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EQUIPMENT UNDER TEST : **MJ waist-portable unit with 2 joystick type Gessmann Type TF02, Model B07D, Configuration M08**
APPARECCHIO IN PROVA :

DERIVED MODELS : **Configuration M09 – M10 – M11 – M12**
APPARECCHI DERIVATI :

REFERENCE STANDARDS : **FCC 47 CFR Part 15**
NORME DI RIFERIMENTO :

CUSTOMER:

RICHIEDENTE:

- **Dept. / Firm :** *Ente / Società':* *AUTEC S.r.l.*
- **Mr.:** *Sig.:* *BIANCHIN STEFANO*
- **Address:** *Indirizzo:* *VIA POMAROLI, 65 - 36030 CALDOGNO (VI) - ITALY*
- **Tel.** : *Telefono :* *++39 0444 901000* **Telefax** *Fax :* *++39 0444 901080* **E-mail:** *e-mail* *sbianchin@autec.it*

Site of test execution: Via Campagna, 92 - 22020 Gaggino Faloppio (CO) - Italy
Località esecuzione prove:

Date of test samples receipt: **26/05/04**
Data ricevimento campioni:

Date of start test: **26/05/04**
Data inizio prove:

Date of end test: **07/06/04**
Data fine prove:

Witness to the test:
Presenti alle prove:

Nobody / Nessuno
.....

Signature of the engineers:
Firma esecutore prove:

.....
F. Barbierato

Signature of the Laboratory Director:
Firma Direttore Laboratori:

.....
R. Furfari

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1. TECHNICAL INFORMATION OF EQUIPMENT UNDER TEST (EUT)

1.1 Identification

Brand name:	AUTEC
Equipment :	MJ waist-portable unit with 2 joystick type Gessmann
Model name or No. :	Type TF02 Model B07D
Serial number :	Prototype
FCC ID :	OQA-TF02B07D
Country of manufacturer:	ITALY

1.2 Technical data

FCC class:	Intentional Radiators
TX module type :	E16STXUS1
Supply voltage:	Custom NiMH Battery pack 7,2 Vdc 750mAh model MBM06MH
Typical usage :	Portable radio remote control used to command Industrial machines
EUT single or system:	Single
EUT dimensions :	255 x 170 x 126 mm

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1.3 Transmitter technical data

TRANSMITTER	
• Working Frequency :	902,150 – 927,725 MHz separated in 32 programmable radio channel
• Frequency Range of Operation :	902 – 928 MHz
• Antenna type :	Integrated

1.4 Modifications incorporated in E.U.T.

The following items are the modifications introduced in the equipment under test :

- None

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1.5 Ports identification

This section contains descriptions of all signal ports and AC/DC power input/output ports, the length and the type of the cable provided by manufacturer needed for the tests.

Moreover it is specified if the ports are ever or optionally connected.

Port		Description	Connection
1	Enclosure	Plastic surface	By screws
2	AC power input/output ports	Line not present	********
3	DC power input/output ports	Customer battery pack NiMH 7,2V 750mAh	Internal Battery support
4	Signals ports	Line not present	********
Note: During the tests all cables must be what provided the manufacturer or the same that used in the real employment of the EUT.			

1.6 Auxiliary equipment

No auxiliary equipment

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2. TEST CONDITIONS

2.1 Operating test modes and test conditions

The equipment has been tested according to the operative conditions described in the user/installation manual provided by the manufacturer and by following reference standards :

Reference Standard:

FCC Part 15, Subpart C, Section 15.231 and 15.249

In the following table there are the operating conditions adopted during tests identified by an indicator (#..) at which has been referred the item “Operating condition of the equipment under test” of all technical sheets of the tests (see Section 4)

Operating condition	*Description*
#1	*Continuous transmission*

2.2 Test overview

Sample tested is the main model of a complete set of 915 MHz RF transmitters.

The appliance is classified as “*intentional radiator”* in conformity to FCC Part 15 Sub. A §15.201, and it is subject to “*Certification*” procedure.

The application is mainly used as Industrial machines radio remote control; the RF signal when the apparatus is switch-on is continuously present.

It is possible to declare that the appliance it is subject to additional requirements stated in §15.249

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3. REFERENCE STANDARD FOR PERFORMED TESTS

Reference standard :	*Title :*
FCC Part 15 part A	Code of Regulations Part 15 (Radio Frequency Devices), Subpart A (General) of the Federal Communication Commission (FCC)
FCC Part 15 part C	Code of Regulations Part 15 (Radio Frequency Devices), Subpart C (Intentional Radiators) of the Federal Communication Commission (FCC)
ANSI C63.4	American National Standard for Methods of Measuring of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz – 40 GHz

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4. SUMMARY OF TEST RESULTS

4.1 Tests

	Port	Phenomena	Operating condition[1]	Result
1	Enclosure	Radiated emission	#1	Within the limit
		Frequency stability	Not applicable	
2	AC mains Input ports	RF Disturbance voltage: • continuous	Not applicable[2]	
		Bandwidth of emission	Not applicable[2]	
3	DC Power supply and Battery	Bandwidth of emission	#1	Within the limit

[1] Ref. Tab. of Section 2

[2] Not applicable: port not present in acc. To §15.207 (d)

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4.2 Emission limits

Acc. to §15.249 for intentional radiator operated within the frequency band 902-928 MHz

Frequency (MHz)	Field Strength of fundamental at a distance of 3m (μV/m)	Field Strength of spurious emission at a distance of 3m (μV/m)
902 – 928	**50**	**500**

According to §15.209 all the other emission of the appliance shall not exceed the following levels:

Frequency (MHz)	Field Strength at a distance of 3m (μV/m)
30 - 88	**100 ****
88 – 216	**150 ****
216 – 960	**200 ****
Above 960	**500**

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54–72 MHz, 76–88 MHz, 174–216 MHz or 470–806 MHz. However, operation within these frequency bands is permItted under other sections of this part, e.g., §§ 15.231 and 15.241.

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5. TEST RESULTS

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TEST 1.

TX – RADIATED FIELD 30 - 1000 MHZ

REFERENCE DOCUMENT FCC PART 15 subpart C

- **TEST LOCATION:** Semi-anechoic chamber (3 meters)
- **TEST EQUIPMENT USED FOR TEST:** EMI receiver Rohde & Schwarz Mod. ESMI
  Chase Antenna Mod. CBL 6111 A
- **TESTED PORT:** Enclosure
- **EMISSION LIMITS:** Acc. to Section 15.209 + 15.249
  of reference document
- **UNCERTAINTY OF MEASURE:** Combined uncertainty = ± 1.75 dB
  Total uncertainty = (k=2) ± 3.5 dB

TEST CONDITIONS:			**MEASURED**
Ambient temperature :	15 - 35 °C		24 ± 3 °C
Ambient humidity :	25 - 75 %rH		40 ± 5 %rH
Pressure :	85 - 106 kPa	(860 mbar - 1060 mbar)	950 ± 50 mbar
Voltage :	customer battery pack		7,2 Vdc

OPERATING CONDITION (Rif. Section. 2) : #1

RESULT: WITHIN THE LIMIT

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SCAN TABLE : "Radiated Emission"

Unit:	dBμV/m		
	Detector : Mode:		
Curve1:	Max Peak ClearWrite		
Curve2:	Avg ClearWrite		
Subrange:			
Start Frequency:	30.0 MHz	Step Size:	80 kHz
Stop Frequency:	1000.0 MHz	IF Bandwidth:	120 kHz
Measure Time:	10 ms		
Receiver:	ESXI	Probe Transducer:	CHASE_6111_PRC
Signal Path:	Path 4	System Transducer:	RFin2-CP1/X11
Scan Mode:	Lin	Add. Transducer:	W71.01
Tracking Gen.:	Off		
Input:	2 DC		
Preamplifier:	10 dB	Demodulation:	FM Broad
RF att.:	Coupled	Volume:	0.0%
Ref. Level:	-50 dBm	Squelch:	--
Min. RF att.:	0 dBm	Option:	None
Autorange:	On		
Curve 1:	On	Repetition:	Single
Curve 2:	On	Stop Mark:	On
		Stop Message:	On
		Text:	Connect antenna

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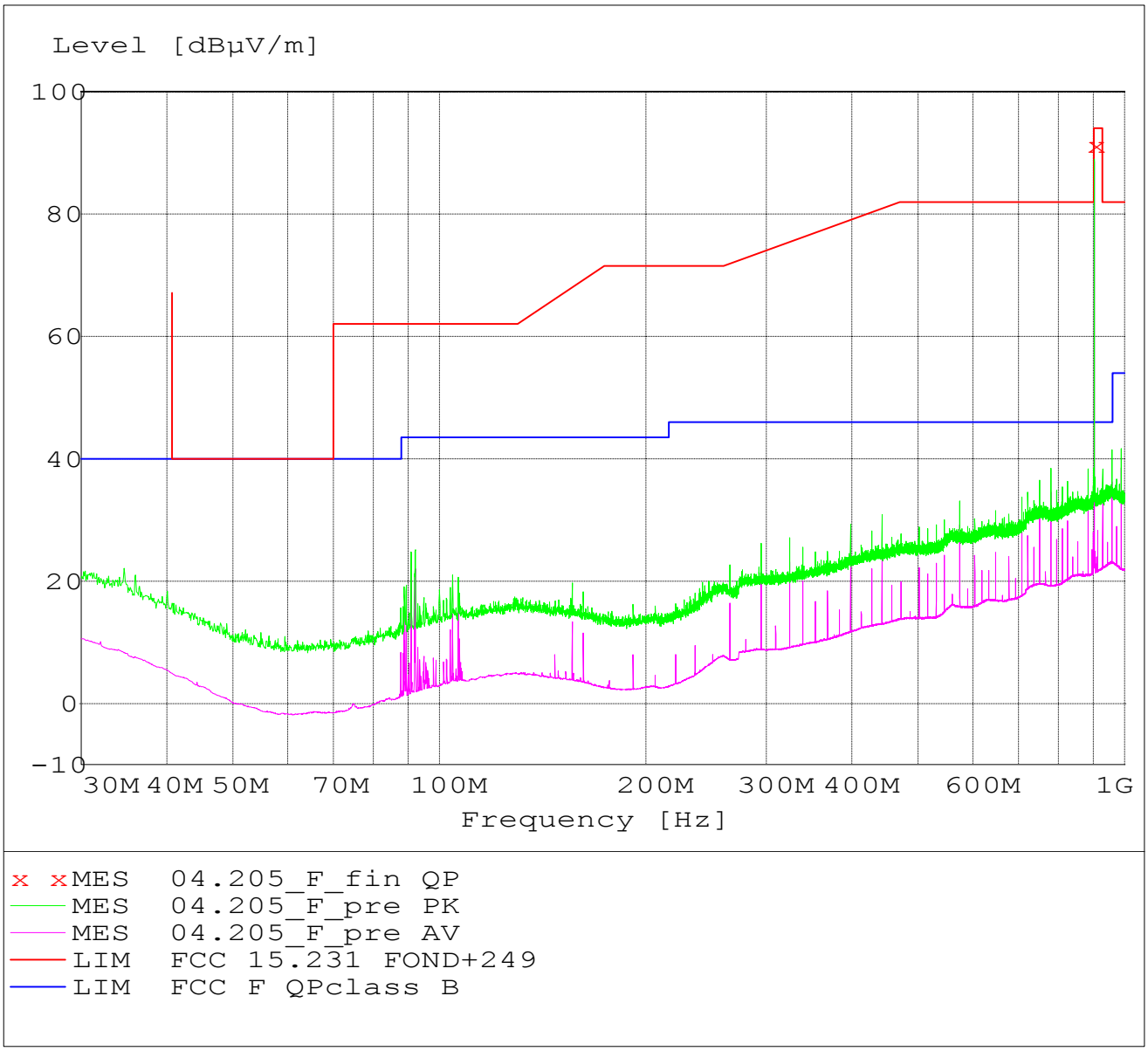

Result of the bottom frequency

Frequency	*Remark*	Limits	Measured QP level	Measured level - Antenna Polarisation
MHz		dBµV/m	dBµV/m	
902.158	Fundamental	93.98	91.20	VERTICAL

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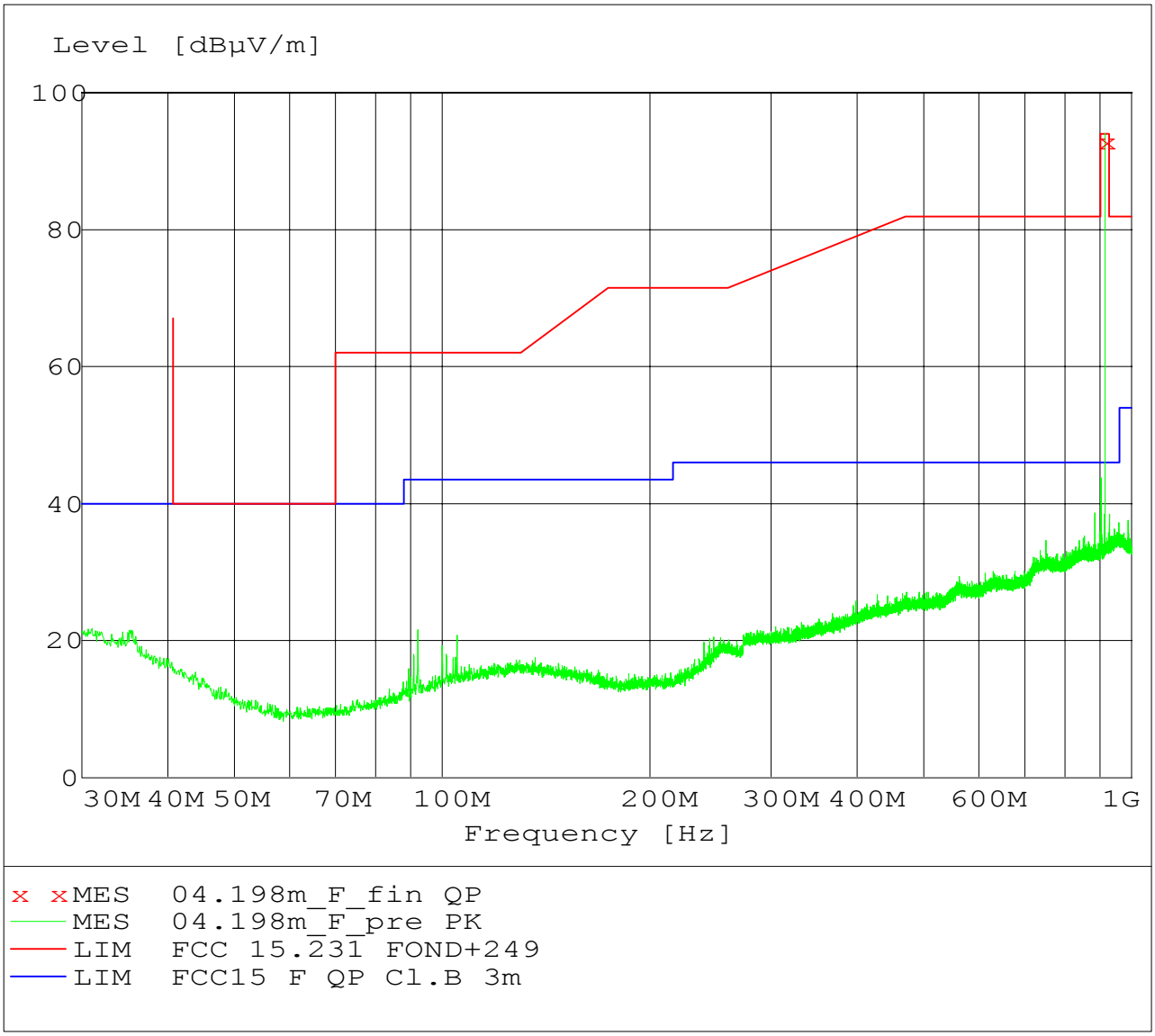

Result of the center frequency

Frequency	*Remark*	Limits	Measured QP level	Measured level - Antenna Polarisation
MHz		dBµV/m	dBµV/m	
915.1200	Fundamental	93.98	92.80	HORIZONTAL

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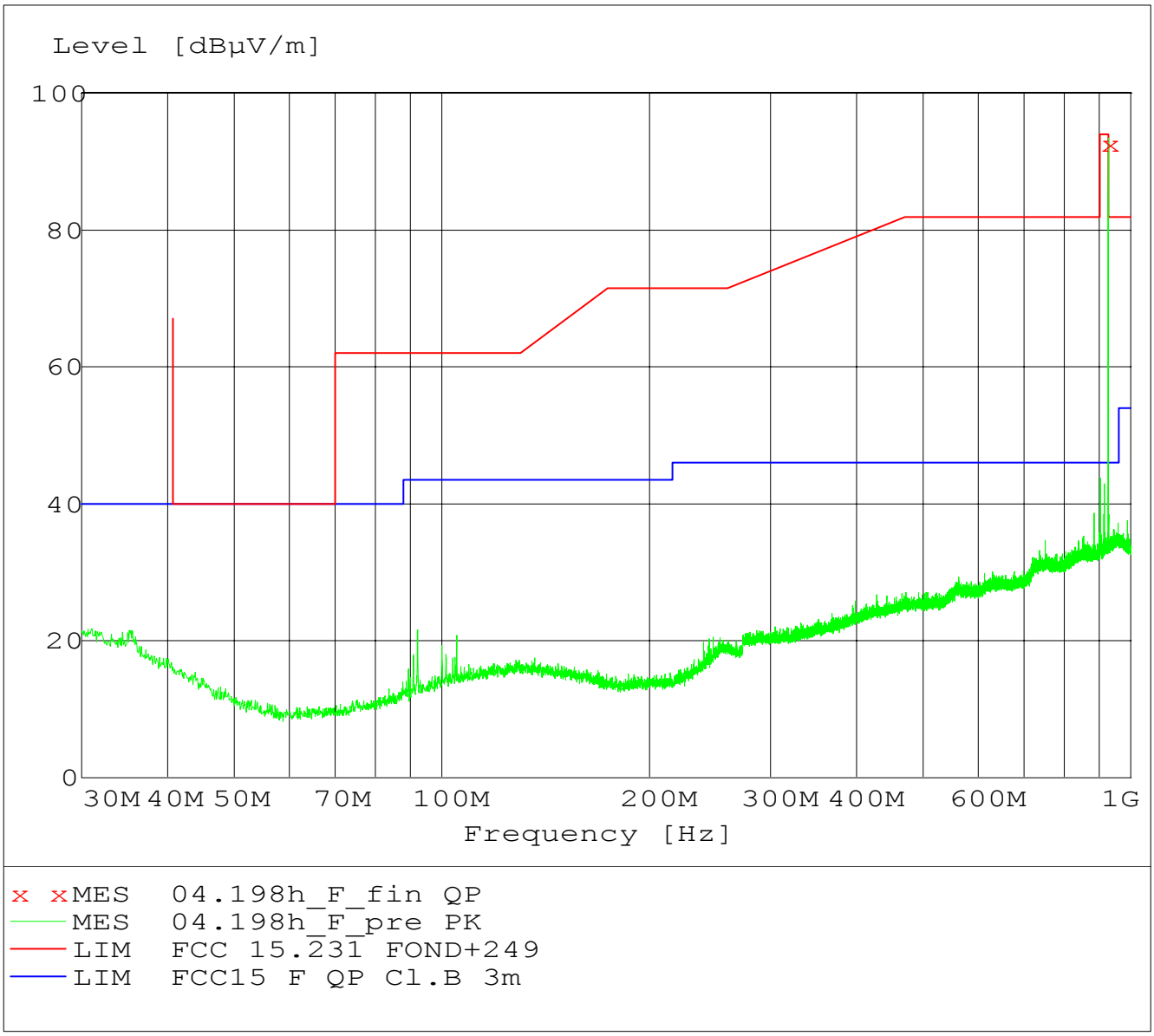

Result of the top frequency

Frequency	*Remark*	Limits	Measured QP level	Measured level - Antenna Polarisation
MHz		dBµV/m	dBµV/m	
927.1200	Fundamental	93.98	93.43	HORIZONTAL

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TEST 2.

TX – SPURIOUS EMISSION 1 - 10 GHz

REFERENCE DOCUMENT FCC PART 15 subpart C

- **TEST LOCATION:** Semi-anechoic chamber (3 meters)
- **TEST EQUIPMENT USED FOR TEST:** Spectrum Analyzer Rohde & Schwarz Mod. FSP (9kHz-40GHz)
  Log-periodica Broadband Antenna mod. HL025

- **TESTED PORT:** Enclosure
- **EMISSION LIMITS:** Acc. to Section 15.209 of reference document
- **FREQUENCY BAND :** Fundamental Frequency to 10th harmonics acc. to §15.33 (a)
- **UNCERTAINTY OF MEASURE:** Combined uncertainty = ± 1.75 dB
  Total uncertainty = (k=2) ± 3.5 dB

TEST CONDITIONS:		**MEASURED**
Ambient temperature :	15 - 35 °C	24 ± 3 °C
Ambient humidity :	25 - 75 %rH	40 ± 5 %rH
Pressure :	85 - 106 kPa (860 mbar - 1060 mbar)	950 ± 50 mbar
Voltage :	customer battery pack	7,2 Vdc

OPERATING CONDITION (Rif. Section. 2) : #1

RESULT: WITHIN THE LIMIT

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SCAN TABLE : "Radiated Emission"

Unit:	dBμV/m

	Detector :	Mode:
Curve1:	Max Peak	ClearWrite
Curve2:	--	ClearWrite

Subrange:

Start Frequency:	1000.0 MHz	Step Size:	600 kHz
Stop Frequency:	10000.0 MHz	Probe Transducer:	HL025
Measure Time:	100 ms		
IF Bandwidth:	1 MHz		
Receiver:	FSP		
Signal Path:	Path 4	System Transducer:	RFin2-CP1/X11
Scan Mode:	Lin	Add. Transducer:	W71.01
Tracking Gen.:	Off		
Input:	1		
Preamplifier:	0 dB	Demodulation:	FM Broad
RF att.:	Coupled	Volume:	0.0%
Ref. Level:	-50 dBm	Squelch:	--
Min. RF att.:	0 dBm	Option:	None
Autorange:	On		
Curve 1:	On	Repetition:	Single
Curve 2:	Off	Stop Mark:	On
		Stop Message:	On
		Text:	Connect antenna

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Limit in acc. to provisions of §15.249 for frequencies between 902-928 MHz related to field strength of spurious emissions.
In addiction to the limits over mentioned, in according to Section 15.205 for restricted bands, the limit applied is 54 dBµV/m

Measurement results

Frequency [MHz]	*Remark*	*AV Level [dBµV/m]*	*+PK level [dBµV/m]*	*AV Limit [dBµV/m]*
1807,616	Spurious	50,01	52,03	54,00
2711,559	Spurious	37,70	39,71	54,00
3615,304	Spurious	35,98	38,00	54,00
4519,233	Spurious	46,63	48,70	54,00
5422,848	Spurious	more than 20dB below limit	more than 20dB below limit	54,00
6326,656	Spurious	more than 20dB below limit	more than 20dB below limit	61,94
7230,464	Spurious	more than 20dB below limit	more than 20dB below limit	61,94
7400< f < 10000	Spurious	more than 20dB below limit	more than 20dB below limit	54,00

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TEST 3.

TX – RANGE OF MODULATION BANDWIDTH

REFERENCE DOCUMENT FCC PART 15 subpart C

- **TEST LOCATION:** Semi-anechoic chamber (3 meters)
- **TEST EQUIPMENT USED FOR TEST:** Spectrum Analyzer Rohde & Schwarz Mod. FSP (9kHz-40GHz)
  Log-periodica Broadband Antenna mod. HL025
- **TESTED PORT:** AC Mains, DC Port and Battery
- **EMISSION LIMITS:** Acc. to Section 15.215 c) of reference document

TEST CONDITIONS:			**MEASURED**
Ambient temperature :	15 - 35 °C		24 ± 3 °C
Ambient humidity :	25 - 75 %rH		40 ± 5 %rH
Pressure :	85 - 106 kPa	(860 mbar - 1060 mbar)	950 ± 50 mbar
Voltage :			2,4 Vdc

OPERATING CONDITION (Rif. Section. 2) : #1

RESULT: WITHIN THE LIMIT

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MEASUREMENT RESULTS

TEST CONDITIONS		Occupied frequency range (at 20 dB point)		
		f_L [MHz]	F_C [MHz]	f_H [MHz]
T_{amb} : + 24 °C	V_{nom} : 2,4 Vdc	902.1092	----	927.775
Incertezza di misura / Measurement Uncertainty : ± 0.1 kHz				
Legenda / Abbreviations : f_L : Lowest frequency at 20dB point F_C : Central frequency f_H : Highest frequency at 20dB point				

LIMITS
Permitted operating frequency range
902 – 928 MHz

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Diagram for bottom frequency

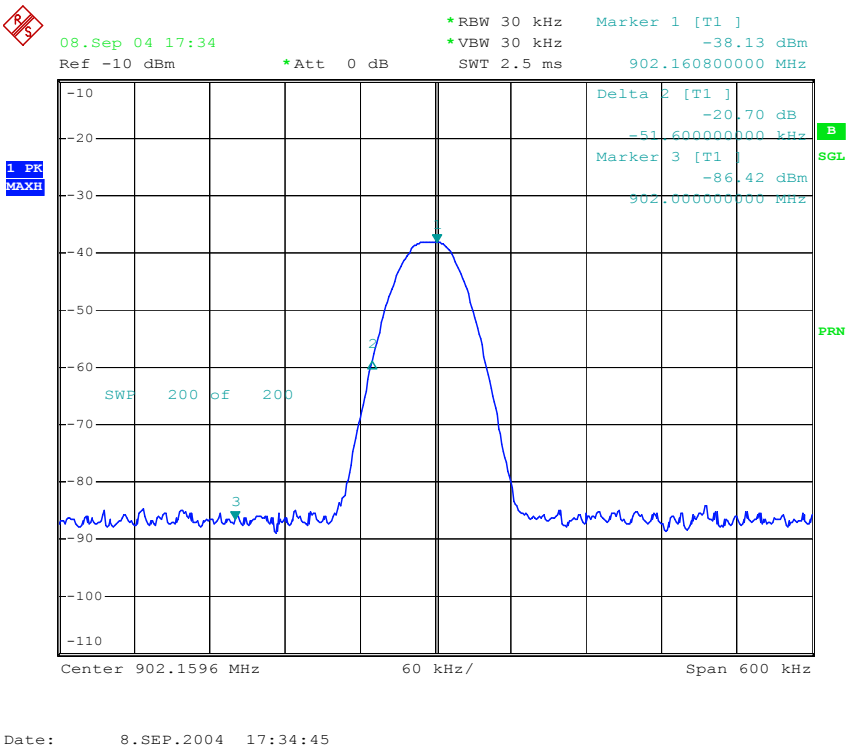
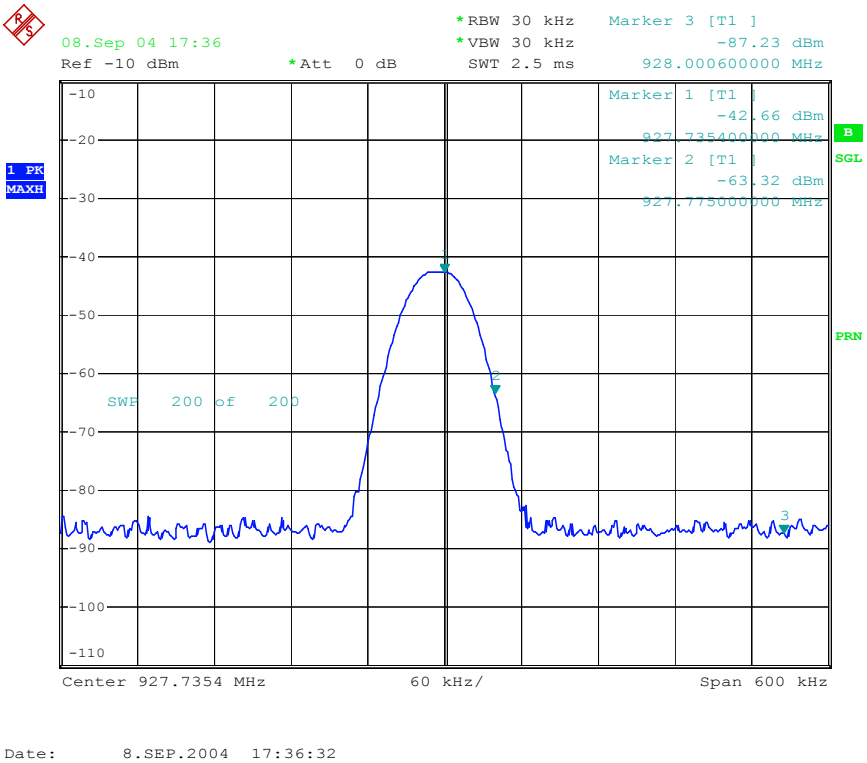


Diagram for top frequency



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6. EUT TECHNICAL DOCUMENTATION

6.1 Wiring diagrams

	Document reference (n., edition, date, ...)
WIRING DIAGRAM	Doc. No. SC000254.dsn File name : Mj 2 led board E16IL02A Issue date: 2004-03-19 Rev. 0 Sheet no. 1 Doc. No. SC000253.dsn File name : Mj interface board E16SIC01A-Z.0 Issue date: 2004-03-19 Rev. 0 Sheet no. 1 Doc. No. SC000259.dsn File name : E16STXUS1 E16S transmitter module Issue date: 2003-06-03 Rev. 0 Sheet no. 4 Doc. No. SC000222.dsn File name : Address key for E16/E16S Issue date: 2004-03-01 Rev. 1 Sheet no. 1
PART LIST	Ref. file : TF02B07D_bill.pdf Issue date: 2004-06-29 Sheet no. 1

6.2 Technical manual

	Document reference (n., edition, date, ...)
Transmitter system User's Manual	LIMJMNA0.pdf sheet no. 20

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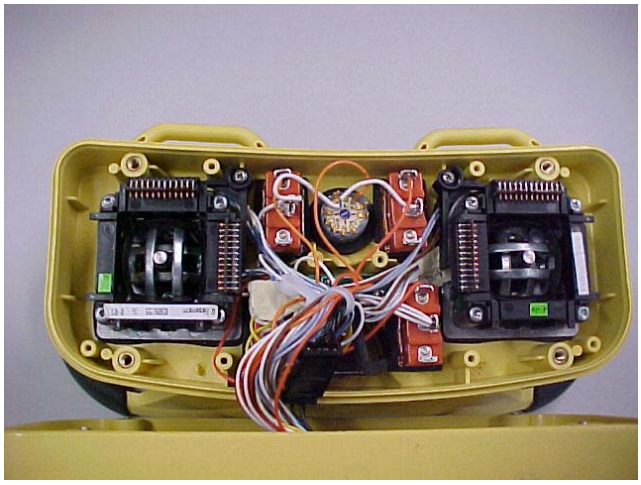
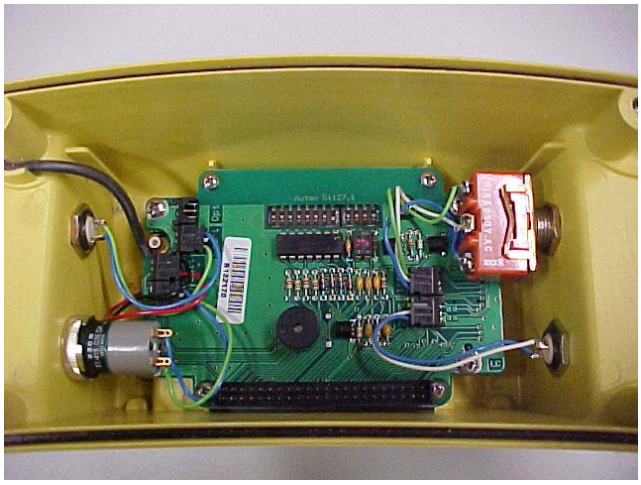
6.3 Photographic documentation

PHOTO N° 1 – EQUIPMENT UNDER TEST IDENTIFICATION





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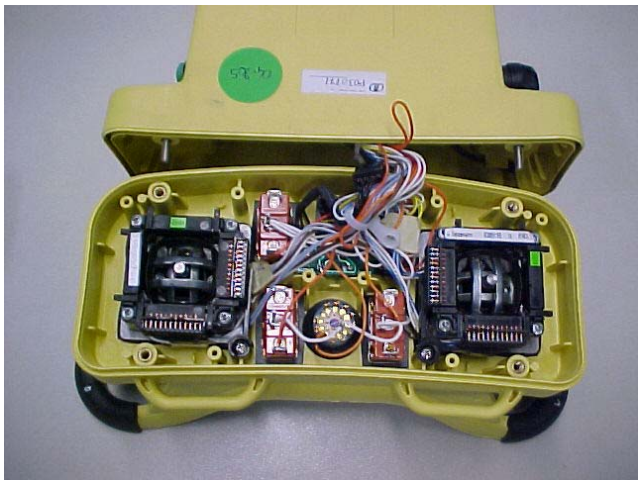
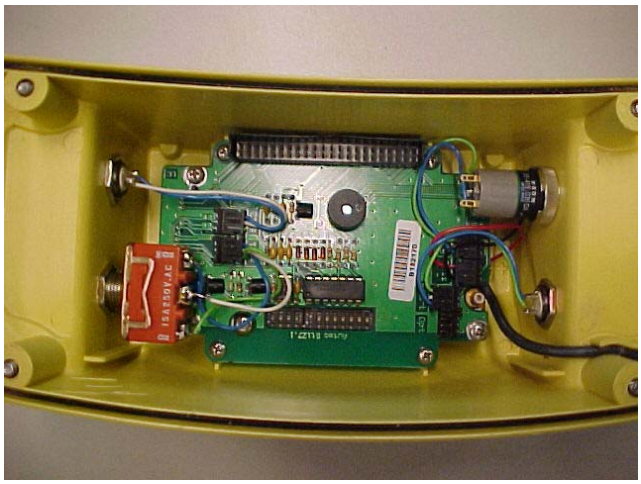
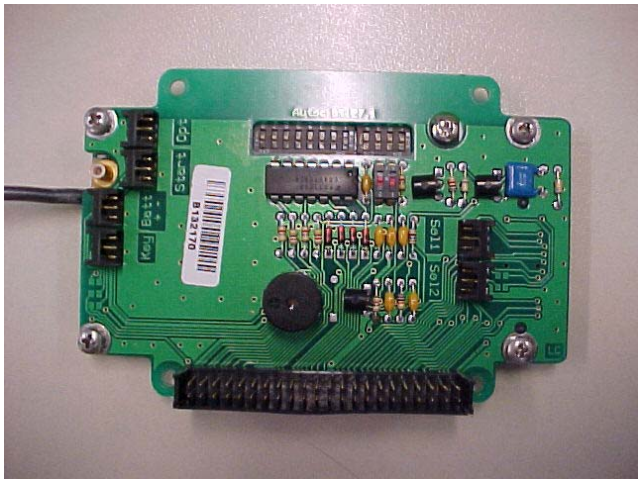
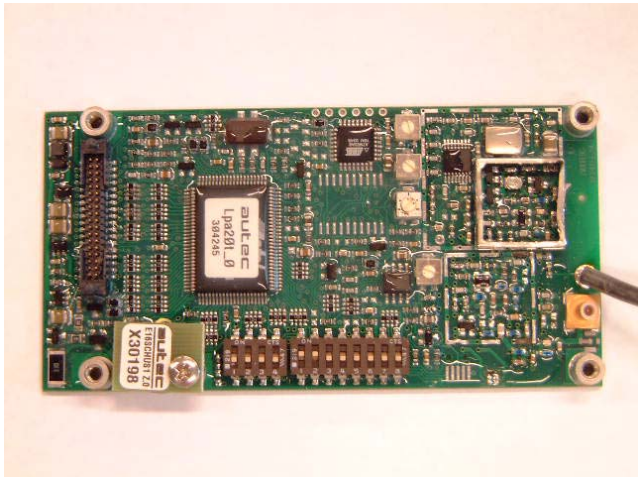






TOP VIEW OF TRANSMITTER BOARD CODE E16STXUS1



TOP VIEW OF TRANSMITTER BOARD CODE E16STXUS1 WITHOUT ALL SHIELD

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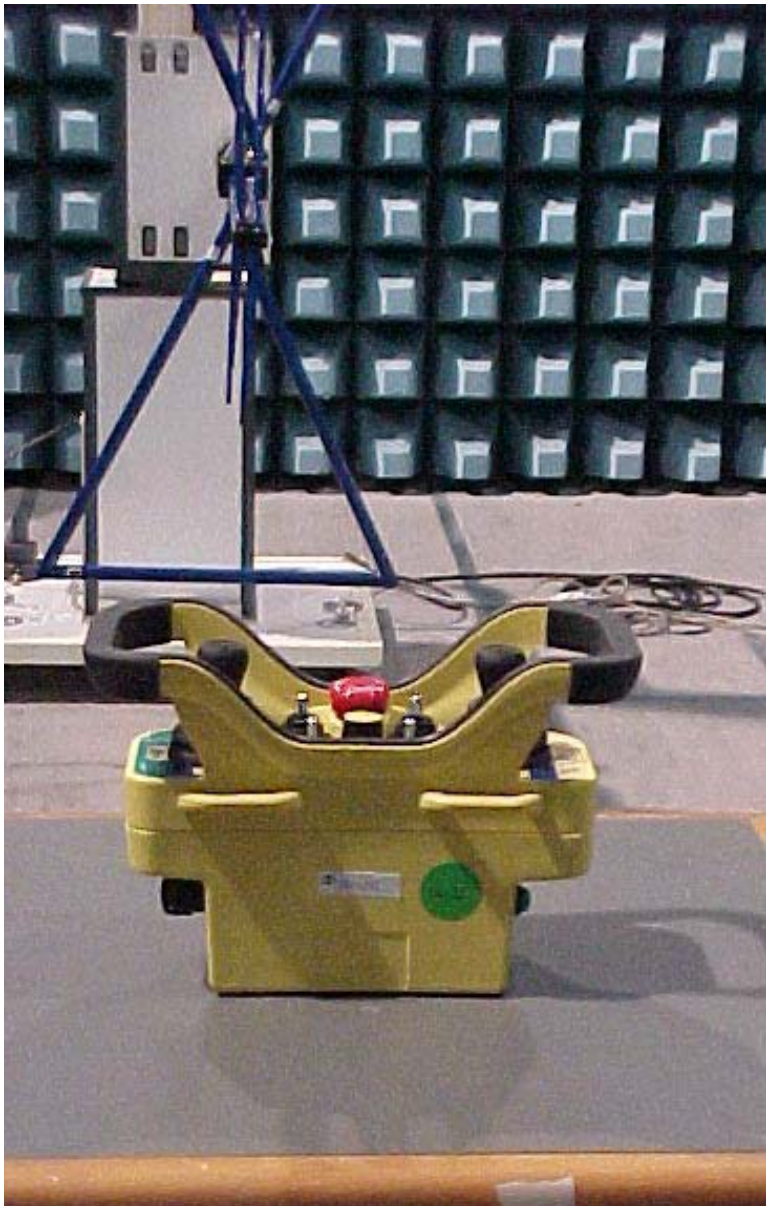
PHOTO N° 2 – SET-UP FOR EMISSION RADIATED TEST



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7. TECHNICAL REPORT OF ANALYSIS OF DERIVED PRODUCTS

EQUIPMENT under ANALYSIS :		**BRAND NAME**
BASIC MODEL	**MJ waist-portable unit with 2 joystick type Gessmann** **Type TF02, Model B07D, Configuration M08**	AUTEC Srl
DERIVED MODELS	**Configuration M09 – M10 – M11 – M12**	

Prima Ricerca & Sviluppo, just on the basis of the technical documents insert in folders called “Schematic diagrams”, “Block diagrams” and “Bill of materials” states as follows :

- the basic model and the derived models have the same plastic case
- the basic model and the derived models have the same Radio Receiver Module code E16SRXUS1
- the basic model and the derived models have the same Antenna
- There are some Configurations which differ each other for the type of the actuators used in the unit:
  - Configuration M08: has 2 joystick type Gessmann with double contacts
  - Configuration M09: hasn’t joysticks (only toggle switch, pushbutton and rotary switch)
  - Configuration M10: has 2 joystick type Euchener
  - Configuration M11: has 3 joystick type Euchener
  - Configuration M12: has 2 joystick type Gessmann with single contacts.

On these basis, Prima Ricerca & Sviluppo considers the basic model more critical to the derived models, from the EMC point of view.

Therefore, all the measures performed on the basic model and carried in this test report, are completely extendable to the derived model.