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ReSound Nexia: Welcome to the Next Era of Hearing

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- My watch says that it is at the top of the hour, so I want to welcome you to this presentation and to welcome you to the next era of hearing. My name is Tammara Stender, I work in Chicago for ReSound, and we are really excited to introduce a brand new product line from ReSound that has some pretty amazing future-proof features and benefits for you as an HCP, as an audiologist, and for your patients most of all. So thank you so much for joining me today and let's just go ahead. So what do we mean by next era hearing? Every time a manufacture comes out, we talk about, "Oh, this feature is new, that feature is new," but to really make a statement of next era hearing, we really have to take our technology to the next level. So that is what I'm hoping to portray to you today, the benefits and advantages of this new technology, both for you and for your patients. The learning objectives today will be to be able to list three main advancements of the ReSound Nexia, be able to describe the change to first time user settings, and define how ReSound directionality supports a natural hearing experience for the user. We are also going to be touching lightly on CROS and BiCROS fittings.

As you may have guessed, this is one of the headlines for the ReSound Nexia. And so you may be very familiar with CROS and BiCROS fittings, but just in case you're not, we're going to be talking a little bit about how to fit which one or the other for your patients. And then finally, we're going to be talking about Bluetooth Low Energy Audio and Auracast and the opportunities that are opening up on a daily basis because of this brand new technology. But before we go into all of the bits and features, because that's not what we're here about today, we are here about trying to make sure that our patients are getting help for the number one challenge that they face. And of course, it comes to no surprise to any one of us here that hearing well in noise is still the biggest challenge we face despite the fact that we always remain focused on it. So what do we mean by that? So let's look at some of the research here. Hearing conversations in noise is the main reason for purchasing hearing aids, especially for new users. It's usually what drives them into our offices to finally get help. They might have noticed hearing problems for 7, 10, maybe even more years before, but it typically is one big event that causes them to say, "You know what? I think I might need some help." And typically that event is when they are surrounded by loved ones, by friends, in a situation where they wish they could have done better and they did not. And that's typically the point where they start to seek solutions. While hearing in noise is the number one driver of hearing aid pursuance and satisfaction, it is a paradox that it is also the biggest unmet need for current users. So while we have made tremendous strides over the last 20 years, especially in directionality, in noise

reduction, it is still something that we are striving to improve because we haven't reached perfection yet. And we know even normal hearing users have troubles hearing the noise sometimes, so reaching perfection might be a lofty goal, but we still want to continue our journey to create this better hearing experience for people wearing hearing aids since it is the number one driver of their satisfaction and the place that we still need to focus. Nearly one in three hearing aid users are unsatisfied with their ability to hear conversations in noise, and this is pretty startling and upsetting because this just came out of MarkeTrak in 2022. So as you can see, we as a profession, we have some ways to go, and Nexia takes one more step in that direction for hearing in noise. ReSound Nexia is a brand new hearing aid line. It features three receiver in the ear products, and it comes in a new microRIE model. It is still powered by Organic Hearing, the concept that we use in ReSound OMNIA, so if you are familiar with ReSound OMNIA, good news is that the Nexia carries over that Organic Hearing concept, the directionality that gives people the ability to focus on what they need to focus on in really difficult situations while not cutting themselves away from their auditory environment. But now it comes in a smaller device than ever.

The microRIE in the ReSound Nexia line is the smallest RIE that we have ever put forth, and it is industry leading in its size. We'll talk about why that is so important, but it doesn't take probably a lot of thought to figure out why. When you are introducing the hearing aid options for your patient in a clinic, maybe you show them this one, that one, et cetera, you're showing them on the table, in the hand. And what is the one that they usually choose? The one that has the most power for their needs, but is also the most small, the smallest, the most discreet, the most invisible, et cetera. So having a microRIE is really important to have people accept wearing hearing aids, to continue to want wearing hearing aids, and to get the kind of benefits that we know that they can get from amplification. But that's not the only thing in ReSound Nexia. We are finally introducing a CROS/BiCROS model, and I am really excited about this because this is something that ReSound has not had in our portfolio, and we now bring to our portfolio. So if you are used to fitting ReSound for people that come into your clinics that need bilateral fittings or monaural fittings, but then you get someone who has an audiogram like this where you need to fit them with a CROS, in this example, you can stay with the ReSound technology and fit them with the same Organic Hearing concept that you would for your users who wear bilateral hearing aids. So we're super excited about that. Thirdly, we have a new setting for first time users, and it is called First Time User Onboarding. It is a milder, gentler,

kinder way of getting that new user who might be pretty skittish about amplification over that initial hump so that they can start to acclimate and get real benefit out of their hearing aids. Fourth, we have unmatched directionality, and this is what we are bringing over from ReSound OMNIA. We've put a ton of development into the 360 All-Around directional option, and we are bringing that forth with Nexia, but I'd like to share today a little more research that we have been able to do to further cement why we believe that this directionality is unmatched and the best that it can be in the industry at this time. Finally, I'm going to be talking about the future of connectivity, and specifically Bluetooth Low Energy Audio. Bluetooth Low Energy Audio is a standardized protocol that has been brought forth by the Bluetooth Special Interest Group. It is not developed by hearing aid manufacturers. Instead, it is developed as part of a new protocol, a new way of streaming and connecting to all kinds of devices. And today we introduce that in ReSound Nexia to provide these benefits that will be ubiquitous as time goes on and are already hitting the market today. So let's start talking about the first point here, the microRIE. Why does it matter?

Well, we all can agree discretion and style matters for everyone. Discreetness, appearance, and fit in the ears are the top three things that are mentioned when users explore hearing aid options. 30% of users consider discreetness as the most important perceptual aspect of how they are going to wear this technology. So despite the fact that they're being brought in to have help in a situation where they need to hear better, it's gotta look good, right? And we agree too. We all want the same thing. Interestingly, the most searched combination online by people seeking hearing solutions is invisible hearing aids. And, you know, we do have as an industry CICs and IICs, but we all know that those don't fit each and every one of our users either for the morphology of their ears or the needs of their hearing loss. So invisible hearing aids is what people want. How do we bring that to them if they aren't a candidate to an IIC, if they need something else? Well, to answer these questions and to try to make advances in these areas, we went back to the drawing board, so to speak, and we came up with how do we make the receiver in the ear, which is of course the best selling model across the world, smaller and more efficient? So the microRIE is 16% smaller than the miniRIE that we launched earlier in 2023. So the ReSound OMNIA miniRIE, we're 16% smaller than that. If you wanna compare to a standard RIE, we're 25% smaller than a standard RIE. So this is a small hearing aid and you will definitely notice, and the users will notice, the size difference and also the shape difference of this new device. I personally love the game of Tetris. I get quite addicted to

it. And so I'm really thrilled to talk about how Tetris has a relation to our new microRIE. So when you are trying to make an RIE, which albeit doesn't have a whole lot of real estate inside of that shell to begin with, when you're trying to make it 16% smaller than the miniRIE that we had, we find ourselves in this crazy game of Tetris trying to find ways to pack the components more nicely, more tightly, but yet more shielded from each other so that the efficiency works and the technology works as it's supposed to. So we rearranged the internal components and we folded components that could be folded, such as antennas, in new ways and optimized the distance and location of components. So what do we mean by optimizing the distance and location?

Well, when you put certain components right next to each other like a receiver connection to other components, there might be some mechanical vibration that happens as that sound is being processed. We don't want that because that could translate into problems like feedback for the user. So keeping in mind that certain components have certain needs and you just can't smush 'em all in there willy-nilly, we had to find a way to make all of these components, including a brand new accelerometer, fit into the shell. We also looked at the microphone ports because if you have a very small device and people want it to be invisible, we don't want them to end up with the microphone ports, which should be more or less horizontal for the best directional benefit, to be somehow 50 degrees pointing towards the sky because we know that they won't get the correct directional benefits that they need if those microphone ports are not more or less horizontal. So we minimize the size requirements of the microphone components and the position of them so that when they are worn on the ear, they are going to create a much more reliable horizontal orientation to get people the kind of directional benefit that they are seeking and that we claim for these devices. While at the same time we're optimizing and rearranging, we're also keeping the same lithium ion battery. This is a rechargeable device, lithium ion. It uses induction to charge, so you won't see any metal contacts on this device for charging. We are using the same battery so that we can get the same battery life. With lithium ion battery technology, of course you get longer battery life if you get larger batteries, and the converse is true also. The smaller the battery, the shorter the life. So we wanted to maintain the 24 hours of battery life that includes 12 hours of streaming with the ReSound Nexia, so we kept the same battery so we could get the same battery life that users of OMNIA are used to. And finally, we challenged the body design. We made it more organic, if you will, taking away some of those sharper edges, making it easier and a more

comfortable fit on the ear. So when you put it on the ear, this is how it is actually going to be oriented. You can see that there is a nice orientation of the microphone ports on the top, or maybe you can't see because it seems to be quite invisible behind this person's pinna. But in addition, we're lowering the center of gravity. And what this does is it creates more stability and comfort all day long so that the device is not flipping around, especially if there's more space between the user's head and their pinna. We also ensured, even though we have a lower center of gravity, that the horizontal position of the top mics are better arranged so that you get better directional performance than what we would like to have when we tell you about how great it is in directionality. And for that reason, we have been able to get the same claim in hearing in noise as we did with ReSound OMNIA. So the nice thing about it, and I know I'm an audiologist and I fit hearing aids, and every time a new company came out with hearing aids when I was fitting in the clinic, I was like, "Oh no, I'm gonna have to learn a brand new scheme." Well, good news to everyone. It is the same high performing scheme for directionality as it was in ReSound OMNIA as it is in ReSound Nexia.

So you can expect the same great benefits, the same all-in-one directional option with Nexia. You also have the option to fit with a M&RIE receiver, and the M&RIE receiver is a special receiver that has a microphone right on the receiver that goes into the ear canal. And this is an option. It's not necessarily something you have to fit with every user. But if the user is a candidate for M&RIE, it offers some pretty unique benefits. Number one, if they have the microphone in the receiver for the M&RIE, they're going to be much more shielded from wind noise because it's just like having a custom device with that microphone right into the ear canal. You're much more shielded from wind noise. You also get some great localization benefits, some great benefits for your own voice. That is an option with ReSound Nexia just as it was with ReSound OMNIA. The same battery and processing power is used in ReSound Nexia as it was in OMNIA, which is great because we can expect the same great performance as we did before. And at the same time that these are the same, we are 25% smaller than a standard RIE, we added an accelerometer for TapControl. Our TapControl is very simple and user friendly. We decided that unintended taps can potentially be disruptive or frustrating for users, so a double tap on the side of the Nexia device just answers phone calls. It doesn't do other things, it just does that. And when you think about when you need to quickly react to something in your environment, it's usually something like the phone is ringing. So quick tap on the side answers a phone call, and that is what TapControl does. For users who decide they

don't wanna have TapControl, it is something that you as an audiologist can disable in the fitting software. We have the microRIE, and it is now also available as a CROS or a BiCROS transmitter. So the microRIE is the model that you'll be fitting for CROS and BiCROS on the transmitter side. However, you can fit whatever model you want on the receiver side. You can fit a Nexia microRIE, a Nexia 61 RIE, or a 62 with telecoil. And finally, all of our Nexia models have this new connectivity paradigm with Bluetooth Low Energy Audio and Auracast. So here are the styles. TapControl is available in the microRIE and it is a lithium ion rechargeable device. It also is available as a CROS or BiCROS. And then we have two models that are with a standard battery, 312 or 13, the 61 with the push button and the 62 with the rocker switch and telecoil capabilities. All of these models are available in technology levels nine, seven, and five. So let's talk a little bit about that CROS that's in the microRIE. We have a new CROS transmitter, and this is the microRIE that is lithium ion rechargeable. Because it is streaming audio all day long as its main job, we expect about 16 hours of battery life when streaming audio to the opposite ear. It streams through near-field magnetic induction and because it is a very intense kind of streaming audio all the time, because that is the purpose, of course, of a CROS or a BiCROS, we expect about 16 hours of battery life. So if you're not real familiar with CROS and BiCROS, here's a little bit of a indication of when to fit which one.

So CROS stands for contralateral routing of signal. So what it is is you would fit the ReSound Nexia, either the micro, the 61, or the 62 on the receiver side, and then the CROS transmitter would go on the other side. And the side that does not have usable hearing is the one that gets the transmitter. You wanna get that sound over to the aidable hearing ear. So in the case of the CROS, we route the signal, hear that little bird song it looks like, to the other ear. And because the other ear has normal hearing, it doesn't get any amplification outside of that routing to the signal. That is a CROS, when the receiver ear is a normal hearing ear. And you can fit any receiver that fits most nicely into the user's ear for that. For the bilateral contralateral routing of signal, that is the BiCROS, we are doing the same thing, routing the sound from the non-hearing ear to the ear that does have usable hearing. But if you notice, that ear also has a little bit of hearing loss or any degree of hearing loss that you want to stream over. And for that reason, we amplify the sound on the receiver side just as in a normal hearing aid, but it's also receiving input from the transmitter. So what is single-sided deafness? And this is seen a lot in literature as SSD. Stands for single-sided deafness. It could also be thought of as single-sided usable hearing too if you flip the other side. So what it is, at least in the

published literature that calls it SSD, is the significant or total loss of hearing in one ear. And this doesn't necessarily mean your pure tone audiometry thresholds. It can also be usable hearing in terms of word recognition scores. So generally it's defined in literature as a severe or worse hearing loss with a pure tone average greater than 70 DBHL. This is where you start to get inner hair cell loss. The main consequences, of course, are hearing speech from the impaired side. When you get into inner hair cell loss, it's very hard to get audibility and also a level of fidelity that gets over the distortion that is present in that ear as well. You get poor sound localization because there is such an offset asymmetry between the ear that is hearing better and the ear that is severe or profound hearing loss. Understanding speech and noise becomes even more difficult because you lose those kinds of binaural effects that help us discern speech in a noisy environment, and ultimately leading to auditory fatigue. It's tiring to work so hard to listen, especially in noise, so when people have single-sided deafness, these are some of the things that they will report as having trouble dealing with in their day-to-day lives. In the United States, the prevalence of single-sided deafness is estimated at about 0.14%, which doesn't sound like a ton, but I bet you've probably seen one or two CROS or BiCROS fittings in your clinics because they are around. It amounts to nearly about 350,000 people. And fun fact, that's about the population of Cleveland, Ohio. So there is a large contingent of our users who are needing this kind of technology, and we're really excited to be able to provide that with ReSound technology now. Very interesting to note, it does not mean deaf. It means that you either have low usability of your hearing in one ear, so it can be a pure tone average of 70 or poorer in that poorer ear, but it can also be a word rec discrepancy that is quite asymmetrical, like 56%, for example, if the other ear is at 96%. So ears with poor or very poor word recognition scores may also be considered candidates for the CROS transmitter to the other side.

The CROS comes with an option of three different chargers, the premium charger, the standard charger, and the desktop charger, based on your users' needs. And about those users' needs. How about those first time users? Let's talk a little bit about how we are looking to make things easier for them to acclimate to this kind of technology. How many of your new users are more like the picture on the left where they're just dipping their toe into amplification? They're really hesitant, they may want the benefits, but when you turn on the hearing aid, it's almost like, "Oh my goodness, stop." And you'll be like, "Oh, well that was just five dB." So this is something that I personally have dealt with with my own father, who is very hesitant about

amplification despite the fact that I am his daughter, despite the fact that he knows what I do for a living, was very hesitant with gain when he was first fitted with hearing aids. And so I had to say that he was much more like that picture on the left here, just tipping his toe into the amplification game because of a lot of factors. The difference in how amplified sound sounds to a brain that has not heard amplified sound or has not heard amplified high frequencies that he's been missing for probably about 30 years before he decided he was going to even get amplification, as well as the mental kind of anxiety of the whole process, the, "Will I be looking old?" and, "Will my friends notice?" and, "Will they tease me for wearing hearing aids?" Which over time, of course, he started to notice all of his friends wear hearing aids, and then it was finally getting over that.

But all of these things together, I mean, humans are really complex individuals, so first time users especially are getting over a lot of different issues when they are getting that hearing aid, and compounding those issues together can make them very hesitant about that hearing aid when it first gets turned on. They might say things like, "Wow, that sounds weird," or, "That's really loud," or, "I just dropped my pencil and now it sounds so loud, I'm jumping out of my skin." It's a combination of that stress as well as not being used to the new sound quality of hearing aids, despite the fact that it can help them in the long run. I don't have too many new users that are like the picture on the right, the plunging right in. I wish I did because that would be super easy for me and I'd be able to set them up with the kind of gains that I know would give them the greatest benefits. But unfortunately that's just not reality for many new users. So we looked at our First Time User settings, the really sensitive settings that we have for the people who are just dipping their toe into amplification, and thought, could we do any better? Could we make it easier for these users? So again, going back to the drawing board, we have a regular setting for experienced users. That's Experienced Non-Linear setting. And then in the fitting software, we have a setting below that, that's First Time User. But we also had a very mild setting called Comfort User, except for we were looking at that Comfort User setting and we thought, "Huh, if you've got a sloping hearing loss, maybe the difference in gains between the Comfort User setting, which is the lowest, and the next highest, which is First Time User, wasn't that big of a difference." So if you were like me and you automatically turn on First Time User, just to try to get that middle ground, see where we're going because I'd like to give them as much gain as possible, but I know they're a new user, and they start backing off on it, I'm like, "Okay, I'll go to Comfort User." But in some cases it wasn't a big enough change, big

enough reduction in their gain to make it be more comfortable for them right away. And then of course it becomes the game of down, down, down, down, down with the gain handles. And that's not a fun game to be in for anyone. So how could we get a better new first fit for optimizing comfort to replace the old Comfort User setting with something that would be more easy to acclimate to for those users who are extra sensitive to sound in hearing aids for the first time? We looked at the research. It's no surprise that 95% of first time users report getting challenges in getting started when they're wearing hearing aids. But at the same time, it's really important that we get them to somewhat immediately accept the hearing aids because without that initial acceptance, we're never gonna get to the point where we can acclimate them to the sound quality of hearing aids. And at which point, if they can't get the sound quality of hearing aids, we're not actually helping them because they didn't get any benefit from that amplification. So we need to get over that first hump of terror for them so that they don't end up putting the hearing aids in the drawer, they don't end up deciding only to wear them once a month, that they can start wearing them more regularly and get more on the road to acclimatization.

On that road to acclimatization, we know it takes time. It's just like getting used to anything else, getting used to contacts, getting used to new glasses. They need an adjustment period. So let's get them into the technology happy with the way it sounds at the first fit so that they can gradually over time be increased to higher settings that give them the more benefit that they truly need. So in ReSound SmartFit 1.17 software, we have a brand new setting for these extra sensitive users, and it is called the First Time User Onboarding setting. And it is designed to make our jobs easier in getting them to that happy feeling as fast as possible, as well as their jobs as new patients easier getting used to the amplification. So what it does is it sets the gain level to 70% of the target level for First Time User. So if you are setting at First Time User and you click down to First Time User Onboarding Settings, you can expect that that you'll get 70% of the gains that were prescribed for First Time User. And this reduces the overall loudness in a more meaningful way than Comfort User ever did before. In addition, it sets the impulse noise reduction in the advanced features to a moderate setting. And this is really important because usually our default is mild because we always try to say less is more when it comes to processing. But for new users, we don't want the first thing that happens is when they turn on the turn signal or when they drop their keys for them to jump out of their skin because of that impulse noise being startling. So we set the impulse noise reduction

automatically to moderate when you choose a First Time User Onboarding setting. And you won't see the profile of Comfort User anymore. Now you will see First Time User Onboarding setting, and this has a more significant reduction in the perceived loudness that the users experience. One of the things I love about working in research is making sure that the changes that we make to fittings and technology are validated. We didn't just decide, "Oh, 70% sounds like a really good number. Let's go with that." We tested this out and we brought in 30 new users to our facility in Glenview, Illinois, our research facility. They had never worn hearing aids before and they all had hearing loss mild to moderate. And we tested out some settings for them. The settings were blinded, double-blinded between the fitters as well as the users. They were listening to sound files of different settings of gain, for example, which sample of piano music is most comfortable? And we would test settings of 90%, 80%, 70%, 60% to try to figure out where that sweet spot would be where these new users would be happy with the sound quality and ready to give amplification a go.

So what we found out with this double-blinded study is that the First Time User Onboarding option was judged more positively or the same in all the tests when the 70% gain prescription was used. And it also was very judged positively across the industry because we didn't stop with just our own. We also looked at how other companies are setting up their first time user settings for those sensitive users to see how they would be compared in this test. And our new First Time User Onboarding option was judged more positively or the same as other first time user settings across the industry. Okay, so let's talk a little bit about directionality. It's one of my favorite things because it actually is the only proven kind of feature. Directionality is the only proven feature throughout the body of evidence that actually really does help resolve that age old problem of hearing in noise. So ReSound Nexia has the same directionality as in ReSound OMNIA. It is called 360 All-Around, and it is in the nine level of devices. And what it provides over earlier versions of our directionality is better auditory awareness. We talk about it being wider sound environment mapping. Well, I have to say that's probably not what you would tell your patients. That's pretty jargon-y. But what it means is that even when you are in a very difficult listening situation, you're able to focus with a beamformer directionality while still having some awareness around you so that while you're at that party and you're talking to someone, that someone coming up on the left hand side or the right hand side of you will be able to be heard, so it doesn't jolt you and startle you, but you can hear that they are saying, "Hey, Tammy," and you're like, "Oh my goodness, I haven't seen you in so

long." This is the kind of environment that we want people to be in, to be able to hear well in very difficult noisy situations while also not being cut away from their surroundings. And we do that by streaming off-axis sounds when you are in those kinds of environments so that you have a more full awareness. We're getting rid of some of the nulls of the directionality paradigm. There's always like blind spots, if you will, when you turn on directionality. We're getting rid of those blind spots so that the user can actually feel more part of their environment. We also have, in 360 All-Around, it's designed to be an all-in-one program because we know a lot of users only use one program. Even if they tell us they want four, they end up really just using one or maybe two. If they stay in that first program, we want it to do everything for them automatically that they need to be able to be successful in their environment. And so that means that it switches from bilateral omni when you're in quiet or in speech only, to directionality in more complex environments where you're able to focus and choose what to listen to, to a very strong beamformer in the most difficult situations when you're looking at the person across from you at the airport ticket counter and there's lots of noise behind you and you really need to focus. It's doing all of those changes within one program. And so while it is making those changes per your environment, we need it to detect the environment quicker, we need it to select and adapt to these environments quicker as well. And that's what 360 All-Around introduced compared to our older versions of directionality.

And finally, that beamformer. It uses four microphones, so the right hearing aid and the left hearing aid in a binaural pair each have two. So all four hearing aid microphones working together to focus a beam that is very precise. And the reason why it is so precise with ReSound is that unlike most kinds of beamformers that are designed based on a free field, for example, just a microphone hanging down from the ceiling and figure out what the best beam would be in a perfect situation, we went to the drawing board again and said, "You know what? None of my patients are microphones hanging from the ceiling." They all have heads, torsos, hair, clothes. They're all having these reflective surfaces that are going to change the directional beam width based on the fact that they are not a free field microphone. So the way to get a more precise beamformer and for it to really narrow in when they especially need to hear in front of them is to take all of those head and torso effects into account. So it's the head related transfer function with the coefficients associated with it put into our directional beamforming, and this allows a much more precise beamformer for the human form, which gives them a greater dBSNR benefit in noise than with a traditional beamformer. So I

mentioned earlier in the presentation that we've done some more testing, and we sure have. We wanted to look at that blind spot problem and make sure that we are really doing a good job and making sure people aren't going to be startled by someone who just happens to come up to them in a blind spot behind them while they're in a very focused beamformer setting, like our Front Focus. So we compared three other premium hearing aid brands that claim access all-around while they're in a beamforming or regular traditional setting, and we turned on strong noise reduction for all, and we put users into this situation where they were set at the strongest beamformer and the strongest noise reduction setting available for these hearing aids, and they were told to repeat sentences from a target speaker that was almost 180 degrees behind them, about 175 degrees. We introduced masking noise in front and to the side, and we also put in noise at 90, 180, and 270 degrees to make this a really difficult test. So when you are in a beamformer, you're facing towards the front. We would not expect you to get the most perfect performance when you're in a beamformer. But if there were somebody behind you, would you be able to hear them at all? And what kind of a signal to noise ratio would it take for you to be able to hear someone? And it's not that you would be able to hear them well, it's that you would be able to know that they were there so that you could then decide to turn and talk to them if that was something that interested you. So here were the results.

ReSound had the best speech reception threshold, the lowest dBSNR score for this test when you are trying to hear off-axis. And again, this is not an amazing dBSNR level, this is just showing that our way of creating all-around hearing truly is industry leading and provides you awareness even when you're in a very strict beamformer. So Front Focus is a component of 360 All-Around. It is the beamformer component. When the situation warrants it, it will go to this Front Focus setting. But it's also something that the user can decide to turn on by themselves as a program two in the nine level technology. So when would they wanna do this? Well, let's say they're in a really weird situation and they're like, "I really need to hear this person. I'm just having some troubles today hearing them." I'm gonna put it in that Front Focus program, program two, to right away with my app so that I can get the best benefit, even if it might not be as noisy as what would warrant turning it on in the 360 All-Around automated program. So what Front Focus does is it's a very strong beamformer, but it does the strong beamformer for the speech frequencies only. So that's 1,000 to 5,000 hertz. Why do you need a beamformer? Presumably to hear speech and noise. So let's focus on those frequencies that give you the greatest amplification for the speech signal from 1,000 to 5,000 hertz. We're

gonna keep them connected to their environment by having off-axis streaming in certain settings, but also having a level of omnidirectionality in all settings. And this changes based on the user's personal characteristics. But having some omnidirectional processing in the low frequencies gives you a multitude of great sound quality benefits such as a more natural sound quality for your own voice, better processing, less wind noise. You get better localization because time difference cues are maintained better. We get all of this from external research. We work hand in hand with external researchers at universities and think tanks around the world to bring this technology into hearing aids. So that's why we have omni in the low frequencies, despite the fact that you also have a directional beam. In the higher frequencies above 5,000 hertz all the way to 10,000 hertz, recent research has showed that having a more hypercardioid directional setting is better for maintaining localization cues that are really important in those high frequencies. Monaural spectral cues, interaural level differences, they get distorted when they're put into a beamformer, so let's put them into a better setting, a hypercardioid directional setting, because that maintains more of your localization cues.

So low frequencies, omni for great sound quality, awareness, and better own voice sound quality, mid frequencies for the directional beamformer to get that speech audible, and high frequencies, a hypercardioid directional response to maintain important localization cues which are also really good for sound quality and spatial hearing. So I love this kind of testing on KEMAR to figure out what exactly are we doing with the sound when it hits the body, in this case when it hits KEMAR's head and torso? So we did some testing. This is in our clinic in Glenview, Illinois. And we presented some white noise, just plain old white noise 'cause we wanted to see what the hearing aid was picking up in these different kinds of situations. We're gonna measure on the right ear, and we're gonna rotate the mannequin on a turntable 360 degrees, and we want to see what the response is when we are set in Front Focus to see how we compare to other directional options that are there to see how this unique strategy has benefits and also to give us some information about how to better counsel patients about how to get the best benefit from Front Focus. When we did the measurements, it resulted in a circular spectrogram as we were going 360 degrees around the head. And you can see that there is a very tight beam in the mid frequencies. So the higher frequencies are towards the center of this circle, and lower frequencies are towards the outer edge. And between 1 and 5,000 hertz, we're getting that beamformer that's very strong and very much to the front. About 20 degrees is where you're going to find the best angle for the Front Focus to pick up that

speech sound and get rid of the noise around. So the highest intensity speech, or the highest intensity that is being picked up by the microphones in Front Focus, is very much in front of the user. So as an audiologist, I wanna make sure to tell my patients, "For Front Focus, you are gonna get an incredible result and it's going to be where you're looking," which is usually what you do anyways when you're trying to really speech read and get all of the cues that you can in a very difficult listening situation. Above 5,000 hertz, you see a more diffuse red angle, and that is the hypercardioid directionality that is there for maintaining the localization effects. So you see that it's a very unique, it's a very multi-band directional kind of response. When you look at it from a binaural standpoint, You see that there is that nice tight cone of audibility to the front for the speech frequencies, and then a little wider in the higher frequencies for those localization cues while it still reduces noise from other areas. Compared to another manufacturer, you see that the directionality is more spread out, and what that means is that more noise is coming in from the sides and from different angles than with ReSound Front Focus.

Looking across the industry, we see that there are some similarities, but yet there are big differences amongst all the manufacturers, and ReSound Nexia and ReSound OMNIA are the only ones to provide this multi-band scheme that gives you the best of all worlds: really good signal to noise ratio benefit, which is 8.6 dB better than omni, while at the same time getting great sound quality even when you're in directionality. It's not the first time we talked about hearing all-around and giving directional benefit. We started this journey way back in 2007 with the ReSound Azure. And that's getting to be a long time ago, honestly. That's a 17 year journey for us, basically. But we started off with more primitive versions of this paradigm, and over the years we've added to it ear to ear communication, spatial sense based on KEMAR cues that would help support better localization, enhanced omnidirectional, getting rid of blind spots. But finally, with a beamformer able to get some really meaningful dBSNR benefit in those difficult situations where the speaker is in front. We end with OMNIA and Nexia at 360 All-Around on this slide, but that's not the end. In the future, you will see a continuance on this journey from ReSound as we strive to make it better for us and for our users at the number one hearing in noise problem that our users face. And while we're talking about hearing in noise, we started to look at what we talk about to our patients versus what they see on their app. So in the past we would set up maybe a second program that was called Front Focus or, you know, Restaurant Program, and we know what that means, but for a user we would tell them, "Well,

you go to program two when you wanna hear better in noise." So why wouldn't the app say the same? So we changed the app and the way that the second program is labeled in the fitting software to call it Hear in Noise now, because we know that people go to program two to hear better in noise, so now that's what the user will see as well. And that means that if you set it up as Restaurant or you set it up as Ultra Focus in a seven level or Front Focus in a nine level Nexia, all it's going to appear to as the user is Hear in Noise, and you will be able to know what you said. But this is a lot more intuitive for users. Of course our app user experience group is super thrilled about this, as we all are, because it just makes better sense for helping us counsel our users about when it's appropriate to change to that second program. All right, so we've talked a lot about the parts of the hearing aid that help us hear better and that make it easier for us to get new users acclimated.

And I'm really excited to end today's presentation with an introduction to what is now currently in the ReSound Nexia hearing aids is the brand new Bluetooth Low Energy Audio paradigm. It is a standardized paradigm for streaming. It is the follow-up to the Bluetooth Classic, which has been used since 1999. It is the new version of that kind of streaming. And what is so great about it is that it's going to open up the world to make it easier to connect to all sorts of Bluetooth devices, not just made for iPhone, not just Android streaming for hearing aids protocols. It will make it easier for us as audiologists, who didn't enter this field necessarily to become experts in every kind of cell phone technology that there was, making it easier for us to make the hearing aids talk to the user's mobile devices with Bluetooth audio. And Bluetooth Low Energy Audio is being introduced in Samsung phones and other phones as we speak. It is going to be introduced in laptops, computers, tablets. It will be ubiquitous, and it is rolling out today. So ReSound Nexia is ready for it and already has this technology enabled. for direct connectivity to the phones, tablets, and computers for calls and streaming using Bluetooth Low Energy Audio, which as the name implies is much more battery friendly, requires a lot less energy. But because it is a new protocol, it maintains all of the sound quality and even improves upon the sound quality of Bluetooth Classic. It enables hands-free use with those phones that have Bluetooth Low Energy Audio, just as we had with MFI streaming as well. And it really levels the playing field for us so we can focus more on the hearing in noise problem and not about figuring out which phone goes with which hearing aid. In addition, there's a side effect, or a side benefit, I should say, of Bluetooth Low Energy Audio, which is going to be showing up in our public venues very soon. In fact, we have a movie theater that is already

implementing it and you can buy this kind of transmitter box on Amazon already, which is broadcasting. We're gonna be able to stream sound to hearing aids using our new TV Streamer+, but also public transmission at different public venues like places of worship, airports, movie theaters, schools. This will be kind of like a new global telecoil. It can coexist with telecoil loop systems as well, giving people another option to be able to tap in to what kinds of overhead announcements are happening at the airport, watching the movie. With this technology in the hearing aids and with the introduction of this technology into public venues, it's going to make those difficult listening situations a whole lot more accessible for everyone. So the ReSound TV Streamer+ also has Bluetooth Low Energy Audio technology, and it affords us some really great options for users of hearing aids and eventually for users of other hearing aids other than ReSound, and for earbuds.

So this is what I mean. We've simplified the TV Streamer 2 design to make it more intuitive. It's got a volume up and volume down with a plus and minus. It's got a single LED that shows you the status of what it's doing. It also has magic pairing, which is awesome because all you have to do is put the hearing aids within two inches of the TV Streamer+ and press the magic pairing button once. And all of the hearing aids in the proximity of two inches will pair automatically to that streamer. You'll hear the little trill in the hearing aids. You will also see an indicator on the LED showing successful pairing. And you can pair 50 devices with this TV Streamer+, so it's got a huge, huge accessibility benefit, and you get the same kind of streaming range that we did with a TV streamer 2, which is about 22 to 30 feet depending on the environment. There is a jack for audio input, but there's only one, so now we are able to send two cables with the TV Streamer+. Each of them has a 3.5 millimeter jack on one end, but the other end, one of those cables has an optical on the other end, so that works with optical outputs for your users' TVs. And you've got another cable that's got a 3.5 millimeter that goes into the audio input of the TV Streamer+ and an RCA connection. So regardless of what kind of television, for example, that the user has, they can use the optical, sometimes known as toss link connector, like we always had with the TV Streamer 2. And they can also use the RCA if that's a better option for their TV. In addition, Nexia is compatible with TV Streamer+, but Nexia is also backward compatible with all of the other accessories that we have on the market today. So you have a lot of options. If they already have a TV Streamer 2, they can use the Nexia with that. If they use the TV Streamer+, it's compatible with the Nexia. It is powered by a USB-C, which has on the other end of that cord a regular USB that can be connected directly

to a USB port in the back of the TV, or it can be connected via a brick to the wall outlet. And it is designed to be smaller than ever and it comes with Velcro so it can hide behind the TV screen so that it is lot easier to use, a lot easier to hide. Discretion is important and you're not gonna see that TV Streamer very much. This is the landscape of where we've been with streaming. We started with telecoils in the 1930s all the way up through FM in the sixties, classic Bluetooth towards the end of the last century. And now with proprietary protocols like MFI and Android streaming for hearing aids. But it does get to be, albeit, you know, I agree, a little confusing. What do I use with this device? What do I use with that device?

Well, this low energy Bluetooth is being translated into the new Bluetooth Low Energy Audio, meaning that we get the great sound quality of Bluetooth, the accessibility and the universality of Bluetooth with Bluetooth Low Energy Audio, with lower battery consumption. For that reason, it is expected to take the world by storm and is expected to be the preferred audio standard for wireless communication in electronic devices in the next 20 years. And that doesn't just mean hearing aids, that means earbuds, that means AirPods. That means everything is going to eventually be changing to this sooner rather than later. And as I mentioned before, there are some devices already on the market that use this Bluetooth Low Energy Audio technology. And this technology uses a standardized protocol. It has a new standardized profile for hearing aids to make them more accessible with more Bluetooth devices so you don't have to remember, is this an Apple, is this a ASHA device, et cetera. It offers better performance in terms of quality, latency, that's delay, and power. It's got a brand new codec. It's a brand new improvement on classic Bluetooth because classic Bluetooth is now about 24 years old. It has true global interoperability. It is able to be used globally because it is in that 2.4 gigahertz range. And it offers just a whole lot more accessibility. And this is some research that came from the Bluetooth Special Interest Group showing about how much more robust this new protocol, which is known here as LC3, that is the Bluetooth Low Energy Audio protocol, those are the blue bars, and the gray bars are the standard protocol, the classic Bluetooth protocol. And what this is showing is that the fidelity and the robustness of the signal is maintained even when the bit rate of transmission is decreased. So what does this mean in terms of that? Well, we all know there's a lot of Bluetooth competition out there with different devices always on, always streaming, always trying to find something to stream, and so occasionally you can find yourself in situations where the bit rate that you get from your hearing aids to your phone, or from your AirPods to what you're listening to, can drop. And that

would be a lower kilobytes per second bit rate. So what Low Energy Audio Bluetooth is able to provide is a maintenance of that signal to reduce dropouts, to improve fidelity, and to maintain the robust signal even when there's a lot of streaming going on around you, when there's a lot of interference. Even at this very low 160 kilobytes per second bit rate, Bluetooth Low Energy Audio is able to maintain a very high fidelity that's four or above when even classic Bluetooth has dropped out and cannot be measured. Those are the gray bars. So the blue bars is where the feature is, and that's the kind of technology we have in Nexia. And this means that the world is going to open up to people. It's gonna be a lot more inclusive and accessible. It's not just going to be hearing aids, it's going to be AirPods, it's going to be earbuds, it's going to be all kinds of ways that people use technology to hear better. It is going to be able to be streamed from venues who can retrofit their existing venue with an Auracast transmitter and make it easier for people to hear. ABI Research estimates that this will be rolling out exponentially. It already is available, but the exponential growth is expected to have 2.5 million locations offering this kind of audio transmission globally by 2030. So just as a summary, what did we talk about today? What's new with Nexia?

We have a microRIE. It is very discreet and will be noticeably smaller than anything we've ever had before. We are offering a CROS and a BiCROS in our portfolio for the very first time with our modern technology. We have a brand new way to get new users acclimated to our technology with First Time User Onboarding. Unmatched directionality. The directionality you might already know and love in OMNIA is carried over into Nexia to provide the same benefits. And we provide the future of connectivity. These hearing aids will last four to five years at least, and this is the kind of connectivity that we are all going to be experiencing very shortly, especially in those next coming years, but even today. So it offers everything for users that are looking for the best that they can possibly get with today's technology. And so I will, with the remaining three minutes, look at these questions here that I've got. Thank you so much for writing them. We've got a question about, "How does the horizontal orientation of the mic work with T-coil axis where vertical orientation is recommended?" That is a fantastic question. When I talk about the horizontal orientation of the mic, that's only for directionality. The actual T-coil that's in the 62 version of the Nexia is oriented diagonally, just as it has before, so that it can be amenable to loop, which would require more vertical. and to a regular telecoil, which would be more horizontal. So the telecoil itself is not what I was talking about there. The telecoil itself is still the same orientation as it was before. And, "For Bluetooth Low

Energy Audio, what about iPhones?" Another great question. So currently, iPhones are still using the made for iPhone technology. So they will continue to have hands-free streaming just as they have before for OMNIA and for Nexia. If you've got an iPhone user, they're gonna be using MFI streaming currently. We expect that in time, the manufacturers of phones will be switching to Bluetooth Low Energy Audio, so that will eventually become Low Energy Audio, but iPhone users will just currently use MFI and then segue into LE audio when it becomes available in those phones. Any other questions? "Does the CROS mute while streaming to the contralateral side?" So that's a great question too. So the CROS transmitter, I'm assuming you're asking about, will be streaming to the other side, so there will be no energy provided to that unaidable ear. It will just literally have the microphone sending over to the other side. And that's true for a CROS or a BiCROS. Great questions.

All right, "The CROS transmitter has approximately 16 hours of battery life," that is true. "If they're using the BiCROS, what is the battery life of the hearing aid if streaming all day?" Great question. So the battery life of the hearing aid in a BiCROS, which provides its own amplification in addition to the streaming of the CROS transmitter, will be longer than 16 hours because it is just receiving. It is not transmitting, so it takes less energy to receive. But if you're streaming all day with the CROS and then you add in some audio streaming, that of course will probably be less than 24 hours. But we do expect for the receiver side, if you're just CROS transmitting or BiCROS transmitting, to get in that typical hearing aid life of whatever the device is. So that'd be 24 hours for the lithium ion battery. And then for the 13 and 312 batteries, you would get much more than that, obviously. "Can the CROS streamer do CROS and phone streaming at the same time?" Great question. The transmitter will choose. If there's a phone call, then it'll stream the phone call over. If there is environmental sound, it streams the environmental sound over. And you can answer the phone with the TapControl on the CROS transmitter and you will get it streamed over to the other side, even if the other side is a 13 or a 312 battery. So the TapControl works bilaterally, so if you wanna answer the phone on your CROS transmitter on the microRIE side, even if the other hearing aid is a battery operated one that doesn't have the accelerometer, you can hear the phone call in that ear too. And, "The transmitter mutes while the phone's streaming to the better ear?" Yes, the transmitter is never providing any kind of amplification to that ear because it's only for the ear that has the poor hearing thresholds or unusable hearing. Great question. So if you're on the phone, you're only gonna hear the phone on that side that's hearing. Great questions, you guys. This is a great

Monday. "Just to confirm, the Auracast can be used with all types of phones at this time, or not yet?" is the next question. The Auracast is a subset of Bluetooth Low Energy Audio, so you are seeing on the market today some Samsung phones, a Samsung Galaxy Notebook 3 that has the Bluetooth Low Energy Audio technology in it. So that's the base requirements to have this technology. Some of these also have Auracast in it, but not all. So the base thing that you wanna make sure if you're buying a new laptop that has this technology is that you have the Bluetooth 5.3 protocol, which offers you Bluetooth Low Energy Audio capabilities.

And you also wanna make sure that that little Auracast logo is there too because that means it has the additional energy, the additional protocol for Auracast. And what we are hearing from Bluetooth is that this Auracast protocol may not be the first thing that they launch out in new products, but it will be activated usually through a firmware update if necessary if it's not there already. And it's not all phones at this point, it's gonna be the newer phones, but they are all rolling out with this kind of technology very quickly, especially in the Android realm. "Is the CROS transmitter available in all battery options or just rechargeable?" It is only available in rechargeable, and adjusting the CROS volume using the app or remote control, this controls how the transmission is being transmitted. I guess I said that wrong. Yes, you can use the volume on the CROS side and that will control how it's being transmitted to the receiver side. But as mentioned before, the CROS transmitter or the BiCROS transmitter provides no amplification to that ear. It literally just streams to the other ear. All right, you guys are awesome. Any other questions? Nothing's here. Okay. Any other questions? Okay, so we're after time. I wanna thank you so much for joining me today. If you have any further questions, my email address is [tstender](mailto:tstender@gnresound.com), that's T-S-T-E-N-D-E-R, @gnresound.com. I'd be happy to answer any questions you have, and I wish you all the best of luck and a wonderful week, and have a great time fitting this new technology. Thank you so much.