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Reflected ions at the quasi-perpendicular shock

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At the crossing of the bow shock foot region, GEOTAIL observed two component of reflected ions: main component and sparse component. While the main component is consistently interpreted in terms of the specular reflection and accleration in the solar wind convection electric field, the sparse ion component is reflected to about three times further upstream than the main foot length. We show with the help of a test particle calculation that the secondary foot component is associated with the existence of heavy ions and discuss how these heavy ions modify the conventional understandings of the perpendicular shock.