

Date: April 15, 2004

Subj: APS drawings [25030101-00014](#) PAR flag/tuner chamber S-6
[25030101-200000](#) PAR spare chamber SP-6 (spare flag)

Spare status: Spare chamber SP-6: chamber design complete;
Beam tube being fabricated



Fig. 1: Eventual storage location of SP-6 chamber in 382

Further details:

- **General information about flag (fluorescent screen) chamber and spares**

There are six flag (fluorescent screen) chambers installed in PAR. There are installed as parts of the following chambers:

- S-5 (located in two places, one on each equator)
- S-6 (located in one place on extraction side of septum)
- S-6A (located in one place on injection side of septum)
- S-9 (located in two places)

The flags are of critical value during beam startup operations. Dr. M. Borland has stated that at least one of the two S-5 flags must be present at all times. Since there are two S-5 chambers, the spare chamber for S-5 (SP-5) is a section of beamtube only (spool piece).

The flags that are part of the S-6 and S-6A chambers are critical and a spare for each of these two chambers is essential. Each of these two chambers is intended to have a dedicated spare.

The S-9 flags are not critical and are spared by S-3 beamtube chamber which is essentially a spool piece.

- **General information about stripline BPM spares**

The S-6 chamber, located on the extraction side of the septum, also contains a stripline tuner as an integral component. However, this stripline tuner is not considered critical to operation of PAR.

“Stripline” is the term given to beam position monitors (BPM’s) used in PAR. One of the important features of all striplines is ceramic feedthroughs which carry the electrical signal from the stripline BPM to relevant instrumentation. The ceramic material is used as the feedthrough vacuum seal and electrical insulator for the signal. These feedthroughs are very sensitive to mechanical impact and are easily cracked. When a failure occurs, the result is often a vacuum leak.

The striplines have been built as integral parts of vacuum chambers in PAR. This was dictated by the generally limited space available between magnets. For this reason, stripline housings are all made on Inconel 625 (non-magnetic). For the S-6 chamber, however, the stripline tuner is not installed in a magnet.

A few stripline ceramics have failed in fabrication, but none has been known to fail in the ring as yet.

Striplines are relatively difficult to make because they require electron beam welding methods as well as close tolerances. The level of difficulty of fabrication and the use of Inconel material makes stripline fabrication costs very high.

The S-4 and S-6 striplines are used as “tuners” or “pingers” to excite the beam and notice a corresponding response. For this reason, there are only two of these units. One unit is part of the S-4 chamber. The other unit is part of the S-6 chamber. Neither of these particular striplines is critical to operation of the beam.

- **S-6 Flag/Tuner Chamber (APS drawing [25030101-00014](#))**

This chamber is installed in PAR in one place as shown in Fig. 3 on extraction side of septum.



Fig. 3: S-6 flag/tuner chamber installed in PAR

Use spare vacuum chamber SP-6 (APS drawing [25030101-200000](#)) to replace an original S-6 chamber if necessary.

- **Original SP-6 vacuum chamber**

A spare chamber for S-6 was fabricated during the original construction period of APS. This chamber was fabricated per APS drawing 25030101-00031. This chamber has been used to fabricate the new SP-6 spare per drawing [25030101-200000](#). The original chamber will be cut at the appropriate location along the beam tube so that the amended spare chamber can accommodate a flag housing.