For patients having residual hearing in one ear and a cochlear implant (CI) in the opposite ear, interaural place-pitch mismatches might be partly responsible for the large variability in individual benefit. Behavioral pitch-matching between the two ears has been suggested as a way to individualize the fitting of the frequency-to-electrode map but is rather tedious and unreliable. Here, an alternative method using two-formant vowels was developed and tested. The interaural spectral shift was inferred by comparing vowel spaces, measured by presenting the first formant (F1) to the nonimplanted ear and the second (F2) on either side. The method was first evaluated with eight normal-hearing listeners and vocoder simulations, before being tested with 11 CI users. Average vowel distributions across subjects showed a similar pattern when presenting F2 on either side, suggesting acclimatization to the frequency map. However, individual vowel spaces with F2 presented to the implant did not allow a reliable estimation of the interaural mismatch. These results suggest that interaural frequency-place mismatches can be derived from such vowel spaces. However, the method remains limited by difficulties in bimodal fusion of the two formants.