

HiRA is a high resolution detector array used to detect charged particles emitted in nuclear collisions. The high position resolution of the HiRA arises from the precise spatial determination of the 1024 pixels obtained using the strips in each Silicon-CsI telescope and the accurate knowledge of the target position where nuclear collisions occur. Sub-millimeter position measurements must be accomplished without mechanically touching either the Silicon detectors or the target, both of which are fragile. Furthermore, during an experiment the HiRA and target are placed inside a chamber, which could be physically restrictive to make accurate position measurement. To measure the precise location of targets and HiRA telescopes used in experiments, the HiRA group develops a Laser Based Alignment System (LBAS). The LBAS device (shown as a small box in the lower left corner of the picture) is compact enough to be inserted into the 4pi and the S800 chamber to determine the location of detectors and targets. The LBAS system is comprised of a class II laser for determining the range and two rotary stages for angular measurements. The distance to an object is measured by bouncing off the laser beam off the surface of the object. Thus the LBAS is best used to locate sharp edges. The overall position resolution is 0.17mm. The lower right panel of the figure shows a target frame supported by thin long carbon fibre inside the soccer ball shape 4pi chamber. The major axis of the target is about 20 mm long. The picture above shows the scanned lines from LBAS measurements superimposed on the outline of the 4pi target frame. The left panels compare the active area of HiRA telescopes determined by LBAS in 3-dimensional space (top) and the photograph of HiRA (bottom) used in the 4pi experiment. The detector active areas of the detectors with strips are not visible in the photograph as they were protected by foils placed in front of the telescopes.

