



# EMI – TEST REPORT

- FCC Part 15.209 -

**Type / Model Name** : Wireless Mini Analyser – Hand Held Unit

**Product Description** : F1-100-1451-003

**Applicant** : bf1systems

**Address** : Technical Centre, Owen Road, Diss

Norfolk, England, IP22 4ER

**Manufacturer** : bf1systems

**Address** : Technical Centre, Owen Road, Diss

Norfolk, England, IP22 4ER

**Licence holder** : bf1systems

**Address** : Technical Centre, Owen Road, Diss

Norfolk, England, IP22 4ER

<b>Test Result</b> according to the standards listed in clause 1 test standards:	<b>POSITIVE</b>
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<b>Test Report No. :</b> <b>T39792-00-02HU</b>	16. July 2015 Date of issue
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Deutsche  
Akkreditierungsstelle  
D-PL-12030-01-01  
D-PL-12030-01-02

The test report merely corresponds to the test sample.  
It is not permitted to copy extracts of these test results  
without the written permission of the test laboratory.

# Contents

<b>1</b>	<b><u>TEST STANDARDS</u></b>	<b>3</b>
<b>2</b>	<b><u>SUMMARY</u></b>	<b>4</b>
<b>3</b>	<b><u>EQUIPMENT UNDER TEST</u></b>	<b>5</b>
3.1	Photo documentation of the EUT	5
3.2	Power supply system utilised	5
3.3	Short description of the Equipment under Test (EUT)	5
<b>4</b>	<b><u>TEST ENVIRONMENT</u></b>	<b>6</b>
4.1	Address of the test laboratory	6
4.2	Environmental conditions	6
4.3	Statement of the measurement uncertainty	6
4.4	Measurement Protocol for FCC, VCCI and AUSTEL	7
<b>5</b>	<b><u>TEST CONDITIONS AND RESULTS</u></b>	<b>8</b>
5.1	Conducted emissions	8
5.2	Field strength of the fundamental wave	9
5.3	Spurious emissions (magnetic field) 9 kHz – 30 MHz	11
5.4	Emission Bandwidth	13
<b>6</b>	<b><u>USED TEST EQUIPMENT AND ACCESSORIES</u></b>	<b>15</b>

## 1 TEST STANDARDS

The tests were performed according to following standards:

### **FCC Rules and Regulations Part 15, Subpart A - General (October, 2014)**

Part 15, Subpart A, Section 15.31	Measurement standards
Part 15, Subpart A, Section 15.33	Frequency range of radiated measurements
Part 15, Subpart A, Section 15.35	Measurement detector functions and bandwidths

### **FCC Rules and Regulations Part 15, Subpart C - Intentional Radiators (October, 2014)**

Part 15, Subpart C, Section 15.203	Antenna requirement
Part 15, Subpart C, Section 15.204	External radio frequency power amplifiers and antenna modifications
Part 15, Subpart C, Section 15.205	Restricted bands of operation
Part 15, Subpart C, Section 15.209	Radiated emission limits, general requirements

ANSI C63.4: 2009	Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.
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ANSI C95.1:1992	IEEE Standard for Safety Levels with respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz
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CISPR 16-4-2: 2003	Uncertainty in EMC measurement
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## 2 SUMMARY

### GENERAL REMARKS:

The carrier frequency is 125.0 kHz

To set the EuT in the different operation modes, Hyper Terminal Programm on a LapTop was used.

### FINAL ASSESSMENT:

The equipment under test **fulfills** the EMI requirements cited in clause 1 test standards.

Date of receipt of test sample : acc. to storage records

Testing commenced on : 02. July 2015

Testing concluded on : 15. July 2015

Checked by:

Tested by:

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Gegenfurtner Klaus  
Teamleader Radio

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Huber Markus

### **3 EQUIPMENT UNDER TEST**

### 3.1 Photo documentation of the EUT – Detailed photos see Attachment A

### 3.2 Power supply system utilised

Power supply voltage: : 9.0 V / DC (Battery)

### 3.3 Short description of the Equipment under Test (EUT)

The EuT is a hand held unit (Wireless mini analyser) used for a tyre pressure monitoring system.

Number of tested samples: 1  
Serial number: 398

### EUT operation mode:

The equipment under test was operated during the measurement under the following conditions:

- Tx mode at 125 kHz

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### EUT configuration:

**The following peripheral devices and interface cables were connected during the measurements:**

- Laptop Model : Supplied from CSA Group Bayern GmbH

- Model :

- Model :

- customer specific cables

- unscreened power cables

## **4 TEST ENVIRONMENT**

### **4.1 Address of the test laboratory**

**CSA Group Bayern GmbH  
Ohmstrasse 1-4  
94342 STRASSKIRCHEN  
GERMANY**

### **4.2 Statement regarding the usage of logos in test reports**

The accreditation and notification body logos displayed in this test report are only valid for standards listed in the accreditation or notification scope of CSA Group Bayern GmbH.

### **4.3 Environmental conditions**

During the measurement the environmental conditions were within the listed ranges:

Temperature: 15-35 ° C

Humidity: 30-60 %

Atmospheric pressure: 86-106 kPa

### **4.4 Statement of the measurement uncertainty**

The data and results referenced in this document are true and accurate. It is noted that the expanded measurement uncertainty corresponds to the measurement results from the standard measurement uncertainty multiplied by the coverage factor  $k = 2$ . The true value is located in the corresponding interval with a probability of 95 %. The measurement uncertainty was calculated for all measurements listed in this test report acc. to CISPR 16-4-2 / 11.2003 „Uncertainties, statistics and limit modelling – Uncertainty in EMC measurements“ and is documented in the quality system acc. to DIN EN ISO/IEC 17025. For all measurements shown in this report, the measurement uncertainty of the test laboratory, CSA Group Bayern GmbH, is below the measurement uncertainty as defined by CISPR. Therefore, no special measures must be taken into consideration with regard to the limits according to CISPR. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

## 4.5 Measurement Protocol for FCC, VCCI and AUSTEL

### 4.5.1 GENERAL INFORMATION

#### 4.5.1.1 Test Methodology

Conducted and radiated disturbance testing is performed according to the procedures set out by the International Special Committee on Radio Interference (CISPR) Publication 22, European Standard EN 55022 as shown under section 1 of this report.

The test methods used comply with CISPR Publication 22, EN 55022 - "Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement" and with ANSI C63.4 - "Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz."

In compliance with 47 CFR Part 15 Subpart A, Section 15.38 testing for FCC compliance may be achieved by following the procedures set out in ANSI C63.4 and applying the CISPR 22 limits.

#### 4.5.1.2 Justification

The Equipment Under Test (EUT) is configured in a typical user arrangement in accordance with the manufacturer's instructions. A cable is connected to each available port and either terminated with a peripheral using the appropriate impedance characteristic or left unterminated. Where appropriate, cables are manually manipulated with respect to each other thus obtaining maximum disturbances from the unit.

## 5 TEST CONDITIONS AND RESULTS

### 5.1 Conducted emissions

For test instruments and accessories used see section 6 Part A 4.

#### 5.1.1 Description of the test location

#### 5.1.2 Photo documentation of the test set-up

#### 5.1.3 Applicable standard

According to FCC Part 15, Section 15.207(a):

Except as shown in paragraphs (b) and (c) of this Section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table.

Frequency of Emission (MHz)	Conducted Limit (dBμV)	
	Quasi-peak	Average
0.15-0.5	66 to 56 *	56 to 46 *
0.5-5	56	46
5-30	60	50

\* Decreases with the logarithm of the frequency

#### 5.1.4 Test result

Frequency range:

Min. limit margin

**Remarks:** The measurement is not applicable. The EuT is battery powered.

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## 5.2 Field strength of the fundamental wave

For test instruments and accessories used see section 6 Part CPR 1.

### 5.2.1 Description of the test location

Test location: OATS1

Test distance: 3 metres

### 5.2.2 Photo documentation of the test set-up



### 5.2.1 Applicable standard

According to FCC Part 15C, Section 15.209:

The emissions from intentional radiators shall not exceed the effective field strength limits.

### 5.2.2 Description of Measurement

The spurious emissions of the EUT have to be measured at an open area test site in the frequency range from 9 kHz to 1000 MHz using a tuned EMI receiver. The set up of the equipment under test will be in accordance with ANSI C63.4. The measurement has been performed at 3 m. The results have been compared to the limits defined at 30 m or 300 m distances according to FCC Part 15C, Section 15.31(f)(2) using an inverse linear distance extrapolation factor of 40 dB/decade. The final measurement has been performed with the EMI receiver using Quasi peak detector except for the frequency bands 9 kHz to 90 kHz and 110 to 490 kHz where an average detector will be used, according to Section 15.209(d).

The resolution bandwidth during the measurement is as follows:

9 kHz – 150 kHz: RBW: 200 Hz

150 kHz – 30 MHz: RBW: 9 kHz

Example:

Frequency (MHz)	Level (dBμV)	+	Factor (dB)	=	Level dB(μV/m)	-	Limit dB(μV/m)	=	Delta (dB)
1.705	5	+	20	=	25	-	30	=	-5

### 5.2.3 Test result

Measurement distance: 3 m

Frequency (MHz)	Level PK (dBμV)	Level AV (dBμV)	Level QP (dBμV)	Band- width (kHz)	Correct. factor (dB)	Corrected Level PK dB(μV/m)	Corrected Level AV dB(μV/m)	Corrected Level QP dB(μV/m)	Limit AV dB(μV/m)	Delta (dB)
0.125	55.4	30.8	42.1	0.2	20	75.4	50.8	62.1	105.0	-54.2

Calculated value at distance: 300 m

Frequency (MHz)	Level PK (dBμV)	Level AV (dBμV)	Level QP (dBμV)	Band- width (kHz)	Correct. factor (dB)	Corrected Level PK dB(μV/m)	Corrected Level AV dB(μV/m)	Corrected Level QP dB(μV/m)	Limit AV dB(μV/m)	Delta (dB)
0.125	-24.6	-49.2	-37.9	0.2	20	-4.6	-29.2	-17.9	25.0	-54.2

Limit according to FCC Part 15C, Section 15.209(a):

Frequency (MHz)	Field strength of fundamental wave (μV/m)	Field strength of fundamental wave dB(μV/m)	Measurement distance (metres)
0.009-0.490	2400/F(kHz)	--	300
0.490-1.705	24000/F (kHz)	--	30
1.705-30.0	30	29.5	30

The requirements are **FULFILLED**.

Remarks:

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### 5.3 Spurious emissions (magnetic field) 9 kHz – 30 MHz

For test instruments and accessories used see section 6 Part SER 1.

#### 5.3.1 Description of the test location

Test location: OATS1

Test distance: 3 metres

#### 5.3.2 Photo documentation of the test set-up



### 5.3.3 Applicable standard

According to FCC Part 15C, Section 15.209:

The emissions from intentional radiators shall not exceed the effective field strength limits.

### 5.3.4 Description of Measurement

The spurious emissions of the EUT have to be measured at an open area test site in the frequency range from 9 kHz to 1000 MHz using a tuned EMI receiver. The set up of the equipment under test will be in accordance with ANSI C63.4. The measurement has been performed at 3 m. The results have been compared to the limits defined at 30 m or 300 m distances according to FCC Part 15C, Section 15.31(f)(2) using an inverse linear distance extrapolation factor of 40 dB/decade. The final measurement has been performed with the EMI receiver using Quasi peak detector except for the frequency bands 9 kHz to 90 kHz and 110 to 490 kHz where an average detector will be used, according to Section 15.209(d).

The resolution bandwidth during the measurement is as follows:

9 kHz – 150 kHz: RBW: 200 Hz

150 kHz – 30 MHz: RBW: 9 kHz

### 5.3.5 Test result

Measurement distance: 3 m

Frequency (MHz)	Level PK (dBμV)	Level AV (dBμV)	Level QP (dBμV)	Band- width (kHz)	Correct. factor (dB)	Corrected Level PK dB(μV/m)	Corrected Level AV dB(μV/m)	Corrected Level QP dB(μV/m)	Limit AV dB(μV/m)	Delta (dB)
0.375	37.5	5.4	26.8	9	20	57.5	25.4	46.8	96.1	-70.7
0.625	31.8	0.7	19.5	9	20	51.8	20.7	39.8	71.7	-51.0

Calculated value at distance: 300m

Frequency (MHz)	Level PK (dBμV)	Level AV (dBμV)	Level QP (dBμV)	Band- width (kHz)	Correct. factor (dB)	Corrected Level PK dB(μV/m)	Corrected Level AV dB(μV/m)	Corrected Level QP dB(μV/m)	Limit AV dB(μV/m)	Delta (dB)
0.375	-42.5	-74.6	-53.2	9	20	-22.5	-54.6	-33.2	16.1	-70.7

Values at distance: 30m

Frequency (MHz)	Level PK (dBμV)	Level AV (dBμV)	Level QP (dBμV)	Band- width (kHz)	Correct. factor (dB)	Corrected Level PK dB(μV/m)	Corrected Level AV dB(μV/m)	Corrected Level QP dB(μV/m)	Limit dB(μV/m)	Delta (dB)
0.625	-8.2	-39.3	-20.5	9	20	11.8	-19.3	-0.5	31.7	-51.0
1.705 – 30.0				9	20				29.5	> 40

Limit according to FCC Part 15 Subpart 15.209(a):

Frequency (MHz)	Field strength of spurious emissions (μV/m)	Field strength of spurious emissions dB(μV/m)	Measurement distance (metres)
<b>0.009-0.490</b>	<b>2400/F(kHz)</b>	--	<b>300</b>
0.490-1.705	24000/F (kHz)	--	30
1.705-30.0	30	29.5	30

The requirements are **FULFILLED**.

**Remarks:** All other unwanted emissions in the frequency range from 9 kHz to 30 MHz were

below < -10.5 dBμV/m.



## 5.4 Emission Bandwidth

For test instruments and accessories used see section 6 Part MB.

### 5.4.1 Description of the test location

Test location: AREA4

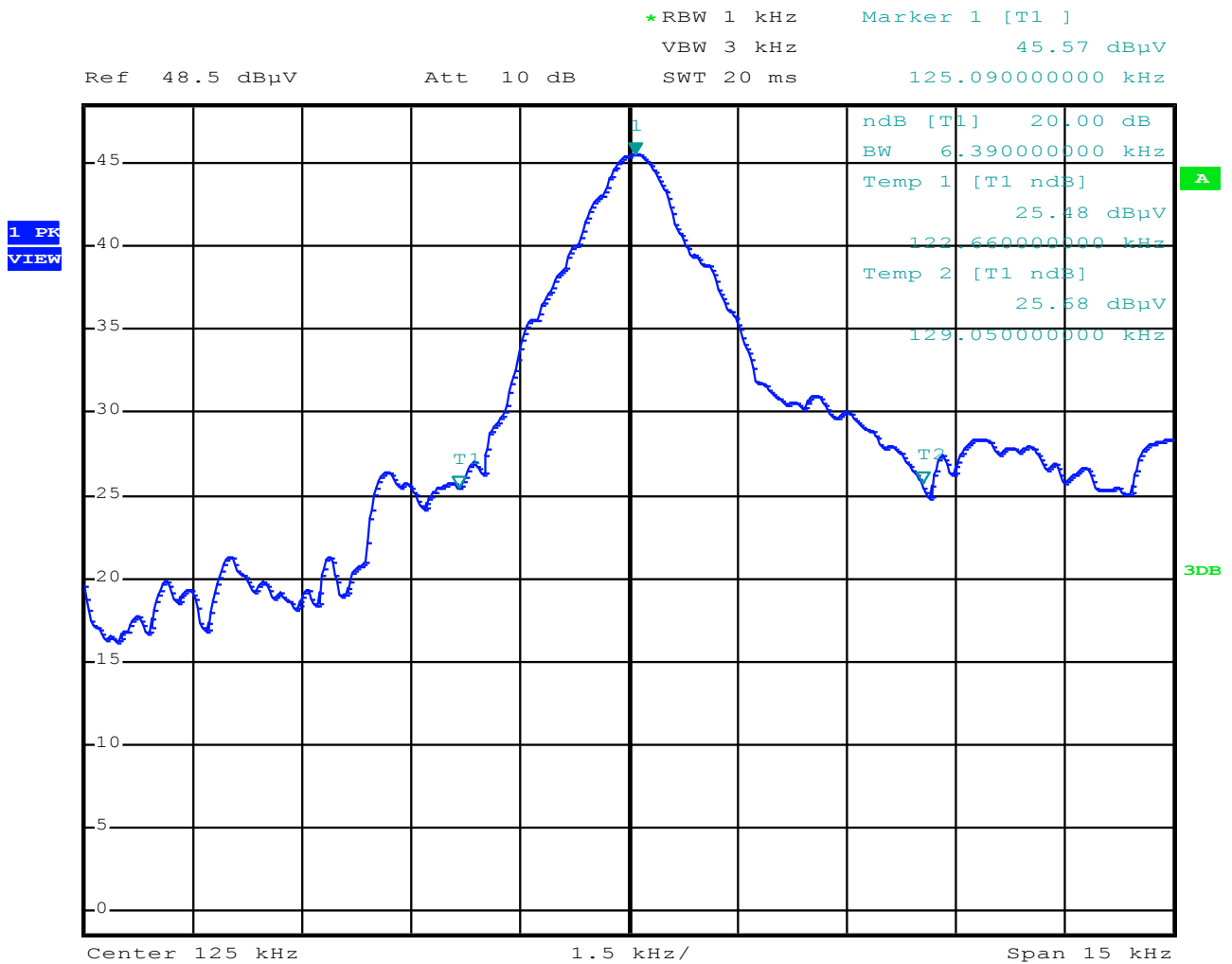
### 5.4.2 Photo documentation of the test set-up



Fundamental [kHz] See Plot 1	20dB Bandwidth F1	20dB Bandwidth F2	Measured Bandwidth [kHz]
125.00	122.66	129.05	6.39

### 5.4.3 Test protocol

#### Emission Bandwidth plots



## **6 USED TEST EQUIPMENT AND ACCESSORIES**

All test instruments used are calibrated and verified regularly. The calibration history is available on request.

Test ID	Model Type	Equipment No.	Next Calib.	Last Calib.	Next Verif.	Last Verif.
CPR 1	FMZB 1516	01-02/24-01-018			19/01/2016	19/01/2015
	ESCI	02-02/03-05-004	12/11/2015	12/11/2014		
	KK-EF393-21N-16	02-02/50-05-033				
	NW-2000-NB	02-02/50-05-113				
	KK-SD_7/8-2X21N-33,0M	02-02/50-15-028				
MB	FSP 30	02-02/11-05-001	20/10/2015	20/10/2014		
	METRAHIT WORLD	02-02/32-15-001	26/11/2015	26/11/2014		
SER 1	FMZB 1516	01-02/24-01-018			19/01/2016	19/01/2015
	ESCI	02-02/03-05-004	12/11/2015	12/11/2014		
	KK-EF393-21N-16	02-02/50-05-033				
	NW-2000-NB	02-02/50-05-113				
	KK-SD_7/8-2X21N-33,0M	02-02/50-15-028				