

E.M.C Test Report

According to the standard:
FCC PART 15 Edition 2002

Equipment under test:
AQUA'FM TX PRO

Company:
TFE

DISTRIBUTION: Mr. BRISEBOIS

(Company: TFE)

Number of pages: 15 + 2 annexes

Ed.	Date	Modified pages	Prepared By Name Signature	Reviewed By Name signature	Approved By Name signature
0	18/10/02	Creation	T. COLARD T.C.	E. CEFUERT 	François TETAERT Responsable Laboratoire CEM

Duplication of this document is only permitted for an integral photographic facsimile. It includes the number of pages referenced hereabove.
This document is the result of testing a specimen or a sample of the product submitted. It does not imply an assessment of the conformity of the whole production to the item tested.

EMITECH ILE DE FRANCE

Centre de MONTIGNY
3, rue des Cordiers - CAP 38
ZA de l'Observatoire
78180 MONTIGNY LE BUX
Tél. 01 30 57 55 55
Fax 01 30 43 74 48
Site : 344 545 645 00022

Centre de SARTRY
Bâtiment 147
13, route de la Minère
78000 VERSAILLES
Tél. 01 30 97 05 70
Fax 01 39 51 84 79
Site : 344 545 645 00071

GRAND SUD

Centre de MONTPELLIER
Z.I. de la Vallée du Solignat
145, rue du Mousson - BP 25
34741 VENDARGUES Cedex
Tél. 04 67 67 13 02
Fax 04 67 70 94 35
Site : 344 545 645 00067

ATLANTIQUE

Centre d'ANGERS
Z.I. Angers - Beaumont
15, rue de la Cloie
49070 BEAUMONT
Tél. 02 41 73 26 37
Fax 02 41 73 26 40
Site : 344 545 645 00055



364, rue Armand Japy
Toulouse - BP 39
31401 ETUPEDES Cedex
Tél. 03 81 90 75 90
Fax 03 81 32 34 28
Site : 344 545 645 00029

E-mail : commercial@emitech.fr - URL : www.emitech.fr

Groupe EMITECH - S.A. au capital de 480 000 € - R.C. VERSAILLES B 344 545 645 - APE 742 C

TEST CERTIFICATION FOR: FCC Certification

NAME OF THE EQUIPMENT UNDER TEST: AQUA'FM TX PRO

Type: ABL005A00P5000

Serial number: 02-41 007

NAME OF THE MANUFACTURER: TFE

Z.I. du Canal

31450 MONTGISCARD

FRANCE

ADDRESS OF THE COMPANY INTRODUCING THE EQUIPMENT:

Company: AMPHICOM

Address: La Briquetterie – RN 113
31450 MONTGISCARD
FRANCE

Person in charge: M. MACKERN

Present person during the tests: M. DOMERG

DATE OF TESTS: The 16th October 2002

TESTS LOCATION: EMITECH open area test site in Aunainville (28)

TESTS OPERATOR: T. COLARD

TABLE OF CONTENTS

1.	INTRODUCTION _____	4
2.	REFERENCE DOCUMENT _____	4
3.	EQUIPMENT UNDER TEST (EUT) CONFIGURATION _____	4
4.	SUMMARY OF TEST RESULTS _____	6
5.	INTENTIONAL RADIATED EMISSIONS IN THE BAND 49.82 MHZ - 49.90 MHZ _____	7
6.	MODULATION BANDWIDTH IN THE BAND 49.82 MHZ - 49.90 MHZ _____	10
7.	UNINTENTIONAL RADIATED EMISSIONS IN THE BAND 30 MHZ - 1 GHZ _____	12

Annexes: *Customer's questionnaire.*

Antenna factors, insertion losses and amplifier values.

1. INTRODUCTION

This document submits the results of Electromagnetic Compatibility tests performed on the equipment " **AQUA'FM TX PRO** " herein referred to as the EUT, according to the document listed below.

2. REFERENCE DOCUMENT

FCC PART 15 Edition 2002

Code of Federal Regulations
Title 47- Telecommunication
Chapter 1- Federal Communication Commission
Part 15- Radio frequency devices
Subpart C- Intentional Radiators

3. EQUIPMENT UNDER TEST (EUT) CONFIGURATION

See photographs next page.

See customer's questionnaire in annex.

See antenna factors, insertion losses and amplifier values in annex.

Modification of the equipment during the tests: No

Photographs of the equipment under test (EUT)



4. SUMMARY OF TEST RESULTS

The following table summarizes test results of the EUT.

Designation of test	Test results				Comments
	Pass	Fail	N.A.	N.P.	
Intentional radiated emissions in the band 49.82 MHz - 49.90 MHz	✓				Section 15.235
Modulation bandwidth in the band 49.82 MHz - 49.90 MHz	✓				Section 15.235
Unintentional radiated emissions in the band 30 MHz - 1 GHz	✓				Section 15.209
Conducted emissions on AC mains ports			✓		Section 15.207

N.A.: Not Applicable

N.P.: Not Performed

The tested sample " **AQUA'FM TX PRO** " complies with the requirements of the standard:

➤ FCC PART 15 Edition 2002

according to the limits specified in the present report.

5. INTENTIONAL RADIATED EMISSIONS IN THE BAND 49.82 MHZ - 49.90 MHZ

Standard: FCC PART 15 Edition 2002

Test method: Section 15.235

Equipment under test arrangement

The equipment under test (EUT) is placed on a non-conductive test table at 0.8 m above the horizontal metal ground plane.

For maximum meter reading at each frequency, the antenna height is adjusted between 1m and 4m above the ground plane. A 360 degrees rotation of the EUT is performed in vertical and horizontal polarization. The frequency azimuth and antenna height are presented in the table on the next page. Only the highest level is recorded.

Test configuration photographs:





Frequency range: 49.82 MHz - 49.82 MHz

Detection mode: Average

Resolution bandwidth: 120 kHz

Measurement distance: 10 meters.

Limit:

10.000 $\mu\text{V/m}$ or 80 dB $\mu\text{V/m}$ at 3 meters corresponding to 70 dB $\mu\text{V/m}$ at 10meters.

Operating mode during the test:

The transmitter is in permanent emission without modulation.

Instrumentation test list:

Meter	NrEmitech	Category	Mark	Type
187	3/16/12/004	OATS	Emitech	Site champ libre
317	3/24/18/051	Biconical antenna	Schwarzbeck	30/300 MHz
1057	1/02/18/045	Receiver	Rohde & Schwarz	ESVP
2341	4/19/00/018	Antenna mast	HD GmbH	MA 240
2342	4/19/00/019	Mast controller	HD GmbH	HD 100

Results:

FREQUENCY (MHz)	ANTENNA POLARIZATION	ANTENNA HEIGHT (cm)	AZIMUTH (degrees)	MEASURE MENT (dB μ V/m)	LIMIT (dB μ V/m)	MARGIN (dB)
49.86	Vertical	100	0	68.5	70.0	1.5

Observation during the test:

The equipment complies with the requirements of the standard FCC PART 15.235 Edition 2002

6. MODULATION BANDWIDTH IN THE BAND 49.82 MHZ - 49.90 MHZ

Standard: FCC PART 15 Edition 2002

Test method: Section 15.235

Equipment under test arrangement:

The equipment under test (EUT) is placed near an antenna which is connected to a spectrum analyzer.

Frequency range: 49.82 MHz - 49.82 MHz

Detection mode: Peak

Resolution bandwidth: 100 Hz

Limit:

The modulation bandwidth at 26 dB under the level of the unmodulated carrier must be contained in the frequency band allowed.

Operating mode during the test:

The transmitter is in permanent emission with a musical modulation because it is the worst case for this measurement.

Instrumentation test list:

Meter	Nr Emitech	Category	Mark	Type
187	3/16/12/004	OATS	Emitech	Site champ libre
317	3/24/18/051	Biconical antenna	Schwarzbeck	30/300 MHz
2205	1/02/18/068	Spectrum analyzer	Agilent	E7405A

Results:

The modulation bandwidth at 26 dB under the level of the unmodulated carrier is occupying the frequency band 49.8424 MHz - 49.8769 MHz.

Observation during the test:

Results of these measurements show that the EUT is in compliance with the requirements of the standard FCC Part 15.235 Edition 2002

7. UNINTENTIONAL RADIATED EMISSIONS IN THE BAND 30 MHZ - 1 GHZ

Standard: FCC PART 15 Edition 2002

Test method: Section 15.209

Equipment under test arrangement:

The equipment under test (EUT) is placed on a non-conductive test table at 0.8 m above the horizontal metal ground plane.

For maximum meter reading at each frequency, the antenna height is adjusted between 1 m and 4 m above the ground plane. A 360 degrees rotation of the EUT is performed in vertical and horizontal polarization. The frequency azimuth and antenna height are presented in the tables on the next pages.

Test configuration photographs:

Same as chapter 5

Frequency range: 30 MHz - 1 GHz

Detection mode: Quasi-peak

Resolution bandwidth: 120 kHz

Measurement distance: 10 meters

Limit: The EUT must satisfy emission requirements of the standard 15.209 as shown in table below.

Frequency range (MHz)	Quasi-peak (dB μ V/m)
30 to 88	30.0
88 to 216	33.5
216 to 960	36.0
Above 960	44.0

Operating mode during the test:

The transmitter is in permanent emission without modulation.

Instrumentation test list:

Meter	NrEmitech	Category	Mark	Type
187	3/16/12/004	OATS	Emitech	Site champ libre
317	3/24/18/051	Biconical antenna	Schwarzbeck	30/300 MHz
1057	1/02/18/045	Receiver	Rohde & Schwarz	ESVP
1282	3/24/18/224	Log-periodic antenna	Schwarzbeck	UHALP 9107
2341	4/19/00/018	Antenna mast	HD GmbH	MA 240
2342	4/19/00/019	Mast controller	HD GmbH	HD 100

Results:

Table reference	Comments
Table 1	Measurement in vertical polarization
Table 2	Measurement in horizontal polarization

Observation during the test:

Results of these measurements show that the EUT is in compliance with the requirements of the standard FCC Part 15.209 Edition 2002

TEST SITE: Open area test site

TABLE 1

RADIATED EMISSION: Electric field

STANDARD: FCC Part 15 Edition 2002

TEST DISTANCE: 10 m

POLARIZATION: Vertical

MODEL: AQUA'FM TX PRO

FREQUENCY (MHz)	ANTENNA HEIGHT (cm)	AZIMUTH (degrees)	MEASUREMENT (dB μ V/m)	LIMIT (dB μ V/m)	MARGIN (dB)
46.74	100	300	20.3	30.0	9.7
648.16	360	210	31.9	36.0	4.1

No significant frequency has been found other than those given above between 30 MHz and 1 GHz.

TABLE 2

TEST SITE: Open area test site

RADIATED EMISSION: Electric field

STANDARD: FCC Part 15 Edition 2002

TEST DISTANCE: 10 m

POLARIZATION: Horizontal

MODEL: AQUA'FM TX PRO

FREQUENCY (MHz)	ANTENNA HEIGHT (cm)	AZIMUTH (degrees)	MEASUREMENT (dB μ V/m)	LIMIT (dB μ V/m)	MARGIN (dB)
648.16	220	290	30.4	36.0	5.6

No significant frequency has been found other than those given above between 30 MHz and 1 GHz.

ANNEX 1

Customer's questionnaire

(2 pages)

Section 1 - Equipment under test:

Designation : AQUA' FM TX PRO

Type (or commercial reference): ABL005A00P5000

Serial number : 02-41 007

Manufacturer: TFE

Address: ZI du Canal

31450 MONTGISCARD - FRANCE.....

Company introducing the equipment: AMPHICOM

Address: 'La Briqueterie' RN113.....

31450 MONTGISCARD.....

FRANCE.....

Name of the Person in charge of the Product: K MACKERN

State of development: ☐ prototype ☐ pre-serial ☒ serial

Power Supply : (If several types , indicate each of them)

☐ single phase Voltage: Vac

☐ three phases Voltage: Vac

☒ continuous Voltage: 6..... Vdc

☐ AC/DC adapter Voltage: Vac / Vdc

Power ☐ greater than 1kW

☒ less than 1kW

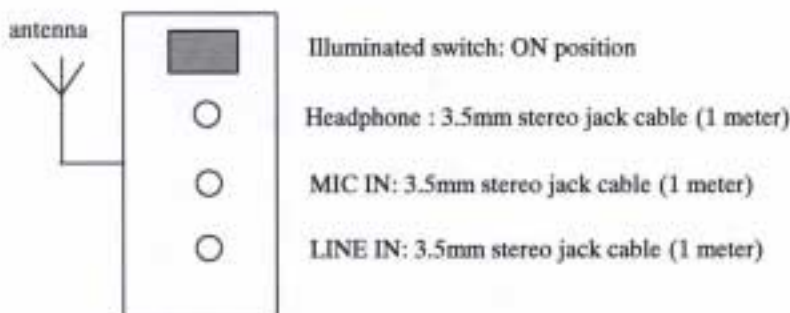
☐ Equipment for professional use only

☒ Equipment other than lighting appliances with power < 75W

Dimensions : (height x length x width in cm) : 15 x 20 x 3.5cm without antenna – antenna length 40cm ..

Section 2 – Schematic of the configuration & Interconnection cables:

Please draw the product configuration with all cables that might be connected to it, and indicate cables length :



Please list all interconnection cables ⁽¹⁾ and their characteristics (recommended max. length, type ...) :

See list above

(1) Cables likely to be connected to the equipment (not only those provided by the manufacturer)

Section 3 : Control procedure to be used during immunity tests

This section describes how it's possible to verify if the equipment is working correctly during the tests.

Procedure (description of the implementation of control means):

1. Check if the led is flashing. If not, put the switch in ON position.....
2. Connect an audio source (walkman for example) in LINE IN input. With a FM receiver (49.86MHz), check the audio signal received.

.....
.....
.....
List of equipment used to realize the control according to the procedure above (except adverse information, equipments allowing to verify the acceptance criteria are dependent on the customer)

Audio source

FM receiver.....
.....
.....
.....

Important: During immunity tests, it might be necessary to protect the control equipments from the disturbances applied during the test. Accordingly, interconnection cables length should be at least 5 m. In case of impossibility, contact us about this.

Section 4 : Susceptibility criteria

In this section, please indicate which function(s) must not be damaged (or which is the maximum allowed level in terms of loss of performances) when the equipment is disturbed:

By a continuous disturbance (electrical field, radiated or conducted, for example)

No operation change during disturbance applying.....
.....
.....
.....

By a transient disturbance (electrostatic discharge for example)

After disturbance applying, no operation change
.....
.....
.....

I assess that the informations included in this questionnaire are right.

Signature of the person introducing the equipment:

(Date and signature)

24/10/02



EMITECH 065 Rev 3

ANNEX 2

Antenna factors, insertion losses and amplifier values

(3 pages)

BILL OF MATERIAL

The test antenna used for the radiated emission between 9 kHz and 30 MHz is the active loop antenna n°315 referenced 3/24/18/049. Antenna factors are given in table 1.

The test antenna used for the radiated emission between 30 MHz and 300 MHz is the biconical antenna n°317 referenced 3/24/18/051. Antenna factors are given in table 2.

The test antenna used for the radiated emission between 300 MHz and 1 GHz is the log-periodic antenna n°1282 referenced 3/24/18/224. Antenna factors are given in table 3.

The measuring receiver n°1057 referenced 1/02/12/045 used in the frequency range 30 MHz to 1 GHz has an integrated preamplifier.

The test cable used between 9 kHz and 1 GHz to connect the antennas to the receiver/analyzer for measurements at a distance of 10 meters has losses given in table 4.

The test antenna used for the radiated emission between 1 GHz and 12 GHz is the horn antenna n°941 referenced 3/24/18/149. Antenna factors are given in table 5.

The amplifier n°1960 referenced 3/01/12/092 and its cable used to connect the spectrum analyzer to the test cable has gain values given in the table 6.

The test cable used between 1 GHz and 12 GHz to connect the horn antenna to the amplifier for measurements at a distance of 3 meters has losses given in table 7.

Frequency (MHz)	Antenna factor (dB/m)	Frequency (MHz)	Antenna factor (dB/m)
0.01	21.5	1	20.4
0.015	20.9	1.5	20.7
0.02	20.4	2	20.5
0.03	20.7	3	20.2
0.05	20.1	5	19.9
0.075	19.8	8	19.9
0.1	19.9	10	19.6
0.15	19.7	15	19.1
0.2	20.3	20	20.1
0.3	20.8	25	20.8
0.5	20.8	30	22.3
0.75	20.3	/	/

TABLE 1 : ACTIVE LOOP ANTENNA

Frequency (MHz)	Antenna factor (dB/m)	Frequency (MHz)	Antenna factor (dB/m)
30	19.3	120	13.7
35	15.9	125	14.1
40	14.5	140	14.2
45	14.3	150	14.1
50	10.5	160	15.7
60	9.2	175	16.5
70	6.5	180	17.3
80	7.8	200	17.2
90	8.5	250	18.3
100	9.7	300	20.2

TABLE 2 : BICONICAL ANTENNA

Frequency (MHz)	Antenna factor (dB/m)	Frequency (MHz)	Antenna factor (dB/m)
300	16.0	700	21.9
400	16.8	800	21.9
500	19.1	900	23.2
600	21.6	1000	24.4

TABLE 3 : LOG-PERIODIC ANTENNA

Frequency (MHz)	loss (dB)	Frequency (MHz)	loss (dB)
0.01	0.2	125	1.3
0.1	0.4	140	1.3
1	0.5	150	1.2
10	0.6	160	1.6
30	0.7	180	1.6
35	0.8	200	1.6
40	0.8	250	1.8
45	0.9	300	2.1
50	0.8	400	2.4
60	1.0	500	2.7
70	1.0	600	3.1
80	1.1	700	3.5
90	1.2	800	3.7
100	1.3	900	3.9
120	1.2	1000	4.3

TABLE 4 : TEST CABLE FOR 10M MEASUREMENT

Frequency (GHz)	Antenna factor (dB/m)	Frequency (GHz)	Antenna factor (dB/m)
1.0	24.5	7.0	37.3
1.5	26.9	7.5	38.1
2.0	29.1	8.0	38.3
2.5	30.1	8.5	38.7
3.0	31.9	9.0	39.1
3.5	32.5	9.5	39.2
4.0	33.7	10.0	39.4
4.5	33.6	10.5	39.5
5.0	34.9	11.0	39.7
5.5	35.7	11.5	40.1
6.0	36.0	12.0	40.1
6.5	36.2	/	/

TABLE 5 : HORN ANTENNA

Frequency (GHz)	Gain value (dB)	Frequency (GHz)	Gain value (dB)
1.0	43.9	7.0	34.7
1.5	44.7	7.5	34.2
2.0	45.3	8.0	35.2
2.0	34.6	8.0	30.5
2.5	36.3	8.5	30.8
3.0	34.1	9.0	31.3
3.5	34.6	9.5	31.1
4.0	35.4	10.0	30.7
4.5	34.8	10.5	29.5
5.0	35.3	11.0	30.3
5.5	35.2	11.5	31.0
6.0	35.3	12.0	29.8
6.5	34.9	/	/

TABLE 6 : AMPLIFIER (1-2GHz/2-8GHz/8-12GHz) + 2M CABLE

Frequency (GHz)	loss (dB)	Frequency (GHz)	loss (dB)
1.0	5.3	4.5	11.2
1.5	6.4	5.0	12.0
2.0	7.4	6.0	12.8
2.5	8.3	8.0	15.8
3.0	9.0	10.0	17.6
3.5	9.2	12.0	18.9
4.0	10.5	/	/

TABLE 7 : TEST CABLE FOR 3M MEASUREMENT