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Initial report on the lunar plasma measurement by MAP-PACE onboard KAGUYA (SELENE)

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Low energy charged particles around the Moon were vigorously observed by Moon orbiting satellites and plasma instrumentation placed on the lunar surface in 1960s and 1970s. Though there were some satellites that explored the Moon afterwards, most of them were dedicated to the global mapping of the lunar surface. KAGUYA(SELENE) is a Japanese lunar orbiter that studies the origin and evolution of the Moon by means of global mapping of element abundances, mineralogical composition, and surface geographical mapping from 100km altitude. KAGUYA was successfully launched on 14 September 2007 by HIIA launch vehicle from Tanegashima Space Center in Japan. KAGUYA was inserted into a circular lunar polar orbit of 100km altitude and started continuous observation in mid-December 2007. One of the fourteen science instruments MAP-PACE (MAgnetic field and Plasma experiment - Plasma energy Angle and Composition Experiment) was developed for the comprehensive three-dimensional plasma measurement around the Moon. MAP-PACE consists of 4 sensors: ESA (Electron Spectrum Analyzer)-S1, ESA-S2, IMA (Ion Mass Analyzer), and IEA (Ion Energy Analyzer). After the successful functional check of the low voltage part, high voltage power supplies were turned on. The applied high voltage was gradually raised to the observation level. Since 14 December 2007, MAP-PACE has been observing plasma around the Moon. ESA-S1 and ESA-S2 have been measuring solar wind electrons, electrons in the wake region of the Moon and electrons in the Earth's magnetosphere. IEA has been measuring solar wind ions and ions in the Earth's magnetosphere. Though the operation period of IMA as a mass spectrometer is limited to several hours/day (during the commissioning period), IMA has already discovered the

existence of alkali ions coming from the lunar surface or lunar atmosphere.