Test data, continued

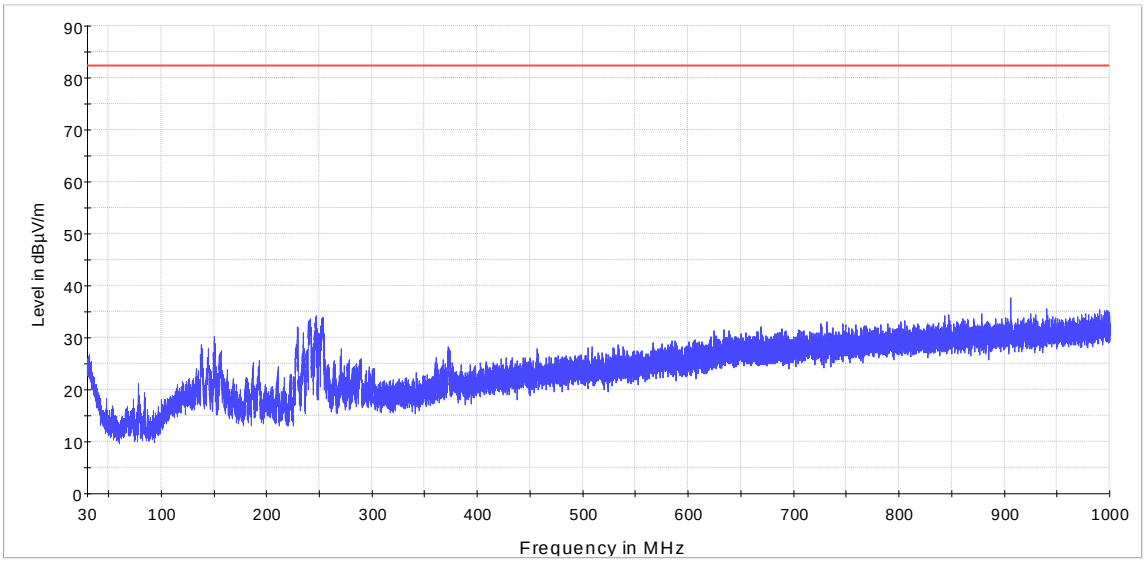


Figure 7.3-21: *Radiated spurious emissions below 1 GHz for sub-band 1, mid channel waveform* ***Y***

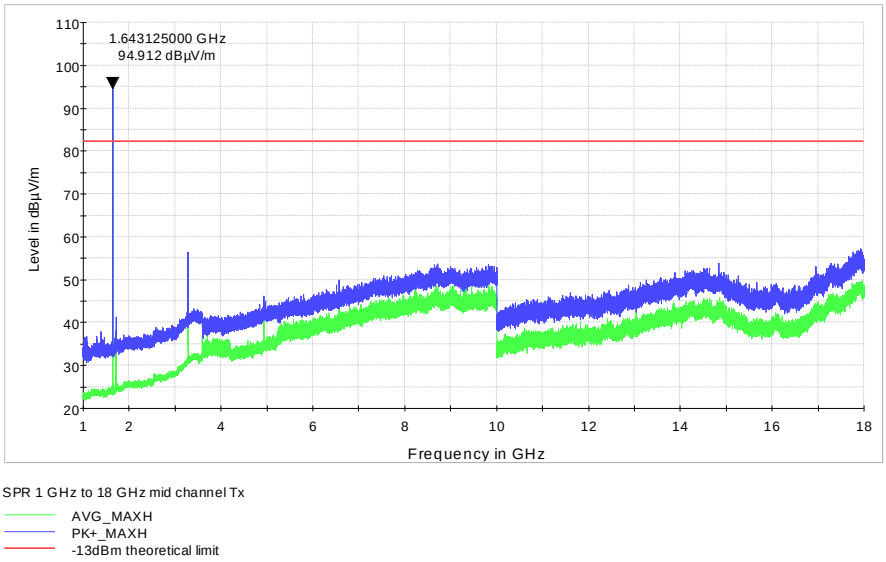
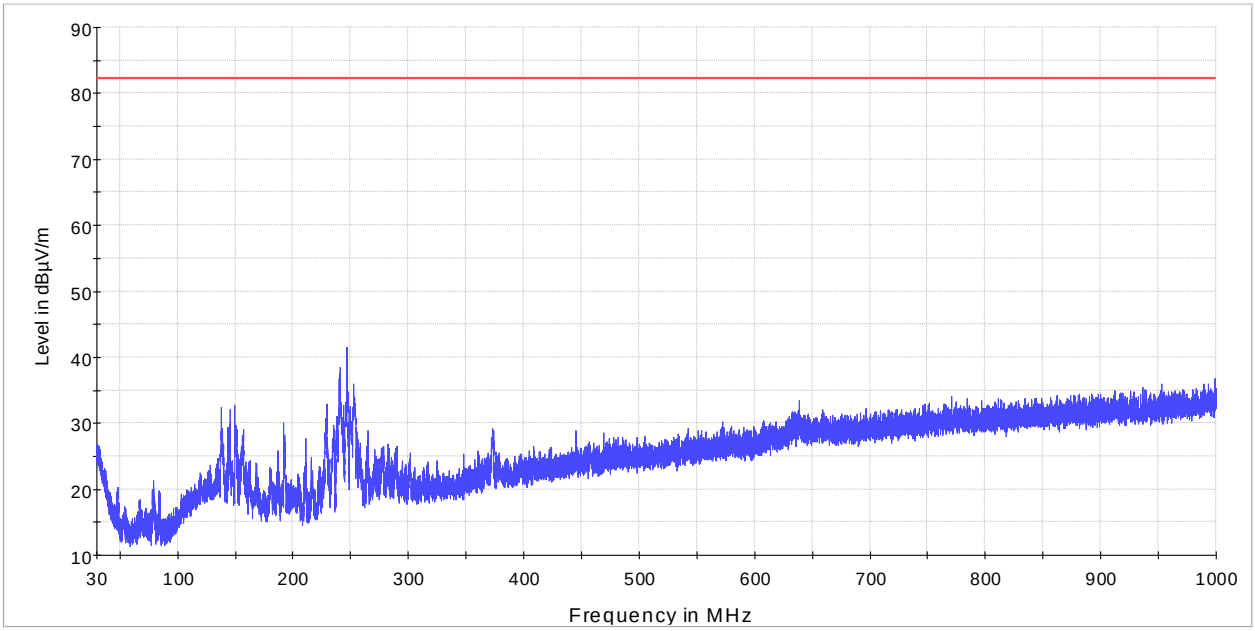


Figure 7.3-22: *Radiated spurious emissions 1 – 18 GHz for sub-band 1, mid channel waveform* ***Y***

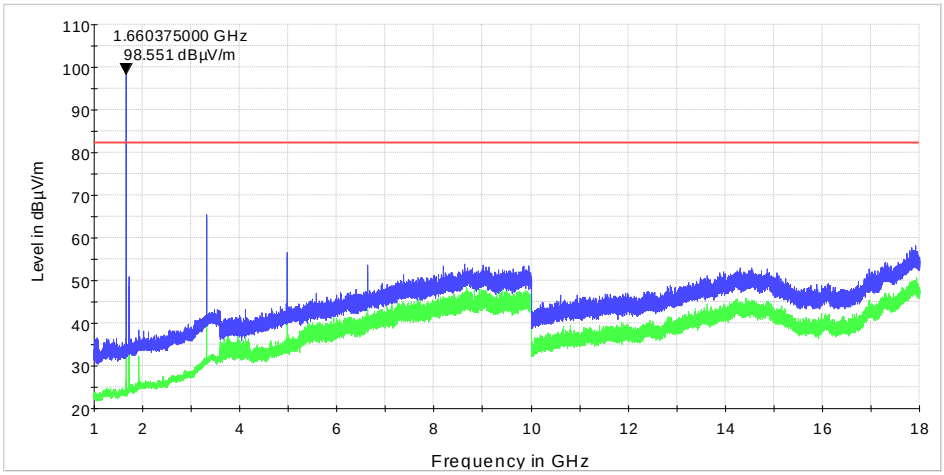
Test data, continued



SPR 30 MHz to 1 GHz high channel Tx

PK+_MAXH
-13dBm theoretical limit

Figure 7.3-23: *Radiated spurious emissions below 1 GHz for sub-band 1, high channel waveform* ***Y***

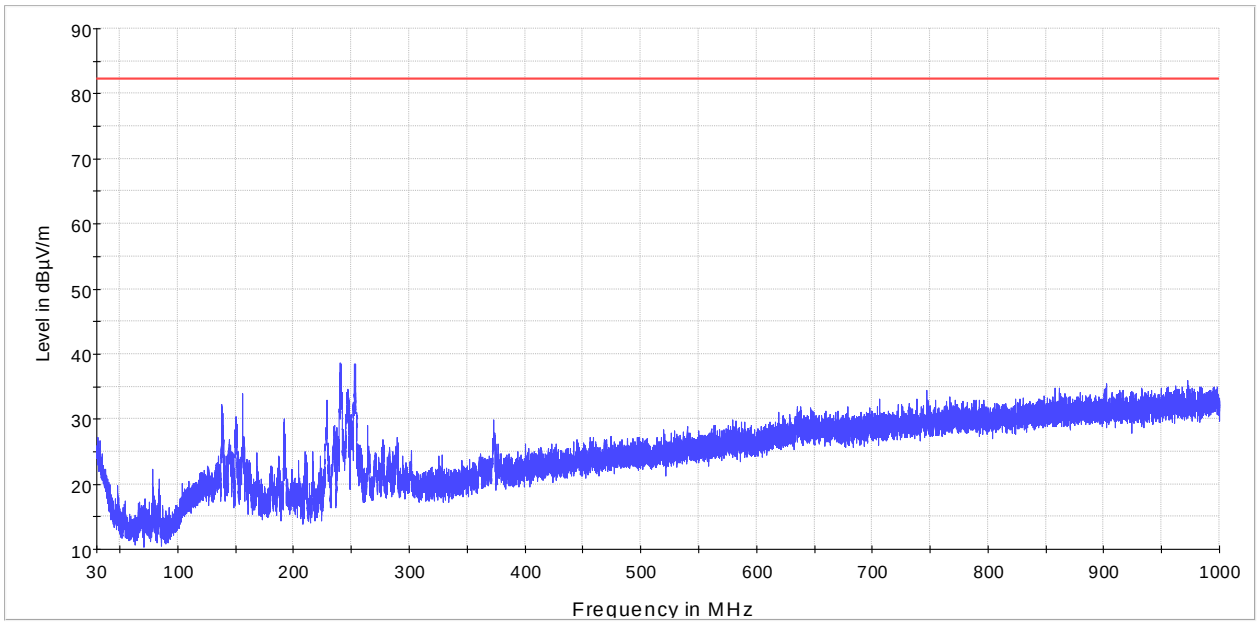


SPR 1 GHz to 18 GHz high channel Tx

AVG_MAXH
PK+_MAXH
-13dBm theoretical limit

Figure 7.3-24: *Radiated spurious emissions 1 – 18 GHz for sub-band 1, high channel waveform* ***Y***

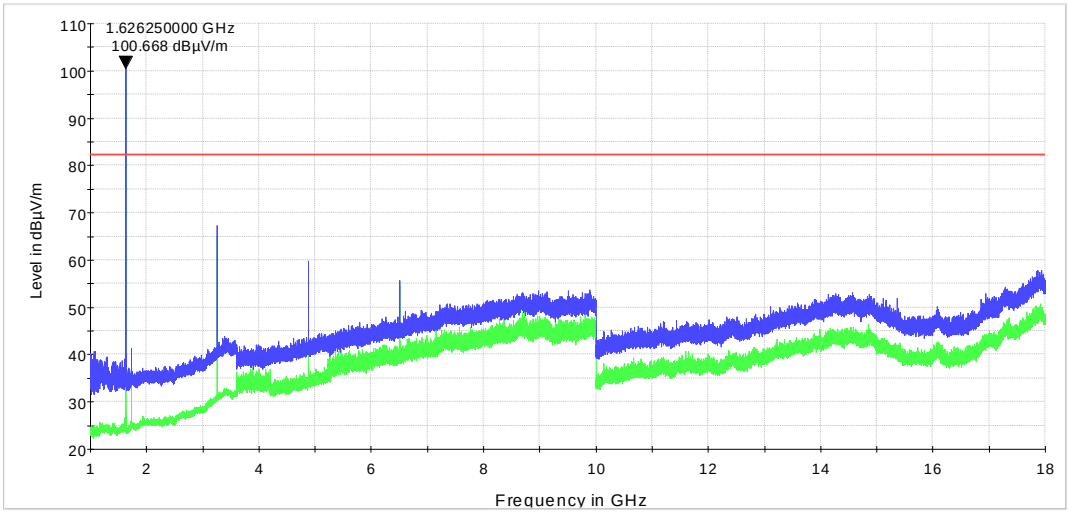
Test data, continued



SPR 30 MHz to 1 GHz low channel Tx

PK+_MAXH
-13dBm theoretical limit

Figure 7.3-25: *Radiated spurious emissions below 1 GHz for sub-band 1, low channel waveform **Z***

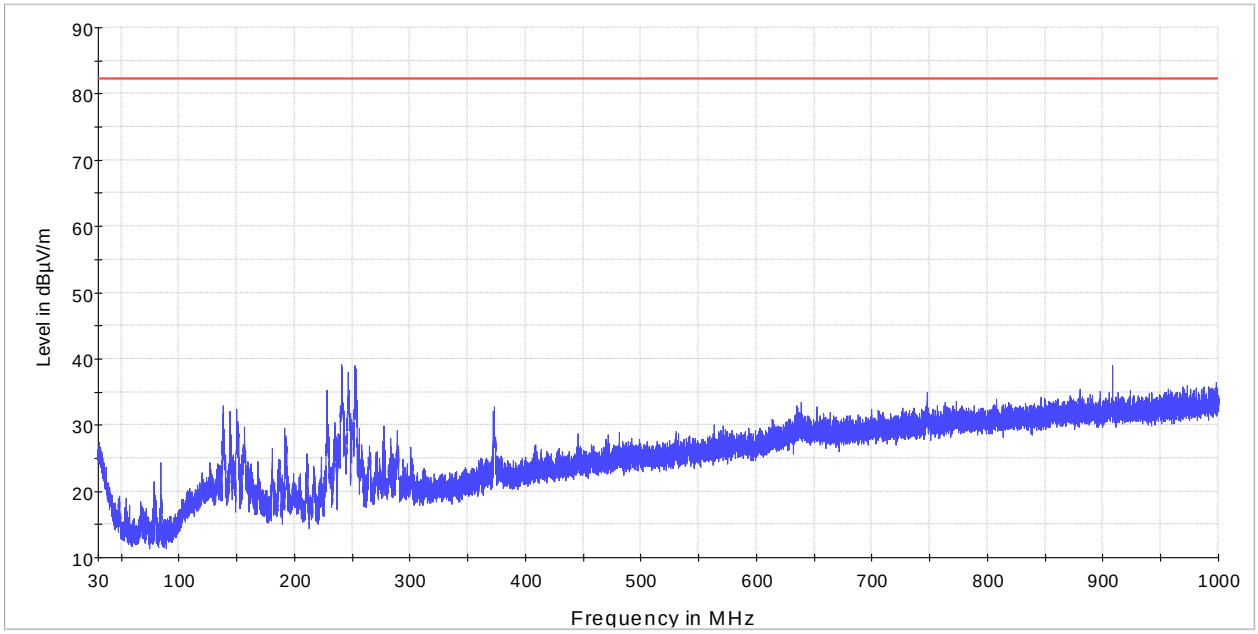


SPR 1 GHz to 18 GHz Tx low channel

AVG_MAXH
PK+_MAXH
-13dBm theoretical limit

Figure 7.3-26: *Radiated spurious emissions 1 – 18 GHz for sub-band 1, low channel waveform **Z***

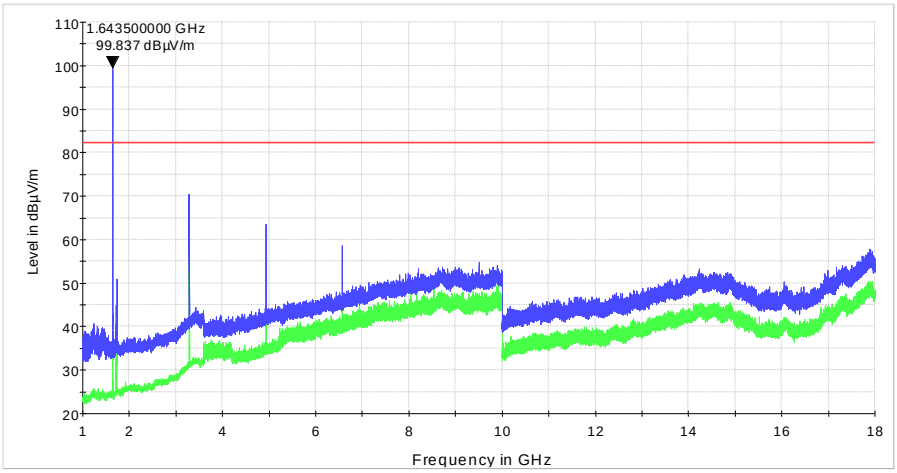
Test data, continued



SPR 30 MHz to 1 GHz mid channel Tx

PK+_MAXH
-13dBm theoretical limit

Figure 7.3-27: *Radiated spurious emissions below 1 GHz for sub-band 1, mid channel waveform* ***Z***



SPR 1 GHz to 18 GHz mid channel Tx

AVG_MAXH
PK+_MAXH
-13dBm theoretical limit

Figure 7.3-28: *Radiated spurious emissions 1 – 18 GHz for sub-band 1, mid channel waveform* ***Z***

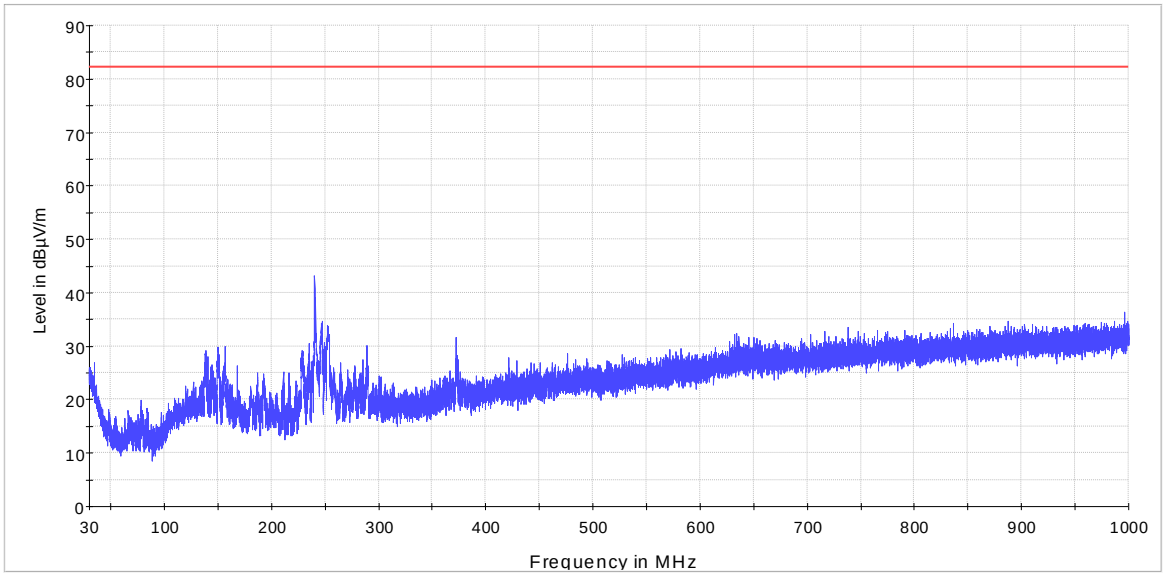


Figure 7.3-29: *Radiated spurious emissions below 1 GHz for sub-band 1, high channel waveform **Z***

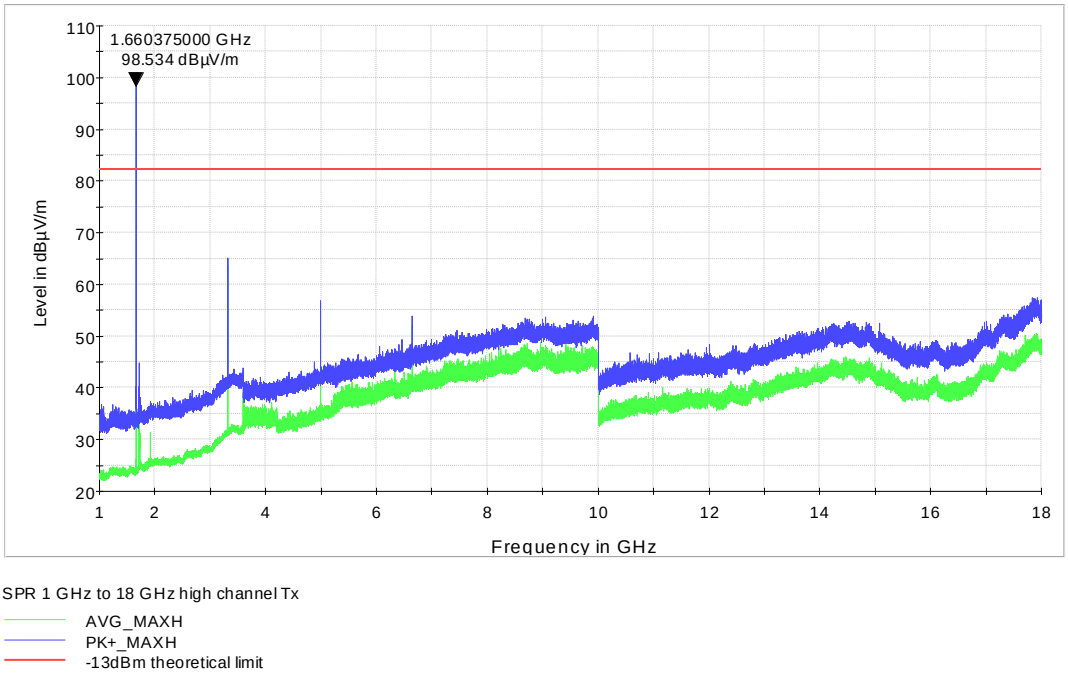


Figure 7.3-30: *Radiated spurious emissions 1 – 18 GHz for sub-band 1, high channel waveform **Z***

Test data, continued (conducted spurious emissions for waveform **J**)

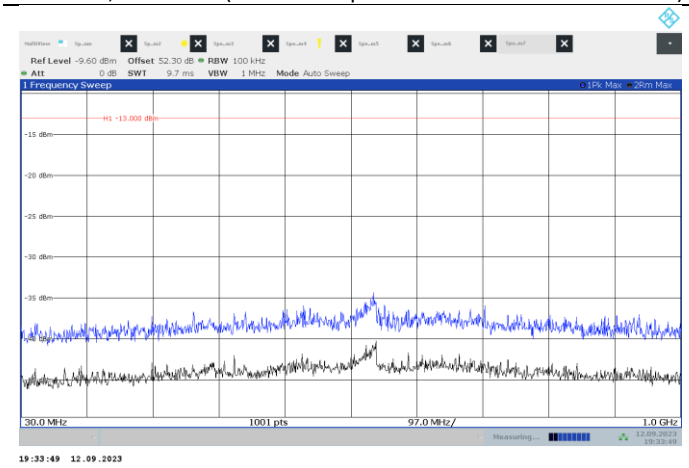


Figure 7.3-9: *Conducted spurious emissions, low channel (30-1000 MHz)*

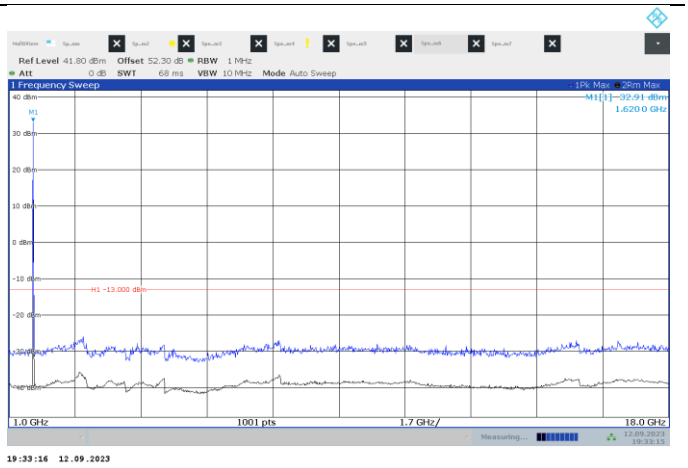


Figure 7.3-10: *Conducted spurious emissions, low channel (1-18 GHz)*

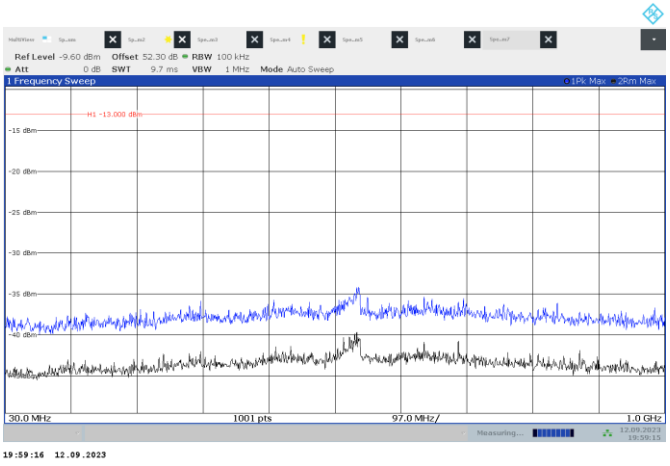


Figure 7.3-9: *Conducted spurious emissions, mid channel (30-1000 MHz)*

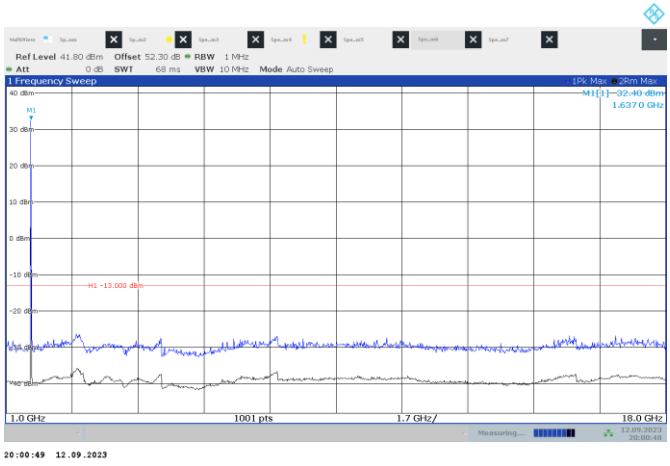
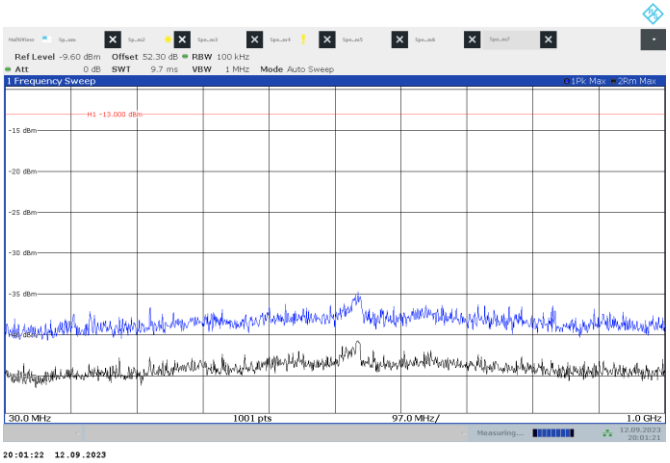


Figure 7.3-10: *Conducted spurious emissions, mid channel (1-18 GHz)*



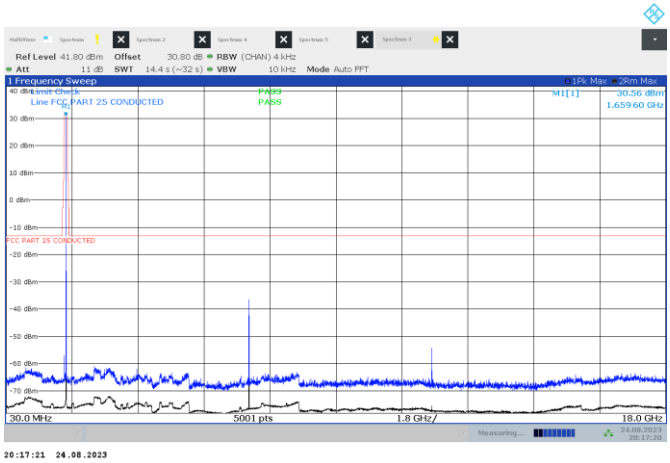


Figure 7.3-9: *Conducted spurious emissions, high channel (30-1000 MHz*

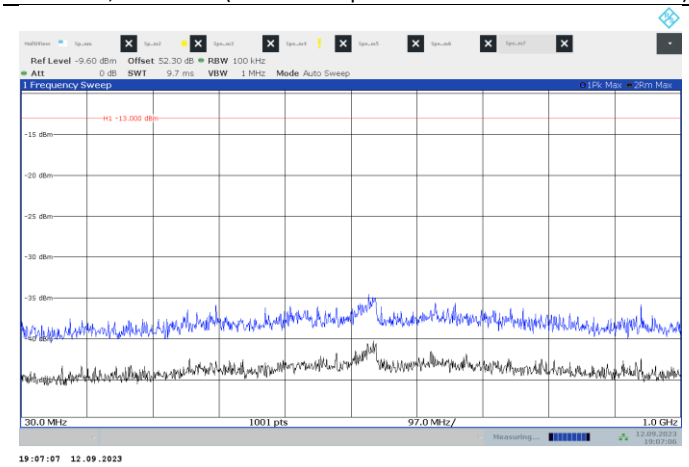
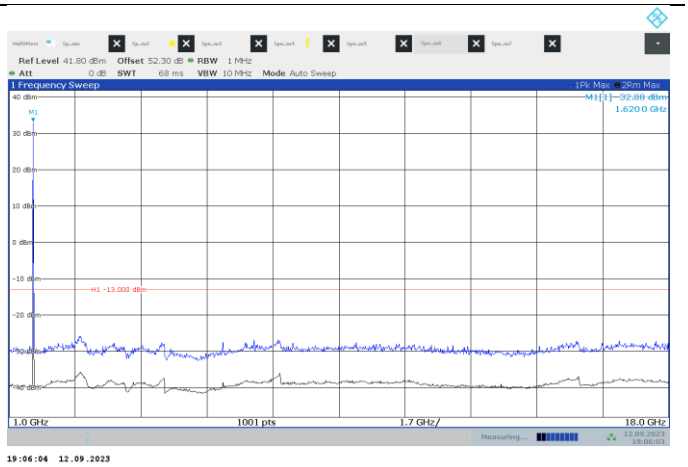


Figure 7.3-10: *Conducted spurious emissions, high channel (1-18 GHz)*



Test data, continued (conducted spurious emissions for waveform **K**)

Figure 7.3-9: *Conducted spurious emissions, low channel (30-1000 MHz)*

Figure 7.3-10: *Conducted spurious emissions, low channel(1-18 GHz)*

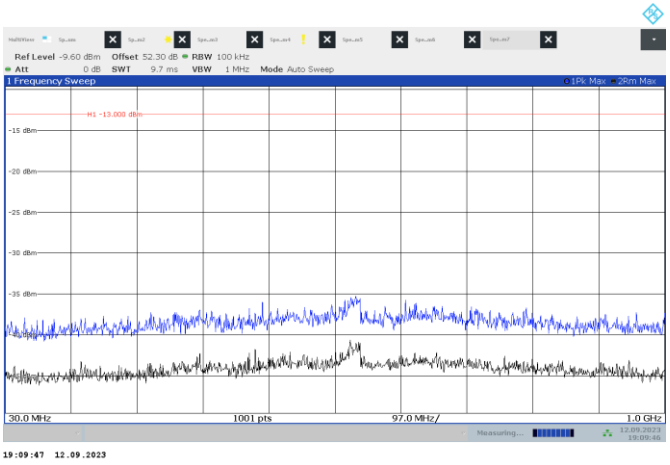


Figure 7.3-9: *Conducted spurious emissions, mid channel (30-1000 MHz)*

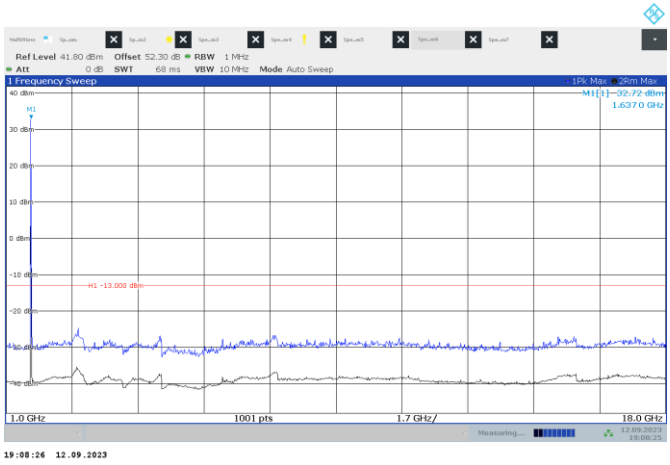
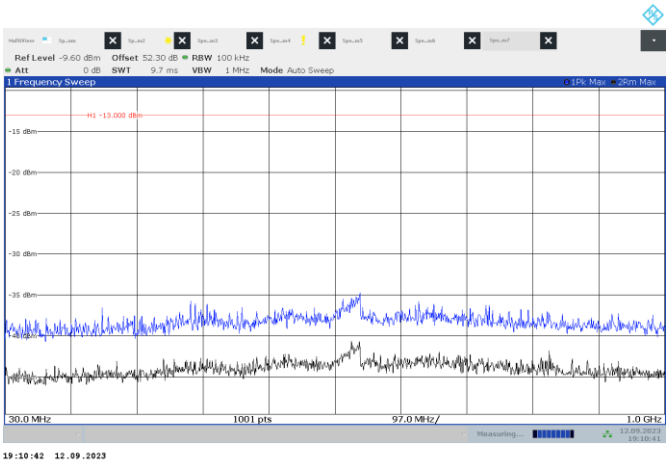


Figure 7.3-10: *Conducted spurious emissions, mid channel (1-18 GHz)*



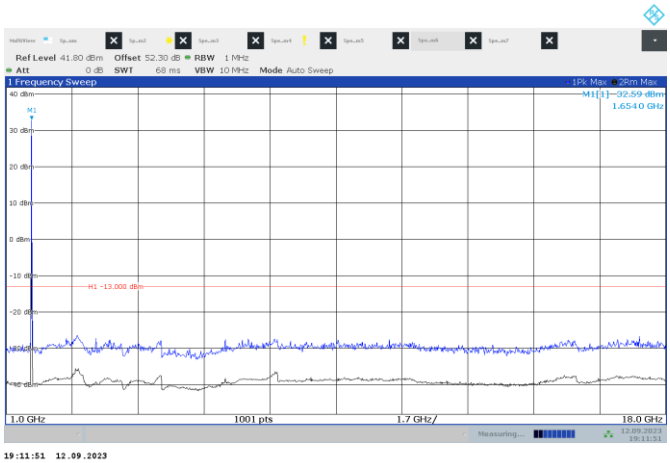


Figure 7.3-9: *Conducted spurious emissions, high channel (30-1000 MHz)*

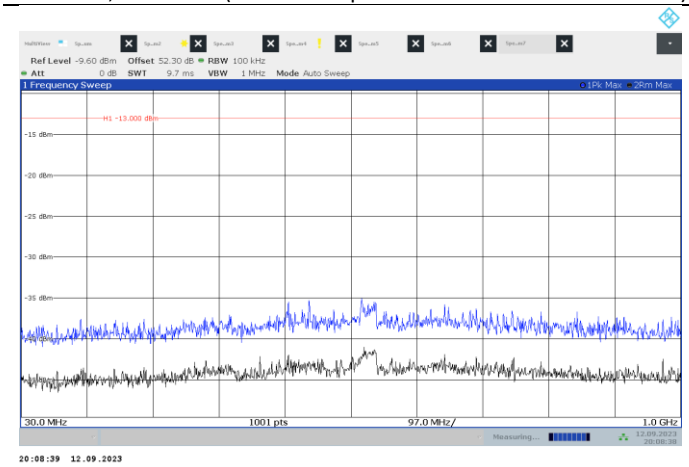
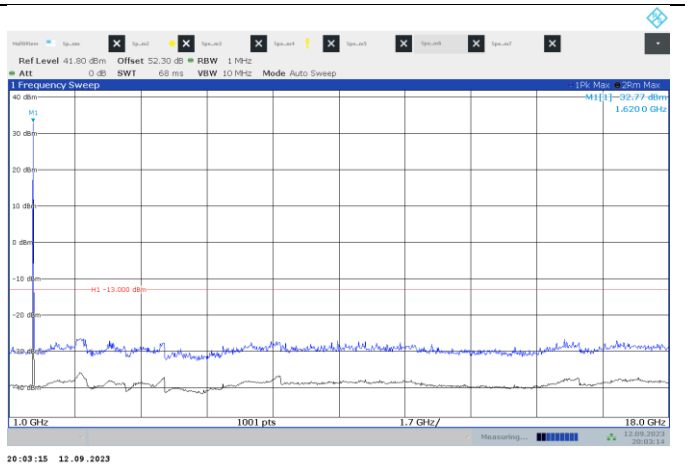


Figure 7.3-10: *Conducted spurious emissions, high channel (1-18 GHz)*



Test data, continued (conducted spurious emissions for waveform **T**)

Figure 7.3-9: *Conducted spurious emissions, low channel (30-1000 MHz)*

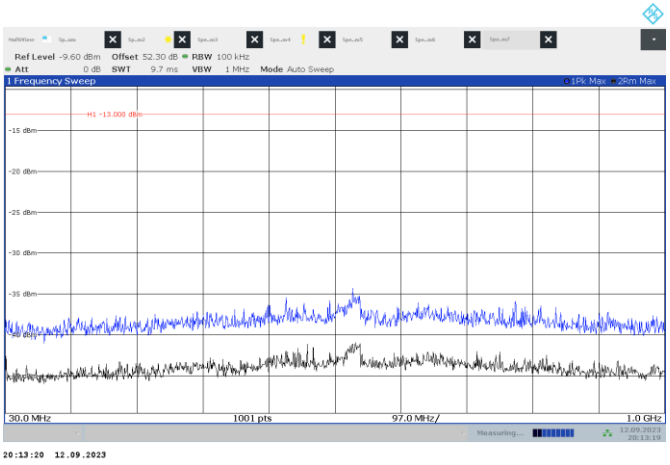


Figure 7.3-10: *Conducted spurious emissions, low channel (1-18 GHz)*

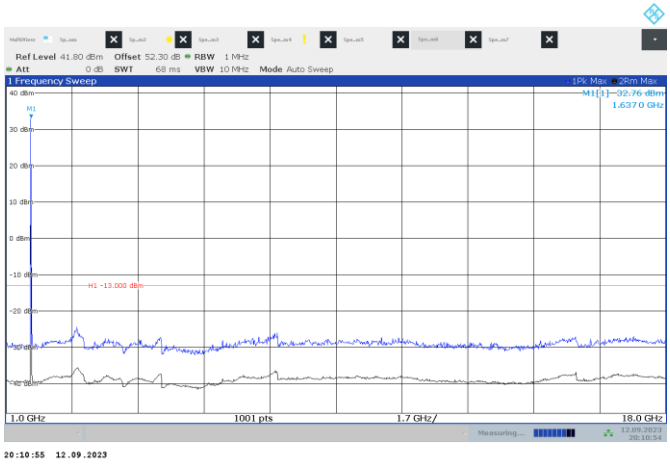


Figure 7.3-9: *Conducted spurious emissions, mid channel (30-1000 MHz)*

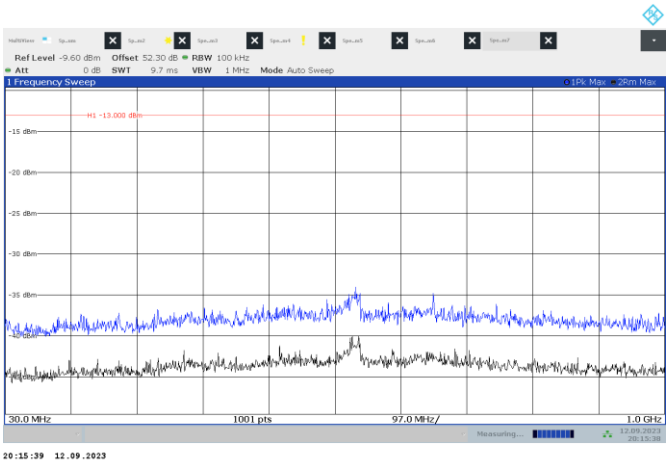


Figure 7.3-10: *Conducted spurious emissions, mid channel (1-18 GHz)*

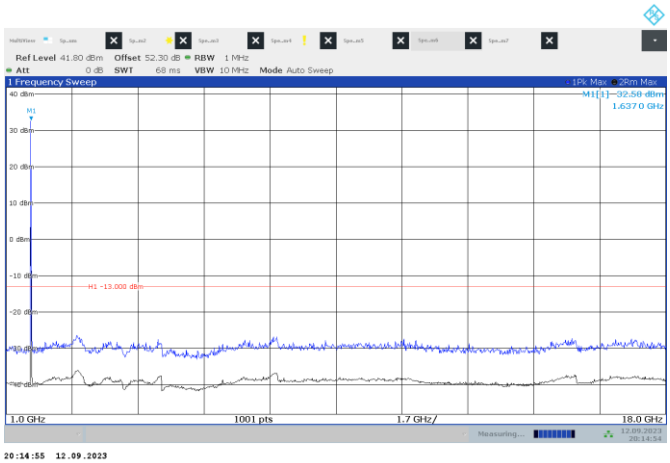


Figure 7.3-9: *Conducted spurious emissions, high channel (30-1000 MHz)*

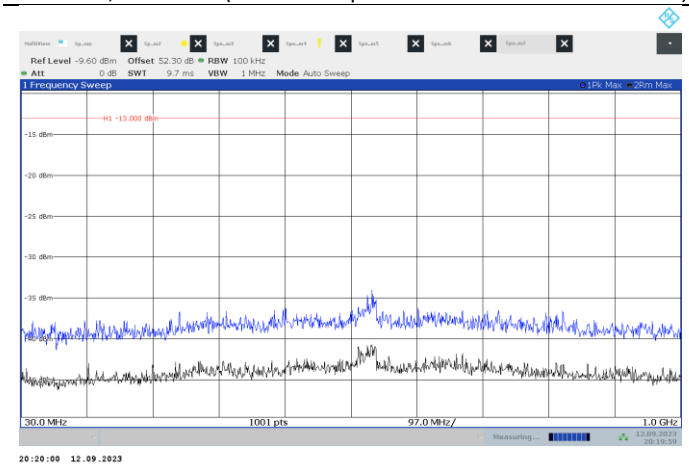
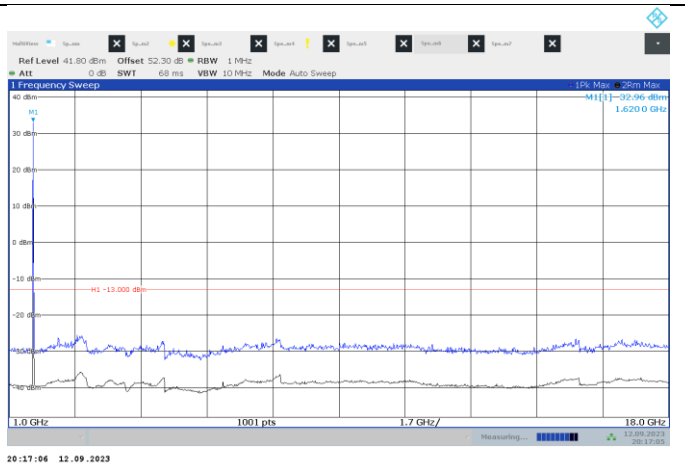


Figure 7.3-10: *Conducted spurious emissions, high channel (1-18 GHz)*



Test data, continued (conducted spurious emissions for waveform **Y**)

Figure 7.3-9: *Conducted spurious emissions, low channel (30-1000 MHz)*

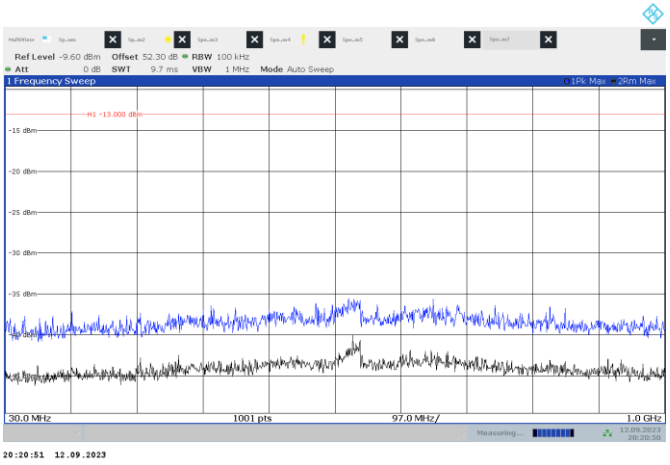


Figure 7.3-10: *Conducted spurious emissions, low channel (1-18 GHz)*

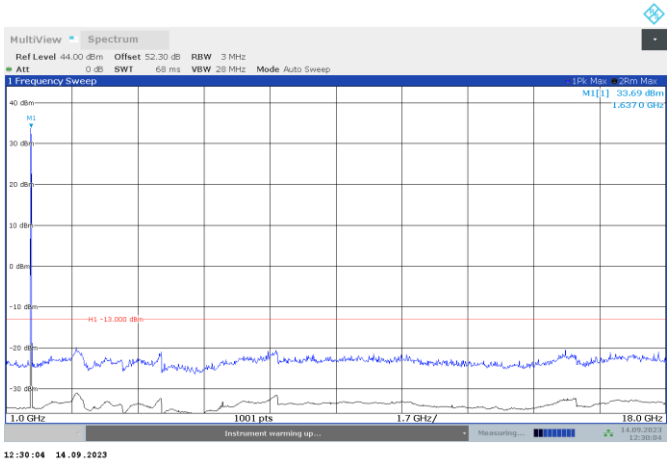


Figure 7.3-9: *Conducted spurious emissions, mid channel (30-1000 MHz)*

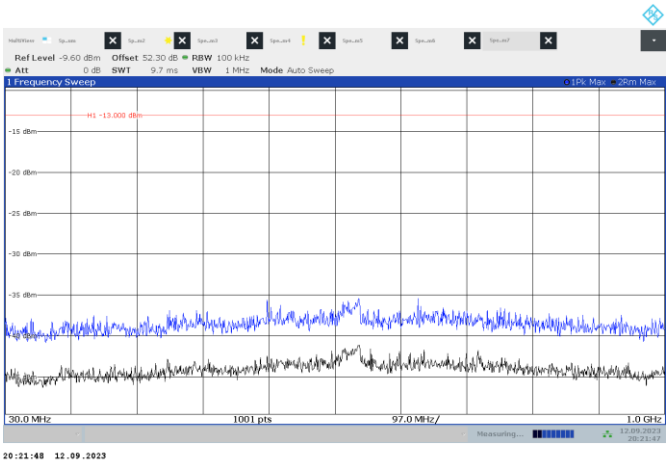


Figure 7.3-10: *Conducted spurious emissions, mid channel (1-18 GHz)*

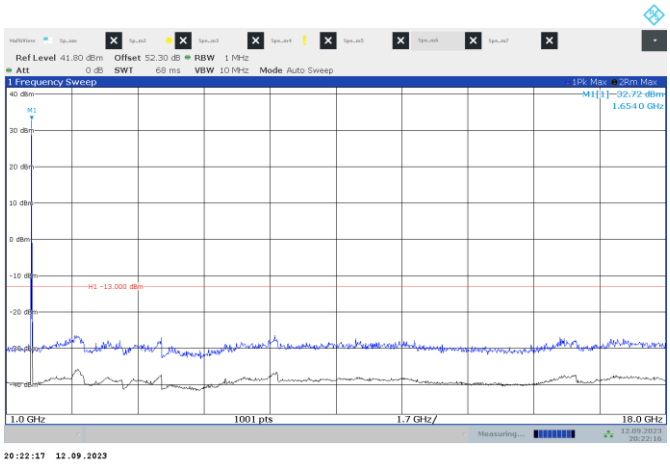


Figure 7.3-9: *Conducted spurious emissions, high channel (30-1000 MHz)*

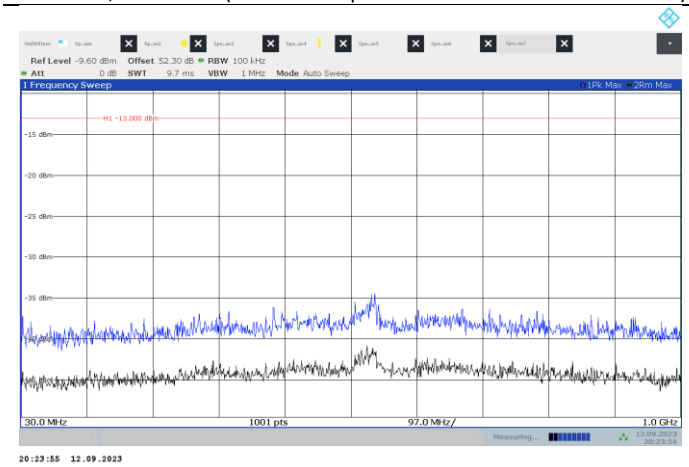
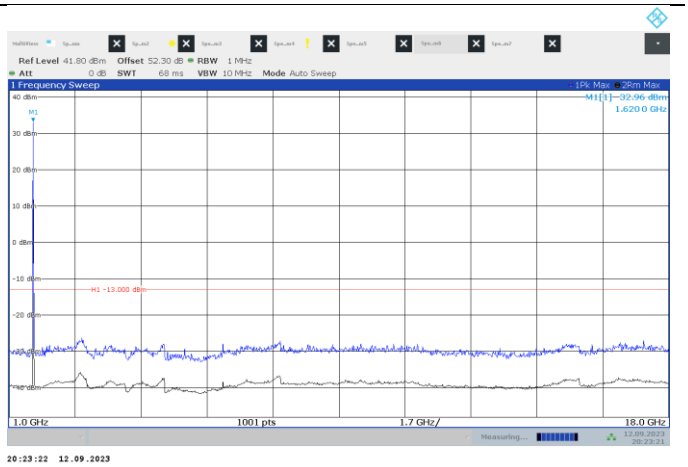


Figure 7.3-10: *Conducted spurious emissions, high channel (1-18 GHz)*



Test data, continued (conducted spurious emissions for waveform **Z**)

Figure 7.3-9: *Conducted spurious emissions, low channel (30-1000 MHz)*

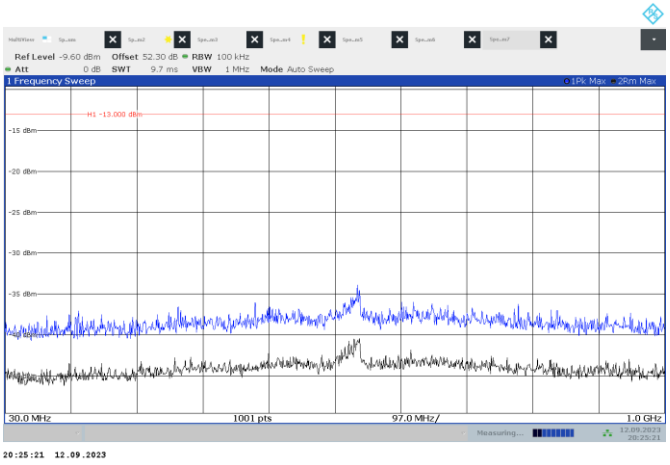


Figure 7.3-10: *Conducted spurious emissions, low channel (1-18 GHz)*

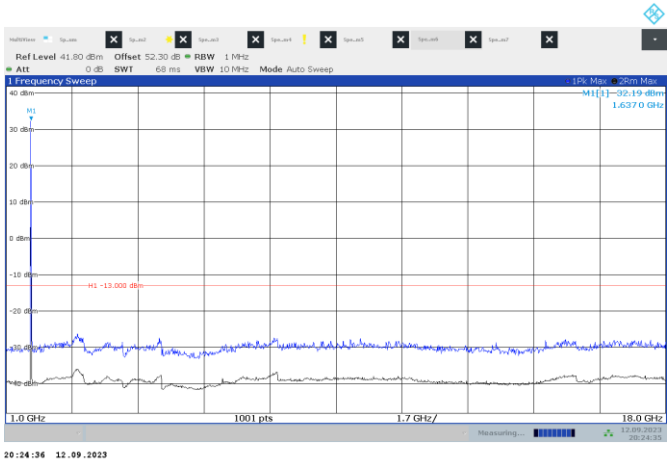


Figure 7.3-9: *Conducted spurious emissions, mid channel (30-1000 MHz)*

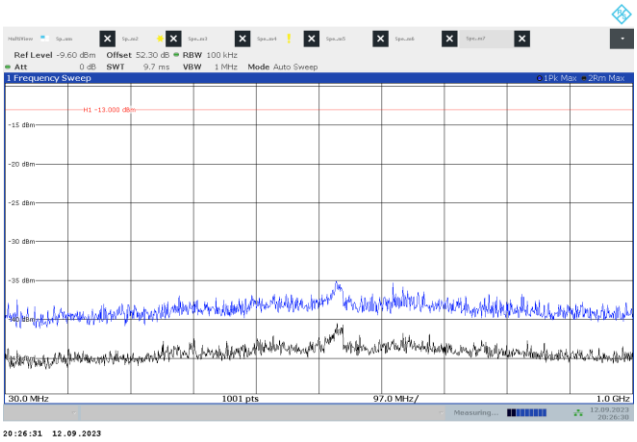


Figure 7.3-10: *Conducted spurious emissions, mid channel (1-18 GHz)*

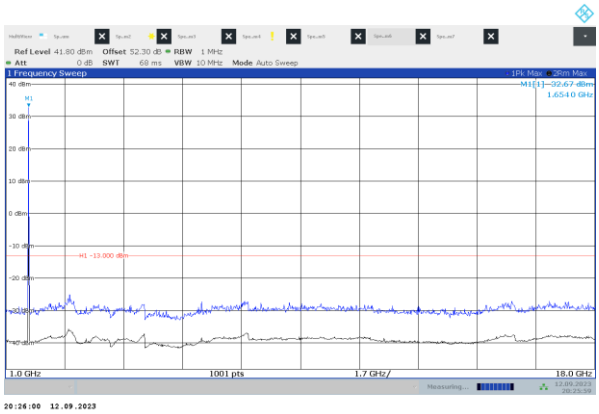


Figure 7.3-9: *Conducted spurious emissions, high channel (30-1000 MHz)*

Figure 7.3-10: *Conducted spurious emissions, high channel (1-18 GHz)*

Test data, continued

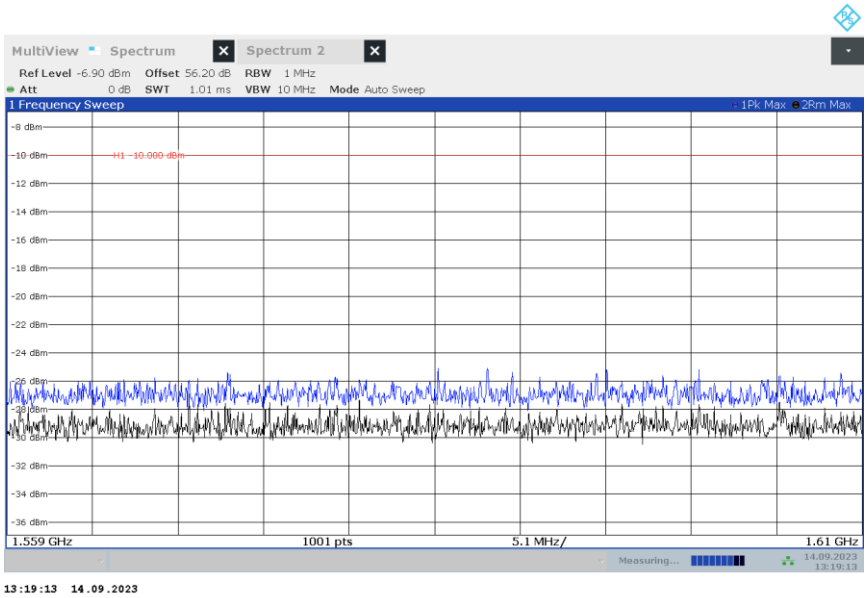


Figure 7.3-31: *Radiated spurious emissions 1559–1610 MHz, carrier-off*

7.4 FCC 25.202(d) and RSS-170 5.3 Frequency tolerance, Earth stations

7.4.1 References, definitions and limits

FCC §25.202:

(d) **Frequency tolerance, Earth stations.**
The carrier frequency of each earth station transmitter authorized in these services shall be maintained within 0.001 percent (±10 ppm) of the reference frequency.

FCC 2.1055:

(a) The frequency stability shall be measured with variation of ambient temperature as follows:
(1) From −30°C to +50°C for all equipment except that specified in paragraphs (a)(2) and (3) of this section

(b) Frequency measurements shall be made at the extremes of the specified temperature range and at intervals of not more than 10 °C through the range.

(d) The frequency stability shall be measured with variation of primary supply voltage as follows:
(1) Vary primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment.

RSS-170, Clause 5.3:

For mobile earth station equipment, the carrier frequency shall not depart from the reference frequency by more than ±10 ppm.

7.4.2 Test summary

Verdict	Pass		
Test date	August 24, 2023	Temperature	22 °C
Tested by	Hossein Zamani	Air pressure	1011 mbar
Test location	Montreal	Relative humidity	32.1 %

7.4.3 Observations, settings and special notes

Frequency stability measurements were performed with reference to ANSI 63.26 section 5.6.3 and section 5.6.5

Offset was calculated as per the following formula: $\frac{F_{Measured} - F_{reference}}{F_{reference}} \times 1 \cdot 10^6$

Waveform Z has been specifically selected to represent the worst case test scenario.

Spectrum analyser settings:

Resolution bandwidth:	20 Hz
Video bandwidth:	≥3 × RBW
Detector mode:	Peak
Trace mode:	Max Hold

7.4.4 Test data

Table 7.4-1: *Frequency tolerance measurement result – Low channel*

Test conditions	Frequency, GHz	Offset, ppm	Limit, ±ppm	Margin, ppm
+50 °C, Nominal	1.626511900	1.0	10.00	9.0
+40 °C, Nominal	1.626511700	0.9	10.00	9.1
+30 °C, Nominal	1.626511100	0.5	10.00	9.5
+20 °C, +15 %	1.626511400	0.7	10.00	9.3
+20 °C, Nominal	1.626510310		**Reference**	
+20 °C, -15 %	1.626514100	2.3	10.00	7.7
+10 °C, Nominal	1.626509000	0.8	10.00	9.2
0 °C, Nominal	1.626510900	0.4	10.00	9.6
−10 °C, Nominal	1.626510900	0.4	10.00	9.6
−20 °C, Nominal	1.626507100	2.0	10.00	8.0
−30 °C, Nominal	1.626511900	0.2	10.00	9.8

Table 7.4-2: *Frequency tolerance measurement result – Mid channel*

Test conditions	Frequency, GHz	Offset, ppm	Limit, ±ppm	Margin, ppm
+50 °C, Nominal	1.643500000	0.1	10.00	9.9
+40 °C, Nominal	1.643501000	0.5	10.00	9.5
+30 °C, Nominal	1.643498000	1.3	10.00	8.7
+20 °C, +15 %	1.643500300	0.1	10.00	9.9
+20 °C, Nominal	1.643500100		**Reference**	
+20 °C, -15 %	1.643500200	0.1	10.00	9.9
+10 °C, Nominal	1.643500000	0.1	10.00	9.9
0 °C, Nominal	1.643499400	0.4	10.00	9.6
−10 °C, Nominal	1.643500300	0.1	10.00	9.9
−20 °C, Nominal	1.643500100	0.0	10.00	10.0
−30 °C, Nominal	1.643497000	1.9	10.00	8.1

Table 7.4-3: *Frequency tolerance measurement result – High channel*

Test conditions	Frequency, GHz	Offset, ppm	Limit, ±ppm	Margin, ppm
+50 °C, Nominal	1.660496400	2.6	10.00	7.4
+40 °C, Nominal	1.660495400	2.0	10.00	8.0
+30 °C, Nominal	1.660495600	2.1	10.00	7.9
+20 °C, +15 %	1.660495500	2.0	10.00	8.0
+20 °C, Nominal	1.660492100		**Reference**	
+20 °C, -15 %	1.660495000	1.7	10.00	8.3
+10 °C, Nominal	1.660495600	2.1	10.00	7.9
0 °C, Nominal	1.660494800	1.6	10.00	8.4
−10 °C, Nominal	1.660495080	1.8	10.00	8.2
−20 °C, Nominal	1.660494000	1.1	10.00	8.9
−30 °C, Nominal	1.660496400	2.3	10.00	7.7

7.5 FCC 25.216 and RSS-170 5.9 Limits on emissions from mobile earth stations for protection of aeronautical radionavigation-satellite service

7.5.1 References, definitions and limits

FCC §25.216:

(c) The e.i.r.p. density of emissions from mobile earth stations with assigned uplink frequencies between 1610 MHz and 1660.5 MHz shall not exceed −70 dBW/MHz (−40 dBm/MHz), averaged over any 2 millisecond active transmission interval, in the band 1559–1605 MHz. The e.i.r.p. of discrete emissions of less than 700 Hz bandwidth from such stations shall not exceed −80 dBW (−50 dBm), averaged over any 2 millisecond active transmission interval, in the 1559–1605 MHz band.

(f) Mobile earth stations with assigned uplink frequencies in the 1610–1660.5 MHz band shall suppress the power density of emissions in the 1605–1610 MHz band to an extent determined by linear interpolation from −70 dBW/MHz (−40 dBm/MHz) at 1605 MHz to −10 dBW/MHz (20 dBm/MHz) at 1610 MHz.

RSS-170, Clause 5.9:

5.9.2 Mobile earth stations with transmitting frequencies between 1626.5 and 1660.5 MHz shall have the e.i.r.p. density of unwanted emissions in the band 1605–1610 MHz, averaged over any 2 ms active transmission interval, not exceed the following limits:
(1) −70 dBW/MHz (−40 dBm/MHz) at 1605 MHz, linearly interpolated to −46 dBW/MHz (−16 dBm/MHz) at 1610 MHz, for broadband emissions; and
(2) −80 dBW/kHz (−50 dBm/kHz) at 1605 MHz, linearly interpolated to −56 dBW/kHz (−26 dBm/kHz) at 1610 MHz, for discrete emissions.

7.5.2 Test summary

Verdict	Pass		
Test date	September 12, 2023	Temperature	24 °C
Tested by	Hossein Zamani Zardehsavari	Air pressure	1008 mbar
Test location	Montreal	Relative humidity	48 %

7.5.3 Observations, settings, and special notes

Spectrum analyser settings:

Resolution bandwidth	1 MHz
Video bandwidth	3 MHz
Detector mode	RMS
Trace mode	Max-hold

7.5.4 Test data

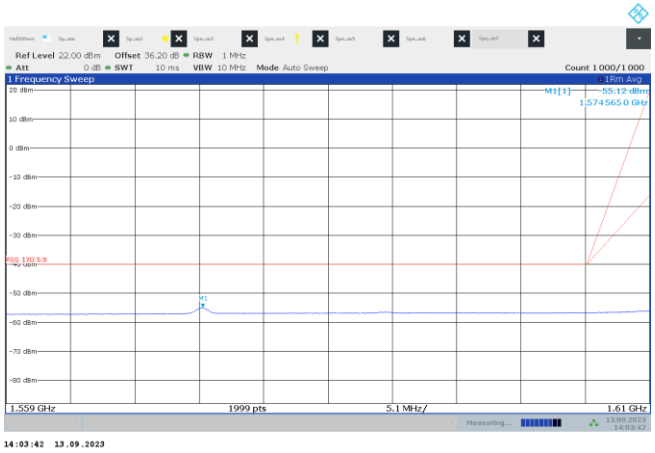


Figure 7.5-1: spurious emissions 1559–1610 MHz, Waveform J, low channel

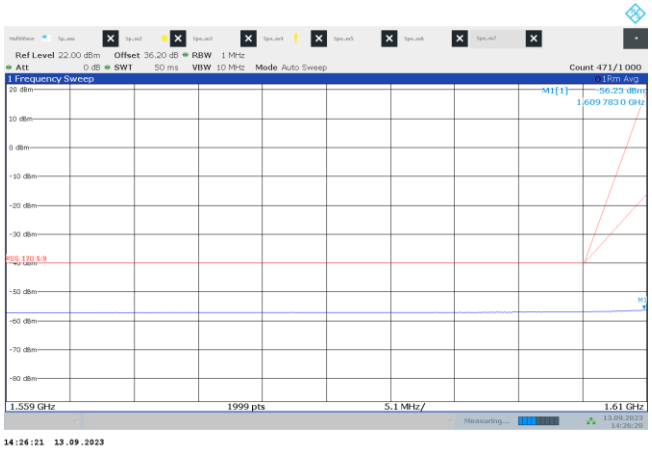


Figure 7.5-2: spurious emissions 1559–1610 MHz, Waveform J, mid channel

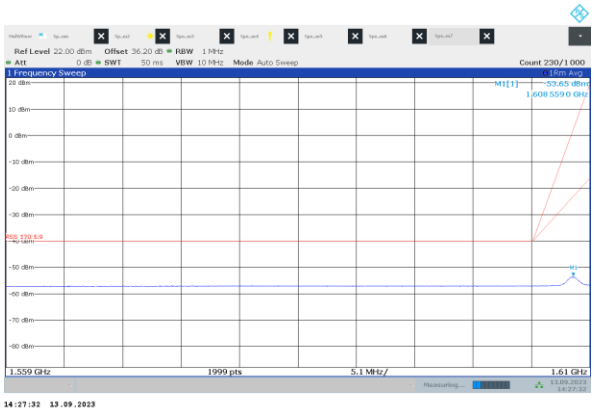


Figure 7.5-3: spurious emissions 1559–1610 MHz, Waveform J, high channel

Test data, continued

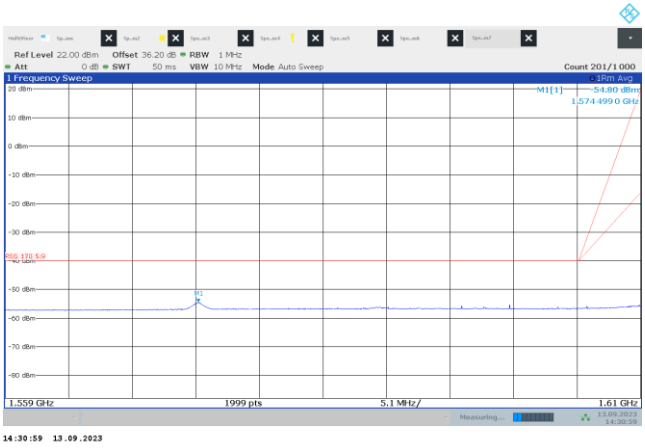


Figure 7.5-4: spurious emissions 1559–1610 MHz, Waveform K, low channel

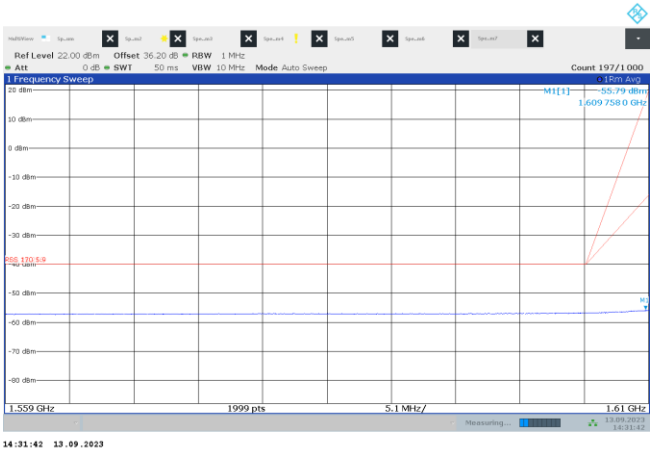


Figure 7.5-5: spurious emissions 1559–1610 MHz, Waveform K, mid channel

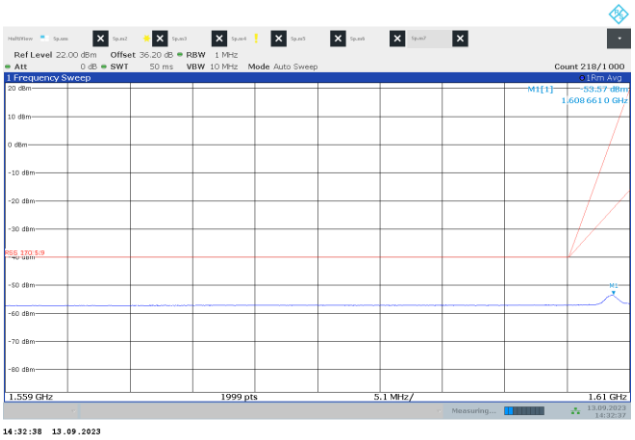


Figure 7.5-6: spurious emissions 1559–1610 MHz, Waveform K, high channel

Test data, continued

Figure 7.5-7: spurious emissions 1559–1610 MHz, Waveform T, low channel

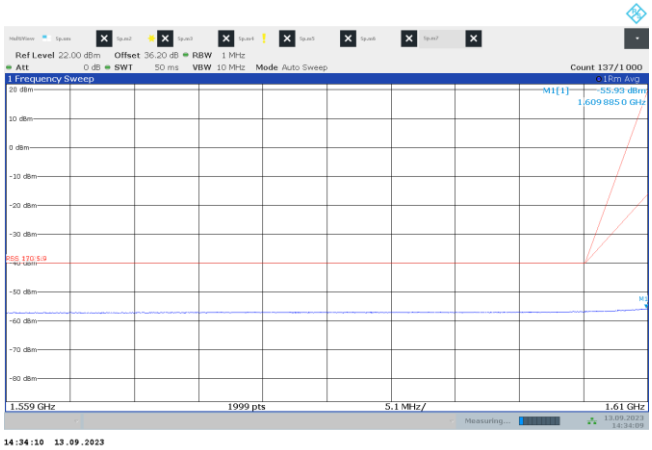


Figure 7.5-8: spurious emissions 1559–1610 MHz, Waveform T, mid channel

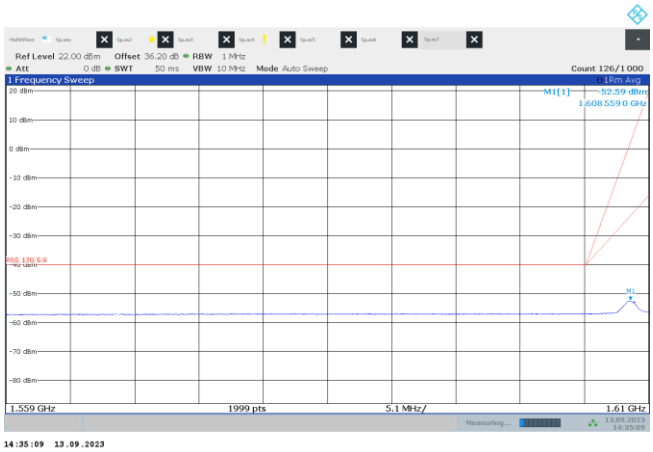


Figure 7.5-9: spurious emissions 1559–1610 MHz, Waveform T, high channel

Test data, continued

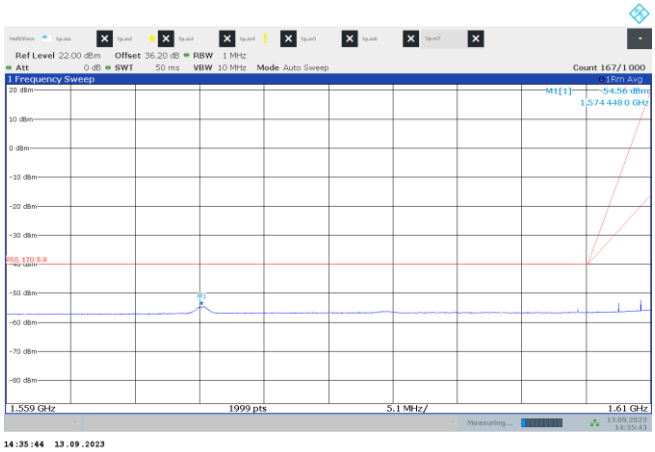


Figure 7.5-10: spurious emissions 1559–1610 MHz, Waveform Y, low channel

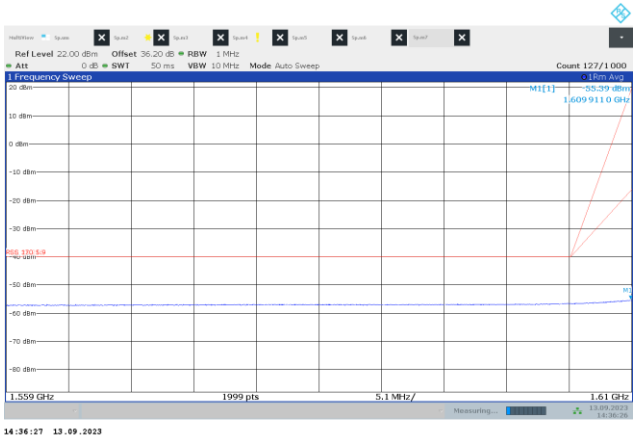


Figure 7.5-11: spurious emissions 1559–1610 MHz, Waveform Y, mid channel

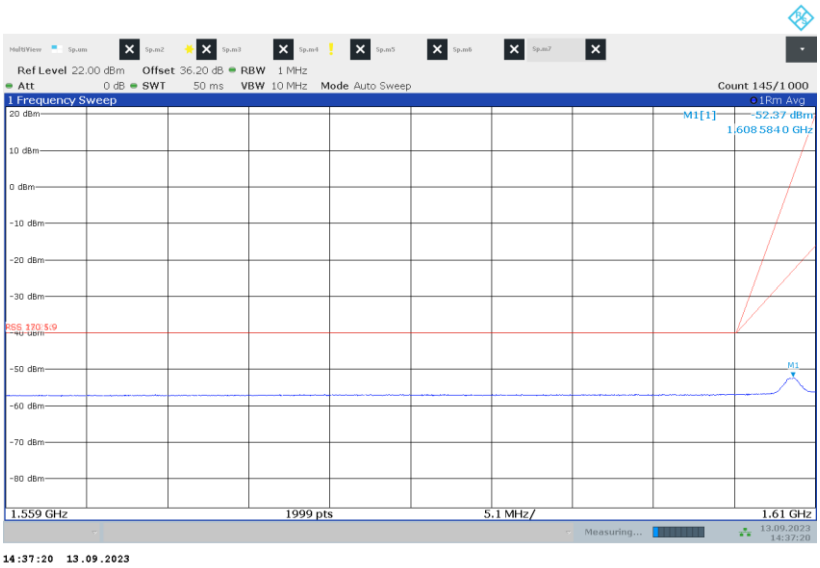


Figure 7.5-12: spurious emissions 1559–1610 MHz, Waveform Y, high channel

Test data, continued

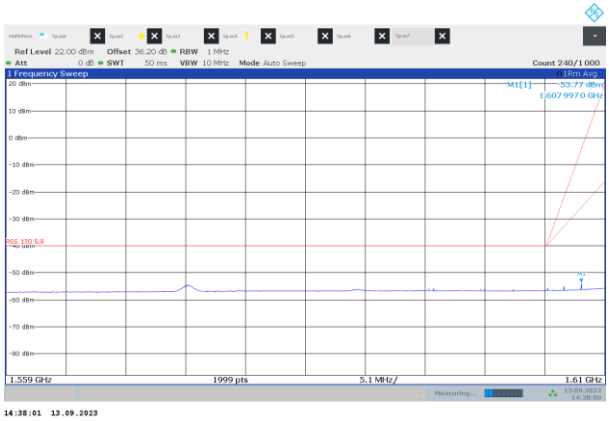


Figure 7.5-13: spurious emissions 1559–1610 MHz, Waveform Z, low channel

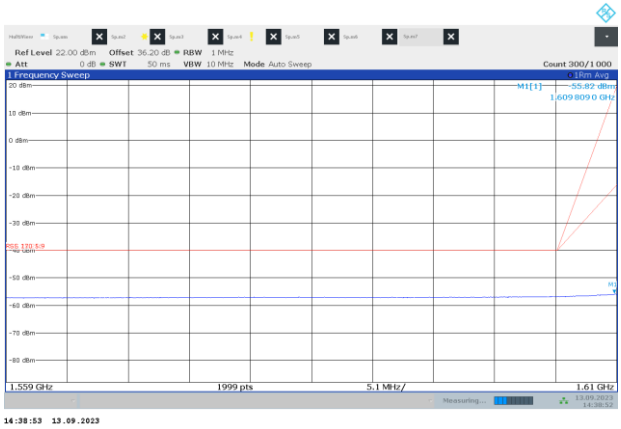


Figure 7.5-14: spurious emissions 1559–1610 MHz, Waveform Z, mid channel

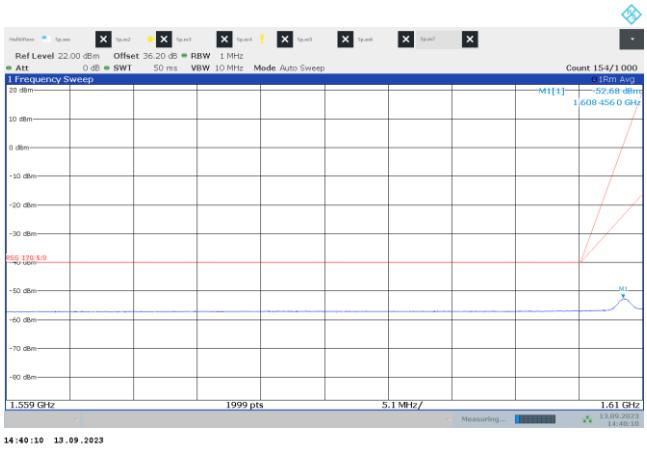
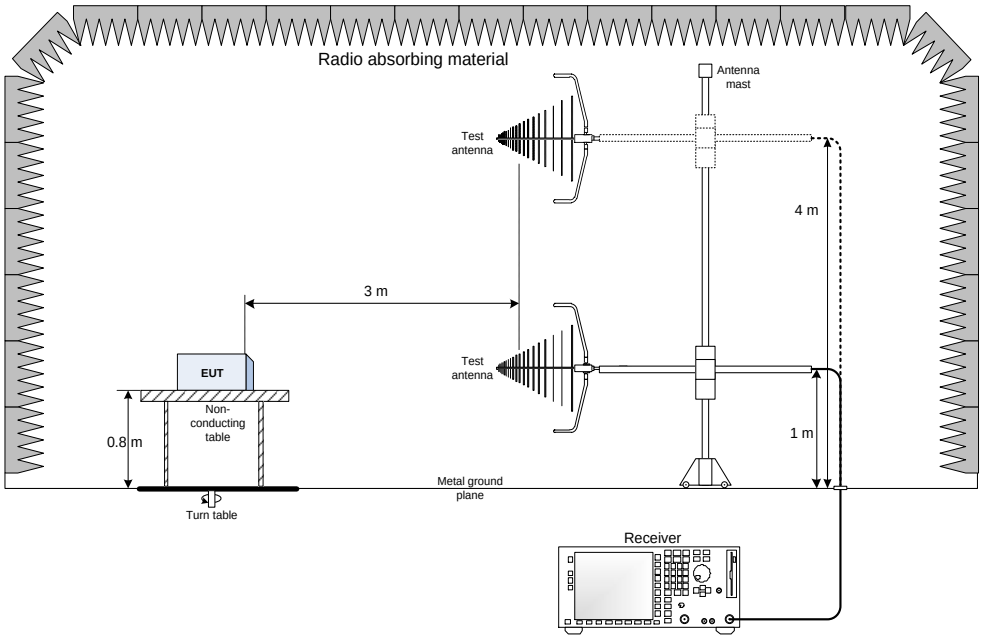


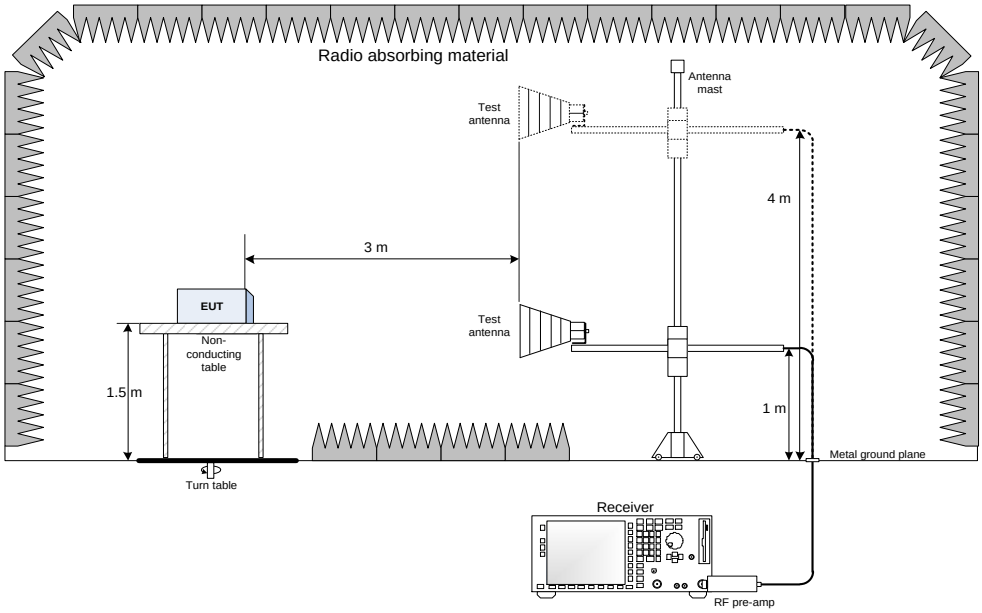
Figure 7.5-15: spurious emissions 1559–1610 MHz, Waveform Z, high channel

Section 8. Test setup diagrams

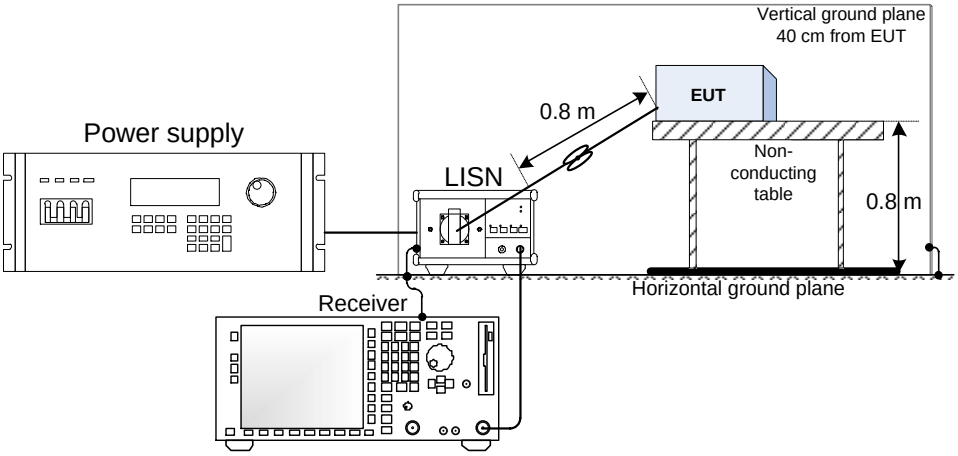
8.1 Radiated emissions set-up for frequencies below 1 GHz



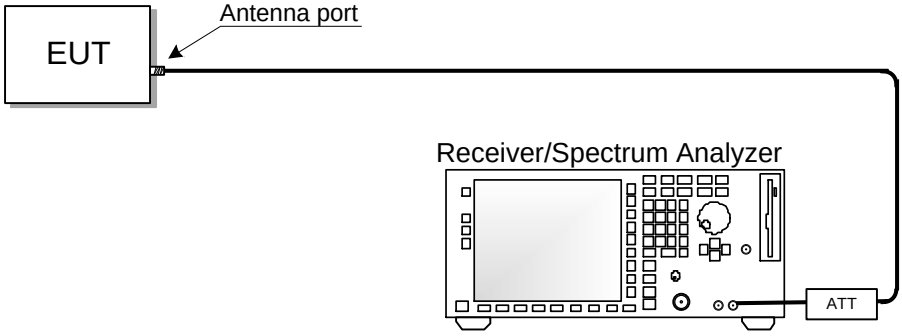
8.2 Radiated emissions set-up for frequencies above 1 GHz



8.3 AC mains conducted emissions set-up



8.4 Antenna port set-up



End of the test report