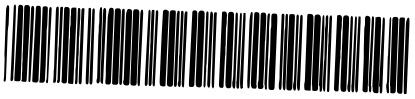

E-6

ISR-ES/KP/1p 5.5.1975

ISR PERFORMANCE REPORT

Run 587 Ring 1, 15 GeV/c TW

"LUMS" at 15 GeV/c with Terwilliger Scheme

Aim

To measure the vertical beam displacements given by "LUMS" with the Terwilliger scheme at 15 GeV/c. Thus allowing a comparison to be made with the recent results at 26 GeV/c[1].

Conclusions

The displacements as measured by the scrapers in intersections I5 and I7 show an appreciable scatter at this energy. However, a straight line fit to the errors, measured while displacing the beam in a manner typical of a luminosity calibration, has a slope of -0.2% in I7 and -0.8% in I5. The negative signs indicating that the measured displacements were smaller than intended. These numbers have to be compared with +1.2% measured in I7 at 26 GeV/c. The apparent energy dependent effect is important for measurements of the total p-p cross section and further measurements are needed to confirm it.

Measurements and Results

The technique used was the same as at 26 GeV/c. The main field was reduced to give 15.183 GeV/c on central orbit thus allowing in-

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1) *ISR Performance Report "Measurement of "LUMS" bumps with Terwilliger scheme - K. Potter 2.4.75.*

jection directly onto the Terwilliger scheme at an average orbit of -20.5 mm. After injection optimisation the Q values were measured at central orbit and Q-shifts of ΔQ_H = + 0.005 and ΔQ_V = + 0.005 applied to obtain the standard values (Q_H= 8.635 Q_V= 8.628).

The program LUMS was used to move the Ring 1 beam in I7 to +3 mm. The vertical beam position was measured with the scrapers using program "PROB" and similarly for displacements of 1 mm from + 3 to - 3 mm. The results are given in Table I and the error $Z_m - Z$ shown plotted as a function of Z in fig. 1a. A straight line fit to the errors has a slope of -0.2%. The scatter of the points is larger than observed at 26 GeV/c but this is to be expected at least as far as power supply setting errors are concerned. However, it should be noted that a fit with the +3 mm measurement neglected gives a slope of +0.2%. The power supply currents as read by XCLOG do not explain this apparently inconsistent point.

The same measurement was repeated in Intersection 5 and the results are presented in the same fashion in Table II and figure 1b. In this case the fitted line has a slope of -0.8% or again neglecting the +3 mm point -0.4%. In this case examination of the magnet currents shows a remarkable similarity between the scatter in the measured beam position and the setting errors of magnet IH549 which had offsets of up to 0.09% in current (allowed by LUMS) equivalent to 0.013 mm in beam position.

The scatter of the points in this measurement is such that it may be misleading to attribute an average error to the LUMS displacements, however, they do not seem compatible with the result of +1.2% measured at 26 GeV/c. As any energy dependent errors are extremely important in the light of rising total cross-sections, further measurements are obviously required.

K. M. Potter

TABLE I

I7	Posn set by LUMS Z (mm)	Scraper Meas. Z_m (mm)	$Z_m - Z$ (mm)
	+ 3	1.320	- 1.680
	+ 2	0.350	- 1.650
	+ 1	- 0.644	- 1.644
	0	- 1.643	- 1.643
	- 1	- 2.659	- 1.659
	- 2	- 3.650	- 1.650
	- 3	- 4.657	- 1.657

TABLE II

I5	Posn set by LUMS Z (mm)	Scraper Meas. Z_m (mm)	$Z_m - Z$ (mm)
	+ 3	1.309	- 169.1
	+ 2	0.348	- 165.2
	+ 1	- 0.643	- 164.3
	0	- 1.618	- 161.8
	- 1	- 2.641	- 164.1
	- 2	- 3.623	- 162.3
	- 3	- 4.633	- 163.3

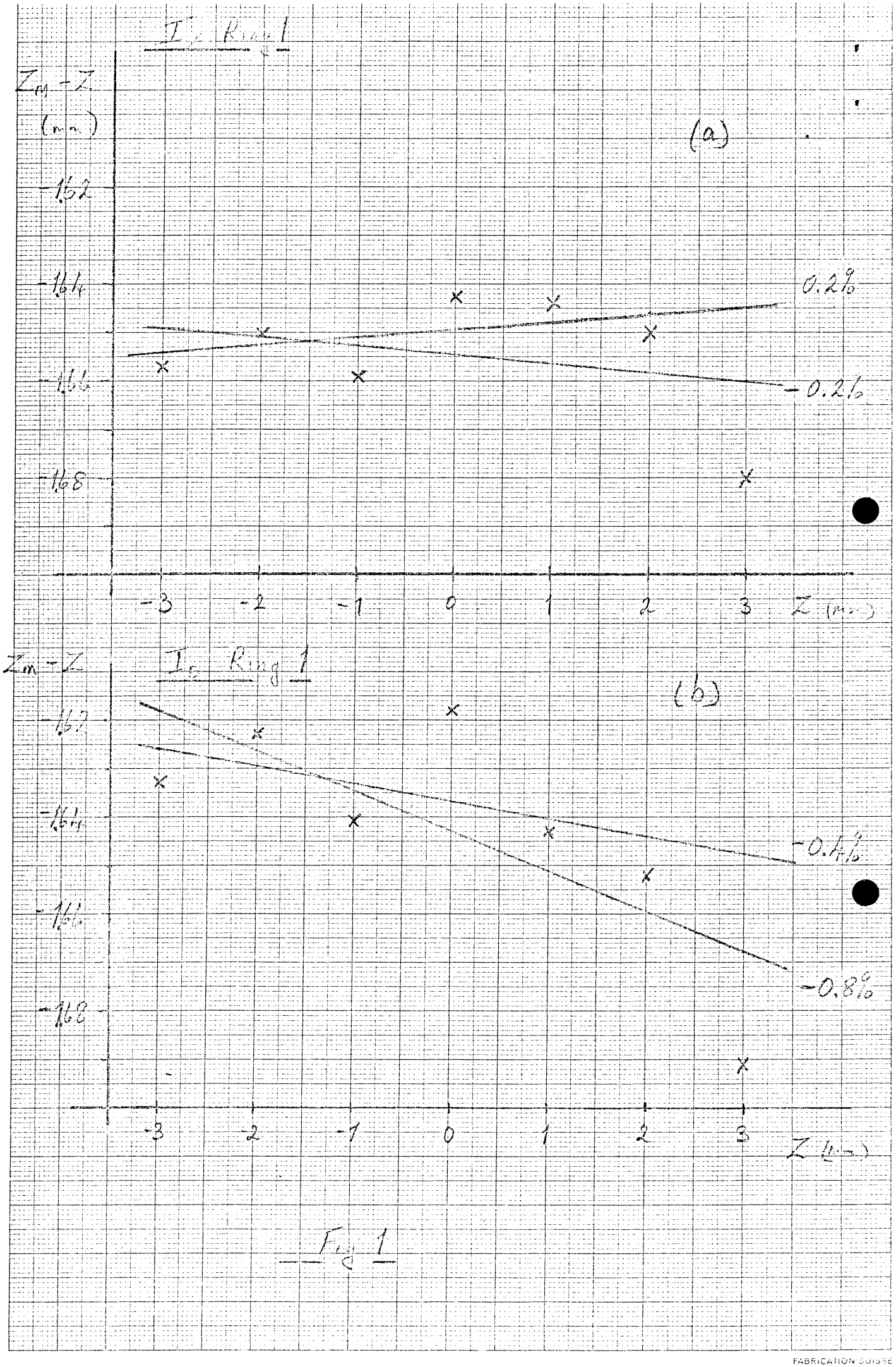

Fig 1