



AMISR experiment design

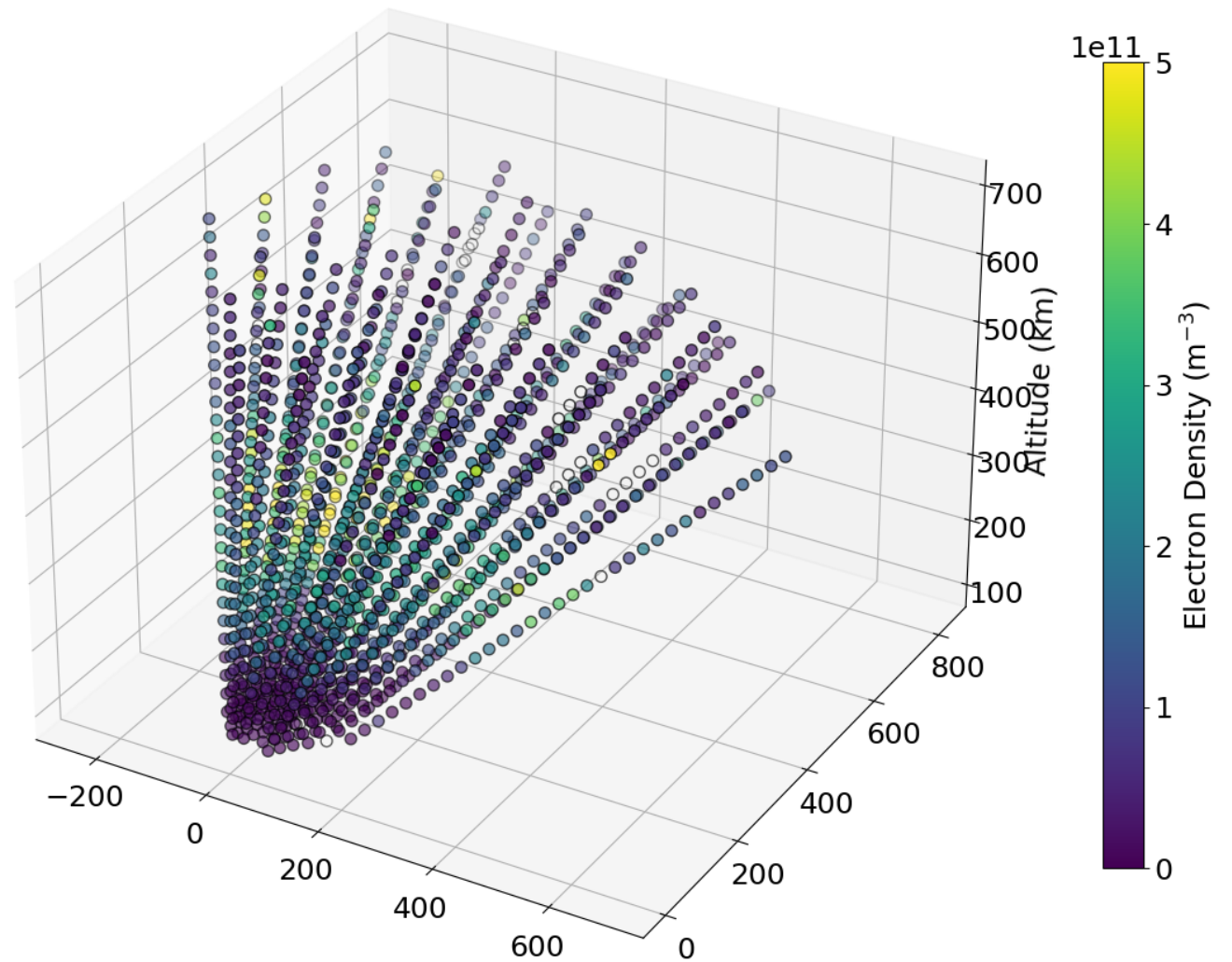
Asti Bhatt

SRI International

ISR Summer School 2025



AMISR can
volumetrically
image the
ionosphere



Key things
to keep in
mind

What region are you interested in?

What is the time resolution you need?

What is the spatial extent and resolution?

Do you want to look in a specific direction?

Types of pulses

Long Pulse (LP):

- a long transmit pulse that is correlated against itself to resolve range
- low range resolution, high sensitivity

Alternating Code (AC):

- phase modulated pulses designed to avoid range ambiguity,
- high range resolution, medium sensitivity

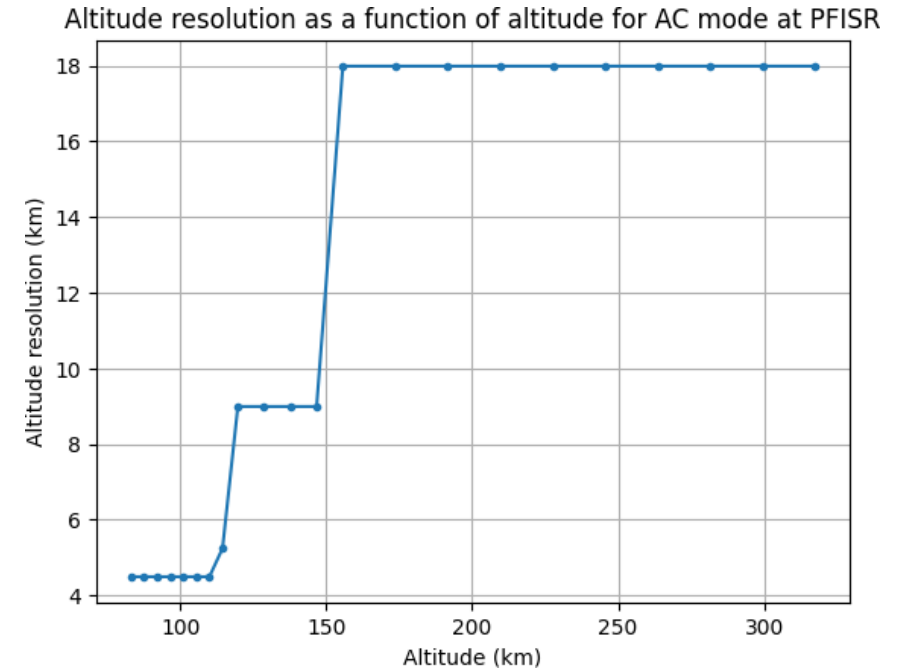
Barker Code (BC):

- similar to AC but applicable in D-region due to –
- highest range resolution, high sensitivity

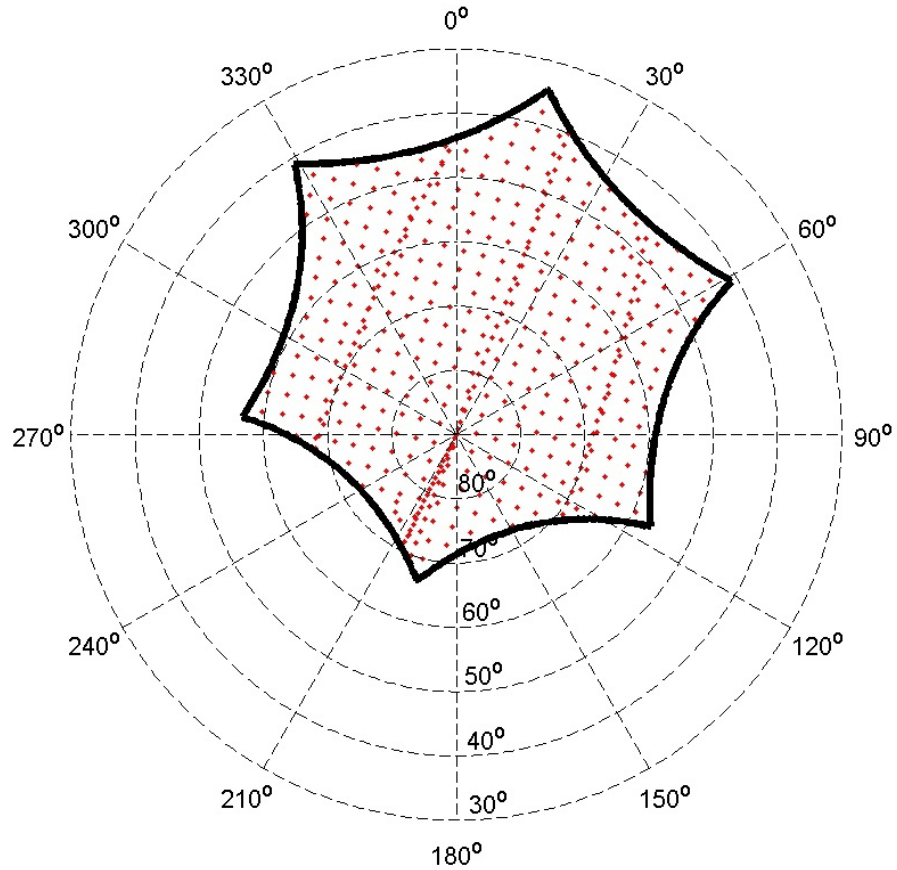
Modes can be interleaved

Regions and pulse types

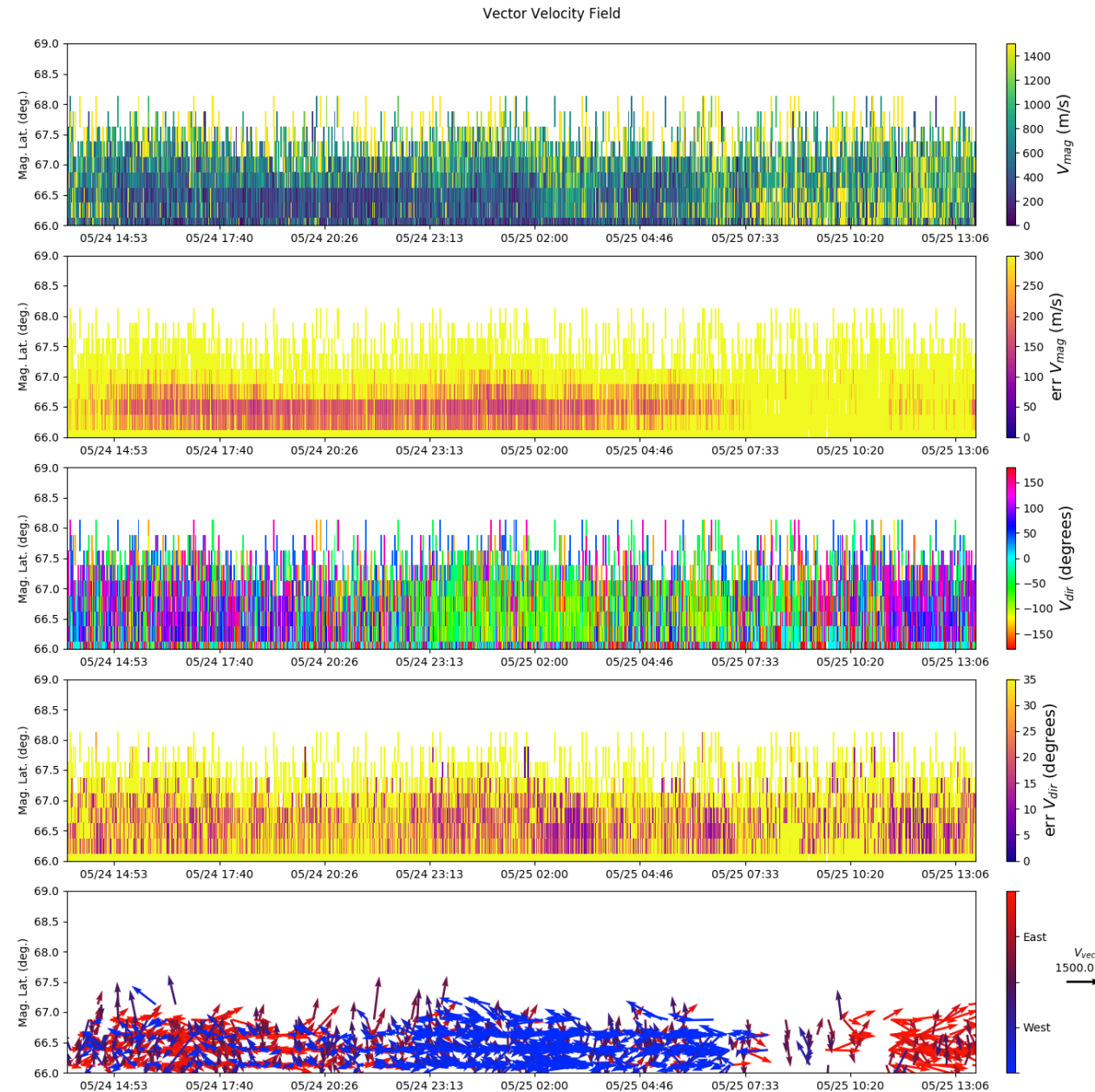
- F-region only
 - Long pulse (~3km range resolution)
- E- and F-regions
 - Alternating code (1.5km range resolution)
 - Long pulse
- D-region focus, sporadic E, E- and F-region context
 - Barker code (750m range resolution)
 - Alternating code
 - Long pulse



Beam positions and vector velocities

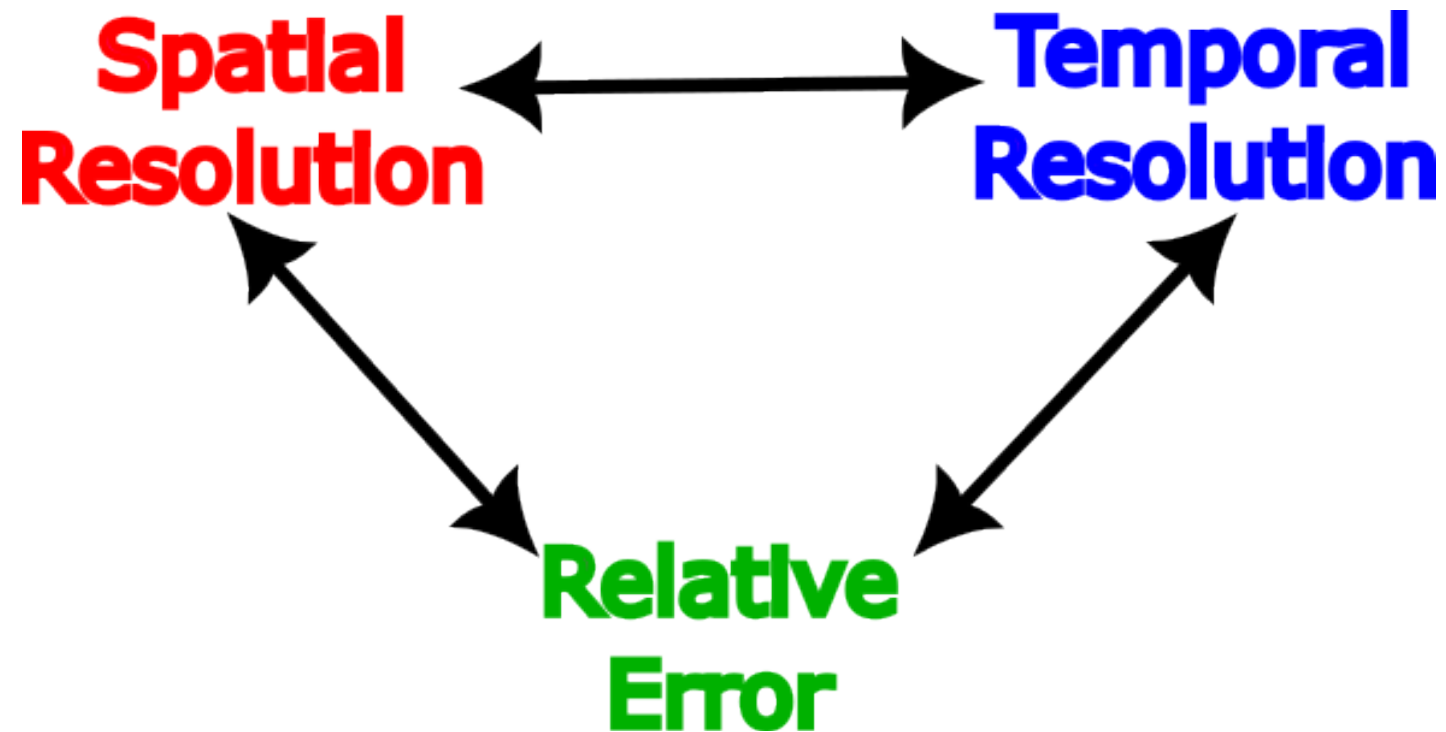


<https://amir.com/amir/media/pfiser/bcortable.txt>



You can get resolved vector velocities/electric field from any experiment with 3 or more beam positions

Trade space for mode design



Trade space for mode design

Temporal resolution == integration period

- Long integration period means lower temporal resolution, less noisy data and less error
- Short integration period means higher temporal resolution, relatively higher errors

Spatial resolution == Beam positions

- More beam positions give higher spatial resolution, each beam is revisited less frequently, meaning longer integration time
- Fewer beam positions give better statistics but lower spatial resolution
- Option to revisit a single beam more often during the cycle

Signal-to-Noise ratio

- Time of the day is important when denser plasma may give higher SNR, allowing for lower integration times, better statistics

PFISR Mode menu

PFISR1. Long Pulse

- 330 us long pulse with multiple frequencies to improve statistics
- Good mode for F-region studies needing high time resolution (e.g. TID studies)

PFISR2. Long pulse + Alternating code (see WorldDay35)

- 330 us long pulse + alternating code
- Good mode for studies spanning E- and F-regions

PFISR3. Long pulse + Alternating Code + Barker Code (see MSWinds26)

- 330 us long pulse + alternating code + barker code
- Good mode for studies needing D-region measurements with E- and F-regions for context

For your experiment, select one of the above modes and beam positions from the beam code table