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Movies as a source of non-occupational noise exposure

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Movies as a Source of Non-Occupational Noise Exposure

by

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1. INTRODUCTION

Hearing loss is a condition that affects a significant portion of the United States population. In fact, it is estimated that nearly 28 million Americans suffer from a hearing impairment of some kind (American Speech-Language-Hearing Association, 1997). There are countless sources of origin for a hearing impairment; however, one of the most common foundations of this condition is exposure to noise. Noise, or unwanted sound, is predicted to be the cause of nearly 10 million American's hearing loss (American Speech-Language-Hearing Association, 1997). It has long been accepted that the effect that noise will have upon one's hearing is highly variable and greatly dependent upon the intensity, duration, and the frequency spectrum of the interfering sound (American Speech-Language-Hearing Association, 1997; Pugsley et al., 1993; Occupational Safety & Health Administration, 1995; Clark, W., 1991; Thiery, L & Meyer-Bish, C., 1988).

- **The Consequences of Noise Exposure**

Noise can damage an individual's hearing in one of two ways. A single loud exposure, more commonly referred to as an acoustic trauma, may cause permanent damage to the inner ear. In order for this single exposure to cause injury it must be very intense, on the order of 140 dB peak sound pressure level or greater, and is typically short in duration. This permanent hearing loss is a direct result of the mechanical division between the organ of Corti and the basilar membrane, which is a consequence of an exceptionally intense noise exposure (National Institute on Deafness and Other Communication Disorders, 2002; Clark, W.W., & Bohne, B.A., 1999). In cases of an acoustic trauma, it is the absolute intensity of the signal, not the duration, which determines the extent of damage that will occur (Clark, W.W., & Bohne, B.A., 1999).

Repeated exposure to fluctuating levels of noise over a period of weeks to years is another manner in which hearing is damaged by noise. This type of noise exposure damages hearing slowly over time, and results in a noise-induced hearing loss, or NIHL. In cases such as these, the noise levels must be in the range of 90-130 dB. This is an A-weighted decibel measure, meaning that the effects of the human ear are taken into consideration. This type of noise exposure causes metabolic changes, which in turn initiate damage to the cochlea (Clark, W.W., & Bohne, B.A., 1999; Saunders, J.C., Dear, S.P., & Schneider, M.E., 1985). According to Clark and Bohne (1999), the noise-induced hearing loss typically will progress in three steps.

The first step that occurs with continuous noise exposure is that the sensory cells of the cochlea, namely the outer hair cells (OHCs), are destroyed permanently (Miller, J.A.L., & Marshall, L., 2001; Clark, W.W., & Bohne, B.A., 1999; Saunders, J.C., Dear, S.P., & Schneider, M.E., 1985). Second to the destruction, the effects of this cochlear damage may begin to change an individual's hearing ability. According to American College of Occupational and Environmental Medicine (ACOEM) (2002), the effect of long-term exposure to noise typically manifests itself in a predictable pattern. Typically the hearing loss is equivalent between both ears, since the noise exposure is also symmetric. Additionally, a notched or falling audiogram at 3, 4, or 6 KHz, with a rise at 8 KHz is emblematic of a noise-induced hearing loss. Although this audiometric shape is characteristic of this type of noise exposure, variability does exist due to the shape of the ear canal and the frequency of the incoming signal (ACOEM, 2002).

- **Non-auditory Effects of Noise Exposure**

An individual is said to be at risk for NIHL if he or she is exposed to an 85 dB A-weighted average over a period of 8 hours (Occupational Safety & Health Administration (OSHA), 1995; Henderson, D., Subramaniam, M., & Boettcher, F.A., 1993). It is also important to note that the degree of hearing loss is greatest within the first 10 to 15 years of exposure, and the effect seems to decline over time. The third stage of NIHL occurs when the hearing loss has begun to significantly affect an individual's speech perception or quality of life, and he or she seeks medical attention. Furthermore, the damage to the inner ear that is associated with NIHL may have consequences other than hearing loss. Tinnitus, or ringing in the ears, commonly accompanies the hearing loss. Non-auditory effects of noise may also include, depression, cardiovascular effects, increased breathing rate, social isolation, and increased risk of accidents (ACOEM, 2002; American Speech-Language-Hearing Association, 1997).

- **Individual Susceptibility to Noise**

Perhaps one of the most interesting effects that noise has upon exposed listeners is also one of the most puzzling. This intriguing issue relates to the fact that no two listeners are alike when it comes to noise exposure, two persons exposed to the exact same noise may experience very different consequences (Sutton et al., 1994; Henderson, D., Subramaniam, M., & Boettcher, F.A., 1993; Saunders, J.C., Dear, S.P., & Schneider, M.E., 1985). Historically, researchers have attributed this intersubject variability to such inherent traits such as, age, gender, and eye color (Henderson, D., Subramaniam, M., & Boettcher, F.A., 1993). This heterogeneous effect of noise exposure has also been linked to various environmental and biological characteristics.

Some of the possible environmental agents responsible for susceptibility to noise include, solvents, carbon monoxide, and lead. Certain biological characteristics, such as the role of the acoustic reflex on sound transmission, have also been explored as contributing to the variability of exposure (Henderson, D., Subramaniam, M., & Boettcher, F.A., 1993). Although many theories do exist surrounding the unpredictability of effects of noise exposure, a good deal of research has been completed on how those who are at risk can be identified early.

The use of both pure tone audiometry and otoacoustic emissions (OAEs), have been explored as a possible means by which those at risk could be identified. Research has demonstrated that OAE testing is a good objective measure for early identification of NIHL (Hall, A.J., 1999; Sutton, L.A. et al., 1994). OAEs are theorized to be an adequate predictor of NIHL because

OAEs directly correlate to OHC function, and NIHL is said to have detrimental affects upon the OHC (Sutton, L.A. et al., 1994). In light of the correlation between OHC function and NIHL, it is apparent why OAEs have proven to be a beneficial measure of susceptibility to noise exposure (Hall, A.J., 1999; Sutton, L.A. et al., 1994).

- **Types of Noise Exposure**

As one might expect, the majority of cases of NIHL are related to industrial exposure. This type of noise exposure yields what is known as an occupational noise-induced hearing loss (ACOEM, 2002). Considering nearly 30 million workers are exposed to hazardous levels of noise in an industrial setting, it is apparent why federal regulations exist to protect at risk individuals (National Institute for Occupational Safety and Health (NIOSH), 2000). These federal regulations, set forth by OSHA prohibit a worker from being exposed to an 90 dB A-weighted average over a period of 8 hours. Those exposed at 85 dB and above must be enrolled in a hearing conservation program, & must wear hearing protection if they sustain a loss of hearing. Although occupational noise-induced hearing loss has historically been the primary area of interest and research in the field of noise exposure, attention has also been focused upon the non-occupational effects of noise.

- **Recreational Noise Exposure**

In the broad area of non-occupational noise exposure, one of the subjects that have received a great deal of attention is recreational noise exposure. Recreational noise exposure occurs during many leisure activities, one of the most common being use of firearms (Clark, W.W., & Bohne, B.A., 1999). According to the National Institute of Justice (NIJ), there are roughly 200 million firearms owned by Americans, and roughly 25 percent of Americans actually own a gun (NIJ, 1997). In a survey conducted by NIJ (1997), nearly 46 percent of gun owners use the weapon for recreational purposes. Considering that firearm use is widespread among Americans, it is apparent why so many people suffer from related noise exposure.

In recent times, several other leisure activities have been explored in order to find other possible causes of noise-related hearing loss. Some of the more commonly investigated sources of recreational hearing loss have included, music, rock concerts, toy weapons, firecrackers, and portable stereo use (Napoli, M., 1999; Mostafapour, S.P., Lahargoue, K., & Gates, G.A., 1998; Pugsley, S. et al., 1993; Yassi, A. et al., 1993; Clark, W.W., 1991; Bennett, W.I., 1990; Gupta, D.S.K., 1989). In addition, increased attention is being focused on the possibility of movie theatres as sources of non-occupational noise exposure.

Recent publications and research have expressed concerns relating to the increasing intensity levels in movie theatres. Complaints of loud movies can be found in various publications worldwide, a concern that is undoubtedly widespread (Dinglasan, F., 2001; Roberts, A., 2001; Ihne et al., 1999; Winer, L., 1999; Adilman, S., 1998; Chase, M., 1997; Kramer, J., 1996). Concern over this issue has lead researchers to investigate the issue. Robert Sweetow, director of audiology for University of California, San Francisco, was one of the first to report his data collected on this issue (Chase, M., 1997). Sweetow reported using a sound level meter; that levels during the movie "Batman and Robin" reached 112 dB, and 107 dB for the movie "Contact." Another study conducted by Smith et al. (1999), measured five different movies at 15 different locations using a noise logging dosimeter (reporting in the dBA scale). Results of the study indicated that some peak levels reached 94 dBA; however, it was concluded that the overall level of the movie did not present any possible threat to audiences (Smith et al., 1999).

One of the chief complaints appearing in much of the literature regarding movie theatre noise is the fact that no government restrictions are in place to keep the volume at a restricted level

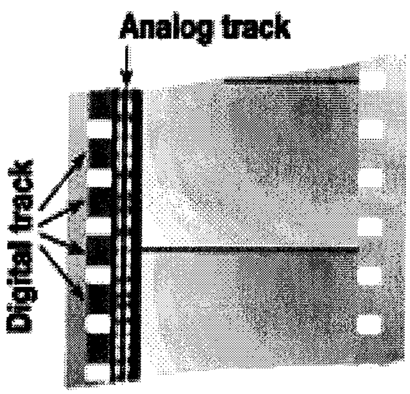
(Dinglasan, F., 2001; Roberts, A., 2001; Mack, K., 1998; Smith, B.C.E, 1997). Although no regulations exist to prevent the feature film from exceeding a certain intensity level, there are limitations on the intensity level of trailers, or previews. The rationale being that loud trailer volume has been the longstanding complaint of movie patrons for years (Dinglasan, F., 2001; Valenti, J., 2001). The trailers are typically louder than the feature film in order to capture the attention of the audience for marketing purposes (Dinglasan, F., 2001). In response to the repeated complaints from moviegoers, the Trailer Audio Standards Association (TASA) was created in 1999 (Valenti, J., 2001). TASA is administered by the Motion Picture Association of America (MPAA), and was "formed to help ensure that volume levels enhance, rather than hurt, the movie going experience" (Dinglasan, F., 2001 pp. 2). Current TASA regulations (newly revised as of June 1, 2001) state that the maximum allowable sound level for a trailer must not exceed an Leq of 85 dBA (Valenti, J., 2001). It is interesting to note, however; that this restriction applies to the trailer only, no restrictions are in place for the feature film. Researchers blame the advances in technology for the subsequent increase in movie theatre volume (Chase, M., 1997; Roberts, A., 2001). One of the most notable developments in the area of movie theatre technology has been the advent of digital surround sound (Roberts, A., 2001; Mack, K., 1998). The history of surround sound is an important area to understand, in order to better appreciate the technology of today.

- **Digital Surround Sound Technology**

According to Joseph Hull of Dolby Laboratories (2002), the first commercially available multichannel sound formats did not become available until the 1950s. From the beginning, film was presented via several front speakers, and at least one rear speaker. However, the rear speaker was only used in rare instances, such as in a religious drama (Hull, 2002). In the 1970s "high fidelity" audio sound was achieved by using a Dolby A-type noise reduction system.

According to Allen (1997), this A-type Dolby Stereo reduced noise by introducing a reference pink noise to the record chain in order that the sound level could be adjusted to a level of 85 dBC. In order for this system to be adequate for use in movie theatres, Dolby placed speakers in various locations (left, center, right, and surround) (Hull, J., 2002).

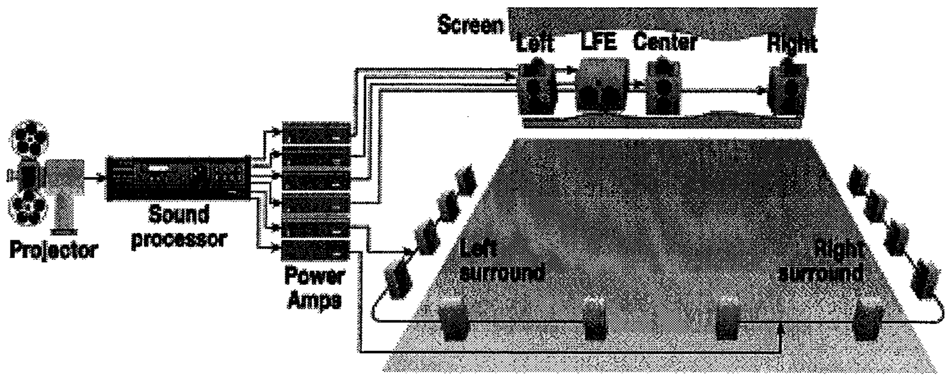
The technology used in movie theatres today was developed in the 1980s. This advanced system simply applies digital audio technology to 35 mm film. The difference between the analog and digital film can be visualized in the graphic below.



Dolby Digital release print

Dolby Laboratories. (2002). Cinema Sound FAQ for the Moviegoer. www.dolby.com

Current technology also makes use of 6 channels, instead of the previous four. The six include, left, center, right, left surround, right surround, and a channel designed for addition of low-frequency effects (LFE). The LFE channel is said to be the source of much of the "power" in movies, this may allow the audience to "feel" some of the action. This Dolby Digital technology was introduced in 1992, and remains the leading digital film format today (Hull, J., 2002). An illustration of a theatre equipped with Dolby Digital surround sound is shown below.



Dolby Digital cinema system

Dolby Laboratories. (2002). Cinema Sound FAQ for the Moviegoer. www.dolby.com

2. PURPOSE OF CURRENT STUDY

As mentioned previously, recent concern has been expressed regarding the possibility that movie theatres may be a source of non-occupational noise exposure. Previous studies on this topic have primarily focused on reporting the peak levels, and not the Leq, or equivalent sound level of the films recorded (Smith, B., 1999; Mack, K., 1998; Chase, M., 1997). The Leq is an important measure to obtain, given that has been proven to be an indicator of subjective loudness of the film (Allen, I., 1997). In addition, describing data only in terms of peak levels is misleading, given that the overall loudness level is of considerable importance.

It is the purpose of this study to determine whether or not sound levels are reached in movie theatres that may be potentially hazardous to viewers. It is also of interest whether or not variability exists among different types of films. For example, is a drama typically louder than a comedy, given that the dramas are usually aimed at an older audience, who are more likely to have a hearing loss? One of the final areas of interest in this study is to determine the dynamic range of each film. Measuring the dynamic range is how we are able to assess the amount of compression that takes place in filmmaking. It is of interest to know whether or not the film is presented at a limited or wide dynamic range, this may also yield information about whether or not accommodations are made for older versus younger audiences.

3. INSTRUMENTATION

A Larson-Davis model Spark 706 personal noise dosimeter was used for obtaining the results for this study. The dosimeter was calibrated according to the specifications set forth by Larson-Davis. The data in this study was recorded in dBA, which is the most common weighting scale for dosimetry, which is meant to adjust for human auditory sensitivity (ANSI, 2003; Clark, W.W., & Bohne, B.A.). Measurements were calculated using the following settings on the Spark 706 (table 1):

Exchange Rate	5
Threshold (dBA)	80
Criterion Level (dBA)	90
Criterion Duration (hours)	8
RMS Weighting	A Weighting
Peak Weighting	C Weighting
Detector	Slow
Gain (dB)	0

TABLE 1

Data was analyzed using the Larson-Davis Blaze (3.02) software. The data analyzed by Blaze (3.02) yielded the following measures: L10-L90 (dBA), Dose (%), Projected Dose (%), Leq (dBA), TWA (dBA), Lmax (dBA), Max Lpeak (dBc), Lep (8) (dBA), and the SE (Pa2hr).

4. PROCEDURES

The examiner attended 11 different movies throughout the St. Louis, Missouri area. The films selected were mix of genres including, drama, comedy, romantic comedy, musical drama, action, and horror. Prior to each film, the examiner programmed the Spark 706 by the use of the

Blaze (3.02) software to collect data at a set time interval (the duration of the movie). For all films the experimenter sat on an outside row in close proximity to a speaker. The microphone of the Spark 706 personal noise dosimeter was clipped to an elevated object, and directed towards the movie screen.

5. RESULTS

One of the most significant measures obtained for the individual movies were the equivalent loudness levels, or the Leq (dBA). These measures are displayed in figure 5 below.

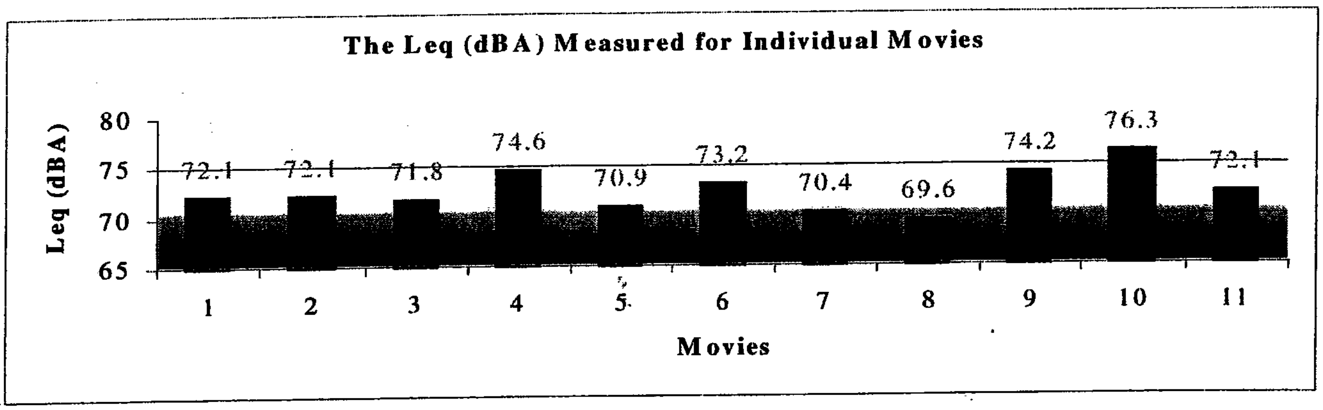


FIGURE 5

In addition to the Leq (dBA), another important portion of data collected were the max Lpeak (dBC) levels for each individual movie. This data is represented in figure 6 below.

As mentioned previously, one of the areas of interest in this study was to determine the amount

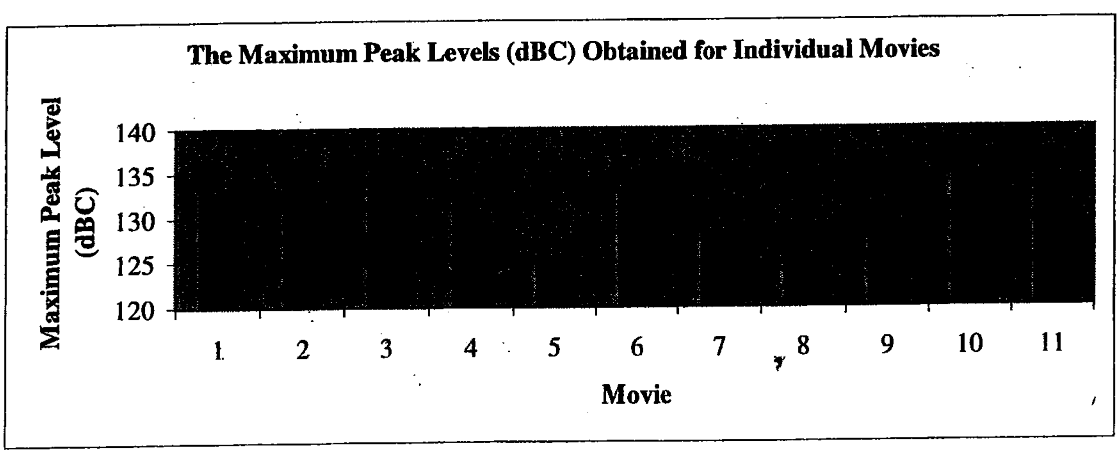


FIGURE 6

of compression employed by the filmmaking industry.

This was assessed by examining the dynamic range of each movie. The L10-L90 range determines the dynamic range, or sound level distribution. The L10, or level that was exceeded 10 percent of the time, is displayed in figure 7 below.

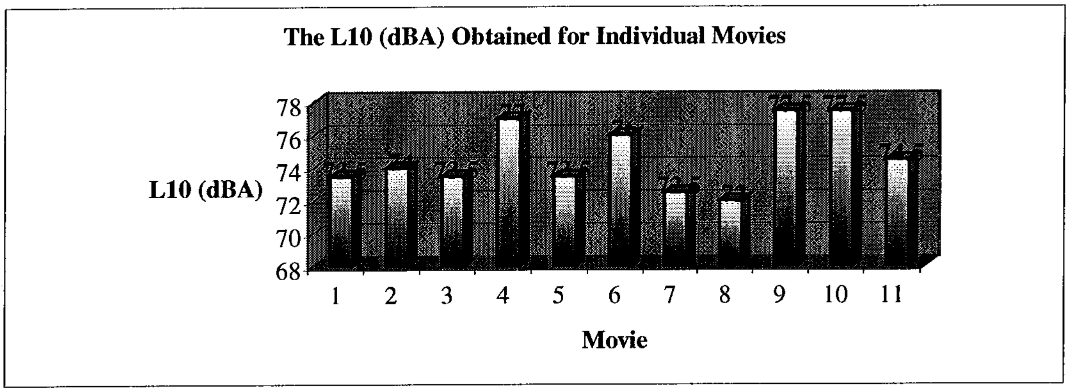


FIGURE 7

An additional purpose of this study was to evaluate any possible differences that may exist, in terms of Leq (dBA), among various genres of films. The comparison of the mean Leq (dBA) for six genres of film is shown in figure 8.

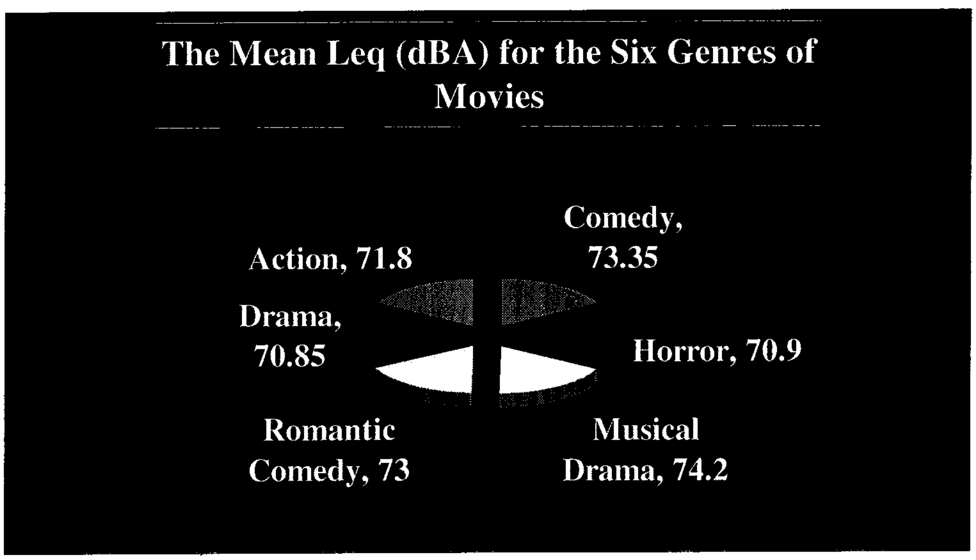


FIGURE 8

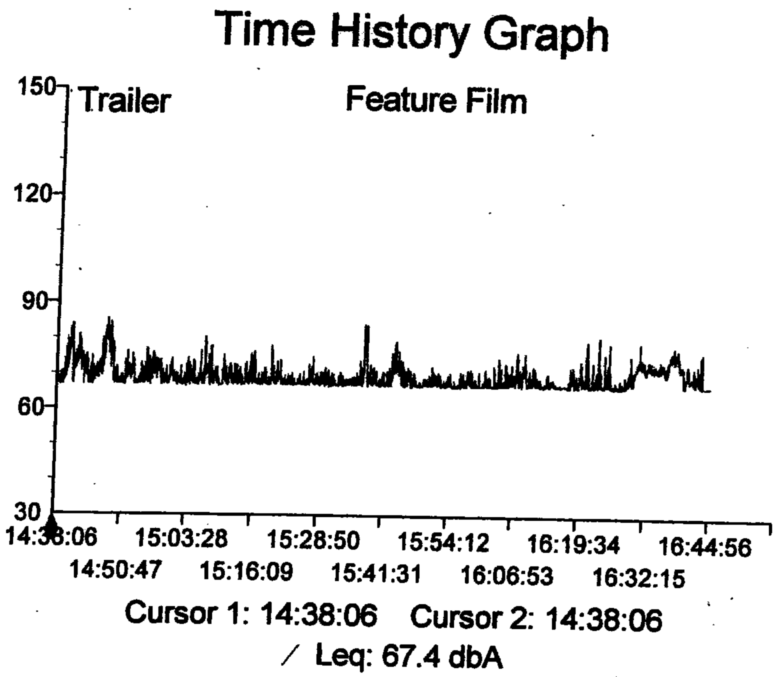


FIGURE 9
Time history graph of the trailer and the feature presentation of the romantic comedy, *Two Weeks Notice.* the graph represents the Leq (dBA) ratio between the trailer and the remainder of the movie.

One final piece of data included in this study relates to the longstanding complaints that have surrounded the loudness of movie trailers (Dinglasan, F.; Valenti, J., 2001). As formerly mentioned, regulations are currently in place by TASA restricting these previews to stay at a level that must not exceed an Leq of 85 dBA (Valenti, J., 2001). It was of interest to assess whether or not the loudness level of the trailer is much greater than the feature film, considering these regulations are in place. The time history graph of the Leq (dBA) data from a romantic comedy (Two Weeks Notice) is shown above in Figure 9. The trailer and feature film segments are clearly marked. The 10 remaining time history graphs are included in appendix A.

6. DISCUSSION

The purpose of this study was to determine whether or not loudness levels in movie theatres ever reach a level that could be deemed potentially dangerous. It was found that the Leq (dBA) did not vary significantly among movies, given that all of the measurements were within 2-4 dBA of the overall mean, which was 72.48 dBA. This data suggests that the Leq (dBA) for the movies sampled does not reach a level that should be considered hazardous. This conclusion is reached by comparing this data to OSHA regulations. OSHA regulations warn against exposures of 85 dB or greater when averaged over an 8-hour time period, and the mean Leq (dBA) in this study does not reach such levels (OSHA, 1995).

These peak levels are considered to be significant only because many of the levels do reach levels near 140 dBC, which is considered a dangerous loudness level. Although peak levels are near 140 dBC, none of the movies sampled actually reached a level considered to be hazardous. It is also important to not that the majority of prior studies on this subject concentrated much of their discussion on peak levels, although a maximum peak only represents a brief moment in the film (Smith, B., 1999; Mack, K., 1998; Chase, M., 1997). The dynamic range of each individual film was evaluated by measuring overall sound level distribution (L10-L90). Unfortunately, the complete dynamic range was not adequately measured in this study. The L90, or the level that was exceeded ninety percent of the time, is the measure that provides the lower point of the dynamic range. Since dosimetry is typically used in industrial settings, the Spark 706 device did not measure below levels of approximately 60 dBA. Given that movies are presented at lower levels, an accurate measure of the dynamic range could not be reached. However, the upper end of the range was correctly obtained by means of the L10 measurement. This data concludes that the mean L10 was 74.68 dBA, which coincides with the average Leq, 72.48 dBA.

As mentioned previously, one of the other areas of interest in this research was to compare any overall loudness differences that may exist among genres of film. It was theorized that films aimed towards a younger audience may be louder or softer than those directed to a more mature population. Presumably, this theory would be easy to assess since different genres of film do target different aged populations. The data yielded no significant differences among types of films, suggesting that the film industry does not alter loudness to please one age group over another. It is interesting to note that theatre owners have criticized this fact. According to an article written by Mack (1998), a theatre owner in the Memphis area complains that different age groups do not prefer to watch a movie at the same loudness level. The owner goes on to say that if he turns the volume down for the older population, than the young audience members will complain, and vice versa.

7. CONCLUSION

The general conclusion that can be drawn from this data is that loudness levels in movie theatres are not hazardous. When the Leq (dBA) data from this study is compared to OSHA regulations, this conclusion is affirmed. Although many of the maximum Lpeak levels (dBC) do reach levels upwards of 125 dBC, no damage to the hearing mechanism will occur since they do not reach the unsafe level of 140 dB. Additionally, it is presumed that the film industry does not alter the loudness levels of different genres of film in order to please any one age group. One of the limitations of this study is that the L90 was not accurately measured, due to preset levels on the Spark 706 dosimeter. In order to adequately assess the compression characteristics of movies, the L90 would have to be set at a level much lower than 60 dBA. Altogether, the data collected in this study and others suggests that attending movies will not damage your hearing, so feel free to enjoy the show.

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Appendix A

Blaze Summary Reports for Movies sampled

Summary Report of Road to Perdition (Movie#1)
User:
Location:
Job Description:

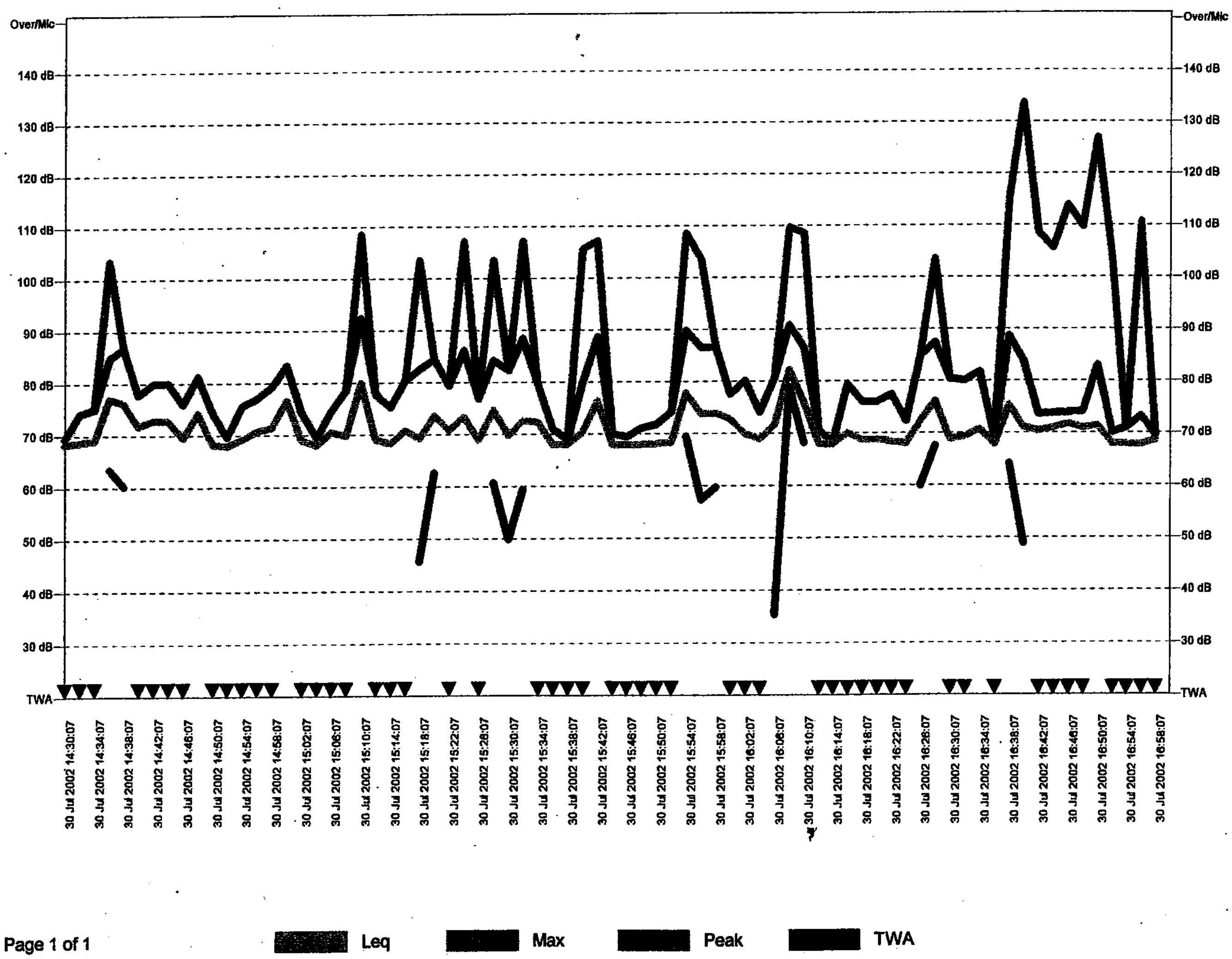
07 May 2003 20:10:18

Serial Number:	17003	Start:	30 Jul 2002 14:30:07
Model Number:	706RC	Stop:	30 Jul 2002 16:59:07
RMS Weighting:	A Weighting	Run Time:	02:29:00
Peak Weighting:	C Weighting	Pre Calibration:	None
Detector:	Slow	Post Calibration:	30 Sep 2002 13:58:00
Gain:	0 dB	Deviation:	---
Sample Period:	60 seconds	Periods:	149

Exchange Rate:	5	Dose:	0.3 %
Threshold:	80.0 dBA	Projected Dose:	0.9 %
Criterion Level:	90.0 dBA	Leq:	72.1 dBA
Criterion Duration:	8.0 hours	TWA:	56.3 dBA
		TWA (8):	47.8 dBA
L10:	73.5 dBA	Lmax:	91.8 dBA
L30:	69.0 dBA	Max Lpeak:	132.7 dBC
L50:	67.5 dBA	Lep (8):	67.0 dBA
L70:	67.5 dBA	SE:	0.0 Pa^2hr
L90:	67.0 dBA		

Note:

Time History



i

Summary Report of My Big Fat Greek Wedding (Movie#2) — 07 May 2003 20:05:20

User:

Location:

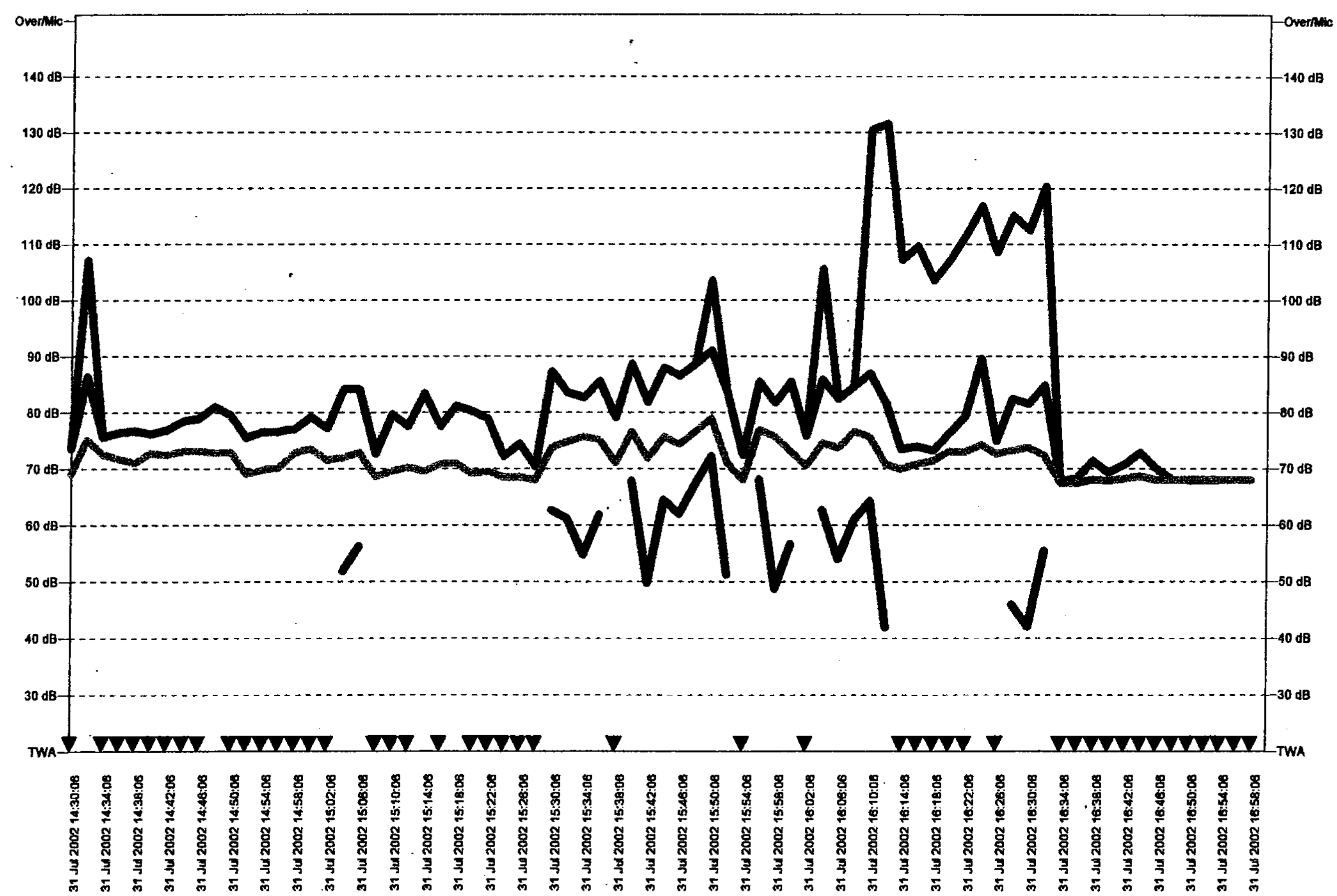
Job Description:

Serial Number:	17003	Start:	31 Jul 2002 14:30:06
Model Number:	706RC	Stop:	31 Jul 2002 16:59:06
RMS Weighting:	A Weighting	Run Time:	02:29:00
Peak Weighting:	C Weighting	Pre Calibration:	None
Detector:	Slow	Post Calibration:	30 Sep 2002 13:58:00
Gain:	0 dB	Deviation:	---
Sample Period:	60 seconds	Periods:	149

Exchange Rate:	5	Dose:	0.2 %
Threshold:	80.0 dBA	Projected Dose:	0.6 %
Criterion Level:	90.0 dBA	Leq:	72.1 dBA
Criterion Duration:	8.0 hours	TWA:	53.5 dBA
		TWA (8):	45.1 dBA
L10:	74.0 dBA	Lmax:	90.4 dBA
L30:	71.5 dBA	Max Lpeak:	130.6 dBC
L50:	69.0 dBA	Lep (8):	67.0 dBA
L70:	67.5 dBA	SE:	0.0 Pa²hr
L90:	67.0 dBA		

Note:

Time History



Leq Max Peak TWA

Summary Report of Spiderman (Movie#3)
User:
Location:.
Job Description:

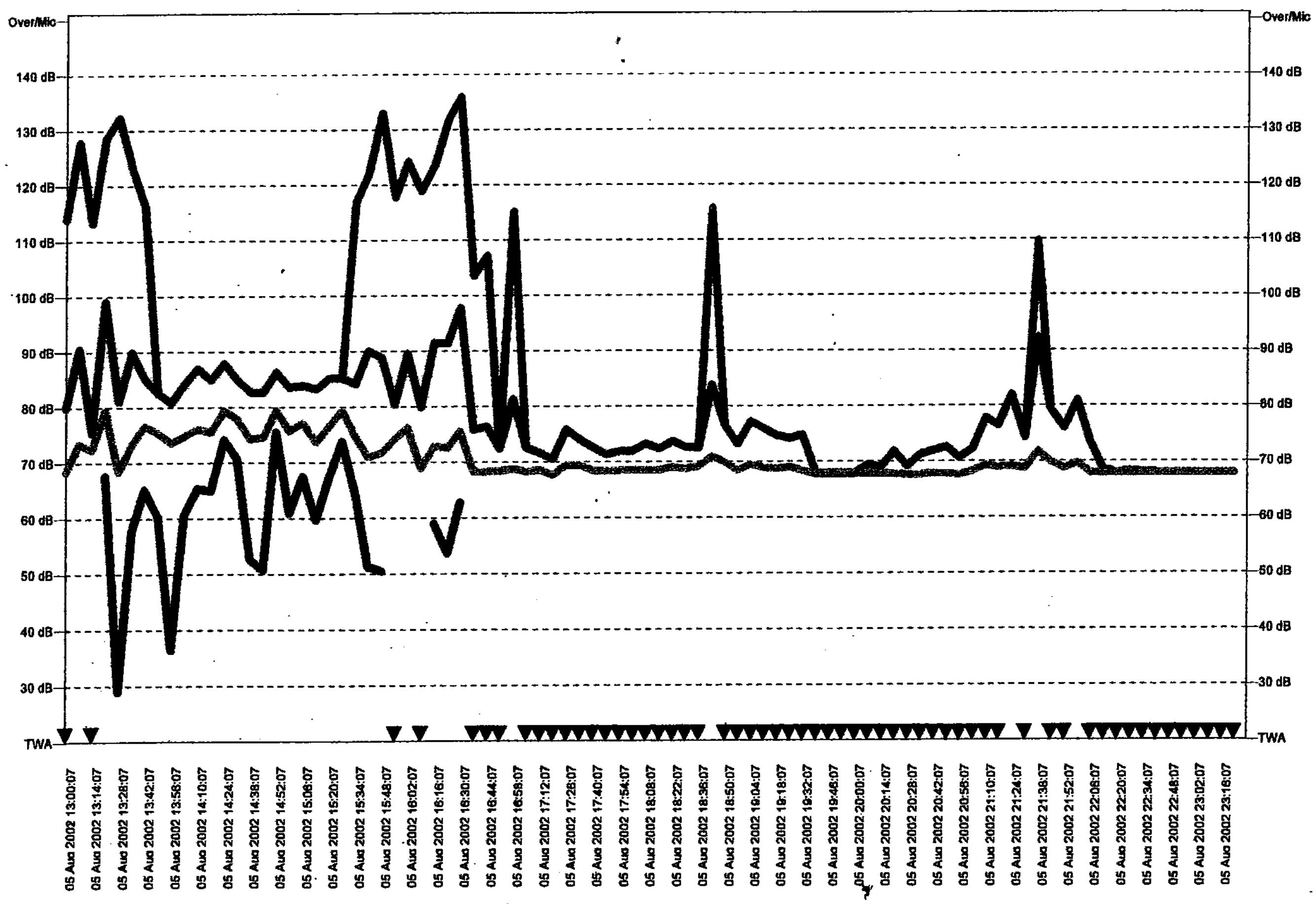
07 May 2003 20:10:57

Serial Number:	17003	Start:	05 Aug 2002 13:00:07
Model Number:	706RC	Stop:	05 Aug 2002 23:29:07
RMS Weighting:	A Weighting	Run Time:	10:29:00
Peak Weighting:	C Weighting	Pre Calibration:	None
Detector:	Slow	Post Calibration:	30 Sep 2002 13:58:00
Gain:	0 dB	Deviation:	—
Sample Period:	60 seconds	Periods:	629

Exchange Rate:	5	Dose:	1.2 %
Threshold:	80.0 dBA	Projected Dose:	0.9 %
Criterion Level:	90.0 dBA	Leq:	71.8 dBA
Criterion Duration:	8.0 hours	TWA:	56.2 dBA
		TWA (8):	58.1 dBA
L10:	73.5 dBA	Lmax:	98.4 dBA
L30:	68.5 dBA	Max Lpeak:	135.0 dBC
L50:	67.5 dBA	Lep (8):	73.0 dBA
L70:	67.0 dBA	SE:	0.1 Pa²hr
L90:	67.0 dBA		

Note:

Time History



Leq Max Peak TWA

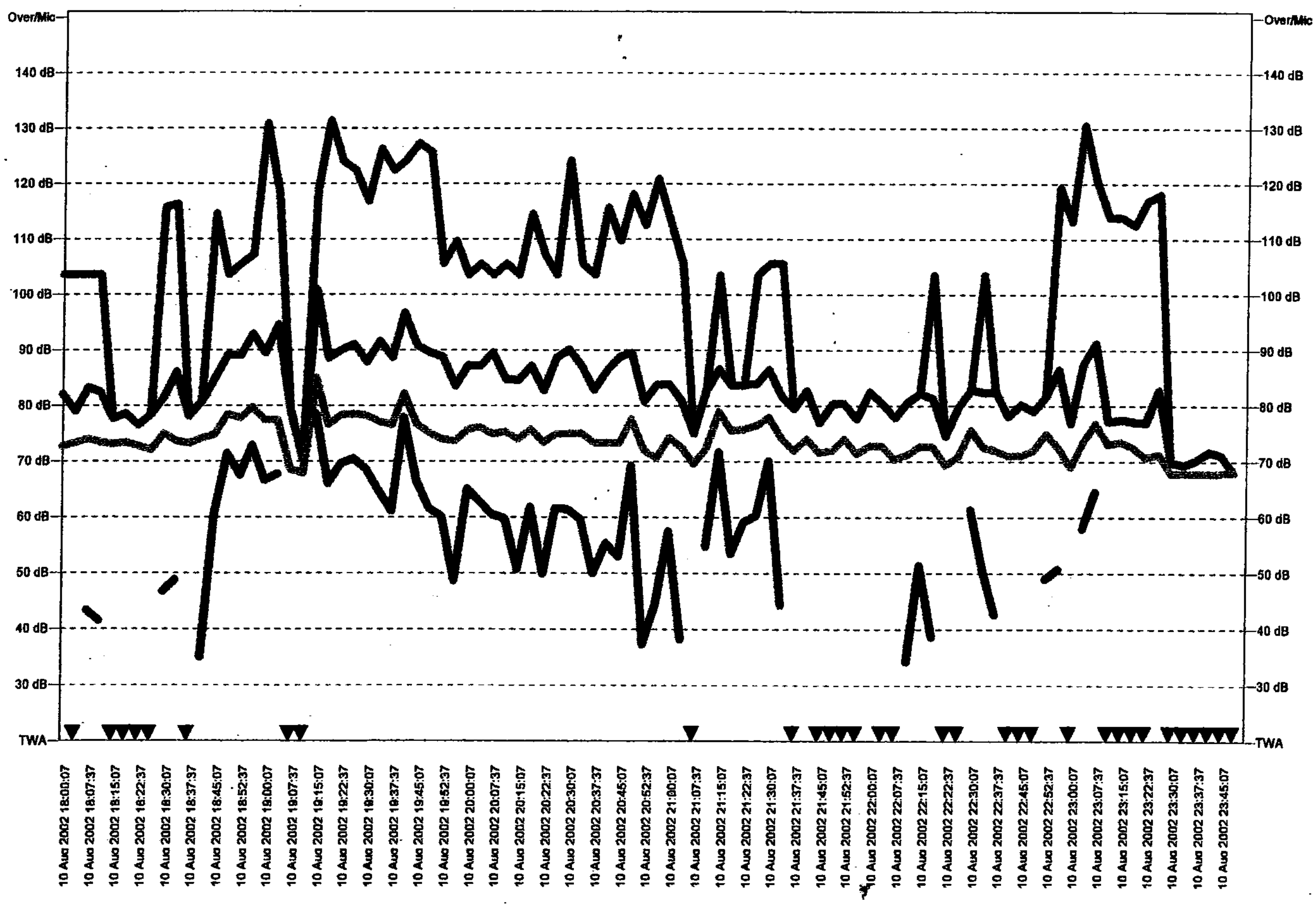
Summary Report of Austin Powers (Movie#4) 07 May 2003 20:01:10
User:
Location:.
Job Description:

Serial Number:	17003	Start:	10 Aug 2002 18:00:07
Model Number:	706RC	Stop:	10 Aug 2002 23:49:52
RMS Weighting:	A Weighting	Run Time:	05:49:45
Peak Weighting:	C Weighting	Pre Calibration:	None
Detector:	Slow	Post Calibration:	30 Sep 2002 13:58:00
Gain:	0 dB	Deviation:	—
Sample Period:	15 seconds	Periods:	1399

Exchange Rate:	5	Dose:	1.2 %
Threshold:	80.0 dBA	Projected Dose:	1.6 %
Criterion Level:	90.0 dBA	Leq:	74.6 dBA
Criterion Duration:	8.0 hours	TWA:	60.2 dBA
		TWA (8):	57.9 dBA
L10:	77.0 dBA	Lmax:	100.1 dBA
L30:	73.0 dBA	Max Lpeak:	130.5 dBC
L50:	71.0 dBA	Lep (8):	73.3 dBA
L70:	69.0 dBA	SE:	0.1 Pa²hr
L90:	67.5 dBA		

Note:

Time History



Leq Max Peak TWA

Summary Report of Red Dragon (Movie#5)
User:
Location:
Job Description:

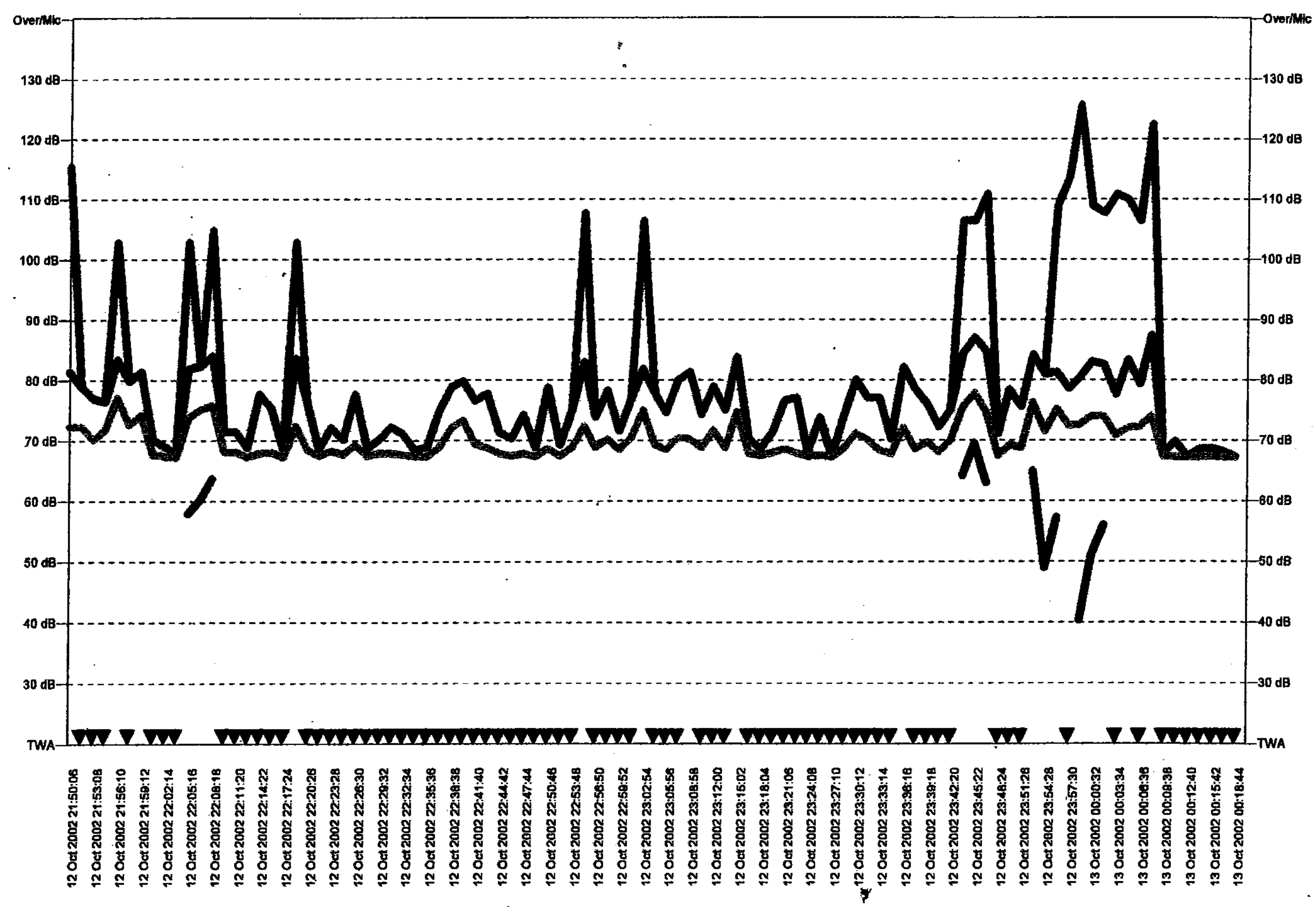
07 May 2003 20:26:40

Serial Number:	17003	Start:	12 Oct 2002 21:50:06
Model Number:	706RC	Stop:	13 Oct 2002 00:20:00
RMS Weighting:	A Weighting	Run Time:	02:29:54
Peak Weighting:	C Weighting	Pre Calibration:	30 Sep 2002 13:58:00
Detector:	Slow	Post Calibration:	None
Gain:	0 dB	Deviation:	---
Sample Period:	1 second	Periods:	8994

Exchange Rate:	5	Dose:	0.1 %
Threshold:	80.0 dBA	Projected Dose:	0.4 %
Criterion Level:	90.0 dBA	Leq:	70.9 dBA
Criterion Duration:	8.0 hours	TWA:	49.6 dBA
		TWA (8):	41.2 dBA
L10:	73.5 dBA	Lmax:	87.3 dBA
L30:	68.5 dBA	Max Lpeak:	125.5 dBC
L50:	67.5 dBA	Lep (8):	65.9 dBA
L70:	67.0 dBA	SE:	0.0 Pa²hr
L90:	67.0 dBA		

Note:

Time History



Leq Max Peak TWA

V

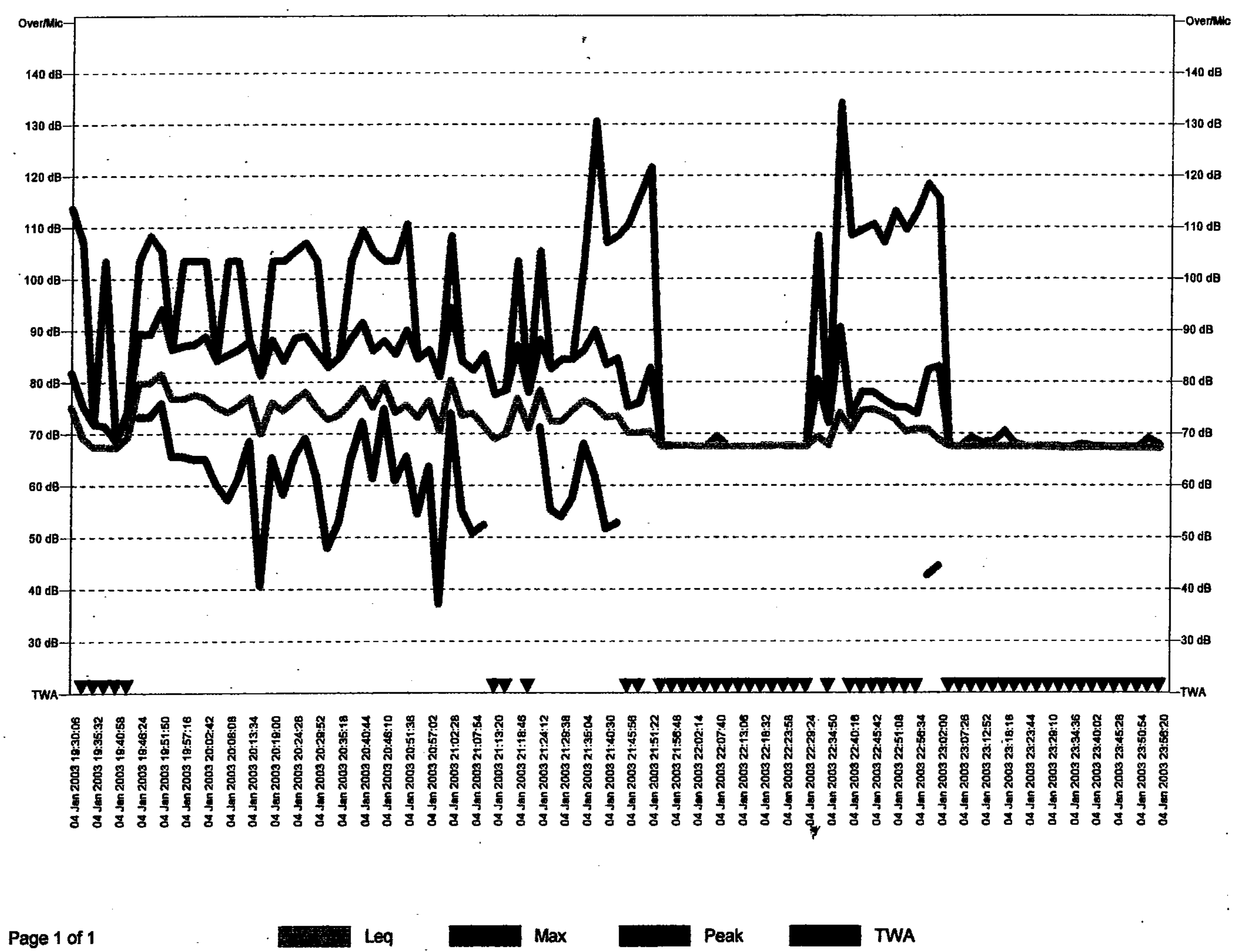
Summary Report of Maid in Manhattan (Movie#6) 07 May 2003 20:04:37
User:
Location:
Job Description:

Serial Number:	17003	Start:	04 Jan 2003 19:30:06
Model Number:	706RC	Stop:	04 Jan 2003 23:59:01
RMS Weighting:	A Weighting	Run Time:	04:28:55
Peak Weighting:	C Weighting	Pre Calibration:	30 Sep 2002 13:58:00
Detector:	Slow	Post Calibration:	None
Gain:	0 dB	Deviation:	---
Sample Period:	1 second	Periods:	16135

Exchange Rate:	5	Dose:	0.8 %
Threshold:	80.0 dBA	Projected Dose:	1.4 %
Criterion Level:	90.0 dBA	Leq:	73.2 dBA
Criterion Duration:	8.0 hours	TWA:	59.2 dBA
		TWA (8):	55.0 dBA
L10:	76.0 dBA	Lmax:	93.7 dBA
L30:	71.0 dBA	Max Lpeak:	133.2 dBC
L50:	67.5 dBA	Lep (8):	70.7 dBA
L70:	67.0 dBA	SE:	0.0 Pa²hr
L90:	66.5 dBA		

Note:

Time History



Summary Report of Two Weeks Notice (Movie#7)
User:
Location:.
Job Description:

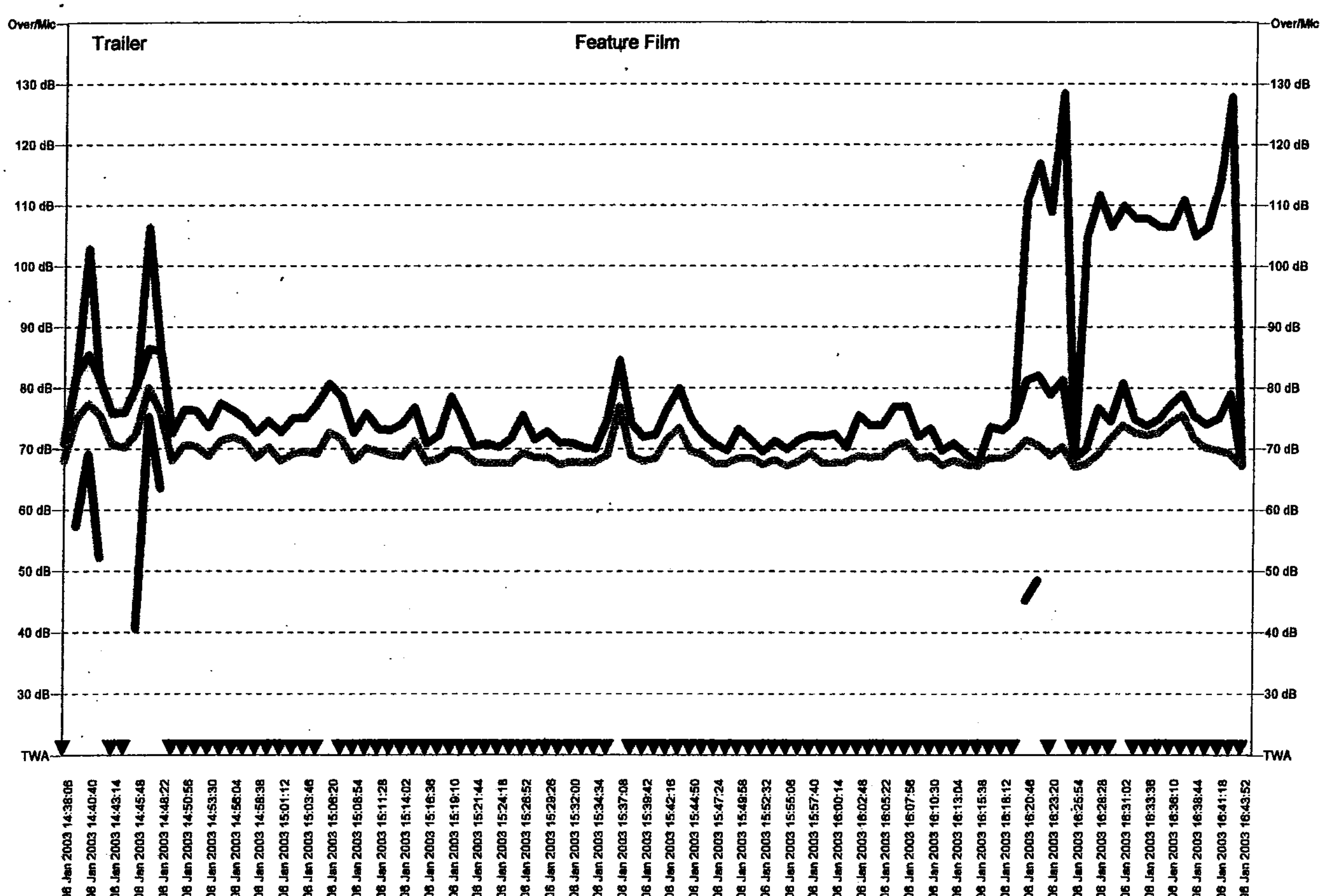
07 May 2003 19:56:44

Serial Number:	17003	Start:	06 Jan 2003 14:38:06
Model Number:	706RC	Stop:	06 Jan 2003 16:44:58
RMS Weighting:	A Weighting	Run Time:	02:06:52
Peak Weighting:	C Weighting	Pre Calibration:	30 Sep 2002 13:58:00
Detector:	Slow	Post Calibration:	23 Jan 2003 12:11:00
Gain:	0 dB	Deviation:	1.7 dB
Sample Period:	1 second	Periods:	7612

Exchange Rate:	5	Dose:	0.1 %
Threshold:	80.0 dBA	Projected Dose:	0.3 %
Criterion Level:	90.0 dBA	Leq:	70.8 dBA
Criterion Duration:	8.0 hours	TWA:	47.9 dBA
		TWA (8):	38.3 dBA
L10:	—	Lmax:	86.3 dBA
L30:	—	Max Lpeak:	128.3 dBC
L50:	—	Lep (8):	65.0 dBA
L70:	—	SE:	0.0 Pa²hr
L90:	—		

Note:

Time History



Leq Max Peak TWA

Summary Report of Antwone Fisher (Movie#8)
User:
Location:.
Job Description:

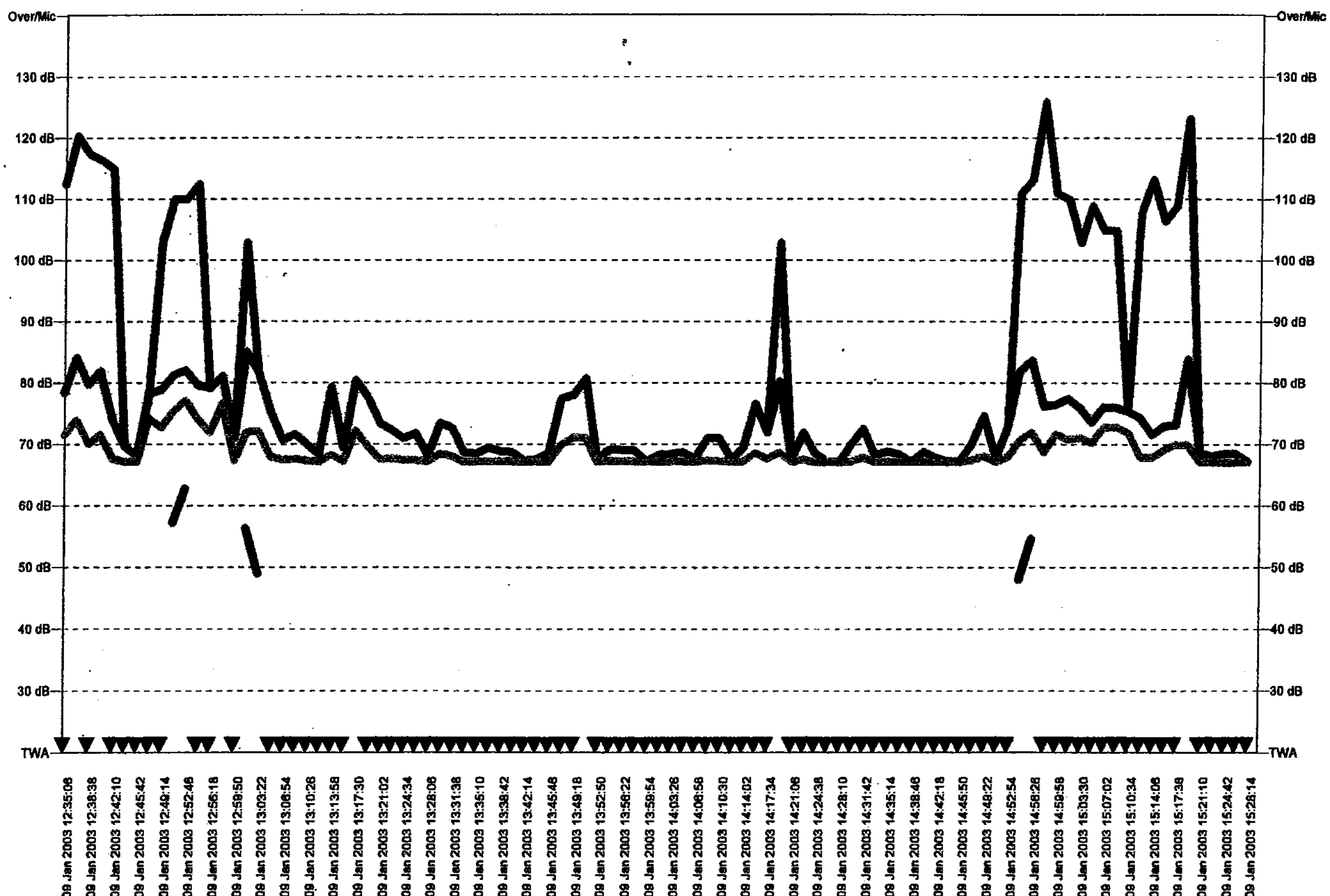
07 May 2003 20:00:16

Serial Number:	17003	Start:	09 Jan 2003 12:35:06
Model Number:	706RC	Stop:	09 Jan 2003 15:30:00
RMS Weighting:	A Weighting	Run Time:	02:54:54
Peak Weighting:	C Weighting	Pre Calibration:	30 Sep 2002 13:58:00
Detector:	Slow	Post Calibration:	None
Gain:	0 dB	Deviation:	—
Sample Period:	1 second	Periods:	10494

Exchange Rate:	5	Dose:	0.0 %
Threshold:	80.0 dBA	Projected Dose:	0.1 %
Criterion Level:	90.0 dBA	Leq:	69.6 dBA
Criterion Duration:	8.0 hours	TWA:	41.2 dBA
		TWA (8):	33.9 dBA
L10:	72.0 dBA	Lmax:	85.0 dBA
L30:	67.5 dBA	Max Lpeak:	125.7 dBC
L50:	67.0 dBA	Lep (8):	65.2 dBA
L70:	67.0 dBA	SE:	0.0 Pa²hr
L90:	66.5 dBA		

Note:

Time History



Leq Max Peak TWA

Summary Report of Chicago (Movie#9)
User:
Location:
Job Description:

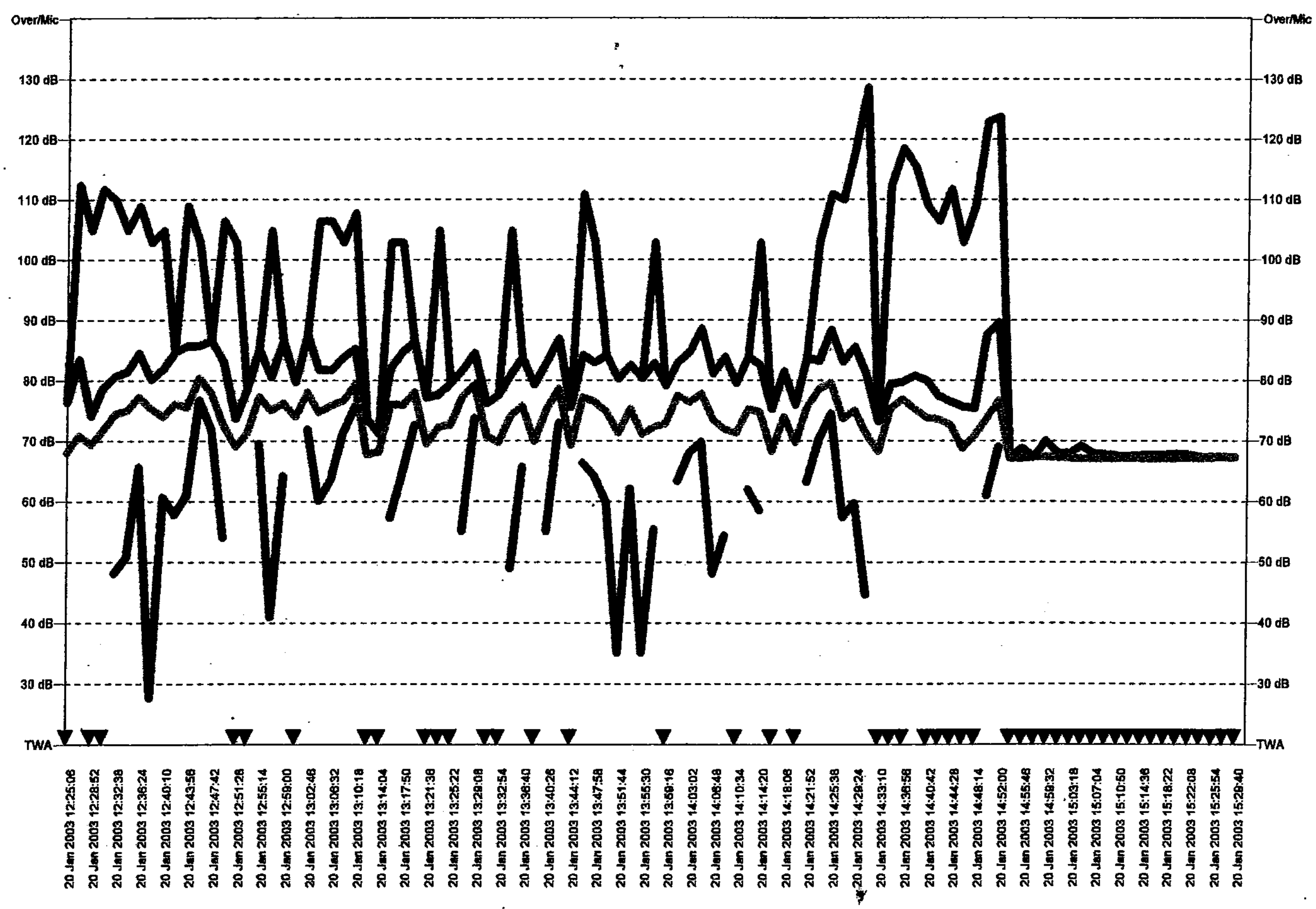
07 May 2003 19:59:05

Serial Number:	17003	Start:	20 Jan 2003 12:25:06
Model Number:	706RC	Stop:	20 Jan 2003 15:30:01
RMS Weighting:	A Weighting	Run Time:	03:04:55
Peak Weighting:	C Weighting	Pre Calibration:	30 Sep 2002 13:58:00
Detector:	Slow	Post Calibration:	23 Jan 2003 12:11:00
Gain:	0 dB	Deviation:	1.7 dB
Sample Period:	1 second	Periods:	11095

Exchange Rate:	5	Dose:	0.7 %
Threshold:	80.0 dBA	Projected Dose:	1.8 %
Criterion Level:	90.0 dBA	Leq:	74.2 dBA
Criterion Duration:	8.0 hours	TWA:	60.9 dBA
		TWA (8):	54.0 dBA
L10:	77.5 dBA	Lmax:	89.5 dBA
L30:	73.0 dBA	Max Lpeak:	128.4 dBC
L50:	69.5 dBA	Lep (8):	70.1 dBA
L70:	67.0 dBA	SE:	0.0 Pa²hr
L90:	67.0 dBA		

Note:

Time History



Leq Max Peak TWA

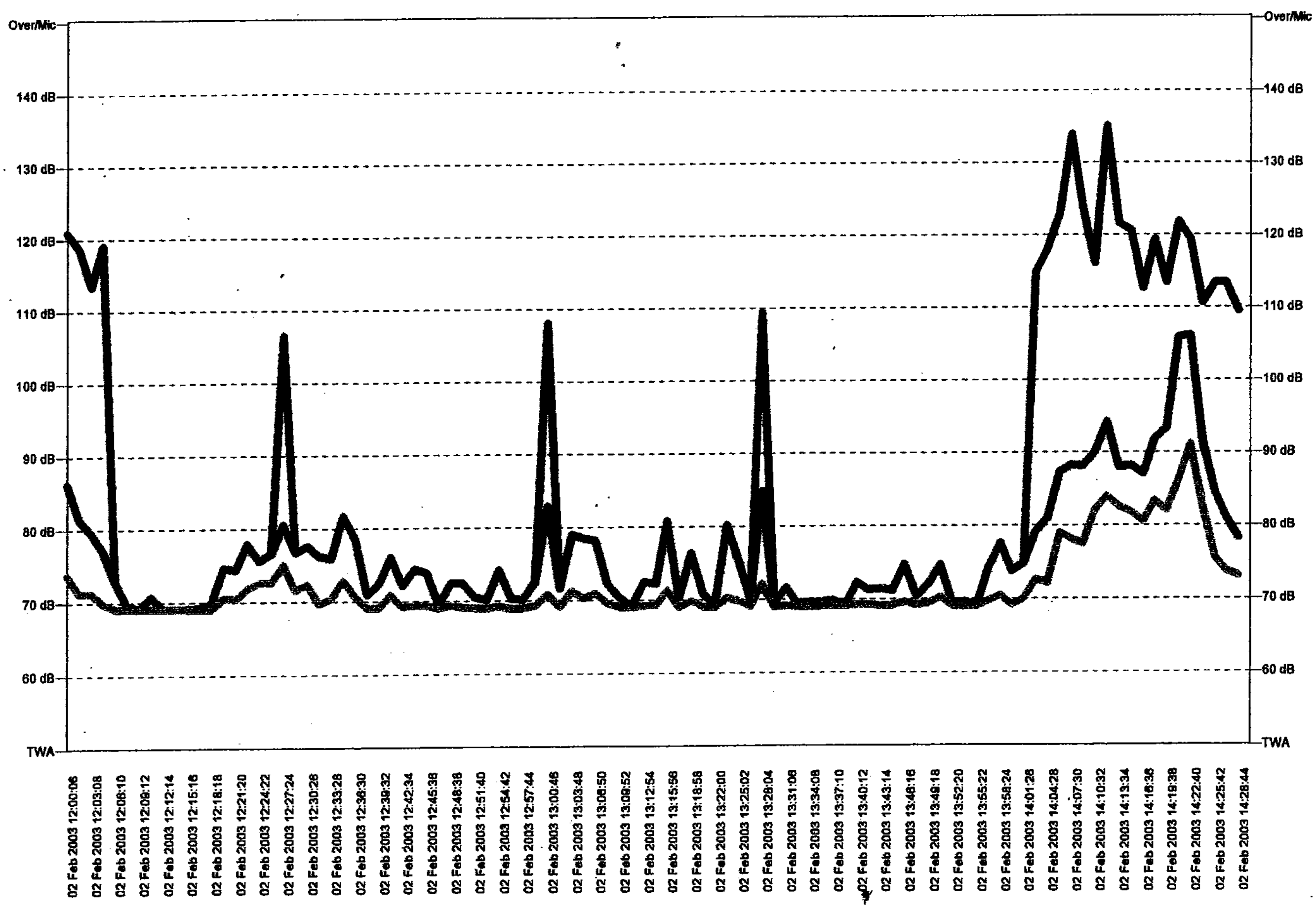
Summary Report of Just Married (Movie#10) 07 May 2003 20:03:46
User:
Location:.
Job Description:

Serial Number:	17003	Start:	02 Feb 2003 12:00:06
Model Number:	706RC	Stop:	02 Feb 2003 14:30:00
RMS Weighting:	A Weighting	Run Time:	02:29:54
Peak Weighting:	C Weighting	Pre Calibration:	30 Sep 2002 13:58:00
Detector:	Slow	Post Calibration:	None
Gain:	0 dB	Deviation:	—
Sample Period:	1 second	Periods:	8994

Exchange Rate:	3	Dose:	1.3 %
Threshold:	0.0 dBA	Projected Dose:	4.3 %
Criterion Level:	90.0 dBA	Leq:	76.3 dBA
Criterion Duration:	8.0 hours	TWA:	76.3 dBA
		TWA (8):	71.2 dBA
L10:	77.5 dBA	Lmax:	106.0 dBA
L30:	70.0 dBA	Max Lpeak:	134.8 dBC
L50:	69.0 dBA	Lep (8):	71.2 dBA
L70:	69.0 dBA	SE:	0.0 Pa²hr
L90:	68.5 dBA		

Note:

Time History



Leq Max Peak TWA

X

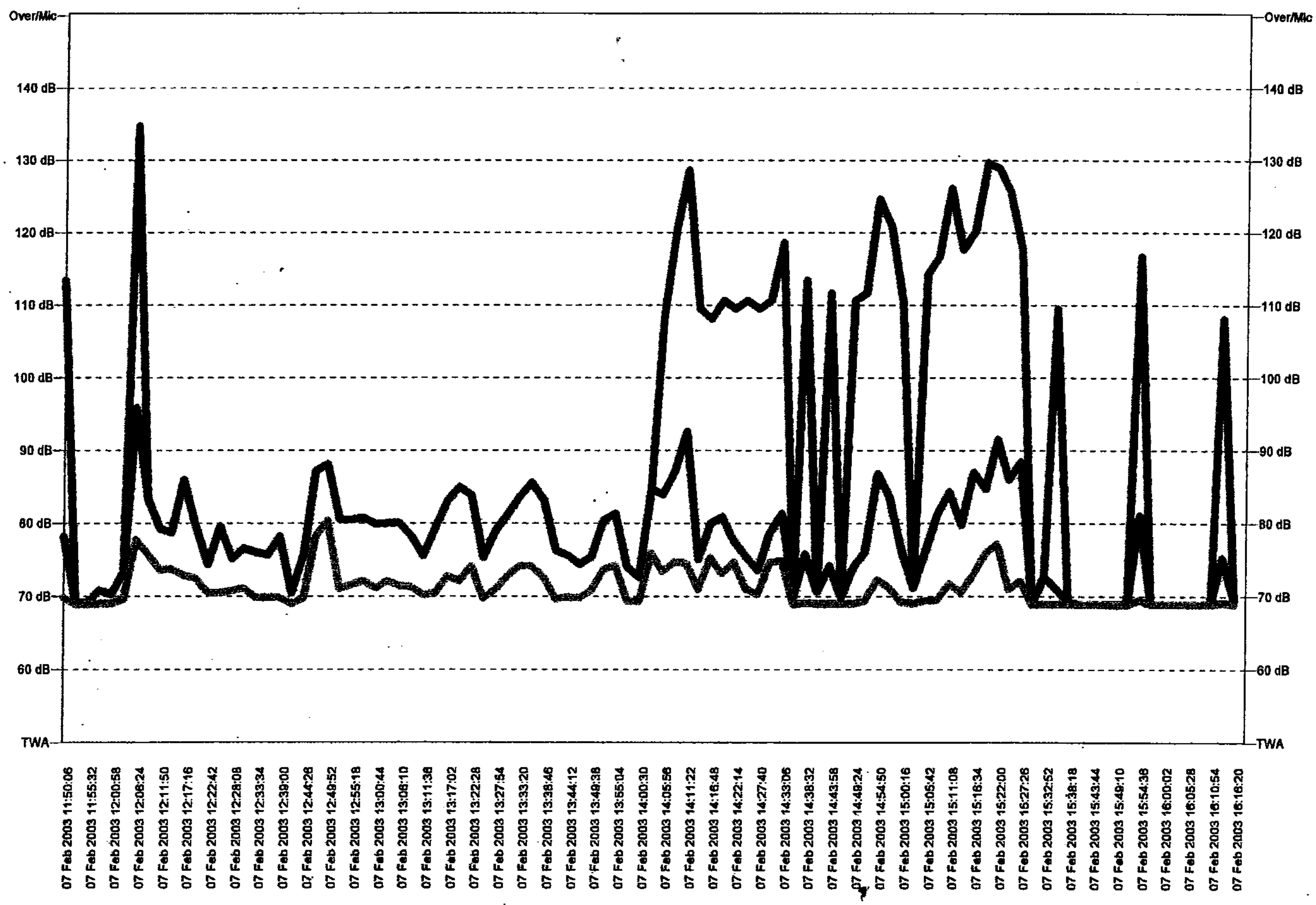
Summary Report of How to Lose a Guy in 10 Days (Movie#11) 07 May 2003 20:02:03
User:
Location:
Job Description:

Serial Number:	17003	Start:	07 Feb 2003 11:50:06
Model Number:	706RC	Stop:	07 Feb 2003 16:17:45
RMS Weighting:	A Weighting	Run Time:	04:27:39
Peak Weighting:	C Weighting	Pre Calibration:	30 Sep 2002 13:58:00
Detector:	Slow	Post Calibration:	None
Gain:	0 dB	Deviation:	---
Sample Period:	1 second	Periods:	16059

Exchange Rate:	3	Dose:	0.9 %
Threshold:	0.0 dBA	Projected Dose:	1.6 %
Criterion Level:	90.0 dBA	Leq:	72.1 dBA
Criterion Duration:	8.0 hours	TWA:	72.1 dBA
		TWA (8):	69.6 dBA
L10:	74.5 dBA	Lmax:	95.7 dBA
L30:	70.5 dBA	Max Lpeak:	134.5 dBC
L50:	69.0 dBA	Lep (8):	69.6 dBA
L70:	68.5 dBA	SE:	0.0 Pa²hr
L90:	68.5 dBA		

Note:

Time History



Leq Max Peak TWA