

Barrel Hybrid Production

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KEK

Production status

- Produced Hybrids
- Recent problems
- Gold and PA pads contamination
- PA bondability tests
- Pitch-adapter production

Produced hybrids

- From Seiko-Precision - ~1900
- Delivered to Sites: 1529

Site	Deliv'd	OldPA	#??	#26	#27	#28	#29	#30	#35	#36	#54	#59	#60	#61	#62	#63	#64	#65
Japan: 744	166	129	1	-	6	28	46	30	30	52	-	17	37	1	?	?	?	
Nordic: 95	6	5	2.5	6.5	8	4	25	15	6	-	2	-	-	-	12	-	-	
UK: 360	39	39	-	-	14	5	16	28	16	8	4	8	-	-	42	50	54	
US: 330	32	18	-	-	16	9	32	45	62	41	-	8	8	-	16	51	69	

(no perfect counting)

Produced hybrids (cont'd)

- HOLD: 392

Old PA	122	Whiskers
Lot#29	44	White PA, too soft metalization?
Lot#31	7	Seemed good but weak peel
Lot#55	104	Improvement in metalization failed
Lot#61-65	115	#61-Whiskers, #63-64 & 65 - Ar plasma cleaning on PA turned out no good

- These pitch-adapter(PA)'s are to be replaced

Recent problems

- Gold and PA pads contamination
 - In the recent lot#64/65 deliveries, worse bondability on gold pads in hybrids were reported.
 - Reported more often cleaning of wedge in bonding gold pads in the US
 - Color of gold pads more orange than yellow
 - Contamination on PA of the hybrids also observed
 - Also, bad bondability at UCSC while bondable at LBL on PA

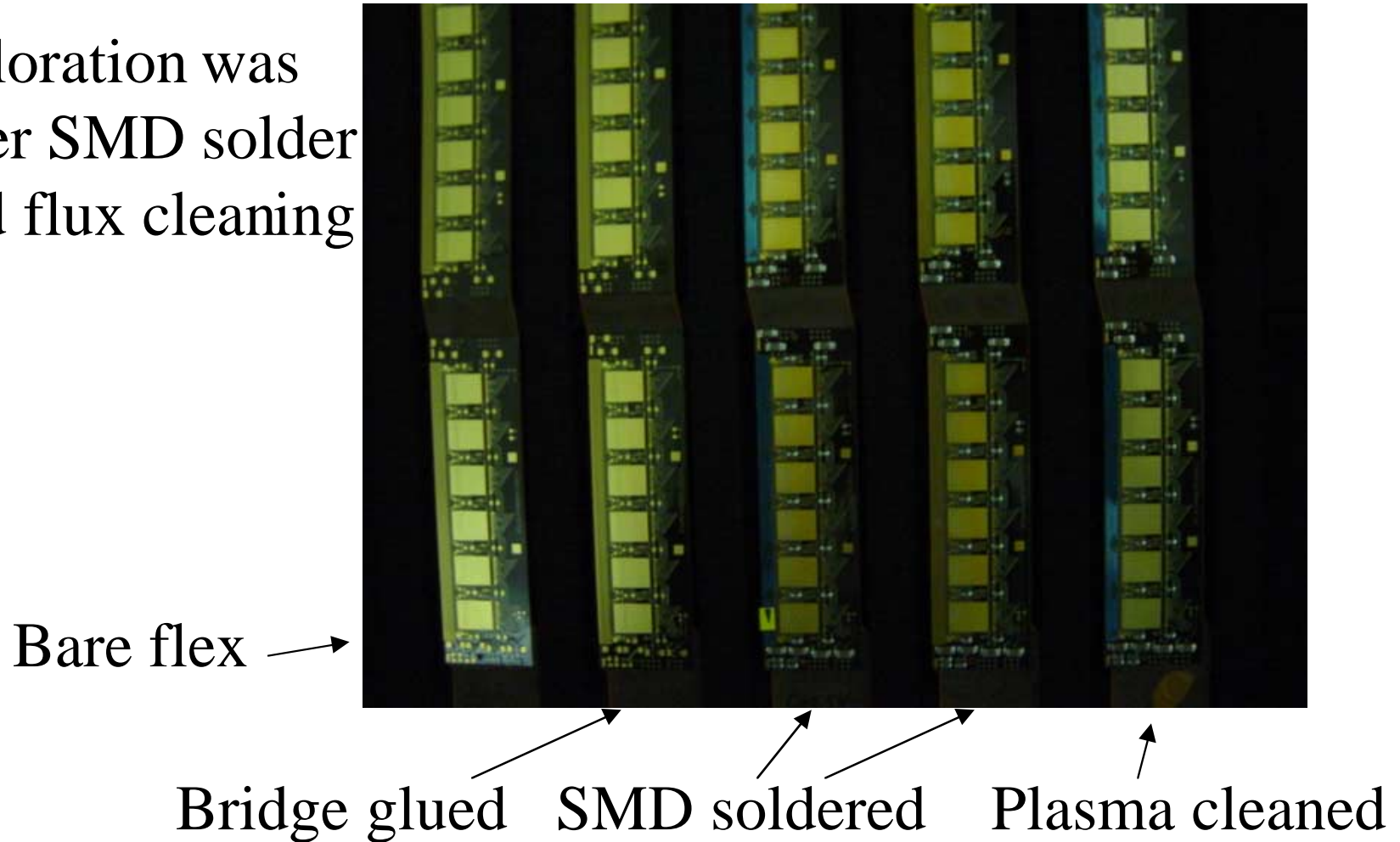
Gold and PA pads contamination

- Gold pads color difference (LBL)
- PA pads contamination in the same hybrid



Gold and PA pads contamination

- Coloration was after SMD solder and flux cleaning



Analysis of gold pad contamination

- SEM 10kV analysis
 - C and O were observed, but no Cu, Ni, and Ag
- Metal thickness analysis (Fluorescent X-ray)

	#1	#2	#3	#4	#5	Design [um]
Au	0.39	0.37	0.34	0.32	0.35	0.3~0.6
Ni	4.36	5.39	5.10	5.05	4.90	4~6

- Bond strength acceleration test (100C, 72 hr, Air)
 - Plasma cleaned, 20 bonds at 12 pads, 3 samples
 - Pull tests: 120 before and 120 after in each sample
 - All heel-breaks, After-Before delta-pull < -0.6 g

Gold pad contamination

- No faulty Ni plating
 - If faulty Ni plating, Cu migration may deteriorate bonds in long term
- Most plausible source is residue of adhesive
 - of protection film during the bridge-flex gluing
 - which absorbed solder flux water and colored or absorbed colored flux water in the cleaning bath (accidentally contaminated)

Gold pad contamination (cont'd)

- Argon plasma cleaning
 - The contamination is easily removed with a short time application of Argon plasma cleaning
 - Unfortunately, plasma cleaning of PA showed detrimental effect on the PA bondability
 - In future shipments, hybrid surface will be plasma cleaned with PA covered.
 - PA cover will be removed and alcohol wipe-cleaning when contamination is observed. No PA cover in the shipping

Recent problems (cont'd)

- Bondability tests of PA samples
 - In advance of real hybrid delivery, samples of PA's were sent to sites for bondability test
 - Samples included a baseline (thinner) and a thicker metalization (but this confused the tests)
 - Baseline one was acceptable and a thicker metalization was at the edge of bondability in Japan
 - Bondability degraded as lot advances, Lot#64 > #65 > #67

PA bondability tests

- Lot#65 PA samples

Site	baseline	thicker
Birmingham	OK, minor "end" whiskers	OK, minor "end" whiskers
RAL	Good	No stick
RAL (another #65 samples)	Good	-
UCSC	12.3g, OK	12g, higher power

- Lot#67 PA samples

Birmingham	better, >50% peel	worse, >50% peel
UCSC	OK, (almost) no whisker, no peel higher power	bad, whiskers higher power

PA bondability tests

- Lot#BS PA sample

Birmingham

OK, minor whiskers

UCSC

higher power, a few peels, fine whiskers

Japan

higher power, splash of metal debris

Pitch-adapter production

- Continue selection of PA glasses
 - About 50 glasses in stock in lots of 65, 66, 67, 68
 - Finer sampling (I.e. one sample from one glass)
 - 20 PA's in a glass: if ~20% yield, still ~100 hybrids
- Search for new metalization company
 - Two vendors in Japan
 - One vendor in the US
 - IMB-CNM: endcap vendor

Delivery expectation

- Selection of glasses
 - 1st round was lost (plasma cleaned)
 - 2nd round was shipped (to Birmingham), ~1.5 week for transport and evaluation, ~1.5 week for attaching and delivery if acceptable glasses: ~3 weeks
- New metalization
 - IMB glasses (10 glasses) delivered
 - One Japanese vendor glasses delivered
 - ~1 week, test samples will be shipped. If good, then ~3 weeks: ~4 weeks

Summary

- More than 50% of hybrids are delivered
- Hybrid production is suffering from problems: bondability of PA metalization and recently gold pad contamination
- Gold pad contamination is cleanable with Ar plasma cleaning
- New PA metalization has to be found and the delivery of hybrids depends on the availability of good metalization