

Skew Quadrupole Modulation Beam Experiment

(Feb. 03-04 , the forth session)

Plan for this session

measuring on ramp modulating simultaneously / modulating one after another

What data taken

1) three ramps:

first ramp suffering PLL DSP problem, only vertical plane tune modulation visible
second ramp beam lost due to unlocking the rf freq. of both rings during
third ramp successful, useful data taken on ramp and at store

2) modulations on ramp

F1: 2 A, 0.2Hz F2: 2 A, 0.5Hz Modulating simultaneously
Start from t110, lasting 250 sec.

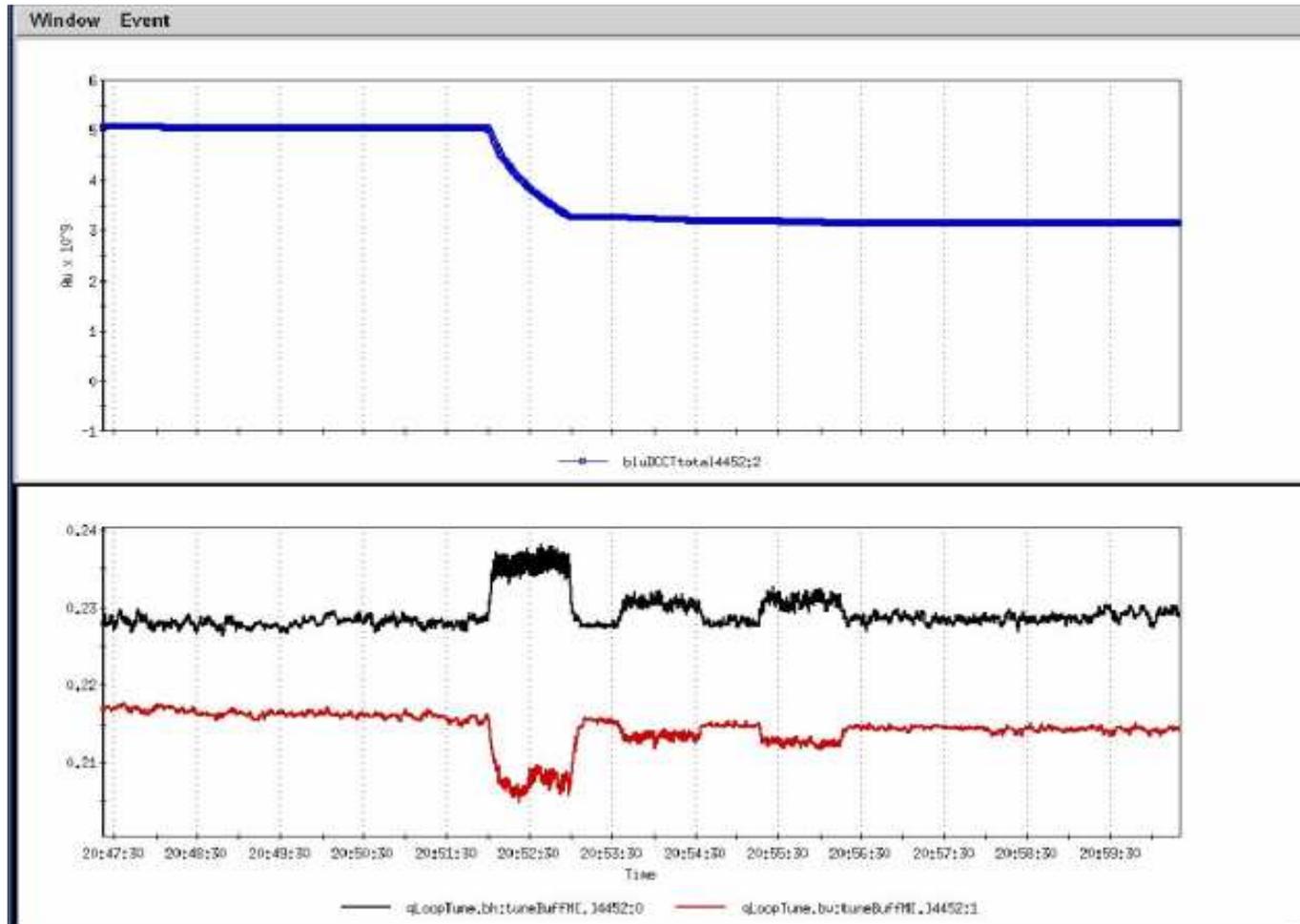
3) one measurement at injection before first ramp

three families one modulation one by, peaks clear, data useful

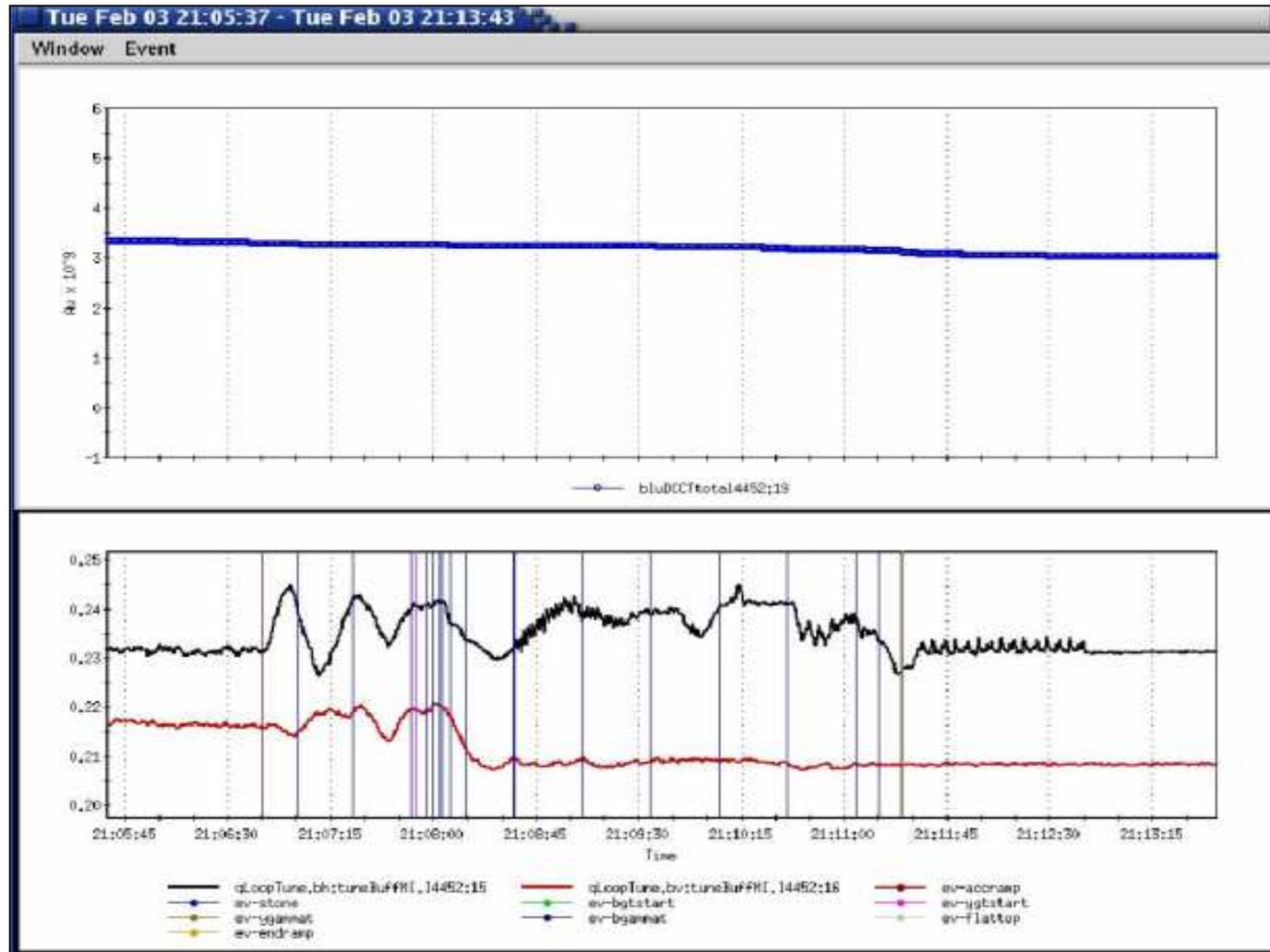
4) one measurement at store after third ramp

two families modulations simultaneously

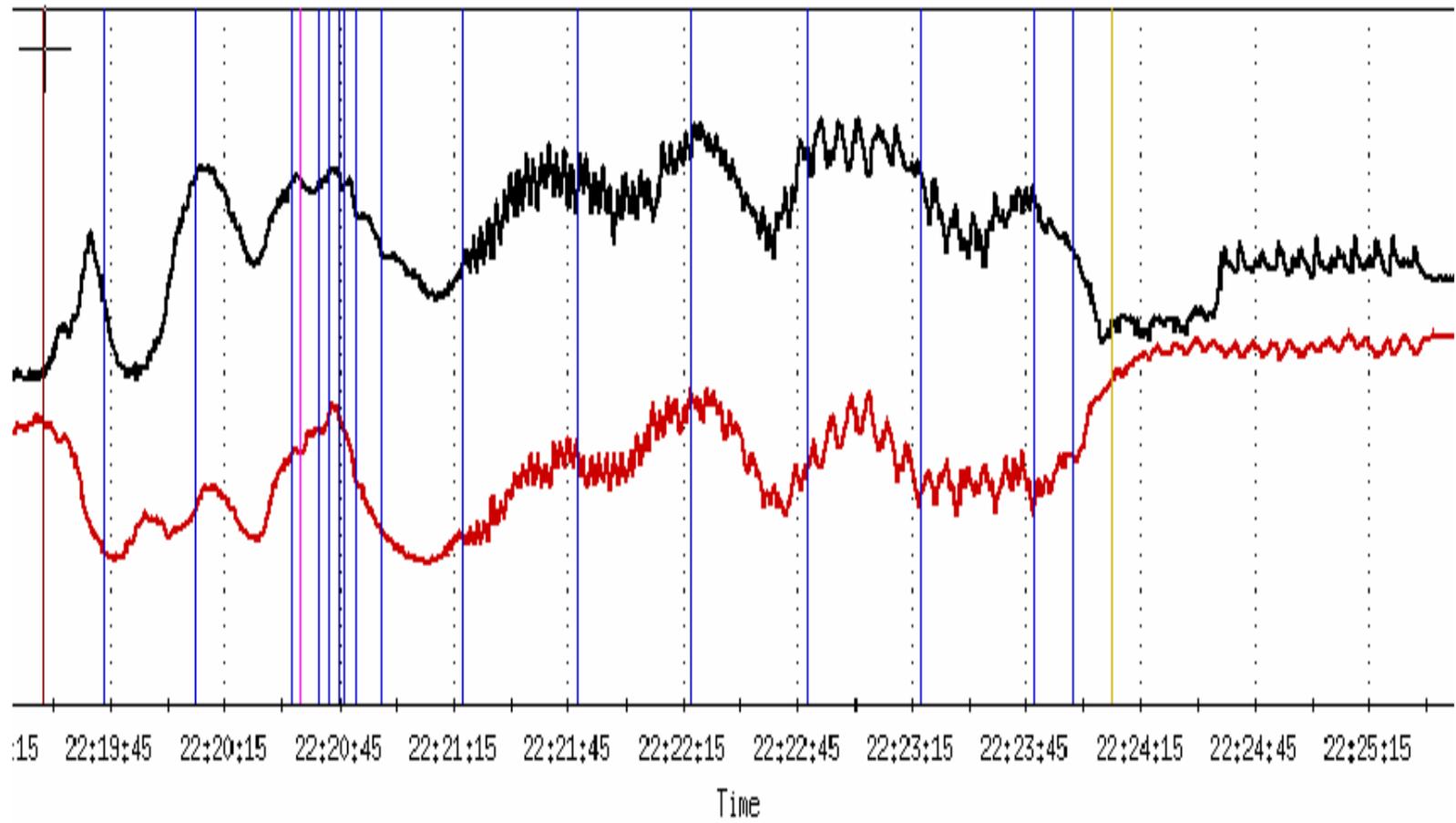
PLL readings at injection before ramp1



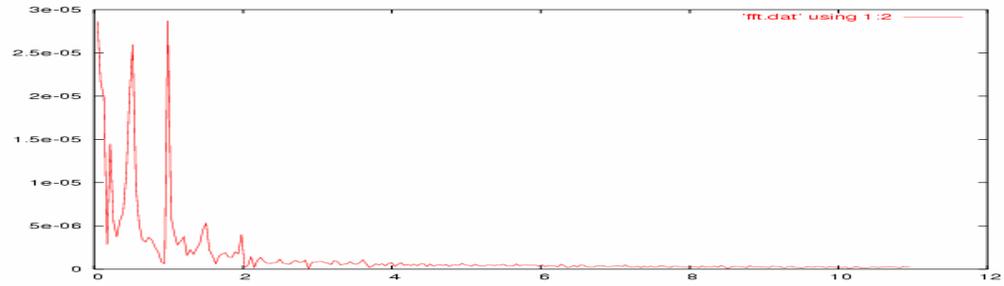
PLL readings on Ramp 1



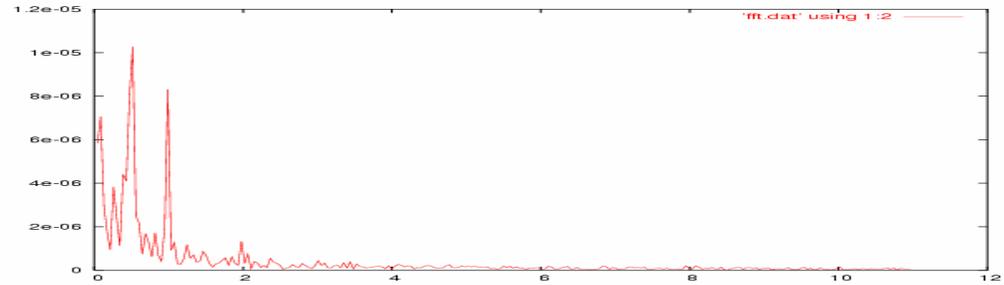
PLL readings for Ramp3



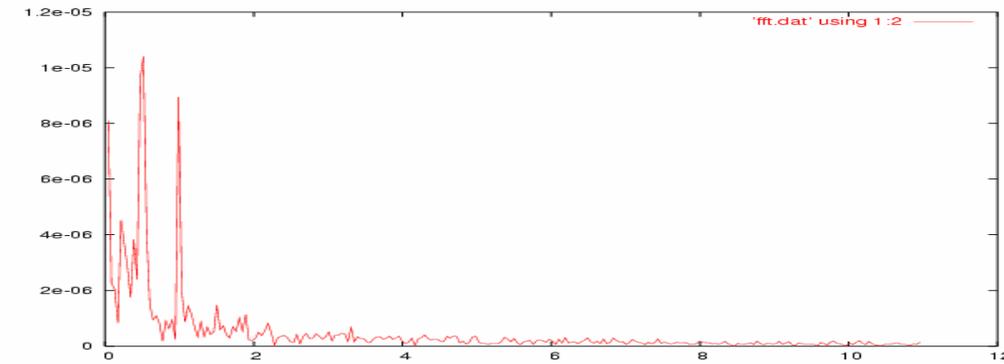
Injection, Family 1 modulate:



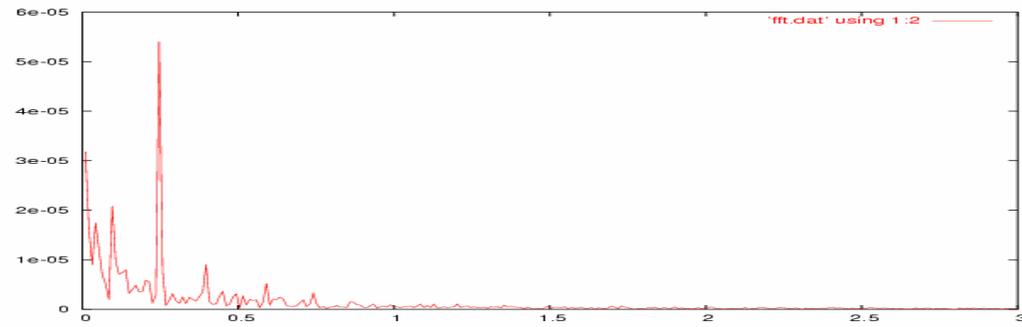
Injection, Family 2 modulate:



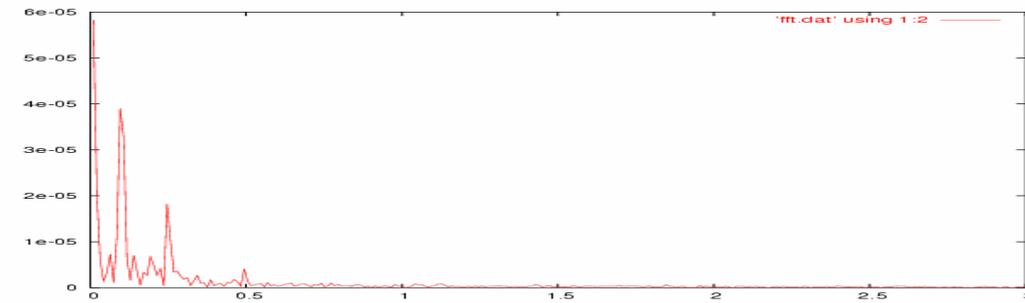
Injection, Family 3 modulate:



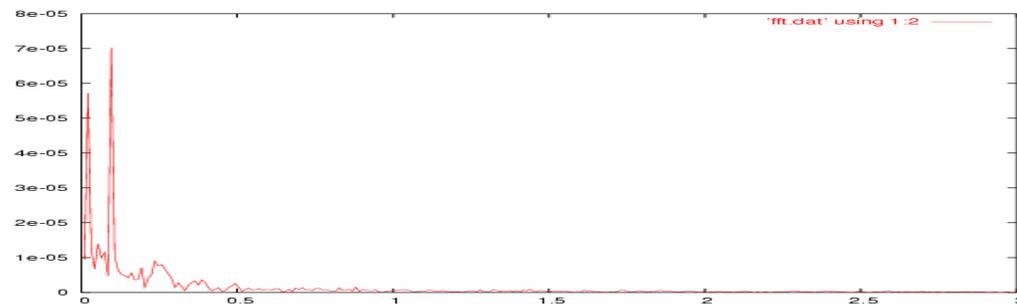
Ramp 3_time1



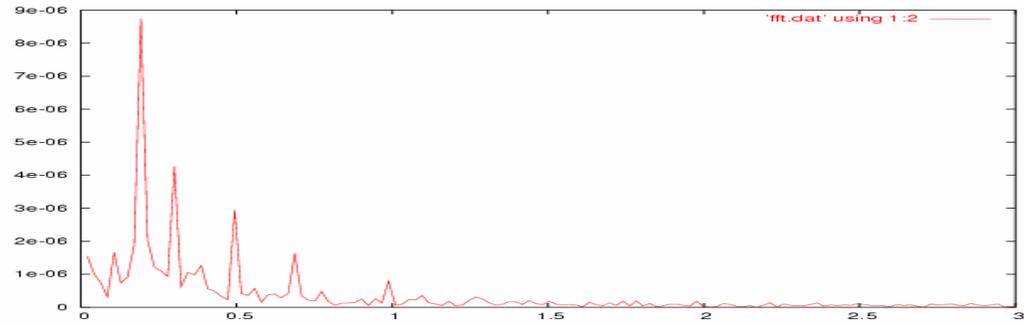
Ramp 3_time2



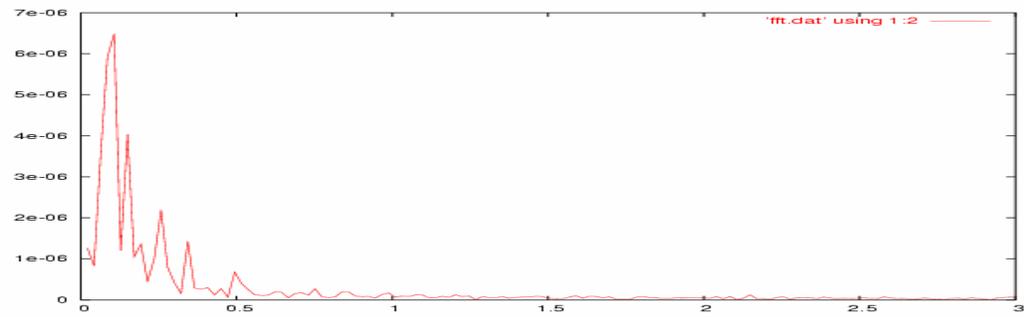
Ramp3_time3



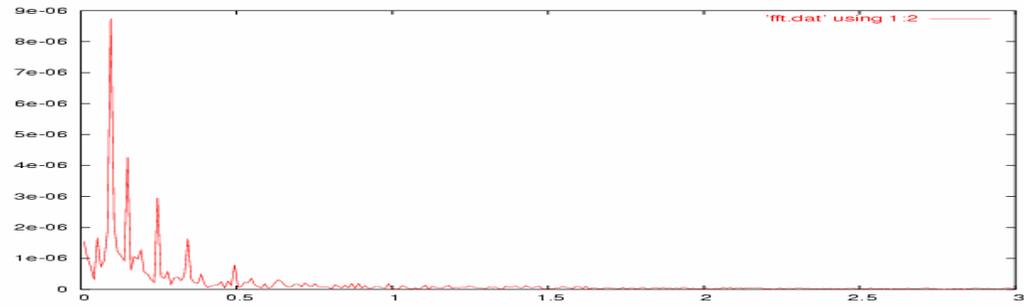
Store_fft1



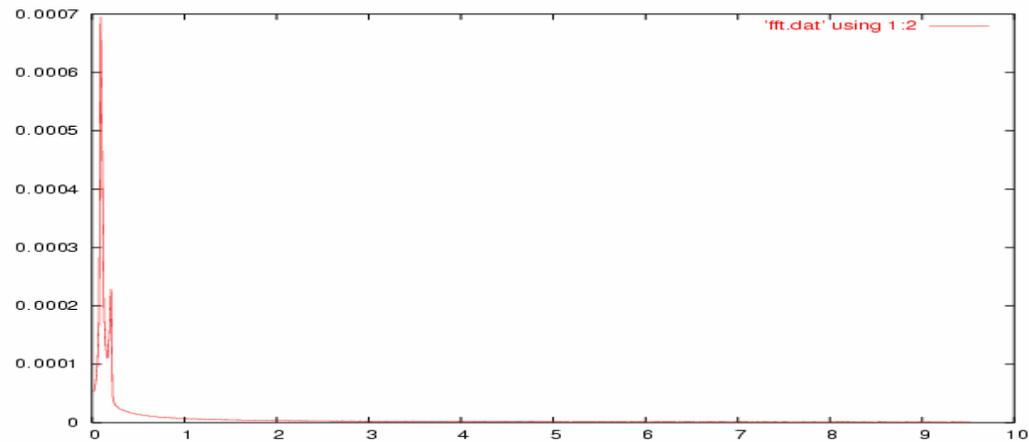
Store_fft2



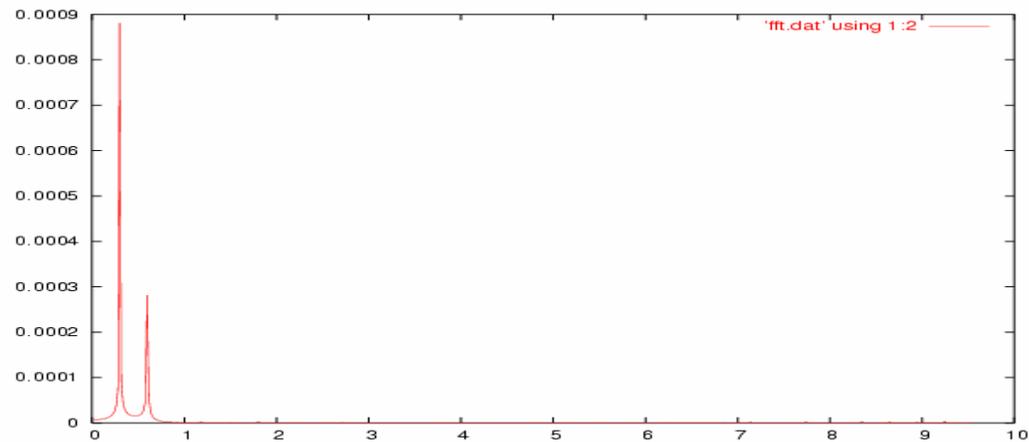
Store_fft3



Modulation with two families with two different frequencies

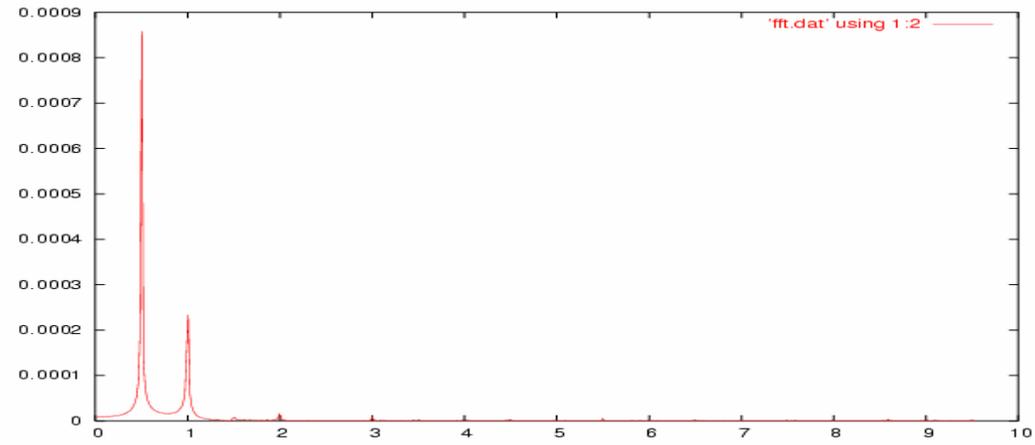


0.1Hz modulate.

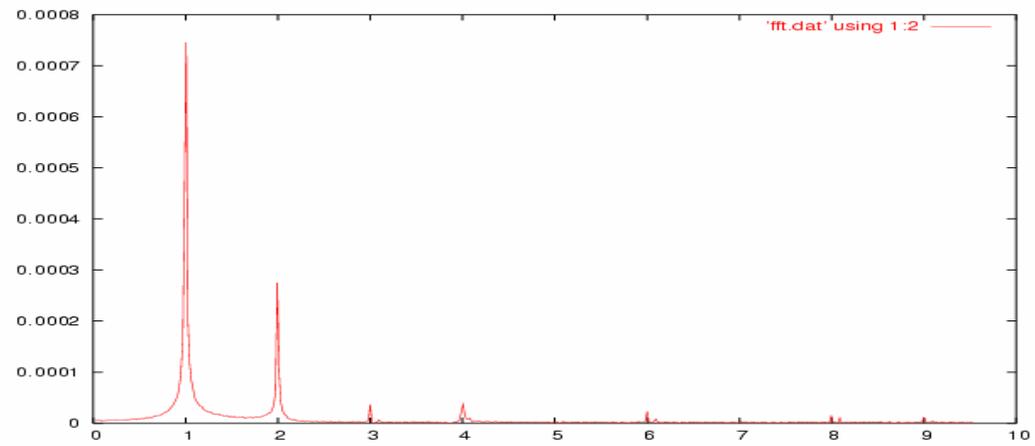


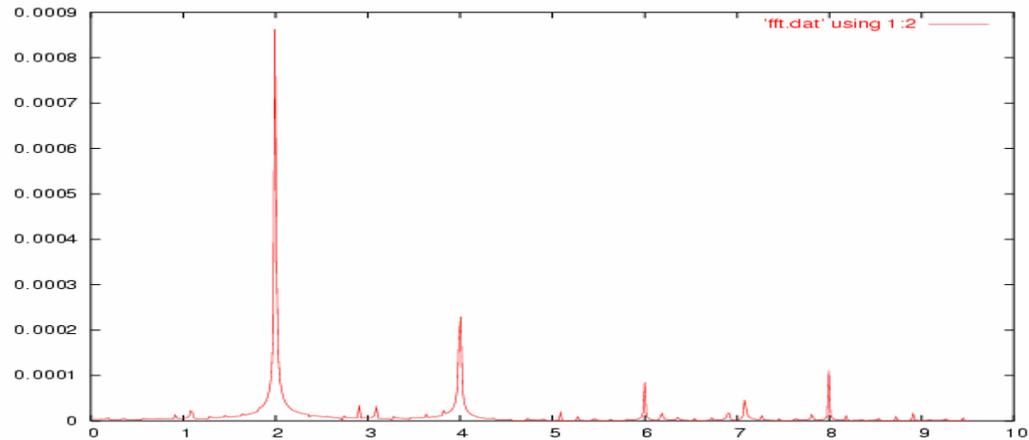
0.3Hz modulate.

0.8Hz modulate



1.0Hz modulate



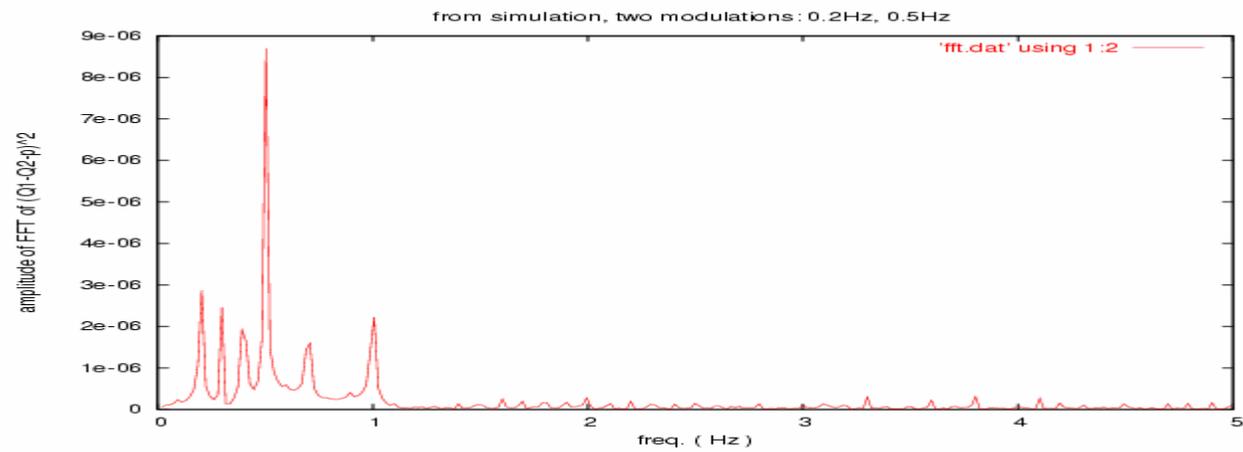
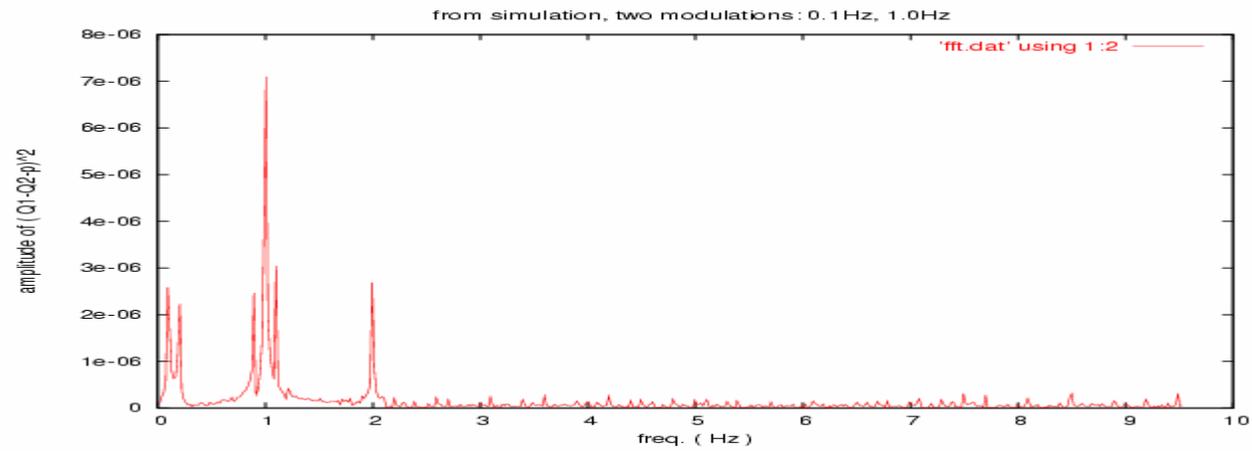


2.0 Hz modulation

Modulation Freq. (Hz)	Peak1 (1f)	Peak2 (2f)
0.1	0.0007	0.00023
0.3	0.00088	0.00028
0.5	0.00087	0.00024
0.8	0.00091	0.00028
1.0	0.00075	0.00028
2.0	0.00088	0.00025

- **High frequency (> 1.0Hz) modulation induces not clean FFT spectrum**
- **Low frequency (< 0.1Hz) modulation needs more data for FFT to get high frequency resolution. One alternative is using FIT instead of FFT to find coupling.**

Two frequencies modulations simultaneously



Conclusion for session

Data have been taken during two families modulations on ramp.

Peaks in the FFT spectrum of $(Q1-Q2-p)^2$ are clear.

Two frequencies coupled, sum and difference frequencies come out.

Next experiment plan

measure coupling on ramp

1) modulating skewQ families **one by one** on ramp

2) modulating two skewQ families **simultaneously** on ramp

Then conclude the Skew Quadrupole Modulation beam experiments

==> applicable to coupling measurement at injection and store ? YES

==> applicable to ramp coupling measurement ? YES/NO