

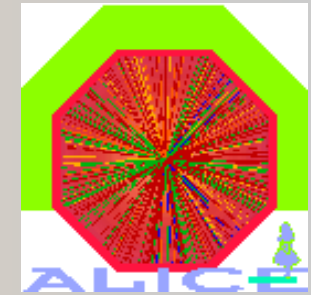


Status of Data Exchange Implementation in ALICE

David Evans



LEADE 26th March 2007

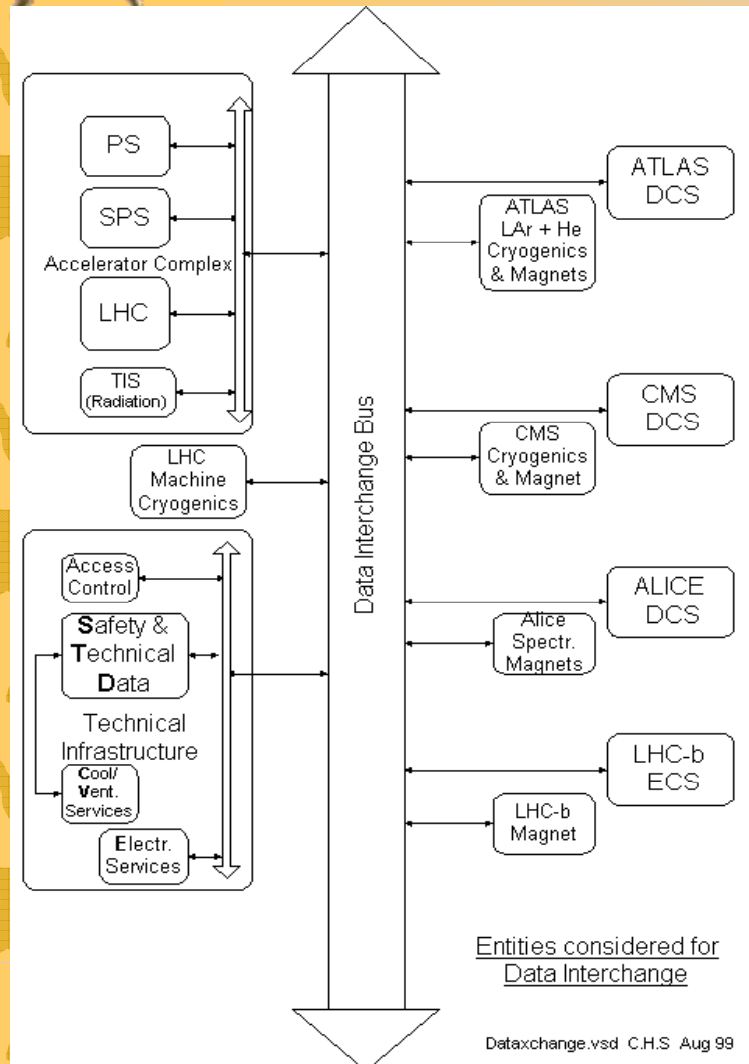
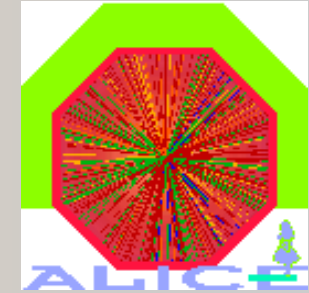


Outline of Talk

- ★ Slow Data Exchange – DIP
- ★ TTC
- ★ Beam Synchronous Timing (BST) Data
- ★ GMT System
- ★ Interlocks
 - Hardware
 - Software
- ★ Beam Position Monitors (BPTX)



Slow Data Exchange



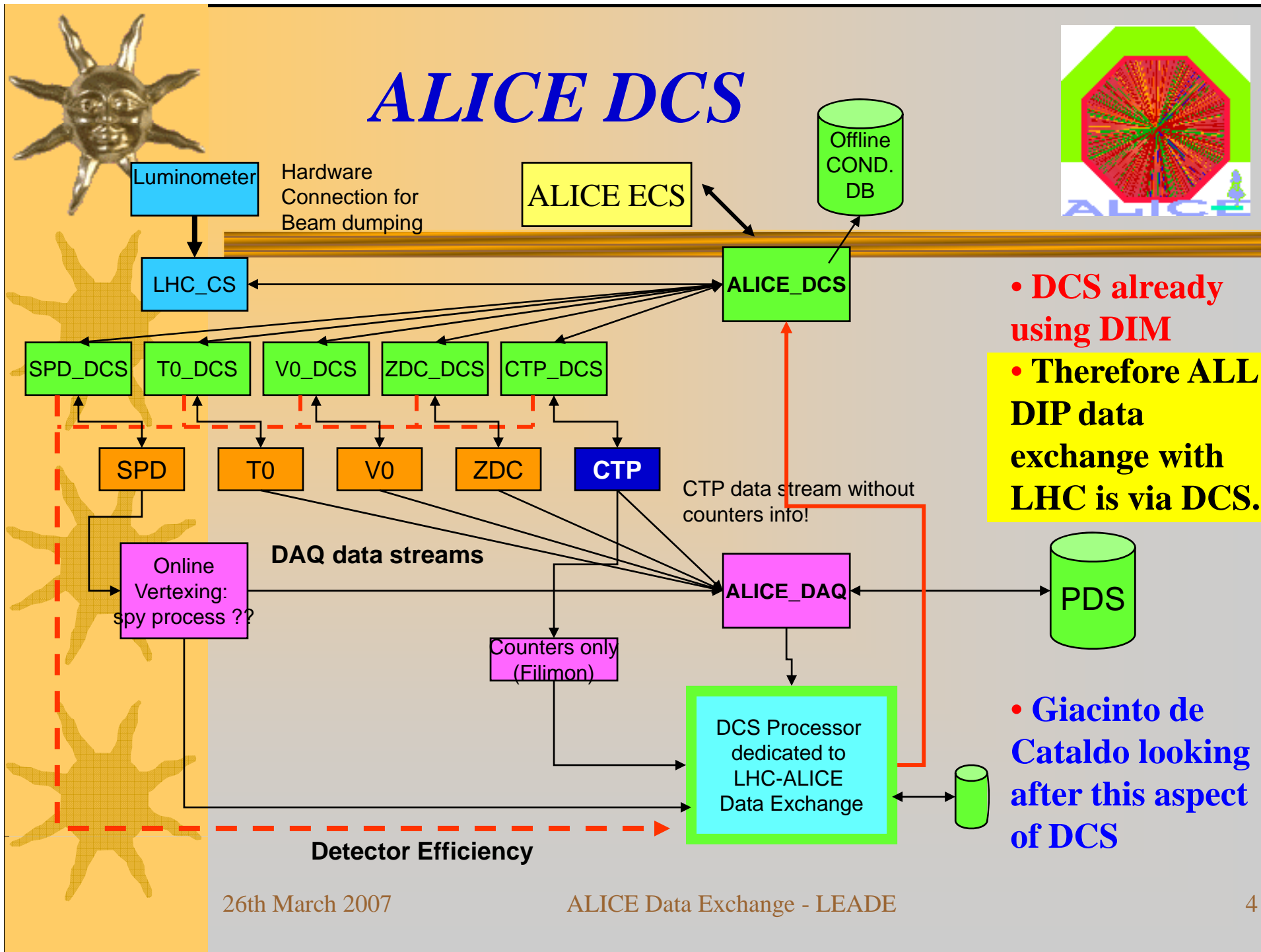
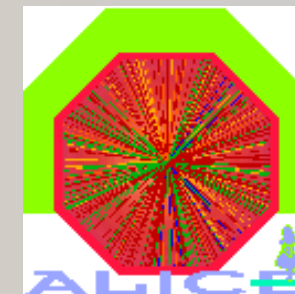
Information/Data via Software

- ★ DIP (data interchange protocol)
- ★ Publish/Subscriber paradigm
- ★ All data with UTC time stamp
- ★ Update rate ~ 1Hz

➤ All software data exchange and software interlocks will use DIP.

➤ LHC machine Modes also to be sent using DIP.

ALICE DCS

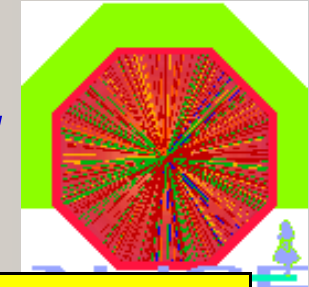


- **DCS already using DIM**
- **Therefore ALL DIP data exchange with LHC is via DCS.**

• **Giacinto de Cataldo looking after this aspect of DCS**



Data from ALICE to LHC

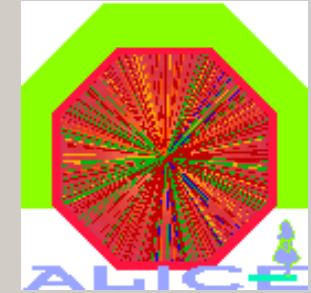


Measurement	Units	Production Volume (Bytes)	Production Interval (sec)	Data Rate (Bytes/sec)
Total luminosity	$\text{cm}^{-2}\text{s}^{-1}$	4	1	4
Average rates	Hz	12	1	12
Luminosity per bunch	$\text{cm}^{-2}\text{s}^{-1}$	14256	60	238
Rates for individual bunches	Hz	42768	60	713
Position and size of luminous region (average over all bunches)	cm	24	600	0.04
Total per experiment				966

**Also: Data on beam backgrounds and status of radiation detector
And: S/W interlocks (Ready-for-Dump, Ready-for-Injection etc.)**



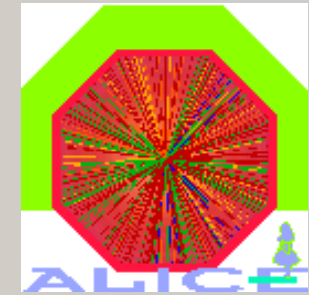
Data to LHC



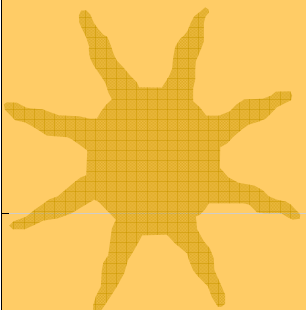
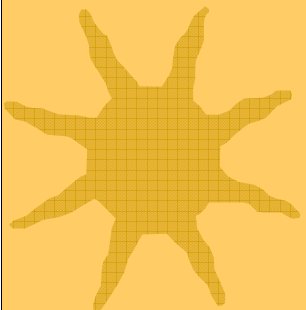
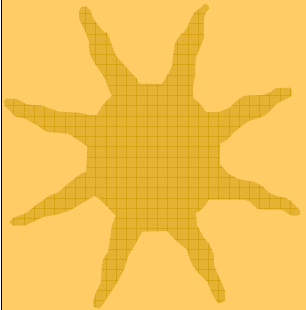
- ★ **Average rates** – from Central Trigger Processor (CTP) counters
- ★ **Average Luminosity** = Factor x Average Rates
- ★ **Rates per bunch** – from CTP Interaction records
- ★ **Luminosity per bunch** = Factor x Rates/bunch
- ★ **Position and size of luminous region** – fast (online) vertex reconstruction from pixel detectors
- ★ **Dedicated DCS processor to read data (from DAQ stream) & perform calculations.**



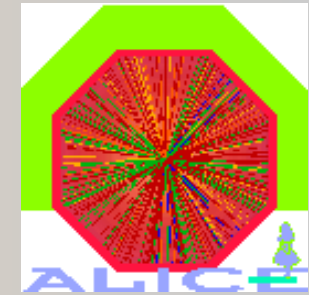
TTC



- ★ **TTC** (& **BST**) optical fibres arrive in optical patch-panel in rack **C26**.
- ★ Signals transferred to **TTC crate** in rack **C25**.
- ★ From **TTC crate**, signals are fanned-out to **CTP**, Local Trigger Units (**LTUs**) (one for each sub-detector), TOF detector, etc.
- ★ TTC system also used for sending triggers and trigger data from **LTUs** to sub-detectors (**TTCvi**, **TTCex**).



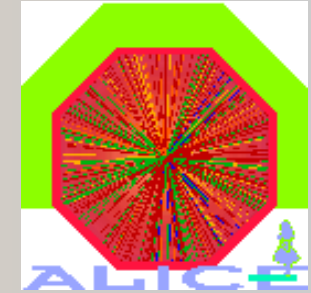
BST Data



- ★ Currently, ALICE does not make use of this facility.
- ★ All required data comes via **DIP**.
- ★ **BST fibre optics installed** in optical patch-panel in rack **C26**, however, in case we decide to use it in the future.



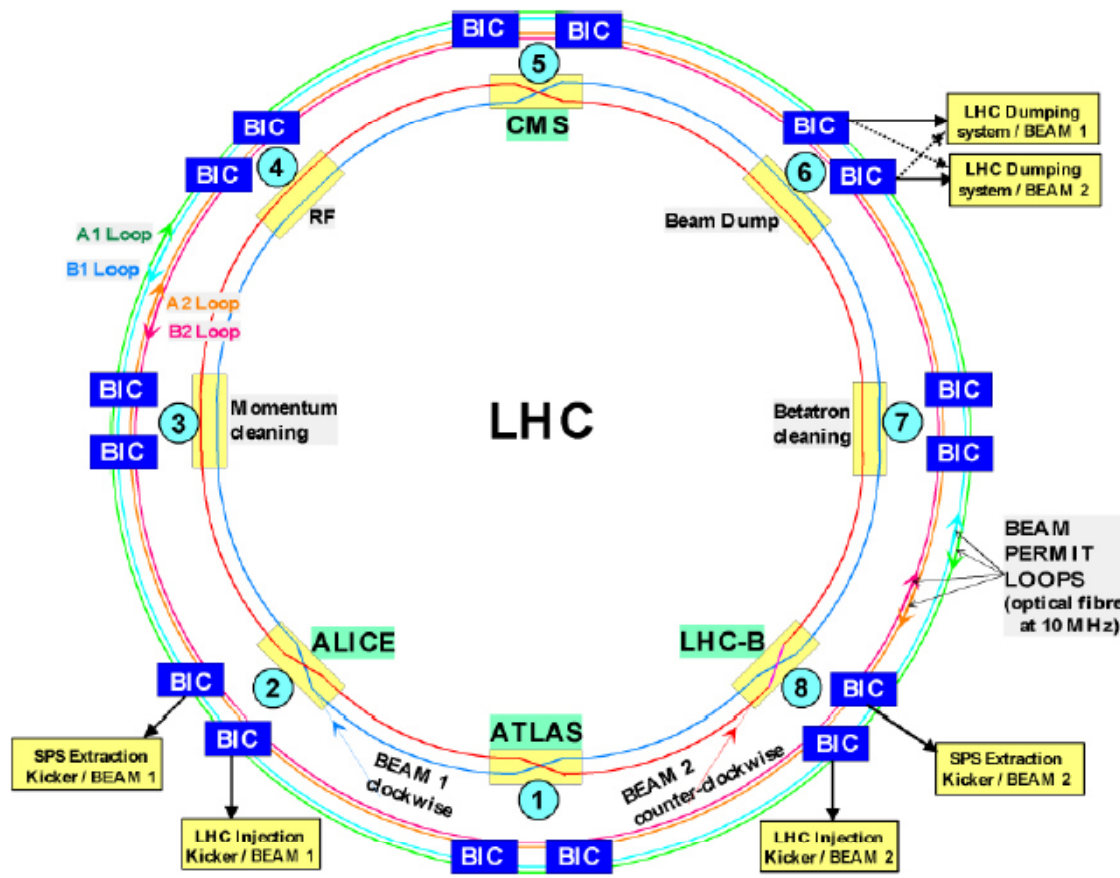
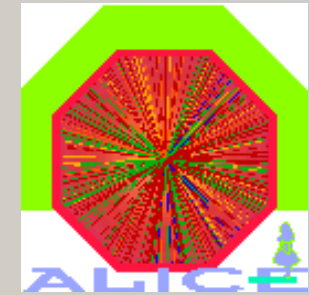
GMT System – Safe Beam Parameters



- ★ ALICE Trigger does not require GPS clock.
- ★ No ALICE sub-detector requires machine mode as a TTL level (only movable detector is **ZDC** which has H/W injection inhibit interlock).
- ★ All other useful data also transmitted over DIP.
- ★ Therefore, ALICE will probably not use the GMT system.



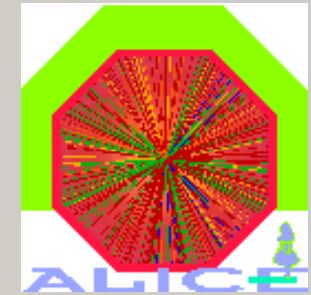
LHC Beam Interlock System (BIS)



- The **BIS** provides a **H/W** link between experiments and the **Beam Dumping** system.
- **USER_PERMIT** signals collected by **BIS** via Beam Interlock Controller (**BIC**) modules.
- Interface between exps. and **BIC** via **CIBU** (19'') modules.



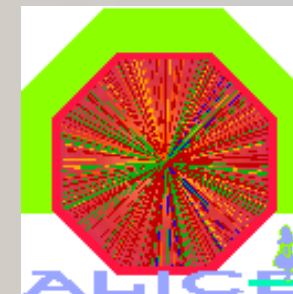
Hardware Interlocks



- ★ Three H/W interlocks in ALICE
 - ZDC Injection Inhibit
 - Dipole Magnet Beam Interlock
 - ALICE Beam Dump Interlock



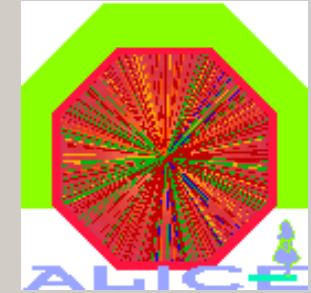
ZDC Injection Inhibit



- ★ One of the LHC injection points is close to Point 2 – injection phase is considered potentially dangerous for the **ZDC**.
- ★ It must, therefore, be moved to its **OUT** position during beam injection.
- ★ **ZDC** position switch is connected to a **CIBU** (located near ZDC) – cable from **CIBU** goes to BIC patch-panel in rack **C28** and there to a **BIC**.
- ★ **Detlef Swoboda** is responsible for ZDC switch and connection to CIBU.



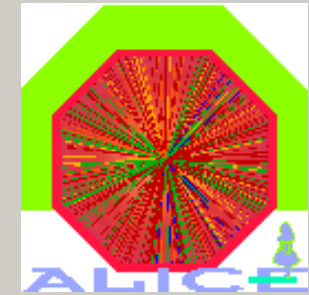
Dipole Magnet Beam Interlock



- ★ **ALICE dipole** has large effect on the beams and is part of the **beam optics**.
- ★ Beam will have to be dumped in case of dipole magnet failure.
- ★ Has dedicated interlock under the control (and responsibility) of PH-DT1 group (E. Sbrissa).
- ★ Dipole magnet **CIBU** to be located in ALICE magnet control room (**PX24**) and connected to BIC patch-panel in rack **C28**.



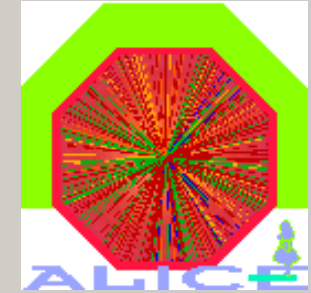
ALICE Beam Dump



- ★ ALICE will use **Diamond radiation detectors** and read-out system developed by **LHCb**.
- ★ Crate in rack **C28** will house **LHCb (TELL) module**, which reads output from radiation detectors. Module will be connected to **CIBU** in rack **C28**.
- ★ Processor in crate will monitor diamond detectors and send data over **DIP** via **DCS**. Processor will also produce post-mortem record in case of beam dump.
- ★ **Marc Tavlet** (ALICE GLIMOS) in charge of this. Still many issues to be resolved: installation, cabling, power supplies, etc.



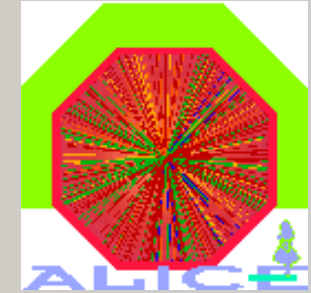
Software Interlocks



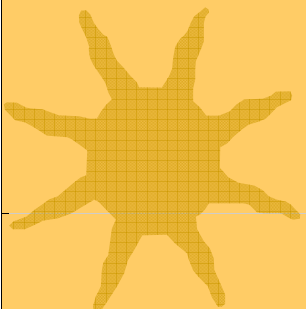
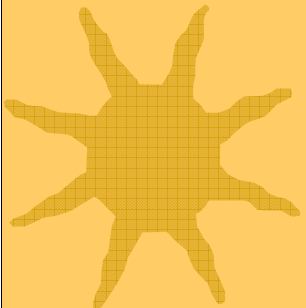
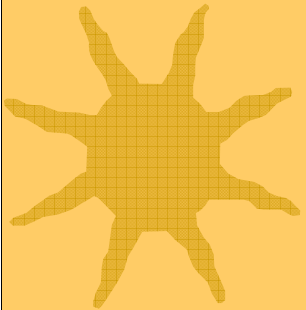
- ★ **S/W interlocks from ALICE to LHC**
 - Injection-Inhibit (Permit)
 - Ready-For-Adjust
 - Ready-For-Beam-Dump (given enough notice)
- ★ **S/W interlocks from LHC to ALICE**
 - Adjust-Request
 - Beam-Dump-Request
- ★ **All S/W interlocks received & transmitted via DCS (using DIP).**



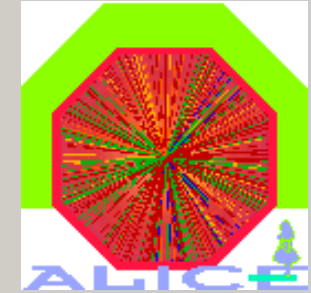
BPTX Monitors



- ★ Cable from **BPTX** monitors will go to patch-panel in rack **C28**.
- ★ We plan to use **LHCb 6U (Beam Phase & Intensity)** module (with **VME** interface) to monitor phase of LHC clock. Will be located in VME crate in rack **C28**.
 - Board being developed by **Richard Jacobsson** from LHCb.
- ★ Module will receive inputs from both **BPTX** monitors and clock from **TTC** fan-out (rack **C26**).



Summary



- ★ Data exchange via **DIP** in good shape (still some software to be written)
- ★ **TTC** – ok from our end – waiting for fibres to be blown (May?) + new boards arrive (July?) (**Sophie Baron**).
- ★ **BST** – not using it
- ★ **GMT** – don't really need it and may not use it
- ★ **Interlocks** – **ZDC** & **Dipole** ok, still some work to be done on installation planning of diamond detectors – **S/W** interlocks ok
- ★ **BPTX** – will probably use **LHCb** (Richard's) board.