Overview of CEPT compatibility studies between safety applications and other services

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Content of presentation

- **Introduction to CEPT/ECC**
- **Radio Regulations**
- **Examples of compatibility studies:**
  - **ECC Report 174**
  - **CEPT Report 42**
  - **ECC Report 128**

European Conference of Postal and Telecommunications Administrations - CEPT

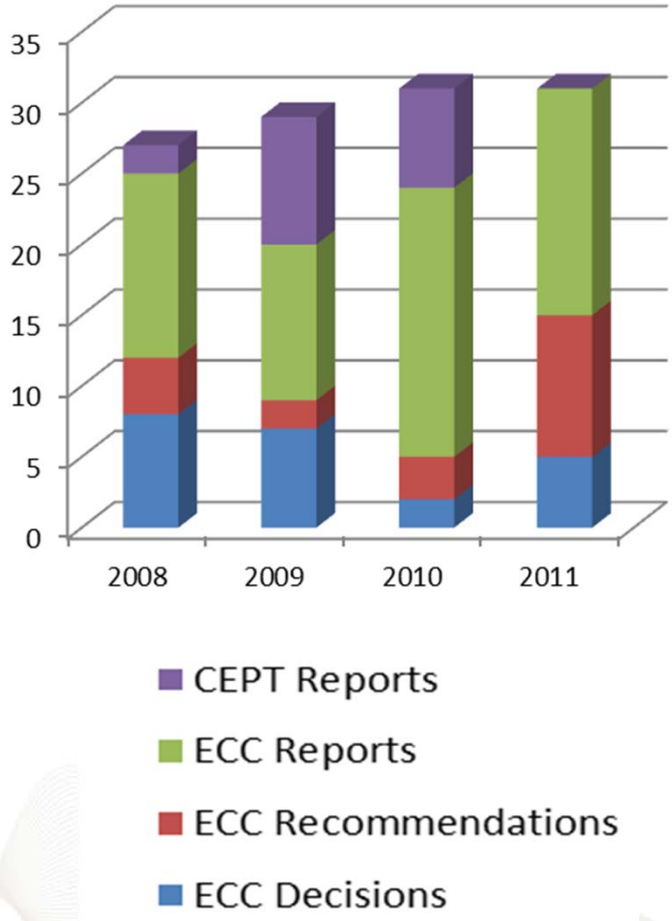
- CEPT established in 1959 by 19 countries (today we have 48 countries)
- CEPT's activities include:
  - Promote cooperation between Members
  - Contribute to creating a European dynamic market
  - Promote further European harmonisation of the radio spectrum and numbering
  - Ensure that the interests of industry, operators, users, consumers are counted in the European regulation
  - Cooperation with Partners (EU)

CEPT - Organisation

- **ECC**: Electronic Communications Committee – telecommunications harmonisation and European co-ordination and preparation for ITU-R meetings
- **Com-ITU**: Committee for ITU Policy – European co-ordination for ITU meetings
- **CERP**: European Committee for Postal Regulation – postal regulation, as well as European co-ordination and preparation for meetings of the Universal Postal Union (UPU)

ECC Deliverables

- ECC Reports
  - Result of studies by the ECC normally in support of a harmonisation measure
- CEPT Reports
  - Result of studies by the ECC in response to Mandates from the EC
- http://www.ecodocdb.dk



Radio Regulations

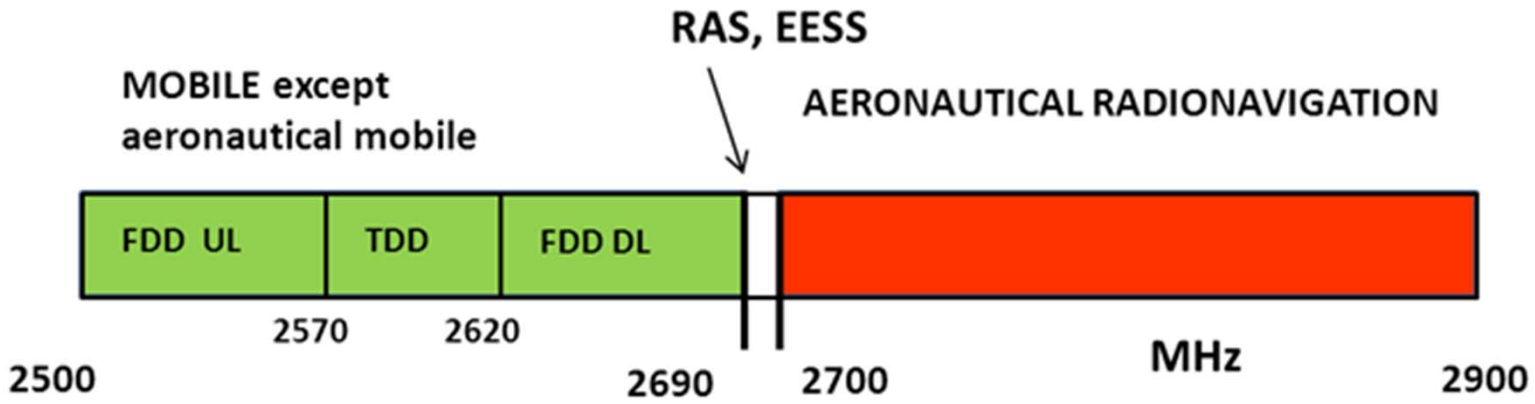
***Safety service**: Any radiocommunication service* used permanently or temporarily for the safeguarding of human life and property

Aeronautical, Radiolocation, Radionavigation services ...
may be safety services

Examples of compatibility studies

- **ECC Report 174** on compatibility between mobile and radar in S-band
- **CEPT Report 42** on compatibility between UMTS and existing and planned aeronautical systems above 960 MHz
- **ECC Report 128** on pseudolites

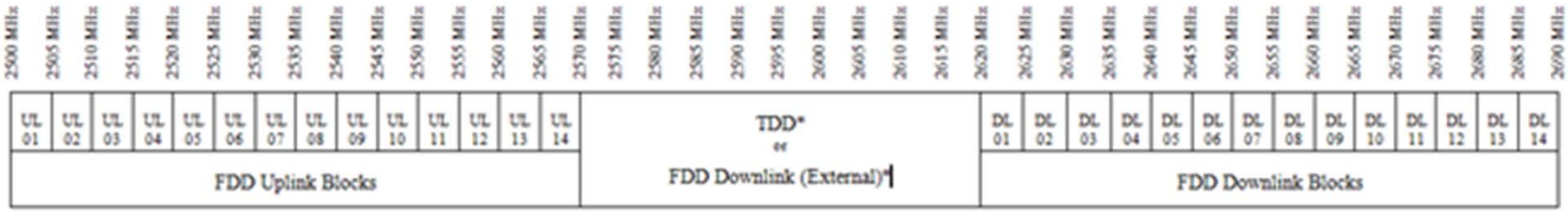
"Compatibility between the mobile service in the band 2500-2690 MHz and the radiodetermination service in the band 2700-2900 MHz"



Primary frequency allocations in the band 2500-2900 MHz

Usage of the bands 2500-2690 MHz (a) and 2700-2900 MHz (b)

a) Frequency arrangement on harmonised utilisation of spectrum for IMT-2000/ UMTS system:



b) The band 2700-2900 MHz is allocated on primary basis to Aeronautical Radionavigation, and restricted to ground-based radars (RR footnote 5.337). The weather radars are included by footnote RR 5.423. Radar characteristics:

Parameter	ATC and defense				Meteorology
	Type 1	Type 2	Type 3		Type 4
Category	Frequency hopping	2 to 4 frequencies			Single frequency
Pulse repetition rate, Hz	<300	~1000	825		250 - 1200 (See ITU-R M.1849[21])
Pulse duration, µs	20 and 100	1	1	100	0.8-2
Antenna rotation, rpm	6-12	12-15	15		See ITU-R M.1849[21]

Methodology

Following interference effects of potential interference have been considered:

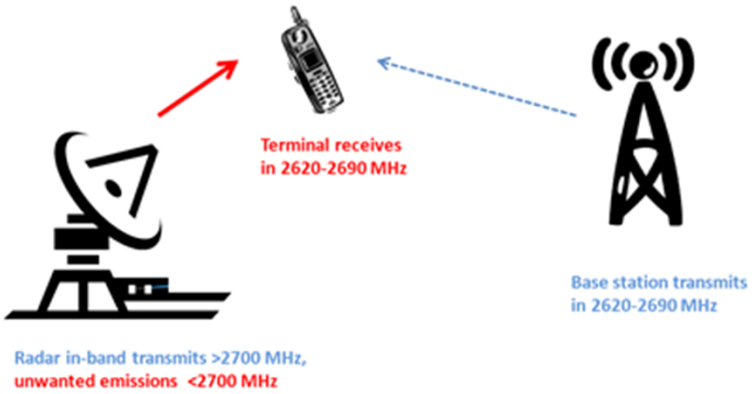
- **Blocking**: where a signal outside of the nominal receiver bandwidth causes the victim receiver to experience an increased noise level or go into compression, thus producing non-linear responses.
- **Unwanted emissions**: where the unwanted emissions (OOB and spurious) of the interfering transmitter fall into the receiving bandwidth of the victim receiver.

The worst case assumption is applied that the antennas of the radar and mobile stations are pointing directly to each other in azimuth (only the elevation patterns was considered)

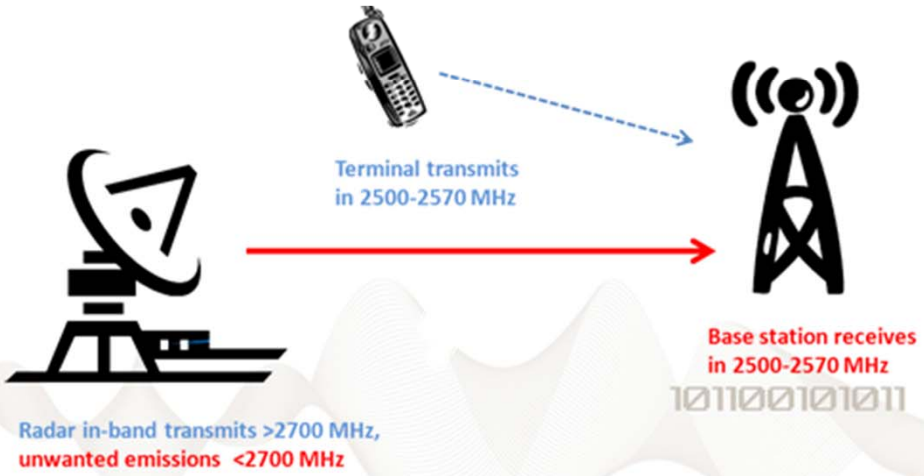
Compatibility scenarios (1)

Radar interferes Terminal of mobile service

LTE technical data: CEPT Report 40 and Report ITU-R M.2039



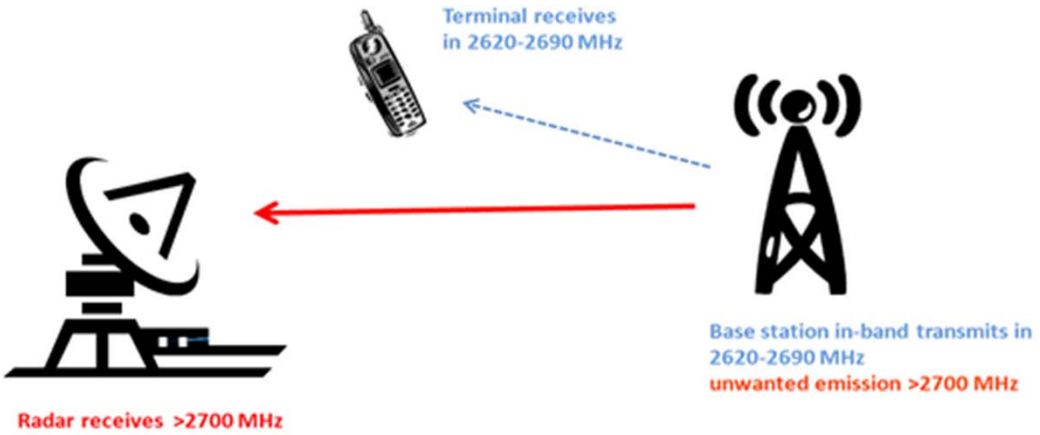
Radar interferes base station of mobile service



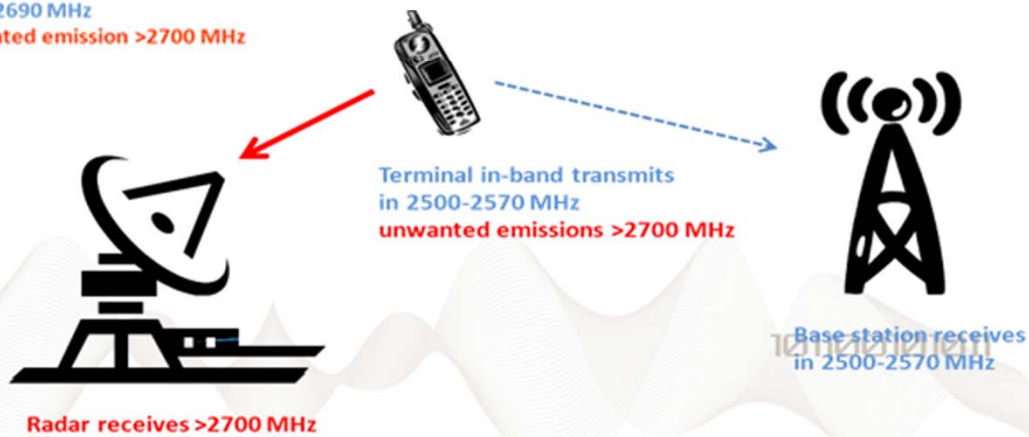
Compatibility scenarios (2)

Base station of mobile service interferes Radar

Radar protection level was taken from Rec. ITU-R M.1464-1



Terminal of mobile service interferes Radar



Mitigation Techniques

- Improvement of the receiver selectivity
- Reduce unwanted emissions of transmitters
- Reduce Power from the mobile service Base Station
- Consider site specific deployment
- Consider physical separation between radar and mobile service stations
- Consider frequency separation

CEPT Report 42 Compatibility between UMTS and existing and planned aeronautical systems above 960 MHz

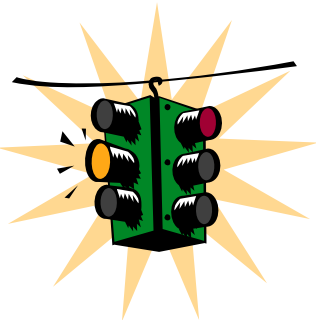
The Report was developed to:

- **Investigate compatibility between UMTS and adjacent band systems above 960 MHz;**
- **Review the risk of interference between UMTS and existing and planned aeronautical systems above 960 MHz, in order to enable the development of all systems below and above 960 MHz without taking a risk relating to aeronautical safety.**

Report focuses on the compatibility between UMTS 900 and the aeronautical systems in the band 960-1215/1164 MHz (existing: DME (Distance Measuring Equipment) and future: L-DACS (L-band Digital Aeronautical Communication System)).

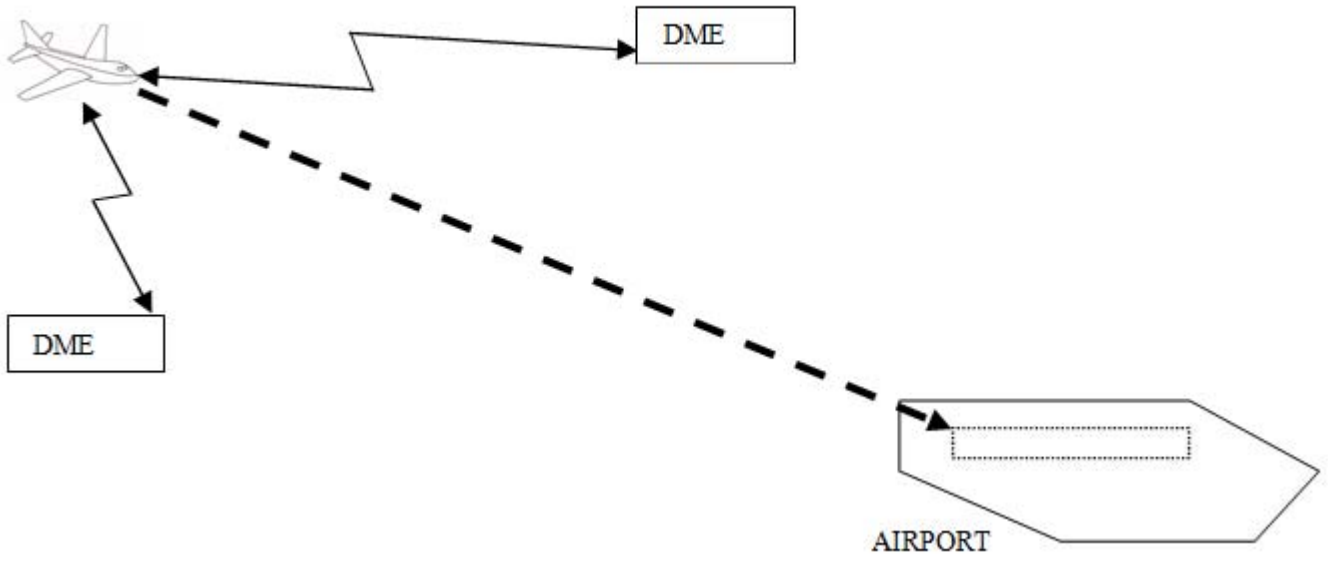
Scenarios

- UMTS base stations → DME (airborne receiver)
- L-DACS 2 airborne transmitter → UMTS UE
- L-DACS 2 ground transmitter → UMTS UE
- UMTS BS → L-DACS 2 airborne receiver
- UMTS BS → L-DACS 2 ground receiver



Low altitude scenario

The interference from the BS of the MS is higher at low altitudes. but the signal, coming from the ground DME transmitter to the airborne DME receiver is higher. Therefore different criterion for the low altitudes below 3000 m have been considered.



Results of the studies (1)

Report considered two different types of LDACS: FDD option - L-DACS 1, and a TDD option, L-DACS 2.

- L-DACS 2 airborne transmitters will not cause any interference to UMTS terminals, when the distance between the aircraft and an outdoor UMTS terminal is greater than 8.6 km, with a L-DACS 2 transmitting frequency of 960,1 MHz. For a L-DACS 2 transmitting frequency of 962,6 MHz, this distance becomes 6.5 km. The limiting factor is currently the selectivity of the UMTS UE.
- L-DACS 2 (operating at 960,1 MHz) ground stations could cause desensitization to UMTS terminals at a distance up to 17.5 km depending on the propagation characteristics and L-DACS 2 ground station antenna height.
- L-DACS 2 (operating at 962,6 MHz) this distance becomes 14.7 km. The limiting factor is currently the selectivity of the UMTS UE.

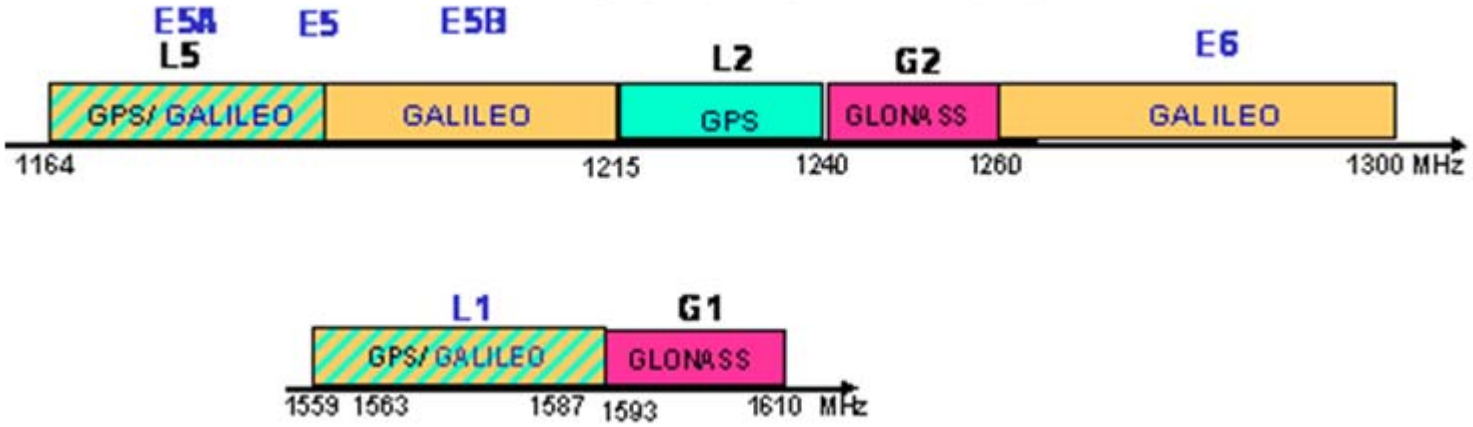
Results of the studies (2)

- No interference from UMTS base stations to DME airborne receivers is expected above 972 MHz. Below 972 MHz some interference, in the order of 3 to 4 dB, may occur at low altitudes for the mixed-urban case.
- UMTS base station transmissions may cause interference to L-DACS ground stations, if these stations are deployed in the lowest part of the band, and if the L-DACS TDD option is selected, in the order of 17 – 25 dB, depending on the distance from the ground station to the nearest base station. If the FDD (LDACS-1) option is chosen and the associated ground stations receive at frequencies far above 960 MHz, then the interference from UMTS base stations to these ground stations would be alleviated.

ECC Report 128 “Compatibility studies between pseudolites and services in the frequency bands 1164–1215, 1215–1300 and 1559–1610 MHz”

Pseudolites are low power devices that operate co-frequency with the provision of RNSS signals from satellites in space (SIS).

The primary allocations to RNSS (space-to-Earth) are in the following bands:



Definition

Pseudolites (Pseudo satellites, PLs) are ground based radio transmitters that transmit a RNSS-like navigation signal. It requires users to have modified RNSS-receivers to receive these signals. It is expected that these RNSS receivers have minor changes compared to today's RNSS receivers and it is therefore possible to extend the satellite navigation technology to difficult environments like indoors with high accuracy and cost effectiveness.

Pseudolites are intended to be complementary to RNSS systems.

It is assumed that following operational requirements have been established for PLs:

- All PLs in an area are controlled by the same entity.
- The PLs coverage for each scenario is limited to a maximum set radius
- 1 to 6 PLs might be seen at any one location
- The signals must be positively monitored.

- There are several other Radio Services and Radio Navigation Satellite Service itself that could be affected because of uncontrolled use of Pseudolites. Therefore it was decided to conduct compatibility studies between Pseudolites and services in the frequency bands 1164-1215, 1215-1300 and 1559-1610 MHz.

- ECC Report 128 studied the above mentioned co-existence for both indoor and outdoor pseudolites, pulsed and continued waves cases have been considered.

Thanks for your attention

Questions?