

# **AIXTRON** Investor Presentation

5G  
Networks

Energy  
Storage

Renewable  
Energy

**AIXTRON  
ENABLES  
INNOVATION**

Autonomous  
Driving

Internet  
of Things

NextGen  
Displays

IR Presentation – Q1/2019

*(FSE: AIXA, ISIN DE000A0WMPJ6)*

## Forward-Looking Statements

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This document may contain forward-looking statements regarding the business, results of operations, financial condition and earnings outlook of AIXTRON. These statements may be identified by words such as “may”, “will”, “expect”, “anticipate”, “contemplate”, “intend”, “plan”, “believe”, “continue” and “estimate” and variations of such words or similar expressions. These forward-looking statements are based on the current assessments, expectations and assumptions of the executive board of AIXTRON, of which many are beyond control of AIXTRON, based on information available at the date hereof and subject to risks and uncertainties. You should not place undue reliance on these forward-looking statements. Should these risks or uncertainties materialize, or should underlying expectations not occur or assumptions prove incorrect, actual results, performance or achievements of AIXTRON may materially vary from those described explicitly or implicitly in the relevant forward-looking statement. This could result from a variety of factors, such as those discussed by AIXTRON in public reports and statements, including but not limited to those reported in the chapter “Risk Report”. AIXTRON undertakes no obligation to revise or update any forward-looking statements as a result of new information, future events or otherwise, unless expressly required to do so by law. This document is an English language translation of a document in German language. In case of discrepancies, the German language document shall prevail and shall be the valid version.

Due to rounding, numbers presented throughout this report may not add up precisely to the totals indicated and percentages may not precisely reflect the absolute figures for the same reason.

Our registered trademarks: AIXACT<sup>®</sup>, AIXTRON<sup>®</sup>, APEVA<sup>®</sup>; Atomic Level SolutionS<sup>®</sup>, Close Coupled Showerhead<sup>®</sup>, CRIUS<sup>®</sup>, EXP<sup>®</sup>, EPISON<sup>®</sup>, Gas Foil Rotation<sup>®</sup>, Optacap<sup>™</sup>, OVPD<sup>®</sup>, Planetary Reactor<sup>®</sup>, PVPD<sup>®</sup>, STExS<sup>®</sup>, TriJet<sup>®</sup>

# Our Vision

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## Technology. Materials. Performance.

### Technology.

We are the **recognized technology leader** in complex material deposition.

### Materials.

We **enable our customers** to successfully shape the markets of the future, exploiting the potential offered by **new materials**.

### Performance.

We **deliver the performance** driving **economic success** through our expertise, our employees and the quality of our products.



## Who we are

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- Headquarters based near Aachen, Germany
- Worldwide presence in 7 countries
- R&D and production facilities in Germany and UK
- ~ 700 employees
- Company founded in 1983, >35 years of experience
- Technology leader in deposition systems
- Around 3,500 deposition systems sold worldwide

# Global Presence



# Technology Portfolio for Complex Material Deposition

OLED: OVPD®/PVPD®



Our technology. Your future.

Carbon – PECVD

NANO: Innovation Pool

LEDs / Optoelectronics



### Lasers (VCSEL/EEL)

(e.g. 3D Sensing; Consumer Electronics; Telecom/Datacom)



### GaN Power | GaN RF

(e.g. Wireless Charging; 5G, Fast Charging, Power Supply)



### Specialty LEDs

(e.g. Fine Pitch-, MiniLED-, MicroLED-Displays; Horticulture; Purification)



### SiC Power

(e.g. Electric Vehicles, Charging Stations, Infrastructure)

Power Management

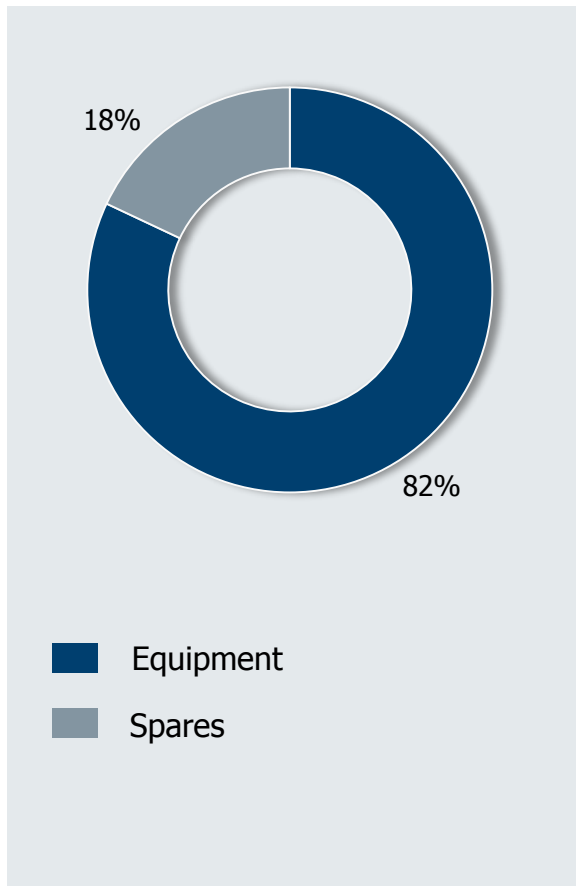
MOCVD Core Technology



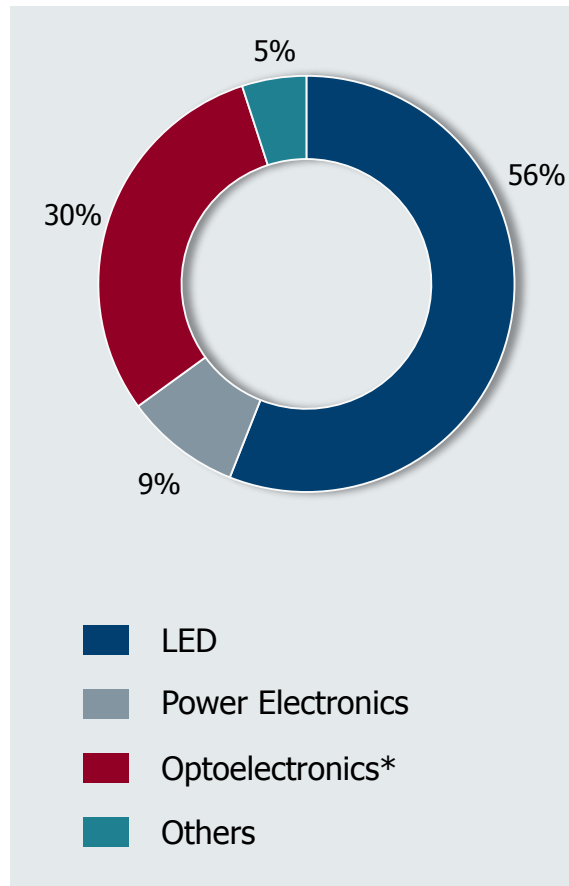
# Revenue Analysis\*

\* Rounded figures; may not add up

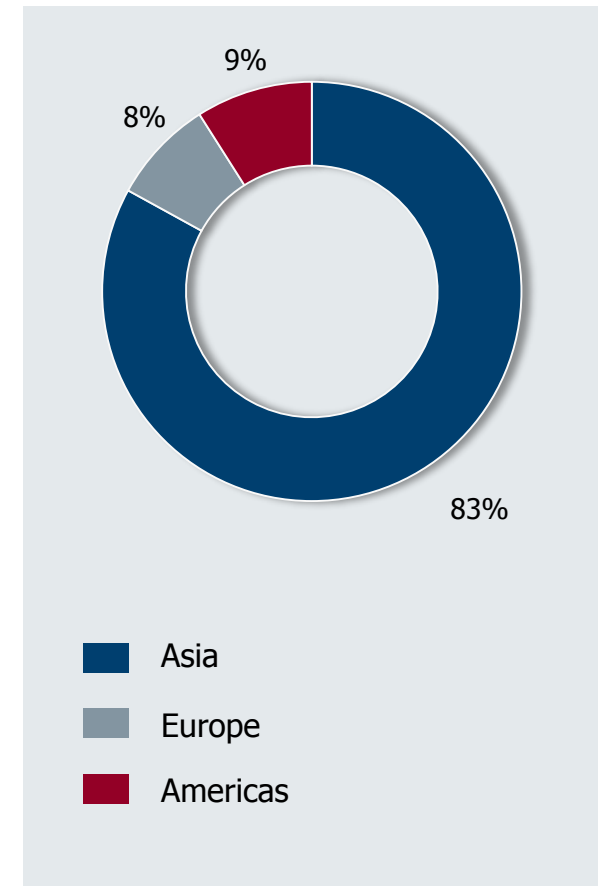
Q1/2019:  
by equipment & spares



Q1/2019:  
by end application  
(equipment only)



Q1/2019:  
by region

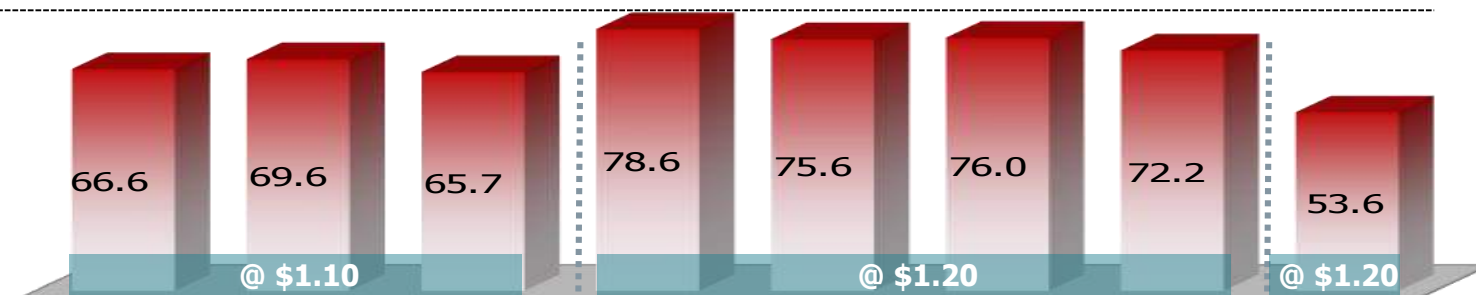


\* Optoelectronics includes applications in Consumer Optoelectronics, Telecom/Datacom and Solar

## 24 - Month Business Development

(€ million)

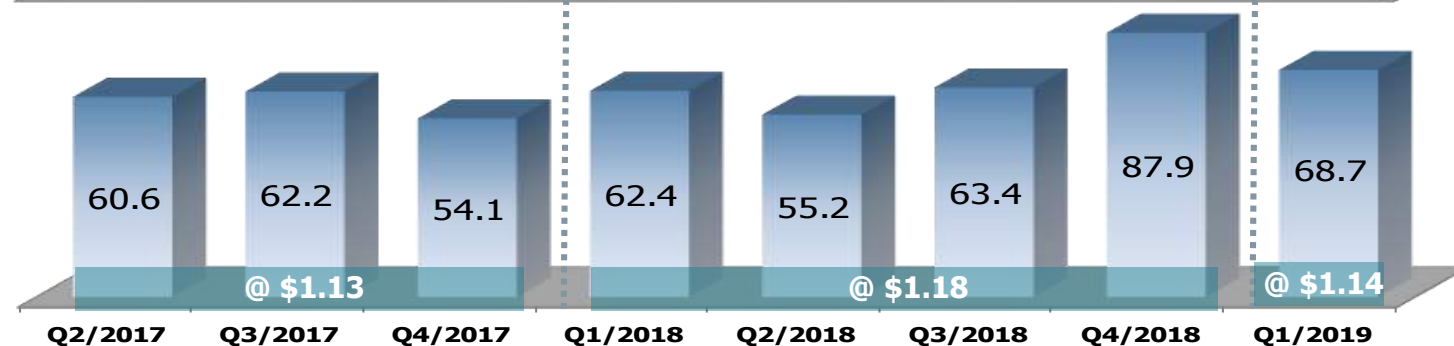
**Order Intake**  
(incl. equipment,  
service, spare parts)



**Order Backlog**  
(equipment only)



**Revenues**  
(incl. equipment,  
service, spare parts)



USD order intake and backlog were recorded at the prevailing budget rate (2017: \$1.10/€; 2018: \$1.20/€; 2019: \$1.20/€)

USD revenues were converted at the actual period average FX rate (2017: \$1.13/€; 2018: \$1.18/€; 2019: \$1.14/€)



# Consolidated Income Statement\*

\* Rounded figures; may not add up

(€ million)	Q1/19	Q1/18	+/- %	Q1/19	Q4/18	+/- %
<b>Revenues</b>	<b>68.7</b>	<b>62.4</b>	<b>10</b>	<b>68.7</b>	<b>87.9</b>	<b>-22</b>
Cost of sales	42.0	35.6	18	42.0	48.5	-13
<b>Gross profit</b>	<b>26.7</b>	<b>26.8</b>	<b>-</b>	<b>26.7</b>	<b>39.4</b>	<b>-32</b>
%	39	43	-4pp	39	45	-6pp
Selling expenses	2.3	2.3	-	2.3	2.7	-15
General & admin expenses	3.8	4.3	-12	3.8	5.0	-24
R&D	12.8	13.7	-7	12.8	12.2	5
Net other operating income	-1.9	-1.4	36	-1.9	-1.3	46
<b>EBIT</b>	<b>9.7</b>	<b>7.9</b>	<b>23</b>	<b>9.7</b>	<b>20.8</b>	<b>-53</b>
%	14	13	1pp	12	24	-12pp
<b>Net result</b>	<b>8.5</b>	<b>12.3</b>	<b>-31</b>	<b>8.5</b>	<b>18.2</b>	<b>-53</b>
%	12	20	-8pp	12	21	-9pp

# Balance Sheet\*

\* Rounded figures; may not add up

(€ million)	31/03/19	31/12/18	31/03/18
Property, plant & equipment	66.3	63.1	63.8
Goodwill	72.2	71.6	71.1
Other intangible assets	2.4	2.1	1.6
Others	13.5	13.3	9.1
<b>Non-current assets</b>	<b>154.4</b>	<b>150.1</b>	<b>145.7</b>
Inventories	80.2	73.5	46.2
Trade receivables	34.8	40.1	30.0
Others	15.5	11.5	7.5
Cash & Cash Deposits	247.9	263.7	223.2
<b>Current Assets</b>	<b>378.4</b>	<b>388.8</b>	<b>306.9</b>
<b>Equity</b>	<b>441.2</b>	<b>429.7</b>	<b>380.7</b>
<b>Non-current liabilities</b>	<b>4.9</b>	<b>1.8</b>	<b>1.5</b>
Trade payables	15.5	27.8	14.3
Contract liabilities for advance payments	45.2	53.3	28.5
Others	25.8	26.3	27.5
<b>Current liabilities</b>	<b>86.6</b>	<b>107.4</b>	<b>70.3</b>
<b>Balance Sheet total</b>	<b>532.7</b>	<b>538.9</b>	<b>452.6</b>

# Consolidated Statement of Cash Flows\*

\* Rounded figures; may not add up

(€ million)	Q1/19	Q1/18	Q1/19	Q4/18
<b>Net Result</b>	<b>8.5</b>	<b>12.3</b>	<b>8.5</b>	<b>18.2</b>
Adjust for				
Non Cash Items	2.4	-3.0	2.4	1.8
Changes in Working Capital	-22.8	-30.4	-22.8	-12.4
<b>Cash Flow from Operating Activities</b>	<b>-11.9</b>	<b>-21.1</b>	<b>-11.9</b>	<b>7.6</b>
<b>Capital Expenditures/Disposals</b>	<b>-5.6</b>	<b>-1.2</b>	<b>-5.6</b>	<b>-1.8</b>
<b>Free Cash Flow</b>	<b>-17.5</b>	<b>-22.3</b>	<b>-17.5</b>	<b>5.8</b>
<b>Cash Flow from Financing</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>10.4**</b>
<b>FX Effects</b>	<b>1.7</b>	<b>-1.0</b>	<b>1.7</b>	<b>2.2</b>
<b>Cash &amp; Deposits</b>	<b>247.9</b>	<b>223.2</b>	<b>247.9</b>	<b>263.7</b>

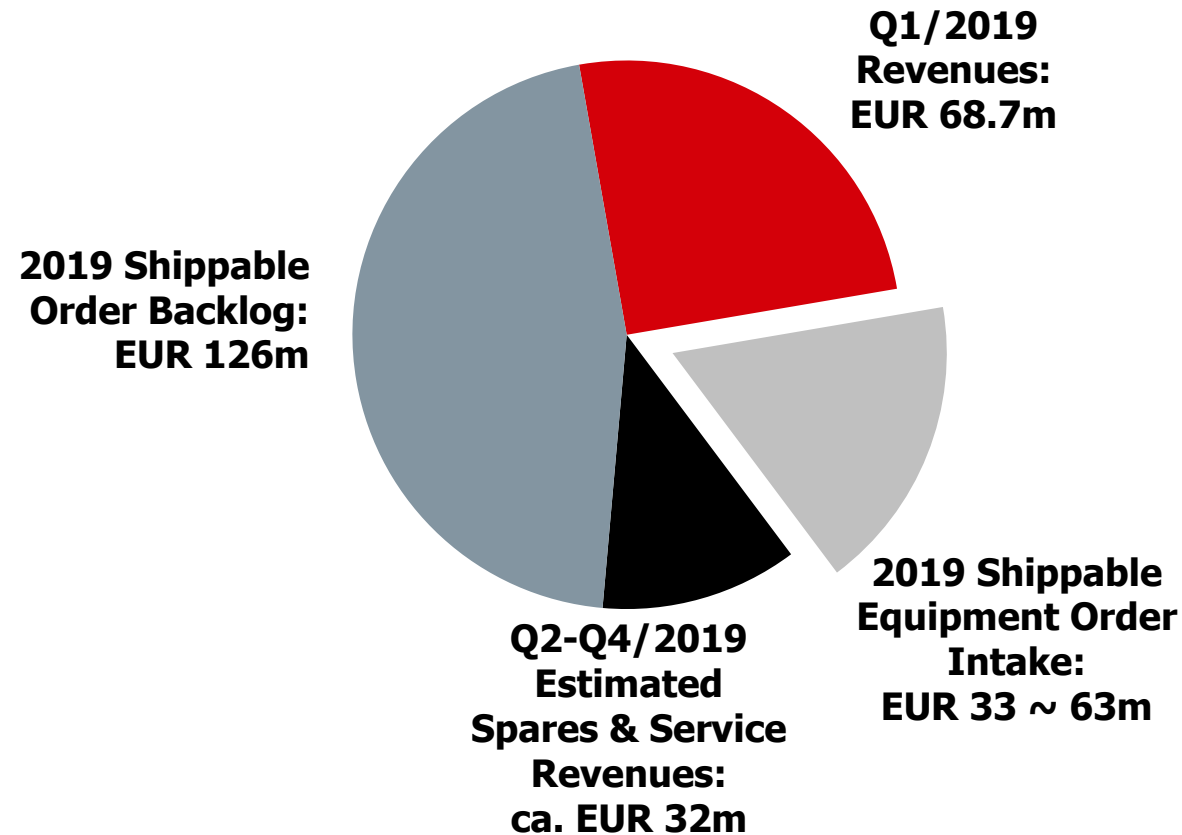
\*\* €10.4m shares issued in APEVA

# AIXTRON – 2019 Guidance\*: Confirmed

**2019 Guidance\* confirmed** taking Q1 Results, the current order situation and customer reticence into account:

- Total Order Intake between EUR 220 ~ 260 million
- Revenues between EUR 260 ~ 290 million
- Gross Margin of 35% to 40%
- EBIT between 8% and 13% of Revenues
- Free Cash Flow between EUR 15 ~ 25 million

## 2019 Guidance\*



• At 1.20 USD/EUR Budget Rate for the remainder of the year; please refer to "Expected Results of Operations and Financial Position" in the AIXTRON 2018 Annual Report for further information



# Market Prospects

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## Short- to Mid-Term

- Increasing adoption of compound semiconductor-based lasers for 3D sensor systems in mobile devices as well as sensors for infrastructure applications.
- Further increasing demand for lasers for ultra-fast optical data transmission of large volumes, such as for video streaming and Internet-of-Things (IoT) applications.
- Increasing use of LEDs and specialty LEDs (esp. red-orange-yellow, UV or IR) in displays and other applications.
- Increasing use of wide-band gap GaN- or SiC-based components for energy-efficient communication and power management in autos, consumer electronics and mobile devices.
- Progress in the development of OLED displays that require an efficient deposition technology.

## Long-Term

- Development of new applications based on wide-band gap materials such as high-frequency chips or system-on-chip architectures with integrated power management.
- Increased use of compound semiconductor-based sensors for autonomous driving.
- Increased development activities for high performance solar cells made of compound semi-conductors.
- Development of new materials with the help of carbon nanostructures (carbon nanotubes, -wires and graphene).
- Development of alternative LED applications, such as visual-light communication technology or micro LED displays.



Our *technology*. YOUR FUTURE.

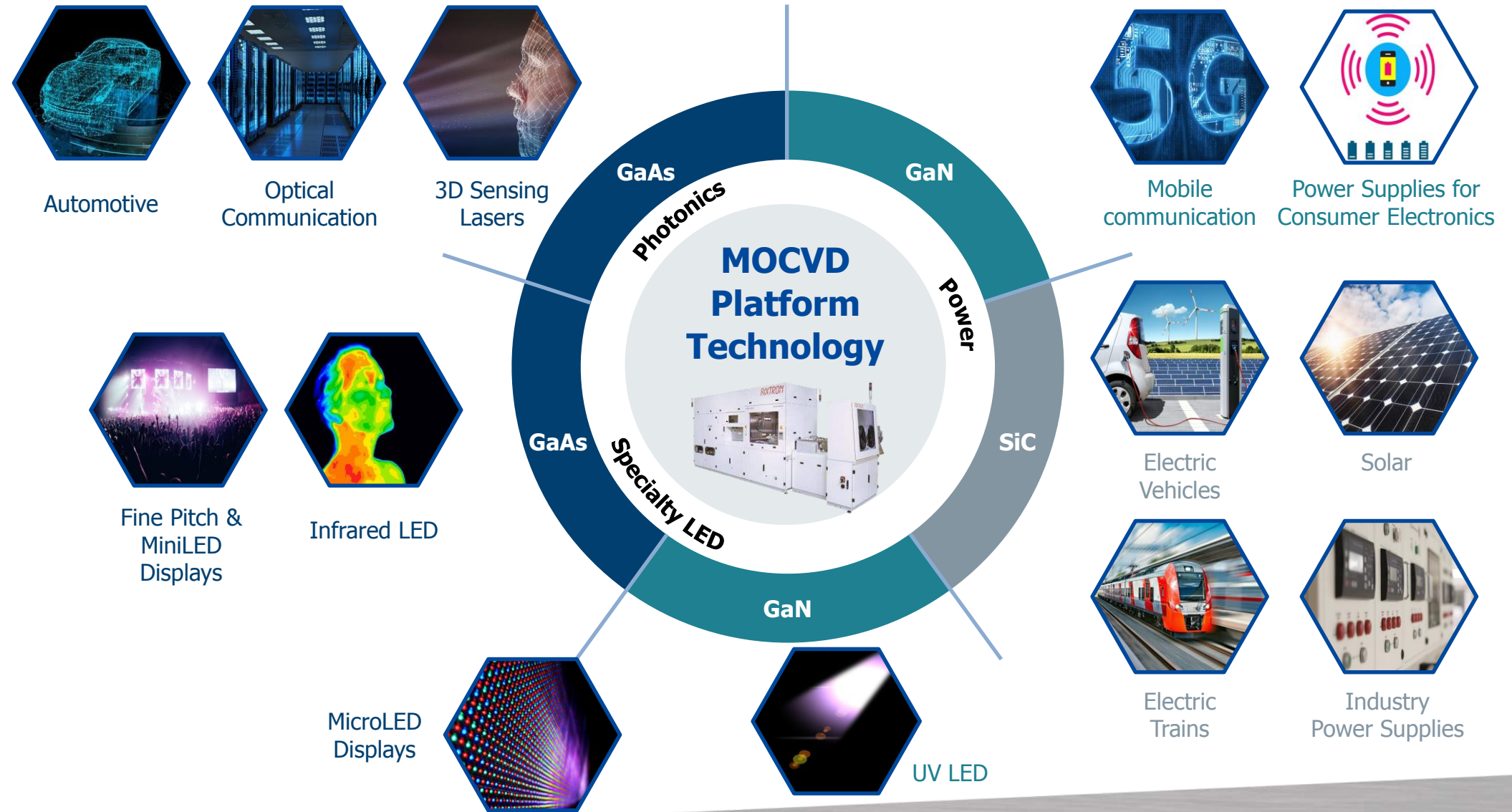
## AIXTRON MOCVD – Planetary Reactor<sup>®</sup>: Tool-of-Record

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- ✓ Individual Wafer Rotation = Best Material Uniformity
- ✓ Individual wafer temperature adjustment = Wafer Level Control/Optimization
- ✓ Highest Epi / Product Yield = Lowest Production Cost



# AIXTRON – Enabling Emerging Global Mega Trends

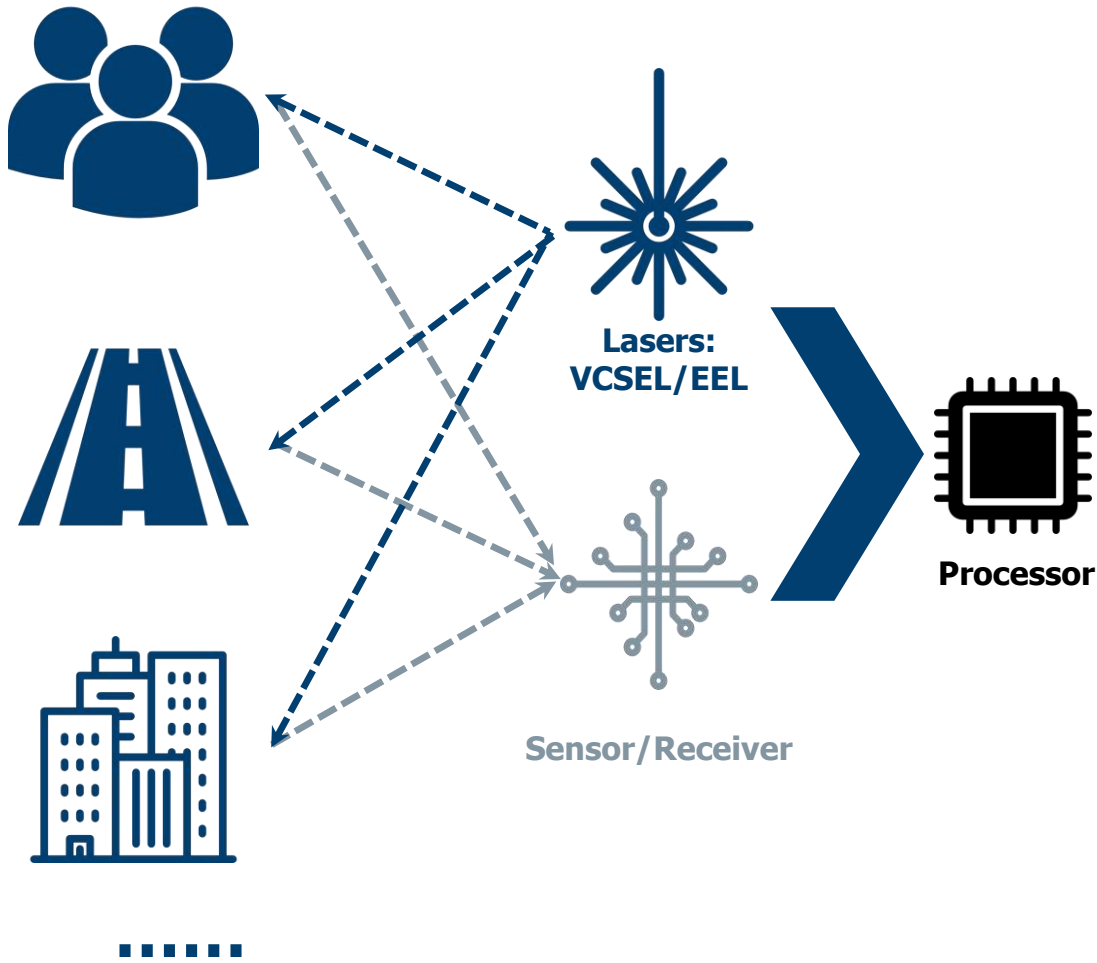




# Devices: VCSEL/EEL – Internet of Things Creates New Opportunities

Source: icons from www.flaticon.com

## 3D Sensing Functionality



Facial Recognition



Autonomous Driving



Tailor-made clothing/shoes



Interior Design



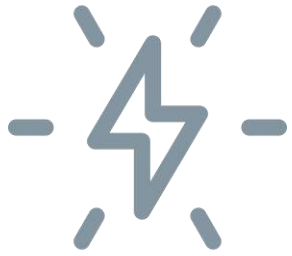
Mapping



Industry 4.0

# Devices: GaN/SiC Power Electronics – Superior Performance

Source: icons from www.flaticon.com



More Efficient

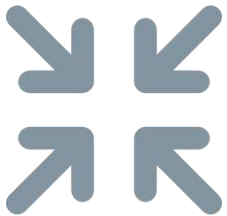


**Energy Saving**

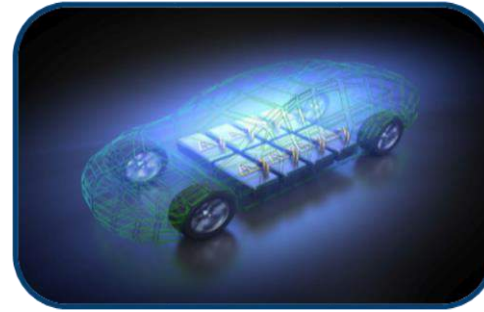
**Less Heat**

**Light Weight**

**Lower System Cost**



Smaller



Electric Vehicles



EV-charging



Data Centers



Renewable Energy



Wireless Charging

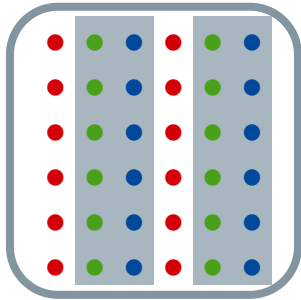


Fast Charging

# Devices: ROY LEDs for RGB\* Displays; UV LEDs for Niche Markets

Source: LEDinside, Yole Développement

## RGB\* LED DISPLAYS



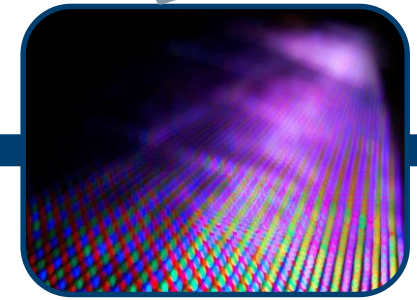
**Stadium Outdoor Display**  
 (Pixel Pitch  $\geq 10\text{mm}$ )  
 (Chip size:  $\geq 200\mu\text{m}$ )



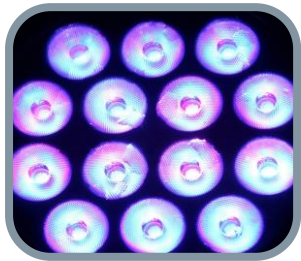
**Fine Pitch Indoor Display**  
 (Pixel Pitch  $\leq 2.5\text{mm}$ )  
 (Chip size:  $\geq 200\mu\text{m}$ )



**MiniLED for Consumer Electronics**  
 (Chip size:  $\leq 200\mu\text{m}$ )



**MicroLED for Consumer Electronics**  
 (Chip size:  $\leq 50\mu\text{m}$ )



**UV LED**



**Curing**



**Water Disinfection**



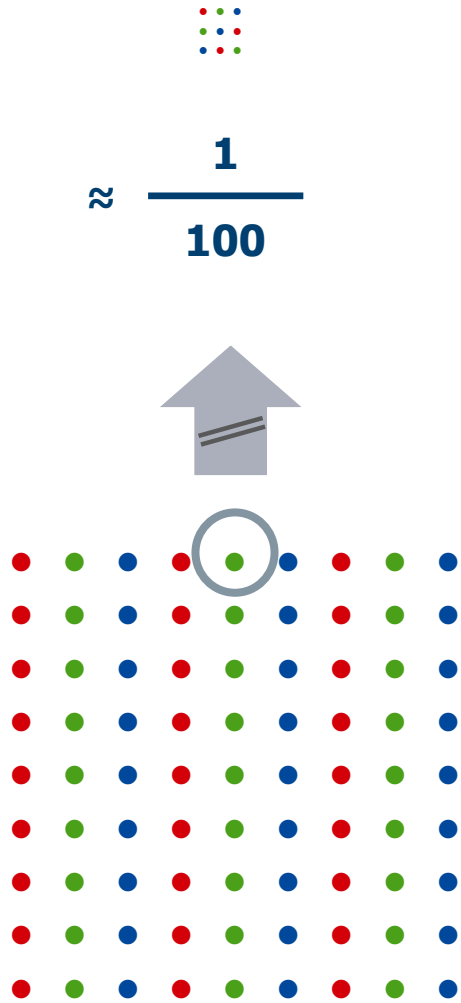
**Air Purifier**

\*RGB = Red, Green & Blue



# Devices: MiniLED & MicroLED – The Perfect Future Display Technology

RGB\*  
MicroLED  
Display



RGB\*  
LED  
Display

Self-Emissive

Low Power  
Consumption

Perfect  
Contrast

High  
Brightness

Fast  
Response

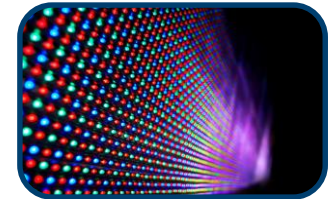
Source: LEDinside



Wearables



AR/VR



Signage

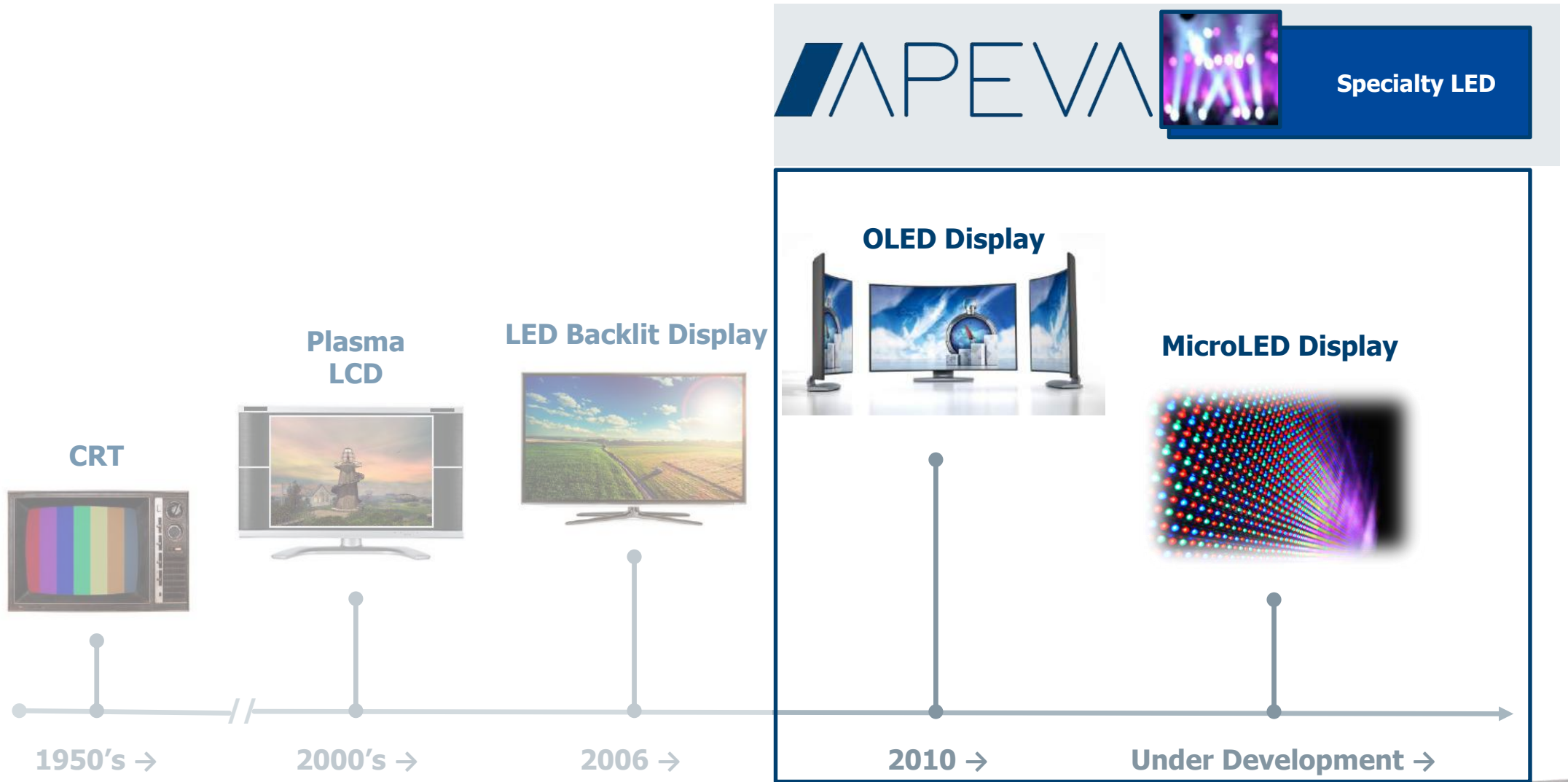


Smartphones/Tablets/TVs

\*RGB = Red, Green & Blue

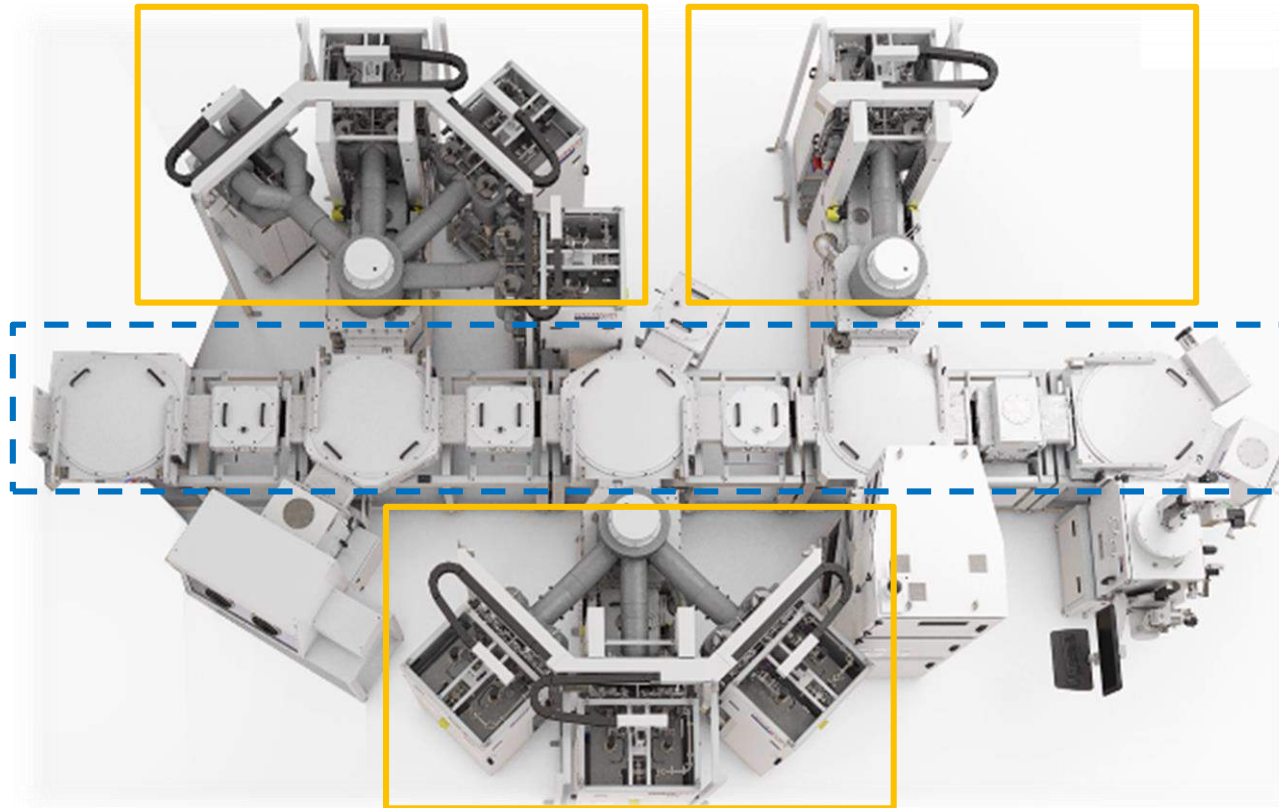


# AIXTRON – Instrumental in Evolving Display Technologies



# APEVA: Complete OLED Deposition System Provider

## OVPD Deposition Line\*



 OVPD Deposition



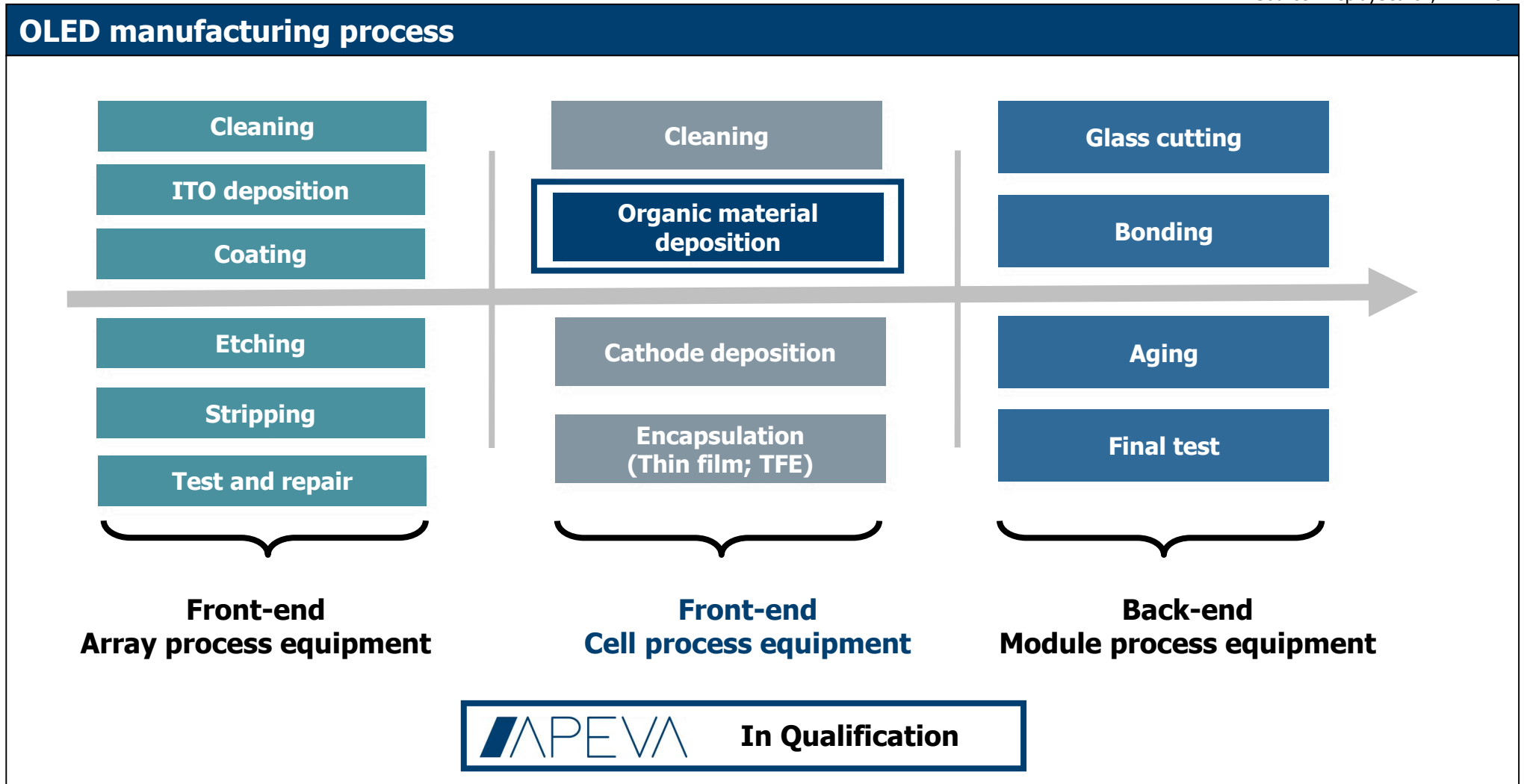
 Automation & Handling 

- Fully Automated OLED Deposition Lines and Fab Integration as a Complete System Provider
- Innovative Deposition Technology with
  - Higher Efficiency of OLED Material Deposition
  - Mixing and Doping of Materials via Multiple Material Deposition in One Chamber
  - Maintaining the Delicate Organic Material Properties improving Lifetime

\* Pictures shown are for illustration purpose only

# Organic Electronics – OVPD<sup>®</sup> – APEVA

Source: DisplaySearch, AIXTRON



# Carbon Nanomaterials – PECVD

## Graphene and Carbon Nanotube Deposition Systems

- Proprietary thermal and plasma enhanced chemical vapor deposition technology
- Excellent uniformity and reproducibility with fast turnaround cycle times
- BM platform: BM R&D (2-inch), BM Pro (4-inch and 6-inch), BM GB (4-inch glovebox), BM HT (high temperature, 1,700C), BM300T (300mm)
- Graphene and carbon nanotube films for electronics, energy storage, thermal management, sensors and flexible/transparent applications

### Product features

- Fast response heater and turnaround
  - Thermal CVD
  - Substrate and top heating
- 
- Closed loop infrared wafer temperature control
  - Plasma enhanced CVD with frequency control
  - Flexible processing for different applications
- 
- Low cost of ownership
  - Easy maintenance and cleaning
  - User management features and growth library



Graphene (2D) and Carbon nanotube (1D)  
 Unique combination of high electrical/thermal conductivity, mobility, flexibility and transparency








Serving R&D market today  
 AIXTRON BM Pro



Production ready for tomorrow  
 AIXTRON BM Pro 300



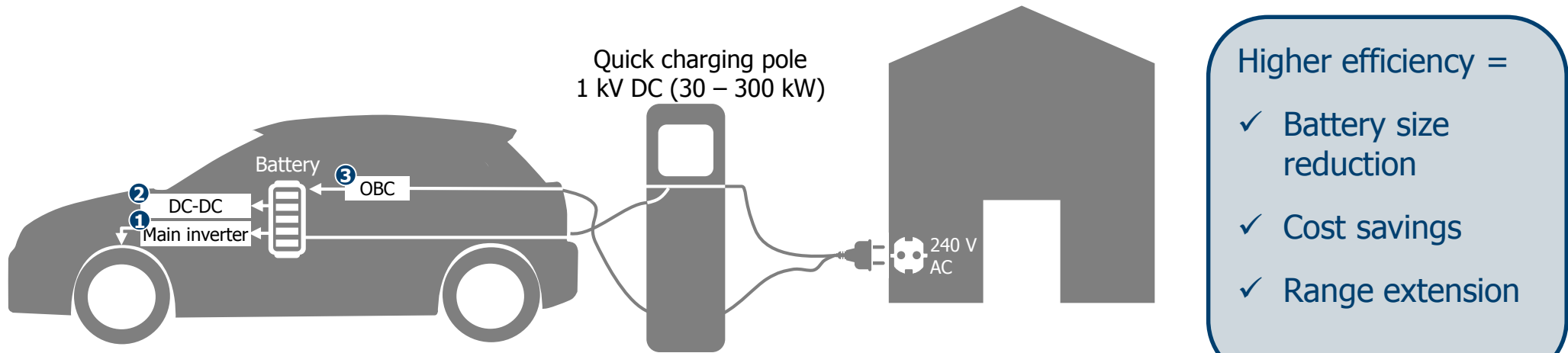
# Overview: GaN/SiC as Wide Band Gap (WBG) Power Electronics

Consumer Electronics & IT		Automotive	Energy	Industrial
Power Management		Power Switching		
30V	600V	1.2 kV	≥2kV	
<ul style="list-style-type: none"> <li>• Electronic appliances</li> <li>• Computing</li> <li>• Wireless charging</li> <li>• Power supplies</li> <li>• PFC</li> </ul> 	<ul style="list-style-type: none"> <li>• Infotainment</li> <li>• GPS</li> <li>• Connected car</li> <li>• Autonomous driving</li> <li>• EMI/EMC</li> <li>• Adaptive cruise control</li> </ul> 	<ul style="list-style-type: none"> <li>• General automotive electronic</li> <li>• HEV/EV</li> <li>• Charging station</li> <li>• Inverter / motor drives</li> <li>• Converter</li> <li>• Radar test applications</li> </ul> 	<ul style="list-style-type: none"> <li>• Power Grid / Smart meter / appliances</li> <li>• Solar / Wind inverters</li> <li>• Solar / Wind power DC distribution</li> <li>• storage</li> <li>• UPS</li> </ul> 	<ul style="list-style-type: none"> <li>• UPS</li> <li>• Industrial machines</li> <li>• Building</li> <li>• Mining, oil, gas power generation</li> <li>• Shipping/Rail</li> </ul> 
GaN		GaN / SiC		SiC

Low to Medium Voltages

Medium to High Voltages

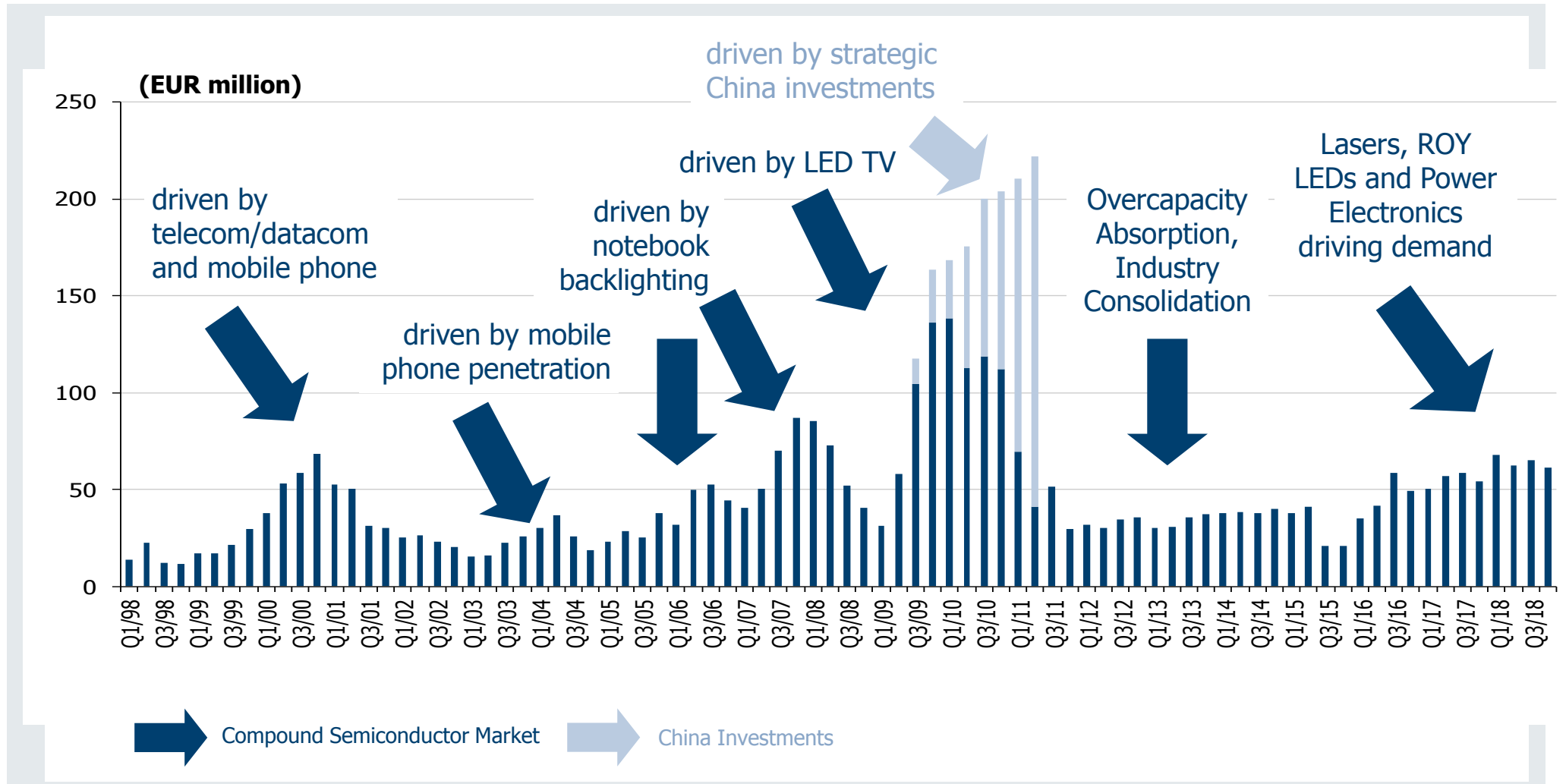
# SiC in Automotive : Main Inverter as the Major Market Opportunity



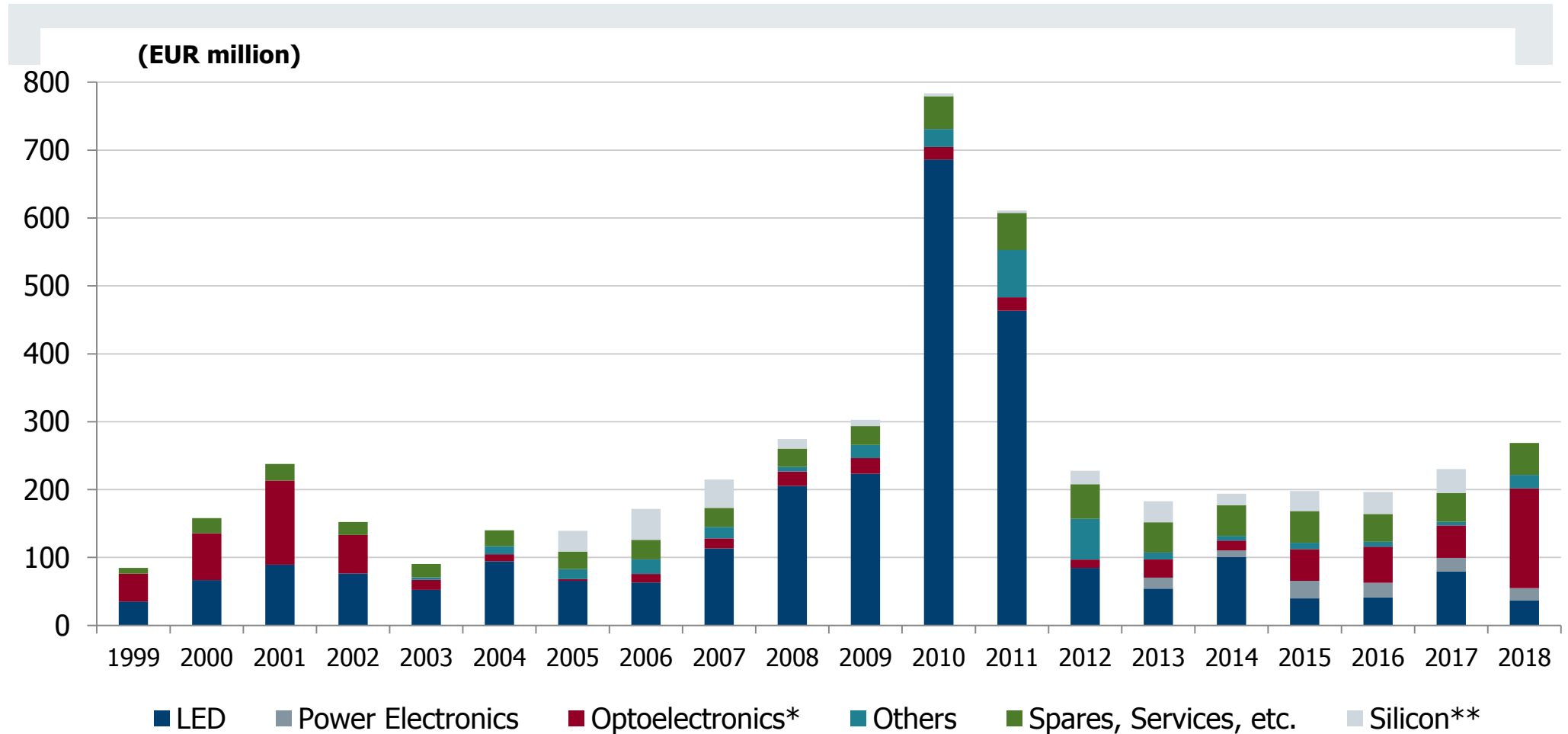
Component	Power (kW)	Fraction 6" wafer*	Comment
<b>Main inverter</b>	20 ~ 150	0.1 ~ 0.5	Brings energy from battery to the electric motor
<b>DC-DC Converter</b>	1 ~ 3	<0.01	Brings energy from battery for car electronics
<b>On Board Charger (OBC)</b>	5 ~ 30	0.01	Brings 240 V AC energy from wall plug to battery
<b>(Quick) Charging Pole</b>	30 ~ 300	0.1 ~ 1	Brings 1–3 kV DC energy directly from grid to battery

\* Back-of-the-envelope order-of-magnitude estimates

# Equipment Order Intake per Quarter



# Annual Total Revenues by Application (including spares)



\* Optoelectronics includes applications in Consumer Optoelectronics, Telecom/Datacom and Solar


\*\* Silicon: ALD/CVD product line sold in 2017



Our *technology*. YOUR FUTURE.



# AIXTRON Competitive Landscape

		USA	Europe	China	Korea	Japan
Opto	GaAs/InP Optoelectronics, ROY LED					
	GaN LED			 		
Power	GaN Power					
	SiC Power					 
OLED					    	 

# Consolidated Income Statement\*

\* Rounded figures; may not add up

(€ million)	2018	2017	2016
<b>Revenues</b>	<b>268.8</b>	<b>230.4</b>	<b>196.5</b>
Cost of sales	151.2	156.4	140.2
<b>Gross profit</b>	<b>117.6</b>	<b>74.0</b>	<b>56.3</b>
%	44%	32%	29%
Selling expenses	9.4	10.2	13.8
General & admin expenses	18.4	17.1	17.1
R&D	52.2	68.8	53.9
Net other operating income	3.8	27.0	7.2
<b>EBIT</b>	<b>41.5</b>	<b>4.9</b>	<b>-21.4</b>
%	15%	2%	-11%
<b>Net result</b>	<b>45.9</b>	<b>6.5</b>	<b>-24.0</b>
%	17%	3%	-12%

# Balance Sheet\*

\* Rounded figures; may not add up

(€ million)	31/12/18	31/12/17	31/12/16
Property, plant & equipment	63.1	64.3	74.2
Goodwill	71.6	71.2	74.6
Other intangible assets	2.1	1.8	5.4
Others	13.3	4.0	2.4
<b>Non-current assets</b>	<b>150.1</b>	<b>141.3</b>	<b>156.5</b>
Inventories	73.5	43.0	54.2
Trade receivables	40.1	19.3	60.2
Others	11.5	5.0	5.3
Cash & Cash Deposits	263.7	246.5	160.1
<b>Current Assets</b>	<b>388.8</b>	<b>313.8</b>	<b>279.7</b>
<b>Equity</b>	<b>429.7</b>	<b>368.9</b>	<b>369.7</b>
<b>Non-current liabilities</b>	<b>1.8</b>	<b>2.0</b>	<b>4.2</b>
Trade payables	27.8	14.3	14.6
Contract liabilities for advance payments	53.3	30.3	26.1
Others	26.3	39.7	21.6
<b>Current liabilities</b>	<b>107.4</b>	<b>84.2</b>	<b>62.3</b>
<b>Balance Sheet total</b>	<b>538.9</b>	<b>455.1</b>	<b>436.2</b>

## Consolidated Statement of Cash Flows\*

\* Rounded figures; may not add up

(€ million)	2018	2017	2016
Cash Flow from operating activities	13.0	70.1	-37.7
Cash Flow from investing activities	-16.1	40.7	43.4
Cash Flow from financing activities	10.4	1.2	0.3
Exchange rate changes	2.4	-5.5	-2.3
Net change in Cash & Cash Equivalents	9.7	106.5	3.7
Cash & Cash Equivalents (beginning of period)	226.5	120.0	116.3
Cash & Cash Equivalents (end of period)	236.2	226.5	120.0
Change in Cash deposits	7.5	-19.5	-52.8
Free Cash Flow**	4.4	91.4	-42.9
Capex	9.2	9.7	5.3

\*\*) Operating CF, CapEx and Capital Divestments

## Financial Calendar & Contact Data

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- May 15, 2019                      Annual General Meeting, Aachen/Germany
- July 25, 2019                      H1/2019 Results, Conference Call
- October 24, 2019                  9M/2019 Results, Conference Call
- February 2020                      FY/2019 Results, Conference Call

For further information please contact:

Investor Relations & Corporate Communications

AIXTRON SE ▪ Dornkaulstr. 2 ▪ 52134 Herzogenrath, Germany ▪ E-Mail: [invest@aixtron.com](mailto:invest@aixtron.com)

IR Team Headquarters

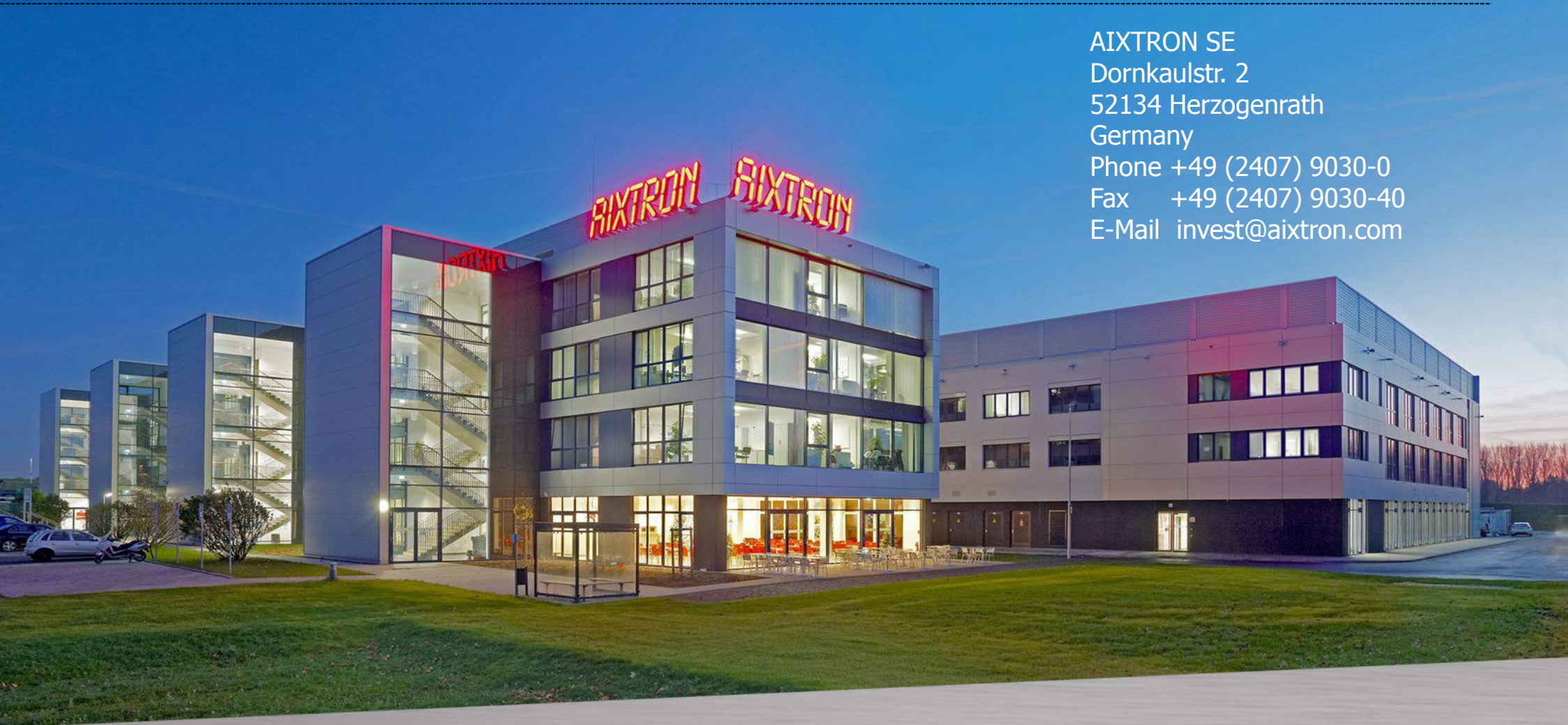
Phone: +49 (2407) 9030-6153



# Technology. Materials. Performance.

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