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Limits on the Strength of the Vestan Magnetic Field Using Dawn's GRaND Instrument

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The well known HED meteorites have long been thought to have originated from Vesta and this interpretation was confirmed by Dawn's visit to Vesta in 2012. Fu et al. (2012) analyzed the HED meteorite Allan Hills ALHA81001 in particular and determined that the remanent magnetization of the meteorite likely formed in the presence of crustal fields about 12 microteslas. The Dawn spacecraft was not equipped with a magnetometer to confirm these results. However, the photomultiplier tube associated with the Bismuth Germanate (BGO) scintillator that is part of Dawn's Gamma Ray and Neutron Detector (GRaND) instrument is known to be sensitive to strong magnetic fields. The gain of the photomultiplier tube varies with both the magnitude and direction of the present magnetic field. Due to the arrangement of the photomultiplier tube, it is most sensitive along one axis. Fortunately, the defined axes of the photomultiplier tube are well aligned with the coordinate system defined for the spacecraft. Using position data, we can monitor how the output of the photomultiplier tube changes as the sensitive axis varies in position with respect to the surface. Here we attempt to use the variation of the gain of the photomultiplier tube as Dawn orbits Vesta as a proxy for any crustal fields that may be present. The photomultiplier tube is sensitive to field strengths greater than 0.5 mT, allowing us to put constraints on the Vestan crustal fields.