

## LHC Beam Operation Committee

Notes from the meeting held on 3<sup>rd</sup> April 2012

### Participants

#### **1. Recent Instabilities Observed in the LHC – N. Mounet ([slides](#))**

N. Mounet presented a summary of the coherent instabilities observed during the LHC commissioning. Three main events were observed at 4 TeV (see slides for beam conditions during observations) for Beam 2; only in one case also Beam 1 became unstable. The horizontal plane seemed to be more affected than the vertical plane. A possible explanation could be that the b3 decay was not yet compensated at that stage of the commissioning. The octupole current was at 232 A and the collimators were either at tight settings or even closer to the beam (during beam based alignment, in particular CFC collimators in IR3).

A coherent signal from the BBQ was measured with a rise time varying from few seconds up to few minutes. The amplitude of the main tune was increasing with a similar speed. Many unexplained lines converging to the nominal tune were observed on the tune spectra in all the observed cases; N. Mounet affirmed that this could be explained by the action of the tune feedback.

N. Mounet concluded that further studies and comparison with the model are needed before drawing conclusions. Moreover, instabilities related to tight collimator settings will be studied during a MD at the end of April.

#### **Discussion:**

R. Steinhagen confirmed that the tune feedback was on for mode 0 and this could explain the lines converging to the nominal tune.

J. Wenninger asked if the behavior observed agrees with the impedance model in case of tight collimator settings and low current in the octupoles.

E. Metral answered that qualitatively this is the case. He explained that, due to the higher energy and the tighter collimator settings, the impedance should have increased by a factor of 2.3 (wrt last year). This means we should increase the octupole current to 450 A, as it is now the case in normal operation; it was not yet so at the time when the instabilities were observed (232 A only in the octupoles). A current of 450 A also allows also to gain some margin for operation with a higher intensity of the nominal bunches ( $1.7 \times 10^{11}$  ppb).

R. Assmann pointed out that the origin of this factor of 2 difference has to be understood for future operation. He added that, on this purpose, all the key parameters should be recalculated before the MD foreseen for the end of April.

E. Metral agreed and proposed to inject 1200 bunches, decrease the octupole current and measure the starting point of the instability.

R. Assmann suggested also to close all the collimators at the same settings and then move them out by families in order to define the contribution of all the different kinds of collimation.

G. Arduini affirmed that one should also understand the interplay between the octupole current and the chromaticity (low or negative chromaticity to reduce current of the octupoles) in view of understanding the octupole strength requirements for 7 TeV.

E. Metral explained that chromaticity plays a main role in the rise time of instability.

R. Steinhagen commented that chromaticity at injection was varied between -10 to +15, with the feedback on, and the beam remained stable.

## **2. Next meeting**

Tuesday, 17/04/2012: **LBOC meeting (15:30 in 874-1-011).**