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PRESENTATION

Operator

Thank you for standing by, and welcome to the Fluidigm mass cytometry investor event. (Operator Instructions) As a reminder, today's conference call is being recorded.

I would now like to turn the conference over to your host, Mr. Peter DeNardo. Sir, you may begin.

Peter Denardo

Thank you, Valerie, and hello, everyone, and apologies for our delayed start time due to some technical problems we experienced in connecting. Welcome to Fluidigm's first-ever investor event today focused on the company's mass cytometry business. During this call, we will review this part of our business, provide commentary on our financial and operational performance, market trends, strategic initiatives as well as discuss our product innovation and strategic growth plans.

Presenting for Fluidigm today will be Chris Linthwaite, our President and CEO; and Steve Kulisch, Senior Vice President, General Manager and Head of Strategic Marketing. We are also pleased to have joining us today a couple of key customers. These include Nasry Yassa and Andrew Brown of Sirona Dx; and Bernd Bodenmiller of Bodenmiller Lab. In addition, Fluidigm's CFO, Vikram Jog; and the company's Chief Science Officer, Andrew Quong, will be on hand to help answer questions during today's event.

During the call and subsequent Q&A session, we will make forward-looking statements about events and circumstances have not yet occurred, including plans and projections for our business, future financial results and market trends and opportunities. Examples include statements about expected financial performance, planned product releases, collaborations and partnerships and market and revenue growth expectations. These statements are subject to substantial risks and uncertainties that may cause actual events or results to differ materially from our current expectations. Information on these risks and uncertainties and other information affecting our business operating results is contained in our annual report on Form 10-K for the year ended December 31, 2020, as well as our other filings with the SEC.

The forward-looking statements in this call are based on information currently available to us, and Fluidigm disclaims any obligation to update these forward-looking statements, except as may be required by law. During the call, we may also present some financial information on a non-GAAP basis. Non-GAAP information is not prepared under a comprehensive set of accounting rules and should only be used to supplement an understanding

of the company's operating results as reported under U.S. GAAP. We encourage you to carefully consider results under GAAP as well as our supplemental non-GAAP information and the reconciliation between these presentations.

I will now turn the call over to Chris, our President and CEO. Chris?

Stephen Christopher Linthwaite - *Fluidigm Corporation - President, CEO & Director*

Thank you, Peter. Welcome to our first Investor Day event of 2021. Today, we are focusing on our mass cytometry franchise and anticipate holding a similar event for microfluidics. As you may recall, we announced our Vision 2025 strategy earlier this year. Vision 2025 is the results of our latest strategy 5-year planning exercise.

Our goal is strong revenue growth through the delivery of innovative new products and services. We intend to leverage beachheads we've established in attractive new markets and customer segments beyond our historic research base, while pursuing new partnerships that generate additional benefits to our business ecosystem. I'm incredibly excited to showcase our perspectives on the market, our innovation road map and to introduce additional industry leaders who will discuss their work, general market needs and thoughts on where clinical and translational work is heading in the years to come.

I'm excited about the prospects for the mass cytometry business for many reasons. Yes, the technology we have pioneered is groundbreaking and simply amazing. However, there is so much more to this franchise. We are enabling advanced medical research around a multitude of diseases. We are integrating in the clinical trials that may accelerate drug development and ultimately accelerate the advancement of personalized medicine with enhanced treatment alternatives or new treatment paradigms.

While the COVID pandemic created headwinds for our mass cytometry franchise, before the outbreak, our business produced multiple years of double-digit growth. We have made significant progress on key milestones that bode well for our future prospects. We've established an installed base of more than 330 systems with 113 imaging enabled. We have introduced new innovation while supporting our customers transition from basic research into emerging clinical and translational applications.

We've been integrated into more than 150 clinical trials, and we have ample room to improve upon these statistics. We have grown our recurring revenue streams as a percentage of overall revenue. We have an adaptive business model. We know that success breeds competition, and we must evolve to reflect new market needs. One example is the price positioning of our systems. We have adjusted instrument pricing to penetrate new customer segments, while driving continuous improvement initiatives in our operations to protect gross margins. We have expanded our menu of fixed and flexible content to drive utilization of consumables.

Judging from our public market valuation, these business milestones, accomplishments and future growth potential are underappreciated by the broader investor community. I hope our conversation today begins a new narrative. In a minute, I will introduce you to Steve Kulisch, our Senior Vice President of Marketing and a seasoned life sciences leader. Following Steve's section, Dr. Nasry Yassa, the founder of Sirona Dx; and Andrew Brown, the Chief Commercial Leader, will discuss their specialty contract research organization. They have created a boutique CRO business that partners with biopharma to do important drug development work, with a focus on introducing novel technologies into early clinical stage development.

Following Nasry and Andrew is Dr. Bernd Bodenmiller, a leading global pioneer of high parameter spatial imaging in oncology. Bernd has recruited an impressive team and earned academic appointments to 2 prestigious Swiss institutions. He works with the nexus of advanced multi-image research of disease and the deployment of these tools into health care decision-making. He partners with pharma and clinical practitioners to create new personalized medicine strategies.

With that, I welcome Steve Kulisch, Senior Vice President of Marketing.

Steve Kulisch

Thank you, Chris. Good morning and good afternoon to all attendees and Fluidigm guest speakers. I'm very happy for the opportunity to spend the next 15 to 20 minutes providing this audience with further insights into Fluidigm's mass cytometry and tissue imaging business. Included in this presentation is an overview of target markets, details of segments where we have significant opportunities for growth with our current portfolio and strategies to continue consistent double-digit growth. Supporting details will include a summary product road map that delivers a more comprehensive capabilities via organic effort and partnerships; and finally, beachhead strategies that altogether, accelerate innovation and expansion of our presence in target markets.

Fluidigm's mass cytometry portfolio has delivered historic growth exceeding 25%. And while 2020 was impacted by COVID associated headwinds, we will return to pre-COVID growth with an increased cadence of platform launches, an accelerated consumables road map and digital capability investments that will broaden our commercial reach as we shift more of our focus to increase adoption of our technologies and public and private research institutes focused on translational and clinical research. The business increased R&D staff-related investments to double the output of consumables assays and panels, as you will see in a later slide, highlighting our portfolio road map goals for both mass cytometry and tissue imaging technologies.

Additional investments in staffing will drive digital innovation capabilities and commercial reach that will capitalize on 2 significant platform launches in the next 10 to 12 months. These launches will dramatically increase our installed base of higher throughput analytical platforms and our consumables pull-through as we increase our penetration in pharma biotech and CRO segments. More specifically, the CyTOF XT system, when combined with increased assay and panel releases, will both facilitate larger studies with more samples and expand system utility into new areas of research, resulting in significantly higher pull-through per system as we've identified here over historical performance.

Fluidigm's mass cytometry and tissue imaging systems are well represented globally, with particular strength in the U.S. aligned to comprehensive cancer centers with placements in over 61% of these recognized institutes. Traction with larger multinational pharma and academic medical centers continues to grow with increasing publications showing expanded adoption in translational and clinical research that feed directly to driving precision medicine initiatives. Our technology and market focus are aligned to driving insights that enable precision medicine, and you will hear some details of such work, as Chris had mentioned earlier, from Dr. Bernd Bodenmiller during this event.

Additionally, as Chris also mentioned, we have invited Dr. Nasry Yassa and Dr. Andrew Brown to highlight the value of Fluidigm technologies in service of Sirona Dx's growing client base in clinical research services. Institutes and laboratories aligned to translational and clinical research turn scientific discovery into new methods of diagnosis, prevention and therapy with clinical research focusing this effort on the study and testing of human samples in subjects. These institutes apply technology like Fluidigm's to understand and solve complex biological problems in an environment where access to certain clinical samples can be limited requiring solutions that maximize data acquisition and resulting insights with added spatial context.

Testing methodologies and technologies must also be accurate, consistent and reliable for broad adoption. While our products continue to be utilized in discovery research in many academic institutes, we have a strong fit with the aforementioned unique needs of translational and clinical research. Fluidigm's innovative mass cytometry technology provides a capability where platform and assay consistency enables site-to-site standardization at the highest levels of plexity. We achieved this with a growing portfolio of disease-oriented assays and innovative lyophilized panels, such as our MDIPA kit, which has demonstrated value in large scale, multi-site studies that drive new insights into human immune system responses, and I will summarize 1 such study later in this presentation.

In addition to the over 1,500 peer reviewed publications, of which 70% are aligned to translational research, Fluidigm technologies are demonstrating increasing value in clinical trials as evidenced by growing inclusion in such studies over the past decade. Since 2018, we have seen an increase in mass cytometry technology utilization in Phase III and Phase IV trials with twice the enrollment of subjects versus Phase I and Phase II, a trend that will continue as we expect to triple the number of clinical trials, citing the use of CyTOF technology by 2025. Historic strength in immuno-oncology will continue, and we expect expanded utilization in vaccine development and autoimmune diseases with new platforms and assays fueling inclusion of Fluidigm technologies and larger, more extensive trials.

I would like to now provide a closer look at the mass cytometry franchise, including a more detailed view of our next-generation mass cytometry platform, CyTOF XT. which will be commercially available and launched at Fluidigm's annual user group meeting tomorrow. Fluidigm will continue to target translational and clinical research with an increasing portfolio of solutions that support the needs of customers and associated institutes. As indicated by the bullets to the right and gold bands on the charts, these focused areas of investigation are growing and continue to be conducted at both academic medical centers as well as in pharma biotech and CROs, customers that Fluidigm serves today.

Academic medical centers are traditionally early adopters of new technologies and frequently provide clinical and translational research services to pharma biotech. As an example, 1 cytometry core laboratory at MD Anderson Cancer Center applies 100% of its resources, including CyTOF capabilities, to clinical trial support for pharma. As new technologies like CyTOF demonstrate increasing value, typically with increasing peer reviewed publications, they are adopted in pharma biotech and CRO accounts, such as Sirona Dx, who are early to see the power of this technology and are providing valuable enabling services to their customers in a segment that is traditionally conservative with onboarding new technology.

Fluidigm have had historic success in serving academic sites. And as mass cytometry has established itself as an enabling research tool, our installations in additional segments will expand over time. And while academic accounts are represented today with the most installations, we will expand that segment with a more affordable, easy to use platform, supported by additional content and assays. Publications in high-impact journals from top-tier academic accounts has led to growing interest and adoption in segments where we had the opportunity to further expand installations with newer platforms along with a portfolio of innovative services and solutions.

I'd now like to spend a few minutes with a high level description of our innovation road map and some associated products that will drive growth in our target markets and customer segments. From left to right on this slide, we start first with the highly anticipated release of our newest platform, CyTOF XT, the first step in what will be a long term program, bringing innovative platform capabilities with high appeal to our target customer segments. Our increased investment in consumables assays and disease-oriented panels meet the need for flexibility and discovery and early translational research. Additional fixed content assays like MDIPA will be expanded to better meet the needs and drive adoption in clinical research and clinical trials where consistency and standardization is crucial.

Our consumables road map aims to more than double our conjugates and dramatically increase our system plexity with the addition of new validated metal tags, enabling us to measure up to 70 parameters per cell analyzed. Our software and analysis programs will focus on the simplification of data acquisition and analysis with the first step, automated analysis for immune monitoring, which has been achieved as part of the MDIPA assay workflow. We will continue with disease-oriented software modules paired with assays to streamline and automate analysis for more consistent interpretation of high plex CyTOF data, including planned modules for blood cancer diagnostic immunotherapy guidance with our partners at PLT.

The next big step in our focus is to make mass cytometry technology more accessible here with tomorrow's commercial release of CyTOF XT. Fluidigm's next-generation mass cytometry platform will offer all the value of our current on-market platform, Helios, and enable increased standardization and productivity with a significantly reduced cost of ownership. With the launch of CyTOF XT, we will maintain Helios on market at a lower ASP, while implementing trade up and capacity expansion programs to bring the added value of CyTOF XT to our existing customer base. CyTOF XT will continue to provide increased access of mass cytometry technology to more researchers. Lower cost of goods enable us to further reduce the list price of XT without impact to margin.

At this list price and expected ASP, CyTOF XT is at a competitive price point in the high plex cytometry market, sitting between platforms with traditional market strength and between more recent entrants. In addition to lower upfront expense, operational costs of an installed XT are 30% lower in large part due to the increased automation, real-time run monitoring and reduced maintenance costs that free up precious operator time. These improvements also result in throughput capabilities from a single instrument with a near tripling of automated run time and the ability to install 2 XT systems in place of a single Helios due to reduced facilities requirements. Fluidigm innovation to serve translational and clinical markets extends to our asset portfolio as well.

While not representative of our entire road map in deliverables for 2021, our live cell bar coding and expansion modules for MDIPA will expand Fluidigm's access to more applied markets, such as infectious disease, and also deliver increased consistency and standardization that enables large multi-site studies. A clear example of this was the selection of the MDIPA assay for the NIH sponsored IMPACC study. This 2019 study was

conducted across 10 sites and included the use of CyTOF technology for the longitudinal study of over 2,000 patients with COVID-19 disease. The drive down format enabled distributed sample collection and preservation, along with standardized automated analysis on our platforms across multiple sites, affirming mass cytometry technology as the best choice for this and similar studies conducted in Europe. This demonstrated the value of Fluidigm's innovative products for large multi-site studies that are characteristic of clinical research.

I'd like to turn our attention now to Fluidigm's tissue imaging portfolio. We will walk through target markets and our innovation road map that bring the value of mass cytometry technology to spatial analysis of tissue. With Fluidigm's Hyperion tissue imaging portfolio, we have access to the $4 billion research market with consistent focus on clinical and translational research in academic, pharma biotech and CRO segments. While there is strong spatial tissue analysis opportunity in the translational research today, long-term potential in the clinical setting exists due to an expanded immuno-oncology therapy pipeline and shift to precision medicine approaches. Research segments are growing at approximately 12%, though we anticipate increasing enablement of clinical testing through expanded Fluidigm beachhead and partnership strategies.

Our multiyear partnership program will open access to the $6 billion diagnostics market as we specifically target oncology and immuno-oncology research and continue to drive spatial proteomic approaches as the near-term solution for clinical adoption is strong as compared to genomics-based technologies. We will continue to support and work closely with partners such as Dr. Bodenmiller to enable adoption of Fluidigm technology for precision medicine initiatives.

As was the story with Fluidigm's mass cytometry platforms and portfolio, we have opportunity to expand in all customer segments. As our academic customers and partners continue to show the value of Fluidigm's spatial tissue imaging technologies, with additional peer reviewed publications, we will increase our installed base and utilization across all segments by 2025. Our large installed base of Hyperion system is an advantage in translational data generation. Biomarker validation and gaining recognition by key opinion leaders will drive additional adoption in the near term.

Fluidigm is certainly not alone in the market with our spatial tissue imaging platform, and there is increasing competitive intensity in the market that rely on different technologies. When we compare different technical approaches to spatial tissue analysis against fundamental requirements of the translational and clinical research markets, it is evident that Fluidigm's technology is well positioned for success today. While a demonstrated discovery tool, spatial transcriptomics technologies, most notably represented by companies such as 10x Genomics and NanoString are challenged by characteristics such as poor resolution and high relative cost per sample, including sequencing.

Rendering these technologies in their current format not as suitable for clinical applications. That said, the value of these technologies and discovery will fuel additional translational and clinical research studies and feed a pipeline of projects that will benefit Fluidigm in the out years. When compared to technologies based on immunofluorescence, such as Akoya, mass cytometry is not constrained by the inherent limitations of fluorescence based analysis when investigating samples with targets containing both low and high abundance markers.

Additionally, Fluidigm's tissue processing is simplified to avoid image distortion, artifacts and autofluorescence, especially from FFPE samples that can impact results in complex solid tumor samples. As I now reveal our high level spatial tissue imaging innovation plan, it will become clear that we are targeting future expansion into high-value applications that will enable precision medicine. From left to right on this slide, starting with our platform development, innovation in our spatial tissue imaging portfolio will drive continued double-digit growth. On the heels of CyTOF XT is an exciting new imaging platform that will be opened up for early access by Q4 of this year, with planned commercial release in the first half of 2022.

Over the long term, Fluidigm will remain focused on extending the value of tissue imaging with a focus on delivering platform improvements critical to meeting the needs of future target markets, including clinical applications. Assay and panel development will expand with increased investment in R&D staff starting in 2021, leading to dramatic increases in both panels and multiplex capabilities, targeting both proteins and the detection of RNA beyond what has already been demonstrated in publication. We continue to innovate in our capabilities, both through partnership and in-house developed approaches that simplify tissue analysis. One such innovation is an AI-driven cell segmentation module paired with proprietary labels that simplifies and automates the process of identifying and properly characterizing individual cells in tissue, an incredibly important innovation with clear value in tumor microenvironment studies. This capability will first be offered through Fluidigm's Therapeutic Insights Services program.

Fluidigm beachhead and partnership strategy has been created to ensure that we establish installations and relationships with public and private organizations, consortia and institutes, important to amplifying the value of our technologies and driving additional innovation in our product development pipeline. Notable beachheads include CIMAC-CIDC and NIH-sponsored consortia that identified CyTOF and MDIPA technology as they select Tier 1 assay for the standardization of immune profiling of immunotherapy patients. Participation in the FLAMIN-GO project in Europe announced today is another example demonstrating the power and value of mass cytometry technology and immune-related diseases. These endorsements serve to amplify the value of Fluidigm technologies in new areas of research pursuing precision medicine solutions.

As with our beachhead strategy, we are aligning partnerships to further develop and deliverable important to realize our success in 2022 and beyond. Platform development and analysis software partnerships will improve automation and improve workflows. Content expansion will be achieved both organically as well as through additional partnerships with companies like Bethyl Labs. Our recently announced partnership with PLT will bring mass cytometry to the clinical diagnostics market in China.

I expect that as I conclude this part of our virtual presentation, that there is agreement of the value of Fluidigm's technology and that we have provided insight into how our comprehensive and powerful technology platform and expanding portfolio is well positioned to serve and grow our addressable markets. These innovative strategies, when paired with ongoing partnerships, will increase our penetration into all customer segments and complete our return to double-digit growth contributions from this business. Thank you.

Stephen Christopher Linthwaite - *Fluidigm Corporation - President, CEO & Director*

Thank you, Steve. With this, I'd like to -- or with that, I'd like to transition now to the team at Sirona Dx. Nasry, are you on?

Nasry Yassa

Yes, we are.

Stephen Christopher Linthwaite - *Fluidigm Corporation - President, CEO & Director*

Please proceed.

Nasry Yassa

Steve, thank you for the introduction and thank you for the invite. Good morning, everyone. I'm here today to share the Sirona Dx experience and excitement about the platform and some of the historical thoughts behind adopting the technology. In 2018, during ASCO conference, I met with one of our largest pharmaceutical clients to discuss active projects milestone and timeline. I happened to sit next to their Chief Scientific Officer, who viewed us as a technical CRO that has visibility to platforms and technologies has not been commercialized to helping their drug development programs. He was asking me specifically about multiplex imaging and in specific about Hyperion, our thoughts.

At that time, we were working really closely with Fluidigm and their R&D group on the genomic side of it, biopanels. I knew about the Hyperion. I did not know as much as he did. He has done his homework. He's done his due diligence, and we proceed to talk about can we build a business plan surrounding the platform. By the time I left the meeting, I felt really comfortable entering into adopting the technology. I'll tell you, this was one of pivotal decision for the company and the success of Sirona as of this day and provided quite a bit of visibility for us as a technical CRO to a large pharmaceutical company.

I'm going to leave some of the details to my colleague, Dr. Andrew Brown, who will share with you who we are and what we do and our vision for the future of the platform. Thank you very much. Looking forward to the Q&A session. Andrew?

Andrew Brown

Thank you very much, Nasry, for the introduction. Good day, everybody. It's great to be here. We're happy to participate in this event. I'm Andrew Brown, Chief Commercial Officer at Sirona Dx. So Sirona Dx, we are really a CLIA accredited technical CRO. We're based in Portland, Oregon in the U.S., and we specialize in the provision of high complexity genomics and proteomics services in support of pharmaceutical companies with their drug discovery and development programs. Now being a technical CRO, we do tend to gravitate to more leading-edge technologies before they become mainstream. And in doing so, we guide clients to the assays and platforms that will really best match their specific requirements.

So in contrast to the vast majority of CROs, we will typically wait for the latest platforms to come to market as pretty much a finished push-button product. We actively embrace new technologies at an earlier stage possible, often assisting companies such as Fluidigm with product development. In this sense, we really function as a bridge between the tools developers on the one side and pharma, with the latter benefiting from early access to the enabling new technologies that have the potential to accelerate their therapeutic programs. So our unique bridging approach makes us highly attractive to pharma, who gain early access to these transformative technologies, along with the technical expertise to harness them. All of this is within our CLIA accredited lab that supports pharma regulatory requirements, which means they can continue working with us and our team as the technologies become embedded into clinical trials.

Our unique approach and cutting-edge service offerings helped us gain recognition as a top 10 service company by Pharma Tech Outlook last year. Several of our key partnerships with life science tools providers were associated with press releases over the past few years. In 2017, we had a joint press release with Fluidigm to announce the development of an enabling immune-oncology expression profiling assay utilizing Fluidigm's Biomark HD system. Then in 2018, we announced how we had embraced Fluidigm's imaging mass cytometry technology with the Hyperion Imaging System. And in doing so, we became the first CRO able to provide high parameter single cell imaging capabilities to pharma.

More recently, we actually did adopt Fluidigm's saliva-based SARS-CoV-2 assay as well for our COVID testing service. So many of our pharma partners are advanced in immune therapy program. This is a real area of focus for Sirona Dx. And as a consequence, they really require highly specialized services that gives them the ability to deeply profile the immune system and reveal the interplay with the tumor tissue microenvironment. With integrated leading edge technologies, Sirona Dx can produce comprehensive multiomic analysis in a way that's rarely seen in a single laboratory, and we have consequently emerged as an essential pharma partner. Our clients seek expert guidance on the best approaches, including which platforms to utilize, which multiplex panels to develop and how best to interrogate the result in big data to gain meaningful insights.

Within our single cell proteomics service offering, Fluidigm's mass cytometry technology is incredibly important, as Nasry had alluded to at the start of this call. For multiplexed imaging, our clients depend on imaging mass cytometry with the Hyperion system. For in-depth characterization of immune cell subsets and suspension from things like whole blood, we rely on mass cytometry with Fluidigm's Helios system. With our imaging mass cytometry service, pharmaceutical companies are no longer constrained by the limitations of traditional immunohistochemistry. They are now able to image up to 39 biomarkers in the same tissue section with single cell resolution. This is really a game changer. It's incredibly powerful because clients can now deeply analyze cell phenotypes and function with full spatial context in the tissue microenvironment.

Our comprehensive services here at the lab include assay design, development and optimization, custom antibody conjugation and validation, slide staining, ablation, image acquisition. And importantly, we also offer expert data analysis capabilities, so our clients can really take the data and interrogate it to reveal the meaningful insights. Early on in embracing the imaging mass cytometry platform, we invested time and effort in the development of a highly optimized 34 market panel, which we call the Immune Portrait TME for tumor microenvironment panel.

This enables comprehensive analysis of the tumor microenvironment at subcellular resolution. We developed it to help clients really rapidly explore the utility of IMC and has become a workhorse for many of our clients and for many pilot studies too, especially since it can be customized with up to 5 additional markers to match client requirements. Here at Sirona Dx, we also utilize mass cytometry with the Helios system for in-depth characterization of immune cell subsets in blood, enabling simultaneous assessment of more than 40 parameters in a single sample, again, a game change in technology for our partners.

Right now, we support clients with a variety of CyTOF assays that we have developed with -- in hand-in-hand with our clients. However, an attractive option is also Fluidigm's Maxpar Direct Immune Profiling System. This has been designed as a simple single tube workflow, has a lyophilized 30 marker antibody panel and automated software, enabling our clients to rapidly and simply count 37 immune subpopulations in their samples.

Thank you very much for your attention, and we look forward to the Q&A after this call. Thank you.

Stephen Christopher Linthwaite - *Fluidigm Corporation - President, CEO & Director*

Thank you, Andrew. Thank you, Nasry. Next, we have Dr. Bernd Bodenmiller. Bernd, are you on?

Bernd Bodenmiller

Yes. I am on.

Stephen Christopher Linthwaite - *Fluidigm Corporation - President, CEO & Director*

All right. It sounds a little quiet on my end, but please proceed. Thank you.

Bernd Bodenmiller

Okay. Is it better now? Okay.

Stephen Christopher Linthwaite - *Fluidigm Corporation - President, CEO & Director*

Yes, sounds a little bit stronger. Thank you.

Bernd Bodenmiller

So thanks for the nice introduction. And I will describe today how we use single cell proteomic technology, namely CyTOF and imaging mass cytometry, to develop precision medicine approaches that we use to benefit cancer patients. In classical pathology, tumor tissue is analyzed in regard to its morphology, and only 1, 2, 3, 4, sometimes 5 additional markers are actually measured. This provides very limited information and consequently very limited personalization of the treatment decision. The result is that in standard pathology, patients of the same cancer type, they're only grouped in as the standard treatment A, as standard treatment B and sometimes yet another group, a standard treatment C branch.

What we are aware though is that tumors are highly heterogeneous. And even patients of the same cancer subtype will have tumors that strongly differ from each other. And that means that the standard pathology approach is simply not sufficient. And therefore, what we are trying to do in my group is to use single cell proteomic approaches to bring the right drug to the right person. And the way we approach this is that we try to describe tumors akin to social networks for individual tumor cells. They are akin members in a social network. They communicate with each other. We monitor how they communicate, what they communicate and, ultimately, how this affects the development of the tumor.

And this provides us a multitude of layers of information of every individual tumor. And as a result, we can then tailor a treatment based on the social network structure of a person's individual tumor. And to achieve this, as I just mentioned, we do need single cell proteomic approaches such as CyTOF and imaging mass cytometry. To give you an example, we recently analyzed 144 breast tumors. And what we found was that there are 3 different immune environments. And what I would like to state is that immune system is key in a human in the fight against cancer. And there was 1 immune environment where the immune system was inactive. There was a second immune environment where the immune system was active.

But where it became very interesting to us is that there was a third immune environment that we call immune group 3, where the immune cells were exhausted. So they are basically tired to fight against the tumor. And this immune environment, though, is highly relevant since recently there are new therapeutics being released called immune checkpoint inhibitors that reactivate the immune system in such an immune environment

and very often shows considerable success in the treatment against the cancers patient. And there are currently thousands of researchers working on assays in order to identify those patients that might benefit from immune checkpoint inhibitor therapy. And I believe that in the case of breast cancer, we have identified using single cell proteomic technology the subset of patients.

So here is an overview of the current workflow typically used in precision medicine applications. We take tumor samples. We profile them comprehensively. We perform data analysis, and then we decide on precision treatment. Now given all the findings that we achieved in my research lab using CyTOF and imaging mass cytometry, we eventually really wanted to know how CyTOF and imaging mass cytometry will perform in a clinical setting. And together with other groups in Zurich and Basel in Switzerland, we initiated the Tumor Profiler observational clinical study. And in this observational clinical study, the aim is to answer the question, whether novel profiling and data analysis approaches are actually clinically implementable and then useful for the clinician. The Tumor Profiler project is a joint partnership between academia, including the University of Zurich and ETH Zurich clinics, including the university hospitals of Zurich and Basel, and industry, including Roche. And it really brought together clinicians, basic researchers and computer scientists.

The workflow of the Tumor Profiler is shown here. Of a given patient, a biopsy is taken, and this biopsy is analyzed using routine diagnostics, including pathology and gene panel sequencing, resulting in a standard clinical report, which is used by the tumor board. We then expanded the standard branch with the Tumor Profiler branch. And here, we use different technologies importantly, including CyTOF and imaging mass cytometry, to gain an in-depth view of the tumor ecosystem and the result is a molecular summary report that also goes to the tumor board. And in total, in this study, we analyzed 240 melanoma, ovarian cancer and AML patient. And as I mentioned before, the key question is, are those technologies clinically useful?

The workflow of the Tumor Profiler is illustrated here. We receive the tumor samples that associated into individual cells for those technologies that need single cell suspension and other technologies simply get the tissue sections on glass slide. We generate the data. The data is integrated. We generate a molecular research report. This research report is assessed by a pre-tumor board, including clinicians and scientists. And this pre-tumor board makes treatment suggestions based on standard guidelines and then plus emerging diagnostics. This is the gene panel sequencing. And then third also plus the results of the Tumor Profiler analysis. And then this report goes to the actual tumor board, who ultimately then takes a treatment decision for a given patient. And as an extension, all the data is also analyzed using basic research approaches.

So my group had 3 roles in the Tumor Profiler project. First, we are the central lab, and we process all of the tissues into single cells. And even second analyze the single cell suspensions using CyTOF analysis. We then also receive tissue sections on routine glass slide from the pathologists and we use imaging mass cytometry to analyze this tumor section. We then analyze the data we generated and then also generate a clinical report that is then accessed in the pre-tumor and the tumor board. So when we started to work in the Tumor Profiler project, we were thinking, what are the key aspects that need to be fulfilled to be viable in a clinical environment?

Now first, we need highly quantitative single cell data because all the analysis we do rely on automated algorithms. And only if you have high-quality data, you will also get very good results or as we like to say garbage in, garbage out. So we have to avoid that any garbage enters the algorithmic pipeline. And second, we have to achieve a 2-week turnaround time, so that our report is at the hands of the tumor board in time when they actually want to take their treatment decision. Third, obviously, in the clinical setting, the whole pipeline and the results have to be robust and highly reproducible. Also the analysis must be failure free because it cannot be that once in a while we do not generate a report for patient.

And fifth, it's also important that the results that we generate are integratable into clinical decision making. So when we then looked into technologies that provide highly quantitative single cell results data, then it was clear that imaging mass cytometry and also CyTOF are truly producers of data that is highly quantitative and really very low on any type of artifacts. To give you an example. Here, we imaged a bone metastasis using fluorescence microscopy, and the very same region using imaging mass cytometry. And you can see here to the left on the fluorescent image, that there's a lot of yellow, that is a marker called cytokeratin. You -- also in other regions, you see a lot of yellow and you actually do not see any yellow over here in the imaging mass cytometry image.

And the reason is that we do not suffer of autofluorescence and especially in formalin-fixed, paraffin-embedded tissue sections, which are the standard in clinical pathology, fluorescence microscopy tends to show this autofluorescence artifact and imaging mass cytometry is completely free of this measurement artifact. Also other issues that one often sees with fluorescence microscopy and also dye based methods used in

immunohistochemistry is that the dynamic range is very low. Meaning to detect the difference between the lowest and higher marker can be very problematic in the case of cancer. And if you want to detect lower bundled markers, the result is that the higher bundled markers cannot be resolved anymore in their range, meaning that you get these overexposed images.

And just look at publications, where this is applied, and you can see this all over. But in imaging mass cytometry, we have a much higher dynamic range, and we do not suffer from this artifact. There also are advantages of imaging mass cytometry for the analysis of patient samples since there's very low signal spillover. There's also no decay of the antibodies and the reports that we put on top. And also there are other artifacts very common in fluorescent based imaging that we do not suffer in imaging mass cytometry. So the result is that we really produce extremely high qualitative and quantitative single cell data using imaging mass cytometry.

Then, as I mentioned before, we have to achieve a turnaround time of 2 weeks using our imaging mass cytometry workflow. To achieve this, we automated basically the whole workflow from putting the references, starting with putting the references on the slide, to the way we do the staining, the data analysis is automated to how we generate the summary and the report. And by now, we can provide a report to the hands of an oncologist in less than 72 hours. Typically, we achieve 48 hours. And also -- and this, I really would like to stress, imaging mass cytometry is 100% compatible with standard pathology workflows. So over here, you see a glass slide with the tissue section on top. For us to do an analysis, it only means to do an additional section in the pathology department and it's something extremely easy for them to implement in their standard workflows.

And furthermore, by now, also imaging mass cytometry, because it's nicely automated and due to several improvements, is also really high throughput and, therefore, amenable to a clinical environment. Similarly, we optimized the whole workflow for CyTOF analysis and also here, typically within 48 hours, but at least within 72 hours, we can upload the report to the hands of an oncologist. And as you have seen today with the release of the new CyTOF XT, with additional methods that we use to put several samples in a given tube, it really is the ultra-high throughput approach for patient sample analysis. And so also here, we clearly have achieved a fast turnaround time of the samples from receiving them to uploading the report.

Finally, I also want to show that suspension mass cytometry and imaging mass cytometry are highly stable and reproducible over a long time frame. Here, you see a series of different markers that we use in our panel in this clinical study, and you see the abundance over a time frame of about a year. And you can see how stable these are. These are independent measurements, independent experiments. And the variation is below 30% on the marker level and especially also on the cell type frequency level. And that is really a level that we can highly reproducible take the same conclusions on the patient and make the same recommendations for patient as we did it on the first day of the study also now where we are reaching the end of this study.

So also at this point, we clearly achieved with CyTOF and imaging mass cytometry. We also developed an automated molecular report that is generated. We routinely report on the cell composition, the cell phenotype inside and the spatial aspects of cell interactions and other features. And based on this data, we then provide suggestions how a patient should be treated based on our observations made by CyTOF and imaging mass cytometry. I also mentioned at the last point that the whole procedure needs to be failure free. And by now, we have analyzed all 240 patients, and we successfully generated the report and uploaded it in over 99% of the cases, also confirming the high reproducibility and robustness of the whole workflow that we have generated using CyTOF and imaging mass cytometry.

A key question is does CyTOF and imaging mass cytometry data help in making treatment suggestions? The study is not yet concluded. So I cannot yet give you quantitative results. But I want to show you 1 example that is fairly common. So here, you -- we are looking at the melanoma patients, Stage 3, and the patient was untreated and the biopsy was taken from a cutaneous metastasis. Then the pathology report indicated that immune checkpoint inhibitor therapy might be used, but it wasn't a clear-cut case. The genomic report also indicated that immunotherapy might be used, but also here the feature that is given is not a clear-cut indicator.

And both pathology and genomics did not provide any information on any targeted therapies. CyTOF and IMC, since we have the single cell resolved measurement, could clearly assess the site of the T cells. We saw that these are exhausted. We measured many markers that support this conclusion. We could see that one of these key markers, PD-1, was interacting spatially with PD-L1 on the single service of tumor cells. You could also see that another key marker indicative of a successful immune checkpoint inhibitor therapy, MHC class I, was expressed on the tumor cells. So here, we had

a clear indication, yes, the patient should be treated with immune checkpoint inhibitor therapy. And then also both CyTOF and IMC together provided strong indication for 2 targeted treatments, including sorafenib and a CDK 4 and 6 inhibitor.

And in the end, the treatment that was suggested for the patient was an anti-PD-1 treatment combined with a sorafenib treatment. And altogether, what the study really showed us is that CyTOF and IMC can be used in the clinical context. We have tested CyTOF and IMC now on a wide range of different tissue types, and we always could successfully implement it. Great strength, as I mentioned before. I said IMC is 100% compatible with the standard format of the glass slides and tissue sections that you can receive from the pathologists. So they do not have to change their standard operating procedures. It had really essential to work with the clinics. We have achieved a high level of automation. We really learned a lot about the number of controls we need, which controls we need, that enable a constant quality control that, results in a highly robust and reproducible sample analysis. And we have also shown that together, we can achieve a fast turnaround time.

Now here, you see what I call [AMLI] approved. And with this, I mean that in Zurich, if you talk to oncologists that are working with us in the Tumor Profiler project, they're extremely happy to see the site of an imaging mass cytometry report to learn more about the patient's disease. Also, coming back to my research lab, the projects that we are now running with imaging mass cytometry. Here we have routinely more than 1,000 patients included. Simply this machine is running 24/7 and as I've said many times highly robust and reproducible. So we can now really analyze very large patient cohorts to better understand disease and to determine most informative biomarker signature.

Now where do I see the future of CyTOF and IMC? So I believe that we have really now reached a value inflection point. Because we could show that imaging mass cytometry and CyTOF can be used in the clinical context. We have shown the applicability and we could confirm in this clinical study the usefulness of the data that we generate to support treatment decision. So clearly, CyTOF and IMC and the previous presenters already showed it, I believe, should be routine techniques to be used in clinical studies. Out of this clinical trial and also based on results from academic labs, we will see an increase in informative biomarker signatures that then ultimately will help in the clinics to perform precision medicine applications and to provide a precision medicine treatment recommendation. So I truly believe that CyTOF and IMC will greatly contribute to the patient benefit in the field of oncology and also far beyond in other types of disease.

Now I just quickly want to show you 2 more slides to present to one of our most recent developments, and that is 3-dimensional imaging of tumors with imaging mass cytometry. And here, you're looking at the HER2-positive breast tumors -- tumor. In yellow, you look at the tumor mass and here in red that's a blood vessel. And in between, you see immune stroma cells. And also shown here on the next slide is the same tumor segmented in the individual cells. You can see in orange, the tumor cells and in violet and blue the immune and stroma cells. And with this, I would like to stress that I really believe those technologies are on a fantastic trajectory to reveal even more in the future about the tumor and the tumor ecosystem for the benefit of patients.

Thank you for your attention, and I'm looking forward to the Q&A session.

Stephen Christopher Linthwaite - *Fluidigm Corporation - President, CEO & Director*

Thank you, Bernd. Before I open up for questions from the audience, I want to thank Steve, Nasry, Andrew and Bernd for presenting at this event. I hope you have a deeper appreciation for the role mass cytometry plays in the scientific community of today and leave with a measure of excitement for the impact it will have in the clinical and translational markets of tomorrow. Our business is growing, and our gross margin profile is attractive. Our innovation pipeline will drive new unit placements and spur new recurring revenue streams. This formula should increase the enterprise value of this franchise as we execute on our Vision 2025 strategy.

With that, I'd like to open it up for questions.

QUESTIONS AND ANSWERS

Operator

(Operator Instructions) Our first question comes from Dan Brennan with UBS.

Daniel Gregory Brennan - *UBS Investment Bank, Research Division - Senior Equity Research Analyst of Healthcare Life Sciences*

Congrats. I missed a little part of it, given our health care conference, but I think I got most of it. Maybe just to start off, just on the new platforms and kind of the new technology that's rolling out. A lot of information was just helpful, still processing it. But when you think about the CyTOF XT, obviously, you talked about a lower cost. You talked about better operational setup, higher throughput, things of that nature, I think higher plex as well. Can you just make sure we're getting the right factors that are attributable to that new platform? Like what should we be taking away as the key features for this new platform? Obviously, lower cost, but like what else specifically is kind of new here maybe from a feature standpoint? And how do we think about what that could mean for uptake as we get to the back half of the year and into '22 and '23?

Stephen Christopher Linthwaite - *Fluidigm Corporation - President, CEO & Director*

Dan, it's Chris. So thank you very much for the question. So I think, broadly, what I take away from this is your -- is let's kind of summarize what are the key features of the CyTOF XT and the value that we'll be conveying. There's multiple factors here. I think you summarized it fairly well. We did highlight, of course, a reduction in the transaction prices and estimated positioning for the XT product, significantly below where the Helios has been indexed today. We will also continue to offer the Helios at a further reduced ASP. So it should sit somewhere below the XT price point. So creating a customer value continuum of offerings.

We also highlighted the total cost of ownership, which we felt was one of the most critical pieces of feedback that we've been receiving. And really, as we thought about through the migration of the journey that we're heading into clinical and translational support, what were the key features and benefits that, that segment of the market was most keen to see. Reducing the operators, the need for a dedicated operator, we felt was really critical and I think it squarely goes into the cost economics. Actually, it fits for both segments, including the academic cores, but in particular, for industrial applications, to reduce the -- whether it's perceived or actual, the burden of a dedicated operator.

In addition, the uptime on the system, which has significant -- had significant implications, meaning that there were more cleaning and changeover cycles, there was need for -- or inability to run long unsupervised runs, and all of this impacted the potential throughput of the platform and, ultimately, for our customers, their ability to realize the total value that the technology unlocks. So we've really gone back after each one of those, driving an affordability campaign that we think reflects really well on the customer value -- continuing fair value of this product offering. We look total cost of ownership. We look for ways to reduce infrastructure costs, committed operator needs and increased throughput, all while maintaining and even improving the reliability and robustness of the platform, which we think is really critical for its long-term trajectory into the clinic. Thank you.

Daniel Gregory Brennan - *UBS Investment Bank, Research Division - Senior Equity Research Analyst of Healthcare Life Sciences*

And maybe I can ask 1 or 2 quick follow-ups on that, and then I go back in the queue and I can recircle back. In terms of -- I heard you talk about -- I think there was a slide -- 1 of the slides talked about higher plex. It sounded like you're going to get to 70 plex it looked like by '23. Just kind of remind us where we are today with plex and you feel whatever road map that you're offering here with CyTOF XT, is that important for uptake? Just -- yes, some color there would be helpful.

Stephen Christopher Linthwaite - *Fluidigm Corporation - President, CEO & Director*

Dan, so I think the key question you were asking on plexity and how does that fit into unlocking the full potential of the mass cytometry platform. It will be on the investor website. But one of the things we tried to highlight was the -- it's not just 1 dimensional. So unlocking the XT, the performance

features of the XT, that's 1 dimension of our innovation. There's additional dimensions of our innovation, which includes offering more and expanded fixed and flexible assay content, that includes pre-conjugated assays panels that are really suitable for fast followers who are looking to run more routine sets of analyses and also a steady increase in the number of parameters that we'd unlock through the introduction of new metals.

And so in the forecast period over the next 5 years, we indicated the goal to expand from 53 parameters up to 70-plus over the forecast period. And then simultaneously expanding more off-the-shelf panels as well as continue to expand our inventory of pre-conjugated content. And that's really a copy, cut, paste, although the parameters are slightly different between the suspension-based approach and the imaging-based approach. It's essentially the same formula. And then finally, mating that with improved reporting, automated reports and disease-specific or mechanisms of action or specific biological question specific panels mated to that. So it's really a multi-pronged approach to improving the ecosystem, starts with unlocking the full potential of the underlying platform and then adding more delighters in terms of consumables and tools to unlock the potential of the system itself. Hope that was helpful.

Daniel Gregory Brennan - *UBS Investment Bank, Research Division - Senior Equity Research Analyst of Healthcare Life Sciences*

And maybe -- yes. No, it was, Chris. And then on the imager itself, that's going to come out, it sounds like first half of next year. What specifically are the key factors on the imager better, new and different? Obviously, you walked us through what the CyTOF XT are. But could you just give us a little more flavor on the specific parameters or kind of improvements that are made on the imager side?

Stephen Christopher Linthwaite - *Fluidigm Corporation - President, CEO & Director*

Well, Dan, I always appreciate the question. So I felt like we gave a lot here. I will tell you that there's a little bit of time left ahead for us in terms of the next-generation imaging platform. So you can imagine that we're not going to talk about a lot of the features and benefits at a specific level. But I think, conceptually, you can see where we're painting, where the puck is going to go on the ice. So we can envision improvements for things like throughput on the platform, total cost of ownership and kind of imagine extending some of the same delighters as the XT platform.

Because remember, at the core, the XT is the detection engine. So this is all interrelated. And there's elements of things we can do with the laser ablation modules and the total workflow to continue to improve. So I think elements to -- and I think Bernd suggested some of those things in his talk around improving automation, loading, throughput, et cetera. So beyond that, you see the same other components, which is building out more elements of the ecosystem, again, without getting into the features and benefits, specifically of the imager itself.

Operator

Our next question comes from Steven Mah of Piper Sandler.

Poon Mah - *Piper Sandler & Co., Research Division - Director & Senior Research Analyst*

Yes, a question actually for Steve or for maybe for you, Chris. But on that 1 slide where you were showing the opportunity to expand the market penetration. Can you give us a little bit more color on how you're actually defining the markets here? You're saying there's over 1,200 academic and medical centers. Just a little bit more color because obviously, there's probably a lot more than that. Is it defined more by people that can support imaging mass cytometer or CyTOF?

Stephen Christopher Linthwaite - *Fluidigm Corporation - President, CEO & Director*

Steve, thanks for the question. So I guess before I turn it over to Steve, I'll just -- to clarify, are you looking to more focus on the suspension elements? Or are you more focused on imaging? Or are you looking for color on both?

Poon Mah - *Piper Sandler & Co., Research Division - Director & Senior Research Analyst*

No, both. Just the opportunity to expand the market penetration. I'm just trying to see how you guys define those market opportunities and where you're penetrated in now. And then while we're at pause here, and then a follow-up for that is, are you guys going to need an additional sales force expansion to attack these new segments? Because some of them like the CROs are 0% right now, hospital reference lab 0%, pharma biotechs have 1%. Are you going to need to increase the sales force as well to get to those penetration levels?

Stephen Christopher Linthwaite - *Fluidigm Corporation - President, CEO & Director*

I will take the -- I'm going to turn it over to Steve to let him talk about the markets, but I'll comment for just a second on the sales force and commercial expansion. I think today, we're not getting the full leverage out of our commercial organization that we can achieve. And I think there's a number of things we can do to help ourselves. Everything from the sort of reference sites and the traction that you're hearing from the work that Sirona Dx is doing as well as the work that Dr. Bodenmiller is doing. These are all things that actually help reduce the activation energy for the adoption of technologies and make it easier for us to identify and secure new accounts.

The second is driving more affordability. So getting the word out on affordability, I think, reduces some of the activation energy for the selling organization that has to first overcome a perception, fair, unfair, that the product is priced beyond the ability for most people to pay. The third is the burden of these tipping points in clinical trials. So with more clinical trials activity -- a lot of actually pharma companies contract with academic medical centers and leading translational centers, I think the Zurich example was well illustrated on the partnering with at least 1 pharma company on one of his slides.

And they tend to consume that experience early on through those academic medical centers and with CROs before bringing that technology in house. So it's actually by working with a lot of the same customer segments that we're working with today that our selling organization calls on today actually seeds the inbound interest that we receive later from the other segments. But we'll certainly keep an eye on commercial sales team expansion and opportunities, and we keep a very open mind about the power of partnerships to leverage -- to reduce our fixed operating expenses. With that, I'll kind of turn it over to Steve to add additional color on the markets.

Steve Kulisch

Steve, so I can speak to both sides, I believe, especially as it relates to the academia and medical center disk there. So the 1,200 sites are anchored to core facilities where we have current strength. But as you could imagine, as we continue to improve the platform over time, that the number of accessible sites in that segment would increase. And certainly, 1 site is not representative of 1 installation. As you might -- as you're aware, there's a lot of medical centers that will have multiple entry point and installation points as well. So that hopefully provides a little bit of the color that you're looking for with regards to the site numbers at the bottom.

Poon Mah - *Piper Sandler & Co., Research Division - Director & Senior Research Analyst*

Yes. No, that's really helpful. I appreciate the color. And I've got a question for Dr. Brown at Sirona Dx. I saw this on the slide that you showed that you also are using Akoya products, CODEX? And then I also believe on your website, you're also using NanoString as well. Could you maybe compare and contrast the differences between these different spatial profiling technologies and how they fit in within your CRO business?

Stephen Christopher Linthwaite - *Fluidigm Corporation - President, CEO & Director*

Yes. Before I -- I was going to say before, Andrew, I pitch that to you, I also -- actually I think that might be good for having Bernd's point of view on this, too. I definitely want to hear, Andrew, what you have to say. But I want to just remind, Steve, you, that we have been positioning for quite some time that various use cases for our technology versus other companies that have been mentioned. And so it's our perception, actually, our belief that we see a lot of complementarity and you recruit and hire different technologies to answer different problems. And so there's no 1 technology that is the most dominant modality for detecting or doing certain pieces of work. And it's really about that continuing from research

on to clinical that it starts to tease out which technologies are better suited for which phases. But Andrew, I'd love to hear your points of view on Sirona Dx and how you think about positioning yourself as a leading CRO, what technologies are best suited for which things.

Andrew Brown

Yes. Thank you very much, indeed. Yes. That's a very broad question. And again, I should emphasize Sirona Dx, we are a technology-agnostic CRO. So we're pretty much guided by our clients. We try and provide them with the tools that will keep them accelerating through their various challenges. And in that respect, if you zoom out a little bit, it's probably fair to say that it's probably never going to be a 1 platform that will check all the boxes for all the requirements of all our customers. So what we try and do is position, understand what our clients are trying to do, what the challenges are, for example, in the tissue imaging space, maybe which markers they're trying to hit, which tissue types they are trying to hit, what throughput they need, what their budget is and then try and match it accordingly to the technology that will best deliver for them as we learn about those platforms and their various nuances.

So it's kind of really hard on this call to position it and explain all of that detail. But certainly, again, just to emphasize, I think, there's not 1 horse for every race. So realistically, I would say, in terms of the Fluidigm platform, it is really -- we're seeing rapid adoption from our clients. It's moving along quite nicely into more clinical support situations, clinical trials. And we're actually getting involved now in much more of the clinical elements of the assays we're developing. So things like reproducibility, these types of factors that our clients require to get meaningful data from the assays. So removing technical noise from their true biological signal. So hopefully, that answers your question.

Stephen Christopher Linthwaite - *Fluidigm Corporation - President, CEO & Director*

Thanks, Andrew. Yes. Thanks, Steve. And actually, Bernd, I welcome you if you have your point of view or perspective since you're a practitioner at another dimension and are certainly always looking for the edge that's required to deliver on your clinical or your research objectives.

Bernd Bodenmiller

Absolutely. I'm happy to say something about this. So in general, I want to make the comparison again between fluorescence-based imaging of formalin-fixed, paraffin-embedded tissues, which are the standard tissue unit in the clinics. And we also use lower multiplex fluorescent imaging of tissues also in my group, often just to do a quick screen on some of the tissues. But as I showed before in my presentation, fluorescence-based imaging is inherently prone to artifacts in formalin-fixed, paraffin-embedded tissues. And for this reason, imaging mass cytometry is, in my opinion, the best option to get high quality, quantitative data out of FFPE samples because we have very little artifacts compared to other physical principles like fluorescence for this type of tissue analysis.

And there are some types of human tissues that is inherently difficult to analyze if any fluorescent-based imaging technology. And the really imaging mass cytometry is, in my eyes, the only technology that will enable you to get reasonable data out of these tissues. And on top, imaging mass cytometry, as I also stressed before, is completely compatible with the routine workflows and sample types of the clinics. And this together, I think, makes it a clear choice for analysis of clinical samples. And in addition, I also mentioned that the technology is extremely robust and reproducible and really ticks all of the boxes that we have to take to give a fast answer and response to the oncologists in the clinics. Thank you.

Poon Mah - *Piper Sandler & Co., Research Division - Director & Senior Research Analyst*

Okay. No, I appreciate that. And Dr. Bodenmiller, maybe just 1 quick follow-up question. You talked about the robustness of the platform and the turnaround time. Can you just give us a sense for the turnaround time you're getting in your lab? Because I know you mentioned the 240 patients, where you got 99% results. Could you just give us like a sense how fast you can get through those 240 patient samples?

Bernd Bodenmiller

So I think there are different scenarios that we have to evaluate. One is getting all of the samples at once or like in the clinical study that you get a sample every other day. And if we get a sample every other day, then we are through with the sample in 2 days, the latest 3 days, and we have everything from sample processing, measurement to the upload to the report done in 2 days. Now if you want to analyze many patients at once, then the question is how many regions of a tissue do you want to analyze. But typically, we spend 1 to 2 hours per patient samples. And that means that in a day, let's say, you can measure 10 to 20 patients and then also push everything to the automated pipeline easily. So that also means that for 240 patients, it doesn't take you a very long time to do the analysis.

Operator

Our next question comes from Sung Ji Nam of BTIG.

Sung Ji Nam - *BTIG, LLC, Research Division - Director and Life Science & Diagnostic Tools Analyst*

Maybe kicking off with a clarification question for Chris or Steve. When you have -- you said you're going to have the Helios still available for customers. What's the advantage of buying that versus the next-gen CyTOF XT? Is it just the cost to own? You're going to -- it's going to be a lower cost to own for Helios? I'm just trying to understand that.

Stephen Christopher Linthwaite - *Fluidigm Corporation - President, CEO & Director*

Yes. It's a great question, Sung Ji. I appreciate the follow-up. So from our perspective, I think that the Helios is a strong platform also. It's not -- just XT provides many features and benefits that are even better suited for translational research and routine testing modalities. Therefore, those individuals, those customers, those market segments that are more focused on those attributes may find that the Helios is a very attractive product -- XT is a very attractive product clearly for them. There may be others in the research space that are much more price conscious.

And in that regard, we wanted to ensure that there was an opportunity for people to -- that could address different types of use cases, different types of needs, throughput requirements and to have a positioning that's an entry-level for them. So if they want to get their feet wet on the technology, they had an even more cost-effective platform available for them. So that's the concept here to provide a value continuum, which is new and -- for us. And we think it's going to be a very attractive opportunity as far as different ways that we can have opportunities for these end customer segments to begin that work and then transition purpose-built for different technology. Over time, we'll -- as we continue to evolve, you could imagine a different positioning for multiple products.

Sung Ji Nam - *BTIG, LLC, Research Division - Director and Life Science & Diagnostic Tools Analyst*

Got you. That's helpful. And then maybe for Dr. Yassa, Brown or Bodenmiller, whoever is planning on adopting the CyTOF XT. Just what does this new platform mean to you guys in terms of could that potentially increase your utilization of the platform commensurate? I realize that there are different applications probably more suitable for the next-gen versus the prior generation. But could this increase your utilization, given the lower operational cost or higher sample throughput? Just kind of curious how you guys are thinking about potentially adopting this.

Stephen Christopher Linthwaite - *Fluidigm Corporation - President, CEO & Director*

Sung Ji, maybe before we pitch to each of them, I just want to reinforce that each of these represent different customer segments. So whether they -- we're not here to try to sell them additional pieces of equipment. We brought them in here as key opinion leaders to have an opportunity to share where the market is headed, and they themselves are just getting some of the first look at the XT platform, synchronized with our broad-based launch tomorrow at our showcase user group meeting. But having said all that, I'd love to hear maybe first, either Andrew or Nasry, your perspectives on what you've heard on the technology, and then we'll move over to Bernd.

Nasry Yassa

Absolutely. Thanks, Chris. We evolved with the technology. We see the transition from being a research tool to now entering in a clinical trial. So the throughput is going to be key into large volume clinical trials. So we're really excited about the new platform. Probably we'll have work for both of them. We'll have work for the Helios that we have for going to be more R&D and panel development, transitioning into a clinical trial with large volume, more controlled environment, the new platform probably will be optimal for that. We're really excited of the evolution of both Hyperion and imaging. We see it with our client for the last 2 years from developing panels to now, they're entering into clinical trials, which we're in the middle of. I hope that answers your questions.

Sung Ji Nam - *BTIG, LLC, Research Division - Director and Life Science & Diagnostic Tools Analyst*

Yes. That's super helpful.

Nasry Yassa

Thank you.

Stephen Christopher Linthwaite - *Fluidigm Corporation - President, CEO & Director*

And Bernd, anything else you'd like to add?

Bernd Bodenmiller

Yes. I also believe that it will really open a new dimension for the analysis of a high number of samples in the clinical trial setting and eventually also in the clinical setting. And also, I think that will be highly beneficial. For example, in my group, we do many types of drug screening against patient samples, where we have the blood-based tumors or we have the associated solid tumors. And with the new XT, we will have greatly facilitated or easier time to measure this high number of samples that we actually generate in such screens. And so perhaps I can even imagine how one could more routinely implement these ex vivo drug screening approaches that also had to call precision medicine applications, again, in a more -- in a clinical context or at least in clinical trial setting.

Sung Ji Nam - *BTIG, LLC, Research Division - Director and Life Science & Diagnostic Tools Analyst*

Great. That's very helpful. Could I follow up with one question for the Sirona team? Just curious what's the split between suspension-based analysis and the spatial analysis for you guys. I'm just kind of curious from your customer perspective. Is that roughly 50-50 in terms of the type of projects that are coming in? And where do you see kind of the faster growth, I guess, going forward? Is it for both or one way or the other?

Andrew Brown

Yes. Thank you. So that's actually a really good question. And here at Sirona, we kind of let -- this tip of the spear for us was on the imaging side quite honestly. So we led with the Hyperion Imaging System. So more of the spatial-omics types of approaches. But in those conversations, as the doors got opened and we got ingrained and embedded with new clients, the CyTOF, the Helios applications have also, as we expected, come to the table. So initially, it was all pretty much Hyperion Imaging. And now that's starting to backfill and be supported by CyTOF studies as well for suspension. So right now -- so the percentage is leaned towards the imaging, but we expect the CyTOF to rapidly fill in behind that, again, just the way our model is in the leading edge of the technology. So we were -- with the imaging, that was definitely a leading -- the leading edge which we were aligned to. So both will be very critical in the next -- in the coming years.

Operator

Our next question comes from Dan Brennan of UBS.

Daniel Gregory Brennan - *UBS Investment Bank, Research Division - Senior Equity Research Analyst of Healthcare Life Sciences*

To the Sirona team, just wondering, as you look at the dimensions, the profile of the new CyTOF XT, even though you are at the bleeding edge, obviously, your use case is going to be ahead of a lot of other more traditional CROs. Could you just give us a sense of, say, what percent of trials today you're actually running Helios? And as you look out, say, over the next, I don't know, 3, 4, 5 years, could you give us a sense of where you think that might go to? And presumably try to incorporate the benefits of the new Helios platform into your thinking.

Stephen Christopher Linthwaite - *Fluidigm Corporation - President, CEO & Director*

So I think the beginning of that question -- yes. Go ahead, Nasry. I think you got it.

Nasry Yassa

Sure. No worries. So like Andrew mentioned, the higher percentage -- when I say maybe 70-30, 70% of our business is -- in this segment is imaging and the Hyperion and about 25%, 30%. We've entered into a clinical trial now with the imaging. We have not -- we are in the development phase of the CyTOF. We anticipate clinical trial in early next year of CyTOF. So I hope that answers your question. Is that...

Daniel Gregory Brennan - *UBS Investment Bank, Research Division - Senior Equity Research Analyst of Healthcare Life Sciences*

Yes. Sure. Right. So you're more focused on the imaging side today. Got it. Okay.

Chris, so when you think about the new CyTOF XT and you gave some slides on planned penetration over the next 5 years, which looks to be a pretty healthy step-up, maybe, call it, 1,000 basis points or so across the different customer groups, just what can you say about how we should think about the CyTOF installed base opportunity? Like where are we today? And with this new platform, how should we think about the opportunity going forward for CyTOF?

Stephen Christopher Linthwaite - *Fluidigm Corporation - President, CEO & Director*

Thanks, Dan. I just want to make sure I got the question correct. So I think the first thing you heard -- or kind of were -- or picking up was kind of what did we envision in terms of the clinical trials, potential participation and expansion in the coming years. I want to touch back on that. And then the second part of your question, I think, was around -- I want to make sure I got that right, was on the -- can you restate the second part of the question again?

Daniel Gregory Brennan - *UBS Investment Bank, Research Division - Senior Equity Research Analyst of Healthcare Life Sciences*

Yes. It's really just on the -- like if we think about the installed base, which you've given updated numbers of recently for CyTOF, I think there was a slide that showed the old TAM and the new TAM. I'm just trying to think through as we think about this box now and the utility of it, like where can the installed base go for CyTOF now with this new platform?

Stephen Christopher Linthwaite - *Fluidigm Corporation - President, CEO & Director*

Sure. So I think in Steve's prepared remarks, he discussed a goal to triple our participation in clinical trials. So I think that's a good starting point for a conversation. I think there's a significant amount of untapped opportunity. Without judging if that's an aggressive number or not aggressive number, I think it's a good place to start a conversation. And I think some of the feedback both from the Sirona team as well as Bernd's work kind of indicates how this might scale.

The second part was we have at least, I think, 2 slides, and you'll see these as posted on the Investor Day. One of them talks about -- in the suspension section, talked about the opportunity to expand across academic medical centers, CROs, pharma/biotech and hospital and reference labs, of which starting kind of from left to right, the area that we're most penetrated in today is the academic medical centers. But by our estimation, it's some place approximately around 19%, 20%. So we're relatively underpenetrated. And we have a goal over the 2025 period to increase that overall penetration by 50%, so moving from 20% up to 30% total penetration.

CROs is probably an area that, particularly the XT, I think, is well suited for -- to significantly increase our expansion in the CRO space. And part of that is interrelated with the customer demand signals that Nasry indicated, so how quickly will the demand signals from the pharma companies to want to integrate that work into their trials, but it's a -- we think it's kind of a virtuous cycle. So you have beachheads established with CROs like SironaDx and these key academic research centers that seed the early trials. And as the trial scale, they often look to move that into CROs, which gives CROs economic motive to invest in the technology and take advantage of the throughput and robustness and operator reduced total cost of ownership, all the other things we talked about in the futures.

So that's the area that we anticipate growing quite significantly from -- to approximately 10% penetration. Pharma/biotech today is about 8%. I think we've listed we're penetrated in 9 of the top 10 biopharma companies, and we're looking to expand that to approximately 30% penetration in pharma/biotech. And then hospital reference labs is probably the one that will lag the most at this stage. We're -- right now, we think it's approximately 0% in that particular segment, and we anticipate that being about a 5% penetration over the forecast period.

Daniel Gregory Brennan - *UBS Investment Bank, Research Division - Senior Equity Research Analyst of Healthcare Life Sciences*

And can you just remind us between the Imager and between the CyTOF alone, which of these -- I mean obviously, we're going to get more details on the Imager next year. But how do we think about the split between your opportunity set between those 2 before today? And how does it look with the new product?

Stephen Christopher Linthwaite - *Fluidigm Corporation - President, CEO & Director*

For sure. So the first one we went through was suspension specifics. The data that I -- we shared with you was the suspension version of this. The imaging version of this is -- it's conceptually relatively similar although, as you might imagine, the imaging technology has not been on the market as long. So on the imaging side, I think we're -- consider ourselves approximately 8% to 10% penetrated in academic and medical centers, and we're looking for a pretty significant step-up. So expanding that to about 30% penetration over the forecast period. So that's probably a faster growth rate than in the suspension-based version of it.

The pharma/biotech, it's -- we're looking at approximately -- we think about 1%, 2% today, so pretty small, and looking to significantly increase that -- if you index it at 1%, then it would be an expansion to 10% in 2025, so a significant growth in penetration. CROs, today, it's virtually 0. We have a very few number in the imaging. SironaDx was one good example, but there's not many. These are a lot of the leading-edge boutiques. And we do believe that's going to increase significantly, but we have a pretty modest target at this stage to 5% penetration; and then similarly with hospital and reference labs.

So the imaging space is very fascinating for the work that -- certainly the work that Bernd was sharing captures the imagination of how this might accelerate much faster. But I think from the time being, this is our point of view on our modeling.

Daniel Gregory Brennan - *UBS Investment Bank, Research Division - Senior Equity Research Analyst of Healthcare Life Sciences*

Great. Okay. Thanks, Chris.

Stephen Christopher Linthwaite - *Fluidigm Corporation - President, CEO & Director*

You bet. And again, we'll have all that positioned on the website for future reference again.

With that, I think we're complete with the number of -- on the open line call. So I think we had maybe 2 questions or a question -- maybe there was a question on the chat line that we can reference. So...

Peter Denardo

Chris, this is Peter. And yes, there are a couple of questions our online audience has submitted on screen if we have time to take those.

Stephen Christopher Linthwaite - *Fluidigm Corporation - President, CEO & Director*

You bet. Maybe I'll -- for ease, I'll just go ahead and read it off and we'll figure out where they should be sorted.

So the first question is, if -- I think, Bernd, as a heads-up, this will be for you. If the tumor profiler project is successful, might the tumor profiling or profile or methodology become commonplace in clinical settings worldwide? In other words, I'm trying to assess how usable CyTOF and imaging might be in a clinical setting going forward. Might it be useful only in oncology or over other diseases or, in this case, they referenced health maladies? So Bernd, maybe with that setup, you can talk a little bit around how you think CyTOF and imaging, one or both, might be used in clinical settings going forward. And where do you think the tumor profiling program could go? In terms of could it become a standard for going -- becoming more commonplace in clinical settings worldwide.

Bernd Bodenmiller

Thank you. Yes. Absolutely. I'm -- I will expand on that. So absolutely, I believe that based on the value inflection points that I've shown you today in my presentation that there's a clear path for imaging mass cytometry in CyTOF to move forward into the clinics. In fact, based on biomarker signatures that my lab has developed, we are currently working on starting a company that will exactly go that path to offer imaging mass cytometry in CyTOF in diagnostic precision medicine applications for clinical care and decision-making. So I'm absolutely convinced that this will happen, and I hope that I can contribute myself to this becoming a reality.

So the tumor profiler project in itself was very broad. And I believe that what we have developed in that and what we have then shown today, some elements of this, in addition with clear signatures on how to best treat patients, can be used in the clinical setting. Is it only useful in oncology? I do believe that in the near future, it will be the main field of application. However, there are also other fields I can clearly see that it will be used. One is, for example, rare diseases. Often, it is unclear what the patients suffer from. And then again, the single cell proteomic technologies will add amazing value to better understand the disease of a patient. And similarly, severe autoimmune diseases and inflammatory diseases, also here, I can clearly see how the single cell proteomic technology in precision medicine applications will provide great benefit to the patients.

Stephen Christopher Linthwaite - *Fluidigm Corporation - President, CEO & Director*

Thank you, Bernd. So the final question we'll have for today and we'll wrap up is a question from another viewer, participant who asked, why is mass cytometry not widely used by large pharmaceutical companies today?

I can welcome any of my other colleagues on here, SironaDx and Bernd, to provide their opinions. But I think from a Fluidigm perspective, our approach or perspective on this is that much of the work being done by -- much of the work being done in academic medical centers and leading centers, including obviously the ones in CROs, is actually being sponsored by these larger pharmaceutical companies. So there's a significant utilization. The big trade-off are -- generally for the large pharma companies, is the time to bring it in-house to decide on staffing, to build out the equipment and the room. They pretend -- they prefer to use newer technologies through third parties in the earlier phases and then later make the decision versus -- buy versus build, so consuming that service through a sponsored relationship or to bring the technology in-house.

But I'd love to hear, maybe just as we wrap up here, Nasry or Andrew, your perspectives on this from a CRO perspective. And then we'll wrap up with Bernd.

Nasry Yassa

I'm sorry. Can you repeat the question again?

Stephen Christopher Linthwaite - *Fluidigm Corporation - President, CEO & Director*

Yes. So basically, the question is why -- from their -- it was a question of why. In your opinion, why isn't mass cytometry being used by large pharmaceutical companies. So why are they contracting with people like you versus doing it themselves?

Nasry Yassa

I mean large pharmaceutical company at the end of the day, they're going to have to use a CRO in their clinical programs. So there's -- so the maturity of -- with the maturity of the platform, I think more pharmaceutical company will adopt it and still going to rely on a technical CRO to kind of guide them through some of those projects. But we see the transition from going to -- where we started 2 years ago with the conversation with pharma to where we are now. And we see that there's definitely going to be more adoption to the platform and the technology itself. Andrew, do you want to add?

Andrew Brown

Yes. I mean I -- based on my view as well here, the -- initially, I think back in 2018, there was still a lot of kinks to figure out and nuances. Even here at Sirona, we're still building our bioinformatics pipeline, improving it. There's always new challenges with new assays. Someone wants to hit a new market. It's certainly important for an immune therapy program. Then we have to figure out how to incorporate it into a panel, how to optimize it, maybe identify the best clone for that particular study.

So there's a lot of expertise under the hood. I think I mentioned in my presentation, whether you get to a point of a push-button instrument, that's -- by the time you get to that stage, it's pretty much like the NGS market was 10 years ago. I mean right now, it's just a trend that they're still going to rely very much on the technical expertise to operate the enabling platform. But that will change in the future. But like Nasry said, ultimately, if you're taking these into clinical programs, you do need to have a CLIA lab that can support that clinical trial, which is what we do here at Sirona. So hopefully, that helps with your question. That's a good question.

Stephen Christopher Linthwaite - *Fluidigm Corporation - President, CEO & Director*

Thank you, both. And then -- and maybe, Bernd, I just want to share a different perspective, which comes from leading academic medical centers. Maybe you can characterize how you work or your colleagues work with pharma companies to get insights and to access these sorts of new cutting-edge technologies.

Bernd Bodenmiller

So of course, in the case of our collaborations with pharma companies, it is purely research-based, and we try to do new things together with them and to address new questions and ideas that they have. And what I would like to add though is that I also believe that there will be more and more adaptation by pharma companies especially since with what was presented today that the technology and data analysis will be more and more automated and the ease of use is given. And I have to say that in Switzerland, I actually already see a broad adaptation of pharmaceutical companies with CyTOF technology. Initially, they had many collaborations with us. There were many discussions. And eventually, it really became clear to them that there's great value in these technologies. And as they've now matured, there's also more and more adaptation. And I can clearly see that this is a trajectory that I believe will continue also with other companies.

Stephen Christopher Linthwaite - *Fluidigm Corporation - President, CEO & Director*

Super. Thank you very much again. So with that, I'd like to wrap up our first Investor Day of 2021 on mass cytometry franchise. Really appreciate all the work of my colleagues in preparation and, of course, thanking our distinguished visitors or guests and key opinion leaders from SironaDx and from the Bodenmiller Lab in Zurich. Thank you very much again today, and be well.

Operator

Thank you. Ladies and gentlemen, this does conclude today's conference. Thank you all for participating, and have a great day. You may all disconnect.
