FAR-ULTRAVIOLET LINES OF INTERSTELLAR CH, INCLUDING ONE DIB

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A far-ultraviolet flash-photolysis spectrum of CH was published in 1969 by Herzberg and Johns[a], but no rotational assignments were made. From their list of 45 lines in the $3d - X^2\Pi$ band, there are three near-coincidences with unidentified (UID) interstellar lines[b] at 1368.74, 1369.13, and 1370.87 Å towards the star ζ Ophiuchi. The spectra of other electronic transitions of CH towards this star are well known, and it was decided to use the interstellar lines as giving the positions of lines with $J'' = 0.5$, as is found for the other interstellar bands. From this, a rotational analysis of the complete band was possible, using a Rydberg-state program previously used for the ArH and ArD molecules[c]. An interesting aspect of this assignment is that the 1369.13 Å line is classified[d] as the only established ultraviolet 'diffuse interstellar line' (DIB). Different broadening of different lines is also seen in the laboratory spectrum, and is attributed to predissociation, which is found to be greater for lines with upper levels of d parity, including the DIB, than for lines with upper levels of c parity, consistent with the dominant predissociating state being a $^2\Sigma^-$ state. From the n^{*-3}-dependence of the splittings of the nd complexes, the rotational structure of the $4d - X^2\Pi$ band is predicted, and allows the assignment of the UID interstellar line at 1270.96 Å[e] to the strongest $J'' = 0.5$ line of this band.

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