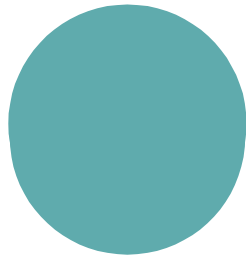


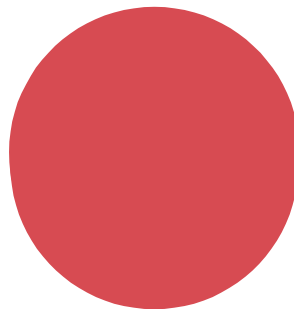


Energistyrelsen



Informationsmemorandum

Bilag M



**Grænsekoordineringsaftaler mellem Danmark og
Tyskland (700 MHz- og 900 MHz-frekvensbåndene)
700 MHz-, 900 MHz- og 2300 MHz-auktionen**

2018

Agreement between the Danish Energy Agency, and the Federal Network Agency concerning the use of the 700 MHz band (694-790 MHz) for MFCN service

[February 2018]

Coordination agreement between MFCN and MFCN

This agreement is valid from the date of a potential Danish change of service to MFCN in the 700 MHz band. Denmark will inform Germany as soon as a final date of the change of service is set.

1. Principles and definitions

- 1.1. The 700 MHz band, as referred to in this agreement, covers the frequencies from 694 MHz to 790 MHz, with the FDD arrangement, including optional SDL (Supplemental Downlink, up to 4x5 MHz in the duplex gap) in accordance with ECC Decision (15)01. The use of other arrangements such as TDD is not covered in this agreement.
- 1.2. This agreement is based on the concept of field strength levels and in the case when LTE systems are used preferential PCIs as defined in Annex 1.
- 1.3. This agreement covers the coordination of the base stations. The user equipment, or terminals, are allowed to be used on non-interfering basis, in accordance with ITU RR 4.4.
- 1.4. For the purpose of this agreement the border of Denmark and Germany is the coastline, where the border is not on land.
- 1.5. The latest version of ITU-R P.1546 "Method for point-to-area predictions for terrestrial services in the frequency range 30-3000 MHz" shall be used for predictions of field strength values.

2. Use of frequencies without coordination by administrations

- 2.1. Denmark may use the 700 MHz band without coordination with Germany, if the predicted field strength E_0 produced by a base station does not exceed 54 dB(μ V/m)/5 MHz at a height of 1.5 m above the ground at the German border, and does not exceed 36 dB(μ V/m)/5 MHz at a distance of 6 km beyond the German borderline.
- 2.2. Germany may use the 700 MHz band without coordination with Denmark, if the predicted field strength E_0 produced by a base station does not exceed 54 dB(μ V/m)/5 MHz at a height of 1.5 m above the ground at the Danish border, and does not exceed 36 dB(μ V/m)/5 MHz at a distance of 6 km beyond the Danish borderline.
- 2.3. In case of using technologies with other channel bandwidths (BW) than 5 MHz, the predicted field strength E shall be adjusted by a factor in comparison with E_0 as defined in paragraphs 2.1 and 2.2:

$$E = E_0 + 10 \cdot \log_{10}(BW/5), \text{ where } BW \text{ is measured in MHz.}$$

2.4. The field strength values (see 2.1 and 2.2) in this agreement are based on a receiving antenna height of 1.5 m, 10% of the time and 50% of the locations.

3. Use of Physical-Layer Cell Identities (PCI) for LTE

3.1. In the case when LTE systems are used, PCI division, according to the table in Annex 1, may be used in border areas to improve coverage and service when channel centre frequencies are aligned. The PCIs are divided between the administrations according to the table.

4. Coordination procedure

4.1. Establishment of arrangements between operators shall be encouraged to the extent possible. Subject to agreement between operators other technical characteristics can be used, e.g. other field strength limits or propagation models. Such arrangements are subject to consent of the administrations concerned. In particular, before giving consent to such arrangements, the administrations concerned should take care that all network operators concerned are parties in such an arrangement.

4.2. Any case of interference shall as far as possible be resolved among the operators concerned. If not resolved, or in case of unequal access to the spectrum band, assistance might be sought from the administrations.

5. Revision and cancellation

5.1. This agreement may be revised upon mutual agreement of the two administrations.

5.2. This agreement may be cancelled with a notice of at least twelve months from any of the two parties.

6. Enter into force

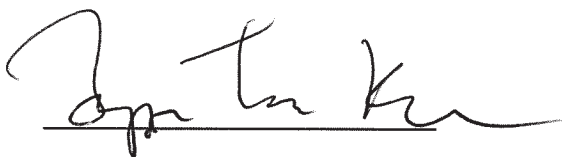
6.1. This agreement is valid from the date of a potential Danish change of service to MFCN in the 700 MHz band.

This agreement has been drawn in two identical copies, one for Denmark and one for Germany.

Place *Copenhagen*

Date *16.02.2018*

For the Danish Energy Agency



Jeppe Tanderup Kristensen

Place *Münch*

Date *05.02.2018*

For the Federal Network Agency



Tobias Schnetzer

ANNEX 1

PREFERENTIAL PHYSICAL-LAYER CELL IDENTITIES (PCI) FOR LTE

PCI division, according to the table below, may be used in border areas to improve coverage and service when channel centre frequencies are aligned.

The PCIs are divided between the administrations according to the following table:

PCI	Set A 0 to 83	Set B 84 to 167	Set C 168 to 251	Set D 252 to 335	Set E 336 to 419	Set F 420 to 503
Country	Denmark	Denmark	Germany	Germany	Germany	Denmark

Table: Division of Preferential Physical-Layer Cell Identities (PCI) for LTE

AGREEMENT

**between the National IT- and Telecom Agency,
Denmark and the Bundesnetzagentur, Germany**

**concerning the opening for IMT services in the
bands,
880-915 MHz and 925-960 MHz
in border areas**

April 2011

1. INTRODUCTION

The frequency bands 880-915 MHz and 925-960 MHz are designated for terrestrial systems capable of providing electronic communications services according to

COMMISSION DECISION (2009/766/EC) of 16 October 2009 on the harmonisation of the 900 MHz and 1 800 MHz frequency bands for terrestrial systems capable of providing pan-European electronic communications services in the Community.

The administrations of the Denmark and Germany have agreed on the following frequency planning and frequency using procedures.

This agreement covers the co-ordination of base stations. The user equipment, or terminals, is allowed to be used on a non interference basis, in accordance with ITU RR 4.4

The field strength values in this agreement are based on a receiving antenna height of 3 meters, **10%** of the time and 50% of the locations.

The latest version of ITU-R REC P.1546 shall be used.

The use of TDD is not covered by this Agreement.

This Agreement will replace the GSM900 Agreement of 2010 and the E-GSM900 Agreement of 2001, by **31. March 2014**. In case of GSM on both sides are in use by that date the existing GSM900 Agreement will remain in force.

2. PRINCIPLES OF FREQUENCY PLANNING AND FREQUENCY USAGE AT BORDER AREAS

The concept of equal access probability is a new frequency planning principle enabling equitable coverage for two or more networks using the same frequency band with the same or different digital technologies in geographically adjacent areas without coordination. Operation of stations in the respective border area exceeding the specified field strength values after performing traditional frequency coordination would disturb the balance in the respective area and is therefore not desirable.

The following principles apply to frequency utilisation by terrestrial systems capable of providing electronic communications services in geographically adjacent areas:

- Field strength values are defined inside a reference frequency block of 5 MHz.
- The field strength calculations shall take into account the sum of all signals radiated from the respective antenna sector within the reference frequency block. The respective field strength values for each signal should be applied by each antenna sector and can be deduced by reducing the limit proportionally to the frequency block portions falling into the reference bandwidth (reduction factor = $10 \times \log(\text{frequency block portion} / 5 \text{ MHz})$).

In order to assure equitable coverage and equal access probability to the spectrum in border areas even with different transmission technologies, and to enhance the efficiency of spectrum usage, the principles and field strength limits as given in chapter 4. of this agreement shall be respected by all networks concerned.

3. OPERATOR ARRANGEMENTS

To further improve the compatibility of terrestrial systems capable of providing electronic communications services in border areas, operator arrangements may be concluded concerning other frequency coordination methods such as:

- preferential frequency distribution arrangements,
- (if concerned neighbouring systems in all affected countries are using code division multiple access technologies such as IMT-2000/UMTS) preferential code division arrangements (e.g. according to ERC/REC(01)01),
- frequency carrier definitions (e.g. with LTE),
- Synchronisation of concerned networks.
- use of other propagation models.

Such arrangements are subject to consent of the administrations concerned. In particular, before giving consent to such arrangements, the administrations concerned should take care that all network operators concerned are parties in such an arrangement.

In case an operator changes from GSM to IMT the affected operator in the other country shall be informed.

4. TECHNICAL CHARACTERISTICS

IMT in both countries and IMT in one country and GSM continue in the other country in common spectrum

For the protection of both IMT and GSM systems, frequencies in the bands 890-915 MHz and 935-960 MHz may be used by both IMT (FDD) systems and GSM systems without coordination with the neighbouring country, if the mean field strength of each carrier produced by the base station does not exceed **55 dB μ V/m/5MHz** at a height of 3 m above ground at the borderline in the frequency band 935-960 MHz.

IMT base stations and GSM base stations may be operated if the produced field strength does not exceed the value of **29 dB μ V/m/5MHz** at a height of 3 meters above ground at a line of **9 km** beyond the border.

GSM continues in common spectrum in both countries

If an operator in one country continues to use GSM and the affected operator in the other country also continues to use GSM after 31. March 2014, the GSM base stations using preferential channels in common spectrum may be operated if the produced field strength does not exceed the value of **22 dB μ V/m/200kHz** at a height of 3 meters above ground at a line of **15 km** beyond the border.

Non-preferential channels in common spectrum may be operated if the produced field strength does not exceed the value of **22 dB μ V/m/200kHz** at a height of 3 meters above ground at the border.

The division into preferential and non-preferential channels is contained in annex 1 to this Agreement.

The timing of the changover from GSM to IMT to be mutually agreed between affected operators.

5. DEFINITION OF BORDER

The borderline is the coastline, where the border is not on land.

6. REVISION OF THE AGREEMENT

This agreement may be modified at the request of one of the signatory administrations where such a modification becomes necessary in the light of administrative, regulatory or technical development.

The technical characteristics may be reviewed in the light of practical experience of its application and of the operation of terrestrial systems capable of providing electronic communications services in general.

7. WITHDRAWAL FROM THE AGREEMENT

Any administration may withdraw from this agreement subject to six months notice.

8. LANGUAGE OF THE AGREEMENT

This agreement has been concluded in English.

9. DATE OF ENTRY INTO FORCE

The date of entry into force is the date of the signatures.

10. SIGNATURE OF THE AGREEMENT

Done *11* . April 2011

For the National Telecom Agency,
Denmark



Per V. Christensen

Done *21* . April 2011

For the Bundesnetzagentur,
Germany



Heinz Hönnekes

AGREEMENT

**Between the National Telecom Agency, Denmark,
and the Regulierungsbehörde für Post und Telekommunikation, Germany,
concerning the use of frequency bands 880-890 and 925-935 MHz**

2001

General

Except as otherwise provided, the rules and procedures of CEPT Recommendation T/R 20-08 shall apply.

Specific agreements on certain issues between the Danish and German Administrations may overrule the corresponding rules of this Agreement.

This Agreement may be revised as desired by one of the national Telecommunications Administrations. If no agreement is reached then, CEPT Recommendation T/R 20-08 shall apply.

Use of Channels

The numbering of channels follows the GSM channel numbering scheme. The band is shown in Annex 1.

If a country uses part of the spectrum for other purposes, the limits of this agreement shall still apply.

Preferential frequencies may be used by one part without coordination with the other part if the field strength of each carrier produced by the base station does not exceed a value of 22 dB μ V/m at a height of 3 meters above ground at a distance of 15 kilometers from the division line inside the other country.

Channels 983, 984, 987, 988, 1012 and 1013 may be used as preferential channels, but must be coordinated with the neighbouring country if the field strength exceeds 22 dB μ V/m at a height of 3 meters above ground at the division line.

The 10 % of time and 50 % of locations propagation curves in CEPT Recommendation T/R 20-08 shall be used for calculating and measuring the field strength.

The division into preferential frequencies is indicated in Annex 1.

Definition of division line

In the Flensburg inlet, and where the border is on land, the division line is the borderline.

In the North Sea and in the Baltic, the division line is composed of straight lines, connecting the following geographical coordinates:

	Longitude:	Latitude:
1)	08°13'00"N	55°12'30"N
2)	08°40'00"N	54°54'30"N
3)	10°00'00"N	54°50'00"N
4)	10°40'00"N	54°35'00"N
5)	11°00'00"N	54°38'30"N
6)	11°30'00"N	54°31'00"N
7)	12°00'00"N	54°23'00"N
8)	12°30'00"N	54°42'00"N
9)	13°28'00"N	55°00'00"N
10)	13°58'00"N	55°00'00"N
11)	14°39'00"N	54°27'30"N

In the North Sea, west of coordinate 1), the division line is due west at latitude 55°12'30"N.

For the NTA in Denmark

Copenhagen, 12 December 2001


J. Lang Nielsen

For the RegTp in Germany

Mainz, 21 December 2001



Ch	Center frequency		Preferential channels
	MHz	MHz	
975	880.2	925.2	DNK
976	880.4	925.4	DNK
977	880.6	925.6	DNK
978	880.8	925.8	DNK
979	881.0	926.0	DNK
980	881.2	926.2	DNK
981	881.4	926.4	DNK
982	881.6	926.6	DNK
983	881.8	926.8	DNK
984	882.0	927.0	D
985	882.2	927.2	D
986	882.4	927.4	D
987	882.6	927.6	D
988	882.8	927.8	DNK
989	883.0	928.0	DNK
990	883.2	928.2	DNK
991	883.4	928.4	DNK
992	883.6	928.6	D
993	883.8	928.8	D
994	884.0	929.0	D
995	884.2	929.2	D
996	884.4	929.4	D
997	884.6	929.6	D
998	884.8	929.8	D
999	885.0	930.0	D
1000	885.2	930.2	D
1001	885.4	930.4	D
1002	885.6	930.6	D
1003	885.8	930.8	D
1004	886.0	931.0	D
1005	886.2	931.2	D
1006	886.4	931.4	D
1007	886.6	931.6	D
1008	886.8	931.8	D
1009	887.0	932.0	D
1010	887.2	932.2	D
1011	887.4	932.4	D
1012	887.6	932.6	D
1013	887.8	932.8	DNK
1014	888.0	933.0	DNK
1015	888.2	933.2	DNK
1016	888.4	933.4	DNK
1017	888.6	933.6	DNK
1018	888.8	933.8	DNK
1019	889.0	934.0	DNK
1020	889.2	934.2	DNK
1021	889.4	934.4	DNK
1022	889.6	934.6	DNK
1023	889.8	934.8	DNK
1024 (0)	890.0	935.0	DNK

AGREEMENT

between the National IT and Telecom Agency, Denmark

and

the Bundesnetzagentur, Germany,

**concerning the use of frequency bands
890-915 MHz and 935-960 MHz**

in border areas

General

Except as otherwise provided, the rules and procedure of ECC Recommendation (05)08 shall apply.

Specific agreements on certain issues between the Danish and German operators may overrule the corresponding rules of this Agreement, if all affected operators agree and such agreements are finally approved by the administrations afterwards.

If an agreement cannot be reached, the operator shall immediately bring the radio channels involved in line with the basic Agreement.

This Agreement may be revised as desired by one of the national telecommunications administrations. If no agreement is reached then, ECC Recommendation (05)08 shall apply.

Use of channels

If a country uses part of the spectrum for other purposes, the limits of this Agreement shall still apply.

Preferential frequencies may be used by one part without coordination with the other part if the field strength of each carrier produced by the base station does not exceed a value of **22 dBuV/m** at a height of **3 meters** above ground at a distance of **15 kilometres** from the division line inside the other country.

Non-Preferential frequencies may be used by one part without coordination with the other part if the field strength of each carrier produced by the base station does not exceed a value of **22 dBuV/m** at a height of **3 meters** above ground at the division line between both countries.

The **10 %** time **50 %** locations propagation curves in ECC Recommendation (05)08 shall be used for calculating and measuring the field strength.

The channel assignment and the division into preferential frequencies are indicated in Annex 1.

Definition of division line

In the Flensburg Inlet, and where the border is on land, the division line is the borderline.

In the North Sea and in the Baltic, the division line is composed of straight lines, connecting the following geographical coordinates:


	Longitude:	Latitude:
1)	08°13'00"E	54°54'30"N
3)	10°00'00"E	54°50'00"N
4)	10°40'00"E	54°35'00"N
5)	11°00'00"E	54°38'30"N
6)	11°30'00"E	54°31'00"N
7)	12°00'00"E	54°23'00"N
8)	12°30'00"E	54°42'00"N
9)	13°28'00"E	55°00'00"N
10)	13°58'00"E	55°00'00"N
11)	14°39'00"E	54°27'30"N

In the North Sea, west of coordinate 1), the division line is due west at latitude 55°12'30"N.

This Agreement replaces the agreement with the same title of 23rd February 1997 and will enter into force on 1. January 2011.

For the National IT and Telecom Agency
Denmark
13. January 2011

For Bundesnetzagentur
Germany
13. January 2011



Per V. Christensen



Heinz Hönnekes

Annex 1

CH	center frequencies/MHz		preferential	DNK	D
	term	base		operator	operator
1	890.2	935.2	DNK	TELIA	VODAFONE
2	890.4	935.4	DNK	TELIA	VODAFONE
3	890.6	935.6	DNK	TELIA	VODAFONE
4	890.8	935.8	DNK	TELIA	VODAFONE
5	891	936	DNK	TELIA	VODAFONE
6	891.2	936.2	DNK	TELIA	VODAFONE
7	891.4	936.4	DNK	TELIA	VODAFONE
8	891.6	936.6	DNK	TELIA	VODAFONE
9	891.8	936.8	DNK	TELIA	VODAFONE
10	892	937	DNK	NEW	VODAFONE
11	892.2	937.2	DNK	NEW	VODAFONE
12	892.4	937.4	DNK	NEW	VODAFONE
13	892.6	937.6	DNK	NEW	TELEKOM
14	892.8	937.8	DNK	NEW	TELEKOM
15	893	938	DNK	NEW	TELEKOM
16	893.2	938.2	DNK	NEW	TELEKOM
17	893.4	938.4	DNK	NEW	TELEKOM
18	893.6	938.6	DNK	NEW	TELEKOM
19	893.8	938.8	DNK	NEW	TELEKOM
20	894	939	DNK	NEW	TELEKOM
21	894.2	939.2	DNK	NEW	TELEKOM
22	894.4	939.4	DNK	NEW	TELEKOM
23	894.6	939.6	DNK	NEW	TELEKOM
24	894.8	939.8	DNK	NEW	TELEKOM
25	895	940	DNK	NEW	TELEKOM
26	895.2	940.2	D	NEW	TELEKOM
27	895.4	940.4	D	NEW	TELEKOM
28	895.6	940.6	D	NEW	TELEKOM
29	895.8	940.8	D	NEW	TELEKOM
30	896	941	D	NEW	TELEKOM
31	896.2	941.2	D	NEW	TELEKOM
32	896.4	941.4	D	NEW	TELEKOM
33	896.6	941.6	D	NEW	TELEKOM
34	896.8	941.8	D	NEW	TELEKOM
35	897	942	D	TDC	TELEKOM
36	897.2	942.2	D	TDC	TELEKOM
37	897.4	942.4	D	TDC	TELEKOM
38	897.6	942.6	D	TDC	TELEKOM
39	897.8	942.8	D	TDC	TELEKOM
40	898	943	D	TDC	TELEKOM
41	898.2	943.2	D	TDC	TELEKOM
42	898.4	943.4	D	TDC	TELEKOM
43	898.6	943.6	D	TDC	TELEKOM
44	898.8	943.8	D	TDC	TELEKOM
45	899	944	D	TDC	TELEKOM
46	899.2	944.2	D	TDC	TELEKOM

47	899.4	944.4	D	TDC	TELEKOM
48	899.6	944.6	D	TDC	TELEKOM
49	899.8	944.8	D	TDC	TELEKOM
50	900	945	DNK	TDC	VODAFONE
51	900.2	945.2	DNK	TDC	VODAFONE
52	900.4	945.4	DNK	TDC	VODAFONE
53	900.6	945.6	DNK	TDC	VODAFONE
54	900.8	945.8	DNK	TDC	VODAFONE
55	901	946	DNK	TDC	VODAFONE
56	901.2	946.2	DNK	TDC	VODAFONE
57	901.4	946.4	DNK	TDC	VODAFONE
58	901.6	946.6	DNK	TDC	VODAFONE
59	901.8	946.8	DNK	TDC	VODAFONE
60	902	947	DNK	TDC	VODAFONE
61	902.2	947.2	DNK	TDC	VODAFONE
62	902.4	947.4	DNK	TDC	VODAFONE
63	902.6	947.6	DNK	TDC	VODAFONE
64	902.8	947.8	DNK	TDC	VODAFONE
65	903	948	DNK	TDC	VODAFONE
66	903.2	948.2	DNK	TDC	VODAFONE
67	903.4	948.4	D	TDC	VODAFONE
68	903.6	948.6	D	TDC	VODAFONE
69	903.8	948.8	D	TDC	VODAFONE
70	904	949	D	TDC	VODAFONE
71	904.2	949.2	D	TDC	VODAFONE
72	904.4	949.4	D	TDC	VODAFONE
73	904.6	949.6	D	TDC	VODAFONE
74	904.8	949.8	D	TDC	VODAFONE
75	905	950	D	TDC	VODAFONE
76	905.2	950.2	D	TDC	VODAFONE
77	905.4	950.4	D	TDC	VODAFONE
78	905.6	950.6	D	TDC	VODAFONE
79	905.8	950.8	D	TDC	VODAFONE
80	906	951	D	TELENOR	VODAFONE
81	906.2	951.2	DNK	TELENOR	TELEKOM
82	906.4	951.4	DNK	TELENOR	TELEKOM
83	906.6	951.6	DNK	TELENOR	TELEKOM
84	906.8	951.8	DNK	TELENOR	TELEKOM
85	907	952	DNK	TELENOR	TELEKOM
86	907.2	952.2	DNK	TELENOR	TELEKOM
87	907.4	952.4	DNK	TELENOR	TELEKOM
88	907.6	952.6	DNK	TELENOR	TELEKOM
89	907.8	952.8	DNK	TELENOR	TELEKOM
90	908	953	DNK	TELENOR	TELEKOM
91	908.2	953.2	DNK	TELENOR	TELEKOM
92	908.4	953.4	DNK	TELENOR	TELEKOM
93	908.6	953.6	DNK	TELENOR	TELEKOM
94	908.8	953.8	DNK	TELENOR	TELEKOM
95	909	954	DNK	TELENOR	TELEKOM
96	909.2	954.2	DNK	TELENOR	TELEKOM
97	909.4	954.4	DNK	TELENOR	TELEKOM
98	909.6	954.6	DNK	TELENOR	TELEKOM

99	909.8	954.8	D	TELENOR	TELEKOM
100	910	955	D	TELENOR	TELEKOM
101	910.2	955.2	D	TELENOR	TELEKOM
102	910.4	955.4	D	TELENOR	TELEKOM
103	910.6	955.6	D	TELENOR	VODAFONE
104	910.8	955.8	D	TELENOR	VODAFONE
105	911	956	D	TELENOR	VODAFONE
106	911.2	956.2	D	TELENOR	VODAFONE
107	911.4	956.4	D	TELENOR	VODAFONE
108	911.6	956.6	D	TELENOR	VODAFONE
109	911.8	956.8	D	TELENOR	VODAFONE
110	912	957	D	TELENOR	VODAFONE
111	912.2	957.2	D	TELENOR	VODAFONE
112	912.4	957.4	D	TELENOR	VODAFONE
113	912.6	957.6	D	TELENOR	VODAFONE
114	912.8	957.8	D	TELENOR	VODAFONE
115	913	958	D	TELENOR	VODAFONE
116	913.2	958.2	D	TELENOR	VODAFONE
117	913.4	958.4	D	TELENOR	VODAFONE
118	913.6	958.6	D	TELENOR	VODAFONE
119	913.8	958.8	D	TELENOR	VODAFONE
120	914	959	DNK	TELENOR	VODAFONE
121	914.2	959.2	DNK	TELENOR	VODAFONE
122	914.4	959.4	D	TELENOR	TELEKOM
123	914.6	959.6	D	TELENOR	TELEKOM
124	914.8	959.8	D	TELENOR	TELEKOM