

Vacuum Group Procedure VA-008.18.1.68
Original Issue Date: 07/09/91
Revision A

Submitted by: G. Melody
Reviewed/Vacuum Supervisor: Bob Sim
Approved/AGS Cognizant Engineer: J. Inyolo 2/9/91

AGS DIPOLE MAGNET VACUUM CHAMBER **BAKEOUTPROCEDURE**

AGS Procedure No.	8.18.1.68
Revision	A
Pages	6
Date Effective	<u>7/9/1991</u>

1.0 PURPOSE

- 1.1 To provide a safe and effective procedure for the baking of steam-cleaned AGS dipole magnet chambers removed from the AGS and refurbished.

NOTE:

This work must be done in the chamber bakeout oven in Building 975, a radiation work area.

2.0 RESPONSIBILITIES

- 2.1 The AGS Vacuum group technicians shall be responsible for the implementation of this procedure.

3.0 DISCUSSION

- 3.1 This procedure will be initiated once the chambers have been steamcleaned, properly welded, initially leakchecked and the chambers placed on the all-metal oven carts. Each cart is equipped with vacuum manifold. Oven, carts, and vacuum system has been designed and built to aid in both safety and efficiency.

4.0 PRECAUTIONS

- 4.1 The operator(s) shall be aware of radiation levels of the chambers as indicated on the "traveler" sheet attached to each. The operator(s) shall work in a manner which keeps their radiation dose as low as reasonably achievable.

- 4.2 All seals used during leak check and bakeout must be clean, grease-free viton a Q-rings. No lubricants will be used anywhere on the chambers once they have been steamcleaned.
- 4.3 Leak checking will be done through the ion pump conduit to avoid the making and breaking of the 9.500 inch clamps, flanges and seals.
- 4.4 UHV practice must be observed in the making and breaking of all joints throughout this procedure. Clean white cotton/nylon gloves must be worn if the chamber interior is exposed.
- 4.5 After bakeout the viton o-rings will adhere to the chamber and blank-off flanges. To separate the flange pair remove the clamp and set aside. Locate the four (4) diametrically opposed notches in the retainer. Using only the notches on the side of the retainer facing the blankoff flanges, carefully insert a thin screwdriver/prying tool with the tip coated with plastic into the notch. Pull the tool handle towards the chamber prying the blankoff flange away from the retainer. With one technician working the tool another technician will hold the blankoff and remove it when the adhesive bond is broken. The o-ring, using clean white gloves, will be peeled from the chamber flange and stored for further use. Caution should be taken not to scratch any of the flanges during this procedure.

5.0 PREREQUISITES

- 5.1 The technicians will have been trained in this procedure and "Bakeout Oven Procedure" 08.18.1.31. Also required is a working knowledge of ultra-high vacuum technique and use of vacuum leak detection equipment.
- 5.2 Activation Worker Training (BNL OH&S Guide 3.5.0) is required for all technicians.
- 5.3 In addition to any protective clothing listed all technicians are required to wear film badges and self-reading dosimeters.

6.0 OPERATIONAL PROCEDURE

- 6.1 with the cart handles removed, the chambers will be loaded on to the oven carts such that the ion pump pumpout conduits point towards the floor. The conduit will rest against the cart on the handle-side of the cart.
- 6.2 As a chamber is placed in the cart, bellows retainers will be clamped on each bellows. Each bellows retainer should reside in both transition convolutions. The ion pump flange will be sealed to the corresponding flex-hose / adapter assembly on the cart-mounted vacuum manifold using a seal retainer, an o-ring seal and an ion pump clamp.

- 6.3 Once all chambers to be baked are on the cart and clamped, the unused flex-hoses, if any, will be sealed with a blankoff flange, o-ring seal and clamp. The unused clamped pairs will be retained by clamping them to the manifold support. The manifold's 36 inch flex-hose will be mated to the turbopump roughing station via a KF-type clamp, flange seal/retainer arrangement.
- 6.4 A vacuum will be pulled on the chambers through the manifold with the turbopump roughing station (station). The station will be appended with a leak detector. The station / leak detector connection will be through the turbopump such that no hydrocarbon backstreaming from the mechanical pump can occur.
- 6.5 The bakeout vacuum system, consisting of chambers, manifold, with 36 inch flex-hose, and the pumping station, will now be leak checked using a leak detector calibrated within the previous eight (8) hours.
- 6.6 Passing leak check, the all-metal valve on the manifold will be closed, the leak detector vented, the station power switched off and the station back-to-air valve opened, once the turbo speed has dropped by 50% of running speed. The manifold / station vacuum joint is now broken.
- 6.7 The "traveler" sheets will be removed from the chambers and stored such the traveler / chamber order is maintained.
- 6.8 With the cart handle replaced, the loaded and leak checked cart will be pushed into the oven until the cart wheels reach the cart-stops. The oven turbo station (oven station) will be connected to the manifold through the KF type fitting on the 36 inch flex-hose. The oven station will be powered on, pulling a vacuum on the oven manifold and the flex-hose. The oven manifold and connection between manifolds will be leak checked.
- 6.9 Passing leak check, the cart handle will be removed. The manifold valve will be opened. The oven doors closed and latched. The oven controller is programmed to reach 2000C (42SoF) in two (2) hours, soak at 2000C for eight (8) hours and cool back to ambient temperature in six (6) hours (a sixteen hour cycle).
- 6.10 AGS Procedure # 08.18.1.31 "Use of Chamber Bakeout Oven" must be followed for the proper baking of the chambers. Section 9.0 (paragraphs: 1 thru 13) will be implemented in this procedure after paragraph 6.9. WARNING: The oven will not be operated by anyone not trained in both procedures.
- 6.11 When the cycle is complete the oven's internal temperature indicator will read between ambient temperature and ambient + 30oF. The oven doors will be opened. The manifold valve will be closed. The turbo station switched off. The turbo station back-to-air valve will be opened once the turbo has reached approximately one half of its normal operating speed. The manifold/station joint will be broken. If necessary, a prying tool will be inserted in to the gap between

the KF-type flanges to break open the joint. Care must be taken not to scratch the flanges.

- 6.12 The cart handle will be replaced and the cart removed from the oven. The travelers will be replaced at this time. Care will be taken so chambers are correctly labeled.
- 6.13 The manifold's flex-hose will be joined to the leak check turbo station. A final leak check will be done. After leak check, the travelers will be updated, the manifold valve will be closed and the turbo station vented, when the proper turbo speed is reached. The flex-hose will be uncoupled from the station and fitted with a KF-type fitting having a .375" hose-barb at the other end. Using this fitting, the chambers will be bled-up to atmosphere with 99.99% nitrogen.
- 6.14 Blankoff flanges will be removed using the criteria of paragraph 4.6 of this procedure.
- 6.15 Once the blankoff flanges are removed, all the chamber flanges must be covered with aluminum foil and/or plastic boots. The chamber will be put into abeyance or transported to the ring.

7.0 ACCEPTANCE CRITERIA

- 7.1 All chambers must pass final leak check (paragraph 6.13). If any chamber fails it must be reported to the factory supervisor and noted on the traveler.
- 7.2 All chamber flanges must be free of scratches and nicks on the sealing surface. Ceramic coated flanges must also be free of scratches as well as free of chips in the ceramic.
- 7.3 All chambers will be correctly tagged with completed and fully updated travelers before leaving building 975.