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The Vivante Portfolio Experience

Presenter: Bill Christman, AuD

- All right. Welcome, everybody. It is the top of the hour. We'll go ahead and get started here. Just for those that don't know me, my name is Bill Christman. I am one of the regional trainers at Unitron and I am thankful for y'all taking the time out of your day here today to join me. I know we have people from different time zones. So whether this is like lunchtime, before or after lunch, you know, I appreciate you taking your time to join us here today. Before we dig into things, I wanna just take a brief moment, review some of the basic housekeeping as relates to our course here today. Now I know a lot of you are regulars on these Audiology Online events and so these details might be second nature.

But I think it's important just to make sure that everybody's on the same page. So first things first, if you have any questions as I go through the presentation today, you can go ahead and use the Q and A panel, Q and A option to type in your questions. Kind of keep a list here for me. I'll do my best to kind of keep an eye on that panel and try to address questions as they go. But I might kind of like pause occasionally just to take a pause, look, and make sure I haven't missed anything. So any questions, go ahead and type those in using the Q and A. Second thing, if you are looking for a handout or some of the other handout of the presentation or some of the other reference materials that we provided to go along with it, if you go to the resources tab at the bottom of the screen, you can access a handout of the presentation and some other materials there as well.

And of course, usually people are curious about... For CEU purposes, once we've finished the training here today, you'll go back into your pending courses in Audiology Online. Take and pass the multiple choice exam and you'll be all set there. And then the last item of business, if you are having any questions or any issues from a support perspective, if you're not hearing my audio as we go here for example, you can call the phone number listed on screen, use the email address, or type a note in the Q and A chat. Caitlin from Audiology Online, she is here with us and she'll kind of keep an eye

on it. If there's anybody having any technical issues, she can help out with that as we go.

All right. So from there, let's get into things. Just to start off real quickly here, I know as people were joining, you might have saw that video that was kinda looping at the beginning. But we're just gonna kick things off with that version of that video with sound. So, here we go. I don't think we need to hear that a second time. But to get a little groove there, a little fun energetic intro to get things started. So now we'll go ahead and kind of get into the details that were highlighted in that video. When we introduced our Vivante platform last summer, we talk a lot and as we... You know, throughout the last six, eight months, you'll hear us talk a lot about the importance of choice.

Choice makes life beautiful. You know, with our latest launch, we continue to play in this theme in saying that there is power in choice. We have expanded the style offering on the Vivante platform to give you more choices for your clients to match their preferences and lifestyle. And because having choice is a good thing, more choice is always the right choice, we're excited to offer you this expanded portfolio of products all powered by the Vivante platform, supported by our newly redesigned Remote Plus app that gives you great technology and features at all performance levels of the products. And now we have expanded the portfolio to include an option for the individuals with severe to profound hearing loss.

'Cause for this population, their hearing aids are important to them and then sometimes there's a lot of challenges that come with their fittings. So, we've got this great new Stride V-UP to add as an extension to the Vivante product portfolio. Now, kinda take a moment here just for a bit of historical context. As you saw the video there, maybe you've seen some of this already. If you weren't aware, 2024 marks Unitron's 60th anniversary. Now coincidentally, 2024 also marks my 25th anniversary

with Unitron. So end of May for me will be 25 years with the company. And over that 25 years here at Unitron, I've seen a lot of products come and go all the way back to our very first digital hearing aid.

It was called Digital Sound Effects back in 1999. And given that we're now launching our latest Ultra Power BTE on the Vivante platform, it seems like this is a good time to me. We go back and highlight some Unitron's long legacy when it comes to meeting the needs of power users. You know, starting way back from our very first product, it was 675 battery, the 210 BTE that was launched in 1965. And then throughout the seventies and eighties, there were multiple iterations of the E1 series and the UE series. So the E1-P, the E1-PP, the UE PP, UE PPL, all variations of that. There was a period of time in there where Unitron also offered a body-worn hearing aid.

Now for those that have been in the industry for a while, you may remember back to probably one of Unitron's most famous and beloved of the Ultra Power products was the US80 Power BTE. Now in those pre-digital analog times, the US80 was a really special product. It had a larger microphone and receiver than other power products on the market at that time. And these larger transducers had a wider frequency response and greater output capability. It was really second to nobody in the industry. Many users became very accustomed to it, might even say they got kind of hooked on the sound quality. And the US80 was really one of the Unitron's best known and most appreciated products to accommodate the needs of wearers with a severe to profound loss.

It was available in the marketplace for almost 20 years. It was finally phased out back in 2009. Back around that time, there also was an analog programmable version of it in the Sigma line. Back in the good old days where we didn't have to worry about software updates, firmware updates, things like that, with a dedicated handheld programmer. Didn't even need your jewelry screwdriver anymore. Good times. So even

back then, in the late eighties to early nineties, we had the analog programmable version of the US80 with the US80 Sigma. Now jumping ahead to 2008 was when Unitron introduced the 360 product. This was our first fully digital Power BTE and it featured an especially robust new water resistant housing and it also had kind of a cool innovation, kind of moving into like design integrated FM receivers.

So if you did need an FM technology, it wasn't a big clunky boot that had to snap onto the bottom. It was actually kind of designed to kind of follow the aesthetic of the hearing aid shell itself. And then quite literally, a new era was ushered in when we introduced the Era platform and our Max Super Power BTE on the Era platform. This was our first Power BTE that used the high-band wireless connectivity, gave us a range of convenient accessories, remembering the uDirect, the uMic, things like that. This model, it was particularly beneficial for the power user population. It also offered a unique power adaptation manager that was designed to kind of help wean users off of over amplification.

You could start them out at a level of gain that they were maybe accustomed to that when you looked at it audilogically, it just makes no sense and you're risking the person's residual hearing. It had a tool that you could kind of gradually try to work them back from that over amplification. And again, in the Era platform or in the Era generation of products, we also had introduced some real game changers with our FLEX:TRIAL and FLEX:UPGRADE that were available for all of the form factors including the Max BTEs. So these experienced innovations, they continue to be unique differentiators across the entire line but also for the power segment, allowing these users to be able to try before purchasing.

And if something changes in their lifestyle and they need something more sophisticated, they can upgrade to a higher level of technology later. Now in 2018, Max moved onto the Tempus platform and that brought us Frequency Compression 2 and

the addition of our Ultra Power presets which I'm gonna talk in a bit more detail about coming up. You know, really in the last 10 years or so, there's really just been a rapid innovation in hearing instrument technology bringing us up to where we are today at present. If I just pause for a moment again, in particular if I call it back in 2021, that's when we brought made-for-all, hands-free Bluetooth connectivity to our Ultra Power products with the Stride B-UP.

Power users, they also gained access to the personalization capabilities of the Remote Plus app. At the same time, Roger Direct also became available with Blu. So meaning we didn't need any external receivers or audio shoes anymore. We could transmit the audio directly from the Roger microphones into the hearing instruments. So when you kinda look at it in totality, you can see here that Unitron, meeting the needs, expanding the opportunities for individuals with severe to profound hearing loss, that has always been a priority for Unitron and that now continues with our new Vivante platform. You know, we're very pleased to bring you the Stride V-UP which is the Ultra Power BTE specifically designed for clients with severe to profound hearing loss.

It features a durable 675 battery with our latest sound performance. And within that several features that are of particular relevance for power wearers, it also features seamless, made-for-all direct connectivity to multiple devices and of course also having a telecoil. Now the Stride V-UP, it is equipped with a powerful dual receiver. And this dual receiver was first introduced in the Blu BTE. With this design, there are two receiver parts that are joined together and by having the two different receiver components joined together, they cancel out each other's vibration patterns resulting in greater mechanical stability so we can drive the receivers harder before the mechanical vibration of the receiver is picked up by the microphone resulting in feedback.

So the Stride V-UP product delivers up to 84DB of gain and 141 DB peak output. You've got a very powerful option here to accommodate most severe to profound

hearing losses. And the Stride V-UP, it is available in the same six color options as the rest of the Vivante styles. So it has kind of that premium lacquered finish to it. And the color options are available to match different skin and hair tones, the personal preference as we go there. So if that's kind of the product itself, if we kind of pivot a little bit here and take a look at some of the features that help make the Stride V-UP stand out, we're gonna start with our Ultra Power presets and look at how these Ultra Power presets help to further bridge that gap between a client's listening communication goals and the options that we have to get them there.

'Cause we don't want... For individuals with severe to profound hearing loss, we know oftentimes these are complex users. They've got challenging needs, challenging audiograms. And so based on maybe what their past history with amplification is, it can really help us to kind of understand that history and understand their unique needs to understand better where we need to start when we're working with them. So as part of the fitting for the Ultra Power products, we have these three Ultra Power presets that are called classic, conventional, and current. And these presets, they represent different amounts of signal processing based on clinical research and field trial validation. So I said there's a three: the classic, conventional, and current. Now the classic preset is the one that's.

.. This suitable for users who are used to kind of an... Shall we say, a time honored approach to amplification. Kind of like an older... Like they were used to the linear analog Ultra Power devices. So with the classic preset, these are great individuals that tend to prefer minimal or no signal processing, little or no directionality, where they're just kind of looking for just general awareness of everything going on in their environment. On the other end of the continuum, the current preset. This current preset, it employs all of the latest signal processing features including our binaural directional microphone features. So this current preset is able to leverage all of the

capability of the Vivante platform just at greater gain and output levels for users with a more severe hearing loss.

This option is popular maybe for individuals who maybe they first were fit with... When they were first fit with hearing aids, they were digital hearing aids rather than analog. So maybe younger users in their thirties or forties that have been wearing digital hearing aids for a long time where they are accustomed to that advanced signal processing and can leverage that capability. And then the third choice in the middle there is the conventional preset. And this is gonna be for your folks that maybe are... They appreciate some signal processing and maybe some directionality but not the maximum strength settings that we would provide in the current preset. Now when we look at the data from past Ultra Power products, we can see that the current preset is overwhelmingly the most commonly used of the presets.

When we look at the data analytics from past fittings of the product, we see that the current preset is actually used about 87% of the time. And then the conventional and classic presets kind of make up the difference of about 7% and 6% each. So I think the majority of patients will prefer having some of that signal processing of the current preset, but there are still going to be those individuals that that's not what they're accustomed to. They don't particularly like it. And so we have an option that you can very quickly and easily preset the hearing instrument kind of based on what their past needs and preferences might be. When you're in the fitting software, when you're doing a new fitting, right within the first fit workflow for your Ultra Power clients, so when you're doing the first fit of the Stride V-UP, it presents you with the option where you can choose which of the presets you want.

It will default to current but you have the option to select either conventional or classic if desired. Now maybe it's after the initial fitting, you can go back and you can change this preset at any point in the process. At any point in the fitting you can go back into

the pre-fitting screen in TrueFit. And then when you go into the pre-fitting, you'll see the option for the Ultra Power presets as we show here on screen. And if you were to hover over that little eyeglass in the bottom right corner of the window, it would show you the popup here where it actually gives you some greater detail about what exactly is being adjusted for the different signal processing features based on each of the presets.

So you can see that if we go with the classic preset here, it uses DSL adult as the fitting formula. Just a straight up omnidirectional microphone. So, not using any kind of directionality at all with no noise reduction, but using actually a little bit more speech enhancement than what our normal defaults would be to try to optimize the audibility of speech signals for these users. And on the other end of the continuum, if we go with current where I said it's going to use all of the adaptive features that we would for less severe hearing losses, it uses our default NAL-NL2 fitting formula with wide dynamic range compression and the default amounts of noise reduction and speech enhancement and everything that we would use for any other fitting as well.

So, you have the option. You can make that determination right when you're doing the initial fit. Or if you need to change it later down the road, you can. As you see there's a question here from Gonzalo. He's from Chile. Well, thank you for joining. Are there any differences in Ultra Power settings between Blu and Vivante? So Gonzalo, that's actually a good question. The default presets have actually stayed the same. So they're consistent from... If you've been using the Stride B-UP, the defaults in these presets are comparable in the Stride V version. Okay, good question though. All right, so I think that's what we got there. All right, and I know sometimes there's that question of how do you figure out which preset to use.

And we do have a little five-question questionnaire form that you can use with a patient to kind of... It helps give you a little bit of sense about kind of their listening preferences or needs. And you know, the questions... Depending on your screen whether you can

read it or not, some of the questions say like, "When having a conversation in a quiet place, I prefer the speech to be loud and full or do I prefer it to be clear and distinct?" And then the second question says, "When having a conversation in noisy place, I prefer to hear a realistic balance of speech and noise or I prefer to hear clear speech and less background noise.

" So, there's five questions like this. You can use this with a client, kind of get a sense of kind of what their preferences are. And then based on how they answer them, this can help give you a suggestion about whether to start with the conventional, the classic, or the current presets. All right. Now of course, being a Unitron product, obviously we cannot forget about our unique experience innovations. So all of these tools, FLEX:TRIAL, Log It All, Ratings, remote programming with the remote adjust feature, coach notification to the app, all of these features, they have become an integral part of Unitron's ecosystem. They're not our focus for today's presentation, but I just wanna acknowledge that these are all here and they are all of course compatible with the new Stride V-UP.

All right, so here we move on. So because the Stride V-UP is powered by Vivante, it has our best sound performance yet. So no matter where your clients are, the hearing instruments are automatically gonna adjust to their surroundings. The engine that's driving this automatic performance is our automatic program, Integra OS. And so Integra OS determines what kind of sound environment the clients are in and then it's gonna automatically adjust accordingly. You know, if they're in a lower complexity, kind of these quieter one-on-one conversations, lower levels of background noise, good signal to noise ratio, we're going to apply the features that are most appropriate for providing good audibility and awareness in people's environments. If they are in a more complex situation, higher levels of background noise, poor signal to noise ratio, then we're going to start using the more advanced directional microphone feed.

.. You know, the binaural communication between the hearing aids to kinda leverage some of that new and improved directional microphone technology. So Integra OS is really the engine that drives all of this. When sounds enter the hearing instruments, Integra OS is analyzing the signal and classifying them into a range of different listening environments from very quiet to loud noisy situations. And then it's gonna optimize the listening experience for each specific situation that the patient is in. Six of the eight environments in Vivante have the ability to blend with each other. Those six environments that you see shown here kind of in the blue frame, those have the ability to be blended with each other in one of thousands of different combinations.

With Vivante then, there are two environments that are unblended and they activate in specific situations when appropriate. The first of which is the music environment. You know, kind of shown down here in yellow. This one has been available for a number of years. The music environment, it's different from the others because it never blends with the rest of the environments. Because we know that music has some fairly unique characteristics. It may or may not have lyrics or other speech components to it and it can vary quite a bit in complexity. So music is always treated as a separate standalone environment. And now the new eighth environment in the automatic program with Vivante is this conversation in loud noise.

So, when we're in face-to-face conversation when certain other criteria are met. We'll talk in a bit more detail about that in a moment. This is when the automatic program will fully activate and it will engage the hyper focus directional microphones which are the most aggressive directional microphone technology that we have in the Unitron portfolio. Again, I'll talk about this in a bit more detail here in a moment. So it's all driven from the automatic program because we know that an ongoing focus in hearing instrument technology is related to automation. You know, many clients, they're very keen to have the hearing instruments to do the heavy lifting. They wanna be able to put the hearing aids on and not have to think about it.

And really, over the last 10 years I would say, automatic program performance, really it has advanced to a point that I think even a lot of power users really prefer to stay in the automatic program. And given that with Vivante, it can quickly analyze the environment and adjust to that. I think it makes sense. However, we do need to keep in mind that individuals with a severe to profound loss, they do tend to want to have more control over how the hearing aids are working throughout the day. When we look at the data from the Ultra Power BTE on the Blu platform, one of the other things that we saw was that the Stride Blu Ultra Power users, they're actually almost twice as likely to use manual programs when we compare them to users of other form factors.

You know, with milder degrees of hearing loss. So we know there is a heavier reliance on manual programs in this population. And with Stride V-UP, users have a variety of ways that they can access these manual programs. They can use the push button on the hearing aid itself. You know, for an onboard control, so they don't have to have anything else with them. They have the ability to just use the simple remote control to turn the volume up or down and change programs. Or if you have users that prefer a bit more control, they also can benefit from the Remote Plus app. So all of these options are there and I think our recent redesign for the app makes it an even more intuitive and easy to use tool for users.

Okay. So just to kind of quickly touch on the app itself, there was a recent update back at the beginning of the year to make the interface more intuitive and easier for patients to access the different functionality. They have the ability to easily navigate through the program options, create their own programs. They can make in the moment ratings. They can apply remote adjustments. There are helpful coach notifications that are presented through the app. All of this is accessible to them. I think one of the biggest changes that came in the update to the app was incorporating the ability for clients to see their own log at all data on the lifestyle tab. So right within the app, they have

access to be able to better understand how their technology level is meeting their listening needs in different situations.

And with the app, we talk a lot about the user's ability to customize their listening experience. So within the different manual programs, they have the ability to customize the frequency response or adjust some of their adaptive features. And that ability to customize, that extends to even when using other accessories like the TV connector or any Roger microphone. For example, like in the slide that we see here, if the client was using the Roger microphone and in the app they would see this Roger tile and it gives them the ability to adjust the balance of the Roger microphone and the hearing instrument microphones. So in a particular noisy situation, they can put more emphasis on focusing on the conversation coming from the hearing aid microphone.

So they can put it more towards the microphone. If they wanna be able to hear more of what's going on around them, they can slide it more towards surroundings. And we have that same... So we have that flexibility with the Roger mic. We have it with the partner microphone. Also with the TV connector. So we have lots of ability for the users to adjust things in a manner that they prefer in any particular moment. And of course, we cannot forget about Bluetooth connectivity. Here at Unitron, we have had made-for-all wireless connectivity for quite a while now since back in 2018. But this remains a major factor for clients and it can be particularly impactful for those with severe to profound loss who wanna be able to leverage that direct wireless capability.

And with our made-for-all connectivity, it's a huge benefit for you as a clinician that you don't... In addition, to all the specific listening needs of the user, you don't also have to think about what type of phone do they have. So whether it's an iPhone, an Android, a flip phone, as long as it has a compatible Bluetooth profile, it's able to be connected to our hearing aids. So they can make hands free phone calls, they can stream music, podcasts, any other media sources directly into the hearing aids. One of the other

things I think kind of building with the Blu and the Vivante platforms is that not only do you have the ability to pair to eight different Bluetooth devices, you can be simultaneously connected to two different devices at the same time.

So we get all the convenience of that universal made-for-all connectivity but made even better by being able to connect to two devices at the same time. So as I've kind of said earlier, Stride V-UP, it has everything that Vivante has to offer including some great automatic performance, manual programs, control options for those manual programs, access through the app, and the made-for-all connectivity. From here, I wanna move on and talk a little bit about some of the features and options that are in particular relevance for importance for individuals with severe to profound hearing loss. And we're gonna start out just kind of recognizing that... You know, when we look at research, that estimates that there are around.

.. It's estimated 87 million individuals globally with severe to profound hearing loss. And if you've been working clinically for any period of time, recognize that this population, they tend to have a fairly complex set of communication and listening needs, you know? And so they tend to become very dependent on their instruments and accustomed to a particular sound quality like talked about before. But often, a top complaint for these individuals is difficulty hearing in background noise like almost any other hearing aid user. So we wanna try to address these needs for providing better hearing in background noise, but we also have to provide tools that are tailored to meet their more unique challenging needs to make those complex environments more manageable.

And so within this, this becomes important because we know for individuals that cognitive resources, they're not unlimited. And that's especially true for individuals with hearing loss. So we have to try to make the best use we can of the tools we have available. Because we know that when people are in a very busy or a challenging

acoustic listening environment, something has to give. It usually ends up with the hearing aid users feeling more fatigued than typical hearing peers in those types of circumstances. Because we don't know the cognitive load of participating in conversations with multiple speakers or in high levels of noise, it can be a lot. And so from there, even if we just look at this picture here on screen, it doesn't take a whole lot of imagination to think about how challenging this acoustic environment could be for somebody with a severe to profound hearing loss.

Not only are there multiple speakers, but the location acoustics, the reverberation of sound is all gonna kind of exacerbate the difficulty of the moment. And it's not just a one-on-one conversation but just being in that level of noise, we know that individuals who struggle to hear and understand others, it becomes associated with a wide range of other negative emotions. Depression, anxiety, sadness, anger, all of these things that are all attributable to that listening related fatigue. But because there isn't yet a gold standard for objectively measuring listening fatigue, it's crucial that we need to work with these clients to really ensure that they're getting the attention that they need and that we've used the tools that we have to get them into the conversation as best possible in a way that they can also accept the sound quality.

So when we think about the tools that we have and how we try to help manage the listening effort for these users, we can start by taking a deeper look at our directional microphone options. And the image that I've got here on screen, this is one of the PDFs that's available as a resource. It's this guidelines from the UK from back in 2020. You know, the best guidelines or best practice in the audiological management of adults with severe and profound hearing loss. A little light bedtime reading for you but it really is the kinda the most up-to-date report of its kind and it really does have some great insider details, if you will, about how to best help clients with these severe to profound losses with the currently available technology.

The article itself kind of talks about guidance for assessment as well as technology selection including the use of directional microphones. So, a little added resource for you there in the resources tab. So, we know that directional microphones are gonna be of help. So just to talk a little bit about the AutoFocus 360. You know that most Ultra Power wearers do appreciate the more sophisticated automatic directionality. 'Cause again, if I think about what I mentioned earlier that when we look at the Ultra Power fittings on the Blu platform, 87% of those fittings used the current preset which as part of that current preset would use the AutoFocus 360 directional microphone. So that involves highly complex listening environments that AutoFocus 360 can automatically detect where is the speech coming from.

You know, from the front, left, right, or behind. And then automatically steer the directional beam in the identified direction. Now if you have the instance where you have an Ultra Power user that if they don't prefer this engaging automatically, you can disable it and kind of remove it from the automatic program, but still give them access and the ability to use it in a manual program so that again they have that option for the control of using it when and where they feel that it's helpful. And of course, then if you do that through a manual program, they would have the ability to do further customization of it through the app. Now in those environments where the noise levels really increase enough to the point where the automatic program will engage the conversation in loud noise environment, that's when HyperFocus engages and it applies a more highly focused beam of directionality in front of the user.

Now because the Ultra Power is a battery-powered instrument and it doesn't have that triaxial accelerometer or it doesn't have that motion sensor in it, in the Stride V-UP, there are two requirements in a particular environment in order for the hearing aids to use this narrow beam directionality. The first thing is that it has to be a face-to-face conversation. Meaning, that speech has to be coming from in front of the user. And then the second part of it is that it has to be a loud enough level of noise and poor

enough signals noise ratio that the hearing aid recognizes, "Okay, we need to do everything we can to get every last bit of improvement in the signals noise ratio.

" So the activation of this feature, it's not an abrupt change 'cause we know that for individuals if we make that change too abruptly, it can become distracting. So once it engages in the automatic program, HyperFocus will gradually and smoothly engage over roughly about an eight to ten-second period. I think that's important to keep in mind for users in this category 'cause those abrupt changes in what you're listening to can be particularly distracting because any little change in audibility when you've got a small residual dynamic range is incredibly noticeable. So again, also just like what I mentioned with AutoFocus 360, with HyperFocus, it is possible if the patient prefers that they... You can disable it as part of the automatic program and still make it accessible for them to use in a manual program either with the button or the remote control or the app so they can access it when and where and how they want to.

So this narrow beam directionality, as I mentioned, it is part of the automatic program in the nine-level instrument. It can also be set up to use as a manual program. It is also available to use in the seven-level instrument as a manual program. So you do have the ability... You know, you don't necessarily have to go to the premium high-end instrument to access this great narrow beam directional mic technology. You can do it in the seven-level for a user in a manual program. So then they can use it kind of in those moments where they need that extra help and they've got control of that situation. Okay. So if you are interested.

.. Again, in the resources that were made available for our presentation today, there is another white paper that kind of discusses in greater detail the AutoFocus 360 and HyperFocus directional microphone technology. So that's there an available as a resource for you if desired. All right, now from here we'll go ahead and we're gonna take a little bit of time to look at the Frequency Compression 2 feature. Because along

with that, just the feature and its relevance for this population, what it's for, how we verify it, things like that. We tend to focus a lot on advanced signal processing and functions like directionality, noise reduction, et cetera. We tend to focus on these features to help clients hear and understand better in all kinds of different listening situations.

But we can't forget there is a fundamental concept in audiology that's important we need to remember is that audibility precedes intelligibility. Meaning that we can't... All of these advanced features don't do us any good if the user's not able to first detect the sounds. I mean, in that concept, that's true of all degrees of hearing loss but it does have particular relevance for users in the severe to profound hearing loss segment. Going back as far back as 1982, Erber introduced this auditory hierarchy which is kinda what you see here on screen which kind of ex... You know, it expands this concept into four different steps or levels from detection to discrimination to identification, comprehension. This model or this hierarchy is often used in the context of pediatric fitting and pediatric rehabilitation, but it really does apply to users of any age.

You know, for individuals with severe to profound hearing loss, we wanna try to... You know, it's not always possible to make the full range of speech and other detectable sounds. It's not always possible to make them audible for the user just using a traditional amplification alone. Particularly or typically I guess I would say in higher frequencies where there might be cochlear dead regions, inadequate residual hearing, or you've got just such a narrow dynamic range that the high levels of amplification that you would need to provide audibility are not tolerable because of the reduced dynamic range. So in those types of situations, so with these individuals with severe to profound loss, this is why frequency lowering has become a proven and widely used approach for improving audibility no higher frequency sounds.

You know, to at least provide the additional potential for improving the intelligibility. 'Cause again, if we can't make those sounds audible, features aren't gonna do us any good. And so Frequency Compression 2, this is the frequency lowering algorithm that we use to provide access to those speech sounds that may occur outside of an individual's audible range. You know, so depending on their level of hearing loss, being able to take those sounds that are inaudible and moving in providing access to them. We have used frequency-lowering frequency compression as far back as in our Max product on our Era platform and then on our Tempus platform. So this is not something that's new in our hearing aid, it's been around for a while.

So some of you are probably fairly familiar with this. With the newer version of Frequency Compression 2, we have a lower cutoff frequency. So we can enable frequency compression to frequencies as low as 800 hertz. So this really becomes more relevant for individuals who have severe ski-slope losses, left-corner audiograms, severe flat losses. Frequency Compression 2, it is available in all of our products and it can have relevance for all kinds of different audiogram configurations. But for Unitron products, it's turned on by default only for our Ultra Power instruments. This hasn't changed with Vivante. This is how it was in Blu and in the Max product on the Tempus platform. So using that just in the Ultra Power products, that's not new for us.

I wanna take a few minutes because it is of particular relevance for this product carry... Product category rather, and for this client population. So I wanna just kind of take a couple minutes, refresh everybody kind of level set on some of the basics of how this feature works. Now if we start here with this familiar sound audiogram, this is a commonly used counseling tool that shows both environmental and speech sounds at, I'm gonna say, approximate frequency and loudness levels. So these are the speech sounds here that we're gonna pay a particular attention to in this explanation. So the Ling Six speech sounds that span the speech banana. Say that fast. So we know that speech sounds, of course, they're not pure tones.

They're comprised of different pitches and they have more or less spread across different frequencies depending on the speaker and things like that. But for purposes of the illustration, the sounds are being presented at one frequency on each audiogram, okay? So we have the M. The /m/ as in from man, /o/ for shoe, /a/ from operate, /e/ as in beep, /s/ as in stop, and /sh/ for shoot. So those are the six sounds that we talked about as the Ling Six speech sounds. Now the horizontal bar here at the bottom of the screen, it shows those six speech sounds spread out across the frequency range and this bar represents the full audibility for all six speech sounds for somebody with normal hearing.

Now these rectangles and bars at the bottom here that we're using, these are... The idea of using these rectangles to represent this with the audiogram, this is adapted from a poster presentation back in 2016 by Bisgaard et al. But we're using here in this presentation because it works particularly well for when we're talking about the concepts of frequency compression. So if we got this... The first gray bar here kind of again representing where the six sounds would be fully audible for somebody with normal hearing. In comparison to that, now the second bar that appears here, this illustrates what would happen or the consequences of somebody with no usable hearing above 3,000 hertz. You know, the hashed area represents the inaudible portion of the spectrum.

And so this is really the purpose of frequency compression is to restore the audibility for these sounds for people that would otherwise not be able to hear them, whether it's the severity of the loss, limits of the hearing instrument or what have you. All right. So it kind of take that bars that we're using on the last slide. We know that Frequency Compression 2 is dynamic and it's what we call input dependent. Meaning that it's gonna be able to adjust the amount of frequency compression that's applied based on the type of signal that's coming into the hearing aid. So if we kind of again start from

that last bar that was on the previous slide, we can see here that with no usable hearing above 3000 hertz that the /sh/ and /s/ sounds would be inaudible for somebody with that type of loss.

And so frequency compression is applied to take that high frequency stimulus and move it. So using this graph, it would look something like this where the sounds that were previously out of range of the prescription are now moved down into an audible range. You know, that upper... The first or cutoff frequency or CT 1, that we can set down as low... That's the cutoff frequency that we can set as low as 800 hertz to help accommodate more profound or corner audiograms. So it really means that we're able to provide more high frequency information to more people. However, if we just left it there with that one cutoff frequency, you would notice that yes, we made the /sh/ and the /s/ sounds more audible but we also ended up.

.. We moved the /e/ kind of down closer. So even though it was within the audible range, we altered the presence of that vowel sound as well. And this is where that second adaptive cutoff comes with Frequency Compression 2. If we have an input stimulus that's lower in frequency like a vowel, we can adjust the settings of frequency compression so that it's applied differently, that we're not applying it across the same frequency region which allows us to preserve the quality and the distinction of the vowel sounds. Now that ability to switch between the two different cutoffs depending on the type of signal coming into the hearing aid, we can do that very quickly, kind of instantaneously. As the signal is coming into the hearing aid, we can map it based on whether it's a vowel sound or a consonant sound.

So when we look at this, there's... When you're looking at this in TrueFit, this first... Let me get my mouse here. That vertical-horizontal line represents the lower cutoff or CT 1. The dashed vertical line... Where is my mouse? Oh, here it is. The dashed vertical line represents that higher cutoff, CT 2. So if the incoming signal is a consonant or higher

frequency sound, the entire frequency response above that vertical line or to the right of the vertical line, if it's a consonant sound, everything to the right of the vertical line, the solid line, would be compressed down into the blue-shaded region. And we can control that... We're using that audibility or distinction slider to control how far down we need to bring that signal.

Then if the incoming signal is a vowel, then it would only apply frequency compression above the dashed line. So it's gonna take anything to the right of the dashed line and compress it down into the blue shaded region. So, let's see. I know I see there's a question here. Are the frequencies specified on spec sheet representing frequencies captured or output? Did you specify it on a spec sheet? No, I think what you're talking about there is the... Like when you look on a data sheet and it shows like the frequency bandwidth. I think that's what you're talking about where it might say from like 50 hertz up to 8,000 or 200 hertz to 9,000. I think that's what you're referring to there.

And what those numbers are referring to is the output of the receiver, not what the incoming signals gave. It's the measured output of the device. I think that's what you're asking. If it wasn't... Go ahead and put another clarification in the Q and A and we'll kind of try to take it from there. Okay, that was it. All right, great. All right, glad we got the question there. All right, pull this out of the way. Okay. So... All right, I think I said everything there. I'm kind of lost. All right, carrying on. So with Frequency Compression 2, given the fact that at Unitron we use industry standard fitting formulas, either NAL-NL2 or DSL version five for adults are the default fitting formula.

NL2 is our default that you can choose between either of those industry standard formulas. In general terms, that makes object real-ear verification that our hearing aid fittings fairly straightforward and it also then makes the verification of Frequency Compression 2 fairly straightforward. Let's see here. I know when we tend to think about doing real-ear verification, we're usually thinking about verifying just our

audibility and our matched target, but we can also use real-ear verification to document or demonstrate that these features like Frequency Compression 2 are working and they're delivering the benefit that you expect them to, right? And of course, it's always about trying to strike that happy medium of providing the audibility and the clarity, the intelligibility, but at the same time not sacrificing their own personal comfort or preference in sound quality.

So what we've got here are a couple of slides just to kind of talk about how you would verify Frequency Compression 2 with your real-ear equipment. Now the examples that I have here are all going to be done using the Audioscan Verifit system. But I know that a lot of different real-ear equipment also have the stimulus available that you can use to verify frequency compression. So we'll kind of walk through everything. But depending on your real-ear equipment, you might go about getting to it slightly differently. But the concept of what we're gonna do is gonna be the same. First thing, we just start in the beginning when you're doing your... If you're going to verify your frequency compression settings, you obviously first have to start by your basic verification of match to target.

And so it is important to remember though because for these Ultra Power fittings that because we do turn on Frequency Compression 2 by default, when you're doing your basic real-ear match for the target that you would wanna make sure that Frequency Compression 2 is turned off while you're doing that initial matching target because otherwise you have the potential that it's not gonna look like it's meeting target, right? So first things first, when you're gonna do your initial match to verify that you're matching target, make sure Frequency Compression 2 was turned off. Other thing to keep in mind is that by default the fitting software will calculate the frequency compression values symmetrically for both ears. If you have somebody that has a markedly asymmetric hearing loss, you have the option and may want to consider going in and switching it so that you can calculate the frequency compression settings

differently for each ear if they have a markedly different asymmetry between the two ears.

So when we talk about the verification of Frequency Compression 2, a couple of key terms just to kind of keep in mind here. First is... As I'm looking at this next couple slides, again we're gonna talk about the good old LTASS, long-term average speech spectrum. So this kind of shows us a representation of the spectral distribution of speech over time. And then secondly is this concept of MAOF, maximum audible output frequency. And so what this is really getting at is this range of frequencies between where the... And actually I'm just gonna put in another little image. So I just kinda put that little orange line to highlight what we're talking about here. This MAOF, maximum audible output frequency, it's that range of frequencies between where the average speech signal, so the solid green line, and the peaks, the green shading above it, where they cross, where they intersect with the audiogram, the most higher frequencies.

So those two concepts that we're gonna kind of need to have established when we talk about the actual verification, okay? Now, so the first thing... Once you've done your match, your real-ear verification with frequency compression turned off and you can see here that we are not achieving audibility for the high frequency sounds without frequency compression, then we can go ahead. So in this case, now we're specifically gonna look at the Frequency Compression 2 feature. And instead of using our live recorded speech signals, we're gonna switch and use a specific stimulus. So it's just that sound and we present that into the hearing aid. And so what we're looking at here, we can see the long-term average speech spectrum, the kind of that area of green shading above the solid green line representing kind of the peaks of speech.

And again, then we're gonna see that MAOF range, kind of right up here where the average and peak sounds are crossing over the audiogram thresholds. So with

frequency compression disabled, when we use the that /s/ stimulus we can see that the... We can see where the sound falls and we can see that it's kind of outside of that minimal audible output frequency range. So, that kind of confirms for us that the /s/ signal without frequency compression is not audible for this user. Then you go ahead turn frequency compression on, you run that same stimulus again. And then using the sliders in TrueFit, this is just a little screenshot from TrueFit, you can adjust that top slider.

And what we're trying to do is find the weakest setting where the client gets the benefit of the feature. And by benefit of the feature, what we're referring to is where the upper shoulder. And when we talk about upper shoulder, we're talking about where that speech signal where it just starts to kind of... You know, from the peak starts to slope down. We wanna get that upper shoulder as close as we can to the upper end of that MAOF range, okay? So in this case now, when we... You know, at this measured setting shown here with the slider at 18, we can verify and show that we're making the sound audible. Kind of an interesting thing to note here is that if we had used the default setting that the software would've calculated, we actually would have been applying more frequency compression than what we really needed in this scenario, okay?

So this is the way that we just first verify that the signal is audible. And then the next piece of it is making sure can the user discriminate between the /s/ and the /sh/. So now we switch stimulus and we use the the second stimulus, the /sh/, and measure that curve. And that's what's shown here with the teal line. And what we're looking for in that case is in the lower shoulder, so kind of the slope of the line here, the difference between those two. For the lower shoulder, you want to see a minimum of a 1/3 octave differentiation. So as long as you see greater... You know, a 1/3 octave or greater, that's an objective verification that you've got enough distinction between the signals that they should be distinctly audible for the listener.

Okay? So I know we're coming right up here at the top of the hour. So just in closing on this, a couple of things just to keep in mind around frequency compression verification. First of all, is the client hearing well without the use of frequency lowering? If they seem to be doing well and they're recording good sound quality without the feature on and they seem to be... they feel that they're hearing all the sounds, the /s/ and the /sh/ sounds, then maybe we don't even need to use frequency compression. Maybe it's not suitable for this individual. If they're... You know, if you do your veri... If you turn feature on, you adjust it, if you're using verification, fantastic.

But maybe you show all... You know, you get all of this measurement and the client doesn't like the sound of it. It's not unreasonable to think about that the client needing an adaptation period to the frequency compression just like any other new user needs an adaptation to amplification. So you can... You know, even though you know what value creates benefit for the patient, if you have to back it off and give a milder setting and let them acclimate into it, that's okay too. With really the concept, kind of you want to try to use the weakest setting possible where the client is gonna get benefit and the most natural sound quality possible. Okay? And so I know we kind of hit here right at the top of the hour.

I wanna thank you all for your time and attention. I'm happy to stay online for a few minutes and address any questions that anyone might have. But otherwise, thank you for your time. Have yourselves a great day. And that kind of wraps it up for now. Remember that if you do want CEUs for the course, go back into your pending courses, take and complete the quiz, and that will earn you your CEU credit. So, thank you for your time. Everybody, have yourselves a great day. Stay warm, stay safe out there. It's 24 degrees and snowing here in Minneapolis. So, have a great day.