

Roman Pot Test Board

Roman Pot Test Board: Development & Goals

- Roman pot detector will be used in UHV -- compatible build types
 - Ceramic PCB (LTCC) with adhesiveless Polyimide Flex (expensive)
 - Only use adhesiveless Polyimide Flex (Kapton) with backing plate not as expensive but can add complications
- Build a stepping stone test article using standard FR4 rigid flex that will have 3 sensors
- It will be used for verifying wire-bonding to the substrate
- Will be backward compatible with existing readout boards RBV1 and ZCU106
- Readout 3 ASICs using RBV1 and/or KCU105
 - needs a new adapter board and the RVB1 can deliver power to the ASICs
- Test signal integrity, power delivery and grounding over flex cable

RIGID FLEX PCB

- FMC SIDE

- LDO regulator (can be bypassed)
- Level shifters -- LVCMOS and Differential
- Power Input
- HV input

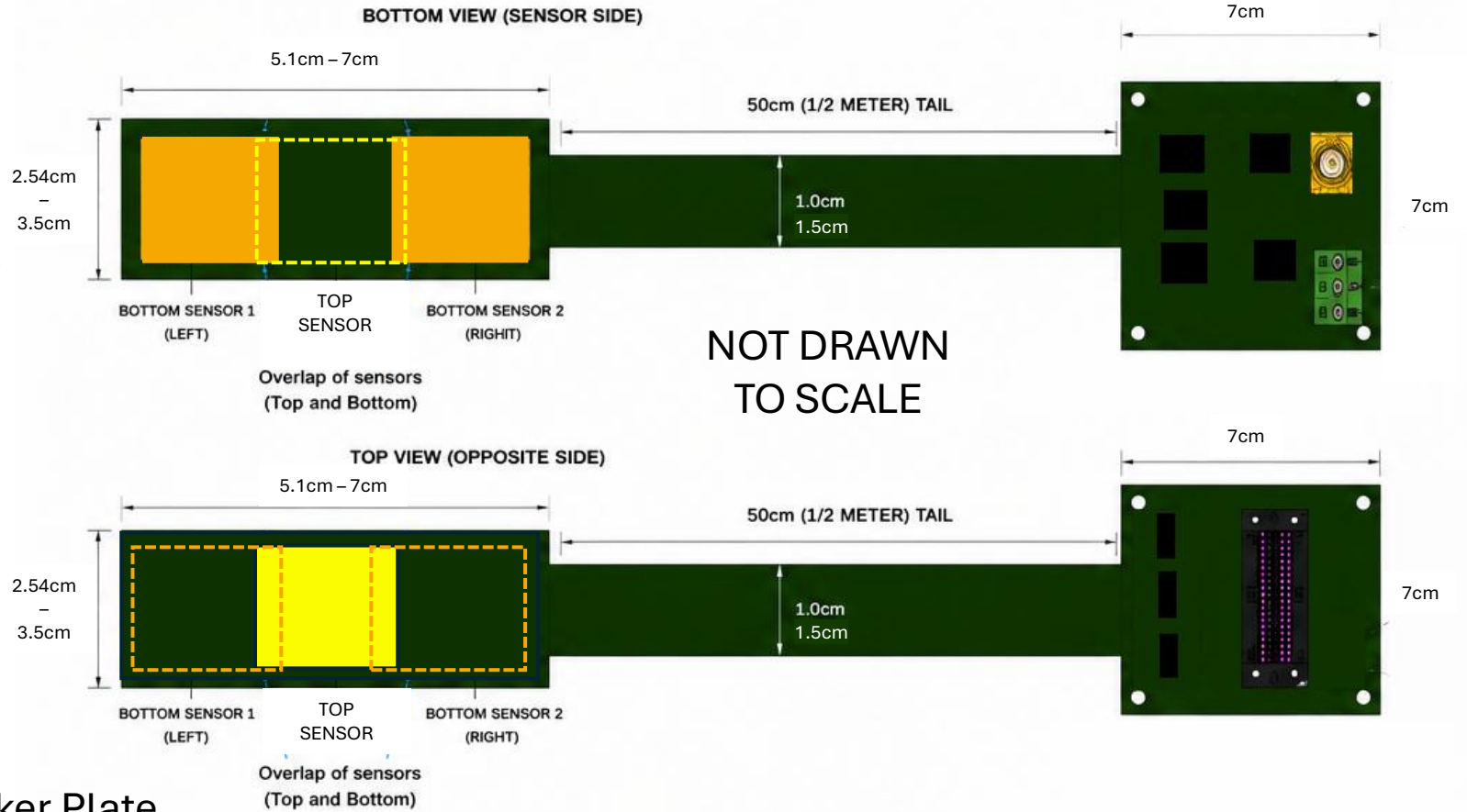
- Sensor side

- ASIC's and sensor
- A lot of filtering

- Build

- Standard rigid flex KAPTON build
- Transition to ADHESIVELESS KAPTON

Test board final dimensions and stackup will be determined based on layout



10-LAYER STACKUP (ADHESIVELESS KAPTON FLEX)

LAYER	NAME	FUNCTION
L1	TOP (SENSOR)	SIGNAL
L2	GND1	GROUND PLANE
L3	SIG1	SIGNAL
L4	PWR1	POWER PLANE
L5	SIG2	SIGNAL
L6	PWR2	POWER PLANE
L7	GND2	GROUND PLANE
L8	SIG3	SIGNAL
L9	GND3	GROUND PLANE
L10	BOTTOM (SENSORS)	SIGNAL

Some planes can be hatched to improve bendability

Backer Plate

Polyimide only build



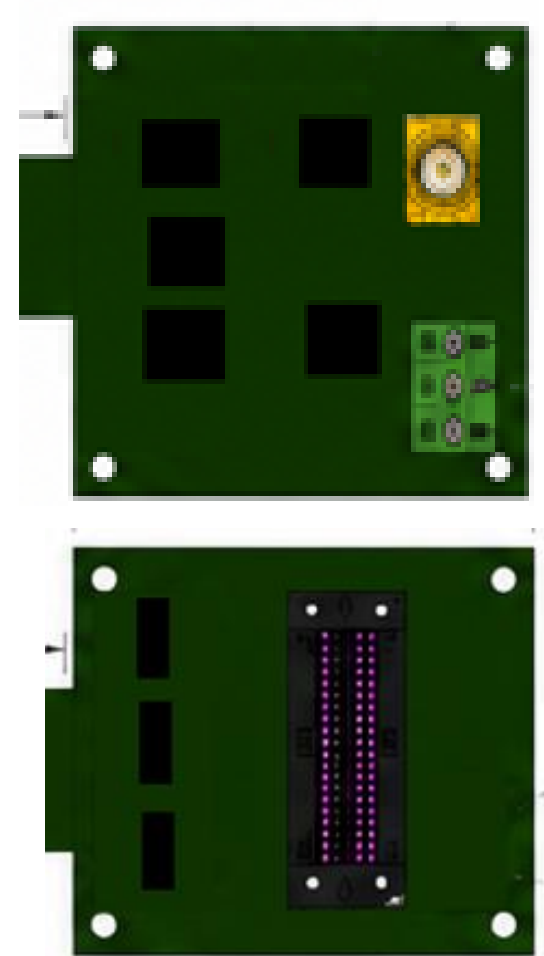
Not need with ceramic LTCC

Version for UHV



Roman Pot Test Board: Features

- On board regulated power to ASICs
 - LDOs can be powered over FMC connector or lab supply
 - LDO's can be bypassed when testing with RBV1
- Level shifters for ASICs
 - 2.5v to 1.2v ZCU106
 - 1.8v to 1.2v KCU105
 - 1.2v to 1.2v for RBV1
- All ASIC IO signals routed to FMC
 - Next revision will only use eLINKs



Test Board FMC Pin Compatibility

- **Magenta** = ASIC 1
 - OMEGA EICROC1 test board
- **Blue** = ASIC 2,3
 - New signals compatible to HPC FMC connector -- AMD KCU105
- **Green** = ASIC power and analog output
 - Floating on HPC FMC connector can be used with RBV1 with a new adapter board
- One ASIC read out (center)
 - ZCU106 -- Omega Firmware (center ASIC)
 - RBV1 -- With current adapter
- Three ASIC readout
 - KCU105 -- New firmware needed
 - RBV1 -- new adapter needed
 - RVB1 supply's power and HV to test board



Power drop across cable

- **1024-channel EICROC running at 2 mW/channel:**
- Per ASIC:
 - **Power: 2.048 W Current: ~1.71 A**
- For **3 ASICs:**
 - **Total power: 6.144 W Total current: 5.12 A @ 1.2 V**



1.5 cm wide

Copper weight	Length	Resistance	Voltage drop @ 5.5 A	Power lost
1/2 oz	1.0 m	65.7 mΩ	0.361 V	1.99 W
1 oz	1.0 m	32.8 mΩ	0.181 V	0.99 W
2 oz	1.0 m	16.4 mΩ	0.090 V	0.50 W
1/2 oz	0.5 m	32.8 mΩ	0.181 V	0.99 W
1 oz	0.5 m	16.4 mΩ	0.090 V	0.50 W
2 oz	0.5 m	8.21 mΩ	0.045 V	0.25 W

1.0 cm wide

Copper weight	Length	Resistance	Voltage drop @ 5.5 A	Power lost
1/2 oz	1.0 m	98.5 mΩ	0.542 V	2.98 W
1 oz	1.0 m	49.3 mΩ	0.271 V	1.49 W
2 oz	1.0 m	24.6 mΩ	0.136 V	0.75 W
1/2 oz	0.5 m	49.3 mΩ	0.271 V	1.49 W
1 oz	0.5 m	24.6 mΩ	0.136 V	0.75 W
2 oz	0.5 m	12.3 mΩ	0.068 V	0.37 W