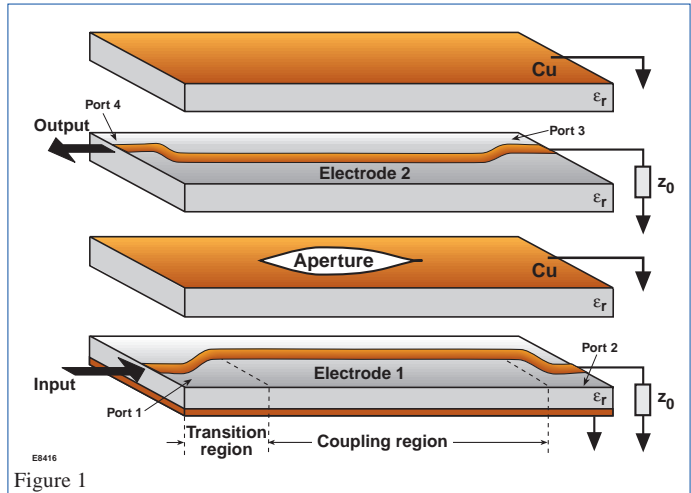
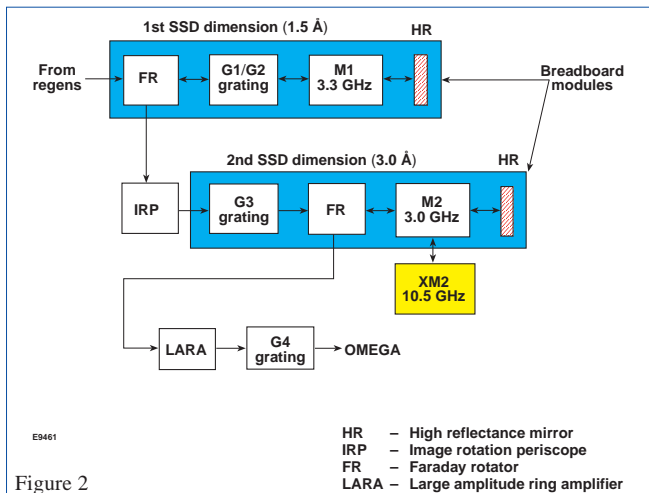


**Distributed Phase Plate Development:** LLE continues to improve its capabilities to design and fabricate distributed phase plates. Several varieties of fully continuous phase plates were fabricated using continuous gray-level contact lithography. A set of 15 distributed phase plates, each producing a sixth-order supergaussian irradiance profile, is now available for 1-mm-size, flat-target, RT imprinting and growth experiments. In addition, a few specialized phase plates that produce one- and two-dimensional, single-frequency, sinusoidal irradiance patterns are being made by the same continuous, contact-lithography technique. Beginning the first quarter of FY99, these sinusoidal phase plates will be used for extensive laser-beam imprinting studies. Further advancements (in progress) involve the development of simulated annealing algorithms to control speckle size and the development of continuous masks to produce even flatter irradiance profiles.

**Pulse Shaping:** A high-bandwidth electrical-waveform generator based on an aperture-coupled stripline (ACSL) was designed and tested for pulse-shaping applications on OMEGA. An exploded view of an ACSL is shown in Fig. 1. In operation, a square electrical pulse from a commercial square-pulse generator is launched into port 1 and propagates along electrode 1 to the terminated port 2 of the ACSL. As the square pulse propagates along electrode 1, a signal is coupled through an aperture to electrode 2 in the backward direction and exits at port 4. By tailoring the aperture width along the length of the ACSL, any desired electrical waveform can be generated at the output and sent directly to electro-optic modulators for pulse shaping. Shaped voltage and optical pulses with ~100-ps structure over a 1- to 5-ns envelope were produced using this approach. The optical pulses are suitable for amplification in a regenerative amplifier and subsequent propagation through the OMEGA laser system.



**Two-Dimensional Smoothing by Spectral Dispersion (2-D SSD):** A double-pass 2-D SSD system was developed in the SSD testbed where off-line testing of SSD modulators and systems are performed. The double-pass 2-D SSD system (Fig. 2) uses the same 3.0- and 3.3-GHz modulators currently employed in the single-pass 2-D SSD OMEGA system to generate up to twice as much SSD bandwidth. Even at 50%-larger total SSD bandwidths, the worst peak-to-mean amplitude modulation (AM) observed in the beam has been reduced from about 12% to less than 8%, and further AM reductions are expected with continued development. This system generates  $1.5 \times 3.0\text{-}\text{\AA}$  infrared bandwidth (0.36 THz in the UV) with approximately one color cycle in each dimension, which is the maximum dispersion bandwidth product allowable under present OMEGA operating procedures. The modular design and double-pass architecture of this system enables further improvements such as including higher-frequency X-band modulators that are currently being developed. A 10.5-GHz phase modulator will replace the 3.0-GHz M2 modulator shown below in the second SSD dimension, producing  $3.0\text{ \AA}$  of infrared bandwidth with three color cycles. A double-pass, 2-D SSD system based on this configuration will be implemented on OMEGA in mid-FY99. Later, a configuration capable of generating 1 THz of bandwidth in the ultraviolet will be installed based on these same modulators.



**OMEGA Operations Summary:** During October, the OMEGA facility was operated on 13 target shot days producing a total of 147 target shots for various experiments. These shots were shared by the planar-foil RTI campaign (37 shots), integrated spherical (ISE, 79 shots), and an NLUF campaign for the University of Maryland (23 shots). In addition, one day was dedicated to long-scale-length plasma studies (8 shots) to continue investigation of NIF-like laser-plasma interactions.