Supplementary Information for Prediction of Solar Proton Event Fluence spectra from their Peak spectra

SI Figures 1-2 show cross-plots of the ΔFluences derived from data using the SEPEM Reference Event List (REL) and the estimations of the ΔFluences using the fitted hypersurfaces at the 10 SEPEM energies.

SI Figure 1. Residuals ΔFluences from analytical fittings of data and estimated ΔFluences from ΔPeaks using the fitted hypersurfaces for 6 MeV, 8.7 MeV, 12.6 MeV and 18.2 MeV
SI Figure 2. Residuals $\Delta$Fluences from analytical fittings of data and estimated $\Delta$Fluences from $\Delta$Peaks using the fitted hypersurfaces for 26.3 MeV, 38 MeV, 55 MeV, 79.5 MeV, 115 MeV and 166.3 MeV.
SI Figure 3. Pearson correlation factors $r$ of log(Peaks) and log(Fluences) at the 10 energy channels for the SEPEM REL and the FORSPEF list.

SI Figures 4-7 show cross-plots of measured and predicted Fluences using the SEPEM REL at all 10 energy bins with the respective bar plots showing the distribution of multiplicative factors by which the predictions differ from the measurements. For the cross-plots equality lines $y=x$ are in blue and $y=4x$ and $y=0.25x$ lines are in red above and below respectively.
SI Figure 4. Cross-plots of measured and predicted Fluences at 6 MeV, 8.7 MeV and 12.58 MeV. The respective barplots show the distributions of multiplicative factors between data and predictions.
SI Figure 5. Cross-plots of measured and predicted Fluences at 18.18 MeV, 26.3 MeV and 38.03 MeV. The respective barplots show the distributions of multiplicative factors between data and predictions.
SI Figure 6. Cross-plots of measured and predicted Fluences at 55 MeV, 79.53 MeV and 115 MeV. The respective barplots show the distributions of multiplicative factors between data and predictions.
SI Figure 7. Cross-plot of measured and predicted Fluences at the 10th energy bin at 166 MeV. The barplot shows the distribution of multiplicative factors between data and predictions.

SI Figures 8-11 show comparisons of measured and predicted Fluences at all 10 energy bins using the FORSPEF Event list. The cross-plots show the Fluence values at each energy bin and the respective barplots show the distribution of multiplicative factors by which the predictions differ from the measurements.
SI Figure 8. Cross-plots of measured and predicted Fluences at 6 MeV, 8.7 MeV and 12.58 MeV using the FORSPEF list. The respective barplots show the distributions of multiplicative factors between data and predictions.
SI Figure 9. Cross-plots of measured and predicted Fluences at 18.2 MeV, 26.3 MeV and 38 MeV using the FORSPEF list. The respective barplots show the distributions of multiplicative factors between data and predictions.
SI Figure 10. Cross-plots of measured and predicted Fluences at 55 MeV, 79.5 MeV and 115 MeV using the FORSPEF list. The respective barplots show the distributions of multiplicative factors between data and predictions.
SI Figure 11. Cross-plot of measured and predicted Fluences at 166 MeV using the FORSPEF list. The barplot shows the distribution of multiplicative factors between data and predictions.

Figures 12-15 show the cumulative distributions of Peak occurrence in hours after onset along with the respective cumulative distributions of Peak occurrence relative to total Event duration for all energies using the SEPEM REL.
SI Figure 12. CDFs of Peak occurrence in hours (left panel) and respective CDFs of Peak occurrence as fraction of total Event duration (right panel) at 6 MeV, 8.7 MeV, and 12.6 MeV for the SEPEM REL.
SI Figure 13. CDFs of Peak occurrence in hours (left panel) and respective CDFs of Peak occurrence as fraction of total Event duration (right panel) at 18.2 MeV, 26.3 MeV, and 38 MeV for the SEPEM REL.
SI Figure 14. CDFs of Peak occurrence in hours (left panel) and respective CDFs of Peak occurrence as fraction of total Event duration (right panel) at 55 MeV, 79.53 MeV, and 115 MeV for the SEPEM REL.
SI Figure 15. CDF of Peak occurrence in hours (left) and respective CDF of Peak occurrence as fraction of total Event duration (right) at 166 MeV for the SEPEM REL.

Figures 16-19 show the cumulative distributions of Peak occurrence in hours after onset along with the respective cumulative distributions of Peak occurrence relative to total Event duration for all energies using the FORSPEF Event list.
SI Figure 16. CDFs of Peak occurrence in hours (left panel) and respective CDFs of Peak occurrence as fraction of total Event duration (right panel) at 6 MeV, 8.7 MeV, and 12.6 MeV for the FORSPEF list.
SI Figure 17. CDFs of Peak occurrence in hours (left panel) and respective CDFs of Peak occurrence as fraction of total Event duration (right panel) at 18.2 MeV, 26.3 MeV, and 38 MeV for the FORSPEF list.
SI Figure 18. CDFs of Peak occurrence in hours (left panel) and respective CDFs of Peak occurrence as fraction of total Event duration (right panel) at 55 MeV, 79.53 MeV, and 115 MeV for the FORSPEF list.
SI Figure 19. CDF of Peak occurrence in hours (left) and respective CDF of Peak occurrence as fraction of total Event duration (right) at 166 MeV for the FORSPEF list.