



MISSISSIPPI STATE
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Jefferson Lab

Compton Electron Detector Hardware update

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Outline

- ❖ e-Detector current view
- ❖ current performance
- ❖ intended modifications
- ❖ plan of action and time line
- ❖ possible hurdles

Current Installed working view



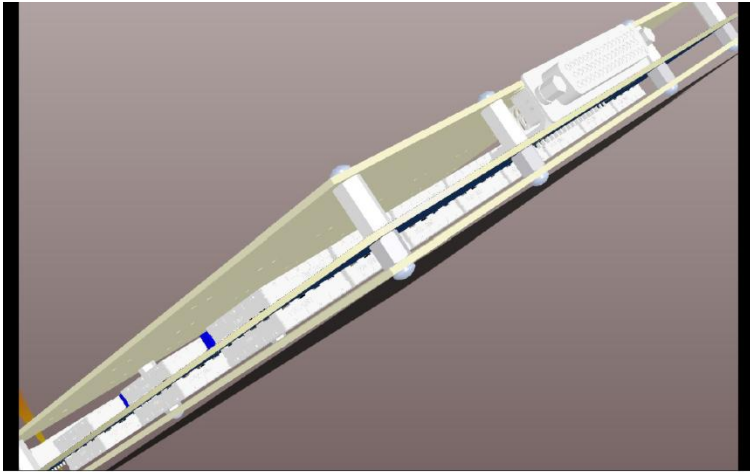
current status

- ✓ 3 out of 4 detector planes working
- ✓ higher capacitance Flex cables
- ✓ QWAD having $\sim 1\text{kHz}$ noise per channel and a significant channel-channel signal correlation

Intended modifications

- replacement of current QWAD boards with version-3 underway in TRIUMF
- replacement of the currently inactive 4th plane
- replacement of current high capacitance Flex cables

QWAD



old design: 4 Layers, 48 channels

1. top layer: 24 channel
(analog, digital, components)
2. calibration input
3. ground layer
4. bottom layer: 24 channels
(analog, digital, components)

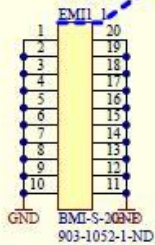
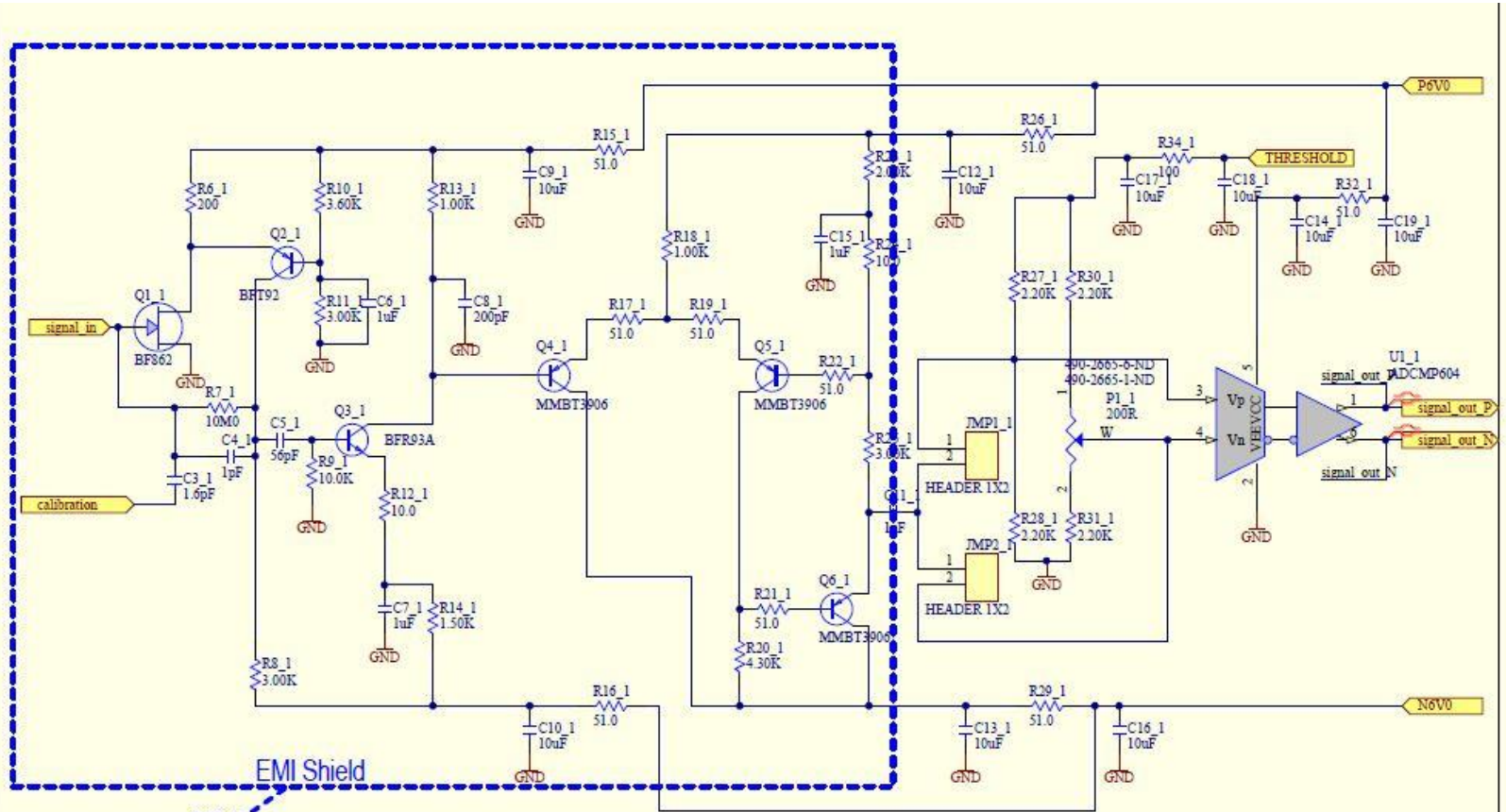
Major modifications:

- 2 additional planes
- individual RF shields covering analog part of each channel
- option of a global threshold
- most part of middle planes is filled with Ground


new design: 8 Layers, 48 channels

1. top layer: 24 channel
(analog circuit and components)
2. calibration input and digital output of top layer channels, +6V line
3. internal ground plane
4. input traces to all 48 channels
5. internal ground plane
6. digital output of bottom layer channels, -6V line
7. calibration and threshold traces
8. bottom layer: 24 channels
(analog, digital, components)

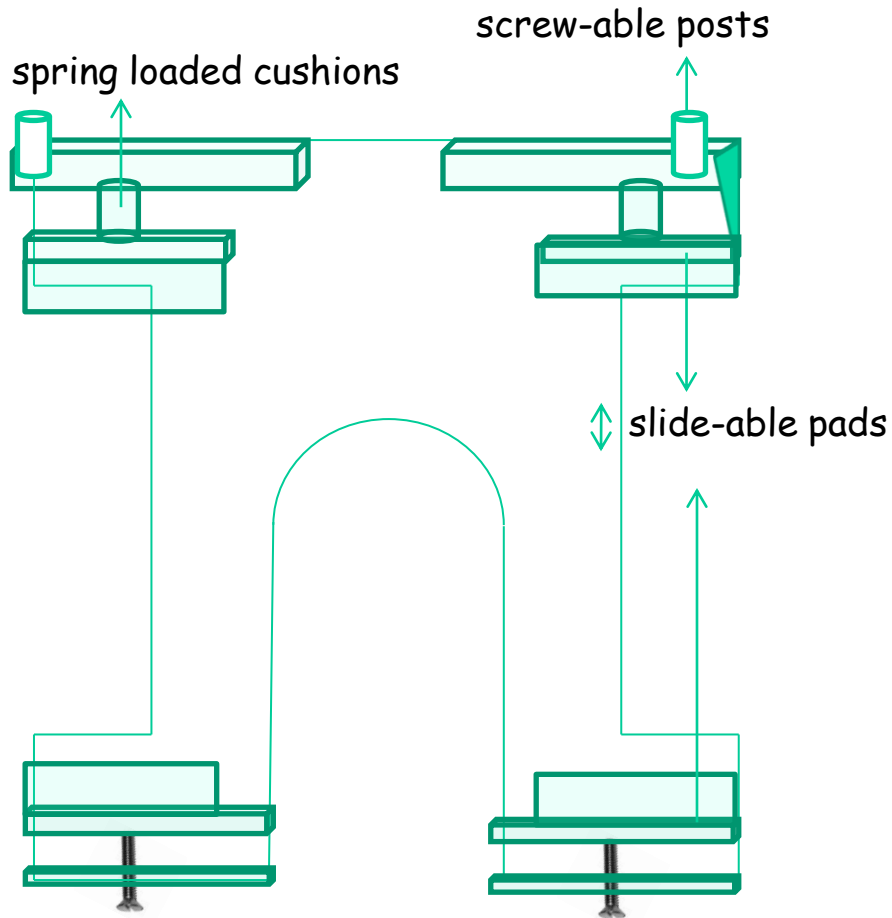
new QWAD circuit



Single Channel

Revision	Drawing #:	TRIUMF	
0	Sheet #:	4004 Wesbrook Mall	
	2 of 3	Vancouver, B.C.	
	Size: A	Canada	
	Drawn by: L.K./K.L.	Date: 4/26/2011	V6T 2A3

additional plane, new holder



✓ replace the currently installed plane which we apprehend to be cracked

Features of new detector holder:

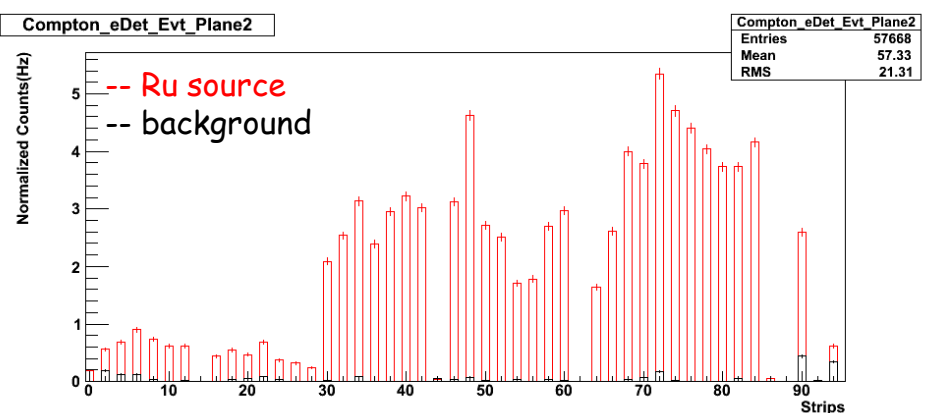
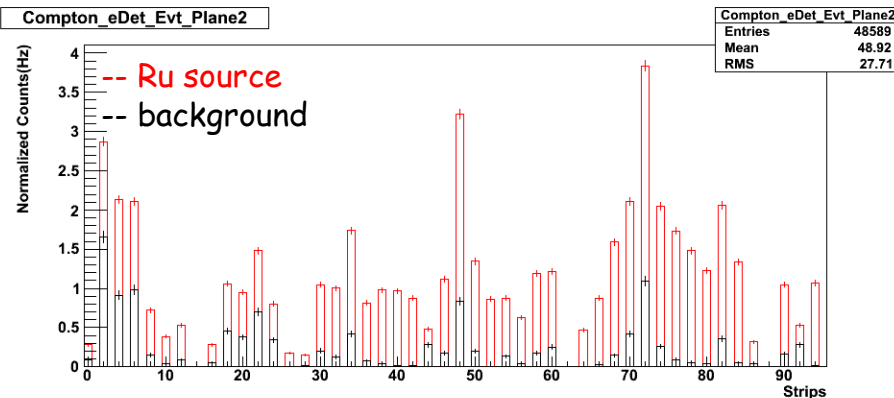
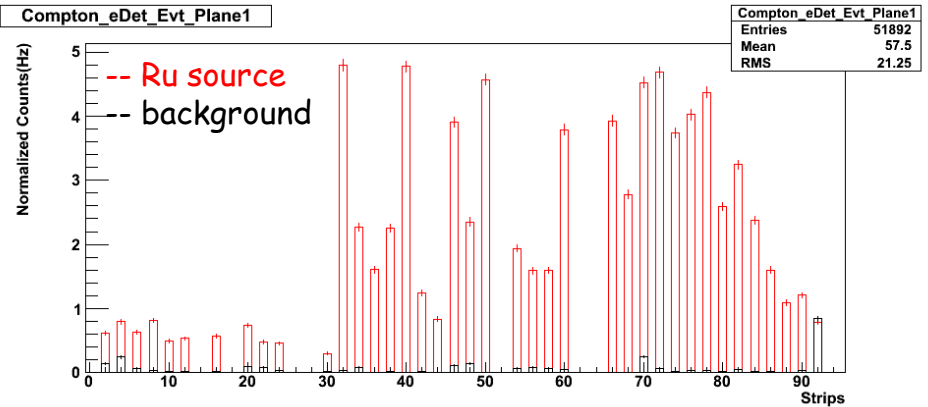
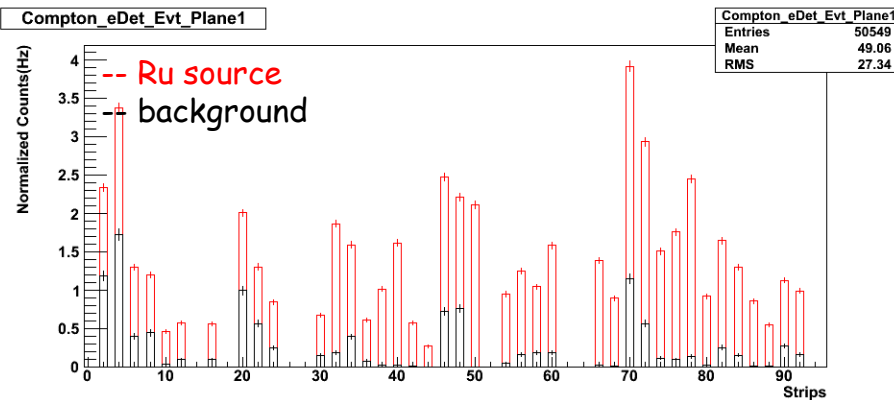
- we can install one detector at a time
- after fixing the position of 1st add 2nd plane and so on.
- Allows to set a offset by choice between strips of various planes by using a travelling microscope

new Flex cable

The new Flex cables have:

- reduced capacitance of 80 pF instead of $\sim 200\text{pF}$ \Rightarrow higher signal gain
- increased length by 5 cm \Rightarrow increased connection flexibility (may be redundant)

ref: Qweak e-detector ELOG: 163 ([link](#)) and 147 ([link](#))



old Flex cables

new Flex cables

Plan of Action

Action ?	When ?	In ?	By ?
Let up Vacuum	June 1	done	Vacuum Tech.
Remove e-detector top assembly	July 27 (sooner !)	1 day	Hall C Tech & CEDET*
Un-install old flex cables	July 28	1 day	Hall C CEDET
Re-install e-detector top assembly	July 29	1 day	Hall C Tech & CEDET
Replace Flex cables	Aug 01	1 day	Hall C CEDET
Ground loop & noise tests	(Aug 01)	--	Hall C CEDET
Install 4th plane	Aug 01	3 days	Hall C CEDET
Install new QWAD	Aug 15	1 day	Hall C CEDET
Radiological source tests	Aug 15	--	Hall C CEDET
Fiducialize e-detector	Sept 19	1 day	Survey and Alignment
Final alignment of Compton system	Sept 30	1 day	Survey and Alignment

*CEDET: Compton Electron Detector Expert Team

Personnel and Availability

Compton Electron Detector Expert Team

- ❖ David Gaskell
- ❖ Dipangkar Dutta
- ❖ Vladas Tvaskis
- ❖ Amrendra Narayan

Sensitivity and hurdles

- The Flex cable and detector installation in tune with Vacuum practices
- Diamond detectors are 0.5 mm thick
- Detector holder can pose challenges and may require some machine - shop fine tuning
- Before uninstalling the detector-Flex combination, we need to carefully disconnect it from the HV cable soldered on the inside of a Vacuum - flange
- attempt to fix the ground line mix-up of detector-Flex-QWAD combination
- Ruthenium radiological source test will require RADCON support

Looking ahead

Possible additions ?

Suggestions on current topics ?