BELGIAN INSTITUTE FOR POSTAL SERVICES AND TELECOMMUNICATIONS

DECISION OF THE BIPT COUCIL OF 3 OCTOBER 2011 ON THE COEXISTENCE BETWEEN 4G OPERATORS IN THE 2500-2690 MHz BAND AND RADARS IN THE 2700-2900 MHz BAND

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1. Introduction

1.1. Legal framework

Article 13 of the Act of 13 June 2005 on electronic communications lays down:

« Art. 13. The Institute is tasked with:

…

3° national and international coordination of radio frequencies;

… »

As the coexistence of 4G operators in the 2500-2690 MHz band and aeronautical radars poses a problem of national coordination, this decision is taken by virtue of Article 13 of the Act of 13 June 2005.

1.2. Purpose of the decision

The purpose of this decision is to ensure coexistence between aeronautical radars of Belgocontrol and of the Ministry of Defense in the 2700-2900 MHz frequency band on the one hand and the use of the 2500-2690 MHz band by 4G operators[1] on the other.

1.3. Public consultation

The public consultation of 1 July 2011 on the coexistence between 4G operators in the 2500-2690 MHz band and radars in the 2700-2900 MHz band lasted until 5 August 2011.

The following stakeholders have sent their contribution:

- Belgocontrol and the Ministry of Defense;
- KPN GB;
- Telenet;
- Belgacom;
- Mobistar.

The contributions received can be seen on the website http://www.auction2011.be. Annex 3 summarizes the points raised by the respondents as well as the answers given by BIPT.

1.4. Cooperation agreement

BIPT has sent a draft decision to the community regulatory bodies in accordance with the procedure described in sections 1 and 2 of Article 3 of the cooperation agreement of 17 November 2006:

"Art. 3. Draft decisions of a regulatory body relating to electronic communications networks are sent by this body to the other regulatory bodies listed in Article 2, 2°, of this cooperation agreement.

The regulatory bodies consulted make their comments to the regulatory body that has sent the draft decision, within 14 calendar days." (free translation)

BIPT has received a response from the VRM and the Medienrat which have no objection against the decision. No response was received from the CSA.

[1] A 4G operator is an operator holding user rights for radio frequencies in the 2500-2690 MHz band.

2. Use of the 2500-2690 MHz band by 4G operators

2.1. Decision 2008/477/EC

Decision 2008/477/CE[2] aims at harmonizing the conditions of provision and efficient use of the 2500-2690 MHz band for terrestrial systems capable of providing electronic communications services in the Community.

Decision 2008/477/EC obliges Member States to make the 2500-2690 MHz band available for terrestrial systems capable of providing electronic communications services in accordance with the technical parameters set in the annex to the decision.

Those parameters set in the annex to Decision 2008/477/EC, called "Block Edge Mask" (BEM) have to ensure coexistence between neighboring networks. However, those parameters do not ensure coexistence between terrestrial systems capable of providing electronic communications services in the 2500-2690 MHz band and systems in adjacent bands.

Yet, Decision 2008/477/EC obliges[3] Member States to ensure that terrestrial systems capable of providing electronic communications services in the 2500-2690 MHz band give appropriate protection to systems in adjacent bands.

2.2. 4G Royal Decree

The 4G Royal Decree[4] lays down the terms for obtaining and exercising the user rights for radio frequencies in the 2500-2690 MHz band, used for electronic communications services.

The 4G Royal Decree stipulates that the user rights are granted by BIPT by means of an auction. On the website http://www.auction2011.be further information is available on the auctions held in 2011.

The 2500-2570 MHz (uplink) and 2620-2690 MHz (downlink) bands have to be used by FDD systems, while the 2575-2620 MHz band has to be used by TDD systems.

The 4G Royal Decree takes over the BEMs laid down in the annex to Decision 2008/477/EC in order to ensure coexistence between the various 4G operators.

3. Use of the 2700-2900 MHz band by radars

In the Radio Regulations of the International Telecommunication Union the 2700-2900 MHz frequency band is allocated to aeronautical radionavigation: the use of the 2700-2900 MHz band is restricted to ground radars and to associated airborne transponders (RR 5.337).

In Belgium, Belgocontrol and the Ministry of Defense use primary approach radars, in the 2700-2900 MHz frequency band, installed in airports.

Belgocontrol uses the primary approach radars in Charleroi, Liège, Ostend and Zaventem.

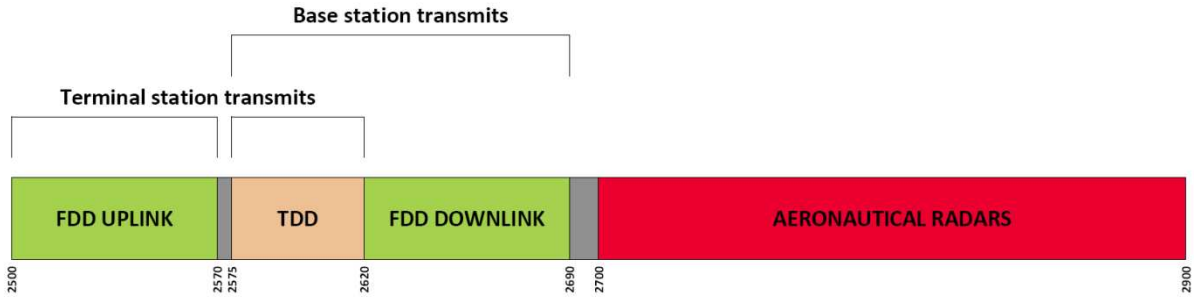
The Ministry of Defense uses primary approach radars in Beauvechain, Florennes and Kleine-Brogel.

[2] Commision Decision of 13 June 2008 on the harmonisation of the 2500-2690 MHz frequency band for terrestrial systems capable of providing electronic communications services in the Community
[3] Article 2, 3
[4] Royal Decree of 22 December 2010 on radio access in the 2500-2690 MHz frequency band

4. Coexistence between 4G networks and aeronautical radars

4.1. Overview of the situation

The figure below shows how the radio spectrum between 2500 and 2900 MHz is used in Belgium.



The 2570-2575 MHz guard band between the FDD systems (uplink) and the TDD systems, should remain unused.

The 2690-2700 MHz band is allocated to radio astronomy but it is currently not used in Belgium. This frequency band can be considered to be a guard band between the systems rolled out by the 4G operators and aeronautical radars. By contrast, the 2690-2700 MHz band is used for radio astronomy in the Netherlands.

4.2. Interference in radars caused by 4G networks

There are two types of interference in aeronautical radars caused by the 4G networks[5] to take account of:

4.2.1. Spurious emissions

This kind of interference results from radiation on frequencies situated outside the necessary bandwidth of 4G emissions, the level of which can be reduced without affecting the quality of the link. Spurious emissions produced in the receiving band of aeronautical radars could affect the operation of the radars.

A distinction can be made between:

- spurious emissions generated by a single station;
- spurious emissions resulting from intermodulation products, generated at the level of a station by various co-located stations.

In theory this type of interference can be produced by base stations as well as terminal equipment. In practice, however, this decision only concerns the base stations. BIPT cannot impose restrictions on terminal equipment considering free movement with the European Union. Moreover, the interference coming from terminal equipment is less important compared to the one coming from the base stations because of:

- the much higher propagation loss;
- the higher frequency separation;
- the much weaker radiated power level.

This type of interference can be solved by adding filters at the level of the basis stations which the interference originates from.

[5] A 4G network is a radio communications network rolled out by a 4G operator.

4.2.2. "Blocking" and intermodulation at the level of the radar receiver

This kind of interference results from radiation on frequencies situated within the necessary bandwidth of the 4G emissions, the level of which cannot be reduced without affecting the quality of the link. The lack of selectivity of the aeronautical radars' receivers is the main cause of this type of interference.

Two distinct phenomena may affect the operation of the radars:

- an overload of the LNA[6];
- a third order intermodulation product in the radar band.

In theory this type of interference can be produced by base stations as well as terminal equipment. In practice, however, for the same reasons as those mentioned in section 4.2.1, this decision only concerns the base stations.

This type of interference can be solved:

- by adding filters at the level of the radars in order to improve selectivity;
- by changing the radar's frequency in order to enhance the frequency separation.

4.2.3. Study made by Intersoft Electronics

Intersoft Electronics has carried out a study on behalf of BIPT in order to evaluate the degradation of Belgian aeronautical radar performance in the 2700-2900 MHz band due to interference from 4G communication technologies and to make recommendations on the measures to take. The public version of the report about this study is available at http://www.auction2011.be.

4.3. Interference in 4G networks caused by radars

In theory both types of interference, unwanted emissions[7] and "blocking", in 4G networks caused by radars may occur: the radars may interfere both with base stations and terminal equipment.

Up to now, no studies have been finalized to evaluate the degradation of 4G networks due to aeronautical radars.

4.4. Solutions recommended by BIPT

4.4.1. Protection of radars

4G operators should ensure that spurious emissions from their base stations do not generate a power level that is too high at the level of the various radars that need to be protected. Indeed problems of spurious emissions cannot be solved at radar level. The maximum power level and the way to calculate it are defined in this decision. The maximum level of spurious emissions corresponds with a power level of -122 dBm/MHz at the LNA input: the Intersoft Electronics study shows that those levels are sufficient for all types of radars installed in Belgium.

In addition, BIPT intends to propose at the international level, modifications to the harmonized standards in order to limit spurious emissions of base stations and terminal equipment.

As mentioned in section 4.2.2, the problems of "blocking" and intermodulation at the level of the radar receiver can be solved:

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[6] Low Noise Amplifier

[7] Unwanted emissions (number 1.146 of the ITU Radio Regulations) include out-of-band emissions (number 1.144) and spurious emissions (number 1.145).

- by adding filters at the level of the radars in order to improve selectivity;
- by changing the radar's frequency in order to enhance the frequency separation.

Contrary to problems of spurious emissions, « blocking » problems can be solved at radar level. Modifications shall be made at the level of aeronautical radars in order for the emissions in the 2575-2690 MHz band coming from 4G base stations situated at more than one km from the radar, not to affect the radar's operation. Base stations situated at less than 1 km are not authorized, unless it was certain that these stations would not affect the radar's operation: therefore, these base stations will have to be coordinated on an individual basis. Normally, a base station that affects less the radar than a base station situated at one km, with a line of sight to the radar and emitting at the maximum power authorized in the direction of that radar, should not be refused.

A period of adaptation is necessary however in order for Belgocontrol and the Ministry of Defense to make the necessary modifications to their aeronautical radars. During that period of adaptation, which will end at the latest on1 July 2013, additional limitations will be imposed on the 4G operators to compensate for the lack of selectivity of the aeronautical radars.

Until 1 July 2013, at the latest, the 4G operators have to ensure that radiation from their base stations on frequencies within the 2575-2690 MHz band do not generate a power level that is too high at the level of the various radars that need to be protected. The maximum power level and the way to calculate it are defined in this decision. The maximum power levels have been calculated based on the Intersoft Electronics study.

The following hypotheses are taken into account:

- Maximum antenna gain of the radars: 34 dBi
- Loss at radar level: 1dB
- The signals coming from the 4G base stations are seen from the radar antenna with a horizontal elevation and a discrimination of the corresponding radar antenna of 6 db
- 6 dB margin in order to take account of the multi-operator/site effects, for radiation within the 2575-2690 MHz band

4.4.2. Protection of the 4G operators

The aeronautical radars should at least observe the international standards concerning unwanted emissions generated in the 2500-2690 MHz band.

There are two international reference recommendations regarding the limits of spurious emissions:

- CEPT recommendation REC 74/01;
- ITU recommendation ITU-R SM.329.

There are two international reference recommendations as well regarding the limits of out-of-band emissions:

- CEPT recommendation ECC/REC/(02)05;
- ITU recommendation ITU-R SM.1541.

CEPT and ITU recommendations give the same maximum tolerance levels of unwanted emissions for radars.

A period of adaptation is necessary however in order for Belgocontrol and the Ministry of Defense to make the necessary modifications to their aeronautical radars.

As from 1 July 2013, at the latest, the radars' unwanted emissions generated in the 2500-2690 MHz band will have to be below the maximum tolerance levels mentioned in the recommendations.

The coexistence problem between 4G networks and aeronautical radars is currently being studied within the CEPT. If these surveys should require a revision of the recommendations, these modifications should of course be taken into account.

5. Decision

1. Until 1 July 2013 total radiation from a 4G operator's base stations situated at the same antenna site[8] generated in the 2575-2690 MHz band has to be such that:

   a) $W + 30 - L < PL$

   b) $W_{SD}(f) + 30 - L < IML(f)$

   for each radar, where:

   – N: number of transmitters used by the 4G operator at the site

   – $W = 10 \times \log \sum_{C=1}^{N} 10^{\frac{P_C(\varphi,\varepsilon)}{10}}$

   – $W_{SD} = 10 \times \log \sum_{C=1}^{N} 10^{\frac{S_C(\varphi,\varepsilon)}{10}}$

   – φ: the radar's azimuth seen from the base station

   – ε: the radar's elevation angle seen from the base station

   – $P_C(\varphi,\varepsilon)$: maximum EIRP of transmitter C in azimuth φ and in elevation angle ε, in dBW

   – $S_C(\varphi,\varepsilon)$: spectral density of maximum EIRP of transmitter C in azimuth φ and in elevation angle ε, in dBW/MHz

   – L: propagation loss in dB, between the base station and the radar, calculated on the basis of recommendation ITU-R P.452 with the following parameters:

     - ΔN = 45 N-units/km
     - N0 = 325 N-units
     - P = 1013 hPa
     - T = 15°C
     - p = 20%

     If a 4G operator thinks that in a specific case, the real loss exceeds the loss calculated, he can ask BIPT to examine that case.

   – PL: level of protection required for the power flux density at the level of the radar in dBW/m^2

   – $PL = 10 \times \log(pl)$

   – $pl = \sum_{C=1}^{N} \left\{ 10^{\frac{P_C(\varphi,\varepsilon)-W}{10}} \frac{1}{B_C} \int_{f_C-B_C/2}^{f_C+B_C/2} plc(f)df \right\}$

   – f_C: centre frequency of the signal generated by transmitter C

   – B_C: bandwidth of the signal generated by transmitter C

   – $PLC = 10 \times \log(plc)$

[8] Article 2, 54°, of the Act of 13 June 2005 on electronic communications

- PLC(f): protection level curve for the power flux density at the level of the radar based on the frequency in dBW/m^2
- IML(f): the spectral density limit of power flux density at the level of the radar in $dBW/m^2/MHz$

2. As soon as the necessary modifications have been made at radar level and, at the latest, from 1 July 2013, the constraints imposed in point 1, no longer apply to this radar.
3. All 4G base stations situated at less than 1 km from a radar have to be coordinated on an individual basis, at BIPT.
4. Total spurious emissions from the 4G operator's base stations situated at the same antenna site generated in the width of the band occupied[9] by the radar has to be such that:

   $U + 30 - L < SEL$

   for each radar, where:

   - $U = 10 \times \log \sum_{C=1}^{N} 10^{\frac{S_C(\varphi,\varepsilon)}{10}}$
   - $S_C(\varphi,\varepsilon)$: spectral density of maximum EIRP of transmitter C radiated in the 2700-2900 MHz band, in azimuth φ and in elevation angle ε, in dBW/MHz
   - SEL: spurious emissions limit (spectral density of power flux density) at the level of the radar. This limit is set at -149 $dBW/m^2/MHz$.

5. The technical characteristics indicated in points 1 to 4 are given for each radar to be protected, in annex 1 to this decision.
6. All 4G base stations, except for the stations situated inside of a building at more than 2,5 km of all radars and of which the maximum PIRE is below 30 dBm, have to be notified to BIPT at least two months before the station is put into operation. The format to be used to coordinate or notify a station to BIPT is indicated in annex 2 of this decision. If BIPT should find a problem of compatibility with the radars, it will inform the operator concerned before the date planned for putting it into operation, and impose appropriate measures.
7. If despite the observance of the constraints imposed in points 1 to 4, a radar experiences interference, BIPT will try, in cooperation with all the stakeholders involved, to find the cause of interference and will take all appropriate measures to put an end to it.
8. From 1 July 2013 onwards, at the latest, for all aeronautical radars, unwanted emissions generated in the 2500-2690 MHz band will have to comply with recommendations ITU-R SM.329 and ITU-R SM.1541 of ITU.

6. Appeal procedures

In accordance with the Act of 17 January 2003 on the appeals and the settling of lawsuits arising from the Act of 17 January 2003 on the status of the regulator of the Belgian postal and telecommunications sectors you have the possibility to lodge an appeal against this decision before the Brussels Court of Appeal, Place Poelaert 1, B-1000 Brussels. The higher appeal shall be lodged, on penalty of nullity pronounced automatically, by filing a signed request with the court registry of the Brussels Court of Appeal within a period of sixty days starting from the notification of the decision, or in the absence of such notification, from the publication of the decision, or in the absence of such publication, from the inspection of the decision.

The request shall be filed with the court registry of the Court of Appeal in as many copies as there are parties involved. On penalty of nullity the request shall contain all indications referred

[9] Number 1.153 of the ITU Radio Regulations

to in Article, 2, § 2 of the Act of 17 January 2003 on the appeals and the settling of lawsuits following the Act of 17 January 2003 on the status of the regulator of the Belgian postal and telecommunications sectors.

Axel Desmedt Member of the Council	Charles Cuvelliez Member of the Council
Catherine Rutten Member of the Council	Luc Hindryckx Chairman of the Council

ANNEX 1
TECHNICAL CHARACTERISTICS OF THE RADARS TO BE PROTECTED

Upon request annex 1 is available at BIPT.

ANNEX 2

FORMAT TO BE USED FOR COORDINATION OR NOTIFICATION OF A BASE STATION

- One line per base station
- Use a decimal point [.] as separator
- List of fields used

1	Name of the site
2	Longitude in decimal degrees (WGS84)
3	Latitude in decimal degrees (WGS84)
4	Height of the transmitting antenna
5	Centre frequency of the signal (MHz)
6	Channel bandwidth (MHz)
7	Maximum EIRP in the main azimuth and elevation angles (dBW)
8-43	Attenuation in 36 azimuths[16] (0°, 10°, 20°, …, 340°, 350°) in comparison with the main azimuth (dB)
44-64	Attenuation in 21 elevation angles[17] (-10°, -9°, -8°, …, 9°, 10°) in comparison with the main elevation angle (dB)
65-105	Spectral density of maximum EIRP (spurious emissions) in the main azimuth and elevation angles for 41 frequencies (2700 MHz, 2705 MHz, 2710 MHz, …, 2895 MHz, 2900 MHz)
106	Planned date of putting into operation (DD/MM/YYYY)

[16] 0° = NORTH ; 90° = EAST ; 180° = SOUTH ; 270° = WEST

[17] 0° = HORIZON ; -90° = TO THE FLOOR ; 90° = TO THE TOP

ANNEX 3
SUMMARY OF THE CONTRIBUTIONS RECEIVED

A3.1. Belgacom

Points raised by Belgacom	BIPT answers
Enormous impact on base stations - before July 2013: 30 to 50 km; - after July 2013: 30 to 40 km.	BIPT is aware of the fact that the impact on the roll-out of the 4G systems is not insignificant. However the distances mentioned seem rather pessimist and could be considerably reduced by taking into account the following elements: - the modification of the spurious emissions of the base stations of a 4G operator by modifying the harmonised standard and/or by placing filters at the level of base stations; -changing the frequency of the radar in Zaventem beyond 2715 MHz; -the use of a mechanical and/or electric tilt on base stations. See also the Decision of the BIPT Council of 3 October 2011 on the start of the period of validity of the user rights in the 2500-2690 MHz frequency band (4G licence) for the provision of electronic communications services on the Belgian territory.
The wording of point 5.6 of the draft decision does not comply with the proportionality principle.	Point 5.6 of the decision draft (point 5.7 of the final decision) has been modified.
Point 5.7 of the draft decision: Belgacom considers that BIPT will intervene in case of non-compliance with the conditions imposed on radars after July 2013.	BIPT will take all possible legal measures to ensure the execution of the decision.

A3.2. Mobistar

A3.2.1. General comments

Points raised by Mobistar	BIPT answers
The survey was conducted by Intersoft Electronics, an organization, which according to Mobistar, is not an independent company.	The contract was assigned to Intersoft Electronics following a European bidding process, in accordance with the specifications. Intersoft Electronics is internationally known in radar expertise and is independent from radar operators.
Decision 2008/477/EC regulates compatibility with the systems in adjacent bands.	It is not right. Decision 2008/477/EC does not handle over sharing conditions with other applications.
Radar operators are the only one responsible.	One can consider that radar operators are responsible for the lack of frequency selectivity of their radars. However is it wise to risk having 4G operators interfering with radars and therefore compromising aviation safety? BIPT decided to give a period of adjustment to radar operators. Moreover the problem cannot be solved by radar operators on their own.
Mobistar finds it regrettable that only few attention is given to 4G networks jammed by radars in the decision. Mobistar request BIPT to conduct an additional survey.	The issue of 4G networks is addressed in a report from the CEPT, which is currently being drafted. However BIPT considers that potential 4G operators are by far the most able to study the impact of radars on their future network.
BIPT must add the spectrum mask of radars. This information should be communicated some time before the auction.	BIPT will provide potential 4G operators with all the information on the radars in its possession.

A3.2.2. Detailed comments

Points raised by Mobistar	BIPT answers
Mobistar is surprised to see that the value of -122 dBm/MHz is based on the measurements of only 3 out of the 8 radars in Belgium.	There are only 3 types of radars in Belgium. The 5 other radars operational in Belgium are of the same type than the 3 radars measured. Results are therefore representative.

Points raised by Mobistar	BIPT answers
Mobistar has doubts as to the proposal of adaptation of the standard: - interference mainly comes from base stations - the modification of the harmonized standard is a long and tedious process.	BIPT will try to have the harmonized standard adapted via the appropriate procedures. BIPT considers that the current equipment achieves better practical results as regards spurious emissions than -30 dBm/MHz. If the harmonized standard is not adapted, the necessary measures will have to be taken at international level by 4G operators in accordance with point 5.4 of the decision.
Mobistar proposes that BIPT guarantees that radar operators are compliant by July 2013.	BIPT will take all possible legal measures to ensure the execution of the decision.
The simulations of Mobistar show that more than a third of the network will suffer from the inconvenience of point 5.1 of the decision. The viability of a 18 month roll-out is called into question.	See the Decision of the BIPT Council of 3 October 2011 on the start of the period of validity of the user rights in the 2500-2690 MHz frequency band (4G licence) for the provision of electronic communications services on the Belgian territory.
Mobistar proposes that the provision of point 5.1 is no longer applicable when the modifications will have really been brought to the radar.	BIPT agrees with this proposal.
Mobistar proposes that 4G operators do not support filter cost to limit spurious emissions.	BIPT disagrees with this proposal. Spurious emissions of 4G systems in the band used by radars cannot interfere with them.
Point 5.4 of the draft decision: Mobistar considers that no modification is needed if the list in annex1 is completed by a new radar.	The case of a new radar is not handled by this decision and should require a modification to the decision. However the cost necessary for the protection of this new radar should not be borne by the 4G operators.
Point 5.5 of the draft decision: No notification necessary for the LTE systems in other bands	The decision only concerns band 2500-2690 MHz.
Is notification necessary for the stations situated inside of a building?	Notification will not be necessary for the stations situated inside of a building at a distance of more than 2.5 km from all radars and of which the maximum EIRP is below 30 dBm.
After July 2013, proposal to make a notification only for the external stations within a range to be determined around radars.	It would be opted for a distance of protection of several dozens of km and in any case most of the base stations should be notified.
BIPT must reply to the notification of presence or not of a problem within one month after its submission.	BIPT agrees with this proposal. Point 5.5 of the decision draft (point 5.6 of the final decision) has been modified.
The level of spurious emissions is not part of the data required.	BIPT agrees with this proposal. Annex 1 has been modified.

Points raised by Mobistar	BIPT answers
Mobistar proposes a clear, detailed and quick procedure in case of degradation of the radar caused by interference, taking into account the responsibility of the radar operator and 4G operator.	If the modifications required are made at the level of the radars by 1 July 2013 and if the 4G operators meet the obligations imposed in the decision, the risk of interference is very weak. However if a radar is jammed, BIPT will try, in cooperation with all the stakeholders involved, to find the cause of interference and will take all appropriate measures to put an end to it. On the other hand BIPT is still competent to take any measure deemed useful and legal in accordance with Article 15 of the Act of 13 June 2005 on electronic communications and Article 53 of the Royal Decree of 18 December 2009 on private radio communications and user rights for fixed networks and trunk networks.
Mobistar proposes that radars are compliant with Recommendation of ITU R SM329 from 1 July 2013 onwards.	This is foreseen by the decision.

A3.3. KPN GB

Points raised by KPN GB	BIPT answers
The notification obligation 2 months before the putting into service is disproprotionate and should possibly be limited to a range of 5 km around each radar.	BIPT does not consider disproportionate the obligation of a simple notification of base stations to avoid possible problems of aviation safety.
BIPT only must be able to take measures for jammed radars.	Point 5.6 of the decision draft (point 5.7 of the final decision) has been modified.
Remedies can only be imposed if the radar complies with Recommendation CEPT 74/01 and ITU-R SM.329.	BIPT agrees with this proposal, unless it is proved that the interference comes from spurious emissions from a base station.

A3.4. Telenet

Points raised by Telenet	BIPT answers
Transponders in aircrafts have not been taken into account.	There are no transponder in the 2700-2900 MHz frequency band.
It is not necessary to have additional filters at the height of the base stations to limit spurious emissions because of the electric and mechanical tilt, mismatch loss, side lobe reduction, etc.	The effects mentioned do reduce the additional necessary filtering. Calculations should however prove what additional filtering degree is required.

Points raised by Telenet	BIPT answers
Are the recommendations mentioned in Section 4.4.2 sufficient to avoid interference on 4G networks?	Up to now no other measures are recommended to protect 4G networks.
Point 5.1 of the draft decision: Wrong reference to the Act of 13 June 2005. It should be Article 2,54 instead of Article 2,52.	BIPT agrees with this proposal.
Point 5.3 of the draft decision: For the EIRP calculation, the tilt and antenna radiation pattern should be taken into account.	BIPT agrees with this proposal.
Point 5.5 of the draft decision: The 2-month period is too short, notification can be done at the same time as the urban planning permit submission.	The decision lays down that notification should be done at least two months before the station is put into operation; therefore, nothing prevents the 4G operator to notify at the same time as the urban planning permit submission.
The concept of "problem of compatibility" should be clarified.	By « problem of compatibility » we mean a situation where the limitations imposed by the decision are not complied with.
How will the interference coming from the 2G and 3G networks will be observed?	No compatibility problem between 2G and 3G networks and aeronautical radars has been observed in Europe, in spite of their coexistence for many years.
The 4G emissions of neighboring countries should be taken into account as well.	The limits of the range which will be imposed on foreign base stations within the framework of border agreements according to recommendation ECC/REC/(11)05 are sufficient to protect the Belgian aeronautical radars.

A3.5. Belgocontrol and the Ministry of Defense

Points raised by Belgocontrol and the Ministry of Defence	BIPT answers
The distance of separation should be at least of 1 km.	BIPT considers that certain stations, like the stations situated at a distance of less than 1 km and not causing any interference, cannot be excluded. The proposed procedure guarantees a coordination process for this type of stations.
Prior coordination should be ensured during the transition period.	The mutual modus operandi between BIPT and the radar operators does not necessarily have to be mentioned in this decision. It is important to point out that BIPT will ensure the observance of this decision.

Points raised by Belgocontrol and the Ministry of Defence	BIPT answers
It should be clearly indicated who will carry out the calculations during the transition period.	BIPT will carry out calculations. Point 5.5 of the decision draft (point 5.6 of the final decision) seems clear on that subject.
The maximum 34 dBi antenna gain should be taken into account.	The hypothesis of a 27 dBi gain comes from the report of Intersoft Electronics (tables 9, 13 and 20)
A number of uncertainties mentioned in the study of Intersoft are not taken into account by the decision.	BIPT has tried to pay the utmost respect to the results of the study from Intersoft Electronics.
A value of -155 dBW/m^2/MHz is proposed for the spurious emissions.	The report of Intersoft Electronics does not recommend this value. Section 4.5 of the report mentions: "*It is not necessary to impose such stringent limit as thousands of IT equipment required to be compliant with the EMC Directive will already be present.*"
Will the specific IT tool required be made available to radar and/or mobile radar operators to make calculations?	BIPT can provide the radar operators with the tools it will use for calculations.
A « worst case » calculation must be made for each radar installation. (Intersoft: free space propagation and a 4 dB multipath enhancement).	The use of Recommendation UIT-R P.452 is more appropriate than a simple free space propagation model when the locations of base stations and radars are known. A « worst case » calculation is only relevant if locations are not known: as the « worst case » corresponds to the locations which lead to the less favorable propagation losses.
The cumulative effect of several base stations and several networks should be taken into account.	A 6 dB margin is foreseen for that purpose.
Belgocontrol does not agree with the calculation method for the PLC(f) for STAR2000.	The protection levels are at all points more restrictive than the levels measured by Intersoft Electronics (figure 3.20 of the report).
It should be pointed out that the value calculated for PLC(f) and IML(f) is given per radar in Annex 1 for consultation by the reader.	It is clearly mentioned in point 5.3 of the draft decision (point 5.4 of the final decision).
Recommendation ITU-R SM 329-11 and Recommendation CEPT/ERC/REC 74-01 state that the values mentioned apply to the radars installed after 1 January 2006.	BIPT will not impose any measure more restrictive than the ITU or CEPT recommendations.