HYBR  
Definitive pipes as made, tuned and measured::

* f0 = fundamental resonant frequency
* l/d = pipe length to internal diameter ratio
* f1 = first overtone frequency, followed by the ratio to the fundamental
* f2 = second overtone frequency, followed by the ratio  to the fundamental
* f3 = thirth overtone frequency, followed by the ratio to the fundamental
* L = pipe length in mm
* De = outer diameter of the tube in mm
* Di = internal diameter of the tube in mm
* SPL= Sound pressure level with a 5Vrms sine wave drive, in dBA measured at 30cm from open end.
* The first column gives the MIDI-note number.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | f0 | l/d | f1 | f2 | f3 | L | De | Di | SPL |
| 33 | 55.0 | 31.8 | 165 [3.00] | 219 [3.98] | 270 [4.91] | 1461 | 50 | 46.4 | 68 |
| 34 | 58.3 | 29.9 | 175 [3.00] | 233 [4.00] | 288 [4.94] | 1378 | 50 | 46.4 | 78 |
| 35 | 61.7 | 28.2 | 183 [2.96] | 245 [3.97] | 286 [4.63] | 1295 | 50 | 46.4 | 77 |
| 36 | 65.4 | 26.4 | 195 [2.98] | 258 [3.94] | 306 [4.68] | 1216 | 50 | 46.4 | 81 |
| 37 | 69.3 | 24.8 | 210 [3.03] | 274 [3.95] | 323 [4.66] | 1142 | 50 | 46.4 | 76 |
| 38 | 73.4 | 23.3 | 218 [2.97] | 291 [3.96] | 344 [4.68] | 1073 | 50 | 46.4 | 82 |
| 39 | 77.8 | 21.8 | 235 [3.25] | 359[4.61] | 772 [9.92] | 1005 | 50 | 46.4 |  |
| 40 | 82.4 | 20.5 | 244 [2.96] | 330 [4.00] | 468 [5.68] | 949.5 | 50 | 46.4 | 82 |
| 41 | 87.3 | 19.9 | 262 [3.00] | 352 [4.03] | 700 [8.02] | 880 | 50 | 46.4 |  |
| 42 | 92.5 | 17.9 | 274 [2.96] | 377 [4.08] | 523 [5.65] | 833 | 50 | 46.4 | 82 |
| 43 | 98.0 | 16.8 | 193 [1.97] | 260 [2.65] | 384 [3.92] | 780.5 | 50 | 46.4 | 86 |
| 44 | 103.8 | 16.6 | 202 [1.95] | 271 [2.61] | 412 [3.97] | 732 | 50 | 44 | 88 |
| 45 | 110.0 | 15.6 | 212 [2.02] | 291 [2.64] | 428 [3.89] | 686 | 50 | 44 | 88 |
| 46 | 116.5 | 14.6 | 231 [1.98] | 312 [2.68] | 444 [3.82] | 643 | 50 | 44 | 84 |
| 47 | 123.5 | 13.7 | 246 [1.99] | 328 [2.66] | 460 [3.72] | 601 | 50 | 44 | 88 |
| 48 | 130.8 | 12.8 | 262 [2.00] | 342 [2.61] | 484 [3.7] | 563.5 | 50 | 44 | 90 |
| 49 | 138.6 | 11.9 | 286 [2.06] | 356 [2.57] | 614 [4.43] | 523.5 | 50 | 44 | 91 |
| 50 | 146.8 | 11.1 | 302 [2.06] | 642 [4.37] | 858 [5.84] | 488.6 | 50 | 44 | 89 |
| 51 | 155.6 | 9.8 | 310 [1.99] | 340 [2.18] | 583 [3.74] | 451 | 50 | 46.4 |  |
| 52 | 164.8 | 10.9 | 341[2.07] | 651[3.95] | 1035 [6.28] | 405 | 40 | 37 | 88 |
| 53 | 174.6 | 9.8 | 387 [2.21] | 725 [4.15] | 1160 [6.64] | 362 | 40 | 37 | 93 |
| 54 | 185 | 9.5 | 395 [2.13] | 739 [3.99] | 1199 [6.45] | 352 | 40 | 37 | 87 |
| 55 | 196 | 9.3 | 497 [2.53] | 996 [5.08] | 1596 [8.14] | 263 | 32 | 28.4 | 93 |
| 56 | 207.6 | 7.7 | 549 [2.64] | 1146 [5.52] | 1848 [8.90] | 220 | 32 | 28.4 | 89 |
| 57 | 220 | 7.3 | 545 [2.48] | 1196 [5.44] | 1964 [8.92] | 208 | 32 | 28.4 |  |
| 58 | 233.1 | 5.7 | 762 [3.26] | 1715 [7.36] | - | 125 | 25 | 22 | 92 |
| 59 | 246.9 | 4.97 | 840 [3.4] | 1900 [7.69] | - | 109.5 | 25 | 22 | 83 |
| 60 | 261.6 | 51.0 | 466 [1.78] | 664 [2.54] | 863 [3.30] | 689 | 20 | 17 | 83 |
| 61 | 277.2 | 38.3 | 470 [1.69] | 682 [2.46] | 900 [3.25] | 652 | 20 | 17 | 86 |
| 62 | 293.7 | 35.7 | 513 [1.75] | 726 [2.47] | 962 [3.27] | 607 | 20 | 17 |  |
| 63 | 311.1 | 33.2 | 538 [1.73] | 768 [2.47] | 1004 [3.22] | 565 | 20 | 17 | 86 |
| 64 | 329.6 | 30.0 | 606 [1.84] | 978 [2.97] | 1129 [3.43] | 511 | 20 | 17 |  |
| 65 | 349.2 | 28.1 | 628 [1.80] | 909 [2.6] | 1206 [3.46] | 478 | 20 | 17 |  |
| 66 | 370 | 26.5 | 658 [1.78] | 936 [2.53] | 1243 [3.36] | 451 | 20 | 17 | 83 |
| 67 | 392 | 31.4 | 711 [1.81] | 973 [2.48] | 1312 [3.35] | 427 | 16 | 13.6 |  |
| 68 | 415.3 | 29.0 | 750 [1.81] | 1005 [2.42] | 1368 [3.3] | 395 | 16 | 13.6 | 78 |
| 69 | 440.0 | 27.2 | 764 [1.74] | 1063 [2.42] | 1450 [3.3] | 370 | 16 | 13.6 |  |
| 70 | 466.2 | 25.2 | 776 [1.66] | 1104 [2.37] | 1544 [3.31] | 342 | 16 | 13.6 | 85 |
| 71 | 493.9 | 23.4 | 820 [1.66] | 1186 [2.4] | 1665 [3.37] | 318.1 | 16 | 13.6 | 86 |
| 72 | 523.2 | 21.3 | 893 [1.70] | 1325 [2.53] | 1866 [3.56] | 290.2 | 16 | 13 | 87 |