

Abstract Submitted  
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**Absolute Instability near Band Edges in a Traveling Wave Tube<sup>1</sup>**

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University of Michigan — We re-examine the beam mode and its interaction with  
the circuit mode near the lower and upper band edges in a traveling wave tube. We  
find that an absolute instability may arise, according to the Briggs-Bers criterion,  
if the beam current is sufficiently high, even if the beam mode intersects with the  
circuit mode at a point in the  $(\omega, k)$ =(frequency, wavenumber) plane with a positive  
group velocity. This finding differs from the previous works [1, 2] for the lower band  
edge, and points to the vulnerability to absolute instabilities at both the upper and  
lower band edges of a TWT. When the threshold current is exceeded, the Green's  
function, at a fixed position, exponentiates in time as  $t^{2/3}$  initially, but as  $(\omega_i t)$   
at later time, where  $\omega_i$  is the imaginary part of  $\omega$  in the unstable pole-pinch root.  
[1] D. M. H. Hung, et al., *Phys. Rev. Lett.* **115**, 124801 (2015). [2] A. P. Kuznetsov,  
et al., *Sov. Radiophys. Electron.* **27**, 1575 (1984).

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