What's an ITLA and Why Do I Need One?

The tunable laser is a core component of every optical communication system, both direct detect and coherent. The laser generates the optical signal modulated and sent over the optical fiber. Thus, the purity and strength of this signal will have a massive impact on the bandwidth and reach of the communication system.

Depending on the material platform, system architecture, and requirements, optical system developers must balance laser parameters—tunability, purity, size, environmental resistance, and power—for the best system performance.

In this article, we will talk about one specific kind of laser—the integrable tunable laser assembly (ITLA)—and when it is needed.

When Do I Need an ITLA?

The promise of silicon photonics (SiP) is compatibility with existing electronic manufacturing ecosystems and infrastructure. Integrating silicon components on a single chip with electronics manufacturing processes can dramatically reduce the footprint and the cost of optical systems and open avenues for closer integration with silicon electronics on the same chip. However, the one thing silicon photonics misses is the laser component.

Silicon is not a material that can naturally emit laser light from electrical signals. Decades of research have created silicon-based lasers with more unconventional nonlinear optical techniques. Still, they cannot match the power, efficiency, tunability, and cost-at-scale of lasers made from indium phosphide (InP) and other III-V compound semiconductors.

Therefore, making a suitable laser for silicon photonics does not mean making an on-chip laser from silicon but an *external laser* from III-V materials such as InP. This light source will be coupled via optical fiber to the silicon components on the chip while maintaining a low enough footprint and cost for high-volume integration. The external laser typically comes in the form of an integrable tunable laser assembly (ITLA).

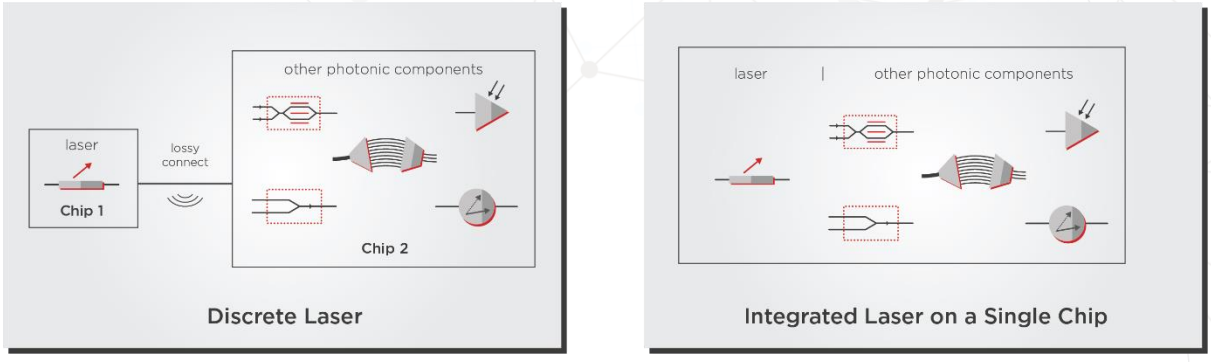

Figure 1: Example of using an external laser (left) with other photonic components in comparison to using an integrated laser (right)

Meanwhile, a photonic chip developer that uses the InP platform for its entire chip instead of silicon can use an *integrated laser* directly on its chip. Using an external or integrated depends on the transceiver developer's

device requirements, supply chain, and manufacturing facilities and processes. You can read more about the differences in this article.

What is an ITLA?

In summary, an integrable tunable laser assembly (ITLA) is a small external laser that can be coupled to an optical system (like a transceiver) via optical fiber. This ITLA must maintain a low enough footprint and cost for high-volume integration with the optical system.

Since the telecom and datacom industries want to pack more and more transceivers on a single router faceplate, ITLAs need to maintain performance while moving to smaller footprints and lower power consumption and cost.

Fortunately, such ambitious specifications became possible thanks to improved photonic integration technology. The original 2011 ITLA standard from the Optical Internetworking Forum (OIF) was 74mm long by 30.5mm wide. By 2015, most tunable lasers shipped in a micro-ITLA form factor that cut the original ITLA footprint in half. In 2021, the nano-ITLA form factor designed for QSFP-DD and OSFP modules had once again cut the micro-ITLA footprint almost in half. The QSFP-DD modules that house the full transceiver are smaller (78mm by 20mm) than the original ITLA form factor. Stunningly, tunable laser manufacturers achieved this size reduction without impacting laser purity and power.

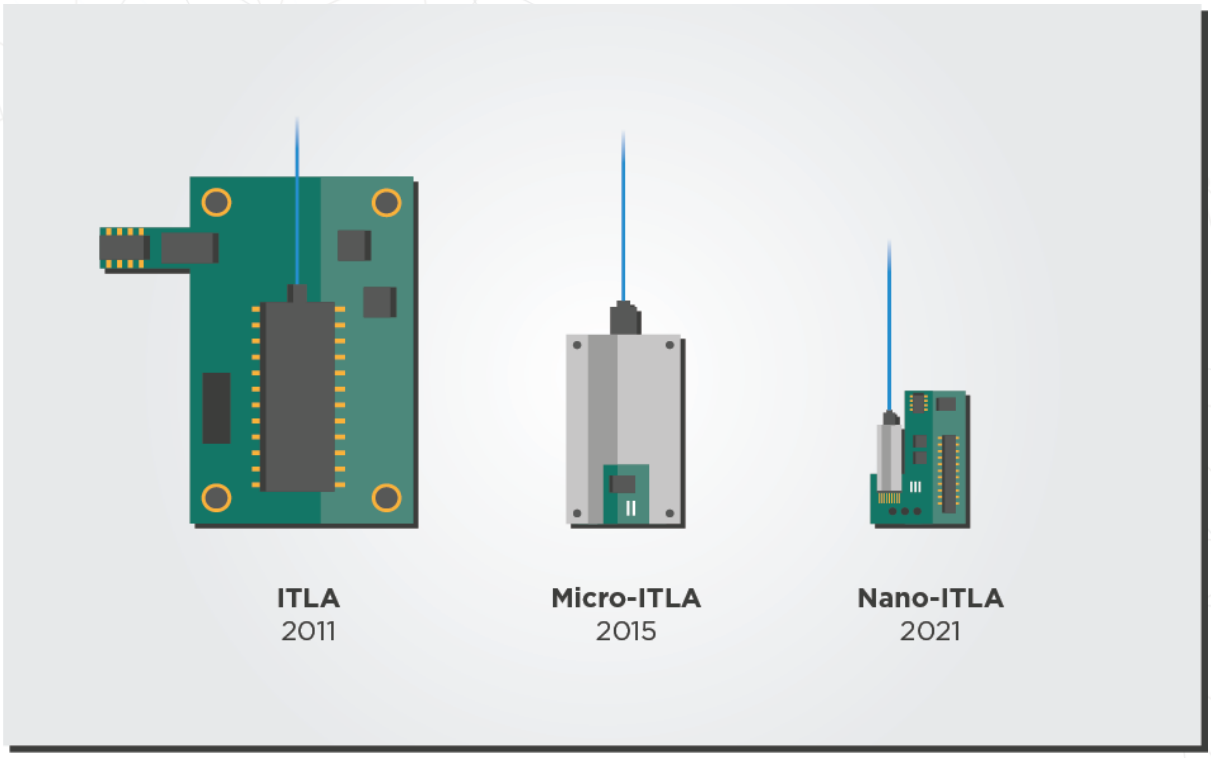

Figure 2: Evolution of tunable laser form factors for coherent optics (2011-2021). Figure inspired from a picture in Laser Focus World.

The Exploding Market for ITLAs

With the increasing demand for coherent transceivers, many companies have performed acquisitions and mergers that allow them to develop transceiver components internally and thus secure their supply. LightCounting predicts that this consolidation will decrease the sales of modulator and receiver components but that the demand for tunable lasers (mainly in the form of ITLAs) will continue to grow. The forecast expects the tunable laser market for transceivers to reach a size of $400M in 2026. We talk more about these market forces in one of our previous articles.

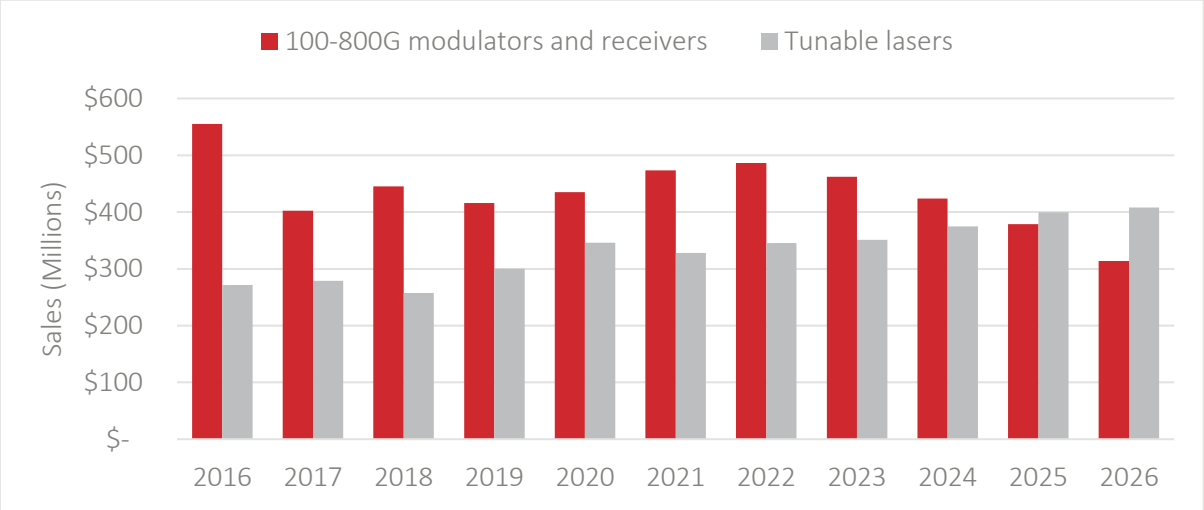

Figure 3: Global Market sales for high-performance modulators and receivers and tunable lasers. (Historical Data and Forecast). Source: LightCounting Market Forecast Report (April 2021)

However, the industry consolidation will make it harder for component and equipment manufacturers to source lasers from independent vendors for their transceivers. The market needs more independent vendors to provide high-performance ITLA components that adapt to different datacom or telecom provider needs. Following these trends, at EFFECT Photonics we are not only developing the capabilities to provide a complete, fully-integrated coherent transceiver solution but also the ITLA units needed by vendors who use external lasers.

Takeaways

The world is moving towards tunability. As telecom and datacom industries seek to expand their network capacity without increasing their fiber infrastructure, the sales of tunable transceivers will explode in the coming years. These transceivers need tunable lasers with smaller sizes and lower power consumption than ever.

Some transceivers will use lasers integrated directly on the same chip as the optical engine. Others will have an external laser coupled via fiber to the optical engine. The need for these external lasers led to the development of the ITLA form factors, which get smaller and smaller with every generation.

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