Radiation Hard Silicon-Strip Detectors for the sLHC

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The Large Hadron Collider (LHC) will soon start collisions but plans are already advancing for an upgrade to about ten times the LHC luminosity in the superluminous-LHC (sLHC) project.

LHC

$10^{34} \text{ cm}^{-2} \text{ s}^{-1}$

sLHC

$10^{35} \text{ cm}^{-2} \text{ s}^{-1}$

An increase in pile-up of events per beam crossing from 20 to 400 and an increase of total fluence of particles will imply the need for the detectors to be replaced and technologically improved.

p-type silicon strip technology: ATLAS07 test sensors

Plots on the right show charge collection efficiency vs bias voltage for proton irradiation (right) and neutron irradiation (far right).
Good ATLAS07 performance !!
☺

Full Size Sensor Testing (99 mm²)

Plots on the right show strip current (top), strip coupling capacitance (middle) and bias resistance (bottom) vs the strip number.

Alternative module integration concepts:

- Powering and readout are grouped for several modules and integrated in a stave (barrel) or petal (endcap)

Sensor area: 830 cm²

120 chips/side
(in red chips/detector type)