MEMO

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Objet: Oscillations in the BAO spectra

1 Introduction

We study for both channels the evolution of the oscillation patterns hereafter callsed "large amplitude/high frequency" with frequency around 3-5 MHz, and "small amplitude/low frequency" with frequency approximately equal to 500 kHz. We use data from Abell1205 cluster (the longest data sample taken from April 2011 to October 2011).

2 Channel 0

On Figure 1 from right to left, top to bottom, we show the cumulated spectra for 0-99, 100-199, 200-299, 300-399, 400-499, 500-599, 600-699 and 700-799 cycles. The spectrum On/Off_{filt} is shown in cyan for Ch0, and the Off/Off_{filt} in blue[1]. The "nasty period" from end of August 2011 until end of September 2011 has not been considered in this analysis.

[1] Off_{filt} means the spectrum taken during the Off part of a cycle in ON-OFF runs, filtered thanks to a median filter with 3MHz total sliding window width.

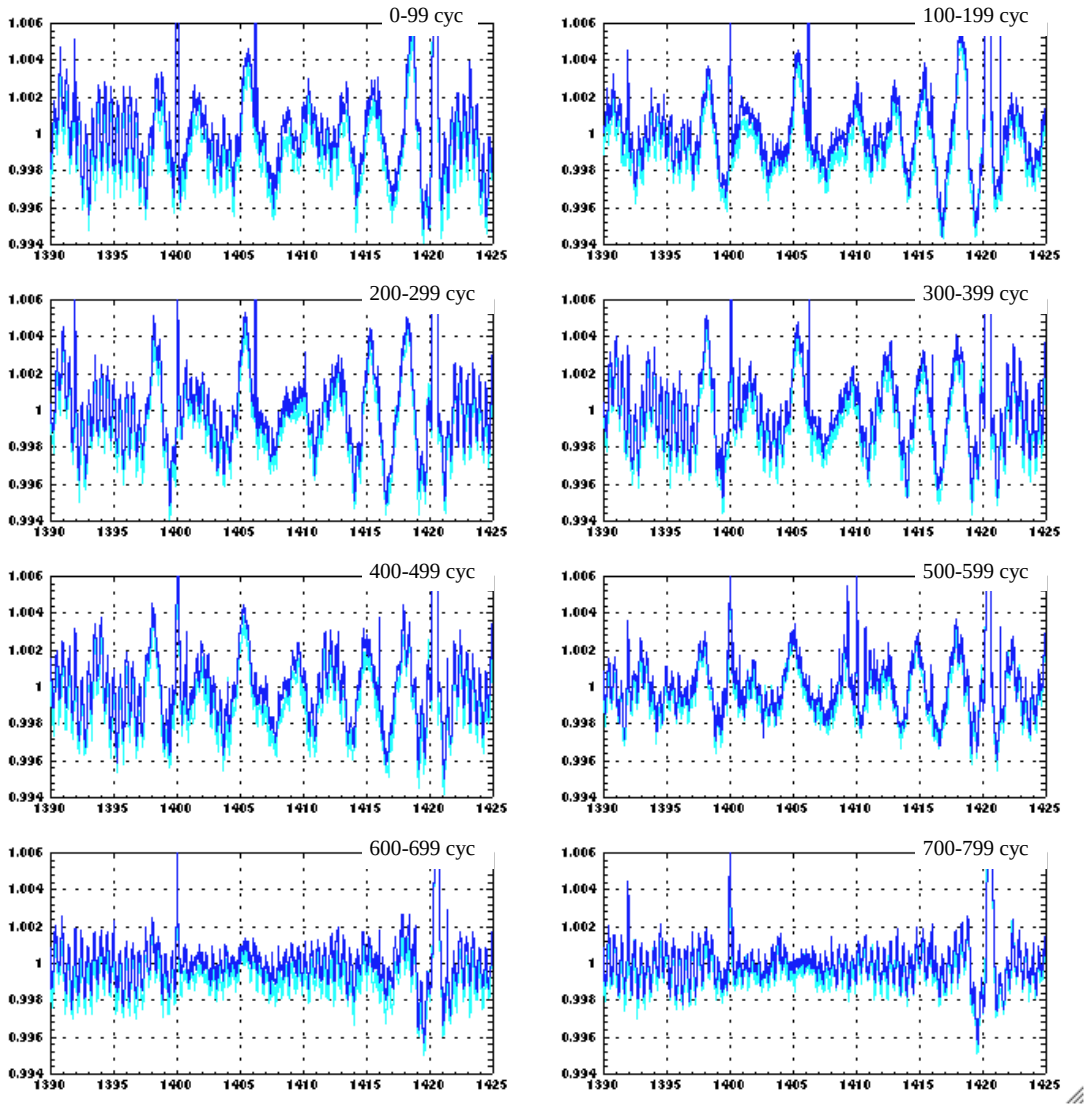

Figure 1

The pattern of the low frequency/large amplitude oscillation remains unchanged in both phase and amplitude for the first 500 cycles starting in 15Apr2011 and ending in 25Jul2011. Then, the amplitude reduces during the period 27Jul2011-18Aug2011 until it almost disappears in October 2011. At this point, only the low frequency/small amplitude oscillations remain.

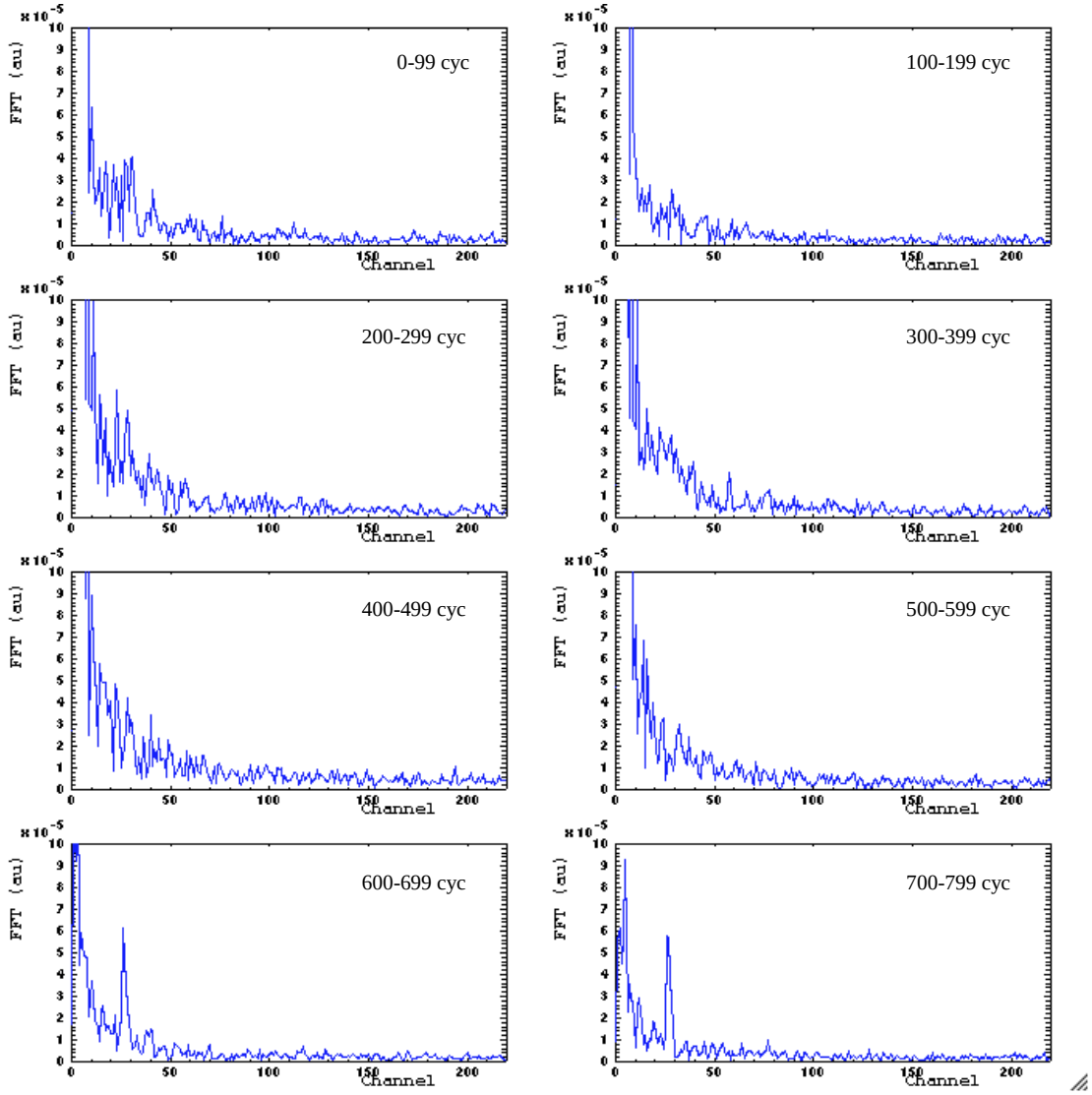

Figure 2

We show (Figure 2) the non-normalized FFT of the previous spectra in the band [1401, 1415] MHz.

We observe a large peak at low "FFT channel" which corresponds to the high frequency/large oscillation pattern, with a maximum amplitude of ~55×10^{-4} a.u. (out of the scale of the plot). When this first peak reduces, we see distinctly a second peak which corresponds to the low frequency/small amplitude oscillations, which become dominant in October 2011. Notice that the intermediate "FFT channels" between the first and the second peaks attenuate considerably in October 2011 too.

Figure 3 is a zoom in the band [1390, 1395] MHz to show that the phase of the low frequency/small amplitude oscillations (500 kHz) changes by $\pi/2$ after 200 cycles (~11^{th} June 2011).

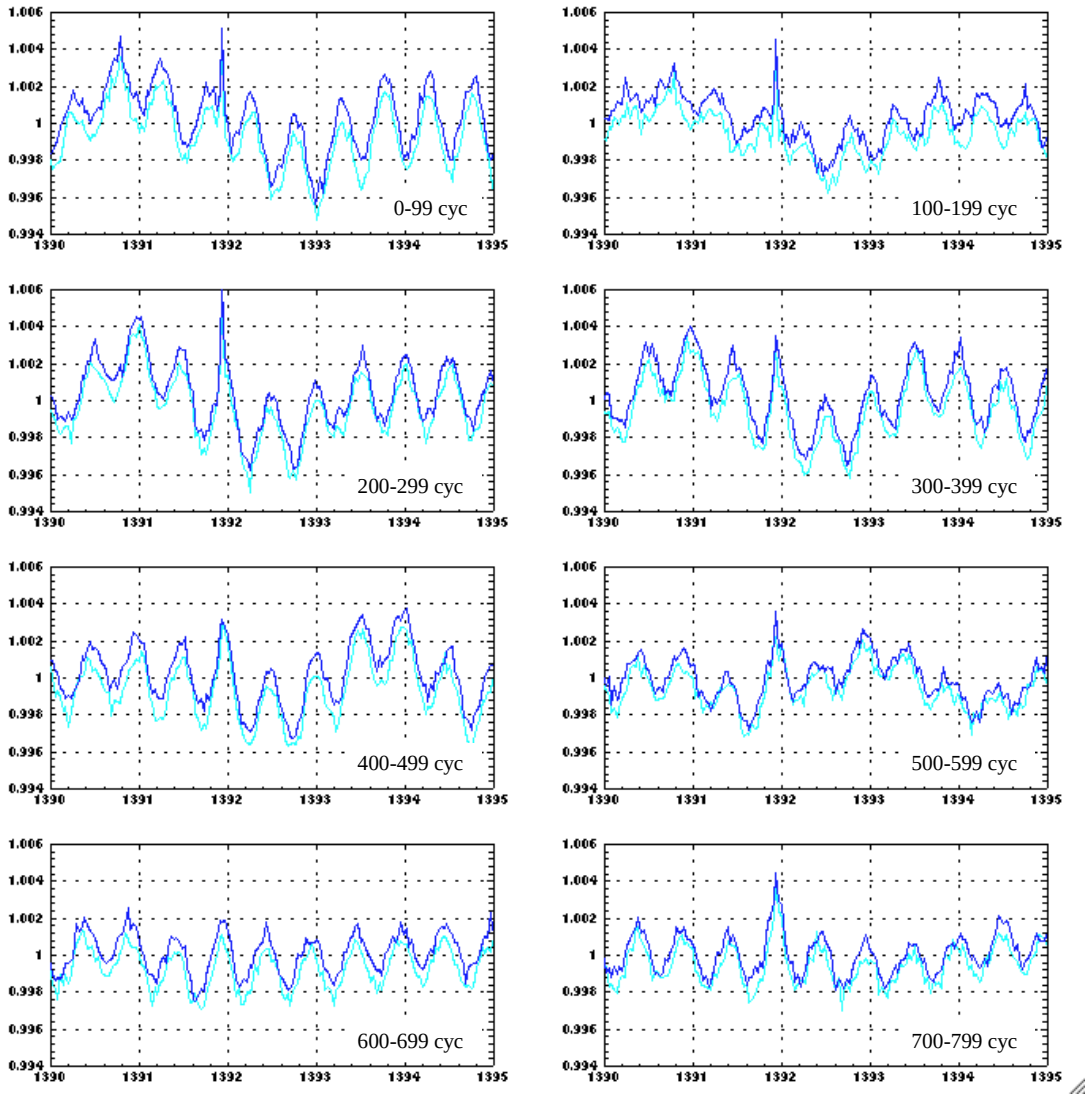

Figure 3

3 Channel 1

Hereafter we show the same plots as in previous section for Ch1. The spectrum On/Off_{filt} is displayed in orange, and the Off/Off_{filt} in red (Figure 4). The high frequency/large amplitude oscillations are quite suppressed and the low frequency/small amplitude oscillations (500 kHz) dominate during the entire period. The amplitude of these oscillations is approximately constant in time, except for the 100-199 and 500-599 cycle periods, corresponding to the time periods of '6May2011-7Jun2011' and '30Jul2011-22Aug2011', where it is remarkably smaller.

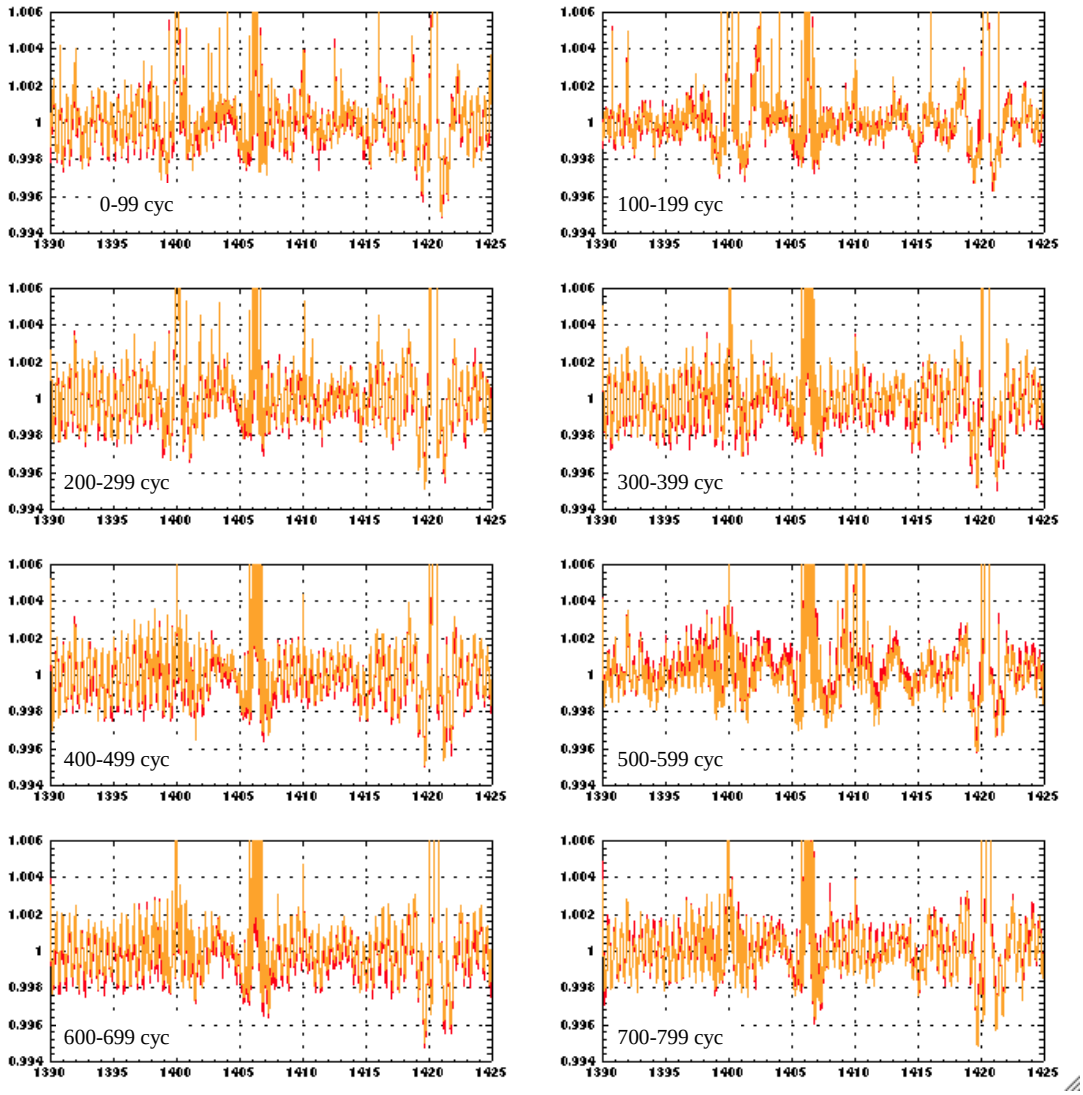

Figure 4

The non-normalized FFT of the previous spectra in the band [1401, 1415] MHz is shown on Figure 5. The first peak (i.e low FFT channel) is wider and it has approximately half the amplitude of the same peak for Ch0 (see Figure 2), that is to say, the low frequency oscillation pattern is still present in Ch1 but with less power than in Ch0, and it extends over a wider range of FFT channels. The second peak, which corresponds to the low frequency oscillation pattern, has an amplitude roughly at the same level or higher than in Ch0 (take care of the vertical scale compared to Figure 2). Note that in the periods of 100-199 and 500-599 cycles already mentioned, the second peak does not appear.

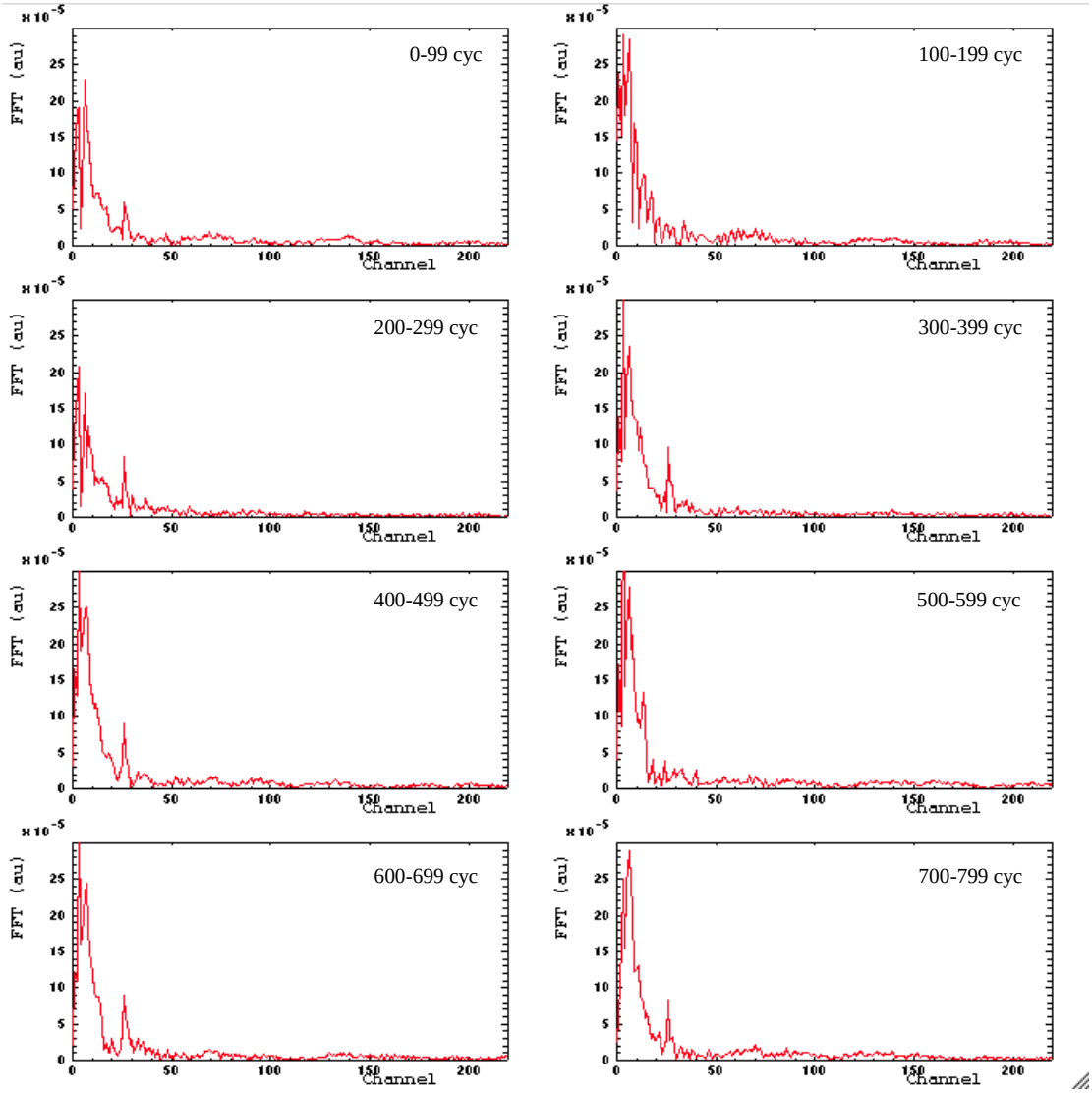

Figure 5

We also observe in Ch1 the change in phase of $\pi/2$ for the small oscillation pattern after 200 cycles, as already mentioned for Ch0 (Figure 3). We show it zooming in the band [1390, 1395] MHz on Figure 6.

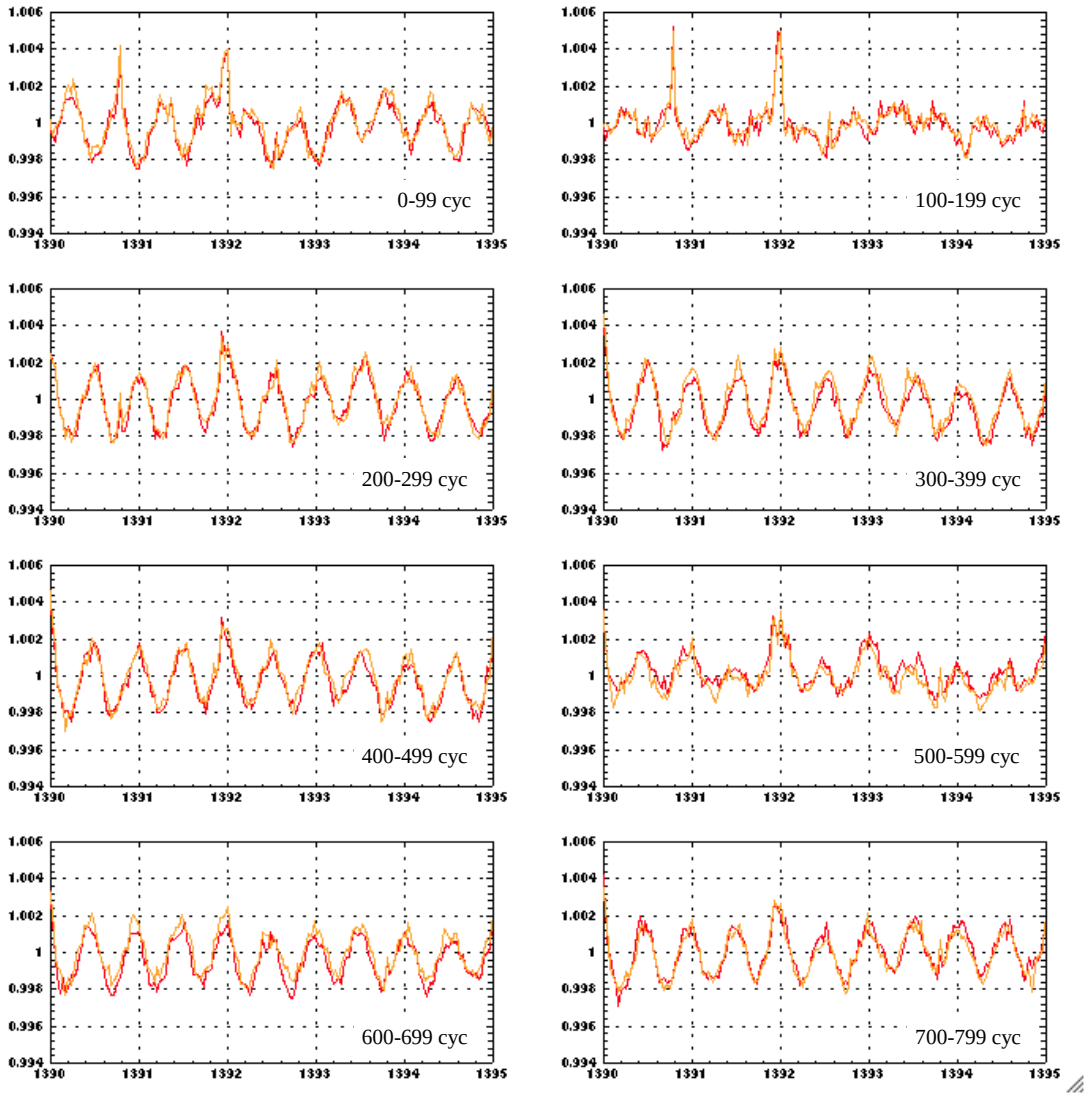

Figure 6

4 Summary

In this MEMO we have investigated the evolution of the two main oscillations found in the power in On/ Off_{filt} and Off/ Off_{filt} spectra produced with the whole data taken on Abell1205 cluster. We have found phase changes by $\pi/2$ after ~11th June 2011 for the 500 kHz oscillation pattern on both channels. Ch 0 has also experienced a higher frequency oscillation (~3-5MHz) with large amplitude during the period starting on 15th April 2011 and ending on 25th July 2011.

The 500 kHz oscillation, more precisely 514kHz (E.Gerard & J.Pezzani) seems to originate from the input return loss between the horn and the fix mirror (290m). There are ideas to profit of the phase shift in certain positions of the trolley. The origin of the 3-5 MHz oscillation has not been yet identified and need more investigation, as it may limit the sensitivity of the experiment.