



EMC TEST REPORT

Nr 3191-FCC-A

This test report applies only on equipment described hereafter.

Proposal number : 200410-2522

Date of test..... : October 13th, 2004

Location : SMEE **Actions Mesures** Laboratory - 38 VOIRON

Performed by : Jacques LORQUIN

Customer : **OPTION INDUSTRIES**
Z.I. Champ Roman
20 rue du Tour de l'Eau – BP 307
38407 SAINT-MARTIN D'HERES CEDEX
FRANCE

Product..... : **ARVA A.D.vanced**

Type of test : **Radiated and Conducted Emission Test**

Applied standards or specification: FCC: 47CFR part 15, Subpart C

Test objective : Qualification

Results : **Samples tested in configuration and description presented in this test report complies with prescriptions and limits of FCC part 15, subpart C, in radiated and conducted emissions.**

The reproduction of this test report is authorized only under its entire form. This report contents 10 pages

Written by : Jacques LORQUIN

Approved by..... : Jacques LORQUIN

Date : February 4th, 2005



1. System test configuration

1.1. Justification

The system was configured for testing in a typical fashion (as a customer would normally use it). A typical ARVA is tested, and I/O port is connected on typical load.

1.2. HARDWARE IDENTIFICATION:

 **Equipment Under Test (EUT):** Avalanche Beacon
ARVA A.D.vanced

Sn : 03165-1C-0002

- Size : 135x30x80mm
- Input/output :
 - 1x analog audio outputs (connector jack)
- power supply : four standard LR03 alkaline batteries
- Frequencies : crystal: 3.656MHz, 3.640MHz
457kHz, 2kHz
(No clock or signal higher than 100MHz)

1.3. Auxiliaries

The FCC IDs for all equipment, plus description of all cables used in the tested system (including inserted cards, which have grants) are :

Trade Mark - Model Number (Serial number)	FCC ID	Description	Cable description
OPTION - ARVA A.D.vanced* (sn: 003165-1C-0002)	0B9ARVAADV	Avalanche Beacon	I/O cable unshielded
Labtec LT-100 (sn: none)	None	Headset	Unshielded cable

* : Equipment under test

1.4. Running mode:

The analogue audio output is loaded by the headset.
Two setup are tested:

- ① The Avalanche Beacon is switch on transmit mode.
- ② The Avalanche Beacon is switch on Receive mode.

1.5. I/O cables

- 1x headset cable, unshielded, length: 3m



1.6. Equipment modifications

No modifications are necessary for achieved test. The unit tested was representative to a production unit.

2. Radiated emission data from 30MHz to 1GHz

2.1. SET-UP

Mains: four standard LR03 Alkaline batteries

The equipment under test and auxiliaries are set on a non-conducted table of 80cm height, above the ground plane. The distance between equipment under test and auxiliary is 10cm.



The installation of EUT is identical for pre-characterization measures in a 3 meters full anechoic chamber and for measures on a 10 meters Open site.

2.2. TEST EQUIPMENT

Test Equipment from 30MHz to 1GHz on 10 meters open site:

Equipment	Company	Model	Serial
Spectrum Analyzer	HP	8568B	2732A04140
Quasi-Peak adapter	HP	85650A	2811A01136
RF Pre-selector	HP	85685A	2833A00773
Biconical Antenna	EMCO	3104C	9401-4636
Log Periodic Antenna	EMCO	3146	2178

EMCO-1050, 6 meters height antenna mast & EMC0-1060, 3 meters diameter Turntable.
A 10 meters Open site located in SMEE *Actions Mesures* - Voiron (FRANCE).



Pre-scan, test Equipment from 30MHz to 1GHz:

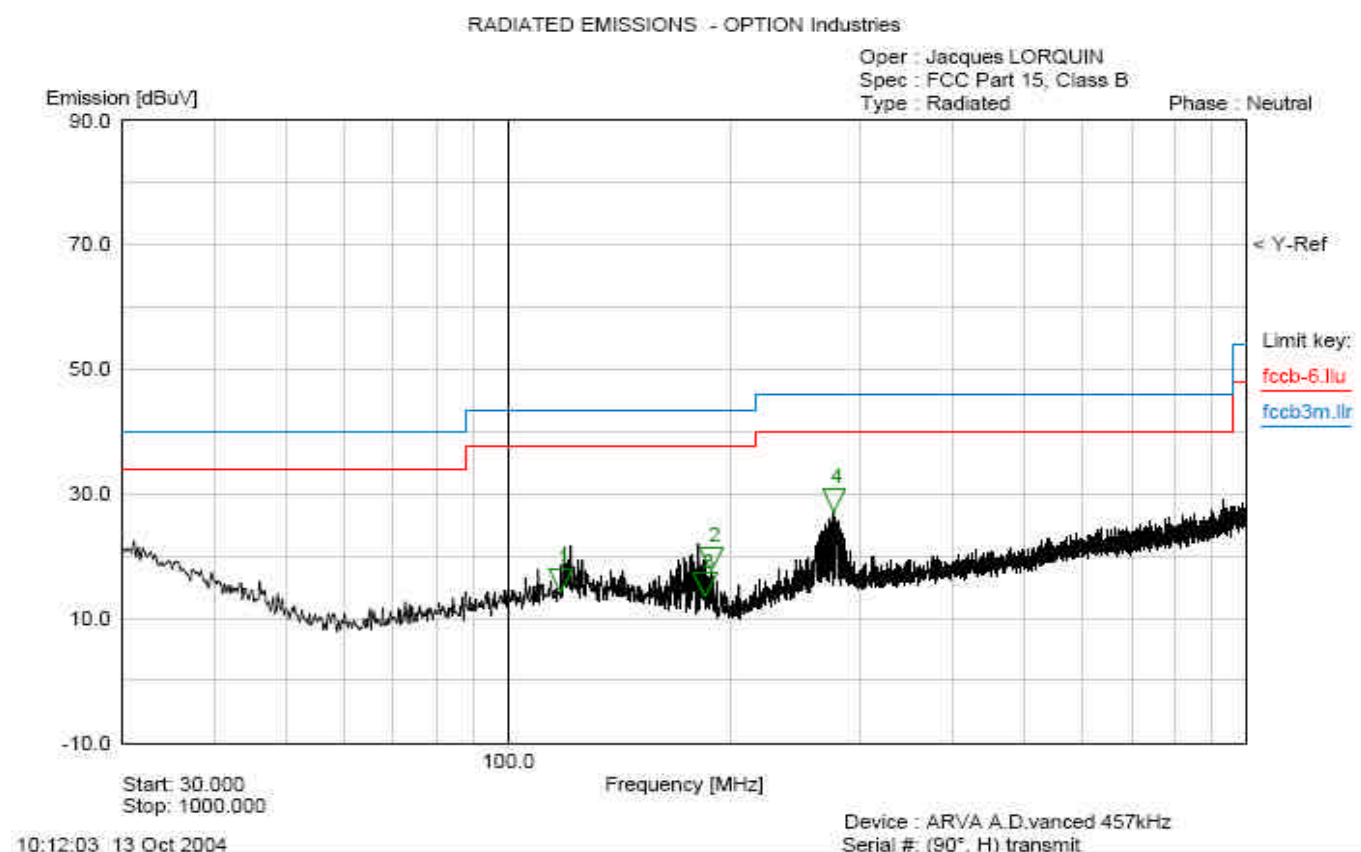
Equipment	Company	Model	Serial
EMC Analyzer	HP	8591EM	3536A00384
Amplifier	HP	8447F H64	3113A06394
Antenna (30MHz-1GHz)	CHASE	CBL6111A	1628

2.3. TEST SEQUENCE AND RESULTS - TRANSMIT MODE

2.3.1.Pre-characterization at 3 meters from 30MHz to 1GHz

A pre-scan of all the setup has been performed in a 3 meters full anechoic chamber.

The distance between EUT and antenna is 3 meters. Test is performed in horizontal (H) and vertical (V) polarization, and on 4 faces of the EUT. See below for graph examples.



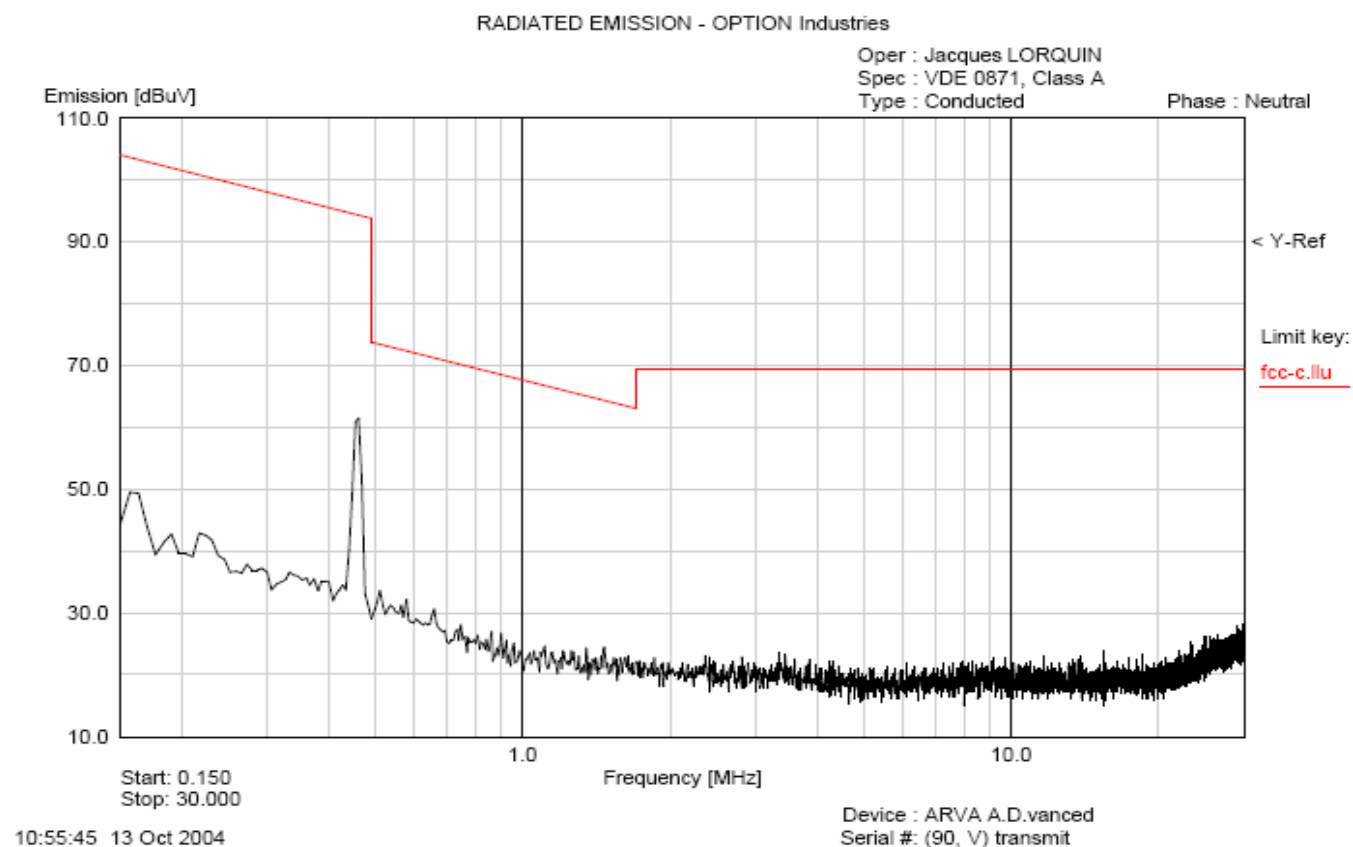
Marker ▽	Frequency [MHz]	Peak [dBuV]	Q-Peak [dBuV]	Average [dBuV]	Limit [dBuV]
1	117.8	14.25	-	-	37.50
2	188.5	17.60	-	-	37.50
3	184.8	13.54	-	-	37.50
4	276.3	18.27	12.09	-	40.00



2.3.2.Pre-characterization at 3 meters below 30MHz

A pre-scan of all the setup has been performed in a 3 meters full anechoic chamber.

The distance between EUT and antenna is 3 meters. Test is performed in horizontal (H) and vertical (V) axis and the loop antenna position was rotated during the test for maximized the emission measurement. See below for a graph example:



Marker	Frequency [MHz]	Peak [dBuV]	Q-Peak [dBuV]	Average [dBuV]	Limit [dBuV]
1	0.460	61.44	-	-	93.80

Result from 150kHz to 30 MHz



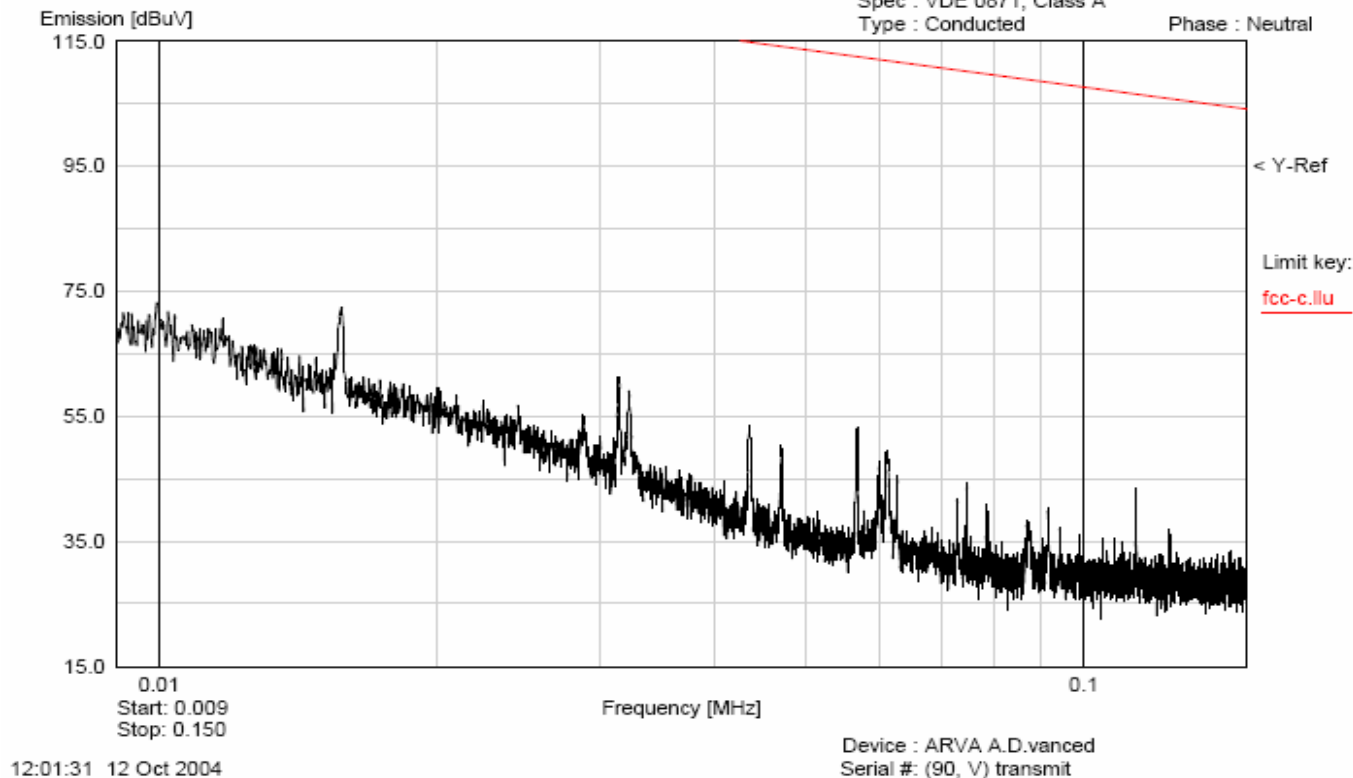
RADIATED EMISSION - OPTION Industries

Oper : Jacques LORQUIN

Spec : VDE 0871, Class A

Type : Conducted

Phase : Neutral



Result from 9kHz to 150kHz

2.3.3.Characterization on 10 meters open site from 30MHz to 1GHz

The product has been tested according to ANSI C63.4-(2003). Radiated Emission was measured on an open area test site. A description of the facility is on file with the FCC.

Interconnecting cables and equipment's were moved to position that maximized emission (device is also tested at 3 orthogonal planes). A summary of the worst case emissions found in all test configurations and modes is shown on clause 2.1.

Frequency list has been created with anechoic chamber pre-scan results.

No	Frequency (MHz)	QPeak Lmt (dBuV/m)	QPeak (dBuV/m)	QPeak-Lmt (dB)	Angle (deg)	Pol	Hgt (cm)	Tot Corr (dB)	Comments
1	117.426	43.5	29.6	-13.9	120	V	237	16	*
2	188.310	43.5	30.5	-13	20	V	111	18.5	*
3	276.048	46.0	29.9	-16.1	206	V	343	15.9	*

* - Measure have been done at 10m distance and corrected following requirements of 15.209.e)



2.3.4.Characterization on 10 meters open site below 30 MHz

The product has been tested at a distance of 10 meters from the antenna and compared to the FCC part 15 subpart C §15.209& §15.225 limits. Measurement bandwidth was 9kHz from 150kHz to 30 MHz and 200 Hz from 9 kHz to 150 kHz.

The loop antenna position was rotated to locate the orientation that maximized emission reception during testing. Antenna search was performed for both horizontal and vertical polarization. Continuous linear turntable azimuth search was performed with 360 degrees range.

Interconnecting cables and equipment's were moved to position that maximized emission (device is also tested at 3 orthogonal planes). A summary of the worst case emissions found in all test configurations and modes is shown on clause 2.1.

Frequency (MHz)	Average Lmt (dBµV/m)	Average (dBµV/m)	Av-Lmt (dB)	Angle EUT (deg)	Pol	Angle Ant. (deg)	Tot Corr (dB)
0.457*	74.4	37.6	-36.8	1	vertical	0	45.4
0.914	Not traceable signal						

* - Measure have been done at 10m distance and corrected following requirements of 15.209.e)

Frequency (MHz)	Peak Lmt (dBµV/m)	Peak (dBµV/m)	Peak-Lmt (dB)	Angle EUT (deg)	Pol	Angle Ant. (deg)	Tot Corr (dB)
0.457*	94.4	39	-55.4	1	vertical	0	45.4
0.914	Not traceable signal						

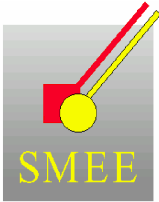
* - Measure have been done at 10m distance and corrected following requirements of 15.209.e)

2.4. TEST SEQUENCE AND RESULTS - RECEIVE MODE

2.4.1.Pre-characterization at 3 meters

A pre-scan of all the setup has been performed in a 3 meters full anechoic chamber.

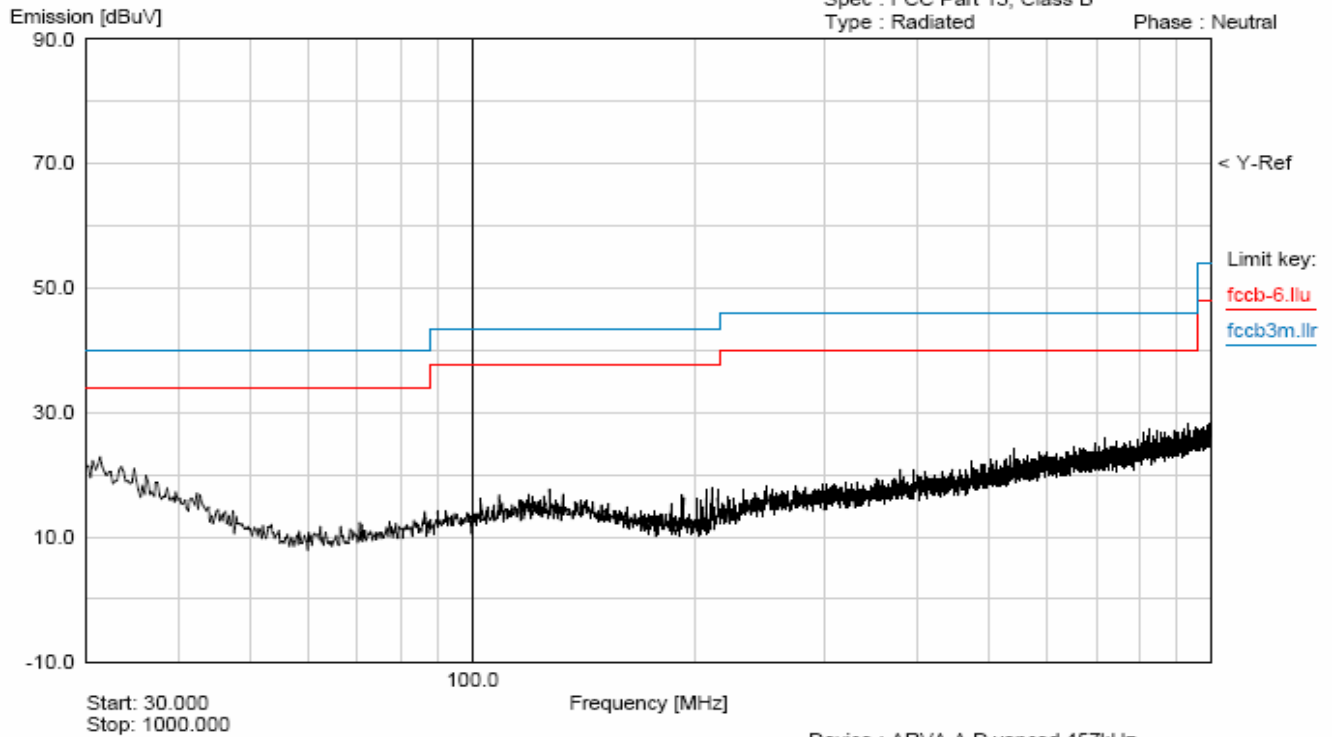
The distance between EUT and antenna is 3 meters. Test is performed in horizontal (H) and vertical (V) polarization, and on 4 faces of the EUT. See below for graph examples.



RADIATED EMISSIONS - OPTION Industries

Oper : Jacques LORQUIN
Spec : FCC Part 15, Class B
Type : Radiated

Phase : Neutral



10:44:19 13 Oct 2004

Device : ARVA A.D.vanced 457kHz
Serial #: (0°, V) receive



2.4.2.Characterization on 10 meters open site from 30MHz to 1GHz

The product has been tested according to ANSI C63.4-(2003). Radiated Emission was measured on an open area test site. A description of the facility is on file with the FCC.

Interconnecting cables and equipment's were moved to position that maximized emission. A summary of the worst case emissions found in all test configurations and modes is shown on clause 2.1.

Frequency list has been created with anechoic chamber pre-scan results.

No	Frequency (MHz)	QPeak Lmt (dBμV/m)	QPeak (dBμV/m)	QPeak-Lmt (dB)	Angle (deg)	Pol	Hgt (cm)	Tot Corr (dB)	Comments
1									No traceable signals

2.5. Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follow:

$$FS = RA + AF + CF - AG$$

Where

- FS = Field Strength
- RA = Receiver Amplitude
- AF = Antenna Factor
- CF = Cable Factor
- AG = Amplifier Gain

Assume a receiver reading of 52.5dBμV is obtained. The antenna factor of 7.4 and a cable factor of 1.1 is added. The amplifier gain of 29dB is subtracted, giving a field strength of 32 dBμV/m.

$$FS = 52.5 + 7.4 + 1.1 - 29 = 32 \text{ dB}\mu\text{V/m}$$

The 32 dBμV/m value can be mathematically converted to its corresponding level in μV/m.

$$\text{Level in } \mu\text{V/m} = \text{Common Antilogarithm } [(32\text{dB}\mu\text{V/m})/20] = 39.8 \text{ } \mu\text{V/m}.$$



3. Conducted emission data

Not applicable

4. Field strength of fundamental

The polarization of the measurements for the larger power level is vertical (the test is performed for both vertical and horizontal axis, and the loop antenna position was rotated during the test for maximized the emission measurement.) Measure have been done at 10m distance and corrected following requirements of 15.209.e)

Frequency (MHz)	QPeak Lmt (dBμV/m)	QPeak (dBμV/m)	QPeak-Lmt (dB)	Angle EUT (deg)	Pol	Angle Ant. (deg)	Tot Corr (dB)
0.457	73.5	67.8	-5.7	1	vertical	0	45.4
0.914	Not traceable signal						

* - Measure have been done at 10m distance and corrected following requirements of 15.209.e)

No significantly variation of the fundamental amplitude during voltage variation testing per 15.31(e).

Maximum deviation under extreme test condition (New batteries): **0.29dBc**

Limits Subclause §15.209:

Frequency (MHz)	Field strength (μV/m)	Measurement distance (m)
0.009-0.490	2400/F(kHz)	300
0.457	5.24 14.4dBμV/m	300