FST Module Assembly Status

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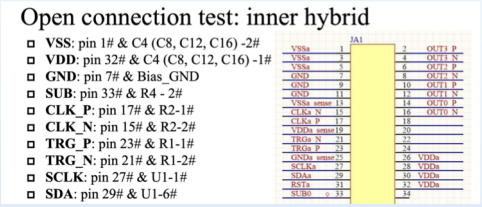
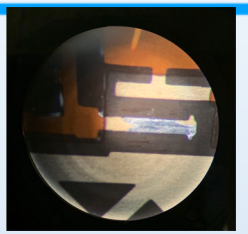
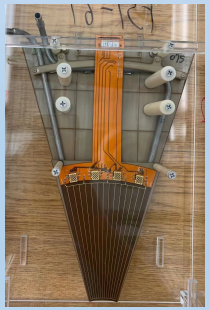
Procedure





- 1)Inspect the bare modules. --Check open and short connection.
  --Check if the solder is on wire-bonding pads.
- 2)Send modules for APV mounting and wire-bonding.
- 3)Check if the wires are broken and floating, short connection between VSS & GND, VDD & GND, SUB & GND, and SUB & VSS, and then make APV RO test and record the current when HV at 180V.
- 4)Check if the wires are broken, and then send modules for one side sensor mounting and wire-bonding.
- 5)Check if the wires are broken and floating, and then make sensor RO test and record the current.
- 6)Check if the wires are broken, and then send modules for another side sensor mounting and wire-bonding.
- 7)Check if the wires are broken and floating, and then make sensor RO test and record the current.
- 8)Check if the wires are broken, and then send modules for encapsulation.
- 9)Make sensor RO test and record the current.

1



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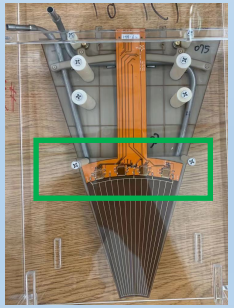
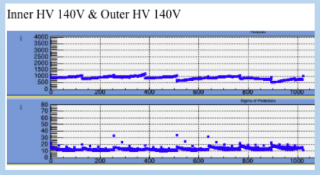


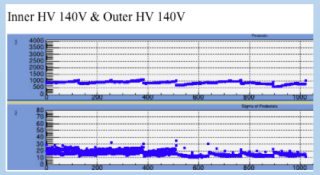
3



HV (V)	0	35	70	105	140	180
I (inner)	-0.02nA	-0.02nA	-0.02nA	0.02nA	0.03nA	0.05nA
I (outer)	0.02nA	14nA	26nA	41nA	60nA	93nA

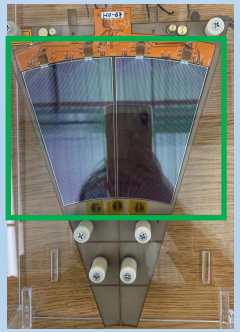
4

5



HV (V)	0	35	70	105	140
I	-0.39nA	43nA	68nA	92nA	105nA

6



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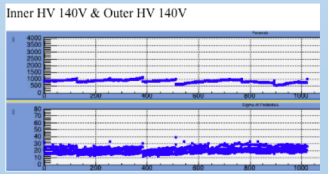
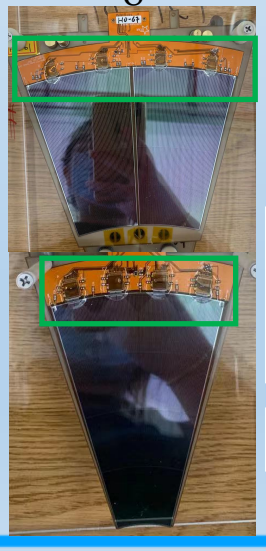


HV (V)	0	35	70	105	140
I	0.06nA	100nA	162nA	0.23μA	0.28μA

8



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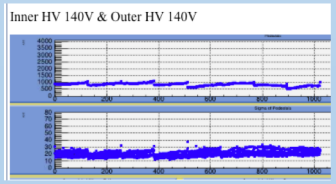
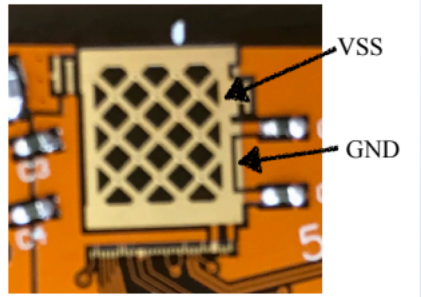


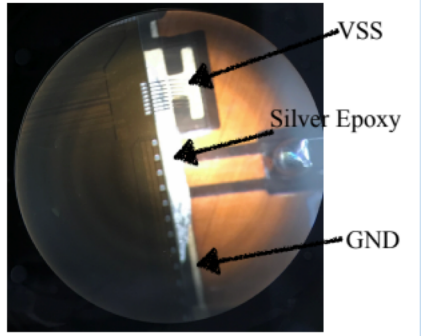
HV (V)	0	35	70	105	140
I (inner)	-0.44nA	43nA	71nA	94nA	107nA
I (outer)	0.04nA	90nA	151nA	0.21μA	0.26μA

If there are broken and floating wires, modules need to be repaired and then retest.

Issues

- 1)Short connection for GND and VSS due to overflow silver epoxy (In the initial phase of assembly).
  --The GND is exposed due to the limitation of the hybrid manufacture process.
  --The epoxy will short the VSS and GND if overflowed to the exposed GND.
  --Fermilab technician removes the copper layer of GND before APV Chips mounting for all modules.
- 2)Current issue (above the 2 uA limit set for the HV module) -> still under investigation.





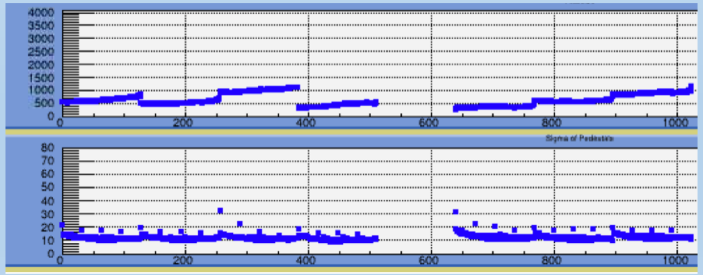
HV (V)	0	5	10	15	20	25
I	-0.52nA	181nA	0.48μA	0.91μA	1.46μA	2.10μA

such as
FST-38 outer sensor

HV (V)	0	35	70	105	140
I (inner)	-0.44nA	50nA	80nA	107nA	121nA
I (outer)	0.04nA	91nA	157nA	0.22μA	0.27μA

Good module:FST-27

- 3)APV RO issue -> still under investigation.
  -- Miss RO for one chip.



--No RO.

FST Module Assembly Status

Module ID	Assembly ID	APV RO test	Inner sensor RO test	Outer sensor RO test	Encapsulation
FST-33, 24, 34 30, 51, 22, 39, 28, 37, 54, 43, 55, 27, 41, 42, 53, 17, 48, 47, 50, FST-18, 56, 61, 62, 63, 64, 65, 66, 75	#2, #4, #7, #9, #13, #23, #24, #1, #12, #14, #25, #26, #28, #15, #16, #18, #27, #19, #20, #22, #5, #29, #32, #33, #34, #35, #36, #37, #49	✓	✓	✓	✓(29)
FST-31	#6	✓	✓	✓	Ready for (1)
FST-72, 67, 68, 69, 70, 52, 76, 77	#38, #39, #40, #41, #42, #44, #45, #46	✓	Waiting for mounting and wire-bonding	Waiting for mounting and wire-bonding	
FST-45	#17	✓	✓ Current is higher than other modules	✓	
FST-35, 38, 36	#8, #11, #21	✓	✓	Current issue	
FST-21	#3	APV 5 missing			
FST-09	#10	No readout of pedestal and noise. No readout of temperature sensors.			
FST-58	#30	Cooling tube issue			

❖ Can be found at: https://docs.google.com/spreadsheets/d/19tY033m6t7pgXE2SQvp0y7JkOrQxoX83sqp4oHj9cOE/edit?ts=600c973e#gid=0

Plan

- Need to take 2~3 weeks to finish the assembly of all rest modules.