ABSTRACTS

12.17

Using VLBI and CEI to determine the Earth's Orientation

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Radio astrometric techniques have been used for several years to determine the Earth's orientation in space. In this time, two distinct methods have evolved: connected-element interferometry (CEI) and very-long-baseline interferometry (VLBI). In this study, we compared the Earth orientation information obtained by these two methods to each other and to the standard data provided by the U.S. Naval Observatory (USNO) and the Bureau International de l'Heure (BIH). Because the CEI data is incorporated in the USNO solution, carrying 20% of the weight in time, it was only meaningful to compare the VLBI, USNO, and BIH directly.

We found that the USNO solution for the y-coordinate of the pole was superior, while the BIH was best in x, and POLARS was superior in time, with an estimated accuracy of ± 0.9 milliseconds. We also found the USNO and POLARS time solutions both show high-frequency variations in the Earth's rotation with no apparent in the BIH solution. These results will be discussed, along with plans for use of both VLBI and CEI in the USNO solution in the future.

12.18

A Microwave Data Link Between the Spacewatch Camera on Kitt Peak and the Spacewatch Computer in Tucson

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A full-duplex, single-channel, 14400 bit/sec digital data link has been put into operation with FCC-licensed 10-GHz, 35 m microwave transceivers between the UMO 0.91-meter telescope on Kitt Peak, a repeater station on Tumamoc Hill, and the Space Sciences Building on our campus. The transceiver 'front-ends' are varactor-tuned Gunnplexers model MA-87127-3 of Microwave Associates, Burlington, MA. The carrier wave (CW) frequencies are: 10290.7 MHz from Kitt Peak, 10260.7 MHz from Tumamoc to Kitt Peak, 10250.0 MHz from Tumamoc to campus, and 10280.0 MHz from campus to Tumamoc, giving an intermediate (mixer) frequency (IF) of 30 MHz. A bandpass filter with a 3 dB bandwidth of 2 MHz is located between the IF amplifier and mixer. Output from the mixer at 10.7 MHz is applied to a ceramic filter with a 3 dB bandwidth of 220 kHz. Frequency shift keying (FSK) modulation is employed, with "0" = 50 kHz and "1" = 60 kHz. Amplified IF is sent to the FM subsystem chip, a CA3189E. Detected modulation frequencies are amplified and demodulated with a tracking bandwidth of ± 0.5 kHz. This translates into an IF automatic frequency control (AFC) tracking range of ± 0.01%. The AFC output from the CA3189E (1 microamp/500 Hz) is amplified, summed with the manual tuning voltage, and applied to the modulation/tuning terminal of the Gunnplexer to allow the slave stations to follow variations in CW frequency.

Phase-locked loops at Kitt Peak and the campus recover the digital clock from preamble bit patterns, thus following the frequency and phase of the received digital data. The unattended system holds digital lock for days, even through 60 km/hr winds at Tumamoc and dense cloud and rain obscuring the line-of-sight view of Kitt Peak 61 km away.

With a 61-cm diameter parabolic dish on Kitt Peak, 122-cm dishes at Tumamoc, and a 61-cm dish on the Space Sciences Building the signal-to-noise ratio of the system is 30 dB.

12.19

Braeside Observatory: A Computer Controlled 16" Cassegrain and Photometer

R. E. Fried, D. C. Morse (Braeside Observatory)

Braeside Observatory is a privately operated facility. Located five miles northwest of Flagstaff, Arizona, it has been making contributions to the astronomical community for six years in the form of accurate photometric data used by professional astronomers. We are able to offer flexible observing schedules to appropriate observers or we can simply supply the data. Our collaborative papers have appeared in the major journals.

The observatory's 16" Cassegrain has recently undergone a major conversion to full microcomputer control making it extremely effective with our GORT-I automatic photometer system. The telescope control and photometry programs are written in compiled C language. These menu driven programs have made it helpful in our being able to offer our facilities to college students working on projects under the guidance of their advisors. A description of our facilities and how they can be utilized by others will be presented. This recent conversion program was supported in part by The Research Corporation, the Mesur-Matic Corporation and the Robert T. Wilson Foundation.

12.20

Is Mt. Wilson the Best Interferometric Site in the World?

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Mt. Wilson has long been known as an excellent astronomical site due to its clear skies and excellent seeing. However, its proximity to Los Angeles limits its usefulness for extragalactic research, due to a darktime sky background of 19 to 19.1/2 magnitudes per square arcsecond. Data recorded for speckle and astrometric interferometry indicate that the site has exceptionally good seeing and uniquely long correlation times, the two critical parameters for maximizing the rate of convergence of the speckle process, and for the successful implementation of an astrometric or long baseline amplitude interferometer. In this paper, we will show data which support the thesis that Mt. Wilson is probably the ideal site for interferometric experiments, and demonstrate why atmospheric conditions are so critical to interferometric techniques.