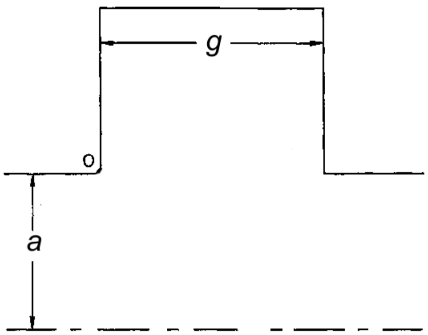
Not knowing anything in this area, I searched for a way to calculate energy loss suffered by a charge on encountering a cavity in an otherwise smooth vacuum chamber. I found a note by Bob Palmer[1]. His equation (2.11) for energy lost is exactly the geometry under consideration:

$$U = (0.85)\frac{Q^2}{4\pi\epsilon_0}\sqrt{\frac{g}{2w}}\,\frac{1}{a} \sim (1.6)\frac{Q^2}{4\pi\epsilon_0}\,\frac{1}{a}$$

Namely, a smooth beam pipe of radius a interrupted by a gap of width g extending to a radius $\gg a$. (See Fig.) w is the length of the wake at the wall; it's some combination of bunch length, γ, and a.



I'm using $a = 25\,\text{mm}$, $g = 60\,\text{mm}$, bunch length $\sim 8\,\text{mm}$ to $30\,\text{mm}$.

For the nominal bunch charge of $Q = 16\,\text{pC}$, we find

$$1.5 \times 10^{-10}\,\text{joule}.$$

And at 650 MHz, this is

$$P = 0.1\,\text{Watt}.$$

To make the connection to conventional notation, note that the "loss factor" is

$$k = \frac{1.6}{4\pi\epsilon_0}\,\frac{1}{a} = 50\,\Omega\,\frac{c}{a} = 0.6\,\text{V/pC}$$

and this is a fairly typical value; see slide 5 of talk by Karl Bane[2]. One sees from that talk that one can reduce this an order of magnitude by tapering and shielding. I do not think it is worth it as 100 mW will not cause any problems. Comments?

References

[1] Bob Palmer: *A Qualitative Study of Wake Fields for Very Short Bunches*, SLAC-PUB-4433 (1987).

[2] Karl Bane: *Numerical Calculations of the NLC Damping Ring Impedances* Presented at the Broadband Impedance Measurements & Modeling Workshop, Feb 28 - Mar 2, 2000, Stanford.