

FLASH seminar 12.06.2007



Beam Interlock System @ FLASH

tasks and features

- MPS tasks
- MPS components
- Operation Modes und Beam Modes
- BIS special functions
- Laserinterlock
- Outlook and status



- Protect accelerator against damage
- Determine operation modes
- Manage beam limitations
- Check subsystems
- Safely switch off in case of failure
- Visualize alarms
- Store data in history
- .
- Personnel safety is not a task!





Movable Collimators with 4 different apertures





Martin Staack, DESY MCS4





~ 80 Photomultipliers distributed over the accelerator









Beam loss detection (2)



4 pairs of toroids with electronics









10 Beam Interlock Concentrators collect alarm signals from

- BLMs
- Toroid protection system
- Vaccuum fast shutter
- Coupler interlock
- Quench detection

...and directly blockgun laser and rf witha total delay of approx.2 microseconds





Beam Interlock System (BIS)





- Reads data from BICs
- Controls BICs
- Determines pulselength limits for the gun laser
- Sends data to DOOCS via ethernet macropulse-synchronized
- Cycle time of approx. 1 millisecond
- Can work independently from controlsystem





PLC collects and processes more than 300 signals

- Magnet powersupplies
- OTR screens
- Collimators
- Pneumatic movers
- Water flow sensors
- Pilotherms
- Vacuum valves
- BLMs
- Toroids
- RF





From the point of view of the Machine protection the board

- Transcripts beam limitations from BIS
- Cuts bunchtrain in case of BIC alarms







The BIS plc determines the operation mode from the machine settings e.g. Vacuun valves and dipole magnets:





Operateur panels for operation mode

show what is missing for operation:

Operation mode Standard modes Gun mode Analysis mode Bypass mode FEL mode Seed section dump Tuning Mode Laser stand-alone Laser Adjust









Beam Modes are determined from:

- Operation Mode
- Collimator- und screen positions
- Beam losses
- Operator wishes

Beam Modes:

- Long Pulse Train (800 us)
- Short Pulse Train (30 bunches)
- Single Pulse Mode (2 bunches)



BIS plc determines the beam modes from positions of collimators, screens and experiments:



An overview can be found...

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... On this panel:



| MPS_screen_overvie | ew: TTF2.UTIL/BIS// ((| 00 |
|-----------------------------|---|----|
| Beam mode limiting elements | | |
| Screens | 3BC2 4DBC2 3UBC3 11BC3 15ACC7 6BYP 9TCOL 2SUND3 35BYP 12EXP 3BC2 6DBC2 8BC3 5DBC3 18ACC7 5ECOL 5SEED 38BYP 9DUMP 8DBC2 7MATCH 14SEED 57BYP 10DBC2 3SUND1 3SUND1 | |
| Magnets | D14SEED RD13DUMP | |
| Wirescanners | While wires are in the beam pipe, the beam mode is limited to short. | |
| | Elements that limit the beam mode to short (30 bunches) or single (2 bunches) are shown in yellow. | |
| | | |



The BIS protects the undulators by stopping ACC1 rf and gun laser if too many BLM alarms occur:







The BIS protects the ACC1 vacuum – gun rf will be blocked when screens are inserted and the valve is open:





Laserinterlock plc



Laserinterlock plc:

- Manages door interlock
- Checks water flow
- Checks water and air temperatures
- Checks VME alive signal
- Switches off in case of failure





BIS:

- Optical Replica screens implemented
- 14 UND wirescanners implemented
- 12 wirescanners prepared
- IR-undulator mirror prepared
- Signals to 2nd laser prepared
- Signal to optical replica prepared

Laserinterlock:

- 2nd Laserinterlock in progress
- ToDo: Switching Laser1/2