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Optical properties of small particles near Saturn's G ring

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The Radio and Plasma Wave Science (RPWS) instrumentation on Cassini has detected many impacts of micron-sized particles during the SOI ring plane crossings at 2.63 R_S. Previous research based on these data has given a set of parameters of the dust particles. The number density is 6×10^{-3} m^{-3}, the root-mean-square size is about 2μm, and the corresponding root-mean-square mass is 7.7×10^{-11}g. The dust particles have a distribution that consists of a core component and a less dense halo component. The north-south thickness of the core is about 300 km and the thickness of halo is about 700 km. We calculated the optical depth based on the dust parameters and compared our results with the Cassini imaging team's observations of scattered light from the same regions. The optical depth computed from the dust impact observations is 10^{-7}. This result is much lower than the Cassini image team's value of 10^{-6}. One possible reason is that RPWS cannot detect particles smaller than the detection threshold of 1.6 mV and these particles contribute significantly to the optical depth. Another possible reason is that we have adopted too large of an effective impact area—the area of the high gain antenna (12.6 m^2). Since the high gain antenna is covered by white paint which has a low charge yield constant, now we propose the RPWS only detected the impacts on the RPWS antenna, which has a much smaller area (0.55 m^2). This area gives a number density that is in much better agreement with the imaging observations, and also with the CDA dust impact observations in the E ring. Further experimental measurements are being carried out to determine the charge yield constant of the RPWS antenna and the white paint on the high gain antenna. In this paper we revise the parameters of the dust particles based on our new assumption.