



CJS Labs

Microphone Electroacoustics

This presentation introduces the basic concepts of microphones, principles of operation, and common applications. Equivalent circuits for condenser, dynamic moving coil, ribbon, and piezoelectric microphone technologies are described. Well-known, contemporary versions – some replicas of classic designs – are shown as examples of each type. Pressure and pressure gradient microphones are described. Various configurations of 1st order directional microphones are described and their associated directionality metrics are detailed. The response of shotgun and parabolic microphones are given. An overview of the principles of higher order directional microphones and their performance is given. Examples of special purpose devices such as boundary layer (PZM) microphones and manikins for binaural recording or electroacoustic measurements are shown. Line arrays and adaptive systems are also discussed. Preamplifiers, powering, and balanced vs. unbalanced operation of microphones are described. Measurements, standards, and specifications are explained, including: Frequency response, sensitivity, polar response, equivalent input noise, 2-tone distortion, and calibration. The effects of wind noise and stands and adaptors are also given. References for additional detailed information are also provided.

Course Outline

Pressure Microphones

- Condenser Microphones
 - Measurement Microphones
 - Miniature Microphones
 - MEMS / Digital Microphones
 - Pre-polarized Electret

- Dynamic Microphones
- Piezoelectric Microphones
- Ribbon Microphones
- Other Microphone Technologies

Pressure Gradient Microphones

- First Order Directional Microphones
 - Polar Equation
 - Omni-Plus-Bidirectional Configuration
 - Directionality Metrics & Polar Response
 - Back-to-Back Cardioid Configuration
 - Dual-Omni Configuration
 - Proximity Effect & Noise Canceling
 - Tube/Shotgun Microphones
- Parabolic Reflector Microphones
- Higher Order Directional Microphones
- Boundary Layer (PZM) Microphones
- Binaural & Measurement Manikins

Arrays & Adaptive Systems

- Electronic Interfacing
- Microphone Preamplifiers
- Microphone Power
- Balanced vs. Unbalanced Operation

Measurements & Specifications

- Frequency Response & Sensitivity
- Polar Response
- Equivalent Input Noise
- 2-tone Distortion
- Wind Noise & Wind Screens
- Effect of Stands & Adaptors

Instructor

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