



Metrology on ELVIA/CIREA PCB

(Following by Saclay's group)

➤ **CONTEXT:**

Saclay ordered 6 PCB to ELVIA PCB Manufacturer .

- 3 PCB 1*0.6 meter
- 3 PCB 2*0.6 meter

➤ **OBJECT**

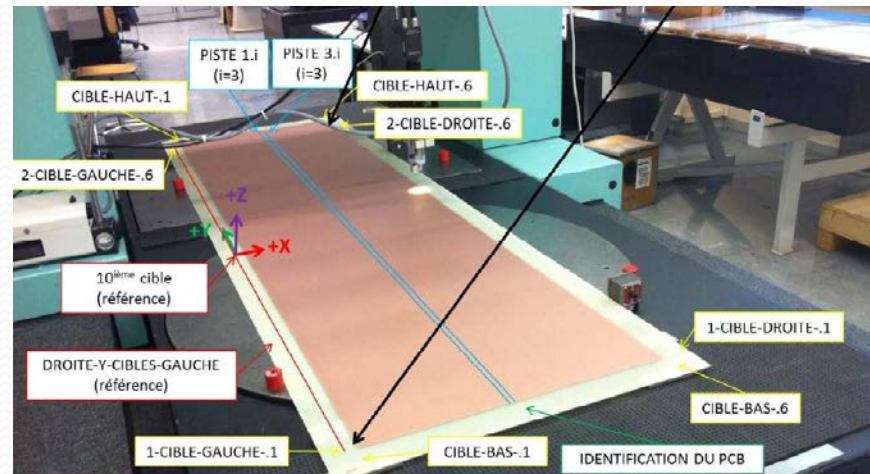
Control the precision of the etching.

➤ **METHOD**

Optical measure at 5/6 microns precision on Olivetti Machine at 19.7 degrees Celsius. (Made by the Metrology lab of CERN)

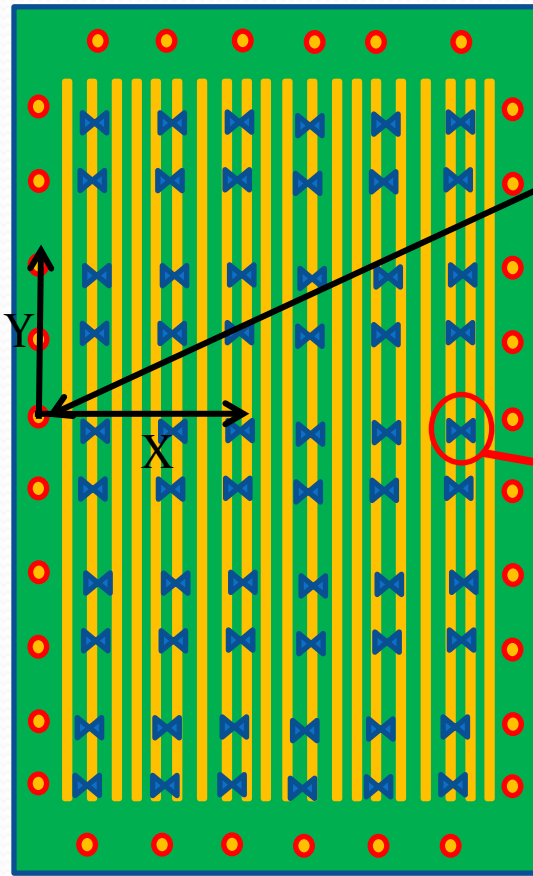
➤ **PARAMETERS**

- Strips width
- Gap between strips
- Pitch
- Rectitude
- Strips positions



HOW MEASURES HAVE BEEN MADE

60 distributed Area



target reference

Measure a

Position 10

Zoom

Position 2

Position 1

Measure c

Measure b

Group 1

Group 6

Measure e

Measure d

For each area 3 neighboring strips have been measured:

Pitch: 2 measures (c - a) and (e - c)

Strip width: 2 measures (b - a) and (d - c)

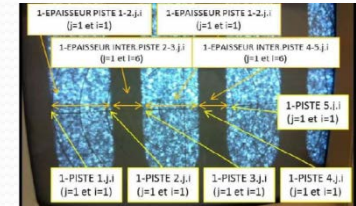
Gap between strips: 2 measures (c - b) and (e - d)

Rectitude:

strip 1: measure a

strip 2: measure c

strip 3: measure e



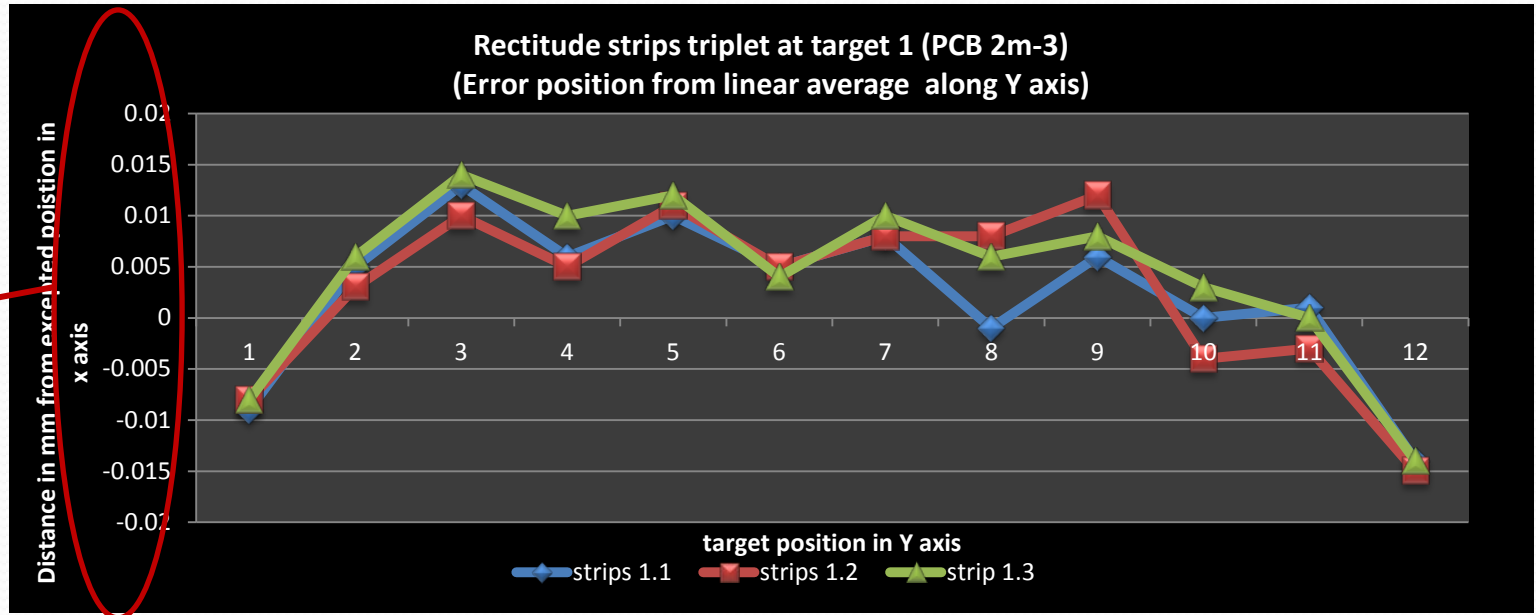
Error of target position relative to target reference to deduce the error of the strips position

Rectitude:

Rectitude follow requirement

(Example of 3 neighboring strip's shape)

Rectitude
+/- 20µm



2 meter

		1 meter			2 meter			
<u>rectitude error</u>	PCB 1	PCB 2	PCB 3	PCB 1	PCB 2	PCB 3	Average	
<i>mimum</i>	12.00	18.00	14.00	18.00	30.00	11.00	17.17	
<i>maximum</i>	31.00	36.00	28.00	37.00	80.00	22.00	39.00	
<i>average</i>	21.00	26.00	20.80	26.50	53.00	16.90	27.37	
<i>standart deviation</i>	5.07	4.94	3.59	4.81	16.70	3.00	6.35	

Expected:
40 µm

Strips size:

Very good precision of the pitch

		1 meter			2 meter			
<u>Pitch</u>	PCB 1	PCB 2	PCB 3	PCB 1	PCB 2	PCB 3	Average	
<i>mimum</i>	390.00	390.00	392.00	392.00	393.00	393.00	391.67	
<i>maximum</i>	408.00	407.00	411.00	410.00	408.00	410.00	409.00	
<i>average</i>	400.00	399.00	400.00	400.00	400.00	400.00	399.83	
<i>standart deviation</i>	4.00	4.00	4.00	3.00	3.00	3.00	3.50	

Expected:
400 µm

		1 meter			2 meter			
<u>Strips width</u>	PCB 1	PCB 2	PCB 3	PCB 1	PCB 2	PCB 3	Average	
<i>mimum</i>	248.00	241.00	248.00	267.00	249.00	242.00	249.17	
<i>maximum</i>	278.00	271.00	280.00	285.00	274.00	274.00	277.00	
<i>average</i>	264.00	257.00	266.00	266.00	260.00	257.00	261.67	
<i>standart deviation</i>	6.00	5.00	6.00	7.00	5.00	6.00	5.83	

Expected:
270 µm

		1 meter			2 meter			
<u>gap strips</u>	PCB 1	PCB 2	PCB 3	PCB 1	PCB 2	PCB 3	Average	
<i>mimum</i>	121.00	132.00	116.00	116.00	127.00	129.00	123.50	
<i>maximum</i>	148.00	154.00	146.00	152.00	151.00	159.00	151.67	
<i>average</i>	135.00	142.00	133.00	133.00	140.00	143.00	137.67	
<i>standart deviation</i>	6.00	5.00	6.00	7.00	5.00	6.00	5.83	

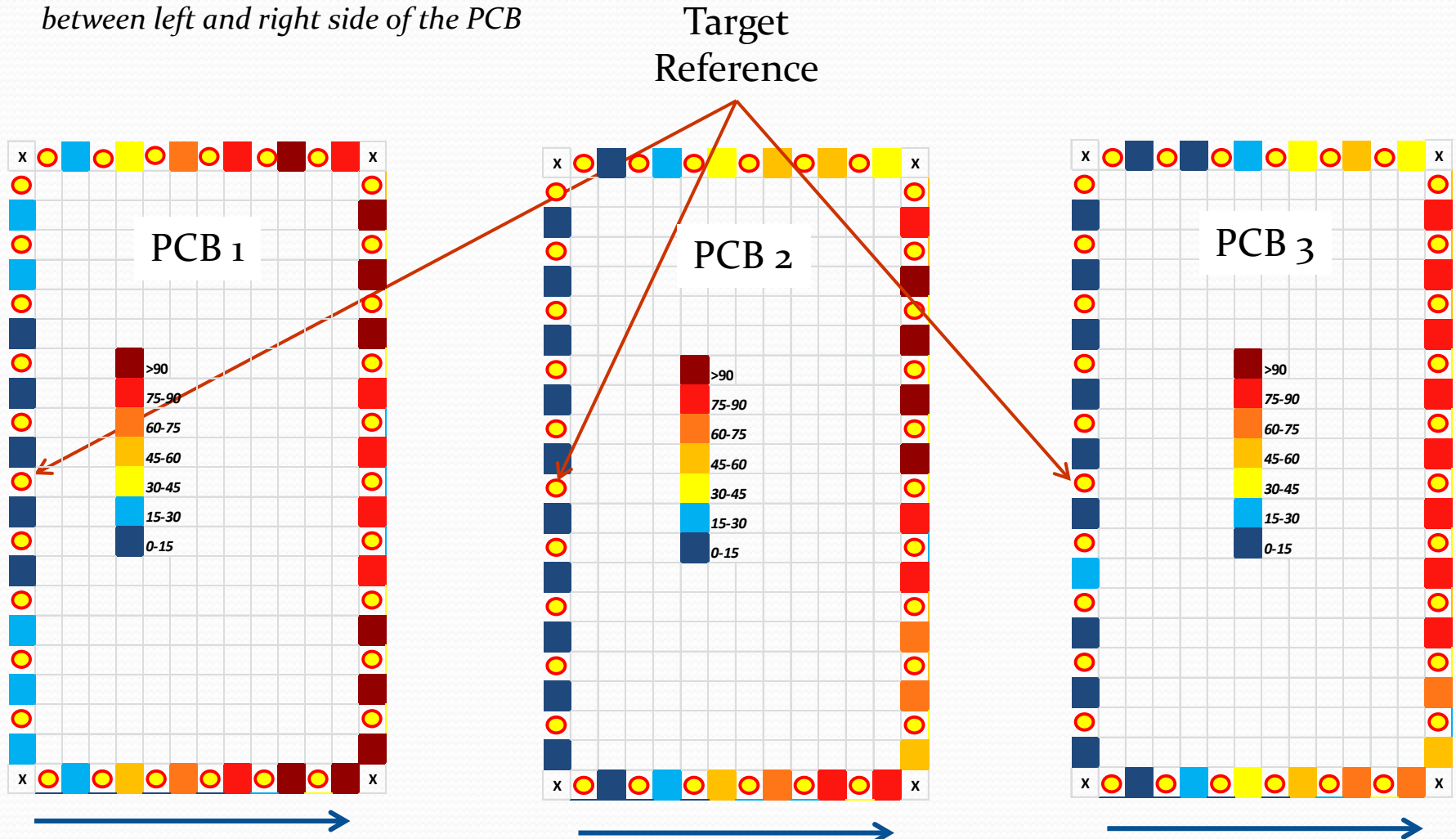
Expected:
130 µm

Strips position (PCB 1m):

Precision of the target position on PCB 1m:

progressive shift of 20 to 100 μm

between left and right side of the PCB

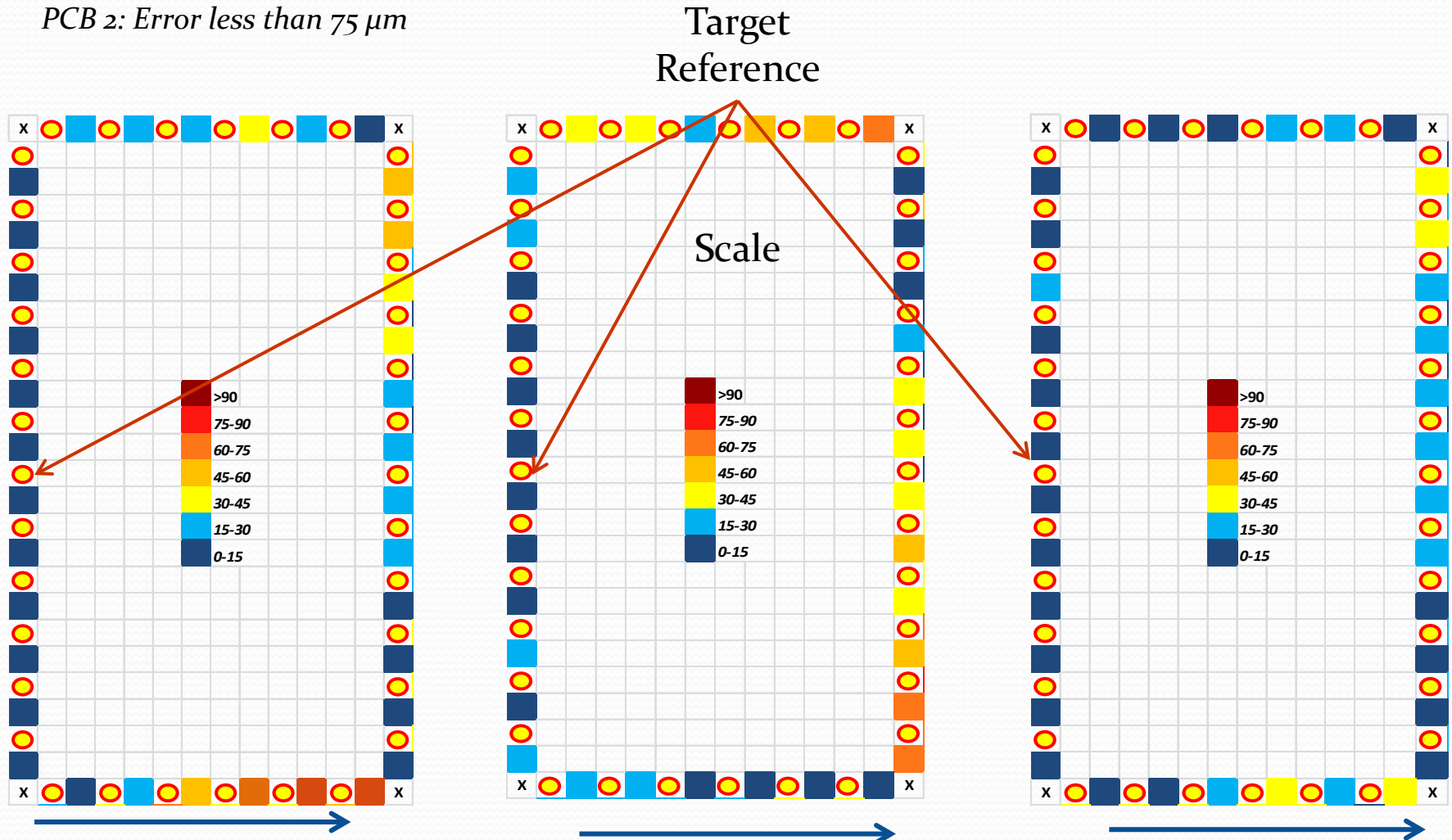


Strips position (PCB 2m):

Precision of the target position on PCB 2m:

PCB 1 & 3: Error less than 45 μm

PCB 2: Error less than 75 μm



Conclusion:

- Pitch and rectitude are very good for a standard process.

Etching process seems very precise and under control.

- Strips positions could be very precise (2m PCB) but could also shown a systematic error.

Pay attention to the printing and/or the storage conditions of the mask to avoid error in the precision of the strips positions.

Thanks for your attention