

Current Use of the 690 to 790 MHz Band in Germany for SAP/SAB

Overview

The following study provides information on the use of the 690-790 MHz tuning range currently under study for WRC 15 Agenda item 1.1 and 1.2.both before¹ the introduction of mobile services in the 790-862 MHz band and after². An average of 32³ to 50⁴ units are shown to be in use prior to the reallocation and 31.5⁵ units after the reallocation.

Use of the tuning range 470-862MHz will vary with location and TV allocations.

If the 694-790MHz is allocated to mobile services the loss of the allocation to radio microphone has three impacts on these types of events:

1. Loss of the spectrum which in this sample relates to ~~between~~^{some} 32 ~~to~~ 50 channels
2. In planning radio microphone use the third and fifth order (at least) intermodulation intercept points must be taken into account, this will cause insurmountable problems if attempts are made to pack an additional 32 channels into the remaining spectrum 470-694MHz.

An additional 32 to 50 channels will not be possible in existing allocations for these events

3. In addition the reorganisation of the DTT transmitters will further reduce the available spectrum for SAB/SAP in the 470-694 MHz band. Dependant on the final DTT plan and possible WSD use up to 75% of existing channels could be lost; this in turn will put in doubt ~~out~~ the survival of the events

Background

The following spectrum scans are ~~mainly~~^{most} ~~times~~ derived from a single scanning station and in many cases the scanning equipment and aerials are located indoors and may not have picked up the local TV stations or other SAB/SAP use. In addition, the local man made noise superimposed weak microphone carrier. This makes the signal analysis difficult.

The scans do not differentiate between radio microphones and In Ear Monitors but in some scans the higher powered audio links can be seen as stronger signals

¹ Sections 1-14

² Sections 15-17

³ Scanned carrier of 15 events

⁴ Calculated from coordinating tables

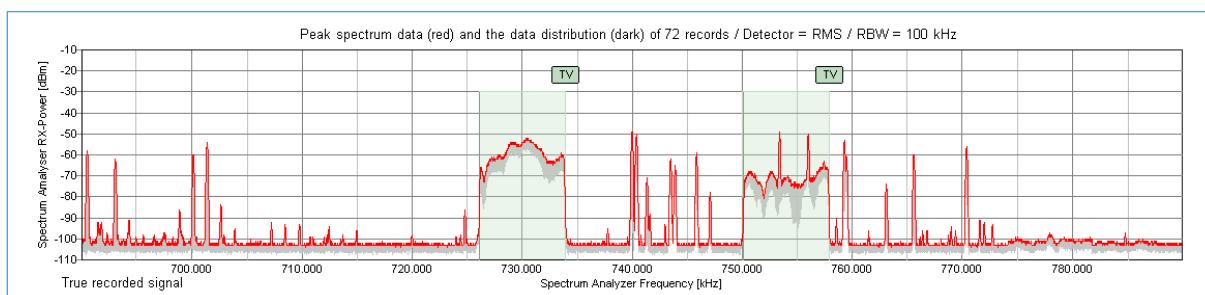
⁵ only two events

1) Live Earth Hamburg, July 2007

The 1st series of benefit concerts were held on July 7, 2007. The concerts brought together more than 150 musical acts in eleven locations around the world and were broadcast to a mass global audience through television, radio, and live internet streams⁶.



The DKE⁷ spectrum record was made the day before at the rehearsal in the football stadium.

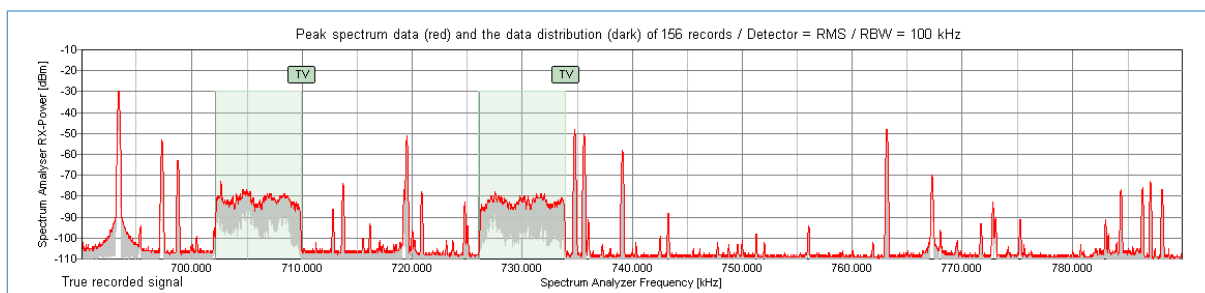


No coordination data were on-hand.

The scanner has recorded more than 30 carriercarriers in the band 690 to 790 MHz.

2) UCI Road World Championships in Stuttgart, September 2007

The 2007 UCI Road World Championships took place in Stuttgart, Germany, between September 25 and September 30, 2007. The event consisted of a road race and a time trial⁸. The spectrum record carried out by the German broadcast organisation “SWR” – a member in the DKE study group.



69 wireless microphones and IEM were coordinated in the band 690 to 790 MHz.

The scanner has recorded approximately 30 carriers in the band 690 to 790 MHz.

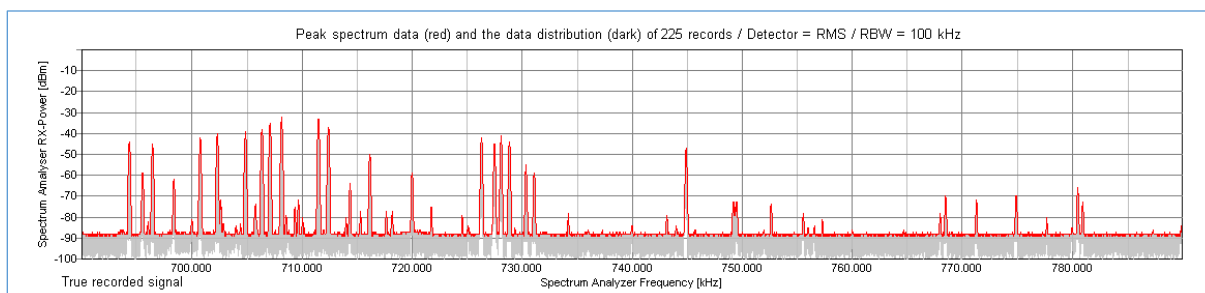
⁶ source: www.wikipedia.org

⁷ German Commission for Electrical, Electronic & Information Technologies of DIN and VDE, abbreviated DKE, is the German organisation responsible for the elaboration of standards and safety specifications in the areas of electrical engineering, electronics and information technologies. DKE constitutes a joint organisation of DIN and VDE, the juridical responsibility for running the DKE being in the hands of the VDE. The DKE is the German member within International and European standardisation organisations (IEC, CENELEC, ETSI) – source: wikipedia.org

⁸ Source: www.wikipedia.org

3) Lower Saxony election Hanover, January 2008

The 2008 Lower Saxony state election was held in Lower Saxony in north-western Germany on 27 January 2008⁹.

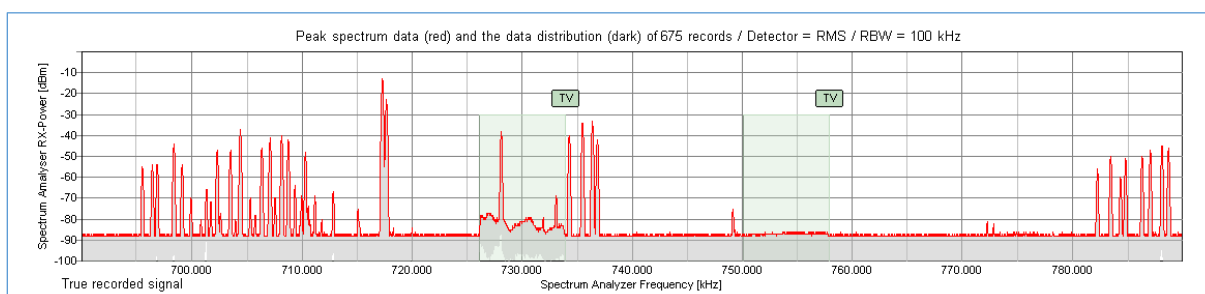


79 wireless microphones, IEM and audio links were coordinated in the band 690 to 790 MHz to the ambient town area and the parliament building.

In the parliament building ground floor was installed the RF scanner. He recorded approximately 29 carriercarriers in the band 690 to 790 MHz.

4) Hamburg state election, February 2008

On 24 February 2008 state elections were held in Hamburg, Germany, for the 19th legislative period of the Hamburg Parliament¹⁰.



73 wireless microphones, IEM and audio links were coordinated in the band 690 to 790 MHz.

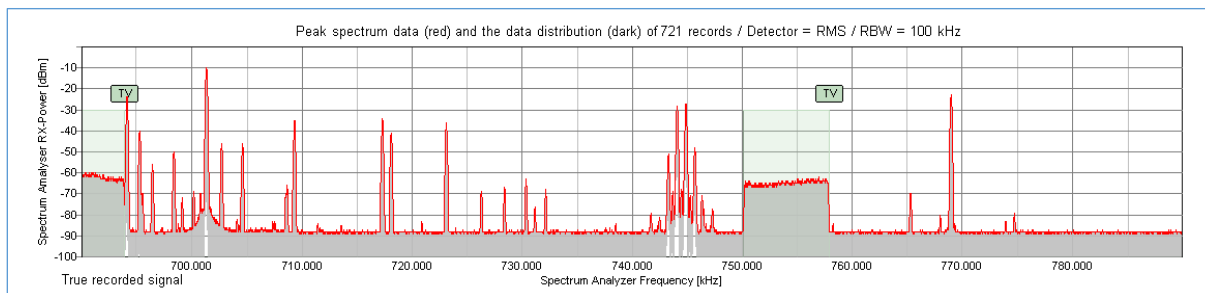
The scanner has recorded approximately 39 carriers in the band 690 to 790 MHz.

⁹ Source: www.wikipedia.org

¹⁰ Source: www.wikipedia.org

5) Bavaria state election Munich, September 2008

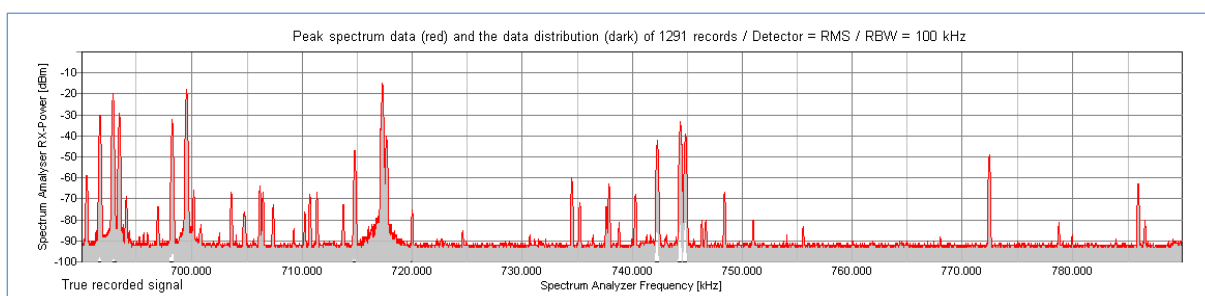
The 2008 Bavarian state election was held on September 28, 2008. Voters of the German state of Bavaria elected members to the Bavarian Landtag (state legislature)¹¹.



65 wireless microphones, IEM and audio links were coordinated in the band 690 to 790 MHz.
The scanner has recorded approximately 28 carriers in the band 690 to 790 MHz.

6) Saxony-Anhalt state election Magdeburg, March 2011

The Saxony-Anhalt state election was held on March 20, 2011 in Saxony-Anhalt for the 20th legislative period of the Landtag of Saxony-Anhalt¹².



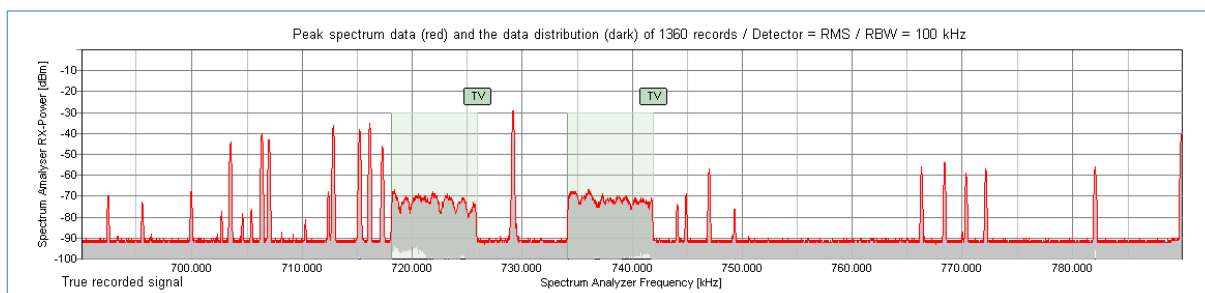
38 wireless microphones, IEM and audio links were coordinated in the band 690 to 790 MHz.
The scanner has recorded approximately 39 carriers in the band 690 to 790 MHz.

¹¹ Source: www.wikipedia.org

¹² Source: www.wikipedia.org

7) Rhineland-Palatinate state election Mainz, March 2011

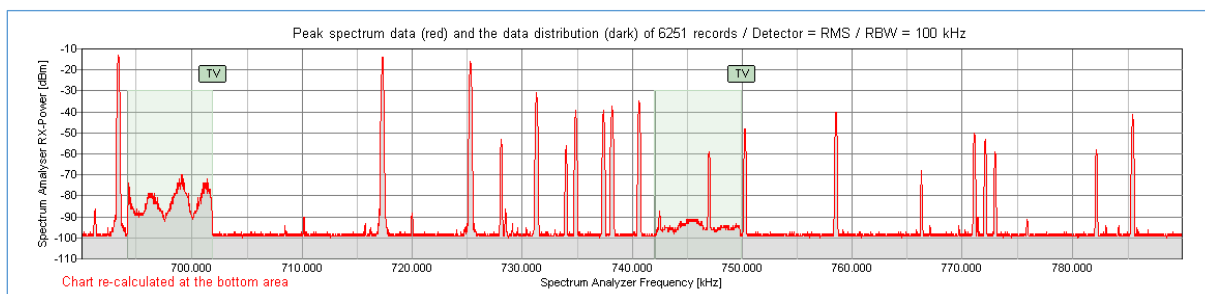
The 2011 Rhineland-Palatinate state election was conducted on 27 March 2011 to elect all 101 members to the Landtag¹³.



27 wireless microphones, IEM and audio links were coordinated in the band 690 to 790 MHz. The scanner has recorded approximately 26 carriers in the band 690 to 790 MHz.

8) Bremen state election, May 2011

A Bremen state election was held on May 22, 2011 to elect the Bürgerschaft (city and state legislature)¹⁴.



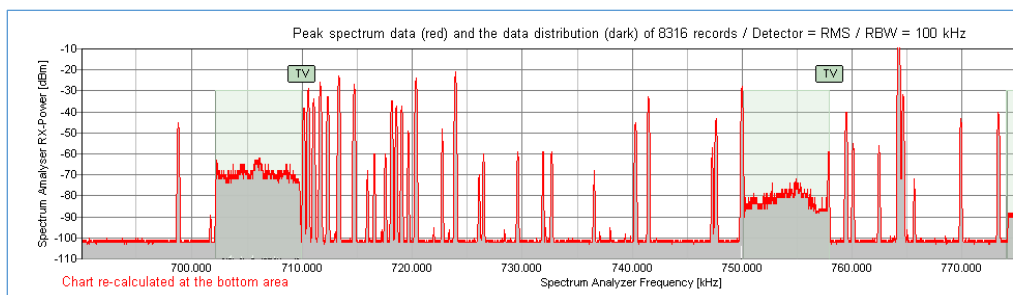
67 wireless microphones, IEM and audio links were coordinated in the band 690 to 790 MHz. The scanner has recorded approximately 25 carriers in the band 690 to 790 MHz.

¹³ Source: www.wikipedia.org

¹⁴ Source: www.wikipedia.org

9) DFB Cup Final Berlin, May 2011

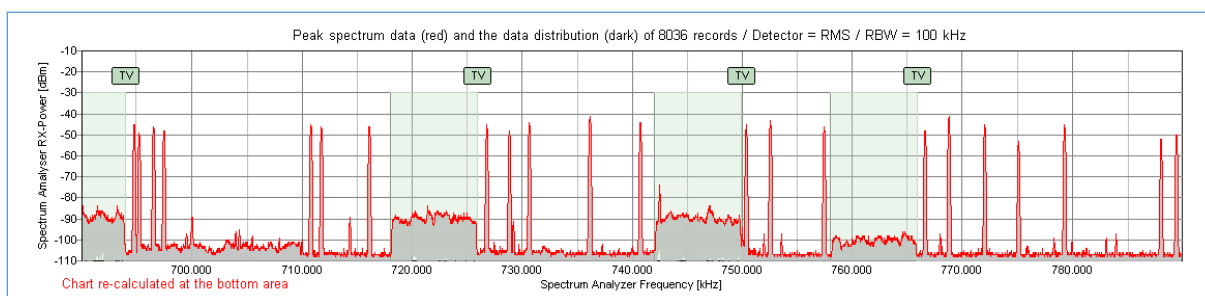
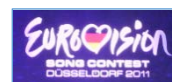
This DFB Final was the 68th season of the annual German football cup competition.



198 wireless microphones, IEM and audio links were coordinated in the band 470 to 862 MHz. Since no detailed data were available 147 wireless microphones and IEM were calculated the band 690 to 790 MHz.

The scanner has recorded approximately 50 carrier carriers in the band 690 to 790 MHz.

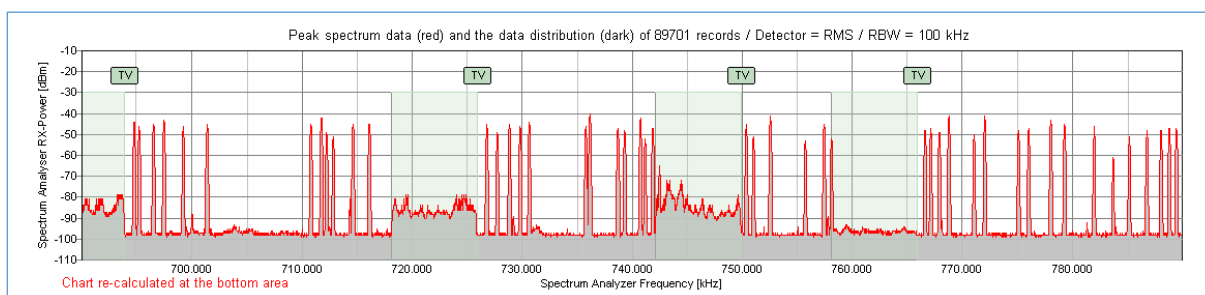
10) Eurovision Song Contest Dusseldorf, May 2011 (final event)



56 wireless microphones, IEM and audio links were coordinated in the band 690 to 790 MHz.

The scanner has recorded approximately 36 carriers in the band 690 to 790 MHz.

11) Eurovision Song Contest Dusseldorf, May 2011 (complete event)

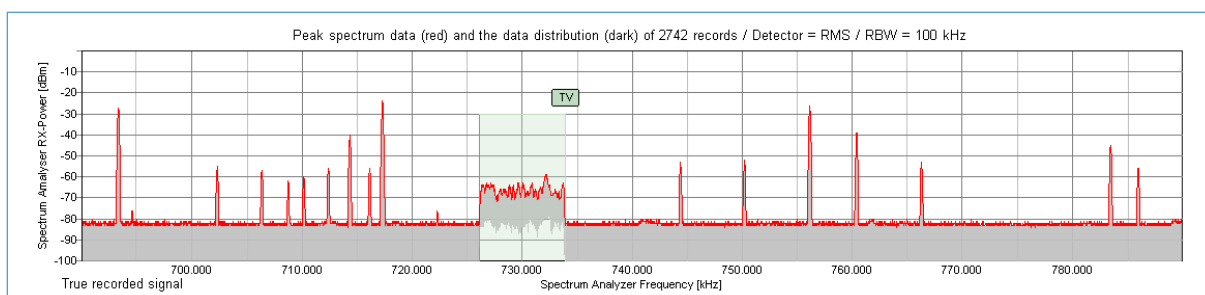


In the neighbourhood exhibition centre was taking part the trade fair "Interpack", at the same time Simultaneously with the Eurovision event "Interpack" was taking place in an adjacent Hall. - 56 wireless microphones, IEM and audio links were coordinated in the band 690 to 790 MHz.

The scanner has recorded approximately 50 carriers in the band 690 to 790 MHz.
 Get detailed information in a detailed DKE report¹⁵.

12) Mecklenburg-Vorpommern election Schwerin, September 2011

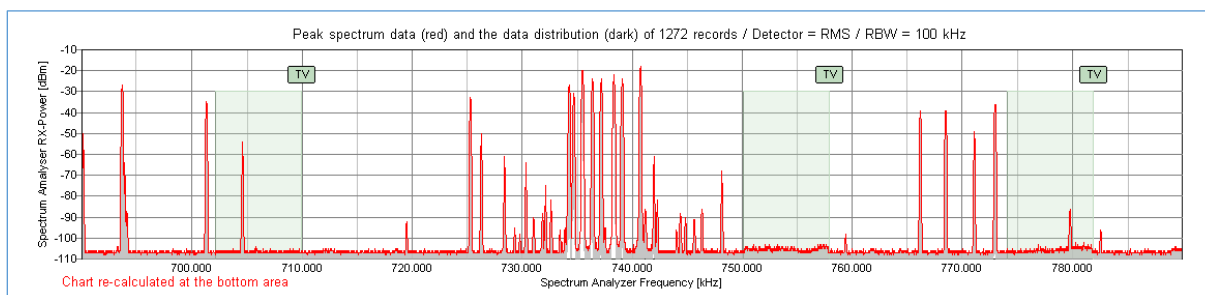
The Mecklenburg-Vorpommern state election was conducted on 4 September 2011, to elect members to the Landtag of Mecklenburg-Vorpommern (Mecklenburg-West Pomerania)¹⁶.



65 wireless microphones, IEM and audio links were coordinated in the band 690 to 790 MHz.
 The scanner has recorded approximately 18 carriers in the band 690 to 790 MHz.

13) Berlin election, September 2011

The last Berlin state election was held on 18 September 2011, to elect members to the Abgeordnetenhaus (House of Deputies) of Berlin¹⁷.



127 wireless microphones, IEM and audio links were coordinated in the band 690 to 790 MHz.
 The scanner has recorded approximately 37 carriers in the band 690 to 790 MHz.

¹⁵ DKE Radio spectrum monitoring in the context of Eurovision Song Contest 2011

Report main part: http://www.apwpt.org/downloads/esc2011_20122011_english_framedoc.pdf

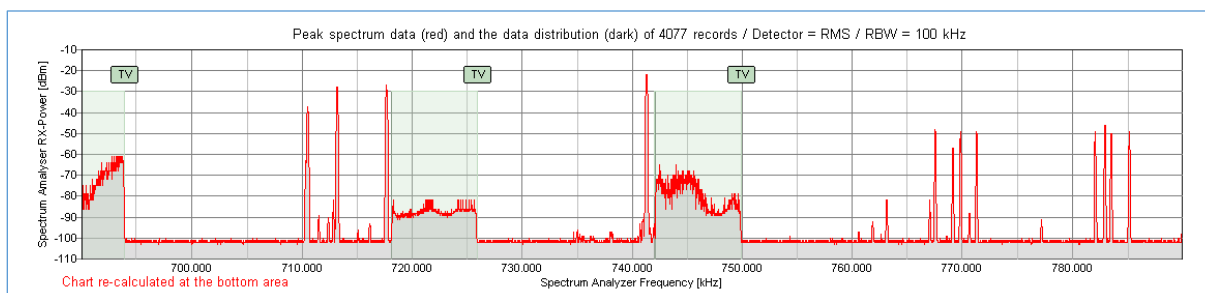
Report annex: http://www.apwpt.org/downloads/esc2011_20122011_english_annex.pdf

¹⁶ Source: www.wikipedia.org

¹⁷ Source: www.wikipedia.org

14) North Rhine-Westphalia state election Dusseldorf, May 2012

The North Rhine-Westphalia state election, 2012 was a snap election held on 13 May 2012, to elect members to the Landtag of the German state of North Rhine-Westphalia¹⁸.

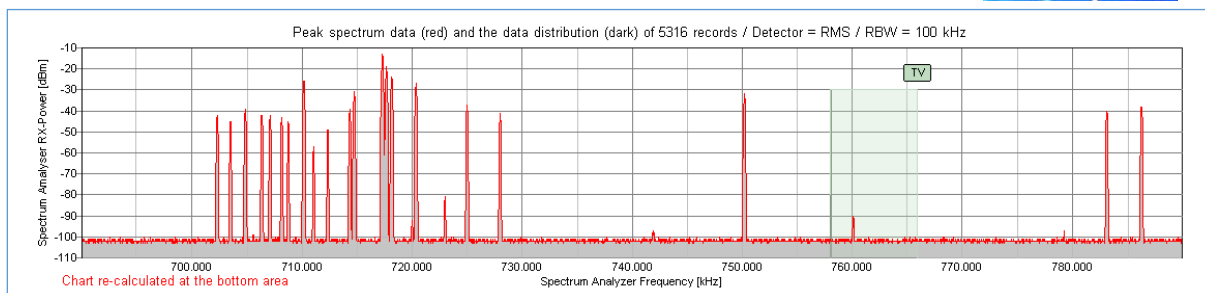


No coordination data on-hand.

The scanner has recorded approximately 23 ~~carrier~~carriers in the band 690 to 790 MHz.

15) Schleswig Holstein state election Kiel, May 2012

A state election occurred in Schleswig-Holstein on 6 May 2012. All 69 seats in the Landtag of Schleswig-Holstein were contested in this election¹⁹.



44 wireless microphones, IEM and audio links were coordinated in the band 690 to 790 MHz.

The scanner has recorded approximately 29 carrier~~s~~ in the band 690 to 790 MHz.

¹⁸ Source: www.wikipedia.org

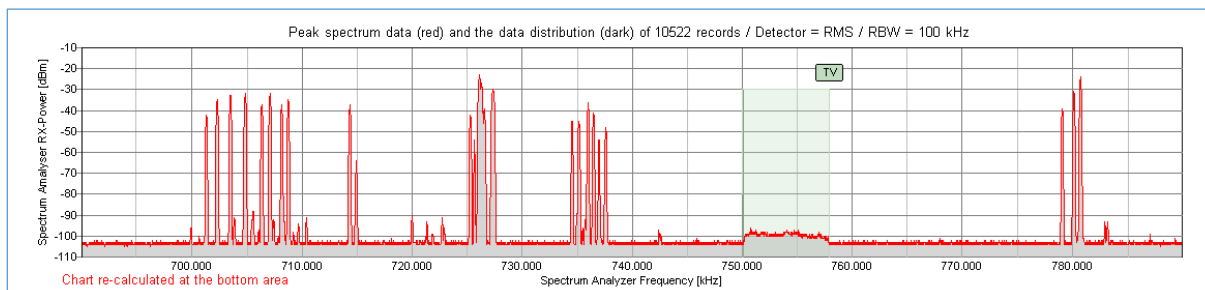
¹⁹ Source: www.wikipedia.org

16) Lower Saxony state election Hanover, January 2013

1st election after the reallocation of 790 to 862 MHz to IMT.



A state election was held in Lower Saxony on 20 January 2013 to elect the 137 members of the Landtag²⁰.

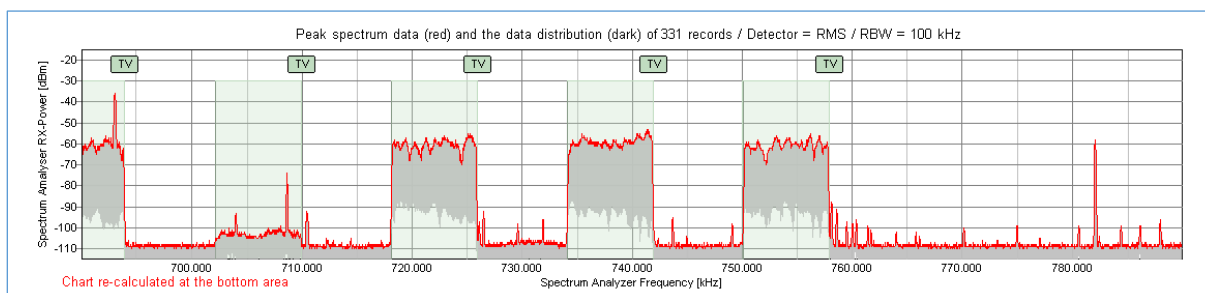
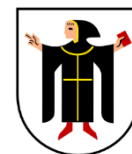


1st election after the reallocation of 790 to 862 MHz to IMT.

80 wireless microphones, IEM and audio links were coordinated in the band 690 to 790 MHz. The scanner has recorded approximately 36 carriers in the band 690 to 790 MHz.

17) Bavarian beer garden festivity “Oktoberfest” in Munich, October 2012

Oktoberfest is a 16-day festival celebrating beer held annually in Munich, Bavaria, Germany, running from late September to the first weekend in October. It is one of the most famous events in Germany and is the world's largest fair, with more than 6 million people from around the world attending the event every year²¹.



No coordination data on-hand.

Because of a large scanning distance most part of microphone signals are close to the noise level. The scanner has recorded approximately 27 carriers in the band 690 to 790 MHz.

Probably it was used much-many more microphones but due to distance from scanner these where not picked up. An intended-scan in October 2013 might-will show further details.

²⁰ Source: www.wikipedia.org

²¹ Source: www.wikipedia.org

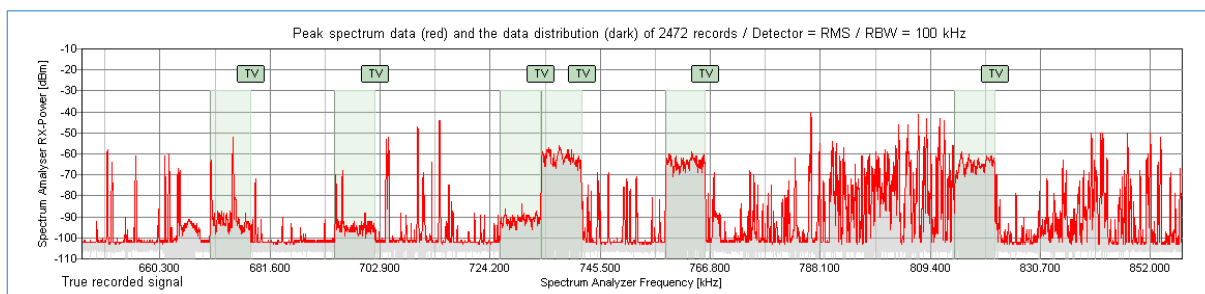
18) Summary

Section	Event name, location and year	Carrier in 690-790 MHz	
		Coordinated	Scanned
1	Live Earth Hamburg, 2007	-	30
2	UCI Road World Championships in Stuttgart, 2007	69	30
3	Lower Saxony election Hanover, 2008	79	29
4	Hamburg state election, 2008	73	39
5	Bavaria state election Munich, 2008	65	28
6	Saxony-Anhalt state election Magdeburg, 2011	38	39
7	Rhineland-Palatinate state election Mainz, 2011	27	26
8	Bremen state election, 2011	67	25
9	DFB Cup Final Berlin, May 2011	147 ²²	50
10+11	Eurovision Song Contest Düsseldorf, 2011	56	50
12	Mecklenburg-Vorpommern election Schwerin, 2011	65	18
13	Berlin election, September 2011	127	37
14	North Rhine-Westphalia state election Düsseldorf, 2012	-	23
15	Schleswig Holstein state election Kiel, 2012	44	29
16	Lower Saxony state election Hanover, 2013	80	36
17	Bavarian beer garden festivity Munich, 2012	-	26

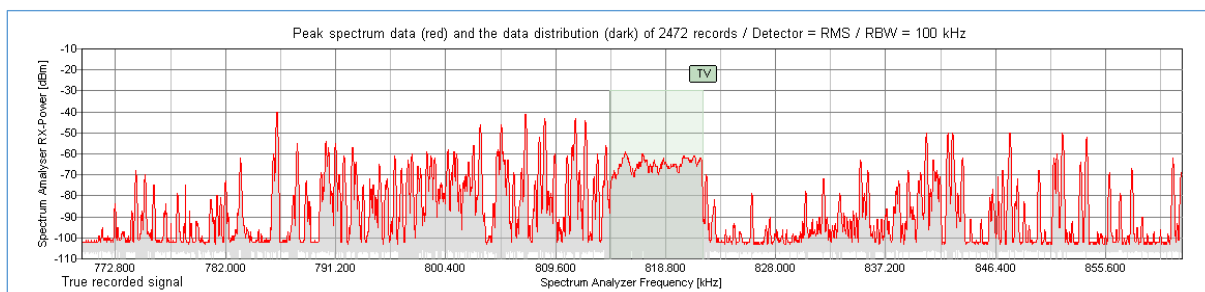
19) Change in the UHF TV spectrum because of Digital Dividend in the band 790 to 862 MHz

This example shows an indoor spectrum records made during the “Prolight and+ Sound” Fair at Frankfurt/Main. Prolight and+ Sound is the world’s largest international trade fair of technologies and services for events and entertainment.

- Radio spectrum occupation from 650 to 862 MHz in the year 2007



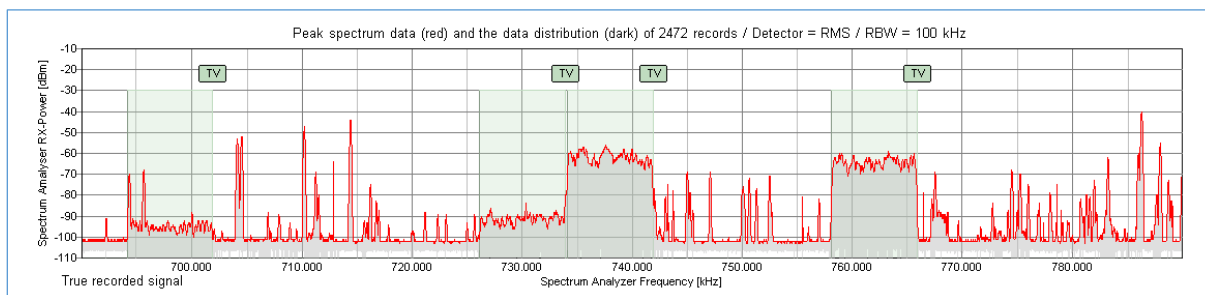
- The UHF TV band zoomed from 790 to 862 MHz (2007)



The licence exempt “microphone bands” 790 to 814 and 838 to 862 MHz are in heavy in-use. The scanner has recorded 113 carriercarriers within 3 days.

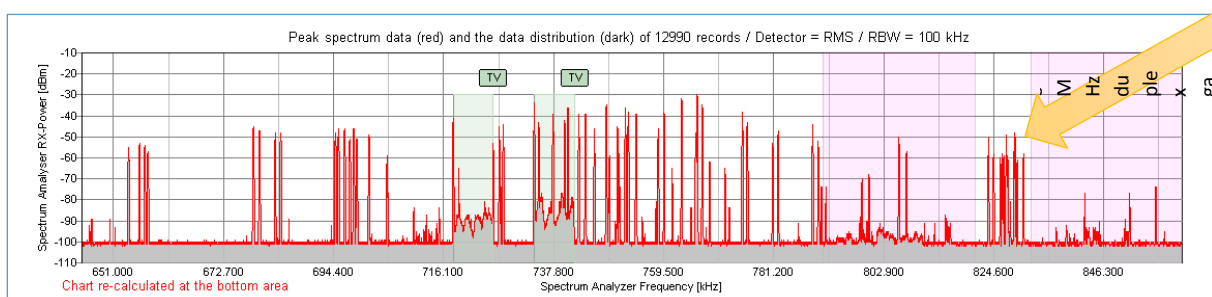
²² Calculated from the total number of SAB/SAP in 470 – 862 MHz

- The UHF TV band zoomed from 690 to 790 MHz (2007)



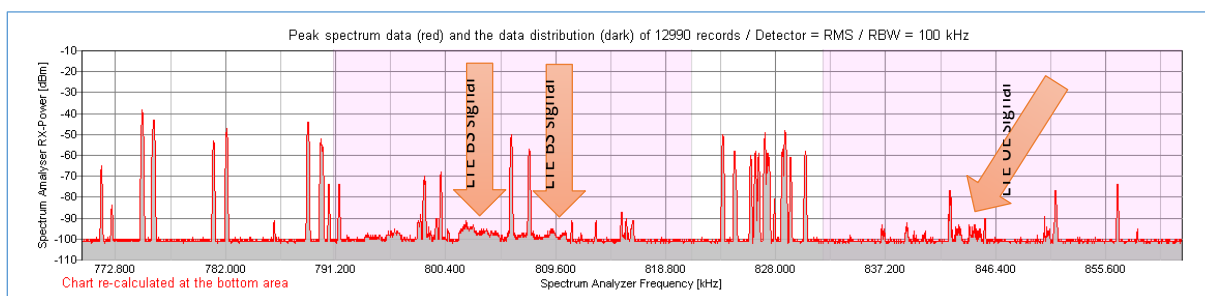
The scanner has recorded approximately 44 carriercarriers in the band 690 to 790 MHz.

- Indoor radio spectrum occupation from 650 to 862 MHz in the year 2013



The new IMT bands are marked as light red background

- The UHF TV band zoomed from 790 to 862 MHz (2013)



The new IMT bands are marked as light red background.

In comparison with the 2007 results noteworthy is the significant decrease of carriers in the licence exempt “microphone bands” 790 to 814 and 838 to 862 MHz.

Shown is the new 800 MHz duplex gap in occupation as a licence exempt “microphone band”.

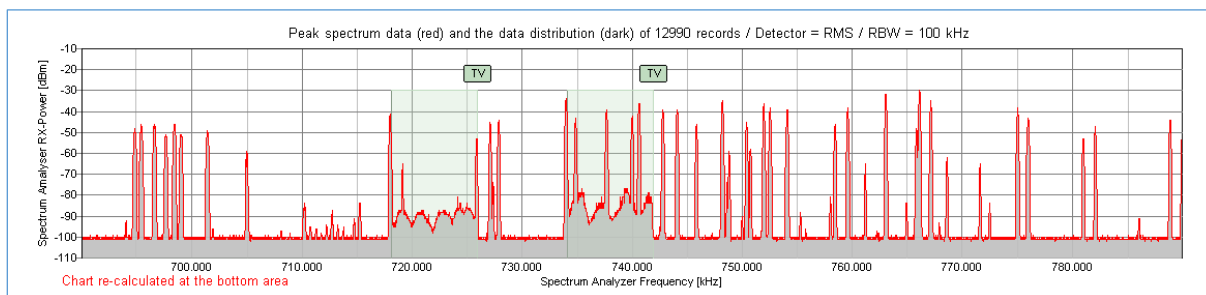
Within 2 days, the scanner has recorded in this room approximately 19 carrier in the duplex band.

The scan also showed that no LTE UE have been used in the observed room. However, in the spectrum record shows weak LTE BS and UE signals from outside.

Note

Since the introduction of LTE services in Germany, some events have made use of the 800MHz duplex gap, as mobile device use intensifies this will be subject to increasing interference and professional events will be unlikely to use as many channels (if any) in the duplex gap.

- The UHF TV band zoomed from 690 to 790 MHz (2013)



Indoor the scanner has recorded approximately 60 ~~carrier~~carriers in the band 690 to 790 MHz.

20) Conclusion

Currently events extensively use the tuning range 690 to 790 MHz as all the spectrum plots show. Each event is “unique” and will have a different spectrum “footprint” and the events shown above can only be regarded as examples of the hundreds of events taking place each year.

From these examples an average of some 32 to 50 channels will be lost if the 694 to 790 MHz reallocation takes place, in addition the reorganisation of the DTT transmitters will further reduce the available spectrum for SAB/SAP in the 470 to 694 MHz band. Dependant on the final DTT plan and possible WSD use up to 75% of existing channels could be ~~lost~~lost; this in turn will put in doubt the survival of such events