

Annex 1: Measurement diagrams to
TEST REPORT
No.: 19-1-0139002T05a

According to:
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RSS-Gen Issue 5
RSS-251 Issue 2

for

Hella GmbH & Co. KGaA

RS5.4
Advanced Driver Assistance System

FCC ID: NBG01RS54
ISED ID: 2694A-RS54



Laboratory Accreditation
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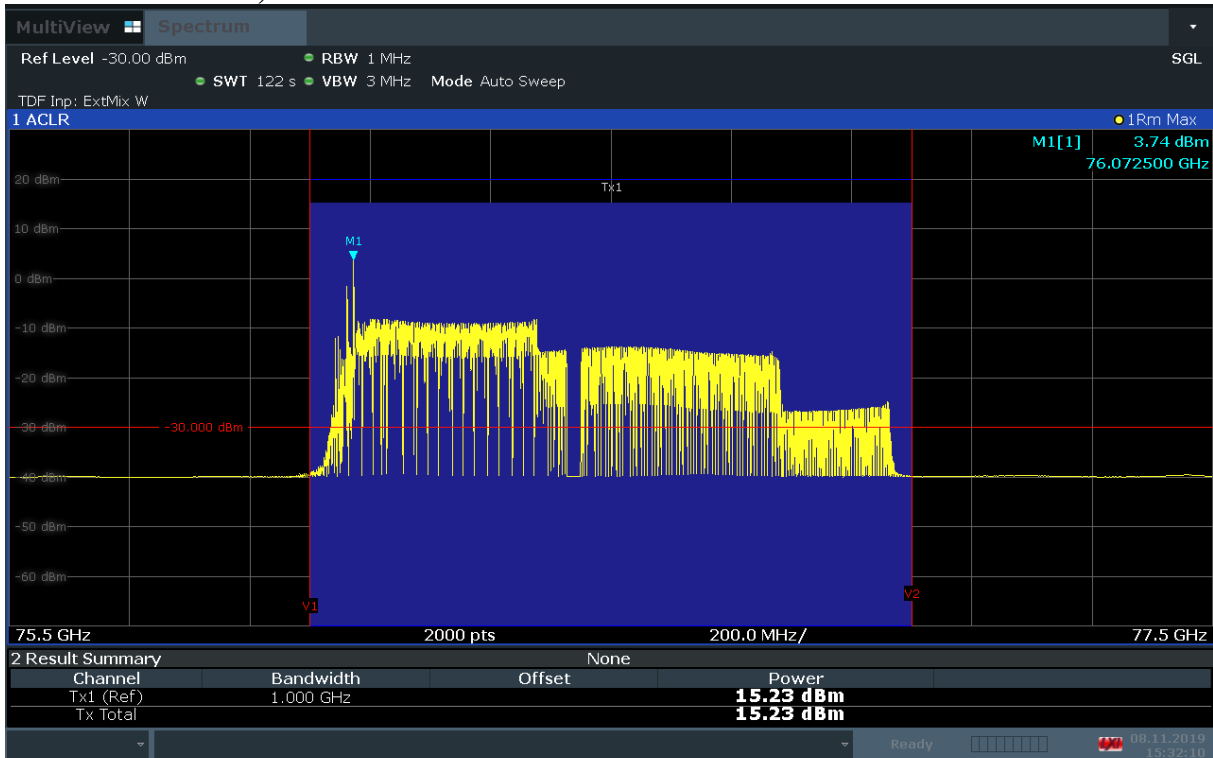
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1. The maximum peak power EIRP / peak EIRP spectral density. The maximum power EIRP/ average EIRP.

1.1. RMS Detector, T_{nom}/V_{nom}



15:32:11 08.11.2019

* -4 dBm is a ref line, not a limit line. Limit: 50 dBm (Average), 55 dBm (Peak).

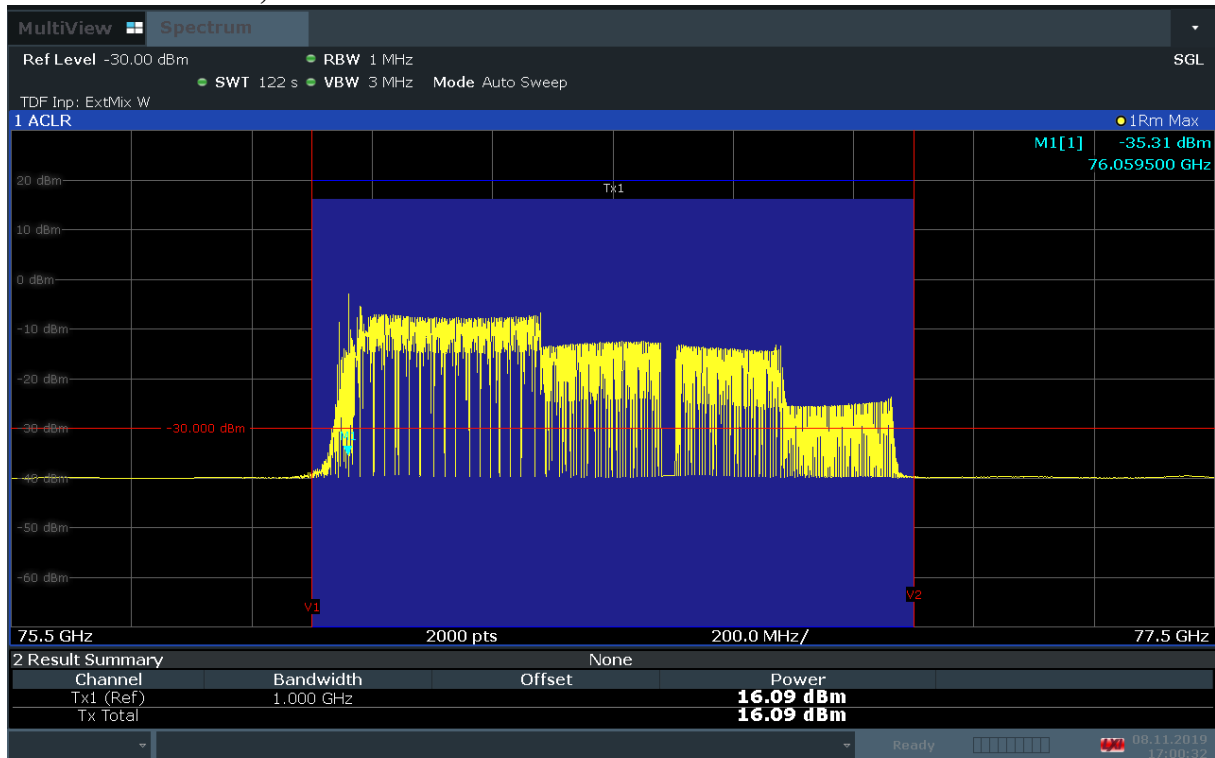
1.2. Peak Detector, T_{nom}/V_{nom}



16:02:39 08.11.2019

* -4 dBm is a ref line, not a limit line. Limit: 50 dBm (Average), 55 dBm (Peak).

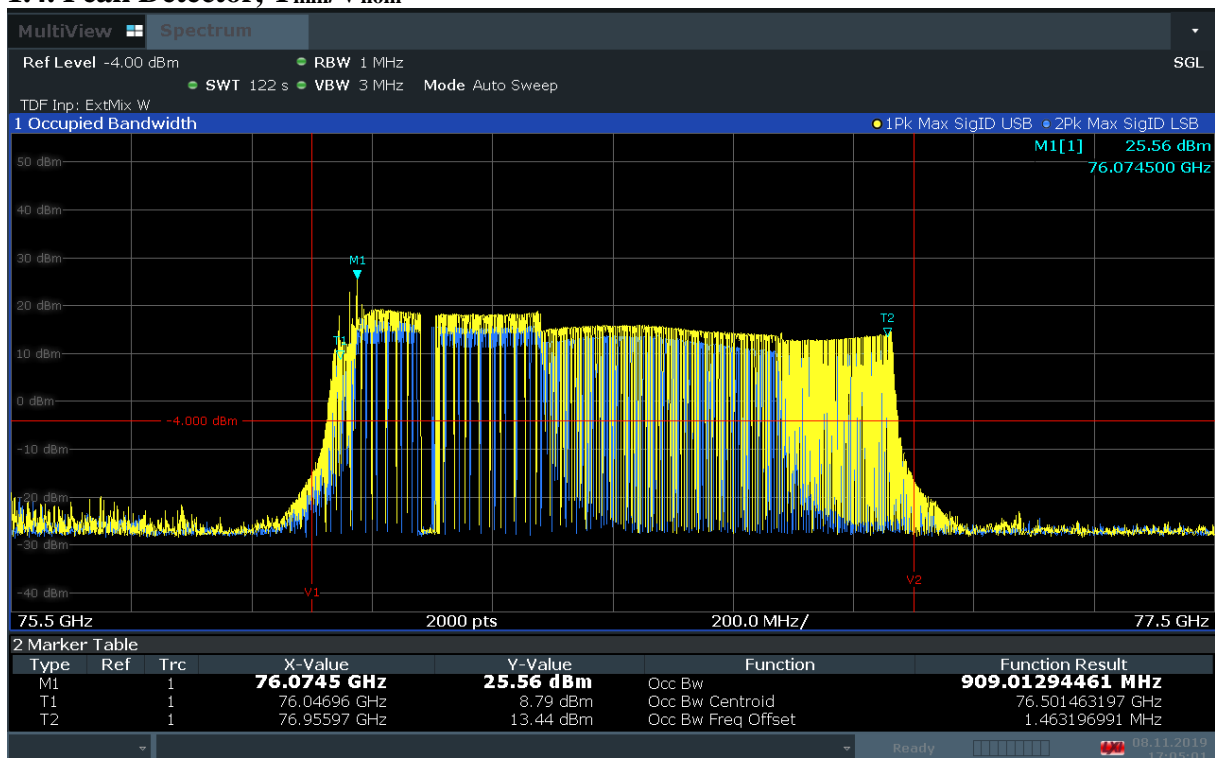
1.3. RMS Detector, T_{min}/V_{nom}



17:00:32 08.11.2019

* -4 dBm is a ref line, not a limit line. Limit: 50 dBm (Average), 55 dBm (Peak).

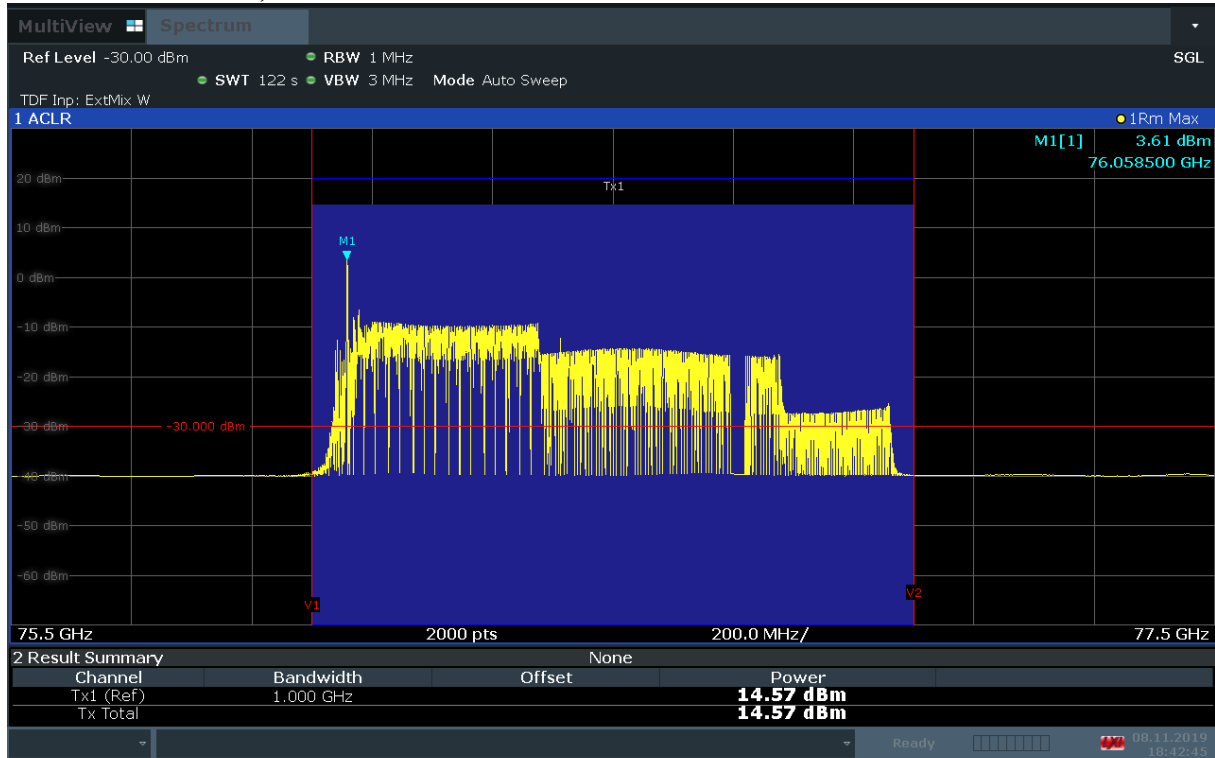
1.4. Peak Detector, T_{min}/V_{nom}



17:05:02 08.11.2019

* -4 dBm is a ref line, not a limit line. Limit: 50 dBm (Average), 55 dBm (Peak).

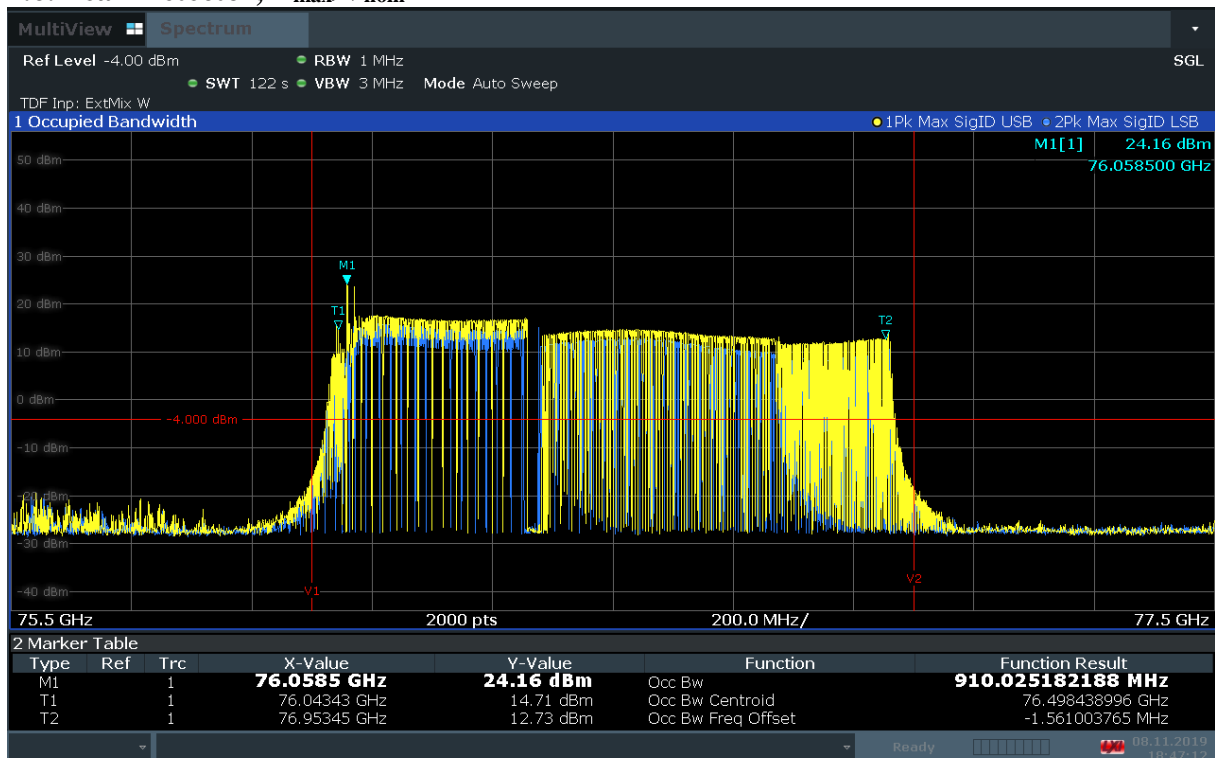
1.5. RMS Detector, T_{max}/V_{nom}



18:42:46 08.11.2019

* -4 dBm is a ref line, not a limit line. Limit: 50 dBm (Average), 55 dBm (Peak).

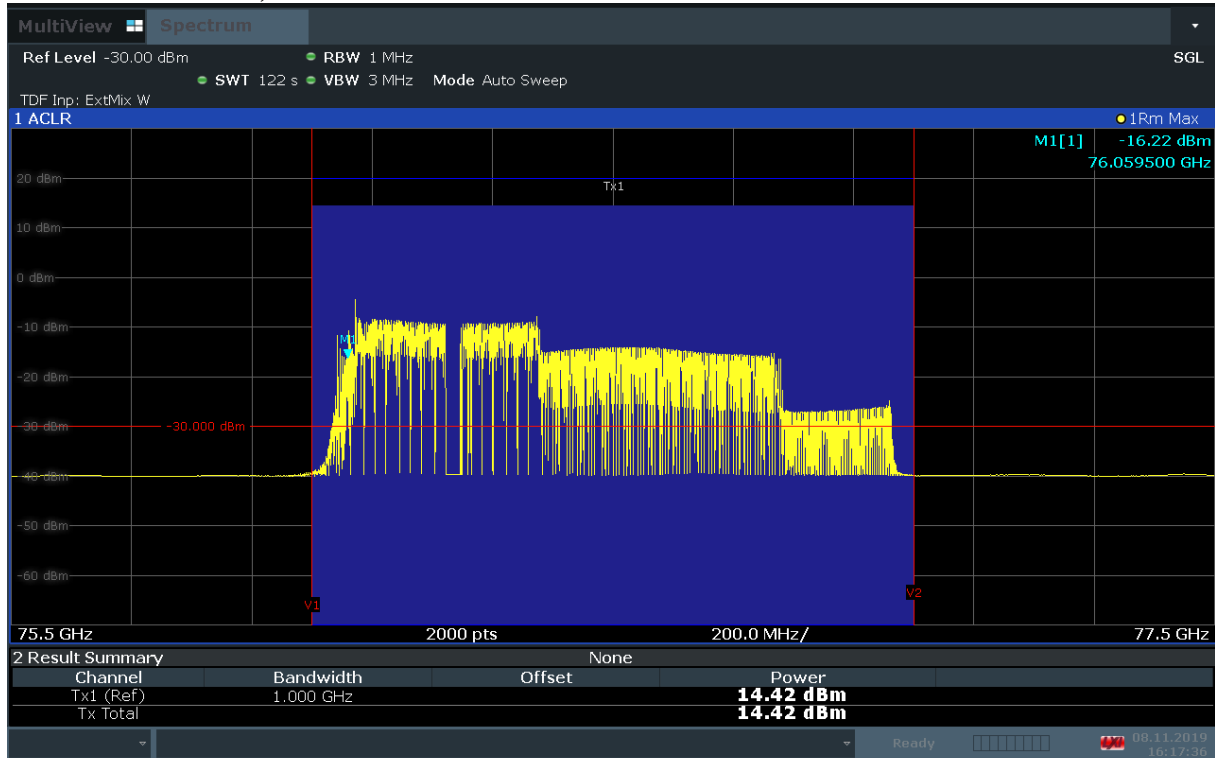
1.6. Peak Detector, T_{max}/V_{nom}



18:47:13 08.11.2019

* -4 dBm is a ref line, not a limit line. Limit: 50 dBm (Average), 55 dBm (Peak).

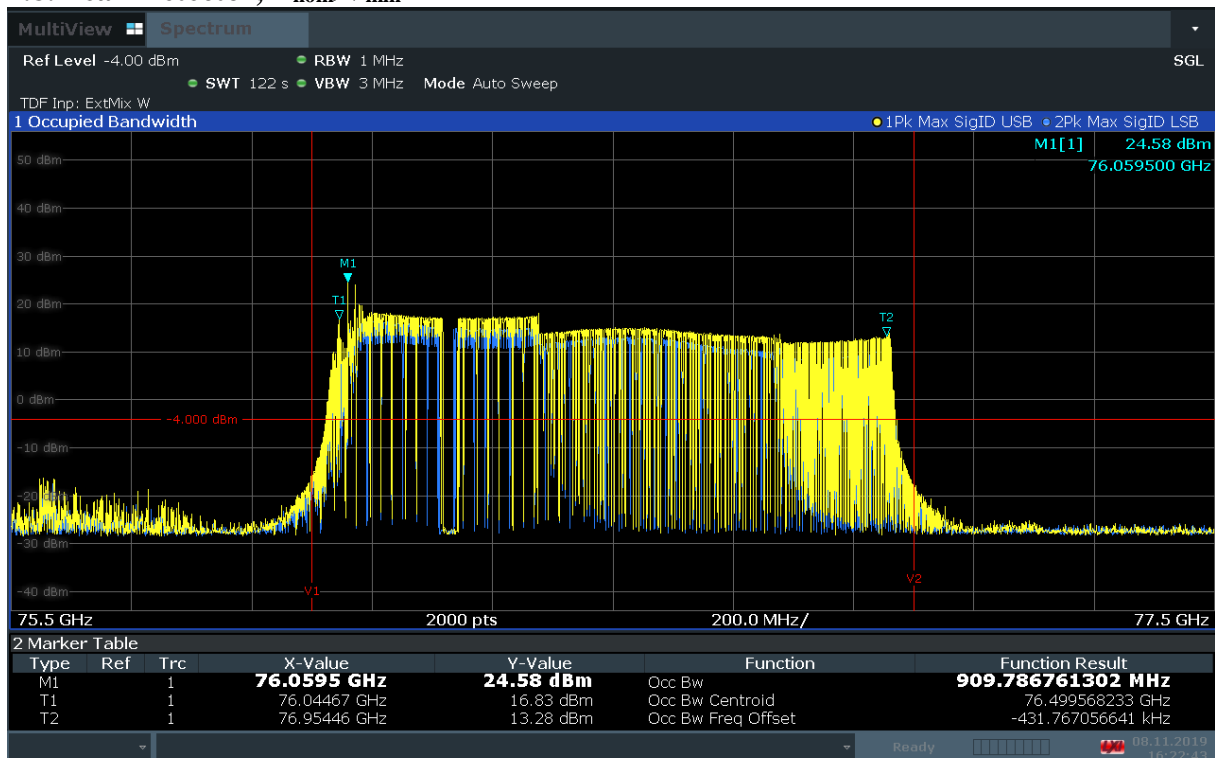
1.7. RMS Detector, T_{nom}/V_{min}



16:17:37 08.11.2019

* -4 dBm is a ref line, not a limit line. Limit: 50 dBm (Average), 55 dBm (Peak).

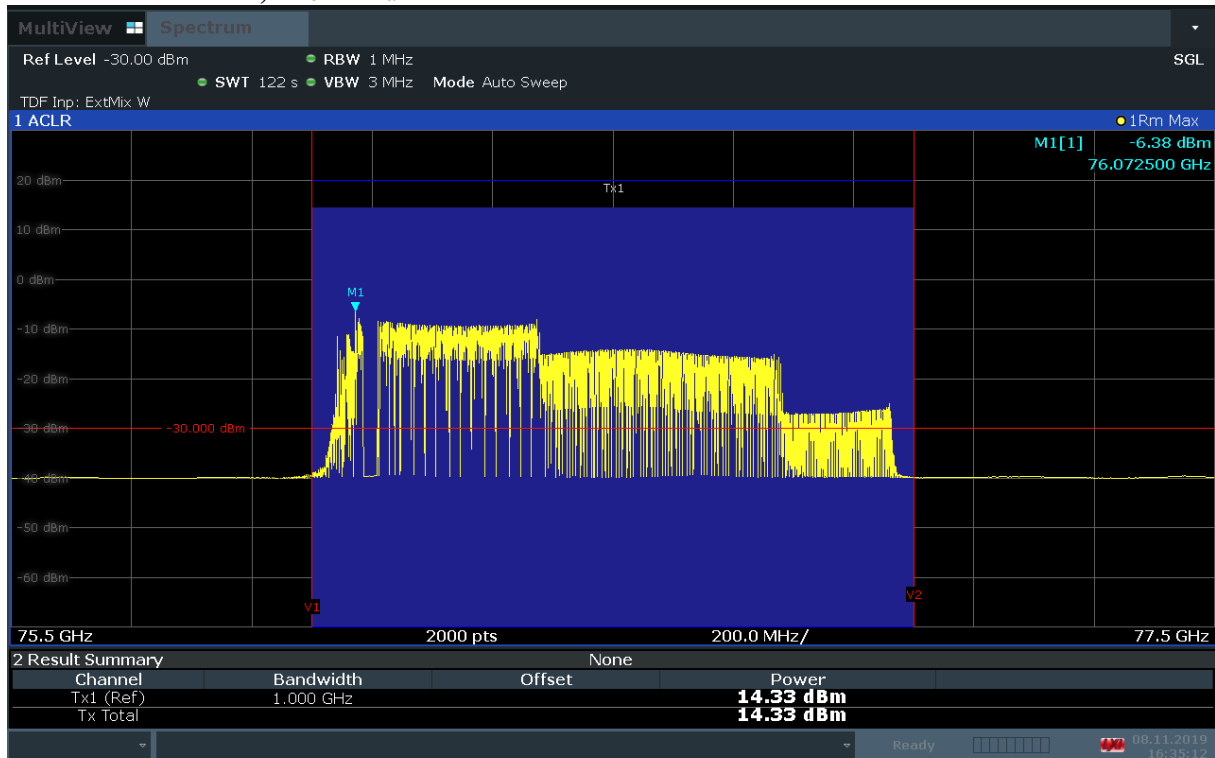
1.8. Peak Detector, T_{nom}/V_{min}



16:22:44 08.11.2019

* -4 dBm is a ref line, not a limit line. Limit: 50 dBm (Average), 55 dBm (Peak).

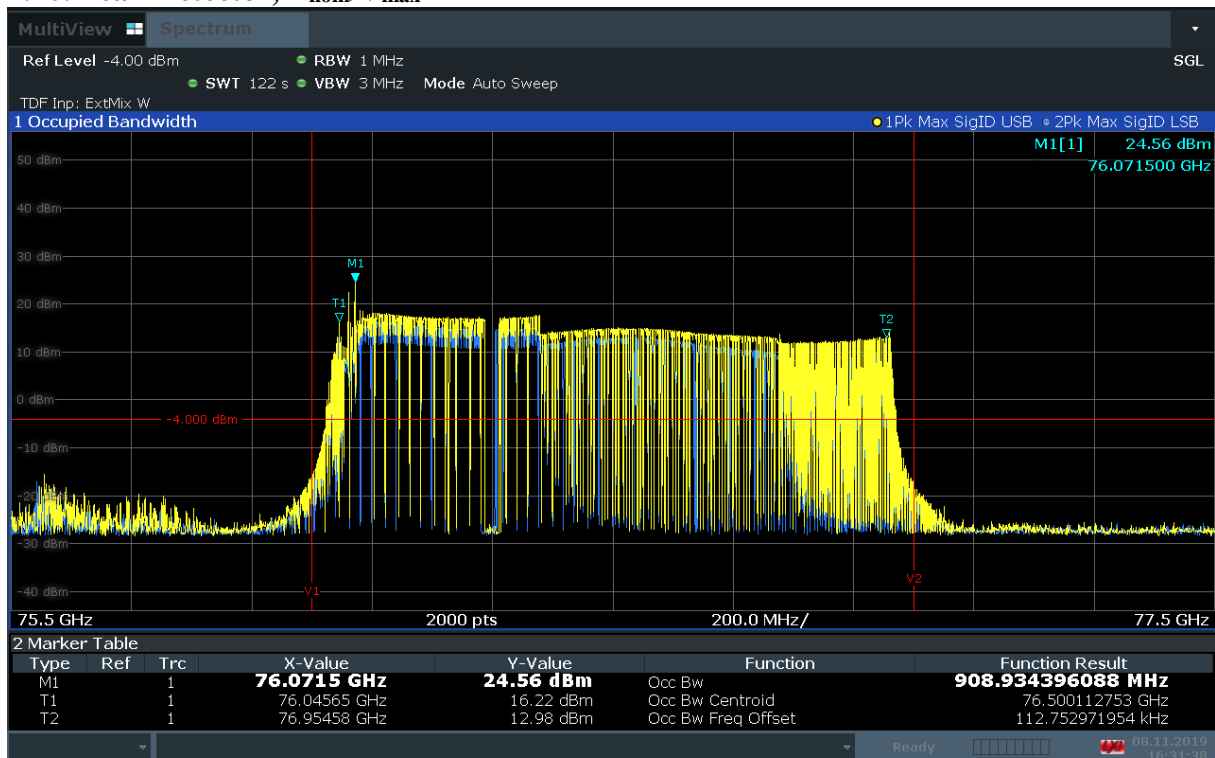
1.9. RMS Detector, T_{nom}/V_{max}



16:35:12 08.11.2019

* -4 dBm is a ref line, not a limit line. Limit: 50 dBm (Average), 55 dBm (Peak).

1.10. Peak Detector, T_{nom}/V_{max}



16:31:39 08.11.2019

* -4 dBm is a ref line, not a limit line. Limit: 50 dBm (Average), 55 dBm (Peak).

2. Modulation characteristics

2.1. Peak Detector, $T_{\text{nom}}/V_{\text{nom}}$

See diagram 1.3

2.2. Peak Detector, $T_{\text{min}}/V_{\text{nom}}$

See diagram 1.6

2.3. Peak Detector, $T_{\text{max}}/V_{\text{nom}}$

See diagram 1.9

2.4. Peak Detector, $T_{\text{nom}}/V_{\text{min}}$

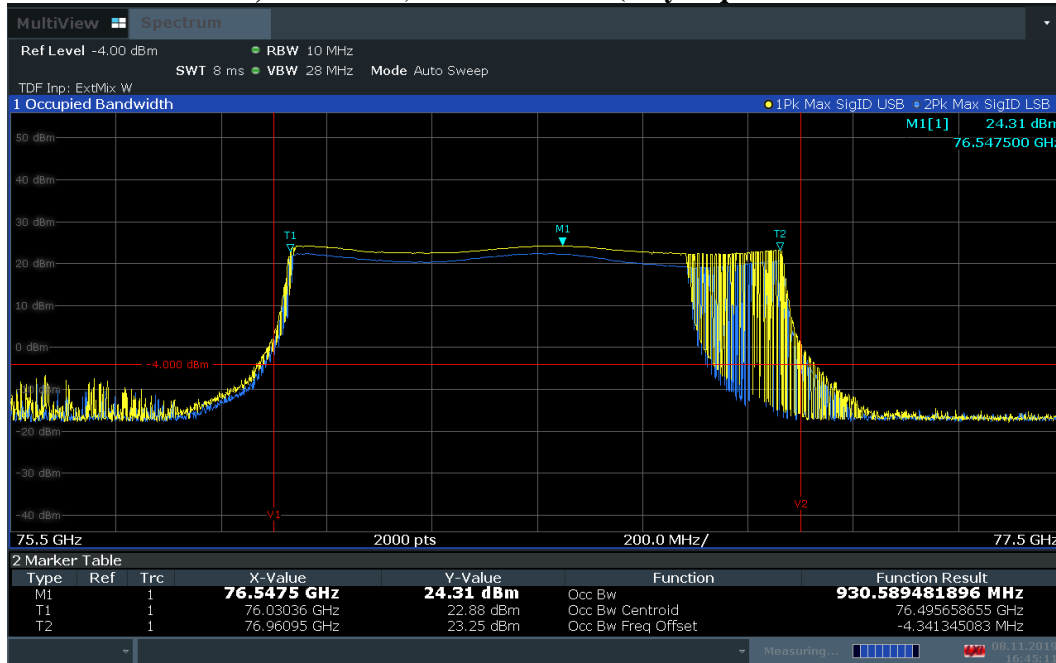
See diagram 1.12

2.5. Peak Detector, $T_{\text{nom}}/V_{\text{max}}$

See diagram 1.15

3. Occupied bandwidth

3.1. Peak Detector, T_{nom}/V_{nom} , RBW 10 MHz (only required for 99% RSS Gen Occupied BW)



16:45:12 08.11.2019

* -4 dBm is a reference line from the FSW67. Limit: 50 dBm (Average), 55 dBm (Peak).

3.2. Peak Detector, T_{nom}/V_{nom}

See diagram 1.3

3.3. Peak Detector, T_{min}/V_{nom}

See diagram 1.6

3.4. Peak Detector, T_{max}/V_{nom}

See diagram 1.9

3.5. Peak Detector, T_{nom}/V_{min}

See diagram 1.12

3.6. Peak Detector, T_{nom}/V_{max}

See diagram 1.15

4. Field strength of emissions (band edge)

4.1. RMS Detector, low edge, 75 GHz – 76 GHz

No emissions below 76 GHz. See diagrams 5.18.

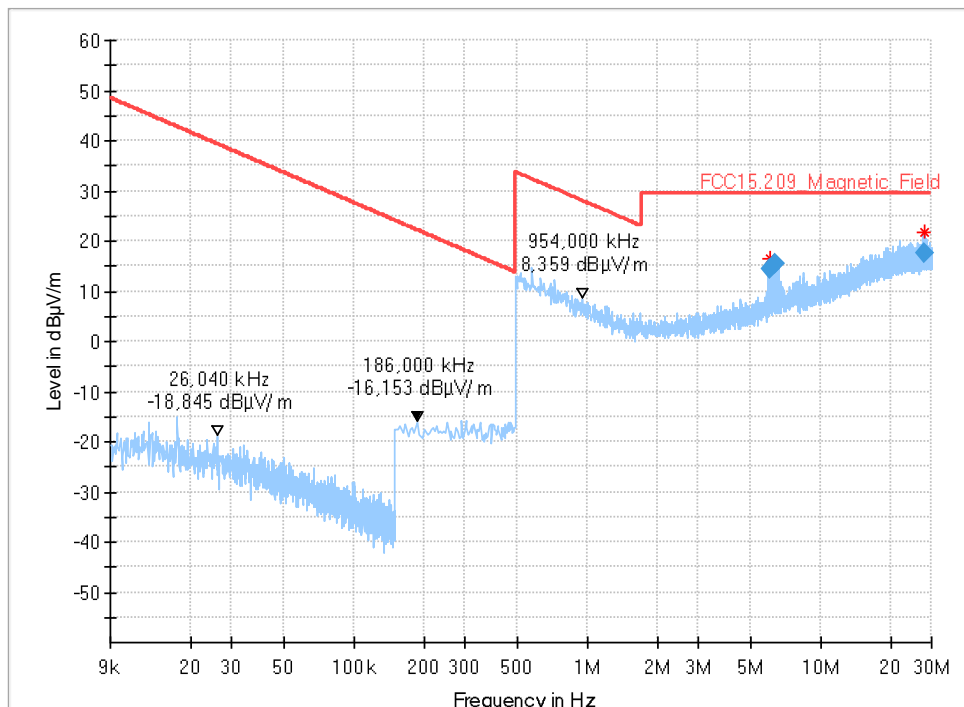
4.2. RMS Detector, high edge, SigID USB + LSB

No emissions above 77 GHz respectively 81 GHz. See diagrams 5.19-5.27.

5. Field strength of emissions (radiated spurious)

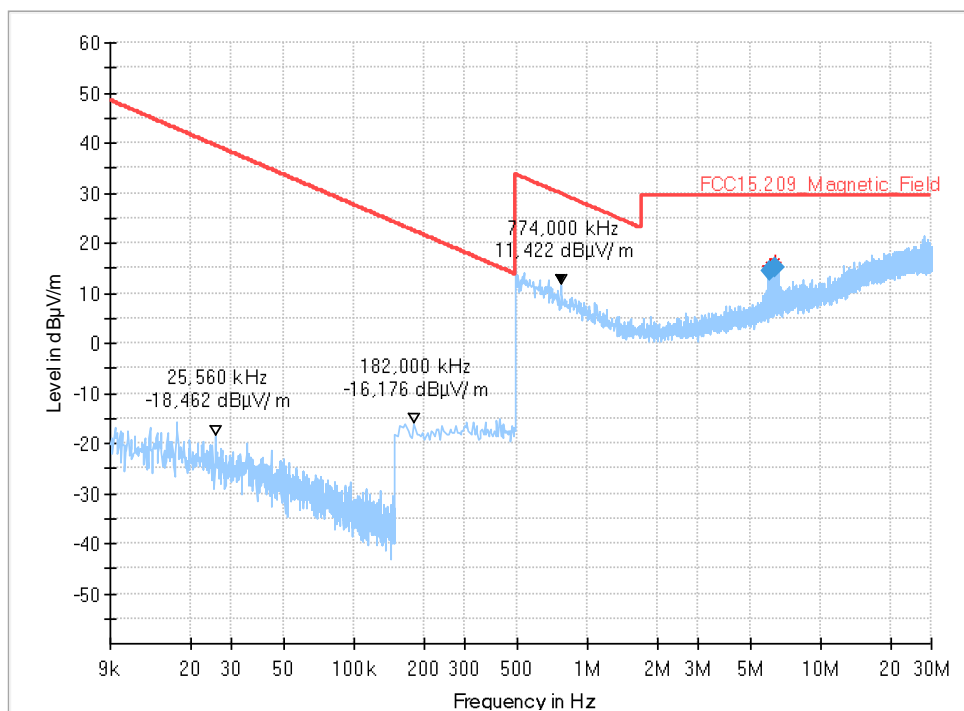
5.1. 9 kHz – 30 MHz, laying

Full Spectrum



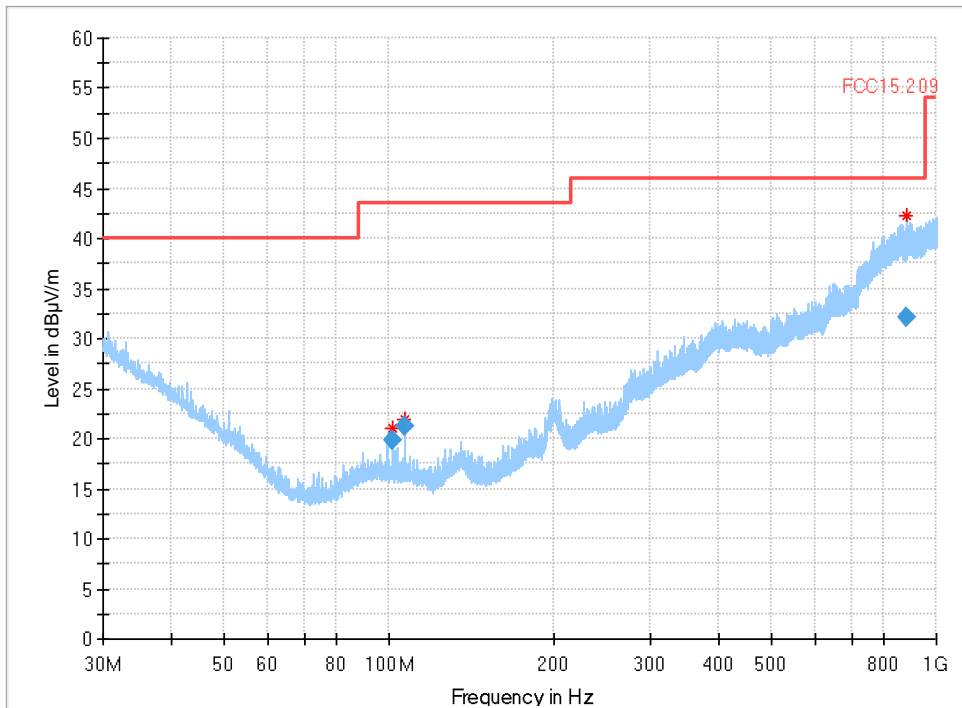
5.2. 9 kHz – 30 MHz, standing

Full Spectrum



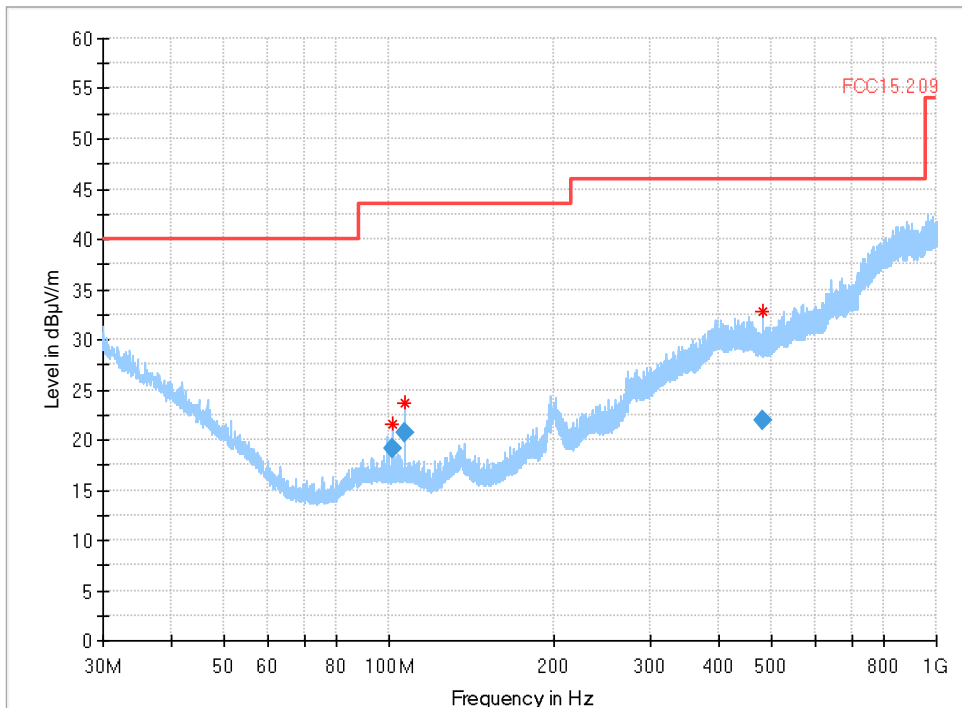
5.3. 30 MHz – 1 GHz, laying

Full Spectrum

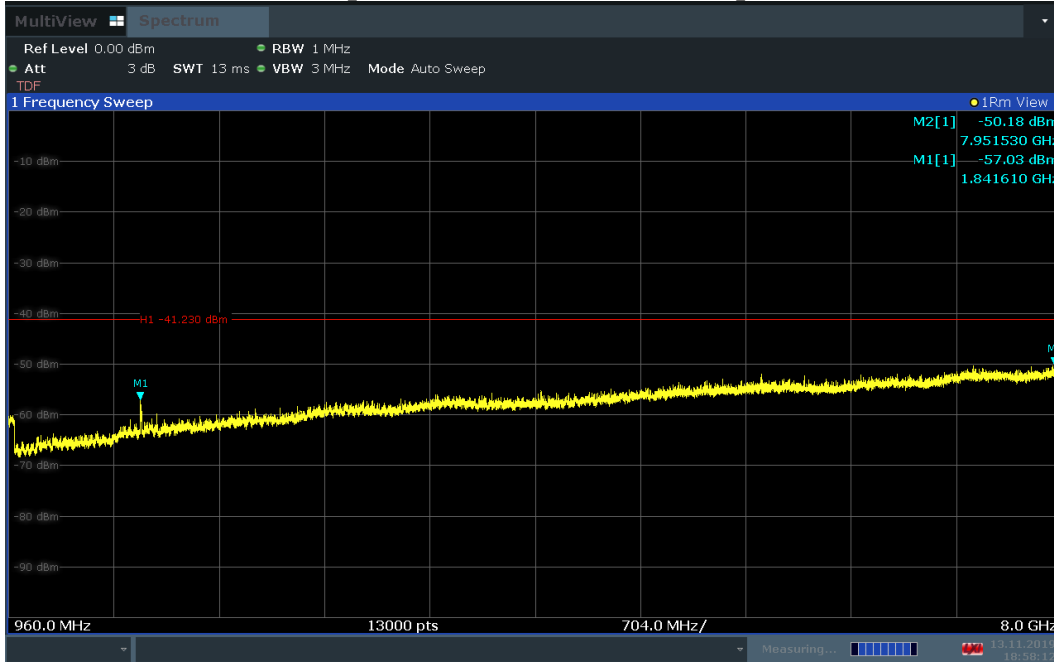


5.4. 30 MHz – 1 GHz, standing

Full Spectrum

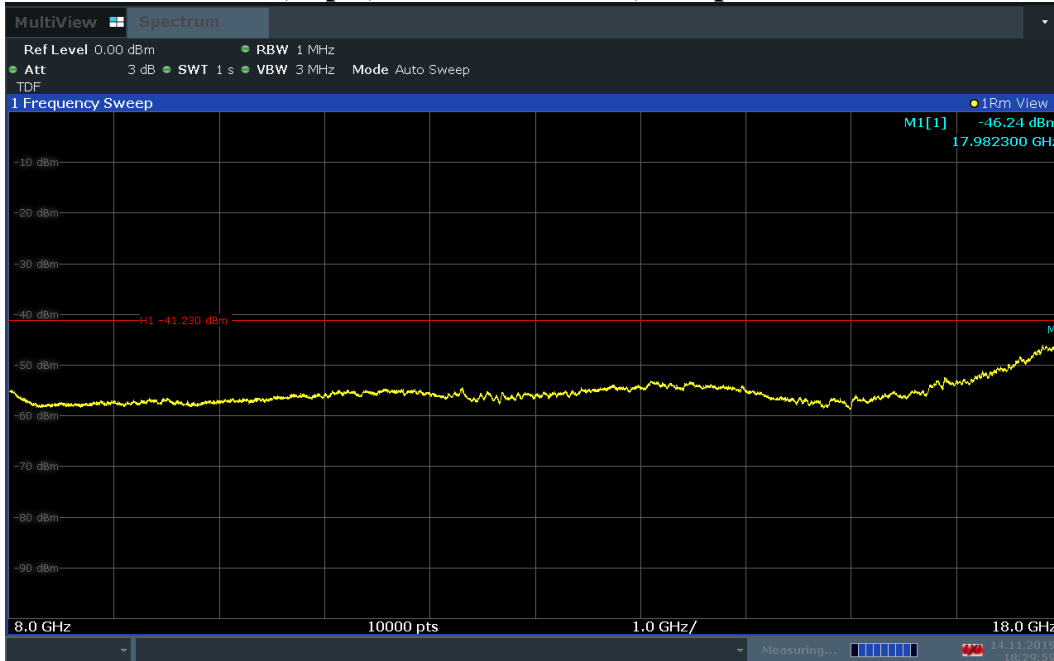


5.5. 960 MHz – 8 GHz, Op.1, ANT HOR + VER, sweep time: auto



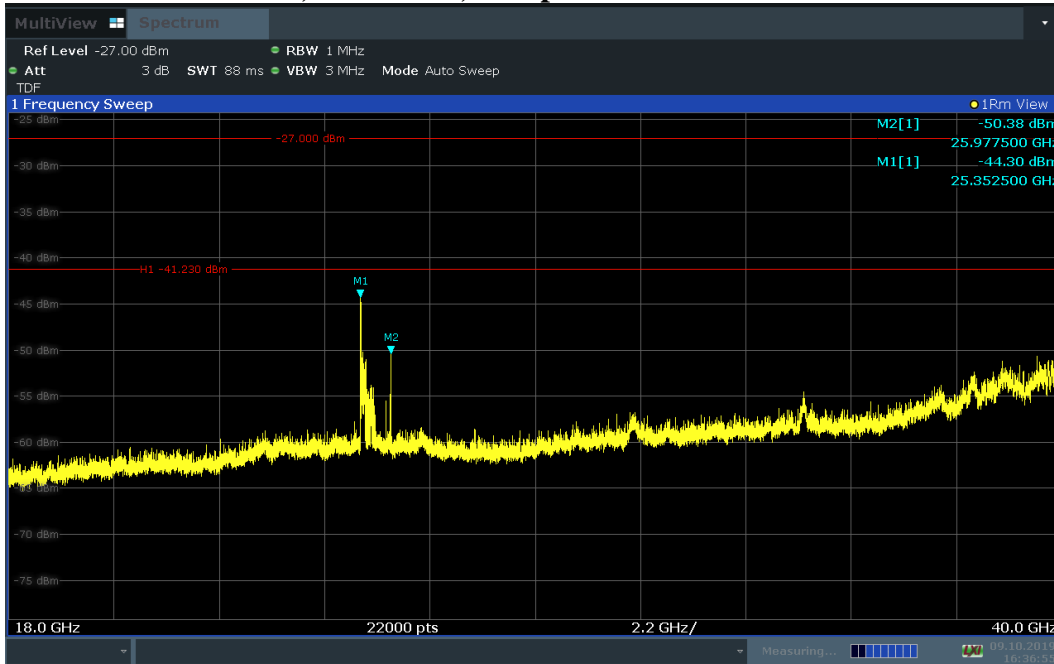
18:58:13 13.11.2019

5.6. 8 GHz – 18 GHz, Op.1, ANT HOR + VER, sweep time: 1 s



18:29:59 14.11.2019

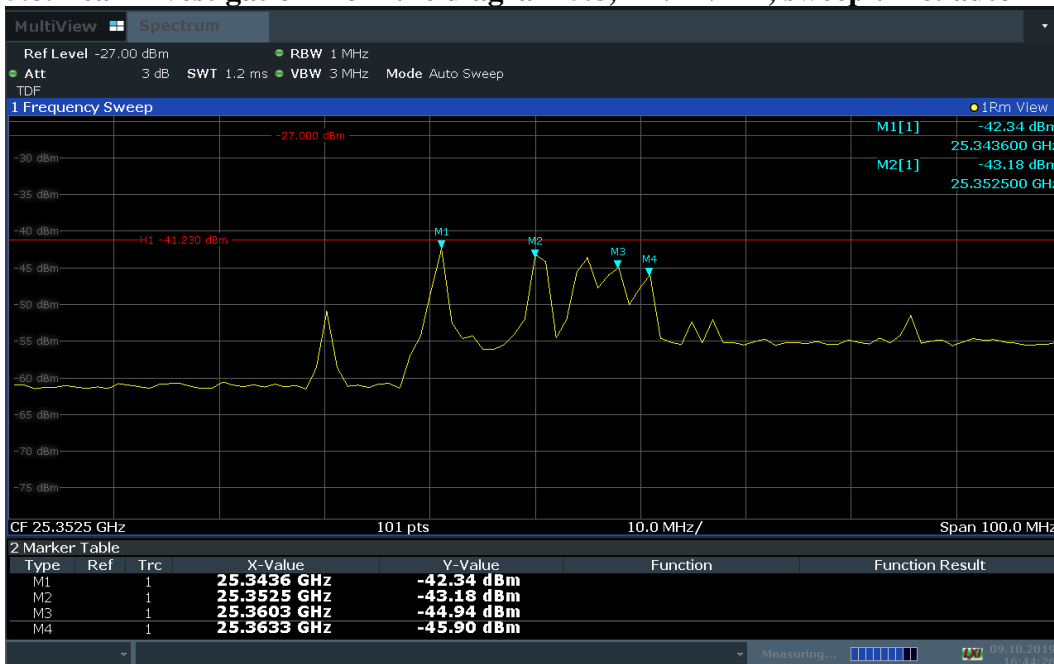
5.7. 18 GHz – 40 GHz, ANT VER, sweep time: auto



16:36:56 09.10.2019

* -27 dBm is a reference line from the FSW67. Limit is -41.23 dBm.

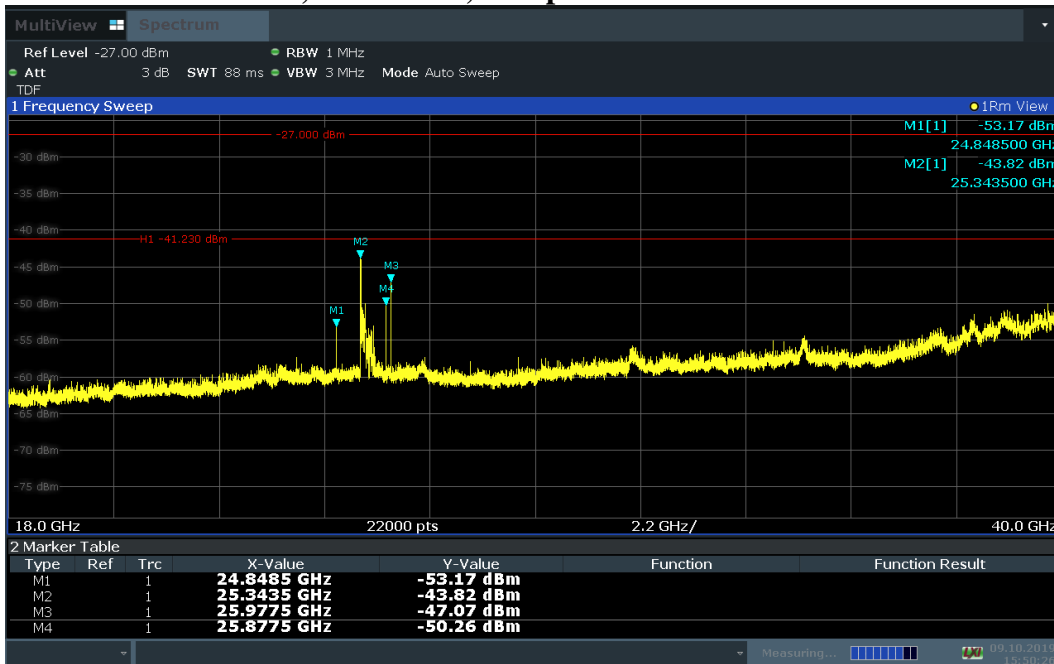
5.8. Peak investigation from the diagram 5.8, ANT VER, sweep time: auto



16:44:26 09.10.2019

* -27 dBm is a reference line from the FSW67. Limit is -41.23 dBm.

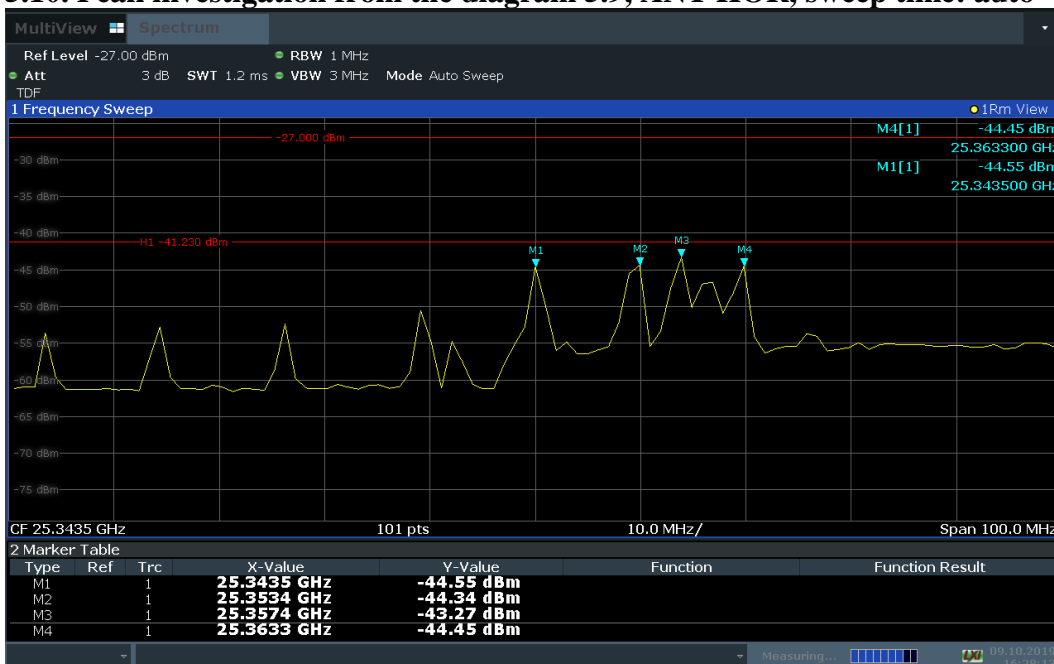
5.9. 18 GHz – 40 GHz, ANT HOR, sweep time: auto



15:50:27 09.10.2019

* -27 dBm is a reference line from the FSW67. Limit is -41.23 dBm.

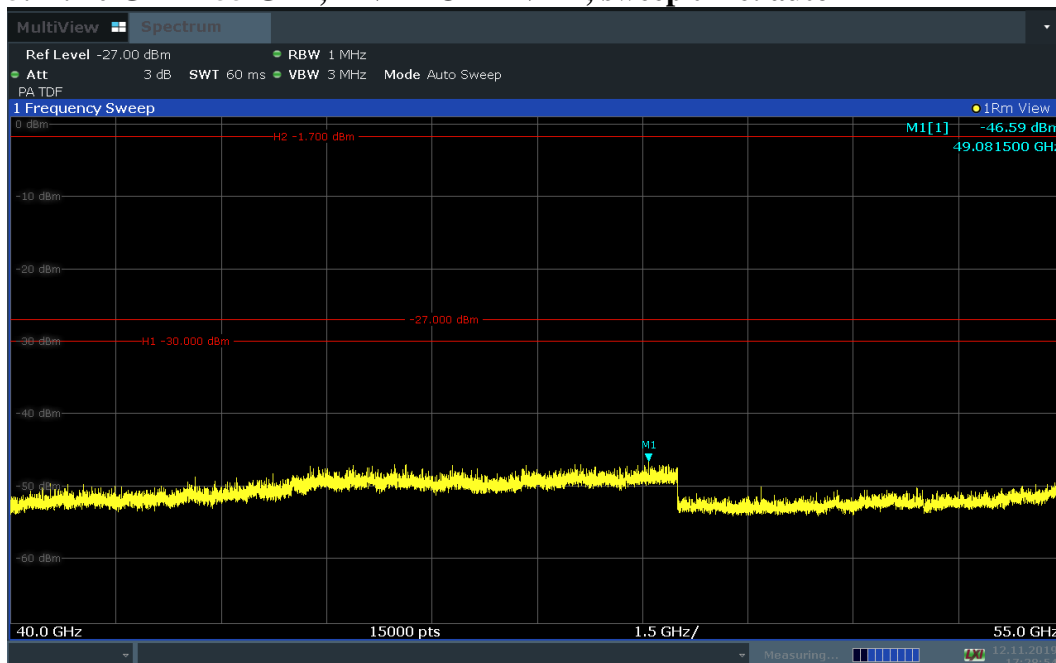
5.10. Peak investigation from the diagram 5.9, ANT HOR, sweep time: auto



16:28:13 09.10.2019

* -27 dBm is a reference line from the FSW67. Limit is -41.23 dBm.

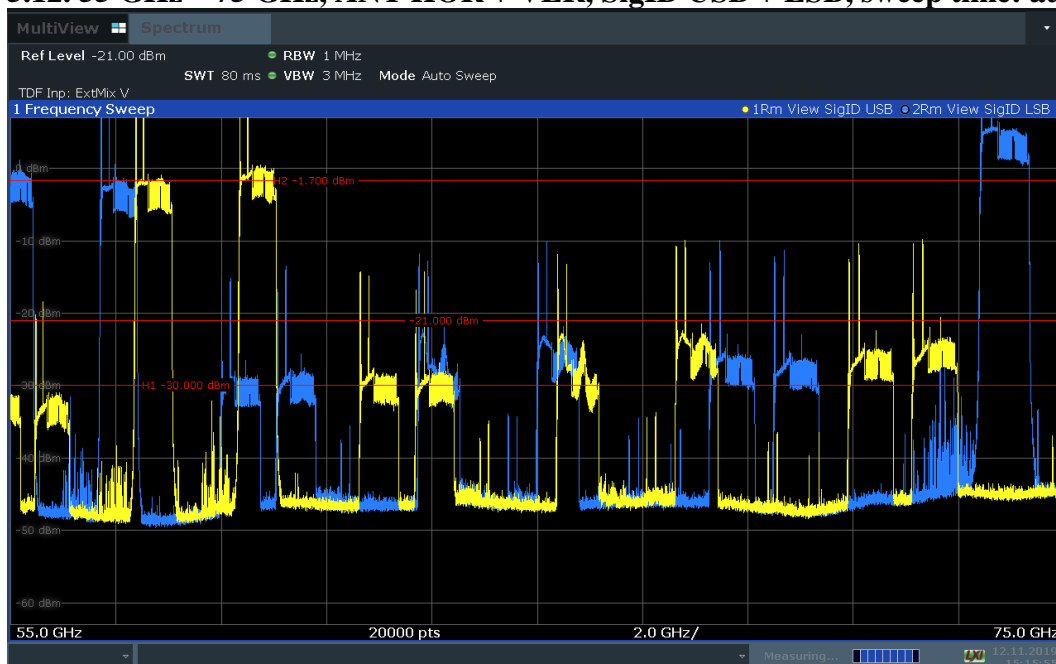
5.11. 40 GHz – 55 GHz, ANT HOR + VER, sweep time: auto



17:28:55 12.11.2019

* -27 dBm is a reference line from the FSW67. Limit is -1.7 dBm (FCC) and -30 dBm (ISED).

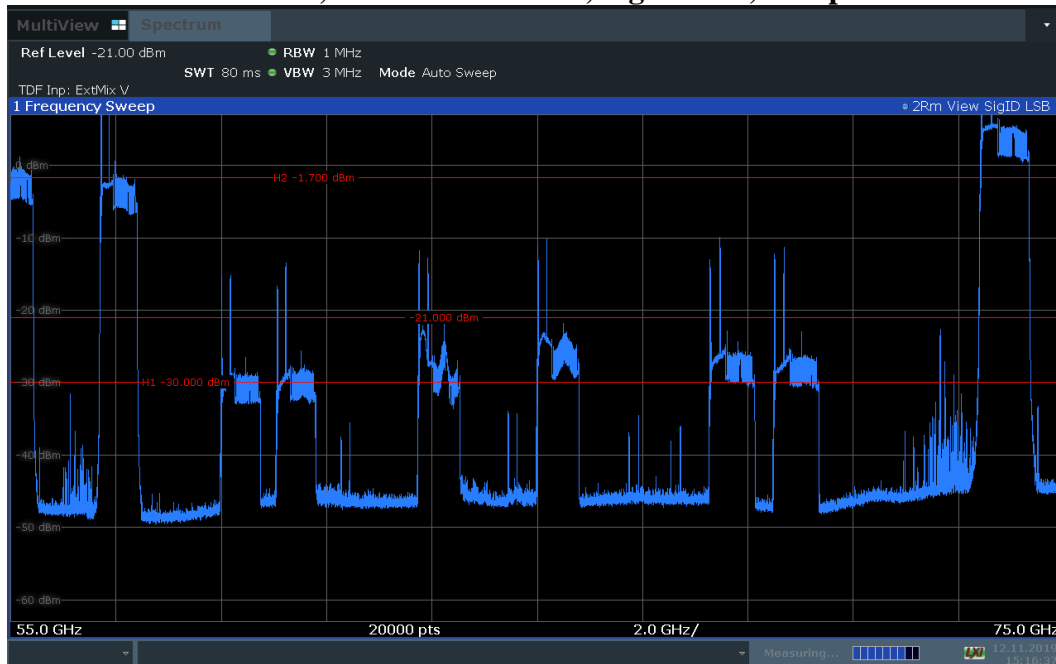
5.12. 55 GHz – 75 GHz, ANT HOR + VER, SigID USB + LSB, sweep time: auto



15:15:55 12.11.2019

* Signal ID function is used. The diagram shows image signals and mixer products. The real input signal is shown, only when USB and LSD traces have the same position on the frequency axis => Apart from the noise floor no real input signal was observed. See subsection 5.8.6. in the main report. -21 dBm is a reference line from the FSW67. Limit is -1.7 dBm (FCC) and -30 dBm (ISED).

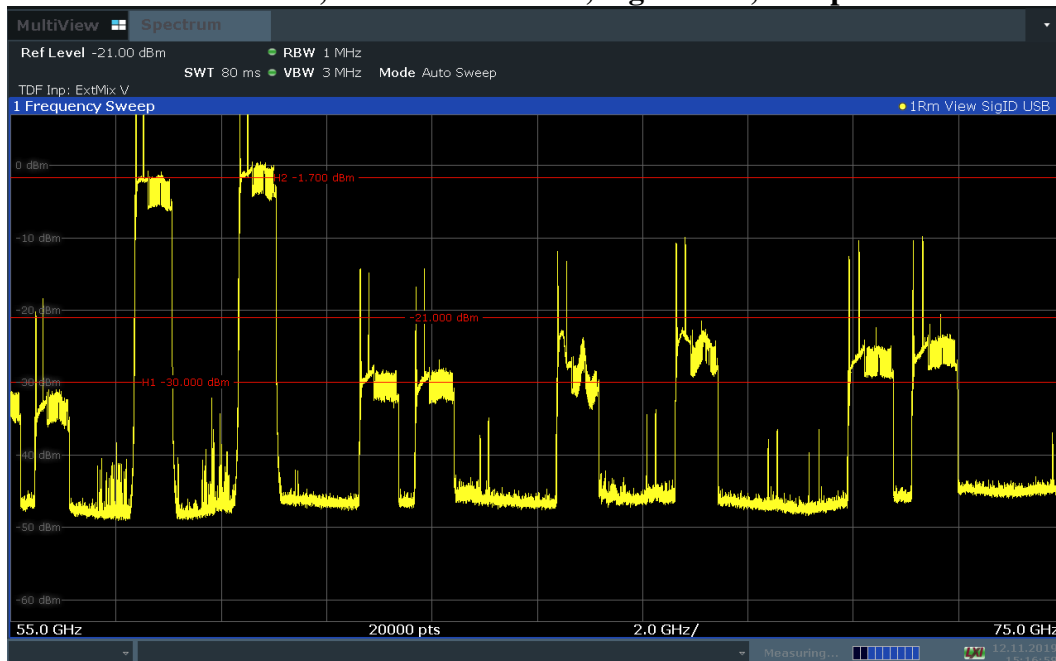
5.13. 55 GHz – 75 GHz, ANT HOR + VER, SigID LSB, sweep time: auto



15:16:38 12.11.2019

* Signal ID function is used. The diagram shows image signals and mixer products. The real input signal is shown, only when USB and LSD traces have the same position on the frequency axis => Apart from the noise floor no real input signal was observed. See subsection 5.8.6. in the main report. -21 dBm is a reference line from the FSW67. Limit is -1.7 dBm (FCC) and -30 dBm (ISED).

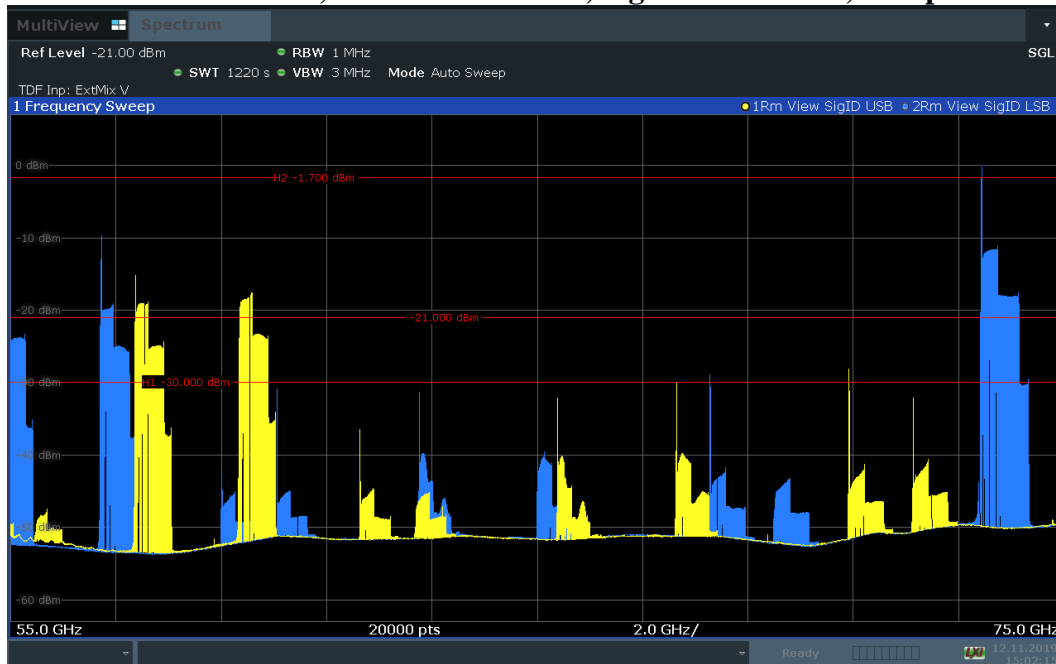
5.14. 55 GHz – 75 GHz, ANT HOR + VER, SigID USB, sweep time: auto



15:16:58 12.11.2019

* Signal ID function is used. The diagram shows image signals and mixer products. The real input signal is shown, only when USB and LSD traces have the same position on the frequency axis => Apart from the noise floor no real input signal was observed. See subsection 5.8.6. in the main report. -21 dBm is a reference line from the FSW67. Limit is -1.7 dBm (FCC) and -30 dBm (ISED).

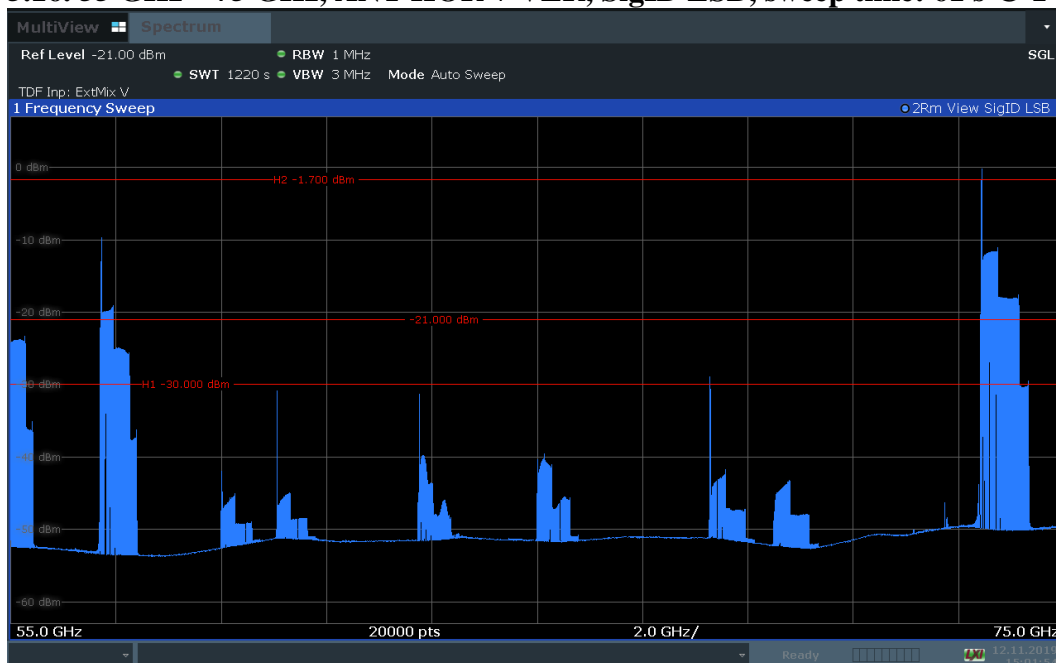
5.15. 55 GHz – 75 GHz, ANT HOR + VER, SigID USB + LSB, sweep time: 61 s @ 1 GHz



15:02:16 12.11.2019

* Signal ID function is used. The diagram shows image signals and mixer products. The real input signal is shown, only when USB and LSD traces have the same position on the frequency axis => Apart from the noise floor no real input signal was observed. See subsection 5.8.6. in the main report. -21 dBm is a reference line from the FSW67. Limit is -1.7 dBm (FCC) and -30 dBm (ISED).

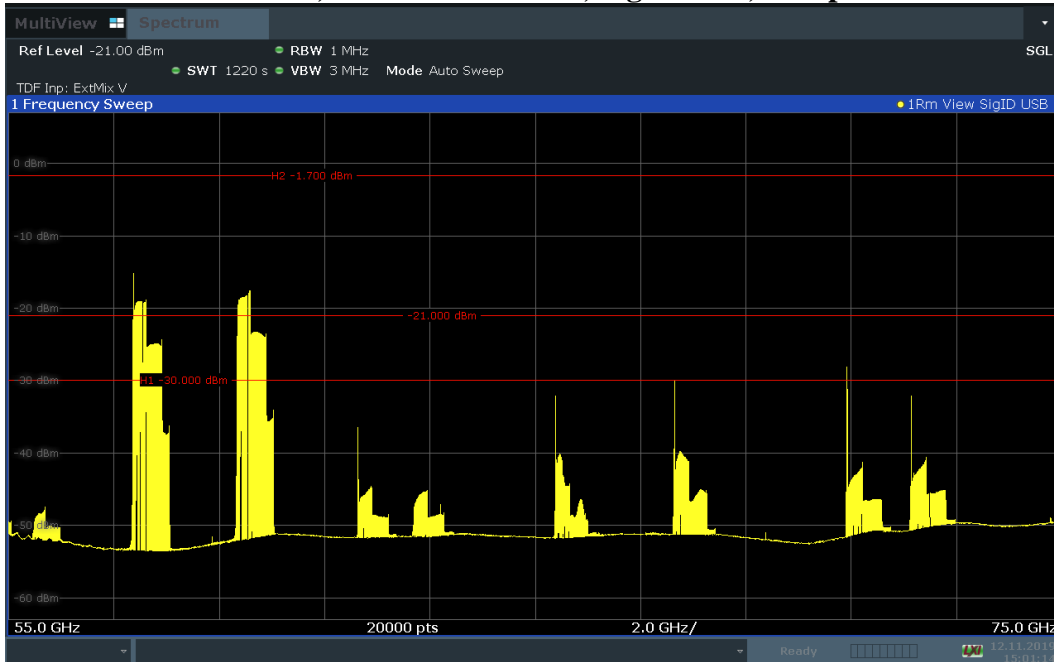
5.16. 55 GHz – 75 GHz, ANT HOR + VER, SigID LSB, sweep time: 61 s @ 1 GHz



15:01:54 12.11.2019

* Signal ID function is used. The diagram shows image signals and mixer products. The real input signal is shown, only when USB and LSD traces have the same position on the frequency axis => Apart from the noise floor no real input signal was observed. See subsection 5.8.6. in the main report. -21 dBm is a reference line from the FSW67. Limit is -1.7 dBm (FCC) and -30 dBm (ISED).

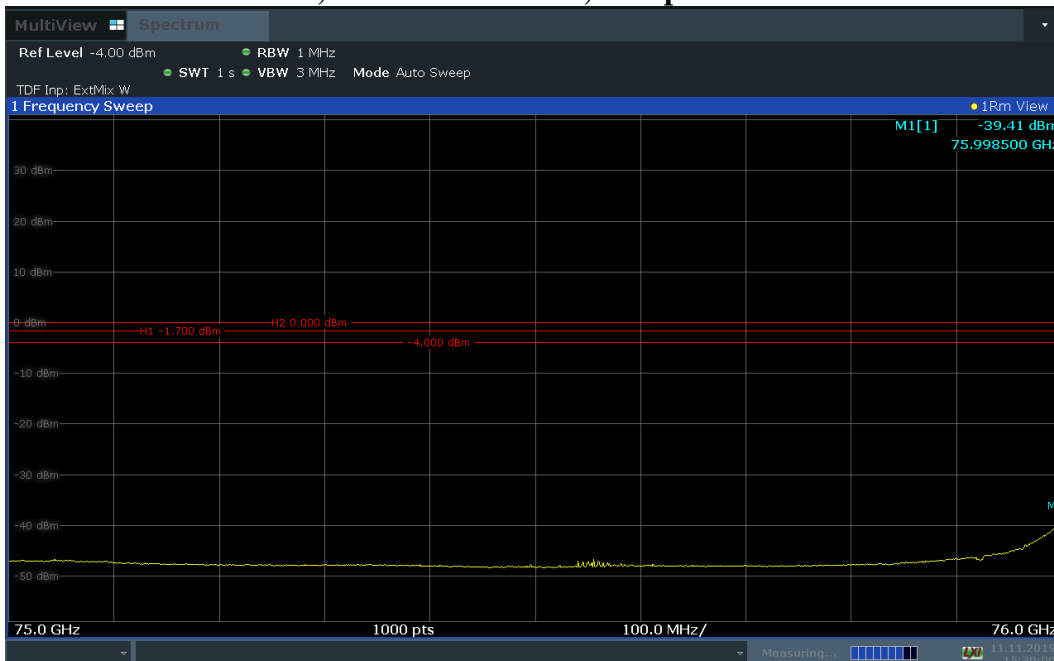
5.17. 55 GHz – 75 GHz, ANT HOR + VER, SigID USB, sweep time: 61 s @ 1 GHz



15:01:15 12.11.2019

* Signal ID function is used. The diagram shows image signals and mixer products. The real input signal is shown, only when USB and LSD traces have the same position on the frequency axis => Apart from the noise floor no real input signal was observed. See subsection 5.8.6. in the main report. -21 dBm is a reference line from the FSW67. Limit is -1.7 dBm (FCC) and -30 dBm (ISED).

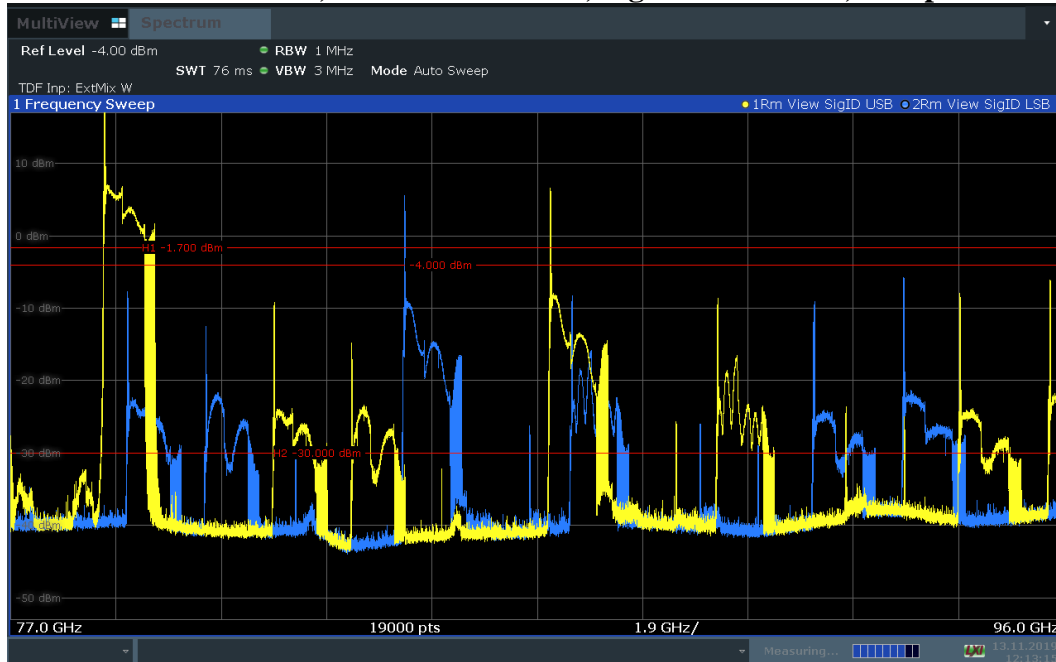
5.18. 75 GHz – 76 GHz, ANT HOR + VER, sweep time: 1 s



15:30:10 11.11.2019

* -4 dBm is a reference line from the FSW67. Limit is -1.7 dBm (FCC) and 0 dBm (ISED).

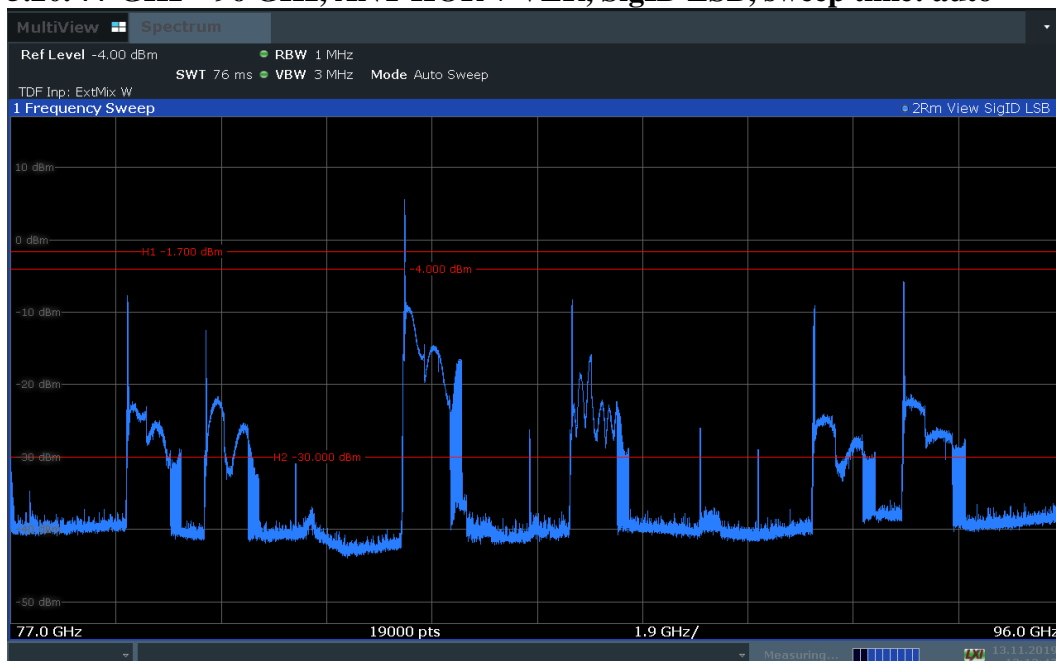
5.19. 77 GHz – 96 GHz, ANT HOR + VER, SigID USB + LSB, sweep time: auto



12:13:16 13.11.2019

* Signal ID function is used. The diagram shows image signals and mixer products. The real input signal is shown, only when USB and LSD traces have the same position on the frequency axis => Apart from the noise floor no real input signal was observed. See subsection 5.8.6. in the main report. -4 dBm is a reference line from the FSW67. Limit is -1.7 dBm (FCC) and -30 dBm (ISED).

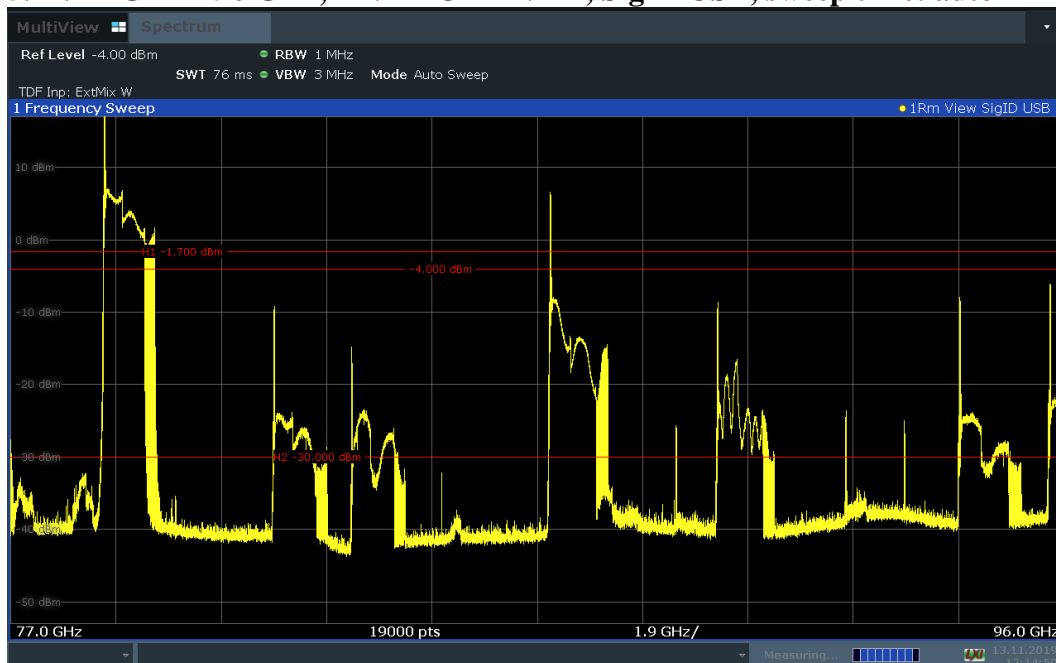
5.20. 77 GHz – 96 GHz, ANT HOR + VER, SigID LSB, sweep time: auto



12:13:47 13.11.2019

* Signal ID function is used. The diagram shows image signals and mixer products. The real input signal is shown, only when USB and LSD traces have the same position on the frequency axis => Apart from the noise floor no real input signal was observed. See subsection 5.8.6. in the main report. -4 dBm is a reference line from the FSW67. Limit is -1.7 dBm (FCC) and -30 dBm (ISED).

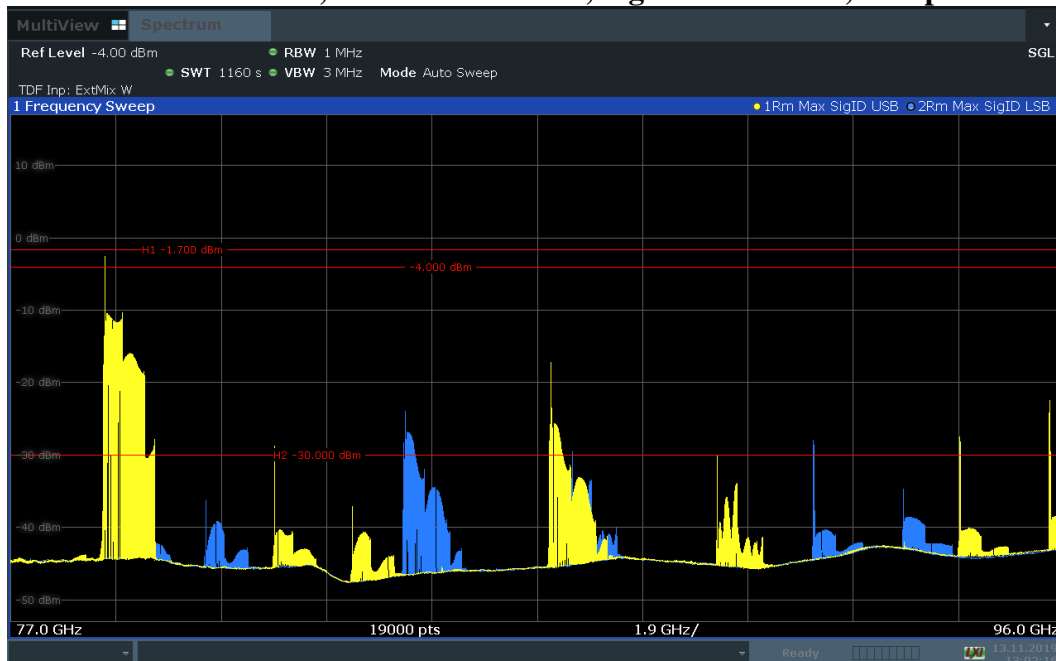
5.21. 77 GHz – 96 GHz, ANT HOR + VER, SigID USB, sweep time: auto



12:14:51 13.11.2019

* Signal ID function is used. The diagram shows image signals and mixer products. The real input signal is shown, only when USB and LSD traces have the same position on the frequency axis => Apart from the noise floor no real input signal was observed. See subsection 5.8.6. in the main report. -4 dBm is a reference line from the FSW67. Limit is -1.7 dBm (FCC) and -30 dBm (ISED).

5.22. 77 GHz – 96 GHz, ANT HOR + VER, SigID USB + LSB, sweep time: 61 s @ 1 GHz



13:02:16 13.11.2019

* Signal ID function is used. The diagram shows image signals and mixer products. The real input signal is shown, only when USB and LSD traces have the same position on the frequency axis => Apart from the noise floor no real input signal was observed. See subsection 5.8.6. in the main report. -4 dBm is a reference line from the FSW67. Limit is -1.7 dBm (FCC) and -30 dBm (ISED).

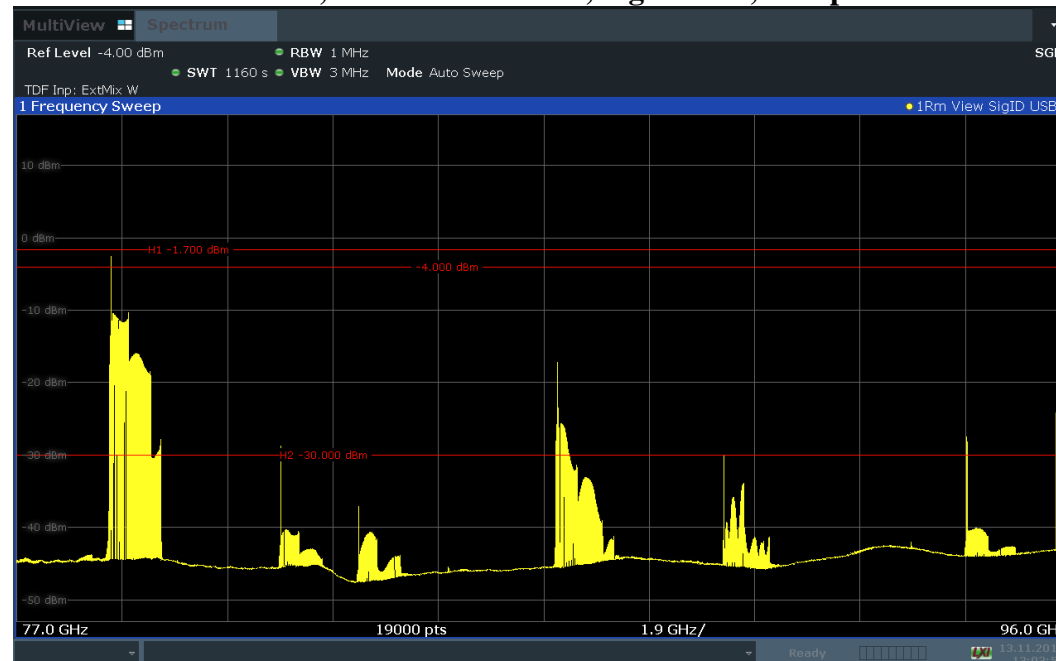
5.23. 77 GHz – 96 GHz, ANT HOR + VER, SigID LSB, sweep time: 61 s @ 1 GHz



13:06:03 13.11.2019

* Signal ID function is used. The diagram shows image signals and mixer products. The real input signal is shown, only when USB and LSB traces have the same position on the frequency axis => Apart from the noise floor no real input signal was observed. See subsection 5.8.6. in the main report. -4 dBm is a reference line from the FSW67. Limit is -1.7 dBm (FCC) and -30 dBm (ISED).

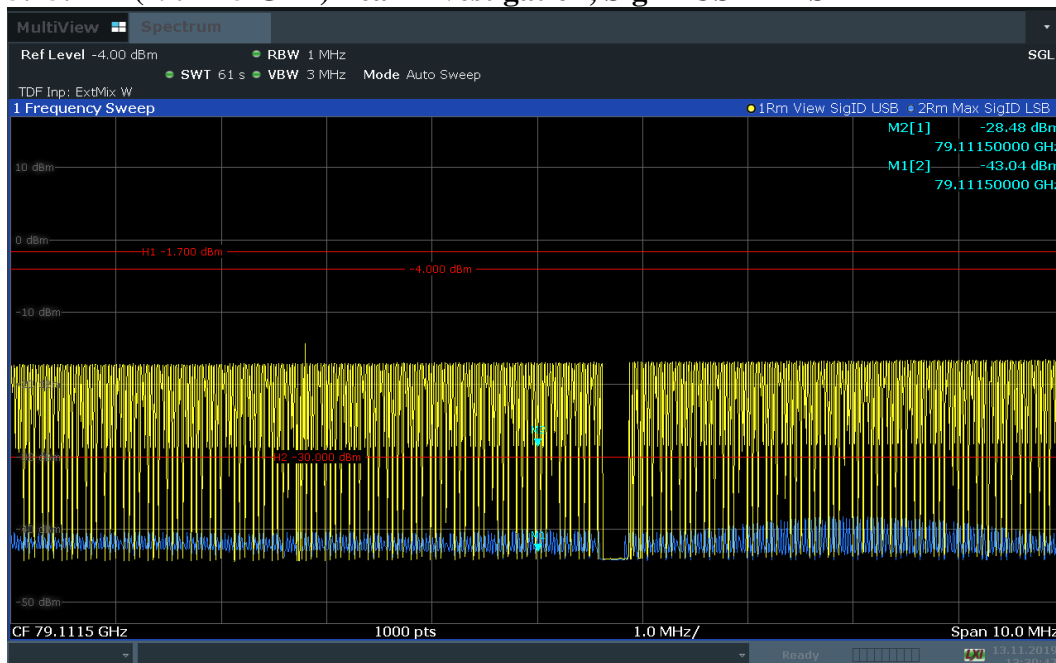
5.24. 77 GHz – 96 GHz, ANT HOR + VER, SigID USB, sweep time: 61 s @ 1 GHz



13:03:59 13.11.2019

* Signal ID function is used. The diagram shows image signals and mixer products. The real input signal is shown, only when USB and LSB traces have the same position on the frequency axis => Apart from the noise floor no real input signal was observed. See subsection 5.8.6. in the main report. -4 dBm is a reference line from the FSW67. Limit is -1.7 dBm (FCC) and -30 dBm (ISED).

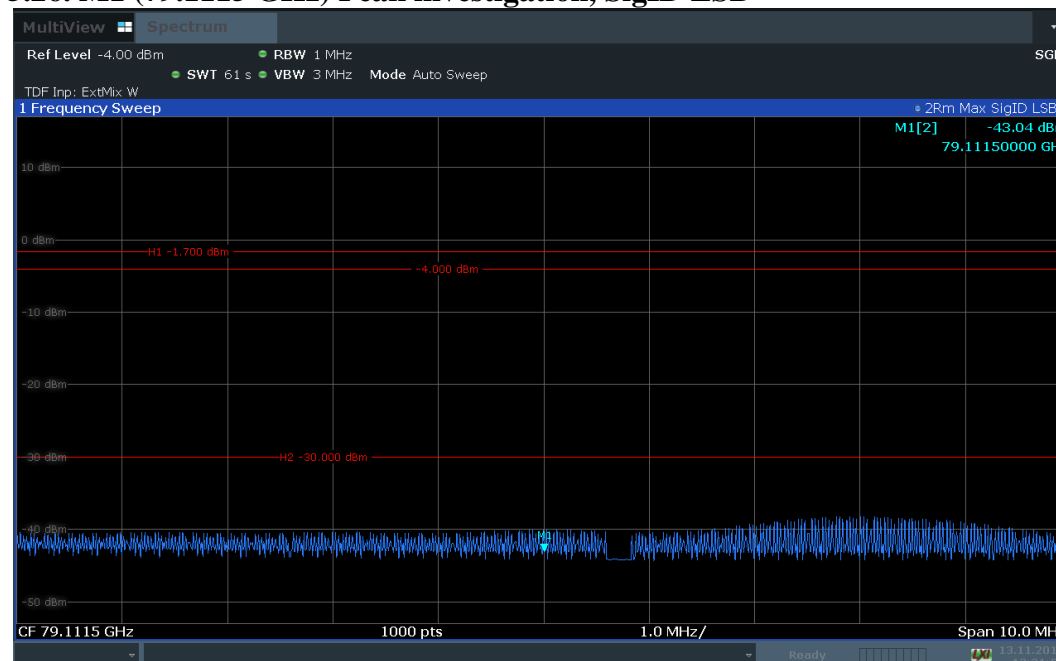
5.25. M1 (79.1115 GHz) Peak investigation, SigID USB + LSB



13:30:48 13.11.2019

* Signal ID function is used. The diagram shows image signals and mixer products. The real input signal is shown, only when USB and LSD traces have the same position on the frequency axis => Apart from the noise floor no real input signal was observed. See subsection 5.8.6. in the main report. -4 dBm is a reference line from the FSW67. Limit is -1.7 dBm (FCC) and -30 dBm (ISED).

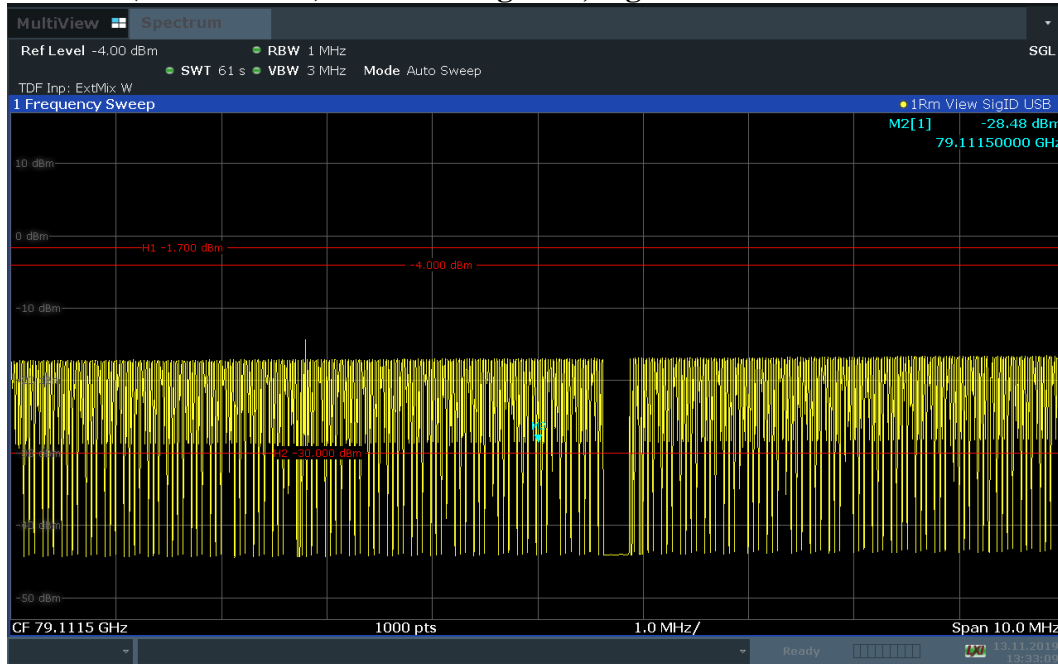
5.26. M1 (79.1115 GHz) Peak investigation, SigID LSB



13:31:56 13.11.2019

* Signal ID function is used. The diagram shows image signals and mixer products. The real input signal is shown, only when USB and LSD traces have the same position on the frequency axis => Apart from the noise floor no real input signal was observed. See subsection 5.8.6. in the main report. -4 dBm is a reference line from the FSW67. Limit is -1.7 dBm (FCC) and -30 dBm (ISED).

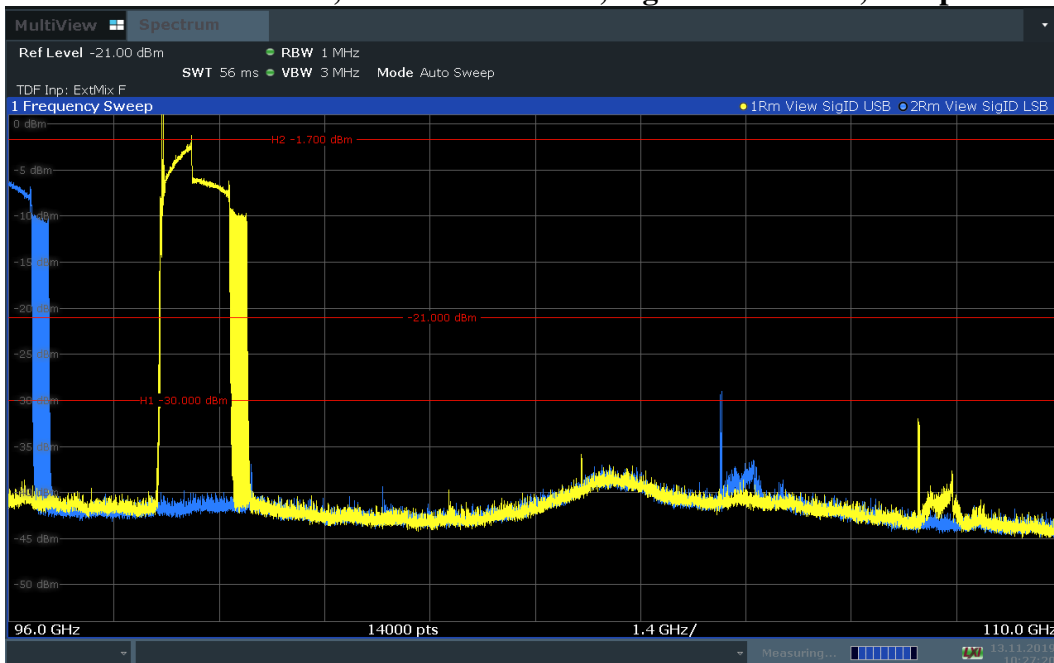
5.27. M1 (79.1115 GHz) Peak investigation, SigID USB



13:33:09 13.11.2019

* Signal ID function is used. The diagram shows image signals and mixer products. The real input signal is shown, only when USB and LSD traces have the same position on the frequency axis => Apart from the noise floor no real input signal was observed. See subsection 5.8.6. in the main report. -4 dBm is a reference line from the FSW67. Limit is -1.7 dBm (FCC) and -30 dBm (ISED).

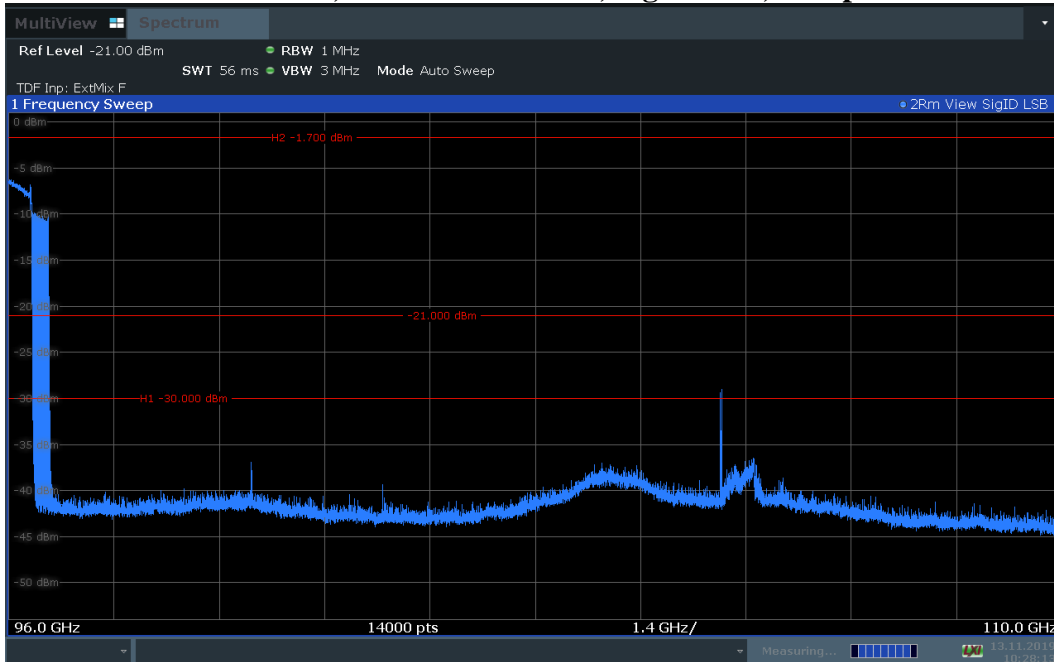
5.28. 96 GHz – 110 GHz, ANT HOR + VER, SigID USB + LSB, sweep time: auto



10:27:21 13.11.2019

* Signal ID function is used. The diagram shows image signals and mixer products. The real input signal is shown, only when USB and LSD traces have the same position on the frequency axis => Apart from the noise floor no real input signal was observed. See subsection 5.8.6. in the main report. -21 dBm is a reference line from the FSW67. Limit is -1.7 dBm (FCC) and -30 dBm (ISED).

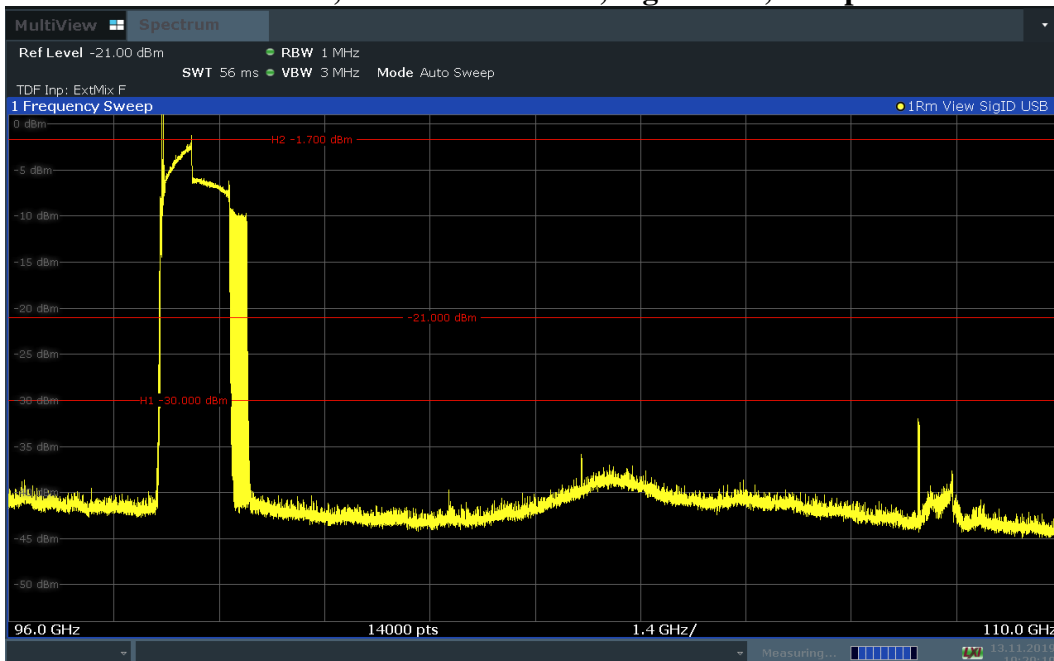
5.29. 96 GHz – 110 GHz, ANT HOR + VER, SigID LSB, sweep time: auto



10:28:14 13.11.2019

* Signal ID function is used. The diagram shows image signals and mixer products. The real input signal is shown, only when USB and LSD traces have the same position on the frequency axis => Apart from the noise floor no real input signal was observed. See subsection 5.8.6. in the main report. -21 dBm is a reference line from the FSW67. Limit is -1.7 dBm (FCC) and -30 dBm (ISED).

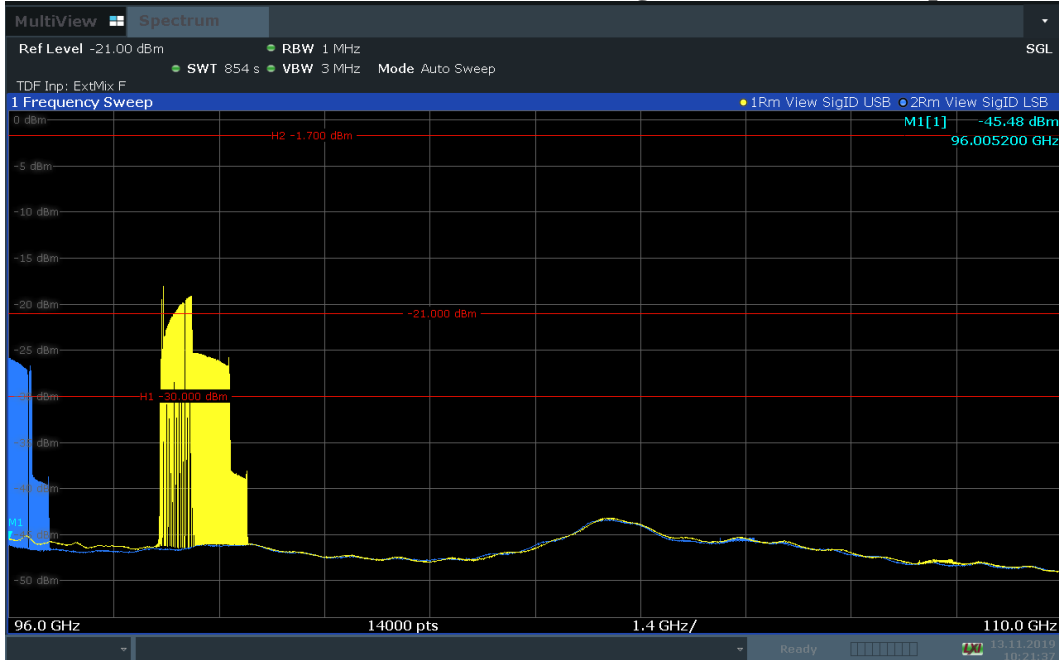
5.30. 96 GHz – 110 GHz, ANT HOR + VER, SigID USB, sweep time: auto



10:29:20 13.11.2019

* Signal ID function is used. The diagram shows image signals and mixer products. The real input signal is shown, only when USB and LSD traces have the same position on the frequency axis => Apart from the noise floor no real input signal was observed. See subsection 5.8.6. in the main report. -21 dBm is a reference line from the FSW67. Limit is -1.7 dBm (FCC) and -30 dBm (ISED).

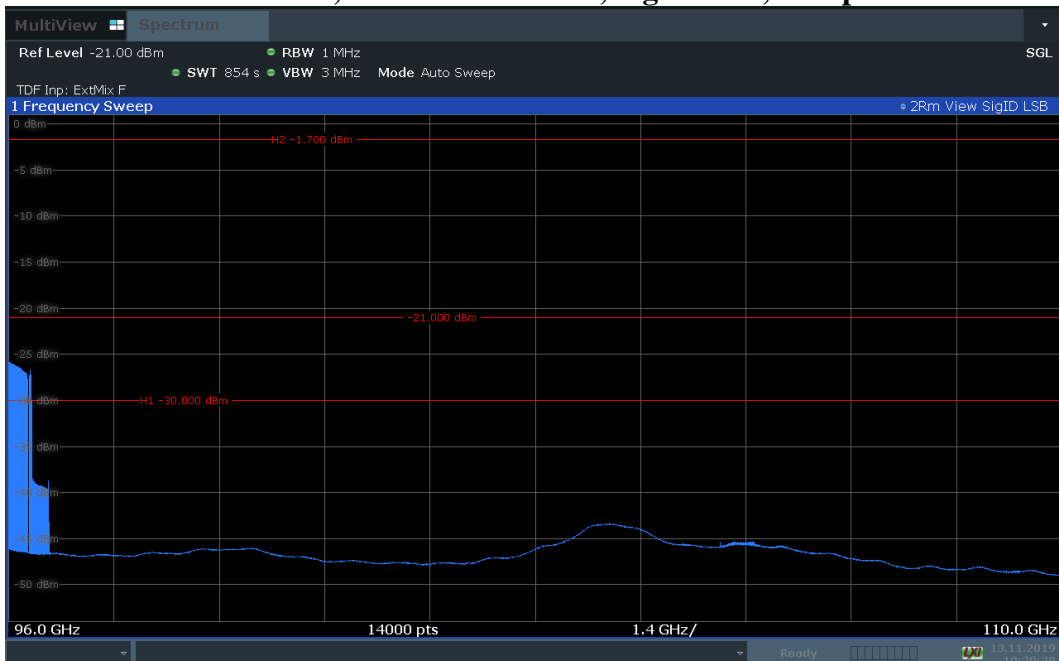
5.31. 96 GHz – 110 GHz, ANT HOR + VER, SigID USB + LSB, sweep time: 61 s @ 1 GHz



10:21:37 13.11.2019

* Signal ID function is used. The diagram shows image signals and mixer products. The real input signal is shown, only when USB and LSD traces have the same position on the frequency axis => Apart from the noise floor no real input signal was observed. See subsection 5.8.6. in the main report. -21 dBm is a reference line from the FSW67. Limit is -1.7 dBm (FCC) and -30 dBm (ISED).

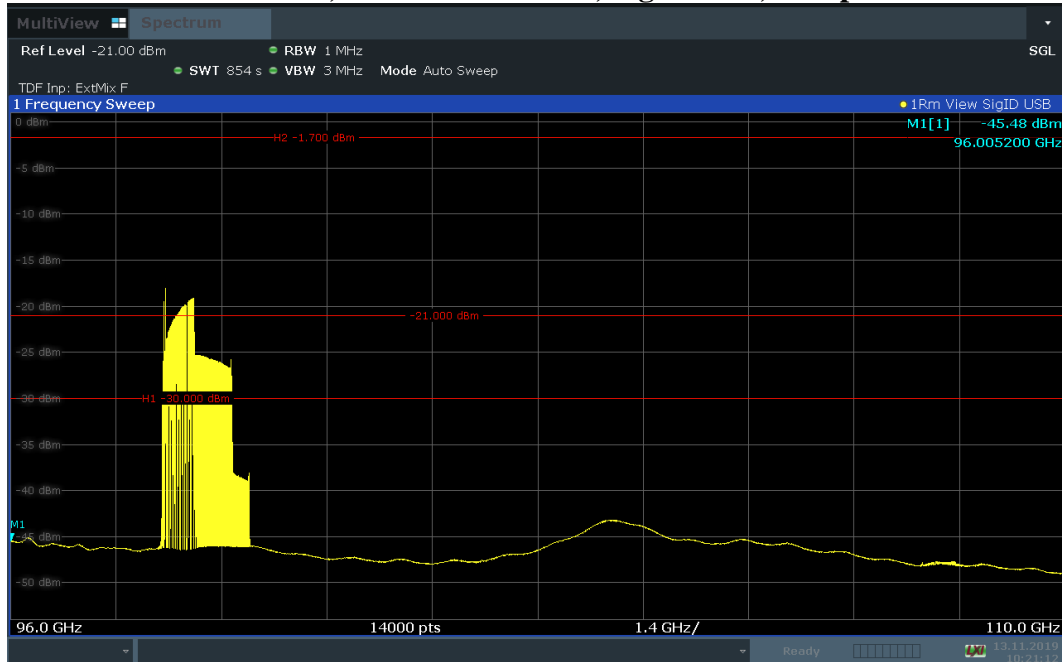
5.32. 96 GHz – 110 GHz, ANT HOR + VER, SigID LSB, sweep time: 61 s @ 1 GHz



10:20:39 13.11.2019

* Signal ID function is used. The diagram shows image signals and mixer products. The real input signal is shown, only when USB and LSD traces have the same position on the frequency axis => Apart from the noise floor no real input signal was observed. See subsection 5.8.6. in the main report. -21 dBm is a reference line from the FSW67. Limit is -1.7 dBm (FCC) and -30 dBm (ISED).

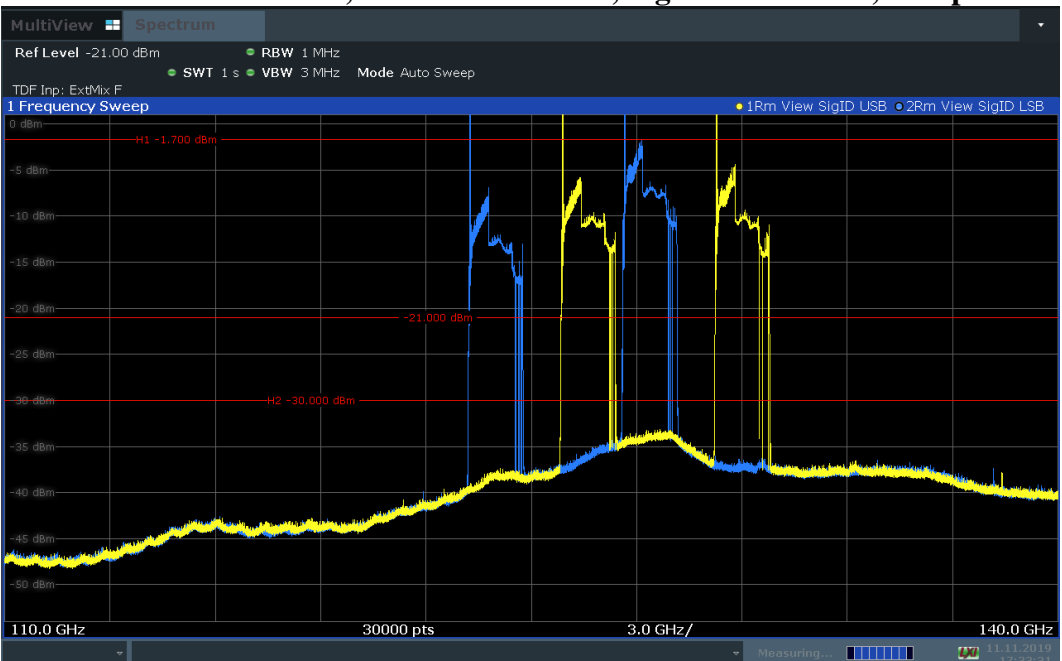
5.33. 96 GHz – 110 GHz, ANT HOR + VER, SigID USB, sweep time: 61 s @ 1 GHz



10:21:13 13.11.2019

* Signal ID function is used. The diagram shows image signals and mixer products. The real input signal is shown, only when USB and LSD traces have the same position on the frequency axis => Apart from the noise floor no real input signal was observed. See subsection 5.8.6. in the main report. -21 dBm is a reference line from the FSW67. Limit is -1.7 dBm (FCC) and -30 dBm (ISED).

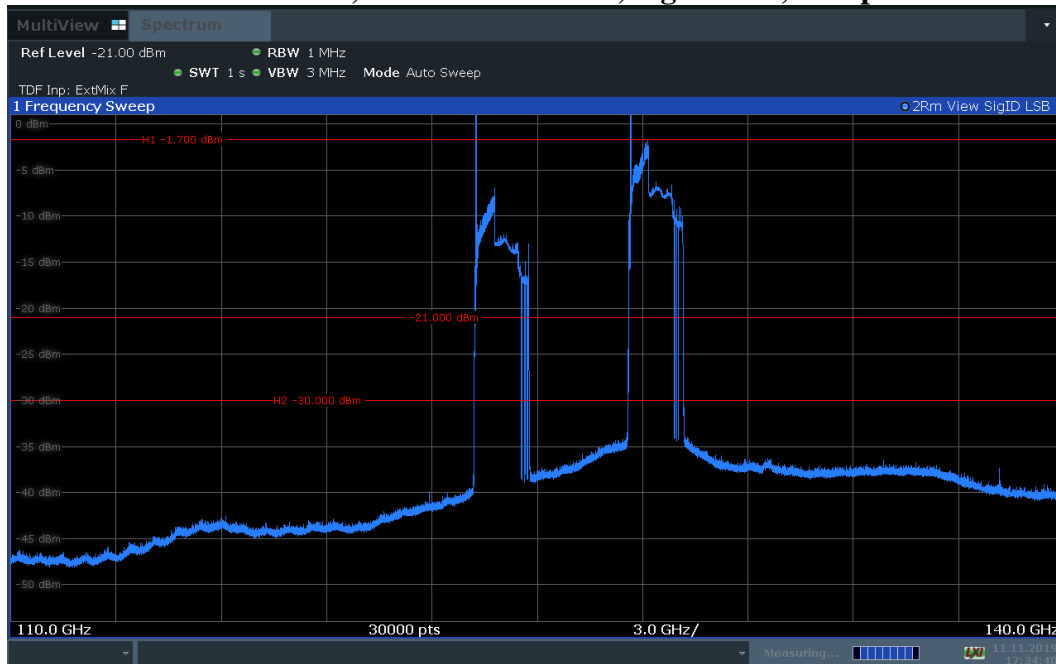
5.34. 110 GHz – 140 GHz, ANT HOR + VER, SigID USB + LSB, sweep time: 1 s



17:33:32 11.11.2019

* Signal ID function is used. The diagram shows image signals and mixer products. The real input signal is shown, only when USB and LSD traces have the same position on the frequency axis => Apart from the noise floor no real input signal was observed. See subsection 5.8.6. in the main report. -21 dBm is a reference line from the FSW67. Limit is -1.7 dBm (FCC) and -30 dBm (ISED).

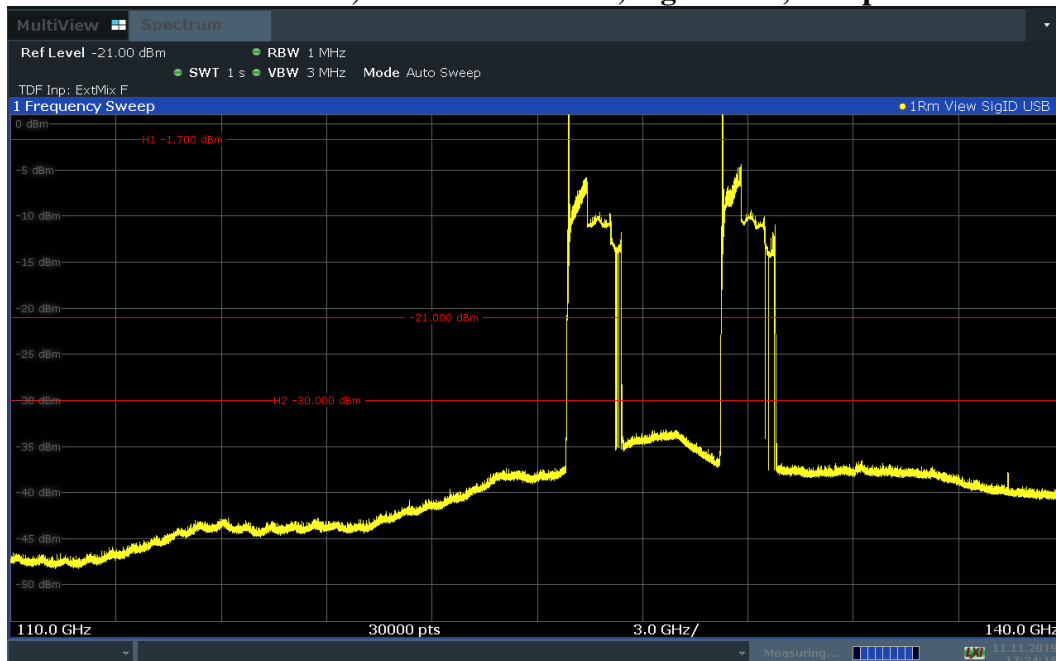
5.35. 110 GHz – 140 GHz, ANT HOR + VER, SigID LSB, sweep time: 1 s



17:34:40 11.11.2019

* Signal ID function is used. The diagram shows image signals and mixer products. The real input signal is shown, only when USB and LSD traces have the same position on the frequency axis => Apart from the noise floor no real input signal was observed. See subsection 5.8.6. in the main report. -21 dBm is a reference line from the FSW67. Limit is -1.7 dBm (FCC) and -30 dBm (ISED).

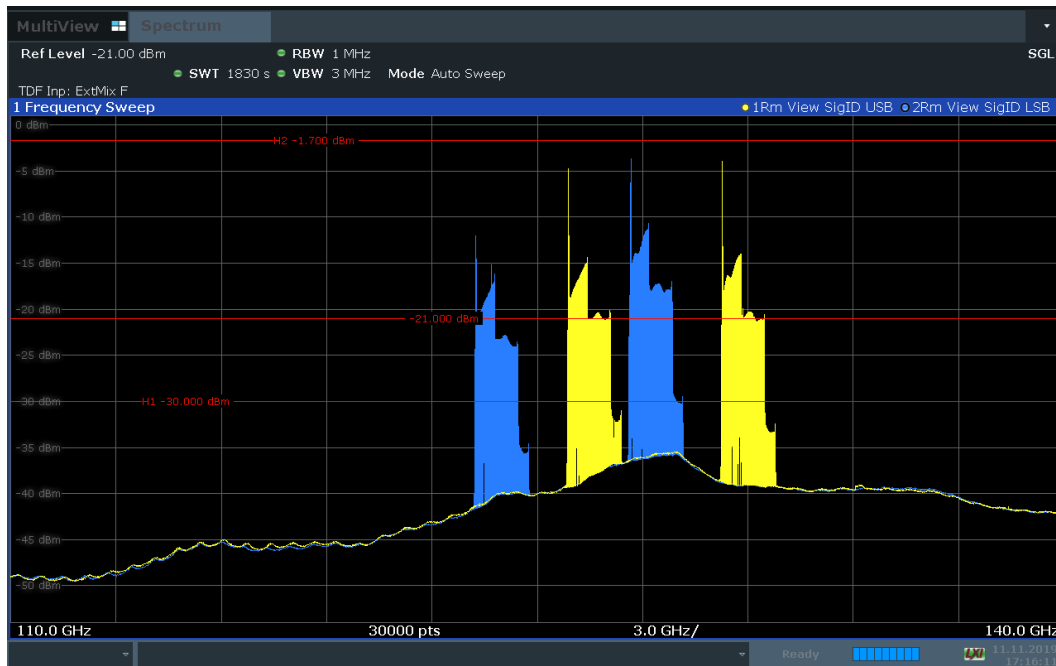
5.36. 110 GHz – 140 GHz, ANT HOR + VER, SigID USB, sweep time: 1 s



17:34:15 11.11.2019

* Signal ID function is used. The diagram shows image signals and mixer products. The real input signal is shown, only when USB and LSD traces have the same position on the frequency axis => Apart from the noise floor no real input signal was observed. See subsection 5.8.6. in the main report. -21 dBm is a reference line from the FSW67. Limit is -1.7 dBm (FCC) and -30 dBm (ISED).

5.37. 110 GHz – 140 GHz, ANT HOR + VER, SigID USB + LSB, sweep time: 61 s @ 1 GHz



17:16:11 11.11.2019

* Signal ID function is used. The diagram shows image signals and mixer products. The real input signal is shown, only when USB and LSD traces have the same position on the frequency axis => Apart from the noise floor no real input signal was observed. See subsection 5.8.6. in the main report. -21 dBm is a reference line from the FSW67. Limit is -1.7 dBm (FCC) and -30 dBm (ISED).

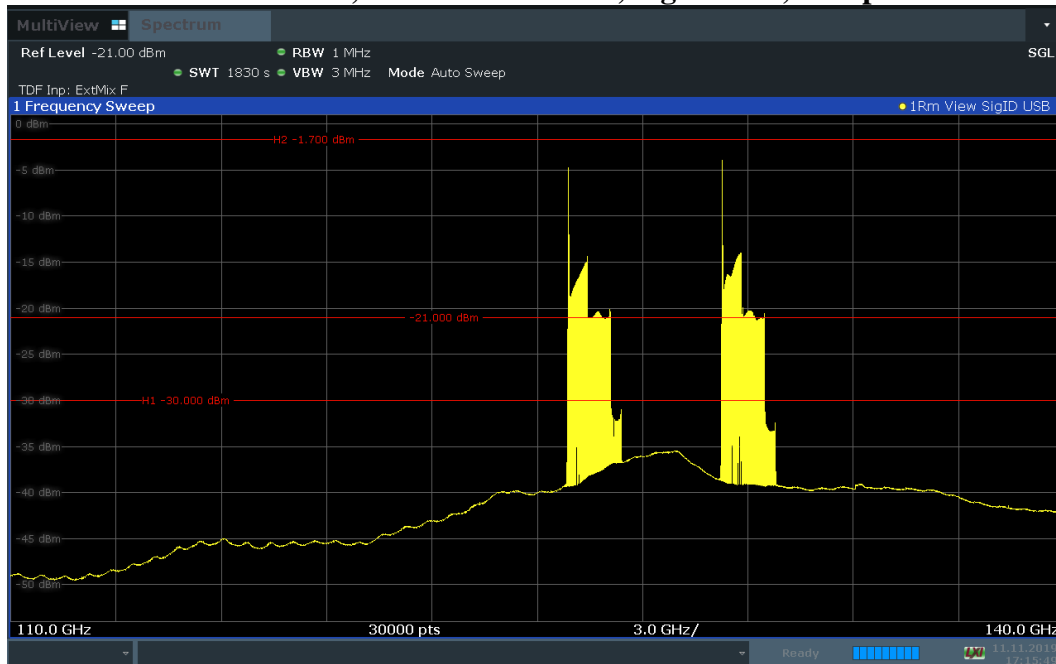
5.38. 110 GHz – 140 GHz, ANT HOR + VER, SigID LSB, sweep time: 61 s @ 1 GHz



17:15:18 11.11.2019

* Signal ID function is used. The diagram shows image signals and mixer products. The real input signal is shown, only when USB and LSD traces have the same position on the frequency axis => Apart from the noise floor no real input signal was observed. See subsection 5.8.6. in the main report. -21 dBm is a reference line from the FSW67. Limit is -1.7 dBm (FCC) and -30 dBm (ISED).

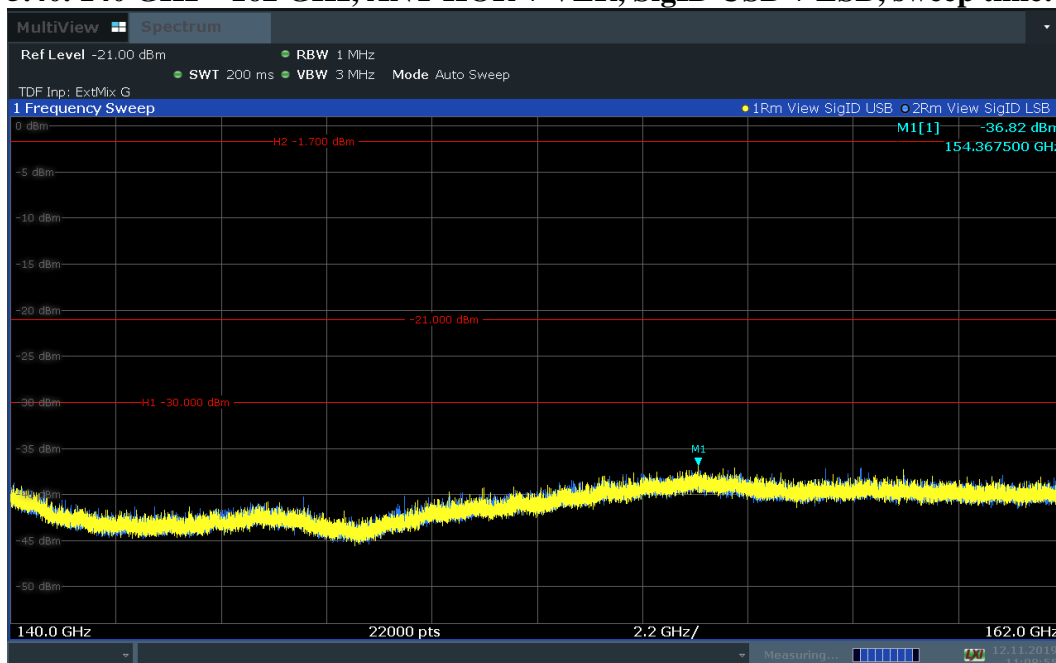
5.39. 110 GHz – 140 GHz, ANT HOR + VER, SigID USB, sweep time: 61 s @ 1 GHz



17:15:50 11.11.2019

* Signal ID function is used. The diagram shows image signals and mixer products. The real input signal is shown, only when USB and LSD traces have the same position on the frequency axis => Apart from the noise floor no real input signal was observed. See subsection 5.8.6. in the main report. -21 dBm is a reference line from the FSW67. Limit is -1.7 dBm (FCC) and -30 dBm (ISED).

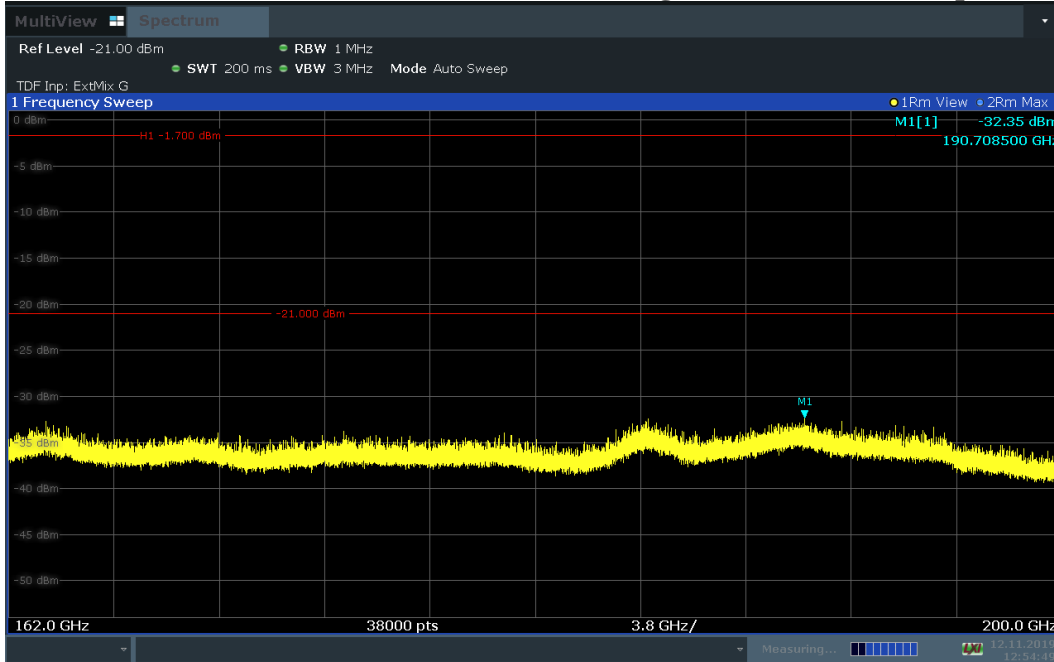
5.40. 140 GHz – 162 GHz, ANT HOR + VER, SigID USB + LSB, sweep time: 1 s



11:08:55 12.11.2019

* Signal ID function is used. The diagram shows image signals and mixer products. The real input signal is shown, only when USB and LSD traces have the same position on the frequency axis => Apart from the noise floor no real input signal was observed. See subsection 5.8.6. in the main report. -21 dBm is a reference line from the FSW67. Limit is -1.7 dBm (FCC) and -30 dBm (ISED).

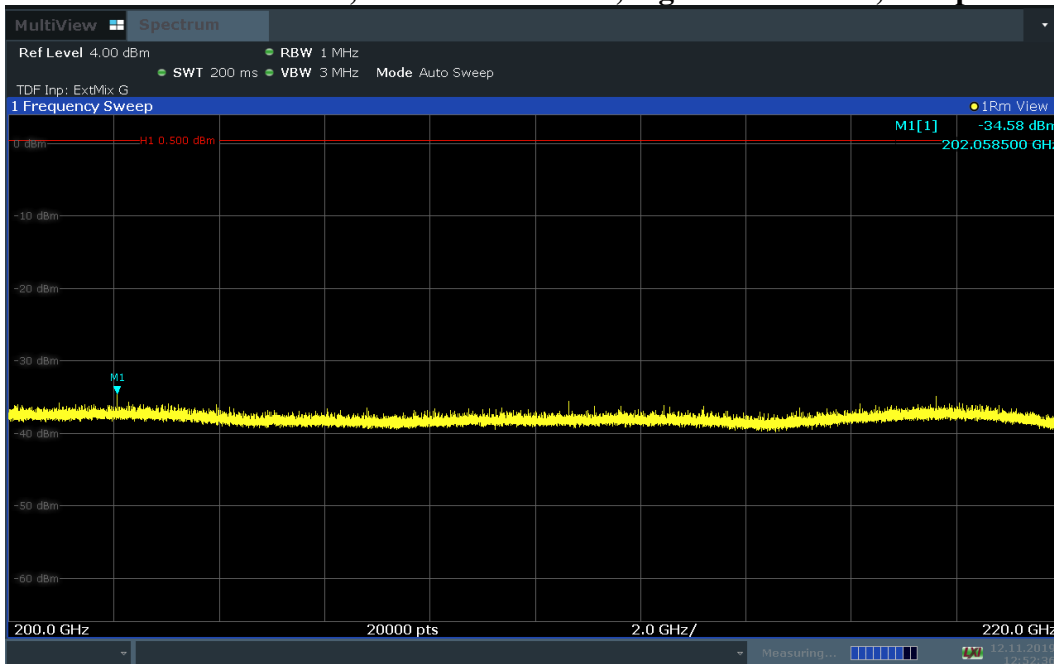
5.41. 162 GHz – 200 GHz, ANT HOR + VER, SigID USB + LSB, sweep time: 200 ms



12:54:49 12.11.2019

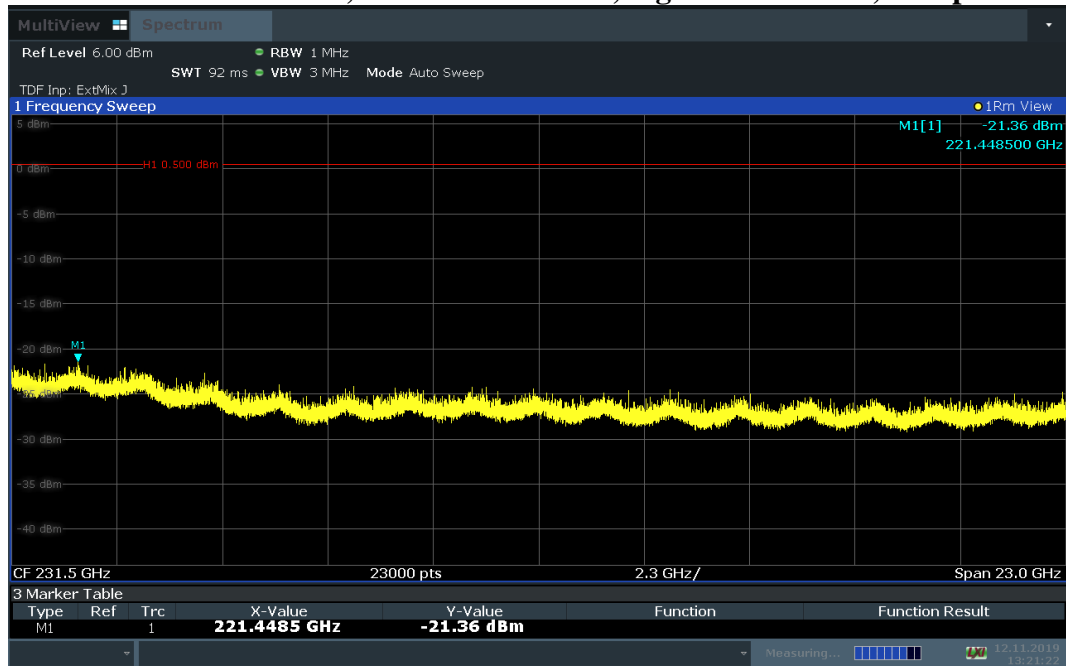
* * -21 dBm is a reference line from the FSW67. Limit is -1.7 dBm (FCC).

5.42. 200 GHz – 220 GHz, ANT HOR + VER, SigID USB + LSB, sweep time: auto



12:52:36 12.11.2019

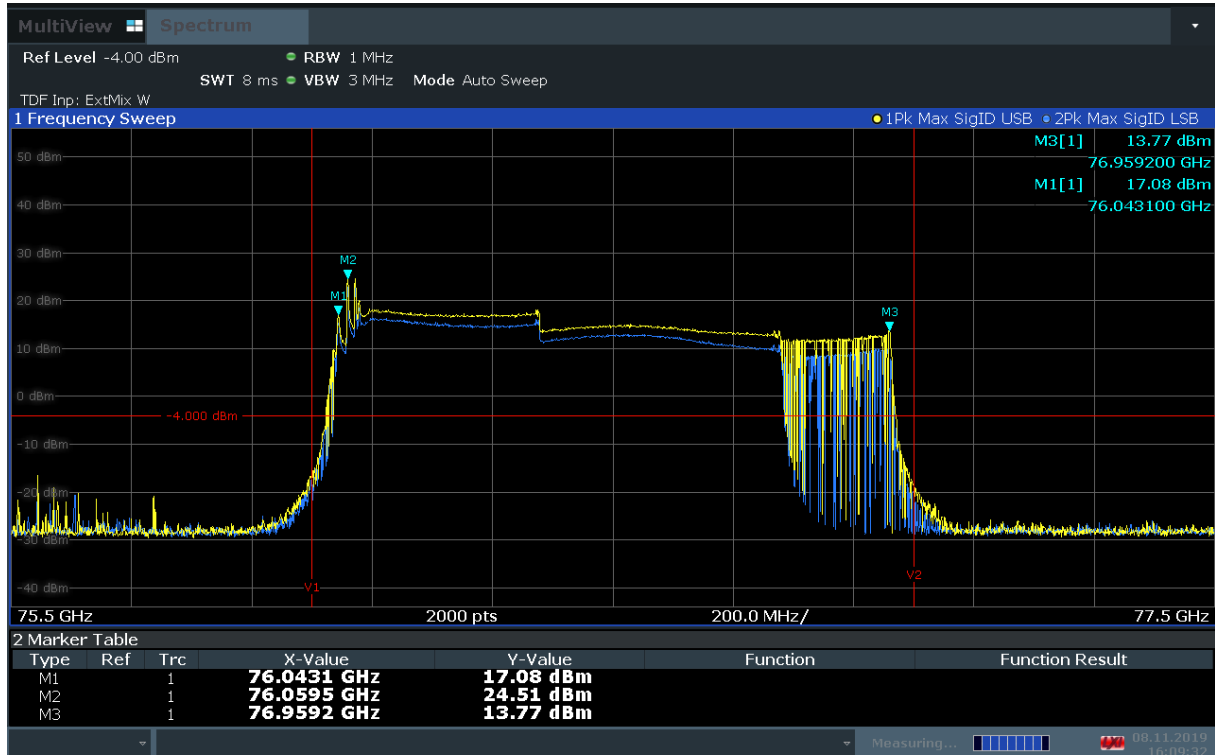
5.43. 220 GHz – 243 GHz, ANT HOR + VER, SigID USB + LSB, sweep time: auto



13:21:23 12.11.2019

6. Frequency stability

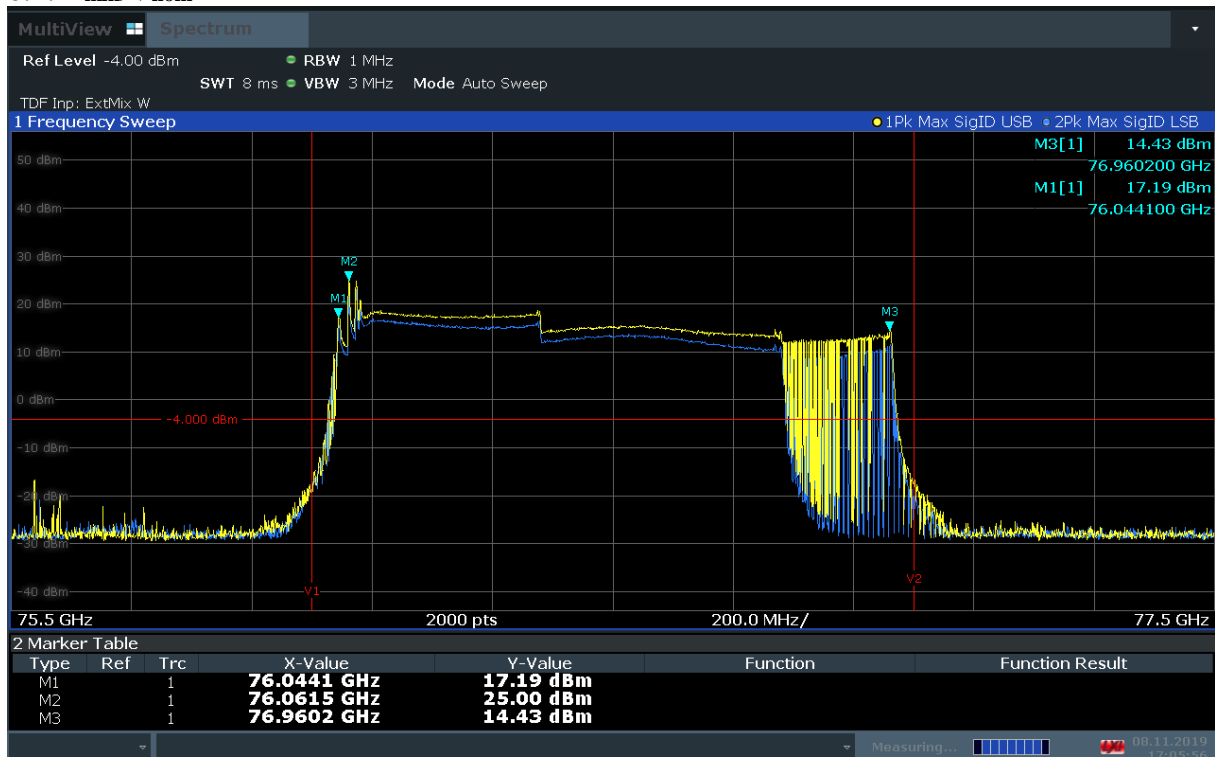
6.1. T_{nom}/V_{nom}



16:09:33 08.11.2019

* -4 dBm is a reference line from the FSW67.

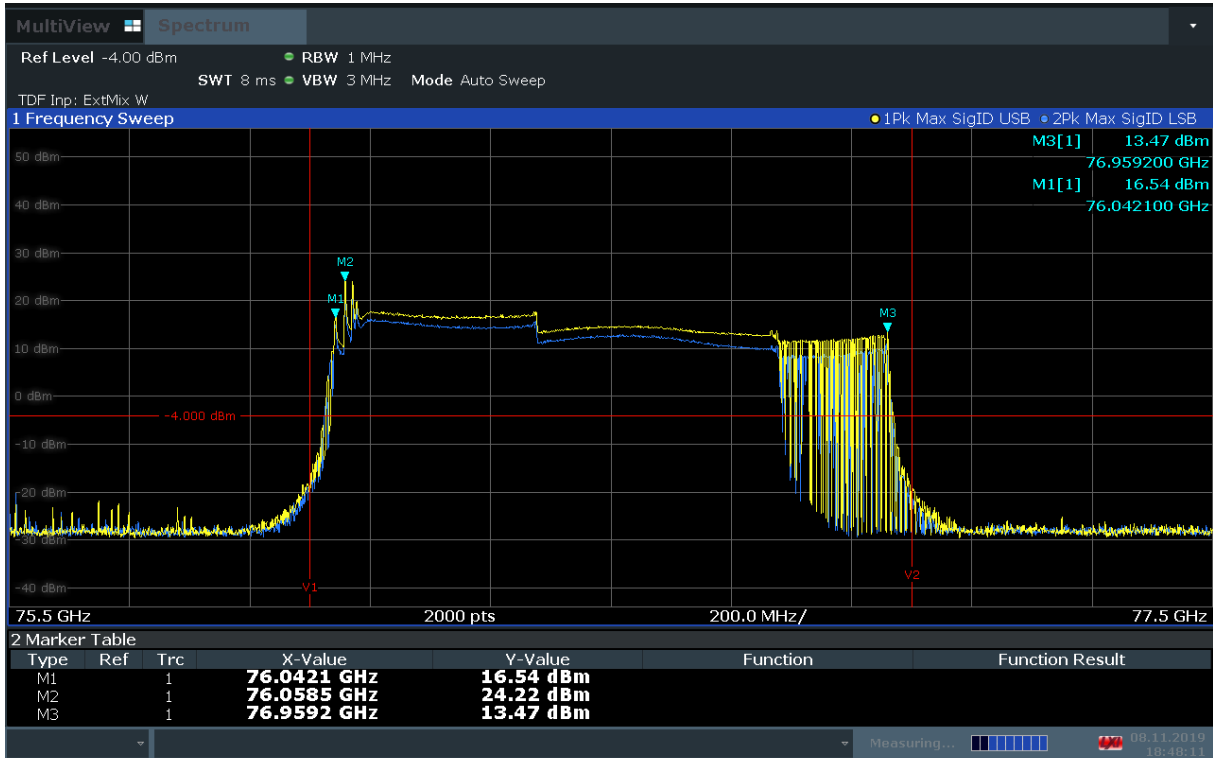
6.2. T_{min}/V_{nom}



17:05:57 08.11.2019

* -4 dBm is a reference line from the FSW67.

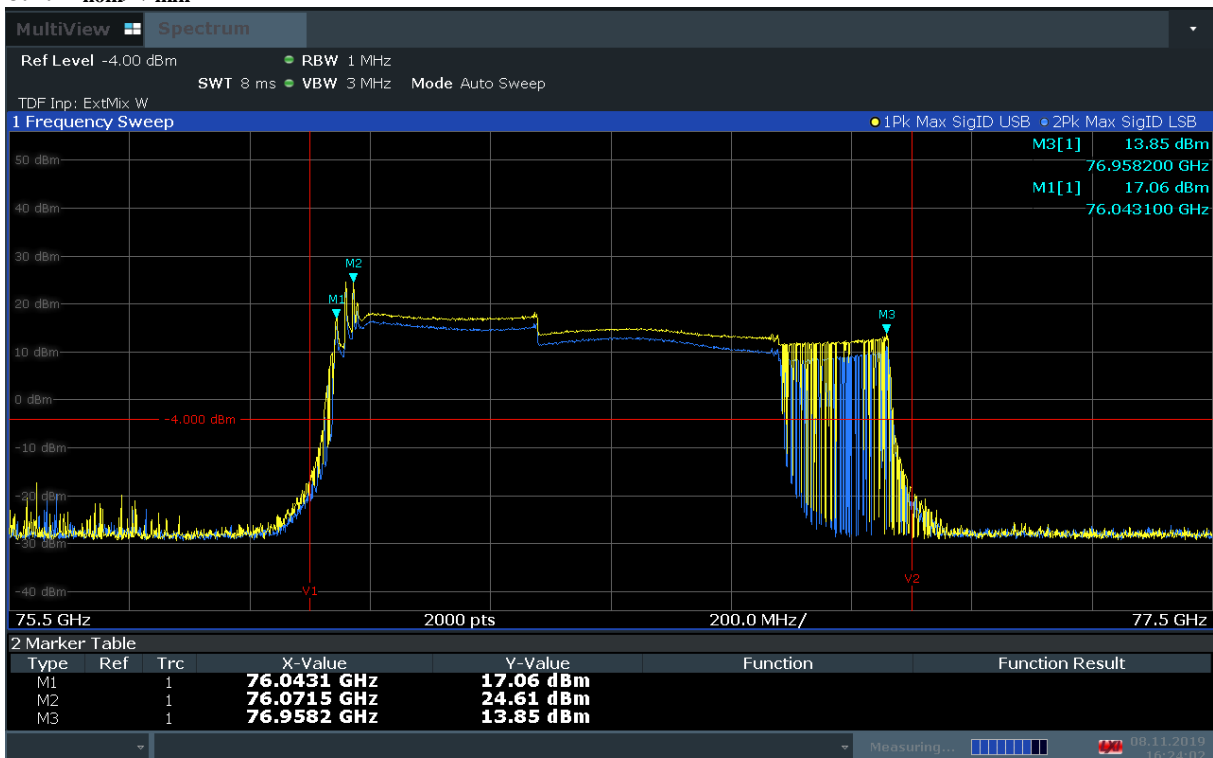
6.3. T_{max}/V_{nom}



18:48:12 08.11.2019

* -4 dBm is a reference line from the FSW67.

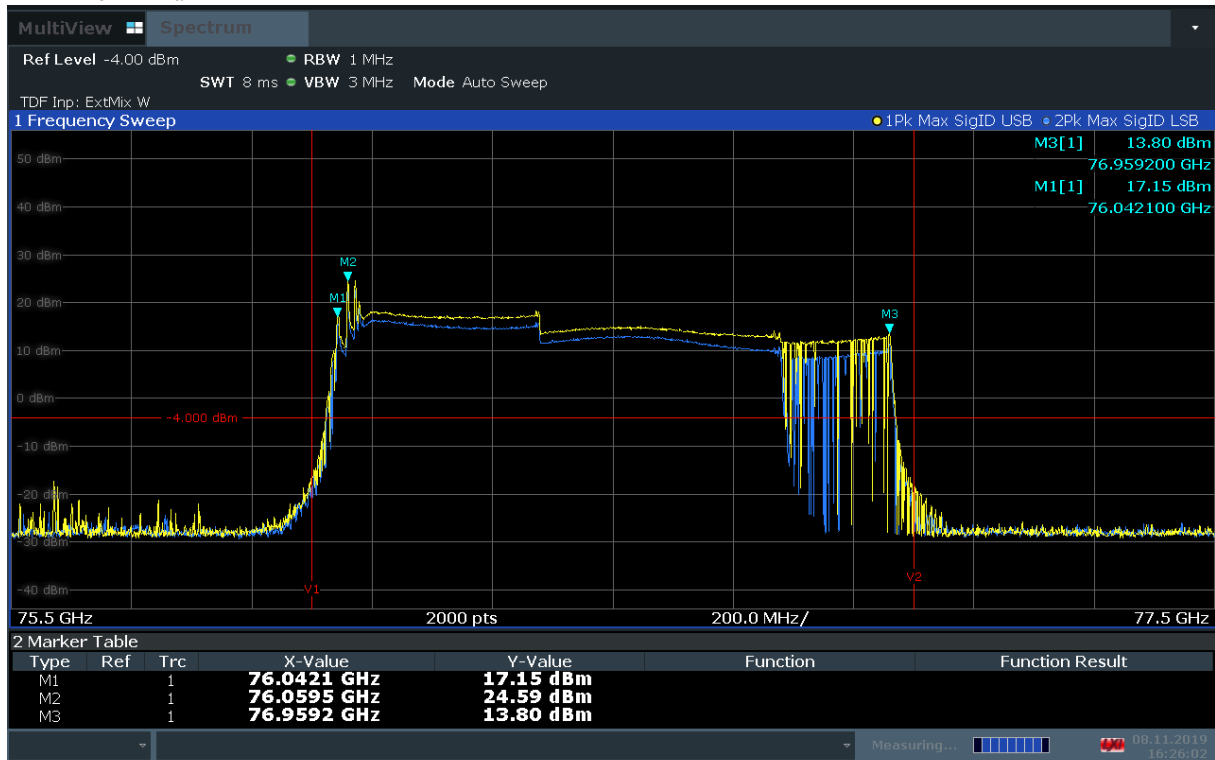
6.4. T_{nom}/V_{min}



16:24:03 08.11.2019

* -4 dBm is a reference line from the FSW67.

6.5. T_{nom}/V_{max}



16:26:03 08.11.2019

* -4 dBm is a reference line from the FSW67.