



HERSCHEL / PLANCK

**Herschel FM EMC Conducted Emissions Data
Collection**

H-P-2-ASP-TN-1406

Product Code : 000 000

Rédigé par/ <i>Written by</i>	Responsabilité-Service-Société <i>Responsibility-Office -Company</i>	Date	Signature
M. Burlas	EMC Engineer		
Vérifié par/ <i>Verified by</i>			
K-R. Hibberd	Electrical Interfaces Manager		
P. Couzin	Electrical Architecture Manager		
Approbation/ <i>Approved</i>			
B. Gobillot	Test Director		
Y. Roche	System Engineering Manager		
D. Montet	Herschel Satellite Manager		
T. Grassin	PA Manager		
J.M. Reix	Programme Manager		
T. Passvogel	ESA Programme Manager		

Data management : Christiane GIACOMETTI

Entité Emettrice : Thalès Alenia Space - Cannes
(détentrice de l'original) :

HERSCHEL FM EMC CE DATA COLLECTION

REFERENCE : H-P-2-ASP-TS-1406

DATE : 15/10/2007

ISSUE : 1

PAGE : 2/48

DISTRIBUTION / DISTRIBUTION RECORD

HERSCHEL/PLANCK		DISTRIBUTION RECORD	
DOCUMENT NUMBER : H-P-2-ASP-TN-1406		Issue 1 / Rev. : 0 Date: 15/10/2007	
EXTERNAL DISTRIBUTION		INTERNAL DISTRIBUTION	
ESA	X	HP team	X
ASTRIUM	X		
ALENIA	X		
ARIANE SPACE			
		Clf Documentation	Orig.

ENREGISTREMENT DES EVOLUTIONS / *CHANGE RECORD*

ISSUE	DATE	§ : DESCRIPTION DES EVOLUTIONS § : <i>CHANGE RECORD</i>	REDACTEUR <i>AUTHOR</i>
1	15/10/2007	Document creation	M. Burlas

TABLE OF CONTENTS

DISTRIBUTION / *DISTRIBUTION RECORD*..... 2

ENREGISTREMENT DES EVOLUTIONS / *CHANGE RECORD*..... 3

TABLE OF CONTENTS..... 4

1. SCOPE 5

2. DOCUMENTS..... 5

2.1 APPLICABLE DOCUMENTS.....5

2.2 REFERENCE DOCUMENTS.....5

3. CONDUCTED EMISSIONS DATA COMING FROM LOWER LEVEL TESTS..... 6

3.1 NOISE ON GROUND STRAP.....6

3.2 ACC SIGNAL LINES FOR RWLS.....8

3.2.1 TD line..... 8

3.2.2 TOCO line..... 11

3.3 TWTA.....14

3.3.1 Current..... 14

3.3.2 Voltage..... 17

3.4 STR.....21

3.4.1 Current..... 21

3.4.2 Voltage..... 24

3.5 PACS/SPU.....25

3.5.1 Current..... 25

3.6 PACS/DPU.....28

3.6.1 Current..... 28

3.7 PACS/BOLC.....31

3.7.1 Current..... 31

3.8 PACS/DECMEC.....33

3.8.1 Current..... 33

3.9 CCU.....35

3.9.1 Current..... 35

3.9.2 Voltage..... 37

3.10 SPIRE/HSFCU.....39

3.10.1 Current..... 39

3.11 HIFI/DPU-ICU.....42

3.11.1 Current..... 42

3.12 HIFI/LCU.....45

3.12.1 Current..... 45

1. SCOPE

The purpose of this document is to give all the data about previous EMC CE tests in order to help the EMC team to deem the results at system level that will be done on the Herschel S/C.

2. DOCUMENTS

2.1 APPLICABLE DOCUMENTS

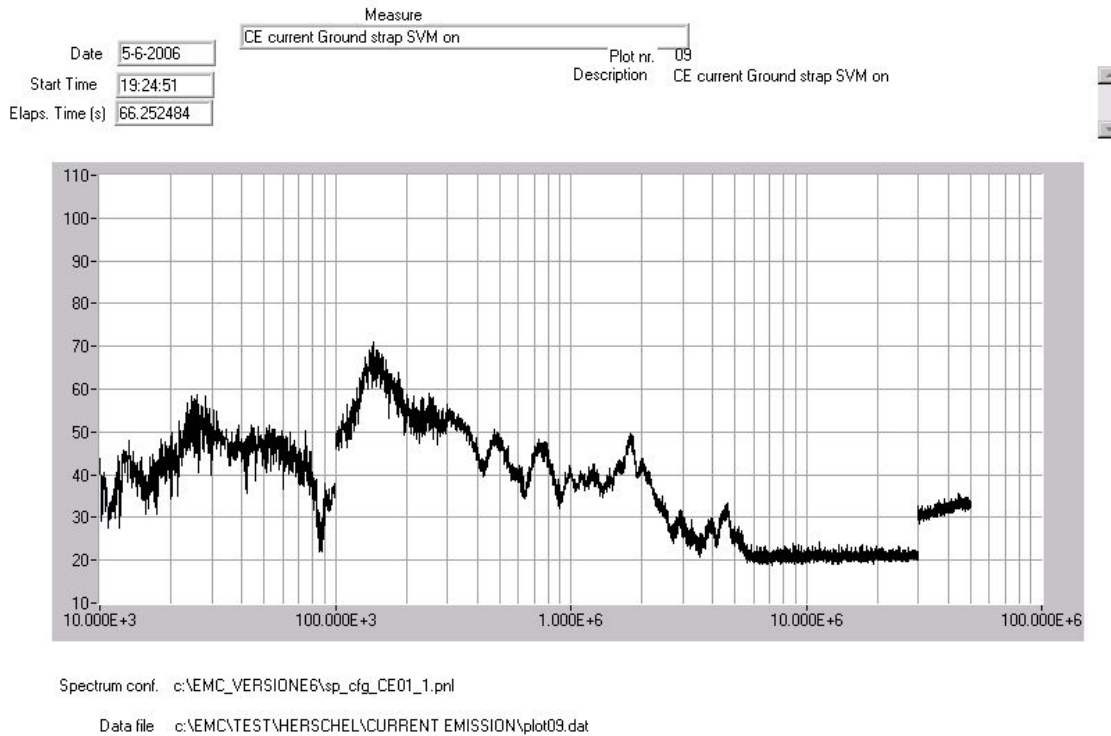
[AD01] H-P-1-ASPI-SP-0037 issue 04, EMC Specification

2.2 REFERENCE DOCUMENTS

- [RD01] H-P-RP-AI-0176 issue 01, Herschel PFM SVM – EMC Confidence Test Report
- [RD02] H-P-RP-AI-0166 issue 01, Conducted susceptibility CM on RWL's TOCO and TD lines Test Report
- [RD03] H-P-4-ETCA-CM-0086, TWTA X band Compliance Matrix
- [RD04] H-P-4-GAF-TR-0050, Autonomous Star Tracker EMC Test report
- [RD05] BOLC FM PSU EMC test report SE-PACS-HPPSU-T-6
- [RD06] HERS-PACS-RP-CGS-014, PACS PFM EMC Test Report for DPUs/ICU
- [RD07] PACS-ME-TR-038, PACS CQM/AVM ILT EMC Test Report
- [RD08] NLR-CR-2007-208, EMC measurements and tests on the LCU
- [RD09] HERS-HIFI-RP-CGS-017, HIFI DPUs/ICU PFM EMC Tests report
- [RD10] HSPIR-PSU-REE-DA0018814-V-ASTR, HSPSU SPIRE EMC Tests report

3. CONDUCTED EMISSIONS DATA COMING FROM LOWER LEVEL TESTS

3.1 Noise on ground strap



N.B.: Those measurements have been performed on SVM sub system in TAS-I premises. For the further EMC tests only the maximum level has to be noticed and the spectrum is expected to be quite different at S/C level.

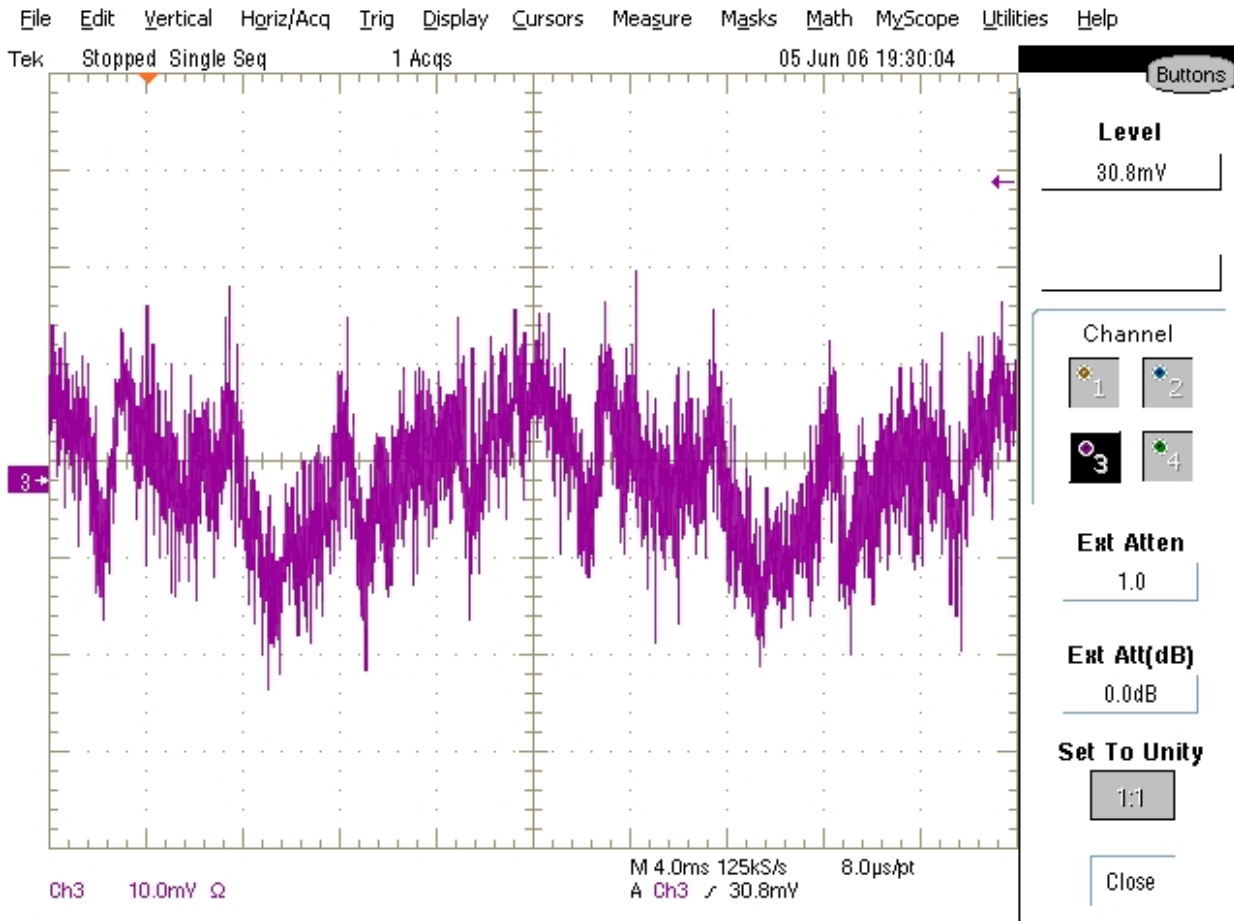
HERSCHEL FM EMC CE DATA COLLECTION

REFERENCE : H-P-2-ASP-TS-1406

DATE : 15/10/2007

ISSUE : 1

PAGE : 7/48

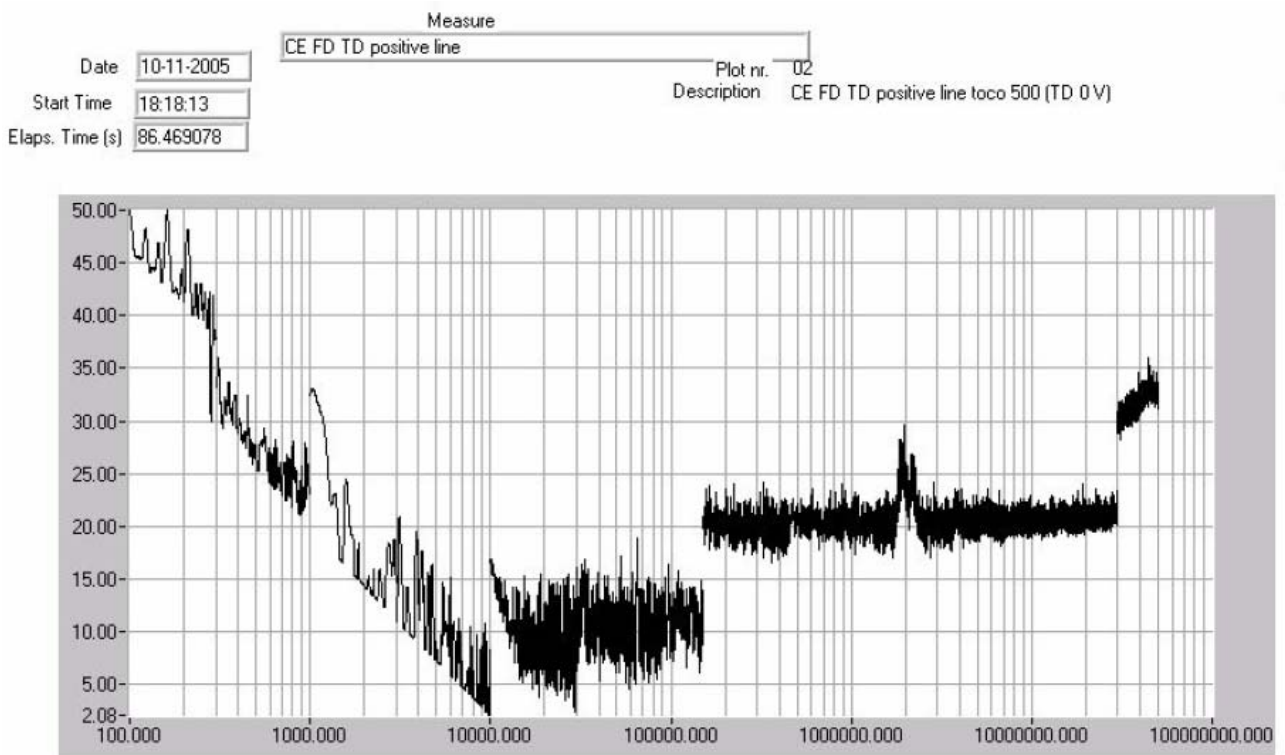


Plot: current noise time domain (10 mA/div) on ground strap_1; SVM ON

3.2 ACC signal lines for RWLs

3.2.1 TD line

3.2.1.1 Current on positive line



3.2.1.2 Current on return line common to TOCO and TD

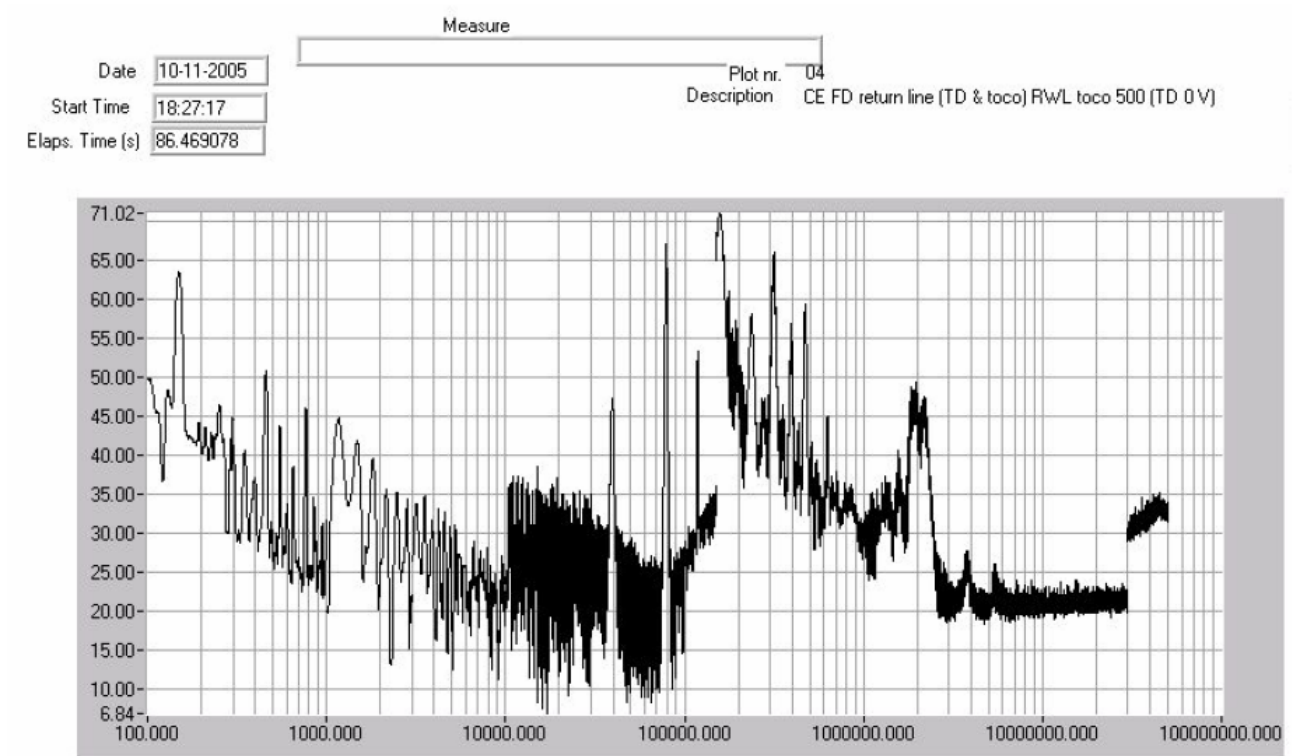


Fig.6.2-9 ToCo set to "500", with TD 0Volt, return line (common to ToCO and TD).

HERSCHEL FM EMC CE DATA COLLECTION

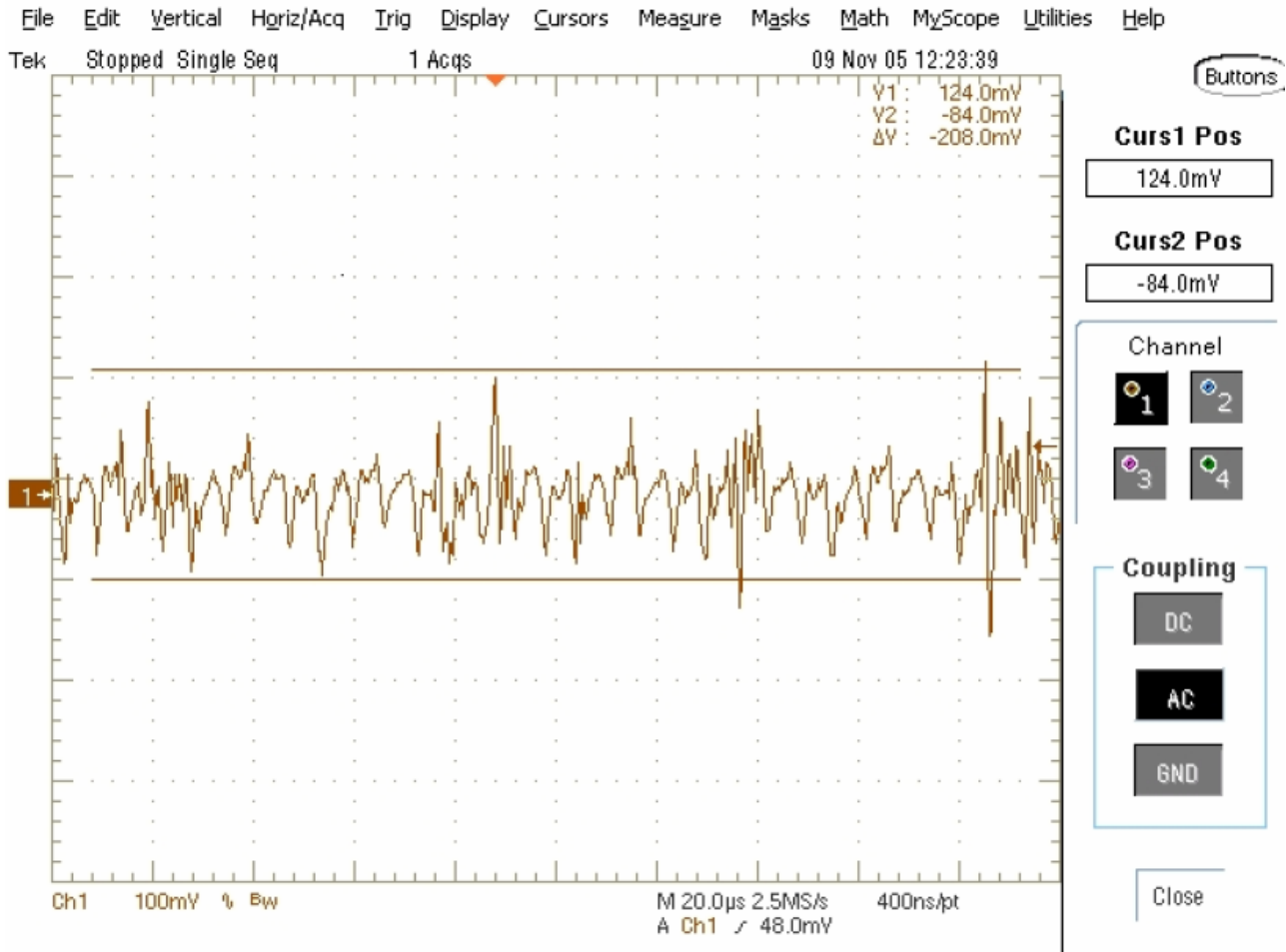
REFERENCE : H-P-2-ASP-TS-1406

DATE : 15/10/2007

ISSUE : 1

PAGE : 10/48

3.2.1.3 Voltage



1 Ripple on TD Lines, with maximum level of ToCo applied (TLM read 4000)

3.2.2 TOCO line

3.2.2.1 Current on positive line

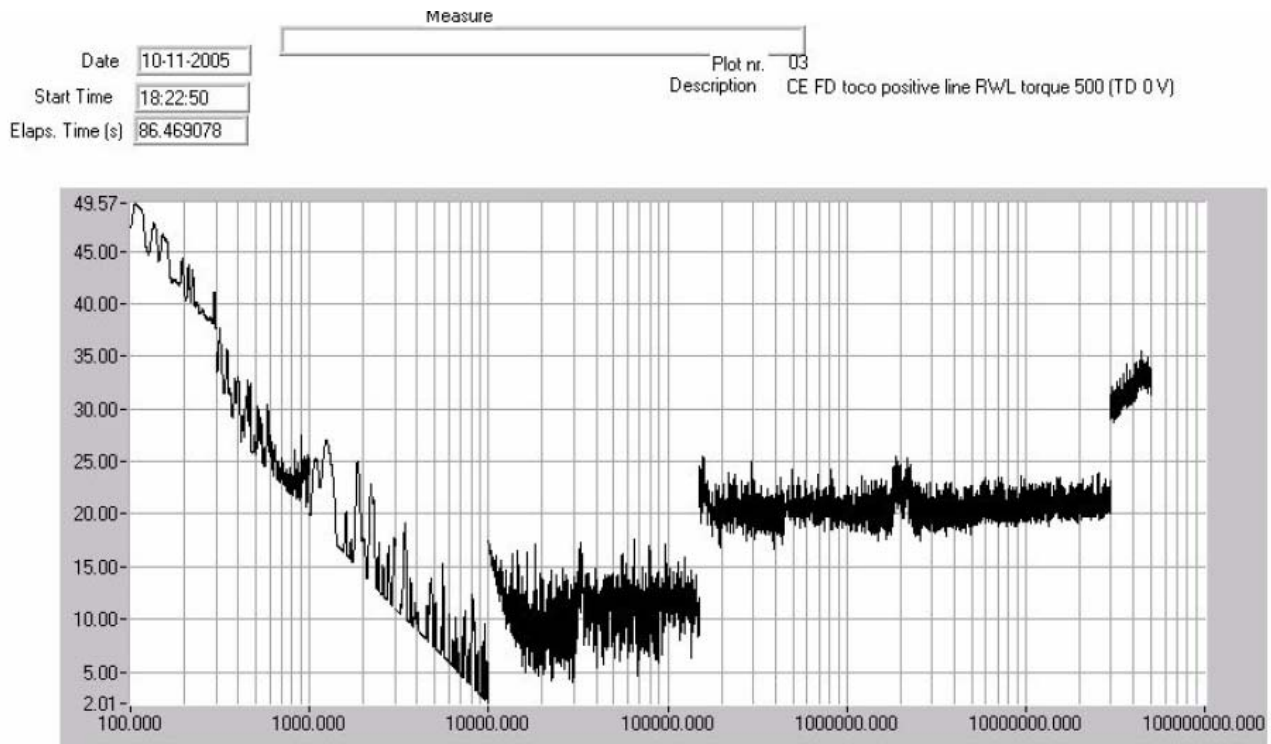


fig.6.2-8 ToCo set to "500", with TD 0Volt, ToCo positive line.

3.2.2.2 Current on return line

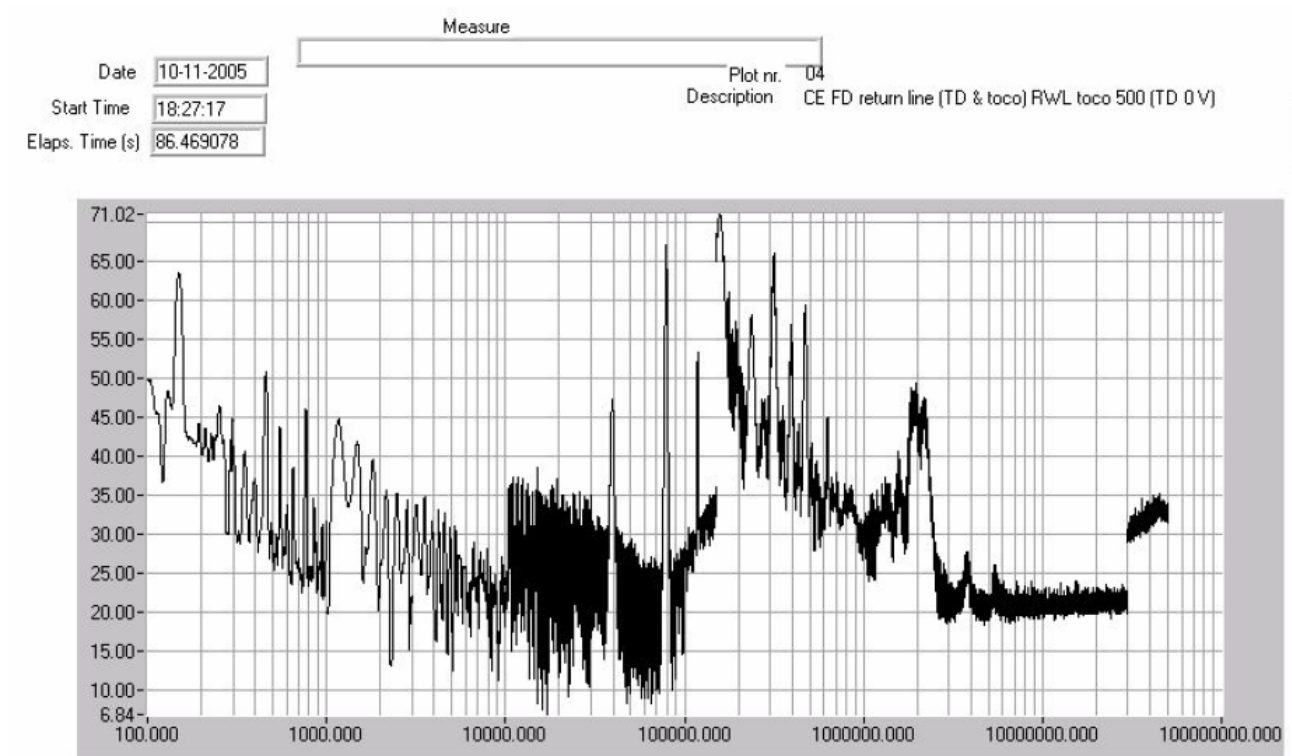


Fig.6.2-9 ToCo set to "500", with TD 0Volt, return line (common to ToCO and TD).

HERSCHEL FM EMC CE DATA COLLECTION

REFERENCE : H-P-2-ASP-TS-1406

DATE : 15/10/2007

ISSUE : 1

PAGE : 13/48

3.2.2.3 Voltage

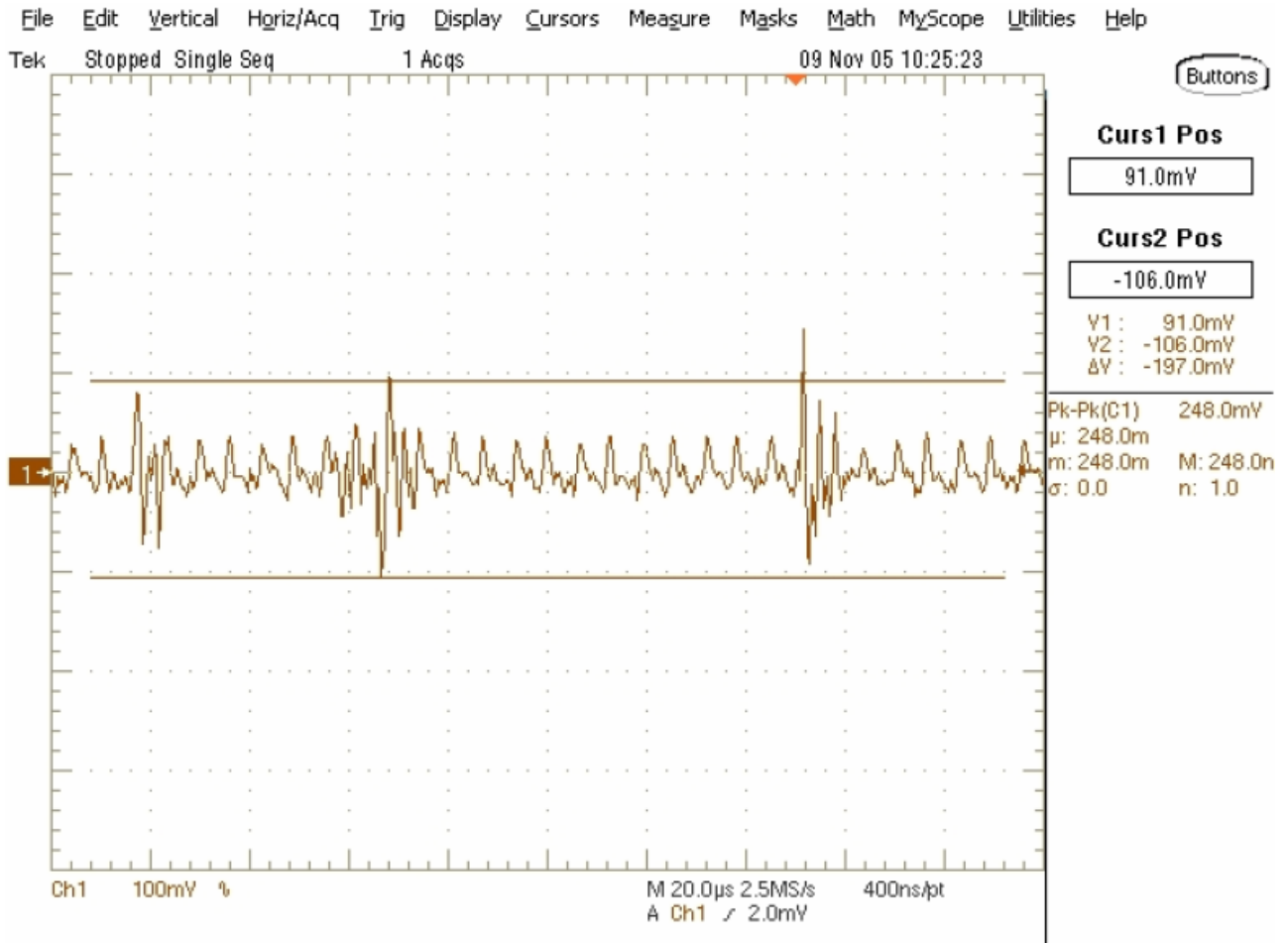
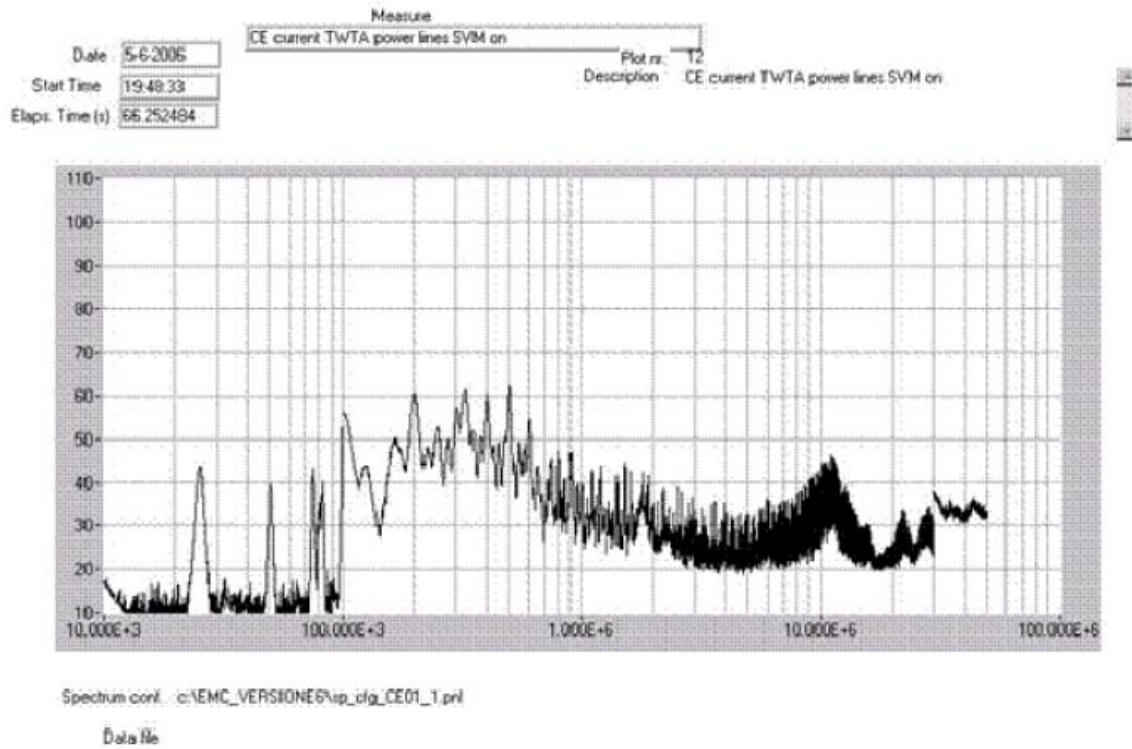


Fig.6.2-3 RWL ON, ToCo set to "0" (scale division 20us)

3.3 TWTA

3.3.1 Current



Plot: CE current frequency domain (dBµA) on TWTA power lines; SVM ON

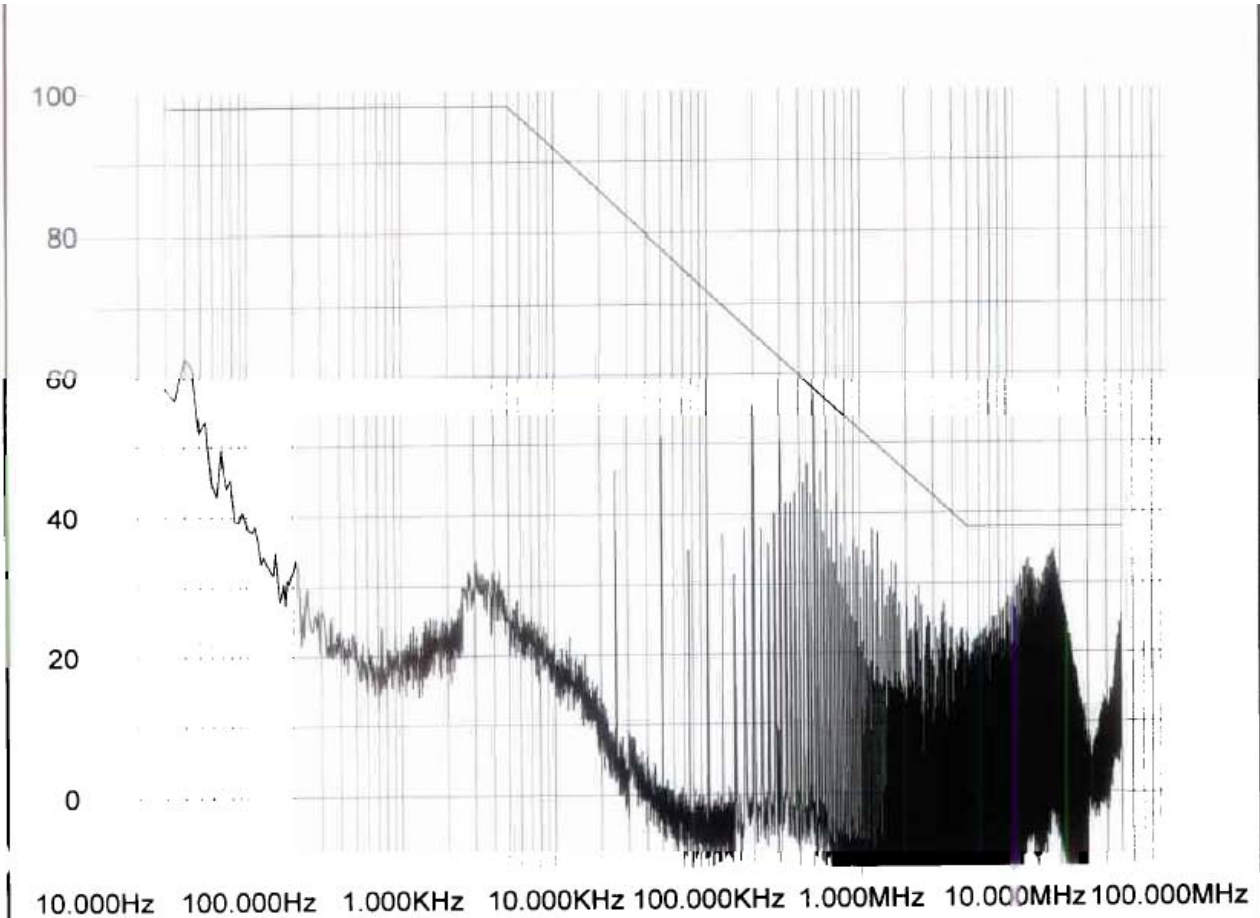
HERSCHEL FM EMC CE DATA COLLECTION

REFERENCE : H-P-2-ASP-TS-1406

DATE : 15/10/2007

ISSUE : 1

PAGE : 15/48



Y axis unit : dBuA rms

Total Sweep Time : 08'21"

Frequency range : 30.000Hz .. 50.000MHz

Max Value : 69.0 @ 100.541KHz

Projet : HP

Unit : TWTA

Model : FM

SN : 003

Procedure : HP4-ETCA-TP-0033-ISS2-REV1

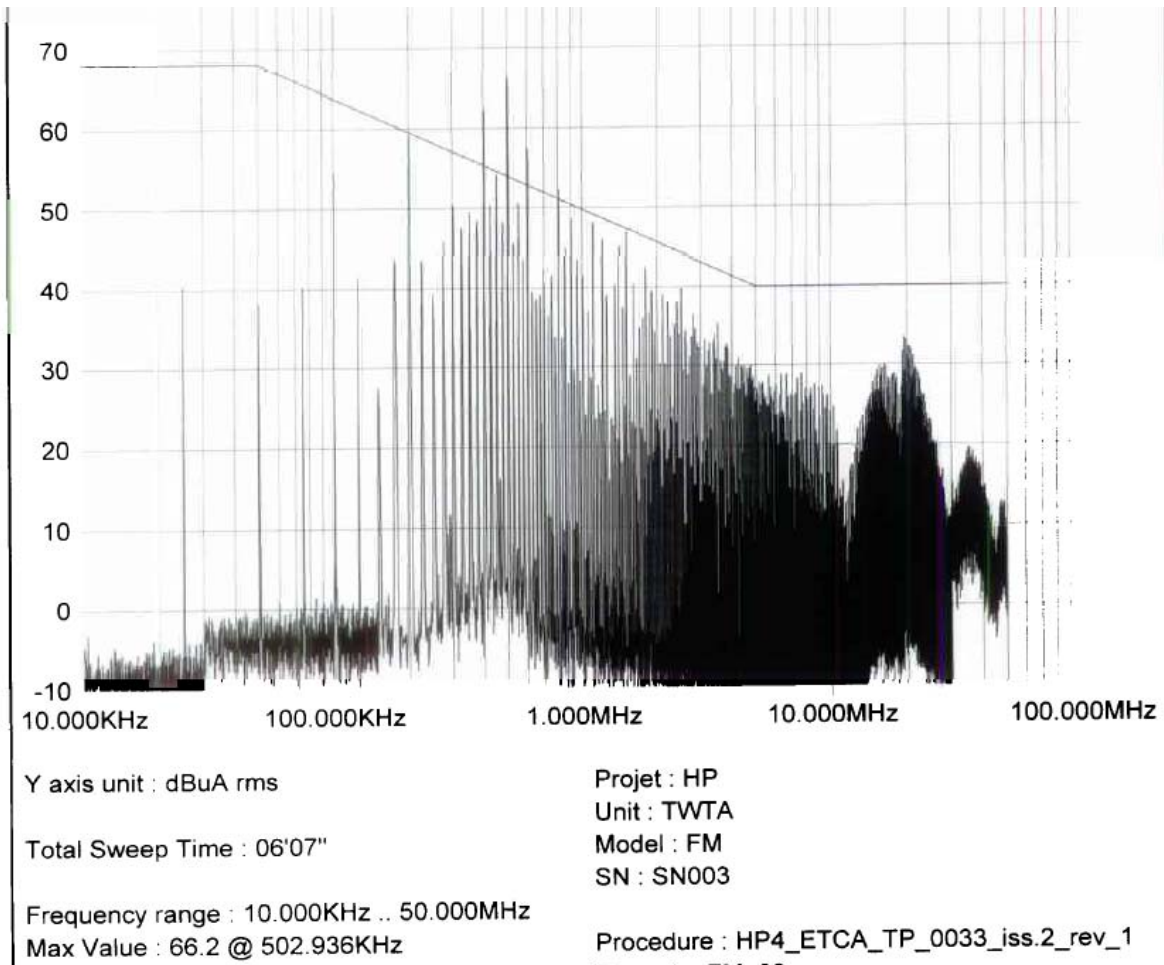
HERSCHEL FM EMC CE DATA COLLECTION

REFERENCE : H-P-2-ASP-TS-1406

DATE : 15/10/2007

ISSUE : 1

PAGE : 16/48



HERSCHEL FM EMC CE DATA COLLECTION

REFERENCE : H-P-2-ASP-TS-1406

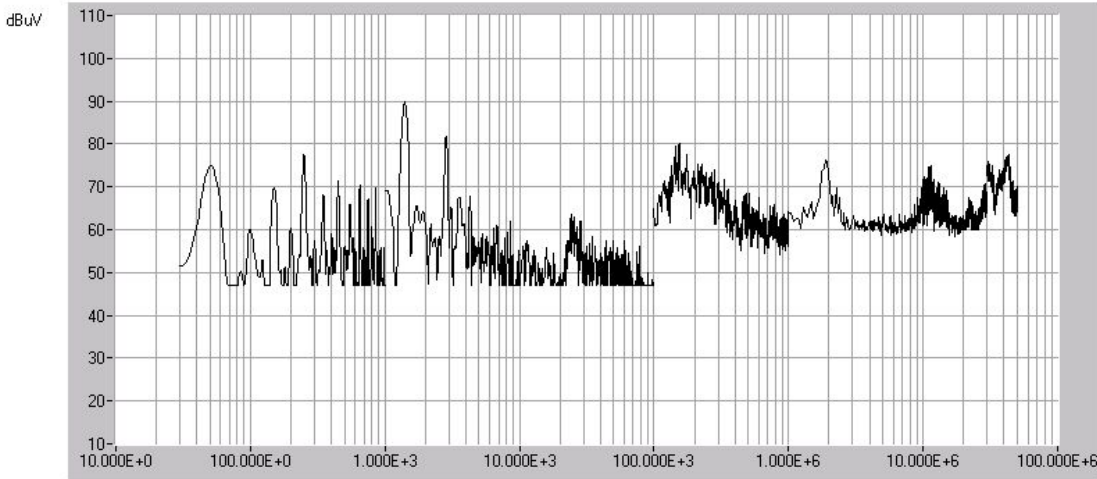
DATE : 15/10/2007

ISSUE : 1

PAGE : 17/48

3.3.2 Voltage

Date	5-6-2006	Measure	CE voltage TWTA power lines SVM on	Plot nr.	13
Start Time	19:56:29	Description	CE voltage TWTA power lines SVM on		
Elaps. Time (s)	19:56:48				



Spectrum conf. c:\NEMC_VERSIONE6\sp_cfg_CE03.pnl

Data file c:\NEMC\TEST\HERSCHEL\VOLTAGE EMISSION\plot_13.dat

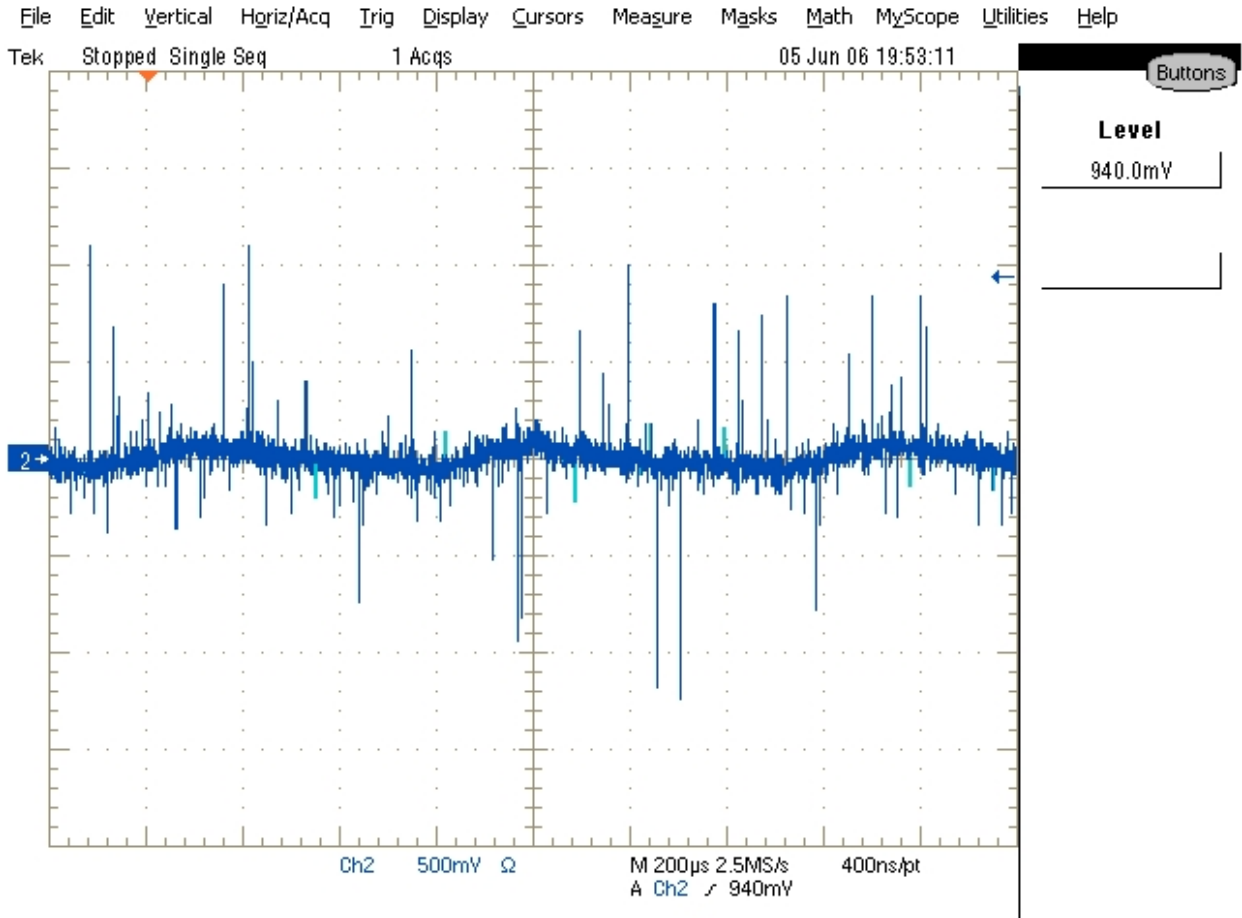
HERSCHEL FM EMC CE DATA COLLECTION

REFERENCE : H-P-2-ASP-TS-1406

DATE : 15/10/2007

ISSUE : 1

PAGE : 18/48



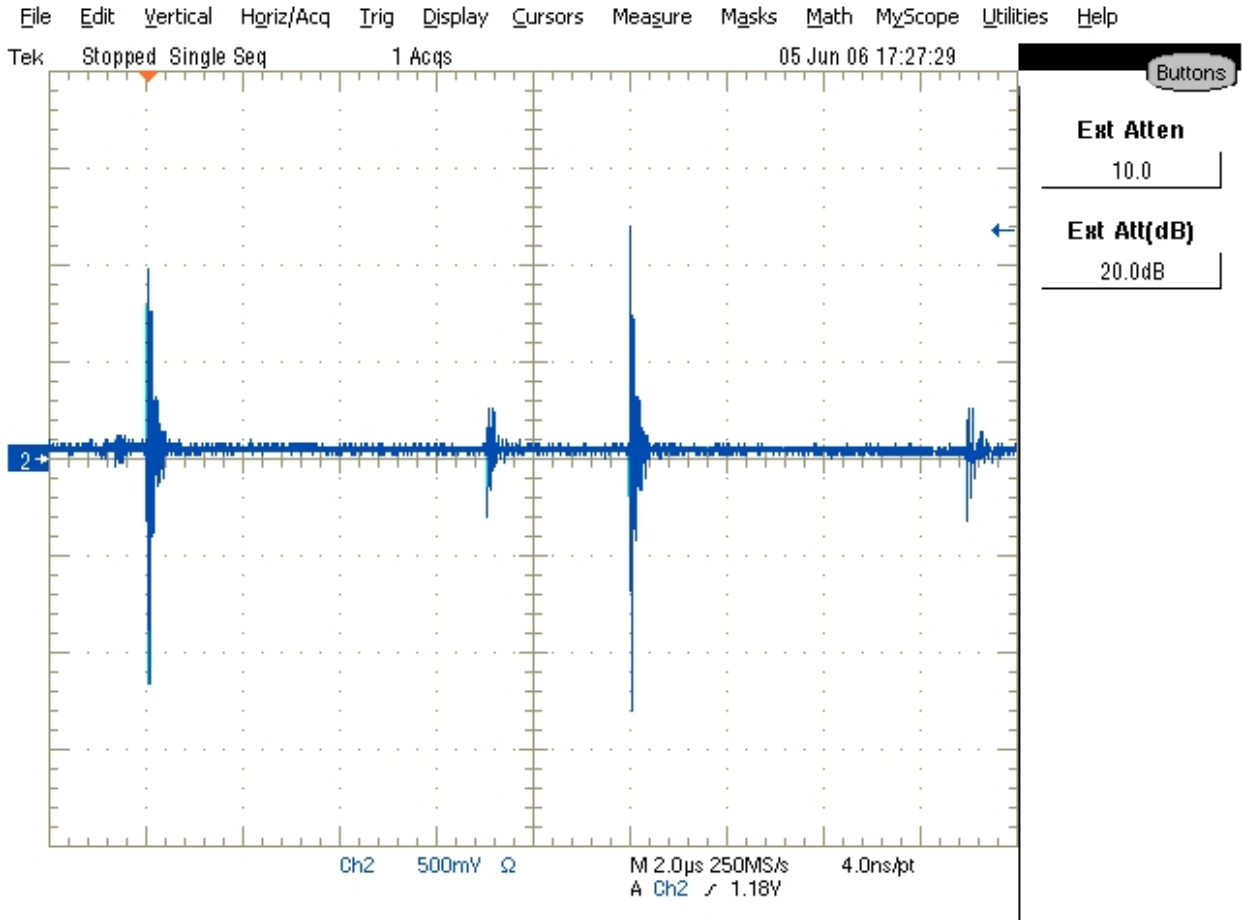
HERSCHEL FM EMC CE DATA COLLECTION

REFERENCE : H-P-2-ASP-TS-1406

DATE : 15/10/2007

ISSUE : 1

PAGE : 19/48



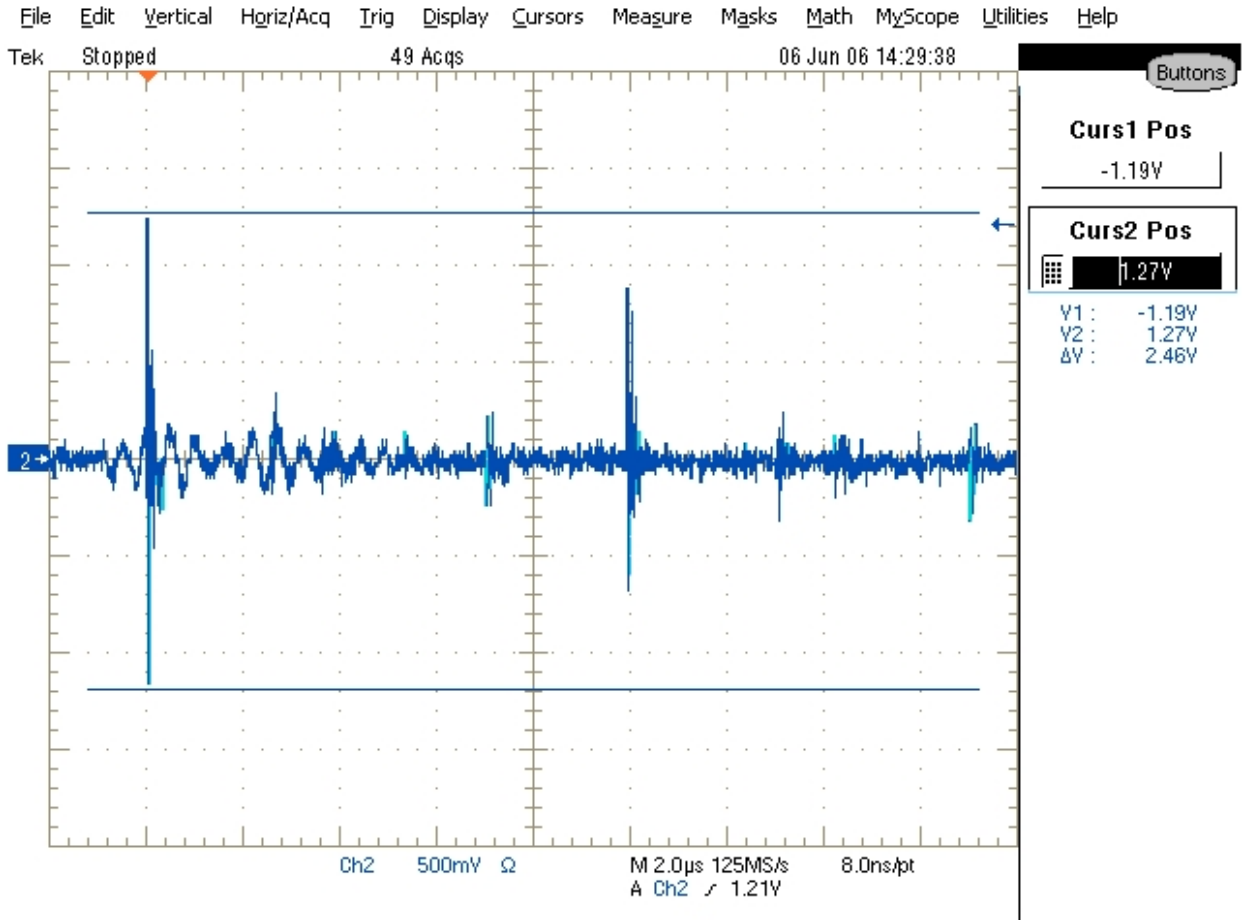
HERSCHEL FM EMC CE DATA COLLECTION

REFERENCE : H-P-2-ASP-TS-1406

DATE : 15/10/2007

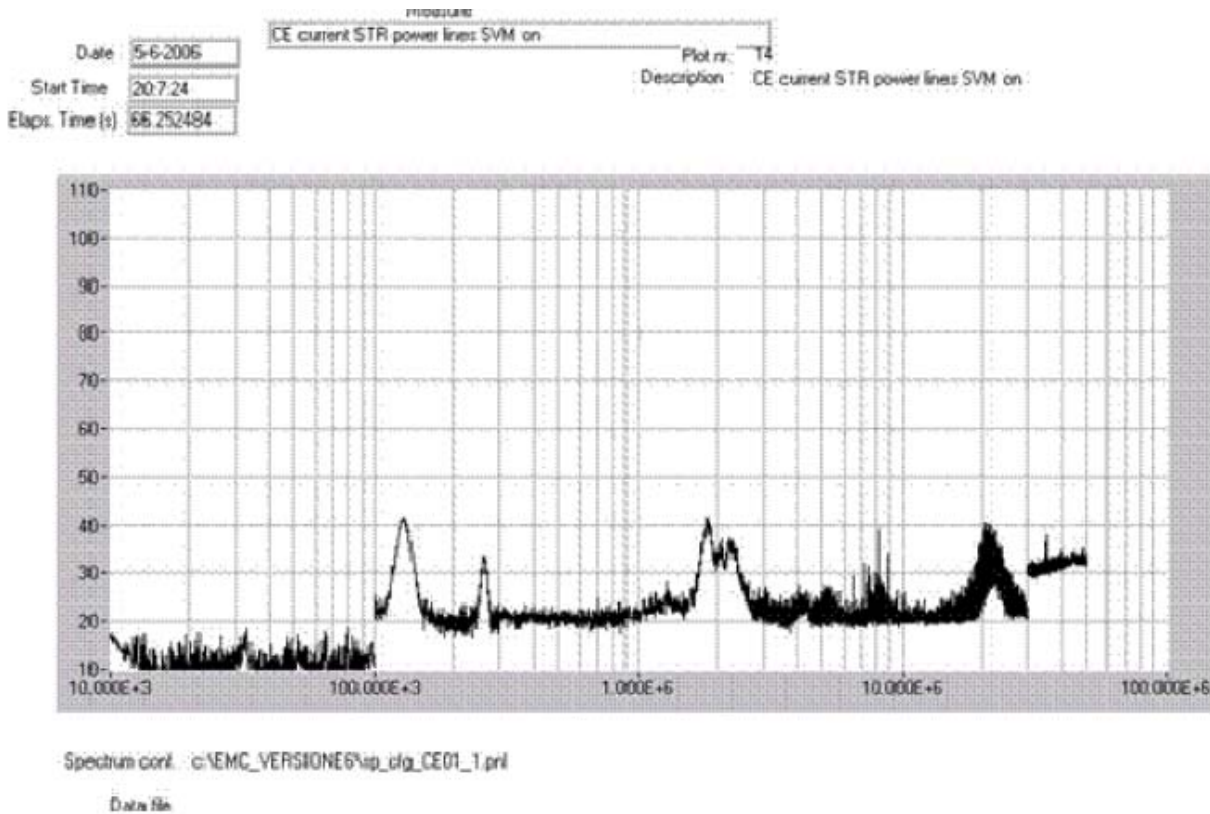
ISSUE : 1

PAGE : 20/48



3.4 STR

3.4.1 Current



lot: CE current frequency domain (dBµA) on STR power lines; SVM ON

HERSCHEL FM EMC CE DATA COLLECTION

REFERENCE : H-P-2-ASP-TS-1406

DATE : 15/10/2007

ISSUE : 1

PAGE : 22/48

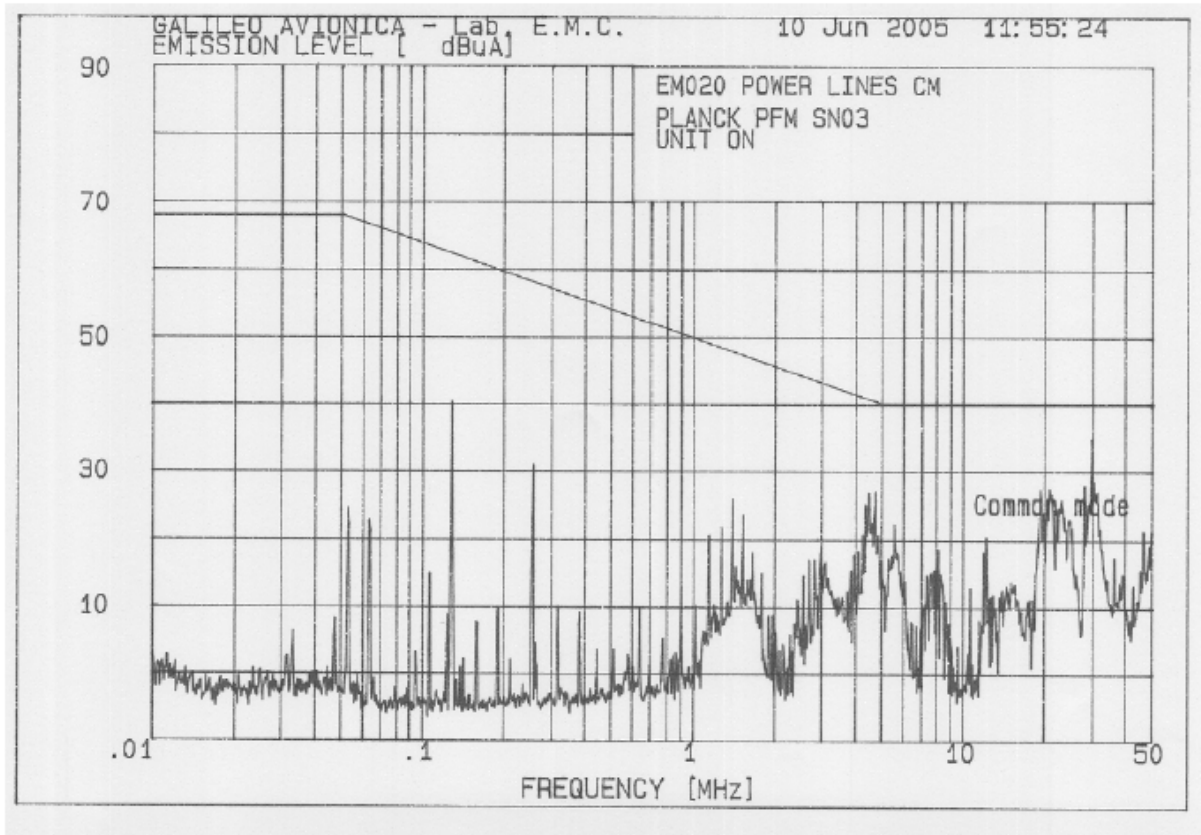


Fig. 5.2.2-3 CE primary power NB [30Hz – 50MHz] CM

HERSCHEL FM EMC CE DATA COLLECTION

REFERENCE : H-P-2-ASP-TS-1406

DATE : 15/10/2007

ISSUE : 1

PAGE : 23/48

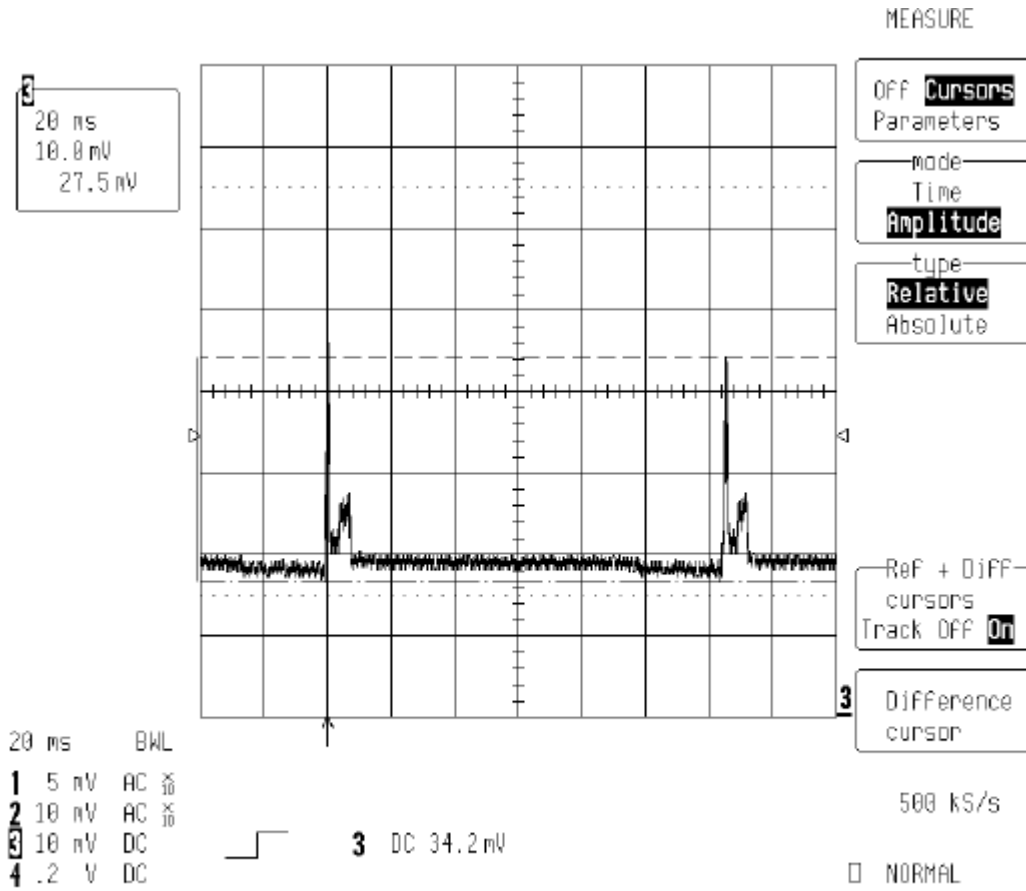


Fig. 5.2.4-4 Current STB mode 20ms/div 200mA/div DM

HERSCHEL FM EMC CE DATA COLLECTION

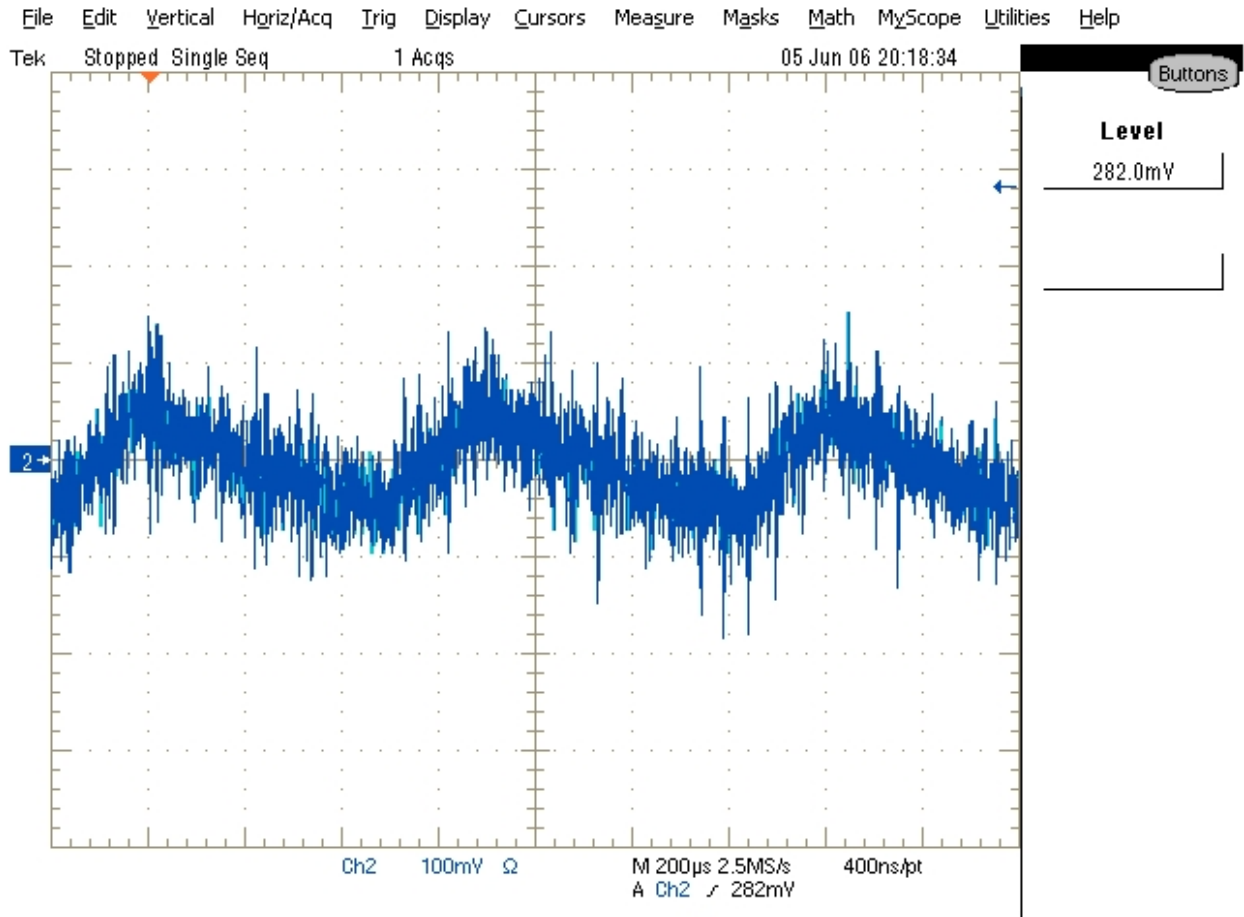
REFERENCE : H-P-2-ASP-TS-1406

DATE : 15/10/2007

ISSUE : 1

PAGE : 24/48

3.4.2 Voltage



HERSCHEL FM EMC CE DATA COLLECTION

REFERENCE : H-P-2-ASP-TS-1406

DATE : 15/10/2007

ISSUE : 1

PAGE : 25/48

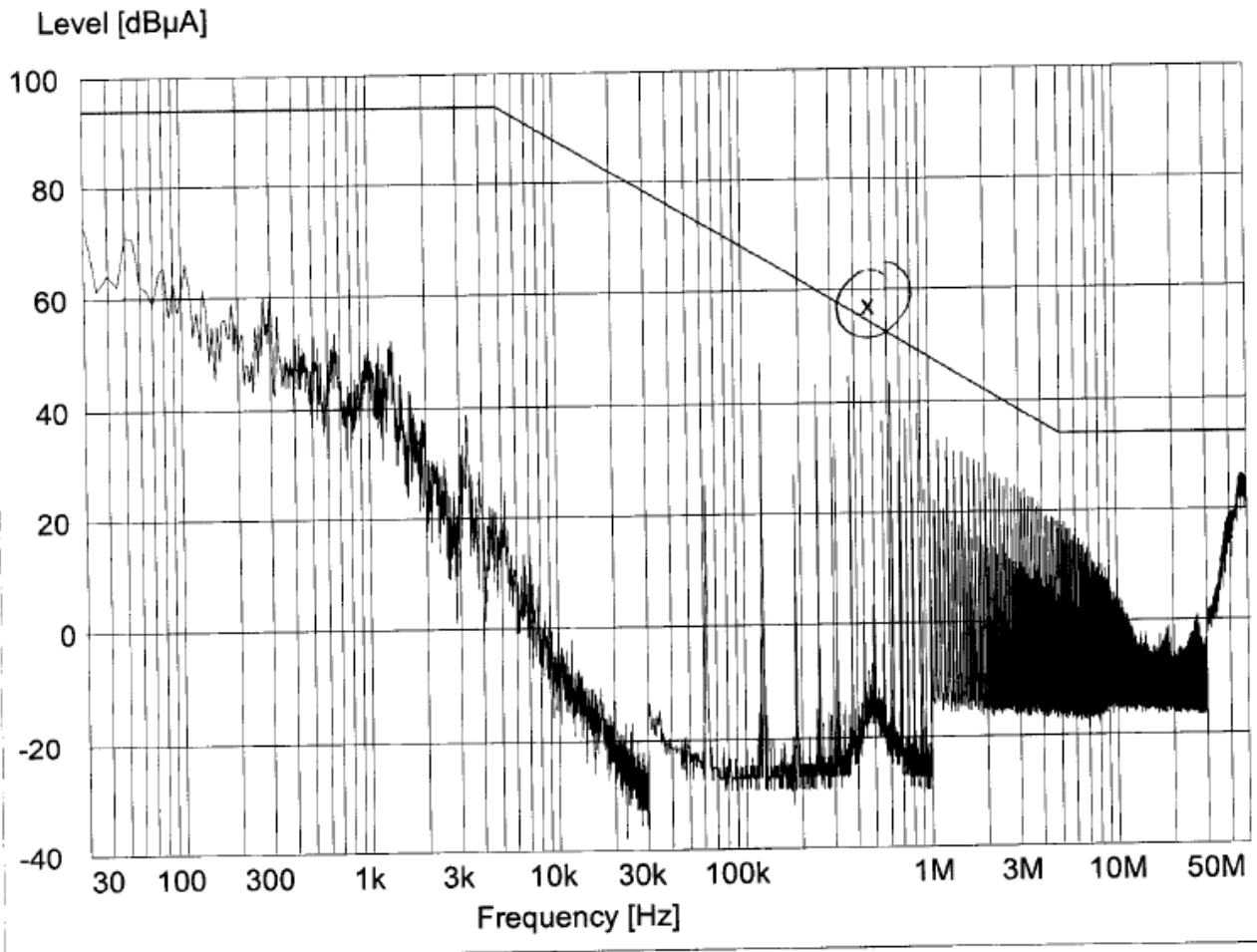
3.5 PACS/SPU

3.5.1 Current

CE DIFF

SPU1

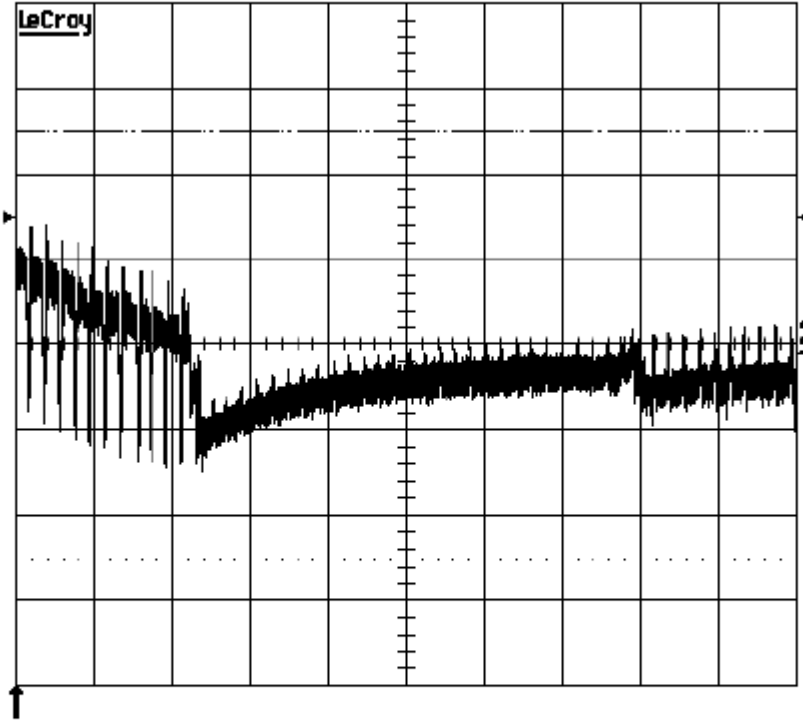
EUT : HERSHEL SPU



x MES HERS_C_2_fin
— MES HERS_C_2_pre
— LIM -CE DIFF HERSHEL Voltaie Limite QP

2-Nov-04
13:40:51

2
20 ms
10.0mV
25.8mV



20 ms

1 10 mV 50Ω
2 10 mV 50Ω
3 .2 V DC
4 .2 V DC



2 DC 16.0mV

5 MS/s

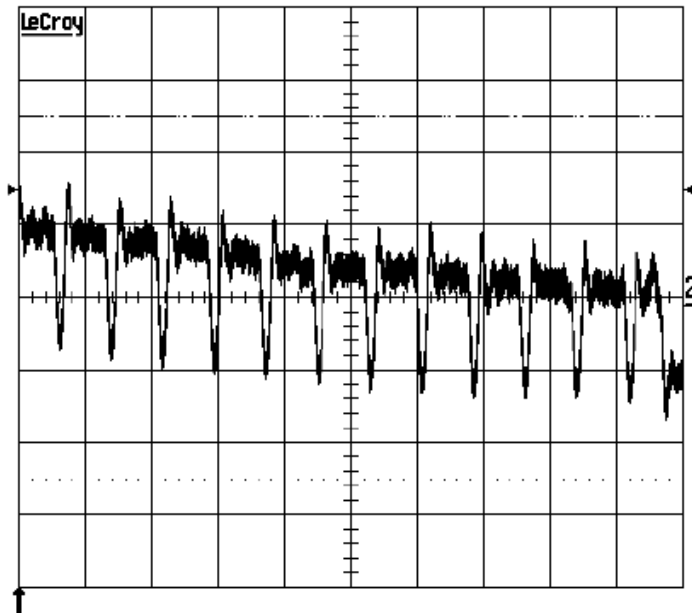
STOPPED

Figure 4-20: SPU DM current ripple in most noisy mode

Scale : 100mA/div

2-Nov-04
13:41:24

2
5 ms
10.0mV
25.8mV



5 ms
1 10 mV 50Ω
2 10 mV 50Ω
3 .2 V DC
4 .2 V DC



2 DC 16.0mV

20 MS/s

NORMAL

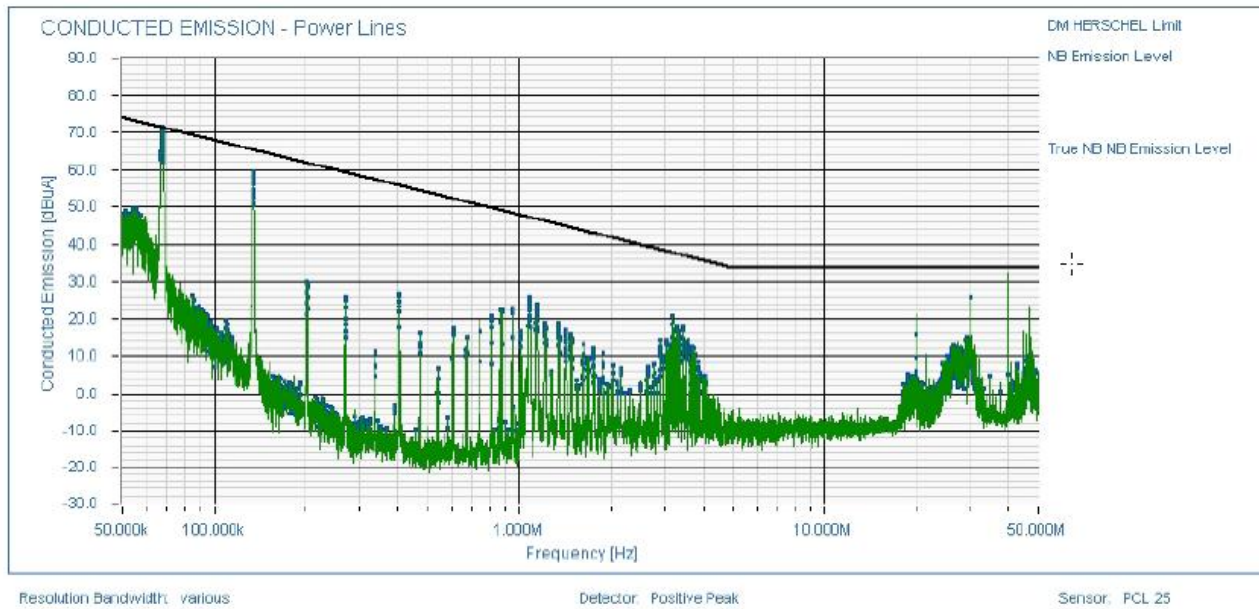
Figure 4-21: SPU DM current ripple in most noisy mode, time scale changed

3.6 PACS/DPU

3.6.1 Current

Customer: CARLO GAVAZZI SPACE ITALIA SpA
Model: PFM
Operating Mode: 26Vdc operational mode

EUT: Satellite Equipment
Number: 20-PACS-00.00



HERSCHEL FM EMC CE DATA COLLECTION

REFERENCE : H-P-2-ASP-TS-1406

DATE : 15/10/2007

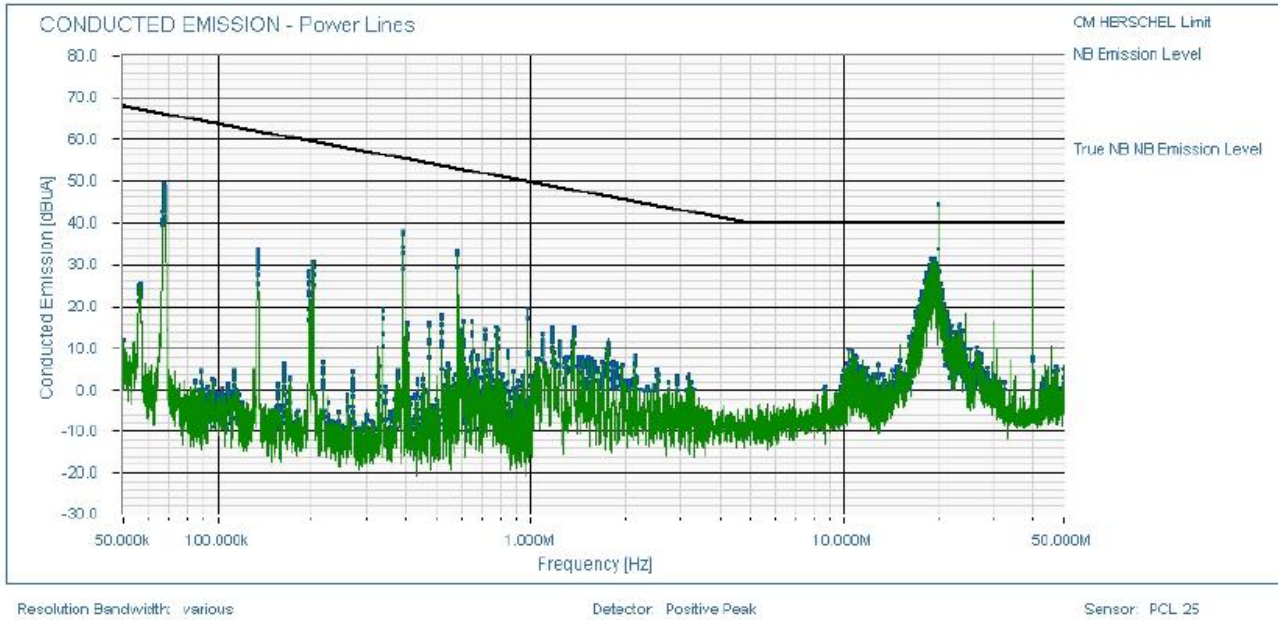
ISSUE : 1

PAGE : 29/48

Customer: CARLO GAVAZZI SPACE ITALIA SpA
Model: PFM

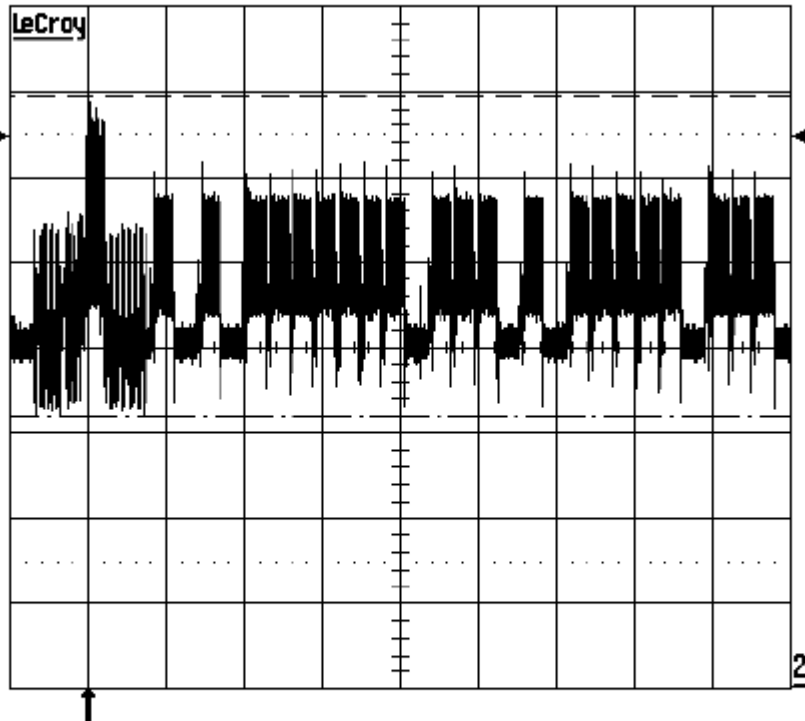
EUT: Satellite Equipement
Number: 20-PACS-00.00

Operating Mode: 28Vdc operational mode



2-Nov-04
12:13:13

2
50 ms
10.0mV
37.4mV



50 ms

- 1 10 mV 50Ω
- 2 10 mV 50Ω
- 3 .2 V DC
- 4 .2 V DC



2 DC 64.2mV

2 MS/s

□ STOPPED

Figure 4-18: DPU DM current ripple in most noisy mode

Scale : 100 mA/div

HERSCHEL FM EMC CE DATA COLLECTION

REFERENCE : H-P-2-ASP-TS-1406

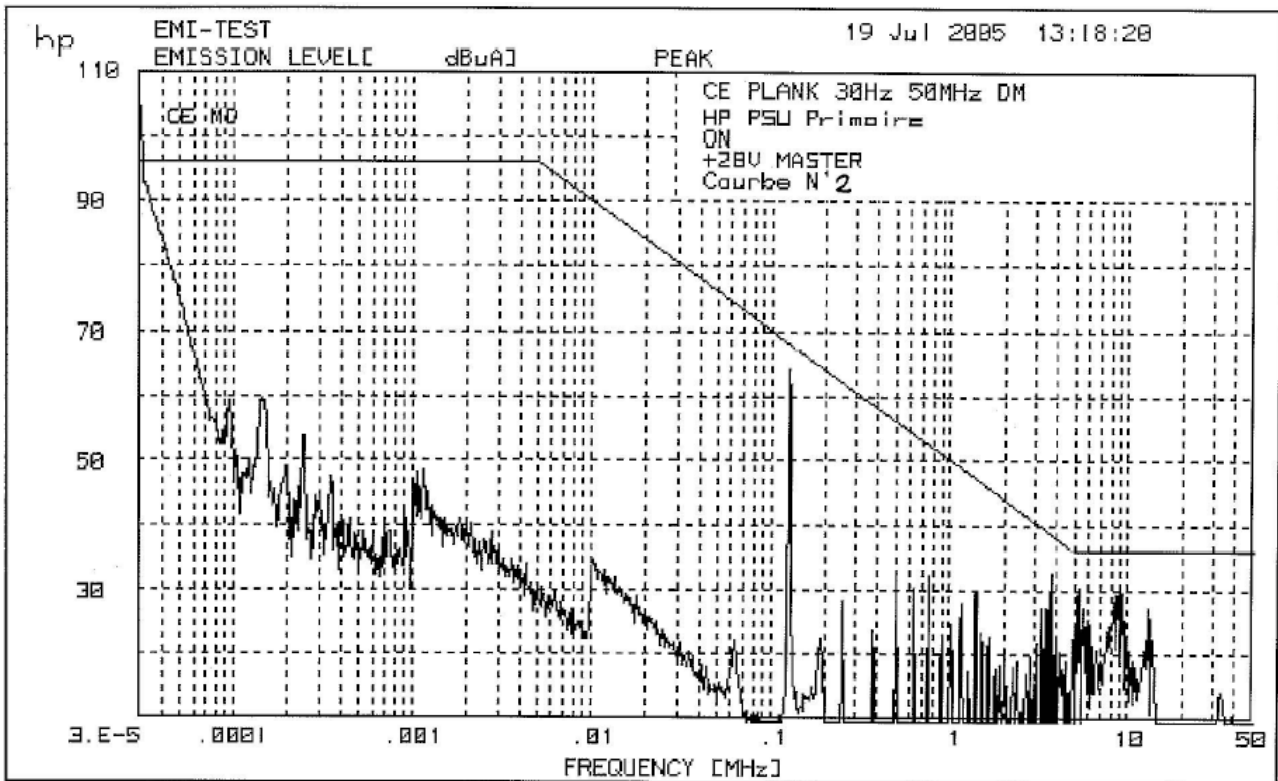
DATE : 15/10/2007

ISSUE : 1

PAGE : 31/48

3.7 PACS/BOLC

3.7.1 Current



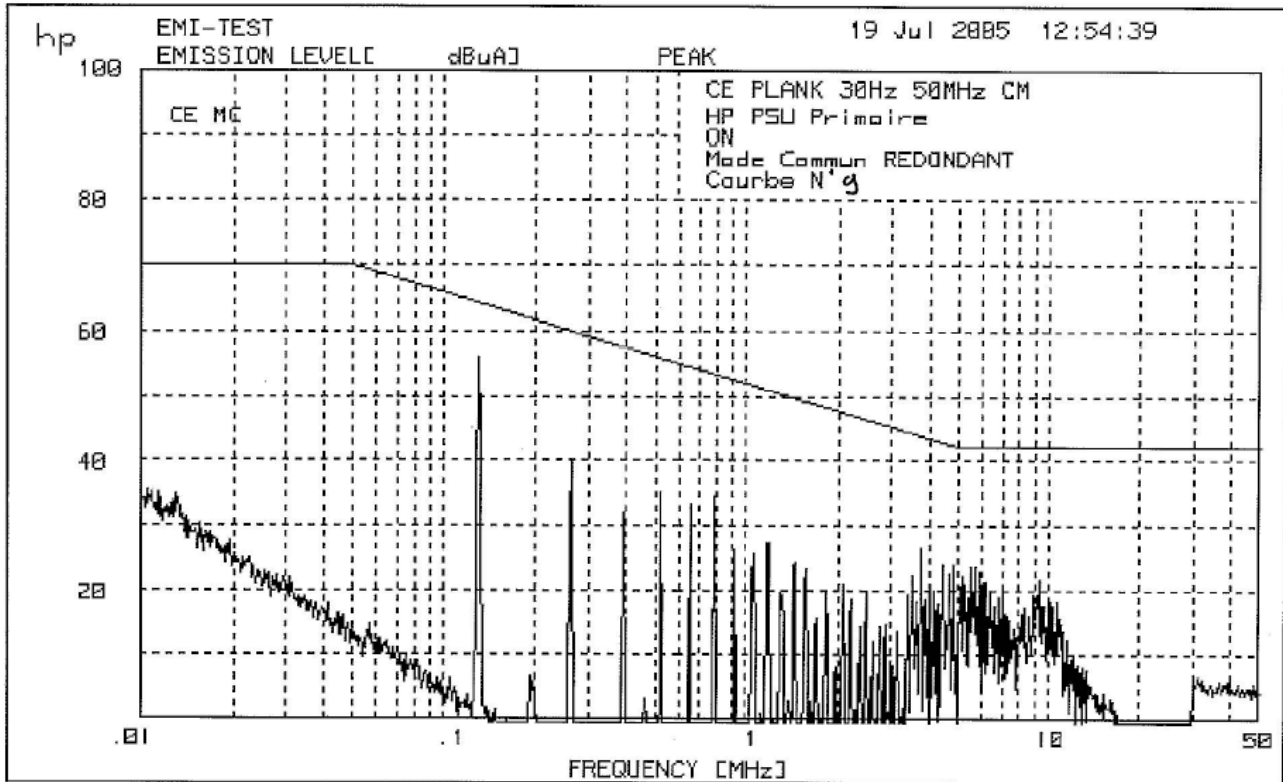
HERSCHEL FM EMC CE DATA COLLECTION

REFERENCE : H-P-2-ASP-TS-1406

DATE : 15/10/2007

ISSUE : 1

PAGE : 32/48



3.8 PACS/DECMEC

3.8.1 Current

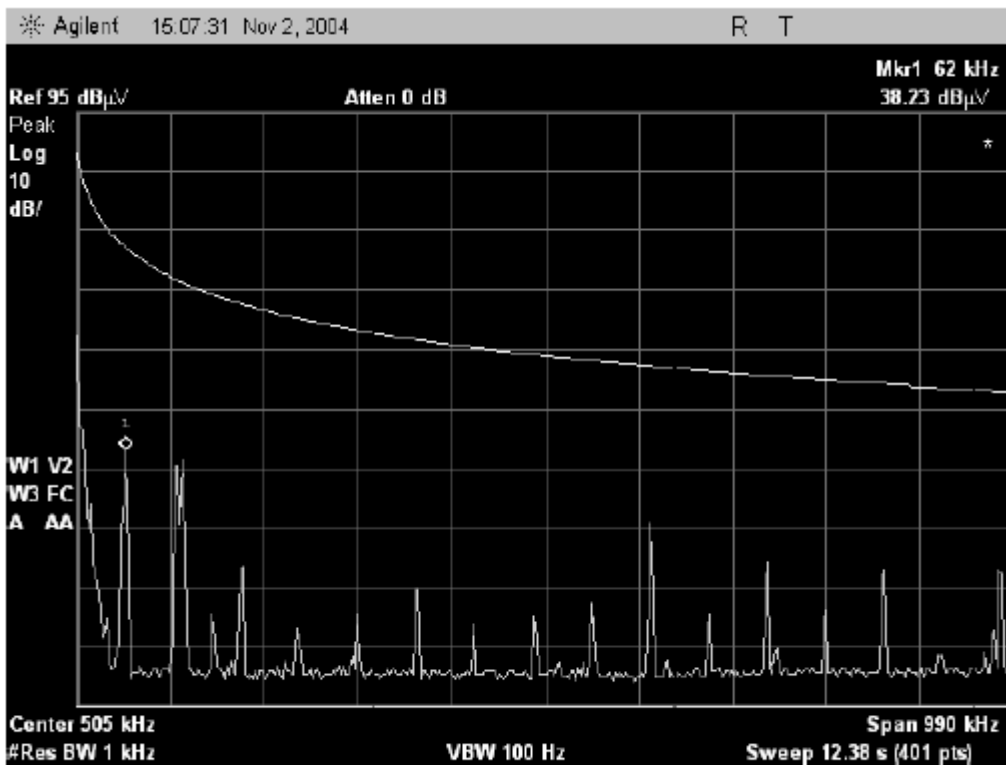


Figure 4-9: DECMEC DM PS 10 kHz – 1 MHz

Scale in dBuA rms

HERSCHEL FM EMC CE DATA COLLECTION

REFERENCE : H-P-2-ASP-TS-1406

DATE : 15/10/2007

ISSUE : 1

PAGE : 34/48

2-Nov-04
13:49:28

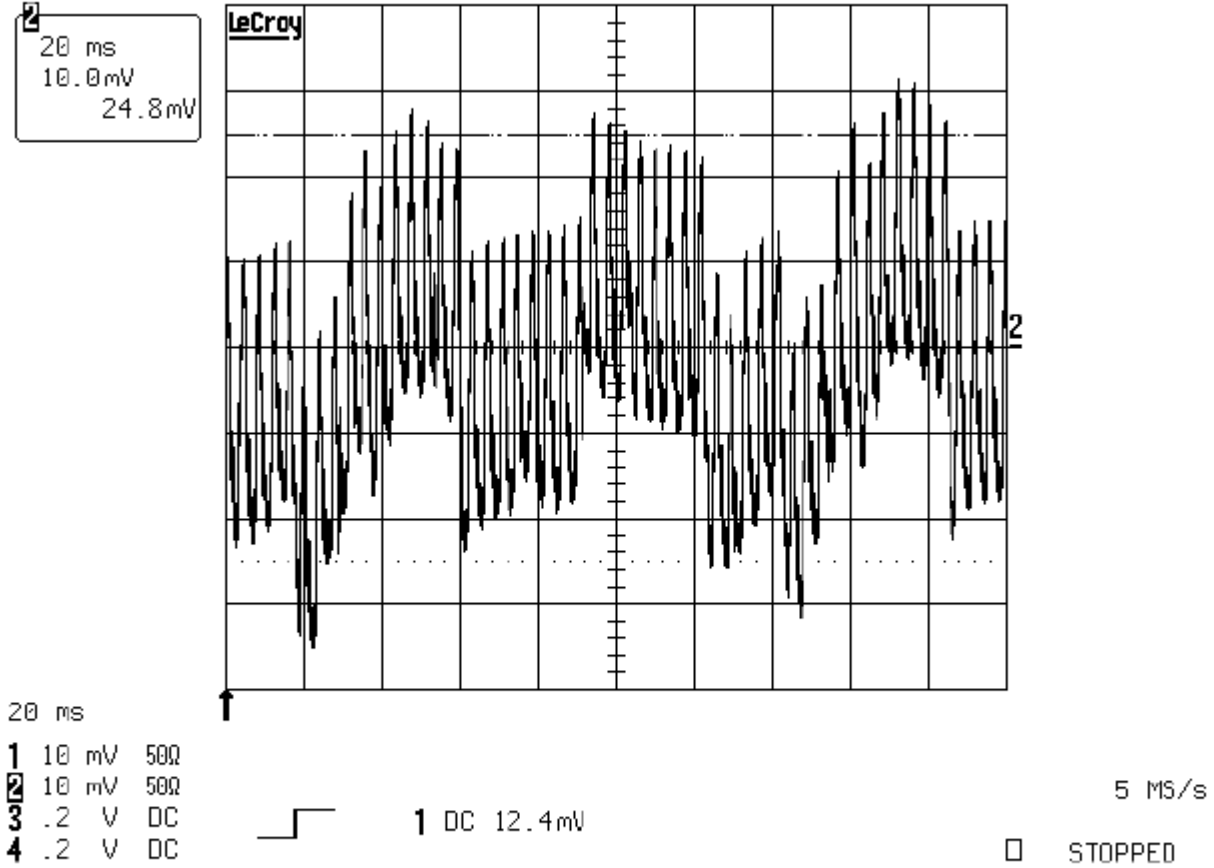
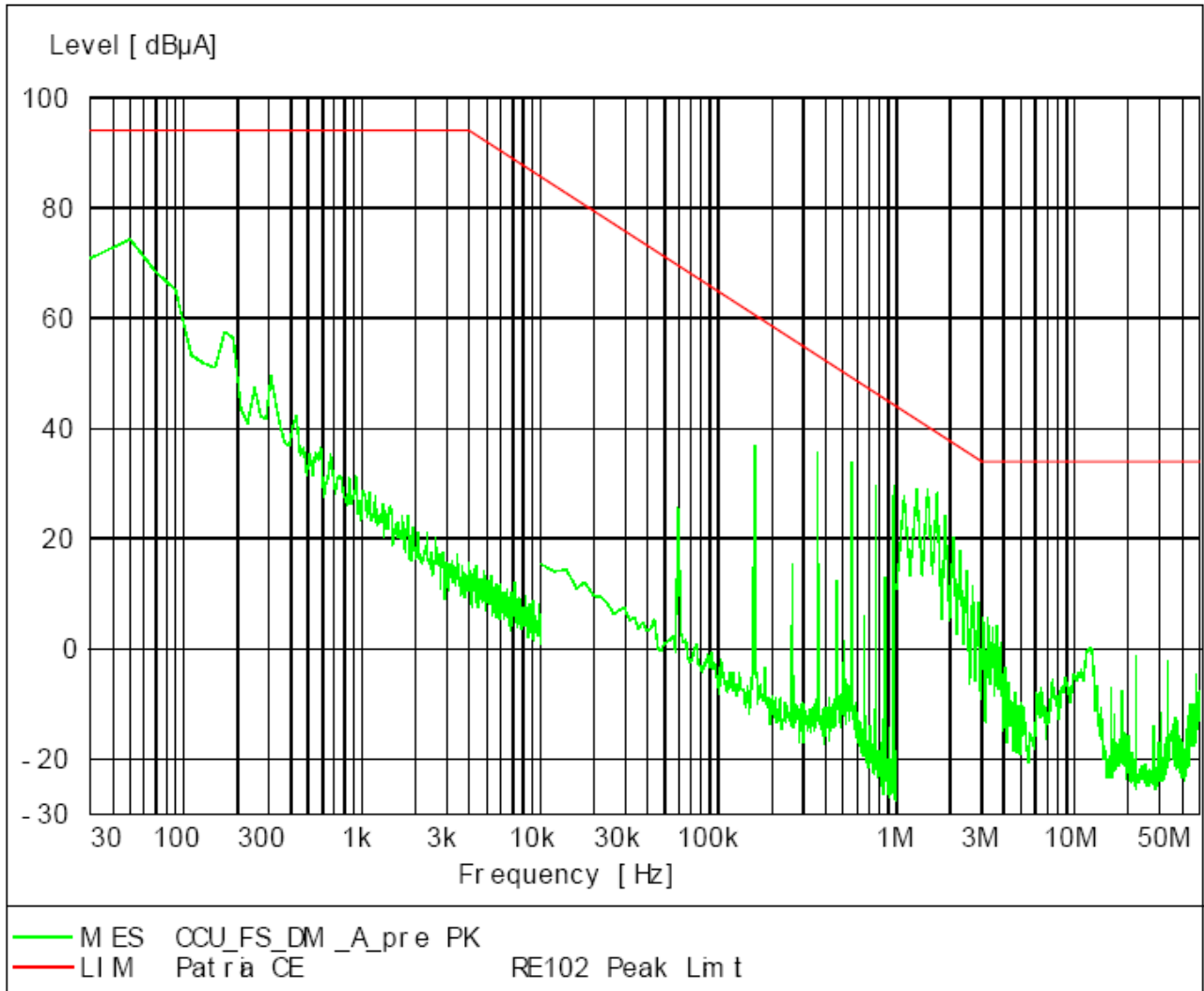


Figure 4-22: DECMEC DM current ripple in most noisy mode

Scale : 10 mA/div

3.9 CCU

3.9.1 Current



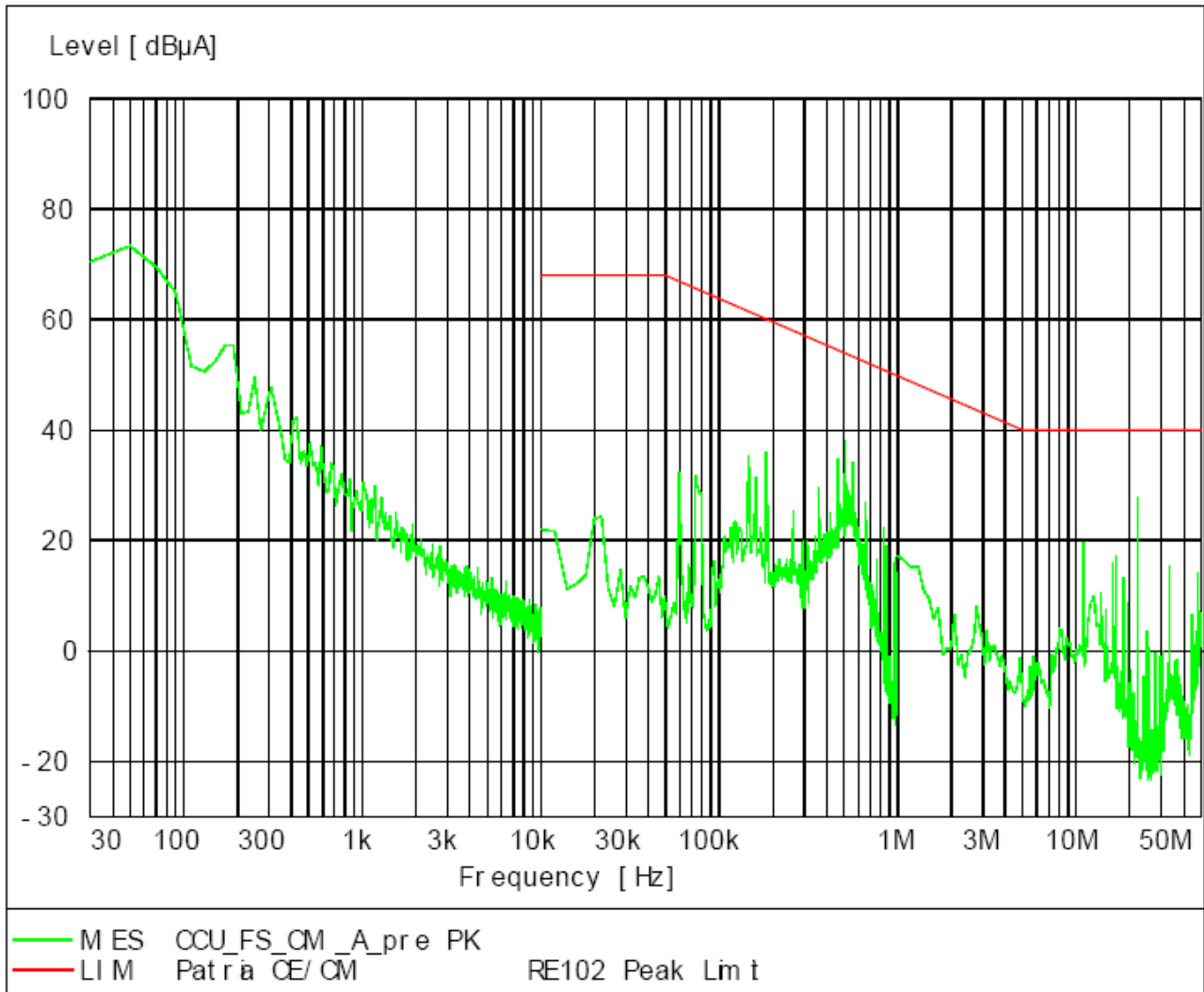
HERSCHEL FM EMC CE DATA COLLECTION

REFERENCE : H-P-2-ASP-TS-1406

DATE : 15/10/2007

ISSUE : 1

PAGE : 36/48



3.9.2 Voltage

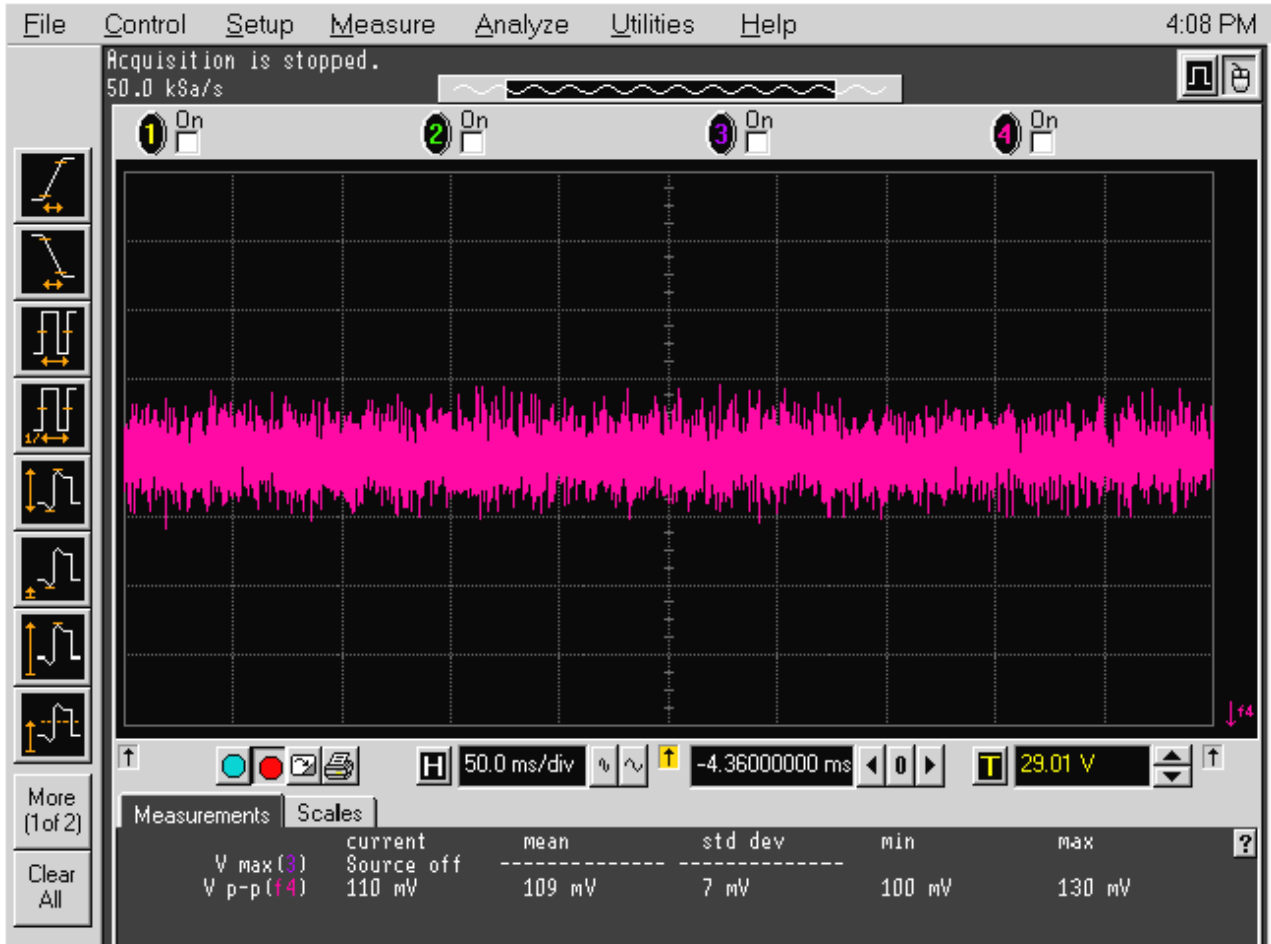


Figure 5-10. BB Voltage, CCU A, Ripple

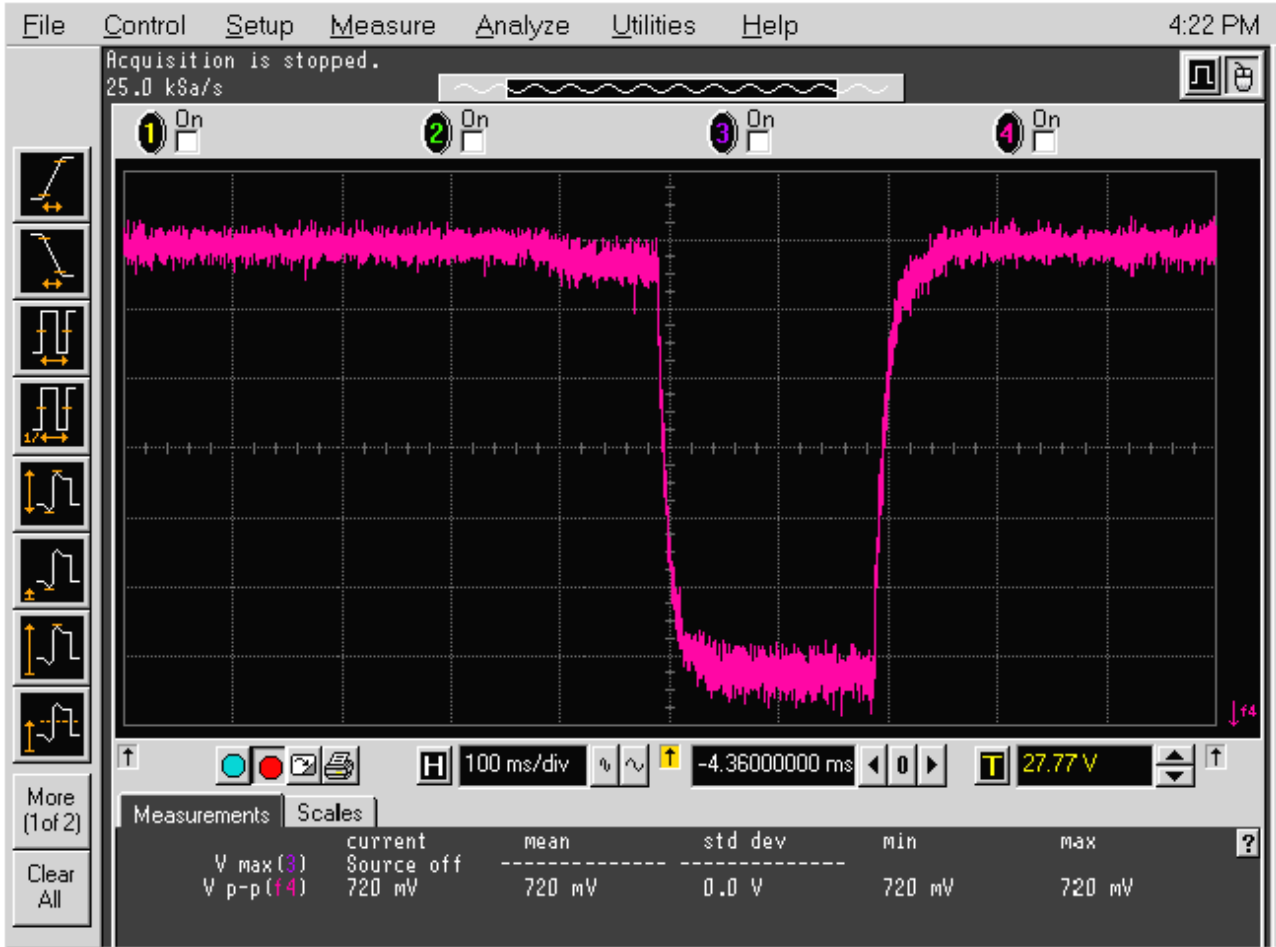
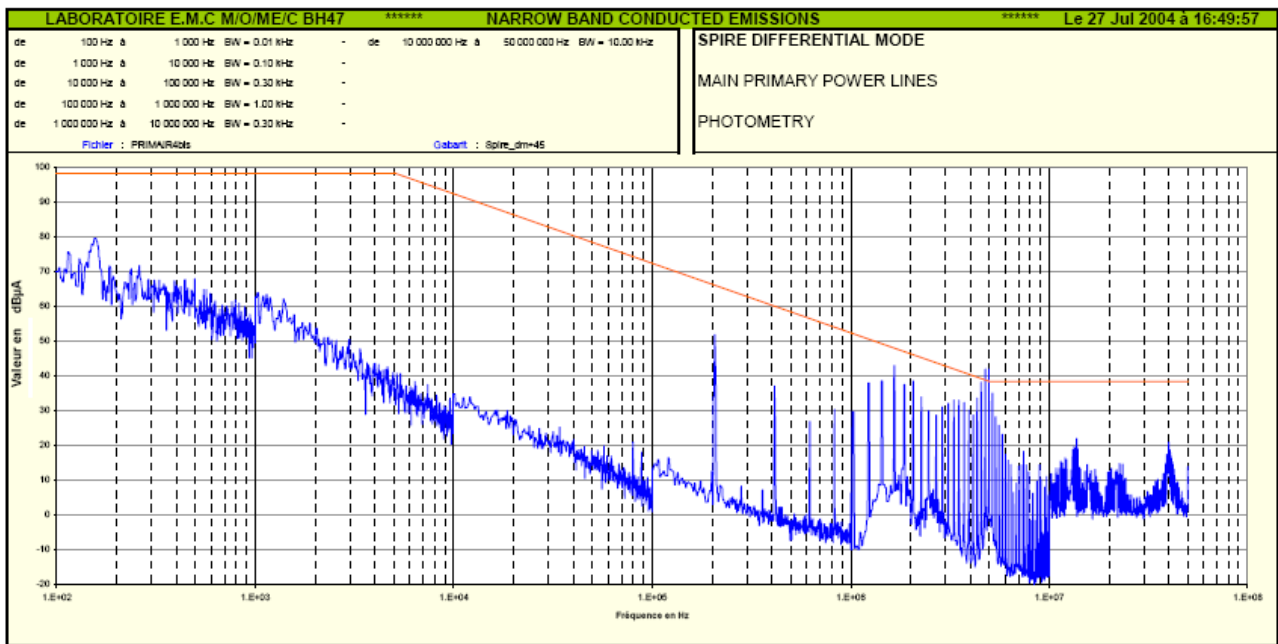


Figure 5-11. BB Voltage, CCU A, Spike

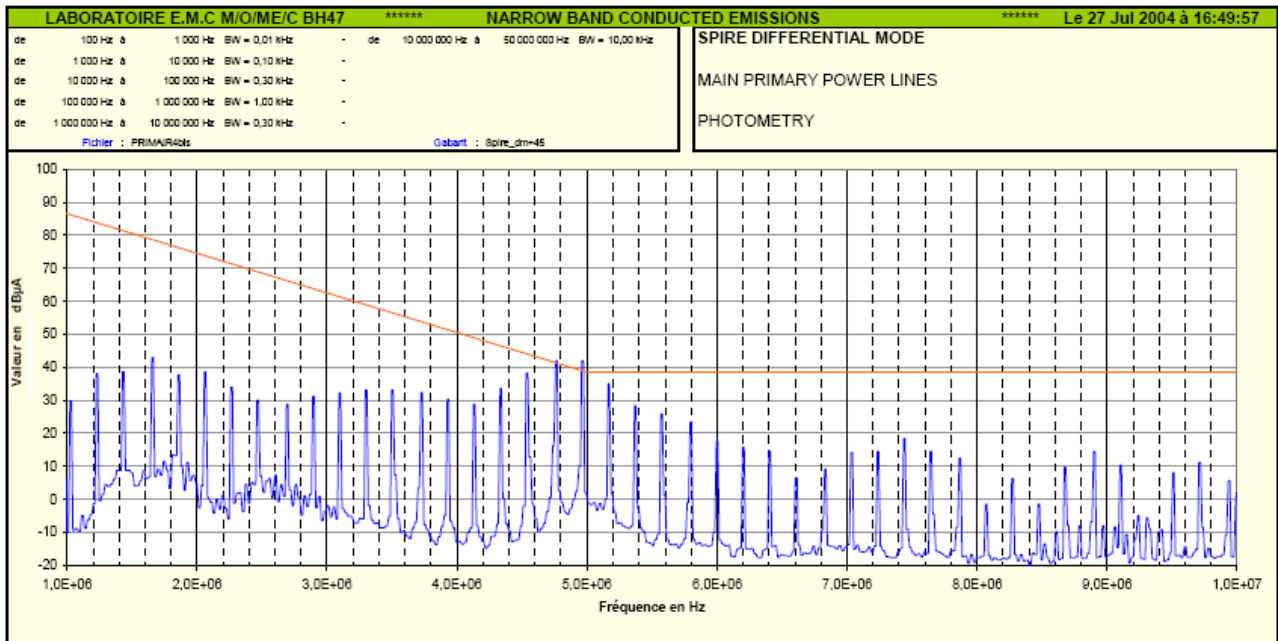
3.10 SPIRE/HSFCU

3.10.1 Current

CURVE 5.1-1 : DIFFERENTIAL MODE – MAIN – PHOTOMETRY



CURVE 5.1-2 : ZOOM OF THE CURVE BEFORE



HERSCHEL FM EMC CE DATA COLLECTION

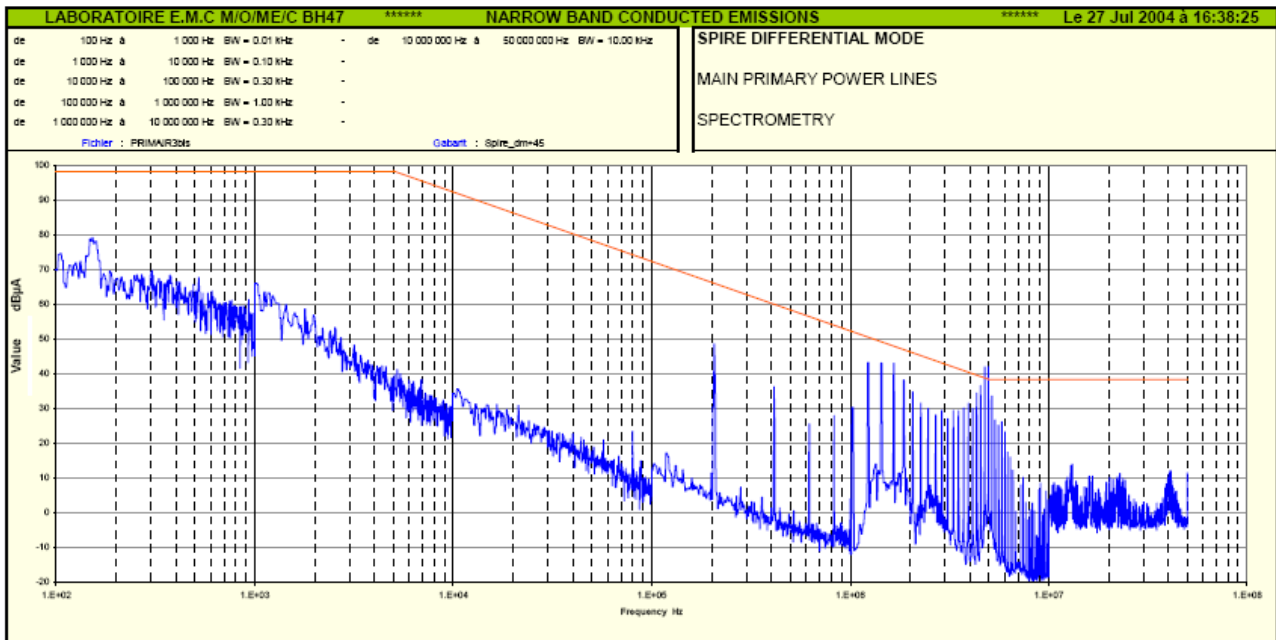
REFERENCE : H-P-2-ASP-TS-1406

DATE : 15/10/2007

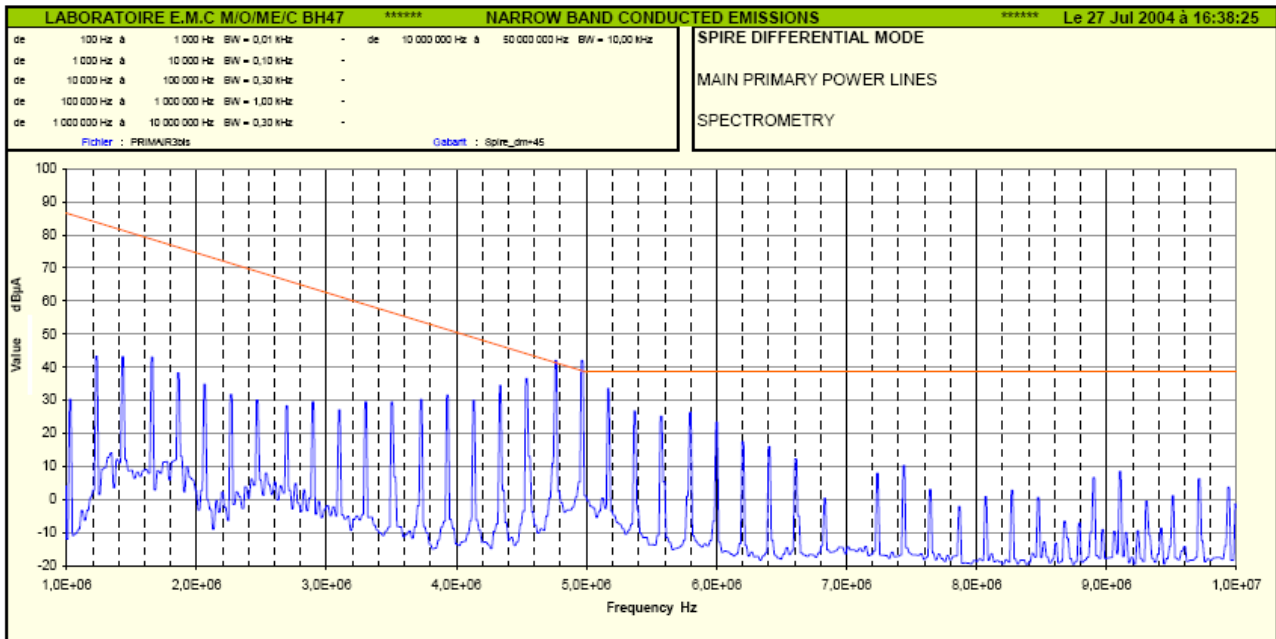
ISSUE : 1

PAGE : 40/48

CURVE 5.1-3 : DIFFERENTIAL MODE – MAIN – SPECTROMETRY



CURVE 5.1-4 : ZOOM OF THE CURVE BEFORE



HERSCHEL FM EMC CE DATA COLLECTION

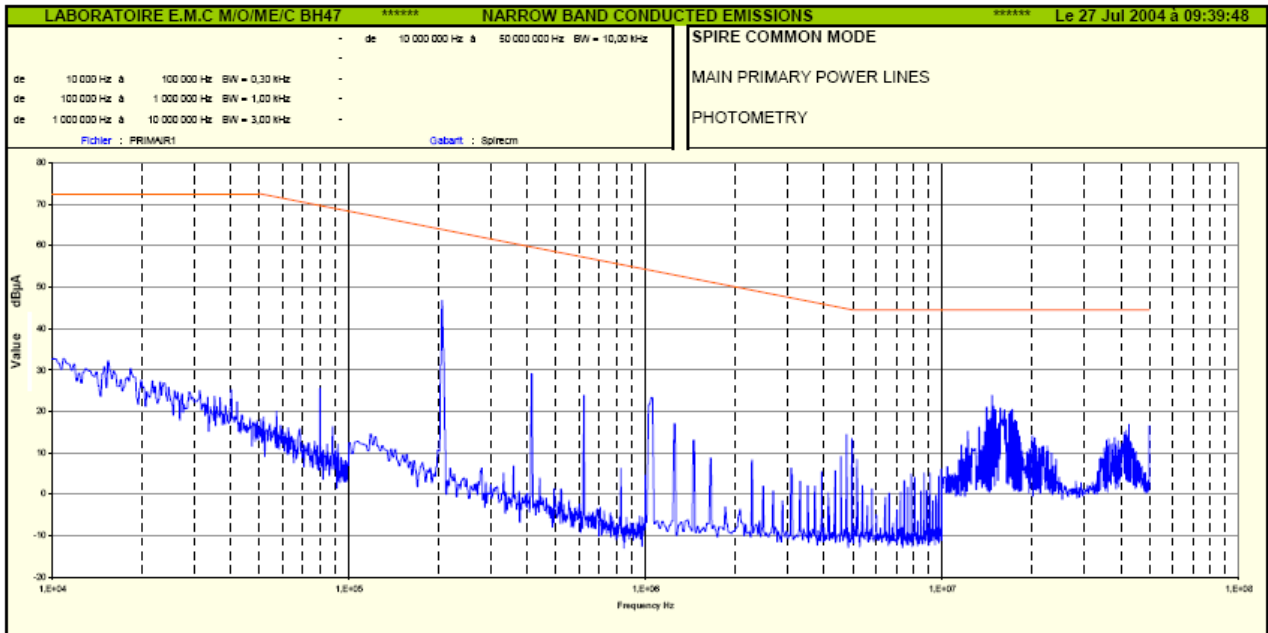
REFERENCE : H-P-2-ASP-TS-1406

DATE : 15/10/2007

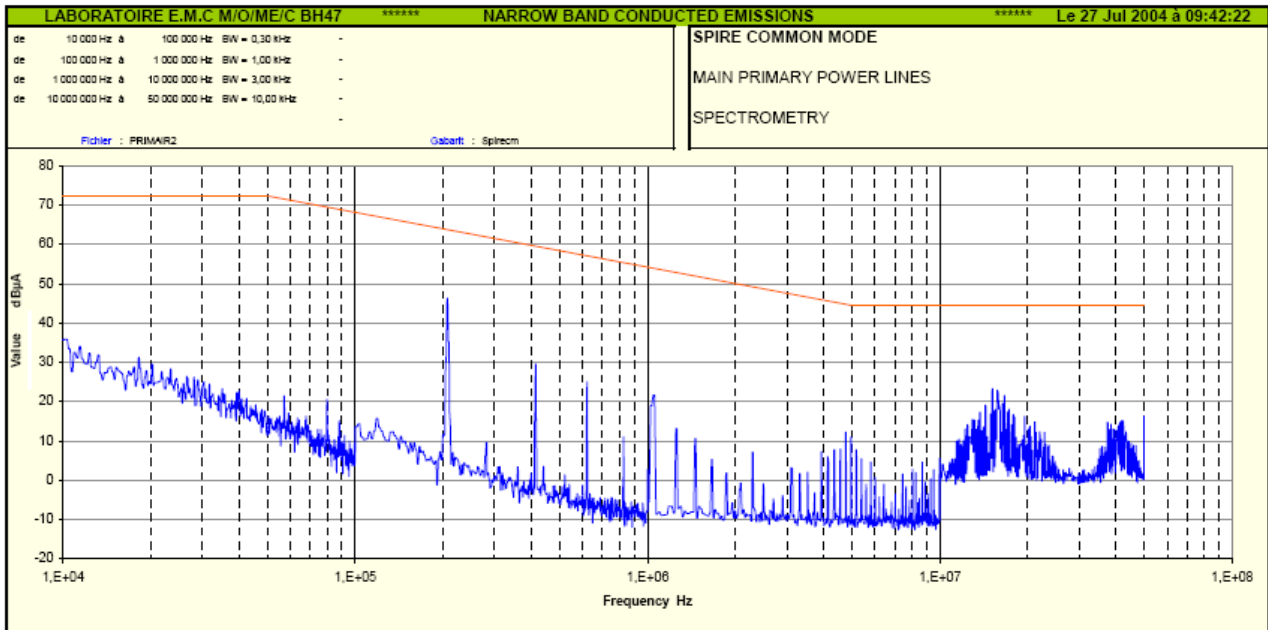
ISSUE : 1

PAGE : 41/48

CURVE 5.1-7 : COMMON MODE – MAIN – PHOTOMETRY



CURVE 5.1-8 : COMMON MODE – MAIN – SPECTROMETRY



3.11 HIFI/DPU-ICU

3.11.1 Current

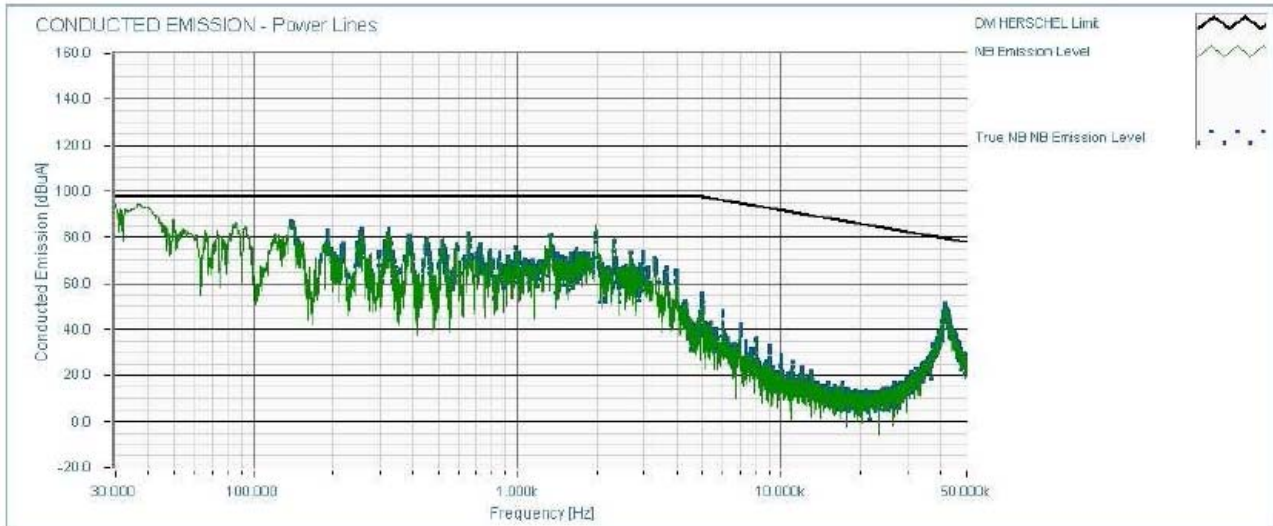


Figure 1-3: Conducted Emission on Input Power Line @ 28V – Differential Mode 30Hz ÷ 50kHz

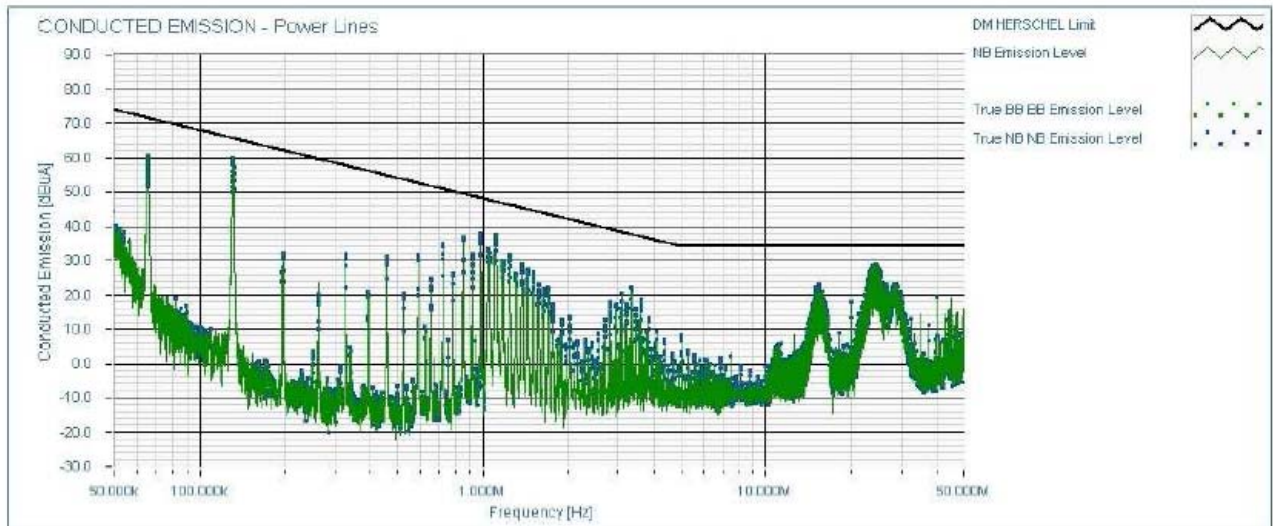


Figure 1-4: Conducted Emission on Input Power Line @ 28V – Differential Mode 50kHz ÷ 50MHz

HERSCHEL FM EMC CE DATA COLLECTION

REFERENCE : H-P-2-ASP-TS-1406

DATE : 15/10/2007

ISSUE : 1

PAGE : 43/48

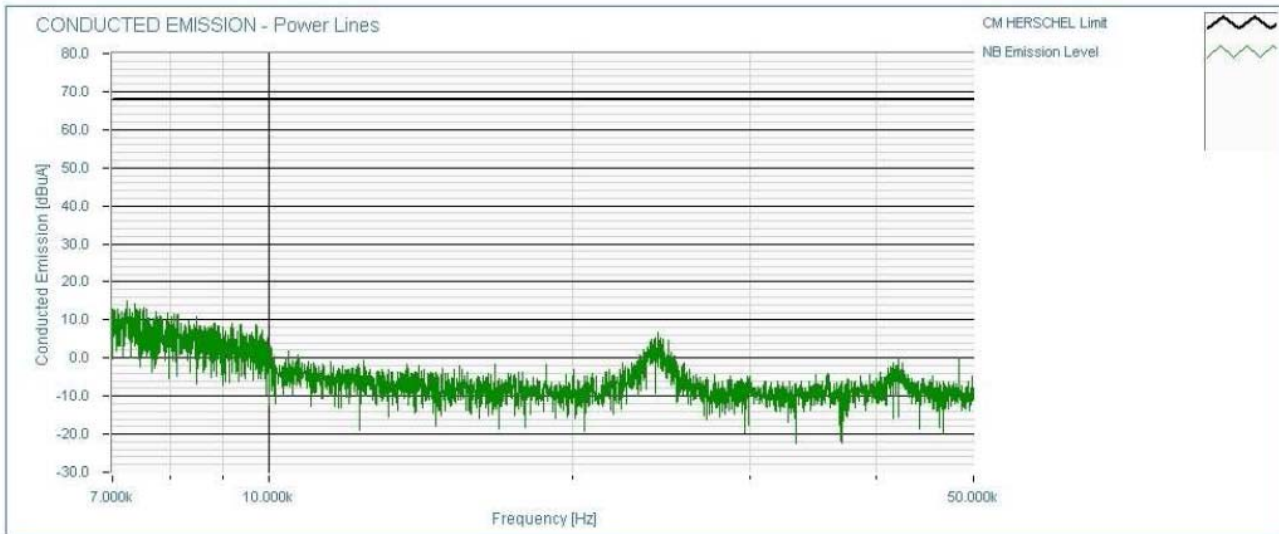


Figure 1-11: Conducted Emission on Input Power Line @ 28V – Common Mode 10kHz + 50kHz

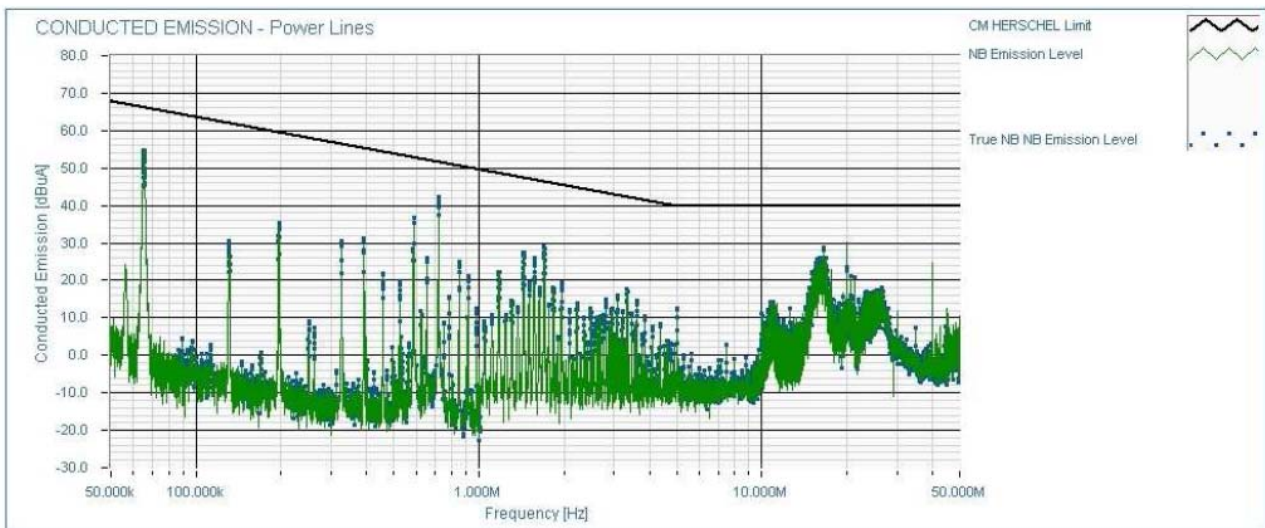


Figure 1-12: Conducted Emission on Input Power Line @ 28V – Common Mode 50kHz + 50MHz

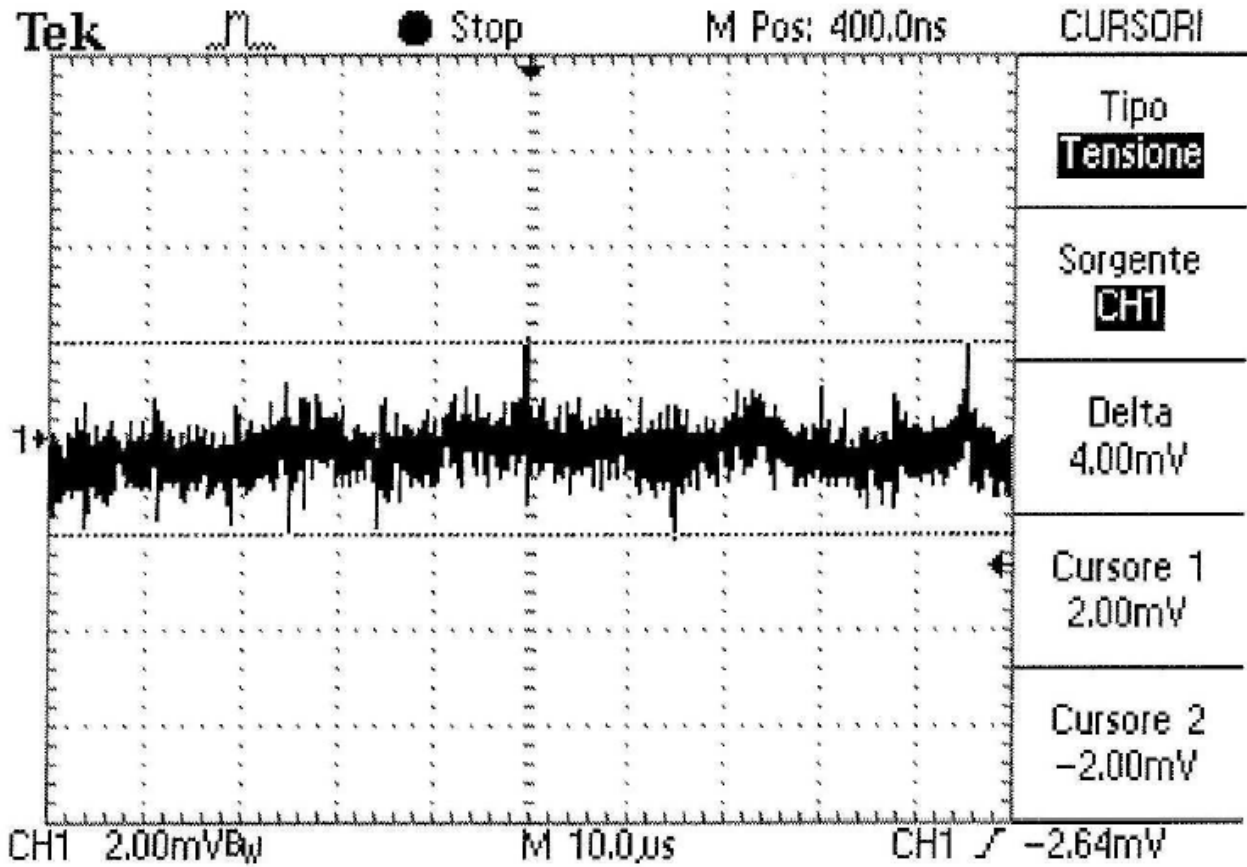


Figure 1-14: Current Spike on Input Power Line

Scale : 20 mA/div

HERSCHEL FM EMC CE DATA COLLECTION

REFERENCE : H-P-2-ASP-TS-1406

DATE : 15/10/2007

ISSUE : 1

PAGE : 45/48

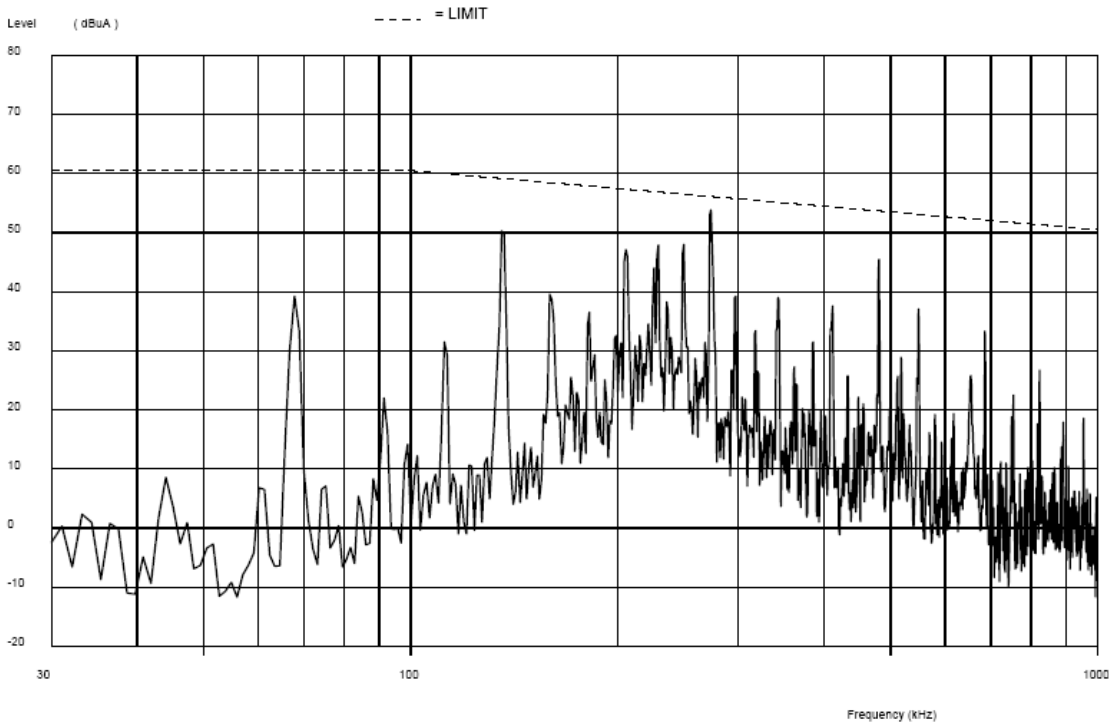
3.12 HIFI/LCU

3.12.1 Current

EUT :FHLCU
Testpoint :J05
Oper.Mode :Main normal
Meas.Nr. :65
Engineer :Heutink

Standard :USER defined
Class :LCU DM
Method :CE DM
Limit :CE CM LCU

Tmsd : tp1
Preamp : a1
CableA : k16
CableB : k1kv3k21



HERSCHEL FM EMC CE DATA COLLECTION

REFERENCE : H-P-2-ASP-TS-1406

DATE : 15/10/2007

ISSUE : 1

PAGE : 46/48

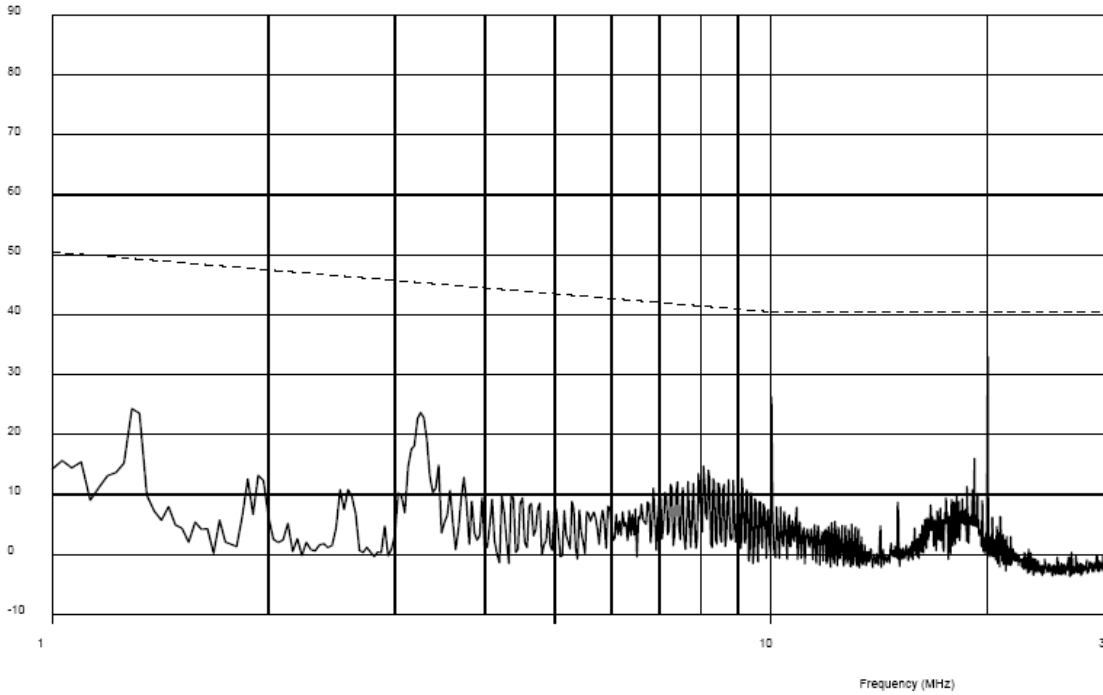
EUT : :FHLCU
Testpoint : :J05
Oper.Mode : :Main normal
Meas.Nr. : :66
Engineer : :Heutink

Standard : :USER defined
Class : :LCU DM
Method : :CE DM
Limit : :CE CM LCU

Trmsd : :tp1
Preamp : :a1
CableA : :k16
CableB : :k1kv3k2

Level (dBuA)

----- = LIMIT



Date : :15-3-2007
Time : :18:24:51
Order : :14973221

S.A. SETTINGS:

Rohde & Schwarz ESMI
EMI scanner
Res.bw.: 10.000 kHz
Vid.bw.: 10.000 kHz
Swptime: 44 Sec
Rf Att.: 10 dB
Ref.lvl: -10.0 dBm
Start : 1.000 MHz
Stop : 30.000 MHz

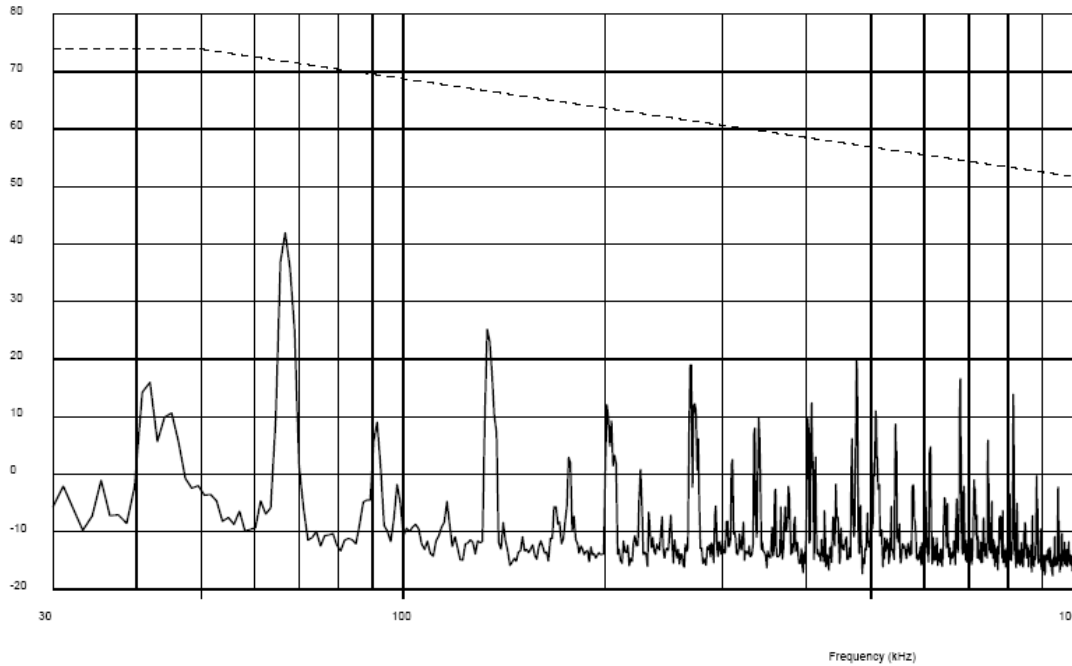
EUT : :FHLCU
Testpoint : :Power CM
Oper.Mode : :Redundant normal
Meas.Nr. : :62
Engineer : :Heutink

Standard : :USER defined
Class : :LCU CM
Method : :CE CM
Limit : :CE CM LCU

Trmsd : :tp1
Preamp : :a1
CableA : :k16
CableB : :k1kv3k21

Level (dBuA)

----- = LIMIT



Date : :8-3-2007
Time : :9:37:17
Order : :14973001

S.A. SETTINGS:

Rohde & Schwarz ESMI
EMI scanner
Res.bw.: 1.000 kHz
Vid.bw.: 1.000 kHz
Swptime: 15 Sec
Rf Att.: 10 dB
Ref.lvl: -10.0 dBm
Start : 30.000 kHz
Stop : 1.000 MHz

HERSCHEL FM EMC CE DATA COLLECTION

REFERENCE : H-P-2-ASP-TS-1406

DATE : 15/10/2007

ISSUE : 1

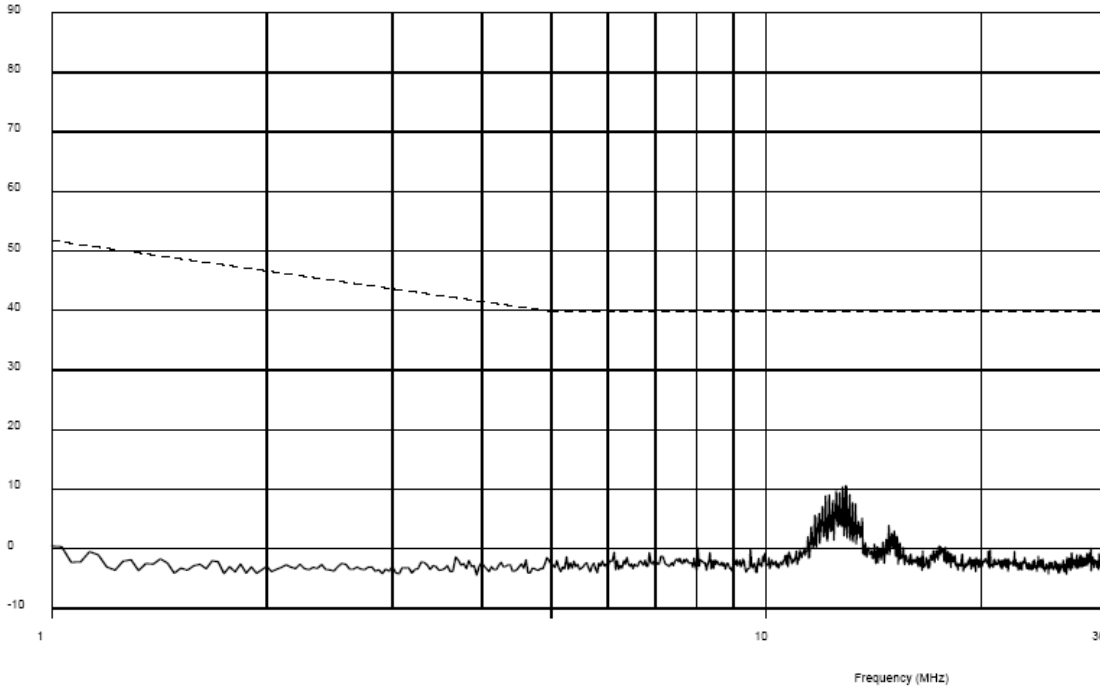
PAGE : 47/48

EUT : FHLCU
 Testpoint : Power CM
 Oper.Mode : Redundant normal
 Meas.Nr. : 63
 Engineer : Heutink

Standard : USER defined
 Class : LCU CM
 Method : CE CM
 Limit : CE CM LCU

Trnsd : tp1
 Preamp: a1
 CableA: k16
 CableB: k1kv3k21

Level (dBuA) ----- = LIMIT



Date : 8-3-2007
 Time : 9:38:21
 Order : 14973001

S.A. SETTINGS:
 Rohde & Schwarz ESMI
 EMI scanner
 Res.bw.: 10.000 kHz
 Vid.bw.: 10.000 kHz
 Swptime: 44 Sec
 Rf Att.: 10 dB
 Ref.Nr.: -10.0 dBm
 Start : 1.000 MHz
 Stop : 30.000 MHz

HERSCHEL FM EMC CE DATA COLLECTION

REFERENCE : H-P-2-ASP-TS-1406

DATE : 15/10/2007

ISSUE : 1 **PAGE :** 48/48

End of Document