

Components needed for LHC Sector Test 2006

Beam Perspective

End T18

MQIF_87800: MQI14, AT = 2499.36711000 + 0.00363139 ;
MBIAH87833: BH4, AT = 2516.71311000 + 0.00363226 ;
MBIAH87841: BH4, AT = 2520.82511000 + 0.00363401 ;
MBIAH87850: BH4, AT = 2524.93711000 + 0.00363575 ;
MBIAH87858: BH4, AT = 2529.04911000 + 0.00363749 ;
MBIAH87866: BH4, AT = 2533.16111000 + 0.00363923 ;
MBIAH87874: BH4, AT = 2537.27311000 + 0.00364097 ;
MBIAH87883: BH4, AT = 2541.38511000 + 0.00364271 ;
MQID_87900: MQI15, AT = 2546.38111000 + 0.00364358 ;
BPMIV87904, AT = 2547.36611000 + 0.00364358 ;
MCIAV87904, AT = 2547.86511 ;
LHCQ7ST: MARKER, AT = 2570.08148000 + 0.00364358 ;
MQIF_88000: MQI16, AT = 2580.58048000 + 0.00364358 ;
BPMIH88004, AT = 2581.56548000 + 0.00364358 ;
MCIAH88004, AT = 2582.06448000 + 0.00364358 ;
MQID_88100: MQI17, AT = 2611.00448000 + 0.00364358 ;
BPMIV88104, AT = 2611.98948000 + 0.00364358 ;
MCIAV88104, AT = 2612.48848000 + 0.00364358 ;
BCT
OTR881S, AT = 2627.02248000 + 0.00364358 ;



TCDIMom H

TCDIH315

TCDIH225

TCDIV135

TCDIV090

TCDIV045

TCDIH090

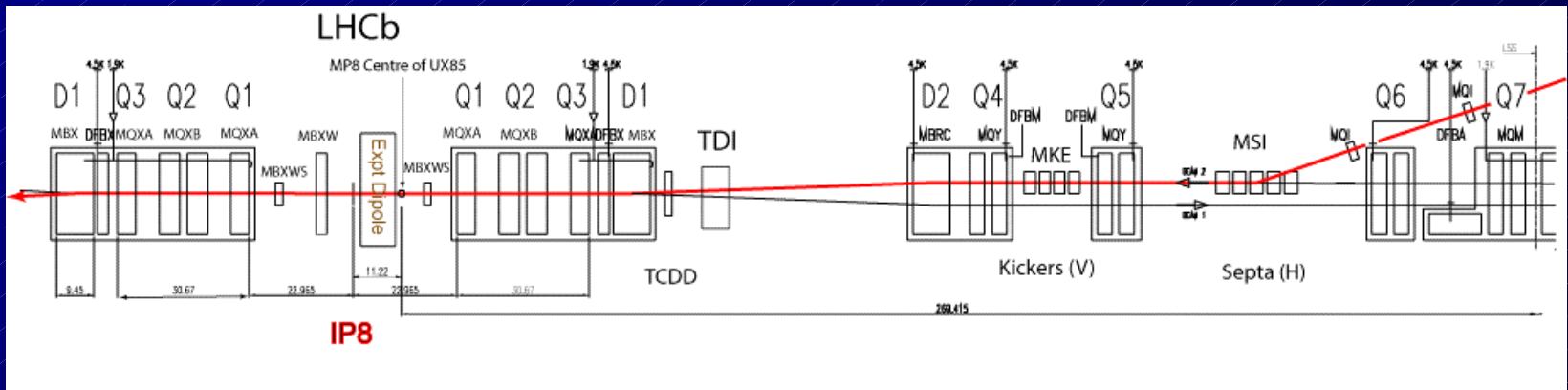
TCDIMSI H,V



Phase 1 of TCDI - not needed for injection test

Injection elements

- Septa, Q5, Kickers, Q4, D2 etc...
- TDI
- TCDD or tertiary collimators
 - Not required for test
- TCLI
 - Not required for test



Beam Instrumentation

- **Beam Position Monitors**

- 1 BPTX: “timing pick-up”
- BPM: Standard Cold BPM (Arc,DS,Q7)
- 2*BPMR: Cold BPM (rotated beam screen)
- 2*BPMS: Cold Directional Coupler (Q2)
- 2*BPMSW: Warm Directional Coupler (Q1)
- 2*BPMSX: Warm Directional Coupler (D1)
- 2*BPMWB: Warm BPM (D2)
- 3*BPMYB: Cold Enlarged BPM (rotated beam screen)

SHOULD ALL BE READY – See Rhodri Jones

NAME
BPMYB.5R8.B2
BPMYB.4R8.B2
BPMWB.4R8.B2
BPMSX.4R8.B2
BPMS.2R8.B2
BPMSW.1R8.B2
BPMSW.1L8.B2
BPMS.2L8.B2
BPMSX.4L8.B2
BPMWB.4L8.B2
BPMYB.4L8.B2
BPMR.5L8.B2
BPMR.6L8.B2
BPM.7L8.B2
BPM.9L8.B2
BPM.10L8.B2
BPM.11L8.B2
BPM.12L8.B2
BPM.13L8.B2



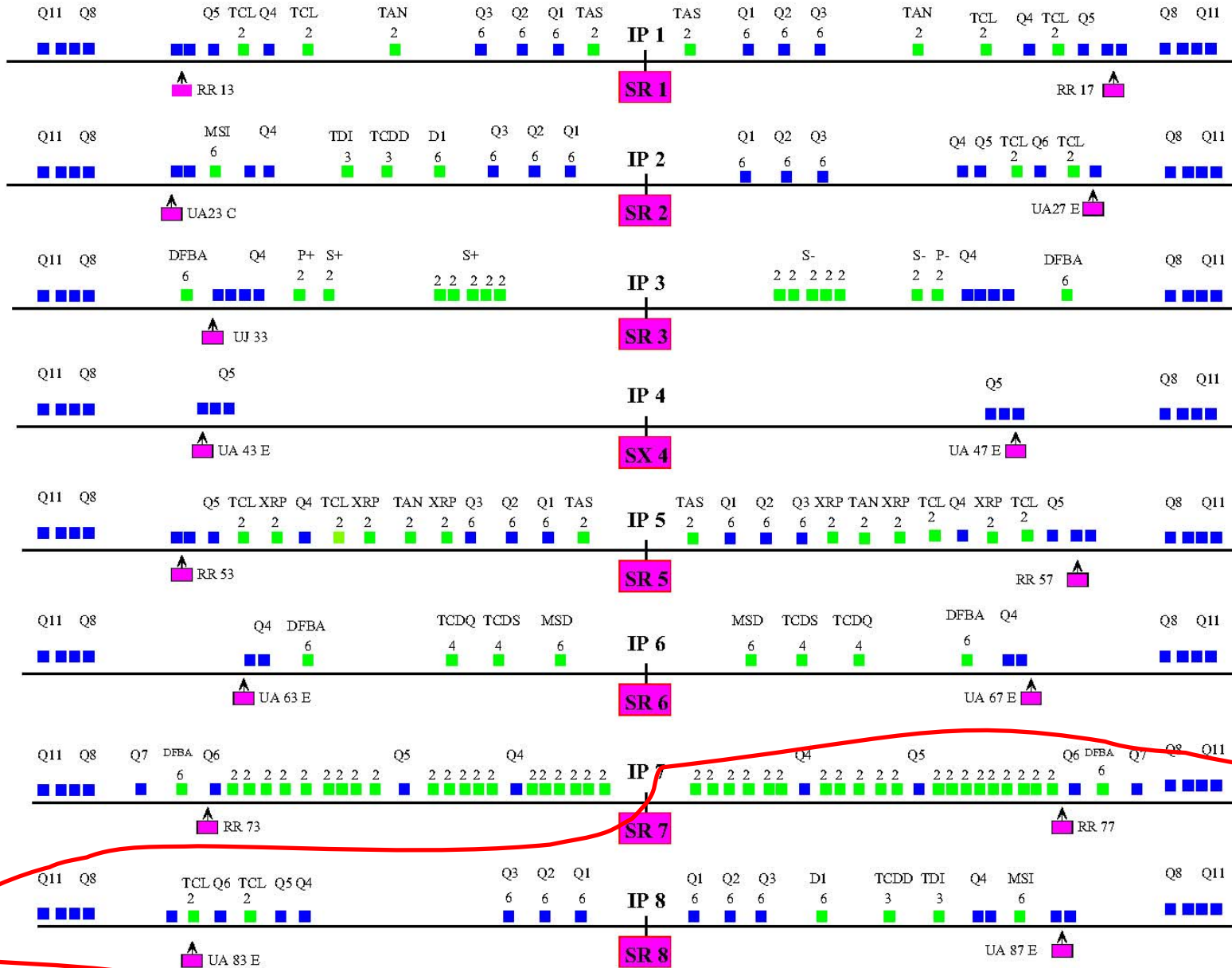
Standard ARC – beam 2

Beam Loss Monitors

- **BLMA**
 - Quadrupoles along the ring (6 per quadrupole), ionization chambers attached outside of cryostat, time resolution 2.5 ms.
- **BLMS**
 - Critical aperture limits or positions, ionization chambers, time resolutions 1 turn.
- **BLMS***
 - Critical positions for injection losses, extended dynamic range: BLMSI (ion. ch.) + BLMSS (SEM), time resolution 1 turn. **Not need for injection test.**

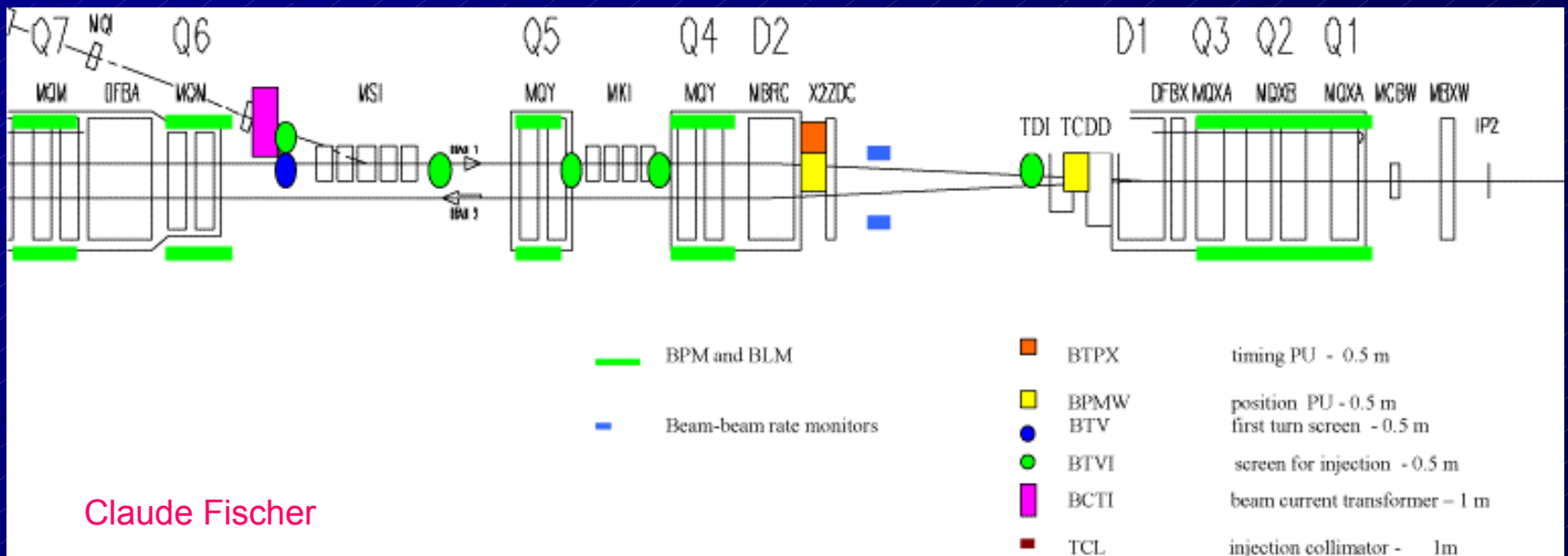
BLMs

- **Injection region**
 - BLMS: Septum MSI, Target TDI, TCDD, TCL, D1
- **IR2: Triplet plus BPM.Q1**
 - BLMS at maximum of beam size
 - BLMS at exit of IP
- **DIS:**
 - BLMS: MB adjacent to Q8 (* IR8R), between Q7/Q8, last MB before Q11 (*IR8R)
- **Arc:**
 - BLMA at every quadrupole
- **Additional monitors needed in LHCb**
 - Every 10 m., both planes



Screens

- Screen before septa (TI8) BTVI
- After septa, BTVSI
- Screen before and after kickers, BTVSI
- Screen before TDI BTVST
- Temporary screen before dump IR7 BTVI



BCT

- Beam Current Transformer end T18
 - Transfer line BCT
- Temporary installation of spare Beam Current Transformer right of IP7
 - Spare transfer line BCT on a foot between Q6 and the dump.

Magnet circuits right of IP8

Circuit Name	Description	Needed
RQ5.R8	Q5 quadrupole	Yes
RQ4.R8	Q4 quadrupole	Yes
RD2.R8	D2 recombination dipole	Yes
RCBYVS5.R8B2	Vertical corrector	Yes
RCBYVS4.R8B2	Vertical corrector	Yes
RCBYV4.R8B2	Vertical corrector	Yes
RCBYHS5.R8B2	Horizontal corrector	Yes
RCBYHS4.R8B2	Horizontal corrector	Yes
RCBYH5.R8B2	Horizontal corrector	Yes

Circuits general:

Beam 2 Only

Don't necessarily have to be commissioned to 7 TeV

Inner Triplet right of 8 [XR8]

Circuit Name	Type	Needed?
RCBXH1.R8	Horizontal corrector	Yes
RCBXH2.R8	Horizontal corrector	Yes
RCBXH3.R8	Horizontal corrector	Yes
RCBXV1.R8	Vertical corrector	Yes
RCBXV2.R8	Vertical corrector	Yes
RCBXV3.R8	Vertical corrector	Yes
RCOSX3.R8	Skew Octupole Corrector	No
RCOX3.R8	Octupole Corrector	No
RCSSX3.R8	Skew Sextupole corrector	No
RCSX3.R8	Sextupole corrector	No
RCTX3.R8	Dodecapole Corrector	No
RD1.R8	Recombination dipole	Yes
RQSX3.R8	Skew Quadrupole Corrector	Yes
RQX.R8	Inner Triplet (Q1,Q2,Q3 in series)	Yes

Ditto XL8

LHCb

- RAMSES radiation monitoring
- Additional PMI monitors
- Additional Beam Loss Monitors
- Compensators and dipole off (decommissioned)

Circuit	Description	State
RBLWH.R8.SR8	LHCb dipole	OFF
RBXWH.L8.SR8	Compensator	OFF
RBXWSH.L8.SR8	Compensator	OFF
RBXWSH.R8.SR	Compensator	OFF

Matching & DS left IP8



Circuit Name	Description
RCBYH4.L8B2	Horizontal corrector
RCBYHS4.L8B2	Horizontal corrector
RCBYHS5.L8B2	Horizontal corrector
RCBYV5.L8B2	Vertical corrector
RCBYVS4.L8B2	Vertical corrector
RCBYVS5.L8B2	Vertical corrector
RD2.L8	D2 Recombination dipole
RQ4.L8	Q4
RQ5.L8	Q5



Circuit Name	Description
RQ6.L8	Quad
RQ7.L8	Quad
RQ8.L8	Quad
RQ9.L8	Quad
RQ10.L8	Quad
RQTL11.L8B2	Quad
RQT12.L8B2	Quad
RQT13.L8B2	Quad
RCBCV9.L8B2	Corrector
RCBCH10.L8B2	Corrector
RCBCH8.L8B2	Corrector
RCBCV7.L8B2	Corrector
RCBCH6.L8B2	Corrector

ARC 7-8

Description	Type	No. of circuits	Priority
Main bends	MBA/MBB	1	1
Main quadrupoles	MQ	2	1
Lattice sextupole	MS	4	2
Lattice octupole	MO	2	3
Skew quadrupole	MQS	1	1
Tuning quadrupoles	MQT	2	1
Skew sextupole	MSS	1	3
Dipole correctors	MCB	24 (V) + 23 (H)	1
Sextupole spool pieces	MCS	1	3
Octupole spool pieces	MCO	1	3
Decapole spool pieces	MCD	1	3

c/o Oliver Brüning

ARC & DS.R7 circuits



Class	Circuit Name
Trim quads D	RQTD.A78B2.UA83
Trim quads F	RQTF.A78B2.UA83
Sextupoles D1	RSD1.A78B2.UA83
Sextupoles D2	RSD2.A78B2.UA83
Sextupoles F1	RSF1.A78B2.UA83
Sextupoles F2	RSF2.A78B2.UA83
Skew sextupoles	RSS.A78B2.RR77
Main quads D	RQD.A78.UA83
Main quads F	RQF.A78.UA83
Skew quads	RQS.A78B2.RR77
Main bends	RB.A78.UA83
Lattice octupoles D	ROD.A78B2.RR77
Lattice octupoles F	ROF.A78B2.RR77
b3 spool	RCS.A78B2.UA83
Octupole spool	RCO.A78B2.UA83
Decapole spool	RCD.A78B2.UA83



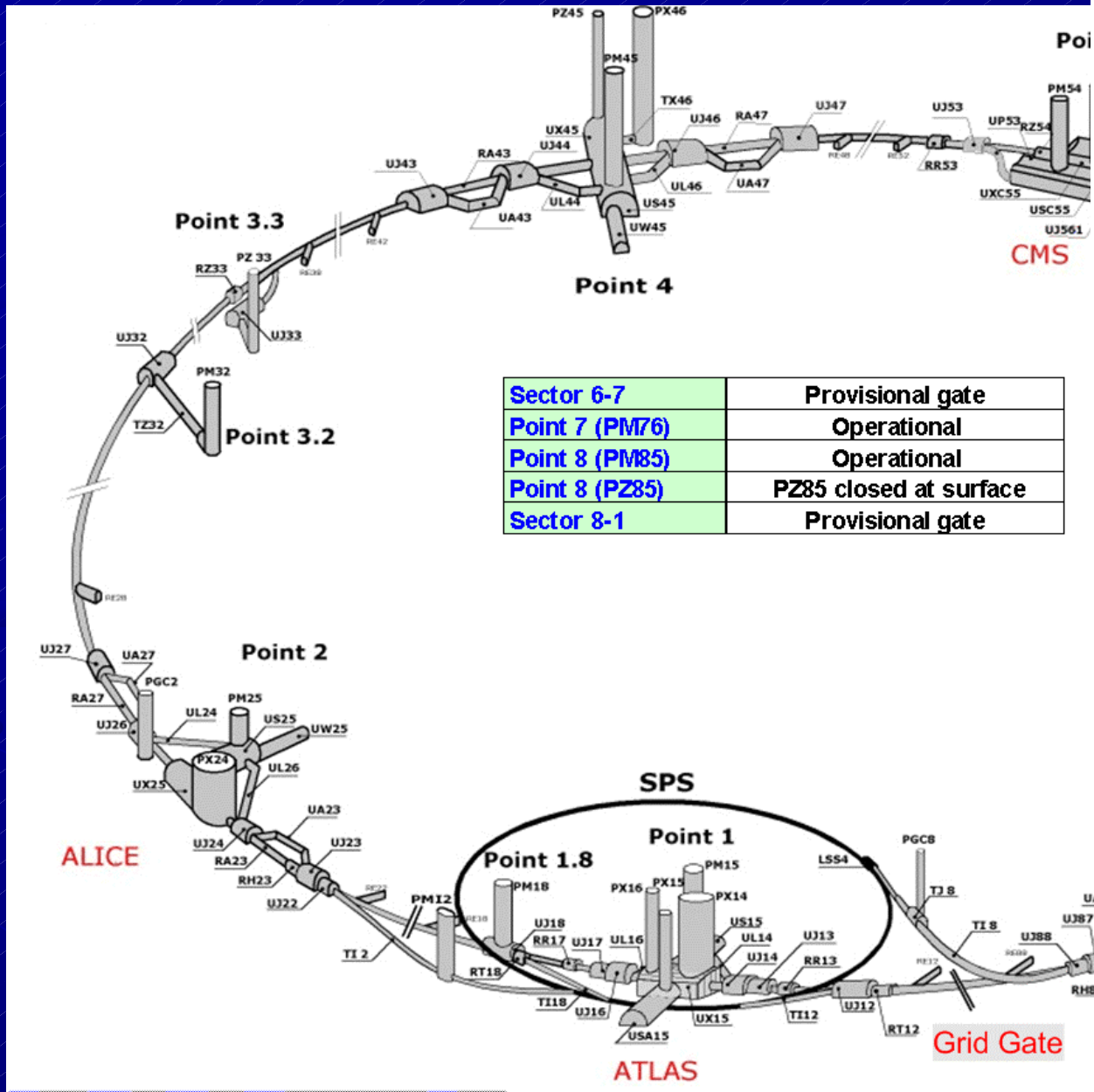
Circuit Name	Description
RQT13.R7B2	Quad
RQT12.R7B2	Quad
RQTL11.R7B2	Quad
RQTL9.R7B2	Quad
RQTL10.R7B2	Quad
RQTL8.R7B2	Quad
RQTL7.R7B2	Quad
RQ6.R7B2	Quad
RCBCH10.R7B2	Corrector
RCBCV9.R7B2	Corrector
RCBCH8.R7B2	Corrector
RCBCV7.R7B2	Corrector
RCBCH6.R7B2	Corrector

IR7

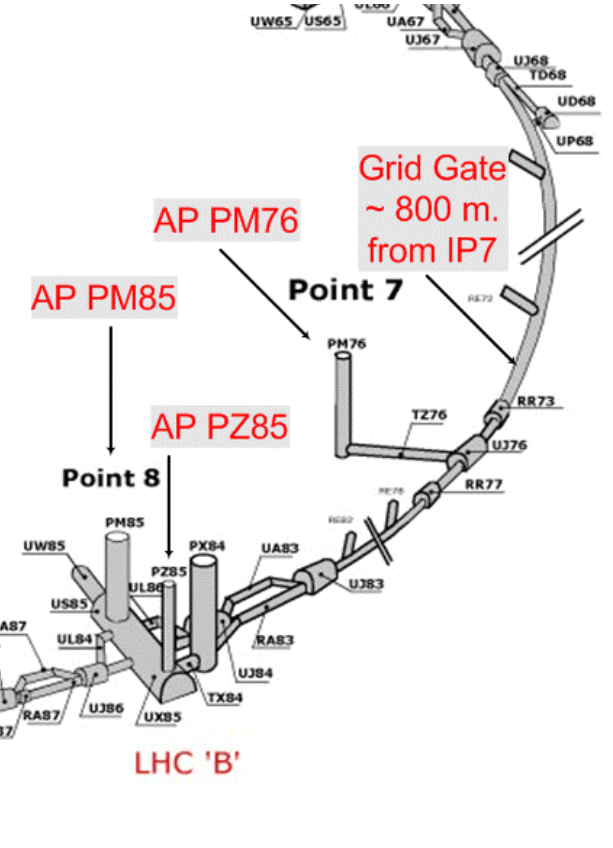
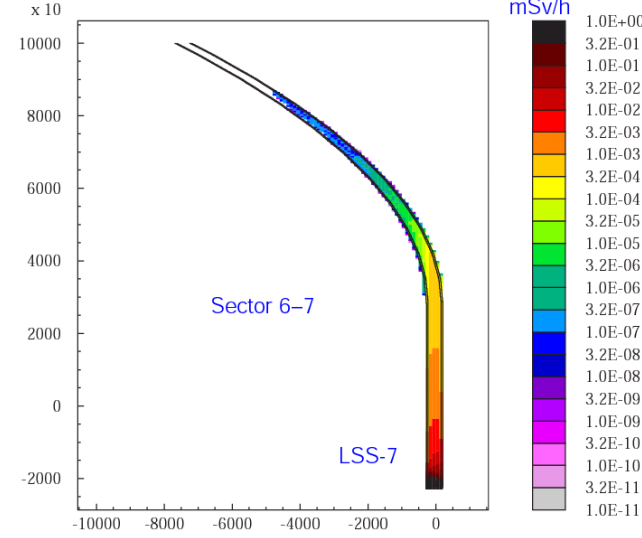
- Dispersion suppressor to Q6 cold and commissioned.
- D4, D3, Q5 etc. not installed.
- Additional vacuum pipe installed
- TED installed
- Extra shielding behind dump
- Radiation monitors
- Additional beam instrumentation:
 - Fast BCT, Screen

Access

- **Sector 6-7.**
 - Interlocked gate \approx 800 m from IP7 is required. Gate & infrastructure to be removed after the test.
- **Point 7 (PM76)**
 - Machine access point at operational.
- **Point 8 (PM85)**
 - Machine access point operational.
- **PZ85**
 - Interlocked gate must be placed at the top
- **Sector 1-8:**
 - Interlocked gate. The gate to be removed after the test

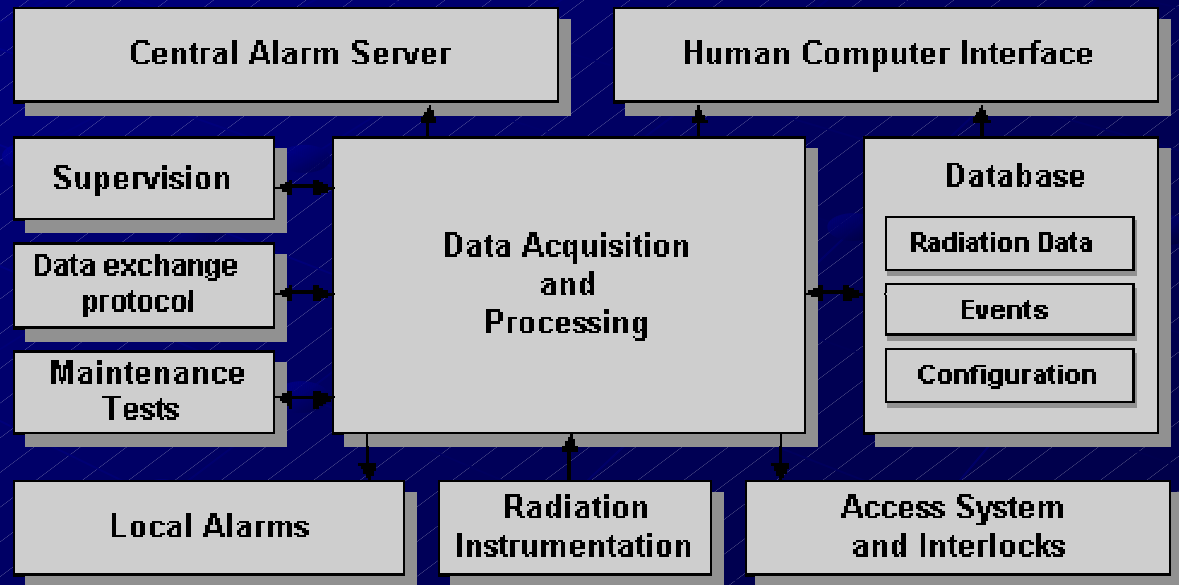


Sector 6-7	Provisional gate
Point 7 (PM76)	Operational
Point 8 (PM85)	Operational
Point 8 (PZ85)	PZ85 closed at surface
Sector 8-1	Provisional gate



Radiation monitors

- Tunnel access gates
 - Monitors connected to interlock system
- LHCb
 - RAMSES
 - Additional



Controls

List

Conclusions

- Essential requirements for beam defined
 - Injection elements
 - Magnets, Magnet circuits and thus Power Converters
 - Beam Instrumentation
 - Dump
 - Access
 - Radiation Monitoring
 - Controls
- Essential pre-requisites also established
 - See Roberto