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**Magnetic Production Plant of ^{99}Mo and ^{99}Tc via Proton
Chain-reactions in Strong Focusing MOLYTRON Reactor and its
Automatic Magnetic Extraction and Separation**

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ABSTRACT

Original proposal of Molytron^{1,2}, based on 2-beam injection at ~ 300 MeV via reaction $^{98}\text{Mo} + ^{100}\text{Mo} \rightarrow ^{99}\text{Mo} + ^{99}\text{Mo}$, is improved by 3-beam injection of 20 MeV D, ^{98}Mo and ^{100}Mo resulting in ^{99}Mo and ^{99}Tc production via two parallel proton chain reactions: $\text{D} + ^{98}\text{Mo} \rightarrow ^{99}\text{Mo} + \text{p}$; $\text{p} + ^{100}\text{Mo} \rightarrow ^{99}\text{Tc} + 2\text{n}$; and $\text{D} + \text{D} \rightarrow \text{T} + \text{p}$; $\text{p} + ^{100}\text{Mo} \rightarrow ^{99}\text{Tc} + 2\text{n}$. All Mo beams are multiply ionized $Z = 30\text{--}33$. Six 1st gen and >10 2nd gen reactions take place with observed^{3,4} ion confinement time >20 s. Reaction products are magnetically funneled along +z and -z axis, then separated via vertical dispersion mass spectrometer.

We project production of 10 mg/day i.e. 500 6-Day Ci/day (1,000 procedures) of ^{99}Mo and ^{99}Tc combined, which is 4% of the current global production at electricity cost of ~\$1/procedure. Projected capital cost of the plant is \$16 million/3 years, payoff time 4 years.

References

1. Proc.12th Int. Top. Meet. Nuclear App. Accel. US DOE/NNSA (2016).
2. 2015 Ann. Meet. Am. Nucl. Soc. (videotaped).
3. Phys. Rev. Lett. 54, 769 (1985).
4. NIM A 271 1 – 288 (1988).