



Low Power FM Broadcasting General User Licence 2010

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1. Introduction

A new General User Licence (GUL) for Low Power FM Broadcasting (LPFM) came into force on 17 June 2010.

The following information is provided to:

- Provide discussion on the requirements of that GUL;
- Identify the aspects that have changed from the previous (2003) LPFM GUL notice; and
- Provide information on the potential for Low Power FM broadcasting stations to cause interference to aeronautical, landmobile and high powered licensed [VHF- FM](#) broadcasting services in adjacent frequency bands.

This information is not intended to replace or extend the requirements of the GUL.

The Clause and Schedule numbers in this document reference to clauses and schedules in the [LPFM GUL](#) published June 2010.

2. General User Licence for Low Power FM Broadcasting Notice 2010 requirements

2.1 Summary of 2010 Changes to LPFM Requirements

The changes to the terms, conditions and restrictions between the 2003 LPFM GUL and the 2010 LPFM GUL include:

- [The requirement for transmission of contact details changes from 3 hourly to hourly;](#)
- [Five new frequencies have been added and four old frequencies removed;](#)
- [A new emission class is added for radio data transmission services;](#)
- [The maximum permitted transmit power level is increased from 0.5 to 1 Watt;](#)
- [The adjustment of the maximum permitted signal strength measurement distance from 10 to 100 meter and corresponding change in maximum signal level;](#)
- [Requirements for external transmitter power controls are changed;](#)
- [The use of vertical polarisation is mandated;](#)
- [Unwanted emission limits are now included; and](#)
- [Use of some frequencies in some areas is restricted for the protection of aeronautical services, until the 2010 LPFM GUL is revoked.](#)

2.2 Transition Processes

The transitional arrangements included in Clause 4. and Schedule 2(2) of the new GUL are no longer applicable. As a consequence, from 1 October 2010 landmobile services in the band 87.5 MHz to 88.0 MHz are no longer be protected and LPFM transmissions on those frequencies are permitted.

2.3 Operational Policy Matters

The "25 km" rule

Clause 3(1) of the LPFM GUL requires that "Within a 25km radius of any broadcast transmitter there must be no more than one low power FM transmitter broadcasting substantially the same programme (including simulcast or re-transmission) as that broadcast transmitter. Broadcast transmitter means a low power FM transmitter or any broadcast transmitter licensed pursuant to section 48 of the [Radiocommunications Act 1989](#)."

- The 25 km rule applies as follows:
 - within 25 km of any low power FM transmitter, there may be no more than one other low power FM transmitter broadcasting substantially the same programme; and
 - within 25 km of a spectrum/radio licence transmitter, there may be no more than one low power FM transmitter broadcasting substantially the same programme;
- The phrase "substantially the same programme (including simulcast or re-transmission)" in application of the 25 km rule above is intended to apply sensibly to a variety of situations. For example:
 - If two stations use the same source material for fairly short periods, or have partially over-lapping play-lists, this is unlikely to amount to being "substantially the same programme":
 - Broadcasting the same play list in a random order from separate locations will amount to being "substantially the same programme"

The "Contact Details" rule

Clause 3(2) requires that "Low Power FM transmitter operators must broadcast the contact details of the person responsible for the transmissions at least once every hour". (The 2003 GUL requirement was for transmission every 3 hours.)

This requirement can be met by a spoken announcement of the name by which the station is identified, or the name of the person responsible for the establishment and operation of the transmitter, where that name is the subject of a current telephone directory listing.

If there is no public telephone directory listing associated with the name in the announcement, the requirement can be met by including one of the following in the announcement:

- a business telephone number
- a business address
- a residential telephone number
- a residential address
- a valid e-mail address
- a postal address

Definition of Broadcasting Transmissions

Clause 3(3) identifies that only “broadcasting” transmissions are permitted. Broadcasting means any transmission of programmes, whether or not encrypted, by radio waves or other means of telecommunication for reception by the public by means of broadcasting receiving apparatus but does not include any such transmission of programmes:

- made on the demand of a particular person for reception only by that person; or
- made solely for performance or display in a public place.

Frequency use and coordination

Clause 3(6) states that “Frequency use is on a shared basis and the Ministry does not accept liability under any circumstances for any loss or damage of any kind occasioned by the unavailability of frequencies, or degradation to reception from other transmissions”.

The Ministry recognises that coordination between users can minimise the risk of interference between services and encourages the establishment of user groups and associations to coordinate installations for the equitable utilisation of the available frequencies by all users.

Protection of licensed Services

Clause 3(7) states that “Should interference occur to services licensed pursuant to a radio licence or spectrum licence, including wireless public address systems, the Chief Executive reserves the right to require and ensure that any transmission pursuant to this general user licence change frequency, reduce power or cease operation”. Where interference is caused to individual radio and spectrum licences with receive protection rights, the Ministry can issue infringement notices under the Radiocommunications Act 1898 and can, where the interference is a significant or flagrant violation of the LPFM licence conditions, seek prosecution.

2.4. Emission Requirements

Permitted Transmit Frequencies

The permitted transmit carrier frequencies (Schedule 1(1)) are:

87.6 MHz	87.7 MHz	87.8 MHz	87.9 MHz
88.0 MHz	88.1 MHz	88.2 MHz	88.3 MHz
106.7 MHz	106.8 MHz	106.9 MHz	107.0 MHz
107.1 MHz	107.2 MHz	107.3 MHz	107.4 MHz
107.5 MHz	107.6 MHz	107.7 MHz	

Emission Designations

Emission designations permitted are specified in Schedule 1(2) of LPFM GUL using the International Radio Regulations format for describing the bandwidth, modulation type and information content of radio emissions.

The LPFM GUL emission designations are:

- 180KF3E; when transmitting mono services;
- 256KF3E; when transmitting stereo services; and
- 256KF3EHW; when transmitting stereo services with multiplex radio data services (RDS) or transmitter control data.

The first four characters for the emission designation indicate the necessary bandwidth of emission, hence the maximum permitted bandwidth for LPFM transmissions is 256 kHz.

Transmit Power Levels

Schedule 1(3) states that the maximum permitted transmit power is 0 dBW e.i.r.p. (1 Watt), where e.i.r.p. means equivalent isotropic radiated power.

In practical terms, the effective transmitted power is the sum of the power output of a transmitter plus the antenna gain, minus both the feeder cable loss between the transmitter and antenna, and any filter or connector losses.

Broadcasters should be aware that locating a non-directional antenna close to a metal mast or tower could increase the effective radiated power beyond the permitted level. For example a folded half wave length dipole mounted approximately 0.5 m from a parallel vertical steel mast can increase antenna gain up to 3 dB and increase effective radiated power to almost + 3dBW in the direction away from the mast, and will therefore not comply with the requirements of the GUL.

Advice on antenna mounting can be obtained from an experienced radio engineer to ensure compliance issues are avoided.

Field Strength Levels

Schedule 1(4) requires that the maximum permitted field strength at a distance of 100 metres from the transmit antenna is 95 dB μ V/m (this is based upon a transmit power of 1 Watt e.i.r.p.) The Ministry will use this value as a reference when making field measurements.

External Transmitter Power Controls

Many LPFM broadcasters now wish to use sophisticated broadcast studio control facilities to provide enhance program reception. Such equipment can also change transmitter emission bandwidths and power levels. In the past, controls that permitted the adjustment of LPFM transmitter power were not permitted to be easily accessible.

This restriction has been modified and Schedule 1(5) now allows use of external studio control features, provided those features do not permit the adjustment of transmitter power above the maximum permitted level.

For the purpose of this requirement, external control means a control that is easily accessible by an LPFM broadcaster without the removal of screws, the removal of secured plates or lids, or unlocking a normally locked door.

Where broadcasters are not certain whether their programme process control features will ensure compliance with the permitted transmit power level, emission designation requirements and/or unwanted emission limits of GUL schedule 1(8),

they should obtain appropriate advice and fit such limiting and filtering devices to the transmitter to ensure those requirements are met.

Emission Polarisation

Schedule 1(6) is a new requirement and specifies the need for vertical emission polarisation. A transmit antenna should therefore comprise vertical elements, either folded dipoles or short vertical dipoles. Horizontal wires or dipoles are not to be used.

This requirement will improve interference protection for aeronautical services.

Transmitter Frequency Stability

Schedule 1(7) requires that the transmitter frequency carrier frequency must be with +/- 5 kHz of the intended frequency. The section [Transmitter frequency control](#) below provides additional information concerning the control of the carrier frequency.

Unwanted Emission Limits (UEL)

Unwanted emissions include all emissions generated by the LPFM broadcast station outside the necessary bandwidth indicated for the widest permitted emission designation (256 kHz). The unwanted emission limits are those prescribed in the [Radiocommunications \(Radio Standards\) Notice 2007](#) Table 3. and in [Schedule 1\(8\) of the new GUL](#).

The limits cover all spurious, harmonic, intermodulation and any other components transmitted outside the emission designation bandwidth and resulting from broadcast modulation and transmitter processes and equipment.

2.5 Protection for Aeronautical Services

There are two areas identified in Schedule 2(1) where the use of some frequencies is prohibited for the protection of aeronautical radio navigation services. The locations are adjacent to landing approaches at Auckland International Airport and Wellington Airport. Maps of the areas and prohibited frequencies are included in [Attachment A - Maps of areas where LPFM Use is restricted](#).

The prohibited frequencies are those which when combined with signals from local high power broadcasters could result in aeronautical receiver intermodulation of sufficient level to cause interference to those navigational services.

Further general information on the protection of aeronautical services is included in [3.2 below](#).

3. Additional information on the Protection of Licensed Services from LPFM

3.1 Protection of Services - General

Notes from interference incidents

The Ministry radio spectrum compliance team has been involved in resolving interference complaints from a number of users of frequency band adjacent to those of LPFM services. These complaints have included interference to voice services used by:

- Low flying helicopters and aircraft during landing procedures; and
- Fire and police landmobile services.

The interference may have resulted from one or more of the following:

- Use of LPFM transmitter equipment without fail safe frequency control;
- Operating a LPFM transmitter above its normal design power level;
- Operating a LPFM transmitter with inadequate filtering or isolation between the antenna and transmitter output;
- Operating a LPFM transmitter on an incorrect frequency; and.
- Transmitter hardware failures.

Transmitter frequency control

Equipment that uses Phase Lock Loop (PLL) devices to produce carrier frequencies can lose phase lock and generate frequencies that vary as much as 20 MHz from that required. High quality LPFM transmitters include PLL devices fitted with fail safe features that disable the transmitter if phase lock is lost. Filtering at the transmitter output can limit emissions to within 1 or 2 MHz but does not provide a complete solution. Kitset PLL fail safe devices are available on the web.

Transmitter intermodulation

Many LPFM transmitters can radiate high levels of unwanted intermodulation signals when operated at power output levels above their design limit. The potential for such intermodulation is significantly increased when the LPFM transmitter is located close to another transmitter and there is inadequate filtering or isolation between the LPFM antenna and its transmitter. One incident involved two co-sited LPFM transmitters, one equipped with an antenna - transmitter isolator and the other without. The transmitter without the antenna-transmitter isolator produced intermodulation signals that interfered with voice communication (COM) receivers of low flying aircraft.

The means for prevention of transmitter intermodulation can include:

- ensuring the LPFM transmitter is operating within its normal design transmit power and frequency range;
- using antenna - transmitter isolators (preferred) or filters; and
- ensuring good physical separation between the LPFM antenna and other transmitter antennas operating in the same or adjacent frequency bands and in the same area. The separation should preferably include an obstructed radio path (no direct line of sight). Use of antenna – transmitter isolators and vertical separation between antennas is necessary for co-sited LPFM services.

Other causes

Radio equipment design, manufacture, installation and maintenance uses a number of techniques to minimize interference potential that have little in common with normal 230 V AC electrical practices. Failure to apply those techniques can result in interference. Such things as poor wiring connections, inadequate electromagnetic screening and rusty bolts and metal work on antenna masts, are notable for their potential to cause interference to radio services.

The LPFM GUL provides opportunities for every person to experiment with radio broadcasting. However, to ensure interference potential is minimized, users should have knowledge of good radio wiring and installation practices or the assistance of someone who has that knowledge.

Maintenance

Regular maintenance of transmitter equipment should be completed by a competent person using appropriate measurement equipment, such as spectrum analysers, modulation meters, power meters and visual inspection.

Regular checks should also ensure compliance with operational policy aspects of the LPFM GUL.

3.2 Protection of Aeronautical Services

Aeronautical services operating in bands adjacent to the LPFM and high power VHF-FM bands include navigation and voice services critical to the safe and efficient operation of air transport. LPFM services have the potential to cause or contribute to interference to those services and care is taken during the issue of licences to minimise that potential.

The LPFM GUL requires, as part of the protection for those services, compliance with unwanted emission limits, use of vertical polarization everywhere, and the prohibition of the use of some LPFM frequencies in locations in Auckland and Wellington.

Those two locations are not the only areas where LPFM interference to aeronautical services is possible. All airports and heliports and many infrequently used landing locations use radio voice services (COM) to provide information on landing conditions and procedures that are susceptible to low levels of interference. Helicopters landing at hospital heliports and accident sites are particularly susceptible to local interference.

When preparing the new GUL, considered was given to the inclusion of zones adjacent to airports and heliports where use of LPFM frequencies would be prohibited to protect aeronautical navigation and voice services. However, because experience had indicated such incidents were rare, the proposal was abandoned. To minimise the likelihood of such interference, LPFM broadcasters near those locations must ensure their services;

- conform to the requirements of the LPFM GUL;
- their transmitters are equipped with PPL fails safe and antenna - transmitter isolators and/or filters; and
- their transmitter, antenna and mast are properly maintained.

3.3 Protection of Licensed Broadcasting Services

LPFM broadcasters regularly operate with 200 kHz separation from other LPFM services in the same coverage area. This is considerably closer than the normal separation permitted by the frequency plans and coordination requirements for licensed VHF-FM services. Those requirements can be viewed in the [Public Information Brochure PIB39](#).

Use of LPFM frequencies with 200 kHz separation from licensed VHF-FM transmitters and within coverage of those licensed services can cause interference to

the reception of those services and, pursuant to [Clause 3\(7\)](#) of the GUL, is not permitted.

The coverage of VHF-FM licensed services includes those areas where the signal strength of their transmissions is not less than 66 dBµV/m.

Currently the only LPFM frequency available at 200 kHz separation from licensed VHF-FM services is 106.7 MHz. Users of 106.5 MHz can be found in [SMART](#) by entering 106.5 in Frequency (From), selecting Current in the Licence Status pull-down menu and selecting Search.

Opportunities for LPFM transmitters to cause interference to licensed VHF-FM services in other situations are likely to be limited to the causes noted above in [3.1 Protection of services – general](#). The precautions noted in those clauses should be taken to reduce the interference potential.

3.4 Protection of Landmobile Services

Landmobile services using the frequency band below 87.5 MHz include Ambulance, Fire and Police services that must be protected from interference. LPFM operators can help provide this protection by ensure they are aware of the potential sources of interference notes in 3.1 Protection of Services – General and ensure their services are operated and maintained in accordance with the recommendations noted therein.

The protection of landmobile services in the band 87.5 MHz to 88.0 MHz identified

4. Information Resources

Additional general and technical information concerning the LPFM GUL is available on this website as follows:

- [Introductory information on radio licences and compliance requirements](#)
- [Introductory information on General User Licences](#)
- [Public Information Brochures and Technical Monographs](#) discussing engineering requirements for licensed broadcasting services;
- [Policy documents](#) on broadcasting requirements; and
- Details of all licences in the [SMART](#) register of Radio Frequencies.

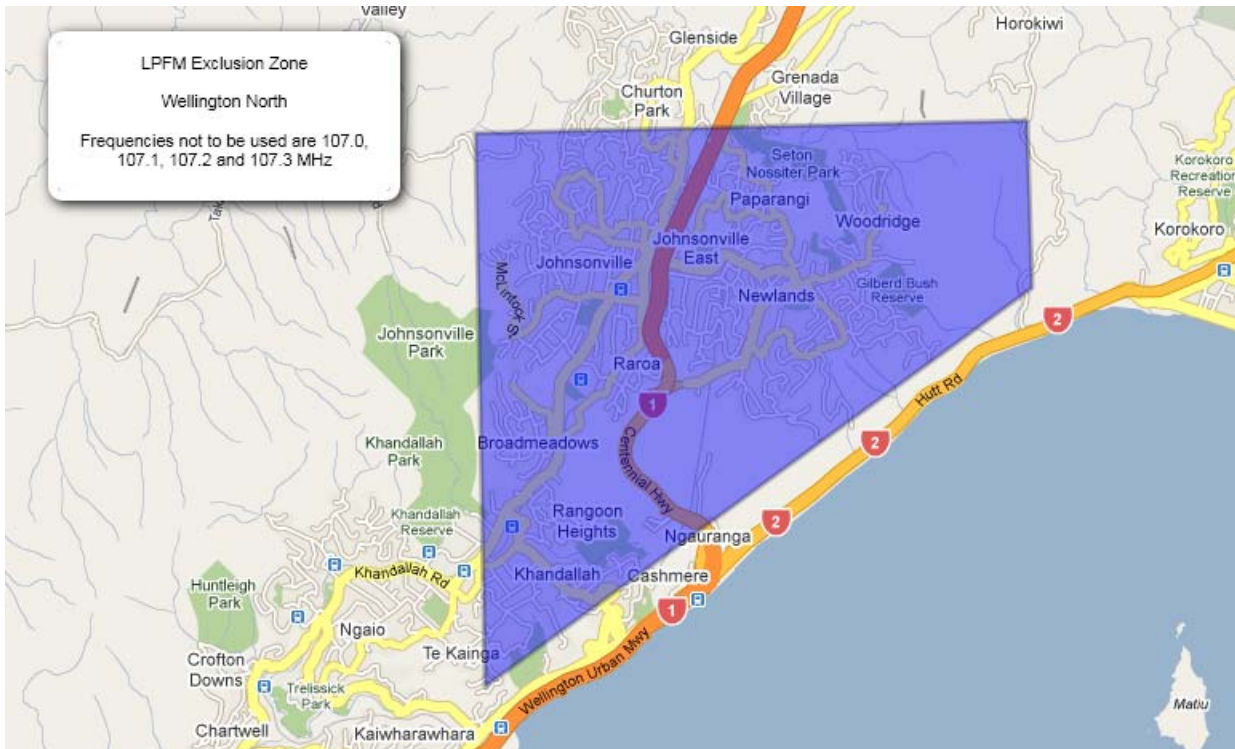
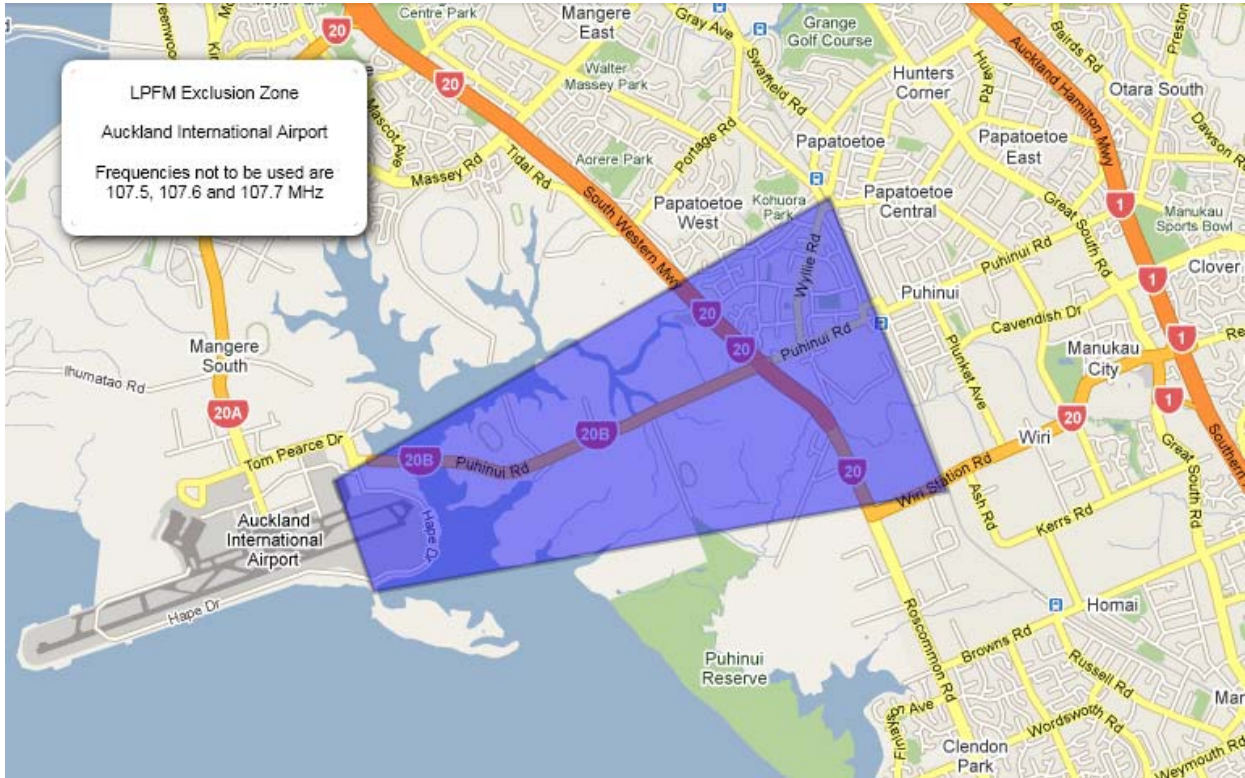
There are also a number of web sites that include discussion groups and information on LPFM. These include:

- www.radioheritage.net; this is a web site that maintains information on current and historic aspects of radio services and people;
- <http://www.lpfmnz.com/> the home site of The Society of Low Power FM Broadcasters Incorporated.

Ministry is not responsible for the contents or reliability of the external linked websites and their listing shall not be taken as endorsement of any kind. MED cannot guarantee that the external links will be available.

Attachment - Maps of Areas where LPFM use is restricted

Auckland International Airport and Wellington



Terminology and Acronyms

A Band	The landmobile radio service currently in the 81.0 – 87.5 MHz band. The band was 81.0 – 88.0 MHz band until 1 October 2010.
COM	Aeronautical voice radio communications services
dB	Decibel. = 10 times the logarithm of the ratio of 2 values
dBW	An absolute value of power relative to 1 Watt. Hence 0 dBW is 1 Watt and - 3 dBW is 0.5 Watts
dBW e.i.r.p.	The power output of a radio transmitter in dB.
e.i.r.p.	Equivalent isotropically radiated power (in dB).
GUL	General User Licence (includes General User Radio Licence (GURL), applicable in radio licence band, and General User Spectrum Licence (GUSL), applicable in a management right.
IM	Intermodulation, the process where two or more electrical signals mix together in non linear devices such as amplifiers and generate new signals on different frequencies.
ITU-R	International Telecommunications Union – Radio; part of the United Nations Organisation
LPFM	Low Power Frequency Modulation, a broadcasting service, operating in the 87.5 - 88.5 MHz (lower) band and 106.63 - 108 MHz (upper) band.
The Ministry	Ministry of Economic Development.
PLL	Phase Lock Loop (a frequency stabilisation technique).
RSM	Radio Spectrum Management
Simulcast	Simultaneous transmission
SMART	Spectrum Management and Regulator Technology database
VHF-FM	VHF-FM broadcasting band includes broadcasting services individually licensed in the Crown management right, 88.4 MHz to 106.63 MHz.

The uses of acronyms in this document include both the singular and plural.