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Electro-Optical Modulators (EOMs)

Market Trend

May, 2024

Introduction

In the rapidly evolving landscape of optoelectronics, Electro-Optical Modulators (EOMs) stand as pivotal components driving advancements in communication and photonic technologies. This report, "Global Electro-Optical Modulators (EOMs) Market Trend 2024-2028," is designed to offer a comprehensive analysis of the global EOMs market, shedding light on materials like Silicon (Si), Indium Phosphide (InP), and Lithium Niobate (LN), as well as products such as Amplitude, Polarization, and Phase Modulators.

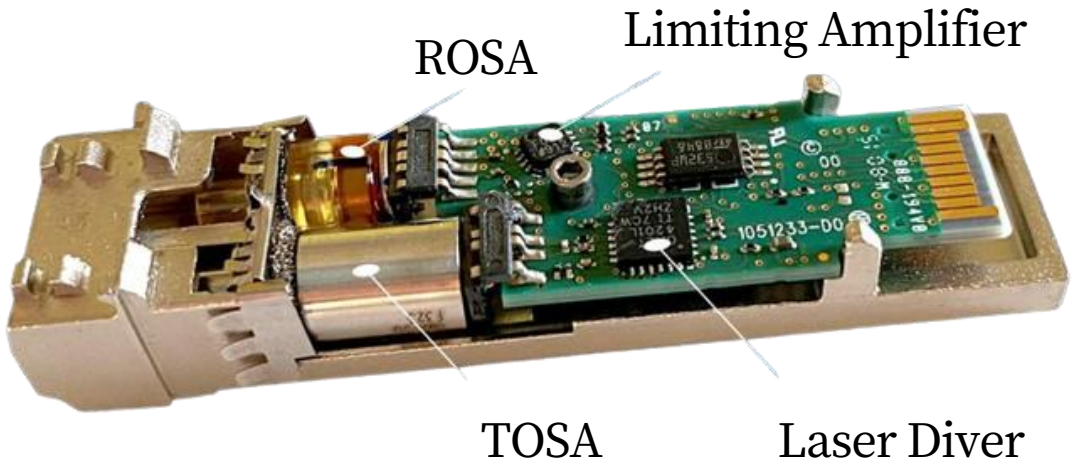
Our study spans across geographies, including China, the Rest of APAC, Europe, America, and Africa, and delves into key players shaping the industry. The EOMs market is characterized by swift technological innovation and growing demand, with Thin-Film Lithium Niobate emerging as a promising material for future development. This report navigates through the challenges and opportunities in the industry, providing a forecast for market growth and a CAGR of 6.97% from 2023 to 2028.

Structured into sections that include market overview, trends, segmentation, competitive landscape, investment analysis, and outlook, this report aims to serve as a valuable resource for industry professionals and decision-makers. We present detailed insights and data to inform strategic decisions and guide success in the competitive market landscape.

Definition & Study Scope

Optical transceivers are interconnects component that can transmit and receive data.

Electro-optical modulators (EOMs) are modulators made using the electro-optical effect of certain electro-optical crystals. The electro-optic modulator can modulate the amplitude, phase and polarization state of the optical signal through the change of the light wave characteristics of the electro-optical crystal when subjected to an external electric field.



Source: GLSUN Medium

Source: JENOPTIK

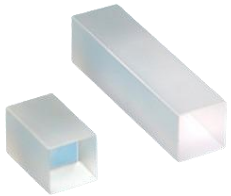
This study will focus on the global optical transceiver market and study the different data rates (such as <=100G, 200G, 400G, >=800G), products (such as ethernet, fibre channel, optical interconnects, CWDM / DWDM, wireless fronthaul, wireless backhaul, FTTx, etc.), geographies (China, Rest of APAC, Europe, America, Africa), key players, and others.

Advancements in Thin-Film Lithium Niobate

From the perspective of industrial law, the innovation and upgrading of electronic components mainly rely on the improvement brought by the optimization of packaging process and material progress, and LPO, CPO, silicon photonics and thin-film lithium niobate solutions are expected to become a breakthrough to solve this series of problems. Among them, lithium niobate modulator is the mainstream product in the current electro-optical modulator market.

Traditional Lithium Niobate

Cracked crystal of lithium niobate



Bulk lithium niobate

- The bulk lithium niobate modulator is subject to the free carrier effect
- The improvement of key performance parameters has encountered a bottleneck
- The volume is too large, which is not conducive to integration

Thin-Film Lithium Niobate

- Ultra-fast electro-optical effect and highly integrated optical waveguide
- Excellent characteristics such as large bandwidth
- Low power consumption, low loss, small size, controllable cost

AI Places Higher Demands on Optical Modules

AI and Data Centers

The development and application of AI requires data exchange between computing power server clusters and network interconnection within the data center.

Requirements for Optical Modules

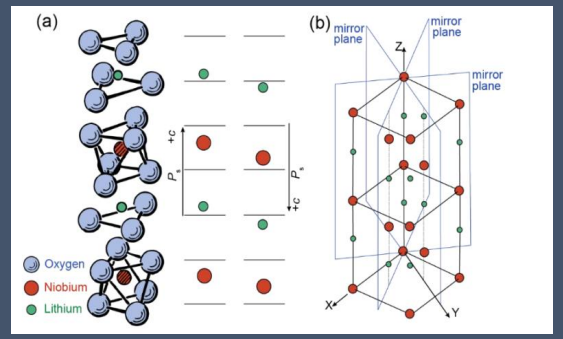
There is a large demand for high-speed, low-energy optical modules. The upgrade of optical module technology needs to double the speed while solving the problems of high-power consumption and high cost caused by the increase in speed.

Challenges & Opportunities

Traditional lithium niobate modulators use bulk lithium niobate as the material, which encounters bottlenecks in the improvement of key performance parameters, and is large, which is not conducive to integration.

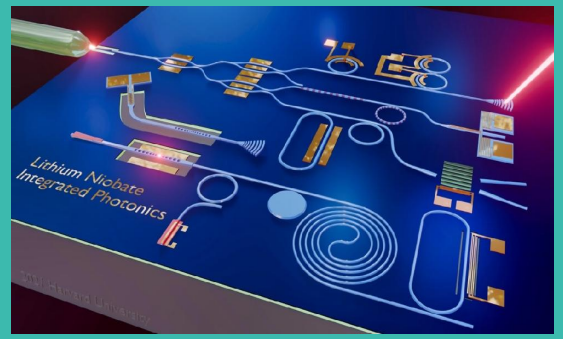
Pioneering the Future of High-Speed, Low-Power EOMs

Material Properties



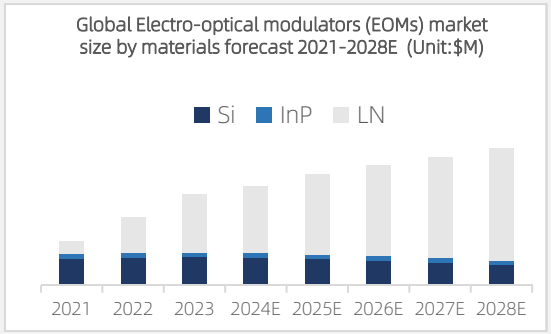
- High electro-optical coefficient
- Large bandwidth,
- High power
- High stability,
- Low driving voltage
- Low loss

Technical Advantage



- Ultra-fast electro-optical response
- Highly integrated optical waveguide
- Compliant with PAM4 single wavelength 200Gbps/400Gbps rate requirements

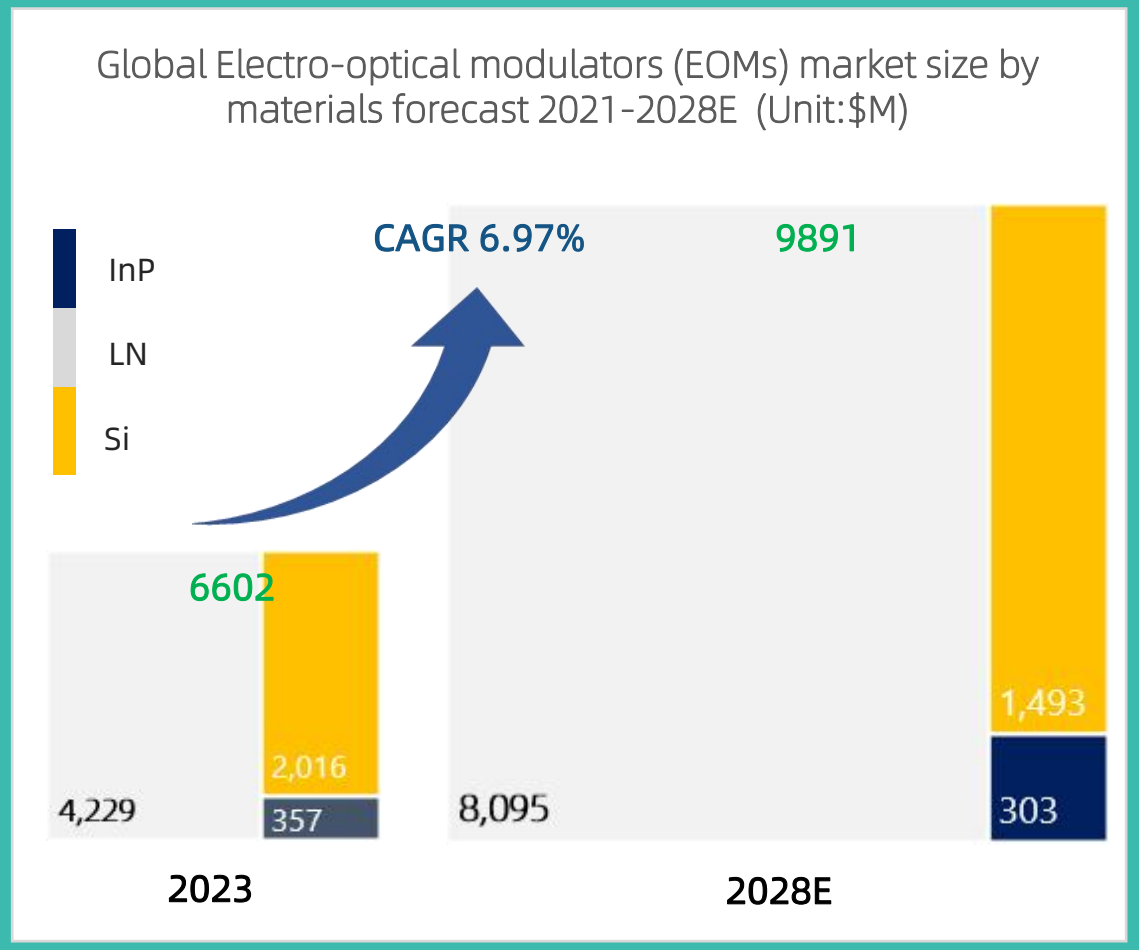
Market Prospects



- The lithium niobate modulator market is expected to have a CAGR of 11.43 % from 2024-2028
- The global electro-optical modulator market is expected to have a CAGR of 6.97% from 2024-2028

Source: Integrated photonics on thin-film lithium niobate, DI ZHU, 2021

Global EOMs Market Size by Materials



According to estimates, the global electro-optical modulators market will exceed $ 3,169 million in 2021, and is expected to reach $ 9,891 million in 2028, with a 2023-2028 CAGR of 6.97%.

At present, 800G in the field of optical communication has begun to use devices made of lithium niobate materials. In the future, the penetration rate of 800G optical modules will gradually increase.

Thin-film lithium niobate modulators are expected to become an important development direction for modulators in the future. There is a demand for thin-film lithium niobate modulators in the fields of optical communications, fiber gyroscopes, and ultrafast lasers, and there is a broad market space for future growth. The global market size of Lithium niobate electro-optical modulators will reach US $ 907 million in 2021, and it is predicted to reach US $ 8,095 million in 2028, with a 2023-2028 CAGR of 11.43%

Global EOMs Market Size by Segment

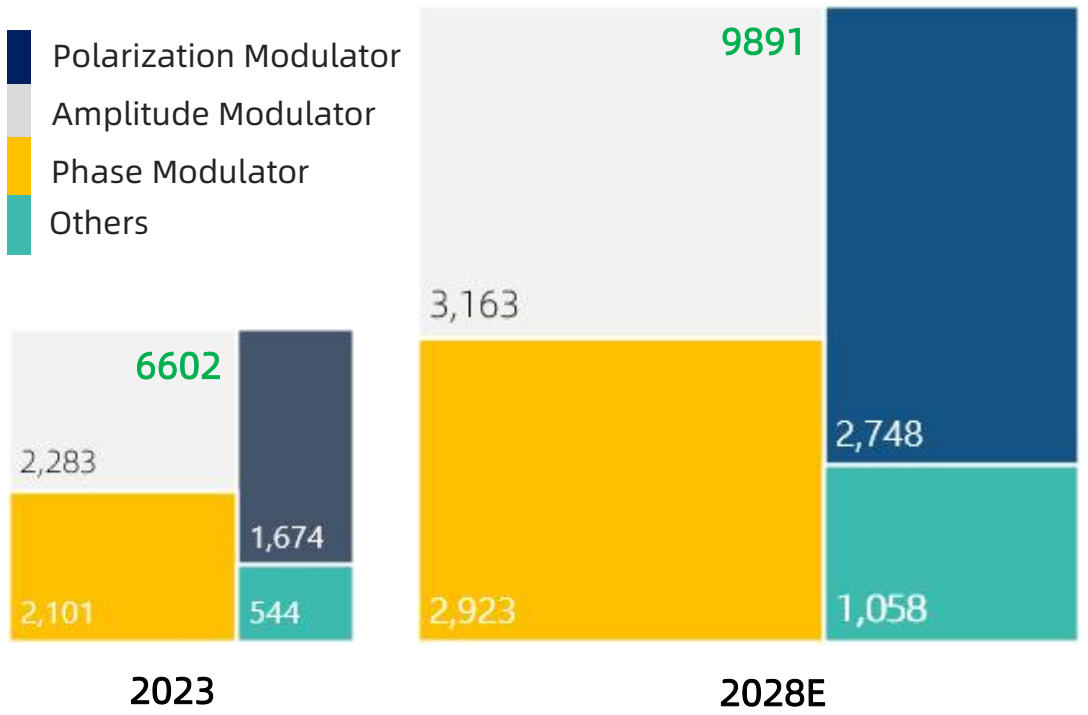
In terms of modulation content, electro-optical modulators mainly include phase modulators, amplitude modulators, polarization modulators and other types. From the modulation principle, electro-optical modulators mainly include resonant electro-optical modulators and non-resonant electro-optical modulators.

In 2021, the global amplitude modulator market size reached US $1,109 million and continue increase to US $2,748 million in 2028, 2023-2028 CAGR of 3.14%.

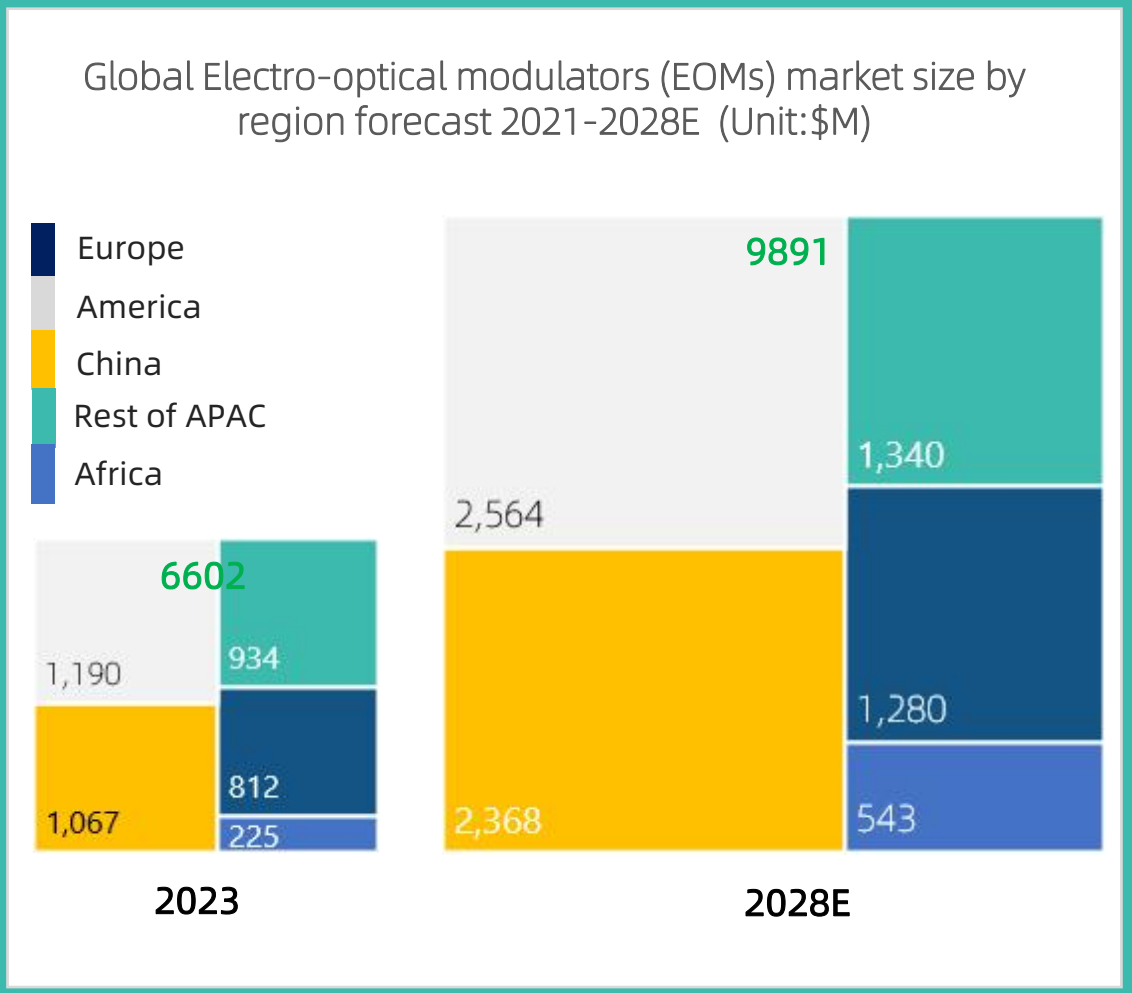
In 2021, the global polarization modulator market size reached US $792 million and continue increase to US $2,923 million in 2028, 2023-2028 CAGR of 9.73%.

In 2021, the global phase modulator market size reached US $951 million and continue increase to US $3,163 million in 2028, 2023-2028 CAGR of 7.05%.

Global Electro-optical modulators (EOMs) market size by segment forecast 2021-2028E (Unit:$M)



Global EOMs Market Size by Region



From the perspective of China, the market scale of electro-optical modulators in China will reach US $207 million in 2021, and it is predicted to reach US $2,368 million in 2028, with a 2023-2028 CAGR of 14.20%;

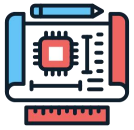
In 2021, the market scale of electro-optical modulators in America will reach US $263 million, and it is predicted to reach US $2,564 million by 2028, with a CAGR of 13.65%.

From the perspective of Europe, the market scale of electro-optical modulators in Europe will reach US $180 million in 2021, and it is predicted to reach US $1,280 million in 2028, with a 2023-2028 CAGR of 10.06%.

Global EOMs Market Size by Region

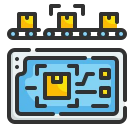
At present, the mainstream companies in the optoelectronics industry all adopt the IDM model. The IDM model requires the company to have a full range of capabilities from design, manufacturing, packaging and testing to sales.

Thresholds to Enter the Market



Design of lithium niobate modulator products is difficult

The process is extremely complex



High thresholds in all aspects of design, manufacturing process, packaging

Capital demand large

Operation cycle is long

Key Members of the Industry Chain

FUJITSU Sumitomo AFR Advanced Fiber Resources

Traditional LN Modulator Industry Vendor

eoptolink® Accelink

HGTECH for Higher Glory in manufacturing Linktel

Major Optical Module Manufacturers

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Ordering Information

Global Electro-optical modulators (EOMs)

Market Research Report

Electronic (1-5 users)	6,500.00 USD
Electronic (6-10 users)	9,200.00 USD
Electronic and 1 Hardcopy (1-5 users)	7,250.00 USD
Electronic and 1 Hardcopy (6-10 users)	9,950.00 USD

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