QUESTIONNAIRE ON HV-CMOS HYBRIDIZATION

List 1: Availability of high accuracy equipment for pairing chips (e.g. flip-chipping machines).

In Genova we have the availability of a manual flip-chip machine: Fineplace 96 die bonder from Finetech.

Even if is not an automatic machine, it has good x-y precision and is a rather simple mechanics that we have customized to apply UV in addition to thermal curing. This is quite practical to study the polymerization of UV and thermal cured glues.

- Additional instruments for the process qualification are:
- Climate chamber: Binder MK-53 (-40 ÷ +180°C)
- Mini Flecto System for Ar / O plasma cleaning.
- Mechanical profilometer KLA-Tencor P7: 8", 1 mm step, Repeatability/reproducibility: 4/15 Å Vertical resolution: 0.01/0.60 Å
- Microscope with 2.1M pixels camera: Keyence VX-8000 with a 25 ÷ 175 x and 100 ÷ 1000 x zoom lenses, several analog microscopes.
- X-ray inspection machine: X-TEK - VTX160 – 2µm resolution

List 2: Known glues/adhesives known/assumed/desirable to test (purpose: maximisation of the AC coupling).

Thermal curing glues:

	Araldite 2011	Araldite 2020	Epotek 301-2	EPOLITE FH-5313
Viscosity [Pas]	30 ÷ 45	0.15	0.22 ÷ 0.45	1.97
Dielectric constant	3.4/3.2/3.2 50Hz/1kHz/10kHz	?	3.8 1kHz	4.06 100Hz
Loss tangent [%]	1.7/1.8/2.6 50Hz/1kHz/10kHz	?	1.2 1kHz	0.1 100Hz
Pot life [min]	100	40÷50	480	30
Curing time [min]	30 @ 60º	90 @ 60º	180 @ 80º	1 @ 65º
Air bubbles	Many	Some	None	Many
Rad-hard	3 MGy	3 MGy	?	
	CERN 2001-006	TOB-NOTE 00.03 (Sep.2000)	Studied for optical properties under limited radiation doses (BaBar)	10 Mrad Test at FNAL Extensively Qualified by SCT

Araldite 2020 and Epotek 301-2 are suitable for the application. Araldite 2011 and Epolite FH-5313 have too high viscosity.

UV / Thermal curing glues:

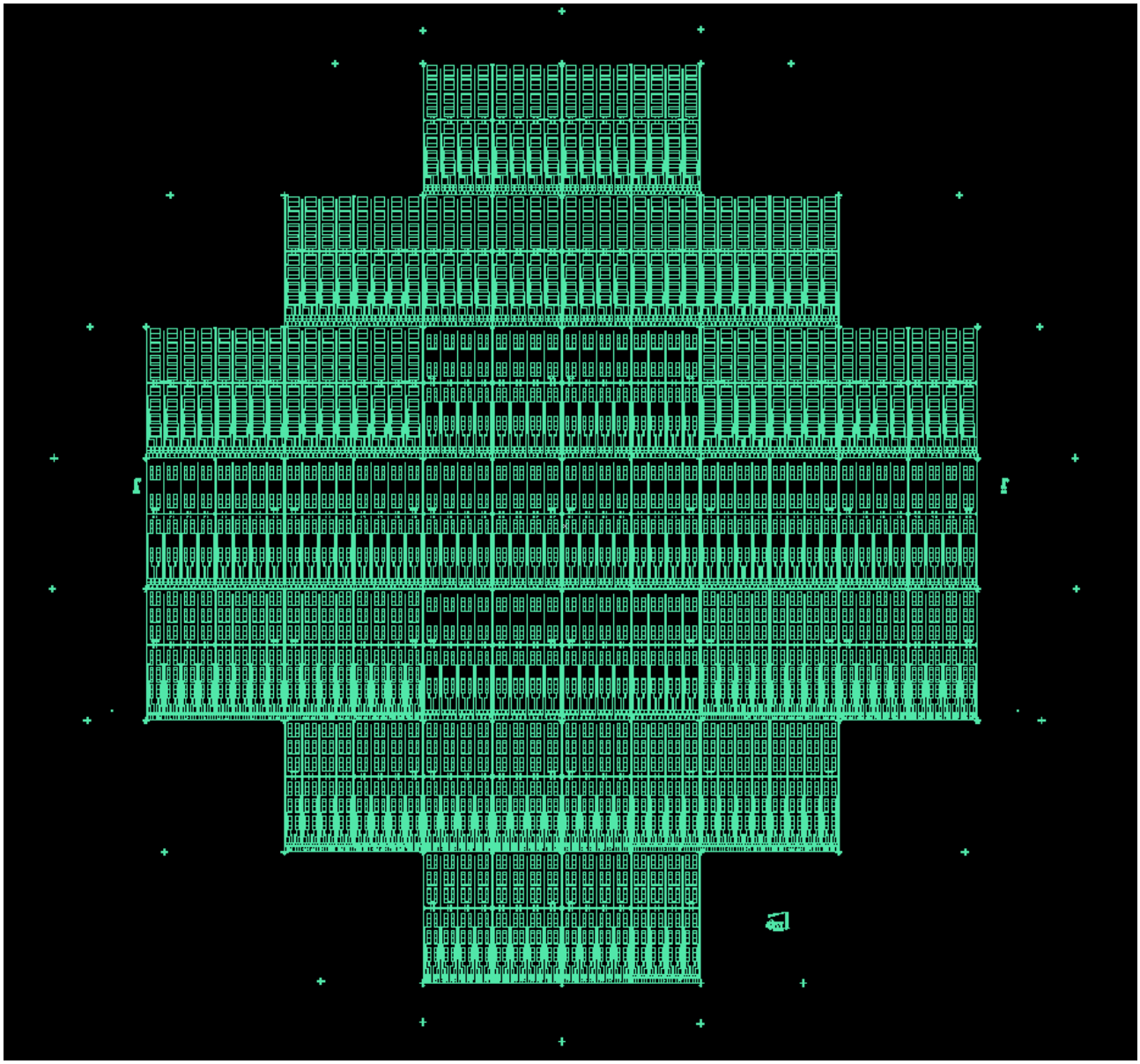
We have found two interesting candidate from Master Bond. We have not tested yet.

- **UV15DC80LV** -> looks interesting. Low viscosity 80ºC curing temperature
- UV15-7DC -> viscosity too high! Curing temperature 125ºC

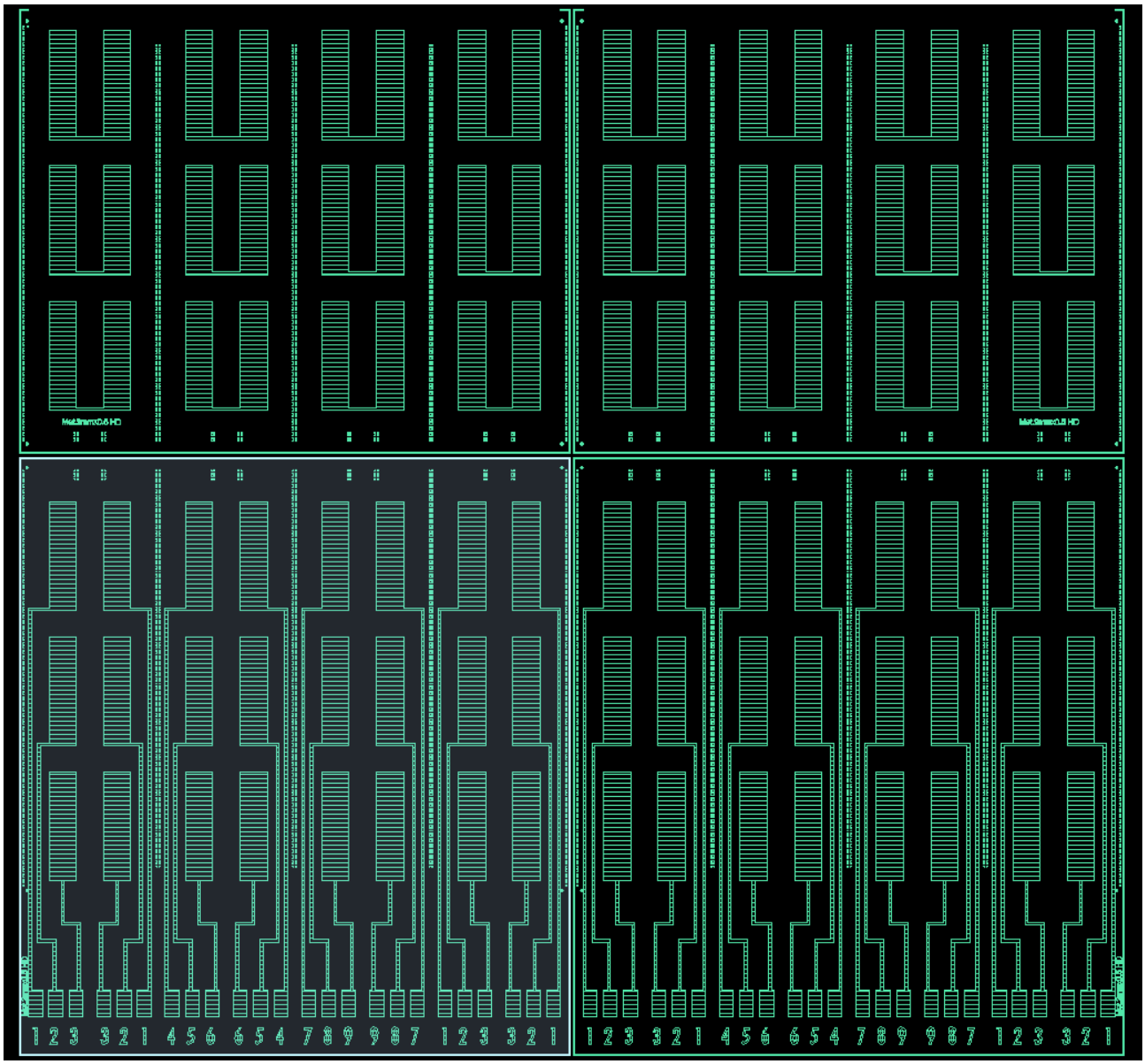
List 3: Available test structures/working chips for the WP6.4 activity (e.g. FBK structures, HV-CMOS chips, etc.).

Dummy wafers (6").

We have produced 6 dummy wafers from FBK with 1 Al metal layer (1.2 µm di Al1%Si). Each wafer has 30 FE-I4 size structures with 16x4 to 24x4 capacitor each device.



Example of a device with 24x4 capacitors is shown below.



Each device can be split into 4 smaller devices with 16 to 24 capacitors each.

We have also a mask to grow pillars on top of the 6” dummy wafers.

Wafers, mask for pillars are at Selex SE in Rome. We are working with them to build 3 to 5 µm high pillars on blank wafers first and then on wafers with metal. We will test gluing in Genova and we can also distribute dummy chip to other sites.

FE-I4

We have a few FR-I4 green and yellow already diced and a full FE-I4 wafer in Genova dedicated to CCPD hybridization.