Frequencies for wireless microphones

This is how it works in Austria, Australia, Denmark, France, Germany, The Netherlands, New Zealand, Norway, Spain, South Korea, Sweden, Switzerland and United Kingdom

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Austria

Mandatory application

- 470 - 786 MHz, max. 50 mW ERP
- 823 - 826 MHz, max. 20 mW e.i.r.p. or max. 100 mW e.i.r.p. for body-worn wireless microphones
- 826 - 832 MHz, max. 100 mW ERP
- 786 - 789 MHz, max. 12 mW ERP
- 174 - 216 MHz, max. 50 mW ERP
- 230 - 250 MHz, max. 50 mW ERP

For all frequency ranges above an application is mandatory with a maximum allocation of 10 years.

License exempt frequencies

- 863 - 865 MHz, max. 10 mW ERP
- 1785-1805 MHz, max. 50 mW e.i.r.p. for body-worn wireless microphones otherwise max. 20 mW e.i.r.p.

Fees

- Fees of € 53 per transmitter will be levied.

Further information

- Application for a fixed term allocation to operate wireless systems: [http://www.bmvit.gv.at/telekommunikation/formulare/index.html](http://www.bmvit.gv.at/telekommunikation/formulare/index.html)
- Application by one of the four responsible Local Telecommunication Offices: A application form is available on request there. A downloadable application form will be served in due time on the web space.
- Contact address of the four responsible Local Telecommunication Offices: [http://www.bmvit.gv.at/telekommunikation/organisation/nachgeordnet/fmb/index.html](http://www.bmvit.gv.at/telekommunikation/organisation/nachgeordnet/fmb/index.html)
Australia

Current status

Wireless audio devices operate under a “Class Licence”, meaning that no special approvals or licence is required to operate equipment that meets the following frequency and power specs.

- Use of free frequencies (no approval needed) from 174 - 230 MHz, (max. e.i.r.p. 3 mW)

- Use of free frequencies (no approval needed) between 520 - 694 MHz, (max e.i.r.p. 100mW)

- Use of free frequencies (no approval needed) between 1790 - 1800 MHz, (max e.i.r.p. 100mW)

Operation on the frequencies shown above is as a secondary service, sharing with DTV transmission, on the basis that you do not operate outdoors on the same frequency as a DTV service licenced in the location, and that you operate on a “no interference – no protection” basis.

Application can be made to operate outdoors on the same frequency as a DTV service licenced in the location for special events.

Note that DTV channels are allocated on a “Block Planning” approach in Australia, with 6 consecutive channels, each 7 MHz wide, allocated to each DTV market. This means that in any location there will be at least one complete block of 42 MHz fully occupied by DTV transmission. In some locations more than 1 Block is in use – refer to www.frequencyfinder.com.au for up to date information about VHF & UHF DTV frequency allocation in any area of Australia

Approval can be requested to operate on higher power levels within these bands for defined “Special Events”
Denmark

No license required

In the Danish frequency plan some frequency bands have been allocated to be used for wireless microphones. In all of those bands the frequencies can be used without a licence (licence exemption).

• 32 - 39.4 MHz, 10 mW ERP, 50 kHz - Only some frequencies are allowed
• 138.2 - 142.070 MHz, 50 mW ERP, 200 kHz - Only some frequencies are allowed
• 470 - 790 MHz, 50 mW ERP, 200 kHz - White spaces only
• 823 - 832 MHz, 100 mW e.i.r.p. 200 kHz - Handheld only 20mW in 823-826 MHz
• 863 - 865 MHz, 10 mW ERP, 200 kHz
• 1785 - 1800 MHz, 50 mW e.i.r.p., 200 kHz - Handheld only 20mW

Further Information

• [http://danishbusinessauthority.dk/spectrum-resources-wireless-mics](http://danishbusinessauthority.dk/spectrum-resources-wireless-mics)

• Online tool to find legal location specific whitespaces
France

License exempt frequencies

The access to spectrum for PMSE (wireless microphones, In-Ear monitor systems, talk-back applications) is subject to a licence-exempt regime, authorized by the national regulatory authority ARCEP (Autorité de régulation des communications électroniques et des postes).

Such use is allowed in the following bands, and is restricted to professional users.

- 174 - 223 MHz, max. 50mW ERP
- 470 - 786 MHz, max. 50 mW ERP
- 786 - 789 MHz, max. 12 mW ERP
- 823 - 826 MHz, max. 20 mW e.i.r.p. or max. 100 mW e.i.r.p. for body-worn wireless microphones
- 826 - 832 MHz, max. 100 mW e.i.r.p.
- 1785 - 1800 MHz, max. 50mW e.i.r.p. for body-worn wireless microphones otherwise max. 20mW e.i.r.p.

Further Information

Additional information about regulation for PMSE audio can be found on ARCEP: http://www.arcep.fr/?id=10887
Germany

Generally approved

- 790 - 814 and
  838 - 862 MHz, 50 mW, permit 91/2005, ends 31.12.2015
  (individual assignments are possible from 2016)
- 823 - 832 MHz, 82/100mW (e.i.r.p.), permit 2/2015
- 863 - 865 MHz, 100mW (e.i.r.p.), permit 2/2015
- 1785 - 1805 MHz, 100 mW (e.i.r.p.), permit 3/2015

A further objective is the additional provision of alternative frequencies for use by wireless microphones in the frequency bands 694-790 MHz, 1452-1492 MHz and 1492 - 1518 MHz (BNetzA Official Bulletin 04/2015).

Individual assignment

- 174 - 230 MHz, 50 mW
- 470 - 608 MHz, 50 mW
- 614 - 790 MHz, 50 mW
- 1452 - 1492 MHz, 50 mW
- 1492 - 1518 MHz, 50 mW

Fees for a “PA system” (wireless microphone systems)

- Non recurrent fee is € 130.00 per application. This amount includes one-time administration costs regardless of the number of wireless microphones that are used in the system (wireless station).
- An additional frequency use and EMC contribution (TKG & EMVG as of 2011) is currently € 9.43 per transmitter per year.
- Any change to an existing license is currently 65.00 €

Payment for frequency changeover (Germany)

More information is at:
http://www.apwpt.org/international-news/germany/aktuelle-entschaedigungsdiskussion/index.html (in German language only)
The Netherlands

Current status

With the Dutch newspaper “Staatscourant Nr. 3750” an updated frequency allocation plan was published on March 4, 2015. Subcategory 8 refers to radio transmission equipment intended for low power wireless audio connections (PMSE). The use of free frequencies (no approval needed) is permit in this tuning ranges:

- 195 - 202 MHz, ≤ ERP 50mW
- 470 - 556 MHz, ≤ ERP 50mW
- 558 - 564 MHz, ≤ ERP 50mW
- 566 - 572 MHz, ≤ ERP 50mW
- 574 - 580 MHz, ≤ ERP 50mW
- 582 - 588 MHz, ≤ ERP 50mW
- 590 - 596 MHz, ≤ ERP 50mW
- 598 - 604 MHz, ≤ ERP 50mW
- 614 - 791 MHz, ≤ ERP 50mW
- 791 - 823 MHz, ≤ ERP 50mW, allowed to January 1, 2016
- 823 - 826 MHz, hand-held ≤ e.i.r.p. 20mW, body-worn ≤ e.i.r.p 100mW
- 826 - 832 MHz, ≤ e.i.r.p 100mW
- 832 - 862 MHz, ≤ ERP 50mW, allowed to January 1, 2016
- 863 - 865 MHz ≤ ERP 10mW
- 1785 - 1805 MHz, portable ≤ e.i.r.p. 20mW, body-worn ≤ e.i.r.p 50mW

Information

Nationaal Frequentieplan 2014 (Dutch)
Programme Making and Special Events (Dutch)
Application-form-events (E)
Norway

No license required

In the Norwegian frequency plan some frequency bands have been allocated to be used for wireless microphones. In all of those bands the frequencies can be used without a licence (licence exemption).

- 41 - 43.6 MHz, 10 mW ERP
- 510 - 790 MHz, 50 mW ERP  White spaces only
- 823 - 832 MHz, 100 mW e.i.r.p.  Handheld only 20mW in 823-826 MHz
- 863 - 865 MHz, 10 mW ERP
- 1492 - 1518 MHz, 50 mW e.i.r.p.  Only indoor use
- 1785 - 1804.8 MHz, 50 mW e.i.r.p.  Handheld only 20mW

Further Information

- [http://www.nkom.no/teknisk/radiolinje-satelitt-og-pmse/pmse/om-tr%C3%A5dl%C3%B8se-mikrofoner](http://www.nkom.no/teknisk/radiolinje-satelitt-og-pmse/pmse/om-tr%C3%A5dl%C3%B8se-mikrofoner)
- Online tool to find legal location specific whitespaces
  [http://finnsenderen.no/traadlos](http://finnsenderen.no/traadlos)
New Zealand

Generally approved

Wireless audio devices are permitted to operate in New Zealand between the frequencies of 510 MHz and 606 MHz and between 622 MHz and 698 MHz, under class licence provisions which limit maximum e.i.r.p. to 250 mW.

At the time of writing no DTV channels are planned to operate between 622 MHz and 698 MHz from March 11th, 2015, however the lower block between 526 MHz – 606 MHz is used for DTV throughout most of the country. TV Channels in New Zealand are 8 MHz wide, and in some places frequencies of operation start at 510 MHz.

Operation under the General User Licence is as a secondary service, sharing with DTV transmission, on the basis that you do not operate on the same frequency as a DTV service licenced in the location, and that you operate on a “no interference – no protection” basis.

From 11 March 2015, radio microphones (and other wireless audio devices such as in-earpieces) are no longer permitted to operate in the 698-806 MHz frequency range (the 700 MHz band).

Note 1: 502 MHz to 510 MHz may also be used with the maximum power limit of -10 dBW e.i.r.p. which is equivalent to around 100 mW.

Operation under the class licence means there is no need to apply for a licence to operate equipment that complies, and there are no fees or charges applicable.

Further Information

Further information can be found here:

- [http://www.retune.co.nz](http://www.retune.co.nz)
- [http://www.wunz.co.nz](http://www.wunz.co.nz)
Spain

Current status

Licence required - Generally approved
470 - 786 MHz, >20 mW ERP, 200 kHz, see IR201 and IR216

License exempt frequencies

- 174 - 194.6 MHz, 50 mW ERP, see IR98
- 470 - 786 MHz, up to 20 mW ERP, 200 kHz, see IR201 and IR216
  - There should not be any interference to other emissions from the same band.
  - For use in interior public spaces, multimedia productions,
    artistic and sport events, of temporary character.
  - Compatible with TV service in the zone of use.
- 823 - 832 MHz, 20mW e.i.r.p. hand-held, 100mW e.i.r.p. body-worn, 200 kHz, see IR201 and IR216
- 863 - 865 MHz, 10mW ERP, see IR98
- 1785 - 1800 MHz, 20mW hand-held and 50 mW e.i.r.p. body-worn, see IR98

Further information

- Cuadro Nacional de Atribución de Frecuencias (CNAF)
- UN36: 470 - 786 MHz
- UN118: 863 - 865 MHz
- UN119: 1785 - 1800 MHz
- UN-95, UN-106 and UN-127: 174 - 194.6 MHz
- UN151: 823 - 832 MHz
South Korea

* Licence required - Generally approved*

- 470 - 698 MHz, 50 mW, ERP, for broadcast and fixes sites only

*Fees per year*

- One-time fee for 5 years: about 12 € (converted)
- In addition per link and year: about 10 € (converted)

*License exempt frequencies*

- 925 - 937.5 MHz, 30 mW, ERP
Sweden

License required - Generally approved

- 174 - 240 MHz, 50mW ERP
- 470 - 790 MHz, 50mW, ERP
- 1785 - 1800 MHz, 20mW ERP, Handheld TX
- 1785 - 1800 MHz 50mW ERP, Body Worn TX

License exempt frequencies

- 41 - 43.6 MHz, 10mW,
- 823 - 826 MHz, 10mW ERP, Handheld TX
- 823 - 826 MHz, 50mW ERP, Body worn TX
- 826 - 832 MHz, 50mW ERP
- 863 - 865 MHz, 10mW ERP

Fees per year

- 230 SEK per transmitter
- Max 2300 SEK per system

Current activity

- The government announced, the band 694-790 MHz will not be available after January 1st, 2017.

Information

- Info: https://www.pts.se/sv/Bransch/Radio/Radiotillstand/Anvandning-av-tradlosa-mikrofoner/
Switzerland

No mandatory concession, no licensing fee

Since 1 January 2013, it is no longer necessary to subject wireless microphone and In-Ear monitor systems to the licensing regime.

Wireless microphones and In-Ear monitor systems can be operated within the following frequency ranges:

- 31.4 - 39.6 MHz, 100 mW ERP, RIR 1009-01
- 174 - 223 MHz, 50 mW ERP, RIR 1009-02
- 470 - 786 MHz, 50 mW ERP, RIR 1009-10
- 470 - 782 MHz, 250 mW ERP, RIR 1013-20
  (only the channels indicated in RIR)
- 786 - 789 MHz, 12 mW ERP, RIR 1009-17
- 823 - 826 MHz, 20 mW e.i.r.p., RIR 1009-18
  (100 mW e.i.r.p. for wireless microphones carried on the body)
- 826 - 832 MHz, 100 mW e.i.r.p., RIR 1009-13
- 863 - 865 MHz, 10 mW ERP, RIR 1009-05
- 1785 - 1800 MHz, 20 mW e.i.r.p., RIR 1009-09
  (50 mW e.i.r.p. for wireless microphones carried on the body)

Further Information

Radio microphones (E)
Drahtlose Mikrofone (D)
Microphones sans fil (F)
Microfoni senza filo (I)
United States

Licensed and Unlicensed Operation Permitted

It is permissible to operate wireless microphones and in ear monitoring systems on either a licensed or unlicensed basis in several bands. In the television broadcasting bands, a power limit of 50 mW applies for unlicensed operation; licensed microphones and in ear monitor transmitters may operate with up to 250 mW.

Currently, wireless microphones may operate on locally unused television channels within the VHF and UHF television broadcasting bands in the 54-72, 76-88, 174-216, and 470-698 MHz bands. Locally unused television channels may be determined by consulting one of the wireless microphone manufacturers’ online frequency finders, or the web site of one of the FCC approved database operators. Currently the first locally unused television channel above and below UHF channel 37 is reserved for use by wireless microphones. The status of these channels will be changing in the future.

In 2016, the Federal Communications Commission (FCC) will auction the upper part of the UHF television band for use by mobile services. This is known as the “Incentive Auction” and it will affect the frequencies available for use by wireless microphones. The auction will take place in two main stages. First, the FCC will conduct a reverse auction in which broadcasters will bid on how much they would accept to relinquish their channels. After this phase of the auction is finished, there will be a forward auction in which interested parties can bid on the blocks of spectrum that are available for sale. The auction is expected to be completed by the end of 2016.

In the United States, television channels are 6 MHz wide. As part of the auction process, the repurposed UHF spectrum will be reorganized into 5 MHz blocks with an 11 MHz duplex or mid-band gap separating the new mobile uplink and downlink bands. The frequency limits of the duplex gap will be set after the auction is completed and will be uniform nationwide. The upper 6 MHz of the gap will be shared by White Space Devices (WSD) and wireless microphones operating on an unlicensed basis. Below the 6 MHz shared band there will be a 4 MHz band for use by licensed wireless microphones. At the bottom of the gap, there will be a 1 MHz buffer to protect the mobile downlink band. Wireless microphones will be limited to a power of 20 mW EIRP in the duplex gap.

At the lower end of the auctioned spectrum band, there will be a guard band to separate the mobile downlink band from the channels that will continue to be used for TV broadcasting. The lower guard band will be either 7, 9, or 11 MHz wide depending on the amount of spectrum that is cleared. Wireless microphones will be permitted to operate in the lower guard band except for a 1 MHz buffer adjacent to the mobile downlink band. White Space Devices will also share this band, observing a 3 MHz buffer to the mobile downlink band. Thus, there will be 2 MHz of spectrum in which wireless microphones will not be subject to potential interference from White Space Devices.

Below, you will find a chart showing various possible auction scenarios and the resulting plan for the upper part of the 600 MHz UHF television band:
In the unique case in which exactly 84 MHz of spectrum is cleared, Channel 37 will serve as the lower guard band with a 3 MHz buffer on the upper side to protect the mobile downlink band. Wireless microphones will be permitted to operate in the 2 MHz closest to Channel 37, leaving a 1 MHz buffer to protect the mobile downlink band. White Space Devices will not be permitted to operate in this guard band but they will be allowed to operate in Channel 37. If the auctioned spectrum extends below Channel 37, there will be a second guard band on the lower side which wireless microphones will also be able to use. See the chart below for a clarification of this situation:

<table>
<thead>
<tr>
<th>Lower 3 MHz Guard Band</th>
<th>Channel 37</th>
<th>Upper 3 MHz Guard Band</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bottom 1 MHz Segment</td>
<td>Lower 2 MHz Segment</td>
<td>WSD only - no microphones</td>
</tr>
<tr>
<td>No WSD</td>
<td>No WSD</td>
<td>No WSD</td>
</tr>
<tr>
<td>No Microphones</td>
<td>Microphones</td>
<td>Microphones</td>
</tr>
</tbody>
</table>

In addition to the Duplex Gap and the Guard Bands in the repurposed UHF spectrum, wireless microphones will still be able to operate in any locally unused TV channels. The FCC has stated that it intends to ensure that there will be at least one and possibly two locally unused channels in each market. Licensed wireless microphone users may register channels they intend to use with one of the FCC approved database operators to receive interference protection from White Space Devices operating in the TV bands. In general, unlicensed users are not protected from WSD interference. Under certain circumstances, unlicensed users can still register with a database, but must do so at least 30 days in advance. Following the Incentive Auction, the FCC intends to remove this provision because of the fact that licensing eligibility has been expanded. Entities that regularly use 50 or more wireless microphones, in-ear monitoring systems, or other audio PMSE devices in their productions are now eligible to apply for a Part 74 FCC license.
A new provision in the FCC wireless microphone rules will permit co-channel operation with TV channels in locations where the received signal strength is below -84 dBm. This can be useful in indoor venues where the TV signal is too weak to be receivable.

In addition to the spectrum available in the television bands, wireless microphones can also operate in one of the license-exempt (ISM) bands at 902 - 928 MHz, 2400 - 2483.5 MHz, or 5725 - 5850 MHz as well as the UPCS (DECT) band at 1920 - 1930 MHz. Microphones operating in these bands have different technical requirements than those for use in the television bands. These bands are shared with many other devices, and can be congested at certain times and places, but they can be useful for semi-professional applications.

Because the amount of spectrum available for wireless microphones in the television bands will be reduced after the Incentive Auction, the FCC is making additional spectrum available in several bands. These include the following:

In the VHF band, the FCC will allocate four new frequencies in the 169-172 MHz VHF band at 169.475, 170.275, 171.075, and 171.875 MHz. These frequencies will have the same 200 kHz bandwidth as the TV band frequencies. Output power will be limited to 50 mW. A separate Part 90 FCC license will be required to use these frequencies. Anyone may apply for a Part 90 license.

The 944-952 MHz band will be expanded to include 941.5-952.0, 952.85-956.25, and 956.45-959.85 MHz. This represents an addition of 9.3 MHz to the existing 8 MHz band for a total of 17.3 MHz. Users must hold a Part 74 FCC license in order to operate in this band. In addition, advance coordination with SBE frequency coordinators will be required. Maximum power in this band will be 1W.

The 1435-1525 MHz aeronautical flight test band will be opened for professional wireless microphone operation on a secondary basis. A maximum of 30 MHz will be available for wireless microphone use at a given location. Advance coordination with the Aerospace and Flight Test Radio Coordinating Committee (AFTRCC) will be mandatory. Industry representatives are working with AFTRCC and the FCC to develop equipment requirements and access protocols. The maximum power permitted will be 250 mW.

The 6875-6900 and 7100-7125 MHz bands will become available for professional wireless microphone operation on a secondary basis. Users must hold a Part 74 FCC license in order to operate in this band. In addition, advance coordination with SBE frequency coordinators will be required. Maximum power in this band will be 1W.

The information in this section represents a snapshot of the situation as of November 2015. It will be updated as new information becomes available.
United Kingdom

Preliminary remark

‘Site’ License required and issued where frequencies are not used for broadcasting in a given geographical location – access could be for a limited period or on a long-term basis.

- 470 - 606 MHz, max. 50 mW ERP
- 614 - 790 MHz, max. 50 mW ERP
- 1785 - 1800 MHz, max 50 mW ERP

‘Shared’ License required – annual renewal

- 606 - 614 MHz, max. 50 mW ERP

License exempt frequencies

- 863 - 865 MHz, max. 50 mW ERP
- 173.8 - 175 MHz max 50 mW ERP

Running Activities

- 790 - 862 MHz paired with 2.6 GHz spectrum – licences now sold by Ofcom and 4G services are now being deployed. Spectrum no longer available for PMSE use. All equipment that tunes to 790 – 862 MHz now obsolete in the UK and most of Europe.

- TV 31 to 37 (550 - 606 MHz) was viewed by Ofcom as their ‘next priority’ in terms of release to the market – UK specific situation – this now put on hold as a result of uncertainty around 700 MHz as a result of developments at WRC-12. Spectrum currently available for PMSE use – and will become increasingly important in light of the potential release of the 700 MHz band for even more IMT services

- BEIRG (British Entertainment Industry Radio Group) in constant contact with UK regulator Ofcom. Having regular high level meetings with Peter Bury MBE (Director of Spectrum Policy) along with Helen Hearn and Vaughan John (Secretary of FM51).
• 700 MHz band looking increasingly likely to be given a co-primary mobile allocation at WRC-15. BEIRG/APWPT talking to Ofcom to try to identify alternative frequency bands outside of UHF bands IV/V for future PMSE use.

• Ofcom have now allowed UK mobile operator Everything Everywhere to deploy LTE 4G services (re-farm) into the band adjacent to 1785 - 1800 MHz.

• Ofcom UK “do not consider it appropriate to impose licence restrictions on the use of any portions of the 832 - 862 MHz block to protect SRD’s” and “We believe the most appropriate mitigations are those available to the makers and users of SRD devices themselves”. Therefore no protection for users of wireless microphones in the 863 - 865 MHz band from interference generated by the new 4G services to be launched in the 800 MHz band.

• European Commission minded to harmonise the duplex gaps 832 - 862 MHz and 1785 - 1805 MHz, but no protection from LTE services on offer. Not sufficient spectrum to meet the needs of professional PMSE services.

• Ofcom now see white space devices as a great vehicle to deliver new services to citizens and consumers, impact on PMSE could be catastrophic.

• Trials of white space devices underway in Cambridge, and at Ofcom’ UK. PMSE community heavily involved with the trials and in the Technical working group being headed up by Reza Karimi at Ofcom UK. The work is ongoing.

• For details on cost of UK licensing contact Arqiva PMSE (formerly JFMG) – www.pmse.co.uk
APWPT - What is our focus?

Secure in long-term production frequencies and the required spectrum quality.

APWPT - What happens now?

In many countries, a decision regarding the digital dividend has yet to be made.  
-> We want to work actively alongside this development

In countries where a decision has been made, we are working for a quick implementation.  
→ We are working for planning security.  
→ In many countries and committees, we are supporting a discussion of the facts.

The entire industry must now adjust to a new situation and, if need be, invest in suitable tools and methods.

APWPT - Activities?

- Inform decision makers on political and regulatory level on PMSE application and spectrum needs.
- Inform PMSE user on the status and trends in the spectrum discussion.
- Secure PMSE protection against interferers in international organisations on standardisation, e.g. EFSC, ETSI, ECC/CEPT and ITU-R.
- Take care of PMSE user interests at World Radiocommunication Conference and following activities.
APWPT – How get further information?

The Association of Professional Wireless Production Technologies (APWPT) represents the interests of manufacturers and users of wireless radio systems. It works at national and international level to obtain the frequencies needed for this technology.

Through the rigorous networking of international experts from the areas of application, standardization, regulation, product development, science and lobbying, we are striving to bring together a maximum amount of expertise.

There is more information in the Internet at www.apwpt.org.

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