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TCT for characterization of interfaces resulting from CMOS compatible wafer bonding

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In the framework of monolithic active silicon sensors (MAPS), a new fabrication process that consists in bonding a CMOS wafer on a high resistivity silicon bulk which is used as the active sensor is investigated. In this way, it is possible to optimize both the read-out electronics and the sensing element. The electrical properties of the bonding interface are therefore important, since the charge generated by the passage of a particle must cross the interface. To characterize this charge transfer between the "CMOS wafer"and the high resistive bulk, Transient Current Technique (TCT) has been proposed. The characterization method consists first in the bonding of two silicon wafers with the same doping concentration. Then, Schottky diodes are fabricated on the bonded substrate and measured using TCT with laser injection. To avoid the use of complex setups for TCT analysis, a different charge injection method has been proposed. This new electrical injection TCT, where a voltage pulse is applied to an injection contact of a PN diode, enables the transient current to be generated 'on chip', further allowing online characterization of silicon detectors during irradiation tests and high energy physics experiments.

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