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Changes of the particle detection properties of irradiated silicon microstrip sensors after room and elevated temperature annealing.

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The changes of the electrical properties of hadron irradiated silicon detectors take place over several years at room temperature.
This annealing can be accelerated or dcelerated by lowering or elevating the temperature at which the sensors are kept. This fact is used by the
scientists involved in the development of the silicon sensors for the LHC experiments: elevated temperatures (up to
80 oC) have been used to accelerate the effect of the annehaling to study their performances after several years in the experiments, and
low temperatures are actually used to retard the undesired effect of annealing duing the times when the detectors are not operated.
The acceleration factors with respect to nominal room temperature (RT = 20oC) have been established monitoring the changes of the
capacitance-voltage characteristics (CV) with time at various temperatures. It remains to establish if the acceleration factors are also valid
for te reverse current (IR) and the charge collection characteristics (CC(V)), that are more relevant to the operations of silicon sensors in high energy
physics experiments. In fact in the experiments, the maximum high temperature evisaged out of operation cannot exceed much the 20oC.
It is important to assess the exact amount of expected annealing in view of planning the operation scenario (i.e. the bias voltage
and temperature) of the
silicon sensors in order to have efficient charge collection and controlled reverse current (responsible for power dissipation).
In fact it is well known that substantial reduction of the reverse current (more than 50%) can be achieved by annealing.
We show here the comparison of elevated and room temperature annealing of the IR and the CC(V) characteristics
of detector irradiated to doses expecte in the future upgrade of the LHC at CERN (sLHC).

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