Chapter 1

Physics Goals of the Neutrino Factory

1.1 $\Delta m^2, \sin^2 \theta_{23}$

1.2 Sign of Δm^2, Measurement of θ_{13}

1.3 Sterile Neutrinos

1.4 CP-Violation

1.5 Energy and Baseline

Chapter 2

Alternatives to the Neutrino Factory

2.1 Conventional Beams

This will be a MINOS-type beam and the baseline is whatever we decide is best.

2.2 Low-Energy Beams

I have no idea what to do with this. We have to talk with the Japanese proponents.

Chapter 3

Systematic Errors and Backgrounds

This chapter should explain the sources of backgrounds and systematics in a detector-independent way. Then we can apply the same backgrounds to the detectors consistently.

3.1 Flux Errors

3.2 Wrong-Sign Appearance

3.3 Conventional Beam Backgrounds

3.4 Low-Energy Beam Backgrounds

3.5 Cosmic Rays and Detector Depth

Chapter 4

Detectors Considered

This should establish the parameters of the detectors for the relevant physics. Ideally there would be a table with σ_E, etc.

4.1 Fe/Scint

4.2 Fine-Grained Calorimeter

4.3 Water

Chapter 5

$\Delta m^2, \sin^2\theta_{23}$

5.1 Disappearance Measurements at L = 2800

From here on we follow a formula. The first two subsections are brief explanations of the dominant errors followed by applications to each detector type. Each of the detector subsections should end with an allowed signal region in perhaps two scenarios, IA and LSND?

5.1.1 Statistical Errors

5.1.2 Systematic Errors

- Fe/Scint
- Fine-Grained Calorimeter
- Water

5.2 Disappearance Measurements at L = 7000

Statistical Errors

Systematic Errors

- Fe/Scint
- Fine-Grained Calorimeter
- Water

5.3 Alternative Beams

5.3.1 Conventional Beams

5.3.2 Low Energy Beam

Chapter 6

Sign of Δm^2

6.1 Sign of Δm^2 at 2800

6.1.1 Statistical Errors

6.1.2 Systematic Errors

- Fe/Scint
- Fine-Grained Calorimeter
- Water

6.2 Sign of Δm^2 at 7000

Statistical Errors

Systematic Errors

- Fe/Scint
- Fine-Grained Calorimeter
- Water

6.3 Alternative Beams

6.3.1 Conventional Beams

6.3.2 Low Energy Beam

Chapter 7

θ_{13}

7.1 θ_{13} at 2800

7.1.1 Statistical Errors

7.1.2 Backgrounds and Systematic Errors

- Fe/Scint
- Fine-Grained Calorimeter
- Water

7.2 θ_{13} at 7000

Statistical Errors

Backgrounds and Systematic Errors

- Fe/Scint
- Fine-Grained Calorimeter
- Water

7.3 Alternative Beams

Conventional Beams

Low Energy Beam

Chapter 8

Sterile Neutrinos

8.1 Sterile Neutrinos at 2800

8.1.1 Statistical Errors

8.1.2 Systematic Errors

- Fe/Scint
- Fine-Grained Calorimeter
- Water

8.2 Sterile Neutrinos at 7000

Statistical Errors

Systematic Errors

- Fe/Scint
- Fine-Grained Calorimeter
- Water

8.3 Alternative Beams

8.3.1 Conventional Beams

8.3.2 Low Energy Beam

Chapter 9

CP-Violation

9.1 CP-Violation at 2800

9.1.1 Statistical Errors

9.1.2 Systematic Errors

- Fe/Scint
- Fine-Grained Calorimeter
- Water

9.2 CP-Violation at 7000

Statistical Errors

Systematic Errors

- Fe/Scint
- Fine-Grained Calorimeter
- Water

9.3 Alternative Beams

9.3.1 Conventional Beams

9.3.2 Low Energy Beam

Chapter 10

Conclusions

10.1 Overall Comparison of Distance and Detectors

10.2 Comparison to Other Beams

10.3 Two-Distance Scenario at the Neutrino Factory

10.4 What Defines an Entry-Level Machine?

10.5 Conclusions and Recommendations for Further Work

Appendix A

Flux Measurements