Abstract 013

Title: **CYCLOTECH – A method for Direct Production of ^{99m}Tc using Low Energy Medical Cyclotrons**

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Introduction:

This paper presents work in progress, to develop an efficient and economical way to directly produce Technetium 99metastable (^{99m}Tc) using low-energy – so-called “medical” – cyclotrons. Its importance is well established and directly relates to the increased global trouble in delivering ^{99m}Tc to Nuclear Medicine Departments relying on this radioisotope. Since the present delivery strategy has clearly demonstrated its intrinsic limits, our group decided to follow a distinct approach that uses the broad distribution of the low energy cyclotrons and the accessibility of Molybdenum 100 (^{100}Mo) as the Target material. This is indeed an important issue to consider, since the system here presented it is not based on the use of HEU (or even LEU) 235 Uranium, so entirely complying with the actual international trends and directives concerning the use of this potentially critical material.

The production technique is based on the nuclear reaction ^{100}Mo (p,2n) ^{99m} Tc whose production yields have already been documented.

The object of the system is to present ^{99m} Tc to Nuclear Medicine radiopharmacists in a routine, reliable and efficient manner that, remaining always flexible, entirely blends with established protocols.

Material and Methods:

We have developed a Target Station that can be installed on most of the existing PET cyclotrons and that will tolerate up to 400 µA of beam by allowing the beam to strike the Target material at an adequately oblique angle. The Target Station permits the remote and automatic loading and discharge of the Targets from a carriage of 10 Target bodies.

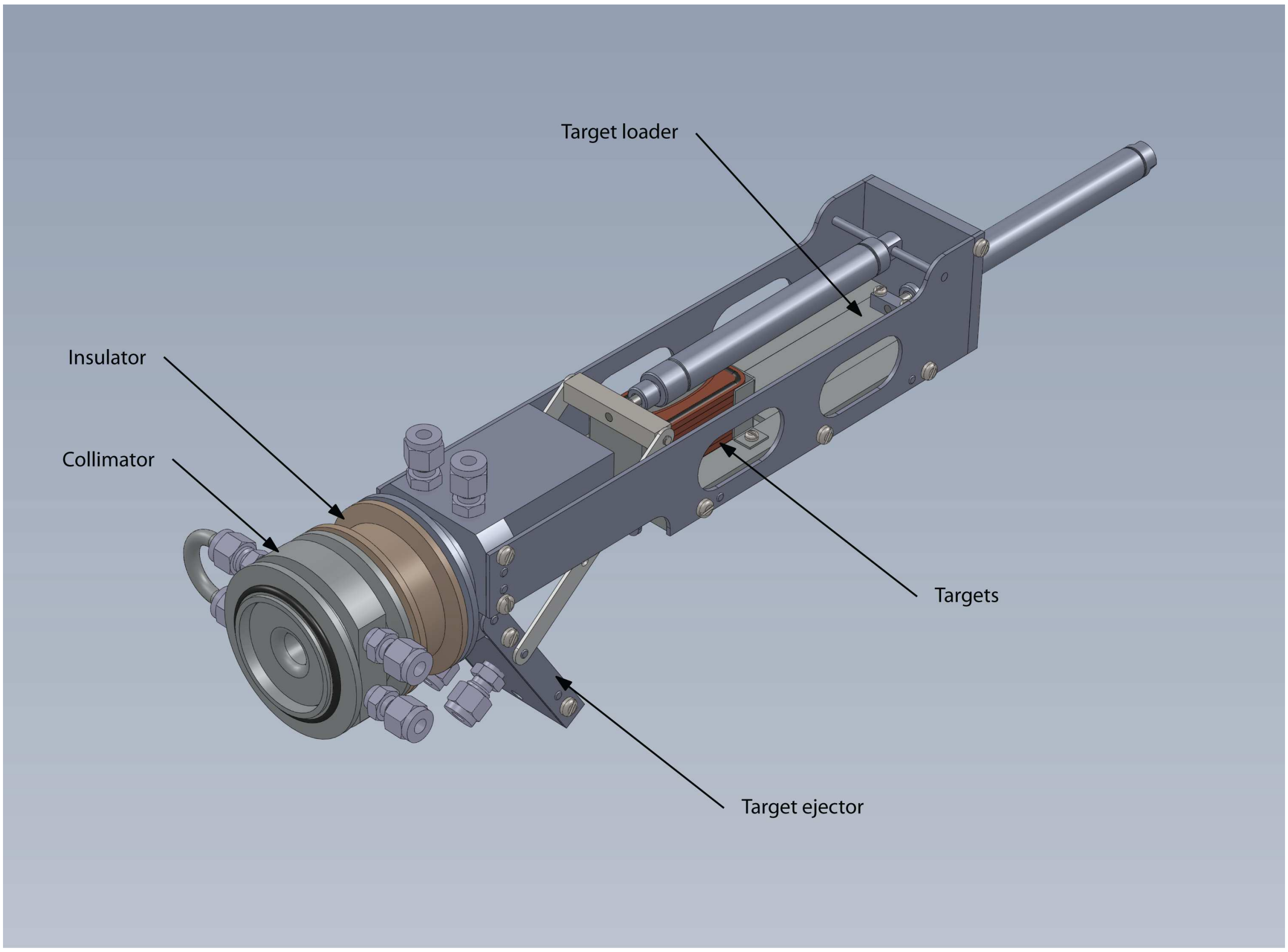

Fig1. The remotely controlled Target Changer ejects the irradiated Target (to a Transfer System that transports it to a Processing Unit –inserted in a dedicated Hot Cell) and loads a new one. Up to 10 Targets can be pre-loaded in the Target Changer.

Several methods of Target material deposition and Target substrates are presented. The object was to create a cost effective means of depositing and intermediate the target material thickness (25 - 100µm) with a minimum of loss on a substrate that is able to easily transport the heat associated with high beam currents.

The separation techniques presented are a combination of both physical and column chemistry. The object was to extract and deliver ^{99m}Tc in the identical form now in use in radiopharmacies worldwide. In addition, the Target material is recovered and can be recycled.