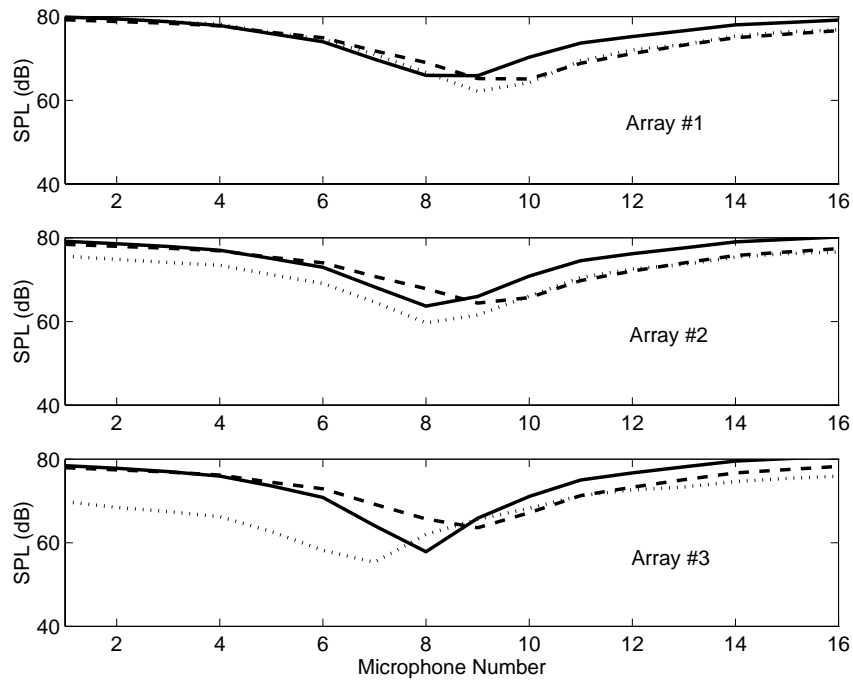


APPENDIX A: Plots of Raw Data for Duct Noise Control Experiment

The figures in this appendix are related to the experimental results presented in Chapter 5 for the duct noise control application which utilizes smart foam as an active/passive liner. The sound distribution *upstream* and *downstream* of the control actuators is of interest as the sound pressure is minimized at a number of discrete points associated with microphone array 4 (see Figure 5.11). The figures in this appendix, illustrate *upstream* sound levels at microphone arrays 1-3 converted to dB relative to 20 μPa . Similarly, the *downstream* sound levels are measured by microphone arrays 4-6 and then converting to dB relative to 20 μPa . To study the efficiency of smart foam in providing sound reduction, the sound levels are plotted relative to the 16 transverse duct positions for three unique duct configurations:

- (1) Untreated Duct (*Anechoically-terminated, rigid walled duct*).
- (2) Passive Control (*Foam-lined duct with inactive smart foam array*).
- (3) Active/Passive Control (*Foam-lined duct with active smart foam array*).

(a)



(b)

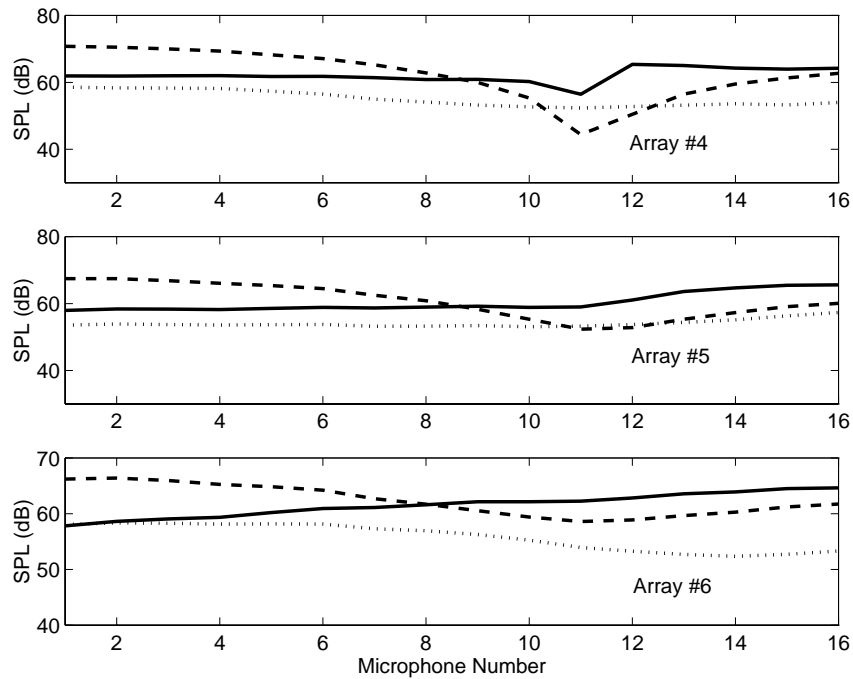
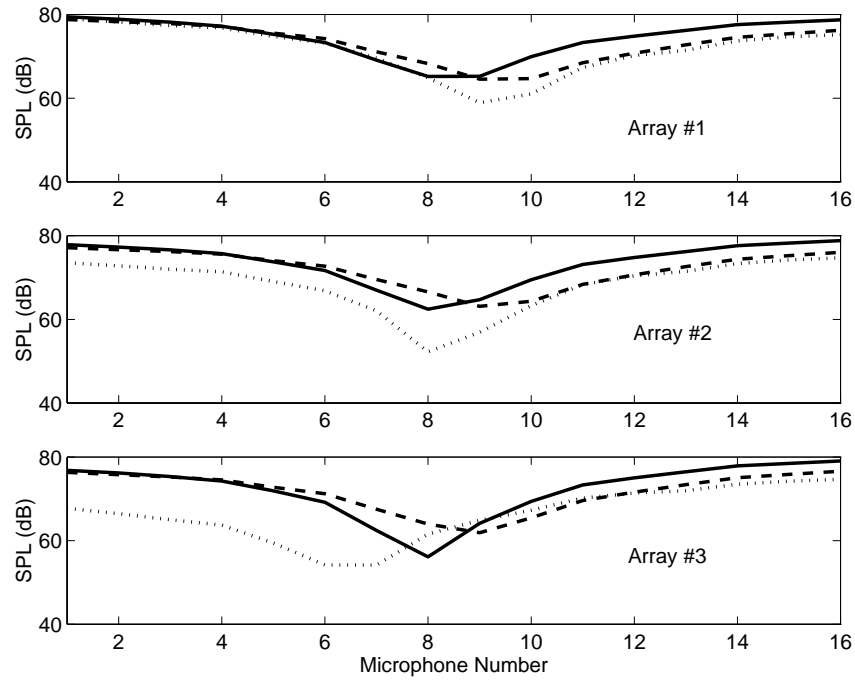


Figure A.1: 2I2O Harmonic Control at 184 Hz with error microphones 1,16 (a) *Upstream* SPL vs. Microphone Number (b) *Downstream* SPL vs. Microphone Number. Untreated Duct , Passive Control , Active/Passive Control .

(a)



(b)

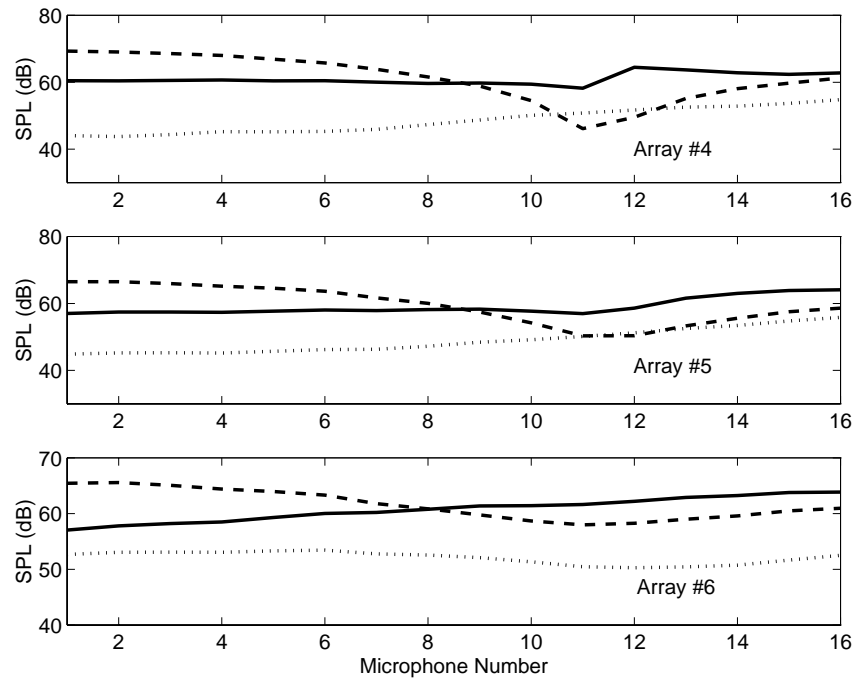
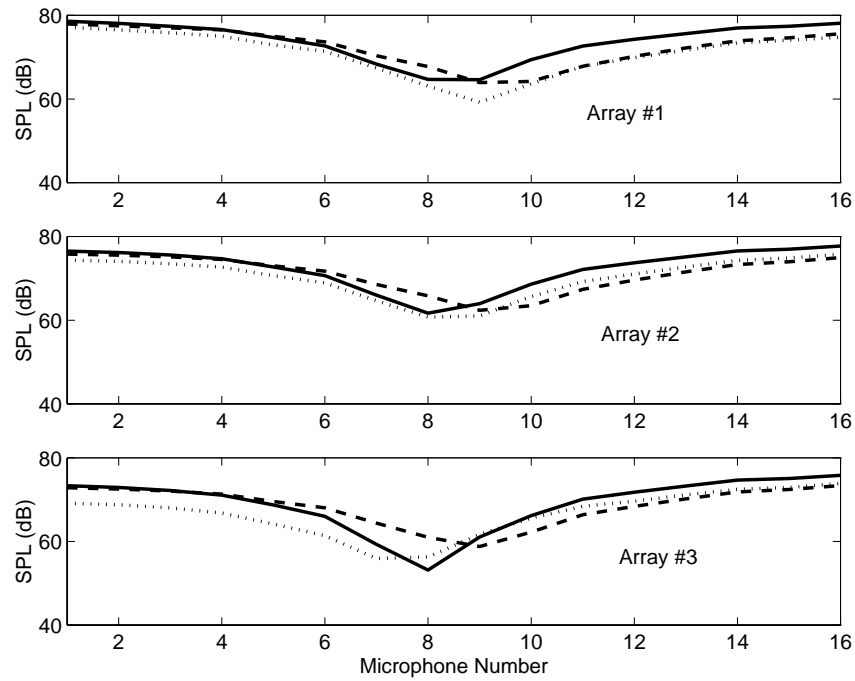


Figure A.2: 2I2O Harmonic Control at 184 Hz with error microphones 1,8 (a) *Upstream* SPL vs. Microphone Number (b) *Downstream* SPL vs. Microphone Number. Untreated Duct ———, Passive Control ······, Active/Passive Control - - - - -.

(a)



(b)

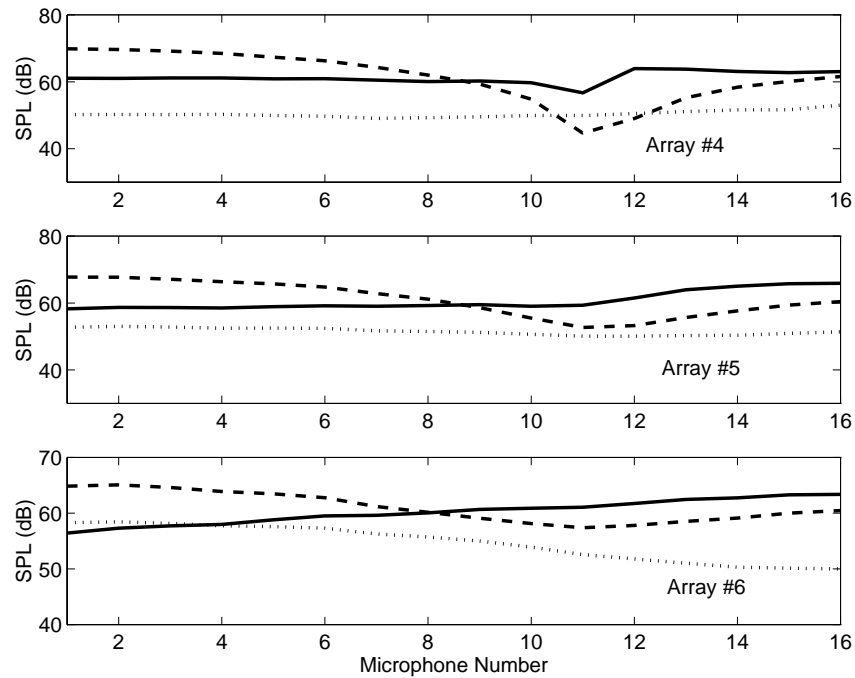
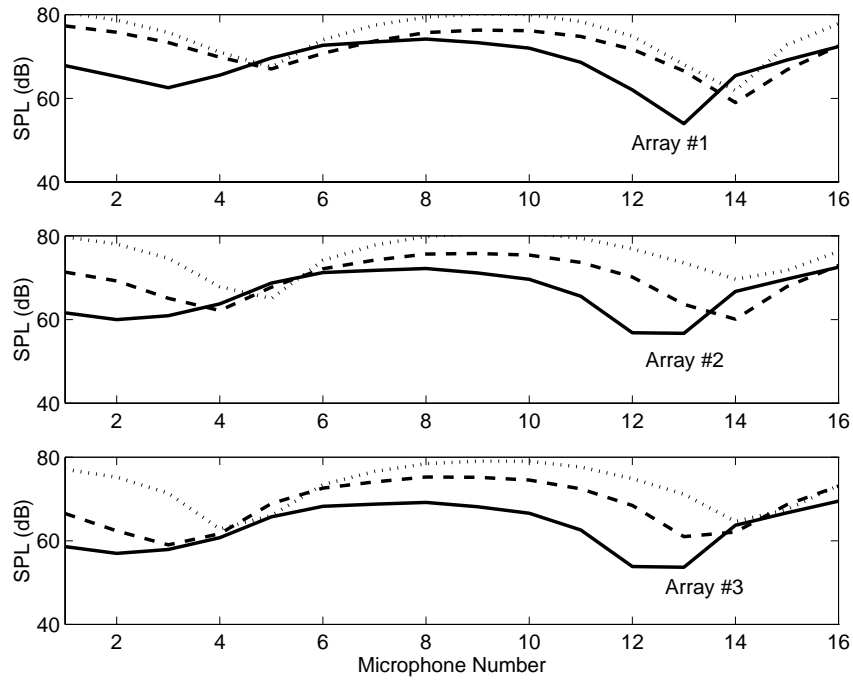


Figure A.3: 2I2O Harmonic Control at 184 Hz with error microphones 1,8,16 (a) *Upstream* SPL vs. Microphone Number (b) *Downstream* SPL vs. Microphone Number. Untreated Duct —, Passive Control - - - - -; Active/Passive Control ······.

(a)



(b)

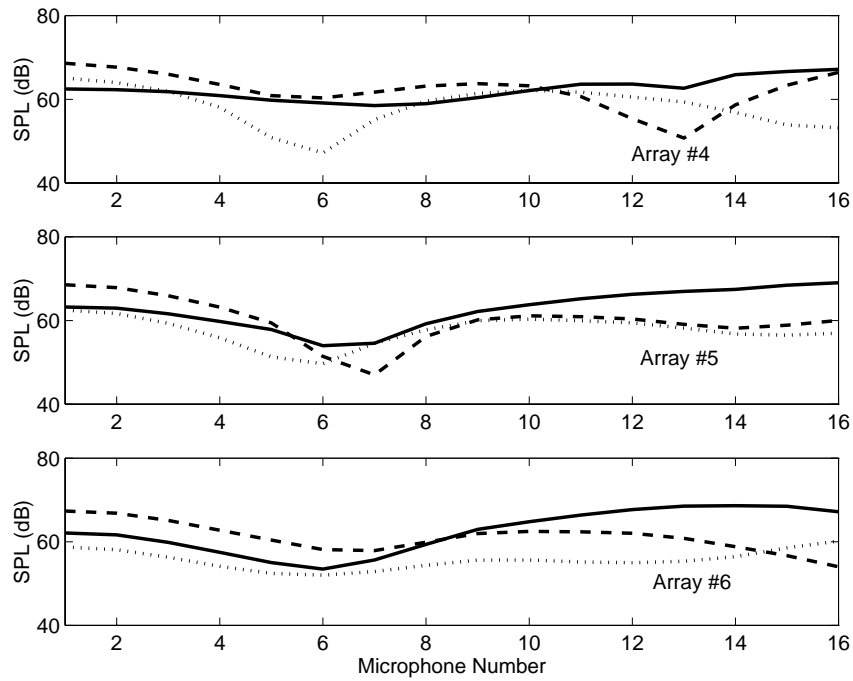


Figure A.4: 2I2O Harmonic Control at 342 Hz with error microphones 1,16 (a) *Upstream* SPL vs. Microphone Number (b) *Downstream* SPL vs. Microphone Number. Untreated Duct —, Passive Control - - - - -; Active/Passive Control ······.

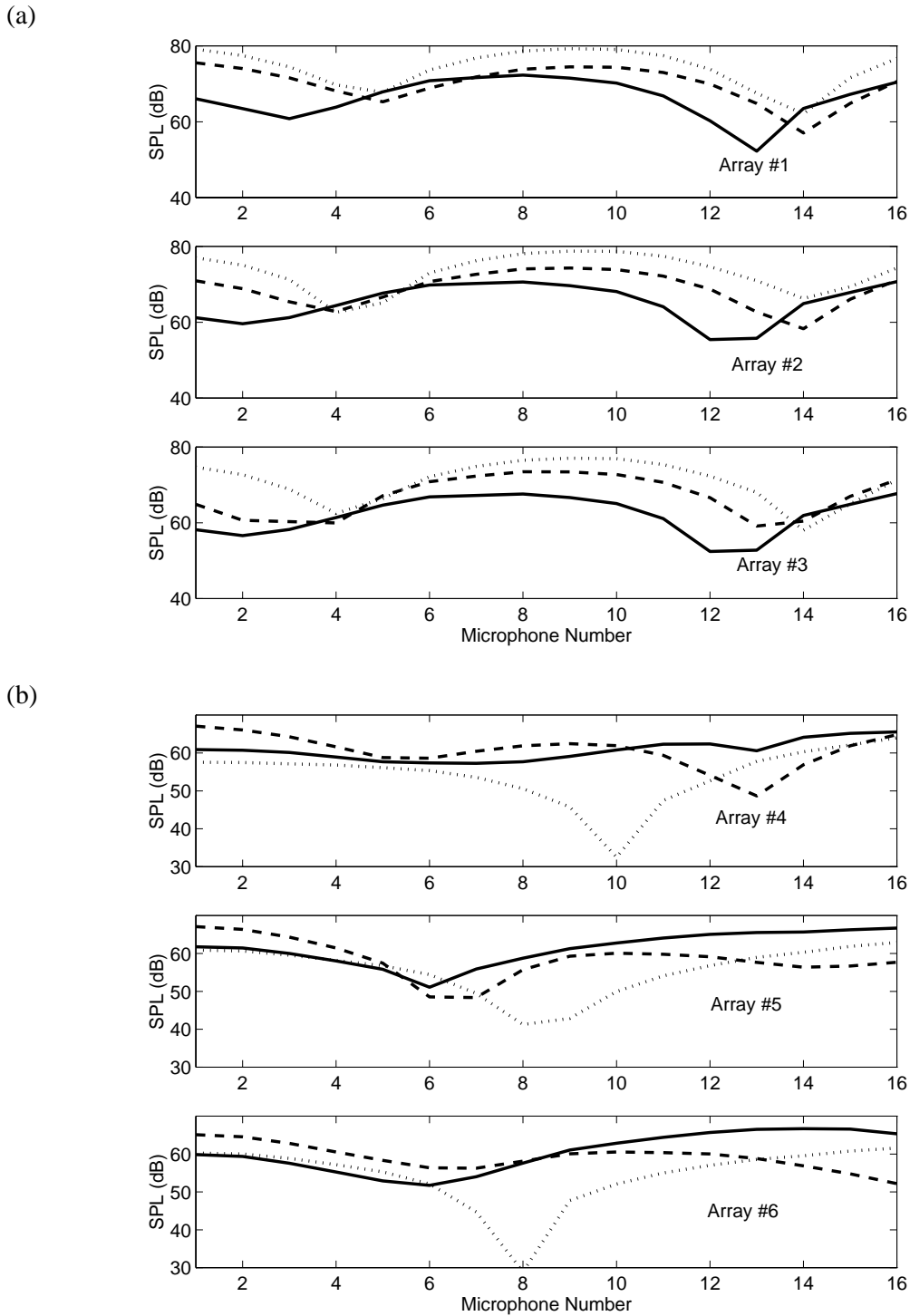
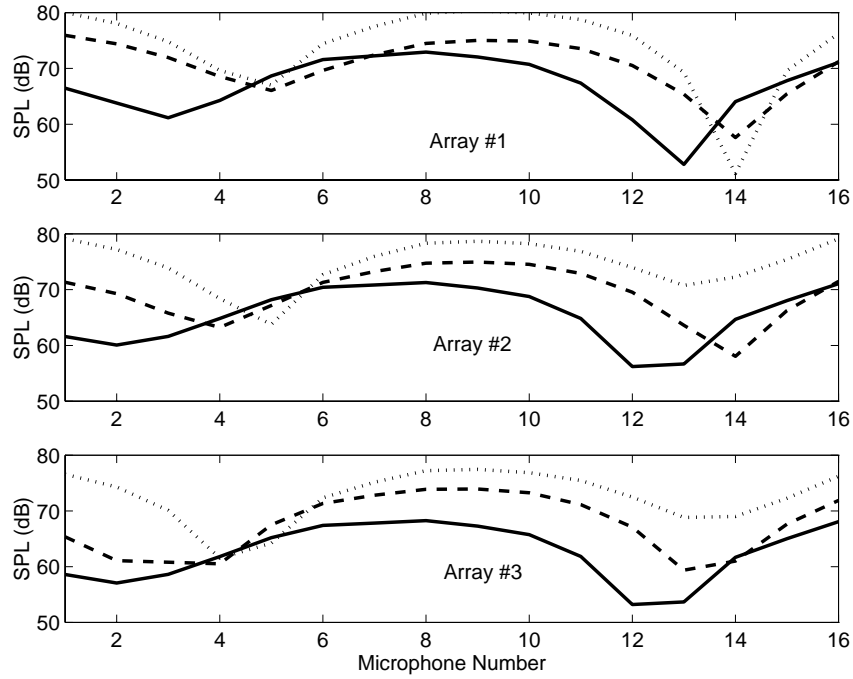


Figure A.5: 2I2O Harmonic Control at 342 Hz with error microphones 3,10 (a) *Upstream* SPL vs. Microphone Number (b) *Downstream* SPL vs. Microphone Number. Untreated Duct —, Passive Control - - - - -; Active/Passive Control ······.

(a)



(b)

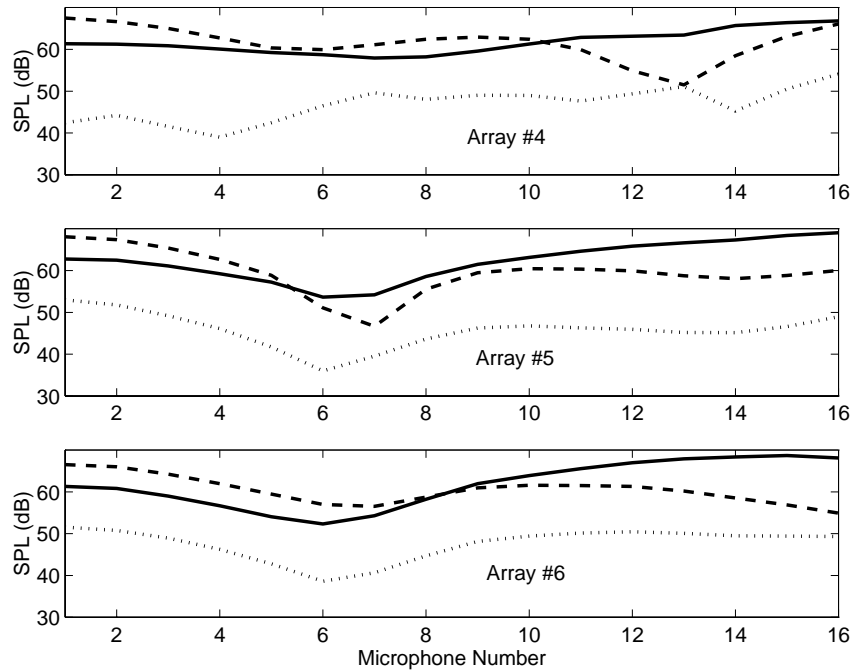
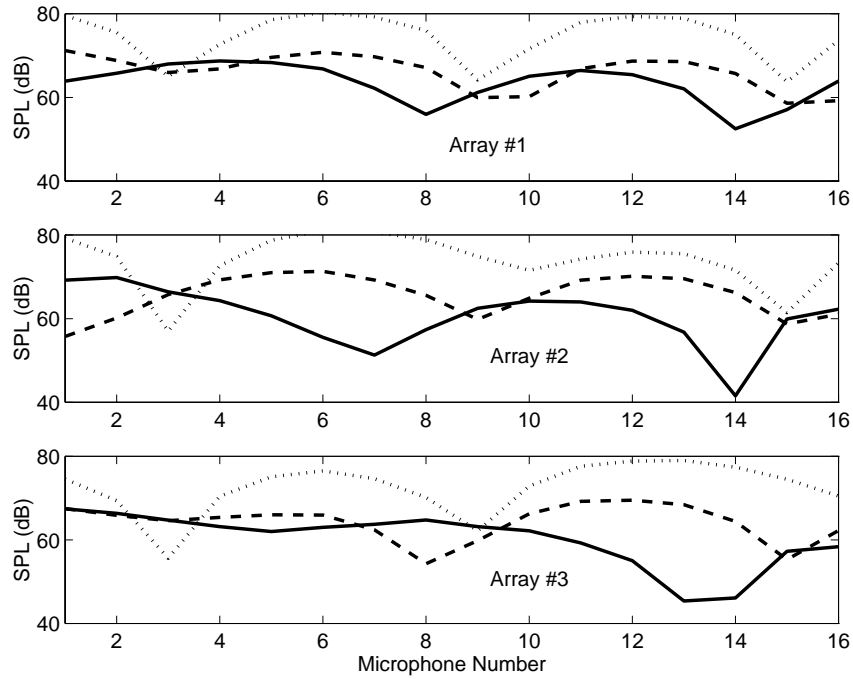


Figure A.6: 3I3O Harmonic Control at 342 Hz with error microphones 1,8,16 (a) *Upstream* SPL vs. Microphone Number (b) *Downstream* SPL vs. Microphone Number. Untreated Duct —, Passive Control - - - - -; Active/Passive Control ······.

(a)



(b)

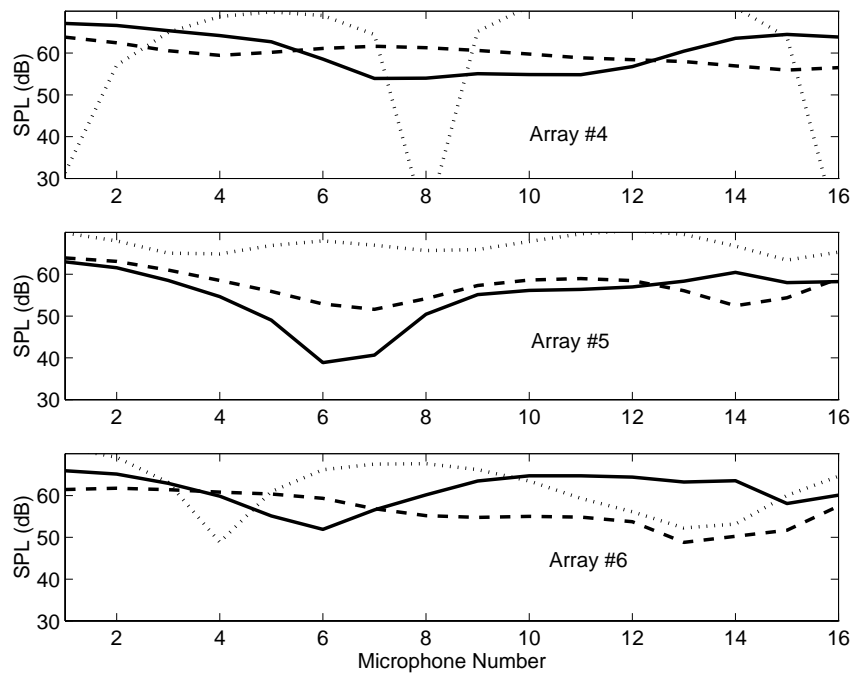
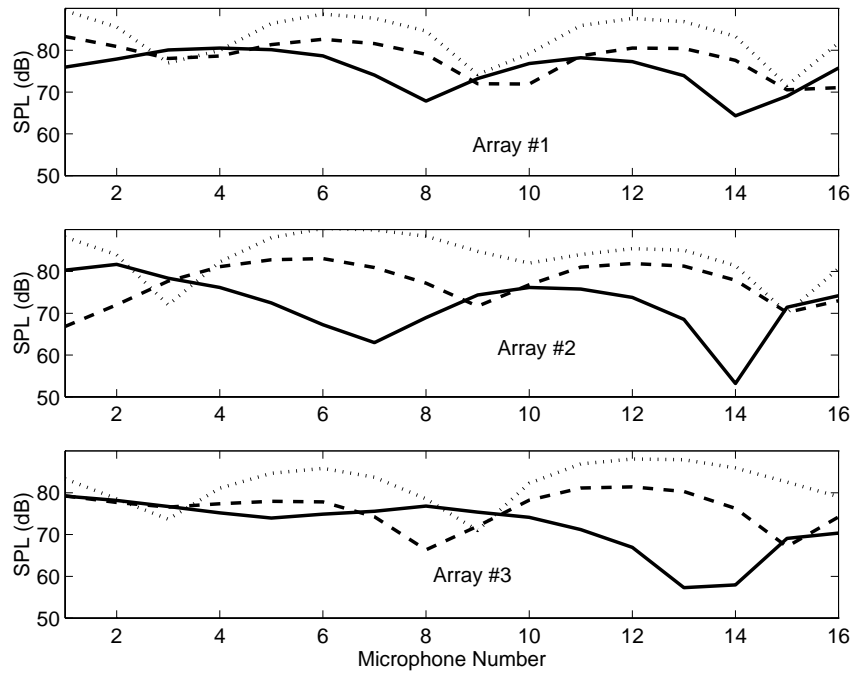


Figure A.7: 3I3O Harmonic Control at 504 Hz with error microphones 1,8,16 (a) *Upstream* SPL vs. Microphone Number (b) *Downstream* SPL vs. Microphone Number. Untreated Duct —, Passive Control - - - - -; Active/Passive Control ······.

(a)



(b)

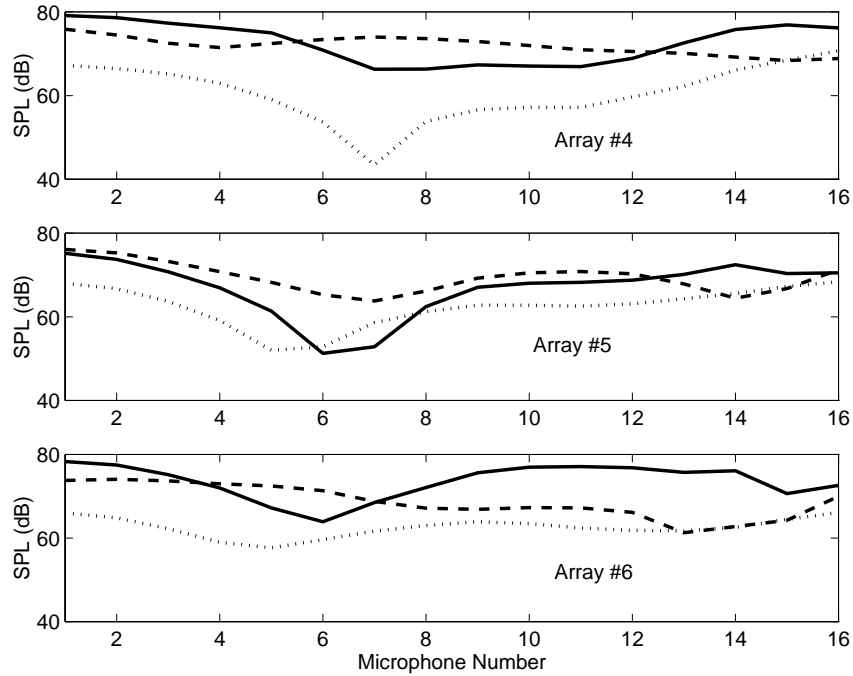


Figure A.8: 4I3O Harmonic Control at 504 Hz with error microphones 1,6,11,16 (a) *Upstream* SPL vs. Microphone Number (b) *Downstream* SPL vs. Microphone Number. Untreated Duct —, Passive Control - - - - -; Active/Passive Control ······.