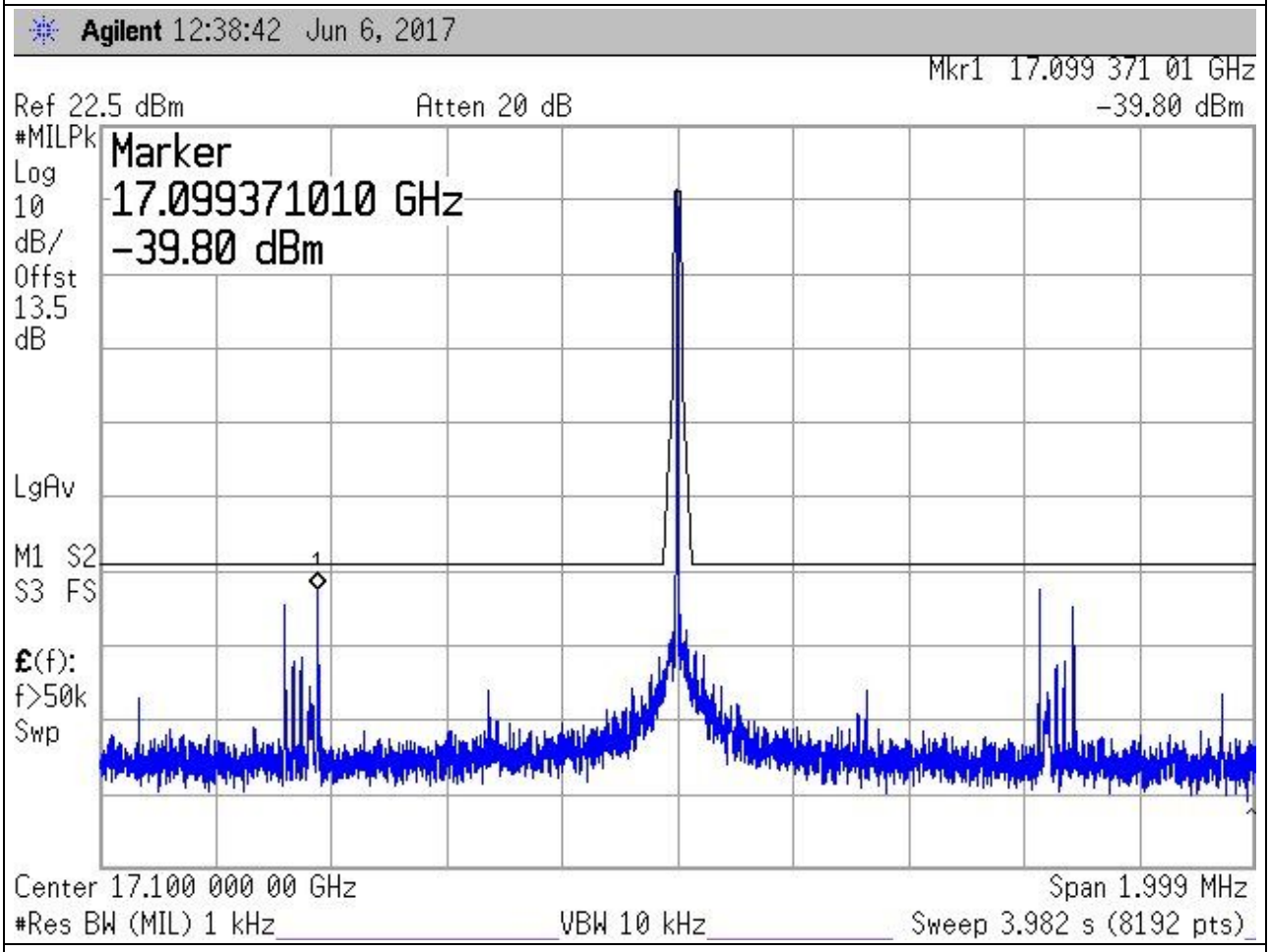


Fig. 6.26
Channel Output B; Low Frequency Channel; High Antenna Gain

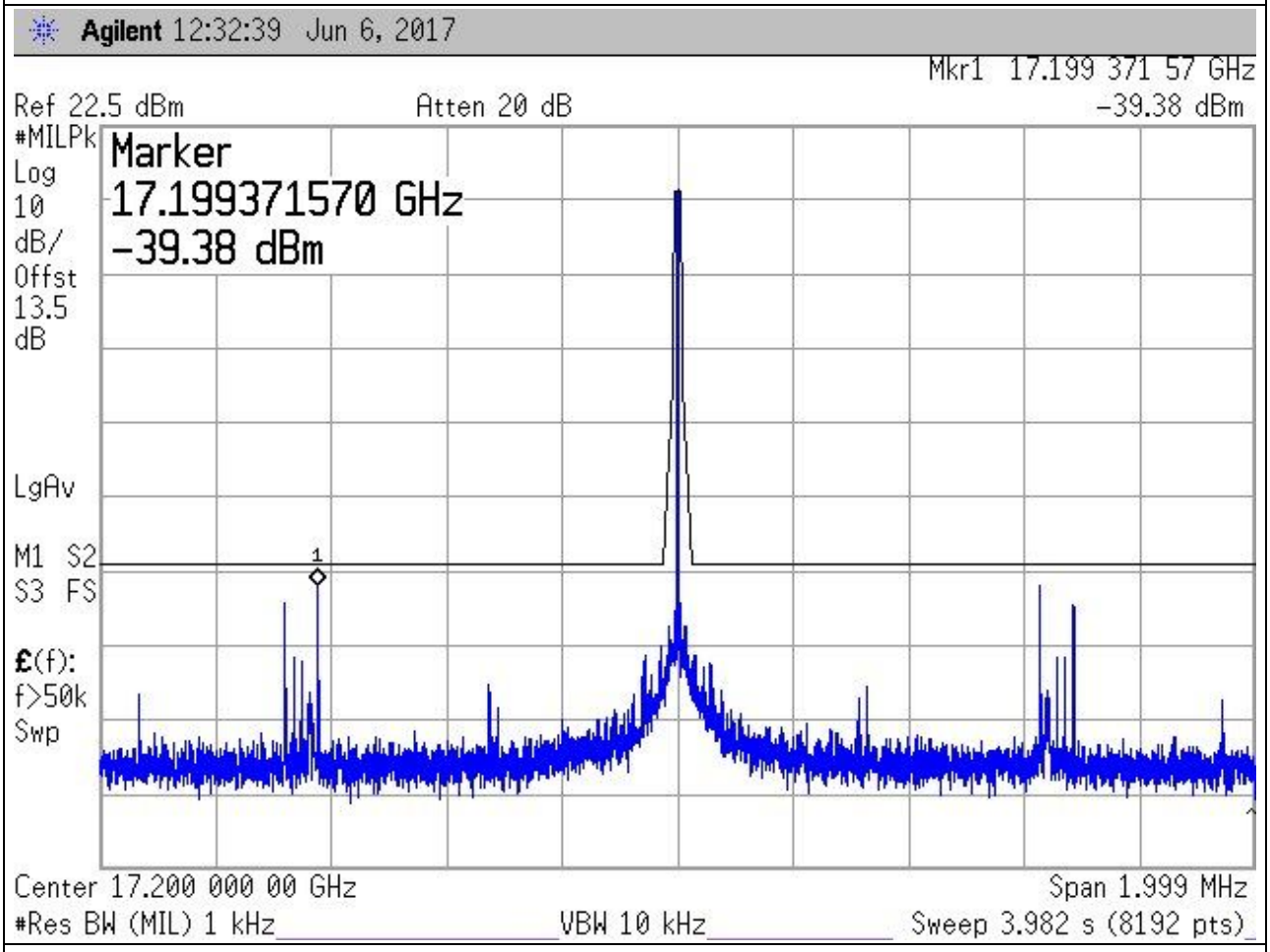


Fig. 6.27

Channel Output B; Mid Frequency Channel; High Antenna Gain

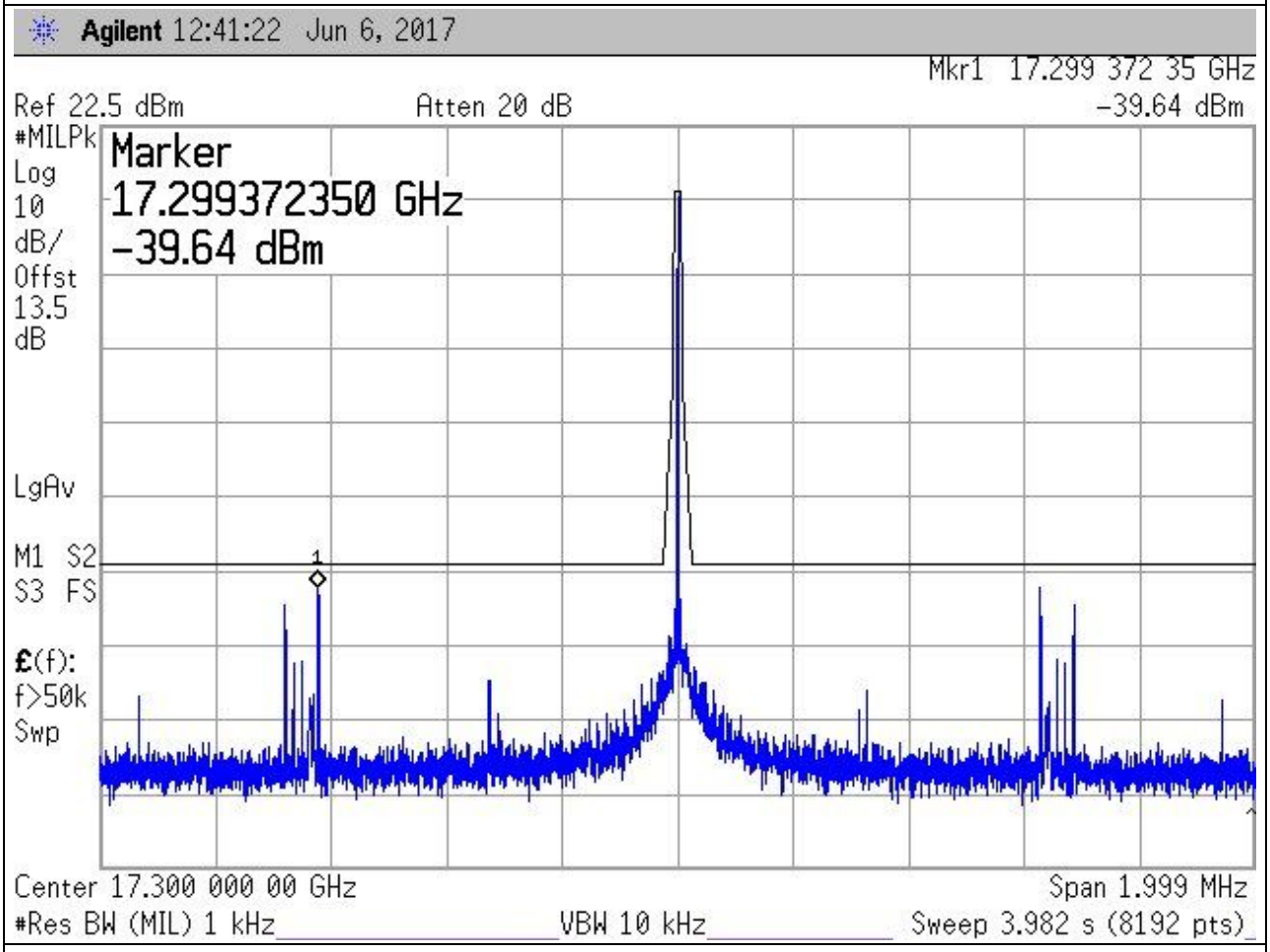


Fig. 6.28

Channel Output B; Hi Frequency Channel; High Antenna Gain

6.5. FREQUENCY STABILITY

EUT was set for mid channel with modulated mode and highest RF output power

The spectrum analyzer was connected to the antenna terminal.

Requirements

The frequency stability shall be measured with variation of ambient temperature as follows:

- from −30° to + 50° centigrade;
- frequency measurements shall be made at the extremes of the specified temperature range and at intervals of not more than 10° centigrade through the range.

The frequency stability shall be measured with variation of primary supply voltage as follows:

- primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment.

Measurement (conducted)

Channel Output A

Frequency stability versus temperature

TEMPERATURE (°C)	***MEAS. FREQ.*** (MHz)	***FREQ. DRIFT*** (kHz)	***FREQ. DEVIATION LIMIT***	***RESULT***
50	17199.999750	-0.051	--	Pass
40	17199.999722	-0.079	--	Pass
30	17199.999868	+0.067	--	Pass
20	Reference (MHz): 17199.999801			
10	17199.999721	-0.080	--	Pass
0	17199.999888	+0.087	--	Pass
-10	17200.000000	+0.199	--	Pass
-20	17200.000134	+0.333	--	Pass
-30	17200.000095	+0.294	--	Pass

Frequency stability versus input voltage

MEAS. VOLTAGE (V_{DC})	***MEAS. FREQ.*** (MHz)	***FREQ. DRIFT*** (kHz)	***FREQ. DEVIATION*** (LIMIT: 0.01 %)	***RESULT***
10.20	17199.999940	+0.018	< 0.01	Pass
12.00	17199.999957	+0.035	< 0.01	Pass
24.00	17199.999922	0	--	Pass
27.66	17199.999932	+0.010	< 0.01	Pass

The frequency of the transmitter was measured at 85% and 115% of the rated power supply voltage at environmental temperature (20 °C).

Channel Output B

Frequency stability versus temperature

Temperature (°C)	***Meas. Freq.*** (MHz)	***Freq. Drift*** (kHz)	***Freq. Deviation Limit***	***Result***
50	17199.999640	-0.145	--	Pass
40	17199.999642	-0.143	--	Pass
30	17199.999808	+0.023	--	Pass
20	Reference (MHz): 17199.999785			
10	17199.999721	-0.064	--	Pass
0	17199.999918	+0.133	--	Pass
-10	17199.999931	+0.146	--	Pass
-20	17199.999998	+0.213	--	Pass
-30	17199.999999	+0.214	--	Pass

Frequency stability versus input voltage

Meas. Voltage (V_{DC})	***Meas. Freq.*** (MHz)	***Freq. Drift*** (kHz)	***Freq. Deviation*** (limit: 0.01 %)	***Result***
10.20	17199.999941	+0.015	< 0.01	Pass
12.00	17199.999952	+0.026	< 0.01	Pass
24.00	17199.999926	0	--	Pass
27.66	17199.999931	+0.005	< 0.01	Pass

The frequency of the transmitter was measured at 85% and 115% of the rated power supply voltage at environmental temperature (20 °C).

Result

Pass

6.6. CONDUCTED SPURIOUS EMISSION AT ANTENNA PORT

EUT was set for chirp sweep with modulated mode and highest RF output power.
Two antennas with lowest and highest gains was imposed.
The spectrum analyzer was connected to the antenna terminal.

Requirements

For transmitters that are not equipped with an audio low-pass filter, the power of any emission must be attenuated below the unmodulated carrier output power (P) as follows:

- On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in kHz) of more than 5 kHz, but not more than 10 kHz: at least 83 log(fd/5) dB;
- On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in kHz) of more than 10 kHz, but not more than 250 percent of the authorized bandwidth: at least 29 log (fd^2/11) dB or 50 dB, whichever is the lesser attenuation;
- On any frequency removed from the center of the authorized bandwidth by more than 250 percent of the authorized bandwidth: at least 43 + 10log(P) dB.

Measurement (conducted)

The single values are:

CHANNELS	Bandwidth (MHz)	
	Low Antenna Gain (13.3 dBi)	High Antenna Gain (22 dBi)
Output A	*Pass*	*Pass*
Output B	*Pass*	*Pass*

Result

Pass

Notes:

The following figures show the acquired graphics.

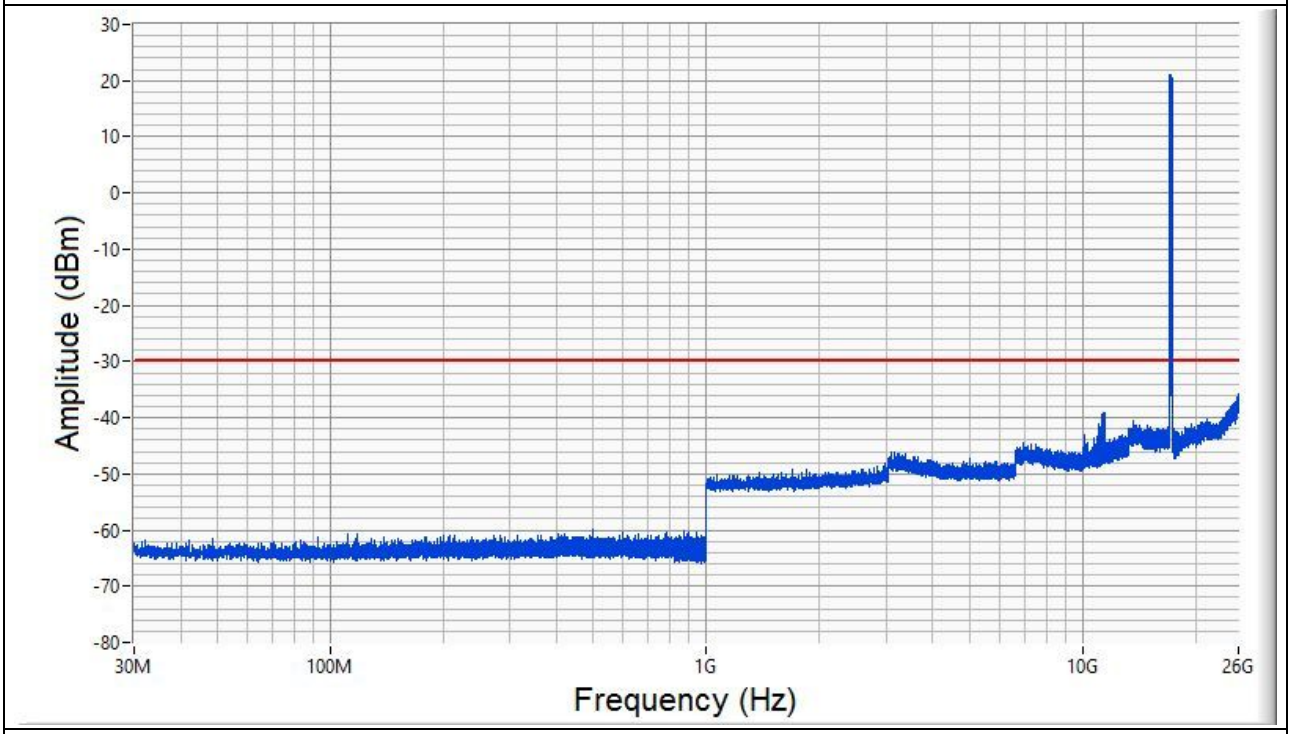


Fig. 6.29
Channel Output A; Chirp mode; Low Antenna Gain
Frequency range: 30 MHz – 26.5 GHz

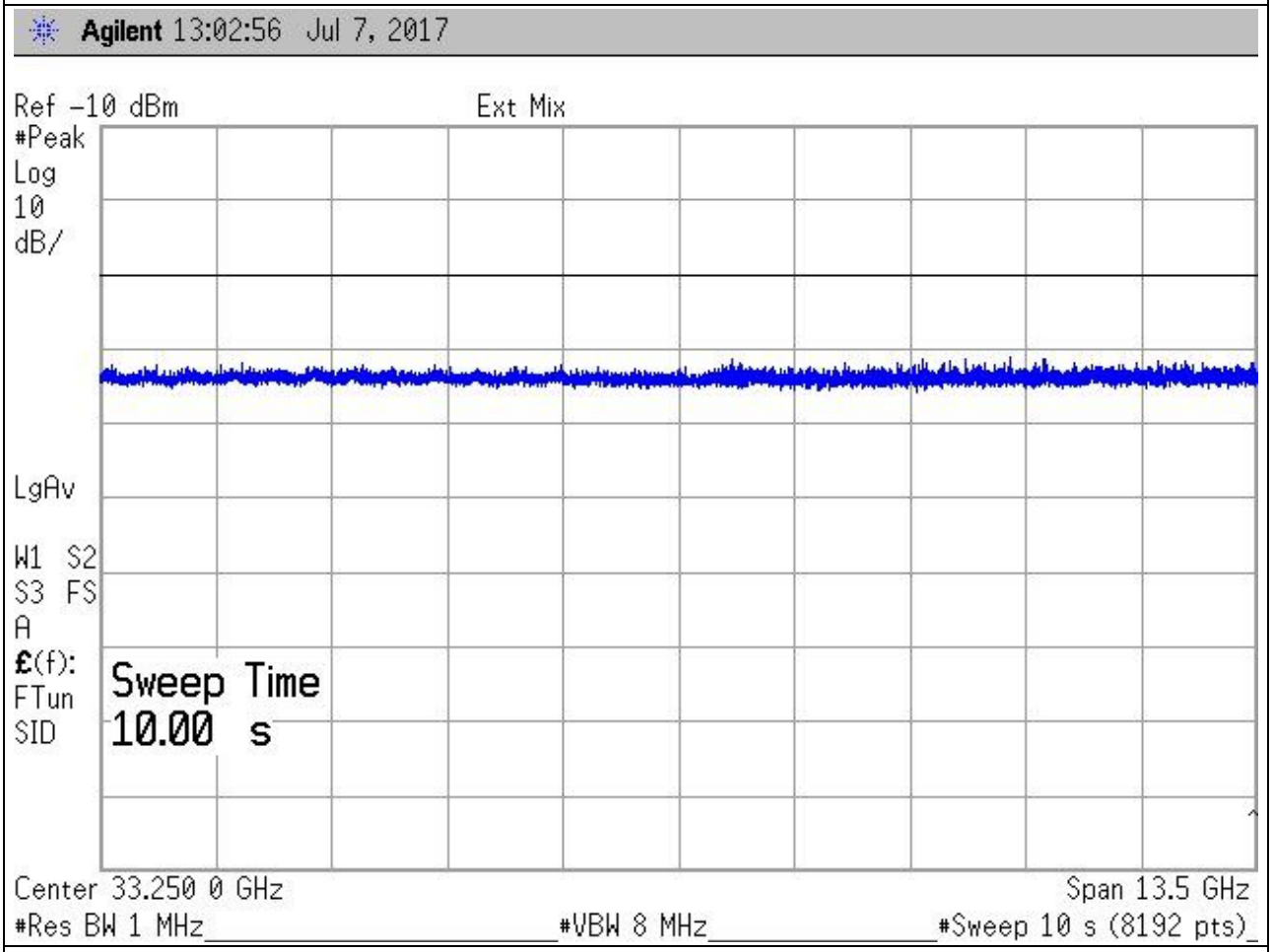


Fig. 6.30
Channel Output A; Chirp mode; Low Antenna Gain
Frequency range: 26.5 MHz – 40 GHz

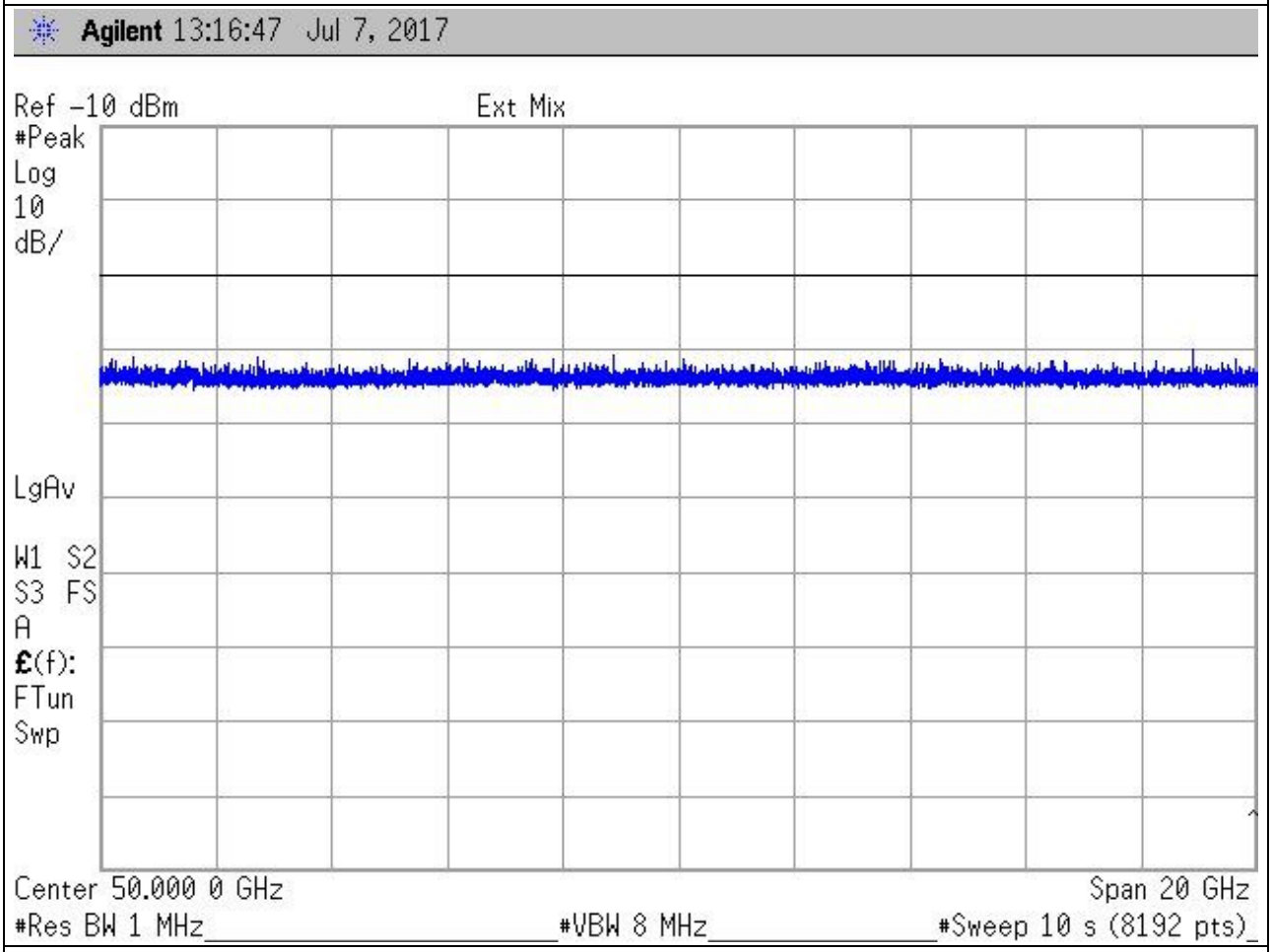


Fig. 6.31
Channel Output A; Chirp mode; Low Antenna Gain
Frequency range: 40 MHz – 60 GHz

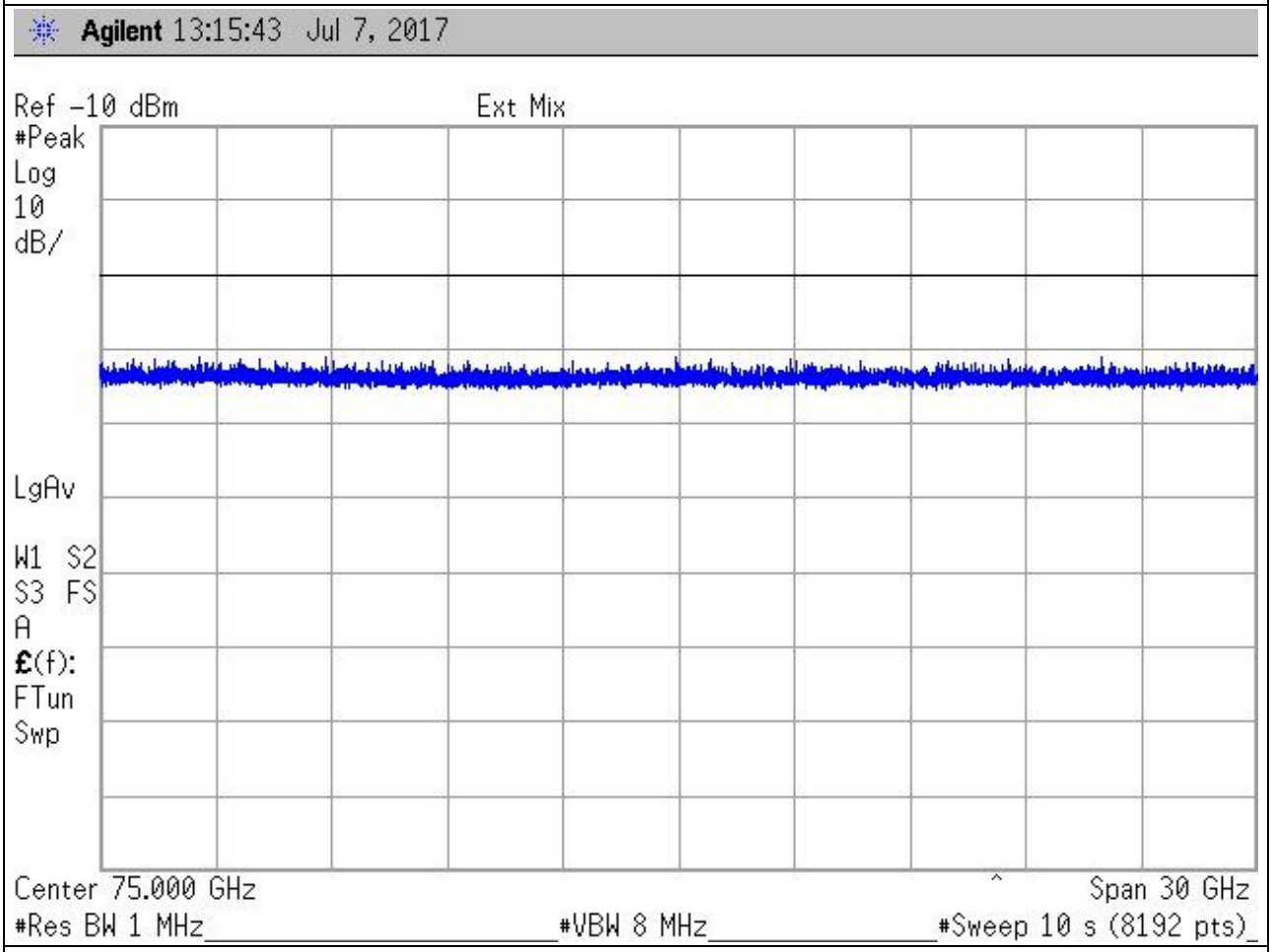


Fig. 6.32
Channel Output A; Chirp mode; Low Antenna Gain
Frequency range: 60 MHz – 90 GHz

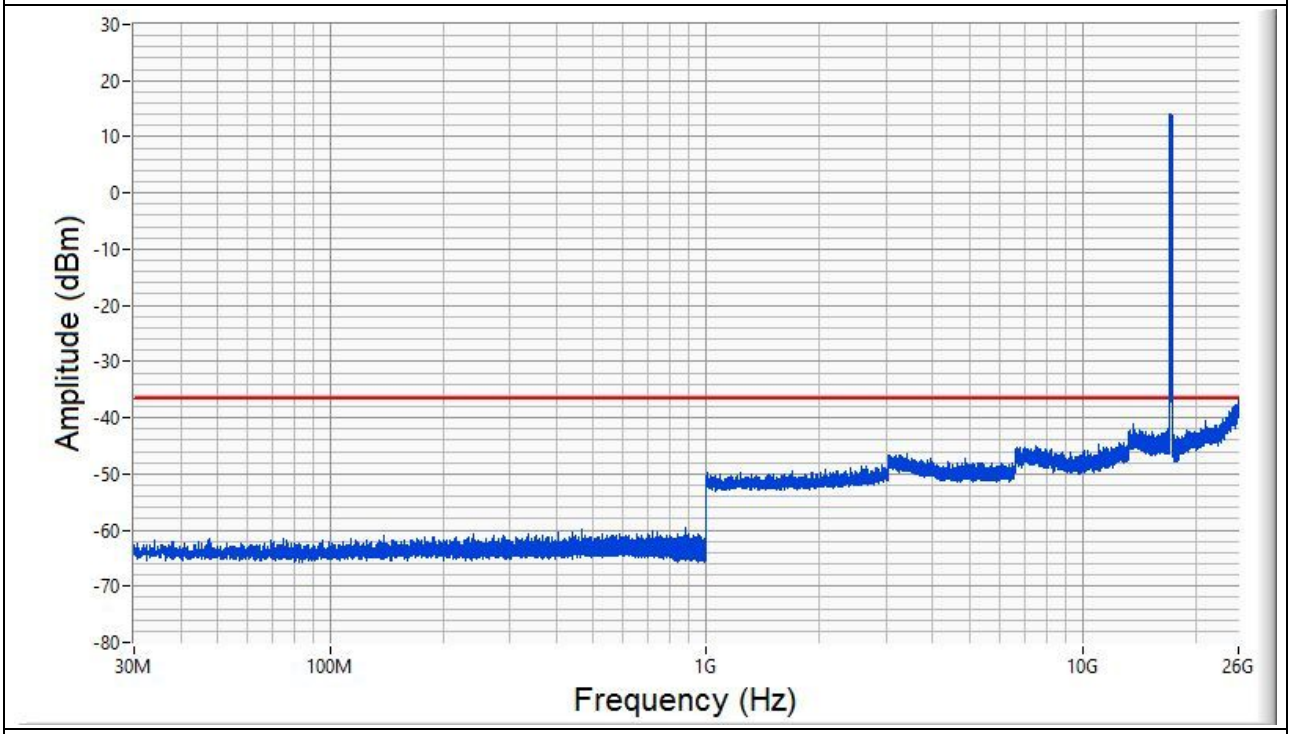


Fig. 6.33
Channel Output A; Chirp mode; High Antenna Gain
Frequency range: 30 MHz – 26.5 GHz

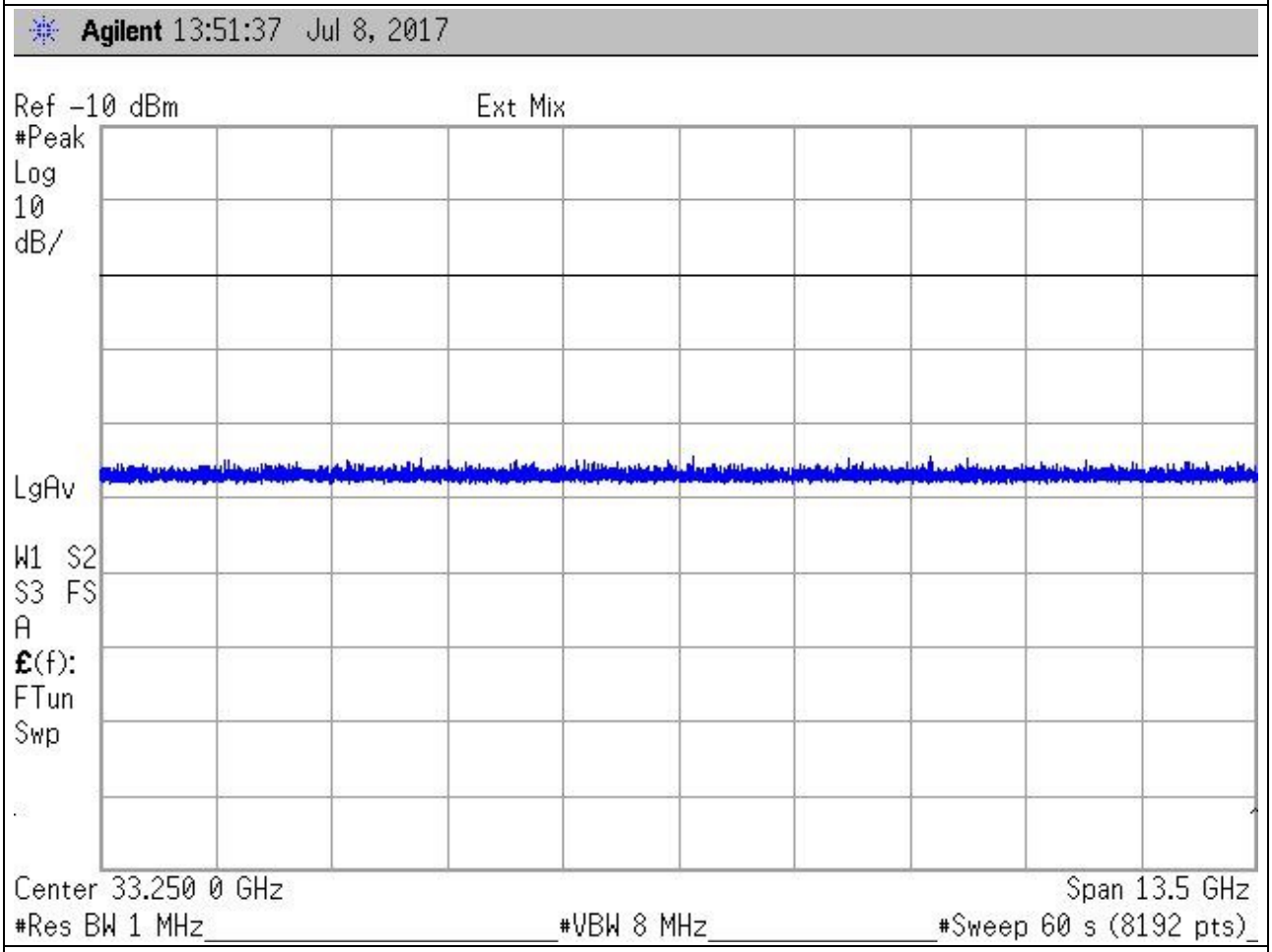


Fig. 6.34
Channel Output A; Chirp mode; High Antenna Gain
Frequency range: 26.5 MHz – 40 GHz

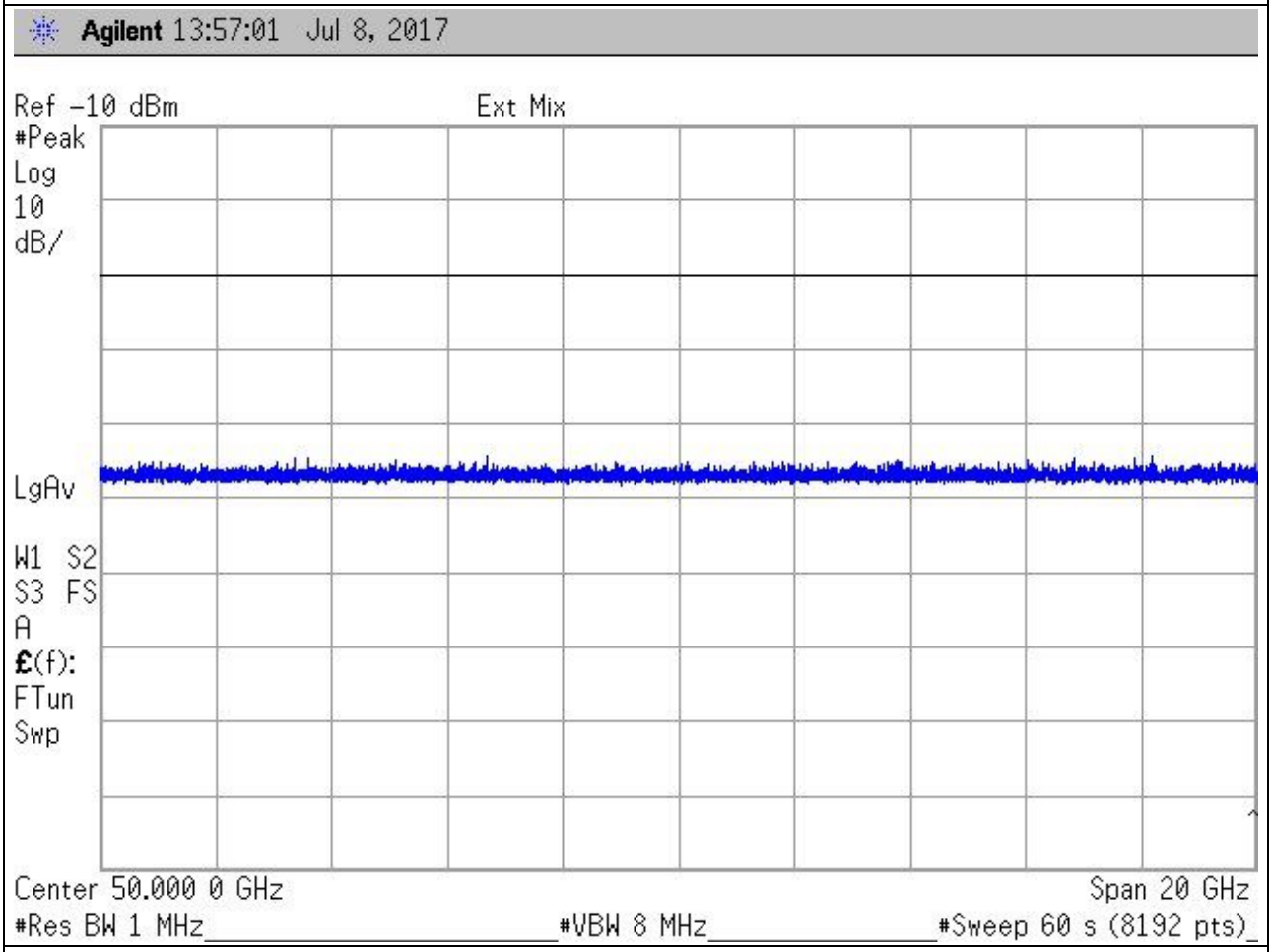


Fig. 6.35
Channel Output A; Chirp mode; High Antenna Gain
Frequency range: 40 MHz – 60 GHz

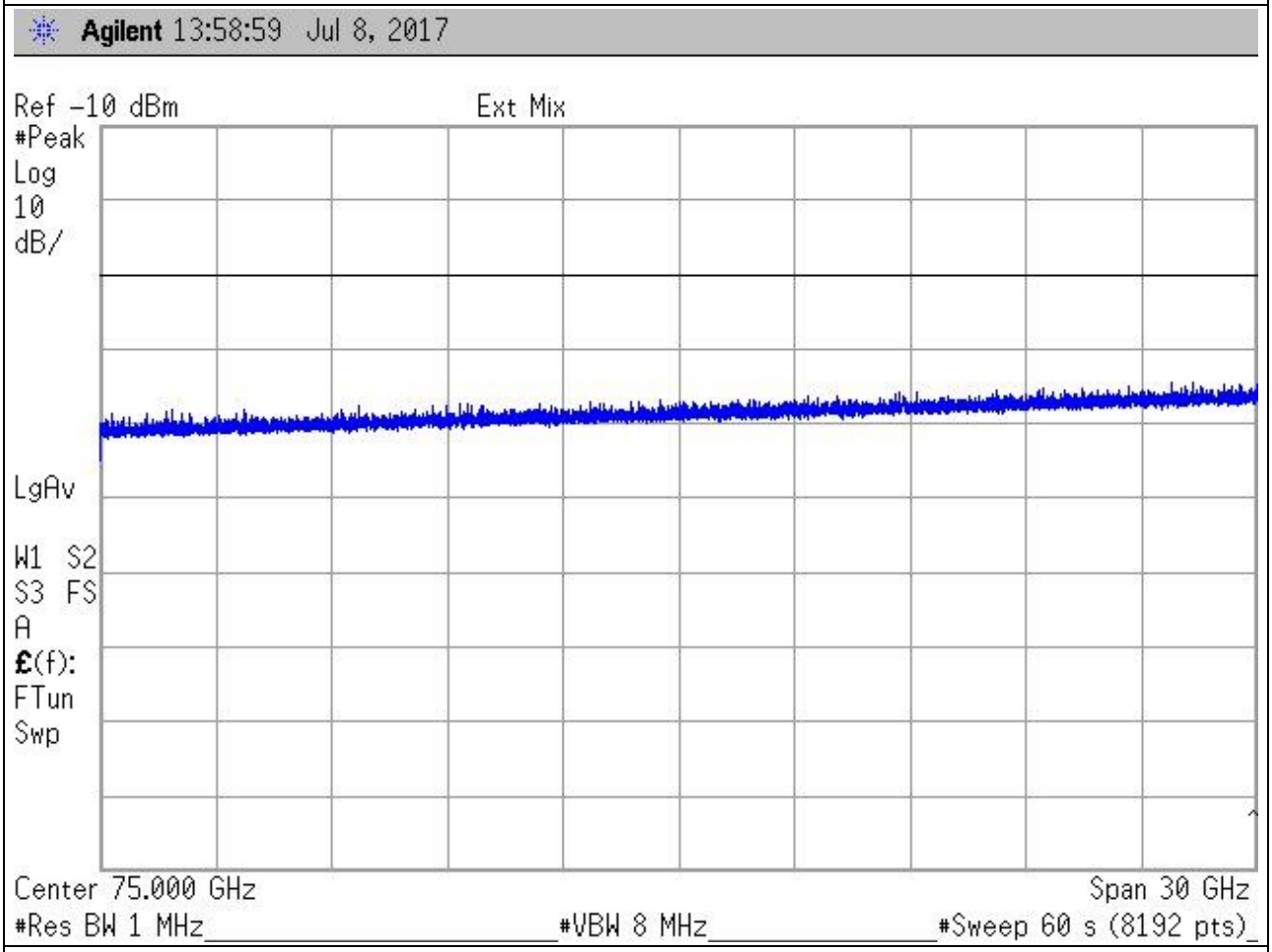


Fig. 6.36
Channel Output A; Chirp mode; High Antenna Gain
Frequency range: 60 MHz – 90 GHz

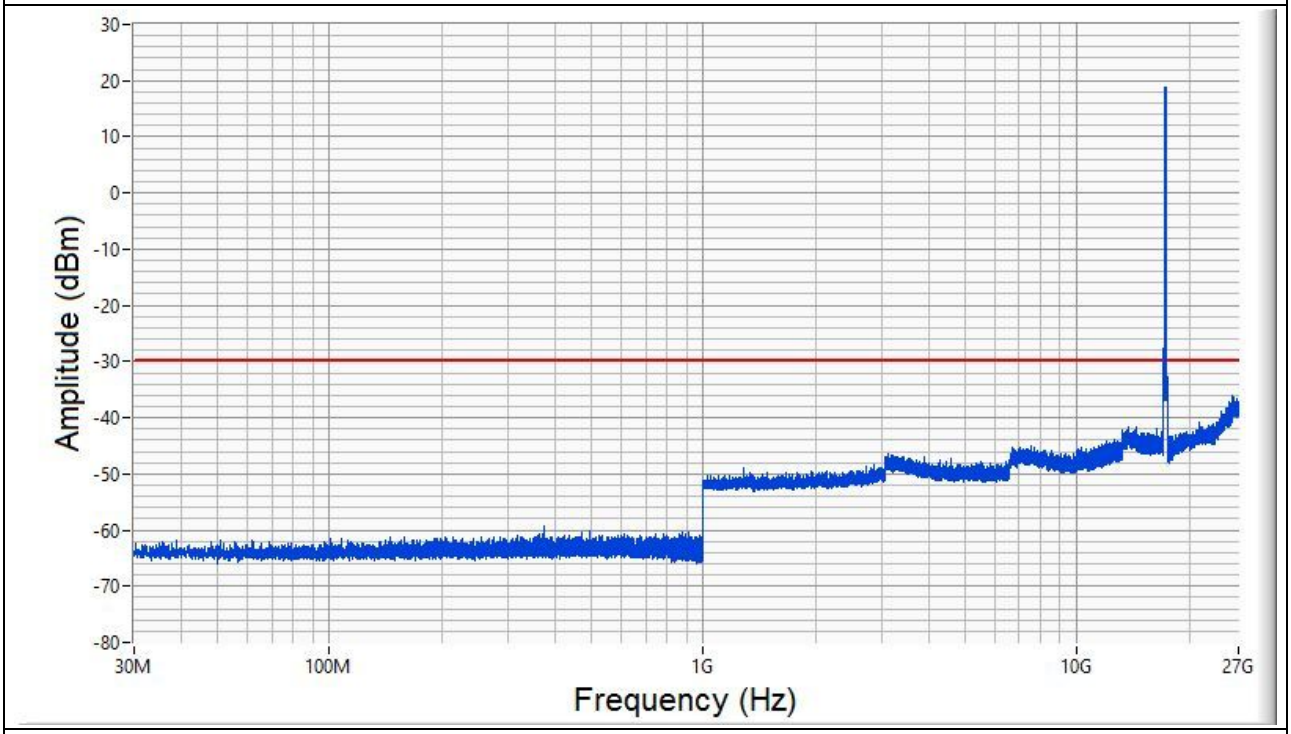


Fig. 6.37
Channel Output B; Chirp mode; Low Antenna Gain
Frequency range: 30 MHz – 26.5 GHz

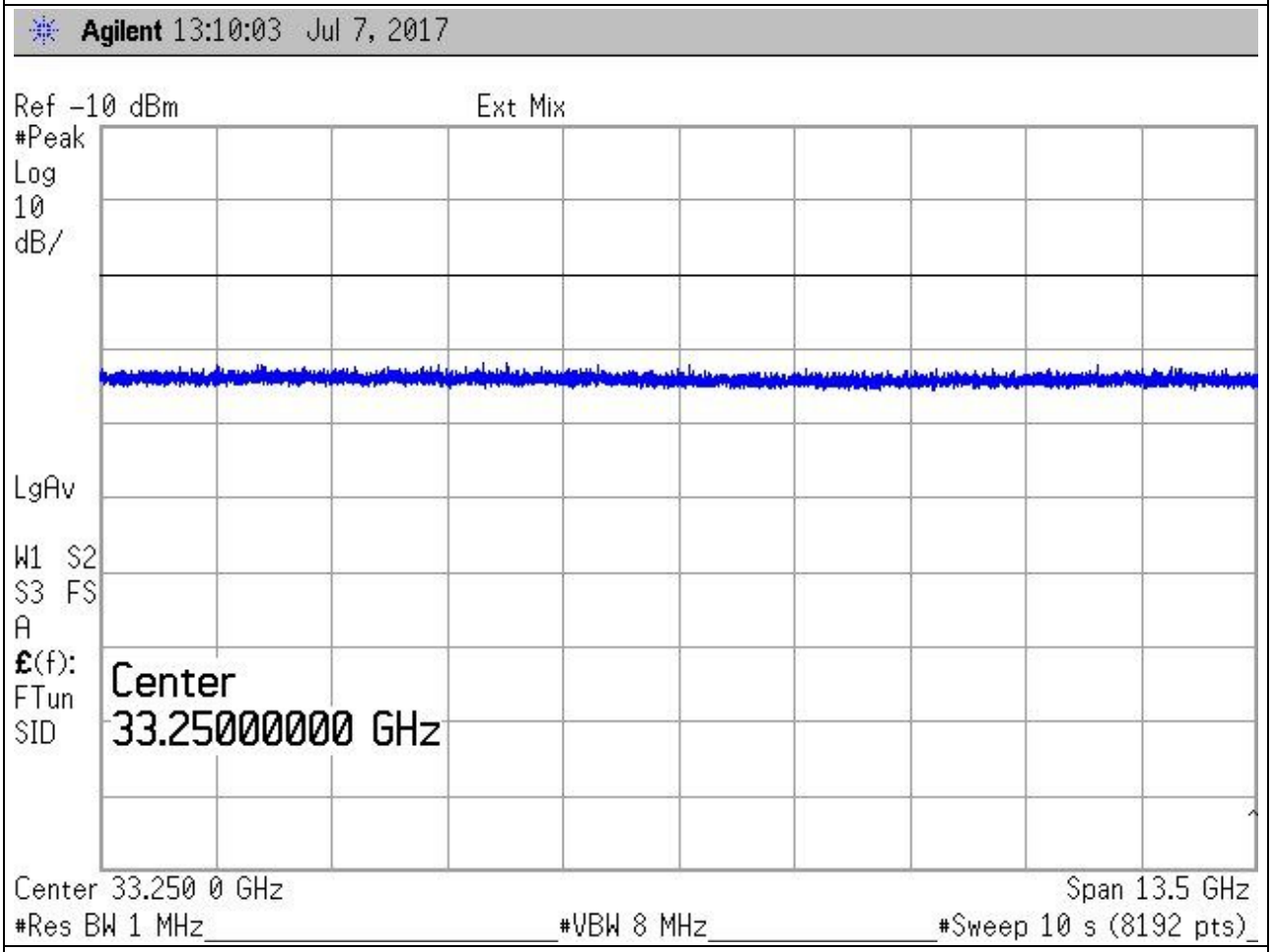


Fig. 6.38
Channel Output B; Chirp mode; Low Antenna Gain
Frequency range: 26.5 MHz – 40 GHz

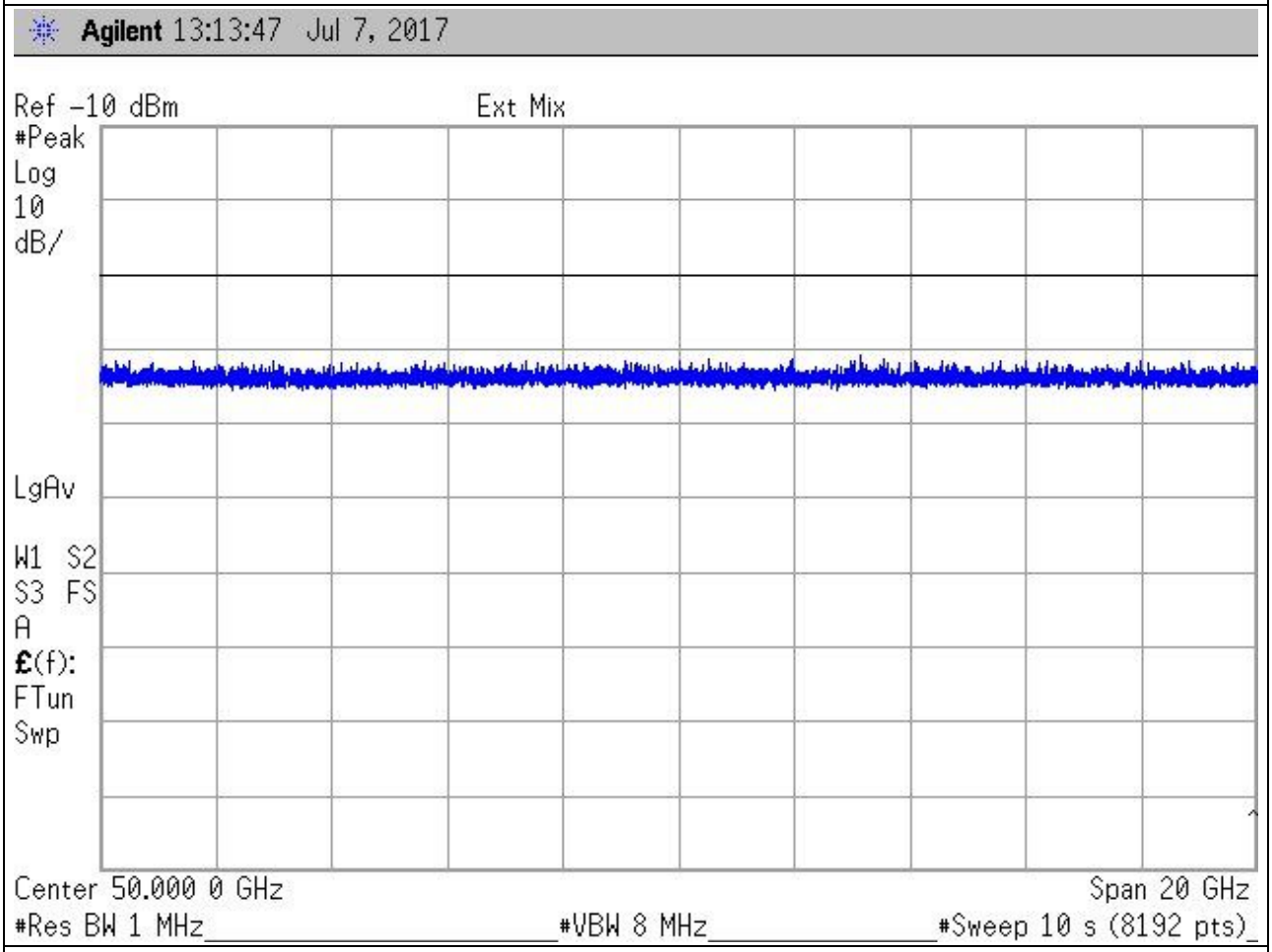


Fig. 6.39
Channel Output B; Chirp mode; Low Antenna Gain
Frequency range: 40 MHz – 60 GHz

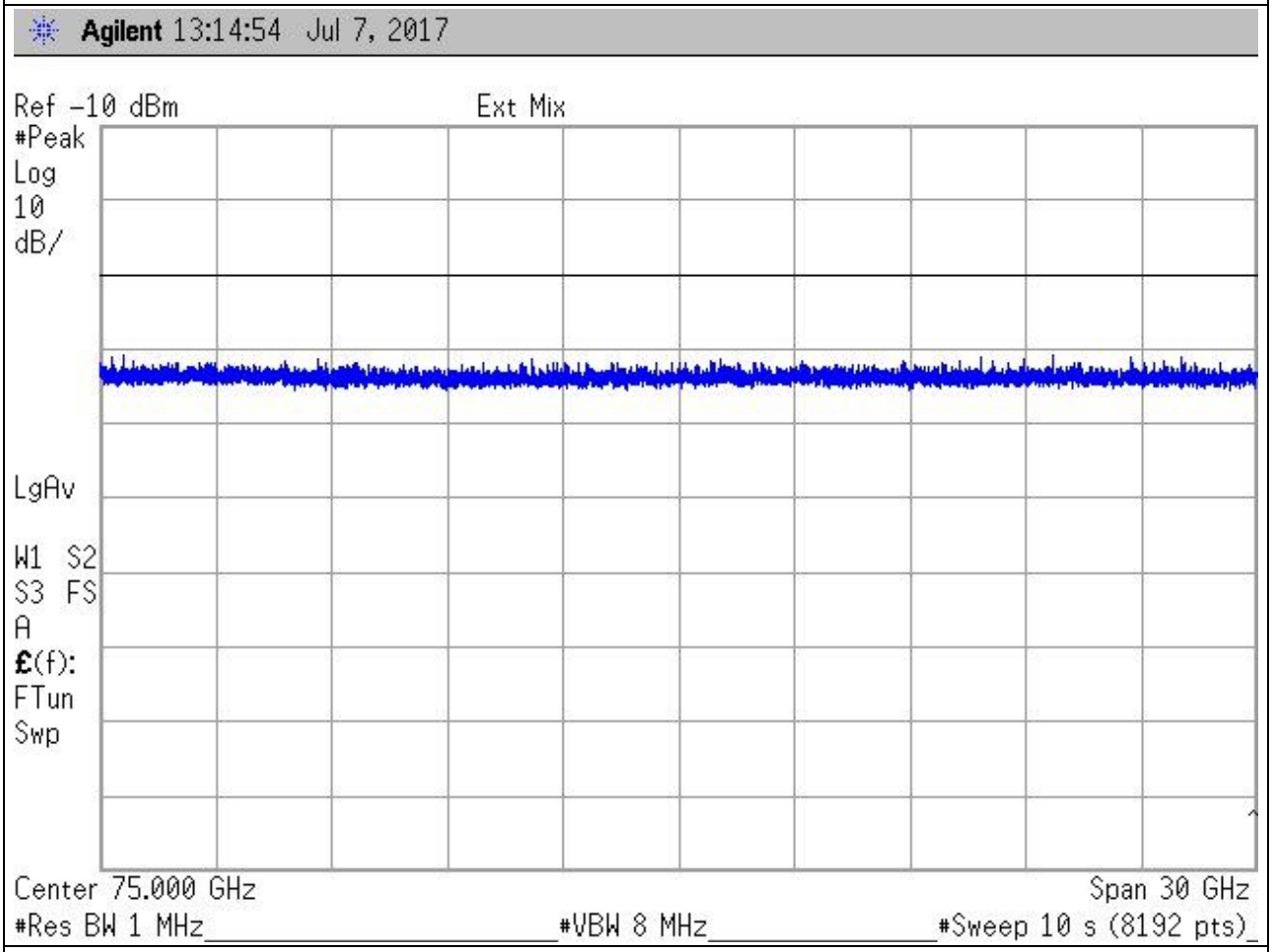


Fig. 6.40
Channel Output B; Chirp mode; Low Antenna Gain
Frequency range: 60 MHz – 90 GHz

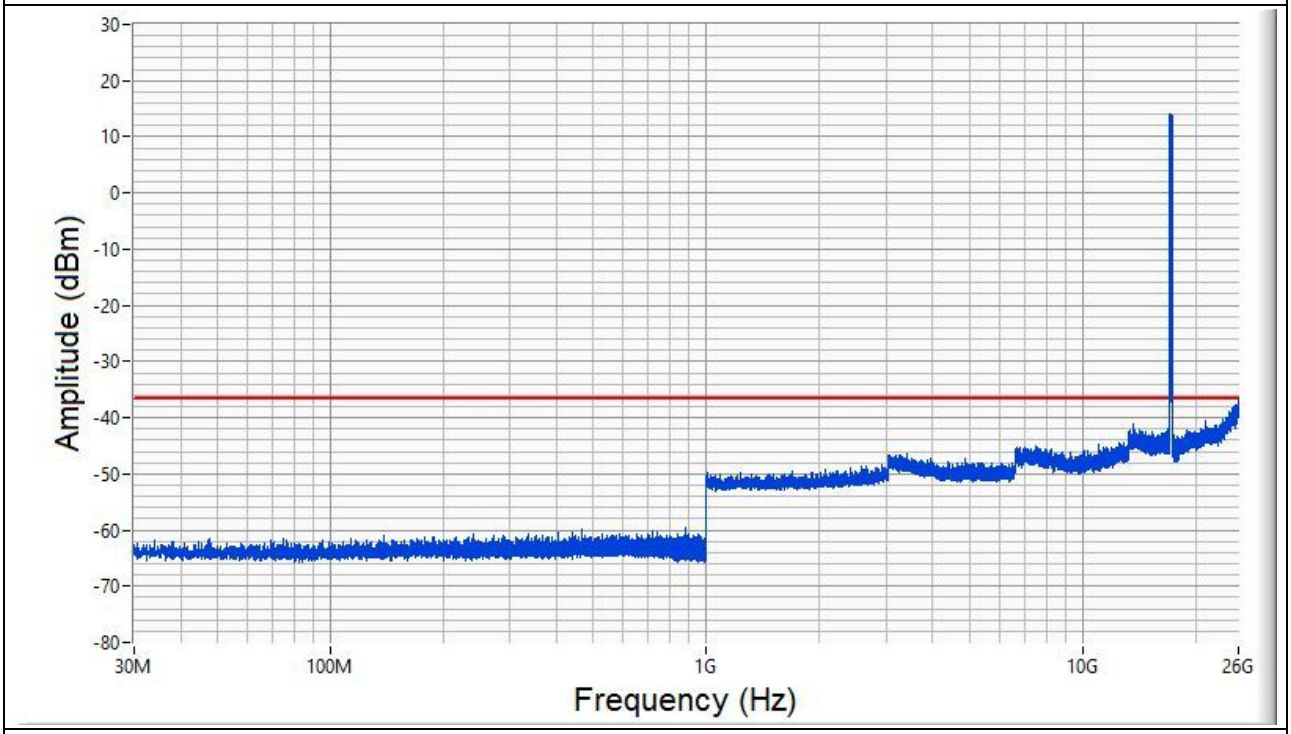


Fig. 6.41
Channel Output B; Chirp mode; High Antenna Gain
Frequency range: 30 MHz – 26.5 GHz

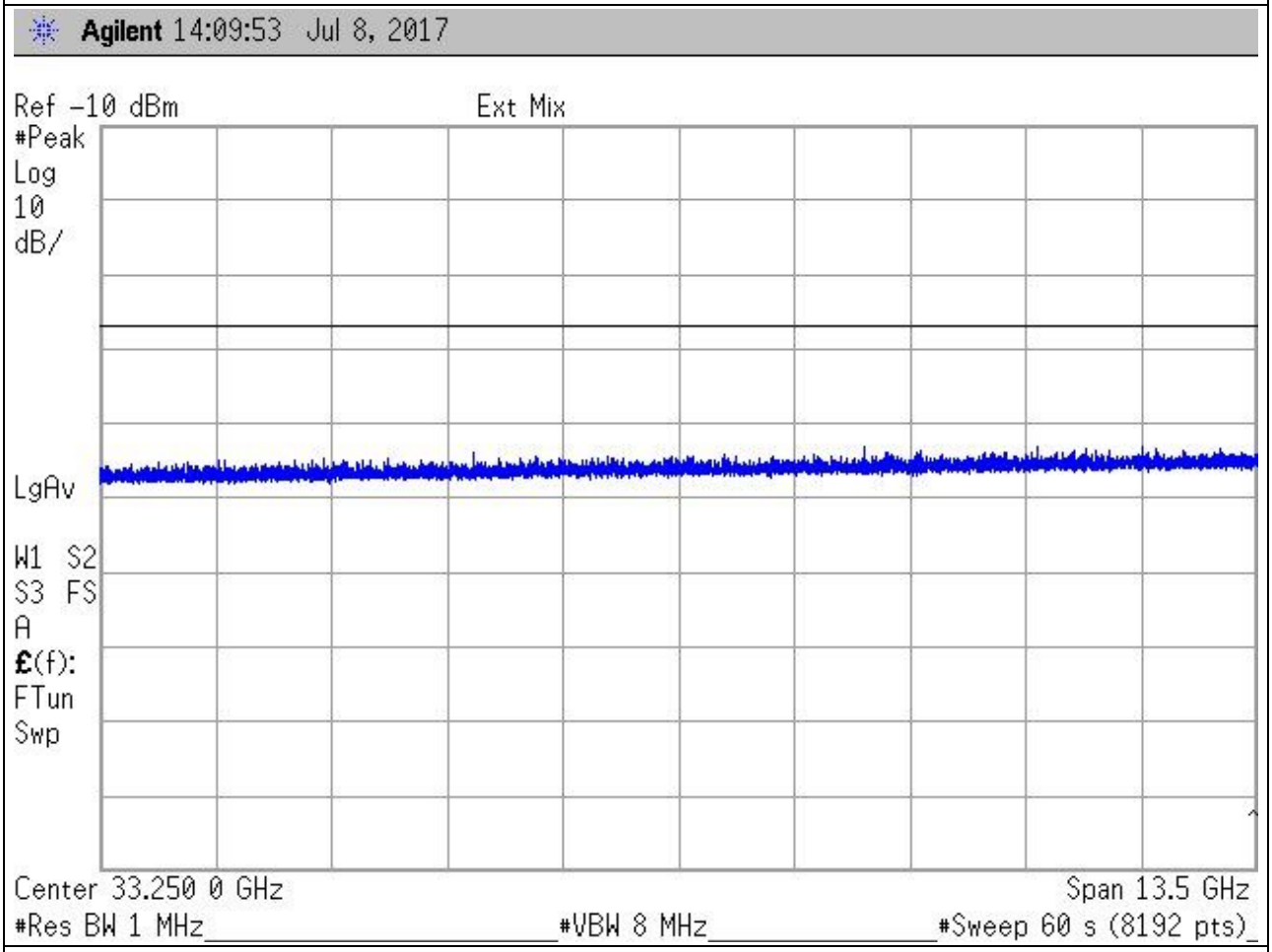


Fig. 6.42
Channel Output B; Chirp mode; High Antenna Gain
Frequency range: 26.5 MHz – 40 GHz

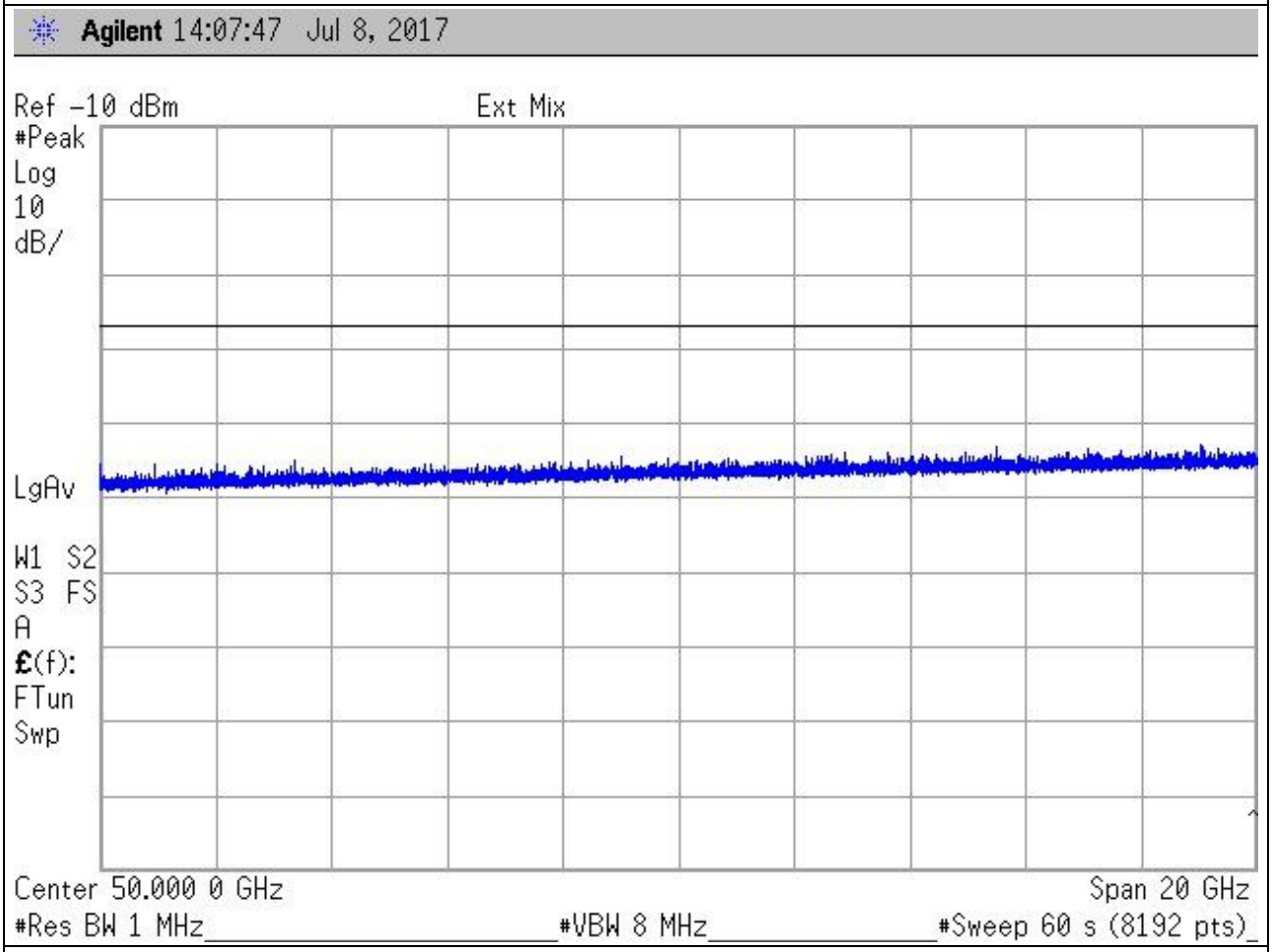


Fig. 6.43
Channel Output B; Chirp mode; High Antenna Gain
Frequency range: 40 MHz – 60 GHz

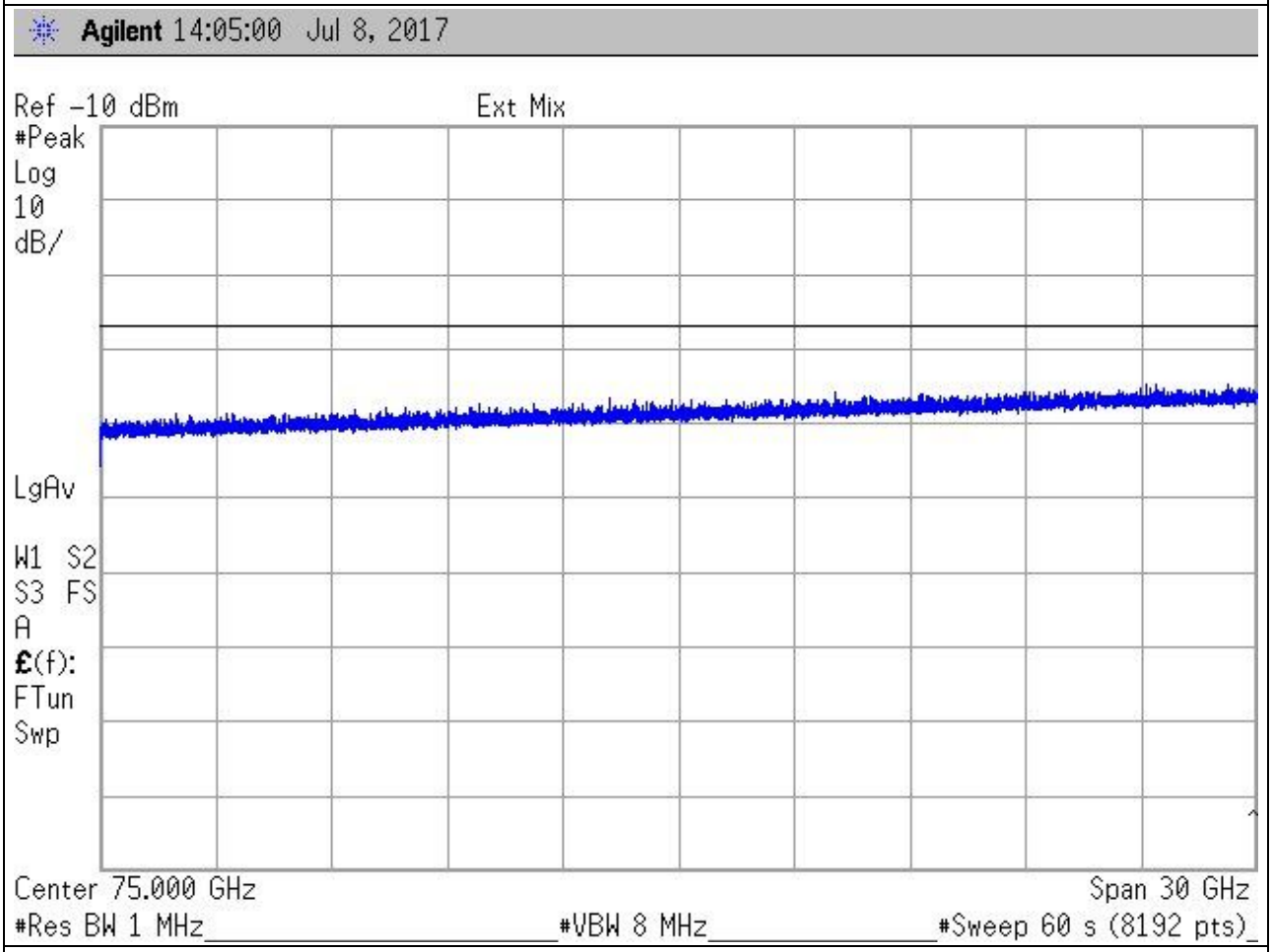


Fig. 6.44
Channel Output B; Chirp mode; High Antenna Gain
Frequency range: 60 MHz – 90 GHz

Test Equipment

EQUIPMENT	MANUFACTURER	MODEL	CAL. DUE
MXE EMI Receiver	Agilent/Keysight	N9038A	01/2018
EMI Receiver	Agilent	E4440	01/2018
Attenuator	Narda	768-10	01/2018

Test procedure: CT15C01

6.7. SPURIOUS RADIATED EMISSIONS

Nr Harmonics	AV Level (dBµV/m)						AV Limits (dBµV/m)	Remark
	Ch Low		Ch Mid		Ch High			
	F (GHz)	(dBµV/m)	F (GHz)	(dBµV/m)	F (GHz)	(dBµV/m)		
2	34.2	--	34.4	--	34.6	--	54.0	
3	51.3	--	51.6	--	51.9	--	54.0	
4	68.4	--	68.8	--	69.2	--	54.0	
5	85.5	--	86.0	--	86.5	--	54.0	
6		--		--		--	54.0	
7		--		--		--	54.0	
8		--		--		--	54.0	
9		--		--		--	54.0	
10		--		--		--	54.0	

Note: Levels below 20 dB of limits are indicated with (--).

Nr Harmonics	Peak Level (dBµV/m)						AV Limits (dBµV/m)	Remark
	Ch 0		Ch 24		Ch 49			
	F (MHz)	(dBµV/m)	F (MHz)	(dBµV/m)	F (MHz)	(dBµV/m)		
2	34.2	--	34.4	--	34.6	--	74.0	
3	51.3	--	51.6	--	51.9	--	74.0	
4	68.4	--	68.8	--	69.2	--	74.0	
5	85.5	--	86.0	--	86.5	--	74.0	
6		--		--		--	74.0	
7		--		--		--	74.0	
8		--		--		--	74.0	
9		--		--		--	74.0	
10		--		--		--	74.0	

Note: *Levels below 20 dB of limits are indicated with (--)*.

Test Equipment

EQUIPMENT	MANUFACTURER	MODEL	CAL. DUE
MXE EMI Receiver	Agilent/Keysight	N9038A	01/2018
EMI Receiver	Agilent	E4440	01/2018
Harmonic mixer	HP	11971A	01/2018
Harmonic mixer	Keysight	11970U	07/2020
EXA Signal Analyzer	Keysight	N9010B	01/2018
Waveguide Harmonic Mixer	Keysight	M1970E	11/2017
Anechoic Chamber	Comtest	CSA01	01/2018
Bilog Antenna	Schaffner	CBL6112B	01/2018
Horn Antenna	EMCO	3115	01/2018
Horn Antenna	Alpha Industries	61932500	01/2018
Standard Gain Horn Antenna	A-INFOMW	LB-19-20-A	01/2018
Standard Gain Horn Antenna	A-INFOMW	LB-12-20-A	01/2018
Controller	Deisel	HD100	01/2018
Turn Table	Deisel	MA240	01/2018

Test procedure: CT15R01