

MARS status report for 2023-2024

B.T. Roeder

This year, we continued the program of providing rare isotope beams (RIBs) for the physics program at the Cyclotron Institute at Texas A&M University with the Momentum Achromat Recoil Separator (MARS) [1]. The MARS beam line was utilized in 7 separate runs for various experiments. 3 of these experiments involved rare isotope beams (RIBs).

A summary of the RIBs produced this year is given in Table I. A ^{11}Be beam was produced for Professor Rogachev's group for a test of the new TexNAAM detector. There was a ^{14}O beam made for an experiment with Professor Lee Sobotka's group from Washington University in St. Louis (WUSTL). Finally, there was a brief run with ^{58}Co to test the "Z" separation capabilities of the Oak Ridge Ion Chamber with Professor Yennello's group. Details of these experiments are provided in separate reports.

TABLE I. Summary of MARS RIBs for 2023-2024.

RIB beam	Reaction	Production Rate (eV/nC)	Purity	Intensity on Target (est.)
^{11}Be	$^{13}\text{C}+^9\text{Be}$ at 30 MeV/u (Frag.)	281 eV/nC	~78%	$\sim 4 \cdot 10^4$ p/s
^{14}O	$^1\text{H}(^{14}\text{N}, ^{14}\text{O})\text{n}$ (Transfer) at 17 MeV/u	293 eV/nC	~75%	$2 \cdot 10^5$ p/s
$^{58}\text{Co}^{25+}$	$^1\text{H}(^{58}\text{Fe}, ^{58}\text{Co})\text{n}$ at 11.5 MeV/u (Transfer)	330 eV/nC	~50%	$\sim 10^3$ p/s

The other 4 experiments with MARS involved measurements with stable beams and are not reported here, with the exception of the $^{48}\text{Ti}+^{48}\text{Ti}$ measurement led by Dr. A. Bonasera in collaboration with Professor G. Souliotis. In this measurement, beam-like fragments from nucleon transfer reactions were measured. The analysis of these data are ongoing and further, similar experiments are planned in the coming year.

[1] R.E. Tribble, R.H. Burch and C.A. Gagliardi, Nucl. Instrum. and Meth. **A285**, 441 (1989).