

2m ARDF behaviour. + Simulation with Radio Mobile.

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Section UBA SNW



Agenda.

- Reflections during 2m direction finding.
- “Radio Mobile” propagation simulation SW.
- Study cases:
 - Reflections.
 - Signal strength on hills.
- Tips and tricks in hilly area.
- Example:
 - Region 3 ARDF Championships '99, Nonsan, Korea.
 - Trainings area, Belgian ARDF-team going to Korea, 2008.
- Summary



Reflections during 2m direction finding.

- Two types of reflection:
 - Local Reflections:
 - The edge of tree lines or the perimeters of wooded areas.
 - Man made objects like houses, cars, palisades, ...
 - Waterfronts.
 - Dunes.
 - Geographical reflections:
 - Dunes.
 - Hills.
 - Mountain borders.



Reflections during 2m direction finding.

- Can be recognized:
 - Wide signal angle.
 - If the signals coming from more than one direction.
 - 4 el. Yagi is better than 3el. or HB9CV as the dip between 2 reflection is measurable.
 - If the direction moves fast during running.
 - Front/back ratio is small.
 - The modulation is not clear due interference.



“Radio Mobile”.

- It's a tool used to predict the performance of a radio system.
- It uses digital terrain elevation data for automatic extraction of path profile between an emitter and a receiver.
- The elevation data is downloadable from the internet.
- Radio propagation model: ITS Irregular Terrain Model (Longley-Rice).
- Antenna heights Range .5 to 2999m.
- Frequency Range : 20MHz – 20 GHz.
- Freeware by VE2DBE
(<http://www.ve2dbe.com/download/download.html>)



Study case: Reflections Simulation.



NRW-Peilsportseminar
im IBZ Schloß Gimborn

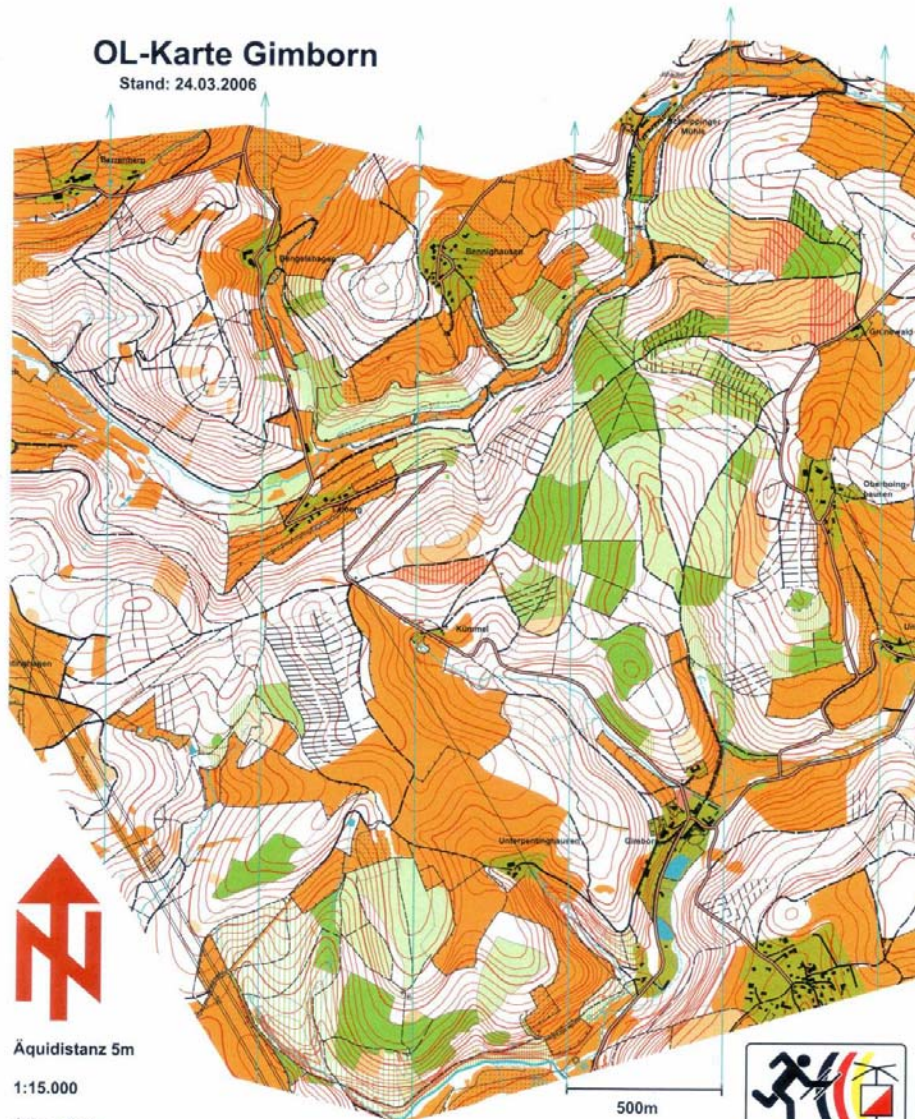


31. März - April 2006

2m-Peilseminar
30. Mai – 1. Juni 2008 im IBZ Schloss Gimborn
<http://www.nrw-peilsportseminar.de>

OL-Karte Gimborn

Stand: 24.03.2006



Äquidistanz 5m

1:15.000

1cm = 150m

1km = 6,66cm



NRW - Peilsportseminar

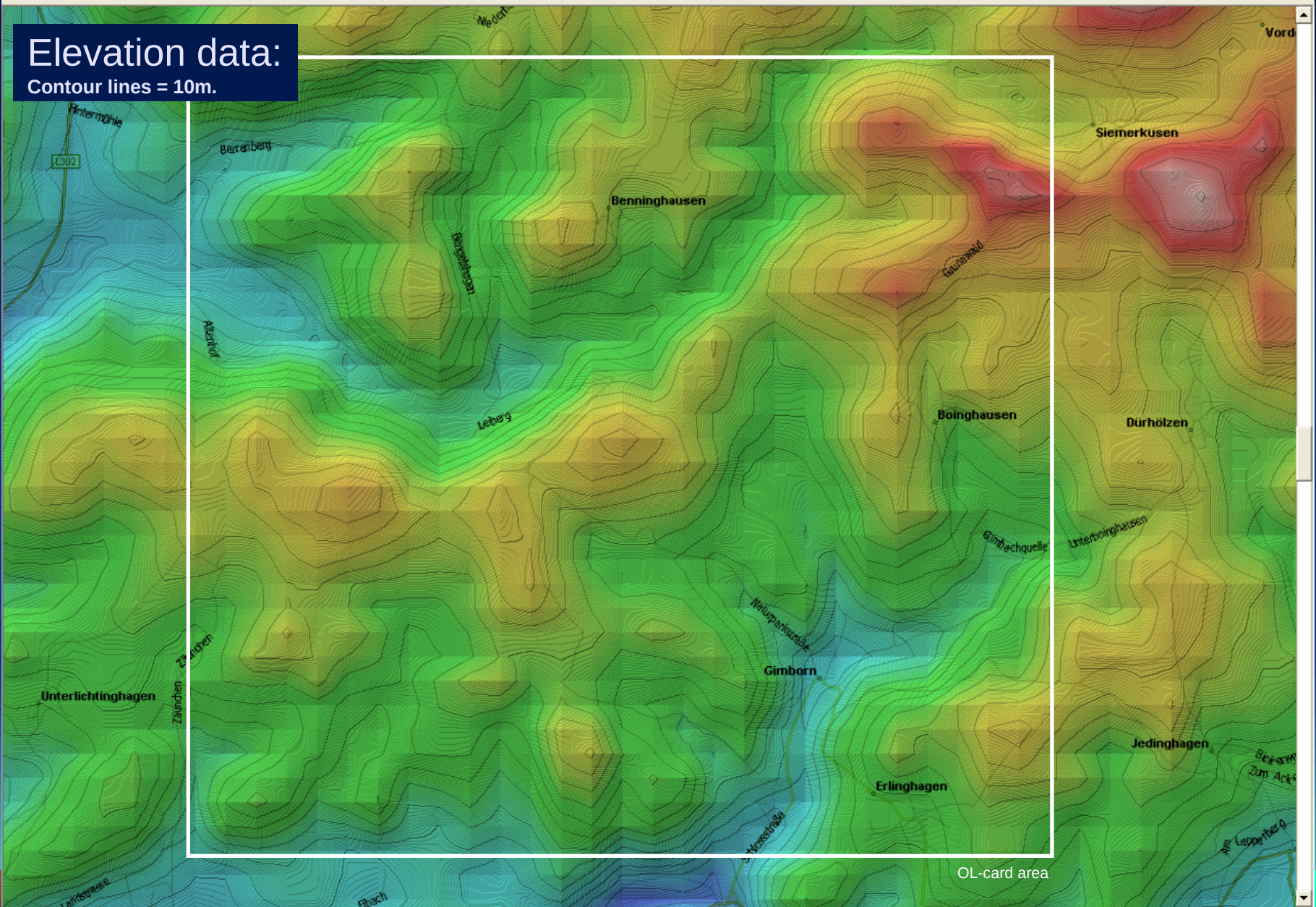
**31. März bis 2. April
Schloss Gimborn**



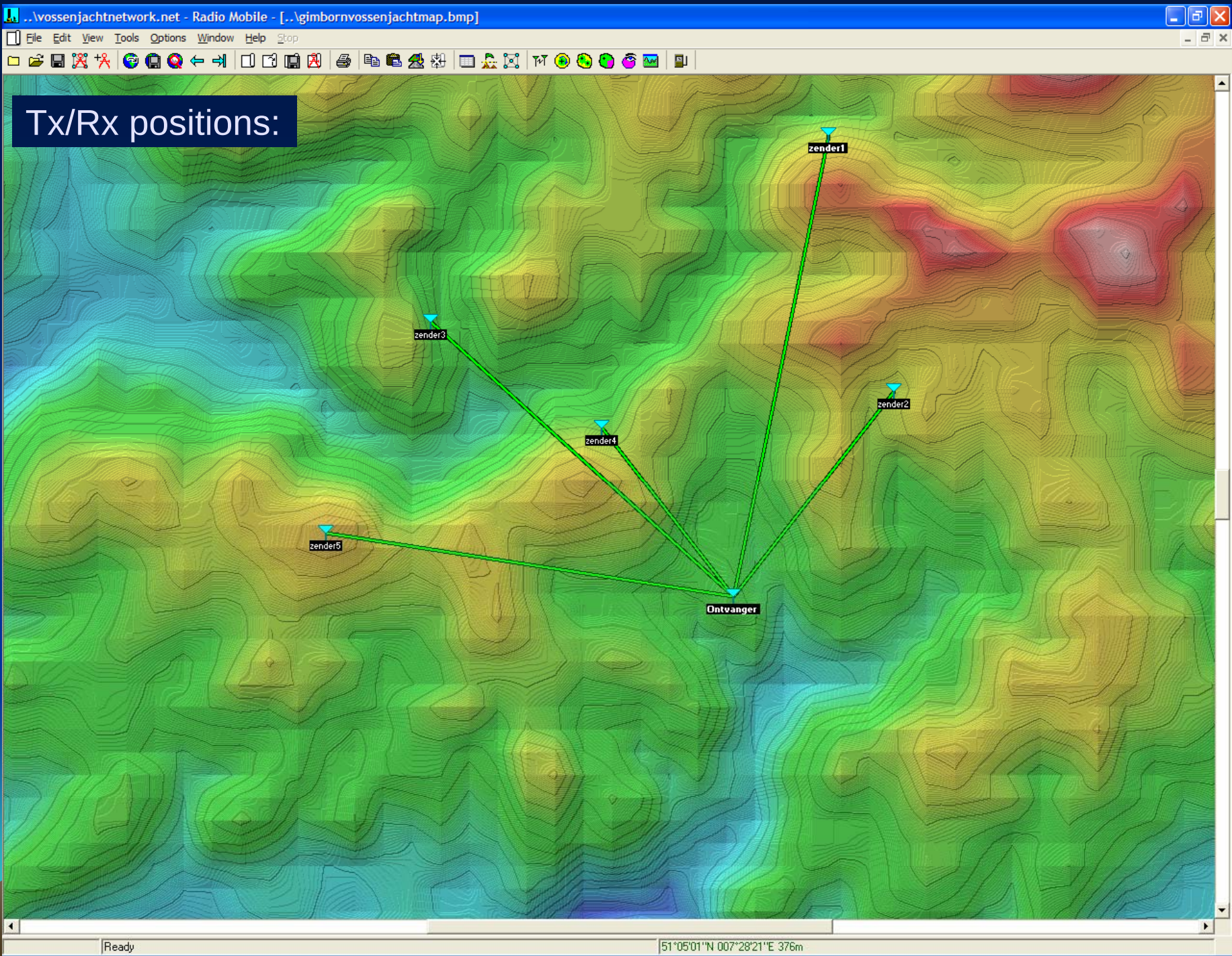


Elevation data:

Contour lines = 10m.



OL-card area



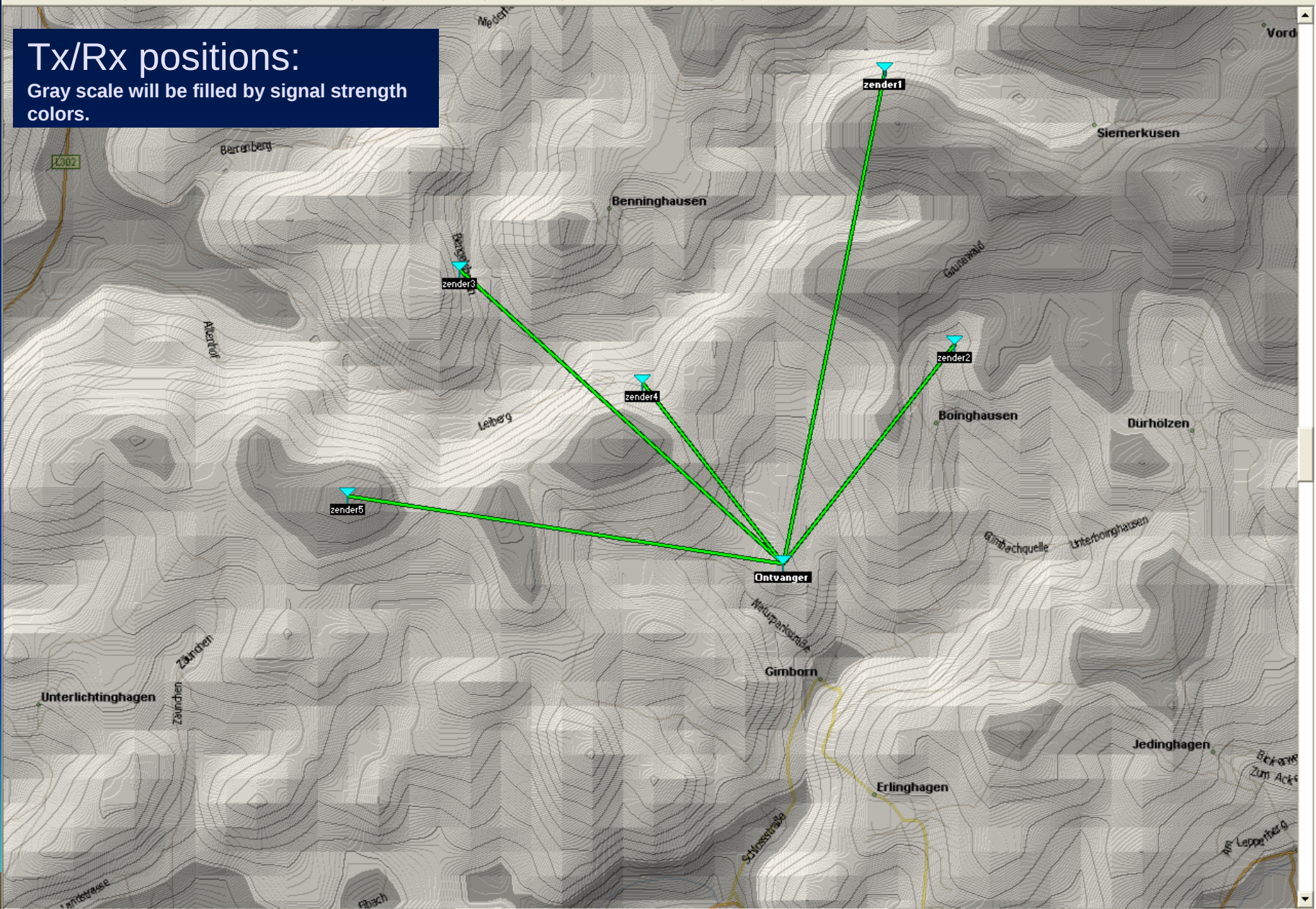
Simulation data:

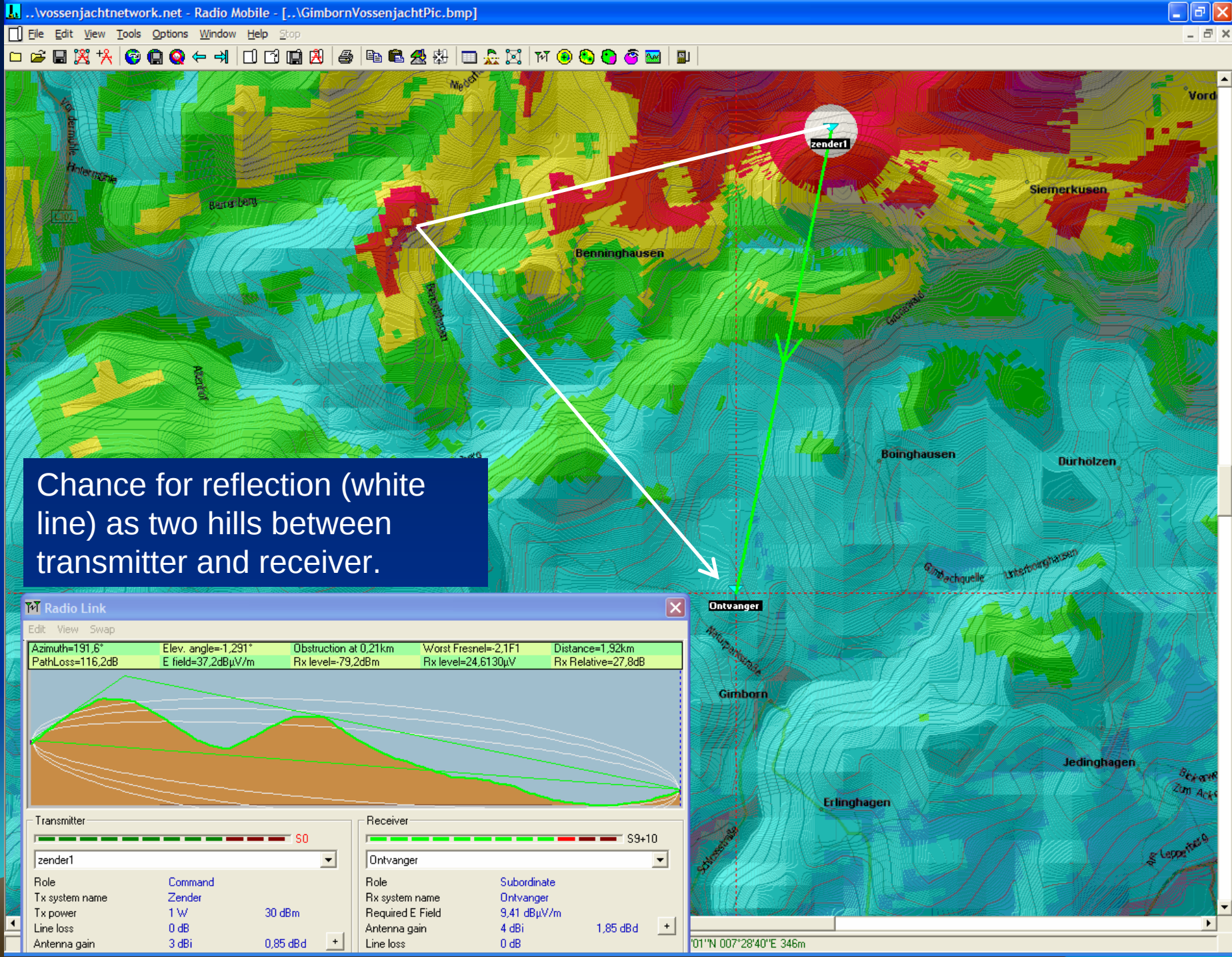
- $f_{\min} = 144\text{MHz}$
- $f_{\max} = 145\text{MHz}$
- Polarization = Horizontal
- Mode of variability = Mobile
- Climate = Maritime temperate over land
- Rx : 1uV, omni antenna 4dBi, height = 1.5m, 0dB cable loss
- Tx : 1W, omni antenna 3dBi, height = 3m, 1db/m loss.
- Propagation mode: Use “Two Rays” for Line-Of-Sight (Interference).

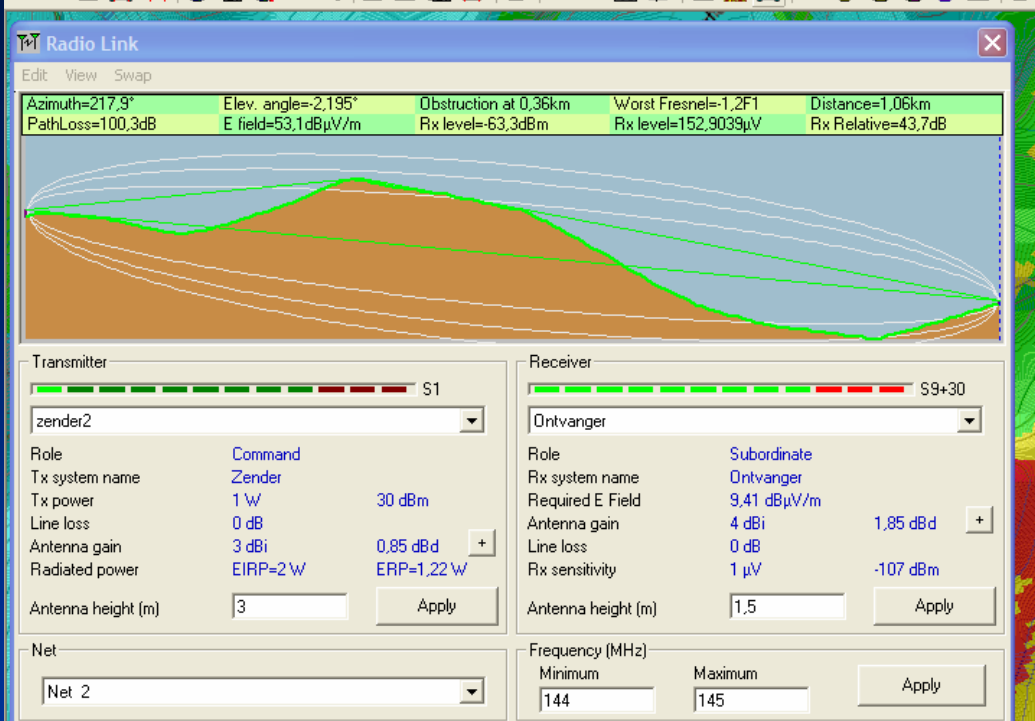


Tx/Rx positions:

Gray scale will be filled by signal strength colors.

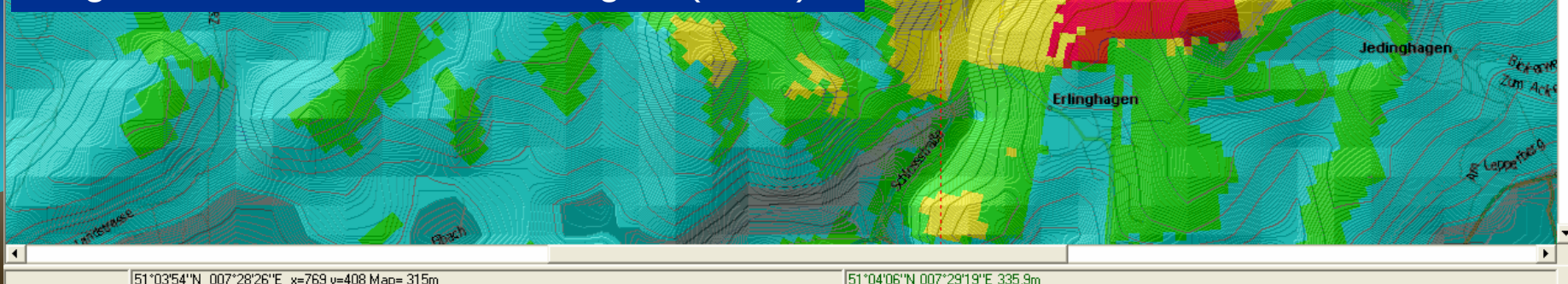


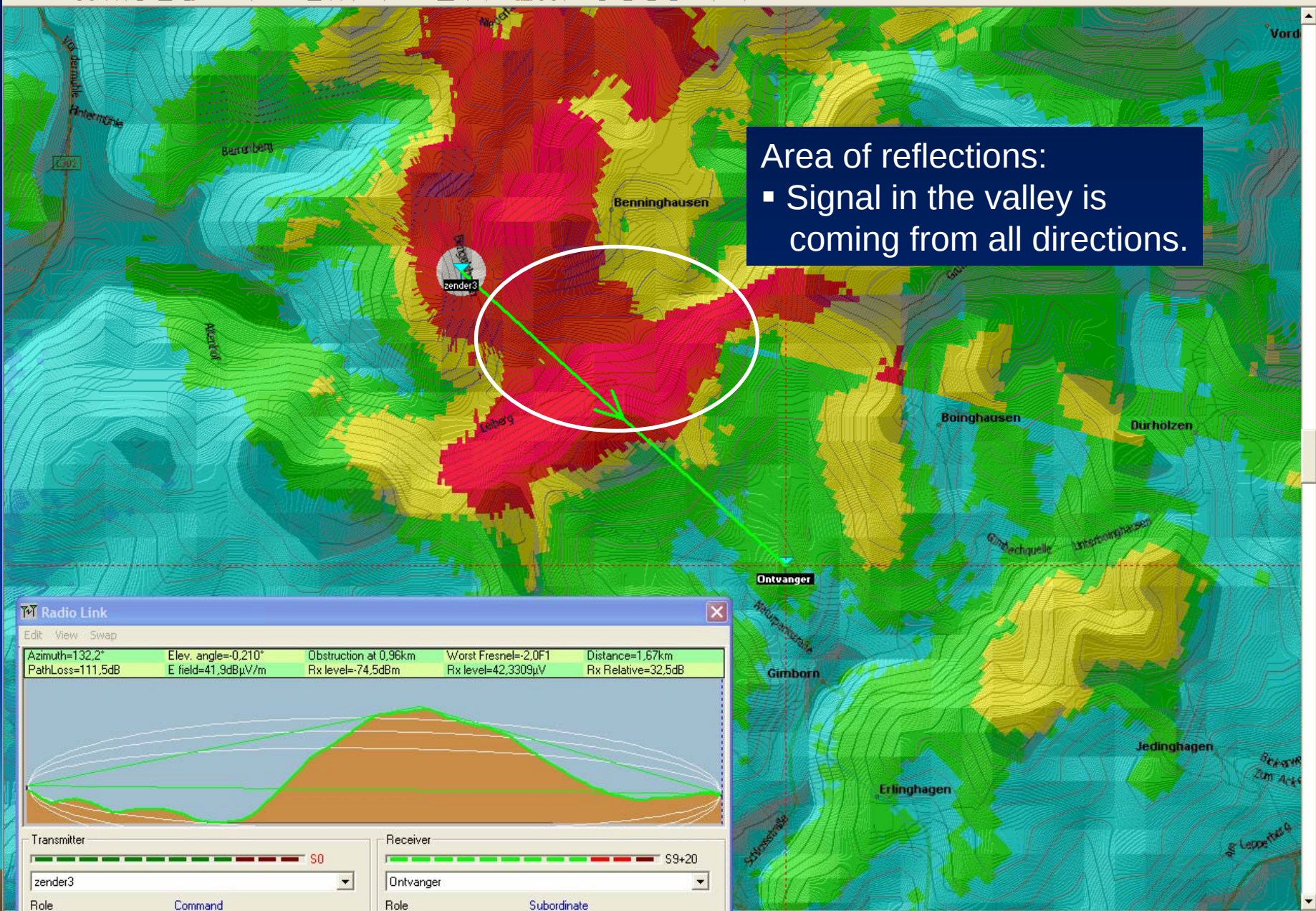


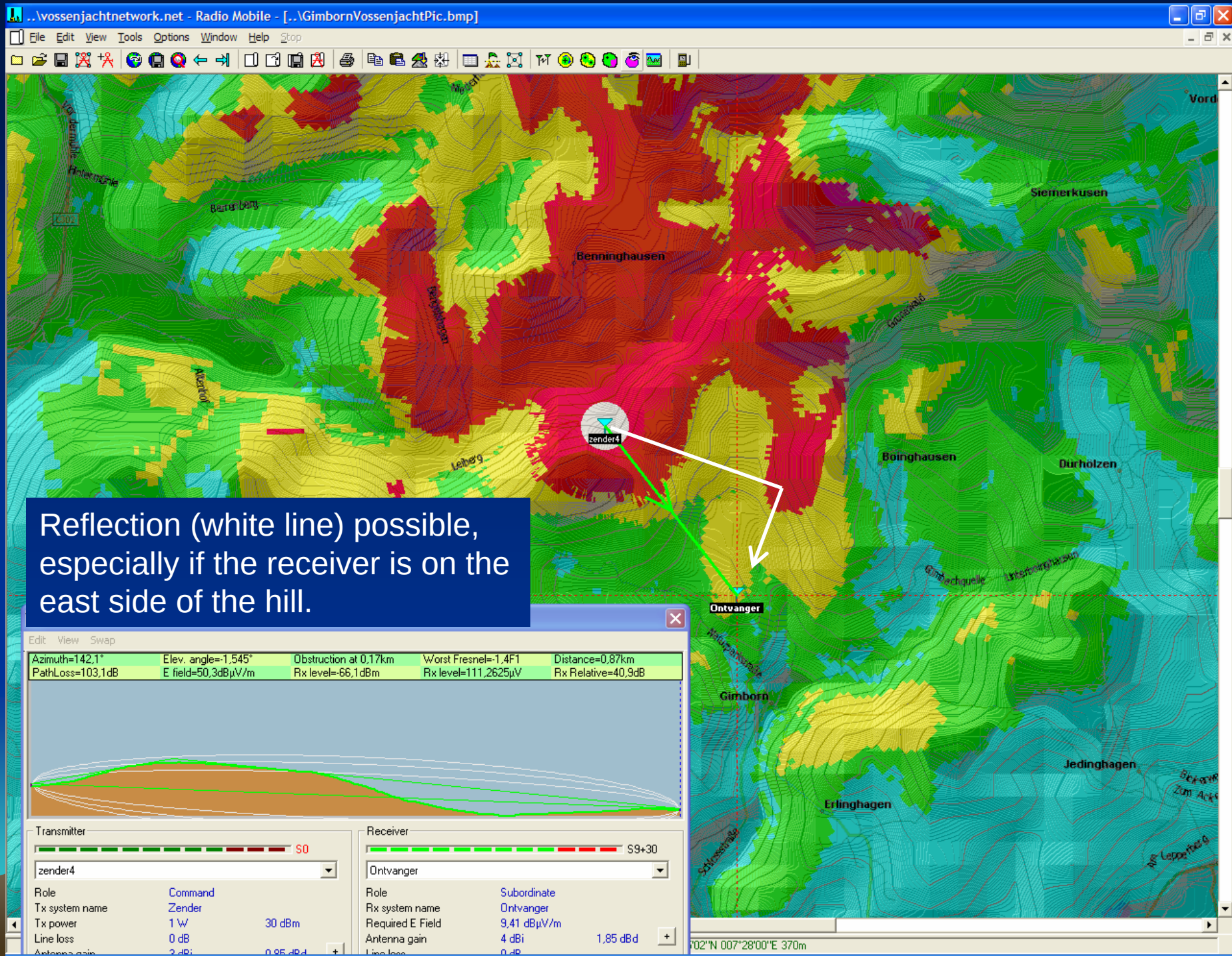


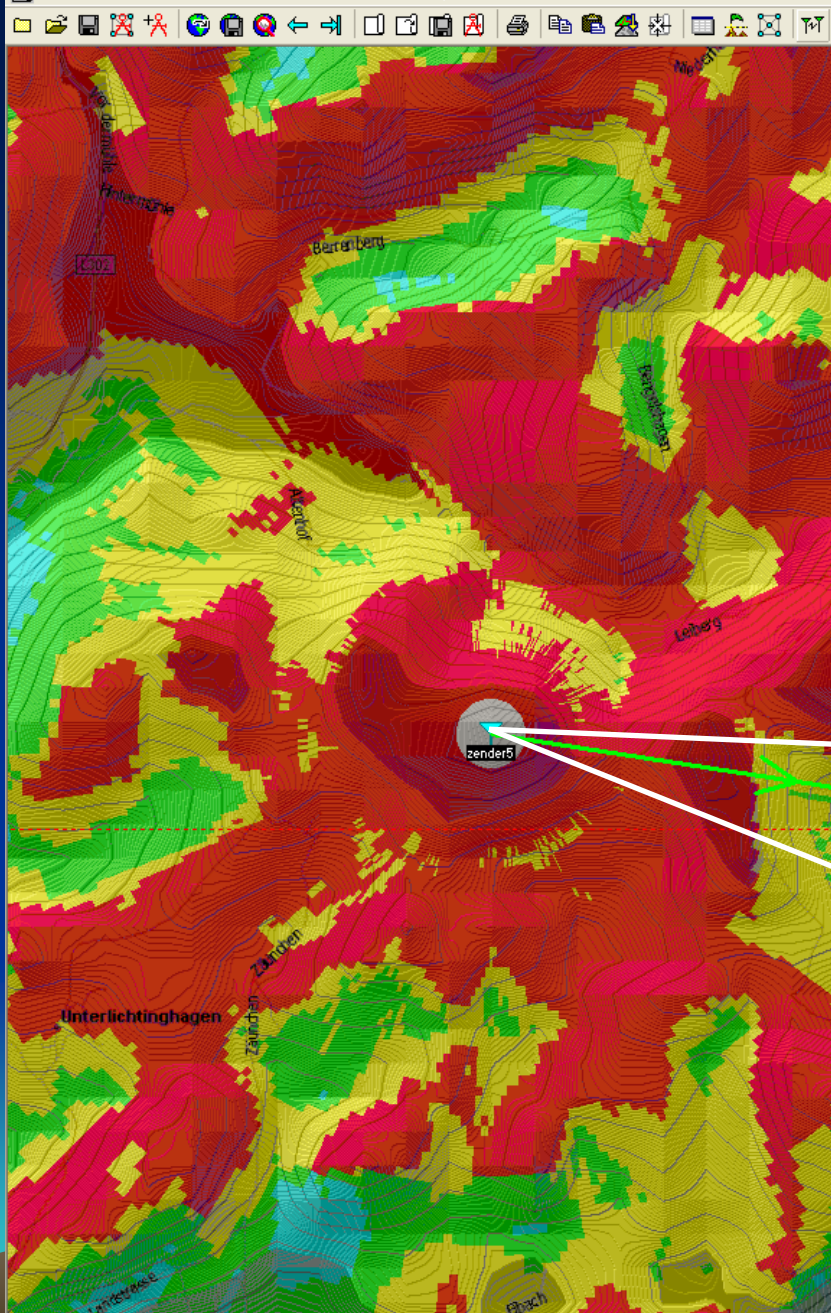
Reflection is probably stronger than original signal:

- No sight of line for the direct signal (green).
- Sight of line for the reflected signal (white).









Radio Link

Edit View Swap

Azimuth=98,8°	Elev. angle=-2,510°	Obstruction at 0,59km	Worst Fresnel=0,3F1	Distance=1,68km
PathLoss=103,1dB	E field=50,3dBµV/m	Rx level=-66,1dBm	Rx level=111,0148µV	Rx Relative=40,9dB

The graph displays the radio link path (green line) and the Fresnel zone clearance (blue area) over the terrain. The path starts at the transmitter and ends at the receiver, with the Fresnel zone clearance shown as a blue area above the path.

Transmitter

zender5

Role: Command

Tx system name: Zender

Tx power: 1 W 30 dBm

Line loss: 0 dB

Antenna gain: 3 dBi 0,85 dBd

Radiated power: EIRP=2 W ERP=1,22 W

Antenna height (m): 3

Apply

Receiver

Ontvanger

Role: Subordinate

Rx system name: Ontvanger

Required E Field: 9,41 dBµV/m

Antenna gain: 4 dBi 1,85 dBd

Line loss: 0 dB

Rx sensitivity: 1 µV -107 dBm

Antenna height (m): 1,5

Apply

Net

Net 5

Frequency (MHz)

Minimum: 144 Maximum: 145

Apply

“Radio Mobile”: Signal strength on hills.



“Radio Mobile”: Signal strength on hills.

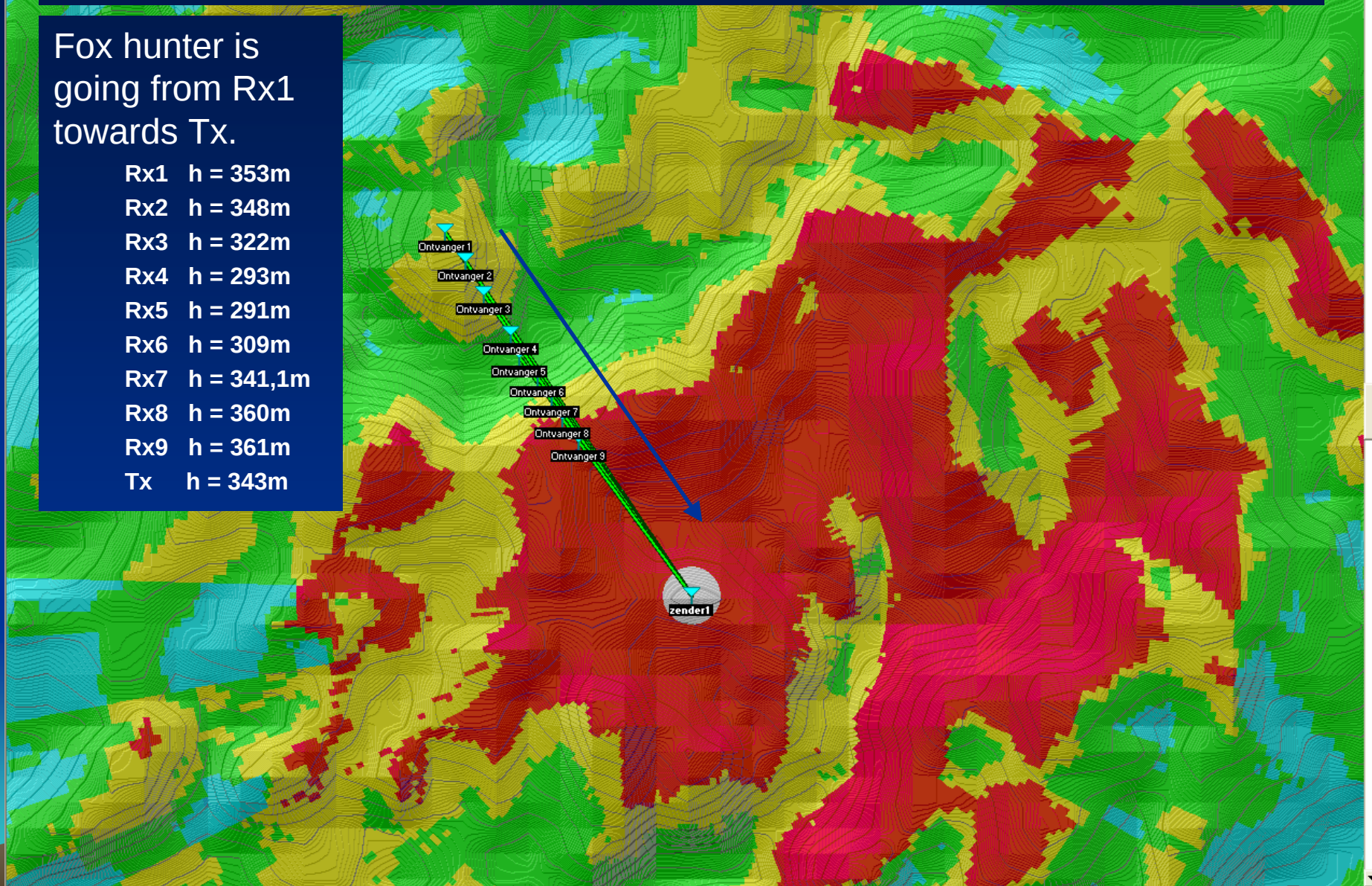
The “hell” for a 2m radio orienteering runner:

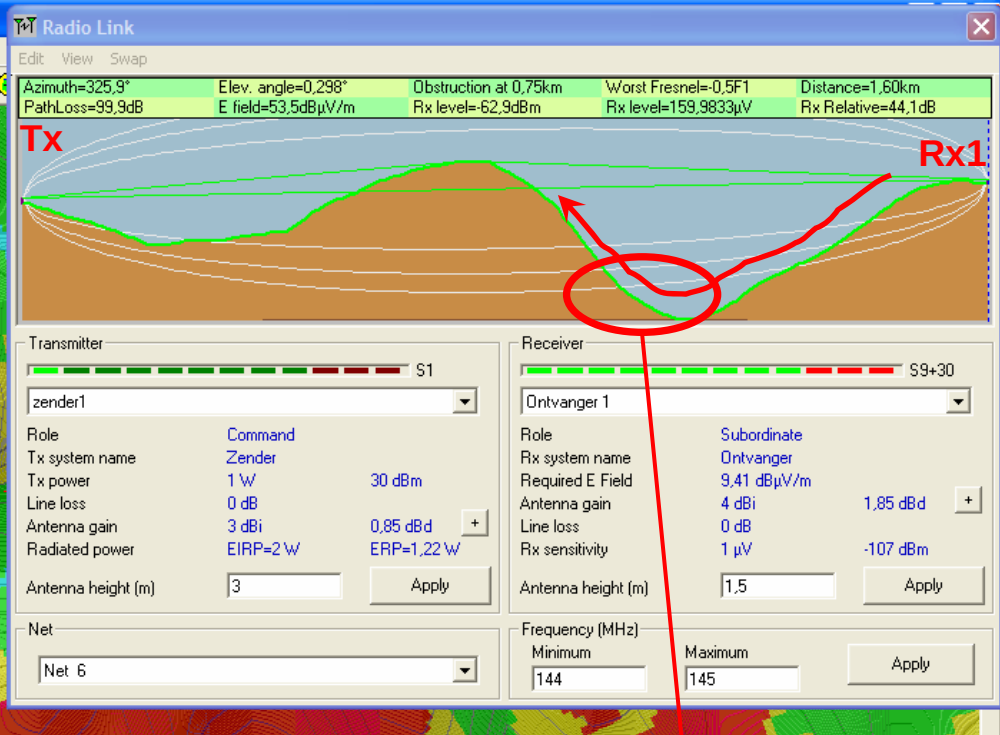


“Radio Mobile”: Signal strength on hills.

Fox hunter is going from Rx1 towards Tx.

Rx1	h = 353m
Rx2	h = 348m
Rx3	h = 322m
Rx4	h = 293m
Rx5	h = 291m
Rx6	h = 309m
Rx7	h = 341,1m
Rx8	h = 360m
Rx9	h = 361m
Tx	h = 343m

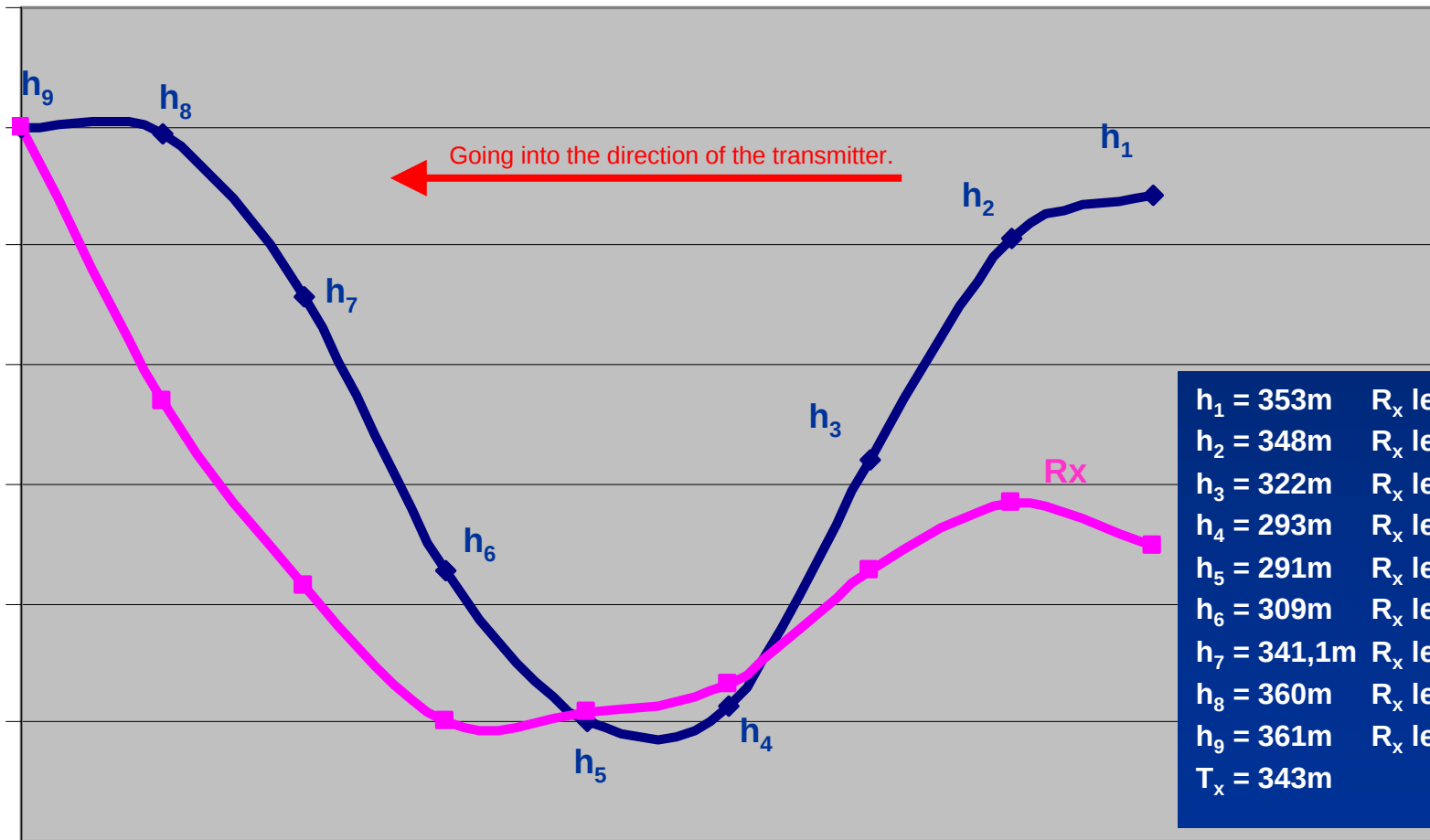




$h_1 = 353\text{m}$ $R_x \text{ level} = -62.9\text{dBm}$
 $h_2 = 348\text{m}$ $R_x \text{ level} = -60.4\text{dBm}$
 $h_3 = 322\text{m}$ $R_x \text{ level} = -64.2\text{dBm}$
 $h_4 = 293\text{m}$ $R_x \text{ level} = -70.5\text{dBm}$
 $h_5 = 291\text{m}$ $R_x \text{ level} = -72.0\text{dBm}$
 $h_6 = 309\text{m}$ $R_x \text{ level} = -72.6\text{dBm}$
 $h_7 = 341\text{m}$ $R_x \text{ level} = -65.0\text{dBm}$
 $h_8 = 360\text{m}$ $R_x \text{ level} = -54.8\text{dBm}$
 $h_9 = 361\text{m}$ $R_x \text{ level} = -39.6\text{dBm}$
 $T_x = 343\text{m}$

Contrary to, he is coming closer and higher (h=18m off-road can be very hard), the signal decreases from point Rx5 to point Rx6.

Signal strength vs. height.



Tips and tricks in hilly area.

- Local Reflections:
 - Antenna with small opening angle e.g. 4 element Yagi.
- Geographical Reflections:
 - Always stay higher than the transmitter.
 - Try to stay on the top of the hill (no reflections in your back).
 - Shoot with your antenna in the valley, if the signal is weaker, the transmitter is in the next valley.
 - Signal is weaker starting the ascend of the hill in case the transmitter is at the other side.
 - The signal coming from all directions, means: you are lower than the transmitter.
 - Right track can avoid reflection areas.



IARU Region 3 ARDF Championships '99, Nonsan, Korea

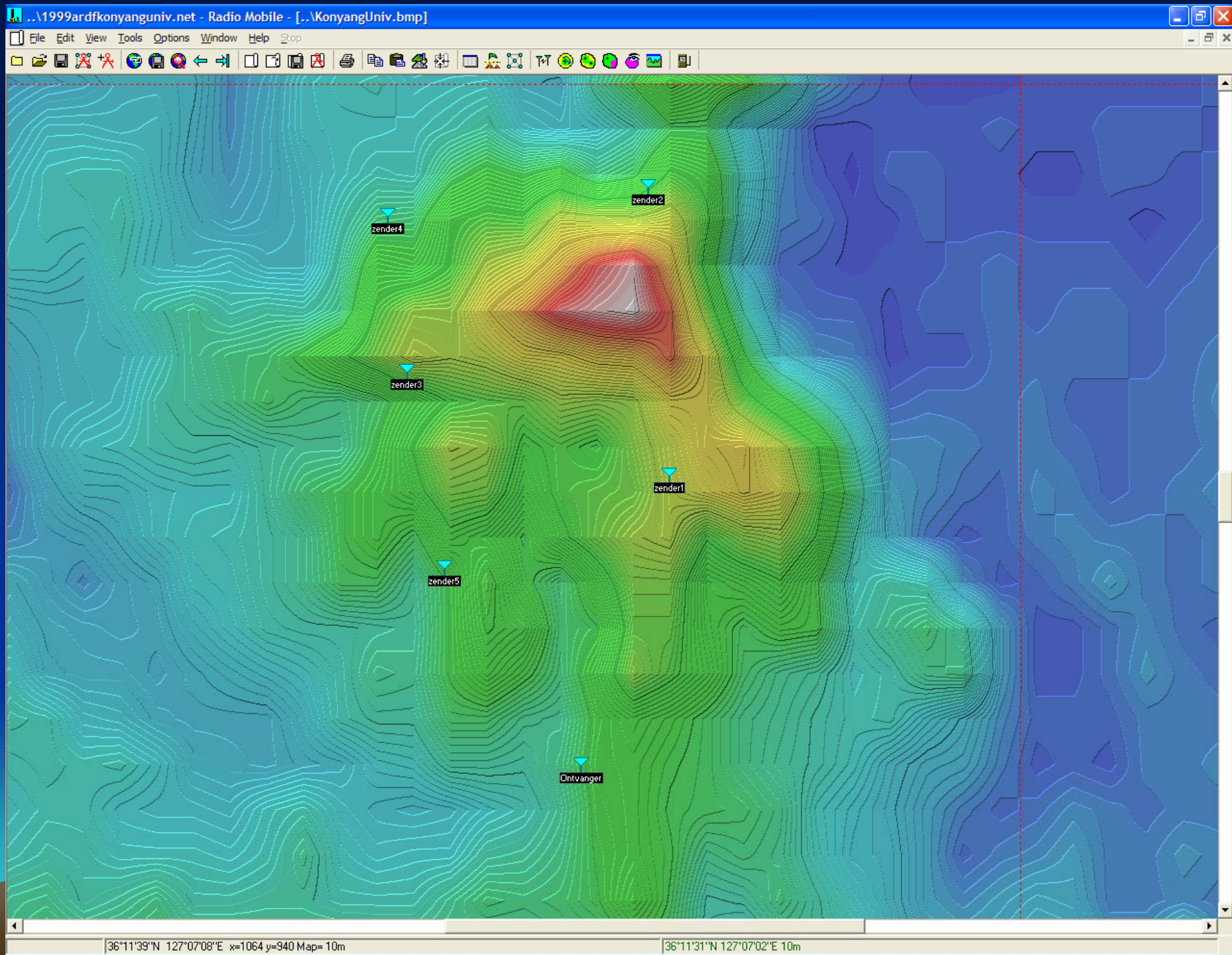


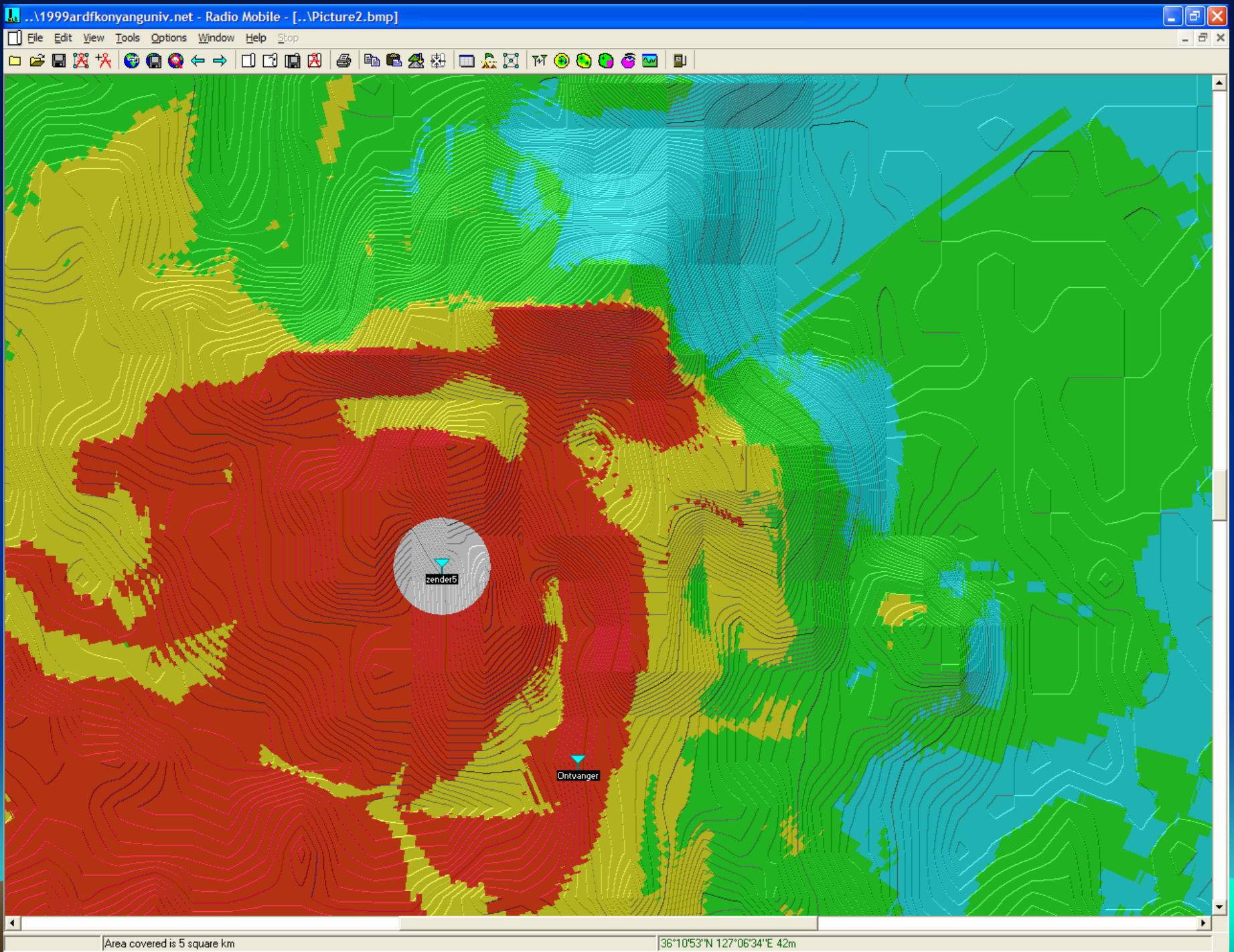
IARU Region 3 ARDF Championships '99, Nonsan, Korea

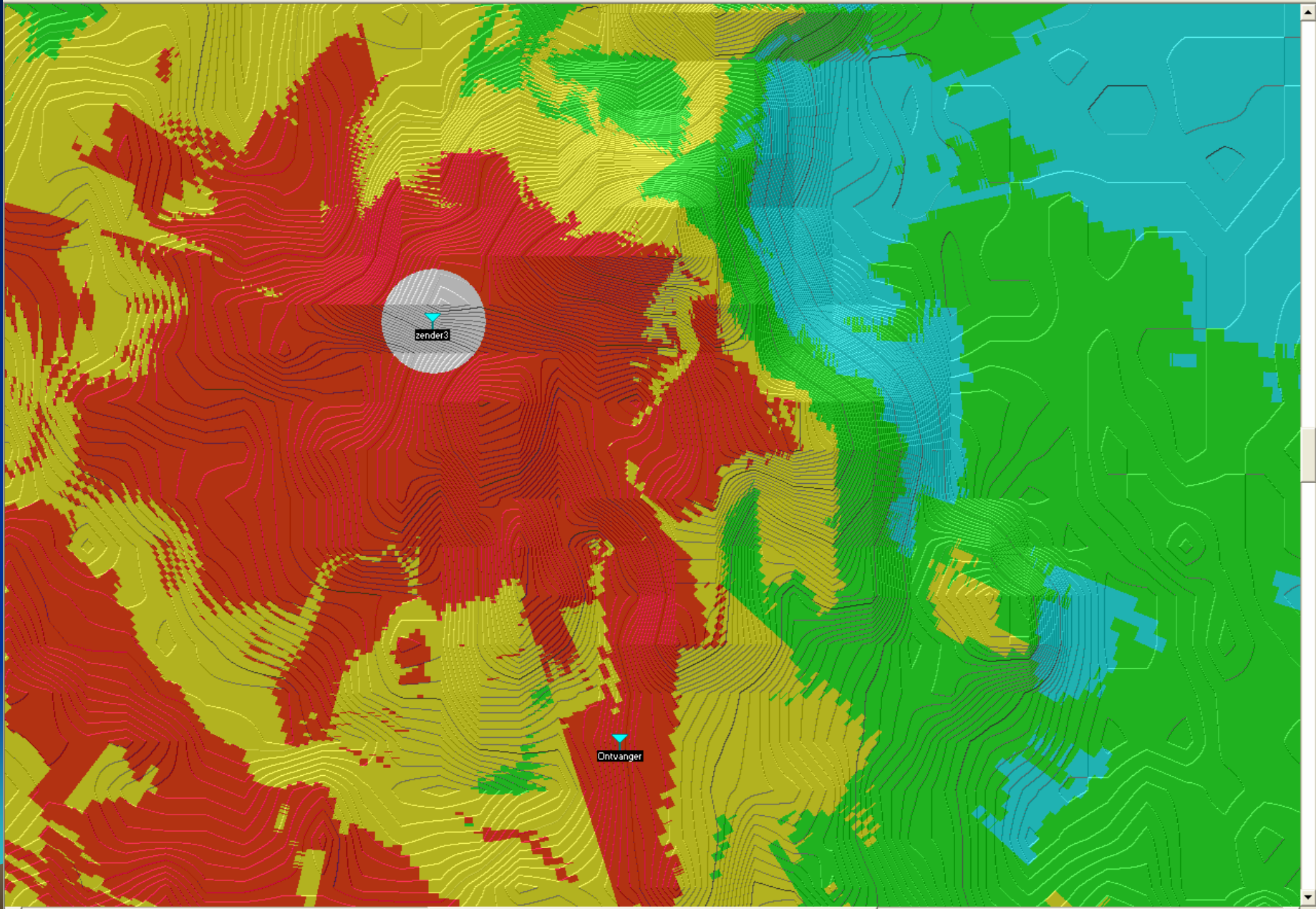


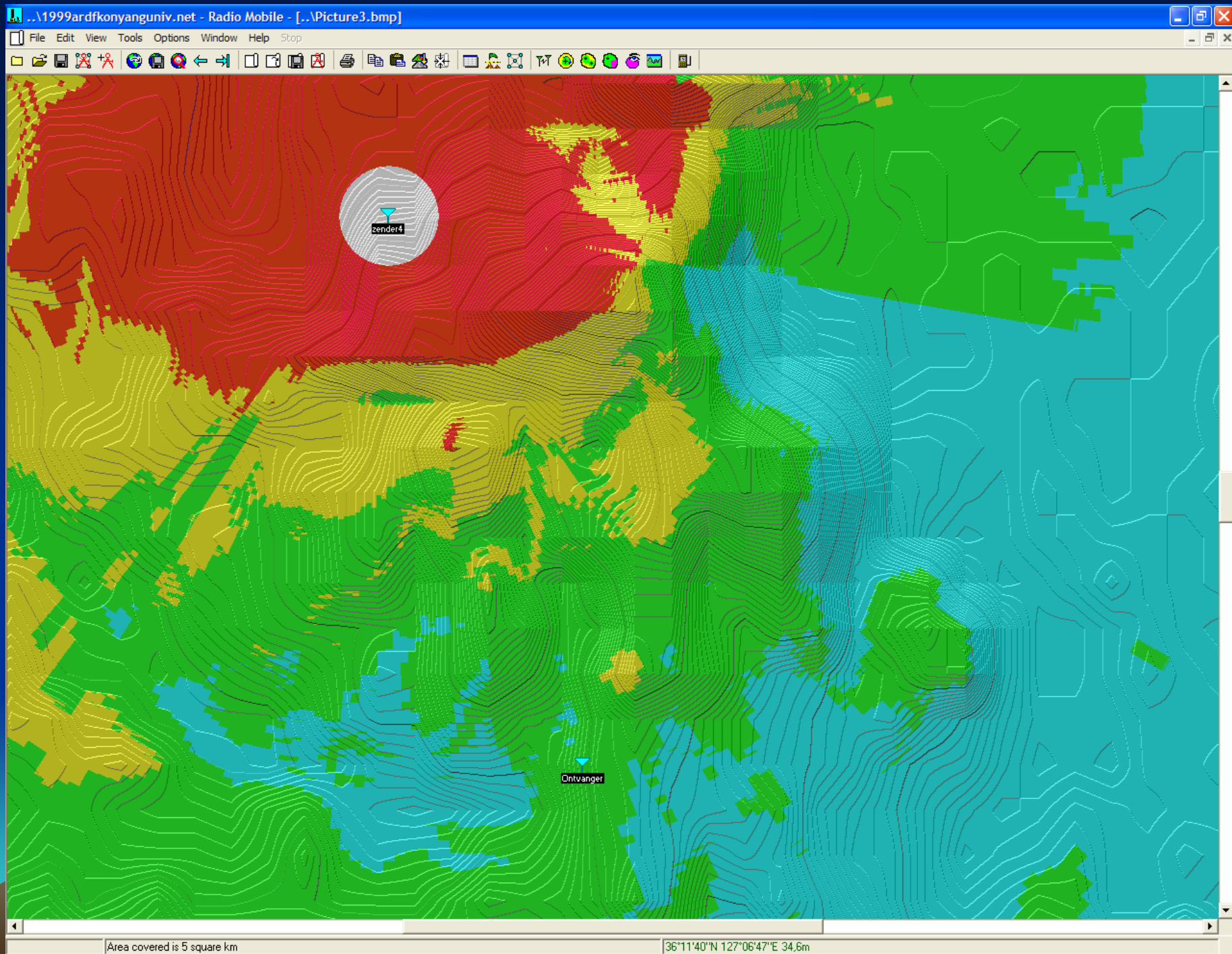
Nonsan 2m Competition area:

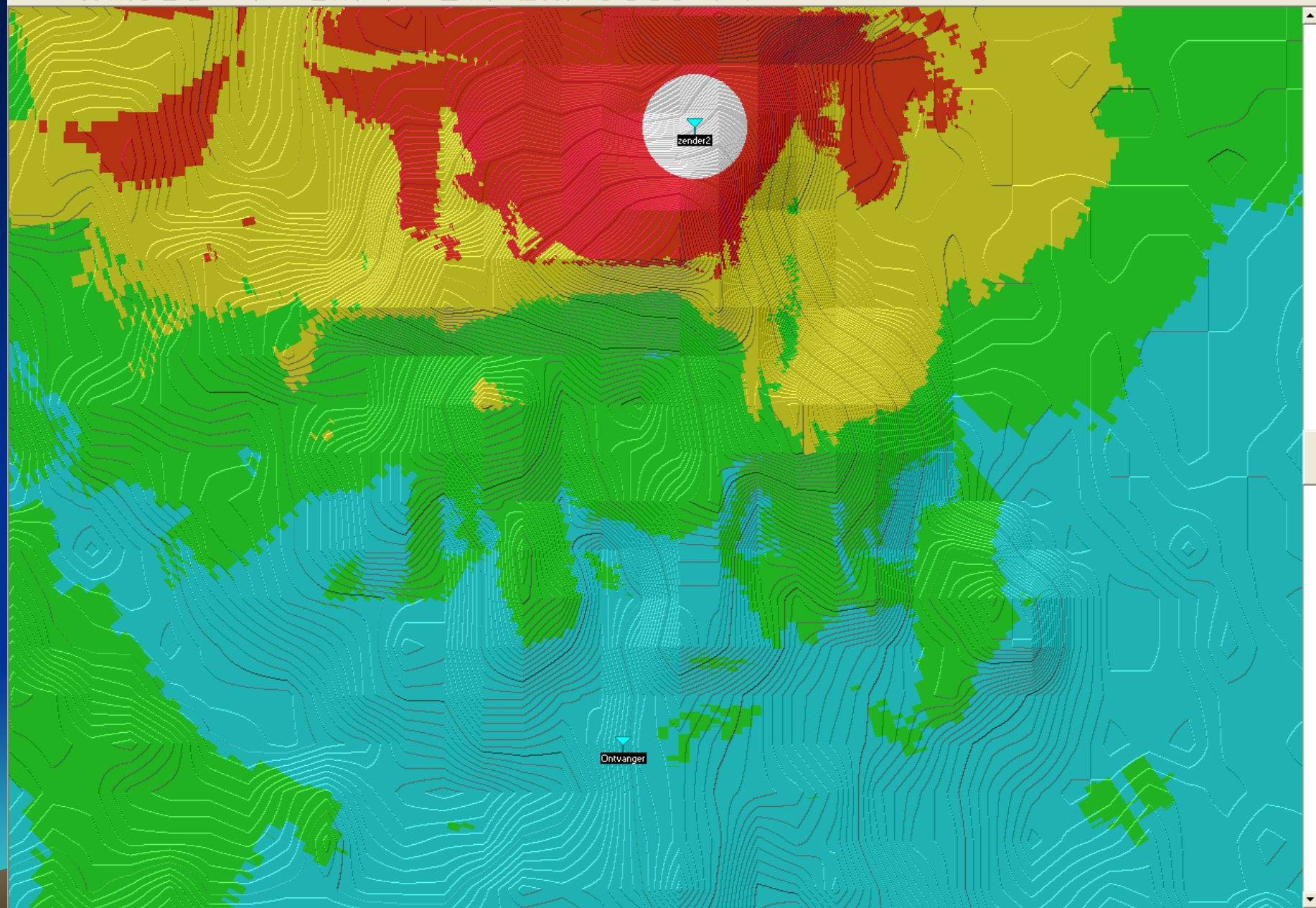


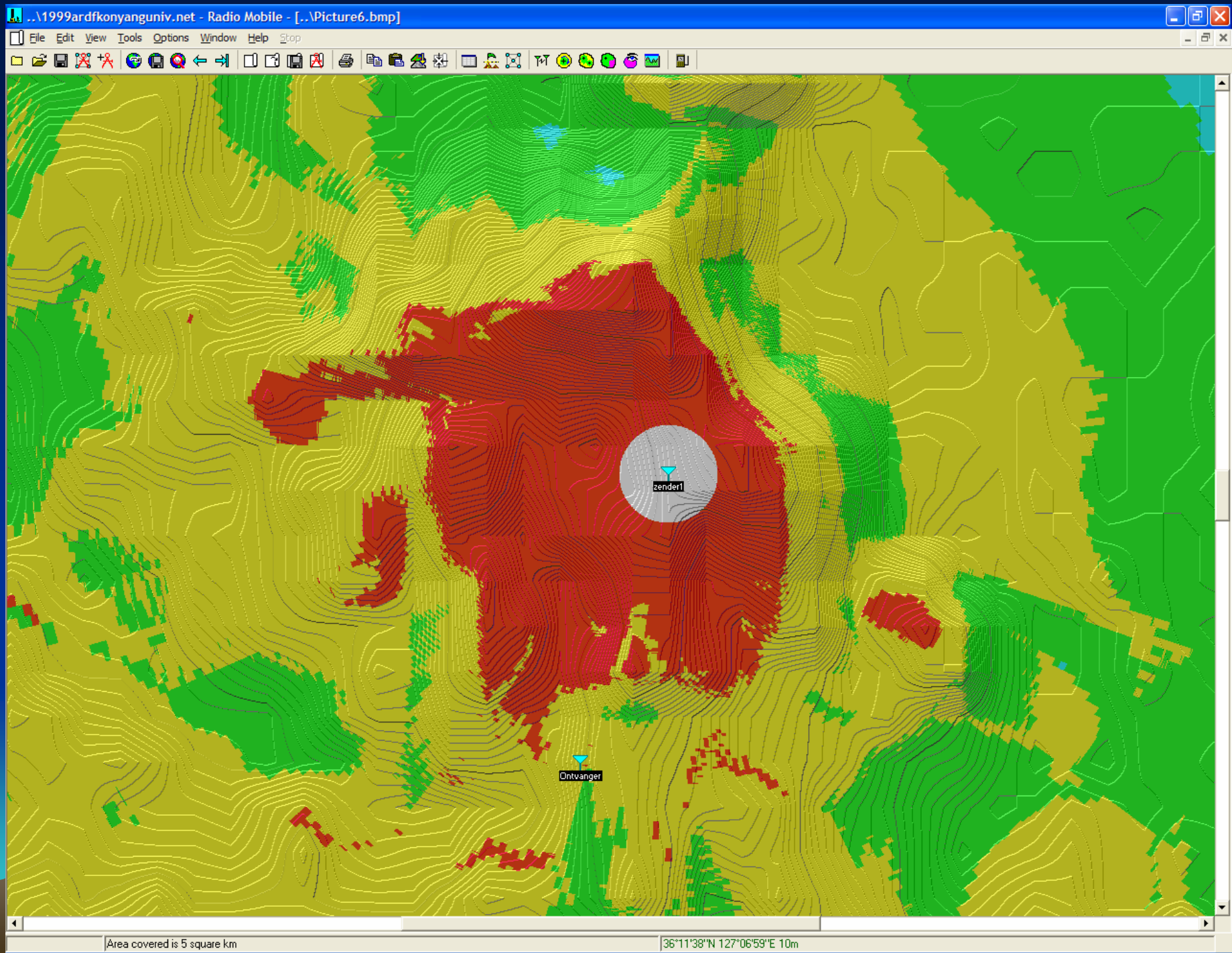












Summary.

- “Radio Mobile”
 - Free software.
 - User friendly.
 - Elevation and map information are downloadable from the internet.
- Simulation with “Radio Mobile”
 - Useful for ARDF trainings:
 - May give indication of reflections directions.
 - May show reflection areas.
 - Is suitable to do area investigation.



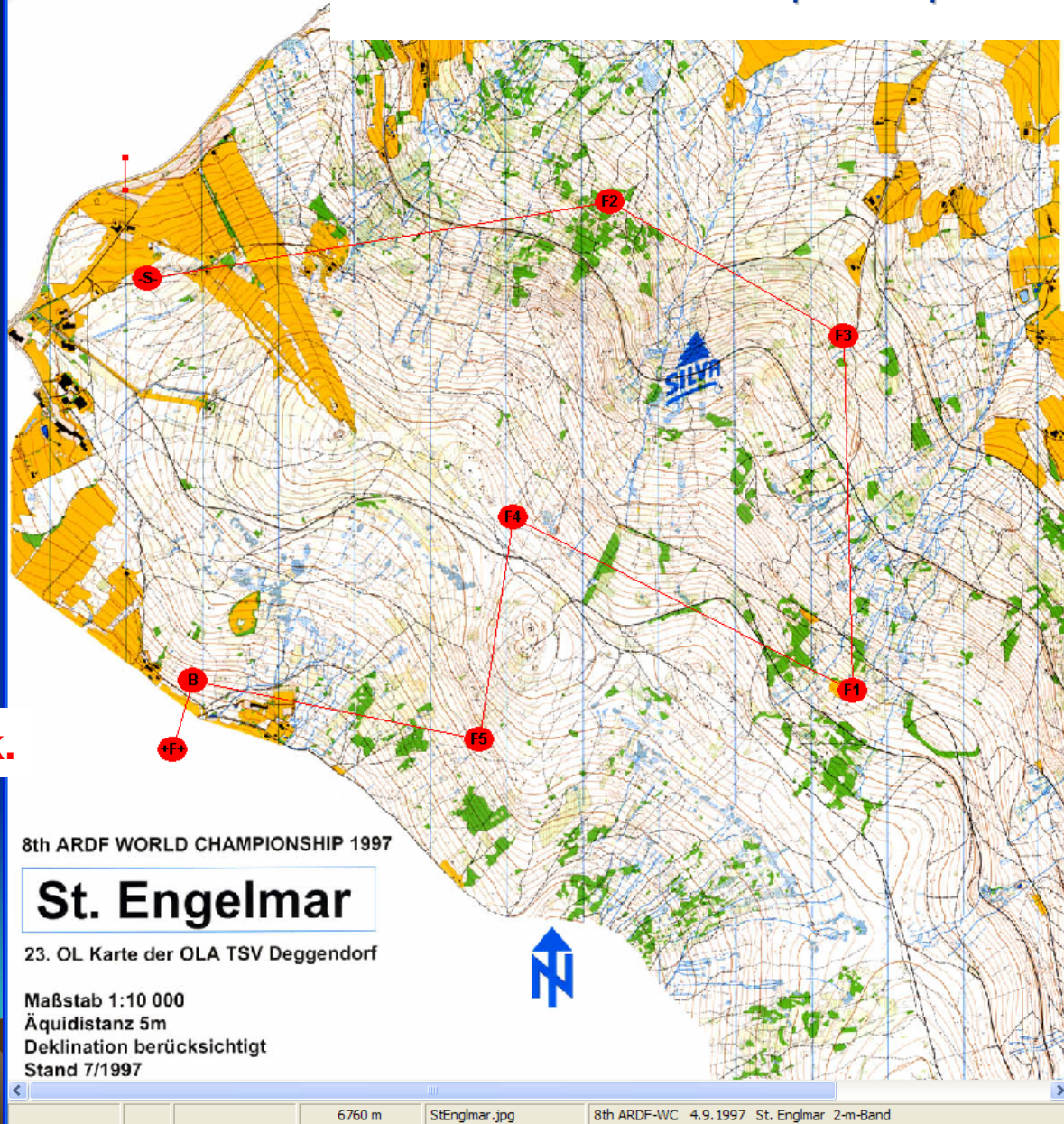
Kategorie: VET

Platz	Name, Vorname	DOK	Call	Laufzeit	Fox	StNo
1.	Nestorov, Anguel	BUL	LZ1AG	101:34	4	10
2.	Lange, Fritz	D	DF9ZY	111:18	4	30
3.	Brajovic, Branislav	YUG	YU6RB	116:52	4	95
4.	Tuttman, Josef	D	DL8YBL	128:21	4	35
5.	Uebel, Dieter	D	-	132:56	4	25
6.	Christensen, Arne	NOR	LA5OBA	80:17	3	110
7.	Maurerlechner, Florian	AUT	OE2MCL	124:00	3	65
8.	Deblie, Henri	BEL	ON7HD	107:22	2	5
9.	Bozinovic, Milan	HRV	9A3AT	124:42	2	55
10.	Nordwaeger, Pa	S	SM0BGU	130:25	2	85
11.	Cserhant, Jozsef	HNG	HA7PX	137:11	2	75
12.	Dapkus, Algimantas	LTU	-	115:58	1	115
aL.	Votinov, Volodymyr	UKR	-	140:48	3	15
aL.	Kirguetov, Vladimir	RUS	-	142:47	4	40
aL.	Holthe, Ole	NOR	-	-	-	-
aL.	Koudelka, Karel	CZE	OK1MAO	174:08	3	45
aL.	Razumov, Valeriy	UKR	-	176:22	2	20
aL.	Kuselj, Janez	SVN	S59D	178:47	2	80
aL.	Zetterval, Leif	S	SM5EZM	184:34	4	90
aL.	Farkas, Imre	HNG	HA8UC	222:53	1	70
-	Gruenbacher, Werner	AUT	OE6GWG	152:28	0	60
-	Veth, Nicolaas	HOL	PA0NHC	161:39	0	50
-	Babic, Veselin	YUG	YU6A	-	0	100

2m aan het werk.

FjwMap - WC1997-2m.map
File Edit View Extras Help

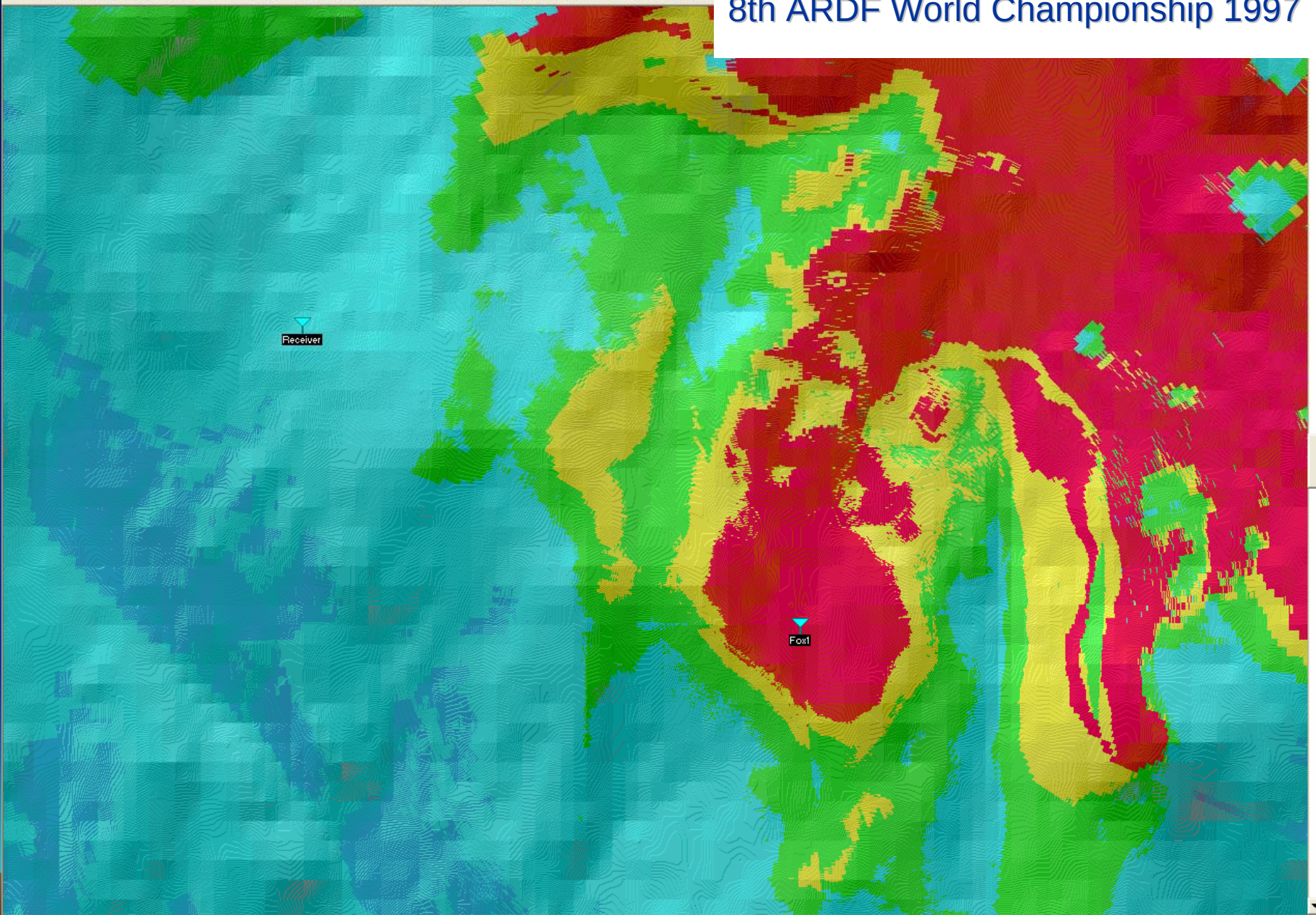
8th ARDF World Championship 1997



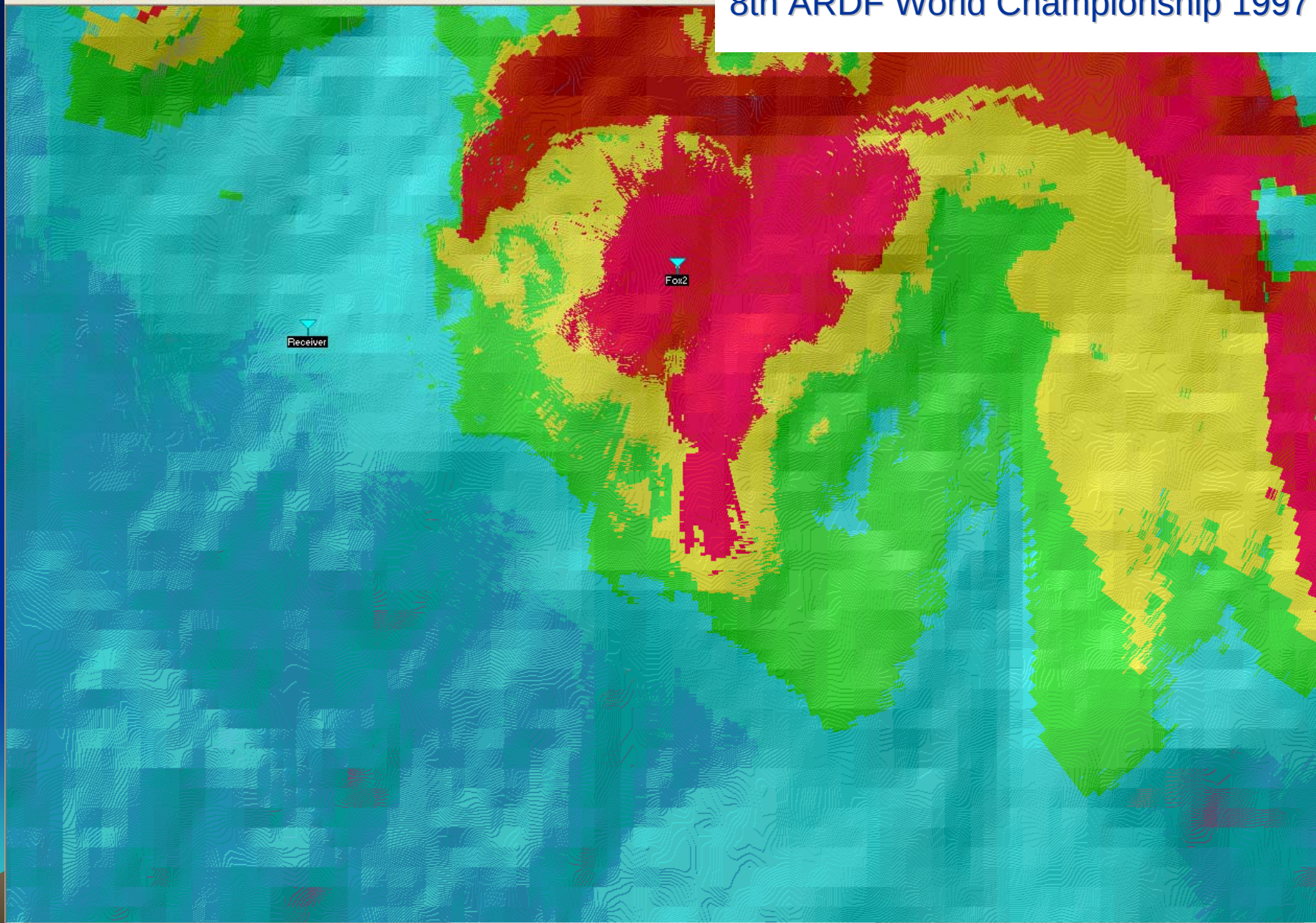
8th ARDF World Championship 1997

Receiver

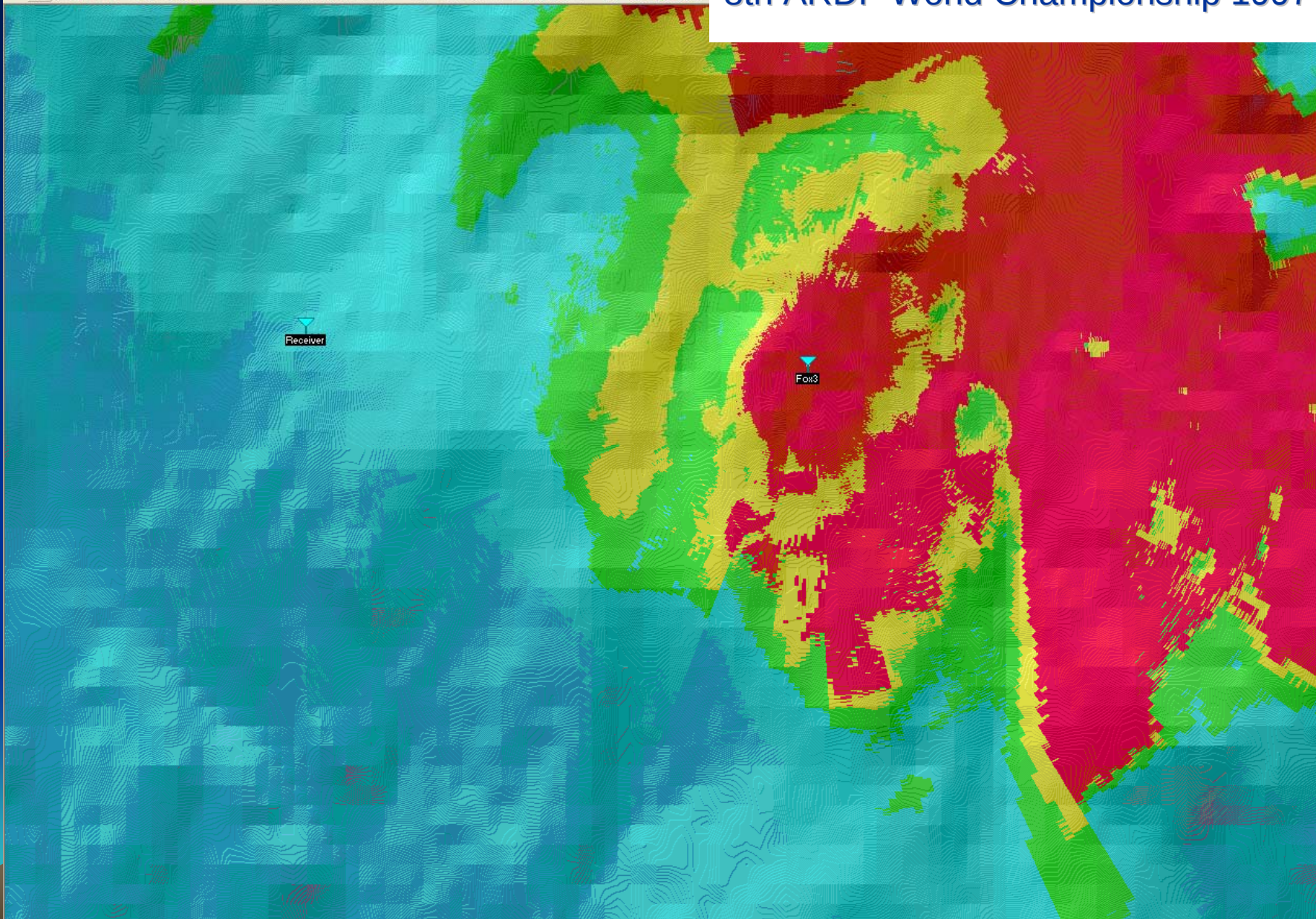
8th ARDF World Championship 1997



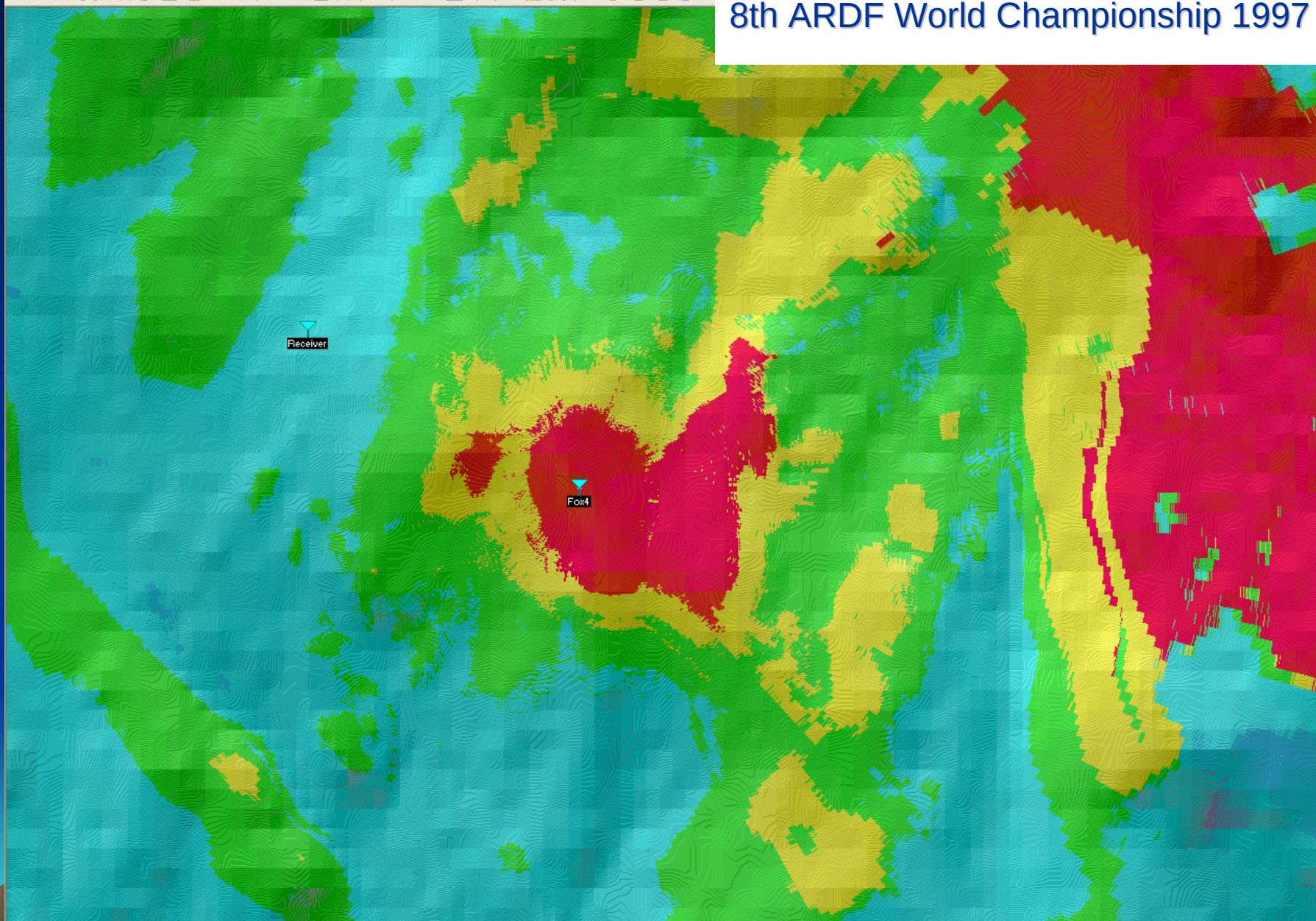
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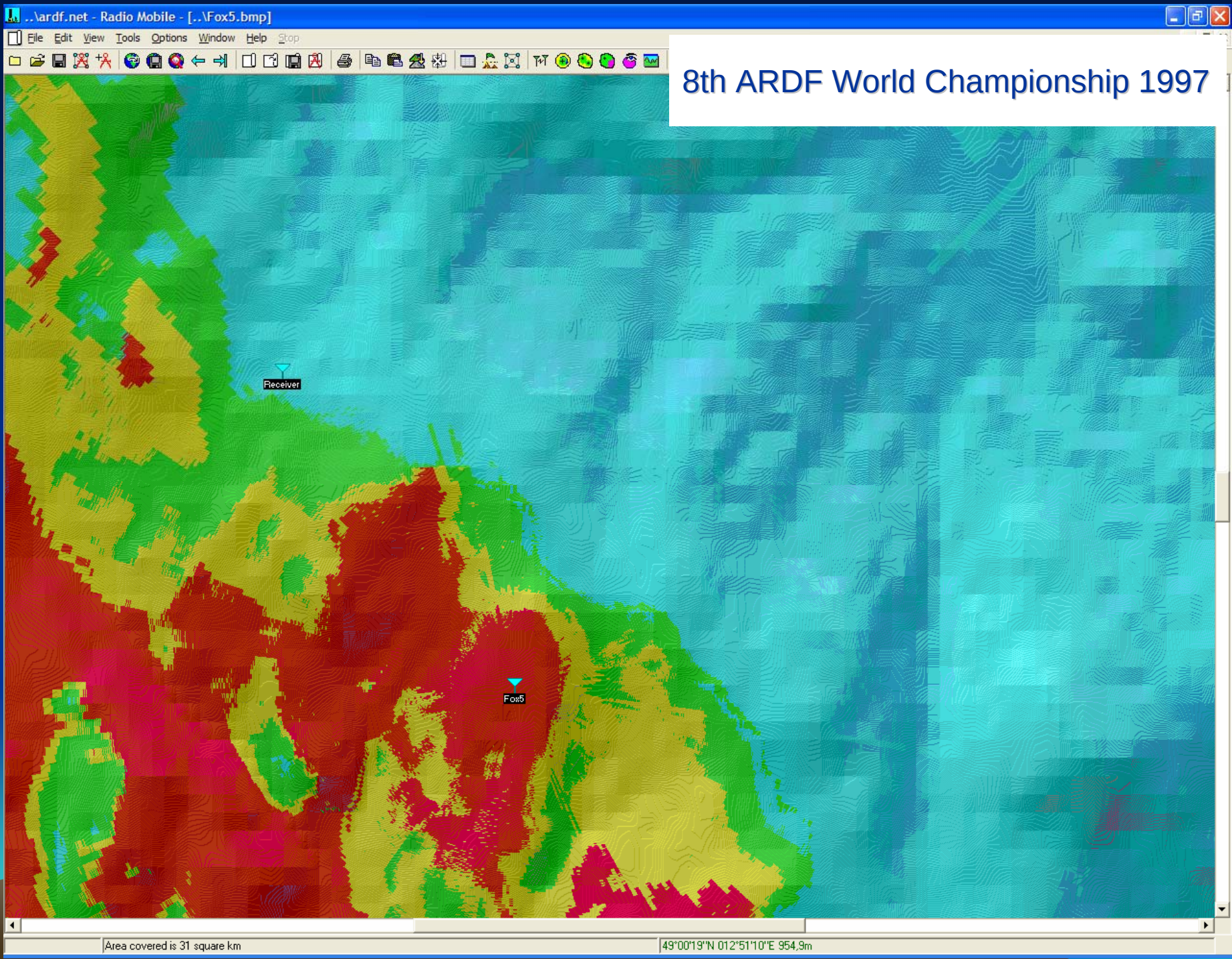


8th ARDF World Championship 1997



8th ARDF World Championship 1997





8th ARDF World Championship 1997

