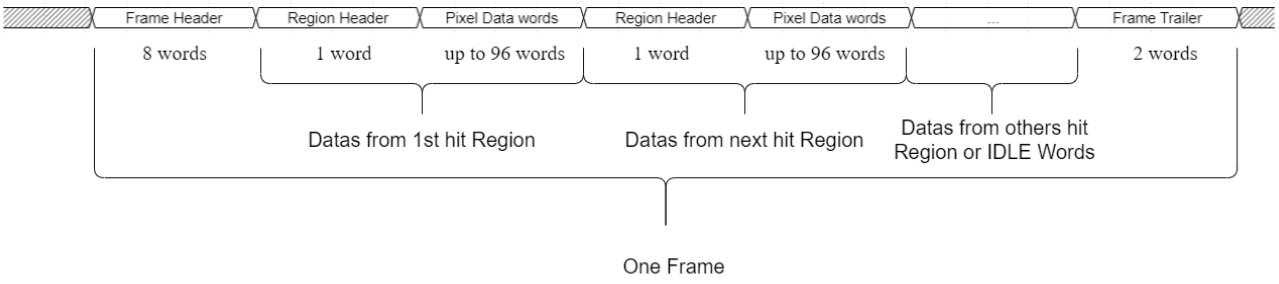
MIMOIS2 Data Format

The output stage serializes an eight data words of 16 bits through a number of serializers depending of the number of outputs set by OUTPUTMODE. The number of outputs and active serializers is equal to $2^{OUTPUTMODE}$. These 16-bit words can be categorized into different data types depending on their value:

- IDLE Word (0xFCAA)
- Frame Header Word (0xFEXX)
- Region Header Word (0xFDXX)
- Pixel Data Word (0x00 to 0xFBFF)
- Frame Trailer Word (0xFFXX)

Frame Header Words, Region Header Words and Frame Trailer Words are used to tag and organised the data Frame flux.

Each Frame (ie the integration window) start with a Frame Header. It is followed by the addresses of the hit pixels of the matrix. These pixels data are grouped in packets of pixels belonging to the same region. A Frame Region Word, specific for each region, marks the beginning of the Pixels Data belonging to same region. A Frame Trailer close the Frame



IDLE Words (0xFCAA)

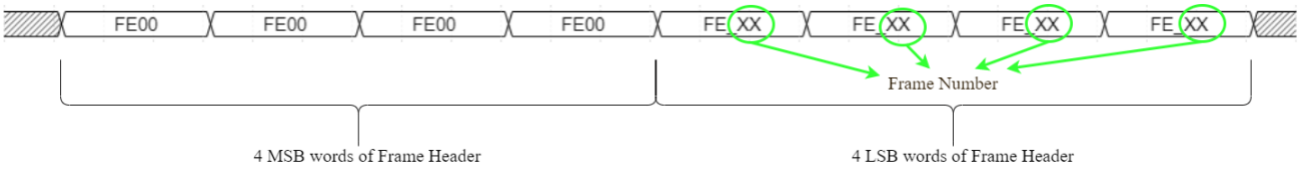
They are are used to fill the data flux when no Data Words are available in order to maintain an activity on the serial links.

Frame Header (0xFEXX)

The Frame header is a 128 bits word composed by eight Frame Header Words.

The first four Header words are fixed to FE00.

The LSB bits of the last four Headers Words encode the Frame Number.

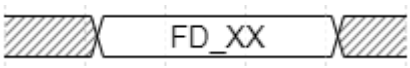


Ex : FE00_FE00_FE00_FE00_FE00_FE00_FE04_FEE2 is the frame Header of the 1250th frame

There is at least one Frame Header Word (FEXX) per active output

Region header Word(0xFDXX)

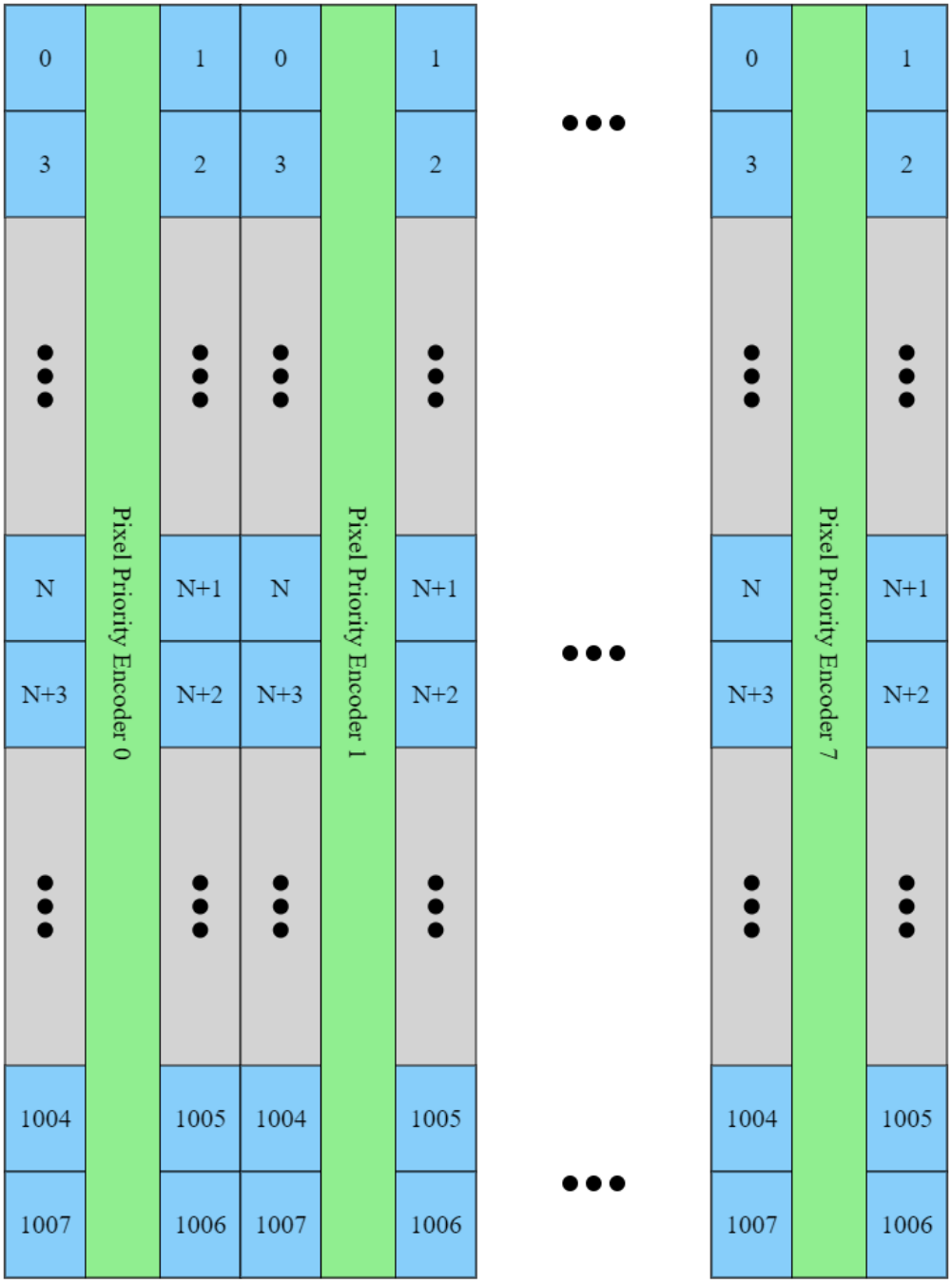
The Region Header tag the be beginning of pixels data belonging to a specific region. The MSB bits are fixed to 0xFD. The LSB bits encoded the region number (from 0x0 to 0x3F)



Ex : FD0C is the Region Header from the 12th region.

Pixels Data Words

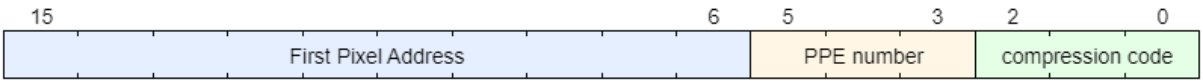
For the readout, the pixels array is divided into 64 logical part called Region. All the Regions are read in parallel. Next picture shows the pixels Region arrangement. A region is composed of 8 Pixel Priority Encoders (PPE). PPE provides the signal to control and read a double column of 504 pixels each, thus the PPE control and read 1008 pixels.



MIMOSIS2 Region description

The 16 bits Data Pixel Words encode

- the address of the first hit pixel inside a potential cluster of 4 successive hit pixels
- the PPE number inside the Region
- a compression code



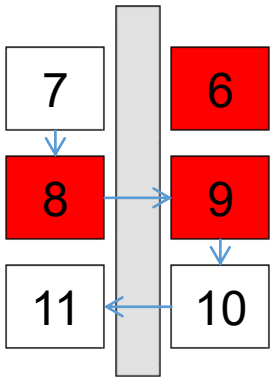
This compression algorithm use an one among N coding style.

Assuming that pixel N had been touched, the map code will be :

Pixel N+3 touched?	Pixel N+2 touched?	Pixel N+1 touched?	Compression code
No	No	No	000
No	No	Yes	001
No	Yes	No	010
No	Yes	Yes	011
Yes	No	No	100
Yes	No	Yes	101
Yes	Yes	No	110
Yes	Yes	yes	111

Ex :

First Pixel Address										PPE address			Compression code		
15									6	5		3	2		0
0	0	0	0	0	0	1	0	1	0	0	0	1	1	0	1



Portion of double-column

In this case, the pixel n°6, 8 and 9 of the double column n°1 are hit.

Frame Trailer

At the end of the frame, a trailer is build. It is composed by two words of 16 bits: the Frame Trailer Word and the CRC. The Frame Trailer Word is always followed by the CRC word. The position of the Frame trailer inside the 128 bits words (and so at the outputs pads) is not fixed. Depending on the MIMOSIS2 output mode and the Pixels Data, the trailer words can be on output pad 0, 2, 4 or 6. So the CRC word could be serialized on output pad 1, 3, 5 or 7.

Frame Trailer Word

The MSB bits [15: 8] of the Frame Trailer Words are fixed at 0xFD.

The LSB bits [7:0] are used to encode saturation flags:

- Bit [7:4] : fixed to 0 (not used)
- Bit [3]: Frame Size Limit Active / Buffer “rather full”:
- Bit [2]: Frame Overflow
- Bit [1]: SR_overflow flag :saturation detected in one ore more Super Region Unit (SRU)
- Bit [0]: SAT_FLAG_MXT : saturation detected in one or more Pixel Priority Encoder (PPE) in the matrix detected

CRC Word

The CRC Word , calculated on the 128 bits words inside the frame generator module. The polynomic used is :

crc[15:0]=1+x^2+x^15+x^16

The CRC is calculated each frame and use the Frame Header and the Pixel Data, but does not included the last 128 bits words containing the Frame Trailer. To avoid confusion between this CRC words and others reserved words (IDLE Word, Frame Header, …), the MSB bit is fixed to logic one after the calculation of CRC.