DeWitt, J. H. and Seyfert, C. K. Control frequency unit for telescope drive.

The system to be described utilizes a precision tuning fork which is electrically driven for the generation of the required ac voltage. This voltage is amplified by a regulated vacuum-tube power amplifier which in turn drives the synchronous drive motor in right ascension. The accurately controlled frequency derived from the fork oscillator may be increased or decreased through the interposition of a motor-driven rotary-phase shifter. Through this means the basic accuracy of the fork oscillator is retained, yet it is possible to vary the over-all drive rate in right ascension continuously and with precision up to a maximum of about 3.5 per cent.

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Dodson, Helen W. Center-to-limb effects in solar flare observations.

The study of photometric light-curves for 194 flares and subflares indicates certain center-to-limb variations in the $H\alpha$ observations of solar flares. First, the position of the flare on the apparent disk apparently influences the observed rates of change of $H\alpha$ intensity. The slowest rates of both rise and decline were observed only for flares in the central part of the solar disk. The fastest rates of decline occurred only with flares near the limb of the sun.

The average intensity of flares at maximum varied with central meridian distance, showing definite limb darkening in units of the central continuous spectrum. Limb darkening in the center of $H\alpha$ is apparently less for flares than for the undisturbed parts of the solar disk. It is also less than for the continuous spectrum near $H\alpha$. Linear equations expressing limb darkening for flares and subflares are:

$$\text{Flares:} \quad I_c = 0.63 + 0.34 \cos\theta,$$

$$\text{Subflares:} \quad I_c = 0.36 + 0.26 \cos\theta,$$

where θ is the angular distance of the flare from the center of the solar disk.

In units of the local continuum the average intensity at maximum increased from center to limb, for both flares and subflares. For flares within 40° of the central meridian, the average value of the central intensity was less than the local continuum. For flares with central meridian distance greater than 40°, the average intensity was greater than the local continuous spectrum. The average width of $H\alpha$ at maximum also increases from center to limb.

For flares of the same importance in the photometric study, the average duration diminished with increasing distance of the flares from the central meridian. Furthermore, $H\alpha$ flares near the center of the disk usually lasted longer than the reported associated SID. For flares far from the center, the reported ionospheric disturbances tended to last longer than the $H\alpha$ phenomena.

McMath-Hulbert Observatory,
University of Michigan,
Ann Arbor, Mich.

Doherty, Lowell R.* and Turner, Eugene B. An experimental study of hydrogen line broadening in shock tubes.

In 1952 groups working at Cornell University under Prof. Arthur Kantrowitz (Resler *et al.* 1952) and at the University of Michigan under Prof. Otto Laporte (Hollyer *et al.* 1952, 1953) reported that temperatures up to 18,000°K could be produced in shock tubes by using the rare gases. It has been found that if approximately 1 per cent hydrogen is added to neon in the low pressure chamber of the shock tube the Balmer lines appear very strong in the luminous region behind the reflected shock wave at the end of the tube. The temperature and ion density can be accurately calculated from the hydrodynamic and Saha equations once the primary shock velocity is measured. By using a revolving drum camera with a prism spectrograph, time-resolved spectra of $H\beta$ have been obtained for ion densities from 5×10^{15} to 2×10^{17} ions per cc. The temperatures ranged from 10,000° to 16,000°K. The dispersion was 25A per mm and the film speed was 0.1 mm per microsecond. The duration of the flash was approximately 250 microseconds but a constant line width in the region behind the reflected shock indicated thermal equilibrium had been established. The film was calibrated with a step filter using a tungsten lamp exposed for 1/100 second and corrections were made for the change in the γ of the film at 20 microseconds, the effective exposure of the time-resolved spectra. Intensity profiles were obtained from tracings made with the microdensitometer of the McMath-Hulbert Observatory. For one condition where the ion density was calculated to be 9.82×10^{15} ions per cc. ±15 per cent, the measured half-width was 12.2A,

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