

Acoustics: Sound Fields and Transducers by Leo L. Beranek and Tim J. Mellow (2012) contains much new and previously unpublished work:

Transmission parameter matrices and analogous circuits for a piezoelectric transducer derived from first principles using parameters found on modern datasheets. See Sec. 3.5.2, pp. 96-101.

Steered beam-forming array of point sources optimized for when the wavelength is greater than the length of the array using least-mean-squares method. See Sec. 4.13, pp. 148-153.

Analogous circuit for a plane circular piston in free space with formulas to determine each element. See Table 4.5, p. 176.

Lumped element model for a very narrow tube with thermal and viscous losses and a slip boundary condition. See Fig. 4.45, p. 191.

Analysis of a dual-diaphragm variable-pattern capacitor microphone. See Sec. 5.9, pp. 231-239.

Formula for the reference efficiency of a dynamic loudspeaker in terms of the diaphragm area, volume of the gap and the properties of the coil material. See Eq. (6.90), p. 269.

Emphasis on on-axis response of loudspeakers and baffle effect rather than just total radiated power with approximations given for point source in a sphere and a closed-back piston. See Eqs. (7.36) to (7.39), pp. 313-314. The on-axis response of a rectangular cap on a sphere is given in Fig. 12.21, p. 514, as a model for the mouth of a rectangular horn, for example.

New sub-Butterworth alignments are derived for bass-reflex enclosures. See Table 7.4, p. 339.

Derivation of a 2-port network for two pistons in one wall of a rectangular enclosure with an absorbent lining on the opposite wall. See Sec. 7.18, pp. 352-358. Used as a model for a closed box (see Fig. 7.12, p. 308), end-correction factor (see Fig. 7.10, p.303), bass-reflex enclosure (see p.349), bend in a horn (see pp. 435-438) and a point source one corner of a rectangular room (see Figs. 10.4 and 10.5, pp. 456 and 457).

Analysis of a transmission-line enclosure with new design formulas verified by measurement results. See Sec. 7.19, pp. 358-373.

New simple method for passive crossover design that considers native roll-off of tweeter and baffle effect while preserving time-domain behavior. See Sec. 7.20, pp. 373-387.

Transmission-parameter matrices are given for finite parabolic, conical, exponential and parabolic horns in Chap. 9, pp. 428-431. The conical horn is verified by experiment. See Example 9.4, pp. 441-447.

MacNair/Lifshitz equation for the optimum reverberation time of an auditorium revised in light of Leo Beranek's lifetime experience (see Eq. (10.63), p. 473). Assuming the reverberation time to be optimum, the distance at which the reverberant sound is equal the direct sound is plotted against the auditorium volume. Using this, together with more recent data on peak sound pressure levels due to various sound sources, the Hopkins-Stryker equation is used to calculate the peak acoustic power needed for sound systems to faithfully reproduce these sources.

To avoid the need for the least-mean-squares algorithm, improved methods are given for calculating the radiation characteristics of a piston in a sphere and a convex or concave dome in an infinite baffle (see Secs. 12.8 to 12.10, pp. 515-533). The on-axis response of the piston in a sphere is plotted for the first time (see Fig. 12.24. p. 519).

The boundary integrals are derived intuitively from monopole and dipole point sources as well as more rigorously from the inhomogeneous wave equation for an arbitrary source distribution, as per previous texts. However, much greater emphasis is placed on explaining the true physical meaning of this result.

R. R. Boyd's state-variable method for the computer analysis of circuits has been extended to include transformers, current sources and pure voltage sources with zero series resistance. Unlike nodal analysis, this method is applicable to purely symbolic as well as numerical computation for deriving transfer functions of circuits. See Chapter 14, pp. 633-670.