

## LITHOGRAPHY METROLOGY PROGRAM

Advances in lithography have largely driven the spectacular productivity improvements of the integrated circuit industry, a steady quadrupling of active components per chip every three years over the past several decades. This continual scaling down of transistor dimensions has allowed more and more components on a chip, lowered the power consumption per transistor, and increased the speed of the circuitry. The shrinking of device dimensions has been accomplished by shortening the wavelength of the radiation used by the lithography exposure tools. The industry at this point has moved into the deep ultraviolet (DUV) spectrum. Currently, exposure tools operating at 193 nm are in leading edge manufacturing facilities. The first 193 nm immersion lithography tools have been shipped to leading edge manufacturers and are being exercised for manufacture. High index fluids and lens materials for 193 nm tools are under intense exploration to develop high numerical aperture systems. Looking beyond the deep ultraviolet, extreme ultraviolet radiation (EUV) at 13 nm is being investigated, and demonstration tools are being designed and assembled. At least three alpha tools will be shipped to development consortia in 2006. The overall goal of this task is to support these developments in DUV and EUV. The areas of emphasis are characterization of lens materials, and immersion fluids, laser calorimetry, radiation detector sensitivity and damage, EUV lens metrology, and metrology for the development of advanced photoresist materials for both DUV and EUV.