

Gluing studies and process

Applied to silicon pad detectors within
SiW Ecal activities at LPNHE Paris

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Overview

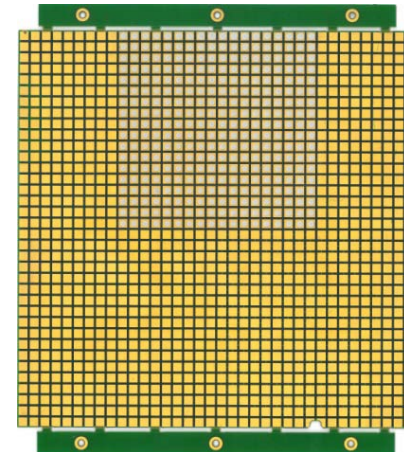
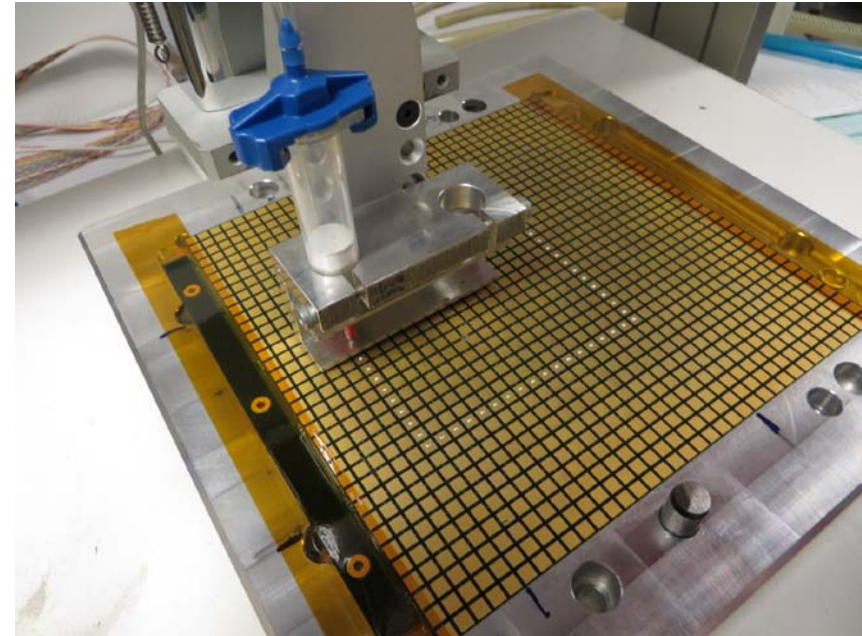
- Objectives
- Current gluing status
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Objectives

- Short-term : to glue one silicon sensor per PCB with a conductive glue for the test beam prototypes
- mid-term: to develop a fully automated process to position, align and glue 4 sensors on a PCB
- long-term: to apply this process to mass production

Current gluing status

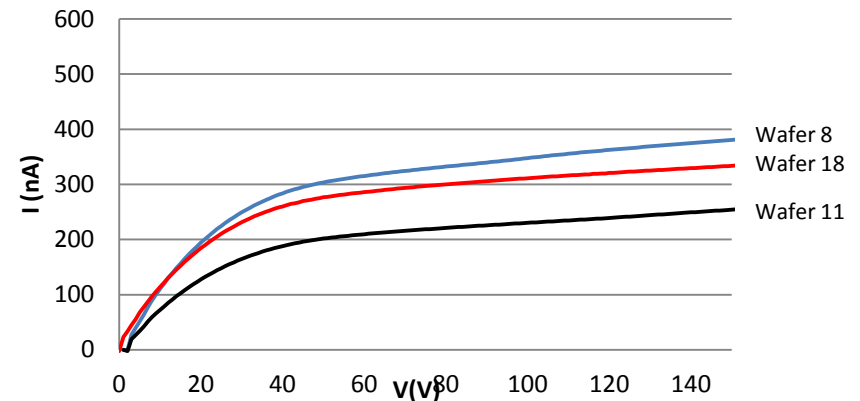
- The parameters of the gluing robot have been optimized to glue a silicon sensor (18x18 pads) on a PCB
- The constraints on the PCB geometry have been identified:
 - Flatness
 - Parallelism of the edges
 - Uniform height of the ASIC soldered on the board



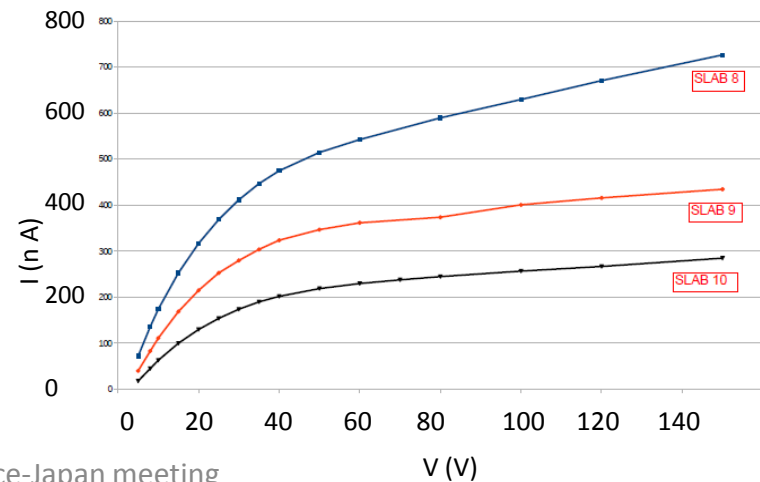
Current gluing status

- The total number of sensors glued with the robot: 9
- The leakage currents measured before and after the gluing process are similar.
- Some sensors were used for test beam: July 2012, February 2013, July 2013

IV-curve measured at LLR on sensors before gluing

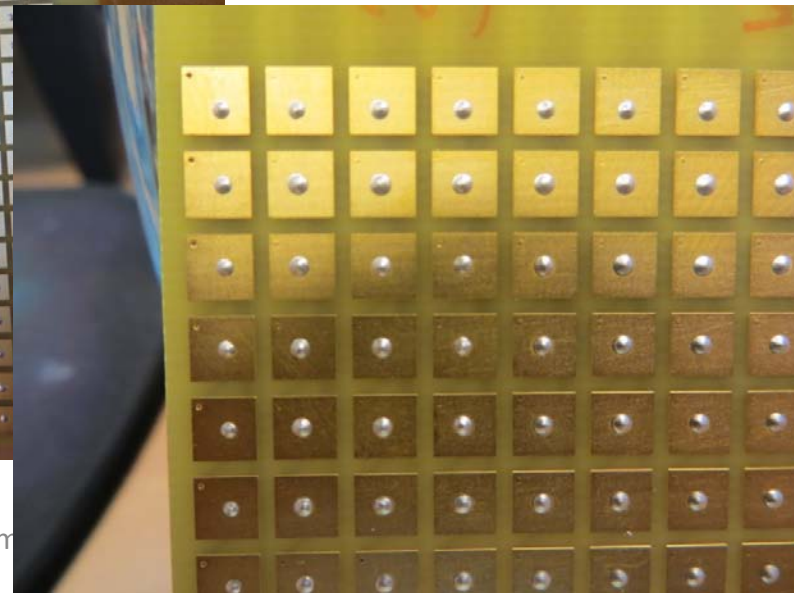
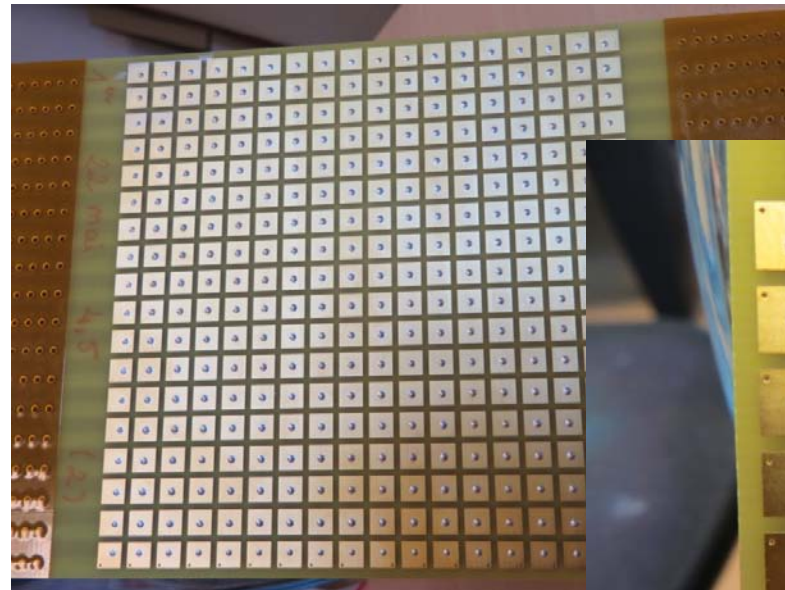


IV-curve measured at LAL on slabs



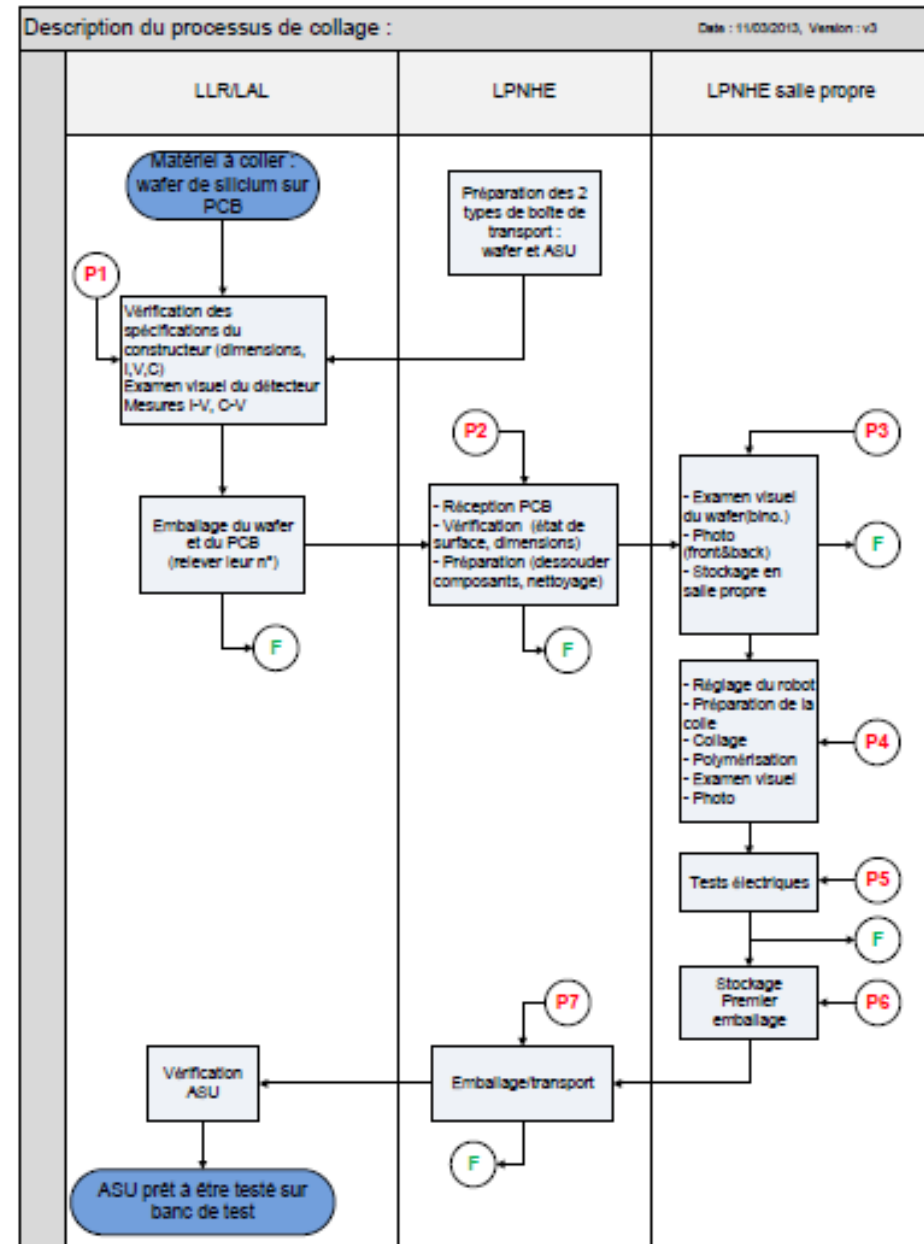
Improvements

- Use of specific pumps for dry and clean vacuum
- Careful cleaning of PCB
- New positioning of the glue dots for the external pads , to avoid short-circuits.




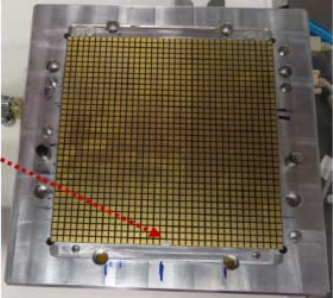
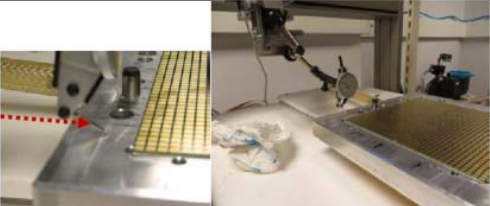






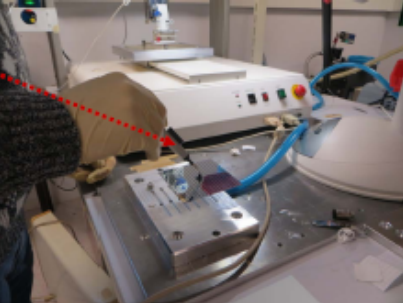
Quality insurance

- Task flow completed
- Reception and gluing procedures written
- Wafer, PCB and ASU transportation improved (dedicated boxes)
- Work in a clean room (ISO8) planned



Gluing procedure

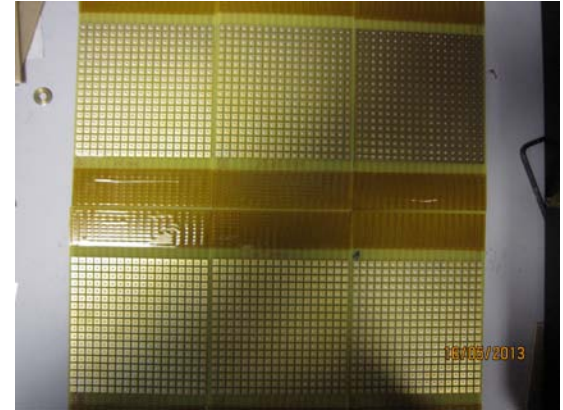
		P4 : Procédure de collage				
		Auteur(s) : GHISLAIN .P Rédacteur : DAVID J.	Approbation :	Date : 31/01/2013 Modifié : 26/03/2013	N° : 2.3	Identification :
Diffusion : J.E. Augustin, J. David, P. Ghislain, D. Lacour, L. Lavergne, D. Vincent						
Positionner le circuit imprimé (PCB), décrochement vers l'opérateur, brancher la pompe à dépression						
Régler le comparateur, installé sur le porte-seringue, à zéro sur la table à dépression (table PCB)						
3/16						

		P4 : Procédure de collage				
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Diffusion : J.E. Augustin, J. David, P. Ghislain, D. Lacour, L. Lavergne, D. Vincent						
Nettoyer le bout de la seringue Lancer le programme 1 Laisser faire 5 – 6 points et arrêter le programme : retour au démarrage Contrôle et nettoyage Puis lancement du programme 1 suivi du programme 2						
<u>Positionnement du capteur silicium :</u> Mettre des gants avant toute manipulation						
Prendre le capteur avec la ventouse						
10/16						

Work in progress

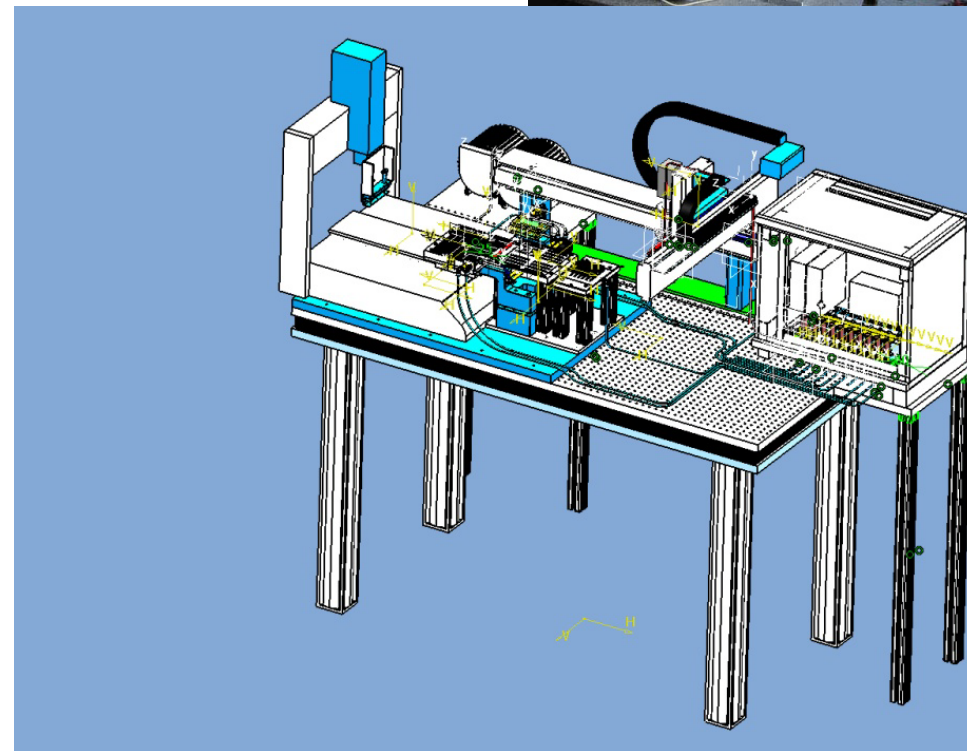
- We are developing a software (Labview) for the gluing robot
- We are assembling the second robot for positioning, alignment, and handling
- We are preparing the clean room to host both robots

In parallel, we continue to glue sensors for the test beam prototype (July 2013)

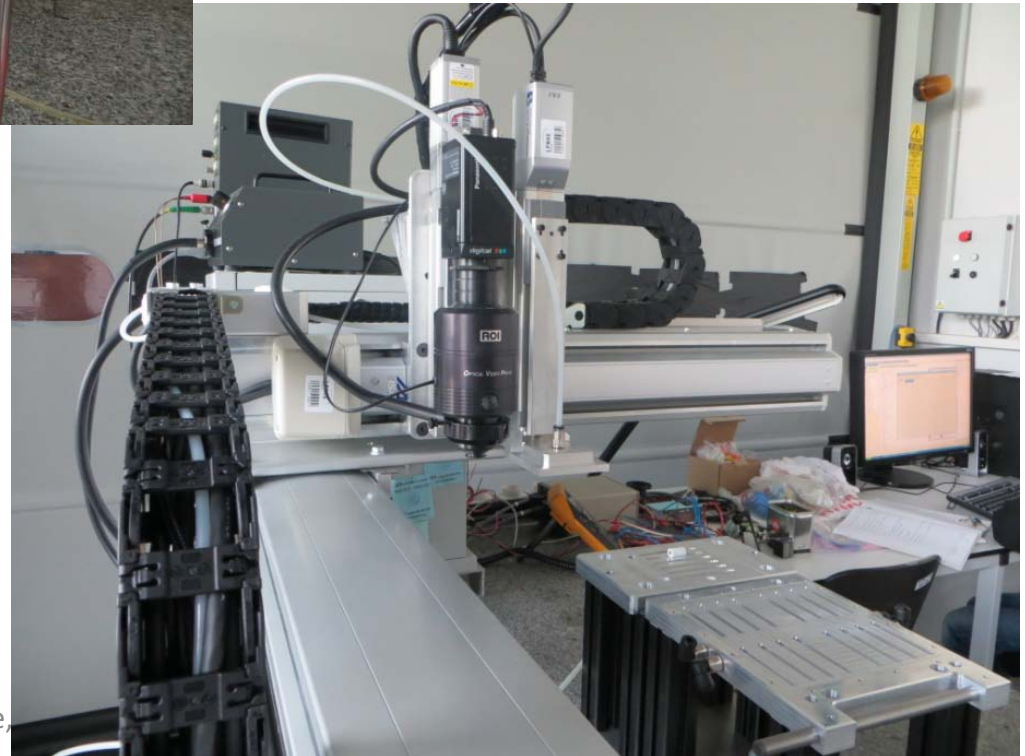


Next steps

- We need to develop the software for automated positioning and alignment
- We plan to combine both gluing and positioning robots
- The robots will be moved and installed in the clean room
- The goal is to glue 4 sensors on the same PCB



Positioning robot



Conclusion

- The automated gluing process is now functional for the beam tests prototypes, reproducible and controlled (for one sensor per PCB).

The next step is to glue 4 sensors on a PCB, using automated positioning

- The quality insurance approach must be continued and improved.

Parameters for gluing

- time of deposit: 0.5 s
- time of shift: <0.5 s
- Pressure of dispenser: 1-2 bar
- Quantity of deposited glue (dot size): 120 μm thick
- Time of polymerization: 24h
- Temperature of polymerization: 40°C
- resistivity after heat polymerization: less than 20 m Ω
- Resistance to strain, peeling and shear stress: checked

- Time for one sensor ~20 minutes
- Predicted time for 4 sensors, using 2 syringes ~40-50 minutes