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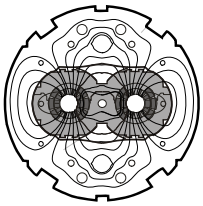

the
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project

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Engineering Specification

SHORT STRAIGHT SECTION TYPES IN THE MATCHING SECTIONS

Abstract

This Engineering Specification defines equipment codes in the LHC Matching Sections for the Cold Mass (CM) mechanical assemblies, cryostats and Short Straight Section (SSS-MS) types from Q4 to Q7.
A total of 27 different types of CM mechanical assemblies, 34 cryostat types and 41 different SSS-MS types are identified.

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History of Changes

Rev. No.	*Date*	*Pages*	*Description of Changes*
0.1 – draft	2003-28-07	All	Version 0.1-draft prepared by Emmanuel Roy
0.2 – draft	2003-10-17	All	Version 0.2-draft checked by V. Parma, H. Prin, K-M. Schirm and sent for approval to the LHC Short Straight Section list. **Deadline: 8 December 2003**.
0.3 – draft	2004-02-16	5, 7	Integrated IFS Box configuration in table 2 and 3; added DFBA instead of DFBM for LMQMK cold mass; added QQMAO instead of QQMO for LQTFC SSS MS equipment code in table 5.
0.4 – draft	2004-03-19	All	Version sent for approval to the LHC Short Straight Section List. **Deadline: 02 April 2004**.
1.0	2004-05-11	1, 2	Version 1.0 following comments given on version 0.4-draft.
		5	First line, DFBM/DFBL/DFBA has replaced DFBM/DFBL.
			Version 1.0 released.
1.1 – draft	2004-12-16		Version 1.1 – draft prepared by F. Lutton, checked by C. Boccard, H. Prin and S. Chemli.
		1	33 types of cryostat instead of 32 and 41 types of SSS-MS instead of 39.
		4	Addition of reference.
		6	Addition of QQMAU cryostat code in table 4.
		7	Introduction of BPM types in table 5 and addition of QQMAU cryostat code and LQNFD, LQNFJ SSS MS codes.
		8	Correction of QQMAU, LQNFD and LQNFJ codes in table 6.
		9	Addition of reference.
1.1 – draft	2004-12-17	All	Sent for approval to distribution list. **Deadline: 14 January 2005.**
			No modification asked after approval.
1.2	2005-02-23	All	**Version 1.2 released.**
2.0	2006-02-01	6, 7, 8, 9	**Version 2.0. Correction of error on jumper height on one SSS type.**
			Introduction of a new SSS type following change of cryogenic schemes by AT-ACR.
			Added references to SSS type drawings.
			Detailed information on BPM and beam screen type assemblies.
			Modification of correctors in cold mass LMQML according to ECO LHC-LMQML-EC-0001.
2.1	2007-04-20	6	Reference Cryostat drawing for QQMAV added
		7	Final SSS reference drawings added
2.2	2007-06-05	All	Submission for approval
3.0	2007-06-20	All	Released version

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1. INTRODUCTION

This Engineering Specification defines the equipment codes of the Cold Mass (CM) mechanical assemblies, cryostats and SSS types in the LHC Matching Sections, Q4 to Q7.

The magnet configuration in the present Engineering Specification is based on LHC optics version 6.4. The cryogenic parameters are based on the Cryogenic Diagram Drawings [5].

The electric power scheme is defined by the Engineering Specification LHC-DCC-ES-0003 [1].

The type of BPM is defined by the Engineering Change Order LHC-BP-EC-0001 [7] and following the Engineering Change Order LHC-VSS-EC-0008 [8].

2. EQUIPMENT CODE NAMES

2.1 EQUIPMENT CODES FOR CM ASSEMBLIES

In the MS region, there are 2 main SSS MS Cold Mass (CM) assemblies:

- Half shell technology cold mass assembly for quadrupole magnets type MQM, MQY, MQML and MQTLH. The general equipment codes for this type are LMQM_, LMQY_ and LMQT_.
- Inertia tube technology cold mass assembly for quadrupole magnets type MQ, MQTL. The general equipment code for his type is LMQT_.

In total, 27 different types of SSS-MS cold mass assemblies are identified; their equipment codes are listed in Tables 2 and 3.

The assigned cold mass equipment takes into account:

- The cold mass mechanical assembly (number of supports, lengths, etc). See Cold Mass Reference drawings [2].
- The combination of MQ quadrupole types and corrector magnets.
- The front covers type, depending on the cryogenic scheme which is directly linked to the QRL interface type and the helium phase separator type (only for type Q7), see Table 1 [6].
- The diode types installed in the cold masses are of type MQ. The type of diode is given according to the drawing LHCDCQAA0002.
- The configuration of IFS box, depending on the type of cold mass.

Table 1 - Cold Mass Interface with Cryogenic Lines

For Q7 → 3 types				
Type	Jumper Type	**Exchanger tube (line X)**		**Line X Upstream Interface**
A	QRLCB/QRLCC	None		Phase Separator type N
B	QRLCA/QRLCG	Line X		Phase Separator type P
C	QRLCF/QRLCH	Line X		Type Z (plug / no plug at cryostating stage)
For Q4 – Q6 → 2 types				
Type	**Jumper Type**	**CL (cool down and magnet level)**		**LD (Quench)**
D	QRLFC/QRLFF/QRLFD/QRLFE	ID 40 mm		ID 50 mm
E	QRLEA/QRLEC	CL1 ID 20 mm	CL2 ID 20 mm	ID 30 mm

In addition, some corrector magnets are powered via the DFBM/DFBL/DFBA instead of the Dipole Current Feed Through (120 A). The units concerned are:

- Q4 at IR1 and IR5,
- Q4, Q5 at IR6,
- Q6 at IR2L,
- Q4, Q5 at IR2 and IR8.

Table 2 - Cold Mass Equipment Codes for Half Shell Technology Cold Mass Assembly

EQUIPMENT CODE	QUANTITY Total: 46	QUADRUPOLE	CORRECTOR	CM INTERFACE WITH CRYOGENIC LINES	CORRECTOR POWERING	IFS BOX CONFIG.
LMQMB	1	MQM	MCBCB	A	DCF 120A	HCQQDSI011
LMQMA	1	MQM	MCBCA	C	DCF 120A	HCQQDIS011
LMQYH	2	MQY	MCBYB	D	DCF 120A	HCQQMIS013
LMQYA	1	MQY	MCBYA	E	DCF 120A	HCQQMIS013
LMQYB	1	MQY	MCBYB	E	DCF 120A	HCQQMIS013
LMQYL	2	MQY	MCBYB	E	DFBM	HCQQMIS010
LMQYK	2	MQY	MCBYA	E	DFBM	HCQQMIS010
LMQMN	4	MQML	MCBCB	E	DCF 120A	HCQQMIS014
LMQMM	4	MQML	MCBCA	E	DCF 120A	HCQQMIS014
LMQYC	2	MQY	MCBYB+MCBYA+MCBYB	D	DFBL	HCQQMIS010
LMQYD	2	MQY	MCBYA+MCBYB+MCBYA	D	DFBL	HCQQMIS010
LMQMF	4	2MQM	MCBCA	C	DCF 120A	HCQQDIS012
LMQME	3	2MQM	MCBCA	B	DCF 120A	HCQQDIS012
LMQMG	1	2MQM	MCBCA	A	DCF 120A	HCQQDIS012
LMQMK	1	MQM+MQML	MCBCA	E	DFBA	HCQQMIS010
LMQMJ	3	MQM+MQML	MCBCA	E	DCF 120A	HCQQMIS013
LMQTI	2	6MQTLH	MCBCA	E	DCF 120A	HCQQMIS012
LMQTJ	2	6MQTLH	MCBCB	E	DCF 120A	HCQQMIS012
LMQYJ	2	2MQY	MCBYB+MCBYA+MCBYB	D	DFBM	HCQQMIS011
LMQYI	2	2MQY	MCBYA+MCBYB+MCBYA	D	DFBM	HCQQMIS011
LMQYF	1	2MQY	MCBYB+MCBYA+MCBYB	E	DFBM	HCQQMIS011
LMQML	2	2MQM	MCBCB+MCBCA+MCBCB	E	DFBM	HCQQMIS010
LMQYE	1	2MQY	MCBYA+MCBYB+MCBYA	E	DFBM	HCQQMIS011

Table 3 - Cold Mass Equipment Codes for Inertia Tube Technology Cold Mass Assembly

EQUIPMENT CODE	QUANTITY Total: 4	QUADRUPOLE		CORRECTOR	DIODE TYPE	CM INTERFACE WITH CRYOGENIC LINES	CORRECTOR POWERING	IFS BOX CONFIG.
LMQTE	1	MQ+MQTL	F/D	MCBCC	A	C	DCF 120A	HCQQDIS010
LMQTS	1	MQ+MQTL	F/D	MCBCC	B	C	DCF 120A	HCQQDIS010
LMQTF	1	MQ+MQTL	D/F	MCBCD	B	B	DCF 120A	HCQQDIS010
LMQTR	1	MQ+MQTL	D/F	MCBCD	A	A	DCF 120A	HCQQDIS010

2.2 EQUIPMENT CODES FOR CRYOSTATS

The general equipment code for SSS-MS cryostat assemblies are:

- QQMA_ for cryostat Q4 to Q6. The magnets are fitted in individual cryostat, with stand alone or semi stand alone units operating at 4.5 K. See cryogenic drawings [4].
- QQMB_ for cryostat Q7. These cryostats are located at the end of the long continuous arc cryostat beside the electrical feed box DFBA. These units are operating at 1.9 K. See cryogenic drawings [4].

At Q6 IR2 left (injection of beam 1), Q6 IR8 right (injection of beam 2) and Q4/Q5 at IR6 (extraction of the beams) the MS units are specific.

In function of BPM support length (232 mm for BPM/BPMR/BPMC and 478 mm for BPMY), the QQS vacuum vessel is different. The Helium Level Gauge Port is 60 mm moved along the Y axis. Other cryostat features related to recent changes in the cryogenic schemes [4], have been added and lead to an additional cryostat and SSS type. Refer to the SSS drawings for more details.

34 different types of SSS-MS cryostats are identified; their equipment codes are defined in Table 4.

Table 4 - Equipment codes for SSS MS cryostats

Equipment code	Total: 50	Reference Cryostat drawings	Standard Vacuum Vessel *supports-type-length*	QRL interface	QQS side	BPM support lenght	JUMPER height	JUMPER orientation axis
QQMAA	1	LHCLQS_S0092	2-arc-4350mm	QRLFF	LEFT	478mm	1060mm	-X
QQMAB	1	LHCLQS_S0105	2-arc-4350mm	QRLFE	RIGHT	478mm	1060mm	-X
QQMAC	2	LHCLQS_S0103	2-arc-4350mm	QRLEA	LEFT	478mm	1060mm	-X
QQMAD	4	LHCLQS_S0112	2-arc-4350mm-SP1	QRLEA	LEFT	478mm	1060mm	-X
QQMAE	4	LHCLQS_S0049	2-arc-5625mm	QRLEC	RIGHT	232mm	1060mm	-X
QQMAF	4	LHCLQS_S0081	2-arc-5625mm	QRLEC	LEFT	232mm	780mm	-X
QQMAG	1	LHCLQS_S0037	2-arc-7025mm	QRLFD	LEFT	478mm	1060mm	-X
QQMAH	1	LHCLQS_S0063	2-arc-7025mm	QRLFC	RIGHT	478mm	1060mm	-X
QQMAI	1	LHCLQS_S0083	2-arc-7025mm	QRLFC	LEFT	478mm	780mm	-X
QQMAJ	1	LHCLQS_S0087	2-arc-7025mm	QRLFD	RIGHT	478mm	780mm	-X
QQMAK	1	LHCLQS_S0117	3-dipole-9405mm-SP2	QRLEA	RIGHT	232mm	1930mm	-Y
QQMAL	1	LHCLQS_S0069	3-dipole-9405mm	QRLEA	RIGHT	232mm	1060mm	-Y
QQMAV	1	LHCLQS_S0143	3-dipole-9405mm	QRLEA	RIGHT	232mm	1060mm	-Y
QQMAM	1	LHCLQS_S0018	3-dipole-9405mm	QRLEA	RIGHT	232mm	1060mm	-X
QQMAN	1	LHCLQS_S0001	3-dipole-9405mm-SP3	QRLDE	RIGHT	232mm	1930mm	+Y
QQMAO	1	LHCLQS_S0079	3-dipole-9405mm	QRLEA	RIGHT	232mm	780mm	-X
QQMAP	2	LHCLQS_S0043	3-dipole-9405mm	QRLEA	LEFT	232mm	780mm	-X
QQMAQ	2	LHCLQS_S0032	3-dipole-10360mm	QRLFE	LEFT	478mm	1060mm	-X
QQMAR	2	LHCLQS_S0056	3-dipole-10360mm	QRLFF	RIGHT	478mm	1060mm	-X
QQMAS	1	LHCLQS_S0047	3-dipole-10360mm	QRLEA	RIGHT	478mm	1060mm	-X
QQMAT	1	LHCLQS_S0055	3-dipole-10360mm	QRLEA	LEFT	478mm	1060mm	-X
QQMAU	2	LHCLQS_S0021	3-dipole-10360mm	QRLEA	RIGHT	232mm	1060	-X
QQMBA	1	LHCLQS_S0098	2-arc-4350mm	QRLCC	LEFT	232mm	1040mm	-X
QQMBB	1	LHCLQS_S0109	2-arc-4350mm	QRLCH	LEFT	232mm	1040mm	-X
QQMBC	1	LHCLQS_S0075	2-arc-5625mm	QRLCF	LEFT	232mm	760mm	-X
QQMBD	1	LHCLQS_S0077	2-arc-5625mm	QRLCG	LEFT	232mm	760mm	-X
QQMBE	1	LHCLQS_S0059	2-arc-5625mm	QRLCC	LEFT	232mm	760mm	-X
QQMBF	1	LHCLQS_S0012	2-arc-5625mm	QRLCH	LEFT	232mm	760mm	-X
QQMBG	2	LHCLQS_S0002	2-dipole-8000mm	QRLCF	LEFT	232mm	1040mm	-X
QQMBH	2	LHCLQS_S0066	2-dipole-8000mm	QRLCA	LEFT	232mm	1040mm	-X
QQMBI	1	LHCLQS_S0072	2-dipole-8000mm	QRLCF	LEFT	232mm	2190mm	-X
QQMBJ	1	LHCLQS_S0090	2-dipole-8000mm	QRLCB	LEFT	232mm	760mm	-X
QQMBK	1	LHCLQS_S0096	2-dipole-8000mm	QRLCH	LEFT	232mm	760mm	-X
QQMBL	1	LHCLQS_S0028	2-dipole-8000mm	QRLCA	LEFT	232mm	2190mm	-X

SP1 are vacuum vessels type “2-arc-4350 mm” modified.
SP2 is a vacuum vessel type “3-dipole-9405 mm” modified.
SP3 is a vacuum vessel type “3-dipole-9405 mm” modified.

2.3 EQUIPMENT CODES FOR SHORT STRAIGHT SECTIONS

The combination of cold masses, cryostats and type of BPM on V1 and V2 lines, leads to 41 different types of SSS-MS assemblies.

Table 5 - Equipment codes for SSS MS types

SSS-MS equipm. code	Ref. SSS drawings	Cryostat equipm. code	Cold Mass equipm. code	BPM/beam screen assembly on Line V1		BPM/beamscreen assembly on Line V2		Total: 50
LQNAA	LHCLQS_S0153	QQMBB	LMQMA	BPMCA	HCVSSB_049	BPMCA	HCVSSB_040	1
LQNAB	LHCLQS_S0160	QQMBA	LMQMB	BPMC	HCVSSB_049	BPMC	HCVSSB_040	1
LQNDA	LHCLQS_S0154	QQMAF	LMQMM	BPM	HCVSSB_215	BPMR	HCVSSB_215	2
LQNDB	LHCLQS_S0155	QQMAF	LMQMN	BPMR	HCVSSB_215	BPM	HCVSSB_215	2
LQNDC	LHCLQS_S0139	QQMAE	LMQMN	BPMR	HCVSSB_215	BPM	HCVSSB_215	2
LQNDD	LHCLQS_S0140	QQMAE	LMQMM	BPM	HCVSSB_215	BPMR	HCVSSB_215	2
LQNFA	LHCLQS_S0162	QQMBK	LMQMF	BPM_A	HCVSSB_087	BPMRA	HCVSSB_088	1
LQNFC	LHCLQS_S0172	QQMBH	LMQME	BPM_A	HCVSSB_089	BPM_A	HCVSSB_080	1
LQNFD	LHCLQS_S0146	QQMBH	LMQME	BPM_A	HCVSSB_087	BPMRA	HCVSSB_088	1
LQNFE	LHCLQS_S0135	QQMBL	LMQME	BPM_A	HCVSSB_089	BPM_A	HCVSSB_080	1
LQNFG	LHCLQS_S0156	QQMBJ	LMQMG	BPM	HCVSSB_089	BPMR	HCVSSB_080	1
LQNFI	LHCLQS_S0132	QQMBG	LMQMF	BPM	HCVSSB_087	BPM	HCVSSB_088	1
LQNFJ	LHCLQS_S0141	QQMBG	LMQMF	BPM	HCVSSB_089	BPMR	HCVSSB_080	1
LQNFK	LHCLQS_S0171	QQMBI	LMQMF	BPM	HCVSSB_087	BPM	HCVSSB_088	1
LQNLB	LHCLQS_S0131	QQMAM	LMQMJ	BPM	HCVSSB_225	BPMR	HCVSSB_225	1
LQNLD	LHCLQS_S0166	QQMAV	LMQMJ	BPM	HCVSSB_225	BPMR	HCVSSB_225	1
LQNLF	LHCLQS_S0149	QQMAN	LMQMJ	BPM	HCVSSB_225	BPMR	HCVSSB_225	1
LQNLH	LHCLQS_S0136	QQMAK	LMQMK	BPM	HCVSSB_225	BPMR	HCVSSB_225	1
LQNMA	LHCLQS_S0130	QQMAU	LMQML	BPMR	HCVSSB_235	BPM	HCVSSB_235	2
LQTAA	LHCLQS_S0167	QQMBC	LMQTE	BPM	HCVSSB_059	BPM	HCVSSB_050	1
LQTAB	LHCLQS_S0159	QQMBD	LMQTF	BPM_A	HCVSSB_059	BPM_A	HCVSSB_050	1
LQTAC	LHCLQS_S0151	QQMBF	LMQTS	BPM_A	HCVSSB_057	BPM_A	HCVSSB_058	1
LQTAD	LHCLQS_S0164	QQMBE	LMQTR	BPM	HCVSSB_057	BPM	HCVSSB_058	1
LQTFA	LHCLQS_S0163	QQMAP	LMQTI	BPM	HCVSSB_225	BPMR	HCVSSB_225	1
LQTFB	LHCLQS_S0150	QQMAP	LMQTJ	BPMR	HCVSSB_225	BPM	HCVSSB_225	1
LQTFC	LHCLQS_S0158	QQMAO	LMQTJ	BPMR	HCVSSB_225	BPM	HCVSSB_225	1
LQTFD	LHCLQS_S0165	QQMAL	LMQTI	BPM	HCVSSB_225	BPMR	HCVSSB_225	1
LQYAA(*)	LHCLQS_S0148	QQMAC	LMQYA	BPMYA	HCVSSG_014	BPMYB	HCVSSG_014	1
LQYAB	LHCLQS_S0152	QQMAC	LMQYB	BPMYB	HCVSSG_014	BPMYA	HCVSSG_014	1
LQYAC(*)	LHCLQS_S0170	QQMAD	LMQYK	BPMYA	HCVSSG_014	BPMYB	HCVSSG_014	2
LQYAD	LHCLQS_S0169	QQMAD	LMQYL	BPMYB	HCVSSG_014	BPMYA	HCVSSG_014	2
LQYBA	LHCLQS_S0137	QQMAB	LMQYH	BPMYB	HCVSSG_014	BPMYA	HCVSSG_014	1
LQYBB	LHCLQS_S0147	QQMAA	LMQYH	BPMYB	HCVSSG_014	BPMYA	HCVSSG_014	1
LQYCB	LHCLQS_S0157	QQMAI	LMQYC	BPMYA	HCVSSG_034	BPMYA	HCVSSG_034	1
LQYCD	LHCLQS_S0161	QQMAJ	LMQYD	BPMYA	HCVSSG_034	BPMYA	HCVSSG_034	1
LQYCF	LHCLQS_S0138	QQMAG	LMQYC	BPMYA	HCVSSG_034	BPMYA	HCVSSG_034	1
LQYCH	LHCLQS_S0145	QQMAH	LMQYD	BPMYA	HCVSSG_034	BPMYA	HCVSSG_034	1
LQYEB	LHCLQS_S0129	QQMAQ	LMQYJ	BPMYB	HCVSSG_054	BPMYB	HCVSSG_054	2
LQYED	LHCLQS_S0133	QQMAR	LMQYI	BPMYB	HCVSSG_054	BPMYB	HCVSSG_054	2
LQYFA(*)	LHCLQS_S0168	QQMAS	LMQYF	BPMYB	HCVSSG_054	BPMYB	HCVSSG_054	1
LQYFC(*)	LHCLQS_S0134	QQMAT	LMQYE	BPMYB	HCVSSG_054	BPMYB	HCVSSG_054	1

* Beam screen/BPM assemblies rotated by 180 deg. to avoid interferance with connection tube.

The orientation of BPM, beam screen and flexible can be found in [9]

SSS-MS, CRYOSTAT AND COLD MASS LOCATIONS

Table 6 - SSS-MS types and locations in the machine

See Mechanical Layout Drawings [3]

Equipment Codes	L E F T					IP	R I G H T				
	DS ←	**Q7L**	**Q6L**	**Q5L**	**Q4L**	**IR1** ***Atlas***	**Q4R**	**Q5R**	**Q6R**	**Q7R**	**DS →**
Cold Mass		LMQMF	LMQMM	LMQMN	LMQYC		LMQYD	LMQMN	LMQMM	LMQME	
Cryostat		QQMBG	QQMAE	QQMAE	QQMAG		QQMAH	QQMAE	QQMAE	QQMBH	
SSS-MS		LQNFJ	LQNDD	LQNDC	LQYCF		LQYCH	LQNDC	LQNDD	LQNFD	
	DS ←	**Q7L**	**Q6L**	**Q5L**	**Q4L**	**IR2** ***Alice – injection***	**Q4R**	**Q5R**	**Q6R**	**Q7R**	**DS →**
Cold Mass		LMQMF	LMQMK	LMQYF	LMQYJ		LMQYI	LMQML	LMQMJ	LMQME	
Cryostat		QQMBI	QQMAK	QQMAS	QQMAQ		QQMAR	QQMAU	QQMAV	QQMBH	
SSS-MS		LQNFK	LQNLH	LQYFA	LQYEB		LQYED	LQNMA	LQNLD	LQNFC	
	DS ←	**Q7L**	**Q6L**	**Q5L**	**Q4L**	**IR3** ***Cleaning***	**Q4R**	**Q5R**	**Q6R**	**Q7R**	**DS →**
Cold Mass		LMQTE	LMQTI						LMQTJ	LMQTF	
Cryostat		QQMBC	QQMAL						QQMAO	QQMBD	
SSS-MS		LQTAA	LQTFD						LQTFC	LQTAB	
	DS ←	**Q7L**	**Q6L**	**Q5L**	**Q4L**	**IR4** ***RF***	**Q4R**	**Q5R**	**Q6R**	**Q7R**	**DS →**
Cold Mass		LMQMB	LMQYA	LMQYH				LMQYH	LMQYB	LMQMA	
Cryostat		QQMBA	QQMAC	QQMAA				QQMAB	QQMAC	QQMBB	
SSS-MS		LQNAB	LQYAA	LQYBB				LQYBA	LQYAB	LQNAA	
	DS ←	**Q7L**	**Q6L**	**Q5L**	**Q4L**	**IR5** ***CMS***	**Q4R**	**Q5R**	**Q6R**	**Q7R**	**DS →**
Cold Mass		LMQMG	LMQMN	LMQMM	LMQYC		LMQYD	LMQMM	LMQMN	LMQMF	
Cryostat		QQMBJ	QQMAF	QQMAF	QQMAI		QQMAJ	QQMAF	QQMAF	QQMBK	
SSS-MS		LQNFG	LQNDB	LQNDA	LQYCB		LQYCD	LQNDA	LQNDB	LQNFA	
	DS ←	**Q7L**	**Q6L**	**Q5L**	**Q4L**	**IR6** ***Dump***	**Q4R**	**Q5R**	**Q6R**	**Q7R**	**DS →**
Cold Mass				LMQYK	LMQYL		LMQYK	LMQYL			
Cryostat				QQMAD	QQMAD		QQMAD	QQMAD			
SSS-MS				LQYAC	LQYAD		LQYAC	LQYAD			
	DS ←	**Q7L**	**Q6L**	**Q5L**	**Q4L**	**IR7** ***Cleaning***	**Q4R**	**Q5R**	**Q6R**	**Q7R**	**DS →**
Cold Mass		LMQTR	LMQTI						LMQTJ	LMQTS	
Cryostat		QQMBE	QQMAP						QQMAP	QQMBF	
SSS-MS		LQTAD	LQTFA						LQTFB	LQTAC	
	DS ←	**Q7L**	**Q6L**	**Q5L**	**Q4L**	**IR8** ***LHC-B - Injection***	**Q4R**	**Q5R**	**Q6R**	**Q7R**	**DS →**
Cold Mass		LMQMF	LMQMJ	LMQML	LMQYJ		LMQYI	LMQYE	LMQMJ	LMQME	
Cryostat		QQMBG	QQMAM	QQMAU	QQMAQ		QQMAR	QQMAT	QQMAN	QQMBL	
SSS-MS		LQNFI	LQNLB	LQNMA	LQYEB		LQYED	LQYFC	LQNLF	LQNFE	

3. REFERENCE

[1] Powering Layout of the SSS Correction Scheme, LHC-DCC-ES-0003, P. Burla.

[2] Cold Mass Reference Drawings: LHCLMQ__0002, 0003, 0006, 0009 to 0016, LHCLMQTF0001, 0002, LHCLMQTE0004.

[3] Mechanical Layout Drawings V6.4: LHCLSX__0001 to 0016.

[4] Cryogenic Diagram Drawing: LHCLSQR_0034 to 0048, LHCLSQR_0060, 0061.

[5] Interface to LHC Machine Cryostat Drawings: LHCLJQRJ0001, 0005, 0007, 0009, 0013, 0015, 0023 to 0026.

[6] Minutes “Line X for Q7 Cold Masses” – 28/04/03 – E. Roy – EDMS N° 408179.

[7] ECR LHC-BP-EC-0001 “Changes to the beam instrumentation for the LHC” – 22/11/04 – C. Boccard – EDMS N°476262.

[8] ECR LHC-LVI-EC-0002-10-00 (EDMS 392308) “Orientation of the beam screens in the cryomagnets of the LSS”. LHC-VSS-EC-0008 (EDMS 483868) “Beam Screens in the DFBA's, DFBX's and in Q7

[9] EDMS LHC-LQN-ES-0003 M. Gandel (EDMS 716070)