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Thermal neutron detector based on planar silicon sensor with TiB₂ coating

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Neutron radiation as a non-ionizing radiation is particularly difficult to detect; therefore conversion material are needed. Conversion materials convert neutrons into secondary charged particles to be detected in silicon sensors. The use of titanium diboride (TiB₂) as a conversion material deposited by electron beam-physical vapour deposition (EB-PVD) as a part of front side contact of planar silicon sensor will be presented. Effects of different front side contact material composition and conversion material thickness will be demonstrated and discussed. Sensor behaviour will be examined using alpha particle spectroscopy and a ²⁴¹Am-Be neutron source. Simultaneously, a Geant4 simulation will be executed to evaluate conversion layer functionality and to discover the conversion material thickness for the best neutron detection efficiency.

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