ISTITUTO NAZIONALE DI FISICA NUCLEARE

Laboratori Nazionali
di Legnaro

INFN/TC-85/22
18 Novembre 1985

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Istituto Nazionale di Fisica Nucleare
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A High Vacuum Portable Exsiccator

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It is often necessary to transport from one laboratory to another, thin films under vacuum, made of of materials which are chemically very reactive.One example is the use of nuclear targets, very often expensive, which are produced in certain locations and employed somewhere else, sometimes overseas.Thus it is indispensable to use containers which are able to maintain a vacuum inside which is better than 10^{-3} mbar and for relatively long periods.At our laboratory a stainless steel container has been constructed of about 1 liter capacity which is able to keep a vacuum better than 2×10^{-5} mbar for more than 3 weeks.

The device is shown in Fig.1.The pumping system is made of a strip of getter material *), wound in a spiral, and mounted on a standard CF 100 flange. A vacuum tight feedthrough for high current and a standard flange DN 25 for pumping are mounted on it. The use of a CF 100 flange gives a high flexibility of usage: it can in fact be mounted on any vacuum system due to its very small dimension.It is for instance compatible with the cryogenic exsiccator installed at the Target Laboratory of LNL [1] .

The device operates in the following way.Once the materials are inside, the container is closed using a copper ring.Using the feedthrough a maximal current of 30 A flows through the strip (maximal power ca. 70 W) from a common transformer.One end of the strip is shorted on the flange which is at ground potential.At the same time the container is evacuated through the DN 25 flange, the vacuum being better than 1×10^{-3} mbar.The previous operation needs around 50 minutes: during that time the 80 cm long strip does not exceeed a temperature of 320 ^{0}C while the exterior does not exceed 60 -70 ^{0}C.In order to protect the samples from heat radiation, they are shadowed by a metallic reflecting sheet, so that their temperature is around 120 ^{0}C during regeneration .They come back to room temperature in about three hours.

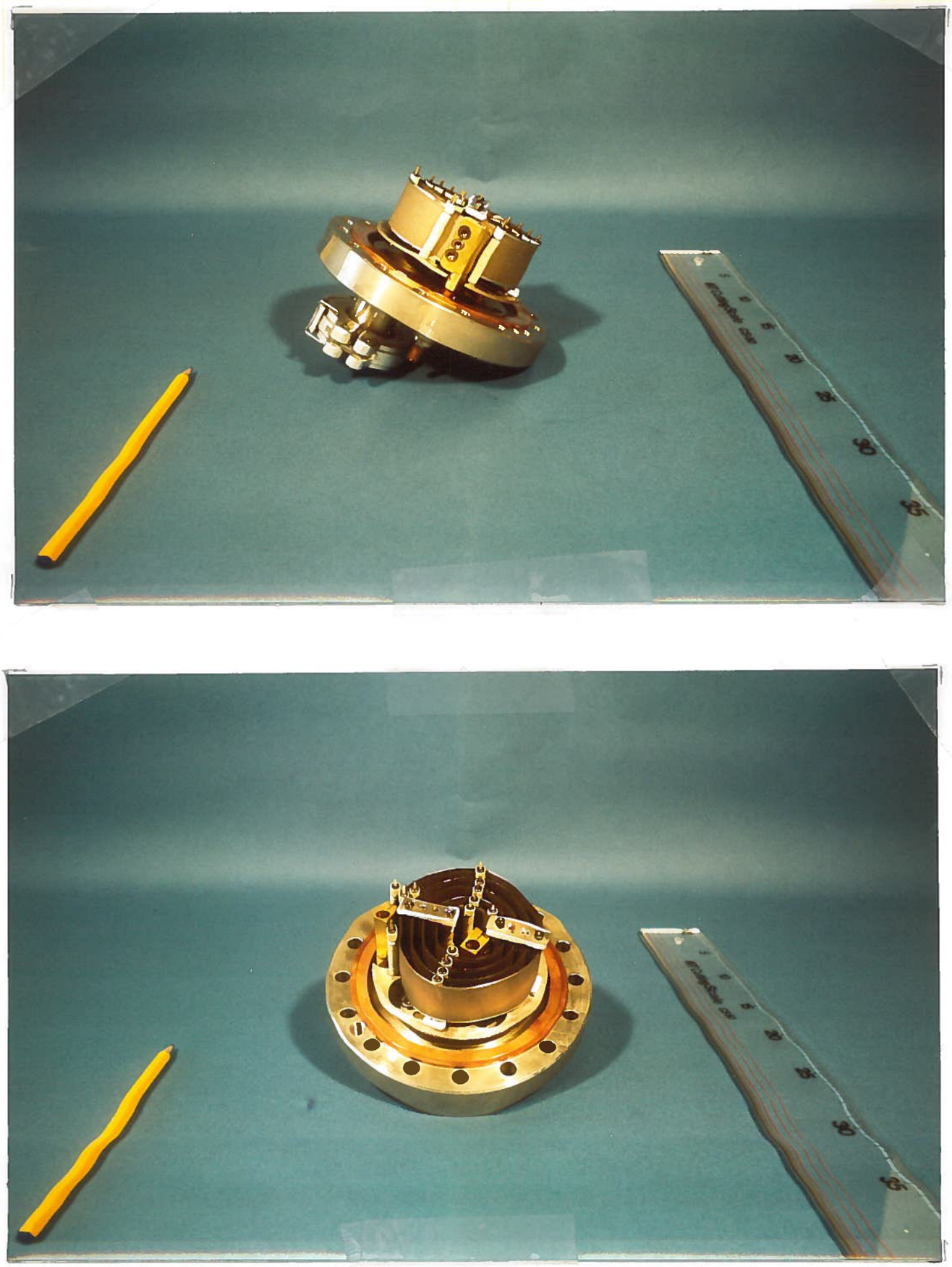

Fig.1 - Photograph of the device.It consists of a CF 100 flange on top of which a 80 cm long getter strip is wound.

The strip is guarantied to be non evaporable [2], and in any case the samples are protected by the metallic sheet from direct contamination.We also performed a X-Ray Fluorescence analysis by means of a scanning electron microscope on a sample of gadolinium, looking for trace of the getter components: iron, zirconium and vanadium.The spectrum shown in Fig.2 does not include any of these elements.

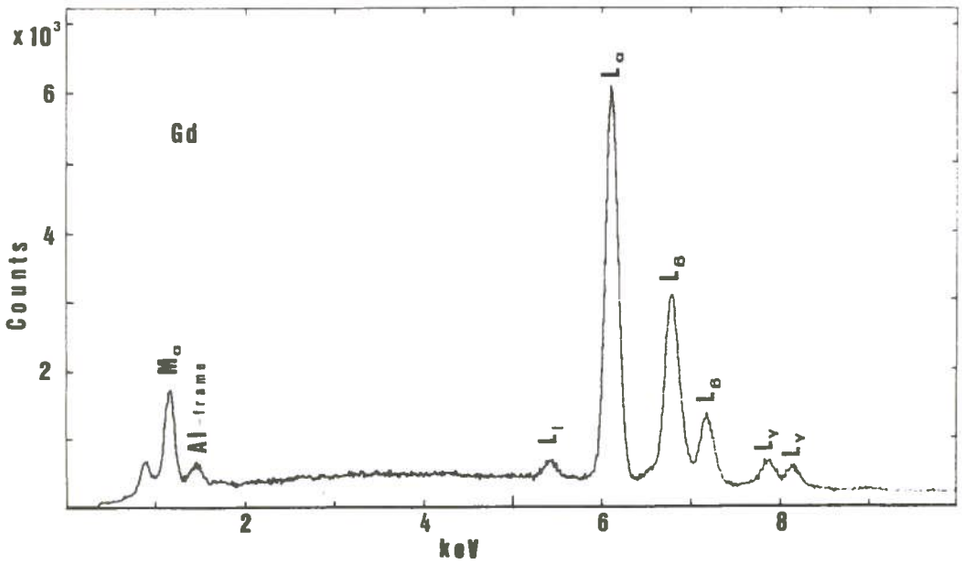

Fig.2 - Spectrum of X-Ray Fluorescence obtained with a SEM , referring to a sample of gadolinium target.

After 50 minutes, the current is stopped and the external pumping continues for 10 minutes more.Than the all system is isolated.From this moment on the value of the vacuum is shown in Fig.3.In it is clearly seen that, after an initial increase in pressure, the vacuum becomes better until the pump starts slowly to saturate and the pressure increases.The process happens in long (three-four weeks) time intervalls compared to the goal of the apparatus.

The device described is at the same time flexible and inexpensive, the cost of 1 meter strip being less than 40 US dollars and it can be regenerated more than 15 times. The flexibility comes from the use of standard CF 100 flange and the very little space needed.

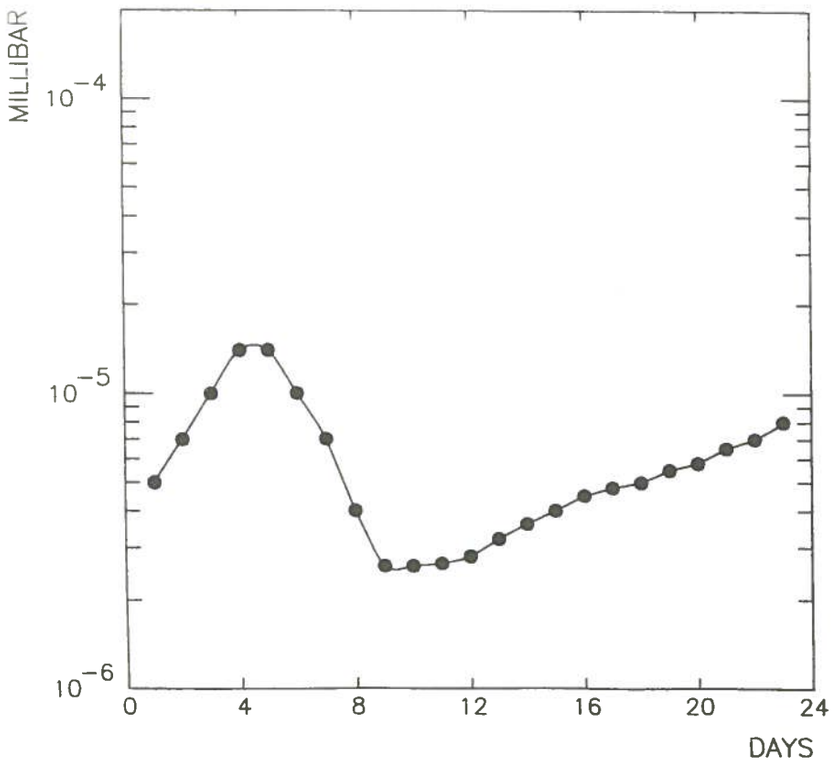

Fig.3 - Plot of the pressure inside the container as a function of the time, when no external pumping was connected nor current was flowing through the getter strip.

References:

*) SAES GETTER,Milan (Italy)

1) R.Pengo, to be published

2) B.Ferrario,A.Figini and M.Borghi,VACUUM 35(1984)13.