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Intensity Variability of Ion Beams Formed at the Oblique Earth's Bow Shock

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Recent CLUSTER observations revealed that field-aligned ion beams appear to emerge from the gyrating ions in the ramp of a quasi-perpendicular shock created by the same reflection process. In fact, effective scattering in pitch angle within the shock ramp during the reflection seem to be the basic production mechanism of field-aligned ion beams. Ion reflection, transmission and wave particle scattering depends on shock parameters, such as Mach number, plasma beta and shock angle. These processes may also depend on the internal dynamic structure and the cross shock potential. All these parameters appear to control ion reflection at the shock and escape of ions into the upstream region, but their relative importance for the ion beam intensity is still unknown. A better understanding will constrain models of ion reflection and transmission processes at perpendicular shocks. A database of shock crossings with a wide range of the aforementioned parameters has been compiled. We include in this database information about the cross shock potential and magnetic field profile at the shock. In a statistical survey we correlate the intensity the gyrating and the beam ions relative to the solar wind flux and to each other with these parameters to determine the main controlling parameters for low and high Mach number shocks.