



REPORT ON DIGITAL FORENSIC ACQUISITION AND ANALYSIS REVIEW

PREPARED ON 21 DECEMBER 2021

(REFRESHED ON 27 DECEMBER 2021)

For

BOARD OF DEPUTIES OF BRITISH JEWS

PREPARED BY

D3 FORENSICS

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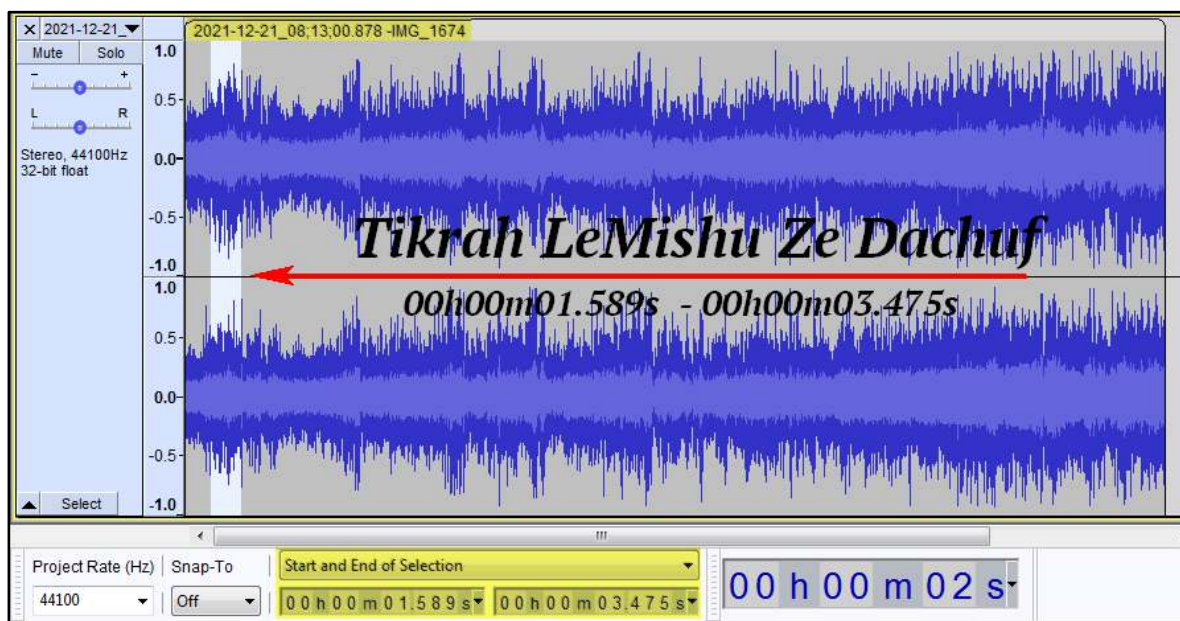
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1. EXECUTIVE SUMMARY - AUDIO ANALYSIS FINDINGS

A native Hebrew-speaking D3 Forensics specialist performed an analysis and review of one audio file which was extracted from the original video documenting an antisemitic incident in Oxford Street, London, during Hanukkah celebration on 29 November 2021.

D3 Forensics unequivocally confirms that the audio does not contain any racial slur, neither the word “dirty” nor the word “Muslim” could be heard in the soundtrack. The disputed speech starting at 00h00m01.589s is clearly a phrase spoken in Hebrew saying “**Tikrah lemishu, ze dachuf**” (call someone, it is urgent).



2. INTRODUCTION TO ASSIGNMENT

Pursuant to the request of the Board of Deputies of British Jews ("BoD"), D3 Forensics Ltd ("D3 Forensics") performed a **digital forensics acquisition** of one (1) Video file.

3. BACKGROUND PROVIDED

D3 Forensics understands that the BoD have concerns with a segment of audio within a video file that was made available on the Jewish Chronicle ("JC") Website and on social media platform Twitter on 01 December 2021 as part of a report on an antisemitic incident in Oxford Street, London. The BBC in its reporting (archived copies) of same incident insists that "a *slur about Muslims can also be heard.*"

The BoD requested that D3 Forensics examine the original video taken during a Hanukkah celebration on Oxford Street, London, in November 2021 and conduct audio forensic analysis of same to confirm whether the recorded audio track within the video file contains an anti-Muslim slur at 0:03 seconds in or otherwise repudiate allegations of same.

4. SCOPE OF WORK

BoD requested D3 Forensics that an expert native Hebrew speaker forensically examines the targeted audio; the tasking was as follows:

I. Acquisition of Video

D3 Forensics was to perform a digital forensic acquisition of the target video; a link to iCloud Drive containing the original (source) video file was shared by the BoD on 18 December 2021 ("Date of Collection").

II. Processing & Analysis

D3 Forensics was to process the video file in question, create exact working copies of the file and conduct forensic analysis of same.

III. Audio Extraction

D3 Forensics was to extract the audio from the video file; convert the file to the most popular audio format, preserve the original audio quality and remove

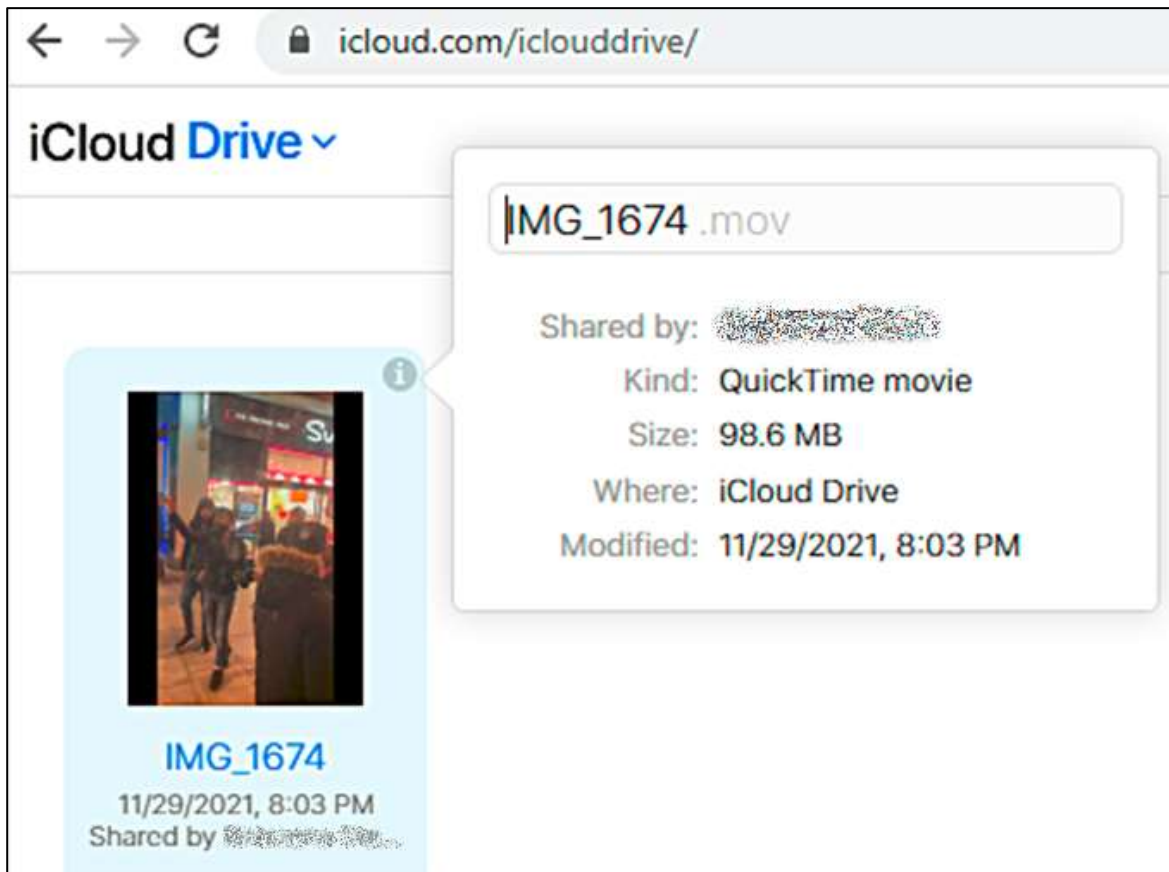
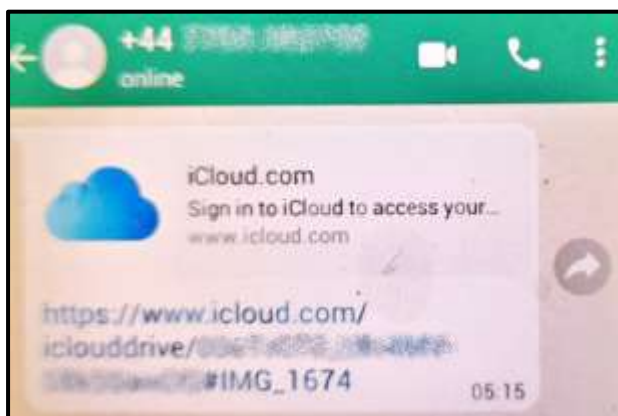
background noise and enhance the sound quality where possible.

IV. Audio Analysis

D3 Forensics was to perform analysis of audio component of the target video file; isolate and examine the disputed speech at 0:03 seconds in to determine whether a racial slur could be heard in the audio.

5. EXHIBIT RECEIVED - ACQUISITION DETAILS

A link provided to the original video file on 18 December 2021 by BoD to D3 via messaging app WhatsApp. We signed into iCloud, reviewed the shared video file and proceeded to download the video to a freshly prepared forensically sterile flash drive.



We successfully completed a forensic digital evidence acquisition of the target video file on 18 December 2021 at 09:15 AM (UK Time). The acquired video file was verified by using both a Message-Digest v5 (“MD5”) algorithm, and a secure hash algorithm (“SHA1”). A set of working forensic copies were created for our review and analysis. The original item was secured inside D3 Forensics’ office exhibit safe. Details of the video file acquisition and verification are provided in [Annex 1](#) of this report.

6. VIDEO FILE ANALYSIS

Using a variety of dedicated media analysis tools and knowhow, D3 Forensics extracted the file’s metadata, gathered information from the video & audio streams and conducted a series of examinations of the video file:

Media File Information

File: Desktop\iCloud Video - Working Copy\IMG_1674.MOV

com.apple.quicktime.make:	Apple
com.apple.quicktime.model:	iPhone 12 mini
com.apple.quicktime.software:	14.8.1
com.apple.quicktime.creationdate:	2021-11-29T20:03:52+0000

File Size:	98 555 141 bytes (93.99 MB)
Md5:	a256 4de8 80dd 13de c332 496b a231 2539
Duration:	00:00:59.38 (59 s 375 ms)
Overall Bit Rate Mode:	Variable
Overall Bitrate:	13 278 kbit/s
Format:	MPEG-4
Format Profile :	QuickTime
Codec ID:	qt 0000.00 (qt)
Encoded Application:	Apple QuickTime
Encoded Date:	UTC 2021-11-29 20:03:52
Tagged Date:	UTC 2021-11-29 20:04:52
Number of all Data Streams:	5
Number of Video Streams:	1
Number of Audio Streams:	1

Basic info	MediaInfo	FFprobe	HEX
Video stream		1	Audio stream
Video codec: HEVC (ID: hvc1)		Audio codec: AAC (ID: mp4a-40-2)	
Profile: Main 10@L4@Main		Profile:	
Bitrate: 12 983 kbit/s		Bitrate: 185 kbit/s VBR	
Resolution: 1 920 x 1 080		Channels: 2	
Display aspect: 16:9		Sampling rate: 44 100 Hz	
Frames / second: 29.97		Bits per sample:	
Scan type:		Samples: ~ 2 618 349	
Pixel format: yuv420p10le(tv)		Video delay: 0 ms	
Bits / pixel: 0.209		Language:	
Frames: ~ 1 780		Stream size: 1.32 MB (1%)	
Stream size: 91.9 MB (98%)		Encoded library:	
Encoded library:		Stream index: 1	
Stream index: 0			

Video Stream

Video Codec:	High Efficiency Video Coding (HEVC)
Profile:	Main 10@L4@Main
Bitrate:	12 983 kbit/s
Resolution:	1 920 x 1 080
Display Aspect:	16:9
Frames / Second:	29.97
Pixel Format:	yuv420p10le(tv)
Bits / Pixel:	0.209
Frames:	~ 1 780
Stream Size:	91.9 MB (98%)
Stream Index:	0

Audio Stream

Audio Codec:	Advanced Audio Coding (AAC)
Profile:	
Bitrate:	185 kbit/s VBR
Channels:	2
Sampling Rate:	44 100 Hz
Bits per Sample:	
Samples:	~ 2 618 349
Video Delay:	0 ms
Stream Size:	1.32 MB (1%)
Language:	
Stream Index:	1

Our examination of both the digital properties of the video (captured metadata) and the video itself are consistent and unmodified; the frames are sequential and there are no indications of the video or audio stream being edited or signs of additional unconnected sounds within the video's audio stream. Review of the file signatures (Hex headers) indicates that the video file is genuine and has not been tampered with in any way and was recorded on an Apple iPhone 12 mini device.

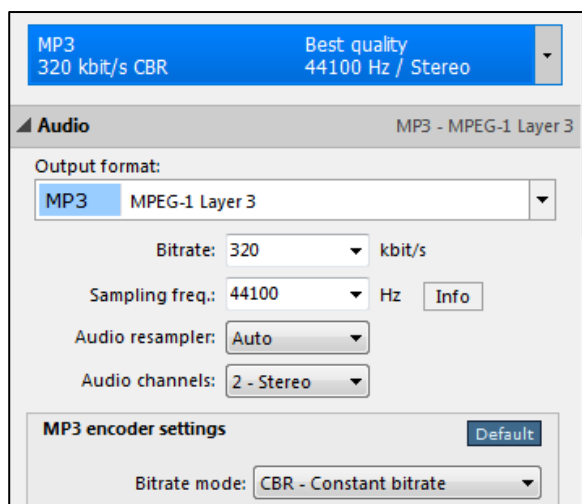
Offset (h)	00	01	02	03	04	05	06	07	08	09	0A	0B	0C	0D	0E	0F	Decoded text
00000000	00	00	00	14	66	74	79	70	71	74	20	20	00	00	00	00	... ftypqt
00000010	71	74	20	20	00	00	00	08	77	69	64	65	05	DF	06	49	qtwide.S.I
00000020	6D	64	61	74	21	20	03	40	68	1C	21	4E	E6	FF	F9	65	mdat! .@h.!Næyùe
00000030	7F	3F	EE	A1	F8	BF	28	A1	03	66	A4	34	20	8C	B1	02	.?i;ø¿(j.f×4 E±.

Offset (h)	00	01	02	03	04	05	06	07	08	09	0A	0B	0C	0D	0E	0F	Decoded text
05DFD470	36	36	39	2F	00	00	00	1D	00	00	00	03	00	00	00	15	669/.....
05DFD480	64	61	74	61	00	00	00	01	00	00	00	00	41	70	70	6C	data.....Appl
05DFD490	65	00	00	00	26	00	00	00	04	00	00	00	1E	64	61	74	e...&.....dat
05DFD4A0	61	00	00	00	01	00	00	00	00	69	50	68	6F	6E	65	20	a.....iPhone
05DFD4B0	31	32	20	6D	69	6E	69	00	00	00	1E	00	00	00	05	00	12 mini.....
05DFD4C0	00	00	16	64	61	74	61	00	00	00	01	00	00	00	00	31	...data.....1
05DFD4D0	34	2E	38	2E	31	00	00	00	30	00	00	00	06	00	00	00	4.8.1...0.....
05DFD4E0	28	64	61	74	61	00	00	00	01	00	00	00	00	32	30	32	(data.....202
05DFD4F0	31	2D	31	31	2D	32	39	54	32	30	3A	30	33	3A	35	32	1-11-29T20:03:52
05DFD500	2B	30	30	30	30												+0000

Sample Extract IMG_1674.MOV File Signatures

7. AUDIO EXTRACTION

D3 Forensics extracted the original audio track from the video file without loss of sound clarity. We maintained all the encoding parameters to preserve the original audio quality. The file, **2021-12-21_07;53;55.175 -IMG_1674.m4a**, was saved in the same directory as the input video file. We additionally exported the file to the popular MP3 format as file **2021-12-21_08;04;46.109 -IMG_1674.mp3** again saving to the same directory. Finally, for completeness, we exported the original audio track to Ogg Vorbis audio format since the encoding of this audio format is more efficient than MP3, and in general we find Ogg Vorbis encodings sound better than MP3. This was saved as **2021-12-21_08;13;00.878 -IMG_1674.ogg** again to the same working directory.



Audio Conversion Parameters – MP3



Audio Conversion Parameters -OGG

Icon	File Name	Date/Time	File Type
Folder icon	Audio Extract Info	12/20/2021 1:10 PM	File folder
Audio icon	2021-12-21_07;53;55.175 -IMG_1674.m4a	12/21/2021 7:53 AM	MPEG-4 Audio
Audio icon	2021-12-21_08;11;53.529 -IMG_1674.mp3	12/21/2021 8:11 AM	MP3 Format Sound
Audio icon	2021-12-21_08;13;00.878 -IMG_1674.ogg	12/21/2021 8:13 AM	OGG File
Video icon	IMG_1674.MOV	12/18/2021 9:15 AM	QuickTime Movie

Extracted Audio Track - M4A, MP3 & OGG file extensions

8. AUDIO TRACK PROCESSING AND ENHANCEMENT

We worked with file 2021-12-21_08;13;00.878 -IMG_1674.ogg, this audio file was extracted from the original video file, it was opened in an audio analysis tool.



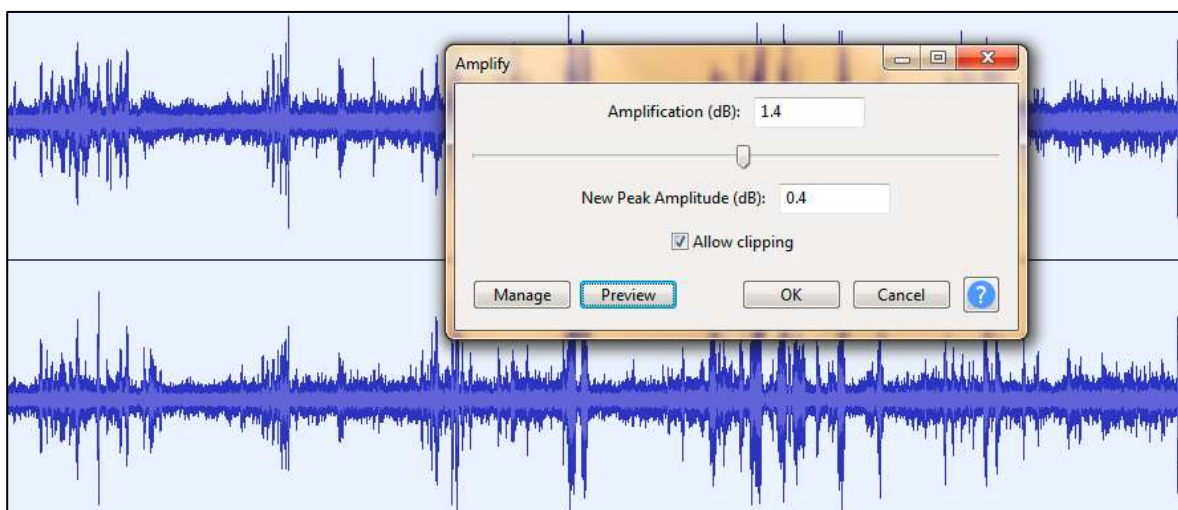
File 2021-12-21_08;13;00.878 -IMG_1674.ogg imported into an audio analysis software



We first ran the DC offset¹ tool and then used noise reduction filters to analyse extraneous noise in the recordings and remove and reduce non-verbal background sounds from same without diminishing the overall sound quality.

¹ DC offset is an offsetting of a signal from zero. It is a potential source of clicks, distortion and loss of audio volume and should be corrected if present before any other enhancements are attempted.

Note: It is not possible to isolate only the speech of interest and discriminate or filter other speech and noises that we do not want, as all operate within the same frequency ranges. What is also important is the distance from the recording device the speech of interest is. The microphone is omni-directional by design and we cannot tune just to the direction of interest.


Next, we ran the audio file through a number of additional filters, including the “normalise” and “amplify” features to improve sound quality and increase the volume. We listened to the input effects, making sure results are optimal, applied the changes and exported the cleaned up audio track file as .mp3 and .ogg files.

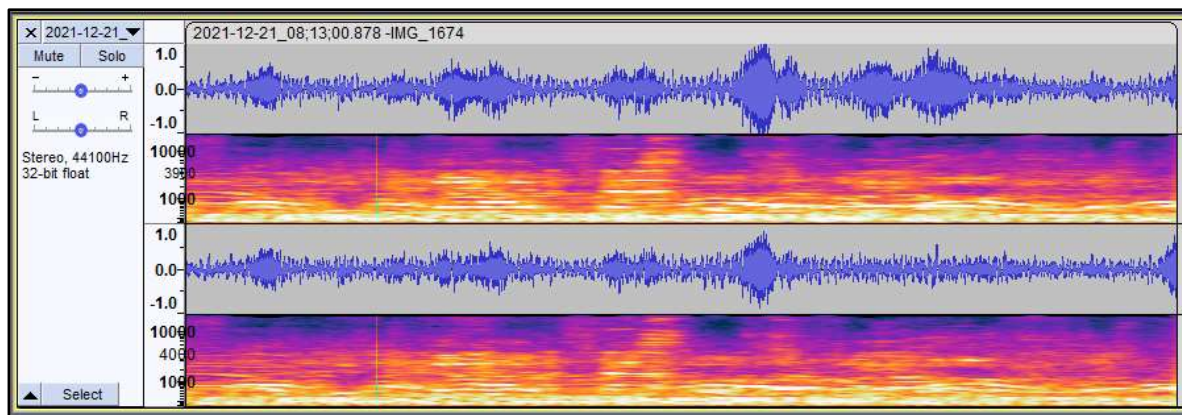


Filename	MD5
 2021-12-21_08;13;00.878 -IMG_1674.mp3	7fa57c3c9fc17be54e48d1396aae2d93
 2021-12-21_08;13;00.878 -IMG_1674.ogg	5b9c96533f523577aa720e0654929c38

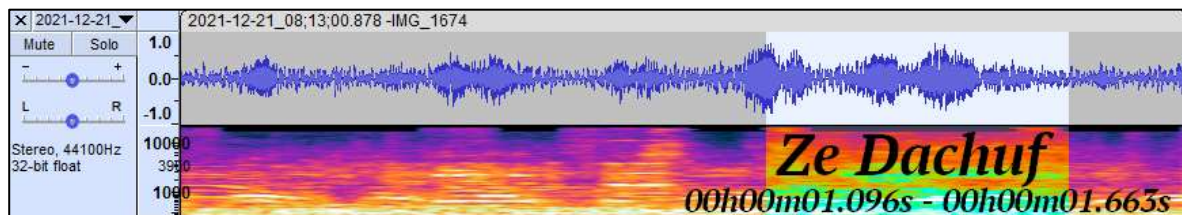
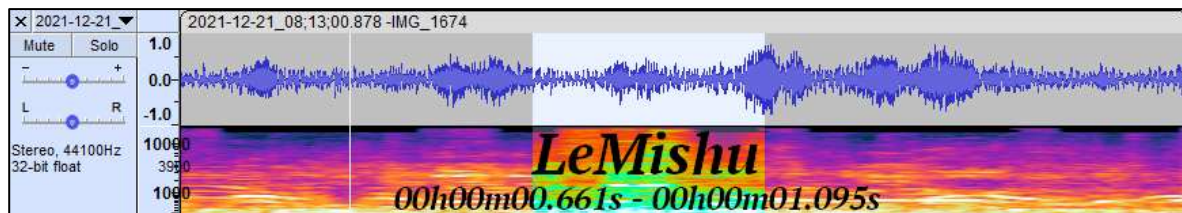
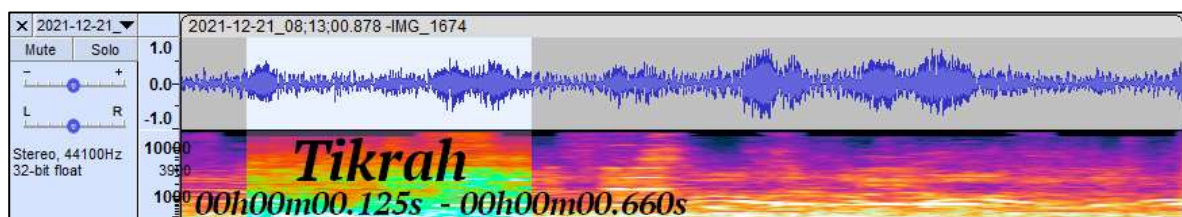
Enhanced Audio Files

Lastly, we isolated the disputed speech, starting at **00h00m01.589s** in and ending at **00h00m03.475s** and ran the selection through additional filters, again to further enhance the sound quality of the segment of interest as much as technically possible without diluting the sound quality. We exported the selected audio segment as .MP3 files, details:

Filename	MD5
 2021-12-21_08;13;00.878 -IMG_1674.mp3	16bea049027fce7f85b7b85922a12cef




File 2021-12-21_08;13;00.878 -IMG_1674.mp3 - Cleaned up, isolated segment of interest imported into audio software



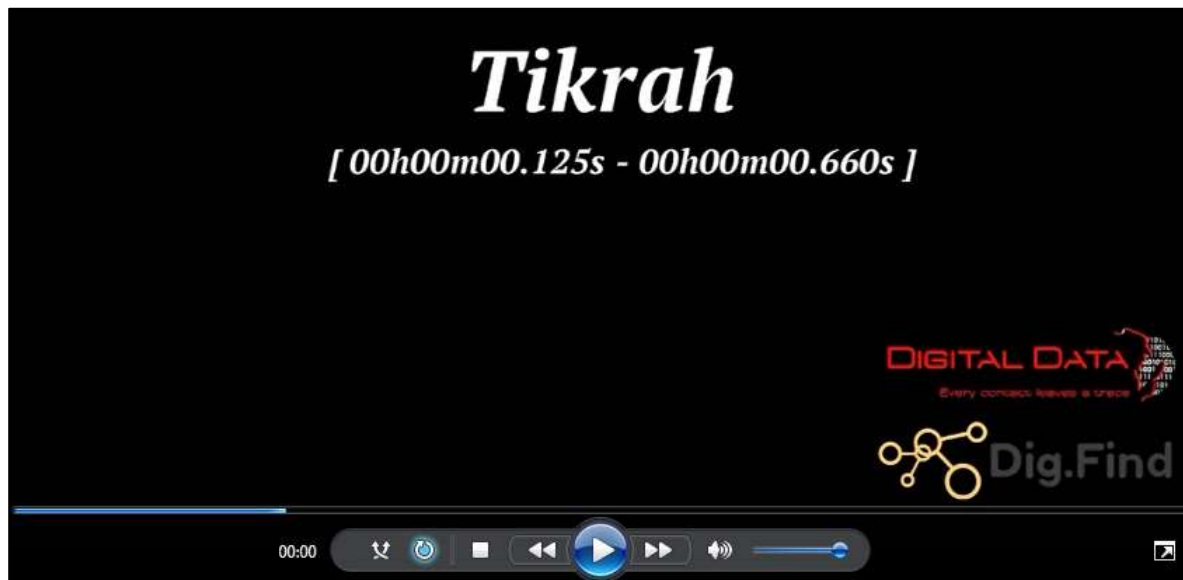
Segment of interest broken down into parts

Furthermore, we **changed the tempo² and speed by -15%** thus increasing the length of the audio and reducing the pitch (lowering the frequencies). This modification caused slight audible distortion but makes the speech content clearer to the listener. We exported this audio track file as.mp3:

Filename	MD5
 -15 T&S 2021-12-21_08;13;00.878 -IMG_1674.mp3	1b4de136ce0c7be243e9756e738a03f1

² Changing the tempo only does not affect the pitch or frequency range.

Our analysis of the entire audio track by a native Hebrew speaker confirms that the sound is a mix of Hebrew and English and that no racial slur, anti-Muslim or otherwise, could be heard. We focused on the disputed speech at 00h00m01.589s in and can categorically confirm that the spoken phrase is Hebrew; "Tikrah lemishu, ze dachuf" meaning call someone it is urgent (תקרא למישהו, זה דחוף).



File 2021-12-21_08;13;00.878 -IMG_1674 Background Cover.mp4

ANNEX 1 – ACQUISITION DETAILS



D3Forensics - Data Acquisition Form Video File

CASE INFORMATION

Project Name: Project Light
Contact: Adam (BoD)

CUSTODIAN FILE INFORMATION

Evidence (File Name):: IMG_1674.MOV
Location of File: iCloud Drive
Type: QuickTime movie
Size: 98.6 MB

Host Device

Model: iPhone 12 Mini MGE03B/A
iOS Version: 15.1.1
Serial Number: F71DJE4J0GPR
Note: The footage was captured on the default iPhone camera app.

ACQUISITION INFORMATION

At 09:13 AM (UK Time) on 18 December 2021, D3 Forensics digital forensics specialist commenced a review of the target video file. At 09:15 AM on same day, the D3 Forensics specialist commenced the acquisition of the target video file. The download process was completed at 09:15 (UK Time) on 18 December 2021.

Acquisition Location:	<input checked="" type="checkbox"/> In-lab <input type="checkbox"/> On Site <input type="checkbox"/> Other:		
Acquisition Method:	<input type="checkbox"/> Hardware <input checked="" type="checkbox"/> Software Application		
Acquisition Hardware:	N/A	Acquisition Software:	Chrome Browser
Start Time:	09:15	Complete Time:	09:15
Time to Complete:	32 Seconds	File Size:	98,555,141
Video File Verified:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		
MD5:	a2564de880dd13dec332496ba2312539		
SHA1:	c01fdbeec6540b9a3a7c5efb9e1e2851b98c608c		

SANDISK USB FLASH DRIVE

The target video file was downloaded to a freshly prepared, forensically sterile, **SanDisk Cruzer 8GB USB Flash Drive** bearing serial number “**B1211157983B**” and model number “**SDCZ50-008G**”.

Device Name: Cruzer Blade
Description: SanDisk Cruzer Blade USB Device
Device Type: Mass Storage
Electronic Serial Number (NirSoft): 03002618111121220756
VendorID: 0781
ProductID: 5567



ANNEX 2 – IMG_1674.MOV MEDIA INFORMATION

```
General
CompleteName           : C:\Users\j\Desktop\iCloud Video - Working Copy\IMG_1674.MOV
Format/String          : MPEG-4
Format_Profile         : QuickTime
CodecID/String         : qt 0000.00 (qt )
FileSize/String        : 94.0 MiB
Duration/String        : 59 s 375 ms
OverallBitRate_Mode/String : Variable
OverallBitRate/String  : 13.3 Mb/s
Encoded_Date           : UTC 2021-11-29 20:03:52
Tagged_Date            : UTC 2021-11-29 20:04:52
Encoded_Library/String : Apple QuickTime
com.apple.quicktime.location.acc : 14.758940
com.apple.quicktime.location.ISO : +51.5137-000.1565+028.669/
com.apple.quicktime.make : Apple
com.apple.quicktime.model : iPhone 12 mini
com.apple.quicktime.software : 14.8.1
com.apple.quicktime.creationdate : 2021-11-29T20:03:52+0000
```

```
Video
ID/String              : 1
Format/String          : HEVC
Format/Info           : High Efficiency Video Coding
Format_Profile         : Main 10@L4@Main
HDR_Format/String     : Dolby Vision, Version 1.0, dvhe.08.04, BL+RPU, HLG compatible
CodecID               : hvc1
CodecID/Info          : High Efficiency Video Coding
Duration/String        : 59 s 375 ms
BitRate/String         : 13.0 Mb/s
Width/String           : 1 920 pixels
Height/String          : 1 080 pixels
DisplayAspectRatio/String : 16:9
Rotation/String        : 90°
FrameRate_Mode/String : Variable
FrameRate/String       : 29.970 (29970/1000) FPS
FrameRate_Minimum/String : 28.571 FPS
FrameRate_Maximum/String : 30.000 FPS
ColorSpace             : YUV
ChromaSubsampling/String : 4:2:0
BitDepth/String        : 10 bits
Bits-(Pixel*Frame)    : 0.209
StreamSize/String      : 91.9 MiB (98%)
Title                 : Core Media Video
Encoded_Date           : UTC 2021-11-29 20:03:52
Tagged_Date            : UTC 2021-11-29 20:04:52
colour_range           : Limited
colour_primaries       : BT.2020
transfer_characteristics : HLG
matrix_coefficients    : BT.2020 non-constant
Metas                  : 3,4,5
Codec configuration box : hvcC+dvvc

Audio
ID/String              : 2
Format/String          : AAC LC
Format/Info           : Advanced Audio Codec Low Complexity
CodecID               : mp4a-40-2
```



```
Audio
ID/String          : 2
Format/String      : AAC LC
Format/Info        : Advanced Audio Codec Low Complexity
CodecID            : mp4a-40-2
Duration/String    : 59 s 373 ms
Source_Duration/String : 59 s 443 ms
BitRate_Mode/String : Variable
BitRate/String     : 186 kb/s
Channel(s)/String  : 2 channels
Channellayout      : L R
SamplingRate/String : 44.1 kHz
FrameRate/String   : 43.066 FPS (1024 SPF)
Compression_Mode/String : Lossy
StreamSize/String  : 1.32 MiB (1%)
Source_StreamSize/String : 1.32 MiB (1%)
Title              : Core Media Audio
Encoded_Date       : UTC 2021-11-29 20:03:52
Tagged_Date        : UTC 2021-11-29 20:04:52
```

ANNEX 3 – AAC BITRATES

We used this bitrate information table as guide in adjusting the audio conversion parameters.

AAC bitrates

Sampling	Audio channels: 2 (stereo)
8000 Hz	8-96 kbit/s
11025 Hz	16-132 kbit/s
16000 Hz	24-192 kbit/s
22050 Hz	24-264 kbit/s
24000 Hz	32-288 kbit/s
32000 Hz	40-384 kbit/s
44100 Hz	64-528 kbit/s
48000 Hz	64-576 kbit/s