Malonaldehyde is an open 5-membered ring molecule which exhibits interesting quantum-mechanical effects due to tunnelling of one of its protons. This results in a $21 \text{ cm}^{-1}$ tunnelling-splitting in the ground vibrational state, which has been well-studied by microwave spectroscopy\textsuperscript{a}. We have taken far-infrared Fourier transform spectra of malonaldehyde at the Canadian Light Source synchrotron, and have recorded a number of rotation-vibration fundamental bands between 100-1000 $\text{ cm}^{-1}$ at 0.00096 $\text{ cm}^{-1}$ resolution. The data permit us to determine with high precision the changes in the tunnelling-splitting induced by vibrational excitation. We have also observed spectra at 240 and 219 $\text{ cm}^{-1}$ that appear to be transitions from the two components of the ground vibrational state to a common upper state that is not mentioned in conventional vibrational analyses of malonaldehyde\textsuperscript{b}. We will offer suggestions as to the nature of the newly-observed state.
