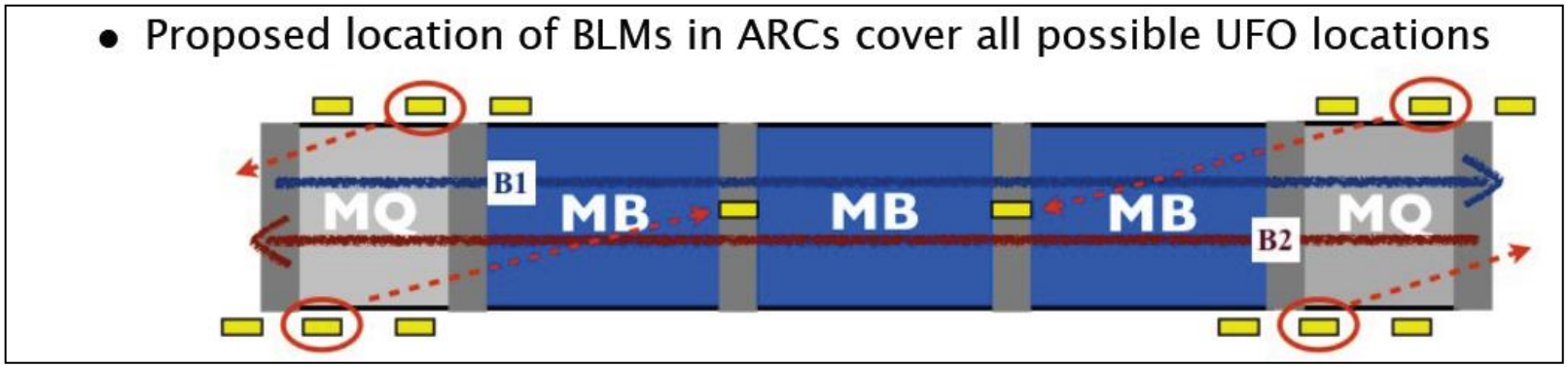
Injection region BLMs – IP2 and IP8
Suggestion of changes – version 2

- Re-distribution of quadrupole BLMs to dipole interconnects in the injection regions
- Layout and threshold changes to allow for higher injection losses and to replace SEM
  - Monitors and filters (new LICs)
  - Channels for possible injection timing blind-out
- Scheduling

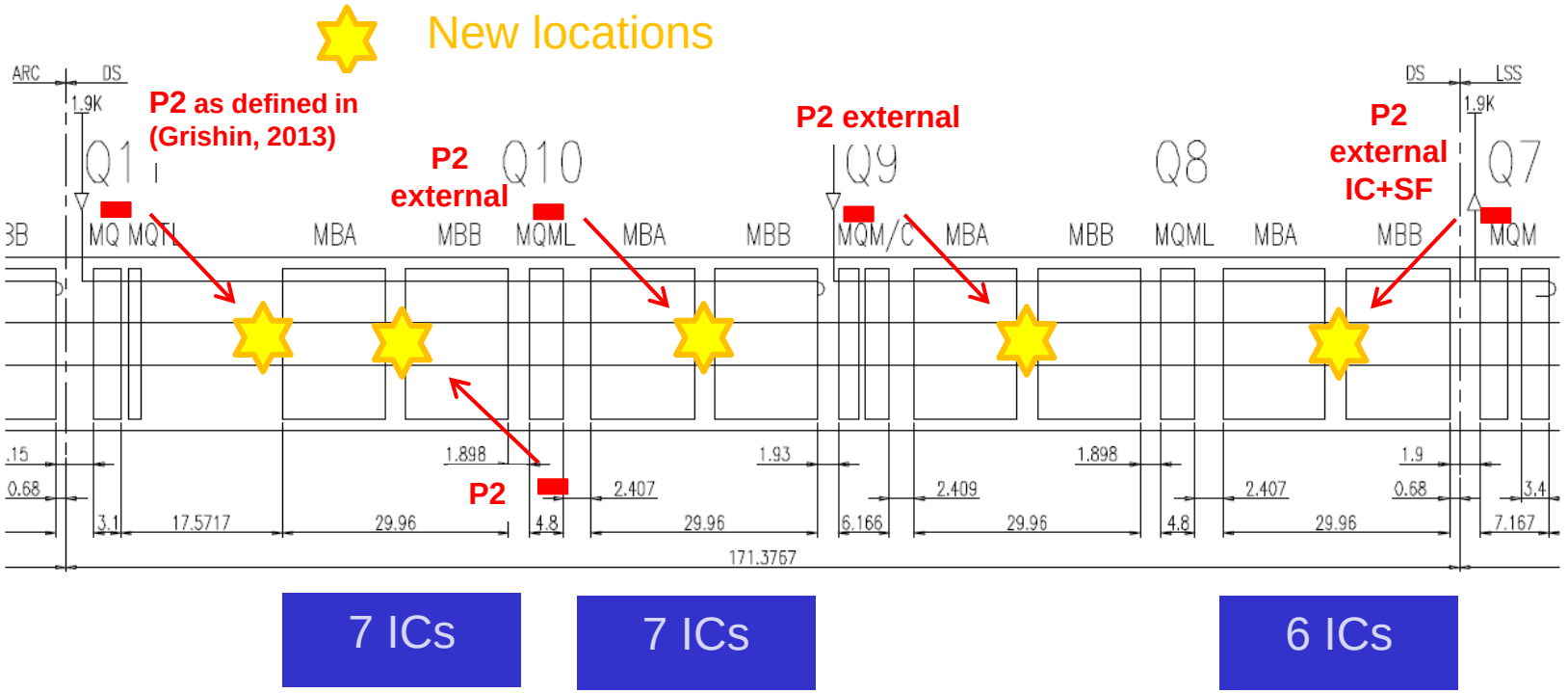
Re-distribution of quadrupole BLMs to dipole interconnects in the injection regions

Re-distribution of Arc and DS BLMs

- LS1: 1 out of 3 BLMs per arc quadrupole and beam will be moved to the dipoles magnets
- Aim: protect the dipoles against UFO-loss caused quenches
- The **second BLMQI** monitor per beam will be moved to the interconnect between two dipoles
- New position is **on top of the interconnect**
  - Equal signal from B1 and B2 losses
  - Expect somewhat smaller signal per lost proton
  - Threshold to be determined by new simulations



Re-distribution of Dispersion Suppressor BLMs



Drawing represents IP2.
IP8 changes are analogue to IP2

Layout and threshold changes to allow for higher injection losses and to replace SEM

- Locations for threshold changes have been identified as well – will be addressed later

Sensitivity and Dynamic Range

- Sensitivity of different monitors and filters:

Sensitivity Range		Relative Sensitivity
A	IC	1
B	LIC	1 / 14
B	IC + SF (small filter)	1 / 20
C	LIC + SF	1 / 280
C	IC + BF (big filter)	1 / 180
D	LIC + BF	1 / 2520
E	SEM	1 / 70000

- Comparison of dynamic range:

SEM	3k Gy/s (from dump region)	1.6 MGy/s
LIC+big filter	~1 Gy/s (from septum LICs in 2012)	58 kGy/s
IC	~5E-2 Gy/s	23 Gy/s

General Remarks

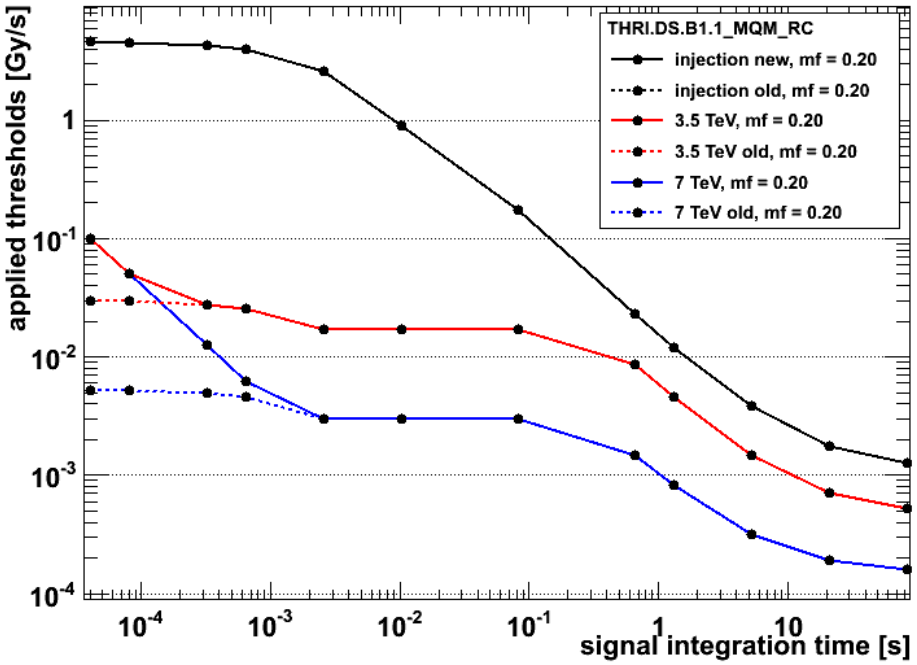
- Required dynamic range is based on the October 2011 analysis from W. Bartmann.
  - Request: Allow for 5 times the max. signal
  - Additionally, there is at least another factor 2 increase possible by threshold changes

- Thresholds shown are for 450GeV and 40us running sum.
  - They need to stay below 23 Gy/s.

- All monitors will have to have their thresholds at 450GeV adapted to allow injection losses – this is because we decided to start without bind-out.

Problem with low sensitivity monitors (LIC, IC+filter)

- On some cold elements the noise level is above the threshold level
- General guideline: use IC+filter on blind-able monitors
  - If we switch on the blinding, we can take away the filter, adapt the thresholds and reduce the problem of sensitivity at high energy.



Blind-able inputs

- Inputs defined as “blind-able”:
  - Maximum 8 monitors per tunnel card
  - Signal cable not too long (longest one in IP2: 60m)
  - 3 tunnel cards in IP2 (left)
  - 3-4 tunnel cards in IP8 (right)
  - They will be connected to one surface crate / IP
  - Should it become necessary, the whole crate can be “blinded” during injection
  - At start-up it will not be “blinded”
  - It is still possible to move cards between blind-able and non-blind-able crates after start-up
- Input we want to be blind-able have to be combined with other monitors (where it is not important, for example because they are not connected to BIS, they are only for measurement)

IP2 Blind-able Inputs

- IP2 left grouped by tunnel cards:

BLMQI.08L2.B1E10_MQML	Requiring blinding
BLMQI.08L2.B1E20_MQML	Requiring blinding
BLMQI.08L2.B1E30_MQML	Requiring blinding
BLMEL.08L2.B2I22_MBA	Measurement only
BLMEL.08L2.B2I21_MBA	Measurement only
BLMEL.08L2.B2I30_MBB	Measurement only
BLMEL.08L2.B2I22_MBB	Measurement only
BLMEL.08L2.B2I21_MBB	Measurement only

BLMQI.07L2.B1E30_MQM	Requiring blinding
BLMQI.06L2.B1E10_MQML	Requiring blinding
BLMQI.06L2.B1E20_MQML	Requiring blinding
BLMEI.06L2.B1E10_MSIB	Measurement only
BLMEI.06L2.B1E20_MSIB	Measurement only
BLMEI.06L2.B1E30_MSIB	Measurement only
BLMEI.06L2.B1E10_MSIA	Measurement only
BLMEI.06L2.B1E20_MSIA	Measurement only

BLMEI.04L2.B2I10_TDI.4L2.B2	Requiring blinding
BLMEI.04L2.B1E10_TDI.4L2.B1	Requiring blinding
BLMEI.04L2.B1E20_TDI.4L2.B1	Requiring blinding
BLMEL.04L2.B1E10_TCDD.4L2	Measurement only
BLMEI.04L2.B1E10_MBXA	Requiring blinding

IP8 Blind-able Inputs

- IP8 has far fewer locations with high losses

- IP 8 right **required** blind-able input (not yet matched to tunnel cards):

BLMQI.03R8.B1I30_MQXA	To be assessed
BLMEI.04R8.B2E10_TDI.4R8.B2	Yes
BLMEI.04R8.B2E20_TDI.4R8.B2	Yes
BLMEI.04R8.B2E10_MBXB	Yes
BLMEI.04R8.B2E10_TCTH.4R8.B2	To be assessed
BLMQI.05R8.B2E10_MQY	To be assessed
BLMEI.06R8.B2E10_MSIB	yes
BLMQI.07R8.B2E10_MQM	yes

83 LICs in IP2 and IP8

- SEM are replace by LIC+BF: **total # 82**
  - at the same location as an IC with/without filter
  - not connected to BIS (measurement only)

		IP2 left	IP8 right	IP2 right	IP 8 right
MBA, MBB	cell 11	6	6	6	6
MBA, MBB	cell 8	6	6	6	6
MSIA, MSIB	cell 6	6	6	-	-
TCLIB	cell 6	-	-	1	1
TDI	cell 4	3	3	-	-
TCTH	cell 4	1	1	1	1
TCTV	cell 4	1	-	1	
TCDD	cell 4	1	-	-	
TCLIA	cell 4	-	-	1	1
“DRIFT”	cell 4	-	-	1	
BPMSW	cell 1	1	1	1	1

- **One LIC** connected to BIS: **BLMQL.08L2.B2I10_MQML**

Example: Q8 left of IP2

450 GeV threshold for IC	*450 GeV thr. for LIC*	*450 GeV thr. for IC+SF*	*2011 monitor names (analysis Wolfgang)*	*2013 monitor names (if different from 2011)*	*Monitor type 2013*	*After LS1*	*Name after LS1 (only noted if not straight forward)*	*Move to blind-able rack*	*Problem*
7)									
138.1	9.86	**6.91**	BLMQI.08L2.B1E10_MQML		IC+SF	IC+SF		yes BJSAP.B8L2	sensitivity 7 TeV
155.65	11.12	**7.78**	BLMQI.08L2.B1E20_MQML		IC+SF	IC+SF, (or disconnect from BIS)		BJSAP.B8L2	sensitivity 7 TeV
178.85	12.78	**8.94**	BLMQI.08L2.B1E30_MQML		IC+SF	IC+SF		BJSAP.B8L2	sensitivity 7 TeV
22.15	**1.58**	1.11	BLMQI.08L2.B2I10_MQML	BLMQL.08L2.B2I10_MQML	0.4 bar LIC	1.1 bar LIC	BLMQI.08L2.B2I10_MQML	No	sensitivity 7 TeV
18.15	1.30	**0.91**	BLMQI.08L2.B2I20_MQML		IC	IC+SF (or disconnect from BIS)		No	sensitivity 7 TeV
14.15	1.01	**0.71**	BLMQI.08L2.B2I30_MQML		IC	IC+SF		No	To be assessed

Scheduling

- ECR for Layout changes: January 2014
- ECR approval: February 2014
- Installation BLMs: from March 2014, in line with the BLM re-installation schedule

END

- Wolfgang analysis: MPP 30.9.2011 and Evian 2011