

**INVESTIGATION INTO
LOUD ADVERTISEMENTS ON TELEVISION**

**Submission to the
Australian Broadcasting Authority**

by



**Federation of Australian Commercial
Television Stations**

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EXECUTIVE SUMMARY

- There is a common belief that differences in “loudness” between programs and advertisements are caused by advertisements being transmitted at a higher volume level than programs. This is not correct.
- Loudness is different from volume. Volume is a measure of the level of sound at any given instant in time. Loudness is a measure of the intensity with which we perceive a sound. How loud something sounds depends on a variety of technical and subjective factors, of which volume is only one.
- When a sound track is being produced certain audio processing techniques such as compression and equalisation can be used to enhance sound and make it seem more “close up”.
- Program sound tracks are not usually processed, whereas most advertisement sound tracks are processed. When a processed sound track is intercut with an unprocessed sound track the processed sound track is perceived as being “*louder*” by comparison.
- Broadcasters have committed substantial resources to developing systems and techniques for the maintenance of consistent sound levels. However, because of the higher energy content of processed sound, it will appear louder to the human ear, even though the sound levels may be the same for both the advertisement and the program. Broadcasters have no way of measuring the energy content, and therefore loudness, of a sound track.
- Of all audio processing techniques, compression is the only technique in relation to which standards have been formulated internationally. Broadcasters attempt to control compression in advertisements by recommending to advertisers and production houses that the application of compression be restricted to certain levels (FACTS Operational Practice 24). This is consistent with a similar recommendation made in the UK.
- The effectiveness of this approach is limited because it is not possible for a broadcaster to measure or alter the compression that has been applied to an advertisement. Further, compression is only one of several factors contributing to loudness. In other countries, such as New Zealand and Canada, regulation has not been implemented due to the subjectivity of loudness.
- A large number of advertisements produced overseas are broadcast in Australia. For this reason, FACTS considers that in the absence of international standards, a regulatory solution to control loudness in advertisements is not feasible.
- FACTS believes that a working group should be established between advertisers, production houses, broadcasters and the ABA to work together to increase awareness of loudness problems, to encourage compliance with FACTS Operational Practices and to facilitate input into work already being undertaken internationally address the issue of loudness.

1. INTRODUCTION

There is a common belief that differences in “loudness” between programs and advertisements are caused by advertisements being transmitted at a higher volume level than programs. This is not correct.

Loudness is different from volume. Volume is a measure of the level of sound at any given instant in time. Loudness is a measure of the intensity with which we perceive a sound.

How loud something sounds depends on a variety of factors, of which volume is only one. A number of other technical and subjective factors contribute to loudness.

Technical factors include the peak amplitude of the sound, the ratio of peak to average sound energy, spectral density, the dynamic range of the sound track and the audio processing that has been applied to the sound track, such as compression and equalisation. Subjective factors include differences in frequencies of sound, the relative loudness of adjoining passages of sound and the listening environment.

Broadcasters mainly use volume unit or VU meters to monitor the sound levels from the station. In some instances, peak program meters (PPM) are used to measure the peaks in sound levels. (Please refer to Section 32 for a detailed description of these meters). However these meters are not capable of measuring loudness due to the number of factors which contribute to loudness and the subjective factors involved. Nor is it possible for broadcasters to control the factors which lead to loudness.

The contents of this submission is as follows:

Section 2 provides an overview of the factors contributing to loudness;

Section 3 discusses the tests available for measuring and monitoring some of the factors that lead to loudness and their limitations;

Section 4 outlines the studies and research into loudness;

Section 5 discusses what broadcasters do to address loudness;

Section 6 discusses the likely impact of digital television on the ability to control loudness;

Section 7 addresses why regulation of loudness under the Commercial Television Industry Code of Practice is not appropriate;

Section 8 looks at the issue of loudness of advertisements on other media;

Section 9 provides a discussion on the overseas experience; and

Section 10 details the conclusion of this paper.

2. FACTORS CONTRIBUTING TO LOUDNESS

Following is a discussion of the factors contributing to loudness in more detail. To understand the impact of these factors, it is instructive to outline the processes involved in television sound.

Sound tracks for advertisements are created by production houses. The production of the sound track involves the recording of the voice track and "layering" this with music and effects to achieve the sound engineer's artistic aims in accordance with their client's specification. This will often involve compression and equalisation of some or all of the audio components to achieve the desired outcome.

Broadcasters require advertisements to be recorded at a standard reference output level (refer to para 3 of FACTS Operational Practice 24 at Annex A) This is designed to ensure that consistent sound levels are maintained. If not at the standard level, the advertisement may be rejected by the station or corrected before playout.

It is important that sound sources remain close to the station reference level as the transmit channel to the viewer is bounded; if the sound is too high the sound quality will be degraded by distortion, if the sound is too low the sound quality will be impaired by noise. Hence broadcasters use volume unit (VU) meters to monitor the sound levels from the station and attempt to maintain sound levels which cause the VU meter to peak at or about the 0VU reference point. To protect against distortion and noise and to keep the station signal within the technical limits of the ABA's licence, the broadcaster applies very mild compression and limiting to the complete station output.

The final stage of the process occurs in the viewing environment. The viewer will adjust their volume to suit their surroundings. Often the viewer will set their volume to understand the dialogue above the surrounding sounds (e.g. the family talking in a living room while others watch the television).

Technical factors

2.1 Compression

Most advertisement sound tracks are “processed,” whereas in most cases program material is not.

Non processed sound is basically that which has originated from a microphone with some minor adjustments to equalise the quality in certain respects such as matching between microphones.

On the other hand, material that is processed is passed through devices such as *equalisers* and *compressors*, which are designed to enhance its *presence* ie to make it sound “up close” or brighter or more immediate. This is referred to as “compression”.

Material that has been compressed will sound louder, even though there is no increase in volume. This is because compression of a sound track raises the energy content of the sound by reducing the dynamic range (i.e. the difference between the peaks and the average level of the sound) thereby making it more dense.

2.2 Spectral processing

The human ear is not equally sensitive to all frequencies in the audible range. As an approximation, the frequencies between 2,000Hz and 4,000Hz are those to which the ear is most sensitive. If this range of frequencies is boosted at the mixing desk during post production, then this version of the product will sound louder than a version where these frequencies were not boosted. This process of varying the spectral content is known as equalisation.

A sound track which has been subject to equalisation processes will sound louder when compared to the same sound track to which such processes have not been applied, even though there has been no increase in volume.

2.3 Dynamic range

In most cases, sound tracks used for advertisements have a more limited dynamic range than program sound tracks.

Dynamic range is the difference between the lowest level audio signal and the highest level audio signal ie the range between the softest and loudest parts of an audio signal. This range is expressed in decibels - dB. In general terms, the more limited the dynamic range is the more "full on" or "concentrated" the experience of the sound will be.

For example, typical classical music will have a wide dynamic range, the level varying from the full orchestra at full volume to a solo instrument so "soft" that it can hardly be heard - and there may be long passages at these low levels.

On the other hand, pop music generally has a dynamic range that remains relatively "full on" all the time. It could be described as "concentrated" sound. In general, pop music is subject to significant audio processing such as compression, limiting, spectral processing and the introduction of synthesized sound.

Program sound tends to be more like classical music in terms of dynamic range and may contain long passages of low levels. However, sound tracks mixed for advertisements usually have a limited dynamic range. This makes the advertisement sound "full on" or "concentrated".

The real problems arise when these two types of sounds are intercut ie when advertisements are inserted into programs. In any normally adjusted system the programs and the advertisements are transmitted at the same reference volume setting as described in the outline of operation above - this is fundamental. A number of objective studies have been done and they show that if anything, the advertisement peaks "are quieter than the program".¹ However, often a more limited dynamic range can make the advertisements sound louder.

Subjective factors

2.4 Contrast of sound tracks

Loudness is complicated by the relative loudness of adjoining passages of sound. A noticeable difference in sound often occurs because of the considerable contrast between two or more sound tracks.

For example, the same advertisement inserted into a pop music program and then inserted into a softly spoken drama program will potentially produce quite different reactions from the audiences of each program. The listeners' perceptions will be

¹ Television Advertisement Noise Levels: Assessment of Television Advertisement Noise Levels, ARUP Acoustics, February 2000.

³ Quantifying loudness for complex sounds, Carini, J.P., Department of Physics, University of Indiana, 1998.

coloured by what they were listening to before and the degree of contrast between the two juxtaposed elements.

Advertisements in movies are probably the most problematic area to address. The audio track of a movie is normally balanced for play-out in a wide band, high level acoustic environment, and will have a wide dynamic range (from very soft to very loud, depending on the plot element). Because of the "cinema" balance, much of the audio energy may be at low or high frequencies, to which the ear is much less sensitive at typical domestic listening levels and which are filtered out by a typical TV set.

The movie's sound track can therefore be perceived as quiet in the domestic environment even when the sound peaks as read on a VU meter are higher than the advertisements.

2.5 The listening environment

How loud an audio signal sounds depends both on the listener and the listening environment.

When compared with the control room/edit suite at a television station or the typical cinema situation, conditions at home are very different and listener perceptions change accordingly.

The home situation will vary with some viewers listening on a portable TV receiver with a built in 2 inch speaker, at a low level, while others will have a home cinema hi fi and be listening at cinema levels. Typically however, the home environment is one of listening at a low sound pressure level with relatively high ambient background sound levels as opposed to environments where high sound pressure levels are experienced by a listener e.g. concerts. This environment can lead to signals with a wide dynamic range being masked or "lost" at the lower levels and this introduces a strain factor to the viewing.

The modern cinema sound track has a wide dynamic range. The dialogue may well be 15 to 20 dB lower than the music and effects. In the cinema the sound pressure level is set for very comfortable reproduction of the dialogue - the music and effects then appear free of distortion, at a dramatically higher level. This is suitable in the cinema but not for the home.

If the broadcaster is showing a movie, the broadcast sound level would be adjusted (referenced) to the music and effects (with the speech levels often 15 - 20 dB below this level). In the case of disaster movies, for example "Twister", this difference may even be up to 31dB. The viewer will adjust their volume in order to understand the dialogue, so the music/effects will sound loud but will form part of an acceptable viewing experience. Then, if the station break contains an advertisement with compressed audio, the dialogue will be near the reference level. Hence the advertisement will sound louder because the viewer has adjusted (increased) their volume for the lower movie dialogue levels, not because the broadcaster has transmitted a higher sound level.

As loudness is a measure of the *intensity* with which we perceive a sound, it necessarily varies with each listener. It is subjective, depending as much on the

characteristic of the individual's ear as on the environment in which the sounds are heard. The listening conditions and the way in which a person is listening will also have a bearing on the subjective loudness of the sound. For instance, age is a determinant of hearing ability with older people's spectral appreciation often compromised at the higher frequencies.

Recent studies disclosed that the male ear and female ear have different responses to loud sounds, with male hearing most sensitive at 3000Hz and female hearing at 4500Hz.

The difficulty is that there can be no accurate description or definition of what is loud in the mind of each individual listener. Industrial standards written for exposure levels to intense sound identify where the sound level is beyond the threshold of pain. However, the task of measuring acceptable variations in loudness is quite different, and extremely difficult to achieve with any degree of success.

2.6 Differences in frequencies

Finally, it is a well documented fact that if the "tonal quality" of a voice corresponds to shouting, we will hear it as loud, whereas if the "tonal quality" is that of a whisper, we will perceive it as quiet. This will be the case even if the "measured volume levels" are nearly identical. Studies have shown that it is difficult to come up with a single number that quantifies the loudness we perceive when sounds of many frequencies are present³.

3. TESTS FOR MEASURING AND MONITORING LOUDNESS

3.1 General

Broadcasters have committed substantial resources in processing equipment to maintain consistent audio levels to the extent possible.

There are a range of instruments used for measuring sound levels such as the volume unit (VU) meter, the peak program meter (PPM) and a range of instruments recently developed for digital audio.

All these instruments provide a means of technical measurement representing precise values of test signals and a measure (however inaccurate) of the complex sound track signal.

However, while the metering devices used to monitor sound levels can indicate the same level for both program and advertisement material, because of the higher energy content of the processed sound, it will appear subjectively louder to the human ear. Broadcasters have no way of measuring the energy content, and therefore loudness, of a sound track.

3.2 VU meters

The problem of measuring sound levels has been an issue for the broadcasting industry from the very beginning. In the US in the late thirties and early forties an attempt at standardising a sound level measuring instrument for broadcasting led to

the adoption of the VU meter. (This was a device originally developed by the telephone industry to measure telephone speech levels).

Today, most broadcasters balance program sound manually using VU meters.

This conventional metering system is intended to indicate the average level of a signal. Its ballistics are designed to approximate the response of the human ear. However it is only a very poor approximation of the actual perceived loudness and as such cannot accurately measure loudness. It is nothing more than a blunt instrument for this task.

The meter is an average reading voltmeter with a mechanical integration time in the order of hundreds of milliseconds, the stepped response reaching 100% after some 300 milliseconds. If the audio signal exists for a shorter period of time than this, then the VU meter will indicate a lesser value depending on the waveform, peak amplitude and the duration of the audio signal. Also, this meter can continue to indicate although the audio signal has decreased to zero. The meter will decay to zero, but only after a finite interval of time, approximately 300ms after the audio signal has ended. Although these characteristics are approximately the same as the ear's performance in the relatively restricted telephone environment, the VU meter is far from being a precision "loudness" reading instrument for the wide range and types of broadcast programmed material. (The only signal which can be measured accurately on this type of meter is a steady state sine wave signal - which is what is used to calibrate the instrument).

It has however been in use for measuring sound levels in broadcasting for many years because it is internationally standardised, and so allows repeatable and standardised measurements and comparisons to be made of the electrical level of an audio signal. This explanation tends to over-simplify the behavior of the meter but it does give an approximate idea of its characteristics.

A programmed audio signal is a vastly more complex waveform than the hypothetical signal discussed above. In the case of audio signals having sharp (short duration) bursts of high energy (high amplitude), then the quasi-peak amplitude is some 6 - 8 dB above the indication that would be shown on a VU meter. The true peak value is more likely to be 10-12 dB above that shown on a VU meter.

3.3 Peak program meters

Another type of meter is the peak program meter (PPM) which measures close to the actual peak of the audio signal. Its ballistics are designed to have a rapid attack time (approximately 3 microseconds) and a very slow decay time in the order of one second. There are a variety of different scales used on PPMs (from different manufacturers and their country of origin) and therefore it is not as closely standardised as the VU meter.

A PPM gives no indication of perceived loudness. It can be used in conjunction with readings from other meters to assessing whether compression has been applied to a signal, however it can not measure the compression applied or allow a broadcaster to alter the compression.

The main use of a PPM is to indicate the amount of headroom (i.e before distortion will be experienced) remaining in a broadcast system and is particularly relevant to a digital broadcast network.

3.4 Loudness meters

So called “loudness meters” (as may be used for example in industrial areas) are equally unsuitable for the purpose of broadcast level control. These are generally very slow response devices, that are calibrated only for wideband “non-coherent” noise (like machinery, air conditioning or traffic). They are not designed for, and cannot be used to compare the loudness of wide dynamic range complex program sounds. Any instruments used for testing and measurement purposes in broadcasting would need to be designed specifically for program audio.

3.5 Other factors

At the stations, broadcasters use a reference test signal to align the optimum operating point of the device in question which may be a audio recorder, videotape recorder or an entire transmission system (refer Annex C). When the advertisement is received by the broadcaster, this reference signal is used to align the replay level to a standard level which matches the test signal recorded point of origination of the sound track. This does not mean that there is any direct relationship between reference levels and dialogue or music levels.

The introduction of a limiter/compressor at the broadcast station output may help to “smooth out” large level variations, however, this in itself is not the answer. Limiter compressors can introduce artefacts into the audio (noise pumping for example) and can even make things worse, by pulling down the occasional high levels of a wide dynamic range program (like a movie) thus reducing its overall perceived loudness, while letting the compressed narrow range advertisement go through relatively unaffected. Another aspect of excessive compression is a problem of listener fatigue when presented with long duration highly compressed program material. Such mechanisms also usually result in producers engineering sound tracks for programs or advertisements in a way designed to defeat the operation of the limiter.

4. THE FUTURE – FURTHER STUDIES

Television broadcasters have been tracking developments in loudness monitoring and measurement, including the development of loudness meters which are based on more recent subjective measurement scaling techniques i.e. using audience research to test perceived loudness.

This work is currently a subject of investigation at the ITU (refer section 9).

Any study however that attempts to compare *perceived loudness* is only valid for that particular set of listening conditions. The methodology would need to account for how the audio was presented – ie was it through a TV set or a home-theatre system, in a typical room environment or an acoustic chamber and at what level? Ideally, a methodology would need to address not only the perceived difference in loudness between programs and advertisements and but also eliminate the variables of the listening environment.

The methodology would need to take into account how the comparison is to be made between program and advertisement material. Some programs and advertisements may measure the same in level while others may exhibit a much greater difference. Would the comparison be made to the average program level or would a comparison be made to the last 15 or 30 seconds of program proceeding the advertisement? What duration of program material would be appropriate and with what frequency would measurements be made? Any process would need to consider the levels of the various items of program content and their relationship to various types of advertisements.

It needs to be accepted that any measurement process will only provide a guide to average or median values. Level measurements do not necessarily correlate with annoyance values which are predominantly subjective in nature and are thus not capable of measurement.

It must also be borne in mind that any methodology for measurement of loudness would need to reflect international standards as a number of television advertisements broadcast in Australia are produced overseas.

The Australian Content in Advertising standard provides for up to 20 per cent of total advertising transmission time to be available for foreign produced advertisements. In 2000, foreign advertising averaged 7.4 per cent of all advertising on the Nine network, 10.6 per cent on Seven and 10.5 per cent on Ten. The majority of these advertisements are transmitted using a sound track produced overseas⁴.

Without international consistency there would be a potential problem of contrasting loudness between advertisements depending on whether they are locally or overseas produced.

5. WHAT BROADCASTERS DO TO ADDRESS THE PROBLEM

As discussed above, broadcasters' ability to control loudness in advertisements is limited.

Of the technical factors contributing to loudness (described in section 2), compression is the only factor in relation to which standards have been formulated internationally. No standards exist for the application of other sound processing techniques such as equalisation.

Broadcasters attempt to control compression in advertisements by recommending (via an Operational Practice applying to producers of sound tracks for advertisements) that the application of compression be restricted to certain levels⁵ (refer Annex A). This approach is consistent with approaches in place overseas, such as the Technical Performance Code implemented in the UK by the ITC⁶.

⁴ May 2001 ABA Update - Australian content in TV advertising: 2000 compliance report, Australian Broadcasting Authority, 2002. www.aba.gov.au/tv/content/advertising/compliance.htm

⁵ FACTS Operational Practice OP 24 recommends limiting excessive compression when producing sound tracks for advertisements by requiring that, where audio compression is used, it is restricted to 6dB, and the onset should not occur below 0dB_r (0VU). This means that audio which if unprocessed would exceed zero VU by twice the range of the red scale above zero on a standard VU meter will, after processing, read +3 on that meter. That represents a compression ratio of 2:1. Setting the onset of compression above zero VU ensures that audio material reading below zero on the meter will not be compressed.

The same principle in the digital domain is contained in FACTS OP 36

⁶ ITC Technical Performance Code: Interface Standards and Signal Levels, Clause 22 – www.itc.co.uk

In this way, broadcasters try to limit excessive loudness in advertisements. Unfortunately, its effectiveness is limited because:

- it is not possible for a broadcaster to measure the compression applied to a advertisement as compression is only measurable at the time it is applied – ie at the time of production;
- the ability to remove compression is limited. Once the compression has been applied it is not practical for the broadcaster to detect the compression characteristic of the sound track and alter it;
- compression is only one of the factors contributing to loudness.

Australia and the UK are two countries where recommendations are made in relation to the application of compression in the production of sound tracks for television advertisements. Elsewhere, such as New Zealand and Canada regulation has not been implemented due to the subjectivity of loudness. Refer to Annex B for a Fact Sheet on Loudness of Commercials available on the website of the Canadian Radio, Television and Telecommunications Commission website at http://www.crtc.gc.ca/ENG/INFO_SHT/G3.HTM

6. THE IMPACT OF DIGITAL TELEVISION ON THE ABILITY TO CONTROL LOUDNESS

The transition to digital television has seen broadcasters encode sound as MPEG-1 Layer II and Dolby Digital (AC-3) bitstreams.

In the immediate future, the introduction of digital television will have little effect on the ability of broadcasters to control or regulate the loudness of advertisements. Digital television is a change of the carriage medium and the issues associated with loudness still need to be addressed prior to transmission.

Indeed, the conversion to a digital environment could exacerbate the loudness variations due to the increased system dynamic range of sound tracks. Taking advantage of the available dynamic range has the potential for introducing even greater level control problems. Therefore, the regulation of loudness may become more difficult, not easier.

Metadata appears to be the method by which the level can most conveniently be controlled. The metadata features of Dolby Digital (AC-3) may afford the broadcaster and the listener the ability to address the relative difference in dialogue levels between programs and advertisements. However, the application of metadata may not be the total solution either. Metadata may assist, but the basic problem of determining what metadata value can be assigned will continue to exist. Refer below regarding the discussion of Dolby parameters.

However, metadata is only a limited solution as it is a feature of Dolby Digital but not of MPEG-1 Layer II and broadcasters are required by legislation to provide an MPEG audio stream.

“Standardised” values for various types of sound material could be overcome by those intent on getting their message across louder than others, and there will always be the perennial

problem of the low level movie scene followed by the psychological interruption factor of the advertisement break. The application of metadata is not likely to be a solution to this problem.

The Dolby Digital technology has incorporated techniques that address perceived loudness of dialogue. Audio coding techniques have been developed to compress the audio's dynamic range by a predetermined amount when appropriate, such as late at night.

This technique permits the listener to automatically adjust the receiver's output level to produce consistent playback loudness of dialogue on all audio content, including advertisements.

Australian television broadcasters are currently investigating the approach that can be taken to use Dolby *dialnorm*, *dynrng* and *compr* parameters to best suit the overall task of conveying and broadcasting audio material from the *contribution* stage through *emission* stage to *consumer option* stage.

Issues being assessed are:

- (a) Can an ideal environment be achieved where there is no audio compression and the listener sets that parameter?
- (b) Can Dolby metadata parameters such as *dialnorm* be generated at the post-production stage and the outside broadcast in the case of live sport?
- (c) Will broadcasters encounter some sound tracks from post-production and live audio that have no Dolby metadata parameters?
- (d) Can metadata parameters be handed across the networks in program-distribution arrangements ?
- (e) What is the effect of metadata parameters constantly changing from segment to segment ?

Broadcasters may be able to develop operating practices in a digital environment for the use of metadata that will allow the playout level of the advertisement to be adjusted to reflect the program content it abuts.

This would amount to an industry-wide recommended operational practice for the application of Dolby parameters to material at the *contribution* point and set parameters for transmission. This approach is not far removed from the prescription of FACT'S *OP-24/36* – that "Volume compression where used, should be restricted to no more than 6dB of compression, and the onset of compression should not occur below zero VU".

7. THE COMMERCIAL TELEVISION INDUSTRY CODE OF PRACTICE

In its Issues Paper, the ABA has asked; "Does the current Commercial Television Industry Code of Practice operate to provide appropriate community safeguards in relation to this issue?"

The Commercial Television Industry Code of Practice regulates the content of commercial television (in accordance with s123 of the Broadcasting Services Act). It does not and should not address technical and transmission issues. Moreover, as outlined in this submission, the issue of loudness of advertisements is largely outside the control of the broadcasters.

Furthermore, as stated earlier, foreign advertising averaged 7.4 percent of all advertising in 2000 on the Nine Network, 10.6 percent on Seven and 10.5 percent on Ten. These advertisement sound tracks are produced by overseas producers and advertising agencies. Any standards put in place in Australia would need to consider how they may be imposed upon overseas program makers and advertising agencies.

Any variance by an Australian regulation or code of practice to international standards will need to take into account the effect this would have on the cost of importing the sound track.

FACTS believes consideration of this issue needs to take account of international studies.

8. LOUDNESS OF ADVERTISEMENTS ON OTHER MEDIA

The ABA has asked if the community has similar concerns about the loudness of advertisements relative to surrounding programming on other media, particularly commercial radio.

FACTS contends that the listening experience for the audience of commercial radio and commercial television are quite different.

Commercial radio programming does not often resemble the characteristic of television programming where there are long passages of program material broken up by shorter duration periods of advertisements. While the effect on the listener is to believe advertising sound tracks on radio are loud, they may believe that the program music (often popular music), is also loud.

Similar problems are experienced in the cinema industry with the relative levels of film trailers and feature material⁸.

9. LOUDNESS - THE OVERSEAS EXPERIENCE

Internationally, television broadcasters have undertaken considerable investigation into perceived loudness and proposed measurement techniques. However, in the measurement of loudness, true standardisation is not possible due to its subjectivity and it has been outpaced by the developments of audio signal processing and mixing technology.

This is illustrated by the US study in 1978, by the Federal Communications Commission "Evaluating Loud Commercials: An Experimental Approach. This study dealt with partially effective loudness monitoring and control technology. Commenting on this report in 1982, the Commission reported "this has been a difficult issue to resolve because there are no commonly accepted standards or techniques by which to judge loudness".

⁸ "Are Movies Too Loud", Ioan Allen, SMPTE Conference, March 1997.

Australian television broadcasters instituted similar techniques. However, while standardised calibration of the technology is yet to be achieved, these techniques can only deal with some of the technical factors of loudness, and not the all important subjective factors contributing to perceptions of loudness.

This was followed soon after in 1984 by the Independent Television Companies Association releasing Technical Standards and Transmission Requirements, which included a standard for Volume Compression.

In 1985 the then CCIR (now ITU-R) addressed the issue of "Measurement of Programme Level in Sound Broadcasting". This work addressed the conditions to be observed using VU and PPM meters to ensure optimum performance in programme exchange. Again, Australian television broadcasters developed and adopted an Operational Practice based on this work. This was introduced in 1986.

In 1994, Dr John Emmett at Thames Television in the UK published a paper that promoted the development of a meter for perceived loudness. Following the paper several prototype meters were produced and trials undertaken. The designers of the loudness meters sought acceptance of the meter in the UK and by a European Broadcasting Union group in 1994.

The EBU has not adopted this technology for standardization.

In 2000, with the establishment of Study Group 6 (Broadcasting Services) at the ITU-R the following topics were proposed for further study up to the World Radio Conference in 2003:

- Subjective assessment of sound quality
- Method for objective measurements of perceived audio quality
- Test signals and metering to be used on international sound programme connections
- Standards for digital audio techniques
- Subjective assessment of sound quality in broadcasting using digital techniques
- Subjective assessment of small, medium and large impairments in sound quality

In September 2001, the European Broadcasting Union set up a new Project "Advisory Group on Audio". This group is to be chaired by Dr. John Emmett of the UKIB. The tasks to be addressed by the group include:

- Current trends used for audio production, and
- Answers to inquiries on audio production technology.

FACTS is a member of the EBU and also a member of this new group. FACTS was represented at the first meeting of the group on 20 March 2002 in Geneva. In its presentation to the group FACTS proposed inclusion of "loudness" within the group's project tasks. This proposal has received the support of Dolby Laboratories. In his remarks to the meeting, Project Group Chair, Dr John Emmett, stated the group should provide from its investigations input to the work in the ITU-R.

10 CONCLUSION

FACTS does not believe that it is possible to effectively address this issue by regulation. The absence of internationally recognised measurement techniques means that a standard and objective approach does not yet exist.

However, this does not mean that the issue should be ignored. FACTS believes that a working group should be established between advertisers, production houses, broadcasters and the ABA to work together to increase awareness of loudness problems, to encourage compliance with FACTS Operational Practices and to facilitate input into work already being undertaken internationally address the issue of loudness.

Annex A

FACTS Operational Practice 24 – VTR Commercials

FACTS Operational Practice 24 is a summary guide to the basic requirements for television commercials necessary to fit the contemporary operational requirements for television presentation.

1. TRANSMISSION STANDARD

VTR commercials shall be supplied on 25.4 mm (1 inch) C Format tape (other tape formats may be used only by agreement with the station/s concerned.)

2. RUNNING TIME

- 2.1 The duration of commercial or promotional material recorded on videotape should be measured from the start of active program video to the end of active program video.
- 2.2 Sound should commence 0.5 seconds after the commencement of active program video. This provides time for the sound channel to be opened after the start of video without risk of sound clipping and provides aural separation between adjacent commercials.
- 2.3 The end of program sound including any sound tag shall occur 0.5 seconds before the end of active program video.
- 2.4 Accurate identification of first frame of active video on commercials should be provided by the inclusion on the colour black in the 2 second interval, of a white marker on the frame, top right of picture, outside picture safe, before first frame of active video. The white marker should be a minimum picture height of 12 lines and a width of 18 pixels. Timing of the commercial is referenced from the first frame of active video.
- 2.5 Where commercials contain closed captions, the caption information should commence no earlier than 1 second after the start of program video and a caption erase signal not later than 1 second before the end of active program video.

3. STANDARDS

In a replay machine, replay levels shall be adjusted such that a reference flux level of 100 nWb/m from a calibrated tape will produce a reference output level of 0dBr. (This reference output level will be either +4dbu or +8dbu and read as 0VU) [0 dbu = 0.775v] The record levels should be adjusted such that a reference level of 0dBr will produce a fluxivity of 100 nWb/m on tape. This practice should ensure that program peaks will not exceed a level of +8dbr equivalent to peak deviation of a television aural transmitter. Failure to restrict this maximum level may result in audio distortion of the recorded and or transmitted signal. Dolby type encoding shall not be used. In stereo audio track 1 shall carry the left channel and audio track 2 shall carry the right channel. In the case of mono the audio signal shall be on both tracks.

4. SOUND QUALITY - VOLUME COMPRESSION

Volume compression should, where used, be restricted to 6 dB of compression, and the onset of compression should not occur below 0dBr (0VU).

Failure to adhere to this practice will lead to degradation of quality.

The use of compression purely in order to obtain a louder sound track is deprecated and with the advent of remote controls now available on television sets may cause viewers to reduce the volume during commercials.

Television stations reserve the right to reduce the level on transmission to ensure that the loudness of commercial sound will match that of programs.

Other FACTS Operational Practices (OP's) relating to tape recordings which should be observed are as follows:

- | | |
|--------|--|
| OP10 2 | 25.4mm video tape interim leader, end and timing |
| OP13 3 | Identification and labelling of recordings of programs and commercials on format C video tape. |
| OP15 1 | Handling of 25.4mm open reel tape. |
| OP18 1 | Commercials containing closed caption subtitles. The requirement of a "caption erase signal" requires special attention. |
| OP19 1 | Alignment procedures for C format VTR's. |
| OP28 1 | Digital Betacam |

Annex B

Canadian Radio-television and
Telecommunications CommissionConseil de la radiodiffusion et
des télécommunications canadiennes

Canada

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Fact sheet

It's a Blast! Loudness of Commercials

You're watching your favourite television program. All of a sudden, you're startled half out of your seat with a blast of commercial message. Believe it or not, that commercial probably wasn't as loud as you think!

The CRTC often receives complaints about the loudness of television or radio commercials. The issue is a difficult one to resolve, since loudness is a subjective matter. As a result, there are no commonly accepted standards by which to judge loudness. However, a number of Canadian and American studies have found a few of the technical and psychological factors which seem to be involved.

Technically speaking

"Audio compression" appears to be the most frequent cause of listener annoyance. It's a technical method by which a commercial's sound track is recorded at a constant and maximum loudness level. When played within a program featuring a normal range of sounds – some loud, some soft – the contrast can be startling. Television and radio stations are in a bind. If they reduce their volume level to try to minimize the effect of commercials, the range between the lowest and the highest sound levels in their normal programming would be too restricted.

Buzzsaw barrage

"Re-shaping the sound" is another commercial production method. The frequencies your ears are most sensitive to are raised in level, while other frequencies (those which can make sounds more pleasant to listen to) are reduced. The resulting commercial now features a sound track that grabs your attention, but may also sound harsh – especially when combined with the audio compression technique.

Faulty level

A faulty audio level setting at the local station is a possibility, but most radio and television stations take care to ensure their programs and commercials don't exceed the maximum level set by Industry Canada's Broadcasting Regulation Branch. If you think a faulty level setting is to blame, give the station the specific date, time of occurrence, and commercial involved. Ask them to check the audio levels being fed to their transmitter. A Regional or

District office of Industry Canada can also be asked to investigate.

Rude awakening

Even if a commercial doesn't use the audio compression or frequency reshaping techniques, it could still give the impression of being louder than the program. Sometimes a commercial intrudes on an otherwise tranquil scene in a program. The contrast can be startling – even though the commercial is not really excessively loud.

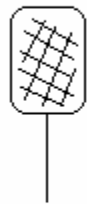
This document is available in alternative format upon request.

G3-07-97

Annex C

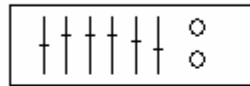
Factors Affecting Loudness

Source



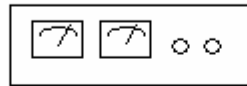
Voice
Music
Effects

Studio



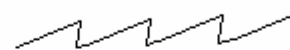
Mixing
Special effects
Audio processing
(including Compression*)

Broadcasting Station



Adjacent
Programming

Transmission



Transmission path
Receiver performance

Audience



Age
Sex
Hearing
Listening environment

* the only area where standards and regulations apply internationally