

DAQ data structure for the Muon g-2 experiment

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Abstract

This document outlines the DAQ data structure of the Muon g-2 experiment. A detailed list of the MIDAS data bank will be shown and their contents will be described.

1 MIDAS DAQ output in a nutshell

The main DAQ framework for the Muon g-2 experiment is based on MIDAS [cite].
 Add MIDAS event structure description here and refer to Fig. 1.

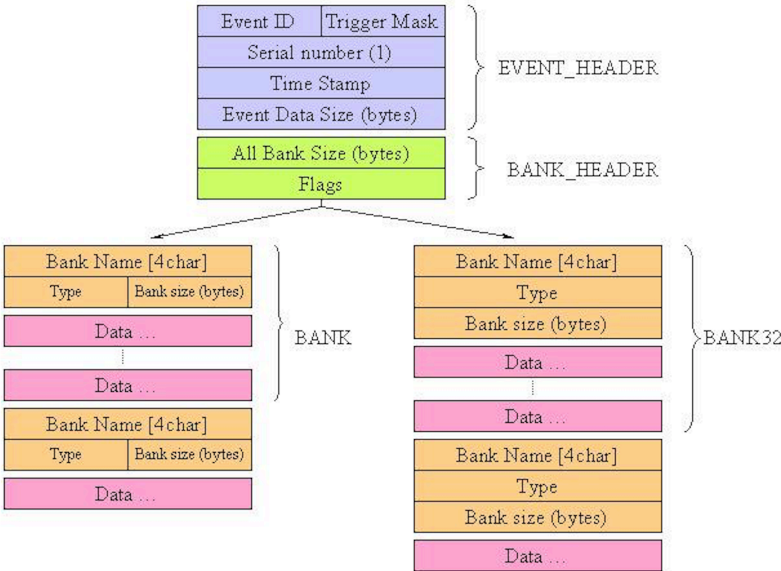


Figure 1: MIDAS event structure.

2 MIDAS Bank list

Hundred of banks will be stored in each MIDAS event and it is very important to classify them properly. Add more descriptions here.

2.1 Calorimeter-related banks

There are 3 fill types for the calorimeter. Muon fill is the typical muon events, laser fill is event dedicated for laser calibration and monitoring events and pedestal fill is trivia from its name. Data from each fill type is identified from the bank name. The muon fill is denoted by "C", the laser fill is denoted by "L" and the pedestal fill is denoted by "P". A summary of the banks is listed in Tab. 1.

Table 1: *MIDAS bank list for the calorimetry data.*

Bank name			Description
muon fill	laser fill	pedestal fill	
CA	LA	PA	AMC13 Header
CB	LB	PB	WFD5 header
CC	LC	PC	GPU timing data
CF	LF	PF	GPU fitted data
CH	LH	PH	per-crystal Q-method data (N-th event, end of run)
CL	LL	PL	Clock data
CP	LP	PP	Pedestal
CQ	LQ	PQ	per-calo Q-method data (every event)
CR	LR	PR	WFD5 raw data
CT	LT	PT	T-method islands
CZ	LZ	PZ	AMC13 CDF trailers

2.2 Auxiliary detector-related banks

A separate T/Q-method is needed for auxiliary detectors. Their data banks are denoted with the initial "K". A list of these banks are summarized in Tab. 2.

Table 2: *MIDAS bank list for auxiliary T/Q data. This is mainly for the fiber harps, quads and kickers.*

Bank name	Description
KH	Per aux. detector channel Q-method data (N-th event, end of run)
KQ	Per aux. detector Q-method data (every event)
KT	T-method data

2.3 CCC related banks

Table 3: *MIDAS bank list for the CCC data.*

TTCA	AMC13 Header
TTCR	CCC AMC13 Payload
TTCZ	AMC13 Trailer

3 Bank contents

This section details contents of each MIDAS bank.

CA (LA, PA) and CZ (LZ, PZ) banks

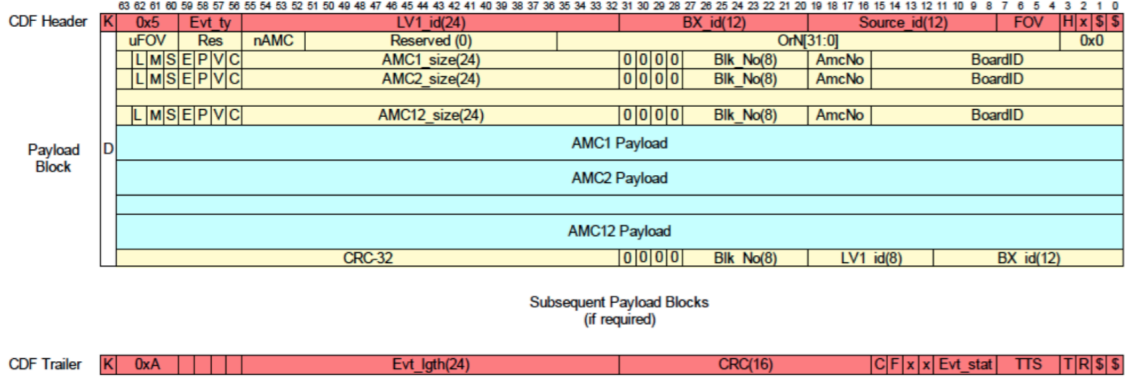


Figure 2: Data structure for AMC13 to DAQ. The first 2 64-bit words are stored in the CA (LA, PA) bank.

CB (LB, PB) banks

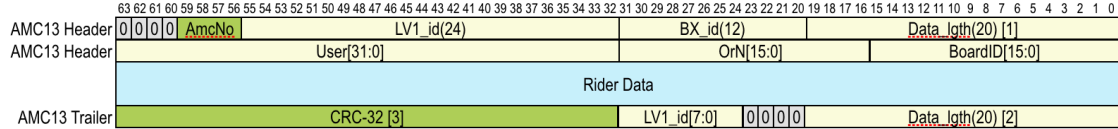


Figure 3: Data structure for Rider to AMC13.

CR (LR, PR) banks

This is the bank for the WFD5 payload.

C? (L?, P?) banks

This is the bank for the WFD5 payload in the asynchronous mode.

CT (LT, PT) banks

This place is reserved for T-method (chopped island) bank.

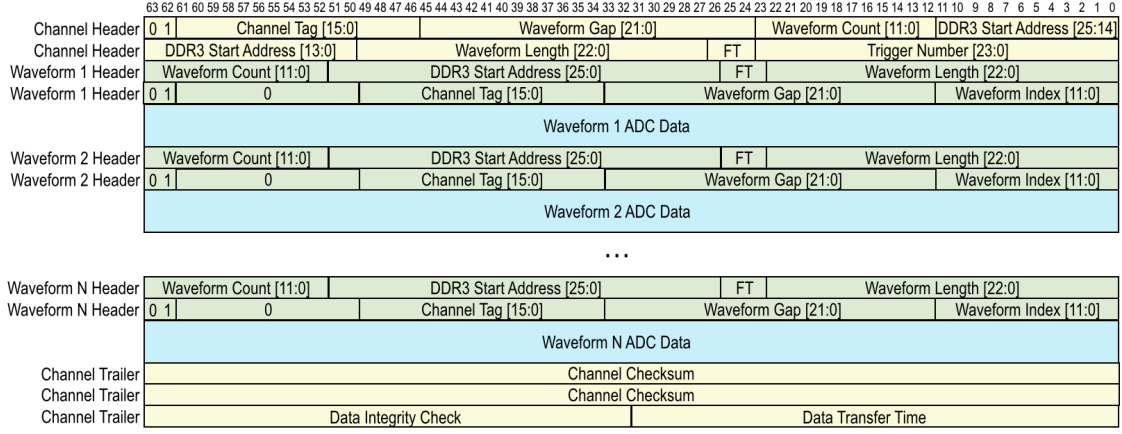


Figure 4: Data structure for Rider.

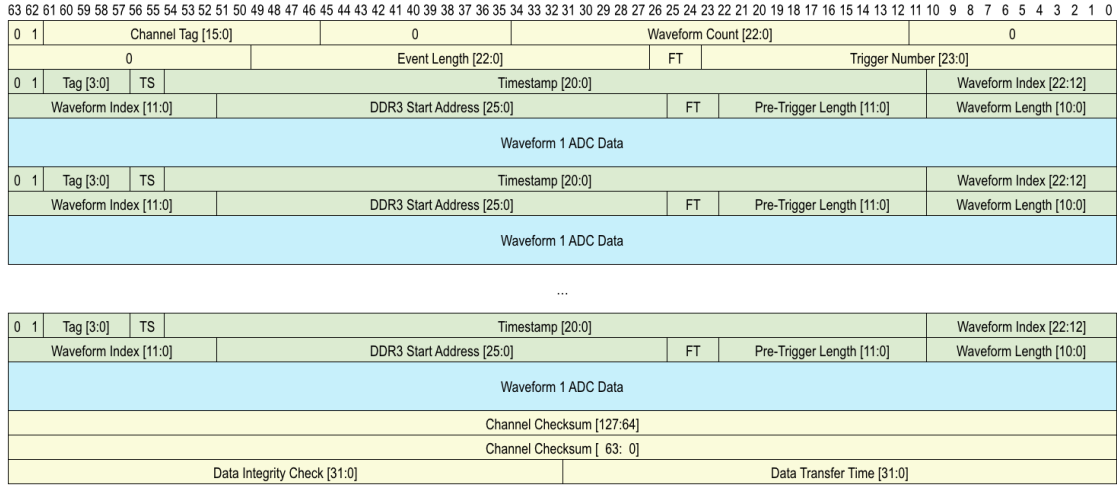


Figure 5: Data structure for asynchronous mode for Rider.

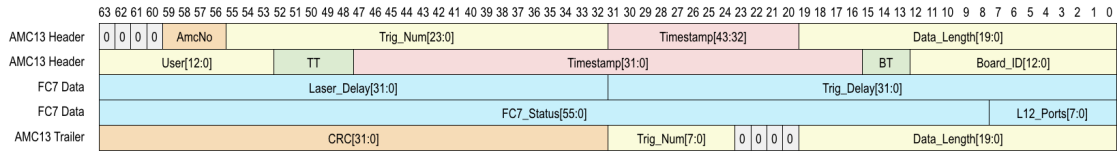


Figure 6: Data structure for encoder FC7.

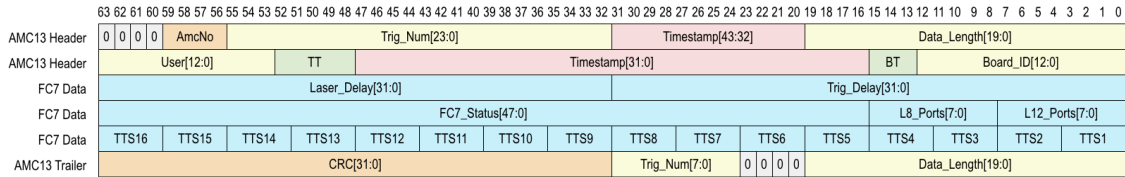


Figure 7: Data structure for fanout FC7.

TTCA, TTCR, TTCZ banks

4 C++ Parser

Muon g-2 offline analysis framework relies on parsers in the gm2parser namespace hosted under repository gm2unpacker to decode the data.