Date: April 2, 2004

Subj: **APS drawing 25030101-121000**
PAR Ring Layout (Vacuum Chamber Locations)

Dwg. status: **Layout complete and latest rev. (01) approved 3-25-2004**
Done by R. Kmak and R. Dortwegt

Further details:

- **Identification of proper spare vacuum chamber**

Use the referenced drawing to identify the locations of the various types of vacuum chambers in PAR (Positron Accumulator Ring). The ring is formed by 49 vacuum chamber elements that are individually identified on the drawing. The 49 elements are comprised of 25 different chambers of varying types. These 25 chamber types are also identified here for convenience with identification "tags" as follows:

Chamber Tag & Name	APS Dwg. No.	Spare Tag & Name	APS Dwg. No.
Ring Item	Drawing/Part No.	Spare Item	Drawing/Part No.
B-1 Vacuum Chamber	25030101-00018	B-2 Vacuum Chamber	25030101-00019
B-2 Vacuum Chamber	25030101-00019	B-2 Vacuum Chamber	25030101-00019
EXTR Vacuum Chamber	25030101-100100	EXTR Vac. Chamber Spare	25030101-100200
INJ Vacuum Chamber	25030101-00006	INJ Vacuum Chamber Spare	25030101-100200
Septum Vacuum Chamber	250104-880000	Septum Vacuum Chamber	250104-880000
RF (fund.) Vac Chmbr	25040101-420000	RF (fundamental) Vac Chmbr	25040101-420000
RF Bellows Chamber	25040101-570201	RF Bellows Chamber	25040101-570201
RF Ceramic Break Chmbr	25040101-570300	RF Ceramic Break Chamber	25040101-570300
RF (12th Har) Vac Chmbr	25040102-150200	RF (12th Harm) Vac Chmbr	25040102-150200
Vacuum valve	VAT 84571	Vacuum valve	VAT 84571
Kicker Vacuum Chamber	250301-700000	Kicker Vacuum Chamber	250301-700000
S-1 Vacuum Chamber	25030101-00009	SP-1 Vacuum Chamber	25030101-100064
S-1A Vacuum Chamber	25030101-000010	SP-1A Vacuum Chamber	25030101-400000
S-1B Vacuum Chamber	25030101-100020	SP-1 Vacuum Chamber	25030101-100064
S-2 Vacuum Chamber	25030101-00011	S-2 or SP-2 Vacuum Chmbr	25030101-00011 or -300000
S-3 Vacuum Chamber	25030101-00016	S-3 Vacuum Chamber	25030101-00016
S-4 Vacuum Chamber	25030101-00017	S-4 Vacuum Chamber	25030101-00017 or -100001
S-5 Vacuum Chamber	25030101-00013	SP-5 Vacuum Chamber	25030101-00030
S-6 Vacuum Chamber	25030101-00014	SP-6 Vacuum Chamber	25030101-200000
S-6A Vacuum Chamber	25030101-00015	SP-6A Vacuum Chamber	25030101-200001
S-7 Vacuum Chamber	25030101-00012	S-7 Vacuum Chamber	25030101-00012
S-7A Vacuum Chamber	25030101-00046	S-7A Vacuum Chamber	25030101-00046
S-8 Vacuum Chamber	25030101-00032	S-8 Vacuum Chamber	25030101-00032
S-9 Vacuum Chamber	25030101-100027	S-3 Vacuum Chamber	25030101-00016
S-T Current Monitor	125541-110000	SP-T Vacuum Chamber	25030101-00029

- **Spare vacuum chamber may not be identical to chamber installed in PAR ring**

For at least one half of all 49 vacuum elements that form the ring, the spare vacuum chamber is not identical to the originally installed chamber. For this reason, use of the reference table above (and in the referenced drawing) must be employed to determine the appropriate spare chamber. When the spare is not identical to the original, a different drawing number will be listed.

- **Spare vacuum chambers located in building 382**

A photograph of the vacuum chamber spares cabinets is presented in Figure 1. The cabinets are located on the mezzanine level in the southeast end of the building. The cabinets are numbered (numbers to be determined).

Fig. 1: PAR spare vacuum chambers shown in (open) cabinets on mezzanine in Bldg 382

- **Persons in ASD responsible for PAR spares**

Person	**Responsibility**	**Item no. (dwg. 25030101-121000)**
M. Jaski	Septum	1
R. Putnam	Kickers	9, 33, 42

L. Morrison	RF components	24, 25, 26
J. Gagliano	Vacuum valve	4, 47
J. Gagliano	Windows for flags	
J. Gagliano	Installation hardware (EVAC seals and clamps)	
R. Dortwegt	All other (see note below)	

Note: the above list concerns responsibility for spares. It should be noted that R. Dortwegt has provided a spare for the current transformer in the form of a spool piece. Responsibility for the current transformer itself was with E. Rotella, the original design engineer, who has since retired. Specification of the responsibility for the current transformer itself is not intended by the above list.

- **Design documents for spares**

Two ASD design specifications exist for PAR spares. These were written for the purpose of documenting background information and rationale for spare vacuum chamber fabrication.

The first document is specification **2001-009**, written in June of 2001. The second document is revision no. 1 to this specification and was written in March of 2002. Together these two documents form the basis of the approach to spares that has been taken by the ASD-ME Group in 2004. This second document was approved by the ring physicist (M. Borland) and both the ASD-ME and Diagnostics Group Leaders (S. Sharma and O. Singh). However, the document is not yet formally approved and is not posted on the ASD website.

The text of the revised ASD specification covering PAR vacuum spares follows in the next section. There is one detail in the text concerning spares for chambers S-6/S-6A and those that contain stripline BPM's (S-1, S-1A, S-1B and S-2) that requires further clarification.

The revised document was written on the basis of employing one identical spare for S-6 and S-6A. Upon further review, it has been determined that this is not possible as the chambers are not installed symmetrically about the PAR centerline. For this reason, chambers S-6 and S-6A must be provided with separate spares tagged SP-6 and SP-6A, respectively.

- **Text of (partially) approved, but unposted specification revision**

Spare Vacuum Chambers for PAR Stripline BPM's and Fluorescent Screens (ASD Specification No. 2001-009, Revision No. 1)

Reference is made to APS drawing no. 25030101-121000 which indicates the location of all PAR vacuum chambers, diagnostic devices, and other components.

Operational requirements and troubleshooting efforts in PAR require a revised approach to the implementation of spares for vacuum chambers that include integral housings for certain

diagnostic devices. This approach recognizes the important need for maintaining certain fluorescent screens operational to diagnose upsets of the injection/extraction process and kicker magnet performance. This approach is also based on the notion that there are sufficient BPM (beam position monitor) striplines such that any anticipated failure of these could be tolerated while a replacement is fabricated.

It is essential that at least one of the two fluorescent screens located along the equator at east and west ends of the ring always be operational (items 14 and 37 of referenced drawing). Since there are two of these chambers (type S-5) and the operation of only one is deemed essential, these chambers will be considered "installed" spares for each other. Should a failure to one of these chambers occur, it may be removed and repaired. While repairs to the chamber are made, it may be replaced with a section of simple beam tube which has no provision for fluorescent screen. In fact, such a spare already exists (labeled chamber SP-5)

It is essential that both fluorescent screens immediately upstream and downstream of the septum (items 3 and 48 of referenced drawing) remain operational at all times. The S-6 chamber (item 3) also houses a "tuner" and S-6A chamber (item 48) also houses horizontal and vertical scrapers that are not essential to PAR operation. Therefore, one spare chamber will be fabricated which will have provision for a fluorescent screen only and can replace either S-6 (item 3) or S-6A (item 48) if needed. (Ed. Note April, 2004: the last sentence is incorrect. S-6 and S-6A will be provided with separate spares tagged SP-6 and SP-6A as discussed in the previous section).

Vacuum chambers that house stripline BPM's will be spared by chambers without striplines (beam tube only). If a stripline fails, it will be necessary to repair the stripline chamber and use of the corresponding BPM will be lost. It is anticipated that repair of stripline chambers would require approximately six months lead time.

There are four types of chambers which house the sixteen stripline BPM's (S-1, S-1A, S-1B, and S-2). There will be only one beam tube spare provided for each type (total of three spare chambers because S-1 and S-1A chambers can be spared by the same chamber).

Currently, there exists one spare S-2 stripline chamber that could be installed if needed. This covers a spare for half of the installed striplines. However, there are no S-1, S-1A or S-1B spare chambers with installed striplines.