

Prüfbericht - Nr.: <i>Test Report No.:</i>		16014463 001		Seite 1 von 34 <i>Page 1 of 34</i>	
Auftraggeber: <i>Client:</i>		Tsuen Shing Enterprises Ltd. 19/F., Billion Plaza 8, Cheung Yue Street Cheung Sha Wan, Kowloon Hong Kong			
Gegenstand der Prüfung: GMRS/FRS Transceiver <i>Test item:</i>					
Bezeichnung: <i>Identification:</i>		WT-555		FCC ID: <i>FCC ID</i> PERWT555	
Wareneingangs-Nr.: <i>Receipt No.:</i>		173039751		Eingangsdatum: <i>Date of receipt:</i> 01.09.2008	
Prüfört: <i>Testing location:</i>		TÜV Rheinland (Guangdong) Ltd. EMC Laboratory Guangzhou Auto Market, Yuan Gang Section of Guangshan Road, Guangzhou 510650 P. R. China		Listed test laboratory according to FCC rules section 2.948 for measuring devices under Parts 95 and Part 15	
Prüfgrundlage: <i>Test specification:</i>		ANSI C63.4: 2003 ANSI / TIA - 603 - C - 2004 FCC "Rules and Regulations", Part 95: 01, Oct. 2007, Subpart A, Subpart B, Subpart E FCC "Rules and Regulations", Part 15: 20, Sep. 2007, Subpart B			
Prüfergebnis: <i>Test Result:</i>		Der Prüfgegenstand entspricht oben genannter Prüfgrundlage(n). <i>The test item passed the test specification(s).</i>			
Prüflaboratorium: <i>Testing Laboratory:</i>		TÜV Rheinland (Guangdong) Ltd.			
geprüft / tested by:		kontrolliert / reviewed by:			
22.10.2008 David Wang Datum Name/Stellung Date Name/Position		David Wang Unterschrift Signature		25.10.2008 Liangdong Xie Datum Name/Stellung Date Name/Position	
				Liangdong Xie Unterschrift Signature	
Sonstiges / Other Aspects:					
Abkürzungen: P(ass) = entspricht Prüfgrundlage F(fail) = entspricht nicht Prüfgrundlage N/A = nicht anwendbar N/T = nicht getestet Abbreviations: P(ass) = passed F(fail) = failed N/A = not applicable N/T = not tested					
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TEST SUMMARY

5.1 RF POWER OUTPUT (FCC PART 2 PER SECTION 2.1046) : GMRS MODE & FRS MODE

RESULT: Pass

5.2 EFFECTIVE RADIATED POWER (FCC PART 2 PER SECTION 2.1046)

RESULT: Pass

5.3 AUDIO FREQUENCY RESPONSE (FCC PART 2 PER SECTION 2.1047)

RESULT: Pass

5.4 MODULATION DEVIATION OVER FREQUENCY AND INPUT (FCC PART 95 PER SECTION 95.637 (A))

RESULT: Pass

5.5 AUDIO LOW PASS FILTER RESPONSE (FCC PART 95 PER SECTION 95.637 (B))

RESULT: Pass

5.6 OCCUPIED BANDWIDTH (FCC PART 2 PER SECTION 2.1049)

RESULT: Pass

5.7 SPURIOUS EMISSIONS AT ANTENNA TERMINALS (FCC PART 2 PER SECTION 2.1051 AND FCC PART 95 PER SECTION 95.635(B))

RESULT: Pass

5.8 RADIATED EMISSION (FCC PART 15 PER SECTION 15.109(A))

RESULT: Pass

5.9 RADIATED SPURIOUS EMISSIONS (FCC PART 2 PER SECTION 2.1053 AND FCC PART 95 PER SECTION 95.635(B))

RESULT: Pass

5.10 FREQUENCY STABILITY (FCC PART 2 PER SECTION 2.1055, FCC PART 95 PER SECTION 95.621(B) AND 95.627(B))

RESULT: Pass

5.11 FREQUENCY STABILITY (FCC PART 2 PER SECTION 2.1055, FCC PART 95 PER SECTION 95.621(B) AND 95.627(B))

RESULT: Pass

Prüfbericht - Nr.:
Test Report No.:

16014463 001

Seite 3 von 34
Page 3 of 34

Contents

1	GENERAL REMARKS.....	5
1.1	COMPLEMENTARY MATERIALS	5
2	TEST SITES.....	5
2.1	TEST FACILITIES	5
2.2	LIST OF TEST AND MEASUREMENT INSTRUMENTS	6
2.3	TRACE ABILITY	6
2.4	CALIBRATION	7
2.5	MEASUREMENT UNCERTAINTY	7
2.6	LOCATION OF ORIGINAL DATA.....	7
2.7	STATUS OF FACILITY USED FOR TESTING.....	7
3	GENERAL PRODUCT INFORMATION.....	8
3.1	PRODUCT FUNCTION AND INTENDED USE	8
3.2	RATINGS AND SYSTEM DETAILS	8
3.3	INDEPENDENT OPERATION MODES	9
3.4	SUBMITTED DOCUMENTS	9
4	TEST SET-UP AND OPERATION MODE	10
4.1	PRINCIPLE OF CONFIGURATION SELECTION.....	10
4.2	TEST OPERATION AND TEST SOFTWARE.....	10
4.3	SPECIAL ACCESSORIES AND AUXILIARY EQUIPMENT	10
4.4	COUNTERMEASURES TO ACHIEVE EMC COMPLIANCE	10
4.5	TEST SET-UP.....	11
5	TEST RESULTS EMISSION	15
5.1	RF POWER OUTPUT (FCC PART 2 PER SECTION 2.1046): GMRS MODE & FRS MODE..	15
5.2	EFFECTIVE RADIATED POWER (FCC PART 2 PER SECTION 2.1046)	16
5.3	AUDIO FREQUENCY RESPONSE (FCC PART 2 PER SECTION 2.1047).....	18
5.4	MODULATION DEVIATION OVER FREQUENCY AND INPUT (FCC PART 95 PER SECTION 95.637 (A))	19
5.5	AUDIO LOW PASS FILTER RESPONSE (FCC PART 95 PER SECTION 95.637 (B))	20
5.6	OCCUPIED BANDWIDTH (FCC PART 2 PER SECTION 2.1049)	21

Prüfbericht - Nr.:
Test Report No.:

16014463 001

Seite 4 von 34
Page 4 of 34

5.7	SPURIOUS EMISSIONS AT ANTENNA TERMINALS (FCC PART 2 PER SECTION 2.1051 AND FCC PART 95 PER SECTION 95.635(B)).....	22
5.8	RADIATED EMISSION (FCC PART 15 PER SECTION 15.109(A)).....	23
5.9	RADIATED SPURIOUS EMISSIONS (FCC PART 2 PER SECTION 2.1053 AND FCC PART 95 PER SECTION 95.635(B))	24
5.10	FREQUENCY STABILITY (FCC PART 2 PER SECTION 2.1055, FCC PART 95 PER SECTION 95.621(B) AND 95.627(B))	26
5.11	DC VOLTAGES AND CURRENT INTO FINAL AMPLIFIER , (FCC PART 2 PER SECTION 2.1033(C)(8)).....	29
5.12	EMISSION DESIGNATOR	30
6	PHOTOGRAPHS OF THE TEST SET-UP	31
7	LIST OF TABLES.....	34
8	LIST OF PHOTOGRAPHS.....	34

Prüfbericht - Nr.:
Test Report No.:

16014463 001

Seite 5 von 34
Page 5 of 34

1 General Remarks

1.1 Complementary Materials

All attachments are integral parts of this test report. This applies especially to the following appendix:

Appendix 1: Test result

2 Test Sites

2.1 Test Facilities

TÜV Rheinland (Guangdong) Ltd. EMC Laboratory

Guangzhou Auto Market, Yuan Gang Section of Guangshan Road
Guangzhou 510650

P. R. China

2.2 List of Test and Measurement Instruments

Table 1: List of Test and Measurement Equipment

Kind of Equipment	Type	Manufacturer	S/N	Calibrated until	Calibrated Interval
EMI Test Receiver	ESCI-3	Rohde & Schwarz	100216	26.Nov.2008	1 year
Spectrum Analyzer	FSP30	Rohde & Schwarz	100286	27.Aug.2009	1 year
Trilog-Broadband Antenna	VULB9168	SCHWARZBECK MESS-ELEKTRONIK	210	08.May.2009	2 year
Double-Ridged Waveguide Horn Antenna	HF906	Rohde & Schwarz	100385	18.Jul.2009	2 year
Double-Ridged Waveguide Horn Antenna	HF906	Rohde & Schwarz	100407	08.May.2009	2 year
Pre-amplifier	AFS42- 00101800- 25-S-42	MITEQ	1101599	31.Jul.2009	2 year
Standard Gain Horn Antenna	3160-09	EMCO	21642	N/A	2 year
Standard Gain Horn Antenna	3160-09	EMCO	21645	N/A	2 year
Communication Test Set	8920A	HP	3417A04 617	8-Jan-09	1 year
Multi-meter	Fluke15B	Fluke	9130004 7	20-Oct-09	2 year
Audio Analyzer	VA-2230A	Kenwood	1008729 0	7-Oct-09	1 year
Pre-amplifier	AFS33- 18002650- 30-8P-44	MITEQ	1108282	31.Jul.2009	2 year
3m Anechoic Chamber	N/A	Albatross Project GmbH	N/A	16.Apr.2009	2 year

2.3 Trace ability

All measurement equipment calibrations are traceable to NIST or where calibration is performed outside the United States, to equivalent nationally recognized standards organizations

2.4 Calibration

Equipment requiring calibration is calibrated periodically by the manufacturer or according to manufacturer's specifications. Additionally all equipment is verified for proper performance on a regular basis using in house standards or comparisons.

2.5 Measurement Uncertainty

Uncertainty for conducted emissions measurements is $\pm 2.51\text{dB}$.

Uncertainty for radiated emissions measurements is $\pm 4.9\text{dB}$ (30MHz-1GHz), $\pm 4.84\text{dB}$ (>1GHz).

The reported expanded uncertainty is based on a standard uncertainty multiply by a coverage factor $k=2$, providing a level of confidence of approximately 95%.

2.6 Location of original data

The original copies of all test data taken during actual testing were attached at Appendix 1 of this report and delivered to the applicant. A copy has been retained in the TÜV Rheinland (Guangzhou) file for certification follow-up purposes.

2.7 Status of facility used for testing

TÜV Rheinland (Guangdong) Ltd. EMC Laboratory; Guangzhou Auto Market, Yuan Gang Section of Guangshan Road, Guangzhou 510650, P. R. China is listed on the US Federal Communications Commission list of facilities approved to perform measurements, the register no. 833845

Prüfbericht - Nr.:
Test Report No.:

16014463 001

Seite 8 von 34
Page 8 of 34

3 General Product Information

The submitted sample is a FRS/GMRS transceiver, which operates in the frequency range of 462.550 MHz to 467.7125 MHz with 22 channels.

Refer to the technical document for further information.

3.1 Product Function and Intended Use

For details, refer to technical document and the user manual.

3.2 Ratings and System Details

Frequency range	:	462.5500 ~ 467.7125MHz
Nominal Operating frequencies	:	Refer to the Frequency List below
Type of antenna	:	Integral antenna
FCC ID:		PERWT555
Power supply	:	DC 4.5V Via 3 AAA Alkaline batteries
Frequency Response	:	300Hz-3kHz
Emission designator	:	11K0F3E
Ports	:	N/A
Protection Class	:	III

Frequency List:

Channel	Frequency	Type	Channel	Frequency	Type
1	462.5625	GMRS/FRS	12	467.6625	FRS
2	462.5875	GMRS/FRS	13	467.6875	FRS
3	462.6125	GMRS/FRS	14	467.7125	FRS
4	462.6375	GMRS/FRS	15	462.5500	GMRS
5	462.6625	GMRS/FRS	16	462.5750	GMRS
6	462.6875	GMRS/FRS	17	462.6000	GMRS
7	462.7125	GMRS/FRS	18	462.6250	GMRS
8	467.5625	FRS	19	462.6500	GMRS
9	467.5875	FRS	20	462.6750	GMRS
10	467.6125	FRS	21	462.7000	GMRS
11	467.6375	FRS	22	462.7250	GMRS

Refer to the technical document for further information.

Prüfbericht - Nr.:
Test Report No.:

16014463 001

Seite 9 von 34
Page 9 of 34

3.3 Independent Operation Modes

The basic operation modes are:

Transmitting
Receiving

For further information refer to User Manual

3.4 Submitted Documents

Block Diagram
Circuit Diagram
Components List
PCB layout
FCC label
User Manual
Photo document

4 Test Set-up and Operation Mode

4.1 Principle of Configuration Selection

Emission: The equipment under test (EUT) was configured to measure its highest possible radiation level. The test modes were adapted accordingly in reference to the instructions for use.

4.2 Test Operation and Test Software

Refer to Test set-up in chapter 5.

4.3 Special Accessories and Auxiliary Equipment

None

4.4 Countermeasures to achieve EMC Compliance

No additional measures were employed to achieve compliance.

4.5 Test set-up

Diagram 1 of Measurement Equipment Configuration for Testing Radiated Emission

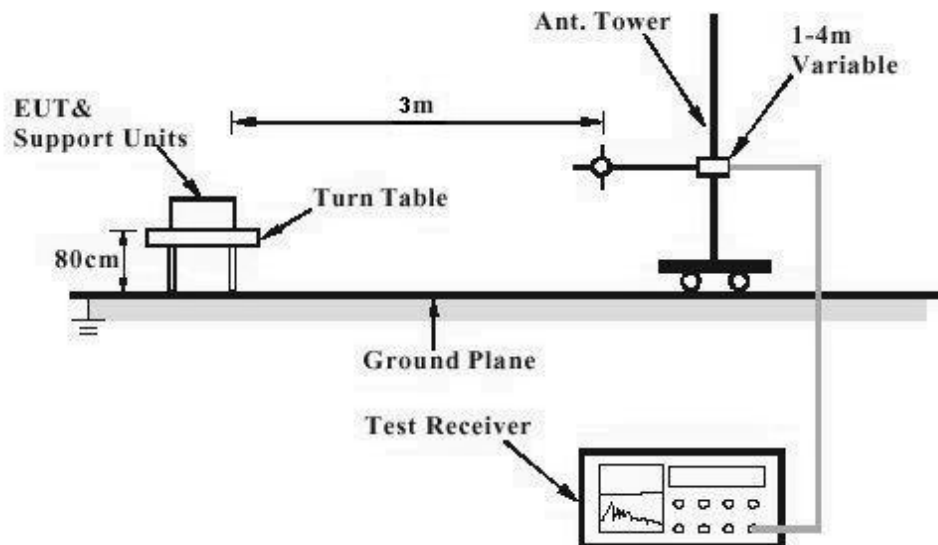


Diagram 2 of Measurement Equipment Configuration for Substitution Method

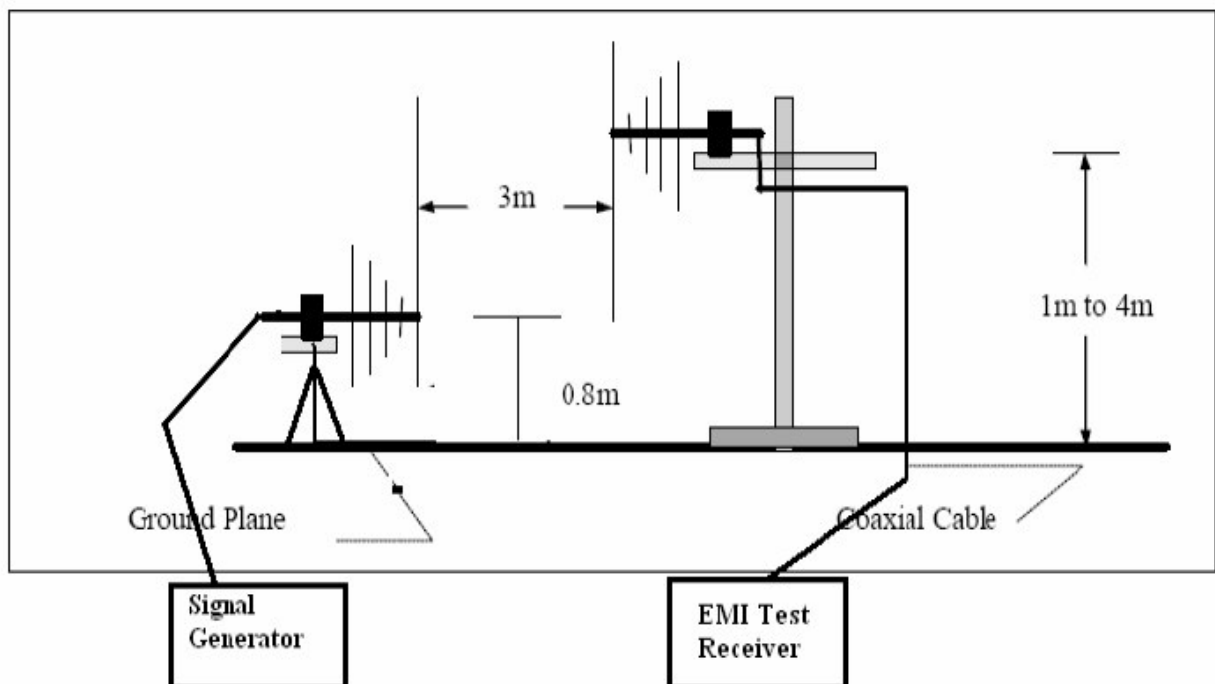


Diagram 3 of Measurement Equipment Configuration for Testing Audio Frequency Response (FCC 2.1047)

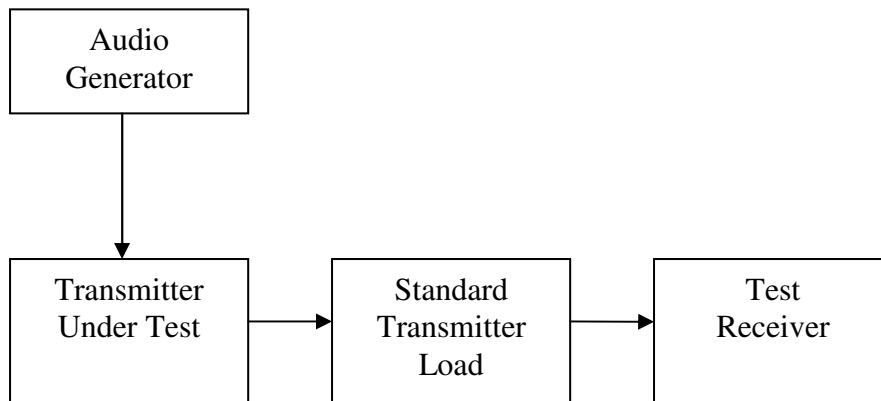


Diagram 4 of Measurement Equipment Configuration for Testing Modulation Deviation Over Frequency and Input (§95.637(a))

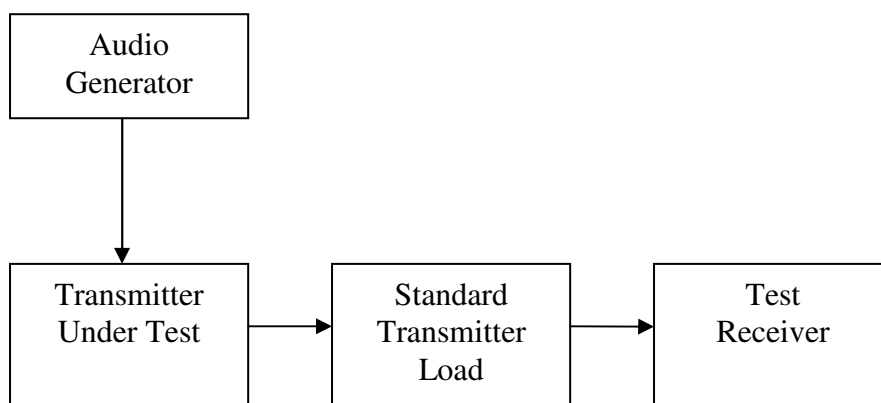


Diagram 5 of Measurement Equipment Configuration for Testing Audio Low Pass Filter Response (§95.637)

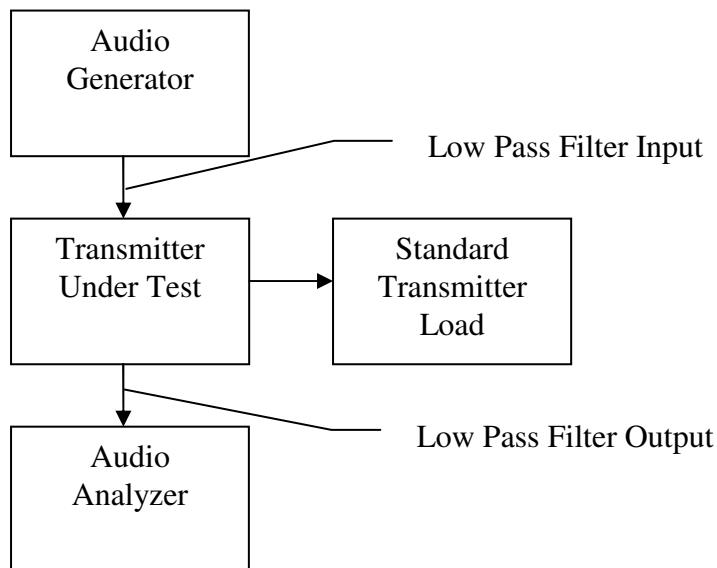


Diagram 6 of Measurement Equipment Configuration for Testing Occupied Bandwidth (§2.1049) and Spurious Emissions at Antenna Terminals (§2.1051 and §95.635(b))

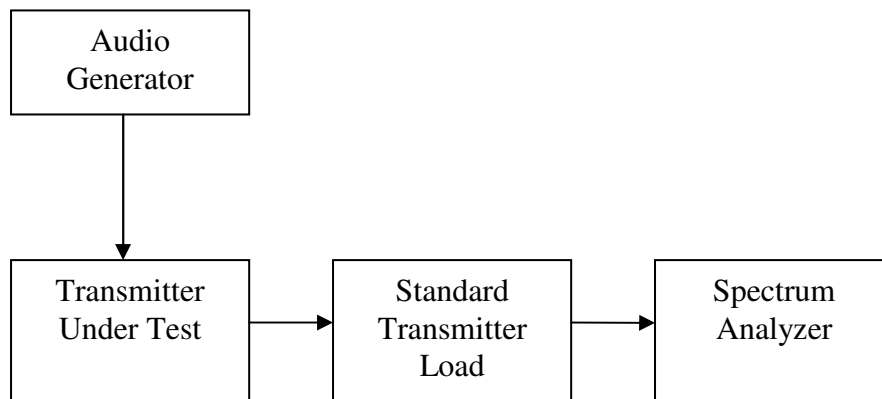
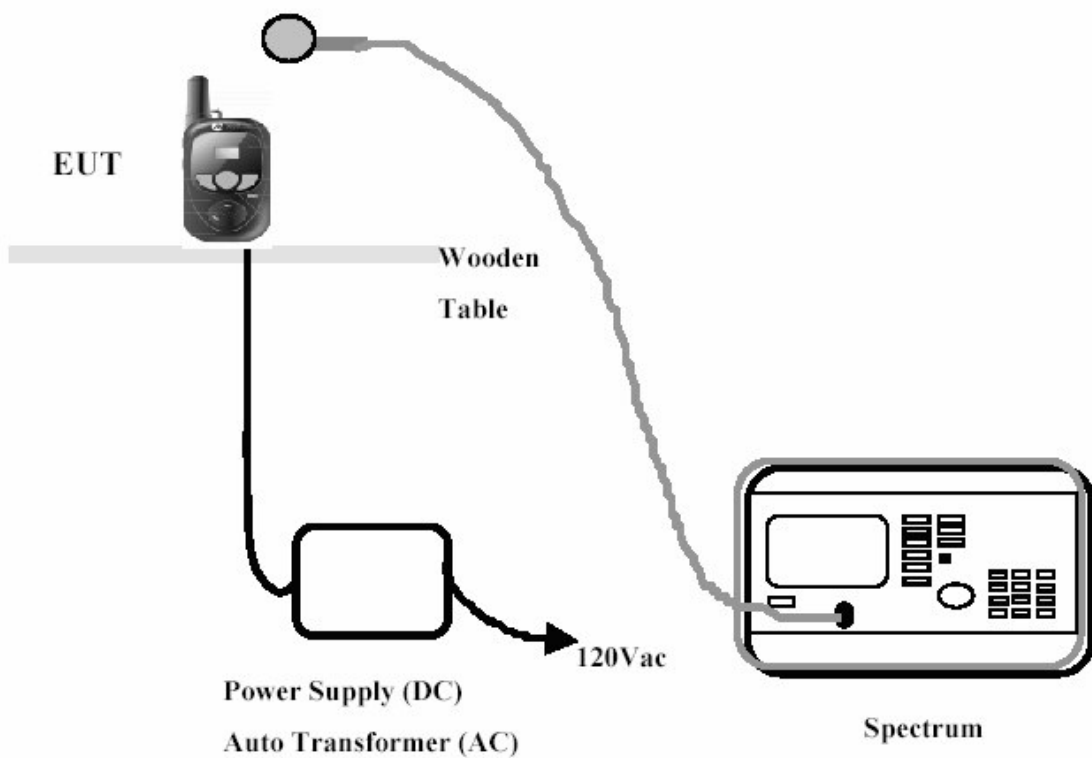
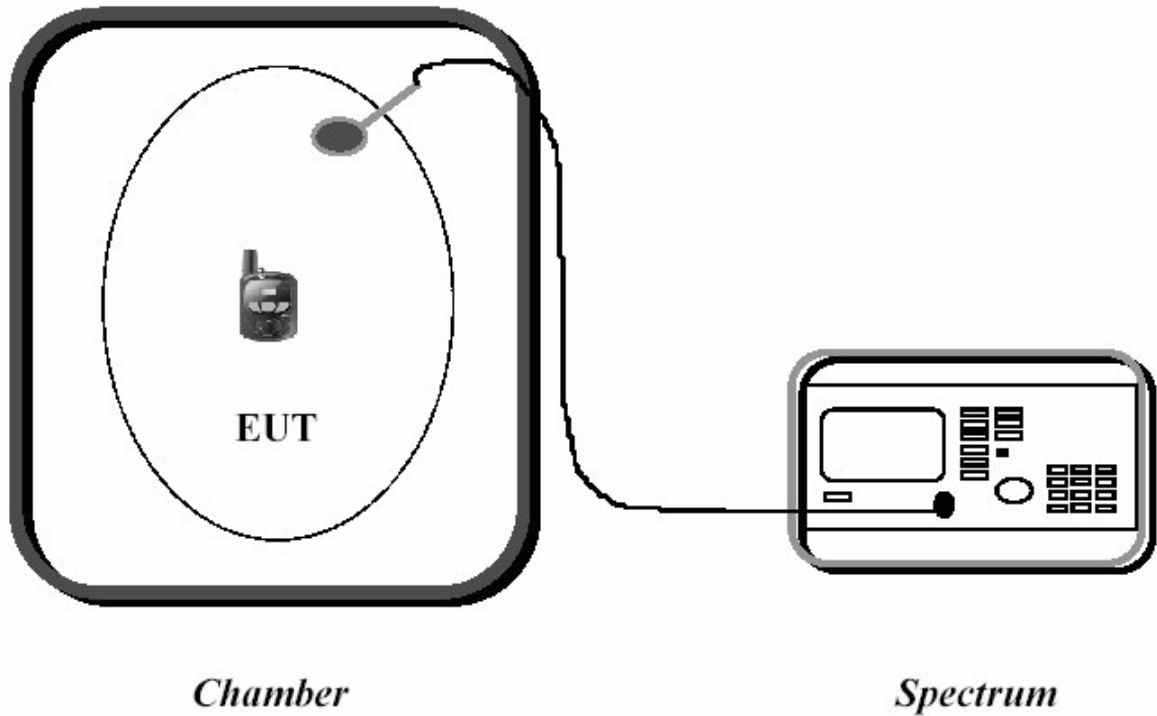


Diagram 7 of Measurement Equipment Configuration for Testing Frequency Tolerance



Prüfbericht - Nr.:
Test Report No.:

16014463 001

Seite 15 von 34
Page 15 of 34

5 Test Results EMISSION

5.1 RF Power Output (FCC Part 2 Per Section 2.1046): GMRS Mode & FRS Mode

Date of testing	:	06.09.2008
Test specification	:	FCC Part 2 Per Section 2.1046
Limits	:	FCC Part 95 Per Section 95.639
Deviations from Standard Test procedures	:	None
Kind of test site	:	3m Anechoic Chamber
Operation mode	:	Transmitting (GMRS & FRS)
Temperature	:	22°C
Humidity	:	50%

Measurement procedure:

The output from the transmitter was fitted with a coax connector for performing certain tests. The conducted output power was measured via connecting the output to an 20 dB attenuator and then to the input of the RF Spectrum Analyzer. The analyzer offset was adjusted to compensate for the attenuator and other losses in the system. The carrier was modulated with a 2500 Hz signal.

The following table lists the results of the conducted output power.

Table 2: Measurement Result of Conducted RF Output Power: GMRS Mode & FRS Mode

Channel	Freq. (MHz)	Transmit power (dBm)	Transmit power (W)	Limit (W)	Pass / Fail
GMRS Channel 17	462.6000	23.3	0.214	50	Pass
FRS Channel 8	467.5625	23.5	0.224	0.5	Pass

Prüfbericht - Nr.:
Test Report No.:

16014463 001

Seite 16 von 34
Page 16 of 34

5.2 Effective Radiated Power (FCC Part 2 Per Section 2.1046)

Date of testing	:	06.09.2008
Test specification	:	FCC Part 2 Per Section 2.1046
Limits	:	FCC Part 95 Per Section 95.639
Deviations from Standard Test procedures	:	None
Kind of test site	:	3m Anechoic Chamber
Operation mode	:	Transmitting (GMRS & FRS)
Temperature	:	22°C
Humidity	:	50%

Measurement procedure:

1. The EUT was placed on an 80 cm high turntable in the anechoic chamber.
2. For radiated power output of the EUT, the measuring antenna was raised and lowered to obtain a maximum reading on the spectrum analyzer with the test antenna polarized vertically and horizontally. The turntable was rotated 360 to further searching the maximum reading on the spectrum analyzer. Then the max value on spectrum was recorded.
3. The EUT was removed and replaced with a substitute dipole antenna. The length of the antenna was adjusted to a half-wave of transmitting frequency measured. The centre of the dipole antenna was placed approximately at the same location as the centre place of the EUT in step 1 and 2.
4. The dipole antenna was connected to a signal generator with a coaxial cable.
5. The signal generator is tuned to the transmitting frequency with the substitute antenna polarized both vertically and horizontally, the output level of the signal generator output was then adjusted to get a maximum reading in the spectrum with the same value recorded in the step 2.
6. The input RF power in the dipole antenna was calculated from the coaxial cable loss and the signal generator output level obtained in step 5. This value was regarded as final result and recorded in following table 3.

Note: While in Step 2, the EUT was placed in 3 orthogonal planes to find a maximum reading.

Prüfbericht - Nr.:
Test Report No.:

16014463 001

Seite 17 von 34
Page 17 of 34

Table 3: Measurement Result of ERP on GMRS Mode & FRS Mode

Channel	Freq. (MHz)	Polarization (V/H)	Transmit power (dBm)	Transmit power (W)	Limit (W)
GMRS Channel 17	462.6000	V	11.8	0.0151	50
	462.6000	H	-0.5	0.0009	50
FRS Channel 8	467.5625	V	12.0	0.0158	0.5
	467.5625	H	-1.4	0.0007	0.5

The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz at frequency below 1GHz.

The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz at frequency above 1GHz.

Prüfbericht - Nr.:
Test Report No.:

16014463 001

Seite 18 von 34
Page 18 of 34

5.3 Audio Frequency Response (FCC Part 2 Per Section 2.1047)

This section summarizes the results of the testing of the modulation characteristics of the EUT.

RESULT:

Pass

Date of testing	:	07.10.2008
Test specification	:	FCC Part 2 Per Section 2.1047
Limits	:	FCC Part 2 Per Section 2.1047
Deviations from Standard Test procedures	:	None
Operation mode	:	Transmitting (GMRS)
Temperature	:	22°C
Humidity	:	50%

Measurement procedure of Audio frequency response in accordance with TIA/EIA-603:

- 1) Configure the EUT as shown in diagram 3.
- 2) Adjust the audio input for 20% of rated system deviation at 1 kHz using this level as a reference (0 dB).
- 3) Vary the Audio frequency from 300 Hz to 6 kHz and record the frequency deviation

Refer to appendix 1 for test result.

Prüfbericht - Nr.:
Test Report No.:

16014463 001

Seite 19 von 34
Page 19 of 34

5.4 Modulation Deviation Over Frequency and Input (FCC Part 95 Per Section 95.637 (a))

RESULT:

Pass

Date of testing	:	07.10.2008
Test specification	:	FCC Part 2 Per Section 2.1047
Limits	:	FCC Part 95 Per Section 95.637 (a)
Deviations from Standard Test procedures	:	None
Operation mode	:	Transmitting (GMRS & FRS)
Temperature	:	22°C
Humidity	:	50%

Measurement procedure of modulation deviation over frequency in accordance with TIA/EIA-603:

- 1) Configure the EUT as shown in diagram 4.
- 2) Apply a 1000 Hz modulating signal to the transmitter from the audio frequency generator, and adjust the level to obtain 60% of full rated system deviation.
- 3) Increase the level from the audio frequency generator by 20 dB.
- 4) With the level from the audio frequency generator held constant at the level obtained in step 3), slowly vary the audio frequency from 100 Hz to 5 kHz and observe the steady-state deviation. Record the maximum deviation.

Measurement procedure of modulation deviation over input in accordance with TIA/EIA-603:

- 1) Configure the EUT as shown in diagram 4.
- 2) Apply a 300 Hz modulating signal to the transmitter from the audio frequency generator, and vary the level from 0.5 mV to 200 mV. Record the maximum deviation.
- 3) Repeat step 2) at 300 Hz and 2.5 kHz.

Refer to appendix 1 for test result.

Prüfbericht - Nr.:
Test Report No.:

16014463 001

Seite 20 von 34
Page 20 of 34

5.5 Audio Low Pass Filter Response (FCC Part 95 Per Section 95.637 (b))

RESULT:

Pass

Date of testing	:	07.10.2008
Test specification	:	TIA/EIA-603
Limits	:	FCC Part 95 Per Section 95.637 (b)
Deviations from Standard Test procedures	:	None
Operation mode	:	Transmitting (GMRS)
Temperature	:	22°C
Humidity	:	50%

Measurement procedure in accordance with TIA/EIA-603:

- 1) Configure the EUT as shown in diagram 5.
- 2) Connect the audio frequency generator as close as possible the input of the post limiter low pass filter within the transmitter under test.
- 3) Connect the audio spectrum analyzer to the output of the post limiter low pass filter within the transmitter under test.
- 4) Apply a 1000 Hz tone from the audio frequency generator and adjust the level per manufacturer's specifications.
- 5) Record the dB level of the 1000 Hz spectral line on the audio analyzer as LEV_{REF} .
- 6) Set the audio frequency generator to the desired test frequency between 3000 Hz and the upper low pass filter limit.
- 7) Record audio spectrum analyzer levels, at the test frequency in step 6).
- 8) Record the dB level on the audio spectrum analyzer as LEV_{FREQ} .
- 9) Calculate the audio frequency response at the test frequency as: *low pass frequency response* = $LEV_{FREQ} - LEV_{REF}$.
- 10) Repeat steps 6) through 9) for all the desired test frequencies.

Refer to appendix 1 for test result.

Prüfbericht - Nr.:
Test Report No.:

16014463 001

Seite 21 von 34
Page 21 of 34

5.6 Occupied Bandwidth (FCC Part 2 Per Section 2.1049)

RESULT:

Pass

Date of testing	:	11.10.2008
Test specification	:	FCC Part 2 Per Section 2.1049
Limits	:	FCC Part 2 Per Section 2.1049
Deviations from Standard Test procedures	:	None
Operation mode	:	Transmitting (GMRS & FRS)
Temperature	:	22°C
Humidity	:	50%

Measurement procedure:

Occupied bandwidth was performed by connecting the output of the EUT to the input of a spectrum analyzer. The unit was supplied a 2500Hz audio signal and the 20dB bandwidth was measured for both the FRS and GMRS modes.

Refer to appendix 1 for test result.

Prüfbericht - Nr.:
Test Report No.:

16014463 001

Seite 22 von 34
Page 22 of 34

5.7 Spurious Emissions at Antenna Terminals (FCC Part 2 Per Section 2.1051 and FCC Part 95 Per Section 95.635(b))

RESULT:

Pass

Date of testing	:	09.09.2008
Test specification	:	FCC Part 2 Per Section 2.1051
Limits	:	FCC Part 95 Per Section 95.635(b)
Deviations from Standard Test procedures	:	None
Operation mode	:	Transmitting (unmodulated) (GMRS & FRS)
Temperature	:	22°C
Humidity	:	50%

Measurement procedure:

The unit with the connector in place of the antenna was connected via an attenuator to the input of the spectrum analyzer. The conducted spurious emissions were measured through the 10th harmonic of the fundamental.

The EUT must comply with requirements for spurious emissions at antenna terminals pre the requirements of §95.635(b)(1)(3)(7). All emissions must be suppressed by:

§95.635(b)(1): at least 25dB on any frequency removed from the center of the authorized bandwidth by more than 50% up to and including 100% of the authorized bandwidth,

§95.635(b)(3): at least 35dB on any frequency removed from the center of the authorized bandwidth by more than 100% up to and including 250% of the authorized bandwidth,

§95.635(b)(7): at least $43 + 10\log(T)$ dB on any frequency removed from the center of the authorized bandwidth by more than 250%.

Refer to appendix 1 for test result.

Prüfbericht - Nr.:
Test Report No.:

16014463 001

Seite 23 von 34
Page 23 of 34

5.8 Radiated Emission (FCC Part 15 Per Section 15.109(a))

RESULT:

Pass

Date of testing	:	16.09.2008
Test specification	:	FCC Part 15 Per Section 15.109(a)
Limit	:	FCC Part 15 Per Section 15.109(a)
Operation mode:		Receiving (GMRS & FRS)
Deviations from Standard Test procedures	:	None
Test procedure		Procedure specified in ANSI C63.4 were followed
Kind of test site	:	3m Semi-anechoic chamber
Temperature	:	22°C
Humidity	:	50%

Measurement procedure:

1. The EUT was turned on and placed on the top of a rotatable table 0.8 meters above the ground with 3-orthogonal XYZ direction and be kept close enough to the measurement receiving antenna (especially for the measurement frequency range above 1 GHz). The table was then rotated 360 degrees to detect the suspected emission frequency points. The position of the worst radiation case with both horizontal and vertical receiving antenna polarization was then recorded together with the suspected emission frequency points above-mentioned.
2. The EUT was then set 3 meters away from the receiving antenna, which was mounted on a variable-height antenna tower.
3. For each suspected emission frequency point recorded in step 1, the EUT was arranged to its worst case that the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to read the maximum emission.
4. The EUT was removed and be replaced with substitute antenna correspondent to the suspected frequency point mentioned in Step 3 (if necessary, characteristic frequency of the antenna is adjusted to a half-wave of the suspected frequency point). The substitute antenna was then connected to a signal generator with a coaxial cable and its center is placed approximately at the same location as the centre place of the EUT in Step 3.
5. The signal generator is tuned to the suspected frequency point mentioned in Step 3 with the substitute antenna polarized both vertically and horizontally, the output level of the signal generator output was then adjusted to get a maximum reading in the spectrum with the same value recorded in the step 3.
6. For each suspected frequency point, the input RF power in the substitute antenna was calculated from the coaxial cable loss, antenna factor and the signal generator output level obtained in step 5. This value was regarded as final result and recorded.

Refer to appendix 1 for test result.

Prüfbericht - Nr.:
Test Report No.:

16014463 001

Seite 24 von 34
Page 24 of 34

5.9 Radiated Spurious Emissions (FCC Part 2 Per Section 2.1053 and FCC Part 95 Per Section 95.635(b))

RESULT:

Pass

Date of testing	:	09.09.2008
Test specification	:	FCC Part 2 Per Section 2.1053
Limits	:	FCC Part 95 Per Section 95.635(b)
Deviations from Standard Test procedures	:	None
Kind of test site	:	3m Full-Anechoic Chamber
Operation mode	:	Transmitting (unmodulated)
Temperature	:	22°C
Humidity	:	50%

Measurement procedure:

1. The EUT was turned on and placed on the top of a rotatable table 0.8 meters above the ground with 3-orthogonal XYZ direction and be kept close enough to the measurement receiving antenna (especially for the measurement frequency range above 1 GHz). The table was then rotated 360 degrees to detect the suspected emission frequency points. The position of the worst radiation case with both horizontal and vertical receiving antenna polarization was then recorded together with the suspected emission frequency points above-mentioned.
2. The EUT was then set 3 meters away from the receiving antenna, which was mounted on a variable-height antenna tower.
3. For each suspected emission frequency point recorded in step 1, the EUT was arranged to its worst case that the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to read the maximum emission.
4. The EUT was removed and be replaced with substitute antenna correspondent to the suspected frequency point mentioned in Step 3 (if necessary, characteristic frequency of the antenna is adjusted to a half-wave of the suspected frequency point). The substitute antenna was then connected to a signal generator with a coaxial cable and its center is placed approximately at the same location as the centre place of the EUT in Step 3.
5. The signal generator is tuned to the suspected frequency point mentioned in Step 3 with the substitute antenna polarized both vertically and horizontally, the output level of the signal generator output was then adjusted to get a maximum reading in the spectrum with the same value recorded in the step 3.
6. For each suspected frequency point, the input RF power in the substitute antenna was calculated from the coaxial cable loss, antenna factor and the signal generator output level obtained in step 5. This value was regarded as final result and recorded in following table 4, table 5 and table 6.

Prüfbericht - Nr.:
Test Report No.:

16014463 001

Seite 25 von 34
Page 25 of 34

To determine the Limit for Spurious Emissions the following method was used:

Maximum output power in watts:

Maximum output power in Watt: 0.0158W (see table 3)

The emission must be reduced by:

$$43+10*\text{Log}(0.0158)= 24.99 \text{ dB}$$

Therefore, the Emission Limit equals:

$$10*\text{Log}(0.0158*1000)- 24.99\text{dB} = -13\text{dBm}$$

Emissions were scanned up to the 10th harmonic of the fundamental. Worst case measurements are reported. The signal substitution method procedure as given in TIA-603 was used to obtain ERP levels.

Table 4: Spurious Emission: EUT operated on GMRS Mode, 462.6000 MHz

Freq. (MHz)	Polarization (V/H)	Transmit power (dBm)	Limit (dBm)
925.310	H	-41.2	-13
1850.500	H	-35.3	-13
2313.000	H	-36.4	-13
2776.000	H	-30.7	-13
3238.000	H	-21.5	-13
4326.000	H	-27.3	-13
925.310	V	-39.5	-13
1850.500	V	-30.7	-13
2313.000	V	-31.7	-13
2776.000	V	-30.1	-13
3238.000	V	-21.2	-13
4326.000	V	-27.0	-13

Table 5: Spurious Emission: EUT operated on FRS Mode, 467.5625 MHz

Freq. (MHz)	Polarization (V/H)	Transmit power (dBm)	Limit (dBm)
935.253	H	-42.0	-13
1402.500	H	-43.2	-13
1870.500	H	-35.9	-13
2338.000	H	-35.9	-13
2805.500	H	-30.0	-13
3273.000	H	-19.8	-13
935.253	V	-39.9	-13
1402.500	V	-39.6	-13
1870.500	V	-30.0	-13
2338.000	V	-32.9	-13
2805.500	V	-21.3	-13
4208.000	V	-26.6	-13

Prüfbericht - Nr.:
Test Report No.:

16014463 001

Seite 26 von 34
Page 26 of 34

5.10 Frequency Stability (FCC Part 2 Per Section 2.1055, FCC Part 95 Per Section 95.621(b) and 95.627(b))

RESULT:

Pass

Date of testing	:	11.10.2008
Test specification	:	FCC Part 2 Per Section 2.1055
Limits	:	FCC Part 95 Per Section 95.621(b) & 95.627(b)
Deviations from Standard Test procedures	:	None
Test procedure	:	Procedure specified in ANSI C63.4 were followed
Operation mode	:	Transmitting (unmodulated)
Temperature	:	-30°C to 50°C
Humidity	:	50%

Measurement procedure:

A. Frequency stability versus environmental temperature

1. Setup the configuration as diagram 7 for frequency measured inside an environment chamber and install new battery in the EUT.
2. Turn on EUT and set spectrum analyzer center frequency to the EUT operating frequency. Set spectrum analyzer Resolution Bandwidth to 30 Hz and Video Resolution Bandwidth to 100 Hz and Frequency Span to 1 kHz.
3. Set the temperature of chamber to 50°C. Allow sufficient time (approximately 30 min) for the temperature of the chamber to stabilize. While maintaining a constant temperature inside the chamber, turn the EUT on and measure the EUT operating frequency.
4. Repeat step 2 with a 10°C decreased per stage until the lowest temperature -30°C is measured, record all measured frequencies on each temperature step.

B. Frequency stability versus input voltage

1. Setup the configuration as diagram 7 for frequencies measurement at temperature range from 15 °C to 25°C. Otherwise, an environment chamber set for a temperature of 20°C shall be used.
2. Set spectrum analyzer center frequency to the EUT operating frequency. Set spectrum analyzer Resolution Bandwidth to 30 Hz and Video Resolution Bandwidth to 100 Hz and Frequency Span to 1 kHz.
3. Set the supply voltage to the lowest voltage of the EUT specified by the manufacture.
4. Turn the EUT on and measure the EUT operating frequency

Prüfbericht - Nr.:
Test Report No.:

16014463 001

Seite 27 von 34
Page 27 of 34

The test results are listed in the following tables for the FRS mode.

Limit of FRS mode: $467.5625 \text{ MHz} * 0.00025\% = 1169 \text{ Hz}$

Table 6: the measurement of Frequency tolerance (temperature), FRS Mode

Temperature (Celsius)	Frequency (MHz)	Deviation (Hz)	Limit (Hz)
Ref. Freq.	467.562500	---	---
-30	467.561948	-552	1169
-20	467.562290	-210	1169
-10	467.562748	248	1169
0	467.563096	596	1169
10	467.563082	582	1169
20	467.563034	534	1169
30	467.562830	330	1169
40	467.562152	-348	1169
50	467.562212	-288	1169

Table 7: the measurement of Frequency tolerance (supply voltage), FRS Mode

Temperature: 25°C

Voltage	Frequency MHz	Difference Hz	Limit Hz
Ref. Freq.	467.562500	---	---
3.6V	467.562752	252	1169

Prüfbericht - Nr.:
Test Report No.:

16014463 001

Seite 28 von 34
Page 28 of 34

The test results are listed in the following tables for the GMRS mode.

Limit of GMRS mode: $462.6000 \text{ MHz} * 0.0005\% = 2313 \text{ Hz}$

Table 8: the measurement of Frequency tolerance (temperature), GMRS Mode

Temperature (Celsius)	Frequency (MHz)	Deviation (Hz)	Limit (Hz)
Ref. Freq.	462.600000		
-30	462.599463	-537	2313
-20	462.599782	-218	2313
-10	462.600235	235	2313
0	462.600738	738	2313
10	462.600744	744	2313
20	462.600282	282	2313
30	462.60024	240	2313
40	462.599652	-348	2313
50	462.599712	-288	2313

Table 9: the measurement of Frequency tolerance (supply voltage), GMRS Mode

Temperature: 25°C

Voltage	Frequency MHz	Difference Hz	Limit Hz
Ref. Freq.	462.600000	---	---
3.6V	462.600204	204	2313

Prüfbericht - Nr.:
Test Report No.:

16014463 001

Seite 29 von 34
Page 29 of 34

5.11DC Voltages and Current into Final Amplifier , (FCC Part 2 Per Section 2.1033(c)(8))

RESULT:

Pass

Date of testing : 10.10.2008
Test specification : FCC Part 2 Per Section 2.1033(c)(8)
Limits : FCC Part 2 Per Section 2.1033(c)(8)
Deviations from Standard Test procedures : None
Operation mode : Transmitting (modulated)
Temperature : 22°C
Humidity : 50%

Measurement procedure:

Measured voltage across C95; Measured current over L2.

Table 10: DC Voltages and Current into Final Amplifier

Voltage in final stage	:	3.7 VDC
Current drawn in final stage	:	0.150 A
DC Power in final stage	:	0.555 W

Prüfbericht - Nr.:
Test Report No.:

16014463 001

Seite 30 von 34
Page 30 of 34

5.12 Emission Designator

The emission designator is determined from the necessary bandwidth, the type of modulation and the information conveyed in the signal.

For the subject unit, the following Emission Designator has been determined according to Section 2.201 of the FCC Rules.

- First Symbol, type of modulation of the main carrier: F-Frequency Modulation
- Second Symbol, nature of signal(s) modulating the main carrier: 3
- Third Symbol, type of information to be transmitted: E

The necessary bandwidth, B_n , is calculated as:

$$B_n = 2M + 2DK$$

$$M = 3000$$

$$D = 2.5$$

$$K = 1$$

$$B_n = (2 \times 3000) + (2 \times 2500) = 11k$$

Hence, the emission designator is: **11K0F3E**

6 Photographs of the Test Set-Up

Photograph 1: Set-up for Radiation Measurement Below 1GHz



Prüfbericht - Nr.:
Test Report No.:

16014463 001

Seite 32 von 34
Page 32 of 34

Photograph 2: Set-up for Radiation Measurement above 1GHz



Photograph 3: Set-up for Spurious Radiation Emission Measurement below 1GHz



Prüfbericht - Nr.:
Test Report No.:

16014463 001

Seite 33 von 34
Page 33 of 34

Photograph 4: Set-up for Spurious Radiation Emission Measurement above 1GHz



7 List of Tables

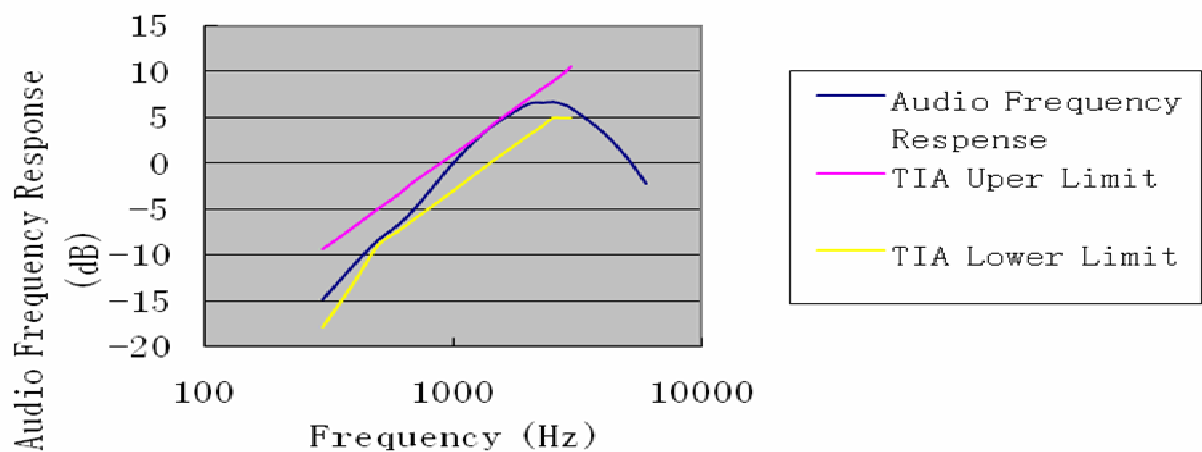
Table 1: List of Test and Measurement Equipment	6
Table 2: Measurement Result of Conducted RF Output Power: GMRS Mode & FRS Mode	15
Table 3: Measurement Result of ERP on GMRS Mode & FRS Mode	17
Table 4: Spurious Emission: EUT operated on GMRS Mode, 462.6000 MHz	25
Table 5: Spurious Emission: EUT operated on FRS Mode, 467.5625 MHz	25
Table 6: the measurement of Frequency tolerance (temperature), FRS Mode	27
Table 7: the measurement of Frequency tolerance (supply voltage), FRS Mode	27
Table 8: the measurement of Frequency tolerance (temperature), GMRS Mode	28
Table 9: the measurement of Frequency tolerance (supply voltage), GMRS Mode	28
Table 10: DC Voltages and Current into Final Amplifier	29

8 List of Photographs

Photograph 1: Set-up for Radiation Measurement Below 1GHz	31
Photograph 2: Set-up for Radiation Measurement above 1GHz	32
Photograph 3: Set-up for Spurious Radiation Emission Measurement below 1GHz	32
Photograph 4: Set-up for Spurious Radiation Emission Measurement above 1GHz	33

Audio Frequency Response**Transmit Audio Frequency Response**

Frequency (Hz)	Input (mV)	Deviation (Hz)	Audio Frequency Response (dB)	TIA Uper Limit (dB)	TIA Lower Limit (dB)
200	4.6	--	--	--	--
300	4.6	90	-14.8945	-9.4	-17.9
400	4.6	140	-11.0568	-6.9	-12.9
500	4.6	189	-8.45016	-5	-9
600	4.6	230	-6.74484	-3.4	-7.4
700	4.6	282	-4.97442	-2	-6.1
1000	4.6	500	0	1	-3
1250	4.6	690	2.797582	2.9	-1
1500	4.6	830	4.402162	4.5	0.5
2000	4.6	1044	6.39461	7	3
2250	4.6	1071	6.616389	8.04	4
2500	4.6	1088	6.753178	8.9	4.9
2750	4.6	1050	6.444386	9.7	4.9
3000	4.6	1001	6.029281	10.5	4.9
4000	4.6	744	3.452059	--	--
5000	4.6	530	0.506117	--	--
6000	4.6	390	-2.15811	--	--

FCC 2.1047. Transmit Audio Response

Prüfbericht - **Nr.:**
Test Report No.

16014463 001

Seite 2 von 31
Page 2 of 31

Modulation Deviation Over Frequency (Inupt 122 mV)

Modulation Deviation Over Frequency				
Audio Frequency (Hz)	Deviation FRS (Hz)	Deviation GMRS (Hz)	GMRS Limit (kHz)	FRS Limit (kHz)
100	85	88	5	2.5
150	160	408	5	2.5
200	341	351	5	2.5
250	1070	1095	5	2.5
300	1601	1697	5	2.5
350	1710	1803	5	2.5
400	1712	1800	5	2.5
500	1702	1806	5	2.5
700	1694	1770	5	2.5
750	1677	1771	5	2.5
1000	1650	1744	5	2.5
1100	1644	1720	5	2.5
1200	1611	1705	5	2.5
1300	1609	1700	5	2.5
1400	1630	1722	5	2.5
1500	1634	1733	5	2.5
1600	1658	1744	5	2.5
1700	1677	1750	5	2.5
1800	1674	1753	5	2.5
1900	1675	1755	5	2.5
2000	1656	1748	5	2.5
2100	1661	1730	5	2.5
2200	1630	1721	5	2.5
2300	1603	1689	5	2.5
2400	1551	1636	5	2.5
2500	1520	1585	5	2.5
2600	1497	1570	5	2.5
2700	1471	1529	5	2.5
2800	1451	1510	5	2.5
2900	1441	1514	5	2.5
3000	1402	1477	5	2.5
3100	1341	1396	5	2.5
3200	1340	1404	5	2.5
3300	1324	1399	5	2.5

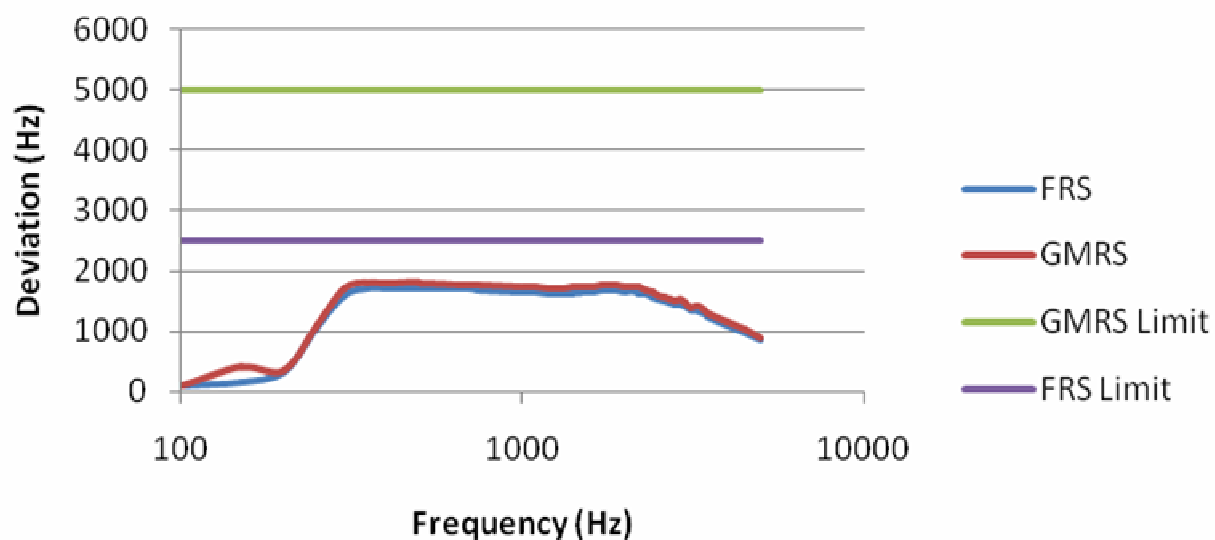
Prüfbericht - Nr.:
Test Report No.

16014463 001

Seite 3 von 31
Page 3 of 31

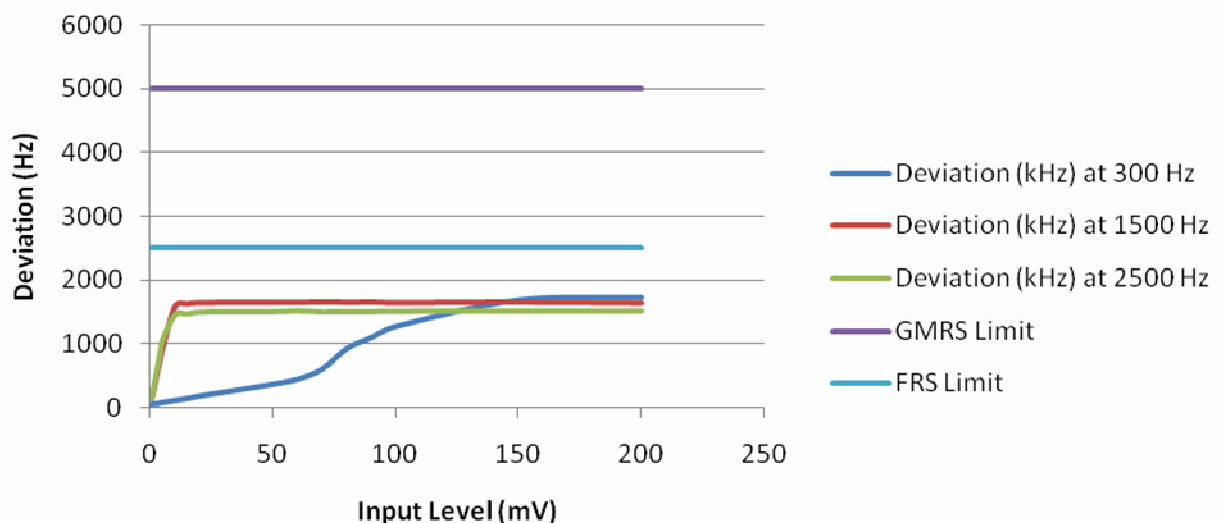
3400	1280	1356	5	2.5
3500	1247	1301	5	2.5
4000	1092	1145	5	2.5
4500	960	1022	5	2.5
5000	844	884	5	2.5

Modulation Deviation Over Frequency



Prüfbericht - Nr.:
Test Report No.
16014463 001**Seite 4 von 31***Page 4 of 31***Modulation Deviation Over Frequency (Inupt 122 mV)****Modulation Deviation Over Input**

Level (mV)	Deviation(kHz) at 300 Hz	Deviation(kHz) at 1500 Hz	Deviation(kHz) at 2500 Hz	GMRS Limit	FRS Limit
0.5	60	139	147	5000	2500
1	66	223	250	5000	2500
3	70	589	669	5000	2500
4	84	766	878	5000	2500
5	88	935	1072	5000	2500
10	120	1591	1459	5000	2500
15	149	1631	1472	5000	2500
20	187	1647	1502	5000	2500
50	373	1650	1508	5000	2500
60	451	1651	1522	5000	2500
70	611	1660	1505	5000	2500
80	933	1653	1510	5000	2500
90	1104	1658	1509	5000	2500
100	1277	1646	1514	5000	2500
150	1691	1657	1519	5000	2500
200	1731	1642	1521	5000	2500

Modulation Deviation Over Input

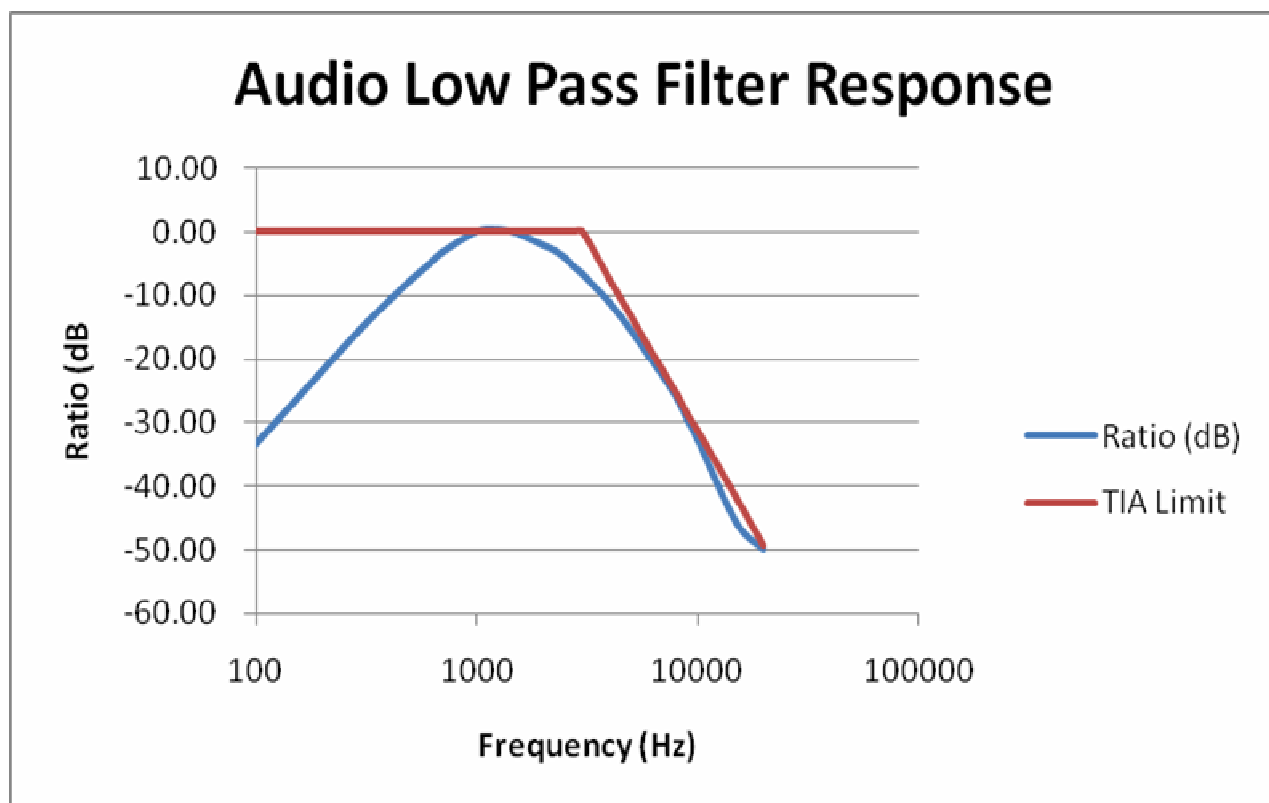
Audio Low Pass Filter Response

Audio Low Pass Filter Response				
Frequency (Hz)	Input (mV)	Output (mV)	Ratio (dB)	TIA Limit (dB)
100	10	3.3	-33.53	0
200	10	12.5	-21.96	0
300	10	27	-15.27	0
400	10	44.8	-10.87	0
500	10	65	-7.64	0
600	10	85.9	-5.22	0
700	10	106.9	-3.32	0
1000	10	156.6	0.00	0
1250	10	161.9	0.29	0
1500	10	152.2	-0.25	0
2000	10	124.1	-2.02	0
2250	10	109.8	-3.08	0
2500	10	96.5	-4.21	0
2750	10	84.7	-5.34	0
3000	10	73.9	-6.52	0
4000	10	43.3	-11.17	-7.4
5000	10	26.6	-15.40	-13.3
6000	10	16.8	-19.39	-18
7000	10	11.2	-22.91	-22
8000	10	7.6	-26.28	-25.5
9000	10	5.3	-29.41	-28.6
10000	10	3.7	-32.53	-31.3
15000	10	0.8	-45.83	-41.9
20000	10	0.5	-49.92	-49.4

Prüfbericht - **Nr.:**
Test Report No.

16014463 001

Seite 6 von 31
Page 6 of 31



Prüfbericht - **Nr.:**
Test Report No.

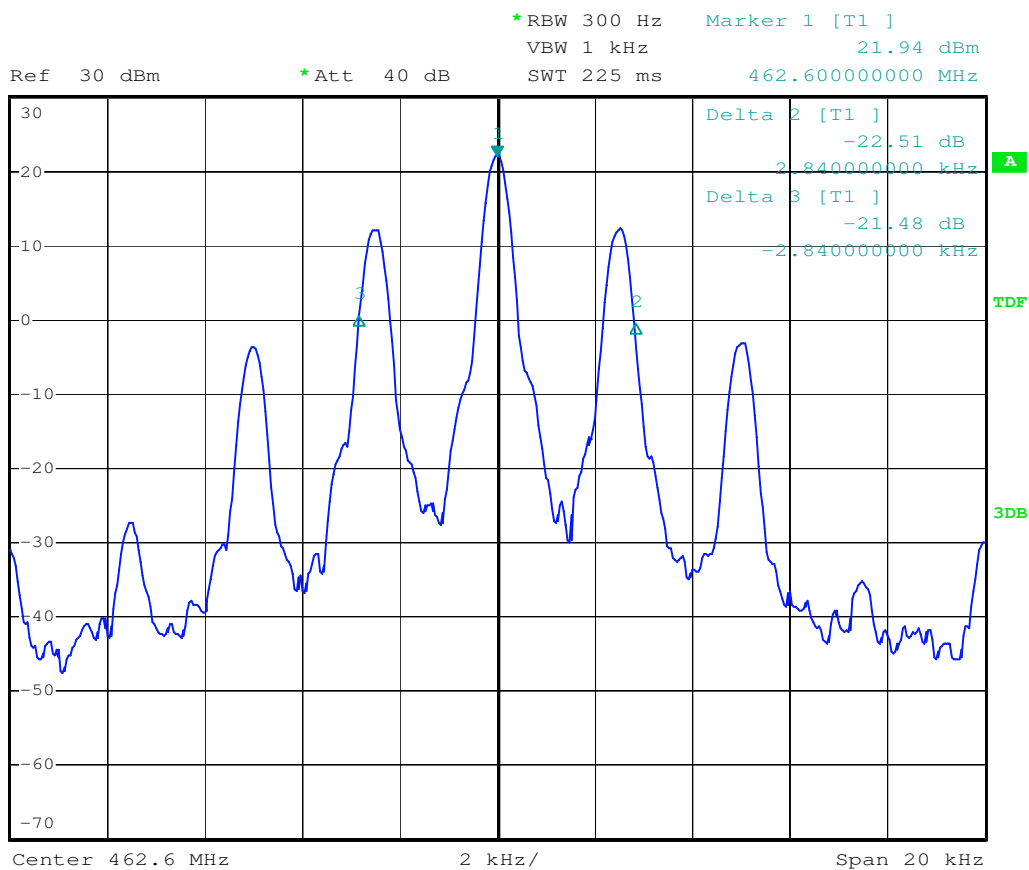
16014463 001

Seite 7 von 31
Page 7 of 31

Occupied Bandwidth: GMRS



1 PK
VIEW



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Date: 11.OCT.2008 16:30:15

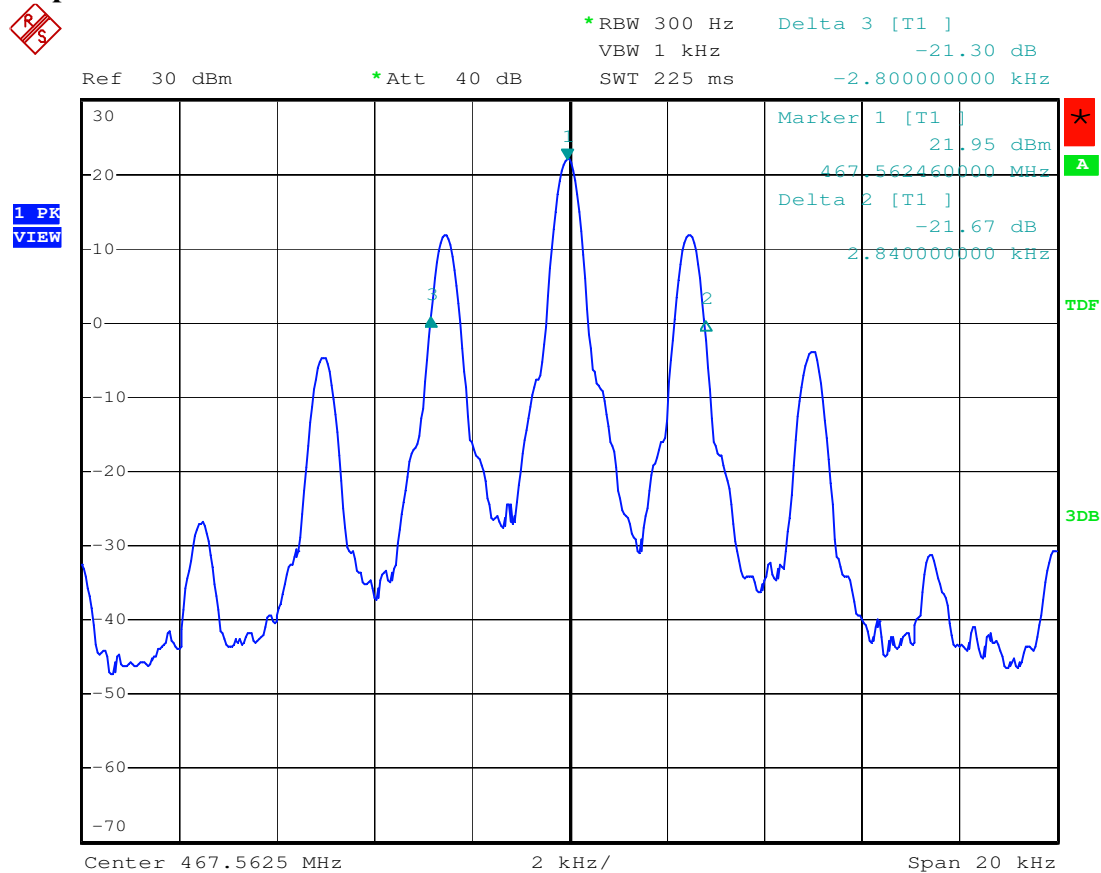
Occupied Bandwidth = 5.68 kHz

Prüfbericht - **Nr.:**
Test Report No.

16014463 001

Seite 8 von 31
Page 8 of 31

Occupied Bandwidth: FRS

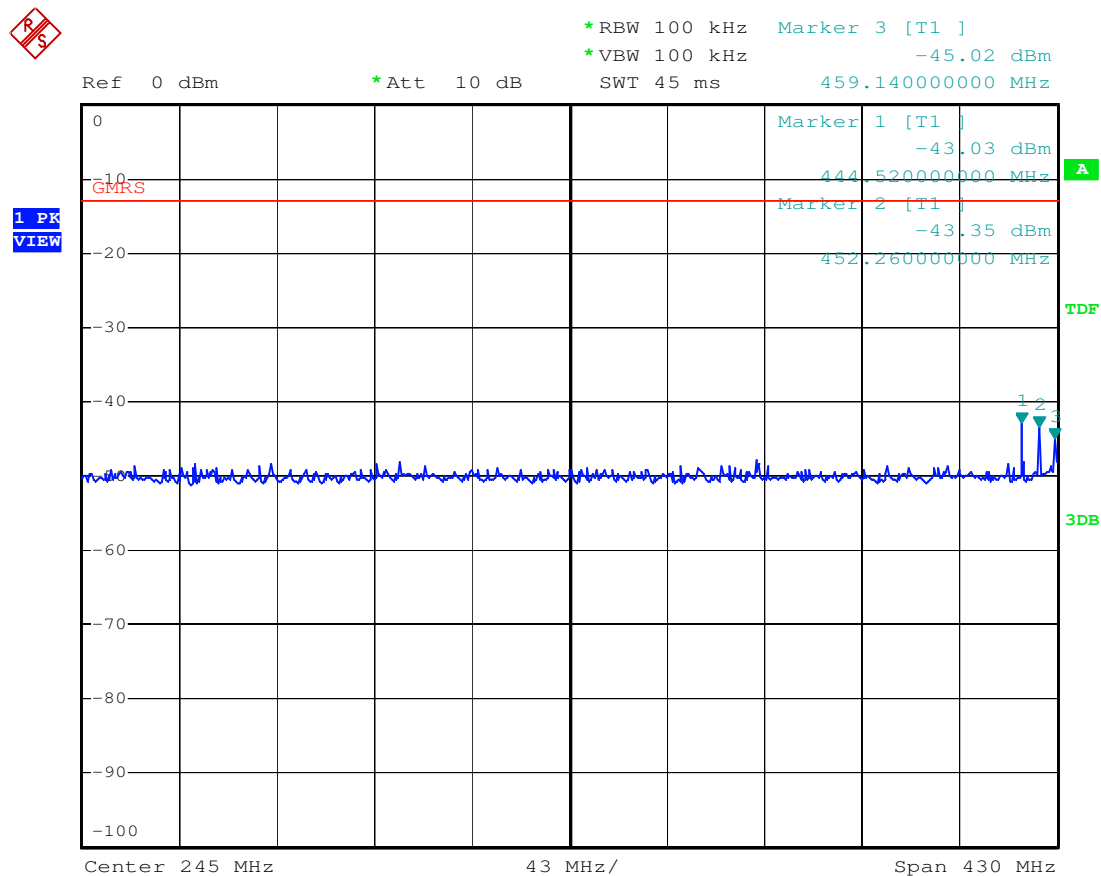


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Occupied Bandwidth = 5.64 kHz

Spurious Emissions at Antenna Terminals: GMRS

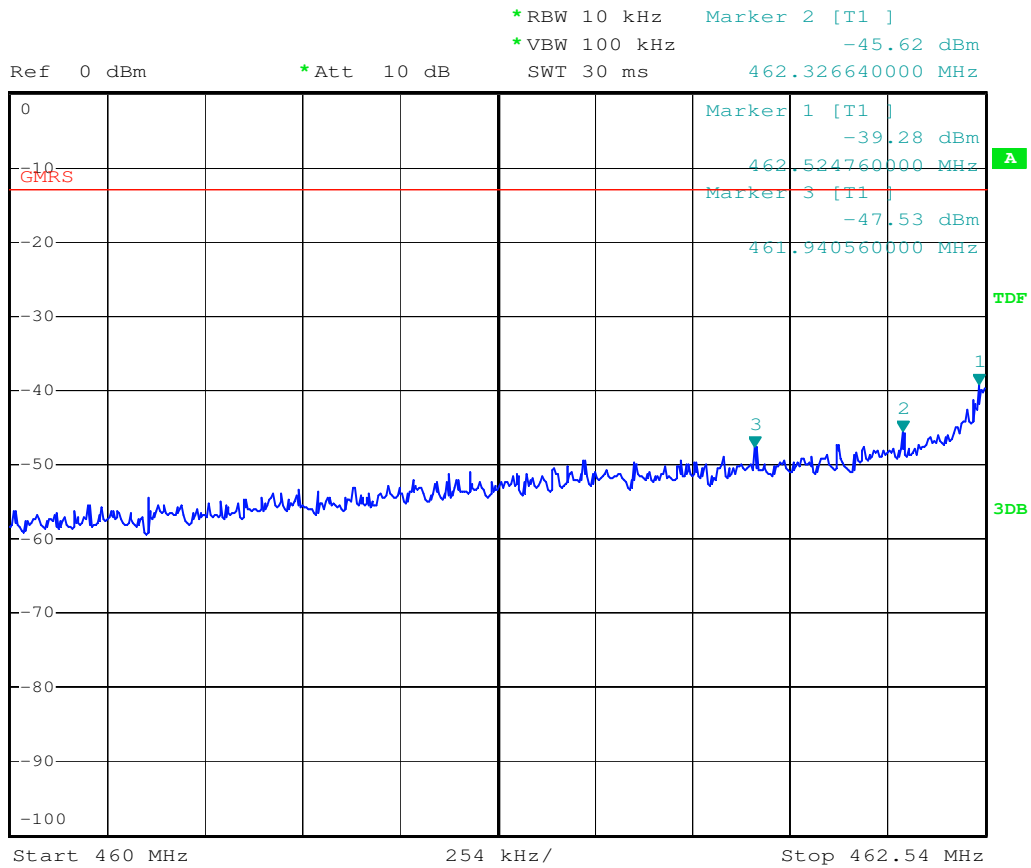


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Date: 11.OCT.2008 14:58:43

Prüfbericht - Nr.:
Test Report No.

16014463 001

Seite 10 von 31
Page 10 of 311 PK
MAXH

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Date: 11.OCT.2008 15:02:02

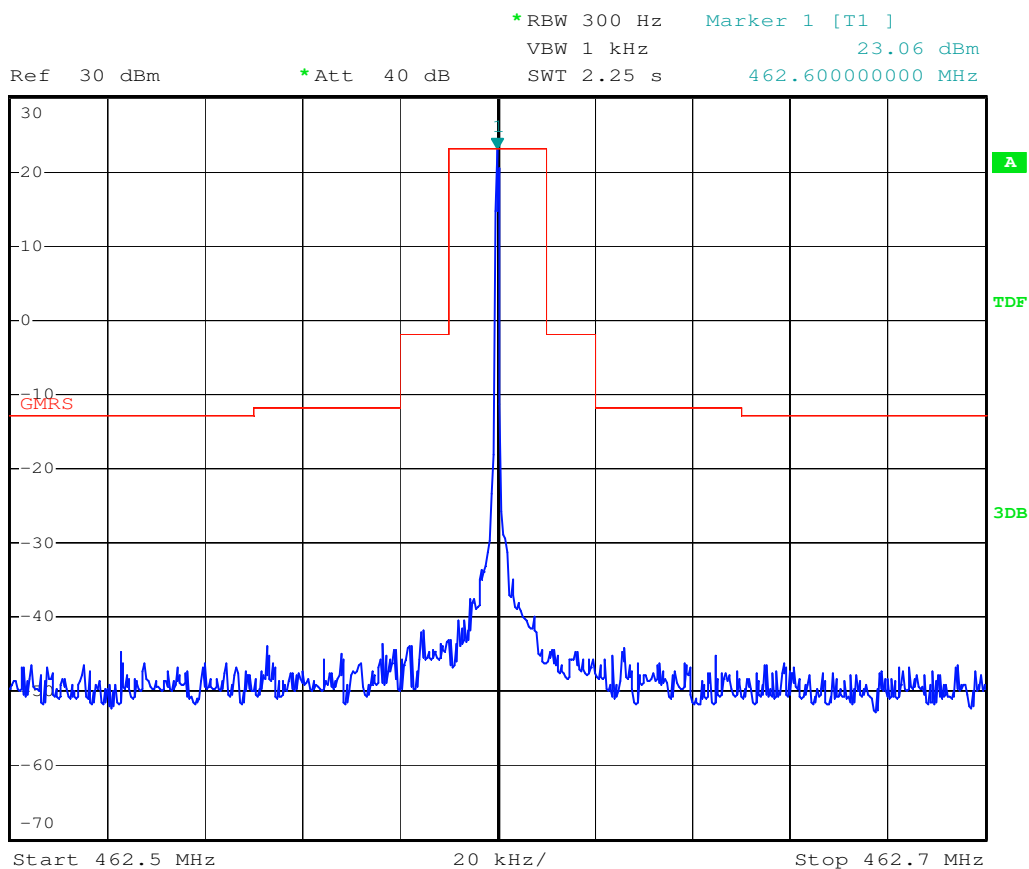
Prüfbericht - Nr.:
Test Report No.

16014463 001

Seite 11 von 31
Page 11 of 31



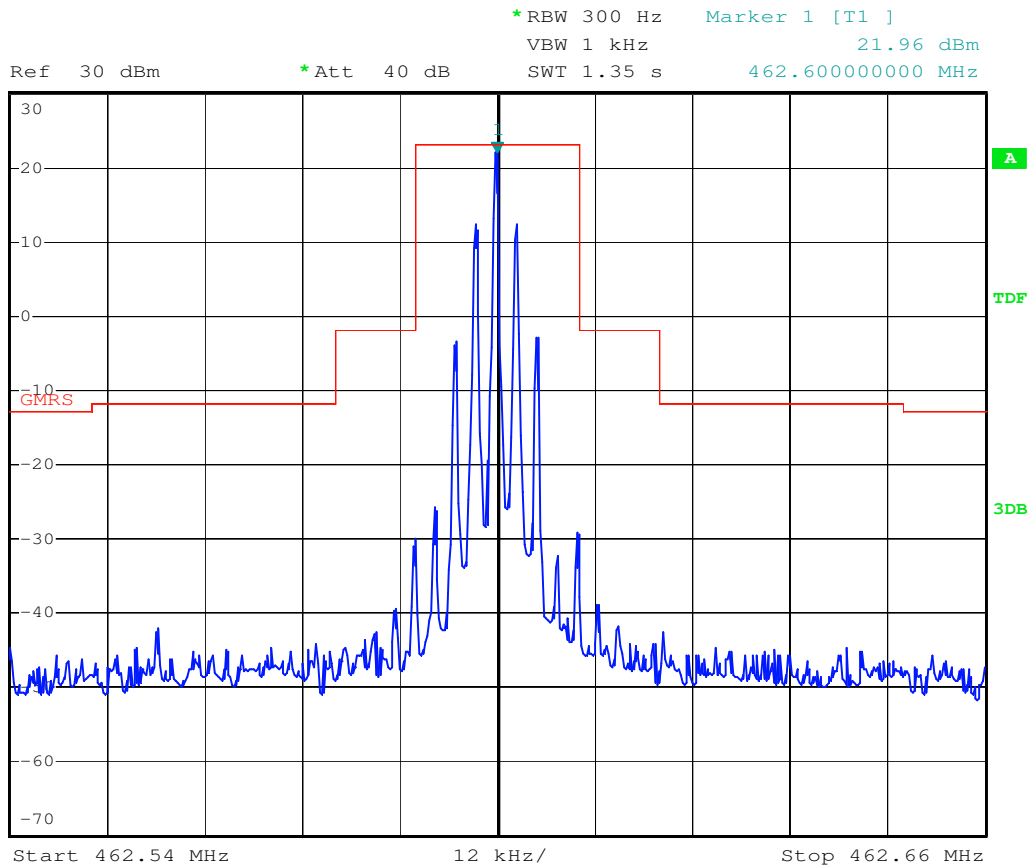
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Unmodulated

1 PK
VIEW

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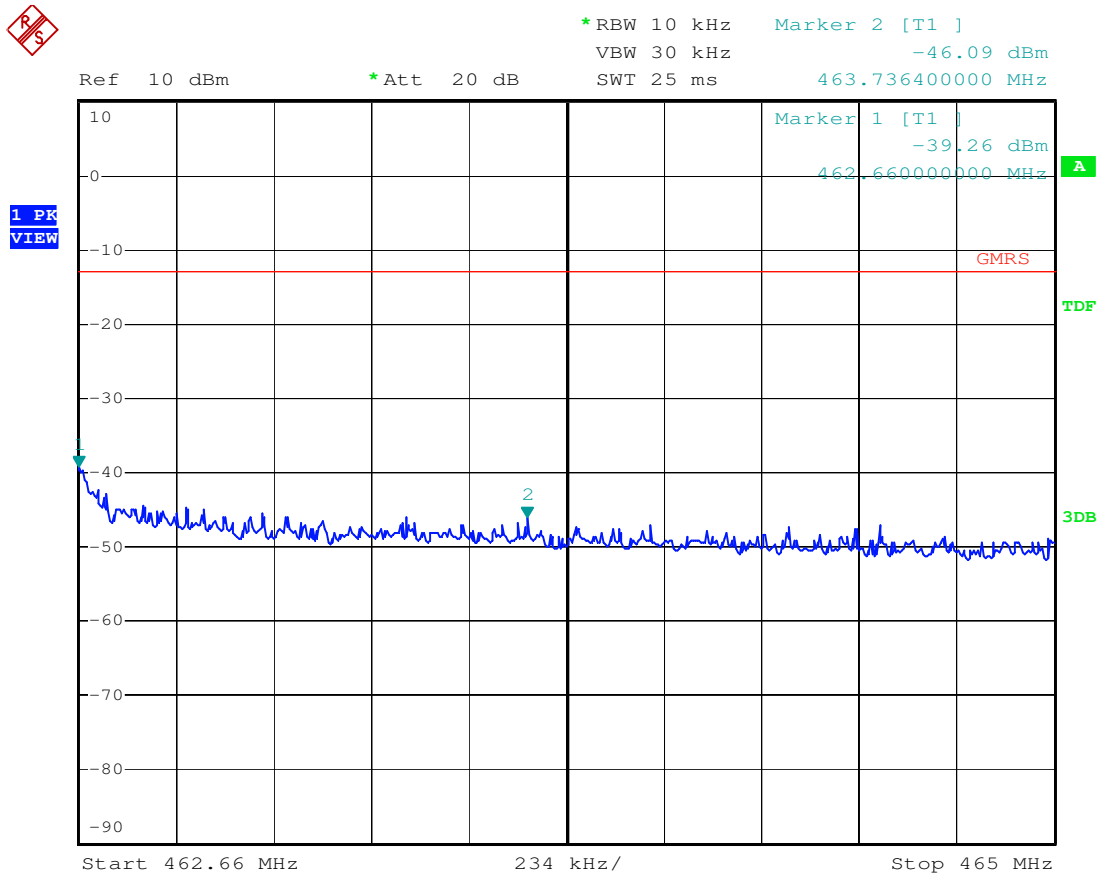
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Modulated

Prüfbericht - Nr.:
Test Report No.

16014463 001

Seite 13 von 31
Page 13 of 31



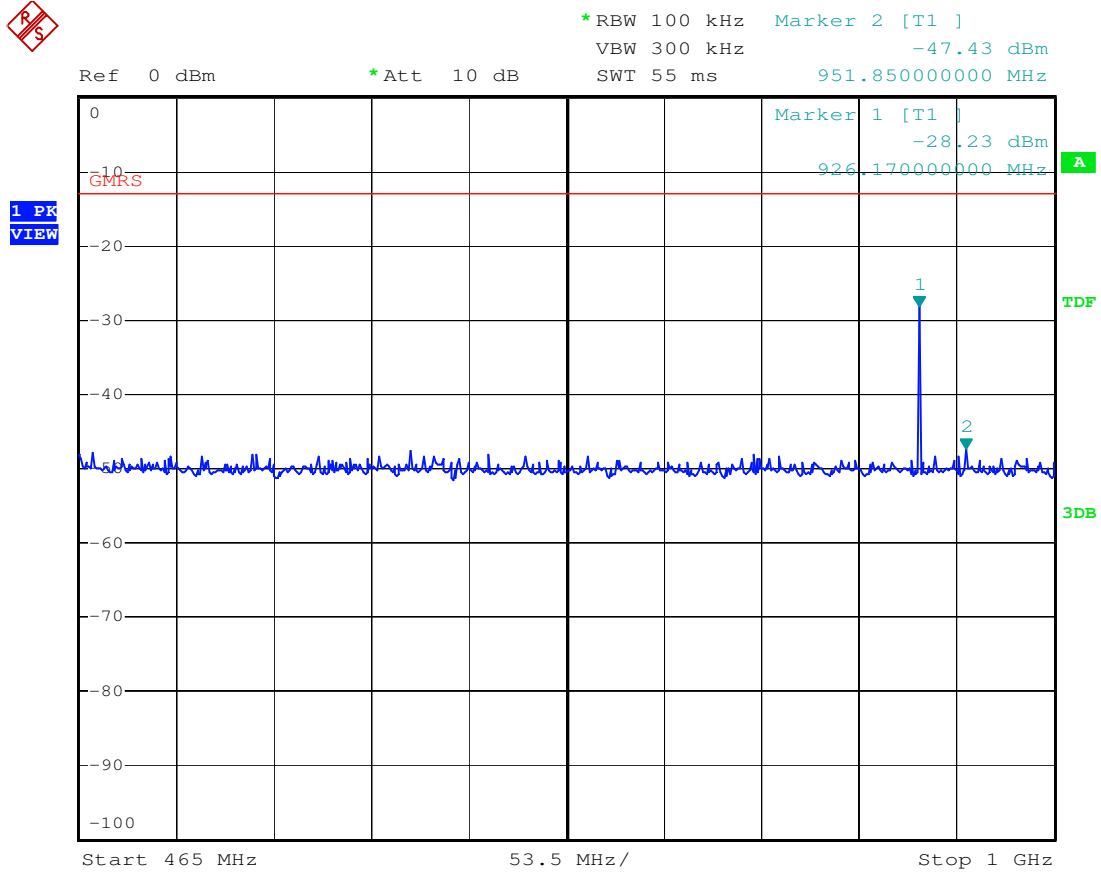
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Prüfbericht - Nr.:
Test Report No.

16014463 001

Seite 14 von 31
Page 14 of 31

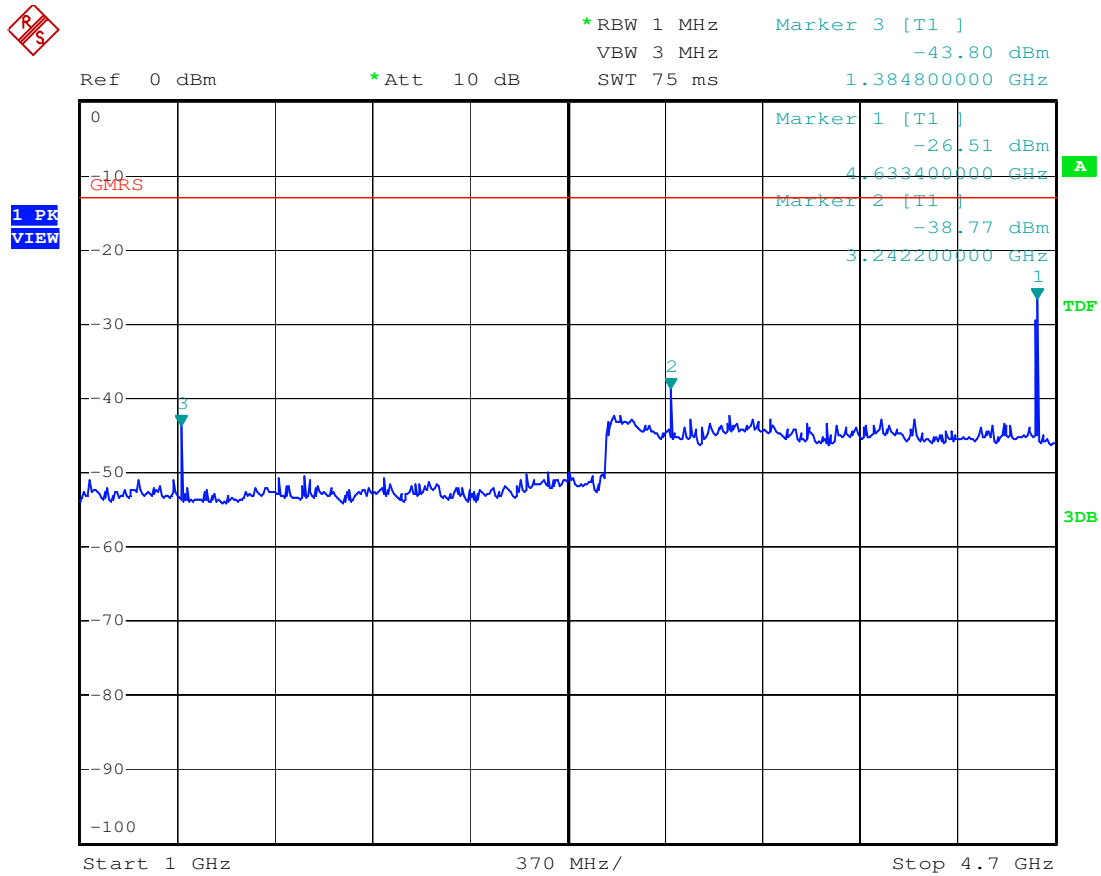


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Date: 11.OCT.2008 15:30:58

Prüfbericht - Nr.:
Test Report No.

16014463 001

Seite 15 von 31
Page 15 of 31

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Date: 11.OCT.2008 15:32:59

Spurious Emissions at Antenna Terminals: FRS

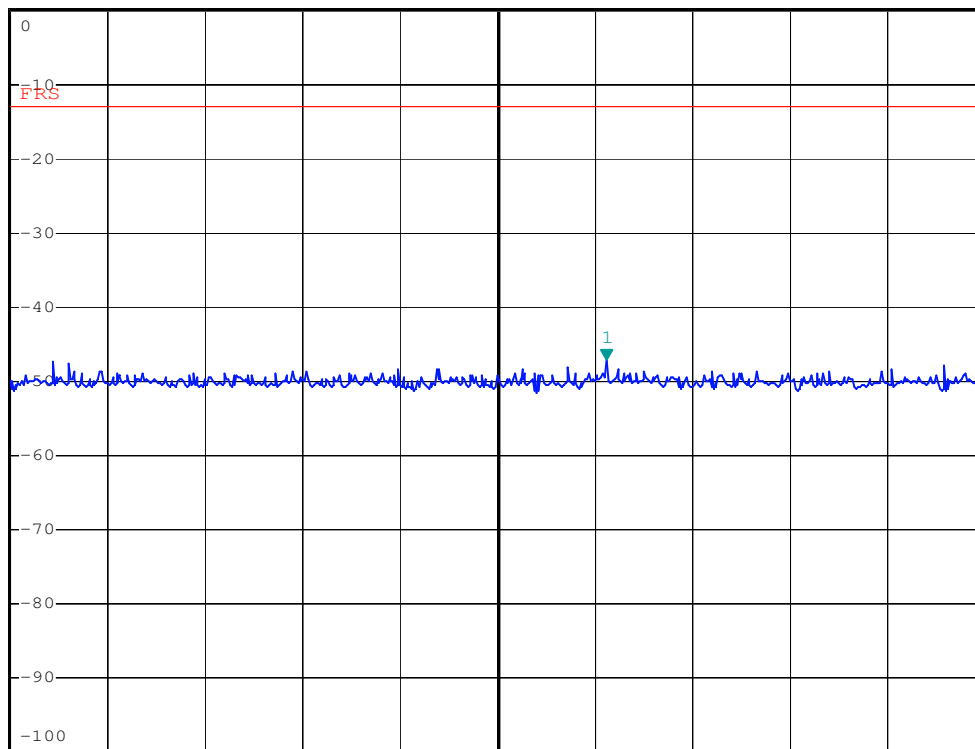


*RBW 100 kHz Marker 1 [T1]
VBW 300 kHz -47.21 dBm
SWT 45 ms 296.22000000 MHz

Ref 0 dBm

*Att 10 dB

1 PK
VIEW



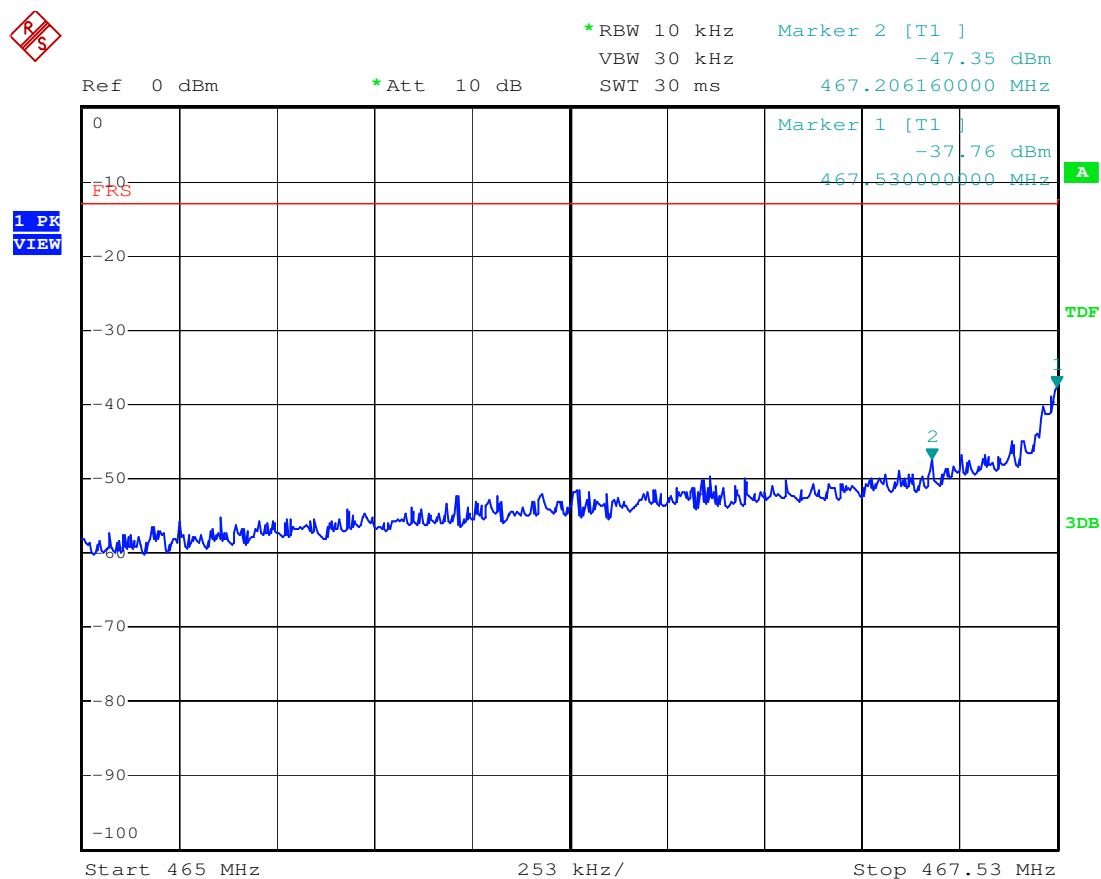
Start 30 MHz

43.5 MHz/

Stop 465 MHz

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Date: 11.OCT.2008 15:58:59



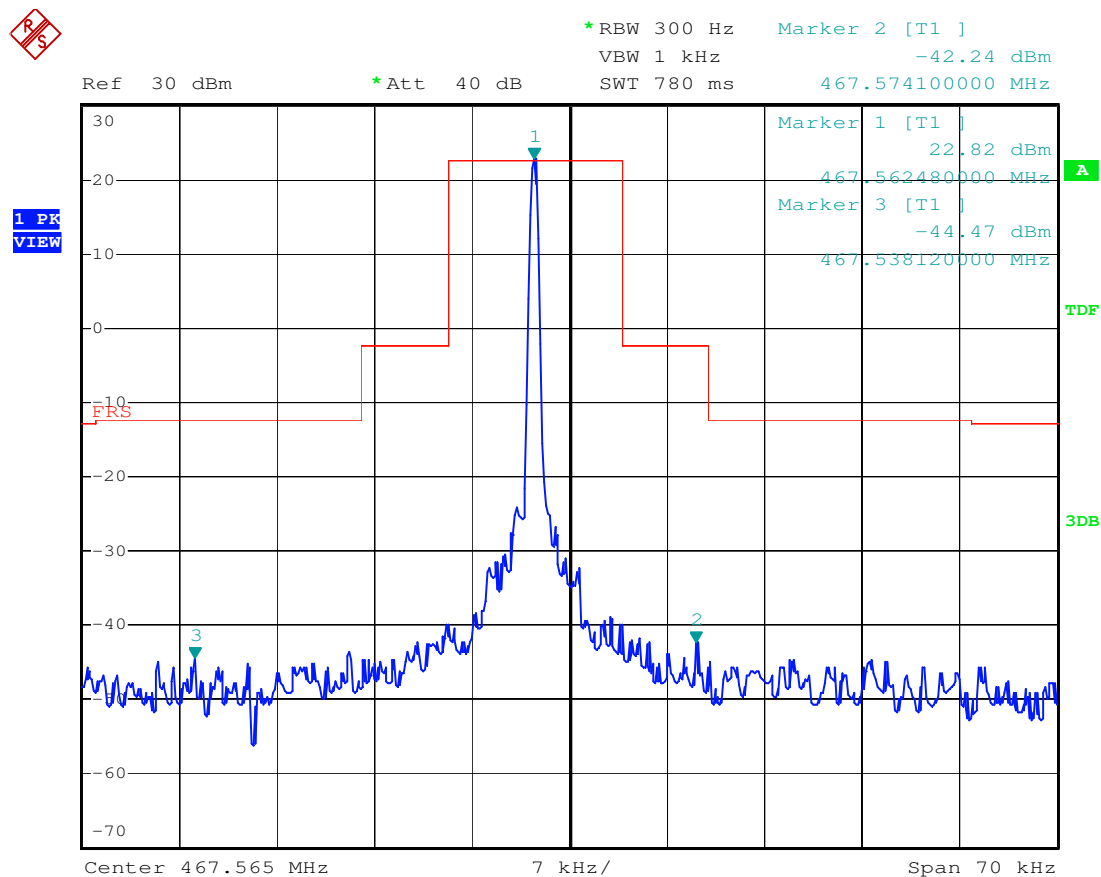
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Date: 11.OCT.2008 16:00:19

Prüfbericht - **Nr.:**
Test Report No.

16014463 001

Seite 18 von 31
Page 18 of 31



000

Date: 11.OCT.2008 16:03:20

Unmodulated

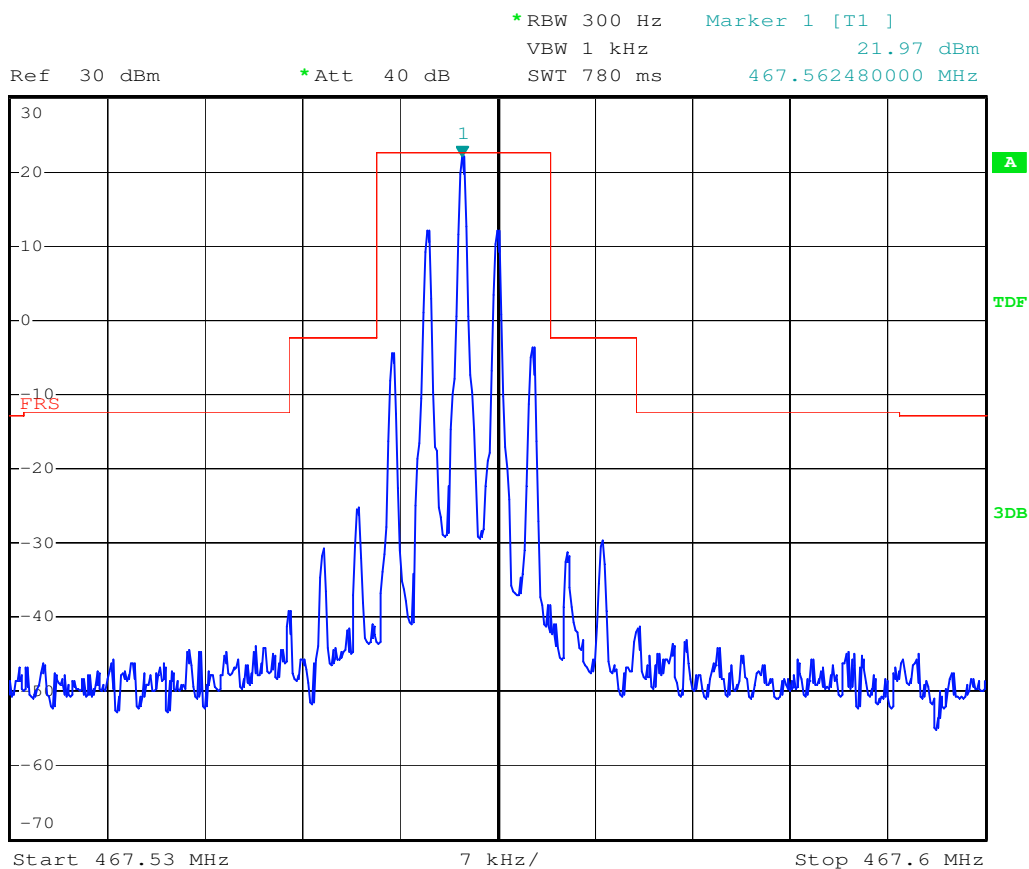
Prüfbericht - Nr.:
Test Report No.

16014463 001

Seite 19 von 31
Page 19 of 31



1 PK
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Date: 11.OCT.2008 16:15:40

Modulated

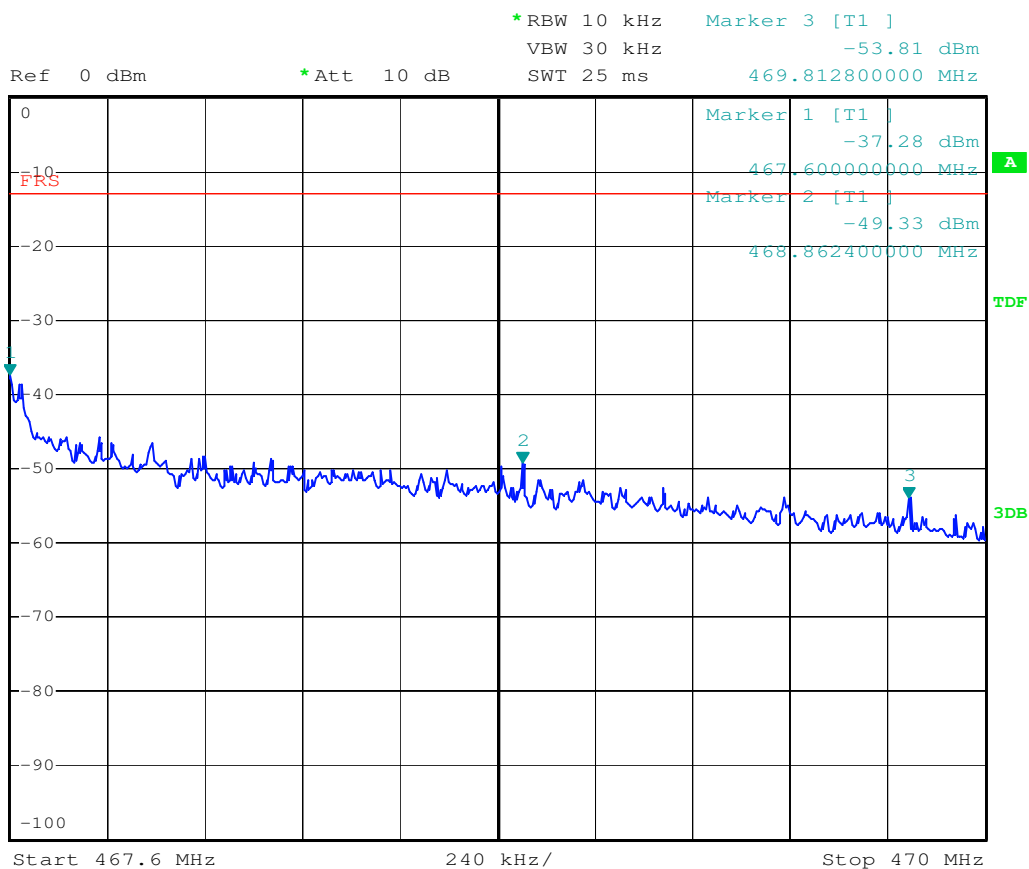
Prüfbericht - Nr.:
Test Report No.

16014463 001

Seite 20 von 31
Page 20 of 31



1 PK
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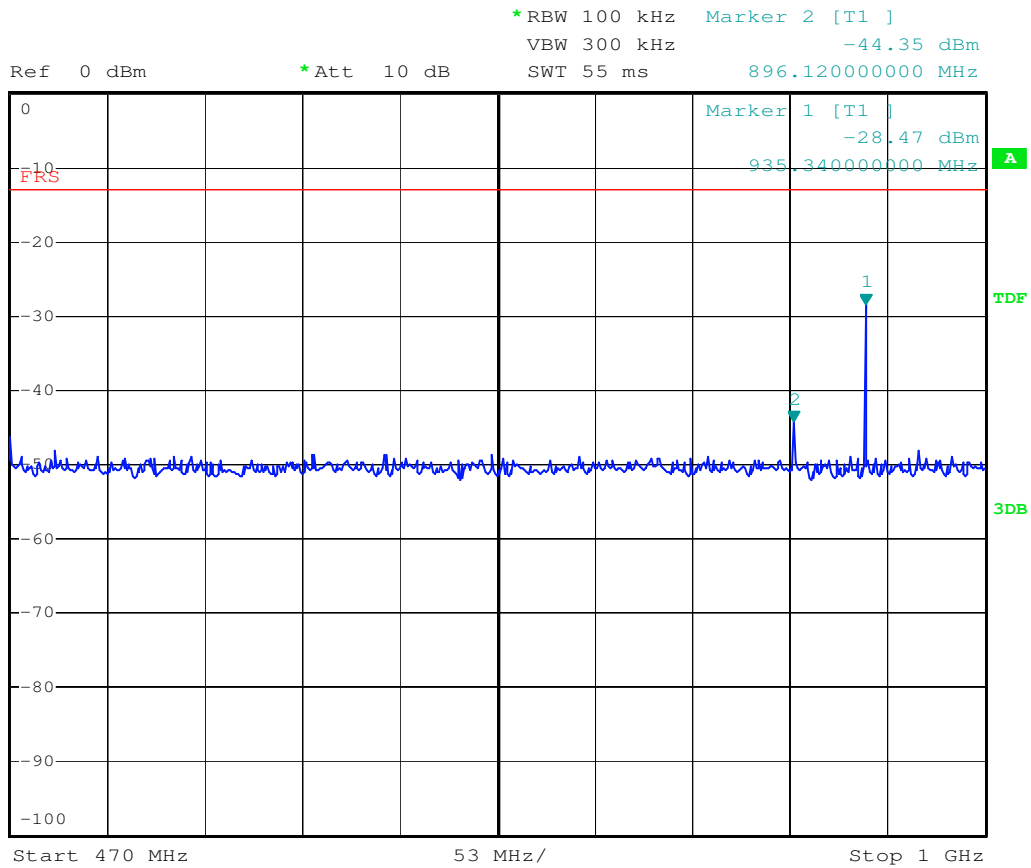


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Date: 11.OCT.2008 16:17:37

Prüfbericht - Nr.:
Test Report No.

16014463 001

Seite 21 von 31
Page 21 of 311 PK
VIEW

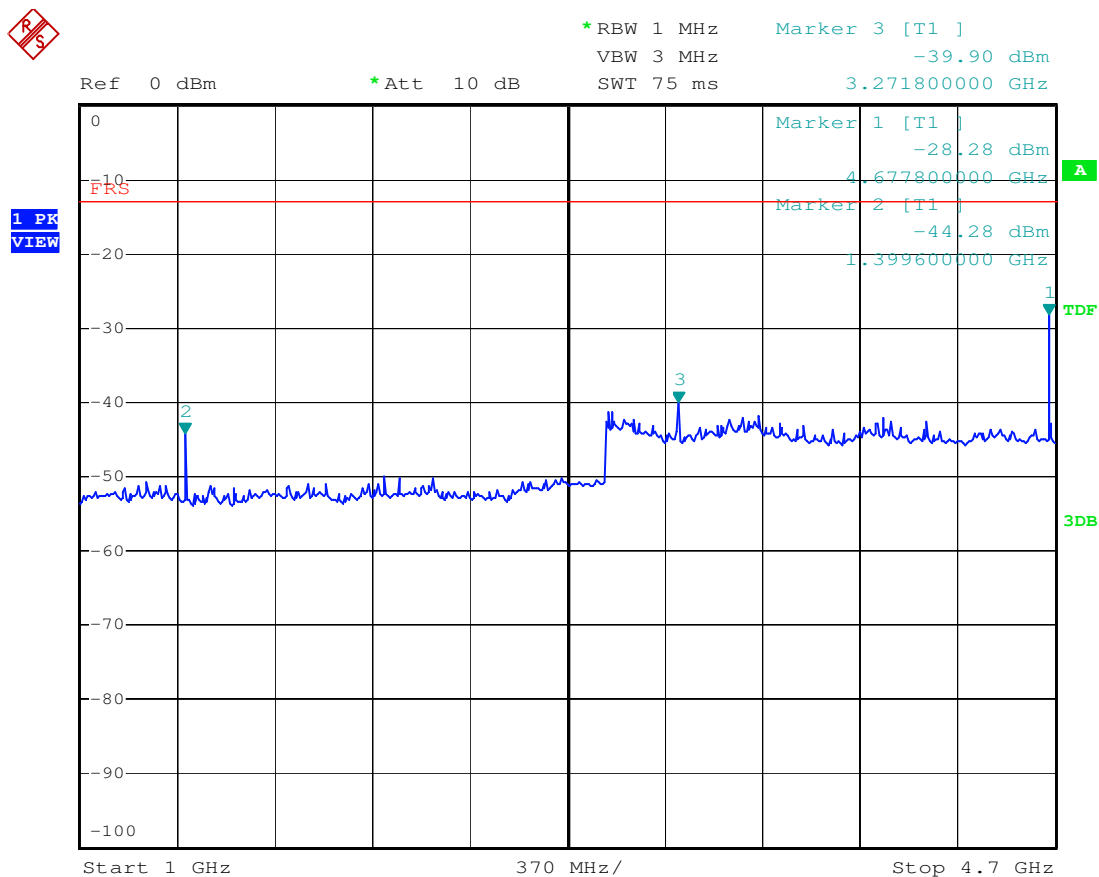
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Date: 11.OCT.2008 16:19:43

Prüfbericht - **Nr.:**
Test Report No.

16014463 001

Seite 22 von 31
Page 22 of 31



000

Date: 11.OCT.2008 16:21:30

Prüfbericht - Nr.:
Test Report No.

16014463 001

Seite 23 von 31
Page 23 of 31

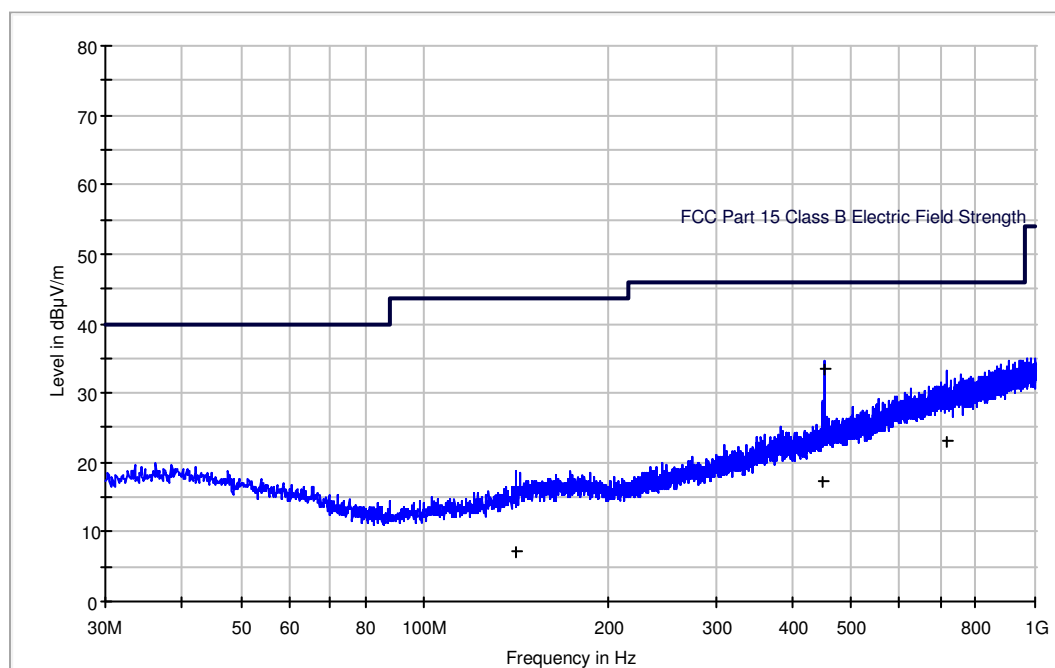
Radiated Emission for FCC Part 15: GMRS

Test Information

Manufacturer Name: Tsuen Shing
Model Number: WT-555
Operating Conditions: Receiving, CH17
Comment: Horizontal

Subrange 1

Frequency Range: 30MHz - 1GHz
Receiver: TUV ESCI 3
Transducer: TUV SAC UVLB 9168 / TUV ESCI3 -TUV SAC UVLB 9168



Limit and Margin

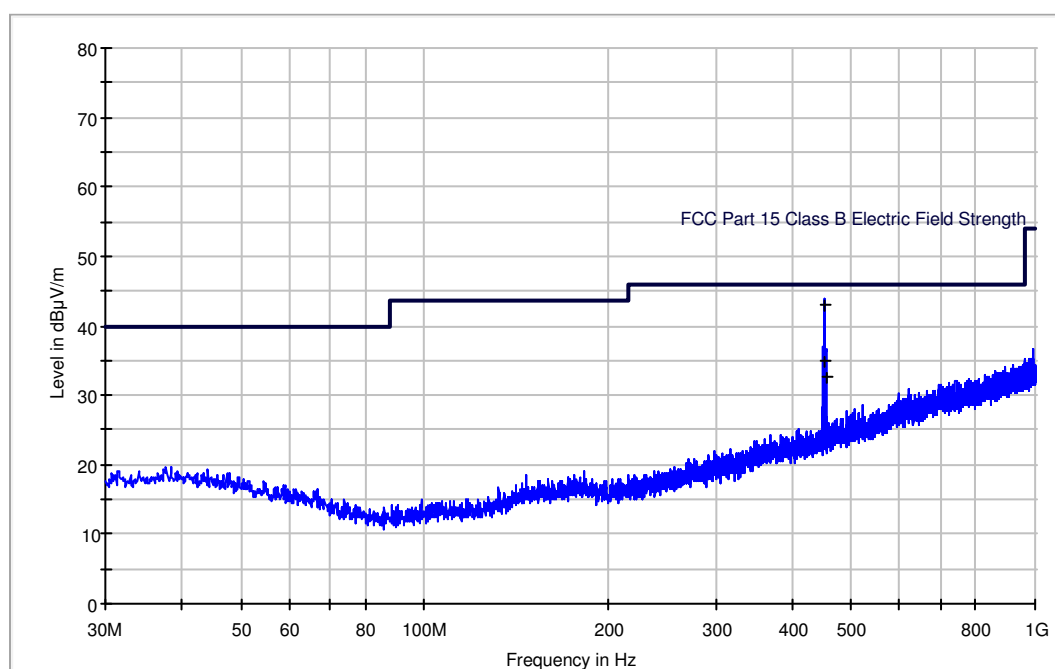
Frequency (MHz)	QuasiPeak (dB μ V/m)	Corr. (dB)	Margin (dB)	Limit (dB μ V/m)	Polarity
141.200000	7.3	11.6	36.2	43.5	H
448.950000	17.3	20.7	28.7	46.0	H
451.900000	33.4	20.7	12.6	46.0	H
714.950000	23.0	25.9	23.0	46.0	H

Test Information

Manufacturer Name: Tsuen Shing
Model Number: WT-555
Operating Conditions: Receiving, CH17
Comment: Horizontal

Subrange 1

Frequency Range: 30MHz - 1GHz
Receiver: TUV ESCI 3
Transducer: TUV SAC UVLB 9168 / TUV ESCI3 -TUV SAC UVLB 9168



Limit and Margin

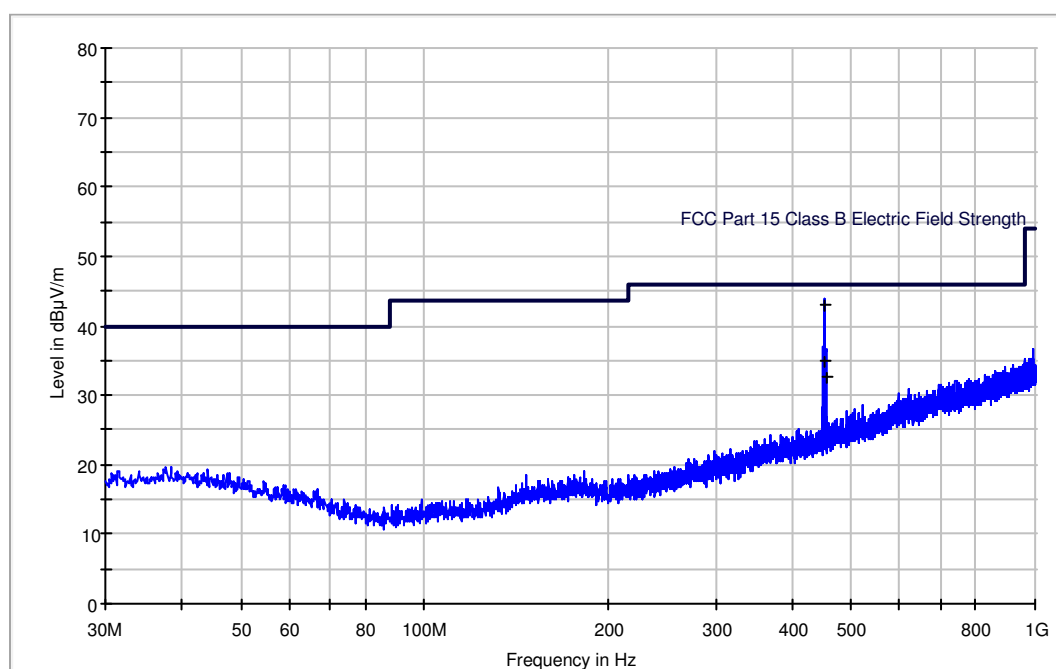
Frequency (MHz)	QuasiPeak (dB µ V/m)	Corr. (dB)	Margin (dB)	Limit (dB µ V/m)	Polarity
450.750000	35.0	20.7	11.0	46.0	V
451.900000	43.0	20.7	3.0	46.0	V
454.000000	32.7	20.7	13.3	46.0	V

Test Information

Manufacturer Name: Tsuen Shing
Model Number: WT-555
Operating Conditions: Receiving, CH17
Comment: Vertical

Subrange 1

Frequency Range: 30MHz - 1GHz
Receiver: TUV ESCI 3
Transducer: TUV SAC UVLB 9168 / TUV ESCI3 -TUV SAC UVLB 9168



Limit and Margin

Frequency (MHz)	QuasiPeak (dB µV/m)	Corr. (dB)	Margin (dB)	Limit (dB µV/m)	Polarity
450.750000	35.0	20.7	11.0	46.0	V
451.900000	43.0	20.7	3.0	46.0	V
454.000000	32.7	20.7	13.3	46.0	V

Prüfbericht - **Nr.:**
Test Report No.

16014463 001

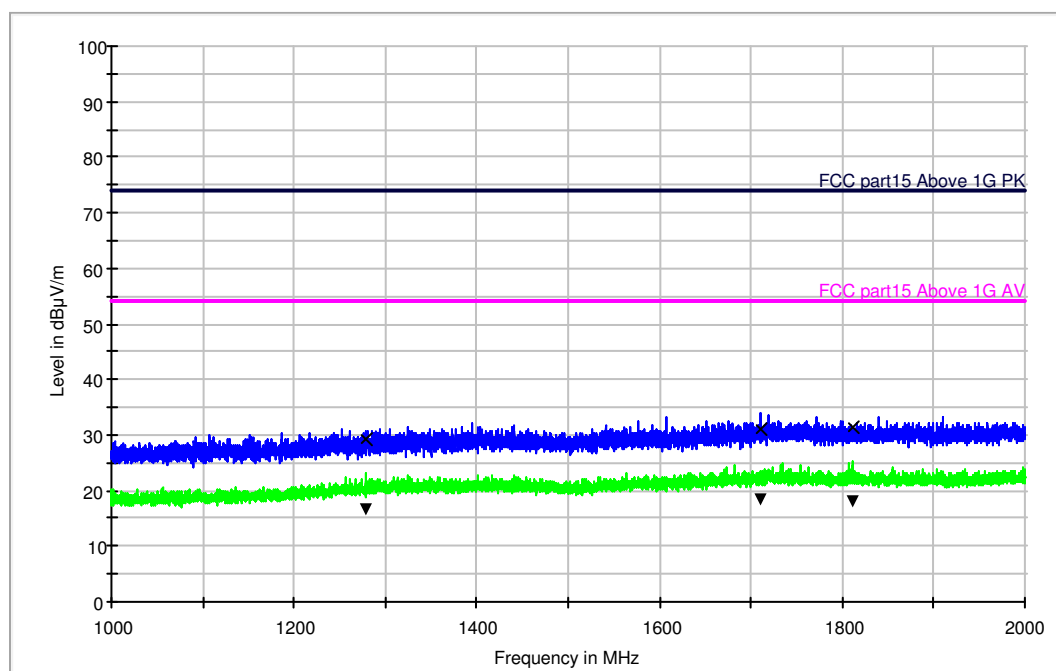
Seite 26 von 31
Page 26 of 31

Test Information

Manufacturer Name: Tsuen Shing
 Model Number: WT-555
 Operating Conditions: Receiving, CH17
 Comment: Horizontal

Subrange 1

Frequency Range: 1GHz - 2GHz
 Receiver: TUV ESCI 3
 Transducer: TUV SAC HF906 / TUV FSP 30-TUV SAC HF906



Limit and Margin PK

Frequency (MHz)	MaxPeak (dB μ V/m)	Margin (dB)	Limit (dB μ V/m)	Polarity	Corr. (dB)
1277.500000	29.3	44.7	74.0	H	-16.4
1710.500000	31.0	43.0	74.0	H	-14.7
1811.000000	31.5	42.5	74.0	H	-14.2

Limit and Margin AV

Frequency (MHz)	Average (dB μ V/m)	Margin (dB)	Limit (dB μ V/m)	Polarity	Corr. (dB)
1277.500000	16.6	37.4	54.0	H	-16.4
1710.500000	18.4	35.6	54.0	H	-14.7
1811.000000	18.2	35.8	54.0	H	-14.2

Prüfbericht - **Nr.:**
 Test Report No.

16014463 001

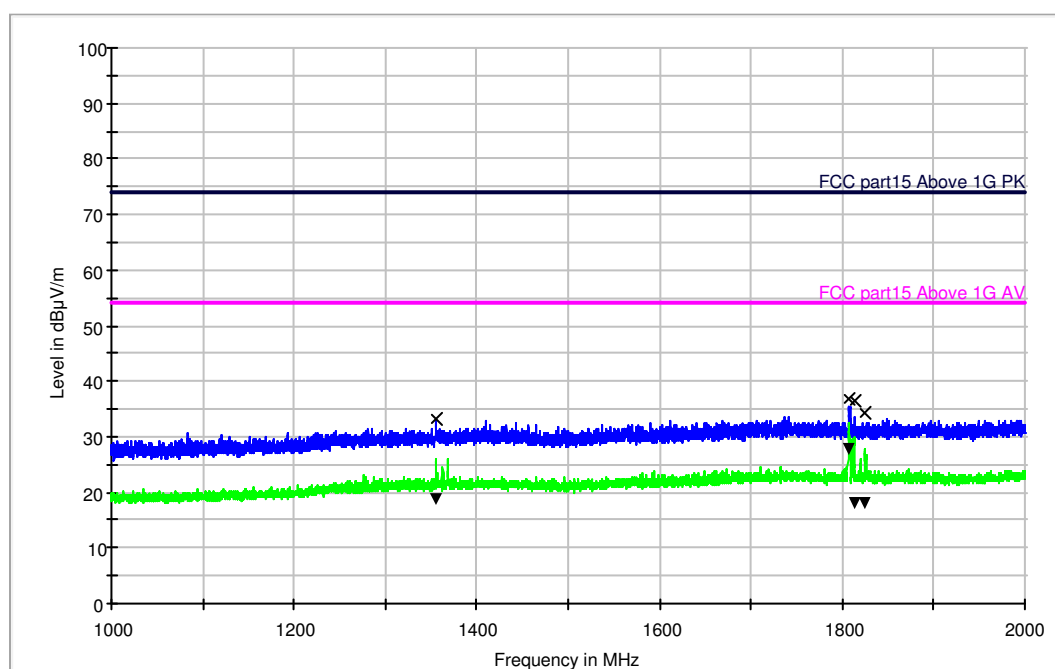
Seite 27 von 31
 Page 27 of 31

Test Information

Manufacturer Name: Tsuen Shing
 Model Number: WT-555
 Operating Conditions: Receiving, CH17
 Comment: Vertical

Subrange 1

Frequency Range: 1GHz - 2GHz
 Receiver: TUV ESCI 3
 Transducer: TUV SAC HF906 / TUV FSP 30-TUV SAC HF906



Limit and Margin PK

Frequency (MHz)	MaxPeak (dB µ V/m)	Margin (dB)	Limit (dB µ V/m)	Polarity	Corr. (dB)
1355.500000	33.1	40.9	74.0	V	-16.3
1807.500000	36.7	37.3	74.0	V	-14.3
1813.000000	36.3	37.7	74.0	V	-14.2
1825.500000	34.2	39.8	74.0	V	-14.1

Limit and Margin AV

Frequency (MHz)	Average (dB µ V/m)	Margin (dB)	Limit (dB µ V/m)	Polarity	Corr. (dB)
1355.500000	18.9	35.1	54.0	V	-16.3
1807.500000	27.8	26.2	54.0	V	-14.3
1813.000000	18.2	35.8	54.0	V	-14.2
1825.500000	18.1	35.9	54.0	V	-14.1

Prüfbericht - **Nr.:**
Test Report No.

16014463 001

Seite 28 von 31
Page 28 of 31

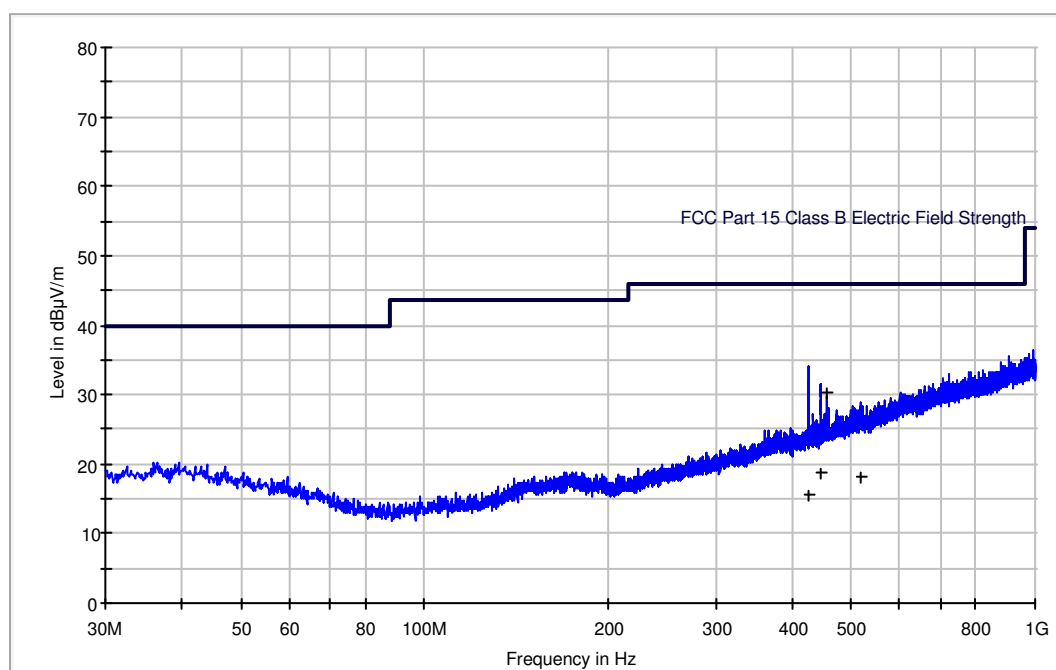
Radiated Emission for FCC Part 15: FRS

Test Information

Manufacturer Name: Tsuen Shing
 Model Number: WT-555
 Operating Conditions: Receiving, CH8
 Comment: Horizontal

Subrange 1

Frequency Range: 30MHz - 1GHz
 Receiver: TUV ESCI 3
 Transducer: TUV SAC UVLB 9168 / TUV ESCI3 -TUV SAC UVLB 9168



Limit and Margin

Frequency (MHz)	QuasiPeak (dB μ V/m)	Corr. (dB)	Margin (dB)	Limit (dB μ V/m)	Polarity
426.250000	15.7	19.8	30.3	46.0	H
444.450000	18.9	20.4	27.1	46.0	H
456.850000	30.4	20.8	15.6	46.0	H
517.550000	18.2	22.1	27.8	46.0	H

Prüfbericht - **Nr.:**
Test Report No.

16014463 001

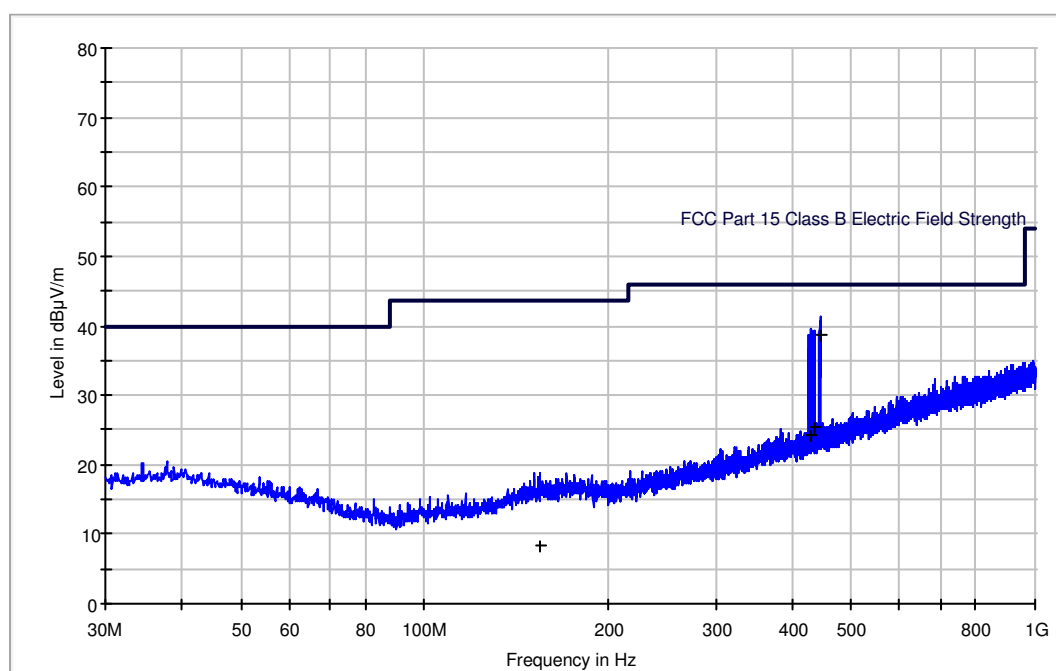
Seite 29 von 31
Page 29 of 31

Test Information

Manufacturer Name: Tsuen Shing
 Model Number: WT-555
 Operating Conditions: Receiving, CH8
 Comment: Vertical

Subrange 1

Frequency Range: 30MHz - 1GHz
 Receiver: TUV ESCI 3
 Transducer: TUV SAC UVLB 9168 / TUV ESCI3 -TUV SAC UVLB 9168



Limit and Margin

Frequency (MHz)	QuasiPeak (dB µV/m)	Corr. (dB)	Margin (dB)	Limit (dB µV/m)	Polarity
154.400000	8.4	12.8	35.1	43.5	V
427.600000	24.2	19.8	21.8	46.0	V
434.600000	25.4	20.0	20.6	46.0	V
444.650000	38.6	20.4	7.4	46.0	V

Prüfbericht - **Nr.:**
 Test Report No.

16014463 001

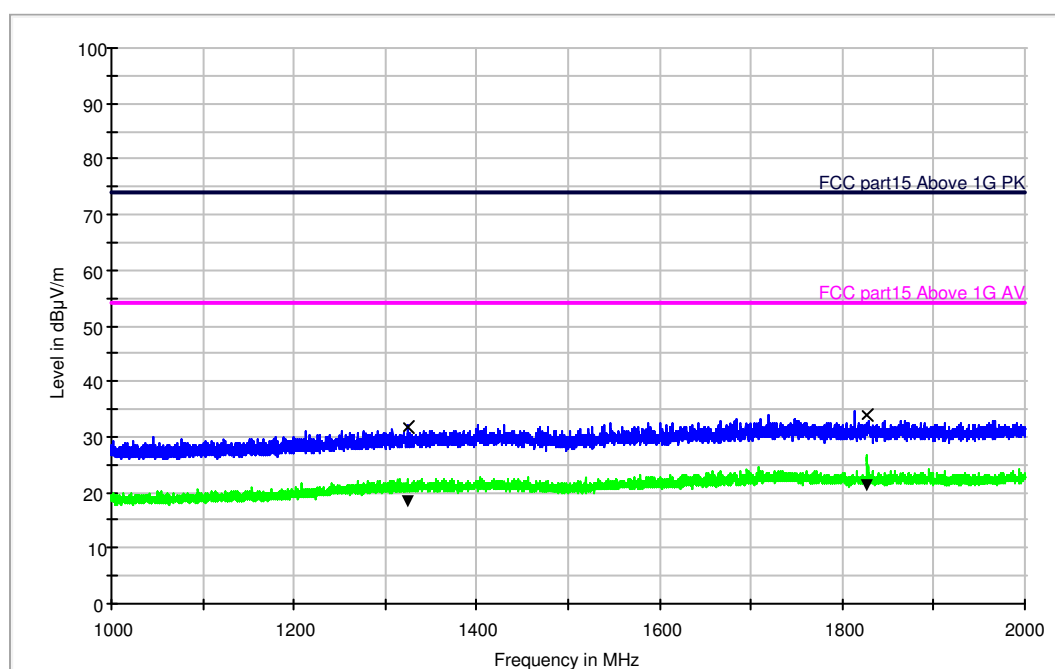
Seite 30 von 31
 Page 30 of 31

Test Information

Manufacturer Name: Tsuen Shing
 Model Number: WT-555
 Operating Conditions: Receiving, CH8
 Comment: Horizontal

Subrange 1

Frequency Range: 1GHz - 2GHz
 Receiver: TUV ESCI 3
 Transducer: TUV SAC HF906 / TUV FSP 30-TUV SAC HF906



Limit and Margin PK

Frequency (MHz)	MaxPeak (dB μ V/m)	Margin (dB)	Limit (dB μ V/m)	Polarity	Corr. (dB)
1325.500000	31.9	42.1	74.0	H	-16.3
1827.500000	33.8	40.2	74.0	H	-14.1

Limit and Margin AV

Frequency (MHz)	Average (dB μ V/m)	Margin (dB)	Limit (dB μ V/m)	Polarity	Corr. (dB)
1325.500000	18.4	35.6	54.0	H	-16.3
1827.500000	21.3	32.7	54.0	H	-14.1

Prüfbericht - **Nr.:**
Test Report No.

16014463 001

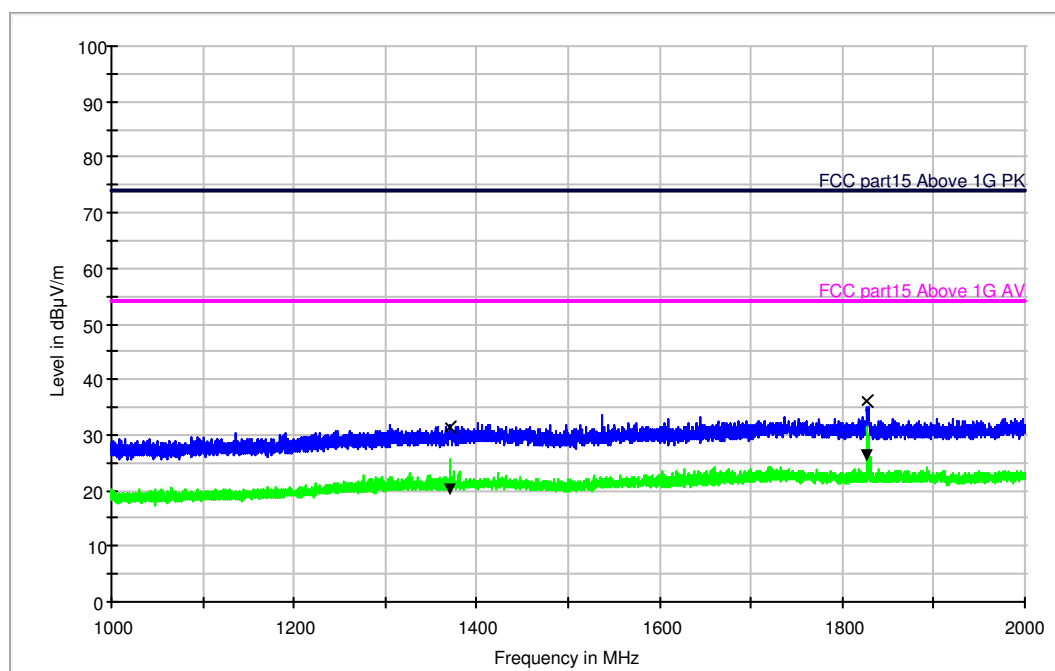
Seite 31 von 31
Page 31 of 31

Test Information

Manufacturer Name: Tsuen Shing
 Model Number: WT-555
 Operating Conditions: Receiving, CH8
 Comment: Vertical

Subrange 1

Frequency Range: 1GHz - 2GHz
 Receiver: TUV ESCI 3
 Transducer: TUV SAC HF906 / TUV FSP 30-TUV SAC HF906



Limit and Margin PK

Frequency (MHz)	MaxPeak (dB μ V/m)	Margin (dB)	Limit (dB μ V/m)	Polarity	Corr. (dB)
1370.500000	31.5	42.5	74.0	V	-16.1
1827.500000	36.2	37.8	74.0	V	-14.1

Limit and Margin AV

Frequency (MHz)	Average (dB μ V/m)	Margin (dB)	Limit (dB μ V/m)	Polarity	Corr. (dB)
1370.500000	20.3	33.7	54.0	V	-16.1
1827.500000	26.3	27.7	54.0	V	-14.1