Digital Audio Broadcasting in France

June 2021

tdf.fr

Before we start

TDF is a private neutral and open infrastructure operator

TDF supports digital players in their strategic connectivity issues in Metropolitan France and overseas.

Whether for radio and DTT broadcasting, mobile coverage or the deployment of fiber, TDF provides its customers with business expertise, a unique and innovative technological mix as well as first-rate regional proximity.

In a world that is even more connected every day, TDF has for more than four decades, thanks to its network of 19,000 sites, enabled telecoms and the media to connect the territories and the French everywhere, more quickly.

TDF and DAB+

In a competitive DAB+ market, TDF broadcasts more than 100 radios on several local and regional areas

TDF is also a Multiplex operator in the cities of Paris, Marseille and Nice through its subsidiary RMux

Agenda

01 DAB+ deployment

02 Frequency planning

03 Network planning

04 Practical implementation

DAB+ deployment - Historical background

End of 90's

First tests of Digital Radio – DAB in the L-Band

No commercial deployments

2008

Attempt to (re)launch using DMB in Band III and L-Band, without success

2013 onwards

Relaunch in three cities : Paris, Marseille, Nice

Using DAB(+) in Band III

On-air since 2014

DAB+ deployment – Accelerated process

Digital Radio is complementary to FM Broadcasting

End of 2017 : decision by the Regulation Authority (CSA) to accelerate the rollout of Digital Radio

“Nodes” and “Arcs” Plan

- Nodes : focus on city / regional coverage – 1 to 3 layers for local allotments + 1 to 3 layers for regional allotments
- Arcs : focus on national coverage, including motorways, main roads, and surrounding cities – 2 layers for national allotments

Multiplex configuration

- Total capacity : 1152 kbps
- Audio coding : AAC+ for DAB+
- Up to 13 programs for the French deployment (~88 kbps per program)

Consumer products

- Legal obligation started when reaching 20% population coverage, end of 2018
- Starting end of 2019 : all new consumer radio receivers available on the French market (except car-mounted receivers) must support DAB+
- End-2020 : obligation extended to car-mounted receivers

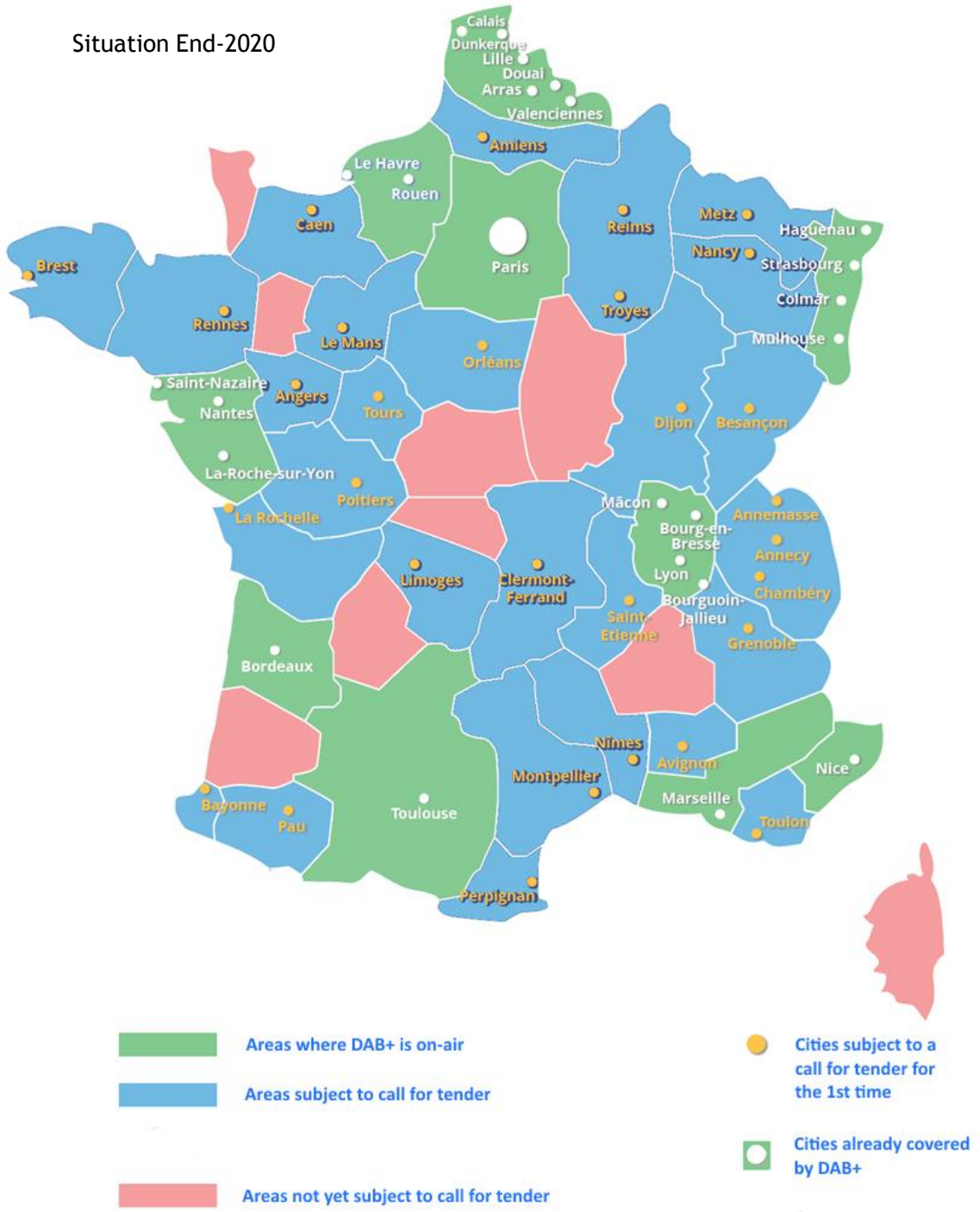
DAB+ deployment – Local / regional allotments

Specific rollout plan for local / regional allotments

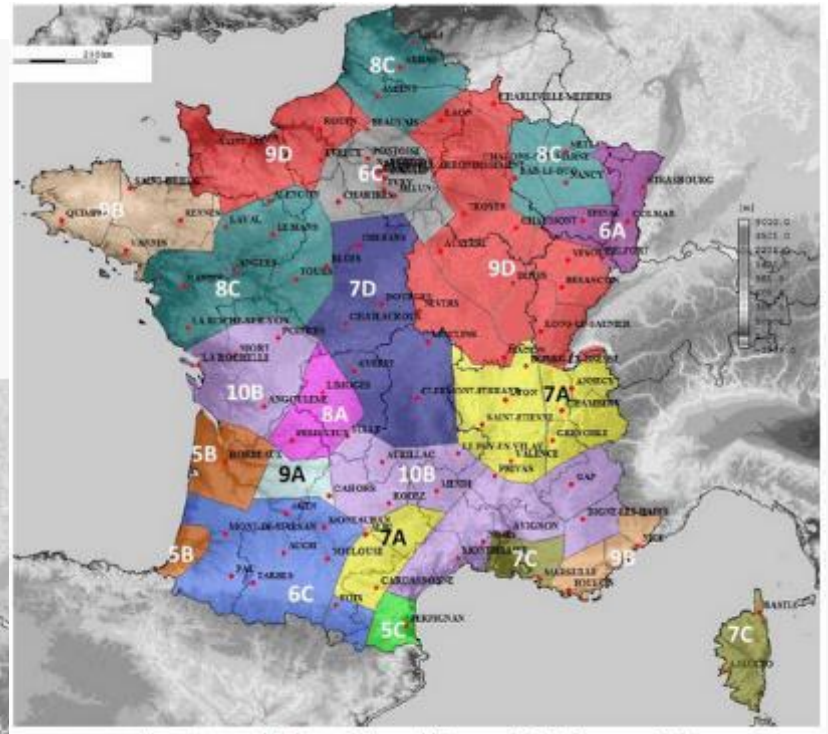
- 2018
  - Launched main cities : Lille, Lyon, Strasbourg
  - Call for tender : 15 new zones by mid 2018 (28 allotments)
- 2019
  - Additional radios on the existing multiplexes of Paris, Marseille, Nice
  - Call for tender : 15 new zones by mid 2019
  - Launched cities : Rouen, Nantes
- 2020
  - Launched cities : Bordeaux ; Toulouse
- 2021
  - Toulon, Avignon, Dijon

Current coverage : ~30 % of the population with 47 local/regional allotments in 10 regions

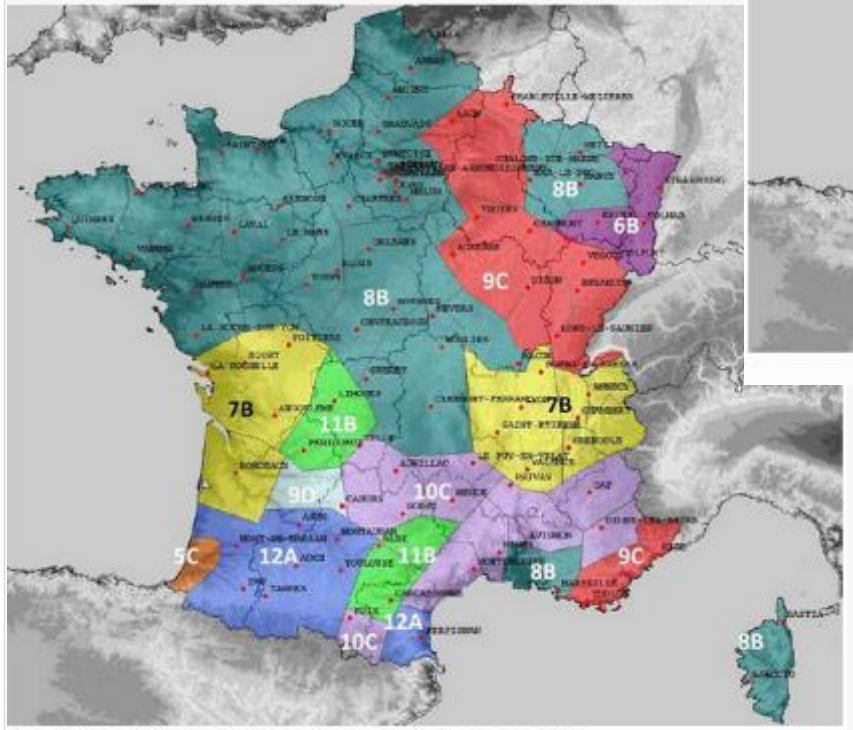
Situation End-2020



DAB+ deployment – National allotments



Premier multiplex métropolitain en DAB+. Image: CSA



Deuxième multiplex métropolitain en DAB+. Image: CSA

(Maps for illustrative purpose, frequency planning was reviewed)

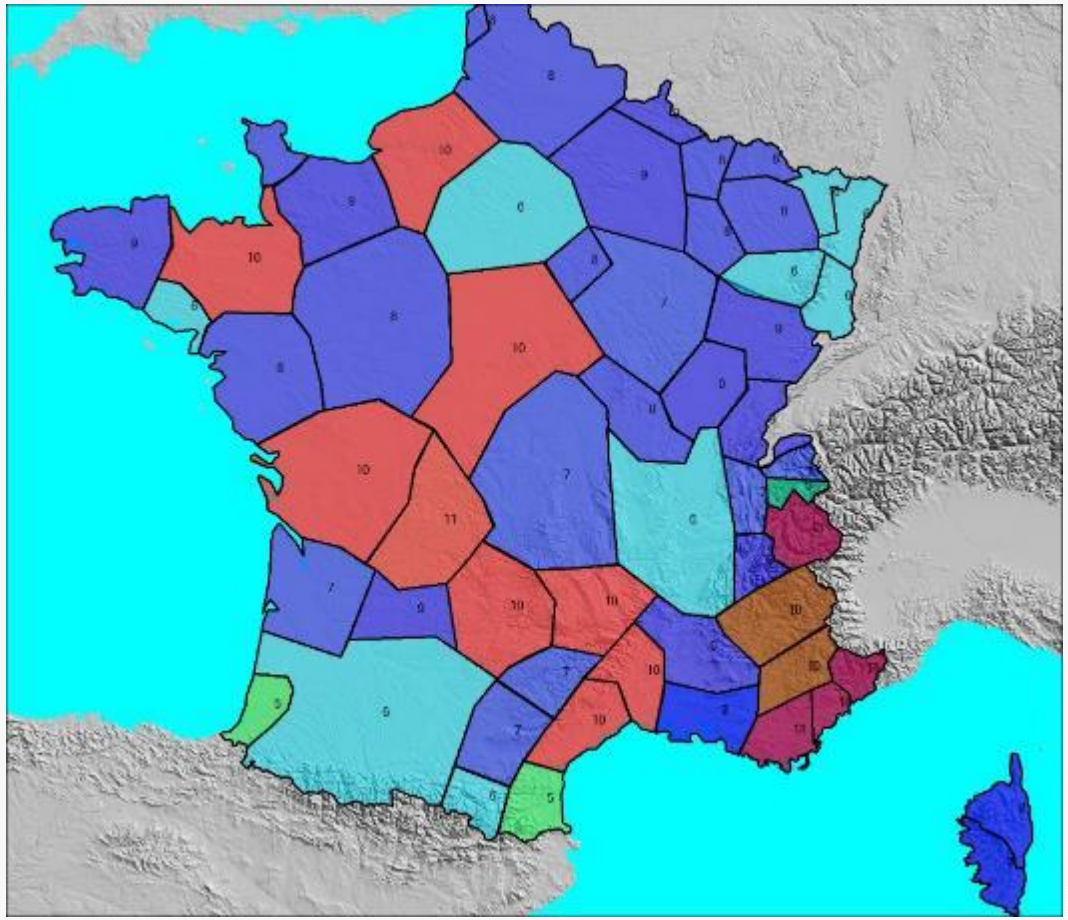
2 national multiplexes are planned

- Focus is on main roads coverage and population
- 24 radios auctioned by the CSA in April 2019 + 1 additional radio in January 2021
  - 13 radios per mux / 12 radios per mux + capacity for data services
  - Public and private radios: Radio France (6), Lagardère (3), RTL (3), NRJ (4), Next Group (3), Others (6)
- October 2021 : Coverage of motorways between Paris and Marseille

Frequency planning

The initial GE-06 plan was not fit for full DAB usage of the VHF Band

- Initial GE-06 plan designed for 1 DVB layer + 2 national DAB layers (and additional partial DAB/DVB layers)
- Huge rework by the CSA of the GE-06 plan to cater for the French needs
- DAB blocks at the borders remain unchanged, as much as possible
- On-going work, led by the ANFR - in coordination with the CSA - to reach bilateral agreements with neighboring countries, considering the specific constraints of VHF use in France and a generic reference network design



Network planning

Two reception environments are targeted

- Mobile rooftop reception
    - Very good quality (99% of locations)
    - Median field strength at 1.5m : 54 dBµV/m
- Indoor portable reception
    - Good quality (95% of locations)
    - Median field strength at 1.5m : 67 dBµV/m

Other planning parameters

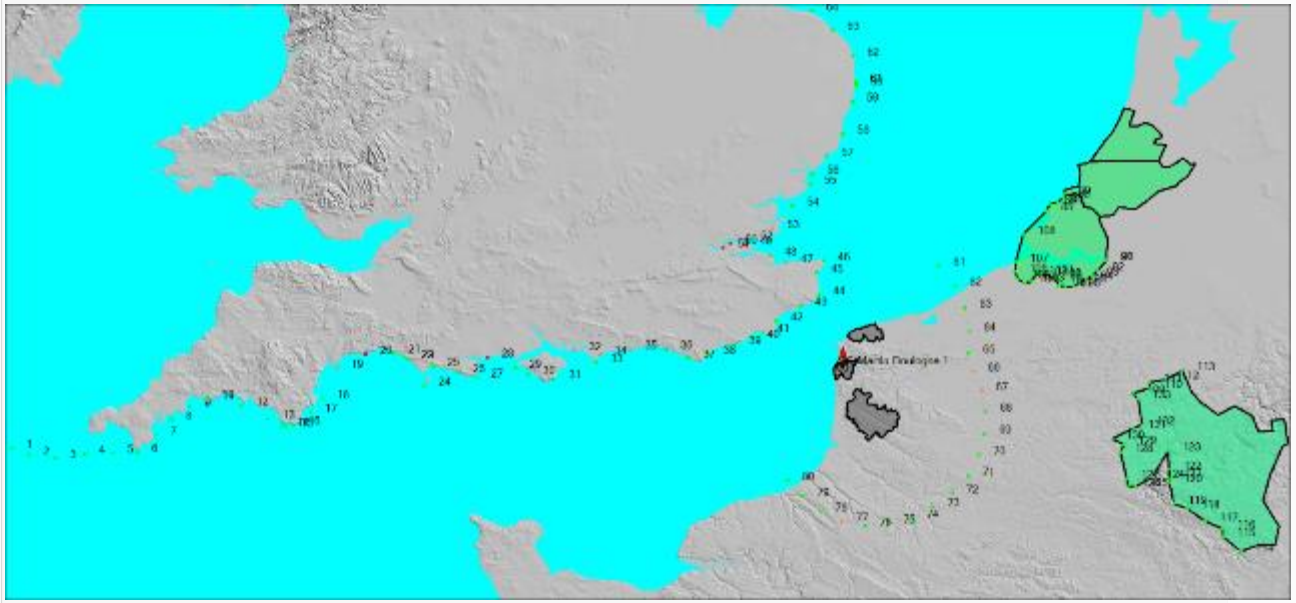
- Co-channel protection ratio : 15 dB
- Adjacent-channel protection ratio : -40 dB
- For large allotments with several transmitters in SFN (more than 80 km) : possible adjustment of transmitter delays

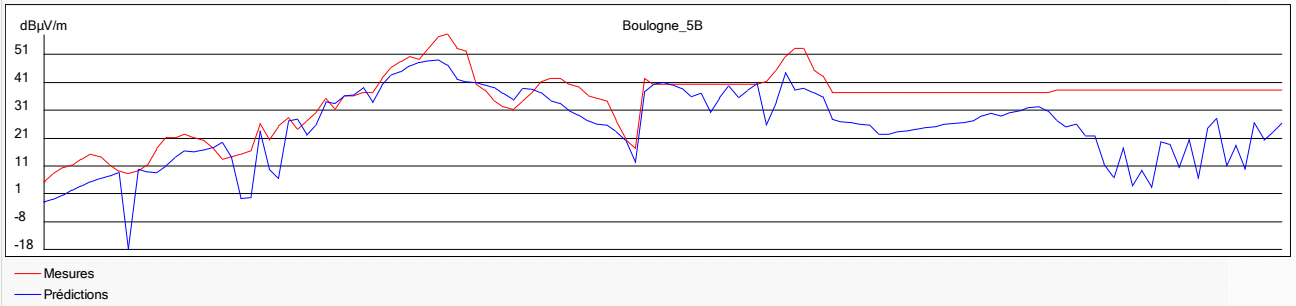
Practical implementation - Choice of the towers

General guidelines

- Towers located
    - In the neighborhood of the urban area to cover
    - Above the local clutter (trees, buildings, …) - at least 30m height
- Usage of several dipole antennas at the top of the mast is preferred
- Panel antennas are used on High Power High Towers with coordination constraints

Practical implementation – Turning allotments into assignments at the border

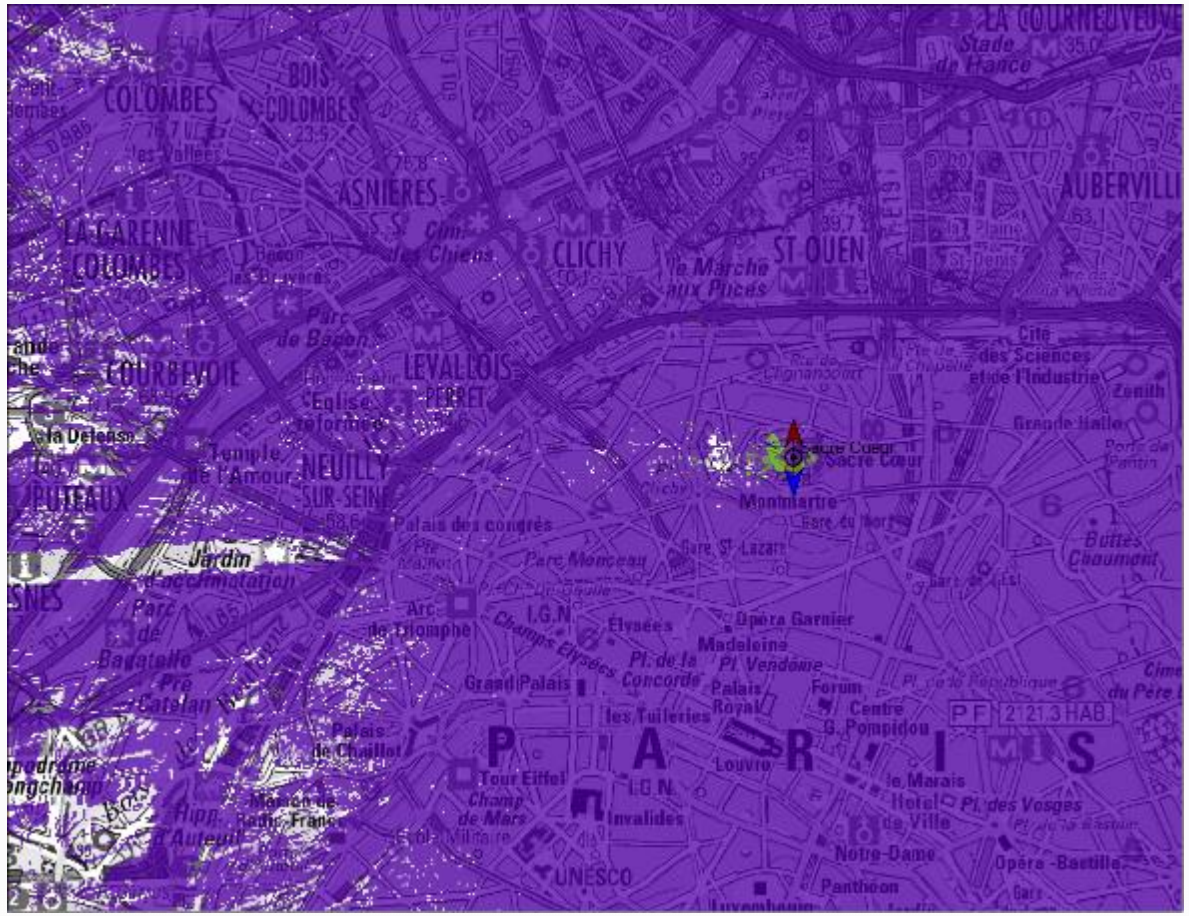




- For allotments subject to coordination, the CSA provides a list of test points where the field strength level should not be excessed
  - Propagation model : ITU-R P.1546 1% of time (sea path)
  - Level not to be excessed depending on neighboring country
- Example of Boulogne-sur-Mer – 5B
  - Transmitter characteristics must be finely tuned to respect the constraints set forth in the coordination agreements, i.e. ERP, antenna height, radiation pattern, …

Practical implementation – Adjacent block interference

- As the frequency planning is based on allotment planning, the practical implementation may differ from block to block on the same geographical area
- Depending on the technical characteristics of the various towers involved, this may cause adjacent block interference
- Example in Paris
    - Romainville 5 kW ERP – block 9B
    - Montmartre 4 kW ERP – block 9A
    - Indoor reception
    - Approximately 6 km separation distance between the two sites
    - -40 dB protection ratio
    - Green area = potential interference from Montmartre on the Romainville coverage
    - Solution : use of several dipoles to reduce the field strength level close to the interfering tower



Practical implementation – Sharing DAB with other services on the same tower

With FM services

Enough decoupling must be ensured between DAB and FM dipole antennas, to avoid perturbations to the respective radiation patterns (induced currents)

With PMR services

DAB intermodulation products might fall within the existing PMR receivers' bandwidth, protection must be ensured in this case

Thank you for your attention !

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