## ECR2 development

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### Introduction

During the last reporting period the ECR2 ion source was used extensively for the production of heavy-ion beams for the K150 cyclotron. Although the ECR2 location in a limited-access area directly above the K150 make it difficult to work on, a major repair and the implementation of two-frequency operation were accomplished.

### Repairs

In August a leak developed in a water line leading to the plasma chamber. The repair made it necessary to move the source from its location above the K150 and extract the plasma chamber from the axial coils in order to gain access to the plastic tubing used for water-cooling of the chamber. Subsequently, all this plastic tubing was replaced. The source was then reassembled, reinstalled and realigned.

### Beams from Solids

A low-temperature oven (Fig. 1), using the same type of Hot-Shot heating element and controller as the low-temp oven on ECR1, was constructed to fit the narrower radial aperture of ECR2. In November the oven was used to run a magnesium beam for an experiment on the K150 ($^{25}Mg^{10+}$ at 11

**FIG. 1.** Low-temperature oven.

AMeV). Because a high-temperature oven has not yet been acquired for ECR2 the sputter fixture was used to produce scandium. Sputtering required as high as 3.5 kV, leading to a somewhat unstable beam, but the beam was sufficient for an experiment.

**Two-frequency Operation**

In February a new injection plate with two wave guides for microwave injection was mounted onto the source (Fig. 2). Along with the standard 14.5 GHz microwave injection from a 2.25 kW transmitter using a narrow-band-width klystron, 11 GHz microwave injection was added using a wide band, 400 watt, travelling-wave-tube (TWT) transmitter excited by a frequency generator. Also, the 14.5 GHz klystron had been weakening to the point where the transmitter was limited to below 900 watts. A new one was purchased and installed in February so that now 1.5 kW can be reached. Running both transmitters definitely improves source performance, but more experimentation with magnetic-field configurations and microwave power levels is needed for optimization.

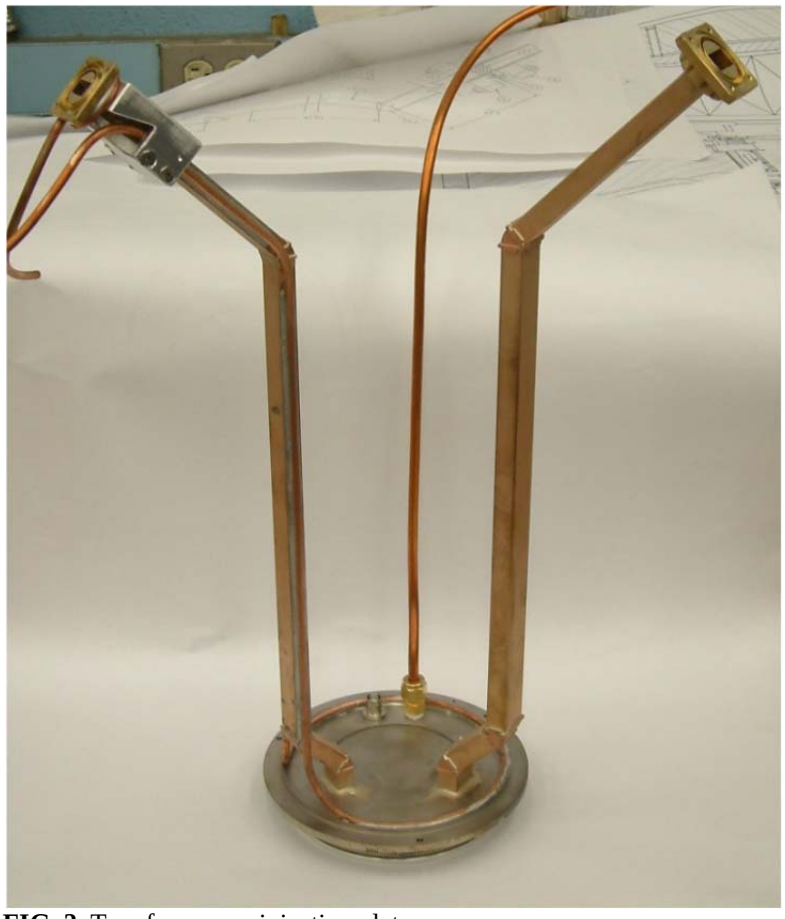

**FIG. 2.** Two frequency injection plate.