

A Compendium of Data Formats

Draft 0.52

C.N. P. Gee

Summary

This paper provides a reference copy of the formats of data transferred on links between level-1 calorimeter trigger modules. The links covered include all the high-speed data paths carrying the real-time trigger signals from the Preprocessor to the Central Trigger Processor, and the Data Acquisition (DAQ) and Region-of-Interest (RoI) readout paths to the RoI Builder and the Readout System (ROS).

Diagrams have been produced in a unified format by excel macros which also record properties of all data fields.

Note: Many details are still undefined in this draft. Refer to the notes in Appendix A for a list of the missing or unknown items.

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1 Introduction

This document is a collection of all data formats used in the level-1 calorimeter trigger.

1.1 Document Conventions

In this document, all data words and bit fields are drawn with the least significant bit at the right hand side.

All diagrams are produced by a set of excel macros. The file and sheet name where the macros reside is printed at the bottom of each diagram.

Each bit-field on the diagrams has a width proportional to the **number** of bits. Where possible, the **number** of bits is also explicitly stated, followed by lower-case "b".

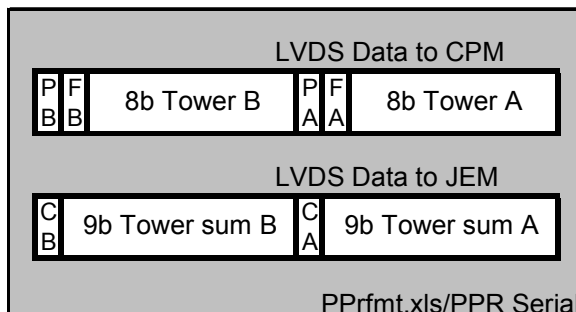
1.2 Nomenclature

The term *hit* is used to describe a bit obtained by thresholding a value or values. The terms *thr* and *count* are used to describe a bit field obtained by counting hits (hits are counted only when they refer to a threshold value having been passed, e.g. *thr4*). A field containing several adjacent individual **hit** bits is named a *map* or a *hit map*. A *sum* is obtained by adding digitised energy values.

Parity wherever used is always odd.

2 Preprocessor LVDS link formats

2.1 LVDS Data Links to CP and JEP



Origin: PreProcessor ASIC User and Reference Manual, version 1.0, 14-Apr-2000, Section 5.

2.1.1 Bit Definitions

Link Type	Signal Name	Description
CPM Data	Tower A, Tower B	8-bit trigger tower data after BCID.
	FA, FB	Flag bit - see note 1 below
	PA, PB	Odd - parity bit
JEM Data	Tower Sum	9-bit sum of 4 electron or hadron towers. See below
	CA, CB	Configurable parity or tower data bit - see note 2 below.

Notes:

1. CPM Data Flag Bit:

- On the first clock cycle, the bit indicates which tower data is being sent in the current bunch crossing (0=tower 1, 1 = tower 2). Tower 1 takes precedence if both are nonzero.
- On the second cycle, the flag indicates to which bunch crossing the data belongs (0=previous, 1 = current). Zero data is always sent with the flag set to 1.

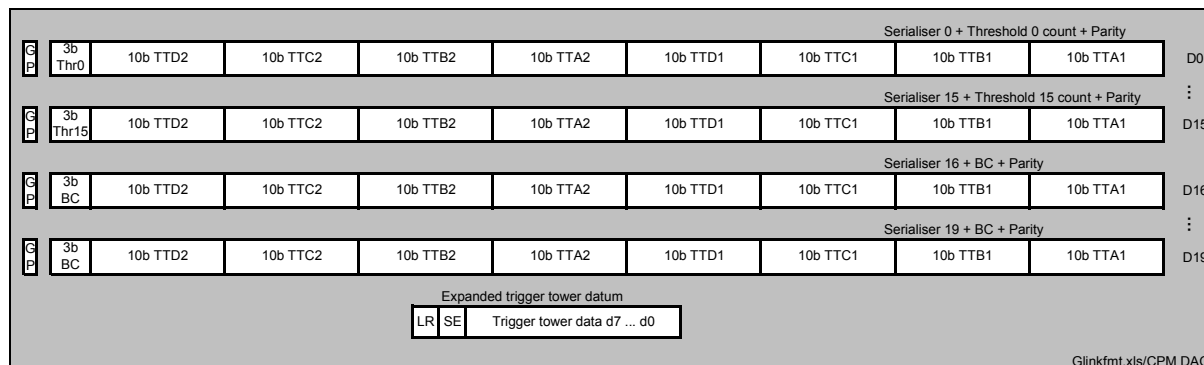
2. JEM Data

Tower sums for the JEM data require 10 bits. One of three different schemes can be chosen at configuration time to fit 10 data bits plus 1 parity bit into the 10-bit LVDS transmission field:

- Truncation of the highest bit of the sum. The transmitted value is set to the maximum of 511 GeV if any sum input is saturated or if the sum output saturates. The CA and CB bits convey odd parity This is the default
- Dropping the LSB of the sum. Saturation and parity are indicated as above.
- Eliminating the parity bits, and using the CA, CB bits to convey the lowest-order bit of the sum. The transmitted value is set to the maximum of 1023 GeV if any sum input is saturated.

3 Cluster Processor G-Link formats

3.1 CPM G-Link to ROD (DAQ)



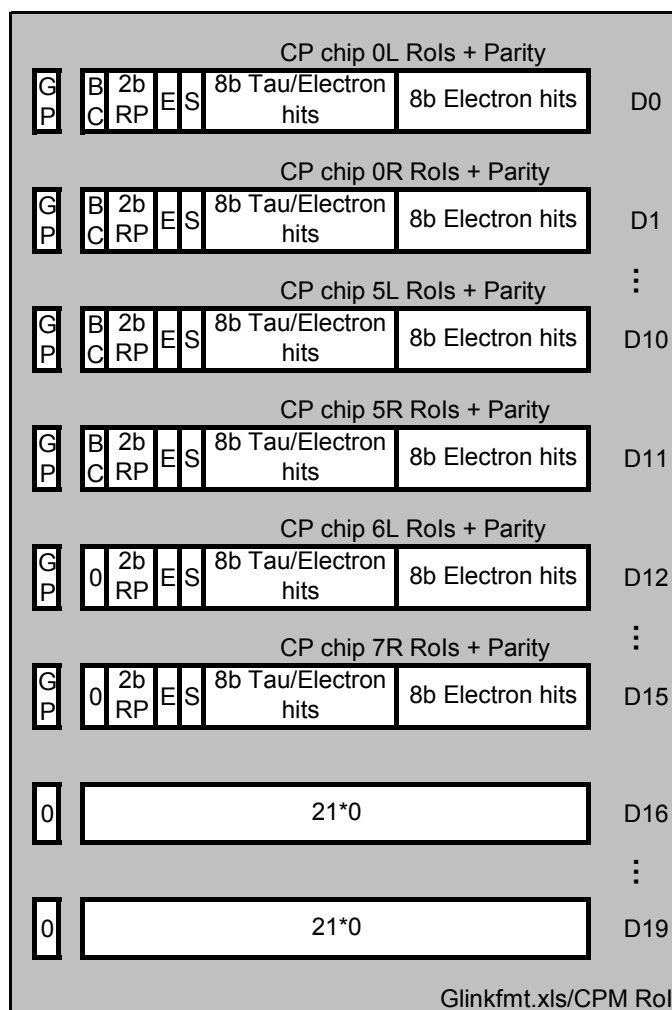
Origin: Prototype CPM Spec version 1.03 16-Oct-2000 Figure 9, and Serialiser Spec version 1.2b 22-May-2003 Figure 6.

3.1.1 Bit Definitions

G-Link Bit no.	Bit Field	Description
D0 - D19	TTxy	Trigger Tower data - see below
D0 - D19	GP	Odd parity bit
D0 - D15	Thr0 - Thr15	Three-bit count of electron or tau candidates passing threshold set 0 - 15 summed over all CP FPGAs on the CPM.
D16 - D19	BC	Three bits of the 12-bit bunch crossing number, with bits 0-2 on D16, 3-5 on D17, 6-8 on D18 and 9-11 on D19

Trigger Tower Data	Bit Field	Description
	Trigger Tower data	Eight bit Trigger Tower value in GeV
	SE	Serialiser Error for corresponding LVDS link. Set to 1 when a Parity Error has been detected in link data including the corresponding tower data.
	LR	Link Ready indicator for corresponding LVDS link. Note that Link Ready remains high for about four ticks after the link drops, so this bit is not useful.

3.2 CPM G-Link to ROD (Rol)



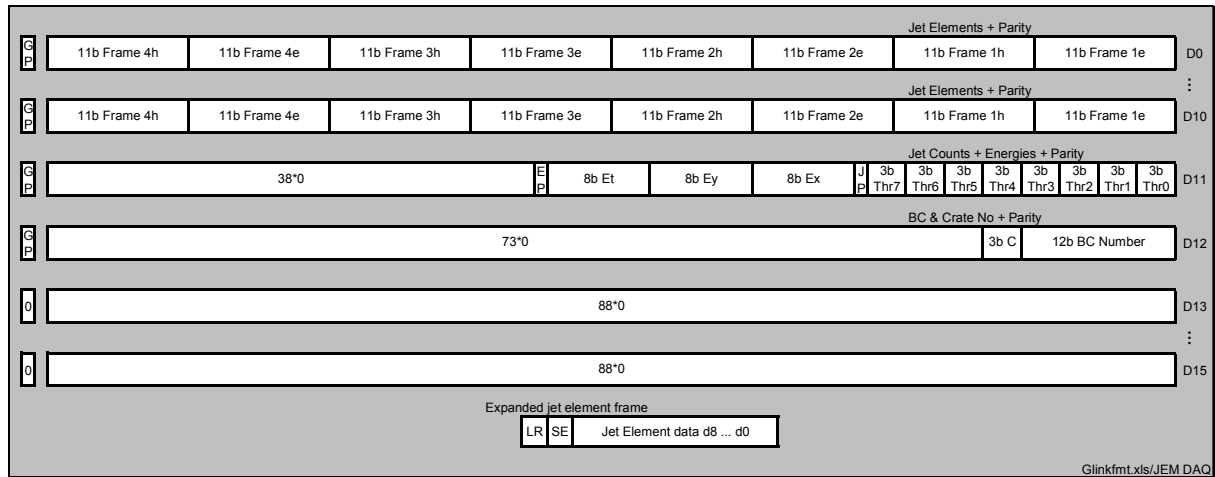
Origin: Prototype CPM Spec version 1.03 16-Oct-2000 Figure 10

3.2.1 Bit Definitions

G-Link Bit no	Signal Name	Description
D0 - D15	Tau/Electron hits	One bit for each electron or tau candidates passing corresponding threshold in CPM 0 -13 in this FPGA area.
D0 - D15	Electron hits	One bit for each electron candidate passing corresponding threshold in CPM 0 -13 in this FPGA area.
D0 - D15	S	Saturation flag - set if a contributing tower was saturated
D0 - D15	E	Error flag indicating parity error on 160 Mbit input into CP FPGA.
D0 - D15	RP	One of four possible RoI Positions in this FPGA area, encoded on 2 bits
D0 - D11	BC	One bit of 12-bit bunch crossing number
D0 - D15	GP	Odd parity bit

4 Jet/Energy Processor G-Link formats

4.1 JEM G-Link to ROD (DAQ)



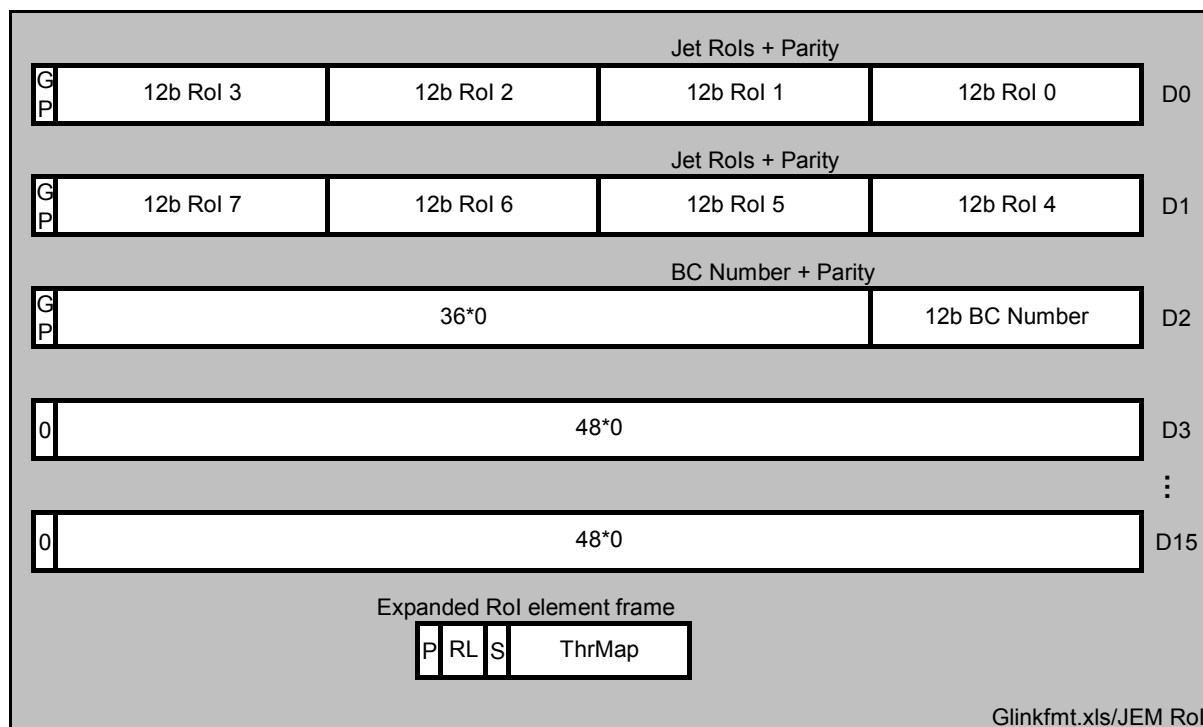
Origin: JEM ROD Spec Version 1.0 13-Nov-2002, Figure 1

4.1.1 Bit Definitions

G-Link Bit no	Signal Name	Description
D0 - D10	Frame	Jet element data - see below
D11	Thr0 - Thr7	Three-bit Jet counts for 8 thresholds
D11	JP	Odd Parity for jet counts
D11	Ex, Ey, Et	8-bit unsigned energy components
D11	EP	Odd Parity for Energies
D12	BC	12-bit bunch crossing number
D12	C	3-bit crate number
D0-D12	GP	Odd Parity bit
D13-D15	Unused	Set to Zero

Jet Element frame	Signal Name	Description
	Jet Element	9-bit jet element data (non-multiplexed)
	SE	Serial Error detected in LVDS chip. If the PPR-JEM LVDS link is operating without parity transmission, this bit carries the LSB of the 11-bit jet element. See section 2 on page 4.
	LR	Link Ready indicates link down.

4.2 JEM G-Link to ROD (RoI)



Origin: JEM Spec Version draft 0.8d 13-Nov-2001, Figure 12

4.2.1 Bit Definitions

G-Link Bit no	Signal Name	Description
D0	RoI	RoI element data - see below
D1	BC	12-bit bunch crossing number
D2-D19	Unused	Set to Zero
D0 - D1	GP	Odd parity bit

RoI Element frame	Signal Name	Description
	ThrMap	8-bit map of thresholds passed
	S	1-bit Saturation flag set in RoI processing
	RL	2-bit RoI Location in jet window.
	P	Parity Error - set if incoming data had parity failure.

Backplane formats

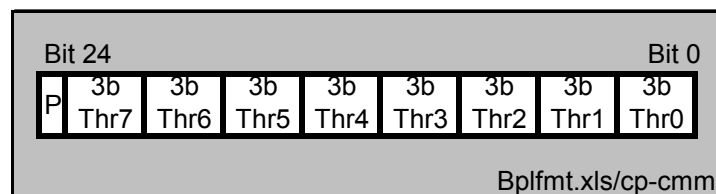
4.3 CPM to CPM backplane link format

1

4.4 JEM to JEM backplane link format

2

4.5 CPM to CMM backplane link format

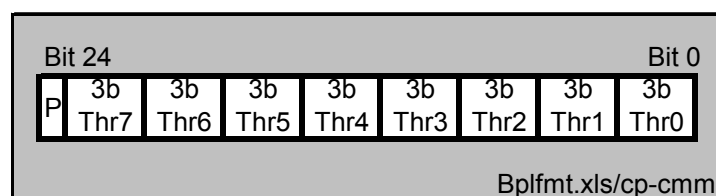


Origin: CMM Spec version 1.2 16-Aug-2002

4.5.1 Bit Definitions

Signal Name	Description
Thr0 - Thr7	Number of electron or tau candidates passing corresponding threshold in CPM 0 -13.
P	Odd parity bit

4.6 JEM to CMM backplane link format



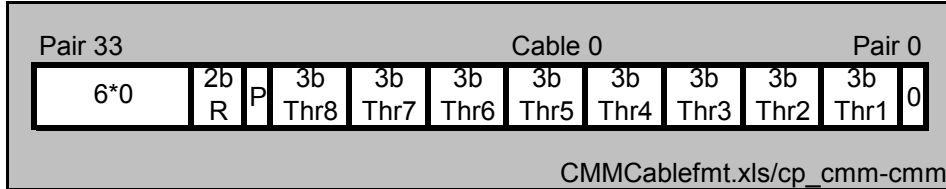
Origin: CMM Spec version 1.2 16-Aug-2002.

4.6.1 Bit Definitions

Signal Name	Description
Thr0 - Thr7	Counts of jet candidates passing corresponding threshold in JEM 0 -15. In JEMs 0,7,8 and 15, a different bit grouping will be used to allow forward jet counts to be transmitted as part of the data.
P	Odd parity bit

5 CMM cable formats

5.1 Cluster CMM to CMM cable link format

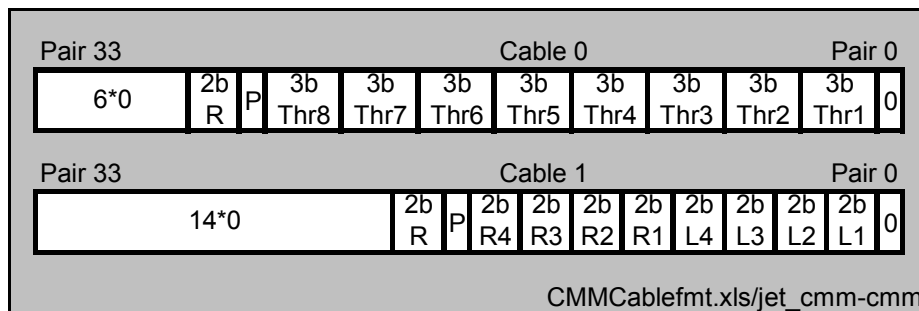


Origin: CMM Spec version 1.2 16-Aug-2002.

5.1.1 Bit Definitions

Signal Name	Description
Thr1 - Thr8	Subtotals of electron or tau hits for 8 thresholds.
P	Odd parity bit
R	2 Reserved bits connected to logic.

5.2 Jet CMM to CMM cable link format

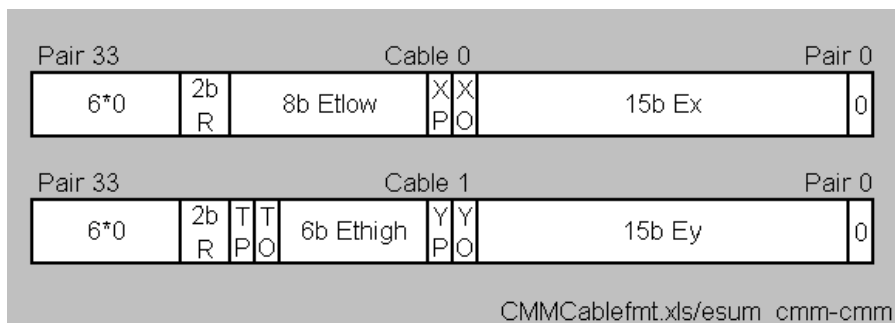


Origin: CMM Spec version 1.2 16-Aug-2002.

5.2.1 Bit Definitions

Cable No	Signal Name	Description
Cable 0	Thr1 - Thr8	Subtotals of main jets for 8 thresholds
	P	Odd parity bit
	R	2 Reserved bits connected to logic.
Cable 1	L1 - L4	Subtotals of forward jets for 4 thresholds, -ve eta.
	R1 - R4	Subtotal of forward jets for 4 thresholds, +ve eta.
	P	Odd parity bit
	R	2 Reserved bits connected to logic.

5.3 Energy-summing CMM to CMM cable link format



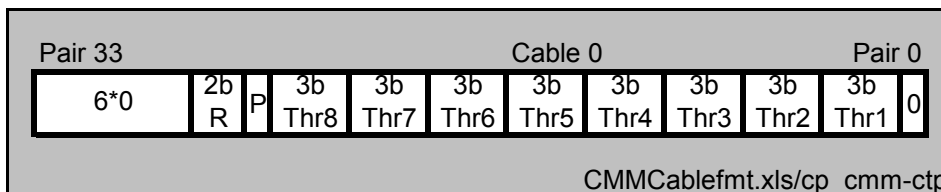
Origin: CMM Spec version 1.2 16-Aug-2002.

5.3.1 Bit Definitions

Cable No	Signal Name	Description
Cable 0	Ex	Signed subtotal of X component of transverse energy
	XO	Overflow in computing Ex
	XP	Odd parity for Ex fields
	Etlow	Least-significant 8 bits of Et
	R	2 Reserved bits connected to logic.
Cable 1	Ey	Signed subtotal of Y component of transverse energy
	YO	Overflow in computing Ey
	YP	Odd parity for Ey fields
	Ethigh	Most-significant 6 bits of Et
	TO	Overflow in computing Et
	TP	Odd parity for Et fields
	R	2 Reserved bits connected to logic.

CMM to CTP Formats

5.4 Cluster CMM to CTP cable link format

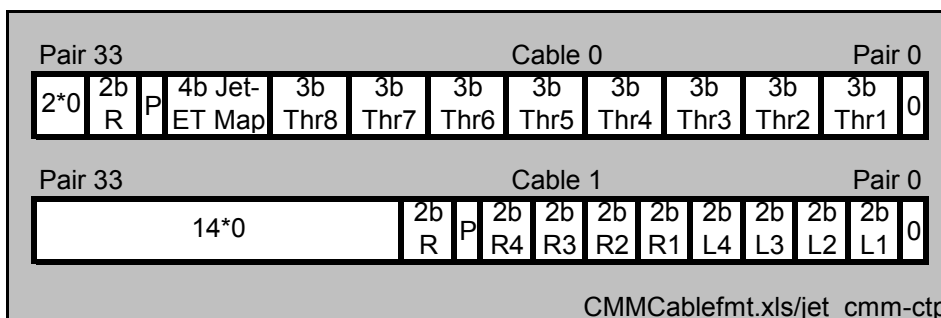


Origin: CMM Spec version 1.2 16-Aug-2002.

5.4.1 Bit Definitions

Signal Name	Description
Thr1 - Thr8	Counts of electron or tau candidates passing 8 thresholds.
P	Odd parity bit
R	2 Reserved bits connected to logic.

5.5 Jet CMM to CTP cable link format

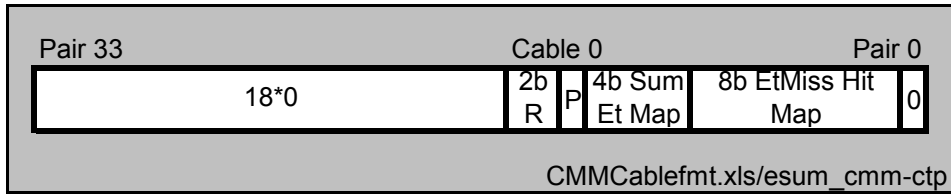


Origin: CMM Spec version 1.2 16-Aug-2002.

5.5.1 Bit Definitions

Cable No	Signal Name	Description
Cable 0	Thr1 - Thr8	Counts of main jet candidates for 8 jet thresholds
	Jet-ET Map	Hit map of thresholds passed by Jet-Et
	P	Odd parity bit
	R	2 Reserved bits connected to logic.
Cable 1	L1 - L4	Counts of forward jet candidates for 4 thresholds, negative eta.
	R1 - R4	Counts of forward jet candidates for 4 thresholds, positive eta.
	P	Odd parity bit
	R	2 Reserved bits connected to logic.

5.6 Energy-summing CMM to CTP cable link format



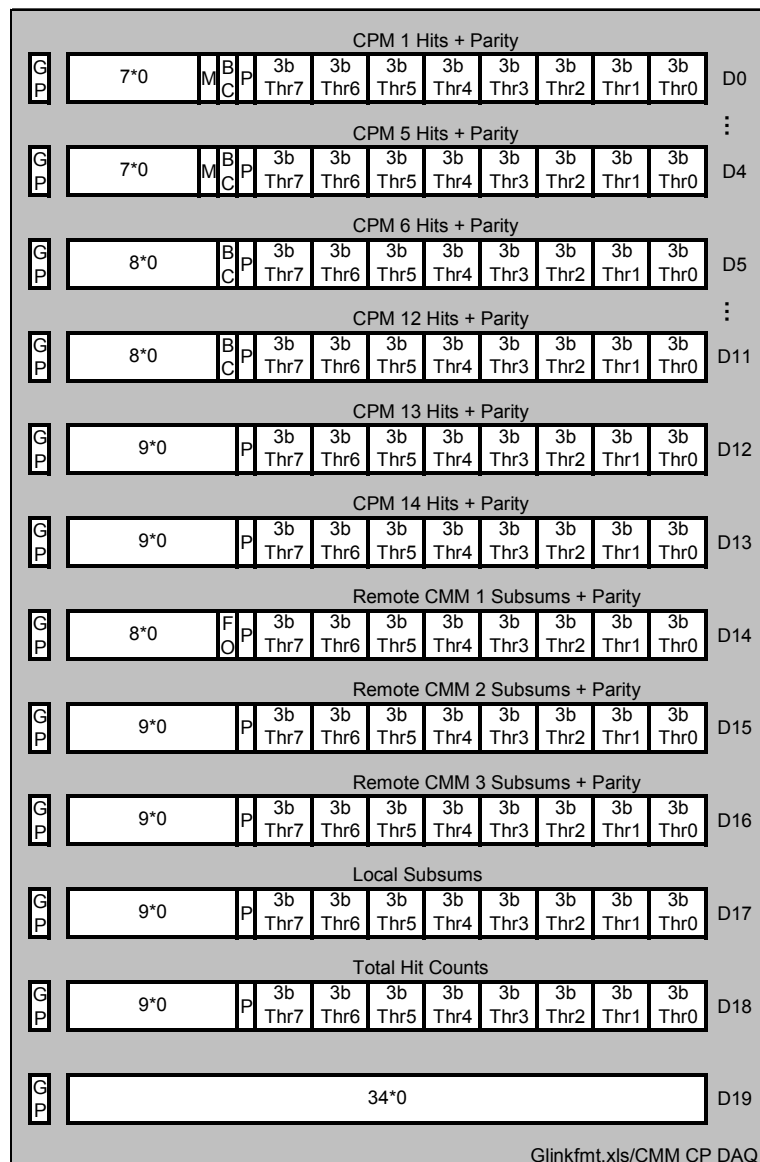
Origin: CMM Spec version 1.2 16-Aug-2002.

5.6.1 Bit Definitions

Signal Name	Description
ETmiss Hit Map	Hit Map of 8 thresholds passed by missing-Et
Sum-ET Map	Hit Map of 4 thresholds passed by summed-Et
P	Odd parity bit
R	2 Reserved bits connected to logic.

6 Common Merger Module G-Link formats

6.1 Cluster CMM G-Link to ROD (DAQ)

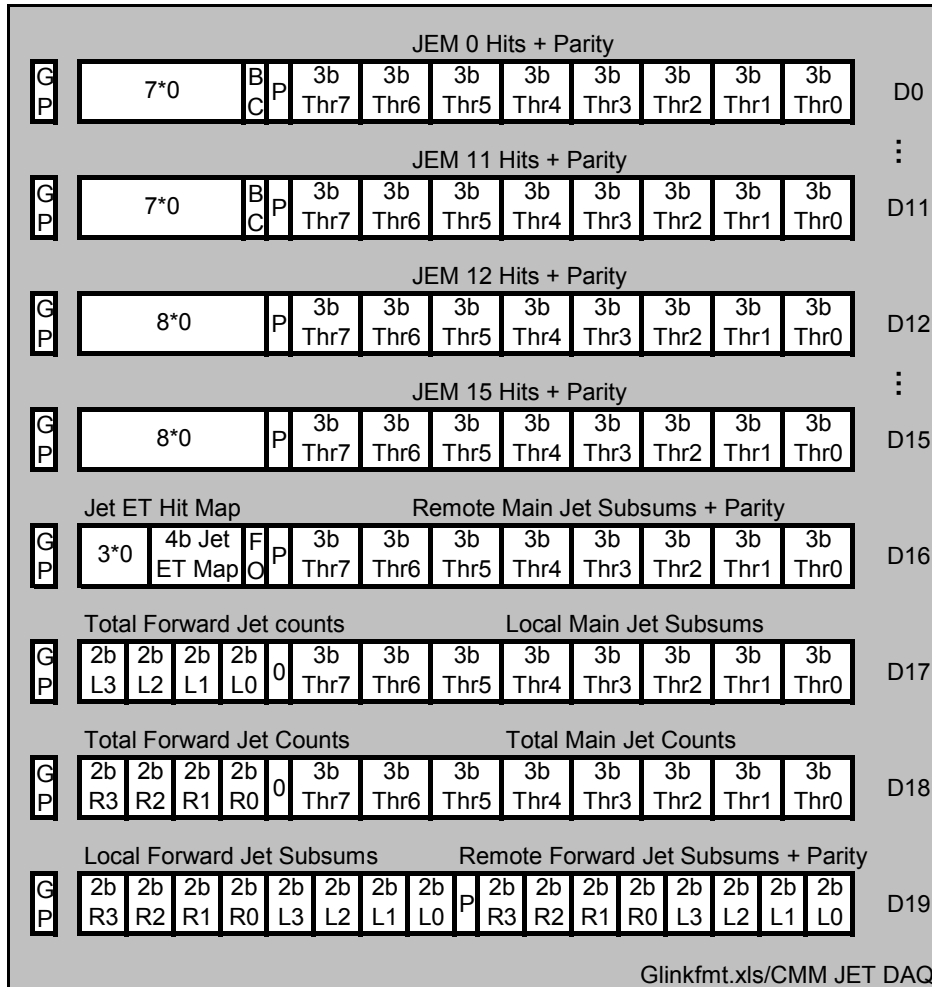


Origin: Prototype CPM_CMM-ROD Spec Version 1.0 11/07/2002

6.1.1 Bit Definitions

G-Link Bit no	Signal Name	Description
D0 - D13	Thr0 - Thr7	Number of electron or tau candidates passing corresponding threshold in CPM 0 -13.
D0 - D13	P	Parity error - when set, indicates parity error detected in incoming data from CPM 0 - 13.
D0 - D11	BC	One bit of 12-bit bunch crossing number
D14 - D16	Thr0 - Thr7	Subsum from remote CMM of electron or tau candidates passing corresponding thresholds.
D14 - D16	P	Parity error - when set, indicates parity error detected in incoming data from remote CMM 0 - 2.
D16	FO	FIFO Overflow - L1A rate exceeds G-Link capacity.
D17	Thr0 - Thr 7	Subsum of electron or tau candidates formed by adding counts from CPMs in this crate.
D18	Thr0 - Thr7	System total numbers of threshold hits.
D0 - D19	GP	Odd parity bit

6.2 Jet CMM G-Link to ROD (DAQ)



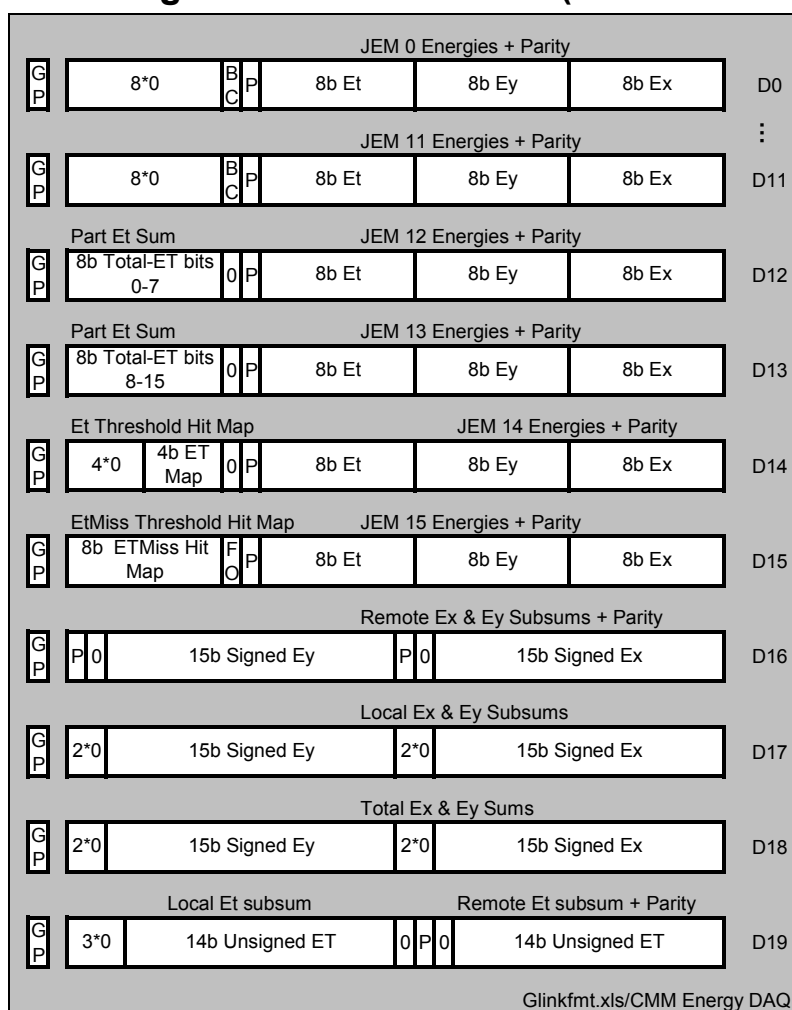
Origin: Prototype CMM Spec version 1.1, 11-Dec-2001, Figure 11, UPDATED³

6.2.1 Bit Definitions

G-Link Bit	Signal Name	Description
D0 - D15	Thr0 - Thr7	Subsums of jets per threshold from local JEMs 0 -15.
D0 - D15	P	Parity error in incoming data from local JEMs 0 - 15.
D0 - D11	BC	One bit of 12-bit bunch crossing number
D16	Thr0 - Thr7	Subsums of jets from a remote CMM.
D16	P	Parity error in incoming data from remote CMM
D16	FO	FIFO Overflow - L1A rate exceeds G-Link capacity.
	ET Map	Jet Transverse energy hit map for four thresholds
D17	Thr0 - Thr7	Subsum of jets from JEMs in this crate.
	L0 - L3	System total Forward Jet Et Counts (Left)
D18	Thr0 - Thr7	System total numbers of jet hits.
	R0 - R3	System total Forward Jet Et Counts (Left)
D19	L0 - L3, R0 - R3	Subsums of forward jets summed in remote CMM.
	P	Parity error in forward jet subsums from remote CMM
	L0 - L3, R0 - R3	Subsum of forward jets from JEMs in this crate.

D0 - D19	GP	Odd parity bit
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6.3 Energy-summing CMM G-Link to ROD (DAQ and Rol)



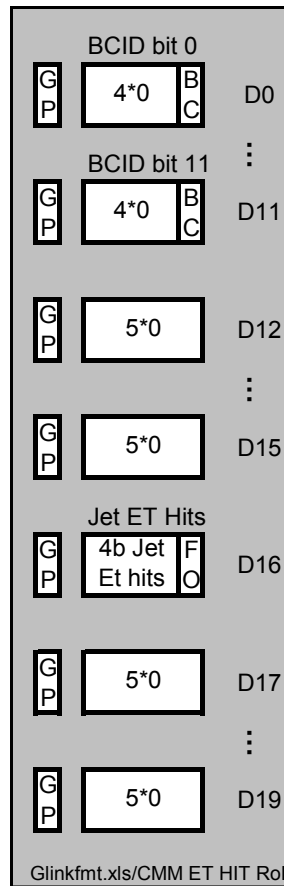
Origin: Prototype CMM Spec version 1.1, 11-Dec-2001, Figure 12, Updated⁴

6.3.1 Bit Definitions

G-Link Bit	Signal Name	Description
D0 - D15	Ex, Ey, Et	Subsums of Energies from local JEMs 0 -15.
D0 - D15	P	Parity error in incoming data from local JEMs 0 - 15.
D0 - D11	BC	One bit of 12-bit bunch crossing number
D11, D12	Et Sum	Unsigned total Et
D14	ET Map	Sum-ET Threshold Map for 4 thresholds
D15	FO	FIFO Overflow - L1A rate exceeds G-Link capacity
	ETMiss Hit Map	ETMiss threshold hit map for 8 thresholds
D16	Ex, Ey	Signed subsums entering from remote CMM
	P	Parity error in incoming data from local JEMs 0 - 15.
D17	Ex, Ey	Signed subsums computed in this crate
D18	Ex, Ey	Signed total Ex and Ey

D19	Et, P	Remote Et Subsum with remote parity
D19	Et	Local ET Subsums
D0-D19	GP	Odd parity bit

6.4 Jet E_T CMM G-Link To ROD (RoI)



Origin: Prototype CMM Spec version 1.1, 11-Dec-2001, Figure 13

6.4.1 Bit Definitions

G-Link Bit	Signal Name	Description
D0 - D11	BC	One bit of 12-bit bunch crossing number
D16	FO	FIFO Overflow - L1A rate exceeds G-Link capacity
D16	Jet Et Hits	Map of Jet Et thresholds passed

7 ROD S-Link formats

7.1 General Principles

All data sent over S-Link from RODs conforms to the ATLAS standard event fragment format, with a fragment header, a fragment body – the data “payload”, and a fragment trailer.

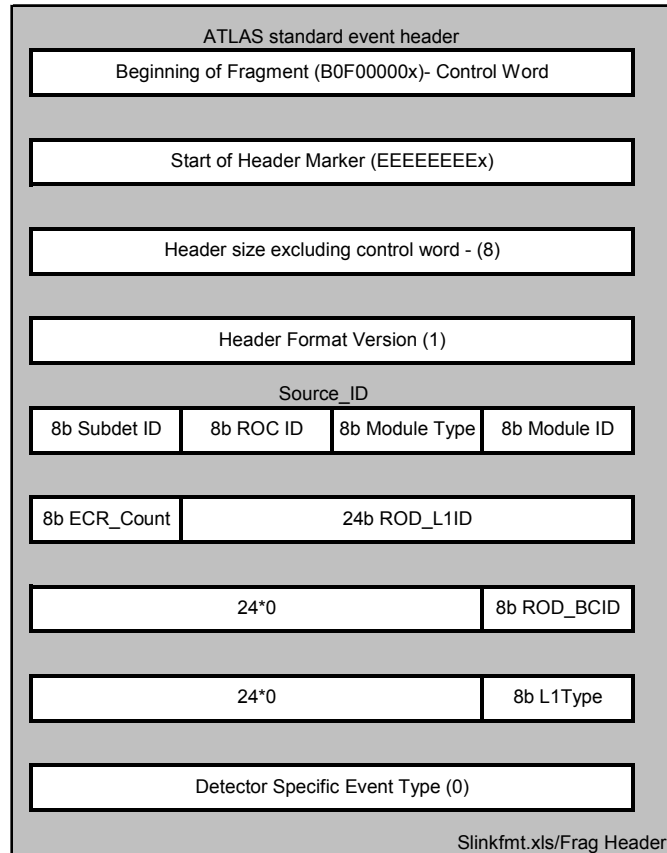
Within the payload, an addressing scheme is used to label data from the different possible sources. The scheme uses the high-order bits of each data word (the "Word ID"). The WordId is unique only with a given class of link, so to determine the data content, analysis software must first identify the specific link concerned, e.g. by examining the ROD identifier in the S-Link header. Then the table below can be used to identify the datafields in the payload.

The assigned values are as follows (high-order bits on the left, '...' indicating 'don't care):

Data Link Type	Word Id	Data Content
CP Subsystem Slice	00...	CMM hit sum slice readout
	01...	CPM trigger tower slice readout
	10...	CPM threshold hit slice readout
	110...	CPM sub-status slice readout
	111...	CMM sub-status slice readout
CP Subsystem RoI	0....	CP RoI
JEP Subsystem Slice	00...	CMM hit sum slice readout
	01...	JEM trigger tower DAQ readout
	10...	JEM hits DAQ readout
	110...	JEM sub-status slice readout
	111...	CMM sub-status slice readout
JEP Subsystem RoI	100...	JET RoI
	1010...	JET ET
	1100...	Energy RoI Ex value
	1101...	Energy RoI Ey value, sumET hits
	1110...	Energy RoI sumEt value, ETMiss hits

To minimise the event size, data in the fragment body is normally either compressed or zero suppressed (all other S-Link readout except energy sums). Such data are annotated "zs" in the diagrams later in this section. Energy sums are not zero suppressed, as the data are unlikely to be zero.

7.2 S-Link Fragment Header

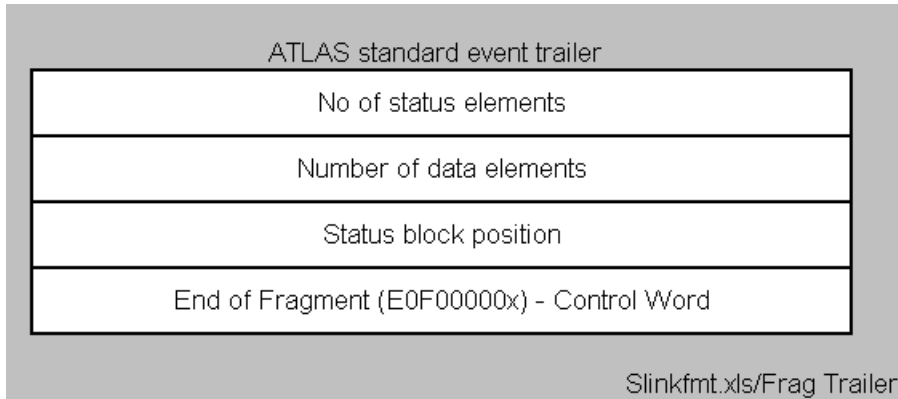


Origin: DAQ Note 50 version 1.5, 15-Dec-1998, Figure 3⁵

7.2.1 Bit Definitions

Signal Name	Description
BOF	Beginning-of-fragment control word, set to B0F00000x
Start of Header	Start of header marker, set to EEEEEEEEEEx
Header Size	Header length in longwords excluding control word.
Format Version	Version of Header, currently 1
Module ID	Serial Number of ROD
Module Type	
ROC ID	Crate Number (0-5)
Subdet ID	Fixed values 70x (Preprocessor), 71x (CP), 72x (JEP)
ROD_L1ID	24-bit Level-1 ID, obtained from TTC system
ECR_Count	Number of Event Counter Resets since run start
ROD_BCID	12-bit bunch-crossing number, obtained from TTC
L1 Trigger Type	8-bit trigger type obtained from TTC
Event Type	Detector-specific event type, currently 0

7.3 S-Link Fragment Trailer



Origin: DAQ Note 50 version 1.5, 15-Dec-1998, Figure 3

7.3.1 Bit Definitions

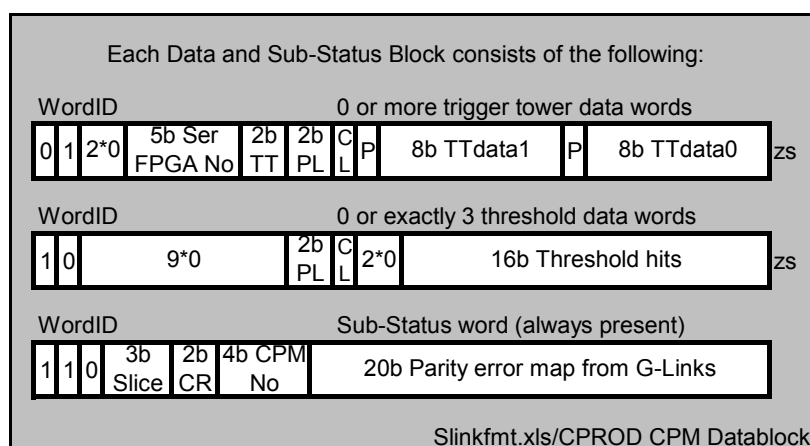
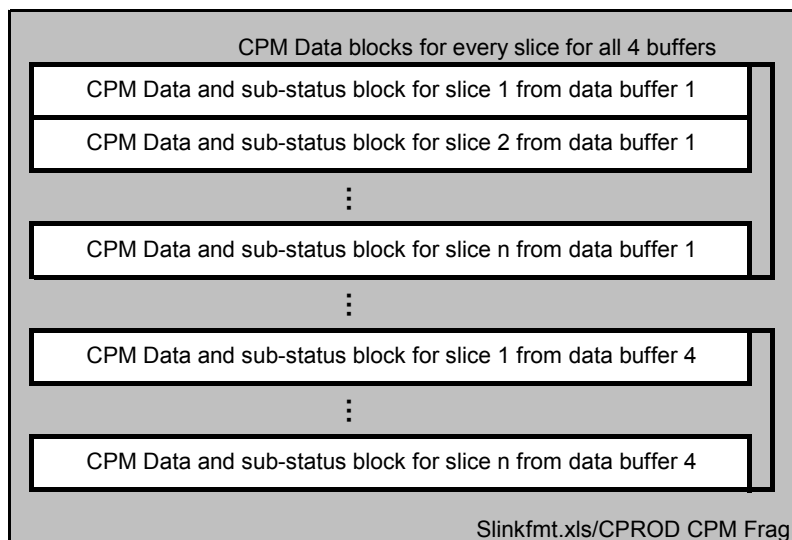
Signal Name	Description
No of Status Elements	Number of Status Longwords
No of Data Elements	Number of Data longwords
Status Block position	Position of Status words - at start or at end of fragment. Values not defined. ⁶
End of Fragment	Version of Header, currently 1

7.4 Preprocessor DAQ⁷

Origin:

7.4.1 Bit Definitions

7.5 CPM DAQ S-Link to ROS



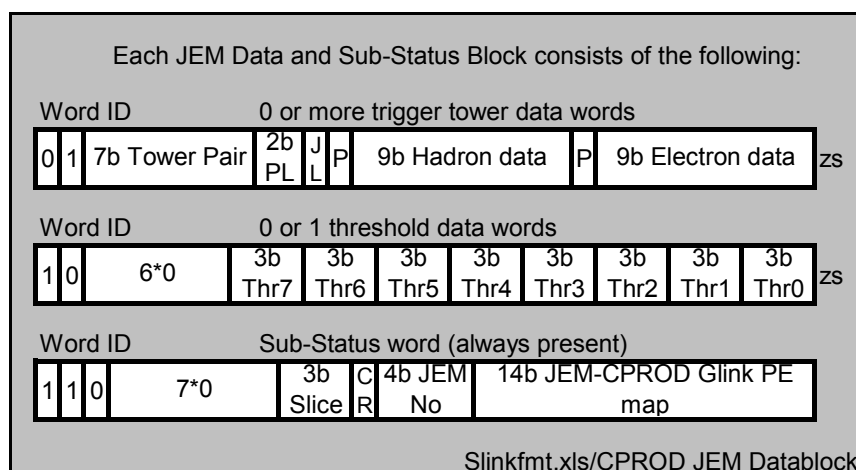
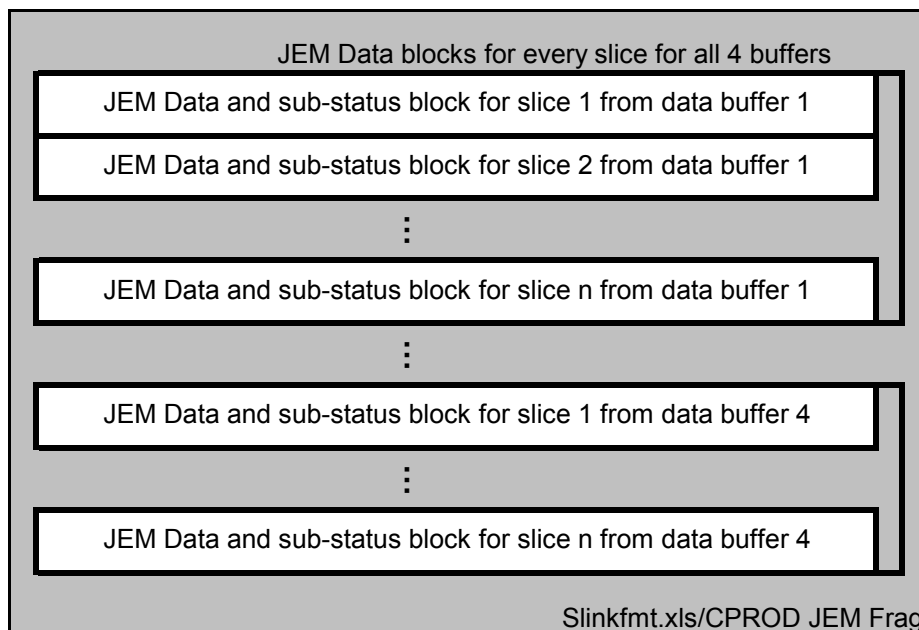
Origin: from CP ROD Spec version 1.0, 2-May-2001, Figure 5, plus additional information from W Stokes.⁸

7.5.1 Bit Definitions

<u>Dataword Type</u>	<u>Signal Name</u>	<u>Description</u>
Trig Tower	TTData0, TTData1	Part of a pair of 8-bit trigger tower data values.
	P	Parity error - set to 1 if parity failure detected which could affect the corresponding tower data.
	CL	Set to 1 if CPM to ROD G-link is down
	PL	Two bits set to 1 if Preprocessor to CPM LVDS link is down. The lower bit refers to the A1B1 or A2B2 link, the upper bit to the C1D1 or C2D2 link.
	TT	Value from 0 to 3 identifying trigger tower pair as A1B1, C1D1, A2B2 or C2D2
	Ser FPGA No	Serialiser FPGA number on CPM from 1 to 20

	Word ID	Value 01 identifying this as a Trigger Tower word
Thresholds	Threshold Hits	One bit for each of 16 thresholds. The 3 successive words contain the three hit count bits per threshold, starting with the LSB.
	CL	Set to 1 if CPM to ROD link is down
	PL	Two bits set to 1 if Preprocessor to CPM link is down.
	Word ID	Value 10 identifying this as a threshold hits word
Sub-Status	Parity Map	One bit per G-link bit (indicates parity error on CPM to ROD link)
	CPM No	CPM Number
	CR	Crate Number, 0-3 for CPMs
	Slice	Slice number, 0-4.
	Word ID	Value 11 identifying this as a sub-status word

7.6 JEM DAQ S-Link to ROS



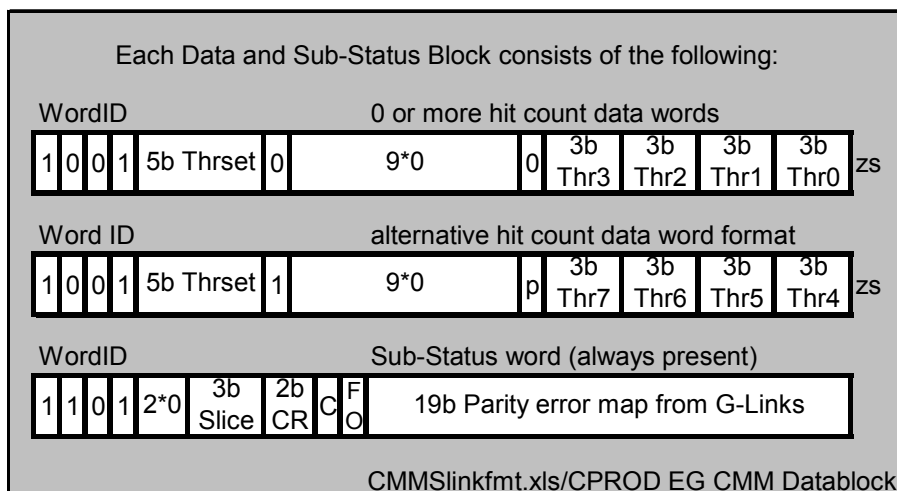
Origin: This document⁹

7.6.1 Bit Definitions

Dataword Type	Signal Name	Description
Tower Data	Electron Data	9-bit electron jet element data
	Hadron Data	9-bit hadronic jet element data
	P	Parity Error indicator, set to 1 if electron or hadron data had an error in transmission
	JL	Set to 1 if JEM to ROD G-link is down
	PL	Two bits set to 1 if Preprocessor to JEM link for these towers is down.

	Tower Pair	Tower pair number on JEM ¹⁰
Thresholds	Thr0-Thr7	Counts of jets passing thresholds
Sub_Status	G-link PE Map	Map of G-Link serial parity errors
	JEM No	JEM number in crate, 0-15
	CR	Crate number, 0=4, 1=5 for JEMs
	Slice	Slice number, 0-4

7.7 CMM Cluster DAQ S-Link to ROS



Origin: This document¹¹

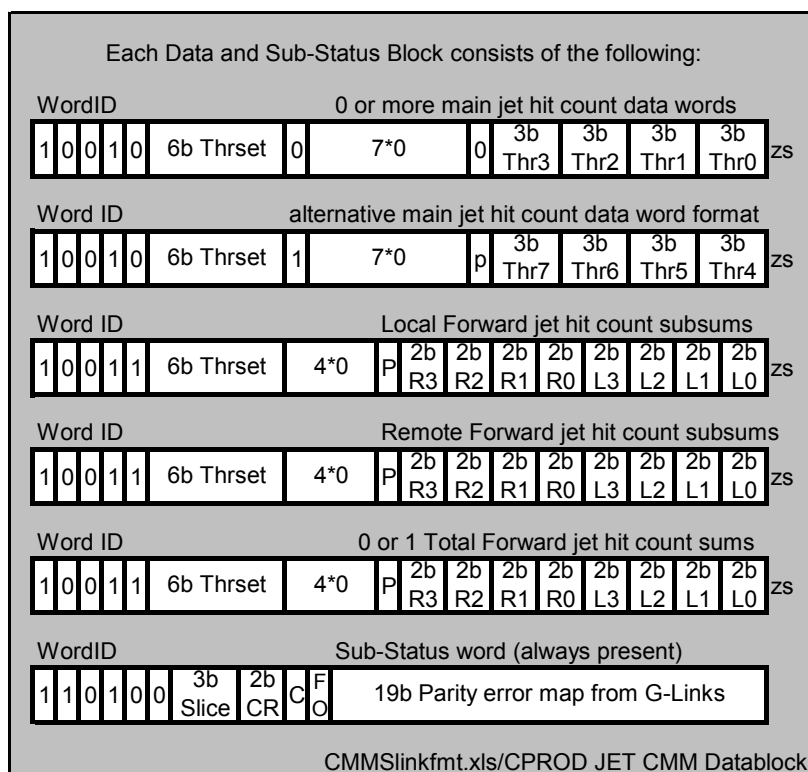
7.7.1 Bit Definitions

Dataword Type	Signal Name	Description
Hit Count	Thrset	Threshold set - see table below
	Thr0-Thr7	Counts of electrons passing thresholds
	P	Parity Error indicator, set to 1 if parity error in input data from CPM
Sub_Status	G-link PE Map	Map of G-Link serial parity errors
	C	Set to 1 if CPM to ROD G-link is down
	FO	Fifo Overflow in CMM (L1A rate too high)
	CR	Crate number, 0=4, 1=5 for JEMs
	Slice	Slice number, 0-4

The Thrset field determines which of the possible threshold groups are contained in each data word, as follows:

Thrset	Data Word Contents
0 - 13	Hit counts from CPMs 1- 14
14-16	Summed hit counts from remote CMMs 1-3
17	Local hit count subsums
18	Total Hit Counts

7.8 CMM JET DAQ S-Link to ROS



Origin: This document.

7.8.1 Bit Definitions

Datavord Type	Signal Name	Description
Main Jet Hit Count	Thr0-Thr7	Counts of main jets passing thresholds
Forward Jet Hit Count	L0-L3, R0-R3	Left and Right Forward Jet counts
All Jets	Thrset	Threshold set - see table below
	P	Parity Error indicator, set to 1 if parity error detected in incoming JEM data
Sub_Status	G-link PE Map	Map of G-Link serial parity errors
	JEM No	JEM number in crate, 0-15
	CR	Crate number, 0=4, 1=5 for JEMs
	Slice	Slice number, 0-4
	FO	Fifo Overflow in JEM (L1A rate too high)
	C	G-Link down from CMM

Thrset	Data Word Contents
0 - 15	Hit counts from JEMs 0-15
16	Local Main Jet Subsums
17	Remote CMM Main Jet Subsums
18	Total Main Jet Sums
19	Local Forward Jet Subsums
20	Remote Forward Jet Subsums
21	Total Forward Jet Subsums

7.9 CMM Energy DAQ S-Link to ROS

Note - this data block is fixed-format, not zero-suppressed.

Each Data and Sub-Status Block consists of the following 27 words:

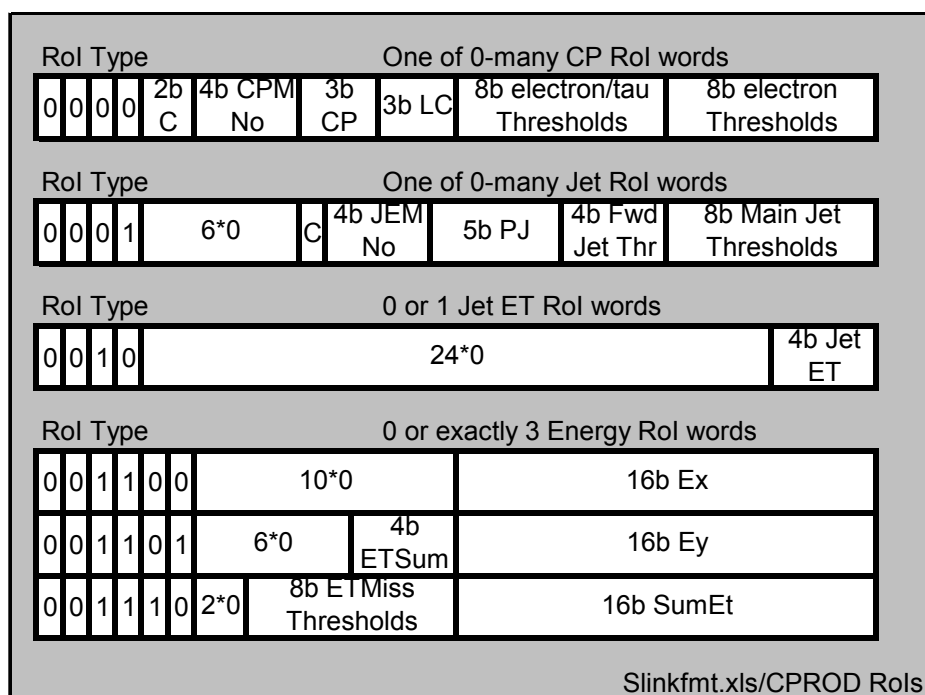
WordID				16 JEM Energy data words				
1	0	1	1	3*0	P	8b Et	8b Ey	8b Ex
WordID				1 Total -ET word				
1	0	1	1	12*0		16b Total Et bits 0-15		
WordID				1 Total -ET threshold hit word				
1	0	1	1	15*0		F O	8b Emiss Hits	4b Et Hits
WordID				3 Remote subsum words				
1	0	1	1	12*0	P	15b Remote signed Ex subsum		
1	0	1	1	12*0	P	15b Remote signed Ey subsum		
1	0	1	1	12*0	P	15b Remote signed Et subsum		
WordID				3 Local subsum words				
1	0	1	1	13*0		15b Local signed Ex subsum		
1	0	1	1	13*0		15b Local signed Ey subsum		
1	0	1	1	13*0		15b Local signed Et subsum		
WordID				2 ex, ey sum words				
1	0	1	1	13*0		15b Signed Ex sum		
1	0	1	1	13*0		15b Signed Ey sum		
WordID				Sub-Status word (always present)				
1	0	1	1	6*0	2b CR	20b Parity error map from G-Links		

CMMSlinkfmt.xls/CPROD EN CMM Datablock

Origin: This document

7.9.1 Bit Definitions

7.10 RoI formats



Origin: from LVL1/LVL2 trigger interface Specification, Version 1, 7-Oct-1999, Figure 9-11

7.10.1 Bit Definitions

RoI Type	Signal Name	Description
CP RoI	Thresholds	8-bit map of threshold sets passed
	LC	Local co-ordinates of RoI within CP FPGA
	CP	CP FPGA number on CPM
	CPM No	CPM Number, 1-14
	C	Crate Number
Jet RoI	Thresholds	Map of threshold sets passed
	PJ	Position of RoI within JEM
	JEM No	JEM number, 0-15
	C	Crate Number
Energy RoI	Ex, Ey, Et	Energy Value
	ETMiss	Map of ETMiss Thresholds passed
	ETSUM	Map of ET Sum thresholds passed
All	RoiTYPE	4-bit field identifying different types of RoI

-
- 1 CPM to CPM Backplane format is not documented here
 - 2 JEM to JEM Backplane format is not documented here
 - 3 Update Jet CMM G-Link figure in latest CMM Documentation
 - 4 Update CMM Documentation, Energy CMM G-Link
 - 5 Insert level-1 trigger type definition into S-Link Header
 - 6 Insert defined values for position of status block in trailer
 - ⁷ Preprocessor DAQ formats missing
 - 8 Requires added definition of status words at end of fragment
 - 9 Needs definition of status words in packet trailer
 - 10 Tower pair definition for JEM to be inserted in compendium