DMC Data Output Project

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SNOLAB Data Format

data format V1

Author and Contact: Belina von Krosigk, UBC

DATA FORMAT VERSION 1: Created: 05. Feb. '16, Last updated: 30. Jun. '16

bits			31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
			0x9				format version=1																total n triggers read									
x N triggers			0x5				event size in bytes																										
			trigger ID																														
			trigger type																														
			global timestamp low																														
			global timestamp high																														
			0x7				n primitives in event																										
			length of entry (=0x6 block) in bytes																														
	x N prims		0x6																trig status				pileup		detector id						index		
			UT at which rt was issued																														
																			time fraction rt was run (100nsec/count)														
			time of trigger in sec																				time rt was run in sec										
			mask pairs																time fraction of trigger (100nsec/count)														
			trigger word																				peak amplitude										
			0x3				n detectors in event																										
	x N dets		0x2				detector type																		detector id						index		
			DCRC1 serial number																DCRC1 version						DCRC0 serial number						DCRC0 version		
			0x4				readout status																series time in sec										
																			series time fraction (100nsec/count)														
			0x0				n channels to follow																										
		x N channels	0x1				pre-trigger offset (22 bits)																						ch num				ch type		
			n pre-pulse samples																														
			n on-pulse samples																														
			n post-pulse samples																														
			sampling rate high in kHz																				sampling rate low in kHz										
			samp1																				samp0										
			samp3																				samp2										
			⋮																														
			sampN																				sampN-1										
			0x8				total n preceding triggers																										

MidasDAQ

- Written in c++ code
- All pulse information is contained in a databank file
- writeDataBank.c uses functions in dbHeaders.cxx to write prim info to the databank file in the specific format
  - E.g.
    DWORD DB_HEADER_V1::overallHeader(DWORD nrTriggersRead_total) {
    bits12 = nrTriggersRead_total;
    return 0x90000000 + (version << 12) + bits12;
    }
- Waveform data is written in 16-bit increments

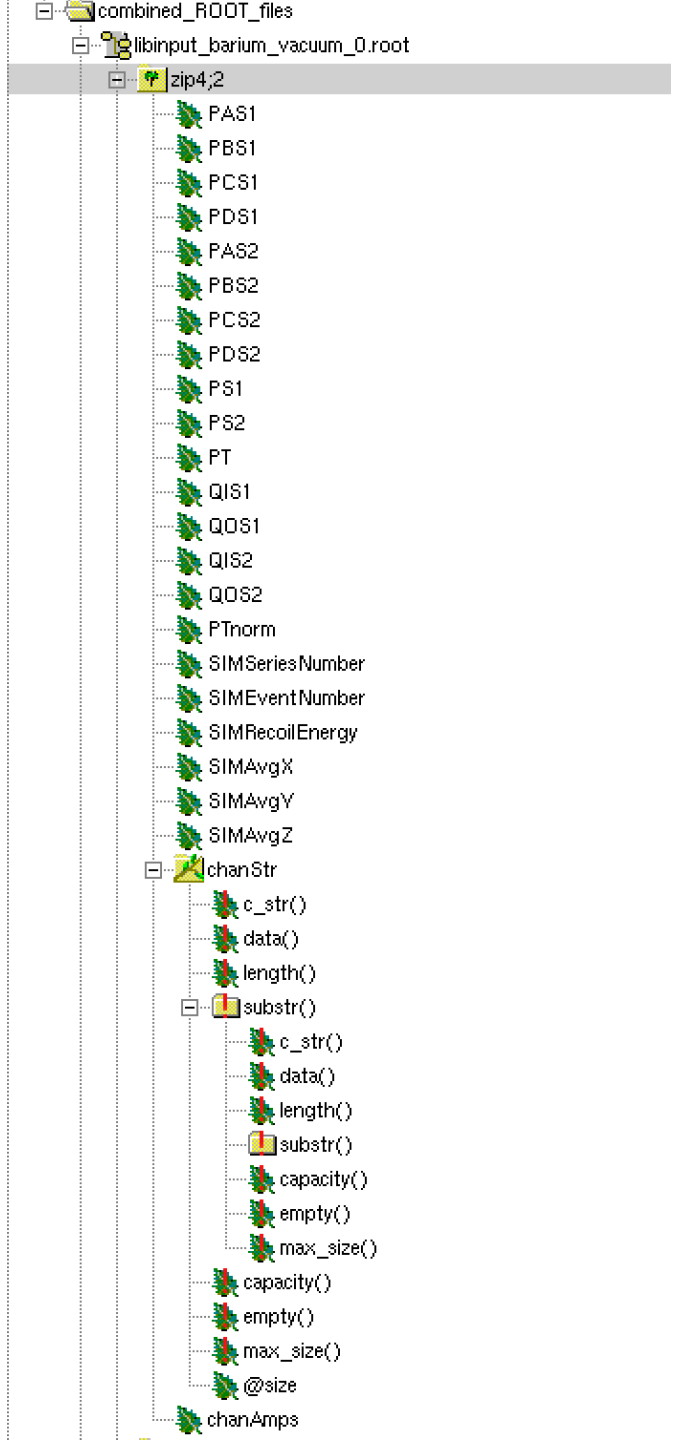
MatLab DMC

- Uses python to write output
- Currently, pulse data is written out ROOT files
  - Each file contains a tree for each detector
  - Each detector/tree contains leaves for
    - Phonon pulse for each channel, and the side's sum and PT
    - Charge pulse
    - DMC event quantiries (event, recoil energy, xyz position, series number)
    - A normalization constant (deprecated, not needed anymore) (Ptnorm)
    - The relative 'amplitude' of the phonon and charge pulses (ratio of the channel's integral over integral of summed channels)
  - Each detector/tree also contains a branch for the names of the channels

MatLab DMC

- ROOT files contain info on **multiple** pulses
  - Quite different from MidasDAQ
  - User defined parameter in config file
  - Input files are one pulse per file, the code receives a dictionary of pulses to be written in a single file

- Is there a unit consideration? DMC waveform information is in keV (energy units)


combined_ROOT_files
libinput_barium_vacuum_0.root
zip4;2
PAS1
PBS1
PCS1
PDS1
PAS2
PBS2
PCS2
PDS2
PS1
PS2
PT
QIS1
QOS1
QIS2
QOS2
PTnorm
SIMSeriesNumber
SIMEventNumber
SIMRecoilEnergy
SIMAvgX
SIMAvgY
SIMAvgZ
chanStr
c_str()
data()
length()
substr()
c_str()
data()
length()
substr()
capacity()
empty()
max_size()
capacity()
empty()
max_size()
@size
chanAmps