N.A.Morozov

Review of the visit to the SACM (Saclay) laboratory

Dubna, 28-29 October 2004

Visit to SACM (Saclay)

1. Presentation and discussion of the Magnets TDR part

F.Kircher O.Napoly O.Delferriere D.De Menezes P.Vernin J.P.Lottin	SACM
O.Chubar	SOLEIL

Remarks and suggestions

- As a whole the project looks well
- To provide the calculation of the magnet mechanical stiffness
- To determine the required number of the magnetic field maps for the B*L interpolation in intermediate energy points with the accuracy 20 ppm
- The hysteresis effects reduction
  - The magnet with laminated core (more expensive)
  - The influence of saturated corners
  - SC approximation

My idea: to realize a set of experiments on studying the hystersis by small model magnet

Future remarks and suggestions will be possible from Saclay after more detail studying of the TDR

SC magnet without iron core

F.Kircher – it's better to forget
P.Vernin - to consider the SC opportunity to remove the hysteresis effects
J.P.Lottin - to consider the SC opportunity as alternative assumption will be helpful for the warm concept

F.Kircher – the SACM has a huge list of work:
HI linear accelerators, TTF prototype, SC cavities, LHC SC quadrupoles, ATLAS, CMS, SC solenoid for TJNAF, LAD for GSI, SC coils for Wendelstein 7-X stellarator for Greifswald, 11.7 T SC magnet for Neurospin.

In the nearest two years there'll not be the interest to the deep participation in our spectrometer project.

Ready to realize expertise, consultations, discussions etc.

Laboratory of the magnetic measurements for SOLEIL

Quadrupole magnets:

- **Rotating coils**

Dipole magnets:

- **Set of Hall probes ($\Delta\int Bdl/\int Bdl \sim 1\times10^{-3}$)**
- **Moving wire ($\Delta\int Bdl/\int Bdl \sim 5\times10^{-4}$)**

  Problems:

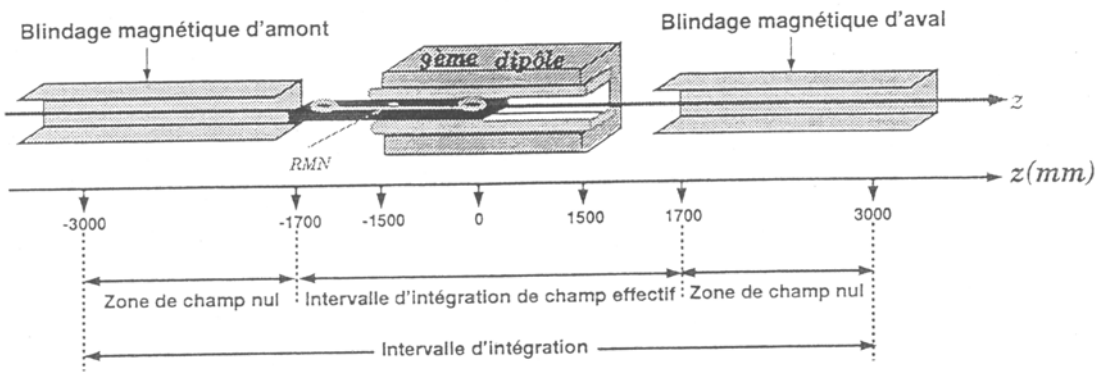
  - **Synchronization movement of the wire ends**
  - **Exiting of the wire vibration**
  - **Wire tension**

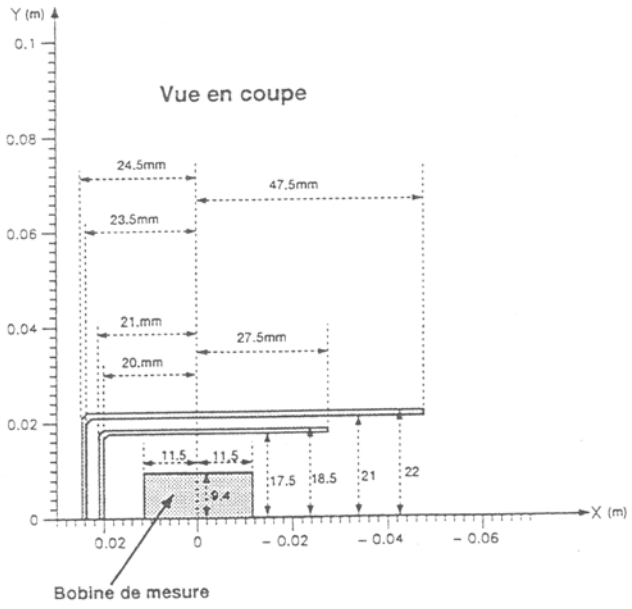
The accuracy may be raised to ($\Delta\int Bdl/\int Bdl \sim 5\times10^{-5}$) by application of the 10-turns wire.

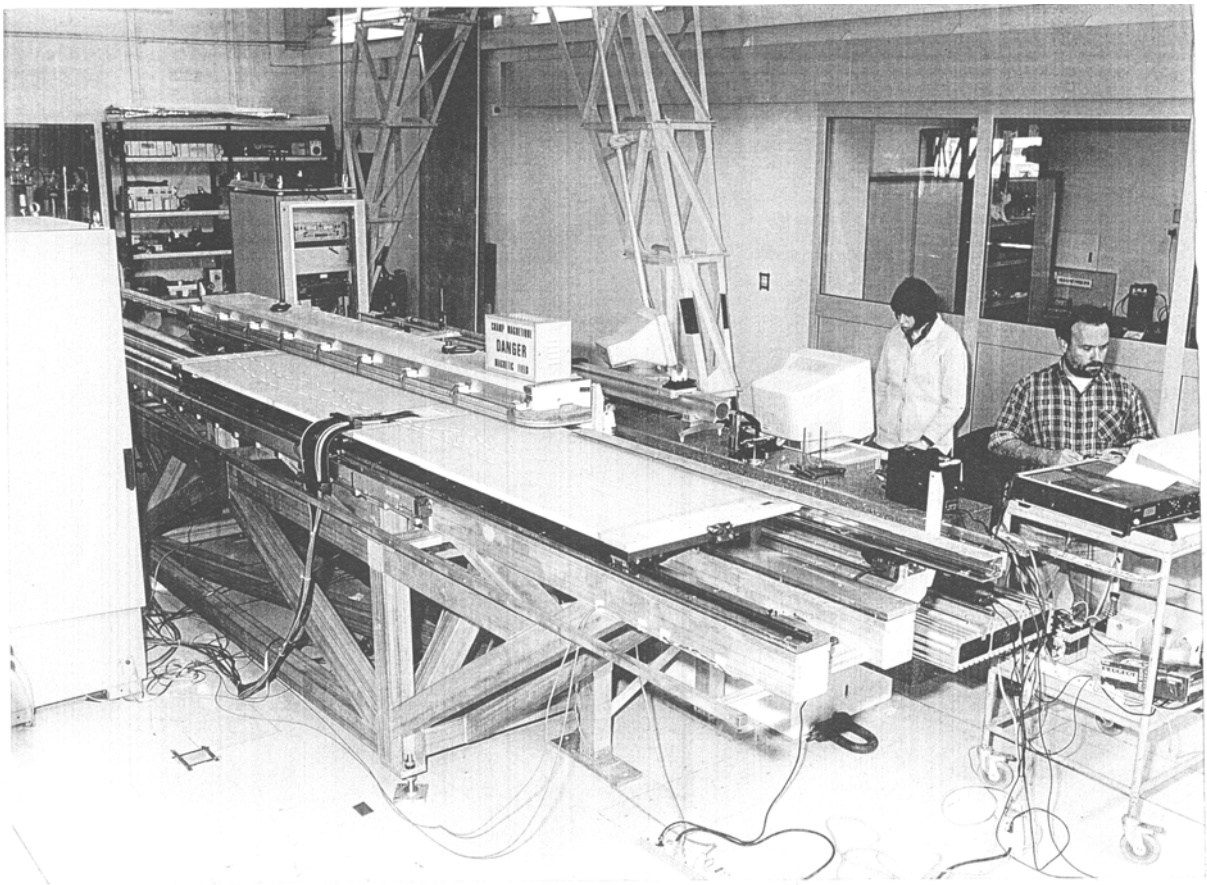
In laboratory conditions the method requires great experience and exact tuning. In situ under routine operation the realization may be problematic.

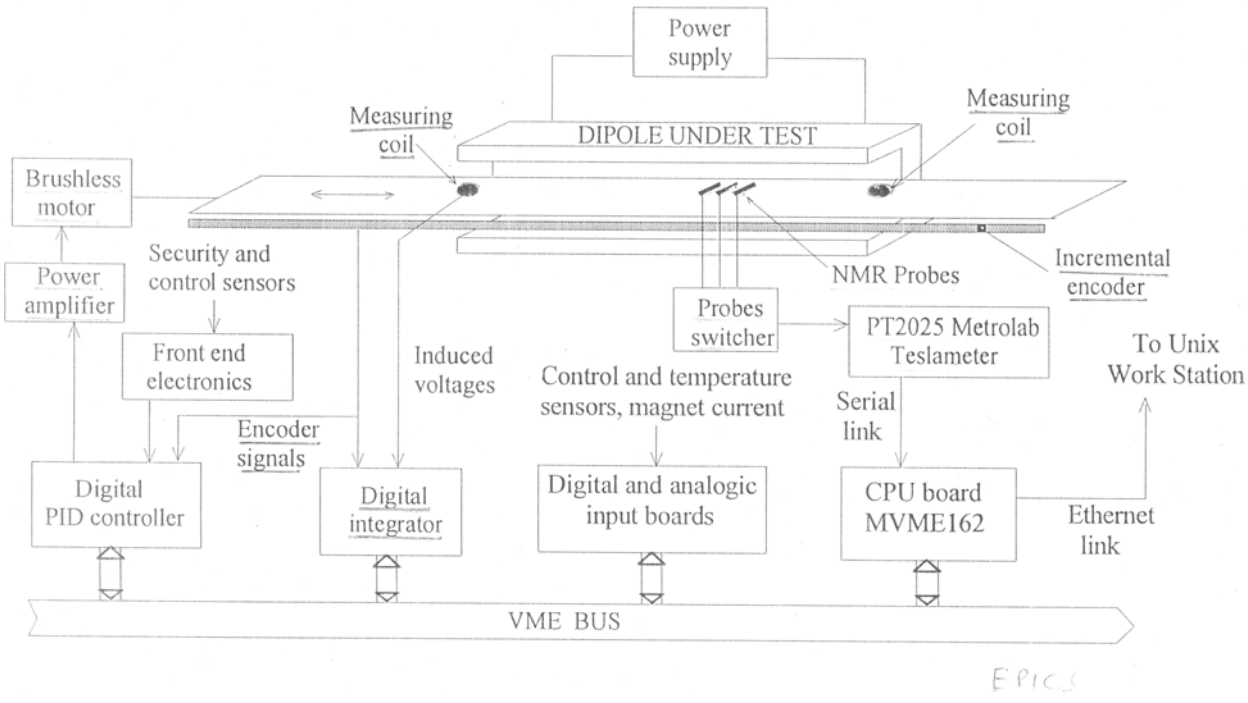
The Novosibirsk team very experienced in this method

Two search coils method






DANGER


Power supply
Measuring coil
DIPOLE UNDER TEST
Measuring coil
Brushless motor
Power amplifier
Security and control sensors
Front end electronics
Encoder signals
Induced voltages
NMR Probes
Incremental encoder
Probes switcher
PT2025 Metrolab Teslameter
To Unix Work Station
Control and temperature sensors, magnet current
Serial link
Digital PID controller
Digital integrator
Digital and analogic input boards
CPU board MVME162
Ethernet link
VME BUS
EPICS

Mesure absolue de l'intégrale de champ magnétique

$$\int B.dl = B_0.L - \frac{v}{s}\iint V\,dt^2$$

- $\frac{\Delta L}{L} = 10^{-5}$ (30µm sur 3m)

$$\frac{\Delta B_0}{B_0} = 10^{-5} \quad (RMN)$$

$$\frac{v}{s}\iint V\,dt^2 \simeq 10^{-3} \text{ (signal de sortie)}$$

↳ erreur sur l'estimation de L

↓

erreur de 10^{-5} sur $\int B.dl$

Finalement,

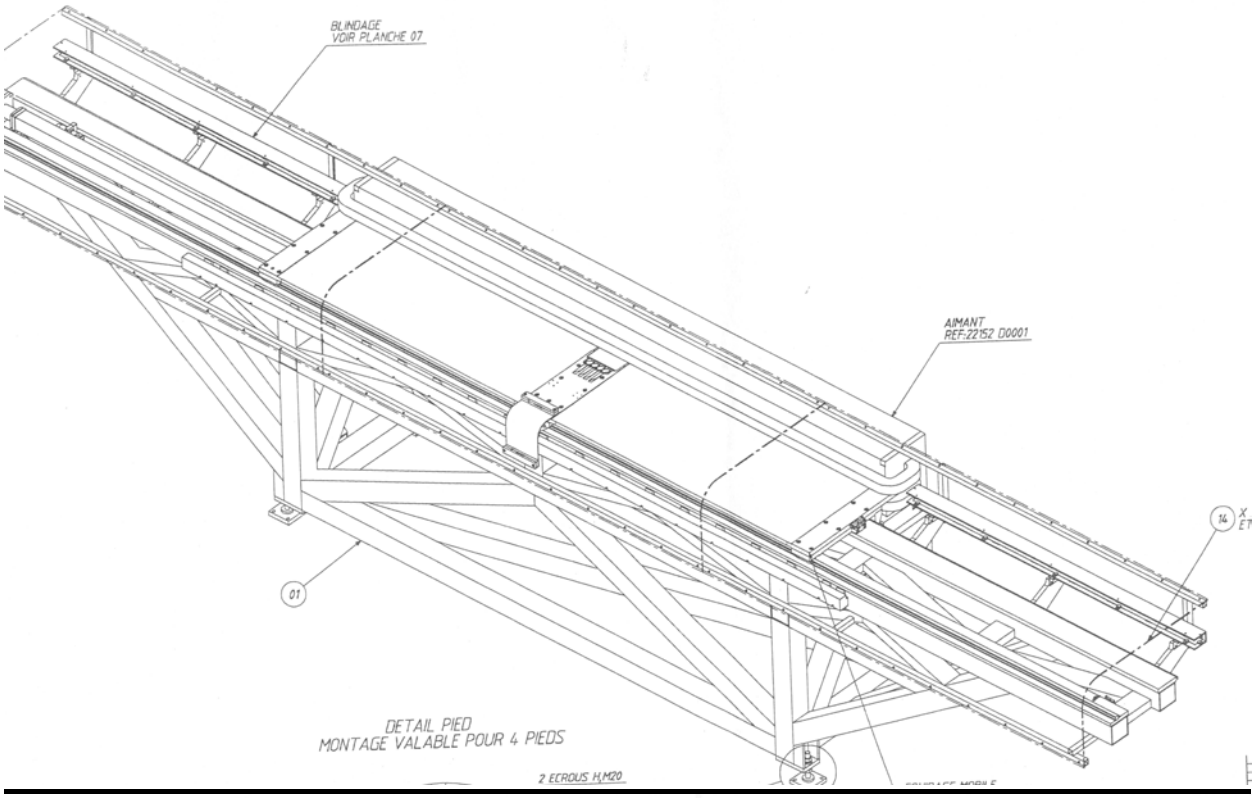
$$\frac{\Delta \int B.dl}{\int B.dl} = 2.10^{-5}$$

PROJET CEBAF ARC (2)

RESULTATS

Date	Machine (MeV)	ARC (MeV)	e,p (MeV)
May 29, 99	3362	3355.1 ± 0.7	3355.0 ± 0.7

$\Rightarrow$ **Recalibration de la machine pour se caler sur nos mesures**


BLINDAGE
VOIR PLANCHE 07
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01
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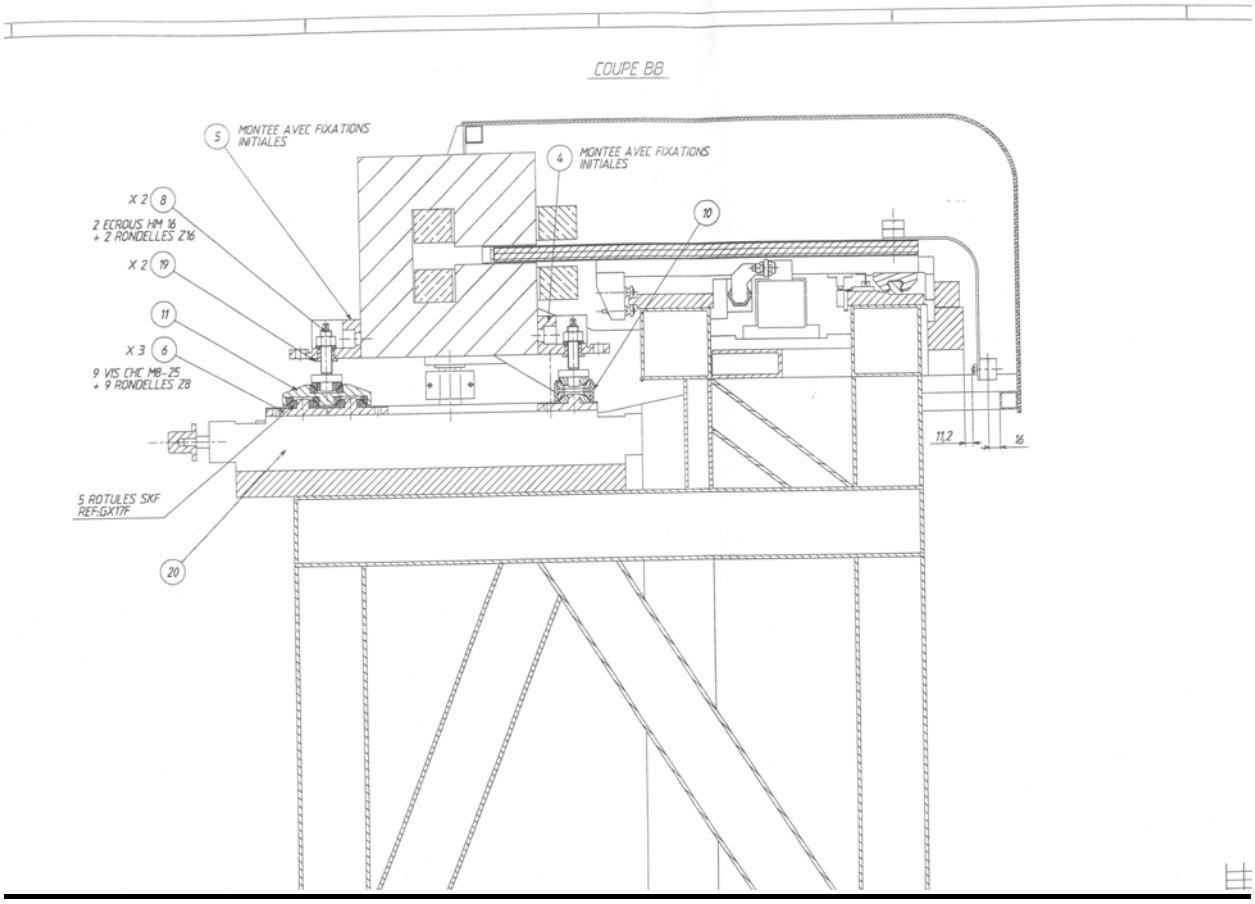
MONTAGE VALABLE POUR 4 PIEDS
2 ECROUS H.M20


COUPE BB
5
MONTEE AVEC FIXATIONS
INITIALES
4
MONTEE AVEC FIXATIONS
INITIALES
X 2
8
2 ECROUS HM 16
+ 2 RONDELLES Z16
X 2
19
11
X 3
6
9 VIS CHC M8-25
+ 9 RONDELLES Z8
10
11,2
16
5 ROTULES SKF
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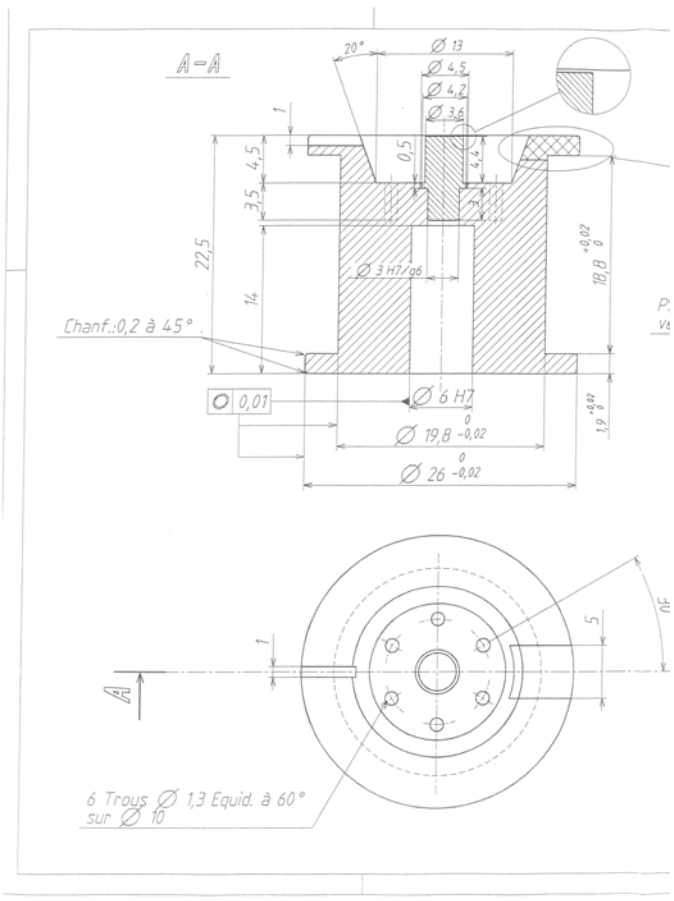
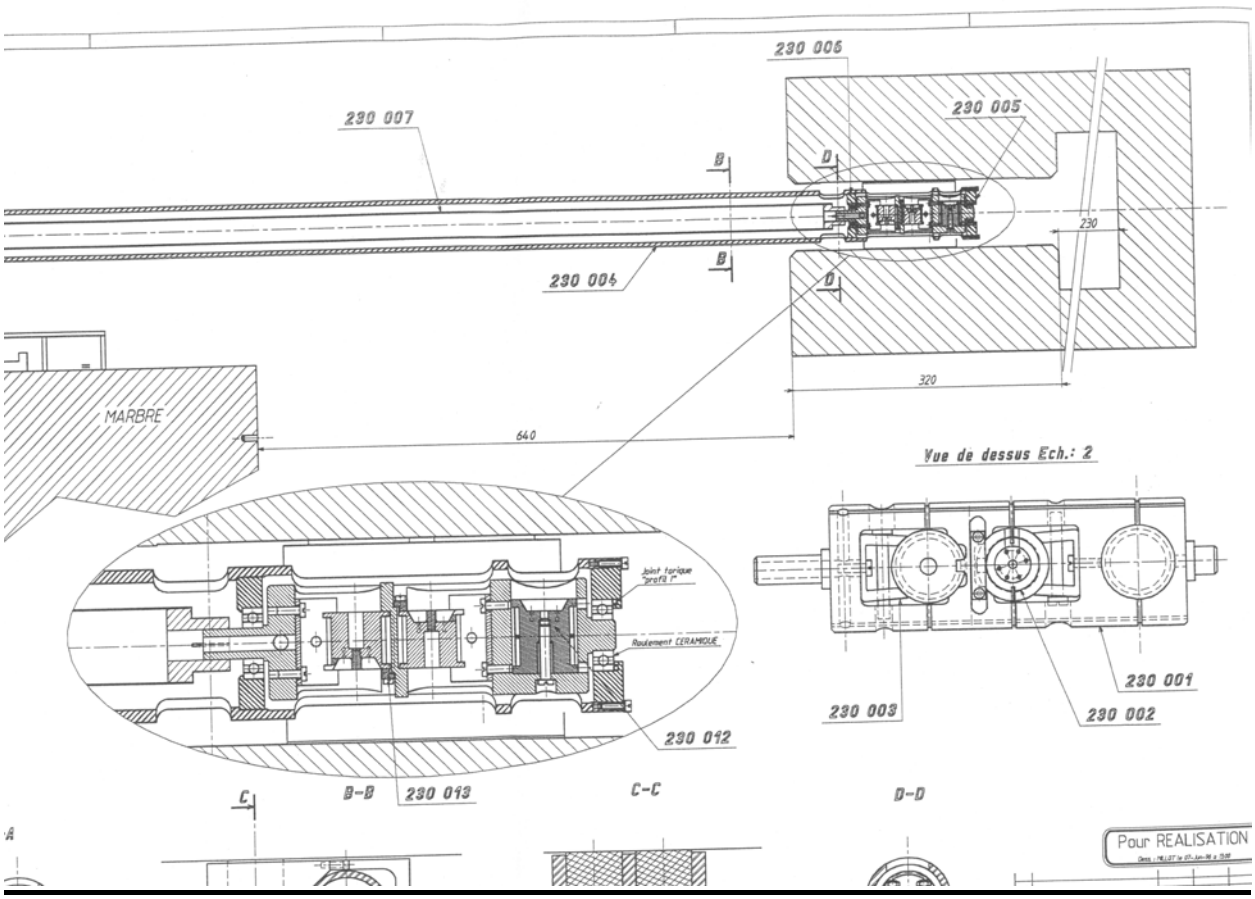
20


A-A
20°
Ø 13
Ø 4,5
Ø 4,2
Ø 3,6
1
0,5
4,4
4,5
3,5
22,5
14
Ø 3 H7/g6
18,8 +0,02 0
Chanf.:0,2 à 45°
0,01
Ø 6 H7 0
Ø 19,8 -0,02 0
Ø 26 -0,02
1,9 +0,02 0
5
nF
A
6 Trous Ø 1,3 Equid. à 60° sur Ø 10


230 006
230 007
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320
MARBRE
640
Vue de dessus Ech.: 2
Joint torique profil "I"
Roulement CERAMIQUE
230 012
230 001
230 003
230 002
B-B
230 013
C-C
D-D
C
Pour REALISATION

It has been studied 6 volumes of documents, 1 volume of drawings, the most important ones were copied.

The cost of the 2 search coils project (1995-96, without the personnel salary) – 120 k$.

The measurement arm for the coils calibration was found. It was promised to ship it in to Dubna.

The consultations on this method are possible. If we need P.Vernin is ready to take part as the 2 search coils expert in the nearest spectrometer workshop.

The proposal:

To realize comparison of two methods (2 search coils and NMR+Hall) at the CEBAF dipole magnet (L=3 m, pole gap = 25.4 mm).