

Initial observation result by the ARD instrument onboard the KAGUYA

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Alpha Ray Detector (ARD) is on-board KAGUYA (SELENE), a Japanese lunar orbiter launched in Sep. 2007. Primary target with the ARD is to observe alpha particles emitted by ^{222}Rn and ^{210}Po . ^{222}Rn is trapped by the lunar gravity and decays with the half-life of 3.8 days emitting 5.490 MeV alpha particles. In the decay sequence of ^{222}Rn , ^{210}Po emits alpha particle with the energy of 5.305 MeV. The ARD that consists of several Si detectors is able to distinguish ^{210}Po from ^{222}Rn with high energy resolution. Time scale of the activity is dominated by the 21-year half-life of ^{210}Pb . Results from Apollo 15, 16, and recent Lunar Prospector mission indicate that the average amount of radon on the lunar surface is much smaller than expected, and the radon-alpha distribution suggests that radon comes out through gas emanation from fissures of the lunar surface. Those problems will be solved by the ARD observation, we think.

We developed a large-area detector of 326 cm^2 for the ARD, which is about 20 times larger than the detectors of Apollo and Lunar Prospector. Reduction of the background was achieved with the anticoincidence by rejecting cosmic-ray tracks. Its system is very important in order to reduce cosmic ray background that of the energy deposit in Si detector of ARD is the same as ^{222}Rn and ^{210}Po . The ARD with large effective area will enable (1) precise global mapping of the radioactive material on the lunar surface, (2) identification of gas emanation, (3) study of the radon gas emanation mechanism on the lunar surface and the origin of the lunar atmosphere, and (4) obtaining information on the crustal movement during the last - 50 years.

We will present the performance of the ARD in lunar orbit and the initial observation result in this paper.