

dRICH data format

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FULL protocol → 256 bit

or

IpGBT →

But.. can we do better?



1. our coarse counter will have a dynamic range between 0 and 12.8 us, not 83 us $12800 \text{ ns} / 2.5 \text{ ns} = 5120 \rightarrow \text{hex } 0x1400 \rightarrow$ So we need just $0x1FFF$ as max value $\rightarrow$ 13 bits instead of 15 $\rightarrow$ 2 bits less
2. via RDO FPGA we can't compute the full ToT (or slew rate) correction, but we could bufferize just one leading hitstamp from a channel and then pack in a single (more than 32-bit) word the corresponding "trailing" hitstamp
3. given we need for the ToT a maximum dynamic range of 100 ns $\rightarrow 100 / 2.5 = 40 \rightarrow$ we just need 64 as max $\rightarrow 0x4F$ only 7 bits are enough (we can reduce/shrink the number of bits of the coarse counter of the trailing timestamp)
4. note we need also to annotate the TDC ID of the trailing hitstamp (that it is different with respect to the TDC ID used to measure the leading timestamp)
5. and we need a bit to alert the first 32 bits have to be interpreted as K-CODE, not as hit timestamps (K CODE FLAG)

This brings us to 51 bits

50	49 48	47 46	45 39	38 30	29 27	26 24	23 22	21 9	8 0
K CODE FLAG	FEB ID	TDC ID (trailing)	Coarse (trailing)	Fine (trailing)	Col. ID	Pixel ID	TDC ID (leading)	Coarse (leading)	Fine (leading)

How we can pack 51 bits in 256 bit words (FULL)



50	49 48	47 46	45 39	38 30	29 27	26 24	23 22	21 9	8 0
K CODE FLAG	FEB ID	TDC ID (trailing)	Coarse (trailing)	Fine (trailing)	Col. ID	Pixel ID	TDC ID (leading)	Coarse (leading)	Fine (leading)

AWORD (Alcor Word)

255	254 204	203 153	152 102	101 51	50 0
DATA FLAG	AWORD4	AWORD3	AWORD2	AWORD1	AWORD0

How we can pack 51 bits in 256 bit words (FULL) or lpGBT



50	49 48	47 46	45 39	38 30	29 27	26 24	23 22	21 9	8 0
K CODE FLAG	FEB ID	TDC ID (trailing)	Coarse (trailing)	Fine (trailing)	Col. ID	Pixel ID	TDC ID (leading)	Coarse (leading)	Fine (leading)

AWORD (Alcor Word)



255	254	253	252	251 204	203 153	152 102	101 51	50 0
DATA FLAG FEB 3	DATA FLAG FEB 2	DATA FLAG FEB 1	DATA FLAG FEB 0	FREE FOR DCS	AWORD3 FEB 3	AWORD2 FEB 2	AWORD1 FEB 1	AWORD0 FEB 0

- this scheme could allow for lpGBT in hybrid mode so with FEC5 or FEC12
- push data from each FEB
- potentially we can send less bits (FEB ID is positional) but DAM should add it then