Contribution ID: **46** Type: **Oral presentation**

Isotope production cross section measurements at the HFNG, LANL-IPF, and LBNL

Thursday 24 May 2018 11:15 (20 minutes)

The future of nuclear medicine would appear to be the paradigm of personalized medicine —targeted radionuclide therapy to spare healthy tissue, and theranostic medicine, which pairs an imaging isotope with a therapeutic isotope to provide simultaneous, real-time dose delivery and verification, leading to drastic reductions in prescribed patient dose. Candidate isotopes to meet these needs have been identified based on their chemical and radioactive decay properties, and the Bay Area Nuclear Data (BAND) Group is currently leading a series of campaigns to perform targeted, high-priority measurements of thin-target cross sections and thick-target integral yields. These studies will serve to facilitate the production of pre-clinical quantities of radioactivity for emerging and novel medical radionuclides. This talk will focus on the BAND Group's recent efforts to measure production cross sections for emerging medical radionuclides, develop new methods for the monitoring of charged-particle beams, and characterize tunable quasi-monoenergetic neutron sources for high specific activity isotope production. These student-driven projects include a host of recent efforts:

1. Production of the emerging diagnostic radionuclides ^{64}Cu and ^{47}Sc via (n,p) at the UC Berkeley High-Flux Neutron Generator (HFNG), which is being developed as a platform for high-specific activity medical isotope production;
2. Production of the emerging PET tracers ^{51}Mn and ^{52g}Mn via intermediate-energy Fe(p,x) reactions at the Lawrence Berkeley National Laboratory (LBNL) 88-Inch Cyclotron;
3. Production of ^{134}Ce as an in vivo PET diagnostic analogue at the LBNL 88-Inch Cyclotron, to characterize the biological fate and transport of the alpha-emitting therapeutic actinides ^{225}Ac and ^{227}Th;
4. Development of tunable quasi-monoenergetic neutron sources and alternative (n,x) production pathways for ^{225}Ac production at the LBNL 88-Inch Cyclotron;
5. Characterization of Nb(p,4n)^{90}Mo at the Los Alamos National Laboratory Isotope production Facility (LANL-IPF), as a new monitor reaction standard for the in-beam measurement of proton fluence in >40 MeV proton beams;
6. Development of the Fission Induced Electromagnetic Response (FIER) code, to analytically predict delayed γ-ray spectra following fission.

These experiments provide valuable opportunities to measure the distribution of excited nuclear states as a function of angular momentum, through the observation of isomer branching ratios in these energetic (p,x) reactions. In addition, these measurements provide a range of cross section data invaluable to not only the medical isotope production community, but also as new measurements to improve the reliability of the range of modern reaction modeling codes. These also provide valuable insight into the challenges and and unexpected nuances involved in precision cross section data measurements.

Author: VOYLES, Andrew (UC Berkeley / LBNL)

Co-authors: Dr BASUNIA, Shamsu; BATCHELDER, Jon; BAUER, Joe; Dr BERNSTEIN, Lee (Lawrence Berkeley National Laboratory); BIRNBAUM, Eva; ENGLE, Jon; GRAVES, Stephen; LEWIS, Amanda; MATTHEWS, Eric (University of California, Berkeley); MORRELL, Jon; NORTIER, Francois (Los Alamos National Laboratory); SPRINGER, Alexander; UNZUETA, Mauricio; VAN BIBBER, Karl

Presenter: VOYLES, Andrew (UC Berkeley / LBNL)

Session Classification: Session 9