Announcement

Planar Lightwave Circuit (PLC) Splitters
Global Market Forecast & Analysis

2015-2020
This is the ElectroniCast analysis and forecast of global market consumption of planar lightwave circuit (PLC) splitters used in optical communication applications. For the purposes of this study, ElectroniCast specifically addresses the PLC splitter, using waveguide circuits and aligned fiber optic pigtails, integrated inside a package.

The 2015-2020 quantitative market forecast data presented in this study report are segmented into the following geographic regions, plus a Global summary:

- America (North America, Central and South America)
- EMEA (Europe, Middle Eastern countries, plus Africa)
- APAC (Asia Pacific)

PLC Splitter Applications analysis covered in this report:

- Service Providers Telecommunication and Cable TV (CATV)
  - Passive Optical Network (PON), FTTX, Other
- Fiber Optic Test/Measurement
- Private Enterprise/Data Centers/Local Area Networks (LANs)
- Harsh Environment (Military, Industrial, Other)

The forecast for each product-level is presented by function:

- Consumption Value ($, Million)
- Number of Units (Quantity in 1,000)
- Average Selling Prices ($, each)
PLC splitters will continue to contribute an important role in Fiber to the Home (FTTH) networks by allowing a single passive optical network (PON) interface to be shared among many subscribers. PLC splitters are available in compact sizes; therefore, they can be used in aerial apparatus, pedestals or in-ground as well as rack mount or other module-based value-added product. Installation is simple using a variety of connector types or fusion splicing.

This report provides a detailed market and technology analysis of PLC splitters, which are largely driven by Fiber-to-the-Home (FTTH) and are trending towards commodity manufacturing processes. The ElectroniCast market forecast is segmented by the following product categories and split configurations:

**Hierarchy of Selected PLC Splitters, by Fabrication-Level**

- Chip
- Component Device (compact)
- Modules

**Hierarchy of Selected PLC Splitters, by Splitter Configuration**

1xN
- 1x2
- 1x4
- 1x8
- 1x16
- 1x32
- 1x64

2xN
- 2x4
- 2x8
- 2x16
- 2x32

Other (miscellaneous MxN)

The information is presented in easy-to-follow illustrations and text. The reasons for the forecasted trends are discussed. The report also outlines the market research methodology followed and the key assumptions made. Terms, acronyms, and abbreviations used are defined. A list of fiber PLC splitter manufacturers and related companies is provided, along with description of the types of PLC splitters and related technologies that they address. The technology trends of other pertinent fiber optic components and devices in the fiber optic marketplace are presented.
Next generation networks will combine voice, audio, data at high and low speeds, video, television (including interactive 3D high resolution television), and other specialized transmission into a single integrated infrastructure.

Included within the infrastructure will be business Enterprise resource planning (ERP) software, unified messaging, web-assisted call centers, and a variety of small-business infrastructures. Residential use will include video on demand, e-commerce, small office/home office telecommuting, advertising, medical monitoring, elder care monitoring, childcare monitoring, home and office security. Most existing communications will be built upon an Internet backbone during the period of this study. Reasons for this transition are rooted in demand. The customers are demanding greater speed, more functionality and reliability, and naturally, they expect “perfect” quality of service.

Planar waveguide circuits (PWCs) also referred to as planar lightwave circuits (PLCs), incorporate numerous active and passive functional uses for packaged modules. The long-term trend is for a larger share of discrete-circuit (single-function) based PWCs/PLCs being displaced by equivalent performance hybrid (multiple-function) planar devices.

The majority of optical functions, such as splitters, variable optical attenuators (VOAs) and array waveguides (AWGs) are currently developed and implemented forming discrete (single function/monolithic) component integration. The combination of the packaging and integrated optics aspects of PWC technology provides for an attractive and powerful technology for devices/modules, which will hold multiple (two or more) functions (integrated multifunction devices); thereby, reducing size, weight, and cost versus larger, bulkier discrete devices/modules.

As the demand for larger quantities of optical communication components evolve, technologies, which are friendly to automation assembly processes, will have a competitive manufacturing/cost advantage. Use of silicon wafers, for example, draws extensively on the mass-production techniques of the commercial integrated circuit (IC) production whelm, since the fabrication of PWCs incorporates many of the same pieces of equipment and processes.

Fiber-to-the-Home passive optical networks (FTTH/PONs) integrated PLCs, with multiple functions, have promise for a sizable market. The biplexer, an all-in-one transponder that includes the two wavelengths, 1310nm upstream and 1490nm downstream, is one end-use modules based on planar waveguide technology that is required for PON. And some networks will use a 1550nm wavelength for a cable TV overlay, creating the need for triplexers.
INFORMATION BASE

This study is based on analysis of information obtained continually over 15 years, but updated through the end of March 2016. During this period, ElectroniCast analysts performed interviews with authoritative and representative individuals in the fiber optics industry plus telecommunications, cable TV, private datacom, military/aerospace & other communication industries, instrumentation/ laboratory – R&D and factory/manufacturing, from the standpoint of both suppliers and users of planar waveguide circuits. The interviews were conducted principally with:

- Engineers, marketing personnel and management at manufacturers of fiber optic couplers/splitters, PON/FTTH components/devices, optical fiber, AWGs/optical waveguide and other components, cable assemblies, test/measurement equipment, Fiber optic connectors, mechanical splices splice and installation apparatus

- Design group leaders, engineers, marketing personnel and market planners at major users and potential users of optical communication devices, including passive optical devices and active/transceivers, such as telecommunication transmission, switching and distribution equipment producers, data communications equipment producers, harsh environment, military systems, aircraft and spacecraft electronic equipment producers, optical instrumentation system producers and others

- Other industry experts, including those focused on standards activities, trade associations, and investments.

The interviews covered issues of technology, R&D support, pricing, contract size, reliability, documentation, installation/maintenance crafts, standards, supplier competition and other topics.

Customers also were interviewed, to obtain their estimates of quantities received and average prices paid, as a crosscheck of vendor estimates. Customer estimates of historical and expected near term future growth of their application are obtained. Their views of use of new technology products were obtained.

The analyst then considered customer expectations of near term growth in their application, plus forecasted economic payback of investment, technology trends and changes in government regulations in each geographical region, to derive estimated growth rates of quantity and price of each product subset in each application. These forecasted growth rates are combined with the estimated
baseline data to obtain the long-range forecasts at the lowest detailed level of each product and application.

A full review of published information was also performed to supplement information obtained through interviews. The following sources were reviewed:

- Professional technical journals and papers
- Trade press articles
- Technical conference proceedings
- Product literature
- Company profile and financial information
- Additional information based on previous ElectroniCast market studies
- Personal knowledge of the research team.

In analyzing and forecasting the complexities of the worldwide markets for planar waveguide circuits and related devices, it is essential that the market research team have a good and a deep understanding of the technology and of the industry. ElectroniCast members who participated in this report were qualified. Note: Market forecast data in this study report refers to consumption (use) for a particular calendar year; therefore, this data is not cumulative data.

**Bottom-up Methodology**    ElectroniCast forecasts are developed initially at the lowest detail level and then summed to successively higher levels. The background market research focuses on the amount of each type of product used in each application in the base year (2015), and the prices paid at the first transaction from the manufacturer. This forms the base year data. ElectroniCast analysts then forecast the growth rates in component quantity use in device type, along with price trends, based on competitive, economic and technology forecast trends, and apply these to derive long term forecasts at the lowest application (use) levels. The usage growth rate forecasts depend heavily on analysis of overall end user trends toward digital broadband communication equipment usage and economic payback.

**Cross-Correlation Increases Accuracy**    The quantities of fiber optic attenuators, DWDM, optical fiber/cable, connectors, transceivers, transport terminals, optical add/drop MUX, couplers/splitters, isolators, photonic switches and other products used in a particular application are interrelated. Since ElectroniCast conducts annual analysis and forecast updates in each fiber optic related product field, accurate current quantity estimates in each application are part of this corporate database. These quantities are cross-correlated as a “sanity check.”

ElectroniCast, each year since 1985, has conducted extensive research and updated their forecasts of each fiber optic component category. As technology and applications have advanced, the number of component subsets covered by the forecasts has expanded impressively.
About ElectroniCast

ElectroniCast, founded in 1981, specializes in forecasting technology and global market trends in fiber optics communication components and devices, as well providing market data on light emitting diodes used in lighting.

As an independent consultancy we offer multi-client and custom market research studies to the world’s leading companies based on comprehensive, in-depth analysis of quantitative and qualitative factors. This includes technology forecasting, markets and applications forecasting, strategic planning, competitive analysis, customer-satisfaction surveys and marketing/sales consultation. ElectroniCast, founded as a technology-based independent consulting firm, meets the information needs of the investment community, industry planners and related suppliers.

Director of Study

Stephen Montgomery, MBA in Technology Management, President at ElectroniCast Consultants. He joined ElectroniCast in 1990 and has specialized in photonics and fiber optic components market & technology forecasting at ElectroniCast for over 25-years. He has given numerous presentations and published a number of articles on optical communication markets, technology, applications and installations. He is a member of the Editorial Advisory Board of LIGHTWAVE magazine (PennWell Publishing) and writes a monthly article covering the optical communication industry for OPTCOM Magazine in Japan (Kogyo Tsushin Co., Ltd.).

Proprietary Statement

All data and other information contained in this data base are proprietary to ElectroniCast and may not be distributed or provided in either original or reproduced form to anyone outside the client’s internal employee organization, without prior written permission of ElectroniCast.

ElectroniCast, in addition to multiple-client programs, conducts proprietary custom studies for single clients in all areas of management planning and interest. Other independent consultants, therefore, are considered directly competitive. ElectroniCast proprietary information may not be provided to such consultants without written permission from ElectroniCast Consultants.
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