Spill header

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
Spill header ID				Board ID							0	SId				Spill tag															

GTRIG header #1

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
GTRIG header ID				Global Trigger tag																											

Event Data : Hit #1

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
Hit time ID				Channel ID								Hit ID		Tag ID		EDGE				Hit time (2.5ns res.)											

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
Hit Amplitude ID				Channel ID								Hit ID		Tag ID		Amplitude ID				Amplitude measurement											

...

Event Data : Hit #n

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
Hit time ID				Channel ID								Hit ID		Tag ID		EDGE				Hit time (2.5ns res.)											

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
Hit amplitude ID				Channel ID								Hit ID		Tag ID		Amplitude ID				Amplitude measurement											

GTRIG trailer #1

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
GTRIG trailer 1 ID				Global Trigger tag																											
GTRIG trailer 2 ID				Hit counts within gtrig*								Global Trigger time (10us res. % current spill start)																			

Spill trailer

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
Spill trailer 1 ID				Board ID							0	SId				Spill tag															
Spill trailer 1 ID				Board ID							1	SId		Temperature											Humidity						
Spill trailer 2 ID				Spill time (10ms res.)																											

*: unused yet

Table 4 : data structure for the communication between FEB & VRB

Amplitude ID:

	HG	**LG**	**TEMP/HV**
COMPUTE	0000	0001	**0111***
COMPARE	0010	0011	0110
BASELINE	0100	0101	**0111***
OTHERS	**0111***	**0111***	**0111***

*: forbidden value (error)

Tag ID: 2 LSB: These bits are used for Tagging synchronization in order to place Timing & Amplitude measurement within the corresponding GTRIG event i.e. between its real Header/Trailer. The 2 LSB bits of the Hit ID must correspond to the current 2 LSB bits of the Global Trigger Tag. Due to the different clock domains and the FIFOs cascade latency used for the readout, the hit or amplitude ID message may be sent on the next GTRIG header/trailer cell if the event occurs just before the GTRIG signal. Moreover the probability of having an amplitude event on the next GTRIG is higher since it takes ~9us to process the analog readout (ASIC LG/HG multiplexed outputs) compared to an hit event which is pushed in the readout flow within 10-20ns due to FIFO to FIFO shorter latencies (2.5ns clocking).

Hit ID: 3 bits: these bits are used to synchronize the Amplitude event with the corresponding Timing event. Indeed, the amplitude measurement takes approximatively ~9s while several timing events can be latched and sent during this lapse. As soon as a Time event occurs on a given channel, the analog stage latches the hit ID of this channel and this latch is enabled during the entire HOLD DELAY duration and the ADC reading is started at the end. In other words, if many channels are hit the time flow, the corresponding analog ones will be associated with the Hit ID bits field since both timing & analog flows tag the same Hit ID. A rollover counter of 8 events (3-bits) is used.

EDGE: used for hit timing identification of event: 0=rising edge of event, 1=falling edge of event. The event duration may be calculated with the difference of the falling and the rising edge time stamps.

Channel ID: the channel IDs are used for the HG/LG identification but also for the TEMP & HV identification. In this particular case, Channel number is equivalent to:

CH	**signal**
0	TEMP ASIC 2
1	NC
2	TEMP ASIC 1
3	TEMP ASIC 0
4	HV

SiD : Sub Board ID for a vertical/horizontal identification (by hardware dip switch)

R : Reserved bit (=0)