ANL-HEP-TR--93-14

DE93 009987

SDC
SOLENOIDAL DETECTOR NOTES

Precision of Source Response Inside Dimpled HAD Brass Tubes

D. Jankowski and R. Stanek
High Energy Physics Division
Argonne National Laboratory, Argonne, Illinois 60439

22 February 1993

SDC-93-453
ANL-HEP-TR-93-14

Precision of Source Response Inside Dimpled HAD Brass Tubes

D. Jankowski and R. Stanek
Argonne National Laboratory
9700 S. Cass Ave.
Argonne, Il 60439

1 Abstract

We have measured the variation in response of the ^{137}Cs source as positioned in 10 samples of the brass source tubes, dimpled at ± 5 cm from the center of a scintillator tile. We find an RMS in the signals of 2.5%.

2 Introduction

In the ANL design for the cast Pb EMC of the BCAL[1], the source tubes in the iron part of the module are situated in square brass tubes fitted into machined slots in the iron absorber plates. The purpose of these brass tubes are to keep Pb from flowing around the stainless steel source tube during casting. These brass tubes are 4.76 mm on a side, and the SS source tube is 1.8 mm ϕ. In order to fix the position of the SS tube inside the brass tube, a set of four dimples around were pressed to constrain the SS tube to the center of the brass tube.

The dimples allowed passage of a tube of 2.1 mm ϕ, and original measurements on pieces having dimple-set spacing of 38 cm showed reproducibility of 10%. The dimple-set spacing was then made so that the separation was 5 cm to either side of the scintillator center.

[1]SDC Technical Proposal. SDC-92-201

Work supported by the U.S. Department of Energy, Division of High Energy Physics, Contract W-31-109-ENG-38.

We report on the variation of the scintillator response as a SS source tube is varied in position inside a sample of ten of these dimpled brass tubes.

3 Description of Measurement

Figure 1 shows a diagram of the test setup[2]. Two pieces of brass were glued to a piece of G-10 such that a channel of 4.76 mm □ was formed. The brass tubes had 4 sets of dimples: at ±5 cm from the center and at ±38 cm from the center. There were 10 samples of these brass tubes measured.

A sample brass tube was pressed into the channel, and the assembly lowered and centered onto a piece of 10cm x 10cm x 2.5mm Kuraray SCSN-81. A SS source tube was guided through the brass tube. A series of source scans were done, each by rotating the source tube inside the brass by 90°. We assume this might be comparable to random insertion of the SS tubes during module construction. Five angular scans for each of the ten sample source tubes were performed.

4 Results

Figure 2a shows the results of the 50 measurements made. Figure 2b shows the angular dependence for each of the 10 brass tubes measured. It is apparent there is a slight bow in the SS tube used. Figure 2c shows the tube-tube variation for each of the angular measurements. There appear to be two types of tubes produced: the jig for pressing dimple depth is not at all precision.

5 Conclusion

With the present technique of putting a source tube inside a brass tube, we can expect the tile to tile response to be no better than 2.5% RMS. Part of this variation may be due to imprecise depths of the dimples in the brass tubes.

[2]See also SDC note SDC-92-350

Figure Captions

Figure 1. A sketch showing the brass tube embedded in an absorber positioned over a scintillator tile.

Figure 2(a). The distribution of the ten brass tube and five angular position measurements. The hotizontal scale is ADC counts. The RMS is 2.5%.

(b). The angular dependence of the SS tube within the ten brass tubes. The vertical scale is ADC counts and the horizontal scale is degrees.

(c). The variation amongst brass tubes. The vertical scale is ADC counts and the horizontal scale is an arbitrary brass tube number. Tubes 2-5 seem to be made differently than the others.

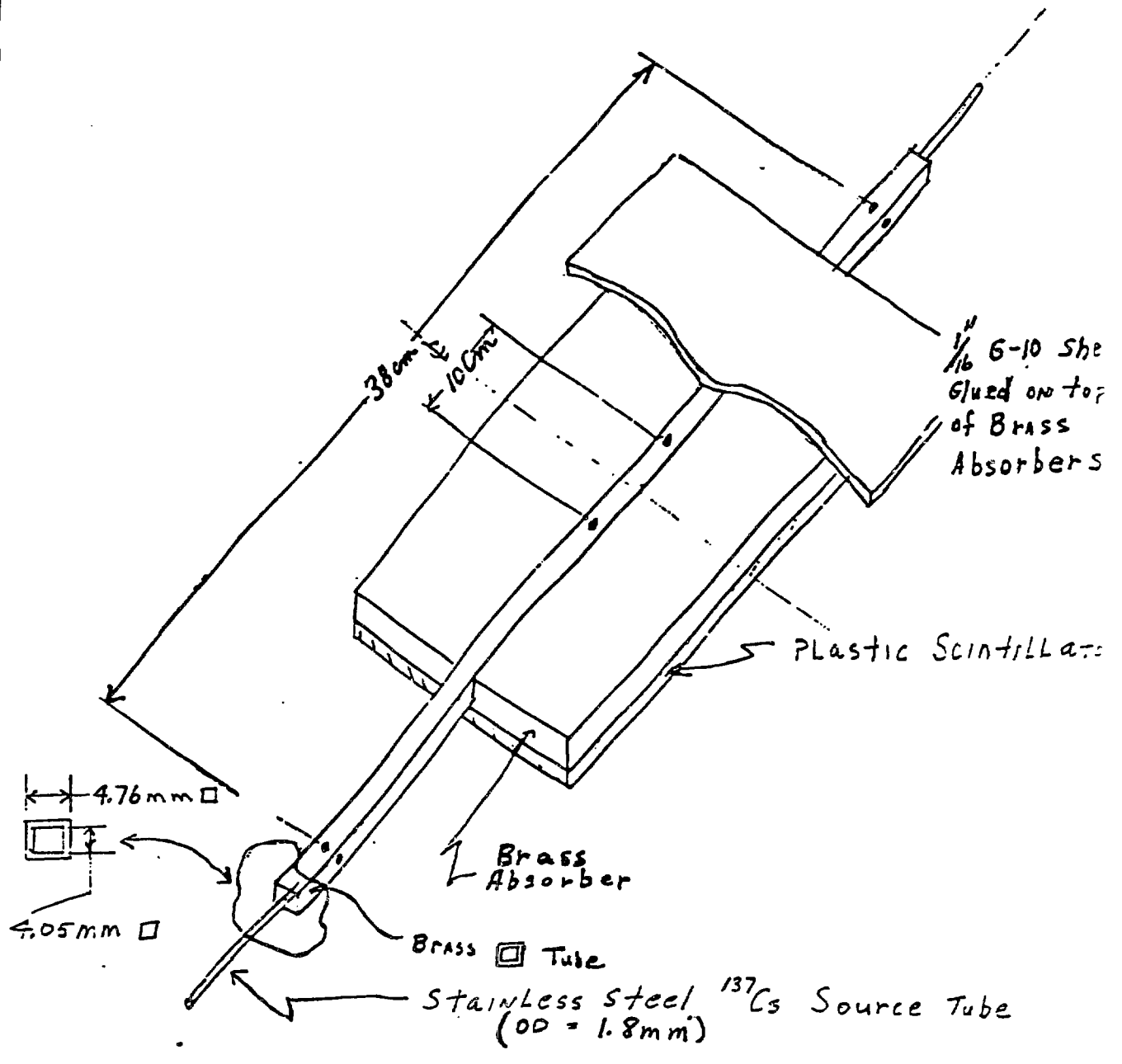
38cm
10cm
1/16" G-10 Sheet Glued on top of Brass Absorbers
Plastic Scintillator
4.76mm
4.05mm
Brass Absorber
Brass Tube
Stainless Steel ^{137}Cs Source Tube (OD = 1.8mm)

Fig. 1

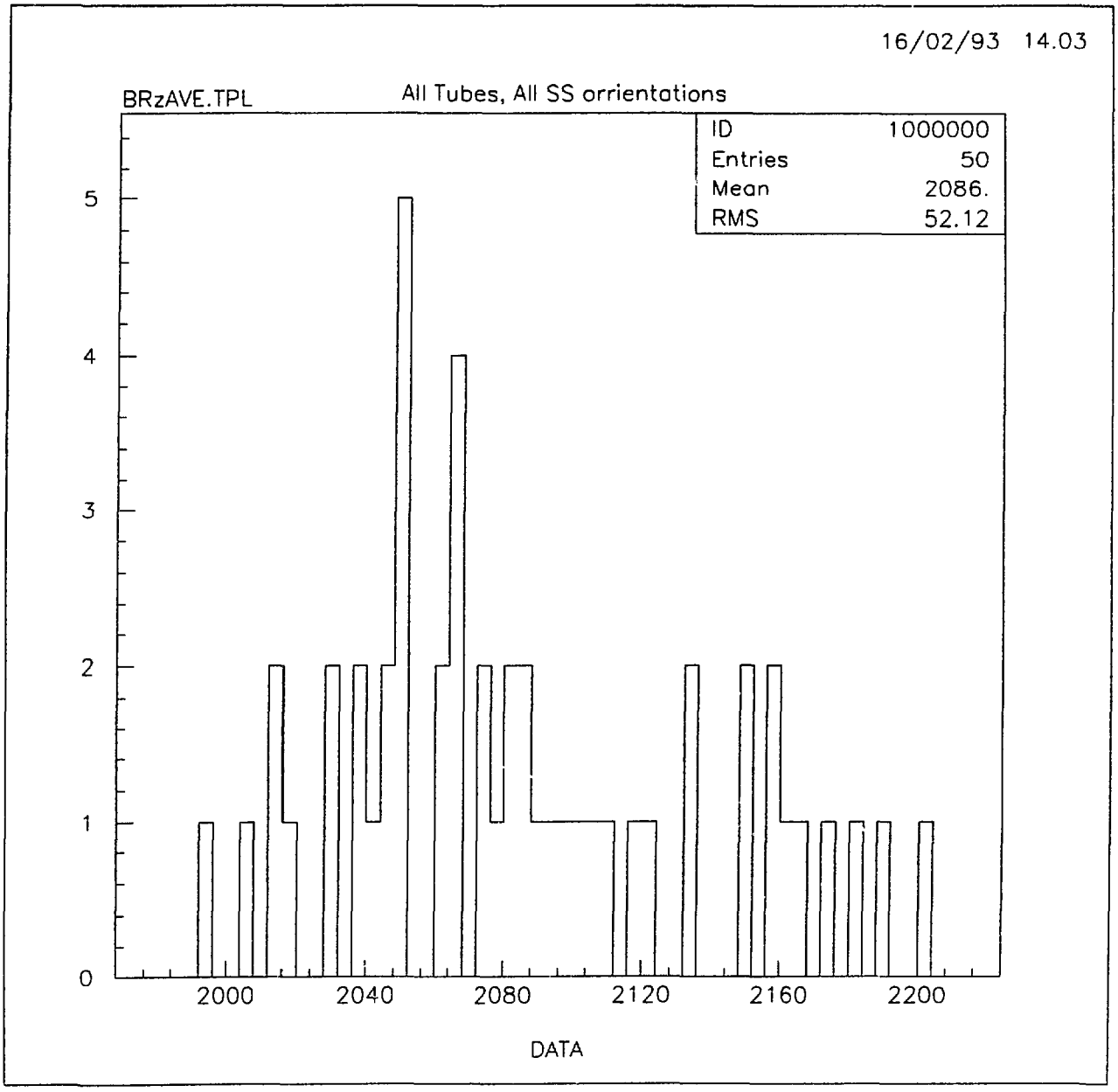
16/02/93 14.03
BRzAVE.TPL
All Tubes, All SS orrientations
ID 1000000
Entries 50
Mean 2086.
RMS 52.12
0
1
2
3
4
5
2000
2040
2080
2120
2160
2200
DATA

Fig. 2a

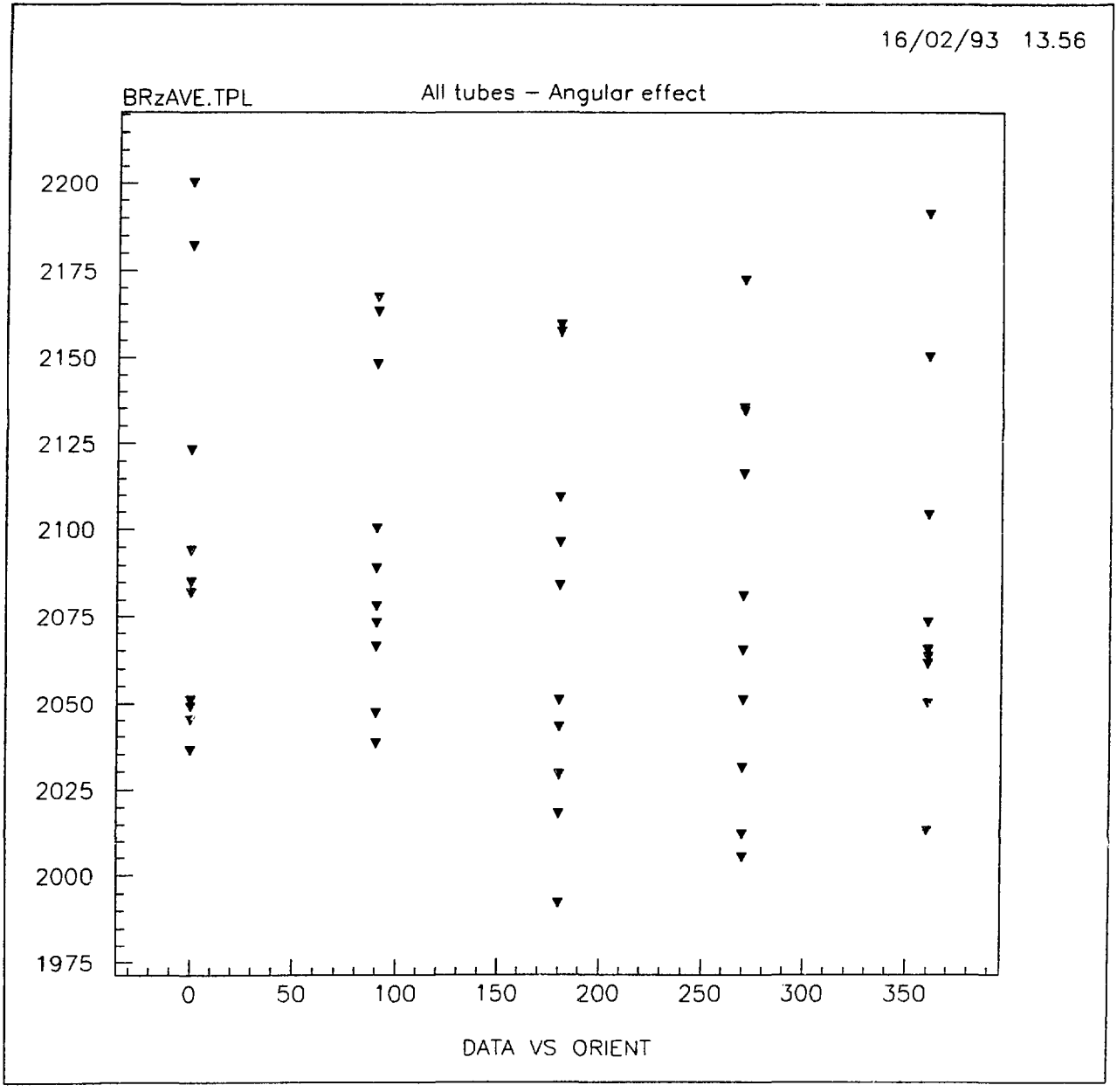
16/02/93 13.56
BRzAVE.TPL
All tubes – Angular effect
2200
2175
2150
2125
2100
2075
2050
2025
2000
1975
0
50
100
150
200
250
300
350
DATA VS ORIENT

Fig. 2b

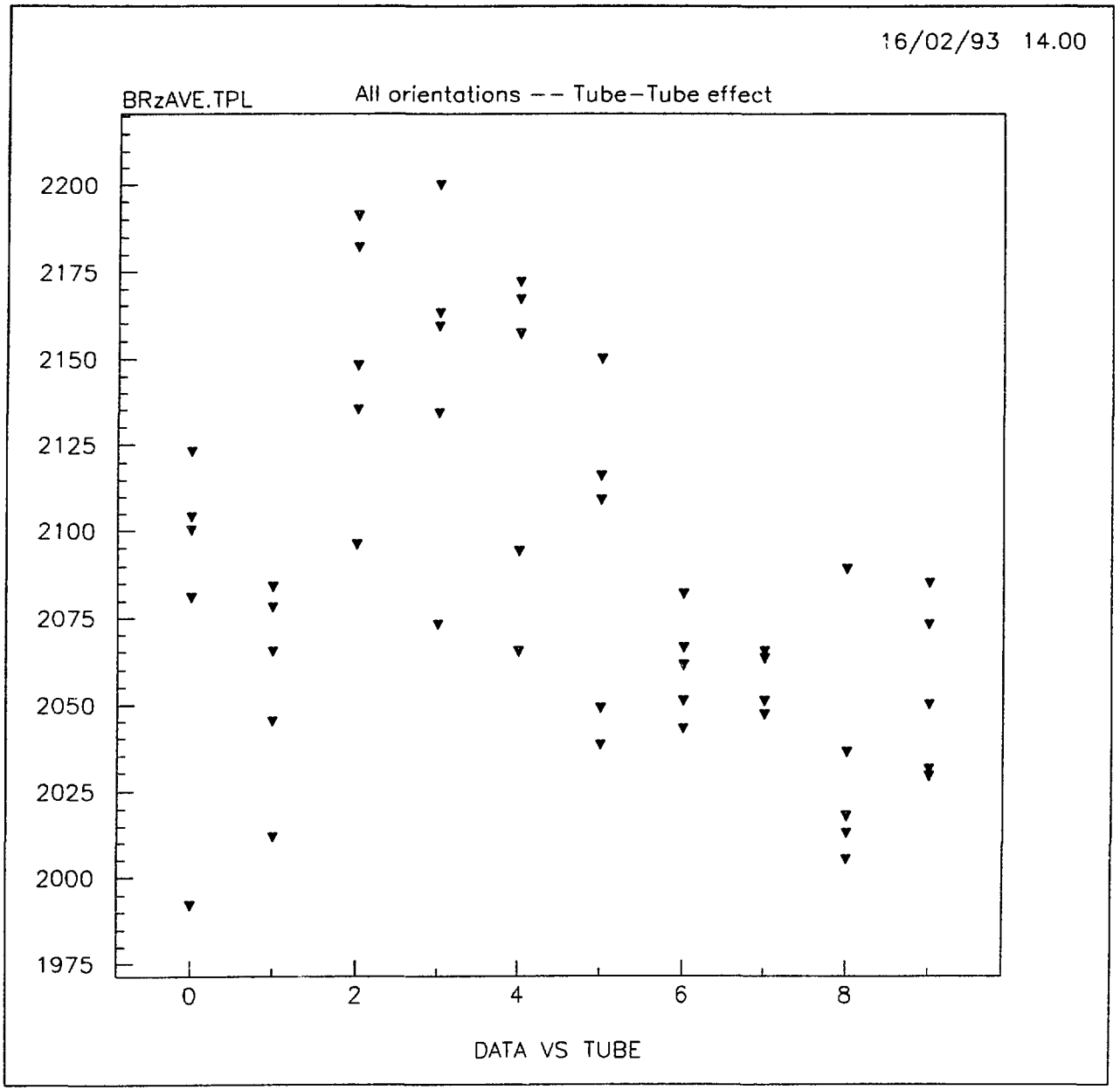
16/02/93 14.00
BRzAVE.TPL
All orientations -- Tube-Tube effect
2200
2175
2150
2125
2100
2075
2050
2025
2000
1975
0
2
4
6
8
DATA VS TUBE

Fig. 2c