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HIGH-POWER RF WINDOW

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HIGH-POWER RF WINDOW
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In the construction of traveling-wave linear accelerators an rf window is normally needed between the accelerator waveguide and the source of rf power. The Berkeley Mark I accelerator used a Polyethylene disk clamped between two flanges. A V-ring turned in one of the flanges was pressed into the Polyethylene disk to form the vacuum seal when the two flanges were clamped together. A choke flange reduced the current at the clamped joint. This window ran at several megawatts of power and had periodic failures.

With the construction of the second linear accelerator, it was desired to fabricate some form of ceramic window of high reliability. Therefore the development of a reheatable high-power ceramic window was undertaken.

Electrical tests showed that the best geometry for a round window in rectangular waveguide is a hole in the common wall between two sections of waveguide. This location also removes the ceramic disk from direct electron bombardment, in case this is a problem.

The problem of fabricating this geometry was solved by vacuum-casting OFHC copper around the edge of a high-alumina disk metalized with titanium hydride. A molybdenum washer is cast in the copper centered on the edge of the disk. This reduces the strain on the copper-ceramic joint during subsequent reheats by restricting the

expansion of the copper. After casting, the metalized disk is machined as shown in Fig. 1. It is then vacuum-checked with a leak detector, heated to 500°C in hydrogen, cooled and rechecked for vacuum tightness. If still vacuumtight, it is then hydrogen-furnace brazed with silver-copper eutectic into a waveguide assembly as shown in Fig. 2.

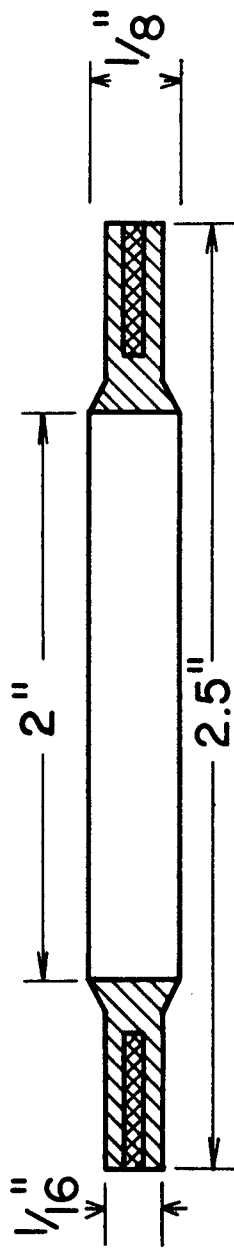
The final window has a voltage standing-wave ratio (V. S. W. R.) in the range of 1.01 to 1.03. For example one window gave a V. S. W. R. of 1.01 at 2855 megacycles, and had a V. S. W. R. less than 1.02 for 200 megacycles centered around 2850 megacycles. To date windows of this type have been used on four linacs and have operated quite satisfactorily. The only ones that failed were punctured at about four megawatts power when a magnetron drifted off frequency and produced a large V. S. W. R. with a high voltage at the window.




For a more detailed account, refer to UCRL-8874.

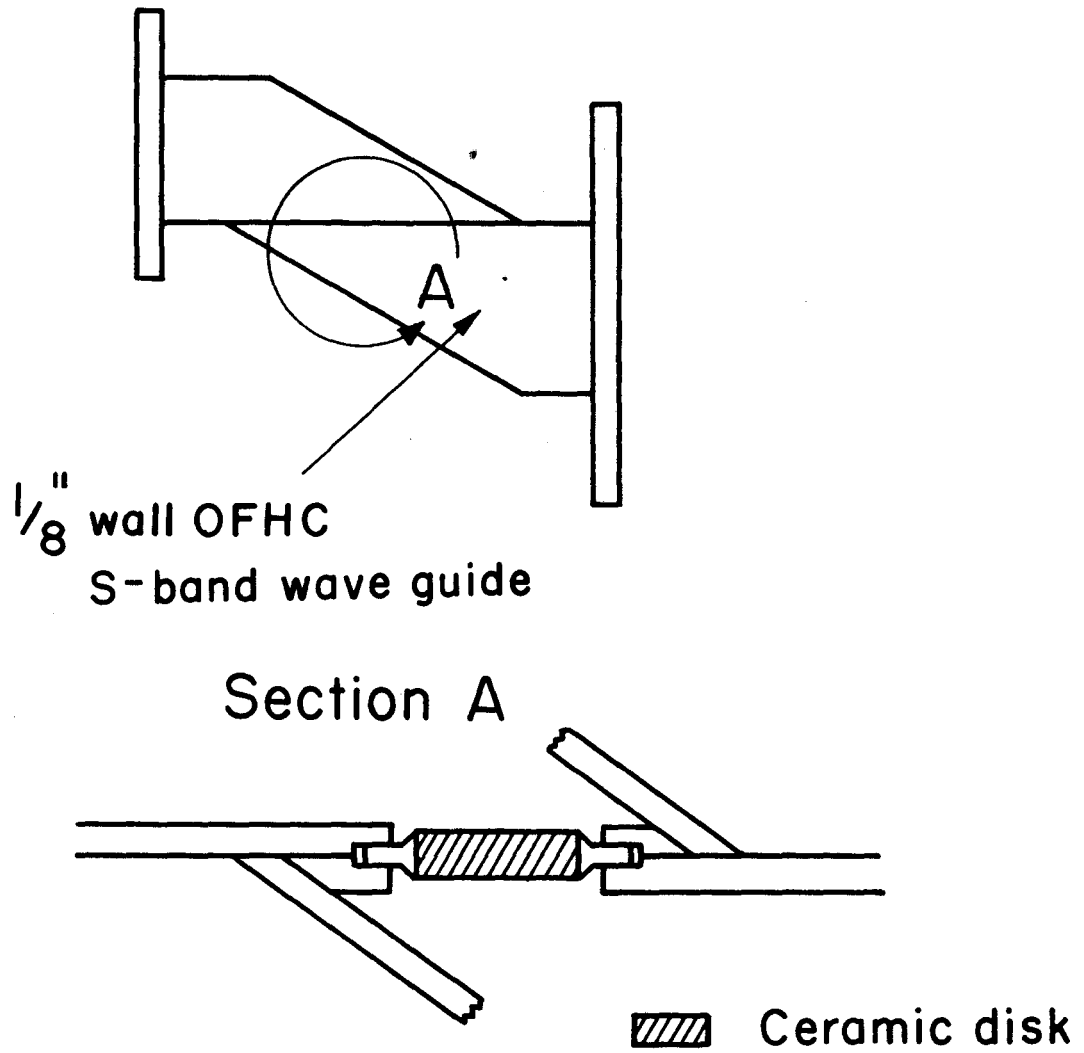
LEGENDS

Fig. 1. Cross section of a metalized disk.

Fig. 2. Waveguide assembly (not to scale).



-  Alumina ceramic
-  OFHC Copper
-  Molybdenum



REFERENCES

1. K. C. Crebbin and D. F. Moiser, High-Power RF Window, UCRL-8874 (to be issued).