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# Detailed Directivity of Sound Fields Around Human Talkers

**Chu, W.T.; Warnock, A.C.C.**

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# INTRODUCTION

This report presents detailed measurements made in the anechoic chamber at IRC of the sound fields around human talkers. The measurements were made on behalf of Public Works and Government Services Canada (PWGSC).

The sound field surrounding a human talker was measured simultaneously by two sets of eight microphones arranged at fixed positions on two fixed orthogonal meridian arcs in the anechoic chamber at IRC. The talker was positioned at the center of the two arcs of the microphone arrays. To complete the survey of the whole sound field surrounding the subjects, each talker rotated to six fixed positions in 15-degree increments.

The measurement team comprised Jean-Charles Guy[†], Wing Chu and Alf Warnock of the Institute for Research in Construction, National Research Council of Canada (NRC).

[†] A guest student from INSA de Lyon, France.

## OVERVIEW

The sound field surrounding human talkers during speech has been surveyed using two microphone arrays on two fixed orthogonal meridian planes in the anechoic chamber at IRC as shown Figure 1.

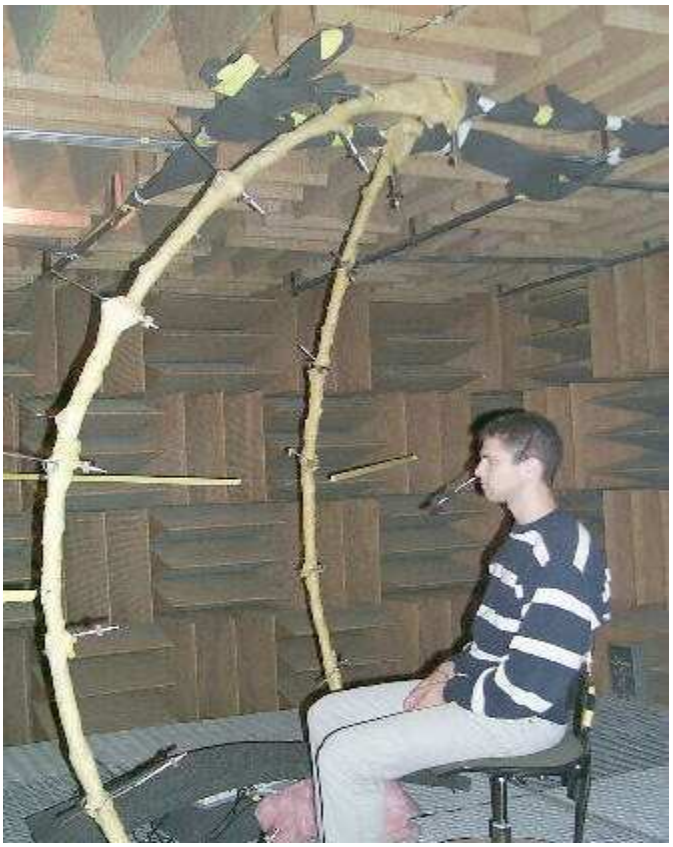

*Figure 1: The array of microphones surrounding the subjects in the anechoic chamber.*

Each subject sat in a chair that was rotated to six fixed positions in 15-degree increments from the initial position. Thus 180° coverage on one side of the talker was achieved. It was assumed that there was symmetry about the mid-plane of the head. At each fixed orientation, the subject was asked to remain sitting with the same posture and talk normally on any subject for 40 seconds. The talker was instructed to talk on the same subject matter at each orientation without worrying about exact duplication of the words. A total of 40 subjects were used in this study.

Sound pressure levels were measured in the one-third octave bands from 160 to 8000 Hz. A-weighted levels were also measured.

The A-weighted results show that

- There was good agreement between the field[1] and laboratory measurements of the male voice spectra. Some difference was observed for the female voice spectra.
- One-third-octave band results showed fairly good agreement with those published by Moreno & Pfretzschner[2] and by Dunn & Farnsworth[3].
- Similar directivities were obtained for both normal and loud voice levels but significant changes behind the talker were observed for low voice level.
- No significant differences in directivity were detected between English and French talkers. The frequency content of the two languages was similar.
- No significant differences in directivity were detected between male and female talkers although male and female voices had different spectra.
- Similar directivities were obtained for the average human talker and the B&K Head and Torso Simulator (HTS).

Tables giving speech levels in one-third-octave bands relative to those directly in front of the talkers are given in the Appendix.

## BACKGROUND

It is common experience that people communicate more easily when facing each other. The reason is that human talkers do not radiate speech uniformly in all directions. More energy is radiated forward than to the side or to the rear. This factor can be utilized when planning office layouts. However, not much information has been published on this phenomenon except for the following three papers.

In 1939, Dunn and Farnsworth[3] presented measurements of human head directivity during speech using just one subject. Special sets of sentences were used to contain a wide selection of sounds and sound combinations.

In 1978, Moreno and Pfretzschner[2] published results obtained with ten male subjects. The subjects were allowed to speak on any subject matter they chose during the measurements. Directivity results were presented in 1/3-octave bands for both the vertical and the horizontal planes.

Seventeen males and thirty-nine females were used in the study performed by McKendree[4]. Each subject was asked to read the same Rainbow Passage, repeating if necessary, during the measurements. Results were presented only in octave bands.

## MEASUREMENT PROCEDURES

The sound field surrounding a human talker during speech was surveyed using two arrays of microphones arranged on two fixed arcs on orthogonal meridian planes of a sphere of 1-meter radius centered at the talker's mouth in the anechoic chamber at IRC (Figure 1). Figure 2 shows a schematic drawing of the arrangement of the 16 microphones used in the measurement.

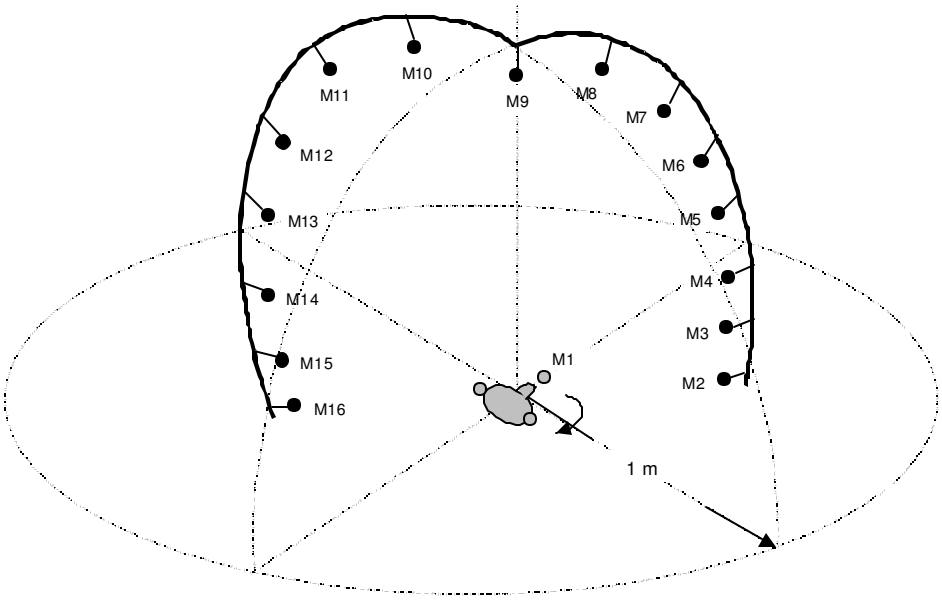


*Figure 2: Schematic drawing of the microphone arrangement used for the survey of the sound field surrounding a human talker during speech.*

Microphone #1 was an Audio-Technica headset microphone worn by the talker and was intended as a reference microphone. Early in the measurements, it became evident that the headset was not a reliable reference because it moved during the repeated repositioning of the talker. Instead, microphone #9, directly above the talker's head, was used as the reference. No changes in sound pressure level were expected there due to rotation of the subject and analysis of the measurements confirmed this expectation.

Microphones # 2 to 16 were B&K 12.7-mm (1/2") free-field condenser microphones, model # 4165 or 4190 arranged with an angular separation of approximately 20°.

The subject sat on a rotatable chair with adjustable height as shown in Figure 1. The subject's position was adjusted so the mouth was located at the center of the spherical surface of the microphone arrays with the subject looking straight ahead. For a complete directivity measurement, the subject was rotated through 90° at 15° intervals. Since there were two microphone arcs, this covered an azimuthal range of 180° on one side; symmetry about the head was assumed.

At each orientation, the talker was asked to remain seated with the same posture and to talk normally on any subject for 40 seconds. The talker was instructed to talk on the same subject matter at each orientation without being concerned about exact duplication of the words. Signals from the 16 microphones were recorded simultaneously on two synchronized DAT recorders (Tascam DA-38). A pistonphone calibration signal from each microphone was recorded at the beginning of each day of testing. The recorded signals were analyzed in 1/3-octave bands using a B&K 2144 real time analyzer.

A total of 40 adults, 20 male and 20 female, were tested. The following table shows the distribution by language and sex.

| | Male | Female |
|---|---|---|
| English | 17 | 15 |
| French | 3 | 5 |

# RESULTS & DISCUSSIONS

Graphical results are presented mostly for the horizontal plane passing through the subject's mouth and the frontal vertical plane containing the "straight ahead" vector from the mouth. Only relative A-weighted levels are presented to show directivity. The horizontal plane results were obtained by interpolating data from the two adjacent elevations since there was no microphone exactly at zero degrees elevation. Tables giving relative levels of the sound field surrounding the human head are given in 1/3 octave bands in the appendix.

## Repeatability

Repeat tests for the measurement arrangement and procedure were performed with talkers using normal conversational type speech and counting. Figure 3 shows three results. The A-weighted differences are less than 1 dB except at 215° in the vertical plane, which is an unimportant direction in practice. Differences in some 1/3 octave bands were greater but still mostly less than 2 dB. Not enough repeats were performed to determine a standard deviation for repeat tests but the differences were judged to be negligible relative to the differences among subjects.

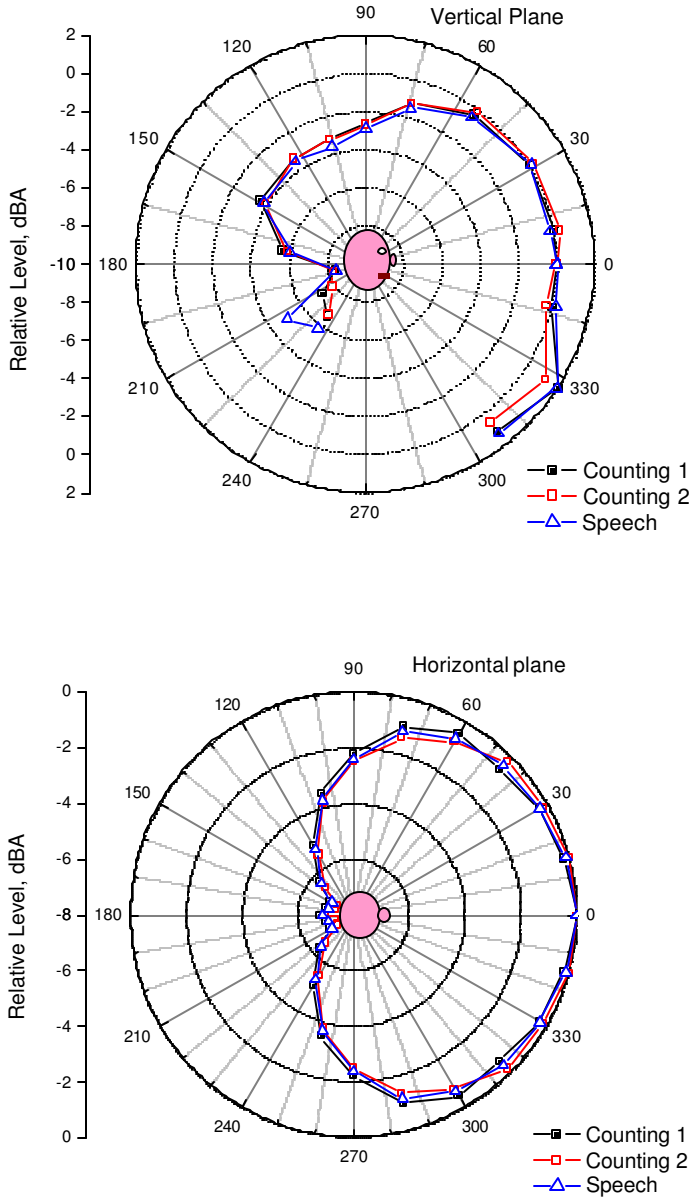


*Figure 3: Repeated test results of relative A-weighted levels in frontal vertical and horizontal plane of a talker.*

## Variations among subjects

The results for all 40 subjects were analyzed as a single data set to determine the extent of variations among subjects. At each frequency and each measurement position the standard deviation of

the relative sound pressure level was calculated. These data are presented as a table in the appendix. Examination of the data there shows that the largest standard deviations occur in directions below the talker's mouth and at high frequencies.

Excluding the reference microphone directly overhead, there were 91 microphone positions. Figure 4 shows for each frequency the fraction of cases where the standard deviation lies in different ranges. At frequencies below 2500 Hz, most values of standard deviation are less that 2 dB. For example, the chart shows that at 800 Hz half of the standard deviation values are below 2 dB. Above 2500 Hz, the standard deviations tend to be greater. For example, at 6300 Hz only about 28% of the values are below 2 dB.

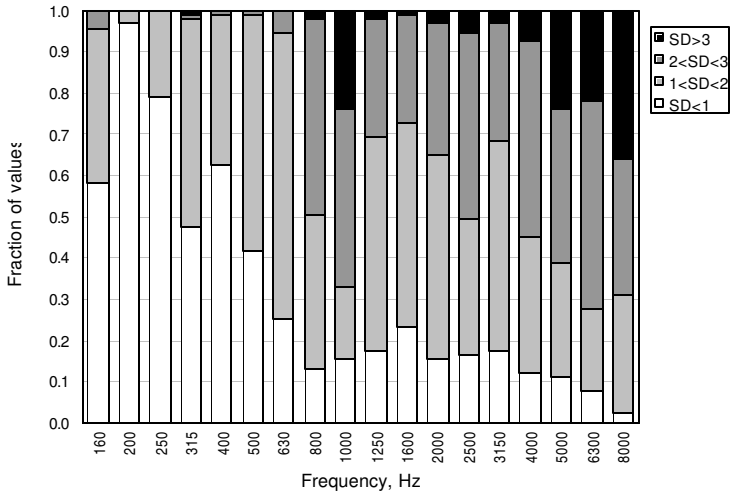


*Figure 4: Cumulative chart showing the fraction of standard deviation values in various ranges.*

## Effect of voice levels

The directivity patterns of a male talker using three different voice levels using conversational speech were measured. Figure 5 shows the relative A-weighted levels for each voice level. No significant differences were observed between normal and high levels except at the 215° elevation. The normal level result is the same as that presented in reference1. The result at the 215° elevation is not in accord with data from other male talkers and could be false due to an experimental error.

Differences in directivity for the low-level speech were significantly greater. The figures suggest that speaker orientation can be even more important when low voice levels are used. Since only one subject was used, more measurements would be needed to determine whether these differences are typical. There were also significant differences in the spectrum of the speech at low level as shown in Figure 6.

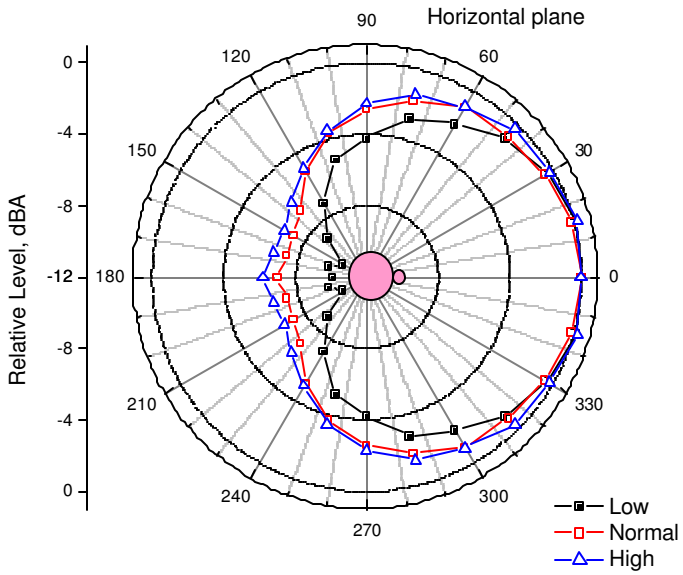


*Figure 5: Directivity patterns of the relative A-weighted levels of a male talker speaking at three different voice levels.*

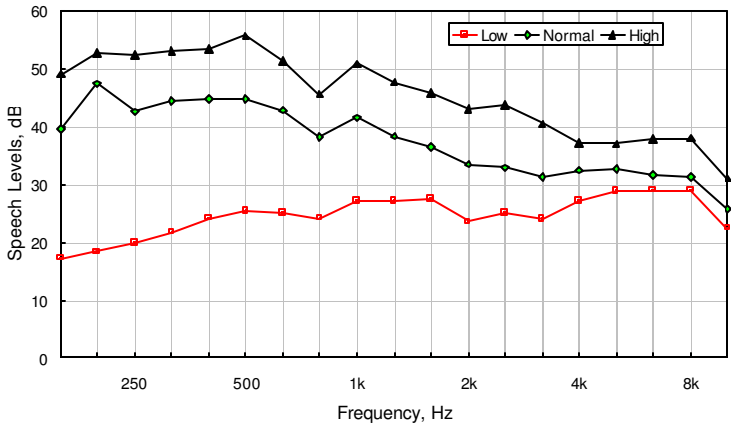


*Figure 6: Speech spectra at three different levels for a male talker.*

## Different languages

Five of the 20 female talkers spoke French. Average results from these 5 French-speaking females were compared with the average results from 5 English-speaking females. There were no significant differences in the directivity patterns of the two groups. Figure 7 also shows good similarity in the spectral contents of the two languages.

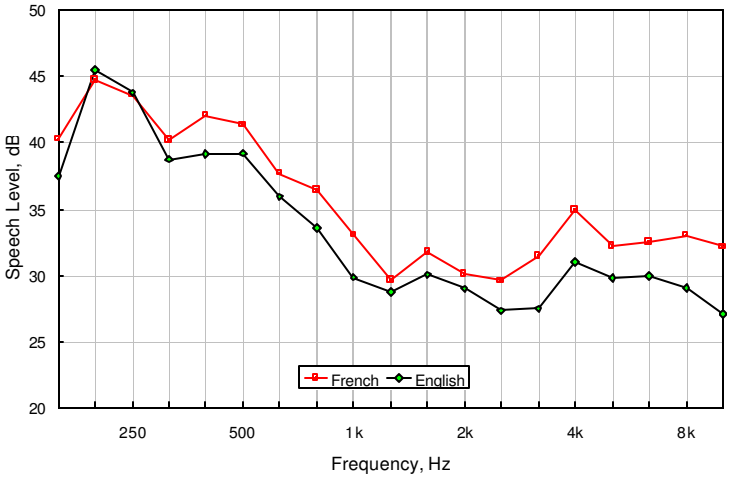


*Figure 7: Comparison of the mean spectra for five female French talkers and 5 female English talkers.*

## Male versus Female

Since language difference was not important, it was not considered when averaging results for the 20 males and the 20 females. The directivity patterns for the males, females and all subjects are shown in Figure 8 for the vertical and the horizontal planes.

There were no significant differences between the directivity patterns of male and female talkers although the spectral contents were different as shown in Figure 9.

The average male spectrum also compared well with that obtained in the field measurements[1] as shown in Figure 10. The average female spectrum, however, shows some differences between the laboratory and the field measurements. The reason for the differences is not known.

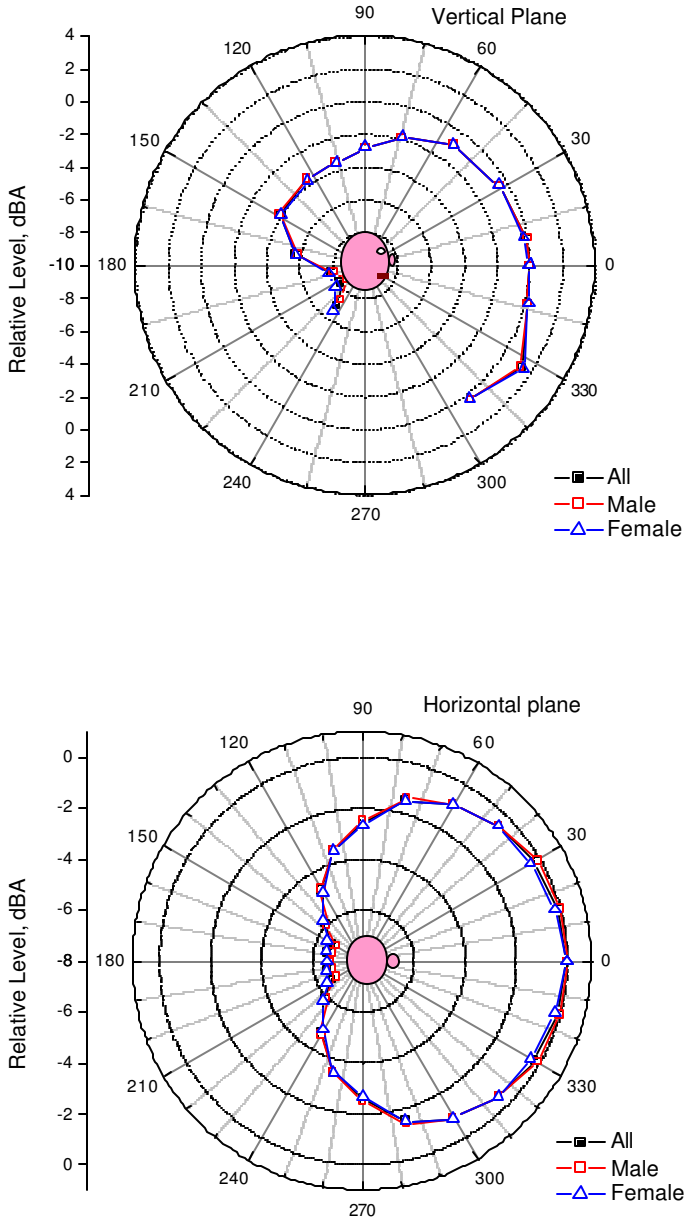


*Figure 8: Comparison of the relative A-weighted levels in the frontal vertical and horizontal planes of the male and female talkers.*

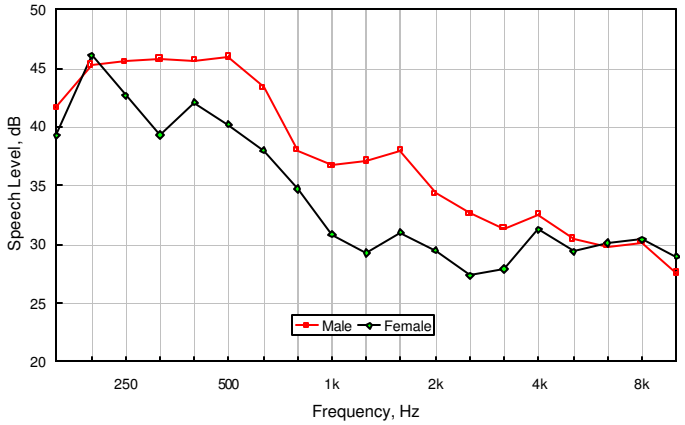


*Figure 9: Comparison of the averaged spectral contents of the male and female talkers in normal conversation speech.*

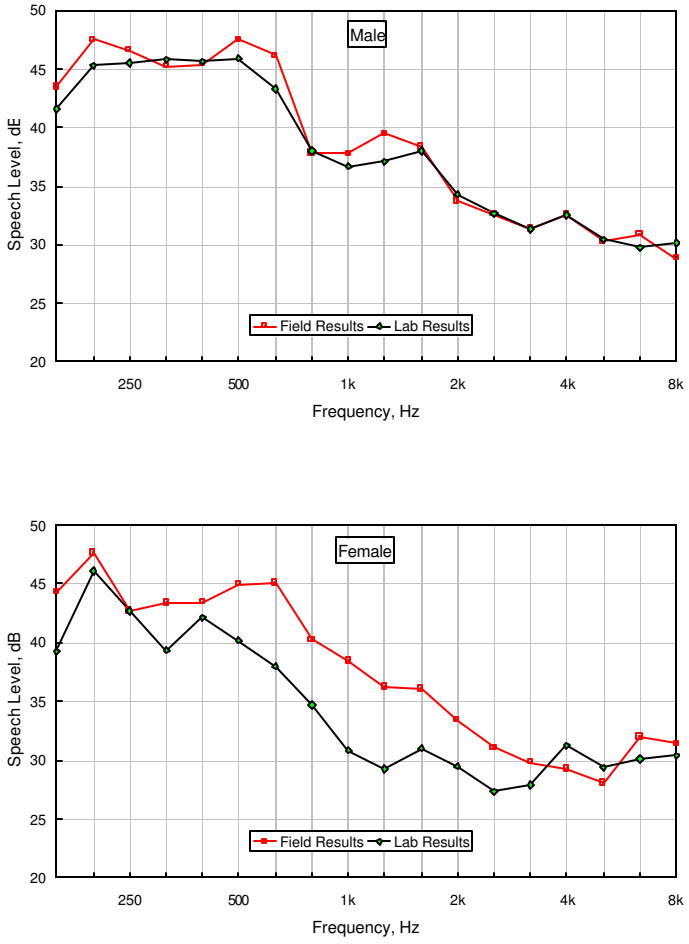


*Figure 10: Comparison of the averaged spectra obtained in the field and in the laboratory for both male and female talkers.*

## Comparison with B&K Head and Torso Simulator

Since the B&K Head and Torso Simulator (HTS) has been used as the sound source for many of the measurements in this project, it was thought useful to compare its directivity with that of human talkers. The directivity of the HTS was measured in the anechoic room using the same equipment and procedure as for talkers. Figure 11 shows that the directivities for the average talker and the HTS are quite similar.

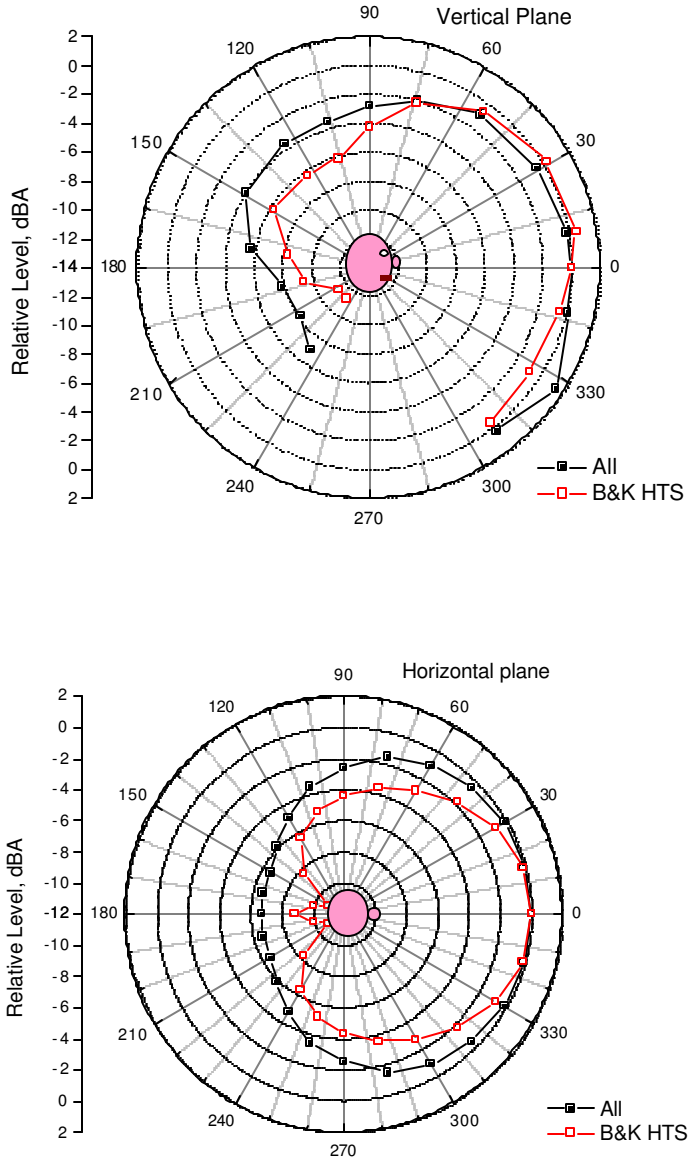


*Figure 11: Relative A-weighted levels in the vertical and horizontal planes for the average talker in the NRC sample and the B&K HTS.*

## Comparison with Moreno and Pfretzschner's results

Moreno and Pfretzschner's results[2] are most suitable for comparison with those obtained in the present study. Their results were based on 10 male subjects and were provided in 1/3-octave bands in both the vertical and the horizontal planes. Figure 12 compares results in the horizontal plane and Figure 13 compares results in the vertical plane. Good agreement was obtained for most frequency bands.

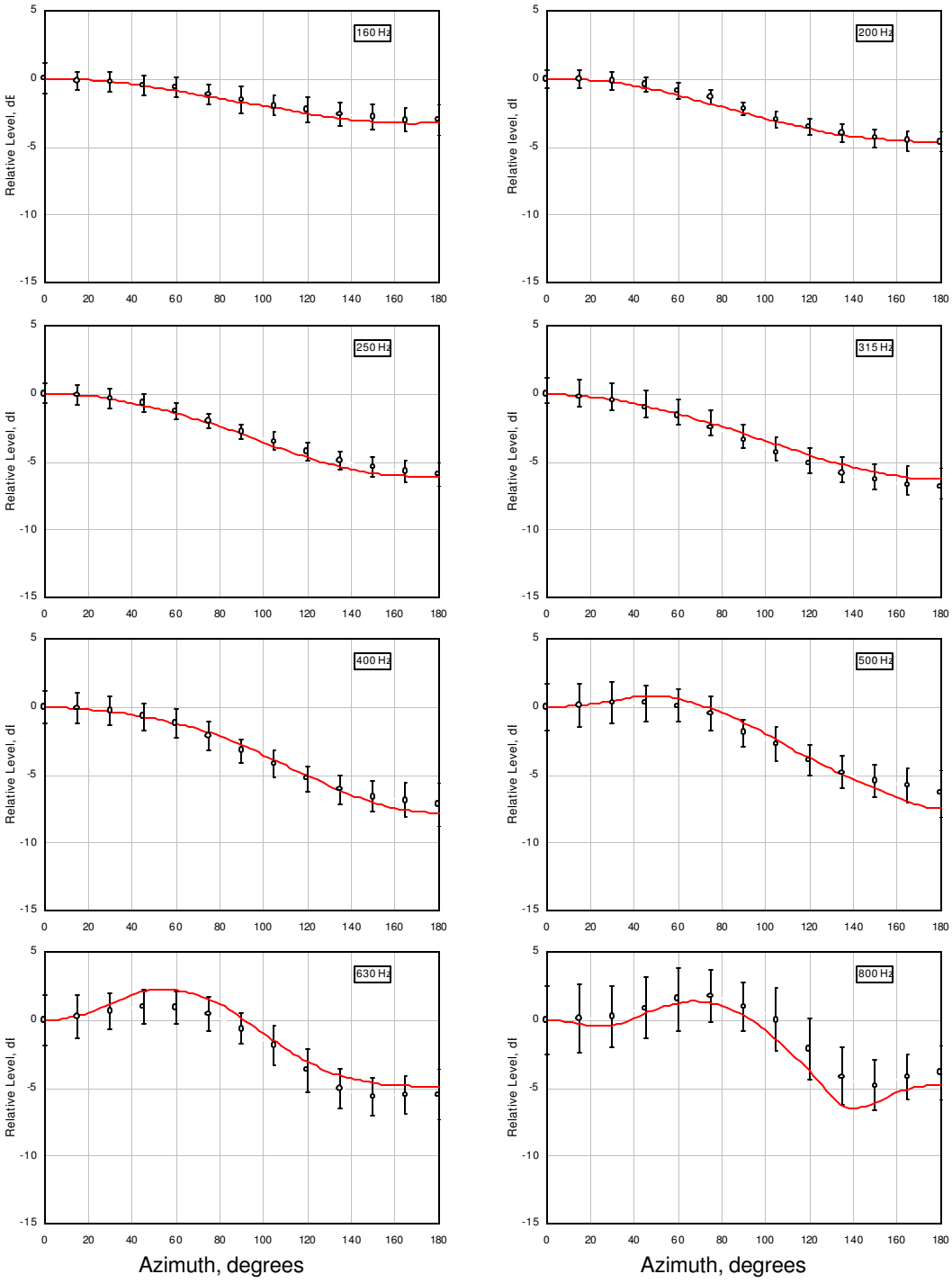


*Figure 12: Comparison of 1/3 octave band directivity results in the horizontal plane between NRC (o) and Moreno & Pfretzschner (—). Vertical bars on NRC results represent ± 1 standard deviation.*

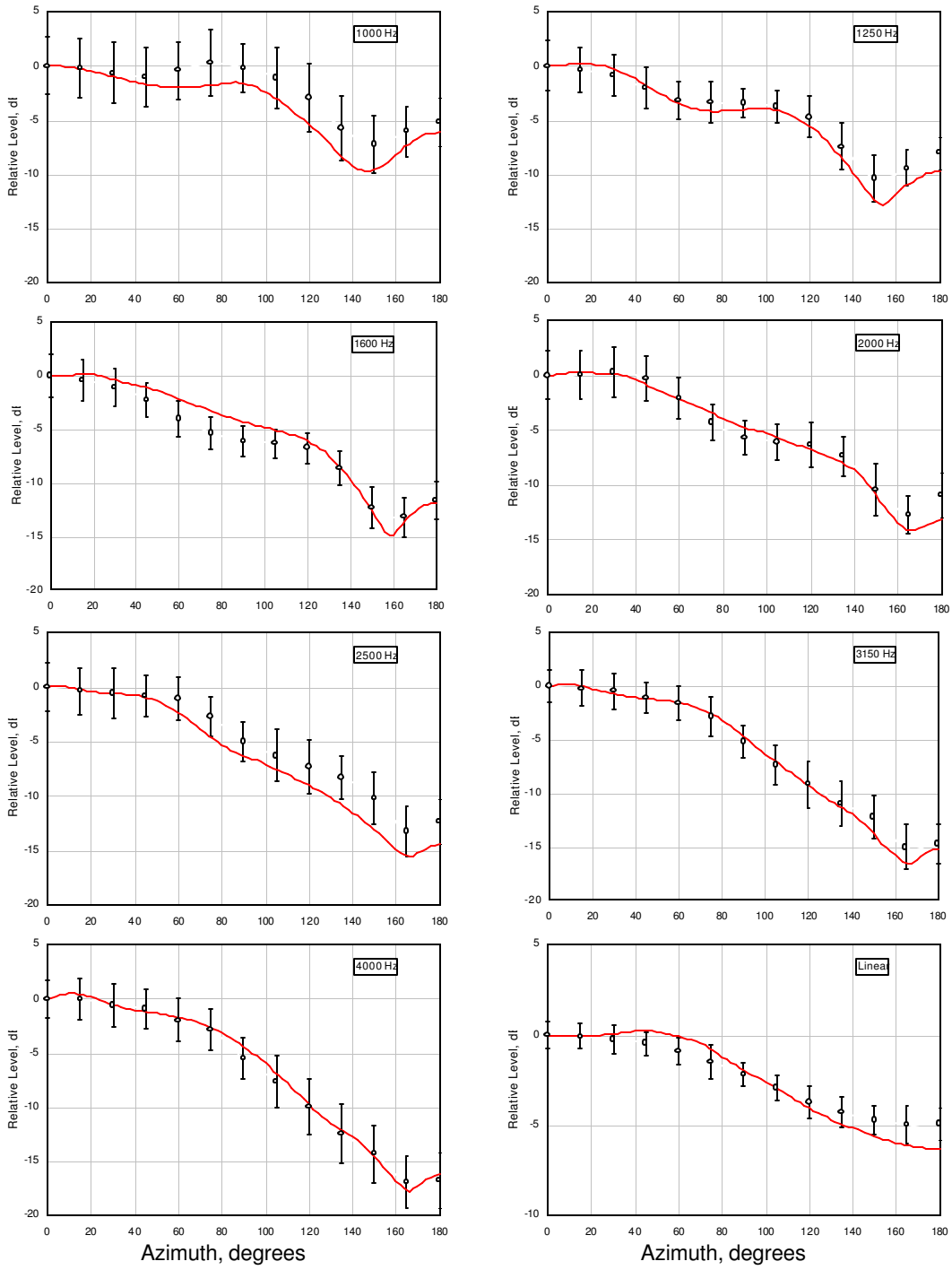


*Figure 11 (cont.): Comparison of 1/3-octave band directivity results in the horizontal plane between NRC (o) and Moreno & Pfretzschner (—). Vertical bars on NRC results represent ± 1 standard deviation.*

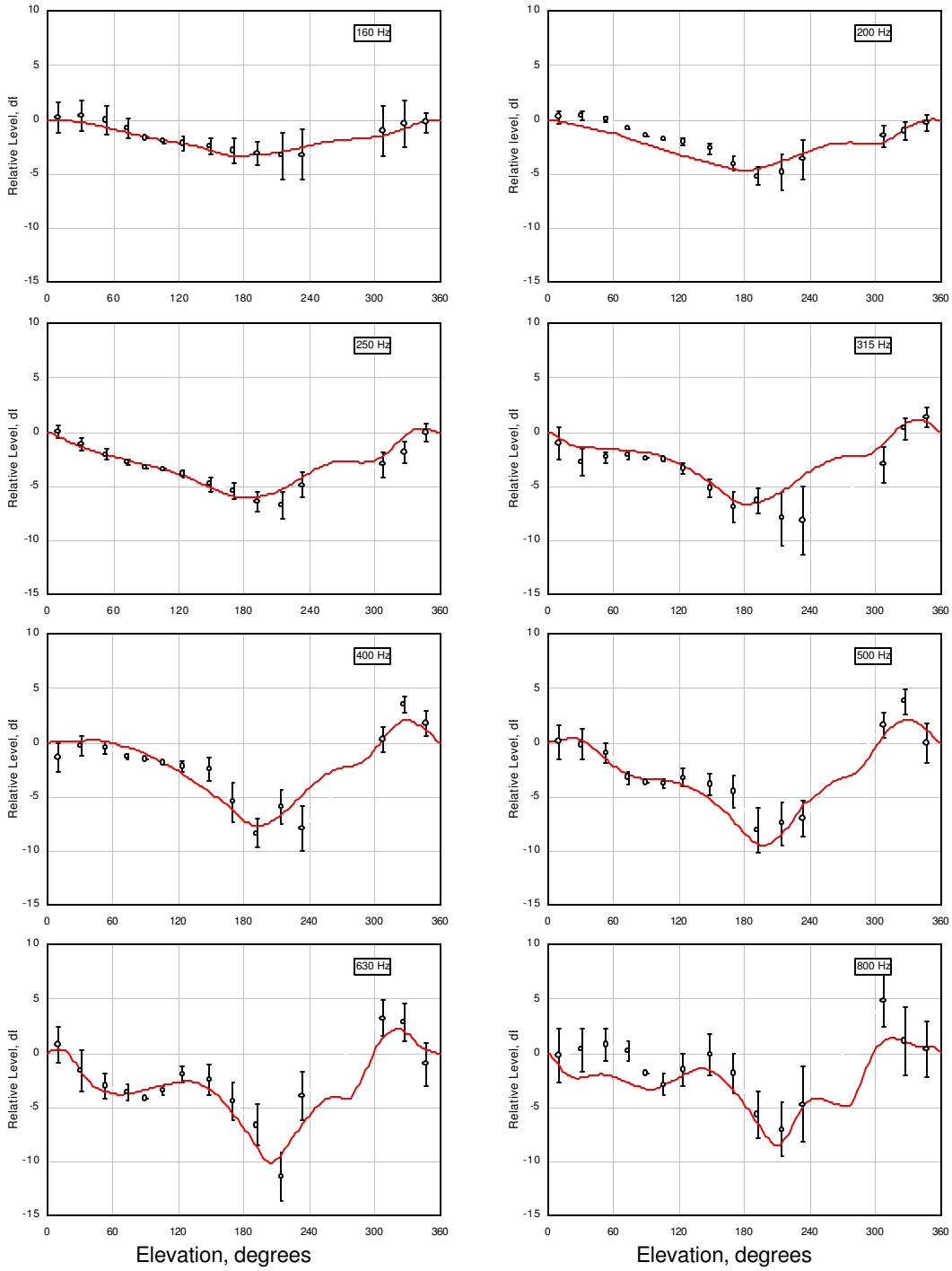


*Figure 13: Comparison of 1/3 octave band directivity results in the vertical plane between NRC (o) and Moreno & Pfretzschner (—). Vertical bars on NRC results represent ± 1 standard deviation.*

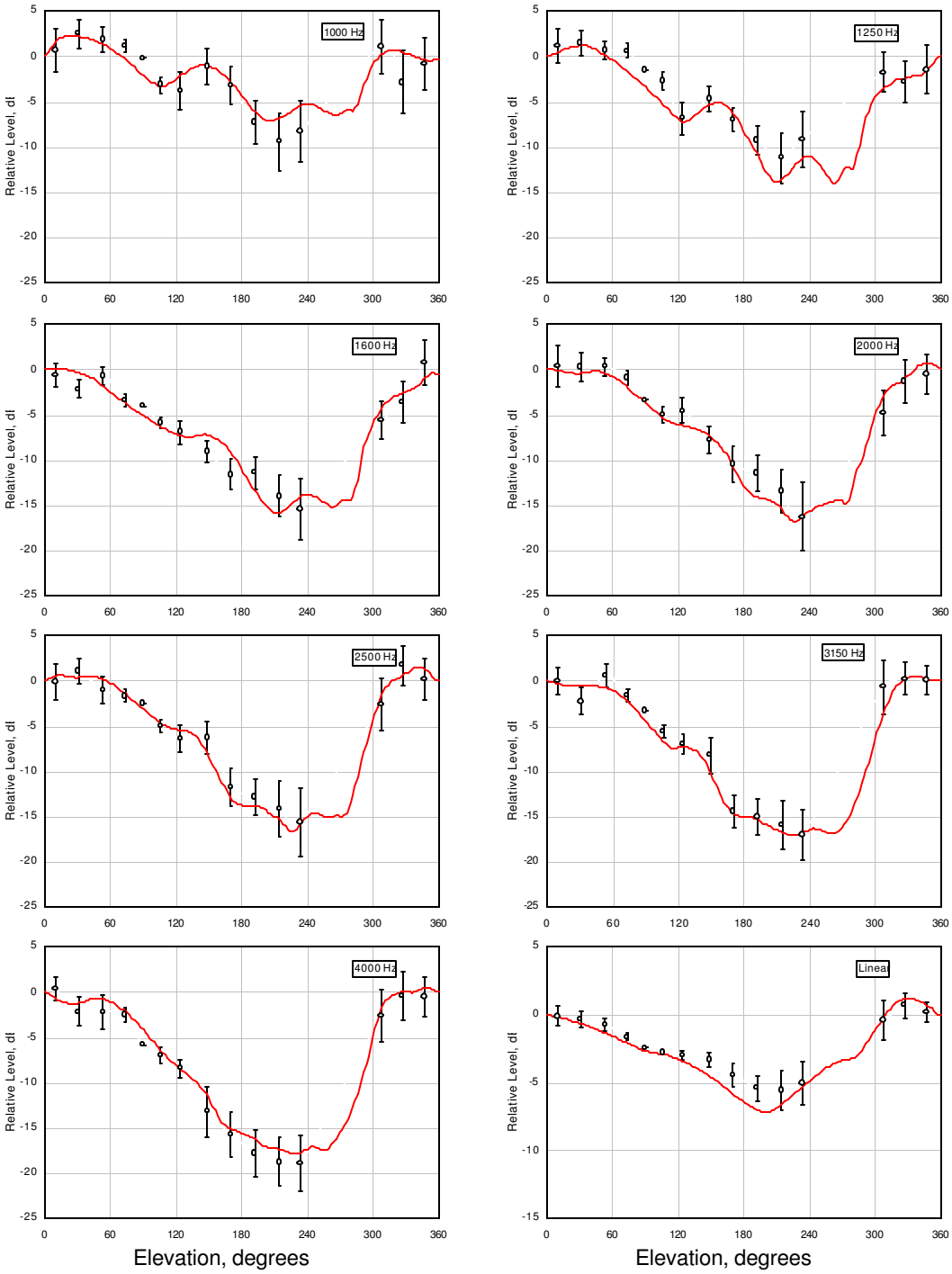


*Figure 12 (cont.): Comparison of 1/3 octave band directivity results in the vertical plane between NRC (o) and Moreno & Pfretzschner (—). Vertical bars on NRC results represent ± 1 standard deviation.*

## Comparison with Dunn and Farnsworth's results

Dunn and Farnsworth's results[3] were presented primarily for the horizontal plane and in non-standard frequency bands. To compare data, the 1/3 octave band data from the present study were summed to approximate the bandwidths used by Dunn and Farnsworth as closely as possible. Figure 14 shows reasonable agreement between Dunn and Farnsworth's results and the average results obtained from the 40 talkers in this study.

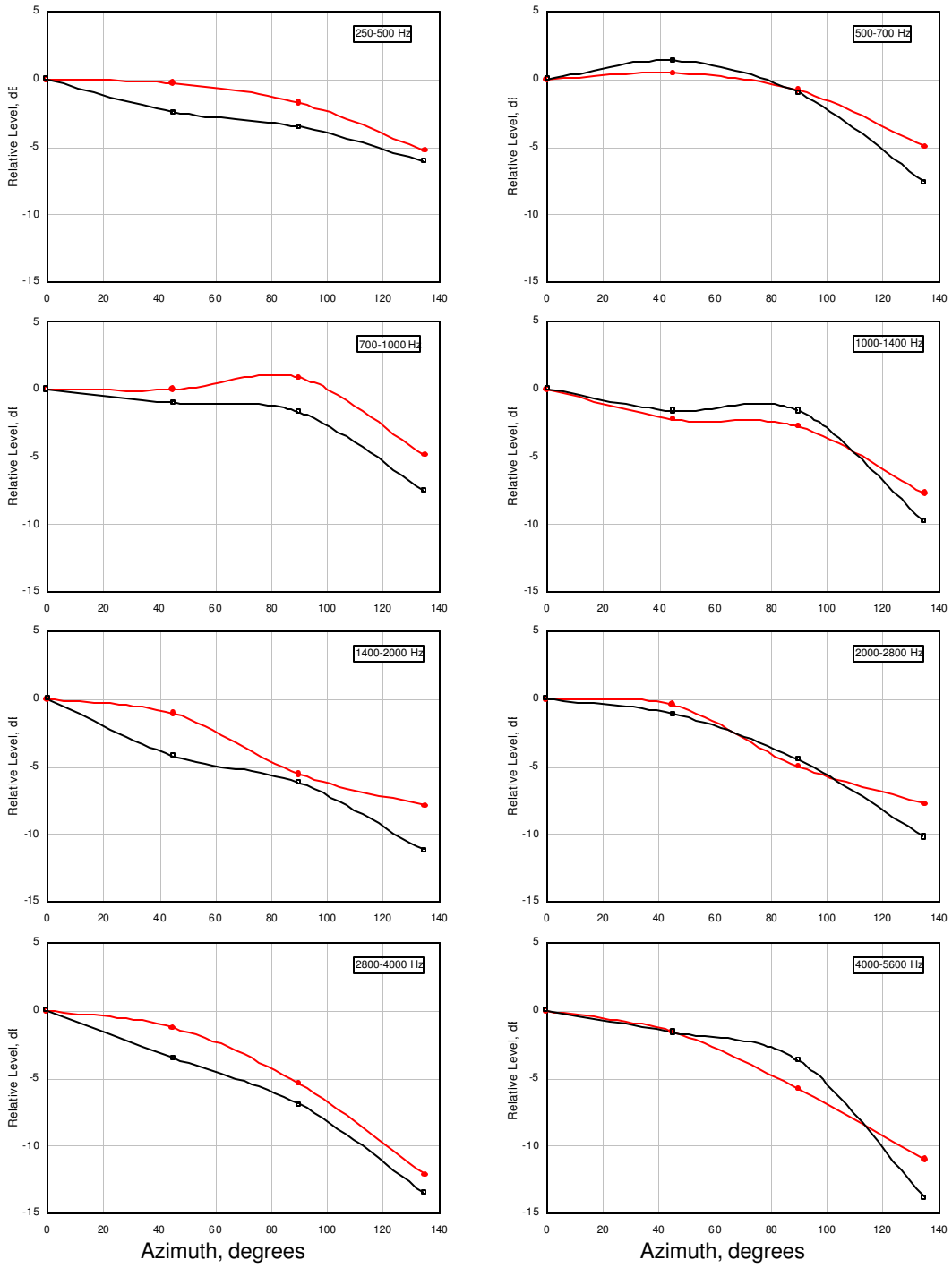


*Figure 14: Broad band directivity results in the horizontal plane for the present NRC study (—●—) and the Dunn & Farnsworth work (—□—).*

## Comparison with McKendree's results

Only octave band data in the horizontal plane are presented in McKendree's paper[4]. To allow comparison, octave band results for the present study were obtained by summing the 1/3 octave band data. Separate male and female results are compared in Figure 15 and Figure 16. Agreement is not as good as for the previous cases.

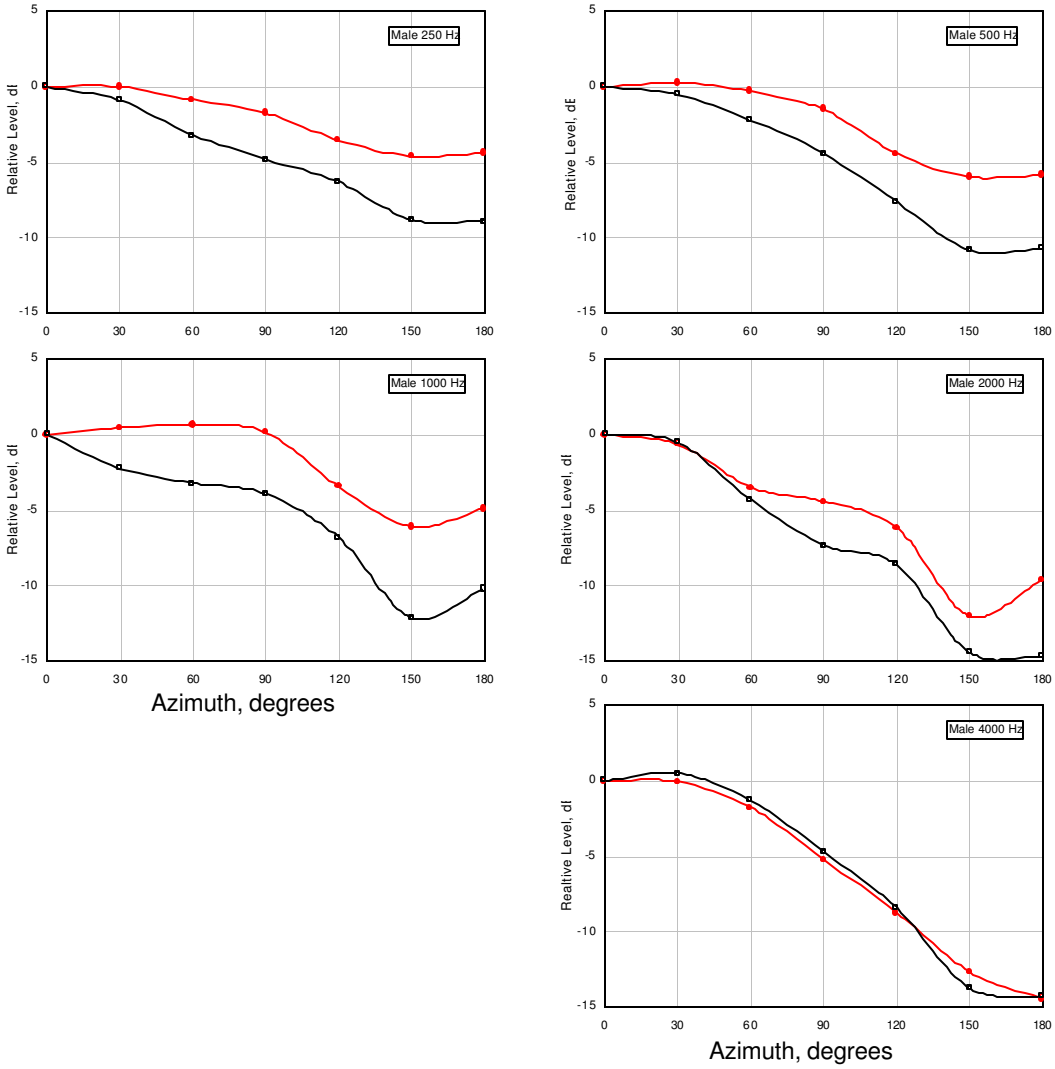


*Figure 15: Male octave-band directivity results in the horizontal plane for the NRC (—●—) and McKendree (—□—) studies.*

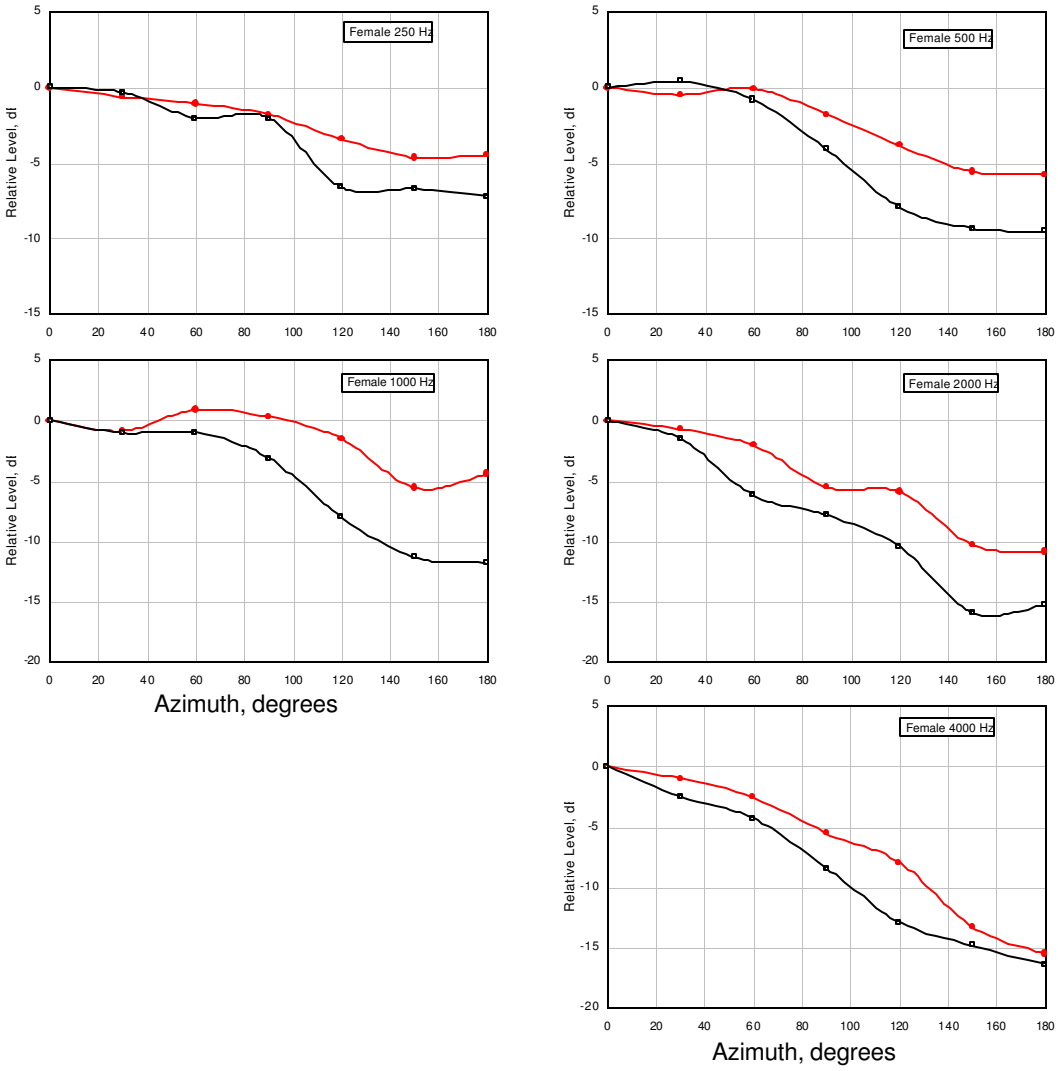


*Figure 16: Female octave-band directivity results in the horizontal plane for the NRC (—●—) and McKendree (—□—) studies.*

## SUMMARY

The measurements of the sound fields surrounding human talkers agree with other measurements made previously. This work, however, provides more details that are needed for modeling of open office configurations. Speech privacy is increased when talkers face away from listeners. If the head is tilted downward when talking on the telephone, the level of sound directed toward barriers will decrease slightly. For accurate modeling, these factors should be considered.

# APPENDIX

## Relative levels at each measurement position for all subjects, males only, females only, and the B&K HTS.

The tables that follow give the levels relative to the “straight ahead” position. Zero degrees azimuth and elevation is directly in front of the talker. The elevation angle increases to 90 degrees above the head, through 180 degrees directly behind the speaker and so on as shown in the polar diagrams earlier in the report.

## Relative Levels, All subjects

| Azimuth | Elevation | 160 | 200 | 250 | 315 | 400 | 500 | 630 | 800 | 1000 | 1250 | 1600 | 2000 | 2500 | 3150 | 4000 | 5000 | 6300 | 8000 | Awt |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 0 | 10 | 0.2 | 0.2 | 0.0 | -1.1 | -1.4 | 0.1 | 0.8 | -0.2 | 0.7 | 1.1 | -0.6 | 0.4 | -0.1 | 0.0 | 0.4 | 0.2 | 0.6 | 1.1 | -0.1 |
| 0 | 31 | 0.3 | 0.4 | -1.1 | -2.8 | -0.3 | -0.2 | -1.6 | 0.3 | 2.5 | 1.5 | -2.2 | 0.3 | 1.1 | -2.3 | -2.2 | 0.8 | -0.5 | 0.5 | -0.5 |
| 0 | 54 | -0.1 | 0.0 | -2.1 | -2.3 | -0.4 | -1.0 | -3.0 | 0.7 | 1.8 | 0.6 | -0.7 | 0.3 | -1.1 | 0.6 | -2.2 | -1.4 | -0.1 | -0.8 | -0.9 |
| 0 | 74 | -0.8 | -0.8 | -2.8 | -2.1 | -1.3 | -3.2 | -3.6 | 0.2 | 1.1 | 0.6 | -3.4 | -0.9 | -1.7 | -1.7 | -2.5 | -0.1 | -2.0 | -1.7 | -1.9 |
| 0 | 90 | -1.7 | -1.5 | -3.3 | -2.5 | -1.6 | -3.7 | -4.2 | -1.9 | -0.2 | -1.5 | -4.1 | -3.4 | -2.5 | -3.3 | -5.8 | -2.6 | -1.7 | -4.6 | -2.8 |
| 0 | 308 | -1.1 | -1.5 | -3.0 | -3.0 | 0.2 | 1.6 | 3.2 | 4.8 | 1.1 | -1.8 | -5.6 | -4.8 | -2.6 | -0.7 | -2.6 | -0.9 | -0.1 | -0.1 | 0.3 |
| 0 | 327 | -0.4 | -1.1 | -1.9 | 0.3 | 3.5 | 3.8 | 2.8 | 1.1 | -2.9 | -2.8 | -3.6 | -1.3 | 1.7 | 0.2 | -0.5 | 2.1 | 2.4 | 2.8 | 1.4 |
| 0 | 347 | -0.2 | -0.3 | -0.1 | 1.4 | 1.8 | -0.1 | -1.0 | 0.3 | -0.9 | -1.5 | 0.8 | -0.5 | 0.2 | 0.0 | -0.5 | -0.2 | -0.7 | -1.5 | 0.1 |
| 15 | 0 | -0.2 | 0.0 | -0.1 | -0.2 | 0.0 | 0.1 | 0.2 | 0.1 | -0.2 | -0.4 | -0.4 | 0.1 | -0.4 | -0.2 | -0.1 | -0.3 | -0.5 | -0.2 | -0.1 |
| 15 | 10 | 0.0 | 0.2 | 0.0 | -1.3 | -1.3 | 0.3 | 0.7 | -0.2 | 0.6 | 0.6 | -0.7 | 0.5 | -0.4 | -0.1 | 0.1 | 0.0 | 0.1 | 0.9 | -0.2 |
| 15 | 31 | 0.3 | 0.4 | -1.1 | -2.9 | -0.3 | -0.1 | -1.5 | 0.5 | 2.3 | 1.2 | -2.2 | 0.2 | 0.9 | -2.4 | -2.0 | 0.6 | -0.9 | 0.3 | -0.6 |
| 15 | 54 | -0.1 | 0.0 | -2.1 | -2.4 | -0.5 | -1.0 | -2.8 | 0.7 | 1.9 | 0.5 | -0.8 | 0.2 | -1.2 | 0.6 | -2.1 | -1.4 | -0.4 | -0.9 | -0.9 |
| 15 | 74 | -0.8 | -0.8 | -2.8 | -2.2 | -1.3 | -3.2 | -3.6 | 0.0 | 1.2 | 0.4 | -3.5 | -1.0 | -1.9 | -1.7 | -2.6 | -0.2 | -2.3 | -1.7 | -1.9 |
| 15 | 90 | -1.7 | -1.5 | -3.3 | -2.5 | -1.6 | -3.7 | -4.2 | -1.9 | -0.2 | -1.5 | -4.1 | -3.4 | -2.5 | -3.3 | -5.8 | -2.6 | -1.7 | -4.6 | -2.8 |
| 15 | 308 | -1.5 | -1.5 | -3.0 | -3.1 | 0.2 | 1.6 | 3.1 | 4.6 | 1.0 | -2.6 | -6.9 | -5.7 | -3.1 | -1.3 | -3.7 | -1.9 | -1.1 | -0.9 | 0.1 |
| 15 | 327 | -0.8 | -1.0 | -1.9 | 0.3 | 3.3 | 3.6 | 2.6 | 1.2 | -1.9 | -3.0 | -4.5 | -1.6 | 1.3 | 0.4 | -0.7 | 1.6 | 1.9 | 2.7 | 1.2 |
| 15 | 347 | -0.3 | -0.3 | -0.1 | 1.2 | 1.6 | -0.1 | -0.5 | 0.6 | -1.1 | -1.6 | 0.0 | -0.5 | -0.3 | -0.3 | -0.3 | -0.6 | -1.4 | -1.6 | 0.1 |
| 30 | 0 | -0.2 | -0.1 | -0.3 | -0.5 | -0.2 | 0.3 | 0.6 | 0.2 | -0.7 | -0.9 | -0.9 | 0.3 | -0.6 | -0.4 | -0.6 | -0.5 | -1.1 | -1.1 | -0.2 |
| 30 | 10 | -0.1 | 0.1 | -0.3 | -1.5 | -1.3 | 0.6 | 0.8 | -0.3 | -0.1 | -0.2 | -0.6 | 0.8 | -0.6 | -0.4 | -0.3 | -0.2 | -0.6 | -0.1 | -0.3 |
| 30 | 31 | 0.3 | 0.3 | -1.3 | -2.9 | -0.3 | 0.0 | -1.6 | 0.4 | 1.7 | 0.9 | -2.0 | -0.1 | 1.2 | -2.5 | -2.3 | 0.2 | -1.3 | -0.3 | -0.7 |
| 30 | 54 | 0.0 | -0.1 | -2.2 | -2.3 | -0.5 | -1.0 | -2.8 | 0.3 | 1.5 | 0.4 | -1.0 | -0.2 | -1.2 | 0.5 | -2.1 | -1.5 | -0.5 | -1.1 | -1.0 |
| 30 | 74 | -0.8 | -0.9 | -2.8 | -2.2 | -1.3 | -3.1 | -3.6 | -0.2 | 0.9 | 0.2 | -3.6 | -1.2 | -2.0 | -1.9 | -2.7 | -0.3 | -2.3 | -1.7 | -2.0 |
| 30 | 90 | -1.7 | -1.5 | -3.3 | -2.5 | -1.6 | -3.7 | -4.2 | -1.9 | -0.2 | -1.5 | -4.1 | -3.4 | -2.5 | -3.3 | -5.8 | -2.6 | -1.7 | -4.6 | -2.8 |
| 30 | 308 | -1.5 | -1.6 | -3.1 | -3.4 | 0.0 | 1.4 | 2.3 | 3.2 | 0.1 | -2.2 | -6.0 | -5.3 | -3.4 | -1.3 | -3.6 | -2.0 | -1.6 | -0.9 | -0.5 |
| 30 | 327 | -0.8 | -1.2 | -2.1 | -0.1 | 2.9 | 2.9 | 1.6 | 1.5 | 0.1 | -2.5 | -5.5 | -2.1 | 1.3 | 0.6 | -1.4 | 1.2 | 1.6 | 2.6 | 0.8 |
| 30 | 347 | -0.4 | -0.5 | -0.4 | 0.9 | 1.1 | -0.1 | 0.3 | 0.9 | -1.4 | -1.9 | -1.3 | -0.3 | -0.5 | -0.5 | -0.9 | -0.9 | -1.9 | -2.5 | -0.2 |

## Relative Levels, All subjects (continued)

| Azimuth | Elevation | 160 | 200 | 250 | 315 | 400 | 500 | 630 | 800 | 1000 | 1250 | 1600 | 2000 | 2500 | 3150 | 4000 | 5000 | 6300 | 8000 | Awt |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 45 | 0 | -0.5 | -0.4 | -0.7 | -1.0 | -0.6 | 0.3 | 0.9 | 0.9 | -1.1 | -2.2 | -2.0 | -0.2 | -0.8 | -1.1 | -1.0 | -1.2 | -2.3 | -2.6 | -0.5 |
| 45 | 10 | -0.3 | -0.1 | -0.6 | -2.0 | -1.4 | 0.8 | 0.9 | 0.3 | -1.0 | -1.8 | -1.2 | 0.8 | -1.3 | -0.9 | -1.0 | -0.9 | -1.9 | -1.6 | -0.6 |
| 45 | 31 | -0.1 | 0.1 | -1.6 | -3.1 | -0.3 | -0.1 | -1.4 | 0.3 | 0.6 | -0.1 | -2.0 | -0.8 | 0.8 | -2.8 | -2.5 | -0.5 | -2.1 | -1.3 | -1.0 |
| 45 | 54 | -0.4 | -0.2 | -2.4 | -2.4 | -0.5 | -1.2 | -2.9 | 0.0 | 0.8 | 0.0 | -1.1 | -0.7 | -1.4 | 0.1 | -2.4 | -1.9 | -0.9 | -1.6 | -1.3 |
| 45 | 74 | -1.1 | -0.9 | -2.9 | -2.2 | -1.3 | -3.3 | -3.7 | -0.4 | 0.6 | 0.1 | -3.9 | -1.6 | -2.1 | -2.2 | -2.9 | -0.5 | -2.6 | -1.9 | -2.1 |
| 45 | 90 | -1.7 | -1.5 | -3.3 | -2.5 | -1.6 | -3.7 | -4.2 | -1.9 | -0.2 | -1.5 | -4.1 | -3.4 | -2.5 | -3.3 | -5.8 | -2.6 | -1.7 | -4.6 | -2.8 |
| 45 | 308 | -1.4 | -1.7 | -3.5 | -4.0 | -0.7 | 0.7 | 0.9 | 1.8 | 0.2 | -0.5 | -4.5 | -4.8 | -4.2 | -2.0 | -3.7 | -1.4 | -1.2 | -0.8 | -1.1 |
| 45 | 327 | -1.0 | -1.4 | -2.6 | -0.7 | 2.2 | 1.9 | 1.0 | 2.4 | 1.2 | -2.5 | -6.1 | -3.6 | 0.1 | 0.5 | -1.6 | 0.1 | 1.1 | 2.3 | 0.3 |
| 45 | 347 | -0.7 | -0.8 | -0.8 | 0.3 | 0.4 | -0.2 | 0.9 | 1.5 | -1.2 | -2.6 | -3.1 | -1.5 | -0.2 | -1.3 | -1.0 | -1.6 | -3.0 | -3.9 | -0.5 |
| 60 | 0 | -0.7 | -0.8 | -1.2 | -1.6 | -1.1 | 0.2 | 0.8 | 1.5 | -0.5 | -3.4 | -3.8 | -1.8 | -1.1 | -1.6 | -2.0 | -2.3 | -3.9 | -4.4 | -0.9 |
| 60 | 10 | -0.5 | -0.5 | -1.1 | -2.5 | -1.5 | 0.7 | 0.7 | 1.1 | -0.9 | -3.8 | -3.0 | 0.1 | -1.4 | -1.8 | -1.6 | -1.8 | -3.2 | -3.5 | -0.9 |
| 60 | 31 | 0.0 | -0.2 | -1.9 | -3.3 | -0.4 | -0.5 | -1.5 | 0.6 | -0.4 | -1.5 | -2.7 | -1.0 | -0.3 | -3.1 | -3.5 | -1.2 | -3.4 | -2.4 | -1.3 |
| 60 | 54 | -0.2 | -0.4 | -2.6 | -2.5 | -0.7 | -1.5 | -2.8 | -0.3 | -0.2 | -0.7 | -1.4 | -1.4 | -2.0 | -0.4 | -2.8 | -2.5 | -1.6 | -1.9 | -1.6 |
| 60 | 74 | -0.9 | -1.0 | -3.0 | -2.3 | -1.4 | -3.5 | -3.7 | -0.7 | 0.1 | -0.3 | -4.0 | -2.1 | -2.5 | -2.6 | -3.3 | -1.2 | -3.2 | -2.3 | -2.3 |
| 60 | 90 | -1.7 | -1.5 | -3.3 | -2.5 | -1.6 | -3.7 | -4.2 | -1.9 | -0.2 | -1.5 | -4.1 | -3.4 | -2.5 | -3.3 | -5.8 | -2.6 | -1.7 | -4.6 | -2.8 |
| 60 | 308 | -1.6 | -1.9 | -3.9 | -4.8 | -1.6 | -0.3 | 0.0 | 1.9 | 0.9 | -0.8 | -5.1 | -4.7 | -4.1 | -3.3 | -5.1 | -2.5 | -2.2 | -1.2 | -1.6 |
| 60 | 327 | -1.2 | -1.8 | -3.3 | -1.5 | 1.3 | 0.8 | 0.4 | 2.3 | 0.6 | -1.2 | -4.3 | -5.2 | -2.6 | -0.8 | -1.4 | -1.3 | 0.0 | 2.0 | -0.3 |
| 60 | 347 | -0.9 | -1.2 | -1.4 | -0.4 | -0.5 | -0.5 | 0.9 | 2.1 | -0.1 | -2.9 | -4.8 | -4.4 | -0.7 | -1.4 | -2.4 | -2.8 | -4.8 | -5.6 | -0.9 |
| 75 | 0 | -1.2 | -1.3 | -2.0 | -2.4 | -1.9 | -0.4 | 0.4 | 1.8 | 0.1 | -3.6 | -5.3 | -4.1 | -2.6 | -2.9 | -2.9 | -3.6 | -5.5 | -6.3 | -1.5 |
| 75 | 10 | -1.1 | -1.0 | -1.8 | -3.2 | -2.1 | 0.2 | 0.3 | 1.3 | -0.2 | -4.7 | -5.9 | -2.0 | -1.9 | -3.0 | -2.7 | -3.0 | -4.6 | -5.3 | -1.4 |
| 75 | 31 | -0.6 | -0.6 | -2.4 | -3.6 | -0.8 | -1.0 | -1.6 | 0.6 | -1.0 | -3.3 | -4.6 | -1.6 | -1.3 | -4.2 | -4.7 | -2.2 | -4.7 | -4.1 | -1.8 |
| 75 | 54 | -0.6 | -0.6 | -2.9 | -2.7 | -0.9 | -1.8 | -2.9 | -1.0 | -1.1 | -1.8 | -2.2 | -2.2 | -3.0 | -1.2 | -3.9 | -3.4 | -2.5 | -2.8 | -2.0 |
| 75 | 74 | -1.2 | -1.1 | -3.1 | -2.3 | -1.5 | -3.6 | -3.9 | -1.1 | -0.5 | -0.8 | -4.4 | -2.8 | -3.1 | -3.3 | -4.1 | -2.0 | -4.0 | -3.1 | -2.6 |
| 75 | 90 | -1.7 | -1.5 | -3.3 | -2.5 | -1.6 | -3.7 | -4.2 | -1.9 | -0.2 | -1.5 | -4.1 | -3.4 | -2.5 | -3.3 | -5.8 | -2.6 | -1.7 | -4.6 | -2.8 |
| 75 | 308 | -2.0 | -2.2 | -4.5 | -6.1 | -3.0 | -1.2 | -0.3 | 1.7 | 0.8 | -2.2 | -6.6 | -5.5 | -4.5 | -3.9 | -6.6 | -4.6 | -4.1 | -3.4 | -2.3 |
| 75 | 327 | -1.6 | -2.3 | -4.2 | -2.5 | 0.2 | -0.4 | -0.5 | 1.1 | -0.1 | -0.3 | -3.5 | -5.3 | -4.0 | -3.1 | -3.7 | -2.5 | -1.5 | 1.0 | -1.2 |
| 75 | 347 | -1.3 | -1.8 | -2.2 | -1.4 | -1.7 | -1.2 | 0.4 | 2.3 | 0.6 | -2.3 | -4.7 | -6.8 | -3.5 | -2.6 | -3.0 | -4.4 | -6.6 | -7.5 | -1.5 |
| 90 | 0 | -1.5 | -2.2 | -2.8 | -3.4 | -3.0 | -1.8 | -0.7 | 1.0 | -0.3 | -3.7 | -6.3 | -5.6 | -4.9 | -5.2 | -5.5 | -4.5 | -7.3 | -8.9 | -2.6 |
| 90 | 10 | -1.3 | -1.7 | -2.6 | -4.0 | -2.8 | -1.1 | -0.6 | 0.8 | -0.3 | -4.6 | -7.5 | -4.7 | -4.1 | -5.0 | -5.4 | -4.2 | -6.9 | -8.4 | -2.5 |
| 90 | 31 | -1.0 | -1.0 | -2.9 | -3.9 | -1.3 | -1.9 | -2.2 | 0.3 | -1.7 | -4.3 | -6.5 | -3.3 | -1.9 | -4.9 | -6.2 | -5.6 | -7.0 | -5.8 | -2.6 |
| 90 | 54 | -1.2 | -1.0 | -3.3 | -3.0 | -1.5 | -2.6 | -3.1 | -1.7 | -2.3 | -3.6 | -3.9 | -2.8 | -4.2 | -3.3 | -5.5 | -4.6 | -5.2 | -4.3 | -2.8 |
| 90 | 74 | -1.5 | -1.3 | -3.4 | -2.6 | -1.8 | -3.8 | -4.1 | -1.9 | -1.4 | -1.4 | -4.9 | -3.9 | -3.6 | -4.0 | -5.2 | -3.2 | -5.1 | -4.3 | -3.1 |
| 90 | 90 | -1.7 | -1.5 | -3.3 | -2.5 | -1.6 | -3.7 | -4.2 | -1.9 | -0.2 | -1.5 | -4.1 | -3.4 | -2.5 | -3.3 | -5.8 | -2.6 | -1.7 | -4.6 | -2.8 |
| 90 | 308 | -2.5 | -3.0 | -5.0 | -7.2 | -4.3 | -2.3 | -0.7 | 0.7 | -0.9 | -4.4 | -8.3 | -7.2 | -6.2 | -6.3 | -9.4 | -7.2 | -6.2 | -6.5 | -3.4 |
| 90 | 327 | -2.0 | -3.1 | -4.8 | -3.6 | -1.0 | -1.9 | -2.2 | -0.5 | -1.2 | -1.5 | -4.7 | -5.3 | -5.0 | -5.4 | -7.3 | -5.5 | -4.1 | -3.3 | -2.7 |
| 90 | 347 | -1.8 | -2.7 | -3.0 | -2.5 | -3.2 | -2.7 | -0.9 | 1.3 | -0.3 | -2.6 | -4.6 | -6.7 | -5.9 | -5.5 | -5.7 | -4.9 | -8.0 | -9.5 | -2.7 |

## Relative Levels, All subjects (continued)

| Azimuth | Elevation | 160 | 200 | 250 | 315 | 400 | 500 | 630 | 800 | 1000 | 1250 | 1600 | 2000 | 2500 | 3150 | 4000 | 5000 | 6300 | 8000 | Awt |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 105 | 0 | -2.0 | -2.9 | -3.5 | -4.2 | -3.9 | -2.6 | -1.9 | 0.0 | -1.2 | -4.0 | -6.4 | -6.1 | -6.2 | -7.4 | -7.7 | -5.8 | -9.3 | -11.3 | -3.5 |
| 105 | 9 | -1.8 | -2.4 | -3.2 | -4.8 | -3.4 | -1.9 | -1.7 | 0.0 | -1.0 | -4.7 | -7.6 | -6.0 | -5.9 | -7.6 | -7.2 | -5.6 | -9.3 | -11.5 | -3.3 |
| 105 | 31 | -1.5 | -1.5 | -3.3 | -4.2 | -1.6 | -2.2 | -2.7 | -0.2 | -2.2 | -5.0 | -7.9 | -5.1 | -2.4 | -4.4 | -7.9 | -8.2 | -9.4 | -7.3 | -3.1 |
| 105 | 56 | -1.7 | -1.4 | -3.2 | -3.0 | -1.9 | -2.9 | -2.8 | -2.0 | -3.2 | -5.1 | -5.1 | -3.0 | -5.0 | -4.9 | -6.9 | -6.0 | -8.6 | -7.0 | -3.2 |
| 105 | 74 | -1.7 | -1.5 | -3.2 | -2.4 | -1.8 | -3.7 | -3.7 | -2.4 | -1.8 | -1.5 | -4.9 | -4.3 | -3.7 | -4.5 | -5.4 | -4.0 | -6.1 | -5.5 | -3.2 |
| 105 | 90 | -1.7 | -1.5 | -3.3 | -2.5 | -1.6 | -3.7 | -4.2 | -1.9 | -0.2 | -1.5 | -4.1 | -3.4 | -2.5 | -3.3 | -5.8 | -2.6 | -1.7 | -4.6 | -2.8 |
| 105 | 306 | -2.8 | -3.4 | -5.2 | -7.9 | -5.4 | -2.8 | -0.9 | 0.1 | -2.2 | -6.0 | -8.5 | -8.1 | -7.6 | -8.6 | -12.3 | -10.2 | -9.3 | -11.2 | -4.1 |
| 105 | 325 | -2.5 | -3.8 | -5.3 | -4.4 | -2.2 | -3.0 | -4.0 | -1.8 | -1.8 | -2.9 | -6.3 | -5.6 | -6.1 | -7.6 | -10.6 | -9.1 | -8.4 | -10.0 | -4.0 |
| 105 | 348 | -2.2 | -3.6 | -3.8 | -3.5 | -4.6 | -3.5 | -2.3 | 0.1 | -1.4 | -3.2 | -4.9 | -6.2 | -6.7 | -7.2 | -8.3 | -6.1 | -9.2 | -11.0 | -3.8 |
| 120 | 0 | -2.3 | -3.5 | -4.2 | -5.0 | -5.0 | -3.8 | -3.7 | -2.1 | -3.0 | -5.0 | -6.7 | -6.3 | -7.3 | -9.3 | -10.0 | -8.1 | -11.2 | -13.3 | -4.8 |
| 120 | 9 | -2.1 | -2.9 | -3.9 | -5.5 | -4.2 | -3.0 | -3.4 | -1.8 | -2.6 | -5.5 | -7.4 | -5.9 | -7.1 | -10.0 | -9.6 | -7.5 | -11.0 | -13.5 | -4.5 |
| 120 | 31 | -1.8 | -1.8 | -3.8 | -4.6 | -2.0 | -2.9 | -3.3 | -1.3 | -3.2 | -6.1 | -9.2 | -6.7 | -4.5 | -5.6 | -10.0 | -9.5 | -11.4 | -9.9 | -3.9 |
| 120 | 56 | -1.8 | -1.6 | -3.5 | -3.1 | -2.1 | -3.1 | -2.8 | -2.6 | -4.0 | -6.3 | -6.3 | -3.8 | -6.1 | -6.0 | -8.0 | -7.3 | -10.2 | -9.0 | -3.6 |
| 120 | 74 | -1.8 | -1.6 | -3.3 | -2.5 | -1.8 | -3.7 | -3.8 | -2.8 | -2.2 | -1.9 | -5.3 | -4.7 | -4.3 | -4.8 | -6.1 | -4.5 | -6.8 | -6.4 | -3.3 |
| 120 | 90 | -1.7 | -1.5 | -3.3 | -2.5 | -1.6 | -3.7 | -4.2 | -1.9 | -0.2 | -1.5 | -4.1 | -3.4 | -2.5 | -3.3 | -5.8 | -2.6 | -1.7 | -4.6 | -2.8 |
| 120 | 306 | -2.8 | -3.5 | -5.3 | -8.4 | -6.7 | -4.2 | -2.1 | -1.8 | -3.7 | -6.7 | -9.1 | -8.4 | -8.9 | -10.4 | -14.7 | -12.8 | -12.5 | -13.9 | -5.3 |
| 120 | 325 | -2.6 | -4.2 | -5.9 | -5.5 | -3.4 | -4.5 | -6.1 | -3.6 | -3.4 | -4.5 | -8.1 | -6.8 | -7.9 | -8.9 | -12.7 | -12.5 | -12.0 | -13.4 | -5.5 |
| 120 | 348 | -2.5 | -4.1 | -4.6 | -4.4 | -6.0 | -4.9 | -4.2 | -2.4 | -3.4 | -4.3 | -5.8 | -6.8 | -7.5 | -8.3 | -10.5 | -9.0 | -11.6 | -13.0 | -5.2 |
| 135 | 0 | -2.6 | -3.9 | -4.8 | -5.7 | -5.7 | -4.7 | -5.1 | -4.0 | -5.8 | -7.7 | -8.6 | -7.3 | -8.1 | -11.1 | -12.5 | -10.6 | -13.6 | -15.2 | -5.9 |
| 135 | 9 | -2.5 | -3.4 | -4.5 | -6.1 | -4.7 | -3.7 | -4.6 | -3.4 | -5.1 | -8.1 | -9.1 | -6.3 | -7.3 | -11.8 | -12.6 | -10.3 | -13.0 | -15.2 | -5.4 |
| 135 | 31 | -2.1 | -2.1 | -4.2 | -4.8 | -2.2 | -3.4 | -3.6 | -1.8 | -4.2 | -7.8 | -11.6 | -8.7 | -6.1 | -7.6 | -11.9 | -11.9 | -13.6 | -12.1 | -4.4 |
| 135 | 56 | -2.0 | -1.7 | -3.6 | -3.2 | -2.1 | -3.1 | -2.8 | -2.6 | -4.6 | -7.1 | -7.4 | -4.9 | -7.0 | -7.5 | -9.3 | -8.9 | -12.0 | -11.0 | -3.8 |
| 135 | 74 | -1.9 | -1.6 | -3.3 | -2.5 | -1.8 | -3.7 | -3.7 | -2.9 | -2.7 | -2.2 | -5.6 | -5.0 | -4.6 | -5.3 | -6.6 | -5.1 | -7.3 | -6.9 | -3.4 |
| 135 | 90 | -1.7 | -1.5 | -3.3 | -2.5 | -1.6 | -3.7 | -4.2 | -1.9 | -0.2 | -1.5 | -4.1 | -3.4 | -2.5 | -3.3 | -5.8 | -2.6 | -1.7 | -4.6 | -2.8 |
| 135 | 306 | -2.9 | -3.5 | -5.3 | -8.6 | -7.7 | -5.7 | -3.4 | -4.0 | -6.4 | -8.0 | -11.1 | -9.7 | -10.0 | -11.7 | -15.8 | -14.8 | -14.9 | -15.1 | -6.4 |
| 135 | 325 | -2.9 | -4.5 | -6.5 | -6.5 | -4.5 | -6.2 | -8.4 | -5.0 | -6.0 | -7.3 | -11.1 | -9.7 | -10.2 | -11.2 | -14.7 | -14.8 | -15.2 | -15.9 | -6.8 |
| 135 | 348 | -2.8 | -4.6 | -5.3 | -5.2 | -7.1 | -5.9 | -5.7 | -4.9 | -6.6 | -7.1 | -8.0 | -8.5 | -9.2 | -10.1 | -12.4 | -11.1 | -14.3 | -15.2 | -6.6 |

## Relative Levels, All subjects (continued)

| Azimuth | Elevation | 160 | 200 | 250 | 315 | 400 | 500 | 630 | 800 | 1000 | 1250 | 1600 | 2000 | 2500 | 3150 | 4000 | 5000 | 6300 | 8000 | Awt |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 150 | 0 | -2.8 | -4.3 | -5.3 | -6.2 | -6.2 | -5.3 | -5.7 | -4.6 | -7.1 | -10.6 | -12.4 | -10.4 | -10.0 | -12.3 | -14.4 | -13.0 | -15.9 | -16.8 | -6.6 |
| 150 | 9 | -2.7 | -3.8 | -4.9 | -6.5 | -4.9 | -4.1 | -5.0 | -3.5 | -5.9 | -10.5 | -13.1 | -9.6 | -8.8 | -12.5 | -14.4 | -12.8 | -15.7 | -16.9 | -5.9 |
| 150 | 31 | -2.3 | -2.4 | -4.5 | -5.0 | -2.3 | -3.5 | -3.5 | -1.4 | -3.6 | -7.8 | -13.2 | -12.7 | -9.4 | -9.3 | -13.0 | -14.1 | -16.0 | -14.4 | -4.5 |
| 150 | 56 | -2.1 | -1.9 | -3.8 | -3.3 | -2.2 | -3.1 | -2.5 | -2.3 | -4.7 | -7.5 | -8.0 | -5.7 | -7.7 | -8.5 | -10.2 | -10.1 | -13.3 | -12.5 | -3.9 |
| 150 | 74 | -1.9 | -1.7 | -3.4 | -2.5 | -1.9 | -3.7 | -3.6 | -3.0 | -3.0 | -2.5 | -5.8 | -5.0 | -4.9 | -5.6 | -6.8 | -5.4 | -7.7 | -7.2 | -3.5 |
| 150 | 90 | -1.7 | -1.5 | -3.3 | -2.5 | -1.6 | -3.7 | -4.2 | -1.9 | -0.2 | -1.5 | -4.1 | -3.4 | -2.5 | -3.3 | -5.8 | -2.6 | -1.7 | -4.6 | -2.8 |
| 150 | 306 | -2.9 | -3.6 | -5.2 | -8.3 | -8.0 | -6.6 | -4.5 | -5.6 | -8.9 | -8.6 | -12.7 | -12.6 | -12.8 | -13.7 | -16.7 | -15.9 | -17.0 | -16.9 | -7.0 |
| 150 | 325 | -2.9 | -4.7 | -6.8 | -7.2 | -5.2 | -7.2 | -10.4 | -6.1 | -7.7 | -10.1 | -14.9 | -13.7 | -13.3 | -14.1 | -16.8 | -16.8 | -17.6 | -17.4 | -7.7 |
| 150 | 348 | -3.0 | -5.0 | -5.8 | -5.8 | -7.9 | -6.8 | -6.6 | -6.0 | -8.7 | -10.6 | -11.5 | -11.4 | -11.5 | -11.9 | -14.3 | -13.3 | -16.2 | -16.6 | -7.5 |
| 165 | 0 | -3.1 | -4.5 | -5.6 | -6.6 | -6.5 | -5.6 | -5.5 | -3.9 | -5.9 | -9.4 | -13.1 | -12.8 | -13.1 | -15.0 | -16.9 | -15.6 | -17.9 | -18.5 | -6.6 |
| 165 | 9 | -3.0 | -4.0 | -5.2 | -6.8 | -5.2 | -4.2 | -4.6 | -2.5 | -4.3 | -8.5 | -13.4 | -12.7 | -12.6 | -15.0 | -16.5 | -14.9 | -17.6 | -18.6 | -5.8 |
| 165 | 31 | -2.5 | -2.6 | -4.7 | -5.1 | -2.3 | -3.5 | -2.7 | -0.6 | -2.0 | -5.7 | -10.5 | -10.3 | -9.7 | -12.3 | -15.7 | -15.2 | -16.6 | -15.6 | -4.1 |
| 165 | 56 | -2.3 | -2.0 | -3.8 | -3.3 | -2.1 | -3.0 | -2.1 | -1.9 | -4.1 | -7.1 | -7.4 | -5.2 | -7.1 | -7.9 | -9.8 | -9.3 | -12.7 | -12.5 | -3.7 |
| 165 | 74 | -2.1 | -1.8 | -3.4 | -2.6 | -1.9 | -3.6 | -3.5 | -3.0 | -3.0 | -2.6 | -5.9 | -5.1 | -4.9 | -5.7 | -6.9 | -5.6 | -7.8 | -7.4 | -3.5 |
| 165 | 90 | -1.7 | -1.5 | -3.3 | -2.5 | -1.6 | -3.7 | -4.2 | -1.9 | -0.2 | -1.5 | -4.1 | -3.4 | -2.5 | -3.3 | -5.8 | -2.6 | -1.7 | -4.6 | -2.8 |
| 165 | 306 | -3.0 | -3.5 | -5.0 | -8.0 | -7.8 | -6.6 | -4.3 | -5.1 | -9.4 | -9.4 | -14.5 | -14.6 | -15.2 | -17.3 | -19.3 | -18.2 | -19.4 | -18.7 | -7.0 |
| 165 | 325 | -3.1 | -4.6 | -6.8 | -7.6 | -5.5 | -7.2 | -11.5 | -6.8 | -8.8 | -11.0 | -15.1 | -15.2 | -15.9 | -16.4 | -19.1 | -18.2 | -18.9 | -18.4 | -8.1 |
| 165 | 348 | -3.2 | -5.2 | -6.2 | -6.2 | -8.2 | -7.3 | -6.6 | -5.8 | -8.0 | -10.7 | -12.8 | -12.8 | -13.8 | -15.1 | -17.5 | -16.5 | -18.3 | -18.5 | -7.8 |
| 180 | 0 | -3.0 | -4.6 | -5.9 | -6.7 | -6.7 | -6.1 | -5.4 | -3.5 | -5.0 | -8.0 | -11.5 | -10.9 | -12.2 | -14.7 | -16.6 | -15.6 | -18.2 | -18.9 | -6.7 |
| 180 | 9 | -2.9 | -4.1 | -5.4 | -6.9 | -5.5 | -4.6 | -4.5 | -1.9 | -3.2 | -7.0 | -11.6 | -10.5 | -11.7 | -14.4 | -15.7 | -14.7 | -18.0 | -18.9 | -5.7 |
| 180 | 31 | -2.5 | -2.7 | -4.8 | -5.2 | -2.5 | -3.9 | -2.4 | -0.1 | -1.1 | -4.7 | -9.1 | -7.7 | -6.3 | -8.2 | -13.2 | -14.3 | -17.0 | -16.5 | -4.0 |
| 180 | 56 | -2.2 | -2.1 | -3.9 | -3.4 | -2.2 | -3.3 | -2.0 | -1.6 | -3.8 | -6.8 | -6.9 | -4.6 | -6.4 | -7.0 | -8.4 | -7.7 | -10.5 | -10.0 | -3.6 |
| 180 | 74 | -2.0 | -1.8 | -3.5 | -2.6 | -1.9 | -3.8 | -3.4 | -2.9 | -3.1 | -2.7 | -5.9 | -5.0 | -5.0 | -5.6 | -7.0 | -5.6 | -7.7 | -7.3 | -3.5 |
| 180 | 90 | -1.7 | -1.5 | -3.3 | -2.5 | -1.6 | -3.7 | -4.2 | -1.9 | -0.2 | -1.5 | -4.1 | -3.4 | -2.5 | -3.3 | -5.8 | -2.6 | -1.7 | -4.6 | -2.8 |
| 180 | 306 | -3.2 | -3.7 | -4.9 | -8.2 | -8.0 | -7.0 | -4.0 | -4.8 | -8.3 | -9.2 | -15.4 | -16.3 | -15.6 | -17.0 | -18.9 | -17.9 | -19.1 | -18.4 | -7.0 |
| 180 | 325 | -3.3 | -4.9 | -6.7 | -8.0 | -5.9 | -7.5 | -11.4 | -7.1 | -9.4 | -11.2 | -14.0 | -13.5 | -14.2 | -16.0 | -18.8 | -17.8 | -18.7 | -18.3 | -8.2 |
| 180 | 348 | -3.2 | -5.2 | -6.4 | -6.4 | -8.4 | -8.1 | -6.7 | -5.7 | -7.3 | -9.3 | -11.4 | -11.4 | -12.8 | -15.0 | -17.8 | -16.6 | -18.5 | -19.0 | -7.8 |

## Standard Deviation of Relative Levels, all subjects

| SD<=1 | *1<SD<=2* | 2<SD<=3 | **SD>3** |
|---|---|---|---|

| Azimuth | Elevation | 160 | 200 | 250 | 315 | 400 | 500 | 630 | 800 | 1000 | 1250 | 1600 | 2000 | 2500 | 3150 | 4000 | 5000 | 6300 | 8000 | Awt |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 10 | *1.4* | 0.6 | 0.6 | *1.5* | *1.3* | *1.6* | *1.6* | 2.6 | 2.4 | *1.9* | *1.3* | 2.2 | 2.0 | *1.5* | *1.3* | *1.9* | *1.9* | *1.9* | 0.7 |
| 0 | 31 | *1.4* | 0.4 | 0.6 | *1.2* | 0.9 | *1.4* | *1.9* | *2.0* | *1.6* | *1.3* | *1.0* | *1.6* | *1.5* | *1.5* | *1.6* | *1.3* | *1.7* | *1.5* | 0.6 |
| 0 | 54 | *1.3* | 0.3 | 0.5 | 0.5 | 0.6 | 0.9 | *1.2* | *1.5* | *1.4* | *1.0* | 0.9 | *1.0* | *1.5* | *1.3* | *1.9* | *1.8* | *1.9* | *1.4* | 0.5 |
| 0 | 74 | 1.0 | 0.1 | 0.2 | 0.4 | 0.3 | 0.6 | 0.7 | 0.9 | 0.8 | 0.8 | 0.7 | 0.7 | 0.7 | 0.7 | 0.9 | *1.1* | *1.6* | *1.5* | 0.3 |
| 0 | 308 | 2.3 | 1.0 | *1.2* | *1.6* | *1.2* | *1.1* | *1.7* | 2.4 | **3.0** | 2.2 | 2.1 | 2.5 | 2.8 | **3.0** | 2.8 | **3.2** | **3.5** | 2.8 | *1.4* |
| 0 | 327 | 2.2 | 0.9 | *1.0* | 1.0 | 0.8 | *1.2* | *1.7* | **3.1** | **3.5** | 2.3 | 2.3 | 2.3 | 2.2 | *1.8* | 2.7 | *2.0* | 2.4 | 2.6 | *1.0* |
| 0 | 347 | 0.9 | 0.8 | 0.8 | 0.9 | *1.1* | *1.8* | *2.0* | 2.5 | 2.9 | 2.7 | 2.6 | 2.2 | 2.3 | *1.6* | 2.2 | *1.6* | 2.6 | 2.0 | 0.8 |
| 15 | 10 | 0.6 | 0.6 | 0.6 | *1.6* | *1.3* | *1.6* | *1.3* | 2.5 | 2.4 | *1.7* | *1.3* | 2.5 | 2.1 | *1.8* | *1.6* | *2.0* | *1.7* | *1.9* | 0.8 |
| 15 | 31 | *1.5* | 0.4 | 0.6 | *1.1* | 1.0 | *1.5* | *1.8* | *1.7* | *1.8* | *1.1* | 1.0 | *1.7* | *1.4* | *1.5* | *1.7* | *1.5* | *1.3* | *1.6* | 0.6 |
| 15 | 54 | *1.4* | 0.3 | 0.5 | 0.5 | 0.7 | 0.9 | *1.1* | *1.3* | *1.2* | 0.9 | 0.9 | 0.9 | *1.2* | *1.5* | *1.9* | 2.1 | 2.0 | *1.6* | 0.5 |
| 15 | 74 | *1.0* | 0.2 | 0.3 | 0.2 | 0.3 | 0.5 | 0.7 | 0.8 | 0.6 | 0.5 | 0.5 | 0.6 | 0.5 | 0.7 | 0.9 | *1.0* | *1.2* | *1.5* | 0.3 |
| 15 | 308 | *1.1* | 0.9 | *1.1* | *1.5* | *1.2* | *1.2* | *1.5* | 2.5 | **3.2** | 2.1 | 2.2 | 2.4 | 3.0 | **3.1** | **3.3** | **3.0** | 3.0 | 3.0 | *1.3* |
| 15 | 327 | *1.0* | 0.8 | 1.0 | 1.0 | 0.7 | *1.4* | *1.8* | 2.9 | **3.5** | 2.4 | 2.5 | 2.0 | 2.3 | *1.9* | 2.3 | 2.2 | 2.5 | 2.7 | *1.0* |
| 15 | 347 | 0.8 | 0.7 | 0.8 | 0.9 | *1.1* | *1.6* | *1.8* | 2.5 | **3.1** | 2.4 | 2.6 | *1.8* | 2.2 | *1.6* | 2.2 | *1.9* | 2.3 | 2.2 | 0.8 |
| 30 | 10 | 0.7 | 0.5 | 0.6 | *1.5* | *1.1* | *1.7* | *1.3* | 2.3 | 2.4 | *1.6* | *1.2* | 2.6 | 2.4 | *1.6* | *1.8* | 2.1 | 2.1 | 2.2 | 0.8 |
| 30 | 31 | *1.9* | 0.4 | 0.6 | *1.2* | 0.9 | *1.5* | *1.9* | *1.5* | *1.7* | *1.2* | 0.9 | *1.7* | *1.4* | *1.6* | *1.8* | *1.7* | *1.6* | *1.8* | 0.6 |
| 30 | 54 | *1.9* | 0.4 | 0.5 | 0.7 | 0.7 | *1.2* | *1.2* | *1.2* | *1.1* | 0.9 | *1.1* | *1.6* | 0.9 | *1.5* | *1.9* | 2.2 | 2.2 | *1.8* | 0.4 |
| 30 | 74 | *1.6* | 0.3 | 0.3 | 0.4 | 0.3 | 0.9 | 0.8 | 0.8 | 0.9 | *1.2* | 0.4 | 0.5 | 0.5 | 0.8 | *1.0* | *1.2* | *1.2* | *1.4* | 0.3 |
| 30 | 308 | *1.3* | 0.9 | *1.1* | *1.5* | *1.1* | *1.4* | *1.7* | 2.4 | **3.1** | 2.3 | 2.0 | 2.5 | 2.3 | 2.9 | 2.8 | 2.9 | 2.9 | 2.8 | *1.3* |
| 30 | 327 | *1.2* | 0.8 | 0.9 | 1.0 | 0.7 | *1.2* | *1.5* | 2.2 | **3.4** | 2.8 | 2.4 | 2.7 | *1.8* | 2.4 | 2.3 | 2.4 | 2.7 | **3.0** | 1.0 |
| 30 | 347 | 0.8 | 0.7 | 0.8 | 0.9 | *1.0* | *1.4* | *1.4* | 2.2 | **3.2** | 2.2 | 2.4 | *1.8* | 2.1 | *1.8* | 2.3 | 2.2 | 2.3 | 2.4 | 0.9 |
| 45 | 10 | 0.6 | 0.5 | 0.6 | *1.5* | *1.1* | *1.4* | *1.3* | 2.2 | 2.3 | *1.8* | *1.3* | 2.1 | 2.1 | *1.3* | *1.5* | 2.1 | 2.3 | 2.4 | 0.7 |
| 45 | 31 | *1.6* | 0.4 | 0.5 | *1.0* | 0.8 | *1.2* | *1.5* | *1.4* | *1.6* | *1.3* | 0.9 | *2.0* | *1.7* | *1.5* | *1.8* | *1.7* | *1.5* | *1.8* | 0.5 |
| 45 | 54 | *1.6* | 0.3 | 0.4 | 0.5 | 0.5 | 0.8 | *1.0* | *1.0* | 1.0 | 0.8 | 0.6 | *1.2* | 0.8 | *1.3* | *1.8* | *2.0* | *1.9* | *1.9* | 0.4 |
| 45 | 74 | *1.3* | 0.2 | 0.2 | 0.3 | 0.3 | 0.4 | 0.6 | 0.5 | 0.5 | 0.5 | 0.4 | 0.4 | 0.5 | 0.5 | 0.8 | 0.7 | *1.0* | *1.3* | 0.2 |
| 45 | 308 | *1.3* | 0.9 | *1.1* | *1.5* | *1.0* | *1.2* | *1.9* | 2.4 | 2.9 | 2.1 | 2.1 | 2.1 | 2.1 | 2.5 | 2.5 | 2.7 | 2.7 | 2.8 | *1.2* |
| 45 | 327 | 1.0 | 0.7 | 0.9 | *1.0* | 0.8 | *1.1* | *1.3* | 2.1 | **3.0** | 2.9 | *1.9* | *1.9* | 2.1 | 2.0 | 2.3 | 2.5 | 2.6 | **3.1** | 0.9 |
| 45 | 347 | 1.0 | 0.6 | 0.8 | 1.0 | 0.9 | *1.3* | *1.3* | 2.3 | **3.1** | *1.9* | *1.9* | *1.8* | *1.7* | *1.5* | 2.0 | 2.7 | 2.4 | 2.8 | 0.7 |

## Standard Deviation of Relative Levels, all subjects (continued)

| Azimuth | Elevation | 160 | 200 | 250 | 315 | 400 | 500 | 630 | 800 | 1000 | 1250 | 1600 | 2000 | 2500 | 3150 | 4000 | 5000 | 6300 | 8000 | Awt |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 60 | 10 | 0.7 | 0.5 | 0.6 | 1.4 | 1.2 | 1.1 | 1.2 | 2.3 | 2.4 | 1.9 | 1.7 | 1.7 | 2.0 | 1.6 | 1.8 | 2.1 | 2.8 | 2.8 | 0.7 |
| 60 | 31 | 1.9 | 0.3 | 0.6 | 0.9 | 0.9 | 0.9 | 1.1 | 1.7 | 1.9 | 1.3 | 1.0 | 1.9 | 2.0 | 1.0 | 2.0 | 1.9 | 1.9 | 2.1 | 0.6 |
| 60 | 54 | 1.9 | 0.2 | 0.4 | 0.4 | 0.5 | 0.6 | 1.0 | 1.1 | 1.1 | 0.9 | 0.6 | 1.3 | 0.9 | 1.1 | 1.7 | 2.0 | 2.1 | 2.2 | 0.4 |
| 60 | 74 | 1.4 | 0.1 | 0.2 | 0.2 | 0.2 | 0.3 | 0.5 | 0.4 | 0.4 | 0.4 | 0.4 | 0.6 | 0.4 | 0.6 | 0.8 | 0.8 | 1.2 | 1.3 | 0.2 |
| 60 | 308 | 1.3 | 0.8 | 1.1 | 1.7 | 1.0 | 1.1 | 1.7 | 2.5 | 3.0 | 2.2 | 2.0 | 2.0 | 2.0 | 2.4 | 2.9 | 2.7 | 2.8 | 3.1 | 1.2 |
| 60 | 327 | 1.2 | 0.7 | 0.8 | 1.0 | 0.8 | 0.8 | 1.4 | 2.4 | 3.0 | 1.9 | 1.6 | 1.8 | 2.0 | 2.3 | 2.0 | 2.9 | 2.9 | 3.4 | 0.9 |
| 60 | 347 | 0.8 | 0.6 | 0.7 | 1.0 | 0.9 | 1.3 | 1.2 | 2.3 | 2.9 | 1.6 | 1.6 | 2.0 | 1.8 | 1.7 | 2.3 | 2.3 | 3.0 | 3.0 | 0.8 |
| 75 | 10 | 0.7 | 0.5 | 0.5 | 1.5 | 1.3 | 1.0 | 1.3 | 2.0 | 3.2 | 2.0 | 1.6 | 1.5 | 1.5 | 1.9 | 1.8 | 2.2 | 2.8 | 2.8 | 0.8 |
| 75 | 31 | 1.5 | 0.3 | 0.5 | 1.0 | 0.7 | 0.8 | 1.2 | 1.9 | 2.6 | 1.5 | 1.5 | 1.5 | 2.0 | 1.3 | 1.7 | 1.9 | 2.0 | 2.1 | 0.6 |
| 75 | 54 | 1.4 | 0.3 | 0.5 | 0.4 | 0.4 | 0.5 | 0.9 | 1.2 | 1.0 | 1.1 | 1.1 | 1.5 | 1.3 | 1.0 | 1.4 | 1.8 | 2.0 | 2.0 | 0.4 |
| 75 | 74 | 1.0 | 0.3 | 0.3 | 0.2 | 0.2 | 0.2 | 0.4 | 0.5 | 0.4 | 0.4 | 0.6 | 0.7 | 0.6 | 0.6 | 0.5 | 0.6 | 1.0 | 1.2 | 0.2 |
| 75 | 308 | 1.1 | 0.8 | 1.1 | 1.6 | 1.1 | 1.1 | 1.5 | 2.2 | 2.8 | 2.4 | 2.0 | 2.0 | 2.3 | 2.3 | 2.5 | 2.7 | 2.7 | 3.3 | 1.1 |
| 75 | 327 | 0.9 | 0.7 | 0.8 | 1.1 | 0.8 | 1.0 | 1.5 | 2.1 | 2.7 | 2.0 | 1.9 | 1.8 | 2.1 | 2.0 | 2.3 | 2.5 | 3.2 | 3.7 | 0.9 |
| 75 | 347 | 0.7 | 0.6 | 0.6 | 1.0 | 0.9 | 1.4 | 1.2 | 1.9 | 2.8 | 1.9 | 1.3 | 1.9 | 2.2 | 1.7 | 1.9 | 2.8 | 2.9 | 2.8 | 0.8 |
| 90 | 10 | 1.1 | 0.4 | 0.5 | 1.2 | 0.9 | 0.8 | 1.0 | 1.7 | 2.3 | 1.5 | 1.5 | 1.4 | 1.6 | 1.5 | 1.8 | 2.1 | 2.8 | 3.0 | 0.7 |
| 90 | 31 | 1.0 | 0.3 | 0.5 | 0.8 | 0.6 | 0.7 | 0.9 | 1.6 | 2.3 | 1.4 | 1.3 | 1.2 | 1.5 | 1.3 | 1.6 | 2.0 | 2.1 | 2.3 | 0.6 |
| 90 | 54 | 0.8 | 0.2 | 1.0 | 0.6 | 0.8 | 0.8 | 1.0 | 1.3 | 1.3 | 1.0 | 1.4 | 1.2 | 1.2 | 0.9 | 1.3 | 1.7 | 2.0 | 1.9 | 0.5 |
| 90 | 74 | 0.6 | 0.2 | 1.0 | 0.5 | 0.7 | 0.8 | 0.8 | 0.6 | 0.6 | 0.6 | 0.8 | 0.8 | 0.7 | 0.6 | 0.9 | 0.9 | 1.2 | 1.4 | 0.4 |
| 90 | 308 | 1.9 | 1.2 | 1.2 | 1.7 | 1.3 | 1.5 | 1.3 | 2.3 | 2.8 | 2.4 | 2.4 | 2.2 | 2.3 | 2.8 | 3.2 | 3.1 | 3.6 | 3.5 | 1.3 |
| 90 | 327 | 1.4 | 0.8 | 0.9 | 1.0 | 0.8 | 1.0 | 1.4 | 2.0 | 2.4 | 1.5 | 2.0 | 1.9 | 1.9 | 1.9 | 2.4 | 2.7 | 3.1 | 3.2 | 0.9 |
| 90 | 347 | 0.8 | 0.6 | 0.6 | 1.0 | 0.8 | 1.2 | 1.2 | 1.8 | 2.3 | 1.1 | 1.3 | 1.6 | 2.0 | 1.7 | 2.1 | 2.5 | 2.8 | 2.9 | 0.8 |
| 105 | 9 | 0.6 | 0.5 | 0.6 | 1.2 | 1.0 | 1.0 | 1.3 | 2.2 | 2.8 | 1.5 | 1.4 | 1.6 | 2.3 | 1.9 | 2.0 | 2.5 | 2.8 | 3.0 | 0.9 |
| 105 | 31 | 0.3 | 0.3 | 0.6 | 0.6 | 0.6 | 0.9 | 1.3 | 2.1 | 2.7 | 1.6 | 1.4 | 1.4 | 1.8 | 1.6 | 2.1 | 2.4 | 2.3 | 2.2 | 0.7 |
| 105 | 56 | 0.2 | 0.2 | 0.4 | 0.3 | 0.3 | 0.5 | 0.7 | 1.5 | 1.8 | 1.1 | 1.6 | 1.6 | 1.8 | 1.1 | 1.4 | 1.8 | 1.8 | 1.7 | 0.4 |
| 105 | 74 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.2 | 0.3 | 0.7 | 0.6 | 0.5 | 0.8 | 0.6 | 1.1 | 0.6 | 0.8 | 0.9 | 0.9 | 1.1 | 0.2 |
| 105 | 306 | 1.0 | 0.9 | 1.1 | 1.6 | 1.3 | 1.3 | 1.4 | 2.1 | 3.2 | 2.6 | 2.1 | 2.5 | 2.9 | 2.5 | 3.0 | 3.6 | 3.7 | 3.9 | 1.1 |
| 105 | 325 | 0.9 | 0.8 | 1.0 | 1.1 | 0.8 | 1.2 | 1.8 | 2.4 | 2.8 | 1.6 | 2.0 | 1.8 | 2.2 | 1.9 | 2.6 | 3.3 | 3.2 | 3.1 | 1.0 |
| 105 | 348 | 0.9 | 0.7 | 0.7 | 1.1 | 1.0 | 1.4 | 1.7 | 2.4 | 2.7 | 1.4 | 1.3 | 1.6 | 2.5 | 1.8 | 2.7 | 3.1 | 3.0 | 2.8 | 0.9 |
| 120 | 9 | 0.7 | 0.5 | 0.6 | 1.2 | 0.9 | 0.9 | 1.3 | 2.1 | 3.2 | 1.9 | 1.3 | 1.9 | 2.3 | 2.3 | 2.5 | 2.7 | 3.0 | 3.3 | 1.0 |
| 120 | 31 | 0.4 | 0.3 | 0.6 | 0.7 | 0.6 | 0.8 | 1.2 | 1.9 | 2.8 | 1.9 | 1.4 | 1.5 | 1.6 | 1.7 | 2.0 | 2.7 | 2.7 | 2.4 | 0.8 |
| 120 | 56 | 0.2 | 0.2 | 0.3 | 0.3 | 0.3 | 0.5 | 0.7 | 1.5 | 1.9 | 1.3 | 1.4 | 2.0 | 1.4 | 1.4 | 1.5 | 1.7 | 2.1 | 2.0 | 0.5 |
| 120 | 74 | 0.1 | 0.1 | 0.1 | 0.1 | 0.2 | 0.3 | 0.3 | 0.8 | 0.7 | 0.5 | 0.8 | 0.9 | 0.9 | 0.6 | 1.0 | 0.9 | 0.9 | 1.2 | 0.3 |

## Standard Deviation of Relative Levels, all subjects (continued)

| Azimuth | Elevation | 160 | 200 | 250 | 315 | 400 | 500 | 630 | 800 | 1000 | 1250 | 1600 | 2000 | 2500 | 3150 | 4000 | 5000 | 6300 | 8000 | Awt |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 120 | 306 | 1.0 | 0.9 | 1.1 | 1.9 | 1.4 | 1.3 | 1.5 | 2.1 | 3.5 | 3.0 | 2.8 | 3.3 | 3.4 | 3.2 | 3.9 | 4.5 | 4.3 | 3.7 | 1.4 |
| 120 | 325 | 1.0 | 0.9 | 1.0 | 1.2 | 0.8 | 1.2 | 2.3 | 2.7 | 3.3 | 2.1 | 2.1 | 2.6 | 2.7 | 2.4 | 3.0 | 4.0 | 3.8 | 3.6 | 1.2 |
| 120 | 348 | 1.0 | 0.7 | 0.7 | 1.1 | 0.9 | 1.4 | 1.8 | 2.5 | 3.1 | 1.9 | 1.5 | 2.2 | 2.5 | 2.0 | 2.6 | 3.2 | 3.7 | 3.4 | 1.0 |
| 135 | 9 | 0.7 | 0.6 | 0.6 | 1.2 | 1.1 | 1.0 | 1.1 | 1.9 | 3.0 | 2.1 | 1.7 | 1.8 | 1.7 | 2.2 | 2.7 | 2.9 | 3.0 | 3.6 | 0.9 |
| 135 | 31 | 0.4 | 0.4 | 0.6 | 0.8 | 0.7 | 0.7 | 1.1 | 1.7 | 2.4 | 2.0 | 1.6 | 1.8 | 1.9 | 1.5 | 2.2 | 2.6 | 2.8 | 2.6 | 0.8 |
| 135 | 56 | 0.2 | 0.3 | 0.3 | 0.4 | 0.4 | 0.5 | 0.7 | 1.6 | 1.8 | 1.5 | 1.4 | 1.4 | 1.1 | 1.5 | 1.7 | 2.0 | 2.3 | 2.3 | 0.5 |
| 135 | 74 | 0.3 | 0.1 | 0.1 | 0.1 | 0.2 | 0.3 | 0.3 | 0.9 | 0.8 | 0.6 | 0.8 | 1.0 | 0.8 | 0.8 | 1.0 | 0.7 | 0.9 | 1.3 | 0.3 |
| 135 | 306 | 0.9 | 0.9 | 1.1 | 1.8 | 1.5 | 1.3 | 1.5 | 2.2 | 3.1 | 2.7 | 2.7 | 2.5 | 2.4 | 2.3 | 3.2 | 3.6 | 3.9 | 4.2 | 1.2 |
| 135 | 325 | 0.9 | 0.9 | 1.0 | 1.2 | 0.9 | 1.1 | 2.2 | 2.6 | 3.0 | 2.3 | 2.1 | 2.3 | 2.6 | 2.3 | 2.8 | 3.6 | 3.5 | 4.1 | 1.2 |
| 135 | 348 | 0.9 | 0.8 | 0.7 | 1.1 | 1.0 | 1.4 | 1.7 | 2.3 | 3.0 | 2.2 | 1.6 | 1.8 | 2.2 | 1.9 | 2.7 | 3.1 | 3.3 | 3.4 | 0.9 |
| 150 | 9 | 0.8 | 0.6 | 0.7 | 1.3 | 1.1 | 0.9 | 1.2 | 1.7 | 2.4 | 2.0 | 2.1 | 2.6 | 2.3 | 2.0 | 2.6 | 2.9 | 2.9 | 3.2 | 1.0 |
| 150 | 31 | 0.4 | 0.4 | 0.6 | 0.7 | 0.7 | 0.6 | 1.0 | 1.8 | 2.1 | 1.5 | 1.7 | 2.3 | 2.5 | 2.0 | 2.2 | 2.9 | 2.7 | 2.5 | 0.7 |
| 150 | 56 | 0.2 | 0.3 | 0.3 | 0.4 | 0.4 | 0.5 | 0.6 | 1.7 | 1.9 | 1.3 | 1.2 | 1.6 | 1.0 | 1.1 | 1.4 | 1.9 | 2.1 | 2.2 | 0.6 |
| 150 | 74 | 0.1 | 0.1 | 0.1 | 0.1 | 0.2 | 0.3 | 0.3 | 1.0 | 0.8 | 0.6 | 0.8 | 0.8 | 0.7 | 0.5 | 0.6 | 0.7 | 0.8 | 0.9 | 0.3 |
| 150 | 306 | 1.0 | 1.0 | 1.2 | 1.7 | 1.3 | 1.2 | 1.6 | 2.6 | 2.9 | 3.0 | 2.8 | 2.9 | 3.1 | 2.8 | 2.8 | 3.4 | 3.5 | 3.7 | 1.3 |
| 150 | 325 | 1.0 | 1.0 | 1.1 | 1.2 | 1.0 | 1.2 | 2.0 | 2.4 | 2.6 | 2.3 | 2.3 | 2.6 | 2.8 | 2.3 | 2.6 | 3.4 | 3.1 | 3.3 | 1.3 |
| 150 | 348 | 1.1 | 0.8 | 0.8 | 1.2 | 1.1 | 1.5 | 1.5 | 2.1 | 2.8 | 2.3 | 1.9 | 2.1 | 2.5 | 2.1 | 2.7 | 3.2 | 3.1 | 3.4 | 1.0 |
| 165 | 9 | 0.7 | 0.6 | 0.7 | 1.4 | 1.4 | 1.0 | 1.4 | 1.6 | 2.2 | 1.7 | 2.0 | 2.1 | 2.5 | 2.0 | 2.4 | 2.9 | 2.7 | 3.4 | 1.0 |
| 165 | 31 | 0.6 | 0.4 | 0.6 | 0.8 | 0.9 | 0.8 | 1.1 | 1.6 | 2.2 | 1.5 | 1.7 | 2.4 | 2.8 | 2.8 | 2.6 | 2.8 | 2.7 | 2.6 | 0.8 |
| 165 | 56 | 0.6 | 0.3 | 0.3 | 0.4 | 0.4 | 0.6 | 0.6 | 1.6 | 2.2 | 1.8 | 1.2 | 1.3 | 1.2 | 1.0 | 1.5 | 1.8 | 2.4 | 2.1 | 0.6 |
| 165 | 74 | 0.6 | 0.1 | 0.1 | 0.2 | 0.2 | 0.3 | 0.4 | 1.0 | 0.9 | 0.6 | 0.8 | 0.9 | 0.8 | 0.6 | 0.6 | 0.7 | 0.9 | 1.1 | 0.3 |
| 165 | 306 | 0.9 | 0.9 | 1.0 | 1.7 | 1.3 | 1.3 | 1.8 | 2.9 | 2.6 | 1.9 | 2.1 | 3.0 | 3.3 | 3.0 | 3.0 | 3.2 | 3.4 | 3.4 | 1.4 |
| 165 | 325 | 0.9 | 0.9 | 1.1 | 1.3 | 1.1 | 1.5 | 1.9 | 2.1 | 2.7 | 1.7 | 1.9 | 2.5 | 2.5 | 2.5 | 2.4 | 3.0 | 3.0 | 3.2 | 1.3 |
| 165 | 348 | 0.9 | 0.8 | 0.8 | 1.3 | 1.1 | 1.5 | 1.5 | 1.8 | 2.5 | 1.6 | 1.7 | 1.5 | 2.2 | 2.2 | 2.5 | 3.1 | 3.0 | 3.3 | 1.0 |
| 180 | 9 | 1.1 | 0.6 | 0.8 | 1.4 | 1.8 | 1.4 | 1.7 | 1.8 | 2.1 | 1.4 | 1.7 | 2.0 | 2.1 | 1.9 | 2.5 | 3.2 | 3.0 | 3.8 | 1.0 |
| 180 | 31 | 0.8 | 0.5 | 0.7 | 0.9 | 1.1 | 1.1 | 1.4 | 1.9 | 2.0 | 1.4 | 1.3 | 1.5 | 1.8 | 2.0 | 2.7 | 3.1 | 2.9 | 3.3 | 0.7 |
| 180 | 56 | 0.7 | 0.3 | 0.4 | 0.5 | 0.6 | 0.8 | 0.8 | 1.6 | 2.1 | 1.8 | 1.3 | 1.4 | 1.4 | 1.0 | 1.1 | 1.4 | 1.3 | 1.7 | 0.5 |
| 180 | 74 | 0.2 | 0.1 | 0.1 | 0.2 | 0.2 | 0.4 | 0.4 | 1.0 | 0.9 | 0.9 | 0.7 | 0.9 | 0.7 | 0.7 | 0.9 | 0.8 | 0.7 | 0.7 | 0.3 |
| 180 | 306 | 2.3 | 1.8 | 1.2 | 3.2 | 2.0 | 1.7 | 2.2 | 3.4 | 3.4 | 3.0 | 3.5 | 3.8 | 3.7 | 2.7 | 3.0 | 3.6 | 4.1 | 4.1 | 1.9 |
| 180 | 325 | 2.1 | 1.7 | 1.3 | 2.5 | 1.6 | 2.0 | 2.2 | 2.5 | 3.2 | 2.8 | 2.3 | 2.4 | 3.1 | 2.7 | 2.7 | 3.3 | 3.8 | 3.9 | 1.7 |
| 180 | 348 | 1.1 | 0.8 | 0.9 | 1.2 | 1.3 | 2.0 | 1.9 | 2.1 | 2.4 | 1.6 | 1.8 | 2.0 | 2.0 | 2.0 | 2.6 | 3.3 | 3.1 | 3.8 | 1.1 |

## Male subjects

| Azimuth | Elevation | 160 | 200 | 250 | 315 | 400 | 500 | 630 | 800 | 1000 | 1250 | 1600 | 2000 | 2500 | 3150 | 4000 | 5000 | 6300 | 8000 | Awt |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 0 | 10 | 0.1 | 0.3 | 0.0 | -1.1 | -1.2 | 0.3 | 0.6 | -0.3 | 1.3 | 1.0 | -0.7 | 0.4 | -0.1 | 0.2 | 0.3 | 0.2 | 1.1 | 1.4 | -0.1 |
| 0 | 31 | 0.3 | 0.4 | -1.2 | -2.9 | -0.1 | -0.1 | -2.0 | 0.7 | 2.6 | 1.2 | -2.3 | 0.3 | 1.1 | -2.7 | -2.2 | 1.0 | 0.2 | 1.1 | -0.6 |
| 0 | 54 | 0.0 | -0.1 | -2.3 | -2.3 | -0.3 | -1.1 | -2.6 | 1.0 | 1.7 | 0.3 | -0.6 | 0.6 | -1.2 | 0.1 | -2.4 | -1.3 | 0.2 | -0.9 | -1.0 |
| 0 | 74 | -0.6 | -0.9 | -2.9 | -2.0 | -1.2 | -3.4 | -3.3 | 0.4 | 1.0 | 0.4 | -3.4 | -0.5 | -1.4 | -2.1 | -2.5 | 0.2 | -1.7 | -2.0 | -1.9 |
| 0 | 90 | -1.5 | -1.6 | -3.4 | -2.2 | -1.6 | -3.8 | -4.0 | -1.8 | -0.1 | -1.6 | -4.1 | -3.0 | -2.0 | -3.5 | -5.8 | -2.3 | -1.1 | -4.7 | -2.8 |
| 0 | 308 | -1.4 | -1.8 | -3.3 | -3.2 | 0.4 | 1.7 | 3.3 | 4.6 | -0.1 | -1.7 | -6.1 | -5.4 | -2.9 | -1.0 | -2.2 | -1.2 | -0.5 | -0.6 | 0.2 |
| 0 | 327 | -0.6 | -1.2 | -1.9 | 0.3 | 3.6 | 3.8 | 2.5 | 0.8 | -3.6 | -3.1 | -3.7 | -1.5 | 2.1 | -0.1 | -0.1 | 2.1 | 2.0 | 2.5 | 1.3 |
| 0 | 347 | -0.2 | -0.3 | 0.0 | 1.4 | 1.6 | -0.4 | -0.8 | 0.3 | -1.7 | -1.3 | 0.9 | -0.5 | 0.1 | -0.2 | -0.4 | -0.3 | -1.4 | -1.8 | 0.1 |
| 15 | 0 | 0.0 | 0.0 | -0.1 | -0.1 | 0.0 | 0.1 | 0.3 | 0.1 | -0.1 | -0.2 | -0.3 | 0.0 | -0.3 | 0.1 | -0.2 | 0.1 | -0.3 | -0.2 | 0.0 |
| 15 | 10 | 0.1 | 0.3 | -0.1 | -1.2 | -1.0 | 0.5 | 0.6 | -0.2 | 1.3 | 0.5 | -0.8 | 0.4 | -0.3 | 0.3 | 0.0 | 0.3 | 0.9 | 1.3 | -0.1 |
| 15 | 31 | 0.4 | 0.4 | -1.3 | -2.9 | 0.0 | -0.2 | -1.8 | 1.1 | 2.4 | 1.1 | -2.3 | 0.2 | 1.0 | -2.6 | -2.0 | 1.0 | -0.1 | 0.8 | -0.6 |
| 15 | 54 | 0.1 | 0.0 | -2.4 | -2.3 | -0.4 | -1.3 | -2.3 | 1.1 | 1.8 | 0.2 | -0.7 | 0.4 | -1.2 | 0.1 | -2.2 | -1.2 | 0.3 | -0.8 | -0.9 |
| 15 | 74 | -0.6 | -0.9 | -3.0 | -2.0 | -1.2 | -3.4 | -3.2 | 0.4 | 1.1 | 0.2 | -3.4 | -0.6 | -1.5 | -2.0 | -2.5 | 0.3 | -1.7 | -1.8 | -1.9 |
| 15 | 90 | -1.5 | -1.6 | -3.4 | -2.2 | -1.6 | -3.8 | -4.0 | -1.8 | -0.1 | -1.6 | -4.1 | -3.0 | -2.0 | -3.5 | -5.8 | -2.3 | -1.1 | -4.7 | -2.8 |
| 15 | 308 | -1.5 | -1.8 | -3.3 | -3.1 | 0.5 | 1.6 | 3.1 | 4.4 | -0.1 | -3.3 | -7.6 | -6.1 | -3.4 | -1.9 | -3.6 | -2.2 | -1.2 | -1.5 | -0.1 |
| 15 | 327 | -0.7 | -1.2 | -2.0 | 0.3 | 3.4 | 3.5 | 2.3 | 1.2 | -2.4 | -3.4 | -4.9 | -1.4 | 1.6 | 0.2 | -0.3 | 1.9 | 1.7 | 2.5 | 1.1 |
| 15 | 347 | -0.2 | -0.3 | -0.1 | 1.3 | 1.4 | -0.3 | -0.2 | 0.6 | -2.0 | -1.1 | 0.3 | -0.4 | -0.4 | -0.2 | -0.4 | -0.1 | -1.8 | -2.2 | 0.0 |
| 30 | 0 | -0.1 | -0.2 | -0.3 | -0.4 | -0.1 | 0.4 | 0.8 | 0.3 | -0.8 | -0.8 | -0.8 | 0.3 | -0.3 | -0.2 | -0.5 | -0.4 | -0.9 | -0.9 | -0.1 |
| 30 | 10 | 0.0 | 0.1 | -0.2 | -1.4 | -1.0 | 0.8 | 0.7 | 0.0 | 0.4 | -0.2 | -0.6 | 0.7 | -0.1 | -0.1 | -0.3 | 0.0 | -0.1 | 0.5 | -0.1 |
| 30 | 31 | 0.2 | 0.3 | -1.5 | -2.9 | 0.0 | -0.1 | -1.6 | 0.9 | 2.0 | 0.8 | -2.0 | 0.0 | 1.6 | -2.8 | -2.3 | 0.7 | -0.5 | 0.1 | -0.6 |
| 30 | 54 | -0.1 | -0.2 | -2.4 | -2.3 | -0.4 | -1.3 | -2.4 | 0.7 | 1.6 | 0.2 | -0.9 | 0.2 | -1.1 | 0.0 | -2.3 | -1.3 | 0.1 | -1.2 | -1.1 |
| 30 | 74 | -0.8 | -1.0 | -2.9 | -2.0 | -1.3 | -3.5 | -3.4 | 0.1 | 1.1 | 0.2 | -3.6 | -0.8 | -1.5 | -2.1 | -2.6 | 0.3 | -1.7 | -1.9 | -2.0 |
| 30 | 90 | -1.5 | -1.6 | -3.4 | -2.2 | -1.6 | -3.8 | -4.0 | -1.8 | -0.1 | -1.6 | -4.1 | -3.0 | -2.0 | -3.5 | -5.8 | -2.3 | -1.1 | -4.7 | -2.8 |
| 30 | 308 | -1.5 | -1.9 | -3.4 | -3.3 | 0.2 | 1.1 | 2.0 | 2.9 | -0.7 | -3.0 | -6.8 | -5.7 | -3.9 | -2.4 | -3.9 | -2.9 | -2.2 | -1.9 | -0.7 |
| 30 | 327 | -0.8 | -1.4 | -2.2 | -0.1 | 2.8 | 2.6 | 1.6 | 2.0 | 0.0 | -3.5 | -5.7 | -1.8 | 1.8 | 0.4 | -1.0 | 1.4 | 1.5 | 2.3 | 0.7 |
| 30 | 347 | -0.3 | -0.5 | -0.3 | 1.0 | 0.9 | -0.1 | 0.9 | 0.7 | -2.2 | -1.7 | -0.9 | -0.2 | -0.5 | -0.3 | -0.8 | -0.9 | -2.0 | -2.6 | -0.1 |

## Male subjects (continued)

| Azimuth | Elevation | 160 | 200 | 250 | 315 | 400 | 500 | 630 | 800 | 1000 | 1250 | 1600 | 2000 | 2500 | 3150 | 4000 | 5000 | 6300 | 8000 | Awt |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 45 | 0 | -0.5 | -0.5 | -0.8 | -1.0 | -0.5 | 0.5 | 0.8 | 0.7 | -1.6 | -2.3 | -2.0 | -0.4 | -0.7 | -1.2 | -1.1 | -1.7 | -2.7 | -3.1 | -0.5 |
| 45 | 10 | -0.3 | -0.2 | -0.7 | -2.0 | -1.0 | 0.9 | 0.5 | 0.4 | -1.2 | -2.0 | -1.2 | 0.5 | -1.1 | -0.9 | -1.0 | -1.3 | -2.2 | -2.1 | -0.6 |
| 45 | 31 | -0.3 | 0.0 | -1.7 | -3.1 | 0.0 | -0.3 | -1.7 | 0.6 | 0.5 | -0.1 | -1.9 | -1.2 | 1.2 | -3.4 | -2.7 | -0.4 | -1.8 | -1.6 | -1.0 |
| 45 | 54 | -0.5 | -0.3 | -2.5 | -2.3 | -0.4 | -1.4 | -2.6 | 0.3 | 0.8 | -0.1 | -1.2 | -0.8 | -1.3 | -0.7 | -3.0 | -2.1 | -0.6 | -1.9 | -1.3 |
| 45 | 74 | -1.1 | -1.0 | -3.0 | -2.0 | -1.3 | -3.5 | -3.5 | -0.1 | 0.6 | -0.1 | -3.8 | -1.3 | -1.7 | -2.6 | -3.1 | -0.3 | -2.3 | -2.5 | -2.2 |
| 45 | 90 | -1.5 | -1.6 | -3.4 | -2.2 | -1.6 | -3.8 | -4.0 | -1.8 | -0.1 | -1.6 | -4.1 | -3.0 | -2.0 | -3.5 | -5.8 | -2.3 | -1.1 | -4.7 | -2.8 |
| 45 | 308 | -1.6 | -2.1 | -3.8 | -4.2 | -0.8 | 0.0 | 0.1 | 1.3 | -0.8 | -1.4 | -5.7 | -5.4 | -4.2 | -2.9 | -3.8 | -2.0 | -1.3 | -1.5 | -1.6 |
| 45 | 327 | -1.1 | -1.8 | -2.8 | -0.9 | 2.0 | 1.5 | 0.9 | 3.0 | 0.7 | -3.4 | -6.5 | -3.5 | 0.6 | -0.4 | -1.9 | 0.2 | 0.8 | 1.8 | 0.0 |
| 45 | 347 | -0.8 | -1.0 | -0.9 | 0.3 | 0.2 | -0.1 | 1.2 | 1.0 | -2.1 | -2.8 | -3.0 | -1.6 | -0.2 | -1.6 | -1.1 | -2.2 | -3.4 | -4.6 | -0.5 |
| 60 | 0 | -0.6 | -1.0 | -1.4 | -1.6 | -0.8 | 0.3 | 0.7 | 1.4 | -1.2 | -3.7 | -3.8 | -1.6 | -1.0 | -1.7 | -2.2 | -2.5 | -4.5 | -5.2 | -0.9 |
| 60 | 10 | -0.5 | -0.7 | -1.2 | -2.5 | -1.0 | 0.7 | 0.4 | 1.2 | -1.4 | -4.1 | -3.0 | 0.2 | -1.3 | -1.5 | -1.8 | -1.9 | -3.8 | -4.4 | -0.9 |
| 60 | 31 | -0.1 | -0.3 | -2.2 | -3.3 | -0.1 | -0.6 | -1.5 | 0.8 | -1.0 | -1.4 | -2.5 | -1.5 | -0.2 | -3.6 | -3.8 | -1.0 | -3.2 | -3.1 | -1.4 |
| 60 | 54 | -0.2 | -0.5 | -2.8 | -2.4 | -0.5 | -1.7 | -2.5 | -0.2 | -0.2 | -0.6 | -1.4 | -1.6 | -1.8 | -1.1 | -3.3 | -2.7 | -1.1 | -2.2 | -1.6 |
| 60 | 74 | -0.8 | -1.1 | -3.1 | -2.1 | -1.4 | -3.6 | -3.6 | -0.5 | 0.1 | -0.3 | -4.0 | -1.9 | -2.1 | -3.0 | -3.5 | -1.1 | -2.9 | -2.7 | -2.4 |
| 60 | 90 | -1.5 | -1.6 | -3.4 | -2.2 | -1.6 | -3.8 | -4.0 | -1.8 | -0.1 | -1.6 | -4.1 | -3.0 | -2.0 | -3.5 | -5.8 | -2.3 | -1.1 | -4.7 | -2.8 |
| 60 | 308 | -1.7 | -2.3 | -4.2 | -4.9 | -1.7 | -0.9 | -0.5 | 1.4 | -0.1 | -1.8 | -5.7 | -4.9 | -3.9 | -3.6 | -5.0 | -2.9 | -2.3 | -1.9 | -2.1 |
| 60 | 327 | -1.2 | -2.2 | -3.6 | -1.7 | 1.1 | 0.5 | 0.6 | 2.8 | -0.3 | -1.8 | -5.2 | -5.0 | -1.8 | -1.3 | -1.6 | -1.6 | -0.2 | 1.6 | -0.6 |
| 60 | 347 | -0.8 | -1.5 | -1.6 | -0.5 | -0.7 | -0.2 | 1.0 | 1.6 | -0.9 | -3.2 | -4.8 | -4.0 | -0.7 | -1.8 | -2.8 | -3.3 | -5.4 | -6.3 | -0.9 |
| 75 | 0 | -1.1 | -1.6 | -2.2 | -2.3 | -1.6 | -0.2 | 0.3 | 1.8 | -0.5 | -4.3 | -5.4 | -3.6 | -2.3 | -3.2 | -2.9 | -3.8 | -5.9 | -7.1 | -1.4 |
| 75 | 10 | -1.0 | -1.2 | -2.0 | -3.0 | -1.3 | 0.3 | 0.2 | 1.5 | -0.7 | -5.5 | -5.9 | -1.5 | -1.4 | -3.5 | -2.5 | -3.1 | -5.0 | -6.3 | -1.4 |
| 75 | 31 | -0.5 | -0.7 | -2.6 | -3.5 | -0.4 | -1.0 | -1.7 | 0.8 | -1.7 | -3.4 | -4.1 | -1.7 | -1.3 | -4.6 | -5.1 | -2.1 | -4.4 | -4.7 | -1.9 |
| 75 | 54 | -0.5 | -0.7 | -3.1 | -2.5 | -0.8 | -1.9 | -2.6 | -0.8 | -1.3 | -1.7 | -2.1 | -2.4 | -2.8 | -1.8 | -4.4 | -3.6 | -2.0 | -3.0 | -2.1 |
| 75 | 74 | -1.0 | -1.2 | -3.3 | -2.1 | -1.5 | -3.7 | -3.7 | -1.0 | -0.6 | -0.8 | -4.4 | -2.7 | -2.7 | -3.5 | -4.3 | -1.8 | -3.6 | -3.5 | -2.7 |
| 75 | 90 | -1.5 | -1.6 | -3.4 | -2.2 | -1.6 | -3.8 | -4.0 | -1.8 | -0.1 | -1.6 | -4.1 | -3.0 | -2.0 | -3.5 | -5.8 | -2.3 | -1.1 | -4.7 | -2.8 |
| 75 | 308 | -2.1 | -2.6 | -5.0 | -6.5 | -3.2 | -1.7 | -0.7 | 1.6 | 0.1 | -2.8 | -6.7 | -5.4 | -4.7 | -4.5 | -6.6 | -4.6 | -3.4 | -3.6 | -2.6 |
| 75 | 327 | -1.6 | -2.7 | -4.5 | -2.8 | 0.0 | -0.4 | -0.2 | 1.4 | -0.6 | -0.9 | -4.1 | -5.2 | -3.3 | -3.3 | -4.4 | -2.8 | -1.4 | 0.7 | -1.4 |
| 75 | 347 | -1.2 | -2.0 | -2.4 | -1.4 | -1.8 | -0.9 | 0.4 | 2.2 | -0.1 | -2.7 | -4.7 | -6.4 | -3.5 | -2.9 | -3.5 | -4.8 | -7.1 | -8.1 | -1.5 |
| 90 | 0 | -1.4 | -2.4 | -3.0 | -3.4 | -2.8 | -1.6 | -0.7 | 1.2 | -0.5 | -4.1 | -6.6 | -5.5 | -4.8 | -5.4 | -5.8 | -4.9 | -7.8 | -9.6 | -2.5 |
| 90 | 10 | -1.2 | -1.9 | -2.8 | -4.1 | -2.4 | -1.0 | -0.5 | 1.1 | -0.3 | -5.1 | -8.2 | -4.7 | -3.8 | -5.1 | -5.5 | -4.4 | -7.4 | -9.4 | -2.4 |
| 90 | 31 | -1.0 | -1.2 | -3.2 | -3.9 | -1.1 | -1.8 | -2.1 | 0.7 | -2.3 | -5.0 | -6.4 | -3.2 | -1.8 | -5.4 | -6.4 | -5.9 | -6.9 | -6.5 | -2.6 |
| 90 | 54 | -1.1 | -1.2 | -3.4 | -2.9 | -1.6 | -2.8 | -2.9 | -1.7 | -2.8 | -3.7 | -3.8 | -2.9 | -3.9 | -3.5 | -5.8 | -5.0 | -4.8 | -4.6 | -2.9 |
| 90 | 74 | -1.3 | -1.5 | -3.4 | -2.3 | -1.9 | -4.0 | -4.0 | -1.9 | -1.5 | -1.4 | -4.8 | -3.6 | -3.1 | -4.2 | -5.1 | -3.0 | -4.7 | -4.7 | -3.1 |
| 90 | 90 | -1.5 | -1.6 | -3.4 | -2.2 | -1.6 | -3.8 | -4.0 | -1.8 | -0.1 | -1.6 | -4.1 | -3.0 | -2.0 | -3.5 | -5.8 | -2.3 | -1.1 | -4.7 | -2.8 |

## Male subjects (continued)

| Azimuth | Elevation | 160 | 200 | 250 | 315 | 400 | 500 | 630 | 800 | 1000 | 1250 | 1600 | 2000 | 2500 | 3150 | 4000 | 5000 | 6300 | 8000 | Awt |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 90 | 308 | -2.5 | -3.5 | -5.5 | -7.6 | -4.6 | -2.4 | -0.8 | 0.7 | -1.5 | -5.0 | -8.4 | -7.2 | -6.3 | -6.9 | -9.3 | -7.1 | -5.7 | -6.7 | -3.6 |
| 90 | 327 | -2.0 | -3.6 | -5.3 | -3.8 | -1.3 | -2.0 | -2.2 | -0.4 | -1.4 | -2.1 | -5.2 | -5.3 | -4.5 | -5.3 | -7.6 | -6.1 | -4.2 | -3.6 | -2.8 |
| 90 | 347 | -1.6 | -3.0 | -3.3 | -2.6 | -3.3 | -2.4 | -0.9 | 1.5 | -0.7 | -2.8 | -4.4 | -6.6 | -6.1 | -5.8 | -6.1 | -5.6 | -8.2 | -9.9 | -2.6 |
| 105 | 0 | -1.6 | -3.2 | -3.8 | -4.3 | -3.8 | -2.6 | -1.9 | 0.1 | -1.6 | -4.3 | -6.6 | -6.2 | -6.5 | -7.6 | -8.0 | -6.1 | -9.6 | -11.8 | -3.5 |
| 105 | 9 | -1.5 | -2.6 | -3.6 | -4.8 | -3.0 | -1.9 | -1.6 | 0.2 | -1.3 | -5.1 | -8.0 | -6.2 | -6.1 | -7.8 | -7.5 | -5.7 | -9.7 | -12.2 | -3.3 |
| 105 | 31 | -1.2 | -1.6 | -3.7 | -4.2 | -1.4 | -2.3 | -2.5 | 0.2 | -3.0 | -5.8 | -7.8 | -5.0 | -2.4 | -5.2 | -7.9 | -8.3 | -9.1 | -7.9 | -3.2 |
| 105 | 56 | -1.4 | -1.5 | -3.5 | -2.9 | -1.8 | -3.0 | -2.5 | -1.9 | -3.9 | -5.2 | -4.8 | -3.1 | -4.9 | -5.1 | -7.3 | -6.2 | -8.1 | -7.1 | -3.3 |
| 105 | 74 | -1.5 | -1.6 | -3.3 | -2.2 | -1.8 | -3.8 | -3.5 | -2.3 | -1.9 | -1.5 | -4.7 | -4.2 | -3.3 | -4.7 | -5.6 | -3.7 | -5.7 | -5.9 | -3.2 |
| 105 | 90 | -1.5 | -1.6 | -3.4 | -2.2 | -1.6 | -3.8 | -4.0 | -1.8 | -0.1 | -1.6 | -4.1 | -3.0 | -2.0 | -3.5 | -5.8 | -2.3 | -1.1 | -4.7 | -2.8 |
| 105 | 306 | -2.6 | -3.9 | -5.8 | -8.4 | -5.8 | -3.2 | -1.0 | -0.3 | -3.2 | -6.9 | -8.8 | -8.6 | -8.3 | -9.6 | -12.8 | -10.4 | -8.7 | -11.3 | -4.4 |
| 105 | 325 | -2.2 | -4.3 | -5.9 | -4.7 | -2.4 | -3.2 | -4.0 | -1.9 | -2.2 | -3.6 | -7.0 | -5.7 | -5.9 | -7.4 | -10.9 | -9.7 | -8.1 | -9.7 | -4.2 |
| 105 | 348 | -1.8 | -3.9 | -4.1 | -3.6 | -4.7 | -3.5 | -2.2 | -0.1 | -2.0 | -3.4 | -4.8 | -6.1 | -7.1 | -7.4 | -8.8 | -6.7 | -9.4 | -11.4 | -3.8 |
| 120 | 0 | -1.9 | -3.8 | -4.6 | -5.1 | -4.9 | -3.9 | -3.7 | -2.0 | -3.1 | -5.2 | -6.9 | -6.3 | -7.6 | -9.9 | -10.4 | -8.3 | -11.4 | -13.7 | -4.8 |
| 120 | 9 | -1.8 | -3.2 | -4.3 | -5.6 | -3.9 | -3.1 | -3.3 | -1.5 | -2.6 | -5.8 | -7.6 | -6.0 | -7.3 | -10.8 | -10.0 | -7.5 | -11.2 | -14.2 | -4.4 |
| 120 | 31 | -1.5 | -2.0 | -4.2 | -4.5 | -1.9 | -3.0 | -3.1 | -0.9 | -3.7 | -7.2 | -9.3 | -6.7 | -4.5 | -6.0 | -10.4 | -9.8 | -11.3 | -10.1 | -4.0 |
| 120 | 56 | -1.6 | -1.8 | -3.7 | -3.0 | -2.1 | -3.1 | -2.5 | -2.4 | -4.8 | -6.7 | -6.2 | -3.6 | -5.9 | -6.4 | -8.5 | -7.5 | -9.9 | -9.0 | -3.7 |
| 120 | 74 | -1.5 | -1.7 | -3.4 | -2.2 | -1.9 | -3.8 | -3.5 | -2.6 | -2.4 | -2.0 | -5.1 | -4.4 | -3.9 | -5.1 | -6.3 | -4.5 | -6.5 | -6.7 | -3.4 |
| 120 | 90 | -1.5 | -1.6 | -3.4 | -2.2 | -1.6 | -3.8 | -4.0 | -1.8 | -0.1 | -1.6 | -4.1 | -3.0 | -2.0 | -3.5 | -5.8 | -2.3 | -1.1 | -4.7 | -2.8 |
| 120 | 306 | -2.6 | -4.0 | -5.9 | -8.8 | -7.2 | -4.5 | -1.9 | -1.9 | -4.8 | -7.8 | -9.5 | -9.1 | -9.7 | -11.7 | -15.4 | -13.4 | -12.5 | -14.2 | -5.5 |
| 120 | 325 | -2.2 | -4.8 | -6.6 | -5.9 | -3.7 | -4.8 | -6.2 | -3.7 | -3.9 | -5.2 | -8.9 | -7.0 | -8.2 | -9.2 | -13.2 | -13.2 | -11.8 | -13.3 | -5.7 |
| 120 | 348 | -2.0 | -4.5 | -4.9 | -4.5 | -6.2 | -4.8 | -4.2 | -2.5 | -3.6 | -4.5 | -6.0 | -6.7 | -7.9 | -8.7 | -10.8 | -9.3 | -11.7 | -13.2 | -5.2 |
| 135 | 0 | -2.3 | -4.3 | -5.3 | -5.9 | -5.8 | -4.9 | -5.4 | -4.3 | -6.2 | -8.1 | -8.9 | -7.5 | -8.3 | -11.8 | -13.1 | -11.2 | -13.7 | -15.8 | -6.1 |
| 135 | 9 | -2.2 | -3.7 | -4.9 | -6.3 | -4.5 | -3.9 | -4.7 | -3.5 | -5.4 | -8.5 | -9.3 | -6.5 | -7.4 | -12.6 | -13.4 | -10.8 | -13.1 | -16.0 | -5.5 |
| 135 | 31 | -1.9 | -2.4 | -4.5 | -4.7 | -2.2 | -3.5 | -3.8 | -1.7 | -4.8 | -8.9 | -12.0 | -8.9 | -6.2 | -8.2 | -12.3 | -12.4 | -13.6 | -12.7 | -4.6 |
| 135 | 56 | -1.8 | -2.0 | -3.8 | -3.1 | -2.1 | -3.2 | -2.7 | -2.6 | -5.6 | -7.6 | -7.4 | -4.9 | -6.8 | -7.9 | -10.0 | -9.3 | -11.8 | -11.4 | -3.9 |
| 135 | 74 | -1.7 | -1.8 | -3.5 | -2.3 | -1.9 | -3.8 | -3.5 | -2.9 | -2.9 | -2.3 | -5.4 | -4.9 | -4.1 | -5.7 | -6.6 | -5.0 | -6.9 | -7.2 | -3.5 |
| 135 | 90 | -1.5 | -1.6 | -3.4 | -2.2 | -1.6 | -3.8 | -4.0 | -1.8 | -0.1 | -1.6 | -4.1 | -3.0 | -2.0 | -3.5 | -5.8 | -2.3 | -1.1 | -4.7 | -2.8 |
| 135 | 306 | -2.8 | -4.0 | -5.9 | -9.0 | -8.3 | -6.2 | -3.7 | -4.5 | -7.7 | -9.1 | -11.7 | -10.2 | -10.4 | -12.6 | -16.4 | -15.4 | -15.0 | -15.5 | -6.8 |
| 135 | 325 | -2.6 | -5.0 | -7.1 | -6.9 | -4.8 | -6.5 | -9.0 | -5.5 | -6.8 | -8.4 | -12.1 | -9.9 | -10.8 | -11.8 | -15.2 | -15.9 | -15.4 | -16.2 | -7.3 |
| 135 | 348 | -2.5 | -5.1 | -5.8 | -5.5 | -7.4 | -6.1 | -6.3 | -5.4 | -7.3 | -7.5 | -8.4 | -8.8 | -9.5 | -10.9 | -12.8 | -11.7 | -14.4 | -15.5 | -6.8 |

## Male subjects (continued)

| Azimuth | Elevation | 160 | 200 | 250 | 315 | 400 | 500 | 630 | 800 | 1000 | 1250 | 1600 | 2000 | 2500 | 3150 | 4000 | 5000 | 6300 | 8000 | Awt |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 150 | 0 | -2.5 | -4.7 | -5.8 | -6.5 | -6.3 | -5.5 | -5.8 | -4.9 | -7.8 | -11.3 | -12.7 | -10.8 | -10.1 | -13.2 | -15.1 | -13.8 | -16.0 | -17.4 | -6.8 |
| 150 | 9 | -2.4 | -4.1 | -5.4 | -6.8 | -4.8 | -4.3 | -5.0 | -3.6 | -6.5 | -11.4 | -13.3 | -9.8 | -8.8 | -13.5 | -15.2 | -13.5 | -15.9 | -17.6 | -6.0 |
| 150 | 31 | -2.0 | -2.6 | -4.9 | -5.0 | -2.2 | -3.7 | -3.5 | -1.3 | -4.2 | -8.6 | -14.0 | -13.3 | -9.5 | -9.5 | -13.5 | -14.9 | -15.7 | -15.0 | -4.6 |
| 150 | 56 | -1.9 | -2.1 | -4.0 | -3.1 | -2.2 | -3.2 | -2.4 | -2.4 | -5.7 | -7.9 | -8.0 | -5.6 | -7.5 | -8.9 | -10.8 | -10.6 | -13.2 | -13.0 | -3.9 |
| 150 | 74 | -1.7 | -1.9 | -3.5 | -2.3 | -1.9 | -3.8 | -3.5 | -3.0 | -3.3 | -2.5 | -5.6 | -4.9 | -4.4 | -5.8 | -6.9 | -5.2 | -7.2 | -7.5 | -3.5 |
| 150 | 90 | -1.5 | -1.6 | -3.4 | -2.2 | -1.6 | -3.8 | -4.0 | -1.8 | -0.1 | -1.6 | -4.1 | -3.0 | -2.0 | -3.5 | -5.8 | -2.3 | -1.1 | -4.7 | -2.8 |
| 150 | 306 | -2.8 | -4.0 | -5.8 | -8.7 | -8.7 | -7.3 | -4.6 | -6.1 | -10.0 | -9.9 | -13.7 | -13.2 | -13.7 | -14.8 | -17.5 | -16.7 | -17.0 | -17.4 | -7.4 |
| 150 | 325 | -2.6 | -5.2 | -7.5 | -7.7 | -5.5 | -7.6 | -11.0 | -6.4 | -8.5 | -11.3 | -16.3 | -14.1 | -14.1 | -14.8 | -17.7 | -17.8 | -17.5 | -17.8 | -8.3 |
| 150 | 348 | -2.6 | -5.5 | -6.4 | -6.1 | -8.3 | -7.1 | -7.0 | -6.5 | -9.6 | -11.1 | -12.0 | -12.1 | -11.9 | -12.8 | -15.1 | -14.2 | -16.2 | -17.1 | -7.8 |
| 165 | 0 | -2.7 | -4.9 | -6.2 | -6.8 | -6.6 | -5.8 | -5.5 | -3.8 | -6.3 | -10.1 | -13.7 | -13.1 | -13.3 | -15.9 | -18.0 | -16.3 | -17.8 | -19.0 | -6.8 |
| 165 | 9 | -2.6 | -4.3 | -5.7 | -7.0 | -5.0 | -4.4 | -4.5 | -2.3 | -4.7 | -9.3 | -14.2 | -13.1 | -12.4 | -15.7 | -17.7 | -15.5 | -17.6 | -19.1 | -5.9 |
| 165 | 31 | -2.2 | -2.8 | -5.1 | -5.1 | -2.2 | -3.5 | -2.6 | -0.4 | -2.4 | -6.3 | -10.9 | -10.6 | -10.2 | -13.5 | -16.3 | -15.3 | -16.3 | -16.0 | -4.2 |
| 165 | 56 | -2.0 | -2.2 | -4.1 | -3.2 | -2.1 | -3.0 | -2.0 | -1.8 | -5.0 | -7.5 | -7.3 | -5.2 | -6.6 | -8.1 | -10.2 | -9.8 | -12.9 | -13.4 | -3.7 |
| 165 | 74 | -1.8 | -1.9 | -3.5 | -2.3 | -1.9 | -3.7 | -3.4 | -2.9 | -3.2 | -2.6 | -5.7 | -5.0 | -4.3 | -5.9 | -7.0 | -5.4 | -7.2 | -7.6 | -3.5 |
| 165 | 90 | -1.5 | -1.6 | -3.4 | -2.2 | -1.6 | -3.8 | -4.0 | -1.8 | -0.1 | -1.6 | -4.1 | -3.0 | -2.0 | -3.5 | -5.8 | -2.3 | -1.1 | -4.7 | -2.8 |
| 165 | 306 | -2.8 | -3.8 | -5.6 | -8.2 | -8.3 | -7.1 | -4.4 | -5.4 | -9.9 | -10.2 | -15.4 | -15.7 | -16.2 | -18.3 | -20.2 | -18.9 | -19.2 | -19.0 | -7.3 |
| 165 | 325 | -2.7 | -5.1 | -7.4 | -8.1 | -5.7 | -7.4 | -12.0 | -6.7 | -9.3 | -11.5 | -15.8 | -16.2 | -16.9 | -17.2 | -19.7 | -18.8 | -18.5 | -18.7 | -8.5 |
| 165 | 348 | -2.8 | -5.6 | -6.8 | -6.5 | -8.7 | -7.6 | -6.9 | -5.8 | -8.3 | -11.2 | -13.1 | -13.1 | -14.6 | -16.0 | -18.4 | -17.3 | -18.1 | -19.0 | -8.0 |
| 180 | 0 | -2.6 | -5.0 | -6.4 | -7.0 | -6.9 | -6.4 | -5.5 | -3.3 | -5.3 | -8.7 | -11.9 | -11.0 | -12.1 | -15.2 | -17.5 | -16.5 | -18.2 | -19.4 | -6.8 |
| 180 | 9 | -2.5 | -4.4 | -5.9 | -7.2 | -5.3 | -4.8 | -4.4 | -1.6 | -3.6 | -7.7 | -12.2 | -10.7 | -11.4 | -14.8 | -16.5 | -15.8 | -18.1 | -19.4 | -5.8 |
| 180 | 31 | -2.2 | -3.0 | -5.3 | -5.2 | -2.5 | -3.9 | -2.3 | 0.3 | -1.3 | -5.2 | -9.5 | -7.9 | -6.4 | -9.3 | -14.4 | -15.6 | -17.0 | -16.7 | -4.0 |
| 180 | 56 | -1.9 | -2.3 | -4.2 | -3.2 | -2.2 | -3.3 | -1.8 | -1.2 | -4.4 | -7.3 | -7.0 | -4.5 | -5.8 | -7.1 | -8.7 | -8.0 | -10.0 | -10.4 | -3.6 |
| 180 | 74 | -1.8 | -1.9 | -3.6 | -2.4 | -1.9 | -3.8 | -3.3 | -2.7 | -3.3 | -2.9 | -5.8 | -4.9 | -4.4 | -5.8 | -7.0 | -5.4 | -7.1 | -7.6 | -3.5 |
| 180 | 90 | -1.5 | -1.6 | -3.4 | -2.2 | -1.6 | -3.8 | -4.0 | -1.8 | -0.1 | -1.6 | -4.1 | -3.0 | -2.0 | -3.5 | -5.8 | -2.3 | -1.1 | -4.7 | -2.8 |
| 180 | 306 | -3.3 | -4.3 | -5.4 | -9.0 | -8.5 | -7.4 | -4.3 | -5.1 | -8.7 | -10.0 | -16.1 | -17.4 | -16.4 | -17.5 | -19.1 | -18.2 | -18.5 | -18.6 | -7.4 |
| 180 | 325 | -3.2 | -5.6 | -7.3 | -8.7 | -6.3 | -7.7 | -11.8 | -6.7 | -10.1 | -11.9 | -14.3 | -13.8 | -14.3 | -16.4 | -19.0 | -18.1 | -18.0 | -18.3 | -8.7 |
| 180 | 348 | -2.7 | -5.7 | -7.0 | -6.7 | -8.9 | -8.4 | -6.9 | -5.6 | -7.4 | -9.8 | -11.5 | -11.3 | -13.1 | -15.7 | -18.6 | -17.5 | -18.3 | -19.5 | -8.0 |

## Female subjects

| Azimuth | Elevation | 160 | 200 | 250 | 315 | 400 | 500 | 630 | 800 | 1000 | 1250 | 1600 | 2000 | 2500 | 3150 | 4000 | 5000 | 6300 | 8000 | Awt |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 0 | 10 | 0.2 | 0.2 | 0.1 | -1.0 | -1.5 | -0.2 | 0.9 | -0.2 | 0.0 | 1.3 | -0.5 | 0.4 | -0.2 | -0.2 | 0.5 | 0.1 | 0.1 | 0.9 | -0.2 |
| 0 | 31 | 0.3 | 0.3 | -1.0 | -2.7 | -0.5 | -0.3 | -1.3 | 0.0 | 2.4 | 1.7 | -2.1 | 0.3 | 1.0 | -1.9 | -2.1 | 0.6 | -1.2 | 0.0 | -0.5 |
| 0 | 54 | -0.2 | 0.1 | -1.9 | -2.4 | -0.5 | -0.8 | -3.4 | 0.5 | 2.0 | 1.0 | -0.9 | 0.0 | -0.9 | 1.1 | -2.0 | -1.4 | -0.4 | -0.7 | -0.9 |
| 0 | 74 | -1.0 | -0.7 | -2.7 | -2.2 | -1.3 | -3.1 | -3.9 | -0.1 | 1.3 | 0.9 | -3.5 | -1.4 | -2.0 | -1.3 | -2.5 | -0.4 | -2.4 | -1.5 | -1.8 |
| 0 | 90 | -2.0 | -1.4 | -3.2 | -2.7 | -1.6 | -3.6 | -4.3 | -2.1 | -0.2 | -1.4 | -4.1 | -3.8 | -3.1 | -3.2 | -5.9 | -2.9 | -2.2 | -4.4 | -2.8 |
| 0 | 308 | -0.8 | -1.2 | -2.8 | -2.8 | 0.1 | 1.5 | 3.1 | 5.0 | 2.2 | -1.9 | -5.0 | -4.2 | -2.3 | -0.3 | -3.0 | -0.5 | 0.3 | 0.3 | 0.4 |
| 0 | 327 | -0.2 | -0.9 | -1.8 | 0.3 | 3.5 | 3.8 | 3.2 | 1.4 | -2.2 | -2.5 | -3.5 | -1.2 | 1.3 | 0.6 | -0.9 | 2.1 | 2.7 | 3.1 | 1.5 |
| 0 | 347 | -0.3 | -0.3 | -0.1 | 1.3 | 2.0 | 0.3 | -1.2 | 0.3 | -0.1 | -1.7 | 0.6 | -0.5 | 0.2 | 0.3 | -0.6 | -0.2 | -0.1 | -1.2 | 0.2 |
| 15 | 0 | -0.3 | 0.0 | -0.1 | -0.3 | -0.1 | 0.1 | 0.1 | 0.1 | -0.2 | -0.6 | -0.5 | 0.1 | -0.4 | -0.4 | 0.0 | -0.7 | -0.8 | -0.1 | -0.1 |
| 15 | 10 | -0.2 | 0.2 | 0.0 | -1.3 | -1.6 | 0.1 | 0.8 | -0.2 | -0.1 | 0.6 | -0.6 | 0.7 | -0.5 | -0.5 | 0.1 | -0.4 | -0.6 | 0.5 | -0.3 |
| 15 | 31 | 0.1 | 0.3 | -0.9 | -2.9 | -0.6 | -0.1 | -1.3 | -0.1 | 2.1 | 1.3 | -2.1 | 0.2 | 0.8 | -2.1 | -1.9 | 0.2 | -1.6 | -0.2 | -0.6 |
| 15 | 54 | -0.2 | 0.0 | -1.9 | -2.5 | -0.6 | -0.8 | -3.3 | 0.2 | 1.9 | 0.8 | -0.9 | 0.1 | -1.3 | 1.1 | -2.0 | -1.6 | -1.0 | -1.0 | -0.9 |
| 15 | 74 | -1.0 | -0.7 | -2.7 | -2.4 | -1.3 | -3.0 | -3.9 | -0.3 | 1.2 | 0.6 | -3.6 | -1.4 | -2.3 | -1.3 | -2.7 | -0.7 | -2.9 | -1.6 | -1.9 |
| 15 | 90 | -2.0 | -1.4 | -3.2 | -2.7 | -1.6 | -3.6 | -4.3 | -2.1 | -0.2 | -1.4 | -4.1 | -3.8 | -3.1 | -3.2 | -5.9 | -2.9 | -2.2 | -4.4 | -2.8 |
| 15 | 308 | -1.5 | -1.3 | -2.7 | -3.1 | -0.1 | 1.7 | 3.0 | 4.8 | 2.2 | -1.9 | -6.3 | -5.3 | -2.8 | -0.6 | -3.8 | -1.6 | -1.0 | -0.4 | 0.2 |
| 15 | 327 | -0.9 | -0.9 | -1.8 | 0.3 | 3.2 | 3.8 | 2.8 | 1.2 | -1.3 | -2.6 | -4.1 | -1.8 | 1.0 | 0.6 | -1.1 | 1.3 | 2.0 | 3.0 | 1.3 |
| 15 | 347 | -0.4 | -0.3 | -0.2 | 1.1 | 1.8 | 0.2 | -0.8 | 0.6 | -0.3 | -2.1 | -0.3 | -0.6 | -0.1 | -0.4 | -0.2 | -1.0 | -1.0 | -1.0 | 0.1 |
| 30 | 0 | -0.3 | -0.1 | -0.3 | -0.6 | -0.3 | 0.2 | 0.4 | 0.2 | -0.5 | -1.0 | -1.1 | 0.3 | -0.8 | -0.7 | -0.7 | -0.6 | -1.3 | -1.4 | -0.3 |
| 30 | 10 | -0.2 | 0.1 | -0.3 | -1.6 | -1.6 | 0.4 | 0.8 | -0.6 | -0.5 | -0.2 | -0.7 | 0.8 | -1.1 | -0.7 | -0.3 | -0.4 | -1.0 | -0.7 | -0.4 |
| 30 | 31 | 0.4 | 0.3 | -1.2 | -2.9 | -0.5 | 0.0 | -1.6 | -0.1 | 1.5 | 0.9 | -2.0 | -0.2 | 0.9 | -2.3 | -2.2 | -0.2 | -2.0 | -0.7 | -0.8 |
| 30 | 54 | 0.0 | -0.1 | -2.0 | -2.4 | -0.5 | -0.6 | -3.2 | 0.0 | 1.3 | 0.5 | -1.2 | -0.6 | -1.4 | 1.0 | -2.0 | -1.7 | -1.0 | -1.0 | -1.0 |
| 30 | 74 | -0.8 | -0.8 | -2.7 | -2.4 | -1.3 | -2.8 | -3.8 | -0.4 | 0.7 | 0.2 | -3.6 | -1.6 | -2.4 | -1.7 | -2.7 | -0.9 | -2.8 | -1.5 | -1.9 |
| 30 | 90 | -2.0 | -1.4 | -3.2 | -2.7 | -1.6 | -3.6 | -4.3 | -2.1 | -0.2 | -1.4 | -4.1 | -3.8 | -3.1 | -3.2 | -5.9 | -2.9 | -2.2 | -4.4 | -2.8 |
| 30 | 308 | -1.4 | -1.3 | -2.9 | -3.4 | -0.2 | 1.7 | 2.5 | 3.4 | 1.0 | -1.5 | -5.1 | -5.0 | -2.9 | -0.3 | -3.4 | -1.2 | -1.0 | 0.2 | -0.2 |
| 30 | 327 | -0.8 | -1.0 | -2.0 | -0.1 | 2.9 | 3.2 | 1.7 | 0.9 | 0.3 | -1.5 | -5.3 | -2.4 | 0.9 | 0.9 | -1.7 | 0.9 | 1.7 | 2.9 | 0.9 |
| 30 | 347 | -0.5 | -0.4 | -0.4 | 0.8 | 1.3 | 0.0 | -0.3 | 1.2 | -0.6 | -2.0 | -1.6 | -0.4 | -0.5 | -0.7 | -1.1 | -0.9 | -1.7 | -2.4 | -0.2 |

## Female subjects (continued)

| Azimuth | Elevation | 160 | 200 | 250 | 315 | 400 | 500 | 630 | 800 | 1000 | 1250 | 1600 | 2000 | 2500 | 3150 | 4000 | 5000 | 6300 | 8000 | Awt |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 45 | 0 | -0.4 | -0.3 | -0.6 | -1.0 | -0.7 | 0.2 | 1.0 | 1.0 | -0.6 | -2.0 | -2.1 | 0.1 | -1.0 | -0.9 | -0.9 | -0.7 | -1.9 | -2.1 | -0.5 |
| 45 | 10 | -0.3 | 0.0 | -0.5 | -2.0 | -1.8 | 0.7 | 1.2 | 0.3 | -0.9 | -1.7 | -1.2 | 1.2 | -1.5 | -0.9 | -0.9 | -0.5 | -1.5 | -1.2 | -0.6 |
| 45 | 31 | 0.0 | 0.2 | -1.4 | -3.1 | -0.6 | 0.0 | -1.1 | 0.0 | 0.8 | -0.2 | -2.1 | -0.3 | 0.4 | -2.1 | -2.3 | -0.6 | -2.5 | -0.9 | -0.9 |
| 45 | 54 | -0.3 | -0.1 | -2.2 | -2.6 | -0.6 | -1.0 | -3.2 | -0.2 | 0.8 | 0.1 | -1.1 | -0.7 | -1.5 | 0.9 | -1.8 | -1.6 | -1.2 | -1.2 | -1.2 |
| 45 | 74 | -1.0 | -0.7 | -2.8 | -2.5 | -1.3 | -3.1 | -4.0 | -0.6 | 0.6 | 0.3 | -3.9 | -1.9 | -2.5 | -1.8 | -2.7 | -0.7 | -2.9 | -1.3 | -2.1 |
| 45 | 90 | -2.0 | -1.4 | -3.2 | -2.7 | -1.6 | -3.6 | -4.3 | -2.1 | -0.2 | -1.4 | -4.1 | -3.8 | -3.1 | -3.2 | -5.9 | -2.9 | -2.2 | -4.4 | -2.8 |
| 45 | 308 | -1.2 | -1.3 | -3.1 | -3.8 | -0.6 | 1.3 | 1.7 | 2.4 | 1.3 | 0.4 | -3.3 | -4.1 | -4.2 | -1.1 | -3.7 | -0.8 | -1.2 | -0.1 | -0.6 |
| 45 | 327 | -0.9 | -1.1 | -2.4 | -0.5 | 2.4 | 2.3 | 1.0 | 1.7 | 1.6 | -1.7 | -5.7 | -3.6 | -0.4 | 1.4 | -1.3 | 0.0 | 1.5 | 2.7 | 0.5 |
| 45 | 347 | -0.6 | -0.6 | -0.7 | 0.3 | 0.6 | -0.4 | 0.7 | 2.0 | -0.2 | -2.4 | -3.3 | -1.3 | -0.2 | -1.0 | -0.9 | -1.0 | -2.5 | -3.3 | -0.4 |
| 60 | 0 | -0.7 | -0.7 | -1.0 | -1.6 | -1.3 | 0.0 | 0.9 | 1.7 | 0.1 | -3.1 | -3.8 | -2.0 | -1.1 | -1.6 | -1.7 | -2.0 | -3.2 | -3.5 | -0.8 |
| 60 | 10 | -0.5 | -0.4 | -0.9 | -2.5 | -2.0 | 0.6 | 1.1 | 0.9 | -0.5 | -3.5 | -3.1 | 0.1 | -1.4 | -2.0 | -1.4 | -1.8 | -2.5 | -2.5 | -0.9 |
| 60 | 31 | 0.0 | -0.1 | -1.7 | -3.2 | -0.7 | -0.3 | -1.4 | 0.4 | 0.1 | -1.6 | -3.0 | -0.5 | -0.5 | -2.6 | -3.3 | -1.3 | -3.7 | -1.8 | -1.3 |
| 60 | 54 | -0.2 | -0.3 | -2.3 | -2.6 | -0.8 | -1.3 | -3.1 | -0.5 | -0.1 | -0.8 | -1.3 | -1.3 | -2.1 | 0.3 | -2.2 | -2.3 | -2.0 | -1.6 | -1.5 |
| 60 | 74 | -1.0 | -0.9 | -2.9 | -2.5 | -1.4 | -3.3 | -3.9 | -0.9 | 0.1 | -0.2 | -4.0 | -2.2 | -2.9 | -2.2 | -3.2 | -1.3 | -3.5 | -1.8 | -2.3 |
| 60 | 90 | -2.0 | -1.4 | -3.2 | -2.7 | -1.6 | -3.6 | -4.3 | -2.1 | -0.2 | -1.4 | -4.1 | -3.8 | -3.1 | -3.2 | -5.9 | -2.9 | -2.2 | -4.4 | -2.8 |
| 60 | 308 | -1.5 | -1.6 | -3.5 | -4.7 | -1.4 | 0.4 | 0.5 | 2.3 | 2.0 | 0.1 | -4.4 | -4.5 | -4.2 | -2.9 | -5.2 | -2.1 | -2.1 | -0.5 | -1.2 |
| 60 | 327 | -1.1 | -1.5 | -3.0 | -1.2 | 1.6 | 1.1 | 0.1 | 1.9 | 1.4 | -0.6 | -3.5 | -5.5 | -3.4 | -0.3 | -1.1 | -1.0 | 0.1 | 2.4 | -0.1 |
| 60 | 347 | -0.9 | -1.0 | -1.2 | -0.4 | -0.4 | -0.8 | 0.8 | 2.6 | 0.8 | -2.5 | -4.8 | -4.8 | -0.7 | -1.0 | -2.0 | -2.4 | -4.1 | -4.9 | -0.8 |
| 75 | 0 | -1.3 | -1.1 | -1.8 | -2.5 | -2.3 | -0.6 | 0.5 | 1.7 | 0.7 | -3.0 | -5.3 | -4.5 | -2.9 | -2.5 | -2.8 | -3.4 | -5.0 | -5.5 | -1.5 |
| 75 | 10 | -1.1 | -0.9 | -1.6 | -3.3 | -2.8 | 0.1 | 0.5 | 1.2 | 0.2 | -3.9 | -5.8 | -2.4 | -2.4 | -2.6 | -2.9 | -3.0 | -4.1 | -4.3 | -1.5 |
| 75 | 31 | -0.6 | -0.5 | -2.2 | -3.7 | -1.1 | -1.0 | -1.5 | 0.4 | -0.3 | -3.1 | -5.0 | -1.5 | -1.3 | -3.9 | -4.4 | -2.4 | -5.1 | -3.5 | -1.8 |
| 75 | 54 | -0.8 | -0.5 | -2.6 | -2.9 | -1.0 | -1.7 | -3.1 | -1.2 | -0.9 | -2.0 | -2.3 | -2.1 | -3.2 | -0.6 | -3.4 | -3.3 | -3.0 | -2.5 | -2.0 |
| 75 | 74 | -1.4 | -1.0 | -3.0 | -2.6 | -1.5 | -3.5 | -4.0 | -1.3 | -0.4 | -0.7 | -4.5 | -2.9 | -3.5 | -3.0 | -3.9 | -2.1 | -4.5 | -2.6 | -2.5 |
| 75 | 90 | -2.0 | -1.4 | -3.2 | -2.7 | -1.6 | -3.6 | -4.3 | -2.1 | -0.2 | -1.4 | -4.1 | -3.8 | -3.1 | -3.2 | -5.9 | -2.9 | -2.2 | -4.4 | -2.8 |
| 75 | 308 | -1.8 | -1.8 | -4.0 | -5.7 | -2.7 | -0.8 | 0.0 | 1.9 | 1.4 | -1.6 | -6.5 | -5.7 | -4.4 | -3.4 | -6.5 | -4.6 | -4.8 | -3.1 | -2.0 |
| 75 | 327 | -1.6 | -1.8 | -3.8 | -2.2 | 0.4 | -0.4 | -0.8 | 0.8 | 0.4 | 0.3 | -2.8 | -5.5 | -4.7 | -3.0 | -3.1 | -2.1 | -1.6 | 1.3 | -1.0 |
| 75 | 347 | -1.4 | -1.5 | -2.0 | -1.3 | -1.7 | -1.5 | 0.5 | 2.4 | 1.3 | -1.8 | -4.7 | -7.1 | -3.6 | -2.4 | -2.6 | -4.0 | -6.1 | -6.9 | -1.4 |
| 90 | 0 | -1.7 | -1.9 | -2.5 | -3.3 | -3.2 | -1.9 | -0.8 | 0.8 | -0.1 | -3.4 | -5.9 | -5.6 | -5.0 | -4.9 | -5.3 | -4.1 | -6.9 | -8.1 | -2.7 |
| 90 | 10 | -1.4 | -1.5 | -2.3 | -4.0 | -3.2 | -1.1 | -0.7 | 0.5 | -0.4 | -4.1 | -6.8 | -4.7 | -4.5 | -4.8 | -5.3 | -4.0 | -6.3 | -7.4 | -2.6 |
| 90 | 31 | -1.1 | -0.9 | -2.7 | -3.9 | -1.5 | -1.9 | -2.3 | -0.1 | -1.1 | -3.6 | -6.6 | -3.5 | -2.0 | -4.4 | -6.1 | -5.4 | -7.2 | -5.1 | -2.6 |
| 90 | 54 | -1.3 | -0.9 | -3.2 | -3.2 | -1.5 | -2.5 | -3.2 | -1.8 | -1.9 | -3.6 | -4.0 | -2.6 | -4.5 | -3.0 | -5.1 | -4.2 | -5.5 | -4.1 | -2.7 |
| 90 | 74 | -1.7 | -1.2 | -3.4 | -2.8 | -1.7 | -3.6 | -4.2 | -2.0 | -1.3 | -1.3 | -5.0 | -4.1 | -4.0 | -3.8 | -5.2 | -3.4 | -5.5 | -3.9 | -3.0 |
| 90 | 90 | -2.0 | -1.4 | -3.2 | -2.7 | -1.6 | -3.6 | -4.3 | -2.1 | -0.2 | -1.4 | -4.1 | -3.8 | -3.1 | -3.2 | -5.9 | -2.9 | -2.2 | -4.4 | -2.8 |

## Female subjects (continued)

| Azimuth | Elevation | 160 | 200 | 250 | 315 | 400 | 500 | 630 | 800 | 1000 | 1250 | 1600 | 2000 | 2500 | 3150 | 4000 | 5000 | 6300 | 8000 | Awt |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 90 | 308 | -2.5 | -2.5 | -4.5 | -6.8 | -3.9 | -2.2 | -0.6 | 0.7 | -0.3 | -3.8 | -8.2 | -7.2 | -6.0 | -5.7 | -9.4 | -7.3 | -6.7 | -6.4 | -3.3 |
| 90 | 327 | -2.1 | -2.6 | -4.3 | -3.3 | -0.8 | -1.8 | -2.3 | -0.5 | -0.9 | -0.9 | -4.3 | -5.4 | -5.5 | -5.4 | -7.0 | -4.9 | -4.0 | -3.1 | -2.5 |
| 90 | 347 | -2.0 | -2.3 | -2.8 | -2.3 | -3.1 | -3.0 | -0.9 | 1.1 | 0.2 | -2.4 | -4.8 | -6.8 | -5.7 | -5.1 | -5.3 | -4.2 | -7.7 | -9.0 | -2.8 |
| 105 | 0 | -2.4 | -2.7 | -3.1 | -4.2 | -4.0 | -2.6 | -2.0 | 0.0 | -0.7 | -3.7 | -6.2 | -6.0 | -5.9 | -7.2 | -7.3 | -5.4 | -9.0 | -10.7 | -3.5 |
| 105 | 9 | -2.2 | -2.3 | -2.9 | -4.8 | -3.7 | -1.8 | -1.7 | -0.1 | -0.7 | -4.3 | -7.1 | -5.9 | -5.6 | -7.4 | -6.9 | -5.5 | -8.9 | -10.8 | -3.3 |
| 105 | 31 | -1.8 | -1.3 | -3.0 | -4.3 | -1.8 | -2.1 | -2.8 | -0.5 | -1.5 | -4.2 | -8.0 | -5.3 | -2.3 | -3.7 | -7.9 | -8.1 | -9.7 | -6.6 | -3.0 |
| 105 | 56 | -1.9 | -1.2 | -3.0 | -3.2 | -1.9 | -2.8 | -3.1 | -2.0 | -2.4 | -5.0 | -5.3 | -2.9 | -5.2 | -4.6 | -6.4 | -5.8 | -9.1 | -6.8 | -3.2 |
| 105 | 74 | -2.0 | -1.3 | -3.1 | -2.7 | -1.7 | -3.6 | -3.9 | -2.5 | -1.6 | -1.5 | -5.0 | -4.5 | -4.1 | -4.3 | -5.2 | -4.2 | -6.5 | -5.1 | -3.1 |
| 105 | 90 | -2.0 | -1.4 | -3.2 | -2.7 | -1.6 | -3.6 | -4.3 | -2.1 | -0.2 | -1.4 | -4.1 | -3.8 | -3.1 | -3.2 | -5.9 | -2.9 | -2.2 | -4.4 | -2.8 |
| 105 | 306 | -3.0 | -2.9 | -4.5 | -7.5 | -4.9 | -2.4 | -0.8 | 0.4 | -1.1 | -5.1 | -8.2 | -7.7 | -6.9 | -7.7 | -11.8 | -9.9 | -9.9 | -11.0 | -3.8 |
| 105 | 325 | -2.8 | -3.4 | -4.7 | -4.1 | -2.0 | -2.8 | -4.0 | -1.7 | -1.5 | -2.1 | -5.7 | -5.5 | -6.3 | -7.7 | -10.4 | -8.5 | -8.6 | -10.3 | -3.8 |
| 105 | 348 | -2.6 | -3.2 | -3.4 | -3.4 | -4.4 | -3.6 | -2.3 | 0.2 | -0.8 | -3.0 | -5.0 | -6.2 | -6.3 | -6.9 | -7.8 | -5.4 | -9.0 | -10.6 | -3.7 |
| 120 | 0 | -2.7 | -3.2 | -3.8 | -4.9 | -5.0 | -3.8 | -3.8 | -2.2 | -2.9 | -4.7 | -6.5 | -6.2 | -7.0 | -8.6 | -9.6 | -7.9 | -11.1 | -12.8 | -4.9 |
| 120 | 9 | -2.5 | -2.7 | -3.5 | -5.5 | -4.4 | -2.9 | -3.4 | -2.0 | -2.6 | -5.2 | -7.2 | -5.8 | -6.9 | -9.2 | -9.2 | -7.4 | -10.8 | -12.9 | -4.5 |
| 120 | 31 | -2.1 | -1.6 | -3.4 | -4.6 | -2.1 | -2.8 | -3.6 | -1.7 | -2.8 | -5.1 | -9.0 | -6.7 | -4.5 | -5.2 | -9.6 | -9.3 | -11.6 | -9.6 | -3.9 |
| 120 | 56 | -2.1 | -1.4 | -3.2 | -3.3 | -2.0 | -3.0 | -3.1 | -2.8 | -3.2 | -5.8 | -6.4 | -4.1 | -6.3 | -5.6 | -7.5 | -7.2 | -10.5 | -9.1 | -3.6 |
| 120 | 74 | -2.1 | -1.4 | -3.2 | -2.7 | -1.8 | -3.7 | -4.0 | -3.0 | -2.0 | -1.9 | -5.4 | -5.0 | -4.7 | -4.6 | -6.0 | -4.6 | -7.1 | -6.0 | -3.3 |
| 120 | 90 | -2.0 | -1.4 | -3.2 | -2.7 | -1.6 | -3.6 | -4.3 | -2.1 | -0.2 | -1.4 | -4.1 | -3.8 | -3.1 | -3.2 | -5.9 | -2.9 | -2.2 | -4.4 | -2.8 |
| 120 | 306 | -3.1 | -3.0 | -4.7 | -7.9 | -6.1 | -3.9 | -2.2 | -1.6 | -2.6 | -5.6 | -8.7 | -7.7 | -8.1 | -9.2 | -14.0 | -12.2 | -12.5 | -13.5 | -5.1 |
| 120 | 325 | -3.0 | -3.6 | -5.3 | -5.1 | -3.2 | -4.3 | -6.1 | -3.5 | -3.0 | -3.8 | -7.4 | -6.7 | -7.6 | -8.7 | -12.1 | -11.7 | -12.1 | -13.5 | -5.2 |
| 120 | 348 | -2.9 | -3.8 | -4.2 | -4.3 | -5.7 | -5.0 | -4.3 | -2.3 | -3.2 | -4.0 | -5.7 | -6.9 | -7.1 | -7.9 | -10.1 | -8.6 | -11.4 | -12.8 | -5.3 |
| 135 | 0 | -2.9 | -3.6 | -4.4 | -5.6 | -5.6 | -4.5 | -4.8 | -3.8 | -5.3 | -7.3 | -8.3 | -7.0 | -7.9 | -10.3 | -11.9 | -10.1 | -13.5 | -14.6 | -5.7 |
| 135 | 9 | -2.8 | -3.1 | -4.1 | -6.0 | -4.8 | -3.6 | -4.4 | -3.3 | -4.7 | -7.6 | -8.9 | -6.1 | -7.3 | -11.1 | -11.7 | -9.7 | -12.9 | -14.4 | -5.3 |
| 135 | 31 | -2.3 | -1.9 | -3.8 | -4.8 | -2.2 | -3.2 | -3.5 | -1.9 | -3.5 | -6.7 | -11.2 | -8.6 | -6.0 | -7.0 | -11.5 | -11.3 | -13.6 | -11.5 | -4.2 |
| 135 | 56 | -2.2 | -1.5 | -3.4 | -3.4 | -2.1 | -3.1 | -2.9 | -2.6 | -3.7 | -6.6 | -7.4 | -4.8 | -7.1 | -7.0 | -8.5 | -8.5 | -12.2 | -10.7 | -3.8 |
| 135 | 74 | -2.1 | -1.5 | -3.2 | -2.7 | -1.8 | -3.7 | -3.9 | -3.0 | -2.4 | -2.2 | -5.8 | -5.1 | -5.1 | -4.9 | -6.6 | -5.1 | -7.7 | -6.5 | -3.4 |
| 135 | 90 | -2.0 | -1.4 | -3.2 | -2.7 | -1.6 | -3.6 | -4.3 | -2.1 | -0.2 | -1.4 | -4.1 | -3.8 | -3.1 | -3.2 | -5.9 | -2.9 | -2.2 | -4.4 | -2.8 |
| 135 | 306 | -3.0 | -3.1 | -4.8 | -8.2 | -7.0 | -5.1 | -3.2 | -3.6 | -5.1 | -6.8 | -10.5 | -9.2 | -9.6 | -10.8 | -15.2 | -14.2 | -14.7 | -14.7 | -6.0 |
| 135 | 325 | -3.1 | -4.0 | -5.8 | -6.0 | -4.2 | -5.9 | -7.8 | -4.6 | -5.1 | -6.3 | -10.2 | -9.5 | -9.7 | -10.5 | -14.3 | -13.8 | -15.0 | -15.7 | -6.4 |
| 135 | 348 | -3.2 | -4.2 | -4.9 | -5.0 | -6.7 | -5.7 | -5.2 | -4.4 | -6.0 | -6.8 | -7.6 | -8.2 | -8.8 | -9.3 | -12.0 | -10.5 | -14.2 | -14.8 | -6.3 |

## Female subjects (continued)

| Azimuth | Elevation | 160 | 200 | 250 | 315 | 400 | 500 | 630 | 800 | 1000 | 1250 | 1600 | 2000 | 2500 | 3150 | 4000 | 5000 | 6300 | 8000 | Awt |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 150 | 0 | -3.2 | -3.9 | -4.7 | -5.9 | -6.1 | -5.0 | -5.5 | -4.3 | -6.4 | -9.9 | -12.0 | -10.0 | -9.8 | -11.3 | -13.6 | -12.3 | -15.8 | -16.2 | -6.3 |
| 150 | 9 | -3.0 | -3.4 | -4.4 | -6.3 | -5.1 | -3.9 | -4.9 | -3.4 | -5.3 | -9.7 | -12.8 | -9.4 | -8.7 | -11.6 | -13.7 | -12.1 | -15.5 | -16.3 | -5.7 |
| 150 | 31 | -2.5 | -2.1 | -4.0 | -5.0 | -2.3 | -3.4 | -3.5 | -1.5 | -3.0 | -6.9 | -12.4 | -12.0 | -9.4 | -9.0 | -12.6 | -13.3 | -16.2 | -13.9 | -4.3 |
| 150 | 56 | -2.3 | -1.7 | -3.5 | -3.4 | -2.1 | -3.0 | -2.6 | -2.3 | -3.8 | -7.0 | -7.9 | -5.7 | -7.8 | -8.0 | -9.6 | -9.6 | -13.4 | -12.0 | -3.8 |
| 150 | 74 | -2.2 | -1.5 | -3.3 | -2.8 | -1.8 | -3.6 | -3.7 | -3.1 | -2.7 | -2.5 | -6.0 | -5.1 | -5.4 | -5.4 | -6.7 | -5.7 | -8.1 | -7.0 | -3.5 |
| 150 | 90 | -2.0 | -1.4 | -3.2 | -2.7 | -1.6 | -3.6 | -4.3 | -2.1 | -0.2 | -1.4 | -4.1 | -3.8 | -3.1 | -3.2 | -5.9 | -2.9 | -2.2 | -4.4 | -2.8 |
| 150 | 306 | -3.1 | -3.2 | -4.7 | -8.0 | -7.3 | -6.0 | -4.3 | -5.0 | -7.8 | -7.4 | -11.8 | -12.1 | -12.0 | -12.7 | -16.0 | -15.1 | -16.9 | -16.4 | -6.6 |
| 150 | 325 | -3.3 | -4.2 | -6.1 | -6.6 | -4.8 | -6.9 | -9.8 | -5.9 | -7.0 | -9.0 | -13.5 | -13.3 | -12.4 | -13.3 | -15.8 | -15.9 | -17.7 | -17.0 | -7.2 |
| 150 | 348 | -3.4 | -4.5 | -5.2 | -5.5 | -7.4 | -6.5 | -6.3 | -5.6 | -7.9 | -10.1 | -10.9 | -10.7 | -11.1 | -11.0 | -13.5 | -12.5 | -16.2 | -16.1 | -7.2 |
| 165 | 0 | -3.4 | -4.1 | -5.1 | -6.3 | -6.4 | -5.3 | -5.4 | -4.0 | -5.5 | -8.7 | -12.6 | -12.4 | -13.0 | -14.2 | -15.9 | -14.9 | -18.0 | -18.1 | -6.5 |
| 165 | 9 | -3.3 | -3.7 | -4.7 | -6.7 | -5.4 | -4.1 | -4.8 | -2.7 | -3.8 | -7.7 | -12.6 | -12.4 | -12.8 | -14.3 | -15.3 | -14.3 | -17.7 | -18.1 | -5.7 |
| 165 | 31 | -2.8 | -2.4 | -4.3 | -5.1 | -2.4 | -3.5 | -2.8 | -0.9 | -1.6 | -5.2 | -10.2 | -9.9 | -9.2 | -11.0 | -15.1 | -15.1 | -17.0 | -15.1 | -4.1 |
| 165 | 56 | -2.6 | -1.8 | -3.6 | -3.5 | -2.1 | -3.1 | -2.2 | -2.0 | -3.3 | -6.8 | -7.4 | -5.3 | -7.5 | -7.7 | -9.5 | -8.9 | -12.5 | -11.5 | -3.7 |
| 165 | 74 | -2.4 | -1.6 | -3.3 | -2.8 | -1.8 | -3.6 | -3.7 | -3.1 | -2.8 | -2.7 | -6.1 | -5.2 | -5.6 | -5.5 | -6.8 | -5.8 | -8.3 | -7.1 | -3.5 |
| 165 | 90 | -2.0 | -1.4 | -3.2 | -2.7 | -1.6 | -3.6 | -4.3 | -2.1 | -0.2 | -1.4 | -4.1 | -3.8 | -3.1 | -3.2 | -5.9 | -2.9 | -2.2 | -4.4 | -2.8 |
| 165 | 306 | -3.2 | -3.1 | -4.5 | -7.7 | -7.2 | -6.1 | -4.1 | -4.7 | -8.8 | -8.5 | -13.7 | -13.5 | -14.2 | -16.2 | -18.5 | -17.6 | -19.6 | -18.3 | -6.7 |
| 165 | 325 | -3.4 | -4.2 | -6.1 | -7.0 | -5.2 | -7.1 | -11.0 | -6.9 | -8.3 | -10.5 | -14.3 | -14.2 | -15.0 | -15.5 | -18.5 | -17.5 | -19.2 | -18.1 | -7.7 |
| 165 | 348 | -3.6 | -4.7 | -5.6 | -5.9 | -7.7 | -7.0 | -6.3 | -5.7 | -7.7 | -10.1 | -12.5 | -12.5 | -13.1 | -14.2 | -16.7 | -15.7 | -18.5 | -18.0 | -7.5 |
| 180 | 0 | -3.4 | -4.2 | -5.3 | -6.4 | -6.6 | -5.8 | -5.4 | -3.8 | -4.7 | -7.4 | -11.1 | -10.8 | -12.3 | -14.2 | -15.8 | -14.6 | -18.3 | -18.4 | -6.5 |
| 180 | 9 | -3.3 | -3.7 | -4.9 | -6.6 | -5.6 | -4.3 | -4.5 | -2.2 | -2.8 | -6.3 | -11.0 | -10.2 | -12.1 | -14.0 | -14.8 | -13.7 | -18.0 | -18.4 | -5.7 |
| 180 | 31 | -2.8 | -2.4 | -4.4 | -5.1 | -2.5 | -3.8 | -2.6 | -0.5 | -0.9 | -4.2 | -8.7 | -7.6 | -6.1 | -7.1 | -12.0 | -13.1 | -17.1 | -16.2 | -4.0 |
| 180 | 56 | -2.5 | -1.8 | -3.6 | -3.5 | -2.2 | -3.3 | -2.2 | -1.9 | -3.2 | -6.4 | -6.9 | -4.6 | -7.0 | -6.9 | -8.2 | -7.5 | -11.0 | -9.7 | -3.7 |
| 180 | 74 | -2.2 | -1.6 | -3.3 | -2.8 | -1.8 | -3.7 | -3.6 | -3.1 | -2.9 | -2.6 | -6.0 | -5.1 | -5.6 | -5.3 | -6.9 | -5.8 | -8.3 | -7.0 | -3.5 |
| 180 | 90 | -2.0 | -1.4 | -3.2 | -2.7 | -1.6 | -3.6 | -4.3 | -2.1 | -0.2 | -1.4 | -4.1 | -3.8 | -3.1 | -3.2 | -5.9 | -2.9 | -2.2 | -4.4 | -2.8 |
| 180 | 306 | -3.2 | -3.1 | -4.4 | -7.4 | -7.4 | -6.6 | -3.6 | -4.5 | -7.8 | -8.3 | -14.7 | -15.1 | -14.8 | -16.6 | -18.8 | -17.6 | -19.7 | -18.3 | -6.6 |
| 180 | 325 | -3.4 | -4.2 | -6.2 | -7.2 | -5.6 | -7.2 | -11.0 | -7.4 | -8.8 | -10.5 | -13.7 | -13.2 | -14.0 | -15.6 | -18.5 | -17.5 | -19.4 | -18.4 | -7.7 |
| 180 | 348 | -3.6 | -4.7 | -5.8 | -6.0 | -7.9 | -7.8 | -6.5 | -5.8 | -7.1 | -8.8 | -11.3 | -11.5 | -12.5 | -14.4 | -17.0 | -15.7 | -18.7 | -18.5 | -7.6 |

## B&K Head and Torso Simulator

| Azimuth | Elevation | 160 | 200 | 250 | 315 | 400 | 500 | 630 | 800 | 1000 | 1250 | 1600 | 2000 | 2500 | 3150 | 4000 | 5000 | 6300 | 8000 | Awt |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 0 | 10 | 0.1 | 0.1 | 0.0 | -0.7 | -0.1 | 0.3 | -1.0 | -1.0 | 0.3 | 1.0 | 0.5 | 1.0 | -0.5 | 0.0 | 0.1 | 0.3 | 0.3 | 0.7 | 0.4 |
| 0 | 31 | 0.2 | 0.4 | -0.8 | -1.5 | 0.5 | -1.8 | -2.5 | -0.9 | 2.5 | 2.2 | -0.6 | 0.6 | 1.3 | -0.8 | -1.6 | -0.6 | -2.5 | 0.4 | 0.3 |
| 0 | 54 | -0.4 | -0.1 | -1.8 | -1.8 | -0.8 | -3.4 | -3.7 | -1.8 | 2.0 | 1.1 | 0.6 | -0.3 | -0.9 | 1.6 | -1.1 | -3.5 | -3.1 | -2.9 | -0.6 |
| 0 | 74 | -1.0 | -0.7 | -2.4 | -2.1 | -2.3 | -5.4 | -5.3 | -2.3 | 1.1 | 1.0 | -3.0 | -1.9 | -2.2 | -1.1 | -2.8 | -3.5 | -5.5 | -2.7 | -2.2 |
| 0 | 90 | -1.6 | -1.3 | -2.9 | -2.6 | -2.6 | -5.5 | -6.1 | -4.4 | -0.4 | -1.6 | -3.5 | -4.5 | -3.6 | -3.0 | -7.6 | -7.2 | -6.6 | -8.4 | -4.4 |
| 0 | 308 | -1.4 | -1.1 | -2.7 | -1.9 | 0.0 | 0.2 | 1.4 | 3.5 | 5.6 | 2.9 | -1.5 | -3.8 | -4.2 | -6.1 | -3.2 | -0.4 | 0.2 | -1.7 | -0.7 |
| 0 | 327 | -0.6 | -0.6 | -1.5 | 0.3 | 1.8 | 0.4 | -0.2 | 2.6 | 4.2 | 0.8 | -5.2 | -6.0 | -1.7 | 2.3 | 2.7 | -1.3 | 0.9 | -0.6 | -0.6 |
| 0 | 347 | -0.1 | -0.2 | 0.0 | 0.9 | 0.1 | -0.4 | 1.3 | 1.3 | -0.4 | -1.3 | -0.7 | -1.3 | 0.6 | 0.0 | -0.1 | -0.3 | -0.4 | -1.0 | -0.6 |
| 15 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -0.1 | 0.0 | 0.2 | 0.2 | -0.2 | -0.1 | 0.0 | 0.1 | -0.1 | -0.1 | -0.2 | -0.4 | -0.5 | -0.2 |
| 15 | 10 | 0.1 | 0.1 | 0.0 | -0.7 | -0.1 | 0.2 | -1.0 | -0.8 | 0.3 | 0.8 | 0.5 | 1.1 | -0.5 | -0.2 | 0.0 | 0.1 | 0.1 | 0.2 | 0.3 |
| 15 | 31 | 0.2 | 0.4 | -0.8 | -1.5 | 0.4 | -1.9 | -2.5 | -0.8 | 2.4 | 2.0 | -0.5 | 0.5 | 1.3 | -0.8 | -1.9 | -0.5 | -2.9 | -0.1 | 0.1 |
| 15 | 54 | -0.4 | -0.1 | -1.8 | -1.8 | -0.8 | -3.5 | -3.7 | -1.8 | 1.9 | 1.0 | 0.5 | -0.4 | -0.9 | 1.6 | -1.2 | -3.4 | -3.3 | -3.2 | -0.8 |
| 15 | 74 | -1.1 | -0.7 | -2.4 | -2.1 | -2.3 | -5.4 | -5.3 | -2.4 | 1.0 | 0.9 | -3.1 | -2.0 | -2.3 | -1.3 | -2.9 | -3.4 | -5.7 | -3.0 | -2.3 |
| 15 | 90 | -1.6 | -1.3 | -2.9 | -2.6 | -2.6 | -5.5 | -6.1 | -4.4 | -0.4 | -1.6 | -3.5 | -4.5 | -3.6 | -3.0 | -7.6 | -7.2 | -6.6 | -8.4 | -4.4 |
| 15 | 308 | -1.4 | -1.1 | -2.7 | -1.9 | -0.1 | 0.1 | 1.3 | 3.5 | 5.6 | 3.0 | -1.0 | -3.2 | -4.8 | -5.9 | -4.6 | 0.5 | -0.3 | -1.4 | -0.6 |
| 15 | 327 | -0.6 | -0.6 | -1.5 | 0.3 | 1.7 | 0.2 | -0.2 | 2.7 | 4.3 | 1.2 | -4.5 | -6.9 | -1.5 | 2.1 | 2.9 | -1.0 | 0.2 | -1.0 | -0.8 |
| 15 | 347 | -0.1 | -0.2 | 0.0 | 0.9 | 0.1 | -0.4 | 1.3 | 1.3 | 0.0 | -1.4 | -1.0 | -1.4 | 0.8 | 0.0 | -0.2 | -0.5 | -1.0 | -1.4 | -0.7 |
| 30 | 0 | -0.1 | -0.2 | -0.2 | -0.2 | -0.3 | -0.3 | 0.0 | 0.6 | 0.7 | -0.7 | -1.3 | -0.4 | -0.1 | -0.6 | -0.7 | -1.0 | -1.7 | -2.1 | -0.8 |
| 30 | 10 | 0.0 | 0.0 | -0.2 | -0.9 | -0.3 | 0.0 | -0.9 | -0.1 | 0.3 | -0.4 | 0.0 | 1.2 | -0.8 | -1.2 | -0.3 | -0.9 | -1.3 | -1.1 | -0.3 |
| 30 | 31 | 0.1 | 0.3 | -1.0 | -1.7 | 0.2 | -2.1 | -2.3 | -0.6 | 1.9 | 1.3 | -0.6 | 0.1 | 1.0 | -1.0 | -2.8 | -1.3 | -4.3 | -1.5 | -0.5 |
| 30 | 54 | -0.5 | -0.1 | -1.9 | -1.9 | -1.0 | -3.6 | -3.7 | -1.9 | 1.6 | 0.6 | 0.2 | -0.6 | -1.3 | 1.6 | -1.9 | -3.7 | -4.3 | -4.5 | -1.2 |
| 30 | 74 | -1.1 | -0.7 | -2.4 | -2.1 | -2.3 | -5.5 | -5.4 | -2.6 | 0.8 | 0.7 | -3.3 | -2.3 | -2.6 | -1.6 | -3.4 | -3.6 | -6.3 | -3.6 | -2.6 |
| 30 | 90 | -1.6 | -1.3 | -2.9 | -2.6 | -2.6 | -5.5 | -6.1 | -4.4 | -0.4 | -1.6 | -3.5 | -4.5 | -3.6 | -3.0 | -7.6 | -7.2 | -6.6 | -8.4 | -4.4 |
| 30 | 308 | -1.4 | -1.2 | -3.0 | -2.3 | -0.4 | -0.3 | 0.9 | 3.1 | 5.4 | 2.9 | -0.2 | -1.7 | -4.2 | -5.5 | -6.1 | -2.0 | -0.6 | -0.3 | -0.2 |
| 30 | 327 | -0.7 | -0.9 | -1.8 | 0.0 | 1.4 | -0.1 | -0.2 | 2.7 | 4.3 | 2.1 | -2.6 | -7.7 | -3.8 | 0.7 | 3.0 | 0.1 | -2.7 | 0.1 | -0.9 |
| 30 | 347 | -0.2 | -0.4 | -0.3 | 0.6 | -0.2 | -0.6 | 1.2 | 1.5 | 1.2 | -1.2 | -3.0 | -2.5 | 0.9 | 0.2 | -1.3 | -1.2 | -2.1 | -3.3 | -1.5 |

## B&K Head and Torso Simulator (continued)

| Azimuth | Elevation | 160 | 200 | 250 | 315 | 400 | 500 | 630 | 800 | 1000 | 1250 | 1600 | 2000 | 2500 | 3150 | 4000 | 5000 | 6300 | 8000 | Awt |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 45 | 0 | -0.4 | -0.5 | -0.6 | -0.7 | -0.8 | -0.7 | -0.1 | 1.1 | 1.6 | -1.1 | -2.7 | -2.1 | -0.7 | -1.2 | -1.3 | -3.1 | -3.4 | -5.1 | -1.9 |
| 45 | 10 | -0.3 | -0.4 | -0.5 | -1.3 | -0.8 | -0.5 | -0.8 | 0.6 | 0.9 | -1.9 | -1.6 | 0.6 | -0.6 | -2.4 | -1.1 | -3.1 | -2.6 | -4.4 | -1.4 |
| 45 | 31 | -0.1 | 0.0 | -1.2 | -2.0 | -0.3 | -2.4 | -2.1 | -0.3 | 1.2 | 0.0 | -1.1 | -0.2 | 0.4 | -1.8 | -3.9 | -2.5 | -6.5 | -4.8 | -1.4 |
| 45 | 54 | -0.6 | -0.3 | -2.0 | -2.0 | -1.2 | -3.8 | -3.7 | -2.2 | 1.0 | -0.1 | -0.3 | -1.0 | -2.2 | 1.1 | -3.0 | -4.4 | -5.8 | -6.2 | -1.8 |
| 45 | 74 | -1.2 | -0.8 | -2.5 | -2.2 | -2.4 | -5.6 | -5.5 | -2.9 | 0.5 | 0.3 | -3.6 | -2.7 | -3.0 | -2.1 | -4.0 | -4.1 | -7.1 | -4.6 | -3.1 |
| 45 | 90 | -1.6 | -1.3 | -2.9 | -2.6 | -2.6 | -5.5 | -6.1 | -4.4 | -0.4 | -1.6 | -3.5 | -4.5 | -3.6 | -3.0 | -7.6 | -7.2 | -6.6 | -8.4 | -4.4 |
| 45 | 308 | -1.6 | -1.4 | -3.4 | -2.9 | -1.3 | -0.9 | 0.2 | 2.5 | 4.9 | 2.7 | -0.1 | -0.9 | -2.8 | -3.1 | -6.6 | -7.0 | -3.6 | -1.3 | -0.5 |
| 45 | 327 | -1.0 | -1.2 | -2.4 | -0.6 | 0.8 | -0.7 | -0.5 | 2.4 | 4.1 | 2.9 | -1.0 | -4.8 | -6.8 | -4.1 | 1.3 | 2.1 | -3.2 | -3.0 | -0.9 |
| 45 | 347 | -0.5 | -0.8 | -0.8 | 0.1 | -0.7 | -1.0 | 0.8 | 1.7 | 2.5 | 0.0 | -4.1 | -5.6 | -0.8 | 0.4 | -1.6 | -3.1 | -4.3 | -5.9 | -2.5 |
| 60 | 0 | -0.8 | -1.0 | -1.2 | -1.2 | -1.4 | -1.4 | -0.6 | 1.2 | 2.4 | -0.9 | -3.3 | -4.0 | -3.1 | -2.2 | -2.3 | -4.0 | -6.6 | -7.8 | -2.8 |
| 60 | 10 | -0.7 | -0.8 | -1.1 | -1.8 | -1.3 | -1.2 | -1.0 | 0.9 | 1.8 | -2.3 | -3.9 | -1.4 | -1.3 | -2.3 | -4.1 | -3.3 | -6.2 | -7.2 | -2.7 |
| 60 | 31 | -0.5 | -0.3 | -1.6 | -2.4 | -0.7 | -2.9 | -2.2 | -0.2 | 0.9 | -1.5 | -2.6 | -0.7 | -0.1 | -3.2 | -4.4 | -5.1 | -8.1 | -7.6 | -2.3 |
| 60 | 54 | -0.8 | -0.5 | -2.3 | -2.3 | -1.4 | -4.1 | -3.9 | -2.6 | 0.2 | -0.9 | -1.1 | -1.6 | -3.4 | 0.0 | -4.0 | -5.9 | -7.6 | -8.7 | -2.7 |
| 60 | 74 | -1.3 | -0.9 | -2.6 | -2.3 | -2.5 | -5.7 | -5.6 | -3.3 | 0.0 | -0.1 | -3.9 | -3.2 | -3.6 | -2.7 | -4.9 | -5.0 | -8.2 | -5.8 | -3.6 |
| 60 | 90 | -1.6 | -1.3 | -2.9 | -2.6 | -2.6 | -5.5 | -6.1 | -4.4 | -0.4 | -1.6 | -3.5 | -4.5 | -3.6 | -3.0 | -7.6 | -7.2 | -6.6 | -8.4 | -4.4 |
| 60 | 308 | -1.8 | -1.6 | -3.9 | -3.8 | -2.2 | -1.8 | -0.7 | 1.7 | 4.0 | 2.2 | -1.0 | -1.4 | -2.4 | -2.2 | -4.6 | -5.3 | -6.6 | -5.8 | -1.4 |
| 60 | 327 | -1.4 | -1.6 | -3.2 | -1.4 | 0.0 | -1.6 | -1.1 | 1.7 | 3.8 | 2.9 | -0.7 | -3.1 | -3.5 | -6.9 | -4.0 | -1.4 | -2.5 | -6.5 | -1.5 |
| 60 | 347 | -0.9 | -1.3 | -1.4 | -0.4 | -1.4 | -1.7 | 0.1 | 1.6 | 3.1 | 1.0 | -2.5 | -7.3 | -5.4 | -2.0 | 0.1 | -5.0 | -7.2 | -8.6 | -2.9 |
| 75 | 0 | -1.2 | -1.5 | -1.9 | -1.9 | -2.3 | -2.4 | -1.5 | 0.9 | 2.6 | -0.3 | -3.6 | -4.9 | -5.4 | -5.2 | -4.1 | -5.6 | -7.8 | -13.0 | -3.5 |
| 75 | 10 | -1.1 | -1.3 | -1.7 | -2.4 | -2.2 | -2.2 | -1.7 | 0.7 | 2.4 | -1.7 | -5.2 | -4.2 | -4.0 | -3.2 | -4.2 | -7.3 | -6.5 | -10.9 | -3.9 |
| 75 | 31 | -0.8 | -0.7 | -2.1 | -2.9 | -1.3 | -3.7 | -2.7 | -0.4 | 0.9 | -2.4 | -4.9 | -2.1 | -0.5 | -4.7 | -5.6 | -6.5 | -9.6 | -10.3 | -3.4 |
| 75 | 54 | -1.0 | -0.7 | -2.6 | -2.6 | -1.8 | -4.5 | -4.2 | -3.1 | -0.7 | -2.0 | -2.3 | -2.5 | -4.7 | -1.8 | -5.1 | -8.1 | -9.7 | -11.5 | -3.8 |
| 75 | 74 | -1.3 | -1.0 | -2.7 | -2.4 | -2.6 | -5.7 | -5.6 | -3.7 | -0.7 | -0.7 | -4.2 | -3.8 | -4.2 | -3.6 | -6.0 | -6.1 | -9.6 | -7.6 | -4.3 |
| 75 | 90 | -1.6 | -1.3 | -2.9 | -2.6 | -2.6 | -5.5 | -6.1 | -4.4 | -0.4 | -1.6 | -3.5 | -4.5 | -3.6 | -3.0 | -7.6 | -7.2 | -6.6 | -8.4 | -4.4 |
| 75 | 308 | -2.1 | -1.9 | -4.5 | -4.9 | -3.6 | -2.9 | -1.8 | 0.8 | 2.8 | 1.3 | -2.4 | -3.1 | -3.4 | -3.4 | -5.1 | -4.9 | -7.1 | -5.8 | -2.5 |
| 75 | 327 | -1.7 | -2.1 | -4.1 | -2.4 | -1.0 | -2.6 | -2.1 | 0.4 | 3.1 | 2.3 | -1.5 | -3.4 | -2.8 | -4.4 | -5.2 | -6.6 | -6.8 | -9.8 | -2.2 |
| 75 | 347 | -1.3 | -1.8 | -2.2 | -1.3 | -2.4 | -2.7 | -1.2 | 1.1 | 2.9 | 1.5 | -1.5 | -5.8 | -7.1 | -7.7 | -3.9 | -3.4 | -9.5 | -15.8 | -3.0 |
| 90 | 0 | -1.7 | -2.3 | -2.6 | -2.8 | -3.4 | -3.5 | -2.8 | 0.0 | 1.9 | -0.5 | -3.6 | -5.4 | -6.2 | -7.4 | -6.8 | -8.2 | -10.6 | -14.8 | -4.3 |
| 90 | 10 | -1.5 | -1.9 | -2.3 | -3.3 | -3.2 | -3.1 | -2.8 | -0.1 | 2.1 | -1.5 | -5.2 | -5.8 | -6.7 | -7.2 | -4.8 | -8.3 | -11.0 | -14.0 | -4.8 |
| 90 | 31 | -1.1 | -1.0 | -2.7 | -3.5 | -1.9 | -4.3 | -3.4 | -1.2 | 0.5 | -2.8 | -6.7 | -4.9 | -1.5 | -4.2 | -9.4 | -8.6 | -12.2 | -12.5 | -4.8 |
| 90 | 54 | -1.3 | -0.9 | -2.8 | -2.9 | -2.3 | -4.7 | -4.2 | -3.8 | -1.6 | -3.5 | -3.8 | -3.2 | -5.5 | -4.6 | -6.8 | -9.8 | -12.6 | -13.6 | -5.0 |

## B&K Head and Torso Simulator (continued)

| Azimuth | Elevation | 160 | 200 | 250 | 315 | 400 | 500 | 630 | 800 | 1000 | 1250 | 1600 | 2000 | 2500 | 3150 | 4000 | 5000 | 6300 | 8000 | Awt |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 90 | 74 | -1.4 | -1.1 | -2.8 | -2.5 | -2.7 | -5.6 | -5.4 | -4.4 | -1.2 | -1.2 | -4.2 | -4.7 | -4.7 | -4.4 | -6.8 | -7.5 | -10.7 | -9.0 | -4.8 |
| 90 | 90 | -1.6 | -1.3 | -2.9 | -2.6 | -2.6 | -5.5 | -6.1 | -4.4 | -0.4 | -1.6 | -3.5 | -4.5 | -3.6 | -3.0 | -7.6 | -7.2 | -6.6 | -8.4 | -4.4 |
| 90 | 308 | -2.4 | -2.4 | -5.0 | -6.1 | -5.4 | -3.9 | -2.5 | -0.2 | 1.4 | -0.3 | -3.7 | -4.4 | -5.0 | -5.6 | -8.3 | -7.7 | -10.2 | -11.3 | -4.1 |
| 90 | 327 | -2.1 | -2.9 | -4.9 | -3.6 | -2.0 | -3.7 | -3.6 | -0.8 | 1.9 | 0.9 | -2.8 | -4.3 | -4.4 | -5.0 | -7.1 | -7.5 | -9.7 | -11.0 | -3.5 |
| 90 | 347 | -1.8 | -2.8 | -3.0 | -2.1 | -3.7 | -3.9 | -2.8 | 0.1 | 1.7 | 0.7 | -1.6 | -5.0 | -5.7 | -7.7 | -9.4 | -7.9 | -10.0 | -15.8 | -3.5 |
| 105 | 0 | -2.0 | -3.1 | -3.2 | -3.6 | -4.6 | -4.8 | -4.6 | -1.8 | 0.4 | -1.6 | -3.8 | -5.6 | -7.1 | -9.5 | -9.4 | -8.8 | -15.2 | -16.7 | -5.2 |
| 105 | 9 | -1.9 | -2.6 | -2.8 | -4.0 | -4.3 | -4.2 | -4.5 | -1.7 | 0.8 | -2.2 | -4.8 | -5.9 | -7.8 | -11.9 | -8.5 | -7.5 | -14.9 | -15.4 | -5.6 |
| 105 | 31 | -1.5 | -1.3 | -3.1 | -4.1 | -2.3 | -5.0 | -4.3 | -2.3 | -0.5 | -3.4 | -7.5 | -8.2 | -3.9 | -3.9 | -12.2 | -11.7 | -15.6 | -12.7 | -6.3 |
| 105 | 56 | -1.6 | -1.2 | -3.0 | -3.2 | -2.8 | -4.9 | -4.2 | -4.5 | -2.7 | -5.1 | -5.3 | -4.0 | -6.3 | -7.6 | -8.7 | -11.7 | -15.6 | -16.0 | -6.1 |
| 105 | 74 | -1.5 | -1.2 | -2.8 | -2.6 | -2.9 | -5.5 | -5.0 | -5.1 | -1.6 | -1.7 | -4.3 | -5.6 | -5.1 | -5.0 | -7.5 | -8.6 | -11.7 | -10.2 | -5.3 |
| 105 | 90 | -1.6 | -1.3 | -2.9 | -2.6 | -2.6 | -5.5 | -6.1 | -4.4 | -0.4 | -1.6 | -3.5 | -4.5 | -3.6 | -3.0 | -7.6 | -7.2 | -6.6 | -8.4 | -4.4 |
| 105 | 306 | -2.6 | -2.8 | -5.2 | -7.0 | -7.4 | -5.4 | -3.2 | -1.9 | 0.3 | -2.1 | -4.8 | -5.8 | -5.7 | -7.3 | -11.5 | -11.7 | -14.2 | -15.7 | -5.5 |
| 105 | 325 | -2.3 | -3.7 | -5.6 | -4.8 | -3.2 | -5.0 | -5.3 | -2.3 | 0.0 | -1.1 | -4.6 | -5.3 | -6.2 | -7.1 | -10.5 | -10.2 | -12.9 | -17.5 | -5.3 |
| 105 | 348 | -2.2 | -3.9 | -3.6 | -3.0 | -5.0 | -5.5 | -4.7 | -1.9 | -0.2 | -0.9 | -2.4 | -5.2 | -6.1 | -6.5 | -10.6 | -10.5 | -15.7 | -18.4 | -4.7 |
| 120 | 0 | -2.3 | -3.6 | -3.8 | -4.1 | -5.5 | -5.9 | -6.2 | -4.0 | -2.0 | -3.7 | -4.7 | -5.6 | -7.2 | -10.8 | -11.6 | -9.5 | -14.7 | -23.1 | -6.4 |
| 120 | 9 | -2.2 | -3.0 | -3.4 | -4.5 | -5.3 | -5.0 | -6.1 | -3.6 | -1.6 | -4.1 | -5.2 | -4.8 | -7.6 | -13.6 | -13.4 | -9.5 | -14.7 | -23.1 | -6.4 |
| 120 | 31 | -1.8 | -1.6 | -3.5 | -4.6 | -2.8 | -5.4 | -5.0 | -3.1 | -2.0 | -5.0 | -8.7 | -9.5 | -7.3 | -6.6 | -13.3 | -15.1 | -16.0 | -16.7 | -7.9 |
| 120 | 56 | -1.8 | -1.3 | -3.2 | -3.5 | -3.0 | -5.1 | -4.2 | -4.6 | -3.5 | -6.3 | -6.6 | -5.2 | -7.4 | -9.7 | -10.9 | -13.5 | -18.4 | -18.1 | -7.2 |
| 120 | 74 | -1.6 | -1.3 | -2.8 | -2.7 | -2.9 | -5.5 | -4.9 | -5.3 | -2.1 | -2.2 | -4.6 | -5.9 | -5.8 | -5.6 | -8.0 | -9.5 | -12.7 | -11.3 | -5.7 |
| 120 | 90 | -1.6 | -1.3 | -2.9 | -2.6 | -2.6 | -5.5 | -6.1 | -4.4 | -0.4 | -1.6 | -3.5 | -4.5 | -3.6 | -3.0 | -7.6 | -7.2 | -6.6 | -8.4 | -4.4 |
| 120 | 306 | -2.6 | -2.8 | -5.1 | -7.1 | -8.8 | -7.1 | -4.1 | -3.4 | -0.8 | -3.2 | -6.9 | -6.5 | -6.9 | -8.0 | -12.1 | -12.2 | -15.3 | -18.9 | -6.8 |
| 120 | 325 | -2.4 | -3.9 | -6.2 | -5.8 | -4.2 | -6.4 | -7.1 | -4.1 | -2.1 | -3.5 | -7.0 | -7.3 | -7.5 | -8.5 | -12.7 | -11.9 | -14.8 | -19.6 | -7.4 |
| 120 | 348 | -2.4 | -4.3 | -4.4 | -3.6 | -5.9 | -7.0 | -6.3 | -4.4 | -2.6 | -3.2 | -3.9 | -6.5 | -6.8 | -7.3 | -9.3 | -9.5 | -14.8 | -23.1 | -6.3 |
| 135 | 0 | -2.4 | -3.8 | -4.3 | -4.5 | -6.1 | -6.7 | -6.8 | -5.7 | -4.8 | -7.4 | -7.5 | -7.3 | -7.5 | -10.9 | -14.1 | -12.5 | -15.8 | -21.2 | -8.4 |
| 135 | 9 | -2.4 | -3.2 | -3.8 | -4.8 | -6.0 | -5.3 | -6.8 | -5.0 | -4.4 | -7.8 | -7.8 | -5.9 | -6.5 | -13.3 | -17.0 | -14.1 | -17.4 | -22.5 | -8.1 |
| 135 | 31 | -2.0 | -1.9 | -3.7 | -4.8 | -3.1 | -5.5 | -5.3 | -2.8 | -2.7 | -7.0 | -11.9 | -12.4 | -8.6 | -8.2 | -15.2 | -18.4 | -18.9 | -18.9 | -9.4 |
| 135 | 56 | -1.9 | -1.5 | -3.3 | -3.6 | -3.0 | -5.1 | -4.0 | -4.2 | -3.6 | -7.0 | -8.0 | -6.3 | -8.4 | -10.7 | -14.1 | -15.2 | -21.3 | -19.0 | -8.0 |
| 135 | 74 | -1.7 | -1.3 | -2.9 | -2.8 | -2.9 | -5.5 | -4.8 | -5.3 | -2.5 | -2.6 | -4.9 | -6.0 | -6.3 | -5.9 | -8.4 | -10.1 | -13.3 | -12.0 | -6.0 |
| 135 | 90 | -1.6 | -1.3 | -2.9 | -2.6 | -2.6 | -5.5 | -6.1 | -4.4 | -0.4 | -1.6 | -3.5 | -4.5 | -3.6 | -3.0 | -7.6 | -7.2 | -6.6 | -8.4 | -4.4 |
| 135 | 306 | -2.6 | -2.7 | -4.9 | -6.8 | -9.4 | -8.5 | -4.8 | -4.2 | -3.4 | -3.7 | -9.7 | -9.8 | -10.4 | -10.0 | -14.4 | -14.0 | -16.9 | -18.9 | -8.8 |
| 135 | 325 | -2.4 | -3.9 | -6.4 | -6.5 | -4.8 | -7.3 | -9.2 | -5.9 | -3.3 | -6.6 | -11.3 | -11.8 | -10.4 | -11.4 | -15.0 | -16.6 | -16.6 | -21.3 | -10.3 |
| 135 | 348 | -2.5 | -4.5 | -4.9 | -4.0 | -6.3 | -8.4 | -6.9 | -6.8 | -5.4 | -6.8 | -7.0 | -9.0 | -8.7 | -7.9 | -10.3 | -10.3 | -13.8 | -19.4 | -8.8 |

## B&K Head and Torso Simulator (continued)

| Azimuth | Elevation | 160 | 200 | 250 | 315 | 400 | 500 | 630 | 800 | 1000 | 1250 | 1600 | 2000 | 2500 | 3150 | 4000 | 5000 | 6300 | 8000 | Awt |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 150 | 0 | -2.5 | -3.9 | -4.5 | -4.5 | -6.2 | -7.1 | -6.5 | -5.8 | -5.0 | -9.0 | -11.5 | -11.6 | -11.3 | -12.9 | -14.6 | -15.0 | -19.6 | -23.3 | -10.8 |
| 150 | 9 | -2.4 | -3.4 | -4.0 | -4.8 | -6.2 | -5.3 | -6.3 | -4.9 | -3.8 | -8.7 | -12.4 | -11.2 | -10.0 | -14.0 | -16.5 | -17.6 | -22.0 | -25.1 | -10.5 |
| 150 | 31 | -2.1 | -2.0 | -3.9 | -4.9 | -3.1 | -5.3 | -5.0 | -1.7 | -1.6 | -5.7 | -11.7 | -17.3 | -16.5 | -11.3 | -13.5 | -17.8 | -23.0 | -19.5 | -9.6 |
| 150 | 56 | -2.0 | -1.6 | -3.4 | -3.7 | -3.0 | -5.0 | -3.7 | -3.5 | -2.8 | -6.7 | -8.3 | -6.7 | -8.6 | -10.6 | -14.4 | -17.2 | -22.5 | -24.0 | -8.0 |
| 150 | 74 | -1.8 | -1.4 | -3.0 | -2.8 | -2.9 | -5.5 | -4.7 | -5.3 | -2.7 | -2.8 | -5.2 | -6.0 | -6.6 | -5.9 | -8.4 | -10.1 | -13.4 | -12.2 | -6.2 |
| 150 | 90 | -1.6 | -1.3 | -2.9 | -2.6 | -2.6 | -5.5 | -6.1 | -4.4 | -0.4 | -1.6 | -3.5 | -4.5 | -3.6 | -3.0 | -7.6 | -7.2 | -6.6 | -8.4 | -4.4 |
| 150 | 306 | -2.5 | -2.5 | -4.6 | -6.3 | -9.0 | -9.4 | -5.1 | -3.5 | -7.4 | -5.4 | -10.6 | -13.9 | -13.5 | -16.4 | -21.6 | -22.2 | -23.6 | -21.6 | -10.5 |
| 150 | 325 | -2.4 | -3.7 | -6.3 | -6.7 | -5.0 | -7.5 | -10.9 | -7.6 | -3.4 | -7.9 | -13.2 | -17.6 | -15.3 | -17.1 | -17.2 | -18.3 | -18.4 | -23.3 | -12.1 |
| 150 | 348 | -2.5 | -4.6 | -5.1 | -4.1 | -6.2 | -9.5 | -6.9 | -6.9 | -6.6 | -9.4 | -10.3 | -12.1 | -13.2 | -11.4 | -12.2 | -11.6 | -16.4 | -21.0 | -11.2 |
| 165 | 0 | -2.5 | -3.9 | -4.6 | -4.5 | -6.2 | -7.4 | -6.1 | -5.0 | -3.6 | -6.6 | -10.1 | -11.1 | -13.8 | -16.4 | -20.7 | -20.6 | -22.3 | -24.3 | -10.0 |
| 165 | 9 | -2.5 | -3.4 | -4.1 | -4.7 | -6.4 | -5.2 | -5.7 | -4.3 | -1.3 | -5.6 | -10.7 | -11.5 | -13.6 | -16.9 | -22.5 | -21.5 | -22.7 | -25.3 | -9.5 |
| 165 | 31 | -2.2 | -2.1 | -4.0 | -5.0 | -3.2 | -5.1 | -4.6 | -0.7 | -0.2 | -3.0 | -7.8 | -9.7 | -10.3 | -14.7 | -22.0 | -22.4 | -21.7 | -23.2 | -7.3 |
| 165 | 56 | -2.1 | -1.7 | -3.5 | -3.8 | -3.0 | -5.0 | -3.6 | -2.7 | -1.9 | -6.0 | -7.4 | -5.9 | -7.4 | -9.0 | -11.7 | -12.9 | -17.8 | -20.4 | -7.1 |
| 165 | 74 | -1.8 | -1.4 | -3.0 | -2.9 | -2.9 | -5.5 | -4.6 | -5.1 | -2.7 | -2.9 | -5.3 | -5.9 | -6.6 | -5.9 | -8.1 | -9.7 | -13.0 | -11.7 | -6.1 |
| 165 | 90 | -1.6 | -1.3 | -2.9 | -2.6 | -2.6 | -5.5 | -6.1 | -4.4 | -0.4 | -1.6 | -3.5 | -4.5 | -3.6 | -3.0 | -7.6 | -7.2 | -6.6 | -8.4 | -4.4 |
| 165 | 306 | -2.5 | -2.4 | -4.3 | -5.7 | -8.5 | -9.6 | -5.2 | -2.1 | -7.2 | -8.9 | -14.5 | -13.5 | -15.5 | -17.3 | -22.8 | -23.6 | -23.3 | -23.2 | -11.6 |
| 165 | 325 | -2.4 | -3.6 | -6.1 | -6.7 | -4.9 | -7.2 | -11.6 | -9.2 | -3.2 | -7.0 | -13.8 | -14.7 | -16.4 | -18.5 | -21.0 | -23.5 | -24.6 | -24.3 | -11.9 |
| 165 | 348 | -2.5 | -4.5 | -5.2 | -4.2 | -6.0 | -10.2 | -6.7 | -5.9 | -6.6 | -7.9 | -9.3 | -10.6 | -14.1 | -15.8 | -18.4 | -19.5 | -21.8 | -23.1 | -10.6 |
| 180 | 0 | -2.5 | -3.9 | -4.7 | -4.5 | -6.3 | -7.5 | -6.0 | -4.7 | -3.1 | -5.5 | -8.4 | -8.8 | -11.1 | -13.4 | -14.2 | -17.2 | -20.9 | -26.0 | -8.7 |
| 180 | 9 | -2.5 | -3.5 | -4.2 | -4.7 | -6.5 | -5.2 | -5.4 | -4.1 | -0.5 | -4.6 | -8.8 | -9.0 | -10.5 | -13.0 | -13.6 | -18.6 | -23.4 | -27.1 | -8.2 |
| 180 | 31 | -2.2 | -2.1 | -4.0 | -5.0 | -3.3 | -5.0 | -4.5 | -0.3 | 0.2 | -2.0 | -6.5 | -7.6 | -6.4 | -9.0 | -17.8 | -19.9 | -23.6 | -18.8 | -6.1 |
| 180 | 56 | -2.1 | -1.7 | -3.5 | -3.8 | -3.0 | -4.9 | -3.5 | -2.4 | -1.4 | -5.6 | -6.9 | -5.4 | -6.7 | -7.8 | -10.2 | -10.7 | -14.7 | -13.7 | -6.6 |
| 180 | 74 | -1.8 | -1.4 | -3.0 | -2.9 | -2.9 | -5.5 | -4.6 | -5.0 | -2.7 | -2.9 | -5.4 | -5.8 | -6.6 | -5.9 | -7.9 | -9.4 | -12.9 | -11.1 | -6.1 |
| 180 | 90 | -1.6 | -1.3 | -2.9 | -2.6 | -2.6 | -5.5 | -6.1 | -4.4 | -0.4 | -1.6 | -3.5 | -4.5 | -3.6 | -3.0 | -7.6 | -7.2 | -6.6 | -8.4 | -4.4 |
| 180 | 306 | -2.5 | -2.3 | -4.2 | -5.5 | -8.2 | -9.5 | -5.2 | -1.5 | -5.0 | -11.7 | -17.7 | -11.5 | -16.3 | -18.5 | -17.5 | -20.8 | -22.3 | -22.8 | -11.3 |
| 180 | 325 | -2.4 | -3.6 | -6.0 | -6.7 | -5.0 | -6.9 | -11.6 | -9.8 | -3.1 | -6.6 | -14.1 | -12.4 | -13.5 | -13.9 | -16.5 | -19.8 | -20.8 | -24.4 | -11.3 |
| 180 | 348 | -2.5 | -4.5 | -5.3 | -4.2 | -5.9 | -10.5 | -6.7 | -5.4 | -6.6 | -6.6 | -7.9 | -8.5 | -11.8 | -14.0 | -14.9 | -15.3 | -17.8 | -24.4 | -9.4 |

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