Development of nuclear instrumentation for the Radioactive Ion Beams in Brazil (RIBRAS) facility.

A brief description of the Radioactive Ion Beams in Brazil (RIBRAS) facility will be presented, with emphasis to the new nuclear instrumentation, which are currently being developed and connected on the RIBRAS experimental program. RIBRAS system is based on two superconducting solenoids, installed along an experimental beam line connected to a Pelletron tandem accelerator of 8MV terminal voltage. After the second solenoid, an improvement of the secondary beam purity, up to 99%, can be obtained. Thus, a new reaction chamber, placed after the second solenoid, is being developed for exotic nuclei reaction measurements. Such chamber has been equipped with two rotating disks that support detectors and allow them to rotate, without breaking vacuum inside the chamber. The first setup was tested using eight surface barrier silicon detectors, mounted in different telescope configurations, and connected to two MSI-8 electronic systems. Electronic noise was carefully treated, increasing the signal to noise ratio (SNR), and improving the quality of new data. A 2015 experimental campaign was carried out for the following reactions: p(^{6}He,p) ^{6}He; p(^{6}He,α)t; p(^{8}Li,p)^{8}Li; p(^{8}Li,α)^{5}He; p(^{8}Li,d)^{7}Li; ^{120}Sn(^{6}He,^{4}He)^{120}Sn+2n. Spectra confirm the quality of new data. The RIBRAS instrumental update includes new silicon strip detectors (SSD) setup. Detectors from Micronsemiconductors Ltd., will be connected to analogical electronics from Mesytec GmbH & Co (MPR pre-amplifiers and STM-16 amplifiers), logical and digital electronics (Folding Logical Units –FLU and Amplitude to Digital Converters – ADC), from CAEN SpA, and the Motorola VME-5500 processor will connect electronics to the new acquisition system. The use of segmented solid state detectors must enhance the efficiency of angular distribution measurements. In addition, an extension of the RIBRAS beam line was recently installed after the new chamber, to be connected with a gamma-particle cave, shielded by a wall of boron-loaded water, in order to use gamma detectors in a low neutron background environment. The detection of particle gamma coincidence measurements would enhance the reaction selectivity of the system. Finally, a position-sensitive large area neutron detector, capable to distinguish neutron from gamma rays, is also available to be tested. It must be of value to measure neutron rich nuclei break up, detecting neutrons in coincidence with charged particles.

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