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Active Region Extent Assessment with X-rays (AREA-X) shown for the example of sensors for the ATLAS ITk tracker

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The development of sensors for new tracking detectors requires characterisation for a range of performance criteria like active area, inter-pixel inefficiencies and homogeneity, which have traditionally only been accessible through measurements in particle beams. In order to achieve sufficient position resolution, particle beam tests require extensive setups for particle tracking, which limit the data acquisition speed and necessitate complex reconstruction algorithms.

Active Region Extent Assessment with X-rays (AREA-X) has been developed within the scope of the ATLAS ITk tracker as an alternative method to assess sensor characteristics such as the extent and shape of the depleted, i.e. active sensor area with applied bias voltage and extent and shape of inefficient areas. This method relies on the use of a monochromatic, micro-focused X-ray beam, available at Light Source beam lines, to scan over a sensor area of interest and utilises the induced sensor current to map the active sensor area. With no additional data acquisition methods being required, this method has been developed to be fast and reliable and not be limited by exposure time like traditional particle beam tests.

The contribution presents an overview of the method and its development using test ATLAS ITk strip sensors and test structures as well as future plans for measurements of interest.

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