Optional Pulse Patterns:

- 13-baud, 130 us (10 us baud) Barker-Code power profile data in raw and processed formats
- 16-baud, 480 us (30 us baud) Alternating Code as lag profile matrices or processed data
- 480 us (30 us sampling) Long Pulse as lag profile matrices or processed data

Beam Positions:

- Any to accomplish your scientific goals; see the following website:
  - http://amisr.sri.com/portal

External Datasets that can be Accessed Upon Request:

- Raw voltage level data (hdf5 format) in either coded (e.g., pulse-to-pulse for D region) or uncoded (e.g., meteor) form (20100222.001 and 20100305.001)
- Lag profile matrices and spectra from a long pulse, fractional lag alternating code, dual plasma line experiment (20100520.001)
- Power profiles and lag profile matrices from a long pulse – barker code imaging experiment (20100227.001)
- Anything you find in Madrigal

Example of Things to do with Raw Voltage Data

1. Understand pulse information / limitations
   a. Matched filter / decode the voltage level data (coded pulse only)
   b. How does the decoding process work?
   c. What is the range resolution of this experiment?
   d. What is the effective IPP? What are the tradeoffs here?
2. Compute power profiles
   a. How is power dependent on experimental parameters?
   b. How is power related to electron density?
   c. How could one obtain absolute power (Watts) and absolute Ne (electrons/m^3)
   d. How could you compute the errors on these power measurements?
3. Compute the signal to noise ratio
   a. Where should you get the noise estimate?
   b. What are the pitfalls?
   c. What does SNR tell you? Why is it important?
4. Compute power spectra
   a. How would one compute spectra?
   b. What is the spectral resolution and Nyquist frequency of this experiment?
   c. What does the spectrum tell you?
5. Investigate spectral properties
   a. How could one deduce spectral widths and velocities?
   b. What does this tell you?
6. Further investigations
   a. Winds, temperatures, meteor count rates, meteor histograms

Example of Things to do with Lag-Profile Matrices or Power Profiles

1. Understand pulse information / limitations
    a. How does this pulse work?
    b. What are the statistics / errors of the data?
    c. What is the range and time resolution of this experiment?
2. Compute power profiles
    a. How is power dependent on experimental parameters?
    b. How is power related to electron density?
    c. How could one obtain absolute power (Watts) and absolute Ne (electrons/m^3)
    d. How could you compute the errors on these power measurements?
3. Compute the signal to noise ratio
    a. Where should you get the noise estimate?
    b. What are the pitfalls?
    c. What does SNR tell you? Why is it important?
4. Compute power spectra
    a. How would one compute spectra?
    b. What is the spectral resolution and Nyquist frequency of this experiment?
    c. What does the spectrum tell you?
5. Investigate spectral properties
    a. How could one deduce spectral widths and velocities?
    b. What does this tell you?
    c. How does the spectra vary with geophysical parameters (e.g., altitude)? Why?
6. Further investigations
    a. Winds, temperatures, etc.?

Examples of Things to do with Multiple Beam, Processed/Fitted Data

- E.g., Imaging (many beam) barker code and long pulse data
    1. Understand pulse information / limitations
        a. How does this pulse work?
        b. What are the statistics / errors of the data?
        c. What is the range and time resolution of this experiment?
    2. Compute power profiles
        a. How is power dependent on experimental parameters?
        b. How is power related to electron density?
        c. How could one obtain absolute power (Watts) and absolute Ne (electrons/m^3)
        d. How could you compute the errors on these power measurements?
    3. Compute the signal to noise ratio
        a. Where should you get the noise estimate?
        b. What are the pitfalls?
        c. What does SNR tell you? Why is it important?
    4. Understand pointing geometry
        a. What kind of spatial resolution does this multi-beam experiment give you?
        b. What are the tradeoffs?
        c. What can you do with this information?
    5. Further investigations
        b. Produce images of geophysical parameters, produce resolved ExB drifts, investigate evolution of features.

Example of Things to do with Interleaved Alternating Code and Long Pulse Data

1. Understand pulse information / limitations
    a. How does this pulse work?
    b. What are the statistics / errors of the data?
    c. What is the range and time resolution of this experiment?
2. Compute power profiles
    a. How is power dependent on experimental parameters?
    b. How is power related to electron density?
    c. How could one obtain absolute power (Watts) and absolute Ne (electrons/m^3)
    d. How could you compute the errors on these power measurements?
3. Compute the signal to noise ratio
    a. Where should you get the noise estimate?
    b. What are the pitfalls?
    c. What does SNR tell you? Why is it important?
4. Understand pointing geometry
    a. What kind of spatial resolution does this multi-beam experiment give you?
    b. What are the tradeoffs?
    c. What can you do with this information?
5. Macrophysics
    a. How could one compute electric fields?
    b. How could one compute winds?
    c. How could one compute currents?
    d. How could one compute Joule heating rates?
    e. What can you do with this information?