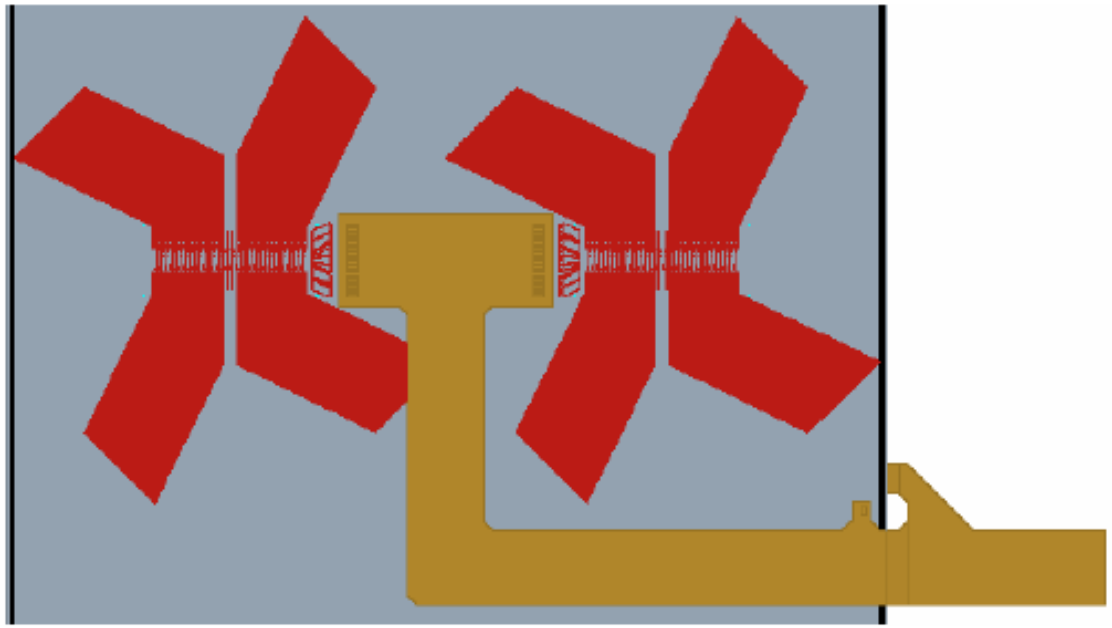
SiD Pigtail Cable Design

Sally Seidel for Martin Hoeferkamp
U. of New Mexico
16 Nov 2010

Introduction

- Low-mass readout cables connect tracker modules to the concentrator boards mounted at the ends of each barrel.



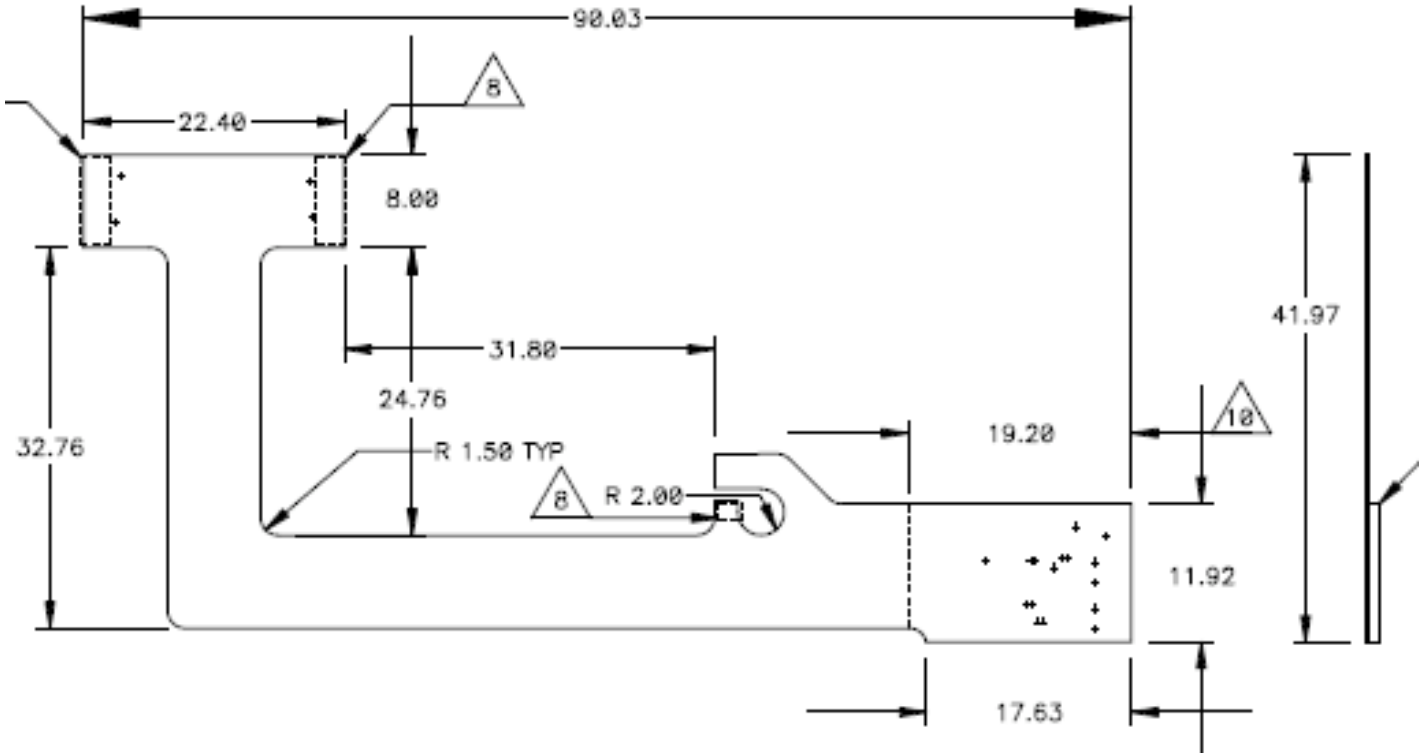
- This cable has two components:
  - Pigtail, a short cable glued to the module
  - Extension, a long cable connecting the Pigtail to the concentrator

Pigtail Cable Specifications

- Connectivity: Detector end connected with wirebonds,
  Extension cable end has a connector,
  HV Bias tabs at sensor edge
- Traces: two pair for Analog & Digital Power
- Traces: one pair for High Voltage Bias
- Traces: 16 traces for Digital Control and Readout
- Metallization: Gold plating on wirebond pads only
- Filtering: of KPIX and HV Bias on the Pigtail Cable
- Signals: Digital signals are LVDS (low voltage differential signaling)

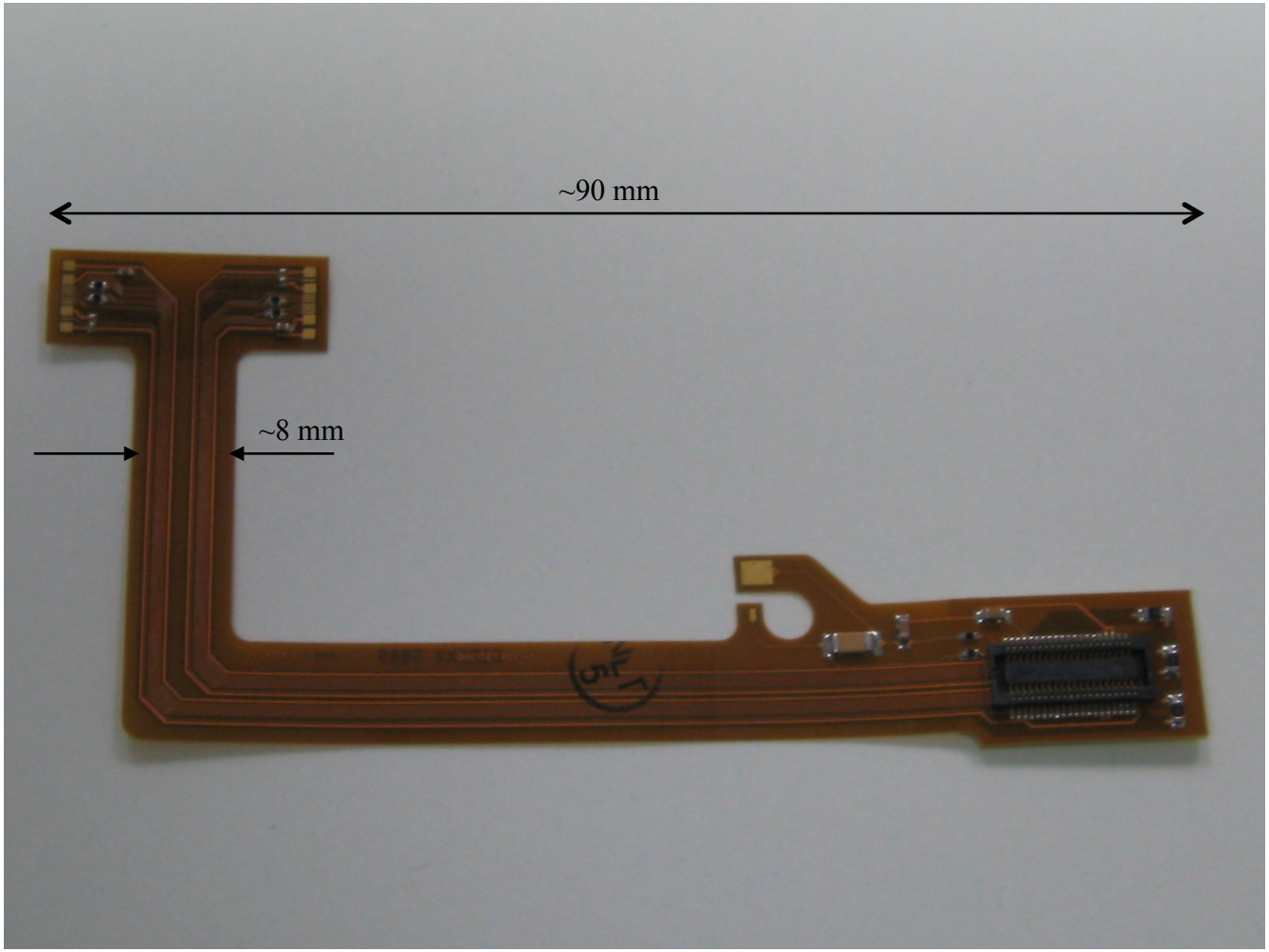
Dimensions

- Length: ~ 90 mm, Width: ~ 8 mm, Thickness: ~ 170 mm



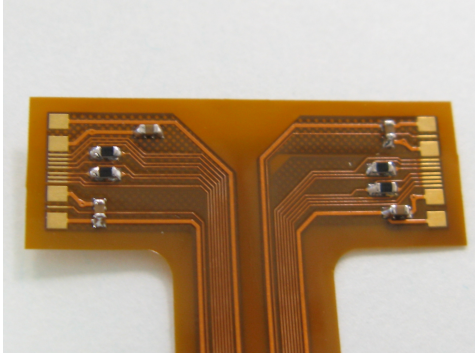
Dimensions

- Length: ~ 90 mm, Width: ~ 8 mm, Thickness: ~ 170 mm

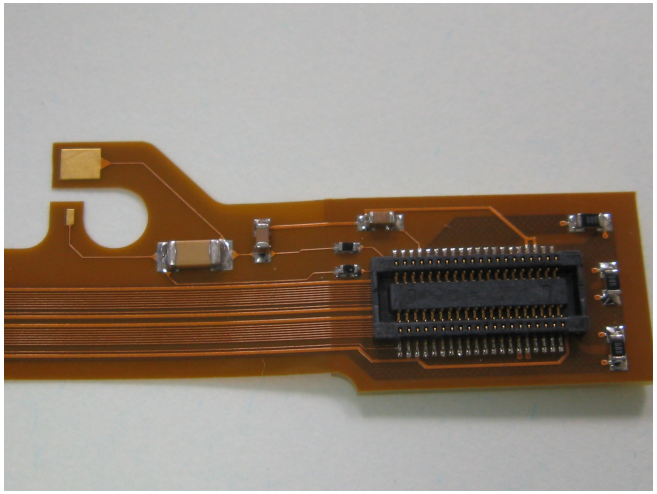


Connectivity

- Detector end connected w/wirebonds, cable has gold plated pads

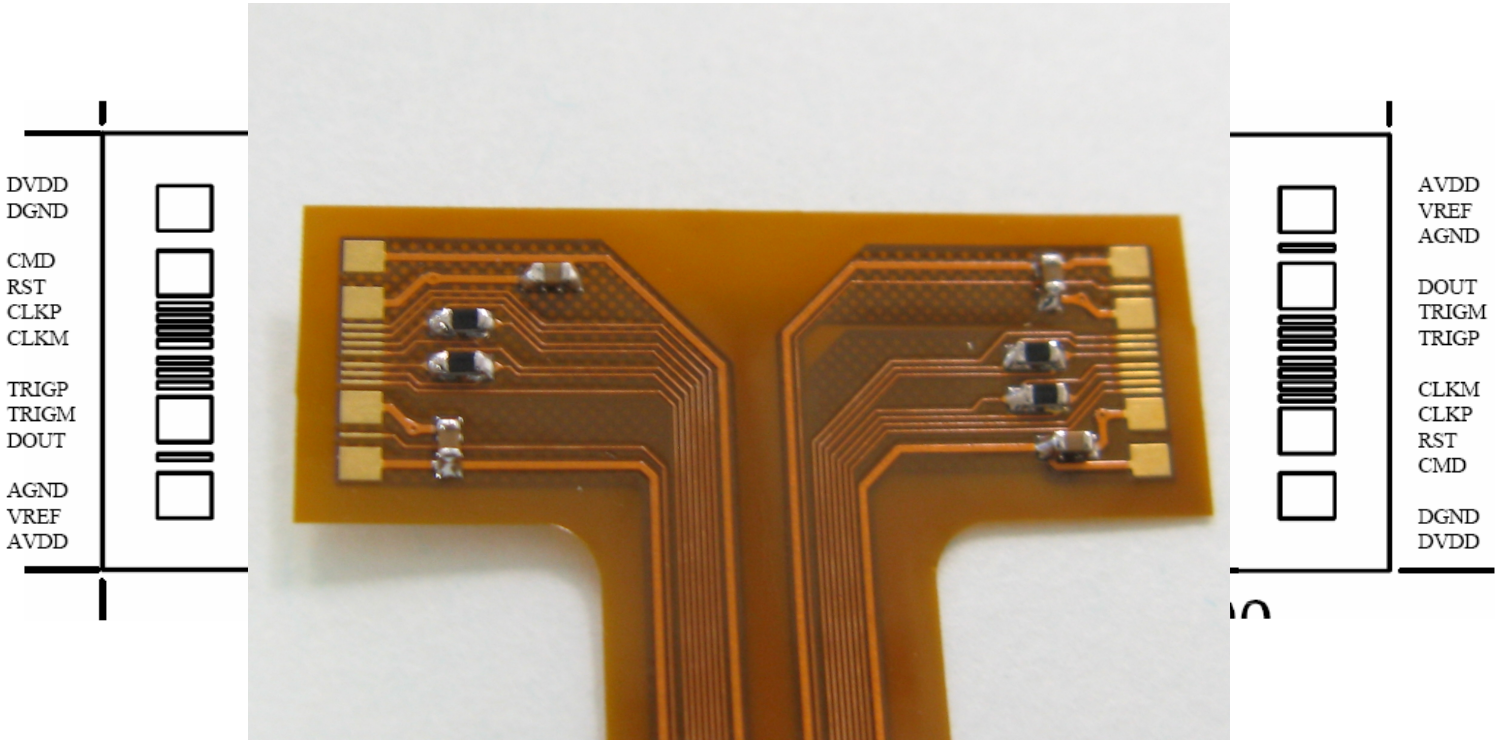


- HV Bias tabs at sensor edge have gold plated pads
- Connector to Extension cable (Molex)



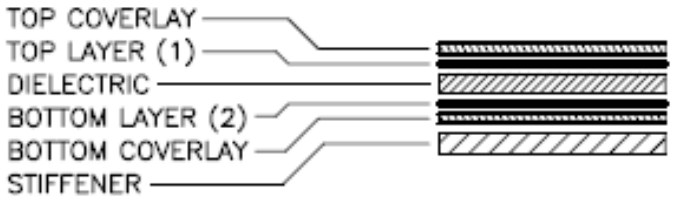
Wirebond Pads

- Pads & Traces: two pair for Analog and Digital Power
- Pads & Traces: eight for Digital Control and Readout

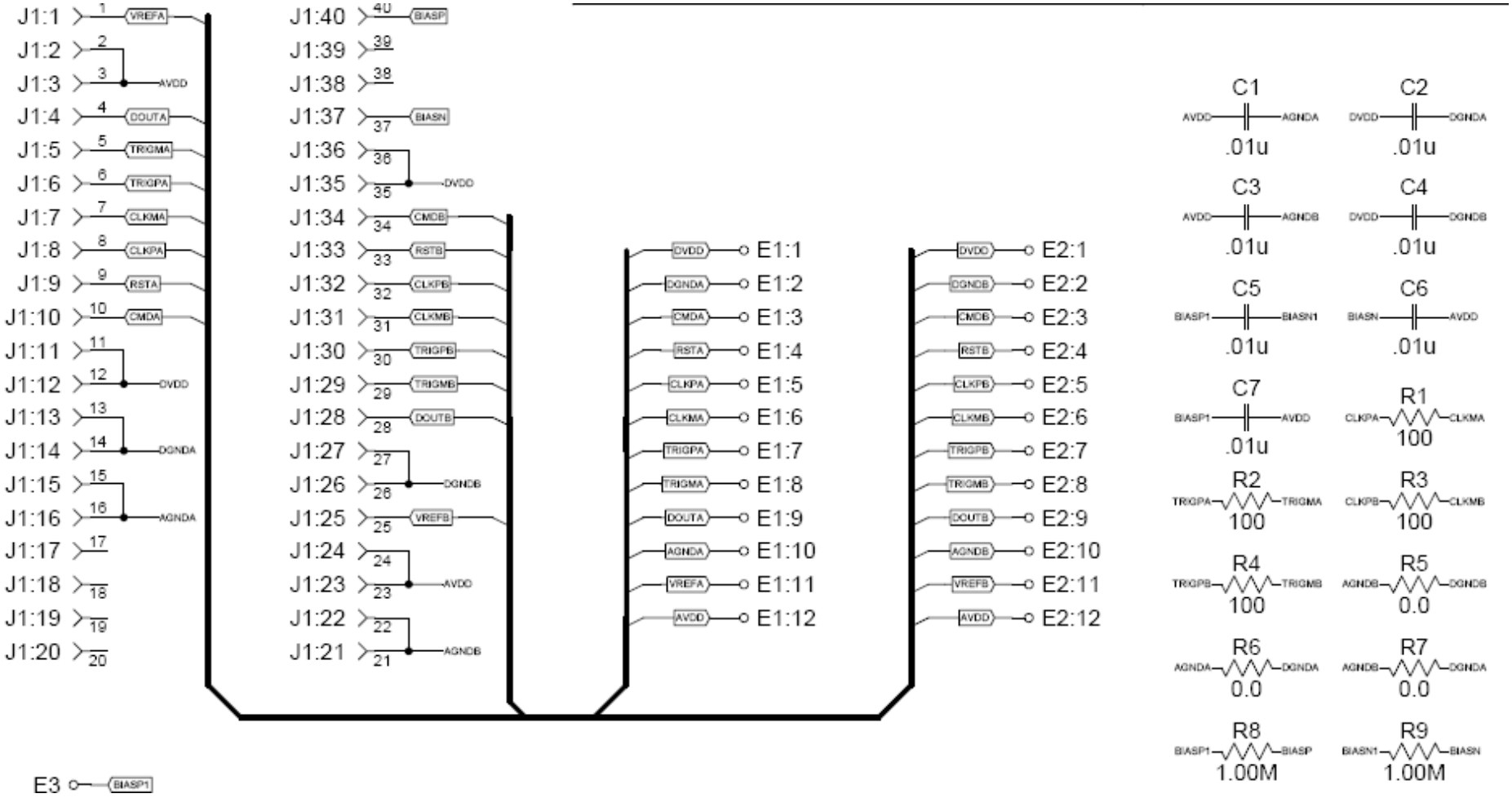


Layers

- Double-sided design
- Top and Bottom have coverlay 38 mm thick, to protect the exposed traces.
- Top side has all signal and power traces
- Bottom side has DGND plane
- Stiffener is 1 mm thk FR-4

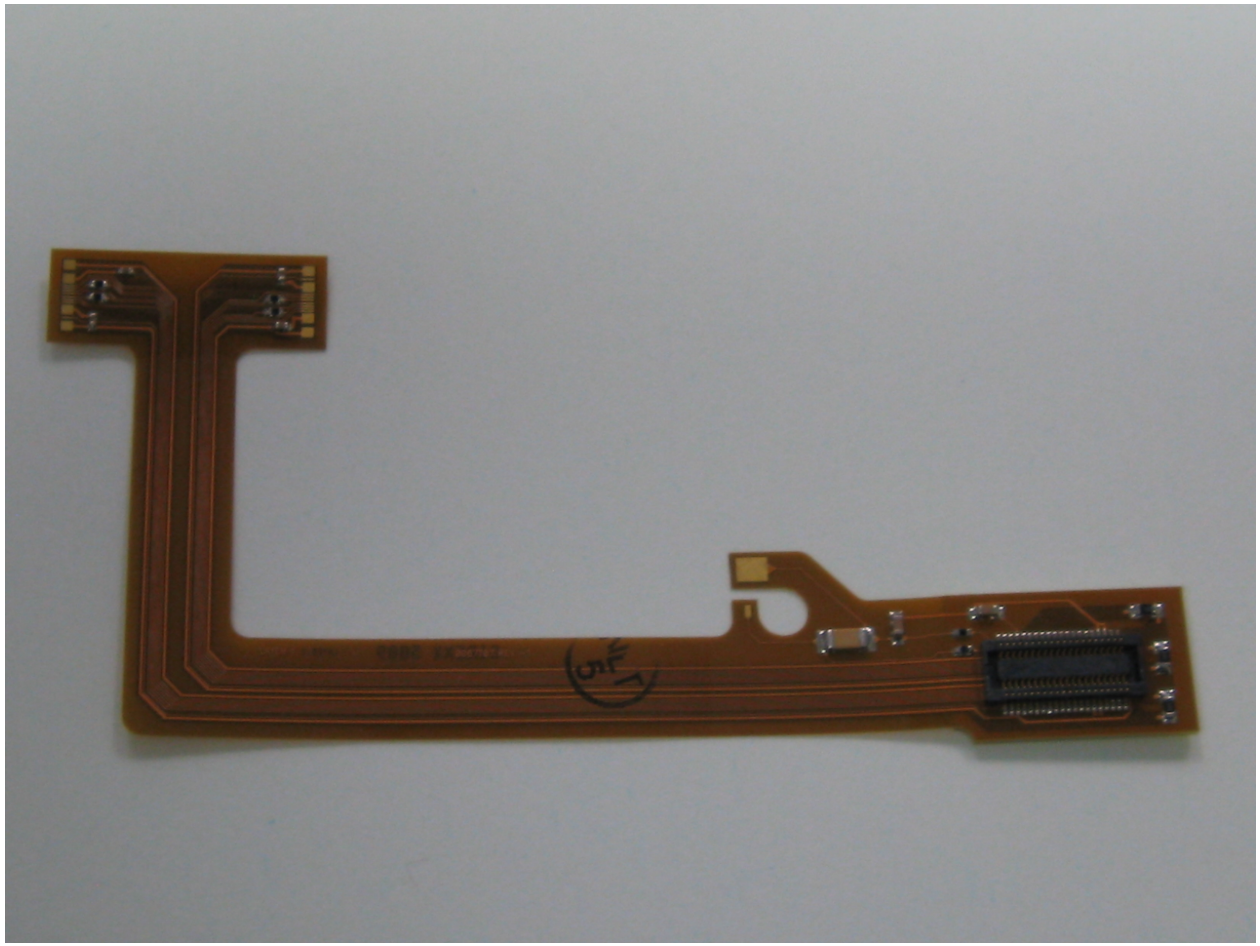


Schematic


J1:1 1 VREFA
J1:2 2
J1:3 3 AVDD
J1:4 4 DOUTA
J1:5 5 TRIGMA
J1:6 6 TRIGPA
J1:7 7 CLKMA
J1:8 8 CLKPA
J1:9 9 RSTA
J1:10 10 CMDA
J1:11 11
J1:12 12 DVDD
J1:13 13
J1:14 14 DGNDA
J1:15 15
J1:16 16 AGNDA
J1:17 17
J1:18 18
J1:19 19
J1:20 20
J1:40 40 BIASP
J1:39 39
J1:38 38
J1:37 37 BIASN
J1:36 36
J1:35 35 DVDD
J1:34 34 CMDB
J1:33 33 RSTB
J1:32 32 CLKPB
J1:31 31 CLKMB
J1:30 30 TRIGPB
J1:29 29 TRIGMB
J1:28 28 DOUTB
J1:27 27
J1:26 26 DGNDB
J1:25 25 VREFB
J1:24 24
J1:23 23 AVDD
J1:22 22
J1:21 21 AGNDB
DVDD E1:1
DGNDA E1:2
CMDA E1:3
RSTA E1:4
CLKPA E1:5
CLKMA E1:6
TRIGPA E1:7
TRIGMA E1:8
DOUTA E1:9
AGNDA E1:10
VREFA E1:11
AVDD E1:12
DVDD E2:1
DGNDB E2:2
CMDB E2:3
RSTB E2:4
CLKPB E2:5
CLKMB E2:6
TRIGPB E2:7
TRIGMB E2:8
DOUTB E2:9
AGNDB E2:10
VREFB E2:11
AVDD E2:12
E3 BIASP1
C1 AVDD AGNDA .01u
C2 DVDD DGNDA .01u
C3 AVDD AGNDB .01u
C4 DVDD DGNDB .01u
C5 BIASP1 BIASN1 .01u
C6 BIASN AVDD .01u
C7 BIASP1 AVDD .01u
R1 CLKPA CLKMA 100
R2 TRIGPA TRIGMA 100
R3 CLKPB CLKMB 100
R4 TRIGPB TRIGMB 100
R5 AGNDB DGNDB 0.0
R6 AGNDA DGNDA 0.0
R7 AGNDB DGNDA 0.0
R8 BIASP1 BIASP 1.00M
R9 BIASN1 BIASN 1.00M

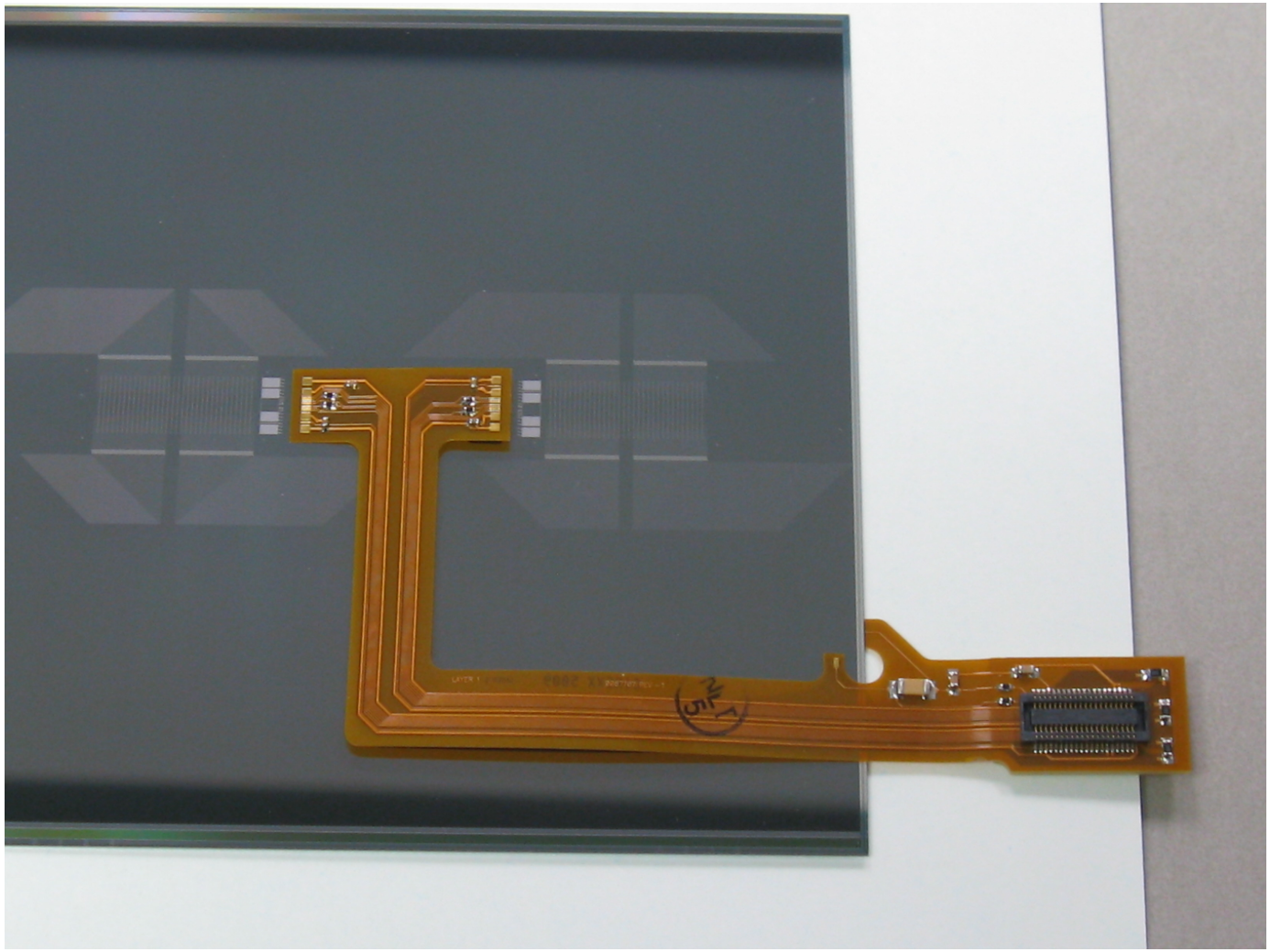
Manufacturing & Assembly

- 10 cables were manufactured at Cirexx for $210.00/ea (thanks to Marcel)
- The parts were soldered on at FNAL with no problems (thanks to Marcel and Johnny Green)



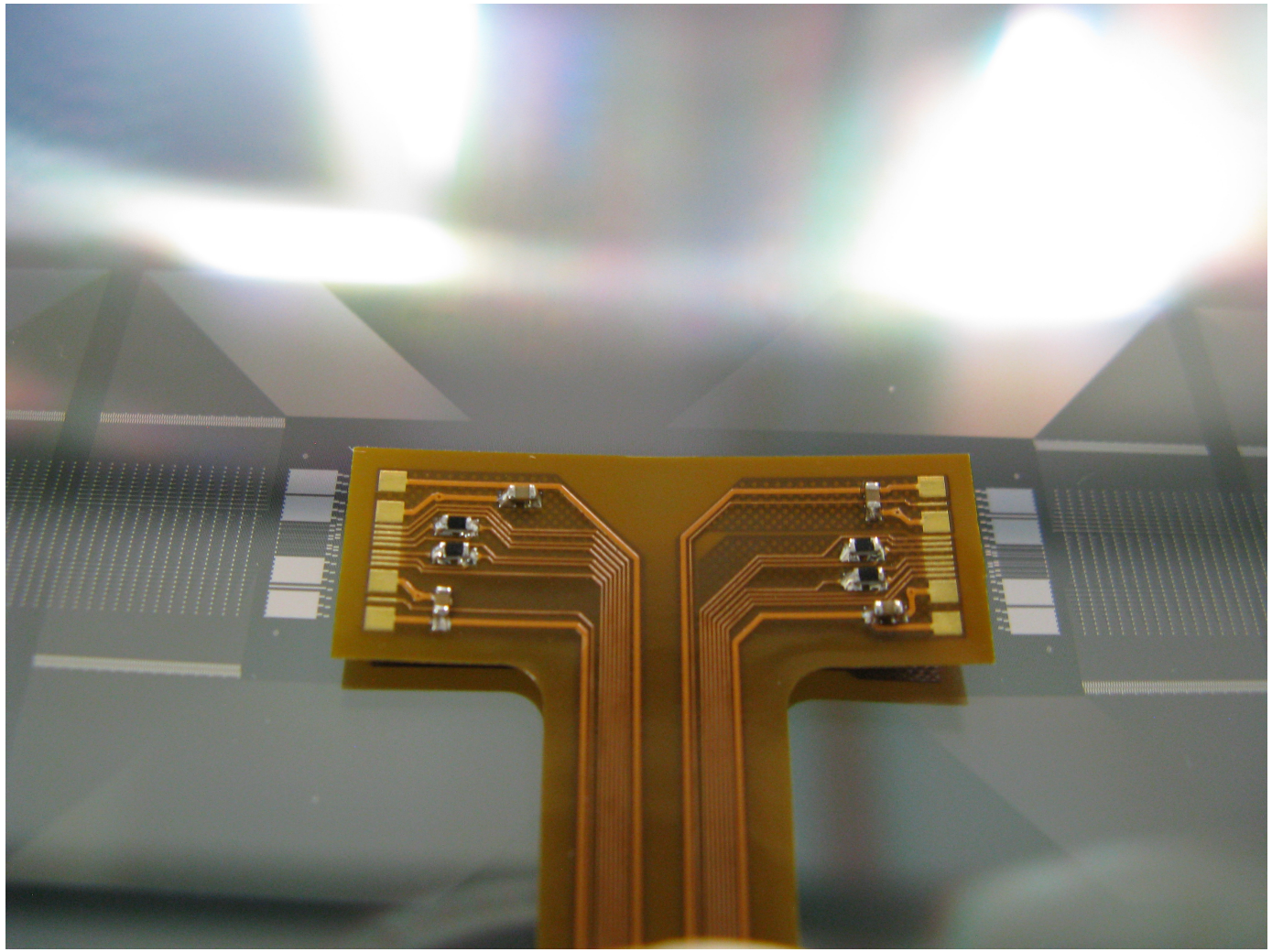
Pigtail Cable on a Sensor

- Cable lying on the sensor, not attached



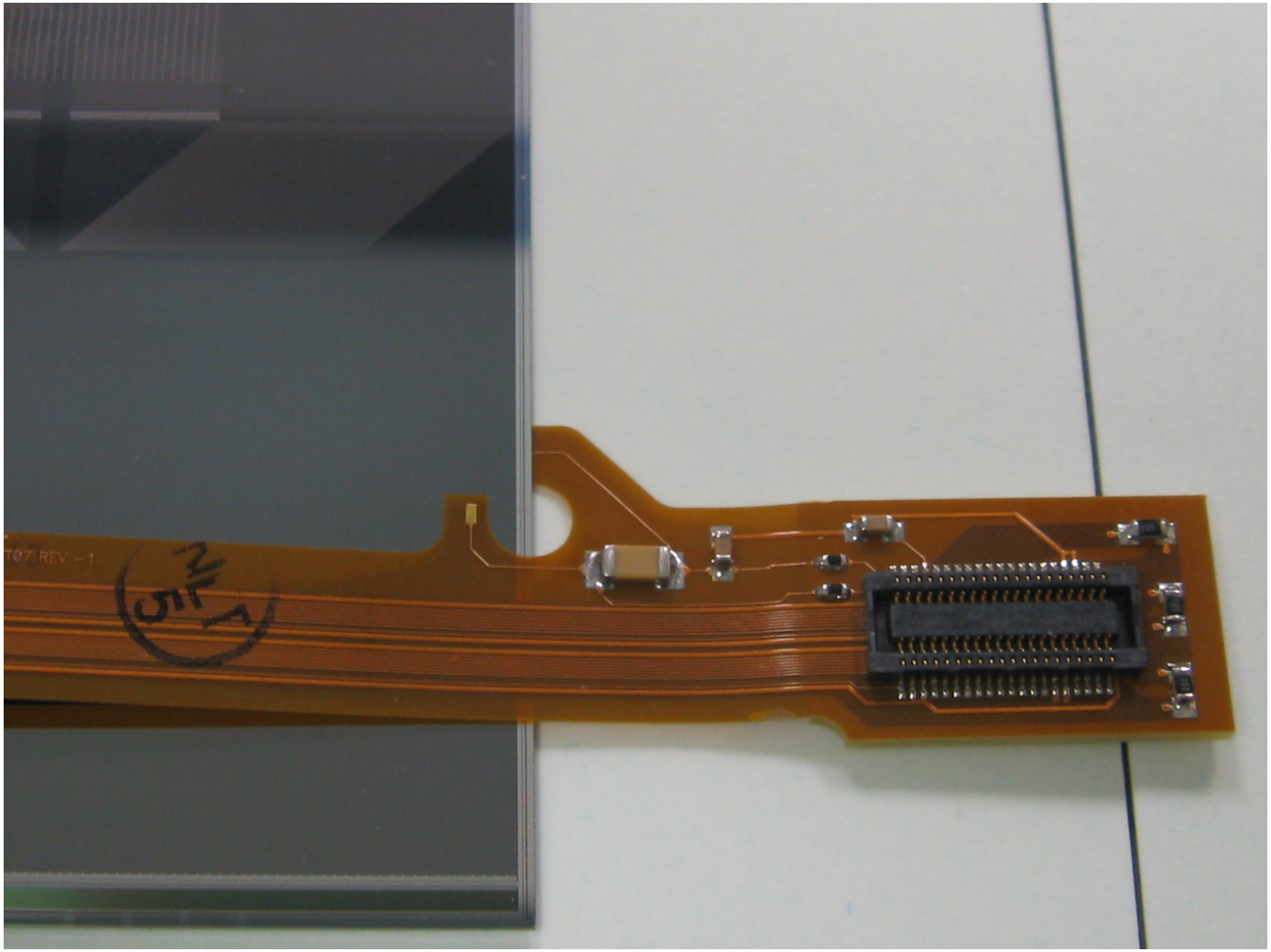
Pigtail Cable on a Sensor

- Sensor end



Pigtail Cable on a Sensor

- HV Tab and connector to Extension Cable



Summary

- The Pigtail cable design has been prototyped and no problems were encountered in the manufacturing and assembly.
- Minimum mass (through two-sided design) and low cost have been achieved.
- Point-to-point connectivity testing was done, electrical tests will be done when a Cable Adapter which interfaces the high density connector to more standard connectors is built.
- Next: extension cable work with Q Flex (Santa Ana) and All Flex (Northfield).