

Experiment Guide

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Experiment Design and Analysis Exercise

- We have 4 timeslots 2 hours each at the PFISR in Alaska.
- You have been divided in 4 groups of 5 people
- Each group is focusing on a different data “type”

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Each group should :

- Discuss and decide on a science topic you want to study with PFISR within the limitations of your “data type” .
- Decide what mode to run to accomplish your science goals.
- Write a request for radar time and send it to Anja and me.
- Get the request approved.
- Submit the mode to the PFISR system, and wait for it to run...

We will also have pre-run “backup” datasets available for additional fun (see handout).

Backup Mode “choices”

- Mode 1: **Muddy** - Raw Voltage Level
 - Group cheerleader: Jonathan Fentzke (PhD)
 - *Understand how we obtain basic products from raw voltage level data*
- Mode 2: **Dirty** - Lag Profile Level
 - Group cheerleader: Christiano Brum (PhD)
 - *Understand how we obtain basic products and IS parameters from lag profile measurements*
- Mode 3: **Wet** - Processed Level - **ISR Imaging**
 - Group cheerleader: Pedrina Terra (PhD)
 - *Understand the science that can be done with multi-beam distributed measurements with AMISR*
- Mode 4: **Dusty** - Processed Level - Derivables / Electrodynamics
 - Group cheerleader: Bob Marshall (PhD)
 - *Understand the science that can be done with E and F region distributed IS measurements with AMISR*

PFISR Operations Schedule for July

POKER FLAT AMISR OPERATIONS SCHEDULE FOR JULY 2009

	LDT	16-17	17-18	18-19	19-20	20-21	21-22	22-23	23-24	00-01	01-02	02-03	03-04	04-05	05-06	06-07	07-08	08-09	09-10	10-11	11-12	12-13	13-14	14-15	15-16
	UT	00-01	01-02	02-03	03-04	04-05	05-06	06-07	07-08	08-09	09-10	10-11	11-12	12-13	13-14	14-15	15-16	16-17	17-18	18-19	19-20	20-21	21-22	22-23	23-24
We	1-Jul																								
Th	2-Jul																								
Fr	3-Jul																								
Sa	4-Jul																								
Su	5-Jul																								
Mo	6-Jul																								
Tu	7-Jul																								
We	8-Jul																								
Th	9-Jul																								
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	UT	00-01	01-02	02-03	03-04	04-05	05-06	06-07	07-08	08-09	09-10	10-11	11-12	12-13	13-14	14-15	15-16	16-17	17-18	18-19	19-20	20-21	21-22	22-23	23-24
	ADT	16-17	17-18	18-19	19-20	20-21	21-22	22-23	23-24	00-01	01-02	02-03	03-04	04-05	05-06	06-07	07-08	08-09	09-10	10-11	11-12	12-13	13-14	14-15	15-16

Experiment specifics for real-time data:

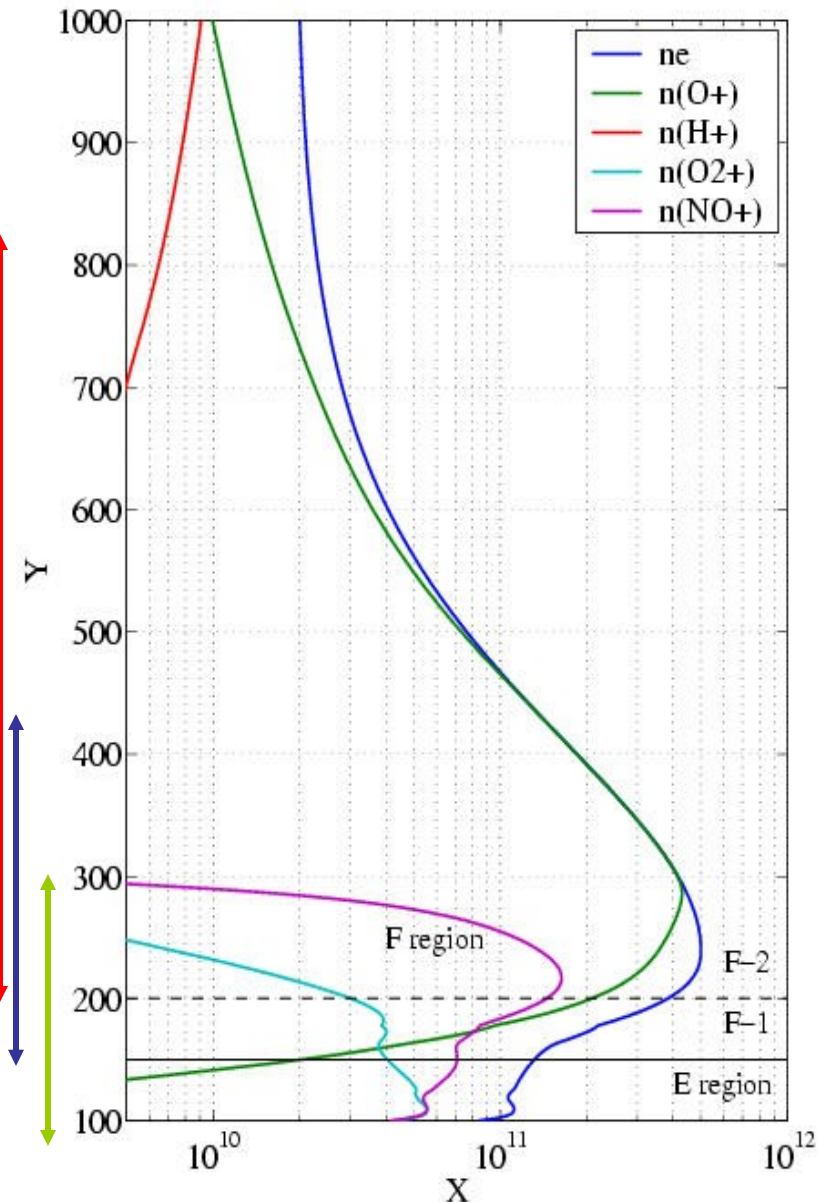
Two different pulse schemes will be used:

Long Pulses - LP-(480 μ s) resulting in 37 km resolution data between ~100-700 km

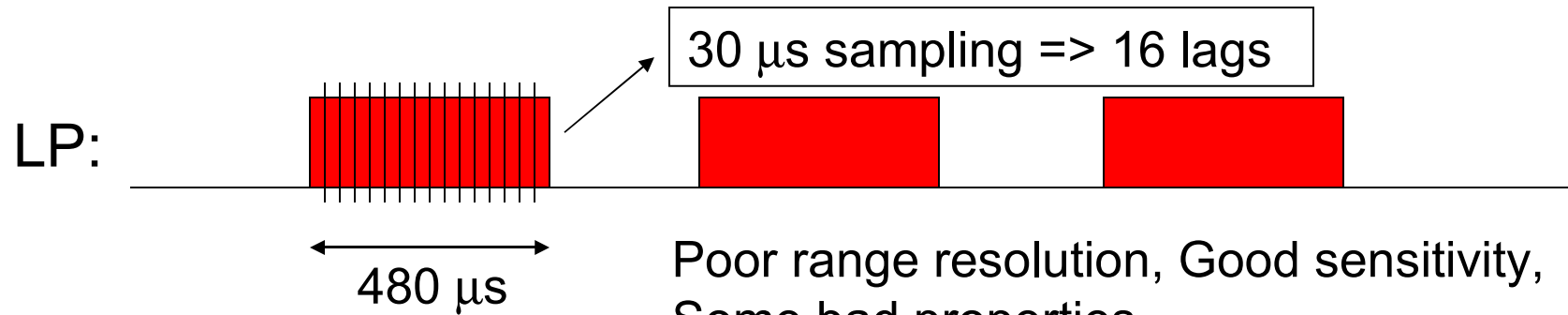
Alternating Codes - AC (16 baud 30 μ s - 32 pulses) resulting in 4.5 km resolution between ~90-350 km

Barker Codes - BC - (13 baud 10 μ s) resulting in 1.5 km resolution between ~90-150 km

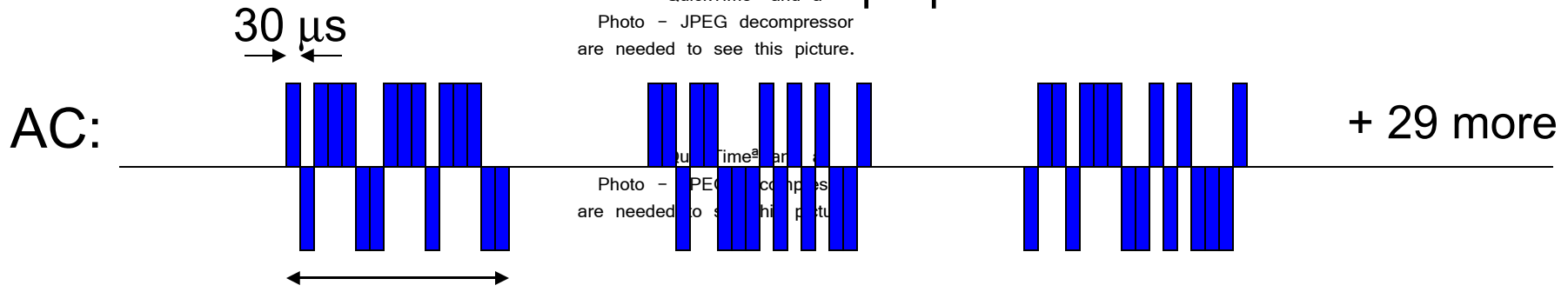
5-10% duty cycle



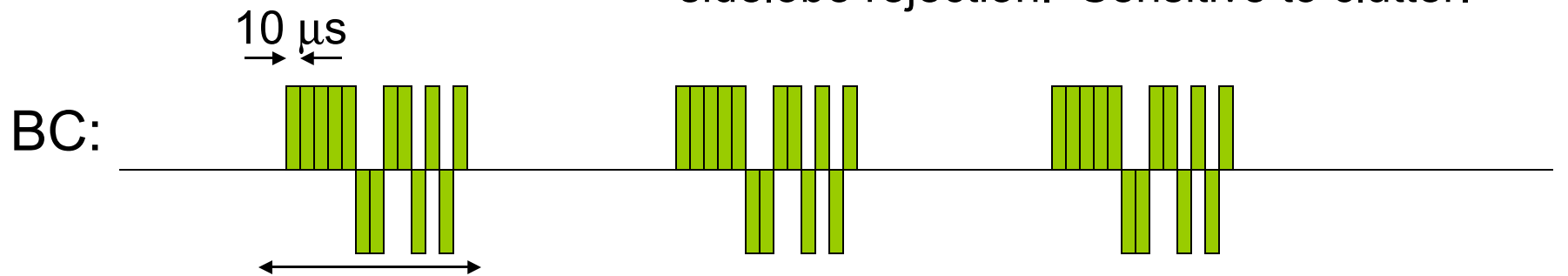
Cartoon of Pulses



Poor range resolution, Good sensitivity,
Some bad properties.

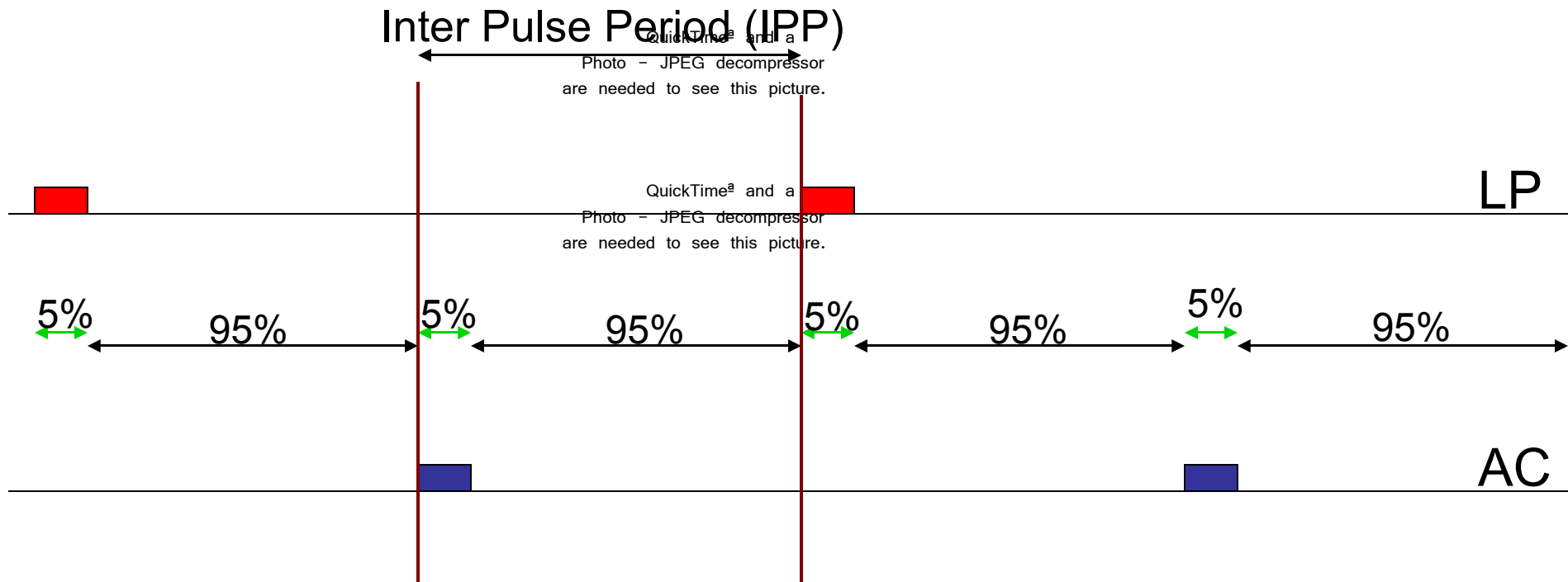


Good range resolution (sub-baud). Perfect
sidelobe rejection. Sensitive to clutter.



Good range resolution. Low sidelobe levels.
Good for 0-lag measurements only.

What 5% duty cycle means...



In the 95% of “non-transmitting” we do sample the signal, noise and calibration.

What can/should you “design” today?

- Design an experiment that is consistent with the goals achievable with your “backup” dataset
- Choose a combination of pulse schemes (or single pulse scheme): BC+LP, BC+AC, BC+LP, AC+LP
- Number of beam positions (between 1 and 32)
- Location of beam positions (out of ~475 possible)

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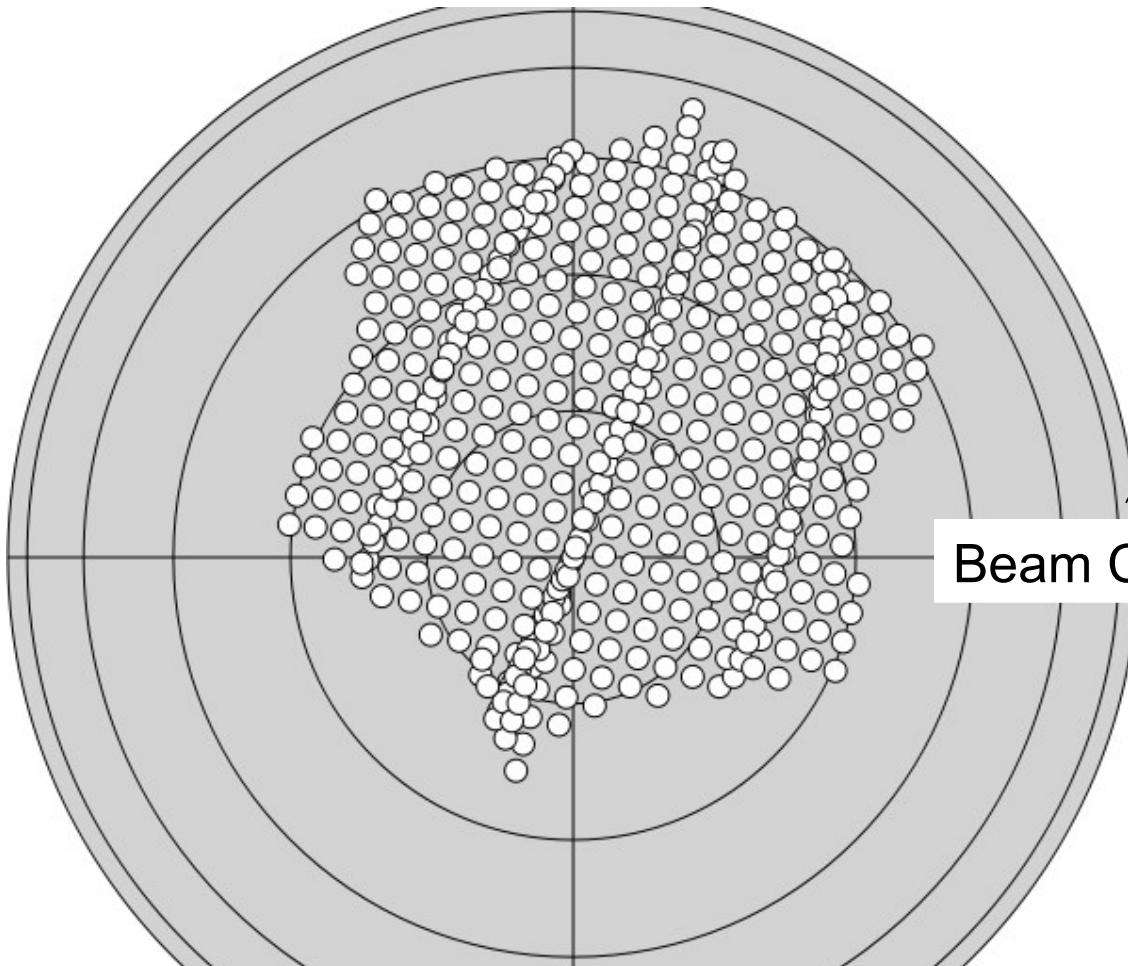
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The most important thing for you is identify an interesting science case AND find the experiment setup most suitable to study it!

You will have both the real-time and processed datasets to achieve these goals.

Note for Group 1 - we will not have the ability to provide raw data, so please design an experiment that will complement that data.

Available beam positions



63221	-21.51	61.46	1.361447e-19
63227	-18.77	60.10	1.346032e-19
63239	-16.23	58.68	1.324891e-19
63245	-13.89	57.20	1.298195e-19
63251	-11.73	55.69	1.266172e-19
63257	-9.72	54.13	1.229106e-19
63263	-7.85	52.53	1.187336e-19
63269	-6.11	50.90	1.141255e-19
63275	-4.48	49.24	1.091302e-19
63281	-2.95	47.55	1.037957e-19
63287	-1.51	45.84	9.817419e-20
63293	-0.15	44.10	9.232058e-20
63299	126.61	69.25	9.356377e-20
63305	121.38	69.66	9.845681e-20
63311	115.98	69.92	1.031070e-19
63317	110.50	70.00	1.074713e-19
63323	105.02	69.92	1.115083e-19
63329	99.62	69.66	1.151791e-19
63335	94.39	69.25	1.184474e-19
63341	89.39	68	
	84.65	67	
	80.22	67	
	76.09	66.19	1.268898e-19
63371	72.27	65.14	1.277260e-19
63377	68.74	63.99	1.280215e-19
63383	65.50	62.76	1.277695e-19
63389	62.51	61.46	1.269685e-19
		3e-19	
		3e-19	
		3e-19	
63413	52.73	55.69	1.184336e-19
63419	50.72	54.13	1.150550e-19
63431	48.85	52.53	1.112323e-19
63437	47.11	50.90	1.070012e-19
63443	45.48	49.24	1.024020e-19
63449	43.95	47.55	9.747898e-20
63455	42.51	45.84	9.232058e-20
6347			
6356			
6377			
63809	-159.50	76.00	9.499506e-20
63905	-159.50	78.00	1.023999e-19

Beam Code

Elevation (EI)

Azimuth (AZ)

System "constant"

+ ~400 more...

<http://amisr.sri.com/portal>

Examples of previous PFISR experiments

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Example....

Dear Craig and Mary,

I just got off the phone with Person1, and he seemed to think the best way for me to initiate an experiment with the PFISR is with a direct request. So here goes ...

We request PFISR time for observations to be made in concert with our coherent scatter radar in Anchorage in support of our ongoing CEDAR project. The local time of the observations should be from 2100-0400. The period of the experiments should be for 7-10 days, preferably in January before the start of classes here (Jan 21). Failing that, we would request observations during the moon-down period in February.

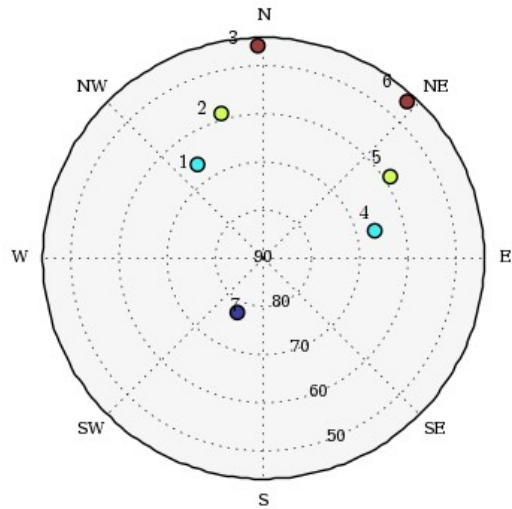
The mode I'm requesting is one being worked out by Mike Nicolls involving combined coded double pulses for high-res F region drifts interleaved with combined long and alternating coded pulses for E region temperatures. It is sufficient to store lagged products with a time resolution of a few seconds. The scientific objective here is to compare coherent scatter spectra with incoherent scatter-derived parameters (E-fields, drifts) in a common volume to better understand Farley Buneman waves and turbulence.

Rick and Russell would also like to run an experiment with support from the coherent scatter radar. Rather than interleaving their PFISR pulses with ours, which would cost us both in terms of statistics, or alternating days, which could well cause one of us to come home empty handed, I propose alternating their PFISR mode with ours on a regular basis - say in half-hour intervals. This way, we could both get what we want from a single substorm event, which is all we're really likely to get in a week of observations. The request isn't intended to make your life more difficult but rather to accommodate everyone's needs in a compact time interval.

Please let me know if you require more information. I hope what we're requesting will be possible.

Thanks for your consideration,
Person2

E-fields with AMISR



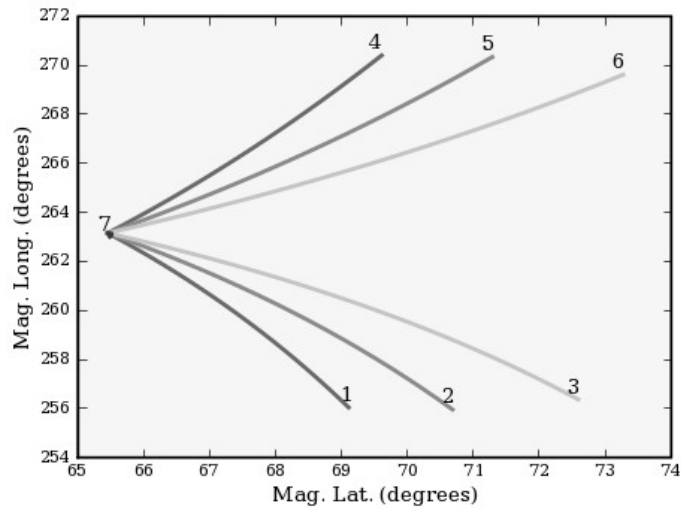
480 μ s pulses (72 km)

7 positions (one up B)

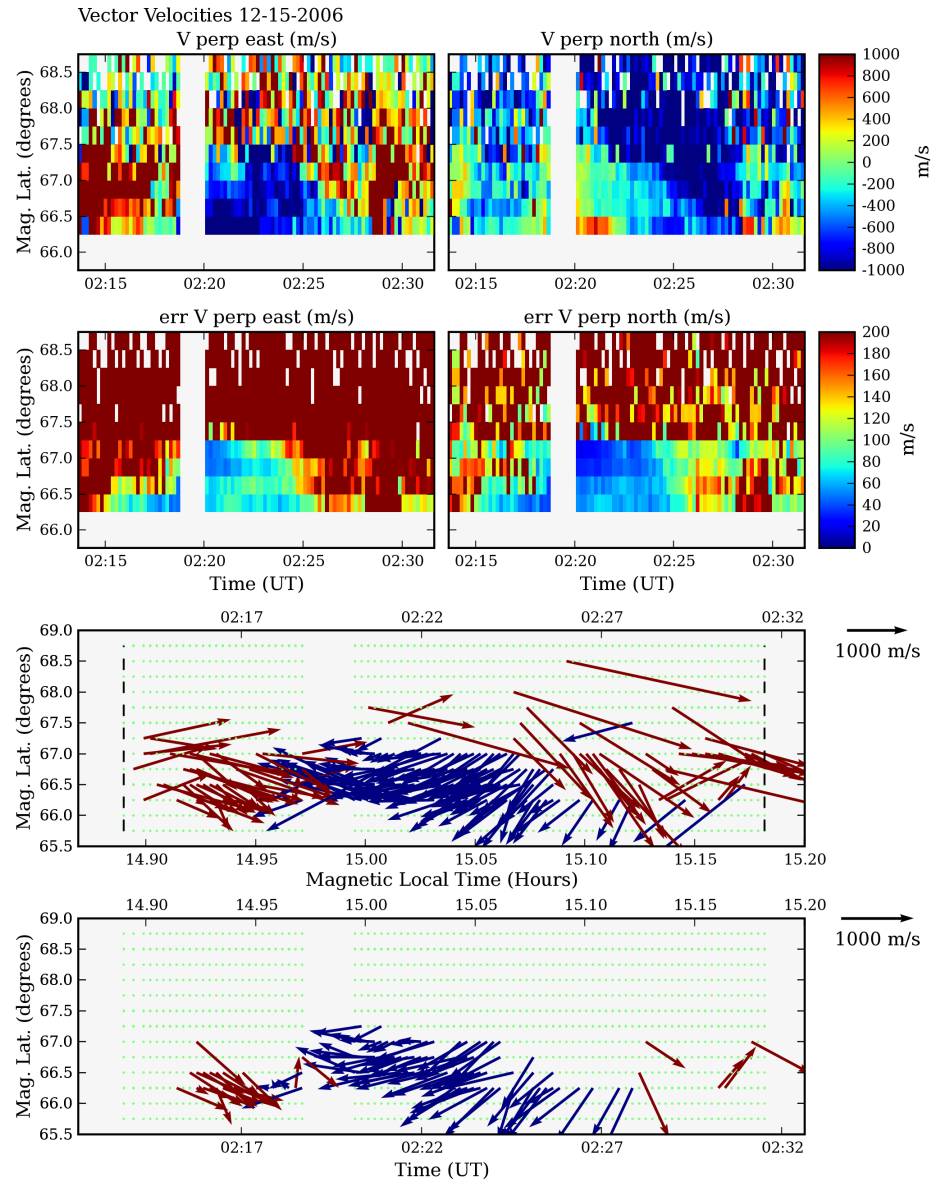
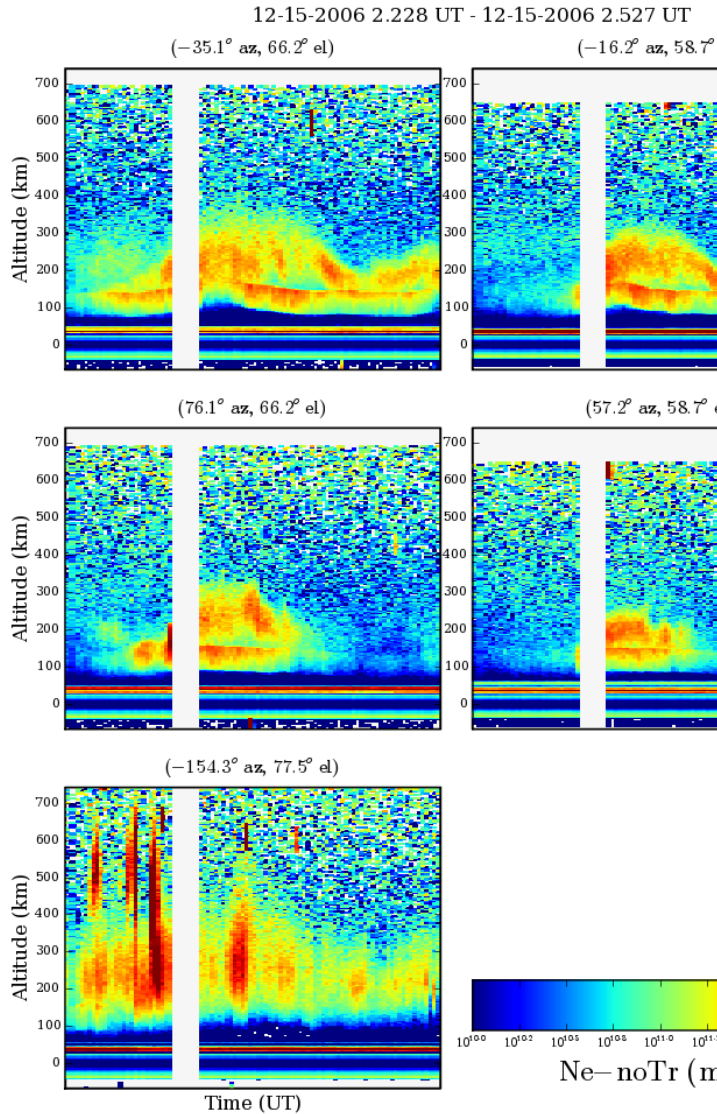
Pre-integration \sim 11 s

Time^a and a
G decompressor
see this picture.

Time^a and a
G decompressor
see this picture.



Standard Parameters and resolved velocities

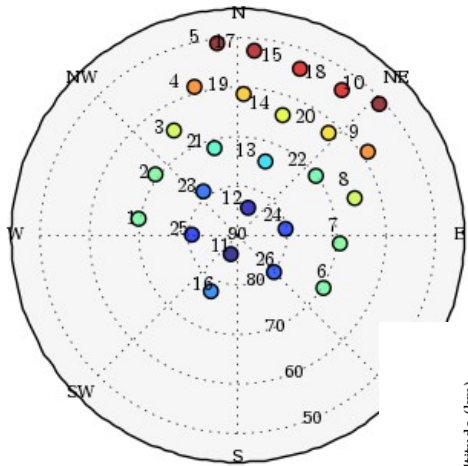


Imaging - PMSE?

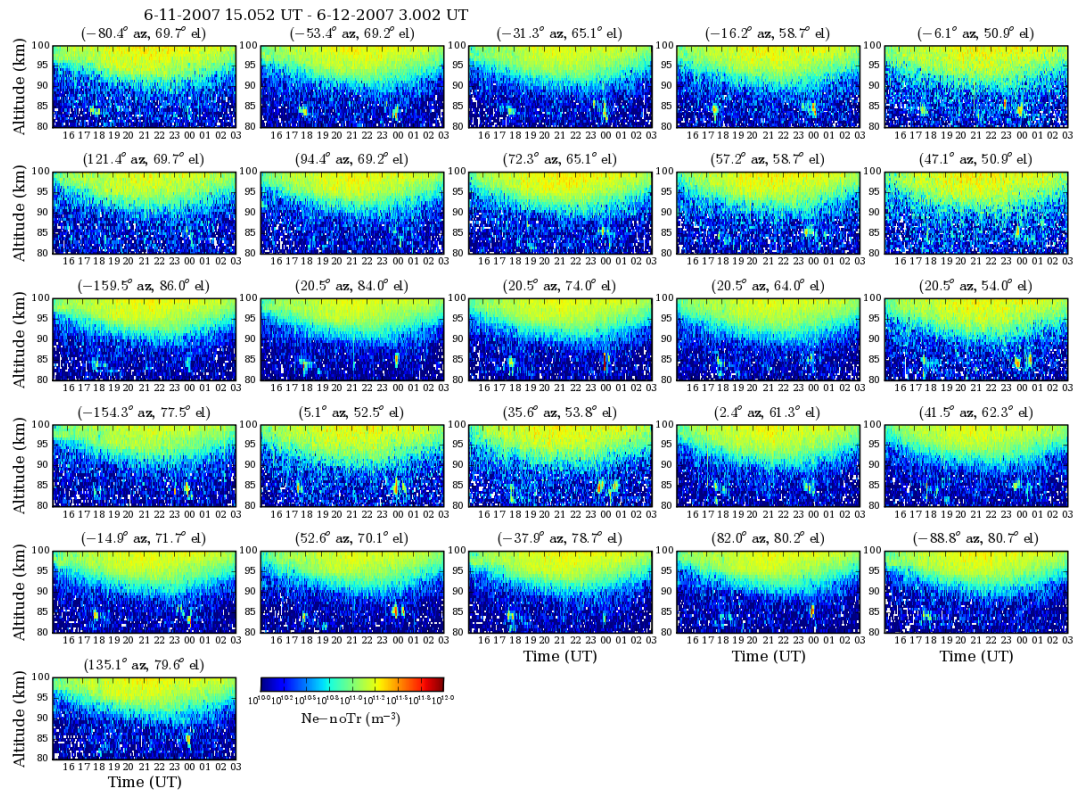
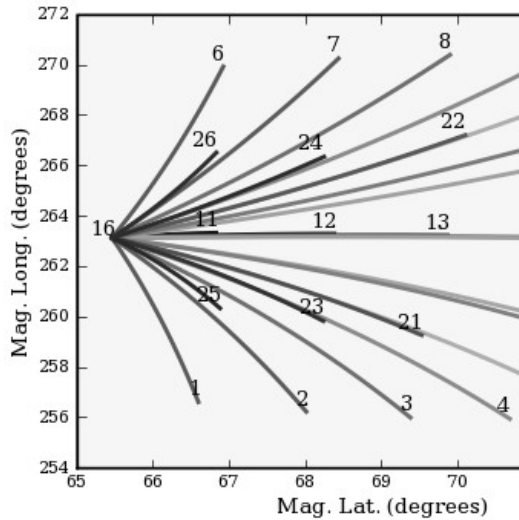
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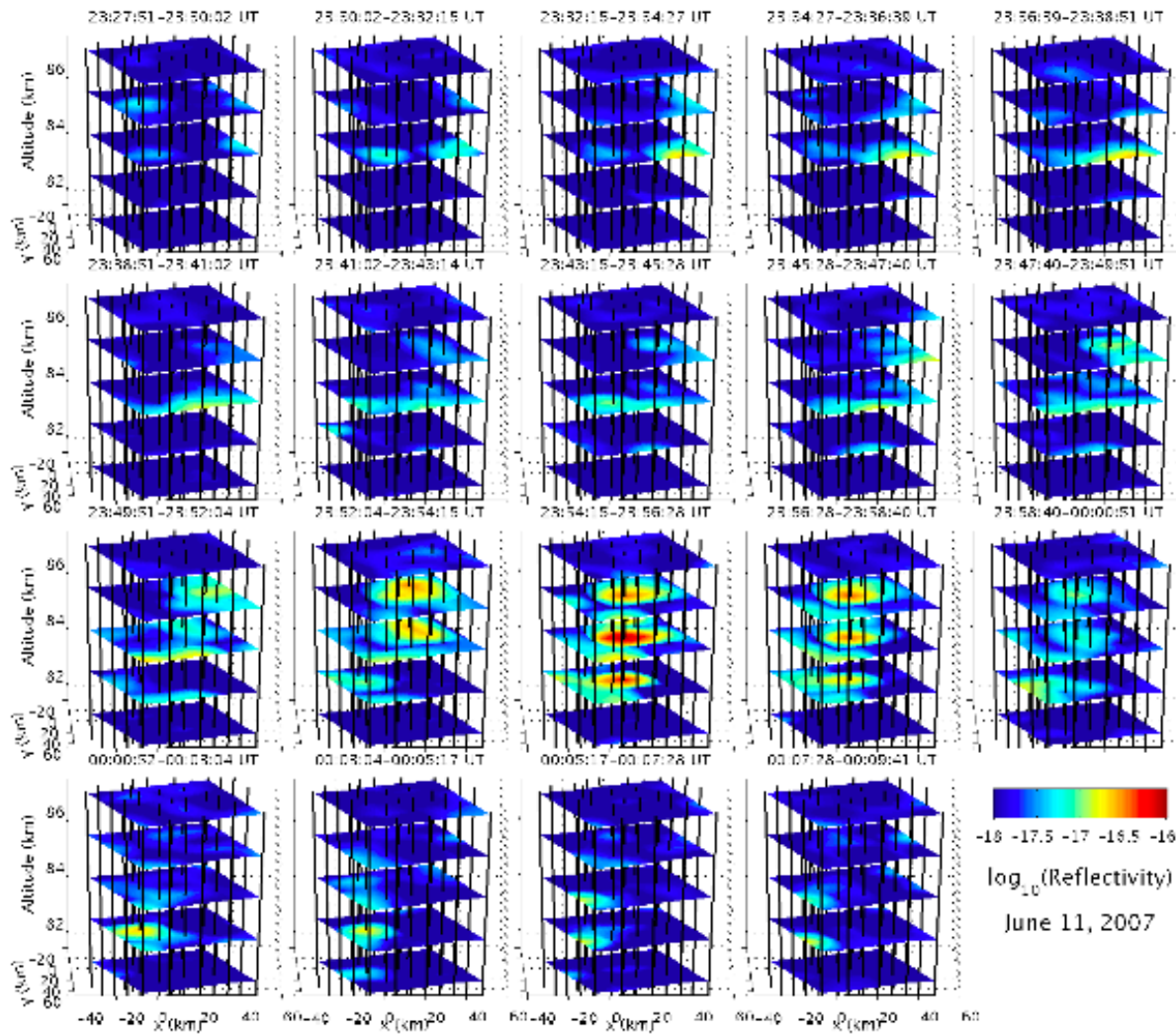
ospheric Summer Echoes)



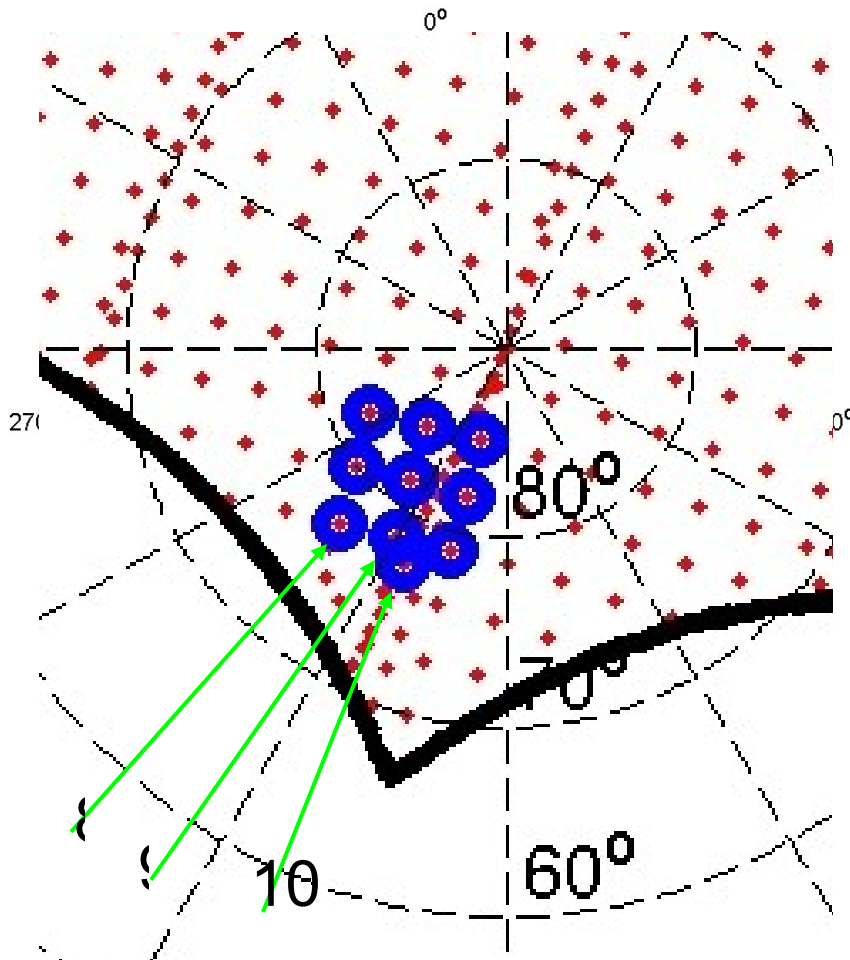
and a



Imaging PMSE over Poker Flat



Small scale studies/aspect sensitivity



- 9 positions in 3 degree grid
- 10th position up B
- 480 μs pulses (72 km range)
- Raw voltage sampling
- Plasma line data

We cycle through the 10 pulses in a fixed order

- 7.5 ms between pulses
- 75 ms between pulses in same direction

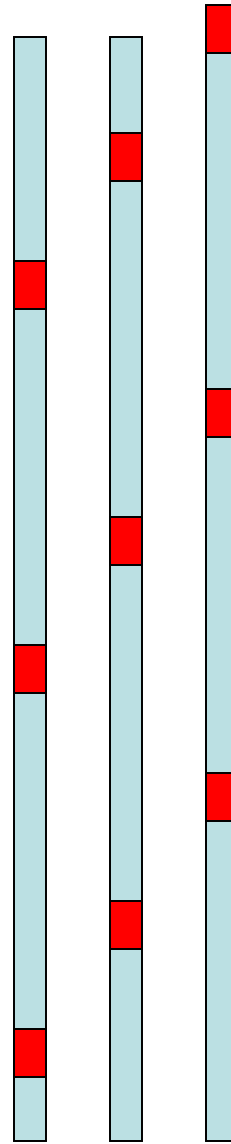
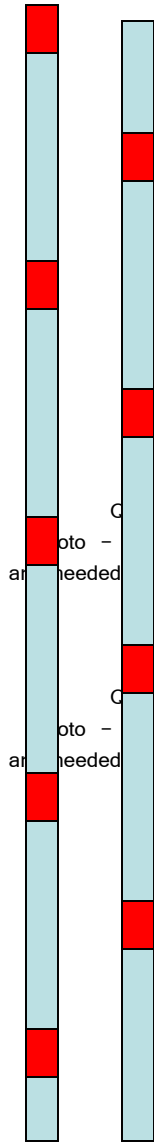
Word of warning!

As all other things in life - designing
PFISR experiments is a game of
tradeoffs.....

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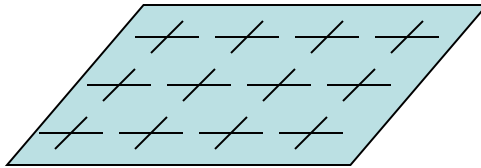
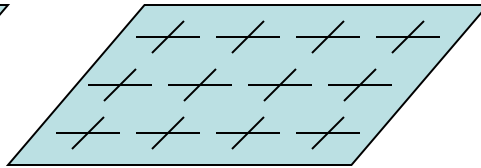
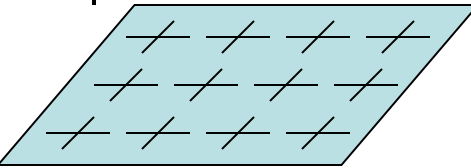
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Time

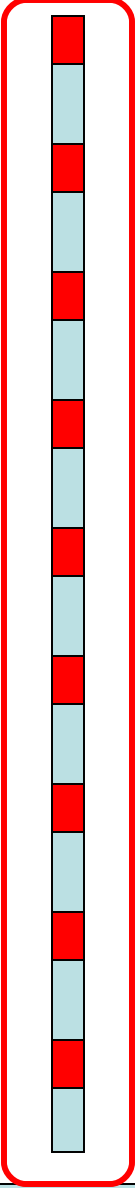


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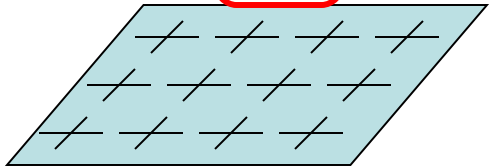
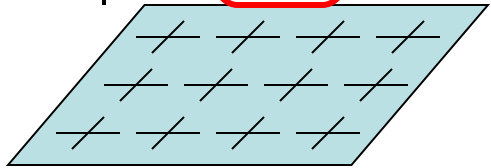
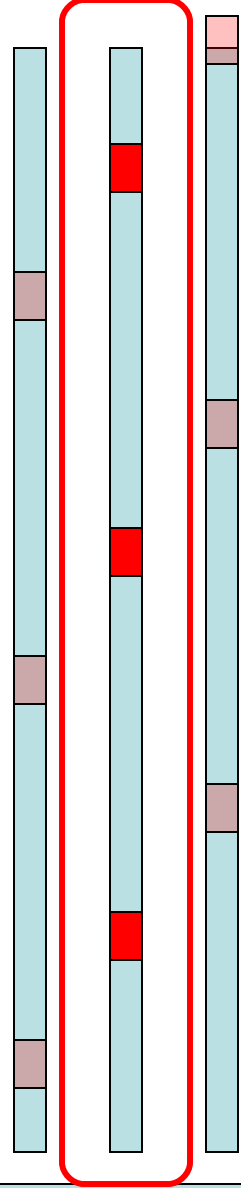


Time

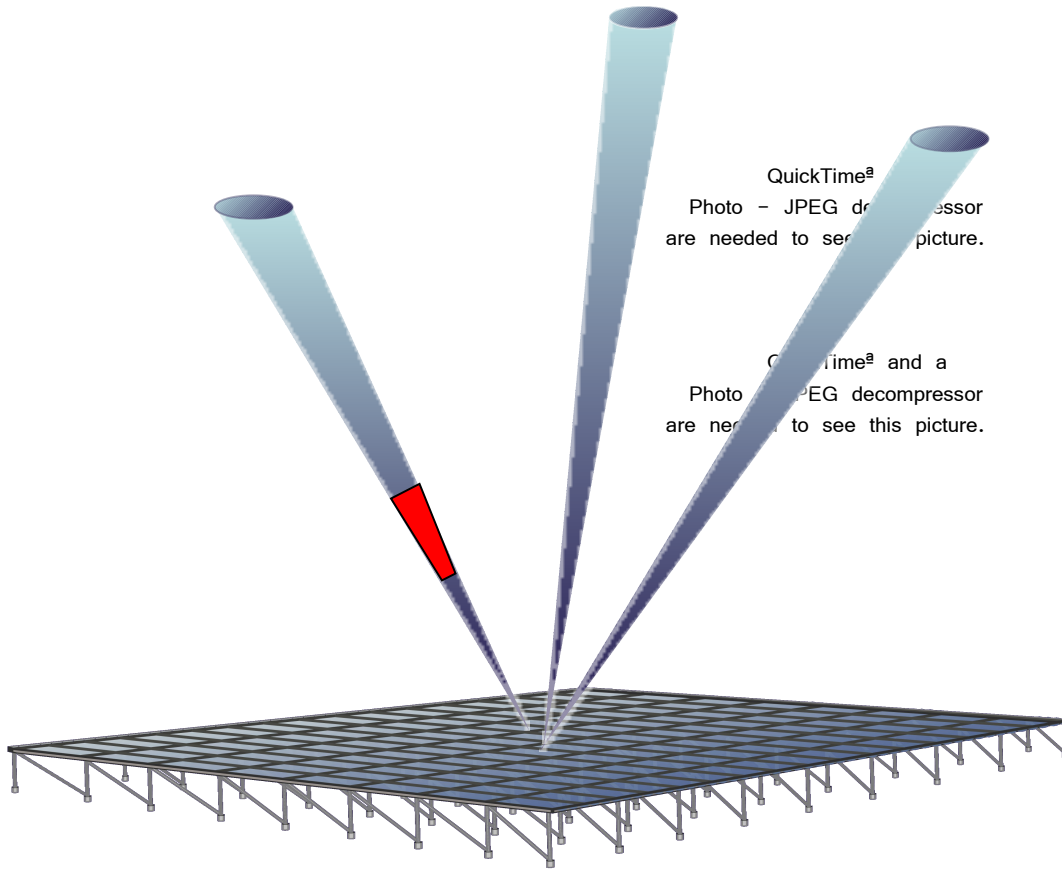


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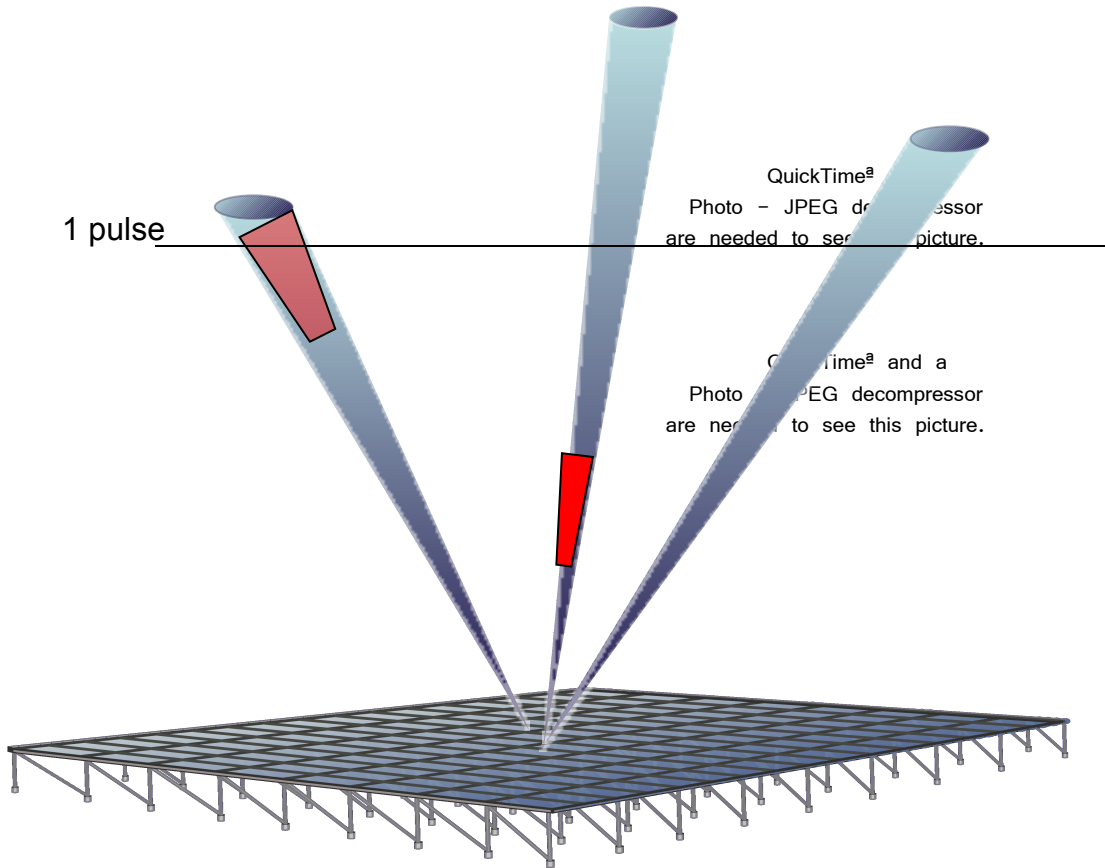
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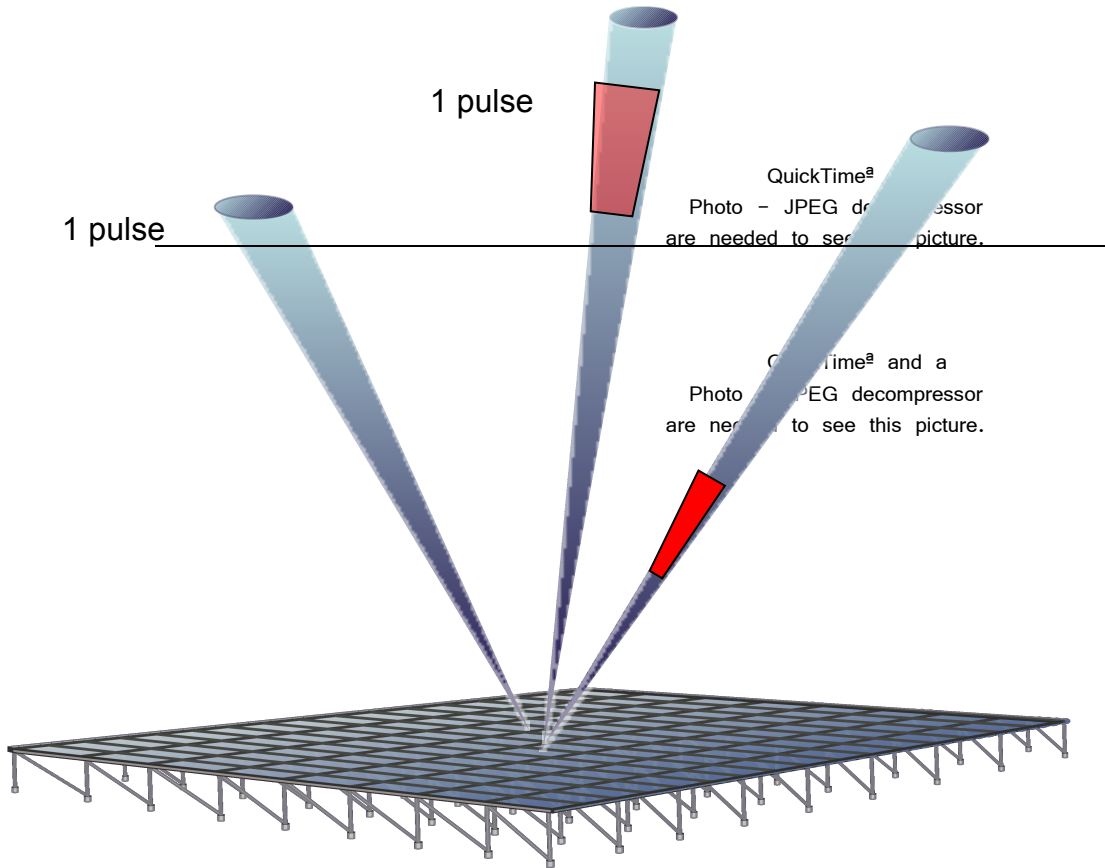
Imaging with AMISR



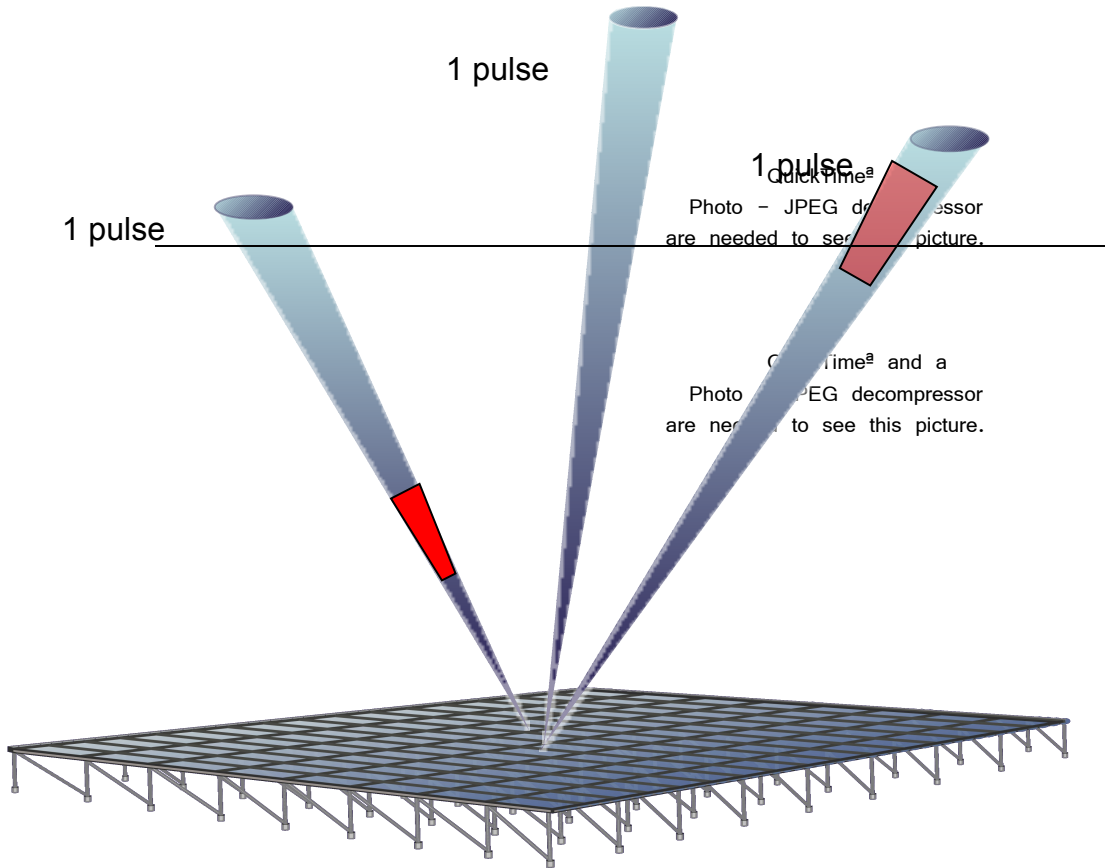
Imaging with AMISR



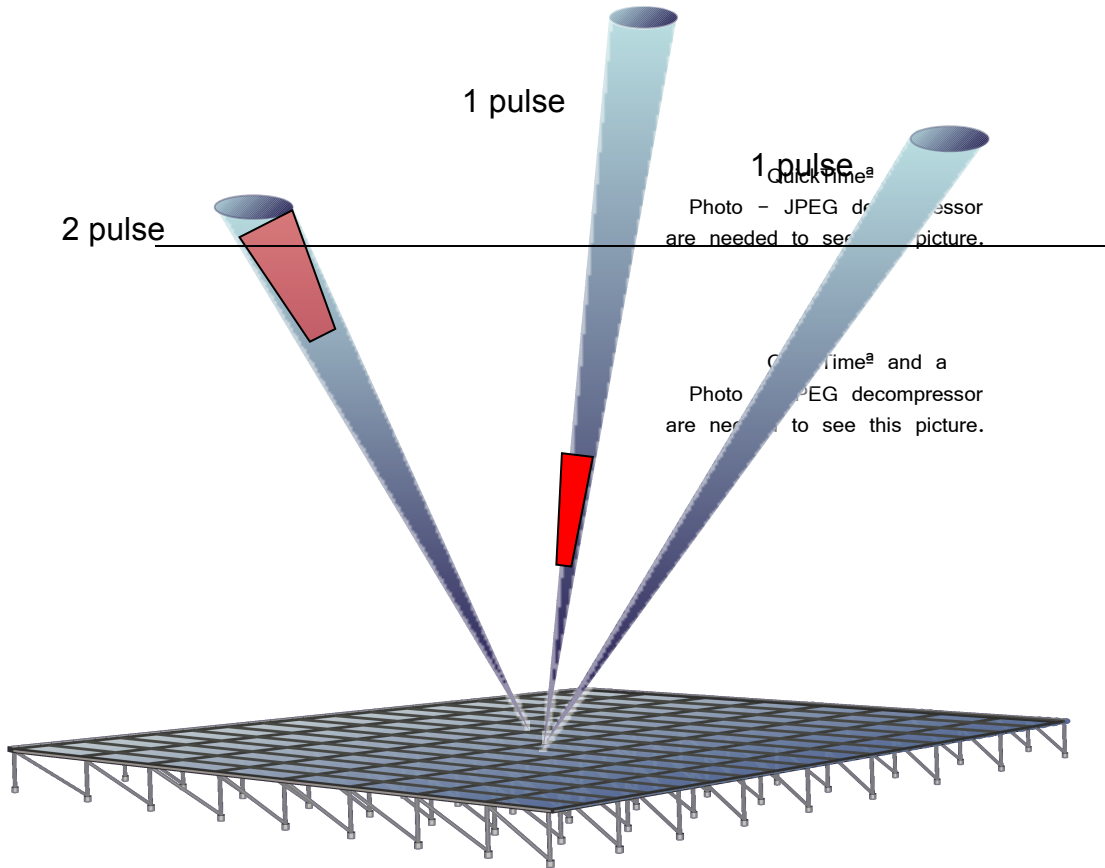
Imaging with AMISR



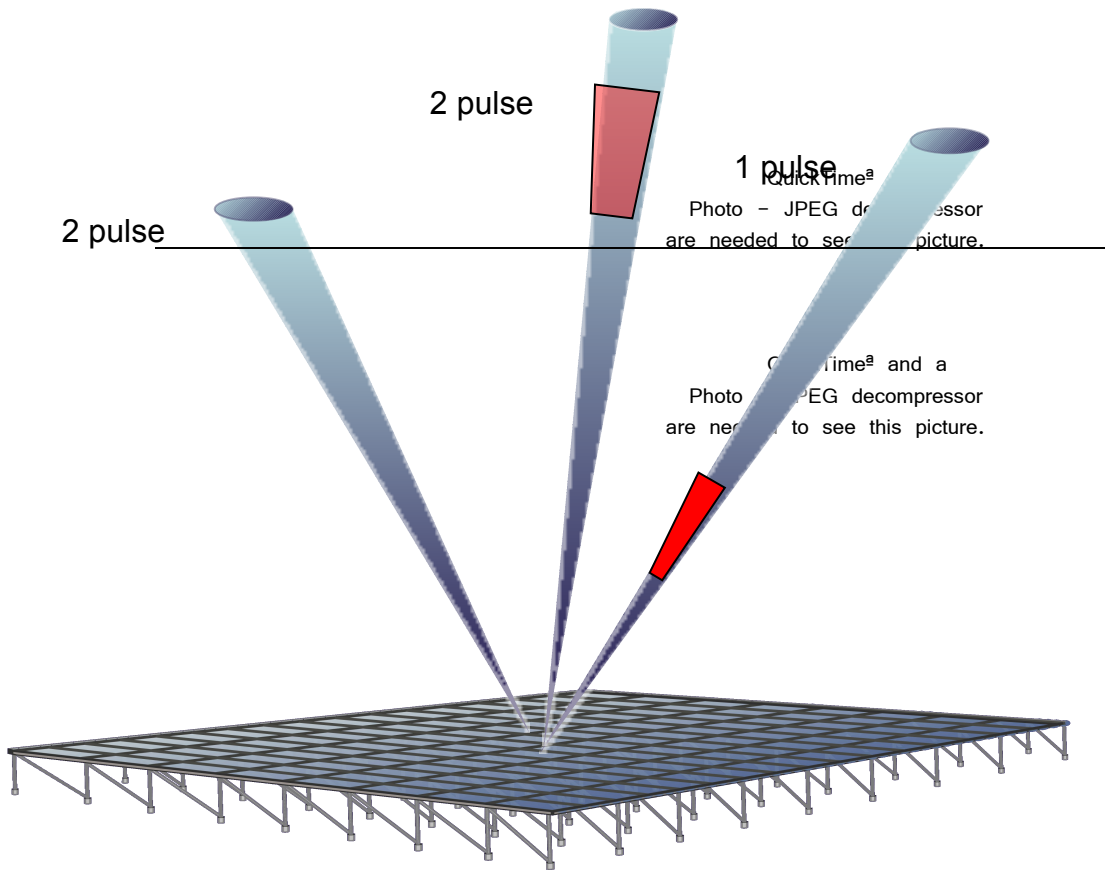
Imaging with AMISR



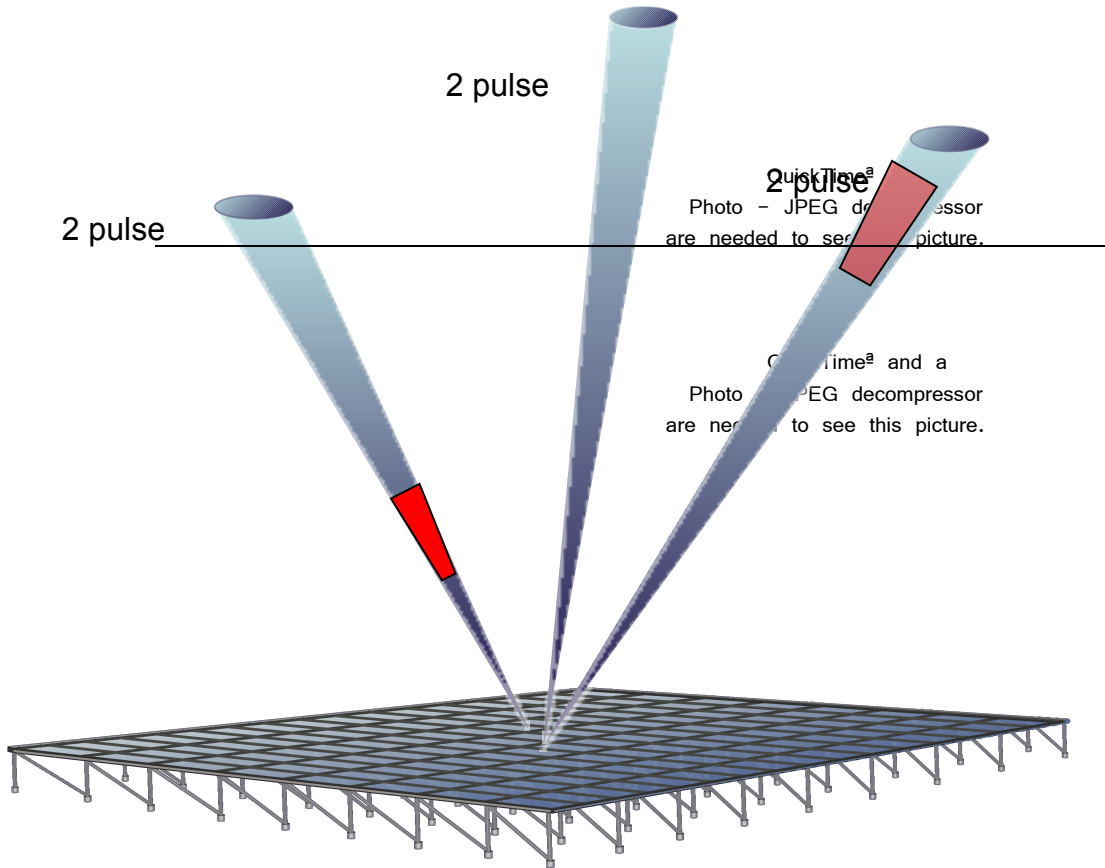
Imaging with AMISR



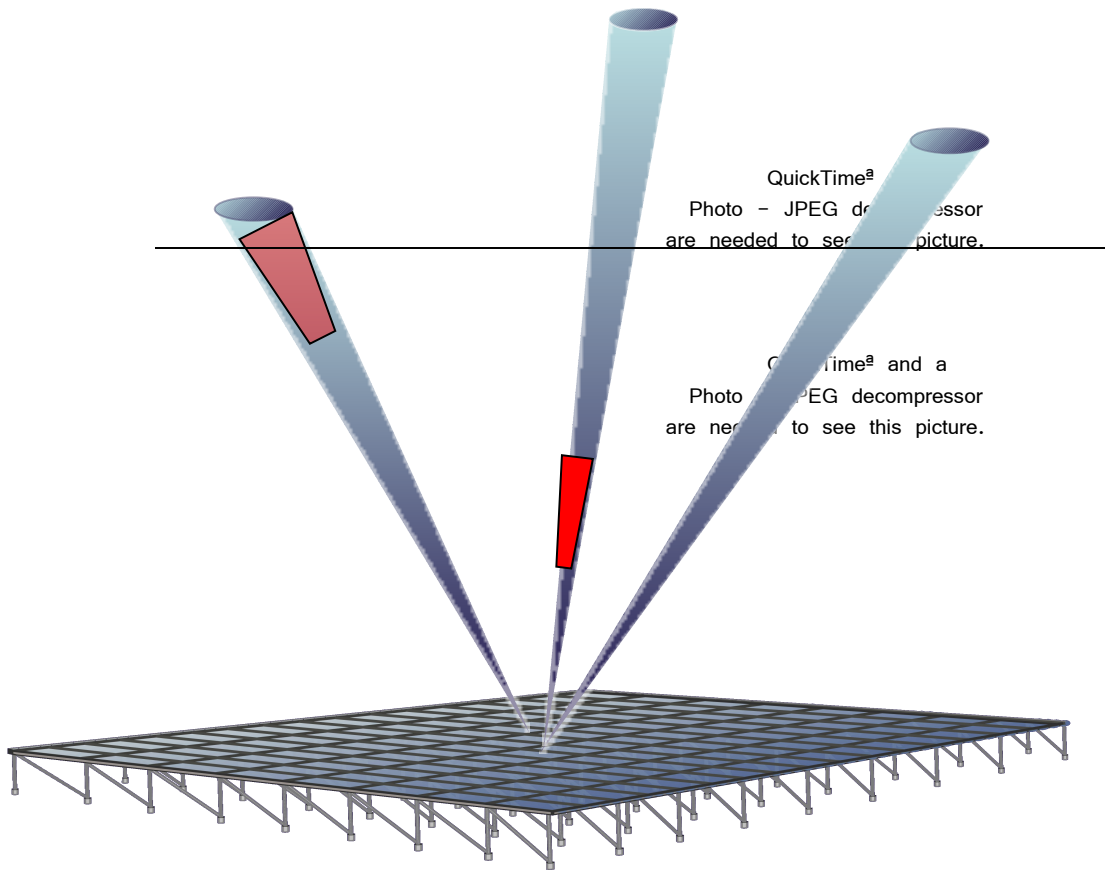
Imaging with AMISR



Imaging with AMISR

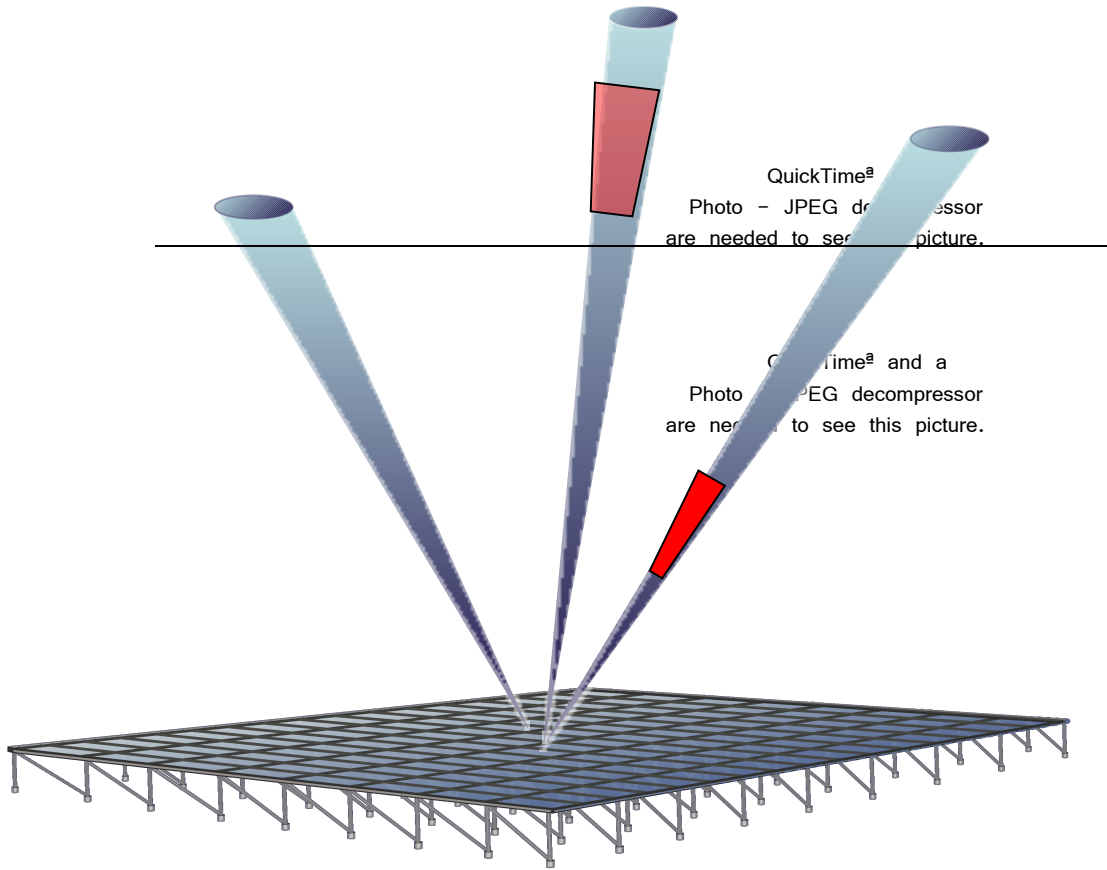


Imaging with AMISR



...until “enough” pulses
in each direction

Imaging with AMISR



Remember:

- The request for radar time should contain:
 - Science goals
 - Desired time slot (between 01:00-18:00 UT or 17:00-10:00 LDT)
 - Number of Beams QuickTime[®] and a Photo - JPEG decompressor are needed to see this picture.
 - Beam Positions
 - Desired Data Product (density, temperature, velocity etc) QuickTime[®] and a Photo - JPEG decompressor are needed to see this picture.
 - Submit to:

michael.nicolls@sri.com

craig.heinselman@sri.com

anja.stromme@sri.com