

TERAHERTZ SPECTROSCOPY OF THE HEAVENS

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Spectroscopy of the heavens started in 1814. Fraunhofer had just discovered in the optical region of the solar spectrum a large number of absorption lines. Kirchhoff and Bunsen identified around 1860 the origin of these Fraunhofer absorption lines. The carriers of these lines were atoms in the chromosphere of the Sun. For example, the elements Cs, Rb, and He were detected this way. Kirchhoff and Bunsen note in one of their papers that the "almost inconceivable" sensitivity of spectroscopy would open "an entirely untrodden field, stretching far beyond the limits of the Earth or even the solar system". At present, about 120 interstellar molecules have been identified in interstellar clouds and circumstellar envelopes, evidence of a rich and diversified chemistry. With the technological opening of the terahertz region ($\nu = 1$ THz corresponds to $\lambda = 0.3$ mm) to both laboratory and interstellar spectroscopy, great scientific advances are to be expected. Amongst these will be the direct detection of the lowest rotational transitions of the light hydrides, the low energy bending vibrations of larger (linear) molecules, and possibly the ring-puckering motion of larger ring molecules like the polycyclic (multiring) aromatic hydrocarbons.