Beamline Magnet Polarity Indication

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Background

The MICE beamline can be used to work with either positively or negatively charged particles. The changeover is achieved by reversing the (DC) current flow through ALL beamline magnets (Q1-9 and D1&2).

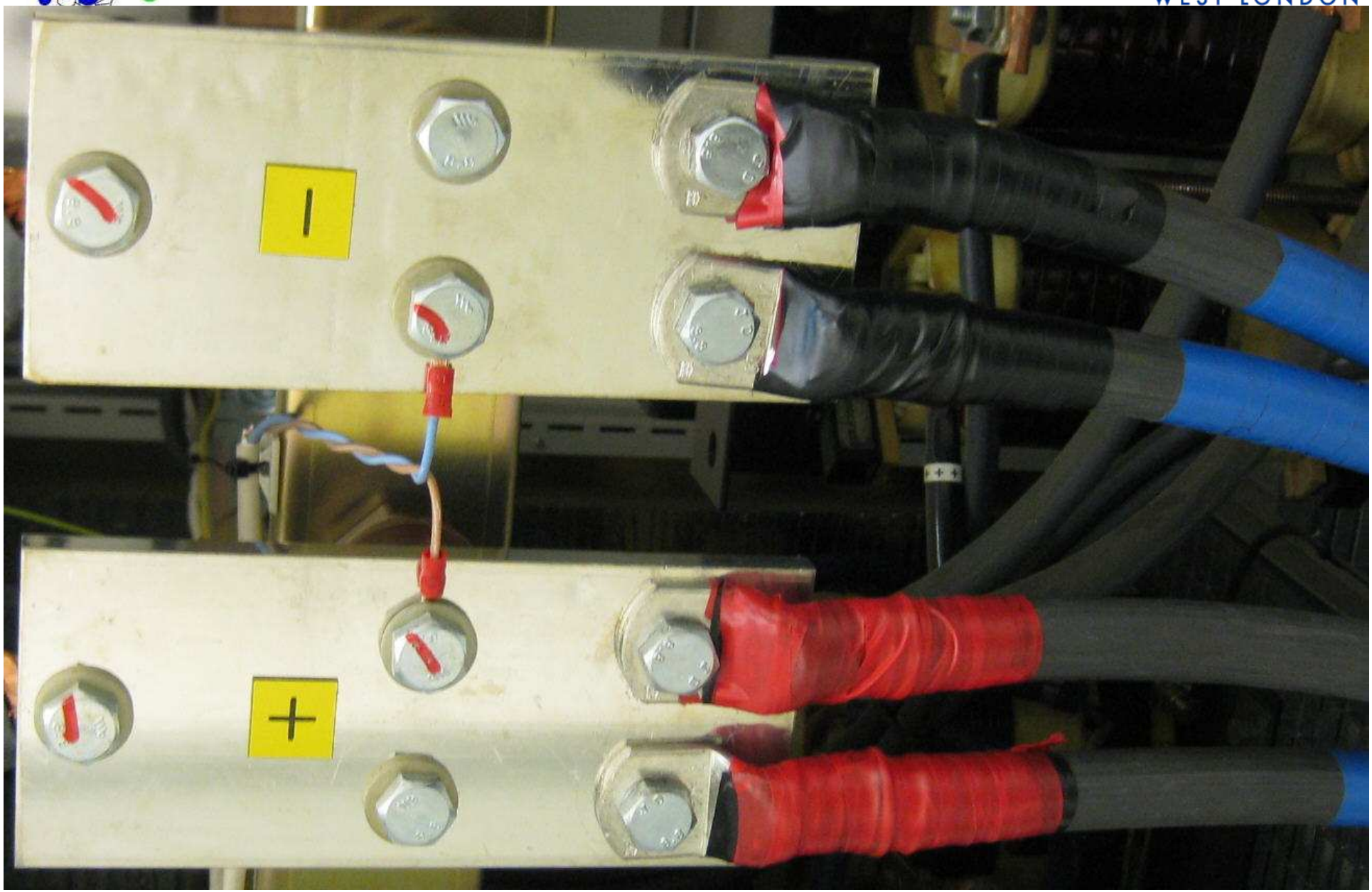
We thus need a way to ensure that all magnets have been wired correctly. The end result is specified by "Convention on MICE Beam Line Magnet Polarities" (MICE Note 198). This defines the electrical input needed for the correct magnetic performance of each magnet, and identifies "positive" and "negative" terminals at the *magnets*. However, it also mandates that changes are implemented by swapping the leads at the *power supplies* (not least because access is easier).

The problem

Hence in order to keep track of things, the Convention applies the labels "positive" and "negative" (and associated colouring) to the *cables*; thus for a "negative beamline" set up for negatively charged particles, the "negative cable" is attached to the *positive* terminal of the supply.

Unfortunately the two separate meanings of *positive* and *negative* (the action of the beamline, and the output of a DC power supply) are not readily appreciated by the electricians (note the layers of tape):

Q4 MPS (as it was before)



Hence…

It would seem preferable to have the *cables* labelled using a scheme that does NOT directly incorporate (or imply) the words "positive" and "negative", or the associated colours of red and black.

Beyond this, the aim here is neither to contradict nor supersede MICE Note 198.

One possibility would be to assign a unique ID to each cable. While this might be useful for other things, it would be far too cumbersome when requesting or verifying a "simple" change of beam polarity.

Current Solution

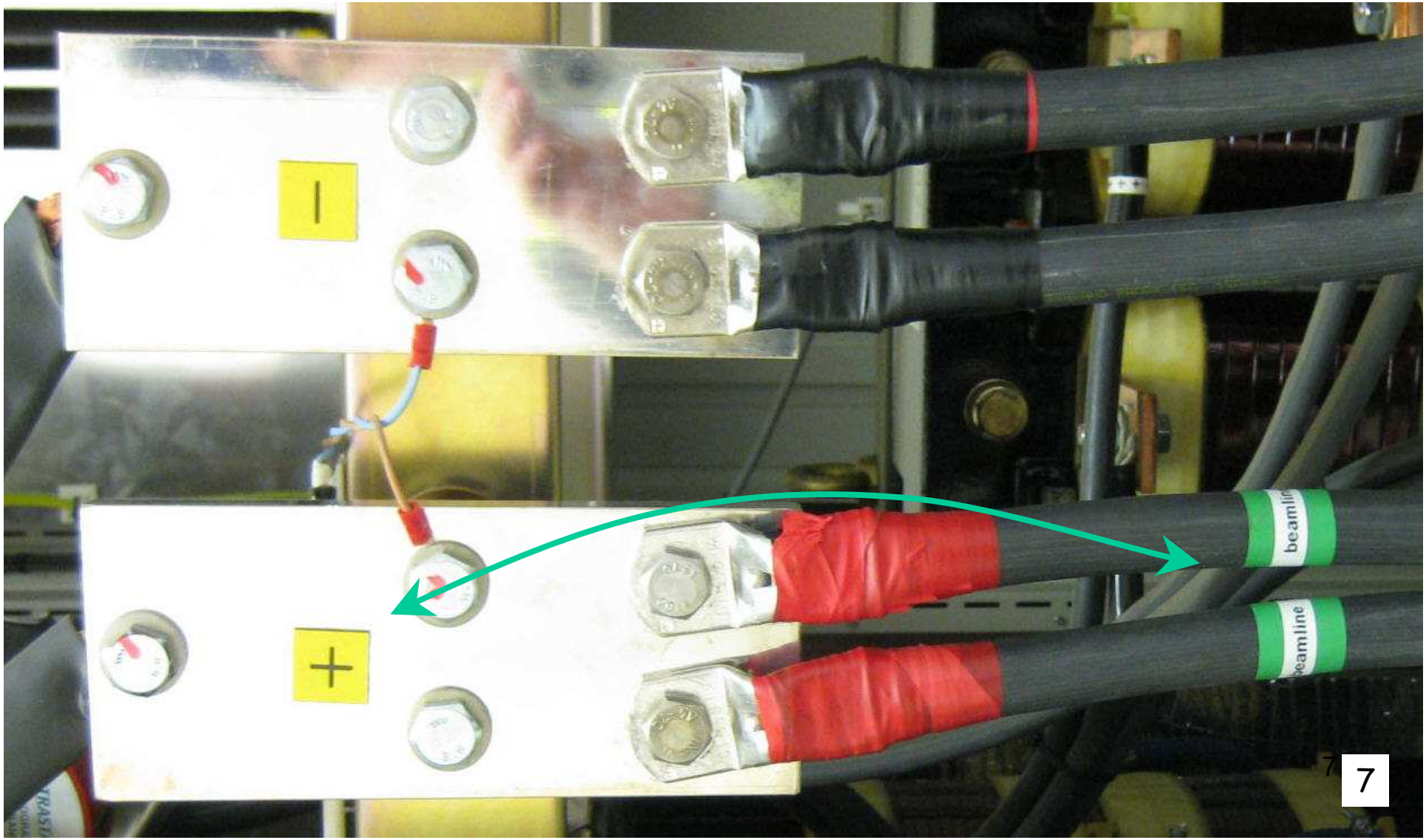
The aim is a scheme that makes it straightforward to open a cabinet in the MICE Hall and confirm that the wiring is correct with a simple visual check.

One (pair of) cables has been labelled with the word "beamline".
Then, for a positive beamline the "beamline" should be connected to the +ve supply terminal.
For a negative beamline, the "beamline" should be connected to the -ve supply terminal.

The label is applied over green tape, making it easy to spot.

(Proposal accepted verbally by Martin Hughes on 18/3/2010 and at MICO meeting on 12/4/2010)

Updated Power Supply End



Magnet end

Although MICE Note 198 specifies that the leads should never be disconnected at the magnet end, there is always the possibility of a mistake. It would thus be prudent also to label the magnet end of the cables.

I suggest using labels with similar appearance but titled "reference" applied to the cable connected to the "positive" magnet terminal.

(Can't use "beamline" as it could get mistaken as indicating the beamline polarity or cables to swap, as at the power supply end. Can't use e.g. "+" as this could be interpreted as being the cable carrying the +ve voltage.)

Updated Q9

Magnet Polarity Summary

At the MAGNETS:

The "reference" leads are permanently connected to the "positive" terminal

At the SUPPLIES:

If the "beamline" leads are connected to the positive output, have a "positive beamline"

If the "beamline" leads are connected to the negative output, have a "negative beamline"

Simples!

http://www.comparethemeerkat.com/

Status

Labels as described have been applied at all beamline magnet power supplies (Q1-9, D1&2).

Labels have been applied at all the magnets.

The beamline polarity has been swapped since Marco checked a couple of the magnets directly with the gaussmeter and it's been a long time since all were checked – thus:
the polarity of ALL magnets needs to be re-validated once all labels are in place.

Q7 (because it's hard to get a picture of casually checking an MPS)

Polarity setting easily visible: