Although several pure rotational studies of H₂CS (thioformaldehyde) have already been undertaken at microwave and millimeter-wave frequencies and even in the far-infrared region, new astronomical observations using submillimeter-wave telescopes require high-resolution laboratory measurements at sufficiently high frequencies and accuracies to confirm the astronomical identifications. Recently, some interstellar lines in the frequency range 487–549 GHz were detected with the Odin satellite towards the hot-core sources in Orion KL. Based on extrapolations from lower frequency data, these lines were assigned to H₂CS in its ground vibrational state. In order to judge the assignments, pure rotational transitions of H₂CS in the ground vibrational state have been measured covering to date a large fraction of the 120–670 GHz region by means of the Ohio State FASSST spectrometer and the phase-locked Cologne Terahertz Spectrometer. Previous microwave and far-infrared pure rotational transitions were then fitted together with the present data to Watson’s $S$-reduced Hamiltonian with appropriate weighting. Transition frequencies were predicted based on the improved molecular parameters derived from the fit. Comparison between the new predictions and some astronomical observations of H₂CS will be discussed in this talk.

In addition to the normal species, the isotopic species H₂C₃₄S, H₂C₃₂S, and H₂¹³CS in their ground vibrational states have been measured with intensities comparable with natural abundance ratios and least-square analyzed together with previous data. Based on the molecular parameters obtained and on $ab initio$ calculations performed, a mixed experimental / $ab initio$ equilibrium molecular structure of H₂CS has been determined.