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**Compilation of Supporting Data for
Auditory 4.5 Model of Impulse
Noise Injury**

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About This Publication

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1. Introduction

This document describes a consolidated, distributable dataset that is composed of data supporting the development of the model known as “Auditory 4.5.” Auditory 4.5 is a model used to predict hearing loss resulting from exposures to impulse noise. Specifically, Auditory 4.5 predicts temporary threshold shift (TTS) and permanent threshold shift (PTS) as a function of the A-weighted sound-exposure level (SELA) of the stimulus. SELA is a metric that weights a sound’s energy content according to the sensitivity of the human auditory system to different frequencies. Threshold shifts are changes in the minimum sound intensity (threshold) that can be perceived at a particular frequency. In Auditory 4.5, PTS and TTS are reported as the average of threshold shifts at 1, 2, and 4 kHz. More information on the Auditory 4.5 model can be found in a number of references (Chan and Ho 2012; Chan, Ho, and Ryan 2016; Adkins et al. 2019; Chan, Ho, and Zagadou 2018; Swallow and Kramer 2019).

As part of an effort to evaluate Auditory 4.5 on behalf of the Joint Intermediate Force Capabilities Office (JIFCO), IDA digitized and compiled the source datasets for Auditory 4.5, which were contained in several reports.

The two main datasets that were used are available from public (distribution unlimited) sources. The first is a set of data on TTS measured for humans exposed to rifle noise (human rifle noise data) (Coles et al. 1967; Garinther and Kryter 1965; Pfander et al. 1980; Brinkmann 2003). The second is a set of data on TTS and PTS measured for chinchilla subjects exposed to a range of impulses, including shock-tube blasts, spark gaps, and narrow-band noise. This second dataset, the USAMRMC chinchilla data, came from an extended project conducted by USAARL / U.S. Army Medical RDECOM from 1985 to 1998 (Patterson et al. 1985, 1986; Hamernik et al. 1988; Hamernik, Ahroon, and Turrentine 1988b, 1988a, Hamernik et al. 1989, 1990, 1991, Patterson, Carrier, et al. 1991a, 1991b; Patterson, Bordwell, et al. 1991; Hamernik, Ahroon, and Lei 1994; Hamernik 1996; Hamernik et al. 1998).

In particular, the USAMRMC chinchilla data were reported with evolving formats over time. Some data were reported in tables, while other data were reported in plots. Data reported in plots were digitized for this compilation using the online application WebPlotDigitizer.

The purpose of this document is to report the data in a format that is readily accessible to a wide audience. This is not the first time data from the cited reports have been compiled, but those compilations have not been released in a format that is both widely accessible and ready for analysis. Section 2 reports the human rifle noise data in a tabular format. Section 3 pertains to the USAMRMC chinchilla data. A large portion of these data were organized into an Excel workbook that has been constructed so that the individual spreadsheets may be easily exported into a

relational database. The spreadsheet will be available as an attachment to this document when accessed through the Defense Technical Information Center (DTIC). Requests for copies of the digitized USAMRMC chinchilla dataset can also be submitted to the Joint Intermediate Force Capabilities Office, 3097 Range Road, Quantico, VA, 22134-5100.

2. Human Rifle Noise Exposure Data

Table 1 is a compilation of the human rifle noise exposure data contained in the Committee on Hearing and Bio-Acoustics (CHABA) dataset, which is sourced from Coles et al. (1967) and Garinther and Kryter (1965). This table reports the number of subjects (N_{subj}), the peak pressure level (SPL), the angle of incidence ($N = \text{normal}$, $G = \text{grazing}$), and the number of shots (N_{shots}) for each exposure condition, along with the reported TTS of three quantiles for each test group. The quantiles reported in Coles et al. (1967) were 50th, 75th, and 90th; in Garinther and Kryter (1965) they were 25th, 50th, and 75th. In some cases Garinther and Kryter (1965) observed negative TTS; this reflects the uncertainty in TTS measurements and should be understood as 0 TTS. The table reports the estimated SELA for the various sound sources; this is determined according to the following formula: $\text{SELA} = \text{SPL} - 37 \text{ dB} - B$ ($B = 0$ for normal and $B = 3.24$ for grazing incidence, following Auditory 4.5). That is the same formula used in the development of Auditory 4.5 (Chan, Ho, and Ryan 2016).

Table 1. CHABA Human Rifle Noise Exposure Data

N_{subj}	SPL (dB)	N/G	SELA (dB)	N_{shots}	TTS ⁱ (dB)	TTS ⁱⁱ (dB)	TTS ⁱⁱⁱ (dB)	Q ⁱ	Q ⁱⁱ	Q ⁱⁱⁱ	Ref.
13	153	N	116	25	5	10	20	0.5	0.75	0.9	1A
20	153	N	116	25	0	2.5	10	0.5	0.75	0.9	1A
29	158	N	121	25	2.33	8.67	13	0.5	0.75	0.9	3A
16	158	N	121	25	3.67	8	22	0.5	0.75	0.9	4A
20	160	G	119.76	25	4	9.67	14	0.5	0.75	0.9	5A
26	163	G	122.76	25	9.33	19.67	23.33	0.5	0.75	0.9	5A
26	165	G	124.76	25	6	13.33	30.33	0.5	0.75	0.9	5A
16	153	N	116	50	7.5	10	13.5	0.5	0.75	0.9	1A
12	155	N	118	50	6.33	14.67	19.67	0.5	0.75	0.9	1A
7	158	N	121	50	4	26.33	33.33	0.5	0.75	0.9	1A
16	155	G	114.76	50	0.33	6	11	0.5	0.75	0.9	2A
8	158	G	117.76	50	1	8.33	11.67	0.5	0.75	0.9	2A
22	155	N	118	50	6.33	11.67	26.33	0.5	0.75	0.9	3A
20	160	G	119.76	50	6	12.33	23	0.5	0.75	0.9	5A
8	165	G	124.76	50	23	52.67	82.33	0.5	0.75	0.9	5A
64	140	G	99.76	100	0	0	9.33	0.5	0.75	0.9	5A
66	150	G	109.76	100	0	6	14	0.5	0.75	0.9	5A
13	161	N	124	100	15	36	63.5	0.5	0.75	0.9	7A

N_{subj}	SPL (dB)	N/G	SELA (dB)	N_{shots}	TTSⁱ (dB)	TTSⁱⁱ (dB)	TTSⁱⁱⁱ (dB)	Qⁱ	Qⁱⁱ	Qⁱⁱⁱ	Ref.
7	172.5	G	132.26	17	-1.33	11	24	0.25	0.5	0.75	GK
18	172.5	G	132.26	32	1.33	5.33	14.33	0.25	0.5	0.75	GK
6	172.5	G	132.26	74	0.67	28	50	0.25	0.5	0.75	GK
6	172.5	G	132.26	102	8	19.67	45.67	0.25	0.5	0.75	GK
21	168.5	G	128.26	30	-2.67	1.67	6.33	0.25	0.5	0.75	GK
35	168.5	G	128.26	60	-0.67	1.33	7.67	0.25	0.5	0.75	GK
36	168.5	G	128.26	100	1.67	6.33	16	0.25	0.5	0.75	GK
5	167.5	G	127.26	23	-2.33	0.67	17.67	0.25	0.5	0.75	GK
12	167.5	G	127.26	63	0	6.33	17.67	0.25	0.5	0.75	GK
27	167.5	G	127.26	97	-0.67	4	12.67	0.25	0.5	0.75	GK
30	159	G	118.76	100	-0.33	4	8.33	0.25	0.5	0.75	GK

*Table reports rifle noise exposure data from the CHABA data set (Coles et al. 1967; Garinther and Kryter 1965). Original data included the number of subjects (N_{subj}), the peak-pressure level of individual shots (SPL), whether shots were at grazing (G) or normal (N) incidence, the number of shots N_{shots}, and the TTS levels (TTSⁱ, TTSⁱⁱ, and TTSⁱⁱⁱ) corresponding to three quantiles (Qⁱ, Qⁱⁱ, and Qⁱⁱⁱ). SELA for a single shot was estimated using the following formula: SELA = SPL – 37 dB – B. B = 0 for normal (N) incidence and 3.24 for grazing (G) incidence. TTS values are the average of reported values for 1, 2, and 4 kHz (if available) at each quantile; otherwise, they are the average of 2 and 4 kHz. Ref. column shows the table number in Coles et al. (1967) from which the data were derived or “GK” to indicate data derived from Garinther and Kryter (1965).

The reader is referred to the cited references for additional details about the original data collection procedures, as well as frequency-specific TTS measurement results (Coles et al. 1967; Garinther and Kryter 1965; Pfander et al. 1980; Brinkmann 2003). In the development of Auditory 4.5, the CHABA human rifle noise data (specifically, the data contained in Coles et al. 1967) were used to guide the scaling for dose calculation between chinchillas and humans, and the G3 and FNC rifle noise results were used to validate the model. The logistic injury curves present in Auditory 4.5 were directly fit on the USAMRMC chinchilla dataset.

Table 2 reports three additional rifle noise data points, for exposures originally reported in Pfander et al. (1980); Brinkmann (2003); and Dancer et al. (1991). The SELA was directly measured by various authors (Chan and Ho 2012; Smooreburg 2003) for these rifles and therefore was not estimated using the 37 dB SPL–SELA conversion used for CHABA (see footnote to Table 1). The FNC and G3 data were included as validation data for Auditory 4.5, while the Dancer data are additional data noted by (Smooreburg 2003).

Table 2. Additional Human Rifle Noise Exposure Data

N_{subj}	SPL (dB)	N/G	SELA (dB)	N_{shots}	TTS (dB)	Quantile	Rifle
103	158.3	G	121.6	6	25	0.95	FNC
78	159.5	G	124.9	5	25	0.85	G3
12	159	G	125	10	25	0.75	(Dancer et al. 1991)

*The SELA values for the FNC and G3 data were reported in Chan and Ho (2012) as being determined *for grazing incidence*. For Dancer et al. (1991), the A-weighted energy was determined for a sound recorded “5 cm in front of the opening of the auditory canal of the left ear of a right-handed subject,” which we interpret to be equivalent to already accounting for grazing incidence. Therefore, no angle correction was applied for these three exposure conditions.

3. USAMRMC Chinchilla Dataset

The USAMRMC chinchilla dataset included audiometry and histology data for 905 chinchilla subjects exposed to a range of sound sources, including shock tubes, spark gaps, and narrow-band noise impulses. In addition to the noise source, the number of impulses, timing between impulses (inter-pulse interval, or IPI), and intensity of impulses was also varied for these experiments. TTS was recorded at a number of time points for the subjects starting 2 minutes after exposure, and PTS was measured 30 days post-exposure. PTS was measured multiple times for each subject and reported as averages of three measurements. Details on the experimental data collection can be found in the original sources (Patterson et al. 1985, 1986; Hamernik et al. 1988; Hamernik, Ahroon, and Turrentine 1988b, 1988a, Hamernik et al. 1989, 1990, 1991, Patterson, Carrier, et al. 1991a, 1991b; Patterson, Bordwell, et al. 1991; Hamernik, Ahroon, and Lei 1994; Hamernik 1996; Hamernik et al. 1998).

The USAMRMC chinchilla data were collected over more than a decade, during which time data collection formats evolved. Neither the time points of TTS measurement nor the frequencies at which TTS and PTS were measured were consistent for the entirety of the dataset. For this reason, in this document data were placed into tables (spreadsheets) organized by time point and measurement frequency. The data reporting format is designed to enable assembly into a relational database such as can be constructed using Microsoft Access or similar software. Figure 1 shows an example diagram of the construction of a relational database using the data tables.

IDA did not digitize the extensive available histology data; nor did IDA individually digitize each plot contained in the reports. Instead, IDA digitized the data most relevant to evaluating the construction and performance of Auditory 4.5—specifically, data pertaining to TTS and PTS as a function of the SELA. In the original reports, some data were reported for individual subject measurements, while other data were reported as group means. In some cases, individual subject PTS data were available in plots, but group mean data for the same exposure were available in other plots. Digitizing individual data points from plots was sometimes limited by overlap of points. In such cases, IDA used the following rules:

- If all individual points corresponding to a given condition could be directly digitized, the individual data points were included in the table `IndivPTS`.
- If all but one of the individual points corresponding to a given condition could be directly digitized, the last point was inferred from the mean PTS value reported for the same condition, and the resulting set of individual data points were included in the table `IndivPTS`. Where this was done, the inferred data point has a SUBJECT tag ending in “X.”

- If more than one of the individual points corresponding to a condition could not be digitized, the condition mean and standard deviation were included in the table MeanPTS_124.

Therefore, all subjects' PTS results are captured either individually in `IndivPTS` or by test group in `MeanPTS_124`. Along with reporting the data, we also provide trace-back to the source of each data point (report, page, and, if applicable, figure number).

All `Indiv` and `Mean` tables connected to `Sources` by `SRC`, and to `References` by `REFNUM`

`Indiv` tables connected to each other by `SUBJECT`

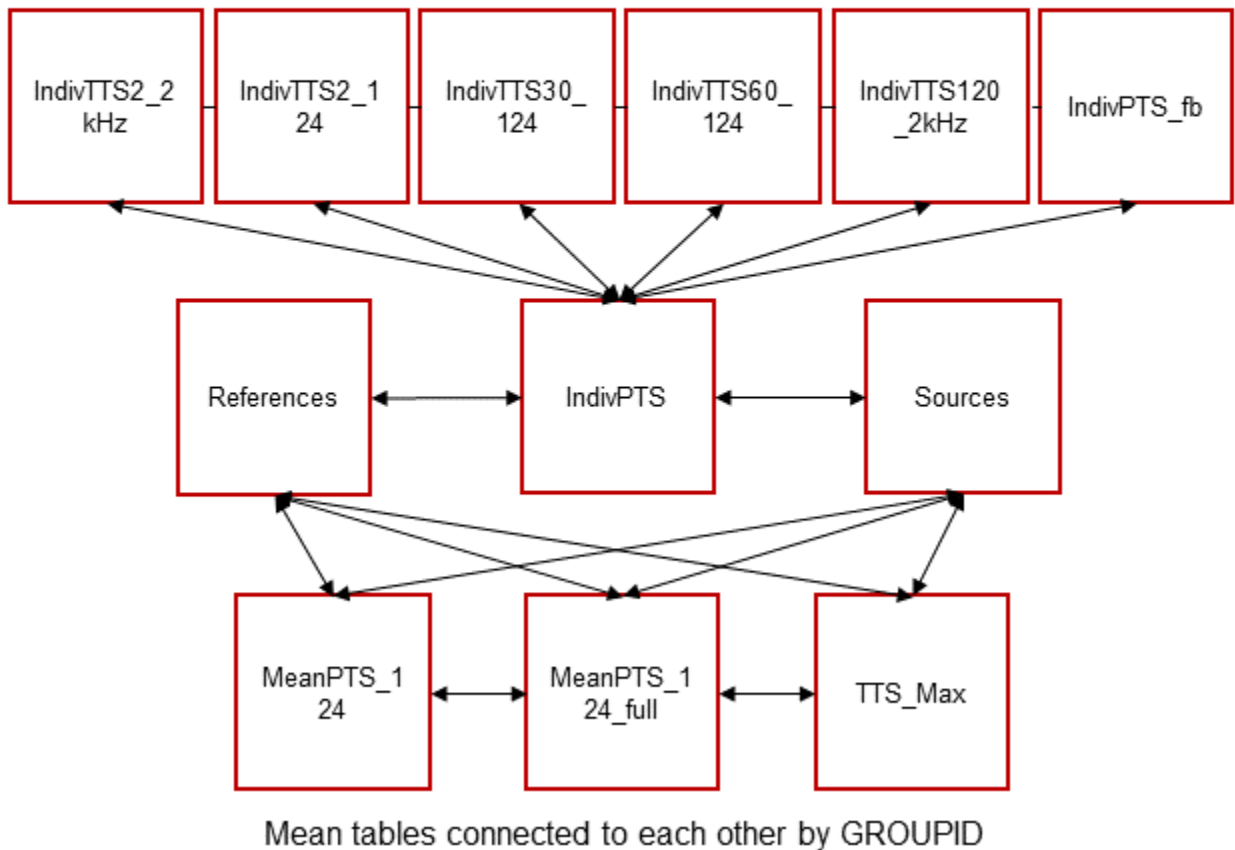


Figure 1. Example Relational Database Construction Using the USAMRMC Chinchilla Data Text Files. GROUPID, REFNUM, SRC, and SUBJECT are tags contained within spreadsheets as column headers, which can be used to relate certain tables to each other.

Note that some details of the use of these data in the construction of Auditory 4.5 are unclear. Auditory 4.5 predicts the average TTS and PTS across 1, 2, and 4 kHz. However, a large portion of the data for TTS at 2 minutes did not include measurements at 1 or 4 kHz, instead measuring 0.5, 2, and 8 kHz. In such cases, IDA digitized the 2 kHz data only.

A. How to Use this Document

This document describes the contents of the individual spreadsheets in the dataset, as well as the relationships between those text files. In Section 3.B, each table is concisely described and its tags (column headers) listed. Because the same tags are contained in multiple spreadsheets, the detailed description of individual tags (including units) is contained in Section 3.C. Therefore, to understand the contents of a particular table (spreadsheet), first look up the table name in Section 3.B, and then look up the listed tags for that table in Section 3.C.

In general, the dataset contains four types of tables:

- `Sources` table describes the sound sources the subjects were exposed to.
- `References` table lists the documents from which data were pulled.
- `Indiv` tables list exposure conditions and TTS or PTS observations for *individual* test subjects.
- `Mean` tables list exposure conditions and TTS and PTS results for experimental groups (i.e., mean and standard errors of TTS and PTS are reported for test groups, rather than for individual subjects that make up a test group). `TTS_Max` is one of the `Mean` tables.

This document provides relevant details about where data were accessed, explains how they were digitized, and gives pertinent metadata pertaining to each table and tag. However, we emphasize that the original reports from which these data are pulled contain much greater detail about the original experimental efforts that produced these data. Those reports are publicly accessible, and anyone intending to use these data is strongly encouraged to review those reports.

B. List of Tables in the USAMRMC Chinchilla Dataset

- `Sources`: This table describes the sound sources used for each experimental condition in the data collection. This table includes the following tags: `SRC`, `SELA_one_Murphy`, `SRC_Description`, and `SRC_Report`.
- `References`: This table lists information for each reference from which data were pulled to construct this database. This table includes the following tags: `REFNUM`, `FIRSTAU`, `YEAR`, `TITLE`, `ARL_REPNUM`, `ORG`, and `PVNUM`.
- `IndivPTS`: This table lists the experimental conditions and PTS measurement results, averaged across 1, 2, and 4 kHz, for individual subjects. This table includes the following tags: `SUBJECT`, `SRC`, `SPL`, `NPULSE`, `INTERVAL`, `PTS124`, `REFNUM`, `REFPAGE`, and `REFFIG`.
- `IndivPTS_fb`: This table lists the experimental conditions and PTS measurement results for individual subjects for which frequency-specific PTS data were available for 1, 2, and 4 kHz. Therefore, this table contains a subset of the subjects contained in

IndivPTS. This table includes the following tags: SUBJECT, SRC, SPL, NPULSE, INTERVAL, PTS124, PTS1, PTS2, PTS4, REFNUM, REFPAGE, and REFFIG.

- IndivTTS2_2kHz: This table lists the experimental conditions and 2kHz TTS measurement results 2 minutes post-exposure, for individual subjects for which 2 kHz data were available. This table includes the following tags: SUBJECT, SRC, SPL, NPULSE, INTERVAL, TTS2_2, REFNUM, REFPAGE, and REFFIG.
- IndivTTS2_124: This table lists the experimental conditions and TTS measurement results 2 minutes post-exposure, for individual subjects for which 1, 2, and 4 kHz data were available. This table includes the following tags: SUBJECT, SRC, SPL, NPULSE, INTERVAL, TTS2_124, TTS2_1, TTS2_2, TTS2_4, REFNUM, REFPAGE, and REFFIG.
- IndivTTS30_124: This table lists the experimental conditions and TTS measurement results 30 minutes post-exposure, for individual subjects for which 30-minute individual data were available. This table includes the following tags: SUBJECT, SRC, SPL, NPULSE, INTERVAL, TTS30_124, TTS30_1, TTS30_2, TTS30_4, REFNUM, REFPAGE, and REFFIG.
- IndivTTS60_124: This table lists the experimental conditions and TTS measurement results 60 minutes post-exposure, for individual subjects for which 60-minute individual data were available. This table includes the following tags: SUBJECT, SRC, SPL, NPULSE, INTERVAL, TTS60_124, TTS60_1, TTS60_2, TTS60_4, REFNUM, REFPAGE, and REFFIG.
- IndivTTS120_2kHz: This table lists the experimental conditions and 2kHz TTS measurement results 120 minutes post-exposure, for individual subjects for which 2 kHz data were available. Note that TTS measurements at this time-point do not appear to have included 1 or 4 kHz. This table includes the following tags: SUBJECT, SRC, SPL, NPULSE, INTERVAL, TTS120_2, REFNUM, REFPAGE, and REFFIG.
- MeanPTS_124: This table lists the experimental conditions and PTS measurement results (mean and standard error), averaged across 1, 2, and 4 kHz, for groups of subjects for which individual data were unavailable or insufficient for full group digitization. This table includes the following tags: GROUPID, SRC, SPL, NPULSE, INTERVAL, NSUBJ, Ave_PTS124, StdErr_PTS124, REFNUM, REFPAGE, and REFFIG.
- MeanPTS_124_full: This table lists the experimental conditions and PTS measurement results (mean and standard error), at 1, 2, and 4 kHz, for all groups of subjects for which frequency-specific individualized PTS data were not available (including all groups also contained in MeanPTS_124). This table includes the following tags: GROUPID, SRC, SPL, NPULSE, INTERVAL, NSUBJ, Ave_PTS124,

StdErr_PTS124, Ave_PTS1, StdErr_PTS1, Ave_PTS2, StdErr_PTS2, Ave_PTS4, StdErr_PTS4, REFNUM, REFPAGE, and REFFIG.

- **TTS_Max:** This table lists the experimental conditions and reported maximum TTS values for groups of subjects (GROUPID) for which no individual subject TTS data were reported. These groups did not report TTS measured at 1 or 4 kHz. Furthermore, although the maximum TTS is often the first TTS measured after exposure, this is not always the case. Therefore, the observations in this table are for various (unknown) post-exposure time-points. This table includes the following tags: GROUPID, SRC, SPL, NPULSE, INTERVAL, NSUBJ, Ave_TSMAX_2, StdErr_TSMAX_2, REFNUM, REFPAGE, and REFFIG.

C. List of Tags in the USAMRMC Chinchilla Data Set

- **ARL_REPNUM:** The Army Research Lab report number, if applicable. If a reference lacks an ARL report number, “NA” appears. Tag contained in: *References*.
- **Ave_PTS1:** The PTS in decibels at 1 kHz averaged across all subjects in a particular exposure group (GROUPID). These data were digitized exclusively from figures. Tag contained in: *MeanPTS_124_full*.
- **Ave_PTS124:** The PTS in decibels (averaged across 1, 2, and 4 kHz and across all subjects) measured for a particular exposure group (GROUPID). Note that *Ave_PTS124* is the average of *Ave_PTS1*, *Ave_PTS2*, and *Ave_PTS4*. Although there are some GROUPIDs for which individual subject data could be fully digitized for *IndivPTS*, *Ave_PTS124* is not necessarily exactly equal to the average of all PTS124 values for individual subjects with exposure conditions (SRC, SPL, NPULSE, and INTERVAL) identical to that GROUPID. *Ave_PTSx* values were digitized from different plots than PTS124 values, producing digitization error in both cases. Tag contained in: *MeanPTS_124* and *MeanPTS_124_full*.
- **Ave_PTS2:** The PTS in decibels at 2 kHz averaged across all subjects in a particular exposure group (GROUPID). These data were digitized exclusively from figures. Tag contained in: *MeanPTS_124_full*.
- **Ave_PTS4:** The PTS in decibels at 4 kHz averaged across all subjects in a particular exposure group (GROUPID). These data were digitized exclusively from figures. Tag contained in: *MeanPTS_124_full*.
- **Ave_TSMAX_2:** The maximum TTS in decibels at 2 kHz averaged across all subjects in a particular exposure group (GROUPID). These data were digitized exclusively from figures. Tag contained in: *TTS_Max*.
- **FIRSTAU:** The last name of the first author for a particular reference. Tag contained in: *References*.

- **GROUPID:** The unique identification code assigned for a test group. Only test groups for which individual subject data could not be sufficiently digitized were assigned a GROUPID. That is, several references did not report individual results for TTS, but did report mean and standard error of the mean results. Furthermore, individual subject PTS results were reported in figures with overlapping points for these references, meaning that some individual subject results could not be digitized effectively. Also, individual subject PTS results were only reported as averages of 1, 2, and 4 kHz, while group average PTS results were reported as a function of frequency. Tag contained in: MeanPTS_124, MeanPTS_124_full, and TTS_Max.
- **INTERVAL:** The time in seconds between impulses for a particular exposure condition. If only 1 impulse was used, then INTERVAL is 0. Tag contained in: IndivPTS, IndivPTS_fb, IndivTTS2_2kHz, IndivTTS2_124, IndivTTS30_124, IndivTTS60_124, IndivTTS120_2kHz, MeanPTS_124, MeanPTS_124_full, and TTS_Max.
- **NPULSE:** The number of impulses a subject (SUBJECT) or group (GROUPID) was exposed to from a particular sound source (SRC). Tag contained in: IndivPTS, IndivPTS_fb, IndivTTS2_2kHz, IndivTTS2_124, IndivTTS30_124, IndivTTS60_124, IndivTTS120_2kHz, MeanPTS_124, MeanPTS_124_full, and TTS_Max.
- **NSUBJ:** The number of subjects in a test group (GROUPID). Tag contained in: MeanPTS_124, MeanPTS_124_full, and TTS_Max.
- **ORG:** The reporting organization for a particular reference document. If a reference did not cite a reporting organization, “NA” is listed. Tag contained in: References.
- **PTS1:** The PTS in decibels measured at 1 kHz for a particular subject (SUBJECT). Tag contained in: IndivPTS_fb.
- **PTS124:** The PTS in decibels (averaged across 1, 2, and 4 kHz) measured for a particular subject (SUBJECT). Note that PTS124 is the average of PTS1, PTS2, and PTS4. Tag contained in: IndivPTS and IndivPTS_fb.
- **PTS2:** The permanent threshold shift in decibels measured at 2 kHz for a particular subject (SUBJECT). Tag contained in: IndivPTS_fb.
- **PTS4:** The permanent threshold shift in decibels measured at 4 kHz for a particular subject (SUBJECT). Tag contained in: IndivPTS_fb.
- **PVNUM:** The part or volume number of a particular reference document, if applicable. Stand-alone documents do not have part or volume numbers; for these, “NA” is listed. Tag contained in: References.

- REFFIG: The figure number, if applicable, where a particular data point was collected from the reference (REFNUM). If a data point was not digitized from a figure, then “NA” is listed. Tag contained in: IndividPTS, IndividPTS_fb, IndividTTS2_2kHz, IndividTTS2_124, IndividTTS30_124, IndividTTS60_124, IndividTTS120_2kHz, MeanPTS_124, MeanPTS_124_full, and TTS_Max.
- REFNUM: An index for the reference from which data were pulled. Tag contained in: References, IndividPTS, IndividPTS_fb, IndividTTS2_2kHz, IndividTTS2_124, IndividTTS30_124, IndividTTS60_124, IndividTTS120_2kHz, MeanPTS_124, MeanPTS_124_full, TTS_Max.
- REFPAGE: The page number(s) where a particular data point was collected from the reference (REFNUM). Tag contained in: IndividPTS, IndividPTS_fb, IndividTTS2_2kHz, IndividTTS2_124, IndividTTS30_124, IndividTTS60_124, IndividTTS120_2kHz, MeanPTS_124, MeanPTS_124_full, and TTS_Max.
- SELA_one_Murphy: The SELA in decibels (dB) for a single pulse from the corresponding source tagged by SRC. SELA estimates were determined using Table 3 from Murphy, Khan, and Shaw (2011), which reported LAEq8, a metric that can be related to SELA using an additive factor of 44.6 dB ($SELA [dB] = LAEq8 + 44.6$) (Murphy, Khan, and Shaw 2011). SELA values were confirmed by comparison with Figure 78 from Hamernik et al. (1998), which plotted PTS vs SELA for all of the 100-impulse exposures in the data set. (Hamernik et al. 1998) Very close correspondence (within 0.5 dB) was found between these two documents. Because the data from Hamernik et al. (1998) were digitized from plots, they were expected to have more errors than the data reported in Murphy, Khan, and Shaw (2011). Tag contained in: Sources.
- SPL: The peak sound pressure level, in decibels, for a particular source (SRC). Tag contained in: IndividPTS, IndividPTS_fb, IndividTTS2_2kHz, IndividTTS2_124, IndividTTS30_124, IndividTTS60_124, IndividTTS120_2kHz, MeanPTS_124, MeanPTS_124_full, and TTS_Max.
- SRC: An index for each sound source used in the experiments. Tag contained in: Sources, IndividPTS, IndividPTS_fb, IndividTTS2_2kHz, IndividTTS2_124, IndividTTS30_124, IndividTTS60_124, IndividTTS120_2kHz, MeanPTS_124, MeanPTS_124_full, TTS_Max.
- SRC_Description: A short description of the sound source. Tag contained in: Sources.
- SRC_Report: The REFNUM indexes for the reference from which TTS and PTS results for that sound source (SRC) were recorded in the tables. Some sources appeared in

multiple references. One source listed in Murphy, Khan, and Shaw (2011) could not be found in the other documents. Tag contained in: `Sources`.

- `StdErr_PTS1`: The standard error due to subject-to-subject variability of PTS at 1 kHz measured for a particular exposure group (`GROUPID`). These data were digitized exclusively from plots. Where no error bar was visible, the height of the boundary of the data point in question was used to estimate standard error. Tag contained in: `MeanPTS_124_full`.
- `StdErr_PTS124`: The standard error due to subject-to-subject variability of `Ave_PTS124` in decibels (averaged across 1, 2, and 4 kHz) measured for a particular exposure group (`GROUPID`). Note that `StdErr_PTS124` was determined as the square root of the sum of the squares of `StdErr_PTS1`, `StdErr_PTS2`, and `StdErr_PTS4`. Although there are some `GROUPIDs` for which individual subject data could be fully digitized for `IndivPTS`, `StdErr_PTS124` is not based on the `PTS124` values for individual subjects with exposure conditions (`SRC`, `SPL`, `NPULSE`, and `INTERVAL`) identical to that `GROUPID`. `StdErr_PTSx` values were digitized from different plots than `PTS124` values, producing digitization error in both cases. Tag contained in: `MeanPTS_124` and `MeanPTS_124_full`.
- `StdErr_PTS2`: The standard error due to subject-to-subject variability of PTS at 2 kHz measured for a particular exposure group (`GROUPID`). These data were digitized exclusively from plots. Where no error bar was visible, the height of the boundary of the data point in question was used to estimate standard error. Tag contained in: `MeanPTS_124_full`.
- `StdErr_PTS4`: The standard error due to subject-to-subject variability of PTS at 4 kHz measured for a particular exposure group (`GROUPID`). These data were digitized exclusively from plots. Where no error bar was visible, the height of the boundary of the data point in question was used to estimate standard error. Tag contained in: `MeanPTS_124_full`.
- `StdErr_TSMAX_2`: The standard error of the mean due to subject-to-subject variability of maximum TTS in decibels at 2 kHz measured for subjects in a particular exposure group (`GROUPID`). These data were digitized exclusively from figures. Tag contained in: `TTS_Max`.
- `SUBJECT`: The unique identification code for each individual chinchilla subject. When individual subject data were reported in tables in the original references, the original subject's identification code was preserved. Where individual subject data were digitized from plots (for which no unique ID code was provided), a new code was assigned, beginning with Roman numerals II, III, or IV. This was necessary for `REFNUMs` 6, 7, and 10. As described above, if all but one of the individual points corresponding to a given condition could be directly digitized from plots, the last point

was inferred from the mean PTS value reported elsewhere for the same condition, and the resulting set of individual data points were included in the table `IndivPTS`. Where this was done, the inferred data point has a `SUBJECT` tag ending in “X.” Tag contained in: `IndivPTS`, `IndivPTS_fb`, `IndivTTS2_2kHz`, `IndivTTS2_124`, `IndivTTS30_124`, `IndivTTS60_124`, and `IndivTTS120_2kHz`.

- `TITLE`: The title of a particular reference document. Tag contained in: `References`.
- `TTS2_1`: The TTS in decibels measured at 1 kHz for a particular subject (`SUBJECT`) 2 minutes post-exposure. Tag contained in: `IndivTTS2_124`.
- `TTS120_2`: The TTS in decibels measured at 2 kHz for a particular subject (`SUBJECT`) 120 minutes post-exposure. Tag contained in: `IndivTTS120_2kHz`.
- `TTS2_124`: The TTS in decibels (averaged across 1, 2, and 4 kHz) measured for a particular subject (`SUBJECT`) 2 minutes post-exposure. Note that `TTS2_124` is the average of `TTS2_1`, `TTS2_2`, and `TTS2_4`. Tag contained in: `IndivTTS2_2kHz` and `IndivTTS2_124`.
- `TTS2_2`: The TTS in decibels measured at 2 kHz for a particular subject (`SUBJECT`) 2 minutes post-exposure. Tag contained in: `IndivTTS2_2kHz` and `IndivTTS2_124`.
- `TTS2_4`: The TTS in decibels measured at 4 kHz for a particular subject (`SUBJECT`) 2 minutes post-exposure. Tag contained in: `IndivTTS2_124`.
- `TTS30_1`: The TTS in decibels measured at 1 kHz for a particular subject (`SUBJECT`) 30 minutes post-exposure. Tag contained in: `IndivTTS30_124`.
- `TTS30_124`: The TTS in decibels (averaged across 1, 2, and 4 kHz) measured for a particular subject (`SUBJECT`) 30 minutes post-exposure. Note that `TTS30_124` is the average of `TTS30_1`, `TTS30_2`, and `TTS30_4`. Tag contained in: `IndivTTS30_124`.
- `TTS30_2`: The TTS in decibels measured at 2 kHz for a particular subject (`SUBJECT`) 30 minutes post-exposure. Tag contained in: `IndivTTS30_124`.
- `TTS30_4`: The TTS in decibels measured at 4 kHz for a particular subject (`SUBJECT`) 30 minutes post-exposure. Tag contained in: `IndivTTS30_124`.
- `TTS60_1`: The TTS in decibels measured at 1 kHz for a particular subject (`SUBJECT`) 60 minutes post-exposure. Tag contained in: `IndivTTS60_124`.
- `TTS60_124`: The TTS in decibels (averaged across 1, 2, and 4 kHz) measured for a particular subject (`SUBJECT`) 60 minutes post-exposure. Note that `TTS60_124` is the average of `TTS60_1`, `TTS60_2`, and `TTS60_4`. Tag contained in: `IndivTTS60_124`.
- `TTS60_2`: The TTS in decibels measured at 2 kHz for a particular subject (`SUBJECT`) 60 minutes post-exposure. Tag contained in: `IndivTTS60_124`.

- TTS60_4: The TTS in decibels measured at 4 kHz for a particular subject (SUBJECT) 60 minutes post-exposure. Tag contained in: `IndivTTS60_124`.
- YEAR: The year a particular reference document was published. Tag contained in: `References`.

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14. ABSTRACT The Joint Intermediate Force Capabilities Office (JIFCO) supports modeling of injury risk for weapons in its portfolio. Temporary and permanent threshold shift (TTS and PTS) are injuries that can occur upon exposure to loud sounds, such as those produced by flashbangs. Among the models in JIFCO's portfolio is Auditory 4.5, which predicts TTS and PTS caused by impulse sounds. Auditory 4.5 was built using multiple data sources, including both human rifle noise exposure data and a large set of chinchilla injury data. As part of an analysis of the uncertainties built into auditory injury models available from JIFCO, these data were digitized from their original sources and compiled. This document describes the consolidated data set, which is available as an attachment in DTIC.					
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