DIE-TO-WAFER HIGH SPEED EQUIPMENT FOR DIRECT HYBRID BONDING

Pascal Metzger
SET, CEO

Leti Workshop @ Semicon West | July 10, 2018

set
Smart Equipment Technology

leti ceatech | TECHNOLOGY RESEARCH INSTITUTE

NANOELEC. Institut de recherche Technologique Nanoelec

SEMICON WEST

Leti @ Semicon West 2018

From 7/10/2018 to 7/12/2018

San Francisco, California

SET CORPORATION

SMART EQUIPMENT TECHNOLOGY

*

WELCOME

Pascal METZGER

San Francisco, July 10th

set Smart Equipment Technology

SET Corporation AT A GLANCE

- Since **1975: Equipment for semiconductor**

  celebrating 40 years in 2015!

- Since **1981: SET designs**, **assembles** and **sells high precision "flip-chip" bonders**

- → **1st flip-chip bonder @ CEA-Leti** in **1981**
- → **Focusing** since the beginning on **thermocompression** and **high precision** for **pixelized sensors**
- → **38 years** of **experience**
- → **World leader** in **submicron** bonding

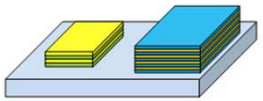
set
Smart Equipment Technology

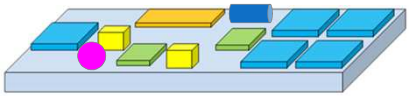
Adressed Markets, Applications and Processes

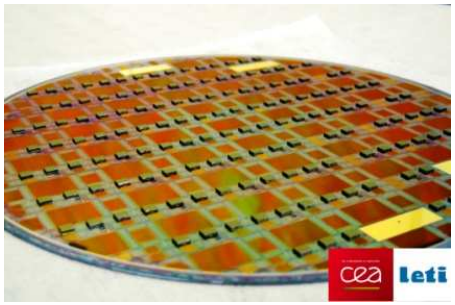
R&D: Research Institutes and Universities

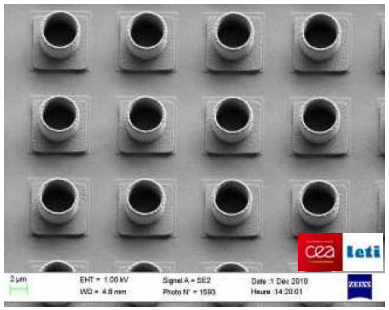
Bonding

- RT compression, Thermocompression, Thermosonic, Thermal Curing, UV Curing, Reflow, Cu-Cu Direct Bonding…
- Heterogeneous integration, 3D

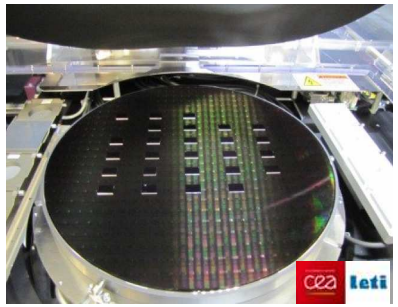








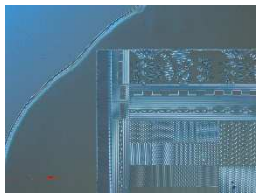
10^6 µtubes - 10 µm pitch - RT process



Direct Cu-Cu bonding – RT process

NanoImprinting

- UV-NIL (room temperature, UV lithography)
- HEL (Hot Embossing Lithography)



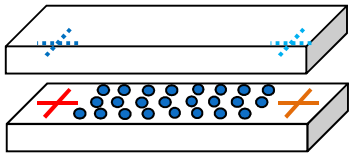
Courtesy: VTT (Finland)

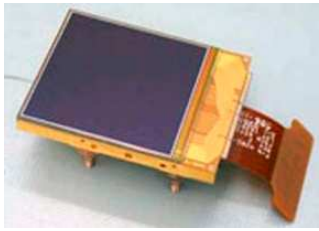
Smart Equipment Technology

Adressed Markets, Applications and Processes

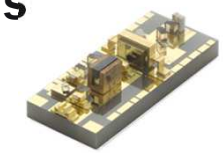
- **PRODUCTION: Industries**

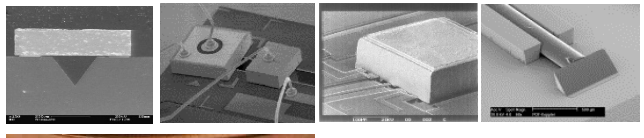
- **Pixelized Sensors (medical, aerospace, military and scientific)**
  - Up to 4k x 4k pixels
  - Down to 10 µm pitch, even better

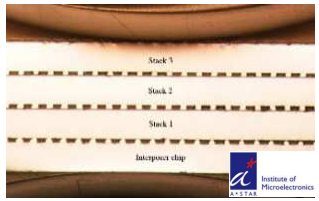


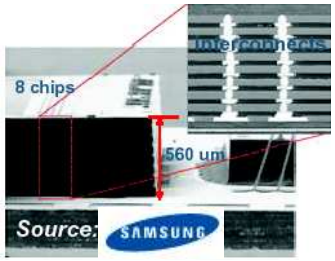


- **Production for commercial applications**
  - Hard Disks / HAMR / Optoelectronic
  - Laser bars
  - 3D-IC / Die to Die, Die to Wafer with TSV
  - Mini/Micro screens
  - MEMS / MOEMS
  - Memories









set
Smart Equipment Technology

PORTFOLIO

NPS300

± 0,5 µm ACCURA Flip-Chip Bonder OPTO

ACCURA Flip-Chip Bonder 100

± 3 µm ACCURA Flip-Chip Bonder m

± 0,5 µm FC 300 Flip-Chip Bonder

± 1 µm FC 150 Flip-Chip Bonder

LDP 150 Large Device Press

set Smart Equipment Technology

PERSPECTIVES

- **Trend**
  - ↘ Size of devices, ↘ Power consumption, ↗ Speed communication
  - Heterogeneous integration (3D) → D2W
  - Finer pitch → High bonding precision
  - Even for consumer market → High throughput

- **Consequences for chip designer, process designer and equipment supplier**

- **Project**
  - Take into account all requirements (front and back end, chips, process, equipment)
  - Process compatible with high throughput and high precision
  - Equipment reaching all these requirements
  - → RT Cu-Cu direct bonding
  - → Cleanliness

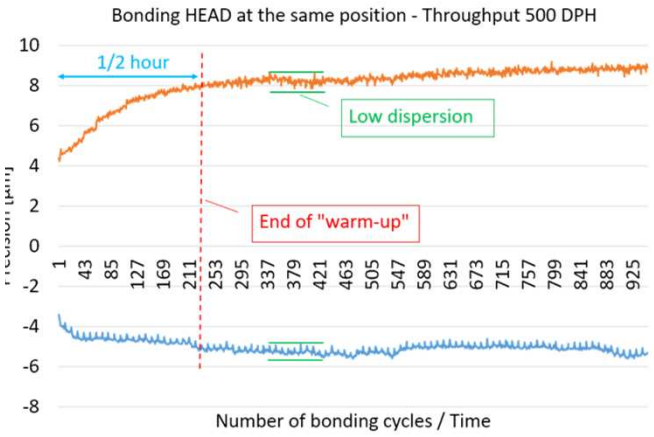
Such equipment does not exist today!

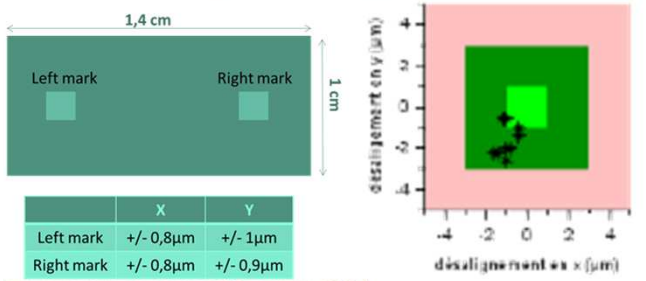
NANOELEC. Institut de recherche Technologique Nanoelec

set Smart Equipment Technology

PROJECT

Technical Characteristics	Target
Throughput	1000 dph
Precision	± 1 µm
Cleanliness	Compatible for Direct Bonding





	X	Y
Left mark	+/- 0,8µm	+/- 1µm
Right mark	+/- 0,8µm	+/- 0,9µm

set
Smart Equipment Technology

PROJECT

Future development

- Collect measurements on precision, cleanliness, throughput for full qualification of beta tool
- Qualify the process on active device, full morphological and electrical characterization on Q4/2018
- Demonstrate, at Leti's site, on customers' components in Q4/2018
- Commercial launching in 2019
- SET aims to be a major player in 3D integration

Part of this work was funded thanks to the French national program "Programme d'Investissements d'Avenir, IRT Nanoelec" ANR-10-AIRT-05.

set Smart Equipment Technology

Thank you for your attention

131 impasse Barteudet
74490 Saint-Jeoire, France
PMetzger@set-sas.fr
www.set-sas.fr