Muon Collider Course Outline

To be given at the Acc. School, Vaderbuilt U., Jan 25-29, 1999
Version #2 10/2/98

- Lectures by Bob Palmer, except those marked (F) by Rick Fernow.

Monday

1 Introduction to Muon Colliders

2 Target and Pion Production (F)

2.1 Production

2.2 Heating & Shock

2.3 Moving Metal Target

2.4 Liquid Jet in Solenoid

2.5 Liquid Jet Exp. & Design

3 Basic Dynamics & p Driver

3.1 Intro. to Emittance

3.2 Intro. to alpha and beta

3.3 Intro. to Resonances

3.4 Bunch Compression

3.5 Intro. to Space Charge Tune Shift

4 Capture & Phase Rotation

4.1 Intro. to Weak Focussing

4.2 Intro. to Quadrupole Focussing

4.3 Intro. to Axial Focussing

4.4 Intro. to Solenoid Focussing

4.5 Capture

4.6 Phase Rotation

4.7 Intro to rf #1

4.8 rf Design

5 Polarization (F)

5.1 Decay Kinematics

5.2 Loss in Material

5.3 Precession

5.4 Loss with sextupoles

5.5 Energy Determination by g-2

6 Ionization Cooling 1

6.1 Intro. to Ionization Cooling

6.2 Weak, Quad, Solenoid or Lithium Lens?

6.3 Dependence on Energy

6.4 Existance in Neutrino Calorimeters

7 Ionization Cooling 2

7.1 Intro. to Solenoid Dynamics

7.2 Angular Momentum Problem

7.3 Intro. to Longitudinal Synchrotron Motion

7.4 Intro. to Matching

8 Ionization Cooling 3 (F)

8.1 Intro. to Scattering and Straggling

8.2 Simulation Codes

8.3 Transverse Cooling Examples

8.4 Work to be done

8.5 Lithium Lens Design

9 Ionization Cooling 4

9.1 Intro. to rf #2

9.2 Cooling rf Design

9.3 Intro. to Bent Solenoid Dynamics

9.4 Emittance Excahange Example

9.5 Bent Solenoid Design

10 Acceleration (F)

10.1 Lifetime Problem

10.2 Longitudinal Emittance Problem

10.3 Induction Acceleration

10.4 Recirculating Linac

10.5 FFAG

10.6 Pulsed Synchrotron

10.7 rf Power Needs

11 Collider

11.1 Intro. to Chromaticity

11.2 Intersection Region Design

11.3 Momentum Compaction & FMC Lattice

11.4 Longitudinal Impedance & rf correction

11.5 Transverse Impedance & BNS Damping

12 Backgrounds etc.

12.1 Intro. to Beam-Beam Tune Shift

12.2 Decay Heating

12.3 Halo Scraping

12.4 Neutrino Radiation

12.5 IR Shielding Design

13 Advanced Ideas

13.1 Luminosity Scaling

13.2 Tune Shift Cancellation

13.3 Exotic Focus

13.4 Friction Cooling

13.5 Muonium Cooling

13.6 Opcal Stochastic Coolng

14 Exam