Approximating π (2007)

A Sound Installation

<u>Construction Method</u>

Point of departure: the converging series $\pi = 4(1 - {}^{1}/_{3} + {}^{1}/_{5} - {}^{1}/_{7} + {}^{1}/_{9} \cdots)$

Each convergence gets a time window of 5040 samples (twice the lowest common multiple of the numbers 1-10), in which ten square wave partials of frequencies 8¾n Hz and amplitude $2\text{^}d_n$ are set up, '8¾' deriving from the 5040 samples, 'n' being the partial number and 'd_n' the n^{th} digit in the convergence's decimal representation; e.g. for '3.141592654', the ten partials' amplitudes are 2^3, 2^1, 2^4, 2^1 ,2^5, 2^9 etc., thereafter rescaled by the arbitrary sawtooth-spectral factor $2\pi/n$, where 'n' is still the partial number. The convergences make the digits stabilize from left to right to a value approaching π, the resultant timbre moving from turbulence to constancy over $4 \times 10^9 \times 5040 = 20.16 \times 10^{12}$ samples or ~14½ years. The installation can be pitch-shifted (by sample-dropping) and/or time-truncated. Here the sixteen sound channels are transposed from 8¾ Hz to frequencies ranging from 9 to 402 times higher (according to the expression $[9 \times \pi^{(1+\frac{1}{2}+\frac{1}{3}+ \cdots +1/\chi))}]$, where χ is the channel number plus one); the duration is truncated to a millionth of the total, i.e. 7' $37^{1}/_{7}$", the highest transposition thereby reaching the $1{,}608{,}000^{th}$ approximation of π, where the first six digits are already stable.