



Product Service

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13 April 2018

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Prüfbericht / *Test Report*

Nr. / No. TR-70464-22758-01 (Edition 1)

Auftraggeber <i>Applicant</i>	Weatherdock AG
Geräteart <i>Type of equipment</i>	AIS Class B SO System
Typenbezeichnung <i>Type designation</i>	GARMIN AIS 800 / easyTRX3
Seriennummer / <i>Serial number</i>	See list of devices under test
Auftragsnummer / <i>Order No.</i>	5444
Prüfgrundlage <i>Test standards</i>	IEC 62287-2:2016

Summary

Prüfergebnisse / <i>Test Results</i>		Auftragsnummer / <i>Order No.</i> 5444			
Die Prüfungen wurden nach folgenden Vorschriften durchgeführt: <i>Tests were performed according to:</i> IEC 62287-2:2017					
Durchgeführte Prüfung <i>Test performed</i>		Prüfergebnis <i>Test result</i>			
		Erfüllt <i>Passed</i>	Nicht erfüllt <i>Not Passed</i>	Nicht zutreffend <i>Not applicable</i>	Nicht durchgeführt <i>Not performed</i>
Frequency error		☒	☐	☐	☐
Carrier power		☒	☐	☐	☐
Transmission spectrum		☒	☐	☐	☐
Modulation accuracy		☒	☐	☐	☐
Transmitter output power versus time function		☒	☐	☐	☐
Sensitivity		☒	☐	☐	☐
Error behaviour at high input levels		☒	☐	☐	☐
Co-channel rejection		☒	☐	☐	☐
Adjacent channel selectivity		☒	☐	☐	☐
Spurious response rejection		☒	☐	☐	☐
Intermodulation response rejection		☒	☐	☐	☐
Blocking or desensitisation		☒	☐	☐	☐
Spurious emissions from the receiver		☒	☐	☐	☐
Spurious emissions from the transmitter		☒	☐	☐	☐

Bemerkungen / Remarks:

Die Prüfergebnisse beziehen sich ausschließlich auf das zur Prüfung vorgestellte Prüfmuster. Ohne schriftliche Genehmigung des Prüflabors darf der Prüfbericht auszugsweise nicht vervielfältigt werden. *The test results relate only to the individual item which has been tested. Without the written approval of the test laboratory this report may not be reproduced in extracts.*

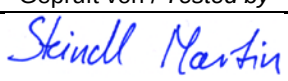
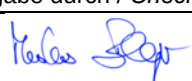
Datum / Date	Geprüft von / Tested by	Freigabe durch / Checked by	Prüfergebnis / Test Result	
2018-04-13	 Martin Steindl Responsible for testing	 Markus Biberger Reviewer	☒ Erfüllt / Passed	☐ Nicht erfüllt / Not passed

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1 Administrative Data

Application details

Applicant:	Weatherdock AG Emmericher Straße 17 90411 Nürnberg Germany
Contact person:	Mr. Wolfgang Werner
Order number:	5444
Receipt of EUT:	See list of devices under test
Return of EUT:	See list of devices under test
Date(s) of test:	See list of devices under test
Note(s):	Mr. Werner and Mr. Pirkelmann, representing the applicant, attended all tests.
Responsible for testing:	Mr. Martin Steindl
Responsible for test report:	Mr. Martin Steindl
Test report checked by:	Mr. Markus Biberger

Report details

Report number:	TR-70464-22758-01
Edition:	1
Issue date:	2018-04-13

2 Details about the Test Laboratory

Details about the Test Laboratory	
Company name:	TÜV SÜD Product Service GmbH
Address:	Äußere Frühlingstraße 45 D-94315 Straubing Germany
Contact:	Mr. Markus Bibberger Phone: +49 9421 5522-0 Fax: +49 9421 5522-99

3 Description of the Equipment Under Test

Equipment characteristics		
Type designation:	GARMIN AIS 800 / easyTRX3	
Parts of the system:		
Options and accessories:		
Type of equipment:	AIS Class B SO System	
Serial number:	See list of devices under test	
Manufacturer:	Weatherdock AG	
Power supply:	External DC supply	
	Nominal:	24.0 V
	Minimum:	9.6 V
	Maximum:	32.1 V
Version of EUT:	See list of devices under test	

List of devices under test					
No.	Type designation	Serial number	Version	Receipt of EUT	Return of EUT
1	AIS 800	000000002	According to do documentation of applicant.	2018-01-16	2018-01-16
2	AIS 800	000000002	According to do documentation of applicant.	2018-01-18	2018-01-19
3	AIS 800	000000002	According to do documentation of applicant.	2018-02-22	2018-02-23
4	AIS 800	000000002	According to do documentation of applicant.	2018-03-13	2018-03-13
5	AIS 800	000000002	According to do documentation of applicant.	2018-03-14	2018-03-14

Marking Plate



4 Operation Mode and Configuration of EUT

Operation Mode(s)

Transmitting with AIS Standard-test-signals according to IEC 62287-2 and Receiving on lowest and highest channel.

List of ports and cables

No.	Description	Classification ¹	Cable type	Cable length used maximum ²
S1	DC-Power with NMEA I/O	signal/control port with dc power	Unshielded	10 m
S2	NMEA 2000	signal/control port	Unshielded	2 m
S3	ANT	signal/control port	Shielded	5 m
S4	VHF	signal/control port	Shielded	5 m
S5	GPS	signal/control port	Shielded	2 m
S6	USB	signal/control port	Shielded	15 m

List of devices connected to EUT

No.	Description	Type designation	Serial no. or ID	Manufacturer
1	Laptop PC	N/A	N/A	N/A
2	GPS antenna	N/A	N/A	N/A

List of support devices

No.	Description	Type designation	Serial no. or ID	Manufacturer

¹ Ports shall be classified as ac power, dc power or signal/control port.

² As specified by applicant

5 Referenced Regulations

<i>European publication</i>	<i>International publication</i>	<i>Title</i>
EN 60945:2002	IEC 60945:2002	Maritime navigation and radiocommunication equipment and systems - General requirements - Methods of testing and required test results
EN 62287-2:2017	IEC 62287-2:2016 Ed.2	Maritime navigation and radiocommunication equipment and systems - Class B shipborne equipment of the automatic identification system (AIS) - Part 2: Self-organising time division multiple access (SOTDMA) techniques

6 Measurement Uncertainty Values

Radio Testing			
Test	k_p	Expanded Uncertainty	Note
Occupied Bandwidth	2.0	$\pm 1.14 \%$	2
RF-Frequency error	1.96	$\pm 1 \cdot 10^{-7}$	7
RF-Power, conducted carrier	2	$\pm 0.079 \text{ dB}$	2
RF-Power uncertainty for given BER	1.96	$+0.94 \text{ dB} / -1.05$	7
RF power, conducted, spurious emissions	1.96	$+1.4 \text{ dB} / -1.6 \text{ dB}$	7
RF power, radiated			
25 MHz – 4 GHz	1.96	$+3.6 \text{ dB} / -5.2 \text{ dB}$	8
1 GHz – 18 GHz	1.96	$+3.8 \text{ dB} / -5.6 \text{ dB}$	8
18 GHz – 26.5 GHz	1.96	$+3.4 \text{ dB} / -4.5 \text{ dB}$	8
40 GHz – 170 GHz	1.96	$+4.2 \text{ dB} / -7.1 \text{ dB}$	8
Spectral Power Density, conducted	2.0	$\pm 0.53 \text{ dB}$	2
Maximum frequency deviation			
300 Hz – 6 kHz	2	$\pm 2.89 \%$	2
6 kHz – 25 kHz	2	$\pm 0.2 \text{ dB}$	2
Maximum frequency deviation for FM	2	$\pm 2.89 \%$	2
Adjacent channel power 25 MHz – 1 GHz	2	$\pm 2.31 \%$	2
Temperature	2	$\pm 0.39 \text{ K}$	4
(Relative) Humidity	2	$\pm 2.28 \%$	2
DC- and low frequency AC voltage			
DC voltage	2	$\pm 0.01 \%$	2
AC voltage up to 1 kHz	2	$\pm 1.2 \%$	2
Time	2	$\pm 0.6 \%$	2

Radio Interference Emission Testing			
Test	k_p	Expanded Uncertainty	Note
Conducted Voltage Emission			
9 kHz to 150 kHz (50 Ω /50 μ H AMN)	2	± 3.8 dB	1
150 kHz to 30 MHz (50 Ω /50 μ H AMN)	2	± 3.4 dB	1
100 kHz to 200 MHz (50 Ω /5 μ H AMN)	2	± 3.6 dB	1
Discontinuous Conducted Emission			
9 kHz to 150 kHz (50 Ω /50 μ H AMN)	2	± 3.8 dB	1
150 kHz to 30 MHz (50 Ω /50 μ H AMN)	2	± 3.4 dB	1
Conducted Current Emission			
9 kHz to 200 MHz	2	± 3.5 dB	1
Magnetic Fieldstrength			
9 kHz to 30 MHz (with loop antenna)	2	± 3.9 dB	1
9 kHz to 30 MHz (large-loop antenna 2 m)	2	± 3.5 dB	1
Radiated Emission			
Test distance 1 m (ALSE)			
9 kHz to 150 kHz	2	± 4.6 dB	1
150 kHz to 30 MHz	2	± 4.1 dB	1
30 MHz to 200 MHz	2	± 5.2 dB	1
200 MHz to 2 GHz	2	± 4.4 dB	1
2 GHz to 3 GHz	2	± 4.6 dB	1
Test distance 3 m			
30 MHz to 300 MHz	2	± 4.9 dB	1
300 MHz to 1 GHz	2	± 5.0 dB	1
1 GHz to 6 GHz	2	± 4.6 dB	1
Test distance 10 m			
30 MHz to 300 MHz	2	± 4.9 dB	1
300 MHz to 1 GHz	2	± 4.9 dB	1

Radio Interference Emission Testing (continued)

Test	k_p	Expanded Uncertainty	Note
Radio Interference Power			
30 MHz to 300 MHz	2	± 3.5 dB	1
Harmonic Current Emissions			4
Voltage Changes, Voltage Fluctuations and Flicker			4

Immunity Testing

Test	k_p	Expanded Uncertainty	Note
Electrostatic Discharges			4
Radiated RF-Field			
Pre-calibrated field level	2	+32.2 / -24.3 %	5
Dynamic feedback field level	2.05	+21.2 / -17.5 %	3
Electrical Fast Transients (EFT) / Bursts			4
Surges			4
Conducted Disturbances, induced by RF-Fields			
via CDN	2	+15.1 / -13.1 %	6
via EM clamp	2	+42.6 / -29.9 %	6
via current clamp	2	+43.9 / -30.5 %	6
Power Frequency Magnetic Field	2	+20.7 / -17.1 %	2
Pulse Magnetic Field			4
Voltage Dips, Short Interruptions and Voltage Variations			4
Oscillatory Waves			4
Conducted Low Frequency Disturbances			
Voltage setting	2	± 0.9 %	2
Frequency setting	2	± 0.1 %	2
Electrical Transient Transmission in Road Vehicles			4

Note 1:

The expanded uncertainty reported according to CISPR 16-4-2:2003-11 is based on a standard uncertainty multiplied by a coverage factor of $k_p = 2$, providing a level of confidence of $p = 95.45\%$

Note 2:

The expanded uncertainty reported according to UKAS Lab 34 (Edition 1, 2002-08) is based on a standard uncertainty multiplied by a coverage factor of $k_p = 2$, providing a level of confidence of $p = 95.45\%$

Note 3:

The expanded uncertainty reported according to UKAS Lab 34 (Edition 1, 2002-08) is based on a standard uncertainty multiplied by a coverage factor of $k_p = 2.05$, providing a level of confidence of $p = 95.45\%$

Note 4:

It has been demonstrated that the used test equipment meets the specified requirements in the standard with at least a 95% confidence.

Note 5:

The expanded uncertainty reported according to IEC 61000-4-3 is based on a standard uncertainty multiplied by a coverage factor of $k_p = 2$, providing a level of confidence of $p = 95.45\%$

Note 6:

The expanded uncertainty reported according to IEC 61000-4-6 is based on a standard uncertainty multiplied by a coverage factor of $k_p = 2$, providing a level of confidence of $p = 95.45\%$

Note 7:

The expanded uncertainty reported according ETSI TR 100 028 V1.4.1 (all parts) is based on a standard uncertainty multiplied by a coverage factor of $k_p = 1.96$, providing a level of confidence of $p = 95.45\%$

Note 8:

The expanded uncertainty reported according to ETSI TR 102 273 V1.2.1 (all parts) is based on a standard uncertainty multiplied by a coverage factor of $k_p = 1.96$, providing a level of confidence of $p = 95.45\%$

7 Test Results

Transmitter tests

IEC 62287-2:2016			
Section(s)	Test performed	Page	Test Result
11.1.1	Frequency error	16	Test passed
11.1.2	Carrier power	21	Test passed
11.1.3	Transmission spectrum	29	Test passed
11.1.4	Modulation accuracy	32	Test passed
11.1.5	Transmitter output power versus time function	47	Test passed
11.3.2	Spurious emissions from the transmitter	68	Test passed

Receiver tests

IEC 62287-2:2016			
Section(s)	Test performed	Page	Test Result
11.2.1	Sensitivity	52	Test passed
11.2.2	Error behaviour at high input levels	54	Test passed
11.2.3	Co-channel rejection	56	Test passed
11.2.4	Adjacent channel selectivity	58	Test passed
11.2.5	Spurious response rejection	60	Test passed
11.2.6	Intermodulation response rejection	63	Test passed
11.2.7	Blocking or desensitisation	65	Test passed
11.3.1	Spurious emissions from the receiver	67	Test passed

7.1 Frequency error

7.1.1 Test Equipment List

Type	Designation	Inv.-no.	Serial No. or ID	Manufacturer
☒ Spectrum Analysator	FSV40	20219	101448	Rohde & Schwarz
☒ Attenuator	RDL50	18858	100390	Rohde & Schwarz
☒ Climatic test chamber	PL-2J	18843	15001626	ESPEC

7.1.2 Test Results

Results for frequency error test are documented as listed below.

Frequency error

Prüfdatum / Date of test:	2018-03-13
Prüfer / Operator:	Martin Steindl
Messplatz / Test site:	Non shielded room

Prüfergebnis / Test Result	
☒	Erfüllt / Passed
☐	Nicht erfüllt / Not passed

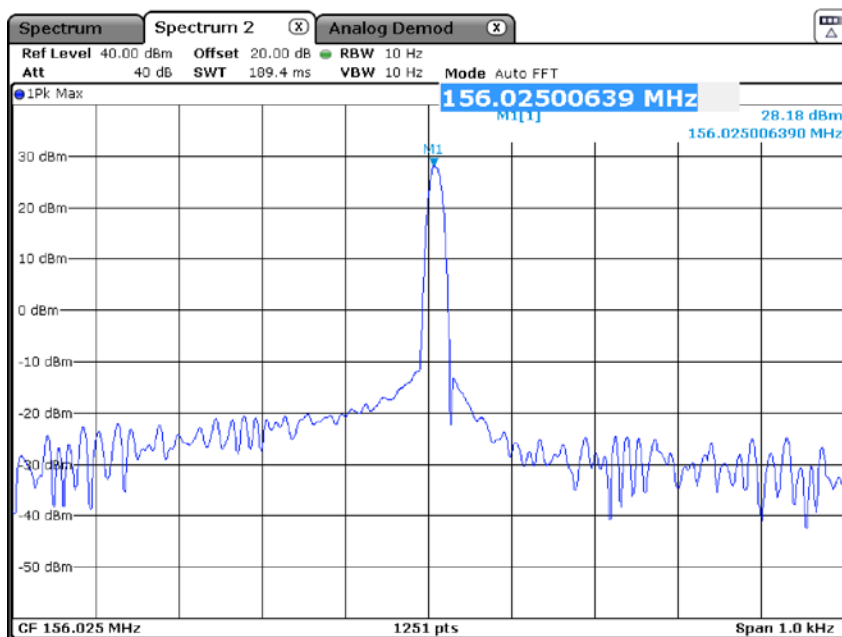
Luftdruck / Barometric pressure:	974 hPa
Relative Luftfeuchtigkeit / Relative humidity:	35 %
Temperatur / Ambient temperature:	24 °C

Prüfgrundlage / Specifications:	IEC 62287-2:2007, section 11.1.1
Prüfling / Test sample:	EUT No. 4, as described in table of devices under test
Betriebsart / Operation mode:	Transmitting with unmodulated carrier
Kommentar / Comment:	

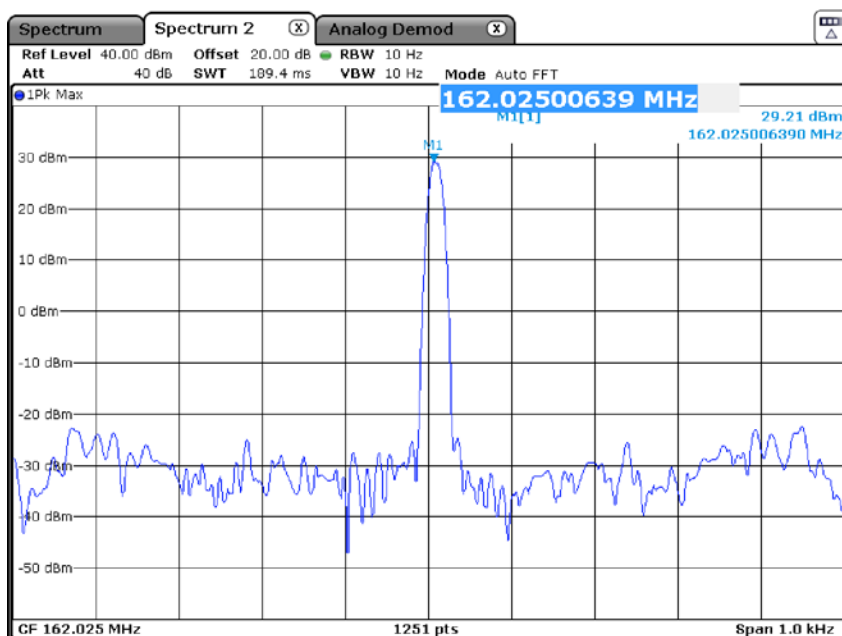
Temperature	Voltage	Frequency (MHz)		Frequency error (kHz)		Result	Note
		Nominal	Measured	Measured	Limit		
-25 °C	9.6 V	156.025	156.02500639	+0.0063	±0.5	Passed	
		162.025	162.02500639	+0.0063	±0.5	Passed	
+20 °C	24.0 V	156.025	156.02500320	+0.0032	±1.0	Passed	
		162.025	162.02500240	+0.0024	±1.0	Passed	
+55 °C	32.1 V	156.025	156.02499520	-0.0048	±0.5	Passed	
		162.025	162.02498641	-0.0136	±0.5	Passed	

Note(s):

-25 °C, 9.6 V

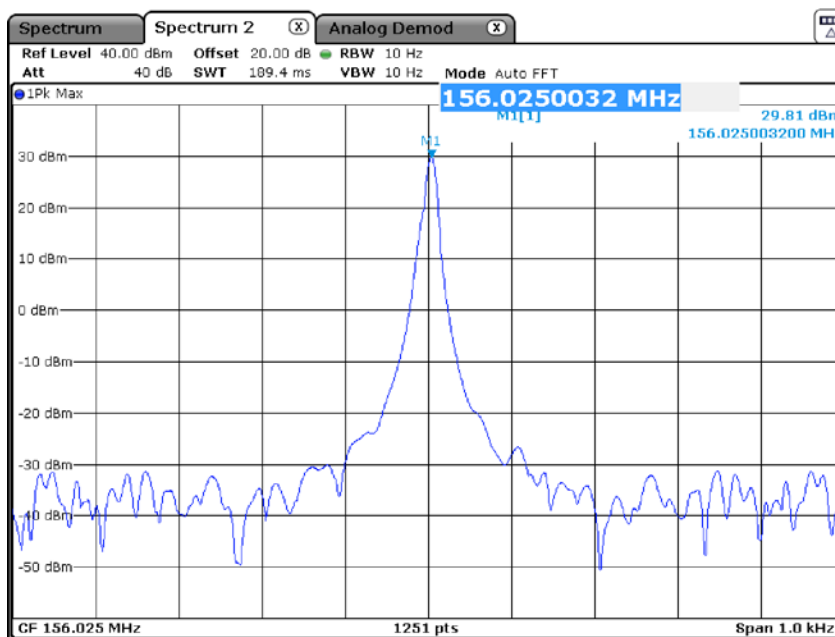


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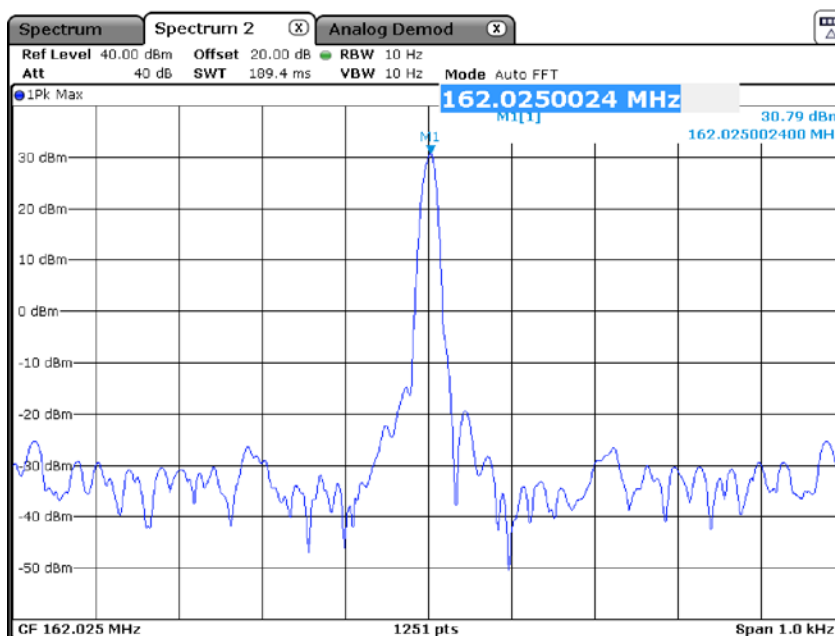


Date: 13.MAR.2018 11:12:08

20 °C, 24.0 V

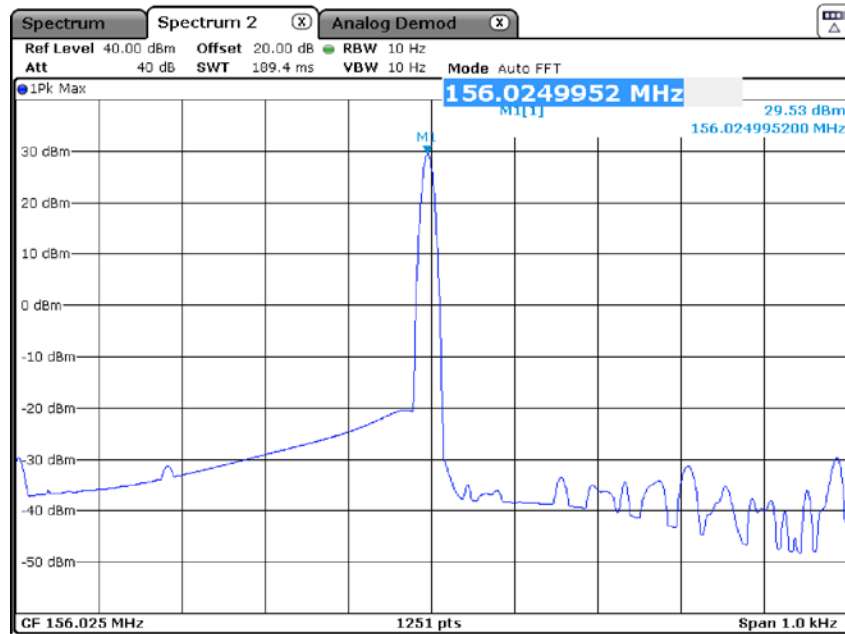


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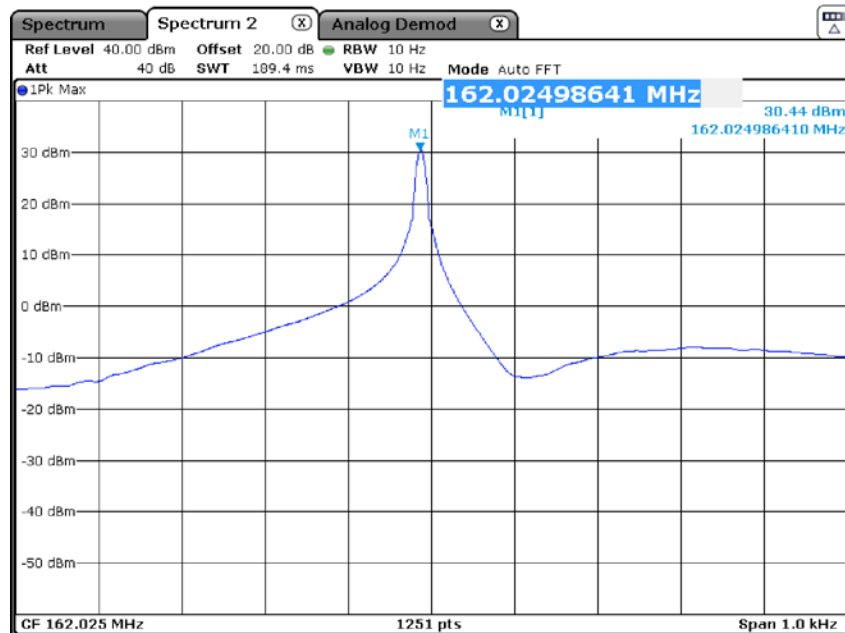


Date: 13.MAR.2018 10:14:41

55 °C, 32.1 V



Date: 13.MAR.2018 13:31:21



Date: 13.MAR.2018 13:30:10

7.2 Carrier power

7.2.1 Test Equipment List

Type	Designation	Inv.-no.	Serial No. or ID	Manufacturer
☒ Spectrum Analysator	FSV40	20219	101448	Rohde & Schwarz
☒ Attenuator	RDL50	18858	100390	Rohde & Schwarz
☒ Climatic test chamber	PL-2J	18843	15001626	ESPEC

7.2.2 Test Results

Results for carrier power test are documented as listed below.

Carrier power

Prüfdatum / Date of test:	2018-03-13
Prüfer / Operator:	Martin Steindl
Messplatz / Test site:	Non shielded room

Prüfergebnis / Test Result	
☒	Erfüllt / Passed
☐	Nicht erfüllt / Not passed

Luftdruck / Barometric pressure:	974 hPa
Relative Luftfeuchtigkeit / Relative humidity:	35 %
Temperatur / Ambient temperature:	24 °C

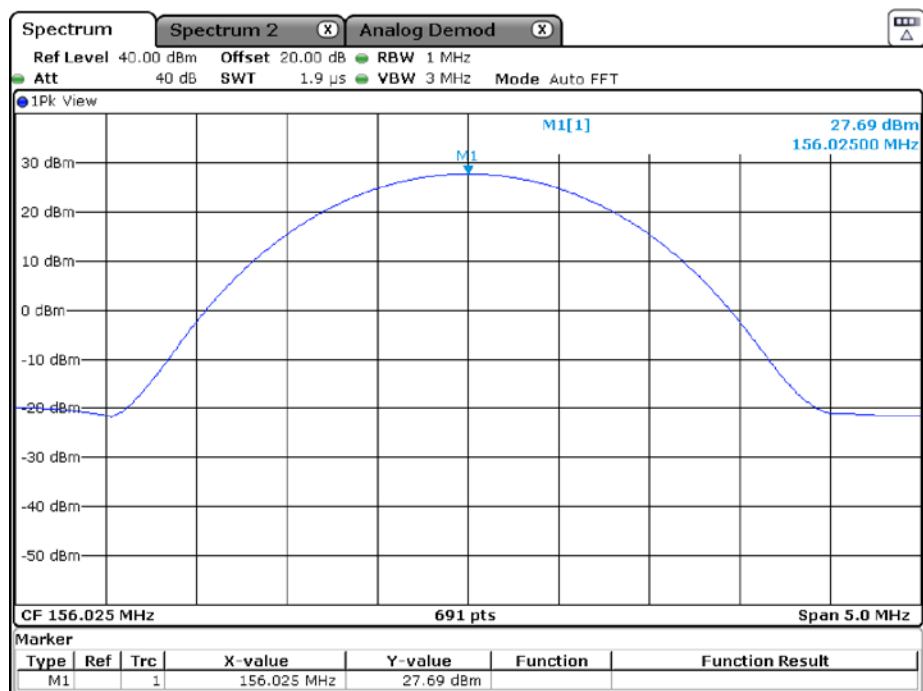
Prüfgrundlage / Specifications:	IEC 62287-2:2017, section 11.1.2
Prüfling / Test sample:	EUT No. 4, as described in table of devices under test
Betriebsart / Operation mode:	Transmitting with modulated carrier at 5 W
Kommentar / Comment:	

Temperature	Voltage	Nominal Frequency	Carrier power		Result	Note
			Measured	Limit		
-25 °C	9.6 V	156.025 MHz	27.7 dBm	30 dBm ± 3.0 dB	Passed	1
			28.7 dBm	30 dBm ± 3.0 dB	Passed	1
		162.025 MHz	34.0 dBm	37 dBm ± 3.0 dB	Passed	2
			35.6 dBm	37 dBm ± 3.0 dB	Passed	2
+20 °C	24.0 V	156.025 MHz	29.2 dBm	30 dBm ± 1.5 dB	Passed	3
			30.3 dBm	30 dBm ± 1.5 dB	Passed	3
		162.025 MHz	36.6 dBm	37 dBm ± 1.5 dB	Passed	4
			36.9 dBm	37 dBm ± 1.5 dB	Passed	4
+55 °C	32.1 V	156.025 MHz	29.1 dBm	30 dBm ± 1.5 dB	Passed	5
			30.2 dBm	30 dBm ± 3.0 dB	Passed	5
		162.025 MHz	36.2 dBm	37 dBm ± 3.0 dB	Passed	6
			36.2 dBm	37 dBm ± 3.0 dB	Passed	6

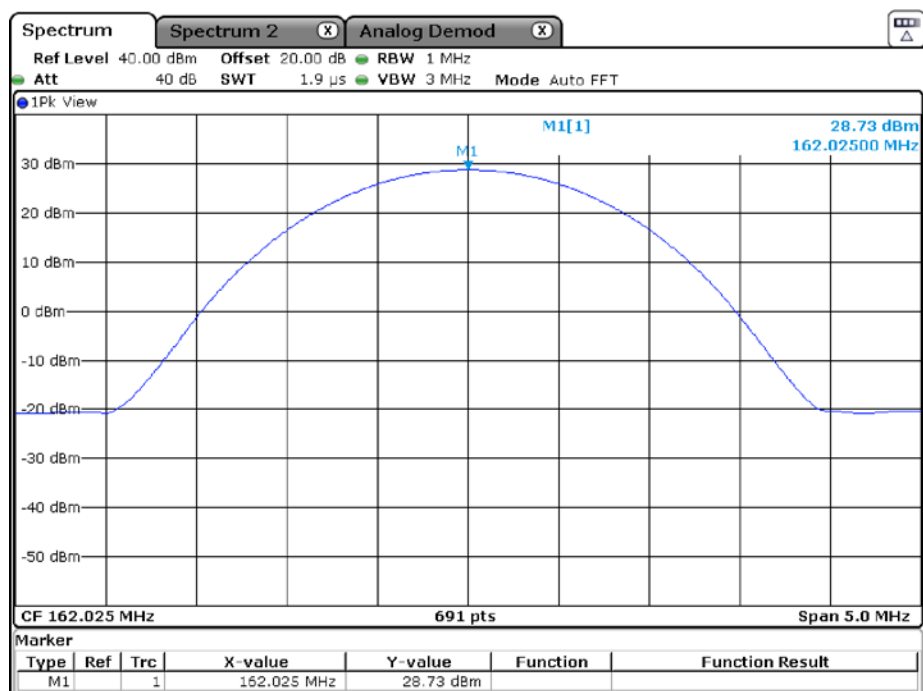
Note(s):

- 1 See plots on page 22 for details
- 2 See plots on page 23 for details
- 3 See plots on page 24 for details
- 4 See plots on page 25 for details
- 5 See plots on page 26 for details
- 6 See plots on page 27 for details

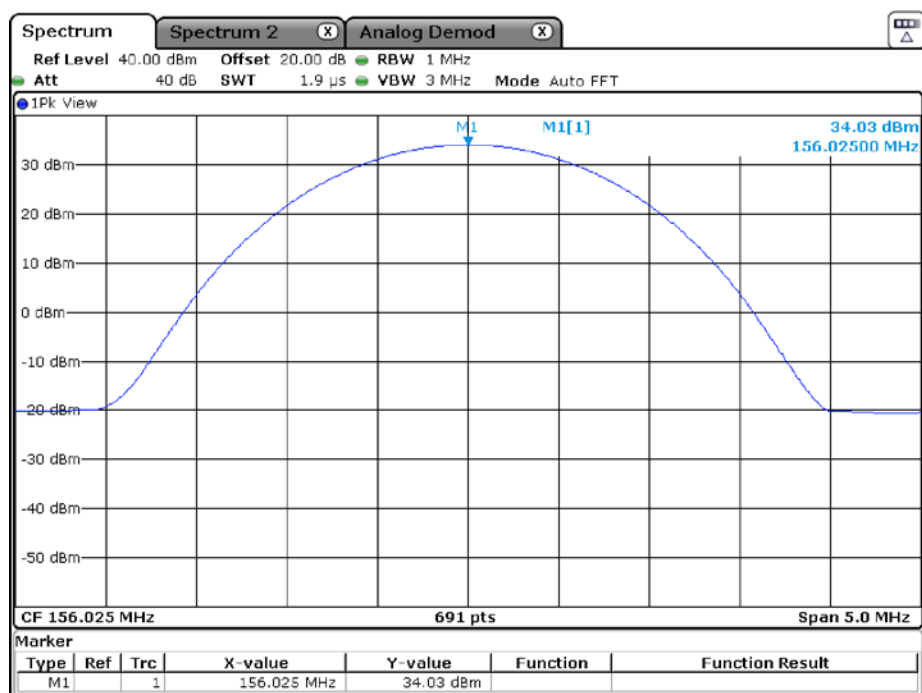
-25 °C, 9.6 V



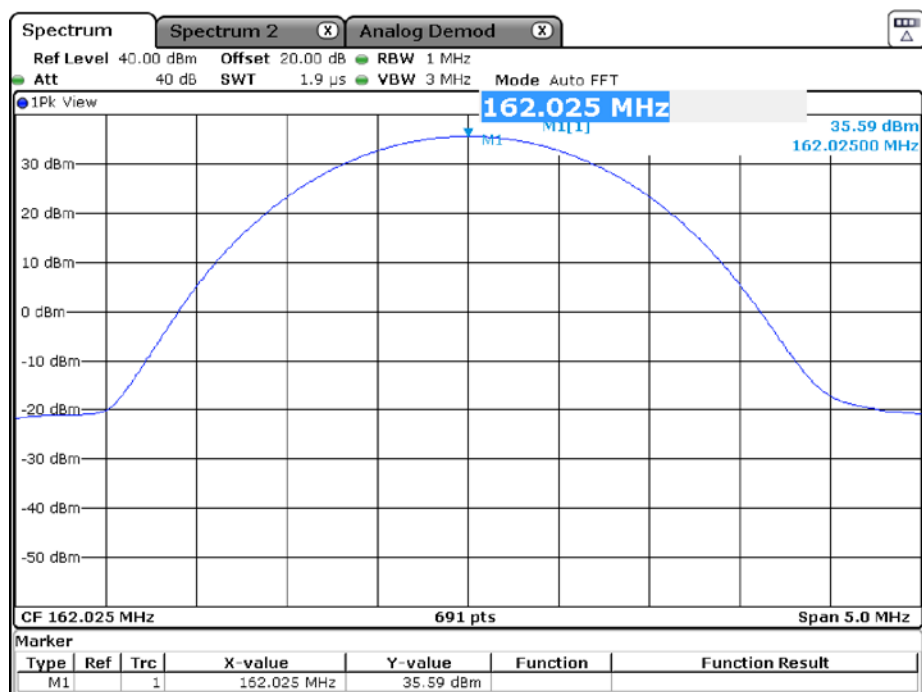
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Date: 13.MAR.2018 11:09:08

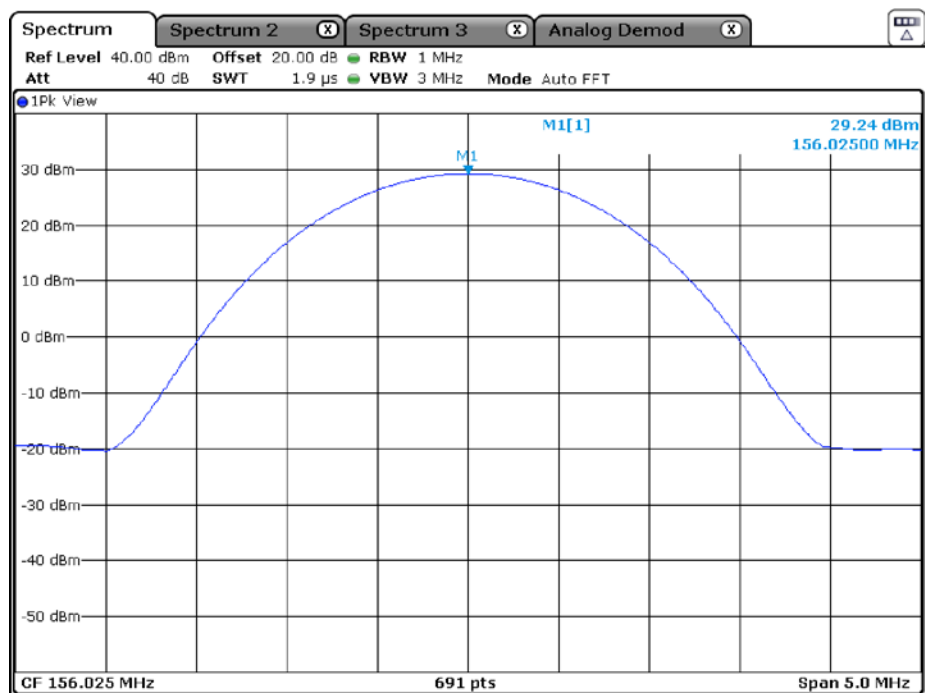


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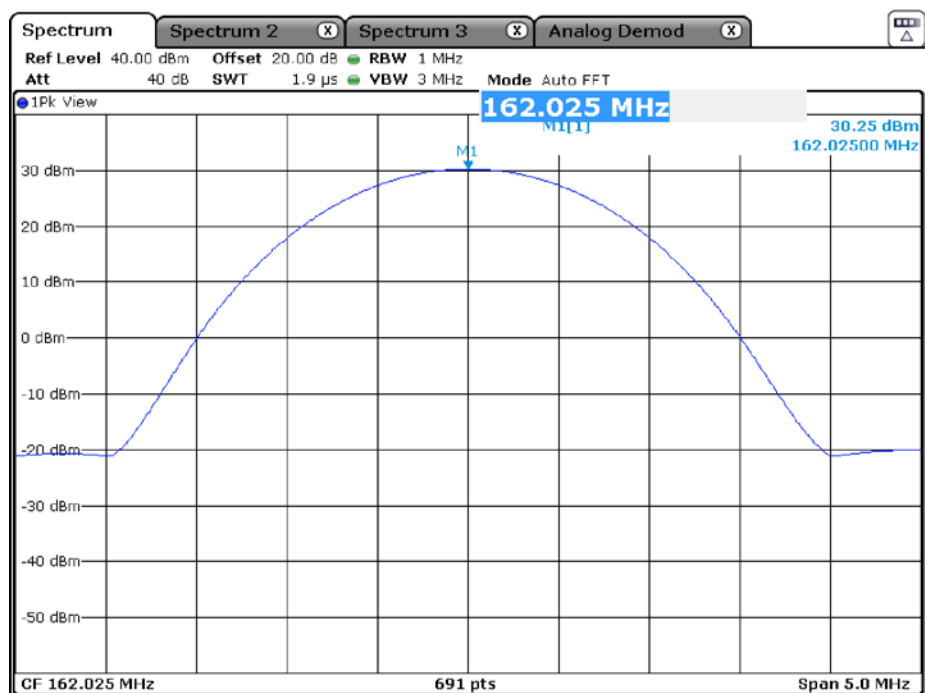


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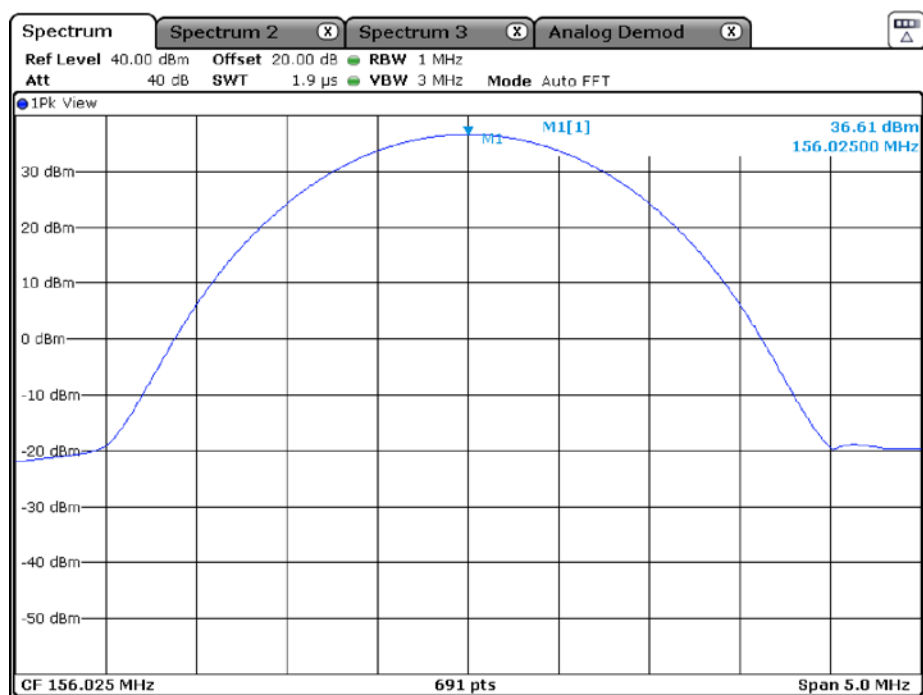
20 °C, 24.0 V



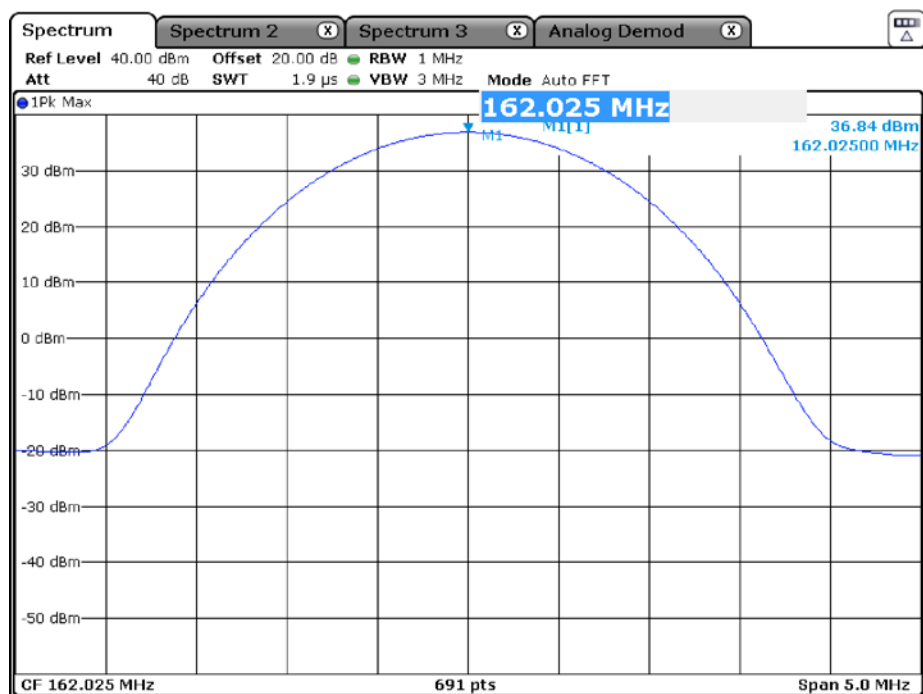
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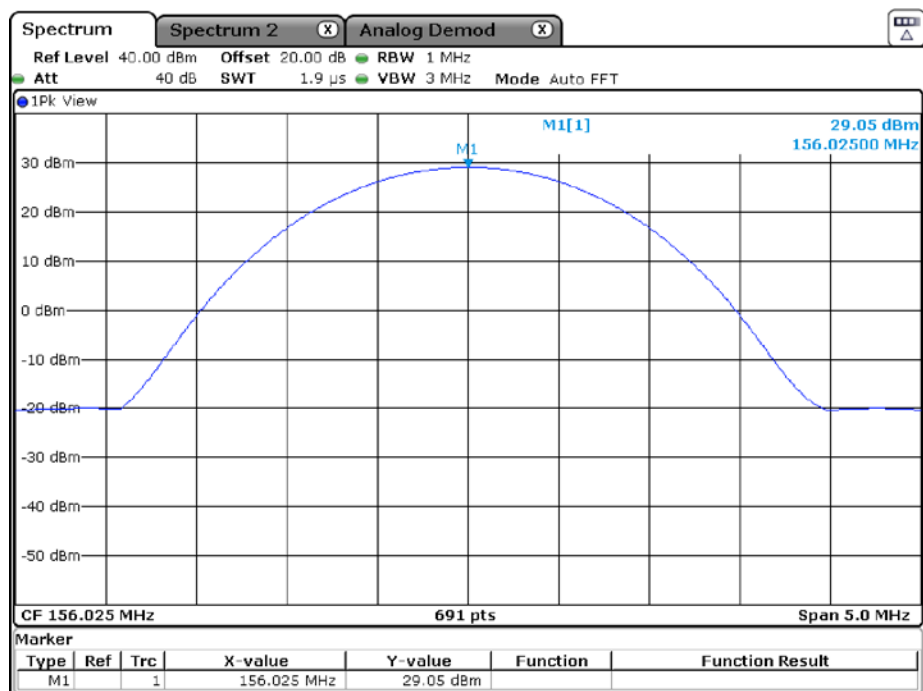


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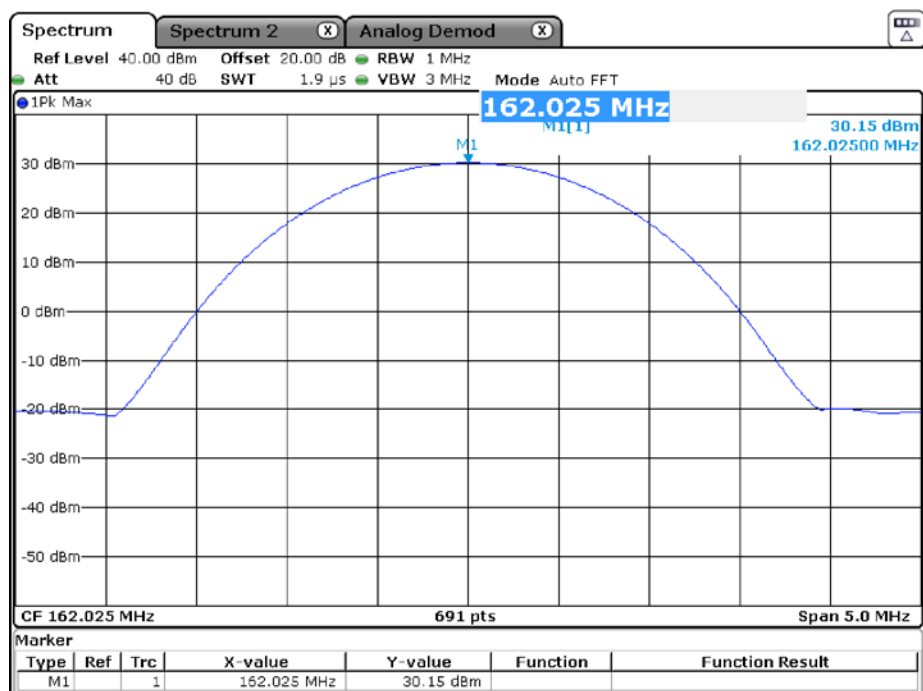


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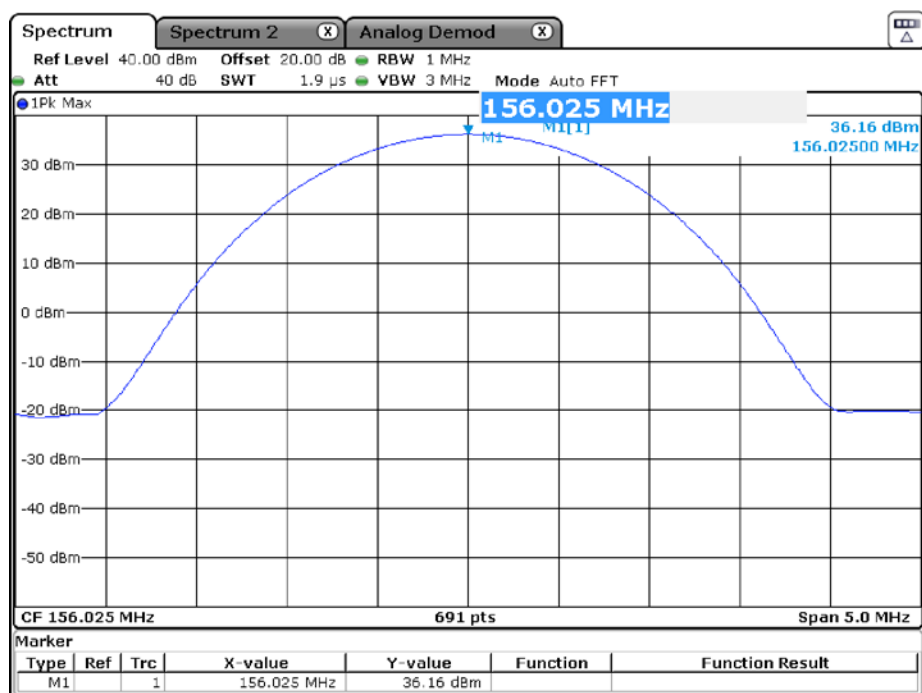
55 °C, 31.2 V



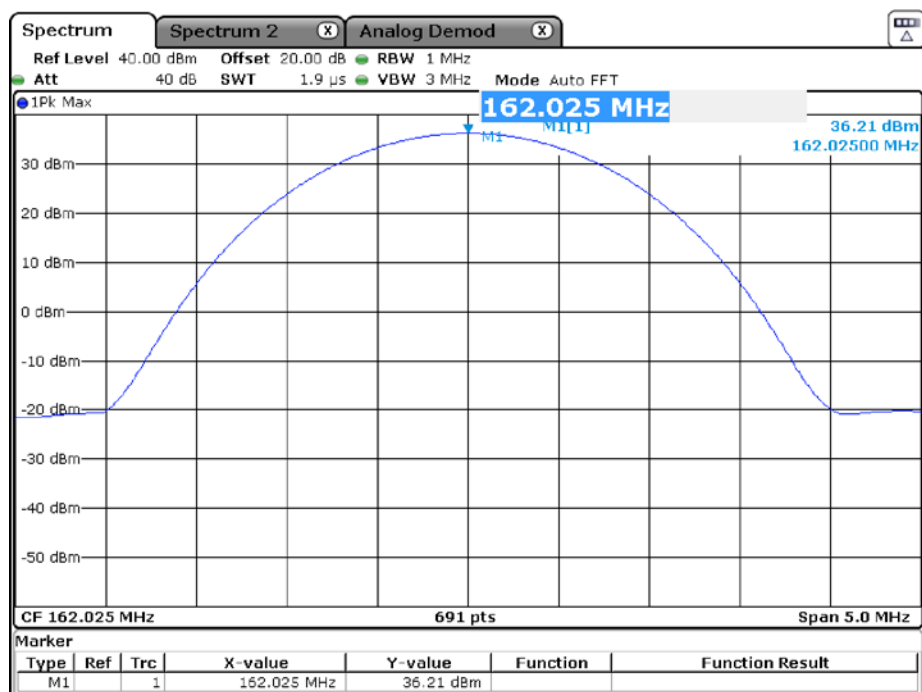
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Date: 13.MAR.2018 13:29:23



Date: 13.MAR.2018 13:28:38



Date: 13.MAR.2018 13:29:03

7.3 Transmission spectrum

7.3.1 Test Equipment List

Type	Designation	Inv.-no.	Serial No. or ID	Manufacturer
☒ EMI Test Receiver	ESPI7	19578	836914/0002	Rohde & Schwarz
☒ Attenuator	RDL50	18858	100390	Rohde & Schwarz

7.3.2 Test Results

Results for transmission spectrum test are documented as listed below.

Transmission spectrum

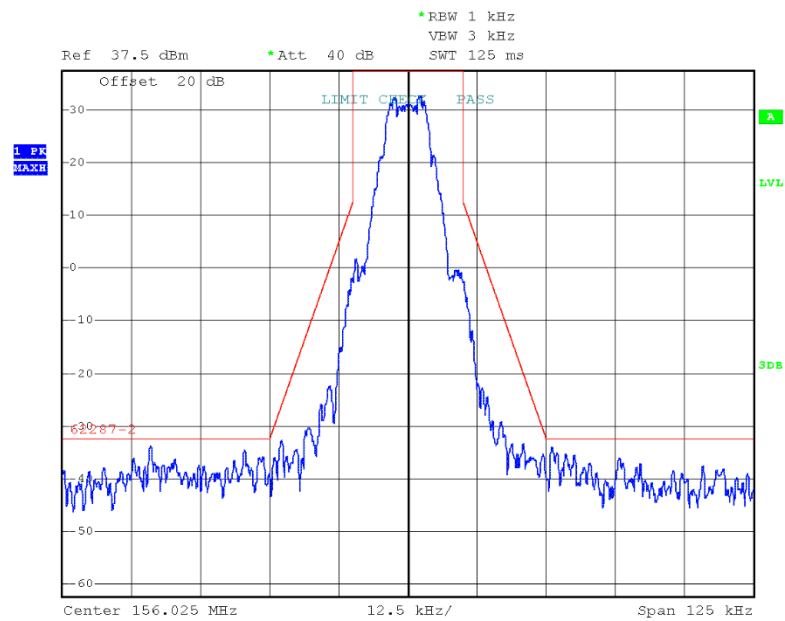
Prüfdatum / <i>Date of test</i> :	2018-02-23
Prüfer / <i>Operator</i> :	Martin Steindl
Messplatz / <i>Test site</i> :	Non shielded room

Prüfergebnis / <i>Test Result</i>	
☒	Erfüllt / <i>Passed</i>
☐	Nicht erfüllt / <i>Not passed</i>

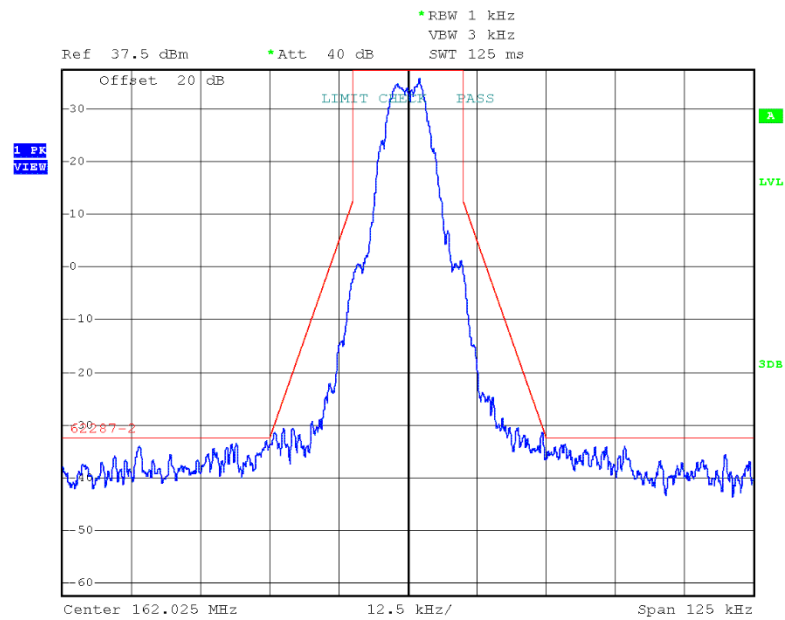
Luftdruck / <i>Barometric pressure</i> :	978 hPa
Relative Luftfeuchtigkeit / <i>Relative humidity</i> :	25 %
Temperatur / <i>Ambient temperature</i> :	22 °C

Prüfgrundlage / <i>Specifications</i> :	IEC 62287-2:2017, section 11.1.3
Prüfling / <i>Test sample</i> :	EUT No. 3 as described in table of devices under test
Betriebsart / <i>Operation mode</i> :	Transmitting with modulated carrier at 5 W
Kommentar / <i>Comment</i> :	

<i>Nominal Frequency</i>	<i>Spectrum mask</i>	<i>Result</i>	<i>Note</i>
156.025 MHz	See plot on page 30 for details	Passed	
162.025 MHz	See plot on page 30 for details	Passed	
Note(s):			



Date: 23.FEB.2018 08:46:57



Date: 23.FEB.2018 08:45:00

7.4 Modulation accuracy

7.4.1 Test Equipment List

Type	Designation	Inv.-no.	Serial No. or ID	Manufacturer
☒ Spectrum Analysator	FSV40	20219	101448	Rohde & Schwarz
☒ Attenuator	RDL50	18858	100390	Rohde & Schwarz
☒ Climatic test chamber	PL-2J	18843	15001626	ESPEC

7.4.2 Test Results

Results for modulation accuracy test are documented as listed below.

Modulation accuracy

Prüfdatum / Date of test:	2018-03-13 and 2018-03-14
Prüfer / Operator:	Martin Steindl
Messplatz / Test site:	Non shielded room

Prüfergebnis / Test Result	
☒	Erfüllt / Passed
☐	Nicht erfüllt / Not passed

Luftdruck / Barometric pressure:	974 hPa
Relative Luftfeuchtigkeit / Relative humidity:	35 %
Temperatur / Ambient temperature:	24 °C

Prüfgrundlage / Specifications:	IEC 62287-2:2017, section 11.1.4
Prüfling / Test sample:	EUT No. 4 and No. 5 as described in table of devices under test
Betriebsart / Operation mode:	Transmitting with modulated carrier at 5 W
Kommentar / Comment:	A "FAIL" in the plots does not concern the test result since this indicates a measured level above the limit line, only but does not take the allowed tolerances into account.

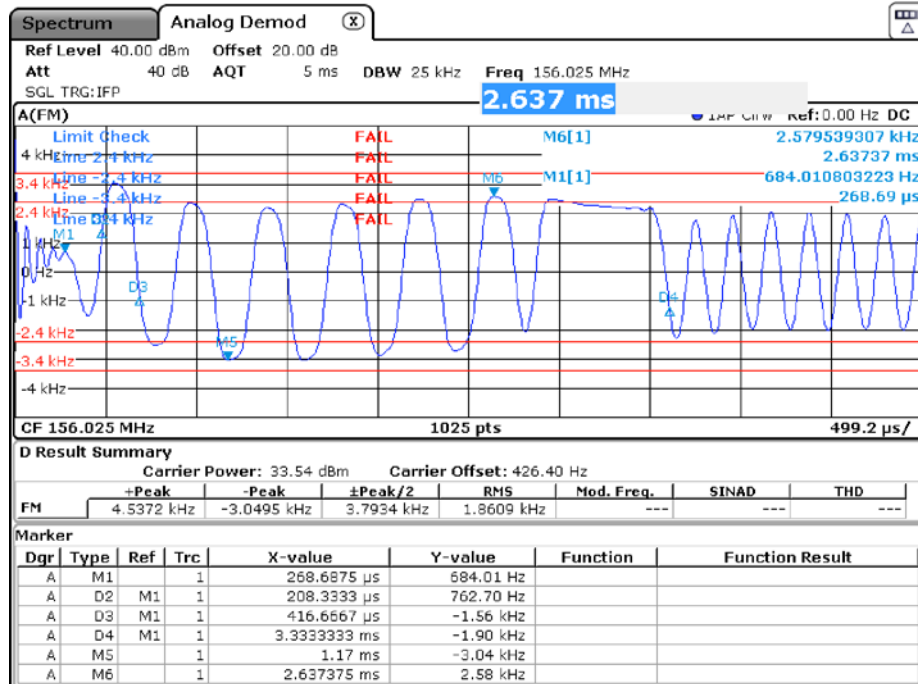
Temperature	Voltage	Nominal Frequency	Test Signal	Spectrum mask	Result	Note
-25 °C	9.6 V	156.025 MHz	No. 1	See plots on page 34 for details	Passed	1
			No. 2	See plots on page 35 for details	Passed	1
		162.025 MHz	No. 1	See plots on page 36 for details	Passed	1
			No. 2	See plots on page 37 for details	Passed	1
+20 °C	24.0 V	156.025 MHz	No. 1	See plots on page 38 for details	Passed	2
			No. 2	See plots on page 39 for details	Passed	2
		162.025 MHz	No. 1	See plots on page 40 for details	Passed	2
			No. 2	See plots on page 41 for details	Passed	2
+55 °C	32.1 V	156.025 MHz	No. 1	See plots on page 42 for details	Passed	2
			No. 2	See plots on page 43 for details	Passed	2
		162.025 MHz	No. 1	See plots on page 44 for details	Passed	2
			No. 2	See plots on page 45 for details	Passed	2

Note(s):

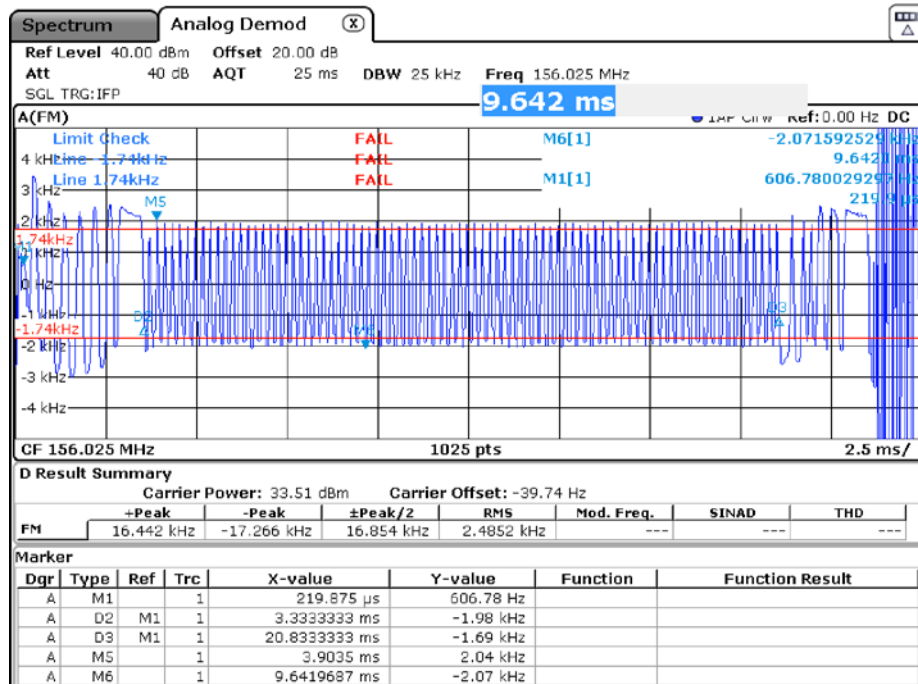
- Test performed on 2018-03-13 with EUT No. 4
- Test performed on 2018-03-14 with EUT No. 5

Limit				
Measurement period from centre to centre of each bit	Test signal 1		Test signal 2	
Ramp up	< 3400 Hz			
Bit 0 to bit 1	< 3400 Hz			
Bit 2 to bit 3	2400 ± 480 Hz			
Bit 3 to bit 31	2400 ± 240 Hz	2400 ± 480 Hz	2400 ± 240 Hz	2400 ± 480 Hz
Bit 32 to bit 199	1740 ± 175 Hz	1740 ± 350 Hz	2400 ± 240 Hz	2400 ± 480 Hz

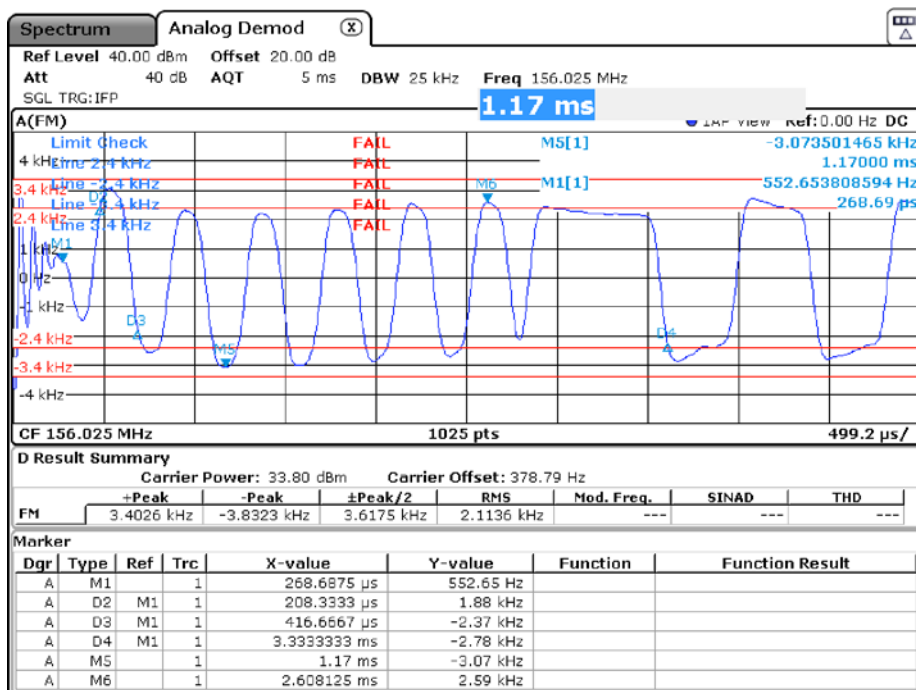
-25 °C, 9.6 V



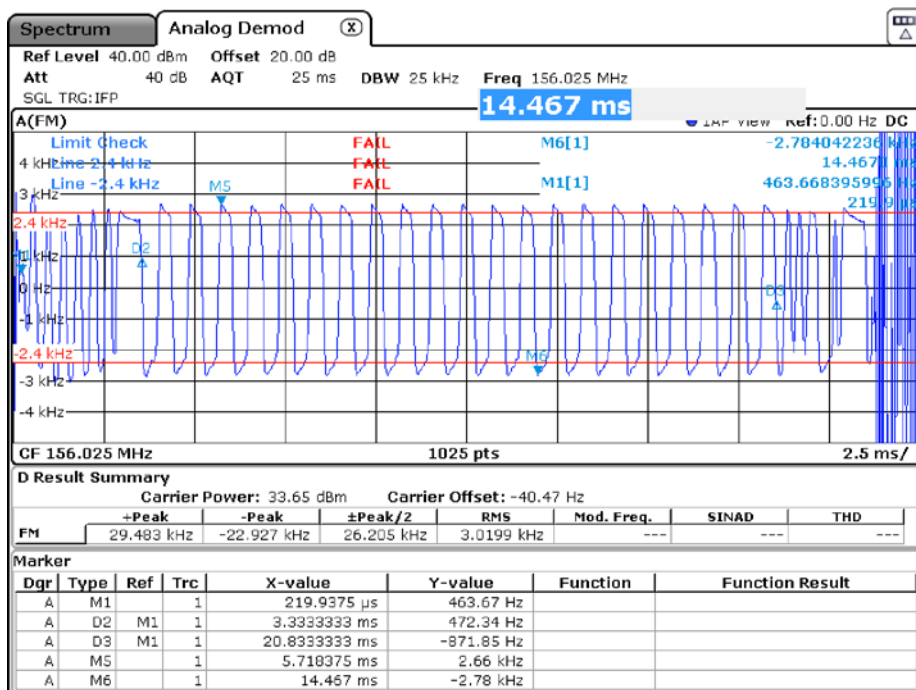
Date: 14.MAR.2018 10:23:11



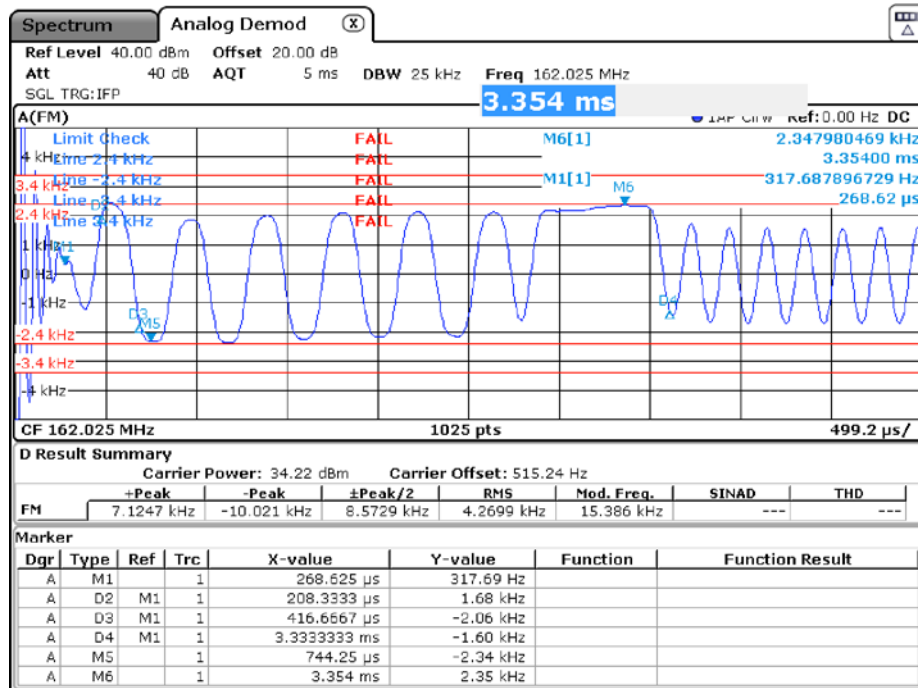
Date: 14.MAR.2018 10:25:28



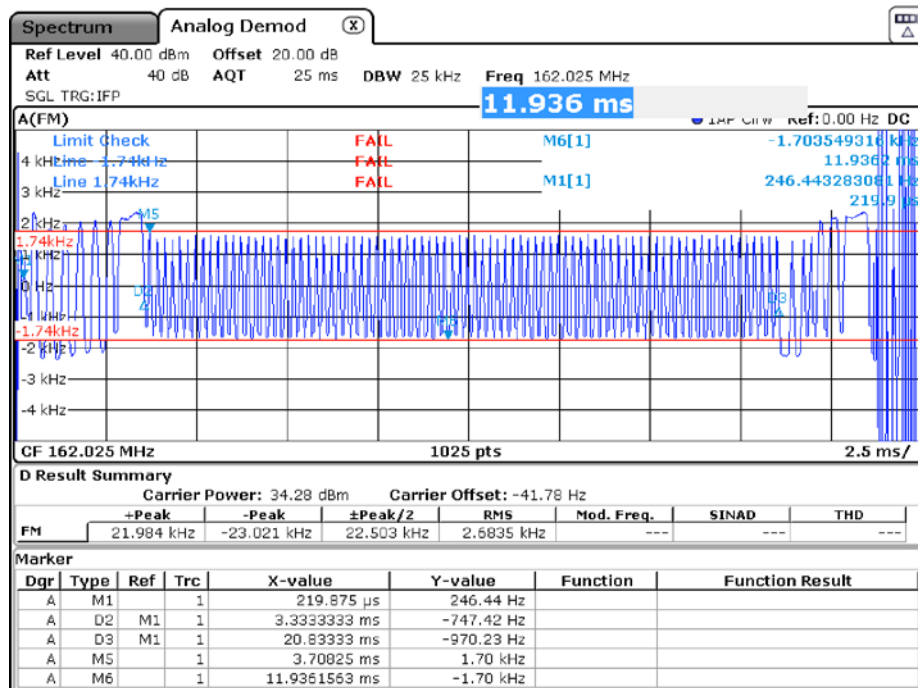
Date: 14 MAR 2018 10:20:15



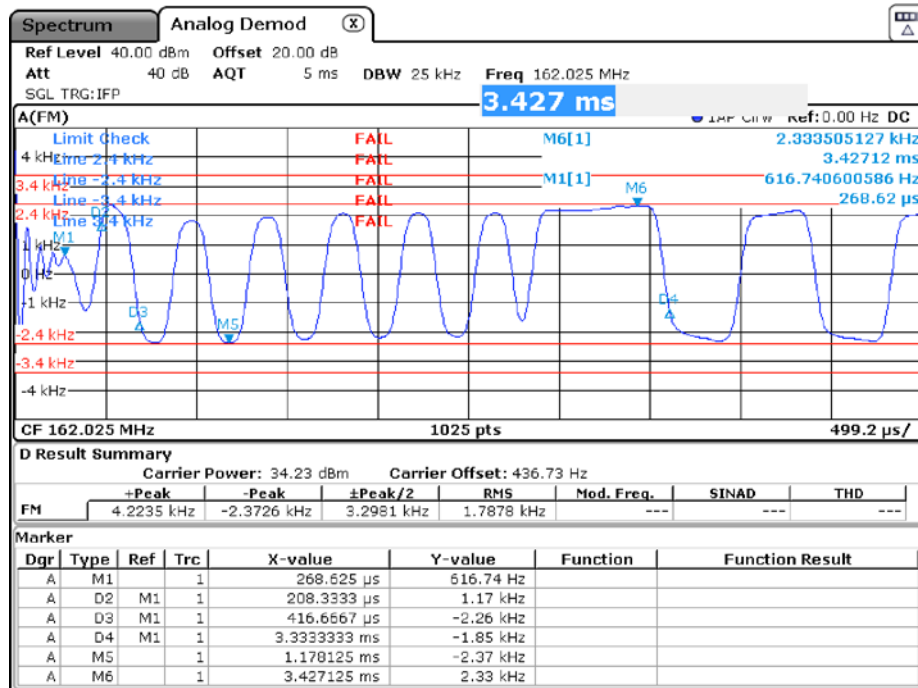
Date: 14 MAR 2018 10:17:34



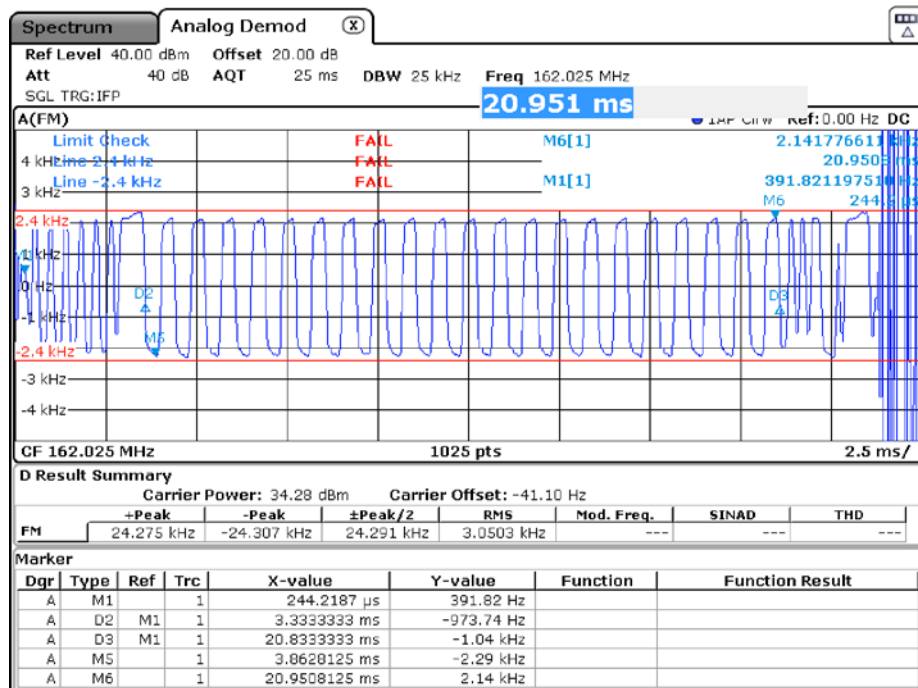
Date: 14.MAR.2018 10:29:11



Date: 14.MAR.2018 10:27:13

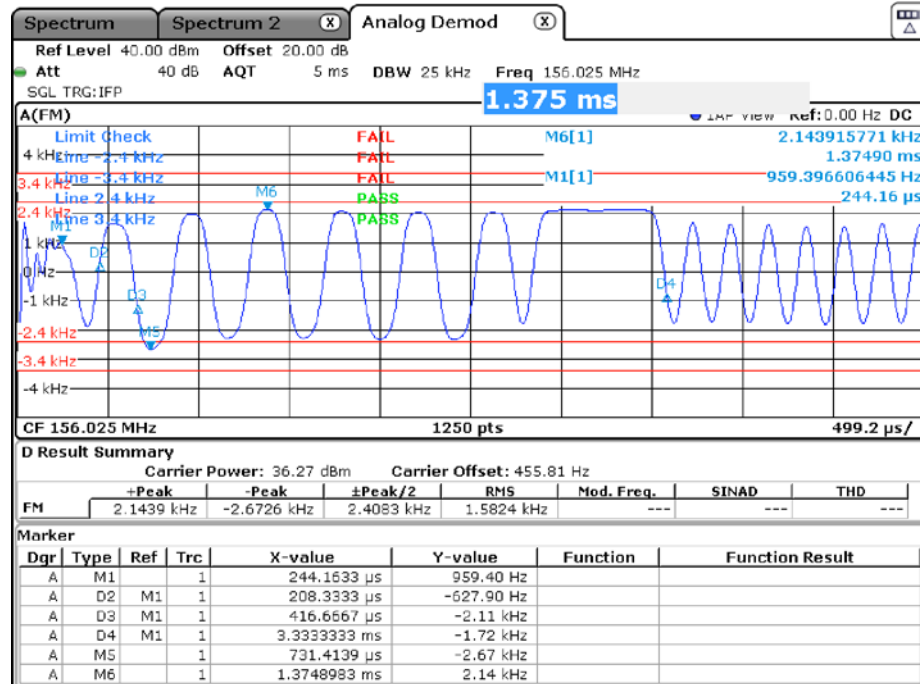


Date: 14.MAR.2018 10:30:30

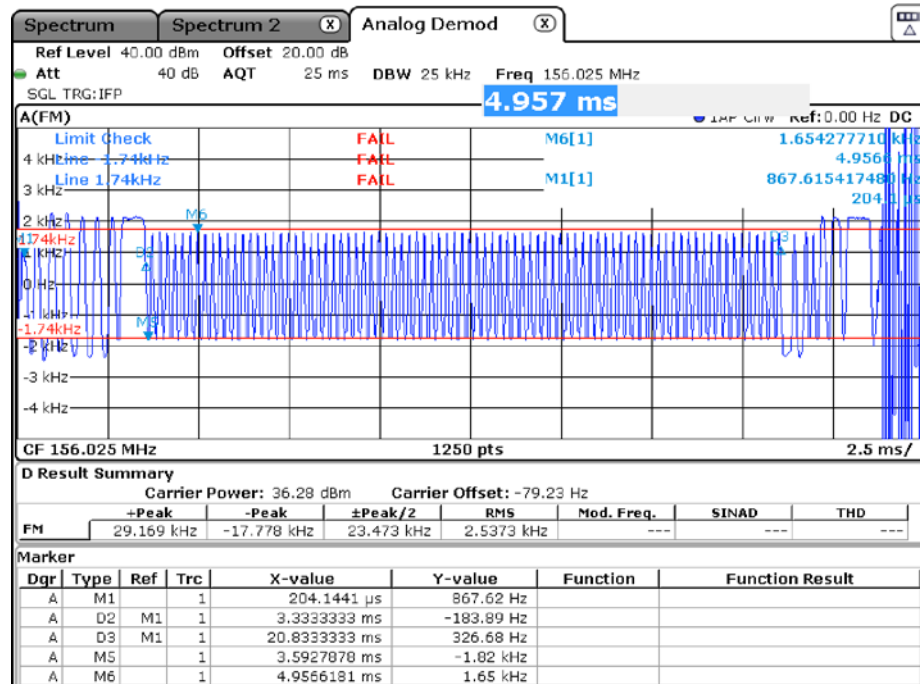


Date: 14.MAR.2018 10:31:54

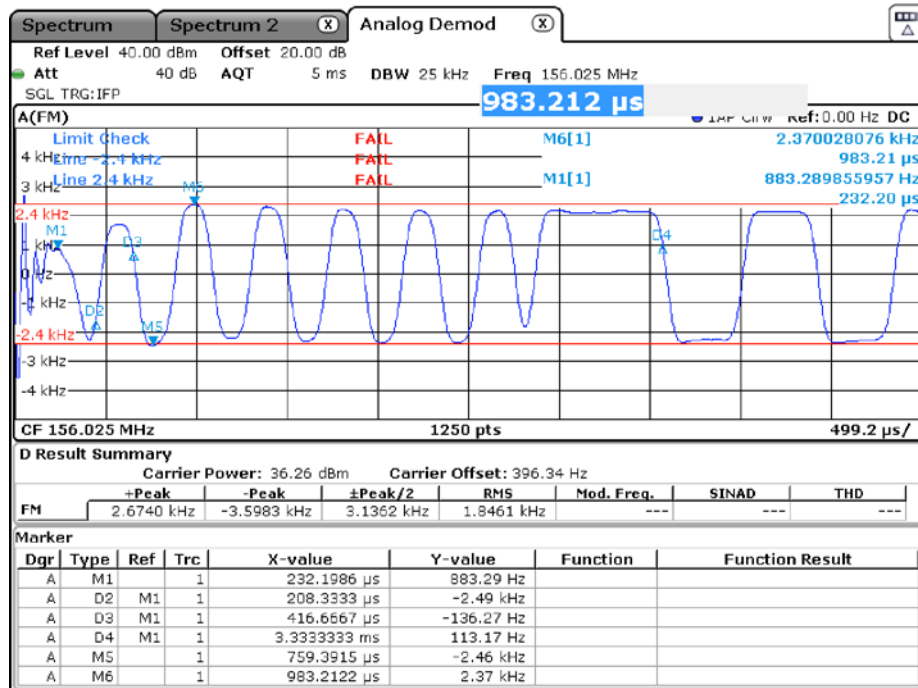
20 °C, 24.0 V



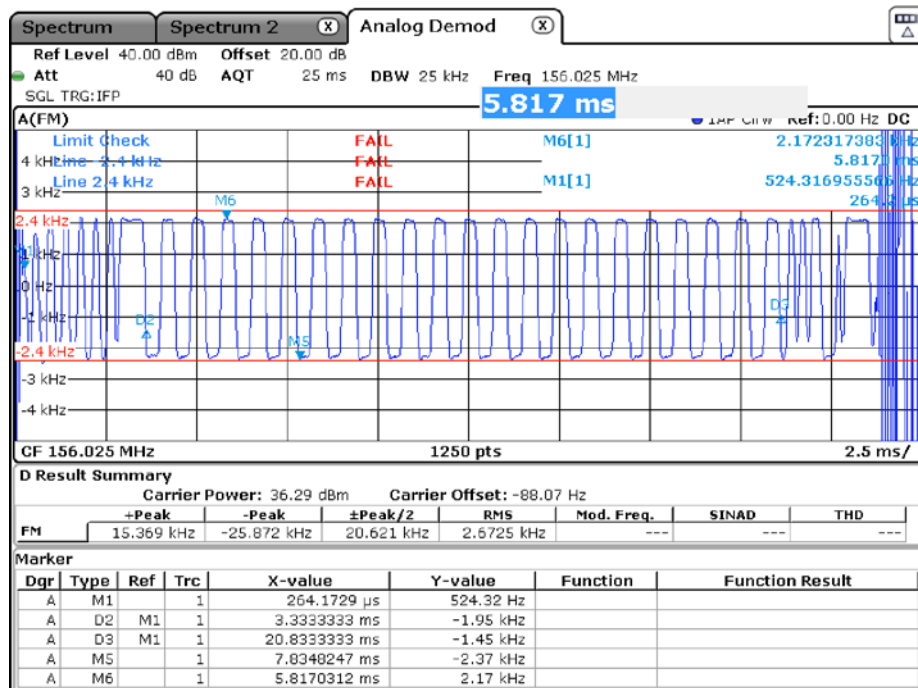
Date: 13.MAR.2018 14:16:47



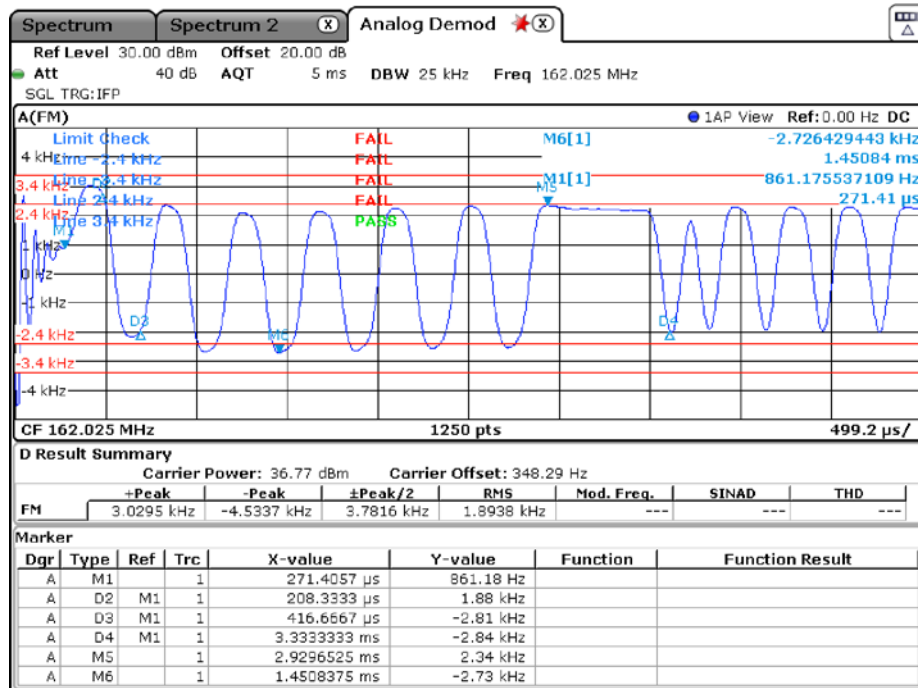
Date: 13.MAR.2018 14:19:15



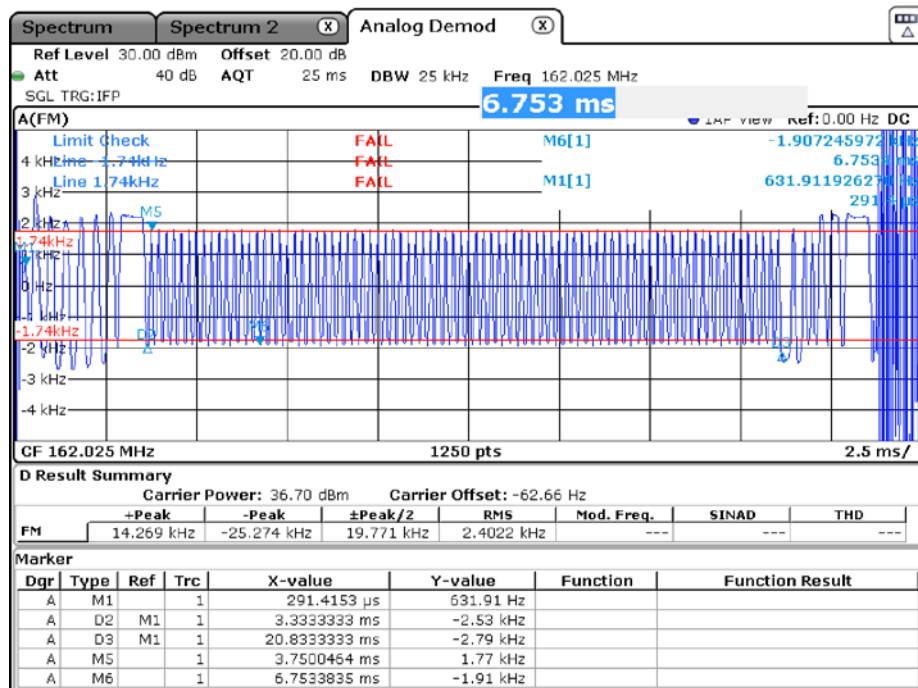
Date: 13.MAR.2018 14:22:16



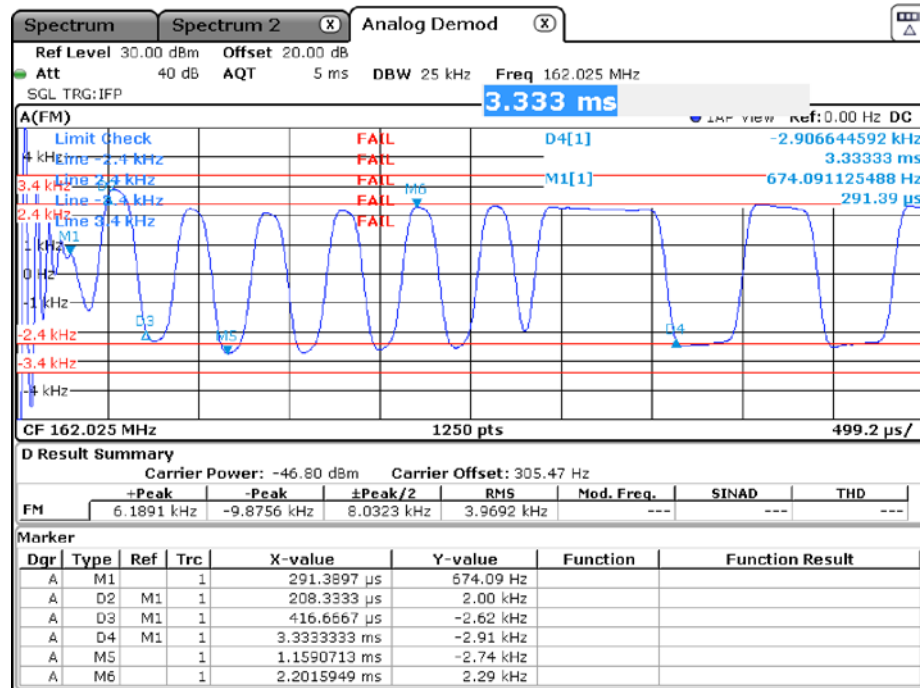
Date: 13.MAR.2018 14:21:08



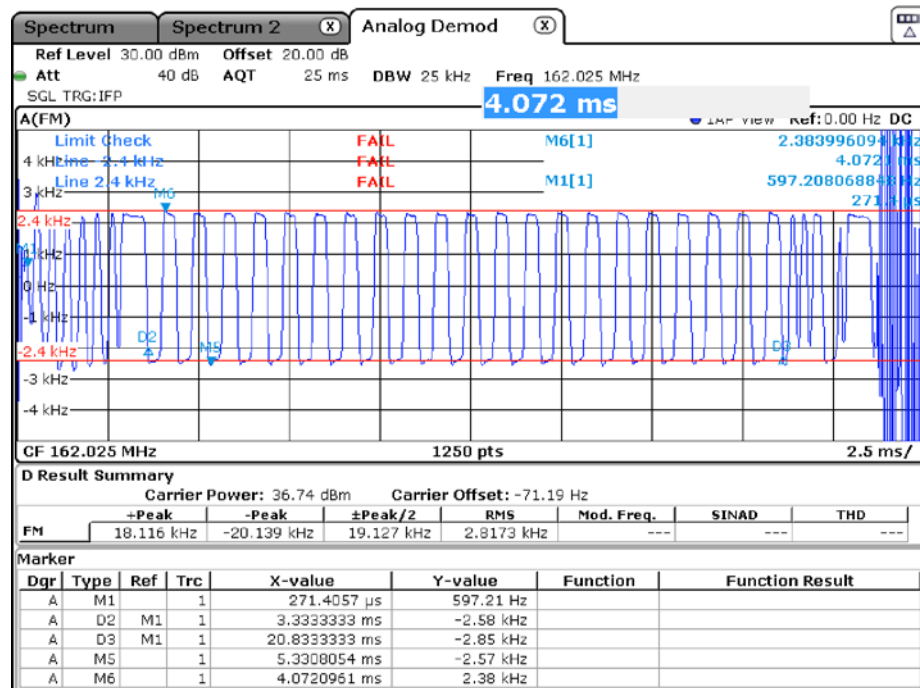
Date: 13.MAR.2018 09:55:31



Date: 13.MAR.2018 10:03:14

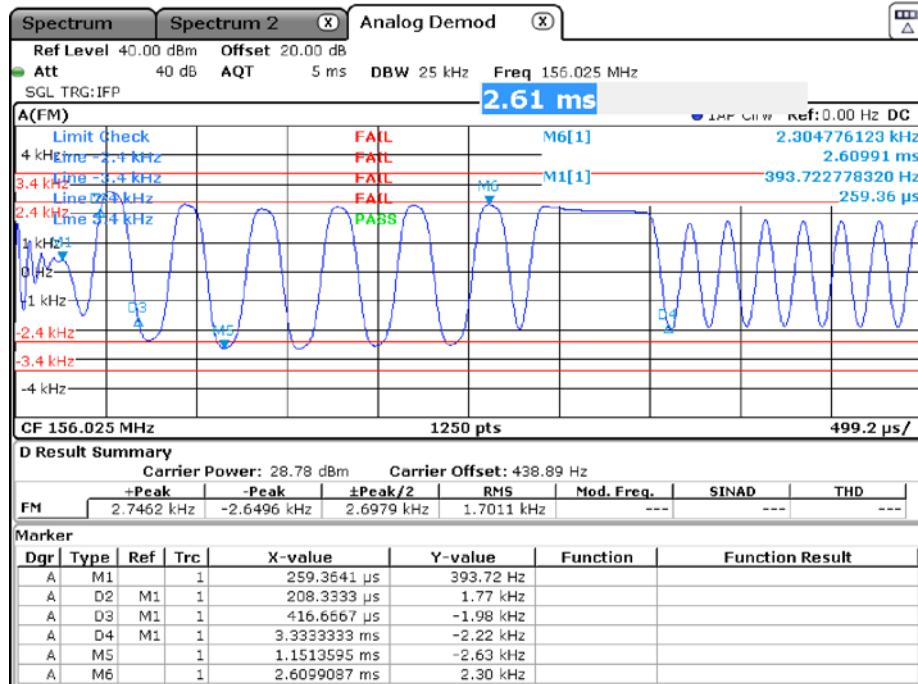


Date: 13.MAR.2018 10:09:26

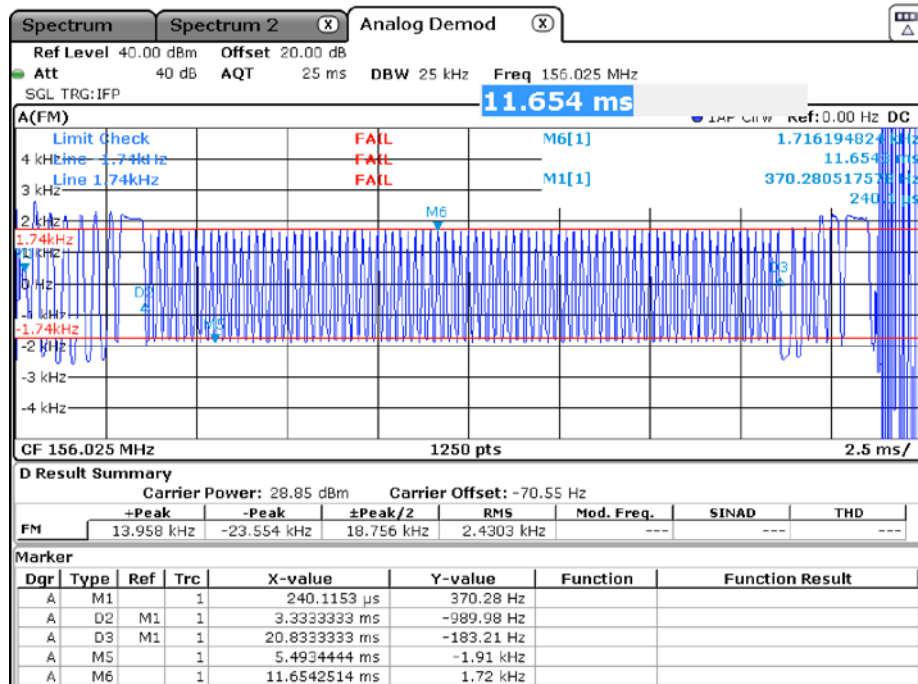


Date: 13.MAR.2018 10:05:49

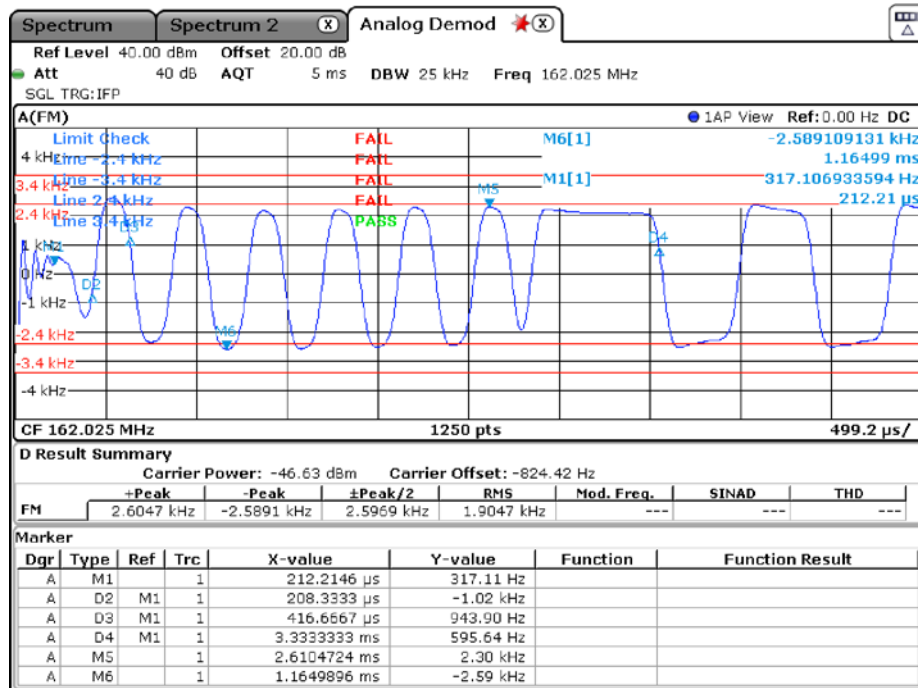
55 °C, 32.1 V



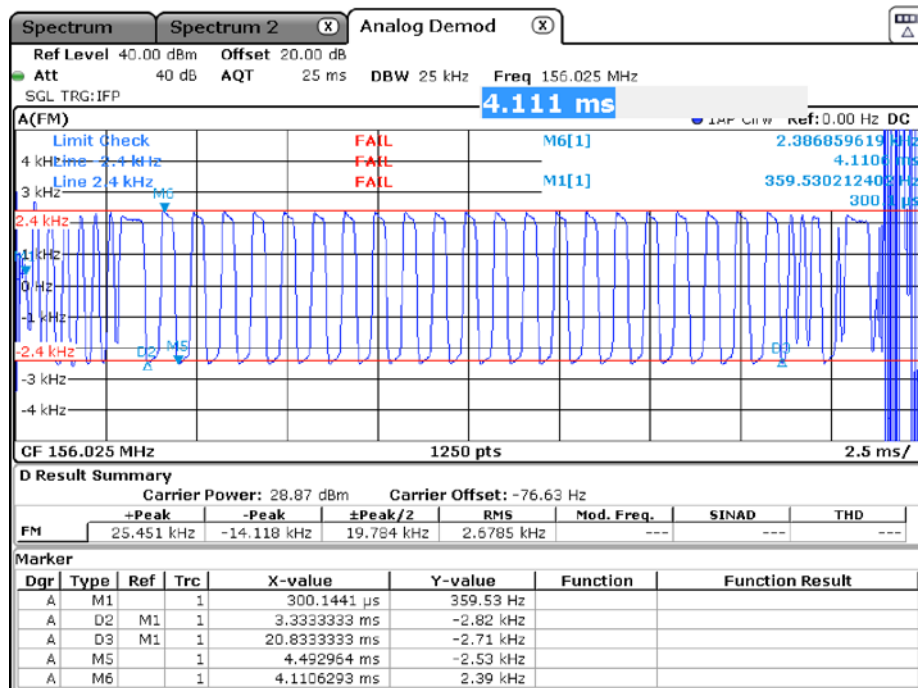
Date: 13.MAR.2018 13:33:54



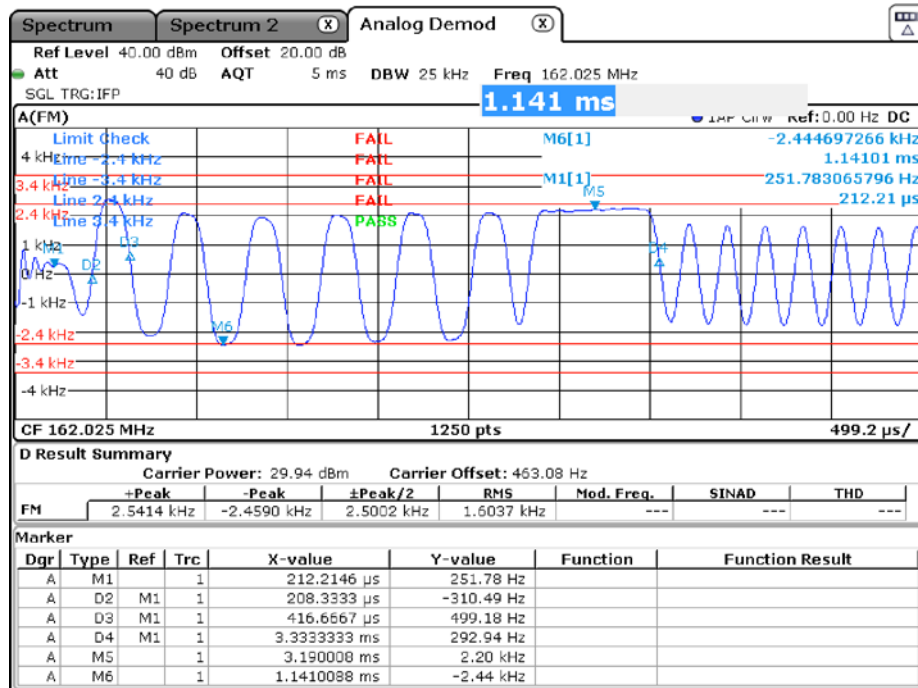
Date: 13.MAR.2018 13:37:30



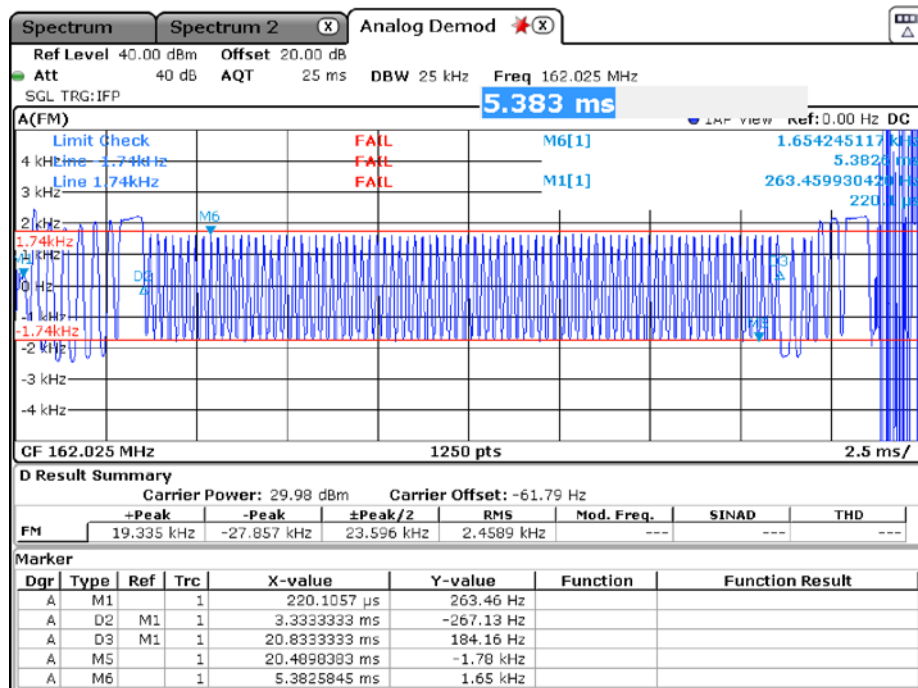
Date: 13.MAR.2018 13:42:53



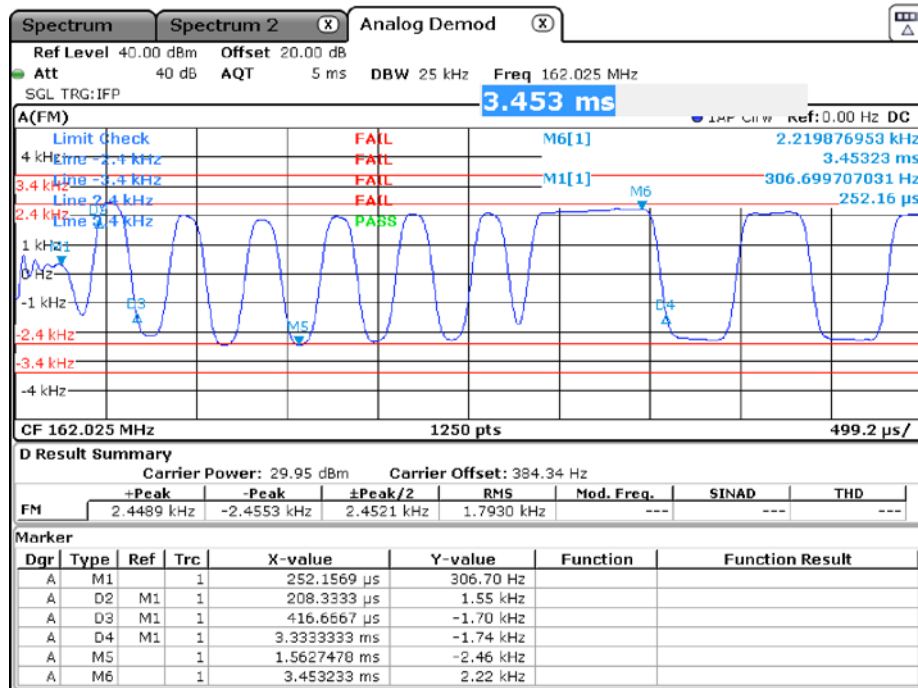
Date: 13.MAR.2018 13:38:56



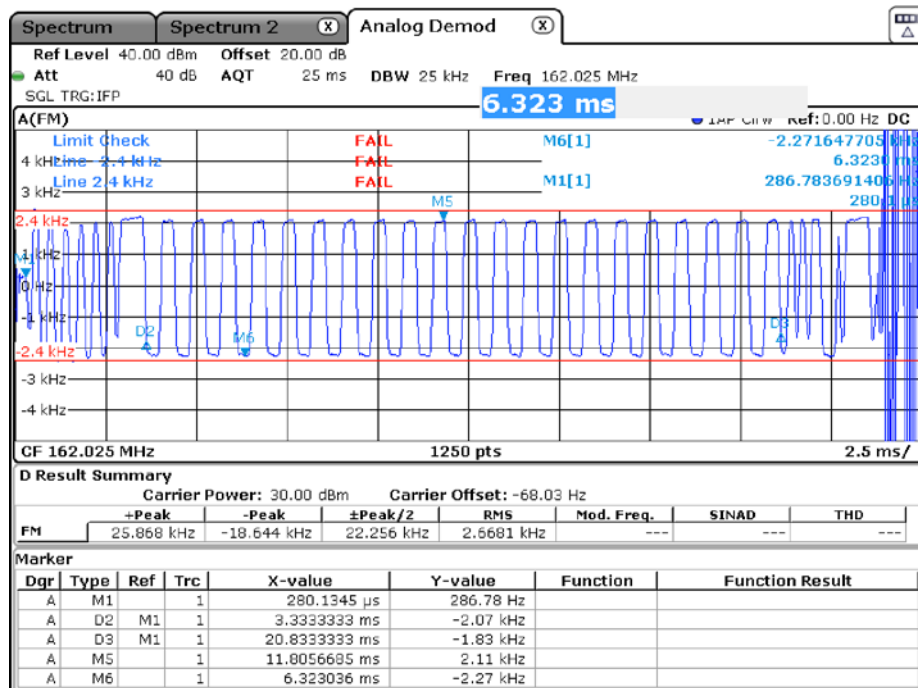
Date: 13.MAR.2018 13:44:25



Date: 13.MAR.2018 13:46:23



Date: 13.MAR.2018 13:50:29



Date: 13.MAR.2018 13:48:23

7.5 Transmitter output power versus time function

7.5.1 Test Equipment List

Type	Designation	Inv.-no.	Serial No. or ID	Manufacturer
☒ Spectrum Analysator	FSV40	20219	101448	Rohde & Schwarz
☒ Attenuator	RDL50	18858	100390	Rohde & Schwarz
☒ Climatic test chamber	PL-2J	18843	15001626	ESPEC

7.5.2 Test Results

Results for transmitter output power versus time function test are documented as listed below.

Transmitter output power versus time function

Prüfdatum / Date of test:	2017-02-22
Prüfer / Operator:	Martin Steindl
Messplatz / Test site:	Non shielded room

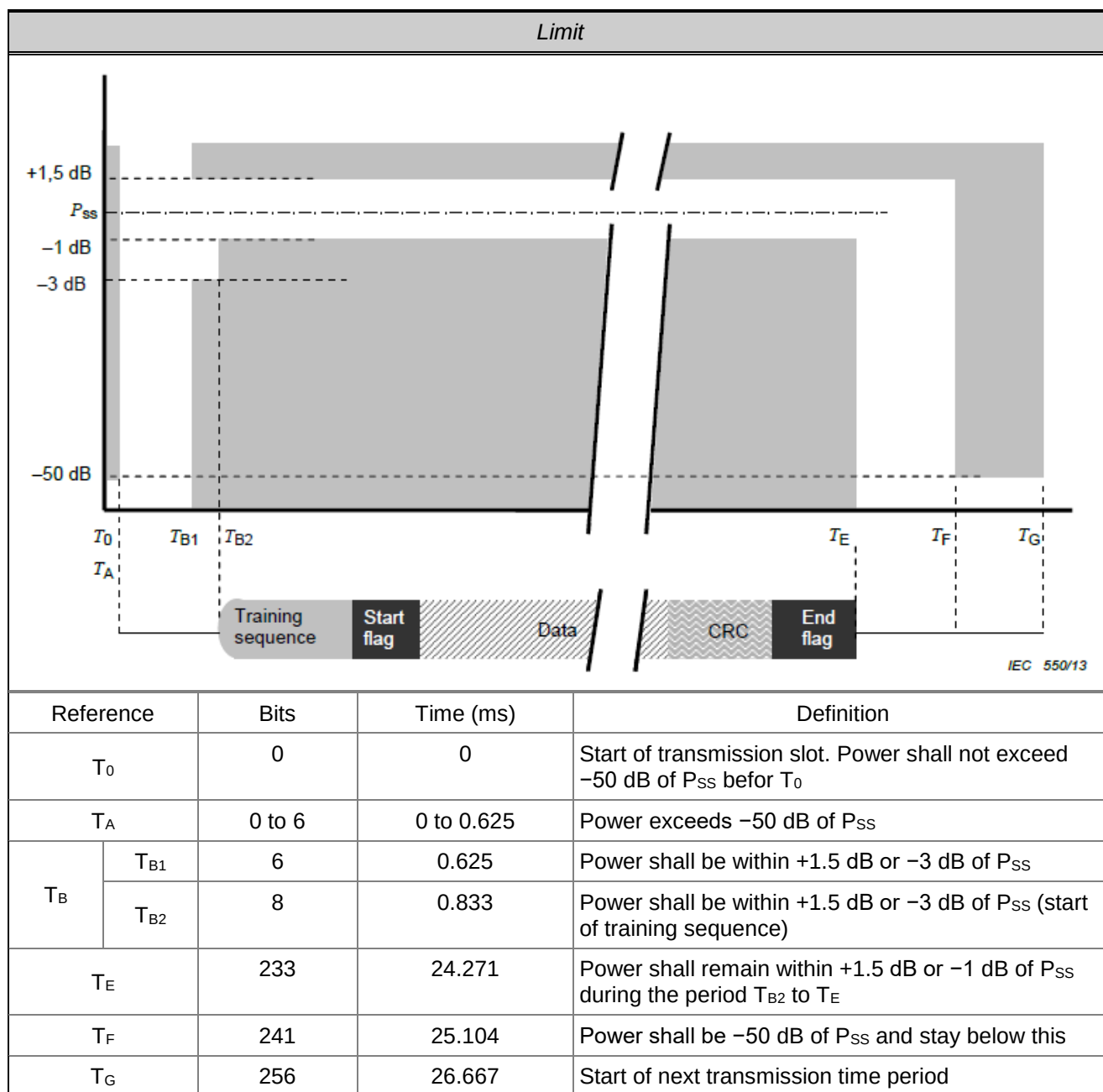
Prüfergebnis / Test Result	
☒	Erfüllt / Passed
☐	Nicht erfüllt / Not passed

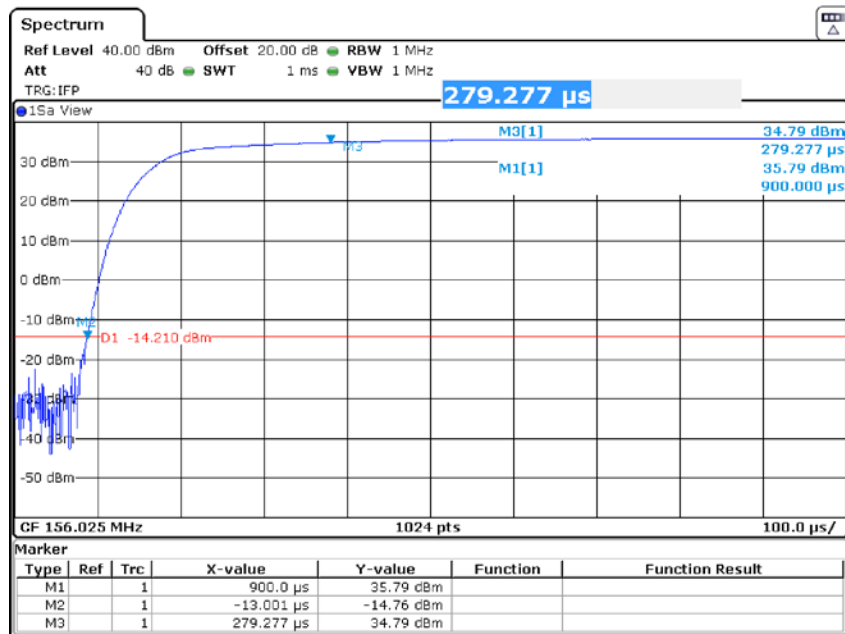
Luftdruck / Barometric pressure:	978 hPa
Relative Luftfeuchtigkeit / Relative humidity:	25 %
Temperatur / Ambient temperature:	22 °C

Prüfgrundlage / Specifications:	IEC 62287-2:2017, section 11.1.5
Prüfling / Test sample:	Test sample No. 2 according to list of test samples
Betriebsart / Operation mode:	Transmitting continuously with 5 W
Kommentar / Comment:	

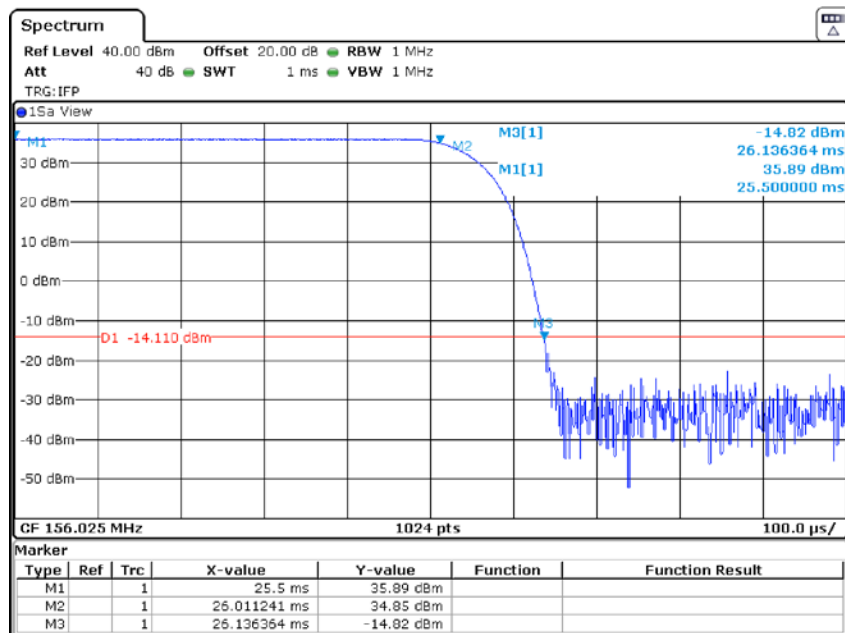
Nominal Frequency	Test Signal	Spectrum mask	Result	Note
156.025 MHz	Power up	See plots on page 49 for details	Passed	
	Power down	See plots on page 49 for details	Passed	
162.025 MHz	Power up	See plots on page 50 for details	Passed	
	Power down	See plots on page 50 for details	Passed	

Note(s):

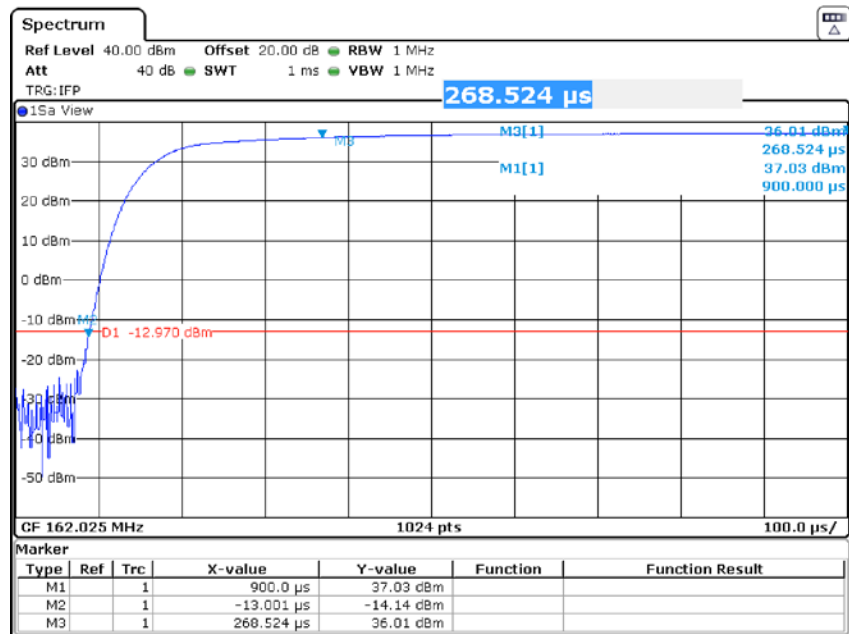




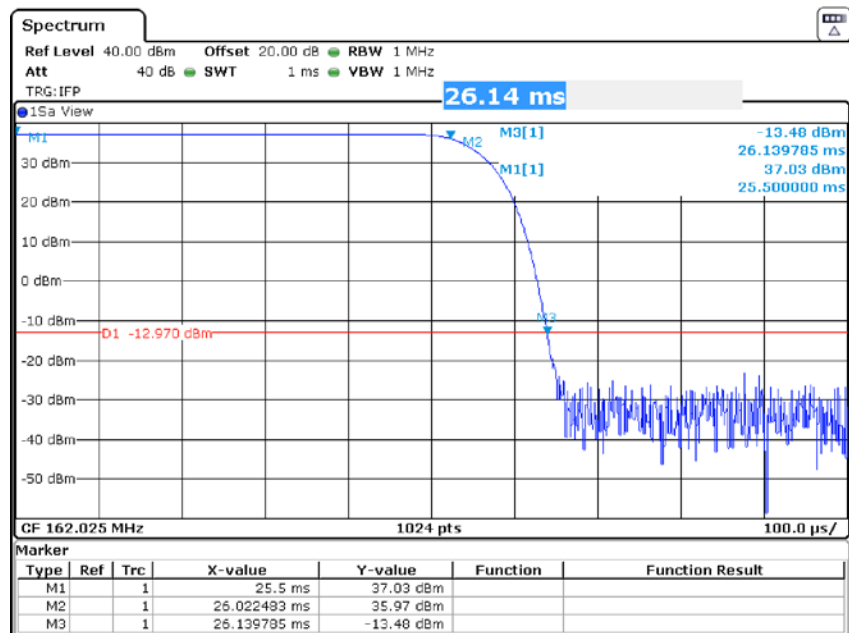
Date: 22 FEB.2018 16:39:41



Date: 22 FEB.2018 16:41:15



Date: 22 FEB.2018 16:36:52



Date: 22 FEB.2018 16:32:22

7.6 Sensitivity

7.6.1 Test Equipment List

Type	Designation	Inv.-no.	Serial No. or ID	Manufacturer
☒ Radio Communication Monitor	CMS54	19398	838384/030	Rohde & Schwarz
☒ Climatic test chamber	PL-2J	18843	15001626	ESPEC

7.6.2 Test Results

Results for sensitivity test are documented as listed below.

Sensitivity

Prüfdatum / Date of test:	2018-03-13 and 2018-03-14
Prüfer / Operator:	Martin Steindl
Messplatz / Test site:	Non shielded room

Prüfergebnis / Test Result	
☒	Erfüllt / Passed
☐	Nicht erfüllt / Not passed

Luftdruck / Barometric pressure:	974 hPa
Relative Luftfeuchtigkeit / Relative humidity:	35 %
Temperatur / Ambient temperature:	24 °C

Prüfgrundlage / Specifications:	IEC 62287-2:2017, section 11.2.1
Prüfling / Test sample:	EUT No. 4 and No. 5 as described in table of devices unter test
Betriebsart / Operation mode:	Receiving
Kommentar / Comment:	

Temperature	Voltage	Frequency		Power (dBm)	PER		Result	Note
		Nominal	Tested		Measured	Limit		
-25 °C	9.6 V	156.025 MHz	156.0250 MHz	-101	10 %	20 %	Passed	1
		162.025 MHz	162.0250 MHz	-101	10 %	20 %	Passed	1
+20 °C	24.0 V	156.025 MHz	156.0245 MHz	-104	0 %	20 %	Passed	2
			156.0250 MHz	-107	0 %	20 %	Passed	2
			156.0255 MHz	-104	0 %	20 %	Passed	2
		162.025 MHz	162.0245 MHz	-104	0 %	20 %	Passed	2
			162.0250 MHz	-107	0 %	20 %	Passed	2
			162.0255 MHz	-104	0 %	20 %	Passed	2
+55 °C	32.1 V	156.025 MHz	156.0250 MHz	-101	0 %	20 %	Passed	2
		162.025 MHz	162.0250 MHz	-101	0 %	20 %	Passed	2

Note(s):

- Test performed on 2018-03-13 with EUT No. 4
- Test performed on 2018-03-14 with EUT No. 5

7.7 Error behaviour at high input levels

7.7.1 Test Equipment List

Type	Designation	Inv.-no.	Serial No. or ID	Manufacturer
☒ Radio Communication Monitor	CMS54	19398	838384/030	Rohde & Schwarz
☒ Vector Signal Generator	SMBV100A	20238	1407.6004K02-2	Rohde & Schwarz

7.7.2 Test Results

Results for error behavior at high input levels test are documented as listed below.

Error behaviour at high input levels

Prüfdatum / Date of test:	2018-03-13
Prüfer / Operator:	Martin Steindl
Messplatz / Test site:	Non shielded room

Prüfergebnis / Test Result	
☒	Erfüllt / Passed
☐	Nicht erfüllt / Not passed

Luftdruck / Barometric pressure:	974 hPa
Relative Luftfeuchtigkeit / Relative humidity:	35 %
Temperatur / Ambient temperature:	24 °C

Prüfgrundlage / Specifications:	IEC 62287-2:2017, section 11.2.2
Prüfling / Test sample:	EUT No. 4 as described in table of devices unter test
Betriebsart / Operation mode:	Receiving
Kommentar / Comment:	

Frequency	Power	PER		Result	Note
	(dBm)	Measured	Limit		
156.025 MHz	-77	0 %	2 %	Passed	
	-7	0 %	10 %	Passed	
162.025 MHz	-77	0 %	2 %	Passed	
	-7	0 %	10 %	Passed	

Note(s):

7.8 Co-channel rejection

7.8.1 Test Equipment List

Type	Designation	Inv.-no.	Serial No. or ID	Manufacturer
☒ Radio Communication Monitor	CMS54	19398	838384/030	Rohde & Schwarz
☒ Climatic test chamber	PL-2J	18843	15001626	ESPEC

7.8.2 Test Results

Results for co-channel rejection test are documented as listed below.

Co-channel rejection

Prüfdatum / Date of test:	2018-02-23
Prüfer / Operator:	Martin Steindl
Messplatz / Test site:	Non shielded room

Prüfergebnis / Test Result	
☒	Erfüllt / Passed
☐	Nicht erfüllt / Not passed

Luftdruck / Barometric pressure:	978 hPa
Relative Luftfeuchtigkeit / Relative humidity:	25 %
Temperatur / Ambient temperature:	22 °C

Prüfgrundlage / Specifications:	IEC 62287-2:2017, section 11.2.3
Prüfling / Test sample:	EUT No. 3 as described in table of devices under test
Betriebsart / Operation mode:	Receiving
Kommentar / Comment:	

Frequency	Frequency-Offset Signal B	PER		Result	Note
		Measured	Limit		
156.025 MHz	-1 kHz	0 %	20 %	Passed	
156.025 MHz	0 kHz	0 %	20 %	Passed	
156.025 MHz	+1 kHz	0 %	20 %	Passed	
162.025 MHz	-1 kHz	0 %	20 %	Passed	
162.025 MHz	0 kHz	0 %	20 %	Passed	
162.025 MHz	+1 kHz	0 %	20 %	Passed	

Note(s):

7.9 Adjacent channel selectivity

7.9.1 Test Equipment List

Type	Designation	Inv.-no.	Serial No. or ID	Manufacturer
☒ Radio Communication Monitor	CMS54	19398	838384/030	Rohde & Schwarz
☒ Vector Signal Generator	SMBV100A	20238	1407.6004K02-2	Rohde & Schwarz

7.9.2 Test Results

Results for adjacent channel selectivity test are documented as listed below.

Adjacent channel selectivity

Prüfdatum / Date of test:	2018-02-23
Prüfer / Operator:	Martin Steindl
Messplatz / Test site:	Non shielded room

Prüfergebnis / Test Result	
☒	Erfüllt / Passed
☐	Nicht erfüllt / Not passed

Luftdruck / Barometric pressure:	974 hPa
Relative Luftfeuchtigkeit / Relative humidity:	35 %
Temperatur / Ambient temperature:	24 °C

Prüfgrundlage / Specifications:	IEC 62287-2:2017, section 11.2.4
Prüfling / Test sample:	Test sample No. 3 acc. to list of test samples
Betriebsart / Operation mode:	Receiving
Kommentar / Comment:	

Frequency	Frequency-Offset Signal B	PER		Result	Note
		Measured	Limit		
156.025 MHz	-25 kHz	0 %	20 %	Passed	
156.025 MHz	+25 kHz	0 %	20 %	Passed	
162.025 MHz	-25 kHz	0 %	20 %	Passed	
162.025 MHz	+25 kHz	0 %	20 %	Passed	

Note(s):

7.10 Spurious response rejection

7.10.1 Test Equipment List

Type	Designation	Inv.-no.	Serial No. or ID	Manufacturer
☒ Radio Communication Monitor	CMS54	19398	838384/030	Rohde & Schwarz
☒ Vector Signal Generator	SMBV100A	20238	1407.6004K02-2	Rohde & Schwarz

7.10.2 Test Results

Results for spurious response rejection test are documented as listed below.

Spurious response rejection

Prüfdatum / Date of test:	2018-02-23
Prüfer / Operator:	Martin Steindl
Messplatz / Test site:	Non shielded room

Prüfergebnis / Test Result	
☒	Erfüllt / Passed
☐	Nicht erfüllt / Not passed

Luftdruck / Barometric pressure:	974 hPa
Relative Luftfeuchtigkeit / Relative humidity:	35 %
Temperatur / Ambient temperature:	24 °C

Prüfgrundlage / Specifications:	IEC 62287-2:2017, section 11.2.5
Prüfling / Test sample:	Test sample No. 3 acc. to list of test samples
Testparametr / Test parameter:	IF₁: 38.855 MHz IF₂: 455 kHz sr: 162.025 MHz – 158.025 MHz = 6 MHz f_{LOL}: 117.17 MHz f_{LOH}: 123.17 MHz Limited Frequency Range: LFR_{LO}: 74.86 MHz LFR_{HI}: 165.48 MHz Specific Frequencies of Interest SFI₁: 207.485 MHz; 285.365 MHz; 330.655 MHz; 408.365 MHz; 453.825 MHz; 531.535 MHz SFI₂: 195.485 MHz; 273.195 MHz; 312.655 MHz; 390.365 MHz; 429.825 MHz; 507.535 MHz
Betriebsart / Operation mode:	Receiving
Kommentar / Comment:	

Frequency	Tested frequency	PER		Result	Note
		Measured	Limit		
156.025 MHz	78.5 MHz	0 %	20 %	Passed	
156.025 MHz	82.5 MHz	0 %	20 %	Passed	
156.025 MHz	156.4 MHz	0 %	20 %	Passed	
156.025 MHz	157.8 MHz	0 %	20 %	Passed	
156.025 MHz	159.8 MHz	0 %	20 %	Passed	
156.025 MHz	163.5 MHz	0 %	20 %	Passed	
156.025 MHz	195.485 MHz	0 %	20 %	Passed	
156.025 MHz	273.195 MHz	0 %	20 %	Passed	
156.025 MHz	312.655 MHz	0 %	20 %	Passed	
156.025 MHz	390.365 MHz	0 %	20 %	Passed	
156.025 MHz	429.825 MHz	0 %	20 %	Passed	
156.025 MHz	507.535 MHz	0 %	20 %	Passed	
162.025 MHz	160.0 MHz	0 %	20 %	Passed	
162.025 MHz	160.5 MHz	0 %	20 %	Passed	
162.025 MHz	161.5 MHz	0 %	20 %	Passed	
162.025 MHz	162.6 MHz	0 %	20 %	Passed	
162.025 MHz	163.7 MHz	0 %	20 %	Passed	
162.025 MHz	207.485 MHz	0 %	20 %	Passed	
162.025 MHz	285.365 MHz	0 %	20 %	Passed	
162.025 MHz	330.655 MHz	0 %	20 %	Passed	
162.025 MHz	408.365 MHz	0 %	20 %	Passed	
162.025 MHz	453.825 MHz	0 %	20 %	Passed	
162.025 MHz	531.535 MHz	0 %	20 %	Passed	
Note(s):					

7.11 Intermodulation response rejection

7.11.1 Test Equipment List

Type	Designation	Inv.-no.	Serial No. or ID	Manufacturer
☒ Radio Communication Monitor	CMS54	19398	838384/030	Rohde & Schwarz
☒ Vector Signal Generator	SMBV100A	20238	1407.6004K02-2	Rohde & Schwarz
☒ Signal Generator	SMB100A	20215	178189	Rohde & Schwarz

7.11.2 Test Results

Results for intermodulation response rejection test are documented as listed below.

Intermodulation response rejection

Prüfdatum / <i>Date of test</i> :	2018-02-23
Prüfer / <i>Operator</i> :	Martin Steindl
Messplatz / <i>Test site</i> :	Non shielded room

Prüfergebnis / <i>Test Result</i>	
☒	Erfüllt / <i>Passed</i>
☐	Nicht erfüllt / <i>Not passed</i>

Luftdruck / <i>Barometric pressure</i> :	974 hPa
Relative Luftfeuchtigkeit / <i>Relative humidity</i> :	35 %
Temperatur / <i>Ambient temperature</i> :	24 °C

Prüfgrundlage / <i>Specifications</i> :	IEC 62287-2:2017, section 11.2.6
Prüfling / <i>Test sample</i> :	Test sample No. 3 acc. to list of test samples
Betriebsart / <i>Operation mode</i> :	Receiving
Kommentar / <i>Comment</i> :	

Frequency	Test No.	PER		Result	Note
		Measured	Limit		
156.025 MHz	3	0 %	20 %	Passed	
156.025 MHz	4	0 %	20 %	Passed	
162.025 MHz	1	0 %	20 %	Passed	
162.025 MHz	2	0 %	20 %	Passed	

Note(s):

7.12 Blocking or desensitisation

7.12.1 Test Equipment List

Type	Designation	Inv.-no.	Serial No. or ID	Manufacturer
☒ Radio Communication Monitor	CMS54	19398	838384/030	Rohde & Schwarz
☒ Vector Signal Generator	SMBV100A	20238	1407.6004K02-2	Rohde & Schwarz

7.12.2 Test Results

Results for blocking or desensitization test are documented as listed below.

Blocking or desensitisation

Prüfdatum / Date of test:	2018-02-23
Prüfer / Operator:	Martin Steindl
Messplatz / Test site:	Non shielded room

Prüfergebnis / Test Result	
☒	Erfüllt / Passed
☐	Nicht erfüllt / Not passed

Luftdruck / Barometric pressure:	974 hPa
Relative Luftfeuchtigkeit / Relative humidity:	35 %
Temperatur / Ambient temperature:	24 °C

Prüfgrundlage / Specifications:	IEC 62287-2:2017, section 11.2.7
Prüfling / Test sample:	Test sample No. 3 acc. to list of test samples
Betriebsart / Operation mode:	Receiving
Kommentar / Comment:	

Wanted Signal Frequency	Frequency-Offset Signal B	PER		Result
		Measured	Limit	
156.025 MHz	-10 MHz	0 %	20 %	Passed
156.025 MHz	-5 MHz	0 %	20 %	Passed
156.025 MHz	-2 MHz	0 %	20 %	Passed
156.025 MHz	-1 MHz	0 %	20 %	Passed
156.025 MHz	-500 kHz	0 %	20 %	Passed
156.025 MHz	+500 kHz	0 %	20 %	Passed
156.025 MHz	+1 MHz	0 %	20 %	Passed
156.025 MHz	+2 MHz	0 %	20 %	Passed
156.025 MHz	+5 MHz	0 %	20 %	Passed
156.025 MHz	+10 MHz	0 %	20 %	Passed
162.025 MHz	-10 MHz	0 %	20 %	Passed
162.025 MHz	-5 MHz	0 %	20 %	Passed
162.025 MHz	-2 MHz	0 %	20 %	Passed
162.025 MHz	-1 MHz	0 %	20 %	Passed
162.025 MHz	-500 kHz	0 %	20 %	Passed
162.025 MHz	+500 kHz	0 %	20 %	Passed
162.025 MHz	+1 MHz	0 %	20 %	Passed
162.025 MHz	+2 MHz	0 %	20 %	Passed
162.025 MHz	+5 MHz	0 %	20 %	Passed

Note(s):

7.13 Conducted spurious emission

7.13.1 Test Equipment List

Type	Designation	Inv.-no.	Serial No. or ID	Manufacturer
☒ EMI test receiver	ESPI7	19578	836914/0002	Rohde & Schwarz
☒ Spectrum analysator	FSP40	19533	100063	Rohde & Schwarz
☒ Attenuator	RDL50	18858	100390	Rohde & Schwarz
☒ High pass filter	WHKS200-10SS	19511	1	Wainwright

7.13.2 Test Results

Results for conducted spurious emission tests are documented as listed below.

Spurious emissions for receiver

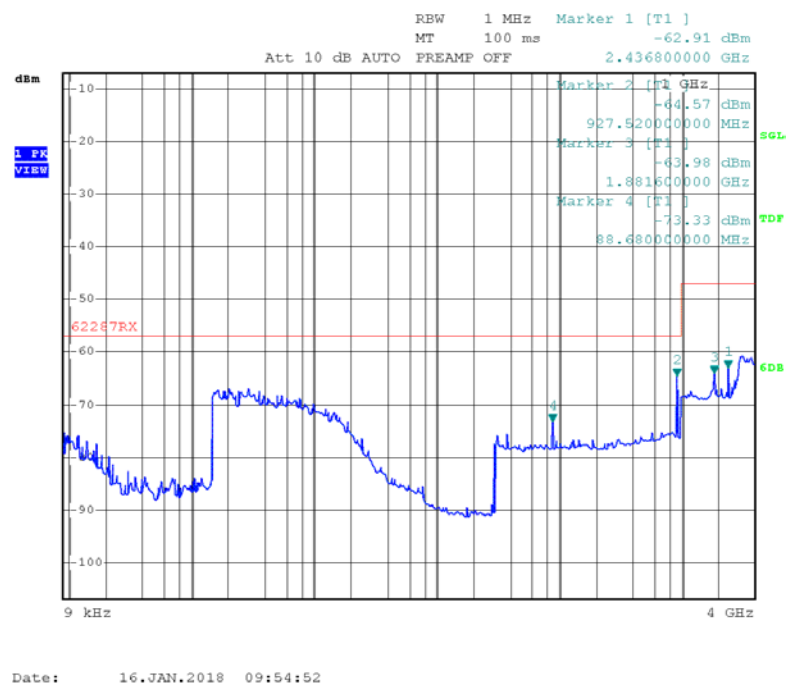
Prüfdatum / Date of test:	2018-01-16
Prüfer / Operator:	Martin Steindl
Messplatz / Test site:	Fully anechoic room, cabin no. 2

Prüfergebnis / Test Result
☒ Erfüllt / Passed
☐ Nicht erfüllt / Not passed

Luftdruck / Barometric pressure:	960 hPa
Relative Luftfeuchtigkeit / Relative humidity:	29 %
Temperatur / Ambient temperature:	23 °C

Prüfgrundlage / Specifications:	IEC 62287-2:2017, section 11.3.1
Prüfling / Test sample:	EUT No. 1, as described in table of devices under test
Betriebsart / Operation mode:	Receiving
Kommentar / Comment:	

Frequenz MHz	Peak dBm	Limit dBm	Margin dB	Dwellt. ms	RBW kHz	Corr. dB
88.68	-73.3	-36.0	37.3	10 ms	100	10.0
927.52	-65.6	-36.0	29.6	10 ms	100	10.0
1881.6	-64.0	-30.0	34.0	10 ms	1000	10.0
2436.8	-62.9	-30.0	32.9	10 ms	1000	10.0



Spurious emissions for transmitter

Prüfdatum / Date of test:	2018-01-18
Prüfer / Operator:	Martin Steindl
Messplatz / Test site:	Non shielded room

Prüfergebnis / Test Result	
☒	Erfüllt / Passed
☐	Nicht erfüllt / Not passed

Luftdruck / Barometric pressure:	960 hPa
Relative Luftfeuchtigkeit / Relative humidity:	29 %
Temperatur / Ambient temperature:	23 °C

Prüfgrundlage / Specifications:	IEC 62287-2:2017, section 11.3.2
Prüfling / Test sample:	EUT No. 2, as described in table of devices under test
Betriebsart / Operation mode:	Transmitting on lowest and highest channel
Kommentar / Comment:	

Transmitting at 156.025 MHz with 1 W

Frequenz MHz	Peak dBm	Limit dBm	Margin dB	Dwellt. ms	RBW kHz	Corr. dB
132.80	-41.2	-36.0	5.2	10	100	30.0

Transmitting at 156.025 MHz with 5 W

No significant emissions above noise floor detected, no values noted – see plots for details

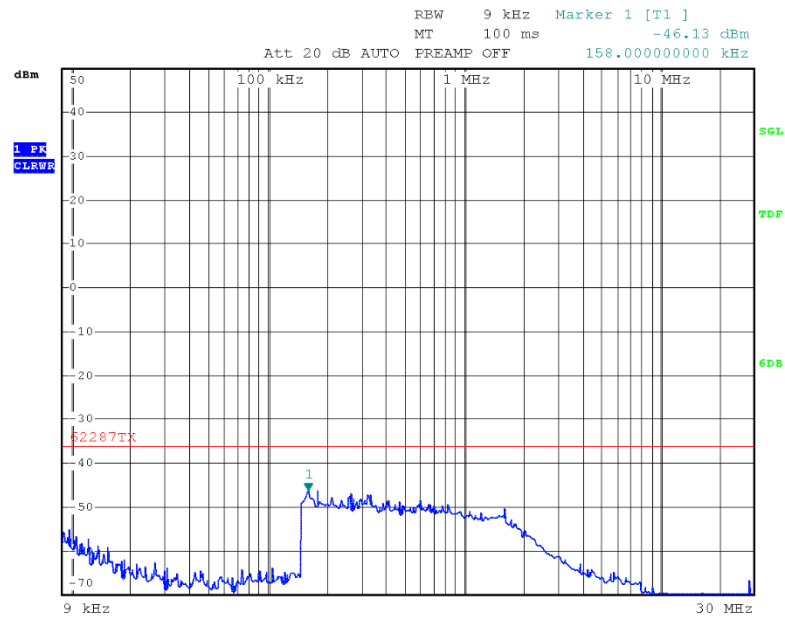
Transmitting at 162.025 MHz with 1 W

Frequenz MHz	Peak dBm	Limit dBm	Margin dB	Dwellt. ms	RBW kHz	Corr. dB
29.254	-61.6	-36.0	25.6	10 ms	10	30.0

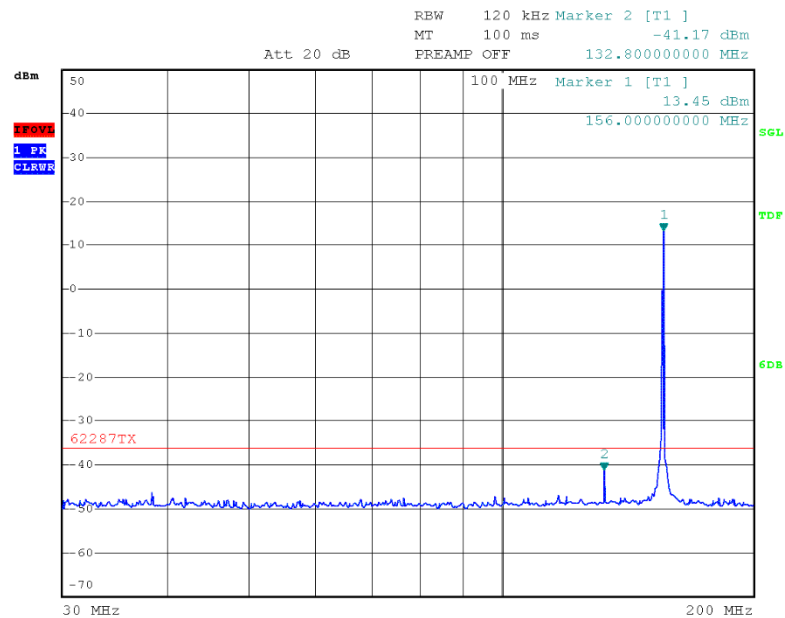
Transmitting at 162.025 MHz with 5 W

No significant emissions above noise floor detected, no values noted – see plots for details

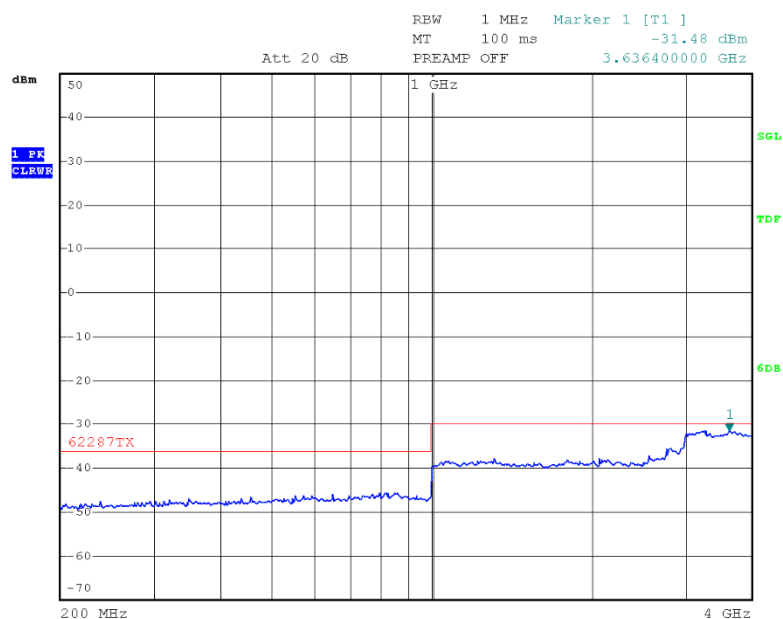
Transmitting at 156.025 MHz with 1 W



Date: 18.JAN.2018 17:18:38

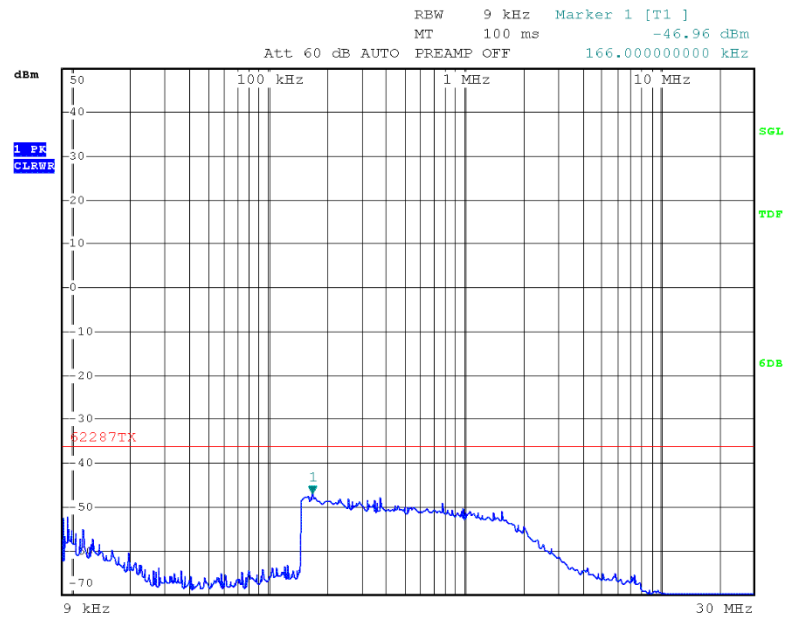


Date: 18.JAN.2018 17:13:08

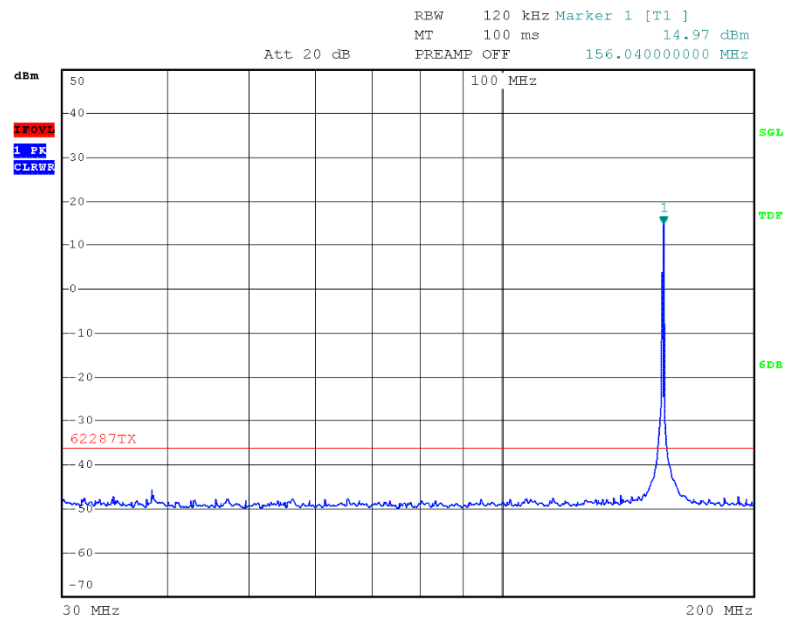


Date: 18.JAN.2018 17:10:29

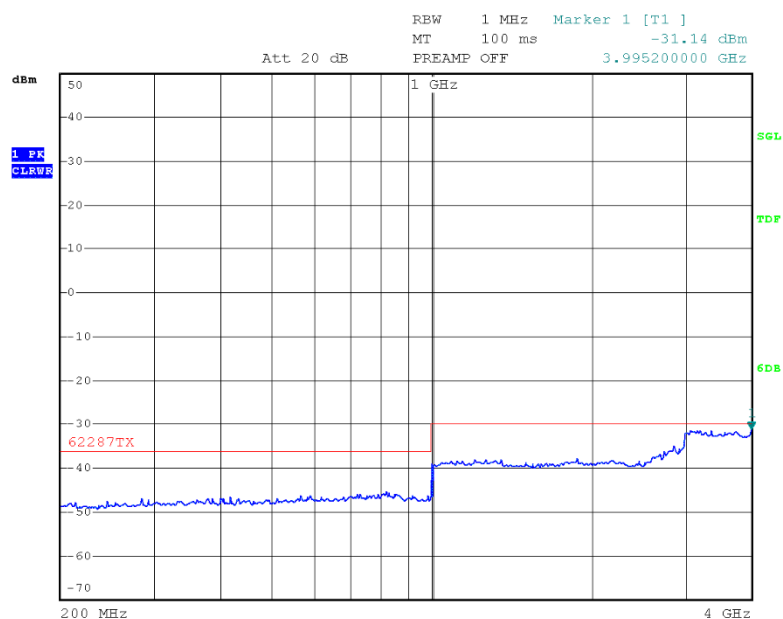
Transmitting at 156.025 MHz with 5 W



Date: 18.JAN.2018 17:25:22

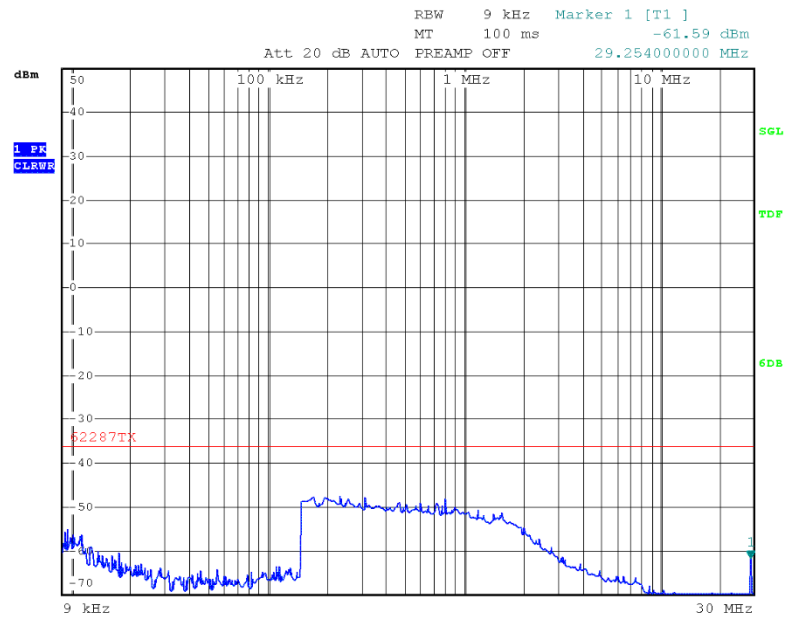


Date: 18.JAN.2018 17:27:34

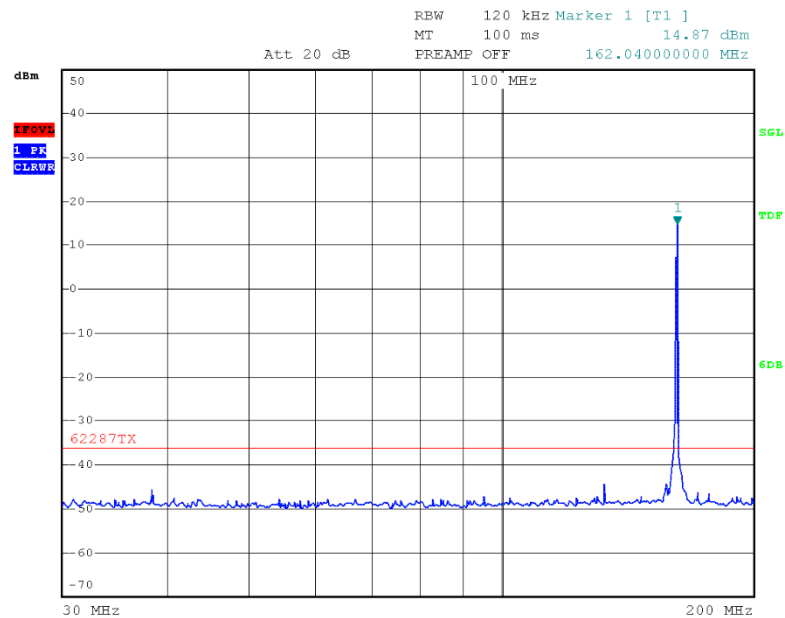


Date: 18.JAN.2018 17:38:09

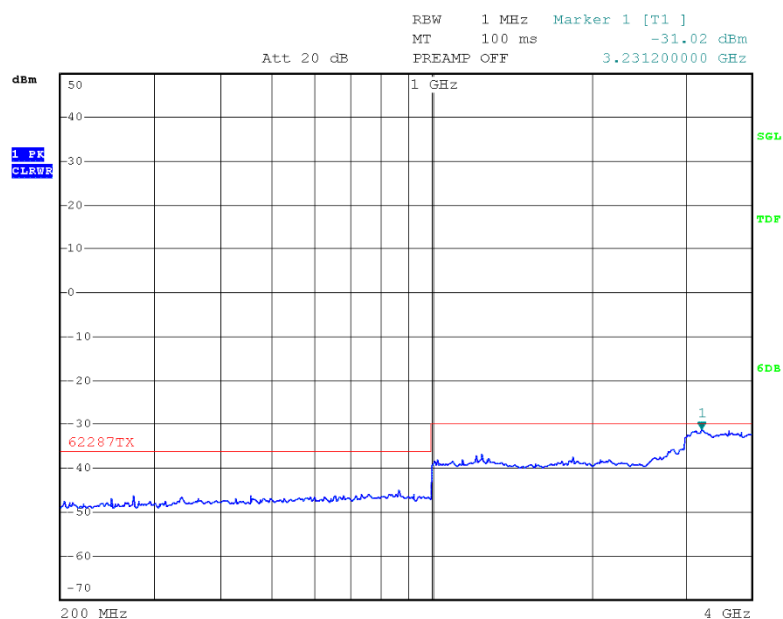
Transmitting at 162.025 MHz with 1 W



Date: 18.JAN.2018 16:41:14

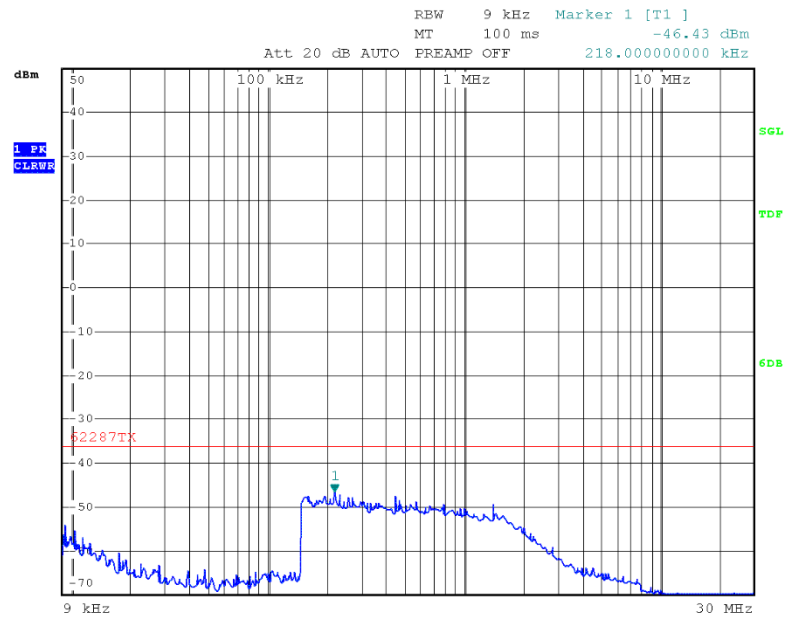


Date: 18.JAN.2018 16:35:50

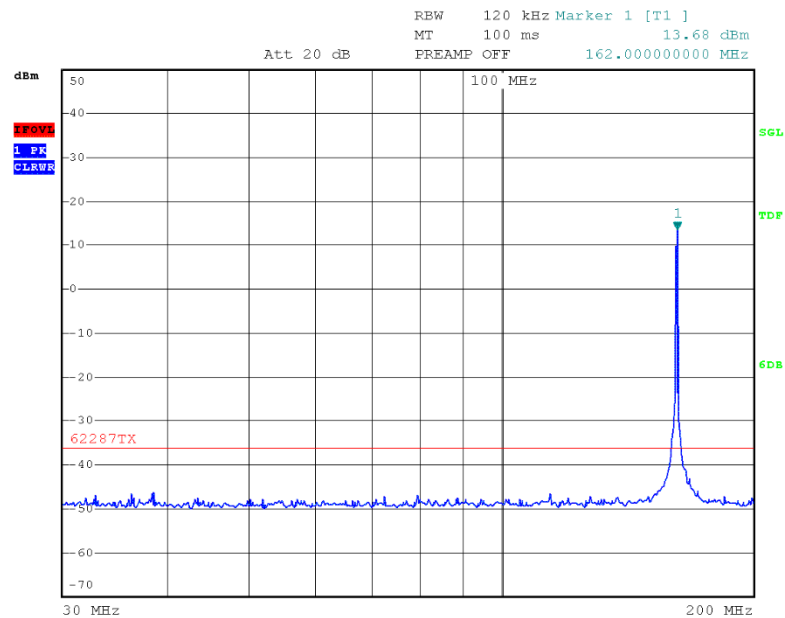


Date: 18.JAN.2018 16:58:19

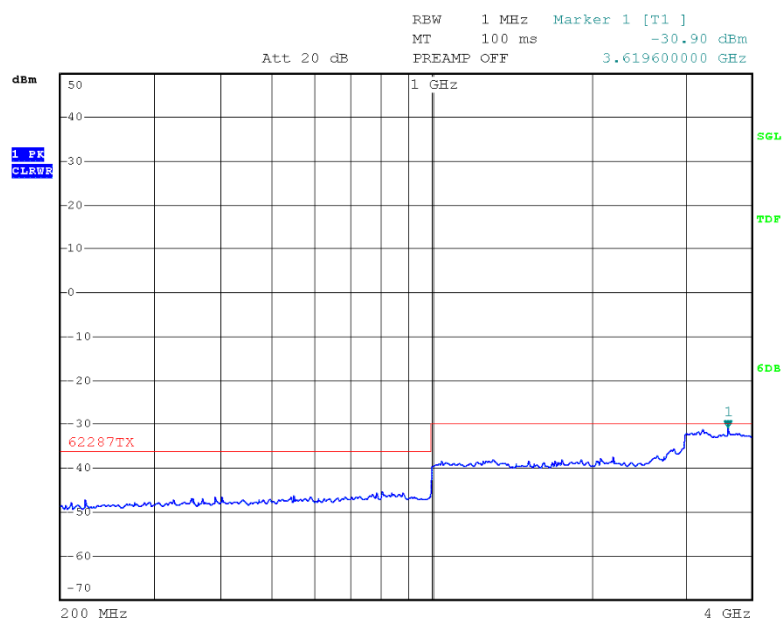
Transmitting at 162.025 MHz with 5 W



Date: 18.JAN.2018 18:01:12



Date: 18.JAN.2018 17:55:45



Date: 18.JAN.2018 17:49:20

8 Revision History

Revision History			
<i>Edition</i>	<i>Date</i>	<i>Issued by</i>	<i>Modifications</i>
1	2018-04-13	Martin Steindl	First Edition