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Spacecraft charging in rarefied plasma under magnetic field

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It is assumed that spacecraft potential is determined primarily by balance of photoelectron input current and ambient electron output current to the satellite. Indeed, the photoelectron density can be in order of magnitude greater than ambient electron density in rarefied plasma (10 per cc or less). That means that in fact a balance between really escaping photoelectrons and photoelectrons, returning back to the spacecraft surface should be considered. Usually an electrostatic approximation is applied for the case and a role of magnetic field in retarding of photoelectron outflow is not taken into account. However, that role becomes quite significant and cannot be excluded from consideration. The magnetic field may suppress an effective photoelectron current in several times for conditions, where the photoelectron gyro-radius becomes comparable or less then spacecraft dimension, while an initial (for uncharged spacecraft) ambient electron current is about 10% or even less. The work presents the model calculations for photoelectron current outflow efficiency and results of investigations of the conditions, where the effect becomes substantial for spacecraft.