

RAL High Accuracy Microtargetry System

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The challenge of positioning laser targets at high repetition rates increases as laser technology and laser repetition rates improve. Higher repetition rates allow experiments to be completed in a shorter time and, potentially, allow high repetition rate systems to be used as particle sources/beamlines. Ultimately the aim is to produce reliable and accurate target positioning for 10Hz lasers.

The CLF are working towards this ultimate goal in phased developments. The initial specification for the HAMS is to deliver pristine targets and align them to the focal spot and plane within the shot rate of Gemini (0.1Hz). The accuracy specified for the positioning of targets is $\pm 4\mu\text{m}$ for Z position and $\pm 10\mu\text{m}$ for the X and Y motion. The HAMS system uses targets mounted on wafer segments located in 1° steps on 2 annuli giving 688 targets and 2 hours of operation.

Phase one methodology for HAMS is to align one target precisely to the focal spot and beam in all degrees of freedom. The wafer segment wheel can then be sequentially rotated through 360° to position each target within tolerance. Development of the wafer mounting and the precision of motion control stages is underway to ensure that the accumulation of all possible errors is smaller than the tolerable positional range.

Phase two methodology for HAMS is to integrate the motion control stages with an automatic target alignment system also being developed within CLF (discussed in a separate paper) which will enable real time automatic positioning of targets.

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