



Andrea Audio Test Labs

## **Andrea's Far Field Audio Filters**

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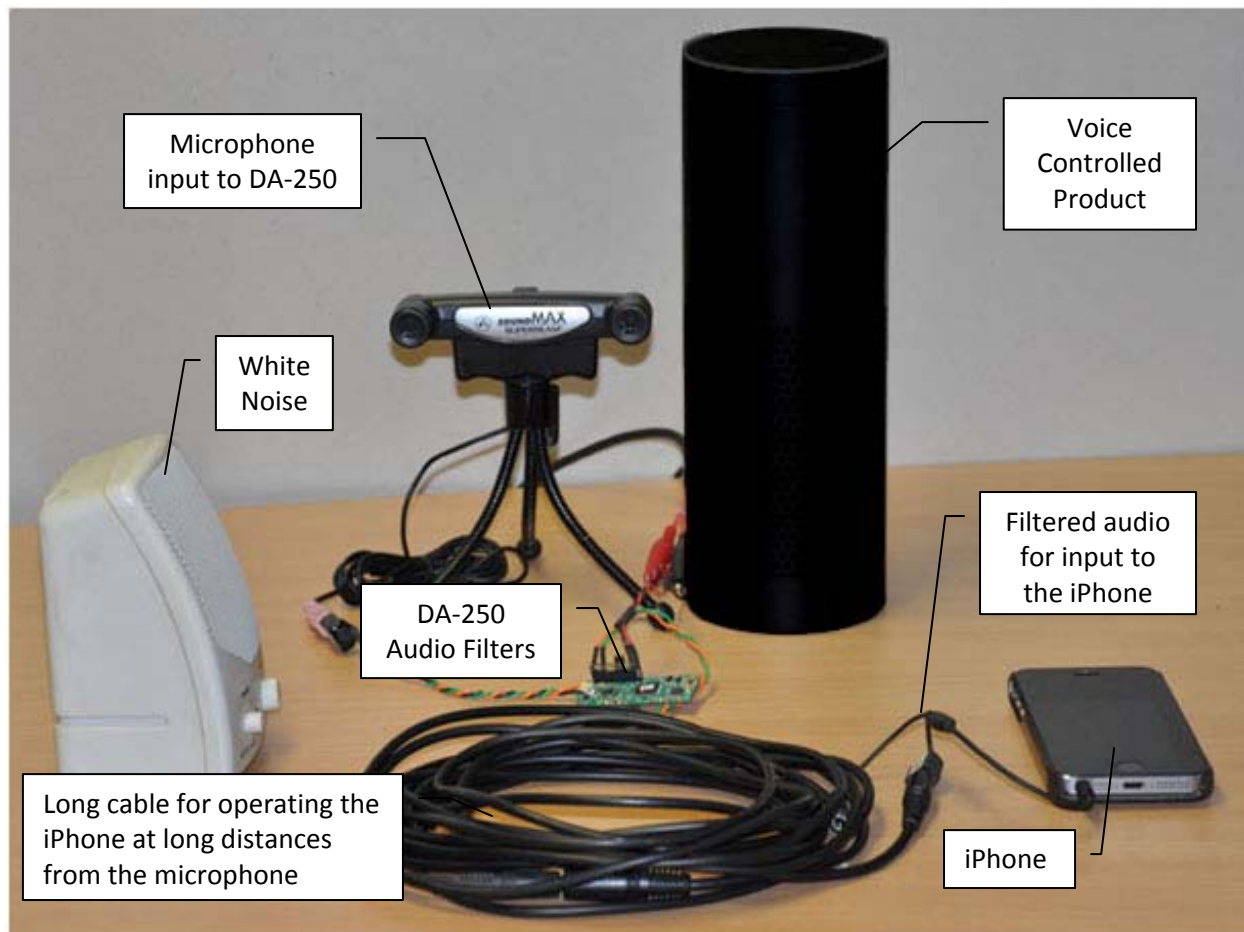
This report documents the performance of Andrea's audio filters compared to a popular Voice Controlled Product (VCP) in far-field operation. Testing Andrea's audio filters consists of providing filtered audio as input to Siri running on an iPhone.

### Andrea Setup:

- Andrea's audio filters running on a DA-250 DSP platform.
- Microphone is an Array 2s connected to the DA-250.
- Filtered audio output from the DA-250 is connect to the iPhone's headphone jack.
- The following audio filters are use:
  - Beam forming (DSDA)
  - Noise reduction (NR)
  - Far-Field Enhancements (FFE), which compensates for weak audio signals when speaking from long distances.

### Voice Controlled Product Setup:

- No special setup is needed for the Voice Controlled Product.

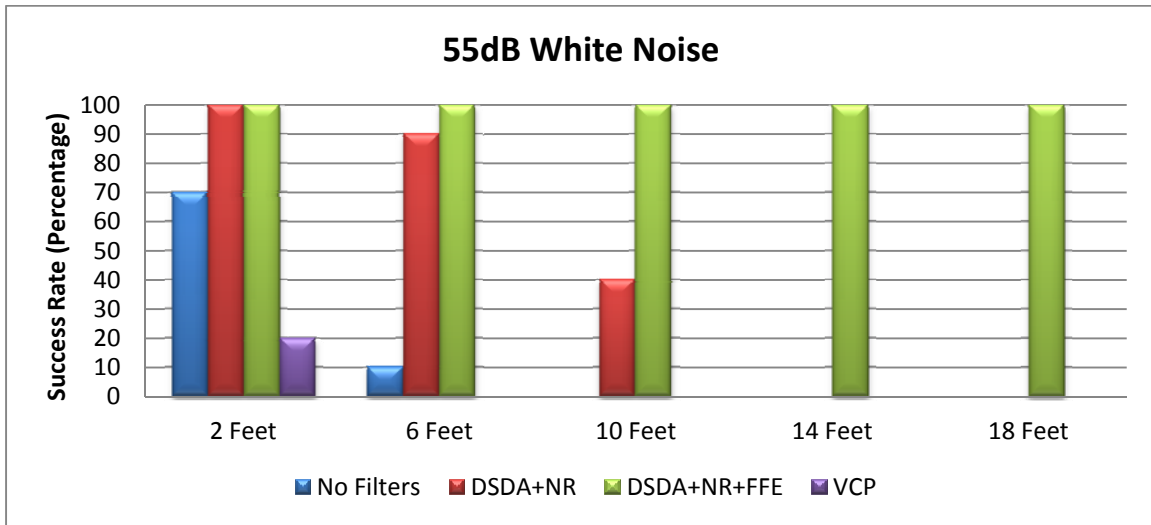
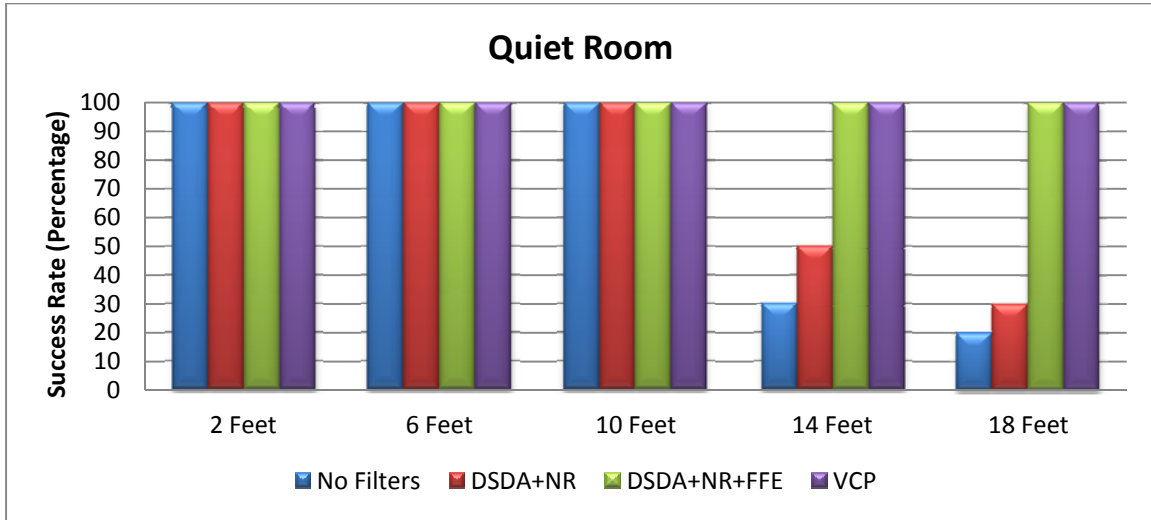


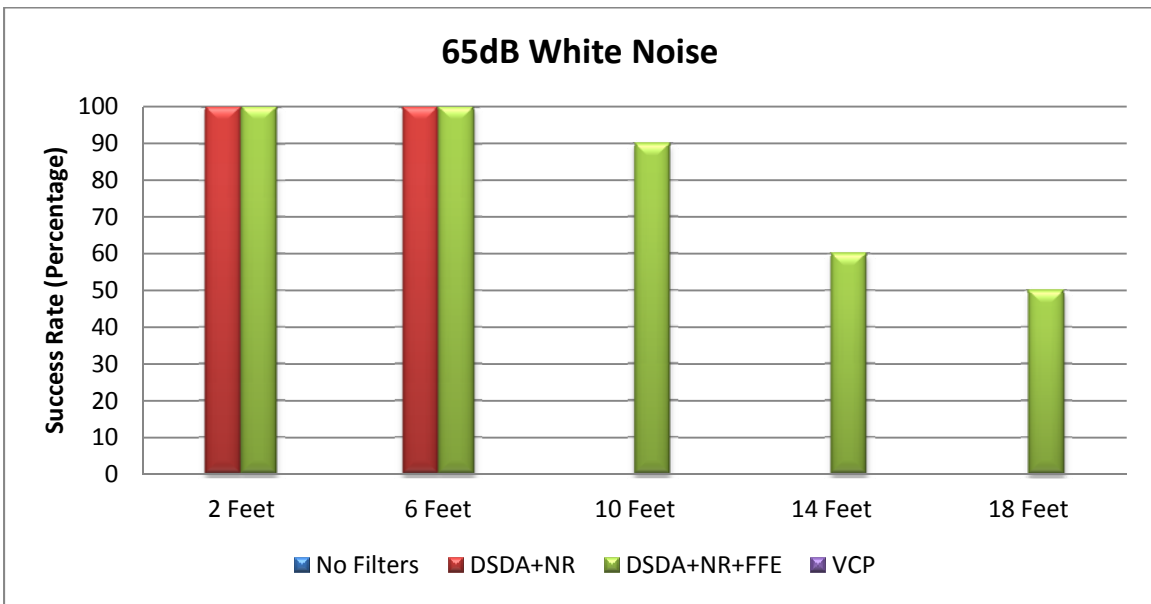
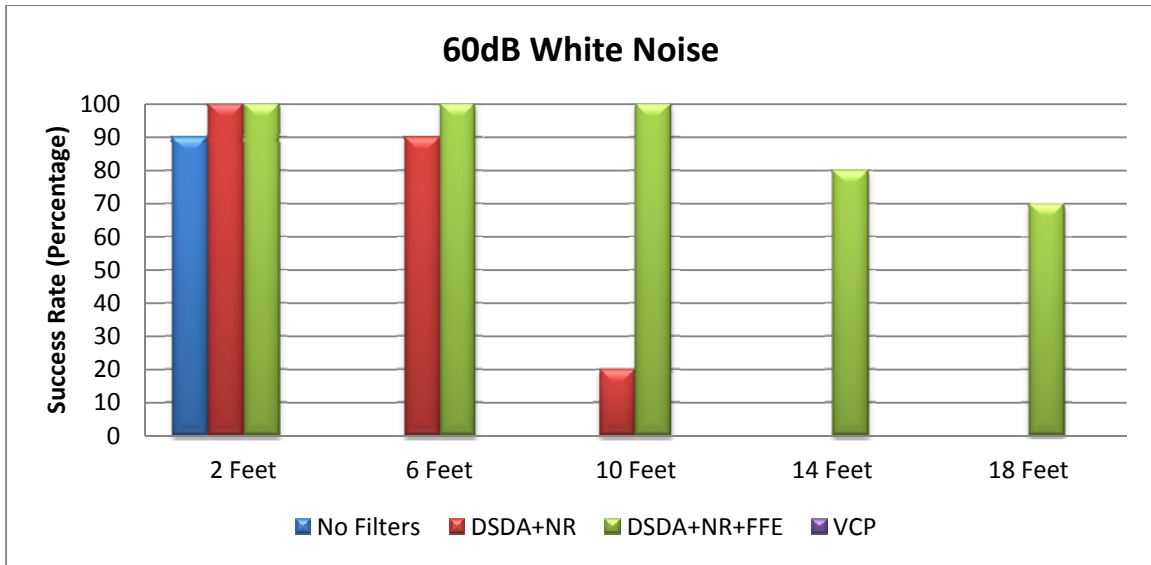
**Test Description:**

- The distance between the spoken commands and the test device varies from 2 feet (0.6 meters) to 18 feet (5.5 meters).
- White noise is played at an angle of 45 degrees from a distance of 2 feet.
- Tests consists of speaking 10 commands at each distance for each noise level. To get a success score the result has to be the expected response. If the result is close, but not exact, the test is considered a failure.
- Tests performed with four different noise levels:
  - Quiet room with no additional noise
  - 55dB of white noise
  - 60dB of white noise
  - 65dB of white noise
- For each distance and noise level, the Andrea Setup is tested with the following filter combinations:
  - No Filters – all audio processing is turned off allowing the raw audio from the microphone to be passed to the iPhone.
  - Beam Forming and Noise Reduction (DSDA + NR)
  - Beam Forming, Noise Reduction and Far-Field Enhancements (DSDA + NR + FFE)

**Results:**

The following graphs show the percent of successful commands under the stated noise conditions from 2 feet (0.6 meters), 6 feet (1.8 meters), 10 feet (3.0 meters), 14 feet (4.3 meters) and 18 feet (5.5 meters).





**Conclusions:**

- With any amount of noise in the room Andrea's filters significantly improve the speech recognition results.
- The Far-Field Enhancements are needed for distances of more than 2 feet.
- The popular Voice Controlled Product works great in a quiet room, but fails when there is any noise in the room.