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Supplemental Material: Impact of proton-induced transmutation doping in semiconductors for space applications

1 Experimental Data Processing

The linear calibration function and detector efficiency calibration function for the Canberra Industries Genie-2000 Spectroscopy System High Purity Ge Detector are shown in Fig. 1 and Fig. 2 respectively.?

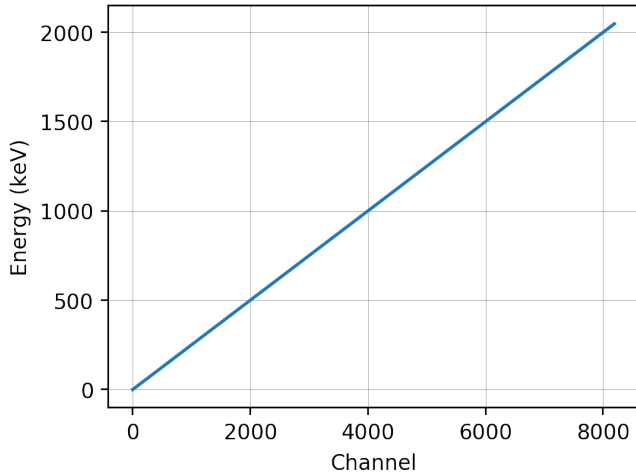


Fig. 1 Channel-to-energy calibration function for the HPGe detector system used in this work to quantify transmutation of an irradiated GaAs sample.

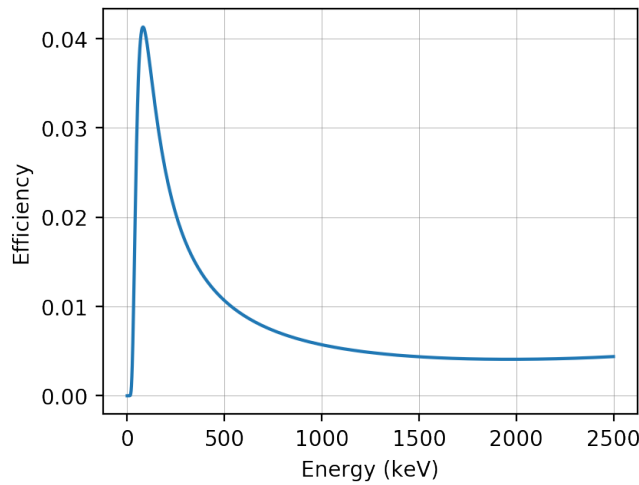


Fig. 2 Efficiency function for the HPGe detector system used in this work to quantify transmutation of an irradiated GaAs sample. This includes detector and geometrical efficiency.

2 Orbit Dominant Temporal Impurity Concentrations

This section contains the impurity concentrations for inclined nonpolar low earth orbit (LEO), polar sun-synchronous LEO, semi-synchronous medium earth orbit (MEO), and geostationary orbit (GEO) for GaAs, $\text{Hg}_{0.7}\text{Cd}_{0.3}\text{Te}$, $\text{InAs}_{0.91}\text{Sb}_{0.09}$, InAs, $\text{InSb}_{0.5}\text{Bi}_{0.5}$, $\text{InSb}_{0.95}\text{Bi}_{0.05}$, InSb and Si over the course of 10 years of operation.

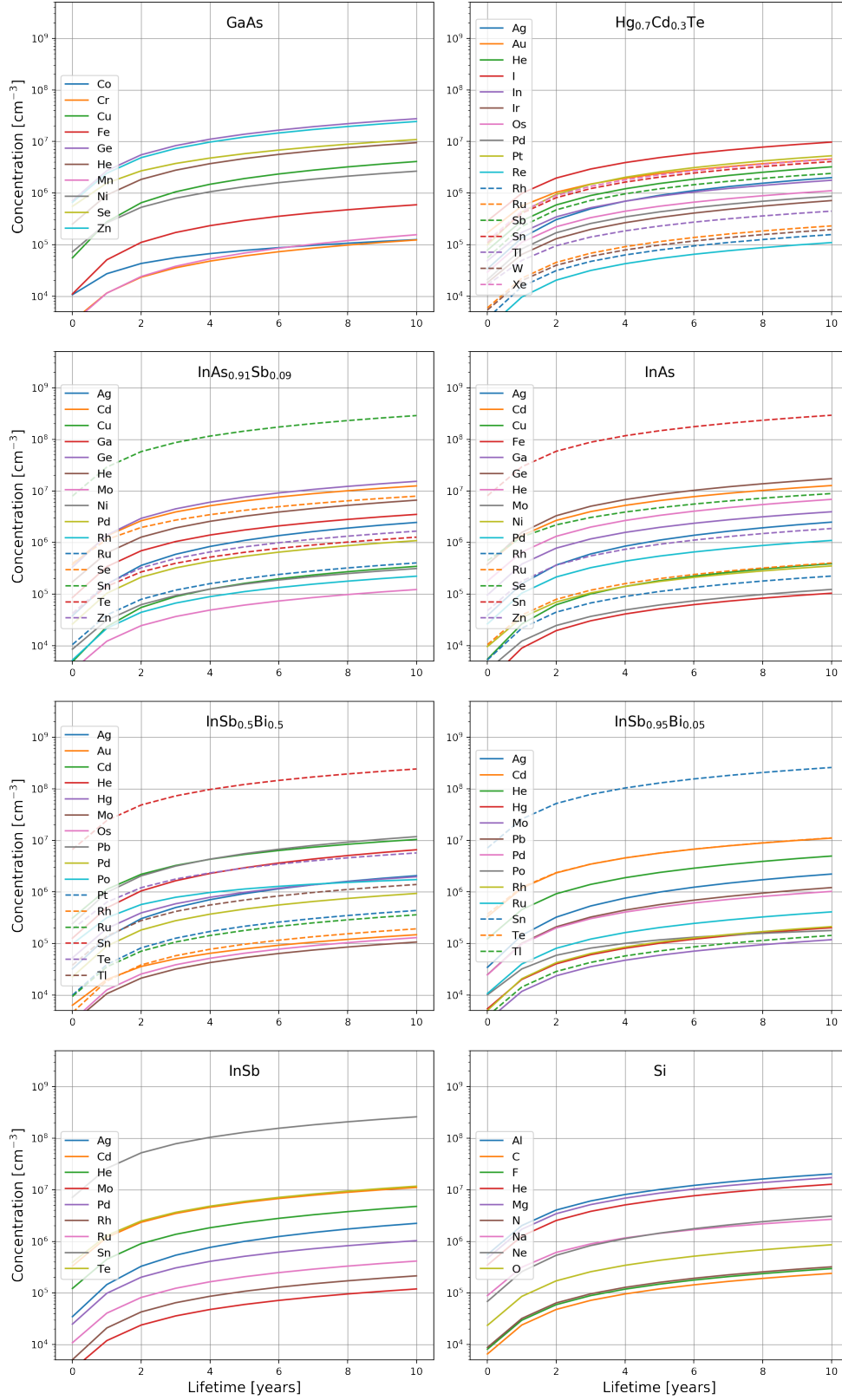


Fig. 3 Impurity concentration (cm^{-3}) for elements with concentrations in excess of $> 10^5 \text{ cm}^{-3}$ for GaAs, $\text{Hg}_{0.7}\text{Cd}_{0.3}\text{Te}$, $\text{InAs}_{0.91}\text{Sb}_{0.09}$, InAs, $\text{InSb}_{0.5}\text{Bi}_{0.5}$, $\text{InSb}_{0.95}\text{Bi}_{0.05}$, InSb and Si as a function of lifetime in inclined nonpolar LEO.

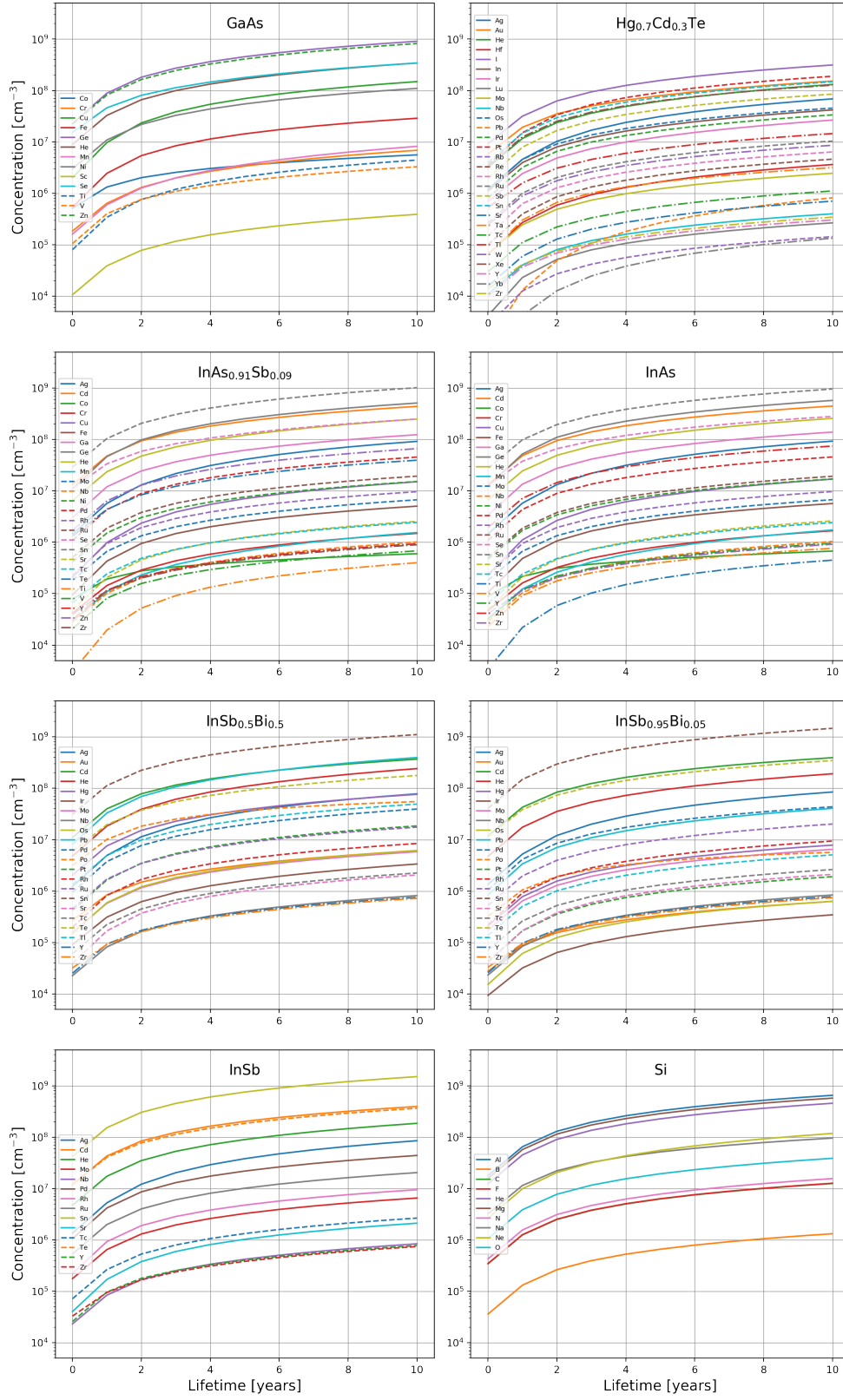


Fig. 4 Impurity concentration (cm^{-3}) for elements with concentrations in excess of $> 10^5 cm^{-3}$ for GaAs, $Hg_{0.7}Cd_{0.3}Te$, $InAs_{0.91}Sb_{0.09}$, InAs, $InSb_{0.5}Bi_{0.5}$, $InSb_{0.95}Bi_{0.05}$, InSb and Si as a function of lifetime in polar sun-synchronous LEO.

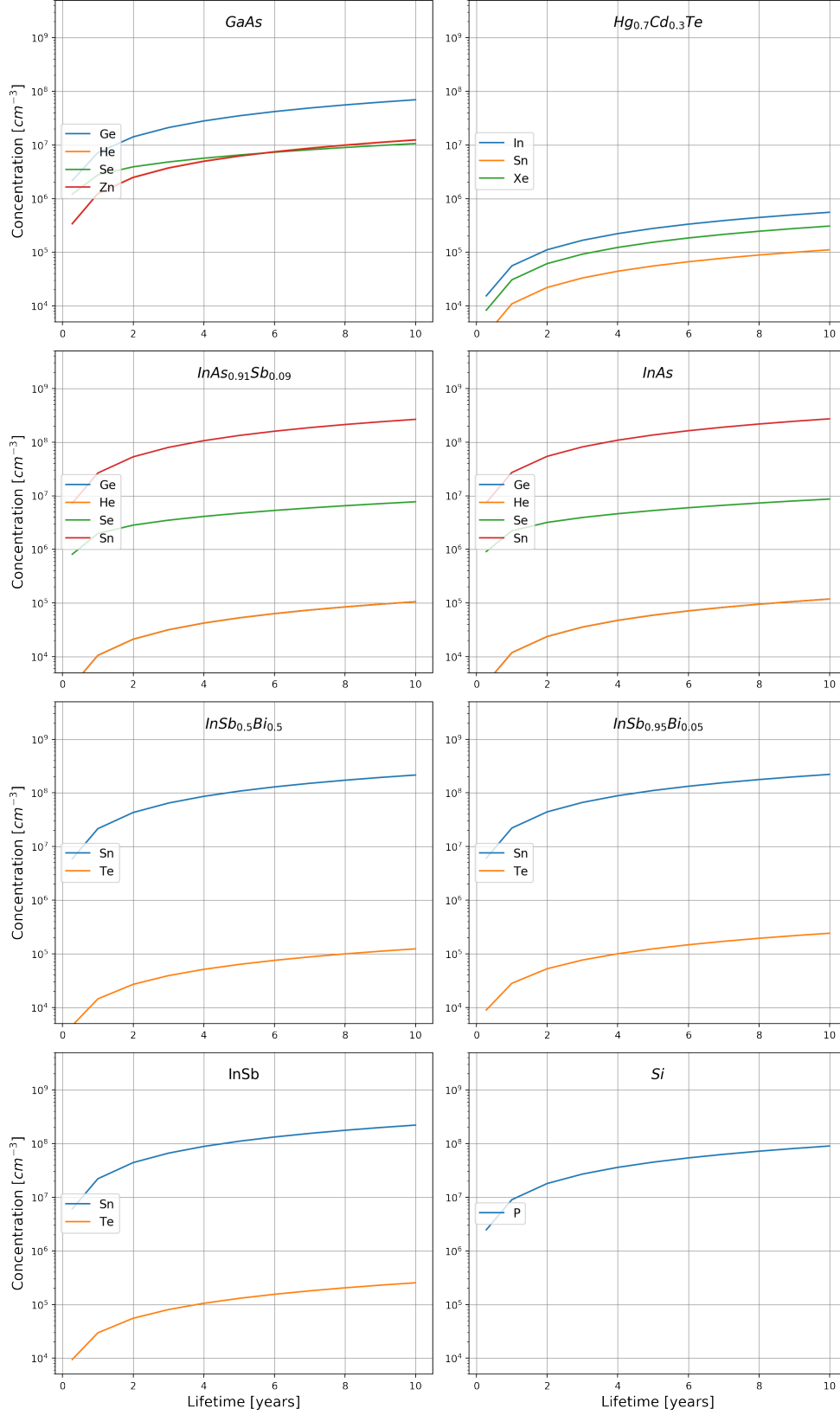


Fig. 5 Impurity concentration (cm^{-3}) for elements with concentrations in excess of $> 10^5$ cm^{-3} for GaAs, $Hg_{0.7}Cd_{0.3}Te$, $InAs_{0.91}Sb_{0.09}$, InAs, $InSb_{0.5}Bi_{0.5}$, $InSb_{0.95}Bi_{0.05}$, InSb and Si as a function of lifetime in MEO.

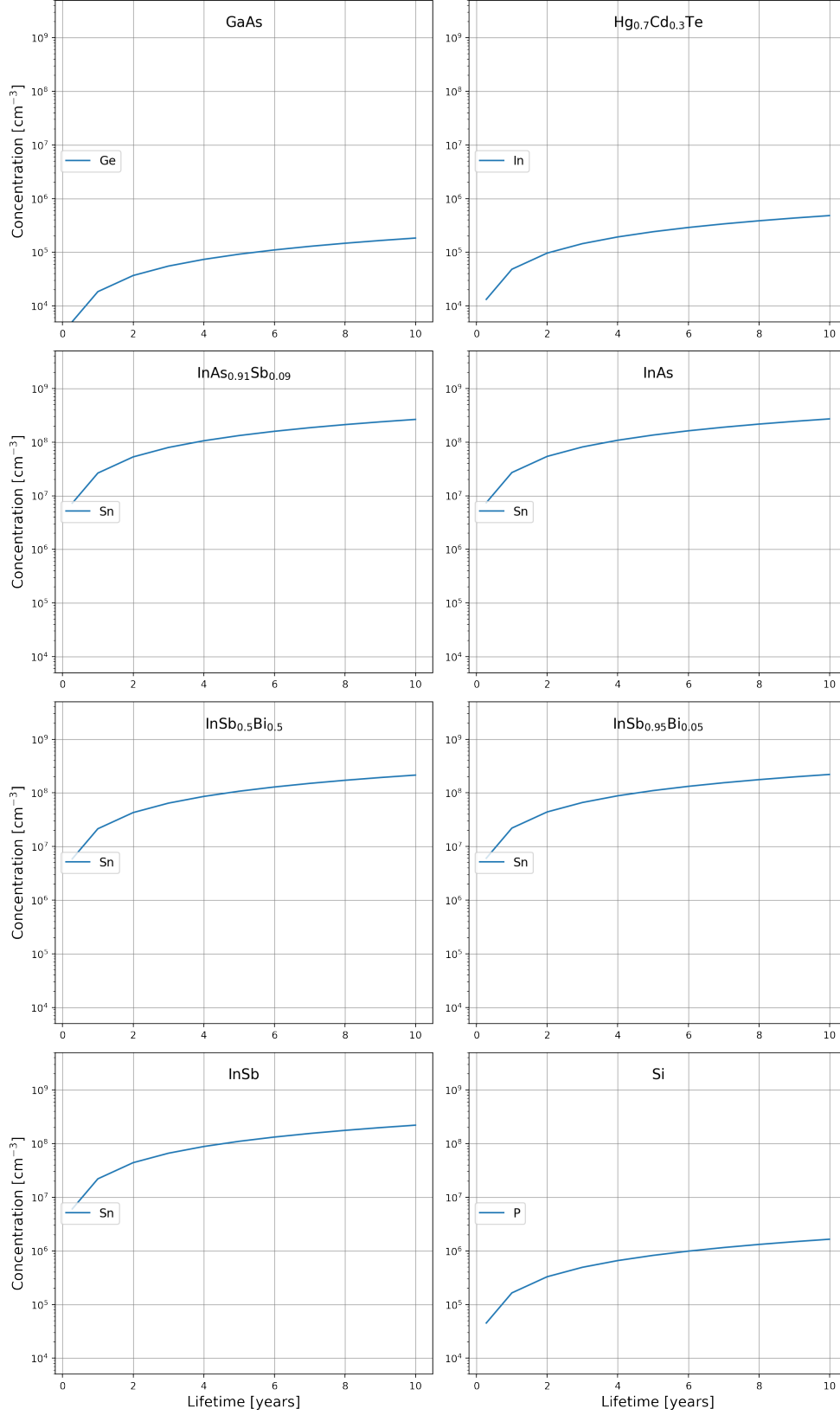


Fig. 6 Impurity concentration (cm^{-3}) for elements with concentrations in excess of $> 10^5 \text{ cm}^{-3}$ for GaAs, $\text{Hg}_{0.7}\text{Cd}_{0.3}\text{Te}$, $\text{InAs}_{0.91}\text{Sb}_{0.09}$, InAs, $\text{InSb}_{0.5}\text{Bi}_{0.5}$, $\text{InSb}_{0.95}\text{Bi}_{0.05}$, InSb and Si as a function of lifetime in GEO.