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MOON (Mo Observatory Of Neutrinos) for double beta decay

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MOON (Mo Observatory Of Neutrinos) is aiming to observe neutrino-less double beta decay for studying neutrino mass of 50 meV region, which is important to be explored according to recent neutrino oscillation measurements. MOON is layers of plastic scintillator which are interleaved with thin ^{100}Mo foils. Energies of two beta-rays are measured with the plastic scintillator. A few tons of ^{100}Mo sources are necessary to collect enough number of events. Area of the foil will be several thousands square meters. In order to put many layers of ^{100}Mo foils, compact and simple structure is applied to MOON detector. Because of high Q-value of ^{100}Mo double beta decay, energies of most background events are far below the Q-value. Therefore, major source of background will be coincidence of two background events. To reject such events, time resolution and position resolution will be powerful tools. Two-neutrino double beta decay is also a background event to neutrino-less double beta decay, which is related to neutrino mass. Difference of energy spectrum is only way to separate them. Therefore, good energy resolution is also required. We have developed a proto-type detector, which is named MOON-1, to investigate performances of MOON detector. MOON-1 has 5 layers of plastic scintillator plate, which size is 53 cm x 53 cm and 1 cm thick. In order to obtain good energy resolution and position sensitivity, the plates are surrounded with 32 square PMTs, which size is 6cm x 6cm, Test measurements shows that position resolution is better than 4 cm (r.m.s.). Because of good coverage of PMTs, 12% (FWHM) energy resolution for 1 MeV electrons is achieved. Details of the measurements and background rejection capability are reported.