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Katie: Good afternoon, ladies and gentlemen, and welcome to the SIG sponsored conference call with KLA. At this time all participants have been placed on a listen-only mode. It is now my pleasure to turn the floor over to your host, Mehdi Hosseini. Sir, the floor is yours.

Mehdi Hosseini: Thanks, Katie. And I want to welcome everyone to this morning's call. It's a pleasure to have the KLA team. We will be focusing on advanced packaging and how KLA is positioned and how they see the industry is evolving and how KLA could benefit from this secular trend towards more advanced packaging. This morning we have Oreste Donzella, Executive Vice-President and in charge of advanced packaging from KLA. We also have the IR team, Ed Lockwood and Kevin Kessel. The format of the presentation is that Oreste will go over a slide available through a webcast. If there is any question, feel free to submit your questions via e-mail to me, Mehdi(dot)hosseini(at)SIG(dot)com. And then we will try to go over the slides and throughout the slides we may pause for some questions, more like a fireside chat between Oreste and I.

And I'll try to help investors to better understand trends and tied to KLA and how KLA's product portfolio is best positioned. So with that, again, I wanted to thank everyone for joining us this morning and I want to thank the KLA team for giving us the opportunity. And without further ado I want to pass on the mike to KLA team. Oreste?

Oreste Donzella: Yes. Thanks, Mehdi, for the opportunity. Thanks everybody who's connected through this webinar, here. Really appreciate the opportunity to give us the possibility to present the KLA for a new, unique growth opportunity that is in advanced packaging. The semiconductor landscape and the electronics landscape are constantly changing and we see more and more interest and more and more technology innovation happening in packaging. And whenever there is technology innovation of course KLA is at the front and the center of it. I'm going to flip the slides and I hope everybody can see. The next slide is the forward-looking statement, the policy that you can see on our IR website. And then I'll go through a few sections. The first section is just a recap of KLA. KLA has made quite significant changes in the last couple of years with the integration of new companies that we acquired, in particular in new spaces like packaging, but also printed circuit board, display and the specialty semiconductor.

Also we're restructuring the organization, so I'm now in charge of EPC group – electronics, packaging, components – you see a lot of new markets that KLA is serving through either organic growth and acquisition. I'm going to talk a little bit more in details later. Next slide is slide four in the deck. You see KLA at a glance. These are numbers from fiscal year 2020 that ended in June 2020. You see pretty

much a pretty big whole base of tool, 46,000 tools. We are now at 10,000-plus employees corporation. We closed the fiscal year 2020 at 5.8 billion dollars revenue. And something that is really in our life blood is innovation, so this is the reason we commit every single year at least 15 percent of the revenue back into R&D and the program development.

Our revenue type was split between system and service. You see three quarters and one quarter. And the revenue mix by geography is all across the world. And the fiscal year 2020 is a pretty big exposure to the Taiwan, driven by the foundry semiconductors, then Mainland China, Korea and the rest of the world. So, let me go to the next slide – just to recap what KLA is all about. We started 44 years ago, since then the company has been focusing in developing innovative solution for wafer inspection and metrology. We were and we are still an equipment company, but we went through many, many different iterations of our vision and mission. We evolved in the 90s in the yield enhancement and process control company, when we instituted the vision of developing the so-called line-monitoring in semiconductor wafer fabs, when inspection and metrology became an integral part of the fabrication process flow. And process control is what we've done since KLA and Tencor were born and eventually merged in 1997.

But as I said at the beginning of this speech, recently we have made quite significant changes in the organization, and these changes came from organic growth, but in particular from acquisitions. And the acquisition of Orbotech was really a pillar of our new strategy to expand in new markets. Orbotech came with three different markets and business, specialty semiconductor, printed circuit board, flat panel display that you can see in the slide. The component part of our business was already in KLA for a different acquisition we made 12 years ago, a company called ICOS Vision Systems, in Belgium. So definitely with Orbotech and SPTS, who was part of Orbotech as a separate subsidiary, we were able really to increase our exposure to very fast-growing markets and the advanced packaging is one of those.

One thing also that we were able to accomplish by acquiring and eventually integrating new companies is also to provide a much more comprehensive and broader product portfolio for not only semiconductor, but also for the value chain. I have one example later on in the slide. And if you look at, for example, the latest announcement of new electronic devices, you'll see like all KLA participating right now in the entire supply chain. So, of course we are contributing to the five nanometer processor with CPU, GPU, integrated AI, memory, but also through the acquisitions we have done we are really strong contributing in the RF market, for example, with our SPTS product division. We are in the camera sensor business. We are also in the display. When you look at the most promoted device of the year, the iPhone 12, you can see a pretty big exposure of KLA of pretty much every single component that is going to the phone right now. It can be a display or a camera or a processor or the memory or just the communication chips that are enabling the 5G communication protocol. And eventually all the packages come together. So really I wanted to put these slides as an example of the broadening of our market reach above and beyond the semiconductor front end and the process control applications. Let me go now deeper in the advanced packaging. From now on I'm

going to focus just on the packaging of semiconductors that is, as I've said, a very exciting growth engine for the company.

So let me navigate you through our journey in the packaging. When I talk packaging technologies, I try to make it as simple as I can. The semiconductors are processed wafer-based. And then the circuit point the wafers are singulated in multiple chips or dies and eventually put in packages. And when you look at the packaging process flow landscape, you can divide with process done at wafer level and the part of the process of packaging that we call assembly, and test and then finally the package gets assembled on a PCB. Now, in the new packaging world also an increasing role is also played by substrate, and with the Orbotech's acquisition we entered that market as well with our PCB division.

So let's go back year over year and what we have done. Before 2008 KLA didn't participate in packaging at all. Was a pure player in semi-conductor front-end inspection and metrology, or as we say process control. And then the first acquisition happened in 2008 when we bought the ICOS component inspection and then you see really on the slide popping up the machines over there – ICOS CI, ICOS CI, ICOS CI. CI is component inspection. This was our first attempt to enter packaging application in packaging industry. Of course 2009 global recession came and we restructured our business and so on and we focused on the front end semiconductor. And then we saw again another opportunity – and this is where you see the CIRCL AP, that is really wafer inspection tool that came from front end semiconductor, customized for packaging application and was really our second step in the journey of packaging penetration adoption.

On the next animation we did another acquisition at the end of 2017 called Zeta, that is machine not for inspection but for metrology, 2D and 3D. And then we started also growing organically because when you start, of course, buying companies, not only you have an M&A play, but you can play much more organically because you have an installed base, a customer base. So in this case, at the end of 2018 we added the two new products to our portfolio coming from the divisions of the companies that we have previously started. And then finally the big one was when we bought Orbotech, including SPTS. You see the map of process fabrication filling with many, many tools either on the inspection and metrology point of view, but also process. And this is where we added the SPTS technologies that are the first technologies that are not inspection and metrology based, that KLA brought in the portfolio.

These are tools that deposit and etch layers, and also this is where we enter the substrate industry with the Orbotech inspection and repair tools. And then finally, recently – this is my last animation – we added new products to our portfolio Taiwan in September. So you see how we intensified our effort in the last three years to become a bigger and bigger player in the packaging industry. It's an effort that you could absolutely translate into revenue and eventually profitability for the company, and this is really our journey in packaging. You see really this is the revenue forecast trend, including substrates, and you see quite a bit of growth. We

are talking about more than 20-25 percent compound annual growth rate via organic growth and acquisition.

This is consistent with what we shared in our September 2019 Investor Day. Again, we outlined a very ambitious plan to add a completely new segment in our market, the advanced packaging, and be a leader in these segments and also representing quite a bit of growth in annual component growth rate for the company. I want to pause here, giving the opportunity to ask questions – this is my first session in the presentation.

Mehdi Hosseini: Thank you, Oreste. This was very helpful in better understanding how KLA's product strategy maps with trends in advanced packaging. What I want to better understand is how KLA and the team is going to be about a standardization. As you highlighted, KLA is now the major dominant player in the wafer, especially for processed diagnostic inspection. And the fact that you have been able to dominate and standardize is very clear. Now, how are you going to use that? And is standardized processes in the back end? And I think this is very important because you're highlighting the share gain in slide number nine and you have the product portfolio, but how are you going to be able to standardize that would help you with the share gain?

Oreste Donzella: Yes, correct. This is a good question, Mehdi. Thanks. Let me give you a little bit of background on myself. I didn't do it at the beginning of the presentation. I've been in the semiconductor for 28 years, so all my experience, work experience. has been in semiconductor, in particular in the front end of semiconductor fabrication. .I've been working at KLA for 21 years. Before then I worked in the fab, in semiconductor fab, in TI and Micron technology. So I have seen what KLA did in front end semiconductor being a customer and also being an employee. And when you go back 25 years ago, what KLA brought into front end semiconductor fabrication was a new vision. And the new vision was not only selling inspection tools, but also helping the customers to improve the yield, to accelerate the yield through a new in-line monitoring methodology.

So this became an industry standard. So Mehdi when you are talking about standardization – this was exactly the standardization that KLA brought into front end semiconductor fabrication. Now, on the other end in the packaging – the packaging industry has not put much effort in establishing this kind of inline monitor and process control methodology. And the reason is because until a few years ago technology packaging was not yet advanced. So in reality there was not a need for the packaging fabricators to do this rigorous process control and line monitor standardization, like Mehdi said, until the product is finished. And then they do a final inspection and they send the product to the integrators. But there was no vision actually to implement process control steps.

Of course the situation is drastically changing now. Now we see an opportunity because, as I will explain later in the slides, there is a transition to smaller geometries in the packages and there is more and more usage of wafer level process stacks. There is a huge trend in packaging multiple die on a single substrate,

either horizontally or vertically. And there is more space for KLA really to do exactly what it's done 25 years ago in front-end but now in packaging. So getting really the new concept of – "I can increase the yield because now I have a more rigorously standardized process control methodology in line"

Mehdi Hosseini: Great. And if I may just raise one quick follow-up. It is very important to understand wafer inspection, especially with the wafer-level packaging from non-good die, which is very critical for multi-chip packages for chiplets. Can you briefly explain how KLA's product portfolio and strategy is aligned with wafer inspection, wafer level? And how is that differentiated with die level or die sorting?

Oreste Donzella: Yeah, that's exactly the preannouncement of my rest of the presentation. You are really right. So when you have fabrication in the packaging, you start from wafer, and then the wafer is singulated and then it's now down to the die level or the component level – in the past what you did was wrapping up a box around the semiconductor device or a chip or a die, and then eventually this is what we used to call component or package and only the final component gets inspected. It's a lot different now. And the difference is in the adoption of multi-die packaging, in particularly when you want to stack multiple DRAM memory on top of a GPU or a CPU or even more in the concept of disaggregation of the system on chip in the multiple functionalities inside a package, you see more and more the need for making sure that the single die is good.

Because when a single DRAM chip will be packaged with multiple DRAM on top of a very expensive GPU or CPU or with a bunch of logic controller chips around in a single package, this package is extremely expensive. And you don't want a single chip to fail in that package because it will have a huge cost. So that is why we see an opportunity for the so-called known good die in how we are going to implement a die sorting application at the die level. And I have a slide later talking about a new technology that is infrared based illumination that is exactly, exactly making sure that after singulation of the wafer, every single die is properly functioning.

Mehdi Hosseini: Okay, great. So maybe you could proceed with the rest of the slides?

Oreste Donzella: Okay. All right. My next session is really an overview of packaging industry that is becoming, as I said, a key enabler of semiconductor scaling. Let me go through a slide that actually I put together for a conference maybe three years ago, two or three years ago. This was really the announcement of starting a new era. People call it data era, people call it digital era. At the end of the day it's all about data. We enter a data era where everything we do – and actually got accelerated because of the COVID pandemic - is based on data. And whoever is able to store the data, analyze the data, transmit the data is going to monetize the data and win in the market space. And the semiconductors have been at the front and the center of this revolution.

And of course when you have to deal with a massive amount of data and when the data become so pervasive of whatever we do, we need to make sure that the cost of the data, the cost of information also goes down because we want to make sure

that the ability to store the data, analyze the data, compute the data, transmit the data is cost effective and people can pop up more applications based on the data. So when you look back – when I started in semiconductor in 1992, 28 years ago, of course Moore's law was already active for many, many years. So, as you know, Gordon Moore and Fairchild founder and Intel co-founder, came up with these economic, was not technology, law saying that, in the article called cramming more components into circuits, the number of transistors expected to double every two years. I mean it said things, but this was really the tag line of the article.

And this is what happened. And then it became every 18 months, then every two years again, but the bottom line is really, really simple. The electronics industry was based on the concept that you can make fabrication cheaper and cheaper and cheaper and more and more and more powerful. And if you look at the slide on the top right, you see the number of transistor trends in the circuit – it's still growing quite a bit. As I said, the new application processor in the iPhone 12 has 11.8 billion transistors. That is an incredible number, but the problem is – and this was another graph coming from AMD - that we know how to scale the technology. We know how to cram more components in the same piece of silicon as engineers. The problem is they come with higher cost. So they have to come with more power, more performance and lower cost. So there is something new that needs to happen.

And next slide is very interesting because you can see from another nice chart over that is really simplistic, but I believe really powerful – that you see the cost per transistor. At a certain point you start with the SOC approach - system on a chip that was created long time ago, when the chip designers saw an opportunity to put more functionality in a single chip, because of course you need to tie more functionality together to make sure you have a stronger bandwidth. SoC was great for some years, but now it's become really expensive. So what we need to do? There is the idea to use new material, new structure, new innovations to allow scaling of semiconductor technology, but also do more so-called disaggregation. So from a concept of having everything plugged in a single chip or a single die, now people are thinking about, "If I have multiple functions in a single chip but I really need to be spending on a portion of the chip, maybe the computing part of the chip because this is the most expensive in terms of technology and development, the other interconnect or logic or even memory can be disaggregated".

And when you disaggregate, you put in the same package. So you have now multiple chips in the same package and not only multiple function in the same chip of it became too complex and too expensive. There are the so-called chiplet or heterogeneous integration. And all this is done via packaging. So that is why we've really moved from a concept of packaging low-end technology just to make sure that we have a protection of the semiconductor to more and more innovation in packaging. And this is something that the top semiconductor companies have been investing a lot of money on. And these are just examples of what tsmc and Intel are promoting and publishing. And the 3D packaging is really a catalyst for product innovation. When we talk product, we talk of the entire system. Not the semiconductor chip, not the packaging, but the entire system, the final product.

So packaging moved from being a protection and connection type of technology into a performance differentiation. And as we see more and more either foundries like tsmc or IDM like Intel or memory like Samsung, technology steps are fabulous. Multi-die integration was at the front and center of the 2.5 integration, companies like AMD and QUALCOMM, everybody is interesting to progress of this packaging technology development. And this is why – and then I have the next slide before finishing the session – this is why KLA has become very, very interested in the packaging. And the innovation is not done yet. In fact, the biggest of all innovations, in my opinion, is what we call hybrid bonding if you are familiar. Today, we bond die on wafer or wafer on wafer with bumps. So in other words when you bond die on another die or a die or on a wafer, you need to use bumps as the connectors.

And there is a possibility in the future – and this is maybe three years in the work from today – that we do bumpless. That means that all these functionalities that are packaged in a single package becomes closer and closer. That means that you have cost saving, power consumption efficiency and bandwidth and speed advantage because you don't need to go to another level of interconnects, but you will directly bond one die on a wafer or one die on another die. But this is not easy. There are several inspection, metrology, and integration challenges. You want to move to a concept of integrating multiple chips in a package, with bumps, and then you want to do the next step that all this integration becomes bumpless. We are working with everybody developing this kind of technologies in the market right now.

And I've been super happy to see the pull from the customers saying, "Hey, please, can you come to our table because this is a big issue and we would like to have somebody with a huge experience in process control in front end to help us out." So I want to pause now, maybe if you have any question"

Mehdi Hosseini: Sure. I have many questions, but I'm going to focus on two important ones in my opinion. You bring up the bumpless, which is the future of advanced package technology. How do you think or how do you differentiate yield improvement, process diagnostic, metrology and inspection from HM deposition? Because the peers will argue that, well, for bumpless you need more advanced etcher and deposition, but would also have the yield issue. So can you please elaborate how do you see these two trends evolving as we move on the advanced package technology roadmap?

Oreste Donzella: Yeah, I'll try to respond, make sure that I'm not complicated. Mehdi, with the acquisition of Orbotech also we acquired SPTS, and SPTS is a process division; it's not only metrology division and it's part of my EPC group. And SPTS have been working for many, many years based in Wales, UK to become a leader in niche applications like RF devices or MEMS or power semiconductor and compound semiconductor. And eventually a few years ago they tried and they succeeded to tailor their technology into some applications for packaging. In fact, SPTS is a very good leader in their position, for example, in technology for fan out wafer level packaging and also has good applications for bump and heterogeneous integration.

SPTS has, for example, a technology called plasma dicing. Plasma dicing means that you have a wafer and you want to dice the wafer. You singulate the wafer in multiple die and you want to make sure you don't damage the die when you singulate. Today the singulation of the wafer is done via saw that is mechanical singulation or laser. And what happens with these technologies is you create a lot of cracks or delamination or defects in the die. So you singulate the wafer and eventually you have a die that is failing after singulation, with die bonding and heterogeneous packaging you cannot tolerate that because, as I said, the singular die quality becomes absolutely paramount.

So having a technology that could give you the possibility to dice the wafer via plasma gives the possibility to our customers not to damage a single die. This is an example where we can help with something that has nothing to do with inspection or metrology and KLA can still contribute to the advancement of packaging technology for hybrid bonding. We have other deposition technology and SPTS that can benefit the customers when they move to hybrid bonding. Now, let's talk about the inspection and metrology process control. If you look at hybrid bonding, first of all you need to make sure every single die is perfect. So you have to start to inspect single die level. And we have a technology to do that – I'll present in the next session. Also, before hybrid bonding means that you do not care particles that are really, really small because the geometry of packaging technology is large "I don't care. My geometry is big. I have a lot of margin" – now it becomes an issue.

Because when you bond die and wafer or wafer to wafer, these particles may create small voids in the surface area that can lead to the failure of entire packages. So in other words the packaging technology now is getting closer and closer to front end semiconductor because of the challenges created in integrated multiple die in packaging. And with hybrid bonding becomes even more a challenge and because of the possible of creation of voids coming from very, very small particles that you need to control with KLA tools. Is it clear?

Mehdi Hosseini: Very clear. Just a quick follow-up. Is there any learning, is there are data that you can bring from front end, from wafer manufacturing to the back end? In other words, is there any shared or common databases that could help you with improving the yield, bridging the front and back end?

Oreste Donzella: You can bring many, many things, but I want to respond with two. You can bring technologies. And infact I have an example later, in the last session, talking about AI. Artificial intelligence, machine learning based data detection and classification – this is stuff that we have developed for many, many years in front end and we are bringing into packaging right now. And it's clear that bringing this kind of technology can help our customers to advance their technology roadmap. The second thing is methodology. And the methodology is still something that we are working with our customers. For example, we developed in my organization with a team that comes from front end semiconductor, like me. A team of people who worked in the semiconductor front end fab, they are now designing process integration flow and simulation to understand hybrid bonding of the heterogeneous packaging process step and where is the right place to put an inspection of a measurement step.

So in other words we are bringing this methodology from front end into back end. We are bringing people from front end experience into the back end. And we are bringing technology from front end to back end like AI-based classification that I mentioned before.

Mehdi Hosseini: Great, thank you. Let's move on to section three.

Oreste Donzella: Perfect. The section three is really what we do in packaging. There are plenty of opportunities for growth. I don't want to spend much time in this slide, this is just an eye-candy shot to show how many different packaging types are there for many, many different applications. Fan-in and Fan-out wafer level packaging started long time ago and then we have flip chip, and so I don't want to spend much time – rather than saying, "There are plenty of different types, plenty of challenges, and these types are connected to the application they serve and sometimes you need really to work much deeper in the electronics value chain to understand, for example what the automotive people want. And automotive is always the industry that makes the slowest step towards changes because of the importance quality. But now also the automotive industry is trying to start looking at more and more sophisticated packaging, like flip chip BGA, and eventually this is going to open up a big question mark and say, "Okay. Can I make these more advanced packages with 100 percent confidence, 200 percent confidence that these packages are reliable and are high quality?" These charts are just to show proliferation of packaging types and connection with any single industry which is super important for us to understand the requirements in the electronics value chain.

The next slide is just to show complexity – I don't want to spend time. I want only to just mention one trend. When you look at antenna in packaging, you'll see in the left part of this chart – this is what he makes pretty much a 5G millimeter smartphone. Without that innovation, you cannot do it. So you got to pack the antenna inside the package, and then it gets integrated in the board. And this is not easy. And this is not done with, like, the five nanometer technology in semiconductor, but there's a lot of complexity in the packaging. So that's just an example.

Now let me talk a little bit about our product portfolio. As you can see, I split this in two – wafer level packaging, so pretty much machines that carry the wafer inside tools and make process steps of fabrication flow on the wafer. And then, of course, after you singulate the wafer in dies or components, we have the final assembly and test with ICOS products. So you see many, many products. At wafer level, as I said before, you see process tools and process control tools. The process tools are coming from SPTS, as I said, and the process control comes from the Zeta acquisition or organically developed moving from front end of semiconductor into the back end. Plenty of challenges here. As I said, I mentioned all of these challenges, I guess. I don't believe I skipped any of those, but there are many, many more. And the challenges are for both, for the wafer-based processing fabrication, but also for the assembly and tests of packaged IC components. And where there is a challenge there is KLA.

So we have just announced new products at the seminar in Taiwan. These are three products. One is a wafer-level inspection Kronos 1190. The other one is, Mehdi as you said, a die sorting. It's called ICOS F160 to sort the known good die and eventually inspect the six sides of the die, and then there is the last tool that we call the component inspection. This is really the final inspection before sending the component to the integrators. A couple of things that we brought from – sorry, give me a second here to fix the slide. A couple of things that we brought from front end, just to give you an idea of exactly how we bring technologies from our experience in front end semiconductor process control into packaging. If you consider the left part of the slide, Kronos 1190, you can clearly see how blurred the image is on the left picture and much better definition on the middle picture, and then right side you can see all these lines in purple, there. So first of all we integrated a higher resolution optics in the new Kronos 1190 to give all our customers the ability to inspect wafers with much higher sensitive. And also we integrated AI for classification. And the artificial intelligence, machine learning algorithms came directly from front end. Not only. We also have the ability to import design information to pinpoint some weakness of the design of the package itself that can lead to error and marginality. So this is best known method that we use in front end for the last 10 years and now we are bringing to packaging.
When you go to the middle part of the slide, on F160XP, you see a differentiated technology that is using an infrared illumination sensor to detect really subtle cracks inside the die or inside the package. This is extremely important because if you have a crack, if you have a delamination and you cannot see this delamination after your mold the die, this delamination or crack stayed there, in your package and eventually under temperature or pressure stress, the die is going to fail. And think about driving a car with a die that is failing in a package while you drive automatically. It's going to create a lot of liabilities there. That's the reason why adding a tool that is capable to find these cracks inside the package or the die is extremely important.
And then on the right side, this is the final component inspection, we came out with a new idea of how we scale 2D and 3D metrology capability combined on a single platform. But this is only process control.
As I said, we also have a process portfolio and these are example of our SPTS applications for packaging. So we have PVD means Plasma Viable Deposition – this is what we call sputtering - the CVD deposition and etch products. And we have quite a good library of applications that we create on technologies that we have already developed for other markets like for example RF or MEMS or power. We develop specific applications to help our packaging customers in all these areas that I mentioned, either deposition or etch.

And this is my last slide. I want just to finish with this slide again, to really communicate the exciting opportunity that KLA is in packaging, we were not in packaging a few years ago, as you said. It was a long journey, but now we are investing either through acquisition or organic growth. And consistently with the September Investor Day we are on track to get these pretty interesting 20-25 percent CAGR from 2015 now to 2023, as we have planned the last year. And this is my last slide. I'm open for more questions.

Mehdi Hosseini: Sure. One follow-up especially to the last slide – obviously the end market application is diversified. The advanced packaging is no longer driven by a smartphone cycle. It still depends on the smartphone, but the market is expanding into data center and other applications. How do you see the customer mix changing? Would it continue to be a concentration or do you think your customers also diversify as end market application diversifies?

Oreste Donzella: That's a fantastic question. When you go back five years ago or ten years ago and you see who was making packaging of semiconductor device, you see the so-called OSAT. So these outsourcing, test and assembly companies like Amkor or ASE or SPIL or these kind of companies, generally in Taiwan or Korea, in Asia. They owned pretty much almost all the packaging business. And there was a presence of IDM, like Intel, that were making some packages on their own or eventually those packages were distributing to the OSAT. Then the memory customers were doing the same. Now we see a big shift. OSATs are extremely important. It's a good portion of our business and eventually they can keep on spending. However, we see the big names more and more in the packaging landscape. And we see more interesting that those companies, either memory or logic, are investing money and they are investing money in developing new technology, eventually also fabricating their packages. We see also tsmc that made a big, big entry in the packaging world with the introduction of the so-called InFO that is the fan out wafer-level packaging technique that they use to assemble the applicational processor of the iPhone from Apple. So the landscape changed because now we see more and more interest from the top semiconductor companies either IDM, logic or memory in participating in both the packaging R&D and packaging production.

So that's what we see. And, again, that's another reason why KLA is investing in packaging. These are the same customers that we have had a long, long relationship in the front end. It becomes easier for us to connect in the back end now and trying to help the back end as well based on the relationship that we had for many, many years in the front-end semiconductor.

Mehdi Hosseini: Great. And just one last question for me on what to do – also big picture question, yields and how improving the yield could help customers and also increase penetration. When CoWoS was first introduced almost like five-ten years ago it was very expensive. And now it's becoming more affordable because the yields are improving. Is there any change with KLA's business model? Is there any – a question is – would there be any opportunity for KLA shared economics if KLA is indeed enabling yield improvement for advanced packages?

Oreste Donzella: Well, we don't know if the business model, for packaging, is going to be different than the one that has been really, really successful in the front end for many, many years. I mean you are talking about maybe yield as a service or something like that and sharing the results of the outcome. It's really early to understand where we go in this particular area. What I can tell right now for sure is we are bringing more and more of the expertise, both that people, technology and methodology levers from front end to the packaging, towards our customers. And in the last six-twelve months we started so many close collaborations in particularly with the top

semiconductor companies, as I said before, but also with OSAT, to figure out how to work together and advance the packaging technologies roadmap.

Now, the fact that frankly speaking – the fact that the packaging technology roadmap is evolving so quickly, so rapidly, and it's also involving many, many new players – big ones, small ones and so on – give us an opportunity to put all this together and to come up with some, as you said in the beginning, standardization in methodology and technology. Now, I don't know if it's going to change our business model. Probably not. The way we do business with our customers will remain the same as long as we are successful, but for sure challenges will keep us all together, will keep us closer to customers that are going to be developing together solutions for the industry.

Mehdi Hosseini: Great, thank you. Shall we open it up to the floor, see if there's any questions?

Oreste Donzella: Yeah, sure.

Mehdi Hosseini: Okay. Katie, can you please help us here?

Katie: Thank you. Ladies and gentlemen, the floor is now open for questions. If you have any questions or comments, you may press star one on your phone at this time. We do ask if you are listening via speaker phone to please pick up your hand set for optimum sound quality. Once again, if you have any questions or comments please press star one on your phone now. We have no questions in the audio queue at this time.

Oreste Donzella: Okay. Maybe I'll –

Mehdi Hosseini: I have one –

Oreste Donzella: Yeah, please.

Mehdi Hosseini: One more, just quickly. If advanced packaging actually is gaining more momentum with increase in market application and so forth, would that actually slow down SOC? Or how do you see advanced packaging commercialization impacting the migration to the five and the three nanometer price technology?

Oreste Donzella: I think it's complementing the front end semiconductor. We can have another special talk about front end semiconductor one day, the technology is not stopping. And now the introduction of EUV photolithography is helping to pretty much break technology barriers and get the costs a little bit more under control, in particular when the EUV high NA optics is going to be implemented. So it's not going to substitute. It's going to complement, it's going to augment what the front end semiconductor industry is doing. Again, it's all about cost at the end of the day. What I said about the disaggregation of the functions. Instead of building a very large, a very complicated chip with a bunch of functionality inside, you can have multiple chips. And some of them are really high end, so the technology have to support this high end chip. But others that are lower end, instead of building the

functionality in the same chip, they're building the same packaging through this disaggregation via chiplet. So it's not going to replace, it's not going to be a substitute. It's going to complement.

Mehdi Hosseini: Okay, great. So with that I want to conclude our presentation. I want to thank Oreste and the KLA team for taking the time. This was very informative. If there's any follow-up questions from the audience, feel free to shoot me e-mail, mehdi(dot)hosseini(at)SIG(dot)com. I want to wish everyone a great rest of November and early Thanksgiving holidays. Katie, you can wrap up this call.

Katie: Thank you, ladies and gentlemen. This does conclude today's conference call. You may disconnect your phone lines at this time and have a wonderful day. Thank you for your participation.