

**RADIO X ARCALA**

**RADIO ARCALA, OH8X,  
FIRST BRANDED AMATEUR  
RADIO STATION**

**OH2MM & OH6KN, Friedricshaven 2009**





# LIFE IS DIFFERENT WAY UP NORTH

Life is more challenging in the Arctic North. The region's deep seasonality and its varied, beautiful landscape help create an extreme, innovative milieu – the Arcalians capitalize on this dimension. Anything they do or experience is challenged by Mother Nature, with chilly temperatures and frozen lakes, with dazzling Aurora Borealis and seemingly empty, barren tundra – they build on these Arctic elements. They raise the antennas where they were born, in the land they love.



## LUMBERJACKS WERE THE BRAVE MEN OF YESTERYEAR - NOWADAYS IT'S ICE HAMMERERS WHO COUNT

The Radio Arcala towers reach the height of 100 meters or more than 300 feet. The higher you go, the more ice formation you have. The tower section gets iced all over but the beams are built to carry an ice load several times their own weight.

After trying just about everything, it turned out that the simpler the method, the better the result. Each larger element has its own hammer reachable from the ground. With less job opportunities in a remote place, the folks of Arcala Village are employed by Radio Arcala as ice hammerers.

Faithfully they arrive at the site every frosty morning to pull those ropes. With 49 beams up, it takes all their few daylight hours as they have 219 elements to go.

Along with achieving the impossible in the most demanding of situations, their experience of life can be uniquely educational and interesting. Make no mistake: their efforts need to be harder than elsewhere – true innovation is essential. They have decided to perform the miracle of North and South swapping places by scoring Southern results here in the Deep North, with a smile.

Life is different in these parts.



# OH8X STATION IN A NUTSHELL

- Building the station began 2003
- Arcala Xtremes concept was launched 2007
- Target is to build state-of-the-art SO2R station
- A lot of diversity in antennas
- Touchscreen based station automation system
- Integrated with microHam station automation



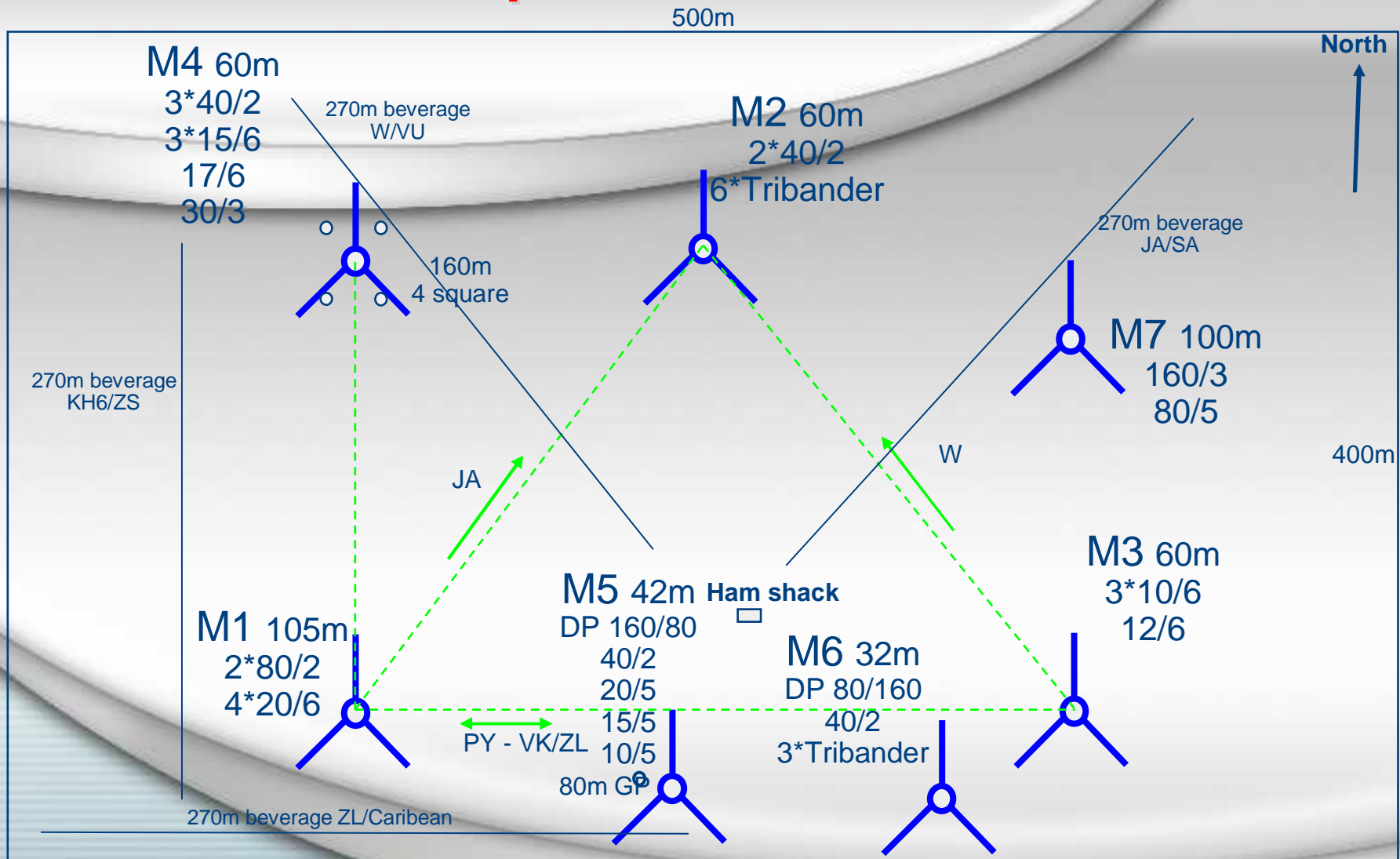
# OH8X STATION IN NUMBERS

- Arcala estate 20ha / 45 acres
  - located on the 65<sup>th</sup> latitude (200km fm Arctic circle)
- Station consists of seven towers
- Towers hold altogether 36 yagis (206 elem.)
- RF-matrix in the schack has 96 coaxials cables
  - full symmetry for A/B radios



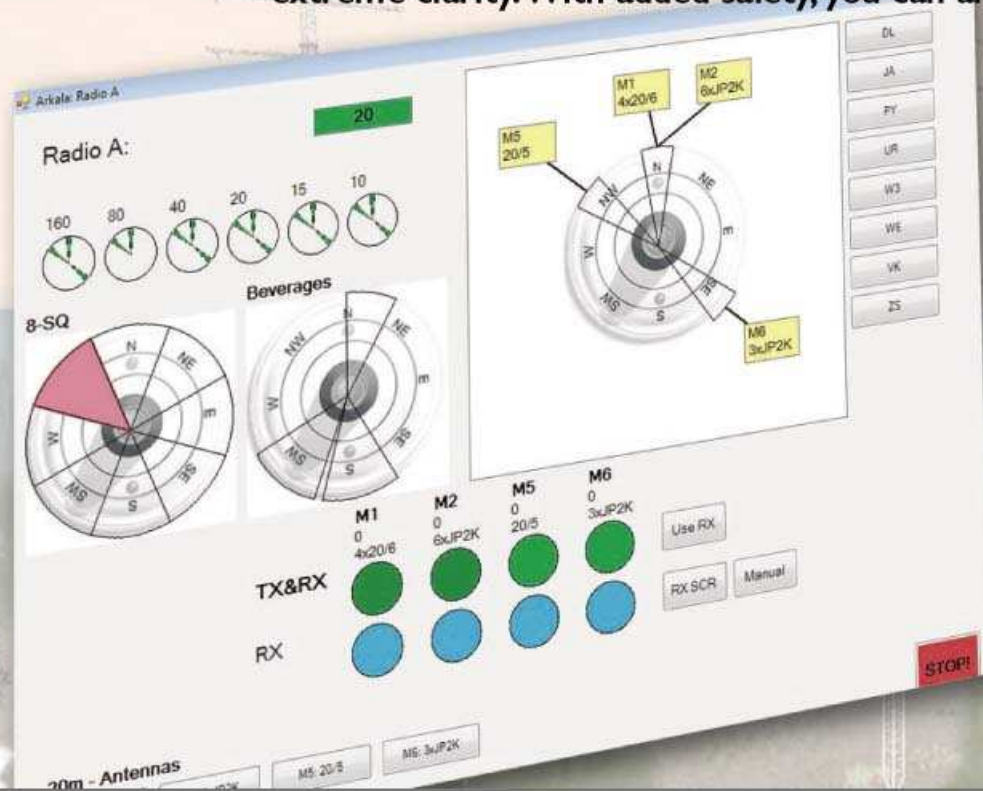


# Arcala Map



# SITTING DOWN IN A HI-TECH COCKPIT

Commanding a complex SO2R Space Shuttle assumes skilled pilots for safe landing and hitting the target. Experts of the Arcala engineering team have created an ultimate cockpit with maximum comfort and ultimate driving pleasure. During a long operating stint, every needed feature is highlighted and brought to the operator with extreme clarity. With added safety, you can always bring the mission home safely.



The cockpit incorporates three supporting touch screens for displaying and controlling the overall situation plus two bands in operation at any given time. Default layouts follow the propagation patterns and allow quick multiplier moves by touching a screen with supporting layout. The Radio Arcala backrooms are designed with plug-and-play modularity.

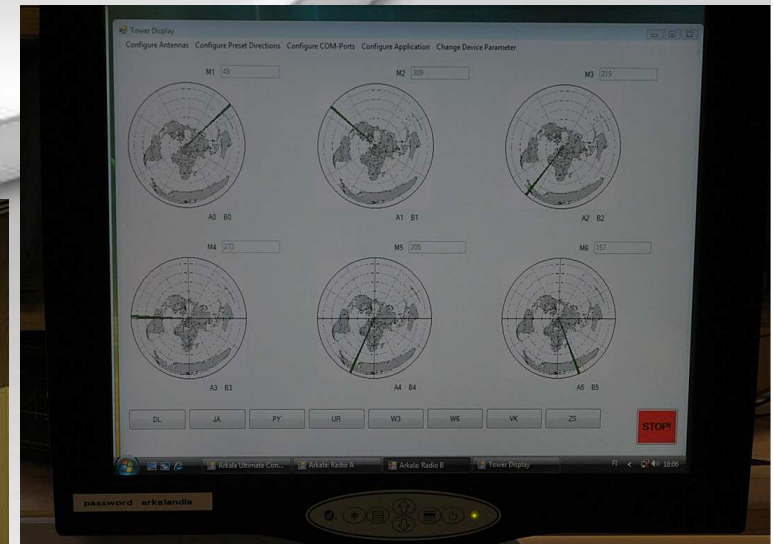




# Station Cockpit



Arkala Cockpit with touch screen  
station control

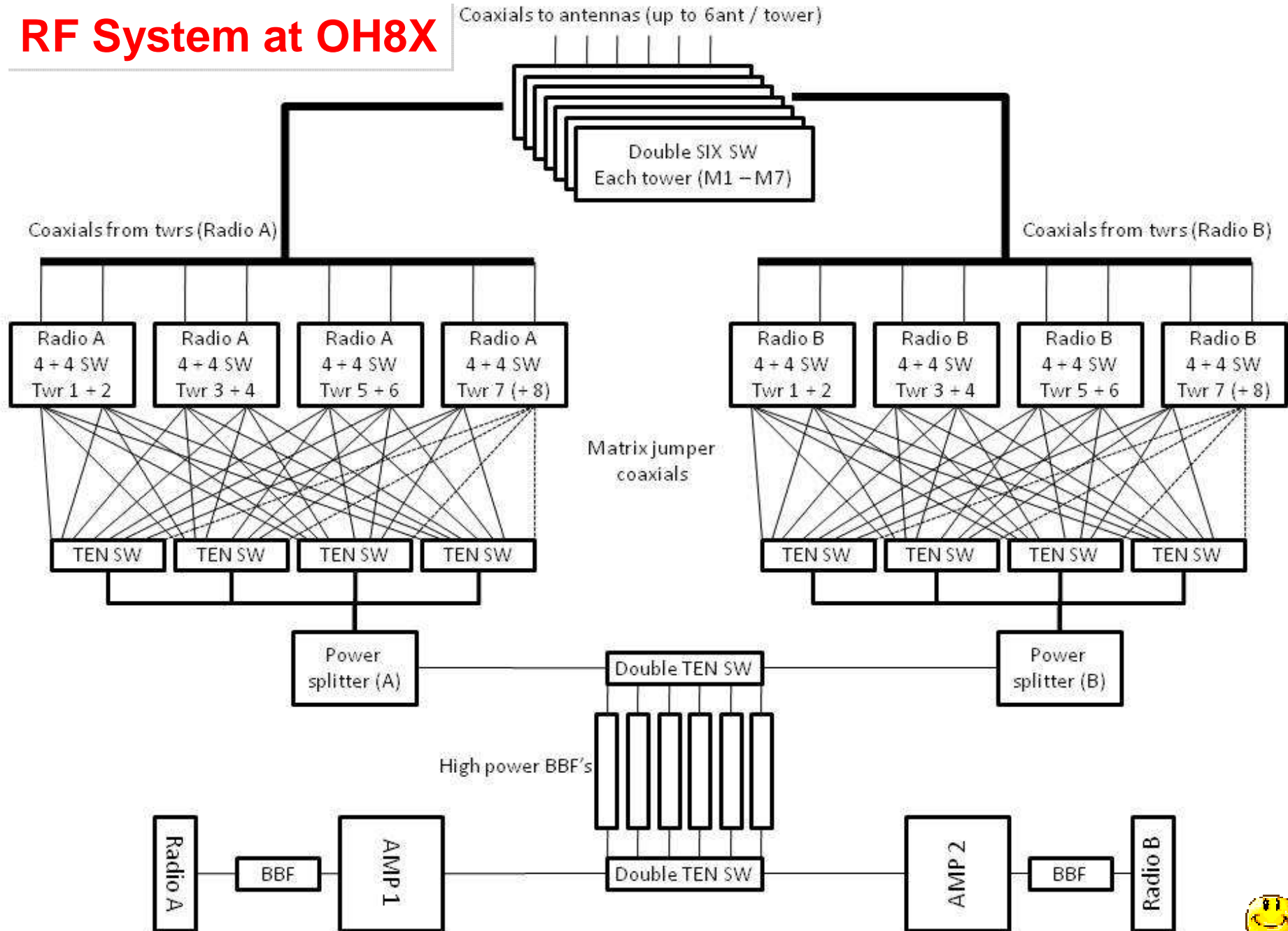


Tower Control

Antenna Control



# RF System at OH8X





# OH8X Tower Tour

## Tower M1



- 105 meter rotatable tower
- 1m aside, 13000kg
- 20m: 4\*6 el
- 80m yagis at 50m and 93m



Rotator by OH6RM enterprises



# OH8X Tower Tour

**M2**  
60m  
6xTrib  
2x40/2



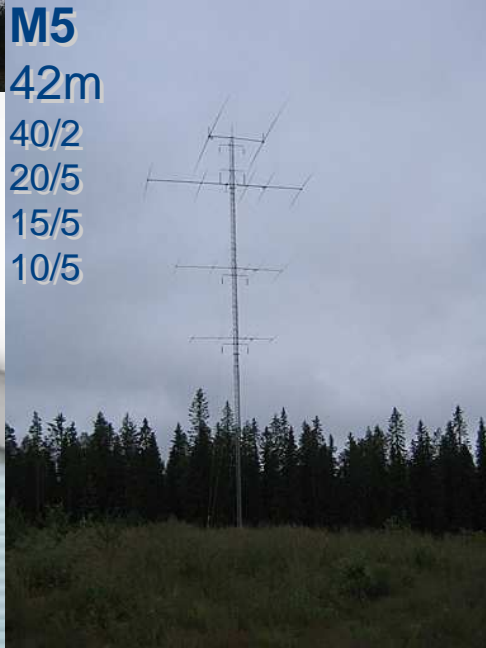
**M3**  
60m  
3x10/6



**M4**  
60m  
3x40/2  
3x15/6



**M5**  
42m  
40/2  
20/5  
15/5  
10/5



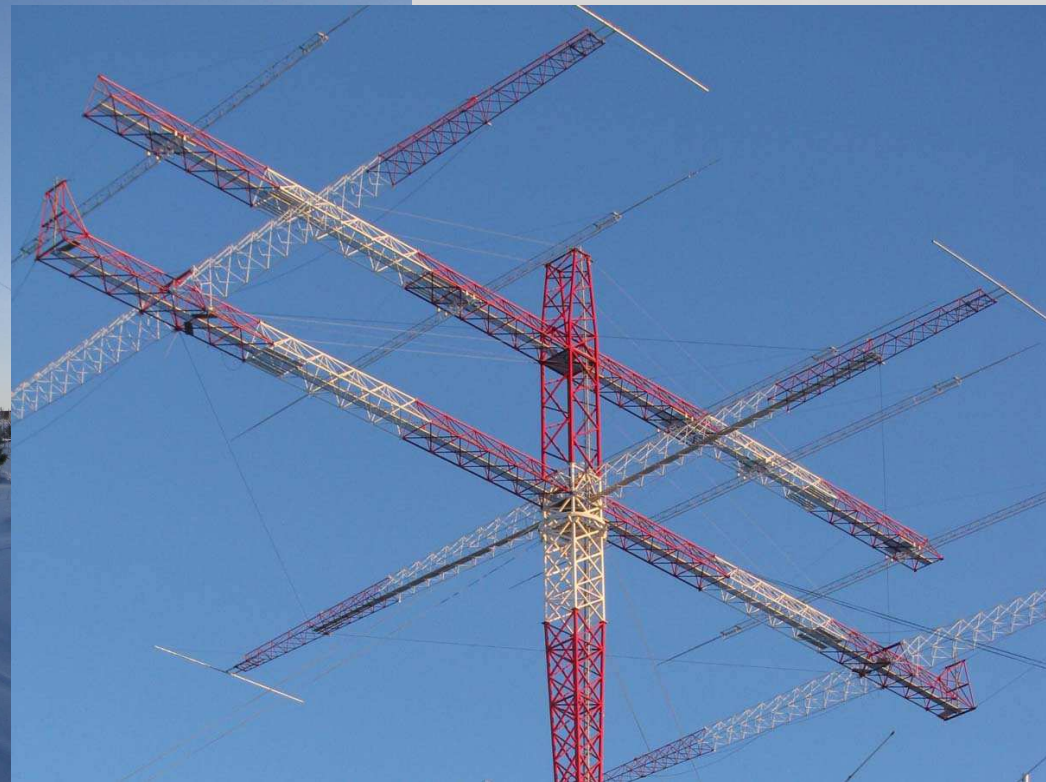
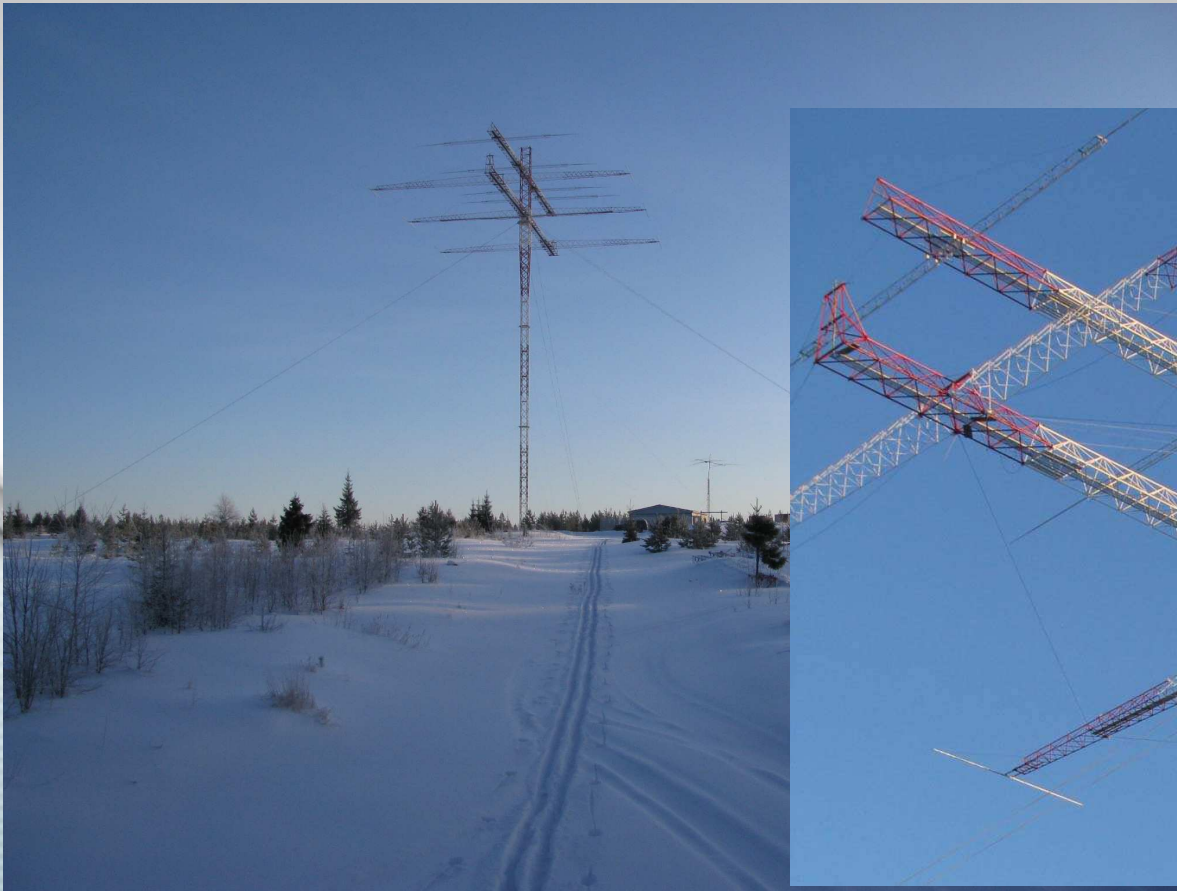
**M6**  
42m  
40/2  
3xTrib





# Tower M7, the Monster

- M7: 100 meters (330ft) high rotatable tower
  - 160M 3el yagi and 80M 5 el yagi



# M7 the Monster

## Height and weight of the system

- Tower height 100 m (330 ft)
- 80 m beam at 90 m (300 ft)
- 160 m beam at 80 m (270 ft)
- Total weight 39 600 kg (80 000 lbs)

## 160m yagi

- 3 elements, 59m long + 12m capacitive hat
- 1600kg weight

## 80m yagi

- 5 elements, 43-46m long

## Booms

- 71m, 2.2m aside, walkway inside

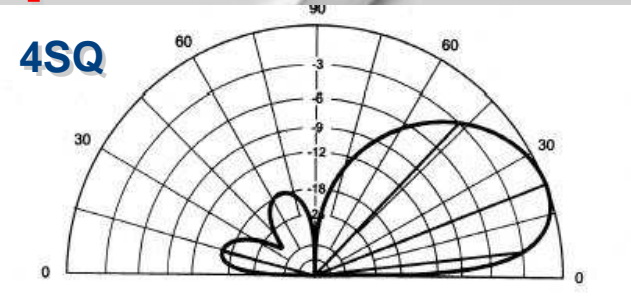
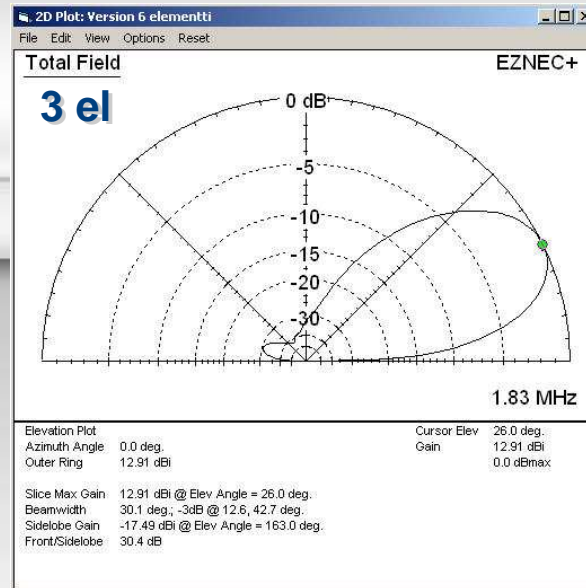




# How does the Monster compare ?

## 160m 3 el vs. Full size 4SQ

- All elements mechanically equal, tuning done by matching
- Two segments: 1830/1860 kHz
- Instant 180° direction switching



**4.8.2.1. Data, optimized 8-direction Four-Square**

Side of square:  $\lambda/4$

Feed currents:  $I_4 = I_3 = 1 \angle -105^\circ$  A (front)

$I_1 = I_2 = 1 \angle 0^\circ$  A (back)

Gain: 5.92 dBi (optimized regular Four-Square configuration: **7.25 dBi**)

3-dB beamwidth: 113°

RDF = 9.72 dB

DMF = 16.5 dB

Feed-point impedances:

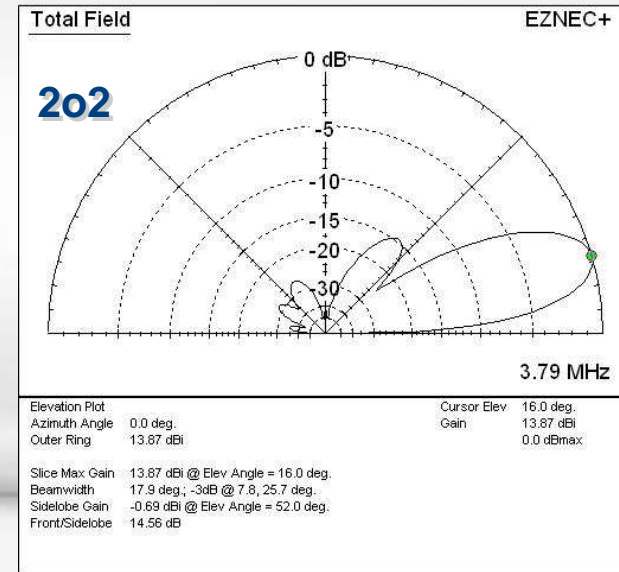
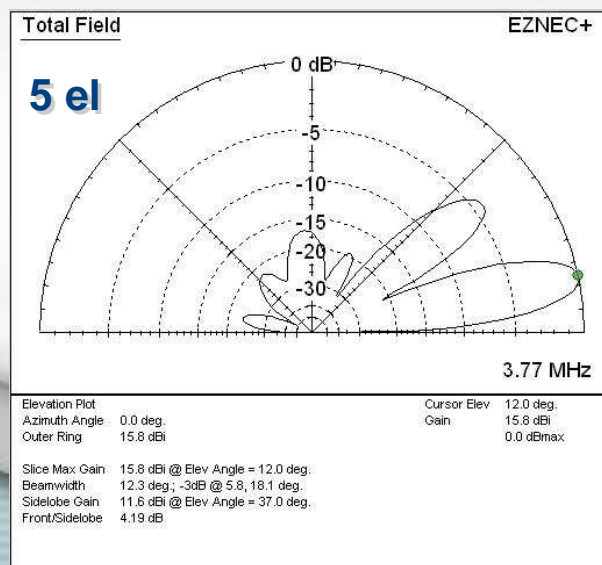
$Z_4 = Z_3 = 81.8 + j 15 \Omega$  (front)

$Z_1 = Z_2 = 13.2 - j 26.3 \Omega$  (back)

Source: ON4UN LB DXing

## 80m 5 el vs. 2 over 2 yagis

- Two segments: CW/SSB
- In practice the F/B of 2el is worse than in the simulations



# More on M7

Construction started in October with short days and winter looming



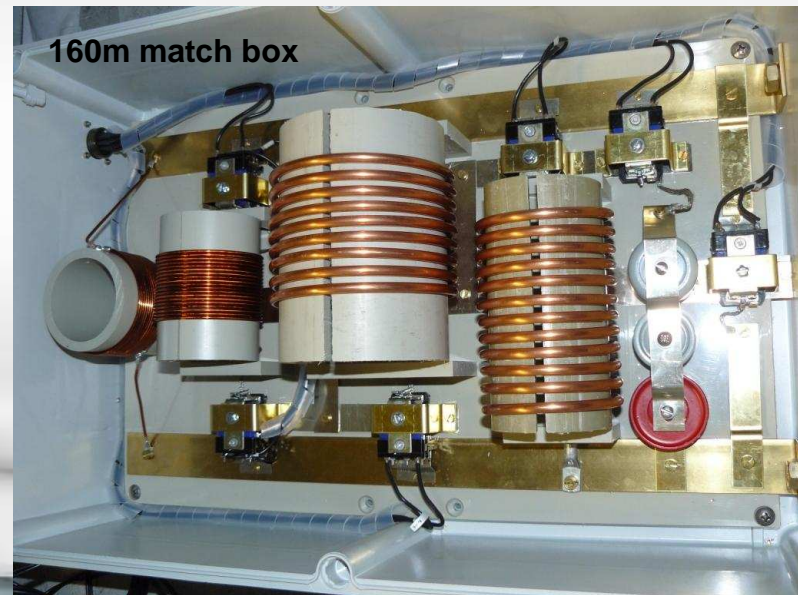
January Moon



OH8SR, Markku at -15C at 80m



160m match box





# M7 Learnings

- Careful electrical simulations
- Careful verification with real element
- Professional mechanical design, simulations
- Ultimate preciseness: 160m element to 1 cm accuracy
- Thick lattice structures are capacitive regardless of the length, you need to compensate with coil.
- Strongly tapered element doesn't behave linearly, the end structures have overly strong impact, including eg. truss attachments
- Capacitive hat is beneficial for 3 element yagi
- Complex mechanical and electrical project





Thank You

