Agence Nationale des Fréquences

Harmful interference to satellite systems

ANFR views

International satellite communication workshop
“The ITU - challenges in the 21st century:
Preventing harmful interference to satellite systems”
Geneva, 10 June 2013

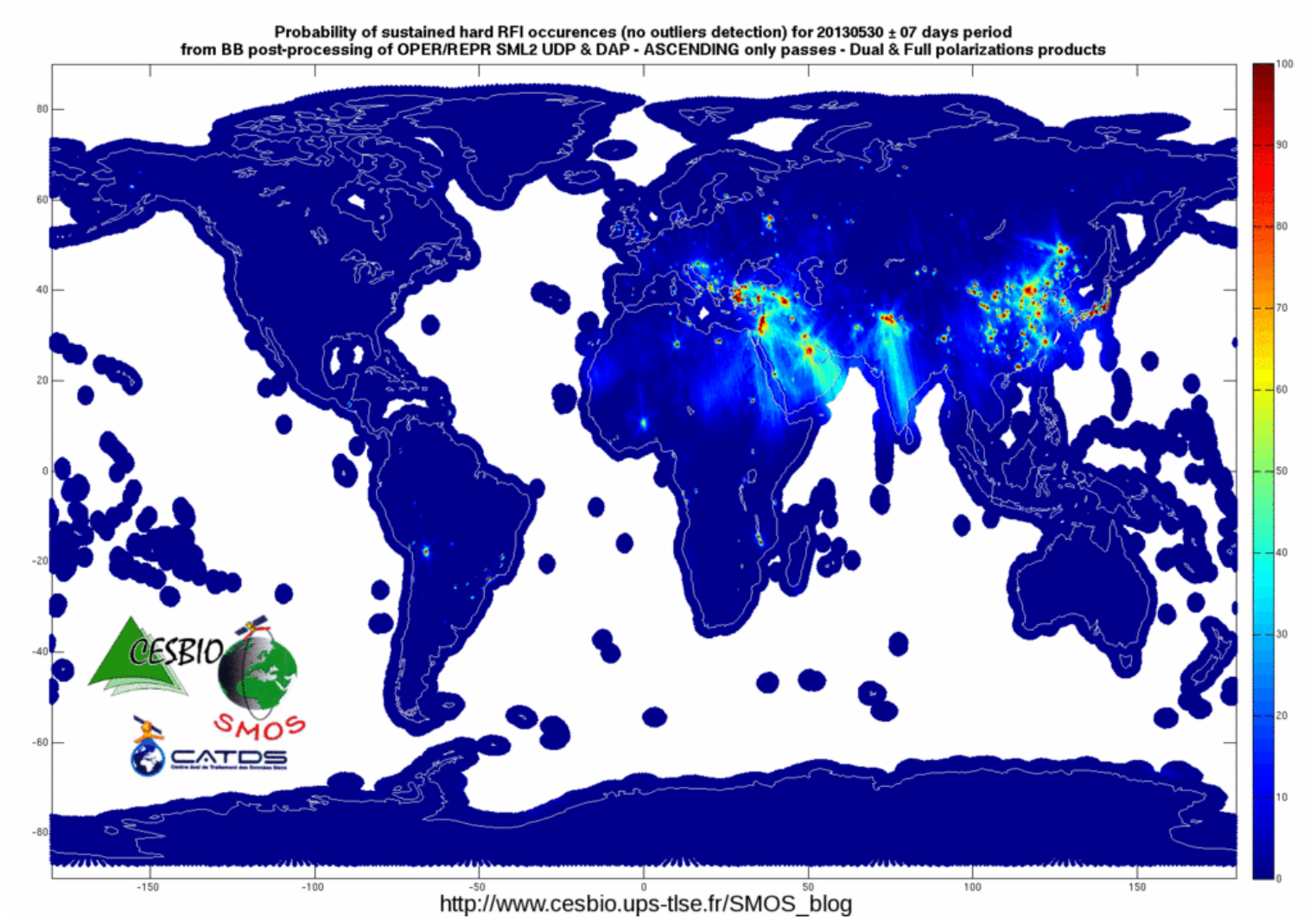
Preventing harmful interference

- One of the first and foremost aim of the ITU-R is **to prevent harmful interference** to occur:
  - ITU Constitution, Article 1, Nos.10, 11 and 12:
    - "To this end, the Union shall in particular:

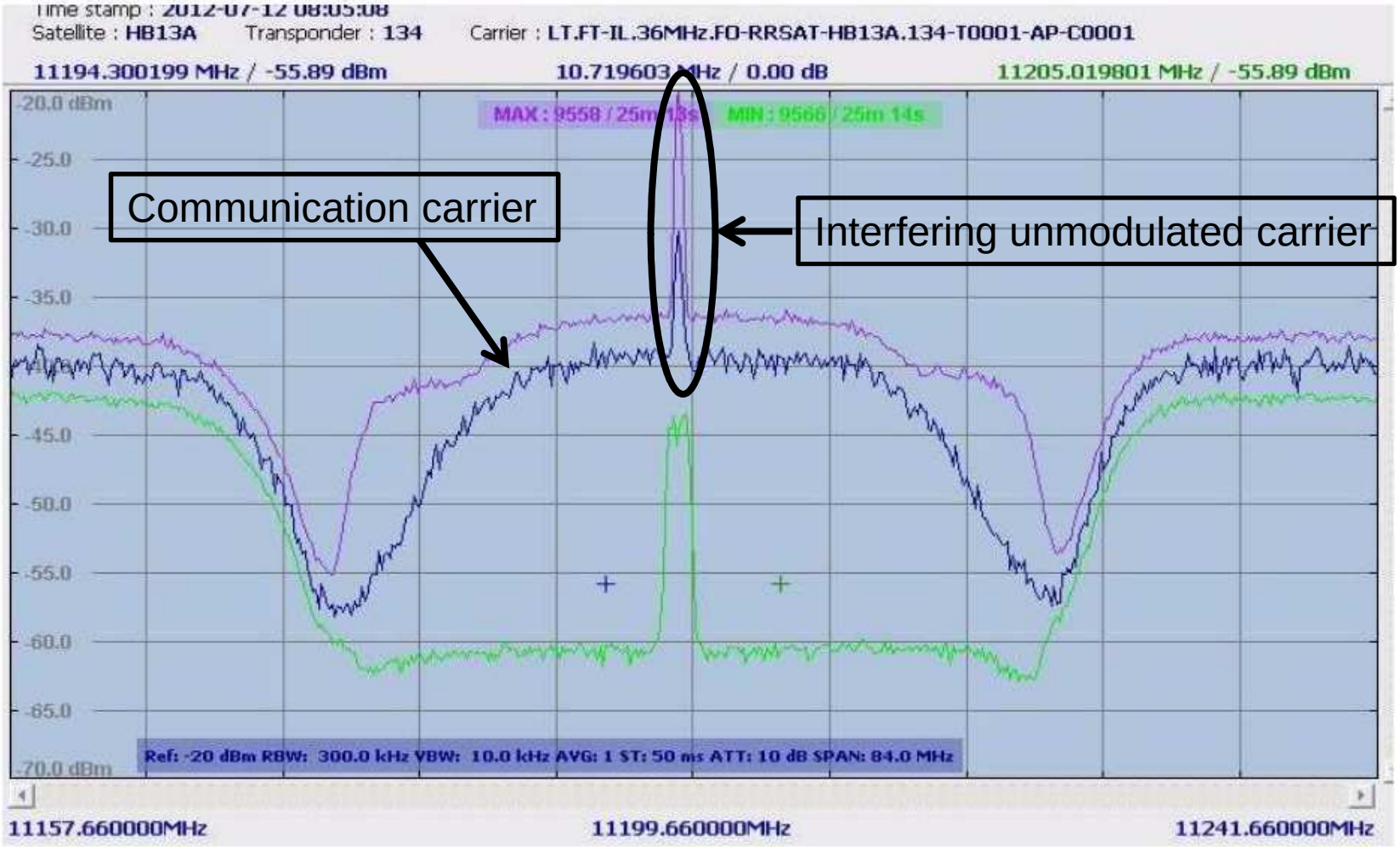
      a) effect allocation of bands of the radio-frequency spectrum, the allotment of radio frequencies and the registration of radiofrequency assignments and, for space services, of any associated orbital position in the geostationary-satellite orbit or of any associated characteristics of satellites in other orbits, **in order to avoid harmful interference** between radio stations of different countries;

      b) coordinate efforts **to eliminate harmful interference** between radio stations of different countries and to improve the use made of the radio-frequency spectrum for radiocommunication services and of the geostationary-satellite and other satellite orbits"
  - Preamble of the Radio Regulations, Nos. 0.4 and 0.8:
    - "0.4 All stations, whatever their purpose, must be established and operated in such a manner as **not to cause harmful interference** to the radio services or communications of other Members or of recognized operating agencies, or of other duly authorized operating agencies which carry on a radio service, and which operate in accordance with the provisions of these Regulations (No. 197 of the Constitution)."
    - "0.8 to assist in the **prevention and resolution of cases of harmful interference** between the radio services of different administrations"
- But the same provisions also emphasise the need **to resolve the cases of actual harmful interference** when they happen by eliminating the interference.

Harmful interference sometimes happens
Case 1: SMOS (EESS satellite – 1400-1427 MHz)



Harmful interference sometimes happens
Case 2: EUTELSAT HOT BIRD 13A (FSS satellite – Ku)



Types of interference

- **Unwanted emissions** may interfere with passive sensors (like SMOS)
  - Resolution 750 (Rev.WRC-12) provides unwanted emissions levels aimed at ensuring compatibility between the Earth exploration-satellite service (passive) and adjacent or nearby active services
- **In-band emissions** are also potential sources of interference to satellite systems:
  - Interference internal to the satellite network (equipment and cabling faults, poor quality transmission equipment, human error settings of polarisation and frequency or accessing at incorrect times).
    - Outside of the scope of the Radio Regulations (solved internally by satellite operators)
  - Interference external to the satellite system
    - **Adjacent satellite interference**: either errors (e.g. antenna mispointing) or lack of coordination (procedures of Articles 9 and 11 (and of Appendices 30, 30A and 30B) are designed to minimise the latter case).
    - **Unauthorized access to the satellite**: carriers (with content) are transmitted towards a satellite without any prior contract/authorisation is put in place with the satellite operator (e.g. piracy)
    - **Intentional jamming of satellite signals**: carriers (often unmodulated) are transmitted towards a satellite with the intent to prevent the current signals to be transmitted.

  → Article 15 of the Radio Regulations provides a goodwill-based mechanism for reporting and resolving cases of harmful interference.

Harmful interference and ITU procedures: what ANFR does today

- To be able to resolve cases of harmful interference, a **first step** is to locate their origin (geolocalisation).
  - Technical means of satellite geolocalisation exist (see next session).
  - Once a gross area has been initially determined through satellite geolocalisation, the precise location of the interferer can only be found with spectrum monitoring mobile units (trucks or helicopters).
- So the notifying administration of the interfered-with satellite sends a complaint of harmful interference to the administration on the territory of which the interfering earth station was geolocalised (**second step**).
  - When the process works, ANFR's experience shows that no response is generally provided BUT interference actually disappears.
- ITU procedures rely on the assumptions that all administrations
  - are able to control emissions originating from their territories,
  - will cooperate to resolve cases of interference.
- Intentional interference, or satellite jamming, is by nature challenging one or both of these assumptions.
  - It should not be however immediately concluded that the ITU process is unable to help in the resolution of the jamming issue.

Harmful interference and ITU procedures: what could be improved?

- Harmful interference affecting satellite network does not result from a lack of regulation but from a need for **<u>better enforcement</u>** of the existing provisions:
  - Unwanted emissions: studies have been done in ITU-R, results are available, a WRC Resolution (750) is contained in the Radio Regulations → let's implement them in designing new active systems or retrofitting existing ones !
  - Coordination under Article 9 is key to minimise adjacent satellite interference.
  - For other cases, ANFR will continue to systematically report each interference case that can be geolocalised.
- The ITU process could be improved if the BR would be able to perform measurements that would confirm or otherwise the technical elements of an interference claim.