Instruction on FE-I4 emulator usage

General description

Both BOC BMFs contain 16 emulated front-end chips, each is connected to one RX channel. These emulated chips have a very limited feature-set compared to a real front-end:

- Reading/writing global registers is supported
- Global registers act as memory and have no specific functionality.
- No shift register support.
- Run-Mode can be changed.
- Automatic random injection up to 255 hits per trigger and manual injection up to 2 kilobyte event size is supported.
- Chip-ID can be configured freely, emulator supports broadcasting.

Note on RX channel configuration

If using the emulator the input of the RX channel needs to be configured properly. The emulator is attached to the former FMC electrical input port. To use this as input the upper 3 bits of the RX control register need to be set to 001.

The boclib provides a function for the RxChannel. Use SelectInput(Addr::Rx::InputEmulator) on the latest boclib version.

Low-Level interface

The low level register interface to the emulator consists of 8 registers per emulator:

- Control register (offset 0x0)
- Status register (offset 0x1)
- L1ID LSB (offset 0x2)
- L1ID MSB (offset 0x3)
- BCID LSB (offset 0x4)
- BCID MSB (offset 0x5)
- Manual hit injection (offset 0x6)
- Hit Count per trigger (offset 0x7)

The address of the registers can be calculated by the following formula:

register address = BMF offset + 128 + 8 * channel + register offset

where as BMF offset is

0x4000 for south BMF

0x8000 for north BMF

Control register

Bit 0: Enable

This bit enables the whole front-end emulator. Setting this bit to zero will do a full internal reset of the emulator.

Bit 1: Armed

This bit will arm the manual hit injection. The content of the hit injection FIFO is only sent out when this bit is set to prevent event corruption during filling the FIFO. If this bit is set to

0 during manual injection mode an empty event will be sent out.

Writing to the FIFO will automatically set this bit to 0.

Bit 2: Mode

Switch between different event modes.
0: manual injection via hit injection FIFO
1: automatic random injection of events

Bits 7:4 Chip ID

The Chip-ID on which the emulator will react.

Note: The emulator will always react on Chip-ID 8 (broadcast)

Status register

Bit 0: RunMode

This bit tells about the RunMode status of the emulator.
0: ConfMode
1: RunMode

Bit 1: Hit injection FIFO full flag

Bit 2: Hit injection FIFO empty flag

L1ID and BCID registers

Both registers contain the values of the internal BCID and L1ID counters. Always read the LSB first!!

Hit injection FIFO

This register is an interface to the manual hit injection FIFO. Writing to this interface will put the value into the FIFO. Please arm the FIFO (see control register) after complete writing of the event.

Hit count

The hit count register holds the value for automatic random hits per trigger. Values supported are 0 to 255.

High-Level interface

The boclib provides a new class Fei4Emu, which provides high level API to the emulator.

Each BMF object has a function GetFei4Emu(int channel) which will give you a Fei4Emu object to the corresponding channel.

Look into include/Fei4Emu.h and src/examples/Fei4EmuTest.cpp how to use the API. It is somehow self explaining.

Connectivity

Emulator channel	**BOC TX**	**BOC RX**	**ROD XC**
0	0	0	0
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8 *	8	8	0
9 *	9	9	1
10 *	10	10	2
11 *	11	11	3
12 *	12	12	4
13 *	13	13	5
14 *	14	14	6
15 *	15	15	7

*) not available on BOC revB