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Breakdown Spot Size and Surface Temperature Studies in High Power Waveguide Simulations[1] PETER STOLTZ, DAVID SMITHE, Tech-X Corporation, VALERY DOLGASHEV, Stanford Linear Accelerator Center — Transmission of high power microwaves in room-temperature, normal-conducting, metallic waveguides is limited by breakdown of the metallic surfaces. A typical breakdown event results in plasma density in the waveguide high enough to result in zero transmitted power. The exact physics of waveguide breakdown is not fully understood, but secondary electron emission, ion-induced electron emission, surface heating, sputtering, gas desorption and ionization are all suspected of playing a role. We show simulation results for breakdown spots of 10-100 microns and how the breakdown rate changes from 100 nanoseconds to less than 10 nanoseconds as the spot size increases. We also show results for waveguide surface temperature for varying surface emission algorithms and discuss whether the temperature increase is sufficient to melt the waveguide structure.

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Peter Stoltz
Tech-X Corporation

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