

1 SYSTEM TEST CONFIGURATION

1.1 Justification

The system was configured for testing in a typical fashion (as a customer would normally use it).
The worst case product (UBET41SL1), as described in chapter 1.1 of this file, has been tested.
No difference have been encountered depending of the functional mode of the product (1, 2, 3 or 4 button used).
The worst case position of the transmitter has been found in vertical position, as shown on photographs.

1.2 EUT Exercise software

No software is embedded in the product.

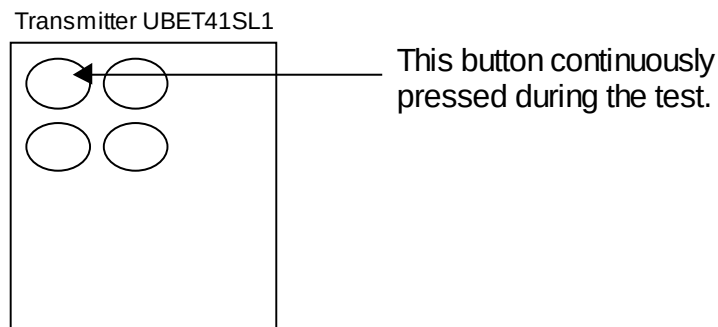
1.3 Special accessories

No special accessories were necessary to perform the test.

1.4 Equipment modifications

No equipment modification has been necessary during testing to achieve compliance to FCC Part15, Subpart C levels. The unit tested was a production unit.

1.5 Configuration of tested system.



2 RADIATED EMISSION DATA

2.1 Test Procedure (15.231.b)

The product has been tested according to ANSI C63.4-1992 and FCC PART15, Subpart C, Section 15.231.

In first, the frequencies are identified in the full anechoic chamber and then are measured on the Open Area Test Site.

The plots on the following page shown only the frequency identification.

The table just after shown the measured levels.

Measured levels are in dB μ V/m, then they are corrected in μ V/m in order to compare them to the FCC limit.

The following conversion is used :

$$L (\mu\text{V/m}) = \text{inv log} (L(\text{dB}\mu\text{V/m}) / 20)$$

The product has been tested at a distance of 3 meters from the antenna and compared to the FCC Part15, Subpart C, limits. Measurement bandwidth was 120 KHz from 30 MHz to 1 GHz and 1 MHz upon 1 GHz.

Under 1GHz, measurement are Quasi Peak measurements, according to CISPR requirements.

Above 1GHZ, measurement are Peak measurement. All these values being under limits, the average measurement has not been performed.

Antenna height search was performed from 0.9m to 4m for both horizontal and vertical polarization. Continuous linear turntable azimuth search was performed with 360 degrees range.

A summary of the worst case emissions found in all test configurations and modes is shown on the following page.

Test Equipment:

HP-8568B Analyzer + HP-85650A Quasi-Peak adapter + HP-85685A RF Preselector

HP 8591EM Spectrum analyzer

HP 8546A EMI Receiver

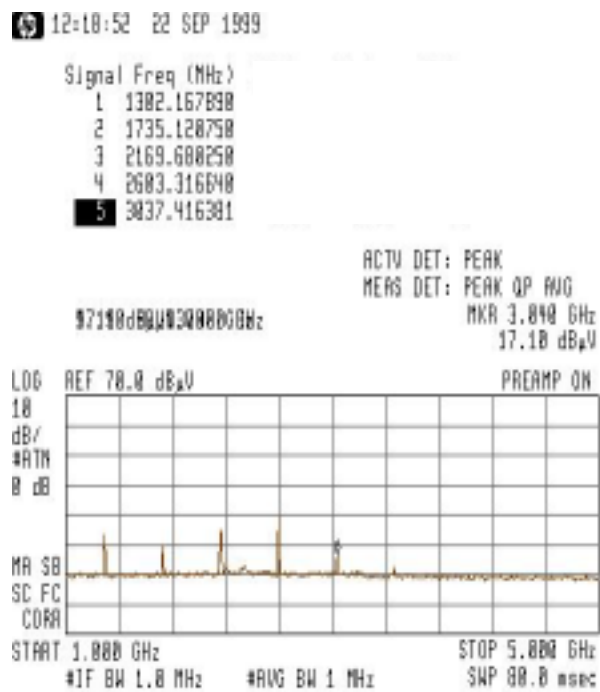
CHASE CBL6111A Antenna, 30-1000 MHz

EMCO 3115 Antenna, 1-18GHZ

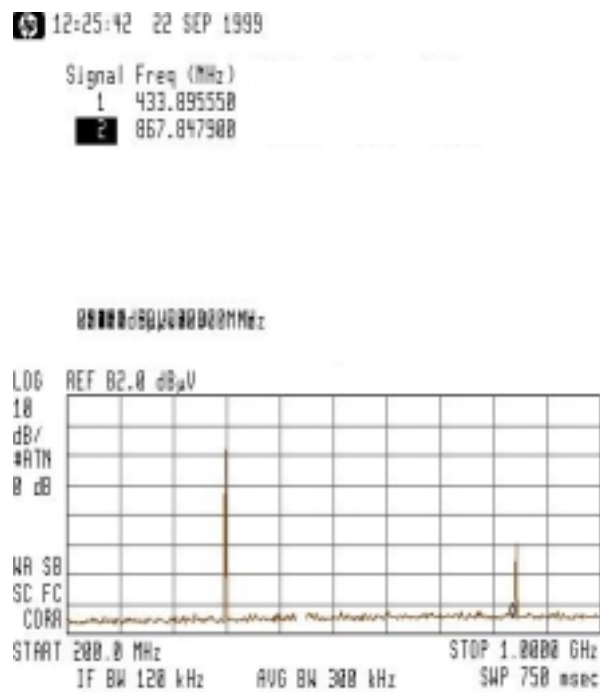
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2.2 Radiated emission data (15.231.b)

Plot of frequencies from 1 to 5 GHZ



Plot of frequencies from 200 to 1000 MHZ



Final result:

Frequency (MHz)	Restricted bands	Limits (Lmt) (uV/m)	Measure* (Mea) (uV/m)	Mea-Lmt (μV/m)	Angle (deg)	Pol	Hgt (cm)	Tot Corr (μV/m)	Comments
433.92	No	10996	6309.6(Q)	-4686.4	10	H	115	9.8	
867.8	No	1099.6	147.9(Q)	-951.7	12	H	143	24.5	
1301.7	Yes	500	105.9(P)	-394.1	9	H	135	25.4	
1735.7	No	1099.6	384.6(P)	-715	16	H	158	35	
2169.6	No	1099.6	1047.1(P)	-144.6	21	H	151	41.2	
2603.5	No	1099.6	1047(P)	-52.6	45	V	135	42.17	
3037.4	No	1099.6	237.1(P)	-862.5	18	H	144	58.8	
3471.4									
3905.3									
4339.2									Not measurable signals
4773.1									

* : (A) denotes an average unit, (Q) denotes a Quasi Peak unit, (P) denotes a peak unit.

2.3 Field Strength Calculation (15.231.b)

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 52.5dB μ V 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 dB μ V/m.

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

The 32 dB μ V/m value can be mathematically converted to its corresponding level in μ V/m.

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

2.4 Emission bandwidth (15.231.c)

Emission frequency is : 433.92 MHz
0.25% of 433.92 MHz = 1.0848 MHz.

Measured bandwidth = 93.8KHz

