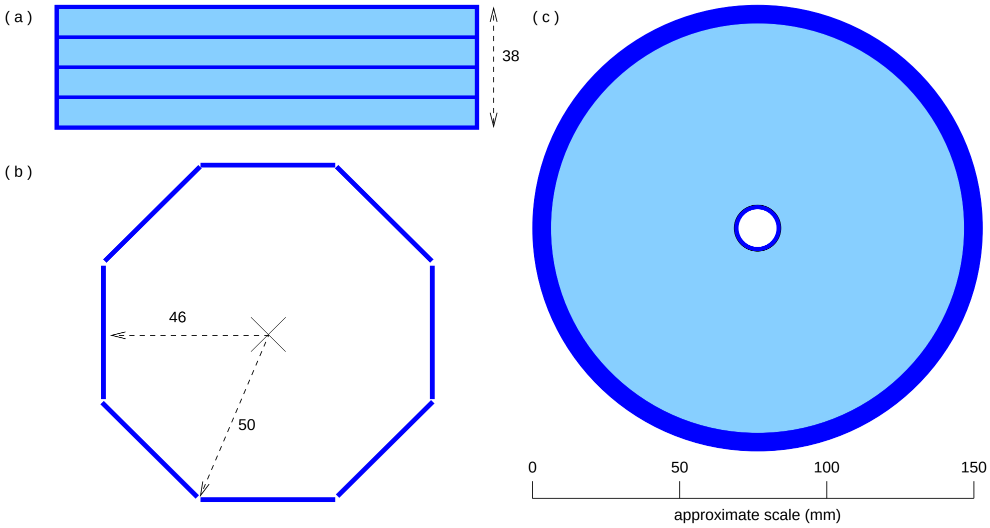
Figure 2: Strip detectors for TIARA: (a) the rectangular detectors each have 4 resistive strips and are single-sided, (b) they are arranged with their long sides touching to form an octagonal box, (c) the annular detectors are double-sided 6-inch wafers with annular strips at 1 mm pitch on one side and radial segments on the other side



mechanism for target changing has been chosen. A more sophisticated remote controlled arrangement could be considered in the future, and may allow the eventual completion of the barrel, but in the first stage this is not included. This partly explains the specific choice of an octagonal geometry for the barrel. It represents a balance between lost solid angle and the complexity of building the barrel from many separate detectors and getting their signals out. The other important reason for the octagonal choice is that it provides a good match between the geometries of the charged particle detectors and the gamma-ray detectors.

2.4 Annular detectors

For the annular detectors, in order to cover completely the forward angle range out to 35 degrees in the laboratory frame, there is a choice of 5-inch and 6-inch wafer technology. Both are available via commercial manufacturers. The 6-inch technology is preferred since it gives more scope for optimisation of the inner hole diameter compared to the outer diameter of the active area and it also allows the detector to be placed further from the target. Note that, whilst the strip pitch on an annular strip detector can be scaled down to very small values, there are two other important quantities that cannot be scaled with the size of the annular detector. Firstly, the achievable beam spot size (or reconstructed hit resolution) in experiments with radioactive beams is limited to of order 1 mm, and secondly there are unavoidable dead areas required for passivation at the edges of detectors and drilling of the central hole and these also amount to at least 1 mm at the crucial most forward angles. The 6-inch (150 mm) diameter annular detector is mounted at a distance of 86 mm from the target, with annular strips of 1 mm pitch which is matched to the beam spot resolution. At this distance, there is no geometrical problem imposed by the gamma-ray detectors, as the segmented clover detectors of Exogam have an overall radius of less than 70 mm and hence the close-packed cube geometry does not conflict with the