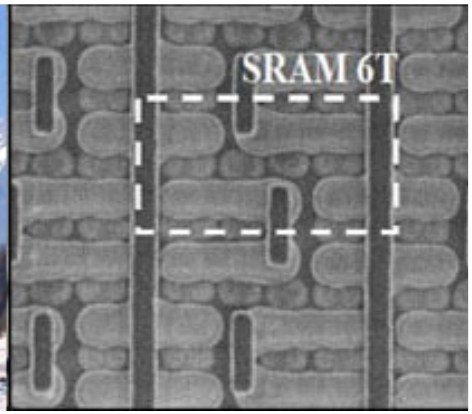






Altitude SEE Test European Platform

www.astep.eu

The Plateau de Bure Neutron Monitor (PdBNM)

Part 1. Integration and Test

Jean-Luc Autran
L2MP-CNRS, Marseille

August 2007

Hautes Alpes Conseil Général

DÉVOLUY

Région Provence-Alpes-Côte d'Azur

SOLUTIONS COMMUNICANTES SECURISEES

L2MP CNRS

UNIVERSITÉ DE PROVENCE

IUF

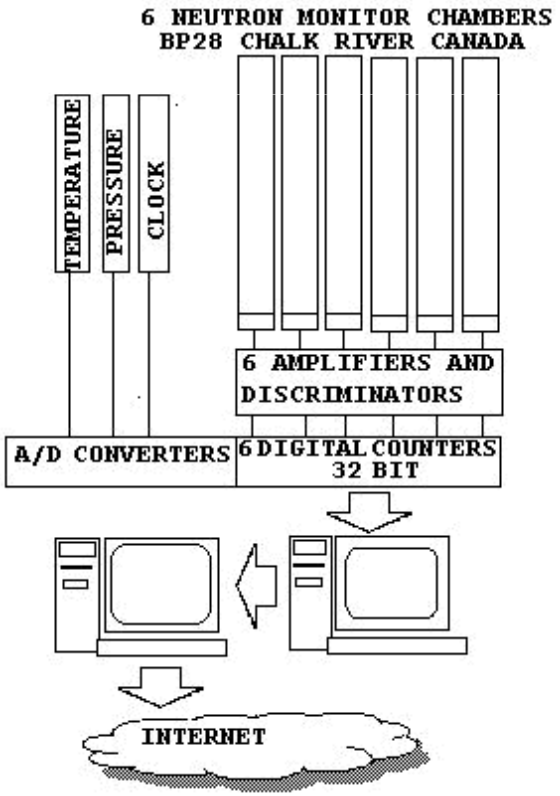
The Plateau de Bure Neutron Monitor (PdBNM)

I. Design

The starting point:

Visit of the Athens Neutron Monitor and Data Processing Center during RADECS 2006 (September 2006)

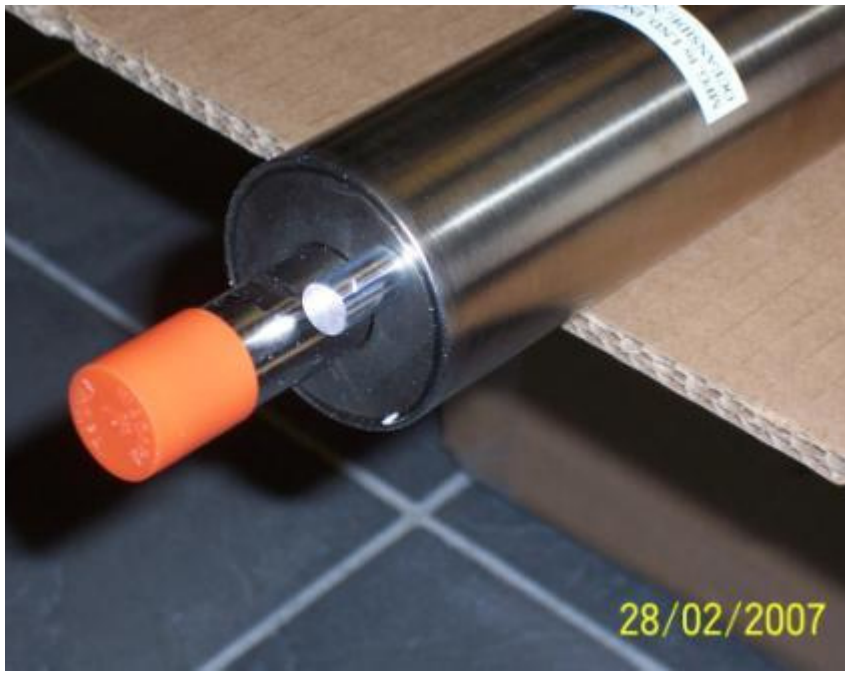
Prof. H. Mavromichalaki and her team are gratefully acknowledged for their technical support



http://cosray.phys.uoa.gr/

Design of the PdBNM

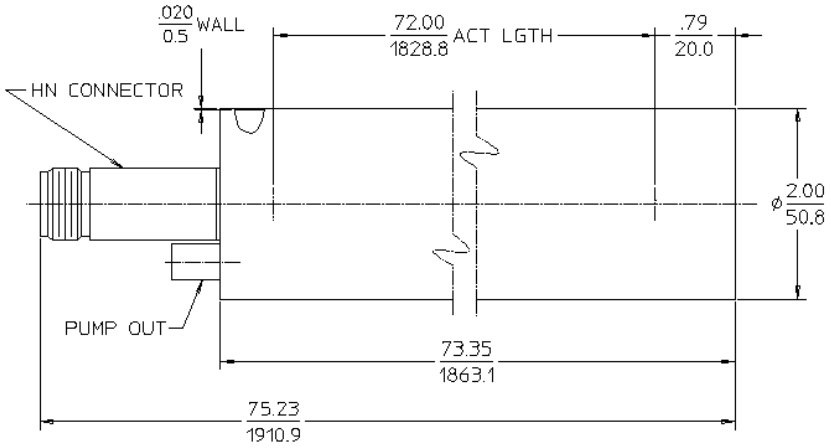
Use of high pressure He^3 detector (model LND 253109) instead of traditional BP 28 BF_3 tube (not longer fabricated by Chalk River Laboratories)



LND 253109

http://www.lndinc.com/neutron/253109.html

Design of the PdBNM



LND 253109

CYLINDRICAL He^3 NEUTRON DETECTOR

GENERAL SPECIFICATIONS

Gas Pressure (Torr)	**2280**
Cathode Material	**Stainless Steel**
Maximum Length (inch/mm)	**75.23 / 1910.8**
Effective Length (inch/mm)	**72.0 / 1828.8**
Maximum Diameter (inch/mm)	**2.0 / 50.8**
Effective Diameter (inch/mm)	**1.96 / 49.78**
Connector	**HN**
Operating Temperature Range ^0C	**-50 to +100**
Effective Volume (cm^3)	**3558**

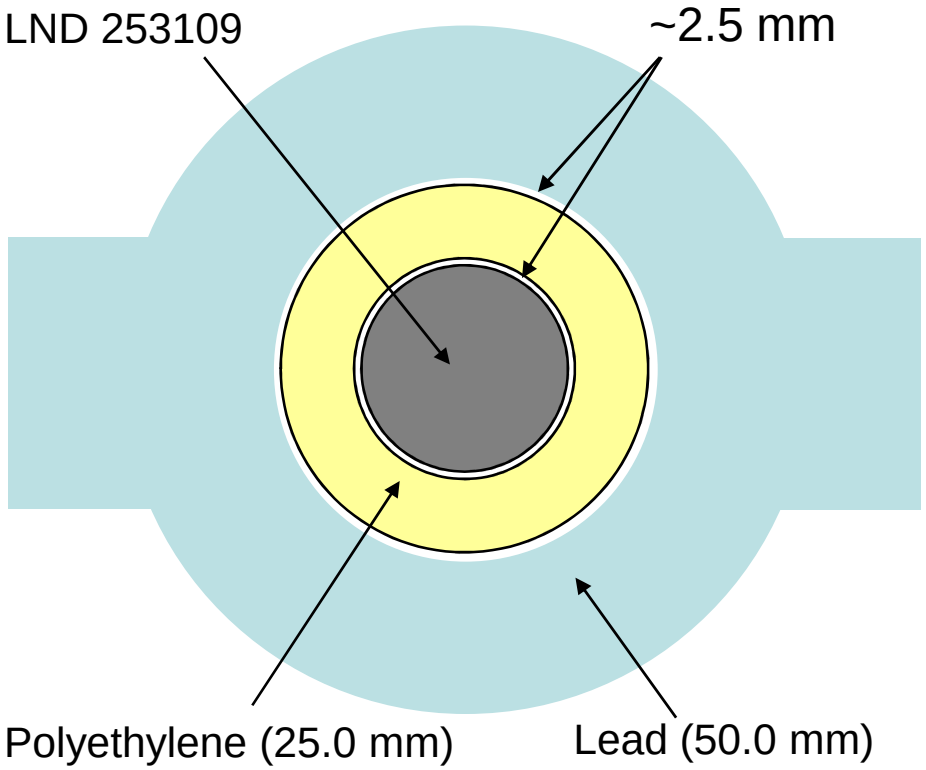
THERMAL NEUTRON SENSITIVITY

Sensitivity (cps / nv)	**1267**

ELECTRICAL SPECIFICATIONS

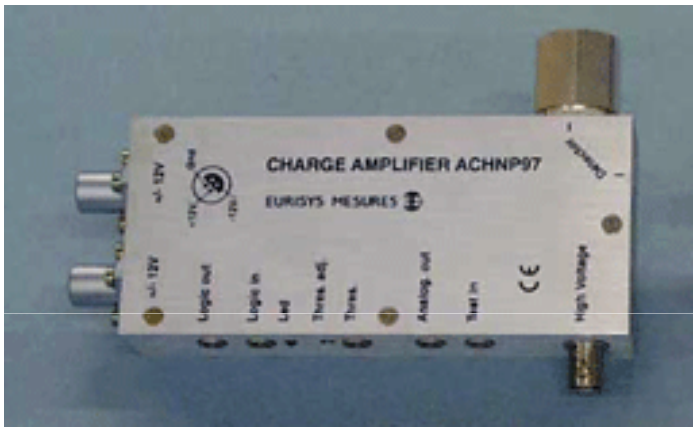
Recommended Operating Voltage (volts)	**1000**
Operating Voltage Range (volts)	**900 - 1150**
Maximum Plateau Slope (% / 100 volts)	**3**
Maximum Resolution (% FWHM)	**6**
Tube Capacitance (pf)	**8.5**
Weight (grams)	**1359**

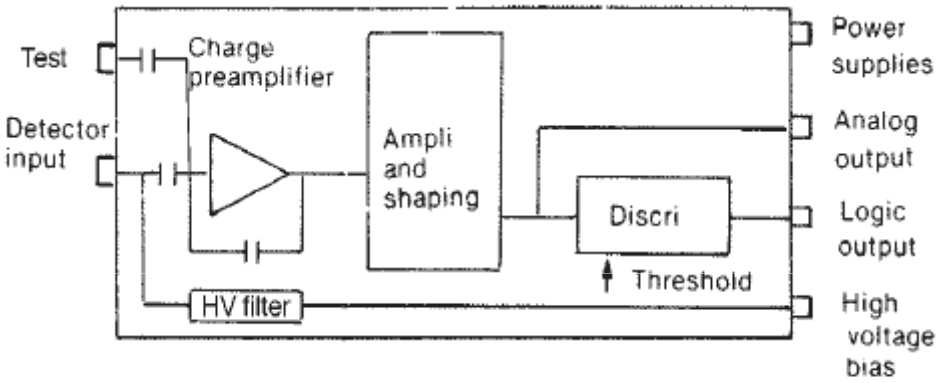
ASSEMBLING



Design of the PdBNM

Use of ACHNP97 Industrial Charge Amplifiers for He^3 detector manufactured by Canberra (Areva group)





+ Use of a high voltage source (0 – 3 kV, model 3200D) designed for nuclear detectors (high stablility, very low noise) and manufactured by Canberra (Areva group)

http://www.canberra.com/pdf/Products/Detectors_pdf/ACHIndustrial.pdf

Design of the PdBNM

Use of KEITHLEY KUSB 3116 acquisition module for interfacing the neutron monitor with the control PC

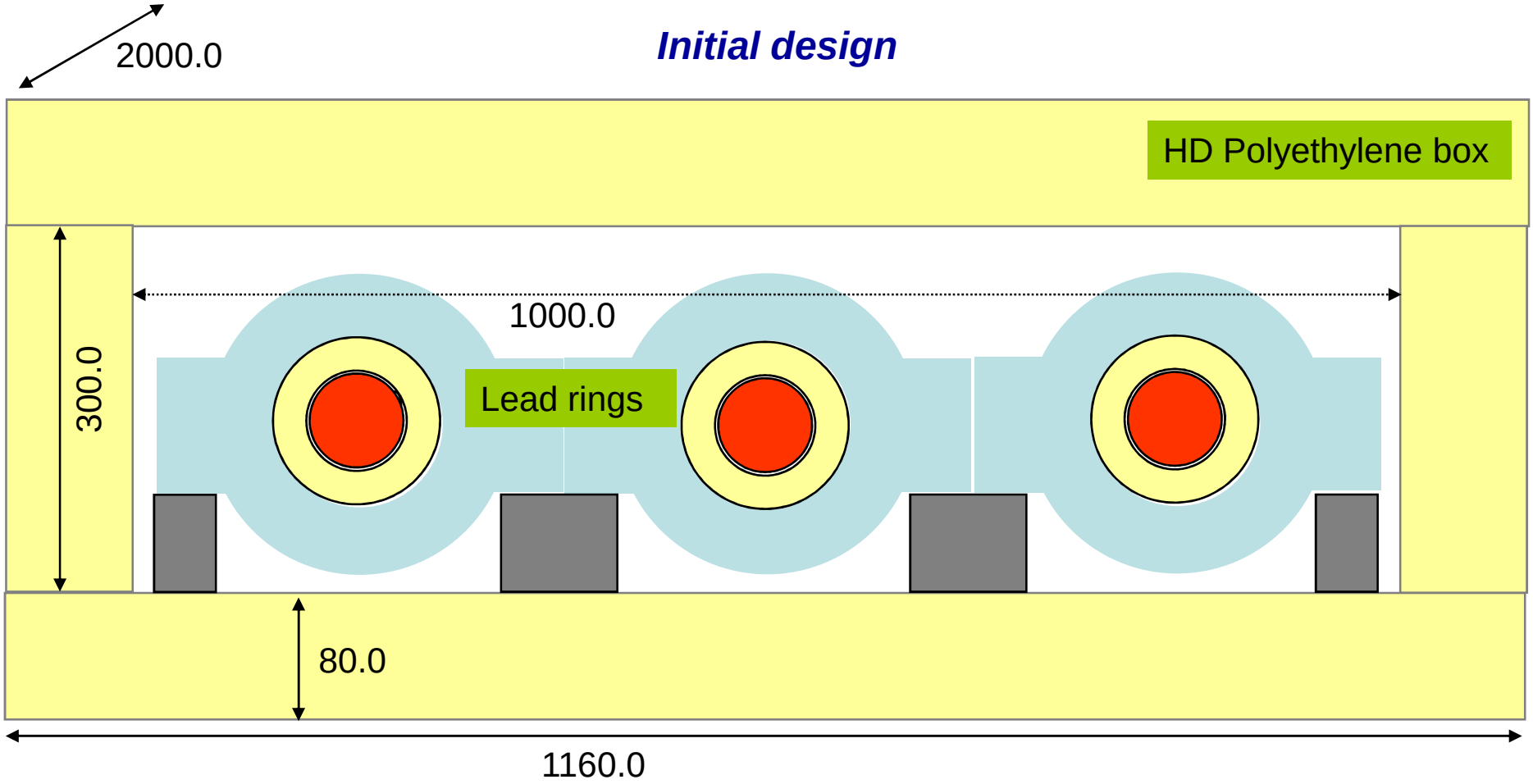
Model KUSB-3116 High Performance
Multifunction Data Acquisition USB Module

- 5 digital counters (TTL signals from ACHNP97)
- 15 ADC entries (T, P simultaneous measurements)

http://www.keithley.com/products/dataacqmodules/?mn=KUSB-3116

Design of the PdBNM

Initial design



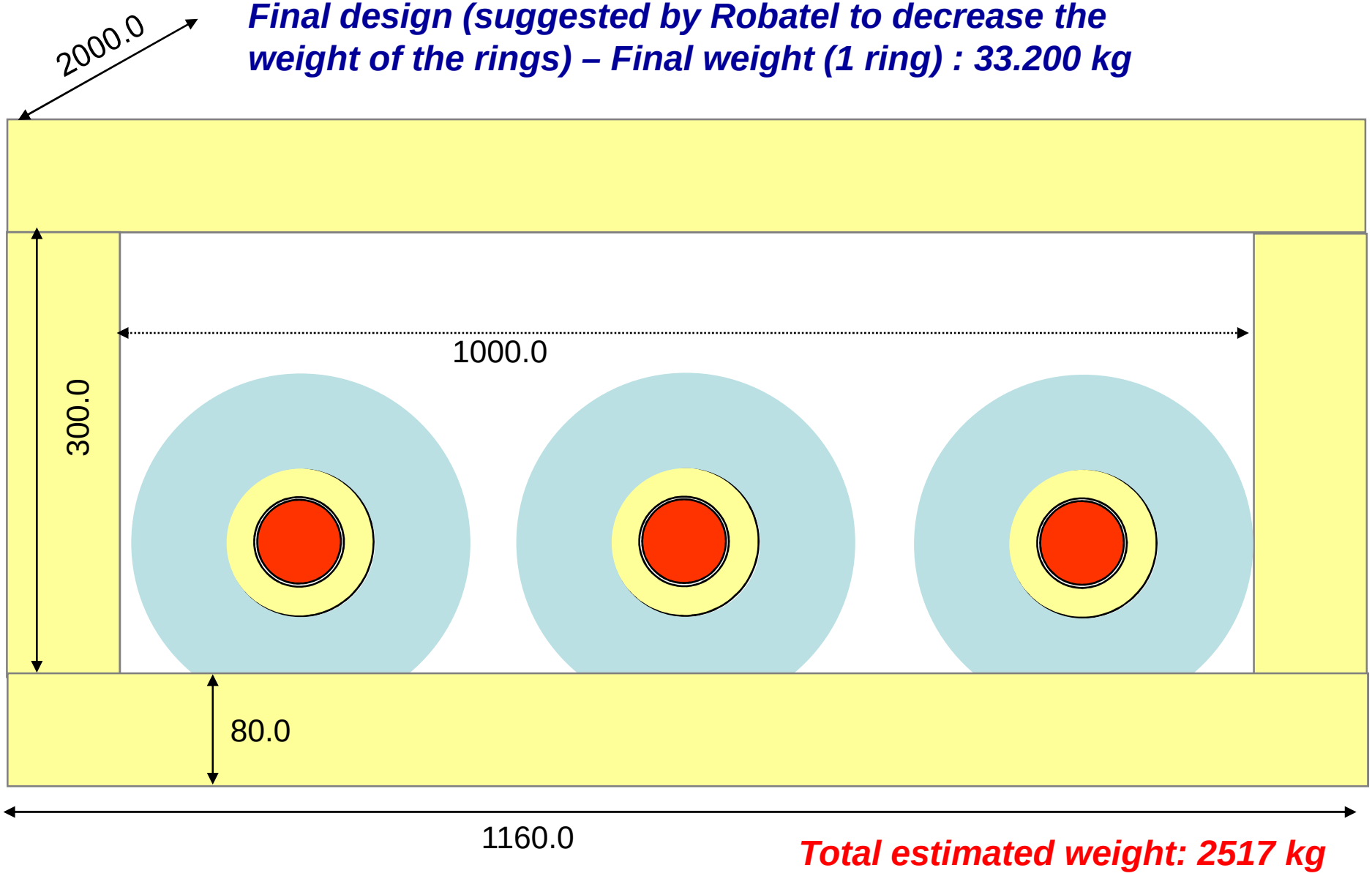
Dimensions are in mm

2 x (1160x2000) thickness 80
2 x (300x2000) thickness 80
2 x (1160x460) thickness 80

Estimated weight (total PEHD box) : 525 kg

Design of the PdBNM

Final design (suggested by Robatel to decrease the weight of the rings) – Final weight (1 ring) : 33.200 kg



Total estimated weight: 2517 kg

The Plateau de Bure Neutron Monitor (PdBNM)

II. Integration

(L2MP, Buiding IRPHE, Marseille)

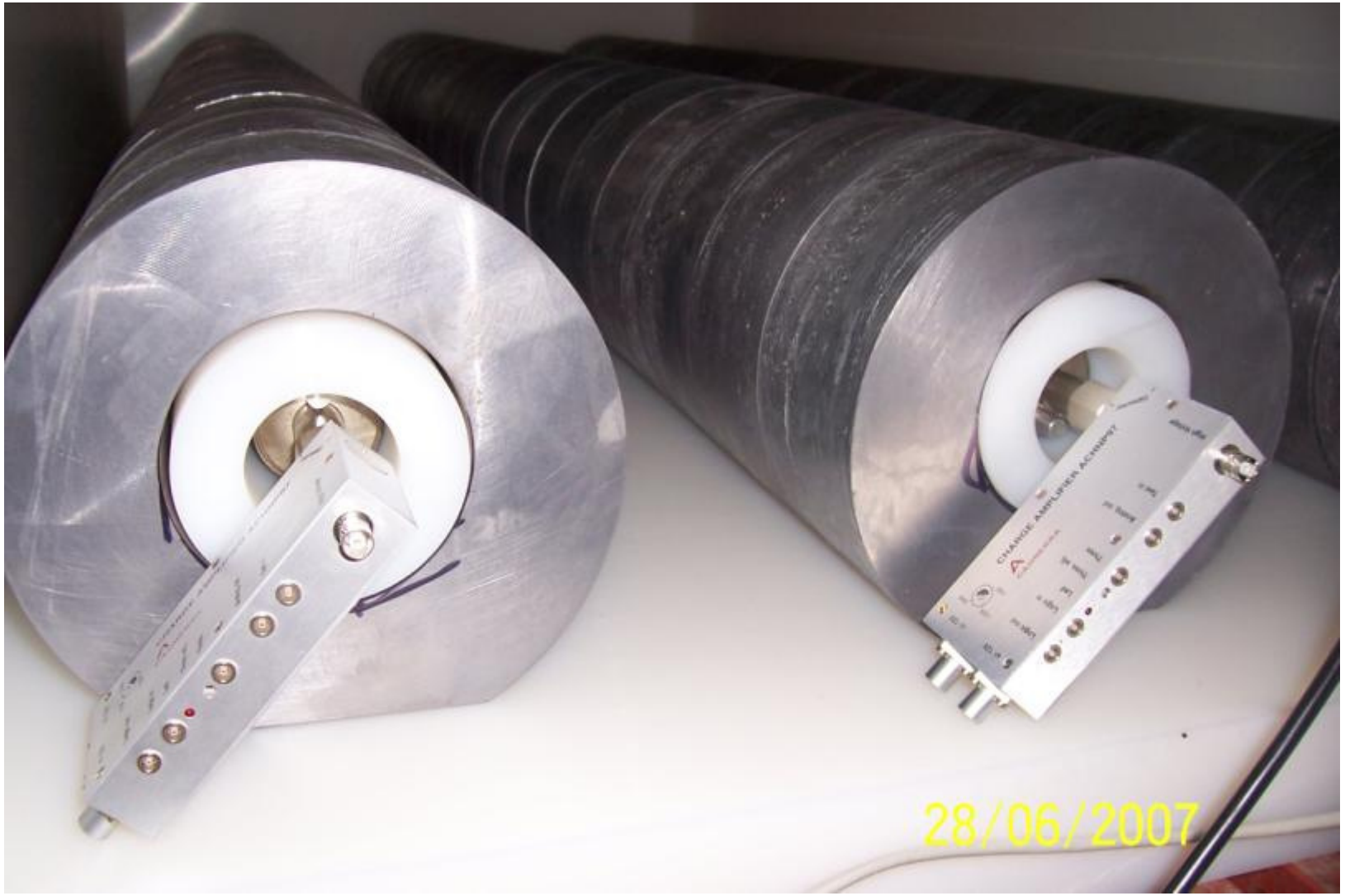
Integration of the PdBNM

Integration of the PdBNM

Integration of the PdBNM

Integration of the PdBNM

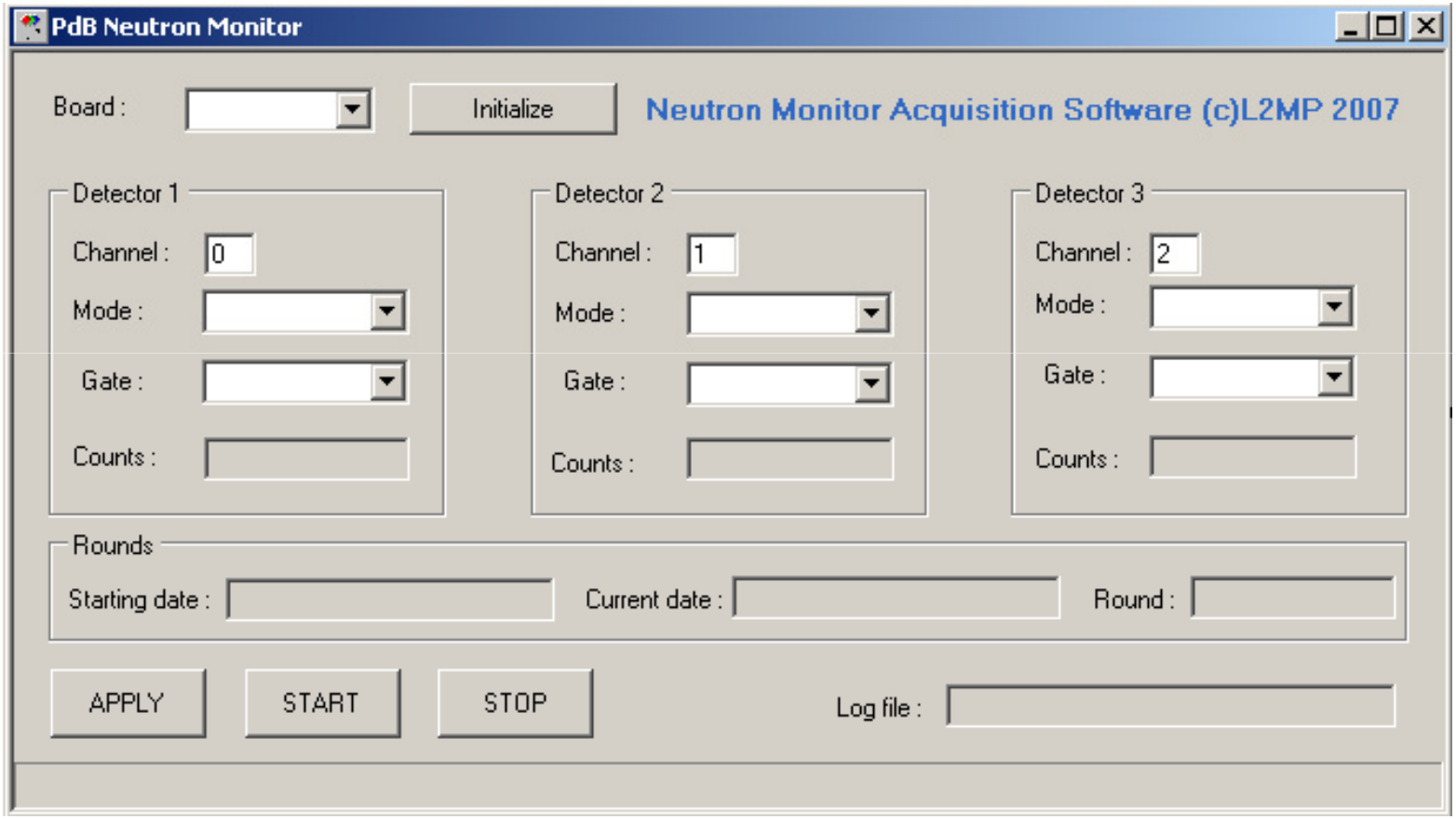
Integration of the PdBNM



Integration of the PdBNM

Integration of the PdBNM

Development of the acquisition software under Microsoft Visual Basic 2005



The Plateau de Bure Neutron Monitor (PdBNM)

III. Preliminary tests

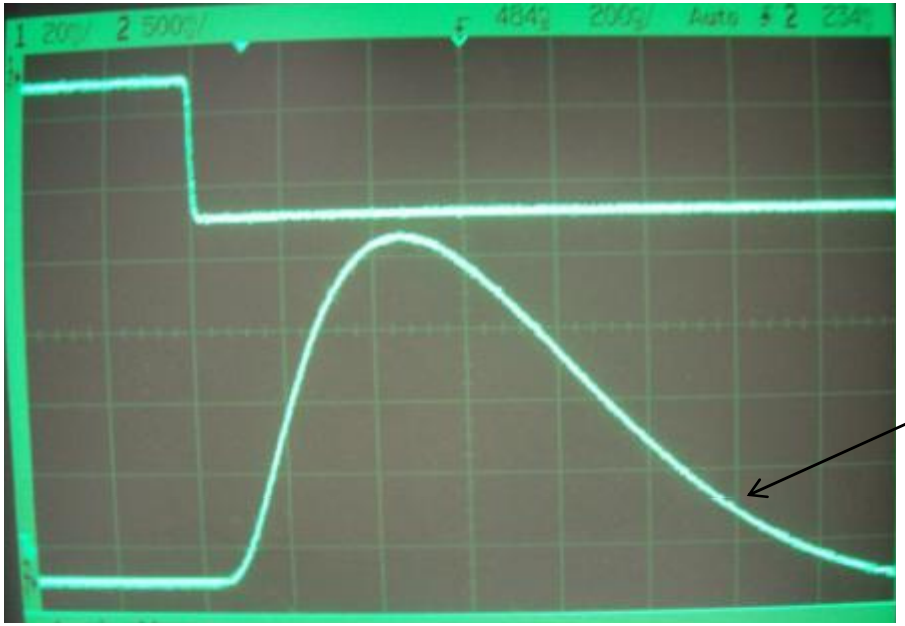
(L2MP, Buiding IRPHE, Marseille)

Location

Réseau Géodésique Français 1993 - coordonnées géographiques **Longitude :** 05° 26' 04" E **Latitude :** 43° 20' 47" N

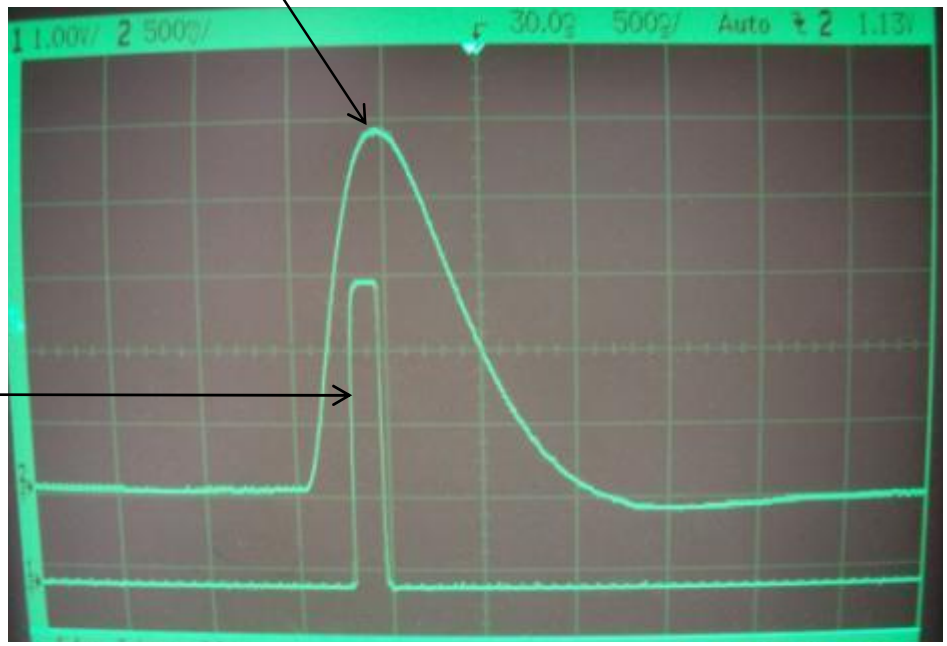
Elevation: 124 m

Preliminary tests



Test input (emulate detector signal)

Analogic output



TTL logic c output
on 50 Ω load

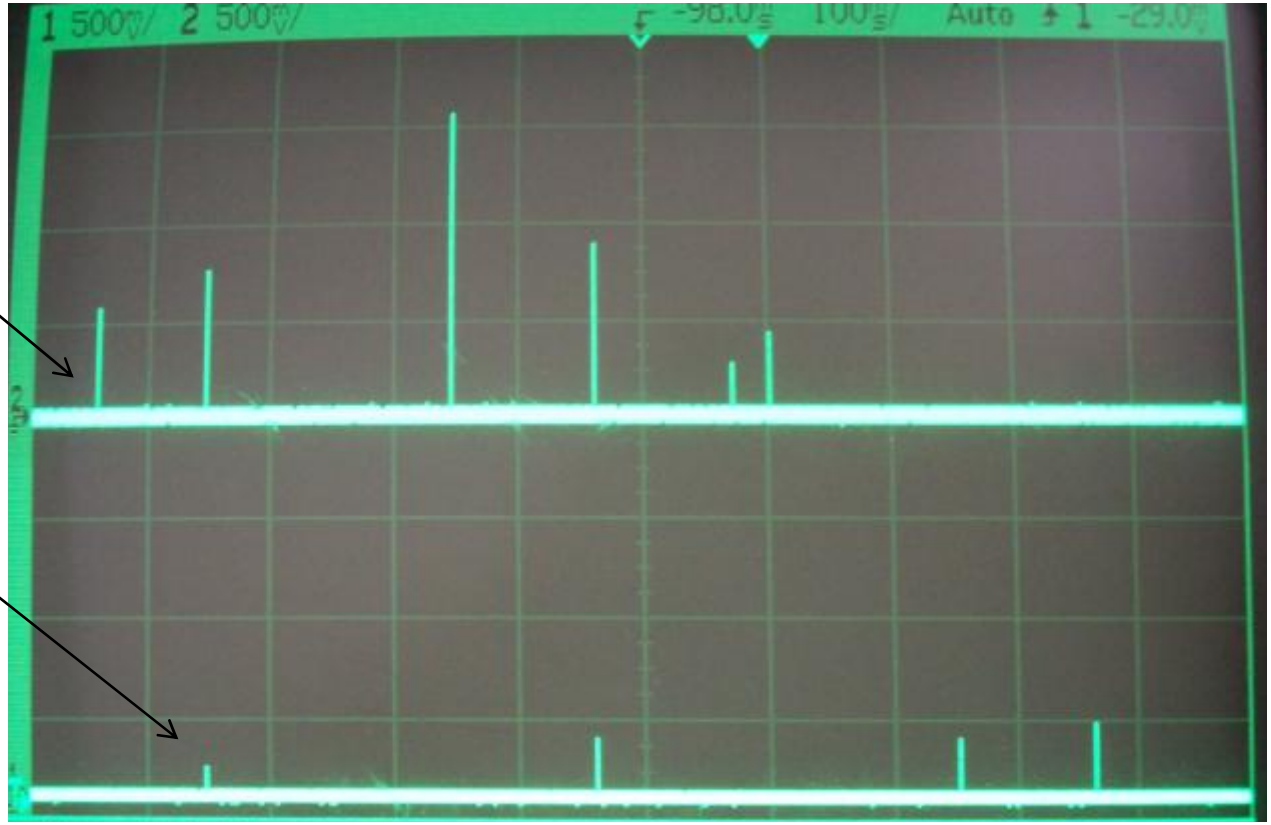
Preliminary tests

First analogic signatures of neutron detection (JULY 6, 2007)

Analogic output

Detector #1

Detector #2



The detection threshold value (used to trig the TTL ouptput) is fixed to ***0.1 V***

The Plateau de Bure Neutron Monitor (PdBNM)

IV. Operational service

(L2MP, Buiding IRPHE, Marseille)


11/07/2007

First recording (July 11-19 2007)

Intermediate output files:
CVS format file

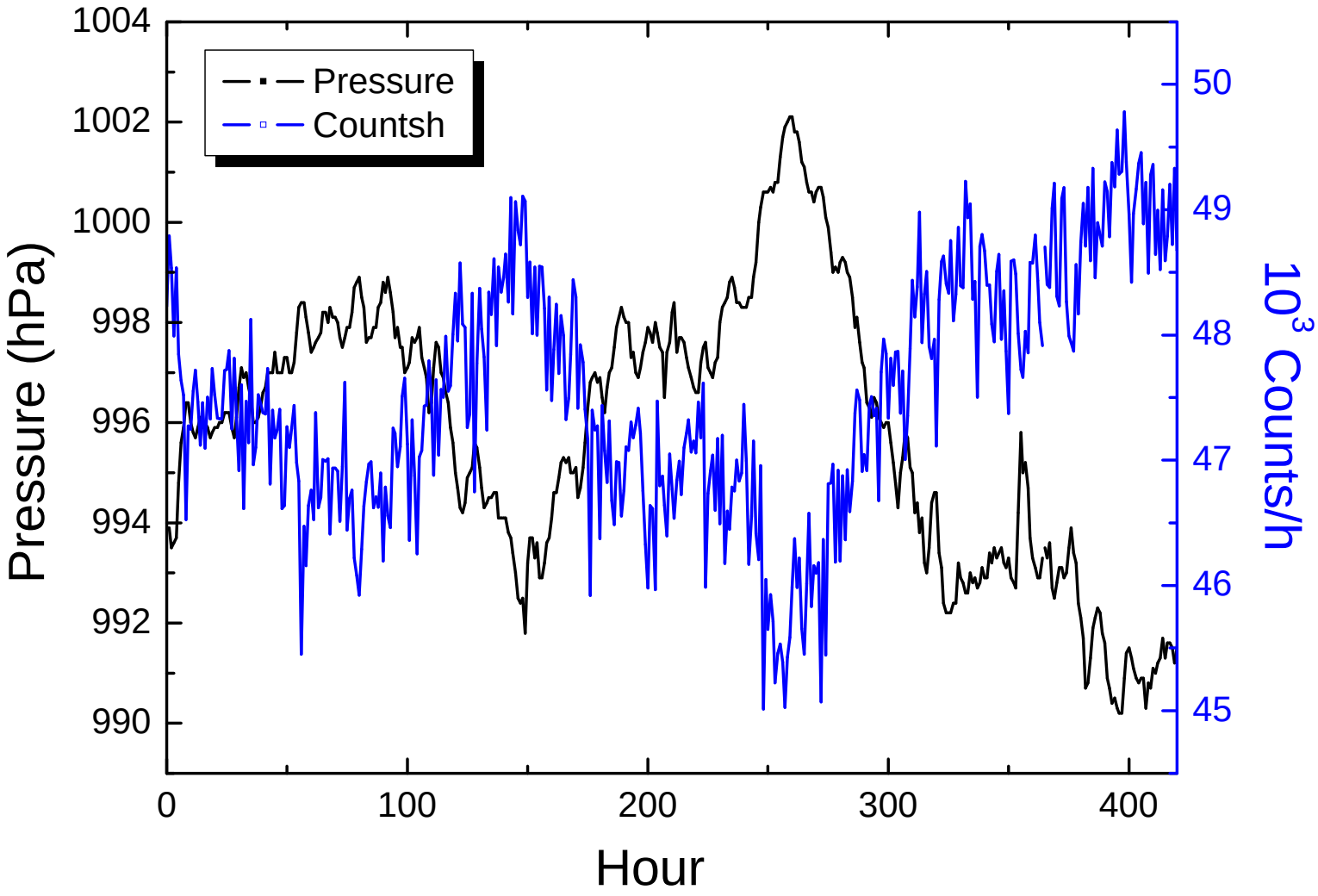
(values are uncorrected)

Barometric pression correction will be automatically performed on the FTP machine (script)

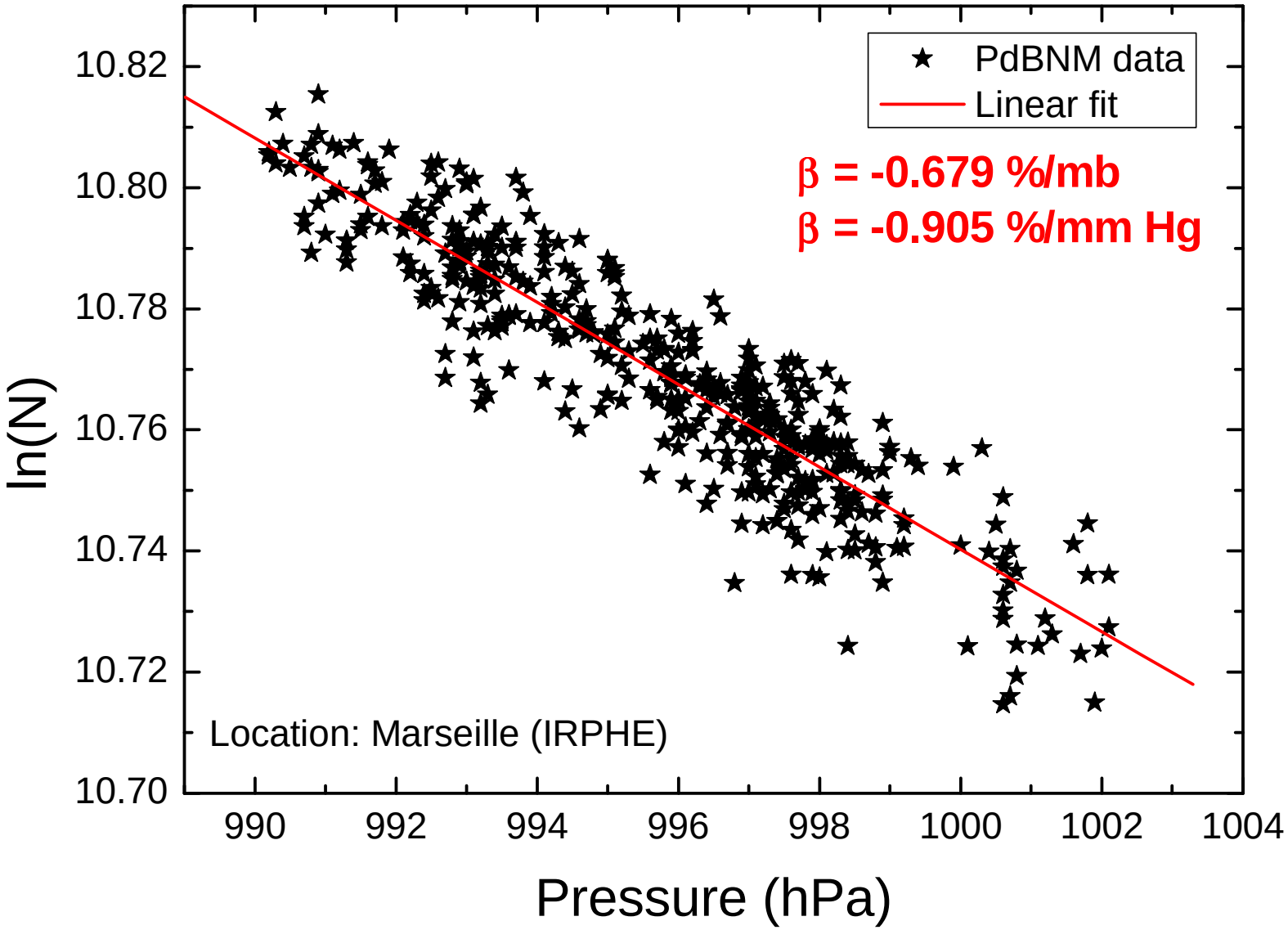
```
**************************************************;;;;;;;
Plateau;de;Bure;Neutron;Monitor;Intermediate;Date;File
**************************************************;;;;;;;
Starting;Date;and;Time;:;11/07/2007;14:00:00;

0;11/07/2007;14:01:00;306;306;287;;
1;11/07/2007;14:02:00;275;310;261;;
2;11/07/2007;14:03:00;272;284;283;;
3;11/07/2007;14:04:00;237;258;236;;
4;11/07/2007;14:05:00;228;279;237;;
5;11/07/2007;14:06:00;231;310;232;;
6;11/07/2007;14:07:00;271;303;234;;
7;11/07/2007;14:08:00;245;298;265;;
8;11/07/2007;14:09:00;275;279;250;;
9;11/07/2007;14:10:00;228;283;239;;
10;11/07/2007;14:11:00;280;332;265;;
11;11/07/2007;14:12:00;289;259;258;;
12;11/07/2007;14:13:00;253;252;251;;
13;11/07/2007;14:14:00;210;270;224;;
14;11/07/2007;14:15:00;234;276;254;;
15;11/07/2007;14:16:00;225;257;245;;
16;11/07/2007;14:17:00;251;275;216;;
17;11/07/2007;14:18:00;268;277;244;;
18;11/07/2007;14:19:00;275;259;235;;
19;11/07/2007;14:20:00;264;287;270;;
20;11/07/2007;14:21:00;223;256;268;;
21;11/07/2007;14:22:00;243;287;251;;
22;11/07/2007;14:23:00;261;290;263;;
23;11/07/2007;14:24:00;254;269;249;;
```

Determination of the barometric coefficient

Data from July 24 2007 4 p.m. to August 12 2007 6 a.m. (local time)



Determination of the barometric coefficient



First data corrected

Data from July 24 2007 4 p.m. to August 12 2007 6 a.m. (local time)