Overview of the BLM Families

2nd BLM Thresholds WG Meeting

26/06/14

Matti Kalliokoski

Monitors

- Total number of monitors in the LSA database (in the beginning of LS1): 3902 (3814 in the Logging database)
  - 1 Flat ionization chamber
  - 3601 Ionization chambers (+51 from coupled monitors)
  - 17 LICs
  - 283 Secondary Emission Monitors (270)
- The detectors are placed in 181 families based on the type and location
- None of the SEMs and the FIC are connected to BIS
- From LICs, 2 are connected to BIS

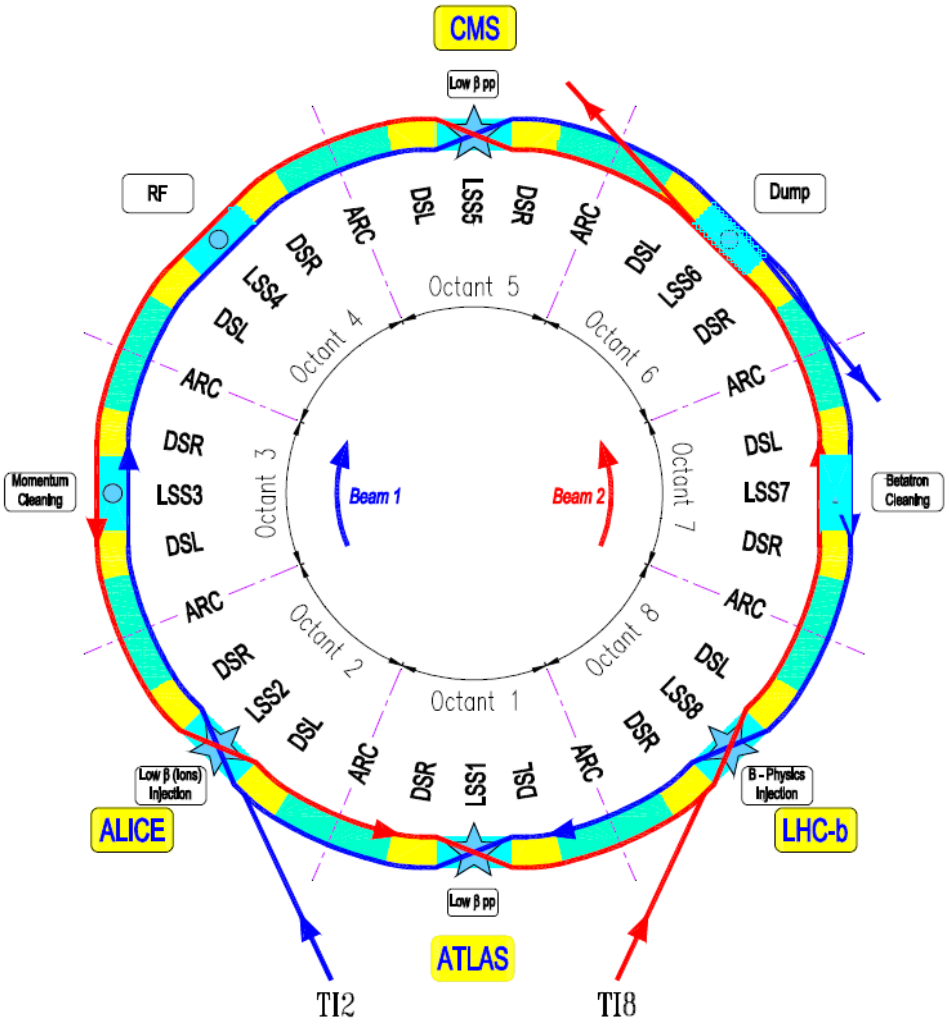
Ionization Chambers

- The 3601 ICs are placed in 144 families
  - 3486 are connected to BIS
  - 3532 are logged
- 221 detectors have their thresholds set to maximum
  - 116 of these are connected to BIS
- 66 detectors have filters
  - 57 are connected to BIS
    - 8 have thresholds set to maximum

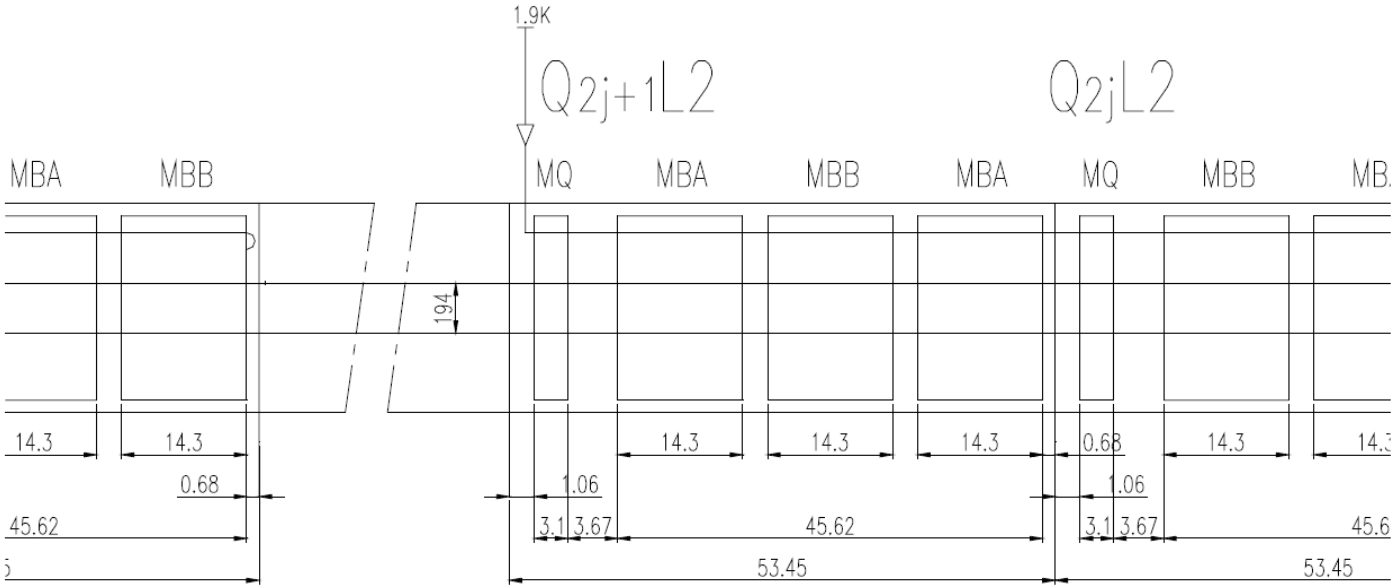
Families

- Naming conventions: THRa.b.c.d.e.f_E
  - a = I for ionization chambers, S for SEM, L for LIC, F for FIC
  - b = half-cell No: AR(12-34) or DS(8-11) or SS(1-7) or number
  - c = L for left, R for right
  - d = IP: CO(3,7), NC(1,2,4,5,6,8) or number
  - e = B1 / B2
  - f = position on magnet (10, 11, 20, 21, 30, …)
  - E = element name (MQ, MQM, MB ...)

LHC Layout


CMS
Low β pp
RF
Dump
Momentum Cleaning
Betatron Cleaning
Low β (Ions) Injection
B - Physics Injection
ALICE
LHC-b
ATLAS
Low β pp
TI2
TI8
Octant 1
Octant 2
Octant 3
Octant 4
Octant 5
Octant 6
Octant 7
Octant 8
Beam 1
Beam 2
ARC
DSR
LSS1
DSL
LSS2
LSS3
LSS4
LSS5
LSS6
LSS7
LSS8

ARC


1.9K
Q2j+1L2
Q2jL2
MBA
MBB
MQ
MBA
MBB
MBA
MQ
MBB
MB.
194
14.3
14.3
14.3
14.3
14.3
0.68
14.3
14.3
0.68
1.06
1.06
45.62
3.1
3.67
45.62
3.1
3.67
45.6
53.45
53.45

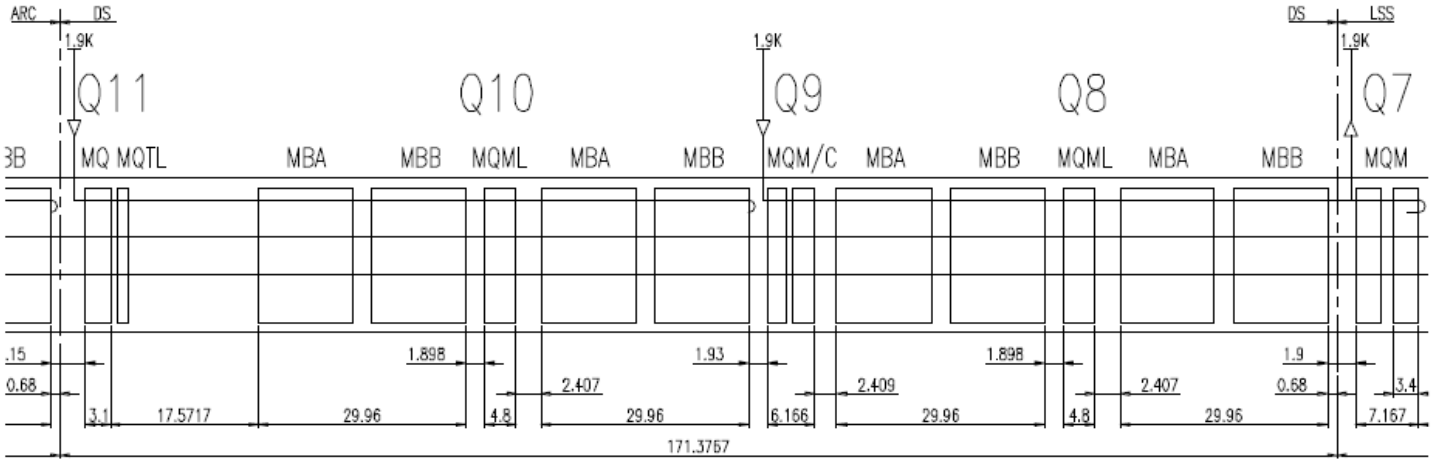
Lattice Quadrupoles, MQ

- 6 large families, 360 monitors in each
  - THRI.AR.B1.1_MQ[360]
  - THRI.AR.B1.2_MQ[360]
  - THRI.AR.B1.3_MQ[360]
  - THRI.AR.B2.1_MQ[360]
  - THRI.AR.B2.2_MQ[360]
  - THRI.AR.B2.3_MQ[360]
- THRI.AR.B1(2).2 and THRI.AR.B1(2).3 have the same threshold values

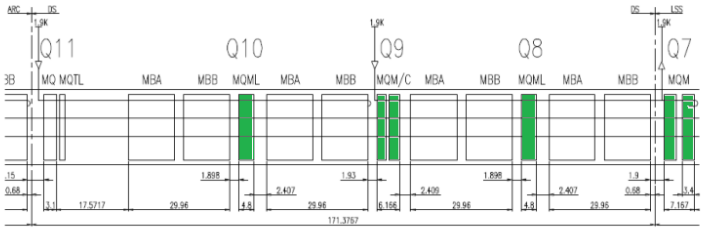
ARC UFO

- IP3, beam 1 right side
- Cell 19
- THRI_MBUFO[4]
  - Thresholds are set to maximum
  - Not connected to BIS

DS

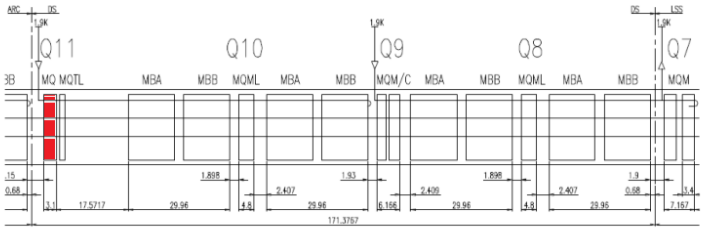

ARC
DS
1.9K
Q11
Q10
Q9
Q8
Q7
DS
LSS
1.9K
1.9K
1.9K
3B
MQ MQTL
MBA
MBB
MQML
MBA
MBB
MQM/C
MBA
MBB
MQML
MBA
MBB
MQM
.15
0.68
3.1
17.5717
1.898
29.96
4.8
2.407
29.96
1.93
6.166
2.409
29.96
1.898
4.8
2.407
29.96
1.9
0.68
3.4
7.167
171.3767

DS MQM & MQML



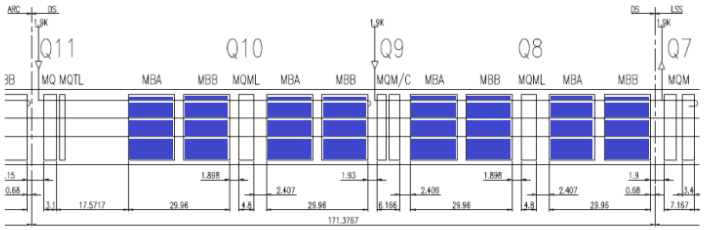
- IP
- Cells
  - THRI.DS.B1.1_MQM[42]
  - THRI.DS.B2.1_MQM[41]
    - BLMQI.07L4.B2E10_MQM is in THRI.SS.B2.1_MQM
  - THRI.DS.B1.2_MQM[42]
  - THRI.DS.B2.2_MQM[42]
  - THRI.DS.B1.3_MQM[42]
  - THRI.DS.B2.3_MQM[42]
- Families for high injection losses
  - THRI.DS.B1.1_MQM_IL[2]
  - THRI.DS.B2.1_MQM_IL[1]
    - BLMQI.08L2.B2I10_MQML was replaced with LIC and put into THRL.DS.B2.1_MQM_IL
  - THRL.DS.B2.1_MQM_IL[1]
  - THRI.DS.B1.2_MQM_IL[2]
  - THRI.DS.B2.2_MQM_IL[2]
  - THRI.DS.B1.3_MQM_IL[2]
  - THRI.DS.B2.3_MQM_IL[2]
- Monitors with filters
  - THRI.DS.B1.1_MQM_RC[2]
  - THRI.DS.B2.1_MQM_RC[2]
  - THRI.DS.B1.2_MQM_RC[2]
  - THRI.DS.B2.2_MQM_RC[2]
  - THRI.DS.B1.3_MQM_RC[2]
  - THRI.DS.B2.3_MQM_RC[2]

DS Lattice Quadrupoles, MQ



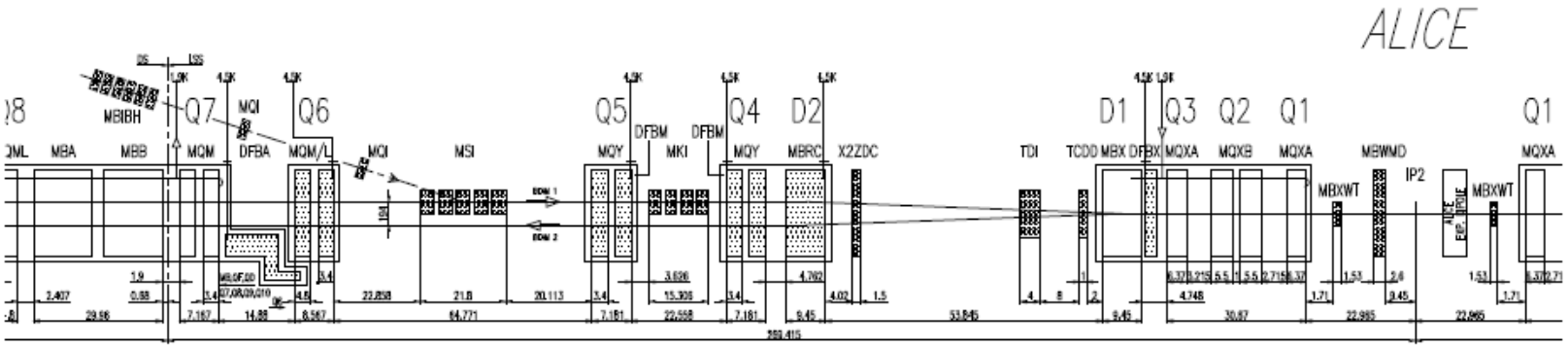
- Cells 8,9 & 10; IP 3 & 7
- Cell 11; all IPs
  - THRI.DS.B1.1_MQ[28]
  - THRI.DS.B2.1_MQ[28]
  - THRI.DS.B1.2_MQ[34]
  - THRI.DS.B2.2_MQ[31]
  - THRI.DS.B1.3_MQ[30]
    - 2 coupled monitors in IP3, cells 9&10
  - THRI.DS.B2.3_MQ[30]
    - 2 coupled monitors in IP3, cells 9&10
- Threshold settings are copied from matching arcs families along with MF values [LHC-BLM-ECR-0016]

Main Dipoles, MB



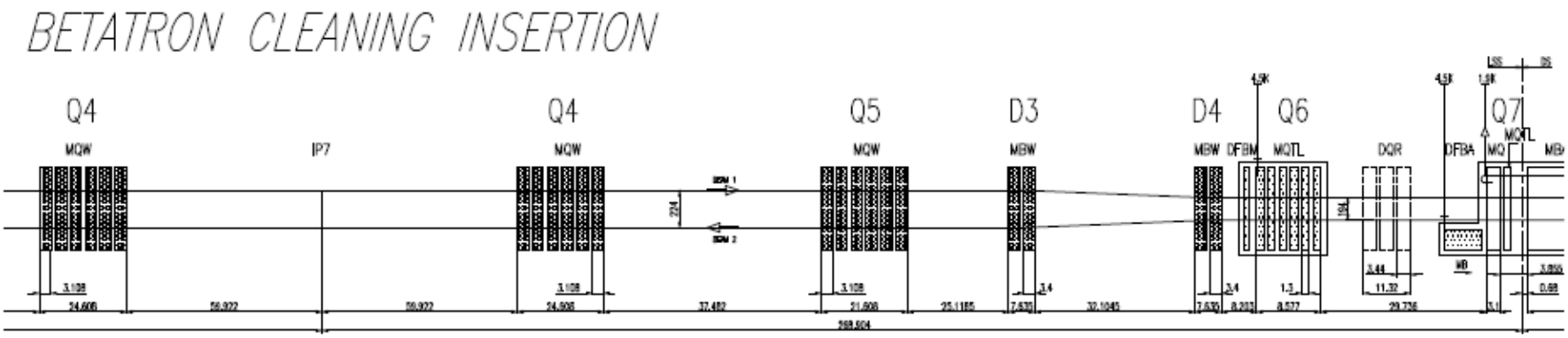
- All Families have same thresholds
  - IP 7
  - Cell 10
    - THRI_B1.1_MB[1]
  - IP 1,2,3,5,6,7 & 8
  - Cells 8-13
    - THRI_B1.2_MB[101]
      - 21 coupled monitors
    - THRI_B2.2_MB[102]
      - 22 coupled monitors
  - THRI_B1.3_MB[17] & THRI_B2.3_MB[18]
    - IP 1,2,3,5,7 & 8
    - Cells 8-11

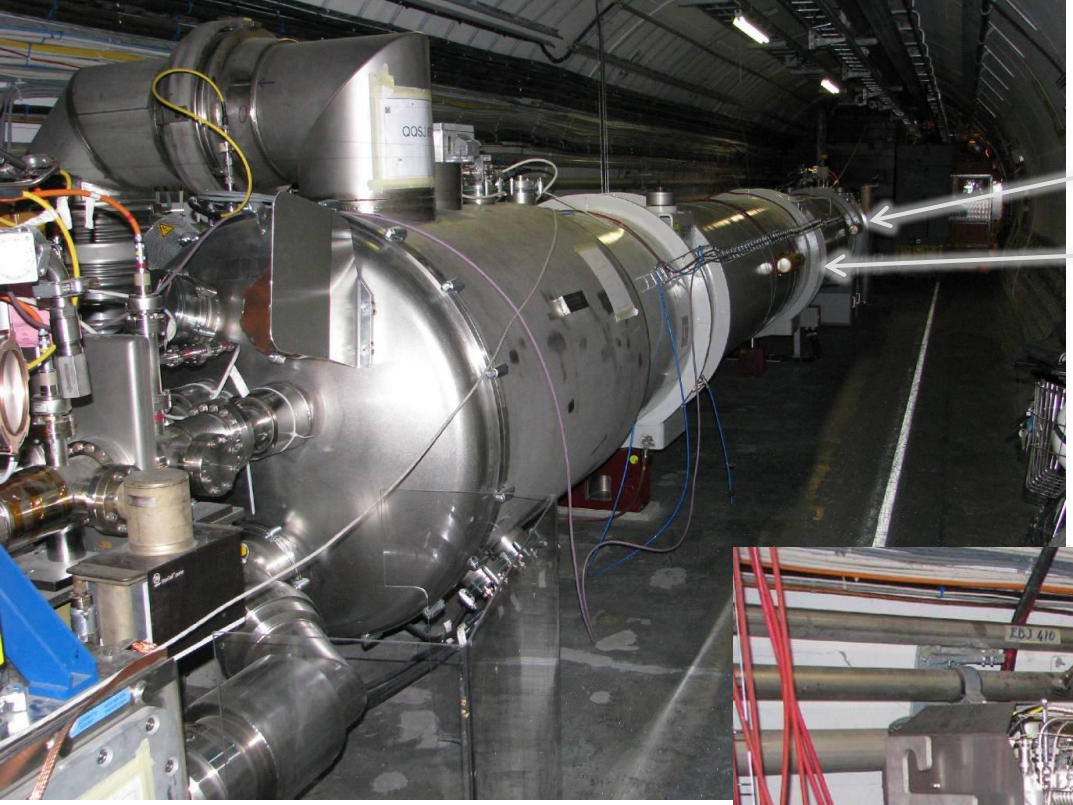
LSS


ALICE
Q7
MQI
Q6
Q5
DFBM
DFBM
Q4
D2
D1
Q3
Q2
Q1
Q1
MBIBH
MBA
MBB
MQM
DFBA
MQM/L
MQI
MSI
MQY
MKI
MQY
MBRC
X2ZDC
TDI
TCDD
MBX
DFBX
MQXA
MQXB
MQXA
MBWMD
IP2
MBXWT
MBXWT
MQXA

Tuning Quadrupole, MQTL

- IP 3 & 7
- Cell 6
- 3+3 families, 3 positions for 2 beams
  - THRI_B1(2).1(2)_MQTLH, position 1 & 2, mounted on the side of the magnet
  - THRI_B1(2).3_MQTLH, position 3, mounted after the magnet
  - 4 monitors in each family

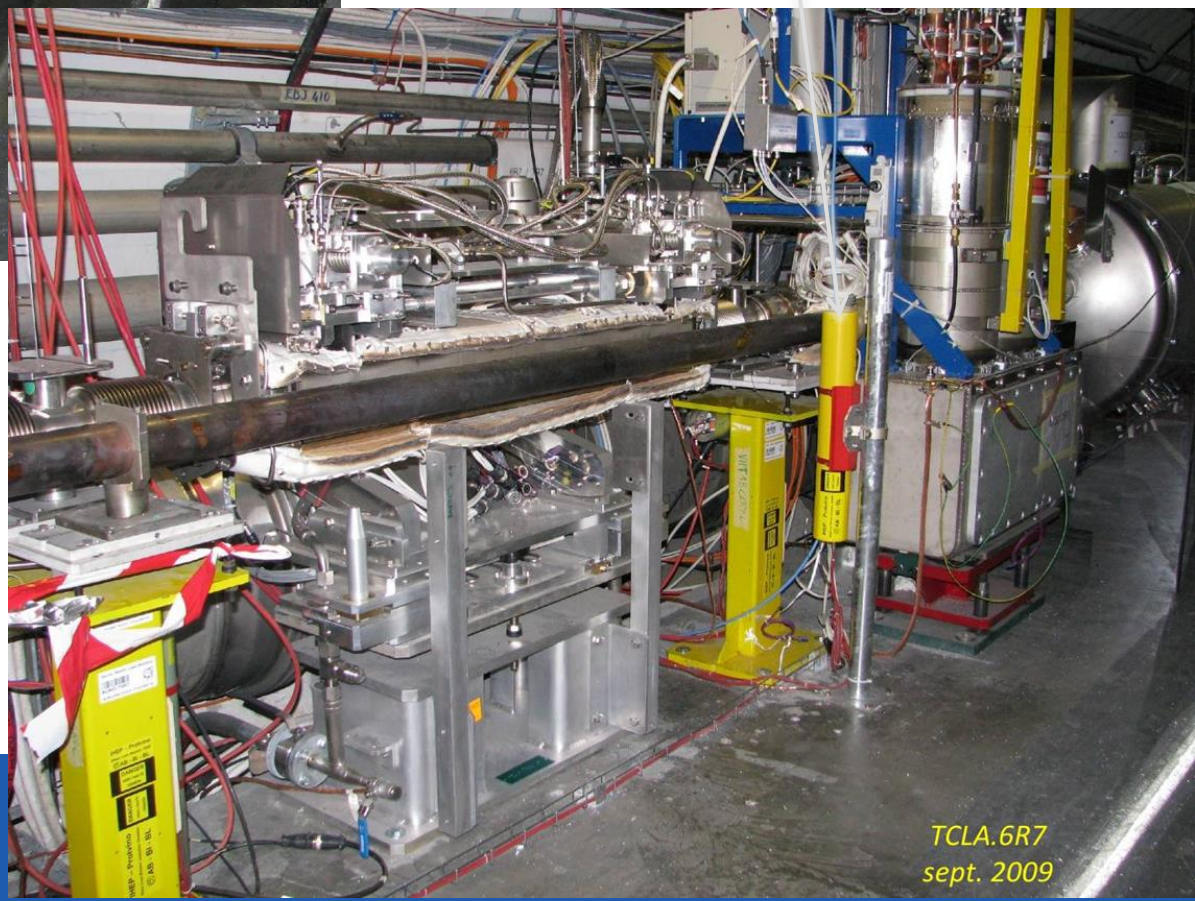




BLMQI.06R7.B2I10_MQTL

BLMQI.06R7.B2I20_MQTL

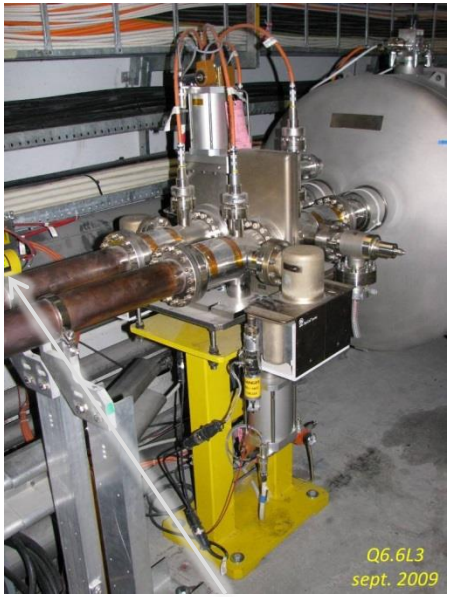
BLMQI.06R7.B2I30_MQTL



THRI_B2.3_MQTLH

BLMQI.06R7.B2I30_MQTL

BLMQI.06L7.B2I30_MQTL



BLMQI.06L3.B2E30_MQTL

BLMQI.06R3.B2E30_MQTL

LSS MQM & MQML

- IP 1,2,5 & 8; 1 in IP4 (probably a mistake)
- Cells 5 & 6
  - THRI.SS.B1.1_MQM[12]
  - THRI.SS.B2.1_MQM[13]
    - 1 extra, BLMQI.07L4.B2E10_MQM, belongs to DS?
  - THRI.SS.B1.2_MQM[12]
  - THRI.SS.B2.2_MQM[13]
    - extra monitor in 06L5
  - **THRI.SS.B1.3_MQM[12]***
  - **THRI.SS.B2.3_MQM[12]***
- Families for high injection losses, IP2 & IP8
  - THRI.SS.B1.1_MQM_IL[1]
  - THRI.SS.B2.1_MQM_IL[1]
  - THRI.SS.B1.2_MQM_IL[1]
  - THRI.SS.B2.2_MQM_IL[1]
  - **THRI.SS.B1.3_MQM_IL[1]***
  - **THRI.SS.B2.3_MQM_IL[1]***
- Monitors with filters, IP2 & IP8
  - THRI.SS.B1.1_MQM_RC[1]
  - THRI.SS.B2.1_MQM_RC[1]
  - THRI.SS.B1.2_MQM_RC[1]
  - THRI.SS.B2.2_MQM_RC[1]
  - **THRI.SS.B1.3_MQM_RC[1]***
  - **THRI.SS.B2.3_MQM_RC[1]***

***Thresholds set to maximum**

LSS Wide Aperture Quadrupoles, MQY

- IP 1,2,4,5,6 & 8
- Cells 4, 5 & 6
  - THRI.SS.B1.1_MQY[15]
  - THRI.SS.B2.1_MQY[15]
  - THRI.SS.B1.2_MQY[14]
  - THRI.SS.B2.2_MQY[14]
  - **THRI.SS.B1.3_MQY[18]***
  - **THRI.SS.B2.3_MQY[18]***
- Families for high injection losses
  - THRI.SS.B1.1_MQY_IL[1]
  - THRI.SS.B2.1_MQY_IL[1]

***Thresholds set to maximum**

LSS MQY Wirescanner

- IP 4
- Cells 5 and 6
  - THRI.SS.B1.1_MQY_WS[2], B1 right
  - THRI.SS.B2.1_MQY_WS[2], B2 left
  - THRI.SS.B1.2_MQY_WS[4], both beams both sides
  - THRI.SS.B2.2_MQY_WS[4] , both beams both sides

LSS Lattice Quadrupoles, MQ

- IPs 3 & 7
- Cell 7
  - THRI.SS.B1.1_MQ[4]
  - THRI.SS.B2.1_MQ[4]
  - THRI.SS.B1.2_MQ[4]
  - THRI.SS.B2.2_MQ[4]
  - THRI.SS.B1.3_MQ[2]
  - THRI.SS.B2.3_MQ[2]

Triplet Quadrupoles

- IPs 1,2,5 & 8
- Naming convention of the BLMs is different from other locations
- None of the monitors are maskable
- MQXA (Q1 & Q3), cells 1 & 3
  - THRI_3_MQXA_LumLoss[4]
  - THRI_B1.1_MQXA[8]
  - THRI_B2.1_MQXA[8]
  - THRI_B1.2_MQXA[16]
  - THRI_B2.2_MQXA[16]
  - **THRI_B1.3B_MQXA[6]**
  - **THRI_B2.3B_MQXA[6]**
  - THRI_B1.3_MQXA[7], 1 monitor replaced by LIC, moved to THRL_B1.3_MQXA_OI
  - THRI_B2.3_MQXA[5],
  - THRI_B2.3_MQXA_IL[3]
  - THRL_B1.3_MQXA_OI[1], LIC connected to BIS, was not logged
- MQXB (Q2), cells 2
  - THRI_2_MQXB_LumLoss[2]
  - THRI_3_MQXB_LumLoss[4]
  - THRI_B1.2_MQXB[23]
  - THRI_B2.2_MQXB[23]
  - THRI_B1.3_MQXB[6]
  - THRI_B2.3_MQXB[6]

Collimators

- In general, installed as IC+SEM / collimator (exception LS1 installations)

TCD

- All thresholds are set to maximum
- IP2, cell 4
  - THRI_TCDD[1]
    - Installed in 2012 for D1 protection
    - Not logged, not connected to BIS
- IP6, cell 4
  - Connected to BIS
  - THRI_TCD[4]
  - THRI_TCD_RC[6]

TCHS

- Thresholds set to maximum
- Not connected to BIS
- THRI_TCHS[4]
  - IP7, cell 6
- THRI_TCHS_RC[4]
  - IP 3 & 7, cell 6

TCL

- TCLA
  - IP 7
    - Cell 6
      - THRI.06_7_AB_TCLA[4]
      - THRI.06_7_CD_TCLA[4]
    - Cell 7
      - THRI.07_7_AB_TCLA[4]
        - 2 monitors connected to BIS
        - 2 disconnected since the respective TCLAs (IP7) were not installed [LHC-BLM-ECR-0002]
  - IP 3
    - THRI_TCLA[8]
      - Cell 3, 5 & 7

TCL

- THRI_TCLI[5]
  - Connected to BIS
  - IP 2R & 8L
  - Cells 4 & 6
    - one extra monitor with filters BLMEI.06L8.B2I11_TCLIB.6L8.B2
      - not connected to BIS, for measurement purposes
- THRI_TCL[8]
  - IP 1 & 5
  - Cells 4 & 5
    - Only cell 5 monitors [4] are connected to BIS

Possible Changes to the Families

- For most of the cases B1 and B2 thresholds are identical
  - These families could be combined into one family?
- Re-combine injection loss families?
- Re-combine families with identical thresholds?
- In some cases the thresholds for monitors in position 2 and position 3 are identical
  - New simulations to check if modifications are needed
  - Combine the families?
- Add “MAX” in the name of the families that have thresholds set to maximum?
- In families that are not connected to BIS, “no_BIS” in the name?
  - Problem with the families that have only some monitors connected/not connected to BIS => Create new families with identical thresholds
- All SEMs in one family?
- All LICs that are not connected to BIS in one family?
- Magnet temperature in the family name?