# Using DIRC Detector in GlueX

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The synthetic fused Silica bars (n = 1.473) used in BARBAR DIRC detector can potentially be used in GlueX spectrometer of Hall-D to provide additional charged particle identification in the forward region with a momentum coverage between 1.5 to 4 GeV where either the existing Time-of-Flight detector or a threshold gas Cherenkov detector will have difficulties to cover. The geometry of existing BARBAR DIRC bars is 17.25 mm × 35.00 mm × 4.9 m. Each of them consists of four 1.225 m long bars glued end-to-end. BARBAR DIRC used 144 bars in total to cover the whole azimuthal acceptance. At normal incidence, the DIRC will introduce a total of about 17% radiation length thickness including supports.

In GlueX spectrometer, the DIRC bars will be placed right in front of the TOF wall to reduce the impact on photon reconstruction due to its thickness. 68 DIRC bars will be reconfigured into two flat panels to provide an angular coverage up to 11 degrees with a 10 cm gap in between for beam exit as Figure 1. One side of bars will be covered by mirrors and Cherenkov lights will be collected on the other side.

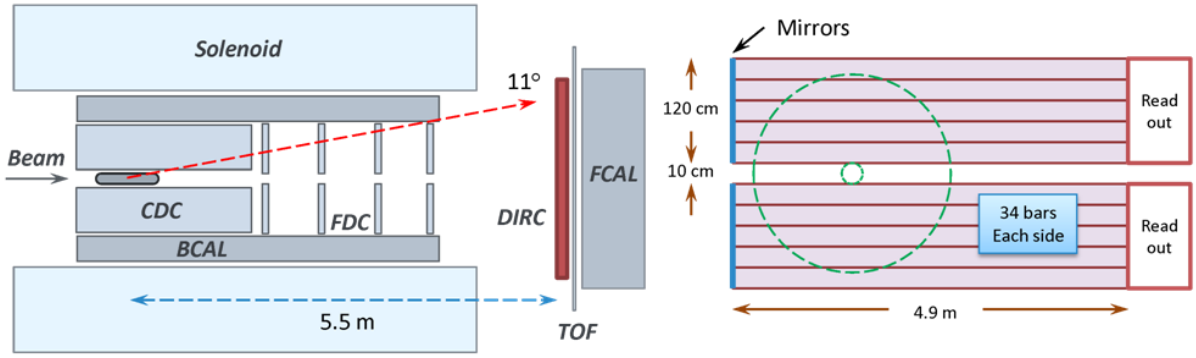


**Figure 1** Configuration of DIRC for GlueX

The Focusing DIRC readout currently being developed by SLAC will provide better performance than the original one used in BARBAR. The new design uses focusing mirrors to remove the smearing due to finite thickness of the bars. In addition, the use of Multi-anode PMTs will allow a much more compact design of the readout assembly (25 times smaller) and the faster timing resolution (~150 ps) can be used to correct chromatic dispersion. As a result, the new design will improve the angular resolution of single Cherenkov photon from 9.6 mrad to less than 7 mrad, thus boost the upper limit of $\pi$/K separation with 3 standard deviations from 3.8 GeV to 4.3 GeV. For GlueX, 276 2" MaPMTs will be needed to readout all 68 bars and the cost for them alone will be about $1.4 M.

Furthermore, the recent development carried out by the large-area picoseconds photo-detector (LAPPD) collaboration since 2009 may provide a very attractive alternative readout solution than MaPMT. Their approach is to apply micro-channel plate (MCP) technology to produce large-area photo-detectors with excellent space and time resolution. These MCP-PMTs can provide much better timing resolution (<10 ps), similar spatial resolution compared to MaMPT at a much lower cost: $140 k for GlueX DIRC (photo-detector alone, another $110 k for DAQ). As the development of individual components is going very well, small size (5 cm × 5 cm) samples will be available by the end of 2013.