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JANUARY/FEBRUARY 2022

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Customization key in customer demand in 2022

Who really knows what lies ahead of us in the coming weeks, months and year – in particular what trends will predominate through 2022? One thing is for sure - tech development is moving at an extremely rapid pace.

Among the many year-end forecasts supplied to me by various industry analysts, this breakdown delivered by global electronics and connectivity innovator – Molex - was off the charts.

Molex's team of industry watchers gathered the following sumnation of prognostications in tech for 2022.

Customization

This new year will usher in an era of mass customization, as consumers' increasing demands for tailored experiences propel continued technology innovation. Nearly every industry will feel the impact of changing buyer attitudes and the desire to choose and pick "what works best for me."

Automotive

- The vehicle experience is about more than driving. Consumers are seeking customization in their automotive choices, requesting more pick-and-choose or ad hoc bundles, including specialized entertainment options. Expect more decoupling of hardware and software to enable carmakers to deliver features and functionality that drive customer adoption.
- Electric trucks are major EV growth catalyst.
- Expect Vehicle-to-Everything (V2X) communications to reach hyper-drive, so addressing rapid data capture, transfer and access will become an even bigger priority.

Consumer Devices/IoT

- Artificial intelligence and machine learning will send device intelligence off the charts. Advancements in AI and ML will require greater compute processing power for a multitude of consumer products—from smart watches to appliances and home-security systems.
- Multipurpose robots raise their profile. The labor shortage, new minimum wage requirements, e-commerce growth and inflation will accelerate the use of robots.

Data Center

- Disruptions continue in the technology ecosystem. Innovations and integration of electronics and photonics will ripple through data centers, enabling more seamless connectivity and device interactions while making on-the-go wellness monitoring and detection more mainstream.
- As data speeds increase and fiber makes it directly into homes, more optical cabling will be needed.

Healthcare & Medtech

- 'The quantified self' demands attention. The phenomenon of self-tracking with technology and to the community of users and makers of tools focused on "self-knowledge through numbers" will drive technological advancements. The result will deliver real-time consumer health diagnostics that keep followers at peak performance, requiring seamless data capture and results exchange among devices and equipment tracking health-related vectors.
- Medical devices get smarter. Evolving clinician and patient expectations dictate easier-to-use and more comfortable systems and delivery methods, such as smart inhalers, intelligent auto injectors, non-invasive glucose monitors and more.

Industry 4.0

- Smart factories will become a reality. Flexible factory architectures with broader implementation of sensors and consolidated sensor data will empower industrial automation. The result will be raised visibility and monitoring of entire facilities while increasing production-line innovations and operational efficiencies.
- Production lines are reconfigured to manufacture custom products. Manufacturers will reduce dependencies on rigid hardware while using automation and robotics for more automated material handling, pick-and-place and reconfigurable production lines.
- Automated guide vehicles push adoption of 5G private networks. As mobile robotics and automated guide vehicles become more prevalent, adoption of 5G private networks over wired Ethernet will grow, supporting low-latency, high-bandwidth, secure wireless communications.

In Conclusion

Under normal circumstances, staying in lock-step with the latest trends is not easy. Now, it can seem almost impossible, given the added complexities layered in with an unending pandemic, and growing global supply chain impingements.

Kudos to all of Canada's engineering centres across this land that have endured thus far – and continue to drive design excellence. **EP&T**

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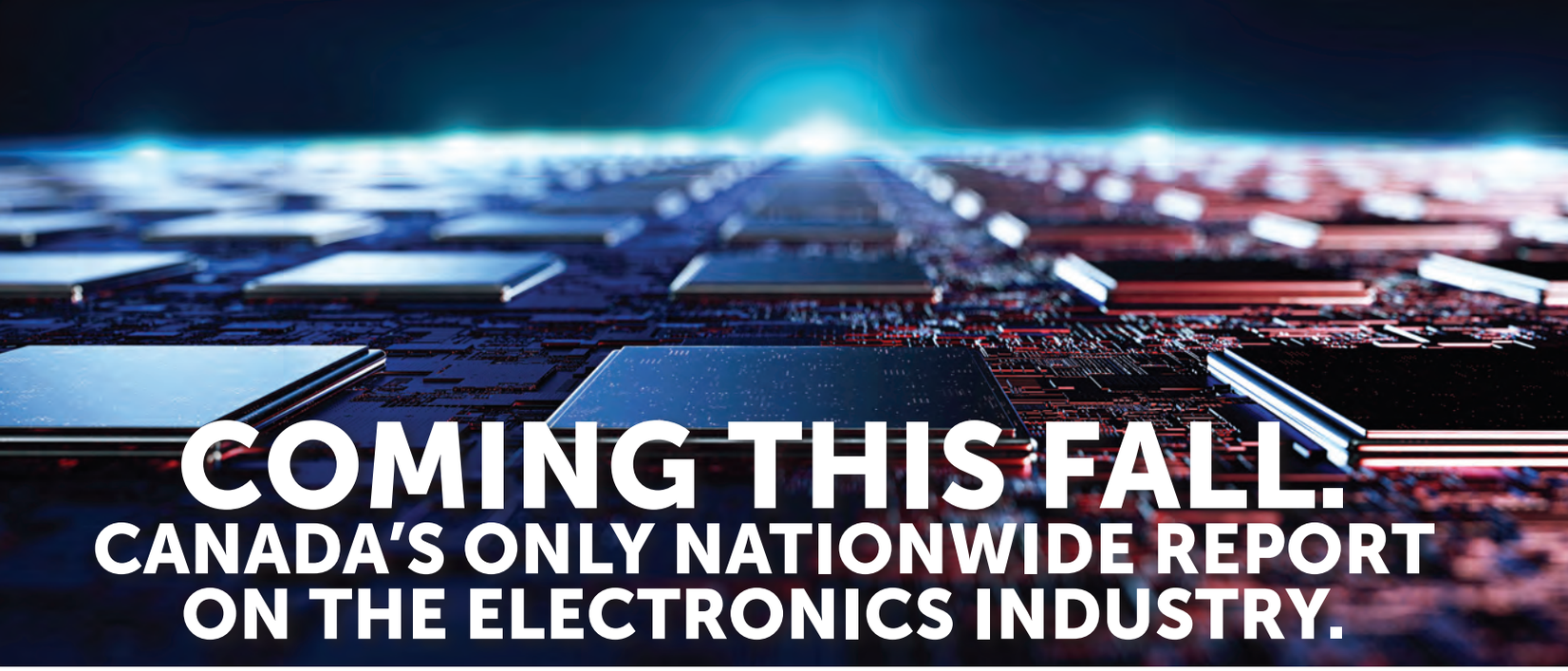

COMING THIS FALL.
CANADA'S ONLY NATIONWIDE REPORT ON THE ELECTRONICS INDUSTRY.

***EP&T* MAGAZINE** will produce an industry report on the electronics engineering and design sector for Canada. Based on the results of a nationwide survey of electronic engineers and designers.

From the rapid advancements being made in areas such as IoT, AI and Medical Electronics, EP&T's Industry Report will track the emerging design markets. The report will serve as a blue print to help the Canadian electronics industry gain an understanding of where the designer hotspots exist geographically in Canada.

Which design disciplines are increasing in importance – is it software, hardware or embedded firmware. Is diversity on the rise within the engineering ranks? We will also aim to gain a better understanding of the impact Covid-19 has had on the design cycle countrywide, as supply chains remain under component allocation pressures.

The data will be compiled and analyzed by Toronto's RK Insights and packaged into a top-line results report that will be utilized during a day-long roundtable discussion — to put results into context — with key industry stakeholders, including leading electronics manufacturers.

The final 32 page report, published this fall, will reveal where electronics engineering professionals stand with respect to the kinds of creations, challenges and future developments they are occupied with.

To be a part of this first ever report on the Canadian Electronics Industry marketplace please contact your account manager.

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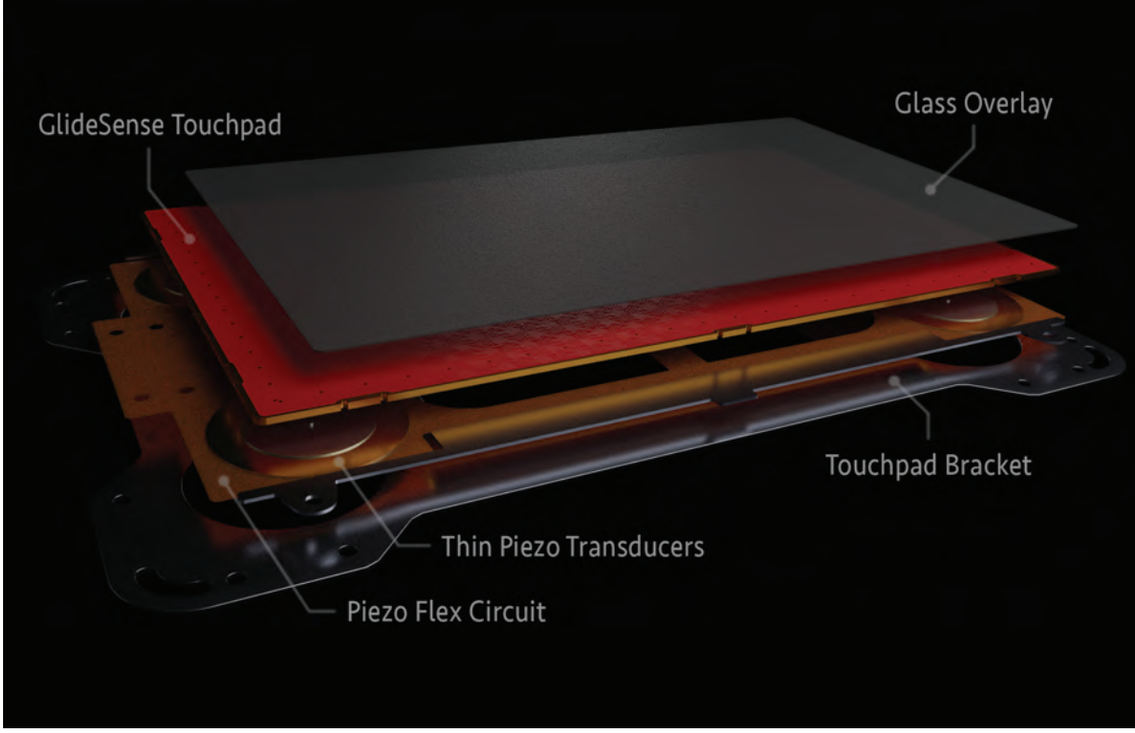


Boreas and Cirque join forces to create a manufacturer-customizable platform offers HD haptics, adjustable force-sensing for thin, light, responsive trackpads.

HAPTICS

BORÉAS, CIRQUE COLLABORATE ON PIEZO HAPTIC TRACKPAD

Boréas Technologies, Bromont Quebec-based developers of ultra-low-power high definition (HD) piezo haptic semiconductors, has joined forces with touch-interface technology specialists Cirque Corp., Salt Lake City, to unveil GlideSense – a trackpad module that helps PC manufacturers meet rising demand for richer, more responsive tactile experiences in trackpads that are slim, light and cost-efficient.

Featuring Boréas' Piezo Haptic Trackpad technology, GlideSense is also the first trackpad module to take advantage of Microsoft's operating systems-level support for haptic trackpads in Windows 11 machines. PC notebook and laptop manufacturers will be able to access the many benefits of piezoelectric haptic architectures that include miniature size, light weight, ultra-low power, and customizable feature sets—in their Windows 11 notebooks and laptops.

"Microsoft's move to support haptic trackpads in Windows 11 reflects a growing shift away from older mechanical-touch trackpads toward newer, thinner haptic-touch trackpads that offer users more satisfying sensory experiences in PC notebooks and laptops," said Simon Chaput, founder and CEO, Boréas.

POWER

UBC RESEARCHERS DEVELOP STRETCHY, WASHABLE BATTERY

UBC researchers have created what could be the first battery that is both flexible and washable. It works even when twisted or stretched to twice its normal length, or after being tossed in the laundry.

"Wearable electronics are a big market and stretchable batteries are essential to their development," says Dr. Ngoc Tan Nguyen, a postdoctoral fellow at UBC's faculty of applied science. "However, up until now, stretchable batteries have not been washable. This is a critical addition if they are to withstand the demands of everyday use."

Dr. Ngoc Tan Nguyen and his UBC colleagues have created a battery that is both flexible and washable. It works even when twisted or stretched to twice its normal length, or after being washed multiple times.

The battery developed by Dr. Nguyen and his colleagues offers a number of engineering advances. In normal batteries, the internal layers are hard materials encased in a rigid exterior. The UBC team made the key compounds in this case, zinc and manganese dioxide stretchable by grinding them into small pieces and then embedding them in a rubbery plastic, or polymer.

The battery comprises several ultra-thin layers of these polymers wrapped inside a casing of the same polymer. This construction creates an airtight, waterproof seal that ensures the integrity of the battery through repeated use.

It was team member Bahar Iranpour, a PhD student, who suggested throwing the battery in the wash to test its seal. So far, the battery has withstood 39 wash cycles and the team expects to further improve its durability as they continue to develop the technology.

"We put our prototypes through an actual laundry cycle in both home and commercial-grade washing machines. They came out intact and functional and that's how we know this battery is truly resilient," says Iranpour.

The choice of zinc and manganese dioxide chemistry also confers another important advantage. "We went with zinc-manganese because for devices worn next to the skin, it's a safer chemistry than lithium-ion batteries, which can produce toxic compounds when they break," says Nguyen.

WIRELESS

OPEN RF GROUP RELEASES NEW SPECIFICATION

The Open RF Association (OpenRF), an industry consortium dedicated to creating an open 5G ecosystem of interoperable hardware and software across member multi-mode RF front-end (radio frequency front-end) and chipset platforms, announced the release of its OpenRF Version 1.0.0 specification. This initial specification provides the groundwork for RF front-end to chipset interoperability including a software development environment for advanced feature sets.

"Our first specification - one year after the formation of the consortium - benefits the entire 5G industry by establishing an open and interoperable ecosystem between chipsets and RF front-end," said OpenRF Association President Kevin Schoenrock.

The OpenRF spec will optimize configurations and standardize certain specifications enabling interchangeable RF front-end to RFIC (radio-frequency integrated circuit) solutions.

This provides 5G wireless device OEMs (original equipment manufacturers) with the maximum choice in RF front-end solutions enabling lower development costs, reduced time-to-market and design risk, high performance utilizing a platform for future innovations, and an improved supply chain implemented across the breadth of OEM consumer mobile products.

"The association's first specification is a significant accomplishment. A baseline for requirements and a common language are essential to the success of any new organization," said Dan McNamara, principal analyst with Mobile Experts Inc. "It is the critical first step as OpenRF establishes the language for RF components and modems to speak with each other."

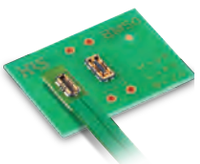
Photo: Kai Jacobson, UBC; Boreas Technologies

INTERCONNECT

COBO WORKING GROUP TO ADDRESS EMBEDDED OPTICAL WAVEGUIDES IN PCBS

Hirose, an associate member of the Consortium for On-Board Optics (COBO), has helped create the Multi-Mode Waveguide Interconnect System (MWIS) Working Group to advance the increase of bandwidth and reduce power consumption for printed circuit board interconnect systems.

The Consortium for On-Board Optics is a member-driven standards-setting organization developing specifications for interchangeable and interoperable optical modules that can be mounted onto printed circuit boards. Led by Joshua Kihong Kim, principal engineer at Hirose Electric, COBO's new MWIS Working Group focuses specifically on the replacement of copper traces with multi-mode waveguides and adding an extra thin interface for electrical/optical and optical/electrical conversion within close proximity to the electrical component.



COBO is a member-driven standards-setting organization that develops specs for interchangeable and interoperable optical modules

AI & IOT

CMC MICROSYSTEMS AND AIOT CANADA FORM STRATEGIC ALLIANCE

CMC Microsystems, Canada's leading hardware technology facilitator, and AIoT Canada, an industrial cluster dedicated to promoting and accelerating the adoption of IoT technologies in Canada, recently announced they have formed a strategic partnership.

"There is such an incredible range of applications for the IoT," says Gord Harling, president & CEO of CMC Microsystems. "We see IoT devices being real growth drivers in Canadian tech. AIoT Canada is the premier resource for the IoT industry across Canada, so we see this partnership pushing the entire IoT ecosystem forward," he added.

Under this partnership, AIoT Canada will connect its industrial IoT partners to leading researchers and institutions across the country. "CMC has decades of experience and expertise working with researchers and institutions across Canada" said Michel Langelier, president and CEO of AIoT Canada. "By bringing together industry and research leaders, we can accelerate IoT growth in Canada which act as enabler for using Artificial Intelligence. CMC's offering of training, world-class design and fabrication services at accessible rates will also be very attractive to new and emerging players in the IoT ecosystem" he said.

Both organizations will also work in concert with government partners to support the Canadian IoT sector.

AI

AIoT Canada will connect its industrial IoT partners to leading researchers and institutions across the country.

CLEARPATH PARTNERS WITH SYGNAL

Clearpath Robotics, Kitchener-Waterloo area manufacturer of mobile robotic platforms for research and development, and Sygnal Technologies Inc. experts in drive-by-wire (DBW) control systems, have partnered to bring Sygnal's drive-by-wire conversion kit to the global autonomous vehicle developer community. Under the partnership agreement, Clearpath is authorized to sell and support the Sygnal DBW system world-wide via its component store.

The Sygnal DBW system is a drive-by-wire control system that allows for seamless electronic control over a vehicle's accelerator, brake and steering, to enable testing for autonomous vehicle applications and technologies. Designed for quick and easy integration, the Sygnal DBW system comes with comprehensive documentation and can be installed in less than 30 minutes in compatible vehicles. Its economical price point makes it ideal for developers looking to build fleets of autonomous vehicles.

"We are excited to partner with Sygnal to offer their drive-by-wire system to researchers and developers." said Bryan Webb, president of Clearpath Robotics.

"We believe that the world has just gotten started with autonomous passenger vehicles. We see a bright future for the technology as developers further embrace the opportunities that driverless vehicles can offer. Our products, partnerships, services and track record uniquely position us to provide leading driverless car technology to the research and development community."

Clearpath Robotics and Sygnal Technologies collaborate to deliver a drive-by-wire conversion kit to automous vehicle developers .

ENGINEERING

SCALE WITHOUT BORDERS SERVES TECH NEWCOMERS

Immigrants and newcomers to Canada face challenges when accessing resources and landing careers commensurate with their qualifications, while the Canadian tech ecosystem is in need of tech talent more than ever.

This is why Scale Without Borders (SWB), an immigrant founded business, built an entire tech ecosystem helping newcomers and immigrants access resources in tech and land tech jobs they can thrive in. SWB recently hosted the largest summit for immigrants in tech (free for newcomers) in Canada, with the goal of helping them break barriers in tech.

"Having immigrated to Canada from Morocco at the age of 17, I know first-hand the challenges of landing and thriving in a fulfilling career in tech. I eventually found myself in the right network circles, and I'm hoping to share some of that with more newcomers and immigrants who want an exciting career in tech," says Nouhaila Chelkhaoui, founder & CEO of Scale Without Borders, who was also recently named Bay Street Bull Women of the Year 2021.

Scale Without Borders is a start-up helping immigrants access tech jobs and resources, and helping tech employers tap into this under-tapped diverse tech talent pool. Newcomers can sign up to the free SWB network here: https://scalewithoutborders.com/ **EP&T**

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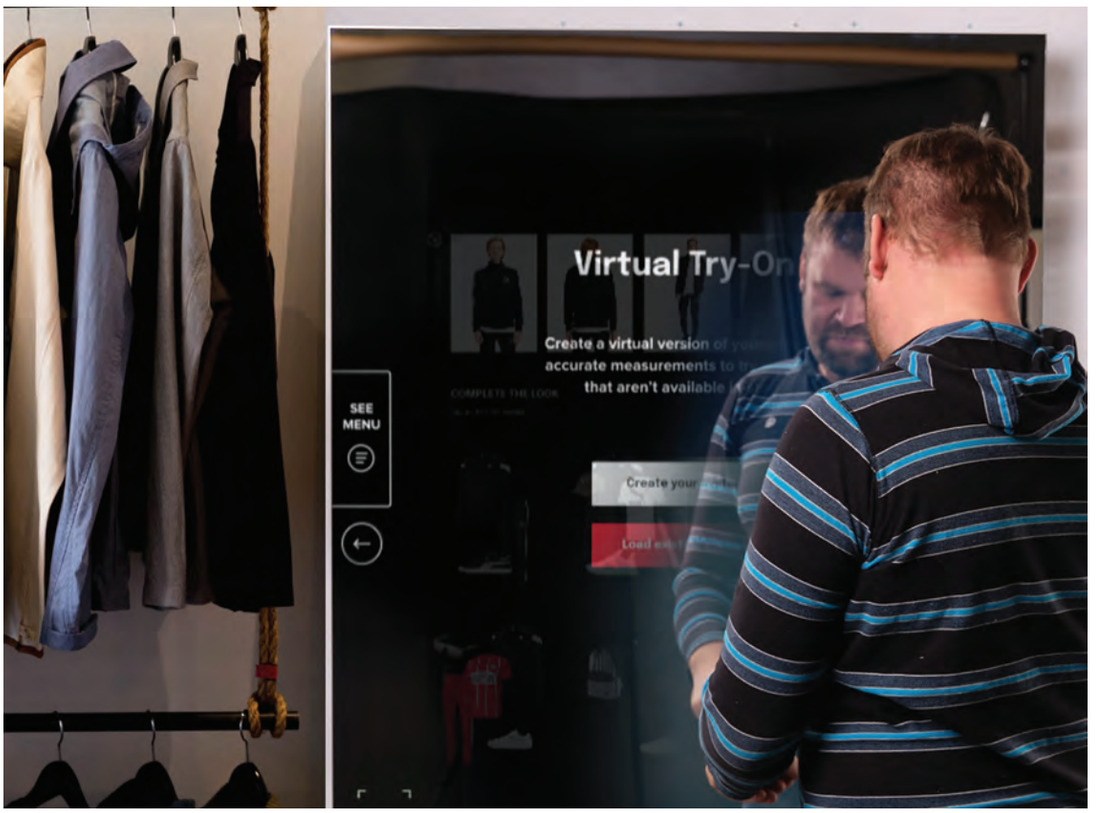
Photo:COBO; AIoT Canada; Sygnal Technologies

NOBAL's iMirror reflects new tech for retail, hospitality industries

BY SOHAIL KAMAL

NOBAL Technologies is revolutionizing the way consumers connect with their favourite brands in-store. With a mandate to improve the shopping experience that gives consumers what they want in the quickest and most convenient way possible, their retail iMirror offers a solution to traditional purchase barriers by enabling shoppers to search, select, and buy from a complete range of inventory.

These barriers are especially prevalent in our current COVID reality, where we still see limited in-store retail sales due to the pandemic. More businesses are looking for ways to get shoppers back in-store and allow them to feel safe. I recently had the opportunity to speak with Amanda Roberts, NOBAL's Chief Operating Officer, to find out how COVID has boosted interest in their products and who will benefit from iMirror.



The iMirror from Calgary-based Nobal Technologies brings its game-changing tech to the retail environment.

New digital experience

"NOBAL was created with the idea of leveraging the latest in smart devices and machine learning…to create an interactive mirror technology that could provide a completely new digital experience for shoppers," explains Roberts.

With a few screen taps, you can create a fully dimensional avatar of yourself: "You can rotate 360 degrees in front of a mirror, see how clothing looks on you and try on different sizes. This allows brick and mortar retailers to have fewer clothes, checkouts, fitting rooms, employees, and square footage," says Roberts. It also means less time spent in fitting rooms and a refined COVID-friendly retail experience for those who are at a heightened pandemic risk, thereby providing more opportunity for sales for retailers.

NOBAL has also created an experience for hotel guests: "The iMirror allows an arriving guest to check in or out in the lobby, browse onsite restaurants, make reservations and even take a selfie and upload it to social media. Once in their room, another iMirror allows them to order room service, book a spa appointment, buy event tickets, request a ride and pay for all the above," explains Roberts.

Reflecting tech

With the impact of COVID, NOBAL is experiencing exponential growth in the public's interest in iMirror. "Both retailers and hotel operators are looking to bring customers and guests back to their stores and properties, and the iMirror is the perfect solution. It creates an engaging, interactive experience unlike any other product in the market today," explains Roberts.

COVID exacerbated the pain points that NOBAL was already working to resolve. The public's aversion to physical shops propels popular adoption of iMirror. "All businesses are feeling the economic crunch of low staffing levels, so having a product that provides a standard and enjoyable experience …ensures that potential engagement and revenue aren't lost," says Roberts.

NOBAL's innovations have great potential, but their recent growth spurt hasn't been without challenges.

"2021 has been a huge year for growth. In the past six months, we have hired seven staff in sales, marketing and client services alone. Our growth translates to an urgent need for establishing processes in how we better manage the pipeline, projects and products," says Roberts.

But, a team is one of the most valuable assets to any company. Roberts shared a thought process that may help others who are building a new product, technology, or a new team: "Those that I lead come before me, they are under my care, they have a voice in our organization and we want to hear it. I surround myself with people that are more skilled than me, help them reach…maybe have them stretch a bit, to be the best they can."

Roberts ends with, "The ease with which customers interact with technology these days is much different than even five years ago. Products like the iMirror are helping traditional industries like retail and hospitality catch up to innovative buyers and make them more likely to want to do business with them." To learn more, visit: www.nobal.ca EP&T

***Sohail Kamal** is EP&T's West Coast correspondent. sohail@nextgear.ca*

Photo: Nobal Technologies

How consumer electronics is becoming more sustainable

BY SGS

Suppliers of consumer electronics are increasingly making their products and operations more sustainable in accordance with consumer demand. Here SGS looks at the drivers and solutions impacting this dynamic market.

Sustainability is now on the agenda for individuals, governments and industries. It has joined traditional market drivers – safety, performance and price – in being a consideration when consumers want to buy a new product.

The Consumer Electronics Association acknowledged the importance of taking a more proactive approach to positive environmental, social and corporate governance - stating "Future success will be determined as much by our stewardship to the environment, as to consumers, employees & business partners."

Environmental Impact

We have grown to rely on a wide variety of consumer electronic devices, but this dependence comes at a price. We are estimated to currently using 1.75 planets worth of resources, a figure that is to rise to two planets by 2030. This is more than the planet can replenish and added to this, deforestation and some mining operations are intensifying the problem. Alongside resource use, there are problems associated with increased energy use, higher greenhouse gas (GHG) emissions, and a lack of effective recycling.

The UN estimates humans generate 50 million tonnes of electrical and electronic (EE) waste every year and the problem is expected to increase to 120 million tonnes by 2050. However, currently only 20% of this is formally recycled. This is a wasted opportunity. Annual e-waste is valued at USD 62.5 billion, more than the GDP of some countries. It is estimated that approximately up to 7% of the planet's gold is lost in e-waste.

Recycling and greater use of recycled materials are just two aspects of the ultimate sustainability goal…Another important focus is the reduction in obslescence and the ability to repair.

There are also environmental concerns over energy use. In the US, residential energy use has steadily been increasing in previous decades and now stands at 22% of total energy use. This is despite improvements brought about by greater insulation and more efficient appliances.

Two factors are impacting these figures. Firstly, the number of households in the US has grown enormously in the last four decades – from 80 million in 1980 to 128 million in 2020. Secondly, we now have multiple devices in every room and even in our pockets. These require electricity, the generation of which is increasing GHG emissions.

Here is how the consumer electronics industry is responding.

Recycling

Recycling reduces the need to extract new resources. Many of the materials used in consumer electronics and their packaging can be sourced from recycled resources. For example, some computer manufacturers are using recycled materials, including plastic resins, to build their products.

Some markets are also introducing initiatives that foster greener solutions to e-waste. For example, the European Union (EU) has passed directives covering the Waste of Electrical and Electronic Equipment (WEEE), Energy-related Products (ErP) and Ecodesign.

Concerns over the use of recycled materials in products relate to contamination. In some instances, this might impact safety and performance.

Reparability

Recycling and greater use of recycled materials are just two aspects of the ultimate sustainability goal, the completely circular economy where resources are made into products, used, reused and recycled multiple times. An important aspect of this is a reduction in obsolescence and the ability to repair rather than replace a product.

In 2020, France led the way with the passing of its Anti-Waste for a Circular Economy act (AGEC). Among the provisions in this act are requirements to provide information relating to the availability of spare parts, the need to use parts from a circular economy, and give time frames for repair. Built-in obsolescence techniques, including software, are banned and vendors are required to display a reparability score for each product.

These requirements will lengthen the time a product remains usable, thereby reducing overall waste. They also align with consumer demand, as a recent survey found 77% of Europeans would prefer to repair rather than replace an EE product.

Energy Efficiency

One area where EE manufacturers are making great advances is in energy consumption. Even so, with the increased prevalence of consumer electronics in our daily lives, there needs to be even greater focus on reducing GHG emissions by reducing energy usage.

Several markets already employ energy efficiency rating systems to help consumers choose better products – for example, the US ENERGY STAR program. The effectiveness of these programs in persuading companies to create more efficient products is demonstrated by the fact the EU had to introduce a new energy labeling system in January 2019 when the previous version became obsolete.

Electronic OEMs have made great advances in reducing energy use and GHG emissions. Examples from leading electronics companies include 70% greater efficiency in products compared with 10 years ago.

Packaging

Being greener also means using less packaging. Many businesses are now addressing this problem by using more sustainable materials, replacing virgin materials with recycled, bio-based or compostable materials. **EP&T**

***SGS** is a leading second-party environmental assessment provider. https://www.sgs.com*

Four ways the wireless power industry will evolve

New methods coming to designers in 2022

BY JACOB BABCOCK, CEO & FOUNDER, NUCURRENT

New methods of contactless power transfer and battery charging are transforming how we experience technology at home, in the office and on the go. Whether it's delivering power to an EV without having to plug it in, or charging your fitness band without ever having to take it off, these wireless power technologies are making significant inroads into our day-to-day lives.

This past year witnessed substantial progress, though: notably, the NFC Forum, the global standards and advocacy association for Near Field Communication (NFC) technology, announced the Wireless Charging Specification (WLC) 2.0 in October. The WLC 2.0 enables easier and more convenient charging of low-power devices, like wireless earbuds, smart watches, digital stylus pens, headsets and fitness trackers. WLC 2.0 also supports even smaller antenna sizes, expanding the range of small, battery-powered consumer and IoT devices that can be wirelessly charged using smartphone and other NFC-enabled devices. This announcement was transformative, enabling device manufacturers and solution providers to design smaller, lighter and more affordable wireless products able to communicate with, and charge alongside smartphones and other NFC-enabled devices.

Advances in NFC technology are also starting to make an impact on design and manufacturing. Since NFC charging addresses so many pain points of current wireless charging methods, physical charging contacts and connectors can be removed, improving device durability and waterproofing - especially important for health and fitness wearables. Additionally, by being able to transfer power and data over the air, designers can develop wireless uART solutions, eliminating the need for data ports and allowing for wireless debugging, testing and software updates.

2021 showed the breadth of wireless power applicability across a number of industries, but only went an inch deep on its potential. The next year will allow us to go deeper, with a number of exciting changes expected.

Wireless wins out

Physical connectors were invented over 125 years ago - before we were driving Model Ts and the radio wasn't yet invented. While the past five years have laid significant evidence that a shift is occurring (iPhones, earbuds, EVs, wearables, etc.), 2022 is when mainstream devices start catching up with the early adopters of game-changing wireless technology.

Connectors, while originally practical, now serve mainly as a vulnerability for devices. While they allow engineers access to the inner workings of a device, physical connectors also make devices less durable, less waterproof and more expensive to build and maintain. Embracing wireless connectors bring both design and user benefits, by making devices sleeker, more durable, and waterproof; and also less cluttered with cables. Wearables like fitness bands, medical devices and earbuds will be among the first adopters, as their small size and low power needs are extremely well-suited to the benefits of wireless charging.

Phone will become the charger as well

Advances in NFC wireless charging technology - and specifically, the WLC 2.0 - will establish a new category of wireless charging over the next year, as smartphones will become charging transmitters for small, space-constrained devices like earbuds, fitness bands and styluses.

Major tech companies are taking note, as many of the leading smartphone manufacturers also produce earbuds, eyeglasses and wearables. This emerging NFC ecosystem will be mutually beneficial, using NFC as a platform for data and power transfer between devices and strengthening the user experience.

The concept of a connector-less smartphone - and especially one that's also charging your wearables - may seem like fantasy to those of us with plugged-in smartphones sitting on our desks, but that future is one that's much closer than we may think. Apple recently filed a patent to incorporate wireless charging capabilities into Macbooks and iPads, enabling these products to reverse-charge mobile devices, like phones, watches and earbuds.

NFC charging is paving the way for a new standard and user experience across devices, leveraging the power of wireless charging to offer longer-lasting, streamlined charging abilities.

As OEMs advance ESG initiatives designed to eliminate waste and streamline efficiency, passive sensing platforms represent a potentially attractive solution.

2.0 WLC

Enables easier and more convenient charging of low-power devices, like earbuds, smart watches, fitness trackers and digital stylus pens.

Photo: © gutekskr7 / Adobe Stock

Being passive progressive

Smartphones and other personal electronics like fitness trackers, smartwatches and hearables, have an increasingly growing number of sensors inside them. These do everything from detecting motion to measuring vital signs and more. Typically sensors in these devices are active components, making them more resource intensive than passive sensing activity.

As electronics manufacturers advance ESG initiatives designed to eliminate waste and streamline efficiency, passive sensing platforms represent a potentially attractive solution. The opportunity becomes even more compelling as we see more and more parts shortages due to global supply chain challenges, since these passive components also represent an alternative design path for product developers. Ultimately these passive sensor platforms will be a positive step towards addressing important consumer, business and environmental concerns.

Supply chain woes stifle innovation

Speaking of the supply chain, unfortunately, our problems are far from over. Not only will current logistical issues persist, but the macro influence of the supply chain crisis is poised to have an even greater impact.

Beyond product shortages, supply chain problems will inevitably disrupt innovation on a wide scale. Imagine you're a product developer at a major hardware company. As you grapple with how to pivot as deliveries of chips and other product components slow down - or even stop - you're forced to put future-looking plans on hold, as you scramble to ensure current products can make it on shelves. Attempting to solve for this shortage and keep existing lines running severely limits the available time and resources to be spent on the research and development of new and innovative products.

Big companies with significant budgets will smartly tap specialists outside of their organizations to retain innovation, while smaller organizations will be stuck between a rock and a hard place.

As wireless power technology continues to advance, we will see a range of new applications as product developers see the benefits of transferring power (and data) without physical connectors. Of course, there will continue to be challenges, too. But as we head into 2022, we are expecting giant leaps forward in our industry. **EP&T**

Jacob Babcock, *CEO & founder, NuCurrent, which was founded out of a graduate-student project at Northwestern University that focused on powering implanted neurostimulation devices wirelessly. From 2009-2013, NuCurrent concentrated exclusively on wireless power for implanted medical devices. The group's original motivation was to develop a new type of antenna technology to deal with complex issues like transmitting power through inconsistent human tissue, Specific Absorption Rate (SAR) limits, tissue heating, implant variability, and significant size restrictions.*

Making accurate 5G mmWave measurements with a signal analyzer

BY DYLAN MCGRATH, KEYSIGHT TECHNOLOGIES

The commercialization phase of 5G is in full swing. Currently, 5G has been deployed in more than 26,000 sites and counting. However, the vast majority of 5G deployments to date have been Frequency Range 1, sub-6GHz deployments. Deployment of 5G Frequency Range 2 (FR2) has only just begun.

Most, but not all FR2 resides in the millimeter wave (mmWave) spectrum. FR2 is defined as 24.25GHz to 52.6GHz. mmWave spectrum is generally considered to be the band of spectrum that resides between 30GHz and 300GHz.

The advantages of using mmWave spectrum in wireless communications have been well documented. The high frequency of mmWave frequencies makes them a very efficient way of sending large amounts of data. The amount of bandwidth available in the mmWave frequency range enables tremendous uplink and downlink speeds and the relatively small size of mmWave transmissions make mmWave suitable for operating in dense urban environments where a lot of devices are present.

In short, FR2 is where the bulk of 5G's promised benefits reside in terms of speed, bandwidth, and latency for both standard wireless communications as we know it today and for enabling entirely new use cases.

However, as is so often the case in wireless technology, the promise of mmWave comes with strings attached. In the case of mmWave, the tradeoffs include path loss (due to the poor propagation of mmWave signals), increased signal noise (due to the inherent high noise level of wideband signals), and poor frequency responses (due to the small margin for error on wideband signals). Further complicating matters, components designed for mmWave devices are so compact and tightly integrated that it leaves no place to probe, which creates the requirement for radiated tests, also known as over the air-the-air (OTA) tests. These challenges can make measuring mmWave signals arduous, preventing you from understanding the true performance of the device under test.

Signals may be hampered by RF cables and accessories.

This article will discuss these specific challenges to mmWave device testing in further detail. It will also present strategies for overcoming these challenges with a signal analyzer using modifications to signal path, signal conditions, and the reference plane, enabling accurate, repeatable measurement of 5G mmWave signals.

Challenges to overcome

One of the most significant challenges to overcome for FR2 transmission is that mmWave signals do not propagate as far as microwave frequencies. mmWave signals are easily absorbed by the atmosphere and are more heavily impacted by rain attenuation and diffraction. mmWave signals also do not penetrate trees and other foliage, building walls, freeway overpasses, and other infrastructure.

The finnicky propagation characteristics of mmWave signals can be further exacerbated by the test setup. For example, signals may be hampered by RF cables and accessories. Also, any skew in a flange connection (above figure) on the test and measurement equipment can cause unwanted reflections that degrade signal quality and power.

Excessive path loss

The OTA testing requirement also complicates matters, because electromagnetic field behavior and characteristics vary depending on the distance from the antenna.

Excessive path loss at millimeter-wave frequencies between instruments and the device under test (DUT) results in a lower signal-to-noise ratio (SNR) for signal analysis. A lower SNR leads to less accurate transmitter measurements for things like error vector magnitude (EVM), adjacent channel power ratio (ACPR), and spurious emissions. To compensate for path loss, engineers typically reduce the attenuation of the signal analyzer. However, even reducing the input attenuation of the signal analyzer to 0 dB may not be able to compensate for the low SNR adequately to result in accurate measurements.

Signal analyzers offer engineers the hardware and software flexibility to optimize for specific types of measurements. An example is that signal analyzers offer a choice of multiple RF signal paths to help overcome path loss issues related to signal propagation and other factors. A signal analyzer can, for example, apply attenuation at higher power levels or a preamplifier at lower power levels to measure a variety of input signals.

The types of RF signal paths typically available include:

- The default signal path is ideal for measurement low-level signals with a bandwidth of less than 45MHz. In this path, the input signal travels through the RF attenuator, preamplifier, and pre-selector before reaching the mixer.
- A microwave preselector bypass path is better suited for analyzing wideband vector signals such as mmWave signals because it allows wide-bandwidth signals to pass unimpeded through the RF chain.
- Making EVM measurements and other measurements that test transmitter modulation quality at higher power levels is generally best done using a low-noise signal path. The gain of the amplifier, frequency responses, and insertion loss are compounded at higher frequencies. This path reduces path loss and the frequency responses and noise created by the preamplifiers and switches, improving signal fidelity and increasing measurement sensitivity.
- A full-bypass signal path — which avoids multiple switches in the low-band switch circuitry and bypasses the microwave preselector — can reduce loss at mmWave frequencies by up to 10dB compared with the default signal path. The full bypass path offers the advantages of lower path loss, higher signal fidelity, and increased measurement sensitivity, but does have some downsides including in-band imaging and low SNR for testing lower power levels.

Photo: Keysight Technologies

Use of an external mixer can extend the frequency range of a signal analyzer and eliminate insertion loss caused by the test setup cables and accessories between the signal analyzer and the DUT. The cable loss can be up to 5 dB/m and can reduce the SNR of the test system. Adding an external mixer, which can be moved closer to the DUT, shortens the mmWave signal path, reducing the path loss and increasing the SNR.

The Shannon-Hartley theorem specifies the maximum rate at which information can be transmitted over a communication channel within a specified bandwidth with the presence of noise

Wideband noise

Wideband signals inherently have higher noise and a lower SNR because energy from the signal spreads across the entire bandwidth of the signal. Hence, the wider the bandwidth, the lower the inherent signal integrity, the more vulnerable it is to noise from the test setup and other factors, and thus the lower the SNR.

Noise is part of all communications channels. A transmit signal needs to compete with the channel's noise floor to get better sensitivity at a receiver. The *Shannon-Hartley theorem* specifies the maximum rate at which information can be transmitted over a communication channel within a specified bandwidth with the presence of noise.

Increasing analysis bandwidth introduces more noise to a signal analyzer. The noise reduces the SNR. As mentioned above, a low SNR causes inaccurate transmitter measurements. The low SNR can result in poor EVM and ACPR measurements that do not accurately reflect the performance of the DUT.

To improve EVM measurement accuracy, it is important to choose the optimum levels for the signal analyzer's mixer and digitizer. It is also critical to choose the optimum phase noise configuration of the local oscillator (LO) to achieve the best results.

Wireless standards specify transmitter measurements at the maximum output power. However, you can attenuate the power level at the first mixer of a signal analyzer to ensure that the high-power input signal does not distort the signal analyzer.

The input signal level can be lower than the optimum mixer level in OTA tests and tests setups with a significant insertion loss, for example. Using a built-in preamplifier can be useful for low-input-level test scenarios. A built-in preamplifier provides a better noise figure, but a poorer intermodulation-distortion-to-noise-floor dynamic range.

The input mixer-level setting is a trade-off between distortion performance and noise sensitivity. A higher input mixer level yields better SNR, while a lower input mixer level offers better distortion performance. The measurement hardware, characteristics of the input signal, and specification test requirements combine to dictate the optimum mixer-level setting. As described in example 3, applying an external low-noise amplifier (LNA) at the front end can also reduce the system noise figure — with or without the internal preamplifier — can also help optimize the input level of the mixer.

Signal analyzers also choices for phase noise optimization. The optimum phase noise performance of a signal analyzer for modulation analysis is dictated by the phase noise profile of the signal analyzer, as well as the operation frequency, bandwidth, and subcarrier spacing (OFDM signal) of the input signal. A wide offset phase noise setting is generally for better 5G NR mmWave modulation analysis.

Frequency responses

The accuracy of the test setup is impacted by the components in path between the test instrument and the DUT. With wide bandwidths and mmWave signals, small margins for error force RF engineers to look for new ways to reduce frequency response errors. These frequency response errors occur at different frequencies, affecting phase and amplitude responses. A signal analyzer provides an internal calibration routine to correct its frequency responses.

Correcting for frequency response errors is required in order to extend the measurement accuracy from the signal analyzer's input port to the DUT's test port. It is possible to configure corrections to both amplitude and phase with a signal analyzer to remove frequency responses. Correcting for magnitude and phase errors in the test network also improves the accuracy of measurements. There are many instruments and accessories available to help correct frequency responses.

Conclusion

In summary, the use of mmWave signals in 5G enables dramatic improvements in speed and latency, offering the performance to significantly boost traditional wireless data applications and enable entirely new use cases such as ultra-low-latency communications (URLLC), cellular vehicle-to-everything (C-V2X) communications, and massive machine-type communications (mMTC).

However, the characteristics of mmWave signals introduce new measurement challenges to accurate, repeatable measurement. Modern signal analyzers provide the flexibility in hardware and software to offset these challenges, including reducing path loss, improving signal condition, and correcting for frequency response errors. **EP&T**

Dylan McGrath *is a veteran technology journalist and presently serving the role of senior industry solutions manager at Keysight Technologies.*

SDR paves the way for 5G testbeds

UE devices to skyrocket with emerging wireless technologies connected to 5G networks

BY BRENDON MCHUGH, FAE & TECHNICAL WRITER, PER VICES

For the full potential of 5G, 5G+, and mmWave technologies involved in cellular networks to be achieved, immense testing of how user equipment (UE) and base stations interact in lab simulations and real-life environments is necessary– in so-called 5G testbeds. Low power consumption, massive equipment connectivity, ultra-low latency, secure communications, cloud and edge computing services, and the deployment of technologies making all this possible, are key challenges being addressed in ongoing research on 5G networks. Software-defined radio (SDR) is a complementary technology that allows for testing many of the technologies involved in 5G networks.

What research are 5G testbeds used for?

The number of UE devices will skyrocket with emerging wireless technologies connected to 5G networks that provide internet of things (IoT) services for everything imaginable. In order for this to occur, 5G will play a central role, with support for Ultra-Reliable Low Latency Communications (URLLC), massive Machine-Type Communications (mMTC), Device-to-Device (D2D), and Machine-to-Machine (M2M) communication. These mmWave networks are expected to play a central part in a variety of IoT related services such as Intelligent Transport Systems (ITS), smart city applications, smart home tech, smart automation for Industry 4.0, and the enactment of mission-critical IoT initiatives.

With an increase in technologies requiring 5G networks will come an increase in the types of base stations (i.e. network cells), access points, and other types of interconnectivity that provide coverage for UE. The latest types of 5G connectivity include device-to-device (D2D) communication that enables direct communication between devices without going through traditional base stations central to macrocells (MCs). This helps to offload traffic from MC base stations to small cell and/or femtocell base stations, as well as to other UE, all while increasing network cell coverage via multihop mesh network transmission. 5G networks will be much more software-driven to support the huge amount of UE using multihop mesh networks. This includes software-defined networking (SDN) architectures and multi-access edge computing (MEC) in the control plane to achieve dynamic network management, for tasks such as packet forward during D2D communication, and thereby enabling enhanced Mobile Broadband (eMBB).

All of these new base stations, IoT devices, and other UE, as well as radio communications between them all, will have their own set of protocols operating at various frequencies, and thus require extensive testing. Moreover, challenges arise due to mmWave/5G (24–54 GHz) electromagnetic waves suffering from extensive propagation loss between transmitter and receiver.

What is a software-defined radio (SDR)?

SDRs contain a radio front end (RFE) and digital back-end. A SDRs radio front-end contains the receive (Rx) and transmit (Tx) functions to receive signals over a very wide tuning range, even extending into the mmWave range. SDRs contain multiple independent Tx and Rx channels, which support MIMO operations, all with dedicated DACs/ADCs. The highest-bandwidth SDRs have 3GHz of instantaneous bandwidth, which is especially important for the immense amount of data required to be sent and received quickly over 5G networks. SDRs have a very high throughput digital backhaul, using 100GBASE-R Ethernet links, that is required for processing data and serving vast amounts of UE at very low latency.

A SDRs digital back-end contains a field-programmable gate array (FPGA) with on-board DSP capabilities for modulation, demodulation, upconverting, downconverting, as well as providing additional logic blocks for custom development. Such logic gates are configurable and upgradeable, and provide capabilities for updating to the latest radio protocols, DSP algorithms, and various other computational needs.

5G

The growing prevelence of user equipment, IoT, M2M, D2D communication will drive greater emphasis on 5G networks.

What does SDR bring to 5G testbeds?

Important fields of 5G research benefiting from SDR include antenna design, signal processing algorithms, propagation studies, channel estimation techniques, latency studies, as well as providing a means to share radio resources among different research groups in a testbed base stations. Moreover, to actually perform measurements, SDR is compatible with various signal processing suites, such as GNU Radio, which provide a means to take spectrum measurements or implement and test modulation schemes.

SDR-based remote radio read (RRH) are found in base stations, and are essentially RF Tx and Rx radio chains which connect to a baseband unit, allowing for a physical interface connection to the core network's using for instance, the enhanced common public radio initiative (eCPRI).

SDRs compatible with open source software suites enable researchers to deploy and experiment with end-to-end 5G networks, even though they may not have access to carrier-grade hardware deployed by the major telecom operators. Such SDRs can be deployed in testbeds, for instance in testbed base stations deployed in dense urban areas, an area of research which will be discussed in the last section.

5G Antenna, Signal Propagation and Network Testing

An important requirement for networks and UE is T&M of antennas and signal propagation. Over-the-air (OTA) testing of 5G signal transmissions is of great importance due to 5G/mmWaves having unfavorable propagation characteristics. Important tasks include measuring antenna performance, testing beamforming algorithms, and ensuring devices meet standards, for starters. In the lab, anechoic chambers can be configured for multiple purposes including antenna pattern measurements (near field), and specialized propagation measurements. For instance, channel sounding measures parameters such as signal path loss, delay, absorption & reflection off surfaces, multipath fading, angle of arrival (AoA), direction of arrival (DoA) and Doppler shifting; all parameters which affect the performance of the radio communications of a 5G network. 5G channel sounding measures channel performance dynamically on channels operating in the mmWave spectrum, using bandwidths upwards of 500MHz, over MIMO transmissions which require extensive DSP for beamforming and beam steering.

Many research studies have been conducted in the area of radio channel propagation in various indoor environments such as in offices, dining rooms in homes, stairwells, to name a few, as well as in a laboratory at 28 GHz (a prominent band for 5G wireless networks). Indoor environments provide rich sources of scattering objects for radio channel propagation studies ranging from people and objects in the building to the building itself. Structural design including construction materials, building size, and the interaction with various other aspects of systems, force EM waves to propagate across multiple paths through reflection, refraction, and diffraction phenomena. Measurements of power delay profiles are particularly important for these multipath signals. Other studies include measuring the effect of outdoor to indoor propagation of 5G signals; an obviously important task for any base station antenna.

In the lab, anechoic chambers can be configured for multiple purposes including antenna pattern measurements (near-field)

Testbed Case studies

One interesting type of 5G testbed is shared between Rutgers, Columbia and NYU. The project, termed COSMOS (Cloud-Enhanced Open Software Defined Mobile Wireless Testbed for City-Scale Deployment), is deployed in the densely populated neighborhood of West Harlem, New York City. This testbed focuses on providing ultra-high-bandwidth and low-latency wireless communications by providing edge-computing capabilities. COSMOS allows researchers to experiment with mmWave, open RAN (ORAN), and optical switching technologies in base stations which incorporate SDR. Quantitative measurements using the testbed include scale (number of nodes, geographic coverage area, user density), radio bandwidth and speed, network latencies, and cloud computing capacity, to name a few.

COSMOS is a multi-layered computing system, with an RF plane that can flexibly divide signal processing and network function virtualization (NFV) on a SDN between a local SDR, using various FPGA functionality, and a remote cloud RAN (CRAN) with massive CPU/GPU and FPGA capabilities.

28

GHz is a prominent band for 5G wireless networks. Channel sounding measures parameters such as signal path loss, delay, absorption & reflection off surfaces,multipath fading, angle of arrival all affect performance.

Conclusion

As discussed here, testbeds will be central to 5G network and UE development. High performance SDRs are playing a significant role in this development, not only for their RF capabilities but also their FPGA resources. By using SDRs, researchers are capable of testing antenna, signal propagation, signal processing, various technologies allowing massive interconnectivity, and provide a means to connect between the 5G core network (mobile backhaul) and radio fronthaul. As the 5G revolution is just underway, SDRs are expected to play a large role in these networks and devices. EP&T

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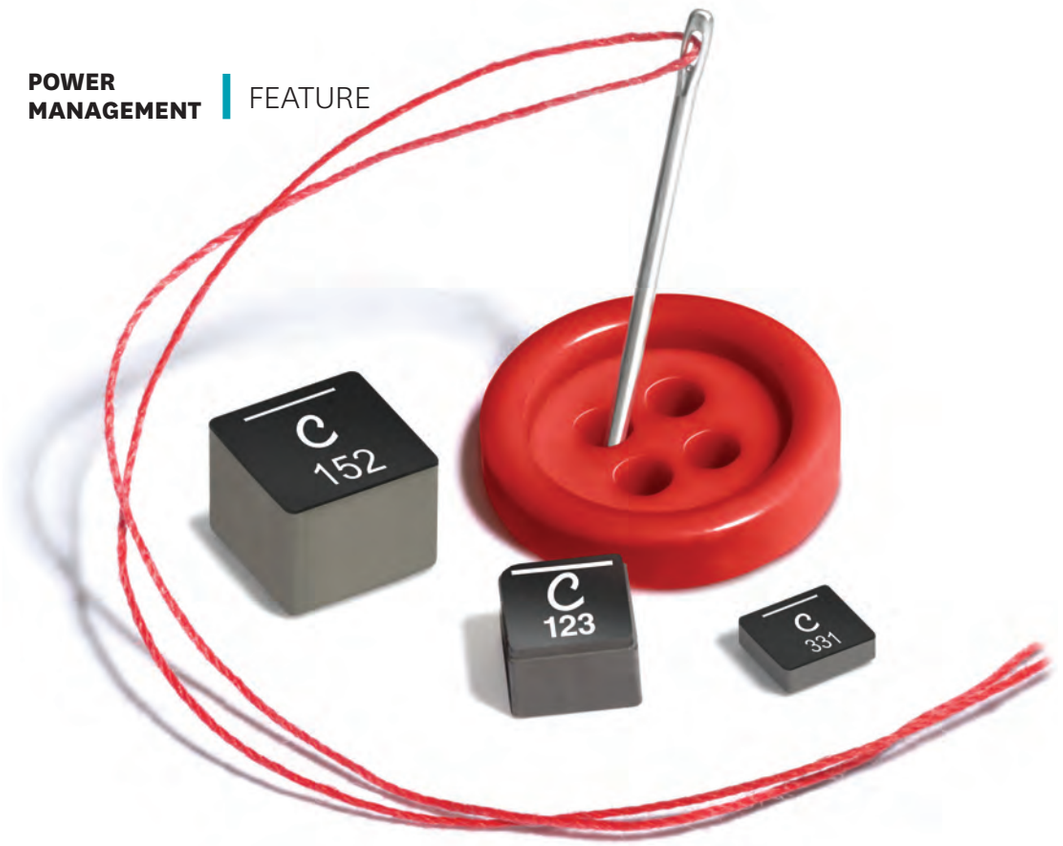

Inductor efficiency is highest when the combination of core and winding losses are the lowest.

Choosing inductors for energy efficient power

Inductors remain as integral as the circuit topology

BY LEN CRANE, SENIOR TECHNOLOGIST, COILCRAFT

In high frequency dc-dc converters, power inductors filter out the ac ripple current superimposed on the dc output. Whether the converter steps the voltage down – buck – or steps the voltage up – boost – or both up and down – SEPIC, the inductor smooths the ripple to provide a pseudo-dc output.

For battery powered applications, battery life is extended by improving the efficiency of the entire power supply circuit and inductor efficiency is often a major consideration in the design. Careful consideration of inductor efficiency can mean the difference between having your battery work when you need it and having to stop in the middle of an important task to plug it into a charger.

Inductor efficiency is highest when the combination of core and winding losses are the lowest. Therefore, the goal of highest efficiency is met by selecting an inductor that provides sufficient inductance to smooth out the ripple current while simultaneously minimizing losses. The inductor must pass the current without saturating the core or over-heating the winding.

Accurately predicting core and winding loss of an inductor can be complicated. Core loss depends on several factors, such as peak-peak ripple current, ripple current frequency, core material, core size, and turn count. The required ripple current and ripple current frequency are application-dependent, while the core material, core size, and turn count are inductor-dependent.

The most commonly-used equation to characterize core loss is the Steinmetz equation: Pcore = K(f)x(B)y Where:

Pcore = power loss in the core
K, x, y = core material constants
F = frequency
B = flux density

Pcore

The most commonly-used equation to characterize core loss is the Steinmetz equation.

This equation shows that core loss depends on frequency (f) and flux density (B). Flux density depends on ripple current, so both are application-dependent variables. It also shows that the core loss is inductor-dependent, where the core material determines the K, x, and y constants. Note that flux density is also a function of the core area (Ae) and the number of turns (N), therefore core loss is both application-dependent and inductor-dependent.

By comparison, dc winding loss is simple to calculate: Pdc = Idc2 × DCR

Where:

Pdc = dc power in Watts dissipated
Idc = Effective dc (rms) value of the inductor current.
DCR = dc resistance of the inductor winding

The ac winding loss is more complicated and may include the effects of increased resistance at higher frequency due to both skin effect and proximity effect. ESR (effective series resistance) or ACR (ac resistance) curves may show some of the increased resistance at higher frequency, however, these curves are typically made at very low current levels, so they do not capture current-dependent (core) loss. They are also prone to misinterpretation.

For example, consider the ESR vs frequency curve shown in Figure 1, which indicates that the ac resistance looks very high above 1MHz. This strongly suggests that this part would have very high ac loss. However, it has been observed that inductors with typical curves like this have performed very well in actual converters – much better than would be suggested by these curves.

Consider a buck converter that has an output of 5V at 0.3A (1.5Watts). Selecting a 10µH Coilcraft inductor with a typical ESR vs frequency operates at an ESR of 0.8 Ohms at 250kHz. The average inductor current equals the load current: 0.3A.

We can calculate the loss in the inductor as I2R = (0.3 A)2 × (0.8Ω) = 0.072W. 0.072W ÷ 1.5W = about 5% of output power lost in the inductor.

If we run the same converter at 5MHz, the ESR curve shows R is between 10 Ohms and 20 Ohms. If we assume the best case R = 10 Ohms, the calculated power loss is: I2R = (0.3 A)2 × (10Ω) = 0.9W, which is 60% of the output power lost in the inductor. Switching converters achieve far better performance than the ESR curves apparently predict. How? - In typical applications, ripple current is kept to approximately 40% of the load current or less. In the 5MHz example, it was assumed the current was all ripple current (ac).

Regardless of ripple content, ESR curves are based on very low current measurements and therefore they do

Photos: Coilcraft

not capture current-dependent core loss at higher current. Total inductor loss determines the overall inductor efficiency. Improvements in core materials have led to inductors with very low ac loss at high frequency, resulting in higher inductor efficiency. Therefore, inductor makers optimize efficiency by selecting low loss materials and rectangular 'flat' wire to minimize total loss.

The XGL family stands as a good option for high frequency power converter applications that must withstand high peak current with lowest dc and ac losses.

To speed up the design process for engineers selecting inductors, Coilcraft has developed tools that calculate measurement-based core and winding loss for each possible application condition. The results from these tools include current-dependent and frequency-dependent core and winding loss, eliminating the need to request proprietary inductor design information, such as core material, Ae, and number of turns, and the need to perform hand calculations.

If your application is a dc converter, the Coilcraft dc-dc Optimizer Tool calculates the inductance value, peak current, and peak-peak current requirements, based on your operating conditions and the amount of ac ripple current you choose. It then feeds this information into our Power Inductor Finder tool to display a list of inductors that may meet these requirements. The list includes the inductance at peak current, current rating, total losses, and resulting part temperature for each inductor listed.

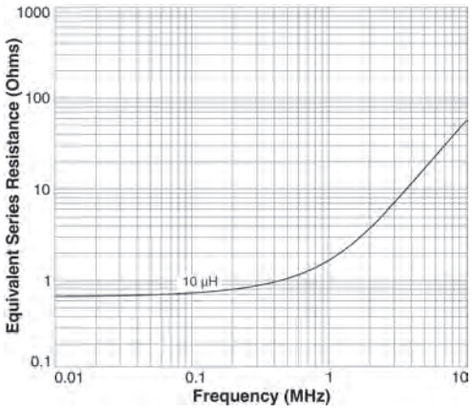

Fig 1: ESSR vs Frequency - Curve indicates that the ac resistance looks very high above 1MHz.

	L nom	DCR typ	Isat (30%)
XGL4020-222	2.2 µH	19.5 mOhms	5.9 A
XEL4020-222	2.2 µH	35.2 mOhms	5.9 A
XAL4020-222	2.2 µH	35.2 mOhms	5.6 A
XFL4020-222	2.2 µH	21.4 mOhms	3.7 A

Table 1: Comparing XAL, XEL and XFL.

If you already know the inductance value and current ratings required for your application, you can enter this information directly into the Power Inductor Finder. The results include core and winding (total) loss and saturation current ratings for each inductor, to verify that the inductance will remain close to the design requirement at the peak current condition for your application.

The tool may also be used to graph the inductance vs current behavior to compare traditional hard-saturating inductors to soft saturation types. To select the highest efficiency inductor, the results can be sorted by total loss. Multiple sorts allow selection by multiple parameters.

Inductor loss is closely related to core size and wire size. In many cases, lowest loss corresponds to larger part size, or it corresponds to using a hard-saturation (ferrite) core material at lower switching frequencies. As with any design, there may be compromises that require analyzing trade-offs in size or inductance at peak current vs efficiency. Having all of the inductor information in a complete list that allows multiple sorting facilitates such an analysis. **EP&T**

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masterbond.com/properties/electrically-insulative-adhesive-systems

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ch.schurter.com/content/download/2357131/40537784/version/31/file/ApplicationNote_ThermalRunaway_EN.pdf

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product.tdk.com/en/power/drb

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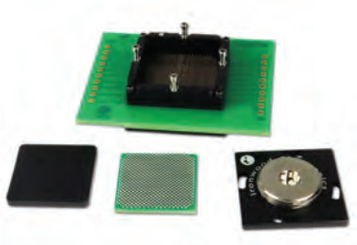
IRONWOOD ELECTRONICS

SG-BGA-6513 high performance BGA socket for 0.8mm interstitial pitch BGA 676 ball device. Device is designed for a Intel's Atom processor and operates at bandwidths up to



27GHz with less than 1dB of insertion loss. Devices are designed to dissipate up to several watts without extra heat sinking and can handle up to 100 watts with custom heat sink. The contact resistance is typically 20 milliohms per pin. Device connects all pins with 27GHz bandwidth on all connections.

ironwoodelectronics.com/press/PressReleasePhotos/C21108b_highres_shadow.jpg

DC CENTRIFUGAL FAN DELIVERS BUILT-IN ELECTRONICS

EBM-PAPST

RVE45 series next-gen dc centrifugal fan provides the added benefit of built-in electronics. Switching quickly and reliably between high and considerably reduced pressures, unit's EC internal rotor motor easily adapts to rapid pressure changes. Vibration-absorbing materials and an optimized aerodynamic design ensure that the device also operates quietly. The rotor is intentionally light, which results in low power consumption at high dynamic performance.

sager.com/manufacturers/ebm-papst-inc/ebm-papst-rve45-series-dc-centrifugal-fan/

DC-DC CONVERTERS' CONFORMAL COATING IMPROVES PROTECTION 4TH GEN

PHOENIX CONTACT

QUINT dc-dc converters feature conformal coating for protection in harsh environments. Units have been approved for use in ATEX, IECEx and Class I Division 2 locations, so they can be used in hazardous locations around the globe. The conformal coating protects against dust and conductive debris, corrosive gases and humidity, and it prevents failures due to creepage currents and electromechanical corrosion. It also reduces the risk of failure due to vibration and thermal shock.

tti.com/content/ttiinc/en/

ZENER DIODES DELIVER LOW TOLERANCE OF ±1%

NEXPERIA

BZT52H-A (SOD123F) and BZX384-A (SOD323) series A-selection Zener diodes provide a tolerance of ±1%,

including a higher precision voltage reference compared to the B (±2%) and C (±5%) variants. Matching the rising demands of mobile, portable/wearable, automotive and industrial applications and meeting the increasing regulatory requirements, the two series are also available as Q-portfolio devices. Devices have a nominal working voltage range of 1.8V to 75V (E24 range). Devices feature a non-repetitive peak reverse power dissipation of ≤40W, total power dissipation ≤250mW and low differential thermal resistance.

nexperia.com/a-selection-zener

RSN

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SUPPLY SIDE

TEST

NAVAIR SIGNS DISTY DEAL WITH RIGOL

Navair Technologies, a Mississauga-based specialty distributor of service, maintenance, test and measurement solutions for the avionics, wireless, infrastructure, government and public safety marketplaces in Canada, has signed an agreement with China-based test and measurement provider RIGOL Technologies.

RIGOL provides a complete range of standalone spectrum analyzers, oscilloscopes, arbitrary waveform generators, RF signal generators, power supplies, electronic loads, multimeters and accessories for electronic test and measurement applications from the benchtop to the automated test stand.

LABTEST CERTIFICATION RECEIVES OSHA'S RECOGNITION

LabTest Certification Inc., Delta BC, recently received recognition by OSHA as a Nationally Recognized Testing Laboratory (NRTL) for Testing and Listing of Electrical products. The new recognition is in addition to the already extensive scope of accreditations that LabTest holds for certification/listing of various product categories, such as hazardous locations equipment, EMC, fuel burning appliances, plumbing, marine, solar, energy efficiency, building materials, environmental and PPE.

A Nationally Recognized Testing Laboratory (NRTL) is a private-sector organization that OSHA has recognized as meeting the legal requirements in 29 CFR 1910.7 to perform testing and certification of products using consensus-based test standards.

As an NRTL, LabTest will now be able to offer its LC NRTL Mark, with US designation (LCus), to manufacturers who are specifically seeking to have their products listed by an OSHA recognized body.

Richard Denier
general manager, CCI Canadian Circuits Inc.

Michael Daly
managing director, Weidmuller Ltd.

PEOPLE

CANADIAN CIRCUITS APPOINTS GM

CCI Canadian Circuits Inc., a Surrey BC-based printed circuit board manufacturer serving a wide range of industries, has appointed industry veteran and professional Richard Denier as company's new general manager.

"We are very excited to have someone of Richard's experience and expertise join our team," says Praveen Arya, president of Canadian Circuits. "We have followed his career over the years and know that he has a proven record of success with pcb fabricators across the globe, from Canada to the U.S., China to Korea. We are looking forward to his contribution towards taking our company into the future."

Founded in 1993, CCI has been serving more than 40 industries with a wide range of circuit boards, specializing in rapid prototyping and volume production of advanced pcbs.

WEIDMULLER APPOINTS MANAGING DIRECTOR

Weidmuller Ltd., Markham ON, a market leader in industrial connectivity, has appointed Michael Daly as managing director for Canada. Daly previously held several sales roles during his two-decade-long career, working closely in the industrial automation and distribution industry. He has vast experience in scaling company operations and sales, thus adding to growth.

"We have been able to gain an experienced manager, who has been vice-president sales at Rotalec during the last years. He is a proven expert in our industry and has extensive knowledge of our products, customers and markets," said Dr. Timo Berger, chief sales officer, Weidmüller Group. Daly will provide strategic leadership to the Weidmuller Canada team with a focus on growth and local production capabilities.

PRODUCTION

AIM UNVEILS SPECIALTY MATERIALS WEBSITE

AIM Solder, a global manufacturer of solder assembly materials for the electronics industry, has implemented a new AIM Specialty Materials website, providing easy navigation and functionality.

Created with the customer in mind, the site includes many features to help users quickly navigate all the products and services AIM Specialty has to offer. In addition to extensive product information, visitors will find technical and safety data sheets, troubleshooting guides and applications advice. www.AIMspecialty.com

BITTELE EXPANDS AUTHORIZED SUPPLIERS

Bittele Electronics Inc., a Toronto-based one-stop printed circuit board (pcb) firm specializing in prototype and low-to-mid volume printed circuit board manufacturing & assembly, has expanded its suppliers to include Quest Components and TME in order to obtain genuine pcb parts. This expansion is due to the global component shortage, which has caused some parts to be unavailable.

"Quality is our highest priority. We quote only from authorized sources whenever possible to ensure genuine parts are sourced for your order," says Ben Yang, CEO of Bittele Electronics.

If parts are only available from Bittele's new suppliers, the firm notifies the customer during the quoting stage. By default, it will consider these new suppliers as approved if we do not hear otherwise by the time of order placement.

ACQUISITION

LITTELFUSE ACQUIRES CARLING TECHNOLOGIES

Littelfuse Inc. has completed its acquisition of Carling Technologies Inc., a leading supplier of switching and circuit protection technologies with a strong global presence in commercial transportation, communications infrastructure and marine markets.

"The combination of both firms significantly expands our technologies and capabilities, enabling critical scale," said Dave Lesperance, vice-president and general manager, Littelfuse Commercial Vehicle Business. "The addition of Carling more than doubles the size of our commercial vehicle business, and our complementary customers, channels, and products will accelerate our growth in strategic markets."

Carling has annualized sales of approximately $170 million and will be reported within the Littelfuse commercial vehicle business incorporated into the company's Automotive reporting segment. **EP&T**

Photo: Rigol; CCI; Labtest; Weidmuller; Bittele

PRODUCT SOURCE GUIDE

AD INDEX

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Fairphone True Wireless Earbuds

BY IFIXIT

These findings are from iFixit, the open source repair guide. The popular online site teaches people how to fix just about any electronic device, and sells the parts and tools to make it possible. For this teardown, the engineers at iFixit tackle the Fairphone True Wireless Earbuds.

Fairphone's first offering in this expanding category bears some familial resemblance to its line of smartphones - which consistently ranks high with our reparability scale. Let's hear what these earbuds have to offer:

What's Inside?

Fig 1

- In-ear detection and touch control
- Active noise cancellation with transparency mode
- Bluetooth 5.3, A2DP, HFP, AVRCP
- 10 mm / 32 Ohm drivers
- IPX4 splash resistance

Fig 2 We kick off disassembly with the most removable and cleanable bit - the flexible tips. Hoping to keep it non-destructive, we aim for a likely seam and get slicing with an opening wheel—luckily no heat required. Inside, we can already spot the glued-in motherboard.

Final Thoughts

The charging case is held together only by clips and standard Phillips screws. While the earbuds can be opened with gentle prying, nothing inside is easily repairable. The critical charging case and earbud components—including batteries and port—are soldered together. Reliance on solder, plastic rivets, and clips make repair harder than the use of screws and connectors.

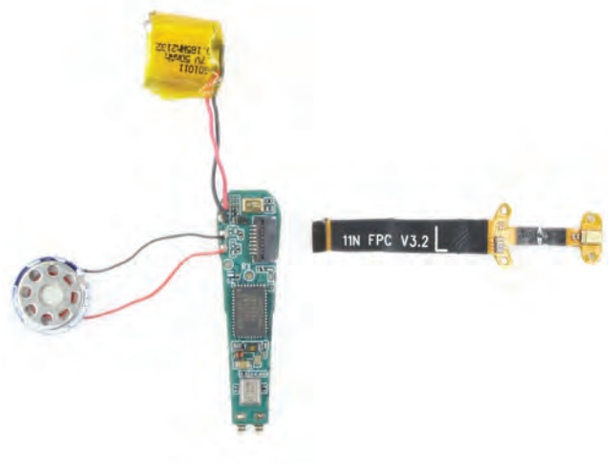

Fig 3 We opt for battery removal—both because it gives more room to maneuver, and because this cell will someday need replacing anyway. The teeny tiny battery pouch measures 10×9.8×5.6mm and delivers 0.1Wh (50mAh @ 3.7V).
On our way to the driver (which is glued down in a super tight recess), we see the ribbon cable held captive by brackets—which in turn are secured by plastic rivets. With heavy hearts, we break out the flush cutter—it's about to get destructive in here.

Fig 4 The silicon is a little more fun on the reverse side:

- Airoha AB 1562 Bluetooth audio SoC (single chip solution)
- Main microphone
- Active noise cancellation microphones
- Proximity sensor for in-ear detection

*These findings are from **iFixit**, a wiki-based site that teaches people how to fix almost any electronic device. Anyone can create a repair manual for a device or edit the existing guides to improve them. iFixit empowers individuals to share their technical knowledge and teach the rest of the world how to fix their stuff.* ***canada.ifixit.com***

Photos: iFixit

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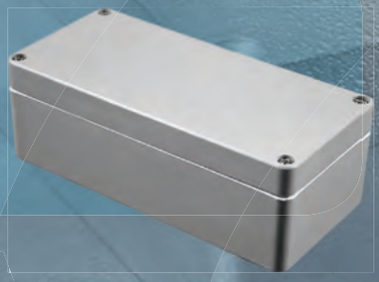
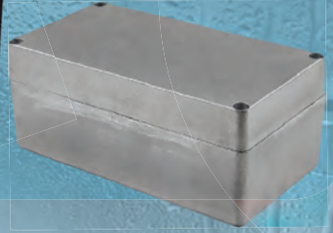


Industrial Wall-Mount Enclosures

Die-Cast Aluminum Enclosures



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