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BEAM INTERLOCK SYSTEM NAMING CONVENTION

Abstract

This document describes the naming convention adopted for the Beam Interlock Systems of the SPS, the SPS-LHC/CNGS transfer lines and the LHC. It is applied to the names of all electronics cards used by the protection system and to its exchanged hardware signals that are accessible through the control system and visible in the CERN Control Centre (CCC).

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History of Changes

Rev. No.	*Date*	*Pages*	*Description of Changes*
1.0	23-Feb-2007	All	Ready for distribution and approval
1.1	04-Apr-2007	All	Including comments after submission for approval
1.2	31-May-2007	9	Chapter 5.3 split in two: one for SPS and for the TL
		12	Modification for the Extraction-BIS part of Table#7, when two Controllers are installed in the same FEC.
		13	Few modifications in Appendix 3

Table of Contents

1. PREAMBLE

The Beam Interlock System (***BIS***) was originally conceived and designed for the LHC [1]. During the development it was always foreseen that the *BIS* would be capable of providing a robust modular solution for any other Beam Interlock System required by CERN.

The BIS is expected to be deployed in four distinct, yet related environments:

I. The LHC Beam Interlock System (***LHC-BIS***):

It permits safe beam operation in the LHC accelerator in delivering the global BEAM_PERMIT information when connected systems are all giving their "green lights" (i.e. USER_PERMITS). With circulating beam, it transmits any beam dump request from connected systems to the LHC beam dumping system (LBDS).

II. The (LHC) Injection Beam Interlock System (***INJ-BIS***):

It provides permission to the injection kicker system (MKI) only when involved systems are all giving their USER_PERMITS. It permits safe injection into the LHC in inhibiting the process in case of failure.

III. The (SPS) Extraction Beam Interlock System (***EXT-BIS***):

The system is used for a safe extraction toward the SPS-LHC and CNGS Transfer Lines (TT60, TI2, TT40, TI8, and TT41). It provides permission to the extraction kicker system (MKE) when involved systems are all giving their USER_PERMITS. In case of failure, it inhibits the extraction.

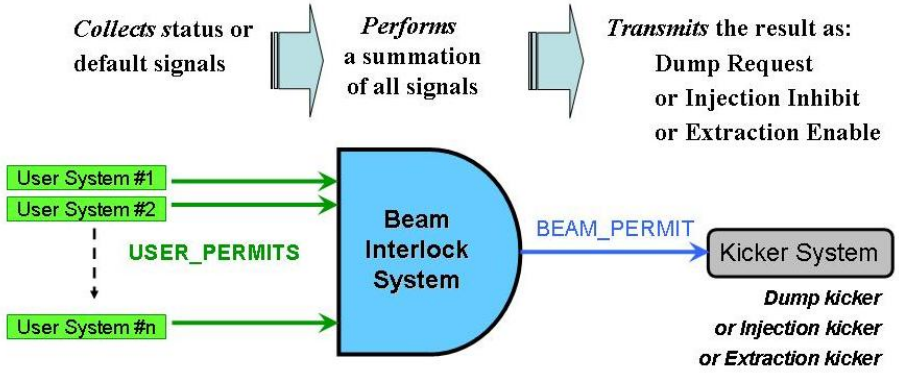
IV. The SPS Beam Interlock System (***SPS-BIS***):

The system is similar as the *LHC-BIS* and will replace the current one named "SPS Emergency Beam Dump Interlock System". It permits safe SPS beam operation and transmits any request from connected systems to the SPS beam dumping system.

The Functionality of the above Beam Interlock Systems is always identical:

- gather USER_PERMIT signals coming from *User Systems* (*any equipment interconnected to the Beam Interlock System with the purpose of interlocking is designated a User System)*
- perform an AND function of the received signals
- This result is produced either by one BIC or by several ones.
- The outcome, named BEAM_PERMIT, is transmitted to another BIC or to a Kicker.

  Note: The BEAM_PERMIT signal can be used for cascading two BIS (not shown in the picture below). For example, the BEAM_PERMIT of the LHC-BIS is used as a USER_PERMIT input signal to the INJ-BIS.



In all cases, the same hardware solution is used with a central element called the *Beam Interlock Controller (BIC)* and distant elements called the Beam Interlock *User Interfaces* (see Figures in Appendix#1)

Depending on the environment, the arrangement, the configuration and the setting of the used BICs will be different. As for example:

- A different programming for the on-board programmable devices in order to get a BEAM_PERMIT with a latched mode for the LHC-BIS and with a non- latched mode for the 3 others BIS.
- A hierarchical architecture for the EXT-BIS with one "master" and several "slave" BICs. The "master" will have a different Matrix programming. In addition, it is foreseen to install two independent slaves in the same crate.
- A unique boards set for a BIC involved in the SPS-BIS (only one beam) and a double set of boards for a BIC used in the LHC-BIS (2 beams).

2. NAMING OF BOARDS

A *Beam Interlock Controller* is identified with a VME crate. It is composed of several boards:

- The *Manager* module (CIBM). This card performs the critical operations of the Beam Interlock System via two redundant matrices. A BIC crate has either one or two CIBM.
- The *Test & Monitoring* module (CIBT). This card liaises with the *Manager* module; it gathers the monitoring information from the *User Interfaces* and transmits this to the *Manager*.
- The *Back-Plane* card (CIBP). This patching card routes the signals coming from the different *User Interfaces* to the *CIBM* module and/or to the *CIBT* module. There are 2 *CIBP* versions: *CIBPL* for the LHC-BIS and *CIBPS* for the others BIS.
- The *Extender* cards (CIBE). This card routes the VME backplane to the CIBP board. There are 2 *CIBE* versions: *CIBEA* and *CIBEB*.
- The optical daughter card (CIBO) is the used interfaces for the transmission/reception of the Beam Permit signal. There are mounted on the CIBM card and on the CIBG card.
- The two display daughter cards: CIBTD (for CIBT board) and CIBMD (for CIBM board).
- The *Generator* module (CIBG). This card achieves the initialisation and the generation of the frequency carried though the 2 redundant Beam Permit Loops. There is only one *Generator* module per Loop.

Depending of the environment, the following table (not exhaustive) indicates the number of involved boards in a BIC:

		LHC	INJ	EXT*	SPS
CIBM	*Manager* module	2	1	1 (x 2)*	1
CIBMD	CIBM's *Display* daughter card	2	1	1 (x 2)*	1
CIBT	*Test & Monitoring* module	2	1	1 (x 2)*	1
CIBTD	CIBT's *Display* daughter card	2	1	1 (x 2)*	1
CIBPS	*Back-Plane* card (SPS Version)	0	1	1	1
CIBPL	*Back-Plane* card (LHC Version)	1	0	0	0
CIBEA	*Extender* card (type-A)	4	2	2 (x 2)*	2
CIBEB	*Extender* card (type-B)	2	1	1 (x 2)*	1
CIBO	Optical daughter card for CIBM	4	2	2 (x 2)*	2
CIBG**	*Generator* module**	(4)	(2)	(2)	(2)
CIBO	Optical daughter card for CIBG	(4)	(2)	(2)	(2)

(*): Inside an *EXT-BIS'* crate it is conceivable to install 2 set of boards.

(**): CIBG is not installed in every crate: only two modules per beam and per system.

Up to 2x14 *User Interfaces* could be connected to a BIC. The elements composing a *User Interface* are:

CIBUS or	User Interface with single connection: for one beam system (SPS-BIS, EXT-BIS, INJ-BIS) and for LHC-BIS (when the "User_Permit" is on both beams)
CIBUD	User Interface with double connection (LHC only): "User_Permit" on individual beam
CIBD	Power Distribution module for User Interface (2 redundant CIBD are used per User Interface (either CIBUD or CIBUS)

Note: Only the CIBM and CIBG boards have a VME-bus interface and therefore have a corresponding FESA device name for remote monitoring purposes.

3. NAMING OF THE INDIVIDUAL SYSTEMS

The equipment codes [2] CIP, CIW and CIB refer respectively to the Powering Interlock System, the Warm Magnet Interlock System and the Beam Interlock System. These equipment codes are used for the complete accelerator complex.

The following table gives some examples for individual interlock systems names [3][4] as referenced in the LHC Layout database:

	Interlock system name
PIC example	CIP.UA83. AL8
WIC example	CIW.UA47.LR4
BIC proposal	CIB.UA87.R8

Here below some examples for BIC system names and Front-End Computer (FEC) names as respectively referenced in the LHC Layout database and in the network database:

I. For the LHC Beam Interlock System (***LHC-BIS***):

BIC system name	FEC name
CIB.UA87.R8	CFV-UA87-CIBR8
CIB.UJ33.U3	CFV-UJ33-CIBU3

II. For the (LHC) Injection Beam Interlock System (***INJ-BIS***):

CIB.SR2.INJ1	CFV-SR2-CIBINJ1

III. For the (SPS) Extraction Beam Interlock System (***EXT-BIS***):

CIB.BA6.EXT1	CFV-BA6-CIBEXT1
CIB.BA4.TT40	CFV-BA4-CIBTT40

IV. For the SPS Beam Interlock System (***SPS-BIS***):

CIB.BA1.S1	CFV-BA1-CIBS1

In appendix#2, at the end of this document, a table shows all the proposed names for the different BICs and Front-End Computers.

4. NAMING OF THE SOFTWARE DEVICES

The interlock system names are also used as identifiers for the software devices deployed on front-end computers, i.e. the FESA devices.

As written in Chapter 2, a BIC system is composed of either one or two CIBM board(s). In addition, there is possibly one (or two) CIBG board(s) installed in the crate. These boards are remotely accessible as FESA devices.

Here below some examples of FESA names when there is only one set of boards installed in a BIC system (i.e. a BIC crate):

BIC system name	FESA device name	FESA device name description
CIB.SR2.INJ1	CIBM.SR2.INJ1	for the unique CIBM board of the crate
" "	CIBG.SR2.INJ1	for a CIBG board placed in the crate
		both are installed in the BIC system dedicated to the injection part of LHC beam 1

CIB.BA1.S1	CIBM.BA1.S1	for the unique CIBM board of the crate
" "	CIBG.BA1.S1	for a CIBG board placed in the crate
		both are in the BIC system dedicated to the sextant 1 part of the SPS ring

In some cases (LHC-BIS and EXT-BIS), there are two sets of boards installed in a BIC crate. Here below some examples:

BIC system name	FESA device name	FESA name device Description
CIB.UA63.L6	CIBM.UA63.L6.B1	for the CIBM managing the Beam 1 part
" "	CIBM.UA63.L6.B2	for the CIBM managing the Beam 2 part
	CIBG.UA63.L6.B1	for a CIBG handling the Beam 1 Permit loop
		all are installed in the LHC BIC system dedicated to the left of point 6

CIB.BA4.TT40	CIBM.BA4.TT40.1	for the CIBM managing 1st half of TT40 signals
" "	CIBM.BA4.TT40.2	for the CIBM managing 2nd half of TT40 signals
		both are installed in the BIC system dedicated to the TT40 part of the SPS Transfer lines

5. SIGNAL NAMES

5.1 ENTITIES CODES FOR SIGNAL ISSUED AND RECEIVED BY THE BIS

It has been defined that a BIC system will include the VME crate with the installed cards as well as all the User interfaces (CIBU) which are connected to this VME crate. The RS422 links in between the BIC cards and the User interfaces are considered to be internal to the system and no signal names are defined for the time being. All signals connected to the outside world will use the corresponding 'BIC Name' as the signal entity (see chapter 3 for details).

Examples for entity codes:

CIB.US15.L1 (for all signals connected to the LHC BIC left of point 1),

CIB.BA4.S4 (for all signals connected to the SPS BIC in BA4)

5.2 QUANTITY CODE FOR SIGNAL ISSUED AND RECEIVED BY THE LHC BIS

Designation for LHC BIS and for INJ-BIS	Proposed SIGNAL_NAME
Beam-1's User Permit channel 'A' from User system	ST_UPERM_B1_A_UsrName
Beam-1's User Permit channel 'B' from User system	ST_UPERM_B1_B_UsrName
Beam-2's User Permit channel 'A' from User system	ST_UPERM_B2_A_UsrName
Beam-2's User Permit channel 'B' from User system	ST_UPERM_B2_B_UsrName
Both Beam's User Permit channel 'A' from User system	ST_UPERM_B1B2_A_UsrName
Both Beam's User Permit channel 'B' from User system	ST_UPERM_B1B2_B_UsrName
Beam-1 Info to User system	CMD_BINFO_B1_UsrName
Beam-2 Info to User system	CMD_BINFO_B2_UsrName
Both Beam Info to User system	CMD_BINFO_B1B2_UsrName
Beam-1 Permit channel 'A' to next BIC or to Kicker system	CMD_BPERM_B1_A
Beam-1 Permit channel 'B' to next BIC or to Kicker system	CMD_BPERM_B1_B
Beam-2 Permit channel 'A' to next BIC or to Kicker system	CMD_BPERM_B2_A
Beam-2 Permit channel 'B' to next BIC or to Kicker system	CMD_BPERM_B2_B
Beam-1 Permit channel 'A' received from previous BIC	ST_BPERM_B1_A
Beam-1 Permit channel 'B' received from previous BIC	ST_BPERM_B1_B
Beam-2 Permit channel 'A' received from previous BIC	ST_BPERM_B2_A
Beam-2 Permit channel 'B' received from previous BIC	ST_BPERM_B2_B
Beam-1 Local Permit channel 'A' for Beam 1	CMD_LOC_BPERM_B1_A
Beam-1 Local Permit channel 'B' for Beam 1	CMD_LOC_BPERM_B1_B
Beam-2 Local Permit channel 'A' for Beam 2	CMD_LOC_BPERM_B2_A
Beam-2 Local Permit channel 'B' for Beam 2	CMD_LOC_BPERM_B2_B
Beam-1 Status of Safe Beam Flag channel 'A'	ST_SBF_B1_A
Beam-1 Status of Safe Beam Flag channel 'B'	ST_SBF _B1_B
Beam-2 Status of Safe Beam Flag channel 'A'	ST_SBF _B2_A
Beam-2 Status of Safe Beam Flag channel 'B'	ST_SBF _B2_B

Note: "UsrName" is the *User System*'s abbreviation as "VAC" for the Vacuum system (see list in Appendix#3).

Examples for complete signal names could be the following:

CIB.US15.L1: ST_UPERM_B1_A_VAC *and* CIB.US15.L1: ST_UPERM_B1_B_VAC

5.3 QUANTITY CODE FOR SIGNAL ISSUED AND RECEIVED BY THE SPS BIS (WITH ONLY ONE BEAM)

For the SPS-BIS, there is only one beam. Therefore the beam type is not specified in the SIGNAL_NAME as shown in the following table:

Designation for SPS BIS and for EXT-BIS	Proposed SIGNAL_NAME
User Permit channel 'A' from User system	ST_UPERM_A_UsrName
User Permit channel 'B' from User system	ST_UPERM_B_UsrName
Beam Info to User system	CMD_BINFO_UsrName
Beam Permit channel 'A' to next BIC or to Kicker system	CMD_BPERM_A
Beam Permit channel 'B' to next BIC or to Kicker system	CMD_BPERM_B
Beam Permit channel 'A' received from previous BIC	ST_BPERM_A
Beam Permit channel 'B' received from previous BIC	ST_BPERM_B
Beam Local Permit channel 'A'	CMD_LOC_BPERM_A
Beam Local Permit channel 'B'	CMD_LOC_BPERM_B

Examples for complete signal names could be the following:

CIB.BA4.S4: ST_UPERM_A_VAC

CIB.BA4.S4: ST_UPERM_B_VAC

CIB.BA4.S4: ST_BINFO_VAC

5.4 QUANTITY CODE FOR SIGNAL ISSUED AND RECEIVED BY THE TRANSFER LINE BIS (WITH ONLY ONE BEAM)

For the EXT-BIS, there is only one beam as well. Due to the hierarchical structure (Master BIC inputs are Slave BICs outputs), the signal names “ST_BPERM” are becoming “ST_UPERM” as shown in the following table:

Designation for SPS BIS and for EXT-BIS	Proposed SIGNAL_NAME
User Permit channel 'A' from User system	ST_UPERM_A_UsrName
User Permit channel 'B' from User system	ST_UPERM_B_UsrName
Beam Info to User system	CMD_BINFO_UsrName
Beam Permit channel 'A' from Master BIC to Kicker system	CMD_BPERM_A
Beam Permit channel 'B' from Master BIC to Kicker system	CMD_BPERM_B
Beam Permit channel 'A' received from a Slave BIC	ST_UPERM_A_BicName
Beam Permit channel 'B' received from a Slave BIC	ST_UPERM_B_BicName
Beam Local Permit channel 'A'	CMD_LOC_BPERM_A
Beam Local Permit channel 'B'	CMD_LOC_BPERM_B

5.5 SIGNALS ISSUED AND RECEIVED BY THE USER SYSTEMS IN THE LHC

The following quantity codes are recommended to be used by ALL *User Systems* of the BIS. This will help maintaining coherency in the signal naming for the signals exchanged in between the BIS and the *User Systems* by defining identical names for the signal at the USER side.

The Entity codes is in these cases of course the *User System*, e.g CIP.UA83.AL8 (for a PIC in UA83, managing the arc left of point 8).

Designation for LHC BIS and for INJ-BIS	Proposed SIGNAL_NAME
Beam-1's User Permit channel 'A' to BIC	CMD_UPERM_B1_A
Beam-1's User Permit channel 'B' to BIC	CMD_UPERM_B1_B
Beam-2's User Permit channel 'A' to BIC	CMD_UPERM_B2_A
Beam-2's User Permit channel 'B' to BIC	CMD_UPERM_B2_B
Both Beam's User Permit channel 'A' to BIC	CMD_UPERM_B1B2_A
Both Beam's User Permit channel 'B' to BIC	CMD_UPERM_B1B2_B
Beam-1 Info received by User system	ST_BINFO_B1
Beam-2 Info received by User system	ST_BINFO_B2
Both Beam Info received by User system	ST_BINFO_B1B2
Note concerning the above signals: The *User Systems* have the possibility to receive an indication of the availability of the beam operation. This information, named BEAM_INFO is available via the CIBU. More details in [5].	
Beam-1 Permit channel 'A' received by Kicker system	ST_BPERM_B1_A
Beam-1 Permit channel 'B' received by Kicker system	ST_BPERM_B1_B
Beam-2 Permit channel 'A' received by Kicker system	ST_BPERM_B2_A
Beam-2 Permit channel 'B' received by Kicker system	ST_BPERM_B2_B

Examples for complete signal names could be the following:

CIP.UA83.AL8: CMD_UPERM_B1B2_A

CIP.UA83.AL8: ST_BINFO_B1B2

5.6 SIGNALS ISSUED AND RECEIVED BY THE USER SYSTEMS IN THE SPS AND THE TRANSFER LINES

Designation for SPS BIS and for EXT-BIS	Proposed SIGNAL_NAME
User Permit channel 'A' to BIC	CMD_UPERM_A
User Permit channel 'B' to BIC	CMD_UPERM_B
Beam Info received by User system	ST_BINFO
Beam Permit channel 'A' received by Kicker system	ST_BPERM_A
Beam Permit channel 'B' received by Kicker system	ST_BPERM_B

6. APPENDIX#1

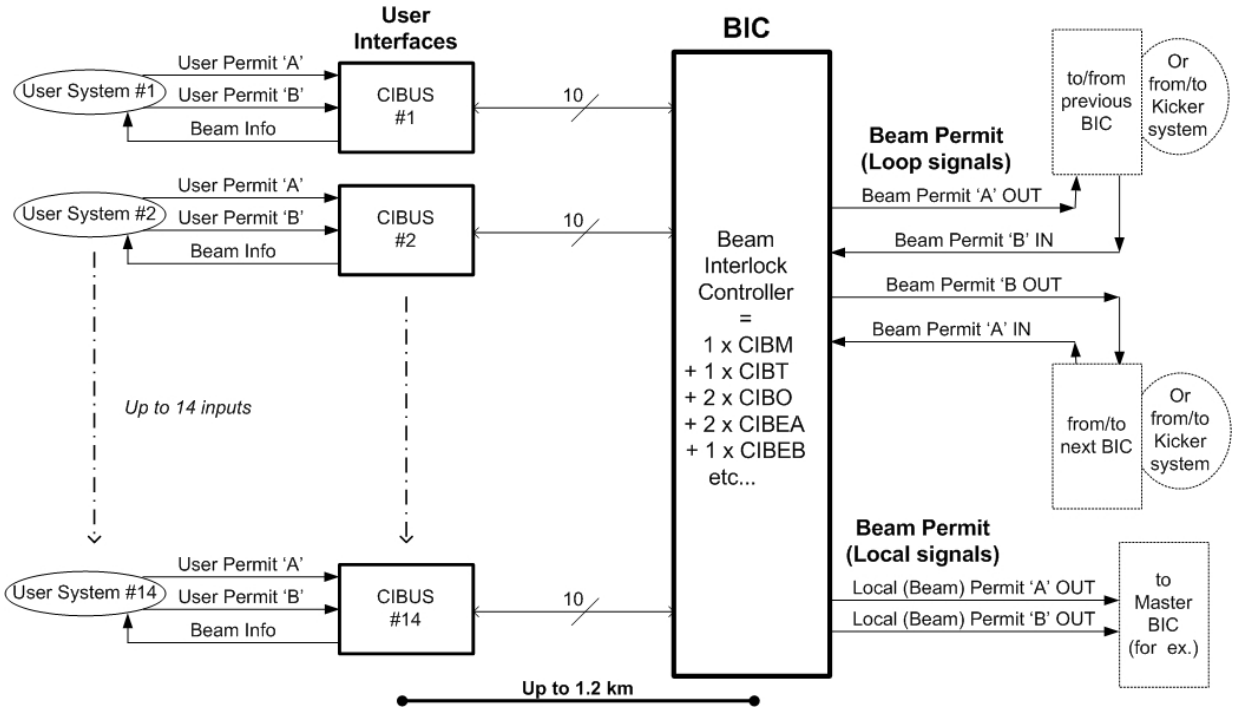


Fig.1: For most of the Beam Interlock Systems, the *Beam Interlock Controller* and the distant *User Interfaces* (type CIBUS) are composing the hardware solution

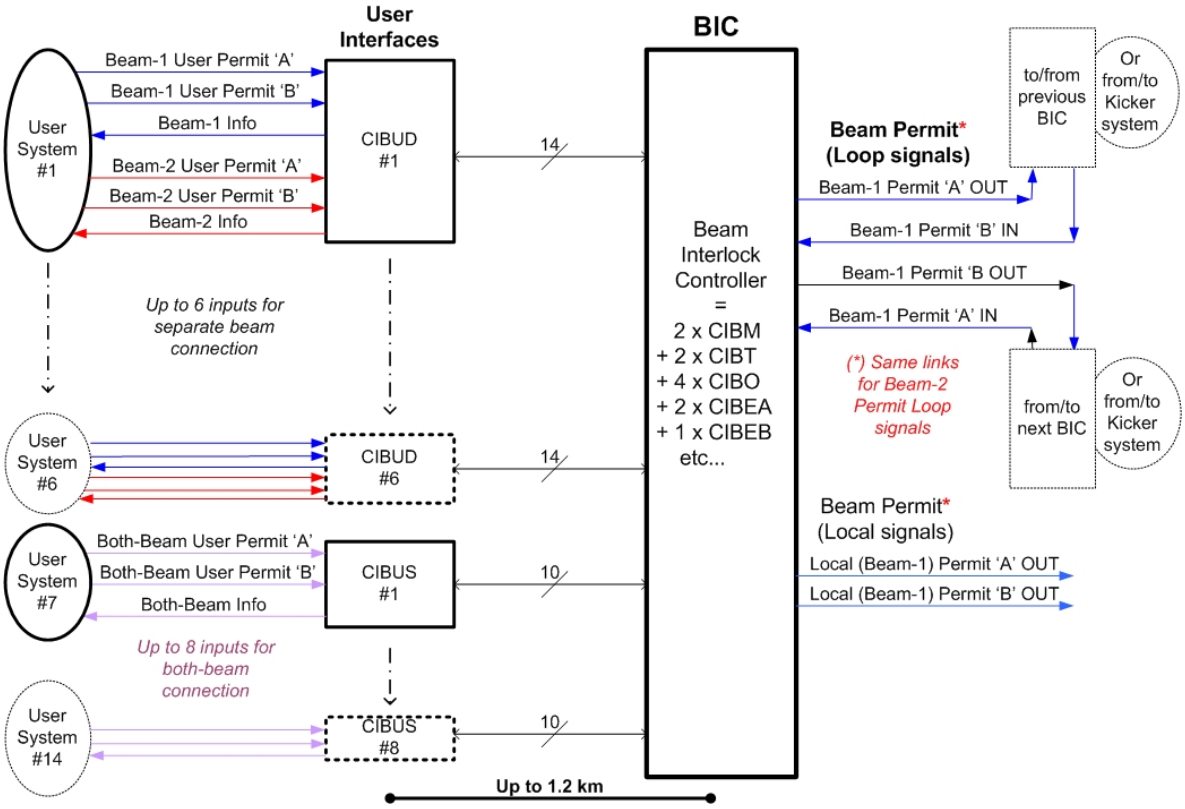


Fig.2: In the LHC case, the BIS manages two beams: dedicated *User Interfaces* are available for double connection (type CIBUD) and the corresponding signals are dual.

7. APPENDIX#2

The following table gives the names for the different BICs and Front-End Computers:

	Description	BIC Name	FEC Name	Loc.	Rack
LHC-BIS	LHC BIC in L1	CIB.US15.L1	CFV-US15-CIBL1	US15	CYCIB.01US152
	LHC BIC in R1	CIB.US15.R1	CFV-US15-CIBR1	US15	CYCIB.02US152
	LHC BIC in L2	CIB.UA23.L2	CFV-UA23-CIBL2	UA23	CYCIB.01UA23
	LHC BIC in R2	CIB.UA27.R2	CFV-UA27-CIBR2	UA27	CYCIB.01UA27
	LHC BIC in IP3 underground	CIB.UJ33.U3	CFV-UJ33-CIBU3	UJ33	CYCIB.01UJ33
	LHC BIC in IP3 surface	CIB.SR3.S3	CFV-SR3-CIBS3	SR3	YYACS.01SR3
	LHC BIC in L4	CIB.UA43.L4	CFV-UA43-CIBL4	UA43	CYCIB.01UA43
	LHC BIC in R4	CIB.UA47.R4	CFV-UA47-CIBR4	UA47	CYCIB.01UA47
	LHC BIC in L5	CIB.USC55.L5	CFV-USC55-CIBL5	USC55	CYCIB.01USC55
	LHC BIC in R5	CIB.UJ56.R5	CFV-UJ56-CIBR5	UJ56	CYCIB.01UJ56
	LHC BIC in L6	CIB.UA63.L6	CFV-UA63-CIBL6	UA63	CYCIB.01UA63
	LHC BIC in R6	CIB.UA67.R6	CFV-UA67-CIBR6	UA67	CYCIB.01UA67
	LHC BIC in IP7 underground	CIB.TZ76.U7	CFV-TZ76-CIBU7	TZ76	CYCIB.01TZ76
	LHC BIC in IP7 surface	CIB.SR7.S7	CFV-SR7-CIBS7	SR7	YYACS.01SR7
	LHC BIC in L8	CIB.UA83.L8	CFV-UA83-CIBL8	UA83	CYCIB.01UA83
	LHC BIC in R8	CIB.UA87.R8	CFV-UA83-CIBR8	UA87	CYCIB.01UA87
	LHC BIC in CCR	CIB.CCR.LHC	CFV-CCR-CIBLHC	CCR	RA 0621
SPS-BIS	SPS BIC in BA1	CIB.BA1.S1	CFV-BA1-CIBS1	BA1	RA 0404
	SPS BIC in BA2	CIB.BA2.S2	CFV-BA2-CIBS2	BA2	RA 1314
	SPS BIC in BA3	CIB.BA3.S3	CFV-BA3-CIBS3	BA3	RA 0423
	SPS BIC in BA4	CIB.BA4.S4	CFV-BA4-CIBS4	BA4	RA 0904
	SPS BIC in BA5	CIB.BA5.S5	CFV-BA5-CIBS5	BA5	RA 2603
	SPS BIC in BA6	CIB.BA6.S6	CFV-BA6-CIBS6	BA6	RA 1313
EXTRACTION-BIS	Master BIC for Beam-1 Extraction in LSS6	CIB.BA6.EXT1	CFV-BA6-CIBEXT1	BA6	RA 1313
	Slave BIC for TT60 (1 of 2)	CIB.BA6.TT60A	" "	" "	" "
	Slave BIC for TT60 (2 of 2)	CIB.BA7.TT60B	CFV-BA7-CIBTT60	BA7	RA 3318
	Slave BIC for Ti2upstream	CIB.BA7.TI2U	" "	" "	" "
	Slave BIC for Ti2downstream	CIB.SR2.TI2D	CFV-SR2-CIBTI2D	SR2	YYACS.01SR2
	Master BIC for Beam-2 Extraction in LSS4	CIB.BA4.EXT2	CFV-BA4-CIBEXT2	BA4	RA 0904
	Slave BIC for Ti8upstream	CIB.BA4.TI8U	" "	" "	" "
	Slave BIC for TT40 (1 of 2)	CIB.BA4.TT40A	CFV-BA4-CIBTT40	BA4	RA 0904
	Slave BIC for TT40 (2 of 2)	CIB.BA4.TT40B	" "	" "	" "
	Slave BIC for TT41 (1 of 2)	CIB.BA4.TT41A	CFV-BA4-CIBTT41	BA4	RA 0904
	Slave BIC for TT41 (2 of 2)	CIB.BA4.TT41B	" "	" "	" "
	Slave BIC for Ti8downstream	CIB.SR8.TI8D	CFV-SR8-CIBTI8D	SR8	YYACS.01SR8
INJ-BIS					
	Injection BIC for Beam1	CIB.SR2.INJ1	CFV-SR2-CIBINJ1	SR2	YYACS.01SR2
	Injection BIC for Beam2	CIB.SR8.INJ2	CFV-SR8-CIBINJ2	SR8	YYACS.01SR8

8. APPENDIX#3

The following table proposes the abbreviation names for the different LHC User Systems:

	User Systems	*Abbreviation*	*Notes*
LHC-BIS	Vacuum system	VAC	
	LHC Access Safety System	LASS	
	LHC Beam dumping system	LBDS	
	LHC Control Room	CCC	Operator Buttons
	BLM at aperture limitations* (Unmaskable input)	BLM_UNM	(*) Very likely there are also some un-maskable BLM's in the arcs
	BLM in arcs (Maskable input)	BLM_MSK	
	PIC essential circuits (Unmaskable input)	PICL_UNM PICR_UNM	PIC Left of IP (essential circuits) PIC Right of IP (essential circuits)
	PIC auxiliary circuits (Maskable input)	PICL_MSK PICR_MSK	PIC Left of IP (auxiliary circuits) PIC Right of IP (auxiliary circuits)
	Warm Magnets Interlock system	WIC	
	Experiments (Detector part)	ATL_DET LHCF_DET ALI_DET CMS_DET TOT_DET LHCB_DET	*ATLAS* *LHCf* *ALICE* *CMS* *TOTEM* *LHCb*
	Experiments (movable devices)	ATL_MOV TOT_MOV LCHB_MOV	
	Experiment Magnets	ATL_MAG ALI_MAG CMS_MAG LHCB_MAG	
	Collimation system	COLL_ENV COLL_MOT	Collimation (Environmental parameters) Collimation (Motor positions)
	RF & Transverse Damper	RF	
	Beam life time	BCT	
	Beam excursion	BPM	
	Beam Aperture Kicker	MKA	
	Injection Kicker	MKI	
	Screens	BTV	
	LHC Sequencer (via the Timing)	LSEQ	
	LHC Safe Beam Parameters	SBP	
	Fast Magnet Current Change Monitors	FM_xxxx	When several FMCM units are connected to the same BIC, xxxx indicates the monitored circuit name. For example: FM_RQ4, FM_RQ5, FM_RD34…

Note (1): the above abbreviation names are intended to easily distinguish the different User Systems and the different connection types. They are only used internally by the BIS.

Note (2):
For the complete up-to-date list of all signals for all Beam Interlock Systems, refer to the naming database (http://cern.ch/service-acc-naming).

9. REFERENCES:

[1]: The Beam Interlock System, Engineering Specification.
LHC-CIB-ES-0001-00-10 (EDMS Document No. 567256)

[2]: LHC Equipment Codes Main Systems:
https://edms.cern.ch/cedar/plsql/codes.systems

[3]: Naming of the LHC Entities and theirs parameters for the Cern Control Centre:
https://edms.cern.ch/file/473091/1.0/LHC-C-QA-0002-10-00.pdf

[4]: Basic Syntactic Rules for Naming of LHC Entities and theirs parameters for the Cern Control Centre:
https://edms.cern.ch/file/473086/1.0/LHC-C-QA-0001-10-00.pdf

[5]: Interfacing to the Beam Interlock System: the CIBU-User-Manual.
(EDMS Document No. 636589)