



# dRICH data format

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## Current scenario



FULL protocol → 256 bit or lpGBT →

### But.. can we do better?





- 1. our coarse counter will have a dynamic range between 0 and 12.8 us, not 83 us 12800 ns/2.5 ns = 5120  $\rightarrow$  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 correspoding "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	FEB ID	TDC ID	Coarse	Fine	Col. ID	Pixel ID	TDC ID	Coarse (leading)	Fine
FLAG		(trailing)	(trailing)	(trailing)			(leading)		(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	,
KCODE	FEB ID	TDCI	D	Coars	se	Fine		Col.	ID	Pixe	lID	TDC	:ID	Coarse	(leading)	Fine	
FLAG		(trailir	ng)	(trailiı	ng)	(trailing)						(lead	ding)			(leading)	

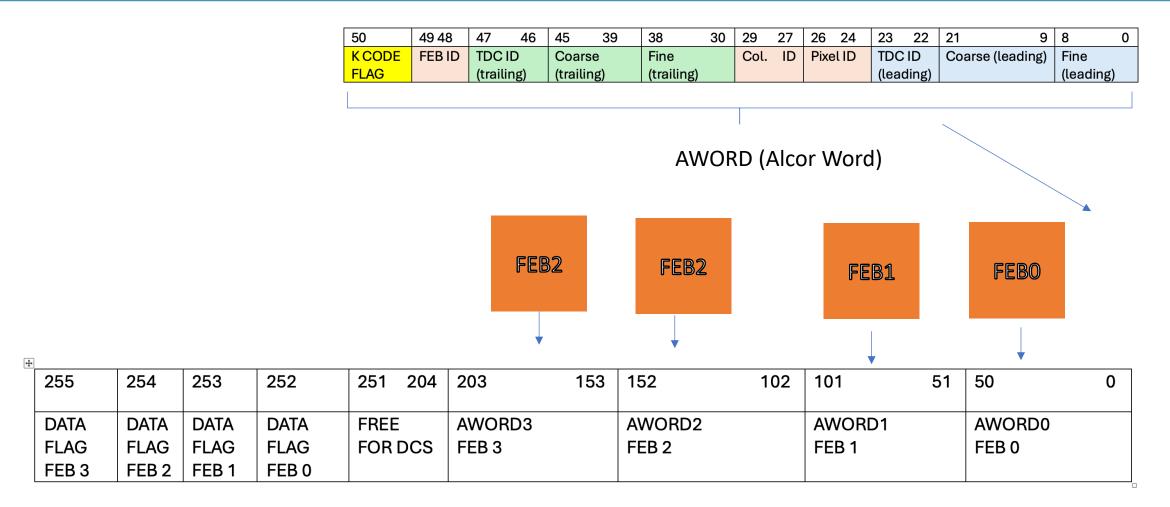
#### AWORD (Alcor Word)

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

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





- this scheme could allow for IpGBT 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