From our own point of view, the retardation occurs high in the F_2 region, reflection occurring at the reflection level of the second ordinary component. Infinite retardation is experienced when $f = f_H \cos \theta$, where θ is the angle between the earth's magnetic field and the direction of propagation. On the wave passing the first reflection point of the ordinary component, however, $\theta \to 0$ and infinite retardation occurs when $f = f_H$.

The frequencies of infinite retardation experimentally observed at Washington and Sydney are therefore simply explained as being the values of f_H at equal heights (340 km.) above these two places. Penetration of the wave to these great heights is rendered possible by the fact that it travels *along* the magnetic field, in which direction no barrier exists. If our view be accepted, then the Sellmeyer, and not the Lorentz, dispersion formula is to be applied in the ionosphere, in agreement with Darwin's[4] theoretical conclusion.

This work, which will be fully described elsewhere, is published by permission of the Radio Research Board of the Commonwealth Council for Scientific and Industrial Research.

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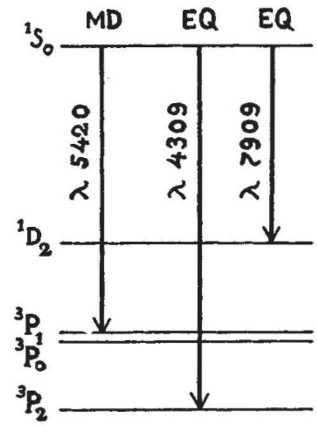
'Forbidden' Lines in the Te I Spectrum

A FEW years ago, one of us developed a method of obtaining the emission of 'forbidden' atomic spectral lines of various metals. These lines have appeared in the spectrum of high-frequency electrodeless discharges in the mixtures of a small quantity of a given metallic vapour with some inert gases such as argon or helium. This method of excitation being applied to lead vapour led to the experimental proof of the existence of the magnetic dipole radiation.[1]

In the spectrum of tellurium under the same excitation conditions, on a very strong background of Te-bands only faint traces of the 'forbidden' atomic magnetic dipole line λ 5420 were found[2]. In our present experiments the main effort was to increase the dissociation of tellurium molecules. Satisfactory results were obtained when tellurium vapour of the density corresponding to that of the saturated vapour at 350°–400° C. was heated to about 900° C. The forbidden line λ 5420 A. ($^3P_1 - {}^1S_0$) appeared even in the case of pure tellurium vapour. When argon or helium was admitted to the tellurium vapour the intensity of this line became considerably larger with increasing density of the added gas. Two other 'forbidden' Te I lines, λ 4309 A. ($^3P_2 - {}^1S_0$) and λ 7909 A. ($^1D_2 - {}^1S_0$), were also found. These lines are much weaker as compared with λ 5420 and appear in the mixtures of tellurium vapour with inert gases only, argon being in this respect much more effective than helium.

The accompanying diagram represents the energy levels of the neutral tellurium atom belonging to the same lowest electron configuration $5s^2\,5p^4$. All these energy-levels, except the ground-level $^3P_2$, are metastable and no spontaneous transitions between them accompanying the normal electric dipole radiation may occur in accordance to the Laporte selection rule. Transitions corresponding to the emission of the obtained 'forbidden' Te I lines are indicated by arrows. The measured wave-lengths of these lines are in complete agreement with those calculated from the known values of spectral terms.



The transitions corresponding to these 'forbidden' lines are to be considered as spontaneous ones since the lack of any sufficiently strong external or intermolecular electric fields excludes the possibility of electrically perturbed transitions. Taking into account the selection rules for the quantum numbers J and L for the electric quadrupole and magnetic dipole radiations, the line λ 5420 ($^3P_1 - {}^1S_0$) is to be regarded as due to the pure magnetic dipole radiation, and the lines λ 4309 ($^3P_2 - {}^1S_0$) and λ 7909 ($^1D_2 - {}^1S_0$) as due to the pure electric quadrupole radiation.

A more detailed account of these experiments will be published later.

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Atomic Absorption Coefficients and Transition Probabilities

THREE recent letters raise the question as to whether there is any experimental basis for applying Kramers' equation for continuous absorption to astrophysical problems[1]. Ditchburn cites the anomalous phenomena shown by alkalis at the absorption series limits as the only direct experimental evidence. A series of papers[2] by me on the emission spectra of cæsium vapour gives direct evidence as to the transition probabilities for the continuous spectra and line spectra of the levels 6 P and 5 D. The first paper indicated that the probability of recombination depended on the pressure but subsequent work showed this to be erroneous, and the last paper (published after the appearance of Ditchburn's letter) shows that the continuous transition probabilities remain nearly constant with electron concentrations ranging from 10^{12} to 10^{16} per cm.[3]