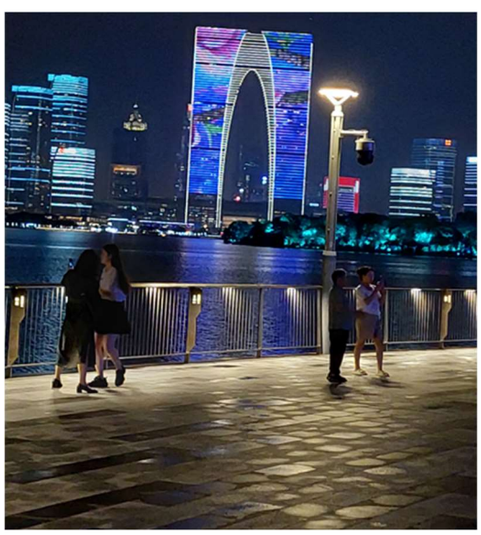
DVN-Lidar Report: EAC Lidar Tech Expo '24



The AEC Lidar Tech Expo is the biggest lidar expo in the World. This year it was co-organized by DVN and Enmore. DVN is now present with events in the EU, the US, and China.

DVN brought about 20 companies, including seven speakers—Valeo, AGC-Wideye, Sony, FKA, Siemens Simulation, Voyant, and Baidu Apollo), three exhibitors (C3nano, RCoola, and Konrad), and multiple visitors from Mobileye, Luminar, Onsemi, AMS Osram, Dexerials, Koito, Forvia Hella, Suna Opted, Schott, LG Innotek, and Robo-technik.

This was a unique opportunity for DVN to better understand why Lidar is so popular in China. We met with lidar suppliers and automakers at the DVN booth, and after the expo we visited the facilities of Robosense and Seyond and meet with Professor Ling Ming, who leads the International Conference for Automotive Lidar, to discuss standards and regulations.

Pictures: DVN Booth

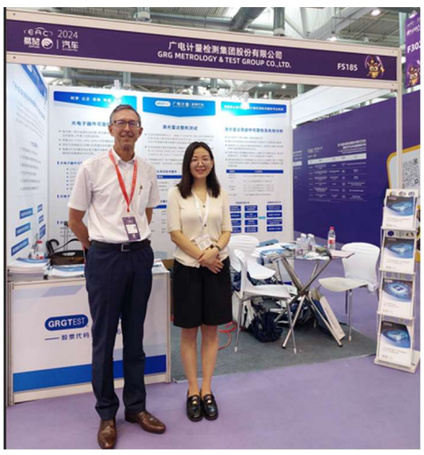
Here are key takeaways:

• Yole revised the size of the lidar business in 2030 to take into account the steep cost reduction curve of lidar in China.
• Buyers of Luxury cars: some buyers are young and like high-tech cars. Most Porsche buyers, for example, are 30 to 35 years old.
• OEMs tried last year to replace Lidar by more vision or imaging radars, but this year no OEM is questioning the value of Lidar (assuming the cost can go down).
• Hesai has been promoting the safety benefit of lidar, which can increase the maximum speed for AEB by 50 per cent, and the development of L^3 applications in China (9-model pilot project already under way).
• Seyond: L^{2+++} applications expanding to urban and highway environments, just a step away from L^3. Seyond has found the mean time between human-driver interventions is improving fast, and already exceeds 100 km on highways.
• Vanjee is launching a premium lidar with 300m range and up to 0.15° × 0,08° resolution in the ROI (80° × 12.5°) – see our lidar technology articles.
• Lidar is getting cheaper and cheaper for L^{2+}/NOA applications (0.1 - 0.2° resolution), expected at $200 in 2025 and with a target of $150 or less in 2026-27.
• To go further in the cost reduction, there are investigations to integrate vision and lidar together (Tanway, DJI…), with installation behind the windshield.
• Huawei will become one of the key suppliers for lidar.
• FMCW: Scantinel announced representative prototypes next year and possible SOP by 2027. Lidwave, a startup from Israel, has shown a simplification of the design, as has US startup Voyant using a design based on mature components from the telecoms industry and also targeting a 2027 SOP.
• Vueron mentioned they are ranking first in the list of Waymo perception software suppliers.
• FKA promoted their research project related to the extension of the first DIN-SAE spec of lidar for bad weather conditions.
• Professor Ling Ming is concerned by the steep price reduction curve of lidar, which might be difficult to manage by startups (e.g., Robosense, Hesai) in case they do not achieve profitability within the next two-three years.
• Robotaxis: Baidu Apollo is operating a fleet of 500 robotaxis without any safety driver, like most of their competitors (Weride, Pony, Didi, Auto X…) but using remote-control monitoring. There are concerns about the business model, given today's low taxi fares. On the other hand, a improvement of traffic conditions might become a priority (smart roads) and support the deployment of robotaxis in some areas.
• Robotrucks are also making progress. The convoying solution might be relatively easy to implement and generate profit.
• Imaging radars are geeting cheaper—they're well below $100—but the resolution is still much higher than lidar (0.6° in best case).

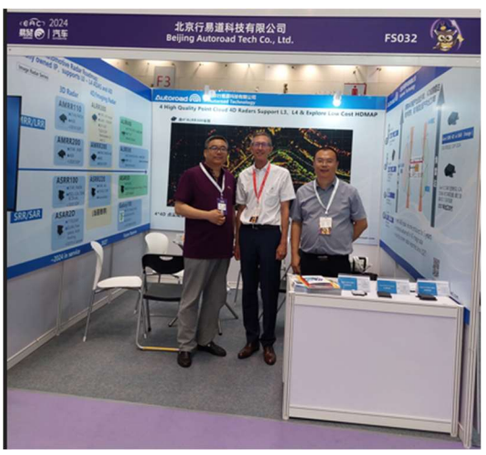
In Pictures: Lidar Tech Expo

Mobileye at the DVN Booth

DVN at the Robosense booth

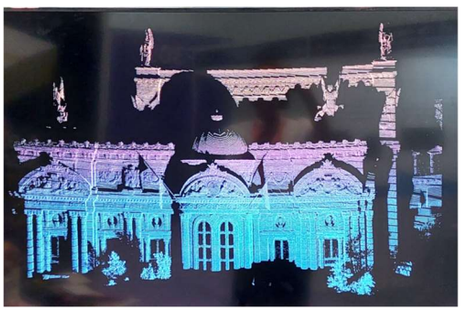


DVN discussing testing with GRG

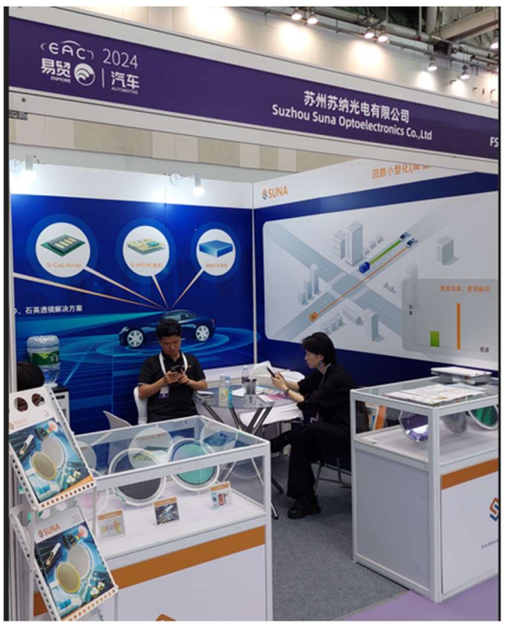


DVN discussing Imaging radars with Autoroad

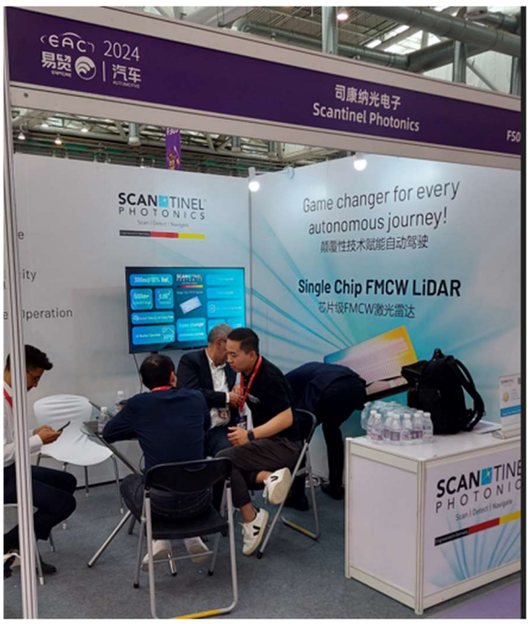
FKA promoting lidar standards online



Lidar picture at the booth from Voyant



Suna Optoelectronics



Scantinel

Lidar integrated in optics by Xing Yu lighting (ALE expo)

DVN-L Visits Robosense in Shenzen

DVN had the pleasure to visit RoboSense's facility in Shenzen, including labs and manufacturing lines. We met with Senior Product Director Sean Wang; Strategic Planning Manager Anna Zhang; Marketing Deputy Director Jasmine Gao, and Overseas Marketing Specialist Gloria He.

The DVN team included DVN-Lidar General Editor and lidar sensor expert Eric Amiot, and ADAS & AD Systems Expert Luc Bourgeois. The main purpose of the visit was to better understand the reasons why vehicular lidar is expanding much faster in China than in Europe. The agenda included discussion about market trends and technology; demo-car presentation, and a factory visit. Here are some of the questions and answers:

Robosense & DVN team in front of the democar

DVN-L: What passenger cars are equipped with lidar today?

Robosense: Today you can find lidar applications on cars with a price above $30,000. Based on the current cost reduction curve, we can expect to see lidar on cars cheaper than $30,000 in the next three years.

DVN-L: What is your expectation for the robotaxi market?

Robosense: 99 per cent of the robotaxis operating in China are still in the testing phase. Some have safety drivers, some have a remote monitoring system in case something happens. The deployment is limited to some big cities, and we do not expect any ramp-up before 2026-27.

DVN-L: Why is lidar so popular in China?

Robosense: There are several reasons adding up to make the lidar more and more popular in China.

• Lidar improves safety. Huawei is one of the OEMs using lidar to improve the AEB function and claims a significant improvement of the max AEB speed with lidar.

• Driver peace of mind: The driver is responsible for L^2 - L^{2+} functions like NOA, the end user also knows the current systems are not 100 per cent reliable (Tesla 'Autopilot' issues are infamous). He needs a robust system and lidar makes the system safer, especially in urban areas.

• Object detection: Lidar is the high-resolution sensor which can measure exactly the dimensions and position of the target, including the moving direction / angle of the target, which is a great help in urban areas and to detect small objects lying on the road.

• SLAM: no HD map is required for the NOA function; this is the new trend. The map is created and memorized for the frequent travel route using lidar (e.g., home-office).

• Price Curve: lidar is getting cheaper and cheaper.

DVN Comments: the driver expects the functional safety level at a similar level for L^{2+} and L^3, the main difference between L^{2+} and L^3 should be the redundancy. This was already the conclusion of the DVN report ***Tesla 'Autopilot', its Implication for the Growth of the Automotive Lidar Market****, published at the end of 2022.*

DVN-L: are there already hands-off applications on the Chinese market for L^{2+}?

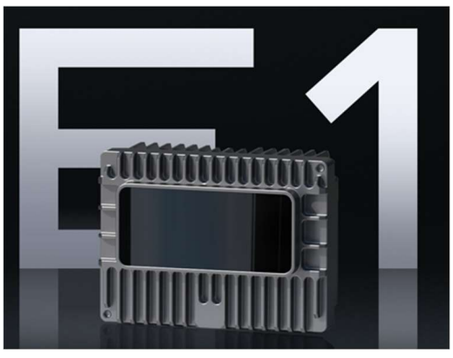
Robosense: In China, hands-off systems are not allowed by the regulation and the driver clearly knows he is fully responsible. This means there is no pure hands-off application, and the driver is warned after a certain time if he doesn't put hands on the steering wheel.

DVN-L: when do you see L^3 applications coming in China?

Robosense: We have developed a new M3 sensor to support future L^3 applications, with a 300-m range and a resolution of 0.05°, anticipating an active deployment from 2027, which means the lidar sensor should be SOP ready in S2-2026.

DVN-L: Do you see BSD applications for lidar coming?

Robosense: We have recently developed a new E1 sensor for BSD applications. This would also support L^3 applications to get a better safety performance in cities for close cutting, and support remote parking / valet parking applications.



DVN-L: What is your competitive position on the market?

Robosense: Robosense is mostly focused on automotive applications, and has already equipped 25 car models with its lidar (>50 per cent of all car models on the market equipped with lidar - announcement at the Beijing Auto Motor Show 2024).

DVN-L: What is the cost reduction curve for lidar applications in China?

Robosense: We have developed a new MX sensor which will be much cheaper - starting early 2025, and the market expects a continuous price reduction over the next three years.

DVN: See DVN special report of the EAC lidar Tech 2024 expo in Suzhou; it is expected some suppliers will reach a $200 price range in 2025 thanks to the high volume effect, and C¥1,000 (USD $138 as of 1 July 2024) was mentioned as a target for the industry in the next three years.

DVN-L: what is your current business model? How big is the Robosense team?

Robosense: Robosense, which was created in 2014, has 1,300 employees currently focused on automotive applications. It sells lidar sensors sending point cloud data.

DVN-L: How many lines do you have in Shenzen?

Robosense: We have four lines in the Shenzen plant for the M1 sensor. The manufacturing process is split in four lines: Scanning Module (MEMs) / Modules Prototypes production / Sensor Assembly / Sensor Calibration & Testing.

DVN comments: We noticed state-of-the-art scanning technology (2D MEMs); high-tech assembly processes to manage the complex architecture of the lidar; high automation levels and systematic quality verification (e.g., CCD cameras) at each station, and state-of-the-art quality organisation and quality tools (QRQC, San Gen Shugi…).

Inside the manufacturing plant

DVN-L: Many thanks to the Robosense team for hosting us at your facility in Shenzen!