Welcome to the Leade Twiki. LEADE is the working group for the LHC Experiment-Machine Data Exchange and the main purpose of this web is the description of the items to be exchanged. The minutes of LEADE are recorded in http://lhc-data-exchange.web.cern.ch/lhc-data-exchange/ The functional specification is available in the EDMS document 701510 by E. Tsemelis. New requirements have been added since by LHC operations, listed in http://cern.ch/lhc-commissioning/systems/data-exchange/data-exchange.htm.

Data exchanged between the LHC machine and experiments

Data exchange is via DIP (Data Interchange Protocol) as described in https://edms.cern.ch/file/457113/2/DIPDescription.doc. DIP is maintained by IT/CO http://itcofe.web.cern.ch/itcofe/Services/DIP/welcome.html. The following chapters describe the items to be exchanged, their location and estimated availability. Announcements of publication availability, new requirements, changes, etc. are announced through the lhc-exp-cons@cern.ch mailing list.

In the LHC machine environment all floating point data is typically produced as double (64-bit) and will be published as such. During the conversion some loss of precision may occur.

Machine to experiments

All publications from LHC are under dip/acc/LHC/ followed by the category of interest (Beam, RunControl, Safety, etc) and the publication items. The following tables depict the publication details. Additional information on some of the publications is available at http://ts-dep-lea-int.web.cern.ch/ts-dep-lea-int/dataexchange-DIP.htm.

Available publications

Publications which are fully defined and currently published. They can still be subject to some small modifications.

<table>
<thead>
<tr>
<th>Measurement</th>
<th>DIP item name/source data description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total beam intensity</td>
<td>dip/acc/LHC/Beam/Intensity/* (Beam1 and 2)/<a href="http://bdidev1.cern.ch/bdisoft/development/BDI-Domains/bdeyelids/bdeyelids.php?currentSelection=Beam1">http://bdidev1.cern.ch/bdisoft/development/BDI-Domains/bdeyelids/bdeyelids.php?currentSelection=Beam1</a> and 2/BeamAcqToExperiments property - Please note that there are two redundant beam intensity publications</td>
</tr>
<tr>
<td>Individual bunch intensities</td>
<td>dip/acc/LHC/Beam/IntensityPerBunch/* (Beam1 and 2)/* (A and B) BI documentation ExperimentAcquisition property - Please note that there are two redundant bunch intensity publications and the one which is flagged as valid is published to DIP</td>
</tr>
<tr>
<td>Average 2D beam size</td>
<td>dip/acc/LHC/Beam/Size* (Beam1 and 2) <a href="http://bdidev1.cern.ch/bdisoft/development/BDI-Domains/bdeyelids/bdeyelids.php?currentSelection=Beam1">http://bdidev1.cern.ch/bdisoft/development/BDI-Domains/bdeyelids/bdeyelids.php?currentSelection=Beam1</a> and 2/BeamAcqToExperiments property</td>
</tr>
<tr>
<td>Luminosity cde mean</td>
<td>dip/acc/LHC/Beam/LuminosityAverage/* <a href="http://bdidev1.cern.ch/bdisoft/development/BDI-Domains/bdeyelids/bdeyelids.php?currentSelection=Beam1">http://bdidev1.cern.ch/bdisoft/development/BDI-Domains/bdeyelids/bdeyelids.php?currentSelection=Beam1</a> and 2/BeamAcqToExperiments property</td>
</tr>
</tbody>
</table>
### Gas Mean Luminosity

Dip/acc/LHC/Beam/Luminosity*/

http://bdidev1.cern.ch/bdisoft/development/BDI-Domains/bdeyelids/bdeyelids.php?currentSelection=0 Acquisition property

### Gas b-by-b Luminosity

Dip/acc/LHC/Beam/LuminosityPerBunch*/

http://bdidev1.cern.ch/bdisoft/development/BDI-Domains/bdeyelids/bdeyelids.php?currentSelection=0 Acquisition property

### Abort Gap Beam Current

Dip/acc/LHC/Beam/AbortGapIntensity*/

http://bdidev1.cern.ch/bdisoft/development/BDI-Domains/bdeyelids/bdeyelids.php?currentSelection=0 Acquisition property

### Average Beam Loss

Dip/acc/LHC/Beam/BLM/LSS* integrated beam losses 10us, 633ms, 1310ms from monitors 260m around IP. Data is coming from BLM concentrator, which itself concentrates and are adjusted by operation.

### Beam Loss thresholds

Dip/acc/LHC/Beam/BLM/LSS*_thr Beam loss thresholds for 10us, 633ms, 1310ms for BLM monitors 260m around IP. Thresholds are calculated in the BLM concentrator and are adjusted by operation.

### HOR & VER Positions

Dip/acc/LHC/Beam/BPM Vertical and horizontal positions from selected BPMs. Includes BPM names and numbers. The BPM name is at index $i$ will be at index $i$. If more BPMs are added, they will be added at the END of the array. BPM positions are given in micro-meter (\text{\mu}m) w.r.t. to the BPM center, which in usually about the same as the design orbit. The BPM misalignment errors are estimated to be about 0.2-0.5 mm r.m.s. Note: positions from the 2 ATLAS Roman Pots are missing yet.

### Beam energy

Dip/acc/LHC/Beam/Energy multiply by 120 to get MeV value

### Collimator positions

Dip/acc/LHC/Machine/CollimatorPositions/* 8 position values from the MeasuredCornerPositions property, see:

https://edms.cern.ch/file/934341/0.1/LHC-TC-ES-0002-00-10.pdf  Positions and gaps in mm, position=2 means OUT (beam through), position=3 means IN (dump), other values: 0, 1(intallation), 4 (transport), 5 (undefined position)

### TCDQ Collimator positions

Dip/acc/LHC/Machine/TCDQPositions/* 2 position values from the MeasuredCornerPositions property, see:

https://edms.cern.ch/file/934341/0.1/LHC-TC-ES-0002-00-10.pdf  Positions in mm, relative to the collimator center

### TED Dump position

Dip/acc/LHC/Machine/TEDPosition/* position from the Status property, position=2 means OUT (beam (unknown), 1(installation), 4 (transport), 5 (undefined position)

### Injection lines intensity

Dip/acc/LHC/Beam/IntensityInj/* (TI2.29125, TI8.87750) The size of totalIntensityHigh is always one and depends on the cycleName. For example, the nominal LHC pilot (5E9 charges) would give "0.5". You have to check the value of cycleName as not all cycles are for LHC. The cycle names are assigned by operation and can change with time.

### Luminosity Scan

Dip/acc/LHC/Beam/LuminosityScan

<table>
<thead>
<tr>
<th>Item</th>
<th>DIP item name/source data description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Run Control</strong></td>
<td></td>
</tr>
<tr>
<td>Machine Mode</td>
<td>dip/acc/LHC/RunControl/MachineMode accelerator mode string defined by LHC operation</td>
</tr>
<tr>
<td>Beam Mode</td>
<td>dip/acc/LHC/RunControl/BeamMode beam mode string defined by LHC operation</td>
</tr>
<tr>
<td>Beam type</td>
<td>dip/acc/LHC/RunControl/BeamType/* (Beam1 and 2) beam type encoding defined by LHC operation</td>
</tr>
<tr>
<td>Safe beam flags</td>
<td>dip/acc/LHC/RunControl/SafeBeam/* (Beam1 and 2) flags encoding defined by LHC operation <a href="http://wwwpsco.cern.ch/private/timing/timing/Seq/tgmLines.html?mode=OPER&amp;net=LHC&amp;mch=LHC">http://wwwpsco.cern.ch/private/timing/timing/Seq/tgmLines.html?mode=OPER&amp;net=LHC&amp;mch=LHC</a></td>
</tr>
<tr>
<td>Fill number</td>
<td>dip/acc/LHC/RunControl/FillNumber LHC fill number <a href="http://wwwpsco.cern.ch/private/timing/timing/Seq/tgmLines.html?mode=OPER&amp;net=LHC&amp;mch=LHC">http://wwwpsco.cern.ch/private/timing/timing/Seq/tgmLines.html?mode=OPER&amp;net=LHC&amp;mch=LHC</a></td>
</tr>
<tr>
<td>Circulating Bunch Configuration</td>
<td>dip/acc/LHC/RunControl/CirculatingBunchConfig/* (Beam1 and 2) Circulating Bunch Configuration, per beam. Contains an array which encodes mapping of circulating bunches to RF buckets i.e. the first element contains the RF bucket number of the bunch 1 etc. If the value is 0 then there is no corresponding bunch.</td>
</tr>
<tr>
<td>Injection Bunch Configuration</td>
<td>dip/acc/LHC/RunControl/InjectionBunchConfig/* (Beam1 and 2) Injection Bunch Configuration, per beam. Contains an array which encodes mapping of injected bunches to RF buckets i.e. the first element contains the RF bucket number of the bunch 1 etc. If the value is 0 then there is no corresponding bunch. The 'ACTIVE' field will be set to true for the injected beam and to false for the other beam.</td>
</tr>
<tr>
<td>LHC handshake</td>
<td>dip/acc/LHC/Handshake/* Injection, Adjust and Beamdump handshakes from LHC operations, see <a href="http://cern.ch/lhc-commissioning/systems/data-exchange/data-exchange.htm">http://cern.ch/lhc-commissioning/systems/data-exchange/data-exchange.htm</a></td>
</tr>
<tr>
<td>SPS probe beam flag</td>
<td>dip/acc/LHC/Safety/* (MaxSpsProbeBeamA and B) SPS Probe Beam Flag Threshold which gives the maximum beam intensity that can be injected into an empty LHC (probe beam). Value is in units of 1E8 charges.</td>
</tr>
<tr>
<td>Post Mortem Timestamp</td>
<td>dip/acc/LHC/Timing/PostMortem Postmortem Event. Typically postmortem request is delivered as HW signal but this software event allows to determine the timestamp of the last PM event to be included with the PM data</td>
</tr>
</tbody>
</table>

### Missing publications

Publications which are planned but delayed because equipment is not available yet or for other reasons

<table>
<thead>
<tr>
<th>Missing publication</th>
<th>DIP item name/source data description</th>
<th>Publication contact</th>
<th>Data contact</th>
<th>Volume Bytes</th>
<th>Frequency</th>
<th>Estimated availability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average bunch length</td>
<td>dip/acc/LHC/Class/Property/Device</td>
<td>K. Kostro</td>
<td>AB/RF A.Butterworth</td>
<td>8</td>
<td>1 min</td>
<td>after 2008</td>
</tr>
<tr>
<td>Total longitudinal distribution</td>
<td>dip/acc/LHC/Beam/LongitudinalDistribution</td>
<td>K. Kostro</td>
<td>AB/BI</td>
<td>285.120</td>
<td>1 min</td>
<td>after 2008</td>
</tr>
</tbody>
</table>

Missing publications
Experiments to machine

Whenever the same kind of publication is expected from several experiments, they shall follow the same naming schema and field definitions so that they can be used by LHC controls in a common way. For instance the same handshake names and values are expected from all experiments. The following table defines this.

All publications used principally by LHC operation shall be under /dip/EXPERIMENT/LHC/. When a single field is published, the field name shall be the DIP default (__DIP_DEFAULT__). When several items which belong together it is preferred that they are published as a single DIP publication. We will always try to prototype the publications with one experiment and others can follow then.

<table>
<thead>
<tr>
<th>Item</th>
<th>DIP item name/source data description</th>
<th>CMW device and property</th>
</tr>
</thead>
<tbody>
<tr>
<td>CMS HF Luminosity</td>
<td>dip/CMS/HF/LumiData</td>
<td>DIP.A</td>
</tr>
<tr>
<td>CMS HF Luminosity histogram</td>
<td>dip/CMS/HF/LumiDataLH</td>
<td>DIP.A</td>
</tr>
</tbody>
</table>

Leade Web Utilities

- advanced search
- WebTopicList - all topics in alphabetical order
- WebChanges - recent topic changes in this web
- WebNotify - subscribe to an e-mail alert sent when topics change
- WebRss, WebAtom - RSS and ATOM news feeds of topic changes
- WebStatistics - listing popular topics and top contributors
- WebPreferences - preferences of this web

This topic: Leade > WebHome
Topic revision: r50 - 2010-03-02 - KrisKostro