International Criminal Court

Trial Chamber IX

Situation: Republic of Uganda

In the case of The Prosecutor v. Dominic Ongwen - ICC-02/04-01/15

Presiding Judge Bertram Schmitt, Judge Péter Kovács and

Judge Raul Cano Pangalangan

Trial Hearing - Courtroom 3

Monday, 13 November 2017

(The hearing starts in open session at 9.33 a.m.)

THE COURT USHER: [9:33:04] All rise.

The International Criminal Court is now in session.

PRESIDING JUDGE SCHMITT: [9:33:27] Good morning, everyone.

Could the court officer please call the case.

THE COURT OFFICER: [9:33:33] Good morning, Mr President, your Honours.

The situation in the Republic of Uganda, in the case of The Prosecutor versus

Dominic Ongwen, case reference ICC-02/04-01/15.

And for the record, we are in open session.

PRESIDING JUDGE SCHMITT: [9:33:47] Thank you very much.

The appearances of the parties. Mr Elderfield for the Prosecution, please.

MR ELDERFIELD: [9:33:52] Good morning, your Honours. My name is

Julian Elderfield. With me, Colleen Gilg, Benjamin Gumpert, Paul Bradfield,

Beti Hohler, Pubudu Sachithanandan, Ayodele Akenroye and Ramu Fatima Bittaye.

PRESIDING JUDGE SCHMITT: [9:34:07] Thank you very much.

And for the Legal Representatives of the Victims, Mr Cox first.

MR COX: [9:34:13] Good morning, your Honours. With me, Anushka Sehmi,

James Mawira and myself, Francisco Cox.

PRESIDING JUDGE SCHMITT: [9:34:20] Thank you.

Mr Narantsetseg.

MR NARANTSETSEG: [9:34:21] Good morning, Mr President, your Honours. Orchlon Narantsetseg and Ms Caroline Walter. Thank you.

PRESIDING JUDGE SCHMITT: [9:34:26] Thank you.

And for the Defence, Mr Rowse, I would say, because I think later on you will be on the stage, so to speak.

MR ROWSE: [9:34:34] Good morning, your Honours. With us today in the courtroom is Dominic Ongwen, our client, Abigail Bridgman, Chief Charles Taku, Thomas Obhof, Krispus Ayena Odongo and myself, Michael Rowse.

PRESIDING JUDGE SCHMITT: [9:34:47] Thank you very much.

The Prosecution is now calling P-242 as its next witness and P-242 is Mr French.

Good morning, Mr French. On behalf of the Chamber, I would like to welcome you to the courtroom. There should be a card in front of you with a solemn undertaking -- I think Mr French would not understand so much, so I repeat it. And wouldn't he need also the earphones?

So I have to repeat myself. Of course, you could not understand me. The acoustic is not so good in this relatively big courtroom.

Good morning, Mr French. On behalf of the Chamber, I would like to welcome you to the courtroom. There should be a card in front of you with a solemn undertaking to tell the truth. Could you please take this undertaking by reading the card aloud.

WITNESS: UGA-OTP-P-0242

(The witness speaks English)

THE WITNESS: [9:35:52] I solemnly declare that I will speak the truth, the whole

truth and nothing but the truth.

PRESIDING JUDGE SCHMITT: [9:35:58] Thank you very much, Mr French. You have now been sworn in. A few practical matters I would like to address before we start with your testimony.

Everything we say here in the courtroom is written down and interpreted. It is therefore important to speak clearly and at a slow pace. Also please speak into the microphone and only start speaking when the person asking you a question has finished. If you have any questions yourself, please raise your hand and then we will give you the floor.

I think that's enough for the practical matters. That was relatively quick compared with other witnesses. I give now Mr Elderfield the floor.

MR ELDERFIELD: [9:36:35] Thank you, your Honour.

Just a preliminary matter, I note that you sent an email recently, your Honour, about the use of the laptop in the courtroom.

PRESIDING JUDGE SCHMITT: [9:36:50] I don't see any problem with this, especially with this witness. Not with other ones, but with this witness there is no problem.

MR ELDERFIELD: [09:37:58] The Prosecution won't be requiring the witness to use a laptop. So just for your information.

PRESIDING JUDGE SCHMITT: [09:37:06] Not require, but if need be, you know, you have to -- you know, I come downstairs from my office and then I am told there is this request, this issue, and then I say there is no problem, and if we don't need the laptop and if it is not used, even better. Let me put it this way, yes.

Please, you can start.

MR ELDERFIELD: [9:37:30] As your Honours are aware, this witness will be

subjected to the 68(3) procedure.

PRESIDING JUDGE SCHMITT: [9:37:36] We are very well aware of that fact, yes.

QUESTIONED BY MR ELDERFIELD:

Q. [9:37:39] Good morning, Mr French.

A. [9:37:41] Good morning.

Q. [9:37:42] As you know, my name is Julian Elderfield. Can you tell the Court your full name?

A. [9:37:49] Alan Robert French.

Q. [9:37:53] What's your birth date and nationality?

A. [9:37:57] 10 August 1963. I am a UK citizen.

Q. [9:38:03] You work for a company called CEDAR Audio Limited; is that correct?

A. [9:38:11] Yes.

Q. [9:38:11] What's your role at that company?

A. [9:38:13] I have two roles there. I am a sales manager for the equipment that we make, but I am also the expert witness and forensic specialist who deals with casework for various institutions and organisations.

Q. [9:38:32] How long have you been the forensic specialist at CEDAR Audio?

A. [9:38:39] I have worked there twice. The last period that I joined was 2010, I think. So it would be seven years, I guess.

Q. [9:38:55] Do you remember giving a statement to the Office of the Prosecutor in May 2016?

A. [9:39:01] Yes, I do.

Q. [9:39:04] Can you please open the small folder in front of you. I believe it has got red -- perhaps the other one, Mr French, on your left side, to tab 1. For the record, tab 1 is UGA-OTP-0261-0333.

Do you recognise this document, Mr French?

A. [9:39:41] Yes, I do.

Q. [9:39:42] What it is?

A. [9:39:43] My witness statement, detailing what I have done in this particular case.

Q. [9:39:50] Do you see both your name and your signature on the first page?

A. [9:39:54] I do.

Q. [9:39:57] And you can see the date there of 12 May 2016?

A. [9:40:04] Correct.

Q. [9:40:09] Can you please turn to the last page and confirm that you can see your signature and the date there under the heading "Witness Acknowledgment".

A. [9:40:21] Yes, I can.

MR ELDERFIELD: [9:40:27] Your Honours will have noticed in the binder, the Prosecution binder, there are seven tabs. Six of these, or five of these, 2 to 6, are associated with the witness's statement. And I, if there is no objection from the Defence, was going to go through those en masse, the witness look through those just to save some time.

PRESIDING JUDGE SCHMITT: [9:40:50] Indeed, en masse, please.

MR ELDERFIELD: [9:40:52] Mr French, can I just have you look briefly through tabs 2 to 6 of your binder.

For the record, tab 2 is 0261-0343; tab 3 is 0261-0345; tab 4 is 0261-0347; tab 5, 0261-03478; and tab 6, 0261-0349.

Q. [9:41:42] Do you recognise these documents?

A. [9:41:44] I do.

Q. [9:41:46] Are they the five annexes to your statement?

A. [9:41:58] Yes.

Q. [9:42:01] And does your signature appear on the first page of each of those documents?

A. [9:42:13] It does.

Q. [9:42:16] Have you had a chance, Mr French, to read carefully through the, through your statement and look through the annexes before coming to testify here today?

A. [9:42:27] I have.

Q. [9:42:29] When you gave your statement did you tell the truth to the Prosecution?

A. [9:42:33] I did.

Q. [9:42:36] And was the statement made to the best of your knowledge and recollection?

A. [9:42:40] Yes, it was.

Q. [9:42:45] Under the Court's rules, if you don't object, the Judges can rely on your statement when they come to their decision in this case. So do you object to this witness statement and its annexes being submitted as evidence?

A. [9:42:59] No.

THE INTERPRETER: [9:43:01] Your Honour, could the parties please be asked

(Overlapping speakers)

PRESIDING JUDGE SCHMITT: [9:43:04] I think this fulfils the requirement of Rule 68.

MR ELDERFIELD: [9:43:05] Thank you, your Honour.

PRESIDING JUDGE SCHMITT: [9:43:07] Unless we have first to hear Mr Obhof.

MR OBHOF: [9:43:10] Nothing special. We just wanted to inform the witness

about the five-second rule because all of this is being interpreted into Acholi and he is -- (Overlapping speakers)

PRESIDING JUDGE SCHMITT: Yeah. No, no, that's (Overlapping speakers)

MR OBHOF: -- responding back very quickly.

PRESIDING JUDGE SCHMITT: [9:43:22] So, Mr French, as I told you in the beginning under the heading "practical matters" we have to speak slowly and (Overlapping speakers)

THE WITNESS: [9:43:32] I Understand, your Honour.

PRESIDING JUDGE SCHMITT: [9:43:33] We have to take our time a little bit. But this happens to everyone in the courtroom, quite often also to the Presiding Judge, so this is absolutely normal. But perhaps from time to time you remind yourself of this.

THE WITNESS: [9:43:44] Thank you.

PRESIDING JUDGE SCHMITT: [9:43:44] Please, Mr Elderfield, continue.

MR ELDERFIELD: [9:43:47] Thank you.

Q. [9:43:48] Mr French, just one or two matters on -- you can close your binder now for the moment. Just one or two matters to follow up based on what's recorded in the statement. The first area relates to the chain of custody of the audio material that you enhanced. When you had finished copying and enhancing the audios, on what physical item did you save the product for its return to the OTP?

A. [9:44:19] It was saved onto a series of CDs.

Q. [9:44:30] Can you please open up your binder again, turn to tab 7, which is ERN 0235-0013. We have a photograph of -- in our binders, you have an original item as well, a hard copy item. Do you recognise what's in front of you?

A. [9:44:59] Yes, I do.

Q. [9:45:00] And what is it?

A. [9:45:05] It's a CDR that I have produced for this case.

Q. [9:45:13] Thank you. You can close your binder again.

The second area I want to cover relates to the potential of -- for the audios that you enhanced being copies. So I would like you to turn to tab 1, which is your witness statement, and focus on paragraph 28.

You say that "It is likely ... some or all of the supplied cassette tapes were copies and not first generation recordings." You do give some explanation in the following perhaps, but I would just like you to explain in layman's terms for the Judges what made you come to that conclusion.

A. [9:46:12] What I found when I was examining the tapes during the investigation was that where a 90-minute cassette tape had been supplied and there was a mix of 60-minute and 90-minute cassettes in this particular case, a 60-minute cassette is referred to in these notes as a C60 and a 90-minute cassette is referred to as a C90. And when I played back some of the C90 tapes the audio recording lasted about 30 minutes on the first side, which would be side A. And then the rest of the tape, the extra 15 minutes of tape that was on that C90 tape was blank.

And then the way that a cassette tape operates is obviously that once the first side is played, you then turn it over and you play side B or side 2.

And in some circumstances in this particular matter there was nothing recorded between 0 minutes and then 15 minutes and then all of a sudden a recording would be heard to start and would quite often last from 15 minutes until the end of the C90 tape, side B.

And I have come across this before on a number of occasions in my career. And if you are copying an audio tape onto another blank tape, quite often organisations or people will use what is known as a fast copier. If you are making a normal

recording on a normal tape-recorder, basically the way that that works is that you will write two channels of information on one way of the cassette, so as the recording starts the tape is pulled past the head of the tape-recorder and information is recorded on tracks 1 and tracks 2. Then when that tape side has ended and the tape is full, the person who is making the recording will normally then turn the tape over and then tracks 3 and tracks 4, because most cassette tapes if they are stereo have four actual tracks on them, will then be recorded.

The way that a fast copier works is slightly different inasmuch as the recording head within a fast copier actually will write four tracks of information simultaneously. So there is no turning over procedure of the cassette tape. You basically put in normally on the left-hand side of a fast copier the tape that is to be copied, you then put your blank tape which is going to be the recipient tape for the information on the right-hand side of the fast copier, you press rewind to make sure that both tapes are rewound fully and then you press copy. And what tends to happen is then that the playback head in the left-hand side of the fast copier will read all four tracks simultaneously and the record track -- the record head in the record side of the fast copier will write all four tracks simultaneously.

What tends to happen as well with most fast copiers is if they sense that the playback tape has ended, has come to its end, then they will automatically stop the record side of the tape. So if the -- if it writes -- if it reads the tape to the end and then all of a sudden there's a click and that tape is heard to finish, then it will switch off the recording mechanism and also the motor drives for the right-hand side of the fast copier.

So what that means is if you are recording a C60 tape or the original tape is a C60 tape, which has 30 minutes of information on both sides, but you are actually using a C90

as your blank tape or your recipient tape, what will happen is that 30 minutes of information from both sides of the playback side of the recorder will be written onto the C90 tape.

But when that C60 tape ends, physically ends, the C90 tape will also stop as well, physically stop on the fast copier. So you end up with the situation where when you play back the C90 copy tape you play it from -- you play side A and side A contains 30 minutes of information and then about 15 minutes of nothing, because there was nothing else to record. But then when you turn over the C90 tape the first 15 minutes of that will be blank and the reason being is because that first 15 minutes of the tape was never recorded on in the first place and then 15 minutes into that side B all of a sudden the information starts to play because that is the point at which the four-headed recording and play-black mechanism on the fast copier wrote to.

And I found this on a number of the C90 cassettes within this case and it's always indicative that these were company copied on a fast copier at some stage.

PRESIDING JUDGE SCHMITT: [9:53:39] I think that was very detailed, Mr Elderfield, and I am sure you will be satisfied with the answer.

MR ELDERFIELD: [9:53:43] I am.

JUDGE PANGALANGAN: [9:53:51] Mr French, I have -- Mr French, over here. I have a question. Is there no deterioration in the quality of the sound from the original copy to the receiving copy? Because I notice that copying is by, is an analogue copy, right?

THE WITNESS: [9:54:05] Yes, correct.

JUDGE PANGALANGAN: [9:54:07] Is there no deterioration then?

THE WITNESS: [9:54:10] There will be some deterioration. The way the analogue tape works, every generation of copy you make from that there will be added noise

and the playback, when you come to play back from the copy, that playback quality will be less.

JUDGE PANGALANGAN: [9:54:30] And you made your enhancements from the deteriorated copy?

THE WITNESS: [9:54:35] Yes. That was -- I worked with what I was given.

JUDGE PANGALANGAN: [9:54:39] The originals then were kept by whom?

THE WITNESS: [9:54:44] I don't think the OTP were ever able to establish where the originals were. I believe that's the case.

JUDGE PANGALANGAN: [9:54:51] Thank you. Thank you, Mr Witness.

PRESIDING JUDGE SCHMITT: [9:54:53] The question would of course be if in the process something, an explanation could also have been that something could have been removed, for example.

THE WITNESS: [9:55:05] It is possible, your Honour. When you are dealing with copies of other tapes you cannot rule that out, I'm afraid.

PRESIDING JUDGE SCHMITT: [9:55:15] Would there be any, from a scientific point of view, from your viewpoint, any indicia from that?

THE WITNESS: [9:55:25] There possibly was, but that fell out of -- to actually examine the tapes I was given didn't come within my remit for the work required.

PRESIDING JUDGE SCHMITT: [9:55:36] But the explanation that you have given that these were originally 60 and then they were copied on 90, that was the explanation where you found indicia for.

THE WITNESS: [9:55:52] (Interpretation) Yes, but it's a pretty obvious indication to me.

PRESIDING JUDGE SCHMITT: [9:55:58] I think so too, yes.

Mr Elderfield.

MR ELDERFIELD: [9:56:02] Thank you.

Q. [9:56:03] Final area I would like to cover with you, Mr French, is about the impact of the CEDAR enhancement process on the audio files. I would like you to turn to tab 1, again your statement, and focus your attention on paragraph 17.

You say in the last sentence, I am just going to paraphrase:

"I would describe audio enhancement as ... striving to enhance the quality of audio material to enable members of the court to comprehend or interpret the material to the best possible standard without adding to or detracting from the content of the original."

I would just like to focus on those words "detracting from the content of the original". What do you mean by "the content of the original"?

A. [9:57:02] I always view the process of enhancing audio for court purposes and for criminal cases a bit like a doctor of the old maxim of "first do no harm". And what we always try to do is, when I am doing this type of enhancement work is to make sure that the enhanced version is always going to be better quality and easier to interpret than the original tapes or original recordings. And one of the things that I do, and I'm very careful about, is to any of the enhancement procedures that I try before I settle on what I think is the best enhancement solution for a set of recordings. You try different combinations of processes and then you compare them all the time against the original recordings to make sure that in your professional opinion what you are doing aids the Court, and the quality of the audio is always going to be better because in all honesty if the -- after you finish processing it, the quality of the audio is poorer, then you have not done a good job.

One or two cases probably in my career the audio hasn't needed enhancement and is best left alone, but invariably with this type of audio recording there is nearly always

something that you can do to improve the quality of it and to make it easier to listen to by members of the court.

Q. [9:59:07] And how did you ensure that the tapes that you, the audios that you enhanced in this case you didn't detract from any of the original content?

A. [9:59:20] Well, firstly, when you are dealing with cassette recordings, I examined physically every one of these, with cassette tapes they normally have two small lugs on the top of them which allow the cassettes to be recorded onto, the first thing that you do is once you check the physical state of a cassette tape is for damage and make sure there is no damage is you break those small lugs which then protects the cassette tapes from actual further recording on them. And then you make sure that when you come to play those cassette tapes, and in my particular case I use a computer-based enhancement system, so as the gentleman said earlier, being an analogue medium normally what we try to do is use a good quality analogue tape player to play those audio recordings into digital based enhancement system and by doing that we make a digital recording of those cassette tapes.

One of the things you have to do before you make that digital recording is to make sure that the playback quality from the cassette tape player that you are using is going to give you the best possible quality and the best possible result. And there are things that you can do, like, for example, there is an alignment procedure that you basically align the playback head of the cassette tape player that you were using to make sure that it's perfectly aligned with the tape within the cassette tape and that will give you the best quality audio signal that can come from that cassette player. Once you have done that, then you go ahead and you make a digital recording and obviously you make sure that you have captured all of the information that is on the cassette into that digital recording.

Once the digital recording is made, you would then save that digital recording, and obviously label it, and then at that point we would have still the original existing cassette in physical form, but we would also have a digital copy of the information from that cassette within the computer-based system, and then we would then use the digital copy that we have made to then produce a further copy that is enhanced. So we, by doing that, what it means is we play the tape once or maybe twice. Cassette tapes are quite prone to damage, especially if they are quite old, so you have to be quite careful with not playing them too many times, not physically abusing them.

Once you have made a good quality digital copy, then that is it, you basically put the tape aside and you then work from that digital copy.

Q. [10:03:02] I just want to focus your attention on the audio file that you are going to use for enhancement. How do you ensure that none of the content of that audio file gets detracted from during this process of enhancement in the CEDAR system?

A. [10:03:21] One of the things that most of my work is done in English, obviously, which tends to make things easier for me because if I can hear what is being said on a particular recording, clear, most easily or clearer once I have applied certain enhancement procedures, then I know that it's likely that I've done a good job. Now obviously these recordings were not in English, but from experience of having done this for a very long time now I think I was pretty certain that what I was doing to those recordings in the enhancement procedure was making the speech that was audible as clear as I could get it. And I, as I said before, we always keep going back to the original, switching out the enhancement module, switching them back in, trying different combinations of them and then coming to a conclusion that we have done the best that we can for the case.

Q. [10:04:41] You said that you were pretty certain that you were getting the best quality recording, the best quality enhancement. What made you certain, what things did you do concretely that made you certain?

A. [10:04:53] Well, for example, some of the recordings I think were pretty low level in their original form. One of the things that we can do with our particular system that we use is to bring the level of the audio signal up into the recording. If you do that and you do it properly, then it obviously makes things easier to listen to. With things like cassette tapes, invariably you have what's called white noise or hiss, in layman's terms, when you play those cassette tapes back. That is, that is actually made worse if you are dealing with a copy or a fast copy because the amount of hiss generated and put onto a copy recording is greater than the original. So one of the things that we, we would obviously do is to reduce that hiss noise, but to make sure that we didn't do too much of that because if you take away too much of the hiss on a particular recording you can start chopping in or reducing the level of sibilant sounds or S sounds that people make when they speak.

I have been doing this for what, 33 years now, so I think I have pretty got a good idea as to the point of when to take enough noise but leave a little bit so it doesn't start detracting from the quality of the audio recording or the quality of the speech and wouldn't change the tenure of the speech that's being spoken onto the recording.

I mean a good example of this would be that if you took away too much of the hiss on a particular recording, a person's voice may start to sound muted, you know, a bit like (witness indicates sound) that sort of thing, because you are not able to hear the higher frequency sounds that the human voice is making like the hiss, like the S sounds. So you have to be very aware of not damaging the speech on there by overprocessing the signal too much.

PRESIDING JUDGE SCHMITT: [10:07:14] May I shortly, Mr Elderfield.
Could it be that in the process content is suppressed?
THE WITNESS: [10:07:22] If you were careless, I would say that that is feasible that content could be suppressed.
PRESIDING JUDGE SCHMITT: [10:07:32] But that is a theoretical issue.
THE WITNESS: [10:07:34] Theoretical, yes. I mean, one of the things in this particular case that we have done almost as like a safety net is also to supply enhanced versions of the cassette tapes as digital files but also unenhanced versions of the, of the cassette tapes so that if there was any question about whether or not the enhanced material was of poorer quality than the original material, the two could be compared.
PRESIDING JUDGE SCHMITT: [10:08:07] Thank you very much.
Mr Elderfield.
MR ELDERFIELD: [10:08:09] Your Honour, I have no further questions.
PRESIDING JUDGE SCHMITT: [10:08:12] Thank you.
And I would assume that the LRVs don't have any questions, Mr Narantsetseg, Mr Cox? That is true.
Then I give the Defence the floor. Mr Rowse, please.
MR ROWSE: [10:08:47] Thank you, your Honours.
QUESTIONED BY MR ROWSE:
Q. [10:08:49] Good morning, Mr French.
A. [10:08:52] Good morning.
Q. [10:08:54] So in this first session I would like to start out primarily discussing your background and role. In the binder to your -- I think it's to your right in black is the binder I will mainly be referring to, although I may be referring to

the Prosecution binder as well.

So looking at your CV, which we have in Defence tab 1 which is at UGA-OTP-0263-2271, I see that your early education was in telecommunication, engineering and marine radios. From your CV I don't see that there is much indication that you continued to learn and work with radios; is that correct?

A. [10:09:45] Yes. I studied actually as a -- initially as a merchant navy radio officer, Merchant Navy College in the UK. When I came to leave the college there weren't, there weren't that many jobs on ships, unfortunately, so I joined a company called London Car Telephones where I was making -- when I was maintaining radio systems for them for a few months. And then a job came up at the Metropolitan Police and I joined them in 1982 and was working as a radio maintenance engineer. And then in 1984 I was offered the chance to join the forensic audio laboratory in a different unit in the Metropolitan Police and I started there, I think, in June 1984 and was there for -- until 1997.

Q. [10:11:03] Thank you.

Now, I have under -- in that CV -- sorry, according to that CV, annex A to your statement, which is OTP -- tab 2, UGA-OTP-0261-0343, it says you have particular experience in the use of fixed surveillance probes and undercover recording techniques.

Is it first -- is it true that first you were involved only in the process of creating intercepts rather than enhancing them?

A. [10:11:48] No, I have never been involved in creating intercepts.

Q. [10:11:55] Were you involved in the process -- I think elsewhere it says that you were involved in enhancing the capture of these intercepts.

A. [10:12:05] Yes.

Q. [10:12:06] Now, at that time were you also doing post-production -- or post-production is the wrong word, post-processing on these intercepts or were you actively more involved in the set-up of the design of the intercepts?

A. [10:12:25] No, I was invariably involved in the end of the chain, which was receiving the recorded information to be processed for -- invariably for court purposes. We did advise various officers about good techniques and how to use things like microphones and stuff like that, just really to try to improve the quality of the recordings that were being made, especially by police staff in the capture of evidence. And we tried to, you know, provide them with practical information as to how to maximise the quality of that, you know.

For example, I worked a lot with undercover police officers who would go into meetings wearing a tape-recorder. Just simple information like, you know, if you are going into a pub or a club or something, obviously stand away from the jukebox or any music source or anything like that. Just very simple, basic things, just to really try to make things easier when we ended up with the recordings ourselves.

Q. [10:13:54] Now, a number of the training programmes you listed on your CV to me appear to be more associated with media and the entertainment industry than enhancement. And you do not list a professional role on your CV before 2003. When did you first start doing enhancement itself?

A. [10:14:18] I joined the audio laboratory in '84, probably started doing the enhancement in the casework probably three to five years after that, I would think. My role when I first joined the audio laboratory at the police was very much a junior one, maintenance, keeping the tape-recorders clean. In those days, we used to use large open-reel tape machines for playback of information at court, so another role was to install that equipment in courts, for example at the Old Bailey in London.

Q. [10:15:07] Are you or have you been involved in the research and development side of things such as engineering the filters that you used?

A. [10:15:18] Not to a code level, but what, what I have done over the years is try to work out techniques using products that are readily available on the market to try to make the enhancement of this type of material better. It should be borne in mind that in the '80s and '90s there were no specific audio filters or products that dealt specifically with evidential material. What was available was all geared towards the music and broadcast industries and so you had to take what was readily available within that sector and try to adapt those technologies for our particular sector of the audio world, which is somewhat different to broadcasting and the music side of things.

Q. [10:16:29] And have you conducted any research on speech enhancement beyond, I suppose, what you say is sort of the --

A. [10:16:37] Practical.

Q. [10:16:39] -- practical?

A. [10:16:42] No.

Q. [10:17:01] Now, in paragraph 17 of your statement, which is already -- which is tab -- OTP tab 1, paragraph 17, which is at 0335, you say that you have worked on hundreds of cases involving enhancement, expert transcription, analysis and authenticity examinations of evidential recordings. Yet in the CV under the reference that I read earlier, which is at Defence tab 1, you say you have worked on thousands of cases. Can you tell me or estimate how many cases you have actually done involving audio enhancement, because it seems that the hundreds of cases you refer to concern, well, several different tasks or roles.

A. [10:17:50] Yeah, the bulk of my work has always been enhancement. The more

expert side of things, such as the expert transcription side, authentication, checking recordings for signs of tampering, that's very much a minor part of it. I think, if I remember rightly, I think the busiest year I had in the police, I did something -- over 300 cases in one year, which was nearly all enhancement work. A lot of the work that you do for -- certainly for the police labs is fairly, fairly mundane. Not quite a conveyor belt of stuff, but it's, you know, small cases, stuff that really isn't that difficult to do.

The procedures within the police, certainly at the time that I worked for the police lab, was that if an officer or a police officer during the course of an investigation came across an audio recording, they basically bagged it up and sent it to us to produce copies, which would then be exhibited and used in any subsequent audio -- subsequent criminal case.

That was a fairly standard set-in-stone procedure, find a tape at a crime scene, it goes to the audio lab where I worked, they would process it and then provide the copies and a witness statement saying what you had done. The copies were invariably given an exhibit number by myself or my colleagues and then that exhibit number was referred to in court if the recording was played in court.

Q. [10:20:07] So at a certain point you began working for CEDAR, which also makes equipment for active surveillance, and earlier on today you said you were working in sales as well?

A. [10:20:18] Yes.

Q. [10:20:21] I believe from something else I have seen, yes, that you worked at -- you worked in sales, let's leave it at that.

What is the balance in your work between sales and active enhancement?

A. [10:20:35] It's probably shifted in the last five years. We seem to be taking on

less and less cases as time goes on. One of the reasons, I think, certainly in the UK, is that the system that I have used to do this type of work, work in this particular case, we sell to police forces within the UK. And we have done quite well selling that particular system to the police forces in the UK, and obviously, if they have got their own processing system, then they don't need to call on my services so much.
So it is more and more sales-orientated these days. I think last year I did something like 20 active cases. This year it's less than that, so -- but it's very -- it's very sporadic and I think probably, maybe next year, you can't tell, it could either be more or less. It very much depends on what happens out there in the world, I'm afraid.
Q. [10:21:54] So I won't ask you what the last case you worked on as it may be confidential, but when was the last case of enhancement that you did?
A. [10:22:06] I think it was in the last two weeks, I think.
PRESIDING JUDGE SCHMITT: [10:22:11] So I think we can fairly assume that the witness has done this kind of work before.
MR ROWSE: [10:22:32]
Q. [10:22:33] Now, a second role that you haven't discussed in your statement was the training of Prosecution staff.
I would like you to look at Defence tab 3, which for the record is UGA-OTP-0280-0508. Do you have it in front of you?
A. [10:22:58] I do.
Q. [10:23:00] This is a certificate that was provided to Mr Laroche and his -- I believe his assistant as well perhaps received it, for completing a training program with you at CEDAR. I'm curious, what other courses are offered? Is this a single course?
A. [10:23:19] Just this -- basically we don't offer generalised training as in, say,

a certificate in basic forensic restoration. We only ever, at the moment anyway, provide training for customers that have purchased one of our enhancement systems. The system that Mr Laroche was trained on is quite a big PC-based enhancement system that has many, many facets and different forms of controls. The manual, the instruction manual that comes with it, for example, I think it goes over 500 pages. So normally when we sell an organisation, like the ICC, a processing system, we include two to three days training for the staff. And that's either done at our training facility in Cambridge or we quite often come out to the customer's premises and train there. It is not a recognised qualification as such but it does show that, you know, we have given a level of training that hopefully the customer can then demonstrate that they are confident to use the system.

PRESIDING JUDGE SCHMITT: [10:24:55] But we are nevertheless happy to have Mr French here in the courtroom. When we look back to the evidence of Mr Laroche, he quite often referred to the expertise of Mr French. I have here the former transcript in front of me, and he quite often said, "You have to ask this Mr French. Perhaps Mr French would know better, would answer quicker, with more substance". And that's now your turn, Mr Rowse.

MR ROWSE: [10:25:31]

Q. [10:25:32] Does a document containing the curriculum that you provided to Mr Laroche exist?

A. [10:25:45] We don't particularly have a curriculum as such. We can -- we have provided certain customers who asked a very undetailed breakdown of probably what will be taught within the two to three days.

But most of the, most of the information that I impart is just by teaching and the students are always welcome to make notes. One of the nice things about our

particular system is that any session that you generate to process a particular type of audio file can be saved and also can be saved as electronic templates as well, which can be reopened and reused.

So we make sure that the student leaves CEDAR as having shown that they can tackle some exercises that I give them, but we also give them, as well as a copy obviously of the manual that goes with the system, we also give them things like templates and a -- I think I've got a sort like a set of instructions that deals with five or six different problems, that's a Word document, we give them that as well and they can then use that for reference purposes.

For example, we have a demo recording which deals with buzz. And so we show the students how to, how to identify the frequency of that buzz and what techniques and modules are used to remove that buzz from that recording and then hopefully if they get a recording in for all casework that contains buzz, they will remember what they were taught on how to do that and apply those techniques that we have taught them to that particular problem.

Q. [10:28:17] Now, in Mr Laroche's testimony he seemed to stress that one of the CEDAR audio system that your company provided to him, major features was an internal sample rate selector. Can you explain to the Court what a sample rate is?

A. [10:28:48] Sample rate is basically if you are digitising an audio signal, the sample rate is the number of samples that you are taking of a particular audio signal at a given time. And the rule of thumb is that if you wish to make a good quality or better quality audio recording, you use a higher sample rate.

An example of a low sample rate device would be something like a very cheap digital pen type recorder, and when you then go to play back that audio signal you will hear that the frequency range is quite constrained, the quality of the signal is not very good.

However, if you then go to say a recording studio where they are making a recording of an involved classical piece, recording studios may use a sampling frequency of up to something like 192 kilohertz because they want to make the best quality audio recording that they can of that particular orchestra.

The sample rate converter within the CEDAR system, it allows you to alter the internal working sample rate at which the signal is processed. And one of the reasons which we have, why we have that in there is because this particular system has been available for a number of years now and when we first started producing this particular system the computer power available to us wasn't very great. And what tends to happen with our particular system is if you use a large sample rate, a very high sample rate internally, quite often it would overwhelm the processing power of the computer, so therefore the sample rate converter within the CEDAR system was there to allow you to turn that down so that you could use more processing modules which again use processing power within the computer without the computer falling over.

It's not something that we use so much these days because we just have so much computing power at our, at our disposal.

Q. [10:31:47] Can you briefly explain the relationship between a Nyquist frequency or theorem and that sample rate.

A. Basically the Nyquist theorem states that the maximum bandwidth of an audio signal is determined how high the sample frequency is, and it is half the sampling frequency normally. So, for example, if you -- it is quite common to see a sample frequency of 44.1 kilohertz and that is the sample frequency at which music and spoken word is engineered for commercially available CDs, the type of CD that you might buy at Fenak (phon), for example, will then have a bandwidth between

0 and 22.050 kilohertz, which is exactly half 44.1 kilohertz.

When I process work for casework I tend to work a sample frequency of 44.1 kilohertz because it then means that if we have to burn audio CDs for the client we know that that will work and that the audio CD that we produce will be playable in any audio CD player.

Q. [10:33:16] After that slight detour, perhaps I will come back to your training. Mr Witness, you didn't say -- you've said you don't speak Acholi, which is the language that was explained to you as the source language. What languages do you speak?

A. [10:33:46] English obviously, a smattering of French, a smattering of German, a few words of Spanish, a couple of words of Flemish and that's about it. I'm not -- I don't have a second language as such.

Q. [10:34:04] So no languages from northern Uganda then?

A. [10:34:07] No.

Q. [10:34:14] Do you have any background in linguistics?

A. [10:34:18] No.

Q. [10:34:21] So you wouldn't be aware that Acholi has tonal elements in the language?

A. [10:34:33] No, I would not.

Q. [10:34:34] From your experience working with intercepted audio, has this ever been a consideration when you've been enhancing languages that may have this dimension?

A. [10:34:45] Yes. I think certainly with certain languages there are different emphasises on certain types of sounds that are used. And if I get material in which is of a foreign language, and by that I don't mean French or German or one of the

mainland European languages, which I can normally hear what the -- you know, whether it's going okay or not, then I'm always very, very careful to be cautious about the enhancement work that I do.

Q. [10:35:42] Just to be clear, it follows from what you've said, if your treatment changed the meaning of the recordings, you would not be aware of this?

A. [10:35:51] I wouldn't, no.

PRESIDING JUDGE SCHMITT: [10:35:58] How could this happen, that the meaning would be changed in the enhancement process? The meaning, as you know, a change in something in a given recording could be that you add something which is more, I think would more be theoretically, that you suppress something, I addressed that before, or that you alter something. If we perhaps focus on the last two possibilities, is this a realistic scenario?

THE WITNESS: [10:36:31] [10:36:31] Altering the material is probably not that, that realistic unless you physically or you actually edited a particular word out. For example, if I had a phrase like in English like "I did commit that murder" or "I did not commit that murder" and I physically edited that removing the "not" to make it say "I did commit that murder".

PRESIDING JUDGE SCHMITT: [10:36:59] I understand.

THE WITNESS: [10:37:01] [10:37:01] That would actually be quite an undertaking. It's likely, it's possible that, for example, when I spoke earlier about suppressing S sounds, for example, it's possible that in some languages that by suppressing like an S sound by overfiltering a recording you may change the meaning of the word by suppressing something like that type of, that type of sound. But you would need to be a native speaker of that language, I would suggest, to make -- to be able to work out whether that would be an issue or not.

PRESIDING JUDGE SCHMITT: [10:37:43] But you were aware of the fact that these were tapes where the people spoke an African language.

THE WITNESS: [10:37:52] [10:37:52] Yes, I was. And going back to what I said earlier, I made sure that I compared the enhancement that I had done with the unenhanced material all of the time. And if I'd have thought that what I had done was changing the phraseology or the way that the person was pronouncing a particular word or phrase, I think I would have backed away from that and removed the or reduced the amount of enhancement. I'm pretty careful at doing that. And one of the things which is easy to do with our particular system is it is very easy to switch all of the processing on and off and on and off and backwards and forwards instantaneously, which allows you to compare. And as I said, you know, I've been doing this a long time. I tend to be very cautious about not going in too heavy-handed.

PRESIDING JUDGE SCHMITT: [10:38:59] Thank you very much.

Mr Rowse, please be indulgent when I interrupt from time to time. On the Bench I think there is no expert at all. I mentioned this also the last time we had Mr Laroche in the courtroom. So we might have sometimes some basic questions for understanding.

MR ROWSE: [10:39:18]

Q. Since we are taking about the sibilance, you said the S sounds, but of course there is other, there's also other aspirants or I think they are called fricative consonants, the "[p]", the "[b]" --

A. Yes.

Q. -- "[t]" sound.

A. Yes.

Q. So it's a whole range of sounds.

A. [10:39:45] Yes. That would be going probably into linguistics, too far for my particular skill set, I'm afraid.

Q. [10:39:55] I'm jumping ahead a little bit in what I was going to ask, but since we're on the subject, are you familiar with what formants are?

A. [10:40:08] Roughly, yes.

Q. [10:40:09] Could you perhaps explain to the Court what they are?

A. [10:40:11] My understanding of formants is the -- is certain frequency that are generated during speech.

Q. [10:40:19] If I gave you, it may put a linguist as well in a cold sweat, if I said they are frequency peaks across -- there is -- looking at a sound, there is certain peaks within the audio, so you can imagine a resonance -- (Overlapping speakers)

A. Yes, and --

Q. -- and these combination, specific combinations of these peaks in the audio create different vowel sounds, would that sound roughly -- (Overlapping speakers)

A. [10:40:57] That -- yeah, I would probably agree with you there. But, as I say, I am not a linguist so you are probably at the edge of my level of understanding of that science.

Q. [10:41:11] So going with what we have said then, if we were to attenuate some of these peaks, we might, potentially anyway, shift the sounds of the vowels as well?

A. [10:41:23] I would suggest that's possible.

Q. [10:41:28] So I think we have already covered it but -- well, we have briefly touched upon the difference between what analogue and digital audio is, and so I hope it's clear.

Now I would like to talk to you briefly about cassette tapes. When audio is recorded

on to a tape, if the audio is recorded too loud, what happens?

A. [10:42:28] When you come to play back the audio signal, it will tend to sound distorted, somewhat painful to listen to if it is badly distorted.

Q. [10:42:41] And is there a way to undo this tape saturation?

A. [10:42:46] We have a process within CEDAR, the CEDAR Cambridge system, which is what I used here, which removes -- can remove certain types of clipping and restore audio to its unclipped form.

Q. [10:43:05] That's clipping, that's not tape saturation, correct?

A. [10:43:09] No, but some forms of tape saturation can lead to clipping and make a sort of clipping-type sound. If you have a -- there is no -- with saturated tape, if something is over -- or you determine is over recorded on a tape, it's -- once it's written on to the tape, it's written on to the tape. There's no physical way of removing that.

Q. [10:43:48] Yes. I guess I can summarise that just for having -- in more layman's terms. Problems can be introduced at the tape-recording stage that can't be undone by the software?

A. [10:44:03] Yes, that's very true.

Q. [10:44:06] Now, you mentioned earlier on the tabs that you removed from the tapes to prevent writing. I don't want to overstress this, but the simple point is that while those tabs are in place, it's trivial to overwrite the tapes?

A. [10:44:25] Yes, it is. I mean, it is also feasible to actually put tape on -- a bit of sticky tape over them and that achieves the same effect. But it's just -- it's rather like putting your safety belt on when you get into the car; you know, from my perspective, as somebody involved in that type of work, somebody hands me a cassette tape, the first thing to do is to break the tabs.

Q. [10:45:00] Now, the Prosecution, I gather, told you that the language in which the tapes -- the purported language on the tapes, as well as, I believe, that ... that the source that was recorded on to the tape was recorded with a microphone. Did they provide you any other background to the tapes?

A. [10:45:36] I think they told me that the -- it was, it was not a line recording as such. And by "a line recording", I mean that the -- you have a particular -- say, a tape machine connected via a hard wire to a recording machine. It wasn't that. There were -- it certainly sounded like it was likely to be something like a microphone that was near to the speaker of a radio receiver. I remember -- I think I can remember sort of hearing movement noises around. Also some of the recordings were -- I think the person making the recording possibly was moving around within the room.

Q. [10:46:26] So they didn't tell you any of the context of the audios?

A. [10:46:31] No. Other than the fact that it was the radio transmission between various members of a group in Uganda.

Q. [10:46:53] Would that information have assisted you in any way, if you'd had more background to the audios?

A. [10:46:59] I don't think so, no.

Q. [10:47:05] Now, I am jumping ahead a little bit. But you noted in your statement at 0339, paragraphs 51 and 52, that you identified a mains hum on the tapes. Can you explain what a mains hum is?

A. [10:47:29] Yeah. Normally in mainland Europe the mains electricity that you get from a wall socket runs at a frequency of 50 hertz. It's slightly different in America and some other countries in as much as it runs at about 60 hertz. If the recording device that you are using to make a particular recording on is not of great

quality or any part of the recording chain is not of great quality - so, for example, if the microphone is not very good or the wire between the microphone and the recorder is not of good quality - quite often you will find that that picks up radiation of that mains frequency, which can be quite strong. You see it quite a lot on recordings, and one of the things that we try to do is to remove that because it's of no intrinsic value to understanding what is going on on a recording.

Q. [10:48:45] So you worked with marine radios, which I believe are, at least in some cases, UHF and VHF? The audio quality of those radios is not very good either, is it?

A. [10:49:00] I'm going back a few years for the last time I messed about with UHF and VHF. But the audio quality of those, from memory, certainly when I was at Merchant Navy College, was not great. Certainly the bandwidth was -- or the signal was pretty limited. I think probably the technology is much better now, I would have thought.

Q. [10:49:29] Just for the record, can you explain what bandwidth is, of the audio signal in particular?

A. [10:49:34] Bandwidth is the range of frequencies, from the lowest frequency that is audible to the highest frequency. If you are using a telephone, for example, a landline, the bandwidth of that signal is about 4 kilohertz. So it goes from maybe 200 hertz as the lower frequencies to maybe 3 and a half, 4 kilohertz, 4,000 hertz. That's perfectly adequate to understand another human being. We know this because we use the phone all the time.

If you are wanting to listen to something like a classical recorded concert and listen to all the high notes and things like the violins and the other instruments that are capable of producing very high notes or very low notes, then having a large

bandwidth is preferable because the whole of the range of those frequencies is then available to the listener. Telecommunications and our radio traffic, if you have a limited bandwidth, it means there is less information needed to send and therefore means that the transmission medium is more efficient.

Q. [10:50:56] Now, at paragraph 35 of your statement you noted that one of the tapes had playback speed errors and that this indicated -- could indicate -- this could indicate some kind of power outage.

A. [10:51:22] Yes, that's correct.

Q. [10:51:33] This was obviously a very obvious issue to you. You weren't asked to examine the tapes more carefully to see what other errors might be present, were you?

A. [10:51:46] No.

MR ROWSE: [10:52:20] Your Honour, in the next -- I would like to move on in the next session to listen to audio examples and annotations and things. So I think it might be a good moment just to break here.

PRESIDING JUDGE SCHMITT: [10:52:31] That is indeed a good moment, and it is also a good moment to ask you if you can already foresee how long your examination will last.

MR ROWSE: [10:52:40] I had foreseen close to three sessions. We have been shedding questions at a somewhat furious rate.

PRESIDING JUDGE SCHMITT: [10:52:52] Okay, that makes me quite optimistic. So I think we should really strive to finish this witness, Mr French, today. I think that will be possible. This is simply for planning purposes, so we can start with the next Witness, P-351, tomorrow.

So we have now a break until 11.30.

THE COURT USHER: [10:53:28] All rise.

(Recess taken at 10.53 a.m.)

(Upon resuming in open session at 11.32 a.m.)

THE COURT USHER: [11:32:19] All rise.

PRESIDING JUDGE SCHMITT: [11:32:39] Mr Rowse correctly assumes that he has still the floor.

MR ROWSE: [11:32:46] My colleagues have noted that there are some new faces in the, in the court today.

PRESIDING JUDGE SCHMITT: [11:32:52] Yes, then of course, as always, we introduce the new faces. But not more, Mrs Bridgman.

That referred to, that was clearly last time I thought, so I wanted to -- I never forget.

Please, Mr Elderfield.

MR ELDERFIELD: [11:33:11] Your Honour, three new faces: Agnese Valenti, Tim McCormack and Elizabeth Flatley.

PRESIDING JUDGE SCHMITT: [11:33:17] Thank you very much.

So, Mr Rowse.

MR ROWSE: [11:33:30]

Q. [11:33:30] So, Mr French, during the Prosecution questions, you, in responding to this question of the 90-minute tapes and the 60-minute tapes, you said that it was always indicative that this was -- showed the tapes had been copied. And I wanted to ask you in relation to that, were you asked to make any -- did you make any suggestions or were you asked to make any suggestions as a result of this observation?

A. [11:34:03] I don't recall being asked that. Other than probably advice would have been to try and get a hold of the originals, which when you are given a copy,

that's always the advice that I would give anyway. I don't recall.

Q. [11:34:25] Although you've said that's it's always indicative, is there anything else that could lead to this scenario, just off the top of your head?

A. [11:34:41] It's feasible to actually make a recording like that, I guess, where you would record maybe first 30 minutes and then turn the tape over manually and then record 30 minutes going the other direction.

But normally if you are making a recording, unless you are making specific 30-minutes recordings, chances are, I should imagine anyway, that you would let the tape go to its very end, which is 45 minutes, before turning it over.

Q. [11:35:27] Yes. So in instruction 3 of Prosecution tab 3, which is UGA-OTP-0261-0345 at 0346, you were instructed "To suggest any further such steps which might be taken by other individuals or entities which you are aware."

Did you think to suggest or suggest further examination of the tapes to confirm the integrity of the recordings?

A. [11:36:00] No, I did not. But as far as I was concerned, my job was to provide enhanced copies to the best of my ability and note any basic points, which I have done. But no further examination.

Q. [11:36:22] Can you tell the Court what is often involved in the process of the authentication of audio?

A. [11:36:30] It's quite involved. First and foremost, if you are authenticating analogue tapes, checking for signs that you have the original and not a copy is, is an obvious one. Certainly if I was -- if I had been given, say, one of these or some of these tapes and had been asked to comment on their authenticity, the -- what I found was the fact that there were 15 minutes of blank tape and then the recordings start initially would straightaway point to the fact that they were likely to be copies.

Another sign that you can spot something like this is a copy is that when you switch off a manual -- an analogue tape-recorder, it quite often leaves what would be called an electronic or electric fingerprint on the, on the tape and that's quite, not quite common if you've listened to something that has been recorded and you will hear a click where there is a switching off. That click can be quite a good sign as to what you are dealing with. For example, the -- if you have the presence of a switching off transient or a click followed by then another one, there is a chance that what you are dealing with is a copy because there should only really be one set of clicks on the end of a cassette recording and not two.

Q. [11:38:31] And so perhaps other obvious indications or other subjects of enquiry in an authenticity examination would involve?

A. [11:38:41] Checking for things like edits, listening out for if something changes specifically in the background which shouldn't occur. These days, with the advent of the availability of editing technology and the fact that most recordings made are digital, it's become a lot harder to do it. Actually authenticating analogue cassette tapes and analogue tapes is probably a bit easier. The premise that somebody could go into their bedroom and edit something undetectably these days is probably quite a real one and --

Q. [11:39:33] Just to clarify, you mean digitally?

A. [11:39:37] Digitally, yeah. And what people tend to do now who do digital authentication is to actually go into code level within the digital file and look for changes that way. I am not a computer expert, so I don't do that. So in all honestly the amount of probably authentication work that I have done over the last few years has dropped off dramatically because I don't particularly feel equipped to do it.

Q. [11:40:07] So just sort of obvious examples perhaps for authentication would

include changes in the quality of audio?

A. [11:40:16] Yeah. Unexplained clicks.

Q. Unexplained clicks.

A. Yeah.

Q. So discontinuities in what's being said.

A. [11:40:26] Yes, absolutely.

Q. [11:40:35] And since you've just mentioned that your expertise is with tapes and you sort of hinted at it, in these technical examinations you can look at, I gather magnetic patterns on the tapes that wouldn't be necessarily detectable in the audio signal itself.

A. [11:40:50] You can do that if you have the equipment and the technology at your disposal.

Q. [11:40:57] And it would help in such examinations to have the original recording device as well?

A. [11:41:04] Yes, very much so. Anything involved in the recording chain such as the original recorder, microphone, any other ancillary equipment is always very useful.

Q. [11:41:41] Now, during your examination for the purposes of enhancement or during the process of enhancement did you notice at any point where there might have been time discontinuities or breaks in the recordings?

A. [11:41:57] I didn't make specific notes to those, to anything that was on the actual content of the recording because obviously the remit from the OTP was to just do the enhancement. The quality of a lot of the recordings was, was quite poor, I would suggest. So hearing things like that, bearing in mind the overall quality of each recording, wouldn't, you know, it wouldn't surprise if there were clicks and

bumps on them, you know. I don't think they were -- the impression I got was that they were not made in a particularly professional manner.

Q. [11:42:36] Now, in broad terms with cassettes what would be telltale indications of edits being made?

A. The most basic one would be a lump of sticky tape halfway through the cassette tape. Actually with cassette tapes that is actually quite hard, quite hard to do. Quite often when I've seen tapes in the past which have been tampered with, and I have to say it's not been that many, there has been basic things that have been tried to have been done. One thing, one case that I came across some years ago was a recording had been made between two parties in -- who had some kind of dispute going on and then the party making the recording had overrecorded, ie recorded fresh material over the top of the part of the existing recording, because at that particular point it probably showed their behaviour not to be in good light before submitting the recording to the police.

And that was pretty obvious to spot because you had a -- halfway through the recording you had a complete change of noise. There was a click at the start of the overrecorded passage. There was a click at the end of the overrecorded passage. And those clicks matched the ones that we found at the end of the recording. So the chances are that the person had probably made the recording, listened to it, realised that part of that recording didn't make them look good for their complaint to the police, they've taken the same recorder, played it to that particular point and then pressed the record and play buttons, overrecorded to what they thought was the right section and then stopped their overrecording. And what that does obviously it realigns the magnetic particles on the tape surface and makes what -- in most cases makes what was originally recorded there unretrievable.

Q. [11:45:12] Since you just mentioned this, I might jump ahead just a second. When you record over tapes, at least repeatedly, it's possible to have sort of the original recording sometimes ghost through or bleed through?

A. [11:45:28] What can happen is that you -- when you make an analogue recording, the recording head which actually transfers the electrical information into a magnetic signal which realigns the particles of iron, which basically is what they were on the cassette tape, sometimes dependent on if you are using different machines, sometimes the head can be misaligned within -- in comparison to the tape.

And very occasionally I've seen cases where a small vestige of the previous information has been left on the tape because the heads of the recorder making the fresh recording have been misaligned with the tape.

The way that a tape-recorder works is basically you have an erase head at the start and that's followed by the record and playback head, and the erase head is basically a large magnet that wipes the preexisting material and then allows the record head of the recorder to then write the, or realign the magnetic particles in a fresh way. But if that erase head is misaligned, then sometimes I've come across cases where it's left a small edge recording which may or may not be retrievable. That's probably what I think you're -- or if you've got a recorder which doesn't have an erase head, which from time to time happens as well, then you will have maybe one recording recorded over the other, but there will be detectible signs of the original recording.

PRESIDING JUDGE SCHMITT: [11:47:28] May I shortly.

Did you come across such phenomenon when enhancing the recordings here?

THE WITNESS: [11:47:36] [11:47:36] I don't recall, sir.

PRESIDING JUDGE SCHMITT: [11:47:38] If you had come across such phenomenon, would you have identified that, would you have that written down or would you

have noted that in (Overlapping speakers)

THE WITNESS: [11:47:48] [11:47:48] I think I probably would, yes.

PRESIDING JUDGE SCHMITT: [11:47:51] Please, Mr Rowse.

MR ROWSE: [11:47:54]

Q. [11:47:56] Perhaps following the Presiding Judge's question, as I understand it, often that additional information may exist outside the audible range because -- perhaps I'm confusing the way the play head works, but the play head or the erase head is wider than the actual track of audio, so in some cases this information may not shall detectible on the digital copy, it would only be detectible if you were to examine the tape itself?

A. [11:48:31] On some specific occasions possibly. When I was in the police we actually designed a system that allowed us to move the playback head of a particular tape-recorder that we had really a long way up and down the surface of the tape so that if there was any information like that to be gathered it would possibly be retrievable. But I certainly don't have access to anything as specialised as that in my place where I work.

What I did would -- when playing these tapes back was to use a best quality cassette player that I could get my hands on. And I manually adjusted the alignment of the tape head to the tape to, in my opinion, give the best playback quality, which means that basically the -- you want to make sure that the tape is going across the tape head in an even fashion.

One of the things that happens if you don't have perfect alignment of the tape and the tape playback head, is that you notice a diminution in the higher frequency sounds coming from the tape. So the sort of the speech starts to sound a bit muted like almost you've got your hand over your mouth, the sibilant sounds are not as

prevalent. So the way that you tend to align azimuth on a cassette tape is to take part of the front panel of the cassette mechanism off and underneath you will see the row of the erase and then the playback and record heads, and on the record head, normally on the left-hand side, is a little screw, a little cross-headed screw which has a sprint underneath it and you use a jeweller's screwdriver, the small screwdriver, to manipulate that up and down, normally with a pair of headphones plugged into the headphone socket on the cassette deck, and you can -- as it's playing you can actually hear the quality of the recording playing back, going up and down, and you can hear it becomes muted so then you readjust it and all of a sudden all of the higher notes and the more sibilant sounds come up and also the hiss from the recording. And the idea is just to really, really adjust it until it sounds as best a quality as you can get it and then use that to play back from the -- into the digital recording system.

Q. [11:51:23] Now, I recall Mr Laroche describing this process of adjusting the tape head, but did you explain to him or mention to him any of this information concerning how to detect --

A. [11:51:45] Overrecordings.

Q. [11:51:46] Overrecordings?

A. [11:51:47] No, I did not.

Q. [11:51:48] Thank you. Coming back to slightly more simple indications of edits, if you have a very noisy recording and there is a sudden break in the volume of this noise, would this suggest to you a break in the continuity of the recording?

A. [11:52:11] It's possible.

Q. [11:52:13] And if the volume of the audio following that break fades back in, this would also suggest that there was an edit made to the audio?

A. [11:52:23] It's entirely possible, yes.

Q. [11:52:28] And I think we have said that the intelligibility of the conversation, if there is breaks in the intelligibility, that might indicate a break in the continuity, but -- this is perhaps a simple question, but in the conversation wasn't particularly clear, if it was using jargons or coded language, it wouldn't be as easy to detect this, would it?

A. [11:52:54] Possibly; possibly not. I think it would be very case specific. One of the things to bear in mind with the, with this type of recording is that you are recording from a radio signal and obviously radio signals vary in their quality and sometimes they fade in, sometimes they fade out, so you're pretty much at the mercy, I'm guessing, of the way that the radio system probably worked as much as the recording technology.

Q. [11:53:22] Now, tempting fate here a little bit, but I'd like to play you three audio clips and then do an annotation which is a new feature in the courtroom, at least in this court. I'm not going to ask the interpreters to do any interpretation, we're just going to play short segments. And following that clip I'm going to show you an image which I believe is called an oscillogram of the clip, and I'll ask you to annotate it if you think it's interesting.

The audio I would like to play, and I perhaps give my colleague a moment to cue up, is Defence tab 15.2, it's ERN is UGA-OTP-0039-0006 and it's track 1. And it is a tape which, according to the Prosecution, would be sometime after the alleged claim of responsibility for the Odek attack but before the second alleged appearance of Mr Ongwen in relation to Odek. And the segment, the first segment I'd like to play you of three is 2.04 to 2.12. So if we have everything.

PRESIDING JUDGE SCHMITT: [11:54:47] Is this one of the enhanced --

MR ROWSE: [11:54:50] This is -- sorry, this is the original version --

PRESIDING JUDGE SCHMITT: The original version.

MR ROWSE: -- of the tape.

PRESIDING JUDGE SCHMITT:

(Playing of the audio excerpt)

MR ROWSE: [11:55:10]

Q. [11:55:11] Now, from what you heard there and what we've said, is that potentially a discontinuity on the recording? I mean that there has been a pause or a stop or an edit?

A. [11:55:26] Could you play it again?

Q. [11:55:28] Of course.

(Playing of the audio excerpt)

THE WITNESS: [11:55:40] That's possible. It could have been caused by a pause or ...

MR ROWSE:

Q. [11:55:46] Now, now here's where we are early adopters. I'd like you to look at Defence tab 20, which UGA-D26-0024-0005. And sorry, this will come up on your screen in front of you.

PRESIDING JUDGE SCHMITT: [11:56:07] By the way, talking about discontinuities, as you said, tab 15 I have -- after tab 12 I have tab 20 in my binder.

MR ROWSE: Oh, yeah. Sorry the tab (Overlapping speakers)

PRESIDING JUDGE SCHMITT: So this would be a discontinuity, but in a very analogue fashion I would say.

But that we have understood where it was. So please continue.

THE COURT OFFICER: [11:56:32] For the benefit of the Court, the evidence will be on the evidence 2 channel.

MR ROWSE: [11:56:43]

Q. [11:56:49] Do you have it before you?

PRESIDING JUDGE SCHMITT: [11:57:02] I think you can start.

MR ROWSE: [11:57:04] Okay, sorry. Just for the record, this is created with a piece of software called Audacity, which is a free and open source piece of software.

Q. So, Mr French, would you be, if you feel you can, able to indicate on the image before you where the discontinuity occurs?

A. [11:57:32] That looks like it. I would need to play it over and over a few times. But just looking at it, it would suggest that that is possible where a discontinuity is.

Q. [11:57:44] What we just heard.

A. [11:57:44] Yeah.

MR ROWSE: We can play it again, yes. But I think Mr French means he would like to play it in the program itself, perhaps.

PRESIDING JUDGE SCHMITT: [11:57:51] Mr French, would it be there where a layman like us would detect it merely by looking at it, at 2.08, something like that? Is this correct what I'm saying or is this --

THE WITNESS: [11:58:08] Yes. I mean, it seems to me that there is a presence of some form of click there, which -- and the fact that the then -- the audio after that click then seems to then sort of build back up again. Could --

PRESIDING JUDGE SCHMITT: [11:58:25] Yeah, I think it was so short, I think we can play it again. Why not. So I think this is really possible. Yeah.

(Playing of the audio excerpt)

THE WITNESS: [11:58:52] I would have to say that I would be probably wanting, if -- to give a proper opinion on this, do the proper investigative work. Initially I would suggest it's possibly some kind of discontinuity, it may be caused by pausing

the recorder or stopping and starting it. Very difficult to say just by looking at that one, one plot on the screen.

One of the things you do if you are doing an authenticity examination is to try and find out what type of recorder the recording was made on, something like a, you know, the make and the model number of the actual recorder used, and then try to re-create the -- what you are seeing here by making test tapes yourself and then comparing what you have made with what you are being presented with. And then if the -- normally if there's a -- if a tape-recorder is switched off there's normally two sets of electrical transients that are generated. One is where the erase head is pulled away from the tape. And basically if you can imagine when you are switching a tape-recorder off, basically you are physically pulling the heads away from the tape surface as the tape mechanism actually physically stops.

And what tends to happen is that on a lot of analogue recordings where you do that you'll get a transient that represents the erase head being pulled away from the tape surface and as it's being done, it actually generates a small magnetic field and then when you go to play that back, you get a click that represents that, you know, the presence of that magnetic field. And also the playback head, the playback record head, when that is pulled away will also leave a remark, which because the erase head, the magnet in the erase head is a fair bit stronger, will probably tend to be a bit smaller.

Now, it's a long time since I did an authentication on a cassette tape, but if I remember rightly, the normal gap is something between 4 to 600 milliseconds in time between the two, the two marks and that's normally indicative of a tape-recorder being switched off.

When you switch the tape-recorder back on sometimes you will find that there are

also some smaller marks that are left by that. But sometimes, depending on the quality of the tape-recorder, they may not be. And the rule of thumb is the more the expensive the tape-recorder you use, the less sort of clicks and marks that you get because the engineering is of a better quality.

PRESIDING JUDGE SCHMITT: [12:02:07] I think everybody in the courtroom would agree that we cannot expect from Mr French a final expert determination, but it's, nevertheless, it's quite interesting, quite useful. And please continue, Mr Rowse. I think nobody expects that. Otherwise he would have to do really research work again if there would be a need.

MR ROWSE: [12:02:32]

Q. [12:02:32] So now I would like to play you another segment that occurs roughly four minutes later. It is the same ERN.

PRESIDING JUDGE SCHMITT: [12:02:41] Wait a moment, Mr Rowse.

Mr Elderfield is rising.

MR ELDERFIELD: [12:02:45] Your Honour, I'm just rising. I notice that the witness has put a small red squiggle at the point 2.08. Perhaps just for the clarification of the record, he could explain what that meant.

PRESIDING JUDGE SCHMITT: [12:02:54] Yes. Could you please explain that, Mr French.

THE WITNESS: [12:02:59] [12:02:59] It's -- the reason for putting the small red mark there is basically to indicate what looks like the discontinuity. And you can see that the -- there is quite a sort of spike in the negative direction. It is likely that that is where the start of the discontinuity has happened.

PRESIDING JUDGE SCHMITT: [12:03:23] I think that is what I already indicated would be even for a layman or laywoman obvious at first sight.

Mr Rowse now.

MR ROWSE: [12:03:32] (Microphone not activated)

PRESIDING JUDGE SCHMITT: [12:03:37] Microphone, please.

MR ROWSE: [12:03:39]

Q. [12:03:39] So we perhaps look at the next segment, if my colleague is finished observing this. Yes. So the next segment is 6.14 to 6.32 of the same audio track.

(Playing of the audio excerpt)

Q. [12:04:21] Did you hear what could be a discontinuity in that segment?

A. [12:04:25] Yes. That's a more pronounced one. I would need to see the plot, but it would -- I would -- on first listening it would sound like the recorder has actually been switched off and then switched back on again.

Q. [12:04:38] So let's then on the same monitor show you UGA-D26-0024-0006, which is Defence tab 21.

A. [12:05:01] Thank you. Is it possible to zoom in the display around here?

PRESIDING JUDGE SCHMITT: [12:05:12] I think that would be not a problem.

MR ROWSE: [12:05:24]

Q. Would it be better to be even further zoomed in, if we can? So same exercise. If you would be willing to indicate where you think -- there we go.

A. [12:05:38] Again, obviously doing this on the, on the hoof, live, I would -- if I was again needing -- if I was to do this properly, I would obviously need to do it in the laboratory setting, but initially, initial indications would be that that is some kind of discontinuity caused by possibly the recording being switched off and then being switched on, back on again.

One thing to bear in mind with cassette recorders, some makes and models of them, some of them have a feature which will automatically stop the system recording

when there is sufficient noise or signal detected by the recorder. And you quite often find this on dictaphone type recorders where you've got a small one in your pocket for recording meetings, and then when the noise level or the detectible signal level into the microphone drops to a certain level, the recorder switches off to save, save tape. That can actually cause these type of discontinuities as well.

Again, it goes back to getting hold of the particular model of recorder and tape that was used and then testing. And if, obviously if that is a particular feature of that particular model of recorder, that's one of the things that you would set it up to do, to make those, to make those sort of automatic discontinuities by operating it in that fashion and then comparing it against the electrical transience generated when you physically switch the thing on and switch it off. And quite often they are, they are different due to the way the cassette mechanism works.

PRESIDING JUDGE SCHMITT: [12:07:56] Perhaps just for my understanding. Would it be a possibility that the people who were on the radio switched on and off?

THE WITNESS: [12:08:10] [12:08:10] I would say it is less likely the presence of the -- these sort of click-type transience on the recording and the fact that you have a smaller recorded section here indicates that that actually is a physical manifestation of something to do with the tape and not so much of the audio.

If, if it was just a fact that the audio had cut out from the actual radio itself, you would -- the noise, the sound level on the plot here would diminish, but it is unlikely to go to this point here, which is pretty much a zero set of -- zero level of recording, that's unlikely to have happened.

PRESIDING JUDGE SCHMITT: [12:09:00] Thank you. And do we need madam court usher at the -- for one more. Okay, good. You have to bear with us that you have still to wait a little bit, but I think we will continue soon.

MR ROWSE: My colleague reminds me that we should, for the sake of the record, that two dots were created after the circling on this.

PRESIDING JUDGE SCHMITT: [12:09:27] Yes. Why not?

MR ROWSE: [12:09:29]

Q. [12:09:30] The final example I would like to provide you is from the same recording and it is from 12.35 to 12.55.

(Playing of the audio excerpt)

THE WITNESS: [12:10:36] [12:10:36] Again it sounds like a discontinuity, but it sounds more like the first one than the second one. It's more like -- it's a bit briefer. Possibly, possible that the machine has been put into pause mode I would suggest.

MR ROWSE:

Q. [12:10:51] And then again the same exercise, which is Defence -- third, sorry, Defence tab 22, UGA-D26-0024-0007, which we have on the screen. So if you could indicate where you might guess that -- there we are. Great, thank you. I think that's all for the annotation, which has perhaps gone off without a hitch.

Now, with these three instances I have played for you, they are in the first 15 minutes of audio on one side of the tape, and you have previously provided an explanation as to why you thought the tapes were copied.

Having three instances in 15 minutes would suggest that these were not anything to do with the tape-copying scenario that you described previously, right?

A. [12:11:59] It's feasible, I guess, to -- if these were -- if they are copy recordings, which is -- I guess it's likely, it's feasible to generate maybe the same effect using the stop and start control on the fast copying machine.

But from listening to these, my feelings are initially that they were done probably at the time that the recordings were made and not during the fast copying or copying

procedure. You couldn't rule that out, but it's just listening to them.

And I think one of the things you would, I guess, probably need to do to explore this area further is, if it was ever feasible to talk to the persons who made the recordings initially to ask them what they were doing. That's the best evidence in this particular matter, I would suggest.

Q. [12:13:09] And if you had the -- we have discussed this magnetic imaging a little bit earlier. Would that potentially assist in knowing whether an original tape had been taped over, so we have overlayed a piece of time over another piece of time?

A. [12:13:39] Yes, it can do.

Q. [12:13:40] And just, just for the sake of a sub-point, it stands to reason, but there is no way to tell how much time would have passed between based on the structure of the (Overlapping speakers)?

A. [12:13:54] Not at all, no.

Q. [12:14:10] Now I would like to change gears a little bit and talk with you about enhancement at a high level. I would like you to turn to Defence tab 4, which is UGA-D26-0022-0064.

This is a BBC white paper titled "Audio Processing and Speech Intelligibility: a literature review" by Mike Armstrong.

And my first question is: Are you familiar with this paper?

A. [12:14:50] No.

Q. [12:14:50] Have you come across it ever?

A. [12:14:53] No.

Q. [12:14:54] Now, in this paper, having reviewed the literature, which include law enforcement studies in its introduction, at 0066 he states:

"... there is no clear evidence that speech processing can be used to reliably improve

intelligibility. Indeed, in many cases the process could reduce the intelligibility of speech."

And at 0071 Mr Armstrong concludes:

"... current audio processing techniques cannot significantly improve the intelligibility of speech in noise, if at all."

He carries on to say:

"Whilst such processing can be used to make the audio more pleasant on the ear, it cannot be used to restore the speech to its original level of intelligibility."

Now, I have a couple of questions raised by these passages. First, is the author correct about the lack of evidence regarding the improvement of intelligibility?

A. [12:16:00] I have no particular knowledge of him. I have not heard of him before.

I've had discussions with people over the years, and certainly internal discussions within CEDAR would suggest that that's a commonly held view. In the main, what enhancement is probably the best at is removing noises that make the listening experience uncomfortable.

Now, certainly -- if, for example, you have something like a recording where there is a defined noise problem, for me that would be something like a very loud buzz or hum or a very low frequency-type signal that may be coming from a vehicle noise. If you are listening to a lot of that type of material, then those noises become very, very tiring and very fatiguing and mean that you struggle to concentrate on the speech part of what you want to listen to.

Whether or not by using those enhancement procedures actually improves the intelligibility, I know quite a few people say that it doesn't, obviously including Mr Armstrong. I am open minded about it. I don't have a particular position. I'm

a practitioner more than a theorist, and the one thing I do know about theorists is they do like arguing with each other.

PRESIDING JUDGE SCHMITT: [12:17:59] That was a nice answer, so to speak, but I understand that you are open to the question if it is merely only more comfortable or more pleasant to listen to afterwards or if it also, in some instances, might better the intelligibility of what has been spoken. I have understood it this way. So this seems to be not decided.

THE WITNESS: [12:18:26] I think it is not decided. I mean one, one instance where I guess it could be argued that it does possibly improve the intelligibility is when a recorded speaker is a very low level. And if you think about a circumstance where you have a telephone call that is between two parties and one is very, very loud because that's the end where the tape-recorder is or the recording device is, but the person on the other end of the line is very, very low, there are techniques that you can do to equalise the levels of those voices by bringing up the very low-level speaker and suppressing perhaps the loud speaker.

Whether or not that could be argued that you are increasing the intelligibility of the low speaker is an argument, but it is -- theoretically you could claim possibly that that is exactly what you are doing.

PRESIDING JUDGE SCHMITT: [12:19:32] Very interesting.

Please continue, Mr Rowse.

MR ROWSE: [12:19:35]

Q. [12:19:35] So is there a scientific way to quantify enhancement?

A. [12:19:43] No.

Q. [12:19:50] So really enhancement is a qualitative assessment then, if somebody says to themselves, "That sounds better"?

A. [12:19:59] I think so, yes.

PRESIDING JUDGE SCHMITT: [12:20:00] And hopefully the listeners later on also say, "This is better" in the end, otherwise the whole process would not be very meaningful in our context, I would say.

MR ROWSE: [12:20:17]

Q. [12:20:17] Now, is it the case that with the production of audio -- sorry, does enhancement require your training as other professional audio professions?

A. [12:20:31] I think you need certain qualifications in an electronics-related discipline. But then the skills needed, I think, are very much built up through experience and doing large amounts of casework and pretty much learning what works and what doesn't.

One of the problems that we have within our industry is there is very, very few general training courses in this discipline. The only one I know of at this moment in time is run by the University of Denver in the US, who are doing sort of up to degree-level courses in enhancement and authentication. It is certainly not available in the UK. I am not aware of any courses available in mainland Europe. It is a very niche discipline and I think on the whole it is -- there's very few of us, I think, who do it to a particular level.

Q. [12:21:39] One final question on this then. So it's a matter of judgment in many respects, the processing enhancement?

A. [12:21:47] It is a matter of judgment but, as I said to you earlier, you know, one of the things we always try to do is supply enhanced material with a copy of the material unenhanced so that if there are questions of whether the enhancement has been done skillfully or not, the end-user can refer back to the unenhanced material and make up their own mind and give their own judgment on that.

Q. [12:22:12] Now I would like to switch once again a little bit further on to -- the subject is really frequency response, and the point that I would like to be driving at has a basic assumption that part of what makes a voice sound like a particular voice is the combinations -- a combination of frequencies present in it. Is that a fair assumption?

A. With my limited knowledge of linguistics, I would say yes.

Q. [12:22:53] Now, can you explain to me and the Court what "frequency response" means?

A. [12:23:06] You might have to put that into a context for me.

Q. [12:23:10] Well, perhaps I can give you a definition and we can put it into a context.

A. [12:23:15] Sure.

Q. [12:23:15] If I said a working definition is the measure of the output spectrum or present frequencies of a device in response to an input, would you agree with this?

A. [12:23:28] Yes, I think so.

Q. [12:23:31] So basically each device or -- you have a device and you put sound through it and that may change the composition of frequencies present in the device -- sorry, in the signal?

A. [12:23:49] Possibly, possibly. I think if you start from the precept that if you're making a recording of any type, you wish the recording to faithfully reproduce what has actually happened, what has actually been heard. For example, if it's, I don't know, recording these proceedings, you would want it to sound as natural as possible.

The frequency response of a particular recorder should then have the ability to record and reproduce the very lowest frequencies and to the very highest frequencies, and

the more money you pay for a particular recorder, the better the frequency response of that particular recorder will be. If you are using something like a very cheap cassette machine, the sort of thing that you maybe had maybe 20 or 30 years ago at school, to make recordings into, it is cheap and so therefore the ability of it to reproduce the full quality of the recorded sound is probably going to be limited. And one of the limitations of that is going to be that it's going to have a limited frequency response.

Q. [12:25:11] And it is also -- I might get this technically wrong, but as well each -- what I am really getting at technically is, we have transducers, microphones and speakers. So speakers also have a frequency response as well?

A. [12:25:27] Speakers, microphones. Any part of the recording chain, there will be a frequency response.

Q. [12:25:41] Now, picking up a question asked to Mr Laroche, which is at T-119, the English transcript, page 32, lines 14 to 15, if a voice is recorded with different equipment then, would the way in which this is recorded change the speech, and by that I mean the character, based on what we have said?

A. [12:26:19] Possibly, possibly. Again, if we go back to the -- if you've got a type of speaking where there is a particular emphasis on S sounds, for example, sibilant type sounds, if you are using a very low quality recorder that has a very limited frequency response, for example, has the -- maybe can only record up to say 3 or 4 kilohertz as its maximum frequency response, that may slightly alter the pronunciation of those sounds because it's unable to reproduce the full, the full range of that human voice. Quality, basically quality is everything in audio. The more -- the higher the quality recorders you have, the more money you pay, the better the quality resultant will be.

Q. [12:27:14] And beyond the content, which you've just mentioned, also the character of the voice would change, potentially?

A. [12:27:19] It's possible.

Q. [12:27:30] I'm going to try and summarise a little bit because we've discussed some of this.

You were aware that these tapes were recorded through the air by a microphone. I think we mentioned that --

A. Yes.

Q. -- earlier on. And I think you've mentioned that that microphone may have a frequency response as well?

A. [12:27:51] Yes.

Q. [12:27:53] And even the tape-recorder itself, in fact, may have its own frequency response?

A. [12:28:05] Yes, that's correct.

Q. [12:28:06] So if someone were to make an attribution of an individual sitting in the room listening to the radio that was being recorded by the microphone, the voice they heard might sound different from the voice that's heard on the tape?

A. [12:28:21] I would say that that's possible, yes.

Q. [12:28:25] I appreciate that it's ...

A. [12:28:27] Yes.

Q. [12:28:27] And without testing this, there wouldn't be any way to know what the original voice sounded like?

A. [12:28:34] You would need to make test recordings and to do the research?

Q. [12:28:55] Now, coming back to the sort of high-level questions about audio enhancement, can it be done by following a sort of recipe?

A. [12:29:07] There are guidelines that you, you probably work to based on your experience. A particular example, and something that I teach the students that I teach, is that a good rule of thumb for doing audio restoration is to try to tackle any particular problems which is sporadic. So, for example, if you have a, if you have a recording where there are clicks, annoying clicks and maybe buzz, anything that is not particularly what I would call a fixed noise, and by a fixed noise I would mean something like a -- something that is droning on continuously like an air-conditioning noise, then it's probably best to try and tackle those type of problems first, and then once those clicks or that buzz is removed, then to then start working on the noise that is left that is probably going to be fairly consistent and constant.

And then once you have done that, then to then try and work to increase the voice frequencies up a little bit and to make the -- to bring them up above any noise that is left after that.

So in that way, in that particular sense then that approach is reasonably formulaic, but from experience of having done this for a lot of years there is -- you know, quite often an approach for a particular recording can be completely, if you described it to somebody, it would sound rather crazy, but sometimes using odd combinations of filters and that just works. And, you know, at the end of the day my job isn't to make the recording sound like broadcast-type recordings that you would get on the radio or the TV. It's whether you can hear it or whether it's easy to interpret what's gone on or not. So it's a different sort of remit that we have to people involved in music and broadcast restoration.

But, yeah, I mean there are outline approaches to take. But then when you get into the, the sort of the very detailed setting of say a particular processing module, then that really has to be dictated by what you are listening to.

Q. [12:32:00] And in the course of the training you gave to Mr Laroche and his assistant, you wouldn't have had time to cover all these exceptions or these exceptional scenarios at least?

A. [12:32:12] No. We give them basic guidelines and training examples and we show them how we would deal with a particular example in the hope that that then act as a sort of a template for similar types of problems that may come in to them. For example, we get in recordings every now and again with GSM type noise or bleeding over the top, and it's invariably caused if you've got a mobile phone near a recording device, and I think we've probably all heard that, that noise, (witness indicates sound), well, we have a set of procedures to deal with that within our CEDAR system that's actually quite effective. That's a commonplace problem, so we can teach that to a reasonably good level, knowing that that will probably deal with a lot of that type of problems like a customer may have in.

Q. [12:33:12] I have a quote from one Didier Meuwly from the National Forensics Institute which I found on an online article which I think summarises sort of the less -- this question in a more layman's terms. She was talking, talking about a slightly different piece of software, but I think it -- "You cannot just place any operator in front of a computer ... These programmes are" not "like airplanes: You can buy an airplane in one day, but you cannot learn how to fly in three" days. Does that -- they are like airplanes, sorry, yes. Does that -- would that capture the essence of these sophisticated systems?

A. [12:34:04] I think so. And certainly with our system the more time you spend on it the better you get and we always encourage people to even mess about with their own music and things on it to see what particular things do. Because it's like driving a car, the more you drive the better you get.

Q. [12:34:41] I think now, I think we have time to shift a little bit before the break into the actual -- little bit more about the actual processes for enhancement. And I would like to start by asking you about the decrackle and declick process that I think you applied on -- or no, sorry, you don't. You have got a decrackle process on one of the audios, which is at Defence tab 6, which is UGA-OTP-0281-1219.

The image has disappeared, but it's 1219 to 1220. You can see the settings.

And my question, my question is: You're not told whether the recordings might include such background noises as people talking or gunshots. Would that have impacted upon how you processed the audio, both, I mean in the specific instance, but perhaps more generally as well?

A. [12:36:39] Gunshots, no. I would suggest a gunshot is what it is. You know it's a loud report on a recording. There's not a lot you can do to mitigate against them. Invariably if we have this type of material with gunshots on, I mean, invariably the client tends to be interested in the gunshots more than wanting to get rid of them. The other noises, or the background speech, one of the problems that you have if you try to filter out speech of any kind is you may damage the wanted speech because obviously the speech, the frequencies within both are very similar. So it's, it's one of those cases where you have to very, very wary and very aware of what you're doing. You by all means you could probably try to suppress the background speech, but then if that then damages the speech that you want to listen to, then that's not really what -- you shouldn't do that, you know, it's self-defeating.

Q. [12:37:52] And just one follow-up question because -- I pointed you to an example where you have used a decrackle?

A. [12:37:59] Yes.

Q. [12:38:01] But Mr Laroche used a --

A. [12:38:06] Declickle.

Q. [12:38:07] Declickle.

A. [12:38:09] Yeah.

Q. [12:38:09] And we only received your reports, and thank you for providing them, on Wednesday, so we haven't been able to go through all.

A. [12:38:18] Yeah, there's a huge amount of data there unfortunately, yeah.

Q. [12:38:20] So I'm asking back and forth a little bit, but certainly Mr Laroche used a declickle.

A. [12:38:27] Yeah.

Q. [12:38:27] And of course a gunshot is a transient --

A. [12:38:30] Yes.

Q. [12:38:31] -- which I think perhaps it would be best if you explained the transient for the Court.

A. [12:38:37] Yes, a transient is a sharp noise on a particular recording that doesn't particularly relate to an audio, to spoken word. A transient can be caused by a gunshot, something like a door slamming. It's basically a loud bang.
What the decrackle and the declickle algorithms do is that they look for and they predict the presence of clicks, and quite often clicks on a recording like this are produced by some kind of electrical interference.
You may have come across this if you've been driving in your car and you've got your car radio on and then a car passes by which maybe the electrical noise suppression system on the car that's going by, especially if it's an old one, isn't very good and all of a sudden your radio is overwhelmed by a series of clicks and crackling. So that's what we would determine as clicks and crackles.
The reason probably Mr Laroche has used declickle and I've used decrackle, he may

not have it because the systems that we sell to customers, we sell a base system and then we sell particular sets of modules or individual modules and each module is charged for. So you can have sort of a reasonably priced system, or if you've got the money, you can have all of the modules and it becomes quite expensive. That may account for the differences. But in basic terms they roughly do a similar job. It's just that sometimes the vintage decrackle which is an older algorithm than the declickle. The declickle is a bit more modern technique. Very occasionally we find that it works better on older recordings such as analogue recordings. And looking at what I've done here, that was probably the case in this particular -- for this particular recording.

Obviously if I had listened to this and there wasn't the presence of any clicks or crackles on it I wouldn't have used it because there would be no need.

Q. [12:41:07] Now, I should backtrack here slightly before talking a little bit more about the processing. I think in your statement and certainly in the literature and manuals you describe these filters as adaptive filters. Can you explain how these differ in relation to what might be called static filters or ordinary filters?

A. [12:41:41] What we would call, what would actually be known as a standard adaptive filter is a filter that is able to predict what is coming up. And although we've not -- I've not used an adaptive, what we call a standard adaptive filter in this particular chain, an adaptive filter basically looks for repetitive noise cycles and they are very good for certain problems, but they are not very good for other, other problems.

For example, if you had a hissy recording and the primary noise source was hiss, adaptive filter is absolutely useless for that. Where they do a good job is on low frequency repetitive noise, things like motor tones, continuous air-conditioning noises,

low frequency noise, which don't particularly change that much because obviously if the algorithm is trying to predict what's coming up next, then if something is changing and jumping around, it's going to struggle to follow that.

We use adaptive filters certainly on car surveillance where we've got vehicle -- stuff that's made inside vehicles where road noise and wind noise to the cab is a problem, things like air-conditioning.

The very nature of the way that they work also means that they are quite good at removing buzzes and hums because if you think about it, a buzz is a set of cycles and therefore it's a predictive noise problem.

We also have technology something like an adaptive limiter. Basically if a filter or a module has the term adaptive attached to it, invariably it's a type of semi-intelligent piece of software. It actually is trying to predict what it thinks is coming up next. If you have something just like a, something like a, what we call an EQ, which is a parametric equaliser, to give it its full name, and you, with a parametric equaliser you can define a curve that represents the blocking of some, of some frequencies and the allowing through or even the enhancing of certain other frequencies, and that would be what I would define as a fixed filter because you are setting it up and it's doing a fixed job. It's not trying to adapt or to change itself dependent on what is coming into its -- the signal path.

Q. [12:44:37] So with these filters under some circumstances they could become -- the results could become unpredictable?

A. [12:44:45] Absolutely, yes.

Q. [12:44:50] And is it possible to examine the algorithms, and by that I mean either the code or at least the algorithm itself --

A. [12:44:58] No.

Q. [12:44:59] -- underlying the adaptive filters? So they are a little bit like a black box then?

A. [12:45:04] I'm not an engineer, I don't design them. I work with engineers and mathematicians who do all of that side of things and I think they would resist showing you what they had done because obviously it's a -- it's a trade guarded secret, so.

Q. [12:45:42] Now, coming back to the processing. You provided an explanation of one of 86 of your filter chains initially in annex E of your statement.

A. Yes.

Q. Which is Prosecution tab 6, UGA-OTP-0261-0349.

A. [12:46:10] Yes, I think if I remember rightly, I was asked to describe a typical procedure for one of the tapes that dealt with how I handed it and how the, how the filter chain was worked through.

Q. [12:46:27] Would you agree that without this report it's impossible to know what processing you did to arrive at the final enhanced audio?

A. [12:46:35] Not necessarily because obviously the, the actual set of filter settings is saved as well, so I could -- it's what we call a .ccw file, so I could go back to a CEDAR system, I could actually input that file, that settings file into the system and it would open up all of the modulus with all of the settings. So it's actually ultimately reproducible for anybody who needs to be shown what has occurred.

Q. [12:47:07] Sorry, perhaps I confused you with perhaps a, a unfair question not well worded.

I mean without having that .ccw file or the report, it's impossible to know --

A. [12:47:22] It would be difficult because obviously it's two years ago so -- and I've done a number of cases since then.

Q. [12:47:28] Sorry, I mean even, perhaps even more simple: If you receive an audio and you have been told it's been enhanced --

A. Yeah.

Q. -- just listening (Overlapping speakers)

A. [12:47:38] Oh, backwards engineering.

Q. Right, you just (Overlapping speakers)

A. Yes, absolutely yes. You would need to see either the report or the settings file.

Q. [12:47:47] Thank you.

Now, you gave a little bit of an explanation about this report, which is in annex E, and perhaps I don't need to refer you, but if you feel you would like to read it, fair enough. In paragraph 54 of your statement you say that by combining a stereo signal into a mono signal it reduced noise. And I'm curious --

A. [12:48:28] Well, basically with this type of recording you had two channels of audio: Channel 1 and channel 2. And occasionally the fact that you have two channels with differing information on them actually makes the recording sound, sound noisy. And one of the techniques that you can, you can do is to what we would call mono-summing both channels. And basically what you are doing is you are combining the information from channel 1 and channel 2 and then producing a single signal.

And in practical terms on some recordings what this does is it has the effect of reducing some of the noise level of, of that signal. It's a very specific technique for very specific recordings. Very seldom, I probably don't use it that often. Have to bear in mind that we don't get that many cassette tape-recordings in these days. I mean it was, you know, probably before these were submitted to us, probably quite a time before the last cassette came in before that. Most of the media that we get in

these days is digital. And that's always been a known technique to do that if you've got two noisy channels, to combine them and create a less noisy one.

And one of the things that I did before starting to do the copying procedures for these tapes was to experiment and see if that would make a particular difference. And I felt with this particular recording and probably other ones as well that it did actually make a slight difference to the levels of noise on the resultant.

Q. [12:50:42] Thank you. So in this same report you describe using -- I'm getting myself confused. Sorry. You describe how you use an adaptive limiter.

A. [12:51:09] Yes.

Q. [12:51:10] Can you explain what an adaptive limiter does?

A. [12:51:15] Basically when you, when you make a recording like the enhanced version of a particular cassette or something that's been submitted to you, one of the things that you want to ensure is that when that recording is burnt to disc or is replayed, that the levels on it are correct, that they are not -- that you have not put so much level onto the disc that when the person who's playing it plays it back it sounds distorted. And also to make sure that you have enough level going onto the recording to make it easier to listen to so that the person listening to it doesn't have to turn the volume up too loud.

And one of the, one of the things that we do is to use what we call an adaptive limiter as possibly the last or the second to last module in the chain. And its function is to adjust the -- after all the filtering is done, is to adjust the audio level so it is never going to distort. So there is a certain point in audio technology called -- what we call the zero dB point and that is the point is to a maximum value to which most certainly commercial music CDs are recorded to and you set a level using this device, this adaptive limiter so that the signal going into it can never go beyond your preset level.

But also with an adaptive limiter as well you can boost the gain of lower signals so that they can actually be easily heard. I always, when I teach I always refer to the adaptive limiter as your -- it's a bit like your safety belt in your car. It's like a -- it makes sure that the, the finished product or your CD that you have produced, the audio is to a good level but can never go above a predefined level. So it's basically a level adjuster that you control.

Q. [12:53:44] So I'm going to try and summarise what you have said and see if you agree, just because I appreciate it's not always -- basically it keeps the loud signals from going too high?

A. [12:53:57] Too loud, yeah.

Q. [12:53:57] And brings the lower signals up?

A. [12:54:01] Yes. If you use it in a particular way.

Q. [12:54:12] And you've done this not just in the example I've cited, but you've also done this in Defence tab 6, which is UGA-OTP-0281-1219 at 1221. And this is a report on one of the purported -- the tapes of purported claims of responsibility, I believe.

A. [12:54:38] Yeah.

Q. [12:54:39] And at is it 1221, I believe you've turned the input gain up 18.3 decibels?

A. [12:54:54] Yes. That was because the signal level actually of the original tapes was pretty low. So the final product needed some gain to make it as audible as possible. The way that you tend to adjust this module is that you set the threshold control, which is the second button in, and that always has to have a value of zero or a minus figure and that's basically the limit, the limit of how loud you are allowing the audio signal to go. Then the way that we tend to adjust it is then to adjust the

gain control up and then look for probably the loudest parts of the recording and then we play those and then adjust that gain control up so that there is a graph that actually comes down from the top of the screen on where the black crisscrosses are. When that starts to appear on the loudest parts of the signal, what that means is that there a actually a limiting effect being applied to the signal. So the way that I tend to do it is to get that to appear so it's just about occurring on the loudest parts of the signal, then you know that you've pretty much got it about right because the very, very loudest signals that are being reproduced from the tape are being slightly deamplified, but then it's applying again to the other parts of the signal and then you end up with a -- basically the point is not to end up with a recording where it's -- one point you're turning the volume down because it's too loud and then the next point you're turning the volume up because you can't hear it. So it's done with the end user's comfort and listenability to be borne in mind.

Q. [12:56:51] And I've got one more question perhaps before we move to the break. But just before that I just say for the record Defence tab 8, UGA-OTP-0281-1630 at 1632 also has a similarly high input gain and that's the -- one of the Abok recordings. With what you've said about bringing the lower signals up while maintaining the high signals, if the volume of a radio signal had any particular significance, this step in the processing could remove that significance, right, because the lower signal would now be about the same or it could come up to the volume of the louder signals, a little bit like the radio -- the example you gave of the telephone?

A. [12:57:44] Yes, that's possible in certain circumstances. My recollection of listening to these recordings was at times they got very -- they get quite low in level and other times they were reasonably, reasonably high level. So because there were so many of them, I think there was quite a variation in quality and content amongst

the however many recordings it was, 20 -- 43 recordings, I think, tapes in total.

MR ROWSE: [12:58:17] I think maybe this is a good moment.

PRESIDING JUDGE SCHMITT: [12:58:21] Yes, indeed it's a good moment to move into the lunch break. Lunch break until 2.30.

THE COURT USHER: [12:58:30] All rise.

(Recess taken at 12.58 p.m.)

(Upon resuming in open session at 2.32 p.m.)

THE COURT USHER: [14:32:31] All rise.

PRESIDING JUDGE SCHMITT: [14:32:51] Mr Rowse, please.

MR ROWSE: [14:32:53]

Q. [14:32:55] Good afternoon, Mr Witness.

I had a request over the break that myself and yourself are speaking too quickly and that we should respect the five-second rule, particularly for the Acholi --

PRESIDING JUDGE SCHMITT: [14:33:11] And on top of that, the matter is so complicated.

MR ROWSE: [14:33:17] The matter is complicated so we need to bring the pace down.

Q. [14:33:22] Before the break we were talking about adaptive limiters and my colleague wished, remarked, that we hadn't - it's just a housekeeping matter really - that we hadn't asked you to look at Defence tab 8, just to confirm that it was an adaptive limiter.

I appreciate this is a bit repetitive, but the ERN is UGA-OTP-0281-1630 at 1632, and that's the Abok report. So it's just to make sure that ... and I believe you have added 17.3 decibels of volume?

A. [14:34:31] That's correct.

Q. [14:34:32] Fantastic. Now, before the break we were talking about the manner in which these adaptive limiters would bring up the more quiet parts of the signal, or, rather, they would ensure that large parts of the signal remain the same and the quiet parts of the signal came up. And I had one quick question as a follow-up to that, which is: The discontinuities that I pointed out earlier on involved a drop of volume followed by a fade-in. Is it possible that in some cases that fade-in would be compressed, so in layman's terms the fade-in would be less obvious, perhaps?

A. [14:35:18] By the adaptive limiter?

Q. [14:35:20] By the limiter, yes.

A. [14:35:24] It's possible. My feeling are that if you are looking at the -- any discontinuity or anything that warrants further examination, you should be doing it from the original and not an enhanced version, because obviously the enhanced version, the information is modified slightly, includes certainly levels of discontinuities, any click caused by maybe a turning of the tape-recorder on or off, the level may be, may be altered. So you should definitely be not working from the enhanced version for that.

Q. [14:36:06] Now, I would like to turn to the two reports that I have selected -- or, rather, it is perhaps a general question about the reports that I have selected for the Defence list of evidence. And as I think I remarked before the break, one set relates to the alleged Odek claim of responsibility and the latter relates to the Abok intercept.

In the Odek intercept or with the Odek intercepts you have maintained exactly the same settings, whereas for the Abok report, settings changed between the two sides. So let me -- maybe that is not totally clear. In the Abok reports, we have a side A and a side B and likewise for the Odek. For the Odek reports, the settings are

precisely the same, side A and B, whereas for the Abok reports, the side A and side B are different.

Would -- perhaps we can -- it may be easier to look at them.

A. [14:37:19] Yes, sure.

PRESIDING JUDGE SCHMITT: [14:37:20] I would also have suggested that so we can follow.

MR ROWSE: [14:37:25] And the tab, this should be -- so we will be jumping ahead to the Abok, which is tab 8. The ERN is UGA-OTP-0281-1630. And the other report is Defence tab 9, which is UGA-OTP-0281-1645.

Q. Now, we see, for example, one can see, for example, in the Precision EQ that there are a number of cuts in the side B, whereas -- sorry, that's at 1646 of tab 9, and by comparison, for tab 8 at 1631, we see relatively flat equalisation.

A. [14:38:43] Yes, that's correct.

Q. [14:38:45] Can you explain perhaps why there might be a difference?

A. [14:38:49] I would probably need to listen to both to give you a full explanation, but certainly, looking at what I have done on side B, it would be apparent that there were a number of frequency tones that have appeared on side B that would warrant putting in the notch filters that I have done, and it is likely that they weren't there on side A.

One thing to bear in mind is that if you finish recording on side A one day, side B may have been recorded at quite -- maybe a few days hence. Therefore something in the acoustic environment or the recording environment may have changed. Maybe the radio on that particular day was more noisy, maybe there was things like thunderstorms or something. You just don't know. Again, if you had access to the people who made the recordings, you could, I guess, find out what -- when exactly

each side was made.

Q. [14:40:20] I suppose a similar explanation might also be for the noise removal for -- I see that the noise imprint which is for the first side is at 1631 and the side B is at 1646, again tabs 8 and 9 respectively.

A. [14:40:46] Yes, that would be correct.

Q. [14:41:06] Now, you say at paragraph 48 of your statement, which is at 0339, that:

"... I reviewed and listened to various parts of each .wav recording ..." End quote. Does this mean that you did not listen to the whole of all 86 audios?

A. [14:41:24] When initially deciding what to do with the recordings, likely not. Once I've -- once I had made a digital unenhanced copy of them, what we would -- what I would tend to do then is dip sample various parts to see if there had been any acoustic changes in the types of noise that were prevalent and then make sure that the enhancement that I'd put into place was good for all of those, all of those parts.

From memory, I don't recall there being really, really drastic changes to the audio quality as each side A and side B was played through. Normally I found I guess you'd call a happy medium for most of the sides of the cassettes, and then once, once I had worked out what I thought was the best strategy, then I would then start to render and then process the audio.

Q. [14:43:01] So that could mean that for the sections you chose for the Odek tapes, everything sounded the same but for the Abok tape, the section you listened to contained different problems (Overlapping speakers)

A. [14:43:16] Possibly, yes.

Q. [14:43:31] Now, perhaps I would like to talk to you a little bit more about the

quality or character of the voice more generally. Can you tell me the lowest tones in an adult male's voice?

A. [14:43:57] I can't.

Q. [14:43:57] If I said to you the number 85 to 180 hertz, would that seem reasonable?

A. That would seem to be reasonable for probably a large adult, I would say, so yes.

Q. [14:44:10] And -- so removing frequencies from those up would tend to -- the more drastic it was, would tend to alter the voice we hear? Not necessarily drastically, but it would tend to alter the voice we hear?

A. [14:44:33] Sometimes.

Q. [14:44:34] Because I have been jumping around a little bit, I realised I'd missed one question, because we talked about sibilants earlier. If I told you that sibilants occur around 8,000 hertz, would that sound reasonable to you?

A. [14:44:54] Possibly, yes, and maybe a little bit lower.

Q. [14:45:02] Now, now I see in -- I'm sorry, I'm backing up a little bit here, so I apologise for sounding a bit like a broken record. I see in two of your process reports that you've cut frequencies below, below -- sorry, below 8,000 hertz, I believe -- sorry, above 8,000 hertz -- or below that number, 8,000 hertz. And this is Defence tab 8, UGA-OTP-0281-1630 at 1632.

A. [14:45:44] Yes.

Q. [14:45:45] Where you've cut, I believe, from 5,705 hertz --

A. [14:45:50] Yes.

Q. [14:45:51] -- at minus 19 dB?

A. [14:45:55] Yes.

Q. [14:45:58] I apologise for repeating myself again, but with Mr Laroche I believe some of these cuts were more extreme. Just to clarify, those kind of cuts could reduce intelligibility of these aspirant sounds?

A. [14:46:14] If it was on the recording in the first place. I think bearing in mind the quality of these cassettes, you know, they were pretty low quality, low bandwidth I would suggest.

Q. [14:46:46] And one question which might be a bit out of place but you've never heard voices of Mr Ongwen, Mr Kony (Overlapping speakers)

A. [14:46:53] Not before this matter, no.

Q. [14:46:55] Before, you never come across them. Thank you.

So I would like to turn now on a little bit to the handling of digital audio, and it might be just more generally helpful for the Court as well to get the terminology right.

There are different qualities of digital audio and at paragraph 44 of your statement you say that you recorded the tapes to .wav. Can you, if you can see this, just confirm that?

PRESIDING JUDGE SCHMITT: [14:47:59] 44 is about the copying procedure.

MR ROWSE: [14:48:04] I'm sorry?

PRESIDING JUDGE SCHMITT: [14:48:06] Is about the copying procedure and the use of the CEDAR Cambridge processing system.

MR ROWSE: [14:48:10] That's right. Yes.

Q. [14:48:10] So in the process of creating tapes into a digital format, you created a .wav file.

A. [14:48:20] Yes.

Q. [14:48:21] Can you explain for the Court what are a lossless format is?

A. [14:48:24] A lossless format is a digital audio format where the -- all of the

information is retained. There is no wastage or throwing away of any of the information. The most common lossy format that you probably have heard of is a .MP3 file. And the way that MP3 coding works, very roughly, to my understanding is that it throws away every other bit of information from music, primarily music signals in order to save space on the -- in the recording medium or on the device from which it's stored. These days with the cheapness and the availability of digital storage space coming down and down and down in price, lossless formats certainly are not as popular as they once were.

We give guidance to police officers and anybody involved in evidential audio that it's, in our opinion, not good, not a good idea to use any lossless, lossy format for evidential purposes because it may well be that you could be accused of actually throwing away some of the evidence.

So when I digitised these cassette tapes or when I digitise any recording that comes in, irrespective of whether it's analogue, or it's a low bit rate digital file, we'll record it at 44.1 kilohertz .wav file, which is lossless, or we will end up upsampling if it's the low rate bit digital file to 44.1 kilohertz. And then by doing that we can at least say to whoever is interested that we have absolutely done nothing to degrade the quality of the original signal by using a less than satisfactory format to put it onto. In fact, our CEDAR Cambridge system that we use doesn't have the availability to re-encode to a lossy format. The output formats are .wav, which is the PC standard, or the Mackintosh standard and that is it. We can take in a variety of digital formats, including MP3s and anything that's capable of being played into a Windows Media Player, but saving out is always done at a -- in either a .wav file or the Apple format AIFF.

Q. [14:51:40] Now I think you mentioned it, but can you tell the Court what

bit-depth is?

PRESIDING JUDGE SCHMITT: [14:51:47] And in what context it is relevant, perhaps, so that I can follow and my colleagues can follow.

THE WITNESS: [14:51:56] Bit-depth is sort of combined with sampling frequency to the amount of samples that you take of an audio signal. The higher the bit-depth the more levels of sample you take. In rough terms that's my understanding of it. The greater the bit-depth the more accurate representation of the, of the signal.

MR ROWSE:

Q. [14:52:20] And what is the standard bit-depth for CD quality audio?

A. [14:52:25] 16 bit.

PRESIDING JUDGE SCHMITT: [14:52:26] And again, what has been applied here?

THE WITNESS: [14:52:30] 16 bit 44.1 kilohertz sample.

PRESIDING JUDGE SCHMITT: [14:52:33] Thank you. Because this is perhaps where we have the connection to our audio enhancement process.

MR ROWSE: [14:52:44] I'm progressing slowly but surely, your Honour.

Q. [14:52:49] Now, speaking in generalities, it's fair to say that 8-bit audio is a bit dated then?

A. [14:53:06] Eight bit audio is -- you would tend to find that in lower quality recording devices like dictation machines and cheap USB type pen type recorders. But as I said earlier, you know, the digital technology is coming down and down in price really, and it's -- the ability to buy something of decent recording quality for not a lot of money is much easier these days than it used to be.

Q. [14:53:38] Are you familiar with the software FFmpeg? It's an open source piece of software.

A. [14:53:48] Not particularly, no.

Q. [14:53:50] Perhaps -- well, I'll show you the output of this program that I run on an enhanced piece of audio provided by Mr Laroche and perhaps you'll still be able to understand it. I don't know. But this is Defence tab 11, which is UGA-D26-0024-0004. It concerns audio, the enhanced version of which is UGA-OTP-0042-0022, which are original, the original versions are UGA-OTP-0264-0566 and UGA-OTP-0264-0571. Now, I appreciate you haven't looked at this. You say you're not familiar with the software, but if you look at the line just above where it says "at least one output file must be specified" and says "stream". Can you see "pcm_u8" there?

A. [14:55:06] Yes.

Q. [14:55:06] And to the right you see 44,100 hertz --

A. Yeah.

Q. -- stereo, u8?

A. [14:55:12] Yeah.

Q. [14:55:15] Would you -- if I told you that u8 is unsigned 8-bit audio, would that seem like a reasonable -- given the context that this is the output of a piece of software describing other characteristics of the audio, would you find that a reasonable interpretation?

A. [14:55:35] Yes, I guess so, yeah.

Q. [14:55:37] I appreciate you can't comment fully, but thank you.

PRESIDING JUDGE SCHMITT: [14:55:43] So, sorry (Overlapping speakers)

MR ROWSE: Just --

PRESIDING JUDGE SCHMITT: For my understanding, so you did this work with the other program. That is something that is supposed to do something similar, very basically formulated than CEDAR does. Do I understand this correctly, or am I completely wrong, or only a little bit wrong?

MR ROWSE: [14:56:05] Your Honour, it's just simply a diagnostic, it just --

PRESIDING JUDGE SCHMITT: Okay.

MR ROWSE: You can -- with that piece of software you can output other versions of the same audio, so by --

PRESIDING JUDGE SCHMITT: [14:56:13] So it was at least have made sense that I intervened so now I understand it better. So it's something different.

MR ROWSE: [14:56:23] So, in essence, if the software is correct, would be 8-bit audio.

Q. [14:56:31] So moving on to another not easy subject. Your enhanced audios were played for witnesses in the courtroom and my aim in the next set of questions is not to send you done the rabbit hole of different compression algorithms, but I think having explained what a lossy format is you may be able to comment on this. Is a .WMA file a lossy way of storing audio?

A. [14:57:10] WMA, I believe so, but I would need to look that up in all honesty.

Q. [14:57:21] Okay. Now, the Prosecution has told us that they made every effort to play the original lossless audio, and this is Defence tab 10, UGA-D26-0021-0001. You won't have it there, Mr French, it's just for the record. But this was not done with a hundred percent uniformity and that a record does not exist of whether a lossy or lossless version was played due to sort of demand at the moment. If I told you that the format of these WMA files, and I appreciate that this terminology is similar, had a bit rate as opposed to a bit-depth of 64 kilobytes per second, would you agree that the quality of the audio played for the Witnesses was potentially of a lesser quality than you provided to the Prosecution?

A. [14:58:12] I would need to try to remind myself what the bit-depth -- what the bit rate of standard CD audio is, but I believe it's higher than that. So if the bit rate

played was of a lesser number, then theoretically it is possible that the audio quality wasn't quite as good.

Q. [14:58:46] Thank you, Mr French.

MR ROWSE: I think unless my colleagues have any other questions, I think I'm done at this point.

PRESIDING JUDGE SCHMITT: [14:58:56] Thank you very much, Mr Rowse. That was -- Mr Elderfield is rising. This was from a surprising side so because of that, you caught me, I think I would say you caught me by surprise. Mr Elderfield, please.

MR ELDERFIELD: [14:59:15] Sorry, your Honour. I understand sometimes I have to be quick, but the Prosecution wishes to undertake a small five-minute redirect examination of this witness. He's given evidence of how the enhancement process is a qualitative assessment or the results of the enhancement processes are qualitative, and the Prosecution wish to merely play to the Witness a 20-second portion of an original unenhanced version and then the same 20-second portion of an enhanced version to get a practical understanding of how the enhancement processes work.

PRESIDING JUDGE SCHMITT: [14:59:50] Mr Obhof.

MR OBHOF: [14:59:52] First, your Honour, the Defence doesn't understand why the Prosecution could not foresee this and ask it during their examination-in-chief. Secondly, it is a very short clip, your Honour. We are not talking about an area where the tape might be spliced or the actual words being said. They are asking if 20 seconds out of an audio, which quite arguably could be anywhere to 48 minutes, might sound better from one to the other.

I believe Mr Rowse today has quite comprehensively discussed the issues with the witness and we do object to them having a redirect, your Honour.

PRESIDING JUDGE SCHMITT: [15:00:28] Mr Elderfield, do you want to reason why you want this redirect?

MR ELDERFIELD: [15:00:33] Your Honour, indeed it is last minute and the witness has talked about this being a qualitative assessment, the fact that it may come down to judgment, and the Prosecution merely wanted to offer the Court an example of how this, you know, assessment played out in practice.

PRESIDING JUDGE SCHMITT: [15:01:02] So technically, Mr Obhof, you are correct, but since we have a different legal framework here at the ICC, for the understanding of the Judges, we would really like to listen to that so that we have one example where we could compare it. Simply like that. And it is five minutes. So it is simply about that, Mr Obhof.

MR OBHOF: [15:01:24] The Defence would merely ask that it may select its own sections and email them to the -- these sections to the Chamber so they can listen to the same audio in the same manner. Because I mean, if it is just a subjective question, it is not something we need this witness to listen to. It is something your Honours could listen to on their own in the Chamber.

PRESIDING JUDGE SCHMITT: [15:01:44] That is also true, but we are talking now about -- yes, I have to admit that, but we are talking about five minutes now, and I think why not exercise it. So we talked about it, the Judges, so it is so-called a Chamber decision, we would say.

So, Mr Elderfield, but I trust that you are really talking about a short procedure?

MR ELDERFIELD: [15:02:01] Yes, your Honour. There is two portions, 20 seconds each. I am just going to read the ERNs, and my colleague, because it is last minute, will play the recordings from our -- from our computers. Hopefully it will go smoothly.

PRESIDING JUDGE SCHMITT: [15:02:15] So then let's hope that it goes smoothly and let's start it.

MR ELDERFIELD: [15:02:19] The first clip is an original audio, ERN 0053-0006, and the 20-second portion is of track 1, from 20.17 to 20.37.

(Playing of the audio excerpt)

PRESIDING JUDGE SCHMITT: [15:03:02] That was which version?

MR ELDERFIELD: [15:03:04] Your Honour, that's the unenhanced, the original version of an audio.

PRESIDING JUDGE SCHMITT: [15:03:09] It was quite good.

MR ELDERFIELD: [15:03:10] They are not all terrible. This second track is the enhanced version, 0235-0049, and again track 1, the timestamp starts from 20.22 to 20.42.

(Playing of the audio excerpt)

PRESIDING JUDGE SCHMITT: [15:04:20] Okay, Mr Elderfield.

MR ELDERFIELD: [15:04:23] Thank you, your Honour.

QUESTIONED BY MR ELDERFIELD:

Q. [15:04:24] Mr French, that second clip was an enhancement that you undertook. Could you tell, in your qualitative assessment, that it was a better quality than the original or not?

A. [15:04:36] I would say so. The first one was quite low level. It had a hum on it, which has been removed, and the voices were very, very low in comparison to the noise. And what I would have sought to have done there is to get rid of, obviously, any extraneous noise like the buzz and the hum and then work on bringing up the two voices from the radio monitoring.

I thought it was a fair bit easier to hear. The first section, I would suggest, would

probably be quite difficult to interpret, especially when the lower-volume man who is speaking there is speaking at points. So I have sought to make sure that it is as audible as I could get it.

PRESIDING JUDGE SCHMITT: [15:05:35] So this is, of course, also a subjective interpretation, and we just talked shortly with each other, and of course the second was better audible than the first one, but even the first one was quite good, frankly speaking here.

So we have an idea. It's not such a big issue, Mr Obhof, I would say, that you would need to email anything. I think this would not be necessary.

So this concludes the testimony of this witness.

Mr Ayena, please.

MR AYENA ODONGO: [15:06:10] Mr President and your Honours, we have been treated to a highly technical, you know, session. But I thought it might be in good taste for me to ask a fairly pedestrian question so that --

PRESIDING JUDGE SCHMITT: [15:06:32] Of course, of course.

MR AYENA ODONGO: [15:06:33] Yes.

PRESIDING JUDGE SCHMITT: [15:06:35] Please go forward.

QUESTIONED BY MR AYENA ODONGO:

Q. [15:06:41] Now, Mr Frenchman, I know that it is -- I mean Mr French, not Frenchman. I'm sorry. I know that it is possible to audio record at different times. Just like you said in the case of Abok, there were disturbances more than when -- I mean on the other side of the tape. Could it be the case that when you record maybe at one time, you could make a cutting and transpose a recording from a different time and connect it to the same tape, to appear like it was a continuation of the same recording?

PRESIDING JUDGE SCHMITT: [15:07:42] That is not a pedestrian, that's a very reasonable question, I would say.

THE WITNESS: [15:07:47] So if I understand you correctly, so you -- what you are saying is: Could somebody have made a recording on a different day and actually, say, for side two of one of those cassettes, instead of actually recording live from the radio loud speaker, that they are actually playing a recording that was made at an earlier time, and instead of recording from the radio loud speaker, they are recording from the tape player loud speaker to make it sound as if it was recorded on a particular time? Is that what you are asking?

MR AYENA ODONGO:

Q. [15:08:31] That is one set of my question. The other one, the other one I want to understand is, I am talking about a subject matter. For instance, I am saying Michael has done such-and-such a thing, I am talking about a subject between me and Michael or I am giving instructions to Michael. And then it stopped. At a certain point I pick another portion, where I am giving instruction to Thomas Obhof, and I transpose it and connect it to the earlier discussion.

A. [15:09:18] So it sounds as if there is one complete conversation which is made up of two parts?

Q. [15:09:26] That's right.

PRESIDING JUDGE SCHMITT: [15:09:28] Exactly.

THE WITNESS: [15:09:29] That is always feasible, sir.

PRESIDING JUDGE SCHMITT: [15:09:31] Thank you.

So this concludes the testimony of this witness.

Mr French, we thank you very much for your testimony.

THE WITNESS: [15:09:34] Thank you, sir.

PRESIDING JUDGE SCHMITT: [15:09:37] We all know it, it was a very technical matter, but these things are technical and we need to understand them as much as possible, the Judges even.

So thank you very much. We wish you a safe trip back and we continue tomorrow with -- I didn't even ask if you were able to call Witness 351, but I would assume that Mr Gumpert would have stood up earlier and would have complained about that.

MR GUMPERT: [15:10:04] I certainly wouldn't have complained, your Honour, but I might have sought the leave of the Court to take some other course. But none of that arises. We are ready.

PRESIDING JUDGE SCHMITT: [15:10:13] Then we abate the proceedings for today, continue tomorrow at 9.30.

THE COURT USHER: [15:10:17] All rise.

(The hearing ends in open session at 3.10 p.m.)