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Calculation of geometrical parameters of 3D sensors for timing application

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One of the requirements for the next generation of tracking sensors is a good time resolution, down to tens of picosecond.

For hybrid pixel sensors, one of the limiting factor for the temporal resolution comes from the readout electronics.

Simulations of typical charge sensitive amplifier electronic front end has been performed and the results shows that the timing jitter is dominated by the relationship between input charge and capacitance (j.nima.2013.04.060).

On the sensor side, 3D sensors have shown good potential for timing applications. In this talk, the capacitance (c_{det}) and input charge (Q_{in}) of 3D sensors have been calculated as a function of the column size (w) and aspect ratio (R). By combing this calculation and results of the front-end electronic simulation, a region in the $w - R$ space which satisfies the requirements for timing resolution of 30 ps is found. In addition the issue of the fill factors of 3D sensors for perpendicular and inclined tracks is discussed.

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