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TITLE

EQUIPMENT SETUP DOCUMENTATION FOR DIOTIC AND DIFFUSE-FIELD MASKER SPEECH DISCRIMINATION STUDY INCLUDING PILOT STUDY RESULTS

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EQUIPMENT SETUP DOCUMENTATION FOR DIOTIC AND DIFFUSE-FIELD MASKER SPEECH DISCRIMINATION STUDY INCLUDING PILOT STUDY RESULTS

Final Report for DCIEM Contract W7711-6-7331/001/SRV

Andrew C. Welker, B.A.Sc.

Welker Audio Consulting
462 Beechwood Place #2
Waterloo, Ontario, Canada
N2T 1Z1

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INTRODUCTION

This study was completed under DCIEM Contract W7711-6-7331/001/SRV and was undertaken to investigate the binaural speech intelligibility performance of varying types of headsets under both diotic and diffuse-field maskers.

The details of the equipment and the signal detection task used are described in detail in "An Investigation into the Differences Between HRTFs in a Spatial Audio Display System for Improving Speech Intelligibility" by Welker, 1996.

The following document describes the equipment setup requirements for this experiment in addition to the results of a pilot study involving five subjects.

Five subjects completed 4 sessions with each of the following headset/masker combinations:

Stax Lambda/Speech Babble
AKG K-500/Speech Babble
SPH5/Speech Babble
Peltor(ANR Active)/Speech Babble

Stax Lambda/SeaKing

These sessions used a diotic masker presented over the headset under test within an International Acoustics Company (IAC) sound-attenuating booth. Each session lasted approximately 30 minutes and measured speech intelligibility thresholds of randomized three digit numbers presented under a Diotic condition and spatialized at 0, 60, 90, 270, and 300 degrees azimuth. The results of these booth sessions are detailed in Figures 7-12 and Tables 1-7.

In addition, two subjects completed a single session with each of the following headset/masker combinations:

Stax Lambda/Speech Babble
AKG K-500/Speech Babble
SPH5/Speech Babble
Peltor (ANR Active)/Speech Babble

Stax Lambda/SeaKing
AKG K-500/SeaKing
SPH5/SeaKing
Peltor (ANR Active)/SeaKing

Stax Lambda/Leopard Tank
AKG K-500/Leopard Tank
SPH5/Leopard Tank
Peltor (ANR Active)/Leopard Tank

These sessions used a diffuse-field masker presented external to the headset under test over a set of equalized loudspeakers within the DCIEM reverb room. The results of these sessions are detailed in Figures 13-21.

1. Diotic Masker Experiment in Booth

Setup and calibrate TDT system as described in Sections 1.1 and 1.2.
Make sure both booth doors are closed during runs.
Presentation of spatial positions should be randomized for each batch file using a Latin square.
Headset/Masker run order should also be randomized.
Watch out for early termination of run. This is usually due to an AP2 stack segment error. The log file where the termination occurred must be deleted and re-run.

Results of runs for 5 subjects are given in Figures 7 through 12 and Tables 1 through 7.

1.1 Setup for Speech Signal Presentation Over Headset (Booth)

1. PD1 DAC[0] -> KEMO [IN1]
2. KEMO [OUT1] -> PA4[1] IN
3. PA4[1] OUT -> Input A on SM3
4. A+B Output on SM3 -> LEFT channel input on Stax SRM-T1 or Phase3 HM-1 headphone module.

5. PD1 DAC[1] -> KEMO [IN2]
6. KEMO [OUT2] -> PA4[2] IN
7. PA4[2] OUT -> Input C on SM3
8. C+D Output on SM3 -> RIGHT channel input on Stax SRM-T1 or Phase3 HM-1 headphone module.

KEMO Filter Settings:

1. Discrete
2. Both channels set to AC
3. Both channels set to x1 Gain
4. Both channels set to NORMAL
5. Both channels set to Filter "IN"
6. Both channels set to 9kHz cutoff

Gain Settings for Headset Playback:

Headset	Speech Babble Masker	SeaKing Masker
AKG K-500	GREEN marker	N/A
Peltor (ANR active)	RED marker	N/A
SPH5	WHITE marker	N/A
Stax Lambda	ORANGE marker	FULL clockwise

NOTE: These settings should be checked before each day of subject runs using the Quest Model 1900 sound level meter with B&K 3134 microphone and 1/2-inch flat plate coupler. Press the flat plate coupler against the ear seal of each headset and set Quest meter to SPL/A-weighting/FAST response. Press "RUN" and measure the output level of each headset with both the speech babble and SeaKing masker signals at the corresponding marker for that headset. The measured output level should be 70.0dBA with the speech babble masker and 75.0dBA with the SeaKing masker.

1.2 Setup for Diotic Masker Presentation Over Headset

Speech Babble:

1. Speech Babble DAT in Panasonic SV-3500, output set to -10dBm.
2. Left channel output of SV-3500 to paralleled Input1 and Input2 of B&K 5612 Spectrum Shaper.
3. Both B&K Spectrum Shaper inputs set to "Linear".
4. Output1 and Ouput2 of Spectrum Shaper summed through ORANGE network box (Note corresponding BLUE and YELLOW tags on Spectrum Shaper and Network box!).
5. Output of ORANGE network box connected to "B" and "D" inputs on TDT SM3 weighted summer, split through BNC T-connector.
6. All gain controls on SM3 set to "0dB" position, two polarity switches set to NON-inverting!

Sea King:

1. SeaKing Hover DAT in Panasonic SV-3500, output set to +4dBm.
2. Left channel output of SV-3500 to paralleled Input1 and Input2 of B&K 5612 Spectrum Shaper.
3. Both B&K Spectrum Shaper inputs set to "Filter".
4. Output1 and Ouput2 of Spectrum Shaper summed through ORANGE network box (Note corresponding BLUE and YELLOW tags on Spectrum Shaper and Network box!).
5. Output of ORANGE network box connected to "B" and "D" inputs on TDT SM3 weighted summer, split through BNC T-connector.
6. All gain controls on SM3 set to "0dB" position, two polarity switches set to NON-inverting!

B&K 5612 Spectrum Shaper Slider Positions:

The following slider settings reproduce the spectrum for the MIRE SPH5 expected attenuation with A-weighting applied. (See Figures 1 and 2)

16Hz	0.5	1kHz	1.5
20	0.0	1.25	1.5
25	1.0	1.6	1.5
31.6	0.75	2	1.25
40	1.25	2.5	2.25
50	1.25	3.16	2.75
63	1.0	4	3.5
80	1.5	5	4.25
100	2.0	6.3	4.0
125	2.0	8	0.0
160	2.75	10	3.5
200	3.0	12.5	3.75
250	3.5	16	3.75
316	3.0	20	3.75
400	3.75	25	10.0
500	4.0	31.6	10.0
630	4.0	40	10.0
800	4.25	50	10.0

2. Diffuse-Field Masker Experiment in Reverb Room

Provide subject with a KILL switch for system shut down.
Warn each subject of the noise levels involved and make it clear to them NOT to remove the headset at any time during the run.
Subject chair should be placed over the "reference" position with the monitor and keyboard in front of them. The subject's BACK should be to the loudspeakers.
Instruct the subject to keep as still as possible during each run and to remain facing forward at all times.
Monitor subject's actions from the control room with the closed-circuit video camera.

Results of runs for 2 subjects are given in Figures 13 through 21.

2.1 Setup for Speech Signal Presentation Over Headset (Reverb Room)

1. PD1 DAC[0] -> KEMO [IN1]
2. KEMO [OUT1] -> PA4[1] IN
3. PA4[1] OUT -> Input A on SM3
4. A+B Output on SM3 -> LEFT channel input on Stax SRM-T1 or Phase3 HM-1 headphone module.

5. PD1 DAC[1] -> KEMO [IN2]
6. KEMO [OUT2] -> PA4[2] IN
7. PA4[2] OUT -> Input C on SM3
8. C+D Output on SM3 -> RIGHT channel input on Stax SRM-T1 or Phase3 HM-1 headphone module.

KEMO Filter Settings:

1. Discrete
2. Both channels set to AC
3. Both channels set to x1 Gain
4. Both channels set to NORMAL
5. Both channels set to Filter "IN"
6. Both channels set to 9kHz cutoff

Gain Settings for Headset Playback:

Headset	Speech Babble Masker	SeaKing/Leopard Masker
AKG K-500	GREEN marker	YELLOW marker
Peltor (ANR active)	RED marker	BLUE marker
SPH5	WHITE marker	between YELLOW and BLUE
Stax Lambda	ORANGE marker	FULL clockwise

2.2.1 Noise System Configuration for Speech Babble Masker - Stax SR-Lambda and AKG K-500 Headsets

1. Speech Babble DAT tape in Panasonic SV-3500, output set to -10dBm.
2. Graphic EQ set to -20dB input sensitivity, level control on YELLOW dot.
3. DEQ7 level control set to RED marker for both channels.
4. Recall DEQ7 file 62, "BABBLE STAX/AKG".
5. ELF cutoff -2- (10Hz), both channels.
6. Power on all amps with YELLOW dots.
7. For subject playback, Oxmoor level control set to 5th click from MUTE!

DEQ7 File 62 filter settings:

GEQ 1/1oct L=R

32Hz=	-18.0dB
63Hz=	+1.2
125Hz=	+6.5
250Hz=	+0.6
500Hz=	+1.2
1kHz=	+0.2
2kHz=	+0.8
4kHz=	-0.8
8kHz=	+0.8
16kHz=	+3.0

-Default Level and Delay settings.

-The measured output of this setup can be found in File 25 on "Masker Spectra 1.0" disc which was measured using a tripod-mounted B&K 4149 microphone, 140cm high, at the "reference" position in the reverb room.
-70dBA free-field.

2.2.2 Noise System Configuration for Speech Babble Masker - Peltor Headset (ANR Active)

1. Speech Babble DAT tape in Panasonic SV-3500, output set to -10dBm.
2. Graphic EQ set to -20dB input sensitivity, level control on YELLOW dot.
3. DEQ7 level control set to RED marker for both channels.
4. Recall DEQ7 file 63, "BABBLE PELTOR".
5. ELF cutoff -8-4-2- (22Hz), both channels.
6. Power on all amps with YELLOW dots.
7. For subject playback, Oxmoor level control set to 27th click from MUTE!

DEQ7 File 63 filter settings:

GEQ 1/1oct L=R

32Hz=	-9.0dB
63Hz=	+1.8
125Hz=	+2.4
250Hz=	-1.0
500Hz=	-1.0
1kHz=	+2.0
2kHz=	+5.0
4kHz=	-4.0
8kHz=	+5.6
16kHz=	-10.0

-Default Level and Delay settings.

-The measured output of this setup can be found in File 30 on "Masker Spectra 1.0" disc which was measured using a tripod-mounted B&K 4149 microphone, 140cm high, at the "reference" position in the reverb room.
-The measured at-ear spectrum can be found in File 27 on "Masker Spectra 1.0" disc which was measured using a B&K 4134 microphone and the 1/2-inch flat-plate coupler sealed against the earcup.
-70dBA at-ear.

2.2.3 Noise System Configuration for Speech Babble Masker - SPH5 Helmet

1. Speech Babble DAT tape in Panasonic SV-3500, output set to -10dBm.
2. Graphic EQ set to -20dB input sensitivity, level control on YELLOW dot.
3. DEQ7 level control set to RED marker for both channels.
4. Recall DEQ7 file 64, "BABBLE SPH5".
5. ELF cutoff -8-4-2- (22Hz), both channels.
6. Power on all amps with YELLOW dots.
7. For subject playback, Oxmoor level control set to 23rd click from MUTE!

DEQ7 File 64 filter settings:

GEQ 1/1oct L=R

32Hz=	-8.0dB
63Hz=	-4.8
125Hz=	-0.6
250Hz=	-3.8
500Hz=	-0.8
1kHz=	+1.6
2kHz=	+2.8
4kHz=	+5.0
8kHz=	+7.5
16kHz=	+2.2

-Default Level and Delay settings.

-The measured output of this setup can be found in File 31 on "Masker Spectra 1.0" disc which was measured using a tripod-mounted B&K 4149 microphone, 140cm high, at the "reference" position in the reverb room.
-The measured at-ear spectrum can be found in File 28 on "Masker Spectra 1.0" disc which was measured using a B&K 4134 microphone and the 1/2-inch flat-plate coupler sealed against the earcup.
-70.3dBA at-ear.

2.2.4 Noise System Configuration for Sea-King Helicopter Masker - Stax SR-Lambda and AKG K-500 Headsets

1. Sea-King DAT tape in Panasonic SV-3500, output set to -10dBm.
2. Graphic EQ set to -20dB input sensitivity, level control on YELLOW dot.
3. DEQ7 level control set to RED marker for both channels.
4. Recall DEQ7 file 61, "SEAKING STAX/AKG".
5. ELF cutoff -2- (10Hz), both channels.
6. Power on all amps with YELLOW dots.
7. For subject playback, Oxmoor level control set to 28th click from MUTE!

DEQ7 File 61 filter settings:

GEQ 1/1oct L=R

32Hz=	-2.6dB
63Hz=	-4.6
125Hz=	+2.8
250Hz=	-3.8
500Hz=	-2.2
1kHz=	-7.5
2kHz=	-3.8
4kHz=	-8.0
8kHz=	-18.0
16kHz=	-11.0

-Default Level and Delay settings.

-The measured output of this setup can be found in File 21 on "Masker Spectra 1.0" disc which was measured using a tripod-mounted B&K 4149 microphone, 140cm high, at the "reference" position in the reverb room.
-75.5dBA free-field.

2.2.5 Noise System Configuration for Sea-King Helicopter Masker - SPH5 Helmet and Peltor Headset (ANR Active)

1. Sea-King DAT tape in Panasonic SV-3500, output set to -10dBm.
2. Graphic EQ set to -20dB input sensitivity, level control on YELLOW dot.
3. DEQ7 level control set to YELLOW marker for both channels.
4. Recall DEQ7 file 41, "SeaKing Hover".
5. ELF cutoff -2- (10Hz), both channels.
6. Power on all amps with YELLOW dots.
7. For subject playback, Oxmoor level control set to full counter-clockwise!

-The measured output of this setup can be found in File 29 on "Masker Spectra 1.0" disc which was measured using a tripod-mounted B&K 4149 microphone, 140cm high, at the "reference" position in the reverb room.

2.2.6 Noise System Configuration for Leopard Tank Masker - Stax SR-Lambda and AKG K-500 Headsets

1. Leopard Cruise Loop DAT tape in Panasonic SV-3500, output set to +4dBm.
2. Graphic EQ set to +4dB input sensitivity, level control on YELLOW dot.
3. DEQ7 level control set to RED marker for both channels.
4. Recall DEQ7 file 65, "LEOPARD STAX/AKG".
5. ELF cutoff -0- (none, 8Hz), both channels.
6. Power on all amps with YELLOW dots.
7. For subject playback, Oxmoor level control set to 16th click from MUTE!

DEQ7 File 65 filter settings:

GEQ 1/1oct L=R

32Hz=	-2.0dB
63Hz=	-1.2
125Hz=	+1.2
250Hz=	+1.6
500Hz=	-2.0
1kHz=	-3.2
2kHz=	-2.0
4kHz=	-8.0
8kHz=	-18.0
16kHz=	-18.0

-Default Level and Delay settings.

-The measured output of this setup can be found in File 22 on "Masker Spectra 1.0" disc which was measured using a tripod-mounted B&K 4149 microphone, 140cm high, at the "reference" position in the reverb room.
-75.2dBA free-field.

2.2.7 Noise System Configuration for Leopard Tank Masker - SPH5 Helmet and Peltor Headset (ANR Active)

1. Leopard Cruise Loop DAT tape in Panasonic SV-3500, output set to +4dBm.
2. Graphic EQ set to +4dB input sensitivity, level control on YELLOW dot.
3. DEQ7 level control set to YELLOW marker for both channels.
4. Recall DEQ7 file 43, "Leo Tape Loop".
5. ELF cutoff -0- (none, 8Hz), both channels.
6. Power on all amps with YELLOW dots.
7. For subject playback, Oxmoor level control set to 28th click from MUTE!

Figure 1: SPH5 A-weighted Attenuation Spectrum Approximation Using Filtered Noise

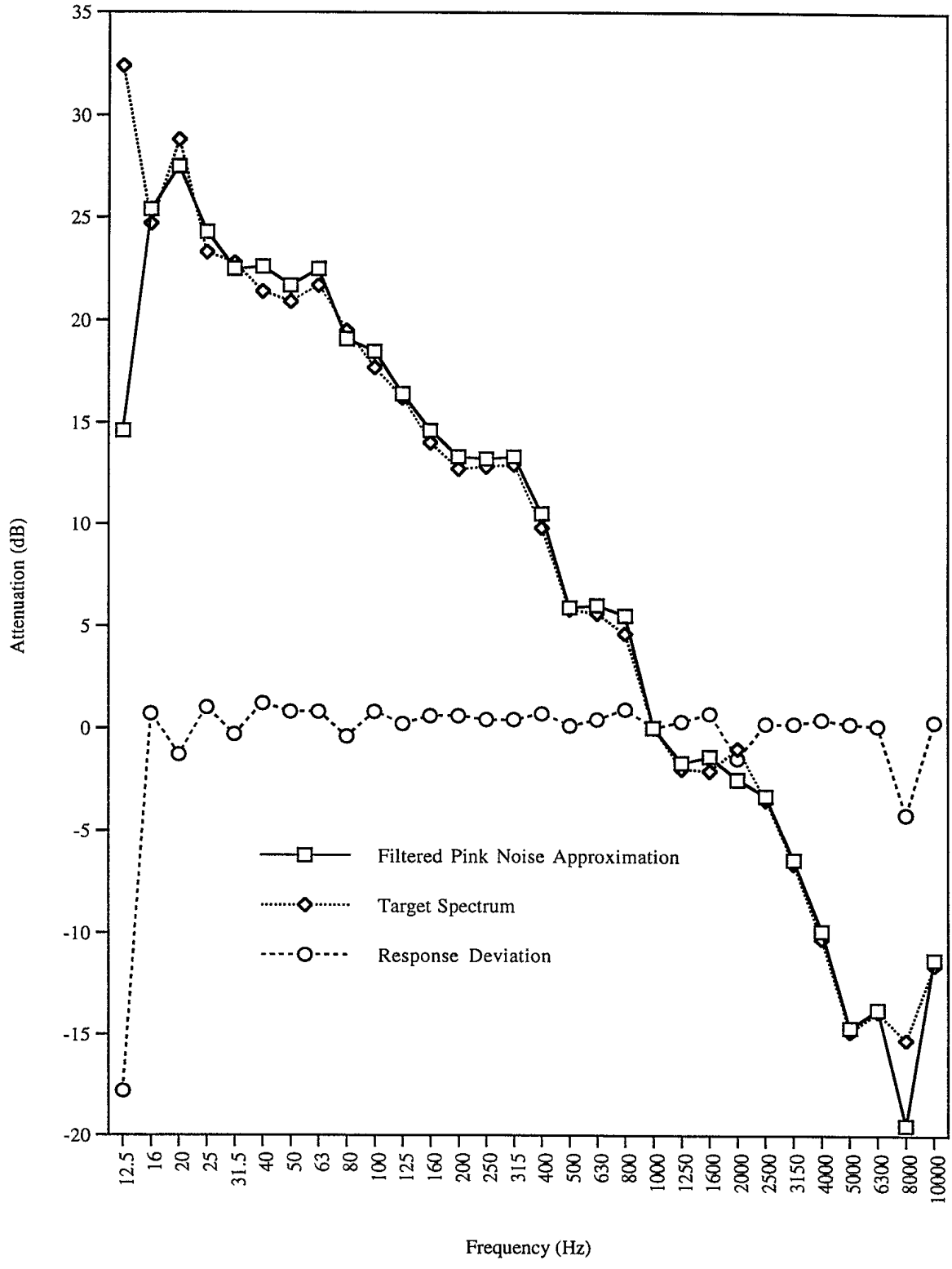


Figure 2: SPH5 MIRE Expected Attenuation

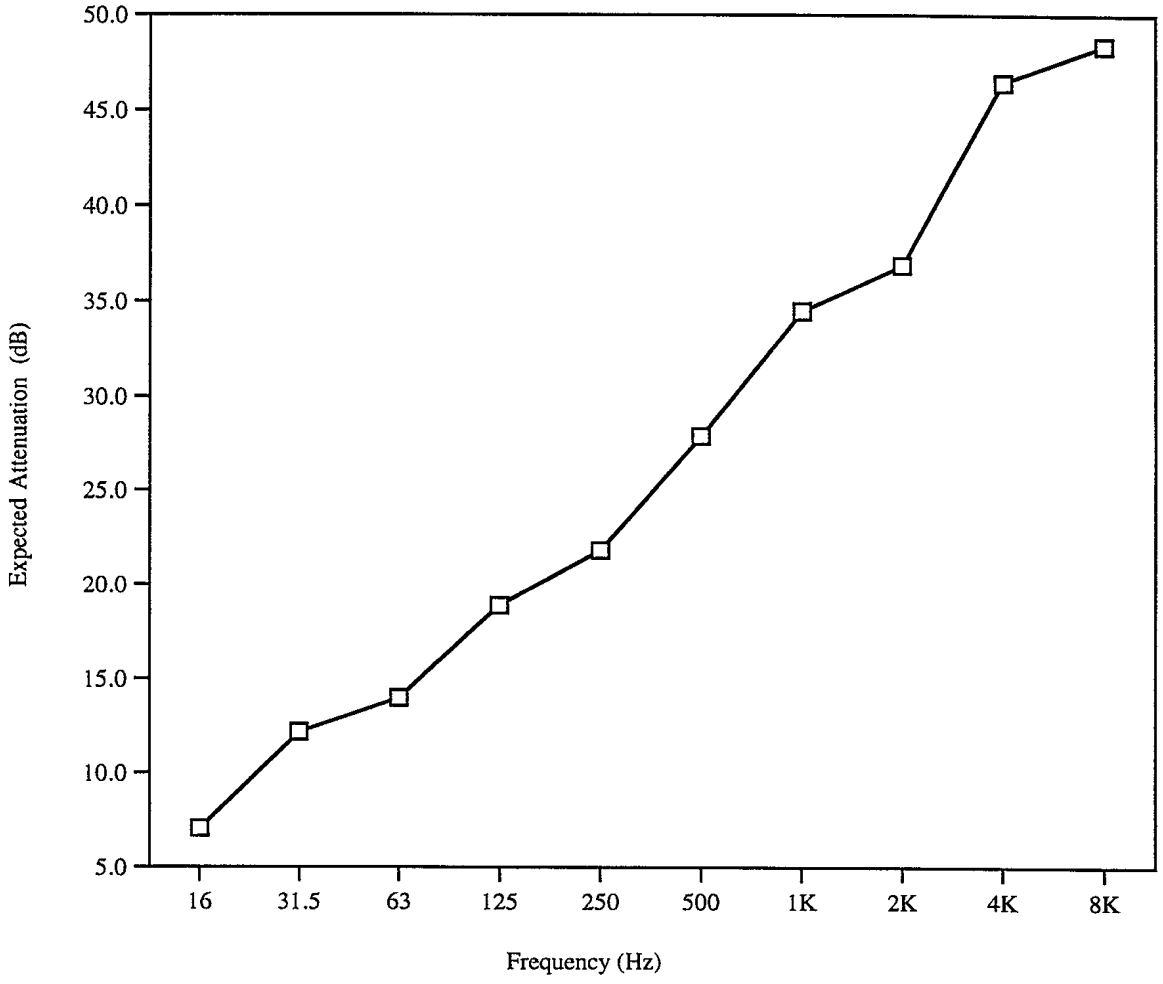


Figure 3: Diffuse-Field Babble Masker Spectra

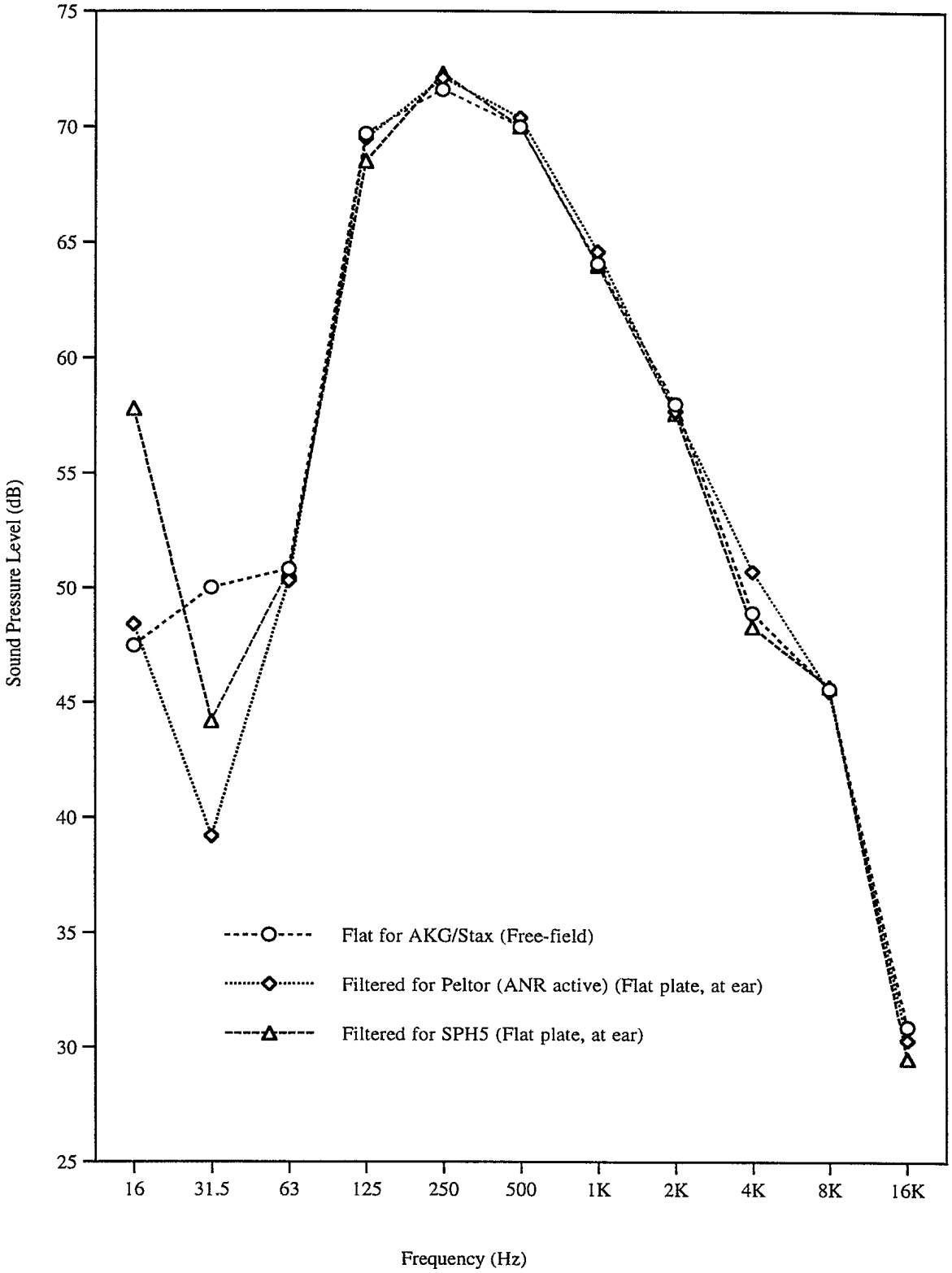


Figure 4: Diffuse-Field Speech Babble Masker Spectra

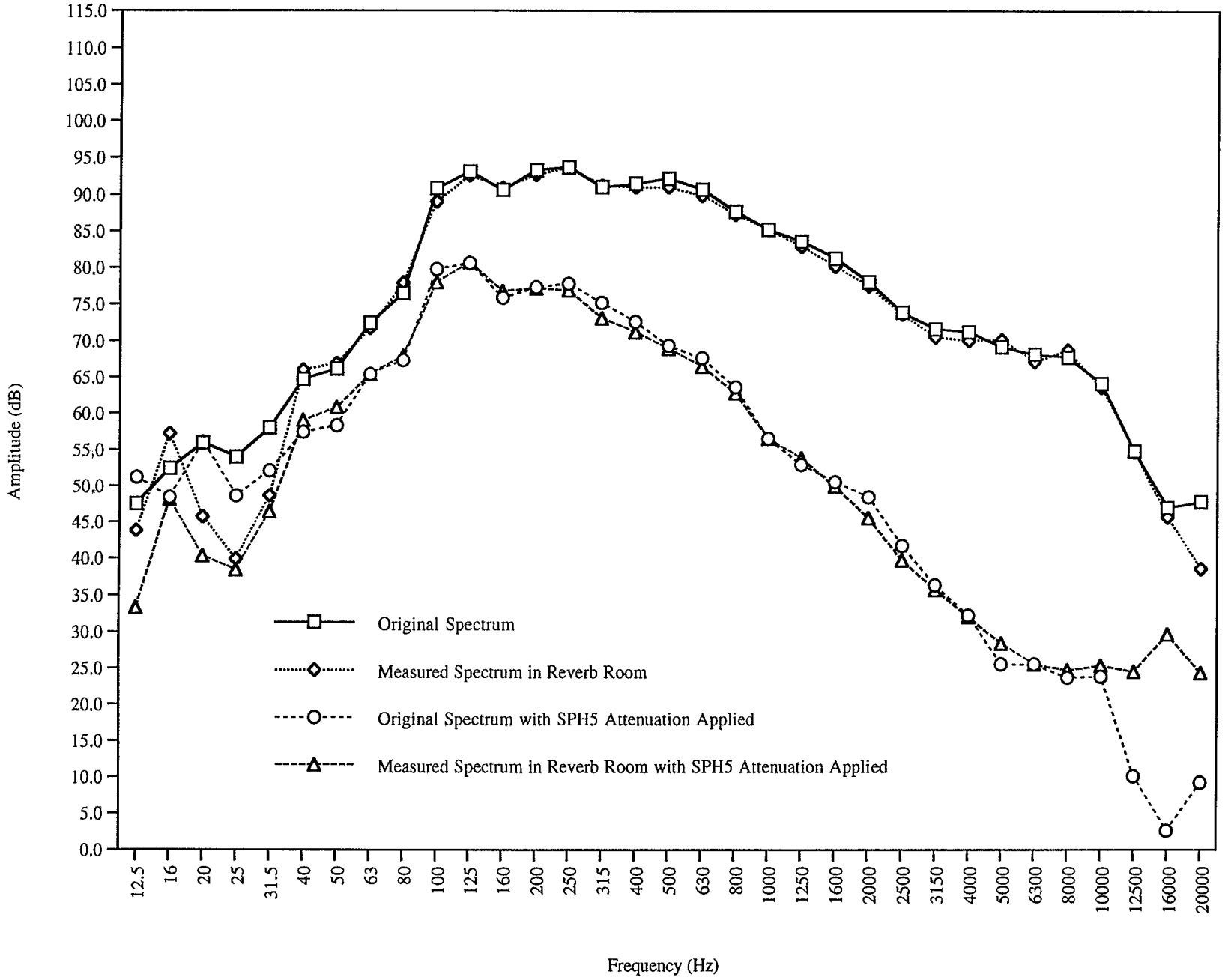


Figure 5: Diffuse-Field Sea King Masker Spectra

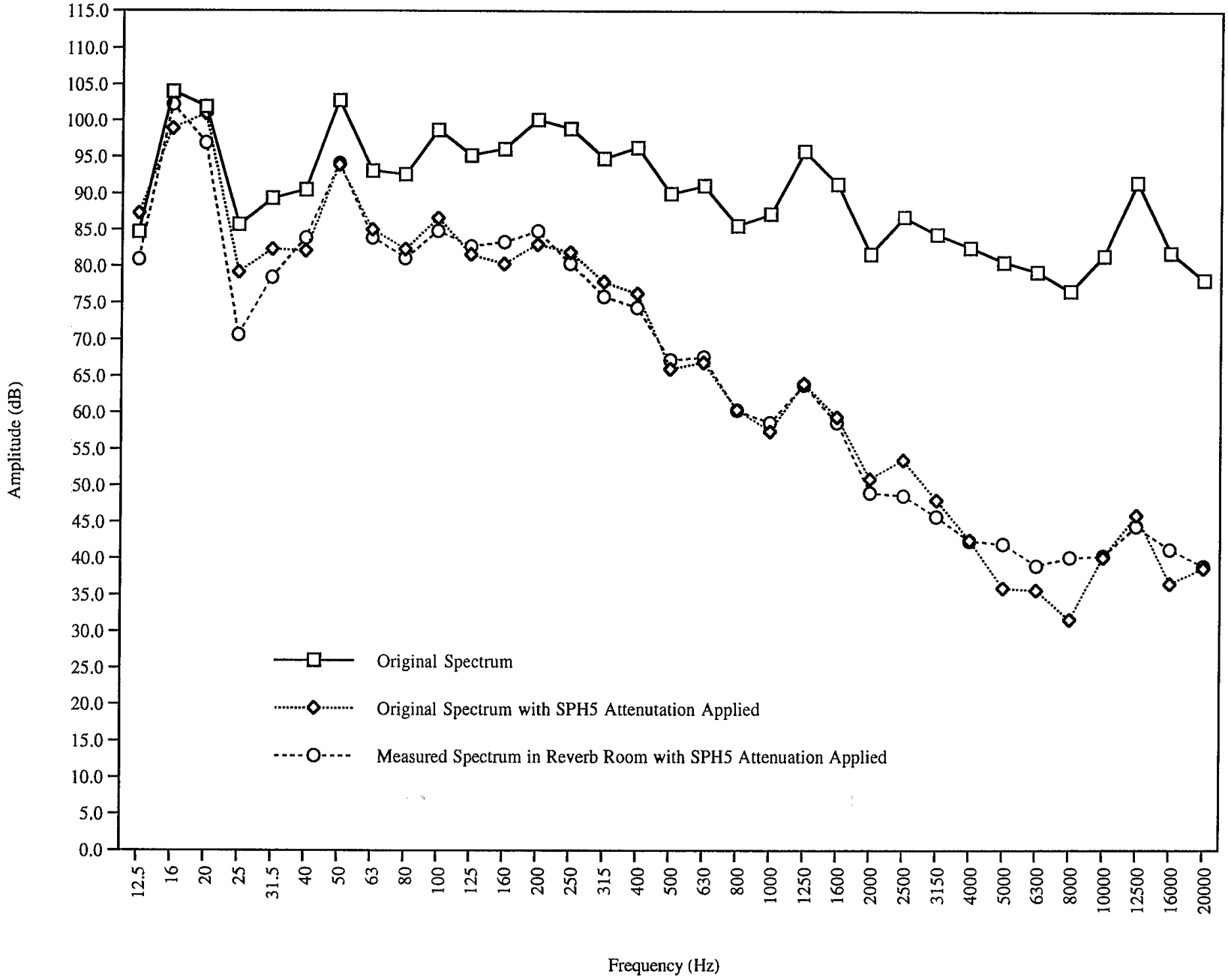


Figure 6: Diffuse-Field Leopard Tank Masker Spectra

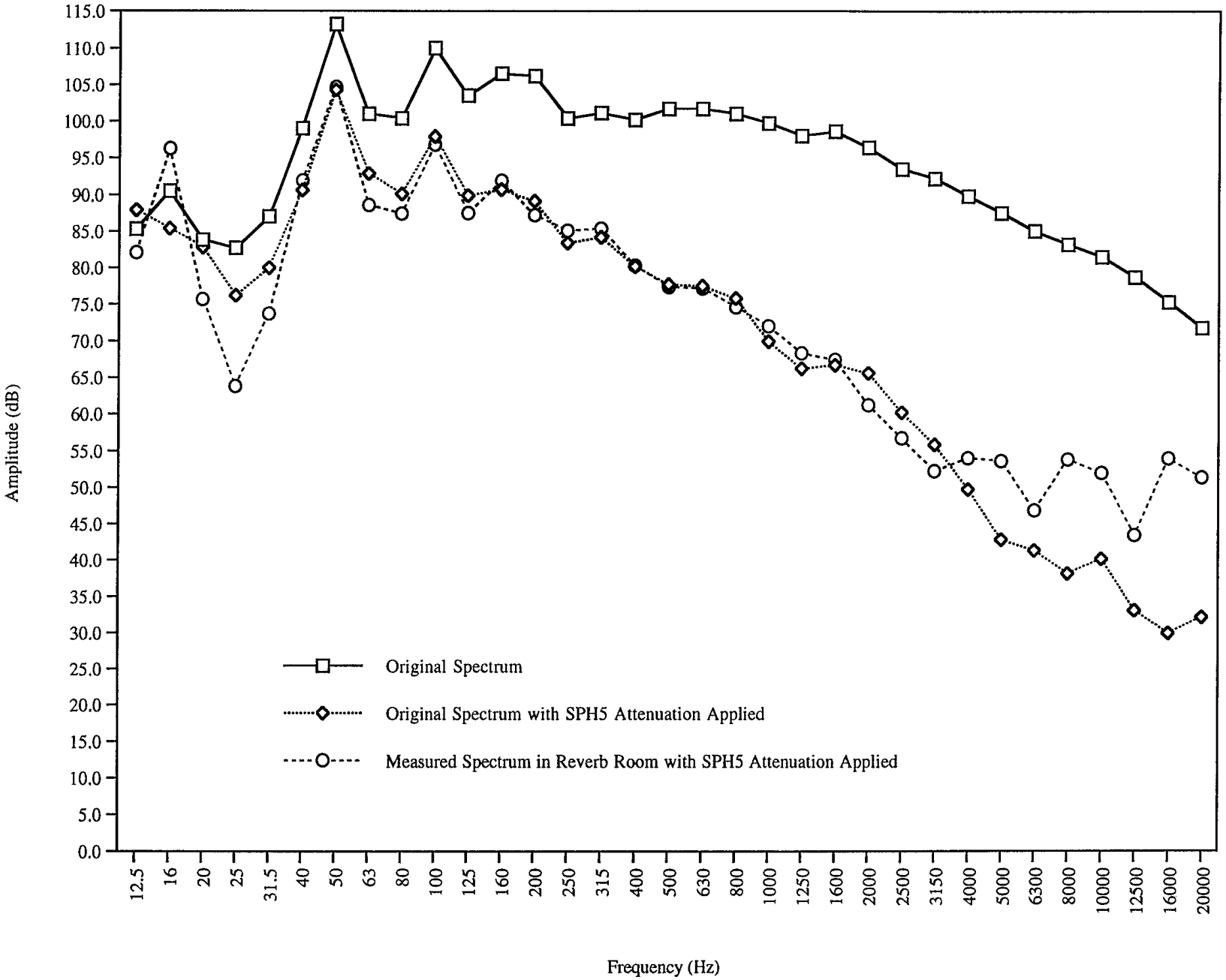


Figure 7: Overall Average Binaural Improvement Values vs. Headset/Masker

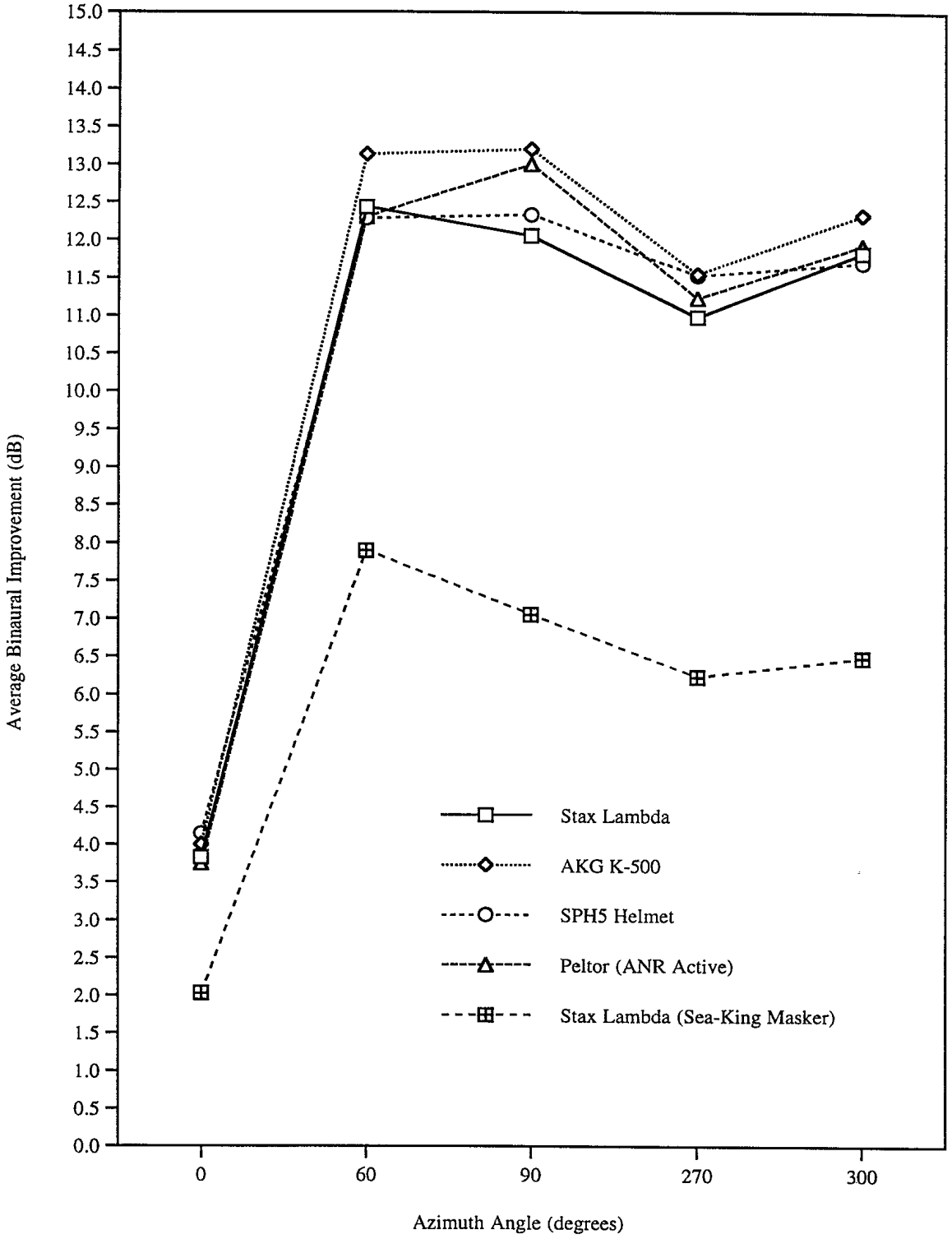


Table 1: Diotic Masker Descriptive Stats Across Subjects

Variable	N	Mean	Std Dev	Std Error
B1D	20	0.000	0.000	0.000
B10	20	3.825	1.398	0.313
B160	20	12.425	1.524	0.341
B190	20	12.050	2.077	0.464
B1270	20	10.975	1.743	0.390
B1300	20	11.825	1.379	0.308
B2D	20	0.000	0.000	0.000
B20	20	4.000	2.317	0.518
B260	20	13.125	1.669	0.373
B290	20	13.200	1.436	0.321
B2270	20	11.550	2.518	0.563
B2300	20	12.325	1.688	0.377
B3D	20	0.000	0.000	0.000
B30	20	4.150	1.319	0.295
B360	20	12.275	1.342	0.300
B390	20	12.325	1.471	0.329
B3270	20	11.525	1.482	0.331
B3300	20	11.700	1.601	0.358
B4D	20	0.000	0.000	0.000
B40	20	3.750	2.185	0.489
B460	20	12.300	2.462	0.551
B490	20	13.000	2.575	0.576
B4270	20	11.225	1.916	0.428
B4300	20	11.925	1.935	0.433
SD	20	0.000	0.000	0.000
S0	20	2.025	1.208	0.270
S60	20	7.900	1.314	0.294
S90	20	7.050	1.459	0.326
S270	20	6.225	1.618	0.362
S300	20	6.475	1.464	0.327

Figure 8: Overall Average Binaural Improvement Values vs. Headset/Masker (Subject #1)

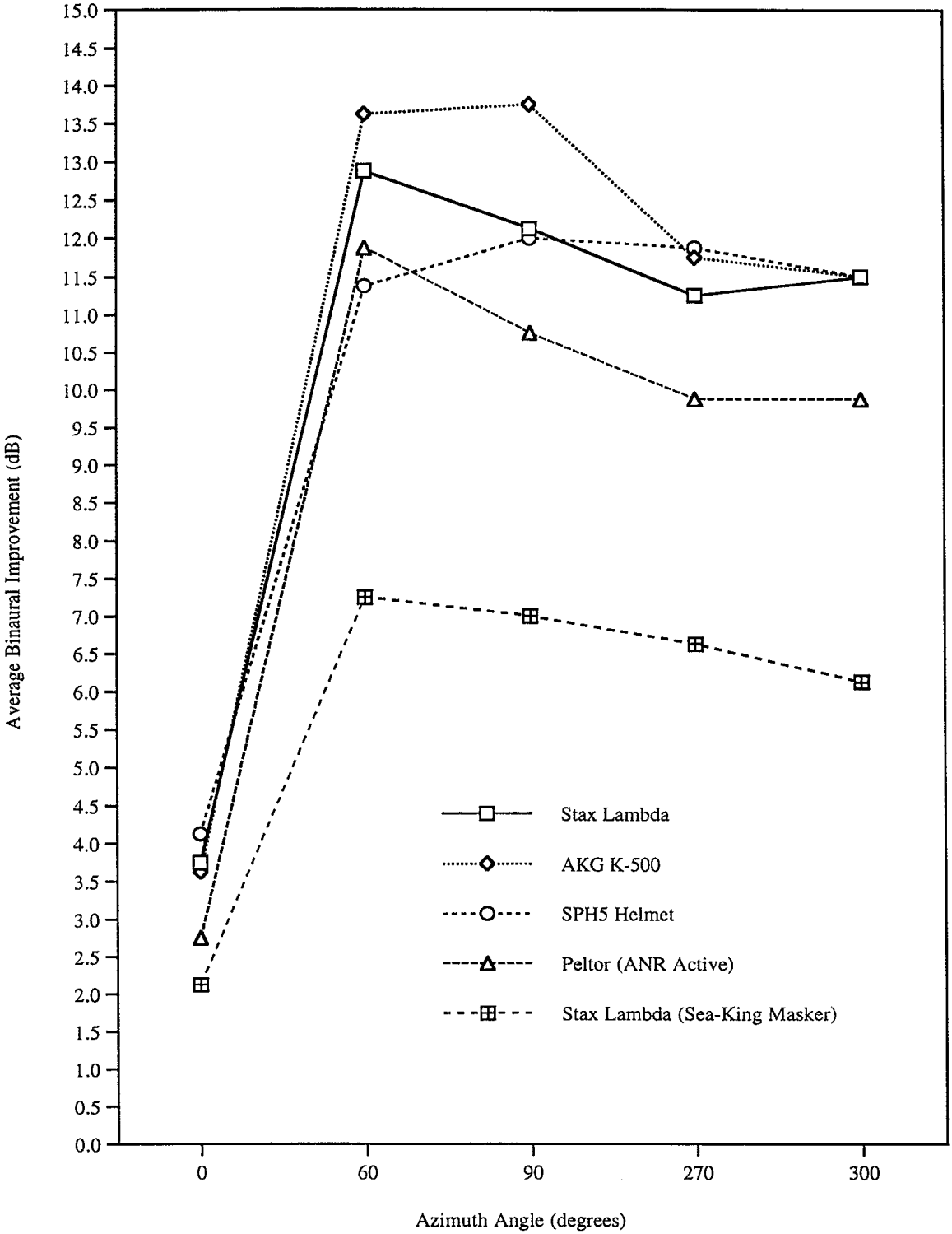


Table 2: Diotic Masker Means by Subject ID

SUBID	Variable	N	Mean	Std Dev	Std Error
1	B1D	4	0.000	0.000	0.000
	B10	4	3.750	1.500	0.750
	B160	4	12.875	1.931	0.966
	B190	4	12.125	1.315	0.657
	B1270	4	11.250	0.500	0.250
	B1300	4	11.500	1.080	0.540
	B2D	4	0.000	0.000	0.000
	B20	4	3.625	2.358	1.179
	B260	4	13.625	1.250	0.625
	B290	4	13.750	1.323	0.661
	B2270	4	11.750	2.062	1.031
	B2300	4	11.500	2.345	1.173
	B3D	4	0.000	0.000	0.000
	B30	4	4.125	0.479	0.239
	B360	4	11.375	1.109	0.554
	B390	4	12.000	0.707	0.354
	B3270	4	11.875	1.181	0.591
	B3300	4	11.500	1.581	0.791
	B4D	4	0.000	0.000	0.000
	B40	4	2.750	1.848	0.924
	B460	4	11.875	1.109	0.554
	B490	4	10.750	1.443	0.722
	B4270	4	9.875	1.843	0.921
	B4300	4	9.875	0.750	0.375
	SD	4	0.000	0.000	0.000
	S0	4	2.125	1.031	0.515
	S60	4	7.250	1.658	0.829
	S90	4	7.000	0.816	0.408
	S270	4	6.625	1.702	0.851
	S300	4	6.125	0.750	0.375

Figure 9: Overall Average Binaural Improvement Values vs. Headset/Masker (Subject #2)

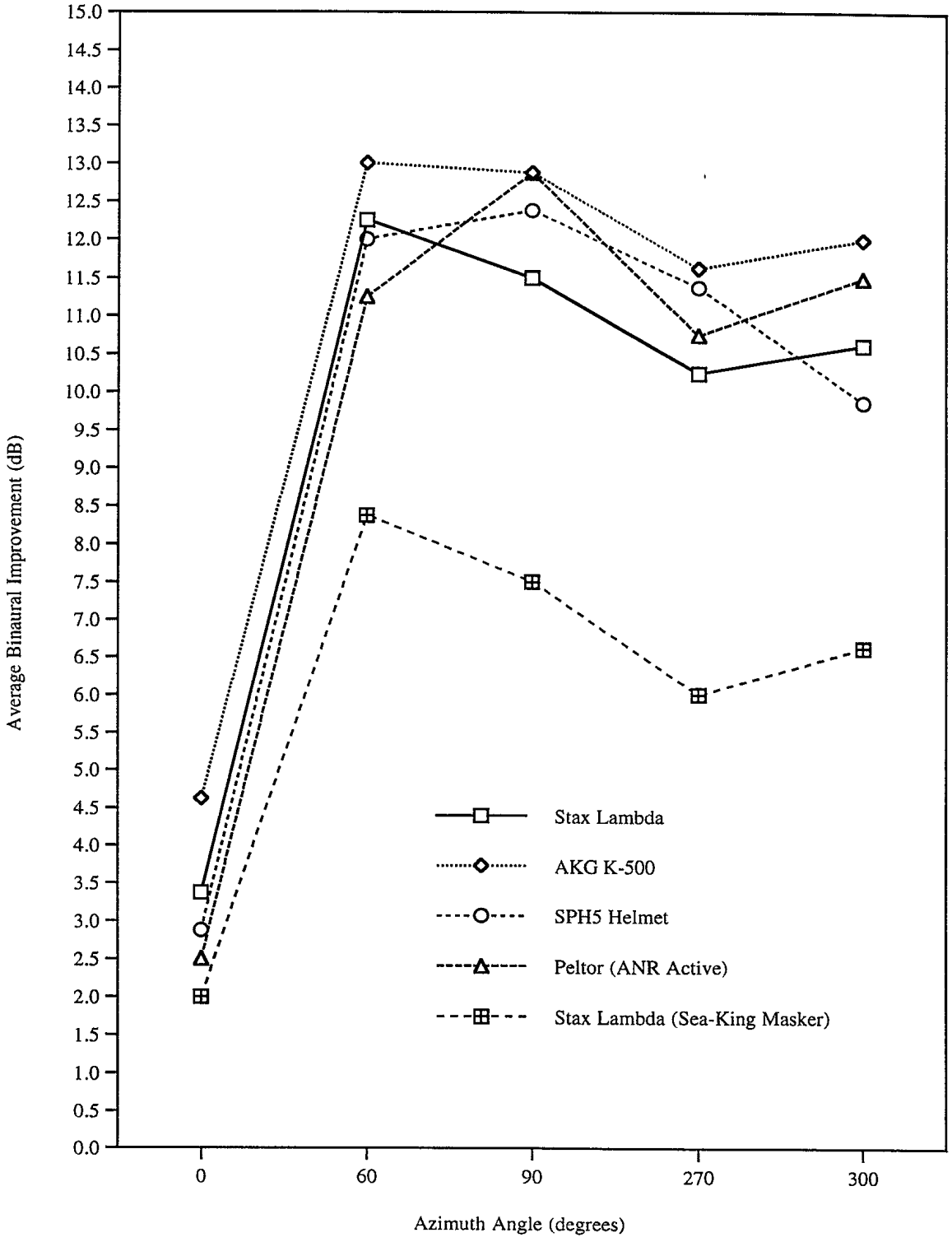


Table 3: Diotic Masker Means by Subject ID

SUBID	Variable	N	Mean	Std Dev	Std Error
2	B1D	4	0.000	0.000	0.000
	B10	4	3.375	1.109	0.554
	B160	4	12.250	1.555	0.777
	B190	4	11.500	3.189	1.594
	B1270	4	10.250	1.323	0.661
	B1300	4	10.625	1.181	0.591
	B2D	4	0.000	0.000	0.000
	B20	4	4.625	1.250	0.625
	B260	4	13.000	1.291	0.645
	B290	4	12.875	1.887	0.944
	B2270	4	11.625	2.780	1.390
	B2300	4	12.000	1.581	0.791
	B3D	4	0.000	0.000	0.000
	B30	4	2.875	0.854	0.427
	B360	4	12.000	1.080	0.540
	B390	4	12.375	1.031	0.515
	B3270	4	11.375	1.315	0.657
	B3300	4	9.875	1.652	0.826
	B4D	4	0.000	0.000	0.000
	B40	4	2.500	0.707	0.354
	B460	4	11.250	1.658	0.829
	B490	4	12.875	2.097	1.048
	B4270	4	10.750	0.645	0.323
	B4300	4	11.500	1.472	0.736
	SD	4	0.000	0.000	0.000
	S0	4	2.000	1.225	0.612
	S60	4	8.375	1.315	0.657
	S90	4	7.500	0.913	0.456
	S270	4	6.000	1.472	0.736
	S300	4	6.625	1.315	0.657

Figure 10: Overall Average Binaural Improvement Values vs. Headset/Masker (Subject #3)

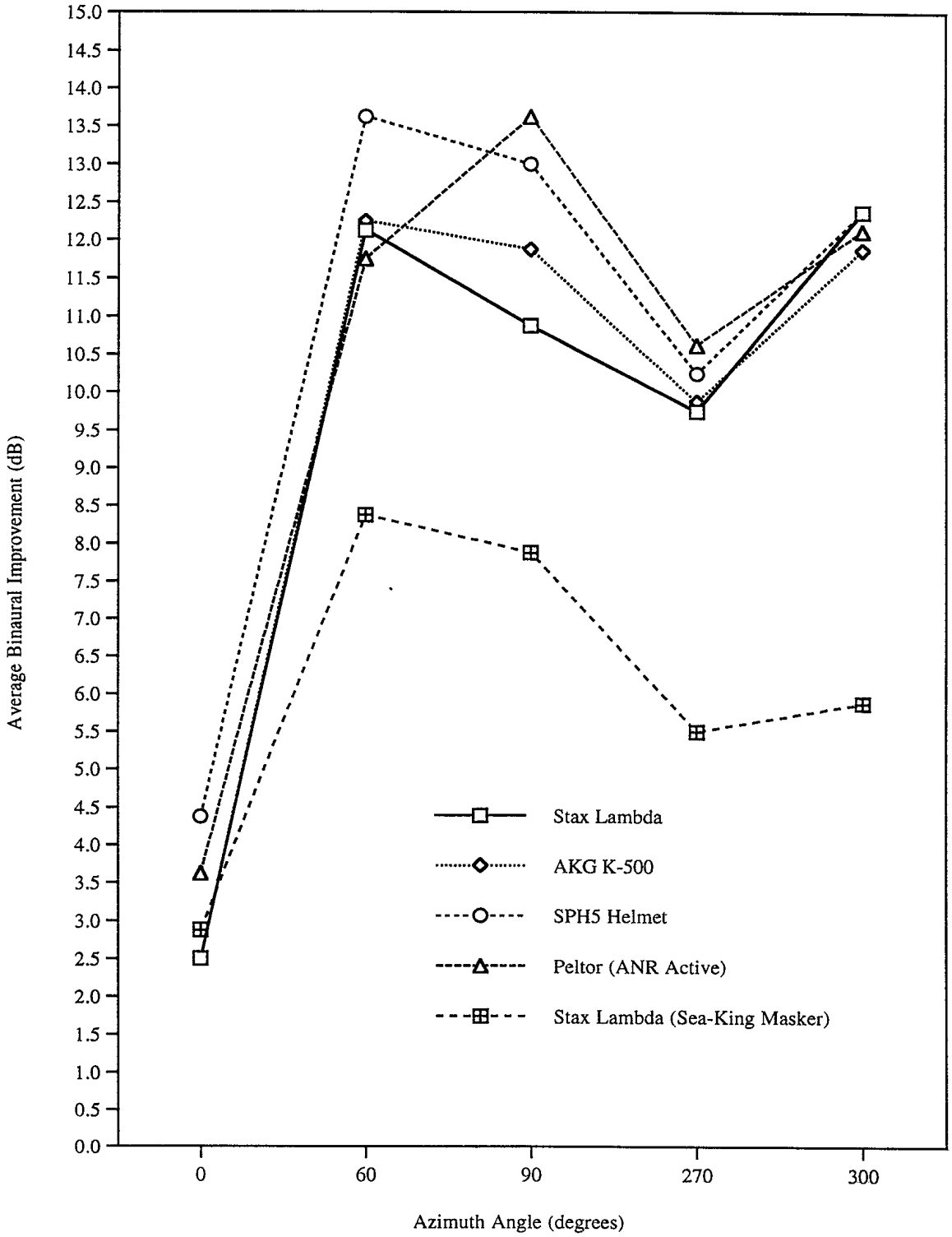


Table 4: Diotic Masker Means by Subject ID

SUBID	Variable	N	Mean	Std Dev	Std Error
3	B1D	4	0.000	0.000	0.000
	B10	4	2.500	0.707	0.354
	B160	4	12.125	2.016	1.008
	B190	4	10.875	1.931	0.966
	B1270	4	9.750	2.986	1.493
	B1300	4	12.375	1.887	0.944
	B2D	4	0.000	0.000	0.000
	B20	4	2.500	2.121	1.061
	B260	4	12.250	1.323	0.661
	B290	4	11.875	1.493	0.747
	B2270	4	9.875	3.065	1.533
	B2300	4	11.875	1.702	0.851
	B3D	4	0.000	0.000	0.000
	B30	4	4.375	1.315	0.657
	B360	4	13.625	1.493	0.747
	B390	4	13.000	0.913	0.456
	B3270	4	10.250	1.443	0.722
	B3300	4	12.375	0.854	0.427
	B4D	4	0.000	0.000	0.000
	B40	4	3.625	0.854	0.427
	B460	4	11.750	3.122	1.561
	B490	4	13.625	1.548	0.774
	B4270	4	10.625	1.109	0.554
	B4300	4	12.125	1.652	0.826
	SD	4	0.000	0.000	0.000
	S0	4	2.875	1.377	0.688
	S60	4	8.375	1.702	0.851
	S90	4	7.875	0.854	0.427
	S270	4	5.500	2.121	1.061
	S300	4	5.875	2.287	1.143

Figure 11: Overall Average Binaural Improvement Values vs. Headset/Masker (Subject #4)

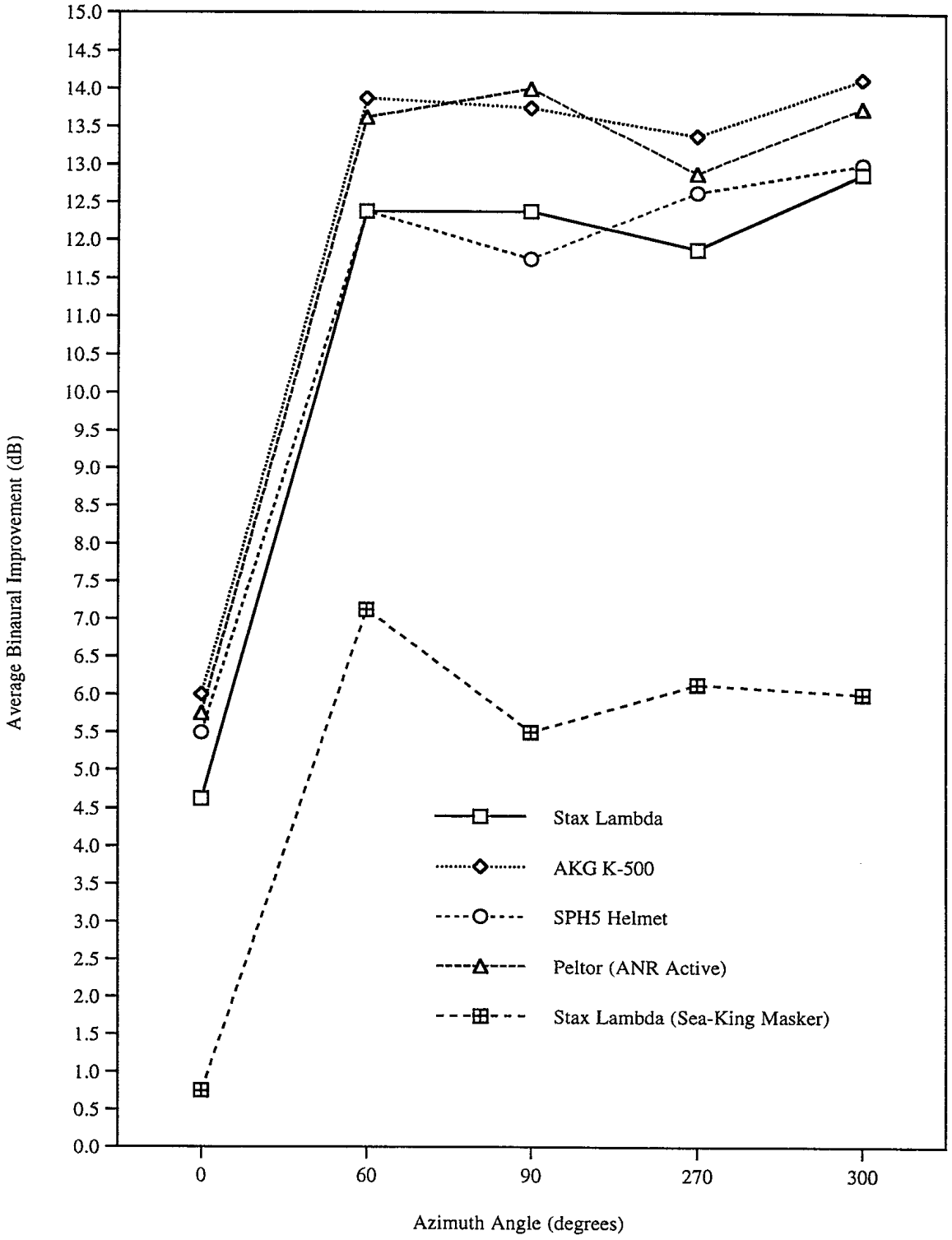


Table 5: Diotic Masker Means by Subject ID

SUBID	Variable	N	Mean	Std Dev	Std Error
4	B1D	4	0.000	0.000	0.000
	B10	4	4.625	1.250	0.625
	B160	4	12.375	1.887	0.944
	B190	4	12.375	2.056	1.028
	B1270	4	11.875	1.109	0.554
	B1300	4	12.875	1.031	0.515
	B2D	4	0.000	0.000	0.000
	B20	4	6.000	1.780	0.890
	B260	4	13.875	2.529	1.264
	B290	4	13.750	0.289	0.144
	B2270	4	13.375	1.109	0.554
	B2300	4	14.125	0.750	0.375
	B3D	4	0.000	0.000	0.000
	B30	4	5.500	1.354	0.677
	B360	4	12.375	1.250	0.625
	B390	4	11.750	1.936	0.968
	B3270	4	12.625	0.629	0.315
	B3300	4	13.000	0.913	0.456
	B4D	4	0.000	0.000	0.000
	B40	4	5.750	2.630	1.315
	B460	4	13.625	3.092	1.546
	B490	4	14.000	3.937	1.969
	B4270	4	12.875	2.529	1.264
	B4300	4	13.750	2.466	1.233
	SD	4	0.000	0.000	0.000
	S0	4	0.750	0.957	0.479
	S60	4	7.125	0.946	0.473
	S90	4	5.500	2.273	1.137
	S270	4	6.125	2.097	1.048
	S300	4	6.000	1.080	0.540

Figure 12: Overall Average Binaural Improvement Values vs. Headset/Masker (Subject #5)

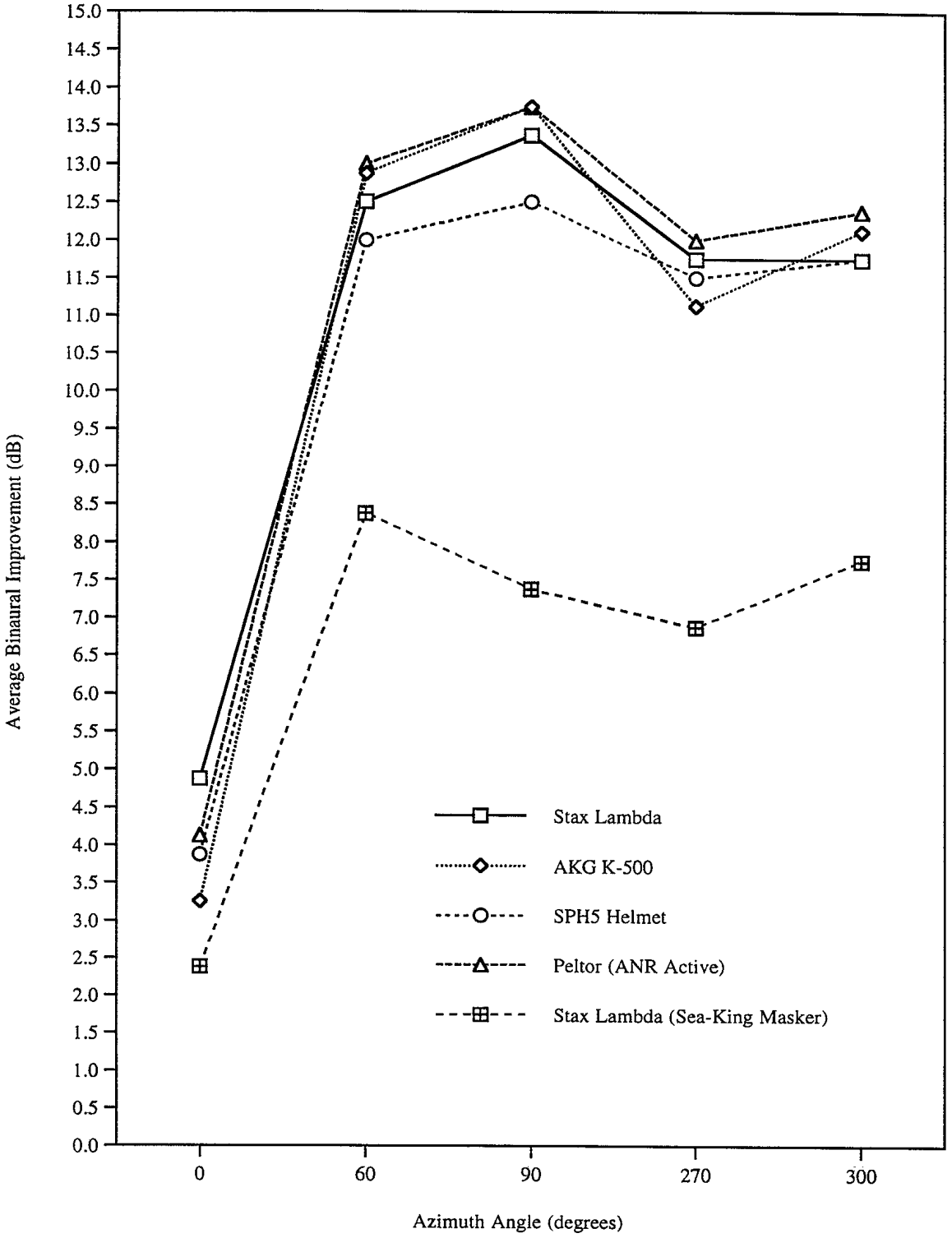


Table 6: Diotic Masker Means by Subject ID

SUBID	Variable	N	Mean	Std Dev	Std Error
5	B1D	4	0.000	0.000	0.000
	B10	4	4.875	1.377	0.688
	B160	4	12.500	0.707	0.354
	B190	4	13.375	1.652	0.826
	B1270	4	11.750	1.555	0.777
	B1300	4	11.750	0.957	0.479
	B2D	4	0.000	0.000	0.000
	B20	4	3.250	3.069	1.534
	B260	4	12.875	2.016	1.008
	B290	4	13.750	1.323	0.661
	B2270	4	11.125	3.010	1.505
	B2300	4	12.125	0.946	0.473
	B3D	4	0.000	0.000	0.000
	B30	4	3.875	1.315	0.657
	B360	4	12.000	1.225	0.612
	B390	4	12.500	2.517	1.258
	B3270	4	11.500	2.082	1.041
	B3300	4	11.750	1.443	0.722
	B4D	4	0.000	0.000	0.000
	B40	4	4.125	3.119	1.560
	B460	4	13.000	3.162	1.581
	B490	4	13.750	2.872	1.436
	B4270	4	12.000	2.041	1.021
	B4300	4	12.375	1.250	0.625
	SD	4	0.000	0.000	0.000
	S0	4	2.375	0.750	0.375
	S60	4	8.375	0.629	0.315
	S90	4	7.375	1.250	0.625
	S270	4	6.875	1.031	0.515
	S300	4	7.750	1.323	0.661

Table 7: Diotic Masker Anova Results

Variable=Headset; $F(4,16)=41.57$, $p<0.001$, $\alpha=0.05$
Variable=Condition; $F(5,20)=705.92$, $p<0.001$, $\alpha=0.05$
Variable=Session; $F(3,12)=3.78$, $p<0.05$, $\alpha=0.05$
Variable=Headset*Condition; $F(20,80)=17.43$, $p<0.001$, $\alpha=0.05$

Tukey Grouping*	Mean	N	Condition
A	11.6050	100	Az60
A A			
A	11.5250	100	Az90
A			
B A	10.8500	100	Az300
B			
B	10.300	100	Az270
C	3.5500	100	Az0
D	0.0000	100	Diotic

Tukey Grouping*	Mean	N	Headset/Masker
A	9.0333	120	B2
A			
A	8.7000	120	B4
A			
A	8.6625	120	B3
A			
A	8.5167	120	B1
B	4.9458	120	S

Tukey Grouping*	Mean	N	Session
A	8.5733	150	S4
A			
B A	7.8900	150	S2
B A			
B A	7.8000	150	S3
B			
B	7.6233	150	S1

*Note: Means with the same letter are not significantly different.

Figure 13: Overall Average Binaural Improvement Values for Diffuse-Field Speech Babble Masker

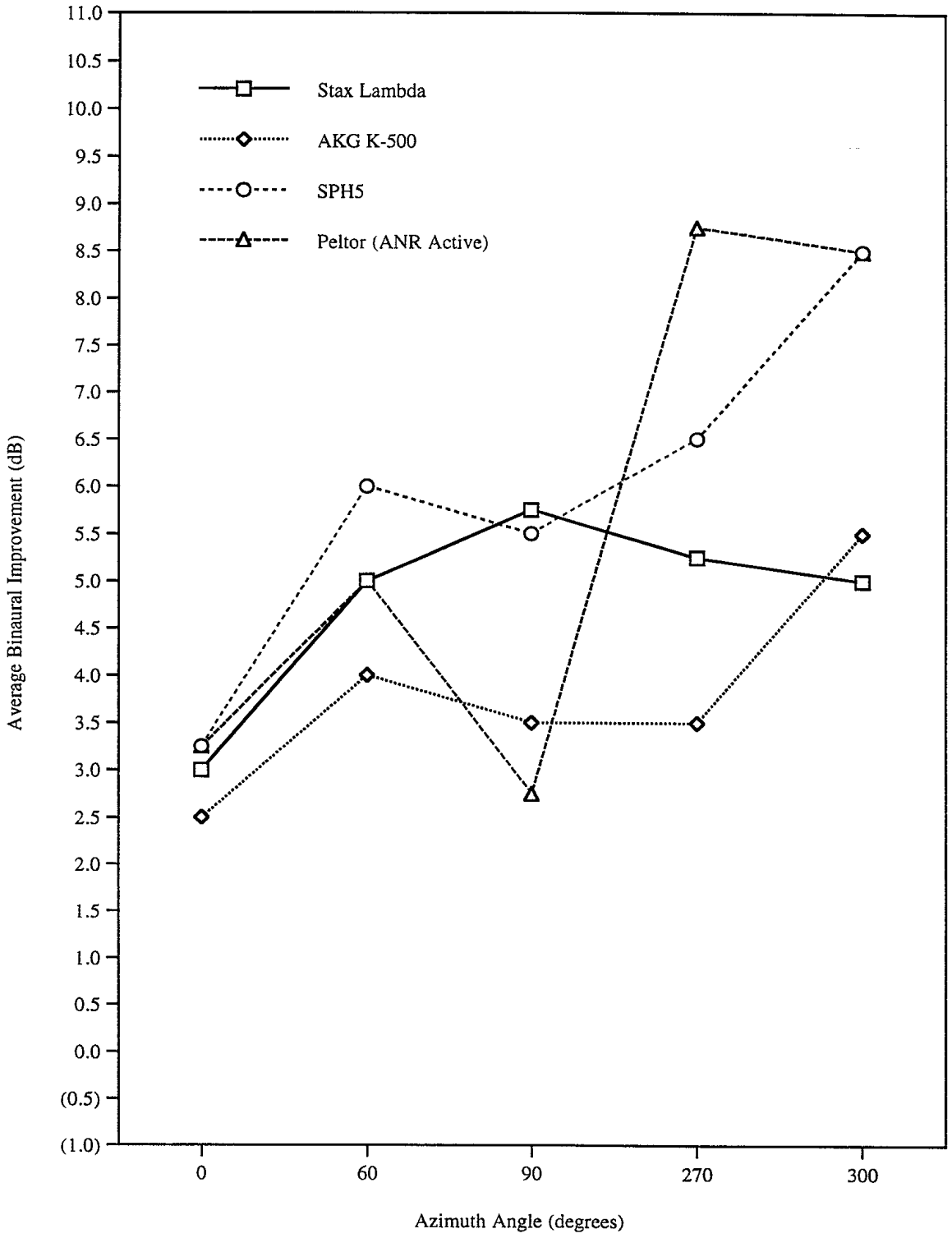


Figure 14: Overall Average Binaural Improvement Values for Diffuse-Field Speech Babble Masker (Subject #1)

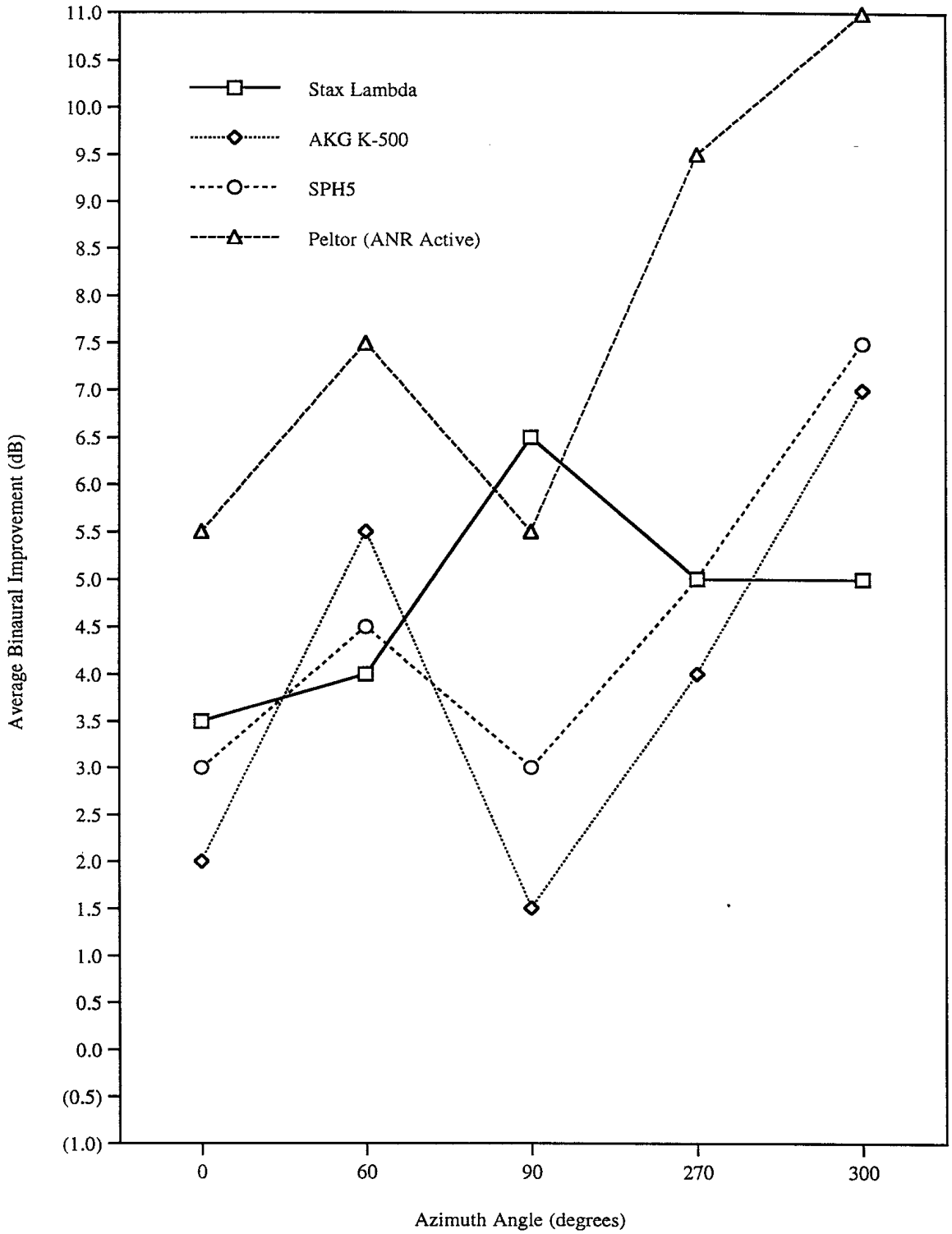


Figure 15: Overall Average Binaural Improvement Values for Diffuse-Field Speech Babble Masker (Subject #2)

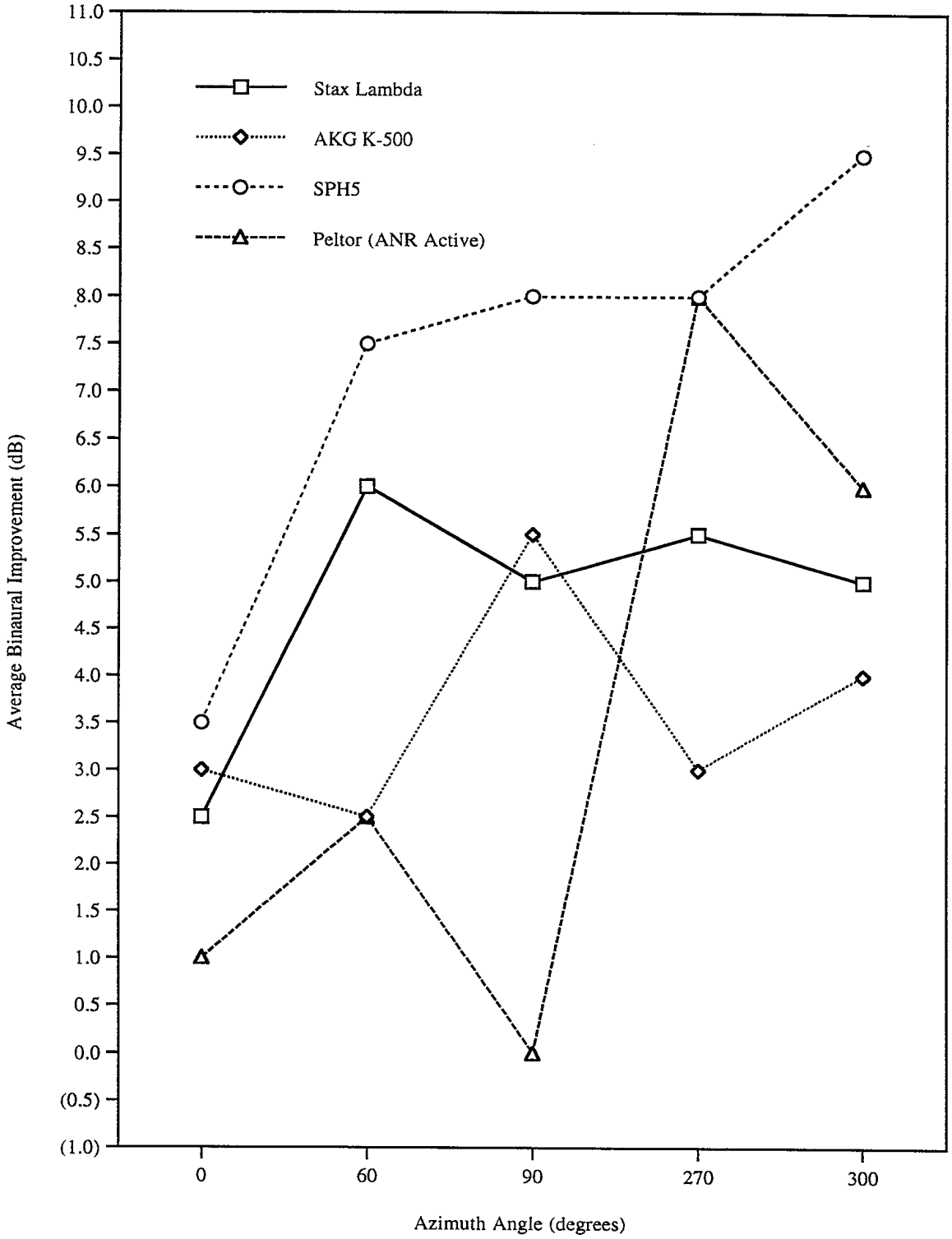


Figure 16: Overall Average Binaural Improvement Values for Diffuse-Field Sea-King Masker

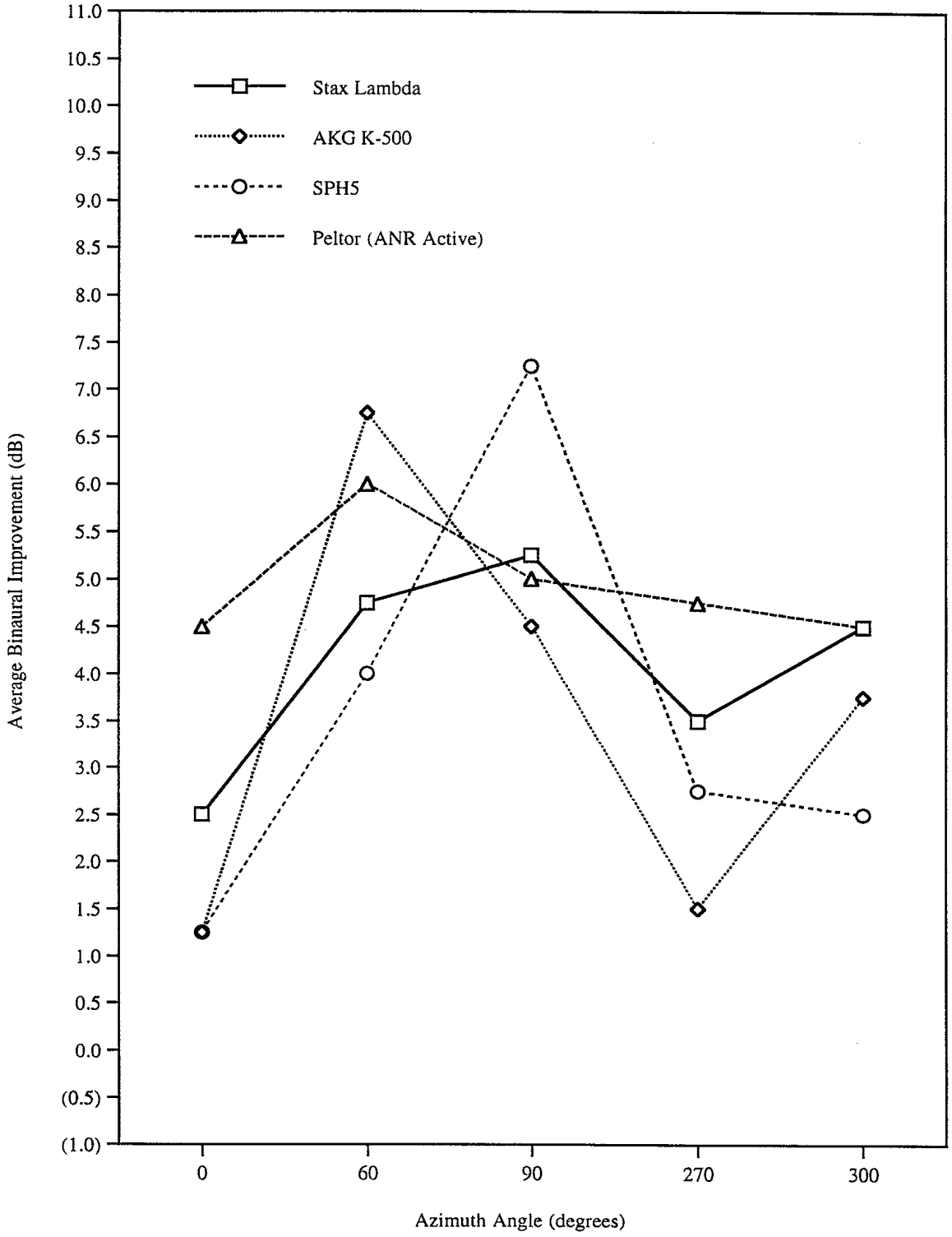


Figure 17: Overall Average Binaural Improvement Values for Diffuse-Field Sea-King Masker (Subject #1)

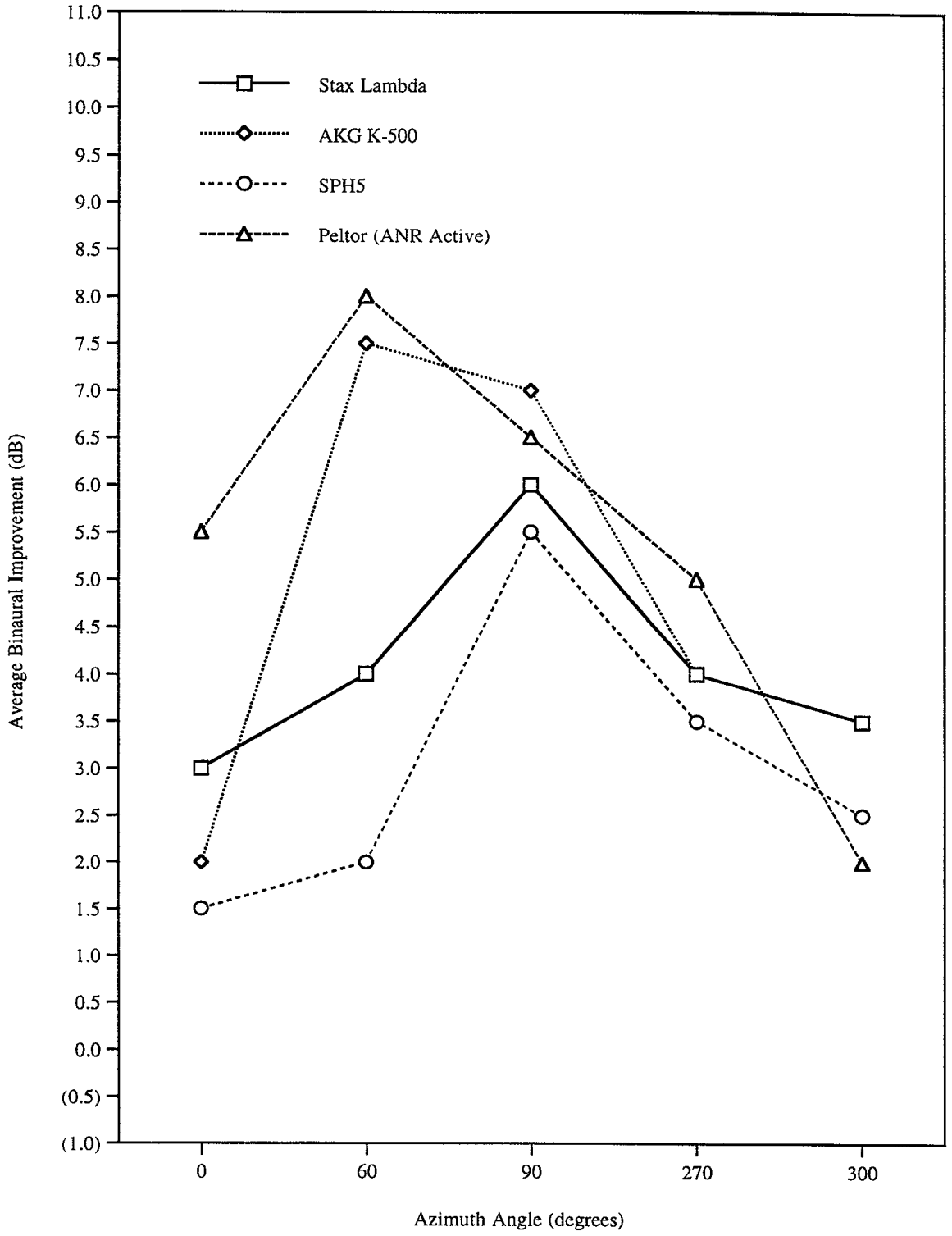


Figure 18: Overall Average Binaural Improvement Values for Diffuse-Field Sea-King Masker (Subject #2)

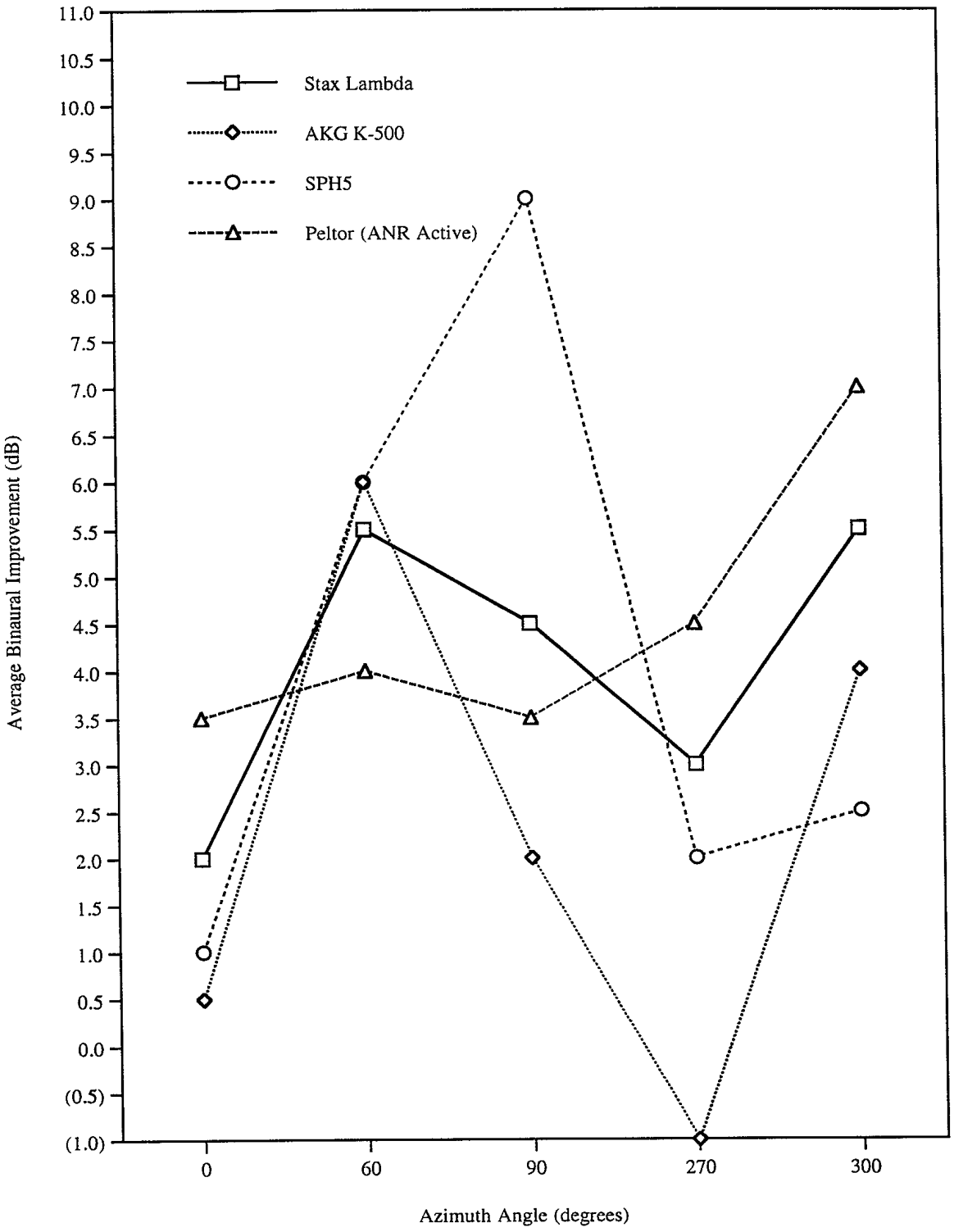


Figure 19: Overall Average Binaural Improvement Values for Diffuse-Field Leopard Tank Masker

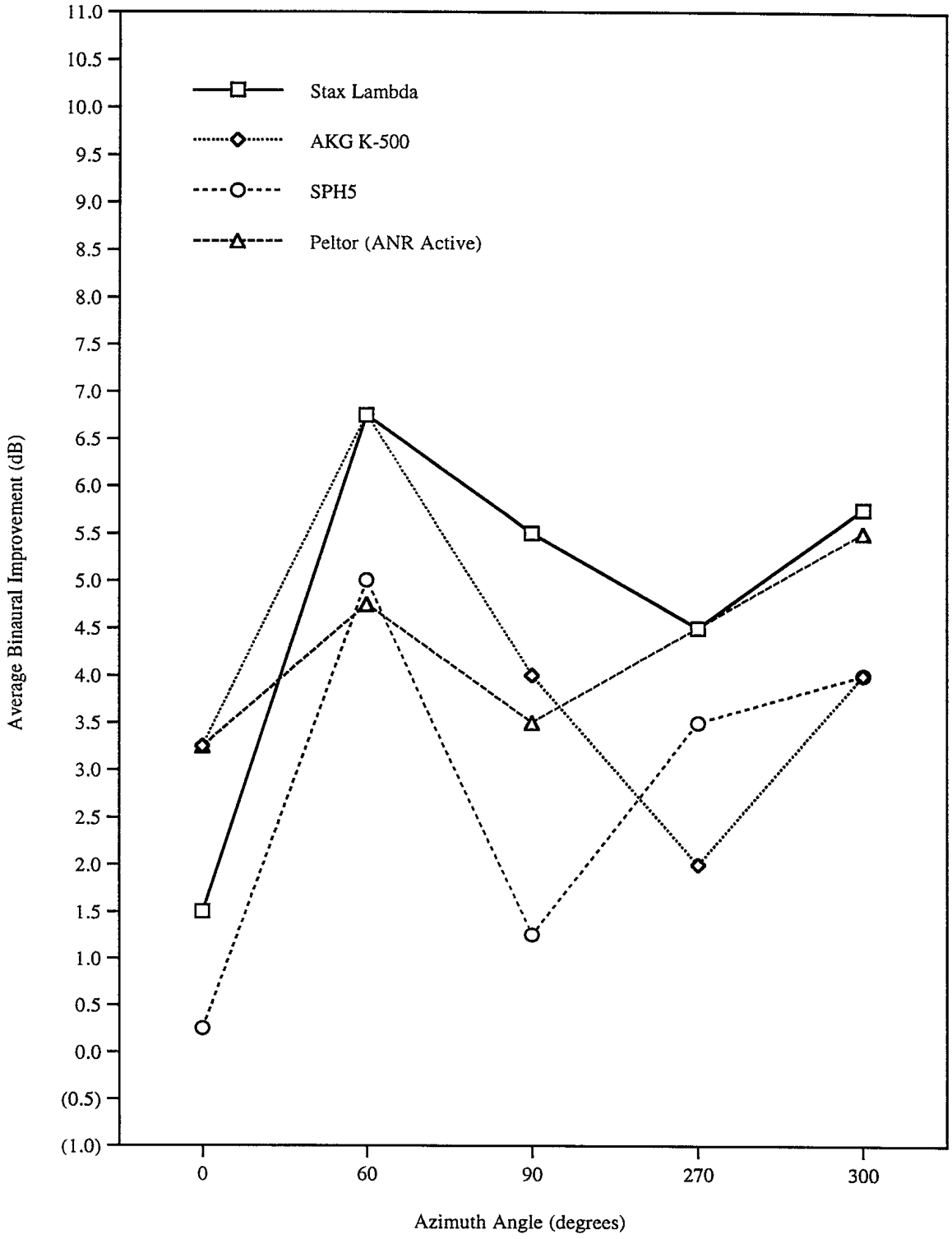


Figure 20: Overall Average Binaural Improvement Values for Diffuse-Field Leopard Tank Masker (Subject #1)

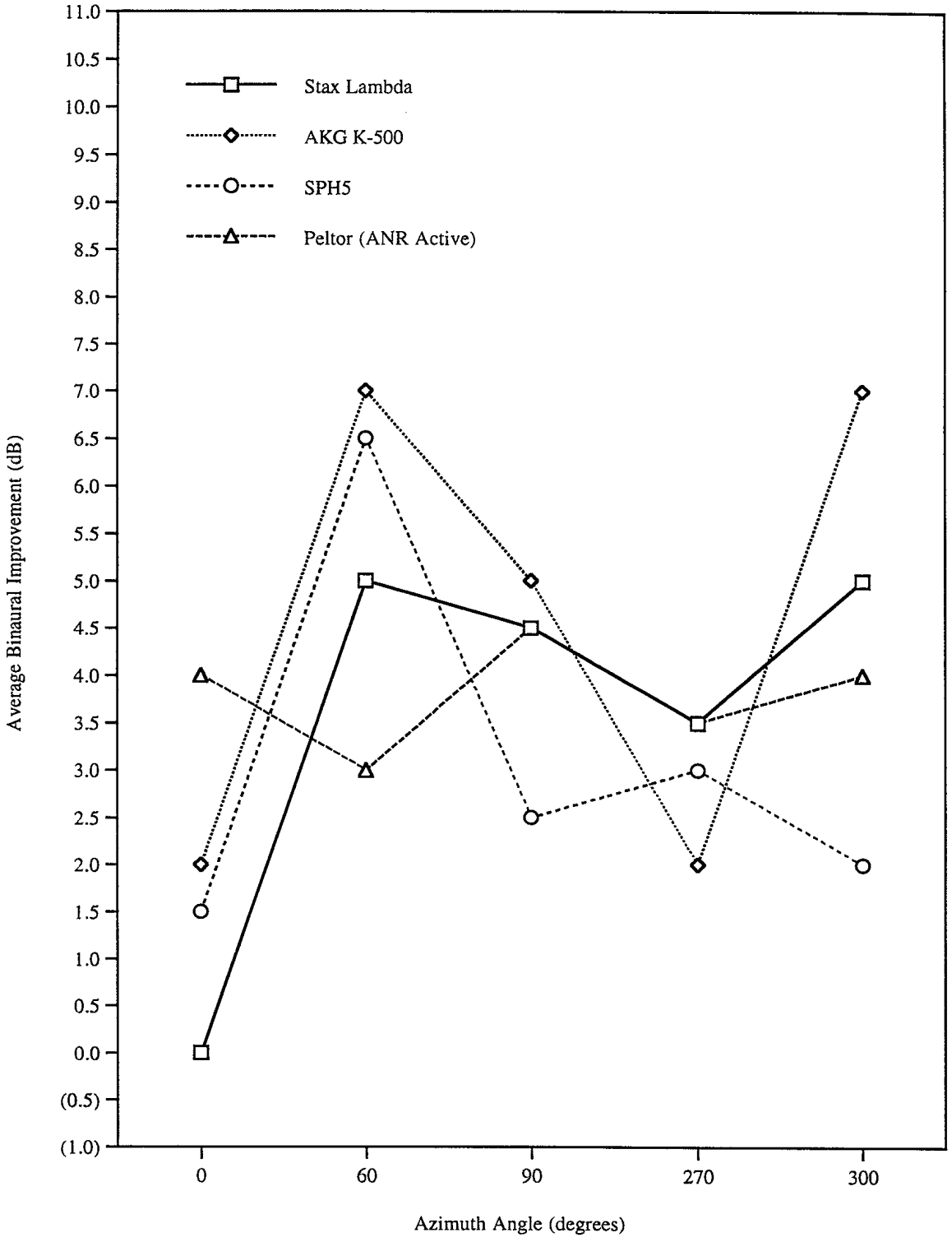
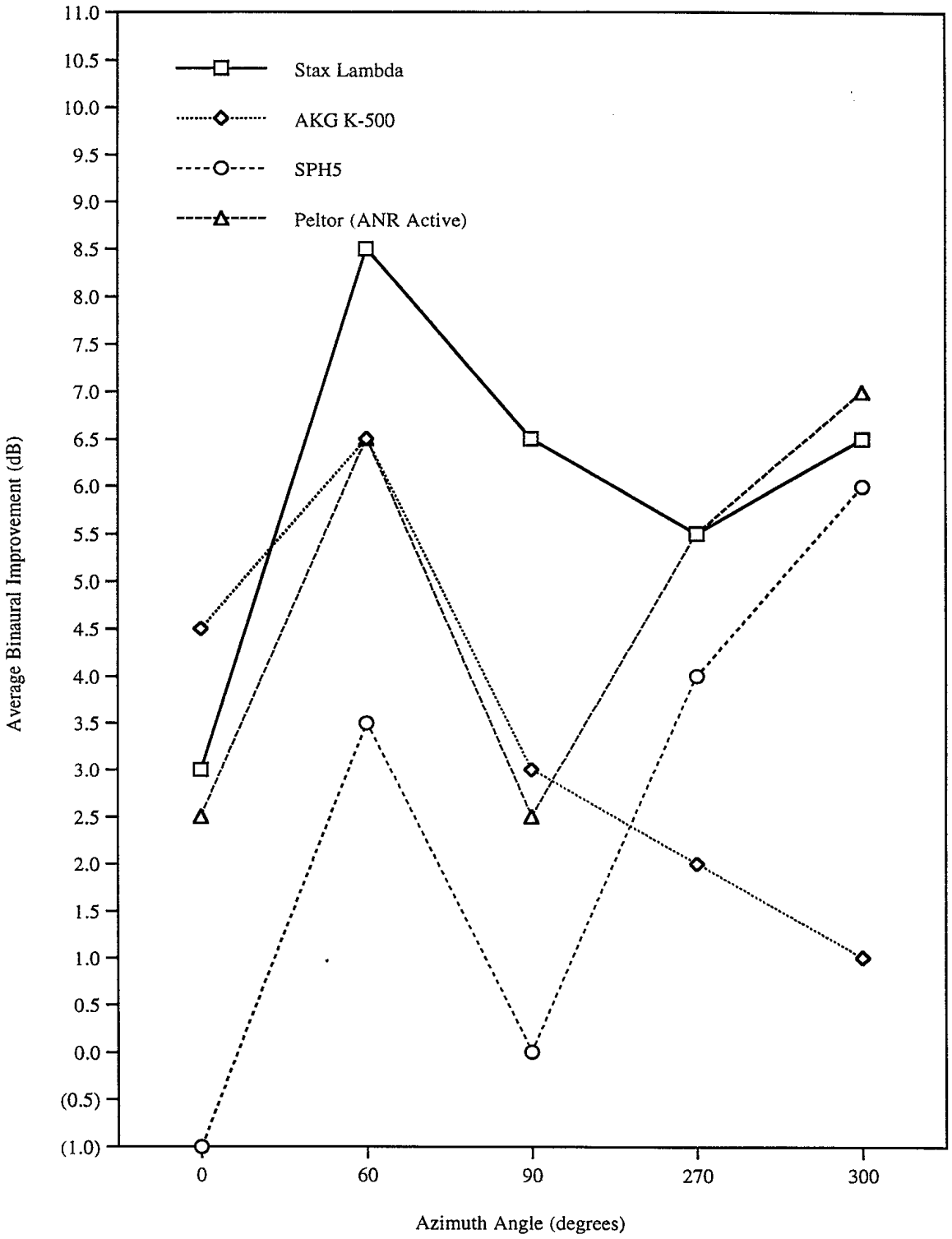


Figure 21: Overall Average Binaural Improvement Values for Diffuse-Field Leopard Tank Masker (Subject #2)



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