

FCC ID: 2AATH-CC300RFIDA

# EMI - TEST REPORT

- FCC Part 15.225 -

|                                         |                                 |
|-----------------------------------------|---------------------------------|
| <b>Test Report No. :</b> T37522-00-02JP | 25. March 2014<br>Date of issue |
|-----------------------------------------|---------------------------------|

**Type / Model Name** : CC300

**Product Description** : Industrial HMI with RFID

**Applicant** : Kontron Europe GmbH

**Address** : Sudetenstr. 7

D-87600 Kaufbeuren

**Manufacturer** : Kontron Europe GmbH

**Address** : Sudetenstr. 7

D-87600 Kaufbeuren

**Licence holder** : Kontron Europe GmbH

**Address** : Sudetenstr. 7

D-87600 Kaufbeuren

|                                                                                  |                 |
|----------------------------------------------------------------------------------|-----------------|
| <b>Test Result</b> according to the standards listed in clause 1 test standards: | <b>POSITIVE</b> |
|----------------------------------------------------------------------------------|-----------------|



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><u>3</u></b>  |
| <b>2</b> | <b><u>SUMMARY</u></b>                               | <b><u>4</u></b>  |
| <b>3</b> | <b><u>EQUIPMENT UNDER TEST</u></b>                  | <b><u>5</u></b>  |
| 3.1      | Power supply system utilised                        | 5                |
| 3.2      | Short description of the equipment under test (EUT) | 5                |
| <b>4</b> | <b><u>TEST ENVIRONMENT</u></b>                      | <b><u>6</u></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><u>9</u></b>  |
| 5.1      | Conducted emissions                                 | 9                |
| 5.2      | Field strength of the fundamental wave              | 12               |
| 5.3      | Spurious emissions                                  | 14               |
| 5.4      | Frequency tolerance                                 | 16               |
| 5.5      | 20 dB Bandwidth                                     | 18               |
| 5.6      | Transmitter spectrum mask                           | 20               |
| <b>6</b> | <b><u>USED TEST EQUIPMENT AND ACCESSORIES</u></b>   | <b><u>22</u></b> |

## 1 TEST STANDARDS

The tests were performed according to following standards:

### **FCC Rules and Regulations Part 15, Subpart A - General (October, 2013)**

|                                   |                                               |
|-----------------------------------|-----------------------------------------------|
| 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 |
| Part 15, Subpart A, Section 15.38 | Incorporation by reference                    |

### **FCC Rules and Regulations Part 15, Subpart C - Intentional Radiators (October, 2013)**

|                                    |                                                                     |
|------------------------------------|---------------------------------------------------------------------|
| 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 15.207 | Conducted limits                                                    |
| Part 15, Subpart C, Section 15.209 | Radiated emission limits, general requirements                      |
| Part 15, Subpart C, Section 15.215 | Additional provisions to the general radiated emission limitations  |
| Part 15, Subpart C, Section 15.225 | Operation within the band 13.110 - 14.010 MHz                       |

### **FCC Rules and Regulations Part 1, Subpart I - Procedures Implementing the National Environmental Policy Act of 1969**

|                                   |                                                               |
|-----------------------------------|---------------------------------------------------------------|
| Part 1, Subpart I, Section 1.1310 | Radiofrequency radiation exposure limits                      |
| Part 1, Subpart 2, Section 2.1093 | Radiofrequency radiation exposure evaluation: portable device |

### **OET Bulletin 65, 65A, 65B, 65C Edition 97-01, August 1997 – Evaluating Compliance with FCC Guidelines for Human Exposure to Radio Frequency Electromagnetic Fields.**

|                    |                                                                                                                                       |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------|
| ANSI C63.4: 2003   | Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz. |
| ANSI C95.1: 2005   | IEEE Standard for Safety Levels with respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz            |
| CISPR 16-4-2: 2003 | Uncertainty in EMC measurement                                                                                                        |

## 2 SUMMARY

### GENERAL REMARKS:

None

### 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 : 27 November 2013

Testing concluded on : 03 February 2014

Checked by:

Tested by:

\_\_\_\_\_  
Klaus Gegenfurtner

\_\_\_\_\_  
Jürgen Pessinger

### 3 EQUIPMENT UNDER TEST

#### 3.1 Power supply system utilised

Power supply voltage : 24V DC

#### 3.2 Short description of the equipment under test (EUT)

The EuT is operator panel (Human Machine Interface) designed for demanding industrial applications. The EuT incorporates a RFID reader for contactless identification of the user.

Number of tested samples: 1  
Serial number: 341634001

#### EUT operation mode:

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

- tag reading mode at 13.56MHz

---

#### EUT configuration:

(The CDF filled by the applicant can be viewed at the test laboratory.)

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

|                      |                                            |
|----------------------|--------------------------------------------|
| - RFID Tag           | Model : Supplied by client                 |
| - AC/DC Power Supply | Model : FSP Group Inc, Model: FSP150-AAAN1 |

## 4 TEST ENVIRONMENT

### 4.1 Address of the test laboratory

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

### 4.2 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

### 4.3 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.

**FCC ID: 2AATH-CC300RFIDA****4.4 Measurement Protocol for FCC, VCCI and AUSTEL****4.4.1 GENERAL INFORMATION****4.4.1.1 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.

**4.4.1.2 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.

**4.4.2 DETAILS OF TEST PROCEDURES****General Standard information**

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.

**4.4.3 Conducted emission****Description of measurement**

The final level, expressed in dB $\mu$ V, is arrived at by taking the reading directly from the EMI receiver. This level is compared directly to the FCC limit or to the CISPR limit.

To convert between dB $\mu$ V and  $\mu$ V, the following conversions apply:

$$\begin{aligned} \text{dB}\mu\text{V} &= 20 \cdot \log(\mu\text{V}); \\ \mu\text{V} &= 10^{(\text{dB}\mu\text{V}/20)}; \end{aligned}$$

Conducted emissions on the 50 Hz and/or 60 Hz power interface of the EUT are measured in the frequency range of 150 kHz to 30 MHz. The measurements are performed using a receiver, which has CISPR characteristic bandwidth and quasi-peak detection and a Line Impedance Stabilization Network (LISN) with 50 $\Omega$ /50  $\mu$ H (CISPR 16) characteristics. Table top equipment is placed on a non-conducting table 80 centimetres above the floor and is positioned 40 centimetres from the vertical ground plane (wall) of the screen room. If the minimum limit margin of a peak mode measurement appears to be less than 20 dB, the emissions are remeasured using a tuned receiver with quasi-peak and average detection and recorded on the data sheets.

**4.4.4 Radiated emission (electrical field 30 MHz - 1 GHz)****Description of measurement**

Spurious emissions from the EUT are measured in the frequency range of 30 MHz to 1000 MHz using a tuned receiver and appropriate broadband linearly polarised antennas. Measurements between 30 MHz and 1000 MHz are made with 120 kHz/6 dB bandwidth and quasi-peak detection. Table top equipment is placed on a 1.0 X 1.5 m non-conducting table 80 centimetres above the ground plane. Floor standing equipment is placed directly on the

## FCC ID: 2AATH-CC300RFIDA

turntable/ground plane. The setup of the equipment under test is established in accordance with ANSI C63.4. The interface cables that are closer than 40 centimetres to the ground plane are bundled in the center in a serpentine fashion so that they are at least 40 centimetres from the ground plane. Cables to simulators/testers (if used in this test) are routed through the center of the table and to a screened room located outside the test area. The antenna is positioned 3, 10 or 30 meters horizontally from the EUT and is repeated vertically. To locate maximum emissions from the test sample the antenna is varied in height from 1 to 4 meters and the EUT is rotated 360 degrees.

The final level in dB $\mu$ V/m is calculated by taking the reading from the EMI receiver (Level dB $\mu$ V) and adding the correction factors and cable loss factor (dB). The FCC or CISPR limit is subtracted from this result in order to provide the limit margin listed in the measurement protocol.

The resolution bandwidth setting:

30 MHz – 1000 MHz:              RBW: 120 kHz

Example:

|           |              |   |        |   |                |   |                |        |
|-----------|--------------|---|--------|---|----------------|---|----------------|--------|
| Frequency | Level        | + | Factor | = | Level          | - | CISPR Limit    | =      |
| Delta     |              |   |        |   |                |   |                |        |
| (MHz)     | (dB $\mu$ V) |   | (dB)   |   | (dB $\mu$ V/m) |   | (dB $\mu$ V/m) | (dB)   |
| 719.0     | 75.0         | + | 32.6   | = | 107.6          | - | 110.0          | = -2.4 |

### 4.4.5 Radiated emission (electrical field 1 GHz - 40 GHz)

Radiated emissions from the EUT are measured in the frequency range 1 GHz up to the maximum frequency as specified in 47 CFR Part 15, Subpart A, Section 15.33, using a spectrum analyser and appropriate linearly polarized antennas. Table top equipment is placed on a 1.0 X 1.5 metre non-conducting table 80 centimetres above the ground plane. Floor standing equipment is placed directly on the turntable/ground plane. The setup of the equipment under test is following set out in ANSI C63.4. The interface cables that are closer than 40 centimetres to the ground plane are bundled in the center in a serpentine fashion so they are at least 40 centimetres from the ground plane. Cables to simulators/testers (if used in this test) are routed through the center of the table and to a screened room located outside the test area. Measurements are made in both the horizontal and vertical polarization planes in a fully anechoic room using a spectrum analyser set to max peak detector function and a resolution 1 MHz and video bandwidth 3 MHz for peak and 10 Hz for average measurement. The conditions determined as worst case will then be used for the final measurements. When the EUT is larger than the beam width of the measuring antenna it will be moved over the surface for the four sides of the equipment. Where appropriate, the test distance may be reduced in order to detect emissions under better uncertainty and are calculated at the specified test distance.

## **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**

Test location:                      Shielded Room SK4

#### **5.1.2 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 given limits.

#### **5.1.3 Description of Measurement**

The measurements are performed following the procedures set out in ANSI C63.4 described under item 4.4.3. If the minimum limit margin appears to be less than 20 dB with a peak mode measurement, the emissions are remeasured using a tuned receiver with quasi-peak and average detection and recorded on the data sheets.

#### **5.1.4 Test result**

Frequency range:                      0.15 MHz - 30 MHz

Min. limit margin                      2.8 dB at 0.1635 MHz

Limit according to FCC Part 15, Section 15.207(a):

| Frequency of Emission<br>(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

The requirements are **FULFILLED**.

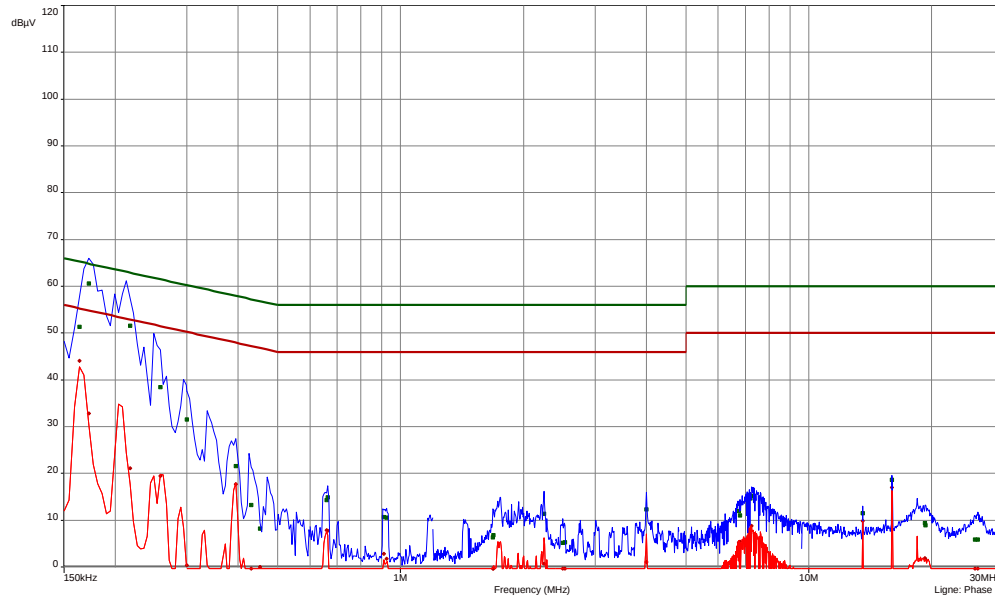
**Remarks:**                      For detailed test result please refer to following test protocols. The measurement was made at  
                                          AC input of the used AC/DC power supply.

## FCC ID: 2AATH-CC300RFIDA

### 5.1.5 Test protocol

Test point L1  
 Operation mode: tag reading mode at 13.56MHz  
 Remarks: none

Result: PASS

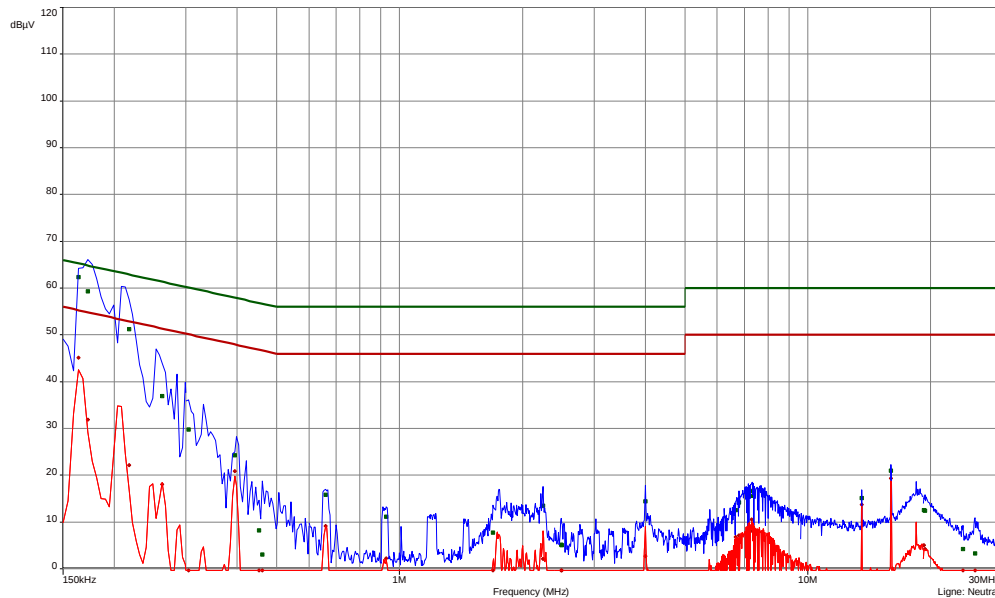


| freq<br>MHz | QP<br>dB(μV) | margin<br>dB | limit<br>dB | AV<br>dB(μV) | margin<br>dB | limit<br>dB | line    |
|-------------|--------------|--------------|-------------|--------------|--------------|-------------|---------|
| 0.1635      | 51.36        | 13.92        | 65.28       | 44.07        | 11.21        | 55.28       | Phase 1 |
| 0.1725      | 60.6         | 4.24         | 64.84       | 32.85        | 21.99        | 54.84       | Phase 1 |
| 0.2175      | 51.52        | 11.39        | 62.91       | 21.1         | 31.81        | 52.91       | Phase 1 |
| 0.258       | 38.49        | 23           | 61.5        | 19.44        | 32.05        | 51.5        | Phase 1 |
| 0.3         | 31.58        | 28.66        | 60.24       | 0.41         | 49.83        | 50.24       | Phase 1 |
| 0.3945      | 21.62        | 36.35        | 57.97       | 17.68        | 30.29        | 47.97       | Phase 1 |
| 0.4305      | 13.24        | 44           | 57.24       | -6.93        | 54.17        | 47.24       | Phase 1 |
| 0.453       | 8.24         | 48.58        | 56.82       | 0.01         | 46.81        | 46.82       | Phase 1 |
| 0.6585      | 14.32        | 41.68        | 56          | 7.9          | 38.1         | 46          | Phase 1 |
| 0.663       | 14.9         | 41.1         | 56          | 7.76         | 38.24        | 46          | Phase 1 |
| 0.9105      | 10.65        | 45.35        | 56          | 2.83         | 43.17        | 46          | Phase 1 |
| 0.924       | 10.52        | 45.48        | 56          | 1.72         | 44.28        | 46          | Phase 1 |
| 1.686       | 6.38         | 49.62        | 56          | -2.15        | 48.15        | 46          | Phase 1 |
| 1.6905      | 6.82         | 49.18        | 56          | -3.03        | 49.03        | 46          | Phase 1 |
| 2.2485      | 11.36        | 44.64        | 56          | 0.71         | 45.29        | 46          | Phase 1 |
| 2.4945      | 5.14         | 50.86        | 56          | -4.51        | 50.51        | 46          | Phase 1 |
| 2.526       | 5.24         | 50.76        | 56          | -3.39        | 49.39        | 46          | Phase 1 |
| 3.9975      | 12.29        | 43.71        | 56          | 1.02         | 44.98        | 46          | Phase 1 |
| 6.735       | 11.95        | 48.05        | 60          | 5.31         | 44.69        | 50          | Phase 1 |
| 6.7755      | 11.07        | 48.93        | 60          | 5.43         | 44.57        | 50          | Phase 1 |
| 7.1895      | 14.71        | 45.29        | 60          | 7.23         | 42.77        | 50          | Phase 1 |
| 7.23        | 15.21        | 44.79        | 60          | 8.76         | 41.24        | 50          | Phase 1 |
| 13.56       | 11.54        | 48.46        | 60          | 9.84         | 40.16        | 50          | Phase 1 |
| 15.999      | 18.63        | 41.37        | 60          | 16.97        | 33.03        | 50          | Phase 1 |
| 19.2585     | 9.4          | 50.6         | 60          | 1.92         | 48.08        | 50          | Phase 1 |
| 19.299      | 8.9          | 51.1         | 60          | 1.63         | 48.37        | 50          | Phase 1 |
| 25.5        | 5.89         | 54.11        | 60          | -0.43        | 50.43        | 50          | Phase 1 |
| 25.95       | 5.89         | 54.11        | 60          | -1.08        | 51.08        | 50          | Phase 1 |

## FCC ID: 2AATH-CC300RFIDA

Test point                      N  
 Operation mode:            tag reading mode at 13.56MHz  
 Remarks:                    none

Result: PASS



| freq<br>MHz | QP<br>dB(μV) | margin<br>dB | limit<br>dB | AV<br>dB(μV) | margin<br>dB | limit<br>dB | line    |
|-------------|--------------|--------------|-------------|--------------|--------------|-------------|---------|
| 0.1635      | 62.41        | 2.87         | 65.28       | 45.12        | 10.16        | 55.28       | Neutral |
| 0.1725      | 59.34        | 5.5          | 64.84       | 31.87        | 22.97        | 54.84       | Neutral |
| 0.2175      | 51.22        | 11.69        | 62.91       | 22.12        | 30.79        | 52.91       | Neutral |
| 0.2625      | 36.88        | 24.47        | 61.35       | 18.05        | 33.3         | 51.35       | Neutral |
| 0.3045      | 29.83        | 30.29        | 60.12       | -0.45        | 50.57        | 50.12       | Neutral |
| 0.3945      | 24.32        | 33.65        | 57.97       | 20.86        | 27.11        | 47.97       | Neutral |
| 0.453       | 8.2          | 48.62        | 56.82       | -0.61        | 47.43        | 46.82       | Neutral |
| 0.462       | 3.1          | 53.55        | 56.66       | -7.37        | 54.02        | 46.66       | Neutral |
| 0.6585      | 15.88        | 40.12        | 56          | 9.12         | 36.88        | 46          | Neutral |
| 0.9285      | 11.14        | 44.86        | 56          | 2.22         | 43.78        | 46          | Neutral |
| 1.695       | 7.7          | 48.3         | 56          | -1.82        | 47.82        | 46          | Neutral |
| 2.2485      | 13.44        | 42.56        | 56          | 2.13         | 43.87        | 46          | Neutral |
| 2.49        | 5.2          | 50.8         | 56          | -3.72        | 49.72        | 46          | Neutral |
| 2.4945      | 5.1          | 50.9         | 56          | -3.9         | 49.9         | 46          | Neutral |
| 3.9975      | 14.47        | 41.53        | 56          | 2.76         | 43.24        | 46          | Neutral |
| 6.654       | 12.54        | 47.46        | 60          | 6.82         | 43.18        | 50          | Neutral |
| 6.7755      | 14.19        | 45.81        | 60          | 7.2          | 42.8         | 50          | Neutral |
| 7.275       | 16.63        | 43.37        | 60          | 10.5         | 39.5         | 50          | Neutral |
| 7.311       | 15.63        | 44.37        | 60          | 8.04         | 41.96        | 50          | Neutral |
| 13.56       | 15.16        | 44.84        | 60          | 13.66        | 36.34        | 50          | Neutral |
| 15.999      | 20.97        | 39.03        | 60          | 19.35        | 30.65        | 50          | Neutral |
| 19.218      | 12.6         | 47.4         | 60          | 5.11         | 44.89        | 50          | Neutral |
| 19.3395     | 12.44        | 47.56        | 60          | 4.19         | 45.81        | 50          | Neutral |
| 24.006      | 4.28         | 55.72        | 60          | -0.33        | 50.33        | 50          | Neutral |
| 25.6755     | 3.24         | 56.76        | 60          | -5.52        | 55.52        | 50          | Neutral |

## FCC ID: 2AATH-CC300RFIDA

### 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: OATS3

Test distance: 3 metres

#### 5.2.2 Applicable standard

According to FCC Part 15, Section 15.225(a):

The field strength of any emission within the band 13.553 – 13.567 MHz shall not exceed the limit at 30 m.

#### 5.2.3 Description of Measurement

The magnetic field strength from the EUT will be measured at an open area test site in the frequency range of 9 kHz to 30 MHz using a tuned receiver and a shielded loop antenna. The set up of the equipment under test will be in accordance to ANSI C63.4. In the case where larger measuring distances are required the results will extrapolated based on the values measured on the closer distances according to FCC Part 15C, Section 15.31(f)(2). The final measurement will be performed with an EMI receiver set to 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 FCC Part 15C, Section 15.209(d).

The resolution bandwidth during the measurement is as follows:

150 kHz – 30 MHz: RBW: 9 kHz

Example:

| Frequency<br>(MHz) | Level<br>(dBμV) | + | Corr. factor<br>(dB/m) | = | Level<br>dB(μV/m) | - | Limit<br>dB(μV/m) | = | Delta<br>(dB) |
|--------------------|-----------------|---|------------------------|---|-------------------|---|-------------------|---|---------------|
| 1.705              | 5               | + | 20                     | = | 25                | - | 30                | = | -5            |

#### 5.2.4 Test result

Measurement result at 3m measurement distance

| Frequency<br>(MHz) | Level<br>(dBμV) | Corr. factor<br>(dB) | Corr. level<br>dB(μV/m) |
|--------------------|-----------------|----------------------|-------------------------|
| 13,56              | 26,4            | 20,0                 | 46,4                    |

Extrapolated values to a distance of 30m

| Frequency<br>(MHz) | Level<br>(dBμV) | Corr. factor<br>(dB) | Corr. level<br>dB(μV/m) | Limit<br>dB(μV/m) | Delta<br>(dB) |
|--------------------|-----------------|----------------------|-------------------------|-------------------|---------------|
| 13,56              | -13,6           | 20                   | 6,4                     | 84                | -77,6         |

**FCC ID: 2AATH-CC300RFIDA**

Limit according to FCC Part 15, Section 15.225(a):

| Frequency<br>(MHz) | Field strength of fundamental wave |                                   | Measurement distance |
|--------------------|------------------------------------|-----------------------------------|----------------------|
|                    | ( $\mu\text{V}/\text{m}$ )         | $\text{dB}(\mu\text{V}/\text{m})$ | (metres)             |
| 13.553 - 13.567    | 15848                              | 84                                | 30                   |

The requirements are **FULFILLED**.

**Remarks:** none

\_\_\_\_\_

**FCC ID: 2AATH-CC300RFIDA****5.3 Spurious emissions**

For test instruments and accessories used see section 6 Part **SER 1**, **SER 2**, **SER 3**.

**5.3.1 Description of the test location**

Test location: OATS3  
Test location: A2  
  
Test distance: 3 metres

**5.3.2 Applicable standard**

According to FCC Part 15C, Section 15.209:

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

**5.3.3 Description of Measurement**

The radiated emissions from the EUT are measured in the frequency range of 9 kHz to 1000 MHz using a tuned receiver and appropriate broadband linearly polarized antennas. The set up of the EUT will be in accordance to ANSI C63.4. In the frequency range above 1 GHz a spectrum analyser is used with appropriate linear polarized antennas. If the emission level in peak mode complies with the average limit then testing will be stopped and peak values of the EUT will be reported, otherwise, the emission will be measured in average mode again and reported. During the test, the EUT was set into continuous transmitting mode.

The resolution bandwidth during the measurement is as follows:

|                    |      |         |
|--------------------|------|---------|
| 9 kHz – 150 kHz:   | RBW: | 200 Hz  |
| 150 kHz – 30 MHz:  | RBW: | 9 kHz   |
| 30 MHz – 1000 MHz: | RBW: | 120 kHz |
| 1000 MHz – 40 GHz  | RBW: | 1 MHz   |

Example:

|                    |                       |   |                |   |                         |   |                         |   |               |
|--------------------|-----------------------|---|----------------|---|-------------------------|---|-------------------------|---|---------------|
| Frequency<br>(MHz) | Level<br>(dB $\mu$ V) | + | Factor<br>(dB) | = | Level<br>dB( $\mu$ V/m) | - | Limit<br>dB( $\mu$ V/m) | = | Delta<br>(dB) |
| 1.705              | 5                     | + | 20             | = | 25                      | - | 30                      | = | -5            |

## FCC ID: 2AATH-CC300RFIDA

### 5.3.4 Test result

< 1GHz

| Frequency (MHz) | Level AV (dBμV) | Level QP (dBμV) | Corr. factor (dB) | Corr. level AV dB(μV/m) | Corr. Level QP dB(μV/m) | Limit dB(μV/m) | Delta (dB) |
|-----------------|-----------------|-----------------|-------------------|-------------------------|-------------------------|----------------|------------|
| 40.670          | --              | 13.4            | 14.7              | --                      | 28.1                    | 40.0           | -11.9      |
| 67.780          | --              | 6.3             | 11.7              | --                      | 18.0                    | 40.0           | -22.0      |
| 78.022          | --              | 6.8             | 10.9              | --                      | 17.7                    | 40.0           | -22.3      |
| 141.946         | --              | 6.3             | 10.6              | --                      | 16.9                    | 43.5           | -26.6      |
| 168.247         | --              | 9.1             | 11.4              | --                      | 20.5                    | 43.5           | -23.0      |

> 1GHz

| Frequency (MHz) | Level AV (dBμV) | Level Pk (dBμV) | Corr. factor (dB) | Corr. level AV (dBμV/m) | Corr. Level Pk (dBμV/m) | Limit dB(μV/m) | Delta (dB) |
|-----------------|-----------------|-----------------|-------------------|-------------------------|-------------------------|----------------|------------|
| 1000            | --              | 61.1            | -19.8             | --                      | 41.3                    | 54             | -12.7      |
| 1036            | --              | 61.1            | -20.5             | --                      | 40.7                    | 54             | -13.3      |
| 1114            | --              | 58.3            | -20.3             | --                      | 38.1                    | 54             | -15.9      |
| 1354            | --              | 59.1            | -19.3             | --                      | 39.8                    | 54             | -14.2      |
| 1660            | --              | 60.2            | -19.8             | --                      | 40.4                    | 54             | -13.6      |
| 1996            | --              | 58.6            | -15.5             | --                      | 44.9                    | 54             | -9.1       |
| 3052            | --              | 54.6            | -12.2             | --                      | 42.4                    | 54             | -11.6      |

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

| Frequency (MHz) | Field strength of spurious emissions |          | Measurement distance |
|-----------------|--------------------------------------|----------|----------------------|
|                 | (μV/m)                               | (dBμV/m) | (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                   |
| 30 - 88         | 100                                  | 40       | 3                    |
| 88 - 216        | 150                                  | 43.5     | 3                    |
| 216 - 960       | 200                                  | 46       | 3                    |
| Above 960       | 500                                  | 54       | 3                    |

The requirements are **FULFILLED**.

**Remarks:** The measurement was performed in the frequency range 9kHz to 30000MHz.

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**FCC ID: 2AATH-CC300RFIDA****5.4 Frequency tolerance**

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

**5.4.1 Description of the test location**

Test location: AREA4

**5.4.2 Applicable standard**

According to FCC Part 15, Section 15.225(e):

The frequency tolerance of the carrier signal shall be maintained within  $\pm 0.01$  % of the operating frequency over a temperature range of  $-20$  °C to  $+50$  °C at normal supply voltage and for a variation in the primary supply voltage from 85 % to 115 % of the rated supply voltage at a temperature of  $20$  °C. For battery operated equipment, the equipment shall be performed using a new battery.

**5.4.3 Description of Measurement**

The frequency tolerance is measured with the spectrum analyzer. The sweep points were set to maximum for higher the frequency resolution or the function "frequency counter" is used. The signal is unmodulated; the marker of the analyzer is set to maximum amplitude at normal temperature, the frequency was recorded. Then the maximum supply voltage is set and the marker of the analyzer is set to maximum amplitude. This procedure is done again for the minimum supply voltage. The EUT was now driven at normal supply voltage but in the climatic chamber to range the temperature from  $-20$  °C to  $+50$  °C in steps of 10 degrees. The drifting carrier is measured by setting the marker at the analyzer.

## FCC ID: 2AATH-CC300RFIDA

### 5.4.4 Test result

| Test conditions          |                    | Test result         |
|--------------------------|--------------------|---------------------|
|                          |                    | Frequency (MHz)     |
| $T_{min} (-20)^{\circ}C$ | $V_{nom} (24,0 V)$ | 13,55983            |
| $T (-10)^{\circ}C$       | $V_{nom} (24,0 V)$ | 13,55983            |
| $T (0)^{\circ}C$         | $V_{nom} (24,0 V)$ | 13,55984            |
| $T (10)^{\circ}C$        | $V_{nom} (24,0 V)$ | 13,55984            |
| $T_{nom} (20)^{\circ}C$  | $V_{min} (20,4 V)$ | 13,55984            |
| $T_{nom} (20)^{\circ}C$  | $V_{nom} (24,0 V)$ | 13,55984            |
| $T_{nom} (20)^{\circ}C$  | $V_{max} (27,6 V)$ | 13,55984            |
| $T (30)^{\circ}C$        | $V_{nom} (24,0 V)$ | 13,55982            |
| $T (40)^{\circ}C$        | $V_{nom} (24,0 V)$ | 13,55982            |
| $T_{max} (50)^{\circ}C$  | $V_{nom} (24,0 V)$ | 13,55982            |
| Measurement uncertainty  |                    | $\pm 10 \text{ Hz}$ |

Carrier frequency:  $f_c = 13.56 \text{ MHz}$   
 Max. tolerance:  $\pm 0.01 \% \text{ of } 13.56 \text{ MHz} = \pm 1.356 \text{ kHz}$

Highest frequency:  $f_h = 13.55984 \text{ MHz}$   
 Lowest frequency:  $f_l = 13.55982 \text{ MHz}$

Negative tolerance:  $f_l - f_c = -0.18 \text{ kHz} < - 1.356 \text{ kHz}$   
 Positive tolerance:  $f_h - f_c = -0.16 \text{ kHz} < + 1.356 \text{ kHz}$

Limit according to FCC Part 15, Section 15.225(e):  
 The frequency tolerance of the carrier signal shall be maintained within  $\pm 0.01 \%$  of the operating frequency.

The requirements are **FULFILLED**.

Remarks: none

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**FCC ID: 2AATH-CC300RFIDA****5.5 20 dB Bandwidth**

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

**5.5.1 Description of the test location**

Test location: AREA4

**5.5.2 Applicable standard**

According to FCC Part 15C, Section 15.215(c):

Intentional radiators operating under the alternative provisions to the general emission limits, as contained in section 15.217 to 15.257, must be designed to ensure that the 20 dB bandwidth of the emission is contained within the frequency band designated in the rule section under which the equipment is operated. The requirement to contain the designated bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed.

**5.5.3 Description of Measurement**

The bandwidth is measured at an amplitude level related to the reference level by a specified ratio of -20 dB. The reference level is the level of the highest amplitude signal observed from the transmitter at either the fundamental frequency or the first order modulation products in all typical modes of operation, including the unmodulated carrier, even if atypical. As alternative the bandwidth was measured with the function "n-dB down" of the spectrum analyzer and recorded. The measurement was performed conducted. The test signal may be modulated as intended.

Spectrum analyzer settings:

RBW: 1 kHz VBW: 1 kHz Detector Peak  
Sweep time auto

**5.5.4 Test result**

| Channel Frequency<br>(MHz) | 20 dB bandwidth<br>(kHz) |
|----------------------------|--------------------------|
| 13.56                      | 2.9                      |

Limit according to FCC Part 15C, Section 15.215(c):

Must be designed to ensure that the 20 dB bandwidth of the emission is contained within the frequency band designated in the rule section under which the equipment is operated. The requirement to contain the designated bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed.

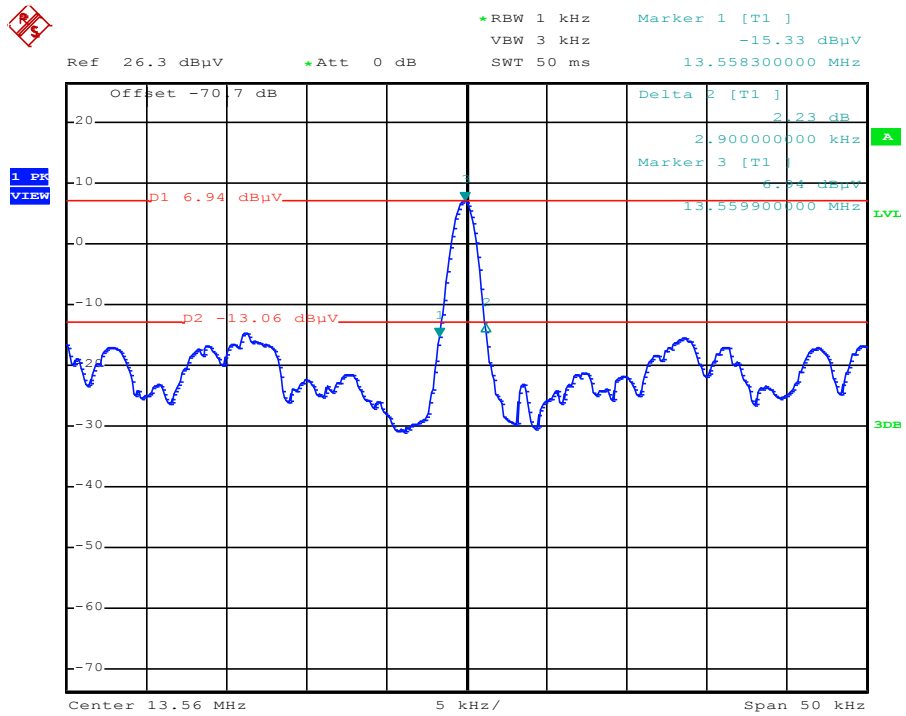
| Frequency band<br>(MHz) | Limit 20 dB bandwidth<br>(kHz) |
|-------------------------|--------------------------------|
| 13.553 - 13.567         | 14.0                           |

The requirements are

**Remarks:** For detailed test result please refer to following test protocol.

# FCC ID: 2AATH-CC300RFIDA

## 5.5.5 Test protocol



Date: 16.JAN.2014 13:30:16

## FCC ID: 2AATH-CC300RFIDA

### 5.6 Transmitter spectrum mask

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

#### 5.6.1 Description of the test location

Test location: AREA4

#### 5.6.2 Applicable standard

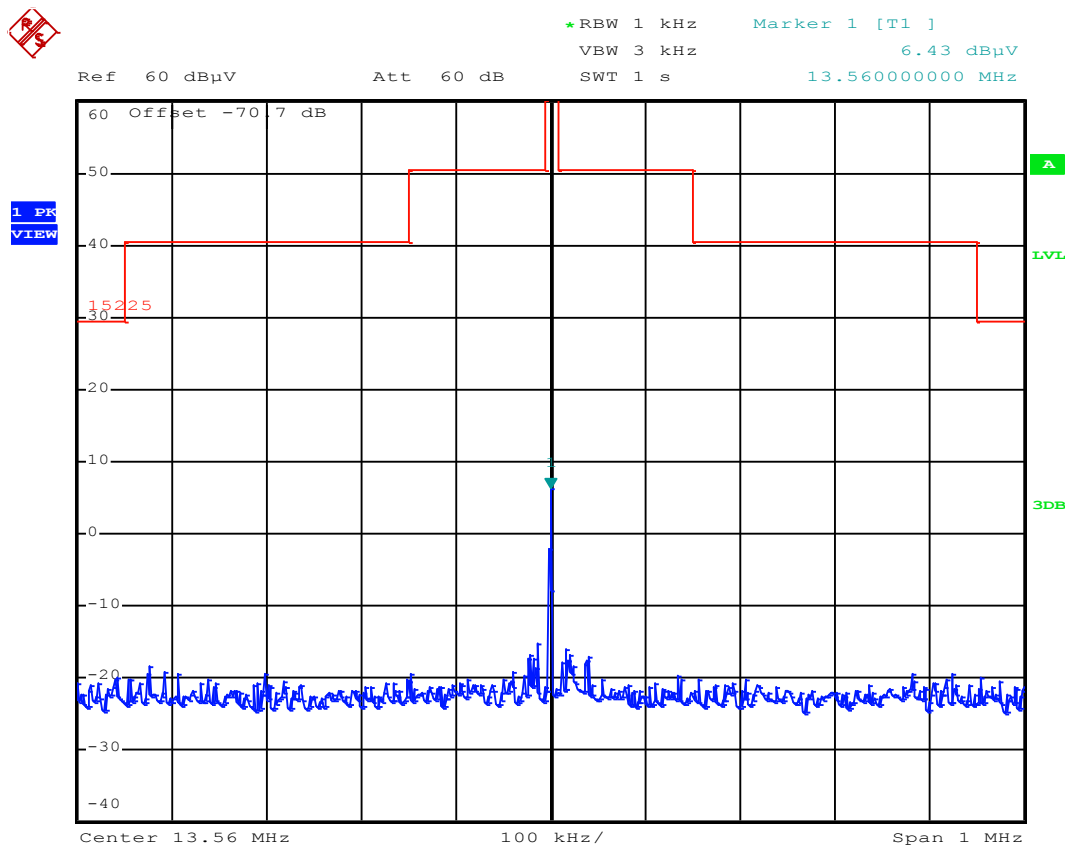
According to FCC Part 15C, Section 15.225 (a-d):

The field strength of any emission shall not exceed the defined limits.

#### 5.6.3 Description of Measurement

The spectrum mask is measured using a spectrum analyser. The profile of the spectrum mask is displayed on analyser and has to be adjusted to the reference level given as maximum output power at 30m measurement distance according to subclause 5.2.5. The test signal may be modulated as intended.

#### 5.6.4 Test result



Date: 16.JAN.2014 13:25:33

**FCC ID: 2AATH-CC300RFIDA**

Limits according to FCC Part 15C, Section 15.225(a-d):

The absolute levels of RF power at any frequency shall not exceed the limits defined in the following table:

| Frequency band<br>(MHz)    | Emission level limit at 30 m<br>( $\mu\text{V/m}$ ) | Emission level limit at 30 m<br>(dB $\mu\text{V/m}$ ) |
|----------------------------|-----------------------------------------------------|-------------------------------------------------------|
| 13.110 – 13.410            | 106                                                 | 40.5                                                  |
| 13.410 - 13.553            | 334                                                 | 50.5                                                  |
| 13.553 - 13.567            | 15,848                                              | 84.0                                                  |
| 13.567 – 13.710            | 334                                                 | 50.5                                                  |
| 13.710 – 14.010            | 106                                                 | 40.5                                                  |
| outside of 13.110 – 14.010 | 30                                                  | 29.5                                                  |

The requirements are **FULFILLED**.

Remarks: none

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

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

| <b>Test ID</b> | <b>Model Type</b>       | <b>Equipment No.</b> | <b>Next Calib.</b> | <b>Last Calib.</b> | <b>Next Verif.</b> | <b>Last Verif.</b> |
|----------------|-------------------------|----------------------|--------------------|--------------------|--------------------|--------------------|
| <b>A 4</b>     | ESH 3                   | 01-02/03-01-005      | 16/01/2015         | 16/01/2014         |                    |                    |
|                | ESH2-Z5                 | 01-02/20-01-001      | 28/01/2015         | 28/01/2014         | 28/07/2014         | 28/01/2014         |
|                | ESH 3 - Z 2             | 01-02/50-02-020      | 15/01/2015         | 15/01/2014         |                    |                    |
|                | BNC-3000-N              | 01-02/50-07-008      |                    |                    |                    |                    |
|                | N-5000-N                | 01-02/50-07-009      |                    |                    |                    |                    |
|                | emitel ESW V31          | 01-02/68-09-002      |                    |                    |                    |                    |
| <b>CPR 1</b>   | ESCS 30                 | 01-02/03-04-003      | 26/02/2014         | 26/02/2013         |                    |                    |
|                | FMZB 1516               | 01-02/24-01-018      |                    |                    | 14/02/2014         | 14/02/2013         |
|                | N-40000-N               | 01-02/50-05-043      |                    |                    |                    |                    |
|                | N-30000-N               | 01-02/50-05-044      |                    |                    |                    |                    |
|                | emitel ESW V31          | 01-02/68-09-002      |                    |                    |                    |                    |
| <b>FE</b>      | FSP 30                  | 02-02/11-05-001      | 24/10/2014         | 24/10/2013         |                    |                    |
|                | HFRAE 5161 _ 50 kHz-120 | 02-02/24-11-004      |                    |                    |                    |                    |
|                | METRA HIT World         | 02-02/32-10-001      | 05/08/2014         | 05/08/2013         |                    |                    |
|                | WK-340/40               | 02-02/45-05-001      | 31/05/2014         | 31/05/2013         | 26/02/2014         | 26/08/2013         |
|                | 6543A                   | 02-02/50-05-157      |                    |                    |                    |                    |
| <b>MB</b>      | FSP 30                  | 02-02/11-05-001      | 24/10/2014         | 24/10/2013         |                    |                    |
|                | HFRAE 5161 _ 50 kHz-120 | 02-02/24-11-004      |                    |                    |                    |                    |
|                | METRA HIT World         | 02-02/32-10-001      | 05/08/2014         | 05/08/2013         |                    |                    |
|                | WK-340/40               | 02-02/45-05-001      | 31/05/2014         | 31/05/2013         | 26/02/2014         | 26/08/2013         |
|                | 6543A                   | 02-02/50-05-157      |                    |                    |                    |                    |
| <b>SER 1</b>   | ESCS 30                 | 01-02/03-04-003      | 26/02/2014         | 26/02/2013         |                    |                    |
|                | FMZB 1516               | 01-02/24-01-018      |                    |                    | 14/02/2014         | 14/02/2013         |
|                | N-40000-N               | 01-02/50-05-043      |                    |                    |                    |                    |
|                | N-30000-N               | 01-02/50-05-044      |                    |                    |                    |                    |
|                | emitel ESW V31          | 01-02/68-09-002      |                    |                    |                    |                    |
| <b>SER 2</b>   | ESVP                    | 01-02/03-01-002      | 18/03/2014         | 18/03/2013         |                    |                    |
|                | HM 5012                 | 01-02/11-01-001      |                    |                    |                    |                    |
|                | N-40000-N               | 01-02/50-05-043      |                    |                    |                    |                    |
|                | N-30000-N               | 01-02/50-05-044      |                    |                    |                    |                    |
|                | emitel ESW V31          | 01-02/68-09-002      |                    |                    |                    |                    |
| <b>SER 3</b>   | VULB 9168               | 02-02/24-05-005      | 11/04/2014         | 11/04/2013         | 04/03/2014         | 04/09/2013         |
|                | FSP 40                  | 02-02/11-11-001      | 30/09/2014         | 30/09/2013         |                    |                    |
|                | JS4-18004000-30-5A      | 02-02/17-05-017      |                    |                    |                    |                    |
|                | AFS5-12001800-18-10P-6  | 02-02/17-06-002      |                    |                    |                    |                    |
|                | AFS4-01000400-10-10P-4  | 02-02/17-13-002      |                    |                    |                    |                    |
|                | AMF-4F-04001200-15-10P  | 02-02/17-13-003      |                    |                    |                    |                    |
|                | 3117                    | 02-02/24-05-009      | 04/04/2014         | 04/04/2013         |                    |                    |
|                | BBHA 9170               | 02-02/24-05-014      |                    |                    |                    |                    |
|                | Sucoflex N-1600-SMA     | 02-02/50-05-073      |                    |                    |                    |                    |
|                | Sucoflex N-2000-SMA     | 02-02/50-05-075      |                    |                    |                    |                    |
|                | KMS102-0,2 m            | 02-02/50-11-020      |                    |                    |                    |                    |
|                | SF104/11N/11N/1500MM    | 02-02/50-13-015      |                    |                    |                    |                    |