



**UNIVERSITA' DEGLI STUDI DI PERUGIA**  
**POLO SCIENTIFICO E DIDATTICO DI TERNI**

**Facoltà di Ingegneria**

*Laboratorio di Caratterizzazione Elettromagnetica*

**TEST REPORT**

**N° 061, Rev. 0**

*Equipment Under Test (EUT)*

**UGPS QM**

P./N.	S./N.
28303101A121A01	100
28303101A121A01	101
28303101A122A01	100
28303101A122A01	101

*Required by*

**G&A Engineering**

Località Miole 100, Oricola (AQ) – 67063 Italy


**OBJECT**

TEST	STANDARD
Conducted Emissions, Power Leads, 30 Hz – 15 kHz	SSP 30237 Rev. F CE01
Conducted Emissions, DC Power Leads, 10 kHz – 50 MHz	SSP 30237 Rev. F CE02
Conducted Emissions, DC Power Leads, Switching Spikes, Time Domain	SSP 30237 Rev. F CE07
Conducted Susceptibility, AC Power Leads, 30 Hz ÷ 50 kHz.	SSP 30237 Rev. F CS01
Conducted Susceptibility, AC Power Leads, 50 kHz ÷ 50 MHz	SSP 30237 Rev. F CS02
Conducted Susceptibility, Spikes, DC Power Leads	SSP 30237 Rev. F CS06
Radiated Emissions, Electric Field, 14 kHz ÷ 20 GHz	SSP 30237 Rev. F RE02
Radiated Susceptibility, Magnetic Induction Field	SSP 30237 Rev. F RS02
Radiated Susceptibility, Electric Field, 10 kHz ÷ 18 GHz	SSP 30237 Rev. F RS03

Terni, 19 April 2006

Test Report issued by:  
Ing. Antonio Faba

Approved by:  
Prof. Ing. Ermanno Cardelli

 <b>UNIVERSITA' DEGLI STUDI DI PERUGIA</b>	<b>ELECTROMAGNETIC COMPATIBILITY TEST REPORT</b>	<i>N.°</i> 061 <i>Rev.</i> 0 <i>Date</i> 19 April 2006
	<b>EUT: UGPS QM</b> <b>P./N. 28303101A121A01 S./N. 100 ÷ 101</b> <b>P./N. 28303101A122A01 S./N. 100 ÷ 101</b>	<b>Test Date</b> 3 ÷ 7 April 2006

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### Attachments

Attachment I (10 pages): Photographic documentation.


Attachment II (14 pages): Results of conducted emissions tests.

Attachment III (4 pages): Results of radiated emissions tests.

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## 1. EUT

The equipment under test (EUT) is the:

UGPS QM

P./N. 28303101A121A01 S.N. 100

P./N. 28303101A121A01 S.N. 101

P./N. 28303101A122A01 S.N. 100

P./N. 28303101A122A01 S.N. 101

produced by

G&A Engineering

Località Miolo 100, Oricola (AQ) – 67063 Italy

The four cards are similar; the difference are on side of the connector: in fact two of them have the connector on the front side and the others have the connector on the rear side (see figures 1 and 2). The EUT is powered by 12 V DC (see figures 3 for a global view), and can be remote controlled (see figures 4 and 5).

All the tests have been performed without any shielding protections or power lead filters.

For this reason, the INFN (Istituto Nazionale di Fisica Nucleare) Rome Section, which has designed this object and which is the customer of the G&A Engineering, has established the pass / fail rules for the immunity tests.

In the normal operating mode, on the remote control station, the values can change in the range 4,05 ÷ 4,15 and all the number are in black; in the range 3,9 ÷ 4,05 and 4,15 ÷ 4,2 the numbers are in red and indicate a small deviations from the rated working performances; the numbers lower than 3,9 and higher than 4,2 are in red too and indicate a great deviations from the rated working performances (see figure 6).

Due to the absence of any shielding protections or power lead filters, the pass / fail rule for the immunity tests is: when a deviations from the rated working performances is noted during a susceptibility test, the test is passed if the EUT will not shown permanent unintended responses, enduring malfunctions or unending deviations from the rated working performances, after the removal of the disturb.

For this reason, during an immunity test the monitored value can changes also lower than 3,9 and higher than 4,2 but the must return in the range 4,05 ÷ 4,15 when the disturb is removed.

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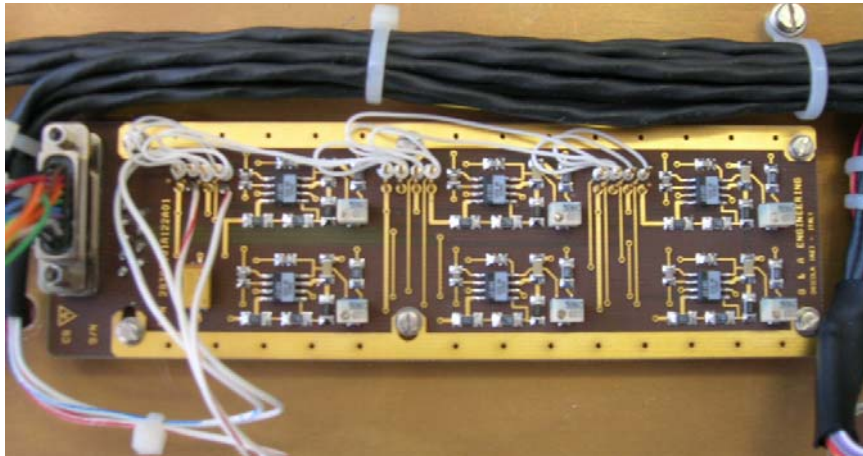


Fig. 1: EUT front Side.

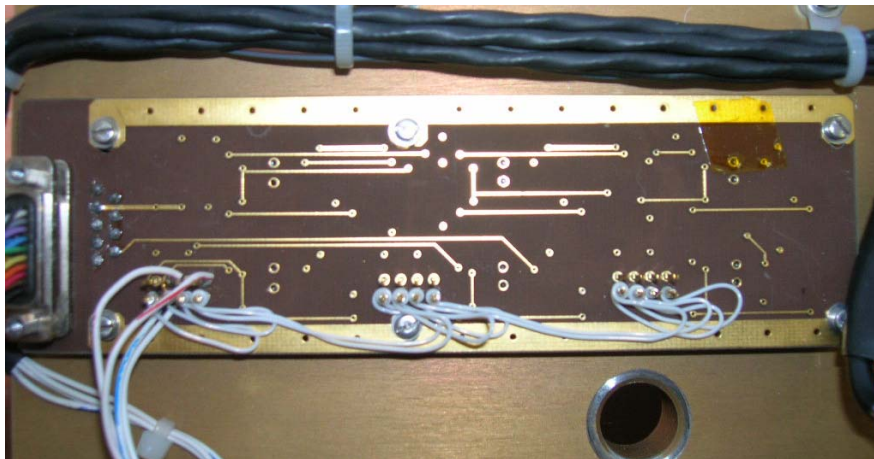


Fig. 2: EUT rear side.



Fig. 3: Global View of the EUT

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Fig. 4: Remote Control Station.



Assembly A4		Assembly A3		Assembly A2		Assembly A1	
PSSIGOUT1_A4	4.08	PSSIGOUT1_A3	4.08	PSSIGOUT1_A2	4.09	PSSIGOUT1_A1	4.10
PSSIGOUT2_A4	4.08	PSSIGOUT2_A3	4.09	PSSIGOUT2_A2	4.09	PSSIGOUT2_A1	4.10
PSSIGOUT3_A4	4.08	PSSIGOUT3_A3	4.09	PSSIGOUT3_A2	4.09	PSSIGOUT3_A1	4.08
PSSIGOUT4_A4	4.08	PSSIGOUT4_A3	4.09	PSSIGOUT4_A2	4.08	PSSIGOUT4_A1	4.08
PSSIGOUT5_A4	4.08	PSSIGOUT5_A3	4.08	PSSIGOUT5_A2	4.10	PSSIGOUT5_A1	4.08
PSSIGOUT6_A4	4.09	PSSIGOUT6_A3	4.09	PSSIGOUT6_A2	4.10	PSSIGOUT6_A1	4.07




Fig. 5 Remote Control Station (particular) in normal operating condition.

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Assembly A4		Assembly A3		Assembly A2		Assembly A1	
PSSIGOUT1_A4	4.07	PSSIGOUT1_A3	4.44	PSSIGOUT1_A2	4.24	PSSIGOUT1_A1	4.29
PSSIGOUT2_A4	4.23	PSSIGOUT2_A3	4.02	PSSIGOUT2_A2	4.37	PSSIGOUT2_A1	3.97
PSSIGOUT3_A4	4.35	PSSIGOUT3_A3	3.81	PSSIGOUT3_A2	4.45	PSSIGOUT3_A1	3.80
PSSIGOUT4_A4	4.43	PSSIGOUT4_A3	3.80	PSSIGOUT4_A2	4.43	PSSIGOUT4_A1	3.80
PSSIGOUT5_A4	4.42	PSSIGOUT5_A3	3.86	PSSIGOUT5_A2	4.36	PSSIGOUT5_A1	3.87
PSSIGOUT6_A4	4.35	PSSIGOUT6_A3	3.98	PSSIGOUT6_A2	4.22	PSSIGOUT6_A1	3.99




Fig. 6 Remote Control Station (particular) in presence of deviations from the rated working performances.

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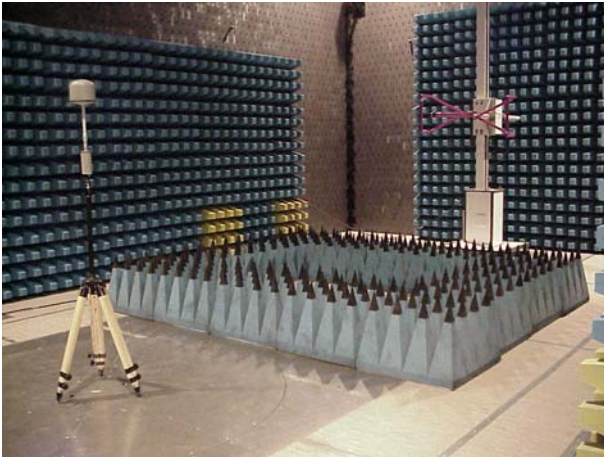
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## 2. TEST SITE

The EMC tests have been performed with the Laboratory of Electromagnetic Characterization of the “Polo Scientifico e Didattico di Terni”, University of Perugia, Faculty of Engineering, Via Pentima Bassa 21, 05100 Terni.



Semi-anechoic chamber:

- Dimensions: 9.15m x 8.00m x 5.55m.
- Turn Table capacity: 1000 kg.
- Automatic Mast for antenna movement.
- Electromagnetic absorbing material: ferrite.
- Frequency range for anechoic characteristics: 30 MHz to 1 GHz.
- Frequency range for shielding: 10 kHz to 18 GHz.




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### 3. CONDUCTED EMISSIONS, POWER LEADS, 30 Hz – 15 kHz

**STANDARD:** SSP 30237 Rev. F CE01

#### Scope

The scope of this test is to verify that the conduct emissions of the EUT in the frequency range from 30 Hz up to 15 kHz are within the SSP 30237 Rev. F CE01 limits.

#### Test procedures

The test has been performed in agreement with SSP 30238 Rev. D CE01 and MIL – STD – 462 CE01 requirements.

The conducted current emissions in the frequency range from 30 Hz up to 15 kHz have been measured on each power supply lead (including returns) and on the interconnecting lead (including returns) powered with a voltage of 4,94 V DC and 5,06 V DC.

During the test, the EUT has been set in normal operating mode.

The test set-up is represented in the attachment I page 2.

#### Test equipment.

Type	Manufacturer	Model	Serial Number	Calibration Due Date
10.0 $\mu$ F $\pm$ 10% R.F. Capacitor	Solar Electronics	6512-106R	0609 11 0609 21 0609 30 0609 34	24 March 2007
Current probe	Hameg	HZ56	P98-04-6347	18 February 2007
Oscilloscope	Tektronics	TDS 210	B023805	18 February 2007
DC Power Supply	KEPCO	JQE 100-1 M	137548	20 March 2007
DC Power Supply	K.E.R.T.	AT 5D	-	20 March 2007
DC Power Supply	Eutron	BV340 30-10	A0135	20 March 2007
Data Acquisition	Personal computer	-	-	n.a.

(p.m. = programmed maintenance - n.a. = not applicable)

#### Results.


The conducted voltage emissions on each lead under test, in the frequency range from 30 Hz up to 15 kHz, are within the SSP 30237 Rev. F CE01 limits, see attachment II pages from 2 up to 7.

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#### 4. CONDUCTED EMISSIONS, POWER LEADS, 15 kHz – 50 MHz

**STANDARD:** SSP 30237 Rev. F CE03

##### Scope

The scope of this test is to verify that the conduct emissions of the EUT in the frequency range from 15 kHz up to 50 MHz are within the SSP 30237 Rev. F CE03 limits.

##### Test procedures

The test has been performed in agreement with SSP 30238 Rev. D CE03 and MIL – STD – 462 CE03 requirements.

The conducted current emissions in the frequency range from 15 kHz up to 50 MHz have been measured on each power supply lead (including returns) and on the interconnecting lead (including returns) powered with a voltage of 4,94 V DC and 5,06 V DC.

During the test, the EUT has been set in normal operating mode.

The test set-up is represented in the attachment I page 2.

##### Test equipment.

Type	Manufacturer	Model	Serial Number	Calibration Due Date
10.0 $\mu$ F $\pm$ 10% R.F. Capacitor	Solar Electronics	6512-106R	0609 11 0609 21 0609 30 0609 34	24 March 2007
R.F. Current Probe	Solar Electronics	6741-1	882720	16 February 2007
Spectrum Analyser	Agilent	E4407B	MY41441068	24 August 2006
DC Power Supply	KEPCO	JQE 100-1 M	137548	20 March 2007
DC Power Supply	K.E.R.T.	AT 5D	-	20 March 2007
DC Power Supply	Eutron	BV340 30-10	A0135	20 March 2007
Data Acquisition	Personal computer	-	-	n.a.

(p.m. = programmed maintenance - n.a. = not applicable)


##### Results.

The conducted voltage emissions on each lead under test, in the frequency range from 15 kHz up to 50 MHz are within the SSP 30237 Rev. F CE03 limits, see attachment II pages from 8 up to 13.

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## 5. CONDUCTED EMISSIONS, DC POWER LEADS, SWITCHING SPIKES, TIME DOMAIN

**STANDARD:** SSP 30237 Rev. F CE07

### Scope

The scope of this test is to verify that the conduct emissions of the EUT in the frequency range from 15 kHz up to 50 MHz are within the SSP 30237 Rev. F CE07 limits.

### Test procedures

The test has been performed in agreement with SSP 30238 Rev. D CE07 and MIL – STD – 462 CE07 requirements.

The voltage conducted switching spikes in the time domain have been measured on the power supply leads.

During the test, the EUT has been set in normal operating mode.

The test set-up is represented in the attachment I page 3.

### Test equipment.

Type	Manufacturer	Model	Serial Number	Calibration Due Date
LISN	UniPG	SSP 30238 Rev. C	001	20 March 2007
Hg switch	UniPG	-	001	p.m.
10.0 $\mu$ F $\pm$ 10% R.F. Capacitor	Solar Electronics	6512-106R	0609 11 0609 21 0609 30 0609 34	24 March 2007
500MHz Oscilloscope Voltage Probe	Tektronix	P6139A	10001108	15 February 2007
Oscilloscope	Tektronics	TDS 210	B023805	18 February 2007
DC Power Supply	KEPCO	JQE 100-1 M	137548	20 March 2007
DC Power Supply	K.E.R.T.	AT 5D	-	20 March 2007
DC Power Supply	Eutron	BV340 30-10	A0135	20 March 2007
Data Acquisition	Personal computer	-	-	n.a.


(p.m. = programmed maintenance - n.a. = not applicable)

### Results.

The voltage conducted switching spikes in the time domain on the power supply leads are within the SSP 30237 Rev. F CE07 limits, see attachment II page 14.

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## 6. CONDUCTED SUSCEPTIBILITY, POWER LEADS, 30 Hz – 50 kHz

**STANDARD:** SSP 30237 Rev. F CS01

### Scope

The scope of this test is to verify the ability of EUT to withstand sine wave signals coupled into positive power supply lead in the frequency range from 30 Hz up to 50 kHz. In particular, the sine wave amplitude was obtained from the calibration curve of SSP 30237 Rev. F CS01 due to 12 V nominal EUT source voltage.

Due to the absence of any shielding protections or power lead filters, after the test, the EUT shall not exhibit any permanent malfunction, permanent degradation of performance, or permanent deviation from specified indications, beyond the tolerances indicated in the individual equipment or subsystem specification.

### Test procedures

The test has been performed in agreement with SSP 30238 Rev. D CS01 and MIL – STD – 462 CS01 requirements.

The sine wave signals has been coupled into positive power supply lead in the frequency range from 30 Hz up to 50 kHz. The voltage level of the coupled signal has been monitored with an oscilloscope.

During the test, the EUT has been set in normal operating mode and has been controlled by remote. The test set-up is represented in the attached I page 3.


### Test equipment.

Type	Manufacturer	Model	Serial Number	Calibration Due Date
10.0 $\mu$ F $\pm$ 10% R.F. Capacitor	Solar Electronics	6512-106R	0609 11 0609 21 0609 30 0609 34	24 March 2007
Coupling Transformer	EuroTrafo	TF-0K25-03	-	m.p.
Signal generator	Hameg	HM8130	130981P-03074	18 February 2007
Power Amplifier	FTB	HP2100	FBR 063 O	28 March 2007
Oscilloscope Voltage Probe	Tektronix	P6139A	10001108	15 February 2007
Oscilloscope	LeCroy	9314A	3467	16 February 2007
DC Power Supply	KEPCO	JQE 100-1 M	137548	20 March 2007
DC Power Supply	K.E.R.T.	AT 5D	-	20 March 2007
DC Power Supply	Eutron	BV340 30-10	A0135	20 March 2007

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### Results.


During the test, when a sine wave signal, specified in the document (SSP 30237 Rev. F CS01) in the frequency range from 30 Hz up to 50 kHz, has been injected into each power leads, the EUT has shown deviations from the rated working performances with monitored values lower than 3,9 and higher than 4,2 (min 1,01 and max 5,99) in all the spanned frequency range, but when the disturb has been removed, the EUT return in the normal operating conditions (values in the range 4,05 ÷ 4,15).

After the test, the EUT has not shown permanent unintended responses, permanent malfunctions or permanent deviations from the rated working performances.

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## 7. CONDUCTED SUSCEPTIBILITY, POWER LEADS, 50 kHz – 50 MHz

**STANDARD:** SSP 30237 Rev. F CS02

### Scope

The scope of this test is to verify the ability of EUT to withstand sine wave signals coupled into each power supply leads in the frequency range from 50 kHz up to 50 MHz. In particular, the sine wave amplitude is in agreement with SSP 30237 Rev. F CS02 requirements.

Due to the absence of any shielding protections or power lead filters, after the test, the EUT shall not exhibit any permanent malfunction, permanent degradation of performance, or permanent deviation from specified indications, beyond the tolerances indicated in the individual equipment or subsystem specification.

### Test procedures

The test has been performed in agreement with SSP 30238 Rev. D CS02 and MIL – STD – 462 CS02 requirements.

The sine wave signals has been coupled into power supply lead (including returns) in the frequency range from 50 kHz up to 50 MHz. The voltage level of the coupled signal has been monitored with an oscilloscope.

During the test, the EUT has been set in normal operating mode and has been controlled by remote. The test set-up is represented in the attached I page 4.

### Test equipment.


Type	Manufacturer	Model	Serial Number	Calibration Due Date
LISN	UniPG	SSP 30238 Rev. C	001	20 March 2007
LISN	Electro-metrics	EM-7820	2859	20 March 2007
10.0 $\mu$ F $\pm$ 10% R.F. Capacitor	Solar Electronics	6512-106R	0609 11 0609 21 0609 30 0609 34	24 March 2007
Signal generator	Rode & Schwartz	SMY01	833104/011	15 February 2007
Power Amplifier	Amplifier Research	25A250A	307913	16 February 2007
500MHz Oscilloscope Voltage Probe	Tektronix	P6139A	10001108	15 February 2007
Oscilloscope	LeCroy	9314A	3467	16 February 2007

(to be continued)

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Type	Manufacturer	Model	Serial Number	Calibration Due Date
DC Power Supply	KEPCO	JQE 100-1 M	137548	20 March 2007
DC Power Supply	K.E.R.T.	AT 5D	-	20 March 2007
DC Power Supply	Eutron	BV340 30-10	A0135	20 March 2007

(p.m. = programmed maintenance - n.a. = not applicable)

### Results.


During the test, when a sine wave signal, specified in the document (SSP 30237 Rev. F CS02) in the frequency range from 50 kHz up to 50 MHz (with some exception), has been injected into each power leads, the EUT has shown deviations from the rated working performances with monitored values lower than 3,9 and higher than 4,2 (min 3,11 and max 5,17) in all the spanned frequency range, but when the disturb has been removed, the EUT return in the normal operating conditions (values in the range 4,05 ÷ 4,15).

After the test, the EUT has not shown permanent unintended responses, permanent malfunctions or permanent deviations from the rated working performances.

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## 8. CONDUCTED SUSCEPTIBILITY, SPIKES, DC POWER LEADS

**STANDARD:** SSP 30237 Rev. F CS06

### Scope

The scope of this test is to verify the ability of EUT to withstand spikes into each power supply leads. In particular, the waveform and the amplitude are in agreement with SSP 30237 Rev. F CS06 requirements.

Due to the absence of any shielding protections or power lead filters, after the test, the EUT shall not exhibit any permanent malfunction, permanent degradation of performance, or permanent deviation from specified indications, beyond the tolerances indicated in the individual equipment or subsystem specification.

### Test procedures

The test has been performed in agreement with SSP 30238 Rev. D CS06 and MIL – STD – 462 CS06 requirements.

The spikes (positive and negative) has been coupled into each power supply lead (including return). The voltage level of the coupled signal has been monitored with an oscilloscope.

During the test, the EUT has been set in normal operating mode and has been controlled by remote. The test set-up is represented in the attached I page 4.

### Test equipment.


Type	Manufacturer	Model	Serial Number	Calibration Due Date
10.0 $\mu$ F $\pm$ 10% R.F. Capacitor	Solar Electronics	6512-106R	0609 11 0609 21 0609 30 0609 34	24 March 2007
Spike generator	UniPG	SSP 30238 Rev. D CS06	001	15 February 2007
500MHz Oscilloscope Voltage Probe	Tektronix	P6139A	10001108	15 February 2007
Oscilloscope	LeCroy	9314A	3467	16 February 2007
DC Power Supply	KEPCO	JQE 100-1 M	137548	20 March 2007
DC Power Supply	K.E.R.T.	AT 5D	-	20 March 2007
DC Power Supply	Eutron	BV340 30-10	A0135	20 March 2007

(p.m. = programmed maintenance - n.a. = not applicable)

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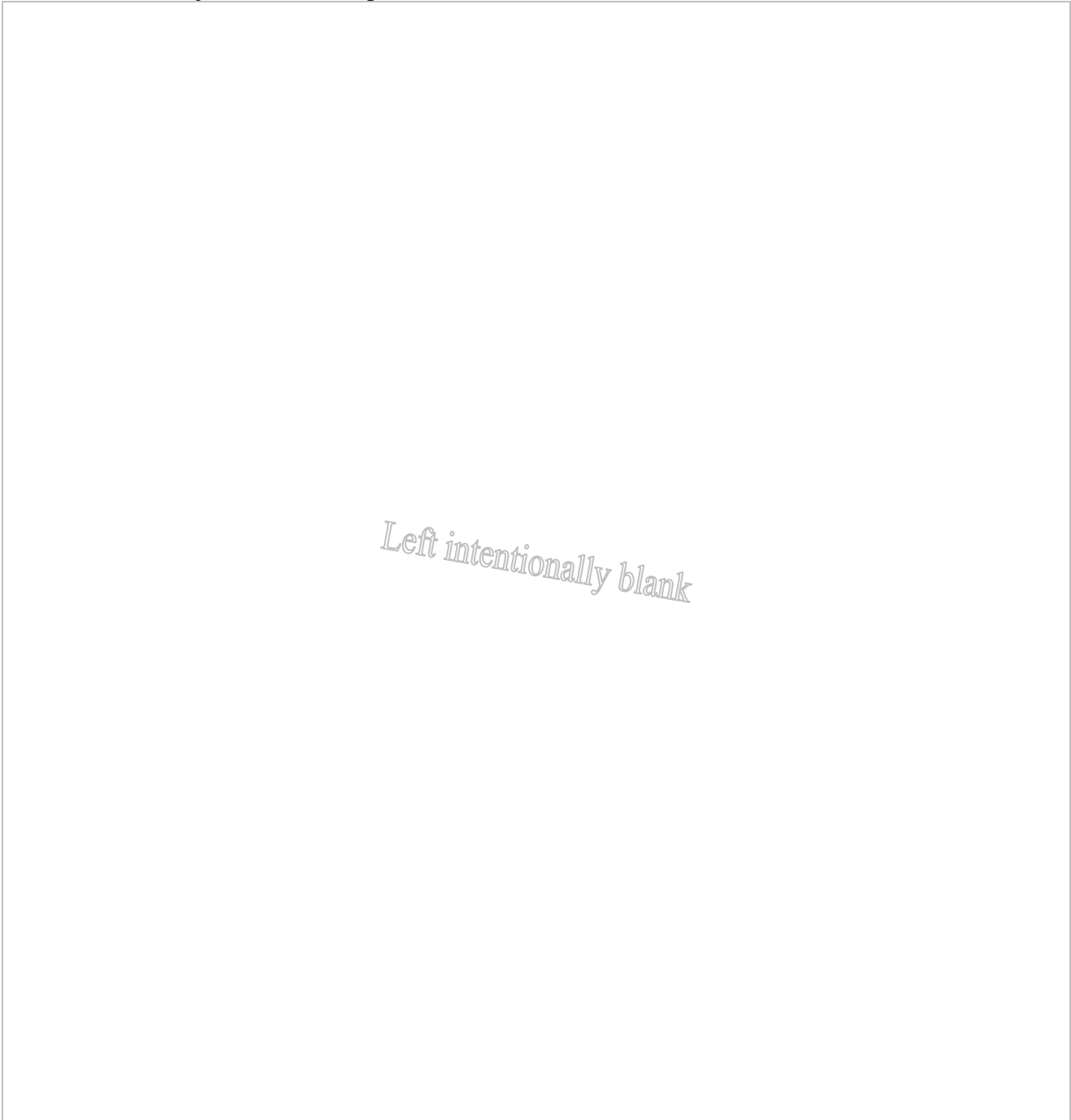
Test Report issued by:  
Ing. Antonio Faba

Approved by:  
Prof. Ing. Ermanno Cardelli

 <b>UNIVERSITA' DEGLI STUDI DI PERUGIA</b>	<b>ELECTROMAGNETIC COMPATIBILITY TEST REPORT</b>	<i>N.°</i> 061 <i>Rev.</i> 0 <i>Date</i> 19 April 2006
	<b>EUT: UGPS QM</b> <b>P./N. 28303101A121A01 S./N. 100 ÷ 101</b> <b>P./N. 28303101A122A01 S./N. 100 ÷ 101</b>	<b>Test Date</b> 3 ÷ 7 April 2006

**Results.**


The EUT has not shown unintended responses, malfunctions or deviations from the rated working performances when spike signals, specified in the document (SSP 30237 Rev. F CS06) MHz, has been injected into each power leads.



Test Report issued by:  
Ing. Antonio Faba

Approved by:  
Prof. Ing. Ermanno Cardelli



 UNIVERSITA' DEGLI STUDI DI PERUGIA	<b>ELECTROMAGNETIC COMPATIBILITY TEST REPORT</b>	N.° 061 Rev. 0 Date 19 April 2006
	EUT: <b>UGPS QM</b> P./N. 28303101A121A01 S./N. 100 ÷ 101 P./N. 28303101A122A01 S./N. 100 ÷ 101	Test Date 3 ÷ 7 April 2006

## 9. RADIATED EMISSIONS, ELECTRIC FIELD, 14 kHz ÷ 20 GHz

**STANDARD:** SSP 30237 Rev. F RE02

### Scope

The scope of this test is to verify that the radiated emissions (electric field) of the EUT in the frequency range from 14 kHz up to 20 GHz are within the SSP 30237 Rev. F RE02 limits.

### Test procedures

The test has been performed in agreement with SSP 30238 Rev. D RE02 and MIL – STD – 462 RE02 requirements.

The narrowband radiated emissions (electric field) in the frequency range from 14 kHz up to 20 GHz have been measured.

During the test, the EUT has been set in normal operating mode.

The test set-up is represented in the attachment I pages from 5 up to 7.

### Test equipment.


Type	Manufacturer	Model	Serial Number	Calibration Due Date
10.0 $\mu$ F $\pm$ 10% R.F. Capacitor	Solar Electronics	6512-106R	0609 11 0609 21 0609 30 0609 34	24 March 2007
Spectrum Analyser	Agilent	E4407B	MY41441068	24 August 2006
Active Rod Antenna	A.H. System	SAS-550-1B	313	12 April 2007
Log - periodic antenna	Electro-metrics	EM-6950	848	12 February 2007
Bi - conical Antenna	Electro-metrics	EM-6912A	704	12 February 2007
Double Ridge Guide Horn Antenna	A.H. Systems	SAS-571	539	16 February 2007
DC Power Supply	KEPCO	JQE 100-1 M	137548	20 March 2007
DC Power Supply	K.E.R.T.	AT 5D	-	20 March 2007
DC Power Supply	Eutron	BV340 30-10	A0135	20 March 2007
Data Acquisition	Personal computer	-	-	n.a.

(p.m. = programmed maintenance - n.a. = not applicable)

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Test Report issued by:  
Ing. Antonio Faba

Approved by:  
Prof. Ing. Ermanno Cardelli

 <b>UNIVERSITA' DEGLI STUDI DI PERUGIA</b>	<b>ELECTROMAGNETIC COMPATIBILITY TEST REPORT</b>	<i>N.°</i> 061 <i>Rev.</i> 0 <i>Date</i> 19 April 2006
	<b>EUT: UGPS QM</b> <b>P./N. 28303101A121A01 S./N. 100 ÷ 101</b> <b>P./N. 28303101A122A01 S./N. 100 ÷ 101</b>	<b>Test Date</b> 3 ÷ 7 April 2006


### Results.

The narrowband radiated emissions (electric field) in the frequency range from 14 kHz up to 20 GHz are within the SSP 30237 Rev. F RE02 limits, see attachment III pages from 2 up to 4.

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Test Report issued by:  
Ing. Antonio Faba

Approved by:  
Prof. Ing. Ermanno Cardelli

 UNIVERSITA' DEGLI STUDI DI PERUGIA	<b>ELECTROMAGNETIC COMPATIBILITY TEST REPORT</b>	N.° 061 Rev. 0 Date 19 April 2006
	EUT: <b>UGPS QM</b> P./N. 28303101A121A01 S./N. 100 ÷ 101 P./N. 28303101A122A01 S./N. 100 ÷ 101	Test Date 3 ÷ 7 April 2006

## 10. RADIATED SUSCEPTIBILITY, MAGNETIC INDUCTION FIELD

**STANDARD:** SSP 30237 Rev. F RS02

### Scope

The scope of this test is to verify the ability of EUT to withstand magnetic inductions fields coupled into the equipment through the wiring connecting equipment. In particular, the waveform and the amplitude are in agreement with SSP 30237 Rev. F RS02 requirements.

Due to the absence of any shielding protections or power lead filters, after the test, the EUT shall not exhibit any permanent malfunction, permanent degradation of performance, or permanent deviation from specified indications, beyond the tolerances indicated in the individual equipment or subsystem specification.

### Test procedures

The test has been performed in agreement with SSP 30238 Rev. D RS02 and MIL – STD – 462 RS02 requirements.

The cable under test has been wired with a the coupling wire. The voltage level of the generated signal has been monitored with an oscilloscope.

During the test, the EUT has been set in normal operating mode and has been controlled by remote. The test set-up is represented in the attached I page 7.

### Test equipment.


Type	Manufacturer	Model	Serial Number	Calibration Due Date
10.0 $\mu$ F $\pm$ 10% R.F. Capacitor	Solar Electronics	6512-106R	0609 11 0609 21 0609 30 0609 34	24 March 2007
Spike generator	UniPG	SSP 30238 Rev. D CS06	001	15 February 2007
500MHz Oscilloscope Voltage Probe	Tektronix	P6139A	10001108	15 February 2007
Oscilloscope	LeCroy	9314A	3467	16 February 2007
DC Power Supply	KEPCO	JQE 100-1 M	137548	20 March 2007
DC Power Supply	K.E.R.T.	AT 5D	-	20 March 2007
DC Power Supply	Eutron	BV340 30-10	A0135	20 March 2007

(p.m. = programmed maintenance - n.a. = not applicable)

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Test Report issued by:  
Ing. Antonio Faba

Approved by:  
Prof. Ing. Ermanno Cardelli

 UNIVERSITA' DEGLI STUDI DI PERUGIA	<b>ELECTROMAGNETIC COMPATIBILITY  TEST REPORT</b>	N.° 061 Rev. 0 Date 19 April 2006
	EUT: <b>UGPS QM</b> P./N. 28303101A121A01 S./N. 100 ÷ 101 P./N. 28303101A122A01 S./N. 100 ÷ 101	Test Date 3 ÷ 7 April 2006


### Results.

The EUT has not shown unintended responses, malfunctions or deviations from the rated working performances when magnetic inductions fields, specified in the document (SSP 30237 Rev. F RS02) MHz, has been coupled into the equipment through the wiring connecting equipment.

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Test Report issued by:  
Ing. Antonio Faba

Approved by:  
Prof. Ing. Ermanno Cardelli

 <b>UNIVERSITA' DEGLI STUDI DI PERUGIA</b>	<b>ELECTROMAGNETIC COMPATIBILITY TEST REPORT</b>	N.° 061 Rev. 0 Date 19 April 2006
	EUT: <b>UGPS QM</b> <b>P./N. 28303101A121A01 S./N. 100 ÷ 101</b> <b>P./N. 28303101A122A01 S./N. 100 ÷ 101</b>	Test Date 3 ÷ 7 April 2006

## 11. RADIATED SUSCEPTIBILITY, ELECTRIC FIELD, 10 kHz ÷ 18 GHz

**STANDARD:** SSP 30237 Rev. F RS03

### Scope

The scope of this test is to verify the ability of EUT to withstand when exposed to radiated electric field emissions in the frequency range from 14 kHz up to 18 GHz. In particular, the amplitude are in agreement with SSP 30237 Rev. F RS03 requirements.

Due to the absence of any shielding protections or power lead filters, after the test, the EUT shall not exhibit any permanent malfunction, permanent degradation of performance, or permanent deviation from specified indications, beyond the tolerances indicated in the individual equipment or subsystem specification.

### Test procedures

The test has been performed in agreement with SSP 30238 Rev. D RS03 and MIL – STD – 462 RS03 requirements.

The ability of EUT to withstand when exposed to radiated electric field emissions in the frequency range from 14 kHz up to 18 GHz has been verified. The radiated electric field level has been monitored with an electric probe.

During the test, the EUT has been set in normal operating mode and has been controlled by remote. The test set-up is represented in the attached I page 7.

### Test equipment.

Type	Manufacturer	Model	Serial Number	Calibration Due Date
10.0 µF ± 10% R.F. Capacitor	Solar Electronics	6512-106R	0609 11 0609 21 0609 30 0609 34	24 March 2007
Signal Generator	Rode & Schwartz	SMY01	833104/011	15 February 2006
Signal Generator	HP	8673C	2645A00405	21 March 2007
Power Amplifier	Amplifier Research	25A250A	307913	15 February 2006
Power Amplifier	Schaffner	CBA9413A	9908	17 February 2006
Power Amplifier	Huges	1277-H09	129	28 March 2007
Power Amplifier	Huges	1177-H01	185	28 March 2007
Power Amplifier	Huges	1177-H02	248	28 March 2007
Power Amplifier	Varian	V7U6991K1D	6208	28 March 2007


(to be continued)

(p.m. = programmed maintenance - n.a. = not applicable)

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Test Report issued by:  
Ing. Antonio Fabà

Approved by:  
Prof. Ing. Ermanno Cardelli

 <b>UNIVERSITA' DEGLI STUDI DI PERUGIA</b>	<b>ELECTROMAGNETIC COMPATIBILITY TEST REPORT</b>	N.° 061 Rev. 0 Date 19 April 2006
	EUT: <b>UGPS QM</b> <b>P./N. 28303101A121A01 S./N. 100 ÷ 101</b> <b>P./N. 28303101A122A01 S./N. 100 ÷ 101</b>	Test Date 3 ÷ 7 April 2006

Type	Manufacturer	Model	Serial Number	Calibration Due Date
Passive Monopole Antenna	A.H. System	SAS-551	202	16 February 2006
X – Wing Bi - log Antenna	Schaffner	CBL 6141A	4170	16 February 2006
Double Ridge Guide Horn Antenna	A.H. System	SAS-571	491	14 February 2006
Electric and Magnetic Field Probe	PMM	EHP 50	0110J00106	09 February 2006
Electric Field Probe	PMM	EP330	0010J90526	13 February 2006
Electric Field Probe	PMM	EP 183	0000J20705	09 February 2006
Electromagnetic Field Meter	PMM	8053	0220J90405	13 February 2006
DC Power Supply	K.E.R.T.	AT 5D	-	20 March 2007
DC Power Supply	Eutron	BV340 30-10	A0135	20 March 2007

(p.m. = programmed maintenance - n.a. = not applicable)

### Results.


During the test, when a radiated electric field emissions with a level specified in the document SSP 30237 Rev. F RS03, in the frequency range from 14 kHz to 18 GHz (with some exceptions), has been generated, the EUT has shown deviations from the rated working performances with monitored values lower than 3,9 and higher than 4,2 (min 0,97 and max 5,99) GHz; when the disturb has been removed the EUT return in the normal operating conditions (values in the range 4,05 ÷ 4,15).

After the test, the EUT has not shown permanent unintended responses, permanent malfunctions or permanent deviations from the rated working performances.

*Left intentionally blank*

Test Report issued by:  
Ing. Antonio Faba

Approved by:  
Prof. Ing. Ermanno Cardelli

 UNIVERSITA' DEGLI STUDI DI PERUGIA	<b>ELECTROMAGNETIC COMPATIBILITY TEST REPORT</b>	N.° 061 Rev. 0 Date 19 April 2006
	EUT: <b>UGPS QM</b> <b>P./N. 28303101A121A01 S./N. 100 ÷ 101</b> <b>P./N. 28303101A122A01 S./N. 100 ÷ 101</b>	Test Date 3 ÷ 7 April 2006

## 12. CONCLUSIONS

From 3 up to 7 April 2006 with the Laboratory of Electromagnetic Characterization of the “Polo Scientifico e Didattico di Terni”, University of Perugia, Faculty of Engineering, Via Pentima Bassa 21, 05100 Terni, have been performed the EMC Tests on the equipment:

UGPS QM

P./N. 28303101A121A01 S.N. 100

P./N. 28303101A121A01 S.N. 101

P./N. 28303101A122A01 S.N. 100

P./N. 28303101A122A01 S.N. 101

produced by

G&A Engineering

Località Mirole 100, Oricola (AQ) – 67063 Italy

The results obtained in the emissions and susceptibility tests are in the following table:

TEST	STANDARD	TEST RESULT
Conducted Emissions, Power Leads, 30 Hz – 15 kHz	<b>SSP 30237 Rev. F CE01</b>	Compliance
Conducted Emissions, DC Power Leads, 10 kHz – 50 MHz	<b>SSP 30237 Rev. F CE02</b>	Compliance
Conducted Emissions, DC Power Leads, Switching Spikes, Time Domain	<b>SSP 30237 Rev. F CE07</b>	Compliance
Conducted Susceptibility, AC Power Leads, 30 Hz ÷ 50 kHz	<b>SSP 30237 Rev. F CS01</b>	Compliance
Conducted Susceptibility, AC Power Leads, 50 kHz ÷ 50 MHz	<b>SSP 30237 Rev. F CS02</b>	Compliance
Conducted Susceptibility, Spikes, DC Power Leads	<b>SSP 30237 Rev. F CS06</b>	Compliance
Radiated Emissions, Electric Field, 14 kHz ÷ 20 GHz	<b>SSP 30237 Rev. F RE02</b>	Compliance
Radiated Susceptibility, Magnetic Induction Field	<b>SSP 30237 Rev. F RS02</b>	Compliance
Radiated Susceptibility, Electric Field, 10 kHz ÷ 18 GHz	<b>SSP 30237 Rev. F RS03</b>	Compliance

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Terni, 19 April 2006.

Test Report issued by:  
Ing. Antonio Faba

Approved by:  
Prof. Ing. Ermanno Cardelli

# Attachment I

# PHOTOGRAPHIC DOCUMENTATION





Fig. 1: Conducted Emissions, DC Power Leads, 30 Hz ÷ 15 kHz (CE01).



Fig. 2: Conducted Emissions, DC Power Leads, 15 kHz ÷ 50 MHz (CE03).



Fig. 3: Conducted Emissions, DC Power Leads, Switching Spikes, Time Domain (CE07).



Fig. 4: Conducted Susceptibility, DC Power Leads, 30 Hz ÷ 50 kHz (CS01).



Fig. 5: Conducted Susceptibility, DC Power Leads, 50 kHz ÷ 50 MHz (CS02).



Fig. 6: Conducted Susceptibility, Spikes, DC Power Leads, (CS06).



Fig. 7a: Radiated Emissions, Electric Field, 14 kHz ÷ 15,5 GHz (RE02) – part 1: 14 kHz ÷ 30 MHz.



**UGPS QM**

**P./N. 28303101A121A01 S./N. 100 ÷ 101**

**P./N. 28303101A122A01 S./N. 100 ÷ 101**

Fig. 7b: Radiated Emissions, Electric Field, 14 kHz ÷ 15,5 GHz (RE02) – part 2: 30 MHz ÷ 300 MHz.



Fig. 7c: Radiated Emissions, Electric Field, 14 kHz ÷ 15,5 GHz (RE02) – part 2: 300 MHz ÷ 700 MHz.



**UGPS QM**

**P./N. 28303101A121A01 S./N. 100 ÷ 101**

**P./N. 28303101A122A01 S./N. 100 ÷ 101**

Fig. 7d: Radiated Emissions, Electric Field, 14 kHz ÷ 15,5 GHz (RE02) – part 3: 700 MHz ÷ 1 GHz.



Fig. 7d: Radiated Emissions, Electric Field, 14 kHz ÷ 15,5 GHz (RE02) – part 4: 1 GHz ÷ 15,5 GHz.

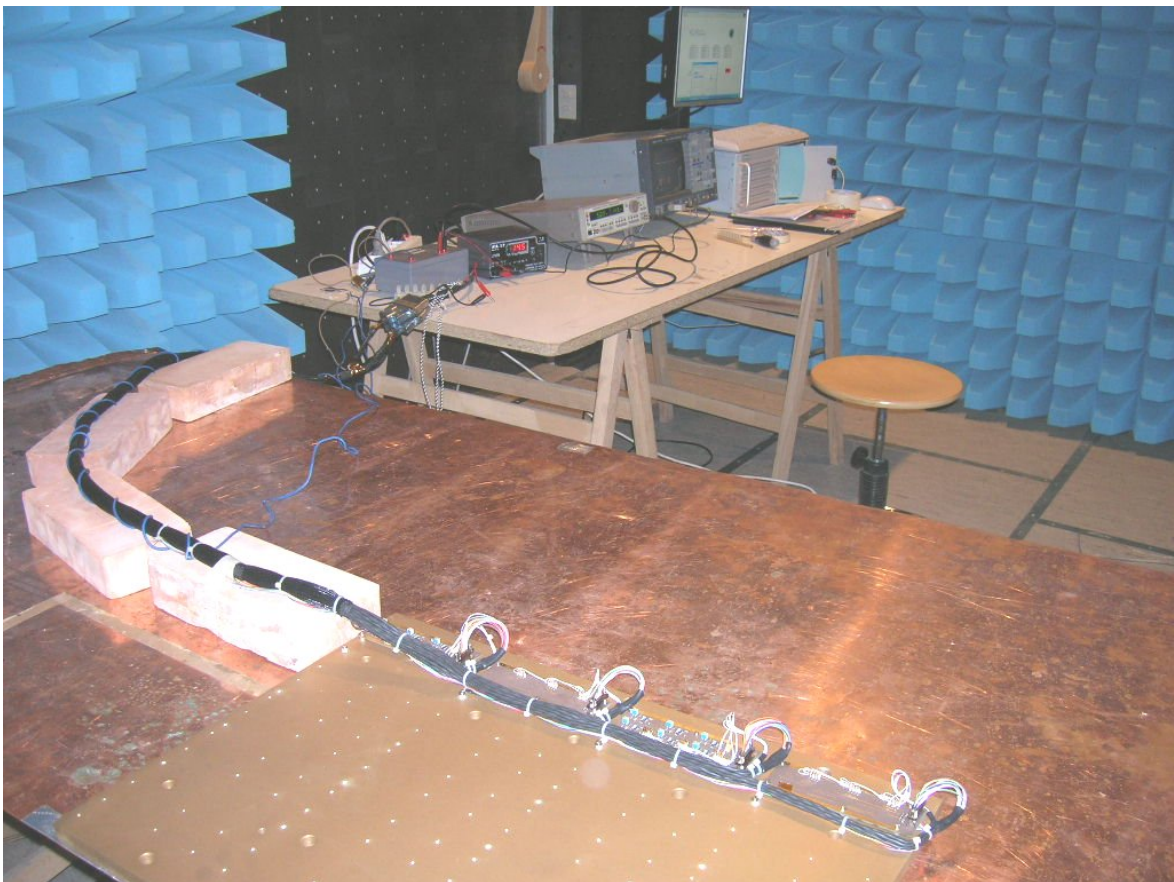


Fig. 8: Radiated Susceptibility, Magnetic Induction Field (RS02)





Fig. 9a: Radiated Susceptibility, Electric Field, 14 kHz ÷ 18 GHz (RS03) – part 1: 14 kHz ÷ 100 kHz.



**UGPS QM**

**P./N. 28303101A121A01 S./N. 100 ÷ 101**

**P./N. 28303101A122A01 S./N. 100 ÷ 101**

Fig. 9b: Radiated Susceptibility, Electric Field, 14 kHz ÷ 18 GHz (RS03) – part 2: 100 kHz ÷ 30 MHz.

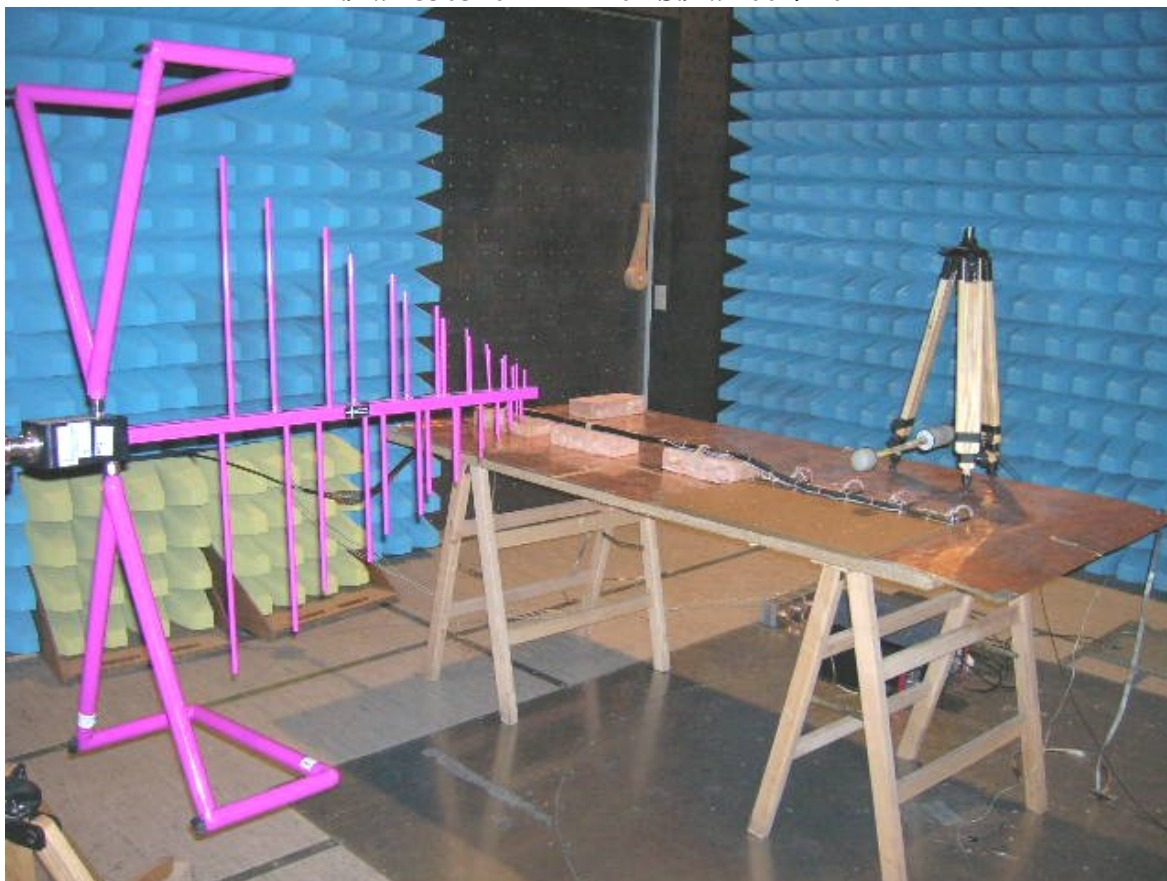


Fig. 9c: Radiated Susceptibility, Electric Field, 14 kHz ÷ 18 GHz (RS03) – part 3: 30 MHz ÷ 700 MHz.



**UGPS QM**

**P./N. 28303101A121A01 S./N. 100 ÷ 101**

**P./N. 28303101A122A01 S./N. 100 ÷ 101**

Fig. 9d: Radiated Susceptibility, Electric Field, 14 kHz ÷ 18 GHz (RS03) – part 4: 700 MHz ÷ 1 GHz.

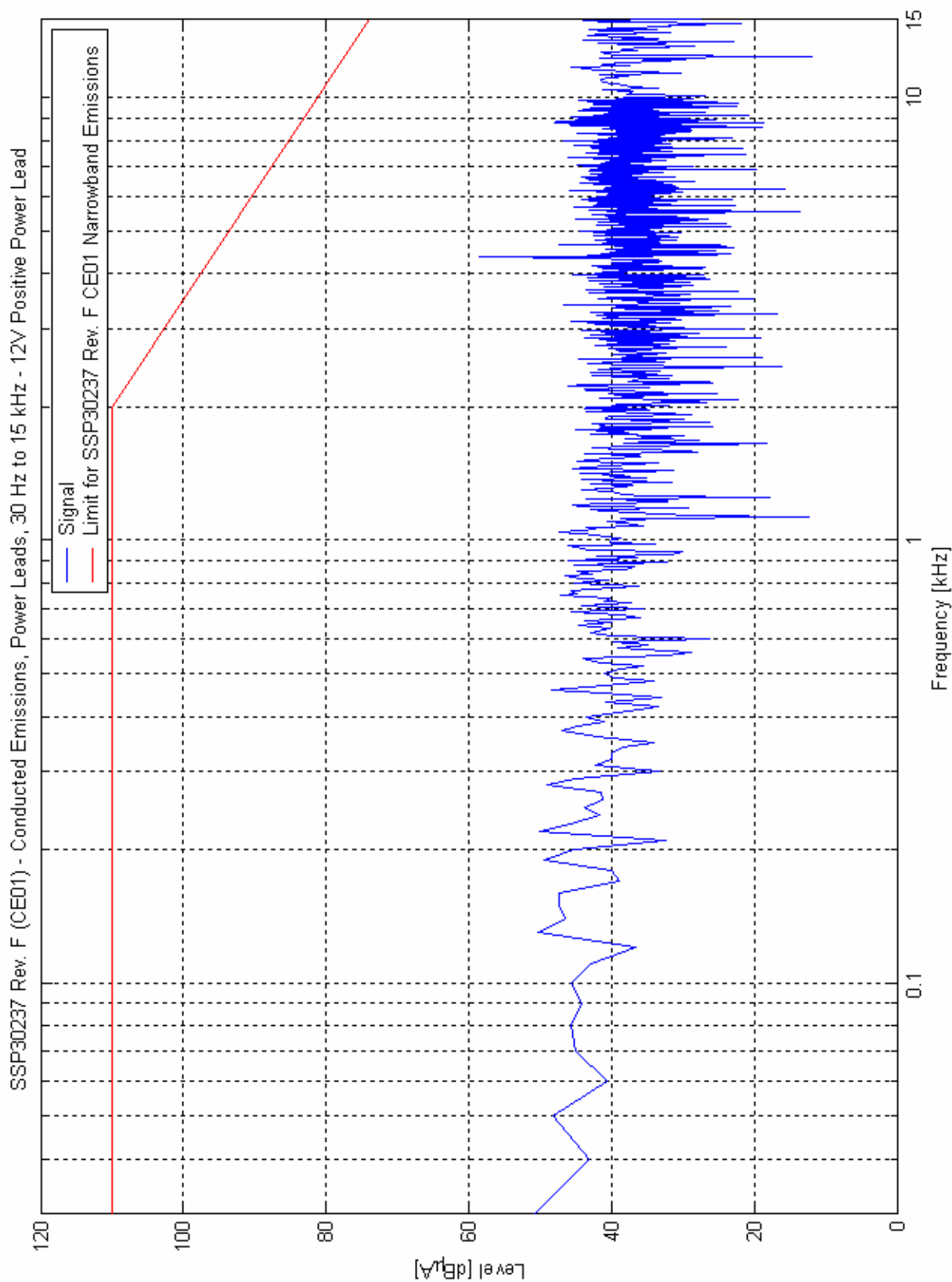


Fig. 9e: Radiated Susceptibility, Electric Field, 14 kHz ÷ 18 GHz (RS03) – part 5: 1 GHz ÷ 18 GHz.

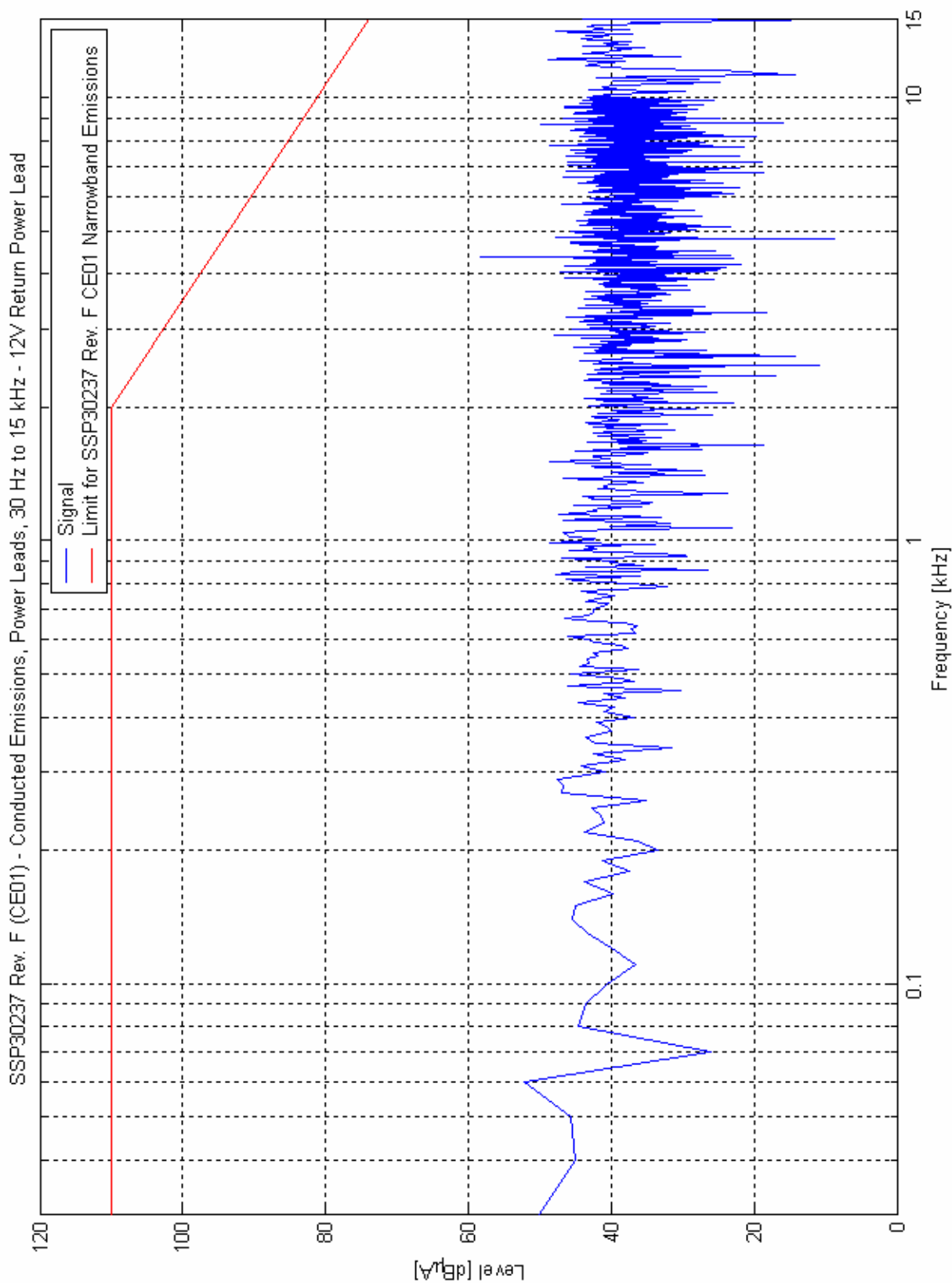
## **Attachment II**

# **RESULTS OF CONDUCTED EMISSIONS TESTS.**

**UGPS QM**  
**P./N. 28303101A121A01 S./N. 100 ÷ 101**  
**P./N. 28303101A122A01 S./N. 100 ÷ 101**  
**SSP 30237 REV. F – CE01**  
**CONDUCTED EMISSIONS, DC POWER LEADS, 30 Hz ÷ 15 kHz**  
**NARROWBAND – 12 VDC POSITIVE POWER LEAD**



**UGPS QM**  
**P./N. 28303101A121A01 S./N. 100 ÷ 101**  
**P./N. 28303101A122A01 S./N. 100 ÷ 101**  
**SSP 30237 REV. F – CE01**  
**CONDUCTED EMISSIONS, DC POWER LEADS, 30 Hz ÷ 15 kHz**  
**NARROWBAND – 12 VDC RETURN POWER LEAD**





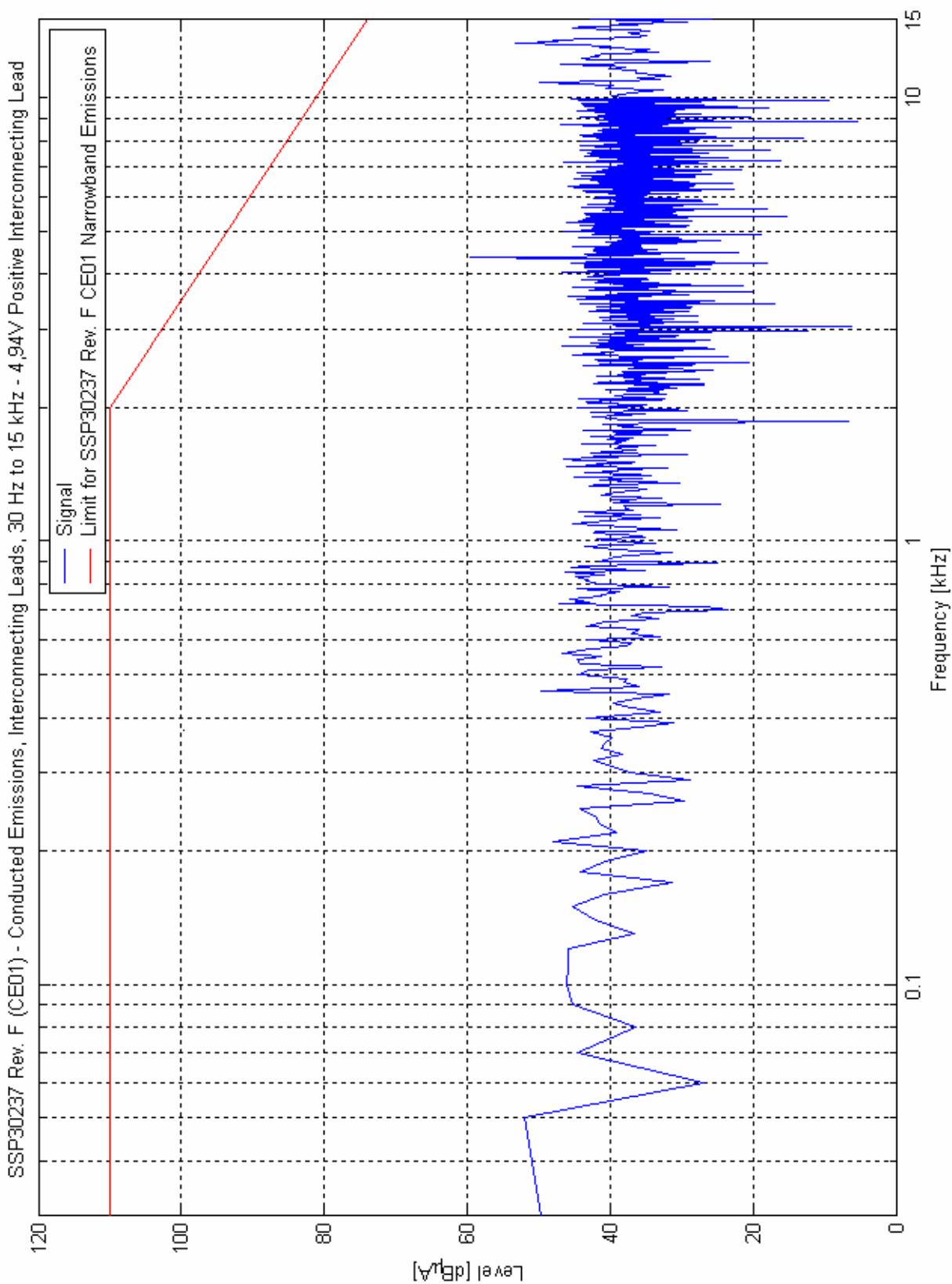
UGPS QM

P./N. 28303101A121A01 S./N. 100 ÷ 101

P./N. 28303101A122A01 S./N. 100 ÷ 101

SSP 30237 REV. F – CE01

CONDUCTED EMISSIONS, INTERCONNECTING LEADS, 30 Hz ÷ 15 kHz  
NARROWBAND – 4,94 VDC POSITIVE INTERCONNECTING LEAD



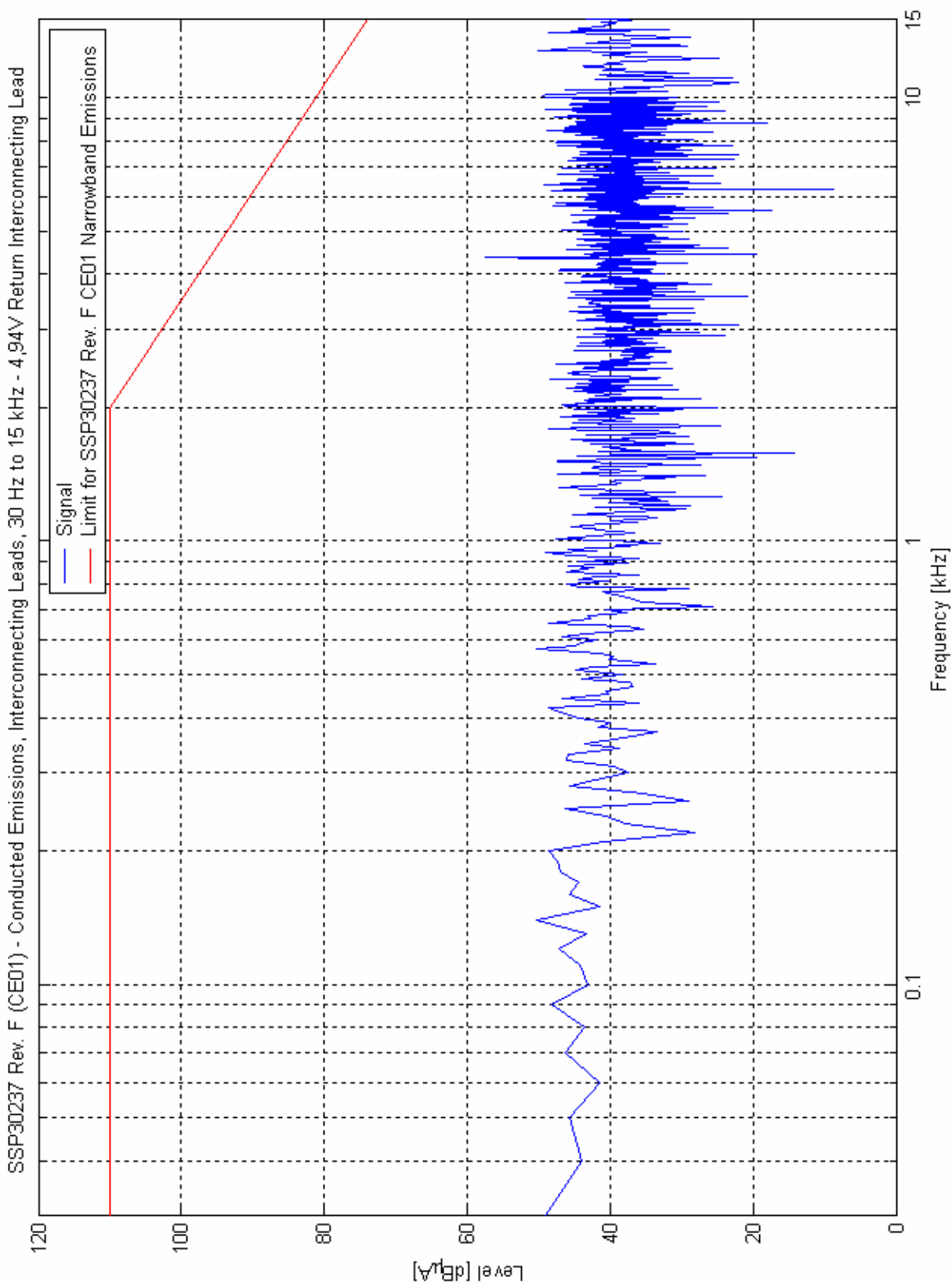
UGPS QM

P./N. 28303101A121A01 S./N. 100 ÷ 101

P./N. 28303101A122A01 S./N. 100 ÷ 101

SSP 30237 REV. F – CE01

CONDUCTED EMISSIONS, INTERCONNECTING LEADS, 30 Hz ÷ 15 kHz  
NARROWBAND – 4,94 VDC RETURN INTERCONNECTING LEAD



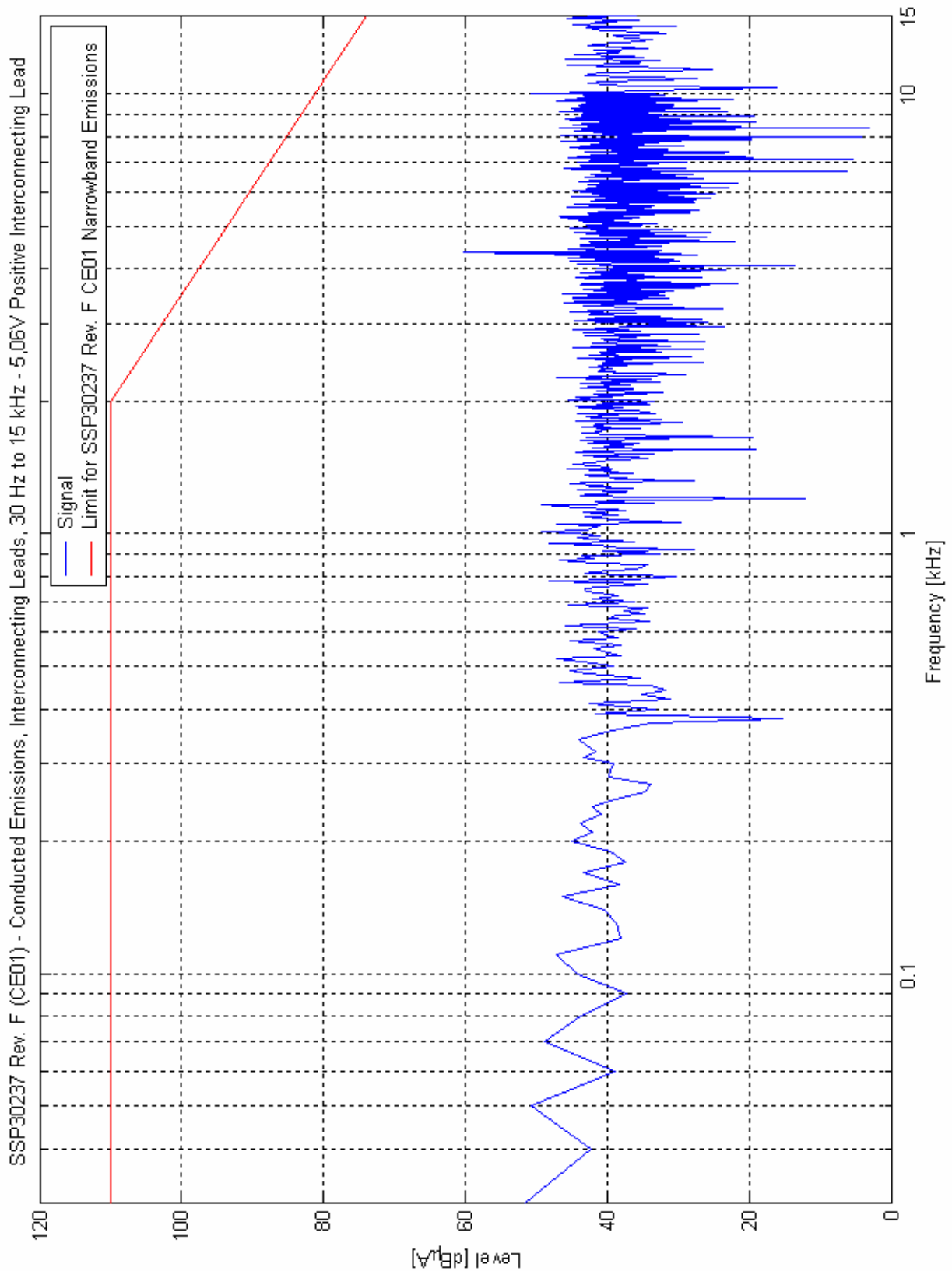
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P./N. 28303101A122A01 S./N. 100 ÷ 101

SSP 30237 REV. F – CE01

CONDUCTED EMISSIONS, INTERCONNECTING LEADS, 30 Hz ÷ 15 kHz  
NARROWBAND – 5,06 VDC POSITIVE INTERCONNECTING LEAD



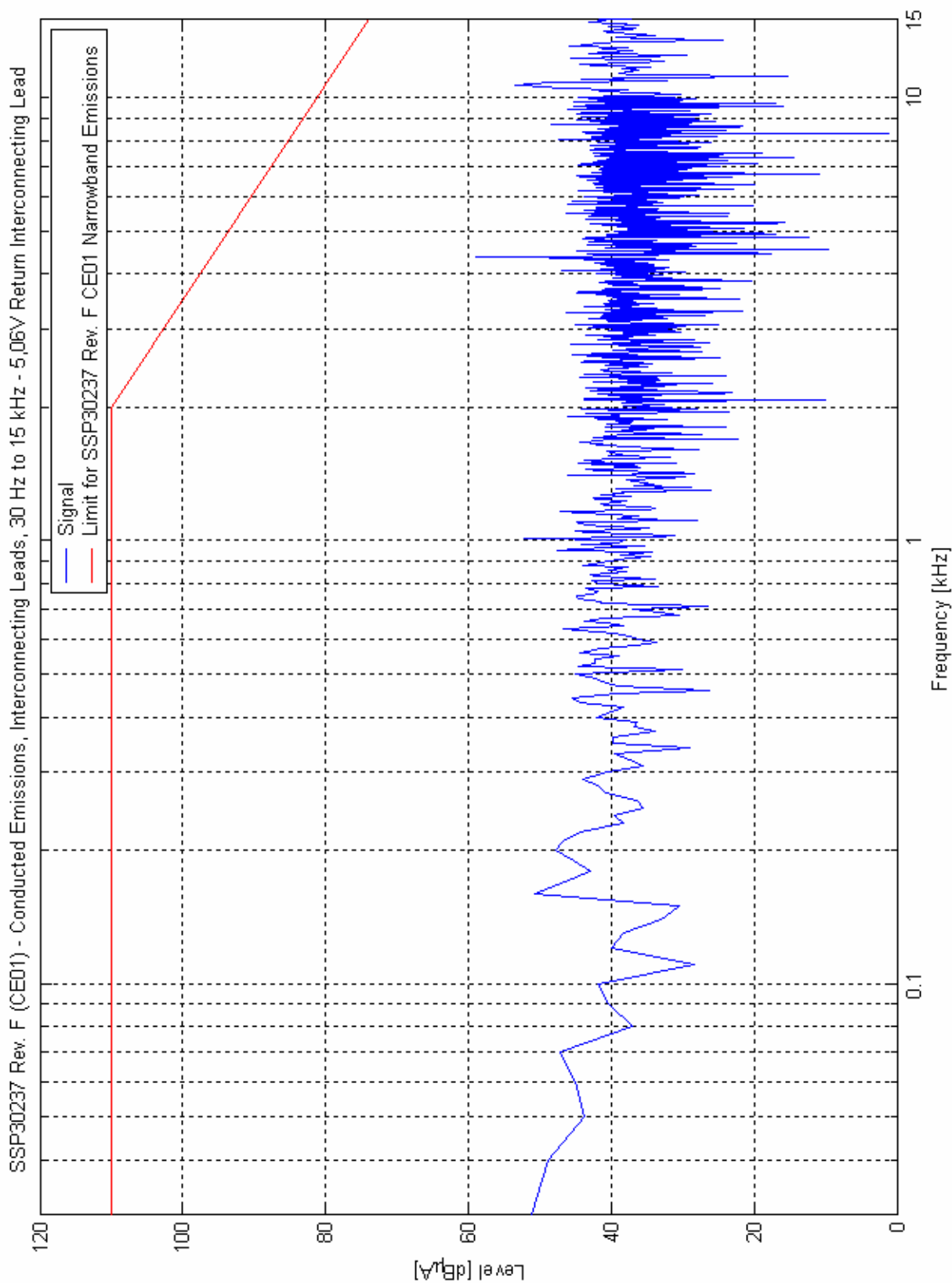
UGPS QM

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P./N. 28303101A122A01 S./N. 100 ÷ 101

SSP 30237 REV. F – CE01

CONDUCTED EMISSIONS, INTERCONNECTING LEADS, 30 Hz ÷ 15 kHz  
NARROWBAND – 5,06 VDC RETURN INTERCONNECTING LEAD



UGPS QM

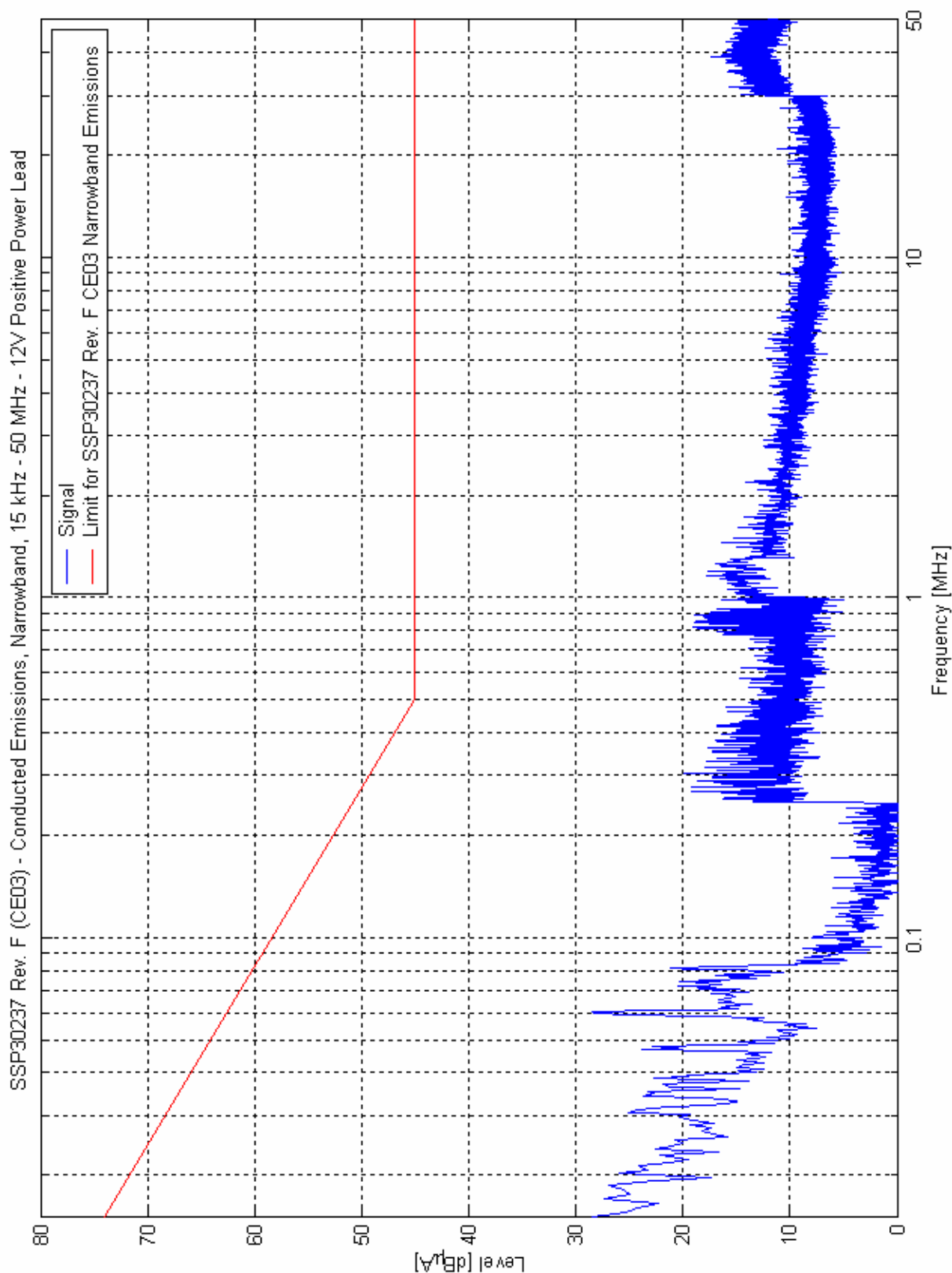
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P./N. 28303101A122A01 S./N. 100 ÷ 101

SSP 30237 REV. F – CE03

CONDUCTED EMISSIONS, DC POWER LEADS, 15 kHz ÷ 50 MHz

NARROWBAND – 12 VDC POSITIVE POWER LEAD



UGPS QM

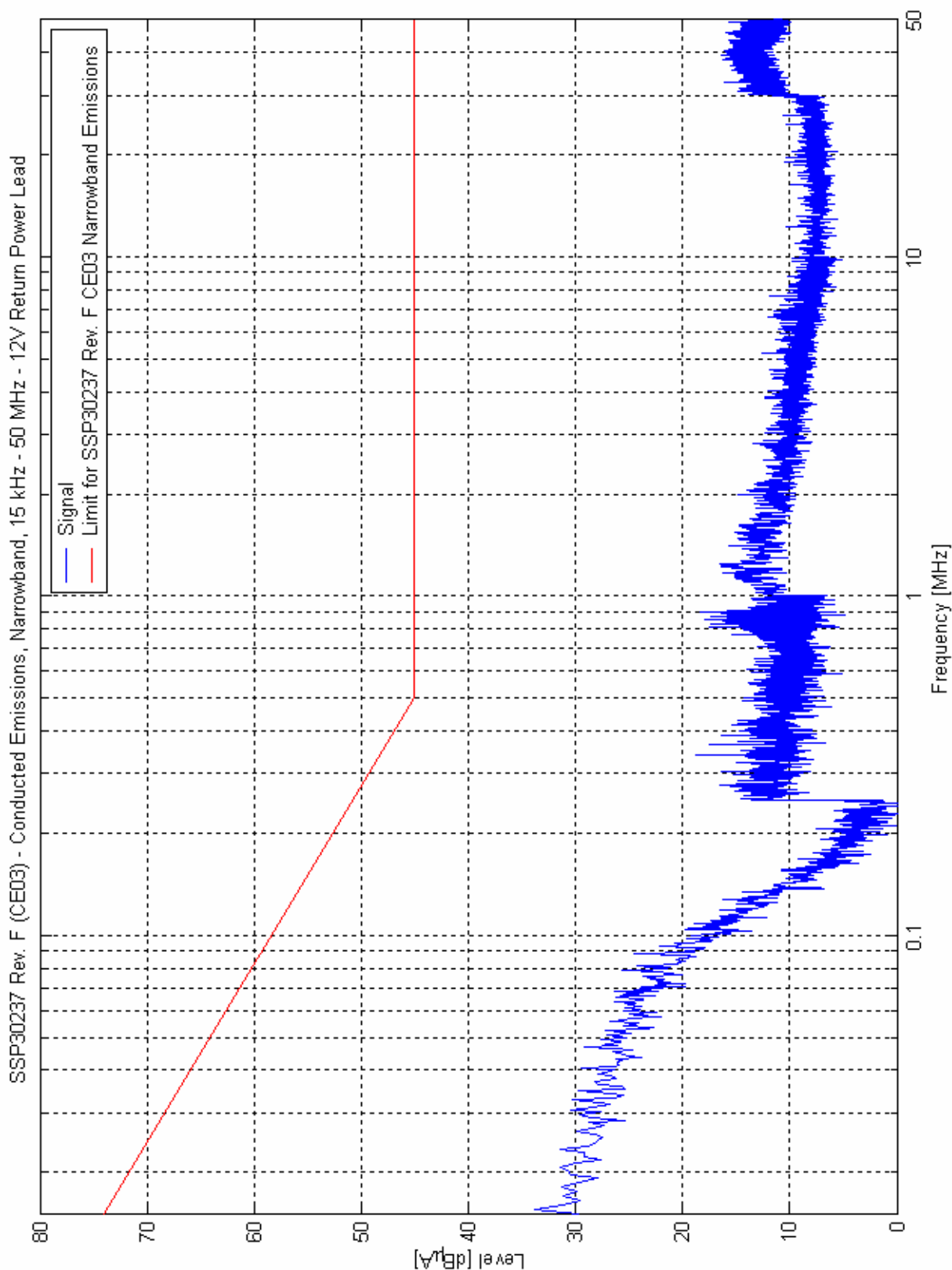
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P./N. 28303101A122A01 S./N. 100 ÷ 101

SSP 30237 REV. F – CE03

CONDUCTED EMISSIONS, DC POWER LEADS, 15 kHz ÷ 50 MHz

NARROWBAND – 12 VDC RETURN POWER LEAD



UGPS QM

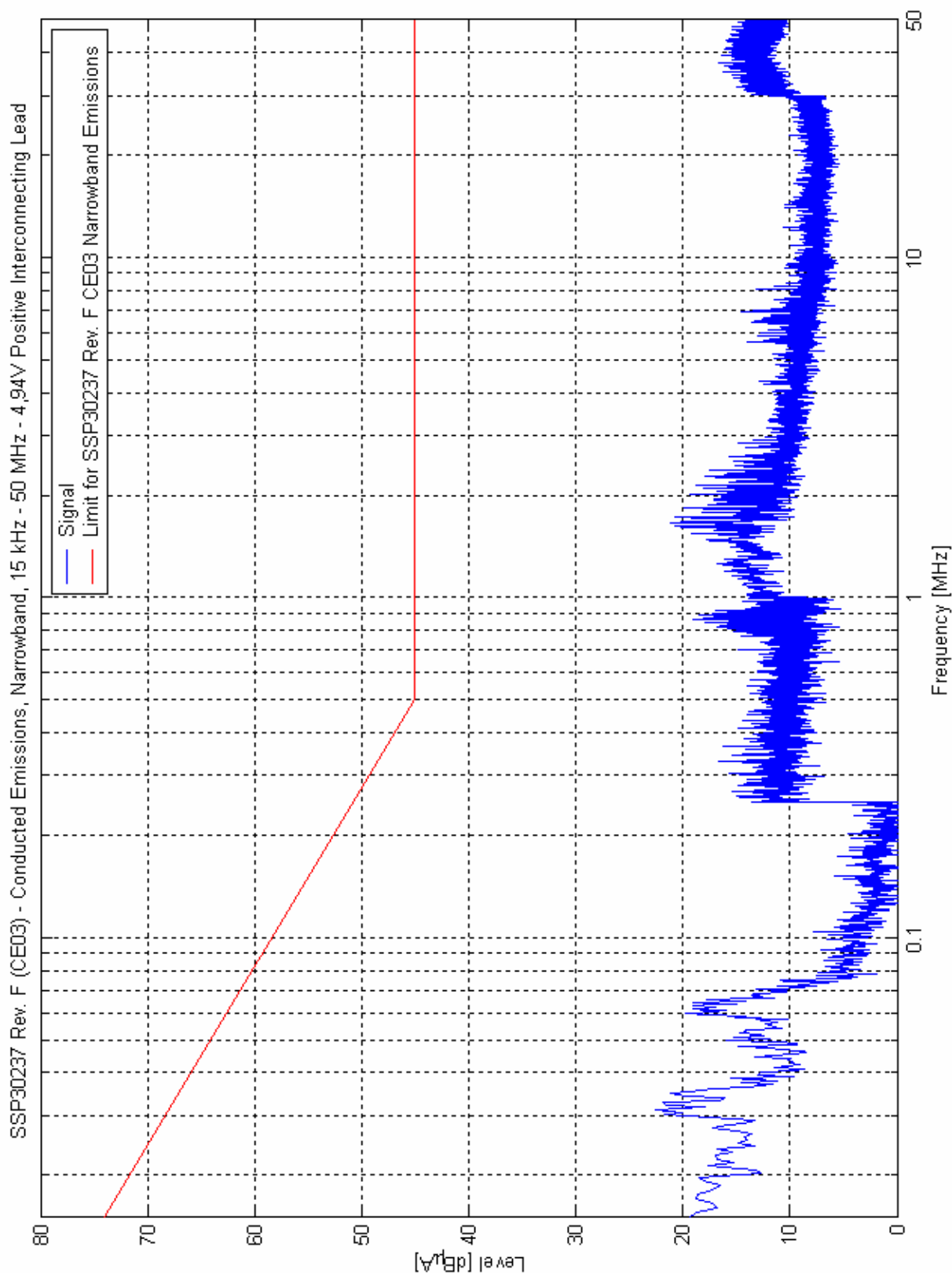
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P./N. 28303101A122A01 S./N. 100 ÷ 101

MIL – STD – 461C – CE03

CONDUCTED EMISSIONS, INTERCONNECTING LEADS, 15 kHz ÷ 50 MHz

NARROWBAND – 4,94 VDC POSITIVE INTERCONNECTING LEAD



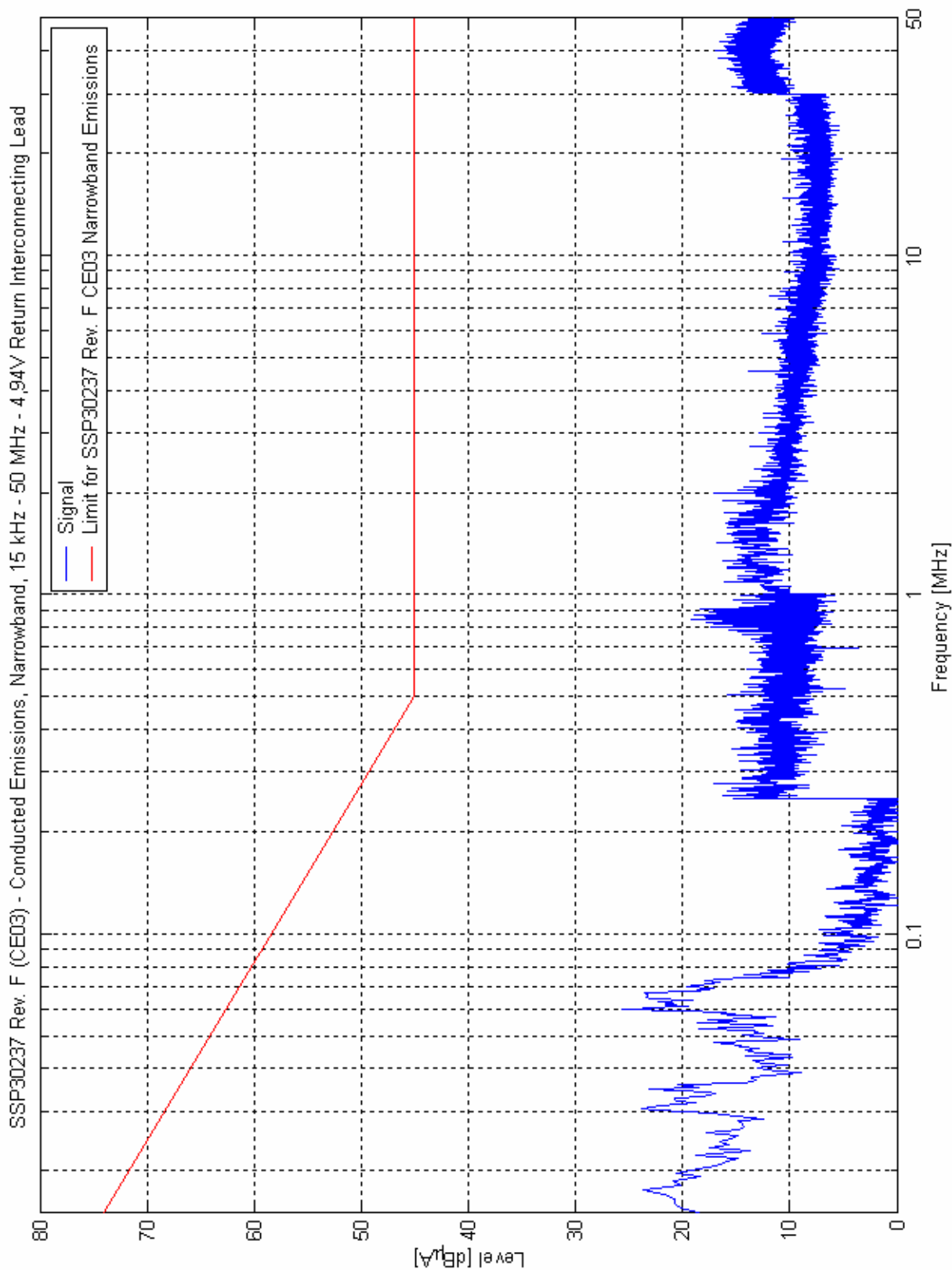
UGPS QM

P./N. 28303101A121A01 S./N. 100 ÷ 101

P./N. 28303101A122A01 S./N. 100 ÷ 101

MIL – STD – 461C – CE03

CONDUCTED EMISSIONS, INTERCONNECTING LEADS, 15 kHz ÷ 50 MHz  
NARROWBAND – 4,94 VDC RETURN INTERCONNECTING LEAD





UGPS QM

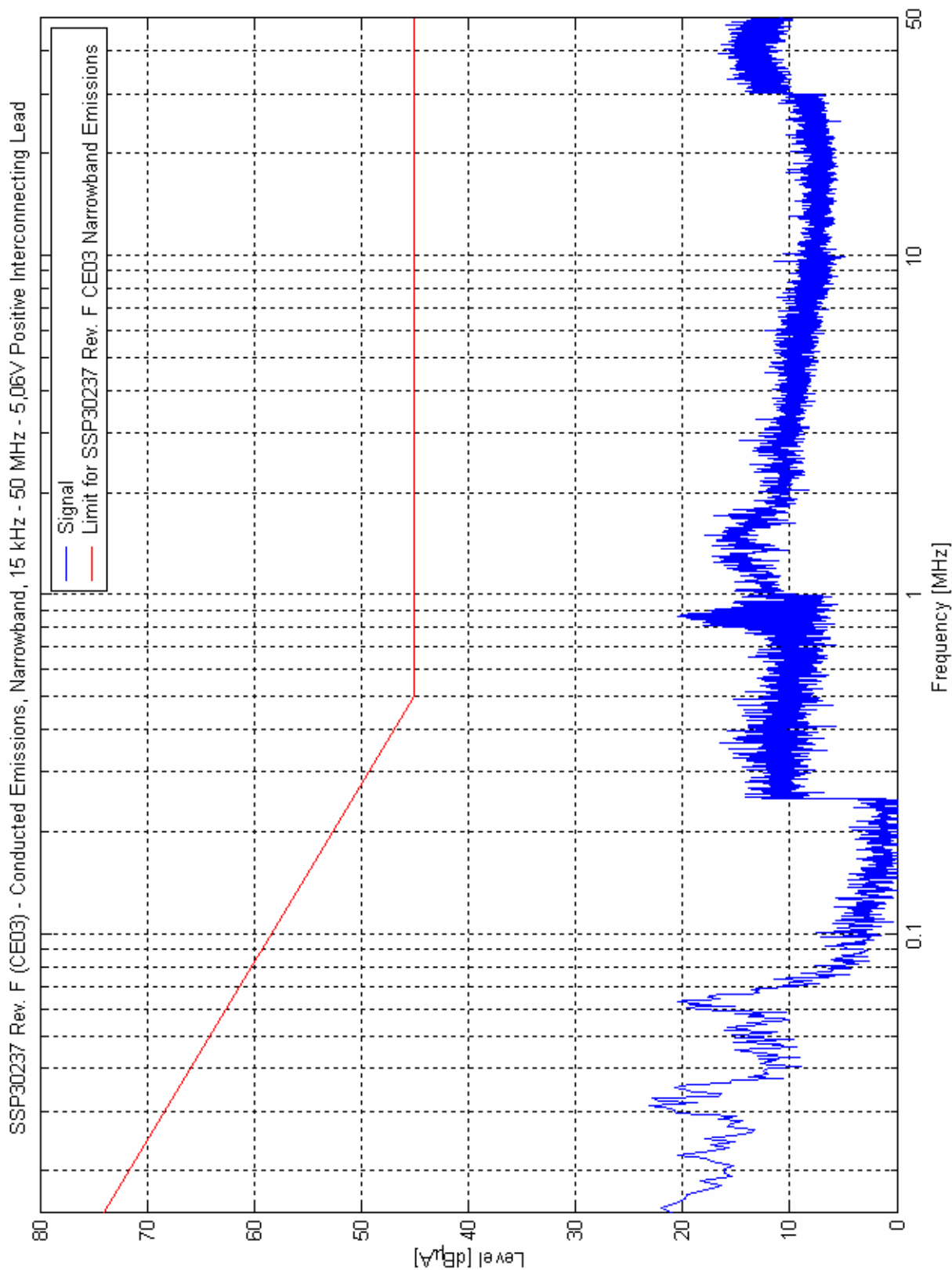
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P./N. 28303101A122A01 S./N. 100 ÷ 101

MIL – STD – 461C – CE03

CONDUCTED EMISSIONS, INTERCONNECTING LEADS, 15 kHz ÷ 50 MHz

NARROWBAND – 5,06 VDC POSITIVE INTERCONNECTING LEAD



UGPS QM

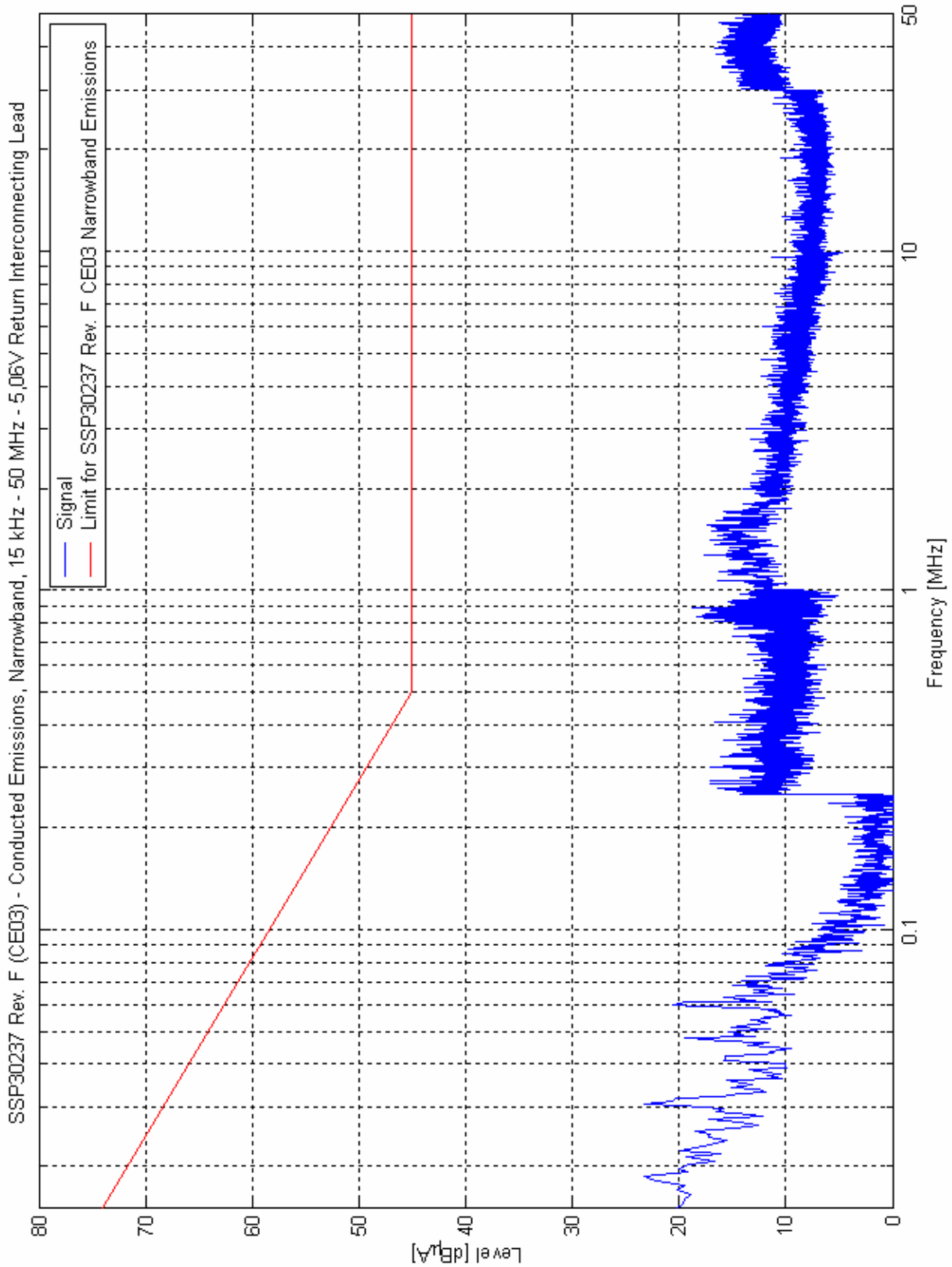
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MIL - STD - 461C - CE03

CONDUCTED EMISSIONS, INTERCONNECTING LEADS, 15 kHz ÷ 50 MHz

NARROWBAND - 5,06 VDC RETURN INTERCONNECTING LEAD



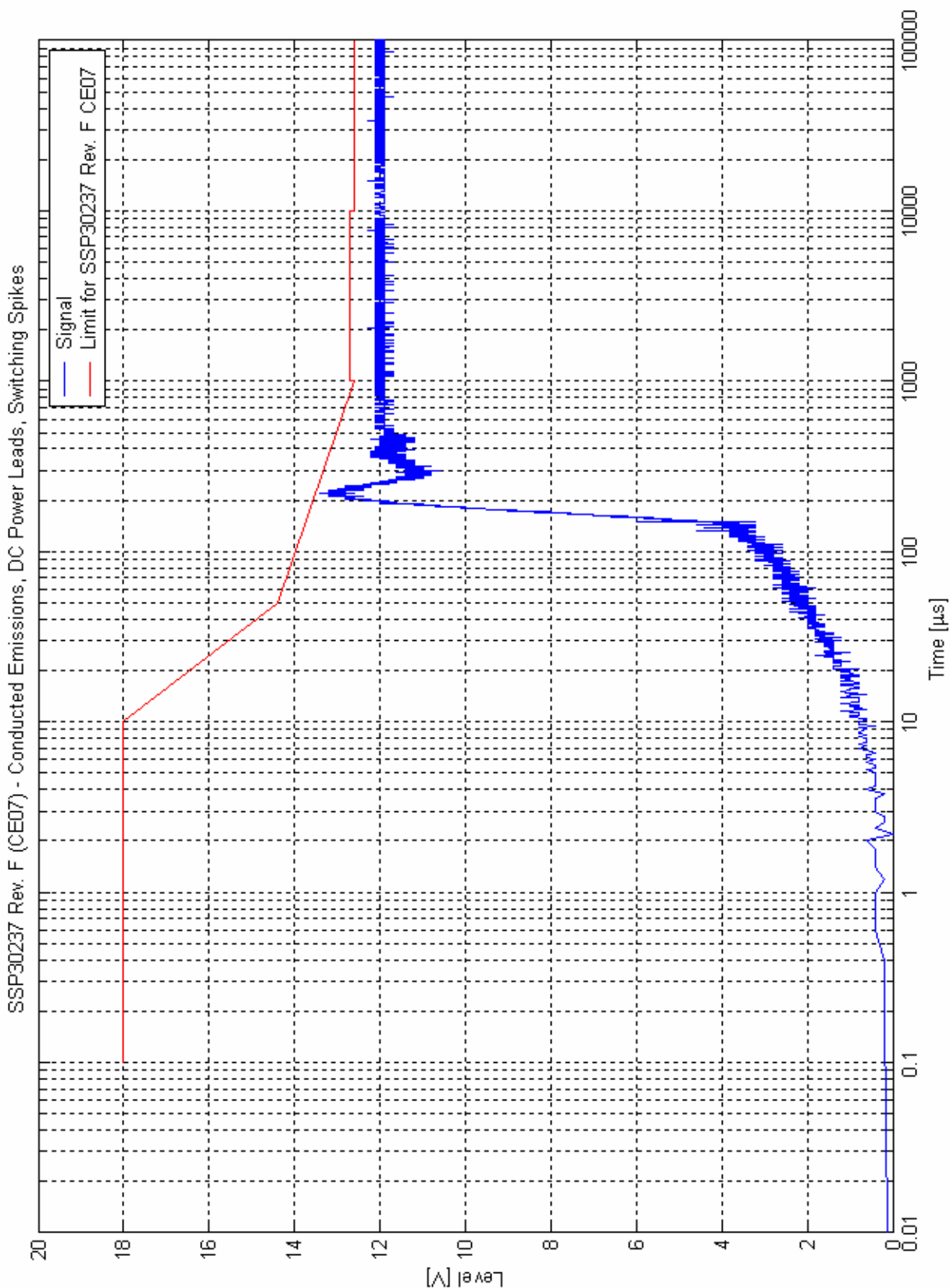
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P./N. 28303101A121A01 S./N. 100 ÷ 101

P./N. 28303101A122A01 S./N. 100 ÷ 101

SSP 30237 REV. F – CE07

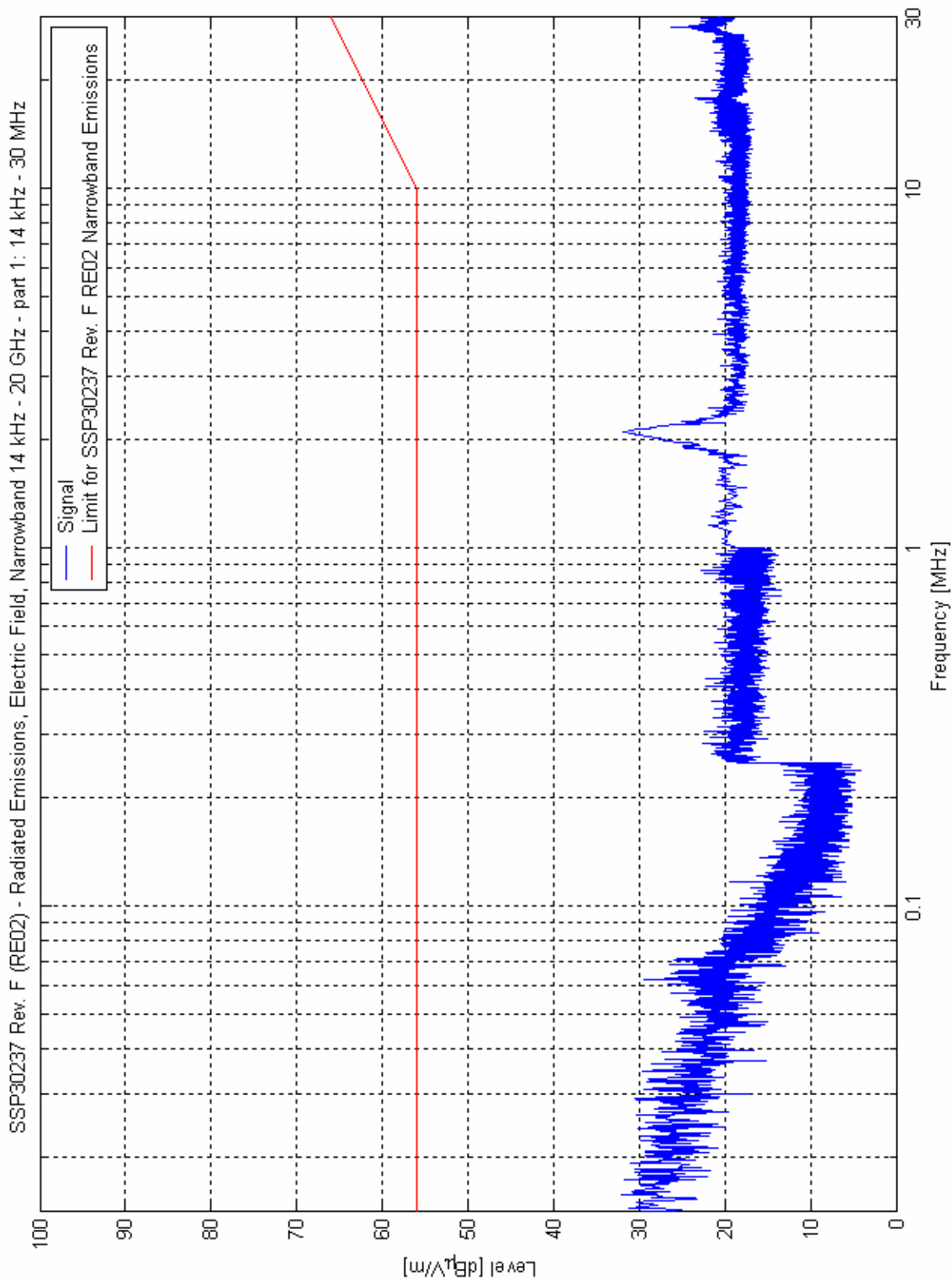
CONDUCTED EMISSIONS, DC POWER LEADS, SWITCHING SPIKES, TIME DOMAIN



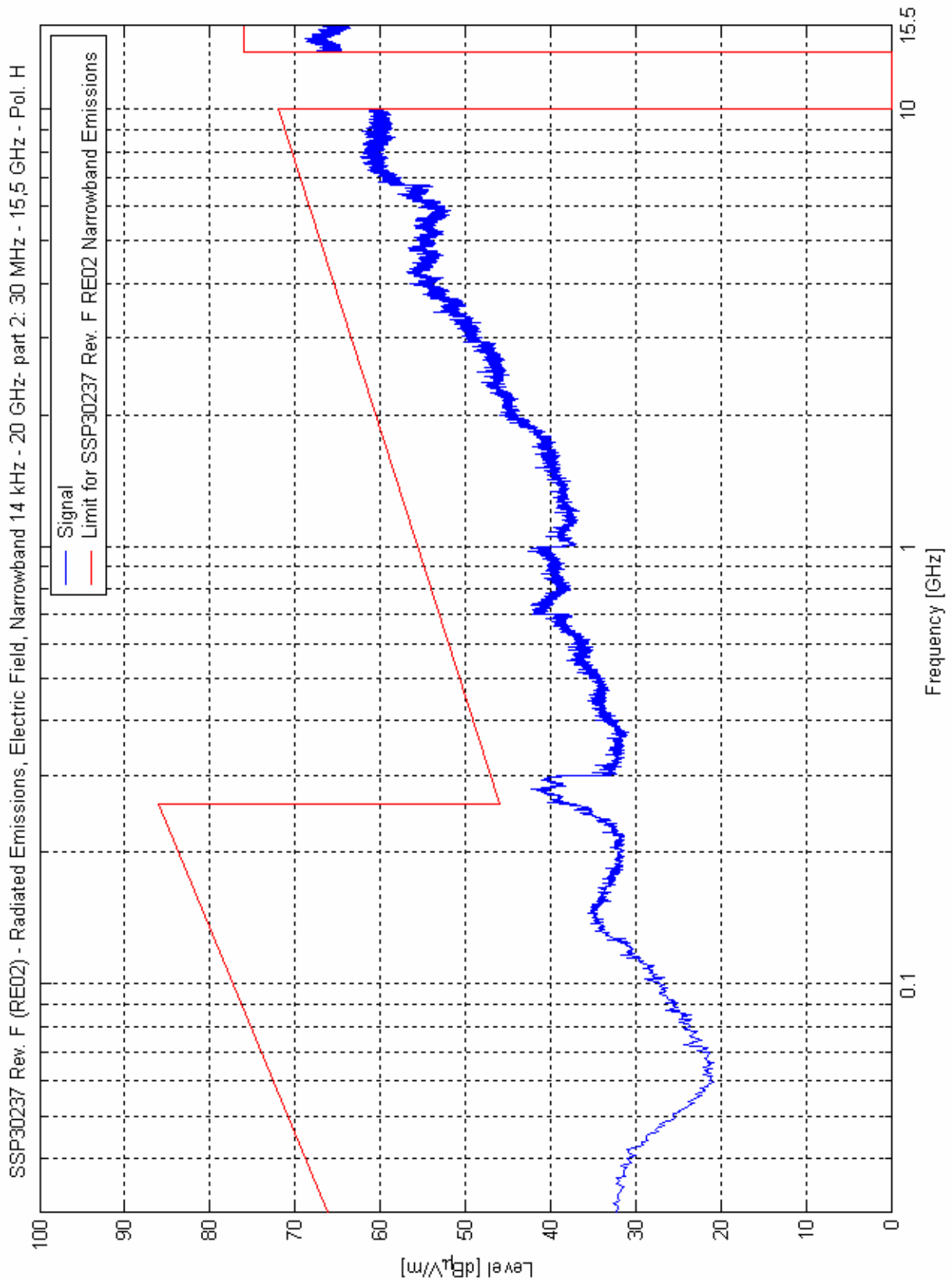
# Attachment III

## RESULTS OF RADIATED EMISSIONS TESTS.

**UGPS QM**  
**P./N. 28303101A121A01 S./N. 100 ÷ 101**  
**P./N. 28303101A122A01 S./N. 100 ÷ 101**  
**SSP 30237 REV. F – RE02**  
**RADIATED EMISSIONS, ELECTRIC FIELD, 14 kHz – 20 GHz**  
**PART #1: 14 kHz – 30 MHz**  
**NARROWBAND**



**UGPS QM**  
**P./N. 28303101A121A01 S./N. 100 ÷ 101**  
**P./N. 28303101A122A01 S./N. 100 ÷ 101**  
**SSP 30237 REV. F – RE02**  
**RADIATED EMISSIONS, ELECTRIC FIELD, 14 kHz – 20 GHz**  
**PART #2: 30 MHz – 15,5 GHz**  
**NARROWBAND – POL. H**



**UGPS QM**  
**P./N. 28303101A121A01 S./N. 100 ÷ 101**  
**P./N. 28303101A122A01 S./N. 100 ÷ 101**  
**SSP 30237 REV. F – RE02**  
**RADIATED EMISSIONS, ELECTRIC FIELD, 14 kHz – 20 GHz**  
**PART #2: 30 MHz – 15,5 GHz**  
**NARROWBAND – POL. V**

