has little influence on the decay time constant and the peak density. An increase in the pulse energy lead to an increase in the peak density and lower decay time constants. The variation of the peak value of the density, its temporal position after the end of the pulse and the growth rate with pressure shows a minimum around 1 Torr.

15:00

RO1 6 Use of a High Power Microwave Source to Detect Superluminal Group Velocities* MOHAMMAD MOJAHEDI,† *University of New Mexico* KEVIN MALLOY,‡ *University of New Mexico* EDL SCHAMILOGLU,§ *University of New Mexico* FRANK HEGELER,‖ *University of New Mexico* GREGORY PARK, *University of New Mexico* A novel time-domain experiment was performed utilizing a high power microwave source to generate a short pulse wave packet whose interaction with the stop band of a one-dimensional photonic crystal (1DPC) was studied. A Sinus-6 electron beam accelerator was used to drive a backward oscillator which generated 100s MW peak power at 9.68 GHz (Δf = 100 MHz) in a 10 ns pulse. The microwave pulse generated from this frequency-agile source was tuned to coincide with the mid-bandgap of a 1DPC consisting of alternating layers of polycarbonate and air. This set-up emulated a wave packet tunneling through a photonic barrier. It is observed that the wave packet group velocity is 2.4 c, where c is the speed of light in vacuum. This apparent anomaly does not contradict Einstein causality since the frontal velocity never exceeds c. Details of this experiment and its implications are presented. In addition, some frequency domain results will also be presented.

*This work supported in part by grants from ARO and AFOSR/MURI.

†Center for High Technology Materials

‡Center for High Technology Materials

§Department of Electrical and Computer Engineering

‖Department of Electrical and Computer Engineering

15:12

RO1 7 Development of a 10 MW, 91 GHz Gyroklystron for W-Band Linear Accelerators* JEFF NIELSON, *Calabazas Creek Research, Inc.* LAWRENCE IVES, *Calabazas Creek Research, Inc.* WES LAWSON, *Institute for Plasma Research, University of Maryland* MELANY ARJONA, *Institute for Plasma Research, University of Maryland* An international effort is underway to design advanced linear electron-positron colliders with mass energies beyond 1 TeV. High power RF sources are required to drive accelerators operating at frequencies as high as W-Band. Calabazas Creek Research, Inc. is funded by the U.S. Department of Energy to design a 10 MW, second harmonic, gyroklystron at 91 GHz. The program is coordinated with W-Band accelerator research at the Stanford Linear Accelerator Center. The goal is to achieve an electronic efficiency of 45presentation will describe the proposed electron gun, three cavity RF circuit, magnetic circuit, and input and output couplers. Current simulation results will be presented and design tradeoffs will be discussed.

*Support provided by the U.S. Department of Energy

15:24

RO1 8 Linear Stability of Stationary Operating Density Profiles in a Crossed-Field, Electron Vacuum Device* D.J KAUP, *Clarkson University* GARY E. THOMAS, *CPI, Beverly, MA* We study the linear stability of the stationary operating density profiles in crossed-field vacuum devices. These profiles are formed when a RF wave (with a wavevector, k, and a frequency, ω) experience a diocotron resonance with a background Brillouin flow. This resonance drives a Rayleigh instability[1], which then reshapes a background Brillouin flow into stationary solutions of a nonlinear diffusion equation[2], $\partial_t n_0 + C_2 \partial_y n_0 = \partial_y (D \partial_y n_0)$, where $C_2 \Omega^2$ (Ω is the electron cyclotron frequency) is the DC current and $D = 2\gamma|\xi_y|^2$ is the quasilinear diffusion coefficient, where γ is the linear growth rate and ξ_y the y-component of the RF Lagrangian displacement. We will show that the linear stability of these profiles is significantly influenced by the DC current and the RF power level in the device. Generally, we find that these profiles are unstable at the higher RF power levels, while there is a parameter regime, inside of which, they are stable.

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15:36

RO1 9 Calculations of Shot Noise in Gyroklystrons* ARNE FLIFLET,† THOMAS ANTONSEN JR.,‡ JEFFREY CALAME, BRUCE DANLY, *Vacuum Electronics Branch, Code 6841, Electronics Science and Technology Division Naval Research Laboratory* The spectrum of noise fluctuations on a spiraling electron beam due to the discrete nature of the electron charge is calculated. Particular attention is paid to the collective shielding effect of the electron beam which can either decrease or increase the noise level[1]. The calculation includes the effects of the nonzero transverse size of the electron beam as well as the axial profile of the confining magnetic field in the drift region between the cathode and the first cavity. Results of the calculations are compared with recently obtained experimental measures of the noise spectrum[2].

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†Code 6793, Plasma Physics Division

‡Science Applications International Corporation, 1710 Goodrich Drive McLean VA, and Departments of Electrical Engineering and Physics, University of Maryland, College Park, MD 20742

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15:48

RO1 10 Grating Couple Radiation in the Highly Relativistic Range* J.E. WALSH, J.H. BROWNELL, J.C. SWARTZ, S. TROTZ, *Dartmouth College* H. KIRK, R. FERNOW, V. YAKIMENKO, *Brookhaven National Laboratory* Recent experiments at Brookhaven National Laboratory's Accelerator Test Facility have revealed interesting features of grating coupled radiation (GCR) processes. In the past GCR, also known generally as Smith-Purcell radiation, has been investigated primarily with low energy electron beams. The high energy limit is also of interest. An investigation of GCR using the 40-50 MeV beam is underway. Signatures of high energy radiative processes (peaking of the emission in the forward direction and sharp increase of brightness with energy) are observed. The emitted wavelength is also foreshortened relative to the grating period. Detected wavelengths in the 1-10 um range imply doppler upshifts extending from 100-1000. There is also evidence of enhanced intensity due to an overlap of higher emission orders. Progress with theory and experiment will be discussed.

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