HAO Stokes Polarimeter. In meeting these goals NSO would prefer a continuous face plate (CFP) rather than segments, long-life actuators (>2000 hours), a flexible computer for the calculation of phase ("Digital Reconstructor"), and a wavefront sensor that will track the granulation and accommodate various types of mirrors. The work is organized into four tasks: 1) Optical System, 2) Adaptive Mirror, 3) Wavefront Analyzer, and 4) Digital Reconstructor.

12.02

Ground-Based Mirror Coronagraph: First Results

R.N. Smartt (NSO/SP), S. Kouchmy (Institut d'Astrophysique), R. Schwenn (MPAE)

A miniature 1–m focal length coronagraph, constructed in the NSO/SP Instrumentation Development Laboratory, is based on a superpolished silicon mirror objective obtained from Zeiss–PFG. The coronagraph is installed on the spar of the Hilltop Dome of NSO/SP. The optical configuration is simply off-axis reflection of the objective to an occcluding disk, Lyot stop, and secondary optics. It has been designed to be used either with photographic recording or a video CCD camera, both in combination with a Vario Image Tube. Video rate recording reveals that the contribution of flying dust particles to the background is larger than previously realized. Using a 0.4mm FWHM interference filter, low resolution images of 530nm coronal emission have been obtained. Details of the design and preliminary results are presented. The prospect for the development of this type of achromatic coronagraph technology to large-aperture, low-scattered light telescopes, of particular importance near the UV and IR ends of the spectrum, is discussed.

12.03

High-Resolution Imaging of the Solar Corona

L. Golub (SAO)

We will discuss the methods which are being developed by our group at the Center for Astrophysics for obtaining high-resolution images of the solar corona. The work includes the construction of X-ray telescopes and high-resolution two-dimensional imaging X-ray detectors. Construction and flight of a multilayer coated normal incidence X-ray telescope operating at 6.5A forms the core of our program, and we will present results from the June 1988 sounding rocket flight of this instrument, in which the rise phase of an M8 flare was observed. In addition a general discussion of the scope and probable future use of multilayer techniques will be presented. The present status of our detector development program will be discussed, including the successful flight of our prototype detector systems, as well as the intensified CCD detector imaging He 304A in real time which will be used on our next rocket flight.

12.04

1024 × 1024 Pixel CCD Cameras for Imaging the Sun in Visible, Near-UV, and Near-IR Wavelengths

D. Duncan, C. Edwards, M. Levay, M. Morrill, A. Title, J. Wolfson, (Lockheed Palo Alto Research Labs), L. Hovland (JPL)

This talk will describe the CCD camera systems being developed at Lockheed for NASA flight instruments. A complete camera system includes sensor, camera head with TEC (optional) electronics, sector shutter, bench checkout equipment (computer interfaces), MicroVax computer, vacuum system (when operating at < 5 × 10^-9 Torr) and software for testing and observing. Starting in 1983, JPL designed and built cameras using TI virtual phase sensors for the Coordinated Instrument Package for SOT. This effort culminated in the CIP brassboard camera, which has done extensive solar observing at SOT. Pk. and La Palma and has digitized the entire SOUP film from Spacelab 2 and other solar films. In 1988, our group at Lockheed began modifying the design and building new cameras with improved performance. We are now building cameras which use either TI virtual phase sensors or SAIC/Ford 3-phase sensors, in work jointly supported by the CIP for OSL and MDI/SOI for SOHO projects. These cameras have 18 micron pixels, large full wells (at least 100,000 e^-), fast readout (900 Kpixel/s), moderate read noise (50 e^-), summing capability in both dimensions, and very little fringing in narrowband light, due to use of unthinned, front side illuminated sensors. The design is intended for eventual space qualification on free-flying satellites; a brassboard type camera will also be used on balloon flights of SOUP in the early 1990's.

This work has been supported by NASA contracts NAS5-26813 (OSL) and NAS5-30886 (SOHO).

12.05

Miniaturized CO2 Laser Heterodyne Spectrometer for Solar Line Profile Studies

D. Glenn, M.J. Mumma, T. Kostik, D. Deming, H. Huffman, J. Degnan (NASA/Goddard), D. Zicoy (U. Maryland)

Heterodyne spectroscopy at 11 μm has been used for measurements of the thermal structure of the upper photosphere, and studies of the effect of p-mode oscillations on line profiles. This technique provides full Doppler-limited line shape information, and can measure gas velocities to several m/s from absolute line position measurements, using a stabilized (c<1 MHz) CO2 laser local oscillator. It is also inherently interference limited, so the spot size is largely determined by the choice of telescope aperture. However, this class of instrument has been used for solar measurements at only one observing site (the Kitt Peak McMath Solar Telescope), since it is assembled on a large optical breadboard and can only be used at telescopes equipped with a coude focus.

We are now completing a highly miniaturized 9-12 μm CO2 laser heterodyne spectrometer that can be installed at IR transmissive telescopes of any size. It features a fully automated, line tunable waveguide CO2 laser, a miniaturized 64-channel filter bank receiver and an on-board CPU controller for fully programmable operation, with single commands from a remote user workstation. Initially, the instrument will use a single element photomixer detector, and can be used for acquiring time-multiplexed, multi-point sunspot temperature and velocity field maps using SiO lines, which exist only in sunspot umbrae, and OH lines which traverse the entire spot. Later, we will incorporate a heterodyne detector array for operation in the staring mode.

12.06

An Imaging Stokes Polarimeter Using Infrared Array Detectors

D. Deming and B. Jennings (GSFC), T. Rehagama and D. Zicoy (U. Maryland)

The advent of sensitive infrared array detectors has great significance for solar magnetic field studies, because the wavelength dependence of Zeeman splitting can result in completely resolved Zeeman patterns for infrared lines. In such cases, the linear polarization (Stokes Q, U) can be just as large as the circular polarization, making transversal field measurements relatively easy. Moreover, instrumental polarization is greatly reduced at long wavelengths. At the longest infrared wavelength where Zeeman studies are currently practical (12 μm), spatial resolution is limited by diffraction in the largest solar telescopes to ~ 2 arc-sec. However, the very