

Prima Ricerca & Sviluppo Srl soggetta a direzione e coordinamento da parte della Giovanni Maspero & C. S.p.A. – C.I. 02634780130
Sede legale : 22100 Tavernola (CO) Via Conciliazione, 1 Cod. FISC. e N. R.I. CO 02635860139
Sede operativa : Laboratori Via Campagna, 92 22020 Faloppio fraz. Gaggino (CO) Tel. +39 03135000.11 Fax +39 031991309

EQUIPMENT UNDER TEST :

APPARECCHIO IN PROVA :

TELEMETRY UNIT

K4b²

REFERENCE STANDARDS :

NORME DI RIFERIMENTO :

FCC 47 CFR Part 15

CUSTOMER:

RICHIEDENTE:

- **Dept. / Firm :** COSMED S.r.l.
Ente / Società:
- **Mr.:** ING. EMANUELE PAGLIEI
Sig.:
- **Address:** VIA DEI PIANI MONTE SAVELLO, 37 00040 PAVONA DI ALBANO ROMA - ITALY
Indirizzo:
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Telefono : **Fax :** **e-mail**

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

Date of test samples receipt: 20/10/04 **Date of start test:** 20/10/04
Data ricevimento campioni: **Data inizio prove:**

Date of end test: 20/10/04
Data fine prove:

Witness to the test:
Presenti alle prove:

Nobody / Nessuno
.....

Signature of the engineers:
Firma esecutore prove:



.....
M. Maltempo

Signature of the Laboratory Director:
Firma Direttore Laboratori:



.....
R. Furfari

The test results recorded in this Test Report are exclusively referred to the tested samples.

I risultati del presente rapporto di prova si riferiscono esclusivamente al campione sottoposto a prova.

Reproduction of this EMC-Test Report in whole or in part is prohibited without the written authorization of the Laboratory Director

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1. TECHNICAL INFORMATION OF EQUIPMENT UNDER TEST (EUT)

1.1 Identification

Brand name:	COSMED
Equipment :	TELEMETRY UNIT
Model name or No. :	K4- b^2
Serial number :	Prototype
FCC ID :	SN7-K4B2T-USA
Country of manufacturer:	ITALY

1.2 Technical data

FCC class:	Intentional Radiators
TX module type :	COSMED
Supply voltage:	6Vdc from Custom NiMH Battery pack or external power supply 115Vac/6Vdc
Typical usage :	ISM
EUT single or system:	Single
EUT dimensions :	170 x 90 x 53 mm

1.3 Transmitter technical data

TRANSMITTER

- Working Frequency : 913,300 – 914,700 MHz
separated in 15 programmable (dip switch) radio channel
- Frequency Range of Operation : 913 – 915 MHz
- Antenna type : Integrated
- Modulation : FSK
- Data rate used : Baud rate 9600

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	external Battery cable
4	Signals ports	Line not present	*****
<i>Note: During the tests all cables must be what provided the manufacturer or the same that used in the real employment of the EUT.</i>			

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)

Operating condition	Description
#1	<i>Continuous transmission (condition true only for this test session)</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. C §15.201, and it is subject to “*Certification*” procedure.

The application is mainly used as Medical machines radio remote control; the portable unit transmits breath by breath data to the receiver unit. Connecting the receiver unit to a PC serial port, allows the researcher to monitor the test on-line through data display in table and graphic format. The completed tests are stored in the memory of the Portable Unit so that, in case of transmission interference, no data is lost.

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

<i>Reference standard :</i>	<i>Title :</i>
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	
		Bandwidth of emission	#1	Within the limit
2	AC mains Input ports	RF Disturbance voltage: continuous	#1	Within the limit
3	DC Power supply and Battery	RF Disturbance voltage: continuous	Not applicable ²	

¹ Ref. Tab. of Section 2

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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 (mV/m)	Field Strength of spurious emission at a distance of 3m (μ 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 (μ 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

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**TEST
1.**

EMISSION OF MAINS TERMINAL DISTURBANCE VOLTAGE

**REFERENCE
DOCUMENT**

FCC PART 15 subpart B

- **TEST LOCATION:** Semianechoic chamber
- **TEST EQUIPMENT USED FOR TEST:** EMI receiver Rohde & Schwarz Mod. ESMI
Artificial Network Rohde & Schwarz Mod. ESH3-Z5

- **TESTED PORT:** AC mains
- **FREQUENCY RANGE:** 0.15 - 30 MHz
- **EMISSION LIMITS:** Acc. to reference document 15.107
- **MEASUREMENT UNCERTAINTY:** Total uncertainty (k=2) ± 2.5 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 :	110 Vac /60 Hz		110 Vac $\pm$ 3%

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

RESULT: Within the limits

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SCAN TABLE : Voltage Mains

Unit : dBμV

Detector : Mode :

Curve 1: MaxPeak ClearWrite

Curve 2: Average ClearWrite

Start Frequency : 150.0 kHz

Stop Frequency : 30.0 MHz

Measure Time : 10.0 ms

IF Bandwidth : 9 kHz

Step size : 6 kHz

Receiver : ESMI

Signal Path : Path 3

Meas. Mode : Lin

Tracking Generator : Off

Input : 1AC

Transducer : ESH3-Z5_PRC

System Transducer : Rfin1-CP2/X11

Add. Transd. 1 : W71.03

Add. Transd. 2 : None

Add. Transd. 3 : None

Preamplifier : 10 dB

RF Att. : Coupled

Ref. Level : -10 dBm

Min. RF Att. : 0 dB

IF Att. : 0 dB

Autorange : On

Demodulation : FM Broad

Volume : 0 %

Squelch : --

Option : None

Curve 1 : On

Curve 2 : On

Repetition : Single

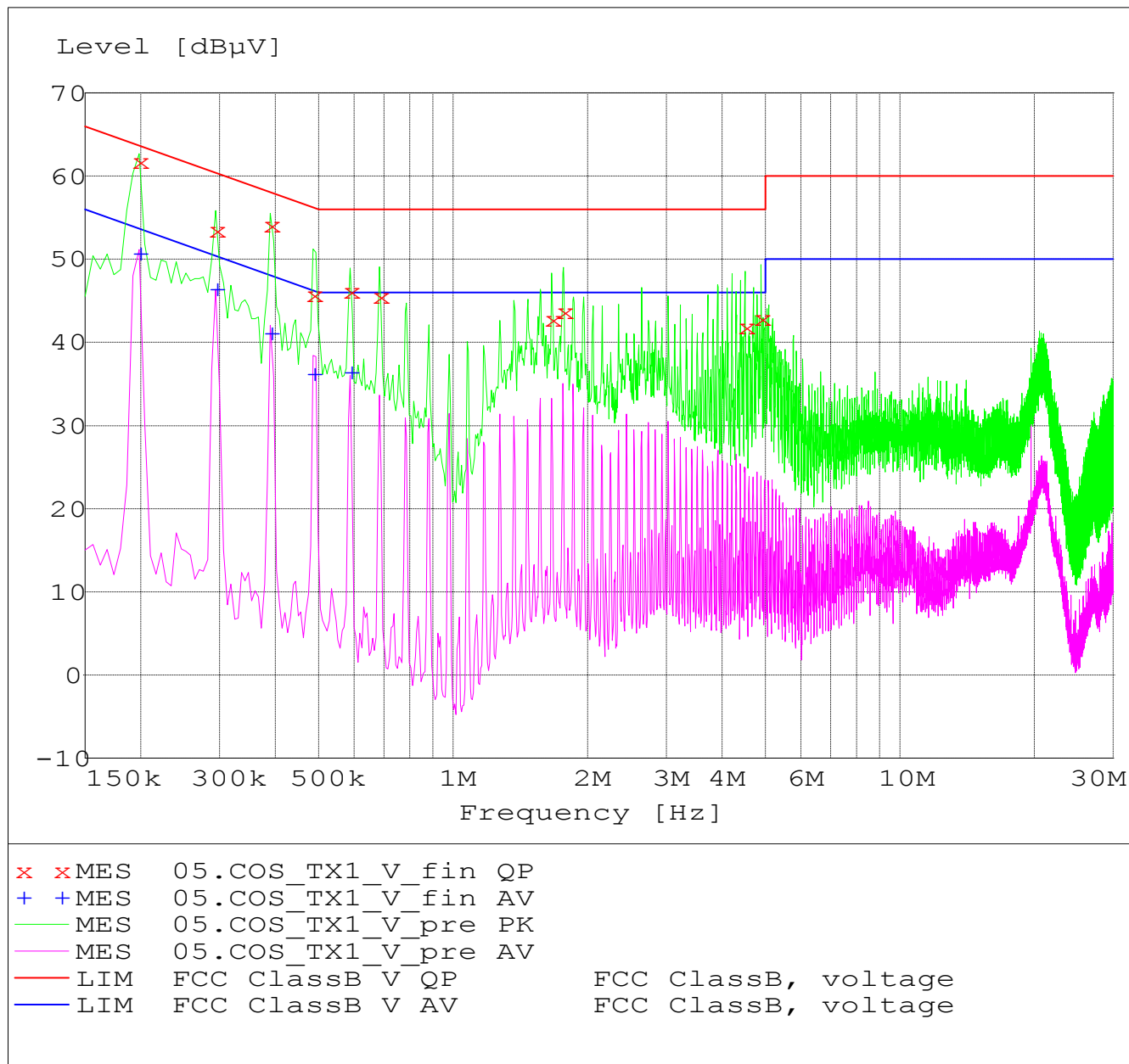
Stop Mark : On

Stop Message : On

Stop Message : Connect EUT

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Conducted emission test with EUT supply by external power adaptor 115Vac / 6Vdc



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FINAL MEASUREMENT – QP detector

Detector	Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Line	PE
QP	0.198000	61.00	0.00	63.70	2.70	N	GND
QP	0.294000	53.30	0.00	60.40	7.10	N	GND
QP	0.390000	53.90	0.00	58.10	4.10	L1	GND
QP	0.492000	47.90	0.00	56.10	8.20	N	GND
QP	0.588000	45.30	0.00	56.00	10.70	L1	GND
QP	0.684000	46.00	0.10	56.00	10.00	L1	GND
QP	1.572000	39.10	0.10	56.00	17.00	N	GND
QP	3.528000	30.80	0.10	56.00	25.20	N	GND
QP	3.822000	31.90	0.10	56.00	24.10	N	GND
QP	4.422000	27.40	0.20	56.00	28.60	N	GND
AV	0.198000	50.50	0.00	53.70	3.20	N	GND
AV	0.294000	46.20	0.00	50.40	4.30	N	GND
AV	0.390000	41.30	0.00	48.10	6.70	N	GND
AV	0.492000	38.20	0.00	46.10	7.90	L1	GND
AV	0.588000	35.10	0.00	46.00	10.90	N	GND
AV	0.684000	33.40	0.10	46.00	12.60	N	GND

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**TEST
2.**

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 $\pm$ 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	6 Vdc

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

RESULT: WITHIN THE LIMIT

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SCAN TABLE : “Radiated Emission”

Unit: dB μ 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

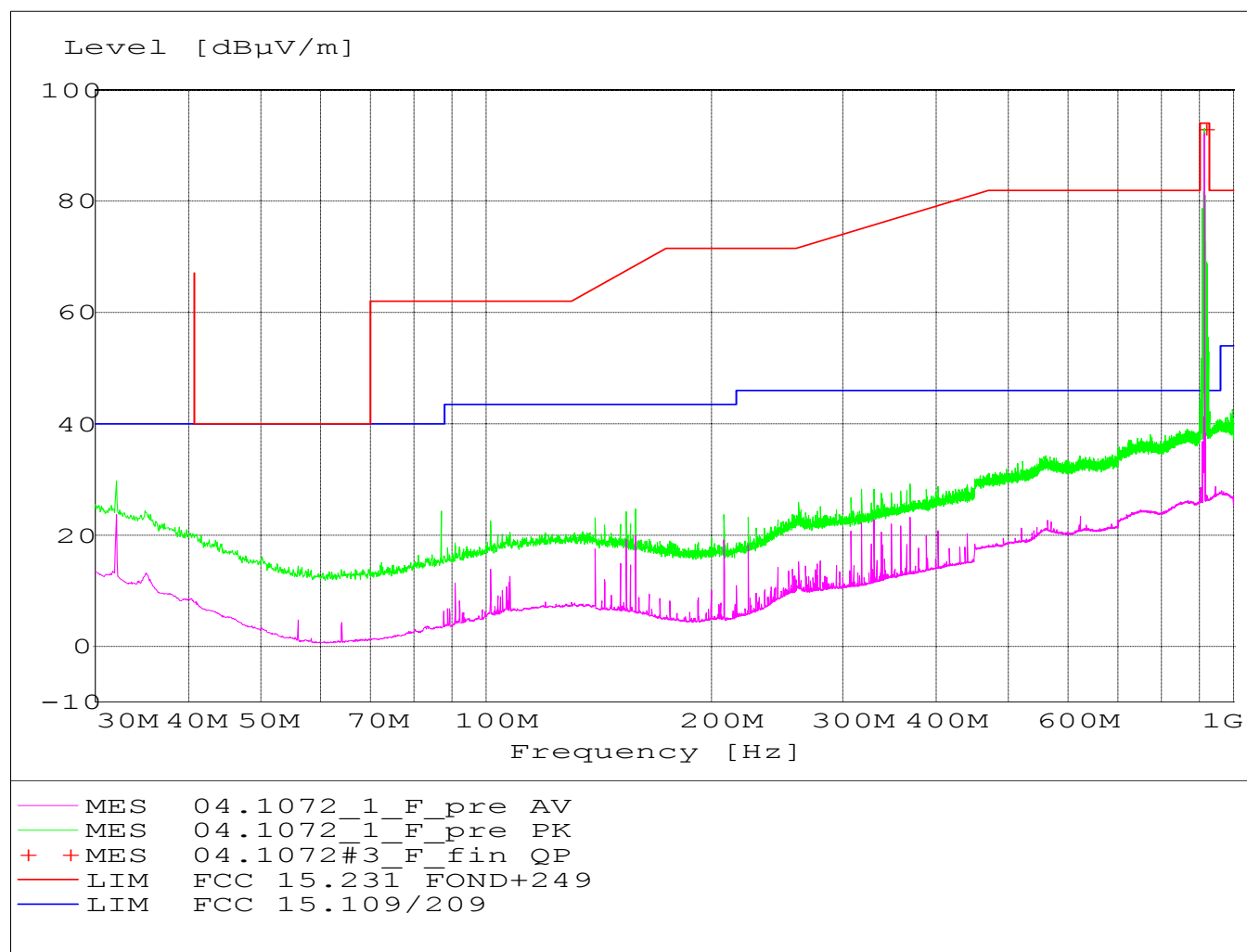
Curve 2: On

Stop Mark: On

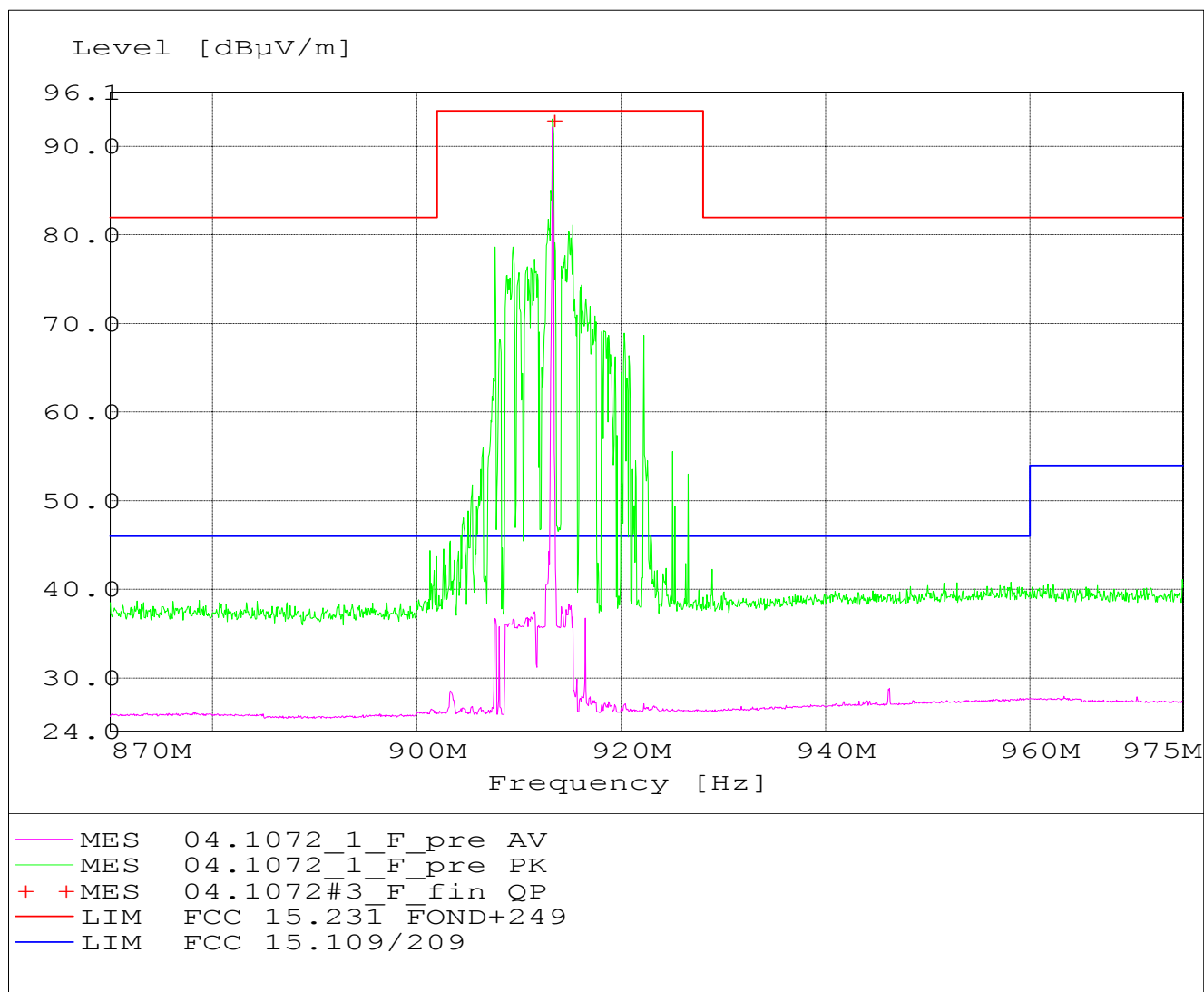
Stop Message: On

Text: Connect antenna

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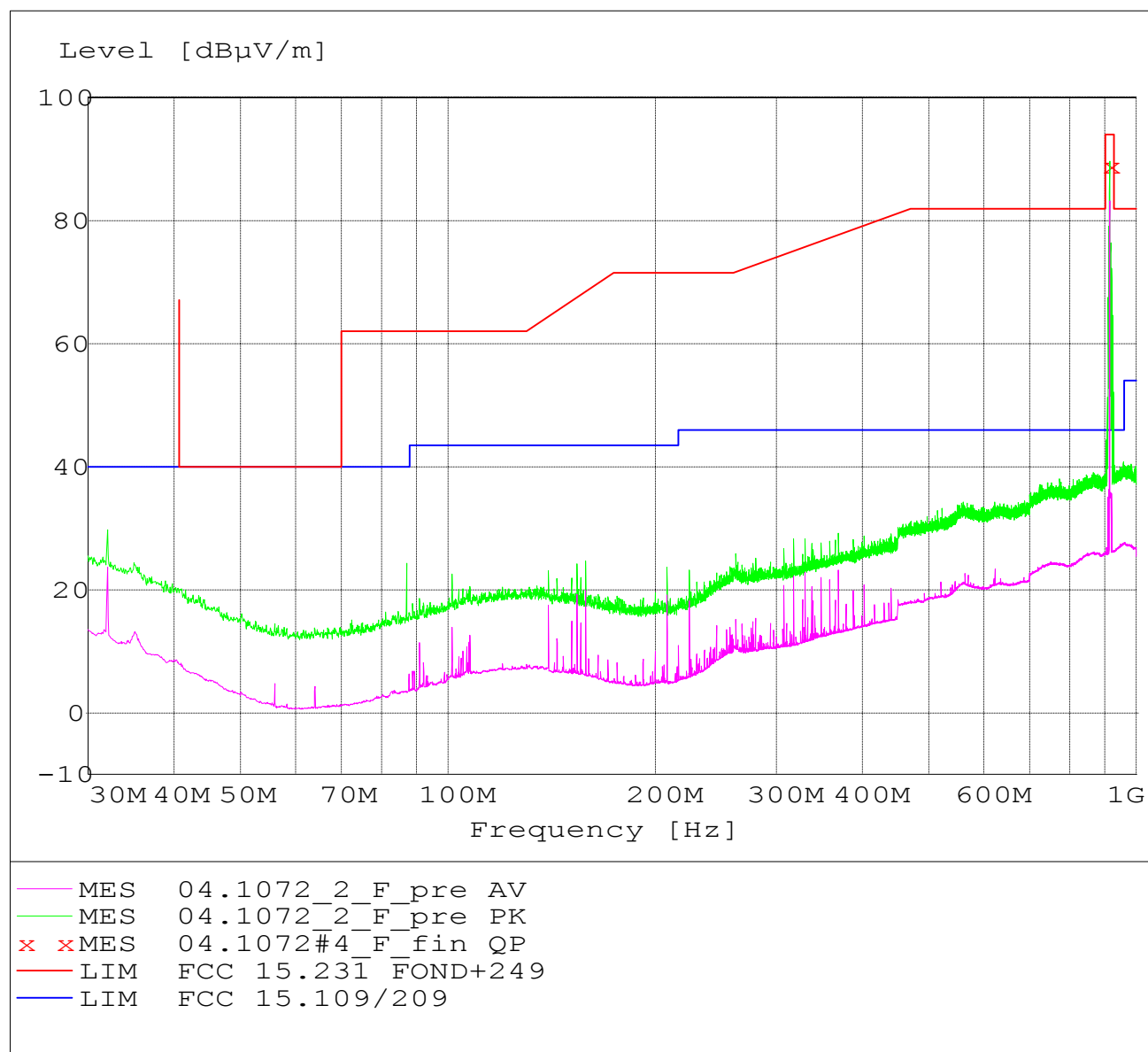
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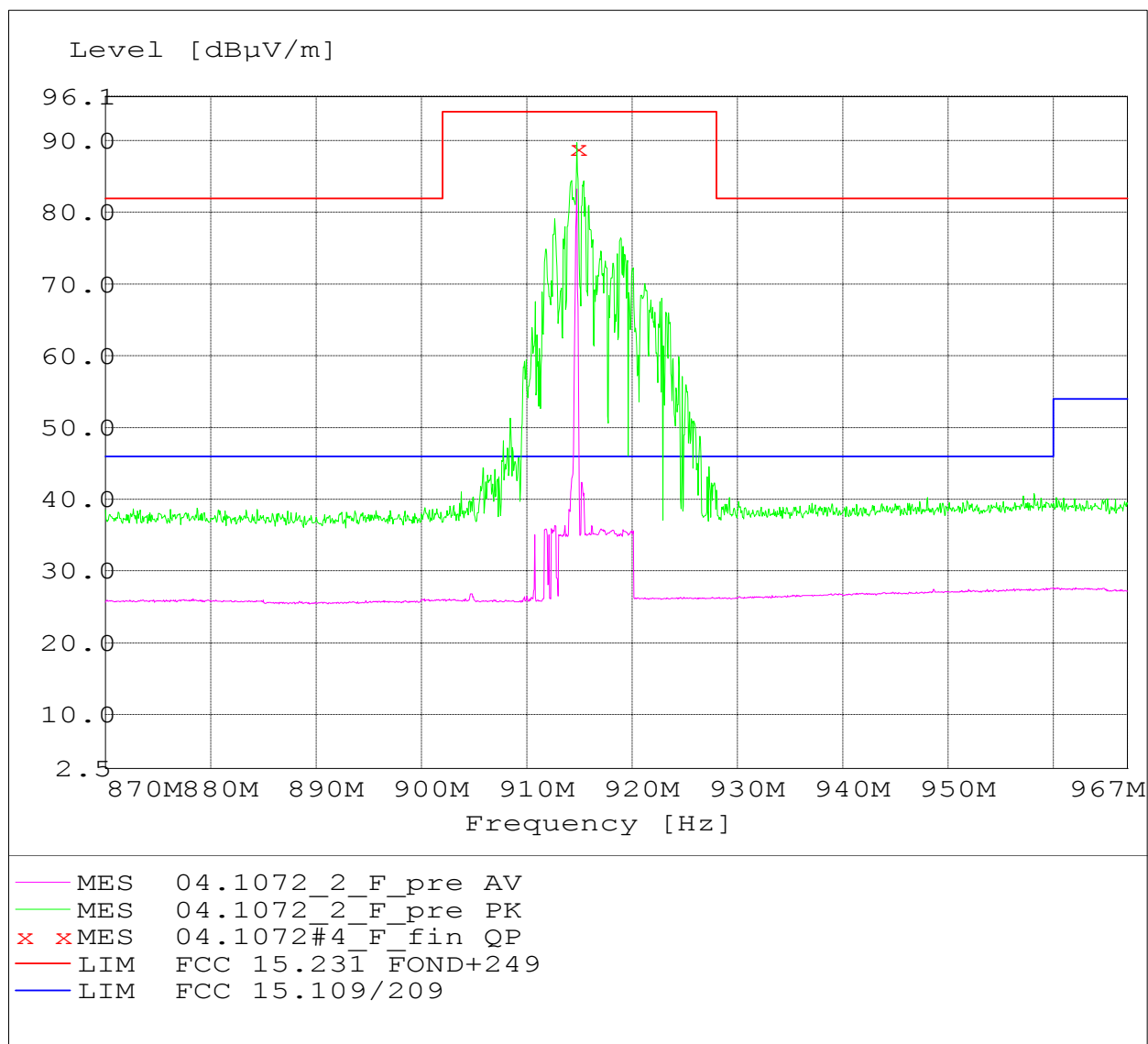
Result of the bottom frequency

Frequency	Remark	Limits	Measured QP level	Measured level - Antenna Polarisation
MHz		dBμV/m	dBμV/m	
913.290	Fundamental	93.98	92.00	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	
914.7200	Fundamental	93.98	88.90	HORIZONTAL

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**TEST
3.****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 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 $\pm$ 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	6 Vdc

OPERATING CONDITION (Rif. Section. 2) : #1**RESULT: WITHIN THE LIMIT**

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SCAN TABLE : “Radiated Emission”

Unit: dB μ 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

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

Measurement results for bottom frequency 913.29 MHz

<i>Frequency</i> [MHz]	<i>Remark</i>	<i>AV Level</i> [dB μ V/m]	<i>+PK level</i> [dB μ V/m]	<i>AV Limit</i> [dB μ V/m]
1826,581	Spurious	40,73	42,8	54,00
2739,872	Spurious	31,22	33,22	54,00
3653,164	Spurious	29,15	31,15	54,00
4566,45	Spurious	more than 20dB below limit	more than 20dB below limit	54,00
5479,74	Spurious	more than 20dB below limit	more than 20dB below limit	54,00
6393,03	Spurious	more than 20dB below limit	more than 20dB below limit	61,94
7306,32	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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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 μ V/m

Measurement results for top frequency 914.70 MHz

<i>Frequency [MHz]</i>	<i>Remark</i>	<i>AV Level [dBμV/m]</i>	<i>+PK level [dBμV/m]</i>	<i>AV Limit [dBμV/m]</i>
1829,401	Spurious	40,65	41,5	54,00
2744,187	Spurious	32,12	34,31	54,00
3658,816	Spurious	28,17	30,05	54,00
4573,5	Spurious	more than 20dB below limit	more than 20dB below limit	54,00
5488.2	Spurious	more than 20dB below limit	more than 20dB below limit	54,00
6402.9	Spurious	more than 20dB below limit	more than 20dB below limit	61,94
7317.6	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
4.****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 :		6 Vdc

OPERATING CONDITION (Rif. Section. 2) : #1**RESULT: WITHIN THE LIMIT**

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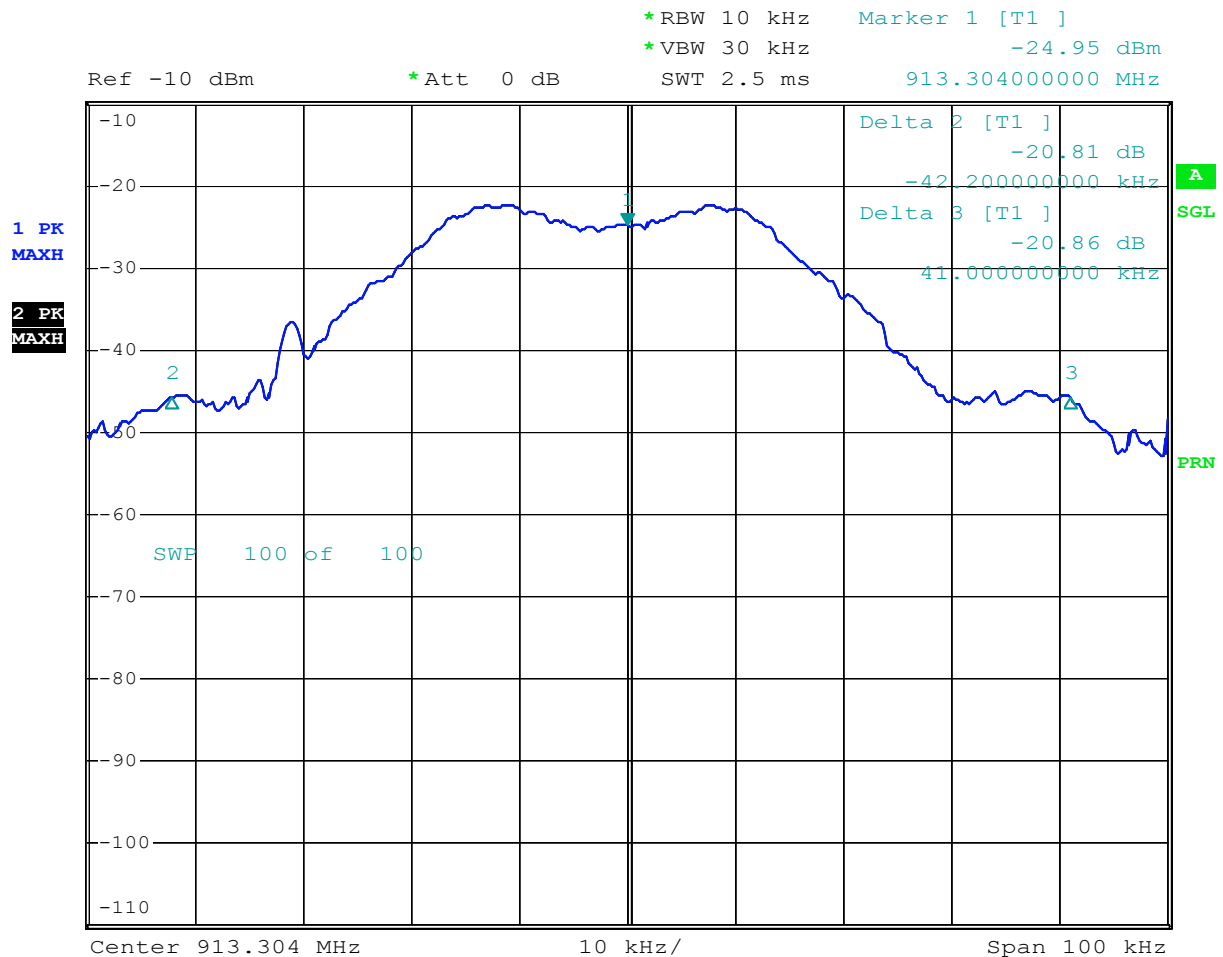
MEASUREMENT RESULTS

TEST CONDITIONS		Occupied frequency range (at 20 dB point)			
		channel	f _L [MHz]	F _C [MHz]	f _H [MHz]
T _{amb} : + 24 °C	V _{nom} : 6 Vdc	1	913.257	913.300	914.341
T _{amb} : + 24 °C	V _{nom} : 6 Vdc	15	914.658	914.700	914.742
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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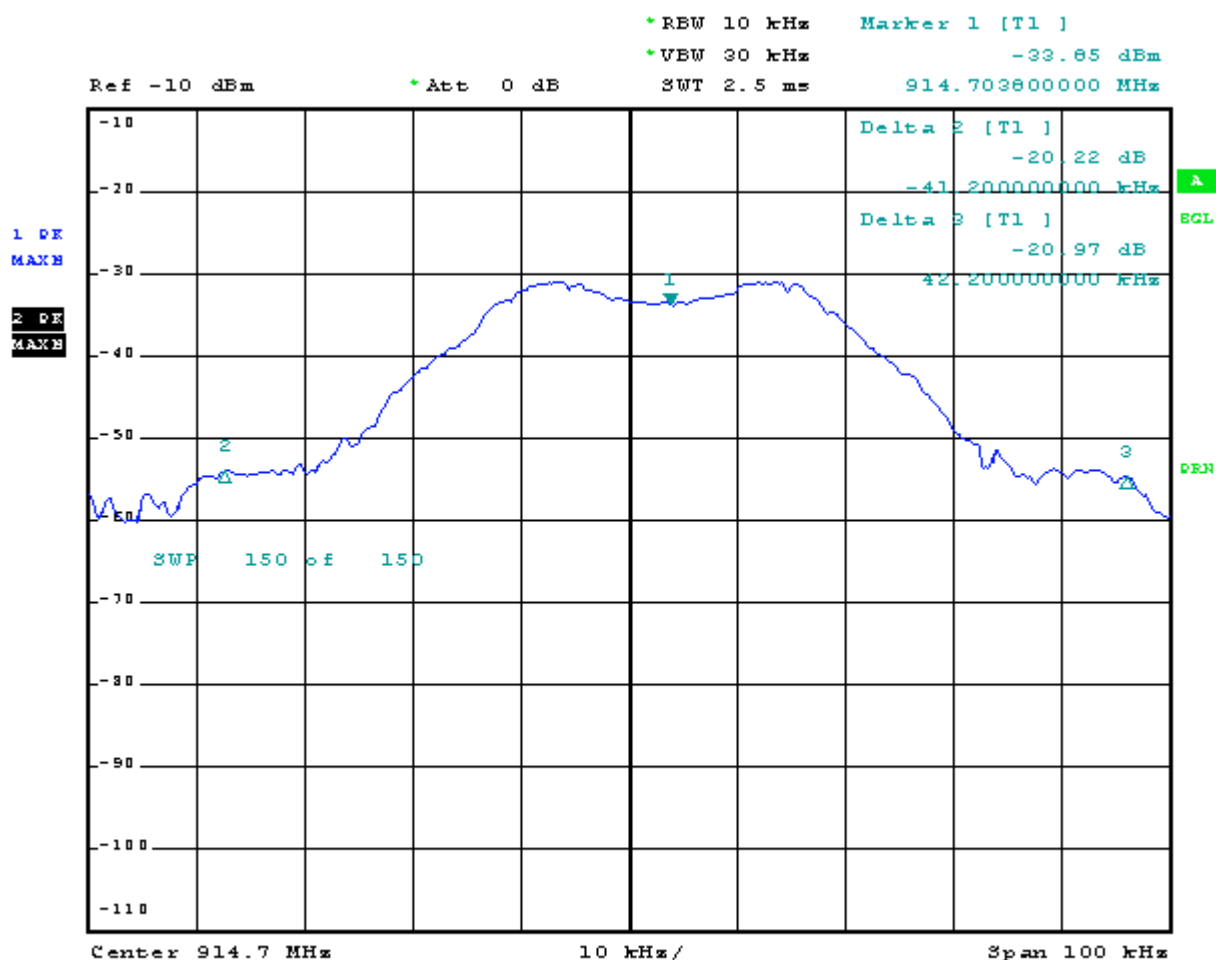
Diagram for bottom frequency



Date: 6.JUL.2005 17:12:04

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Diagram for top frequency



Date: 6.JUL.2005 15:48:00

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6. EUT TECHNICAL DOCUMENTATION

6.1 Wiring diagrams

	<i>Document reference (n., edition, date, ...)</i>
WIRING DIAGRAM	schematic diagram cod 32000519B.pdf
PART LIST	Bill of material cod C00952-02-04B.pdf

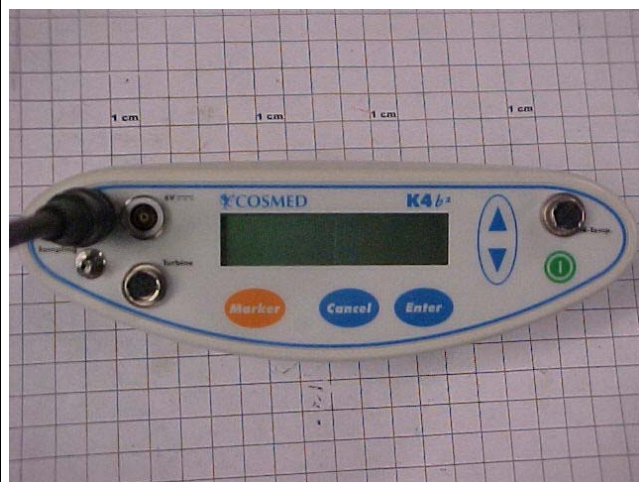
6.2 Technical manual

	<i>Document reference (n., edition, date, ...)</i>
K4 b ² USER MANUAL	User_man_K4B2_en.PDF–XII Edition 01/2005

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6.3 Photographic documentation

PHOTO N° 1 – EQUIPMENT UNDER TEST IDENTIFICATION



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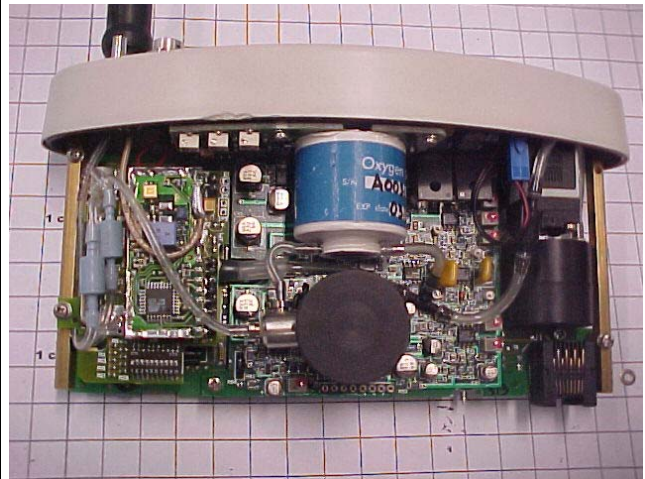
PHOTO N° 2 – EQUIPMENT UNDER TEST IDENTIFICATION



ANTENNA

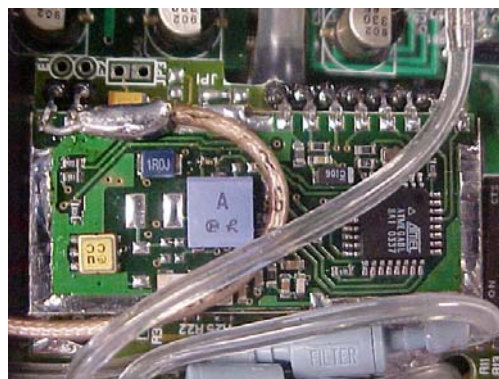
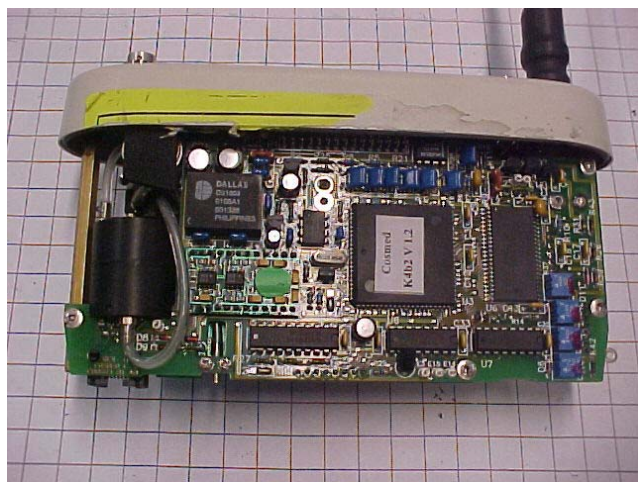


INTERNAL ANTENNA CONNECTION



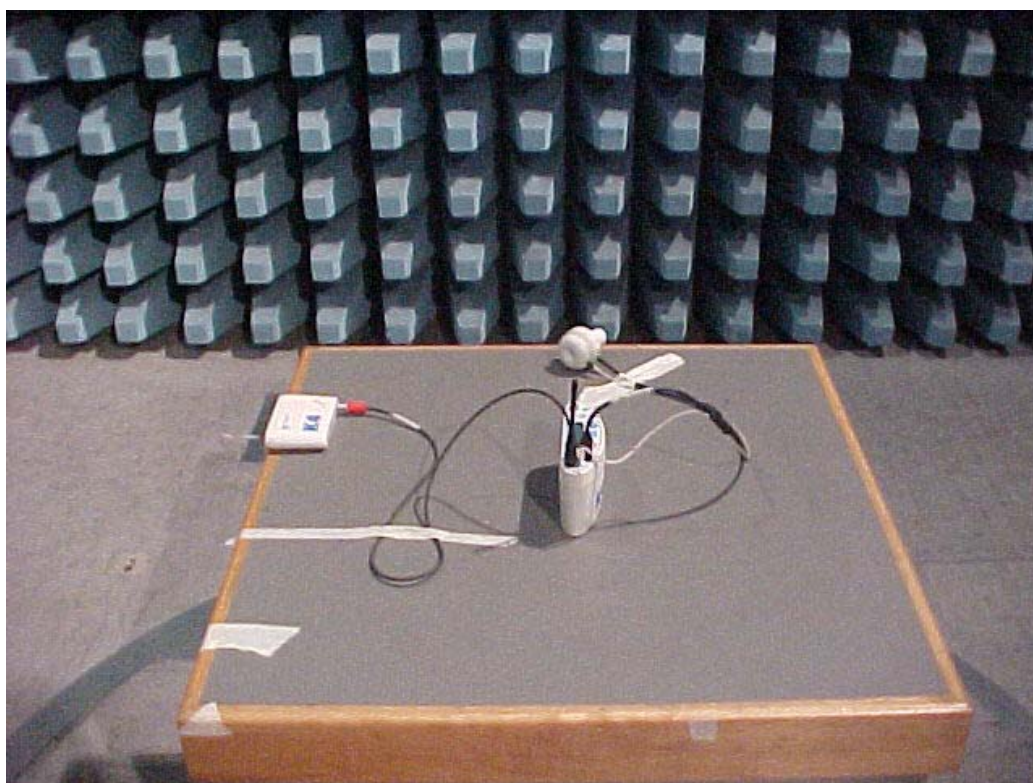
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PHOTO N° 3– EQUIPMENT UNDER TEST IDENTIFICATION



PARTICULAR OF RADIO BOARD

PHOTO N° 4 – SET-UP FOR EMISSION RADIATED TEST



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PHOTO N° 5 – SET-UP FOR EMISSION CONDUCTED TEST

