

# News Release

## Hyundai CRADLE Invests in Metawave to Help Develop Smart Automotive Radar Platforms

- Hyundai autonomous vehicles will be equipped with next-generation radar systems
- High-performance, high-resolution radar system capable of 3-D imaging and vehicle-to-vehicle communication
- Metawave's WARLORD advanced radar platform uses just one antenna, instead of hundreds

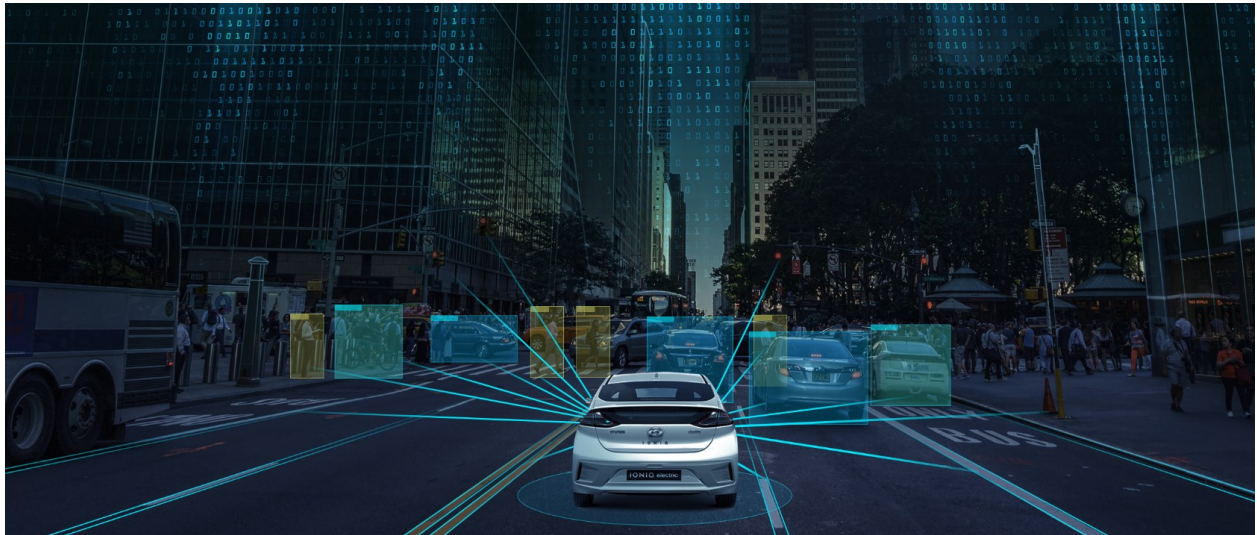
**May 16, 2018** – Hyundai CRADLE, Hyundai Motor Company's corporate venturing and open innovation business, today announced it is investing in Metawave Corporation to build intelligent radars for autonomous vehicles. Metawave is revolutionizing radar sensing by leveraging adaptive metamaterials (conventional materials using engineered structures with unique electromagnetic properties not found in nature) and artificial intelligence (AI) to create smart radars. Hyundai is closely evaluating new technologies, such as Metawave's high-performance radar capable of 3-D imaging, for future autonomous platforms.

"Next-generation radar technology can use advanced algorithms for object detection and classification," said John Suh, vice president of Hyundai CRADLE. "A new radar system that can increase resolution and accuracy with an AI engine will be a disruptive technology."

Three sensors are the fundamental components of the perception system for self-driving cars today: camera, LiDAR and radar. The camera is the highest-resolution sensor but cannot see objects beyond 50 meters. LiDAR extends the range to about 150 meters, with a fairly high-resolution imaging capability. Both camera and LiDAR are affected by bad weather and dirty roads. Radar, by its nature, operates at a lower frequency and "sees" objects at long ranges faster and in all weather and driving conditions. Today's radar cannot cover wide angles at long ranges and lacks the resolution to differentiate between objects. It needs a large number of antennae and expensive chips to run the complex digital signals. This type of system takes time and energy, making it inefficient. Metawave's advanced radar platform, [WARLORD](#) uses just *one* antenna and pushes the complexity of the analog space, using ultra-fast and precise responses. With WARLORD, the antenna itself shapes and steers the beam in all directions using pencil beams, deep learning engines and AI algorithms to recognize objects quickly and send 4-D point cloud to the sensor fusion.

"The investment by Hyundai represents another key company milestone and further proof of our rapid momentum as we bring WARLORD long-range radar with imaging and AI capabilities to autonomous vehicles," said Metawave CEO Maha Achour, PhD. "With our talented team of mm-wave and metamaterial experts, we were the first to demonstrate Electronically Scanned Metamaterial Array for Autonomous Driving

at 77GHz. This technology will be an enabling factor for Hyundai and other auto leaders who are striving to improve the vehicle experience.”



Metawave Smart Automotive Radar Platform

### **Hyundai Autonomous Vehicle Development**

In January, Hyundai Motor Company and Aurora, a leader in autonomous vehicle technology, announced a strategic partnership to bring self-driving Hyundai vehicles to market by 2021. This partnership will incorporate Aurora’s self-driving technology into Hyundai vehicles, starting with models custom-developed and launched in test programs and pilot cities.

In February, a fleet of Hyundai NEXO fuel cell electric SUVs successfully completed a self-driven 190-kilometer journey from Seoul to Pyeongchang. The NEXOs were equipped with level 4 self-driving technology, as defined by SAE international standards, and 5G network technology.

These NEXOs featured a number of advanced technologies that enabled them to recognize surrounding vehicles more accurately and make better judgments at junctions and at branching roads, navigate through toll gates by accurately calculating the toll gates’ width and position and precisely pinpoint the vehicle’s position on a map by using external sensors fitted for situations when the GPS signal was interrupted, such as going through long underground tunnels.

### **Metawave Technology**

Metawave is building next-generation wireless technology platforms to address major challenges facing the wireless sensing and communications industries operating at mm-wave frequencies. By using engineered metamaterial structures and AI algorithms, Metawave was able to simplify architectures and improve system performance while lowering cost to both providers and consumers using its electronically beamforming and steering WARLORD and SABER technologies. The company is initially focusing on delivering the WARLORD smart radar platforms for Advanced Driver Assistance Systems (ADAS) and autonomous driving. In parallel, Metawave is building the SABER™ (Smart Antenna for Beamforming Electromagnetic Radiation) smart

antenna platforms for fixed wireless and the 5G cellular infrastructure to power dense point-to-point, point-to-multipoint and mesh configurations for backhaul and access networks.

The 5G market will benefit from Metawave's SABER platform by reducing interference and increasing the reach of coverage of their base stations. Instead of the massive numbers of antennae and complex digital processing used in today's 5G radios, [SABER](#) uses one antenna per transceiver port, which is able to focus the signal in narrow beams to extend the reach of base stations and service dense number of users with little interference.

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#### **About Hyundai CRADLE**

Hyundai CRADLE is the Center for Robotic-augmented Design in Living Experiences. CRADLE strengthens Hyundai Motor Group's core automotive business and expands it into new and adjacent markets with the goal of enhancing transportation on and off the road. The company also plans to expand the Hyundai CRADLE innovation concept globally.

#### **About Metawave**

[Metawave Corporation](#) is a wireless technology company that seeks to revolutionize the future of wireless communications and radar sensing. Leveraging adaptive metamaterials and AI, Metawave's primary focus is to build intelligent beamsteering radar for autonomous driving. Changing the way automakers think about radar, Metawave is building high-performance radar capable of 4-D point-cloud imaging, non-line-of-sight object detection and vehicle-to-vehicle communication, making cars safer, smarter and more connected. In parallel, Metawave is developing smart beamsteering antennas for fixed wireless and 5G cellular networks to provide faster infrastructure and near-instant connectivity for billions of users.

Visit the Metawave website at [www.metawave.co](http://www.metawave.co), follow us on Twitter [@metawavecorp](https://twitter.com/metawavecorp) or on [Facebook](#) or contact us at [info@metawave.co](mailto:info@metawave.co).

#### **About Hyundai Motor Europe**

In 2017, Hyundai Motor achieved registrations of 523,258 vehicles in Europe – an increase of 3.5 per cent compared to 2016, growing stronger than the market. By mid-2018, Hyundai will have replaced 90 per cent of its model line-up to create the youngest car range in Europe. 85 per cent of the vehicles Hyundai sold in the region are models designed, engineered, tested and built in Europe to meet the needs of European customers, served by the company's extensive European infrastructure. This includes two factories in the Czech Republic and Turkey, which have a combined annual capacity of 600,000 units. Hyundai Motor sells cars in 31 European countries through 2,500 outlets.

Hyundai Motor offers its unique Five Year Unlimited Mileage Warranty package with all new cars sold in the region, providing customers with a five-year warranty with no mileage limit, five years of roadside assistance and five years of vehicle health checks.

More information about Hyundai Motor Europe and its products is available at [www.hyundai.news](http://www.hyundai.news).

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#### **About Hyundai Motor**

Established in 1967, Hyundai Motor Company is committed to becoming a lifetime partner in automobiles and beyond. The company leads the Hyundai Motor Group, an innovative business structure capable of circulating resources from molten iron to finished cars. Hyundai Motor has eight manufacturing bases and seven design & technical centers worldwide and in 2017 sold 4.5 million vehicles globally. With more than 110,000 employees worldwide, Hyundai Motor continues to enhance its product line-up with localized models and strives to strengthen its leadership in clean technology, starting with the world's first mass-produced hydrogen-powered vehicle, ix35 Fuel Cell and IONIQ, the world's first model with three electrified powertrains in a single body type.