DAΦNE TECHNICAL NOTE

INFN - LNF, Accelerator Division

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Note: **V-9**

VACUUM CHAMBER FIRST ASSEMBLING

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The following items are the result of many discussions with Henry Halama; we thank him for many helpful suggestions.

1) We assume (and we will try) to receive all the vacuum chamber parts and components (Al or S.S.) cleaned, welded, and leak checked. Generally they will not be baked, except the ring chambers which will be leak checked at vendor's plants.

   At Frascati, after inspection, components will be assembled in a proper room and connected to a vacuum system (oil-free forevacuum plus an ion pump). Heaters for baking and gauges for total and partial pressure measurements are installed, together with electrodes for glow discharge treatement.

   The following procedures are foreseen.

   - First Helium leak detection using Mass Spectrometer.

   - Baking. During the bake-out the water partial pressure will be observed using the Mass Spectrometer; a large reduction of the water peak indicates the end of the baking.

   - Glow discharge cleaning. Conditions:
     a) Vacuum chamber at baking temperature.
     b) A mixture of Argon 90% - Oxigen 10% is recommended.
     c) This mixture will flow continuosly at a pressure of about 10 milli-torr (a proper vacuum system must be designed for this purpose).
     d) A Mass Spectrometer installed in a separate vacuum chamber, connected to the vacuum chamber under test through a leak valve, will be used to monitor the C-H peaks (carbon organic compounds), a large reduction of these peaks will indicate the end of the treatement.
     e) A Nitrogen glow discharge, following the Argon-Oxigen treatement, is recommended but not necessary.
     f) Ion pumps, specially the Distributed ion Pumps, must be protected from the discharge. If NEG pumps will be used it is advisable to mount them after this treatement.

- After baking and glow discharge cleaning a second Helium leak detection will be performed at the maximum possible sensitivity.

- Finally the chamber will be vented with slight positive dry Nitrogen and sealed until ready to be installed.

2) Vacuum Group has to follow the above procedures. Proper instruments must be bought to control the gas mixture. Point 1) rules are valid both for Aluminum and for Stainless Steel.

3) As a general rule, to check how good the chemical cleaning has been, it is sufficient to observe if a continuous layer of water is present on the treated surface, if the water film is interrupted or the water forms drops on the surface, this means that the degreasing treatement is absolutely not sufficient. This rule must be accepted by the contractor.

4) Beam conditioning. The first conditioning will create a very large gas desorption. On the other hand, it is not advisable to let ion pumps work at a high pressure because in this case their pumping efficiency will be reduced. The same for sublimators, high evaporation rate reduces their useful life. Therefore very low beam currents are recommended at the beginning of the conditioning.

   If a quick conditioning is needed, the installation of additional pumps with high throwput can be foreseen. For example, if it is necessary to work continuously, at the beginning, at 100 nanotorr a small number of cryopumps would be sufficient, saving ion and sublimation pumps.

5) Chemical cleaning. The traditional procedure makes use of tanks to clean and wash the vacuum chambers. In our case a big number of large tanks would be necessary, also because we would need different baths for cleaning Aluminum, Stainless Steel and Copper. Nowadays a high pressure spray gun is often used, specially for long chambers (see the cleaning of the LEP vacuum chamber). The spray gun system is not expensive and needs only a few tanks (but if aggressive chemical are used there are more safety problems). We have to study the best solution for our system.

6) Titanium ion pumps. Star-Cell ion pumps are well known and studied. If they will be used, performance tests will not be necessary. Pumps from other companies will need laboratory evaluation. Following tests are necessary:

   - The ultimate pressure.

   - The behaviour after having pumped high gas loads.

   - The pumping speed versus pressure.