Improving meteorological services TOGETHER

Meteorological RFI Issues

The EU perspective

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EUMETNET

What is EUMETNET

EUMETNET MEMBERS:

COOPERATING MEMBERS:

STRATEGIC EUROPEAN AND GLOBAL PARTNERS:

A collaboration between European National Meteorological Services

....

On:

- Observations
- Forecasting
- Climate
- Aviation services

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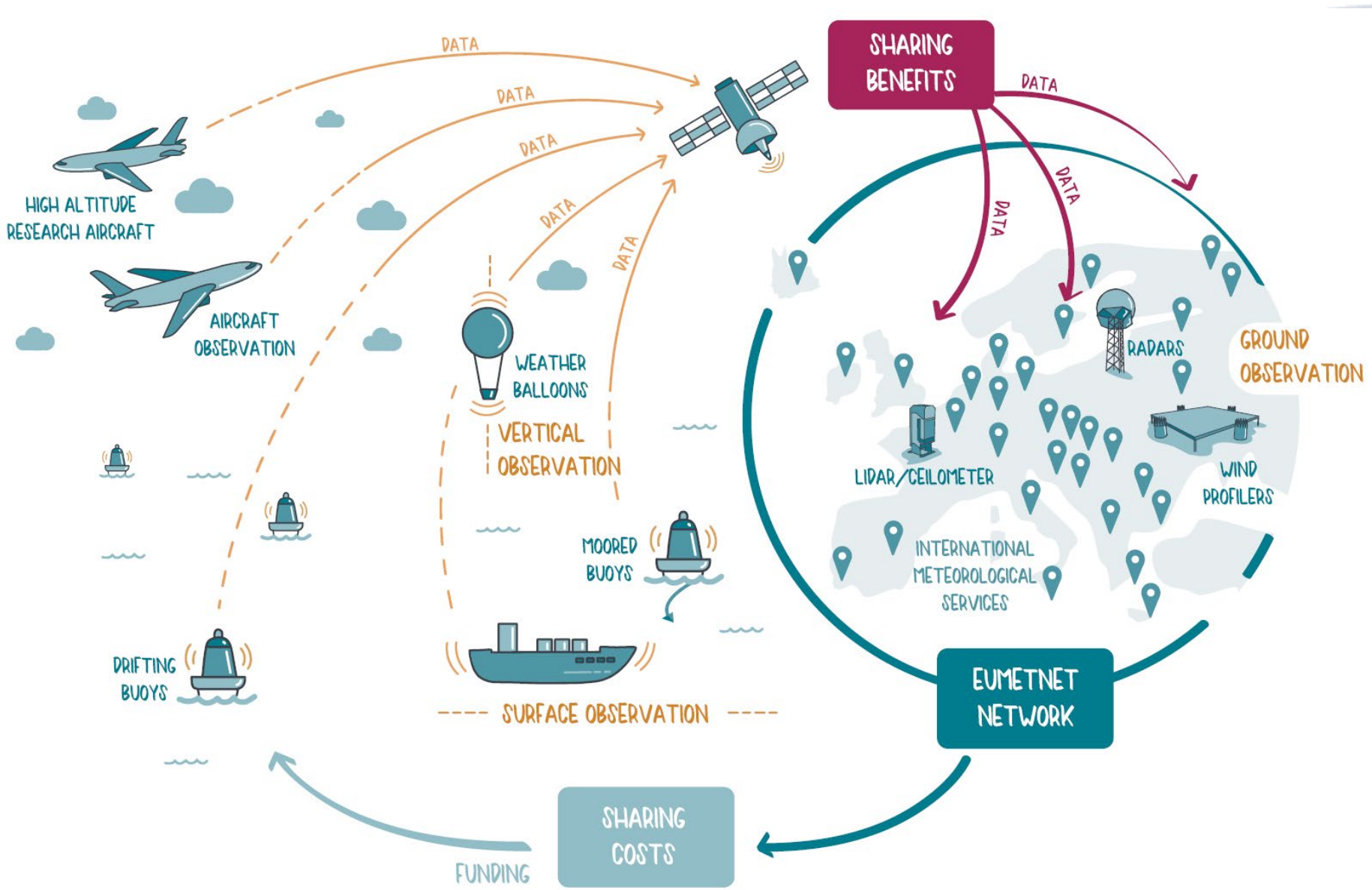
What does EUMETNET do?



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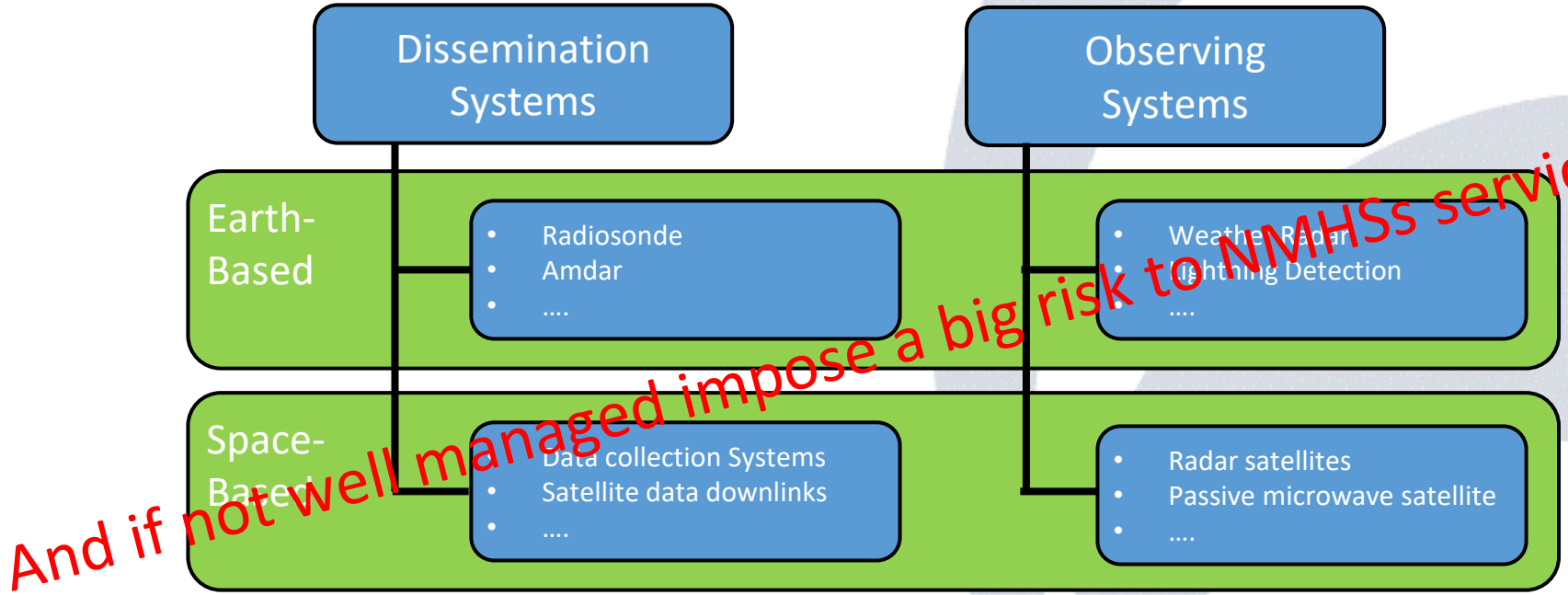
…. is about radio frequency coordination for meteorological services within Europe

Why do NMHSs care?

…. Because radio spectrum touches virtually all aspects of their business



And if not well managed impose a big risk to NMHSs services

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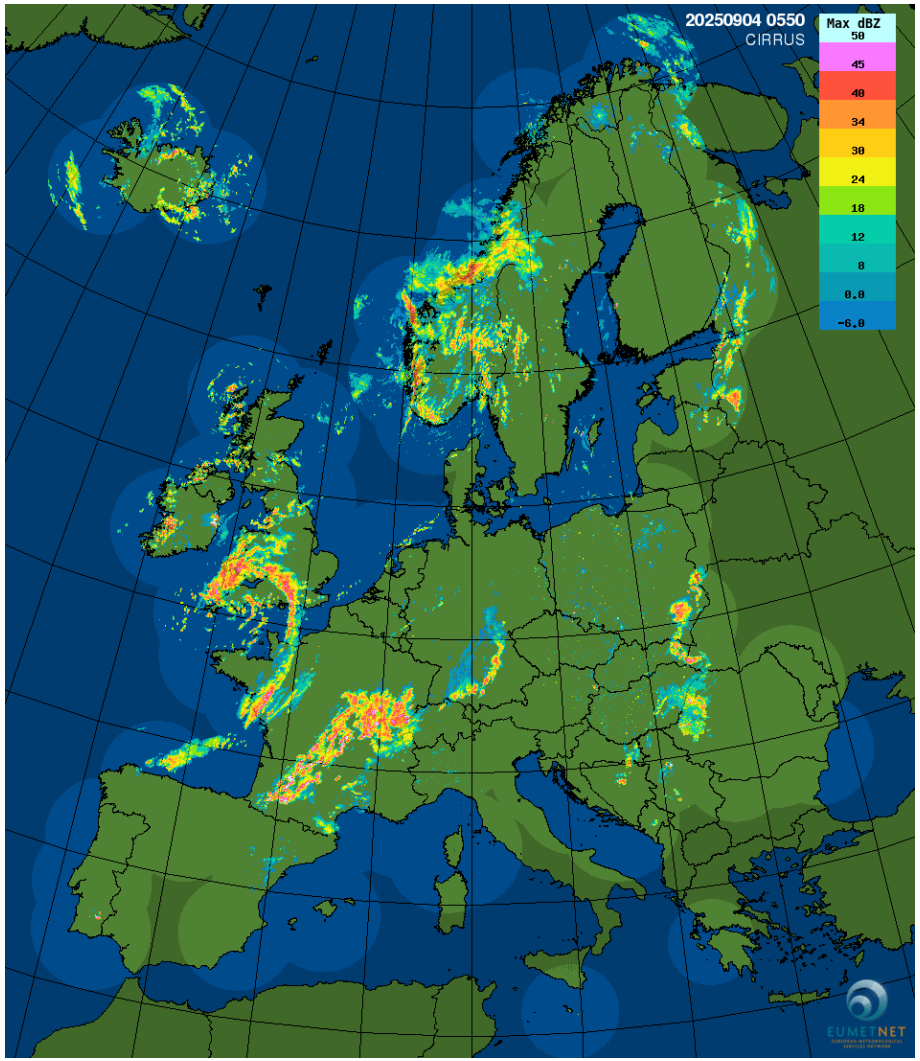
European network of precipetation radars



- 152 radars from 24 countries operational in composites
- Most of them deployed in the C band (5600 – 5650 Mhz)
- The most important tool for detecting extreme weather

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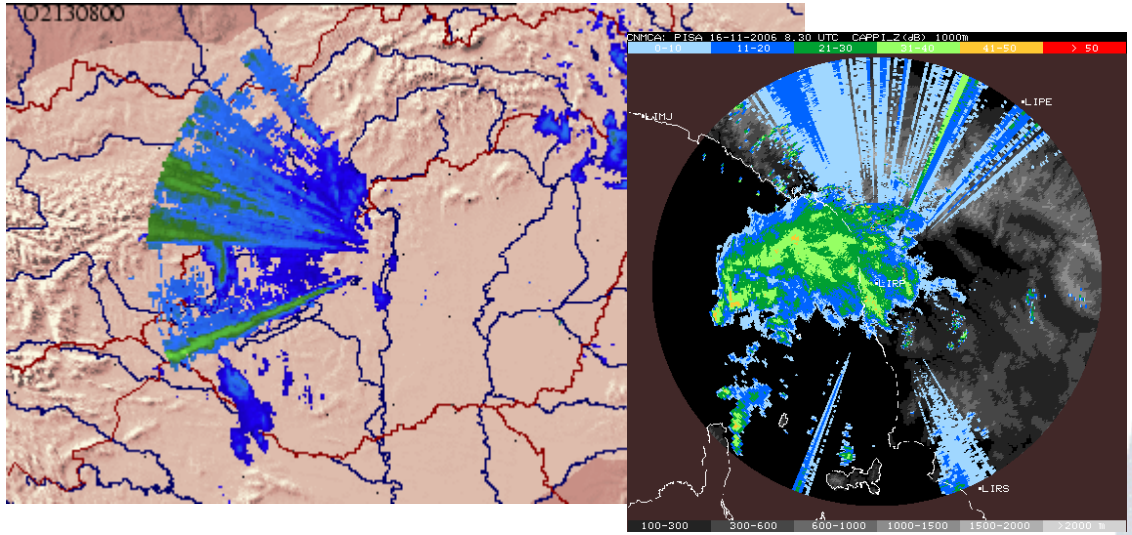
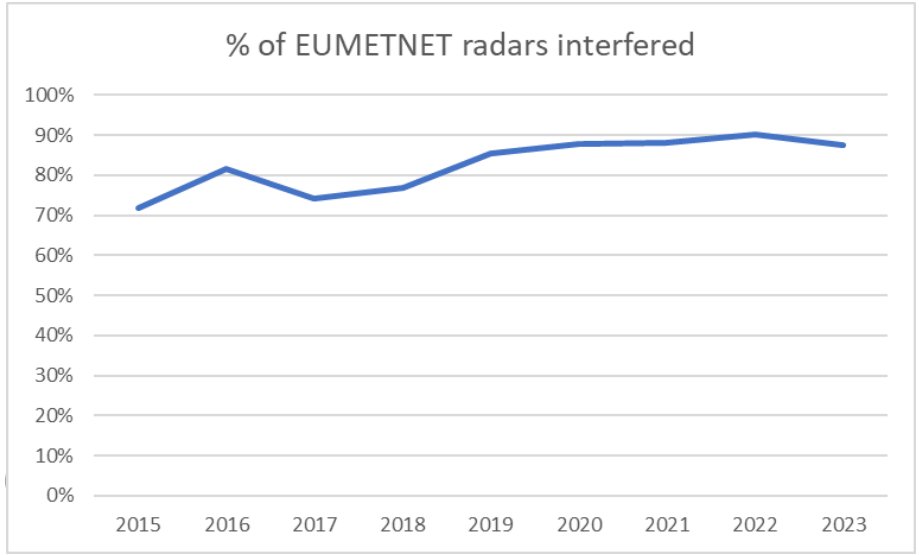
RFI situation since WRC-03 (2003)





WRC-03: Authorise WAS/RLAN in the 5150-5350 MHz and the 5470-5725 MHz band as a secundary user

Requirement for implementing a DFS to detect and avoid radar frequencies

DFS was not sufficiently adressing the specificities of weather radars

First interference in 2006, mainly in eastern countries

Now all EU members are effected

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RFI situation since WRC-03 (2003)

What went wrong:

The DFS was not sufficiently adressing the specifities of precipitation radars:

- Volume scanning repeating strategy (typically 10 to 15 min)
- operational elevation ranging from 0° to 90°
- Pulse width ranging from 0.5 to 2.5 µs (for operational radars)
- Pulse repetition Frequency (PRF) ranging from 250 to 1200 Hz (for operational radars)
- Fixed, staggered, interleaved PRF
- Rotation speed ranging from 1 to 6 rpm
- DFS could be switched off

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Modification of DFS specifications in 2008

- **The ETSI standard EN 301 893 was then modified to include new DFS specifications**

	INITIAL	NEW	
	All Channels	**5600-5650 MHz**	Other channels
Minimum pulse width (see detailed test signals in Recommendation)	1 µs	0.8 µs	
PRF (with detailed random test signals)	Fixed	Fixed, Staggered and Interleaved	
Channel Availability Check (CAC) time	1 minute	10 minutes	1 minute
CAC and Off-Channel CAC detection probability (Note 2)	60%	99.99%	60%
CAC for slave devices with power above 200 mW (after initial detection by In-service)	No	Yes	

- **It was associated with commitments from the European meteorological community, in particular to always transmit at least one rotation of radars with minimum detectable signal (EUMETNET Recommendation adopted in 2008)**

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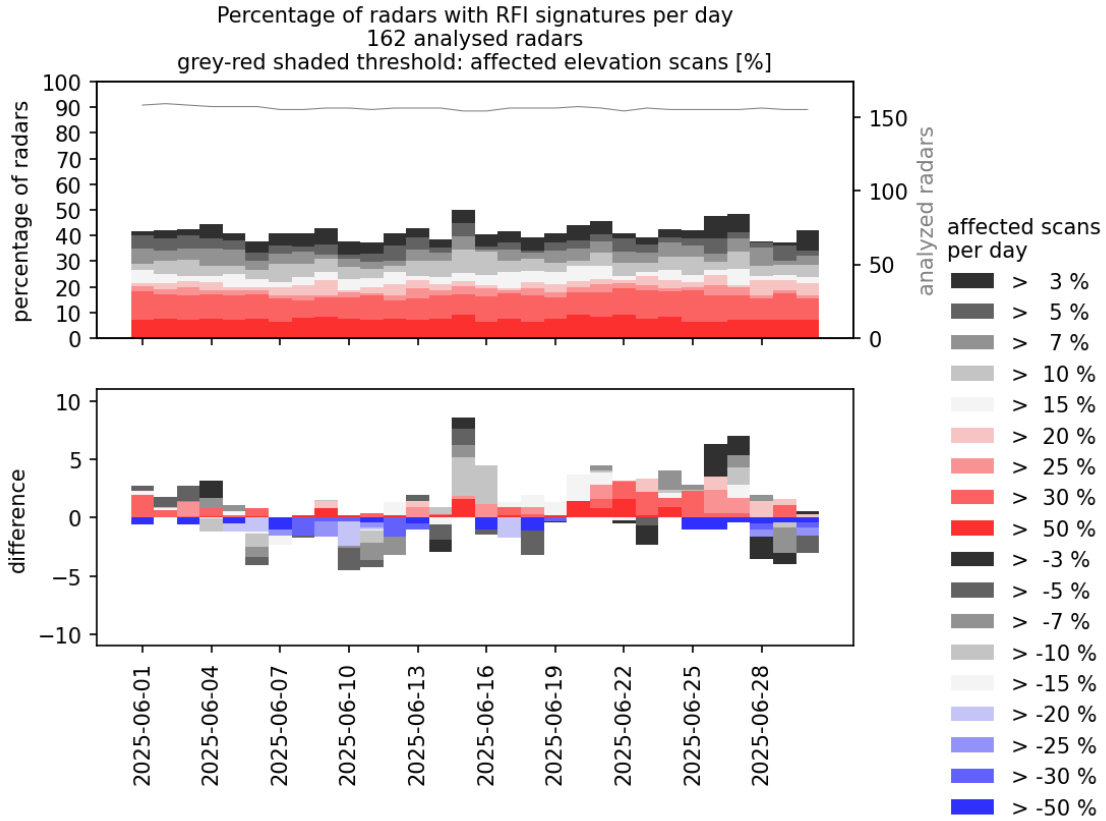
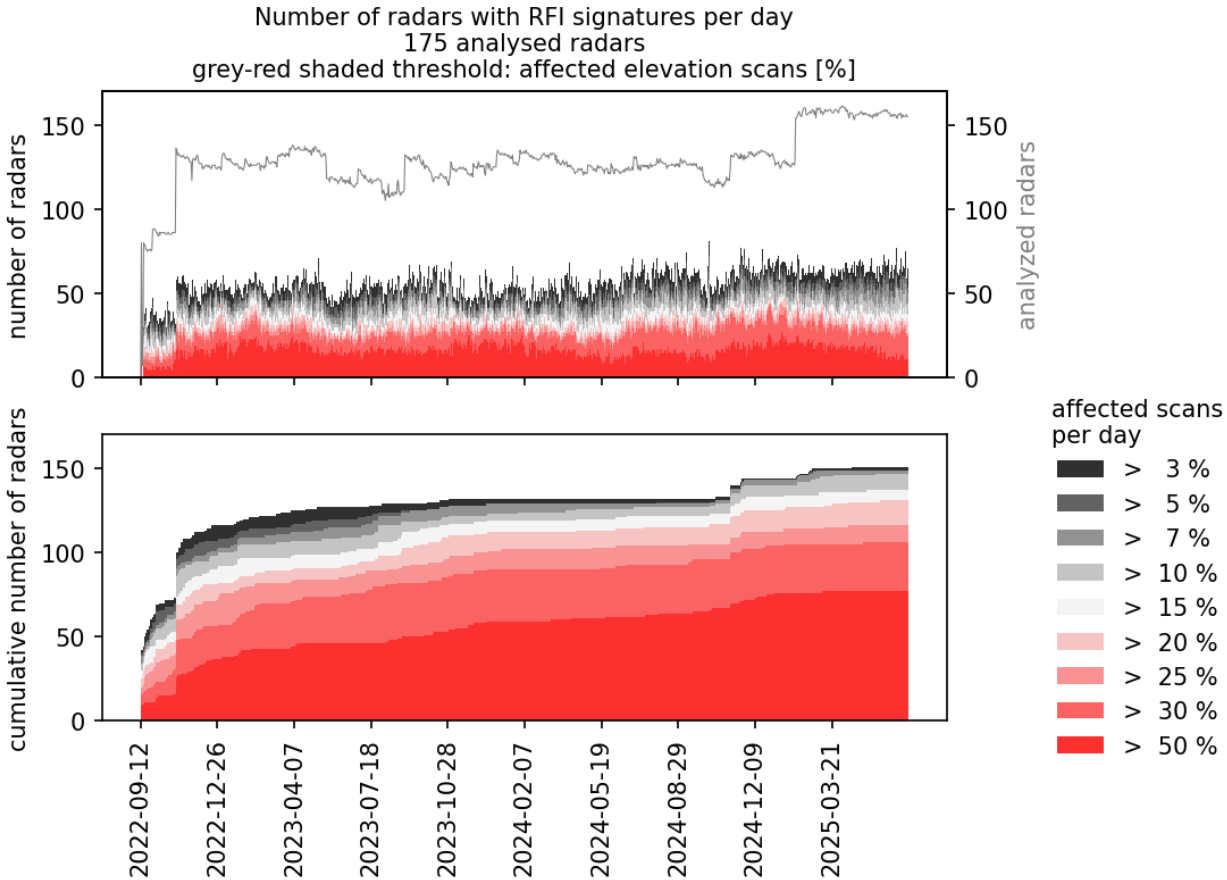
Where are we now

RFI monitoring tool





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Challenges towards WRC 27 – Solid State Power Amplifier (SSPA) radars

Differences with traditional tube based radars:

Transmitter peak power:

- Solid State ≈ 4 – 8 kW
- Tube-based ≈ 250 – 450 kW (125 – 225 kW per polarization)
- Power difference ≈ 14 to 20 dB

Pulse Length:

- Solid State ≈ up to 100 µs
- Tube-based ≈ 0,5 – 3,5 µs

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Challenges towards WRC 27 – Solid State Power Amplifier (SSPA) radars

- Protection of meteorological radars in the C-Band from WAS/RLAN relies on DFS technique, detecting radar signal based on certain specifications (Peak power and Pulse length)
- With the current DFS detection threshold (62 dBm), a minimum radar peak power of 8 kW would be required
- Current DFS allow for detecting pulses between 0,5 and 5 µs
- DFS is likely not being able to detect Solid State weather radars, hence increasing the probability of interference from WAS/RLAN.
- Additional work is needed to address this issue on technical, operational and regulatory prospective, considering:
  - That Pulse compression technique may reduce the interference susceptibility of radars (to be confirmed)
  - Modification of DFS specifications?
  - Beacon signals?

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Challenges towards WRC 27 – UWB Security scanners

- New Low Frequency Microwave Security Scanners are introduced
- They operate from 3.6 Ghz to 10.6 Ghz
- Targeted deployement sites are airports, public events, public transportation, shopping malls

- ➢ A thread that these type of scanners will be installed next to precipitation radars
- ➢ Facing the current RFI problem for meteorological radars from RLAN devices it is important that this technology will not further deteriorate this problem

WRC-27 Agenda item 1.7

IMT identifiations in the 4.4-4.8 GHz, 7.125-8.4 GHz and 14.8-15.35 GHz bands

Protection is needed for services (EESS / MetSat) to which the frequency bands are allocated on a primary basis, without imposing additional regulatory or technical constraints (including services in adjacent bands)

- **EUMETNET:**
  - Band 7750 – 7900 MHz is used for data downlink from non-GSO MetSat sattelite systems (used by EUMETSAT, NOAA and CMH), directly to user stations
  - Is part of the WMO Integrated Global Observing System
  - Band 8025 – 8400 MHz is used for data downlink from Earth Observation satellites (for example the Sentinel missions of the EU Copernicus programme)

My colleague Safana Judge (UK MetOffice) will give more details on the WRC-27 agenda items of interest to meteorology

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