DAB+ planning for mobile reception in Italy

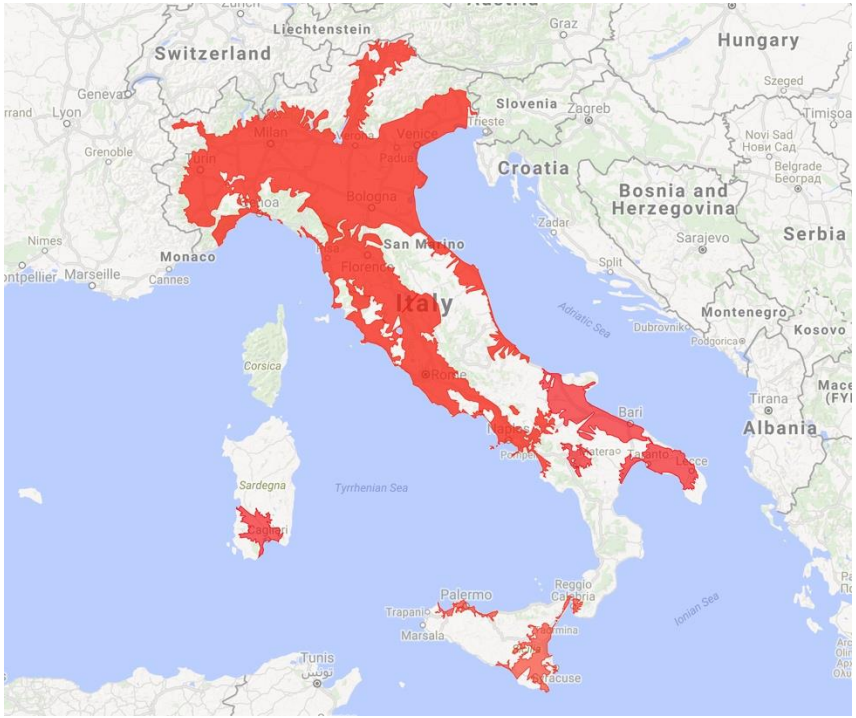
WorldDAB Automotive 2017

Munich, 21 June 2017

DAB ITALIA s.c.p.a.

DAB Italia s.c.p.a.

- Commercial network operator
- From mux to receiver!
- Continuous network expansion
- 75% population coverage for mobile reception, steadily increasing



DAB ITALIA s.c.p.a.

Overview

- Site selection and issues
- Planning methods and parameters
- Synchronisation
- Signal degradation
- How to improve coverage

Site selection

- Theoretical coverage area (good/bad/too good)
- Available space on mast
- Available space in the transmitter cabin
- Accessibility
- Landscape limitations
- Electromagnetic pollution limitations
- Int. Frequency coordination (test points -> planning)
- Costs!!!!!

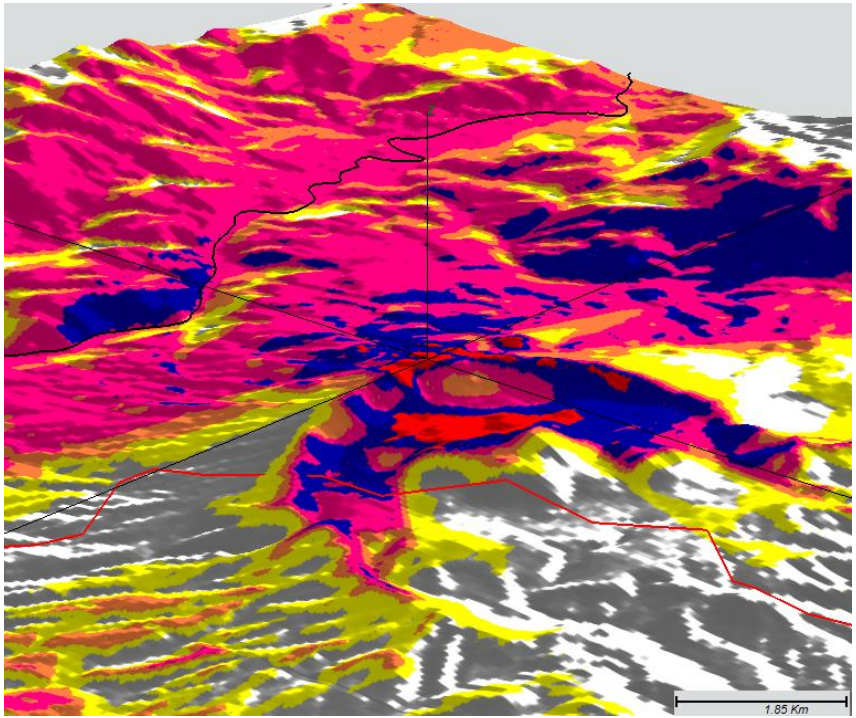
DAB ITALIA s.c.p.a.

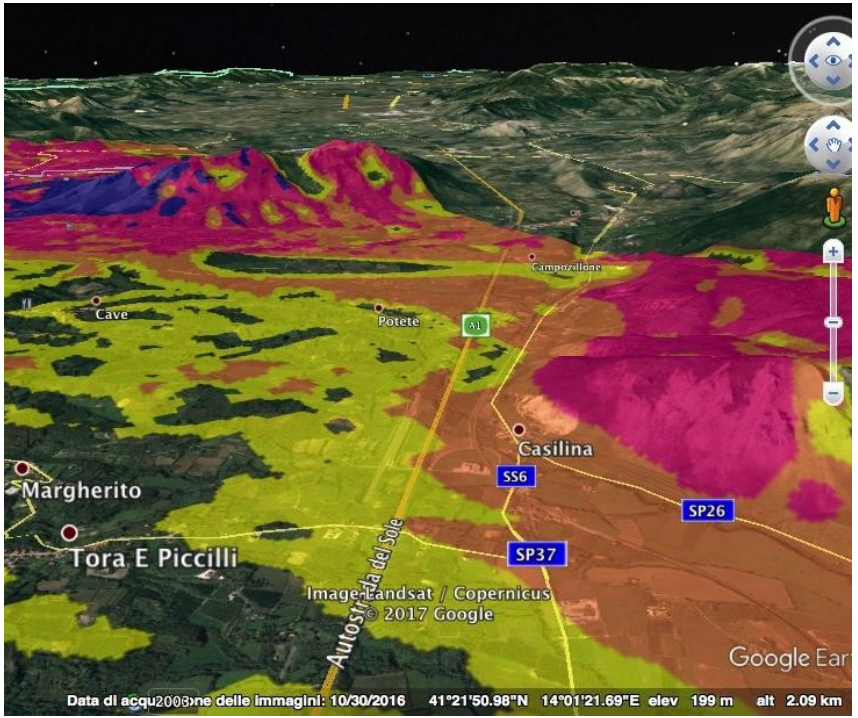
Planning methods and parameters

- ITU 1812, UKPM, P1546-3, IRT 3D
- Parameters which influence planning
  - Height loss
  - Antenna gain
  - Building penetration loss
  - Required percentage of locations
  - Interference (CCI, ACI)
  - …

Country	dBuV@1,5m 99% loc
UK	44
AUS	50
SUI	48
I	48
NOR	48
D	48

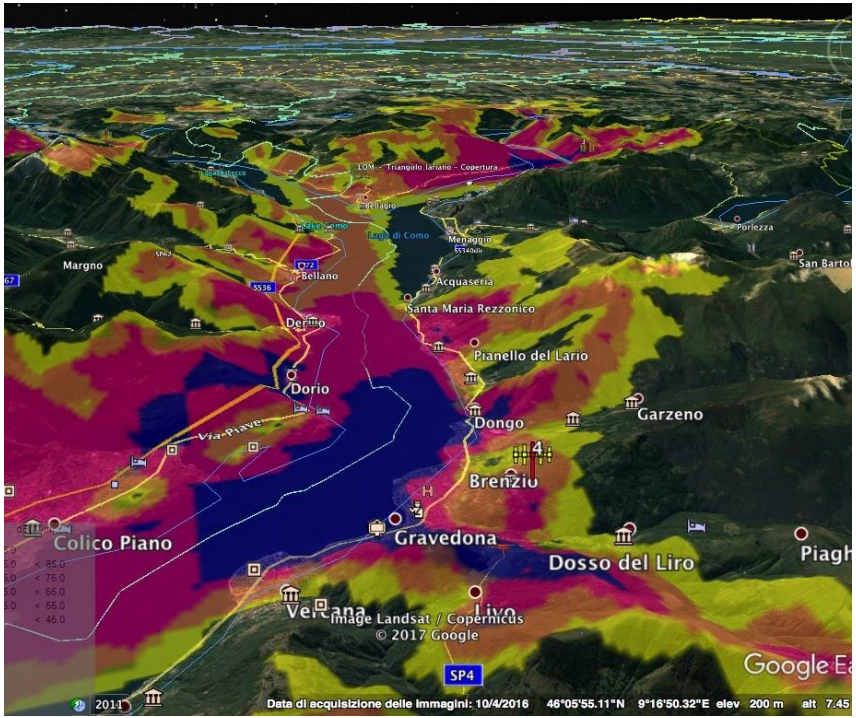
Planning – site evaluation

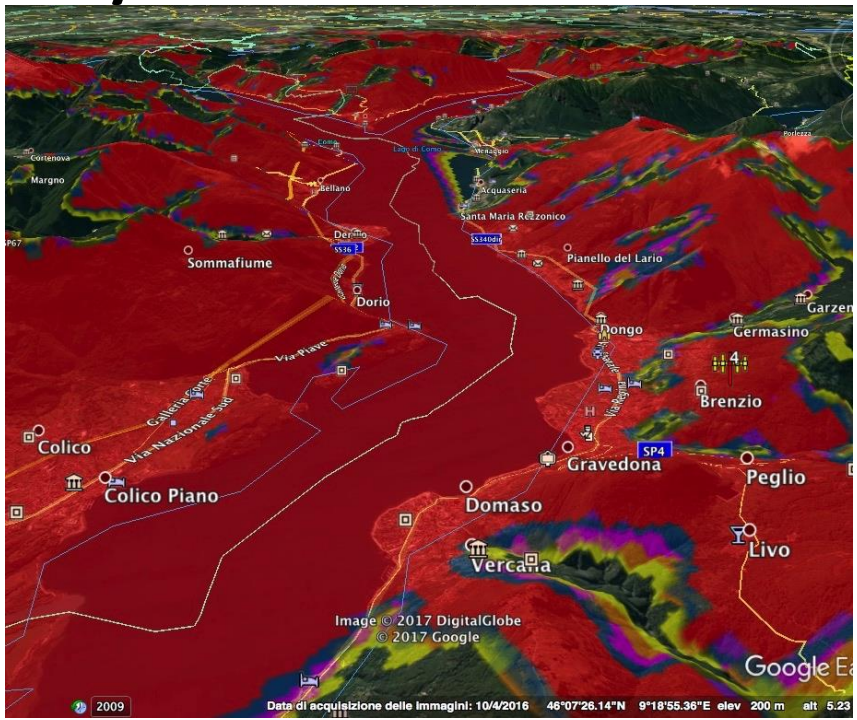




DAB ITALIA s.c.p.a.

Planning – from raw data to detailed SFN analysis





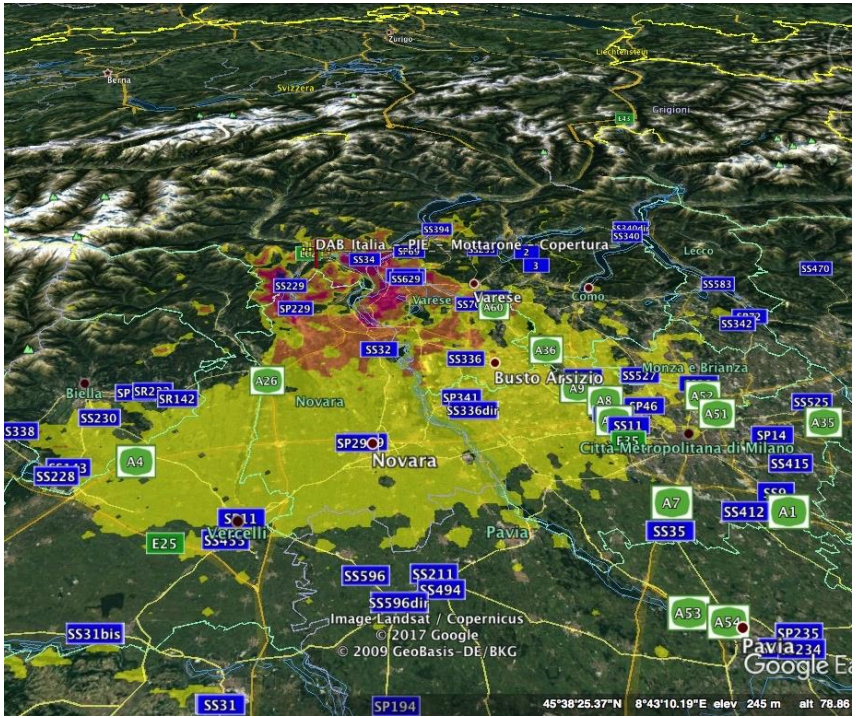
DAB ITALIA s.c.p.a.

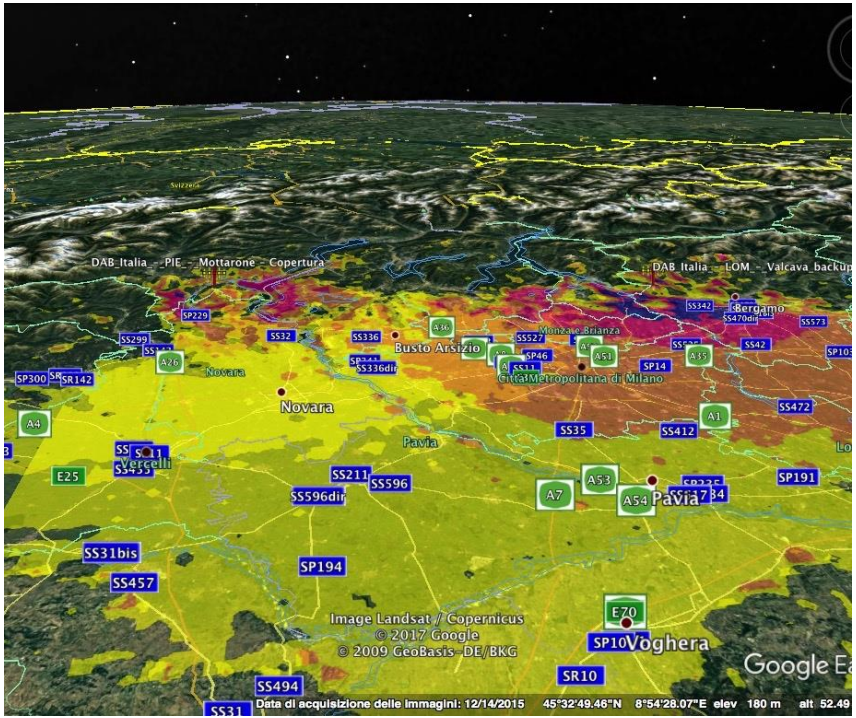
Synchronisation

- Regulation in Italy forces the use of SFNs for national operators
- Large SFN networks can be complex to synchronise
- High sites add difficulty
- Warm water adds more difficulty (seasonal changes)!
- Butterfly effect!

DAB ITALIA s.c.p.a.

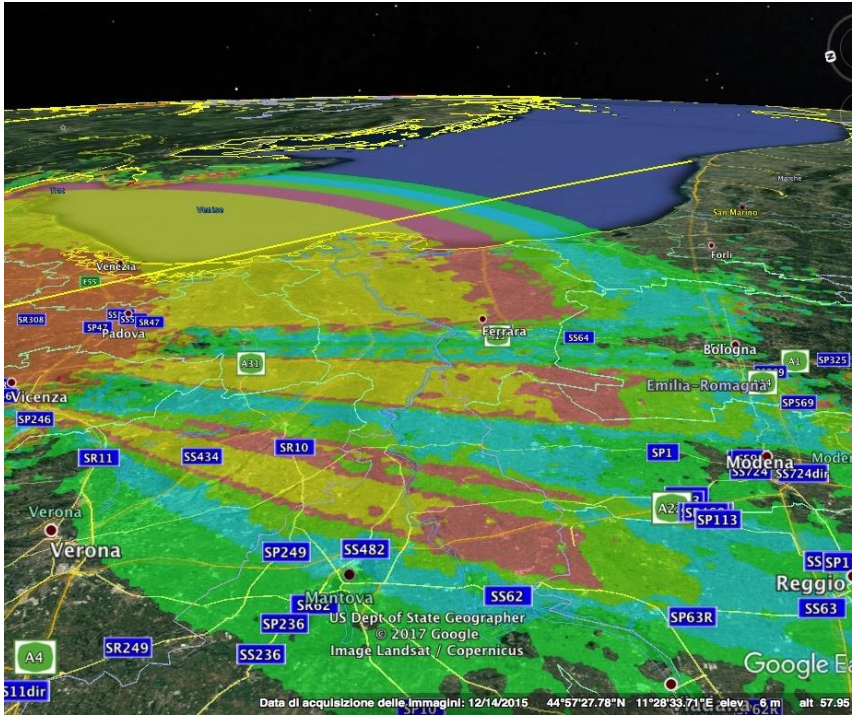
Let’s play in Sync





DAB ITALIA s.c.p.a.

Warm water ☹



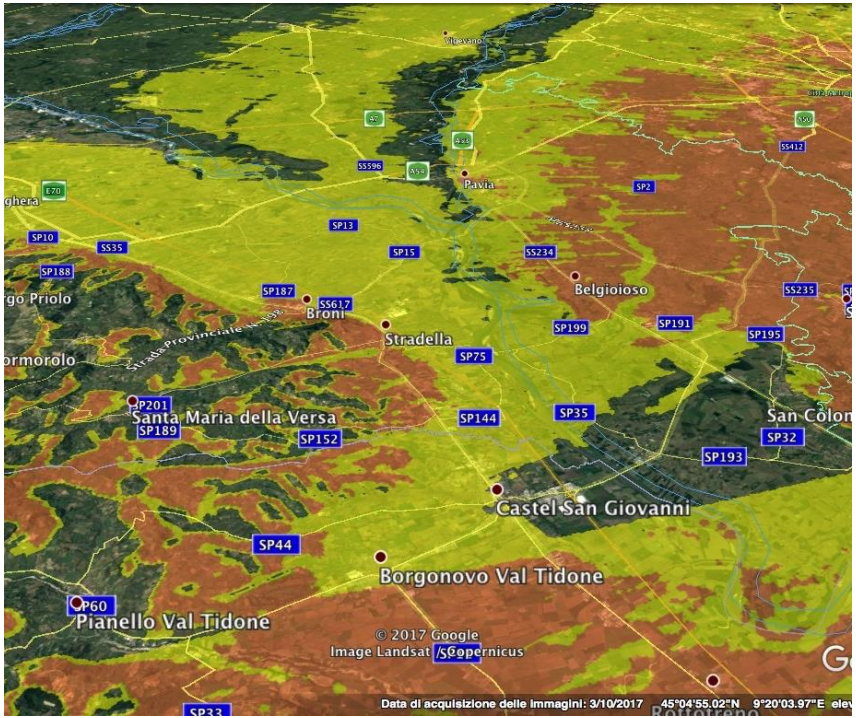
- At over 280 km from tx the signal will be present
- In spring and summer interference will be much worse than in autumn and winter
- High sites and warm water create a combination very complex to manage

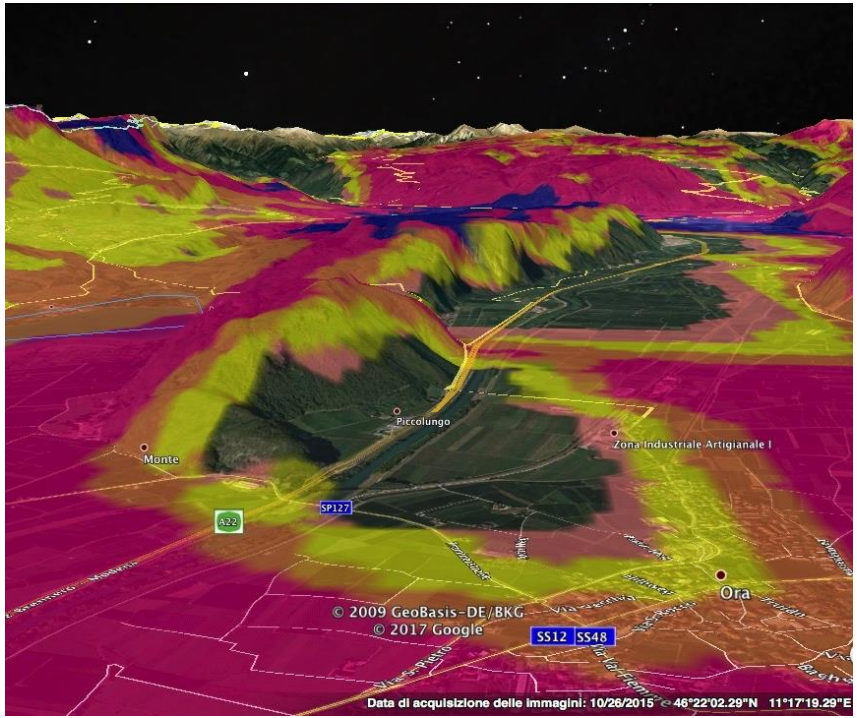
DAB ITALIA s.c.p.a.

Signal degradation/improvement

- External influences
  - CCI
  - ACI
  - EM noise from LED lights, traffic lights, electric motors, chargers and dozens of other sources
- Landscape elements outside the planning tools
  - Buildings
  - Bridges
  - Trenches
- Tunnels
- Reflections

Degradation vs. Improvement





DAB ITALIA s.c.p.a.

How to improve coverage

- Improving coverage can be accomplished with 2 options
  - More ERP
    - More TX power
    - More antennas
  - More tx sites

Improving coverage – pros and cons

	PROS	CONS
More antennas	No additional power bill	Antenna cost, tower space, environmental impact, synchronisation
More tx power	No antennas	TX cost, cabin space, electricty cost, synchronisation
More sites	Reduces synchronisation issues	More costs for sites, txs and antennas

Improving coverage

- Improving coverage is complex and extremely costly
- In some cases up to 3dB can be added with changes on existing sites (this means doubling the existing field strength)
- Adding more than 3dB will require a replanning of the existing network, adding more sites and increasing significantly costs
- DAB networks will become more granular over time and increase coverage also in difficult areas, but the process will firstly put attention to main sites
- Broadcasters expect car radios to work appropriately at current planning values or lower
- TX antennas are polarised vertically and RX antennas shall be the same
- As a network operator we provide the best possible RF signal and hope that manufacturers provide the best possible means of reception

Thank you for your attention!

DAB ITALIA s.c.p.a.