**Formant values**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | |  | **f1** | **f2** | **f3** | **f4** | **f5** | | **soprano "a"** | | | | | | | freq (Hz) | 800 | 1150 | 2900 | 3900 | 4950 | | amp (dB) | 0 | -6 | -32 | -20 | -50 | | bw (Hz) | 80 | 90 | 120 | 130 | 140 | | **soprano "e"** | | | | | | | freq (Hz) | 350 | 2000 | 2800 | 3600 | 4950 | | amp (dB) | 0 | -20 | -15 | -40 | -56 | | bw (Hz) | 60 | 100 | 120 | 150 | 200 | | **soprano "i"** | | | | | | | freq (Hz) | 270 | 2140 | 2950 | 3900 | 4950 | | amp (dB) | 0 | -12 | -26 | -26 | -44 | | bw (Hz) | 60 | 90 | 100 | 120 | 120 | | **soprano "o"** | | | | | | | freq (Hz) | 450 | 800 | 2830 | 3800 | 4950 | | amp (dB) | 0 | -11 | -22 | -22 | -50 | | bw (Hz) | 70 | 80 | 100 | 130 | 135 | | **soprano "u"** | | | | | | | freq (Hz) | 325 | 700 | 2700 | 3800 | 4950 | | amp (dB) | 0 | -16 | -35 | -40 | -60 | | bw (Hz) | 50 | 60 | 170 | 180 | 200 | | **alto "a"** | | | | | | | freq (Hz) | 800 | 1150 | 2800 | 3500 | 4950 | | amp (dB) | 0 | -4 | -20 | -36 | -60 | | bw (Hz) | 80 | 90 | 120 | 130 | 140 | | **alto "e"** | | | | | | | freq (Hz) | 400 | 1600 | 2700 | 3300 | 4950 | | amp (dB) | 0 | -24 | -30 | -35 | -60 | | bw (Hz) | 60 | 80 | 120 | 150 | 200 | | **alto "i"** | | | | | | | freq (Hz) | 350 | 1700 | 2700 | 3700 | 4950 | | amp (dB) | 0 | -20 | -30 | -36 | -60 | | bw (Hz) | 50 | 100 | 120 | 150 | 200 | | **alto "o"** | | | | | | | freq (Hz) | 450 | 800 | 2830 | 3500 | 4950 | | amp (dB) | 0 | -9 | -16 | -28 | -55 | | bw (Hz) | 70 | 80 | 100 | 130 | 135 | | **alto "u"** | | | | | | | freq (Hz) | 325 | 700 | 2530 | 3500 | 4950 | | amp (dB) | 0 | -12 | -30 | -40 | -64 | | bw (Hz) | 50 | 60 | 170 | 180 | 200 | | **countertenor "a"** | | | | | | | freq (Hz) | 660 | 1120 | 2750 | 3000 | 3350 | | amp (dB) | 0 | -6 | -23 | -24 | -38 | | bw (Hz) | 80 | 90 | 120 | 130 | 140 | | **countertenor "e"** | | | | | | | freq (Hz) | 440 | 1800 | 2700 | 3000 | 3300 | | amp (dB) | 0 | -14 | -18 | -20 | -20 | | bw (Hz) | 70 | 80 | 100 | 120 | 120 | | **countertenor "i"** | | | | | | | freq (Hz) | 270 | 1850 | 2900 | 3350 | 3590 | | amp (dB) | 0 | -24 | -24 | -36 | -36 | | bw (Hz) | 40 | 90 | 100 | 120 | 120 | | **countertenor "o"** | | | | | | | freq (Hz) | 430 | 820 | 2700 | 3000 | 3300 | | amp (dB) | 0 | -10 | -26 | -22 | -34 | | bw (Hz) | 40 | 80 | 100 | 120 | 120 | | **countertenor "u"** | | | | | | | freq (Hz) | 370 | 630 | 2750 | 3000 | 3400 | | amp (dB) | 0 | -20 | -23 | -30 | -34 | | bw (Hz) | 40 | 60 | 100 | 120 | 120 | | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | |  | **f1** | **f2** | **f3** | **f4** | **f5** | | **tenor "a"** | | | | | | | freq (Hz) | 650 | 1080 | 2650 | 2900 | 3250 | | amp (dB) | 0 | -6 | -7 | -8 | -22 | | bw (Hz) | 80 | 90 | 120 | 130 | 140 | | **tenor "e"** | | | | | | | freq (Hz) | 400 | 1700 | 2600 | 3200 | 3580 | | amp (dB) | 0 | -14 | -12 | -14 | -20 | | bw (Hz) | 70 | 80 | 100 | 120 | 120 | | **tenor "i"** | | | | | | | freq (Hz) | 290 | 1870 | 2800 | 3250 | 3540 | | amp (dB) | 0 | -15 | -18 | -20 | -30 | | bw (Hz) | 40 | 90 | 100 | 120 | 120 | | **tenor "o"** | | | | | | | freq (Hz) | 400 | 800 | 2600 | 2800 | 3000 | | amp (dB) | 0 | -10 | -12 | -12 | -26 | | bw (Hz) | 40 | 80 | 100 | 120 | 120 | | **tenor "u"** | | | | | | | freq (Hz) | 350 | 600 | 2700 | 2900 | 3300 | | amp (dB) | 0 | -20 | -17 | -14 | -26 | | bw (Hz) | 40 | 60 | 100 | 120 | 120 | | **bass "a"** | | | | | | | freq (Hz) | 600 | 1040 | 2250 | 2450 | 2750 | | amp (dB) | 0 | -7 | -9 | -9 | -20 | | bw (Hz) | 60 | 70 | 110 | 120 | 130 | | **bass "e"** | | | | | | | freq (Hz) | 400 | 1620 | 2400 | 2800 | 3100 | | amp (dB) | 0 | -12 | -9 | -12 | -18 | | bw (Hz) | 40 | 80 | 100 | 120 | 120 | | **bass "i"** | | | | | | | freq (Hz) | 250 | 1750 | 2600 | 3050 | 3340 | | amp (dB) | 0 | -30 | -16 | -22 | -28 | | bw (Hz) | 60 | 90 | 100 | 120 | 120 | | **bass "o"** | | | | | | | freq (Hz) | 400 | 750 | 2400 | 2600 | 2900 | | amp (dB) | 0 | -11 | -21 | -20 | -40 | | bw (Hz) | 40 | 80 | 100 | 120 | 120 | | **bass "u"** | | | | | | | freq (Hz) | 350 | 600 | 2400 | 2675 | 2950 | | amp (dB) | 0 | -20 | -32 | -28 | -36 | | bw (Hz) | 40 | 80 | 100 | 120 | 120 | |