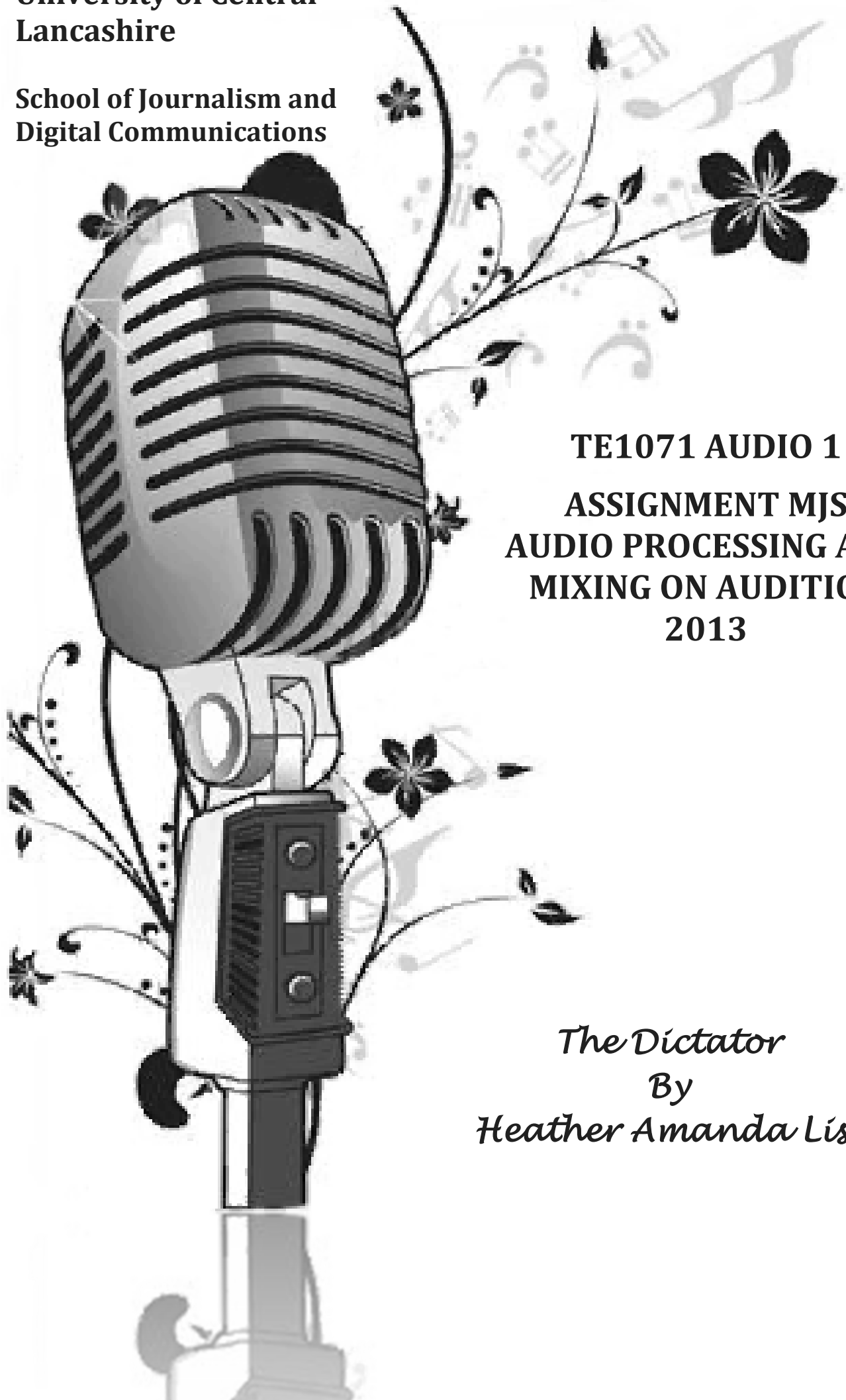


**University of Central
Lancashire**

**School of Journalism and
Digital Communications**



**TE1071 AUDIO 1
ASSIGNMENT MJS
AUDIO PROCESSING AND
MIXING ON AUDITION
2013**

*The Dictator
By
Heather Amanda List*

Summary



My assignment brief was to produce a ninety minute audio sample that would sound like it had been recorded live from a drive-time fm radio show.

The idea was to start with a piece of music ending and the presenter in the middle of eating something noisily being caught unawares. It would then continue with a short intro from the radio anchor before going to a supposedly live broadcast from a dictator in a foreign country giving a passionate speech to his people.

As the dictator rallies his people we would hear them roaring and clapping, the sound getting louder between pauses in the speech then quiet again as the dictator continues. The whole piece would finish with a brass band playing before fading out.

The materials for the music and background sounds were to be sourced from royalty free sound databases; making sure that all the files were mine to freely used and not restricted under the creative commons license restrictions. I was to record the crunching noises of the presenter eating, his subsequent announcement and the dictators speech myself using a suitable microphone and recorder.

The whole broadcast has to be in style of radio 3 and the finished mixed recording has to be suitably processed to replicate the low dynamic range of a radio broadcast. In order to fabricate a successful radio show I would need to do some research and analysis into radio broadcast bandwidths and dynamic ranges.

Further treatment of the sound files to make them appear genuine would be achieved using Adobe Audition CS6 software.





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Introduction

Utilising the skills and knowledge I have gained within my lectures and workshops I have attempted to produce a simulated radio broadcast in the style of radio 3.

The assignment brief was very detailed in how the broadcast should run; it was to start with a piece of music coming to an abrupt end catching the presenter in the middle of eating something noisily. After an apology and short intro from the radio presenter it would go to a live broadcast from a dictator in a foreign country giving a passionate speech to his people. The speech would be interspersed with cheering and clapping from the crowd then finishing with a brass band playing cheerfully as the piece fades out.

In the following report I will describes how I sourced royalty free sound files to intermix with my own vocal recordings and how I treated these files within Adobe Audition CS6 to produce the effects required for the simulation.

I will also demonstrate my understanding of basic audio analysis and sound file generation technologies as well as the use of compressors and dynamic bandwidths within radio broadcasting.

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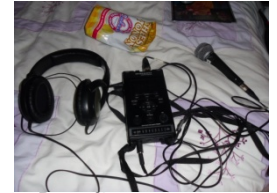


Report



Food...

In the absence of a soundproof recording studio I recorded the food sound, announcer and the dictator speech in my bedroom. I ruled out my kitchen due to its hard surfaces which would have created too much of an echo; plus it has a fridge-freezer humming away in one corner and a boiler in the other both of which would have caused too much background interference and noise. I tested my sitting room for sound quality and it would have been passable however my clock has a very audible tick which the Shure SM58 cardioid dynamic mic picked up quite clearly even when not pointed at it. So I closed all the doors in my flat to limit the ambient sound of clocks, boilers and electrical equipment and retired to the soft furnishings of my bedroom. I used a packet of crisps to help simulate the crunching sounds and a cup of coffee (not present in photo) for the slurping noise.



Recording environment

The recordings went well and I saved my files, uploaded them to audition edited them for errors and length and arranged them in the order I would require them. Unfortunately when my tutor played them back he noticed something that I hadn't. When examining the wave form up close he saw that the stereo waves were not symmetrical indicating that there was some imbalance. Upon investigation it turned out that in my attempt to find the best environment to record my sounds I had rushed through the setting on my Marantz recorder and instead of recording via the Shure Microphone I had recorded via the on-board Mic of the Marantz. This would explain the clear pickup of the wall clock and the interference I got from moving around on the bed.

In the picture to the right that I took at the time of the recording you can clearly see it is set for internal microphone (INT-MIC) not (MIC/LINE). It also has the wrong sample rate, my assignment brief asks for a sample rate of 44100k and this was set to 48000k.



Incorrect settings

This was a sloppy error that may possibly have been disastrous had I been recording a live event that could not have been repeated. I could have used this recording however I decided that I would have another go and thus learn from my mistakes.

My second attempt at recording the sounds of the broadcaster crunching food didn't go exactly to plan either due to a faulty XLR microphone cable. When I played my recording back there were gaps in the vocals and a significant amount of background hiss that I knew with my experience of using Shure SM58 microphones should not have been present.

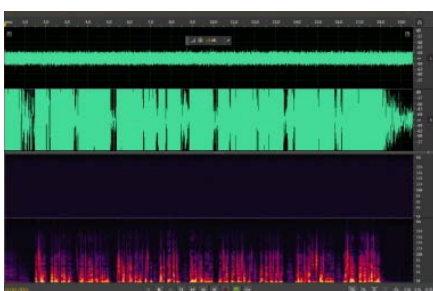
My third endeavour however went very smoothly as I had now had plenty of practice; so once again with my trusty Marantz recorder and Shure SM58 cardioid dynamic microphone I set to the task. I set the Marantz to record from the microphone (MIC/LINE) in stereo to ensure I had a balanced sound recording and at the sample rate specified in the assignment brief of 44100k; which is also the sample rate of an audio file on a standard compact disc. We were also asked to make sure we saved out recordings as uncompressed 'wav' files so there would be no data loss before we began our manipulation of the sound files in Audition. On a Marantz recorder this setting is labelled



Correct settings

PCM-16; which stands for pulse code modulation at 16bits.

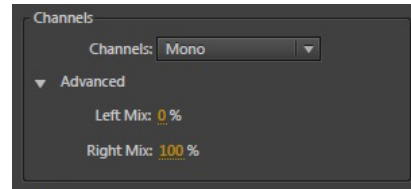
Creating a multi-track recording within Audition I imported the audio file for the announcer and listened to a run through within the software's environment. After toping and tailing the file to remove the bits I didn't need with Auditions slice tool I converted the stereo sound file to a mono file using one of Auditions preset programs to



Wave form view

remove the left channel. This was necessary because even though I was recording in stereo with the Marantz and it produced a dual channel sound file it only actually recorded my voice on the right channel the left channel picked up the low static hiss of the recorders internal mechanisms. There are several ways I could remove this noise from sampling the unwanted background noise with the software and deleting it from both channels or inverting the left channel and then combining the two thus cancelling out the unwanted bits of data however both of these methods could possibly also delete information that we wanted as well distorting the quality of the sound file.

The Audition preset handles the conversion to mono by simply eliminating the data from the left channel when it resamples the file and keeps 100% of the data from the right channel which has our voice recording.



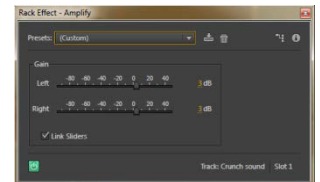
Mono Channel Mix settings



Announcer...

The radio announcer was recorded at the same time as the food effects in the same environment and was treated in the same manner within the Audition window environment. Although my bedroom was the best acoustic environment within my home it was not a perfect one due to the general size of the room and the fact that I was sitting on a spring mattress. If I had been able to record the announcer in the sound proof atmosphere of a recording studio or radio broadcast booth there would have been less background noise and it would have had the sound quality that a more sensitive condenser microphone can pick up.

In addition to rendering the stereo file to a mono one I also applied some amplification as I felt the volume of the recording was too low. After testing several of Auditions preset amplifications I choose a +3db increase anything more would have caused clipping due to the vocal range of my voice.



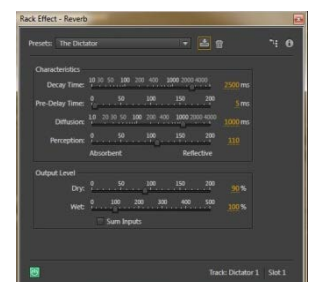
Amplification settings

Dictator...

A reverb effect is used to simulate the acoustic echo in a large enclosed space. The reverb effect on the dictator's speech was the most difficult to achieve due to the complexity and subjectivity of audio sounds and echo reproduction. I recorded the dictator at the same time as I did the radio announcer using the Shure SM58 Microphone and a Marantz recorder. As with the announcer sound file I reduce the stereo channels down to one single mono channel before I began any work on it. The speech was supposed to have a break in it to allow the crowd to cheer loudly so I recorded it as two separate files so I would not have to worry about splitting the file once it had been imported. They were though both imported to the same timeline so that any effects applied to that timeline would be equally applied to each sound file. After topping and tailing to remove unwanted dead air from each of the segments I positioned them along the multitrack editor window so that the first part of the speech began at the end of the announcer and the second part approximately five to ten seconds further down the timeline. This was to allow for the crowd to cheer; the exact distance was tweaked after I had finalised the position of the cheering crowd sound file to allow for the loudest part of the crowd cheer to coincide with the gap in the speech. I decided not to increase the volume of the dictator because I knew when I added the reverb for the stadium effect I could increase the gain at that stage if it was necessary.

When it came to applying a reverb to simulate the sound of a speech being given and recorded live in an open air stadium I tested a variety of the custom reverbs available within the Adobe Audition software. Unfortunately even though there was plenty to choose from I was disappointed with the effects and could not find one that I was happy with. Part of the problem was that I am use to dictator speeches being given by men i.e. in a male voice so my female voice was distracting me. To try and find out how my voice should sound I did some research into female speech makers via the video sharing website YouTube. The best speeches I could find were from some very powerful women such as the former secretary of state Condoleezza Rice and the first lady Michelle Obama. After listening to several of these women speak in large auditoriums and footballs stadiums I realised that their voices were not as timbered as a male voice and the reverb tended to be very quick. The echo dissipated fast so that only when the speaker stopped and paused did you really hear it.

With this knowledge I returned to the audition reverb software and decided the best way forward was to take a basic reverb and custom it to my requirement. The full reverb effect option in Audition allows you to adjust a wide range of parameters however I choose to keep things simple and concentrate on the decay time, perception of sound and the wet and dry mix.



Reverb Effect

The decay time is how long it takes in milliseconds for the reverb to die down to an inaudible sound. For a small room this would be low as the sound would bounce or 'echo' off the walls much quicker; so for a large stadium with space for the sound wave to stretch out the decay time would be much longer. Conversely the highest setting of 4000ms was too much so I did some testing and found that 2500 was about right for the reverb effect I was after.



The perception is about how much of the echo is either absorbed or reflected off the surrounding environment. For instance the reflection echo in an underground car park would be very high but the reflection echo in a large stadium would be lower. Conversely I wanted some audible reverb for my dictator speech so I set the level at just over half way.

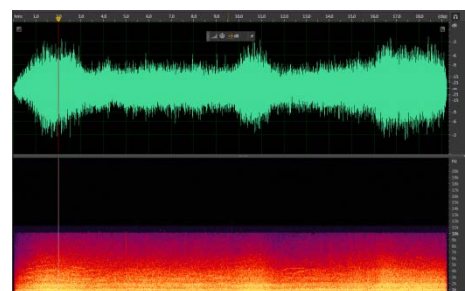
The dry setting determines the audio output level in relation to the wet which is the reverb output. I wanted to clearly hear the dictator's voice before the reverb effect so I set the dry to the recommend 90% and kept the wet at the low end of the scale.

The final result wasn't quiet as perfect as I was hoping for nonetheless I think I achieved an approximation of the effect required to simulate a dictators speech in front of a large crowd in an open air stadium. Part of the problem with the finished effect was a 'bumping' sound that the microphone picked up from my voice when I recorded the speech. This noise was probably due to me holding the microphone too close to my mouth; regrettably the reverb effect amplified it. The feedback 'bump' was impossible to remove without distorting the quality of the original sound file so I decided not to and leave it as it was.

Crowd... <http://www.freesound.org/search/?g=1&f=type%3Awav&q=cheering&s=duration+desc&advanced=0&page=4#sound>

The sound effect file for the crowd was downloaded from a royalty free website after some extensive search. The problem wasn't the lack of sound files but the quality of the files. My assignment brief asked for the use of wav files as these are lossless uncompressed files; conversely compressed mp3 files are more commonly used by sound file distribution websites as they take up less room and are faster to up and download.

In the end I considered three sound files for my crowd effects. I rejected the first one; an mp3 file of a large crowd at a cricket match because it was too short and lacked variety. The second file I found was a wav file recorded at a large stadium and was of ample length and variation, however when looking at the spectrum graph of the wave form it was clear that the audio level had clipped the maximum recording level and hence data had been lost. My third file was of a roaring crowd at a rock concert and though by looking again at the waveform graph it was obvious that at some point the file had been an mp3 and then converted to a wav, I decided that it had the variety and depth of sound I needed for my assignment piece. The file was also licensed under the creative commons regulations meaning I could download, alter, reuse and republish as much as I required.

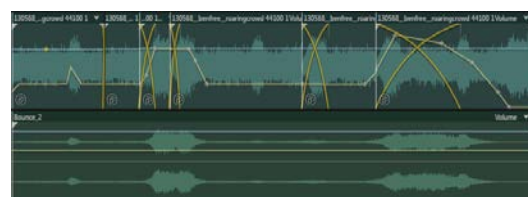


Roaring Rock crowd

The original file was 48000hz 16bit mono file however when I imported it into Audition I was given the option to convert it to a 44100hz sample rate file to match the files I already had in the multitrack editor. Once this was done I copied and pasted the file several times and arranged them along the timeline beneath the dictator's speech. What followed was several hours of cutting and moving the files around until I had the segments aligned for the best background sound effects. Some of the files were pushed together so that they overlapped to prevent the sound of the crowd sounding disjointed. The next process was to reduce the overall volume level to simulate background noise while the dictator was speaking. To make the crowd appear to get more excited when the dictator pauses at a dramatic moment the sound was faded up and down, ending with a long fade out when the band music at the end begins.

A final treatment of the sound track was to bounce it to a stereo track to create two channels this would enable me to pan the sound levels to the left; a process that could not be applied in a single channel environment. The reason for panning the sound was to make the crowd appear to be on the opposite side of the microphone to the dictator.

The result was quiet effective considering I used a roaring crowd at a rock concert in place of an excited crowd at a political rally. With the bounced file it is easier to see where the volume increases and decreases.



Spliced files and combined as stereo

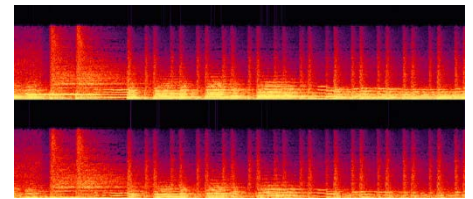
Band... <http://incompetech.com/music/royalty-free/index.html?isrc=USUAN1100016>

Royalty free music is one of the hardest things to find because the rights to the ownership of music are some of the most prized and protected in the industry. Nonetheless it is possible to illegally reproduce and copy just about any piece of music these days and is one of the biggest headaches for the recording industry and musicians. I did find a few websites that offered royalty free music files however most of them wanted token payments for the use of these files so it took me several hours to find a website where I was able to download a sample file of sufficient length for free.



Originally the file I downloaded was an mp3 but I decided I wanted to keep my files all wav so I used the adobe media encoder and changed it to a wav format; I didn't need to do this it was a personal choice. The file didn't require much processing my first move was to position it along the track so the end faded out at ninety seconds then faded the music in over the top of the crowd which I had previously faded out at this point. One thing I did do was pan the music to the right to imply that the band was playing at the side of the stadium away from the microphones directional pickup. Because the music was a sample file and not a full recording it had its own fade out that fit in quite well with the end of the broadcast. The Washington Post March I thought was also a perfect piece to play at the end of the dictators pontificating speech.

The volume level of the band file was very good considering it originated as an mp3 file so I didn't have to do any adjustment to it in that respect. When you look at the spectral frequency display you can clearly make out gaps where it has been compressed and the frequency range itself has been filtered at 16 kHz; this is typical of mp3 files.



Spectral Frequency

Overall Mix...

Multitrack editing systems are common in media editing software, from a simple layered Photoshop file to a multifaceted Final Cut Pro production and are a good non-destructive method of working with digital data. By importing each of the sound files I used into their own tracks on the timeline I was able to preserve the original files and apply appropriate effects to each in turn.

Once I was happy with the pieced together broadcast simulation in the multitrack editor I performed several processes to generate a single stereo track file.

This final wav form stereo image was achieved in three stages; first I mixed all the multitrack files down to a single stereo track then I used Auditions Broadcast multitrack compressor before finally adding a hi and low frequency filter. All this was done to simulate the dynamic broadcast frequency of an FM radio station.



Multitrack mix

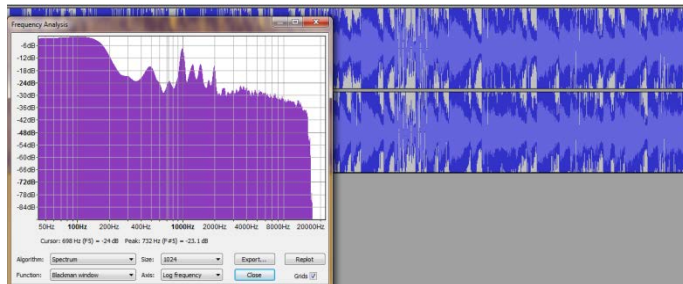
All radio stations use multiband compression to ensure that their broadcasts are uniform in volume and do not exceed the audible capacity level of human ears. There are two ways of performing this dynamic range reduction; this first is to reduce the louder sounds while maintaining the level of the quieter ones and the second is to increase the quieter sounds without increasing the louder ones. The result is a squeezing of the sound waves within a threshold that is determined by a base ratio of 4:1. This means that if the input level is 4db over the threshold, the output level will be reduced to 1db over the threshold reducing the level by 3db. The highest ratio known as 'limiting' is $\infty:1$ and can be achieved with a ratio of 60:1. This is obviously a huge decrease in dynamic range so it requires a complex method of attack and release compressions using the look 'ahead' ability of digital broadcasting. The look ahead allows the system to listen a few seconds down the broadcast and predict how much the gain level will need to be reduced or increased and prepare the compression rate accordingly. The upshot is that when listening to the radio in say a car you can hear the quiet bits of an Adel song over the background engine noise but do not get deafened when Rammstein is played.

Broadcasters especially radio with their reliance on compact disc or mp3 file audio sources use compression to its max to accommodate the narrow range of a broadcast signal. In the UK the Permitted Maximum Level (PML) is 8 dB, which corresponds to '6' on the British PPM scale with a legal peak limit of 9db.

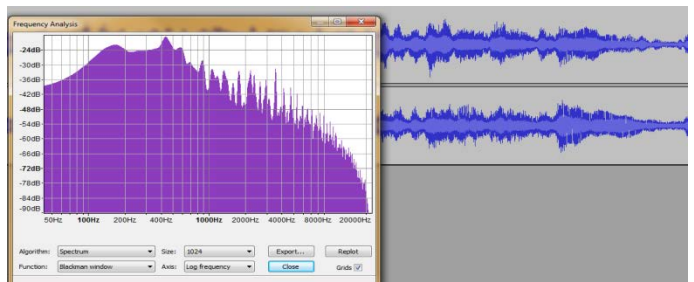
The majority of Broadcast equipment is fitted with hardware that performs the required compression before it is sent over the air waves. Something a lot of the illegal radio stations of the seventies and eighties didn't have.



Conversely though there is a significant difference between what some stations consider a reasonable peak volume level. Below are two Audacity frequency analysis of radio broadcasts recorded over the internet via Audacity's internal sound card recording facilities.



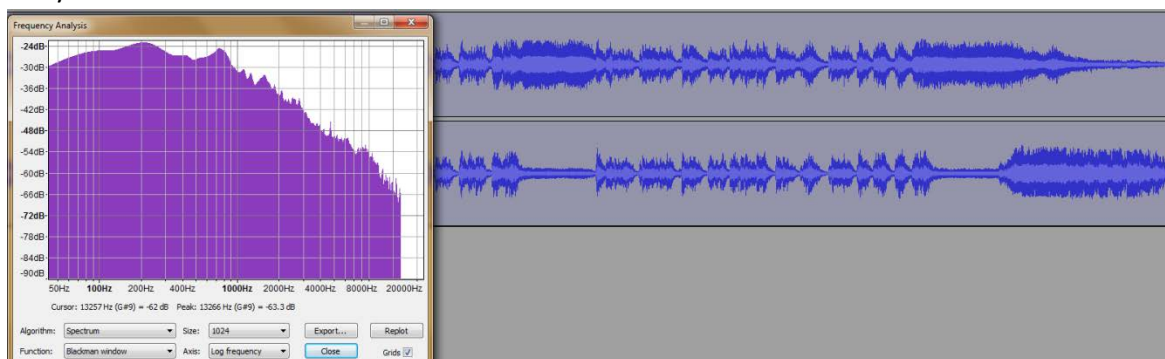
Radio 1 Broadcast



Radio 3 Broadcast

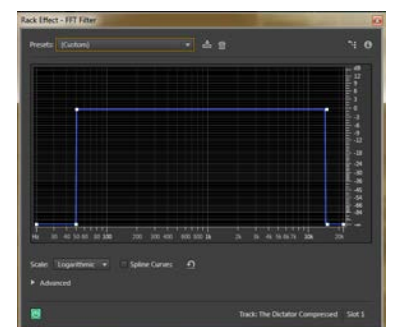
Even without the frequency analysis it is obvious from the wave form patterns that when it comes to broadcast levels radio three observe a more conservative approach. The heights of the sound waves for the Radio One recording have exceeded the maximum decibel threshold and have been clipped whereas the Radio Three sound waves are well within the limits. The Radio One broadcast is however within the legal limit at -6db with plenty of headroom for those annoying advertisements. The clipping is most likely due to the frequency filter applied to limit the dynamic bandwidth.

The frequency analysis of my own mixed down track with multi broadcast compression and frequency filter resembles the Radio Three broadcast and not the radio one which is a good indicator that it has been processed appropriately.



Dictator Broadcast

The audio frequency (AF) range of the human hearing which is often referred to as the acoustics levels is between 20Hz and 16,000Hz. The audio frequency range of an FM radio broadcast is a little over 15,000Hz and is lost below 50Hz. As you can see from the bottom scales of each broadcast respective of the station they do not broadcast outside of these frequencies. To replicate this frequency limit I used the Auditions FFT Filter and cut of the frequency's below 50Hz and above 15,000Hz.



Audition FFT Filter

Overall I am very pleased with how my recording came out; conversely though there is a lot I am not happy with. The 'bumping' sound in the dictator's speech and the fact that I could not get rid of it is frustrating and I would have liked a better crowd sound file but I was restricted to what was available. I am very happy with the two pieces of music they were easier to source than I expected the only negative I had was the search for wav files over mp3. I think if I learnt anything from this project it is to check your equipment before you take it on location and you can only work within the confines of the quality of the digital media you have access to.

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