Abstract Submitted
for the SES21 Meeting of
The American Physical Society

Thermonuclear Supernovae as a Source of Galactic Positrons[1] TYCO MERA EVANS, PETER HOEFLICH, Florida State University, ROLAND DIEHL, Max Planck Institut fur extraterrestische Physik — We present a study on the emission of positrons from Type Ia Supernovae (SNe Ia). We evaluate their escape fractions and energy spectra and then address their role in the Galactic positron puzzle. Our simulations encompass a wide variety of explosion scenarios, including the explosion of Chandrasekhar mass limit ($M_{\rm Ch}$) white dwarfs (WD), He-triggered explosions of sub-$M_{\rm Ch}$ WDs, and dynamical mergers of two WDs. For each model, we study the influence of the size and morphology of the progenitor magnetic field between 1 and 10^{13} G. Based on the observed brightness distribution of SNe Ia, we find that the resulting positron injection is dominated by normal bright SNe Ia, which may reduce the dependence on the explosion mechanism. The morphology of the progenitor B-field dominates the positron escape at about (1.96 ± 0.75) and $(0.94 \pm 0.56) \times 10^{52}$ e^+ per SN Ia for large scale dipole and turbulent fields, respectively. Assuming a Galactic SN Ia rate between 0.13 and 0.76 per century, we find positron injection rate ranges from (0.48 to 6.42) and (0.20 to 3.91) $\times 10^{42}$ e^+ s^{-1} for dipole and turbulent fields, respectively. SNe Ia may be contributed to $\approx 1 - 13\%$ of the Galactic positron annihilation rate.

[1]We acknowledge support by National Science Founda-704tion (NSF) grant AST-1715133.

Tyco Mera Evans
Florida State University

Date submitted: 29 Sep 2021 Electronic form version 1.4