



**FROM DEPTHS TO SPACE**

# **Future Trends in Radar Monitoring**

ICT EnvSafSec in the Baltic Sea, 12.4.2010, Pekka Sjöman

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# Future trends in radar monitoring

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Baltic Sea Conference, 12.4.2010, Pekka Sjöman

# Company and History

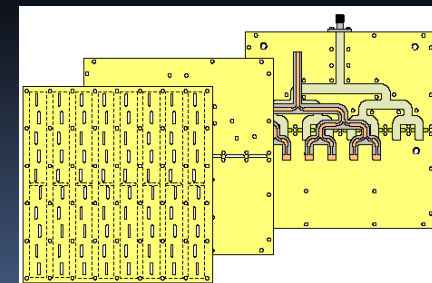
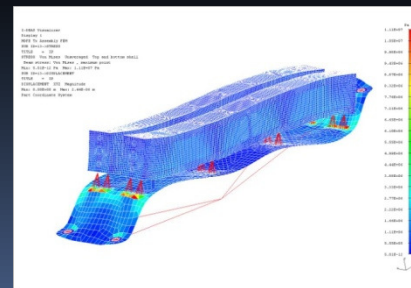
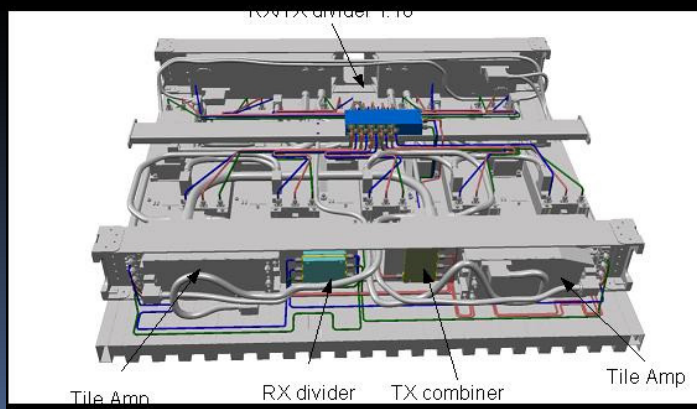


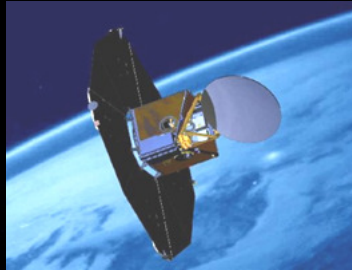
- Founded 1995,  
History from 1972
- > 80 employees
- Locations:  
Jokioinen and  
Tampere

# Knowledge



**RF and Microwaves  
Electronics and Software  
Electromechanics  
Real time algorithms  
Fast data communications**





**Space:**



# References

**Sentinell 1 SAR**

**Planck 70 GHz radiometers**

**SMOS satellite calibration system**

**Odin 119 GHz radiometer**

**Huygens 15 GHz altimeter radar**

**Terrasar, Tandem-X and PAZ**



# References



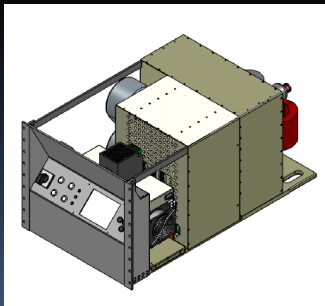
**Commercial:**

**High power (1.5 MW) pulse  
modulators**

**Surveillance radars**

**Muzzle velocity radar**

**Atmospheric radiometer**



# History in Oil Spill Detection



- Oil Spill Radar in 1986, study of oil behavior at sea surface
- Oil measurement radiometer 1990, study of oil slick thickness measurement with radiometer

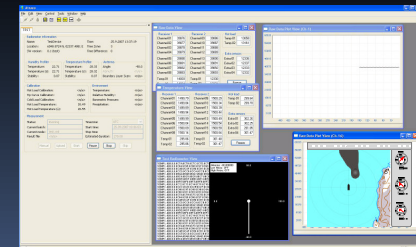


# Oil Spill Detection System OSDS



- Based on data fusion of dual polarization X-band radar and radiometers

- Oil spill detection
- Detect oil and organic mass (alga)
- Measure the oil thickness 0,05 – 4 mm with accuracy of 0,05m
- Operation range 5 nm
- Operation in all weather conditions
- Use in rescue operations: locate objects and measure temperatures





# Dual Polarization Radar



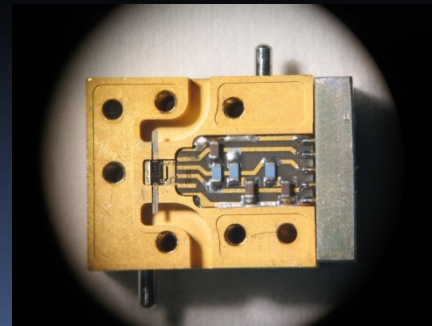
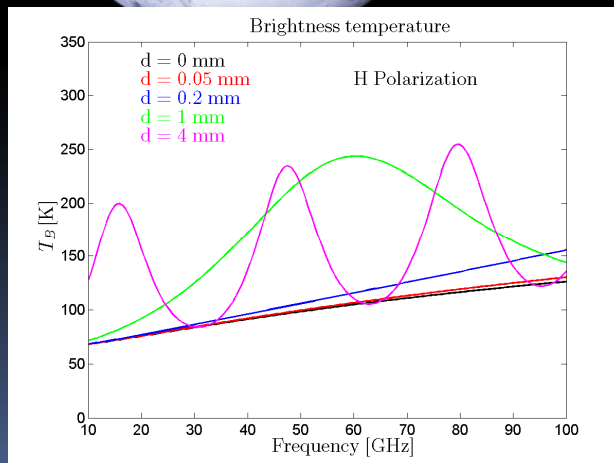
- Estimation of oil thickness from polarizations
- Estimation of reflected material ->algae and oil can be separated
- Measured water/wave speeds -> more accurate oil spill forecast can be made
- Separation between heavy and light fuel oils
- Can be used as weather radar



# Dual Band Radiometers



- Oil thickness related to the microwave emissivity
  - Very low noise and high stability radiometers needed
  - Technology developed in ESA projects
- Higher frequency -> higher resolution -> shorter operation range



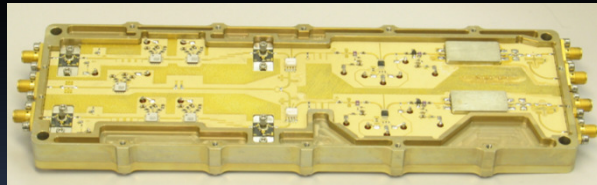
# Data Fusion with VTS System



- OSDS can be one sensor of Navielektro VTS-System
- Navielektro oil spill forecast algorithms can be used
- Oil detection algorithms from DAD can be used in Navielektro surveillance radars
- Critical areas can be monitored 24/7
- Data can be send from vessels to VTS



# Future radar projects

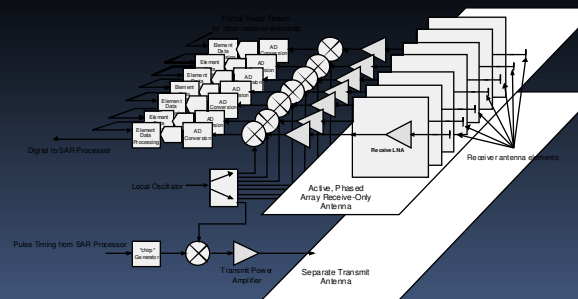
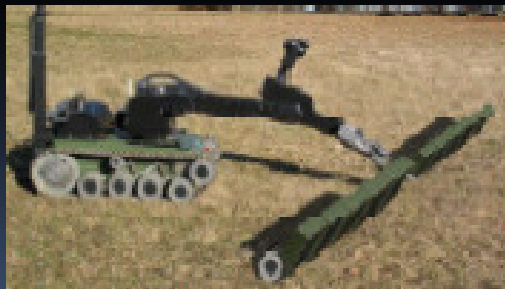


- Data fusion of multiple radars and radiometers
  - >Multistatic and passive radars
- Electronic steerable (180°) antenna
  - > no need for 3D mechanical steering
- Solid state wideband radar
  - >no need for magnetrons and klystrons
- Digital coding will be used -> Very High Resolution Radars
- Oil spill detection accuracy ~4 times better

# Future projects



- 3D Ground penetration radar
  - Near field SAR
  - Can also be used as high resolution 3D bottom radar
- Integrated SAR receiver (8x8mm)
  - > next generation SARs will be about 1/10 size compared to present ones



# Future Trends?



SKY IS NOT THE LIMIT

- Data fusions (Multiuse sensors)
- Low power transmitters (Solid State)
- Wide bandwidth (High resolution)
- High integration level
  
- Based on demand
- Research funding is needed for innovations

# Thank You



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