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Editorial Board
Physical Review C

To whom it may concern:

I am writing to submit an original manuscript entitled "*Proton-induced reactions on Fe, Cu, & Ti from threshold to 55 MeV*", for publication in Physical Review C. This manuscript describes an original work conducted by myself, the first and corresponding author, along with my co-authors and collaborators Amanda M. Lewis[a], Jonathan T. Morrell[a], M. Shamsuzzoha Basunia[b], Lee A. Bernstein[ab], Jonathan W. Engle[c], Stephen A. Graves[d], and Eric F. Matthews[a].

This work described in this manuscript is a measurement of 34 unique excitation functions spanning from threshold up to 55 MeV for the ^{nat}Fe(p,x), ^{nat}Cu(p,x), and ^{nat}Ti(p,x) reactions, along with 3 independent measurements of isomer branching ratios for pairs of radioisotope isomer/ground states populated in this mass region. This is part of a recent, ongoing effort at UC Berkeley and Lawrence Berkeley National Laboratory to address the gaps in existing nuclear data which have been identified by the applications community, focusing in particular on the production of novel and emerging medical radioisotopes. The primary motivation for this work is to provide the most comprehensive characterization to date of the Fe(p,x)^{51m,52m,52g}Mn reactions, as these radionuclides have been proposed as a suite of valuable emerging medical radionuclides for PET-based medical imaging with improved resolution. However, as proton-induced reaction data in this mass region is poorly-characterized, this measurement offers a valuable opportunity to study these underlying physical reaction mechanisms through the distribution of angular momentum in compound nuclear and direct pre-equilibrium reactions. Additionally, this measurement provides a benchmark across a wide range of mass and energy for a suite of commonly-used reaction modeling codes, to illustrate deficiencies in the predictive capabilities of these codes, and provide experimental data to help tune them.

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The methodology used to measure these cross sections involved a stacked-target activation of thin (25 µm) metal foils, at the Lawrence Berkeley National Laboratory's 88-Inch Cyclotron. Target foils of natural iron metal were irradiated with nominal 55 MeV and 25 MeV proton beams, along with copper and titanium monitor foils at each energy position. This stack design allows for measurement of cross sections at multiple energies within a single irradiation. This technique is widely-used for measurements of excitation functions, with multiple measurements of the sort having been previously published in PRC, both recently and historically[efgh]. Our work also makes use of the "variance minimization" techniques described in our recent work[j] to significantly reduce the systematic uncertainties associated with energy assignment, typical in many stacked-target irradiations.

Several major novel contributions are reported in the present work. Most notably, this work serves as the most well-characterized measurement of the ^{nat}Fe(p,x), ^{nat}Cu(p,x), and ^{nat}Ti(p,x) reaction below 60 MeV to date, with cross sections measured at the 6–10% uncertainty level. Indeed, nearly all cross sections have been reported with higher precision than previous measurements. We also report the first measurements of the independent cross sections for ^{nat}Fe(p,x)^{49,51}Cr, ^{51,52m,52g,56}Mn, and ^{58m,58g}Co. We use these measurements to illustrate the impact of pre-equilibrium particle emission in the reaction dynamics for the $E_p < 55\,\mathrm{MeV}$ region in ^{nat}Fe(p,x), ^{nat}Cu(p,x), and ^{nat}Ti(p,x) reactions.

The attached manuscript is an original work which bears no significant overlap with any journal or conference papers published by any of the authors herein, aside from extending the energy range of our earlier ^{nat}Cu(p,x) measurements down to reaction thresholds[i]. Previous measurements exist in the literature for approximately half of the cross sections presented in this work, though our measurements nearly exclusively have the highest precision to date. The most recent previous measurements of the ^{nat}Fe(p,x) reactions are generally by S.A. Graves, *et. al.*[k], the most recent previous measurements of the ^{nat}Cu(p,x) reactions are generally from our earlier work[j], and the most recent previous measurements of the ^{nat}Ti(p,x) reactions are generally by E. Garrido, *et. al.*[l].

While I defer to your judgment in the selection of potential reviewers, if there is any difficulty in finding suitable reviewers, several notable experts have been proposed as potential reviewers for this manuscript: Steve Wender of Los Alamos National Laboratory (`wender@lanl.gov`), Ron Nelson of Los Alamos National Laboratory (`rnelson@lanl.gov`), Steven Yates of the University of Kentucky (`yates@uky.edu`), Arjan Plompen of the Belgian Joint Research Centre (`Arjan.Plompen@ec.europa.eu`), Roland Beyer of Helmholtz-Zentrum Dresden-Rossendorf (`roland.beyer@hzdr.de`), and Zsolt Revay of the Technical University of Munich (`zsolt.revay@frm2.tum.de`). All of these individuals are highly experienced in the nuclear data community, and have many years of experience in nuclear reaction evaluation and cross section measurements. Any of the editorial staff with the technical background to properly evaluate the manuscript would be welcome on our end. This would primarily involve a familiarity with activation experiments and nuclear spectroscopy.

Please find our manuscript attached. I hope that this work will be deemed of sufficient merit and interest

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[e] J.W. Engle, *et. al.*, PRC 88.1 (2013): 014604.

[f] A. Belhout, *et. al.*, PRC 76.3, (2007): 034607.

[g] R.L. Brodzinski, *et. al.*, PRC 4.4 (1971): 1257–1265.

[h] H.R. Heydegger, *et. al.*, PRC 6.4, (1972): 1235–1240.

[i] E. Lamere, *et. al.*, PRC 100.3 (2019):034614.

[j] A.S. Voyles, *et. al.*, NIM B: 429, pp. 5374, Aug. 2018, doi:10.1016/j.nimb.2018.05.028.

[k] S.A. Graves, *et. al.*, NIM B: 386, 44–53 (2016), doi:10.1016/j.nimb.2016.09.018

[l] E. Garrido, *et. al.*, NIM B: 383 Supplement C, 191–212 (2016), doi:10.1016/j.nimb.2016.07.011

to be published in PRC, and I look forward to working with the editorial staff if this is the case.

Sincerely yours,

Andrew S. Voyles