BEAM POSITION MONITOR

(Drawing No. MPS 1A 23-000-3)

This monitor is a prototype to be tried out on the 50 MeV transfer line just up-stream the bending magnet IBH2.

The monitor, as presented in the drawing, can indicate the position of the proton beam along the horizontal axis only. To measure the beam position in two ordinates, two monitors are needed, the pick-up loop of the second one being turned 90^{o} around the long axis.

In principle, the monitor consists of a ferrite window frame with a copper strap pick-up loop inside the frame and a pulse current transformer. In addition to that the assembly features a support-plate with alignment and transport facilities, a shielding cover and a vacuum chamber in glass or ceramic.

A. SPECIFICATION

1. The ferrite window frame is to be made of eight blocks 130x200x28 mm, so that they form a square window opening of 172 mm, 260 mm long.

2. The pick-up loop can be made of a commercial quality copper sheet. The criterion for sheet thickness is mechanical rigidity.

3. Between the copper of the pick-up loop and the ferrite no insulation is needed.

4. The vacuum tube inside the pick-up loop has to be made of an insulating material.

5. The dimensional tolerances are:

   parallelism of ferrite frame ± 0.2 mm,
   parallelism of pick-up loop walls ± 0.25 mm.

6. Positioning tolerances from the theor. beam axis are:

   - in the horizontal sense ± 0.25 mm,
   - in the vertical sense not important,
   - tilt to the horizontal plane in beam axis ± 0.5 mrad,
   - tilt to the vertical plane in beam axis ± 0.5 mrad,
   - rotation around the beam axis ± 0.25 mrad,
   - long-term positional stability ± 0.2 mm in all co-ordinates.

This specification has been given by T.R. Sherwood.

B. CONSTRUCTION

The ferrite window with the pick-up loop and the transformer is one mechanical unit. The window frame is glued together with an araldite that hardens at ambient temperature. The pick-up loop, together with the transformer, can be taken, again as a unit, out of the window frame being only fixed by screws to the two vetronite blocks glued on the ferrite. The transformer, on the contrary, has to be detached from the pick-up loop by unsoldering the thin copper strip which is closing the loop.

The vacuum chamber is a glass tube with covar rings fused in. On the down-stream end there is a bellows with a standard conical flange, whereas the up-stream end is provided with a dismountable flying flange, thus making it possible to build in the tube without welding during assembly.

The ferrite window is sitting freely on the base plate. The radial position of the window is insured by pushing the window with spring washers against a fixed stop bar. On the base plate there is a column which carries two Taylor-Hobson spheres and a lifting hook. The vacuum tube is supported on two front plates bolted on the base plate. The front plates can be split horizontally in two halves for assembly reasons. The base plate with the front plates and a U-shaped cover, all in mild steel, are forming a box which is protecting the monitor against stray el. and magnetic fields. There are no special contacts except between the vacuum chamber and the front plates.

C. ASSEMBLY

Taken as starting situation:

- ferrite body fully equipped,
- base plate equipped, but without front plates and cover,

- vacuum tube without flying flange.

The assembly is to be done in the following order:

1. The ferrite body is put on the base plate and pushed against the stop-bar as indicated on the drawing.

2. Put the two Taylor-Hobson spheres in position as indicated on the assembly drawing within required tolerances by machining the shimms foreseen for this purpose. The reference surfaces are the top surface and the vertical outside surface of the ferrite frame.

3. Insert the vacuum tube without the flying flange and bolt on both front plates.

4. Put on the flying flange with the retaining ring.

5. Connect the coaxial cable coming from the transformer to the chassis feed-through.

The assembly is transported and fixed to the quadrupole support in the transfer line with the cover on, but it is aligned with the cover off because the top surface of the ferrite frame has to be put into horizontal plane (spirit level) before the Taylor-Hobson spheres are aligned into the sighting axis of the line.

It is important to have a flexible element (drawing 1A16-003-3) between the up-stream flange and the rest of the transfer line. With this element the total built in length of the assembly is 600 mm nominal.

C. COST AND TIME

The cost of the hardware, including machining material and assembly time, is about SFr. 3600.-. Not included in this price is the cost of the ferrite plates and the transformer.

The drawing effort amounts to 11 man-days.

The production time is 2 weeks; this does not include the 4 weeks delivery time for the glass tube.

E. Boltezar

Distribution

T.R. Sherwood
MD files

Coupe „A-A"

Sighting axis

B

200

D

172 +0,0 −0,15 ferite

163,5 ±0,25

4

copper

copper thickness

Tighten these screws so that the spring washers ϕ 6,2/12,5×0,7 are ~50% compressed

E

ϕ150 in copper

550 ±0,2

114

140

100

15

100

20

D

B

160

410

294

30

330

142

ϕ ferite

Proton Beam

Faisceau

4 vis inbus M12×60
avec écrou + rond. + rond. ress.
2 goupille cyl. ϕ 8×30

Coupe „E-E"
sans tube ϕ140

A

Taylor-Hobson Sphere

To be ajusted with shimms measuring from the ferite frame

~200

~200

1A23-400-3

487

260 ferite

40

Glass chamber

1A23-300-2

1A23-100-3

1A23-500-3

Faisceau

Proton Beam

ϕ120/113

E

C

C

23

A

ϕ plate

ϕ ferite

ϕ18
goes on quadr. support
SI 3,20.1019,1B

300

120

120

30

130

130

30

320

Coupe „C-C"
Ech: 1:10

Coupe „D-D"

Pulse Current Transf. Model 110, 0.1 V/A
Pearsons Electronics, Inc, Palo Alto U.S.A.

BNC 50Ω
chassis feed-through

ϕ195
3A81-104-3 Pos.1

ϕ195

1A23_312_4

Vis inbus M5×12 + rond.

Vis inbus M8×80 + écrou + rond. + rond. ress.

Poids : ~120 kp

Mod.A: Changé chambre à vide 1A23_200_3 par chambre en verre 1A23_500_3 – Le 29.4.1973 – FERIGOULE

NOMBRE DE PIÈCES	DÉSIGNATION	POS.	MATIÈRE	OBSERVATIONS			
	Prototype			ECHELLE 1:5 (1:10)	DESSINÉ	4.73.	BoHezar
	Beam Position Monitor Indicateur de position du faisceau				CONTROLÉ	2.5.1973	FÉRIGOULE
					VU		
					REMPLACE		
					REMPLACÉ PAR		
					RÉDUCTION		

CERN ORGANISATION EUROPÉENNE POUR LA RECHERCHE NUCLÉAIRE - GENÈVE

M.P.S. 1A23-000-3A