

## ARGONNE'S NEW TUNABLE RF WINDOW

### BENEFITS

- Lower return loss
- Easily accessed for tuning
- More robust in service
- Less expensive to braze the ceramic

### LINKS TO ONLINE INFORMATION:

Argonne's Advanced Photon Source:  
<http://www.aps.anl.gov>

How to license Argonne technologies:  
[http://www.anl.gov/Working\\_with\\_Argonne/index.html](http://www.anl.gov/Working_with_Argonne/index.html)

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ANL's concept is a unique process/system/hardware design that optimizes the rf *s parameters*, resulting in a ceramic window that exhibits return loss superior to that of other high-quality ceramic windows found on the market. The keys that provide this superior performance are simple tuning features that can yield better than 40 dB return loss for a selected radio frequency.

ANL has produced 340-size ceramic windows, designed for WR 340 waveguides, that exhibit a measured return loss of between 40 and 54 dB when tested at 2.856 GHz. When these windows were high-power tested at the same frequency, they enabled the klystron to ramp smoothly to a peak level of 42 MW, using a 4.5  $\mu$  sec pulse. The windows provided separation of one waveguide section filled with pressurized SF<sub>6</sub>, 30 psig, from a second waveguide section evacuated at ultrahigh level vacuum, 10<sup>-9</sup> Torr.



The benefits offered by this new technology include:

- **IMPROVED RETURN LOSS**—Waveguide component manufacturers can offer their customers ceramic windows in S band or another microwave band, with a better return loss at the selected frequency.
- **FABRICATION TECHNIQUE EXPANDABLE TO OTHER WINDOW SIZES**—Waveguide component manufacturers would be able to adopt this new process/system/hardware design to other sizes of rf windows.
- **FURTHER POTENTIAL**—Waveguide component manufacturers could implement these features in other waveguide components to improve return loss without degrading power handling capacity.
- **IMPROVED HIGH POWER PERFORMANCE**—For particle accelerator applications where higher power is utilized, windows with lower return loss become especially desirable because they can be installed in series without degrading waveguide performance.
- **COST SAVINGS**—In addition to allowing potential design/fabrication of various sizes of windows with improved return loss, the new features offer potential cost savings by 1) eliminating the difficult production process of pinning, brazing posts, etc., and 2) necessitating that the ceramic only undergo a single braze cycle.