Nuclear reaction ion discrimination in plasma-laser interactions by coupling contiguous TOF-SiC devices

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Nuclear reactions produced in high intensity laser-target interaction involve, depending on atomic composition of the target, the simultaneous presence of different ion species, as proton, deuteron, ^{3}He, ^{4}He, etc. Typically, nuclear reactions, as d+ d, d+^{3}He, p+^{7}Li, d+^{6}Li, d+^{7}Li, p+^{11}B, produce output-ion energies of several MeV whose contributions can be mixed its self or to that of impurity protons. Ion discrimination is basically performed by means of analysis of pits observed on tracks detector, which is critically dependent on calibration, or qualitatively evidenced by fast TOF devices based on SiC and diamond detectors. By using these TOF devices , if two ion species are present in the same spectrum, the discrimination of their contribution is not directly attainable. Recently, a new method which allows to discriminate the contribution of two ion species in the wide energy range of the involved nuclear reactions, has been published [1]. It is based on charge response of two TOF-SiC contiguous detectors to the two ion species. The response of the detectors of suitable active thicknesses, associated to different energy losses, can determine the ion specific contribution in each TOF interval. In this contribution an extension of the method to more complexes cases of ion discrimination, with various detector characteristics, is presented and discussed.

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“Plasma-laser ion discrimination by TOF technique applied to coupled SiC detectors.” EPJ Web of Conferences 167, 04003 (2018).https://doi.org/10.1051/epjconf/ 201816704003 PPLA 2017