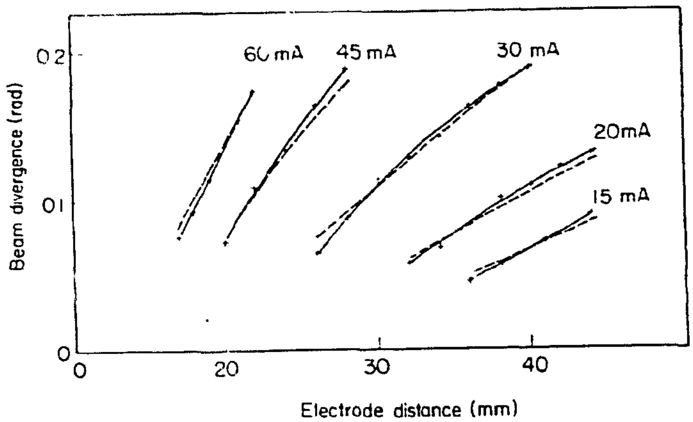

Fig. 4

Beam divergence as a function of electrode distance for various beam currents of a neon beam emitted from a slit 1.5 mm wide with an aperture angle of 2×60°
– – – calculated ; —+—+ experimental

REFERENCES:

1. Chavet, I. and Bernas, R., Nucl. Instrum. Methods 47, 77 (1967)
2. Chavet, I., Proc. in: Int. Conf. on EMIS and the Techniques of their Applications 1970 Marburg. ed. by H. Wagner and W. Walcher, Physikalisches Institut der Universität Marburg, p. 303
3. Menat, M., Chavet, I. and Kanter, M., Nucl. Instrum. Methods 118, 135 (1974)
4. Chavet, I., Kanter, M., Levy, I. and Sar-El, H.Z., in: Proc. of 8th Int. EMIS Conf. 1973 Skövde, ed. by G. Andersson and G. Holmén , p. 191

VARIATION OF THE TRANSVERSE PROFILE OF A WEDGE-TYPE ION BEAM UNDER DIFFERENT OPERATIONAL CONDITIONS

I. Chavet and M. Kanter

In addition to the main divergence α discussed in the previous report, other interesting features of the profile of an ion beam emitted from a slit are disclosed by the "divergence curve" obtained by scanning the beam in the horizontal direction with a vertical probe. The shape and quality of this divergence curve may be adversely affected by non-essential factors described recently[1]. Under proper experimental conditions, two main additional features may be distinguished: the "parasitic divergence" β and the concavity k of the curve top arbitrarily defined as shown in Fig. 5.

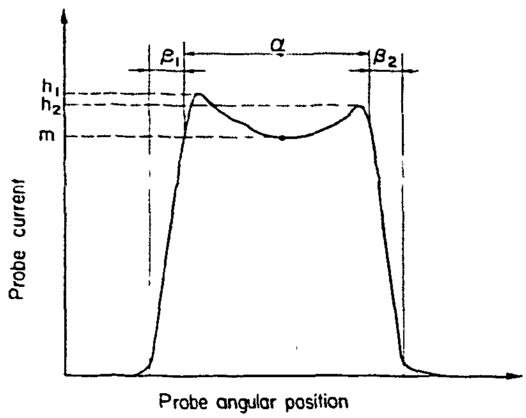

Fig. 5

Typical shape of the transverse profile of the beam or "divergence curve". Main divergence: α; parasitic divergence: $\beta=\beta_1+\beta_2$; concavity: $k=(h_1+h_2)/2m$

Variations of β and k with operational parameters were measured for the MEIRA isotope separator, with the following results.

1. Variation of β

β was found to vary with all the extraction parameters investigated: the emission slit aperature angle δ, the ion mass M, the ion current density emitted i, the electrode distance d and the slit width f. For otherwise similar conditions, β increases with δ. It was found that for a constant aperture angle (60°) the results concerning the other parameters could be summarized in a single empirical expression which permits a reasonable prediction of β for any set of conditions:

$$\beta = a+b\ln(if\sqrt{M}/\alpha) \qquad (1)$$

where a and b are constants. This relation takes into account, explicitly or implicitly, all the above-mentioned parameters (except the aperture angle).

The effect of the acceleration voltage U was not measured. In our case U = 40 kV.

As an example, the fit of the experimental data to this curve is shown in Fig. 6 for the case of xenon. No physical interpretation was found for relation (1).

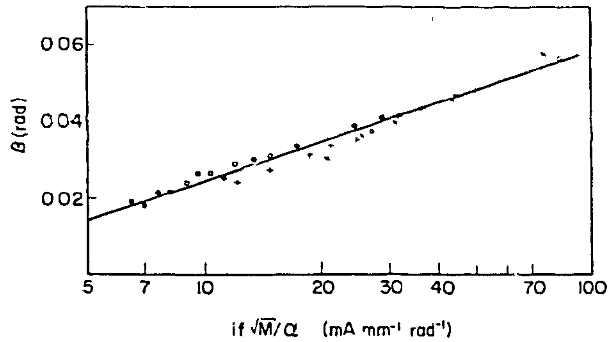

Fig. 6

Variation of β as a function of $if\sqrt{M}/\alpha$ for xenon with $f = 1.5$ mm, $d = 15$ to 44 mm and total ion current i_t: (x) = 30 mA; (+) = 20 mA; (o) = 14 mA; (•) = 10 mA

2. Variation of k

The results for k are more difficult to summarize in a single expression. The best relationship found is the following for the case of a slit aperture angle of 2x60° and U = 40 kV:

$$k = 0.84 + 7.9\alpha_o(\text{rad}) \qquad (2)$$

where α_o is the initial divergence of the beam determined by the meniscus curvature and calculated according to a relation published previously[2]. Figure 7 shows the fit of the experimental data to this curve for the case of xenon.

It was found that the values of k are much reduced for an emission aperture angle of 2x70° and are practically unity for a correct Pierce profile.

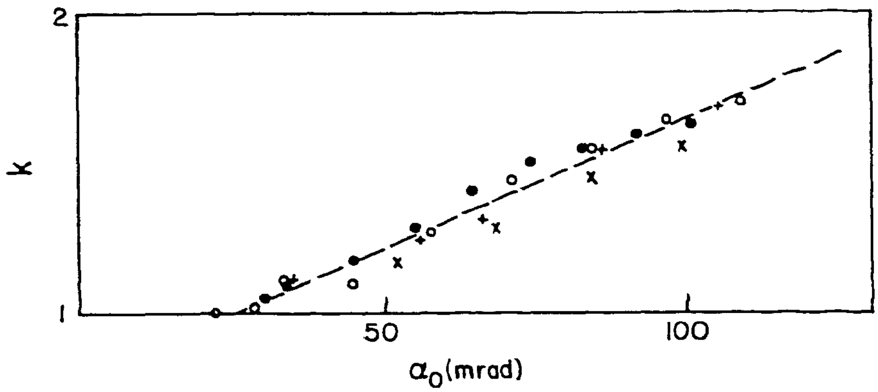

Fig. 7

Variation of the concavity k with the initial divergence α_o for xenon, with f = 1.5 mm and different values of i_t and d
(x) = 30 mA; (+) = 20 mA; (o) = 14 mA; (•) = 10 mA

REFERENCES:

1. Chavet, I., Kanter, M. and Menat, M., Nucl. Instrum. Methods 139, 47 (1976)
2. Chavet, I. and Bernas, R., Nucl. Instrum. Methods 47, 77 (1967)

DESORPTION OF RESIDUAL GASES FROM METALLIC SURFACES BY CO_2 LASER RADIATION

H. Galron

In recent years several methods of gas desorption from metals in vacuum systems e.g. baking, ion bombardment, acoustic shock or gamma radiation have been studied. The aim of this work was to investigate another method, the use of CO_2 laser radiation for desorption of gases from metal targets suspended in a vacuum chamber.

A CW CO_2 laser with an output of 30W was employed. The laser beam was directed into a vacuum chamber (through a germanium window) to strike a metal target with an area of 6 cm^2. The chamber was evacuated down to a pressure of 10^{-8} torr by an ion pump. The desorption of residual gases from the target was observed by means of a magnetic mass spectrometer. Measurements were made with samples of [illegible], aluminum and stainless steel. All experimental results show that CO_2 laser radiation causes desorption of H_2O, CO_2 and CO from these