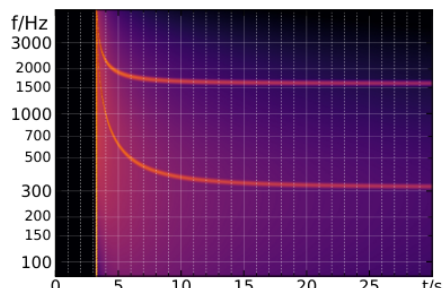
8. Jet sound (8 points) — *Teo Kai Wen, Jaan Kalda.* A fighter jet flies past a ground observer along a straight horizontal line at constant supersonic velocity, passing at closest-approach distance d. The jet's Mach number is $M = v/c > 1$, where v is the speed of the jet and c is the speed of sound. The air is at rest. The observer records the sound as a spectrogram (intensity colour-coded as a function of frequency and time; black means silence), shown below.



i) *(2 points)* Explain, qualitatively, the features seen in the spectrogram.

ii) *(3 points)* From the spectrogram, find the Mach number M.

iii) *(3 points)* Find the closest-approach distance d given that $c = 340\,\mathrm{m}\cdot\mathrm{s}^{-1}$.