56.03
Observations of Mutual Phenomena of the Galilean Satellites in 1985-1986.

R. L. Marcialis (U. Arizona)

High-speed photoelectric observations of representative Jovian satellite mutual events will be presented. Two-channel observations were made in Tucson with the LPL Occultation Photometer system. Telescopes employed include the Steward Observatory 53.3 cm and LPL #1 34.6 cm reflectors. Time resolution is 10 msec, and observations were tied to a WWV signal to provide overall timing accuracies of $\lesssim$ 0.03 sec.

Preliminary analysis of our data confirms the predicted ephemeris of Asknes and Franklin (1984) to within $\sim$ 30 seconds of time and $\sim$ 5% in depth for most of the observed events. Combination of our data with those of other observers will serve to improve the ephemerides of the Galilean satellites, refine targeting of the upcoming Galileo mission to Jupiter, and search for tidal effects in the motion of Io. This data will also support eclipse studies of Io's extended atmosphere (Schneider et al. 1985).

A complete, up-to-date list of all observed events will be made available at the meeting.

References: Aksnes, K. and Franklin, F. (1984) Icarus 60, 180-188.

Schneider, N. M. et al. (1985) B.A.A.S. 17, #3, submitted.

56.04
Observation of a Gamma Ray Burst from Spacelab 2

C.A. Meegan, G.J. Fishman, R.B. Wilson (NASA/MSFC) and W.S. Paciesas (Univ. of Alabama, Huntsville)

A strong gamma-ray burst was observed on August 5, 1985 by a nuclear radiation monitor on the Spacelab 2 mission. The monitor is a 5"x5" NaI(Tl) scintillation detector designed to measure various sources of background radiation in the Shuttle/Spacelab environment. Data in twelve energy channels between 70 keV and 10 MeV are recorded every 5 ms and high resolution spectra in the same energy region are sampled every 20 s. A plastic scintillator surrounding the central detector enables separation of the detected pulses into charged and uncharged events.

The main peak of the burst is ~3 s wide, centered at 00:56:38 UT with symmetric rise and fall times of ~0.5 s. The peak has a very hard spectrum extending to above 5 MeV. At low energies, emission is seen for ~25 s after the main peak with time varying structure. No precursor emission or structure with time scales less than 0.1 s is apparent. These features may be common to a particular sub-set of bursts.

The gamma-ray burst was also observed by instruments on the PVO and ICE spacecraft (J.G. Laros, private communication) which will permit an accurate location to be determined.

56.05
Evidence for Evolution of Quasar Environments

H.K.C. Yee (U. de Montréal), R.F. Green (KPNO)

Images in Gunn r and i from small fields around 31 quasars having redshifts between 0.3 and 1.2 have been obtained using the CCD camera at the Steward 2.3 m. A catalog of the detected galaxies, complete up to r $\sim$ 22.9 is compiled. From these data, luminosity function, colors and spatial co-variance function of galaxies apparently associated with the quasars are obtained. It is found that the 10 radio-loud and 6 radio-quiet quasars at redshift between 0.3 and 0.5 have quasar-galaxy spatial co-variance amplitudes similar to those reported by Yee and Green (1984, Ap.J., 280, 79) for quasars having $z < 0.4$. However, the 9 radio-loud quasars at the redshift range of 0.55 to 0.65 are situated in significantly richer environments. Their average quasar-galaxy spatial co-variance coefficient is larger than that of the low redshift sample at the 95% confidence level. The average richness of the apparently associated clusters appears to be greater than that of Abell 1 clusters. This is compared with the finding that only I out of 17 radio-loud quasars with $z < 0.4$ in the sample of Yee and Green (1984) is found in a cluster similar in richness to an Abell 0 cluster. This is a strong indication that some evolution of the environment of bright radio-loud quasars has taken place at an epoch as close as $z = 0.6$. Deeper images taken at the CFHT 3.6 m and CTIO 4 m confirms the existence of the apparently associated clusters.

56.06
Far Infrared Spectroscopy of M82: Electron Densities and N^{++}/O^{++} Ratios

P.B. Duffy, E.F. Erickson (NASA/Ames), M.R. Haas (Mycol, Inc.) J.R. Houck (Cornell U.)

Emission lines of [OIII] at 52 μm and 88 μm and of [NIII] at 57μm in the nucleus of the galaxy M82 have been observed from the Kuiper Airborne Observatory with the facility's cooled grating spectrometer. This is the first detection of the [NIII] line in an extragalactic source. The fluxes in the lines indicate a population of massive stars equivalent to $4 \cdot 10^4$ O6.5 stars in the nucleus. Both [OIII] line profiles show a narrow (<80 km/s FWHM) peak at $V_{LSR} \approx$ 90 km/s superposed on a broad (300 km/s FWHM) peak at $v_{LSR} \approx$ 200 km/s, implying two distinct sources of ionized line radiation in the direction of M82. The [NIII] line does not have a significant narrow component. From the ratio of the intensity in the 52 μm line to that at 88 μm, we find average electron densities of 250^{+100}_{-90} and 340^{+160}_{-170} cm^{-3} for the broad and narrow components respectively. These densities are 10 to 100 times lower than those typically observed in individual HII regions in the Galaxy. The relative line strengths of the [OIII] and [NIII] lines imply an N^{++}/O^{++} ratio of .32 ± .07 in the source of the broad component, and a 3σ upper limit of .11 in the narrow component. Both these values are significantly lower than those measured by the same method at similar galactocentric radii (≲400 pc) in the Galaxy, but comparable to those in the solar neighborhood. The lower N^{++}/O^{++} ratios in M82 could be due to a lower N/O ratio or different ionization structure of the HII regions in that galaxy. We consider several models for the source of the narrow [OIII] line component, and conclude that it may originate in a giant HII region produced by a localized burst of star formation.

56.07
A Statistical Analysis Of Errors In The 21-cm Line Redshifts Of Galaxies*

G.G.C. Palumbo (NASA/GSFC)**, G.C. Basiesi-Pillastrini (Dipartimento Di Astronomia, Bologna, Italy)

A sample of about 2500 21-cm line redshift measurements was selected from the updated version of the Catalogue of Radial Velocities of Galaxies (Palumbo and Vettolani, to be published). From this sample, a list of 98 galaxies (whose redshift was measured at least 5 times) defines a sample of accurate weighted mean heliocentric radial velocities with mean error $\leq$ 10 Km/s and 99% confidence limit $\leq$ 50 Km/s. This sample of "standard" (SRV) has been compared to the two similar lists by Fisher and Tully (1981) and Bottinelli et al. (1982). From this analysis it has been shown that the dispersion in velocity between the present list of standards and Fisher and Tully's is consistent with zero, while there is a small but significant difference of 2.4 Km/s with Bottinelli et al.. On the other hand errors given by Bottinelli et al. appear to be actual estimates, whereas errors given by Fisher and Fully appear to be somewhat overestimated. The mean error associated with the present SRV is shown to depend, as expected, on galaxy morphological type, i.e. on its hydrogen content. This effect ought to be kept in mind if the standards given here are intended to be used as calibrators. Because of the bias in the SRV list of galaxies with respect to the velocity distribution, the