RLAN 5 GHz interference to weather radars in Europe

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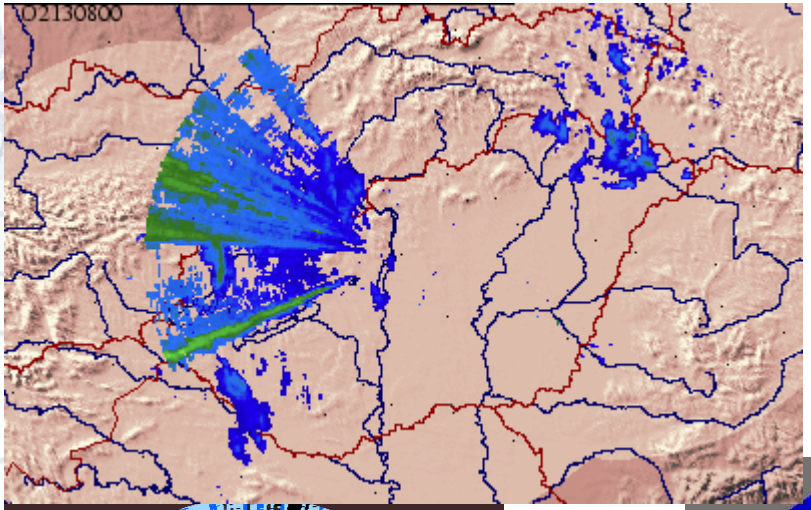
Background

- **RLAN 5 GHz (WIFI)** were authorised in the 5 GHz range (5150-5350 MHz and 5470-5725 MHz) following a decision made at WRC-03
- This allocation was associated with an obligation to implement a so-called **Dynamic Frequency Selection (DFS)** mechanism to ensure protection of radars operating in the 5250-5350 MHz and 5470-5725 MHz bands, including weather radars in the 5600-5650 MHz band
- Under DFS, RLANs have to monitor their channel and, if they detect a radar signal, they have to move to another channel.
- 2 main DFS modes :
  - **CAC (Channel Availability Check)** : before transmitting on a given channel, the RLAN is on receive only mode during 1 minute (CAC time); If no radar is detected, it can start using the channel
  - **ISM (In-Service Monitoring)** : while using a channel, the RLAN still need to constantly monitor this channel in case a radar signal shows-up

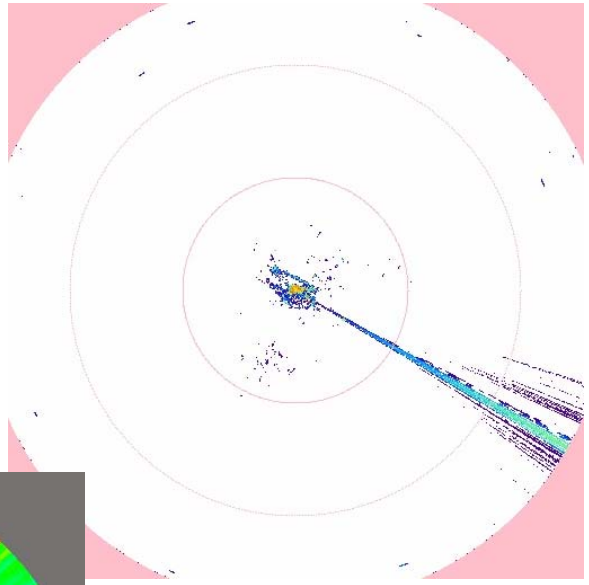
Background

- RLAN DFS is highly **dependent on radars characteristics** and emission schemes (pulse width, PRF,…)
- DFS mechanism parameters were mainly specified on a theoretical basis, included in Equipment standards (IEEE, ETSI,…) in 2004 and implemented in RLAN equipments designs, allowing for **market deployment by about years 2005-2006**
- During this whole process, **the European Meteorological Community was absent** and was therefore not able to argue about specificities of meteorological radars
- Roughly, only the **Australian and canadian NMHs were involved**, resulting, at their national basis, on a non-autorisation of RLANs in the 5600-5650 MHz
- This was not the case in Europe where Decisions on RLAN are covering the whole 5 GHz range
- And …….

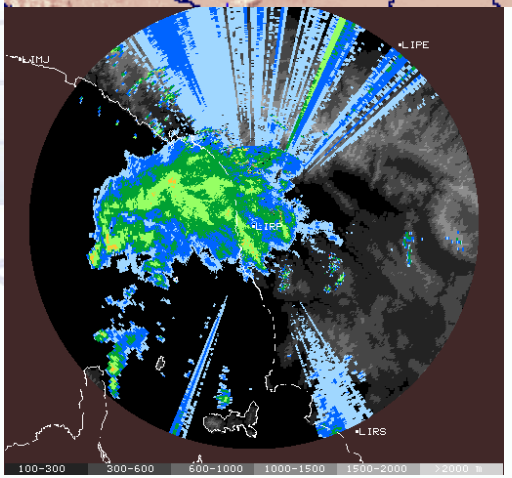
RLAN interference to met radars



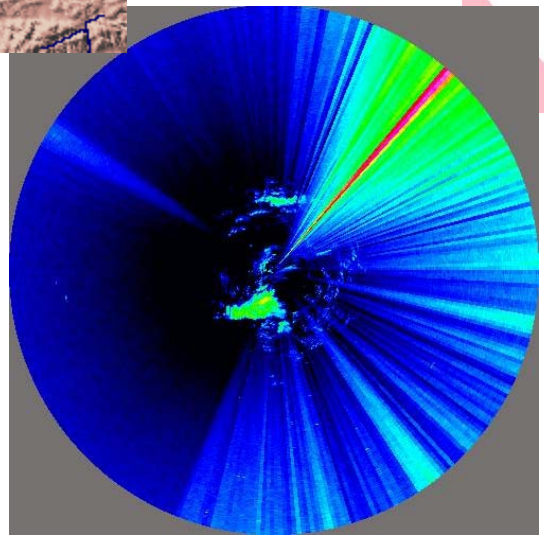
Hungary



France



Italy



UK

RLAN 5 GHz interference to radars

- More than **12 European countries** experienced such interference cases (other cases have now been reported in number of countries in the world)
- Definitively **harmful interference** (in Hungary, the radar was declared as non-operational for more than 1 month)
- In all cases, the localisation of the interference source took **long time** to the NRA
- There was **only few RLANs** deployed in this band, but the situation was already of high concerns for meteorological services
- A solution was to be found before any mass-market deployment of RLAN in this band (**point of no-return**)

Analysis of the situation

- EUMETNET raised this issue at the European Commission level that requested **both the RLAN industry and the meteorological community** to analyse the situation and propose long-term solutions.
- It appeared that these interference were mainly due to **2 different cases** :
  - On some equipments, it was possible to swicth-off the DFS (mandatory feature !!)
  - On some others, the DFS was inefficient to detect meteorological radars
- After a enquiry on characteristics of emission schemes of all meteorological radars, it was clear that **DFS parameters in European Standard were not covering main radar characteristics** :
  - Pulse width down to 0.5 us : the DFS was only able to detect 1 us)
  - Variable PRF schemes (staggered or interleaved) : the DFS was only specified to detect fixed PRF
  - Radar noise calibration : a number of radars perform noise calibration without emissions

Solutions

- EUMETNET would have preferred a similar solution as in Canada or in Australia (**Notching the 5600-5650 MHz** band for RLAN) but it was not anymore a realistic solution
- the solution proposed by the meteorological community and the RLAN industry to the European Commission was therefore **twofold** :
  - **Modify the RLAN European standard** to include DFS parameters consistent with weather radar specificties, as well as to increase in the 5600-5650 MHz band, the "CAC time" from 1 to 10 minutes with a 99.99% probability of detection (instead of 60%) (in-force by April 2009)
  - To commit, from the meteorological prospective, to limit the weather radar **operation in the 5600-5650 MHz band** and, to ensure that, at least **1 or 2 "detectable signals"** will be transmitted by radars during their scanning strategies (typically 10 to 15 minutes)
- EUMETNET is confident that this "package solution" would ensured a long-term coexistence but its efficiency in "real life" **will need to be monitored** and verified in the following years

Lessons of the RLAN 5 GHz issue

- The European meteorological community is currently facing consequences of Decisions taken more than **6 years ago** and its absence in the debate at WRC-03
- involvement at that time could have resulted in a **total different situation** (exclusion of the 5600-5650 MHz band ?)
- It also makes no doubt that without recent actions, this issue could have seen **disastrous conclusions** :
  - Uncontrolled deployment of a very large number of “non detecting” RLAN, impossible to manage by NRA, i.e. a *de facto* **pre-emption of the band**
  - Although “Primary”, for the meteorological services it would have lead to **loss of the band**, moving meteorological radars in another band, with obvious operational and financial consequences (estimated between 3 and 400 M€ in Europe)

Lessons of the RLAN 5 GHz issue

In order to avoid similar situation in the future, it is essential that the meteorological community involve itself in frequency management, on a prospective basis :

- This was done when possible use of RLAN 5 GHz on-board aircraft was released since the European “package solution” is not efficient in this case. Positive outcomes are currently on-going

- On a more general basis, the RLAN 5 GHz case raises the issue of **unlicensed and mass-market** radio equipment, mainly SRD, that, if not adequately regulated, can become “killer applications”, *stricto sensus*

Thank you for your attention