Three-dimensional Bernstein-Greene-Kruskal modes in a multi-species plasma: Void solutions in a dusty plasma?[1] C.S. NG, A. BHAT-TACHARJEE, Space Science Center, Institute for the Study of Earth, Oceans, and Space, University of New Hampshire, Durham, NH 03824 — A recent theory on three-dimensional (3D) Bernstein-Greene-Kruskal (BGK) mode [Ng and Bhattacharjee, Phys. Rev. Lett., **95**, 245004 (2005)] is generalized to the case of a multi-species plasma. One particular class of exact Vlasov solutions is sought and some are constructed explicitly with electrons and ions following Boltzmann distributions and the distribution function of the other species depending on energy and angular momentum. Some of these solutions are shown to have a depleted (void) or enhanced (clump) density of the third species, or even more complex structures such as a void shell. Comparison with dust voids observed in dusty plasma experiments will be made, as well as a recent theory of the dynamical formation of dust voids [Avinash, Bhattacharjee and Hu, Phys. Rev. Lett., **90**, 075001 (2003)], which has been generalized to 3D [Ng et. al., Phys. Plasmas, submitted].

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