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DMSP Auroral Charging at Solar Cycle 24 Maximum

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It has been well established that polar orbiting satellites can experience mild to severe auroral charging levels (on the order of a few hundred volts to few kilovolts negative frame potentials) during solar minimum conditions (Frooninckx and Sojka, 1992; Anderson and Koons, 1996; Anderson, 2012). These same studies have shown a strong reduction in charging during the rising and declining phases of the past few solar cycles with a nearly complete suppression of auroral charging at solar maximum. Recently, we have observed examples of high level charging during the recent approach to Solar Cycle 24 solar maximum conditions not unlike those reported by Frooninckx and Sojka (1992). These observations demonstrate that spacecraft operations during solar maximum cannot be considered safe from auroral charging when solar activity is low. We present a survey of auroral charging events experienced by the Defense Meteorological Satellite Program (DMSP) F16 satellite during Solar Cycle 24 maximum conditions. We summarize the auroral energetic particle environment and the conditions necessary for charging to occur in this environment, we describe how the lower than normal solar activity levels for Solar Cycle 24 maximum conditions are conducive to charging in polar orbits, and we show examples of the more extreme charging events, sometimes exceeding 1 kV, during this time period.