

# FCC PART 15C TEST REPORT No. 2014EEB00058-BLE

For

LOCCA lost&found services GmbH

**GPS** tracker

**Model Name: T100** 

Market Name: Locca Mini

With

Hardware Version: V3.1

Software Version: V2.0

FCC ID: 2ABNZ-LOCCAMINI

IC Number: 11840A-LOCCAMINI

Issued Date: Jun 11th, 2014

**Test Laboratory:** 

FCC 2.948 Listed: No.310359 IC O.A.T.S listed: No.6629C-1

Note:

The test results in this test report relate only to the devices specified in this report. This report shall not be reproduced except in full without the written approval of TMC Beijing.

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# 1. Test Laboratory

#### 1.1. Testing Location

Company Name:

TMC Shenzhen, Telecommunication Metrology Center of MIIT

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#### 1.2. Testing Environment

Normal Temperature:

15℃-30℃

Extreme Temperature:

-20°C/+55°C

Relative Humidity:

30%-60%

#### 1.3. Project data

Project Leader:

Zhang Bojun

Test Engineer:

Tang Weisheng

Testing Start Date:

Jan 6<sup>th</sup>, 2014

Testing End Date:

May 27<sup>th</sup>, 2014

### 1.4. Signature

Tang Weisheng

(Prepared this test report)

Zhang Bojun

(Reviewed this test report)

Lu Minniu

Director of the laboratory

(Approved this test report)



# 2. Client Information

#### 2.1. Applicant Information

Company Name: LOCCA lost&found services GmbH

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City: Vienna

Postal Code: /

Country: Austria
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Telephone: (86) 755 2391 0500 Fax: (86) 755 2351 0530

#### 2.2. Manufacturer Information

Company Name: emporia INDUSTIES

Address /Post: No 367 avendia da praia grande keng ou commercial building 16

andar a, macau

City: Macau

Postal Code: /

Country: China

Contact Persons: Michael Sun

E-mail: Michael.sun@emporiatelecom.com

Telephone: (86) 755 2391 0500 Fax: (86) 755 2351 0530



# 3. Equipment Under Test (EUT) and Ancillary Equipment (AE)

#### 3.1. About EUT

Description GPS tracker

Model Name T100

Market Name Locca Mini

Frequency Band 2402MHz~2480MHz

Type of Modulation GFSK

FCC ID 2ABNZ-LOCCAMINI IC Number 11840A-LOCCAMINI

Note: Photographs of EUT are shown in ANNEX A of this test report.

# 3.2. Internal Identification of EUT used during the test

| EUT ID* | IMEI | <b>HW Version</b> | SW Version |
|---------|------|-------------------|------------|
| EUT1    | /    | V3.1              | V2.0       |

#### 3.3. Internal Identification of AE used during the test

| AE ID* | Description    | Туре         | SN |
|--------|----------------|--------------|----|
| AE1    | Li-ion Battery | AK-T100      | /  |
| AE2    | Charger        | TPA-655055UU | 1  |

<sup>\*</sup>AE ID: is used to identify the test accessory in the lab internally.



# 4. Reference Documents

#### 4.1. Documents supplied by applicant

EUT feature information is supplied by the applicant or manufacturer, which is the basis of testing.

# 4.2. Reference Documents for testing

The following documents listed in this section are referred for testing.

| Reference  | Title   | Version  |
|------------|---|----------|
| FCC Part15 | FCC CFR 47, Part 15, Subpart C:                               | Oct,2012 |
|            | 15.205 Restricted bands of operation;                         | Edition  |
|            | 15.209 Radiated emission limits, general requirements;        |          |
|            | 15.247 Operation within the bands 902-928MHz, 2400-2483.5     |          |
|            | MHz, and 5725-5850 MHz.                                       |          |
| ANSI C63.4 | Methods of Measurement of Radio-Noise Emissions from          | 2009     |
|            | Low-Voltage Electrical and Electronic Equipment in the Range  |          |
|            | of 9 kHz to 40 GHz  |          |
| KDB558074  | Measurement of Digital Transmission Systems                   | April,   |
|            | Operating under Section 15.247                                | 2013     |
| IC RSS-210 | RSS-210 Spectrum Management and Telecommunications            | Issue 8  |
|            | Radio Standards Specification - Low-power Licence-exempt      | Dec,2010 |
|            | Radiocommunication Devices (All Frequency Bands): Category    |          |
|            | I Equipment   |          |
| IC RSS-Gen | General Requirements and Information for the Certification of | Issue 3  |
|            | Radio Apparatus   | Dec,2010 |



# 5. Laboratory Environment

**Half-anechoic chamber** (11.20 meters×6.10 meters×5.60 meters) did not exceed following limits:

| Temperature                             | Min. = 15 °C, Max. = 30 °C                             |  |  |
|---|--|--|--|
| Relative humidity                       | Min. = 30 %, Max. = 60 %                               |  |  |
| Shielding effectiveness > 110 dB        |  |  |  |
| Electrical insulation $> 2M \Omega$     |  |  |  |
| Ground system resistance $< 0.5 \Omega$ |  |  |  |
| Normalized Site Attenuation (NSA)       | < ±3.5dB, with 3m of Measuring distance, 30MHz 1000MHz |  |  |
| Uniformity of field strength            | Between 0 and 6 dB, from 80MHz to 3000 MHz             |  |  |

**Fully-anechoic chamber** (11.20 meters×6.10 meters×6.60 meters) did not exceed following limits:

| Temperature              | Min. = 15 $^{\circ}$ C, Max. = 30 $^{\circ}$ C |  |  |
|--------------------------|--|--|--|
| Relative humidity        | Min. = 30 %, Max. = 60 %                       |  |  |
| Shielding effectiveness  | > 110 dB                                       |  |  |
| Electrical insulation    | > 2M Ω   |  |  |
| Ground system resistance | < 0.5 Ω  |  |  |
| VSWR                     | Between 0 and 6 dB, from 30MHz to 18 000 MHz   |  |  |

#### Conduction Lab did not exceed following limits:

| Temperature              | Min.=15 ℃, Max.=30 ℃  |
|--------------------------|-----------------------|
| Relative humidity        | Min.=30 %, Max.= 60 % |
| Shielding effectiveness  | > 80 dB               |
| Electrical insulation    | > 2M Ω                |
| Ground system resistance | < 0.5 Ω               |



# 6. Summary of Test Results

### 6.1. Summary of Test Results

| Na | Tost coops                                | Sub-clause of   | Sub-clause of | Vondiet |  |
|----|---|-----------------|---------------|---------|--|
| No | Test cases                                | Part15C         | IC            | Verdict |  |
| 0  | Antenna Requirement                       | 15.203          | 1             | Р       |  |
| 1  | Maximum Peak Output Power                 | 15.247 (a)      | RSS-210       | -       |  |
| ı  | Maximum Feak Output Fower                 | 15.247 (a)      | Issue8 A8.4   | Р       |  |
| 2  | Peak Power Spectral Density               | 15.247 (e)      | RSS-210       | ь       |  |
|    | reak rower Spectral Delisity              | 13.247 (e)      | Issue8 A8.2   | P       |  |
| 3  | Occupied 6dB Bandwidth                    | 15.247 (a)      | RSS-210       | Р       |  |
| 3  | Occupied odb Baildwidti                   | 13.247 (a)      | Issue8 A8.2   |         |  |
| 4  | Band Edges Compliance                     | R 15 247 (d)    |               | Р       |  |
| 7  | Band Edges Compliance                     | 15.247 (d)      | Issue8 A8.5   |         |  |
| 5  | Transmitter Spurious Emission - Conducted | 15.247(d)       | RSS-210       | Р       |  |
|    | Transmitter opunous Emission - Conducted  | 15.247 (d)      | Issue8 A8.5   | ľ       |  |
| 6  | Transmitter Spurious Emission - Radiated  | 15.247, 15.205, | RSS-210       | P       |  |
|    | Transmitter Spunous Emission - Tradiated  | 15.209          | Issue8 A8.5   | Г       |  |
| 7  | AC Powerline Conducted Emission           | 15.207          | RSS-Gen       | Р       |  |
|    | AC Fowerline Conducted Emission           | 13.207          | Issue3 7.2.4  | F       |  |
| 8  | Occupied Bandwidth                        | ,               | RSS-Gen       | ,       |  |
| 0  | Occupied Baildwidth                       | 1               | Issue3 4.6.1  | ,       |  |

#### 6.2. Statements

TMC has evaluated the test cases requested by the applicant/manufacturer as listed in section 6.1 of this report, for the EUT specified in section 3, according to the standards or reference documents listed in section 4.2

#### 6.3. Terms used in the result table

Terms used in Verdict column

| Р  | Pass          |
|----|---------------|
| NA | Not Available |
| F  | Fail          |

#### Abbreviations

| AC       | Alternating Current                             |  |
|----------|---|--|
| AFH      | Adaptive Frequency Hopping                      |  |
| BW       | Band Width                                      |  |
| E.I.R.P. | equivalent isotropical radiated power           |  |
| ISM      | SM Industrial, Scientific and Medical           |  |
| R&TTE    | Radio and Telecommunications Terminal Equipment |  |
| RF       | Radio Frequency                                 |  |
| Tx       | Transmitter                                     |  |



# 7. Test Equipments Utilized

#### **Conducted test system**

| No. | Equipment                 | Model | Serial<br>Number | Manufacturer       | Calibration Due date | Calibration<br>Period |
|-----|---------------------------|-------|------------------|--------------------|----------------------|-----------------------|
| 1   | Vector Signal<br>Analyzer | FSV40 | 100903           | Rohde &<br>Schwarz | 2015-04-22           | 1 year                |

#### Radiated emission test system

|     | Radiated Chilosion test system       |           |                  |                 |                      |                       |
|-----|--------------------------------------|-----------|------------------|-----------------|----------------------|-----------------------|
| No. | Equipment                            | Model     | Serial<br>Number | Manufacturer    | Calibration Due date | Calibration<br>Period |
| 1   | Chamber                              | FACT5-2.0 | 4166             | ETS-Lindgren    | 2016-05-29           | 3 years               |
| 2   | Test Receiver                        | ESCI      | 100701           | Rohde & Schwarz | 2014-07-31           | 1 year                |
| 3   | Spectrum Analyzer                    | FSP40     | 100378           | Rohde & Schwarz | 2014-12-20           | 1 year                |
| 4   | BiLog Antenna                        | VULB9163  | 9163-329         | Schwarzbeck     | 2017-01-20           | 3 years               |
| 5   | Dual-Ridge Waveguide<br>Horn Antenna | 3160-09   | 00118383         | ETS-Lindgren    | 2015-09-05           | 3 years               |
| 6   | Test Receiver                        | ESCI      | 100702           | Rohde & Schwarz | 2014-07-31           | 1 year                |
| 7   | LISN                                 | ESH2-Z5   | 100196           | Rohde & Schwarz | 2015-01-14           | 1 year                |
| 8   | Signal Generator                     | SMR40     | 100541           | Rohde & Schwarz | 2014-12-26           | 1 year                |
| 9   | Dual-Ridge Waveguide<br>Horn Antenna | 3117      | 00066577         | ETS-Lindgren    | 2016-04-01           | 3 years               |
| 10  | Loop Antenna                         | HLA6120   | 35779            | TESEQ           | 2016-02-25           | 3 years               |

# **Anechoic chamber**

Fully anechoic chamber by ETS-Lindgren.



# **ANNEX A: EUT photograph**



Pic A-1 GPS tracker



Pic A-2 GPS tracker





Pic A-3 Docker



Pic A-4 Charger



# **ANNEX B: MEASUREMENT RESULTS**

#### **B.0 Antenna requirement**

#### **Measurement Limit:**

| Standard               | Requirement   |
|------------------------|---|
|                        | An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of  |
| FCC CRF Part<br>15.203 | this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of §15.211, §15.213, § 15.217, §15.219, or §15.221. Further, this requirement does not apply to intentional |
|                        | radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with §15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.                |

Conclusion: The Directional gains of antenna used for transmitting is -1.0 dBi.

The RF transmitter uses an integrate antenna without connector.



# **B.1 Maximum Peak Output Power**

#### **Measurement Limit and Method:**

| Standard                  | Limit (dBm) |
|---------------------------|-------------|
| FCC CRF Part 15.247(b)(1) | < 30        |
| RSS-210 Issue8 A8.4       | <b>\</b> 30 |

#### **Test Condition:**

| Hopping Mode | RBW  | VBW  | SPAN  | Sweeptime |
|--------------|------|------|-------|-----------|
| Hopping off  | 3MHz | 3MHz | 10MHz | Auto      |

#### **Measurement Results:**

| Mode | Channel | Maximum Peak Output Power (dBm) | Conclusion |
|------|---------|---------------------------------|------------|
|      | 0       | -6.15                           | Р          |
| GFSK | 19      | -4.85                           | Р          |
|      | 39      | -4.83                           | Р          |



# **B.2 Peak Power Spectral Density**

#### **Measurement Limit:**

| Standard               | Limit                     |
|------------------------|---------------------------|
| FCC CRF Part 15.247(d) | < 0 dDm/2 kH <del>-</del> |
| RSS-210 Issue8 A8.2    | < 8 dBm/3 kHz             |

#### **Measurement Results:**

| Mode | Channel | Peak Power Spectral Density (dBm) |        | Conclusion |
|------|---------|-----------------------------------|--------|------------|
|      | 0       | Fig.1                             | -21.45 | Р          |
| GFSK | 19      | Fig.2                             | -21.28 | Р          |
|      | 39      | Fig.3                             | -21.26 | Р          |

**See ANNEX C for test graphs.** 



# **B.3 Occupied 6dB Bandwidth**

#### **Measurement Limit:**

| Standard                   | Limit (kHz) |
|----------------------------|-------------|
| FCC 47 CFR Part 15.247 (a) | > 500       |
| RSS-210 Issue8 A8.2        | ≥ 500       |

#### **Measurement Result:**

| Mode | Channel | Test Results ( kHz) |       | conclusion |
|------|---------|---------------------|-------|------------|
|      | 0       | Fig.4               | 687.4 | Р          |
| GFSK | 19      | Fig.5               | 687.4 | Р          |
|      | 39      | Fig.6               | 687.4 | Р          |

**See ANNEX C for test graphs.** 



# **B.4 Band Edges Compliance**

#### **Measurement Limit:**

| Standard                   | Limit (dBc) |  |
|----------------------------|-------------|--|
| FCC 47 CFR Part 15.247 (d) | > 20        |  |
| RSS-210 Issue8 A8.5        | > 20        |  |

#### **Measurement Result:**

| Mode | Channel | Test Results | Conclusion |
|------|---------|--------------|------------|
| GFSK | 0       | Fig.7        | Р          |
| Grak | 39      | Fig.8        | Р          |

See ANNEX C for test graphs.



# **B.5 Transmitter Spurious Emission**

#### **B.5.1 Transmitter Spurious Emission - Conducted**

#### **Measurement Limit:**

| Standard                   | Limit                                   |
|----------------------------|---|
| FCC 47 CFR Part 15.247 (d) | 20dB below peak output power in 100 kHz |
| RSS-210 Issue8 A8.5        | bandwidth                               |

#### **Measurement Results:**

| MODE | Channel      | Frequency Range | Test Results | Conclusion |   |
|------|--------------|-----------------|--------------|------------|---|
|      |              | 2.402 GHz       | Fig.9        | Р          |   |
|      | 0            | 30 MHz-3 GHz    | Fig.10       | Р          |   |
|      |              | 3GHz-18GHz      | Fig.11       | Р          |   |
|      |              | 2.440 GHz       | Fig.12       | Р          |   |
| GFSK | 19           | 19              | 30 MHz-3 GHz | Fig.13     | Р |
| GFSK |              |                 | 3GHz-18GHz   | Fig.14     | Р |
|      |              | 2.480 GHz       | Fig.15       | Р          |   |
|      | 39           | 30 MHz-3 GHz    | Fig.16       | Р          |   |
|      |              |                 | 3GHz-18GHz   | Fig.17     | Р |
|      | All channels | 18GHz-26GHz     | Fig.18       | Р          |   |

See ANNEX C for test graphs.



# B.5.2 Transmitter Spurious Emission - Radiated Measurement Limit:

| Standard                               | Limit                        |  |
|--|------------------------------|--|
| FCC 47 CFR Part 15.247, 15.205, 15.209 | 20dP holow pook output nower |  |
| RSS-210 Issue8 A8.5                    | 20dB below peak output power |  |

In addition, radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in § 15.209(a) (see § 15.205(c)).

#### Limit in restricted band:

| Frequency of emission | Field atronath(u)//m) | Measurement      |
|-----------------------|-----------------------|------------------|
| (MHz)                 | Field strength(μV/m)  | distance(meters) |
| 0.009-0.490           | 2400/F(kHz)           | 300              |
| 0.490-1.705           | 24000/F(kHz)          | 30               |
| 1.705-30.0            | 30                    | 30               |
| 30-88                 | 100                   | 3                |
| 88-216                | 150                   | 3                |
| 216-960               | 200                   | 3                |
| Above 960             | 500                   | 3                |

#### **Test Condition**

The EUT was placed on a non-conductive table. The measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height and the EUT azimuth were varied in order to identify the maximum level of emissions from the EUT. This maximization process was repeated with the EUT positioned in each of its three orthogonal orientations.

| Frequency of emission | RBW/VBW       | Sweep Time(s) |
|-----------------------|---------------|---------------|
| (MHz)                 |               |               |
| 30-1000               | 120kHz/300kHz | 5             |
| 1000-4000             | 1MHz/1MHz     | 15            |
| 4000-18000            | 1MHz/1MHz     | 40            |
| 18000-26500           | 1MHz/1MHz     | 20            |

#### Note:

According to the performance evaluation, the radiated emission margin of EUT is over 20dB in the band below 30MHz. Therefore, the measurement starts from 30MHz to tenth harmonic.

The measurement results include the horizontal polarization and vertical polarization measurements.



#### **Measurement Results:**

| Mode | Channel      | Frequency Range     | Test Results | Conclusion |
|------|--------------|---------------------|--------------|------------|
|      |              | 30 MHz ~1 GHz       | Fig.19       | Р          |
|      | 0            | 1 GHz ~ 3 GHz       | Fig.20       | Р          |
|      |              | 3 GHz ~ 18 GHz      | Fig.21       | Р          |
|      |              | 30 MHz ~1 GHz       | Fig.22       | Р          |
|      | 19           | 1 GHz ~ 3 GHz       | Fig.23       | Р          |
| GFSK |              | 3 GHz ~ 18 GHz      | Fig.24       | Р          |
|      |              | 30 MHz ~1 GHz       | Fig.25       | Р          |
|      | 39           | 1 GHz ~ 3 GHz       | Fig.26       | Р          |
|      |              | 3 GHz ~ 18 GHz      | Fig.27       | Р          |
|      | Power(CH0)   | 2.38 GHz ~ 2.45 GHz | Fig.28       | Р          |
|      | Power(CH39)  | 2.45 GHz ~ 2.5 GHz  | Fig.29       | Р          |
| 1    | All channels | 18 GHz~ 26.5 GHz    | Fig.30       | Р          |

### GFSK CH0 (1-18GHz)

| SI SI SI SI (1 10SI 12) |         |          |       |        |          |
|-------------------------|---------|----------|-------|--------|----------|
| Frequency               | Average | Polariza | Corr. | Margin | Limit    |
| (MHz)                   | -ClearW | tion     | (dB)  | (dB)   | (dBµV/m) |
| 7446.7500               | 43.5    | Н        | 8.7   | 10.5   | 54.0     |
| 10513.000               | 41.5    | Н        | 12.0  | 12.5   | 54.0     |
| 12156.000               | 43.6    | V        | 13.1  | 10.4   | 54.0     |
| 13813.000               | 44.7    | V        | 13.0  | 9.3    | 54.0     |
| 15777.000               | 48.1    | V        | 14.5  | 5.9    | 54.0     |
| 16779.000               | 48.9    | V        | 15.5  | 5.1    | 54.0     |

#### GFSK CH0 (1-18GHz)

| Frequency | MaxPea  | Polariza | Corr. | Margin | Limit    |
|-----------|---------|----------|-------|--------|----------|
| (MHz)     | k-Clear | tion     | (dB)  | (dB)   | (dBµV/m) |
| 16220.000 | 59.8    | V        | 14.8  | 14.2   | 74.0     |
| 16762.000 | 60.1    | V        | 15.4  | 13.9   | 74.0     |
| 16854.000 | 60.0    | V        | 15.9  | 14.0   | 74.0     |
| 17265.000 | 61.1    | Н        | 15.5  | 12.9   | 74.0     |
| 17409.000 | 60.6    | V        | 15.8  | 13.4   | 74.0     |
| 17484.000 | 60.0    | Н        | 15.9  | 14.0   | 74.0     |



### **GFSK CH19 (1-18GHz)**

| Frequency<br>(MHz) | Average -ClearW | Polariza<br>tion | Corr.<br>(dB) | Margin<br>(dB) | Limit<br>(dBµV/m) |
|--------------------|-----------------|------------------|---------------|----------------|-------------------|
| 7019.7500          | 38.8            | V                | 9.1           | 15.2           | 54.0              |
| 8082.8750          | 40.0            | Н                | 9.3           | 14.0           | 54.0              |
| 9974.6250          | 41.8            | V                | 11.7          | 12.2           | 54.0              |
| 11552.000          | 42.4            | Н                | 12.3          | 11.6           | 54.0              |
| 13606.000          | 44.9            | V                | 12.8          | 9.1            | 54.0              |
| 16768.000          | 49.6            | V                | 15.5          | 4.4            | 54.0              |

#### **GFSK CH19 (1-18GHz)**

| Frequency | MaxPea  | Polariza | Corr. | Margin | Limit    |
|-----------|---------|----------|-------|--------|----------|
| (MHz)     | k-Clear | tion     | (dB)  | (dB)   | (dBµV/m) |
| 16725.000 | 60.7    | V        | 15.2  | 13.3   | 74.0     |
| 17248.000 | 60.7    | Н        | 15.5  | 13.3   | 74.0     |
| 17334.000 | 60.7    | Н        | 15.7  | 13.3   | 74.0     |
| 17377.000 | 60.7    | V        | 15.7  | 13.3   | 74.0     |
| 17392.000 | 61.0    | V        | 15.8  | 13.0   | 74.0     |
| 17477.000 | 60.6    | V        | 15.9  | 13.4   | 74.0     |

#### **GFSK CH39 (1-18GHz)**

| Frequency | Average | Polariza | Corr. | Margin | Limit    |
|-----------|---------|----------|-------|--------|----------|
| (MHz)     | -ClearW | tion     | (dB)  | (dB)   | (dBµV/m) |
| 2356.5000 | 38.1    | V        | 3.7   | 15.9   | 54.0     |
| 6256.7500 | 38.3    | V        | 9.4   | 15.7   | 54.0     |
| 6304.8750 | 38.4    | Н        | 9.3   | 15.6   | 54.0     |
| 12665.000 | 44.0    | V        | 13.6  | 10.0   | 54.0     |
| 13799.000 | 44.7    | V        | 13.0  | 9.3    | 54.0     |
| 15773.000 | 48.0    | V        | 14.5  | 6.0    | 54.0     |



#### **GFSK CH39 (1-18GHz)**

| Frequency<br>(MHz) | MaxPea<br>k-Clear | Polariza<br>tion | Corr.<br>(dB) | Margin<br>(dB) | Limit<br>(dBµV/m) |
|--------------------|-------------------|------------------|---------------|----------------|-------------------|
| 15785.000          | 59.7              | V                | 14.6          | 14.3           | 74.0              |
| 16351.000          | 59.9              | V                | 15.6          | 14.1           | 74.0              |
| 16843.000          | 59.8              | V                | 15.9          | 14.2           | 74.0              |
| 16858.000          | 60.0              | V                | 15.9          | 14.0           | 74.0              |
| 16905.000          | 60.1              | Н                | 16.0          | 13.9           | 74.0              |
| 17485.000          | 60.2              | V                | 15.9          | 13.8           | 74.0              |

See ANNEX C for test graphs.

**Conclusion: Pass** 

#### Note:

A "reference path loss" is established and the  $A_{Rpl}$  is the attenuation of "reference path loss", and including the gain of receive antenna, the gain of the preamplifier, the cable loss.

P<sub>Mea</sub> is the field strength recorded from the instrument.

The measurement results are obtained as described below:

Result=P<sub>Mea</sub>+A<sub>Rpl=</sub> P<sub>Mea</sub>+Cable Loss+Antenna Factor



#### **B.6 AC Powerline Conducted Emission**

#### **Test Condition:**

| Voltage (V) | Frequency (Hz) |
|-------------|----------------|
| 120         | 60             |

#### Measurement Result and limit:

BT (Quasi-peak Limit)-AE2

| Frequency range | Quasi-peak   | Result       | Result (dBμV) |            |  |
|-----------------|--------------|--------------|---------------|------------|--|
| (MHz)           | Limit (dBμV) | Traffic Idle |               | Conclusion |  |
| 0.15 to 0.5     | 66 to 56     |              |               |            |  |
| 0.5 to 5        | 56           | Fig.31       | Fig.32        | Р          |  |
| 5 to 30         | 60           |              |               |            |  |

NOTE: The limit decreases linearly with the logarithm of the frequency in the range  $0.15\,\mathrm{MHz}$  to  $0.5\,\mathrm{MHz}$ .

#### BT (Average Limit)-AE2

| Frequency range | Average-peak | Result (dBμV) |        | Conclusion |  |
|-----------------|--------------|---------------|--------|------------|--|
| (MHz)           | Limit (dBμV) | Traffic Idle  |        |            |  |
| 0.15 to 0.5     | 56 to 46     |               |        |            |  |
| 0.5 to 5        | 46           | Fig.31        | Fig.32 | Р          |  |
| 5 to 30         | 50           |               |        |            |  |

NOTE: The limit decreases linearly with the logarithm of the frequency in the range  $0.15\,\mathrm{MHz}$  to  $0.5\,\mathrm{MHz}$ .

Note: The measurement results include the L1 and N measurements.

See ANNEX C for test graphs.



# **B.7 Occupied Bandwidth**

#### **Measurement Limit:**

| Standard             | Limit |
|----------------------|-------|
| RSS-Gen Issue3 4.6.1 | /     |

#### **Measurement Result:**

| Mode | Channel | Occupied Bandwidth<br>( MHz) |       | conclusion |
|------|---------|------------------------------|-------|------------|
|      | 0       | Fig.33                       | 1.143 | 1          |
| GFSK | 19      | Fig.34                       | 1.100 | 1          |
|      | 39      | Fig.35                       | 1.100 | 1          |

**See ANNEX C for test graphs.** 

**Conclusion: PASS** 



# **ANNEX C: TEST FIGURE LIST**

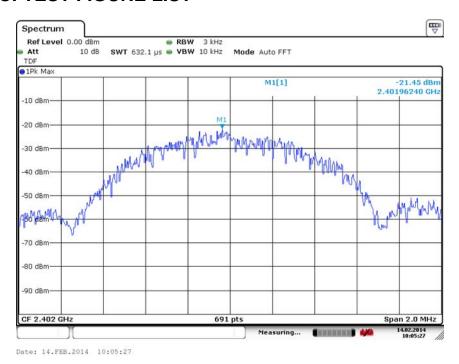


Fig. 1 Power Spectral Density (Ch 0)

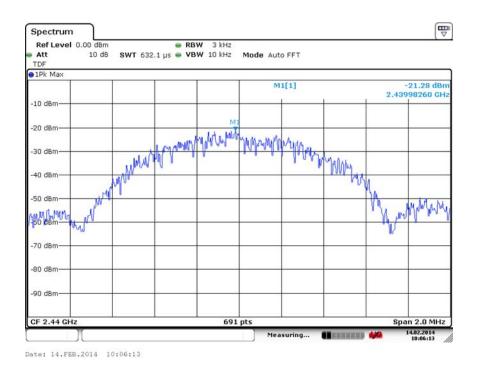


Fig. 2 Power Spectral Density (Ch 19)



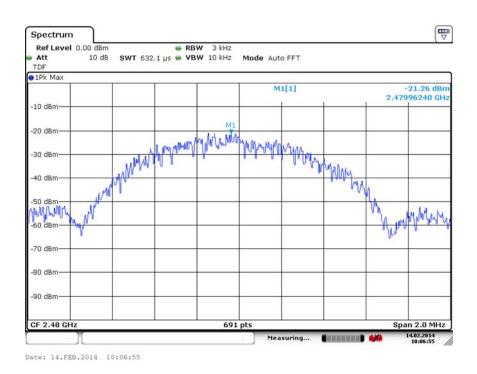


Fig. 3 Power Spectral Density (Ch 39)

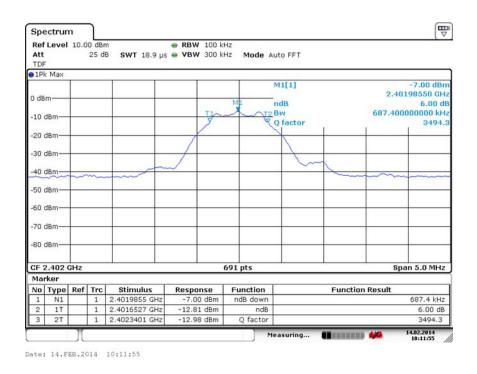


Fig. 4 Occupied 6dB Bandwidth (Ch 0)



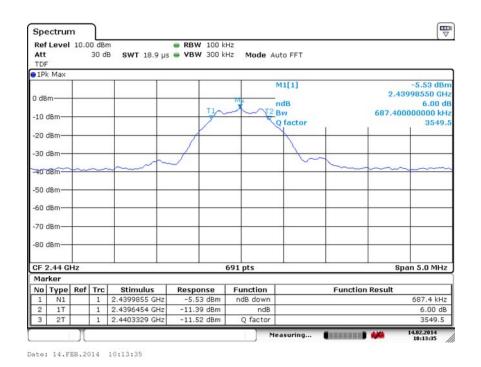


Fig. 5 Occupied 6dB Bandwidth (Ch 19)

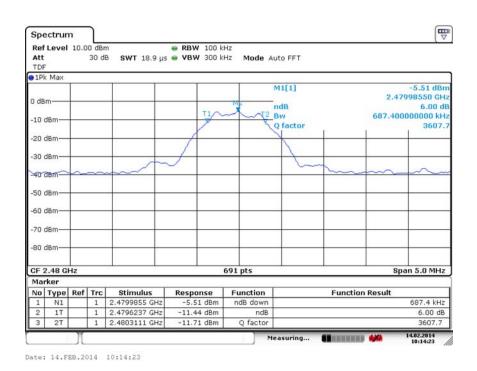


Fig. 6 Occupied 6dB Bandwidth (Ch 39)



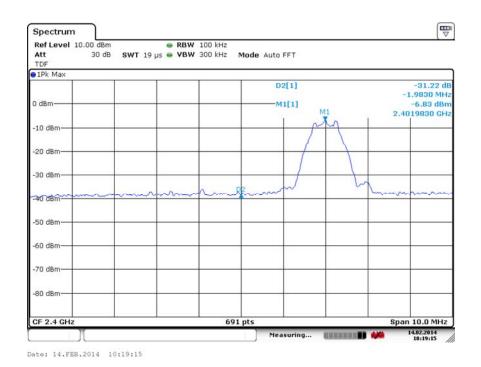


Fig. 7 Band Edges (Ch 0)

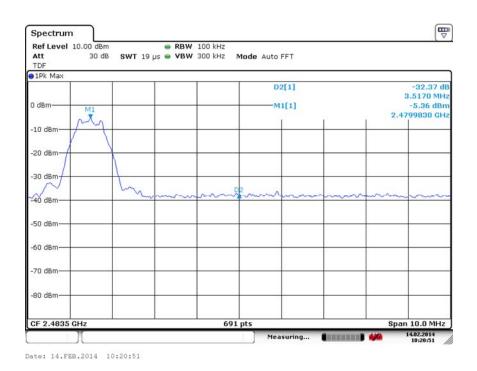


Fig. 8 Band Edges (Ch 39)



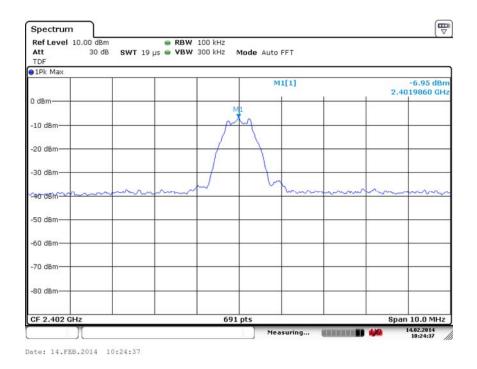


Fig. 9 Conducted Spurious Emission (Ch0, Center Frequency)

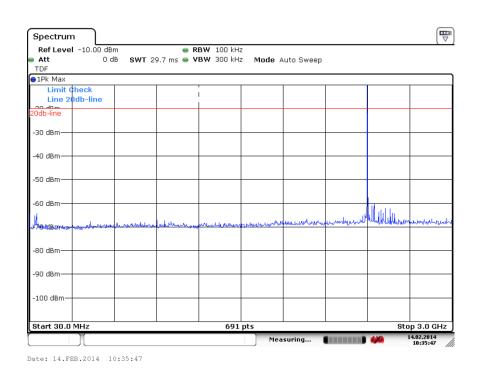


Fig. 10 Conducted Spurious Emission (Ch0, 30 MHz-3 GHz)



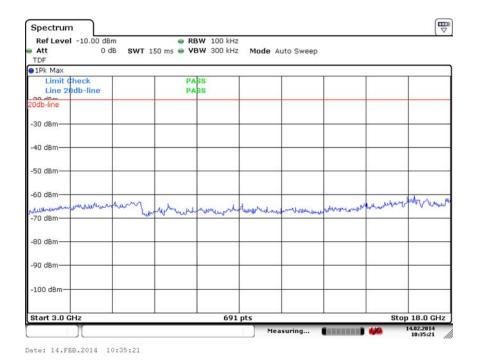


Fig. 11 Conducted Spurious Emission (Ch0, 3 GHz-18 GHz)

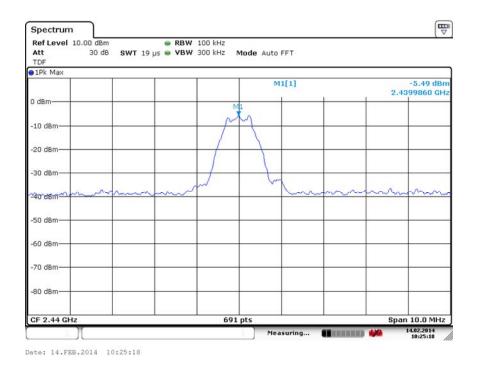


Fig. 12 Conducted Spurious Emission (Ch19, Center Frequency)



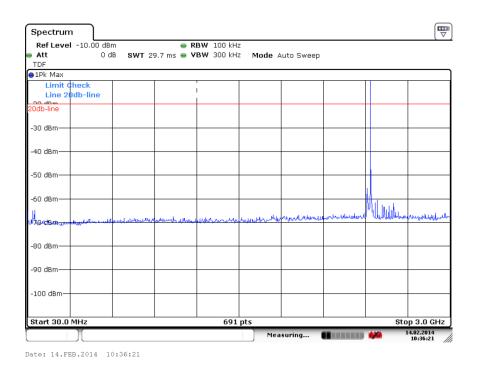


Fig. 13 Conducted Spurious Emission (Ch19, 30 MHz-3 GHz)

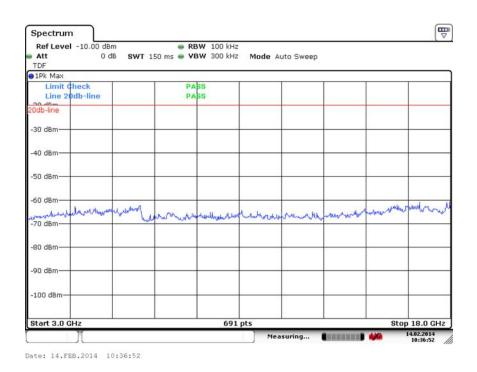


Fig. 14 Conducted Spurious Emission (Ch19, 3 GHz-18 GHz)



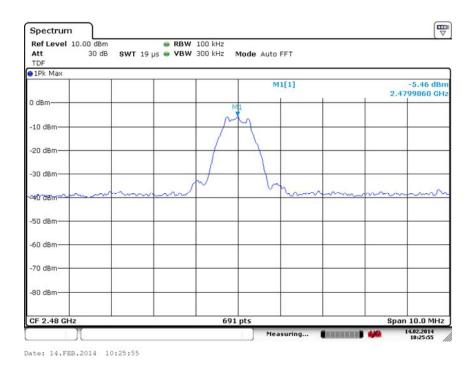


Fig. 15 Conducted Spurious Emission (Ch39, Center Frequency)

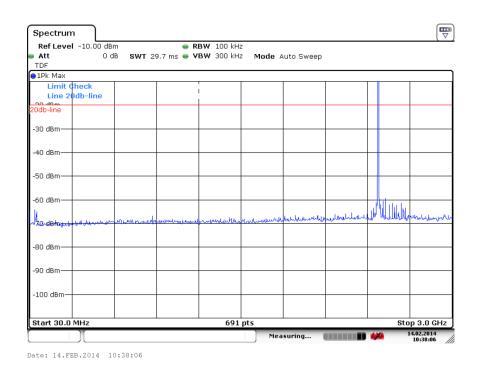


Fig. 16 Conducted Spurious Emission (Ch39, 30 MHz-3 GHz)



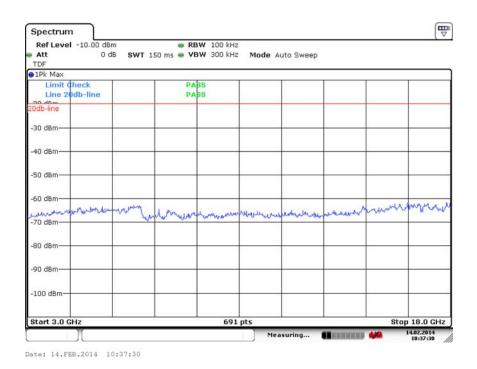


Fig. 17 Conducted Spurious Emission (Ch39, 3 GHz-18 GHz)

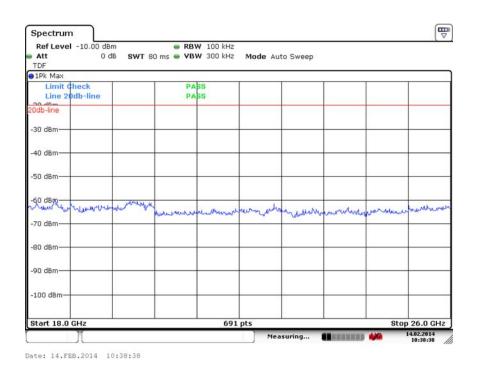


Fig. 18 Conducted Spurious Emission (All channels, 18 GHz-26 GHz)



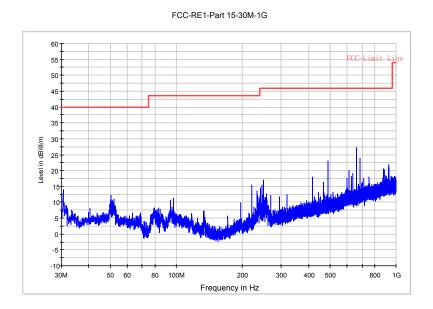


Fig. 19 Radiated Spurious Emission (Ch0, 30 MHz-1 GHz)

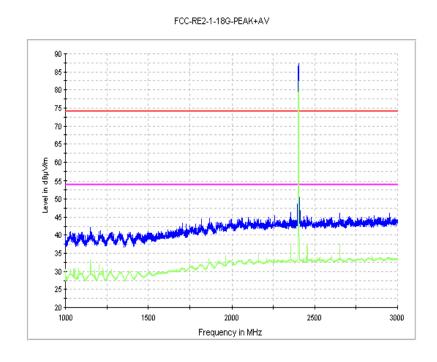


Fig. 20 Radiated Spurious Emission (Ch0, 1 GHz-3 GHz)



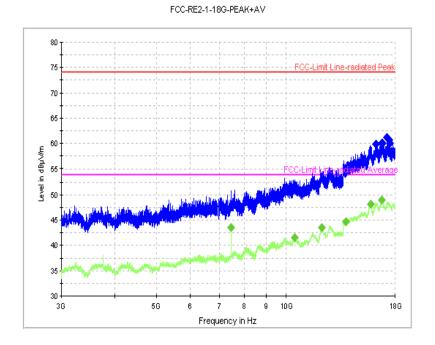


Fig. 21 Radiated Spurious Emission (Ch0, 3 GHz-18 GHz)

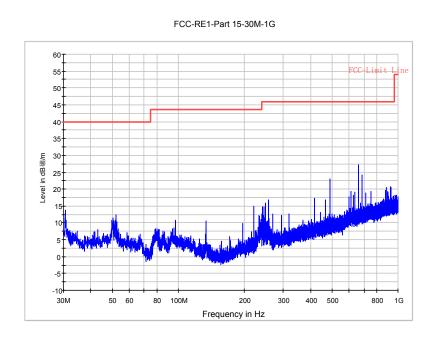


Fig. 22 Radiated Spurious Emission (Ch19, 30 MHz-1 GHz)





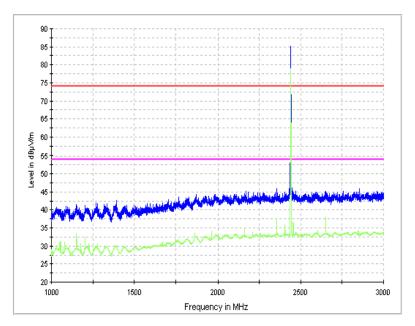


Fig. 23 Radiated Spurious Emission (Ch19, 1 GHz-3 GHz)

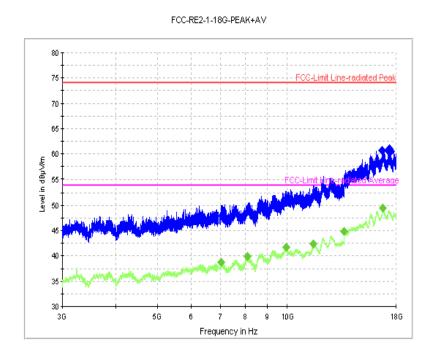


Fig. 24 Radiated Spurious Emission (Ch19, 3 GHz-18 GHz)



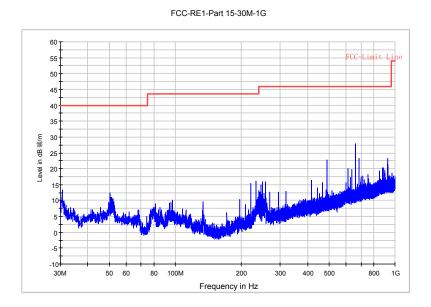


Fig. 25 Radiated Spurious Emission (Ch39, 30 MHz-1 GHz)

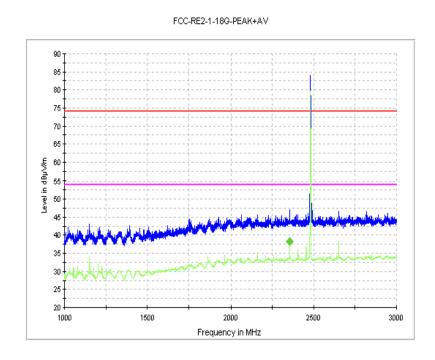


Fig. 26 Radiated Spurious Emission (Ch39, 1 GHz-3 GHz)



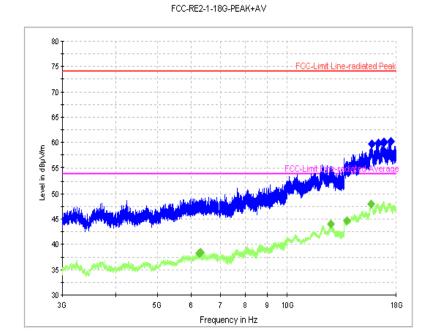


Fig. 27 Radiated Spurious Emission (Ch39, 3 GHz-18 GHz)

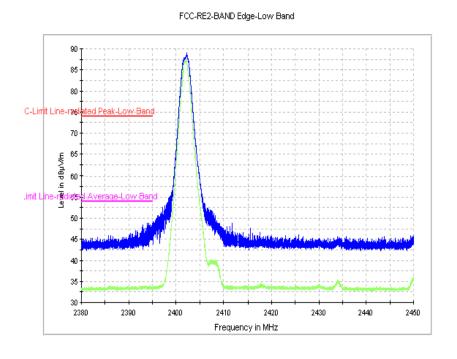


Fig. 28 Radiated Emission Power (GFSK, Ch0, 2380GHz~2450GHz)

2500



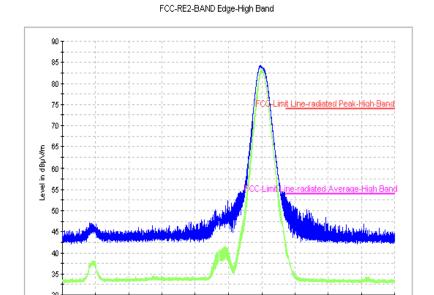


Fig. 29 Radiated Emission Power (GFSK, Ch39, 2450GHz~2500GHz)

Frequency in MHz

2470

2480

2490

2450

2460

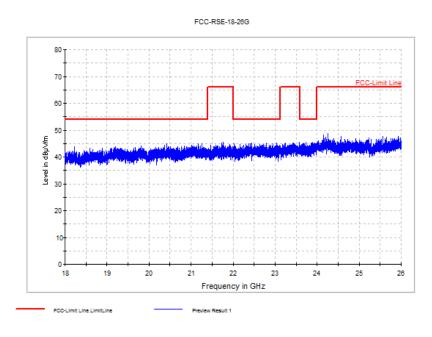
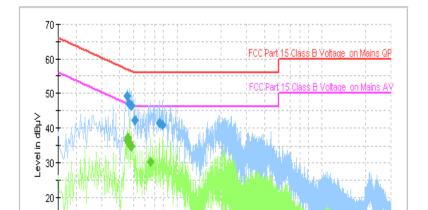


Fig. 30 Radiated emission: 18 GHz - 26 GHz





ESH2-Z5 Scan-FCC

Fig. 31 AC Powerline Conducted Emission(Traffic, AE2)

2M

Frequency in Hz

3M 4M 5M 6

20M

#### MEASUREMENT RESULT: " QuasiPeak "

10

150k

300 400 500

800 1M

| Frequency<br>(MHz) | QuasiPeak<br>(dBµV) | PE  | Line | Corr.<br>(dB) | Margin<br>(dB) | Limit<br>(dBµV) |
|--------------------|---------------------|-----|------|---------------|----------------|-----------------|
| 0.450000           | 49.1                | FLO | L1   | 10.0          | 7.8            | 56.9            |
| 0.466000           | 47.0                | FLO | L1   | 10.0          | 9.6            | 56.6            |
| 0.482000           | 46.4                | FLO | L1   | 10.0          | 9.9            | 56.3            |
| 0.510000           | 42.2                | FLO | L1   | 10.0          | 13.8           | 56.0            |
| 0.762000           | 41.4                | FLO | L1   | 10.1          | 14.6           | 56.0            |
| 0.790000           | 40.8                | FLO | L1   | 10.1          | 15.2           | 56.0            |

#### MEASUREMENT RESULT: " Average "

| Frequency (MHz) | CAverage<br>(dBµV) | PE  | Line | Corr.<br>(dB) | Margin<br>(dB) | Limit<br>(dBµV) |
|-----------------|--------------------|-----|------|---------------|----------------|-----------------|
| 0.450000        | 36.7               | FLO | L1   | 10.0          | 10.2           | 46.9            |
| 0.458000        | 37.1               | FLO | L1   | 10.0          | 9.7            | 46.7            |
| 0.466000        | 35.6               | FLO | L1   | 10.0          | 11.0           | 46.6            |
| 0.474000        | 35.2               | FLO | L1   | 10.0          | 11.3           | 46.4            |
| 0.482000        | 34.8               | FLO | L1   | 10.0          | 11.5           | 46.3            |
| 0.658000        | 30.3               | FLO | L1   | 10.0          | 15.7           | 46.0            |



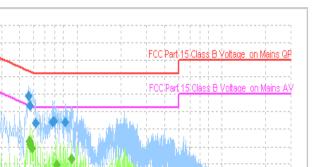


Fig. 32 AC Powerline Conducted Emission(Idle, AE2)

#### 

ESH2-Z5 Scan-FCC

### MEASUREMENT RESULT: " QuasiPeak "

60

50

20

10

Vevelin dBµV

| Frequency<br>(MHz) | QuasiPeak<br>(dBµV) | PE  | Line | Corr.<br>(dB) | Margin<br>(dB) | Limit<br>(dBµV) |
|--------------------|---------------------|-----|------|---------------|----------------|-----------------|
| 0.462000           | 49.4                | FLO | L1   | 10.0          | 7.3            | 56.7            |
| 0.474000           | 46.7                | FLO | L1   | 10.0          | 9.8            | 56.4            |
| 0.518000           | 41.6                | FLO | L1   | 10.0          | 14.4           | 56.0            |
| 0.678000           | 41.9                | FLO | L1   | 10.0          | 14.1           | 56.0            |
| 0.694000           | 42.2                | FLO | L1   | 10.0          | 13.8           | 56.0            |
| 0.830000           | 41.9                | FLO | L1   | 10.0          | 14.1           | 56.0            |

#### MEASUREMENT RESULT: " Average "

| Frequency<br>(MHz) | CAverage<br>(dBµV) | PE  | Line | Corr.<br>(dB) | Margin<br>(dB) | Limit<br>(dBµV) |
|--------------------|--------------------|-----|------|---------------|----------------|-----------------|
| 0.466000           | 36.6               | FLO | L1   | 10.0          | 10.0           | 46.6            |
| 0.474000           | 35.6               | FLO | L1   | 10.0          | 10.8           | 46.4            |
| 0.482000           | 34.8               | FLO | L1   | 10.0          | 11.5           | 46.3            |
| 0.490000           | 34.5               | FLO | L1   | 10.0          | 11.7           | 46.2            |
| 0.726000           | 29.9               | FLO | L1   | 10.0          | 16.1           | 46.0            |
| 0.918000           | 31.6               | FLO | L1   | 10.1          | 14.4           | 46.0            |



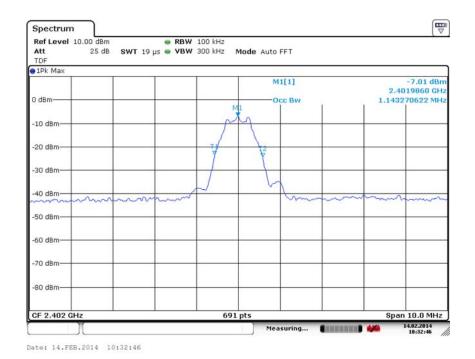


Fig. 33 Occupied Bandwidth (Ch 0)

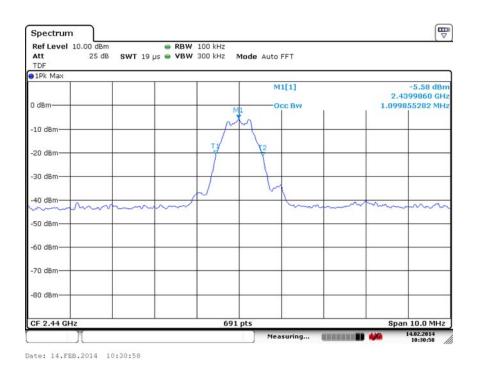


Fig. 34 Occupied Bandwidth (Ch 19)



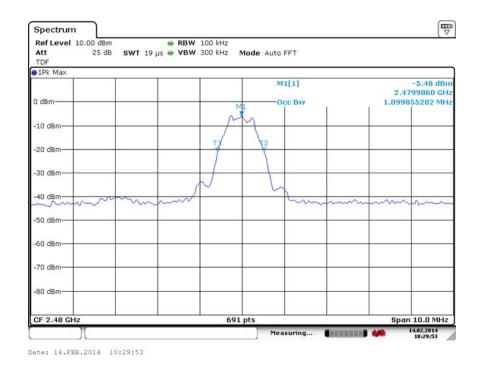


Fig. 35 Occupied Bandwidth (Ch 39)

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