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## **1. TECHNICAL INFORMATION OF EQUIPMENT UNDER TEST (EUT)**

### **1.1 Identification**

Brand name:	AUTEC
Equipment :	LK handheld unit (6 keys)
Model name or No. :	Type TD02 Model C05D
Serial number :	Prototype
FCC ID :	OQA-TD02C05DP03
Country of manufacturer:	ITALY

### **1.2 Technical data**

FCC class:	Intentional Radiators
TX module type :	E16STXUS1
Supply voltage:	Custom NiMH Battery pack 2,4 Vdc 1,6Ah model LBM02MH
Typical usage :	Portable radio remote control used to command Industrial machines
EUT single or system:	Single
EUT dimensions :	80 x 185 x 43 mm

### **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

### 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 2,4V 1,6Ah	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

## 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 15.209 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)

<b>Operating condition</b>	<b>Description</b>
#1	<i>Continuous transmission</i>

### 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

### 3. REFERENCE STANDARD FOR PERFORMED TESTS

<i>Reference standard :</i>	<i>Title :</i>
<b>FCC Part 15 part A</b>	Code of Regulations Part 15 (Radio Frequency Devices), Subpart A (General) of the Federal Communication Commission (FCC)
<b>FCC Part 15 part C</b>	Code of Regulations Part 15 (Radio Frequency Devices), Subpart C (Intentional Radiators) of the Federal Communication Commission (FCC)
<b>ANSI C63.4</b>	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

## 4. SUMMARY OF TEST RESULTS

### 4.1 Tests

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

<sup>1</sup> Ref. Tab. of Section 2

<sup>2</sup> Not applicable: port not present in acc. To §15.207 (d)



## 4.2 Emission limits

In 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 ( $\mu\text{V/m}$ )	Field Strength of spurious emission at a distance of 3m ( $\mu\text{V/m}$ )
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 ( $\mu\text{V/m}$ )
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.

## 5. TEST RESULTS

TX – RADIATED FIELD 30 - 1000 MHZ .....	11
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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 =  $\pm 1.75$  dB  
Total uncertainty = (k=2)  $\pm 3.5$  dB

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

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

**RESULT: WITHIN THE LIMIT**

**SCAN TABLE : “Radiated Emission”**

Unit: dB $\mu$ V/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		

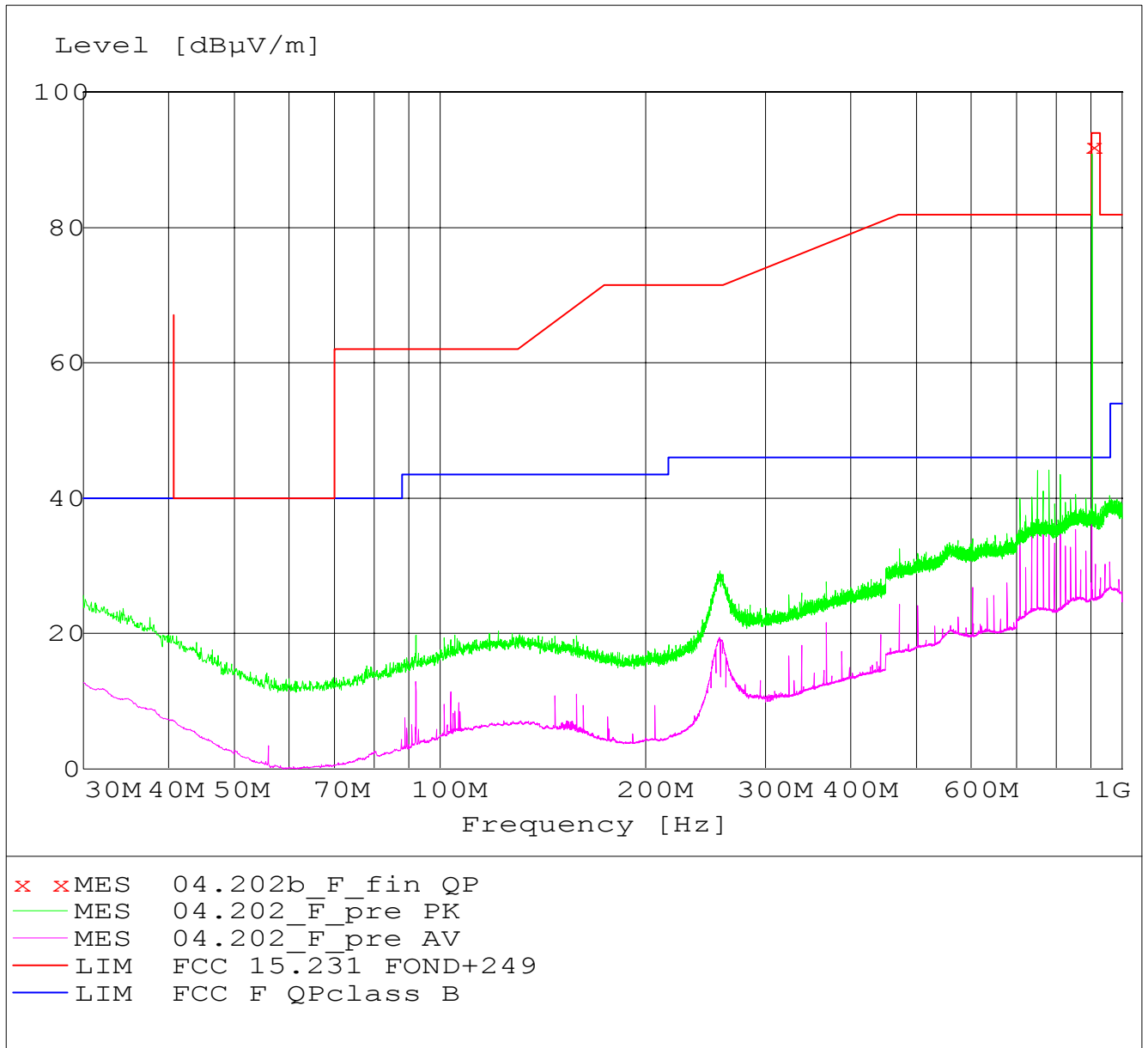
Receiver:	ESXI	Probe Transducer:	CHASE_6111_PRC
Signal Path:	Path 4	System Transducer:	RFin2-CP1/X11
Scan Mode:	Lin	Add. Transducer:	W71.01
Tracking Gen.:	Off		
Input:	2 DC		

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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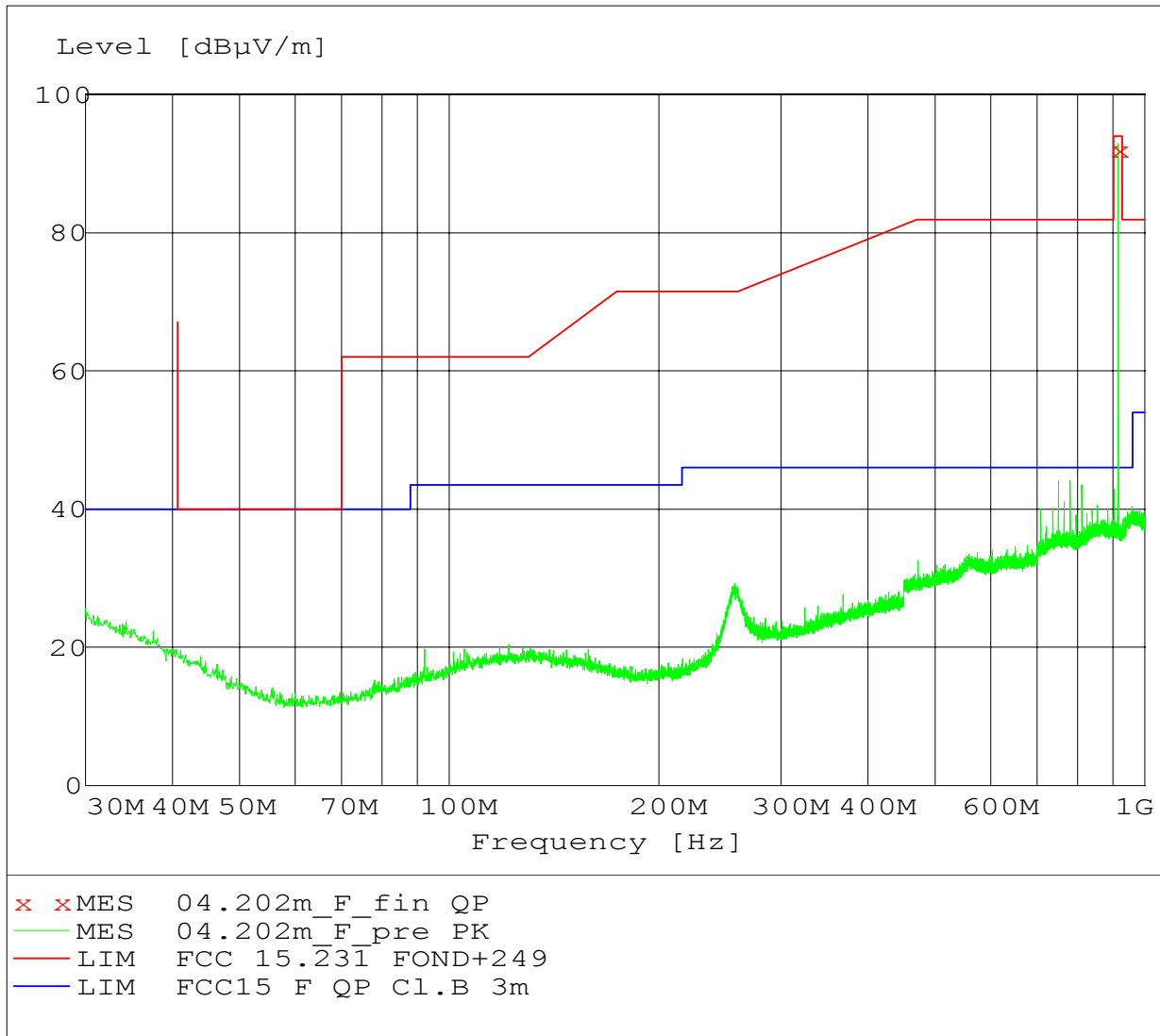


### Result of the bottom frequency

Frequency	Remark	Limits	Measured QP level	Measured level - Antenna Polarisation
MHz		dBµV/m	dBµV/m	
902.1500	Fundamental	93.98	92.00	HORIZONTAL



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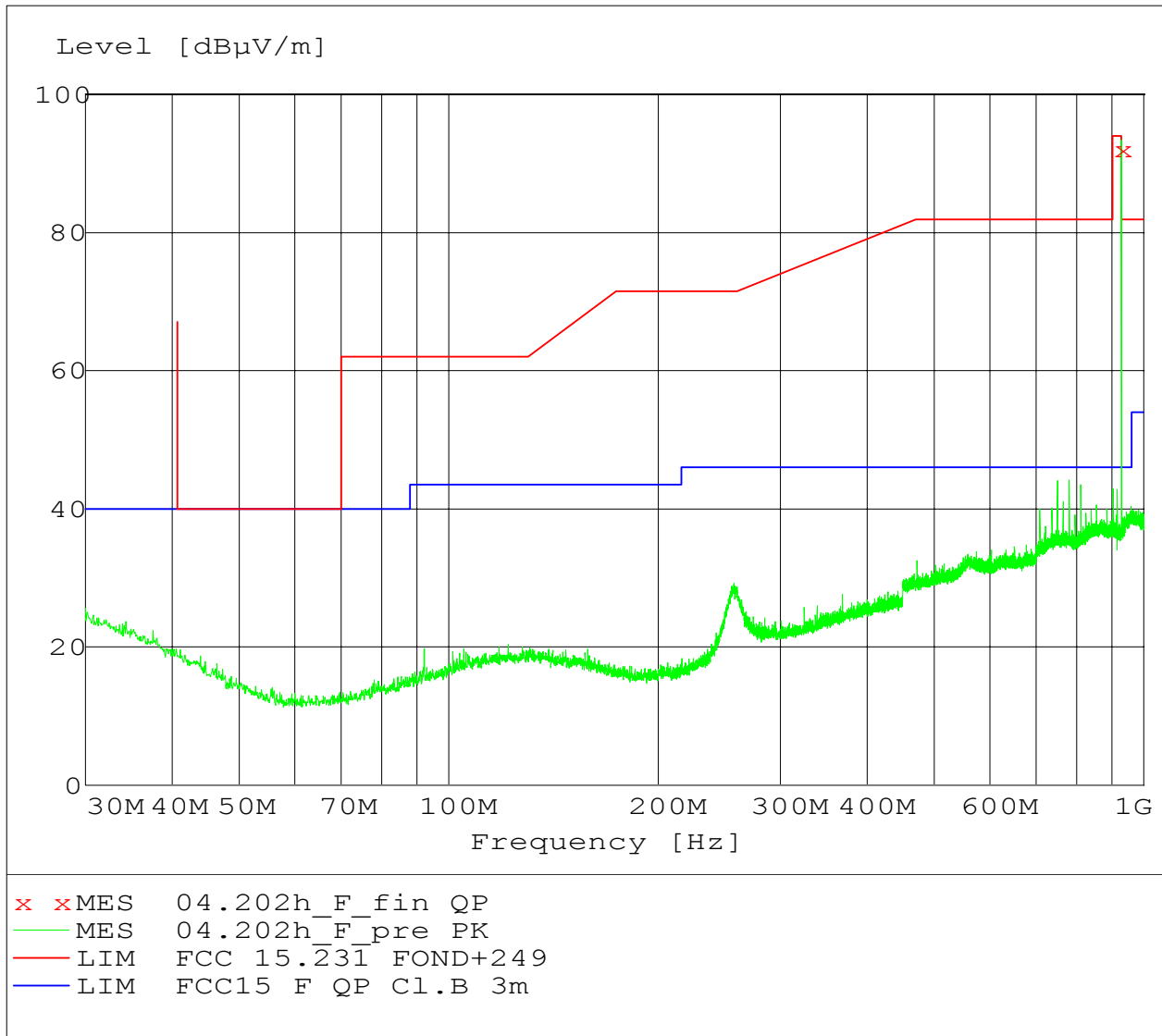


### Result of the center frequency

Frequency	Remark	Limits	Measured QP level	Measured level - Antenna Polarisation
MHz		dBµV/m	dBµV/m	
915.1200	Fundamental	93.98	91.80	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	
927.7600	Fundamental	93.98	92.10	HORIZONTAL

**TEST  
2.**

**TX – SPURIOUS EMISSION 1 - 10 GHz**

**REFERENCE  
DOCUMENT**

FCC PART 15 subpart C

- **TEST LOCATION:** Semi-anechoic chamber
- **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 10<sup>th</sup> harmonics acc. to §15.33 (a)
- **UNCERTAINTY OF MEASURE:** Combined uncertainty =  $\pm 1.75$  dB  
Total uncertainty =  $(k=2) \pm 3.5$  dB

<b>TEST CONDITIONS:</b>		<b>MEASURED</b>
Ambient temperature :	15 - 35 °C	24 $\pm$ 3 °C
Ambient humidity :	25 - 75 %rH	40 $\pm$ 5 %rH
Pressure :	85 - 106 kPa (860 mbar - 1060 mbar)	950 $\pm$ 50 mbar
Voltage :	customer battery pack	2,4 Vdc

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

**RESULT: WITHIN THE LIMIT**



**SCAN TABLE : “Radiated Emission”**

Unit: dB $\mu$ V/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

Limit in acc. to provisions of §15.249 for frequencies between 902-928 MHz related to field strength of spurious emissions.

In addition to the limits over mentioned, in according to Section 15.205 for restricted bands, the limit applied is 54 dB $\mu$ V/m

**Measurement results**

<i>Frequency</i> [MHz]	<i>Remark</i>	<i>AV Level</i> [dB $\mu$ V/m]	<i>+PK level</i> [dB $\mu$ V/m]	<i>AV Limit</i> [dB $\mu$ V/m]
1807,68	Spurious	47,95	49,95	54,00
2711,52	Spurious	37,55	39,55	54,00
3615,36	Spurious	33,92	35,92	54,00
4519,20	Spurious	41,56	43,56	54,00
5423,04	Spurious	more than 20dB below limit	more than 20dB below limit	54,00
6326,88	Spurious	more than 20dB below limit	more than 20dB below limit	61,94
7230,72	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

**TEST  
3.**

**TX – RANGE OF MODULATION BANDWIDTH**

**REFERENCE  
DOCUMENT**

FCC PART 15 subpart C

- **TEST LOCATION:** Control room
- **TEST EQUIPMENT USED FOR TEST:** Spectrum Analyzer Rohde & Schwarz Mod. FSP
- **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**

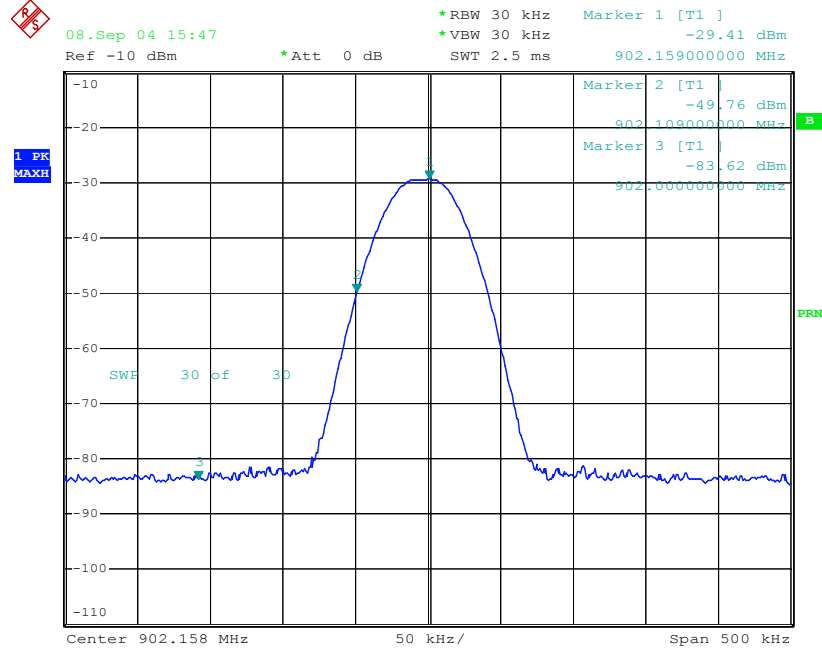
**MEASUREMENT RESULTS**

<b>TEST CONDITIONS</b>		<b>Occupied frequency range (at 20 dB point)</b>		
		<b>f<sub>L</sub> [MHz]</b>	<b>F<sub>C</sub> [MHz]</b>	<b>f<sub>H</sub> [MHz]</b>
T <sub>amb</sub> : + 24 °C	V <sub>nom</sub> : 2,4 Vdc	902.109	----	927.775
Incertezza di misura / Measurement Uncertainty : ± 0.1 kHz				
Legenda / Abbreviations : <b>f<sub>L</sub></b> : Lowest frequency at 20dB point <b>F<sub>C</sub></b> : Central frequency <b>f<sub>H</sub></b> : Highest frequency at 20dB point				

<b>LIMITS</b>
<b>Permitted operating frequency range</b>
902 – 928 MHz

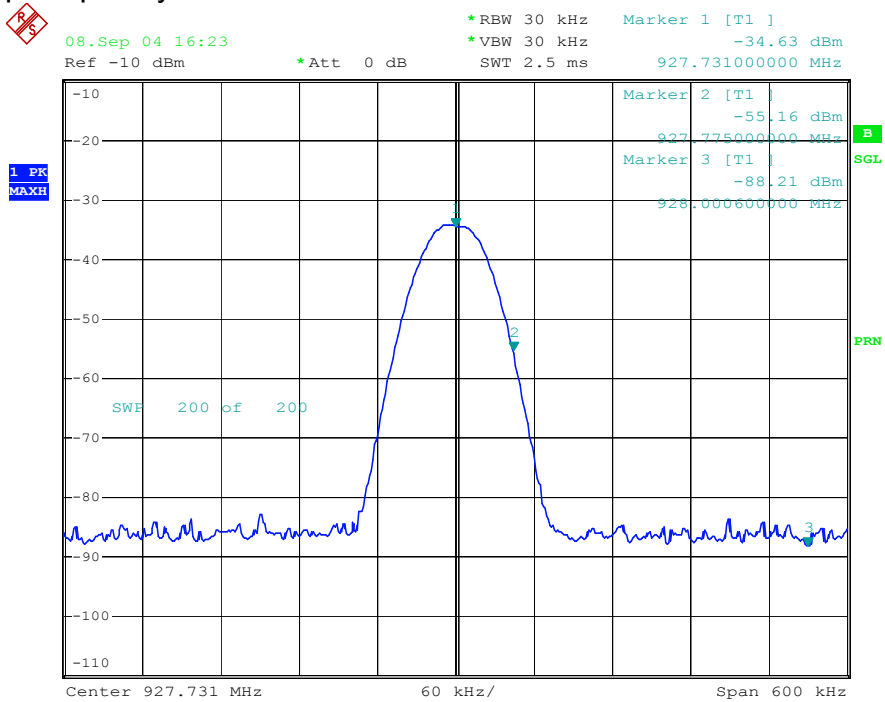
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**Diagram for bottom frequency**



Date: 8.SEP.2004 15:47:07

**Diagram for top frequency**



Date: 8.SEP.2004 16:23:48

## 6. EUT TECHNICAL DOCUMENTATION

### 6.1 Wiring diagrams

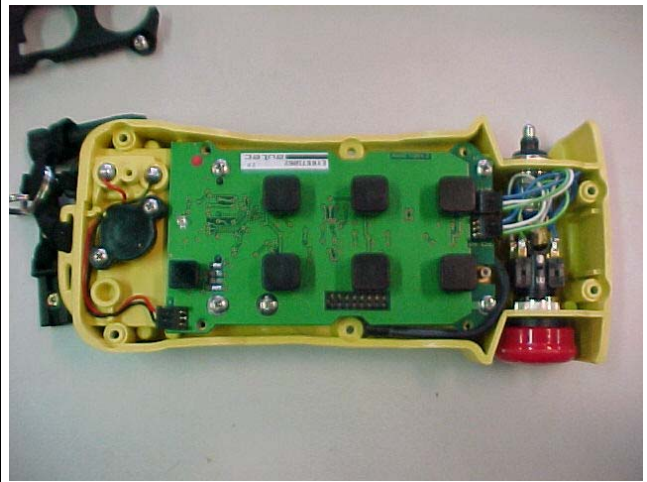
	<i>Document reference (n., edition, date, ...)</i>
<b>WIRING DIAGRAM</b>	<p>File SC000246.dsn File name : keyboard E16STI062-Z* / E16STI061-Z* E16STI042-Z* / E16STI041-Z* Issue date: 2003-11-27 Rev. 0 Sheet no. 1</p> <p>Doc. No. SC000259.dsn File name : E16STXUS1 E16S transmitter module Issue date: 2004-06-03 Rev. 0 Sheet no. 4</p> <p>Doc. No. SC000222.dsn File name : Address key for E16/E16S Issue date: 2004-03-01 Rev. 1 Sheet no. 1</p>
<b>PART LIST</b>	<p>Ref. file : TD02C05DP03_bill.pdf Sheet no. 1</p>

### 6.2 Technical manual

	<i>Document reference (n., edition, date, ...)</i>
<b>Transmitter system User's Manual</b>	<p>LILKNPA0.pdf sheet no. 20</p>

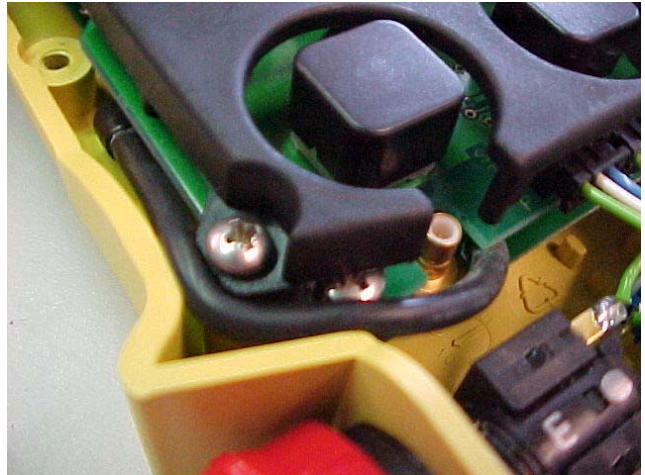
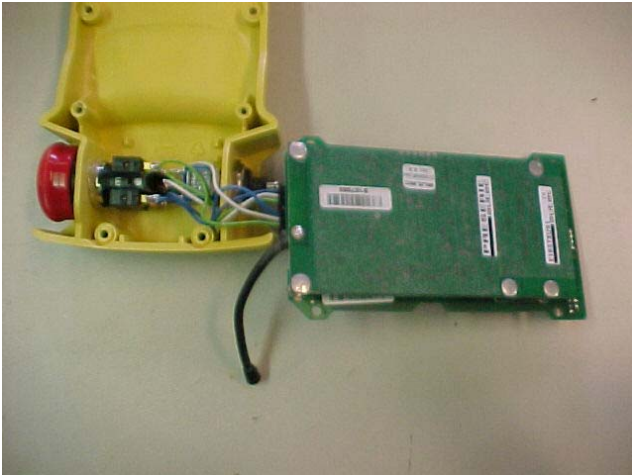
**6.3 Photographic documentation**

PHOTO N° 1 – EQUIPMENT UNDER TEST IDENTIFICATION

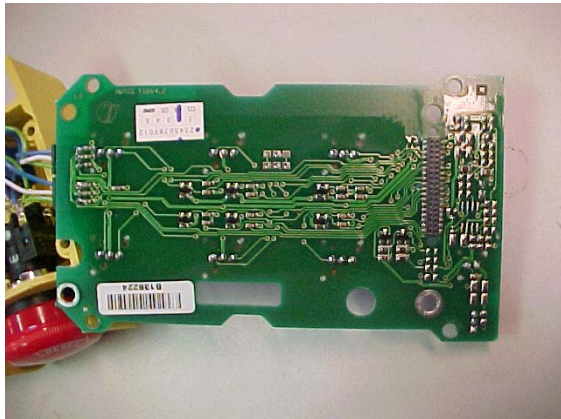


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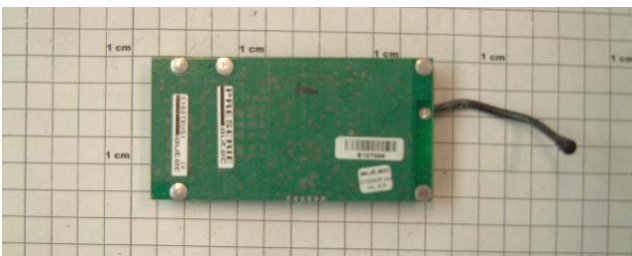
**PHOTO N° 2 – EQUIPMENT UNDER TEST IDENTIFICATION**



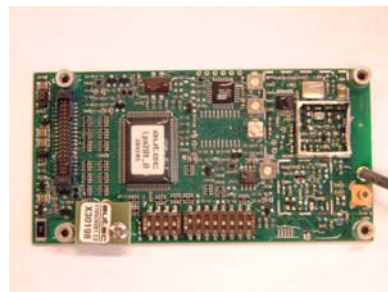
**ANTENNA LOCATION**



**RADIO BOARD**



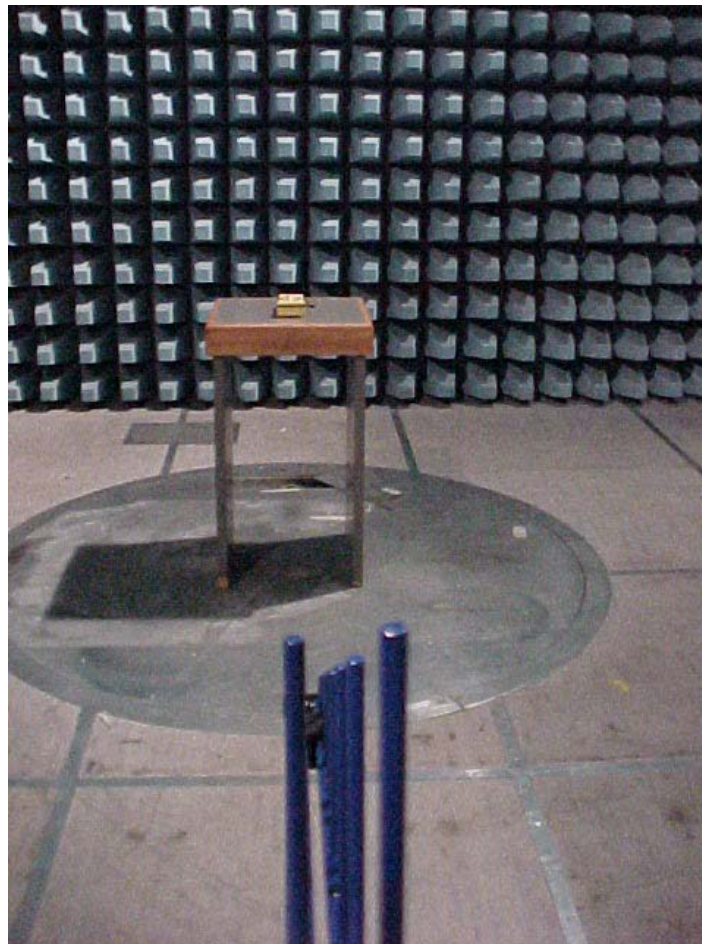
**RADIO BOARD**



**RADIO BOARD**



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



## 7. TECHNICAL REPORT OF ANALYSIS OF DERIVED PRODUCTS

EQUIPMENT under ANALYSIS :		BRAND NAME
<b>BASIC MODEL</b>	<b>LK Handheld transmitting unit (6 keys) Type TD02, Model C05D, Configuration P03</b>	AUTEC Srl
<b>DERIVED MODELS</b>	<b>LK Handheld transmitting unit (4 keys) Type TD02, Model C05D, Configuration P04</b>	

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 Transmitter Module code E16STXUS1
- ◆ the basic model and the derived models have the same Antenna

The two configuration differ each other for the number of key:

- configuration P03 has 6 keys
- configuration P04 has 4 keys

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.

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**PHOTO N° 1 – DERIVED MODEL IDENTIFICATION**

