on any point in the plasma cannot be equal to the local source function. Hence, a non-Maxwellian plasma which is optically thick cannot be in a steady state. Several approximations, and their implications on the interpretation of nonthermal radio emission are discussed.

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Theoretical Models for the Magnetic Field Distribution of Bipolar Regions in the Solar Corona.

LUDWIG OSTER, *Boeing Scientific Research Laboratories, Seattle, Washington* (Permanent address: *Yale University Observatory*).—Recent observations have made it more and more probable that an understanding of the origin and motion of certain solar radio emissions during and after flare events can be achieved only if magnetic fields are taken into account. An attempt has been made to derive on a theoretical basis magnetic field configurations that are able to represent the observed field structure in the photosphere in the neighborhood of bipolar regions. Using the theoretical models, predictions of the magnetic field structure in the outer atmosphere, in particular, of the regions around “neutral points” are made. Here, charged particles are trapped in a manner similar to the confinement of a plasma in the mirror field of thermonuclear experiments.

Multifrequency 23 to 13 Mc Solar Radio Observations. KENELM W. PHILIP, *Yale University Observatory*.—Since 1958, solar radio activity at decameter wavelengths has been recorded at the Yale Observatory Bethany Station with multifrequency phase-switched interferometers. The present paper reports on observations through 1960. The frequencies used were: 1958—23 and 22.2 Mc; 1959—23, 22.2, 20.005, and 19.2 Mc, with 16.5 and 13.25 Mc being added later in the year; 1960—all of the above frequencies.

Analysis of the records is in progress, the chief problem at these low frequencies being to separate the effects of ionospheric refraction from those of the motion of the radio source in and through the corona. The existence of simultaneous records over an almost two-to-one range of frequency, coupled with the $(f_0/f)^2$ dependence of the refraction, allows source motion to be measured despite severe refraction effects, and also permits information to be obtained on ionospheric behavior during times of solar activity.

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Limiting Magnitude Studies with the Image Orthicon.

WILLIAM T. POWERS, *Dearborn Observatory*.—A major problem in determining limiting magnitude of an image conversion system is distinguishing faint stars from noise pulses. This paper deals with a simple theoretical treatment of signal-to-noise ratio in an idealized image orthicon. It offers suggestions for predetermining the probability that a given image is a star and not a noise pulse. The theoretical computations are compared with observational data.

Also described is a method for reaching fainter magnitudes by suppressing effects of skylight, and some preliminary results of attempts to improve image readout in the image orthicon.

Simultaneous Spectroscopic and Photoelectric Observations of RR Lyrae during Rising Light.

G. W. PRESTON AND J. SMAK, *Lick Observatory*.—Simultaneous spectroscopic (10.7 Å/mm, 120-inch coude) and photoelectric (*UBV*, Crossley reflector) observations of RR Lyrae during rising light have been made during 1962 in a study of spectroscopic and photometric variations associated with the 41^d period. To maximize the time resolution of the spectroscopic observations a single-trail technique is employed in which the star image is advanced along the slit of the spectrograph at a rate that depends on the size of the tremor disk. The time resolution varies from 10 min in average seeing to 2 or 3 min under the best seeing conditions encountered so far.

The strength of the transitory hydrogen emission that occurs during rising light appears to vary regularly in the 41^d cycle. The emission increases in strength rapidly during small-amplitude cycles when a stillstand develops on the rising branch of the light curve and is conspicuous during subsequent large-amplitude cycles. On the basis of observations made to date it appears that the emission is strongest in cycles when the light amplitude is increasing. In a given light cycle the maximum emission intensity occurs at the phase of the *U–B* maximum. The doubling of the hydrogen lines that follows the emission phase is inconspicuous when the emission is weak and is well-marked when the emission is strong.

Doubling of the K line of *Ca II* always precedes the doubling of the hydrogen lines by approximately 30 min. It occurs at the phase of the *U–B* maximum and its visibility is strongly correlated with the strength of the hydrogen emission. These circumstances suggest that part or all of the K-line doubling is due to *Ca II* emission that is analogous to the hydrogen emission.