Optimizing DAB+ networks for mobile reception

World DAB General Assembly 2019

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Agenda

1. DAB Italia
2. Why is automotive so important
3. The “Trip” – all issues in one road trip

   ……..and some solutions

DAB Italia

- First national operator for commercial radio services
- Consortium of commercial radio operators with national license
- 8 programs in simulcast, 8 DAB-only services, 3 test channels
- 1 big and happy SFN (for now)
- Currently working to both extend coverage area and to improve indoor reception in already served areas

Why is automotive so important for DAB?

Automotive & DAB+

- In many countries there is a big audience for radio in cars (Italy nearly 80%)
- Lots of easy to access content
- EC directive for DAB+, more and more cars with line-fitted DAB receivers
- The car is one of those environments where DAB+ is particularly appreciated, no multipath, excellent audio, etc
- The user experience needs to be guaranteed:
  - In FM a little interference goes unnoticed by most users
  - In DAB even the smallest dropout is noticed and creates dissatisfaction

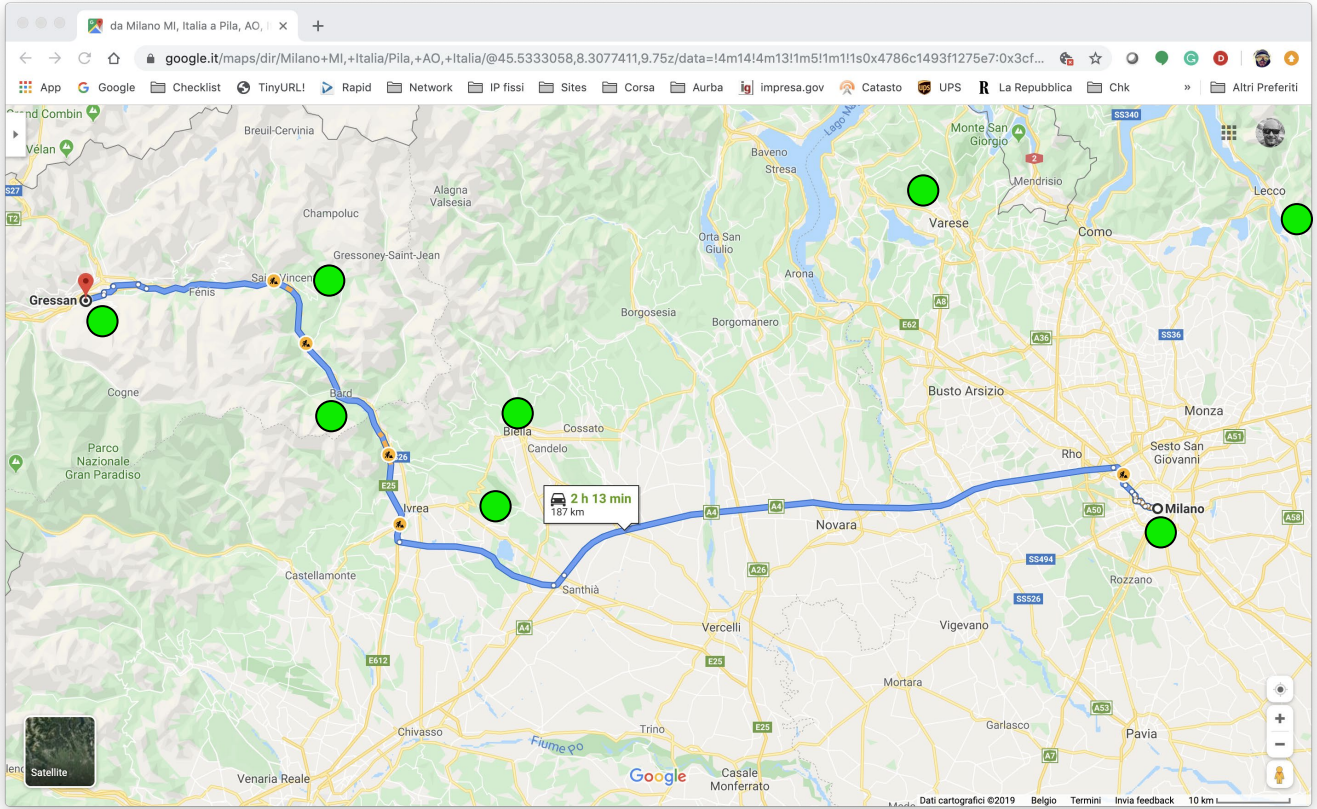
The Trip

What happens when you go for a ride?

Who, why, where?

- 7 friends, 1 weekend for skiing, going from Milan to Pila
- 5 pairs of skis, 2 snowboards, 12 boots, 10 poles, helmets, gloves...
- 2 cars -> Car A and Car B
- Both have OEM DAB receivers
- But different brands of cars and of receivers

On the road



- 187 Km
- 2h 13min drive
- 90% on highways
- DAB coverage on the entire trip
- At least 8 different TX sites involved, plus a number of overspill areas

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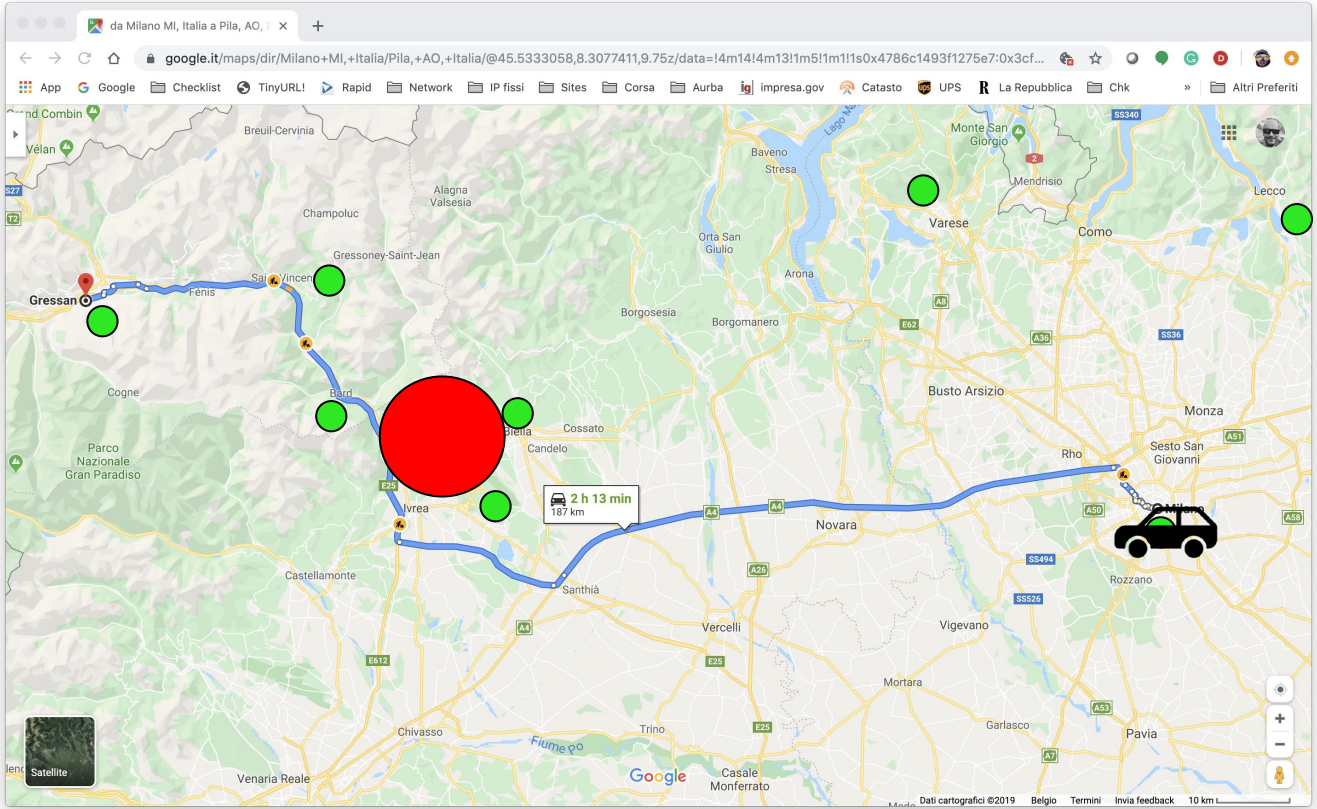
On the road 2

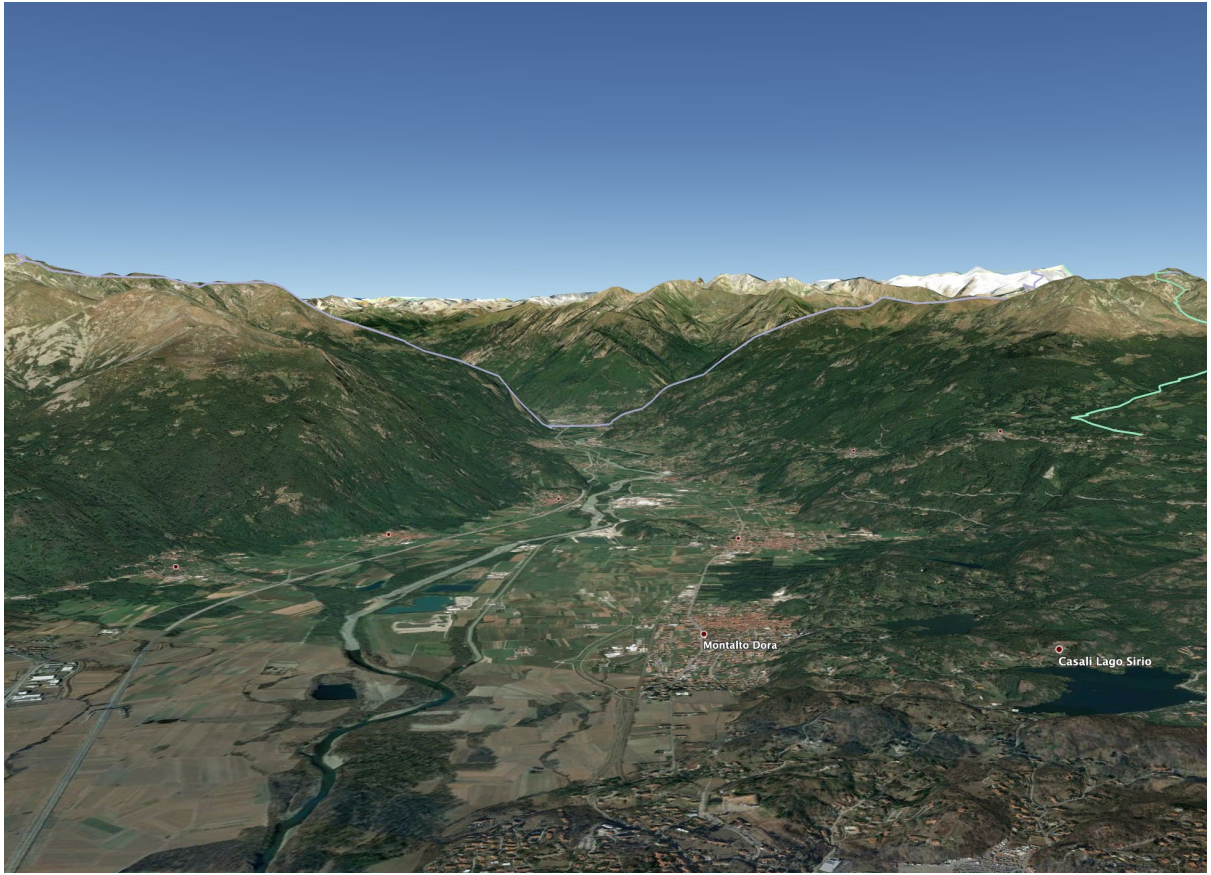


- The trip is smooth, no traffic and nice music from the car radios….
- After a while both cars reach an area where for about 500m the field strength drops below 50 dBuV @1,5meters
- A strong signal on the adjacent channel pops up
- Reception on Car A is not affected, on Car B there is s short interruption (and my friends have a laugh at me)

So, what *@%& just happened to Car B????

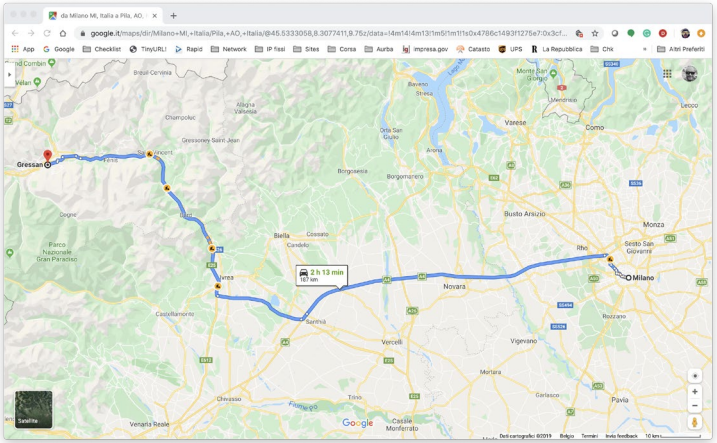
Limitations to mobile reception - 4 points

- Field strength below a certain level -> yes, below 50dBuV @1,5m
- Antenna directionality –> yes, rear window antenna
- Strong adjacent signal -> yes, transmitter of other operator and adjacent channel (and with lots of antennas ☹)
- Out of SFN signal on air -> yes, depending on propagation there might be a very low signal generated by a reflection on the mountains



4 major issues to be tackeled

- Minimum fieldstrenght -> receiver & antenna sensitivity
- Antenna directionality
- Adjacent channel interference
- Out of SFN behavior
  - Receiver strategy
  - Planning, site modeling etc



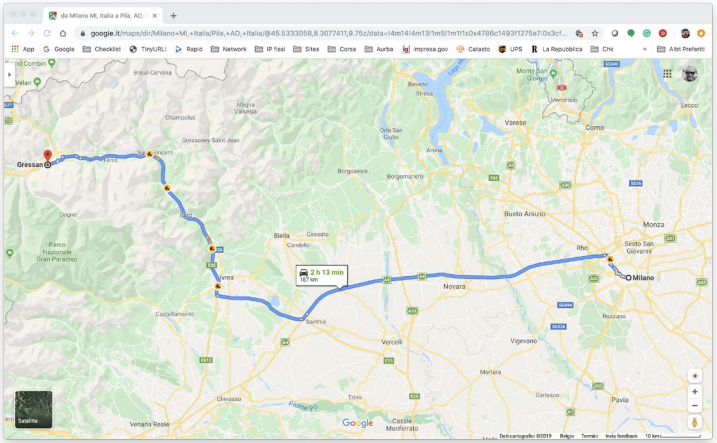
Fieldstrenght & Antenna performance

- Car manufacturers must improve receiver sensitivity, too many deaf receivers around!
- Increase the network density to improve coverage -> cost only for network operators
- Don’t increase the TX power!

- Best solution remains the external stylus antenna
- Aftermarket internal glass antennas are the worst solution, shall be avoided and not encouraged during marketing
- Glass antennas are still too directional and prone to internal EM interference
- If glass antennas are used, diversity receivers shall be installed by OEMs

Adjacent channel interference & out of SFN behaviour

- Reason 1: high power on adjacent channels (1 or 2 blocks away)
  - Reduce power
  - Co-siting
- Reason 2: out-of-characteristics mask filter
  - Retune filter



- "Unexpected" DAB propagation (weather, reflections)
- Receiver decoding strategy can improve significantly reception continuity

Lessons for broadcasters/network operators and regulators

- Broadcasters/network operators
  - Coherent networks give a better user experience than spotty coverage
  - Plan for “double coverage” for difficult areas
  - Support car industry in improving reception and in mitigating EM interference inside the vehicles

- Regulators
  - Make resources available for both public and commercial radio at national AND local level quickly
  - Avoid planning adjacent channels
  - Plan for large SFNs whenever possible

Thank you for your attention!

Questions?

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