

## Replacing the Q1, TSP at A49 and B11

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The Q1's and the TSP spools installed at A49 and B11 are required for a future C0 IR. This is a proposal on how to replace these devices so that functionality is not lost at A49 or B11.

### A49:

At this location the Q1 and TSP are adjacent and the TSP is inboard of the Q1 (closer to the IR). A dipole is just upstream of the Q1, and the start of the bypass for the separators is just downstream of the TSP. There is main Tev bus through these devices, but it is not connected in these 2 devices. (According to QPM drawing #1760-ED-158503 the Tev bus is folded at the end of A48-5.) The circuits used in the TSP are HDA49, VDA49, and SQA4 which are all essential for Tevatron operation. HBPMA49 and VBPM49 are also in the TSP and are essential for operation. The Q1 slot length is 72.827" and the TSP slot length is 56.149".

Plan A: Replace the Q1 and TSP with two devices: a (new) cold spool containing a horizontal BPM and a TSH (non-HTS leads, since the power leads will not be used here). The TSH has VD, HD, and SQ coils and a VBPM. The slot length of a TSH is 49.910" The slot length of the new HBPM spool will need to be 79.066". The TSH should be inboard of the cold BPM spool in order to maximize the effectiveness of VDA49 in making IR position bumps.

Some concrete work will need to be done to fill the 1.5 – 2" trench made for the Q1. A check needs to be done to see if any additional tunnel infrastructure modification is required to accommodate the TSH (probably not). It also needs to be checked that the internal He and N interconnects are compatible in this scheme.

### B11:

At this location the Q1 and TSP are adjacent and the TSP is inboard of the Q1 (closer to the IR). The end of the separator bypass is just upstream of the TSP, and a TSR is just downstream of the Q1. A dipole is downstream of the TSR. There is main Tev bus through these devices, but it is not connected in the Q1 or TSP. The circuits used in the TSP are HDB11, VDB11, and SQB1 which are all essential for Tevatron operation. HBPMB11 and VBPMB11 are also in the TSP and are essential for operation. The TSR has no internal coils and is used only to provide an (external) turnaround for the main Tev bus. It has reversed cryogen pipes. It has a slot length of 40.729".

Plan A: Replace the Q1, TSP, and TSR with two devices: a (new) cold spool containing a horizontal BPM and a TSHH (with HTS leads). The TSHH has VD, HD, and SQ coils, a VBPM, and will provide an external turnaround for the main Tev bus. The slot length of the new HBPM spool will need to be 119.795". The TSHH should be inboard of the cold BPM spool so that the cryogen pipes can be reversed in the BPM spool. This will require Tev through bus in the BPM spool.

Some concrete work will need to be done to fill the 1.5 – 2" trench made for the Q1. Some cryo and QPM software needs to be modified to accommodate the HTS leads, but this has previously been done successfully at A48. A check needs to be done to see if any additional tunnel infrastructure needs to be modified to accommodate the TSHH (perhaps, because of the larger HTS

leads). It also needs to be checked that the internal He, N, and through-bus interconnects are compatible in this scheme.

**Spares:**

Currently there are 7 installed TSH, 1 spare, 4 on the repair list (all 4 are listed at “hard” repairs). There is 1 installed TSHH and 3 spares. In the above scheme, at least one of the TSH would have to be repaired and made into a good spare.

**Plan B:**

Same as above plan, but put a TSHH at A49. This plan will not require repairing a TSH.

**Plan C:** At D0 2 TSS’s were made from TSH’s by removing the power leads. This could be done to one more H spool and installed at A49, especially if one of the TSH is ripped into for repair.

**Plan D (could be part of Plan A or B or C):**

Remove the TSHA from A11 and replace with a TSH. Then convert both TSHA to TSH. Needs to be investigated if a TSH will fit in A11.

**Summary:**

**At A49 replace Q1-TSP with cold BPM spool and TSH(H).**

**At B11 replace Q1-TSP-TSR with cold BPM spool and TSHH.**

**finer details to be worked out .....**