

TEST REPORT

on

IEC 62320-2: Edition 1.0 2008-03

**MARITIME NAVIGATION AND
RADIOCOMMUNICATION EQUIPMENT
AND SYSTEMS-AUTOMATIC IDENTIFICATION SYSTEM (AIS)
Part 2: AIS AtoN Stations-Operational and
Performance Requirements,
Methods of test and required test results**

Test Report Reference: F110939E1

Equipment under Test:

MANDO-303/301 AIS AtoN

Serial Number: -

Applicant: Alltek Marine Electronics Corp

Manufacturer: Alltek Marine Electronics Corp

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2 IDENTIFICATION

2.1 APPLICANT

| | |
|----------------------------|---|
| Name: | Alltek Marine Electronics Corp |
| Address: | 7F, No.605, Ruei-Guang Rd., Neihu, Taipei |
| Country: | Taiwan, R.O.C. |
| Name for contact purposes: | Y.Y. Chiou |
| Tel: | +886 2 2627 1599 ext.109 |
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| e-mail address: | yychiou@alltekmarine.com |

2.2 MANUFACTURER

| | |
|----------------------------|---|
| Name: | Alltek Marine Electronics Corp |
| Address: | 7F, No.605, Ruei-Guang Rd., Neihu, Taipei |
| Country: | Taiwan, R.O.C. |
| Name for contact purposes: | Y.Y. Chiou |
| Tel: | +886 2 2627 1599 ext.109 |
| Fax: | +886 2 2627 1600 |
| e-mail address: | yychiou@alltekmarine.com |

2.3 DATES

| | |
|---------------------------------|------------------|
| Date of Receipt of Test Sample: | 7. November 2011 |
| Start of test: | 7. November 2011 |
| Finish of test: | 9. November 2011 |

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2.4 TEST LABORATORY

The tests were carried out at: **PHOENIX TEST-LAB GmbH**
Königswinkel 10
D-32825 Blomberg **Tel: +49 (0) 52 35 / 95 00-0**
Germany **Fax: +49 (0) 52 35 / 95 00-10**

accredited by Deutsche Gesellschaft für Akkreditierung mbH (DGA) in compliance with DIN EN ISO/IEC 17025 under Reg. No. DGA-PL-105/99-22

| | | | |
|----------------------|---------------|--|------------------|
| Test engineer: | Raimund BLASK |  | 25 November 2011 |
| | _____ Name | _____ Signature | _____ Date |
| Authorized reviewer: | Bernd STEINER |  | 28 November 2011 |
| | _____ Name | _____ Signature | _____ Date |

2.5 RESERVATION

This test report is only valid in the original form.

Any reproduction of it's contents without written permission of the accredited test laboratory PHOENIX TEST-LAB GmbH is prohibited.

The test results herein refer only to the tested sample. PHOENIX TESTLAB GmbH is not responsible for any generalisations or conclusions draw from these test results and concerning further samples. Any modification of the tested samples is prohibited and leads to the invalidity of this test report. Each page contains the PHOENIX TESTLAB Logo and the TEST REPORT REFERENCE.

2.6 REFERENCES

[1] IEC 62320-2: Edition 1.0 2008-03: Maritime Navigation and Radio Communication Equipment and Systems- Automatic Identification System (AIS);
Part 2: AIS AtoN Stations-Operational and performance requirements, Methods of test and required test results.

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3 TECHNICAL DATA OF EQUIPMENT

| | | | |
|------------------------------|--|----------------------|-----------------------|
| Type: | AIS AtoN Navigation System | | |
| Type designation: | MANDO-303/301 AIS AtoN | | |
| Serial No.: | MANDO-303: A1K310903 MANDO-301: A1K310901 | | |
| Alignment range: | 156.025 to 162.025 MHz | | |
| Switching range: | 156.025 to 162.025 MHz | | |
| Channel separation: | 25 kHz | | |
| Rated RF output power: | 2W / 5W / 12.5 W (programmable) | | |
| Supply Voltage: | $U_{nom} =$ 12.0 V DC | $U_{min} =$ 9.6 V DC | $U_{max} =$ 15.6 V DC |
| Temperature range: | -20°C to +55°C | | |
| Printed circuit designation: | M-PCB-CTLN3, M-PCB-RFNR2 | | |
| Hardware: | M-PCB-CTLN3, M-PCB-RFNR2 | | |
| Software: | Version 1.4.3 | | |

Ports/Connectors

| Identification | Connector | | Length |
|-----------------|-----------------|------------|--------|
| | EUT | Ancillary | |
| DC-power-supply | Customized | - | 3 m |
| GPS-antenna | TNC | TNC | 10 m |
| VHF-antenna | SO-239 (M-Type) | N-Male | 3 m |
| RS 232-Display | Customized | Customized | 5 m |
| RS 422-Sensor | Customized | Customized | 5 m |

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4 ADDITIONAL INFORMATION

General:

Full tests were carried out at 156.025 MHz and 162.025 MHz.

The EUT was powered by an external 12 V-DC-power-Supply.

All Tests were carried out with the MANDO-303. The MANDO-301 is using the same Hard- and Software, only the Receivers are not integrated (as declared by the applicant).

Wanted signal:

AIS-Mode (wanted signals):

The Test-Signals were generated by the AIS-Simulator "Attingimus".

For the Receiver-Tests the Output-Signal of the Simulator was used to modulate a calibrated RF-Generator from Phoenix TESTLAB. The received Data-Telegrams were compared transmitted Data-Telegrams.

A number of 200 Packets (unless otherwise stated) were used to calculate the Packet Error Rate PER.

Unwanted signal:

All unwanted-signals were generated by the RF-Generators from Phoenix Test-Lab.

Test Report History:

| Test Report Number: | Date of issue: | Report Status: |
|---------------------|-----------------|----------------|
| F110939E1 | 9 November 2011 | First issue |
| - | - | - |
| - | - | - |

5 TEST OVERVIEW

| | | | |
|---------------|--|------------|--------|
| Part 7 | AIS AtoN stations | | |
| 7.1 | RF-Tests (receiver and transmitter) | | |
| 7.1.1 | TDMA Transmitter | | |
| 7.1.1.1 | Frequency error | Applicable | Passed |
| 7.1.1.2 | Carrier power (conducted) | Applicable | Passed |
| 7.1.1.3 | Modulation spectrum slotted transmission | Applicable | Passed |
| 7.1.1.4 | Transmitter test sequence and modulation accuracy | Applicable | Passed |
| 7.1.1.5 | Transmitter output power versus time function | Applicable | Passed |
| 7.1.2 | TDMA Receiver | | |
| 7.1.2.1 | Sensitivity | Applicable | Passed |
| 7.1.2.2 | Error behaviour at high input level | Applicable | Passed |
| 7.1.2.3 | Co-channel rejection | Applicable | Passed |
| 7.1.2.4 | Adjacent channel selectivity | Applicable | Passed |
| 7.1.2.5 | Spurious response rejection | Applicable | Passed |
| 7.1.2.6 | Intermodulation response rejection | Applicable | Passed |
| 7.1.2.7 | Blocking and desensitisation | Applicable | Passed |
| 7.1.3 | Conducted spurious emissions at the antenna | | |
| 7.1.3.1 | Spurious emissions from the receiver | Applicable | Passed |
| 7.1.3.2 | Spurious emissions from the transmitter | Applicable | Passed |

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6 TRANSMITTER REQUIREMENTS

TEST REPORT REFERENCE: F110939E1

6.1 FREQUENCY ERROR

SUBCLAUSE 7.1.1.1

| | | | |
|---------------------|-------|-------------------|------|
| Ambient temperature | 20 °C | Relative humidity | 45 % |
|---------------------|-------|-------------------|------|

Operation mode: Continuous transmission without modulation, f = 156.025 MHz

| TEST CONDITIONS | | FREQUENCY | FREQUENCY ERROR |
|--------------------------|------------------------------|----------------|-----------------|
| Temperature | Voltage | | |
| T _{nom} (+20°C) | U _{nom} (12.0 V DC) | 156.024620 MHz | -380 Hz |
| T _{min} (-20°C) | U _{min} (9.6 V DC) | 156.024920 MHz | -80 Hz |
| | U _{max} (15.6 V DC) | 156.024950 MHz | -50 Hz |
| T _{max} (+55°C) | U _{min} (9.6 V DC) | 156.024920 MHz | -80 Hz |
| | U _{max} (15.6 V DC) | 156.024890 MHz | -110 Hz |
| Maximum frequency error | | -110 Hz | |
| Measurement uncertainty | | ± 10 Hz | |

Operation mode: Continuous transmission without modulation, f = 162.025 MHz

| TEST CONDITIONS | | FREQUENCY | FREQUENCY ERROR |
|--------------------------|------------------------------|----------------|-----------------|
| Temperature | Voltage | | |
| T _{nom} (+20°C) | U _{nom} (12.0 V DC) | 162.024598 MHz | -402 Hz |
| T _{min} (-20°C) | U _{min} (9.6 V DC) | 162.024910 MHz | -90 Hz |
| | U _{max} (15.6 V DC) | 162.024940 MHz | -60 Hz |
| T _{max} (+55°C) | U _{min} (9.6 V DC) | 162.024910 MHz | -90 Hz |
| | U _{max} (15.6 V DC) | 162.024885 MHz | -115 Hz |
| Maximum frequency error | | -402 Hz | |
| Measurement uncertainty | | ± 10 Hz | |

LIMITS: SUBCLAUSE 7.1.1.1.3

The frequency error shall not exceed ± 0.5 kHz under normal and ± 1 kHz under extreme conditions.

TEST EQUIPMENT USED:

29, 42, 51

TEST REPORT REFERENCE: F110939E1

6.2 CARRIER POWER (CONDUCTED)

SUBCLAUSE 7.1.1.2

| | |
|---------------------|-------|
| Ambient temperature | 20 °C |
|---------------------|-------|

| | |
|-------------------|------|
| Relative humidity | 45 % |
|-------------------|------|

Operation mode: Transmit mode, f = 156.025 MHz

| Test conditions | | Carrier Power (conducted) | | |
|--------------------------|------------------------------|---------------------------|-------------|----------------|
| | | 2W / +33dBm | 5W / +37dBm | 12.5W / +41dBm |
| T _{nom} (+20°C) | U _{nom} (12.0 V DC) | 33.5 dBm | 36.8 dBm | 40.8 dBm |
| T _{min} (-20°C) | U _{min} (9.6 V DC) | 32.7 dBm | 36.7 dBm | 40.6 dBm |
| | U _{max} (15.6 V DC) | 32.9 dBm | 37.1 dBm | 40.7 dBm |
| T _{max} (+55°C) | U _{min} (9.6 V DC) | 33.2 dBm | 37.2 dBm | 40.7 dBm |
| | U _{max} (15.6 V DC) | 33.5 dBm | 37.0 dBm | 40.9 dBm |
| Measurement uncertainty | | + 0.66 dB / - 0.72 dB | | |

Operation mode: Transmit mode, f = 162.025 MHz

| Test conditions | | Carrier Power (conducted) | | |
|--------------------------|------------------------------|---------------------------|-------------|----------------|
| | | 2W / +33dBm | 5W / +37dBm | 12.5W / +41dBm |
| T _{nom} (+20°C) | U _{nom} (12.0 V DC) | 33.8 dBm | 37.5 dBm | 41.2 dBm |
| T _{min} (-20°C) | U _{min} (9.6 V DC) | 33.5 dBm | 37.7 dBm | 41.8 dBm |
| | U _{max} (15.6 V DC) | 33.2 dBm | 37.3 dBm | 41.7 dBm |
| T _{max} (+55°C) | U _{min} (9.6 V DC) | 33.7 dBm | 37.2 dBm | 41.7 dBm |
| | U _{max} (15.6 V DC) | 33.8 dBm | 37.5 dBm | 41.5 dBm |
| Measurement uncertainty | | + 0.66 dB / - 0.72 dB | | |

LIMITS: SUBCLAUSE 7.1.1.2.3

The carrier output power (conducted) under normal test conditions shall be within ± 1.50 dB of the rated output power. The carrier output power (conducted) under extreme test conditions shall be within ± 3.0 dB of the rated output power.

TEST EQUIPMENT USED:

29, 42, 51

TEST REPORT REFERENCE: F110939E1

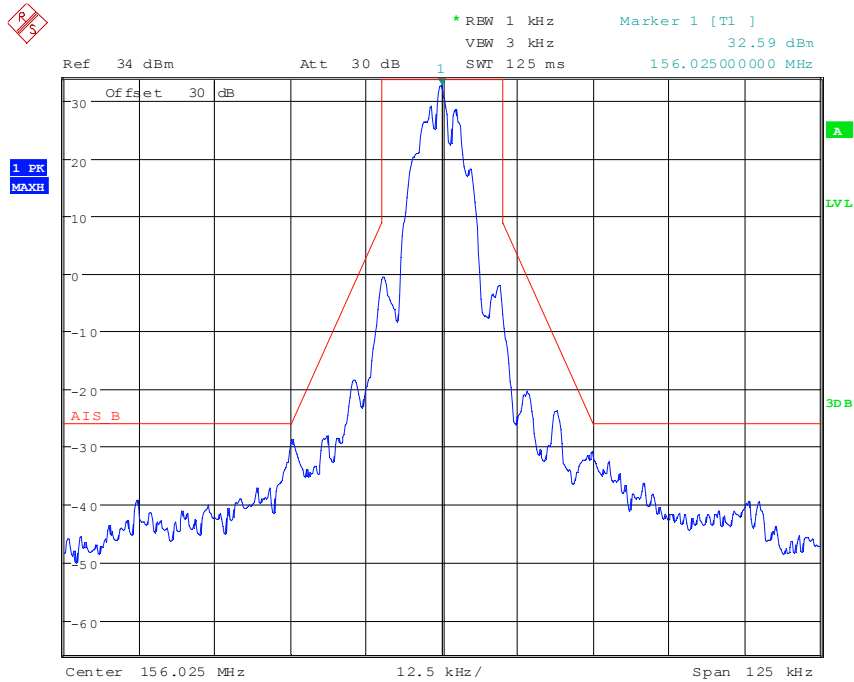
6.3 MODULATION SPECTRUM SLOTTED SPECTRUM

SUBCLAUSE 7.1.1.3

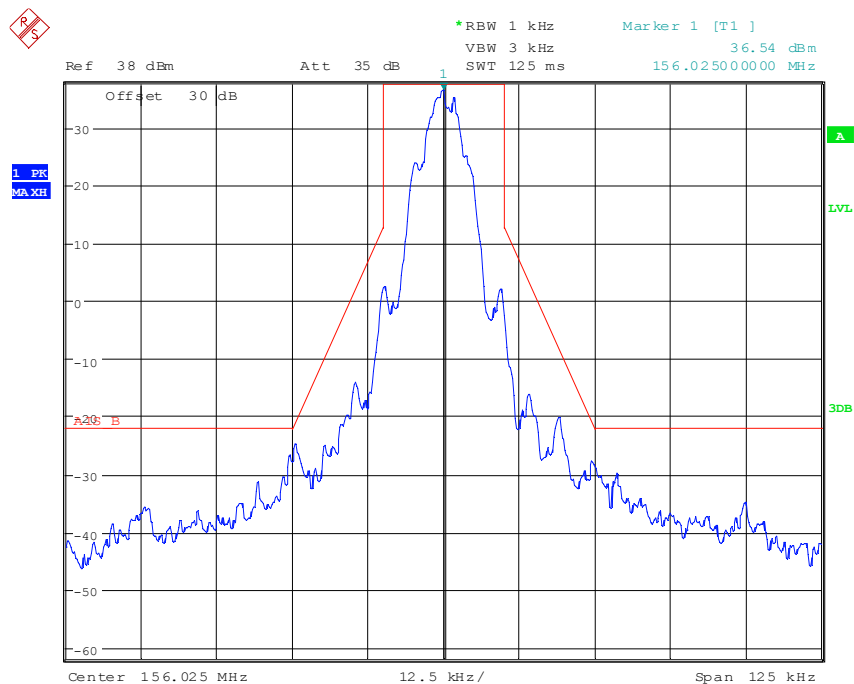
| | |
|---------------------|-------|
| Ambient temperature | 20 °C |
|---------------------|-------|

| | |
|-------------------|------|
| Relative humidity | 45 % |
|-------------------|------|

Operation mode: Transmit mode

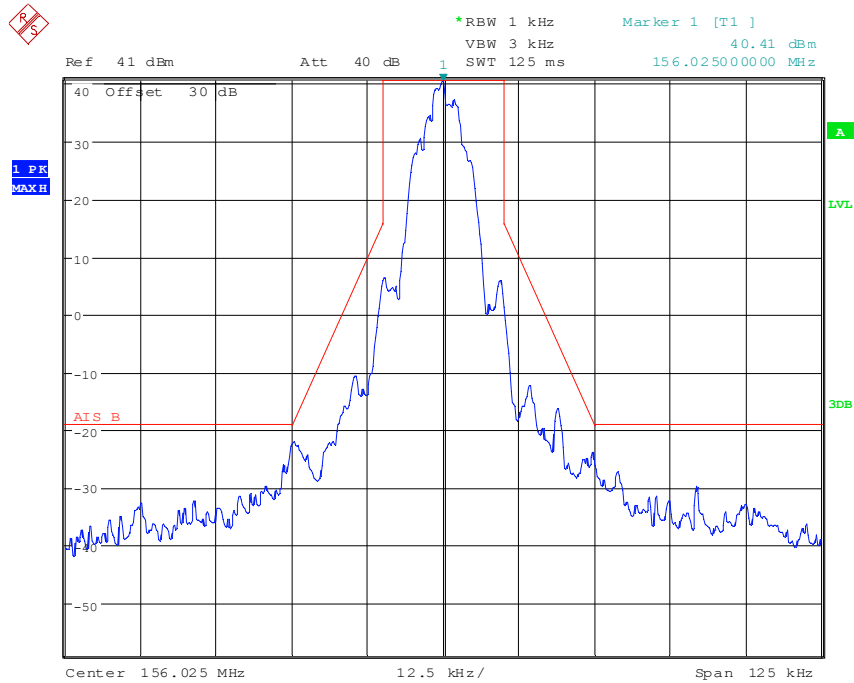


156I Mod: Transmit 156.025 MHz / 2W



156m Mod: Transmit 156.025 MHz / 5W

TEST REPORT REFERENCE: F110939E1

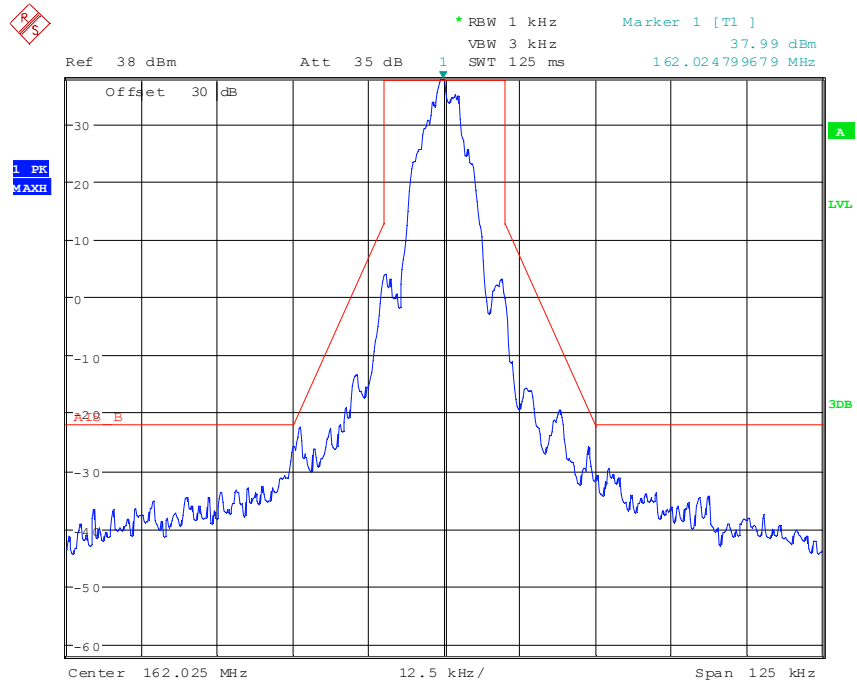


156hMod: Transmit 156.025 MHz / 12.5W

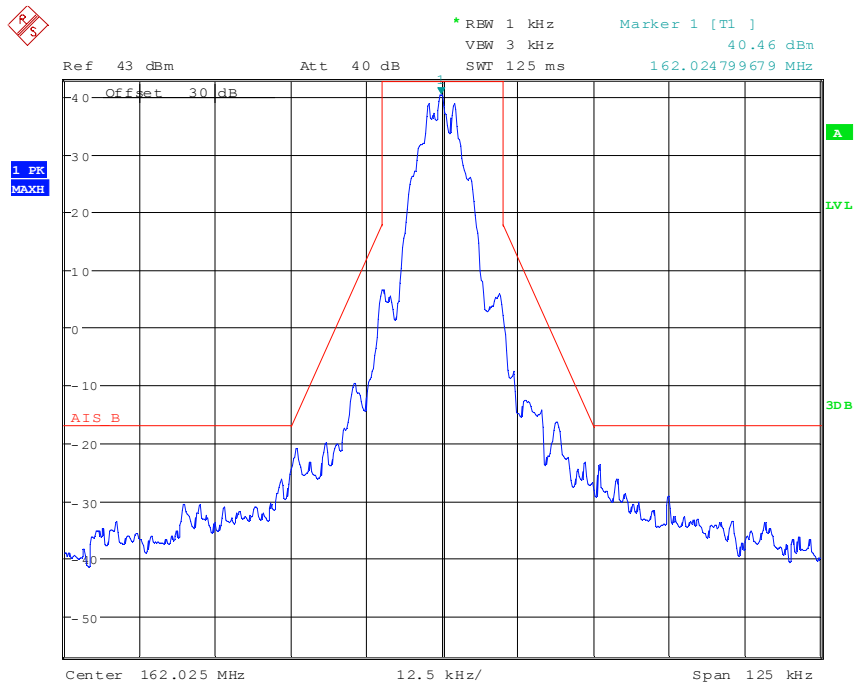


162IMod: Transmit 162.025 MHz / 2W

TEST REPORT REFERENCE: F110939E1



156mMod: Transmit 162.025 MHz / 5W



156hMod: Transmit 162.025 MHz / 12.5W

TEST REPORT REFERENCE: F110939E1

LIMITS: SUBCLAUSE 7.1.1.3.3

At ± 10 kHz removed from the carrier, the modulation sideband is below - 25 dBc.

At ± 25 kHz to ± 62.5 kHz removed from the carrier, the modulation sideband is below - 60 dBc or -30 dBm.

In the region ± 10 kHz and ± 25 kHz removed from the carrier, the modulation and transient sideband is below a line specified between these two points.

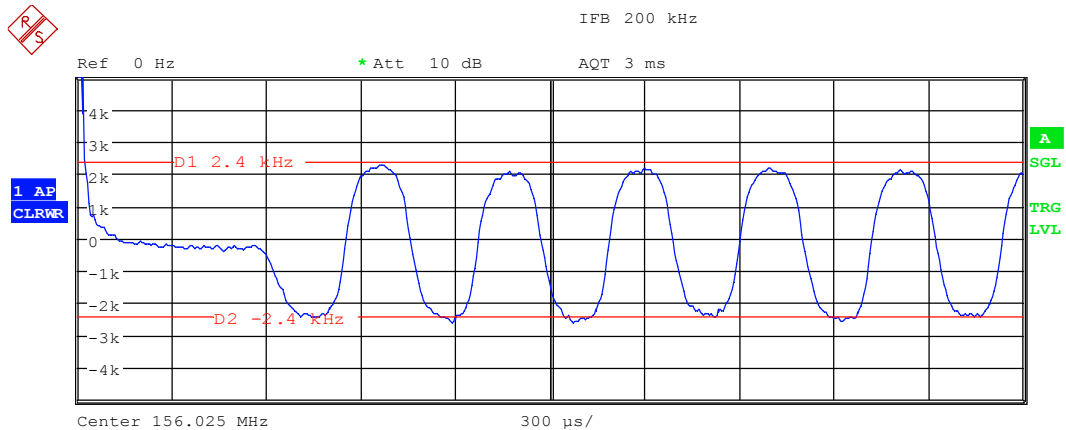
TEST EQUIPMENT USED:

06, 42, 79-81, 100-102

TEST REPORT REFERENCE: F110939E1

6.4 TRANSMITTER TEST SEQUENCE AND MODULATION ACCURACY SUBCLAUSE 7.1.1.4

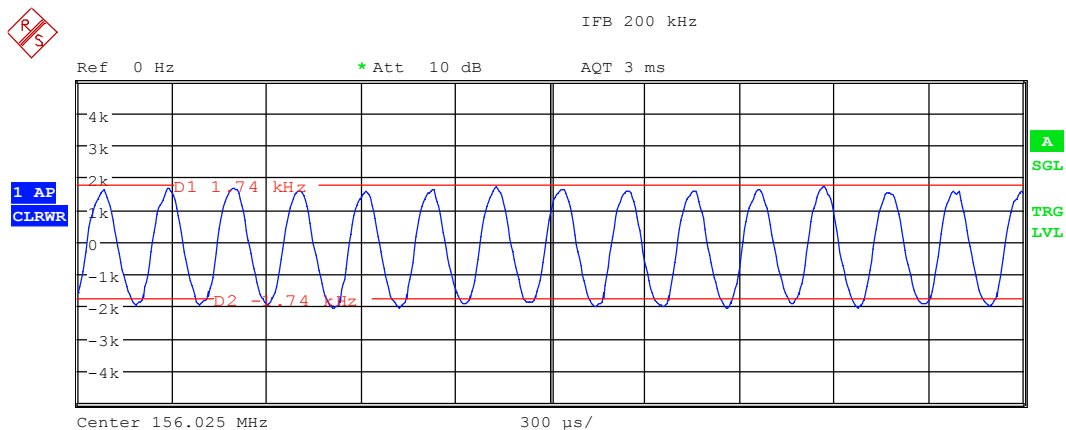
| | | | |
|---------------------|-------|-------------------|------|
| Ambient temperature | 20 °C | Relative humidity | 55 % |
|---------------------|-------|-------------------|------|



Frequency Modulation Summary

| | | | | |
|-----------|---------------------|----------------|----------------------|-----------|
| Coupling | DC | Carrier Offset | -223.22 Hz | |
| Deviation | +peak | 6.522 kHz | Carrier Power | 32.82 dBm |
| | -peak | -2.631 kHz | Modulation Frequency | --- |
| | f _{peak/2} | 4.576 kHz | Sampling Rate | 125 kHz |
| | RMS | 1.760 kHz | Record Length | 376 |
| | | | Demod Bandwidth | 100 kHz |

156modL1: 156.025 MHz / 2W

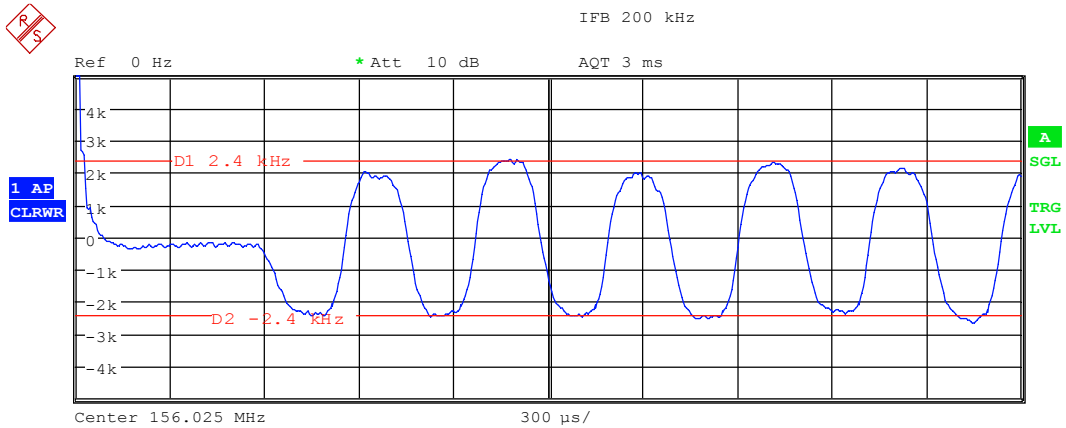


Frequency Modulation Summary

| | | | | |
|-----------|---------------------|----------------|----------------------|-------------|
| Coupling | DC | Carrier Offset | -178.64 Hz | |
| Deviation | +peak | 1.703 kHz | Carrier Power | 32.81 dBm |
| | -peak | -2.067 kHz | Modulation Frequency | 4.80082 kHz |
| | f _{peak/2} | 1.885 kHz | Sampling Rate | 125 kHz |
| | RMS | 1.313 kHz | Record Length | 376 |
| | | | Demod Bandwidth | 100 kHz |

156modL2: 156.025 MHz / 2W

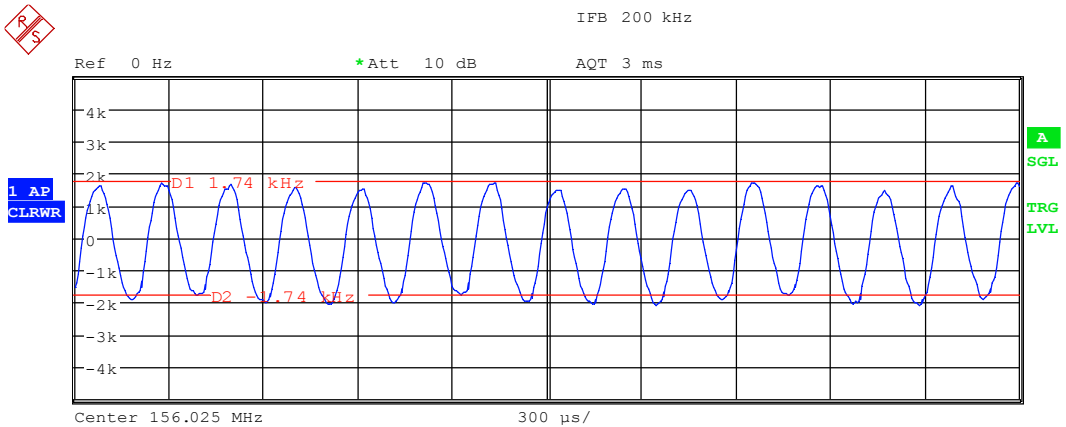
TEST REPORT REFERENCE: F110939E1



Frequency Modulation Summary

| | | | | |
|-----------|---------|----------------|----------------------|-----------|
| Coupling | DC | Carrier Offset | -200.81 Hz | |
| Deviation | +peak | 8.096 kHz | Carrier Power | 37.18 dBm |
| | -peak | -2.669 kHz | Modulation Frequency | --- |
| | ↑peak/2 | 5.382 kHz | Sampling Rate | 125 kHz |
| | RMS | 1.779 kHz | Record Length | 376 |
| | | | Demod Bandwidth | 100 kHz |

156modM1: 156.025 MHz / 5W

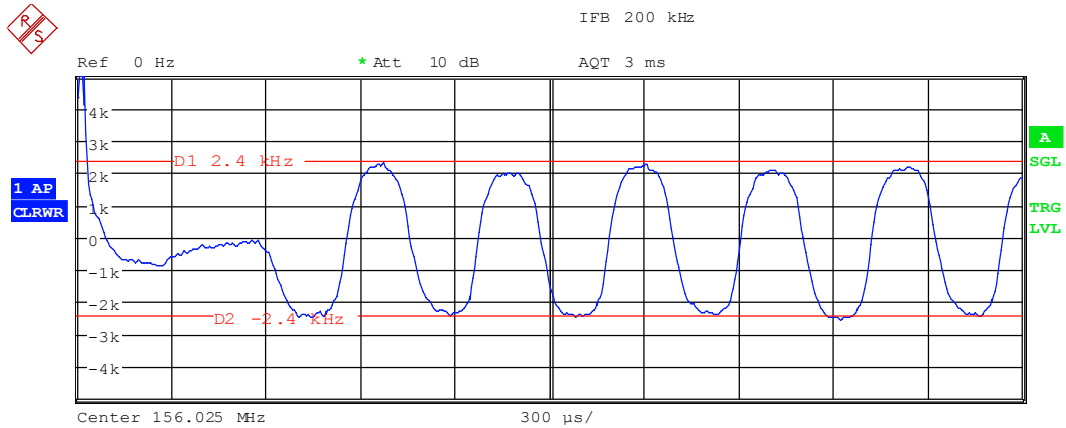


Frequency Modulation Summary

| | | | | |
|-----------|---------|----------------|----------------------|-------------|
| Coupling | DC | Carrier Offset | -172.83 Hz | |
| Deviation | +peak | 1.708 kHz | Carrier Power | 37.14 dBm |
| | -peak | -2.109 kHz | Modulation Frequency | 4.80080 kHz |
| | ↑peak/2 | 1.908 kHz | Sampling Rate | 125 kHz |
| | RMS | 1.307 kHz | Record Length | 376 |
| | | | Demod Bandwidth | 100 kHz |

156modM2: 156.025 MHz / 5W

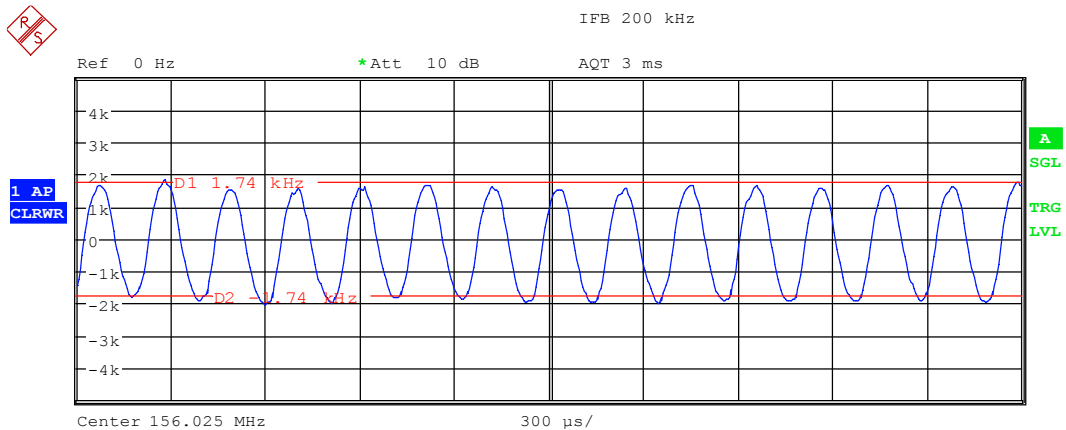
TEST REPORT REFERENCE: F110939E1



Frequency Modulation Summary

| | | | | |
|-----------|---------|----------------|----------------------|-----------|
| Coupling | DC | Carrier Offset | -203.87 Hz | |
| Deviation | +peak | 6.868 kHz | Carrier Power | 40.82 dBm |
| | -peak | -2.567 kHz | Modulation Frequency | --- |
| | ↑peak/2 | 4.717 kHz | Sampling Rate | 125 kHz |
| | RMS | 1.765 kHz | Record Length | 376 |
| | | | Demod Bandwidth | 100 kHz |

156modH1: 156.025 MHz / 12.5W

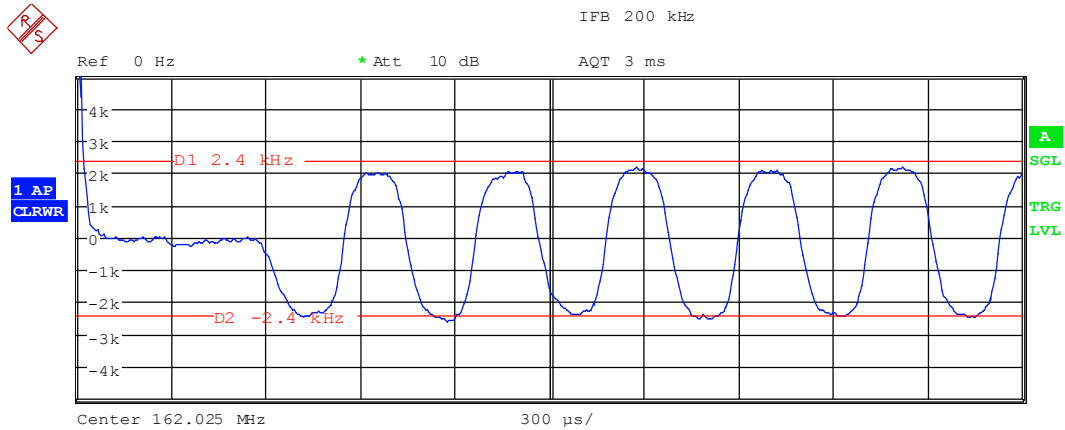


Frequency Modulation Summary

| | | | | |
|-----------|---------|----------------|----------------------|-------------|
| Coupling | DC | Carrier Offset | -162.68 Hz | |
| Deviation | +peak | 1.838 kHz | Carrier Power | 40.81 dBm |
| | -peak | -2.052 kHz | Modulation Frequency | 4.80122 kHz |
| | ↑peak/2 | 1.945 kHz | Sampling Rate | 125 kHz |
| | RMS | 1.305 kHz | Record Length | 376 |
| | | | Demod Bandwidth | 100 kHz |

156modH2: 156.025 MHz / 12.5W

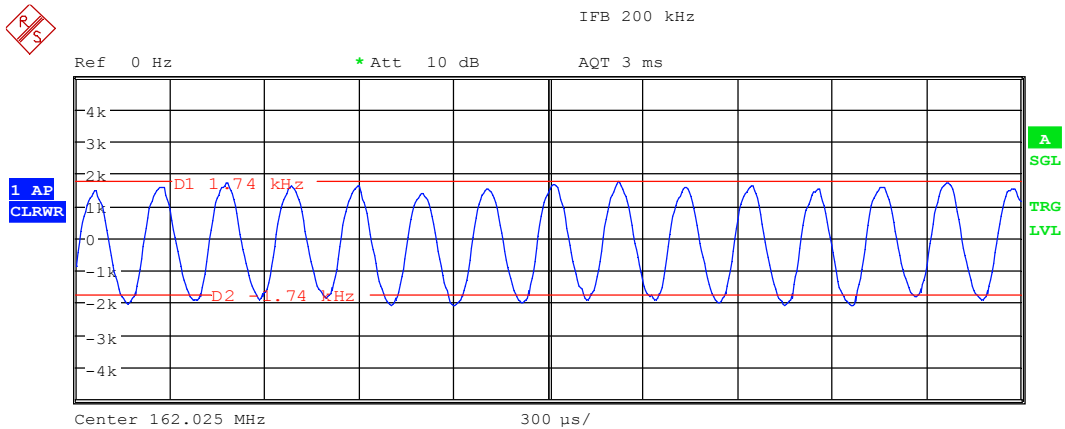
TEST REPORT REFERENCE: F110939E1



Frequency Modulation Summary

| | | | |
|-----------|------------------------|----------------------|------------|
| Coupling | DC | Carrier Offset | -229.98 Hz |
| Deviation | +peak 7.123 kHz | Carrier Power | 32.41 dBm |
| | -peak -2.625 kHz | Modulation Frequency | --- Hz |
| | ↑peak/2 4.874 kHz | Sampling Rate | 125 kHz |
| | RMS 1.741 kHz | Record Length | 376 |
| | | Demod Bandwidth | 100 kHz |

162modL1: 162.025 MHz / 2W

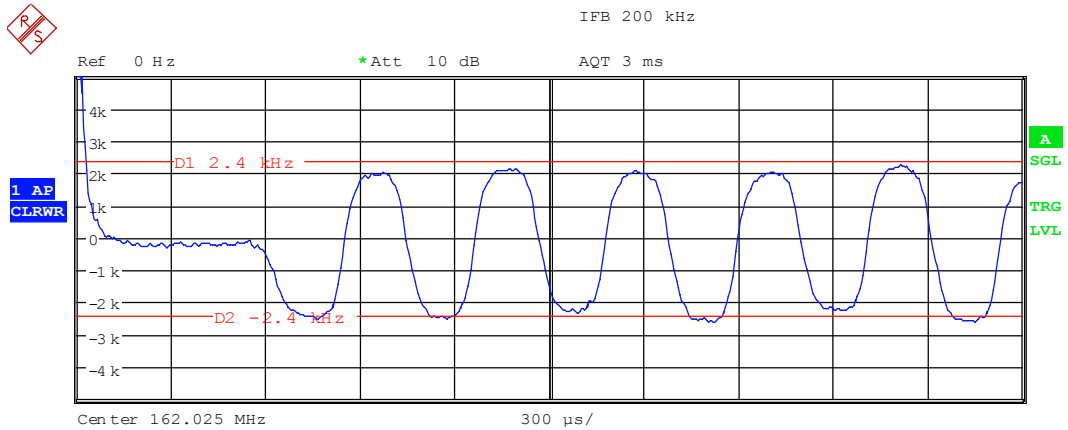


Frequency Modulation Summary

| | | | |
|-----------|------------------------|----------------------|-------------|
| Coupling | DC | Carrier Offset | -192.12 Hz |
| Deviation | +peak 1.718 kHz | Carrier Power | 32.40 dBm |
| | -peak -2.113 kHz | Modulation Frequency | 4.80447 kHz |
| | ↑peak/2 1.916 kHz | Sampling Rate | 125 kHz |
| | RMS 1.302 kHz | Record Length | 376 |
| | | Demod Bandwidth | 100 kHz |

162modL2: 162.025 MHz / 2W

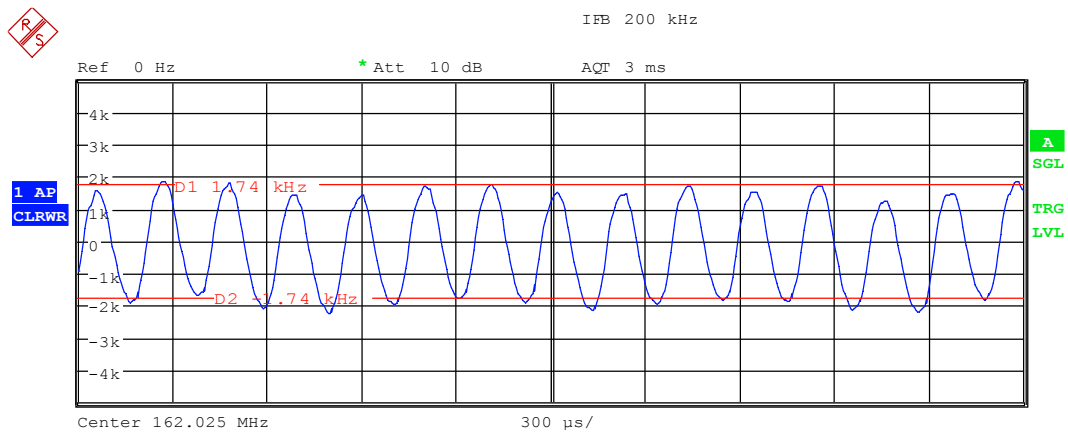
TEST REPORT REFERENCE: F110939E1



Frequency Modulation Summary

| | | | |
|-----------|-------------------|----------------------|------------|
| Coupling | DC | Carrier Offset | -214.05 Hz |
| Deviation | +peak 6.829 kHz | Carrier Power | 37.23 dBm |
| | -peak -2.618 kHz | Modulation Frequency | --- Hz |
| | ↑peak/2 4.723 kHz | Sampling Rate | 125 kHz |
| | RMS 1.754 kHz | Record Length | 376 |
| | | Demod Bandwidth | 100 kHz |

162modM1: 162.025 MHz / 5W

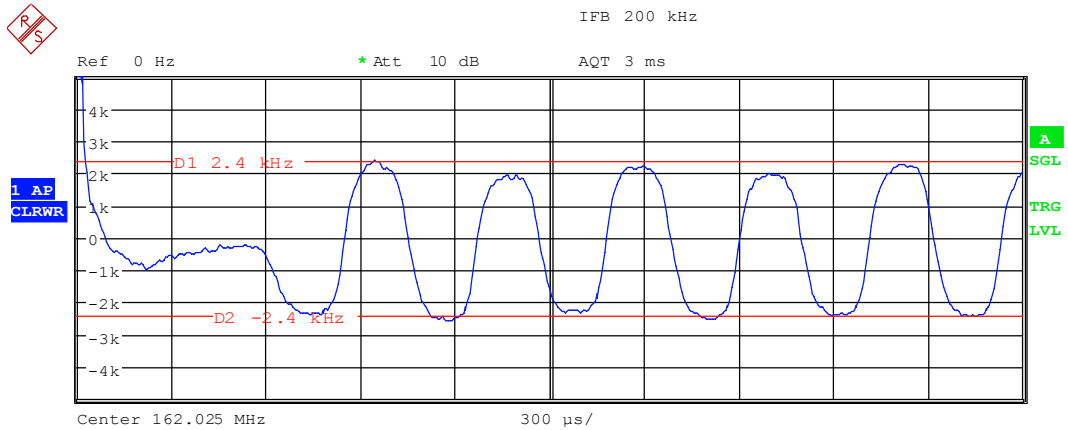


Frequency Modulation Summary

| | | | |
|-----------|-------------------|----------------------|-------------|
| Coupling | DC | Carrier Offset | -178.04 Hz |
| Deviation | +peak 1.839 kHz | Carrier Power | 37.07 dBm |
| | -peak -2.240 kHz | Modulation Frequency | 4.80980 kHz |
| | ↑peak/2 2.040 kHz | Sampling Rate | 125 kHz |
| | RMS 1.309 kHz | Record Length | 376 |
| | | Demod Bandwidth | 100 kHz |

162modM2: 162.025 MHz / 5W

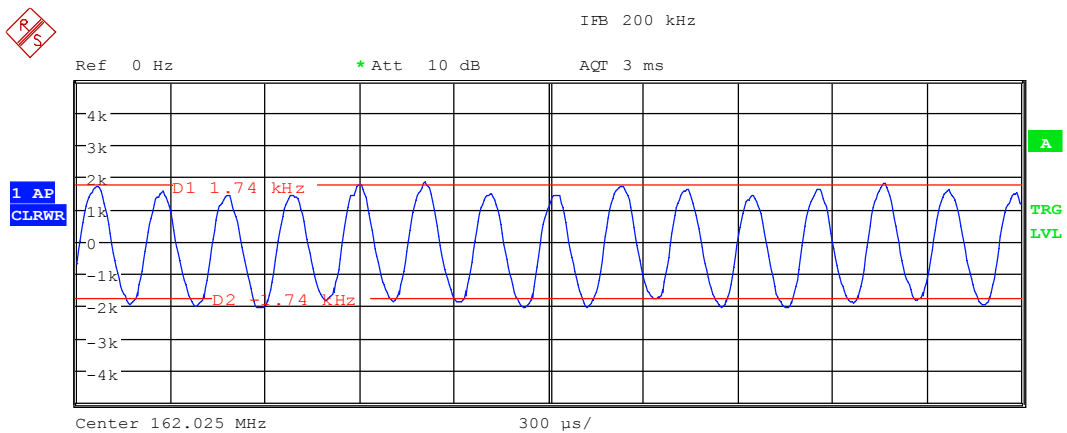
TEST REPORT REFERENCE: F110939E1



Frequency Modulation Summary

| | | | | |
|-----------|---------|-----------------|----------------------|-----------|
| Coupling | DC | Carrier Offset | -217.73 Hz | |
| Deviation | +peak | 8.280 kHz | Carrier Power | 40.55 dBm |
| | -peak | -2.603 kHz | Modulation Frequency | --- |
| | ↑peak/2 | 5.442 kHz | Sampling Rate | 125 kHz |
| | RMS | 1.796 kHz | Record Length | 376 |
| | | Demod Bandwidth | 100 kHz | |

162modH1: 162.025 MHz / 12.5W



Frequency Modulation Summary

| | | | | |
|-----------|---------|-----------------|----------------------|-------------|
| Coupling | DC | Carrier Offset | -171.22 Hz | |
| Deviation | +peak | 1.810 kHz | Carrier Power | 40.53 dBm |
| | -peak | -2.081 kHz | Modulation Frequency | 4.79177 kHz |
| | ↑peak/2 | 1.946 kHz | Sampling Rate | 125 kHz |
| | RMS | 1.299 kHz | Record Length | 376 |
| | | Demod Bandwidth | 100 kHz | |

162modH2: 162.025 MHz / 12.5W

LIMITS: SUBCLAUSE 7.1.1.5.3

See table 18.

TEST EQUIPMENT USED:

06, 42, 79-81, 100-102

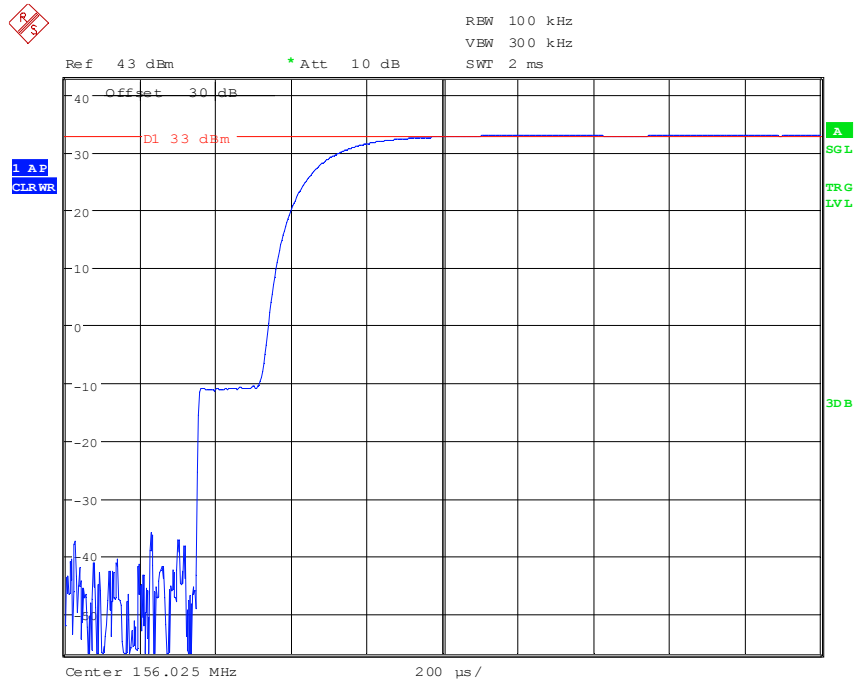
TEST REPORT REFERENCE: F110939E1

6.5 TRANSMITTER OUTPUT POWER VERSUS TIME FUNCTION SUBCLAUSE 7.1.1.5

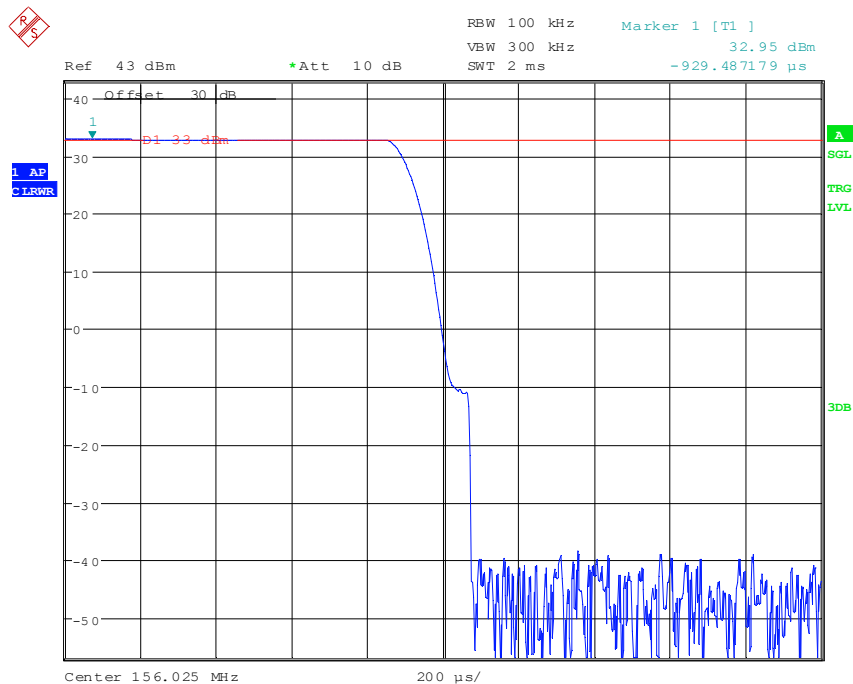
| | |
|---------------------|-------|
| Ambient temperature | 20 °C |
|---------------------|-------|

| | |
|-------------------|------|
| Relative humidity | 55 % |
|-------------------|------|

Operation mode: Transmit, f = 156.025 MHz

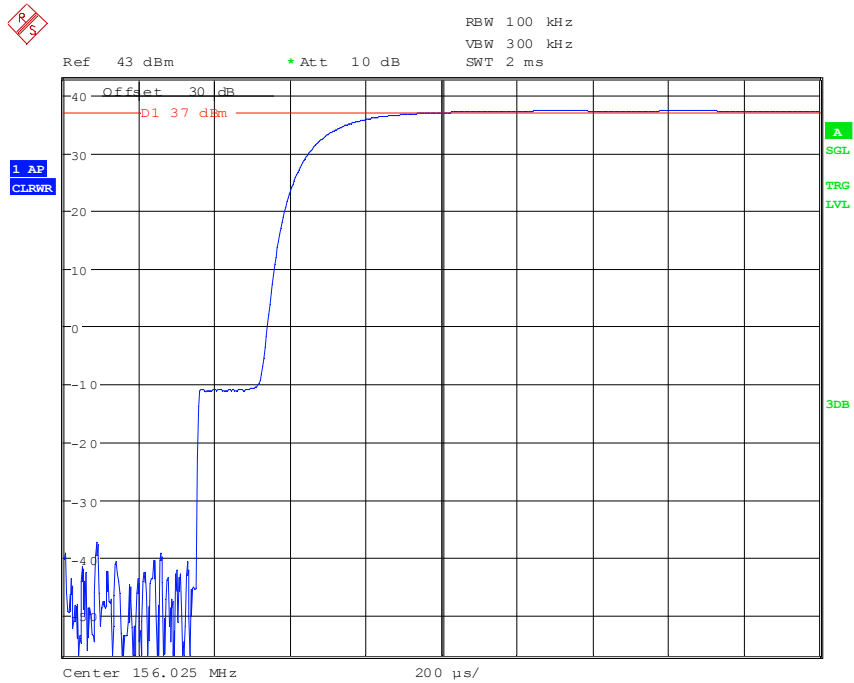


onL1: 156.025 MHz / 2W, Power-Ramp-up

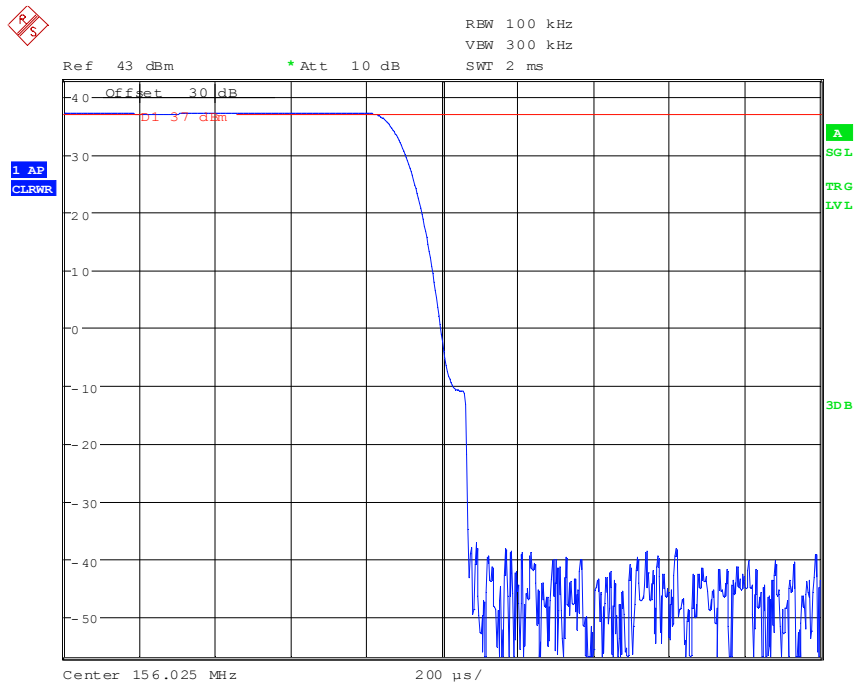


offL1: 156.025 MHz / 2W, Power-Ramp-down

TEST REPORT REFERENCE: F110939E1

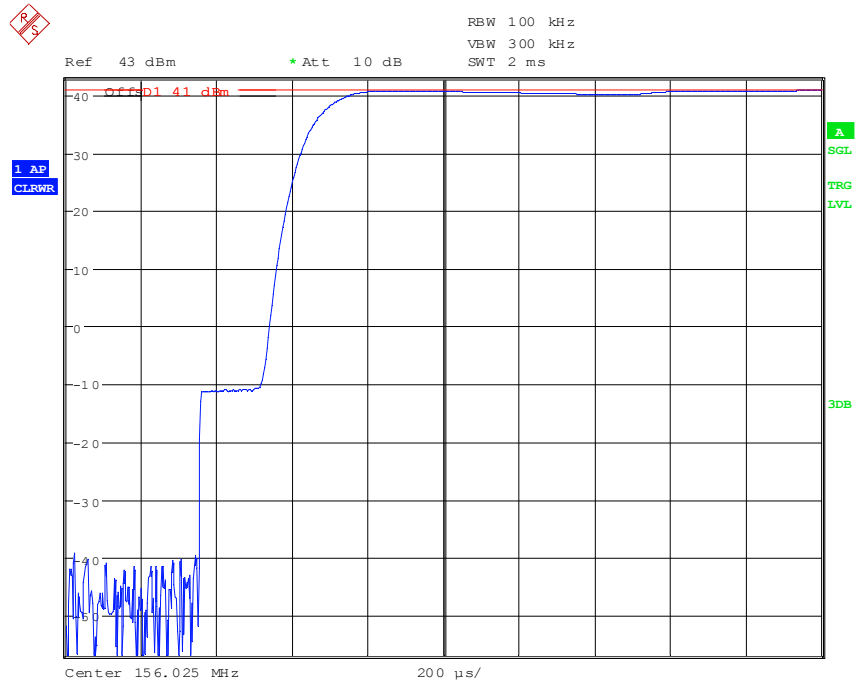


onM1: 156.025 MHz / 5W, Power-Ramp-up

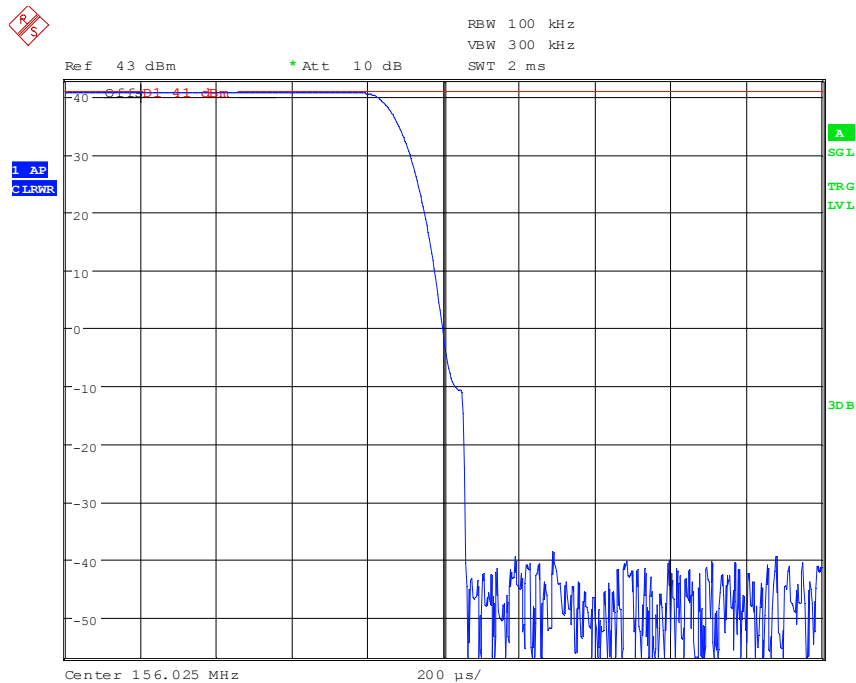


offM1: 156.025 MHz / 5W, Power-Ramp-down

TEST REPORT REFERENCE: F110939E1



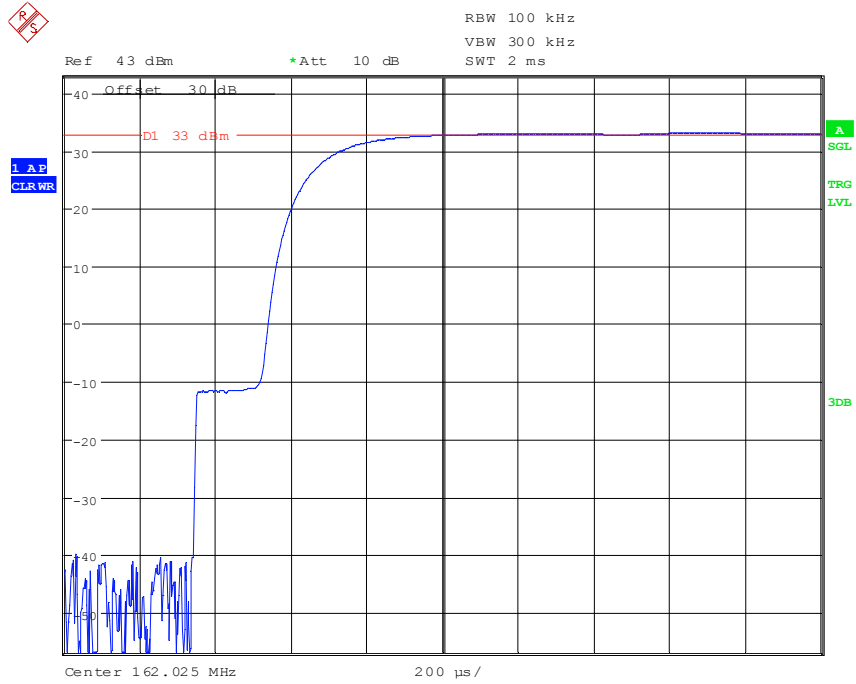
onH1: 156.025 MHz / 12.5W, Power-Ramp-up



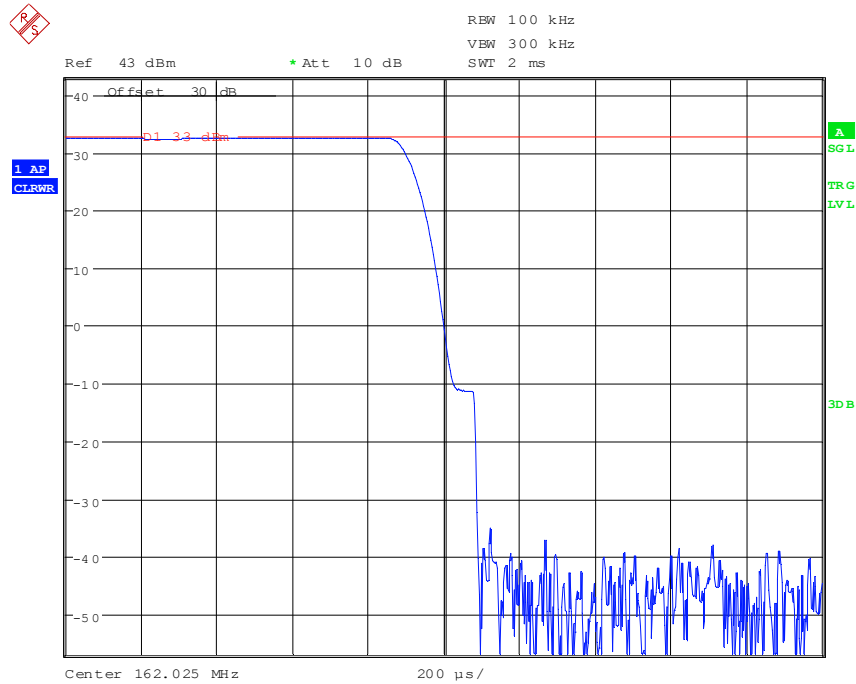
offH1: 156.025 MHz / 12.5W, Power-Ramp-down

TEST REPORT REFERENCE: F110939E1

Operation mode: Transmit, f = 162.025 MHz

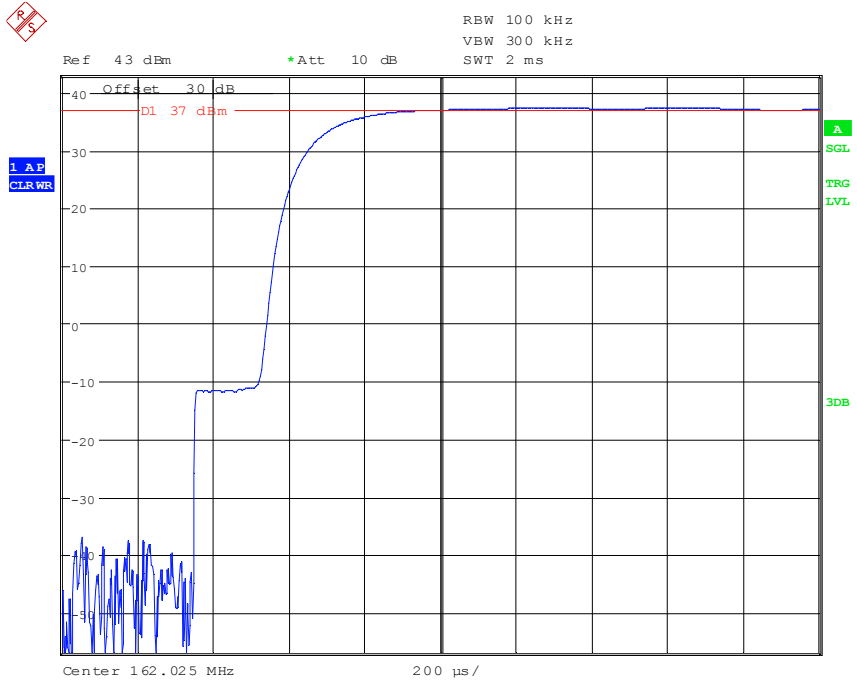


onL1: 162.025 MHz / 2W, Power-Ramp-up

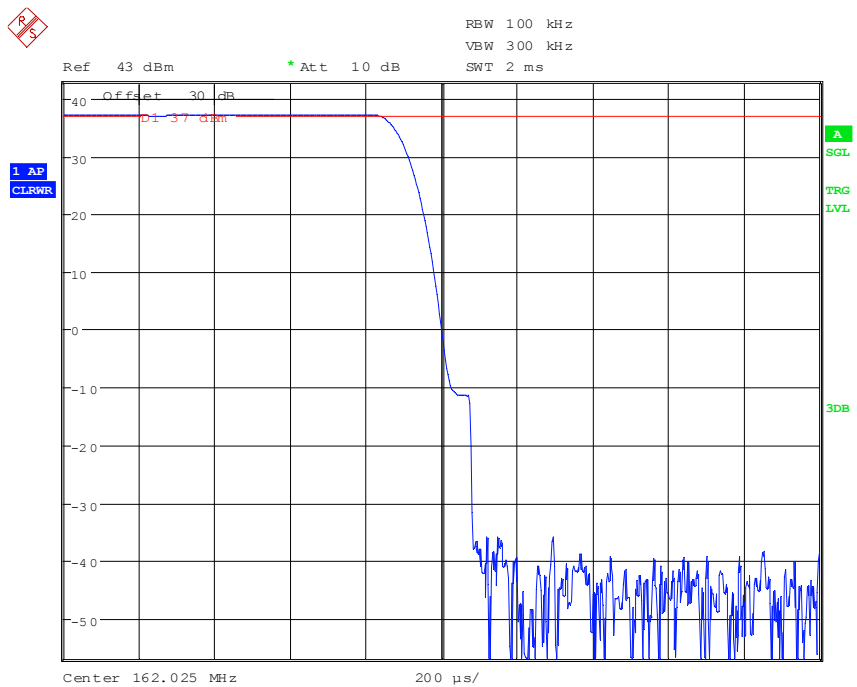


offL1: 162.025 MHz / 2W, Power-Ramp-down

TEST REPORT REFERENCE: F110939E1

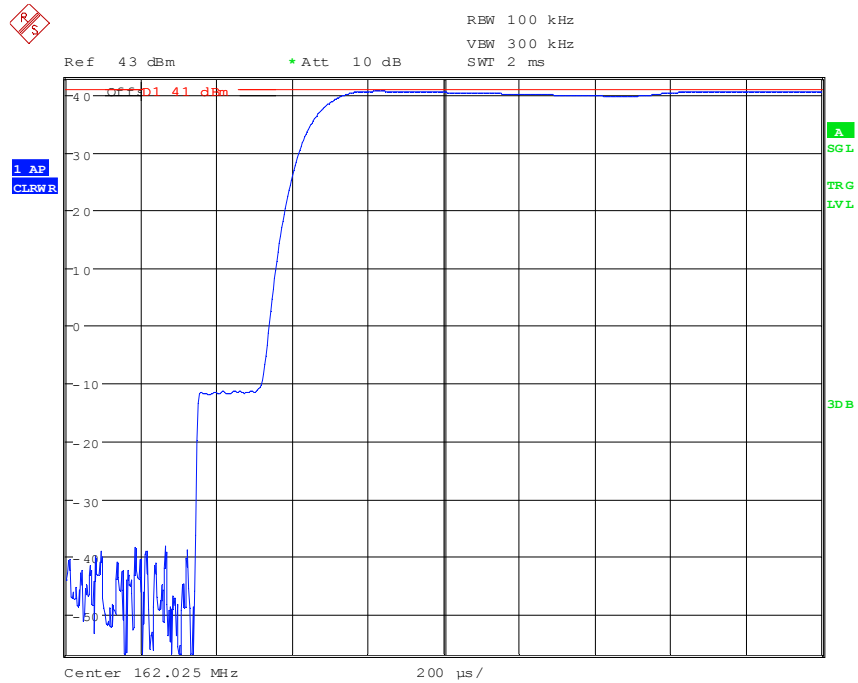


onM1: 162.025 MHz / 5W, Power-Ramp-up

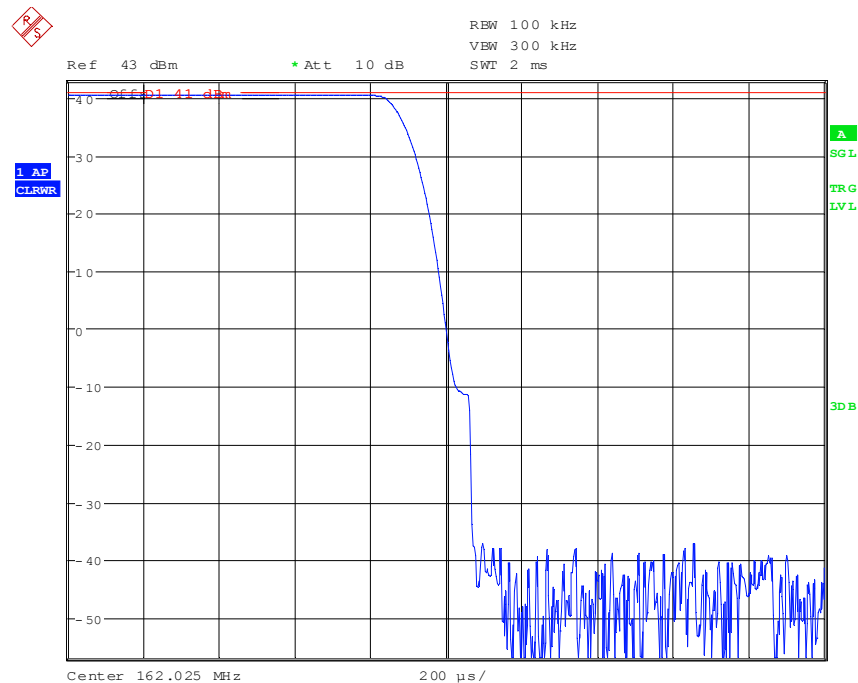


offM1: 162.025 MHz / 5W, Power-Ramp-down

TEST REPORT REFERENCE: F110939E1



onH1: 162.025 MHz / 12.5W, Power-Ramp-up



offH1: 162.025 MHz / 12.5W, Power-Ramp-down

TEST REPORT REFERENCE: F110939E1

Additional Information:

Due to the fact that the measurement results under extreme test conditions are equal to the results under normal test-conditions the additional plots from the measurement under extreme conditions are not documented in this test-report.

LIMITS: SUBCLAUSE 7.1.1.4.3

| |
|---------------|
| See table 17. |
|---------------|

TEST EQUIPMENT USED:

| |
|------------------------|
| 06, 42, 79-81, 100-102 |
|------------------------|

TEST REPORT REFERENCE: F110939E1

7 RECEIVER REQUIREMENTS

TEST REPORT REFERENCE: F110939E1

7.1 TDMA-RECEIVER SENSITIVITY

SUBCLAUSE 7.1.2.1

| | | | |
|---------------------|-------|-------------------|------|
| Ambient temperature | 20 °C | Relative humidity | 45 % |
|---------------------|-------|-------------------|------|

Operation mode: Receive in AIS-mode, f = 156.025 MHz

Wanted signal: Test signal 4 (-107 dBm / -101 dBm under extreme conditions)

| MEASUREMENT CONDITIONS | | RECEIVER SENSITIVITY at PER < 20% | |
|--------------------------|------------------------------|-----------------------------------|----------------|
| TEMPERATURE | VOLTAGE | Frequency: | Test signal 4 |
| T _{nom} (+20°C) | U _{nom} (12.0 V DC) | 156.024500 MHz | 1.8% |
| | | 156.025000 MHz | 1.2% @ -107dBm |
| | | 156.025500 MHz | 1.7% @ -112dBm |
| T _{min} (-20°C) | U _{min} (9.6 V DC) | 156.024500 MHz | 1.0%* |
| | | 156.025000 MHz | 1.0%* |
| | | 156.025500 MHz | 1.5%* |
| | U _{max} (15.6 V DC) | 156.024500 MHz | 0.6%* |
| | | 156.025000 MHz | 0.7%* |
| | | 156.025500 MHz | 0.6%* |
| T _{min} (+55°C) | U _{min} (9.6 V DC) | 156.024500 MHz | 11.0%* |
| | | 156.025000 MHz | 11.0%* |
| | | 156.025500 MHz | 11.0%* |
| | U _{max} (15.6 V DC) | 156.024500 MHz | 8.9%* |
| | | 156.025000 MHz | 8.9%* |
| | | 156.025500 MHz | 8.9%* |
| Limit | | < 20% | |
| Measurement uncertainty | | + 0.66 dB / - 0.72 dB | |

*Remark: These Tests were also carried out with -107dBm-Signal-Level (wanted signal).

TEST REPORT REFERENCE: F110939E1

Operation mode: Receive in AIS-mode, $f = 162.025$ MHz

Wanted signal: Test signal 4 (-107 dBm / -101 dBm under extreme conditions)

| MEASUREMENT CONDITIONS | | RECEIVER SENSITIVITY at PER < 20% | |
|-------------------------|-----------------------|-----------------------------------|----------------|
| TEMPERATURE | VOLTAGE | Frequency: | Test signal 4 |
| T_{nom} (+20°C) | U_{nom} (12.0 V DC) | 162.024500 MHz | 1.8% |
| | | 162.025000 MHz | 2.0% @ -107dBm |
| | | 162.025500 MHz | 9.6% @ -112dBm |
| T_{min} (-20°C) | U_{min} (9.6 V DC) | 162.024500 MHz | 1.1%* |
| | | 162.025000 MHz | 1.1%* |
| | | 162.025500 MHz | 1.1%* |
| | U_{max} (15.6 V DC) | 162.024500 MHz | 1.7%* |
| | | 162.025000 MHz | 1.7%* |
| | | 162.025500 MHz | 1.7%* |
| T_{min} (+55°C) | U_{min} (9.6 V DC) | 162.024500 MHz | 13.3%* |
| | | 162.025000 MHz | 13.3%* |
| | | 162.025500 MHz | 13.3%* |
| | U_{max} (15.6 V DC) | 162.024500 MHz | 10.6%* |
| | | 162.025000 MHz | 10.6%* |
| | | 162.025500 MHz | 10.6%* |
| Limit | | < 20% | |
| Measurement uncertainty | | + 0.66 dB / - 0.72 dB | |

*Remark: These Tests were also carried out with -107dBm-Signal-Level (wanted signal).

LIMITS: SUBCLAUSE 7.1.2.1.3

| |
|---|
| The maximum PER shall be not more than 20%. |
|---|

TEST EQUIPMENT USED:

| |
|---------------------|
| 29, 42, 51, 81, 100 |
|---------------------|

TEST REPORT REFERENCE: F110939E1

7.2 ERROR BEHAVIOUR AT HIGH INPUT LEVELS

SUBCLAUSE 7.1.2.2

| | |
|---------------------|-------|
| Ambient temperature | 20 °C |
|---------------------|-------|

| | |
|-------------------|------|
| Relative humidity | 45 % |
|-------------------|------|

Operation mode: Receive in AIS-mode, f = 156.025 MHz
Wanted signal: Test signal 4

| RF-INPUT SIGNAL LEVEL | NUMBER OF MESSAGES NOT SUCCESSFULLY RECORDED |
|-----------------------|--|
| - 77 dBm | 1.0% |
| - 7 dBm | 3.2% |

Operation mode: Receive in AIS-mode, f = 162.025 MHz
Wanted signal: Test signal 4

| RF-INPUT SIGNAL LEVEL | NUMBER OF MESSAGES NOT SUCCESSFULLY RECORDED |
|-----------------------|--|
| - 77 dBm | 1.0% |
| - 7 dBm | 2.8% |

LIMITS: SUBCLAUSE 7.1.2.2.3

| |
|---|
| The maximum PER shall not exceed 2% at -77 dBm and 10% at -7 dBm. |
|---|

TEST EQUIPMENT USED:

| |
|---------------------|
| 29, 42, 51, 81, 100 |
|---------------------|

TEST REPORT REFERENCE: F110939E1

7.3 CO-CHANNEL REJECTION

SUBCLAUSE 7.1.2.3

| | | | |
|---------------------|-------|-------------------|------|
| Ambient temperature | 20 °C | Relative humidity | 45 % |
|---------------------|-------|-------------------|------|

Operation mode: Receive in AIS-mode, f = 156.025 MHz
 Wanted signal: Test-signal 4, P = -101 dBm
 Unwanted signal: Modulated with 400 Hz / 3 kHz deviation

| Unwanted signal frequency: | Unwanted signal level: | Signal ratio: | Packet error rate: |
|----------------------------|------------------------|-----------------------|--------------------|
| 156.024 MHz | -111 dBm | 10 dB | 5% |
| 156.025 MHz | -111 dBm | 10 dB | 3% |
| 156.026 MHz | -111 dBm | 10 dB | 7% |
| Measurement uncertainty | | + 0.66 dB / - 0.72 dB | |

Operation mode: Receive in AIS-mode, f = 162.025 MHz
 Wanted signal: Test-signal 4, P = -101 dBm
 Unwanted signal: Modulated

| Unwanted signal frequency: | Unwanted signal level: | Signal ratio: | Packet error rate: |
|----------------------------|------------------------|-----------------------|--------------------|
| 162.024 MHz | -111 dBm | 10 dB | 6% |
| 162.025 MHz | -111 dBm | 10 dB | 5% |
| 162.026 MHz | -111 dBm | 10 dB | 3% |
| Measurement uncertainty | | + 0.66 dB / - 0.72 dB | |

LIMITS: SUBCLAUSE 7.1.2.3.3

| |
|---------------------------------------|
| The maximum PER shall not exceed 20%. |
|---------------------------------------|

TEST EQUIPMENT USED:

| |
|-----------------------------|
| 27, 29, 33, 42, 81, 100-102 |
|-----------------------------|

TEST REPORT REFERENCE: F110939E1

7.4 ADJACENT CHANNEL SELECTIVITY

SUBCLAUSE 7.1.2.4

| | | | |
|---------------------|-------|-------------------|------|
| Ambient temperature | 20 °C | Relative humidity | 45 % |
|---------------------|-------|-------------------|------|

Operation mode: Receive in AIS mode
 Wanted signal: Test-signal 4; P = -101 dBm
 Unwanted signal: Modulated with 400 Hz / 3 kHz deviation

| TEMPERATURE | VOLTAGE | WANTED SIGNAL | UNWANTED SIGNAL | SIGNAL RATIO | PACKET ERROR RATE |
|--------------------------|---------------------------------|---------------------------------|-----------------|-----------------------|-------------------|
| T _{nom} (+20°C) | U _{nom} (12.0 V DC) | 156.025 MHz | 156.000 MHz | 70 dB | 7% |
| | | | 156.050 MHz | 70 dB | 4% |
| | | 162.025 MHz | 162.000 MHz | 70 dB | 1% |
| | | | 162.050 MHz | 70 dB | 3% |
| T _{min} (-20°C) | U _{min} (9.6 V DC) | 156.025 MHz | 156.000 MHz | 70 dB | 9.8% |
| | | | 156.050 MHz | 70 dB | 11.5% |
| | | U _{max} (15.6 V DC) | 156.000 MHz | 70 dB | 8.9% |
| | | | 156.050 MHz | 70 dB | 13.3% |
| | U _{min} (9.6 V DC) | 162.025 MHz | 162.000 MHz | 70 dB | 9.3% |
| | | | 162.050 MHz | 70 dB | 10.6% |
| | | U _{max} (15.6 V DC) | 162.000 MHz | 70 dB | 11.0% |
| | | | 162.050 MHz | 70 dB | 10.2% |
| T _{max} (+55°C) | U _{min} (9.6 V DC) | 156.025 MHz | 156.000 MHz | 70 dB | 15.5% |
| | | | 156.050 MHz | 70 dB | 14.4% |
| | | U _{max} (15.6 V DC) | 156.000 MHz | 70 dB | 12.6% |
| | | | 156.050 MHz | 70 dB | 13.5% |
| | U _{min} (9.6 V DC) | 162.025 MHz | 162.000 MHz | 70 dB | 12.0% |
| | | | 162.050 MHz | 70 dB | 12.8% |
| | | U _{max} (15.6 V DC) | 162.000 MHz | 70 dB | 13.1% |
| | | | 162.050 MHz | 70 dB | 12.0% |
| Measurement uncertainty | | | | + 0.66 dB / - 0.72 dB | |

LIMITS: SUBCLAUSE 7.1.2.4.3

The maximum PER shall not exceed 20%.

TEST EQUIPMENT USED:

27, 29, 33, 42, 51, 81, 100-102

TEST REPORT REFERENCE: F110939E1

7.5 SPURIOUS RESPONSE REJECTION

SUBCLAUSE 7.1.2.5

| | | | |
|---------------------|-------|-------------------|------|
| Ambient temperature | 20 °C | Relative humidity | 45 % |
|---------------------|-------|-------------------|------|

Operation mode: Receive in AIS-mode, f = 162.025 MHz (1st-IF RX1: 21.4 MHz)
 Wanted signal: Test-signal 4, P = -101 dBm
 Unwanted signal: Modulated with 400 Hz / 3 kHz deviation / -31dBm

| DEFINITION | UNWANTED FREQUENCY | MEASURED PACKET ERROR RATE |
|-----------------------------------|--|----------------------------|
| IF | | |
| 1 st - IF | 21.4 MHz | 1.7% |
| 1 st LO-Freq. - IF | 119.225 MHz | 0.7% |
| 2 x 1 st LO-Freq. - IF | 259.850 MHz | 0.9% |
| 2 x 1 st LO-Freq. + IF | 302.650 MHz | 1.1% |
| 3 x 1 st LO-Freq. - IF | 400.475 MHz | 1.1% |
| 3 x 1 st LO-Freq. + IF | 443.275 MHz | 0.2% |
| 4 x 1 st LO-Freq. - IF | 541.100 MHz | 1.1% |
| 4 x 1 st LO-Freq. + IF | 583.900 MHz | 0.9% |
| - | No other spurious response rejection frequencies found | - |
| - | | - |
| - | | - |
| Measurement uncertainty | | + 0.66 dB / - 0.72 dB |

Continued next page:

TEST REPORT REFERENCE: F110939E1

Continued:

Operation mode: Receive in AIS-mode, f = 156.025 MHz (1st-IF RX2: 38.855 MHz)
 Wanted signal: Test-signal 4, P = -101 dBm
 Unwanted signal: Modulated with 400 Hz / 3 kHz deviation / -31dBm

| DEFINITION | UNWANTED FREQUENCY | MEASURED PACKET ERROR RATE |
|-----------------------------------|--|----------------------------|
| IF | | |
| 1 st - IF | 38.855 MHz | 3.0% |
| 1 st LO-Freq. - IF | 84.315 MHz | 2.0% |
| 2 x 1 st LO-Freq. - IF | 207.485 MHz | 1.5% |
| 2 x 1 st LO-Freq. + IF | 285.195 MHz | 2.6% |
| 3 x 1 st LO-Freq. - IF | 330.655 MHz | 4.6% |
| 3 x 1 st LO-Freq. + IF | 408.365 MHz | 4.6% |
| 4 x 1 st LO-Freq. - IF | 453.825 MHz | 3.3% |
| 4 x 1 st LO-Freq. + IF | 492.680 MHz | 4.6% |
| - | No other spurious response rejection frequencies found | - |
| - | | - |
| - | | - |
| Measurement uncertainty | | + 0.66 dB / - 0.72 dB |

LIMITS: SUBCLAUSE 7.1.2.5.8

At any frequency separated from the specified frequency of the receiver by 50 kHz or more, the PER shall not exceed 20%.

TEST EQUIPMENT USED:

27, 29, 33, 42, 81, 100-102

TEST REPORT REFERENCE: F110939E1

7.6 INTERMODULATION RESPONSE REJECTION

SUBCLAUSE 7.1.2.6

| | | | |
|---------------------|-------|-------------------|------|
| Ambient temperature | 20 °C | Relative humidity | 45 % |
|---------------------|-------|-------------------|------|

Wanted signal A: Test-signal 3, P = -101 dBm
 Unwanted signal B: Unmodulated
 Unwanted signal C: Modulated with 400 Hz / 3 kHz-deviation

| FREQUENCIES OF THE UNWANTED SIGNALS | | | PACKET ERROR RATE |
|-------------------------------------|-------------|-------------|-----------------------|
| Generator A | Generator B | Generator C | |
| 162.025 MHz | 161.525 MHz | 161.025 MHz | 2.7% |
| Limit: | | | 20% |
| Measurement uncertainty: | | | + 0.66 dB / - 0.72 dB |

Wanted signal A: Test-signal 3, P = -101 dBm
 Unwanted signal B: Unmodulated
 Unwanted signal C: Modulated with 400 Hz / 3 kHz-deviation

| FREQUENCIES OF THE UNWANTED SIGNALS | | | PACKET ERROR RATE |
|-------------------------------------|-------------|-------------|-----------------------|
| Generator A | Generator B | Generator C | |
| 156.025 MHz | 156.525 MHz | 157.025 MHz | 4.4% |
| Limit: | | | 20% |
| Measurement uncertainty: | | | + 0.66 dB / - 0.72 dB |

LIMITS: SUBCLAUSE 7.1.2.6.3

| |
|--|
| The packet error rate shall not exceed 20 %. |
|--|

TEST EQUIPMENT USED:

| |
|--|
| 25, 27, 29, 33, 34, 42, 81, 100-102, 119-121 |
|--|

TEST REPORT REFERENCE: F110939E1

7.7 BLOCKING OR DESENSITISATION

SUBCLAUSE 7.1.2.7

| | |
|---------------------|-------|
| Ambient temperature | 20 °C |
|---------------------|-------|

| | |
|-------------------|------|
| Relative humidity | 45 % |
|-------------------|------|

Operation mode: Receive in AIS-mode: f = 156.025 MHz
 Wanted signal A: Test-signal 3, P = -101 dBm
 Unwanted signal B: Unmodulated, P = -15 dBm / -23 dBm

| FREQUENCIES OF THE UNWANTED SIGNALS | | PACKET ERROR RATE PER |
|-------------------------------------|--------------|-----------------------|
| -10 MHz | 146.025 MHz | 0.6% |
| -5 MHz | 151.025 MHz | 1.3% |
| -2 MHz | 154.025 MHz* | 2.6% |
| -1 MHz | 155.025 MHz* | 1.3% |
| -500 kHz | 155.525 MHz* | 1.3% |
| +500 kHz | 156.525 MHz* | 4.0% |
| +1 MHz | 157.025 MHz* | 3.3% |
| +2 MHz | 158.025 MHz* | 5.3% |
| +5 MHz | 161.025 MHz | 2.6% |
| +10 MHz | 166.025 MHz | 0.6% |
| Limit: | | 20% |
| Measurement uncertainty | | + 0.66 dB / - 0.72 dB |

*Remark: These Tests were done with -15 dBm unwanted signal level too.

TEST REPORT REFERENCE: F110939E1

Operation mode: Receive in AIS-mode: f = 162.025 MHz
 Wanted signal A: Test-signal 3, P = -101 dBm
 Unwanted signal B: Unmodulated, P = -15 dBm / -23 dBm

| FREQUENCIES OF THE UNWANTED SIGNALS | | PACKET ERROR RATE PER |
|-------------------------------------|--------------|-----------------------|
| -10 MHz | 152.025 MHz | 0.7% |
| -5 MHz | 157.025 MHz | 2.0% |
| -2 MHz | 160.025 MHz* | 6.2% |
| -1 MHz | 161.025 MHz* | 5.8% |
| -500 kHz | 161.525 MHz* | 6.7% |
| +500 kHz | 162.525 MHz* | 6.2% |
| +1 MHz | 163.025 MHz* | 5.3% |
| +2 MHz | 164.025 MHz* | 4.0% |
| +5 MHz | 167.025 MHz | 2.0% |
| +10 MHz | 172.025 MHz | 0.0% |
| Limit: | | 20% |
| Measurement uncertainty | | + 0.66 dB / - 0.72 dB |

*Remark: These tests were done with -15 dBm unwanted signal level too.

LIMITS: SUBCLAUSE 7.1.2.7.3

| |
|-------------------------------|
| The PER shall not exceed 20%. |
|-------------------------------|

TEST EQUIPMENT USED:

| |
|-----------------------------|
| 27, 29, 33, 42, 81, 100-102 |
|-----------------------------|

TEST REPORT REFERENCE: F110939E1

7.8 SPURIOUS EMISSIONS FROM THE RECEIVER

SUBCLAUSE 7.1.3.1

| | | | |
|---------------------|-------|-------------------|------|
| Ambient temperature | 20 °C | Relative humidity | 45 % |
|---------------------|-------|-------------------|------|

Operation mode: Receive-mode, AIS 1 = 156.025 MHz / AIS 2 = 162.025 MHz

| SPURIOUS EMISSIONS LEVEL | | | | | | | |
|---|--------------|-------------|-------------------|---------|--------------|-------------|------------|
| f (MHz) | Polarisation | Level (dBm) | Bandwidth* | f (MHz) | Polarisation | Level (dBm) | Bandwidth* |
| No significant spurious emissions caused by the receiver found. | | | | | | | |
| Measurement uncertainty | | | +2.2 dB / -3.6 dB | | | | |

* the measuring receiver bandwidth

LIMITS: SUBCLAUSE 7.1.3.1.3

Conducted emissions:

| | | |
|-----------------|------------------|------------------|
| Frequency range | 150 kHz to 1 GHz | 1 to 2 GHz |
| Rx operating | 2 nW (- 57 dBm) | 20 nW (- 47 dBm) |

TEST EQUIPMENT USED:

07, 42, 81, 111

TEST REPORT REFERENCE: F110939E1

7.9 SPURIOUS EMISSIONS FROM THE TRANSMITTER

SUBCLAUSE 7.1.3.2

| | | | |
|---------------------|-------|-------------------|------|
| Ambient temperature | 20 °C | Relative humidity | 45 % |
|---------------------|-------|-------------------|------|

Operation mode: Transmit, f = 156.025 MHz / 12.5W

| SPURIOUS EMISSIONS LEVEL (CONDUCTED) | | | | | |
|--------------------------------------|-----------|-----------|-----------------------|---------|--------|
| f | Level | Bandwidth | Limit | Margin | Result |
| 312.050 MHz | -38.3 dBm | 100 kHz | -36 dBm | 2.3 dB | passed |
| 468.075 MHz | -48.2 dBm | 100 kHz | -36 dBm | 12.2 dB | passed |
| - | - | - | - | - | - |
| Measurement uncertainty | | | + 0.66 dB / - 0.72 dB | | |

Operation mode: Transmit, f = 156.025 MHz / 5W

| SPURIOUS EMISSIONS LEVEL (CONDUCTED) | | | | | |
|--------------------------------------|-------|-----------|-----------------------|--------|--------|
| f | Level | Bandwidth | Limit | Margin | Result |
| - | - | - | - | - | - |
| - | - | - | - | - | - |
| - | - | - | - | - | - |
| Measurement uncertainty | | | + 0.66 dB / - 0.72 dB | | |

Operation mode: Transmit, f = 156.025 MHz / 2W

| SPURIOUS EMISSIONS LEVEL (CONDUCTED) | | | | | |
|--------------------------------------|-------|-----------|-----------------------|--------|--------|
| f | Level | Bandwidth | Limit | Margin | Result |
| - | - | - | - | - | - |
| - | - | - | - | - | - |
| - | - | - | - | - | - |
| Measurement uncertainty | | | + 0.66 dB / - 0.72 dB | | |

TEST REPORT REFERENCE: F110939E1

Operation mode: Transmit, f = 162.025 MHz / 12.5W

| SPURIOUS EMISSIONS LEVEL (CONDUCTED) | | | | | |
|--------------------------------------|-----------|-----------------------|---------|--------|--------|
| f | Level | Bandwidth | Limit | Margin | Result |
| 324.050 MHz | -41.5 dBm | 100 kHz | -36 dBm | 5.5 dB | passed |
| 486.075 MHz | -40.5 dBm | 100 kHz | -36 dBm | 4.5 dB | passed |
| - | - | - | - | - | - |
| Measurement uncertainty | | + 0.66 dB / - 0.72 dB | | | |

Operation mode: Transmit, f = 162.025 MHz / 5W

| SPURIOUS EMISSIONS LEVEL (CONDUCTED) | | | | | |
|--------------------------------------|-------|-----------------------|-------|--------|--------|
| f | Level | Bandwidth | Limit | Margin | Result |
| - | - | - | - | - | - |
| - | - | - | - | - | - |
| - | - | - | - | - | - |
| Measurement uncertainty | | + 0.66 dB / - 0.72 dB | | | |

Operation mode: Transmit, f = 162.025 MHz / 2W

| SPURIOUS EMISSIONS LEVEL (CONDUCTED) | | | | | |
|--------------------------------------|-------|-----------------------|-------|--------|--------|
| f | Level | Bandwidth | Limit | Margin | Result |
| - | - | - | - | - | - |
| - | - | - | - | - | - |
| - | - | - | - | - | - |
| Measurement uncertainty | | + 0.66 dB / - 0.72 dB | | | |

LIMITS: SUBCLAUSE 7.1.3.2.3

| | | |
|-----------------|-------------------------|----------------------|
| Frequency range | 150 kHz to 1 GHz | 1 to 4 GHz |
| TX operating | 0.25 μ W (- 36 dBm) | 1 μ W (- 30 dBm) |

TEST EQUIPMENT USED:

07, 42, 79-81, 111, 112

TEST REPORT REFERENCE: F110939E1

8 TEST EQUIPMENT

TEST REPORT REFERENCE: F110939E1

| No. | Test equipment | Type | Manufacturer | Serial No. | PM-No |
|-----|-------------------------------------|-----------|--------------------|-------------------|--------|
| 01 | Fully anechoic chamber M8 | - | Siemens Matsushita | B83117-E7019-T231 | 480190 |
| 02 | Fully anechoic chamber M20 | - | Albatross Projects | B83107-E2439-T232 | 480303 |
| 03 | Open area test site | - | Phoenix Test-Lab | - | 480085 |
| 04 | Outdoor test site | - | Phoenix Test-Lab | - | 480293 |
| 06 | Spectrum Analyser | FSU | Rohde & Schwarz | 200125 | 480956 |
| 07 | Measuring Receiver | ESI 40 | Rohde & Schwarz | 837808/007 | 480335 |
| 08 | Measuring Receiver | ESCS 30 | Rohde & Schwarz | 828985/014 | 480270 |
| 09 | Spectrum Analyser | R2361C | Advantest | 51720469 | 480144 |
| 10 | Loop antenna | HFH2-Z2 | Rohde & Schwarz | 832609/014 | 480059 |
| 11 | BILOG Antenna | CBL6112 A | Chase | 2034 | 480185 |
| 12 | BILOG Antenna | CBL6112 B | Chase | 2688 | 480328 |
| 13 | Bikon Antenna | HK 116 | Rohde & Schwarz | 833599/008 | 480071 |
| 14 | Bikon Antenna | HK 116 | Rohde & Schwarz | 836891/012 | 480122 |
| 15 | Log-Per Antenna | HL 223 | Rohde & Schwarz | 835556/014 | 480123 |
| 16 | Log-Per Antenna | HL 223 | Rohde & Schwarz | 833335/005 | 480072 |
| 17 | Horn Antenna | 3115 A | EMCO | 9609-4918 | 480183 |
| 18 | Horn Antenna | 3115 B | EMCO | 9609-4922 | 480184 |
| 19 | Precision Dipole | HZ 12 | Rohde & Schwarz | 831781/02 | 480061 |
| 20 | Precision Dipole | HZ 13 | Rohde & Schwarz | 831782/02 | 480062 |
| 21 | Shorted Dipole | VHAA 9110 | Schwarzbeck | 143 | 480166 |
| 22 | Power amplifier | 25A100 | AR | 12610 | 480023 |
| 23 | Loop Antenna $\varnothing = 110$ mm | - | Phoenix Test-Lab | - | 410084 |
| 24 | Signal generator | SMP 03 | Rohde & Schwarz | 848986/004 | 480245 |
| 25 | Signal generator | SMHU | Rohde & Schwarz | 844170/017 | 480266 |
| 26 | Signal generator | SME 06 | Rohde & Schwarz | 844530/008 | 480174 |
| 27 | Signal generator | SMG | Rohde & Schwarz | 8334497/030 | 480013 |
| 28 | Signal generator | 83650L | Agilent | 3844A00554 | 480333 |
| 29 | Radio communication analyser | CMTA 54 | Rohde & Schwarz | 841904/011 | 480169 |
| 30 | Oscilloscope 4channel | 54540A | Hewlett Packard | 3339A00192 | 480001 |
| 31 | Oscilloscope 2 channel | 54520A | Hewlett Packard | 3344A00390 | 480007 |
| 32 | Signal generator | TOE 7704 | TOELLNER | 39385 | 480008 |
| 33 | Combiner | ZFSC-2-11 | Mini Circuits | - | 410089 |
| 34 | Combiner | ZFSC-2-11 | Mini Circuits | - | 410090 |

TEST REPORT REFERENCE: F110939E1

| No. | Test equipment | Type | Manufacturer | Serial No. | PM-No |
|-----|-----------------------------------|------------------|-------------------------|------------|--------|
| 35 | Power splitter | 11850C | Hewlett Packard | 01052 | 410069 |
| 36 | Power splitter | - | Suhner | - | 410070 |
| 37 | Symmetrical transformer | - | Phoenix Test Lab | - | 410086 |
| 38 | Feeding bridge A | - | Phoenix Test Lab | - | 410087 |
| 39 | Feeding bridge A | - | Phoenix Test Lab | - | 410088 |
| 40 | Regulating transformer | BR802 | Block | - | 480094 |
| 41 | Regulating transformer | BR802 | Block | - | 480095 |
| 42 | Power supply | TOE 8872 | Toellner | 61005 | 480833 |
| 43 | Power supply | TOE 8852 | Toellner | 51712 | 480233 |
| 44 | Power supply | TOE 8752 | Toellner | 31569 | 480009 |
| 46 | Power supply | TOE 8852 | Toellner | 51786 | 490001 |
| 47 | Climatic chamber | KS600/75L | RS-Simulatoren | 19002901 | 490065 |
| 48 | Climatic chamber | KS600/75 | RS-Simulatoren | 19004201 | 490070 |
| 49 | Climatic chamber | ST2K220/75 | RS-Simulatoren | 9803901 | 490020 |
| 50 | Climatic chamber | ST2K220/75 | RS-Simulatoren | 2002701 | 490072 |
| 51 | Climatic chamber | - | Binder | - | 480462 |
| 52 | Double circulator | - | Motorola | - | - |
| 53 | Directional coupler | ZFDC-20-5 | Mini Circuits | - | 410092 |
| 54 | Directional coupler | 4001B-20 | Narda Microwave | 02010 | 410150 |
| 55 | Directional coupler | 774D | Hewlett Packard | 06375 | 410149 |
| 56 | Impedance matching unit | - | Phoenix-Test-Lab | - | 410091 |
| 57 | High Pass Filter | HP-350 | Dirk Fischer Elektronik | - | 410151 |
| 58 | High Pass Filter | HP-450 | Dirk Fischer Elektronik | - | 410152 |
| 59 | High Pass Filter | HP-1000 | Dirk Fischer Elektronik | - | 410147 |
| 60 | IF-Filter 20kHz/25kHz | MQF 10.7-1400/11 | Telefilter | 0043 | 480323 |
| 61 | IF-Filter 12.5kHz | MQF 10.7-0850/11 | Telefilter | 0043 | 480324 |
| 62 | Notch Filter | TTR 375-3EE | TELONIC Berkeley | - | 480330 |
| 63 | Notch Filter | TTR 190-3EE | TELONIC Berkeley | 97284-6 | 480331 |
| 64 | Notch Filter | TTR 95-3EE | TELONIC Berkeley | 00104-2 | 480332 |
| 65 | Mixer | ZP-1 | Mini Circuits | 15542 | 410148 |
| 66 | Variable Attenuator / 0-11 dB | 8494B | Hewlett Packard | 3308A38264 | 480264 |
| 67 | Variable Attenuator 0 - 110 dB | 8496B | Hewlett Packard | 3308A71365 | 480265 |

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| No. | Test equipment | Type | Manufacturer | Serial No. | PM-No |
|-----|-----------------------------------|-----------|------------------|------------|--------|
| 68 | Attenuator / 3 dB / 5 W | WA2-3 | Weinschel | 8250 | 410115 |
| 69 | Attenuator / 3 dB / 5 W | WA2-3 | Weinschel | 8251 | 410116 |
| 70 | Attenuator / 3 dB / 5 W | WA2-3 | Weinschel | 8252 | 410117 |
| 71 | Attenuator / 3 dB / 50 W | 33-3-34 | Weinschel | BH 5062 | 410131 |
| 72 | Attenuator / 6 dB / 5 W | WA2-6 | Weinschel | 8253 | 410118 |
| 73 | Attenuator / 6 dB / 5 W | WA2-6 | Weinschel | 8254 | 410119 |
| 74 | Attenuator / 6 dB / 5 W | WA2-6 | Weinschel | 8255 | 410120 |
| 75 | Attenuator / 6 dB / 25 W | 33-6-34 | Weinschel | BH 5536 | 410128 |
| 76 | Attenuator / 10 dB / 1 W | 6810.17A | Huber + Suhner | - | 410067 |
| 77 | Attenuator / 10 dB / 5 W | WA2-10 | Weinschel | 8259 | 410121 |
| 78 | Attenuator / 10 dB / 5 W | WA2-10 | Weinschel | 8260 | 410122 |
| 79 | Attenuator / 10 dB / 5 W | WA2-10 | Weinschel | 8261 | 410123 |
| 80 | Attenuator / 10 dB / 10 W | WA8-10 | Weinschel | 7538 | 410112 |
| 81 | Attenuator / 10 dB / 25 W | 33-10-34 | Weinschel | BH 4878 | 410129 |
| 82 | Attenuator / 10 dB / 25 W | 33-10-34 | Weinschel | BH 4856 | 410130 |
| 83 | Attenuator / 10 dB / 100 W | BN 745353 | Spinner | 20262 | 480274 |
| 84 | Attenuator / 20 dB / 1 W | 6820.17A | Huber + Suhner | - | 410068 |
| 85 | Attenuator / 20 dB / 5 W | WA2-20 | Weinschel | 8256 | 410124 |
| 86 | Attenuator / 20 dB / 5 W | WA2-20 | Weinschel | 8257 | 410125 |
| 87 | Attenuator / 20 dB / 5 W | WA2-20 | Weinschel | 8258 | 410126 |
| 88 | Attenuator / 20 dB / 10 W | WA8-20 | Weinschel | 7539 | 410113 |
| 89 | Attenuator / 30 dB / 200 W | BN 745395 | Spinner | 29971 | 480232 |
| 90 | Termination / 50 Ω / 15 W | 6515.17.A | Huber + Suhner | - | 410078 |
| 91 | Termination / 50 Ω / 0.5 W | 6500.17.A | Huber + Suhner | - | 410074 |
| 92 | Termination / 50 Ω / 0.5 W | 6500.17.A | Huber + Suhner | - | 410075 |
| 93 | RF-cable No. 1 | RTK 081 | Rosenberger | - | 410093 |
| 94 | RF-cable No. 2 | RTK 081 | Rosenberger | - | 410094 |
| 95 | RF-cable No. 3 | RTK 081 | Rosenberger | - | 410095 |
| 96 | RF-cable No. 4 | RTK 081 | Rosenberger | - | 410096 |
| 97 | RF-cable No. 5 | RTK 081 | Rosenberger | - | 410097 |
| 98 | RF-cable No. 6 | RTK 081 | Rosenberger | - | 410098 |
| 99 | RF-cable No. 7 | Sucoflex | Huber + Suhner | - | 410099 |
| 100 | RF-cable No. 8 | RG223 | Phoenix-Test-Lab | - | 410100 |
| 101 | RF-cable No. 9 | RG223 | Phoenix-Test-Lab | - | 410101 |
| 102 | RF-cable No. 10 | RG223 | Phoenix-Test-Lab | - | 410102 |

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| No. | Test equipment | Type | Manufacturer | Serial No. | PM-No |
|-----|---------------------------|------------|--------------------|------------|--------|
| 103 | RF-cable No. 11 | RG223 | Phoenix-Test-Lab | - | 410103 |
| 104 | RF-cable No. 12 | RG223 | Phoenix-Test-Lab | - | 410104 |
| 105 | RF-cable No. 13 | RG223 | Phoenix-Test-Lab | - | 410105 |
| 106 | RF-cable No. 14 | RG223 | Phoenix-Test-Lab | - | 410106 |
| 107 | RF-cable No. 15 | RG223 | Phoenix-Test-Lab | - | 410107 |
| 108 | RF-cable No. 16 | RG223 | Phoenix-Test-Lab | - | 410108 |
| 109 | RF-cable No. 17 | RG223 | Phoenix-Test-Lab | - | 410109 |
| 110 | RF-cable No. 18 | RG58 | Phoenix-Test-Lab | - | 410110 |
| 111 | RF-cable No. 30 | RTK 081 | Rosenberger | - | 410141 |
| 112 | RF-cable No. 31 | RTK 081 | Rosenberger | - | 410142 |
| 113 | Oscilloscope | HM | HAMEG | - | 480160 |
| 114 | Probe | HM | HAMEG | - | 410057 |
| 115 | Power-Amplifier | AR25A250A | Amplifier Research | 18647 | 480154 |
| 116 | Combiner | ZFSC-2-11 | Mini Circuits | - | 410169 |
| 117 | Signal generator | SMY 01 | Rohde & Schwarz | - | 580010 |
| 118 | 225 MHz Universal counter | 53131 A | Hewlett & Packard | - | 480134 |
| 119 | Zirkulator | 156-162MHz | DFE | - | 410162 |
| 120 | Zirkulator | 156-162MHz | DFE | - | 410163 |
| 121 | Zirkulator | 156-162MHz | DFE | - | 410164 |
| 122 | Zirkulator | 156-162MHz | DFE | - | 410165 |

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9 LIST OF ANNEXES

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