iii. The Storage rf System

Initial plans foresaw the development at BNL of a dedicated 160 MHz system. It happened, however, that CERN was introducing superconducting cavities in the SPS ring, therefore, decommissioning part of their so-called "SWC" system working at 200.1 MHz. After a feasibility study, the decision was taken to adapt the available SWC-units for use in RHIC. Each CERN cavity is equipped with a DC servo motor driven tuner, HOM-suppressor, a pneumatically actuated damping loop to reduce the impedance of non-operating units by a factor of 500, an individual local power amplifier and the low level circuitry. In the CERN SPS installation, groups of 8 cavities share a common power supply and driver amplifier. A complete description may be found in the paper of P.E. Faugeras;[1] an axonometric view of the cavity is given in Fig. 7-5.

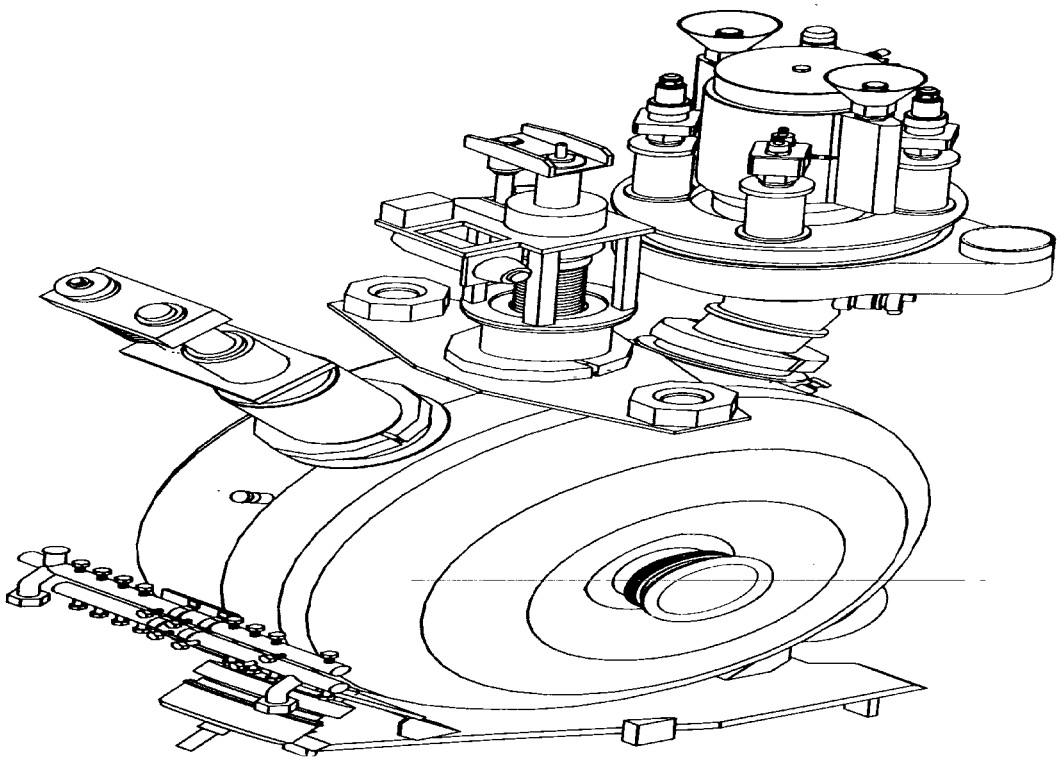

Fig. 7-5. Standing wave cavity (CERN), complete assembly with accessories (CCW from top right): amplifier, damping loop, tuner, water manifold, HOM-coupler.

[1] P. E. Faugeras et al, *The New rf System for Lepton Acceleration in the CERN SPS*, Proc. of the IEEE 1987 PAC, Washington, D.C., p. 1719.

The main modifications for use in RHIC include:

- Retuning of the system to 197.05 MHz by reducing the cavity gap via a lead-screw "crusher" tuner available from the NSLS at BNL and modification of the power amplifier.
- Addition of individual driver amplifiers to implement local rf feedback loops for reduction of the beam-induced voltage.
- Purchase of individual anode power supplies to prevent beam dump which would occur during a combined anode power supply crowbar.

The modified units will have the following key parameters:

Frequency	197.05	MHz
R/Q	162	Ω
Q unloaded	44000	
Q with local feedback	~250	
Accelerating voltage	1	MV per cavity

Ten cavity systems have been purchased from CERN and will be installed in the RHIC ring. In order to provide the required 6 MV/ring at minimum cost 4 cavities will be located common to both rings in the 4 o'clock interaction point. The remaining 6 cavities will be placed 3 per individual ring to provide the required capture voltage and control of the separate beams. Studies are continuing to build the necessary flexibility into the rf system to cope with the possible future RHIC upgrades:

- Provide a voltage of 16 to 18 MV per ring.
- Accept a sixfold increase in beam current (doubled number of bunches, each with tripled charge).

Reducing the transient beam loading to acceptable levels is a key consideration in this context. The use of superconducting cavities becomes very attractive under these conditions because of the extremely low R/Q which can be obtained, in addition to a high accelerating gradient.