Parameters describing the orientation naming and layout of Inner Detector Services

Abstract

The document discribes:

- ATLAS coordinate system (x, y, z)
- Side definition (A, C)
- Installation break points LF1 – LF8, LB1 – LB16
- Splicing boxes for SCT alignment cables (SB1-SB4)
- Gaps between LAr boxes (G1 – G16)
- Gaps between tile fingers (L1 – L64)
- Positions of PP2 between Muon Layers (P2-1 – P2-6)
- Numbers of Pixel/TRT boxes at those platforms (P2-1.1,…, P2-6.3)
- Phi position of Patch Panels 1 for SCT, TRT barrels (B1 - B36)
- Phi position of Patch panels 1 for SCT, TRT end caps (F1 – F56)
- Phi position of Patch Panels 1 for Pixel (O1 – O8)
- Phi position of Patch Panels 1 at ID end plate (I1 – I8)
- Naming convention of service bundles including bare service identifier

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Distribution List

History of Changes

Rev. No.	*Date*	*Pages*	*Description of changes*
01	08.12.2003	All	Draft prliminary agreed with TC, prepared for Inner Detector Services PRR, 17.12.2003
02	03.02.2004	All	Second version prepared after final agreement with TC on labeling and naming. The drawings included in that version have to be updated!
03	22.03.2004	All	The drawings are updated. There were some small modifications in the chapter 5. References updated.
04	06.05.2004	All	Comments from approval process included, including change of drawings ATLICS__0058, __0059
05	05.12.2005	All	Fig. 2-6 and Table 2 updated Fig.7 updated and split to Fig.7 and 8 Fig.8 updated and split to Fig.9 and 10 Fig.9 updated and numbered as Fig.11 General text update

Table of Contents

1 ATLAS coordinate system, side definition

The diagram shows the detector situated in the experimental cavern UX15 and the location of the USA15 and US15 caverns. Also shown are the two ends A and C

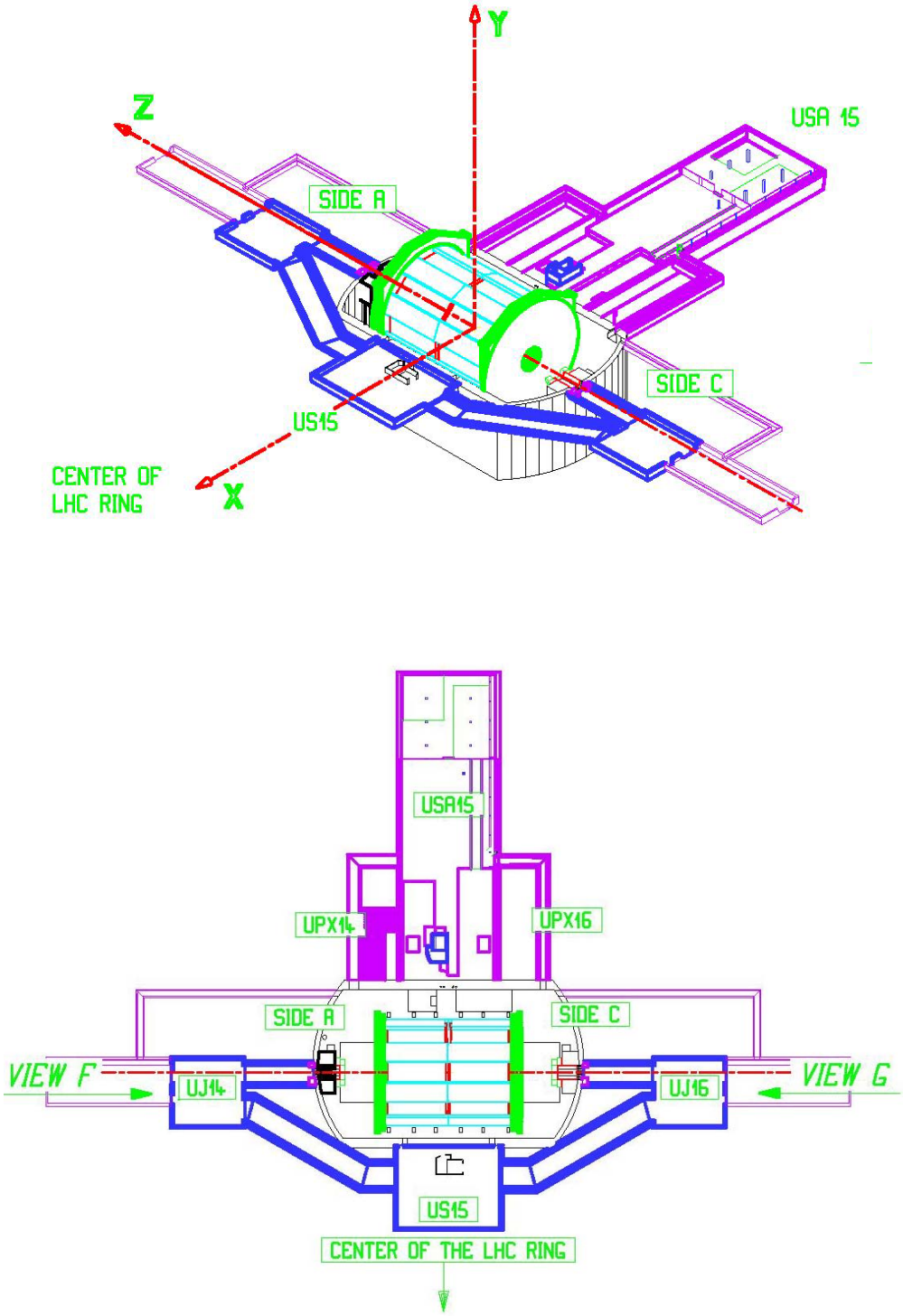

Fig. 1 ATLAS coordinate system

2 Naming of break points and mapping of ID services bundles

A break point is defined as a point where the services change type/size or where they have to have a permanent or dismountable connector for installation reason.

Various types of break points are used as function of the type of services:

- Electrical cables: patch panels, simple connectors, soldered/crimped spliced joints
- Tubes: flexible Si unions, dismountable fittings (Serto, Swagelock), permanent connectors (Lockring), soldered unions (for copper tubes), orbital weldings (for TRT active gas tubes)
- Optical cables: connectors, fusion spliced joints

The position of the break points in the various areas on the cryostat flange up to PP2 (see fig. 2 and 3) is identified as follows:

- LFx: break point on LAr flange surface, eg. Pixel evaporative tubes
- LBxx: break point in the LAr gaps between the electronics boxes
- SBx: splicing boxes for SCT alignment fibers
- P2-x: patch panel 2 areas for pixel, TRT and other ID services

Figures 2 and 3 also show the numbering of the LAr gaps (Gxx) and tile finger gaps (Lxx).

Table 1 gives the mapping between the ATLAS sectors, LAr gaps, tile finger gaps and PP2s in terms of routing of the services bundles.

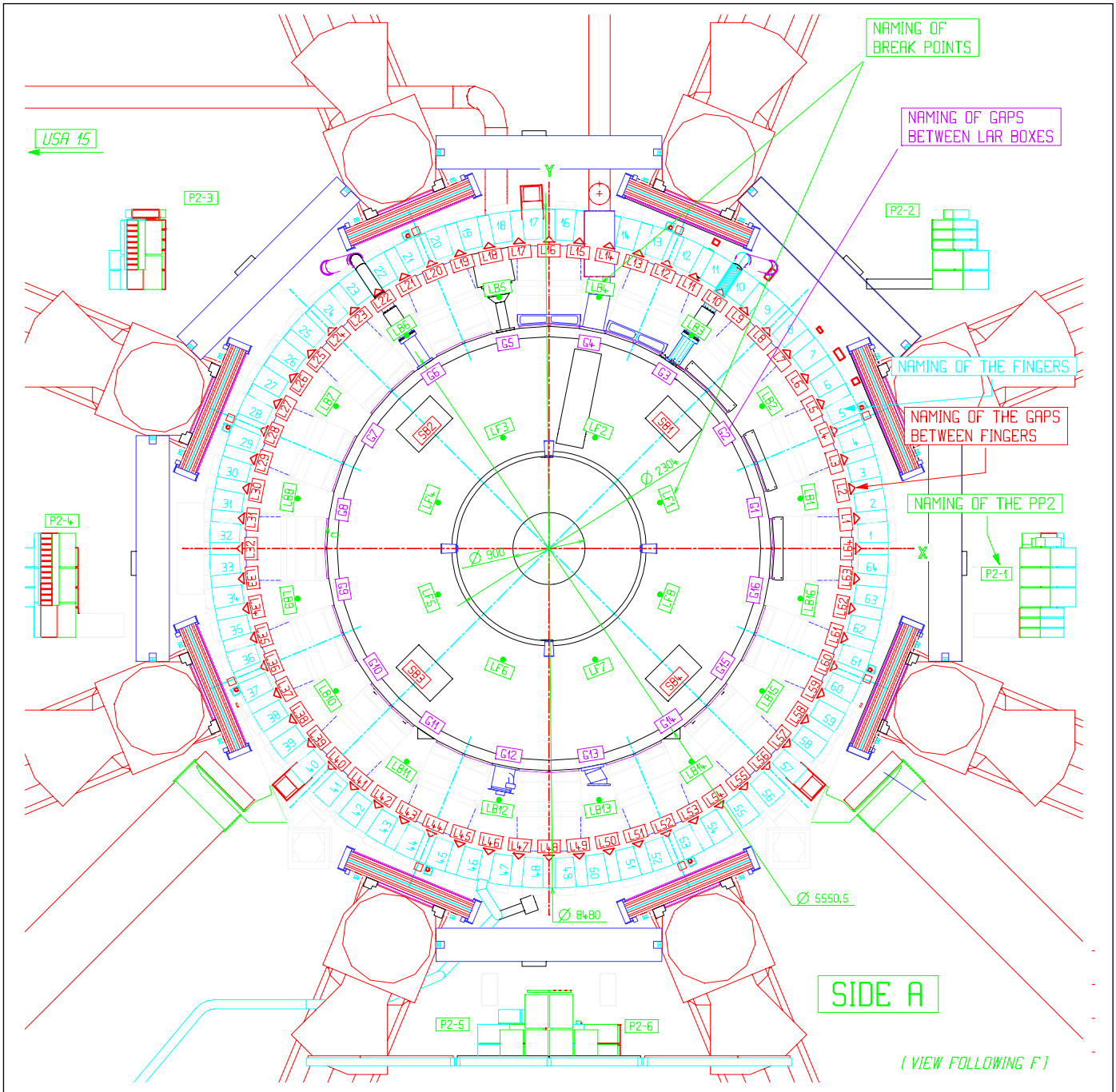

Fig.2 side A (*drawing ATLICS__0057, [1]*)

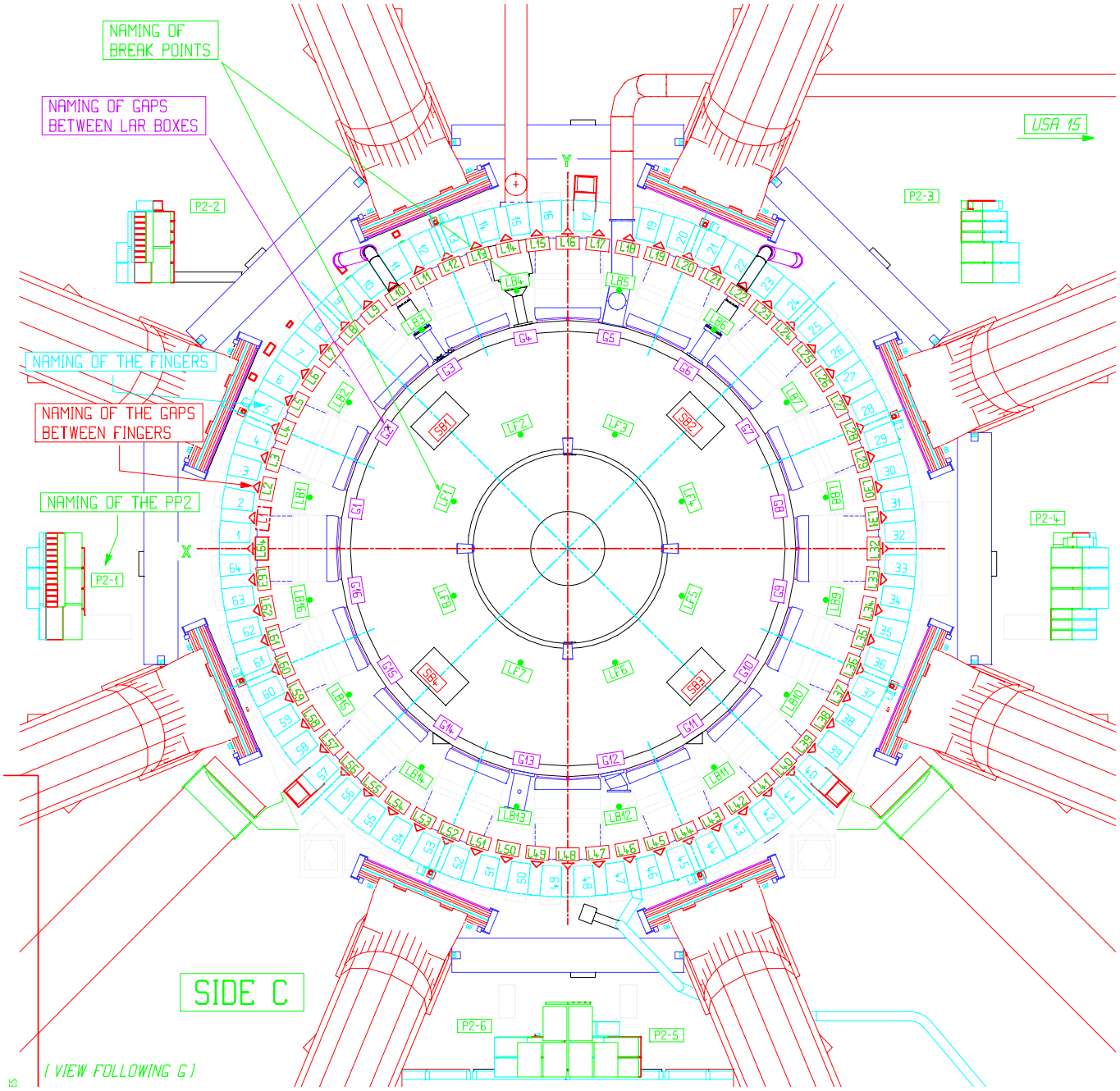

Fig.3 side C (drawing ATLICS__0057, [1])

Table 1 Mapping between ATLAS sectors, Lar gaps, tile finger gaps and PP2 positions

Side A and C			
ATLAS sectors	LAr gaps	tile finger gap	PP2 position
1	**G1**	**L1 , L2 , L3**	**P2 -1**
3	**G2**	**L5 , L6 , L7**	**P2 -2**
3	**G3**	**L9 , L10 , L11**	**P2 -2**
5	**G4**	**L13 , L14 , L15**	**P2 -2**
5	**G5**	**L17 , L18 , L19**	**P2 -3**
7	**G6**	**L21 , L22 , L23**	**P2 -3**
7	**G7**	**L25 , L26 , L27**	**P2 -3**
9	**G8**	**L29 , L30 , L31**	**P2 -4**
9	**G9**	**L33 , L34 , L35**	**P2 -4**
11	**G10**	**L37 , L38 , L39**	**P2 -4**
11	**G11**	**L41 , L42 , L43**	**P2 -5**
13	**G12**	**L45 , L46 , L47**	**P2 -5**
13	**G13**	**L49 , L50 , L51**	**P2 -6**
15	**G14**	**L53 , L54 , L55**	**P2 -6**
15	**G15**	**L57 , L58 , L59**	**P2 -1**
1	**G16**	**L61 , L62 , L63**	**P2 -1**

3 Numbering of boxes/connectors at PP2 platforms between Muon Layers

The numbering scheme of the individual boxes for each PP2 position is given in figure 4.
Table 2 gives the number of boxes for each type of services passing through PP2.

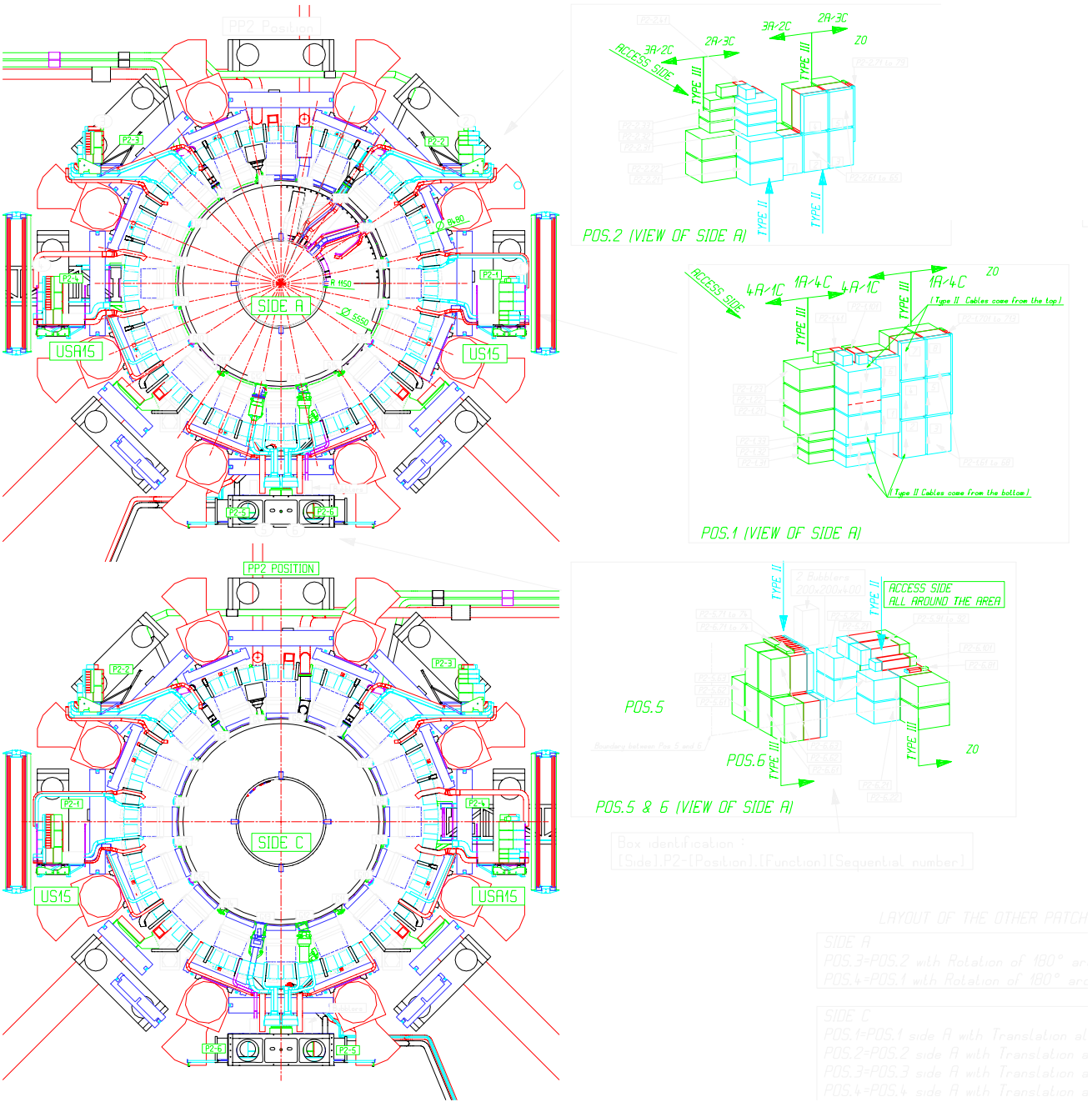

Fig.4 Numbering of boxes/connectors at P2-x.xx platforms between muon layers

(*drawing ATLICSP20001, [4]*)

Table 2 Number of boxes/connectors and type of services at P2-x.xx platforms

(*drawing ATLI CSP20001, [4]*)

SIDE A											
(Function) Weight per box	1.	2. 30 Kg	3.	4.	5.	6. 15 Kg	7.	8.	9.	10.	
PP2 Box IDENTIFICATION	A.P2-[pos].1[]	A.P2-[pos].2[]	A.P2-[pos].3[]	A.P2-[pos].4[]	A.P2-[pos].5[]	A.P2-[pos].6[]	A.P2-[pos].7[]	A.P2-[pos].8[]	A.P2-[pos].9[]	A.P2-[pos].10[]	
PP2 Position	PIXEL HV number of groups	PIXEL POWER number of boxes	PIXEL NTC/OPTO number of boxes	PIXEL ENV number of boxes	ID NMR AMPLI. number of boxes	TRT Power Data number of boxes	TRT HV number of connect.	B-P number of connect.	ID BCM MONITOR number of boxes	ID Rad. MONITOR number of boxes	
1		3	3	1	0	8	13	0	0	1x size 2	
2		2	3	1	0	5	9	0	0	0	
3		2	3	1	0	5	9	0	0	1x size 1	
4		3	3	1	4	8	13	0	0	1x size 2	
5		2	0	0	0	3	4	0	2	0	
6		2	0	0	0	3	4	1	0	1x size 1	

SIDE C											
(Function) Weight per box	1.	2. 30 Kg	3.	4.	5.	6. 15 Kg	7.	8.	9.	10.	
PP2 Box IDENTIFICATION	C.P2-[pos].1[]	C.P2-[pos].2[]	C.P2-[pos].3[]	C.P2-[pos].4[]	C.P2-[pos].5[]	C.P2-[pos].6[]	C.P2-[pos].7[]	C.P2-[pos].8[]	C.P2-[pos].9[]	C.P2-[pos].10[]	
PP2 Position	PIXEL HV number of groups	PIXEL POWER number of boxes	PIXEL NTC/OPTO number of boxes	PIXEL ENV number of boxes	ID NMR AMPLI. number of boxes	TRT Power Data number of boxes	TRT HV number of connect.	B-P number of connect.	ID BCM MONITOR number of boxes	ID Rad. MONITOR number of boxes	
1		3	3	1	0	8	13	0	0	1x size 2	
2		2	3	1	0	5	9	0	0	0	
3		2	3	1	0	5	9	0	0	1x size 1	
4		3	3	1	0	8	13	0	0	1x size 2	
5		2	0	0	0	3	4	0	2	0	
6		2	0	0	0	3	4	1	0	1x size 1	

4 Phi positions of services in cryostat bore and Patch Panel 1:

The position in phi of the service inside the cryostat bore and of the Patch Panel 1 is identified by naming the cryostat sectors as follows (see figure 5 and 6):

- Ox: pixel PP1 octants
- Bxx: barrel services along the cryostat bore and PPB1 patch panels
- Fxx: End Cap services along the cryostat bore and PPF1 patch panels
- Ix: services routed along the ID end plate and PPI (patch panel 1 of ID services on the ID end plate)

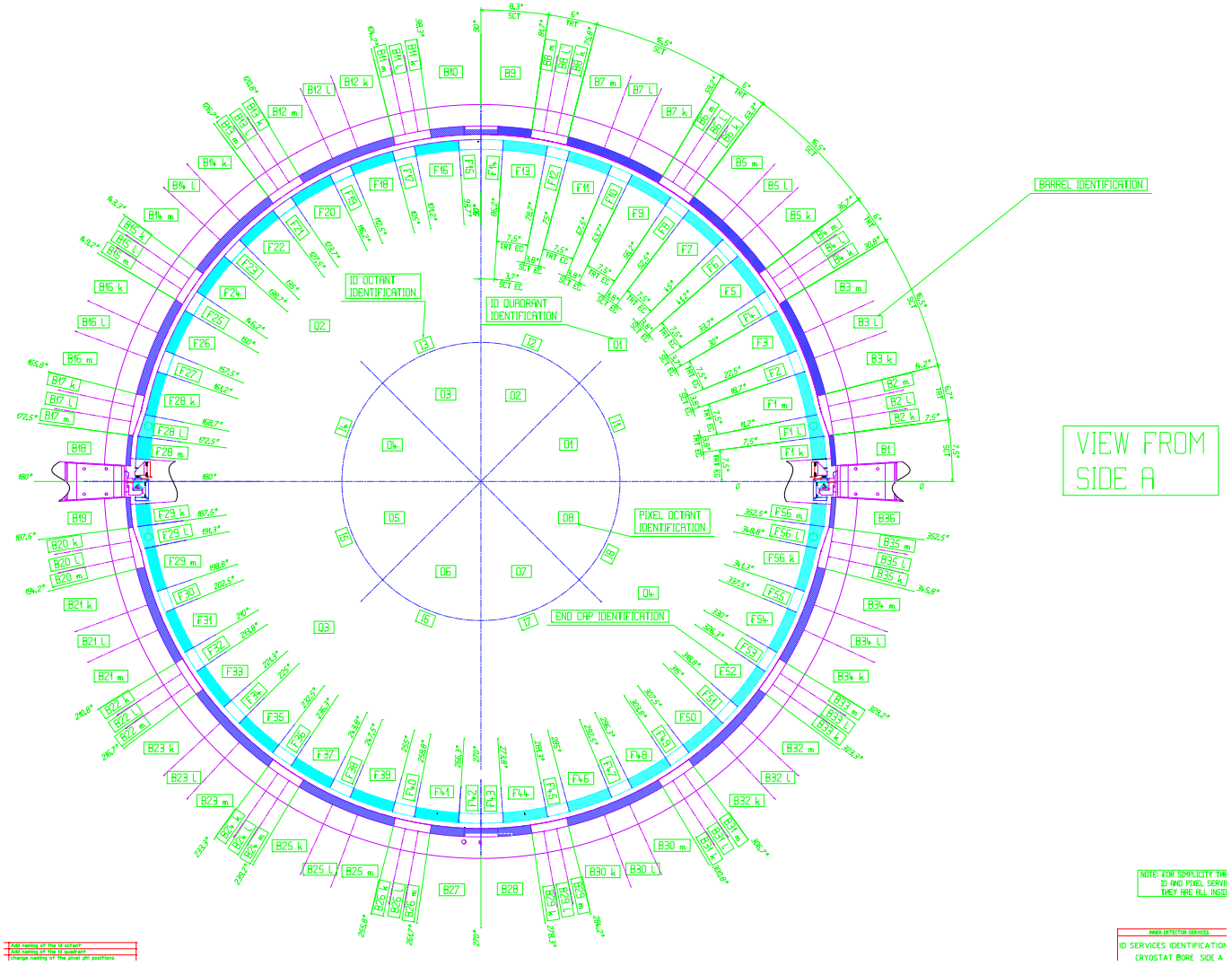

Fig.5 side A (*drawing ATLICS__0058, [2]*)

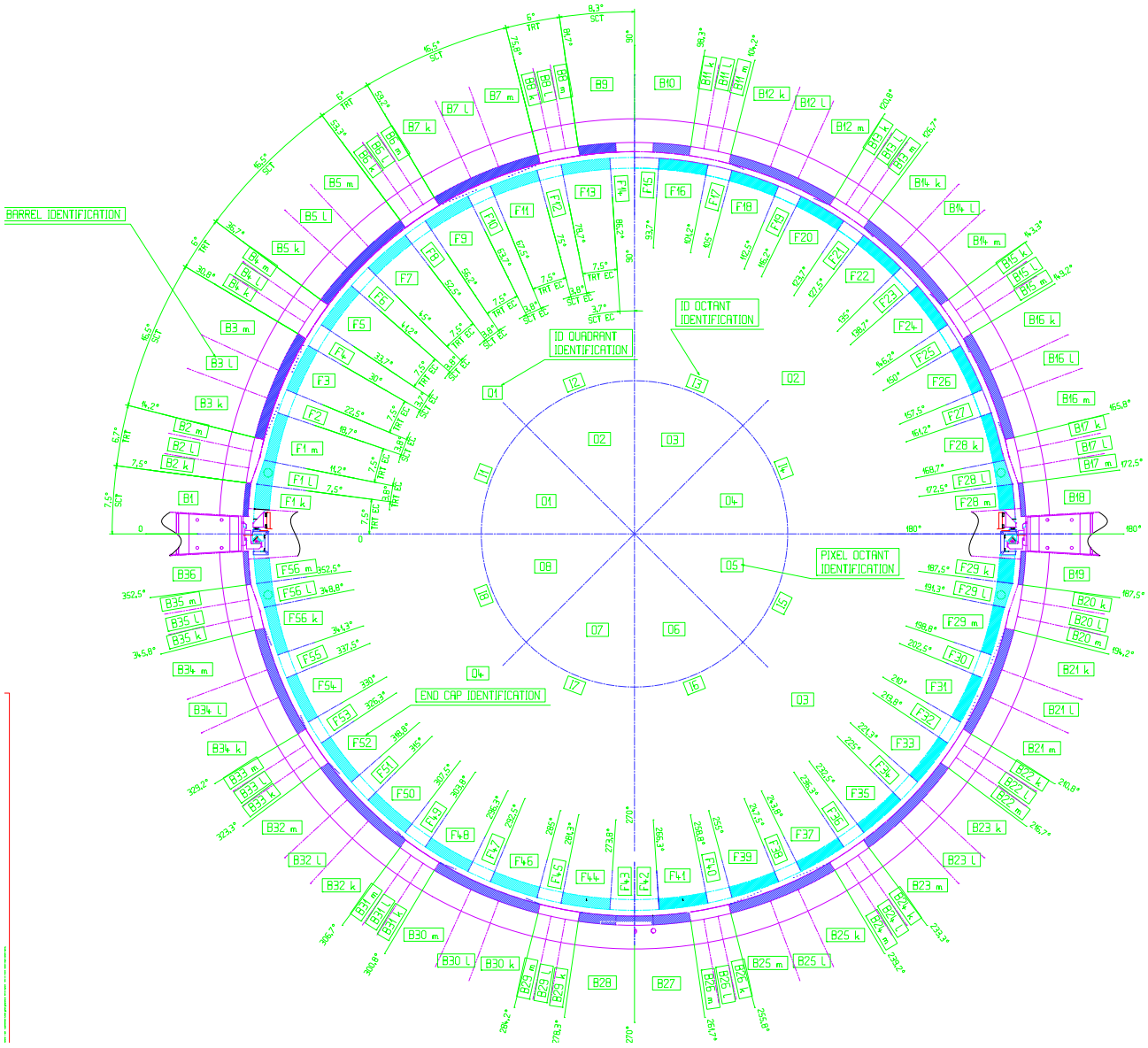

Fig.6 side C (*drawing ATLICS__0059,[3]*)

5 Racks distribution

The rack distribution and naming in the UX, USA15 and US15 caverns is controlled by TC through a rack wizard.

Figure 7 to 11 are just for reference and show the issue 4 of the rack distribution inside the 3 caverns.

It is recommended to consult the rack wizard to check out the most updated position of the racks.

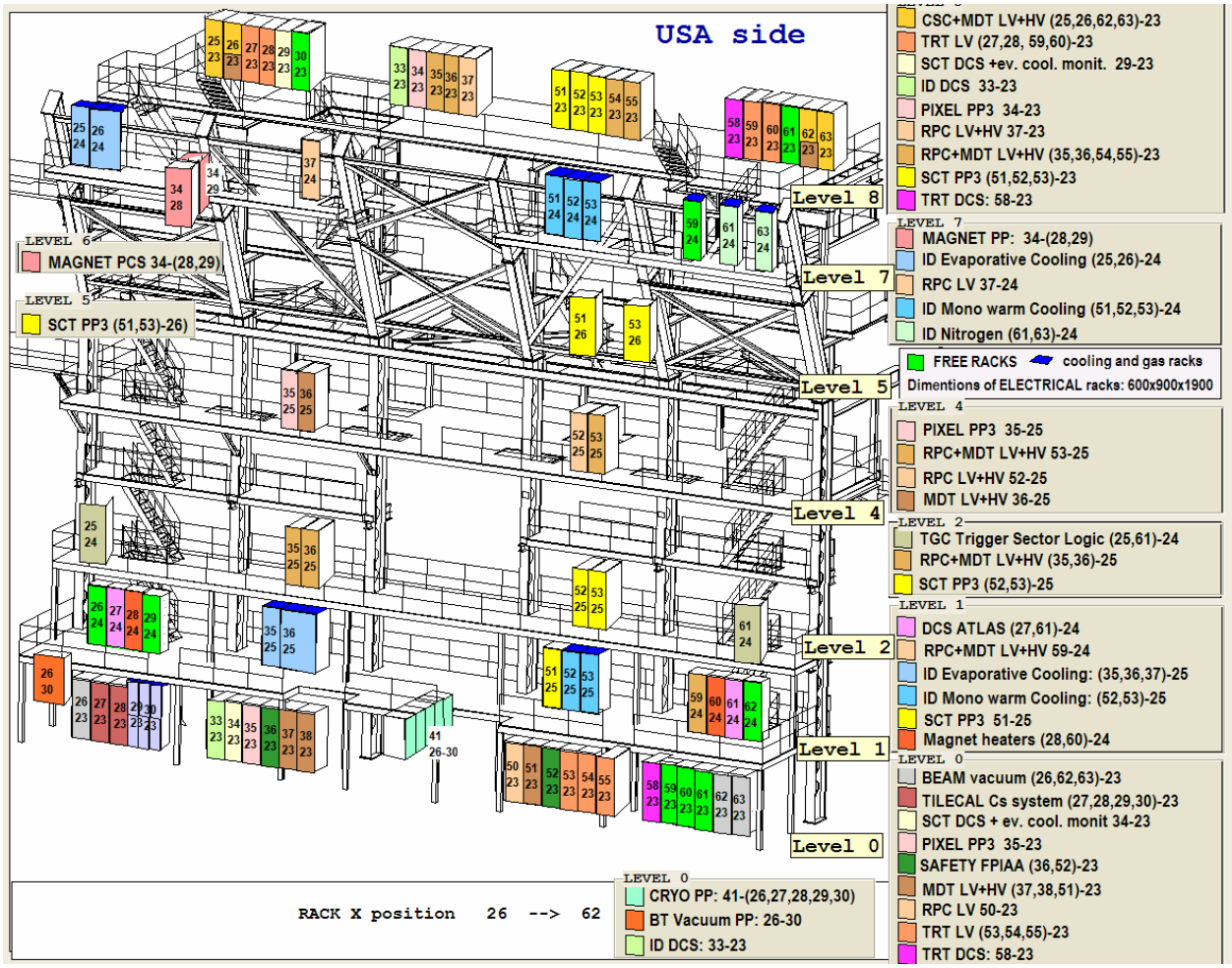

Fig.7 Distribution of racks in UX15 at USA15 side (*ATC-TB-EP-0007, ver.4.0, [5]*)

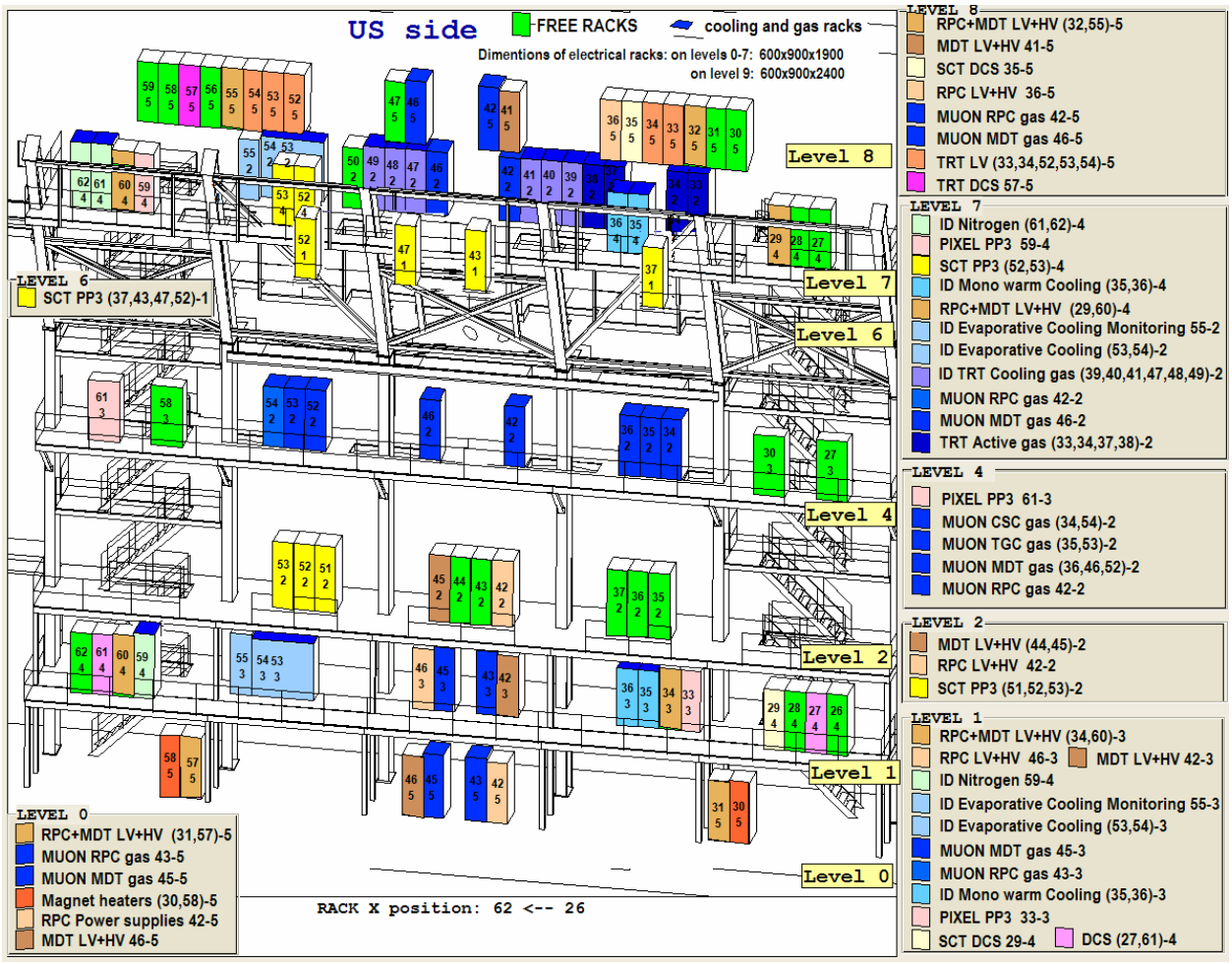

Fig.8 Distribution of racks in UX15 at US15 side (*ATC-TB-EP-0007, ver.4.0, [5]*)

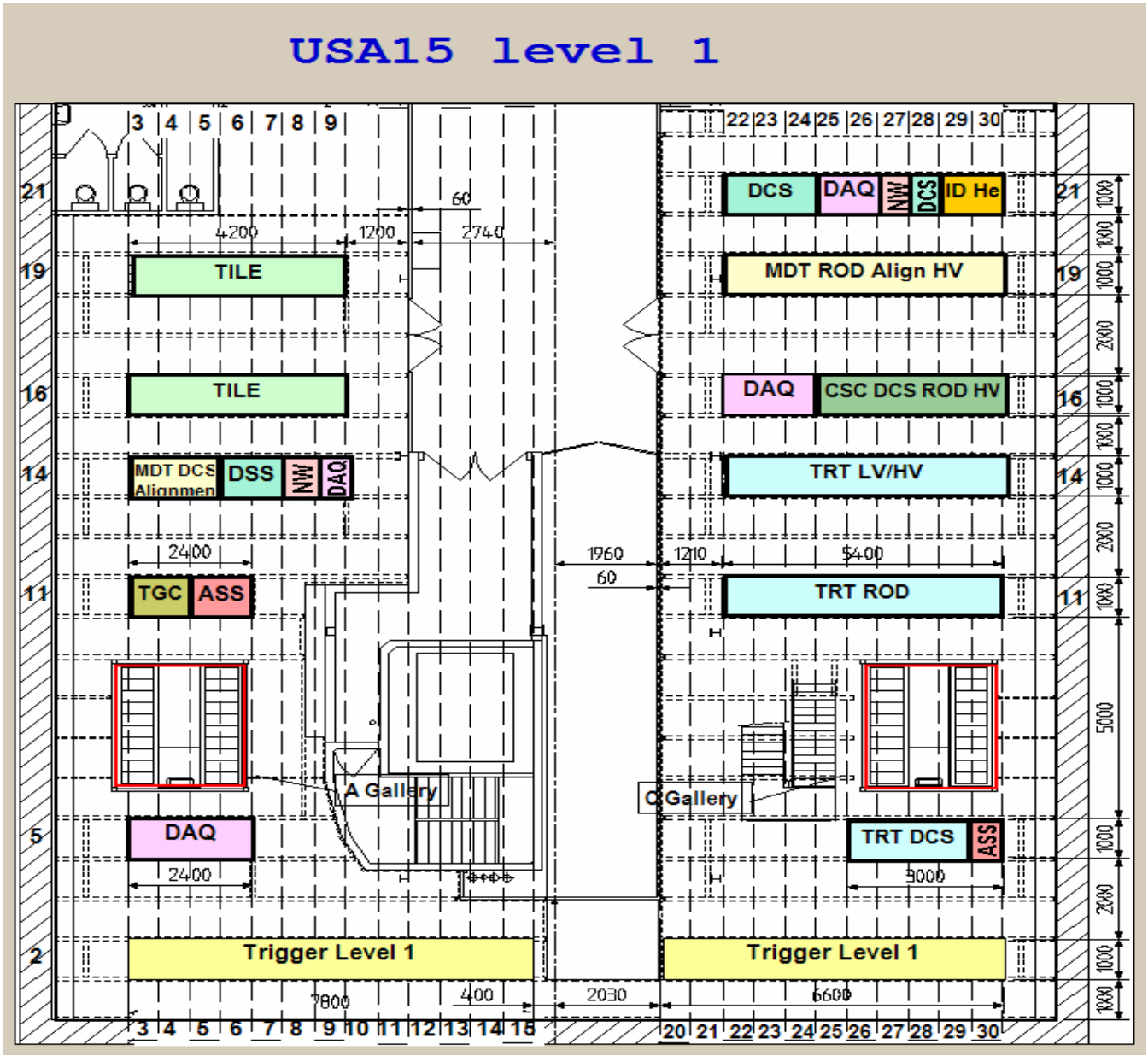

Fig.9 Distribution of racks in USA15, level 1 (*ATC-TB-EP-0007, ver.4.0, [5]*)

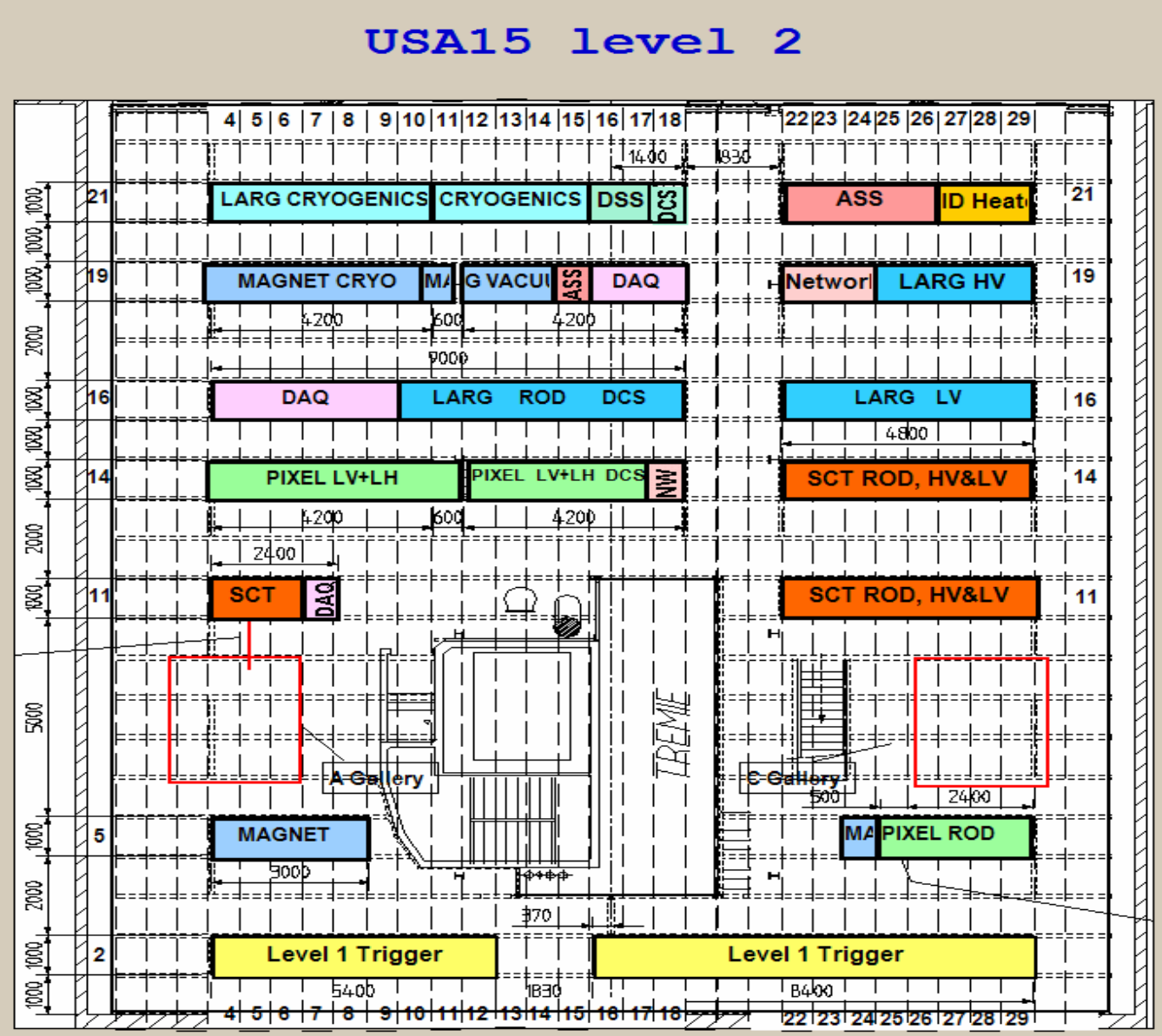

Fig.10 Distribution of racks in USA15, level 2 (*ATC-TB-EP-0007, ver.4.0, [5]*)

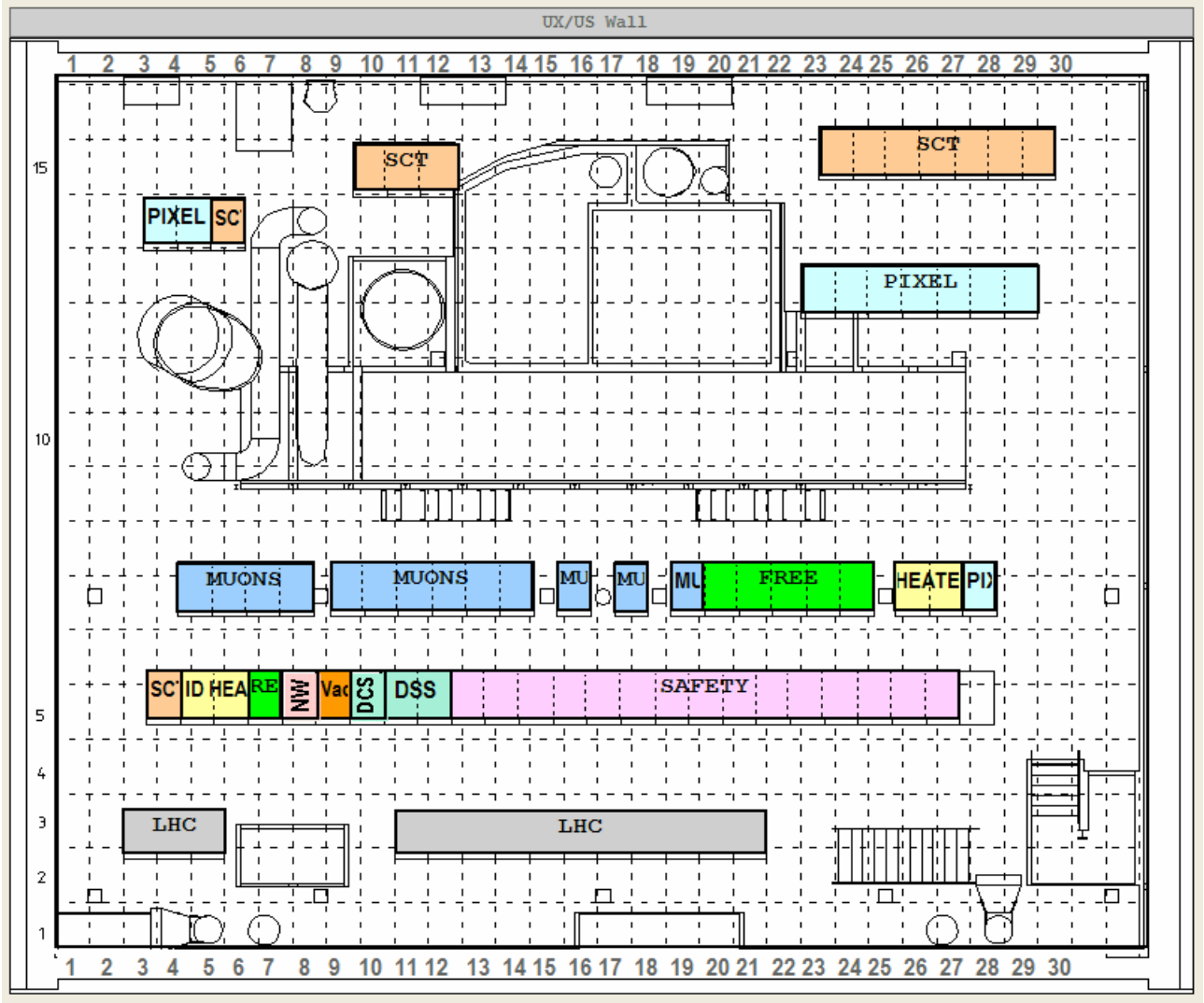

Fig.11 Distribution of racks in US15, level 2 (*ATC-TB-EP-0007, ver.4.0, [5]*)

6 Identification of services

The Inner Detector services naming convention is used to define services uniquely at the level of individual cables or tubes. It consist of 3 parts:

- Bare Service Identifier ("USER FIELD" in TC database)
- Bundle Identifier ("STANDARD FIELD" in TC database)
- Unique Service Identifier: numeric identifier of each individual service.

The Bare Services Identifier characterises the type of the service (Electrical cable, Optical Fibre, Tubes etc) and the associated (owning) sub-system. Details are given in 8.1 below.

The Bundle Identifier provides information on the routing and refines the information given in the Bare Services Identifier on the nature and function of the services. A Bundle is defined as a group of services that have the same: start point, routing and End-Point. Details are given in 8.2 below.

The Unique Services Identifier gives a unique identity to each of the services (cables, pipes, fibres etc) in a bundle.

All of the identifiers are printed together on the labels that identify the services. TC is responsible for printing the labels

It should be noted that the Bare Services Identifier is only used by ID and not TC. It is mainly used for procurement and ease of identification. The Bare Services Identifier is fully under the control of ID and is defined in the ID services inventory.

The Bundle Identifier is used by ID and TC and must conform to ATLAS wide guidelines.

The unique numeric identifier is the responsibility of TC and is defined in the TC services database which maintains the master list of all individual services.

6.1 Bare service identifier

The bare service identifier is ID specific and it is used to easily identify the bare services. It is composed of a sequence of alphanumeric symbols as follows:

sn(sub)/dim/req

sn - service nature

- **E** - electrical cable
- **O** - optical ribbons, cables
- **T** - tubes

sub - sub-system responsible for procurement of the service. A service can be used in general by other sub–systems.

- **C** - Inner Detector (common services)
- **P** - pixel detector
- **S** - SCT detectors
- **T** - TRT detectors

dim – typical dimension(s), easy to check, of a service: i.e outer diameter (OD) in case of cables; some of services require more information: tubes - inner diameters (ID), optical cables – number of ribbons in a cable and number of fibers in a ribbon; that info is added with the format shown in the following examples.

req - requirements on service features

C - conventional cables
RH - radiation hard cables
AL - aluminium alloy tube
CU - copper tube
ML - multilayer tube
P - plastic tube
SS - stainless steel tube

Examples:

a) the Inner Detector is responsible for purchasing of stainless steel tubes of 8 mm outer diameter and 6 mm inner diameter

T(C)/8-6/SS

b) the SCT is responsible for purchasing of an optical cable of 10.5 mm OD including 8 ribbons of 12 radiation hard fibers each.

O(S)/10.5-8s-12/RH

6.2 Bundle identifier

The bare service identifier is common for ID and TC. It is used to identify the services bundles providing also information about their routing and their starting and end points. It is composed of a sequence of alphanumeric symbols as follows:

|used by|/|side(if applicable)|.|start point|.|intermediate point(optional)|/function type|/|side(if applicable)|.|end point|

|**used by|:** **IC**- Inner Detector (common services)
IP - Pixel
IS – SCT (common services/items for barrel and end caps)
ISB - SCT Barrel
ISE – SCT End Caps,
IT – TRT (common services/items for barrel and end caps)
ITB -TRT Barrel
ITE - TRT End Caps

|**side(if applicable)|:**

ATLAS sides **A** or **C**, Fig.1, are indicated to determine: phi positions in cryostat bore, splicing boxes, installation break points, LAr/tile finger gaps and PP2 positions

|**start point**|:

Type 2 services (starting at pach panels 1)

B1,…, B36 (SCT/TRT/Pixel/ID Barrel services) , Fig.5, 6

F1,…., F56 (SCT/TRT/ID End Cap services) , Fig.5, 6

SB1,….SB4 (SCT alignment cables) , Fig.2, 3

O1,…., O8 (Pixel/ID/beam pipe services) , Fig.5, 6

I1,…., I8 (Inner Detector services on ID end plate), Fig.5, 6

LF1,…,LF8 (installation break points at cryostat flange), Fig.2, 3

Type 3 services, Fig.2, 3, Table 1:

starting at Tile Barrel – gap number between tile fingers **L1,…, L64** or installation break points between LAr boxes LB1,…,LB16

starting at patch panels 2 – PP2 position (**P2-1**,…,**P2-6**)

box/connector number (**.1**,…, **.13**)

region in UX15 (**.XB**)

Type 4 services:

racks at platforms in UX15 e.g.**Y.50-04.X2** (rack.column-line.cavern UX15,level 2)

The UX15 cavern , USA15 and US15 are subdivided into several regions, these regions are used to distinguish different working areas.

UX15

X0, X1,..X9 - follow the Surrounding Structure (HS) by level

XA - Forward Region A corresponding to the volume between the Big wheels and MEO Chambers

XB - Barrel Region corresponding to the volume inside the two Big wheels (all Inner Detector P2 platforms are situated in that region)

XC - Forward Region C corresponding to the volume between the Big wheels and MEO Chambers.

H0, H1,..H12 (?) - follow the End Wall Structure (HO) by level (naming to be decided)

USA15

A1 - 1st level of USA15

A2 - 2nd level of USA15

US15

S2 - 2nd level of US15

|intermediate point(optional)|

break points LB1,…,LB16 in case of type 2 services ending at tile barrel (L1,…,L64) and broken between LAr boxes due to installation reasons

gap number between tile fingers **L1,…, L64** for type 2 services routed to PP2 between Muon Layers and also in case of services started at LBxx or LFxx routed along Tile Barrel to PP3, UX15, US(A)15 without change of diameter or requirements (req)

|function type|

currently three characters are assigned to determine function type of services listed below:

cables

Aln	– **A**lignment cables
C	- **C**ontrol cables
Can	- **Can** bus cables
Dcs	- **Dcs** cables
Gs	- **G**rounding/**s**hielding cables
H	- **H**igh voltage cables
HLC	– **H**igh, **L**ow voltage and **C**ontrol cables
L	- **L**ow voltage cables
LC	- **L**ow voltage and **C**ontrol cables
Ro	- **R**ead **o**ut cables
RoT	- **R**ead **o**ut and **T**TC cables

*tubes (additionally inlets (**i**) and outlets (**o**) can be distinguished if it is helpful)*

Act	- **A**ctive gas tubes
Co2	- **C**O_2 cooling tubes
Env	- **E**nvironmental gas tubes
Ev-i	- **E**vaporative cooling system inlet tubes
M-o	- **M**ono phase cooling system outlet tubes
P	- **P**ressure sensing tubes
S	- **S**afety gas tubes (sniffers, ended with bubblers)
V	- detector **V**entilation gas tubes

|end point|

ending at Tile Barrel - gaps between tile fingers **L1,…, L64**

ending at patch panels 2 – see explanation for |**start point**| of Type 3 services (between Muon Layers)

ending at racks on UX15 platforms - e.g. on level 2 **Y.50-04.X2**

ending at racks on US15 platforms - e.g. on level 2 **Y.22-07.S2**

ending at racks on USA15 platforms - e.g. on level 1 **Y.5-11.A1**

6.3 Unique service identifier

The unique service identifier is a numeric identifier of each individual service. It consists of a 7-digit number and a corresponding bar code. The unique identifier allows to access the ATLAS services data base managed by TC via either a keyboard or a bar code reader:

bar code	|||||| ||||| || |||||||||| |
corresponding 7 digit number	**1234567**

It is also possible to define a sub-bundle, using two extra digits. In this case the TC unique identifier will have 9 digits. For example this approach has been followed by the SCT for the optical fibre cables. In this case the 8th and 9th digits are used to number each individual ribbon inside a cable. More details can be found in the SCT Fibre Optic Cable PRR2 document [7].

6.4 Labels

Labels prepared by TC includes all the three service identifiers. ID contact persons responsible for the services should decide how many labels and where to be stuck along services. The ID team can help if it is necessary. The labels can be provided to the suppliers who should use them during the preparation of the individual cables.

Here after a few examples of labels are shown.

Examples of labels

Note! TC service identifiers are fictious as well as start/end points

T(C)/8-6/SS
ISE/A.F12/Ev/A.L13
|||||| ||||| || |||||||||| ||||||||||||||||||||||
1234567

A bundle of stainless steel tubes of 8 mm OD and 6 mm ID procured by Inner Detector is used by SCT end cap for evaporative cooling system. The bundle is routed at A side; it starts at phi position F12 and ends at tile finger gap L13.

O(S)/10.5-8s-12/RH
ISB/C.B15k.L27/RoT/Y.22-11.A2
|||||| ||||| || |||||||||| ||||||||||||||||||||||
2234567

A bundle of optical cables of 10.5 mm OD consisting of 8 ribbons, 12 radiation hard fibers each procured by SCT is used by SCT barrel for data read out and TTC. The bundle starts at C side phi position B15k, is routed through the tile finger gap L27 and ends at the rack Y.22-11 in USA15 level 2.

E(P)/9.4/RH
IP/A.O2.L10/L/A.P2-2.21.XB
3234567

A bundle of radiation hard electrical cables of 9.4 mm OD procured by Pixel is used by Pixel for low voltage supply. The bundle is routed at side A; it starts at phi position O2, routed through the tile finger gap L10 ends at PP2 position 2, Pixel low voltage box number 21.

E(T)/15.6/C
ITB/C.P2-4.713.XB/H/Y.24-14.A1
4234567

A bundle of conventional electrical cables of 15.6 mm OD procured by TRT is used by TRT barrel for high voltage supply. The bundle starts at C side at PP2 position 4 with the TRT HV connector 713 and is routed to the rack Y.24-14 in USA15 level 1.

E(S)/15/C
ISE/Y.52-02.X6/HLC/Y.24-15.S2
4234580

A bundle of conventional electrical cables of 15 mm OD procured by SCT is used by SCT end cap for high voltage, low voltage supply and control. The bundle starts at the rack Y.52-02 in UX15 level 6 and is routed to the rack Y.24-15 in US15 level 2.

7 References

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3. ID SERVICES IDENTIFICATION IN - CRYOSTAT BORE SIDE C, ATLICS__0059, Drawing Information
4. LAYOUT OF ID PATCH PANELS PP2, ATLICSP20001, **Drawing Information**
5. Rack layout in USA15 control rooms, levels 1 and 2, in US15, level 2, in UX15 cavern, ATC-TB-EP-0007, **https://edms.cern.ch/file/384843/2/RACK_LAYOUT_Approved.xls** ,*https://edms.cern.ch/file/483961/1/RACK_LAYOUT_V4.xls*
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