HERSCHEL/SPIRE

DETECTOR CONTROL UNIT
LIA_P
TEST PLAN

LIA_P BOARD Number:1

	Function	Name	Date	Visa
Prepared by		**PINSARD**	**20/7/2001**	
Verified by				
Approved by				

DOCUMENT STATUS and CHANGE RECORD

Date	Issue	Affected pages
9/3/2001	0.-	Creation

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PICTURES

1 INTRODUCTION

1.1 PURPOSE

The purpose of this document is to detail the tests that have been performed on the LIA_P boards. This document follows a specific order: first the success criteria are given, followed by the testing parameters and finally whether the test was successful or not.

1.2 SCOPE

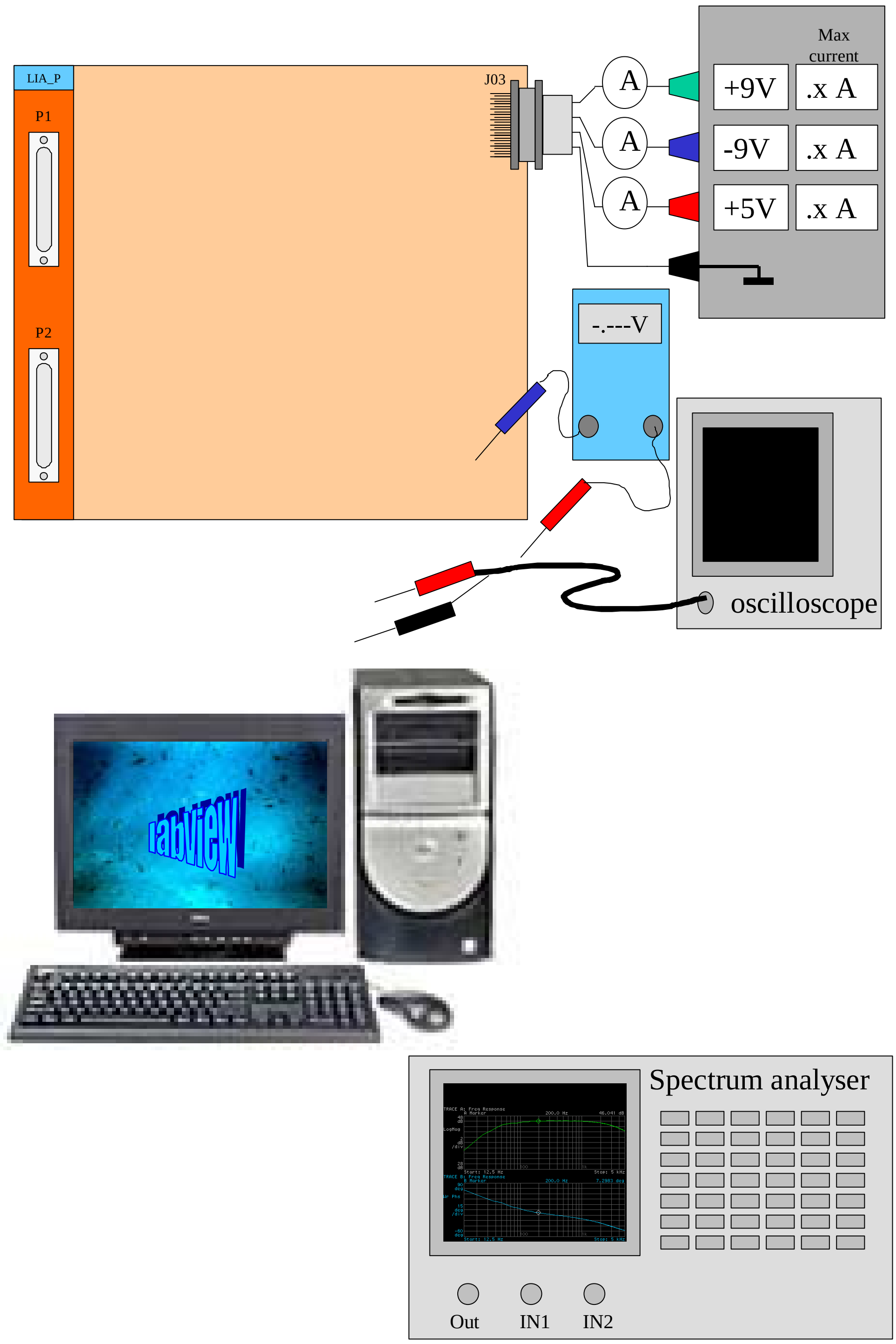
1.3 APPLICABLE DOCUMENTS

1.4 REFERENCE DOCUMENTS

- DETECTOR SUBSYSTEM SPECIFICATION DOCUMENT	: FIST-SPI-PRJ-000103
- DRCU SUBSYSTEM SPECIFICATION DOCUMENT	: SAp-SPIRE-CCa-25-00

2 GENERAL DESCRIPTION

2.1 OVERVIEW



Picture 2-1: overview

3 TEST EQUIPEMENT

- DUAL OUTPUT DC POWER SUPPLY	HP E3620A 0-25V 0-1A
- DIGITAL OSCILLOSCOPE	TEKTRONIX 2230
- MULTIMETER	WAVETEK
-2-CHANNEL NETWORK SIGNAL ANALYZER	SRS SR780

4 DCU QM1 ELECTRICAL TESTS

4.1 LIA_P test

4.1.1 Visual test

Test number	Test	Test check Date	Check Result	Corrections	Test Status OK/NOK
LIA_P 1	Check that no components are missing and that all the components are in the right position.		Missing R26 and R55 Implantation error R1016=100 ohm instead of 15k R1211 (1%) 0505 instead of 0603 (0.01%) R1236 incorrect position so there was a short circuit R1436= 100 ohm instead of 15k R1532= 15k 0505 instead of 115 ohm 0603	Added a 51k for R26 Added a 1Ω for R55	OK
LIA_P 2	Check that there aren't any visible short circuits				OK

NON CONFORMANCE:

Error in the demodulation signals named DEMOD1, DEMOD2 and DEMOD3 instead of DEMOD_1, DEMOD_2 and DEMOD_3.

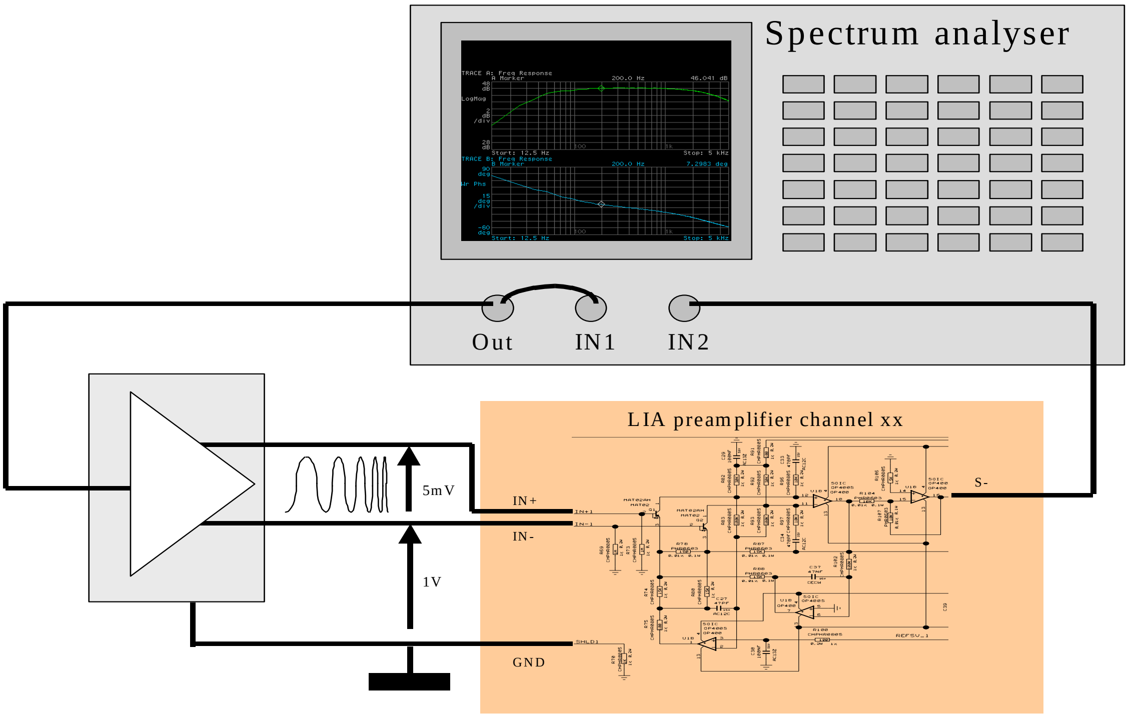
Correction:
Add connections between :
- U9 pin 3 and U303 pin 6
- U9 pin 5 and U1103 pin 6
- U9 pin 11 and U1503 pin 6

4.1.2 Tests with power supply

4.1.2.1 Test

Test number	Test	Test Date	Results	Corrections	Test Status OK/NOK
LIA_P 3	Switch on the power supply Check to see if there are any short circuits.	31/7/02	none		OK
LIA_P 4	Measure the current on +9V	31/7/02	113mA		OK
LIA_P 5	Measure the current on -9V	31/7/02	113mA		OK
LIA_P 6	Measure the current on +5V	31/7/02	16mA		OK

4.1.2.1.1 Preamplifier transfer function



This test is considered successful if on each channel there is:

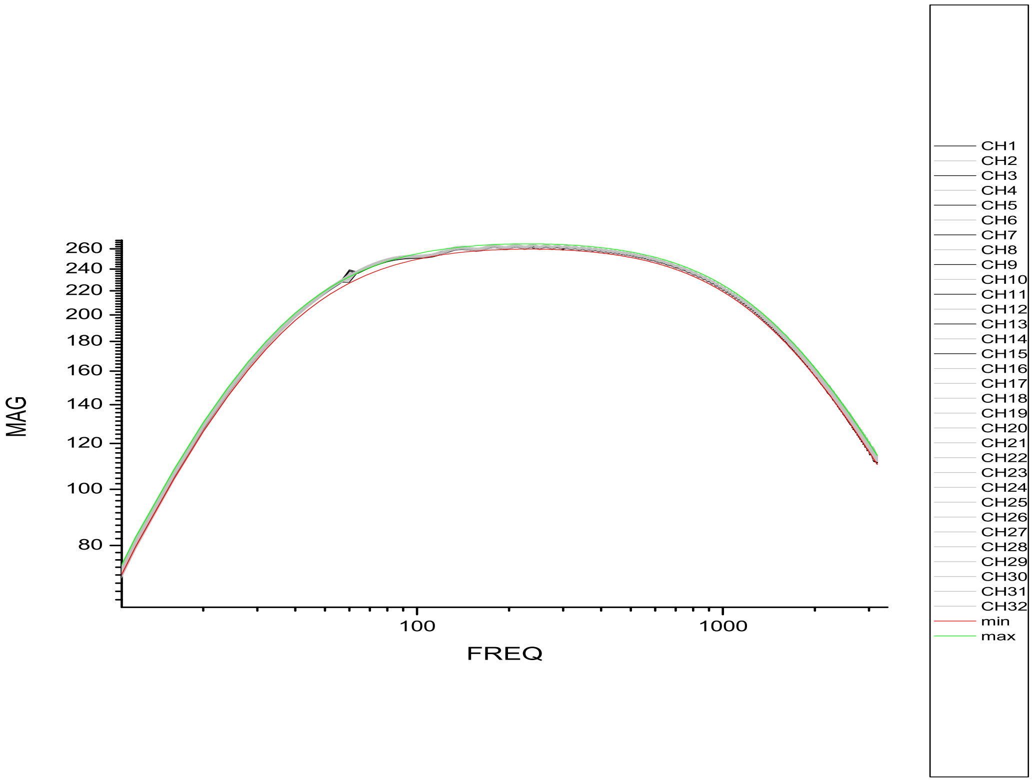
A maximum gain between:	260 and 265,5
A low cut off frequency between:	34,4 and 35,1Hz
A high cut off frequency between:	1453 and 1483 Hz

Measurement parameters:
BAND-PASS Filter Transfer Function
4 – 3200 Hz sine sweep, 10 mV amplitude at the input of the BPF
window: uniform, average: VecAvg*2

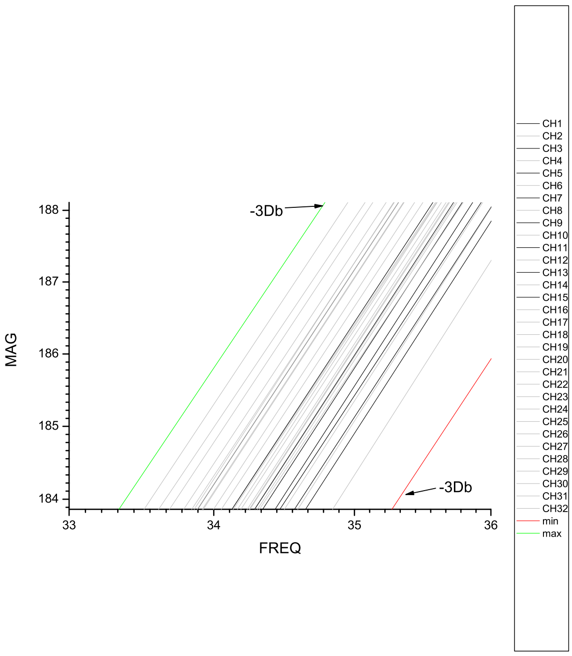
Test number	Test	Test Date	Results	Corrections	Test Status OK/NOK
LIA_P 7	Measure the transfer function of the channel 1 preamplifier		See pictures below		OK
LIA_P 7	Measure the transfer function of the channel 2 preamplifier		See pictures below		OK
LIA_P 7	Measure the transfer function of the channel 3 preamplifier		See pictures below		OK
LIA_P 7	Measure the transfer function of the channel 4 preamplifier		See pictures below		OK
LIA_P 7	Measure the transfer function of the channel 5 preamplifier		See pictures below		OK
LIA_P 7	Measure the transfer function of the channel 6 preamplifier		See pictures below		OK
LIA_P 7	Measure the transfer function of the channel 7 preamplifier		See pictures below		OK
LIA_P 7	Measure the transfer function of the channel 8 preamplifier		See pictures below		OK
LIA_P 7	Measure the transfer function of the channel 9 preamplifier		See pictures below		OK
LIA_P 7	Measure the transfer function of the channel 10 preamplifier		See pictures below		OK
LIA_P 7	Measure the transfer function of the channel 11 preamplifier		See pictures below		OK
LIA_P 7	Measure the transfer function of the channel 12 preamplifier		See pictures below		OK
LIA_P 7	Measure the transfer function of the channel 13 preamplifier		See pictures below		OK
LIA_P 7	Measure the transfer function of the channel 14 preamplifier		See pictures below		OK
LIA_P 7	Measure the transfer function of the channel 15 preamplifier		See pictures below		OK
LIA_P 7	Measure the transfer function of the channel 16 preamplifier		See pictures below		OK

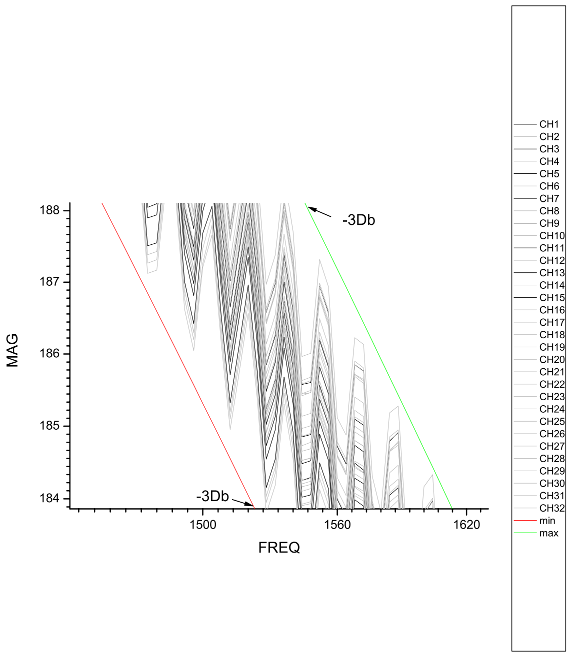
Test number	Test	Test Date	Results	Corrections	Test Status OK/NOK
LIA_P 7	Measure the transfer function of the channel 17 preamplifier		See pictures below		OK
LIA_P 7	Measure the transfer function of the channel 18 preamplifier		See pictures below		OK
LIA_P 7	Measure the transfer function of the channel 19 preamplifier		See pictures below		OK
LIA_P 7	Measure the transfer function of the channel 20 preamplifier		See pictures below		OK
LIA_P 7	Measure the transfer function of the channel 21 preamplifier		See pictures below		OK
LIA_P 7	Measure the transfer function of the channel 22 preamplifier		See pictures below		OK
LIA_P 7	Measure the transfer function of the channel 23 preamplifier		See pictures below		OK
LIA_P 7	Measure the transfer function of the channel 24 preamplifier		See pictures below		OK
LIA_P 7	Measure the transfer function of the channel 25 preamplifier		See pictures below		OK
LIA_P 7	Measure the transfer function of the channel 26 preamplifier		See pictures below		OK
LIA_P 7	Measure the transfer function of the channel 27 preamplifier		See pictures below		OK
LIA_P 7	Measure the transfer function of the channel 28 preamplifier		See pictures below		OK
LIA_P 7	Measure the transfer function of the channel 29 preamplifier		See pictures below		OK
LIA_P 7	Measure the transfer function of the channel 30 preamplifier		See pictures below		OK
LIA_P 7	Measure the transfer function of the channel 31 preamplifier		See pictures below		OK
LIA_P 7	Measure the transfer function of the channel 32 preamplifier		See pictures below		OK

The following graph shows all the BPF gains (V/V) according to the frequency as well as the theoretical templates:

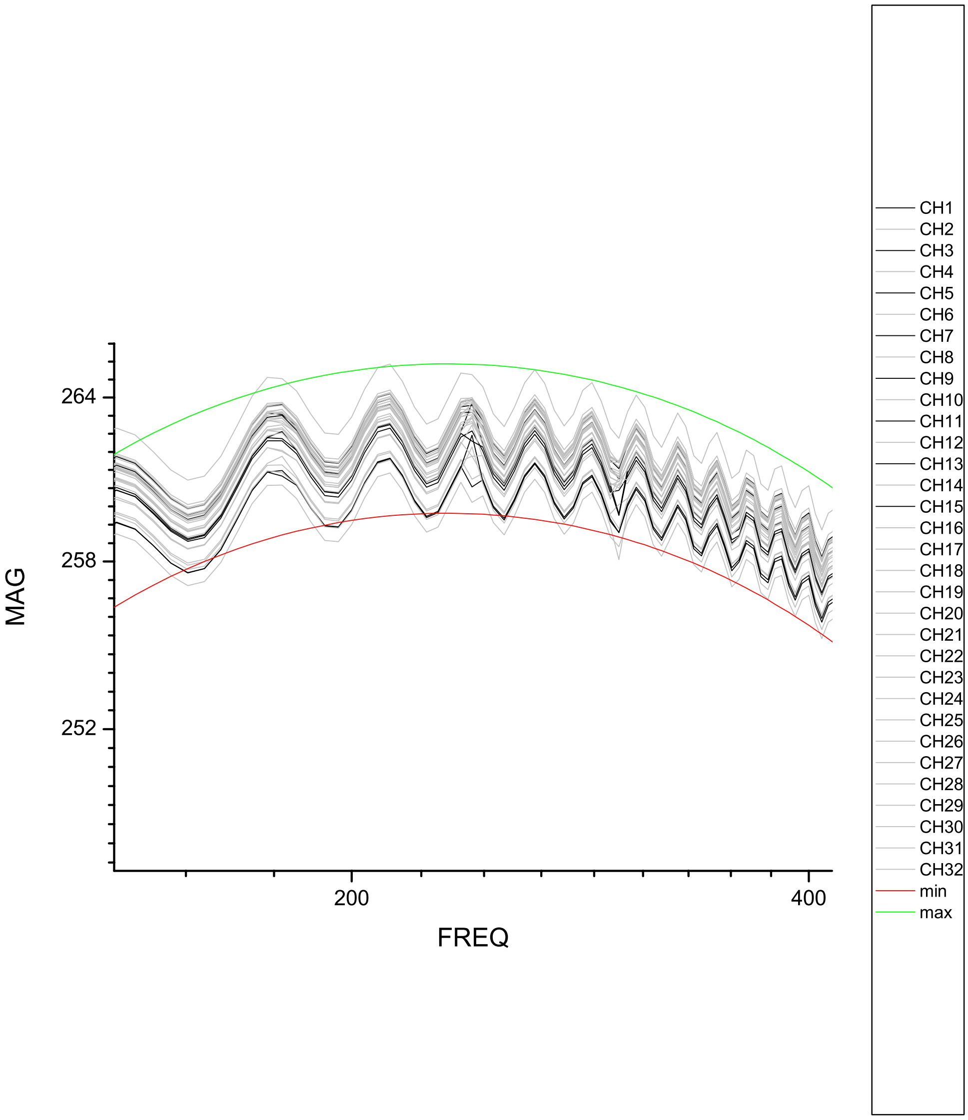


The following two graphs show close-ups of the cut-off frequencies:

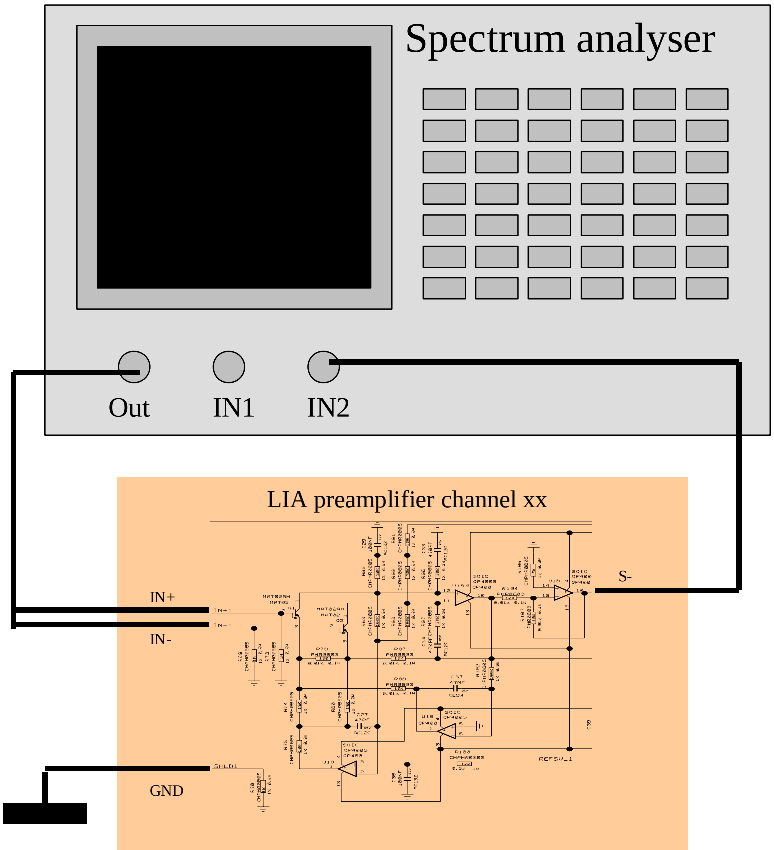




The following graph shows a close-up of the maximum gain zone:



4.1.2.1.2 Common-mode rejection



This test is considered successful if on each channel the CMR is less than **–60dB from 50 to 300 Hz**.

Note: To obtain a better rejection result, we need a better match between Rxx14 and Rxx16 (Rxx36 and Rxx38)

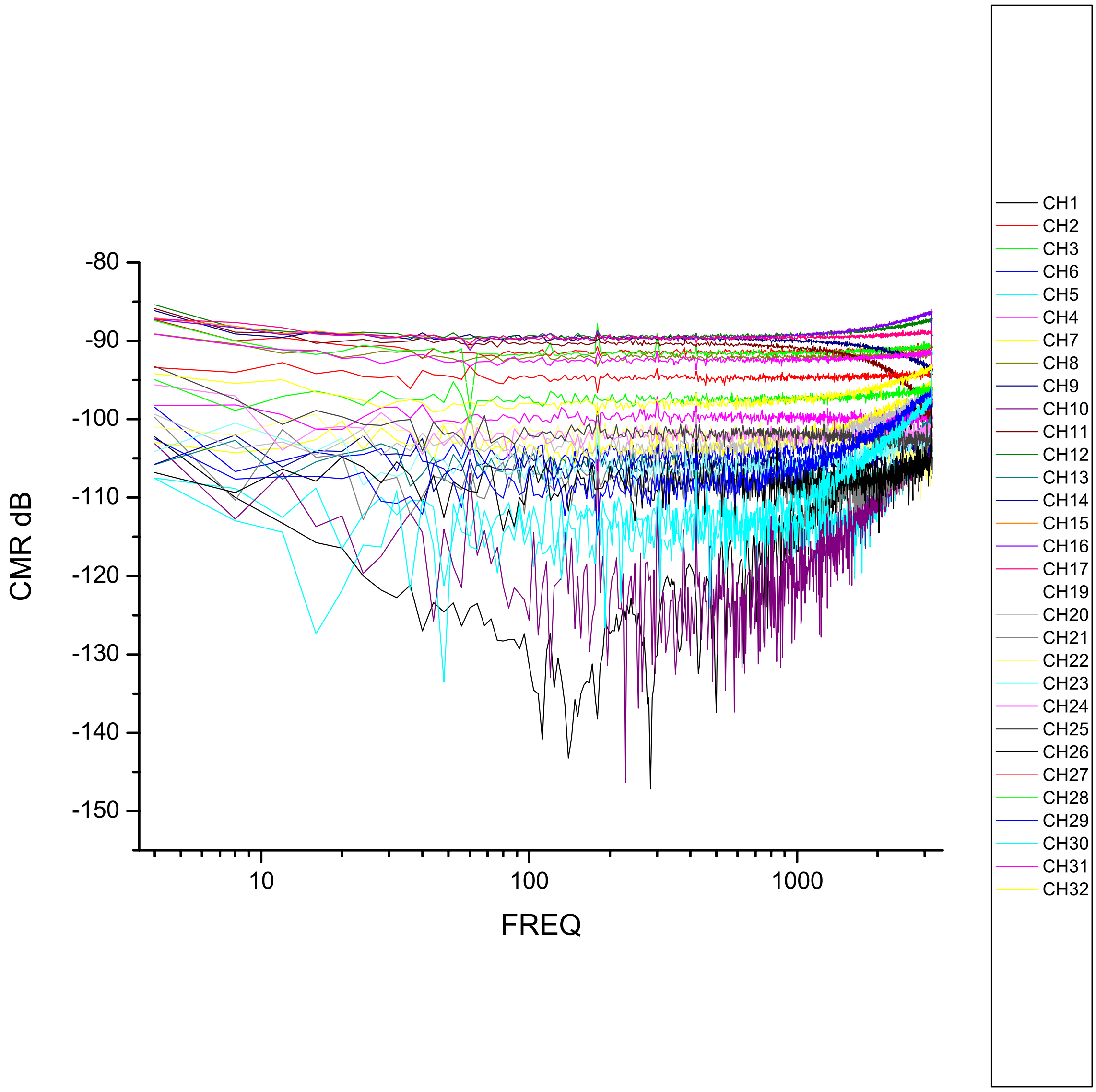
Measurement parameters:

4-3200 Hz sine sweep 100 mV between the inputs of the BPF and the gnd.
CH1 connected to source CH2 on output of the BPF
Measurement : <F2>/<F1> in dB, then minus BPF gain in dB.
Window = UNIFORM

Test number	Test	Test check Date	Check Result	Corrections	Test Status OK/NOK
LIA_P 8	Measure the CMR of the channel 1 preamplifier		See pictures below		OK
LIA_P 8	Measure the CMR of the channel 2 preamplifier		See pictures below		OK
LIA_P 8	Measure the CMR of the channel 3 preamplifier		See pictures below		OK
LIA_P 8	Measure the CMR of the channel 4 preamplifier		See pictures below		OK
LIA_P 8	Measure the CMR of the channel 5 preamplifier		See pictures below		OK
LIA_P 8	Measure the CMR of the channel 6 preamplifier		See pictures below		OK
LIA_P 8	Measure the CMR of the channel 7 preamplifier		See pictures below		OK
LIA_P 8	Measure the CMR of the channel 8 preamplifier		See pictures below		OK
LIA_P 8	Measure the CMR of the channel 9 preamplifier		See pictures below		OK
LIA_P 8	Measure the CMR of the channel 10 preamplifier		See pictures below		OK
LIA_P 8	Measure the CMR of the channel 11 preamplifier		See pictures below		OK
LIA_P 8	Measure the CMR of the channel 12 preamplifier		See pictures below		OK
LIA_P 8	Measure the CMR of the channel 13 preamplifier		See pictures below		OK
LIA_P 8	Measure the CMR of the channel 14 preamplifier		See pictures below		OK
LIA_P 8	Measure the CMR of the channel 15 preamplifier		See pictures below		OK
LIA_P 8	Measure the CMR of the channel 16 preamplifier		See pictures below		OK

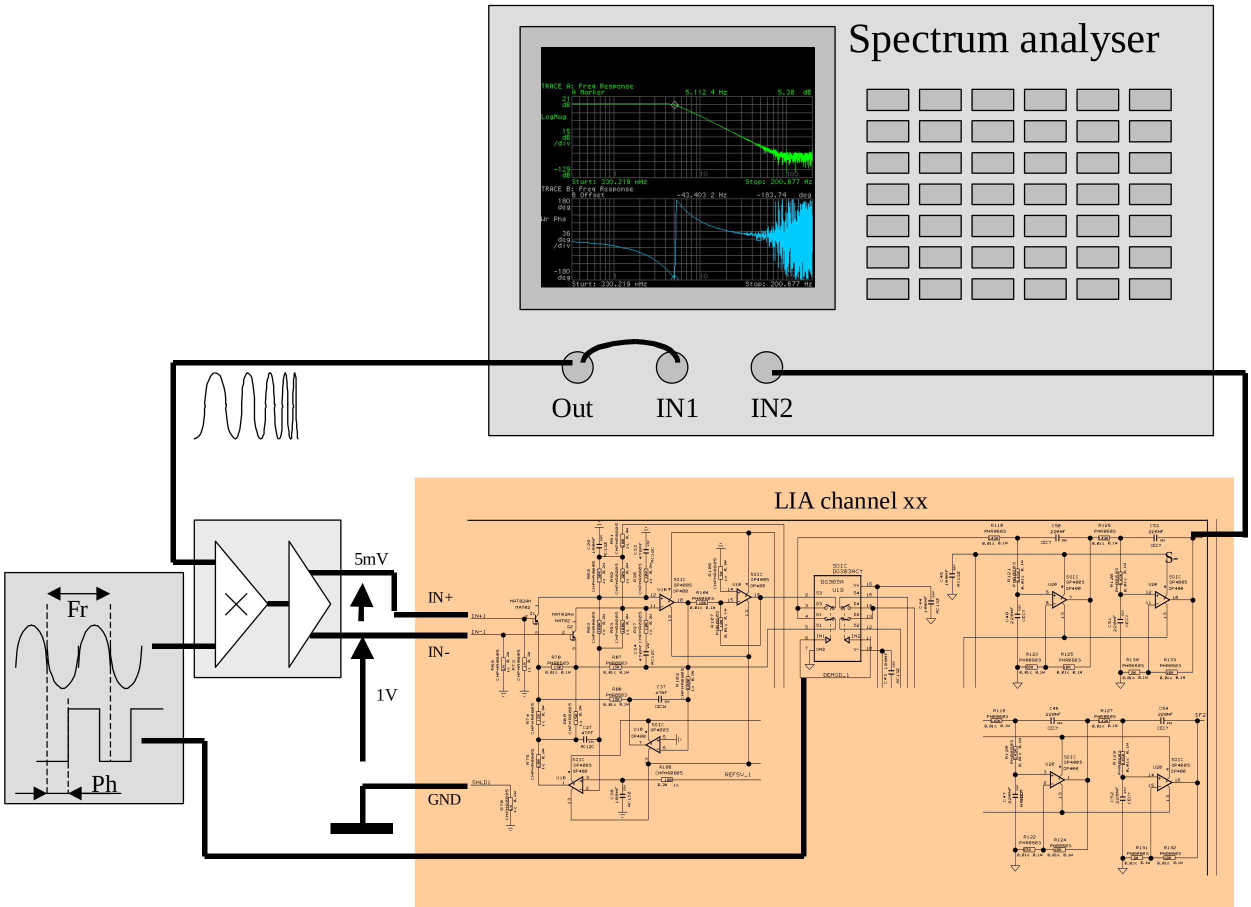
Test number	Test	Test check Date	Check Result	Corrections	Test Status OK/NOK
LIA_P 8	Measure the CMR of the channel 17 preamplifier		See pictures below		OK
LIA_P 8	Measure the CMR of the channel 18 preamplifier		See pictures below		OK
LIA_P 8	Measure the CMR of the channel 19 preamplifier		See pictures below		OK
LIA_P 8	Measure the CMR of the channel 20 preamplifier		See pictures below		OK
LIA_P 8	Measure the CMR of the channel 21 preamplifier		See pictures below		OK
LIA_P 8	Measure the CMR of the channel 22 preamplifier		See pictures below		OK
LIA_P 8	Measure the CMR of the channel 23 preamplifier		See pictures below		OK
LIA_P 8	Measure the CMR of the channel 24 preamplifier		See pictures below		OK
LIA_P 8	Measure the CMR of the channel 25 preamplifier		See pictures below		OK
LIA_P 8	Measure the CMR of the channel 26 preamplifier		See pictures below		OK
LIA_P 8	Measure the CMR of the channel 27 preamplifier		See pictures below		OK
LIA_P 8	Measure the CMR of the channel 28 preamplifier		See pictures below		OK
LIA_P 8	Measure the CMR of the channel 29 preamplifier		See pictures below		OK
LIA_P 8	Measure the CMR of the channel 30 preamplifier		See pictures below		OK
LIA_P 8	Measure the CMR of the channel 31 preamplifier		See pictures below		OK
LIA_P 8	Measure the CMR of the channel 32 preamplifier		See pictures below		OK

The following graph shows the wave of each channel's CMR:



The CMR dispersion between channels depends on the dispersion of the 15k resistors, which bias the MAT02.

4.1.2.1.3 LIA transfer function



1) The gain if a square modulation is used for the test:

$$Vin = Vrms \sum_{n=0}^{\infty} \frac{4}{(1+2n)\pi} \sin[(1+2n)\omega t]$$

After passing through the BPF there is the following signal:

$$V_{BPF} = Vrms \sum_{n=0}^{\infty} \frac{4}{(1+2n)\pi} \sin[(1+2n)\omega t] \bullet G_{BPF}[(1+2n)\omega]$$

After demodulation the DC value of the signal is:

$$V_{DEMODDc} = Vrms \frac{8}{(\pi)^2} \sum_{n=0}^{\infty} \frac{4}{(1+2n)} \bullet G_{BPF}[(1+2n)\omega]$$

So after the LPF, The gain max expression is :

$$G_{SQ}\max = \left(\frac{8}{(\pi)^2} \sum_{n=0}^{\infty} \frac{4}{(1+2n)} \bullet G_{BPF}[(1+2n)\omega] \right) \bullet 1.93$$

So This test is considered successful if on each channel:

-With a modulation frequency of 204Hz:

$$468 \le G_{SQ}\max \le 478$$

2) The gain if a sine modulation is used for the test:

$$Vin = Vrms\sqrt{2} \bullet \sin[\omega t]$$

After passing through the BPF there is the following signal:

$$V_{BPF} = Vrms\sqrt{2} \bullet \sin[\omega t] \bullet G_{BPF}[\omega]$$

After demodulation the DC value of the signal is

$$V_{DEMODDc} = Vrms\sqrt{2}\frac{2}{\pi} \bullet G_{BPF}[\omega]$$

So after the LPF, The gain max expression is :

$$G_{SINE}\max = \left(\sqrt{2}\frac{2}{\pi} \bullet G_{BPF}[\omega]\right) \bullet 1.93$$

So This test is considered successful if on each channel:

-With a modulation frequency of 204Hz:

$$451 \le G_{SQ}\max \le 461$$

3) The cut off frequency should have a precision of ±**1%** at **5Hz**.

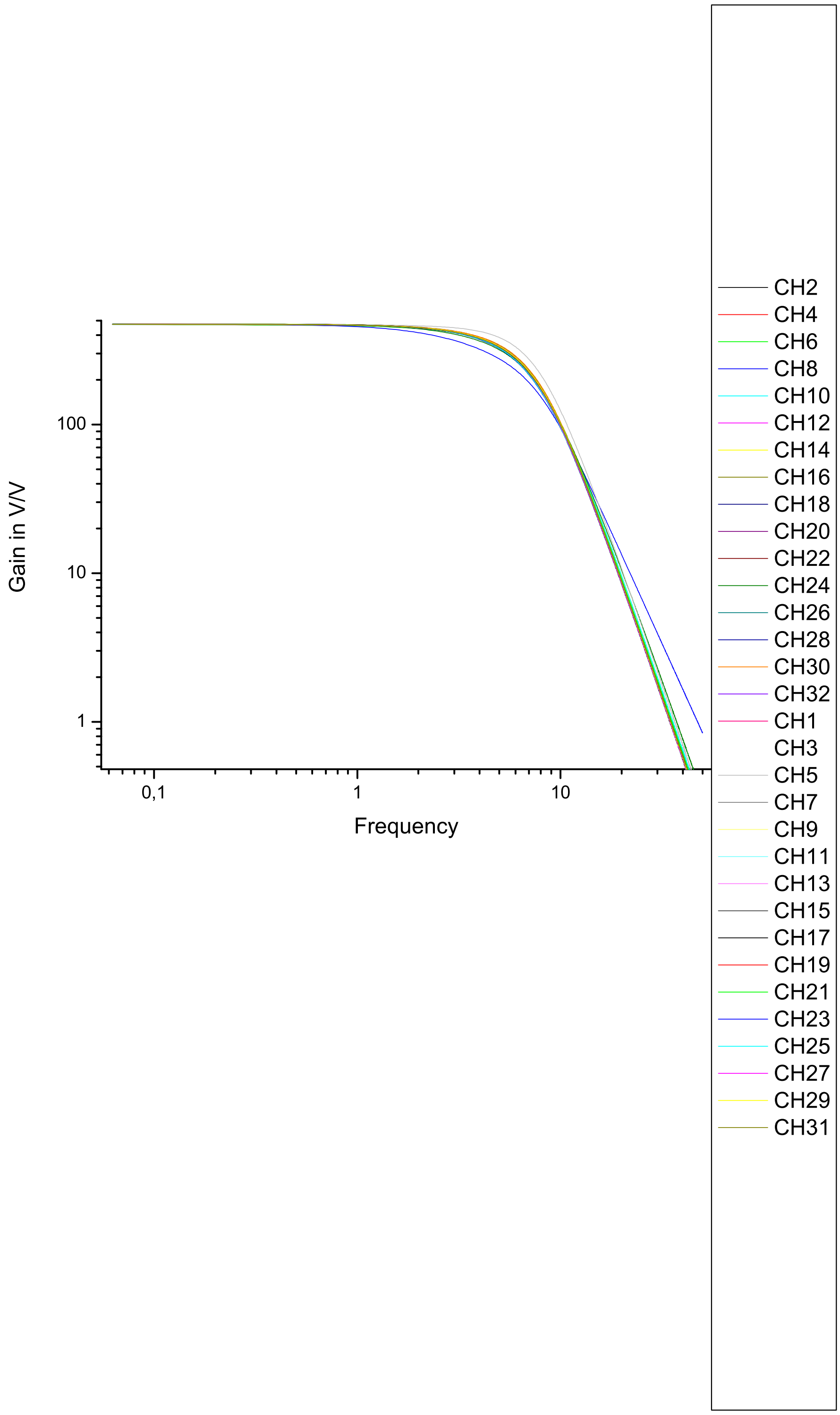
Measurement parameters:

Modulation frequency Fbias = 204 Hz, rectangular modulation of a 0-50 Hz sine sweep, 1V amplitude @ the input of the modulator (~10 mV @ the input of the LIA)

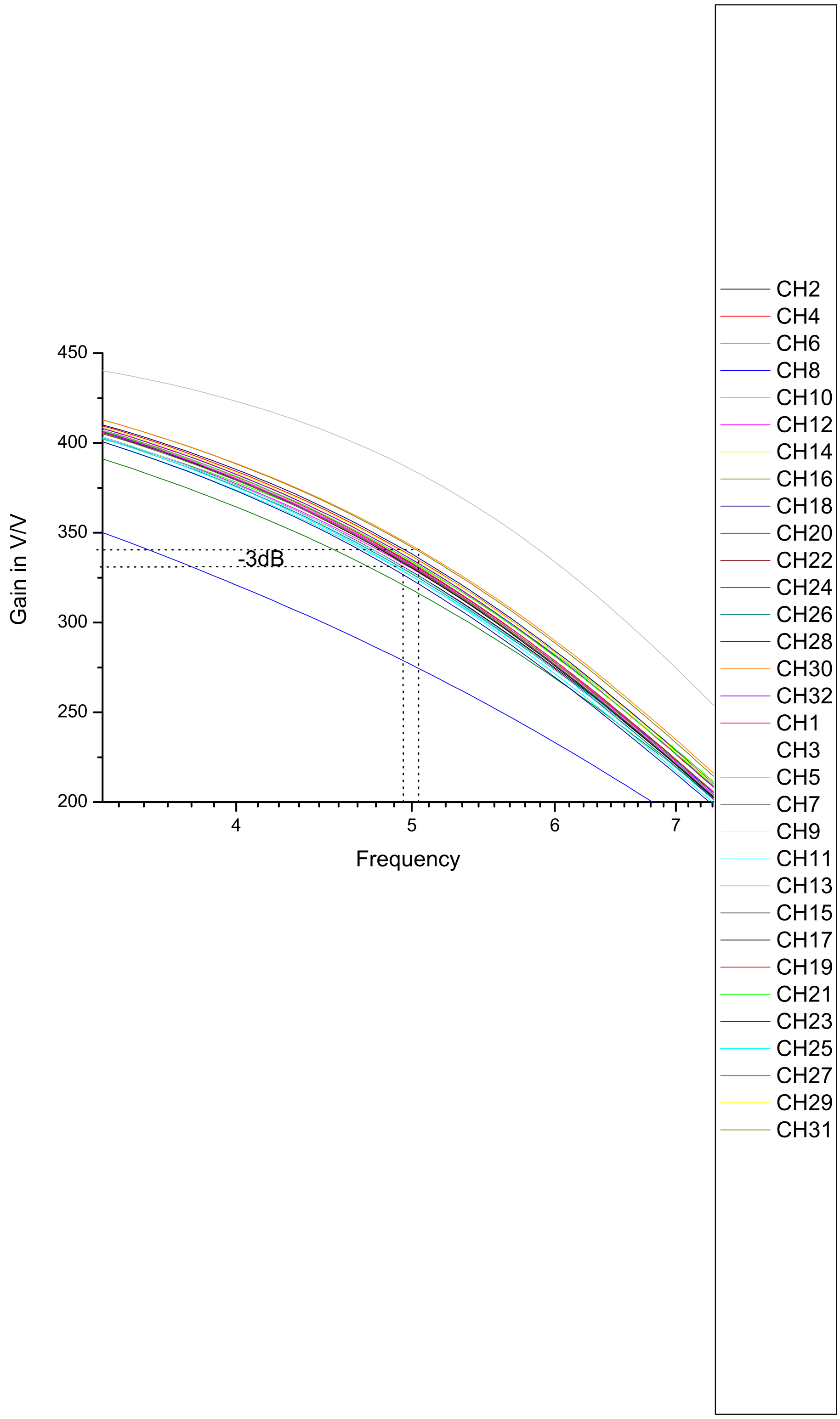
Test number	Test	Test Date	Result	Corrections	Test Status OK/NOK
LIA_P 9	Measure the transfer function of the channel 1		Fc=4,961 Gain=473,64 Gain for a sine=448		OK
LIA_P 9	Measure the transfer function of the channel 2		Fc=4,88 Gain=472 Gain for a sine=446		OK
LIA_P 9	Measure the transfer function of the channel 3		Fc=4,922 Gain=474,85 Gain for a sine=449		OK
LIA_P 9	Measure the transfer function of the channel 4		Fc=5 Gain=473,96 Gain for a sine=448,3		OK
LIA_P 9	Measure the transfer function of the channel 5		The problem will be corrected before the QM1 integration		NOK
LIA_P 9	Measure the transfer function of the channel 6		Fc=5,02 Gain=470,17 Gain for a sine=444,7		OK
LIA_P 9	Measure the transfer function of the channel 7		Fc=4,922 Gain=473,85 Gain for a sine=448.2		OK
LIA_P 9	Measure the transfer function of the channel 8		The problem will be corrected before the QM1 integration		NOK
LIA_P 9	Measure the transfer function of the channel 9		Fc=4,959 Gain=471,5 Gain for a sine=446		OK
LIA_P 9	Measure the transfer function of the channel 10		Fc=4,82 Gain=473,2 Gain for a sine=447		OK
LIA_P 9	Measure the transfer function of the channel 11		Fc=4,891 Gain=471,7 Gain for a sine=446		OK
LIA_P 9	Measure the transfer function of the channel 12		Fc=4,93 Gain=471,33 Gain for a sine=446		OK
LIA_P 9	Measure the transfer function of the channel 13		Fc=4,946 Gain=473,48 Gain for a sine=448		OK
LIA_P 9	Measure the transfer function of the channel 14		Fc=4,98 Gain=473,17 Gain for a sine=447,5		OK
LIA_P 9	Measure the transfer function of the channel 15		Fc=4,896 Gain=475,48 Gain for a sine=449.7		OK
LIA_P 9	Measure the transfer function of the channel 16		Fc=5,12 Gain=474,95 Gain for a sine=449,25		OK

Test number	Test	Test check Date	Check Result	Corrections	Test Status OK/NOK
LIA_P 9	Measure the transfer function of the channel 17		Fc=4,87 Gain=475,35 Gain for a sine=449,6		OK
LIA_P 9	Measure the transfer function of the channel 18		Fc=5,075 Gain=472,6 Gain for a sine=447		OK
LIA_P 9	Measure the transfer function of the channel 19		Fc=5,04 Gain=473 Gain for a sine=447,41		OK
LIA_P 9	Measure the transfer function of the channel 20		Fc=4,88 Gain=472,7 Gain for a sine=447,1		OK
LIA_P 9	Measure the transfer function of the channel 21		Fc=4,97 Gain=473,27 Gain for a sine=447,6		OK
LIA_P 9	Measure the transfer function of the channel 22		Fc=4,96 Gain=473 Gain for a sine=447,4		OK
LIA_P 9	Measure the transfer function of the channel 23		Fc=4,93 Gain=473,61 Gain for a sine=448		OK
LIA_P 9	Measure the transfer function of the channel 24		The problem will be corrected before the QM1 integration		NOK
LIA_P 9	Measure the transfer function of the channel 25		Fc=4,82 Gain=473,72 Gain for a sine=448		OK
LIA_P 9	Measure the transfer function of the channel 26		Fc=4,85 Gain=473,36 Gain for a sine=447,75		OK
LIA_P 9	Measure the transfer function of the channel 27		Fc=4,96 Gain=472,17 Gain for a sine=446,6		OK
LIA_P 9	Measure the transfer function of the channel 28		Fc=4,8 Gain=472,3 Gain for a sine=446,6		OK
LIA_P 9	Measure the transfer function of the channel 29		Fc=5,03 Gain=473,7 Gain for a sine=448		OK
LIA_P 9	Measure the transfer function of the channel 30		Fc=4,922 Gain=473,6 Gain for a sine=448		OK
LIA_P 9	Measure the transfer function of the channel 31		Fc=4,922 Gain=472 Gain for a sine=446,5		OK
LIA_P 9	Measure the transfer function of the channel 32		Fc=4,922 Gain=474,35 Gain for a sine=448,7		OK

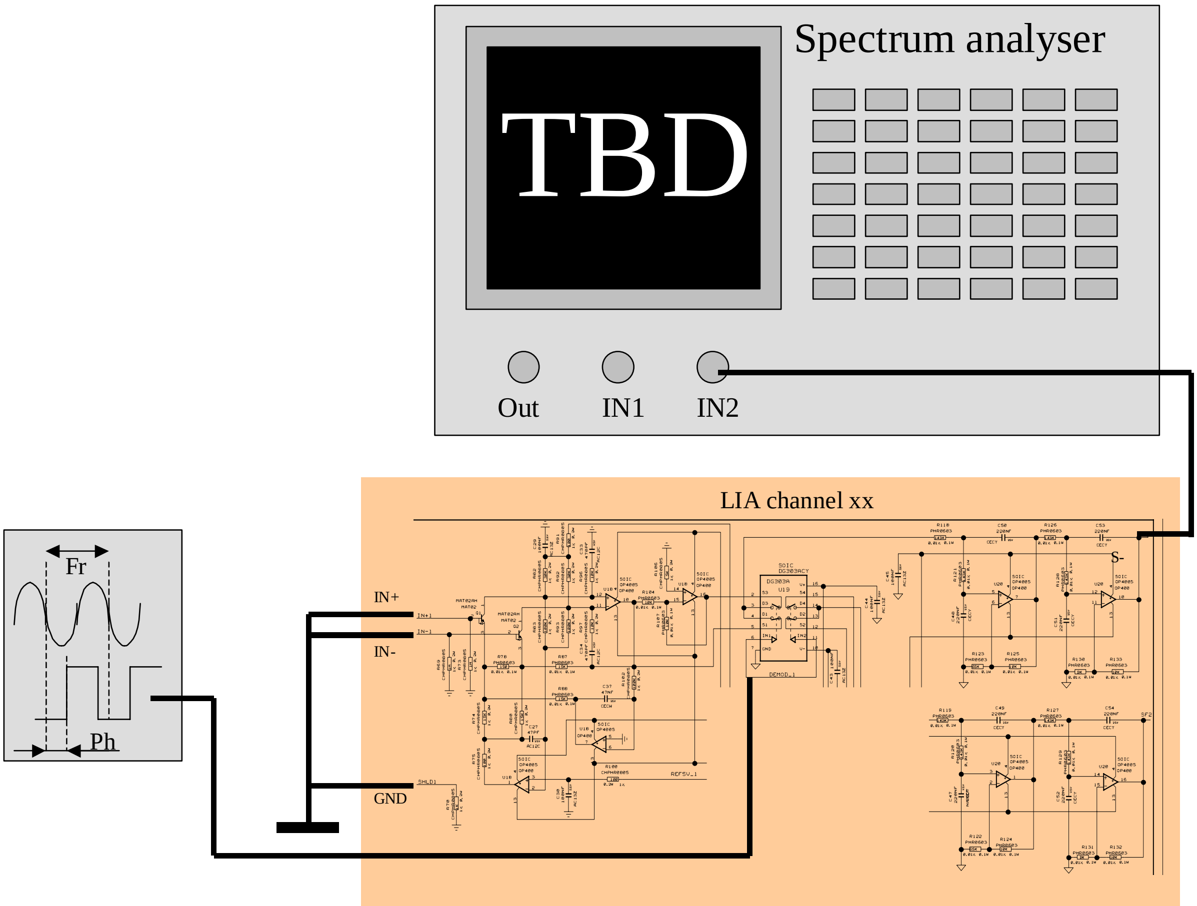
The following graph shows all the LIA_P transfert function (V/V) according to the frequency



The following graph shows close-ups of the cut-off frequencies:



LIA input noise



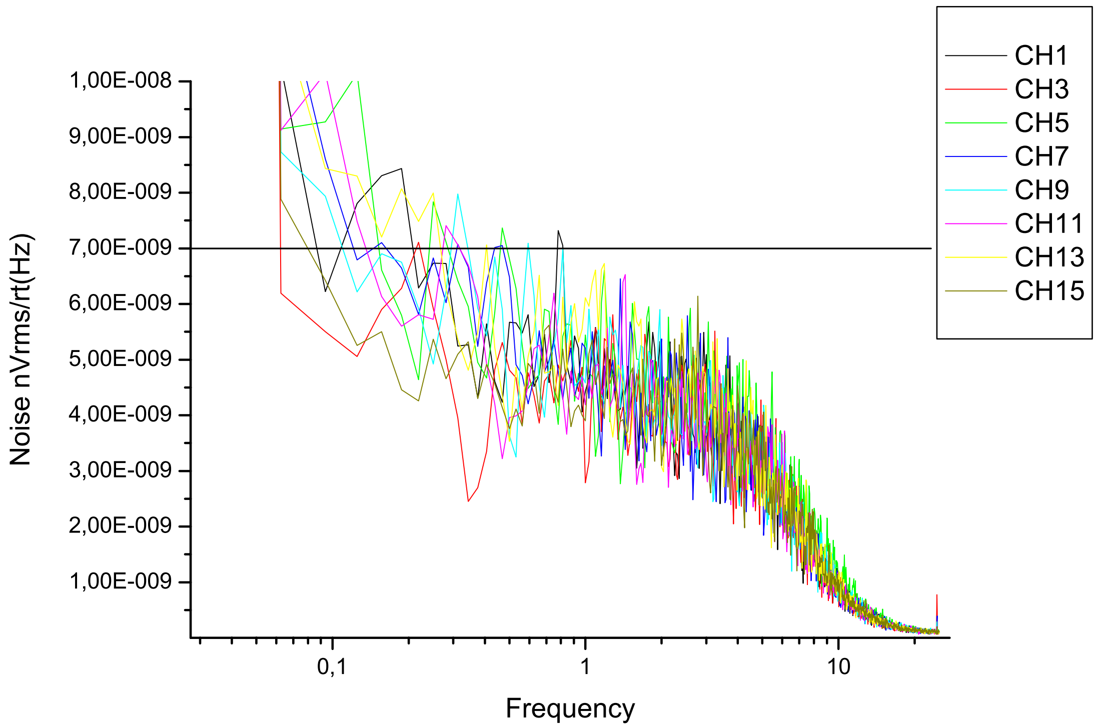
This test is considered successful if the input noise is lower than **7nVrms/rt(Hz)** over a frequency range of 0.05 to 5Hz on each channel

Measurement parameters:

Fbias = 204 Hz (sine bias)
Band width = 0-25 Hz, Window = Hanning, input range ~ -34 dB,
CH1 and CH2 AC coupled via 10uF/1 MOhm, 9 RMS AVG * 30sec.

Test number	Test	Test Date	Result	Corrections	Test Status OK/NOK
LIA_P 10	Measure the noise of the channel 1		See pictures below		OK
LIA_P 10	Measure the noise of the channel 2		See pictures below		OK
LIA_P 10	Measure the noise of the channel 3		See pictures below		OK
LIA_P 10	Measure the noise of the channel 4		See pictures below		OK
LIA_P 10	Measure the noise of the channel 5		See pictures below		OK
LIA_P 10	Measure the noise of the channel 6		See pictures below		OK
LIA_P 10	Measure the noise of the channel 7		See pictures below		OK
LIA_P 10	Measure the noise of the channel 8		See pictures below		OK
LIA_P 10	Measure the noise of the channel 9		See pictures below		OK
LIA_P 10	Measure the noise of the channel 10		See pictures below		OK
LIA_P 10	Measure the noise of the channel 11		See pictures below		OK
LIA_P 10	Measure the noise of the channel 12		See pictures below		OK
LIA_P 10	Measure the noise of the channel 13		See pictures below		OK
LIA_P 10	Measure the noise of the channel 14		See pictures below		OK
LIA_P 10	Measure the noise of the channel 15		See pictures below		OK
LIA_P 10	Measure the noise of the channel 16		See pictures below		OK

Test number	Test	Test Date	Result	Corrections	Test Status OK/NOK
LIA_P 10	Measure the noise of the channel 17		See pictures below		OK
LIA_P 10	Measure the noise of the channel 18		See pictures below		OK
LIA_P 10	Measure the noise of the channel 19		See pictures below		OK
LIA_P 10	Measure the noise of the channel 20		See pictures below		OK
LIA_P 10	Measure the noise of the channel 21		See pictures below		OK
LIA_P 10	Measure the noise of the channel 22		See pictures below		OK
LIA_P 10	Measure the noise of the channel 23		See pictures below		OK
LIA_P 10	Measure the noise of the channel 24		See pictures below		OK
LIA_P 10	Measure the noise of the channel 25		See pictures below		OK
LIA_P 10	Measure the noise of the channel 26		See pictures below		OK
LIA_P 10	Measure the noise of the channel 27		See pictures below		OK
LIA_P 10	Measure the noise of the channel 28		See pictures below		OK
LIA_P 10	Measure the noise of the channel 29		See pictures below		OK
LIA_P 10	Measure the noise of the channel 30		See pictures below		OK
LIA_P 10	Measure the noise of the channel 31		See pictures below		OK
LIA_P 10	Measure the noise of the channel 32		See pictures below		OK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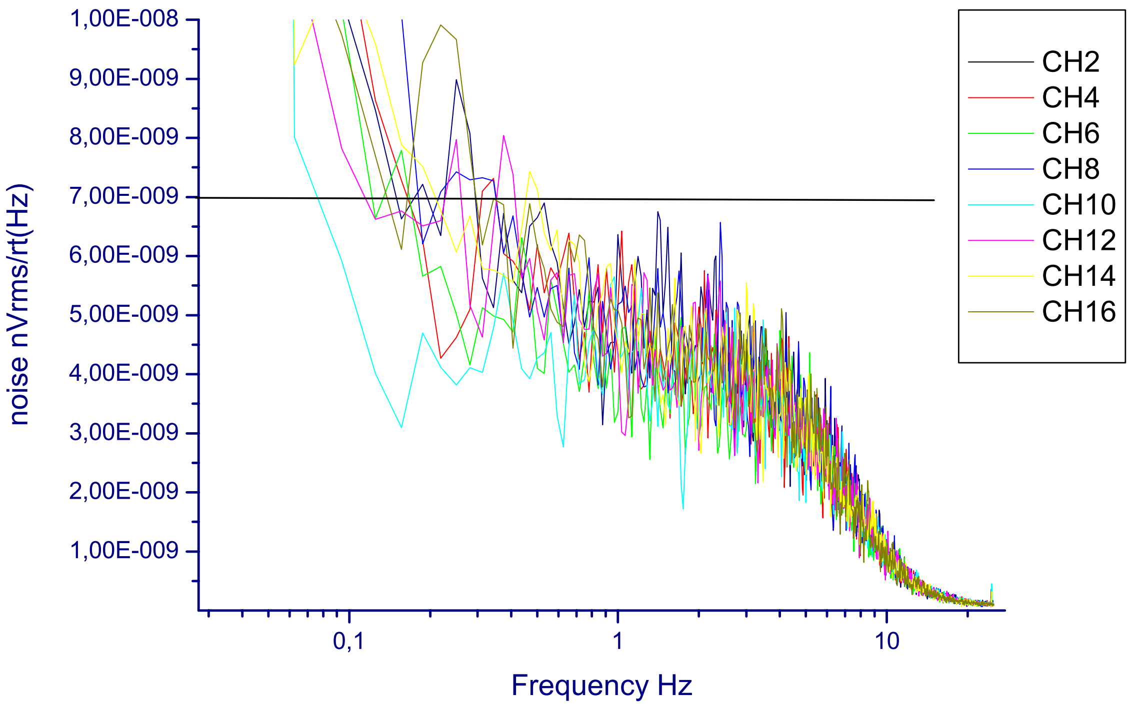
9,00E-009
8,00E-009
7,00E-009
6,00E-009
5,00E-009
4,00E-009
3,00E-009
2,00E-009
1,00E-009
Noise nVrms/rt(Hz)
0,1
1
10
Frequency
CH1
CH3
CH5
CH7
CH9
CH11
CH13
CH15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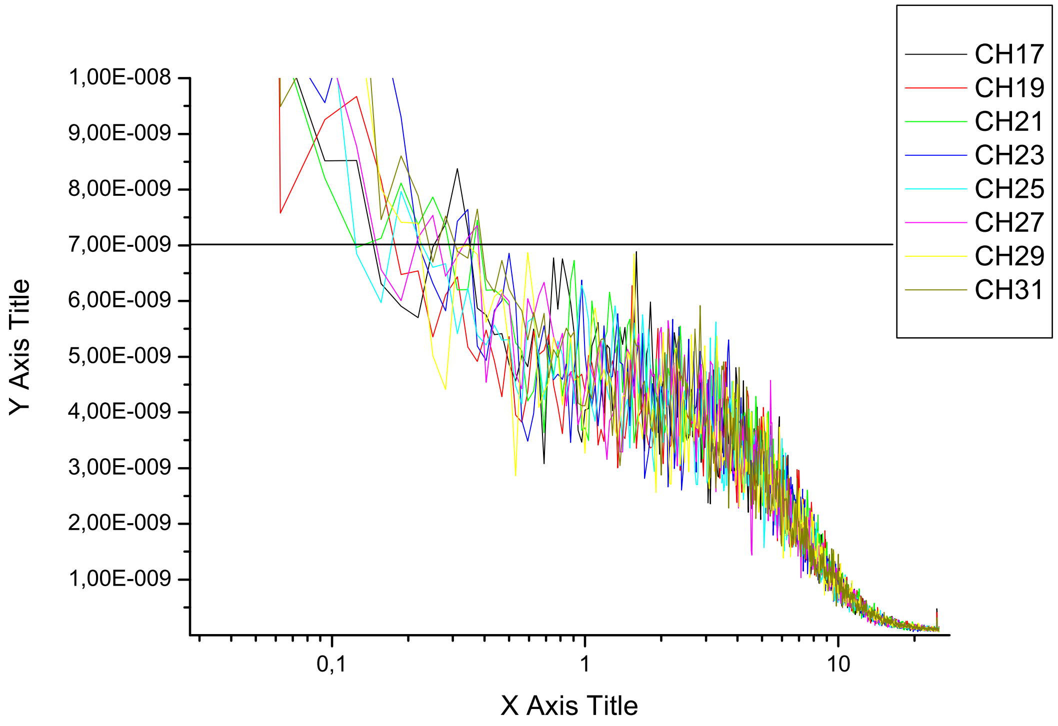
8,00E-009
7,00E-009
6,00E-009
5,00E-009
4,00E-009
3,00E-009
2,00E-009
1,00E-009
noise nVrms/rt(Hz)
0,1
1
10
Frequency Hz
CH2
CH4
CH6
CH8
CH10
CH12
CH14
CH16


1,00E-008
9,00E-009
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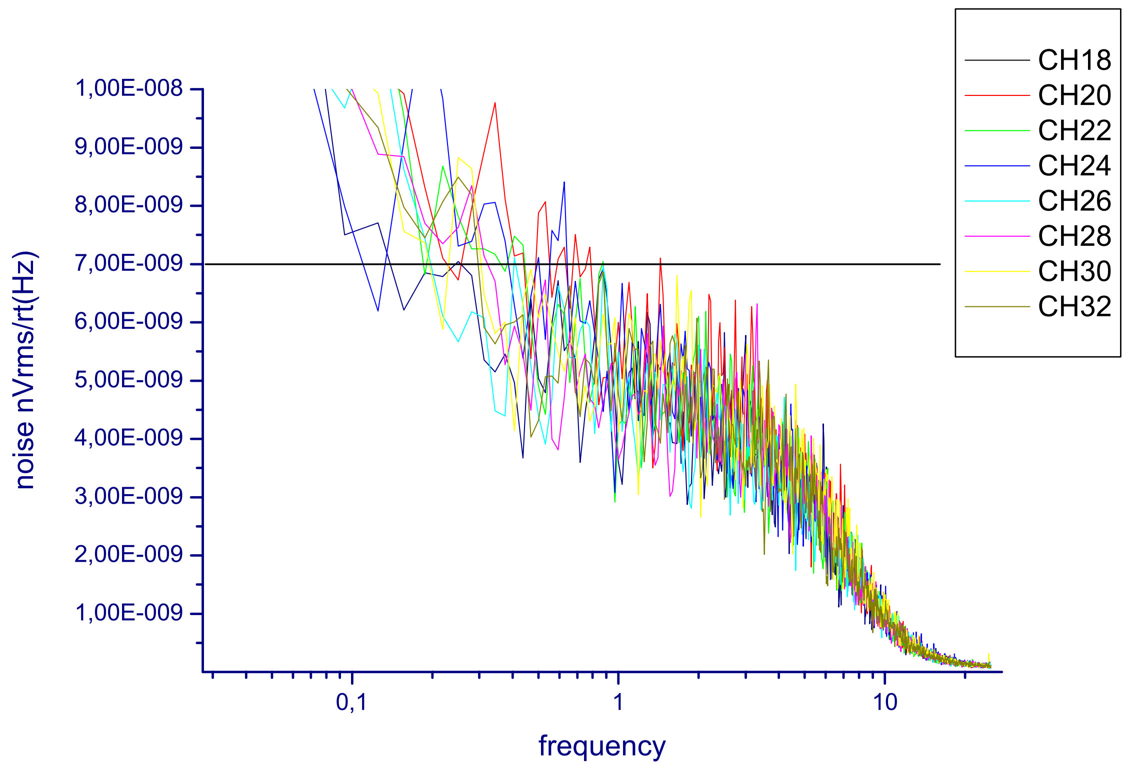
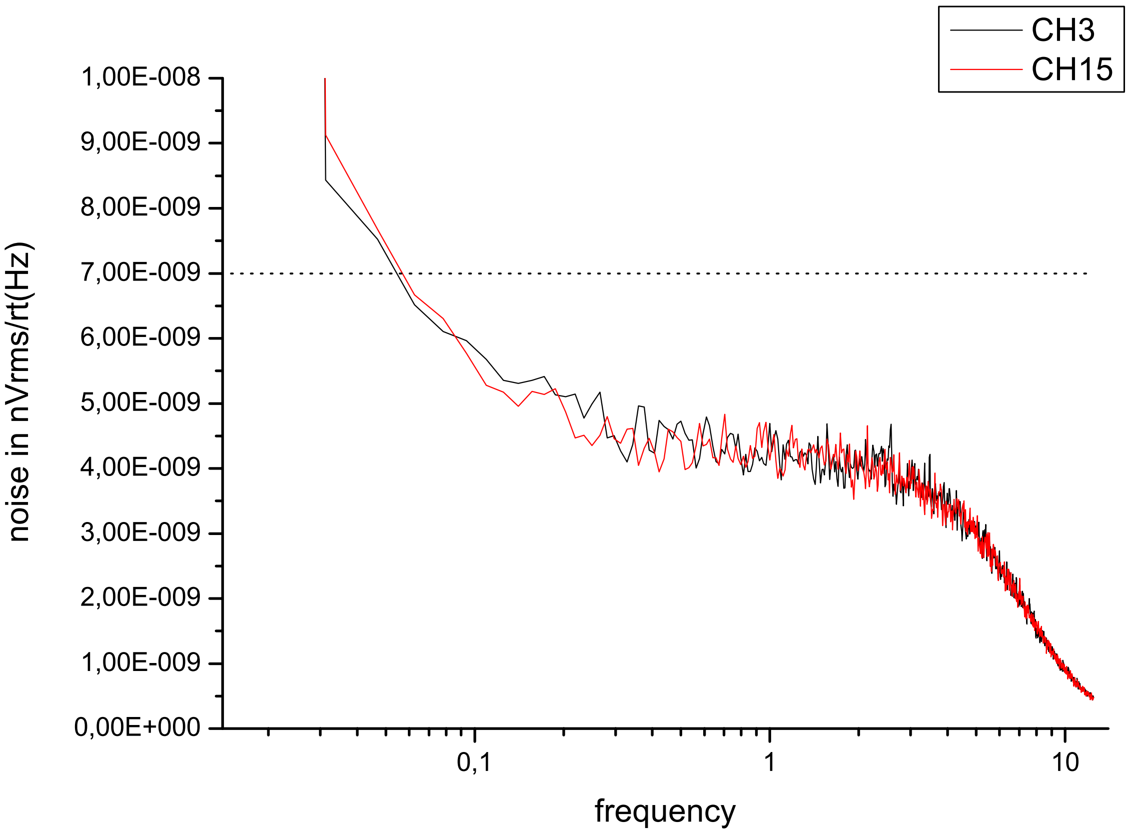
7,00E-009
6,00E-009
5,00E-009
4,00E-009
3,00E-009
2,00E-009
1,00E-009
Y Axis Title
0,1
1
10
X Axis Title
CH17
CH19
CH21
CH23
CH25
CH27
CH29
CH31


1,00E-008
9,00E-009
8,00E-009
7,00E-009
6,00E-009
5,00E-009
4,00E-009
3,00E-009
2,00E-009
1,00E-009
noise nVrms/rt(Hz)
0,1
1
10
frequency
CH18
CH20
CH22
CH24
CH26
CH28
CH30
CH32

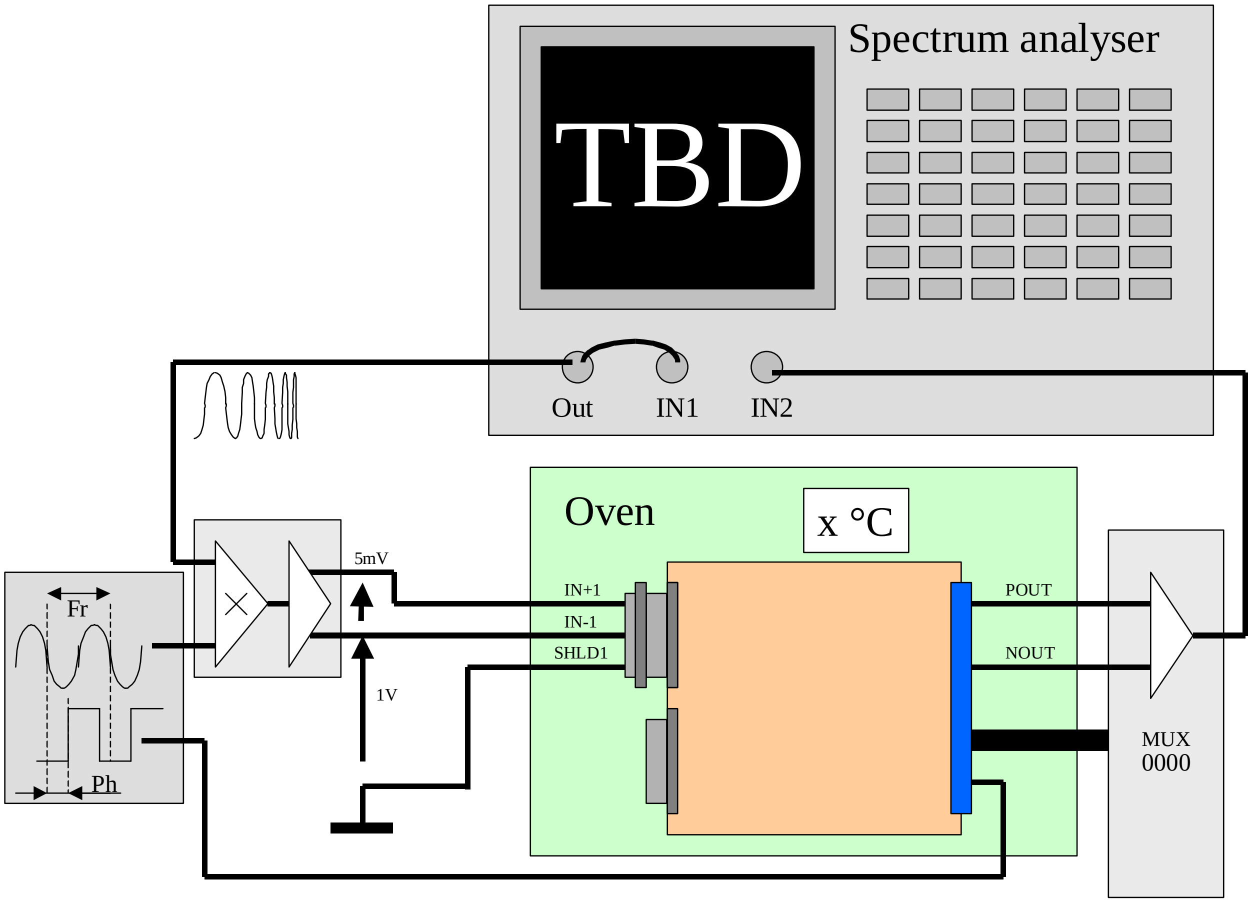
Noise measurement with a better precision on two representative channels

Measurement parameters:

channels biased to Vout = 2.730 V, noises BW = 0-12.5 Hz,
Window = Hanning, channels AC Coupled via 10uF/1 MOhm,
channels input range ~ -34dB,
100 RMS AVG * 64 sec.

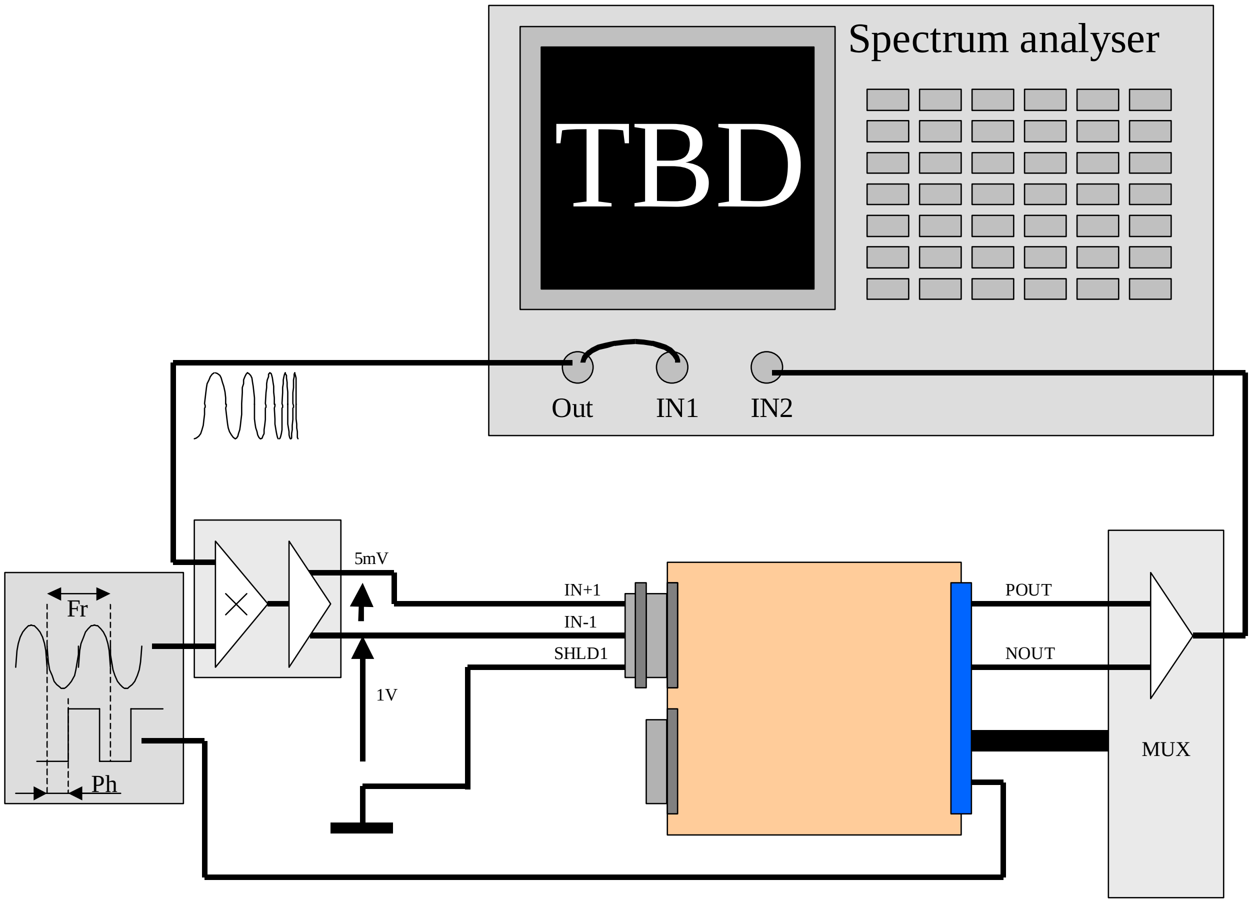


4.1.2.1.4 LIA TEMPERATURE STABILITIE



Test number	Test	Test Date	Result	Corrections	Test Status OK/NOK
LIA_P 11	Measure the transfer function of the channel 1 at 0°C		This test are going to be done when the QM1 is integrated		
LIA_P 12	Measure the transfer function of the channel 1 at 20°C		This test are going be done when the QM1 is integrated		
LIA_P 13	Measure the transfer function of the channel 1 at 40°C		This test are going be done when the QM1 is integrated		

4.1.2.1.5 LIA channel cross-talk

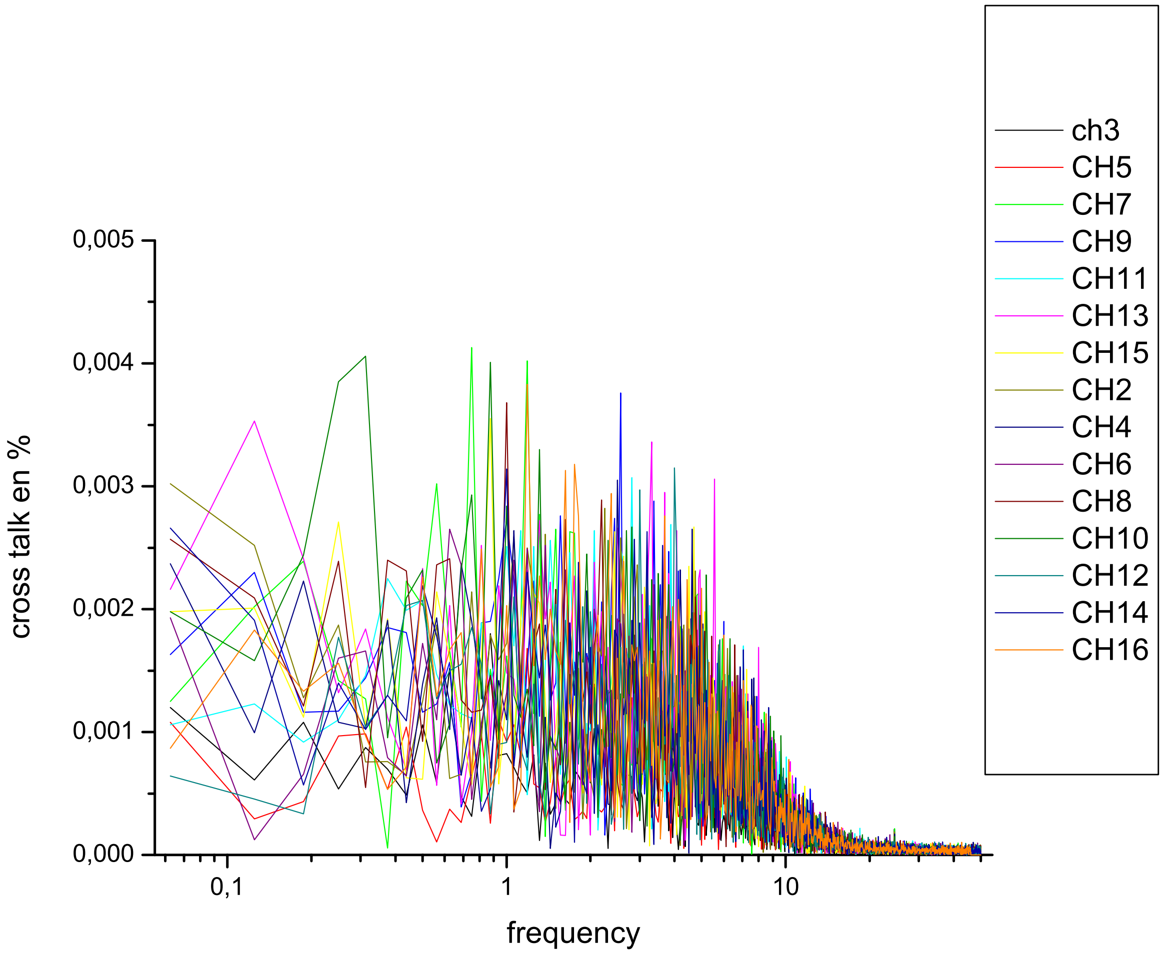


This test is considered successful if the electrical cross-talk between channel 1 and others channels is less than **0.05%**

Measurement parameters:

Modulation frequency Fbias = 204 Hz, rectangular modulation of a 0-50 Hz sine sweep,
1V amplitude @ the input of the modulator (~10 mV @ the input of the LIA)

Test number	Test	Test Date	Result	Corrections	Test Status OK/NOK
LIA_P 14	Measure the cross-talk between channel 1 and channel 2		See pictures below		OK
LIA_P 14	Measure the cross-talk between channel 1 and channel 3		See pictures below		OK
LIA_P 14	Measure the cross-talk between channel 1 and channel 4		See pictures below		OK
LIA_P 14	Measure the cross-talk between channel 1 and channel 5		See pictures below		OK
LIA_P 14	Measure the cross-talk between channel 1 and channel 6		See pictures below		OK
LIA_P 14	Measure the cross-talk between channel 1 and channel 7		See pictures below		OK
LIA_P 14	Measure the cross-talk between channel 1 and channel 8		See pictures below		OK
LIA_P 14	Measure the cross-talk between channel 1 and channel 9		See pictures below		OK
LIA_P 14	Measure the cross-talk between channel 1 and channel 10		See pictures below		OK
LIA_P 14	Measure the cross-talk between channel 1 and channel 11		See pictures below		OK
LIA_P 14	Measure the cross-talk between channel 1 and channel 12		See pictures below		OK
LIA_P 14	Measure the cross-talk between channel 1 and channel 13		See pictures below		OK
LIA_P 14	Measure the cross-talk between channel 1 and channel 14		See pictures below		OK
LIA_P 14	Measure the cross-talk between channel 1 and channel 15		See pictures below		OK
LIA_P 14	Measure the cross-talk between channel 1 and channel 16		See pictures below		OK


0,005
0,004
0,003
0,002
0,001
0,000
cross talk en %
0,1
1
10
frequency
ch3
CH5
CH7
CH9
CH11
CH13
CH15
CH2
CH4
CH6
CH8
CH10
CH12
CH14
CH16

5 TRACEABILITY MATRIX

Requirement ID	Description	test
BDA-DRCU-01	The DRCU signal processing electronics shall have less than 7 nV/rtHz as seen post demodulation, after digitzation. Noise is referred to the input over the frequency range 0.05 to 25 Hz. This performance must be accomplished with a bias input signal to the DRCU of 10 mVrms AC, 5 mV DC, 1 V DC common-mode offset, with an input load of 7 kOhms.	LIA_P10
BDA-DRCU-03	Input capacitance to be less than 100 pF, measured from the DRCU DxMA connector pins without the harness.	TBD
BDA-DRCU-04	Input impedance to be larger than 1 MΩ from 50 – 300 Hz.	TBD
BDA-DRCU-11	The common-mode rejection is –60 dB (50 – 300 Hz).	LIA_P8
BDA-DRCU-13	The signal bandwidth of the photometer channels shall be 0.03 Hz to 5 Hz. The 5 Hz cutoff should have a precision of 1 %.	LIA_P9
BDA-DRCU-19	DRCU noise performance (BDA-DRCU-01) to be maintained under a warm electronics thermal drift of 1 K / hour (TBC).	LIA_P11, LIA_P12 & LIA_P13
BDA-DRCU-22	The DRCU shall not saturate at an input voltage as large as 11 (TBC) mV_{rms} at input (photometer), 17 (TBC) mV_{rms} at input (spectrometer). DRCU channels shall remain functional if one input signal goes to Vbias.	LIA_P7 & LIA_P9
BDA-DRCU-25	The electrical cross-talk between channels in the DRCU shall be less than 0.05 % (TBC). The electrical cross-talk shall be verified by varying the input signal on one channel and measuring the response in other channels. The input signal level to each channel must be representative.	LIA_P14
BDA-DRCU-26	Each signal input to the LIA module must be connected to ground by a diode. This provides both protection and allows the JFETs to turn on without the JFET heater.	LIA_P1