Section 4
NATIONAL LASER USERS FACILITY NEWS

The National Laser Users Facility (NLUF) is currently hosting several user experiments. This report highlights the UCLA/Yale University, University of Maryland, and University of Illinois experiments. A brief summary of the completed Brigham Young University experiment is also included.

UCLA researchers Francis F. Chen, Chan Joshi, and Humberto Figueroa, in a joint effort with Yale University researchers Nizarali Ebrahim and Hiroshi Azechi, have obtained initial recordings of stimulated Raman spectra. They intend to measure the growth and angular dependence of stimulated Raman-scattered light and the angular dependence of electron spectra from an underdense plasma. The underdense plasma will be formed by focusing a 1.05 μm beam onto a thin foil which is then probed by a second pulse of 0.35 μm laser radiation. Measurements will be taken by two visible light spectrometers and two electron spectrometers to measure the Raman light and electrons produced from the plasma.

University of Maryland experimenters Hans Griem and John Adcock, in collaboration with Joe Reader from the National Bureau of Standards and Uri Feldman from the Naval Research Laboratory, are examining the Balmer Series spectra from low ions. An ultraviolet spectrometer, previously used in solar astronomy, has been installed on the GDL system to measure Balmer Series lines from various targets. To date, spectra have been observed from fluorine, graphite, plastic, iron, niobium, and molybdenum. A full reduction of the data is being carried out at all three home institutions.

University of Illinois investigators George Miley, Aaron Bennish, Chan Choi, and Dave Harris are studying the energy losses of charged fusion products through the tamper (the hot outer-plasma region). A time-of-flight spectrometer, to measure the charged particles, has been installed on OMEGA. The spectrometer consists of two quadrupole magnets which relay the charged fusion products from the targets to a scintillator-photomultiplier. Transmission curves, indicating the fraction of charged fusion product collected at the spectrometer, have been generated.

Brigham Young University's Larry Knight, James Thorne, and David Gaines, working with Troy Barbee of Stanford University, are credited with the first user experiment completed at the NLUF. They developed new measurement techniques for x-ray radiation to probe high-density plasmas. These techniques involved the development of new x-ray optics using layered thin synthetic structures to supplement the more standard x-ray diffraction crystals.

The following is excerpted from the final BYU report:

> A practical method of fabricating x-ray optics is crucial to the development of a system for the x-ray probing of dense plasmas. Layered Synthetic Microstructures (LSM's) appeared to have a real chance of filling this need. Relatively little x-ray characterization has been done on LSM's, at least as measured against their potential value. The Brigham Young University experiments performed low energy characterization of LSM's on the laser facility at BYU, followed by experiments at LLE. Experiments were conducted with both flat crystals and crystals bent in a cylindrical shape.
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> Two series of experiments were performed at the National Laser Users Facility; the first was of a preliminary nature in May 1981 and the second was just completed (August and September of 1981).
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> Direct comparison measurements were made between a tungsten/carbon LSM and a standard Tl.A.P. diffraction crystal on the GDL laser at LLE. Spectra were taken at 8 Å (aluminum) and at 15 Å (fluorine). Densitometer traces of the fluorine comparison spectra are shown in Fig. 23. The LSM had 150-layer pairs of tungsten/carbon with a total d-spacing of 15 Å. The LSM spectra have lower resolution and somewhat lower reflectivity than the Tl.A.P. spectra. The lower resolution was expected and the lower reflectivity is not surprising for an LSM with a small d-spacing. The fact that the spectra are comparable in these two respects is in itself an interesting result.
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> We consider the LSM's performance to be quite good. Its reflectivity is clearly reduced from that of an ideal structure. A defect-free LSM would have an integrated reflectivity about

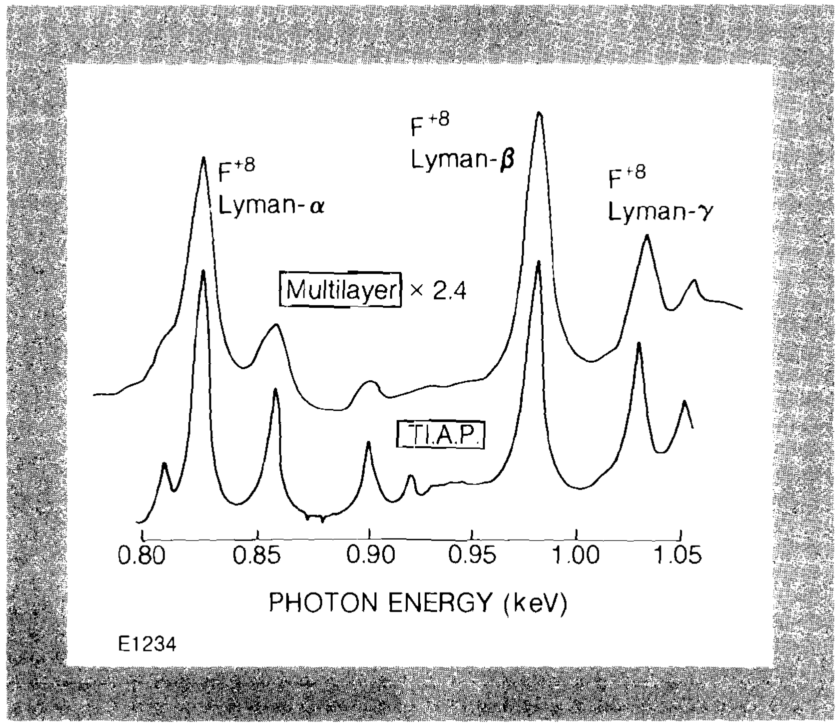

Fig. 23
Comparison of a fluorine x-ray spectra diffracted by a multi-layer and standard Tl.A.P. crystal. Scale of the upper trace increased by 2.4 over the lower trace.

60% greater and a peak reflectivity 40% lower than Tl.A.P. The reduced reflectivity of the real LSM is probably due to surface roughness effects.

(A copy of the entire report may be obtained from the National Technical Information Service, 5285 Port Royal Road, Springfield, Virginia 22161, $8.00 per printed copy.)

Additional user experiments will be described in the next issue of the LLE Review. The users include Anthony J. Burek (National Bureau of Standards), Uri Feldman (Naval Research Laboratory), and Chuck Hooper (University of Florida).

Further information on the NLUF is available from:

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