

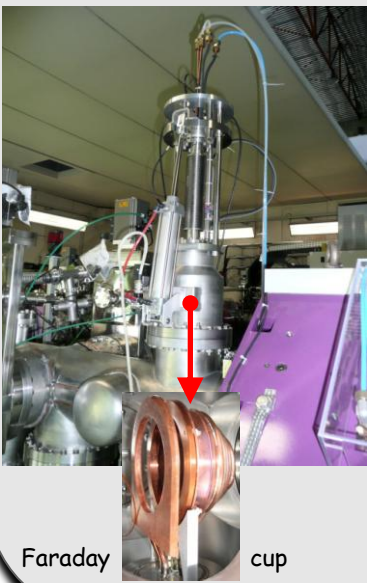
The first steps of the beam intensity measurement of the SPIRAL2 Injector

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ABSTRACT :

The Spiral2 Injector includes several diagnostics. The first ones implemented are Faraday Cups and emittancemeters. Two types of acquisition for the beam intensity measurement on the Faraday Cup are being developed. The goal of the first type of acquisition is to determine an average intensity value using a traditional acquisition COTS VME board (32 multiplexed channels). This was carried out for the first beam tests on the low beam energy line at LPSC Grenoble in June 2009. The second type of acquisition is to perform a measurement synchronized with the beam pulse to provide the peak value. Due to the bandwidth of the expected signals, it is necessary to be able to sample at 1 Msamples/sec. A test bench is presented with the selected COTS VME boards ADAS ICV108 and ICV178.

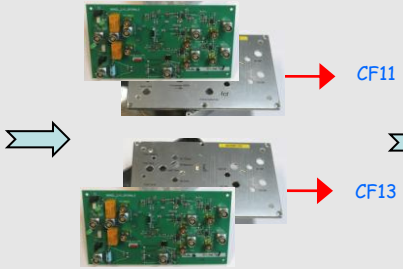
Low Energy Beam Transfer line



Faraday cup

Average Intensity Measurement at Spiral2 ion source

The command control to measure the average intensity with 2 Faraday cups was tested at LPSC Grenoble in June 2009 during the first beam tests with the q/A=1/3 ion source.

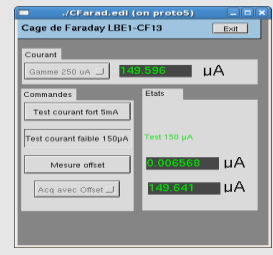
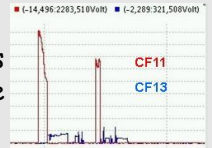


Electronic boards designed by Ganil/GEM provide the current to voltage (I/V) conversion. This conversion is on 2 ranges to allow the measurement of high and low currents. These 2 ranges are simultaneously available.



VME boards:

- CPU Emerson Motorola MVME5500.
- ADC ADAS ICV150 32 channels 16 bits resolution, 30KSamples/s frequency, permanent scanning.
- Binary I/O ADAS ICV196 board to manage 2 reference currents for calibration and tests.



The operator has to choose the high or low level current range.

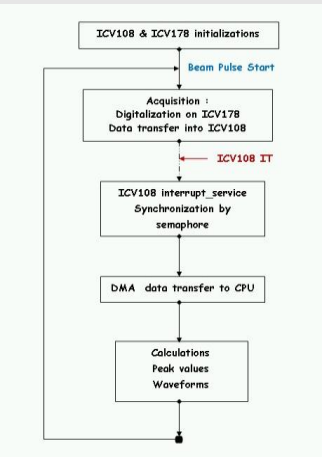
- A procedure of offset measurement is available.
- Reference current tests permit to validate the measurement chain.

Test bench of the beam pulse synchronized acquisition at 1 Msamples/sec

The diagnostics have to be used in pulsed beam mode during commissioning, daily process and machine studies. The signal bandwidth of the ion and deuteron sources reaches 50 KHz. Therefore, one of our major constraints was to choose a COTS VME board with a sampling frequency about 1 Msamples/sec and ADCs with a resolution greater or equal to 14 bits.

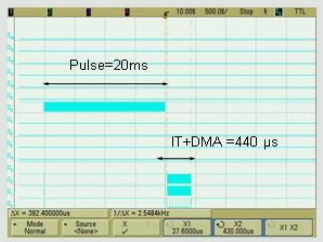
Selected VME ADAS boards :

- an ICV178 16 bits resolution, 8 analog inputs and 1.2 Msamples/sec connected with :
- a controller board ICV108 with an external trigger, a RAM buffer of 4 Mbytes and runs in "Single Event" or "Flip/Flop" modes.



Flowchart of EPICS software :

- beginning of the acquisition at the pulse start.
- storage of digitalized data in ICV108 RAM.
- DMA transfers to CPU local memory.
- peak values calculations.
- beam pulse shape.



Collaboration with ADAS
Tests to evaluate DMA basic pattern to save data in RAM. Each pattern transfer and calculations includes 10 subpatterns. Each subpattern includes time before next pulse.

timestamps	ch1	ch2	ch3	ch4	subpatterns			
0x83800000:	0000	0007	a945	7ff3	8049	7ff7	a945	7ff3
0x83800010:	804b	7ff9	a97f	7ff5	804b	7ff3	a945	7ff3
0x83800020:	804b	7ff9	a945	7ff5	8047	7ff5	a943	7ff1
0x83800030:	804d	7ff7	a943	7ff7	804d	7ff9	a941	7ff1
0x83800040:	8047	7ff9	a943	7ff7	804b	7ff5	a943	7ff1
0x83800050:	804b	7ff9	0000	00a7	a945	7ff3	8049	7ff5
0x83800060:	a947	7ff3	8049	7ff9	a941	7ff3	8049	7ff7
0x83800070:	a941	7ff3	804b	7ff7	a947	7ff3	804d	7ff7
0x83800080:	a941	7ff5	8049	7ff5	a947	7ff5	8049	7ff7

Measurements following the pattern table
The ICV108 comprises a pattern table of 32K x 16 bits in A24 space. This table consists of a basic pattern to save data in RAM. Each pattern transfer and calculations includes 10 subpatterns. Each subpattern includes 4 channels.



Next steps :

- Flip / Flop mode tests.
- DMA transfer optimisation.
- fix remaining CPU problems.
- mode of operation.