

Linear Accelerators: Theory and Practical Applications

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This course introduces the fundamentals of linear accelerators ranging from Alvarez DTLs through to electron linear accelerators in the ILC. Both superconducting and room temperature linacs are presented in the lectures. Throughout the course, fundamental concepts such as conservation of energy are used. In particular, the following topics are discussed:

- Phase stability
- Beam focussing
- Principal RF design parameters
- Waveguide to cavity coupling
- Globalised scattering matrix analysis
- Tuning and modal stability
- Steady state and transient beam loading.
- Beam compensation schemes
- Shunt impedance and 'R/Q' optimisation
- Travelling wave accelerators (constant impedance and constant gradient)
- Standing wave accelerators
- RF pulse compression and SLED
- Circuit analysis
- Long-range and short-range wake-fields
- Instabilities and beam dynamics
- Emittance and phase space concepts
- Current e.m. field computer codes and their range of applicability