



The European Institute for the PCB Community

EIPC SPEeDNEWS

*The Weekly On-Line Newsletter from the European Institute of Printed Circuits.
Issue 26 – August 2021*

ELECTRONIC INDUSTRY NEWS

Pandemic Fuels a PC Boom

By [George Leopold](#)

The reopening of U.S. schools after more than a year of virtual classes along with hybrid work arrangements are creating “massive refresh potential” for PC makers.

According to figures released this week by market analyst Canalsys, the U.S. PC market grew a healthy 16.6 percent on an annual basis during the second quarter. Shipments of desktops, notebooks, tablets and workstations topped 36.8 million units.

Notebook computers were the top category, with second quarter shipments increasing 27 percent over the same period in 2020.

The momentum generated by virtual schooling during the pandemic is expected to persist, the market tracker predicted.

“It is clear now that pandemic-related use cases will extend well into the future,” said Brian Lynch, a research analyst at Canalsys.

“The commercial and education segments have exploded, triggering tremendous refresh potential,” Lynch added. “The U.S. economy has bounced back well from its pandemic woes and small businesses are recovering, which will lead to a wave of purchasing from the segment.”

**US total PC (including tablets) shipments (market share and annual growth)
Canalys PC Market Pulse Q2 2021**

Vendor (company)	Q2 2021 shipments	Q2 2021 market share	Q2 2020 shipments	Q2 2020 market share	Annual growth
HP	8,070	21.9%	6,711	21.2%	20.2%
Apple	7,603	20.6%	7,821	24.8%	-2.8%
Dell	5,730	15.6%	5,183	16.4%	10.5%
Lenovo	4,572	12.4%	3,651	11.6%	25.2%
Samsung	3,039	8.2%	2,007	6.4%	51.4%
Others	7,833	21.3%	6,220	19.7%	25.9%
Total	36,846	100.0%	31,594	100.0%	16.6%

Note: Unit shipments in thousands. Percentages may not add up to 100% due to rounding.
Source: Canalys PC Analysis (sell-in shipments), August 2021

(Click on image to enlarge.)

A key factor driving PC replacement is the U.S. resurgence of Covid-19 via the Delta variant that has upended return-to-office plans. Canalys reckons that many large companies will adopt permanent hybrid work arrangements, further tying employees to home devices. That shift will fuel “commercial refresh opportunities” for PC makers, it predicted.

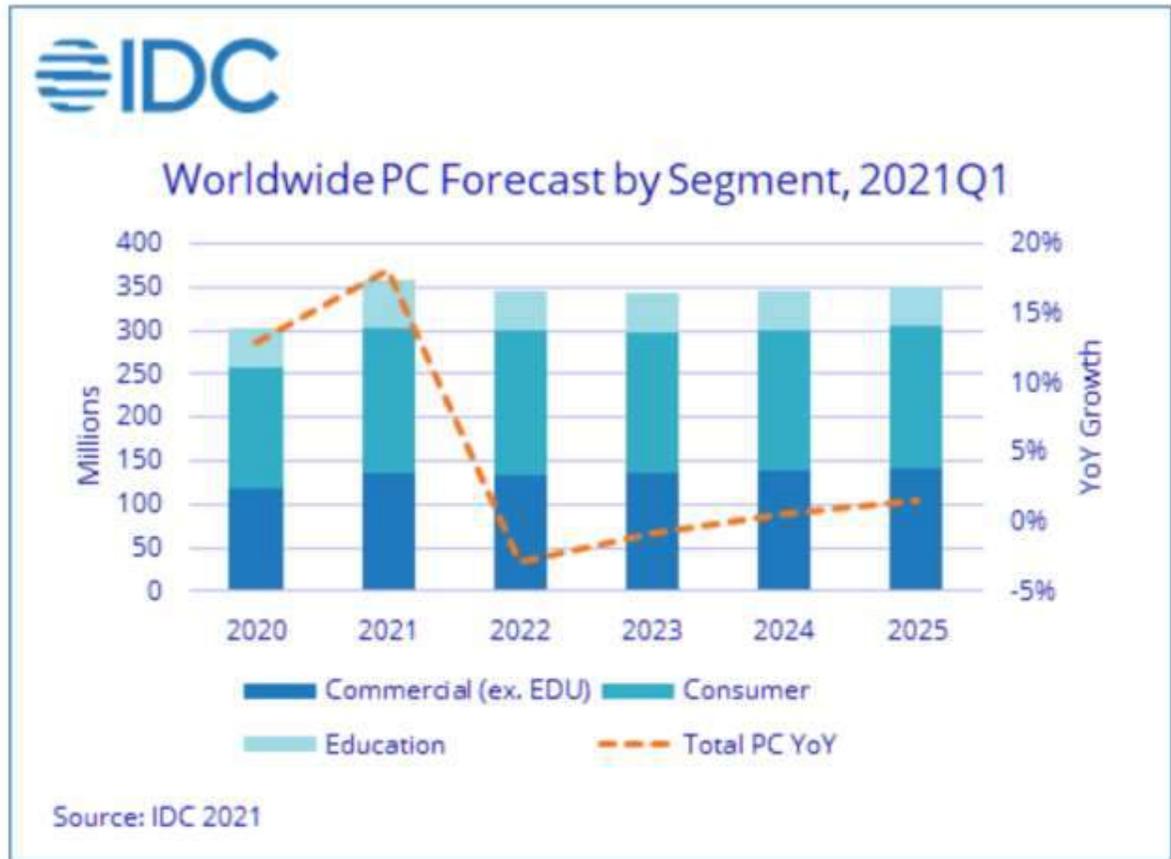
For now, U.S. schools are expected to continue in-person classes as post-secondary education shifts toward blended learning, online courses and hybrid teaching. “Education is now transitioning to a replacement market for PCs in the U.S., and the mass procurement seen in 2020 and 2021 is expected to begin its refresh cycle in 2023,” Canalys said.

Those fundamental shifts in education and work are good news for the PC industry that looked anemic before the pandemic struck. So far, the biggest gainer in the U.S. PC market is Samsung, which saw its annual shipments jump a whopping 51.4 percent during the second quarter of 2021.

Oddly, the only PC and tablet vendor registering negative annual growth was Apple, which saw computer shipments decline by 2.8 percent. Still, Canalys said Apple fared better than competitors in navigating component shortages for products like its iPad.

In May, International Data Corp. (IDC) downplayed concerns over chip shortages, forecasting that global PC shipments will grow more than 18 percent this year, topping 357 million units.

“It is important to peel back the onion because there is a lot happening underneath the PC supply chain,” said IDC’s Ryan Reith. “We don’t debate that the overall semiconductor market is constrained right now, but for the overall PC market it is a very different narrative than the years leading up to the pandemic.”



(Click on image to enlarge.)

Pre-pandemic, for example, PC vendors faced shortages of CPUs along with tight memory and display supplies. “Now the focus is around lower-priced components like notebook panel driver ICs, audio codecs, sensors and power management ICs,” Reith noted.

Continuing components shortages may lead some consumers to opt for desktops over scarce notebooks. Either way, IDC said, PC demand will remain strong.

“The consumer refresh cycle is also expected to be pulled in slightly as the pandemic has raised the profile of PCs and consumers continue to spend more time and dollars on PC gaming and content consumption,” added IDC analyst Jitesh Ubrani.

Global light vehicle production impacts now expected well into 2022



19 August 2021 [Mark Fulthorpe](#) [Phil Amsrud](#)

IHS Markit analysts Mark Fulthorpe and Phil Amsrud offer the latest analysis on the global semiconductor shortage, automotive supply chain challenges and global light vehicle production impacts, including the latest IHS Markit forecasts, reflecting light vehicle production impacts well into 2022. The estimates here do not include the latest announcement by Toyota and any others that have followed since the beginning of this week.

Wafer and Semiconductor Capacity Remains Tight

For the first half of 2021 the semiconductor shortage issue was mainly that of wafer, front-end capacity. The good news is the disruptions due to the fire at Renesas's Naka facility and the ice storm in Texas that impacted NXP, Infineon and Samsung fabs are largely behind us. Wafer fab capacity remains tight, but with those plant disruptions behind us, the impact is lower than in the first half. Having wafers is necessary to make integrated circuits (ICs) but not sufficient. The front-end process is followed by the back-end assembly and test process, which is another challenge.

While front-end processing transforms a raw 200mm or 300mm silicon wafer into thousands of dice, each die needs to be packaged to provide a complete IC that can be soldered onto a circuit board to be part of an electronics control unit (ECU).

"Wafer fab capacity got all the attention early this year, and rightly so, but if you can't put the die into a package so it can be put into an ECU, then you still can't produce and sell a car."

-- Phil Amsrud, senior principal analyst, IHS Markit

Once the wafers are processed they are sent to the assembly and test location to be diced, packaged and tested before sending them to a customer to be placed into an ECU and then into a car.

Constraints in the back-end process can disrupt the supply chain just like the constraints in the front-end process. During the first half of 2021, wafer fab capacity

constraints were causing the greatest disruption and getting the most attention, but now that those have improved, other related constraints in getting leadframes, substrates and resins are getting attention.

COVID-19 Still Impacting Supply Chain

Unlike the capacity constraints in wafer fabs, which was impacting mainly automotive MCUs, assembly capacity constraints impact all semiconductor types including sensors, power supplies and discrettes. Assembly and test locations are concentrated in China, South Korea, Japan, Singapore, Philippines, Indonesia, Thailand, Vietnam and Malaysia. With the exception of Singapore and Malaysia, the vaccination rates are reported to be less than 6% for many of these countries, according to the Center for Strategic and International Studies. Malaysia has been shutdown due to COVID-19 outbreaks recently and its vaccination rate is almost 12%. Several of these countries have seen their average infections increase over the past 2 weeks, and the ongoing threat of COVID-19 impacting labor forces in other countries is real. This threatens the operators at the assembly and test locations themselves as well as the workers necessary to move the finished products to distribution hubs for global distribution.

Like wafer fab capacity, there is a need for expanded packaging capacity. However, the margins in assembly and test are a fraction of those in wafer fabs, so there is more hesitation to add capacity speculatively. There also is a shortage of assembly equipment, with some lead times increasing to 40 weeks. One of the main reasons the lead times for this equipment has increased is because they cannot get semiconductors. In short, the equipment needed to make more semiconductors has limited availability because they cannot get enough semiconductors.

As result, IHS Markit expects the semiconductor shortages across the automotive sector now extending into Q1 2022 and possibly into Q2. Both Intel and Infineon have cautioned that the situation may persist throughout all of 2022. So while improvements in wafer capacity has improved, the situation is still fraught with challenges.

Global Light Vehicle Production Forecast Implications - Latest Update Reflects 8.3% Increase over 2020

The global forecast for light vehicle production in 2021 now stands at 80.78 million units with our latest August release. This represents an 8.3% increase over 2020 levels.

"Output lost to disruption to the semiconductor supply chain is estimated to have reached 1.44 million units in Q1 and 2.60 million units in Q2. Visible downtime in Q3 now stands at 1.60 million units underlining the assessment that Q3 will continue to see disruption, and this is becoming more significant. While we do not expect to see levels of disruption like those in Q2, it now seems highly likely that the impact will be in the range of 1.8 to 2.1 million units for the quarter if the rate of downtime that we

currently see was to continue through September. We expect Q4 will be exposed to ongoing disruption and this disruption is now expected to spill over into Q1 2022. Q2 2022 may be the point at which we look for the stabilization of supply, with recovery efforts now starting only from H2 2022.

Across the full year, taking the estimates for Q3 and Q4, in addition to the losses already identified in the first half of the year, this would put the full-year risk associated with semiconductor shortages between 6.3 million to 7.1 million units globally, according to IHS Markit estimates."

-- Mark Fulthorpe, Executive Director, global light vehicle forecasting, IHS Markit

The situation in Q3 is undermined by some delay at Renesas. Though manufacturing capacity has been restored, the ability to fulfil shipments may not be possible until September. We are also seeing additional volatility due to COVID-19 lockdown measures in Malaysia where many back-end chip packaging and testing operations are performed. As this is more labor-intensive than the wafer fabrication processes, activity is more easily affected by public health measures that impact workforce participation.

In view of these developments, we expect Q4 will be exposed to ongoing disruption and this disruption is now expected to spill over into Q1 2022. Q2 2022 may be the point at which we look for the stabilization of supply, with recovery efforts now starting only from H2 2022.

'An iPhone with four wheels': Inside Foxconn's bid to build EVs

Apple maker confident of becoming a dominant player in auto supply chain

LAULY LI, ERI SUGIURA, and CHENG TING-FANG, Nikkei staff writers

AUGUST 20, 2021 06:00 JST

TAIPEI/TOKYO -- Foxconn, the world's largest contract consumer electronics manufacturer and the biggest supplier to Apple, has long dreamed of building cars.

"If we can make iPhones, why can't we make EVs? It is an iPhone with four wheels," founder and former chairman Terry Gou told internal meetings more than once, according to people at the meetings.

Gou backed an internal project in 2014, code-named "A-Fu Initiative," to build a prototype of a complete electric vehicle, Nikkei Asia has learned. The project, which was not reported at the time, was led by a Foxconn group in charge of precision instruments. Gou promised to award shares to employees involved if they were successful, said one person familiar with the plan.

The A-Fu initiative was short-lived – car making was more complex than expected -- but the dream never died. Now Foxconn is in the middle of a new push into EVs. It is doing so just as the automotive industry's rigid, century-old pyramid-shaped supply chain, where carmakers sit at the helm with tiers of suppliers underneath, appears on the cusp of a radical transformation. Will it be more successful this time?

Young Liu, who took over from Gou two years ago, has vowed to have Foxconn's designs, components, mechanical parts or software inside 5% of global EVs by 2025. But the company has bigger ambitions. It has announced plans to build factories in the U.S. and Thailand that will assemble whole vehicles, and is looking for locations to build cars in Europe, too. Meanwhile, it has put itself at the center of an industry initiative to develop new technologies and standards for EVs that could challenge traditional carmakers.

The developments come against a backdrop of declining profits from consumer electronics. Foxconn's sales grew just 0.3% last year, and net profit has been shrinking since 2017. EVs are crucial if the company is to boost its gross margin from the current 6% to 10% as targeted. Optimism over its EV push spurred Foxconn's shares to a four-year high in March and they are still up more than 15% since the start of the year. The stakes are high if its EV ambitions stall again.

Foxconn's subsidiaries already supply electronics to many traditional and electric carmakers, from Tesla to BMW, with products ranging from dashboard displays to printed circuit boards plus a host of mechanical and plastic parts.

To expand its product set and gather broader know-how, Liu has signed a rash of supply deals and technology development partnerships in the past year and a half. A joint venture with Stellantis, owner of Fiat and Chrysler and the world's fourth-largest automaker, is developing cockpit software for connected cars. A joint venture with Geely of China, launched in January, aims to sell manufacturing and consulting services related to intelligent drive systems, software platforms and even whole vehicles.

Foxconn has been racing to improve its expertise in software -- a weak spot for a company known internationally for its hardware capabilities -- through its subsidiary FIH Mobile, which has historically made Android phones.

And earlier this month it bought a semiconductor facility in Taiwan to gain more control over the supply of chips needed for EVs.

The company estimates its revenue from automotive components -- excluding display panels used in vehicle telematics -- could exceed 10 billion New Taiwan dollars (\$359 million) in 2021. That remains marginal in a manufacturing empire that generates more than NT\$5 trillion a year, but it represents growth of 40% on the year, according to the company.

"The current revenues are mostly from mechanical and plastic parts, but we would expand our reach to the system and module level, and start to build the whole car in the near future," Liu told an investor conference this month.

That is the prize: the whole car.

The interactive dashboard of Foxconn's open platform electric car frame is displayed during the HHTD forum in Taipei on Oct. 16, 2020. © EPA/Jiji

For decades, conventional auto companies competed on heavy investments in engines, transmissions and complex powertrain systems, which worked as significant barriers to entry. But making an electric vehicle is less complicated, tempting a rash of startups globally to try.

Foxconn plans to replace the traditional tier-one suppliers and make whole EVs for newcomers such as New York-listed Fisker and China's Byton, and traditional carmakers looking to transform into EV companies, like Taiwan's Yulon Motor.

New entrants keep coming. Xiaomi, a longtime electronics manufacturer that entered the smartphone market in 2011 and is now the second-largest player behind Samsung and ahead of Apple, plans to introduce smart EVs under its brand by 2024. Baidu, the Chinese search engine and internet giant, has a joint venture with Geely and plans to do the same.

Perhaps the biggest opportunity of all would be Apple. Foxconn, which assembles more than 60% of iPhones globally, is widely assumed to be a candidate to produce Apple cars.

For the time being, its fortunes are closely linked with those of several ambitious but risky startups, who are more willing to work with emerging suppliers than established carmakers are. Byton, founded by executives from BMW, came close to running out of money before inking its partnership with Foxconn in January. Fisker is yet to start production of its first model, which will be made by Magna International, an established tier 1 automotive supplier. Its Foxconn vehicles will not roll off the production line until 2023.

Foxconn is leading an effort to smash the traditional automotive supply chain pyramid. Liu last October launched what Foxconn called an "open EV alliance" of software and hardware players in the automotive industry. The MIH Consortium -- MIH stands for "Mobility in Harmony" -- aims to set industry standards and develop "kits" combining hardware and software that EV makers can use to slash the development time and cost of new cars.

The consortium has already attracted more than 1,800 companies, including Qualcomm, Microsoft and the world's largest battery maker Contemporary Amperex Technology, or CATL. While it has issued more announcements than products at this early stage, it unveiled specifications for its first EV software and hardware kit in January and plans to deliver it to automakers later this year. Foxtron, a joint venture of Foxconn and Yulon Motor, has used the MIH platform to design a prototype electric bus for a southern Taiwanese transit operator, which will hit the road next year.

"What MIH is trying to do is to make a similar chain of partners, just like how conventional carmakers built up their supply chains," said Shinpei Kato, founder and chief technology officer of Tier IV, a Japanese autonomous driving software startup that is a key player in the consortium.

But, he added, "in the conventional supply chain, only carmakers at the top of the pyramid could make decisions." That is changing. In EVs, key components such as motors and batteries are controlled via software, unlike highly mechanical engines designed from the top of the pyramid, he said.

That suggests components can be packaged together in bigger modules and integrated as subsystems, making them easier to assemble, just as smartphone development and production are achieved today, potentially giving more power to suppliers working in concert.

"Participating companies can make decisions together," Kato said. "We might no longer need mega global automakers to produce cars when it comes to EVs."

"We might no longer need mega global automakers to produce cars when it comes to EVs," says Tier IV Founder and CTO Shinpei Kato. (Photo by Yuki Kohara)

There are questions about how MIH will evolve and to what extent, ultimately, it will benefit Foxconn.

"Component suppliers could enter the EV supply chains faster through the MIH consortium, while Foxconn could also gain access to various suppliers to strengthen its competitiveness in the EV industry," said Chiu Shih-fang, an automotive electronics analyst with the Taiwan Institute for Economic Research (TIER), who has tracked Foxconn for a long time.

"But whether MIH could work or not still depends on the suppliers' real technological capability."

MIH also became a registered nonprofit foundation last month, meaning it no longer belongs to Foxconn, and its members are not subservient to the company.

As the automotive supply chain pyramid breaks apart, it remains to be seen who will be Foxconn's partners and who will be its rivals.

Foxconn is not the only tech player wanting to catch the once-in-a-lifetime opportunity from electrifying the automobile industry, and each tech company has

different anchor points in the EV supply chain.

Nidec, which announced in July that it is in talks to form a joint venture with Foxconn next year, is another example of an auto supplier seeking to play a bigger role. It is the world's largest motor manufacturer, whose products are used in everything from computers, smartphones and refrigerators, and it has publicly proclaimed a target of supplying 45% of EV traction motors in 2030.

The open platform electric car frame is displayed during the HHTD forum in 2020. © EPA/Jiji

Foxconn's peers Quanta Computer and Pegatron have been supplying electronic control units to both traditional automobile and EV makers. And Delta Electronics, the world's leading power management solutions provider, has been focusing on providing power, charging, thermal and motor management systems for EVs for more than 10 years.

None of these has expressed an ambition to build whole cars. But LG Electronics, the South Korean giant, has been deepening its relationship with Magna. Their joint venture has featured in speculation regarding who might build a car for Apple.

Meanwhile, traditional carmakers at the top of the old pyramid retain a formidable position, and not just because of their brand recognition. They also have skills and experience that will be hard for others to replicate.

Making an EV may be simpler than making a traditional car, but it is more complex than making an iPhone. It involves at least 10 times more components -- and it has much higher safety requirements than handsets because, after all, car safety is a matter of life and death.

Those automakers, watching how Foxconn's EV projects unfold, "probably believe Foxconn doesn't understand how the industry works," said Sanshiro Fukao, senior fellow at the Itochu Research Institute.

"An automaker has the capacity to pull together these components and certify safety," he said. "Foxconn may believe that the gathering of tier 2 suppliers would help this process, but that is not right."

Former Foxconn Chairman Terry Gou urged staff on more than one occasion that if the company could make iPhones, it could make EVs. © Reuters

Other analysts who express caution about Foxconn's ambitions argue that the development cycle for automobiles is much longer than consumer electronics, and building automotive production lines is not the same either.

Raymond Tsang, a Shanghai-based partner at consultancy Bain & Co, points out that cars are typically offered with more options for customization. Customers can order specific colors, interiors, paid options and so on, so a production line will have to make cars to unique specifications, compared with a more standardized smartphone assembly.

TIER's Chiu said there is room for plenty of winners as the automotive industry undergoes its seismic shift from old technologies to new. "The era of the EV ... creates new possibilities," she said. "The ways to make vehicles are different and there are various business models. Traditional manufacturers and new entrants will find their position. The market will be big enough to house all the players."

Foxconn's chairman Liu views the EV push as a way to build his own legacy after taking the baton from its iconic founder Gou, two people close to Foxconn's management team told Nikkei Asia.

The blizzard of partnership deals he has signed, especially with Stellantis, Geely and Fisker, will help Foxconn achieve experience of vehicle production, obtain economies of scale and secure components like batteries, said Soumen Mandal, a research analyst covering automobile and emerging technologies for Counterpoint Research.

"With this gained knowledge, Foxconn will have to deliver some best-in-class products to gain the trustworthiness and credibility of big [customers]," he said. "Including Apple."



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NEWS FROM THE FED

IPC A-610H-DE available as pdf

Dear newsletter subscribers,

At last! The IPC A-610H is available in German and can now be ordered as a pdf from the FED shop. As soon as the print version is available, we will inform you in a special newsletter.

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Many greetings from Berlin

Your FED team



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NEWS FROM THE UK

Ventec and Taiyo America Sign Exclusive Distribution Agreement for Mainland Europe & UK

Leamington Spa, UK and Carson City, USA – August 16, 2021 – Ventec International Group Co., Ltd. (6672 TT), is pleased to announce it will be taking over the exclusive distribution of Taiyo products in mainland Europe, the UK and Ireland.

Ventec has a long-held commitment to providing best-in-class laminate & prepreg materials, including high-quality enhanced FR4, high-speed/low-loss material technology and an advanced range of high-performance thermal management solutions, supported by world class technical & service support, to customers around the world. With a long-term strategy to continuously invest in ownership and control of its complete sales process and supply chain for its PCB materials, Ventec has an established reputation for logistics excellence.

Effective from October 1, 2021, customers in Europe will immediately benefit from the supply chain partnership with Ventec, as it will grant greater and faster access to Taiyo product inventories which will be stocked and fulfilled from Ventec's distribution hubs in Germany and the United Kingdom. As a leading provider of specialty dielectric inks and via filling inks for use with microvia and build-up technologies, legend inks, dielectric and conductive ink products for the solar, lighting & display markets as well as thermal-cure and UV-cure solder masks, Taiyo America will continue to provide sales and technical support to its direct customers, with Ventec providing supply chain fulfillment and invoicing services. For all other customers, Ventec will offer sales, technical, supply chain / distribution support. The agreement also opens up the opportunity for Ventec to offer Taiyo's innovative range of **specialty inks and solder masks for printed circuit boards** to Ventec's own strong and varied customer base in Europe from industries including medical, aerospace, consumer electronics and automotive.

Mark Goodwin, COO EMEA & Americas at Ventec, said: "We are delighted to partner with Taiyo America as their exclusive pan-European distributor. Taiyo's products have a reputation worldwide for proven performance and outstanding quality, which creates the perfect complement to Ventec's existing material solutions. We are looking forward to supporting Taiyo's existing customers and growing the business together by introducing Taiyo's products to our customers across our assigned region."

John Fix, Manager & Director, Sales & Marketing at Taiyo America, added: "Taiyo America is pleased to partner with Ventec to distribute our product lines in Europe. Their reputation for providing leading-edge high-performance PCB base material solutions combined with their proven expertise in supply chain management will enable us to expand our market opportunities whilst enhancing our ability to meet the needs of our existing customers."

Ventec International is a world leader in the production of polyimide & high reliability epoxy laminates and prepregs and specialist provider of thermal management and IMS solutions. Further information about Ventec's solutions and the company's wide variety of products is available at www.ventecclaminates.com and/or by downloading the Ventec APP.

IFS2021-MT Registration Now Open

Will the current shortages continue through 2022? Get the answer to this and other key questions at IFS2021-MT, Future Horizons' Mid-Term Industry Webinar: <https://www.futurehorizons.com/page/135/>

When? Tue 14 Sep 2021

3 pm GMT / 7 am PST / 10am EST / 3pm GMT / 4pm CET / 11 pm JST

Where?

https://us02web.zoom.us/webinar/register/3616293135785/WN_9dsYHWvMTpaUAVf1cEIV3A

Why? Now in its 33rd year, Future Horizons is committed to providing high quality, accurate, cost-effective market research and analysis to help industry leaders prepare themselves for the next new normal. At January's IFS, we alone predicted 18 percent market growth for 2021, and were ridiculed at the time for being "ever-optimistic", but it was us who were right forcing all the other industry pundits to revise their forecasts in line with our views.

Our proven methodology, based on our analyses of the industry ecosystem and our interpretation of how these interact, is based on our 55 plus years of direct industry

experience, longer than any other analyst and most industry execs. We are also not afraid to stick our necks out and go against the consensus tide to ensure you get the right information, backed up by data and sound analytical process. As a result, our industry forecasts have consistently proved accurate and insightful, second to none. and this event will be no exception.

Our experience and deep insights makes this a must-attend event for any leader within the semiconductor, electronics and related industries. Find out what's in store at IFS2021-MT, Future Horizons' Mid-Term Industry Webinar:

<https://www.futurehorizons.com/page/135/>

What You Will Learn

We understand there is a lot of uncertainty ahead which makes it hard to make strategic decisions. The one-hour broadcast will cover a subset of the normal 4½-hour proceedings, focusing primarily on the semiconductor industry forecast and outlook, will help you gain accurate industry insight to make good strategic decisions in these uncertain times, including:

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Malcolm Penn
Chairman & CEO

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Accelerating PEMD supply chain capability and growth through:
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More Information on the State of the Art Power Electronics equipment for prototyping and scaling up to manufacture
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PANDEMIC NEWS

Could Covid-19 lead to a lifetime of autoimmune disease?

When Aaron Ring began testing blood samples collected from covid-19 patients who had come through Yale–New Haven Hospital last March and April, he expected to see a type of immune protein known as an autoantibody in at least some of them. These are antibodies that have gone rogue and started attacking the body’s own tissue; they’re known to show up after some severe infections.

Researchers at New York City’s Rockefeller University had already found that some patients with bad cases of Covid had [copies of these potentially dangerous immune proteins](#), circulating in the bloodstream. These pre-existing auto antibodies, likely created by previous infections, were still lurking around and appeared to be mistakenly attacking other immune proteins. It helped explain why some people were getting so sick from covid-19.

Still, what Ring, [a shaggy-haired cancer immunologist](#) at Yale University, detected in his blood samples last fall so spooked him that he pulled his nine-month-old daughter out of day care and put his family back on lockdown.

The Rockefeller researchers had identified a single type of antibody primed to attack immune cells. But Ring, using a novel detection method he had invented, found a vast array of [auto antibodies](#) ready to attack scores of other human proteins, including ones found in the body’s vital organs and bloodstream. The levels, variety, and ubiquity of the auto antibodies he found in some patients shocked him; it looked like what doctors might see in people with chronic autoimmune diseases that often lead to a lifetime of pain and damage to organs including the brain.

“What rocked my world was seeing Covid patients with levels of auto reactivity commensurate with an autoimmune disease like lupus,” he says.

Ring’s autoantibody tests showed that in some patients—even some with mild cases of Covid—the rogue immune proteins were marking blood cells for attack. Others were on the hunt for proteins associated with the heart and liver. Some patients appeared to have auto antibodies primed to attack the central nervous system and

the brain. This was far more ominous than anything identified by the Rockefeller scientists. Ring's findings seemed to suggest a potentially systemic problem; these patients seemed to be cranking out multiple varieties of new auto antibodies in response to Covid, until the body appeared to be at war with itself.

What scared Ring the most was that auto antibodies have the potential to last a lifetime. This raised a series of chilling questions: What are the long-term consequences for these patients if these powerful assassins outlive the infection? How much destruction could they cause? And for how long?

Even as hope is building that vaccines will provide a way to halt Covid's relentless spread, another public health crisis is looming: the mysterious and persistent chronic condition afflicting some survivors, often referred to as "[long Covid](#)." Roughly 10% of Covid survivors, many of whom had only mild initial symptoms, can't seem to kick it.

These long-haulers often suffer from extreme fatigue, shortness of breath, "brain fog," sleep disorders, fevers, gastrointestinal symptoms, anxiety, depression, and a wide array of other symptoms. Policymakers, doctors, and scientists around the globe warn that countless millions of otherwise [healthy young adults could face decades of debilitating issues](#).

Slack groups and social media are connecting people who've never fully recovered from coronavirus to collect data on their condition.

The causes of long-haul Covid are still mysterious. But autoimmunity now tops the list of possibilities. And Ring believes that among the likeliest culprits, at least in some patients, are the armies of runaway auto antibodies.

A system gone haywire

It did not take long for doctors on the front lines of the Covid pandemic to recognize that the biggest threat to many of their patients was not the virus itself, but the body's response to it.

In Wuhan, China, some clinicians noted that the blood of many of their sickest patients was flooded with immune proteins known as [cytokines](#), a cellular SOS signal capable of triggering cell death or a phenomenon known as a cytokine storm, where elements of the body start attacking its own tissue. Cytokine storms were thought to represent a kind of risky, doomsday immune response—akin to calling in an air strike on your own position while badly outnumbered in the middle of a fire fight.

Though this was something doctors had seen in other conditions, it quickly became apparent that the cytokine storms produced by covid-19 had unusual [destructive power](#).

Early on in the pandemic, Jean-Laurent Casanova, an immunologist and geneticist at Rockefeller University, decided to take a closer look. In 2015, Casanova had

demonstrated that many people who contracted severe cases of influenza carried genetic mutations blocking their ability to produce an important signalling protein, called interferon-1 (IFN-1), that enables patients to mount an effective early immune response. Interferon got its name, Casanova says, because it “interferes” with viral replication by informing neighbouring cells “that there’s a virus around, and that they should close the windows and lock the door.”

When Casanova looked at patients with severe Covid, he found that indeed, a small but significant number of those suffering from critical pneumonia also carried these inborn errors—genetic typos that prevented them from producing interferon. But he also found something else intriguing: an additional 10% of Covid patients with pneumonia were suffering from interferon deficiencies because the signalling agent was being attacked and neutralized by auto antibodies.

These auto antibodies, he concluded, had likely been circulating in the patients’ bloodstream before they contracted Covid. However, in response to the Covid infection, these lingering auto antibodies had replicated in massive numbers and attacked the crucial early warning signal before it could sound the alarm. By the time the immune system finally kicked into gear, it was so far behind the 8-ball that it resorted to its last-ditch option: a dangerous cytokine storm.

“The auto antibodies already exist—their creation is not triggered by the virus,” Casanova explains. But once a person is infected, they seem to multiply in large numbers, causing catastrophic pulmonary and systemic inflammation.

Casanova’s findings, published in September in *Science*, suggested that many [critical Covid patients could be saved with widely available existing drugs](#)—types of synthetic interferon that could evade the auto antibodies and kick the immune system into gear early enough to avoid a cytokine storm.

[The race to find a covid-19 drug in the blood of survivors](#)

Scientists are scrambling to find powerful antibodies that can turn back the disease. But can they manufacture enough for everyone?

But the results also hinted at something that fed Ring’s anxiety: the ability of the auto antibodies, once created and allowed to circulate, to stick around and pose an ongoing threat. There was something else that worried Ring too. While Casanova attributed the rogue antibodies to the legacy of a previous infection, Ring’s data suggested that new ones can somehow be created by Covid itself.

Ring quickly confirmed Casanova’s results in some of his own patients. But that was just the start, since his own detection technique, created as a tool in cancer immunology, could test for the presence of antibodies directed against any of 2,688 human proteins.

Ring found antibodies targeting 30 other important signalling agents besides interferon, some of which play an essential role in directing where immune cells needed to attack. There were also antibodies against a number of organ- and tissue-specific proteins—some of which seemed to account for certain symptoms of Covid. Ominously, unlike Casanova’s auto antibodies, many of Ring’s appeared to be brand new.

On his computer, Ring can pull up several graphs displaying the population of 15 different auto antibodies found in several patients as their infection progressed. Just as Casanova described, antibodies against interferon are clearly visible in the blood when patients were first tested at the hospital. Those numbers stay high as the infection progresses. But Ring found the trajectory to be quite different for the other auto antibodies.

In the initial samples, auto antibodies except for the ones against interferon are nonexistent or undetectable in the blood. Those other antibodies first appear in subsequent blood samples and continue to rise as the infection persists. It seemed to confirm Ring’s worst fears: that those auto antibodies were created by Covid itself.

“These are very clearly newly acquired—no question about it,” he explains, pointing to one line of rising auto antibodies. “They came up during the course of infection. The infection *triggered* autoimmunity.”

In most of those patients, the auto antibodies returned to undetectable levels in subsequent blood samples. But in some, the auto antibodies remained high at the point of last testing—in some cases more than two months after infection. Some of those patients developed long Covid.

“We have been, publicly and in the paper, pretty cautious about the interpretation of our results,” he says. “But this does have implications for post-Covid syndrome, because auto antibodies can plausibly persist well after the virus has been dealt with.”

An all-out attack

Why do these new auto antibodies appear? Some enticing clues have emerged. In October, a team of researchers led by Ignacio Sanz, an expert on lupus at Emory University, documented a phenomenon in the immune system of many severe Covid patients that is often seen during [lupus flare-ups](#).

It occurs in the specialized immune cells known as B cells, which produce antibodies. In order to quickly scale up production of the B cells needed to combat the Covid virus, Sanz explains, the immune systems of some patients seem to take a dangerous shortcut in the biological process that usually determines which antibodies the body generates to fight off a specific infection.

Normally when an invading virus triggers an immune response, B cells form into self-contained structures in the follicles of the lymph nodes, where they multiply rapidly, mutate, and swell into an immune army of billions, each one bearing a copy of its signature antibody protein on its surface. Almost as soon as this happens, however, the cells launch into a deadly game of molecular-level musical chairs, competing to bind with a small number of viral fragments to see which one is best suited to attack it. The losing cells immediately begin to die off by the millions. In the end, only the B cells with the antibody that forms the strongest bond to the invading virus survive to be released into the bloodstream.

It's a good thing the rest don't, Sanz explains, because as many as 30% of the antibodies produced in the race to fight off an invading virus will target parts of the body the system is designed to protect.

When Sanz looked at the blood of patients with severe Covid, he found that many did quickly create antibodies to fight the virus. But most of these antibodies were produced by rapidly multiplying B cells generated outside the normal weeding-out process. Sanz had seen this phenomenon before in lupus, and many believed it to be a hallmark of immune dysfunction.

Eline Luning Prak, a professor at the Hospital of the University of Pennsylvania, says she is not surprised. Luning Prak, an expert on autoimmune diseases, notes that when the body is in crisis, the usual controls may be relaxed. "This is what I call an all-hands-on-deck-style immune response," she says. "When you're dying from an overwhelming viral infection, the immune system at this point says, 'I don't care—just give me anything.'"

Still a mystery

In March, James Heath, president of the Institute for Systems Biology in Seattle, worked with a long list of eminent immunologists to publish what he believes to be the first scientific paper characterizing the immune system of patients two to three months after becoming infected. Heath and his colleagues found that people who survived took one of four different pathways. Two groups of patients experienced full recoveries—one group from severe acute Covid, and a second from the disease's milder form. And two other groups—some of whom had severe acute Covid and some of whose initial symptoms were mild—continued to experience massive immune activation.

[Why covid-19 might finally usher in the era of health care based on a patient's data](#)

After nearly three decades of proselytizing, Lee Hood believes the pandemic may finally enable his vision of personalized, precision medicine for all.

The vast majority of patients Heath studied have yet to make a full recovery. Only a third, he says, “are feeling and looking, from immunology metrics, like they’re recovered.”

But what exactly is causing this continued immune reaction—whether it’s autoimmune disease and auto antibodies or something else—is “the million-dollar question.” To Heath, the persistent presence of self-attacking antibodies, like those found by Ring and others, seems like a leading hypothesis. He believes, though, that the chronic symptoms could also be caused by undetectable remnants of the virus that keep the immune system in a state of low-level activation.

In the end, Heath thinks that what we call long Covid may well turn out to be more than one disorder caused by the initial infection. “For sure, your immune system is activating against something,” he says. “And whether it’s activating itself or not, which is the difference between autoimmune and something else, is an open question. It’s probably different in different people.”

Luning Prak agrees that the cause of long Covid may well be different in different patients.

“What could be causing long Covid? Well, one possibility is you have viral injury and you have residual damage from that,” she says. “Another possibility is that you have autoimmunity.” She adds, “A third possibility is some type of chronic infection; they just don’t completely clear the virus and it allows the virus to kind of chronically set up shop somehow. That’s a really scary and creepy idea for which we have very little evidence.” And, she says, all three might turn out to be true.

Why risk it?

Though the culprit (or culprits) behind long Covid remains a mystery, the work being done by Ring, Heath, Luning Prak, and others may soon give us a far better idea of what is happening. Ring notes, for example, that a growing number of reports from long-haulers suggest that in some cases, the vaccine seems to be curing them.

Ring’s colleague Akiko Iwasaki, a Yale immunologist and a co-author on his autoantibody paper, speculates that if long Covid is caused by the presence of viral remnants, the vaccine might help clear them out by inducing more viral-specific antibodies. And if the cause is auto antibodies, she says, the specificity of the vaccine—which is engineered to train the immune system to target the Covid virus—might be mobilizing a response with such urgency and force that other aspects of the system are stepping in to inhibit the auto antibodies.

All this remains scientific speculation. But Ring hopes he and his collaborators will soon get some answers. They are in the process of collecting blood samples from long Covid patients from clinics around the country, looking for telltale signs of auto antibodies and other indications of immune dysfunction.



Issue 26 – August 2021

NEWS FROM THE IPC

North American PCB Industry Sales Up 7.3 Percent in July

IPC Releases PCB Industry Results for July 2021

BANNOCKBURN, Ill., USA, August 26, 2021 — [IPC](#) announced today the July 2021 findings from its North American Printed Circuit Board (PCB) Statistical Program.

The book-to-bill ratio stands at 1.29.

Total North American PCB shipments in July 2021 were up 7.3 percent compared to the same month last year. Compared to the preceding month, July shipments fell 15.8 percent.

PCB year-to-date bookings in July were up 18.6 percent compared to last year. Bookings in July fell 4.3 percent from the previous month.

"The North American PCB sector continues to see strong demand, but supply chain shortages are slowing shipments, leading to a growing backlog," said Shawn DuBravac, IPC's chief economist. "The book-to-bill of 1.29 is a historic high, going back to the start of the IPC PCB report in 1991."

Detailed Data Available

Companies that participate in IPC's North American PCB Statistical Program have access to detailed findings on rigid PCB and flexible circuit sales and orders, including separate rigid and flex book-to-bill ratios, growth trends by product types

and company size tiers, demand for prototypes, sales growth to military and medical markets, and other timely data.

Interpreting the Data

The book-to-bill ratios are calculated by dividing the value of orders booked over the past three months by the value of sales billed during the same period from companies in IPC's survey sample. A ratio of more than 1.00 suggests that current demand is ahead of supply, which is a positive indicator for sales growth over the next three to twelve months. A ratio of less than 1.00 indicates the reverse.

Year-on-year and year-to-date growth rates provide the most meaningful view of industry growth. Month-to-month comparisons should be made with caution as they reflect seasonal effects and short-term volatility. Because bookings tend to be more volatile than shipments, changes in the book-to-bill ratios from month to month might not be significant unless a trend of more than three consecutive months is apparent. It is also important to consider changes in both bookings and shipments to understand what is driving changes in the book-to-bill ratio.

IPC's monthly PCB industry statistics are based on data provided by a representative sample of both rigid PCB and flexible circuit manufacturers selling in the USA and Canada. IPC publishes the PCB book-to-bill ratio by the end of each month.

North American EMS Industry Down 2.9 Percent in July

IPC Releases EMS Industry Results for July 2021

[IPC](#) have nounced the July 2021 findings from its North American Electronics Manufacturing Services (EMS) Statistical Program. The book-to-bill ratio stands at 1.42.

Total North American EMS shipments in July 2021 were down 2.9 percent compared to the same month last year. Compared to the preceding month, July shipments fell 26.3 percent.

EMS bookings in July rose 1.7 percent year-over-year but fell 30.6 percent from the previous month.

“The electronics industry continues to be bogged down by supply chain disruptions,” said Shawn DuBravac, IPC’s chief economist. “Raw material lead times remain long and shortages are hindering production and delaying shipments.”

Detailed Data Available

Companies that participate in IPC’s North American EMS Statistical Program have access to detailed findings on EMS sales growth by type of production and company size tier, order growth and backlogs by company size tier, vertical market growth, the EMS book-to-bill ratio, 3-month and 12-month sales outlooks, and other timely data.

Interpreting the Data

The book-to-bill ratios are calculated by dividing the value of orders booked over the past three months by the value of sales billed during the same period from companies in IPC’s survey sample. A ratio of more than 1.00 suggests that current demand is ahead of supply, which is a positive

indicator for sales growth over the next three to twelve months. A ratio of less than 1.00 indicates the reverse.

Year-on-year and year-to-date growth rates provide the most meaningful view of industry growth. Month-to-month comparisons should be made with caution as they reflect seasonal effects and short-term volatility. Because bookings tend to be more volatile than shipments, changes in the book-to-bill ratios from month to month might not be significant unless a trend of more than three consecutive months is apparent. It is also important to consider changes in both bookings and shipments to understand what is driving changes in the book-to-bill ratio.

IPC's monthly EMS industry statistics are based on data provided by a representative sample of assembly equipment manufacturers selling in the USA and Canada. IPC publishes the EMS book-to-bill ratio by the end of each month.



The European Institute for the PCB Community

EIPC SPEeDNEWS

Issue 26— August 2021

International Diary

2021

11th EIPC Technical Snapshot Webinar

Registrations via www.eipc.org

22 September

EIPC @ FED Conference

Bamberg

16 & 17 September

KPCA Korea

6-8 October

12th EIPC Technical Snapshot Webinar

Registrations via www.eipc.org

October

EIPC @ Productronica 2021

Stand B3-529

Messe München

16-19 November

TPCA Taiwan

21-23 December