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Measurement result of the neutron monitor onboard SEDA-AP on the ISS - Kibo Exposed Facility

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To support future space activities, it is very important to acquire space environmental data related to space radiation degradation of space parts and materials and spacecraft anomalies. Such data are useful for spacecraft design and manned space activity.

SEDA-AP was mounted on Kibo of ISS (International Space Station) to measure the space environment of the 400 kilometres altitude for 3 years.

Neutrons are very harmful radiation because of their strong permeability attributable to its electrical neutrality. The Neutron Monitor measures the energy of neutrons from thermal to 100 MeV in real time using a Bonner Ball Detector and a Scintillation Fiber Detector. The Bonner Ball Detector discriminates neutrons from other charged particles using 3He counters, which have high sensitivity to thermal neutrons. It also measures neutron energy using the relative response, which corresponds to different polyethylene moderator's thickness (6 pcs.). The Scintillation Fiber Detector measures the track of incident particles using a cubic arrangement sensor on which are heaped up 512 scintillation fibers. The sensor discriminates neutrons using differences of these tracks, and measures neutron energy by measuring its track length.

There are three kinds of neutrons measured in space as follows,

1. Albedo Neutron
   Caused by galactic cosmic ray and radiation react with atmosphere
2. Local Neutron
   Caused by galactic cosmic ray and radiation react with spacecraft
3. Solar Neutron
   Caused by accelerated particle in solar flare

Because the shield is difficult, and the influence is large to the human body, the neutron is very important for the astronauts radiation exposure management. Moreover, it is important to measure the albedo neutron because it is thought that the proton that is generated by neutron decay is an origin of the radiation belt. This theory is called as CRAND (Cosmic Ray Albedo Neutron Decay).

An accurate energy spectrum of the solar neutron is measured in space in which the atmosphere is not attenuated, and information on the high energy particle generation mechanism at flare is obtained. This becomes a valuable basic data to do the forecast of flare in the future.

The candidate of some neutron events was found as a result of analyzing the data of the solar flare of M>2 from September, 2009. The detailed analysis on the event on March 7, 2011 was done in these candidates.

This paper reports the development, mission objectives, instrumentation and the result of these analyses.

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