

# 10th Anniversary "Trento" Workshop on Advanced Silicon Radiation Detectors

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## Studies of non-irradiated and irradiated HVCMOS detectors

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The charge collection mechanism in HVCMOS detectors produced by AMS was studied by Edge-TCT and by measuring signals from minimum ionizing particles before and after neutron irradiation. The sensors were produced for investigation of HVCMOS technology for pixel and strip detectors for ATLAS upgrade. In reverse biased HVCMOS sensor thin depleted layer is formed in relatively low resistivity p-type silicon.

In addition to the charge released in the depleted layer which is collected because of drift in electric field, also the charge from the vicinity, entering the depleted region by diffusion, contributes to the total collected charge. From analysis of Edge-TCT signals it was found that the drift component of collected charge increases with irradiation while the diffusion part is diminishing.

Such behavior was attributed to the initial acceptor removal on one side and reduction of minority carrier lifetime on the other. Reduction of effective space charge concentration results in wider depleted region and therefore in high charge collection efficiency for heavily irradiated sensors which may even exceed the charge collection efficiency before irradiation.

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