TIMING MEETING #3 – Minutes

Presents:

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Meeting Aims:

- Check the RF synchronization modes
- Define the type of data to be published on DIP from BPTXs

Slides and Material

- Indico page of this meeting: http://indico.cern.ch/conferenceDisplay.py?confId=85840
- RF synchronization slides are available here: http://indico.cern.ch/getFile.py/access?resId=0&materialId=slides&confId=85840
- Alick's document: https://edms.cern.ch/document/1026129

Proposal to start the meeting

PROPOSAL:

0) use DIP structure proposed in Alick's doc:
dip/EXPT/LHC/Timing

1) zLocationIP: indeed, change to **DeltaT** in ns

Purpose: value for OP/EiC to fine-adjust the crossing point

Definition: measure arrival time difference of paired bunches (i.e. average over all bunch pairs *which are supposed to collide in the given IP*)

Rate: 1 Hz (or less frequent ?)

NB: this requires colliding pairs for a given expt to give a value.

NB: cogging will be verified with proper bunch scheme (with pairs that are supposed to cross in IPs. We do not have anymore the pressure of last year.)

2) **PhaseB1** [ns]: phase difference between B1 (averaged over all bunches) and bunch clock used by experiment.

Purpose: Monitor possible drifts which may lead to non-optimal detector signal sampling. Offset to 0 as soon as experiment time alignment has been performed.

Rate: currently 1 Hz, but maybe overkill for drift monitoring. 0.1 Hz or 1/minute would be enough. No ?

NB: drifts we are looking for are of the order of 100 ps, therefore it is important that the published value be "baseline-subtracted" to give a value which is not too far from zero (relative to 100 ps).

NB: if using BC, this automatically reduces value to <12.5ns, and is independent of fill pattern. So, seems more appropriate than ORB.

Conclusion

1. All of us agreed to use Alick's structure for DIP publication. We agreed on the main definitions above and on the purpose of the publication of each field, but added a few more:
    a. For each BPTX phase value, we will add its error in rms
    b. To report a mismatch between official and observed filling schemes, there will be 2 fields : a flag, and a vector containing the RF bucket numbers of the missing or additional observed bunches with respect to the official scheme.
    c. DeltaT will be published together with its rms error
2. All the fields published for one BPTX will be part of the same publication
3. Same for the deltaT fields.
4. The structure will be as follows (update of Alick's document):

dip/*EXPT*/LHC/Timing/BPTX1					4 Main Expt
Phase	Float	Time difference of time(BPTX1) - time(BCmain) + offset. BCmain is defined as the clock that each experiment decides to use to run its electronics. Offset is set at the start of running.*	ns	0.1- 0.3 Hz	
PhaseErr	Float	The RMS on the measurement of Phase	ns	0.1- 0.3 Hz	
wrongBucketFlag	Boolean	Flag indicating if the observed bunch pattern is not as expected. wrongBucketFlag = True means that the bunch pattern was not what was expected.	None	On Change	
wrongBucketArray	Int[]	Integer array of RF bucket numbers for all locations where the bunch configuration is not as expected. A positive entry in the array indicates that a bunch was observed at the given RF bucket when none was expected, and a negative entry in the array indicates that a bunch was missing at the given RF bucket when one was expected. If there are no irregularities, the wrongBucketArray should contain a single entry which has a value of zero.**	None	On Change	
dip/*EXPT*/LHC/Timing/BPTX2					4 Main Expt
Phase	Float	Time difference of time(BPTX2) - time(BCmain) + offset. BCmain is defined as the clock that each experiment decides to use to run its electronics. Offset is set at the start of running.*	ns	0.1- 0.3 Hz	
PhaseErr	Float	The RMS on the measurement of Phase	ns	0.1- 0.3 Hz	

wrongBucketFlag	Boolean	Flag indicating if the observed bunch pattern is not as expected. wrongBucketFlag = True means that the bunch pattern was not what was expected.	None	On Change	
wrongBucketArray	Int[]	Integer array of RF bucket numbers for all locations where the bunch configuration is not as expected. A positive entry in the array indicates that a bunch was observed at the given RF bucket when none was expected, and a negative entry in the array indicates that a bunch was missing at the given RF bucket when one was expected. If there are no irregularities, the wrongBucketArray should contain a single entry which has a value of zero.**	None	On Change	
dip/*EXPT*/LHC/Timing/BPTX					4 Main Expt
deltaT	Float	time(BPTX1) - time(BPTX2). The value published is is an average over all bunch pairs that are supposed to collide at the given IP.***	ns	0.1-0.31Hz	
deltaTErr	Float	The RMS on the measurement of deltaT	ns	0.1- 0.3 Hz	

***:** Purpose: Monitor possible drifts which may lead to non-optimal detector signal sampling. Offset to 0 as soon as experiment time alignment has been performed.

NB: drifts we are looking for are of the order of 100 ps, therefore it is important that the published value be "baseline-subtracted" to give a value which is not too far from zero (relative to 100 ps). This information is more for the experiments to have a global understanding of the drifts they may observe, than for the OP. However, 4 experiments seeing the same drift (including CMS) shows that it may be due to RF problems.

****:** In principle, the combination of the Flag AND the Array gives also an indication of the presence of ghost bunches (if not in RF buckets). In that case, the Flag is True but the Array just shows '0'.

*****:** Purpose: value for OP/EiC to fine-adjust the crossing point.

NB: this requires colliding pairs for a given expt to give a value.

NB: during startup when the number of bunches will be really reduced, the published value will be a moving average of the measured deltaT over about 10 or 20 values (so as the value is more meaningful). That means that if the phase is dynamically adjusted by OP or RF during a run, the effect of the shift may be visible only after about one minute. Of course, once experiments get several bunches colliding on IPs, this latency will be reduced and the averaging will not require to be done on more than one acquisition.

Note1: for each publication, it has been recommended that the experiments publish as well the QUALITY LEVEL (BAD, GOOD, UNCERTAIN) to help the subscribers to understand their data.

Note2: we agreed not to publish the BPTXn-Orb value, as they will be useful out of each experiment only during the first cogging check. This is going to be handled via the cogging blog, as last year.