



**ADAS and Autonomous Driving Industry
Chain Report, 2018-2019– Automotive Lidar**

Mar. 2019

STUDY GOAL AND OBJECTIVES

This report provides the industry executives with strategically significant competitor information, analysis, insight and projection on the competitive pattern and key companies in the industry, crucial to the development and implementation of effective business, marketing and R&D programs.

REPORT OBJECTIVES

- ◆ To establish a comprehensive, factual, annually updated and cost-effective information base on market size, competition patterns, market segments, goals and strategies of the leading players in the market, reviews and forecasts.
- ◆ To assist potential market entrants in evaluating prospective acquisition and joint venture candidates.
- ◆ To complement the organizations' internal competitor information gathering efforts with strategic analysis, data interpretation and insight.
- ◆ To suggest for concerned investors in line with the current development of this industry as well as the development tendency.
- ◆ To help company to succeed in a competitive market, and

METHODOLOGY

Both primary and secondary research methodologies were used in preparing this study. Initially, a comprehensive and exhaustive search of the literature on this industry was conducted. These sources included related books and journals, trade literature, marketing literature, other product/promotional literature, annual reports, security analyst reports, and other publications. Subsequently, telephone interviews or email correspondence was conducted with marketing executives etc. Other sources included related magazines, academics, and consulting companies.

INFORMATION SOURCES

The primary information sources include Company Reports, and National Bureau of Statistics of China etc.

Abstract

LiDAR Industry Report 2018-2019: Price Slump Conduces to Massive Shipment of LiDAR

In the markets where Chinese companies master core technologies, price of products is bound to plummet. Take IPG for example, its 20W fiber lasers were priced at over RMB150,000 per unit in 2010, compared with current quote at RMB8,800 from the peer -- Shenzhen REEKO Information Technology Co., Ltd.. Maxphotonics Co., Ltd. and Shenzhen JPT Opto-electronics Co., Ltd. are another two rivals in the fiber laser price war.

The similar stories echo in the LiDAR market where price competition pricks up in 2019 as Hu Xiaobo, a founder of Maxphotonics Co., Ltd., ventures into the LiDAR field for a new undertaking.

Wholesale Prices of LeiShen Intelligent System Co., Ltd.'s Multi-channel LiDAR	
32-channel	RMB60,000
16-channel	RMB12,000
8-channel	RMB10,000
4-channel	RMB8,000

Yet, front runners still have a big say in the automotive LiDAR market. Velodyne has shipped 30,000 LiDARs worth a whopping \$500 million since production. The giant will continue to produce more LiDARs for autonomous driving and short-range ones used in ADAS for detecting road conditions, blind spots and obstacles.

Velodyne's new factory in San Jose which already becomes operational, can produce as many as 1 million units a year. If acquiring orders for 100,000 units, Velodyne will cut down the price of its VLS 128-channel products to less than \$1,000, and that of VLS 32 to roughly \$650, let alone \$500 for mass-produced 32-channel Velarry solid-state LiDAR and \$150 for 8-channel ones.

It is clear that LiDAR price may be 10 times lower than what it is now, and the reduction hinges on how many are demanded. Start-ups are rushing to deploy automotive LiDAR. Also, leading Tier-1 suppliers like Bosch, Continental, Aptiv, Valeo and Veoneer, are vying with each other in LiDAR research and development, and prepare to launch products in the next two years.

In Valeo's case, as an early multi-channel LiDAR bulk supplier of OEMs, its product lines from the first generation to the second to the third, reflect the development trend of LiDAR.

VALEO LIDAR ScaLa



	SCALA 1	SCALA 2
SOP	2017	2021
Technology / v Layers	Rotating Mirror (vertical 4 layers)	Rotating Mirror (vertical 16 layers)
Wavelength	905nm	905nm
Detection Range (vehicles)	Ca. 150m	Ca. 150m (improved vs. ScaLa1)
FoV / Resolution (horizontal)	145° / 0.25° (horizontal 580 points)	133° / 0.25° (±15°/0.125°) (horizontal 652 points)
FoV / Resolution (vertical)	3.2° / 0.8°	10° / 0.6°
Update Rate	25 fps	25 fps
Points per Second	43, 500 (x3 Echo)	260,800 (x3 Echo)
Interface	FlexRay	BroadR-Reach Ethernet
Package Size	106x100x60mm	107x94x65mm



**VALEO
AWARDED
SOP 2017**

SCALA GENERATION 1

ROTATING MIRROR



**VALEO
AWARDED
SOP 2019**

SCALA GENERATION 2

ROTATING MIRROR
ENLARGED
FIELD OF VIEW



**VALEO
AWARDED
PRE-DEVELOPMENT
CONTRACT**

SCALA GENERATION 3

SOLID-STATE

Valeo plans to roll out its second-generation LiDAR in 2019, a product offering three times wider vertical field of view. Valeo's upcoming SCALA Cocoon system combining five SCALA LiDARs, provides a 360-degree view of the vehicle's surroundings. Its third-generation SCALA being developed is a MEMS-based solid-state LiDAR.

Comparing with the previous year, Chinese LiDAR vendors have come a long way in factory construction, mass production, shipment, financing and other aspects.

In 2018, Hesai Tech announced to close Series B funding rounds of RMB250 million, with its automotive LiDAR sales only second to Velodyne's.

RoboSense raised RMB300 million from investors like Cainiao, SAIC and BAIC. Its shipments of 16/32-channel mechanical LiDARs boomed in 2018. The vendor also acquired a MEMS micromirror firm in the year.

Although the automotive market is "wintering", the financing story in LiDAR industry still goes on.

In October 2018, Innovusion announced it raised about \$30 million in Series A funding, led by NIO Capital and Eight Roads Ventures in China, and F-Prime Capital in the US.

In October 2018, Aeva announced a \$45 million Series A funding round.

On October 29, 2018, Quanergy announced to close its Series C funding rounds of tens of millions of dollars.

In November 2018, AEye announced \$40 million in Series B funding, led by Taiwan Capital with participation of Intel Capital, etc.

In early 2019, Benewake closed the Series B2 funding round, co-invested by Delta Capital, Keywise Capital and Cathay Capital. The firm also claimed shipments of hundreds of thousands of solid-state LiDARs.

In January 2019, Baraja announced to raise \$32 million in a series A round of funding led by Sequoia China and Main Sequence Ventures' CSIRO Innovation Fund, with participation of Blackbird Ventures.

In March 2019, Innoviz raised over \$100 million.

2018 Summary of Chinese LiDAR Vendors and Outlook

Company	Performance in 2018	Outlook
LeiShen Intelligent System Co., Ltd.	The introduction of semiconductors and chips as modules is a way to cut the cost of mechanical LiDAR, when the firm upgrades its automatic calibration line to lift output. LeiShen has mass-produced its 1550nm fiber lasers, and is striving to apply its 128-channel LiDAR to automobiles.	The optical phased array (OPA) type has a rosy prospect in the long run; though MEMS LiDAR has grown mature so far, there is no technology excellent enough. LeiShen intends to design automotive LiDAR on the basis of its successfully developed 1550nm fiber laser and its superiority in MEMS.
Hangzhou GeniusPros Technologies Co., Ltd.	GeniusPros has taken up research on image sensor-based semiconductor process and development of solid-state LiDAR since the year before last. Its focus in 2018 was still on semiconductor. Under the leadership of Xue Bo, an image sensor forerunner, a chip design team has been built, and chips will soon undergo tape-out.	GeniusPros, a typical flash LiDAR vendor, just devotes itself to developing flash LiDAR on the aspects of chip and system instead of engagement in other technology roadmaps. Together with its sister companies, it will provide quality solutions for Tier-1 suppliers and OEMs.
Hesai Tech	The self-driving delivery vehicles of Nuro, a Silicon Valley-based autonomous driving startup, pack Hesai's LiDAR. In 2019 more foreign autonomous vehicle fleets will use a lot of LiDARs from Hesai whose automotive LiDAR sales was only behind Velodyne's.	In current stage, mechanical LiDAR is the best option since it has prevailed over the years. Hesai, however, has its eye on MEMS LiDAR as application of MEMS micromirror in projection field helps the technology mature. Yet perhaps flash LiDAR capable of long-range detection will have a brighter future in the forthcoming years (in a decade) along with the rapid development of single photon area array detection technology.
Benewake (Beijing) Co., Ltd.	In 2018, Benewake's overseas sales made up 50% of the total. Monthly output of TF03 LiDAR the firm rolled out in November 2018, has reached tens of thousands of units.	
RoboSense	RoboSense released its 905nm MEMS LiDAR at CES 2018; in May 2018, RoboSense and Cainiao, Alibaba's logistics network operator, together unveiled G Plus, a solid-state LiDAR unmanned logistics vehicle; at CES 2019, RoboSense launched a MEMS LiDAR. The vendor's shipments of 16/32-channel mechanical LiDARs shot up in 2018, the largest volume among its domestic peers.	RoboSense acquired a MEMS micromirror firm so as to improve its automotive MEMS LiDAR technology, considering that autonomous vehicles need exceedingly reliable radars.

Source: 25th MEM Seminar

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ADAS and Autonomous Driving Industry Chain Report, 2018-2019 of ResearchInChina covers following 17 reports:

- 1) **Global Autonomous Driving Simulation and Virtual Test Industry Chain Report, 2018-2019**
- 2) **China Car Timeshare Rental and Autonomous Driving Report, 2018-2019**
- 3) **Report on Emerging Automakers in China, 2018-2019**
- 4) **Global and China HD Map Industry Report, 2018-2019**
- 5) **Global and China Automotive Domain Control Unit (DCU) Industry Report, 2018-2019**
- 6) **Global and China Automated Parking and Autonomous Parking Industry Report, 2018-2019**
- 7) **Cooperative Vehicle Infrastructure System (CVIS) and Vehicle to Everything (V2X) Industry Report, 2018-2019**
- 8) **Autonomous Driving High-precision Positioning Industry Report, 2018-2019**
- 9) **ADAS and Autonomous Driving Industry Chain Report, 2018-2019– Processor**
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- 11) **ADAS and Autonomous Driving Industry Chain Report, 2018-2019– Automotive Radar**
- 12) **ADAS and Autonomous Driving Industry Chain Report, 2018-2019– Automotive Vision**
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- 16) **ADAS and Autonomous Driving Industry Chain Report, 2018-2019– Low-speed Autonomous Vehicle**
- 17) **ADAS and Autonomous Driving Industry Chain Report, 2018-2019– L4 Autonomous Driving**

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