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**Indo-Pacific Subcommittee**

***Standing United Against the People's Republic of China's Economic Aggression and Predatory Practices***

Chairwoman Kim, Ranking Member Bera, and distinguished Members of the Subcommittee thank you for the opportunity to testify at today's hearing entitled "Standing United Against the People's Republic of China's Economic Aggression and Predatory Practices." It is an honor to be here and share my story.

I am the Chief Executive Officer of FemtoMetrix, Inc., a small California-based company innovating in-line process control tools for advanced semiconductor production. We produce a tool that is both wholly unique and utterly vital to progress in advanced microchip manufacturing. Today, I will testify about my company's recent experience with trade secrets and intellectual property theft and how that theft highlights industry-wide vulnerabilities in developing advanced semiconductor production in the United States.

## Introduction

FemtoMetrix is a world leader in in-line optical Non-Visual Defect metrology tools for surface and buried defect detection in advanced semiconductor production. Its metrology system – the Harmonic F-Series – uses unique non-destructive Second Harmonic Generation techniques to detect advanced microchip manufacturing blind spots created by the introduction of new materials, new processes, and new 3D architectures.

FemtoMetrix technology is essential to any country wanting to lead in cutting-edge integrated circuit manufacturing capability. Our technology is crucial to the next iteration of microchip manufacturing. It is the only way to characterize many critical aspects of advanced microchips on the production line. It is also the only metrology tool in existence that functions in line for critical applications within newly emerging chip structures and designs like Gate All Around (also known as RibbonFET and MBCFET). Staying on the cutting edge of microchip manufacturing capability will require FemtoMetrix's technology.

FemtoMetrix's unique technology for process control provides vital data to advanced chip makers, increasing yields and decreasing the field failure rate of chips sold. Advanced microchip manufacturers must be able to characterize what they are making because atomic level deviations in the manufacturing process can cause chip failure if not addressed.

FemtoMetrix was founded in 2011 as a spin-out of the University of California, Santa Barbara, building on decades of Department of Defense-funded research at various institutions, including Boeing, NASA JPL, and the Institute for Space Defense Electronics. FemtoMetrix was founded on the premise that shifts in semiconductor production techniques and materials were needed to continue leveraging the benefits of Moore's Law. Since then, the company has grown from a prototypical startup out of a dorm room, to a small laboratory, to a Samsung Ventures and SK hynix portfolio firm with market-leading technical results and full manufacturing capabilities. FemtoMetrix's progress has been advanced with its Chief Technologist David Adler, former Chief Technologist at KLA Tencor.

**Theft of FemtoMetrix's Trade Secrets and Intellectual Property by Chinese Nationals**

The Harmonic F-Series is a highly complex measurement tool, the building, calibration, and use of which all involve highly confidential and specialized trade secret information. FemtoMetrix goes to great lengths to protect these trade secrets. FemtoMetrix employees are subject to contractual agreements to keep company information confidential, among other security measures, inside its walls. Outside of the company, FemtoMetrix shares the above information only with select customers and only under strict non-disclosure agreements. In all circumstances, FemtoMetrix limits such disclosures to what is absolutely necessary.

In September 2020, FemtoMetrix's Vice President of System and Field Chongji Huang, a Chinese national, announced his resignation, citing issues with his wife's visa as the impetus to move back to China. Shortly after, Huang's colleague Wei Wei Zhao – a Chinese national hired at Huang's recommendation – also left the company, followed by Puxi Zhou, a third Chinese national.

During their duties, the three Chinese nationals were trusted team members privy to the inner workings of FemtoMetrix's technology. The three had significant experience building, calibrating, and using the Harmonic F-Series systems. In addition, Huang, Zhou, and Zhao worked collaboratively at FemtoMetrix in different areas. FemtoMetrix believed it had a good relationship with all three men and parted on seemingly good terms. Huang even invested in the company while employed there.

As FemtoMetrix later learned, the three individuals were able to piece together the trade secrets they were separately privy to and create a competing copycat business in China called Weichong Semiconductor ("Weichong") that uses entire aspects of FemtoMetrix's trade secrets and proprietary technology. They made a business plan presentation that contained highly sensitive and proprietary FemtoMetrix information, which they used to solicit FemtoMetrix's customers – all while still employed there. This presentation included graphics and photographs created by FemtoMetrix and depicting FemtoMetrix's trade secret product information; reports purchased under the Non-Disclosure Agreement by FemtoMetrix for FemtoMetrix's sole use; and lists of FemtoMetrix past and current employees misrepresented as Huang's employees, among other confidential information. In the business plan, Huang did not remove FemtoMetrix's name from product images.

FemtoMetrix also discovered that, despite security measures, Huang and Zhou covertly absconded with thousands of files and years' worth of proprietary information upon leaving the

company and snuck those files to Weichong in China. In addition, because Huang was also an investor in the company, he had access to – and seems to have taken – additional materials. Huang currently still owns stock in FemtoMetrix.

Weichong has also filed Chinese patents using FemtoMetrix's technology to publicize trade secrets and thwart legal challenges to enforce American law regarding trade secret protection. The full extent of Huang, Zhao, and Zhou's theft continues to unfold as information regarding Weichong trickles out of China.

**Inadequacy of Litigation Against Weichong**

In 2022, FemtoMetrix sued Huang, Zhou, Zhao, and Weichong in federal court in California per the employment agreements signed by all three former employees. Although litigation is still in the early stages due to service issues and motion-related delays, on March 10, 2023, the Court ordered an expedited jury trial in the Central District of California to begin on October 3, 2023. Weichong has retained the United Kingdom-based multi-national law firm Orrick Herrington & Sutcliffe to defend the lawsuit. Counsel for Weichong has explicitly indicated their intended strategy of waging a legal war of attrition. Thus far, Defendants have collectively filed two motions to dismiss and appear to be preparing for a third dispositive motion to drive up FemtoMetrix's legal fees. It is unclear how a new company like Weichong can afford one of the most expensive law firms in the world.

Nonetheless, FemtoMetrix is committed to fighting and defending what is right because the U.S. cannot afford to lose FemtoMetrix, as that would critically undermine U.S. semiconductor capabilities and leadership.

Assuming FemtoMetrix successfully obtains the injunction it seeks, as a practical matter, such an injunction is not enforceable in China. A permanent injunction likely would limit Weichong's prospects for expansion beyond China, but not within. Similarly, a judgment for monetary damages against Weichong and its founders is uncollectible in China. Consequently, litigation in a U.S. court has not slowed Weichong's growth, solicitation of investment, or solicitation of FemtoMetrix's customers. The American legal system is not designed to address deliberate, international thefts of this kind and is not adequate for the task. Foreign companies like Weichong have become more accustomed to exploiting the court system's slow pace and unwieldy cost. Alternative means of addressing such international theft are needed. Absent more substantial repercussions, Weichong will continue to develop FemtoMetrix's technology in China while hampering FemtoMetrix's development.

**Systematic Theft of American Semiconductor Innovations by Chinese Entities Utilizing Chinese Nationals.**

Weichong is not an outlier but an exemplar of the first half of a playbook for the theft of American intellectual property. It begins in China when someone, like a venture capitalist, knows someone else, like a technologist, from a university or other connections. Once the technologist is placed at an American company of interest, he may recruit other Chinese colleagues to the

company or else conspire with other current Chinese employees. Sometimes the technologist is selected by paid Western agents employed by the venture capitalist to target technologies of interest by a foreign entity. The technologist (or group of technologists) works to create rapport with the target company. Sometimes the venture capitalist will even provide funds for the technologist to invest in the American target company to build trust and access to otherwise restricted materials. Once the technologist has the required access and data, the venture capitalist funds a Chinese company supported by the stolen technology. The venture capitalist funds litigation through the copycat company attacks American intellectual property, and discloses trade secrets through published papers and patent applications. Summitview Capital and Yunqi Partners are two such venture capital firms that invested in Weichong.

In the second half, predatory venture funds likely owned or controlled by foreign entities, such as OmniPE, approach the undermined American company to invest, despite the foreign challenges. They seek proprietary information on technology, customer status, and market position under the guise of due diligence. Their primary goal is to utilize leverage created by the first venture capitalist to eviscerate the American target company further. Foreign entities employ this deliberate and systematic playbook to steal strategic technologies and address current challenges with advanced semiconductor production.

**Systemic Vulnerabilities in Domestic Development of Novel Semiconductor In-Line Process Control Technologies.**

Developing a novel in-line process control technology costs between $20,000,000 to $100,000,000 or more. It takes approximately eight to ten years of development before microchip manufacturers consider adopting it and provide meaningful revenues. During that extended pre-revenue period, new companies are vulnerable without significant support from large organizations. Small companies like FemtoMetrix are innovating against all odds domestically but cannot protect these innovations from foreign agents. Small companies do not have the tools or capacity to fight a pattern of systemic theft by foreign entities. Litigation in American courts is inadequate to address incursion, and little support is available.

Larger, established companies are subject to the same tactics but are better equipped to protect innovations. However, they are also hesitant to accept the risks inherent in expensive, speculative, long-term, research-based projects such as novel techniques for in-line process control. And they are reluctant to report foreign theft problems due to economic concerns, such as share prices and marketing image, in addition to other concerns. This leaves small companies such as FemtoMetrix filling a critical gap in the industry without the necessary resources and protections.

While the CHIPS Act seemingly provides additional resources, absent cost-share waivers, smaller companies cannot participate in the program. Instead, larger companies will receive the lion's share and grow without the incentive to innovate as smaller companies like FemtoMetrix do. Suppose the U.S. wants to lead the world in advanced microchip manufacturing. In that case, it must nurture smaller, more agile companies and eliminate the fear that foreign entities will ultimately reap the benefit.

In addition, CHIPS Act funding has yet to reach equipment manufacturers. Groups like MITRE will be critical to advancing innovation from lab to fab, but the effect has yet to be felt.

**Consequences of Weichong's Theft on U.S. Advanced Semiconductor Manufacturing**

The two leading South Korean microchip makers first invested with FemtoMetrix in 2016 and 2018 to enable yields in advanced node production and expedite next-generation memory product introduction. Yet due to the theft of FemtoMetrix's technology, Weichong is now a Chinese company making a vital tool for advanced semiconductor production. Suppose Weichong continues to develop and sell FemtoMetrix's technology internationally unchecked, with an unfair competitive advantage. In that case, FemtoMetrix cannot compete, and there will be no American source of this vital tool.

While novel hardware is fundamental to technological advances, in-line control process tools rely on algorithms to function and improve. When a tool is integrated into the production line of a microchip fab, its efficacy grows. This is because the algorithms learn from access to a more extensive data set. The more use, the more data, the more it improves.

This means that if the Weichong tool is installed at leading-edge microchip makers' fabs instead of the FemtoMetrix tool, the FemtoMetrix tool will swiftly become obsolete. Moreover, the tool would be a Trojan horse allowing Weichong to use the improved (and improving) algorithms in other areas, further accelerating foreign technological advancement.

Lastly, a Chinese firm would be the sole supplier of this strategic global resource; there would be no competitive American source of this vital tool.