ATLAS PROJECT	Cabling of the Endcap Signal Feedthroughs		
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LAr Signal Feedthroughs

Cabling of the Endcap Signal Feedthroughs

Abstract

This note provides a brief summary of the cabling assignments and orientations for the endcap feedthroughs. The relation between the global ATLAS coordinate system and the coordinate systems local to each endcap module is described, as well as the consequences of the use of the local rather than global system for the cable assignments. The cable slot assignments for the *standard*, *special*, *HEC*, and *FCAL* endcap feedthroughs are also given.

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History of Changes			
Rev. No.	Date	Pages	Description of changes
1	28/11/00	1-3,7-11	include the approval list, minor text improvements

1 Local and ATLAS coordinate systems

As outlined in reference [1], the cable position assignments for the endcap feedthroughs are designated relative to a coordinate system local to each endcap module and its associated feedthroughs (see figure 1). The local origin is the "pp collision point", and the z axis is along the LHC beam line. More specifically:

z axis: points along the beam from the interaction point to the endcap. This axis defines a positive rotation (right handed rotation) direction, i.e., a positive direction for the local azimuthal angle ϕ.

x axis: points to large radius, aligned to the edge of the wedge so that the wedge is at positive ϕ.

y axis: defined such as to get a right handed system.

The ATLAS coordinate system is defined such that the ATLAS origin is the "pp collision point", the x axis points toward the centre of the LHC ring, the y axis points up, and the z axis is along the beam line in a direction to get a right handed system.

It should be noted that the fact that the endcap feedthroughs are cabled according to their local coordinate systems rather than the global ATLAS system leads to the consequence that all endcap feedthroughs of a given type (*standard*, *special*, *HEC*, or *FCAL*) are in every way identical with one another, regardless of which endcap cryostat (endcap A or endcap C) they are to be installed on. Figure 2 shows the relation between the local and ATLAS coordinates systems, while figure 3 shows the orientations of the cable slots for endcaps A and C. Pin numbering assignments for each of the 64 pins of each of the 30 cable slots of a feedthrough are defined in figure 4. Note also in figures 3 and 4 the rotation between the cold and warm flanges, the warm flange undergoing a positive right-handed 90° rotation about the local x axis.

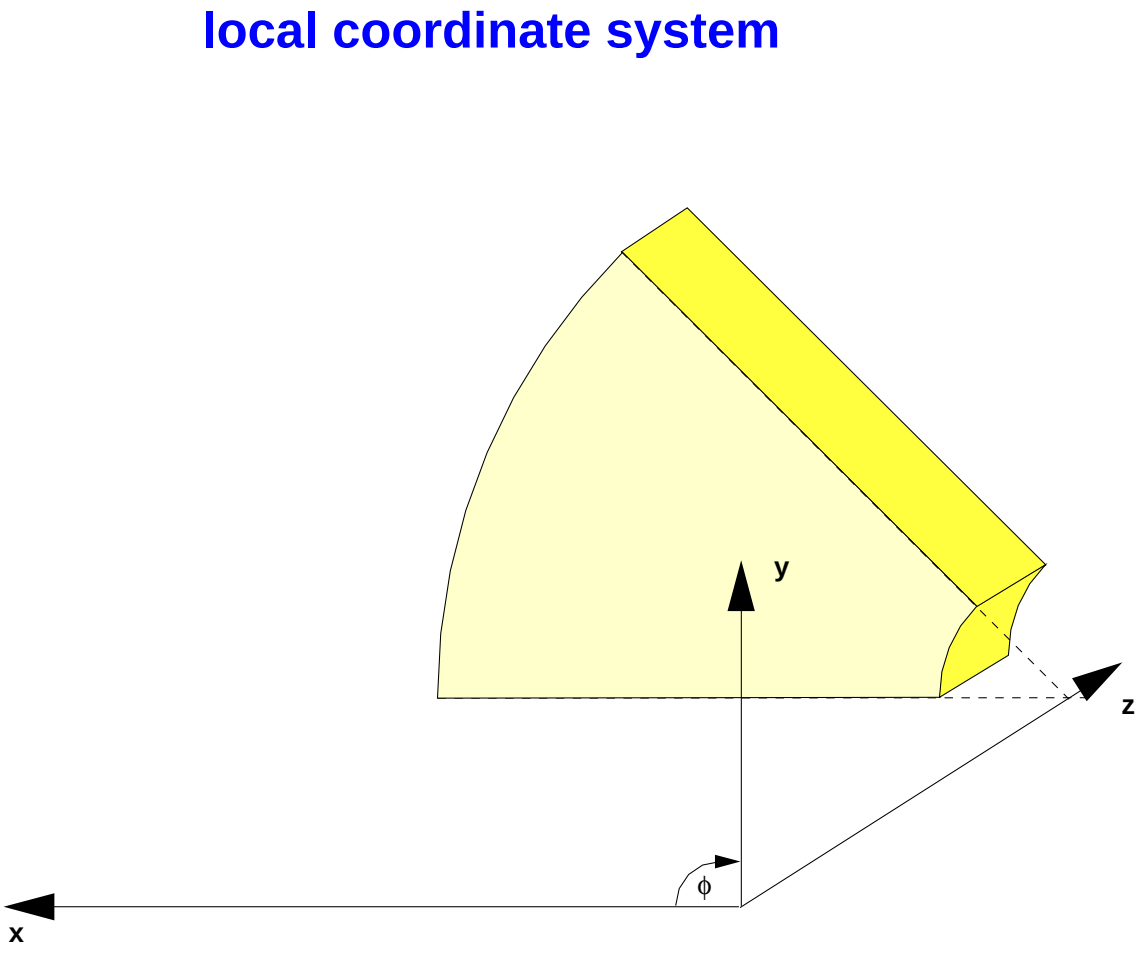

Figure 1: Definition of the local coordinate system for an endcap module.

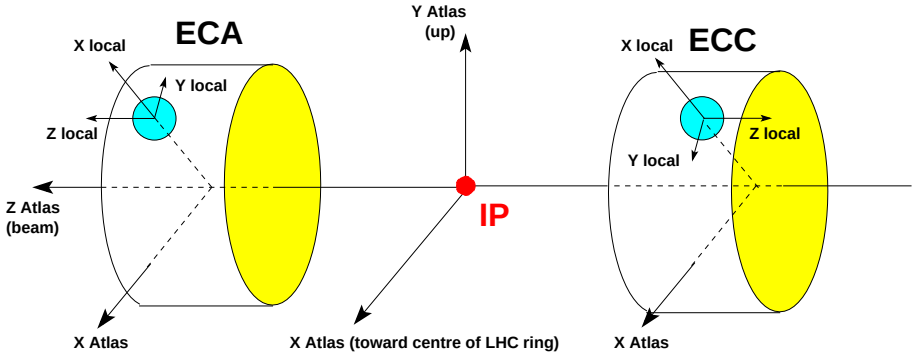

Figure 2: Schematic representation of two endcap feedthroughs on opposite ends of the ATLAS detector, showing the relation between the local and ATLAS coordinate systems. See text in Section 1 for a description of the local and ATLAS coordinate systems.

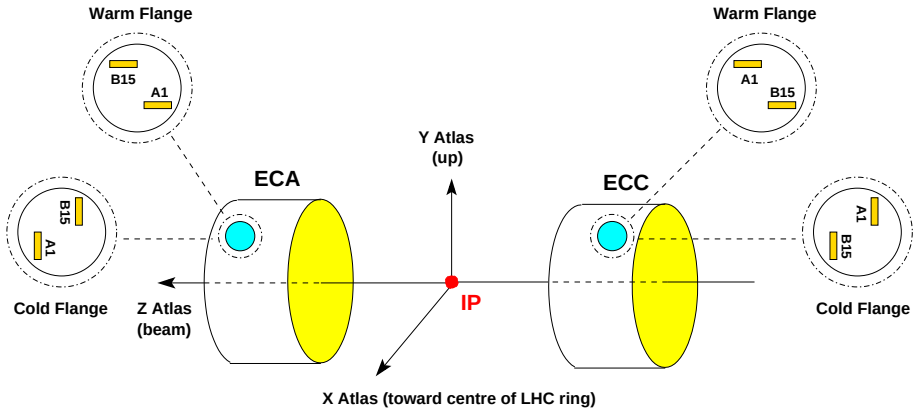

Figure 3: Schematic representation of two endcap feedthroughs on opposite ends of the ATLAS detector, showing the relative orientations of the cable slots at each endcap. **A1** and **B15** refer to the positions of those slots on each flange. Note the $+90^{\circ}$ rotation about x_{local} of the warm flange with respect to the cold flange.

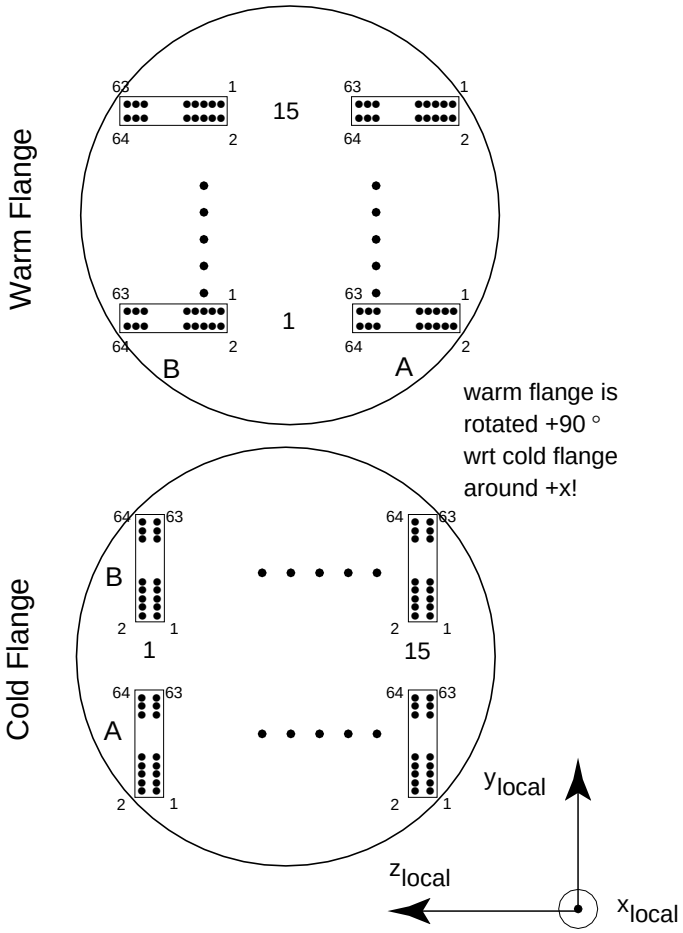

Figure 4: Connection to the feedthrough flanges. The pin numbers 1 – 64 refer to the signal line numbers as defined in reference [1]. Note the definition of the connector numbering on the flange from **1A** to **15B**. Note also the direction of the rotation between the cold and warm flanges.

2 Vacuum cable and Pigtail cable assignments

With the exception of the low voltage cables in the *HEC* feedthroughs, all vacuum cables (located inside the feedthrough bellows volume) are of the same type — 64 line micro-stripline cables with a nominal impedance of $33 \pm 4\ \Omega$ and resistance approximately $1\ \Omega$. Several of the slots in all *standard* and *HEC* feedthroughs will be used to connect calibration lines for the *EM* calorimeter. Those slots will be filled with vacuum cables found during the preassembly tests to have the best electrical properties. Each *HEC* feedthrough has four slots designated for the supply of low voltage to the *HEC* preamplifiers. The vacuum cables for those connections are comprised of 64 single conductor wires, with three different wire gauges chosen to optimize current carrying ability and heat transfer properties [2].

The pigtail cables (harness B, connecting the cold flange to the calorimeter patch panel) are comprised of seven different types — **T47**, **T48**, **T49**, **T50**, **T51**, **T52**, and **LV**. The slot assignments for the pigtails in each of the four types of endcap feedthroughs are shown in figures 5 – 8. The slots carrying calibration lines are indicated with '(cal)'. A complete description of the properties of each of the pigtail cable types can be found in reference [3].

It should be noted that the only difference with regard to cable assignments between the content of this note and that of reference [1] pertains to the connector positions **A13** and **B13** of the *HEC* feedthroughs, where **T51** cables are used instead of **LV** cables, and the connector positions **A15** and **B15** of the *FCAL* feedthroughs, where $25\ \Omega$ (**T52**) cables are used instead of $50\ \Omega$ cables.

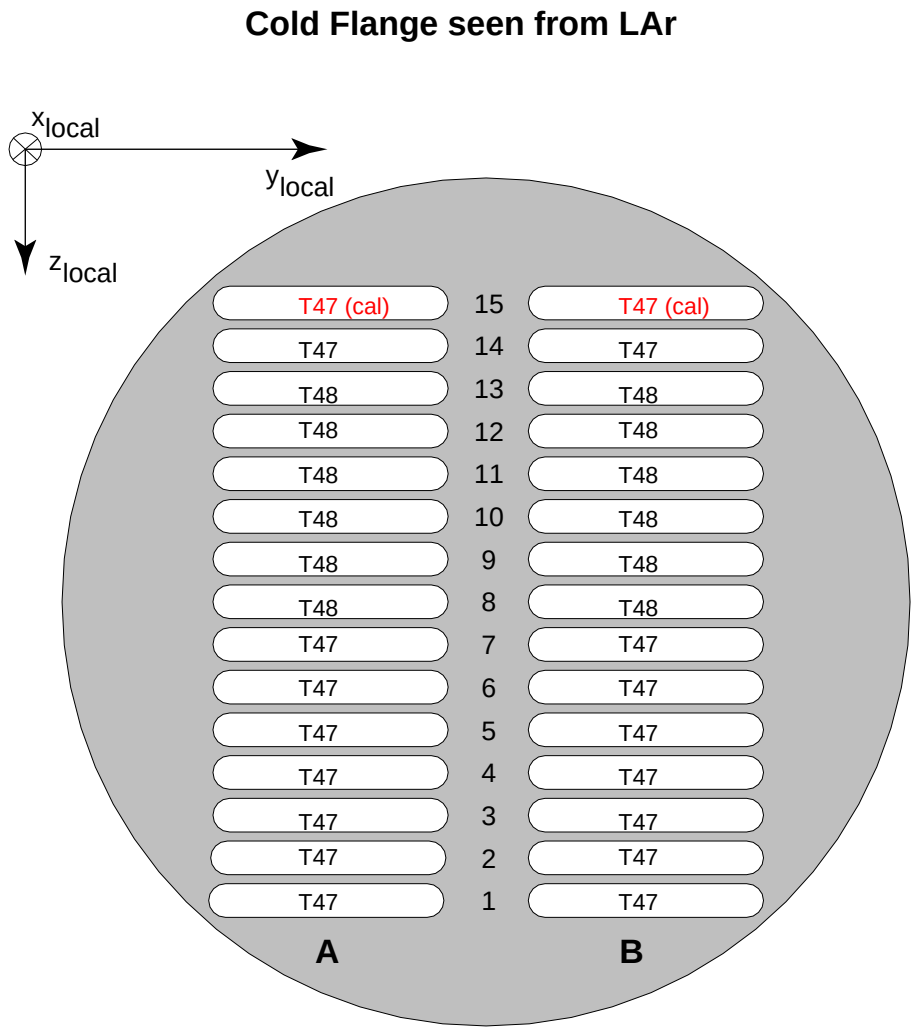

Figure 5: Pigtail (harness B) map of the cold flange seen from liquid argon for the *standard* feedthrough of the EM endcap calorimeter. Calibration slots are indicated with '(cal)'. Each endcap cryostat has 16 *standard* feedthroughs.

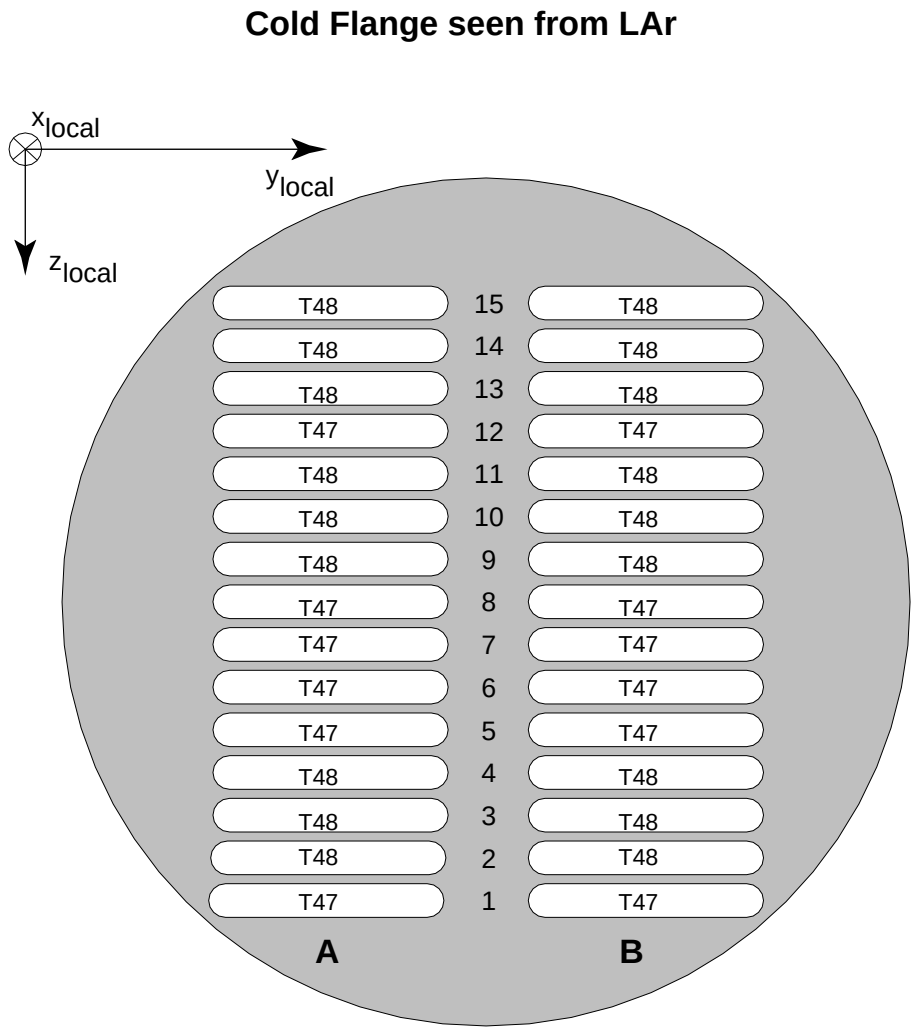

Figure 6: Pigtail (harness B) map of the cold flange seen from liquid argon for the *special* feedthrough of the EM endcap calorimeter. Each endcap cryostat has 4 *special* feedthroughs.

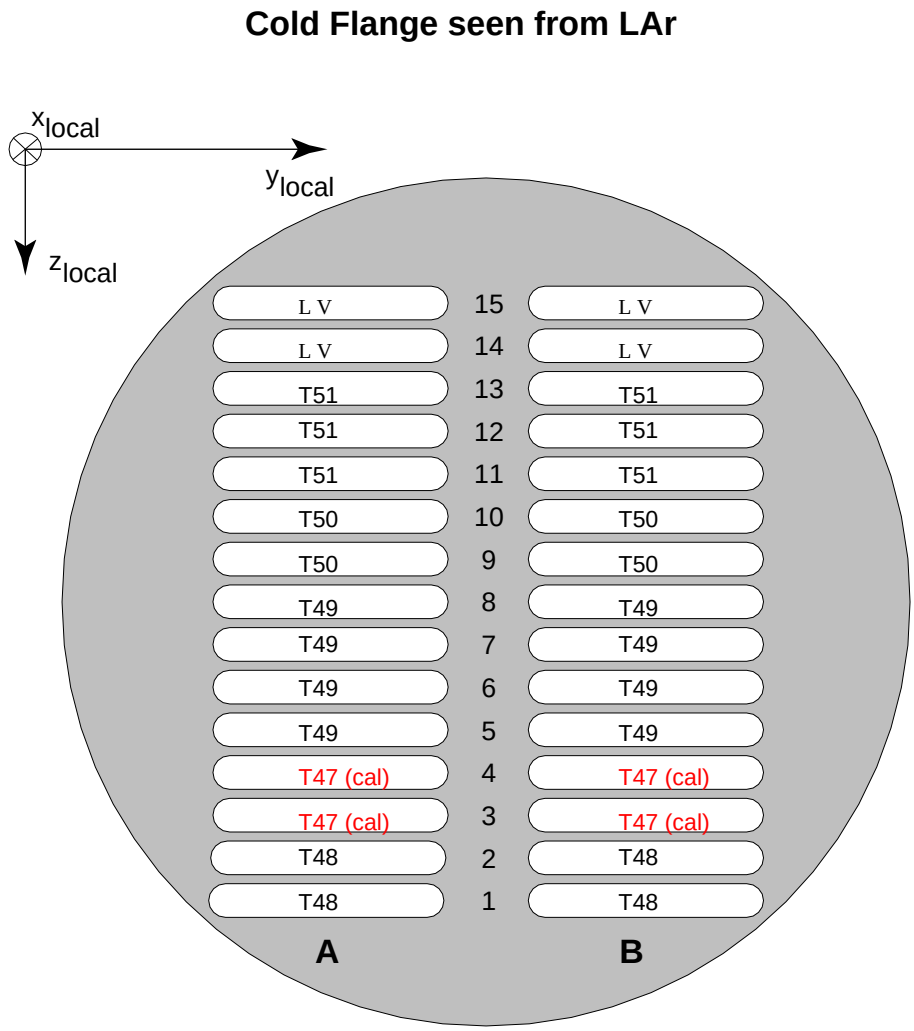

Figure 7: Pigtail (harness B) map of the cold flange seen from liquid argon for the *HEC* feedthrough servicing both the EM endcap and the HEC calorimeters. Calibration slots are indicated with '(cal)'. Each endcap cryostat has 4 *HEC* feedthroughs.

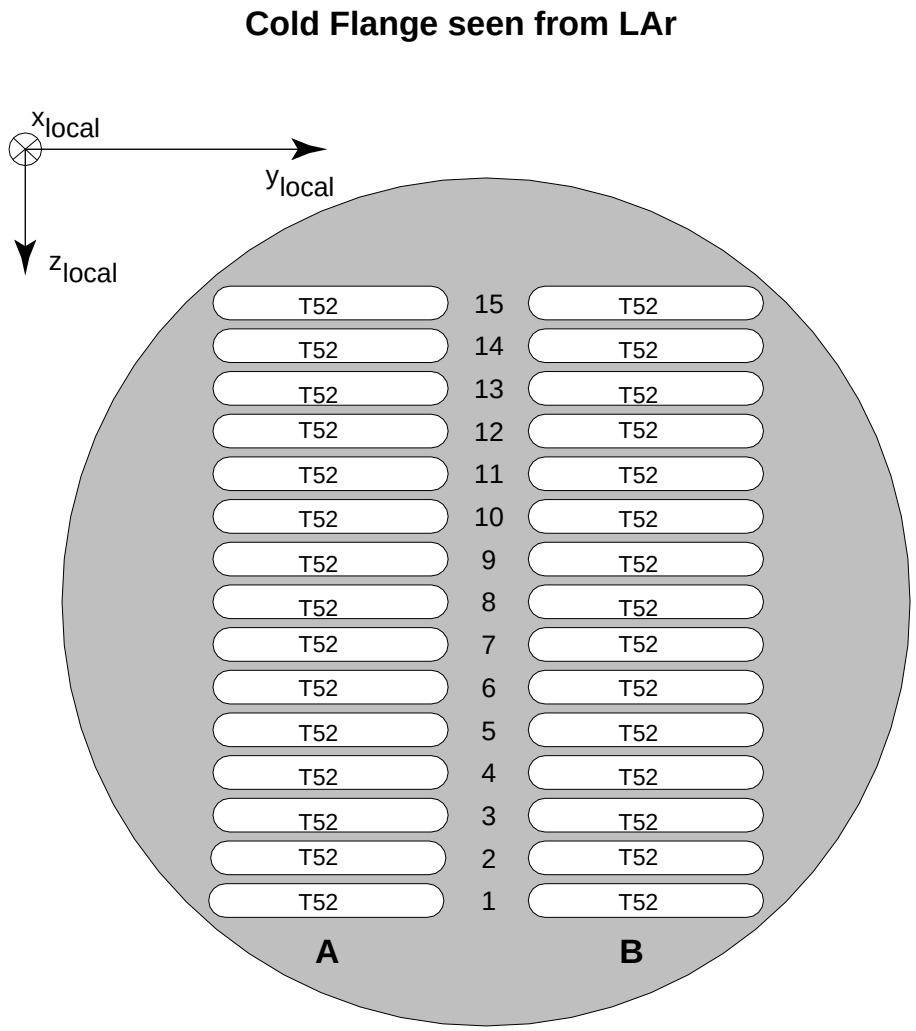

Figure 8: Pigtail (harness B) map of the cold flange seen from liquid argon for the *FCAL* feedthrough of the EM endcap calorimeter. Each endcap cryostat has 1 *FCAL* feedthrough.

References

[1] J. Colas, J.Y. Hostachy, D. Lissauer, P. Perrodo, S. Rajagopalan, D. Sauvage; *Cabling of EM Calorimeters*, **ATL-AL-ES-0004**, 31 May 1999.

[2] M. Fincke-Keeler and M. Lefebvre; *A proposal for a Low Voltage Vacuum Cable Design for the HEC Feedthroughs in the ATLAS Endcap Cryostat*, ATLAS Internal Note **HEC 068**, Dec 1998.

[3] W.Bonivento, A.Fallou, P.Imbert; *Cold Cable Lengths and Quantities*, **ATL-AL-EP-0001**, 20 Nov 1998.