NASA SBIR 2009 Phase I Solicitation

X14.01 Active Charged Particle and Neutron Radiation Measurement Technologies

Lead Center: ARC

Participating Center(s): JSC

For exploration class missions, there is extraordinary premium on compact and reliable active detection systems to meet very stringent size and power requirements. NASA requires compact, low power, active monitors that can measure charged particle spectrum and flux separately from neutrons and other radiations. Also, NASA requires compact active neutron spectrometers that can measure the neutron component of the dose separate from the charged particles. Advanced technologies up to technology readiness level (TRL) 4 are requested in the following areas:

Charged Particle Spectrometer

Measure charge and energy spectra of protons and other ions (Z = 2 to 26) and be sensitive to charged particles with LET of 0.2 to 1000 keV/m. For Z less than 3, the spectrometer should detect energies in the range 30 MeV/n to 400 MeV/n. For Z = 3 to 26, the spectrometer should detect energies in the range 50 MeV/n to 1 GeV/n. Design goals for mass should be 2 kg and for volume, 3000 cc. The spectrometer should be able to measure charged particles at both ambient conditions in space (0.01 mGy/hr) and during a large solar particle event (100 mGy/hr). The time resolution should be less than or equal to 1 minute. The spectrometer shall be able to perform data reduction internally and provide processed data.

Neutron Spectrometer

Measure neutron energy spectra in the range of 0.5 MeV to 150 MeV. Measure neutrons at ambient conditions such that proton/ion veto capability should be approaching 100% at solar minimum GCR rates; measure ambient dose equivalent of 0.02 mSv in a 1 hour measurement period, using ICRP 74 (1997) conversion factors; store all necessary science data for post measurement data evaluation. Design goals for mass and volume should be 5 kg and 6000 cc, respectively.