IHEP PPA Hybrids Metrology

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		PPA Workf	low
	•	hybrid	
	glue 🌰	metro	bonded
PPA_LS1	X-GPC-2104-002-H4	X-GPC-2104-002-H4	X-GPC-2104-002-H4
DD4 004	X-GPC-2104-002-B-H0	X-GPC-2104-002-B-H0	X-GPC-2104-002-B-H0
PPA_551	Y-GPC-2105-002-C-H4	Y-GPC-2105-002-C-H4	Y-GPC-2105-002-C-H4
224 000	X-GPC-2104-002-B-H2	X-GPC-2104-002-B-H2	X-GPC-2104-002-B-H2
PPA_552	Y-GPC-2105-002-C-H2	Y-GPC-2105-002-C-H2	Y-GPC-2105-002-C-H2

• 5 hybrids so far. 3X and 2Y.

• Here 5 IHEP hybrids + swapped hybrids results shown.

Requirement for hybrid metrology



- Z height:
- Glue height (chip-hybrid)
 - Nominal 120; Tolerance: 80-160um;
- Total package height
 - Nominal 800; Tolerance: 760-840um;
 - Tolerance is large so usually pass;

• XY Position:

The chip position over hybrid fiducials: $\Delta X, Y < 100um$.

In our current assembly, Usually several positions beyond the limit.

Swap Hybrid GPC1938_X_008_A_H3



For repeatability test, we measured this hybrid twice. 2 results are consistent to each other.



Chip Tilt







The tilt range is smaller than 0.025. All the results can pass this test.

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Position XY



The swap hybrid shows very good agreement in XY position.



Our script will out put 7 plots. For simplicity, 2 z plots and xy plots will be shown in the following.

IHEP-X-0012, GPC-2104-002-H4



Hybrid on PPA_LS1. Glue height~100um indicates the glue come out.



IHEP-X-0012, GPC-2104-002-H4

Now, IHEP hybrids perform good on X position but bad on Y position.

For one chip, the left and right y difference in 80um, with 0.8cm x distance. As the slope 1%, it's large, but difficult to recognize by eye.



IHEP-X-0013, GPC-2104-002-H0



X Hybrid on PPA_SS1.

Same 100um glue height, same shape for package height. Package height do not consider hybrid plane. So it's totally due to the hybrid pickup tool.





IHEP-X-0013, GPC-2104-002-H0



X Hybrid on PPA_SS1. One y position failed.



IHEP-X-0015, GPC-2104-002-H2



X Hybrid on PPA_SS2.

Same 100um glue height, same shape for package height. Xiyuan reported that she saw serious glue come out for this hybrid. But in metrology it's in the limit.



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IHEP-X-0015, GPC-2104-002-H2



So far so good. (Good news!)

But difficult to keep this result and avoid the bad y alignment.



Database

- Database need json file.
- Thanks Shudong to fix the script.
- One typical metrology result in database like:
 - With the raw file uploaded.

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$GPC2105_Y_002_C_H4$

Y Hybrid on PPA_SS1. Twice. Y pickup tools very buggy.



CEPC

GPC2105_Y_002_C_H4

Y Hybrid on PPA_SS1.





Kaili

$GPC2105_Y_002_C_H2$

CEPC

Y Hybrid on PPA_SS2.



$GPC2105_Y_002_C_H2$

CEPC

Y Hybrid on PPA_SS2.





X hybrid pickup tool is not calibrated very well. Package height, the absolute height for chip surface shows pattern. All glue for x hybrid is ~100um, and several glue come out.



Hint:

Serious issue for y pickup tool. Glue very insufficient. Difference shape for total package height ->Relate to assembly technique.



