Attachment to comment in the second EASA EPTS from the 12th dec 2023 regarding the lower end frequency, limited to 50Hz 1/3-octave band.

("EPTS applicable to VTOL-capable aircraft powered by tilting rotors", https://www.easa.europa.eu/en/downloads/139024/en)

<u>This limit has to be extended to, say, 20 Hz in order to cover significant sound from already existing VTOLs like Joby.</u>

Example and motivation

One example is for the Joby eVTOL when flying in level flight with constant speed with a RPM of ca 240, or with a fundamental frequency of ca 20Hz, i.e. 5 blade propellers giving: f0 = 5*RPM/60 = 20Hz.

This can be seen in Figure 6. of "Acoustic Flight Test of the Joby Aviation Advanced Air Mobility Prototype Vehicle, Kyle A. Pascioni et.al.2022 (report at: https://ntrs.nasa.gov/api/citations/20220006729/downloads/Aeroacoustics2022_Pascioni_STRIVES5.pdf) , reproduced below:

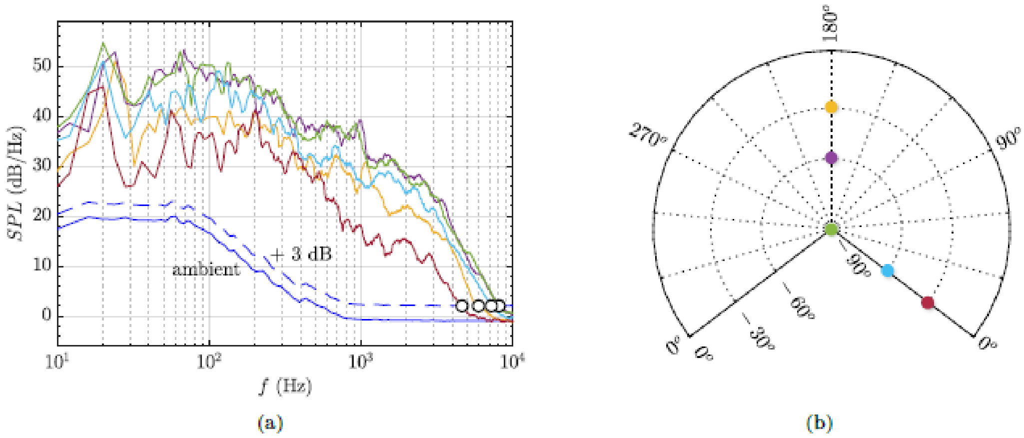

Figure 6. Spectral estimates used for directivity mapping for the 110 kt nominal true airspeed level flyover (Condition Code L8). The spectra in (a) are color coded based on emission angle as shown in (b). Ambient noise levels are also given, and the high frequency signal-to-noise cutoff is noted by the white filled circles.

On the other hand, in case of the Joby VTOL, in hover mode, a higher RPM is needed (ca 660 RPM) and the fundamental frequency becomes ca 55 Hz , see figure below. But still, 50Hz tend to be slightly too high to cover this probably typical VTOL case. (Note that the measured data from the hover case below is measured for the vehicle at 6 ft and microphones on ground ca 100 m away, where the ground effect might have a strong impact)

Here an attempt to compute the 1/3-octave spectrum with the "simple" SAE AIR 1407 method is applied. All data in figure below are "back-propagated" to a 1m distance in order to represent a simplified point source for "plug-in" in our code.