Overview of SIM External Calibration

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Like all astrometric instruments, the Space Interferometry Mission (SIM) suffers from field-dependent errors that require calibration. Diffraction effects in the delay line, polarization rotations on corner cubes, and beam walk across imperfect optics, all contribute to field-distortion that is significantly larger than is acceptable. The bulk of the systematic error is linear across the field – that is, it results in a magnification error. We show that the linear terms are inconsequential to the performance of SIM because they are inseparable from baseline length and orientation errors. One approach to calibrating the higher-order terms is to perform 'external' calibration; that is, SIM periodically makes differential measurements of a field of bright stars whose positions are not precisely known. We describe the requirements and constraints on the external calibration process and lay the groundwork for a specific procedure detailed in accompanying papers.