Focusing of a phased array radar with local test antennas and modeling

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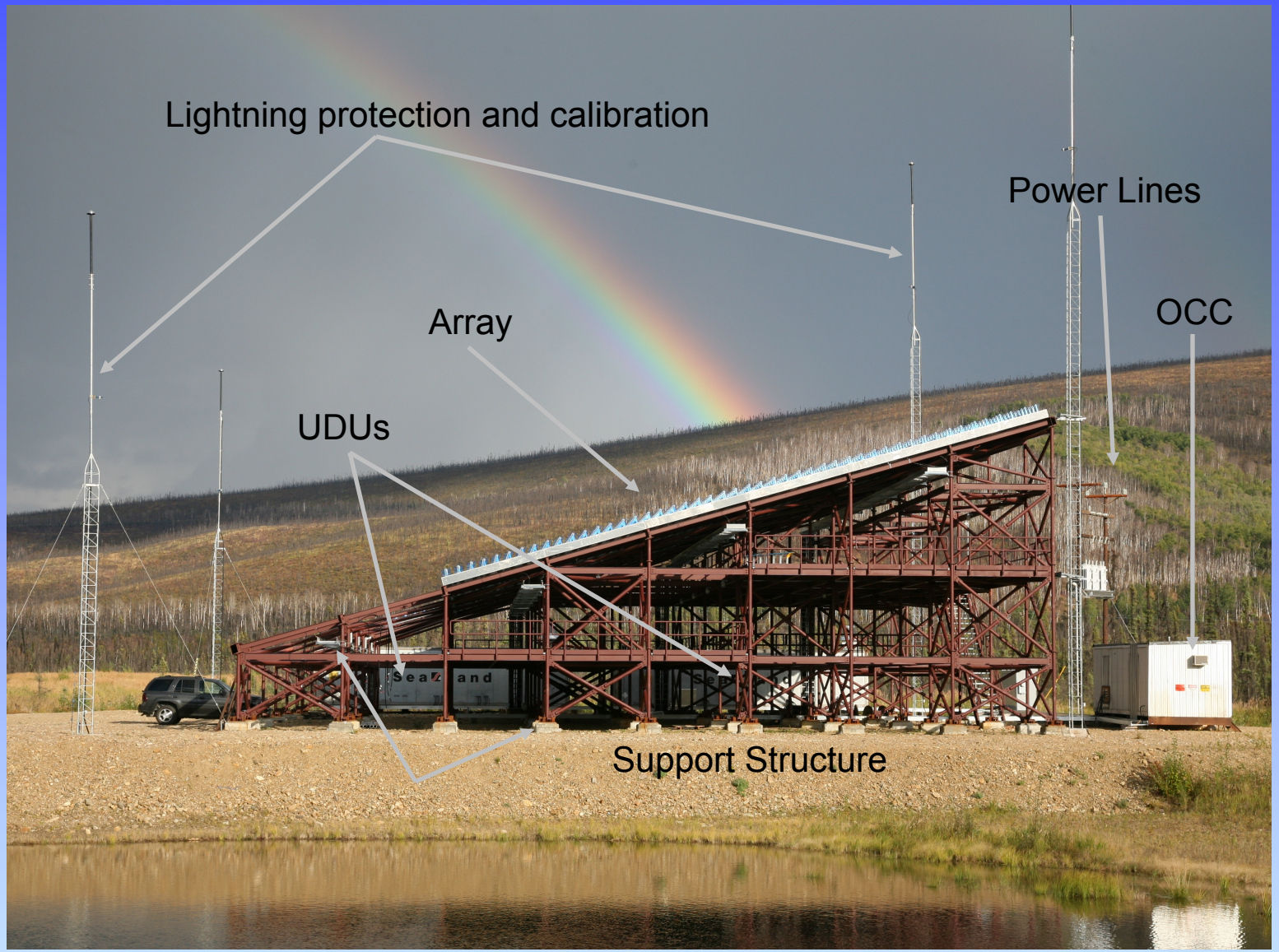
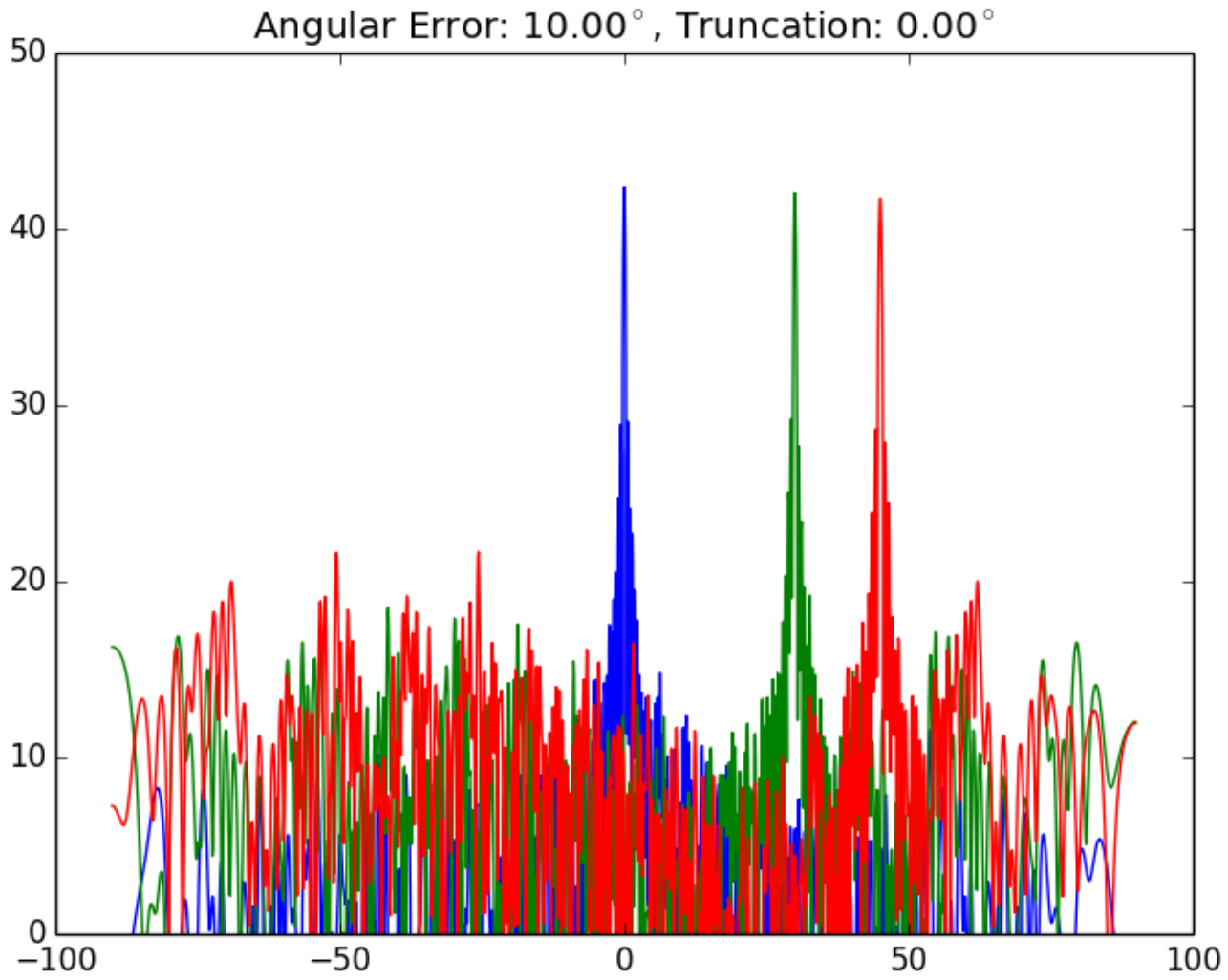
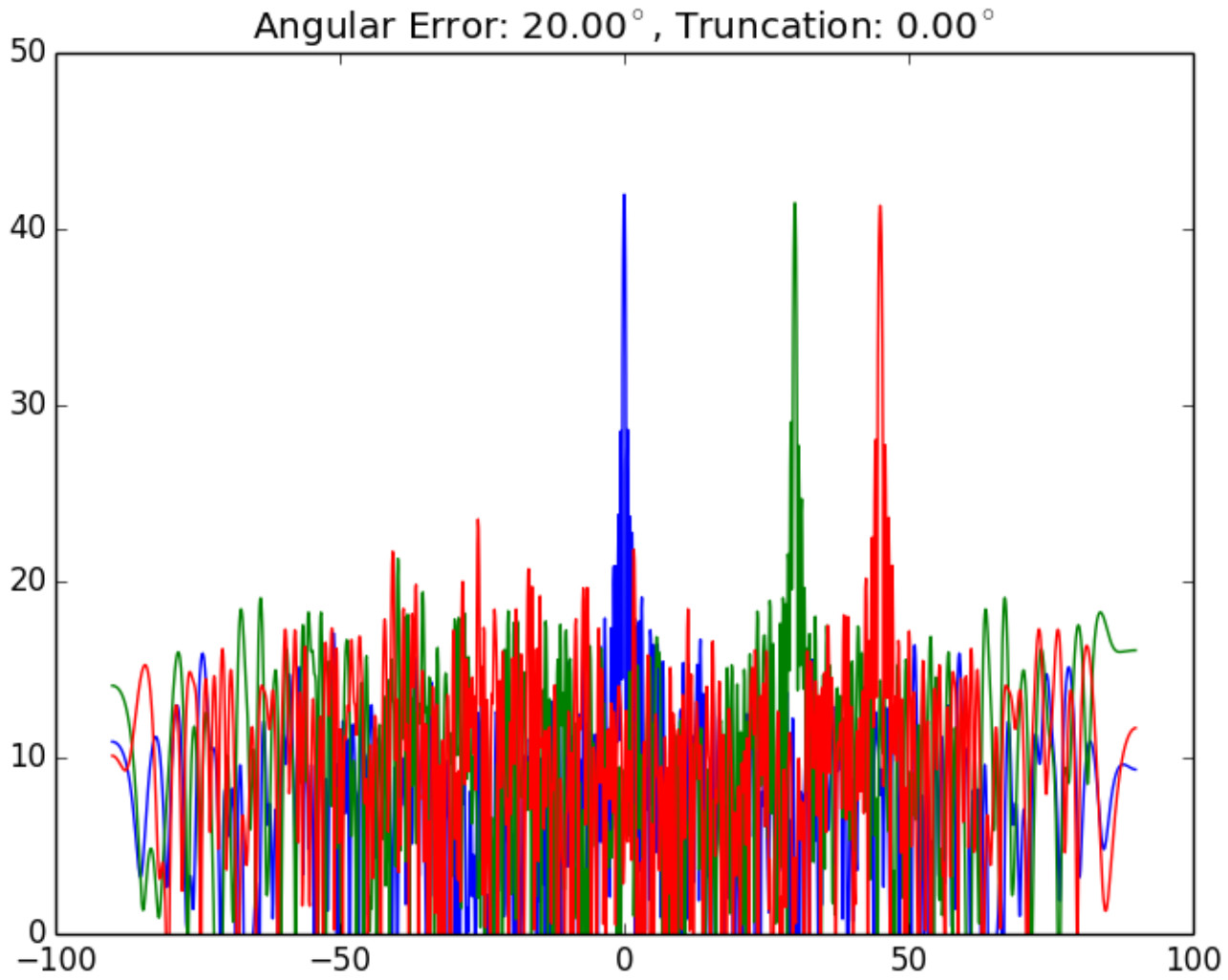
Poker Flat AMISR



Error budget

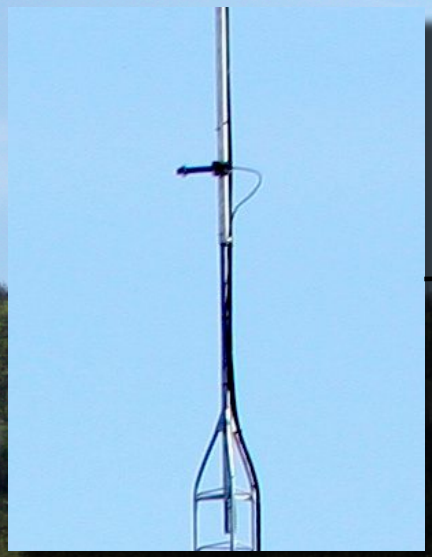


Error budget



How Accurate Need We Be?

F0 (MHz)	T (nsec)	L (meters)	10 deg random errors	20 deg
450 MHz	2.22 nsec	0.67 m	61.7 psec, 1.85 cm	123.5 psec, 3.70 cm
233 MHz	4.29 nsec	1.29 m	119.2 psec, 3.6 cm	238.4 psec, 7.15 cm
50 MHz	20 nsec	6.00 m	556 psec,16.7 cm	1111 psec, 33.3 cm

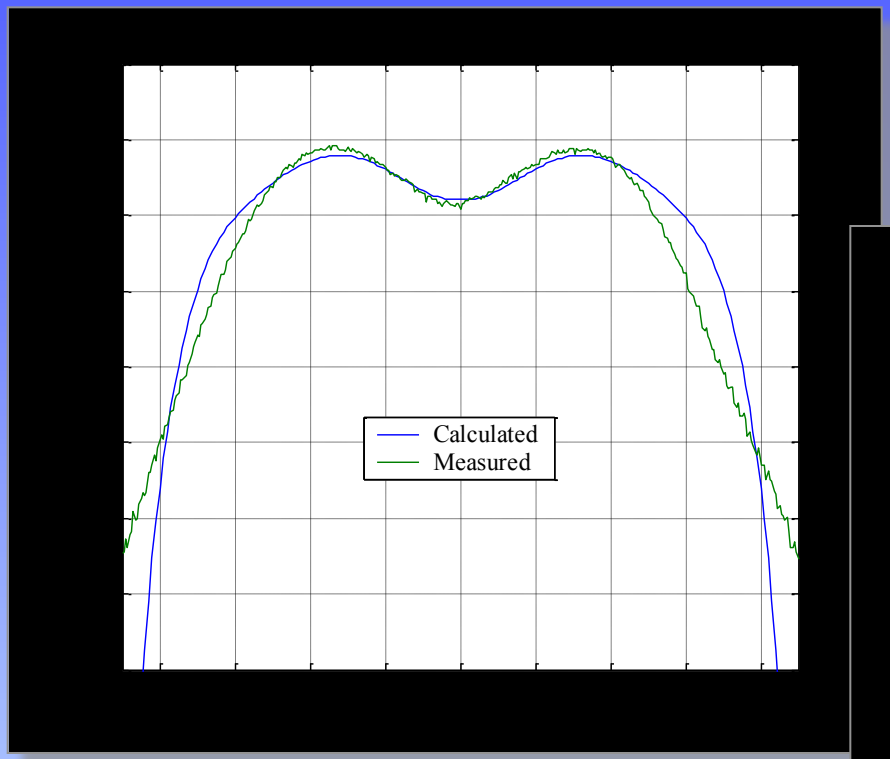


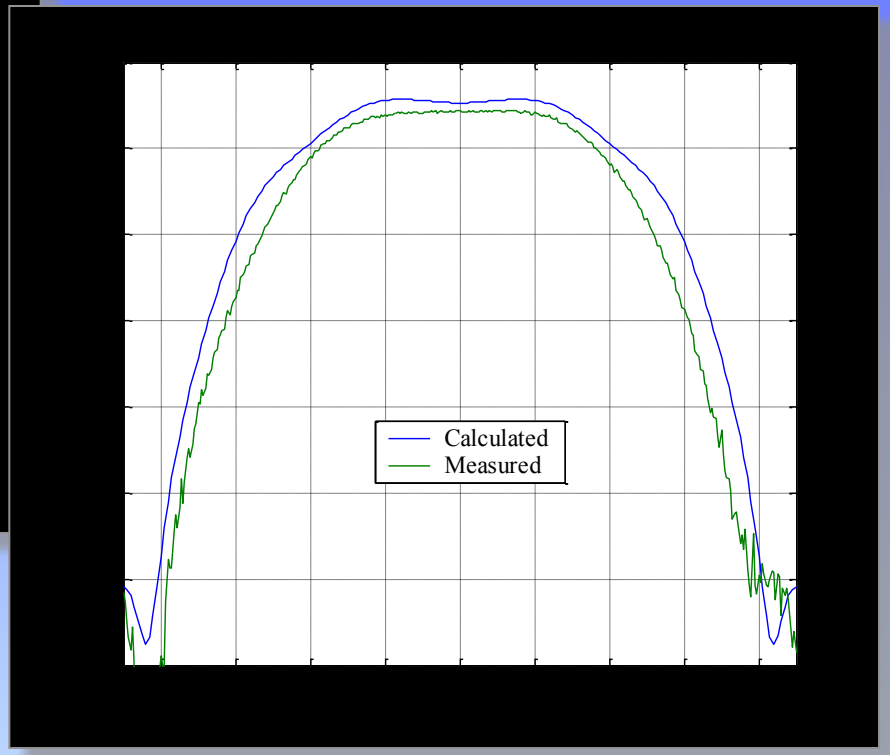
NEC Model of propagation & scattering to/from cal antennas

Array Focusing, Poker Flat

AFRL Testing/Modeling

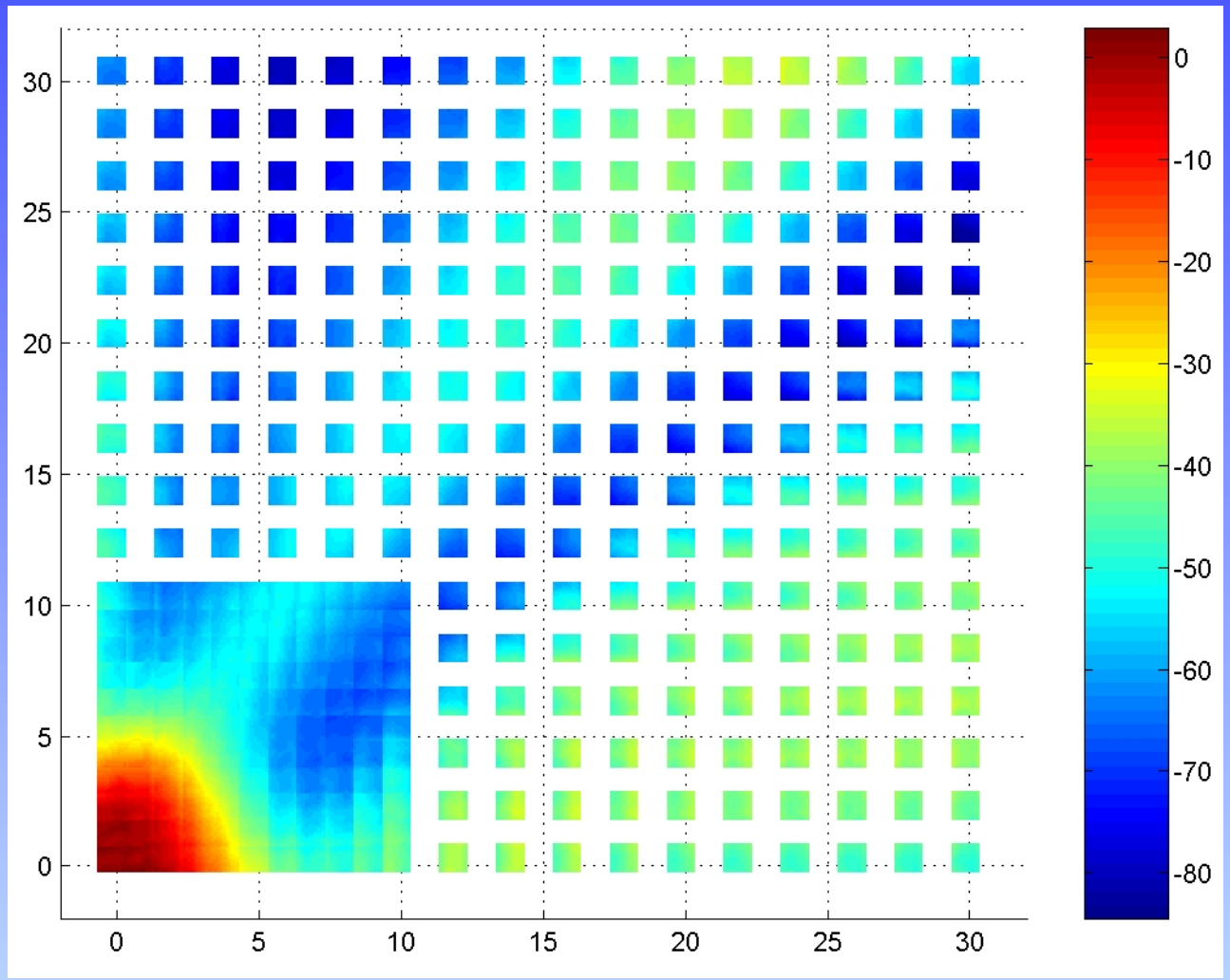
- Livio Poles, AFRL/SNHA
- Marat Davidovitz, AFRL/SNHA
- James Kenney, AFRL/SNHA
- Edward Martin, AFRL/SNHA





Testing confirmed long-term phase and amplitude stability of the hardware design

Array Focusing



Comparison of the geometric distance between the cal antenna and individual AEUs with the NEC computed phases shows the effects of the antenna phase functions and scattering. Note that in this case the errors are systematic and have magnitudes as large as ~90 degrees. Other geometries can result in even more dramatic effects.

6 row buffer around each calculation tile (except on edges)

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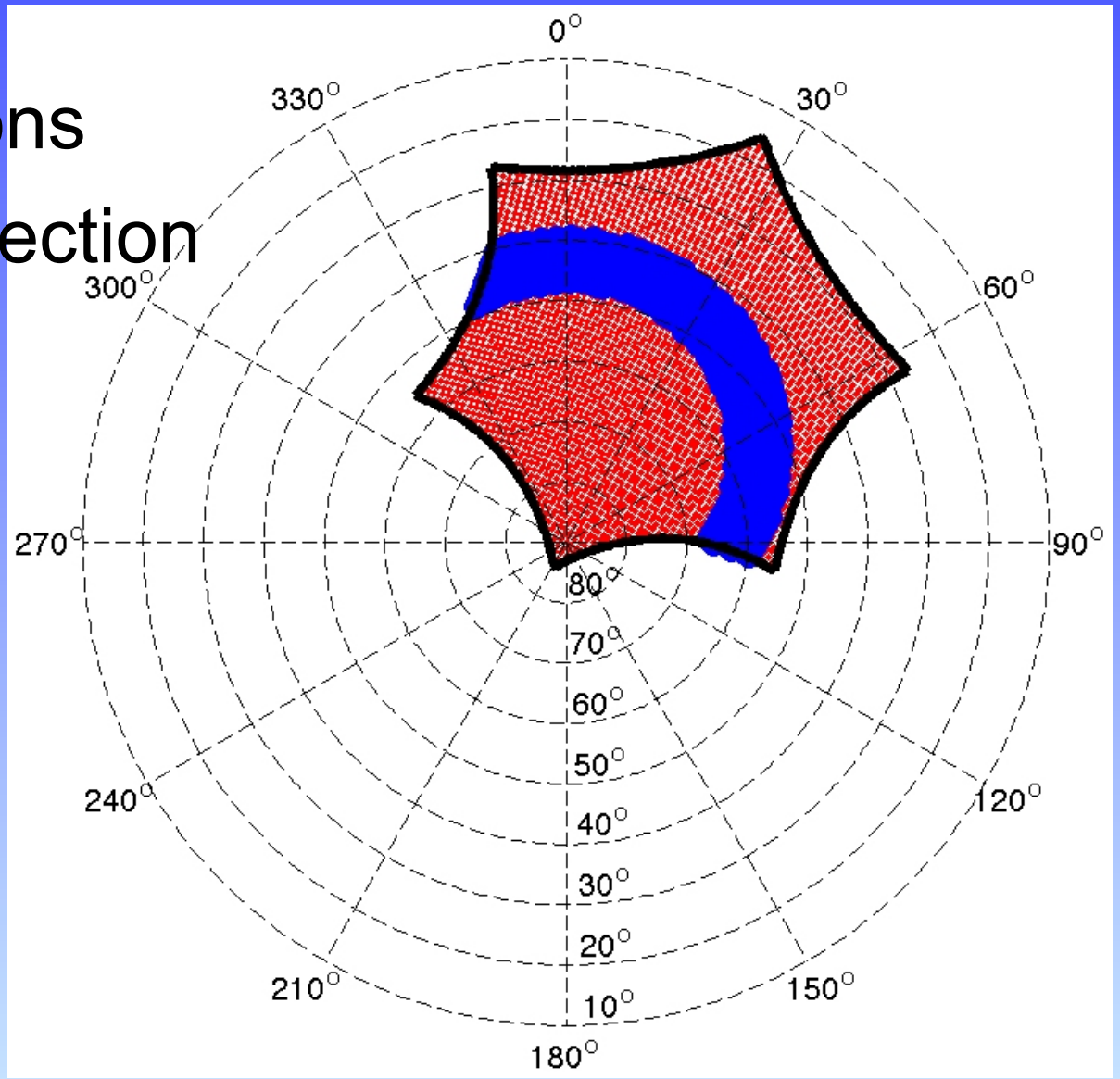
Calibration antenna at RISR-N

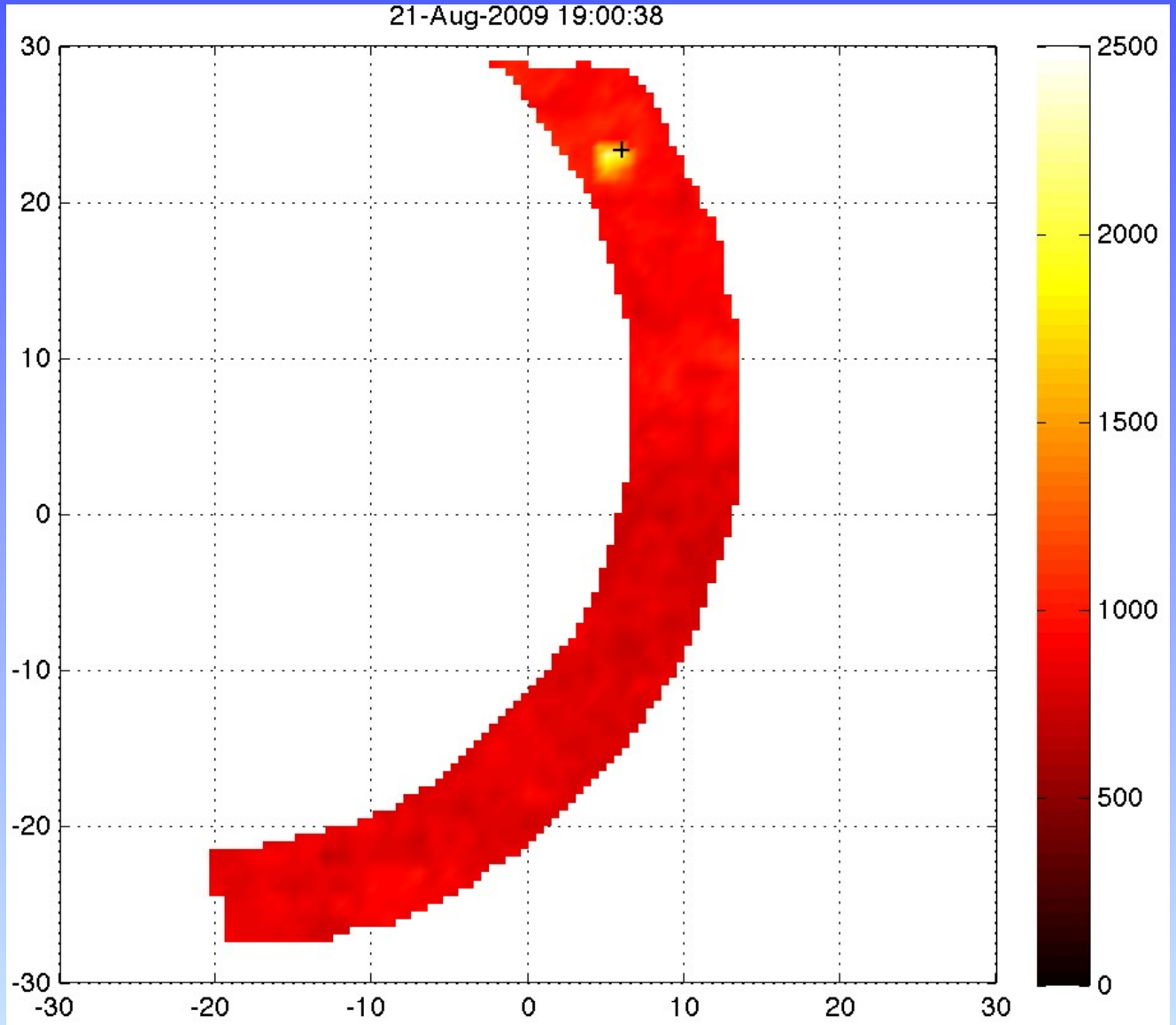
Cass-A Tracks at Resolute Bay

593 look directions

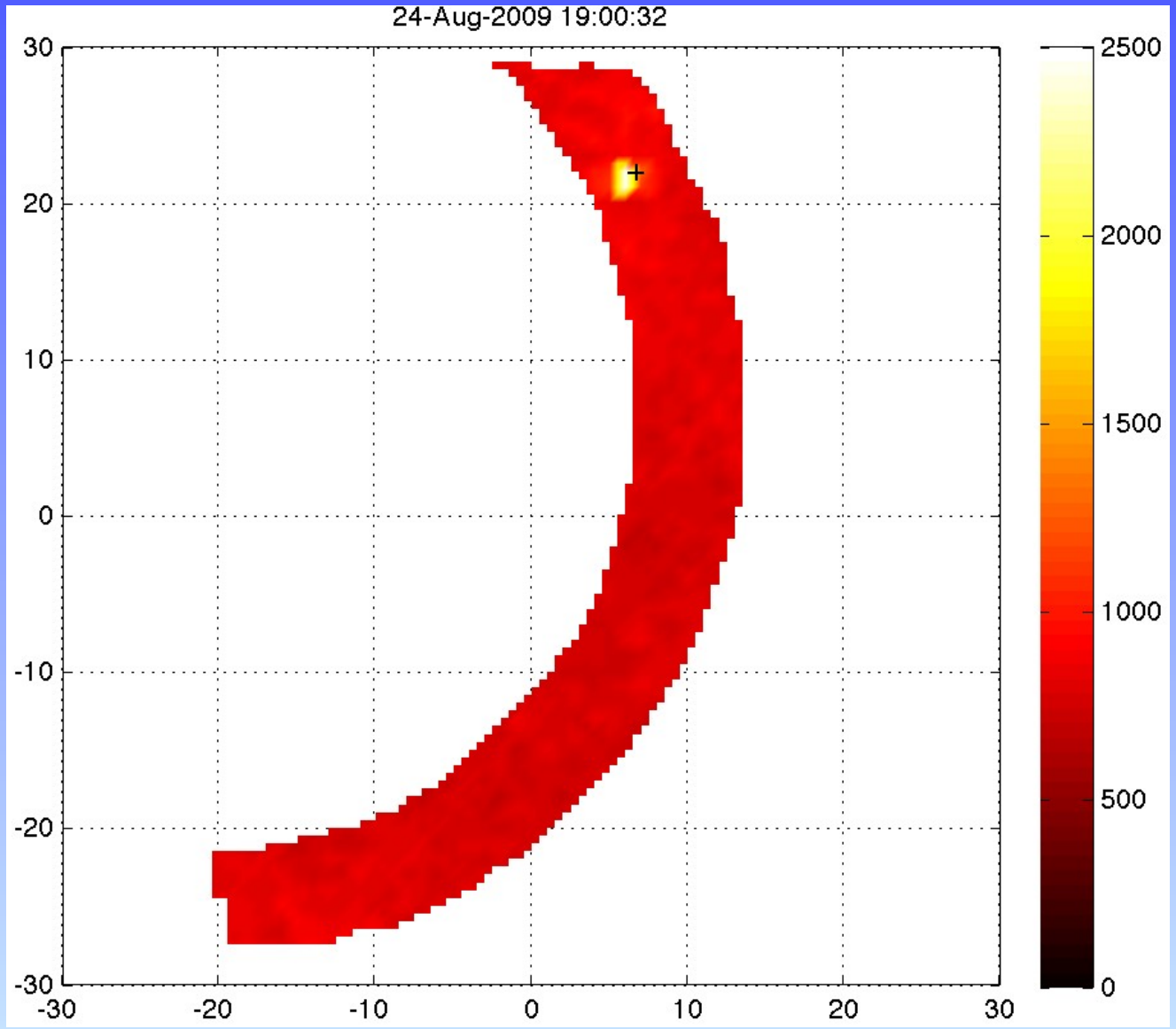
2.5 msec per direction



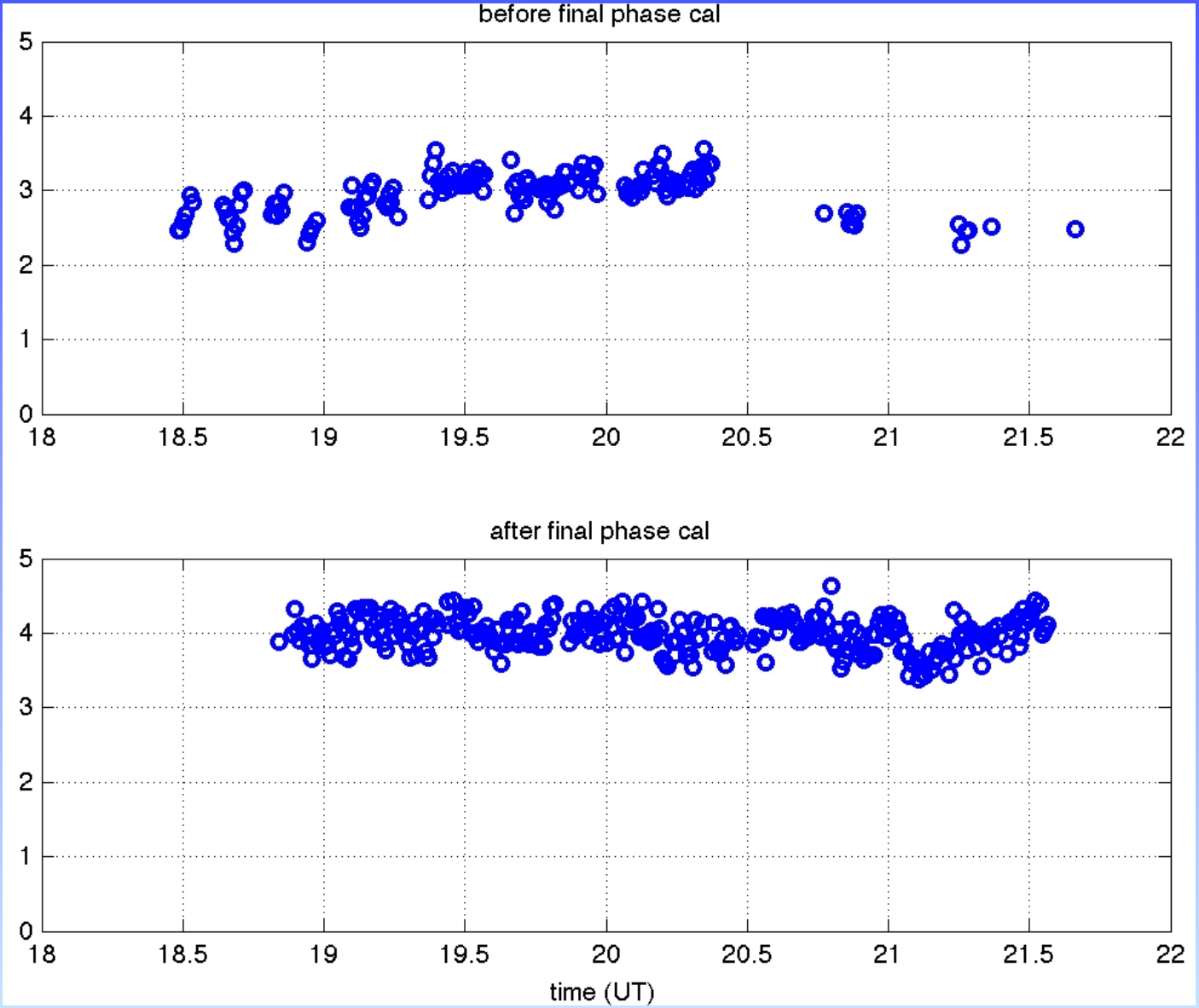
Cass-A before phase calibration



Cass-A after phase calibration



Gain Improvement



Calibration antenna at RISR-C

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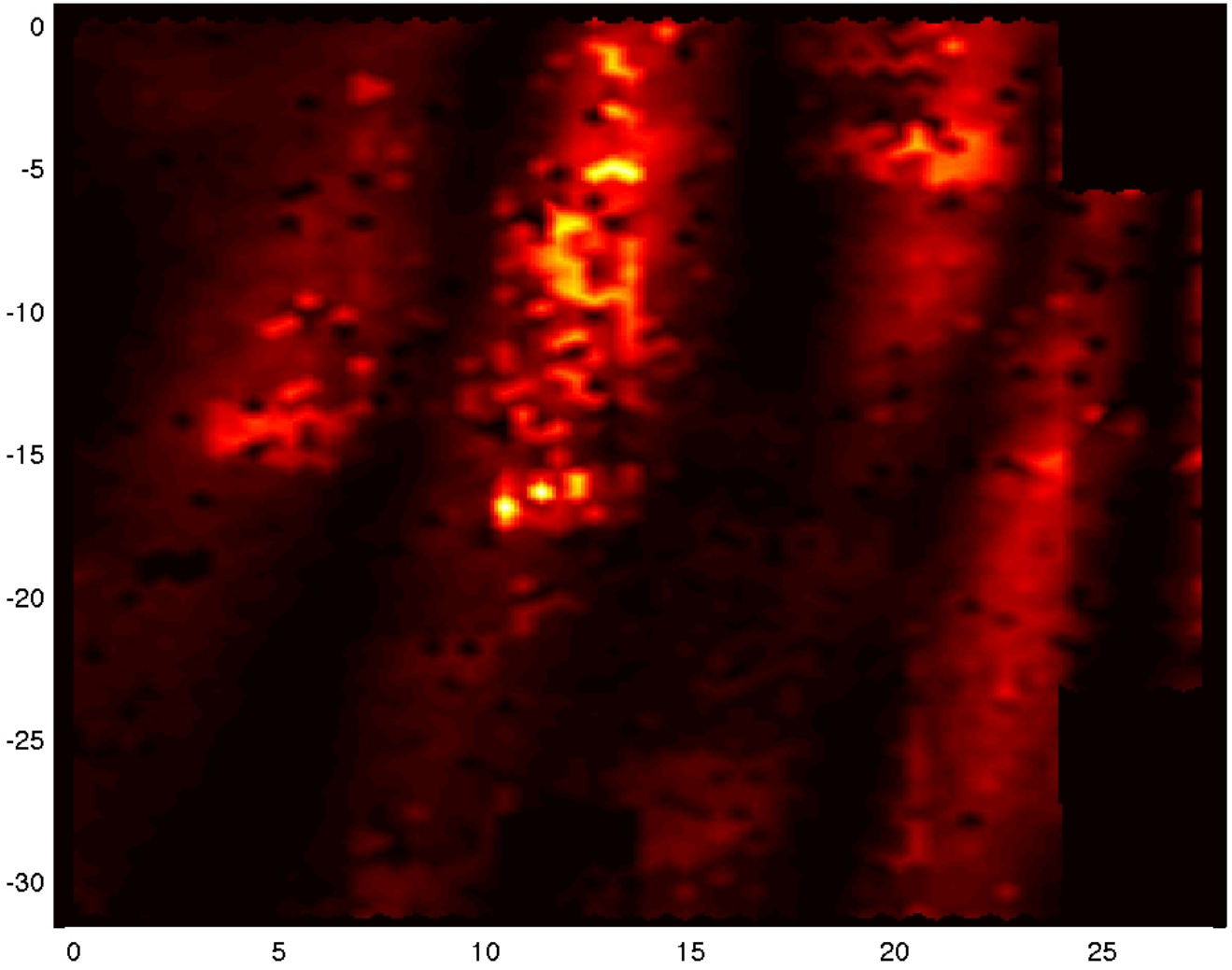
Calibration at RISR-C



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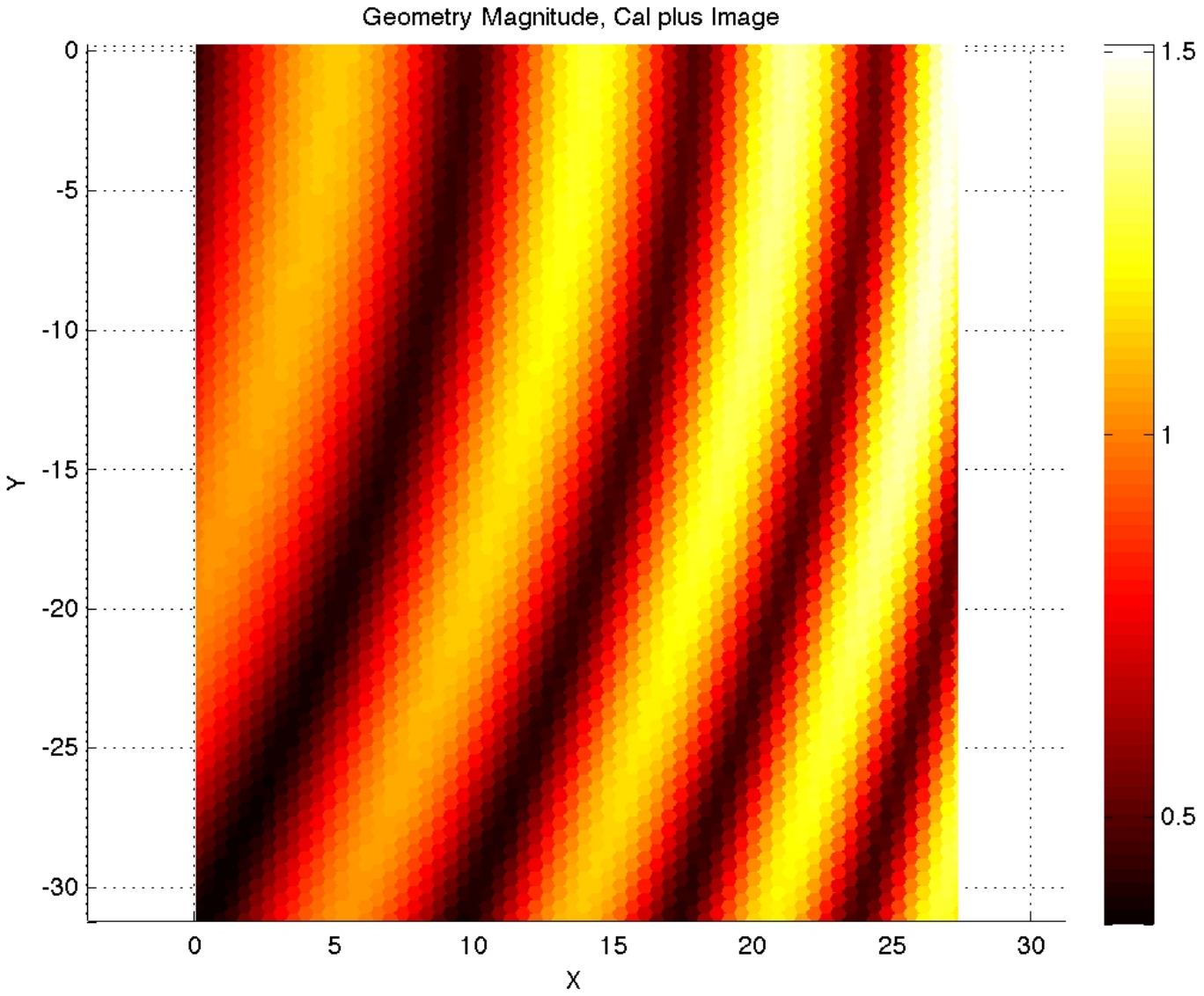
Calibration at RISR-C



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Calibration at RISR-C

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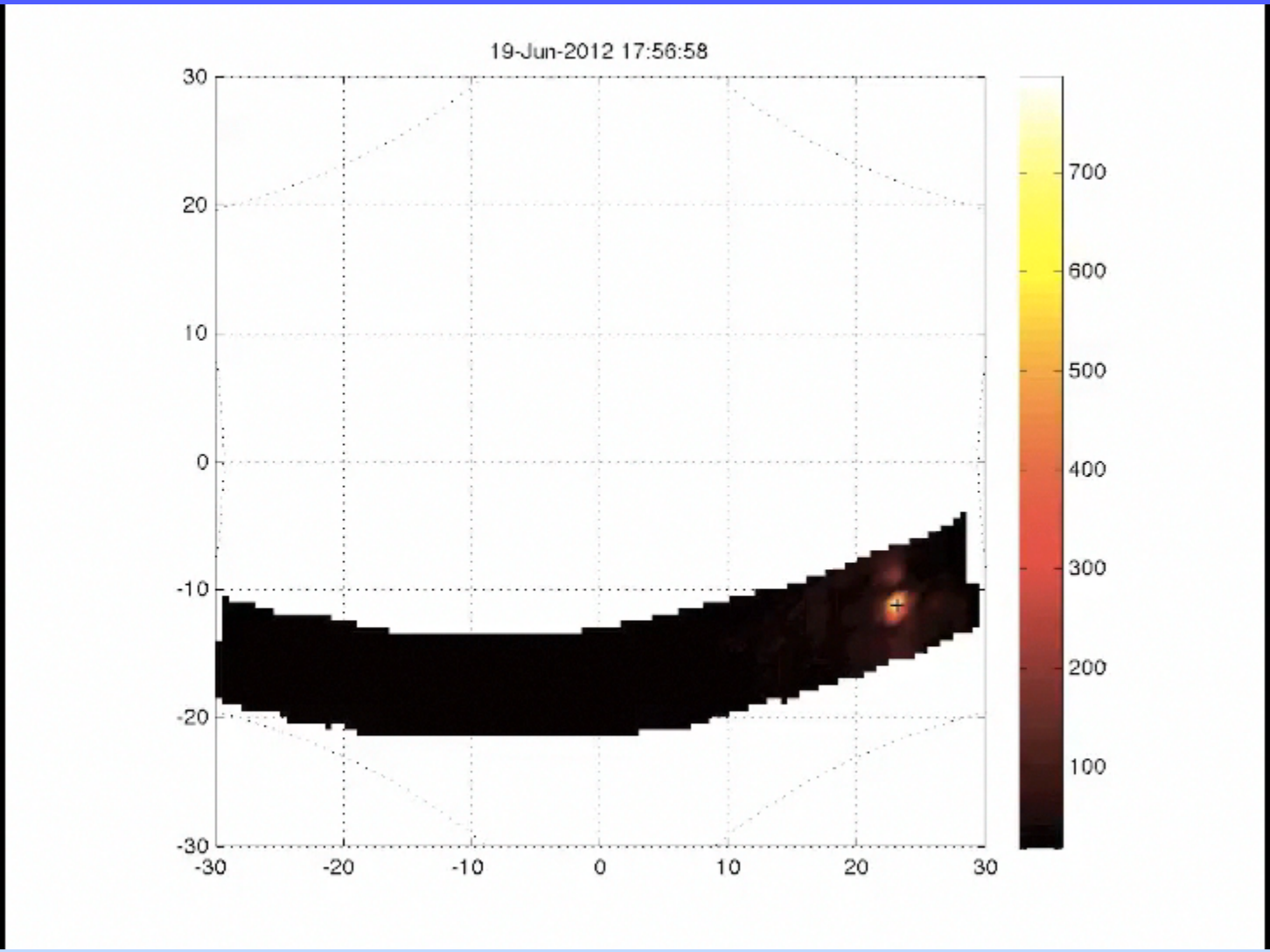
Calibration at RISR-C



QUESTIONS?