PLATIMO - Versatile assembling facilities to bring concepts to prototypes and automated production

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Abstract *PLATIMO is a platform set up by the CEA-LETI. It offers to industrial and institutional optical designers a partnership to develop automated assembly solution.*

Introduction

Packaging is well known to be the production flow bottleneck and the cost major part for most of optoelectronical devices due to manual fastidious operations. Hence, one solution is to use automated assembling equipments in order to speed up both prototyping and production [1]. However, many companies can't spend time and money to develop the custom machine needed and the assembling process [2]. That's the reason why the CEA-LETI has created at Grenoble a platform called PLATIMO to help companies to step in automated assembling with versatile equipments and the support of a skilled team.

PLATIMO is a photonic devices micro-components integration unit set up by the CEA-LETI in the Optronics Department thanks to a contribution of the Rhône-Alpes region. The aim of PLATIMO is to propose to industrial and institutional designers a partner team with the knowledge, experience, and necessary automated equipments to speed up the prototyping process and to develop automated assembly solutions. Today, PLATIMO main equipment is a versatile assembly robot (optobonder) specifically developed by a French firm (OPUS). It allows passive and active alignment components with fixation solutions such as gluing and soldering.

After a brief review of the capabilities of the PLATIMO's optobonder, we present two very different realisations : a microlaser and a splitter. The first is a picked&placed chips device, the second is a planar optical waveguides device for telecommunication application.

PLATIMO's optobonder

The Optobonder200 is a semi automatic assembly machine for small and micro components : from a few hundreds micron to a few millimeter. It has been specially developed by OPUS in order to meet photonic devices needs. Figure 1 shows the optobonder marble with its equipments.

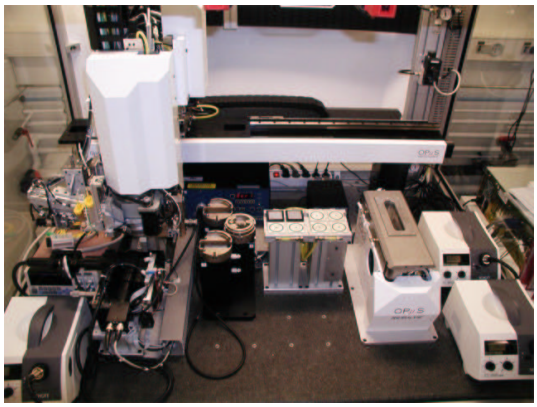

figure 1. optobonder

The main functionalities are : chip handling, pick & place with force control, parallelism adjustment, autocollimation adjustment, placing by a passive or an active alignment with a resolution down to less than 50nm, reflow soldering ovens, glue dispenser and UV insulator. Any of these functionalities may be adapted to a given device assembling specifications.

Including this optobonder, the platform's equipments are accessible either by a bilateral contract for a R&D project done by the PLATIMO's team, or by a direct hiring for a self-exploitation. Other researches managed by the PLATIMO's team include optical designing, dicing, polishing, thermal management, mechanics, assembling (gluing, soldering, molecular bonding) and test.

Realisation #1 : microlaser

The first realisation we present is a microlaser assembling. For this device from JDS Uniphase - Nanolase, the optobonder works as a chip pick&place with optical alignment as autocollimation, passive and active alignment, and chip gluing.

Figure 2 shows this microlaser with a pumping diode, a gradient index lens, and a laser chip.

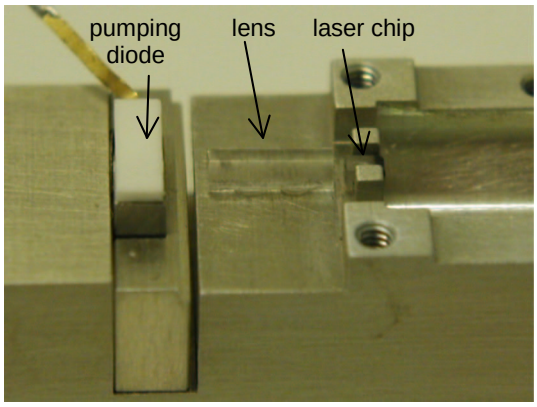

figure 2. microlaser

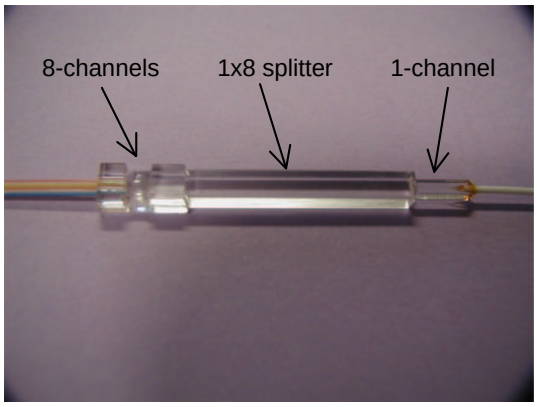

figure 3. splitter

Comparing with a manual operation, the assembling process time has been reduced by a factor 8 and improves both productivity and repeatability.

Current researches are done to use silicon micro-benches in order to reduce cost, and to replace gluing by soldering in order to improve the device reliability.

Realisation #2 : splitter

The second realisation we present is a 8-channel V-groove assembling with a splitter. For this planar device from TEEM Photonics, the optobonder allows parallelism alignment between the components faces to bring to contact, force contact control, waveguides coupling active alignment, and components gluing.

Figure 3 shows the splitter with a 8-channels V-groove part, a planar optical waveguides splitter, and a 1-channel ferule part.

Active alignment on the 8-channels side optimises both channel #1 and #8 with a scanning on XY translations and θ_z rotation. The assembling process time has been reduced to a few minutes by side with less than 0.15dB insertion loss.

Concerning this type of components, current researches are done on pumping diode coupling into planar optical waveguide, with components fixed by soldering.

Conclusions

With PLATIMO, the CEA-LETI propose a skilled team support and versatile equipments to optical designers to bring their concepts to prototypes, as well as to do production. Devices may be as well picked&placed chips as planar optical waveguides. Further developments are mainly focused today on soldering in order to get rid of glue drawbacks, but soldering needs further developments not to jeopardize optical components integrity.

References

1 “The automation crisis”, Photonics Spectra, p.98-110, June 2001

2 Fabel-M, “Bridging the gap from concept & development to production”, Fiberoptic product news, January 2003