QIE INPUT CABLE STUDIES

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Over the past few weeks I have played on the bench with different types and lengths of cables feeding the non-inverting input of the CMS QIE chip. I would like to quickly summarize what I have learned, since it may help in selecting the most appropriate cable.

The cable types that I connected to the QIE were 50 ohm RG58 and RG174, 93 ohm RG180, and 93 ohm mini-coax.

Signal dispersion

The most striking phenomenon I observed (which I just had not considered before) was the smearing out of a fast "PMT-like" pulse due to cable attenuation and dispersion. Essentially what ones sees at the QIE input is the arrival of most of the charge in a narrow pulse, followed by the remaining charge "smeared out" over a time approximately equal to the round trip cable delay. Following are some results for different cables.

Cable type	Impedance	Length	% of Charge Smeared	Length of Charge Smear
RG58	50	3.2 m	1.8%	32 ns
RG58	50	4.8 m	3.5%	48 ns
RG58	50	7.5 m	4.3%	75 ns
RG174	50	7.5 m	9%	75 ns
RG180	93	3.0 m	2.2%	30 ns
Minicoax	93	4.6 m	9%	46 ns

Obviously, the larger diameter cables have less dispersion, but this effect is significant even for RG58 when the cable length is 5 meters. To make this effect insignificant would probably require using something like RG8, which is not very practical.
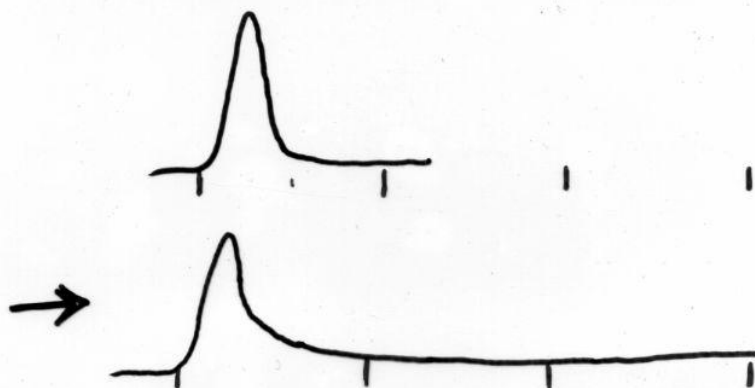
CKM-QIE & CKM-TDC Prototypes.

- VVS Beam Test: We will use LeCroy ADCs and TDCs (LRS-2249W, LRS-3377).

- For bench and auxillary tests with VVS test beam, we are deveoping a CKM QIE prototype board based on the CMS-QIE, and a CKM-TDC prototype based on SERDES-FPGA commercial technology.

- The CKM-TDC prototype card will be a PCI card plugged into a PC backplane with LVDS inputs.

- The CKM-QIE prototype will be a modification of an existing CMS QIE prototype card with RG-58 inputs, and a fiber G-link data output. We will use the reprogrammed CKM-TDC to receive the serial data output of the CKM-QIE board. This is will provide a considerably better noise environment for the CKM-QIE, and will allow straightforward tests of RG-58 cable length to the PMT base.

- This represents a move toward a PCI based readout environment, which is probably a good step, but will require that we gain PCI programming skills within the group.