

ARM2008

12 March

Arrive by early/mid-evening

1600 Dinner

2000 Evening meal (cold)

Informal discussion before/after dinner with possible topics:

- The Council has decided to start on a history of EISCAT. There's lots of documentation on the administration, etc, but what's the most interesting thing from the EISCAT history from the staff's viewpoint?
- How to survive an earthquake at the ESR (Martin/Espen)

13 March

Breakfast

0800 0805 Welcome/Introduction

0805 0845 'State of EISCAT' (40 min, Tony)

0845 0855 EISCAT Council view (10 min, Kirsti Kauristie)

0855 0905 Open discussion/questions

0905 1045 Site reports

- ESR (15 min, Halvard)
- Tromsø
 - Radars (15 min, Roger)
 - Heating (10 min, Mike)
- HQ & Budgets (10 min, Henrik)

1000 1015 Coffee break

- Kiruna (10 min Lars-Göran)
- Sodankylä (20 minutes, Markku, includes HW & SW aspects of Heating upgrade)

1045 1115 Science 2007 summary (30 min, Ingemar)

1115 1130 TransNational Access (15 min, Lisa)

1130 1150 Heating upgrade: New uses & opportunities (20 min, Mike)

1150 1200 New network at ESR (10 min, Martin/Assar)

1200 1300 Lunch

1300 1345 EISCAT_3D: Technical Project Leader's invited review presentation (45 min, Gudmund Wannberg, IRF)

1345 1500 EISCAT_3D:

- EISCAT 3D test array (20 min Lars-Göran)
- Direct Digital Downconverters (DDC) for the Test array receiver: (20 min Tarmo)
- Serializers/Deserializers (SERDES) for the Test array receiver: (10 min Peter)
- Discussion

1500 1515 Coffee break

1515 1545 Plans for 2008 (10 min, Tony)

- Redistributed responsibilities
- EISCAT_3D: Summaries of each remaining EISCAT Work Package

1545 1730 Discussion session(s). Possible topics include:

- Staff representation at Council
- IPY and lessons to be learned
- Web site
- Monthly reports and information distribution (site leaders)
- How to install the BAS dynasonde
- The Doritos Broadcast Project

1730 1800 Wrap up

1900 Aperitif in the bar

1930- Dinner

14 March

Depart after breakfast

The centre has a swimming pool, sauna and gymnasium, so remember to bring suitable equipment to swim or exercise if you wish!





Designverket

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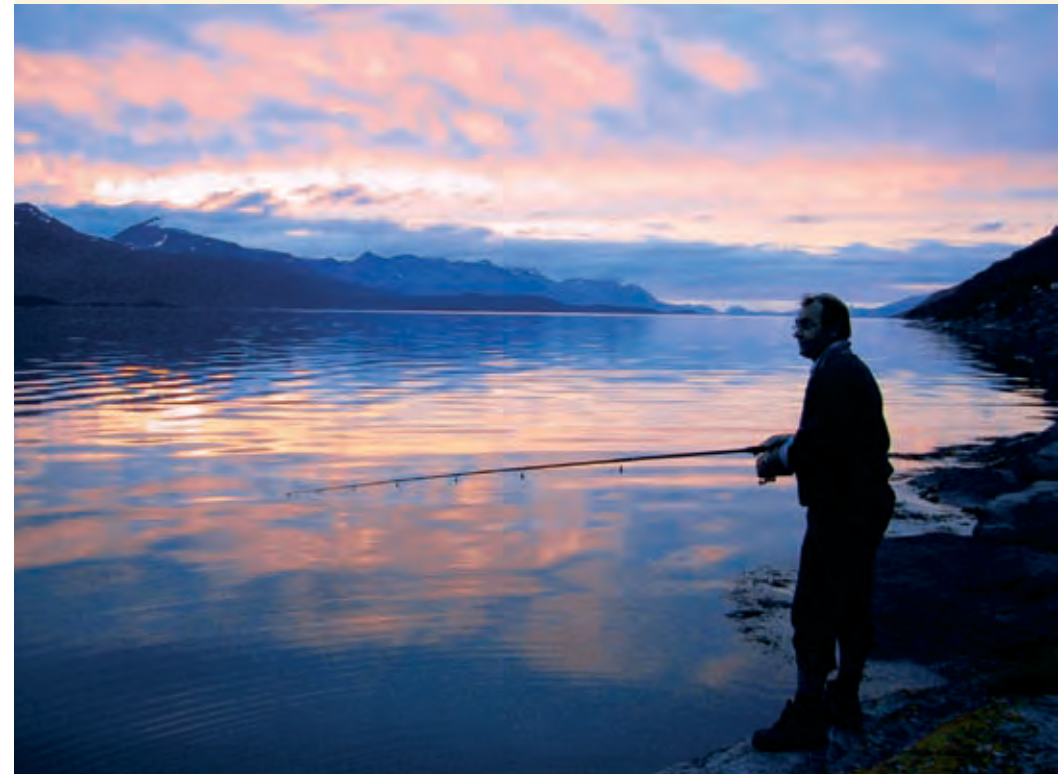
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Kurs og konferanse. Familiehelg og opplevelser.

Møte, kurs, konferanse

Med tradisjonsrik gjestfrihet kombinerer vi velvære, opplevelse og møtevirksomhet. Vi skreddersyr pakker i samarbeid med våre kunder. Det skaper effektive møter kombinert med litt annerledes opplevelser.

Vi kan ta imot store og små grupper. Spisesalen, med plass til 100 gjester, er lys og åpen. Der serverer vi sunn, "hjemmelaget" mat. Vi har bar med alle rettigheter. Våre to store peisestuer og tre mindre TV-stuer gir mulighet for sosialt samvær i større og mindre grupper. Vi har plass til over 100 overnattingsgjester. Rommene har eget dusjbad, telefon og radio. Flere rom er tilpasset rullestolbrukere.

Kursdeltaker eller turist? Spennende muligheter inne og ute

Skibotnsenteret serverer måltider ute i grillstua, der våre gjester kan sitte under tak med åpen flamme utover kvelden. Vårt basseng, solarium og sauna står til disposisjon. Det samme gjør trimrom med vekter og sykler. Hos oss kan våre gjester få opp pulsen med bordtennis, biljard eller en forfriskende tur med spark eller sykkel, alt etter årstiden.

Med Skibotn som utgangspunkt kan du i vintersesongen dra på brevandring, skitur eller scootertur. Til andre årstider frister rike bærforekomster, havfiske og kanopadling. Du kan prøve deg på sandvolleyball og klatrevegg. Her er også mulig å bestille massasje eller akupunktur.



Vår kursavdeling inneholder:

- 2 plenumssaler med AV-utstyr og 6 grupperom
- Prosjektør og overhead
- TV og video
- Storskjerm
- Høytaleranlegg med trådløse mikrofoner og teleslynge
- Datalab med tilgang til internett for 11 deltakere og kursleder
- Kurslederkontor med tilgang til pc, scanner og kopimaskin
- Øvingskjøkken og verksteder



Tromsø site status report 2007

Personnel

The staff situation is not good. The changes since last meeting are:

Ralf Larsen has one year leave of absence (From January 1, 2008.) It is not likely that he will return.

Stian Grande has been employed for Larsen's leave of absence time.

Kjellfrid Ingebrigtsen used to have a half position employment paid by EISCAT. Now UiTø pays for a 40% and EISCAT pays for a 10% position.

Liv Nymo (cleaning) has a half position employment, UiTø pays for a 25% position and EISCAT for 25%.

Espen Rørvoll will apprentice for 18 months, he started September 2007.

The current staff complement plan for the Tromsø site is based on about 600 hours of operation, the main load within working hours and the remaining in campaigns. In the process of staff reduction at Ramfjordmoen it was stated that we would receive help from the remote sites and from HQ to carry out this.

So far there has not been any campaign operation.

The main load of operation has not been on day time. It seems that the users can request and get whatever they want.

In addition to the 600 hours, about 100 hours have been added later on for transnational access, and we also expect to run about 60 hours paid by the French.

What happened in 2007: it was scheduled and run about 1500 hours. If we include HEATING it was around 1700 hours.

We can expect the same number of hours in 2008.

The extensive number of operation hours means that we are pushing problems ahead of us. We have little time for maintenance because of experiments and time off after experiments.

We should find a replacement for Larsen and employ at least one more technician.

Ramfjordmoen

The new main road to Tromsø will probably be built on the east side of Ramfjord.

RF radiation

Post- og teletilsynet made some measurements in the area where they plan to build the industrial park. The highest values reached 20% of the permitted radiation level.

The conclusion is that EISCAT does not represent any danger for the planned industrial park. The possible interference from the industrial park to EISCAT has not been investigated yet. In that connection it would be helpful to present scientific evidence of reduced quality of our data. I believe we have seen this during activity on the motocross track?

We have done our own measurements close to the antennas, and we think we should avoid the lowest elevation angles on the UHF radar. We have discussed to use about 25 degrees as the lower limit.

We also need to check the levels close to HEATING. The equipment used to measure the level was not suited for the purpose, and I think Post- og teletilsynet should come back and do the measurements for us.

The MORRO radar is now in operation.

They managed to select 56 MHz for the radar, and it is interfering with the EISCAT VHF radar. This makes it necessary to synchronize the operation between the two radars. The equipment for doing this is not installed yet. The MORRO radar gets mains power from PRE. PRE has been separated from our mains power.

Internet

We have new fiber connection between Radar and Heating.

The router (at PRE) and the other internet equipment have UPS backup.

Water supply

We have had problems with the water supply on Ramfjordmoen. UiTø has replaced the pump and other parts, and the problem seems to be solved.

EISCAT radar general equipment

A new fire alarm system has been installed.

The site has a new UPS, and the emergency generator has been repaired and serviced.

Heat exchanger on the platform (glycol-loop)

One of the heat exchangers has been disconnected because of leaks. We expect problems in the summer if we do not repair it...

The price is 230 k NOK.

Both **HV-SWITCH** gears have been modified to respond quicker.

CROWBAR: we need to buy a spare thyatron tube (About 20 K NOK). It may be possible to modify the crowbar system and use the tubes we got from Søndre Strømfjord. So far we have not had time nor access to the system long enough to test it.

UHF radar

The radar is in full operation. The output power is in most cases between 1700 and 1900 kW peak power. We have problems when we try to mix frequencies far away from each other. (switchless combiner).

Problems:

- The intermediate power amplifier failed. A new has been installed.

- The receiver protector dummy-load failed, and has been serviced.

- The cryo-head failed and had to be sent away for repair.

- The EXITER has failed, and we use a lab generator (Marconi).

- Quite a few diodes in the rectifier has burned and been replaced.

- The DC high voltage cable connector has been repaired.

UHF antenna: We have some problems with the brake on one of the elevation drives. At the moment we are running with only one brake instead of two. The motor drives were serviced by assistance from Kiruna- and Sodankyla engineers.

VHF radar

The radar is running with only one klystron. The output power is about 1800 kW peak power.

Klystron number two is still in the transmitter hall and it is pumped with two vacuum pumps.

We have established contact with Thales and they can supply us with a sealant material that can withstand the type of transformer oil we are using in the klystron tank. We will have to take away the other sealant first and then use the sealant they have. The sealant can not be stored, but has to be used within a few days.

VHF antenna

The reflector surface has been repaired during the summer and autumn. Damaged sheets have been replaced and the other have been fastened. We used about 3000 pop rivets. The cabling of the motor controls has partly been rewired. We still have a lot of work remaining.

We do not have any spare servomotors. They are still available in the secondhand market, and the price is around 10 k NOK.



HQ & budgets (10 min, Henrik)

- 2007
- 2008
- 2009
- 2010
- 2011
- Other



2007

- Accounts not finalised yet

Financial Development 2007

As of September 2007

Associate contributions and other income		Budget	Forecast
Associate contributions	<i>Page 2</i>	22 151	23 419
Development contracts	<i>Page 2</i>	6 275	4 608
Bank interest and other income	<i>Page 2</i>	964	4 434
Own reserves	<i>Page 2</i>	1 478	2 585
		30 869	35 047
Expenditure			
Core	<i>Page 2</i>	13 880	15 411
Operations	<i>Page 4</i>	8 174	11 399
Development contracts	<i>Page 6</i>	8 461	6 069
Capital Operating	<i>Page 7</i>	353	535
		30 869	33 415
Balance		0	1 632



2007

- Accounts not finalised yet

Financial Development 2007

As of September 2007

Associate contributions and other income		Budget	Forecast	Very prel outcome
Associate contributions	Page 2	22 151	23 419	23 944
Development contracts	Page 2	6 275	4 608	1 036 (only
Bank interest and other income	Page 2	964	4 434	4 570
Own reserves	Page 2	1 478	2 585	2 226
		30 869	35 047	31 776
Expenditure				
Core	Page 2	13 880	15 411	17 960
Operations	Page 4	8 174	11 399	10 802
Development contracts	Page 6	8 461	6 069	360 (only
Capital Operating	Page 7	353	535	551
		30 869	33 415	29 673
Balance		0	1 632	2 103

Division between Core and Op - staff costs incorrect (to be fixed)

Probably year-end thing re. some IPY costs.

All-in-all as planned



2008

- Final budget

Budget 2008

October 2007

Associate contributions and other income		Budget07	Budget08
Associate contributions	<i>Page 2</i>	22 151	24 474
Development contracts	<i>Page 2</i>	6 275	6 417
Bank interest and other income	<i>Page 2</i>	964	688
Own reserves	<i>Page 2</i>	1 478	527
		30 869	32 106
Expenditure			
Core	<i>Page 2</i>	13 880	14 179
Operations	<i>Page 4</i>	8 174	8 681
Development contracts	<i>Page 6</i>	8 461	8 850
Capital Operating	<i>Page 7</i>	353	396
		30 869	32 106
Balance		0	0



2009 - 2011

- Five years plan

In KSEK
unless
otherwise
stated

Five Years Plan
Based on 2007 price level

		2007	2008	2009	2010	2011	2012
Associate contributions and other income							
<u>Associate contributions</u>							
CRIRP (People's Republic of China)		2 525	2 525	2 525	2 525	2 525	2 525
DFG (Germany)	a)		1 665	1 665	1 665	1 665	
NIPR (Japan)	b)	1 344	1 260	1 260	1 260	1 260	1 260
RCN (Norway)		5 484	5 484	5 484	5 484	5 484	5 484
SA (Finland)		3 238	3 238	3 238	3 238	3 238	3 238
STFC (United Kingdom)	c)	4 160	4 208	4 208	4 208	4 208	
VR (Sweden)		5 400	5 400	5 400	5 400	5 400	5 400
New Associate: Ukraine	d)		694	694	694	694	694
New Associate: Russia	e)			694	694	694	694
<u>Development contracts</u>							
Design Study		4 933	5 075	5 357			
Transnational Access		1 342	1 342	1 342			
External project income	f)						
Bank interest		458	637	555	444	444	444
Other income		506	50	53	54	55	56
<u>Own reserves</u>							
From restructuring reserve	g)	1 322	1 355	884			
Transfer from previous year	h)	1 758	3 234	4 062	4 237	4 307	3 335
Transfer to next year	i)	-1 602	-4 062	-4 237	-4 307	-3 335	
From final outcome of DS	j)				485		
		30 869	32 106	33 183	26 081	26 639	23 130
Expenditure							
<u>Core</u>							
Infrastructure	k)	2 486	2 446	2 499	2 553	2 608	2 664
Repair and maintenance		406	644	941	552	485	495
Administration		2 244	2 396	2 448	2 501	2 555	2 610
Personnel		12 201	12 397	12 664	12 938	13 217	13 503
Resources used for dev. contracts		-3 456	-3 704	-3 758			
<u>Operations</u>							
Operations		1 883	2 042	2 087	2 044	2 088	2 133
Administration		1 155	1 301	1 329	1 358	1 387	1 417
Personnel		5 136	5 337	4 913	3 723	3 508	3 584
<u>Development contracts</u>							
Design Study	l)	7 119	7 508	7 844			
Transnational Access	m)	1 342	1 342	1 342			
Capital Operating	n)	353	396	875	414	790	432
		30 869	32 106	33 183	26 081	26 639	26 838
Balance	o)	0	0	0	0	0	-3 708
Cash flow for the year	p)	-1 478	-527	-708	70	-972	-7 043
Number of staff	q)	22.5	23.0	22.0	20.0	19.5	19.5
Number of operating hours	r)	2 696	2 696	2 696	2 600	2 600	2 600



2009 - 2011

		<u>2007</u>	<u>2008</u>	<u>2009</u>	<u>2010</u>	<u>2011</u>	<u>2012</u>
Associate contributions and other income							
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VR (Sweden)		5 400	5 400	5 400	5 400	5 400	5 400
New Associate: Ukraine	d)		694	694	694	694	694
New Associate: Russia	e)			694	694	694	694
<u>Development contracts</u>							
Design Study		4 933	5 075	5 357			
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2009 - 2011

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Expenditure							
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Number of staff	q)	22.5	23.0	22.0	20.0	19.5	19.5
Number of operating hours	r)	2 696	2 696	2 696	2 600	2 600	2 600





Other

- Gudmund has resigned and returned to IRF
 - He will continue as Technical Project Leader for the EISCAT_3D project
 - And continues with frequency management issues
 - EISCAT pays



Other

- Elisabet Goth has joined the admin staff at Headquarters
 - Lisbeth is now at an accounting firm in Kiruna
 - Elisabet works full-time

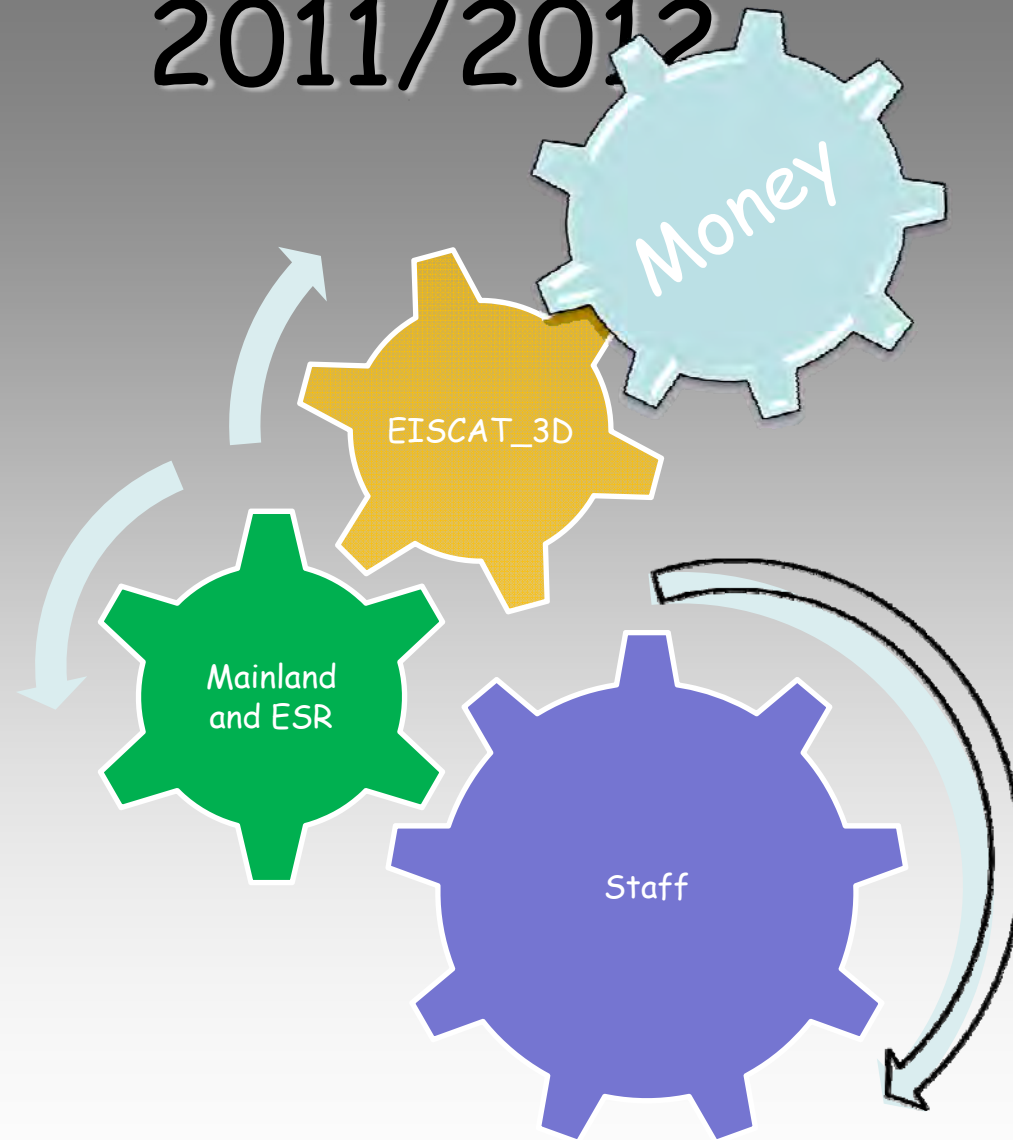


Summing up

2007	Ok as planned
2008	Probably bit less income (Ukraine), more expenses (IPY) and Deputy Director settlement. IPY though continues but not 24/7. Focusing on mainland operations. EISCAT_3D and TNA continues. 3D work planned 20 man-months (-7 mm), from 1 May 2007 - 30 April 2008
2009	Ukraine and Russia uncertain. One man short. Tristatic runs?. New Director. 3D work 41 mm (+11 mm) period 1 May 2008 - 30 April 2009. EISCAT_3D then ends. TNA project ends 31 December
2010	As above but no development projects. Build phase starts?
2011	Build phase?. Last year with UK and Germany contributions, unless changing minds
2012	Very uncertain. Basic funding can maintain minimal staffing and infrastructure but not really operations. Build phase?



2011/2012



A street sign for 'Icecatvägen' stands in a snowy forest. The sign is white with a black border and features a small logo on the left. The background is filled with snow-covered evergreen trees and a deep layer of snow on the ground. The scene is brightly lit, suggesting a sunny day.

 Icecatvägen

Kiruna site status, 13 March 2008

Staff.

Peter Bergqvist - Electronic engineer / Computer system administration

Inge Marttala - Electronic engineer

Lars-Göran Vanhainen - Site manager

A new contract between EISCAT and IRF was signed in November 2007

Operation.

- Operating hours 2007 (recorded):
- UHF experiments: 525
- VHF experiments: 4
- Passive (scinti): 139
- Total: 668 hours**

- The National Post and Telecom Agency (PTS) in Sweden, have announced that a decision to allow 3G operators to deploy UMTS services in the 900 MHz band, is being prepared. This follows an agreement by the EU telecom ministers to open up the GSM spectrum for other services.

The timescale for the introduction of UMTS900 is one to two years.

Data archive.

- Two 22 TB RAID disc arrays, (arch and deposit) - around 70 percent of the available disc space is used.
- One hard drive failure during 2007 (out of 112 units).
- A total of 1500, DAT, Exabyte, DLT and Reel tapes, remains to be copied to the archive.

UHF Antenna/Receiver.

- An increasing number of plastic cable ties behind the reflector panels have started to fall off and needs to be replaced.
- Spare parts for the mainland and ESR receivers have been purchased: two GPS power supplies, one ADC board and a Truetime board.

EISCAT_3D.

- WP4 - Phased array receivers: The phased array antenna is now completed; all antenna elements, combiners and internal cabling are in place. A 224 MHz test receiver has been built, and is used for the initial tests.

The first radar tests were performed in October. We successfully received the signal from the VHF transmitter in Tromsø, signal-to-noise ratio was around 4 percent.

The receiver front ends (24 receivers) for the test array, covering LNAs, filters and A/D converters, will be delivered by the Luleå group during the spring.

- WP12 – Networking: Serializer/Deserializer (SERDES) components have been under evaluation, and will be used for the data transfer from the test array. We are now working with the SERDES/DDC integration into three operational units for the test array.

EISCAT_3D Test Array







Sodankylä site status

March 2007- ARM 2008

- Personnel
- Antenna
- Interference
- Computers
- SD-activities
- E_3D
- Miscellaneous
- Heating upgrade





Personnel

- 3.5 persons working at Sodankylä site 2007 (Tarmo part-time pension 50/50)

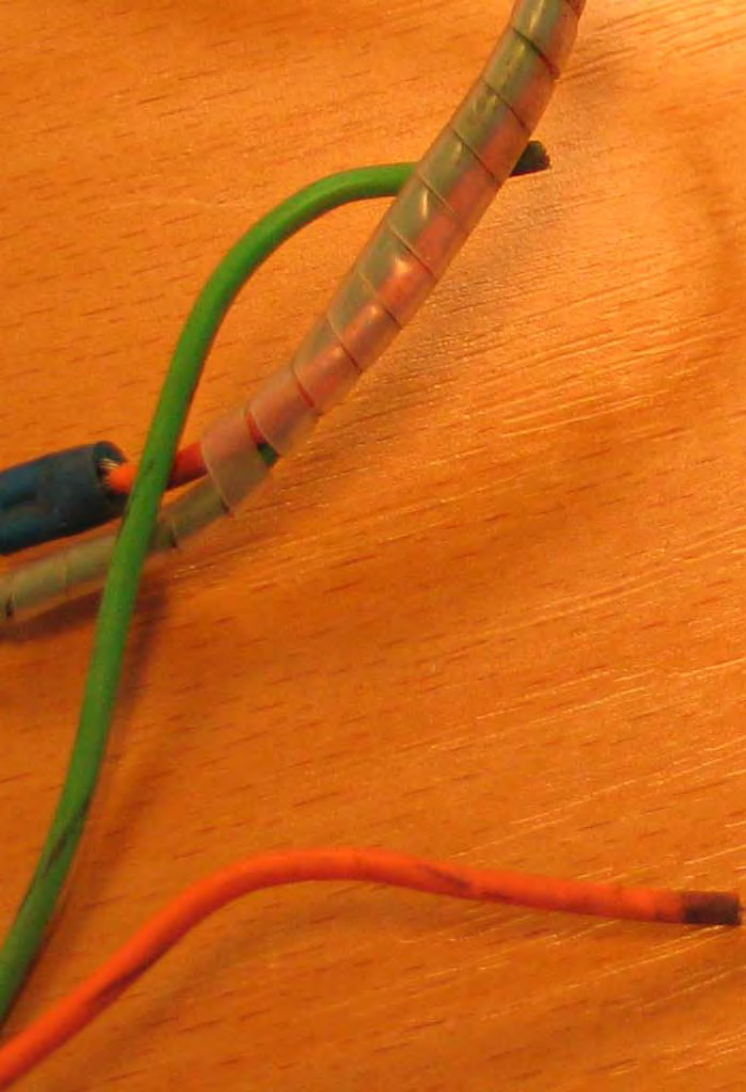
Antenna

- changing back and forth 930MHz receiver to 1.4 GHz receiver
- antenna maintenance work at Tromsø 11-14.6
- antenna maintenance work at the Kiruna and the Tromsø site 17-22.9
- Antenna calibration (all mainland sites)
 - new plots, new documentation
- Az motor drive II brake was causing the problem
 - after "hunting", reason for the brake problem was found, it was a broken cable
 - [Opened_brake_08.jpg](#) [Oxidized_wire_08.jpg](#)
- Tightening loosen panel bolts [Ant_UHF_08.jpg](#)
 - Nuts and bolts to be bought



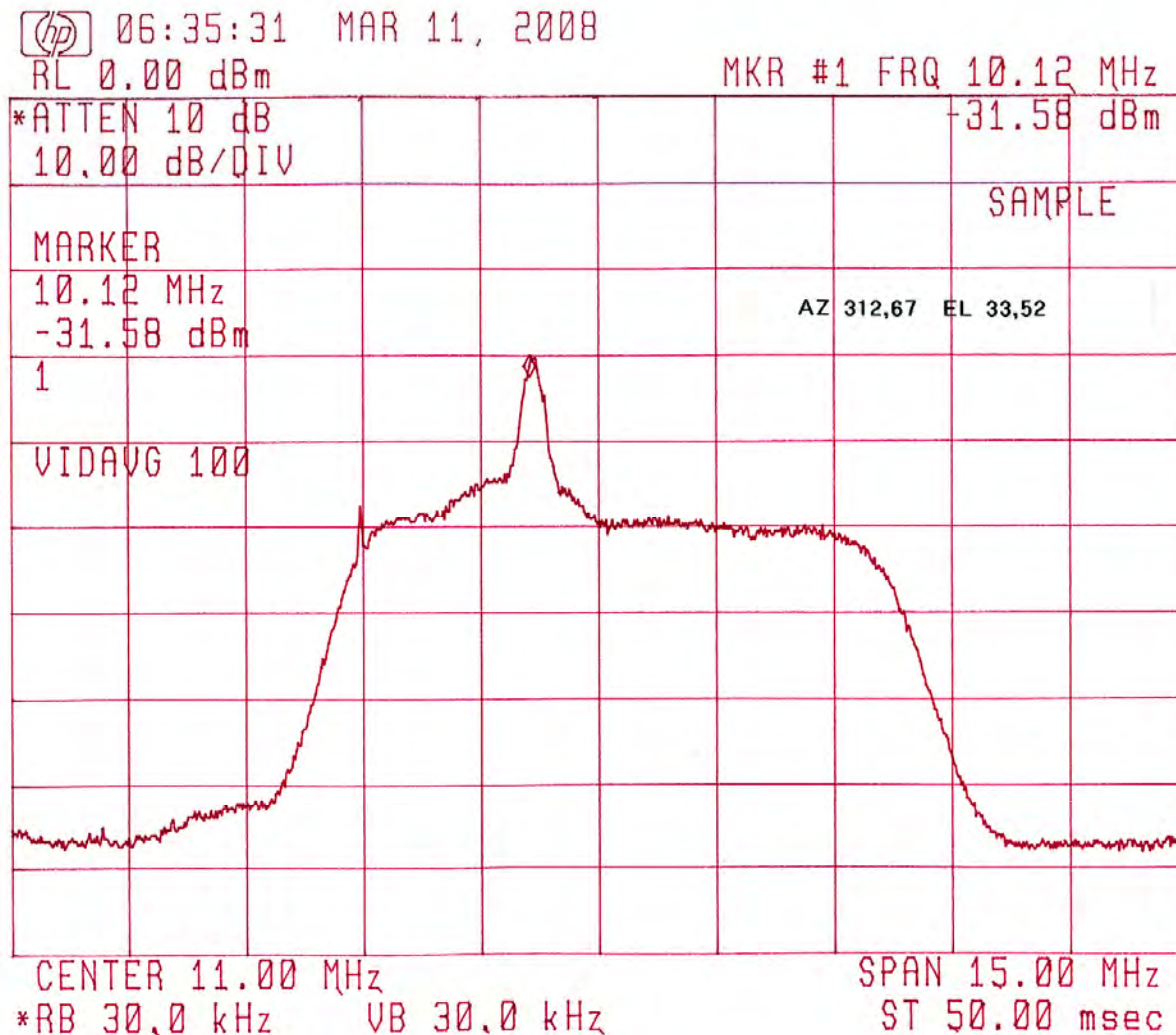


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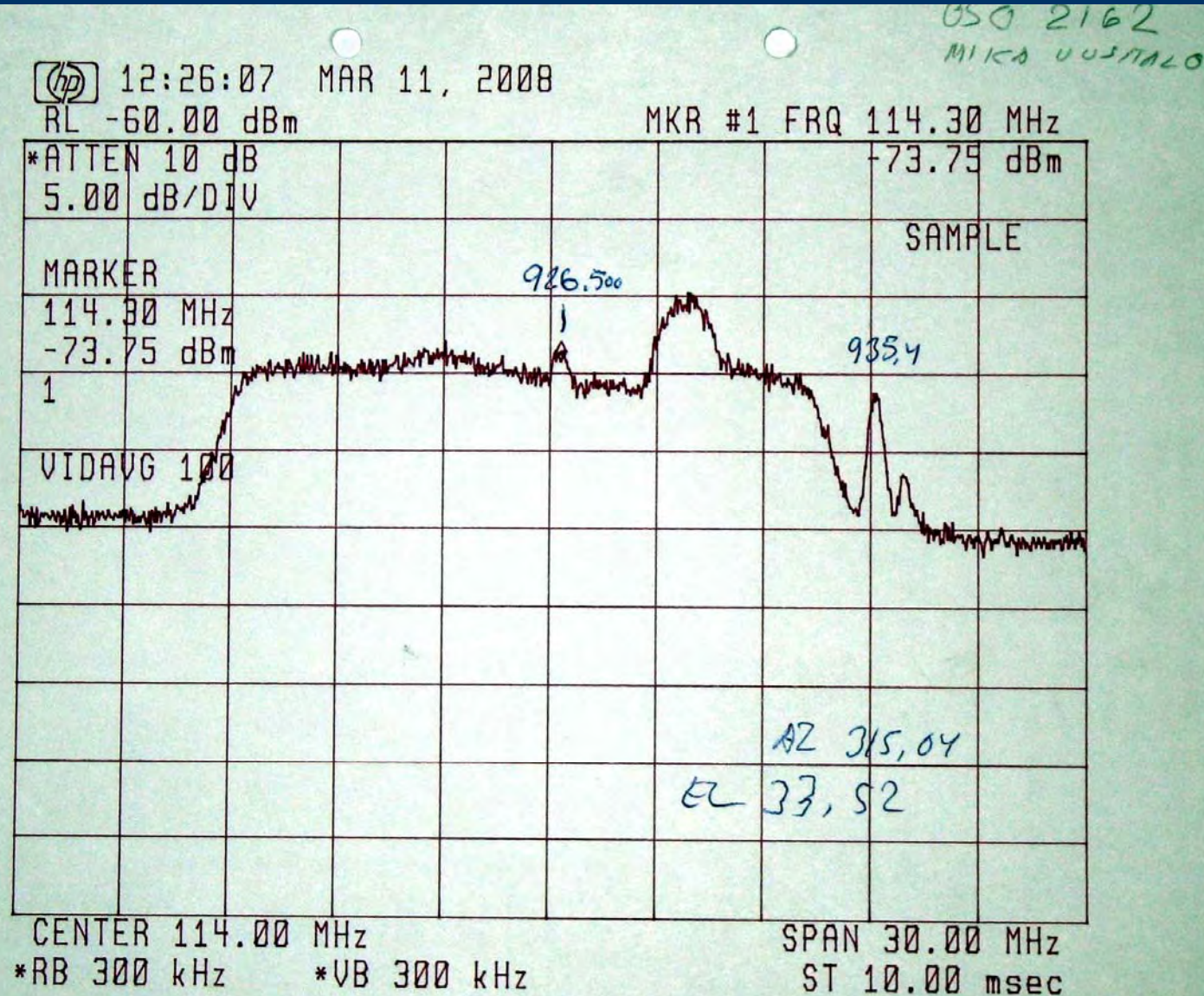




Interference 11.3.2008



Interference 12.3.2008





Computers

- disk failure on Tarmo's laptop (new disk bought and operating system and all programs were installed)
- Sun (s2501) "hot-plug" power supply was failed, fault was found and repaired (power supply)
- One external 4 Gb disc of eiscats failed
 - Peter B. brought old 4 Gb disc from Kiruna and with help of him we managed to load the data back into that disc from the backup tape.
- eiscats' backup DAT-tape recorder fault (spare unit was borrowed from the Kiruna site)





SD-activities

- EISCAT's SD-campaign
 - IPY campaign 3/2007-2/2008 at the ESR site
 - On Jan 11, 2007, Chinese military destroyed by missile the polar-orbiting Fengyun 1C weather satellite, at an altitude of about 850 km.
 - More information on Jussi's [www-page](#)



E_3D



- **WP1 Management of Design**
 - 6th Steering Group meeting 11.2
 - handling DSTime and DSCost reports
- **WP4 Phased Array Receivers**
 - cable work at Kiruna site (on the demonstrator antenna field)
- **WP9 Signal processing**
 - Work with the ISL5416 evaluation board
 - studying EvB SW
 - running using the EvB SW
 - testing with 80 MHz ADC
 - studying the register structure
 - sketching block diagram of the EvB
 - DSP (DDC, SERDES etc..) integration work week (1-5.10) at the Sodankylä site.
 - EISCAT 3_D receiver planning
 - ISL5416EVAL board communication via USB-extender tested
 - DDS & SERDES box mechanical design
 - making regulated power supply for the SERDES
 - mechanical check of the DSP converter board (made by LTU)
 - DSP/DDC control, synchronization design and documentation
 - RC-signals proposal
 - DSP signal cable list proposal
 - drawing digital receiver documentation
 - drawing E_3D receiver overall block diagram
 - HW-meeting in Kiruna 5-6.2





Miscellaneous

- evaluating risks on place of work (identifying danger, ergonomics, chemical and biological danger, mental stress etc.)
- "Hot work course" for renewing the hot work licence (28.3. Markku, Toivo and Tarmo)
- "Open doors" arrangements together with SGO and FMI 24.9 12-19LT (IPY year celebration)
- Research Assessment Exercise 2007 of UoO/SGO, panel meeting 4 at the UoO 2.10.
- TV2 film group was using our antenna and receiver as scene in a film, which tells "communication attack from other galaxy in year 2040" ... or something like this...

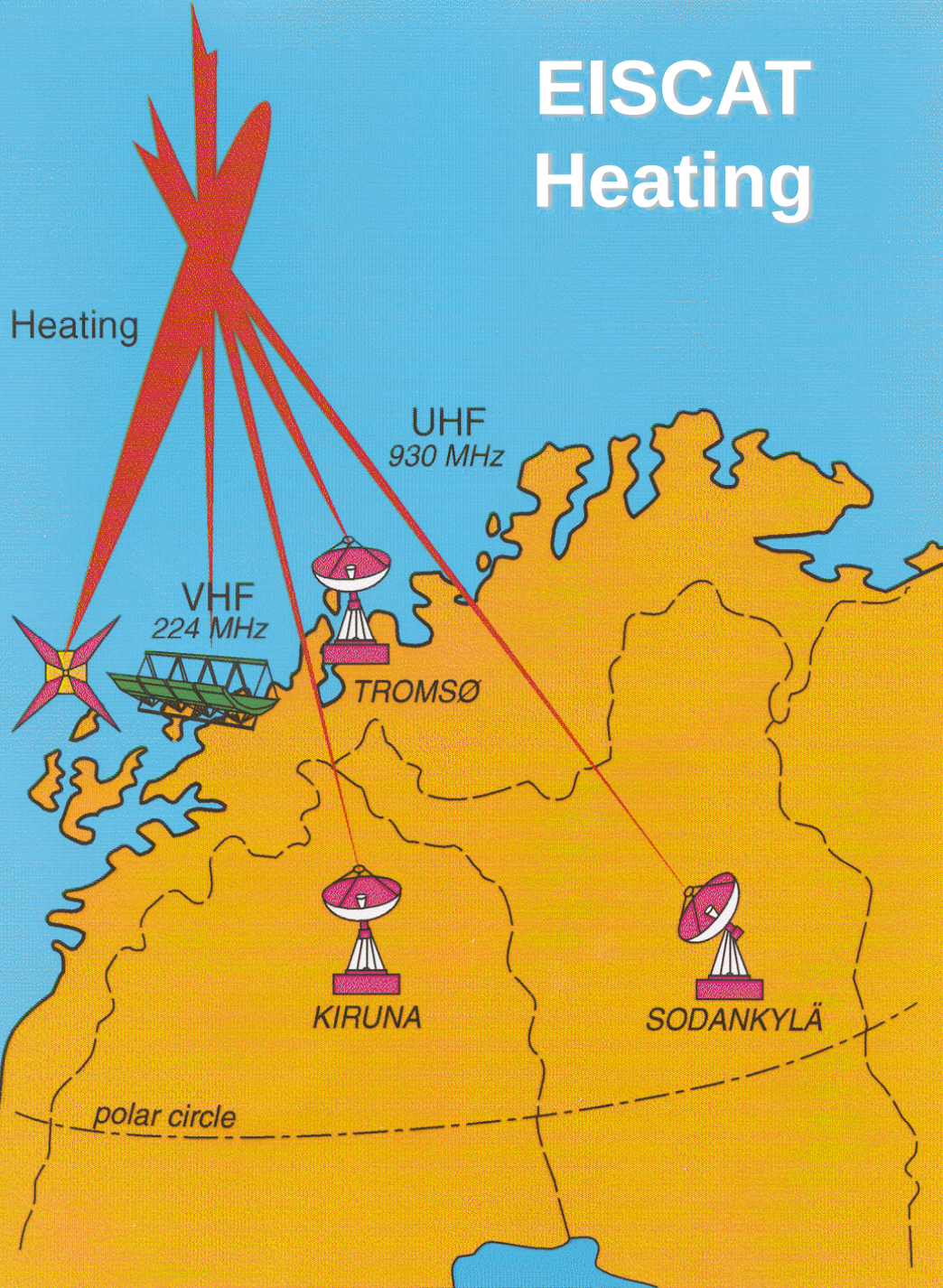




Heating upgrade status next

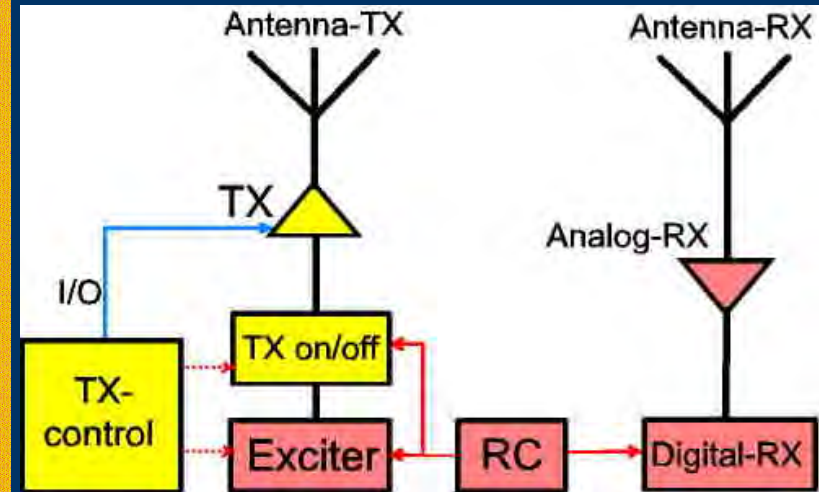


EISCAT Heating



Upgrade → Heating RADAR

- Replace HP **synthesizers** with **DDS**
- Construct Heating receiver



HP analogue synthesizers



HF control room

1 set of meters per transmitter

RF freq.
synthesizers

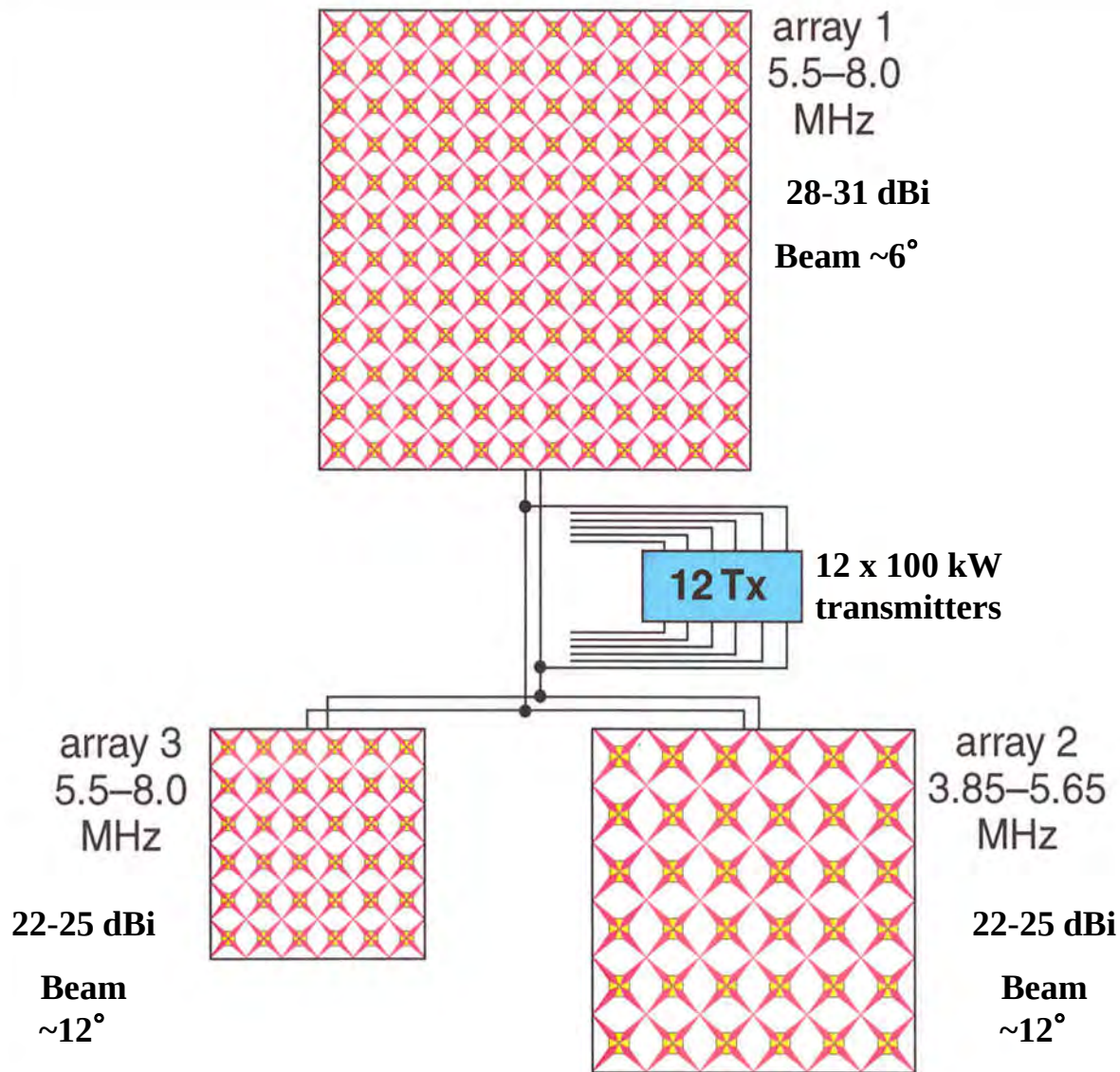
OLD EXCITER

Texas
Instruments
microcomputer
for modulation

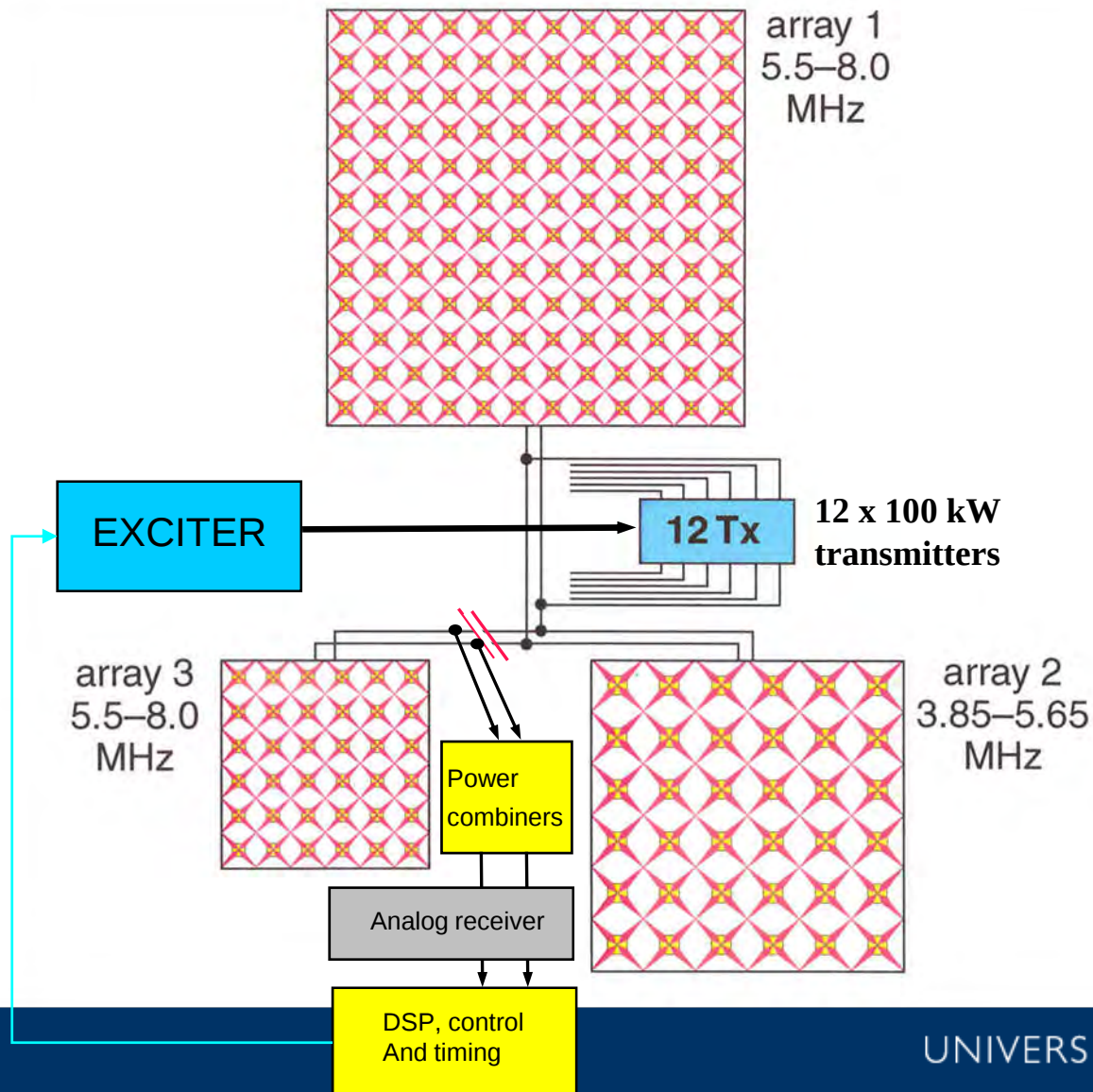
PC for
transmitter
control and
array phasing



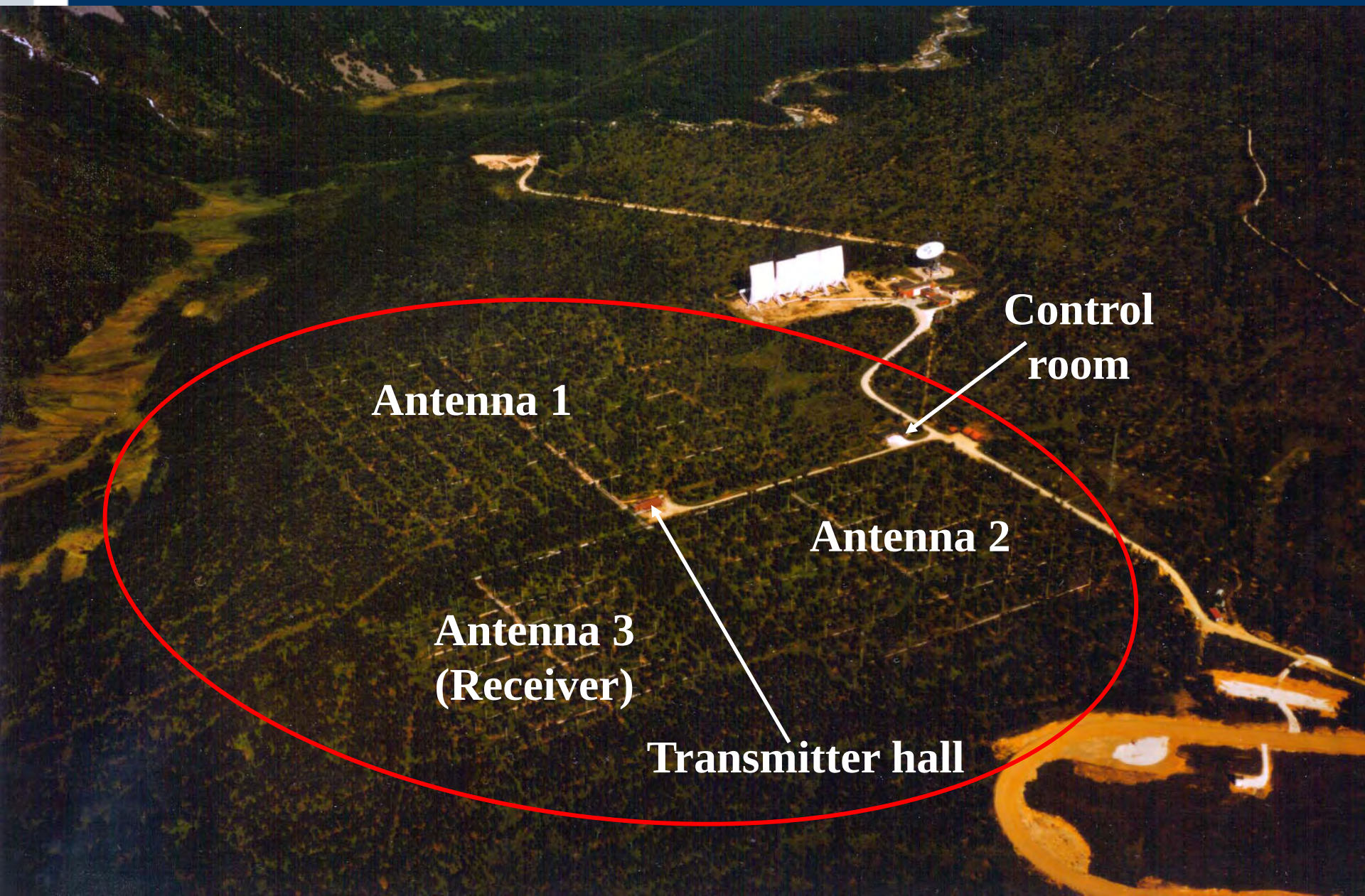
Current HEATING facility layout



HEATING Radar layout



The Heating facility at Tromsø



Antenna 1

**Control
room**

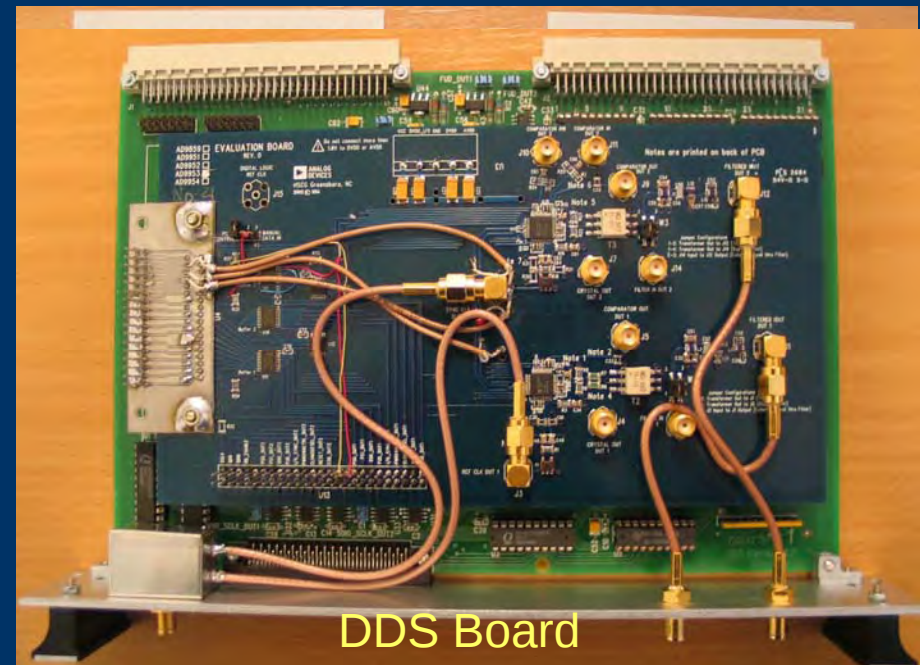
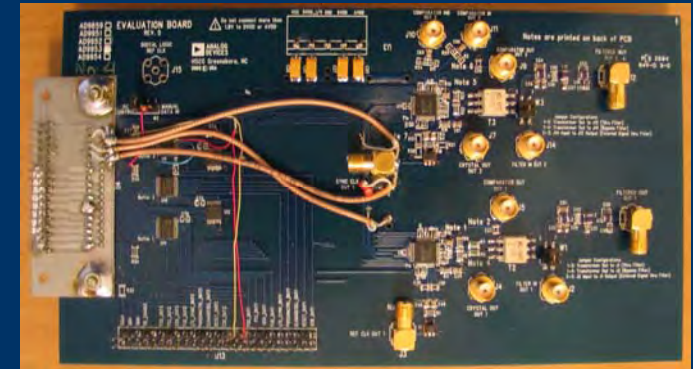
Antenna 2

**Antenna 3
(Receiver)**

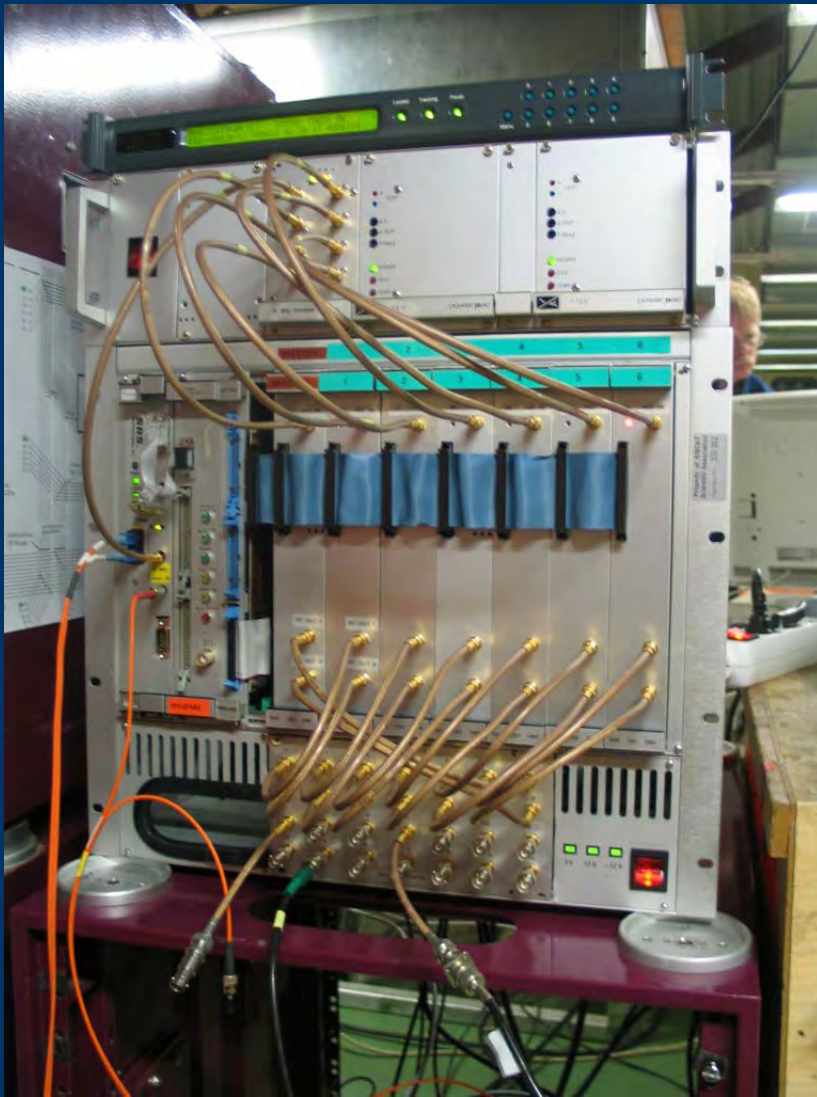
Transmitter hall

Heating DDS TX- HW

DDS Module



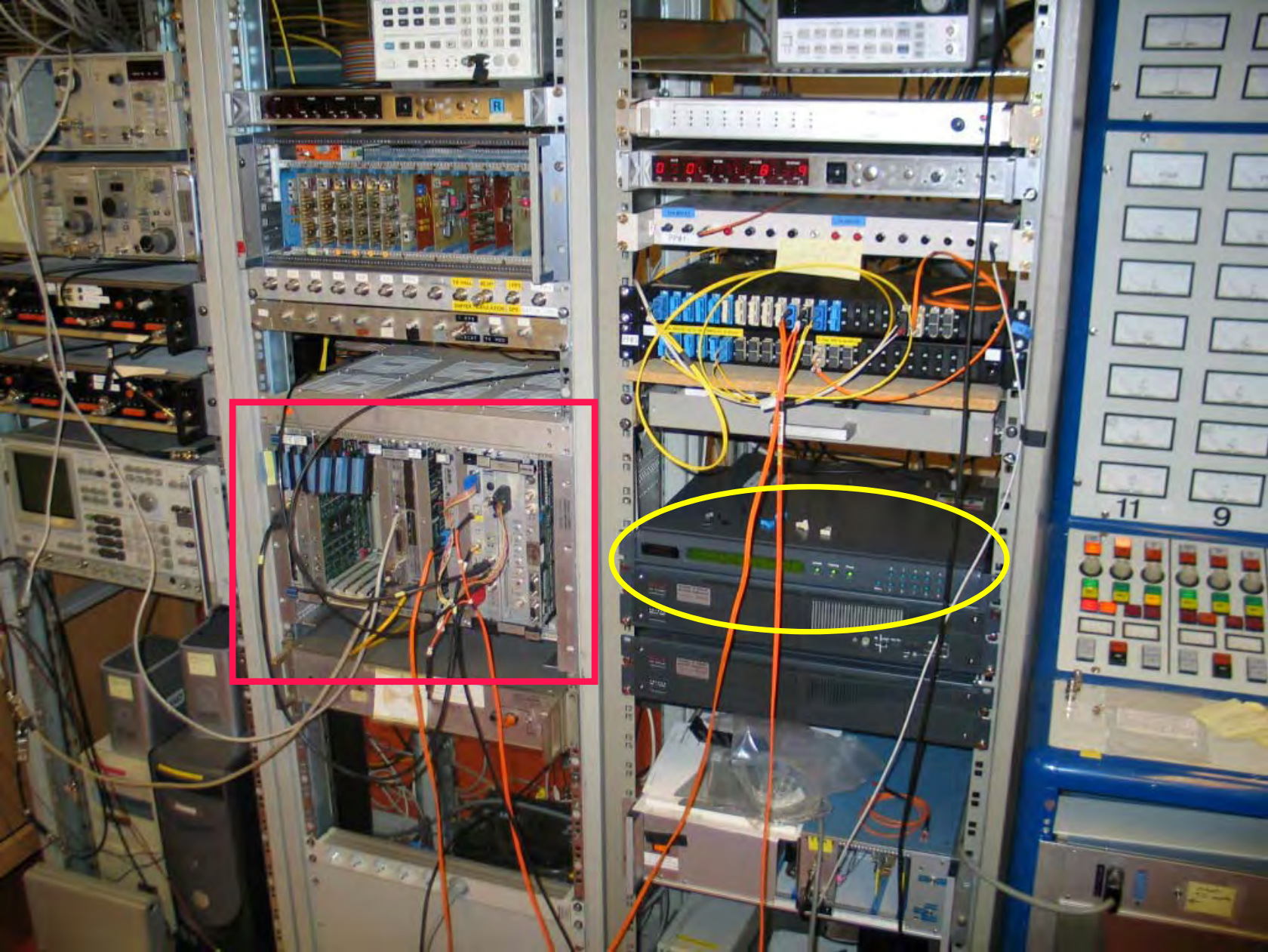
DDS Board



Heating server, DSP and timing



Heating RX VME crate and GPS receiver



Eros h

```

H:
H:
H: help *dds*
selectddsboard setddsamplitude loaddds changeddsamplitude setddsphase startddsboard
setddsfrequency dds deselectddsboard printdds syncdds hot_scanddslist
H:
H: help dds
dds args
dds Task ?Task...? ?-verbose? ?-conf ConfigFile? ?BoardList?
Task = init|initboard|phalamp|freq|sync|reset|set|save Filename
BoardList = ?board...?|boardN?,N...?|all, default=all
dds init board0
dds init board1,2,3
dds reset = dds initmpv initboard amp pha freq sync all
dds init = dds initmpv initboard all
dds set = dds amp freq pha all
dds amp freq -conf myconfig.conf
dds phase -conf /kst/etc/hotconfig.conf
H:
H: help *print*
printradar printexperiment printlog printdds printcelestial printantenna printdataac
cess
H:
H: printdds
(HOT) DDS 29-Feb-2008 08:45:33.7 [rt f]
-----
dds1 0.850 4.04000 0.0
dds2 0.316 4.04000 0.0
dds1 0.316 4.04000 0.0
dds2 0.316 4.04000 0.0
dds3 0.316 4.04000 0.0
dds4 0.316 4.04000 0.0
dds5 0.316 4.04000 0.0
dds6 0.316 4.04000 0.0
dds7 0.316 4.04000 0.0
dds8 0.316 4.04000 0.0
dds9 0.316 4.04000 0.0
dds10 0.316 4.04000 0.0
dds11 0.316 4.04000 0.0
dds12 0.316 4.04000 0.0
H: help *start*
Eros_TxstartConfig InitTxstartComm startradar startddsboard startdata getstarttime r
estartdata startantenna
H:
H:
H:
H:
H:
H:
H:
H:
H:
H:
H:

```



Heating upgrade status

- **HW**
 - Exciter built and tested
 - DSP built and partly tested
 - GPS for receiver exist
- **SW**
 - Tarlan-compiler
 - Eros h (vs 09-Feb-2008)
- **To be bought**
 - New crate computer and server
 - GPS reference oscillator for exciter
 - Built parts for receiver
- **To be done**
 - Finalize cabling in TX-hall
 - Design an built a new SOUSY-switch controller
 - Analog receiver
 - Further develop Eros h
 - Digital I/O control SW



Review 2007

- Why and how we did it
- Outline
 - Hours run
 - SP CP Budget
 - Highlights
 - Very personal, only things that past me
 - KST
 - ESR
 - IPY

Operations 2007

- CP Common
- SP Special
- 'OP' Other Programmes
 - IPY, TNA(LB), TB, 3P, EI, 3D(LGV)

KST TOTALS

2007	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Total	Target
CP	0	59	54.5	3	44.5	44	0	39	86	55	5	94.5	484.5	450
SP	57	38.5	36	48.5	86	47	102	152.5	57.5	287.5	187.5	280	1380	1347
OP	0	0	0	0	0	0	0	22	4.5	5	1.5	84	117	265
Total	57	97.5	90.5	51.5	130.5	91	102	213.5	148	347.5	194	458.5	1981.5	2062

ESR TOTALS

2007	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Total	Target
CP	0	52	0.5	0	0	0.5	0	0	0	0	0	0	53	450
SP	45	4	22	20	15.5	1.5	22	65.5	21	60.5	1.5	196	474.5	1013
OP	0	0	573	689	529	605.5	714.5	492	587	524	120.5	365	5199.5	6166
Total	45	56	595.5	709	544.5	607.5	736.5	557.5	608	584.5	122	561	5727	7629

LPACI

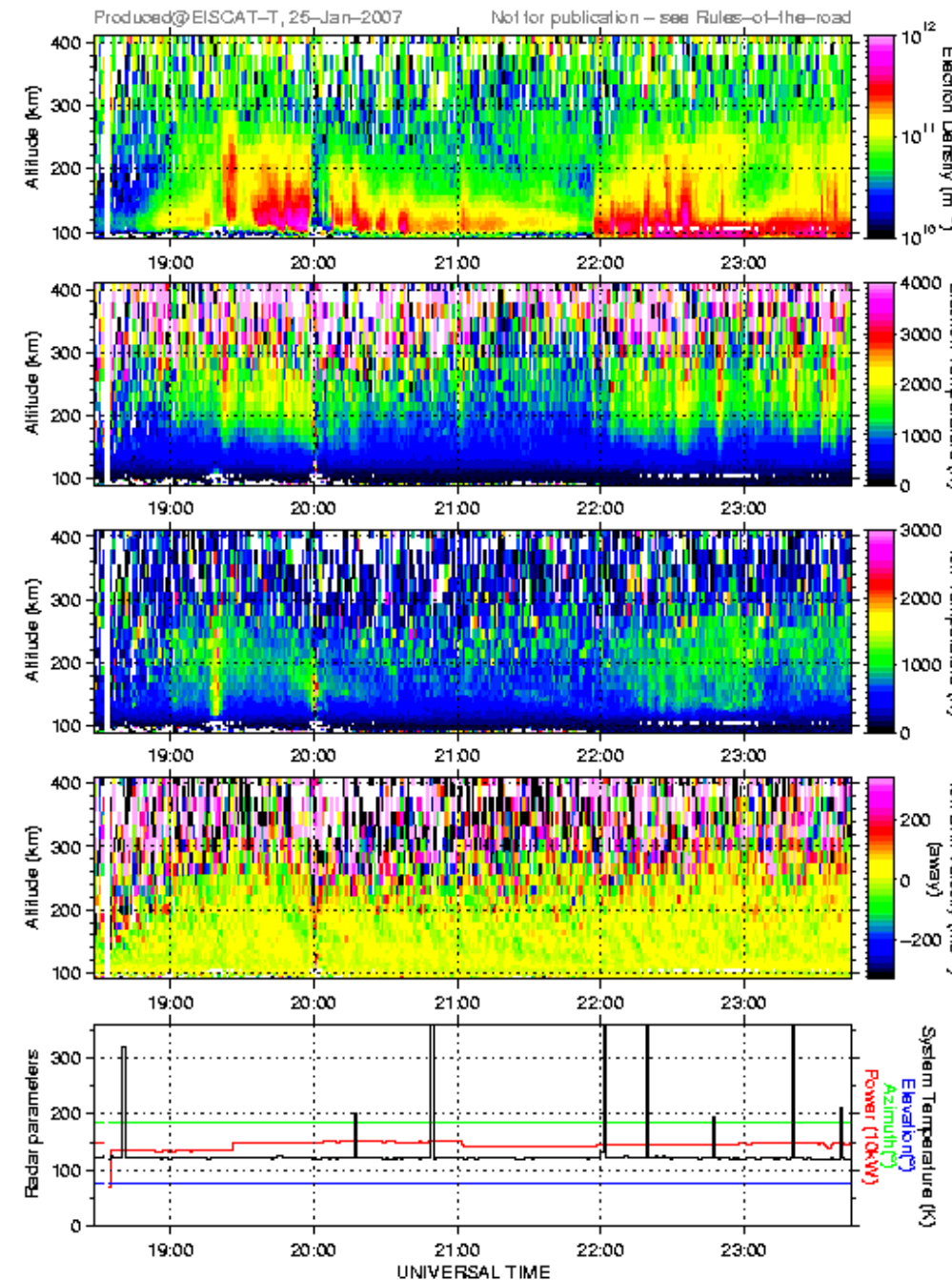
- Combined optics and NEILS
 - SW+UK
 - January
 - arc1
 - high range + time resolution
 - Arcs
 - High density
 - Strong E fields
 - High temperatures



EISCAT Scientific Association

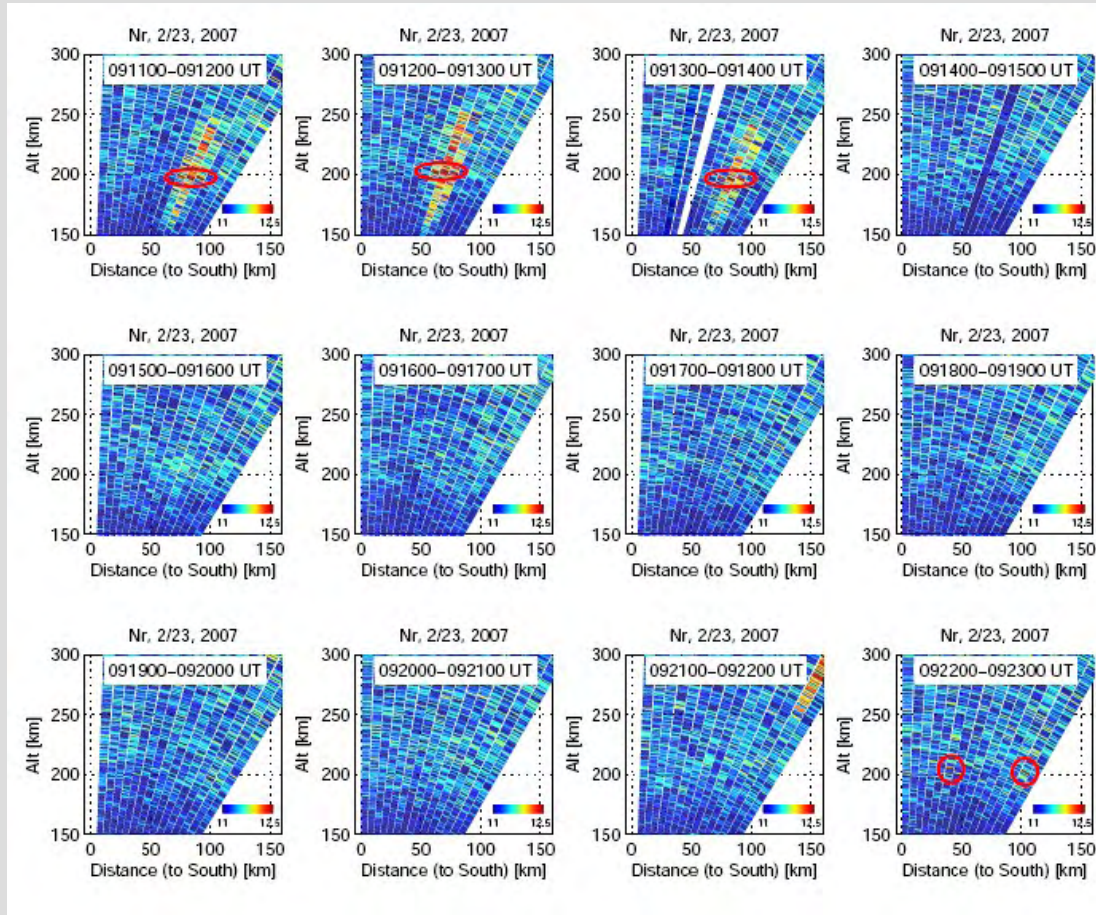
EISCAT UHF RADAR

SP, uhf, arc1, 18 January 2007



Heating

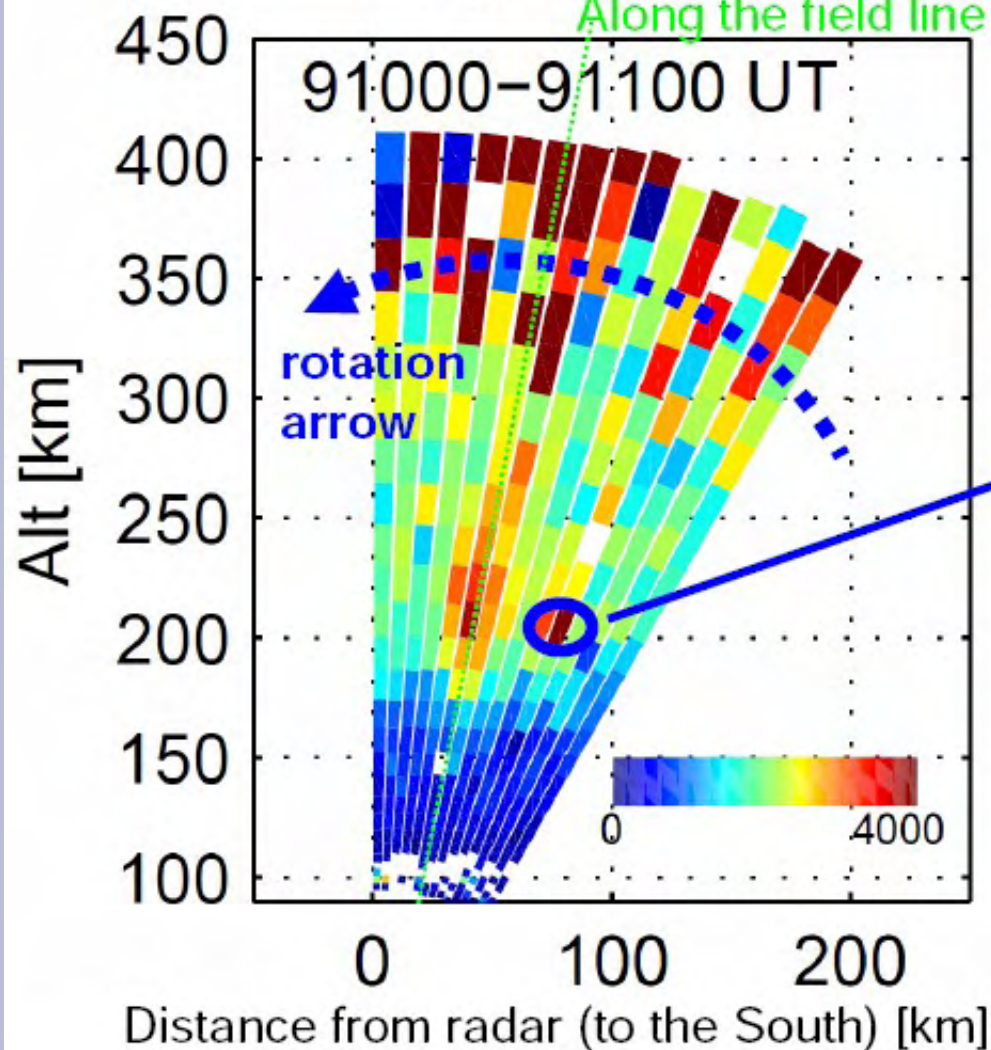
- Field aligned irregularities
 - Heating + UHF and SuperDARN radars
 - NI
 - Effects
 - Field aligned
 - + Both sides of FA



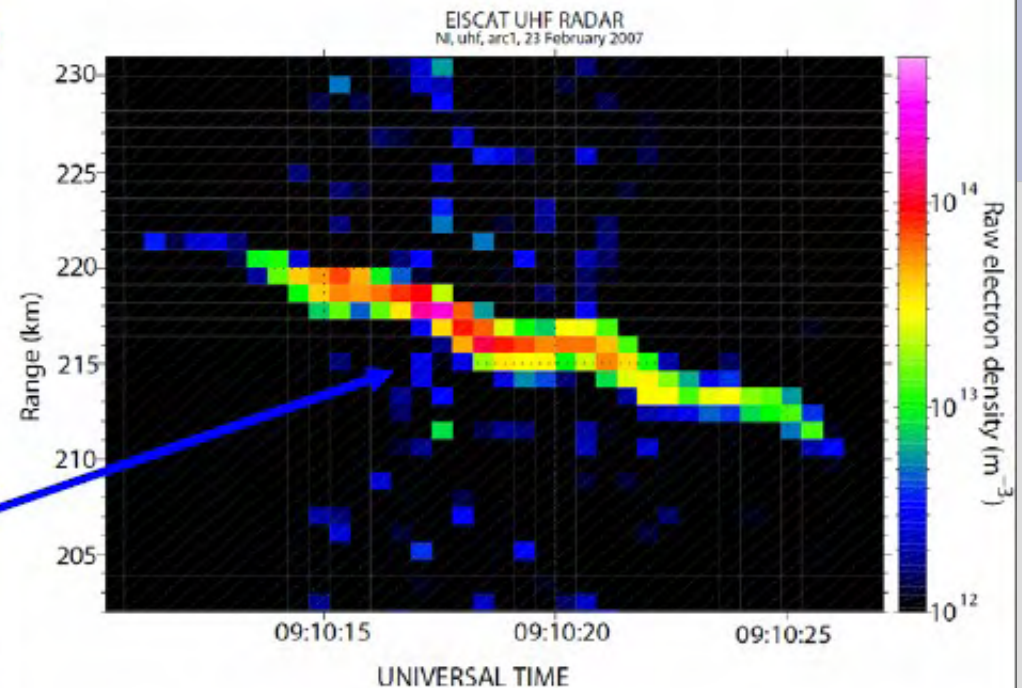
Examples of the EISCAT data analysis (1)

Te, 2/23, 2007

Along the field line



Electron temperature distribution above Tromsø between 0910-0911 UT on February 23, 2007. 4-sec integration data.



Time variation of the raw electron density (0.44-sec data)

Spatial scale of the ion-acoustic turbulence due to ionospheric modulation:

latitudinal width: about 20 km,
altitudinal width: about 1 km.

PMSE

- UK
- ULF waves
- Heating to increase temperature



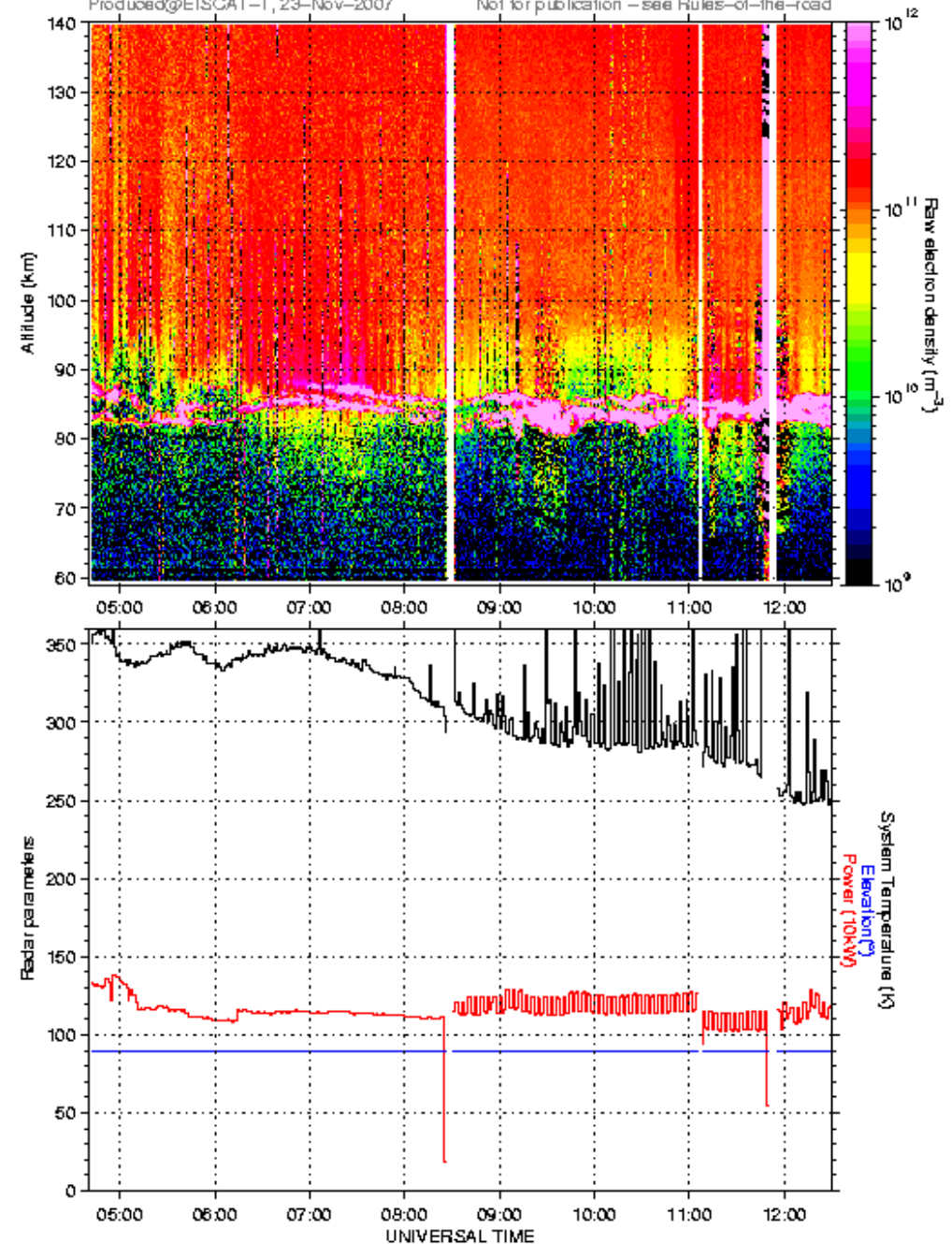
EISCAT Scientific Association

EISCAT VHF RADAR

UK, vhf, arcd, 22 June 2007

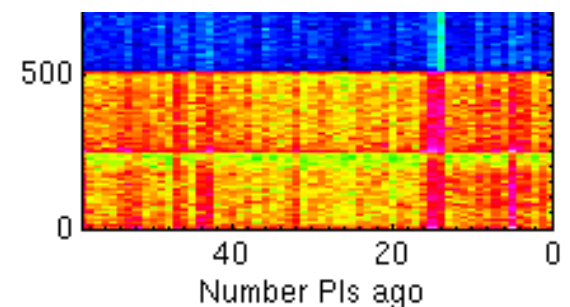
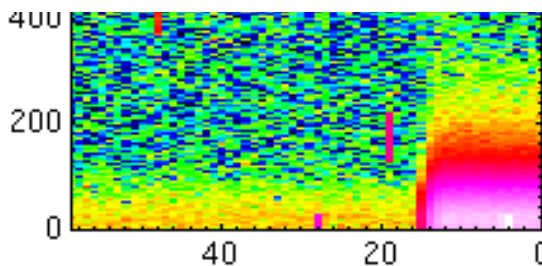
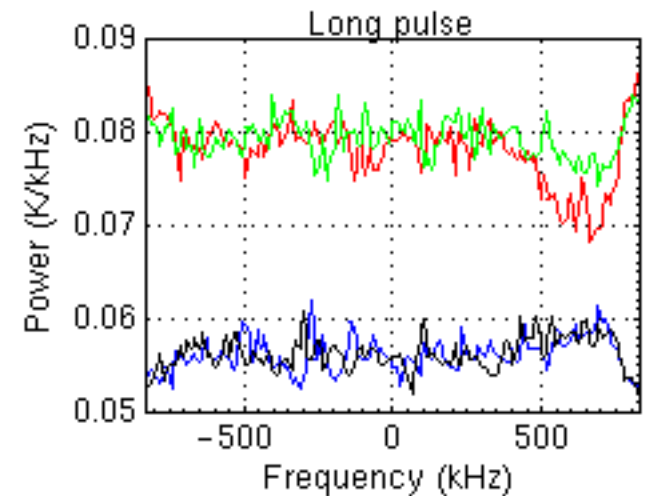
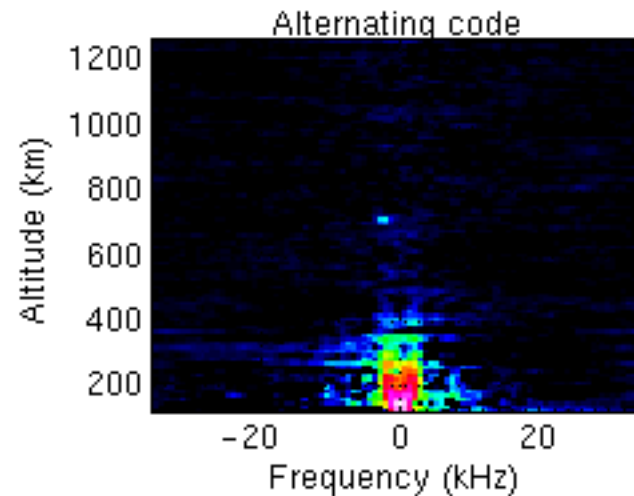
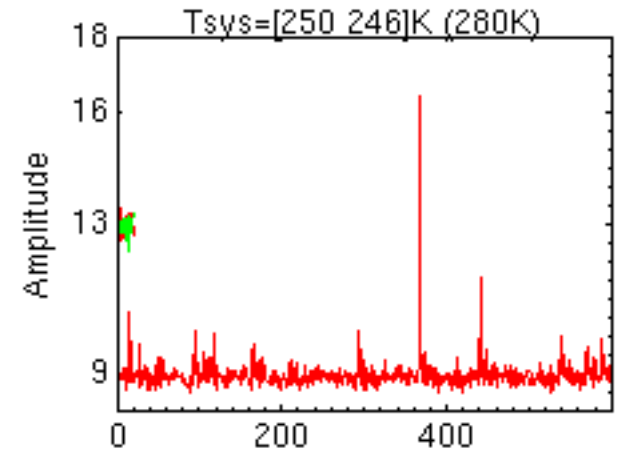
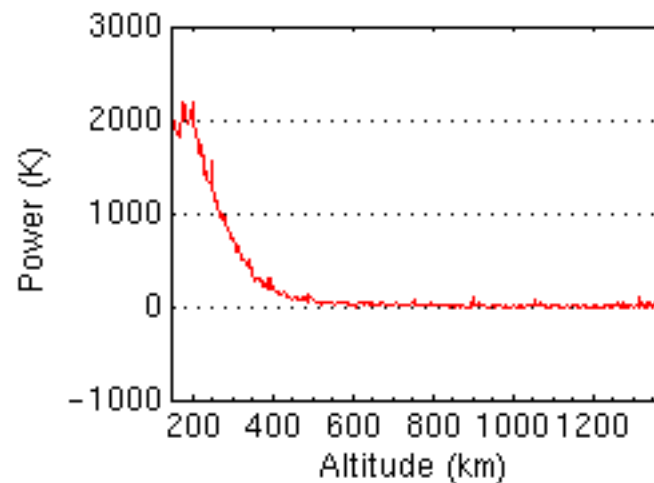
Produced@EISCAT-T, 23-Nov-2007

Not for publication - see Rules-of-the-road



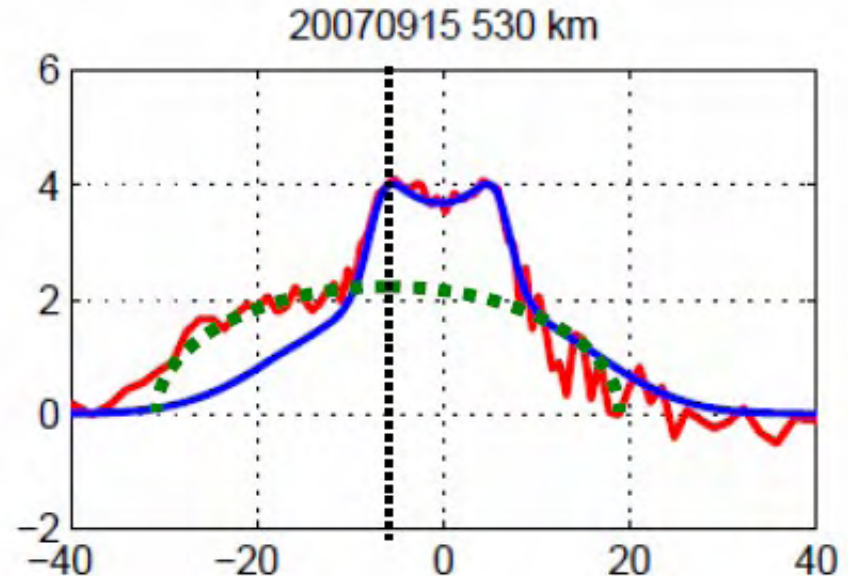
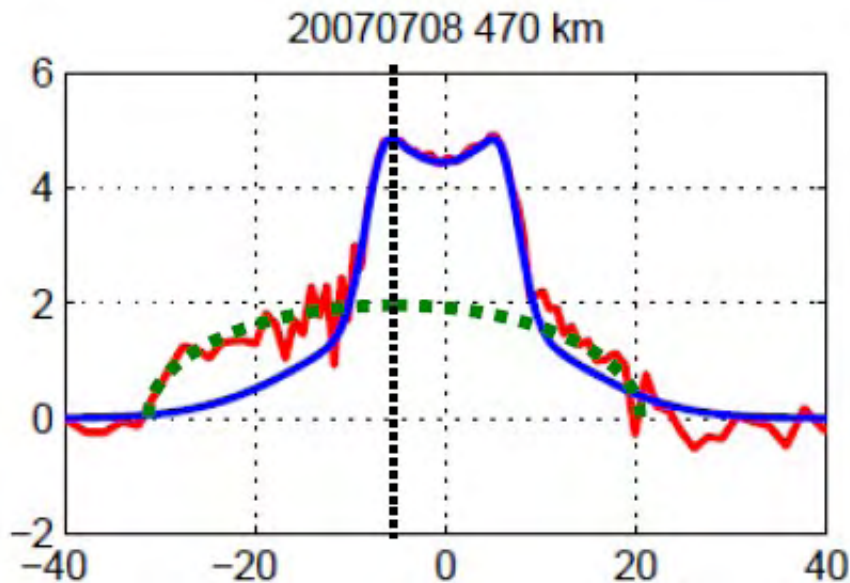
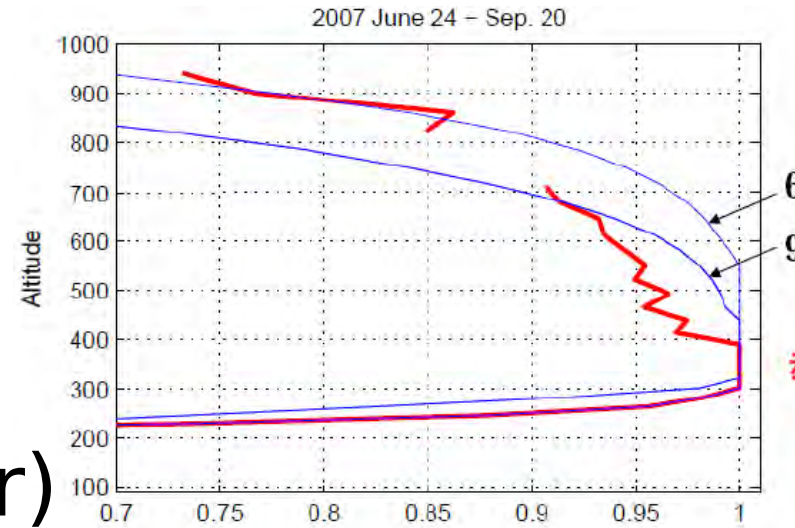
VHF-FA

- Radiation measure
- 2x3min full power
- Strong ground interferences
- Strong plasma lines



Hydrogen ions @ ESR

- Over ~500 km
- One of the main goals
 - VHF (maybe), ESR (never)
- Wide filter + low densities = difficult



Rocket campaigns

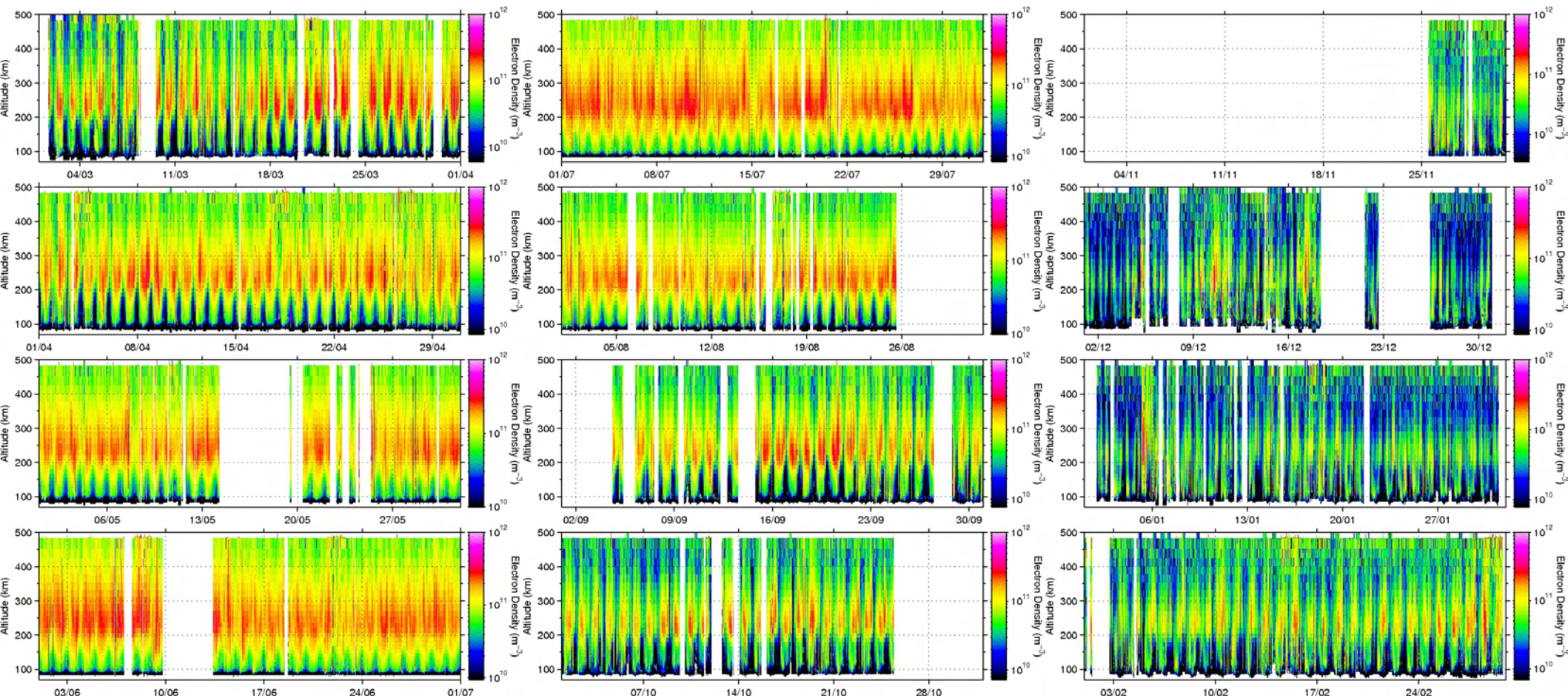
- ECOMA
 - Existence and Charge state Of Meteoric smoke particles in the middle Atmosphere
 - Launch 6 Aug 22:56 from Andøya
 - UHF+VHF (not analysed)
- NEMI
 - Night-time Emissions from the Mesosphere and Ionosphere
 - October – no launch
- TRICE
 - Twin Rocket Investigation of Cusp Electrodynamics
 - Launch 10 Dec 09:00 09:02
 - UHF+VHF+ESR
 - taro Ne

IPY

- ESR
 - One year (ESR+PFISR)
 - CP1
 - Bi-weekly scans (+Sondrestrom+MillstoneHill)
 - CP2
 - 1 March 2007 – 29 February 2008
 - Statistical studies
 - Events

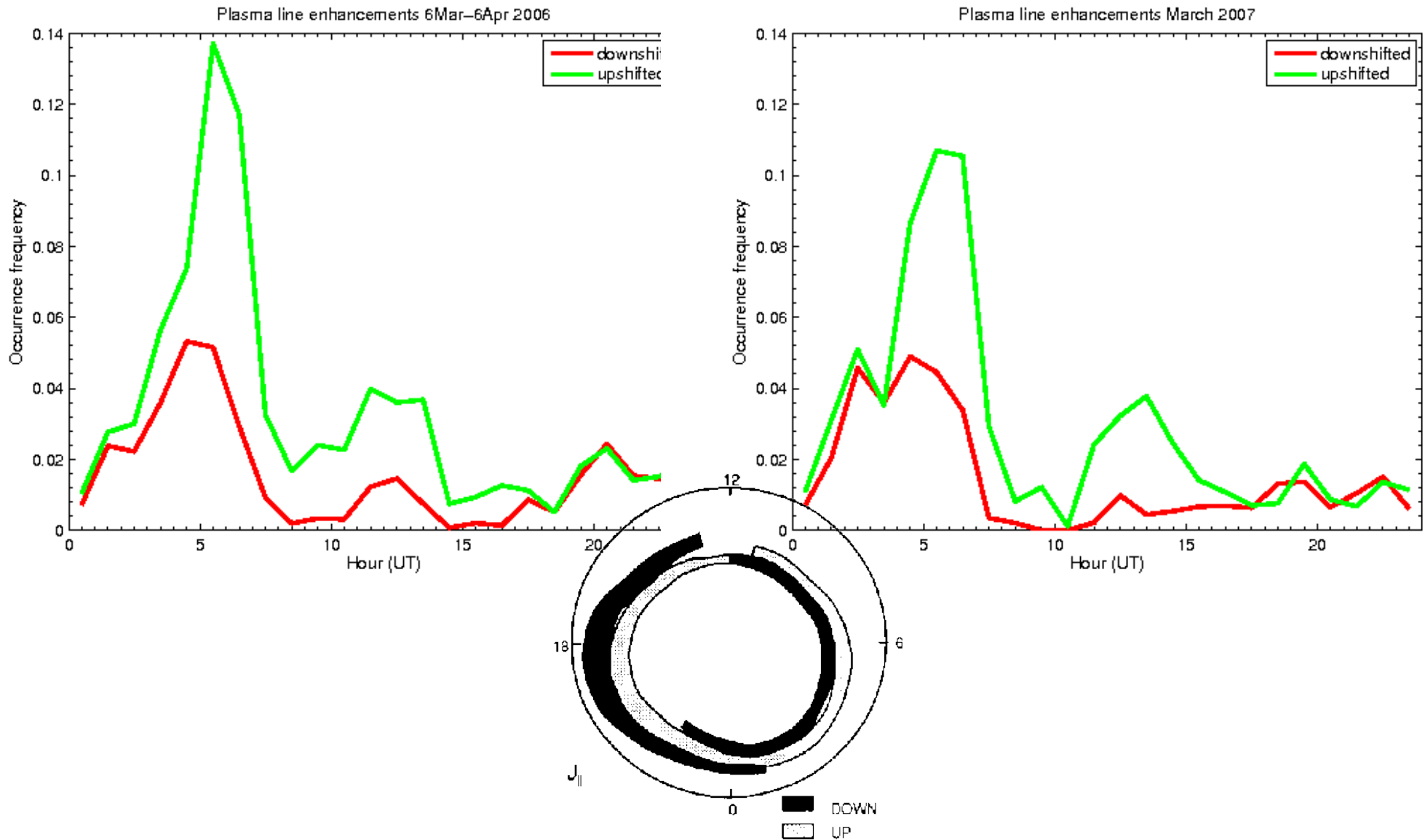
IPY-1

- One year of data!

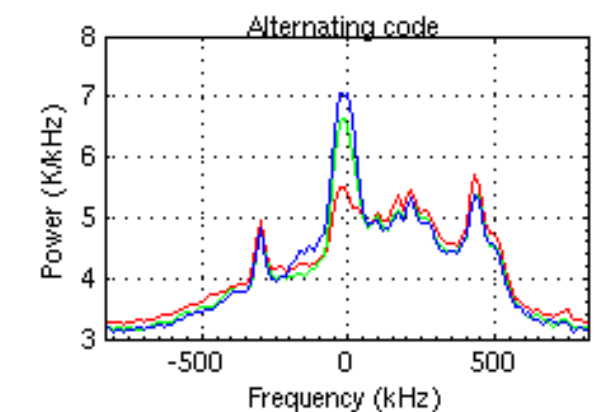
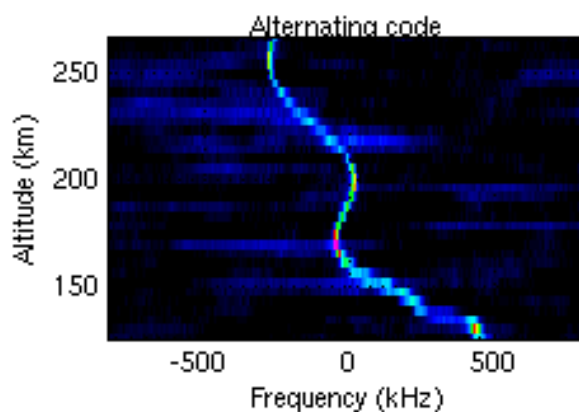
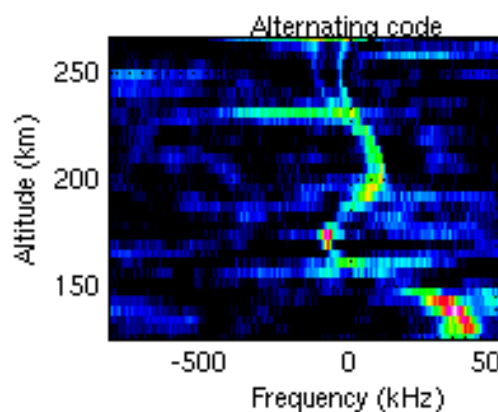
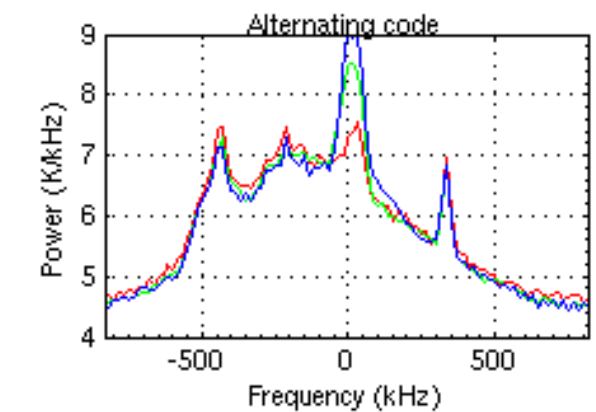
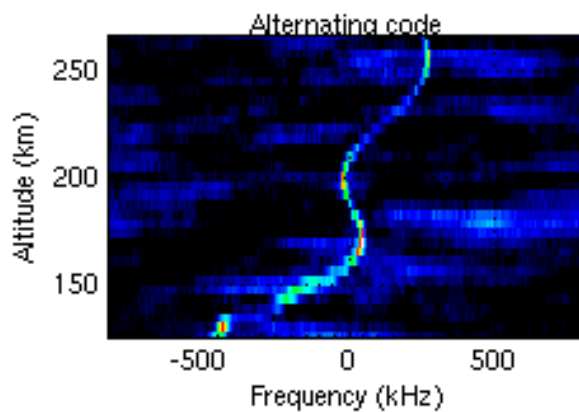
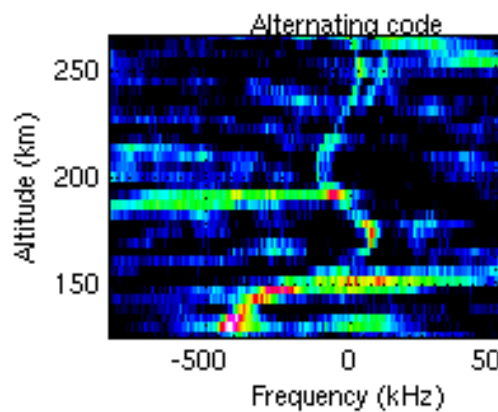
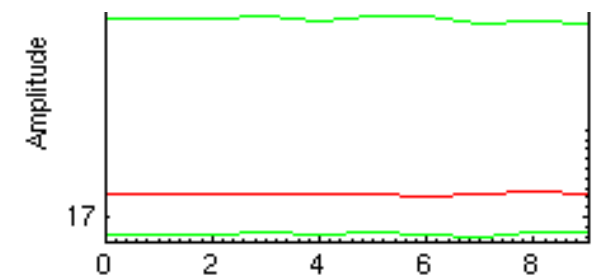
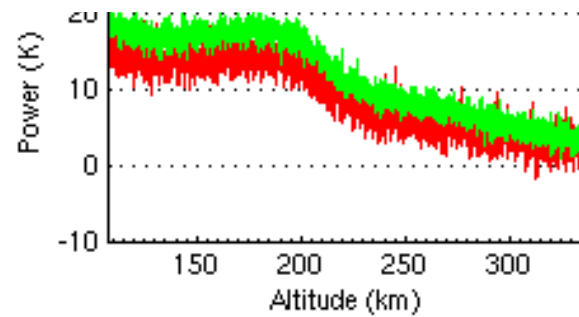
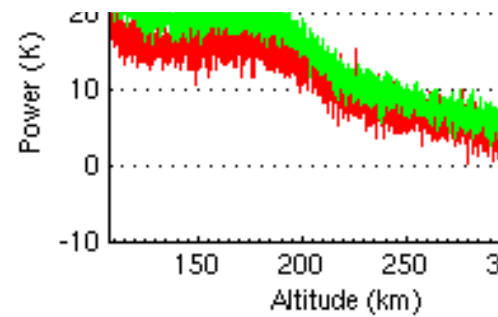


Field aligned currents from EISCAT

- div E: total current
- plasma lines: suprathermal current
- ion lines: thermal current

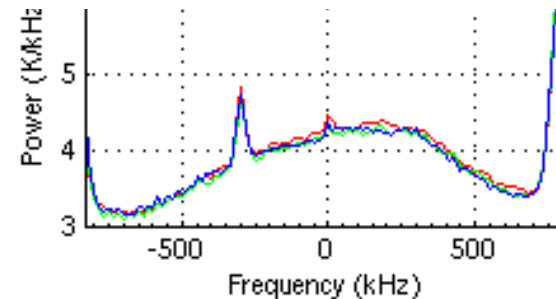
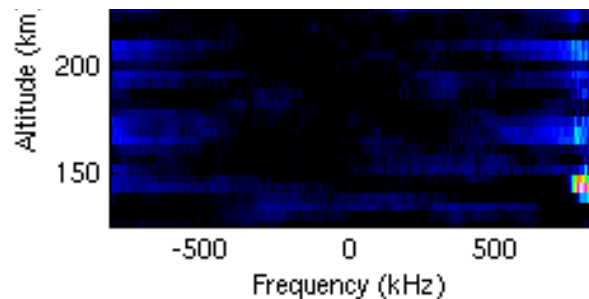
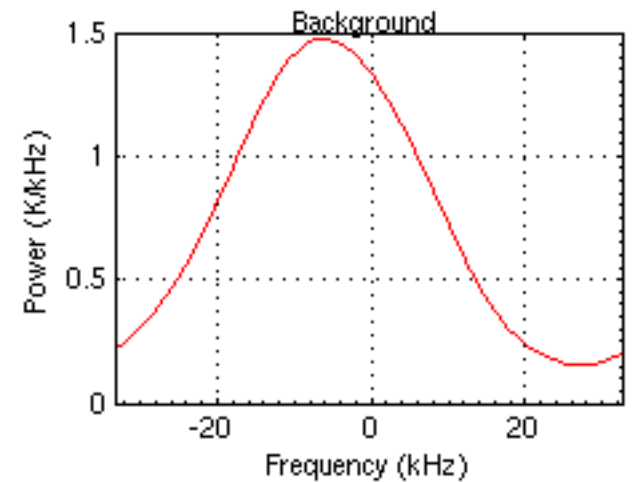
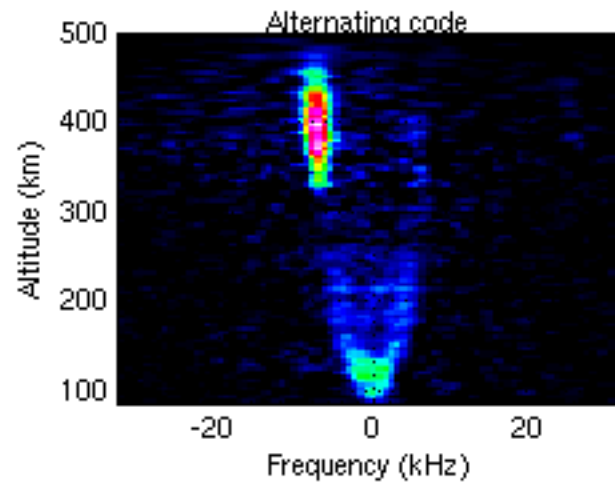
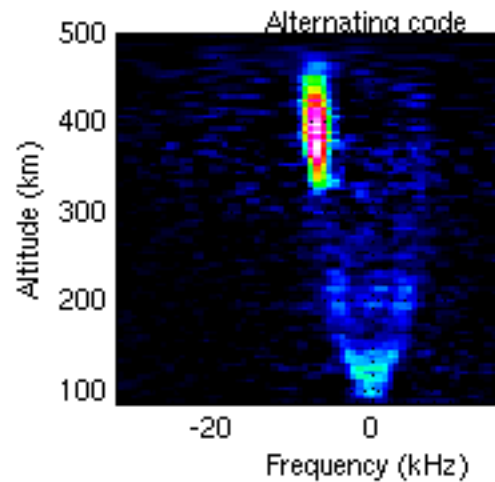
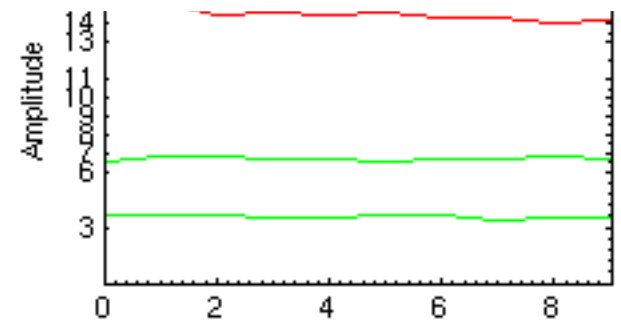
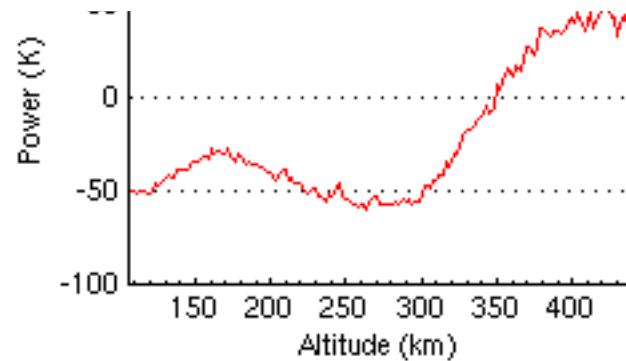
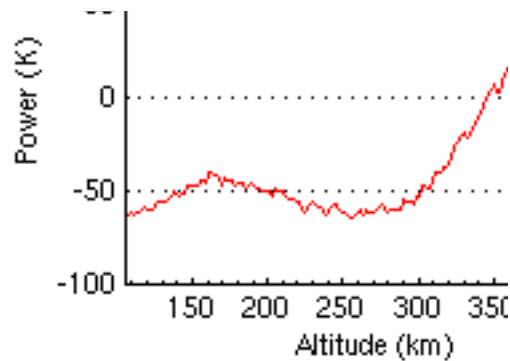


Plasma lines

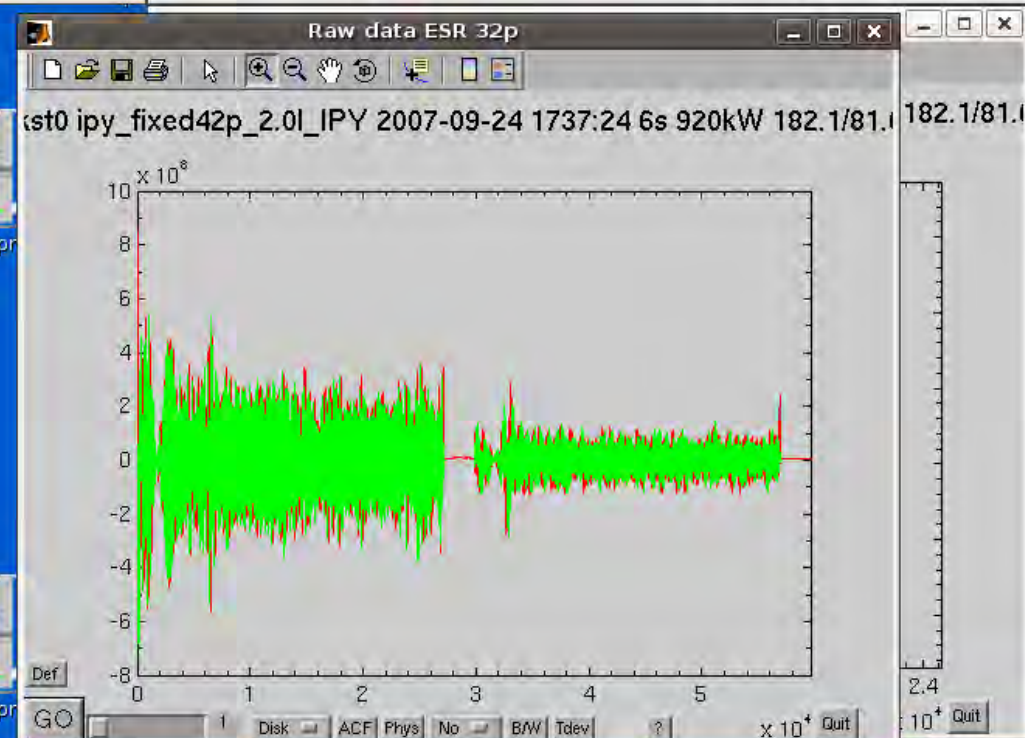
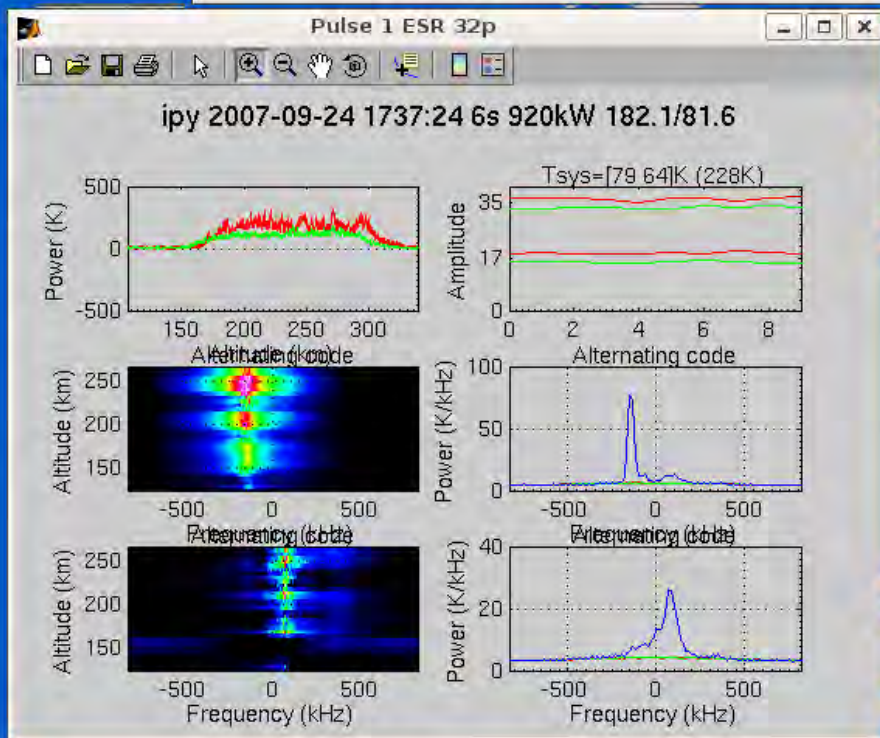
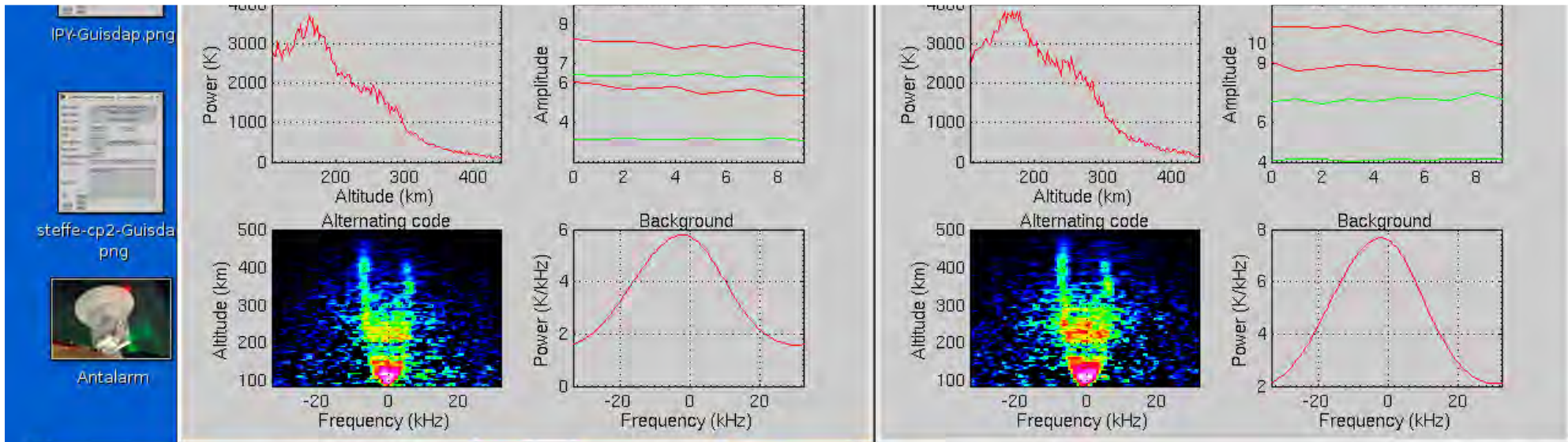


Asymmetric spectra

Opposite currents!



FA features

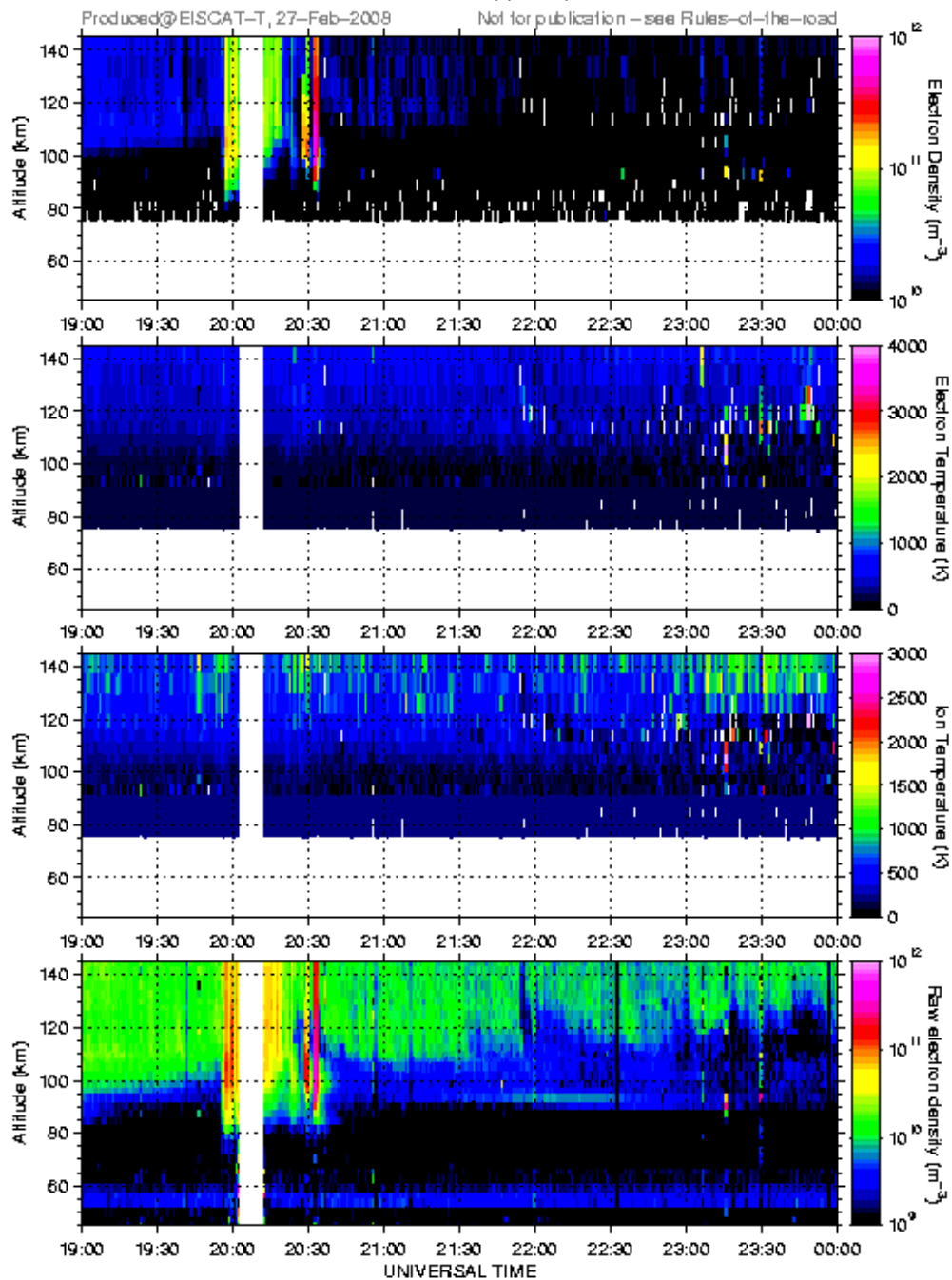




EISCAT Scientific Association

EISCAT SVALBARD RADAR

CP, 42m, ipy, 4 April 2007

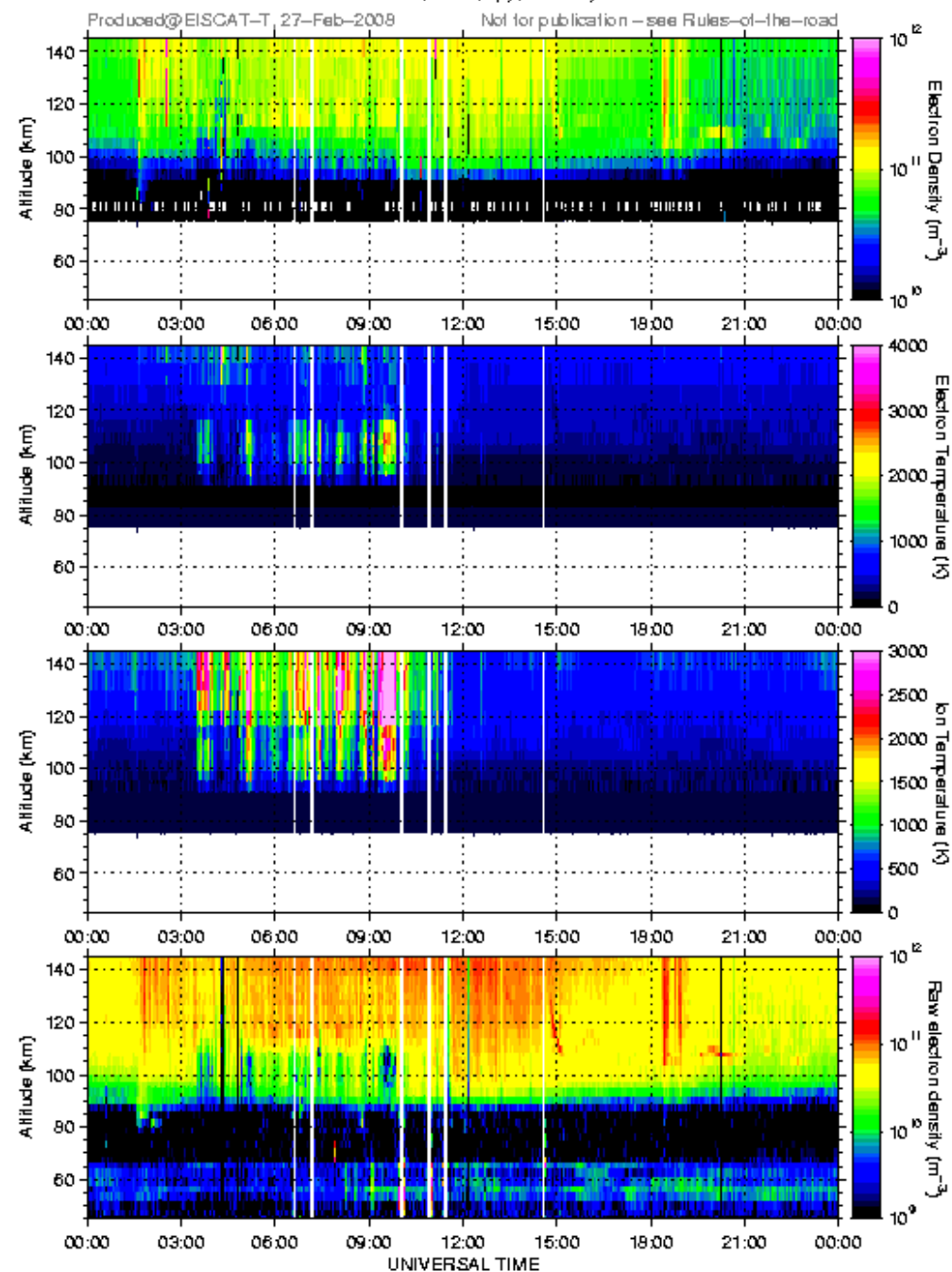


D region

EISCAT Scientific Association

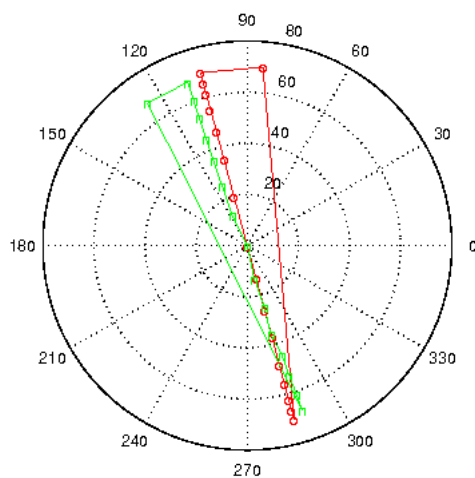
EISCAT SVALBARD RADAR

CP, 42m, ipy, 11 July 2007

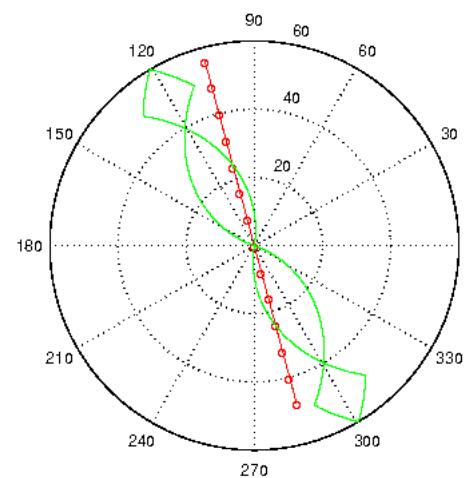
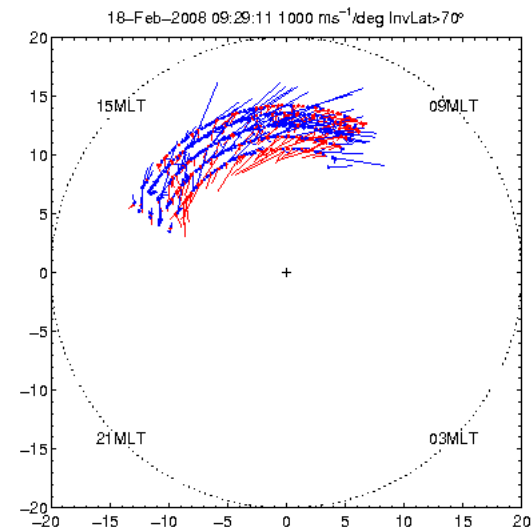


2008 notes

- Vector velocities
 - CP1
 - CP2
 - CP3
 - new pointings?



• KST



ESR

EISCAT_3D Test Array



Yagis



Dual polarization

6 elements/pol

Gain = 11 dB

$F_c = 224$ MHz

BW = 6 MHz

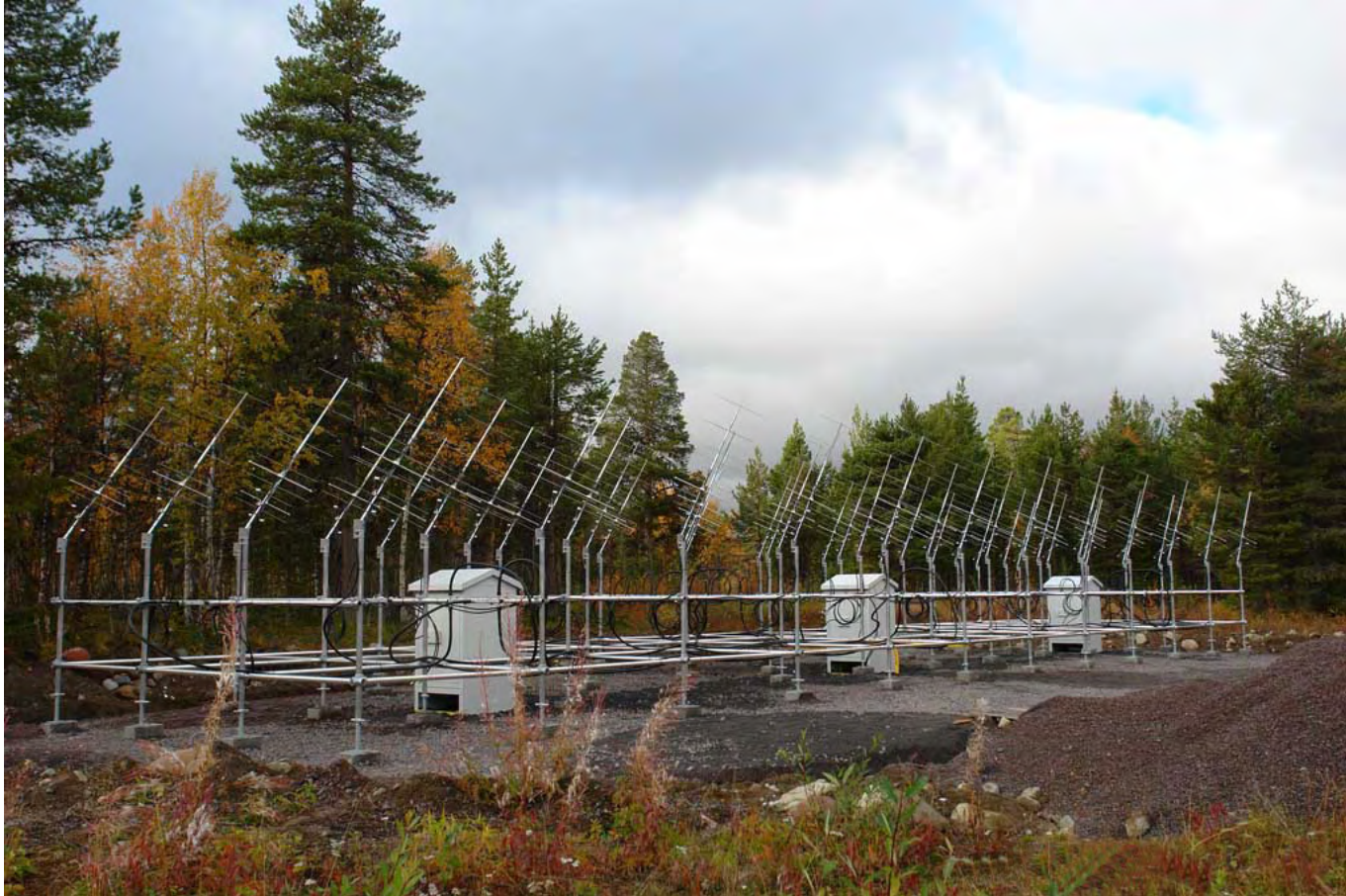
55 degree fixed mount

Coaxial combiners



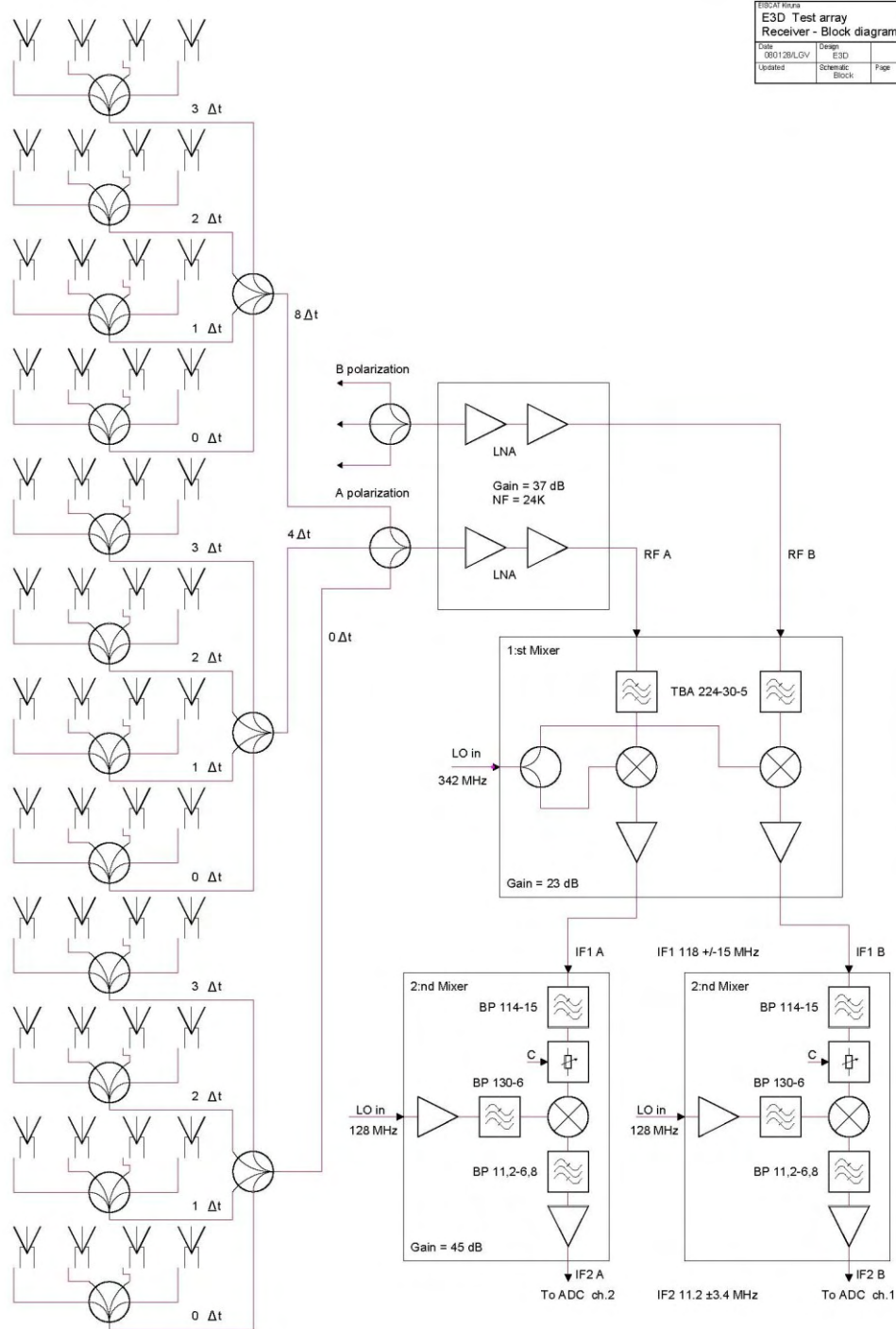
$F_c = 224 \text{ MHz}$

$V_{\text{SWR}} = 1.10$



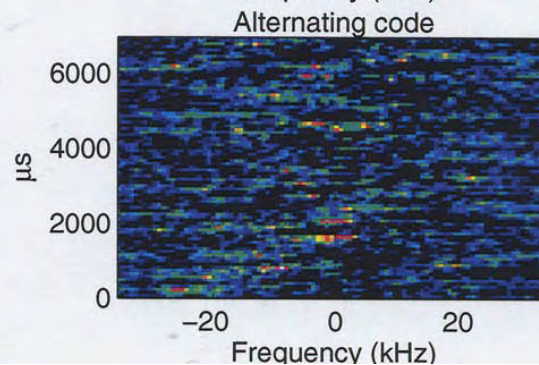
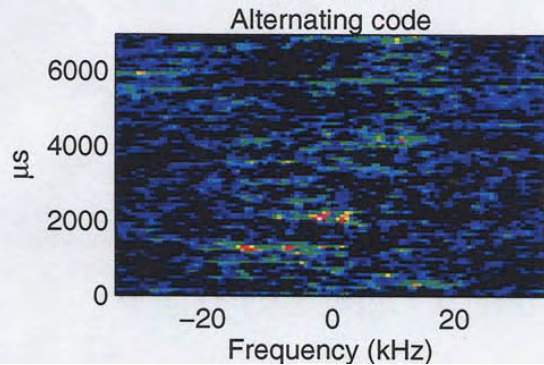
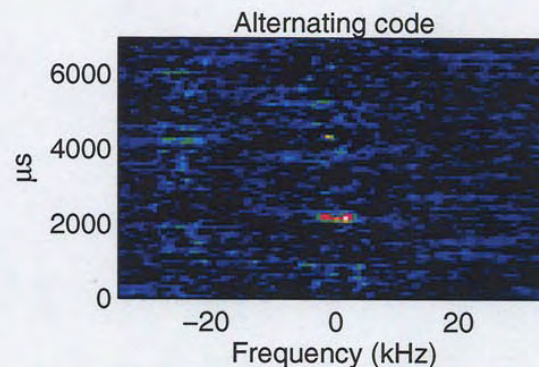
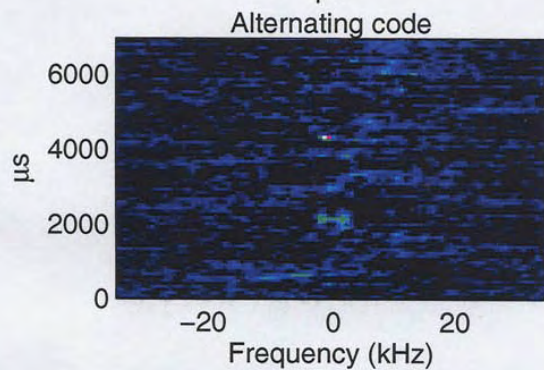
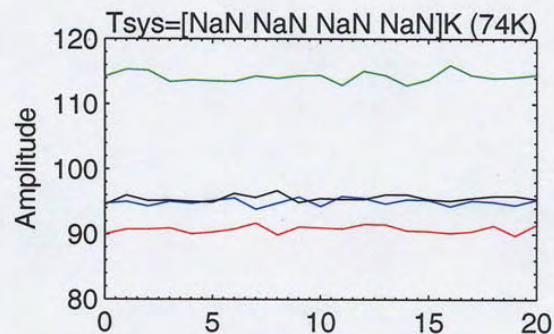
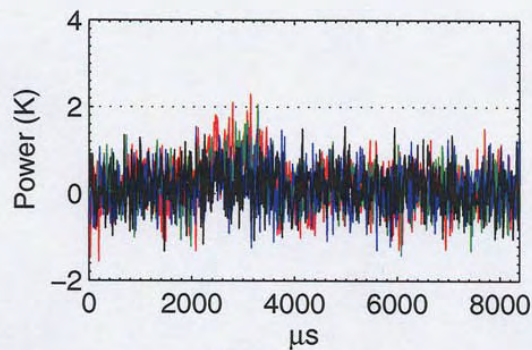




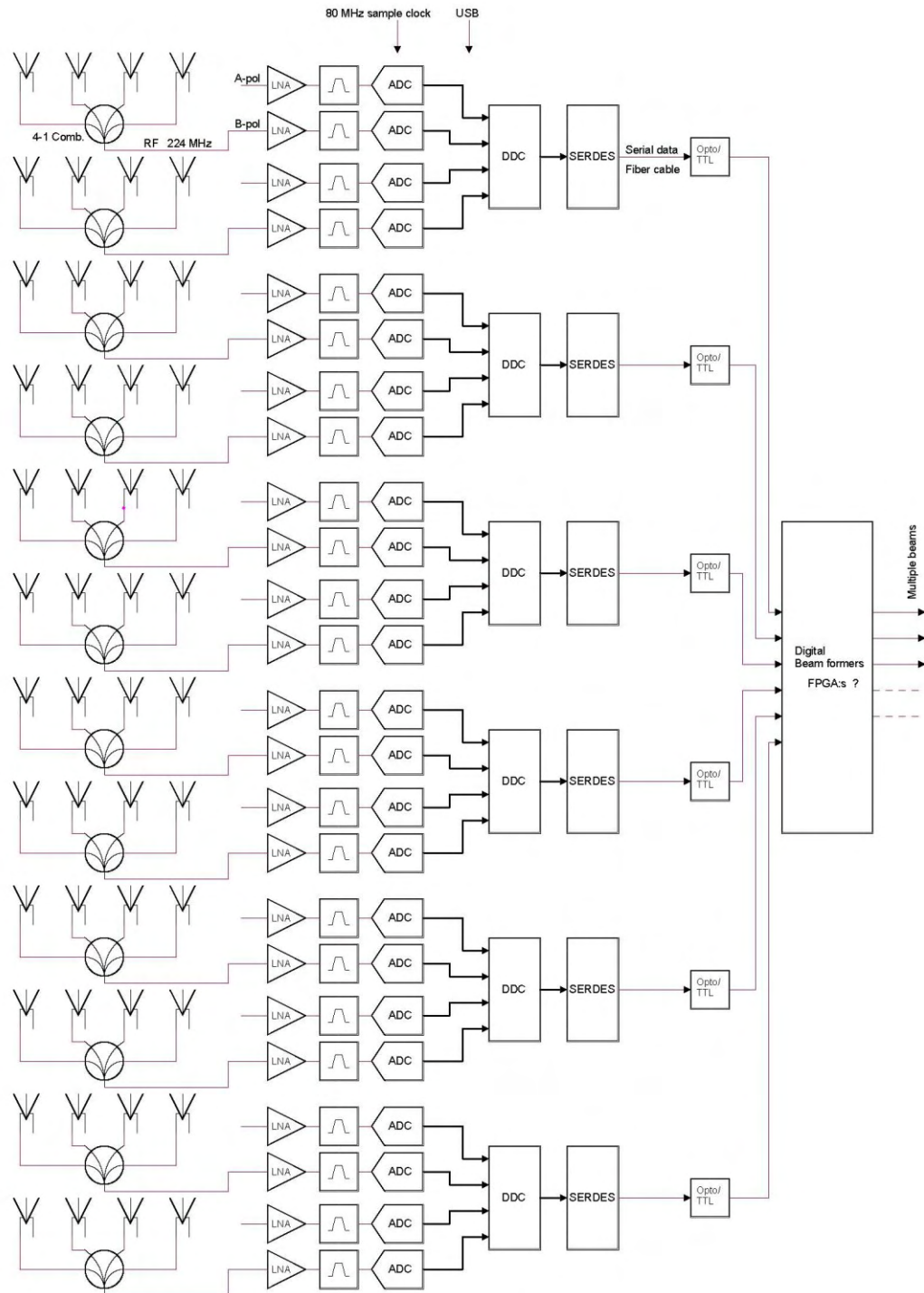


tau8 2007-10-16 0801:30 150s -0kW 342.1/43.9

First signal from test array

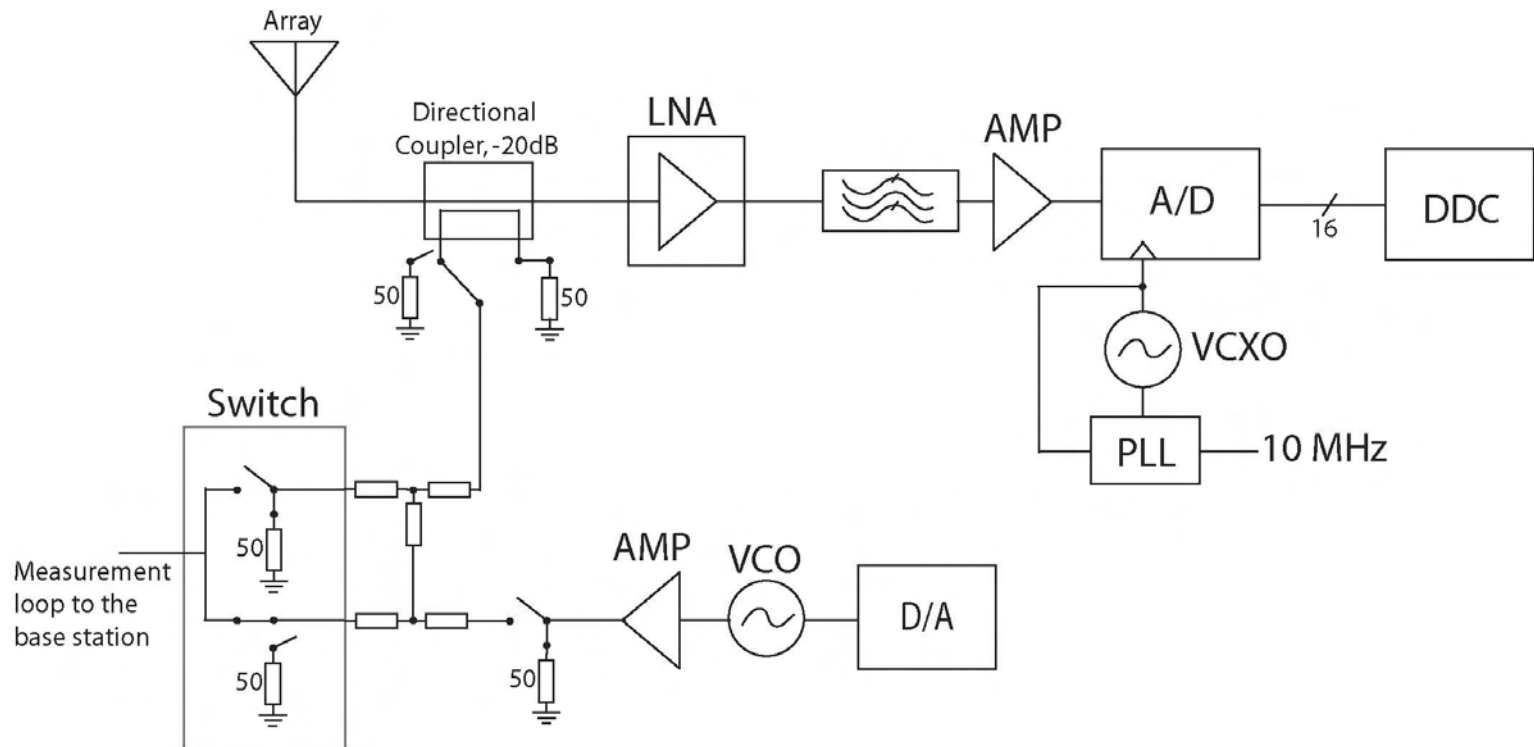




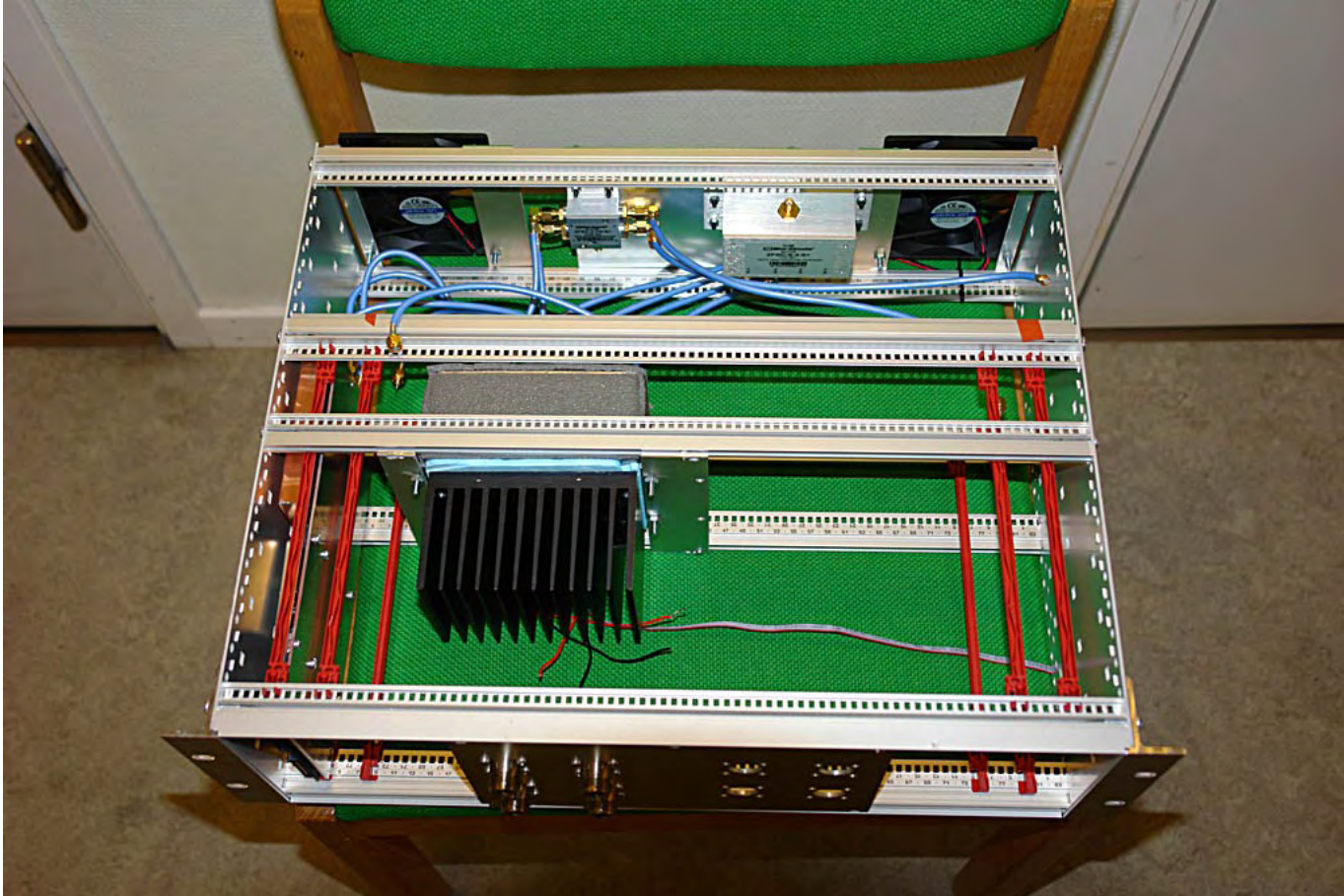


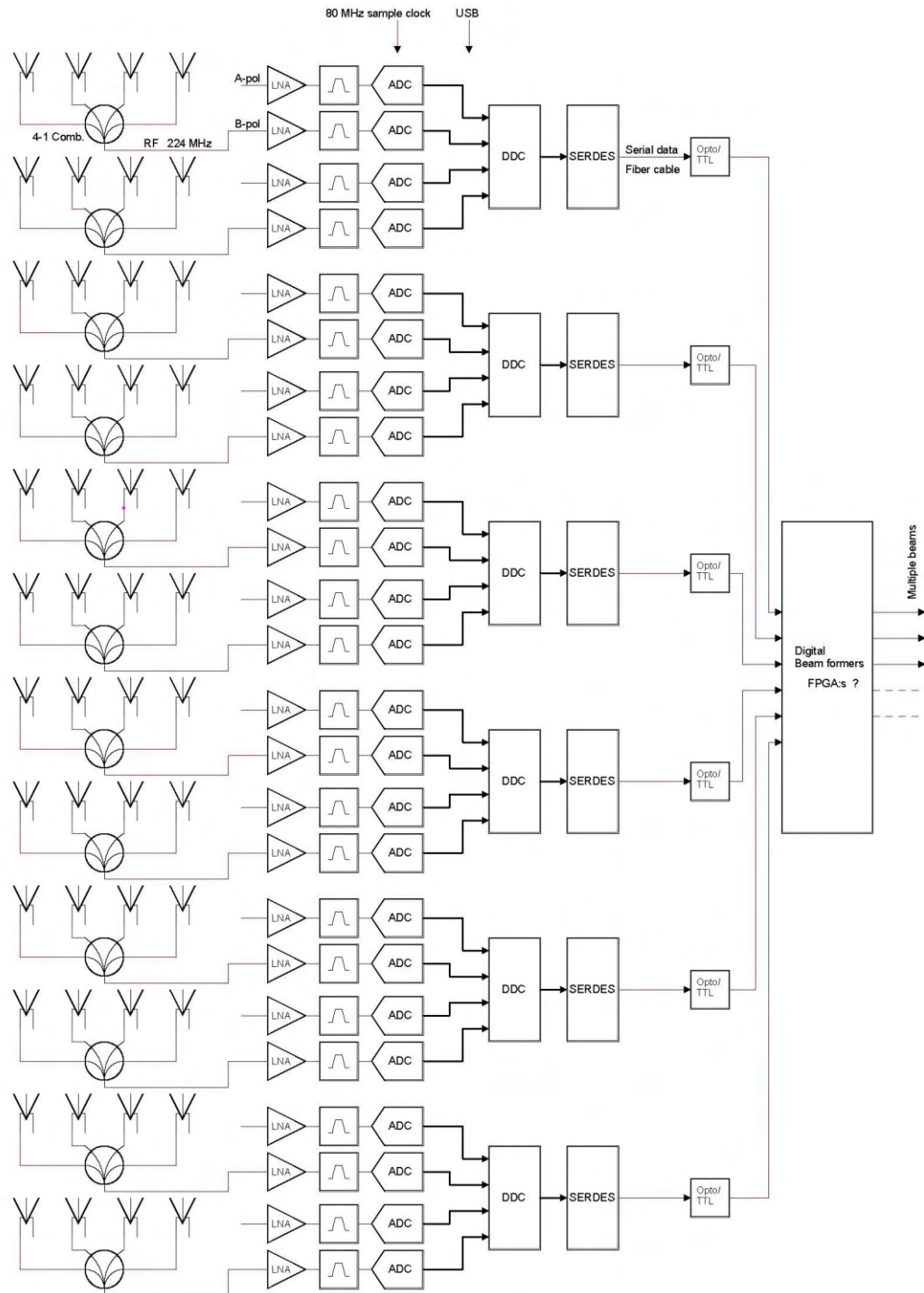
Noise figure = 36 K
Gain = 43 dB

Sampling clock 80 MHz



Low noise amplifier and A/D converter







SerDes (Serializer/Deserializer)

Convert data from-parallel-to-differential serial and vice versa

Parallel encoding/decoding (e.g. 8B/10B, 64B/66B)

Embedded clock

DC-balance, reduce intersymbol interference ISI

Differential signaling

LVDS - Low Voltage Differential Signaling (ADC-DDC converter board)

CML - Current Mode Logic

VML - Voltage Mode Logic

LVPECL - Low Voltage Emitter Coupled Logic (FIR clock at the present channel boards)

TLK1501 (0.6-1.5 Gbps transceivers)

16:1 SerDes, CML, Pre-Emphasis

TLK2501 (1.5-2.5 Gbps transceivers)

16:1 SerDes, CML, Pre-Emphasis, both pin compatible and functionally identical to the TLK1501

TLK3101 (2.5-3.125 Gbps transceivers)

16:1 SerDes, VML, Pre-Emphasis, functionally identical to the TLK1501 and TLK2501

Differential serial data rate (16-bit)

Parallel-to-serial shift register using both rising and falling edges with 10 x GTX_CLK bit clock i.e.

Diff. serial word rate (20-bit): 20 x GTX_CLK and with 8B/10B encoding

Diff. serial data rate (16-bit): 16 x GTX_CLK

Microstrip

6 layer (2 signal S/P, 2 VDD, 2 GND)

50 ohm controlled impedance

Balanced pair, minimize skew

Beveled or radiused corners

Top View (layer 1)

CML - Current Mode Logic, NMOS output transistor drive only falling edges, need pullup resistors for rising edges and termination on the receiver.

VML - Voltage Mode Logic, PMOS and NMOS output transistors drive both rising and falling edges, no need for pullup and pulldown resistors only termination on the receiver.

Transmit Pre-Emphasis - Signal compensation/shaping, most efficient up to 3.125 Gbps.

SFF - Small Form-Factor

MMF - Multi-Mode Fiber

AFBR-5921ALZ (1.0625/2.125 Gbps)

2x5 SFF package

LC Full-Duplex optical connector

850 nm Laser for MMF

Internally AC-coupled with pullups and termination (CML and LVPECL voltage swings compatible)

Full-Duplex

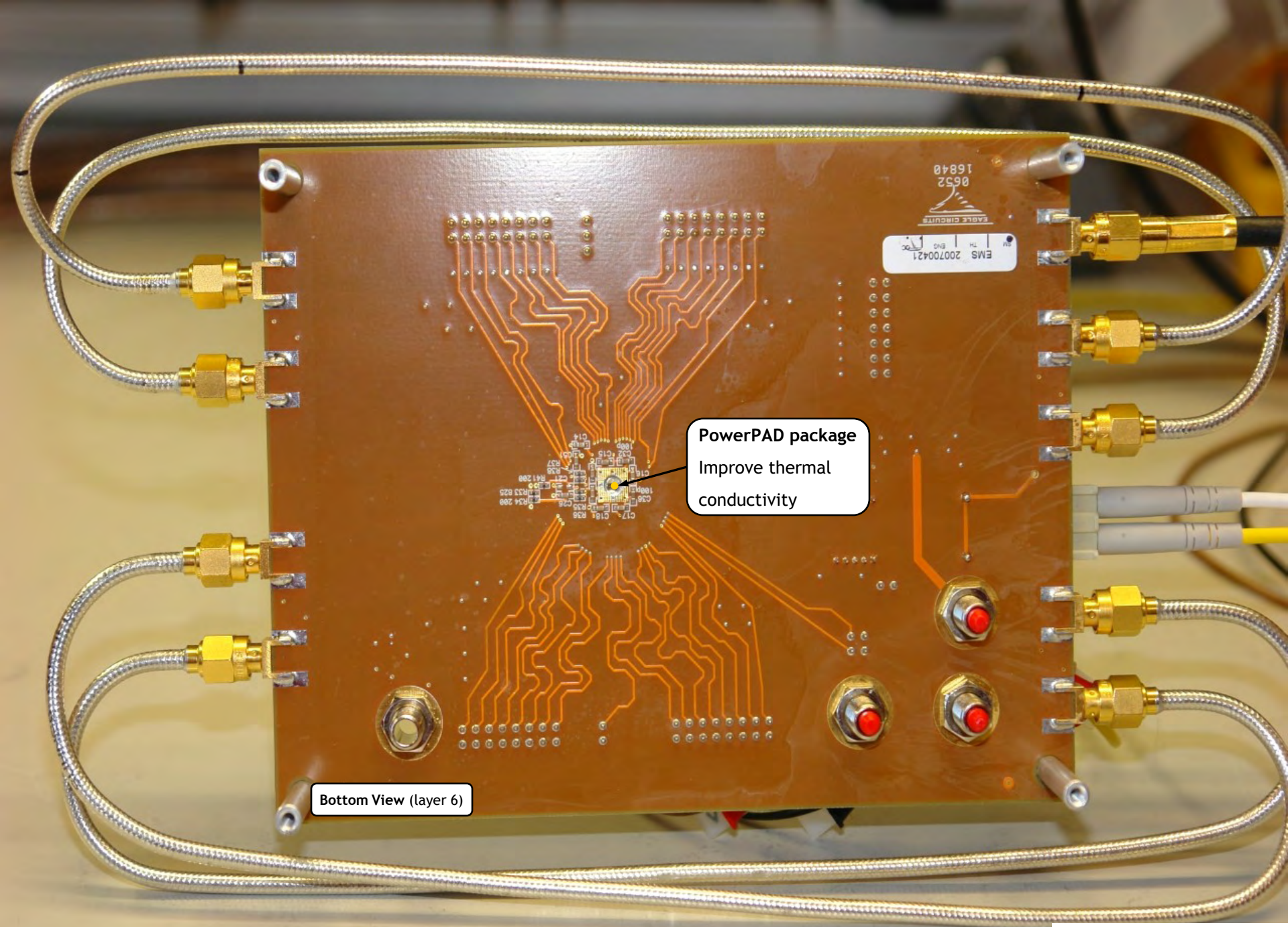
Reference clock GTX_CLK (TLK1501)

30-75 MHz (tested at 16-80 MHz)

100 ppm frequency tolerance

(4 kHz at 40 MHz GTX_CLK)

40 ps peak-to-peak jitter



PowerPAD package
Improve thermal
conductivity

Bottom View (layer 6)

Link lengths at 1.0625 Gbps:

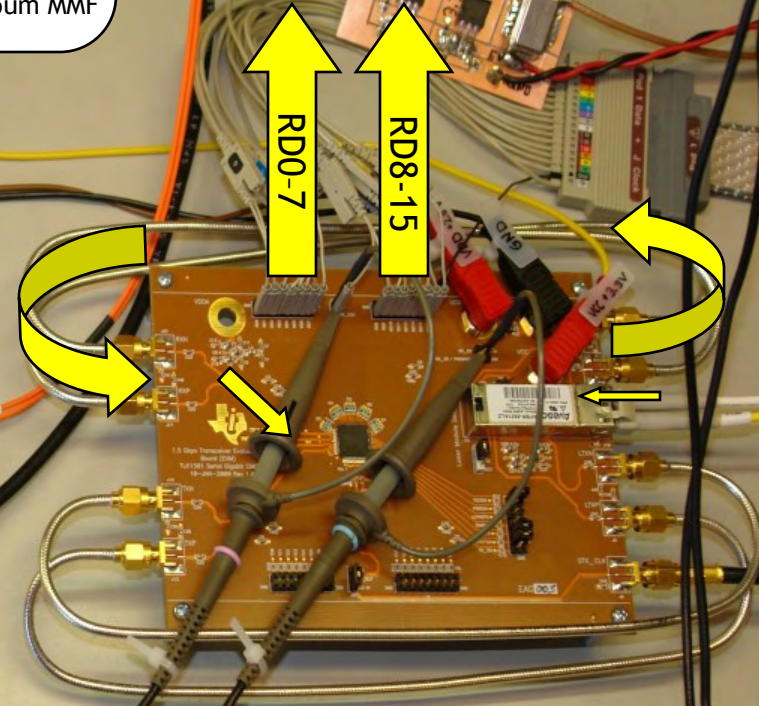
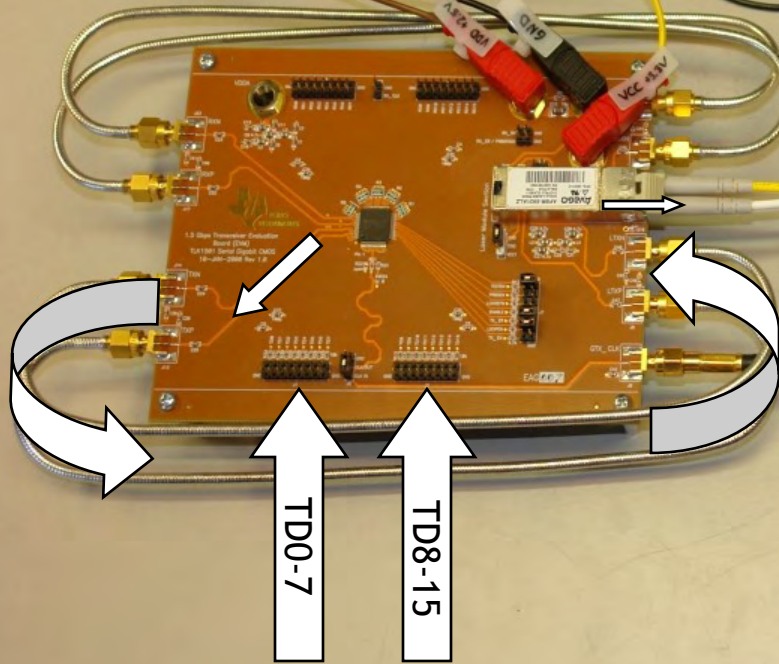
0.5-500m with 50/125um MMF

0.5-300m with 62.5/125um MMF

Link lengths at 2.125 Gbps:

0.5-300m with 50/125um MMF

0.5-150m with 62.5/125um MMF



IPY lessons learned.

Hardware lessons learned:

AVR need replacements for continuous operation.

Air circulation in the transmitter hall.

Remote triggering of main fuse for transmitters.

Upgraded fire preventing/defending system.

Outsourcing of maintenance: Cars, tractor, generator, snowmobiles etc.

Regular maintenance of all systems.

Need for acu spare parts.

Staff lessons learned:

Continuous operation with 4 people is possible- but only for a defined period.

Longer shifts with longer intervals feels more comfortable than shorter.

For safety reasons- separate housing would be preferred for people on shifts.

Need for a safety review to identify hazards.

Routine staff meetings.

Defined routines for operation of the station. (Data transfers, daily, weekly and monthly checks)

Conclusion:

IPY have been a challenge in many ways and we have had many interesting experiences, but in the end we have learned a lot about how to comfortably run continuously with few people. In the event of any future runs- we can build on this knowledge and maybe use this as a base future manning needs.

Doritos

Challenges in terms of radar controller memory.

To send uncompressed:

video PAL:

$$25 \text{ fps} * 29 \text{ sec} * 320 \times 200 * 3 \text{ bpp} = 133 \text{ Mb}$$

Sound:

$$44.1 \text{ khz} * 2 \text{ channels} * 29 \text{ sec} = 2.4 \text{ Mb}$$

Around 135 Mb total amount of data. + overhead to do line and frame sync.

Perhaps possible to modulate transmitters with external IO card.

By recording transmitter samples we could display the data as it is transmitted.

UK computers to Kiruna site

The situation is now:

Sites->wlan->arch<->deposit->wlan->www

UK is bringing 6 1U computers: UC

Place: IRF or Site?

Site was chosen as the most transfer is made between deposit and UC.

In a way UC should be some sort of data reduction machine of the raw data. Split up UC (3+3)??

Needed resources:

Place: Antenna foundation

Cooling: Exists

Rack: Buy

UPS: Buy with filter, under and overvoltage

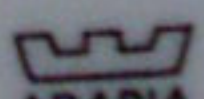
Communication: Buy GBIT switch + VLAN a la ESR

: Buy+dig Fiber IRF-EISCAT, IRF to Knutstorp? 50/50(33/67) costs

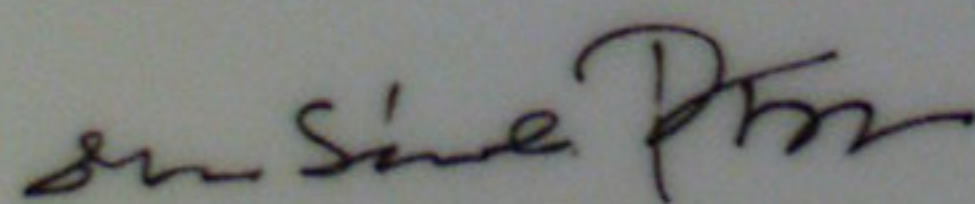


2008

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ARABIA
FINLAND
ART PLATE

flora & fauna



Eeva Sivula & Pekka Toivanen



Kjellfrid Ingebrigtsen
For achievements working with
EISCAT for more than 10 years
Skibotn 13 March, 2008