



# Direction Finding and Tracking Array

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Andrea's Patented Direction Finding and Tracking Array (DFTA™) technology utilizes an array of microphones and a unique algorithm to detect the presence of a user's voice, determine the direction of the voice and follow and track it when it moves. In a videoconferencing setting, this unique technology can provide direction to a videoconferencing camera and allow the system to steer and concentrate on the speaker, thus providing a "video-follow-audio" capability.

## *Some of the unique FTA features include:*

- Multi-element (e.g. 6-8 microphones) round array structure which can be adapted to accommodate placement in many different product configurations.
- Capable of providing both azimuthal direction and elevation.
- Ability to handle a multi-speaker situation by tracking multiple directions simultaneously.
- Incorporates DSDA beamforming technology to focus on sound in any direction with very fine resolution.
- Highly immune to background noise.
- Can accept a reference signal, such as the conferencing loudspeaker, and ignore its direction as a non-legitimate source.
- An ability to locate a speaker in both constrained and unconstrained situations, such as a driver and passenger in pre-defined locations or people speaking from varying or undefined locations, to a mobile robot.

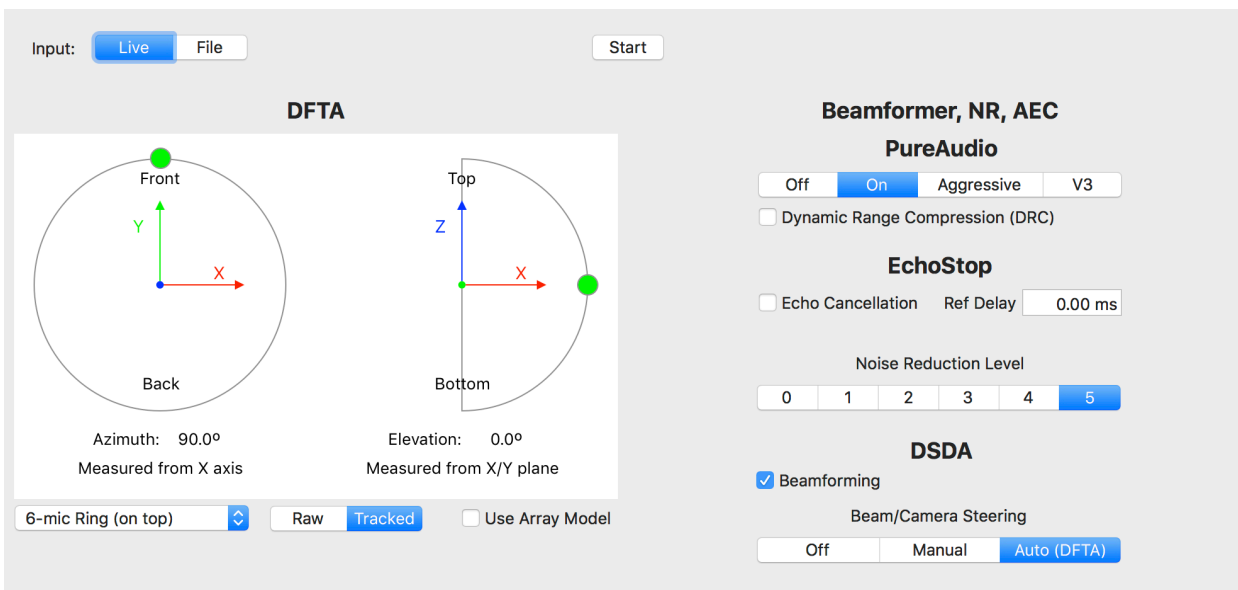


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## Andrea Test/Demonstration Setup:

- Andrea’s audio filters running on a Mac notebook computer.
- A 6-element USB microphone array.
- The filtered audio output from notebook is routed to the headphone jack on the USB microphone array.
- The following audio filters can optionally be run simultaneously:
  - DFTA
  - DSDA beamformer
  - Noise reduction (PureAudio NR)
  - Far-Field Enhancement (FFE, or DRC), which compensates for weak audio signals when speaking from long distances.
  - Echo cancellation with residual noise reduction (EchoStop)

## Andrea Test and Demonstration App for Mac



Input:

**DFTA**

Front  
Back  
Azimuth: 90.0°  
Measured from X axis

Top  
Bottom  
Elevation: 0.0°  
Measured from X/Y plane

6-mic Ring (on top)    Use Array Model

**Beamformer, NR, AEC**

**PureAudio**

Dynamic Range Compression (DRC)

**EchoStop**

Echo Cancellation Ref Delay

Noise Reduction Level

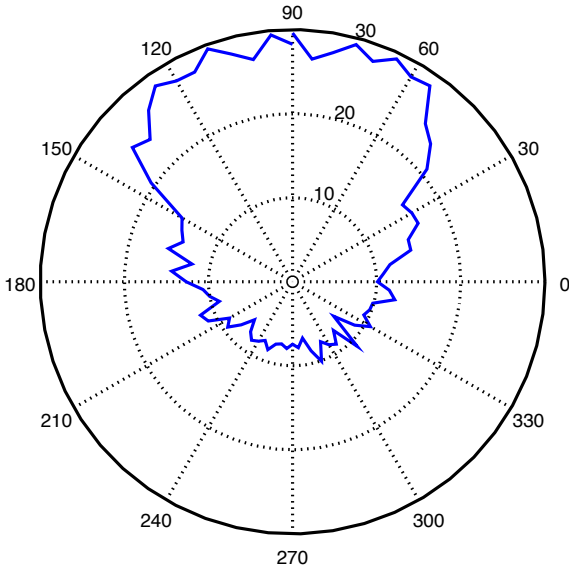
**DSDA**

Beamforming

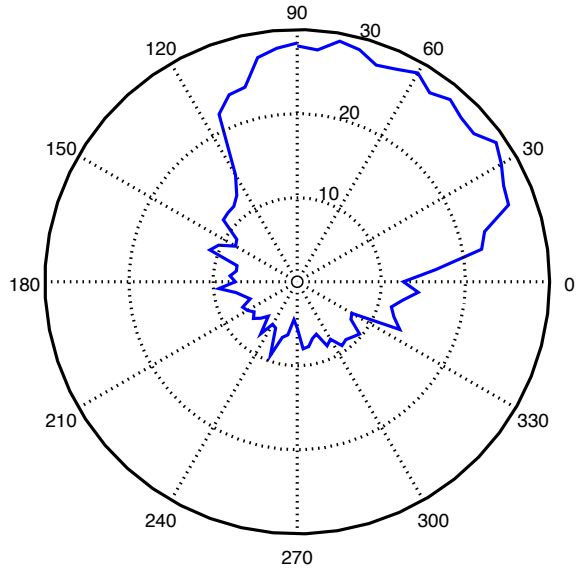
Beam/Camera Steering

### Steered Beam Measured in Acoustic Test Chamber

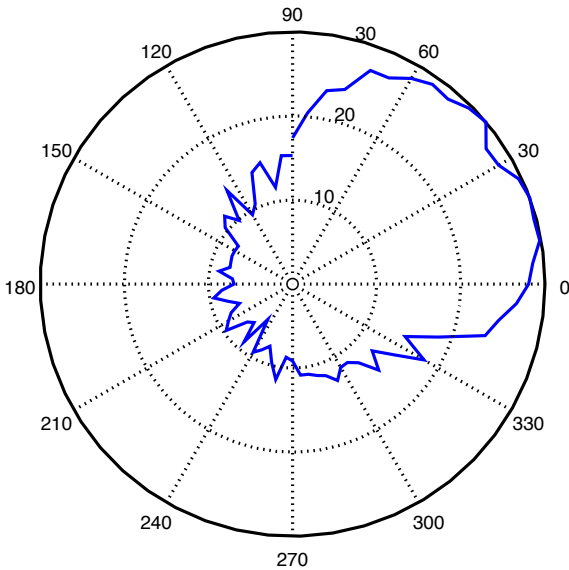
6-mic Array 1/3-Octave Band: 1000Hz (dB, 90 degrees)



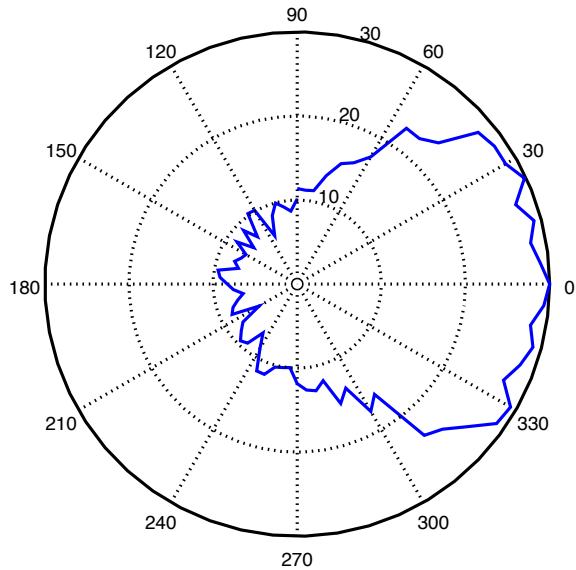
6-mic Array 1/3-Octave Band: 1000Hz (dB, 60 degrees)



6-mic Array 1/3-Octave Band: 1000Hz (dB, 30 degrees)



6-mic Array 1/3-Octave Band: 1000Hz (dB, 0 degrees)



Note: These graphs illustrate beam width and 30° steering increments. Beam steering can operate over 360 degrees in increments as fine as a fraction of a degree. Alternate beam widths are also available.