



ECC Report 44 (rev)

Guidance on radio usage at special events

Approved October 2014

0 EXECUTIVE SUMMARY

Effective and uninterrupted wireless communication is essential for the organisation and achievement of a special event. Nearly every task uses spectrum intensively and relies on it for critical applications. Typical examples of wireless systems used in an event are: Programme Making and Special Events (PMSE) (including wireless microphones, in ear monitors, talk backs, video links, cameras and remote controls) as described in ECC Report 204 [2], Private Mobile Radio (PMR), timing and scoring systems, services for the audience, satellite up-links, temporary broadcast transmitters and mobile phone networks. Preparatory planning and actions are essential in the period before the event. During the event the critical issue is rapid interference resolution which needs qualified personnel with suitable equipment. After the event experiences should be collected and reported. Issues for further improvements should be identified and lessons learned.

This Report was reviewed and updated in order to assist future planning and execution of the frequency management process in major events. It supersedes the original edition of ECC Report 044 [1]. The tasks described in this Report are divided into actions needed to be undertaken prior to, during and after the event. Experiences from recent major events such as the London 2012 Olympic and Paralympic Games, UEFA EURO-2012 football championships in Ukraine, and XXII Olympic Winter and XI Paralympic Winter Games Sochi 2014 are included. Check lists can be found in order to help the planning and execution of the tasks. Examples are also given of the different kind of event scales, parameters in license application forms, equipment labels and layout of monitoring facilities at the event area.

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LIST OF ABBREVIATIONS

Abbreviation	Explanation
CEPT	European Conference of Postal and Telecommunications Administrations
DECT	Digital European Cordless Telecommunications
DF	Direction Finding
ECC	Electronic Communications Committee
ECO	European Communications Office
EMC	Electromagnetic compatibility
ITU	International Telecommunication Union
MD	Match day
PMR	Private Mobile Radio
PMSE	Programme Making and Special Events
RLANs	Radio Local Area Networks
RRL	Radio Relay Link
Rx	Receiver
SNG	Satellite News Gathering
TETRA	Terrestrial Trunked Radio
Tx	Transmitter
UEFA	European Union of Football Associations
UMTS	Universal Mobile Telecommunications Service

1 INTRODUCTION

The aim of this ECC Report is to provide guidance to CEPT administrations for the planning of radio usage before, during and after special major events such as Olympic Games, Tour de France, Formula 1, music festivals and state visits etc. in order to minimise the risk of interference, especially to safety of life services. It also enables host organisers, broadcasters and other interested radio users to co-ordinate their requirements with the authorities and to take into account differences in rules and regulations that may exist between CEPT member countries.

The frequency spectrum usage at special events ranges from broadcasting, PMR, police and ambulance radio, PMSE (including wireless microphones, in ear monitors, talk backs, video links, cameras and remote controls) to RLANs. Adequate spectrum planning, licensing, spectrum monitoring, inspection of radio stations and resolution of radio interference is essential for the success of a major event. Moreover, technical equipment limitations and late license applications require a rapid and flexible on-site frequency management capability during the event.

Although this Report refers to major events, the basic considerations are also applicable to minor regional or local special events.

2 GENERAL CONSIDERATIONS

There are plenty of events during a year, some of which are annual occurrences (e.g. Formula 1, football cup finals, cultural festivals etc.) but there are also a number of irregular or occasional events such as music concerts and even more unique events such as the football World Cup or Olympics. Information from newspapers, television, Internet, calendars of events should be examined to identify those that may need special attention due to the economic or political importance of the event, the number of expected short term licenses or previous knowledge of problems experienced during previous similar events. These should be recorded in an annual plan.

The annual plan must be handled in a flexible way and may need to be revised when new information is available. The plan should be visible to the staff, e.g. on the Intranet, so that the all interested parties are aware of upcoming events.

In planning for the communications needs, administrations need to consider the scope of the event. The events can be categorised as follows:

- National: where radio use is in one country only. However, if spectrum use may affect bordering countries and if it is possible that cross-border interference can occur then neighbouring countries need to be informed. Where anticipated spectrum use is high enough it may be necessary to warrant the attendance of a co-ordination team.
- International: where radio use is in more than one country but where spectrum usage may be different in each country. CEPT administrations in each country will need to co-ordinate frequency assignments to make sure that interference is not caused to other event and non-event users.
- Trans-national: where one event crosses into neighbouring countries and where the same frequencies have to be used on both sides of the border. Full co-operation between all participating administrations will need to be achieved throughout the planning and running of the event to ensure that common frequencies can be used wherever possible. They may need to work as one organisation to achieve this.

There are regional as well as local events for which temporary licences are granted in advance without participation of licensing staff on site. Monitoring staff may be needed for equipment testing and labelling before and also during the event in order to solve any interference cases that may take place.

The physical location of the event will have an impact on the amount of planning involved (one place or several places, indoor or outdoor.) such as:

- Stadium, circuit, Olympic complex;
- City, country side, proximity to airport;
- Hotel, conference centre etc.

3 PREPARATORY ACTIONS BEFORE THE EVENT

Proper planning is essential for a successful event to ensure a considered approach is taken rather than reacting to problems during the event. It is beneficial if most of the work is performed before the event as it is often difficult to intervene during the event because of restricted movement around the venue due to additional security, crowded areas etc.

It would be useful to create a special web-page on the event site or links provided by the event organiser dedicated to the special event. The web-page could contain specific information for radio users.

Administrations shall ensure that their contact details are up to date on the ECC PMSE dedicated webpage: [Link to ECC PMSE dedicated Page](#)

3.1 CONTACTING THE ORGANISER OF THE EVENT

It is essential for an administration to have the full co-operation of the event organisers. This co-operation should be started as early as possible - depending on the scale of the event this could be 1 year in advance or earlier. Information regarding the licensing and the application process should be established early and provided to the event organiser so this can be passed on to the participating teams and organisations. This includes information regarding testing and labelling requirements for radio equipment needed before using equipment at the event. Information on licensing fees, if there are any, should also be provided by administrations to the end users.

Contact information for licensing applications, e.g. web links including time deadlines for submission needs to be provided to the event organiser.

Application forms along with any related guidance should be published in English if the event is expected to attract international participation.

Contact information for persons involved in the frequency management process need to be shared between all involved organisations.

Negotiations between the event organisers and the administration should also take place regarding the practical elements of equipment inspection, testing and tagging and the requirements of field officers. At this stage a suitable location should be agreed and an appropriate amount of workspace reserved for testing and tagging equipment including secure overnight storage for equipment and other material.

3.2 ORGANISATION TEAM

A special organising team should be formed for each event. It is suggested that the need for the following specialists should be considered:

- General coordinator (responsible for liaison between the administration and other parties). This person would chair the co-ordination meetings of the event. At smaller events this post may also act as the project manager;
- Project manager for one specific event (responsible for the day-to-day management of the staff and resources and of the work to be done). In smaller events may also act as general coordinator;
- Frequency manager;
- Field officers (enforcement, technical, monitoring and interference tracing staff);
- Administrative staff (planning, issuing licenses, secretariat, call centre etc.);
- Logistic support (vehicle, equipment, accommodation, access to sites etc.).

The organising team should prepare a plan of action. The plan of action should be presented to the organiser of the event and other involved organisations, such as police, fire, medical and local authorities, for comments and agreement.

The project manager should set up a plan of action that describes the organisation of the team, its working procedure and the schedule of the event.

3.3 COORDINATION WITH OTHER ORGANISATIONS

The objective of the coordination is to make sure that everybody is aware of the importance of correct frequency use. Some of the following elements are worth considering:

- Organisation of the meeting (invitation, documents, information, forms);
- Participants to the meeting (on a case by case basis);
- Organisers of the venue;
- Local administrative offices (local council, coastguard, aviation authorities);
- Organisers of the event;
- Security services of the organisers;
- Participants, competitors, teams etc.;
- Media;
- Sponsors;
- Safety and emergency services;
- Telecommunication operators (mobile phones);
- Other government organisations (if necessary);
- Others (sellers, renters of radio equipment etc.).

The organisation team should set the priorities between groups of users to deal with frequency planning and interference cases adequately. The following order of priority is recommended:

- Priority 1: Safety of life services and governmental (Officials) including radio enforcement teams;
- Priority 2: Site security, event organisation and participants;
- Priority 3: Other organisations such as the host broadcaster;
- Priority 4: Other users.

3.4 FREQUENCY PLANNING

The goal of frequency planning is ensuring that the event runs smoothly and radio communications are free from harmful interference. Several CEPT administrations have for a number of years been experiencing interference from unauthorised use of radio transmitters by foreign teams and organisations at international events. This unauthorised use has even interfered with national safety services and thus endangered safety of life. A common reason for this is that foreign teams have taken along and used their own radio transmitters operating according to their home national frequency assignments without contacting the national telecommunications administration in the visited country in advance. When these unauthorised users have been checked, the explanation has often been that the users have not been aware that a licence or frequency assignment is necessary, even though it may be required in their own country! Most cases of interference could be avoided if visiting participants are made aware that they should contact the national telecommunications administration in the visited country in advance.

It is essential that frequency planning is carried out in well in advance before the event taking into account the following aspects:

- Satisfying spectrum demands (with regard to the scale and location of the event);
- Securing the access to the spectrum for the event for all relevant parties, considering the priority of users, defined by organisation team;
- Communicating with existing secondary users to suspend or alter their activity during the event;
- Collection of fees ;
- Establishing a frequency plan taking into account user priorities;
- Issuing as many licensees as possible before the event to reduce the need for issuing 'last minute' licenses during the event;
- Taking into account other radio users within the event area including temporary usage (e.g. temporary mobile telephone communications networks) planned to be deployed during the event.

3.5 MONITORING FREQUENCY USAGE

Spectrum needs to be monitored at the geographical area of the event in advance in order to identify the baseline or "zero state". This status has to be compared with the licensing records to identify free spectrum and to provide information for the enforcement teams who have to "clean" the spectrum from interference sources and any unauthorised use. Typically this course of action will take place at the beginning of the planning phase prior to any frequency assignments and may be repeated around two weeks before to the event.

It should be noted that within the event area, radio interference may be created close to the start of the event due to the installation of electrical appliances such as big TV screens, generators etc.

For a significant event, spread over a large area and/or taking place in an already congested radio environment, monitoring the available spectrum is potentially a very large task and should therefore be broken down into different stages.

Frequency bands or channels which are expected to be empty or inactive should be relatively easy to assess through spectrum monitoring and any detected use will need to be investigated. These bands may be in 'uncommon' areas of the spectrum as a band may be 'loaned' from another service (e.g. Defence) for the duration of the event. Some incumbent users may not vacate 'loaned' frequencies until near the start date of the event therefore any legacy use observed should be re-checked before the start of the event.

Channels identified as licensable during the event which already have co-channel 'Business as Usual' users, active at a certain distance from the event, present a more difficult challenge. Any use detected in the area of the event which is stronger than expected needs to be investigated on a channel by channel basis to establish if the current user is operating within their license conditions. The reason for spectrum monitoring is to ensure smooth operation of the radio spectrum. Once the event has started, monitoring is required to eliminate interference from electrical appliances and from unlicensed spectrum use.

3.6 LICENSING

As already mentioned radio users from abroad intending to bring and use their own radio equipment should be informed that a licence or frequency assignment is required. The procedure for applying for a licence or frequency assignment needs to be as simple as possible. The user should be supplied with information concerning the type of technical and administrative details required by the administration. The user must also be provided with information on where to send the application. It is therefore recommended that administrations should make available a simple information sheet and application form.

The application form for (temporary) use of radio equipment should be completed at least two months before the start of the event in order to give the administrations time to process the licence. The licence authorities should respond in time (e.g. within two weeks) by granting a short-term license (temporary license). This time

scale is necessary to allow PMSE equipment to be tuned to the licensed spectrum. In some case a licence can be refused due to expected or calculated interference. In most cases the licence authorities will contact the applicant for alternative frequencies. It is helpful in the licensing process if the applicant provides in advance alternative frequencies where his devices can be tuned to.

Purely passive bands according to the ITU Radio Regulations Article 5 (provision No. 5.340) should be excluded from authorisation.

Typically, application forms will contain at least the fields, described in Annex 4.

With regard to 'licence free' equipment e.g. PMR446, 2.4/5 GHz RLAN, users participating in the event should be informed, if possible, that the use of this equipment during the event is at their own risk as the 'license free' usage is not frequency coordinated. For larger events, the decision might be made to restrict the general use of 'license free' equipment to provide protection to other devices.

3.7 FEES AND MONEY COLLECTION

Applicants for special events licenses often face a diverse and sometimes complex fee charging system. When considering fees for special events administrations need to strive towards simplifying as much as possible the way fees are calculated and there should be transparency about how the costs are recovered and how the fees are set.

Fee collection should be carefully arranged. If license applications are received well in advance of the event then standard procedures could be applicable. Procedures need to be put in place for last minute applications and for 'on-site' applications or license modifications. The fee collection should be arranged in a way that it does not adversely impact the licensing process. Cash collection by field inspectors is not recommended for security reasons.

The staff need very clear regulations and management support in this regard. In addition, fees and payment procedures should be published along with the license application procedures.

3.7.1 Examples from countries how license fees have been collected

The German administration uses its standard procedure also for the collection of license fees at major events. Licensees are addressed in writing, unfortunately in German language only, and requested to transfer the fee to the administration's account. In an estimated 85 – 95 % of cases the fees are paid properly. Unfortunately cross-border cash transfer comprises a difficulty. The bank fees may be paid by the applicant, by the payee or be split between both parties. For example, if the applicant pays a requested amount of 130 € the payee may receive only 125 € resulting in a supplemental claim. Procedures for on-line payments by credit card have been developed. Unfortunately they have not yet been launched.

Another problem which may be applicable only referring to the German administration is the collection of EMC contributions which cover the costs for radio interference investigation. For legal reasons they cannot be determined on the spot. They can only be calculated after the end of the fiscal year and licensees may be surprised to receive an additional bill long time after the event. Luckily these contributions are applicable only for regular licenses and not for short time licenses.

Finland collects fees for licensees during major events the same way as for other licensees. This means that the invoice is sent to the applicant by mail. Applicants usually pay their invoices, however, a few cases have been seen where the same user has not paid fees for annually repeating sport events. In that case there is an option not to accept a license application unless the unpaid license fees are paid.

Cash collection on the spot has been tried but that caused too many difficulties such as handling money. There are also quite heavy rules on risk management, how governmental money must be handled, kept recorded and delivered to the bank and for these reasons cash collection at the major events is no longer used in Finland.

Credit card payment has been investigated but after consideration it has not been implemented. Some overseas users have also complained that bank transfer costs are quite high.

3.8 INSPECTION OF RADIO EQUIPMENT

Licensing does not guarantee that equipment brought to the event, even having been granted a license, will meet the licensing conditions. Typically in some cases equipment is not tuned or programmed on the assigned channels. Equipment therefore needs to be checked to ensure that it is meeting its licensing conditions. A minimum check would be to measure the centre frequencies of the transmitter. Cost effective, handy size frequency counters are established and proven equipment. In some cases it may be necessary also to measure occupied bandwidth and transmitter power. This requires the use of a spectrum analyser and/or power meter. Users must be informed that any additional channels which may be available on the radio equipment but which do not have specific assignment are not allowed to be used. Equipment checked and fulfilling licensing conditions should be labelled appropriately.

Testing involves mainly portable equipment for the event. Typically these include wireless cameras, wireless microphones, talk back communication for TV, remote control of TV cameras, PMR, wireless triggers for press photo cameras, wireless components of timing system, In-Ear Monitoring etc.

In all cases a visual inspection of the equipment should take place to ensure that there are no obvious faults and/or modifications visible, however dismantling of the user equipment is not recommended.

If the device under test fails the initial testing then a second test should be performed to verify the results. Equipment which fails the second test should not be labelled until rectification has taken place or alternatively a 'Do Not Use' label could be attached to reinforce that the equipment has failed. If the owner rectifies the fault, the equipment should be re-submitted for inspection.

A report on the reason for the failure should be issued to the user and, where practical, advice given regarding any remedial action required to become compliant.

It might be necessary to perform tests and labelling on the spot for large fixed installations. These are typically commentary systems, various remote controlled wireless TV cameras and TV production facilities in containers, trucks and vans etc. The Date/Time and location of inspections should be agreed with responsible persons. Installations complying with licensing conditions should be labelled.

All tested equipment should be recorded and basic information regarding the equipment users and their contact information should be collected. If equipment fails to fulfil licensing conditions, users must be requested to bring the equipment in line with the license and return for testing. If equipment still does not comply, the user must be informed that they are not allowed to use that equipment and a 'Do Not Use' label should be attached.

Special attention should be drawn to the fact that inspectors should refuse to program/retune equipment frequencies although this might be asked by the equipment owners. It is solely under responsibility of the license holder to tune and program correct frequencies on their equipment.

Practical arrangements for testing and labelling should be agreed in advance with event organiser. Suitable office facilities to perform the testing should be arranged with the event organiser. The space should have basic facilities including electricity, internet connection, and locked storage for equipment and it should be located in a monitored and secure controlled area. Information about the location of this inspection office and the timing of the inspections must be provided to users in advance. Direction signs pointing to the inspection office should also be present. The organiser and any security staff should be aware of the correct label for the venue and only allow equipment to enter if it has the appropriate label attached.

If a large number of identical items of equipment have to be tested then it may be possible to perform tests on a random sample and, if all the samples pass the test, consider that the remainder of the items would also pass the test and label all items.

3.9 LABELLING

Equipment found to be compliant with licensing conditions should be labelled. Different labels can be used for different purposes e.g. in order to indicate different usage areas for the event. All stakeholders should be informed that only properly labelled equipment can be brought into the event. It is also possible to provide

labels with a sequential serial number in order to help checking/inspection during the event in cases such as interference investigations. The label size should be as small as practicable whilst remaining visible. In order to estimate the number of labels needed, the experience of organisers from previous similar events shall be taken into account.

The label design should be agreed between the radio frequency authority and the organiser of the event and care must be taken that label design does not infringe any image copyright.

The labels must be visible on all devices, they must be affixed to the body of the item (not the battery case which can be moved between devices) and where possible on a flat smooth surface. The labels shall be put on non-separable part of equipment ensuring the visual identification of them. For a truck-mounted SNG station the label can be displayed on the vehicle windscreen.

All labels must be accounted for. During each labelling activity a note must be made of which labels have been used and the sequence numbers listed. If serial numbers have been used all voided or damaged labels must also be recorded.

The labelling process shall be started in advance in specially identified places. For example, in Ukraine during final tournament of UEFA EURO-2012 football championship the labelling of local services equipment (police, ambulance, fire-fighting, security etc.) started 15 days before the event, labelling of equipment of other users started 2 days before each football match.

The following conditions shall be met in order that the equipment can be labelled:

- presence of the license for frequency usage issued by radio frequency authority, if required;
- availability of document confirming the right on admission to corresponding area of the event for specific equipment and user of this equipment, issued by the organiser of the event;
- conformity of equipment technical parameters to those which are indicated in the respective frequency license.

Figures 1 to 3 provide examples of labels.

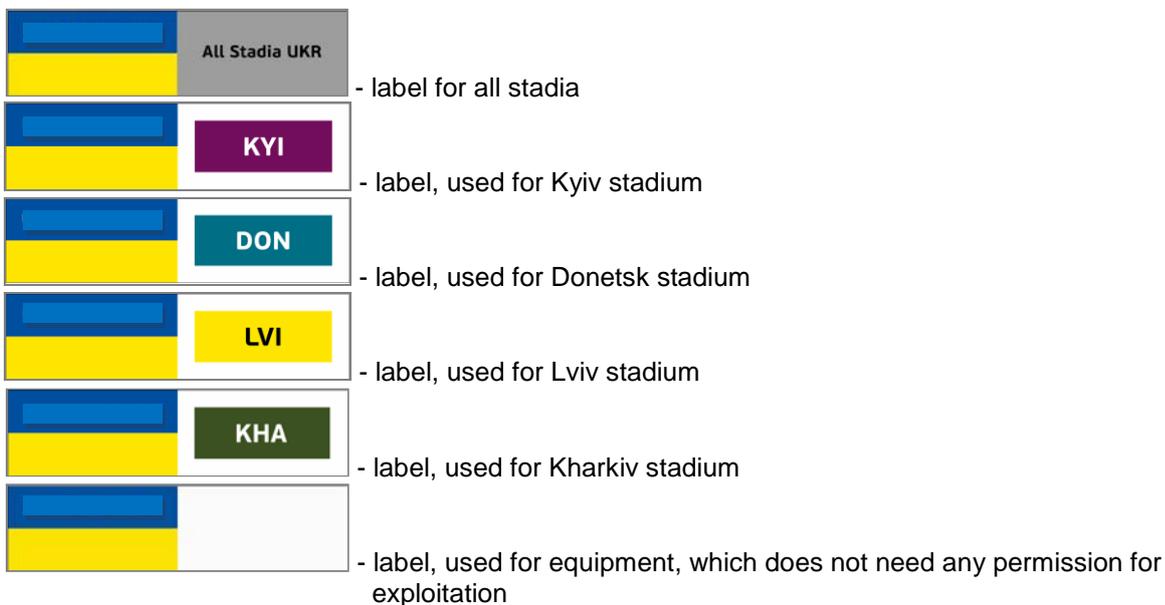


Figure 1: Ukraine during final tournament of UEFA EURO-2012 football championship

	00001	This device is authorised to operate in accordance with its London 2012 Spectrum licence
	00001	This device is authorised to operate in accordance with its London 2012 Spectrum licence
	00001	MMC This device is authorised to operate in accordance with its London 2012 Spectrum licence
	00001	This device is authorised to operate in accordance with its London 2012 Spectrum licence
	00001	This device is authorised to operate in accordance with its London 2012 Spectrum licence
	00001	This device is authorised to operate in accordance with its London 2012 Spectrum licence
	This device is not compliant and must not be used.	00001

Figure 2: London Olympics and Paralympics Games 2012



Figure 3: XXII Olympic Winter Games and XI Paralympic Winter Games Sochi 2014

3.10 RESOURCES

3.10.1 Measuring equipment

Depending on the size of the event the following equipment may be required:

- A fixed monitoring (remote) station if one is located close to the venue;
- Radio direction finders, depending on their locations, can be of great use;
 - Fixed – where the DF is housed in a building with a permanent tower or on a rooftop, These are generally remotely controlled;
 - Transportable – where the DF is fitted in a vehicle or trailer with a telescopic mast and can be relocated to a new location if required. This may be locally or remotely controlled;
 - Mobile – where the DF is mounted in a vehicle where bearings can be taken and the vehicle moved to another location or where bearings can be taken on the move enabling the crew to be able to drive to the source.
- Portable receivers or preferably spectrum analysers together with portable directional antennas, by which the final stage of localising the interference source is done on foot;
- The frequency range of the equipment depends on the radio service in use. Hand held equipment might have a higher frequency range than fixed direction finders;
- There is often a need to measure EMC related parameters;
- Measuring equipment for radio equipment testing e.g. frequency counters, power meters and spectrum analysers;
- A separate mobile communications network for field staff, preferably with speech privacy.

3.10.2 Staff

Necessary human resources should be allocated for field work. (testing and labelling, interference investigations etc.). For administrative work, necessary resources should be allocated with sufficient office space and access to appropriate databases e.g. licenses and frequency assignment databases.

Human resources need to be allocated in sufficient numbers that all planned work can be done. This may require working on shifts during the event. Staff needs to be prepared and trained for the event. It would be advisable to organise test events prior to actual event in order to train the staff and test all equipment etc. Staff should be informed of any health and safety issues.

Typically, competitors come from a number of different countries to participate in major events. Not all of them have sufficient skills in the native language of the country hosting event. Hence the staff must be prepared to communicate in English language because this is nowadays the most common language.

As staff represent their organisation, a competent professional approach and friendly appearance is taken for granted however it may be necessary to provide some guidance regarding expectations.

Event organisers usually require a list of names and other information about persons entering into event areas. Universal arrangements are that each member of staff must go through an accreditation process in order to gain access to the venue.

Accreditation is carried out in order to identify people and their roles at the event and allow them necessary and appropriate access to perform their roles. Accreditation is not an external sign of a privileged status but is a necessary working tool to manage the large number of people from different organisations participating in the event and facilitating their movements in a flexible and secure fashion. Accreditation is not granted as a "free pass" or "event ticket".

Accreditation is undertaken according to guidance and rules by the event organiser well in advance. For example, the deadline for accreditation of personnel to UEFA EURO-2012 championship was 1.5 months before the event. Security service and police should be informed about measuring equipment and that portable antennas might be mistaken for fire arms. Pictures showing how field officers equipped with such equipment and antennas would look like may be presented for information.

For very large scale international events such as the Olympic Games, consideration should be given to enlisting the assistance of engineers from other countries. This can be beneficial in a number of ways. The host country does not have such a large drain on its own resources; first-hand knowledge of spectrum in participating countries will assist when dealing with imported equipment; multilingual skills are always useful; different skills are brought to the team etc. If this approach is adopted there needs to be some 'team building' activities leading up to the event in order to ensure that the multinational team is performing well as a group.

3.10.3 Other logistic aspects

Alternative communication network should be considered in parallel with public mobile networks as these can sometimes become overloaded at peak periods.

All logistics issues need to be planned and agreed in advance. These include:

- parking arrangements for measuring vans and other vehicles used;
- access passes for vehicles;
- travel arrangements during the event;
- security checks and arrangements for staff entering into venue;
- arrangements for shifts change;
- availability of accommodation during the event;
- accreditation availability of electric power, is it UPS backed;
- availability of internet access;

- office room arrangements (rooms, containers...);
- contact information for all relevant parties e.g. event organiser, host broadcaster, first aid, network operators;
- interpretation;
- uniform clothing;
- catering for the staff;
- options for the staff to have something to eat and to have breaks;
- storage of equipment;
- means of communications (public mobile networks, TETRA, PMR etc.);
 - this may need some training before event;
 - in crowded and noisy places use of earpieces should be considered.

3.11 APPEARANCE IN PUBLIC

Appearance in public is important. A special uniform can be envisaged in order to simplify identification of personnel by frequency users if required. In some administrations the enforcement staff wear official clothing so that the staff can be easily identified. Other administrations may consider the procurement of a uniform for this particular case. A cheap solution would be a vest labelled with the administration's name or simply "frequency management" to be worn together with street clothes.

All staff working in public are considered as representatives of event organiser, representatives of their administration and their country. All users and public must be treated in a professional, confidential, equal and balanced way.

Whilst staff are encouraged to engage with end users and the public at these events, it is important that any official statements are released through a central point such as a Press/Media Office and any questions considered to be unduly probing should be referred to the media office. In the age of social media it is very easy for any comments made to be misinterpreted (accidentally or deliberately) and spread globally in a very short space of time and it is almost impossible to 'correct' inaccuracies once they have been distributed.

3.12 LEGAL ASPECTS

Major events require enormous preparatory efforts from national administrations in terms of spectrum management. Making appropriate changes in existing regulations before special event may be necessary. Such changes could include: releasing temporary import procedures, simplifying application procedures for obtaining frequency usage licenses, considerably reducing time of application form examination etc.

Sometimes legal rules may have to be modified in support of an event. For example in order to facilitate temporary import and operation of equipment before, during and after UEFA EURO-2012 football championship in Ukraine, a Decision adopted "On approval of the Procedure for issuing permissions for import and operation of radio electronic facilities to foreign users during EURO-2012" determined the simplified procedure for using equipment by foreign users shortly before, during and for a short period after the event, allowing license free temporary import of equipment. The Russian Federation adopted three decrees prior to the XXII Olympic Winter Games and XI Paralympic Winter Games in Sochi regulating the radio spectrum use during the period of preparation and hosting of the Games regarding specific features of the allotment of frequency bands, assignment of radio frequencies or radio frequency channels for civil radio equipment, use of radio spectrum, approval of a frequency allocation plan, and radio monitoring.

3.13 PLAN OF ACTION

A plan of action should cover preparation for the whole event. This should include the plan for work shifts for the staff and coordination with organisers of the event. The plan should be coordinated with the staff in order to guarantee availability of all staff members for the work shifts.

Table 1: Typical plan of action

Action	Timing
Contact event organiser	At least 1 year before
Cooperation and planning with event organiser and other relevant operators e.g. TV- Host Broadcaster	1 year...2months before
Information and application forms available for all parties for license application	At least 8 months before
Processing license applications	8 months...3 months before
Spectrum monitoring before event	3 weeks before event
Training for the staff on use of measuring equipment and communication equipment	4 weeks before
Travel arrangements and accommodation booking for the staff	6 months before
Planning and presenting work shifts to staff	3 months before
Presentation of event area lay-out, access and exit points, accredited entry zones, safety checks	2 months before
Accreditation for the staff	1 week before
Equipment testing and tagging	1 week before until end of event
Interference investigations	3 days before until end of event
Reporting of the event and issues to be taken into account in future occasions	After event

3.14 OTHER ASPECTS

SNG (Satellite News Gathering) is used by news media organisations to provide live feeds and is likely to turn up anywhere, often without notice. All SNG terminals should hold authority to operate but need clearance from the satellite operator and, importantly for radio communications administrators, site clearance to operate from a particular location. This request is normally circulated to aviation, military and emergency authorities, but clearance is refused if the earth station is too close to sensitive installations or aircraft flight-paths. In some CEPT Member countries a 'Site Clearance Procedure' is required to be undertaken before the up-link transmission can be started. Therefore, it is recommended that foreign SNG operators should contact the Administrations in an early phase in order to be informed about the legal use of SNG terminals.

Because of the larger coverage area, airborne frequency use might be a problem if the same frequency is also used for ground applications. Particular attention should therefore be given to requests for airborne use.

4 ACTIVITIES DURING THE EVENT

Activities by the regulator during the event are focusing on frequency availability and rapid interference investigation and elimination. Frequency monitoring is essential in order to find out possible illegal use of radio equipment. It is also important to make visual observations within the venue area on radio equipment in use and to check if equipment is labelled accordingly. Typically there might be a need for late licensing and labelling of some radio equipment used in the event.

4.1 MONITORING FREQUENCY USAGE

- Monitoring of the temporary authorised emissions should be carried out in order to detect any source of interference and of the correct use of these frequencies according to the frequency plan. Lists of the temporary frequency authorisations should be available for monitoring teams and frequency lists must be updated regularly if new temporary assignments are given at the late stage or during the event;
- Specific monitoring of some permanent frequency usage (*PMR close the site, Civil aviation etc*);
- Identify users of unauthorised emissions in order either to stop them or 'formalise' their situation;
- Monitoring results should be compared against granted assignments and any conflicting frequency usage should be clarified and brought in line with the frequency allocation table;
- Monitoring results obtained should be used to plan for future events.

4.2 INTERFERENCE INVESTIGATION AND RESOLUTION

When using a large amount of radio equipment in a small restricted area it is not possible to avoid harmful interference. Usually, interfering cases are caused by:

- operation of legal radio equipment with wrong or exceeding parameters with respect to those contained in their license;
- transmitters operating with their antennas too close to each other causing intermodulation frequencies which fall within the passband of licensed channels;
- site-engineering problems e.g. a satellite antenna farm may be too close to a mobile network base station;
- illegal operation;
- incorrect equipment programming;
- frequency allocation bands with different uses from country to country;
 - imported DECT telephones may cause interference to UMTS networks in Europe;
 - equipment brought directly from another event without changing the used frequency channels from the last assignments;
- damaged cables and faulty equipment;
 - faulty equipment may radiate excessive spurious signals or transmit continuously.

Some examples of interfering cases that have been found out in an event are:

- The telemetry channel of TV cameras, tuned to unlicensed frequency 440.425 MHz, caused interference to several cash machines (ATM) around the stadium. The interference was eliminated after tuning the camera to the correct licensed frequency 450.425MHz;
- The illegal use of the frequency 11035 MHz by a local radio relay link caused interference to a SNG station, which used the frequency 11022.5 MHz. The Interference was eliminated by switching off the interfering radio relay link;
- The illegal use of the frequency 417.025 MHz outside of a stadium venue, this was used for communication between studio and cameraman and caused interference to the trunk communications of the stadium;
- The use of a damaged control cable in a broadcasting camera caused accidental broadcasting faults during pre-match run through as it resulted in the incorrect tuning of Rx and Tx frequencies of the broadcasting camera.

4.3 ENFORCEMENT IN CASE OF VIOLATIONS

By experience it has been noticed there are always some radio users who do not apply for a license. These illegal users should be identified and located – perhaps by their equipment not having the required labels. These users should be informed that they are using illegal equipment that could cause interference or they can suffer from interference.

When unlicensed usage of radio has been found, it may be tolerated for short term period e.g. if the user is involved in a live broadcast session. After that the user should be informed about illegal use and encouraged to obtain a licence before any future broadcasts. All these users should be treated in an equal and balanced way.

The best approach is to investigate if the frequency being used can be returned to the correct frequency. If that is not possible, users should be informed that they are not allowed to use their equipment. If the user successfully retunes their equipment and is subsequently allowed to use their equipment it is essential that the information of the new frequencies is updated into the central frequency allocation table for the event. During the event, it may be challenging to prepare a license and invoice, but these should be processed if possible.

5 ACTIVITIES AFTER THE EVENT

It is essential that the planning and execution of the original plan is reviewed and lessons learned from mistakes and those of other organisations that affect your work. It is important to identify the things that went well as this has an effect on the morale of the staff and makes them keen to work well at the next event.

These are the areas to work on:

Debriefing meeting applicable:

- For the staff involved in the event;
- For the participants of the co-ordination meeting.

It is recommended that a “debriefing” report of the event is written. This report should contain the following information:

- An overview of the event as a whole;
- A statistics of frequencies assigned;
- A statistics of labelling affixed and licences issued;
- A statistics of interference complaints;
- Number of violations;
- Income (fees);
- Cost and working hours of the operation;
- Other relevant information of interest.

The ‘debriefing’ report should be sent to the participants of the co-ordination team, the organisers of the event and applicable broadcasting organisations.

The following issues should be dealt with and proposals agreed for improvement of the whole process for the next event:

- Legal proceedings (depending on local legal rules);
- Regularising legal actions started during the event;
- Responding to complaints about staff interventions;
- Preparing next event (lessons learnt);
- Analysis of unsolved problems to improve future events (learning from the mistakes: changing procedures, rules etc).

6 CONCLUSIONS

The interference free operation of a variety of radio applications and other electronic equipment in a small area associated with the demands for additional spectrum requires thorough planning and close cooperation with all relevant parties. Standard procedures have to be modified and short-term decisions based on sometimes incomplete information have often to be made. A flexible response by the spectrum management and enforcement staff to these challenges is essential for the success of major events.

ANNEX 1: EXAMPLE CHECKLIST OF ACTIVITIES BEFORE THE EVENT

- Consulting the organiser in written form;
- Counselling interview with the organiser;
- Information about the radio monitoring/inspection service;
- Further meetings with the organiser;
- Providing information on the organiser's web home page; a link to the spectrum agency would be advisable;
- Providing event related information on the spectrum agency's home page, creation of dedicated e-mail address and hot-line;
- Visit to the event location;
- Drawing up a time-table;
- Labelling required: yes or no?
- Assigning tasks to the spectrum monitoring/inspection service;
- Fixing the manpower requirements;
- Review of the situation regarding accreditation;
- Fixing the location of measuring vehicles and vehicles for passenger transportation;
- Organisation of the power supply;
- Contacting the host broadcaster regarding spectrum coordination;
- Contacting security organisations (police, ambulance, etc.);
- Monitoring the spectrum (Zero State);
- Allowing spectrum applications;
- Handling of applications;
 - Considering applications (availability of spectrum, compatibility);
 - Spectrum coordination with neighbouring administrations;
 - Approving applications;
 - Issuing licence in time to allow tuning of user equipment;
- Hotel booking;
- Organising an on-site office and office equipment;
- Planning of communication ear pieces preferred (radio, telephone, Internet);
- Preparation of on-site money collection;
- Arrangement of staff schedule;
- Any specific measures for staff safety e.g. personal protection wear;
- Staff uniforms;
- Collecting information on required spectrum, potential frequency users and radio technologies from organiser and hosting countries of previous events, if any;
- Simplifying frequency application procedure;
- Issuing of information about the frequency authorisation procedure to broadcasters during dedicated meetings and using other possible distribution methods well in advance.

ANNEX 2: EXAMPLE CHECKLIST OF ACTIVITIES DURING THE EVENT

- Coordination of the staff involved in the event;
- Processing short term applications;
- Documentation of all activities including date and time;
- Client counselling;
- Contacting the relevant persons (event manager, companies, public authorities);
- Inspection and labelling of radio equipment; at least the frequency should be checked;
- Monitoring the spectrum;
- Interference investigation;
- Identification and elimination of unlicensed frequency use.

ANNEX 3: EXAMPLE CHECKLIST OF ACTIVITIES AFTER THE EVENT

- Equipment removal;
- Return transport of staff;
- Return of borrowed equipment;
- Settlement of accounts;
- Finalisation of interference handling if necessary;
- Initiation of legal measures (in cases of identified infringements);
- Reporting, including relevant findings, should be retained for use at later events;
- Final review.

ANNEX 4: TYPICAL PARAMETERS NEEDED FOR THE LICENSE APPLICATION FORM

1. CONTACT INFORMATION OF APPLICANT

- name and postal address of person responsible for radio licence application;
- telephone, fax and e-mail address;
- name and mobile phone number of the on-site contact person;
- unique reference number to be used in all communications and invoice.

2. DATES WHEN EQUIPMENT WILL BE USED

- start date (and time if appropriate) and end date (and time if appropriate) for equipment use.

3. DETAILED INFORMATION OF EQUIPMENT

- brand name and type designation;
- location of use, coordinates for the area, type of equipment (base station, mobile);
- frequency tuning range of equipment;
 - channels already programmed in the equipment ;
- proposal by user for operating channels;
- maximum radiated power;
- class of emission (including bandwidth);
- antenna height from ground level (for both transmitter and receiver if appropriate);
- amount of equipment
 - mobile;
 - fixed;
 - airborne.

4. SIGNATURE

- agreement to fulfil requirements and to pay license fees;
- date, signature and clarification with block letters.

5. CONTACT INFORMATION FOR ADMINISTRATION

- contact point for submitting applications (postal address and/or email address and/or fax number);
- contact point for further information and questions.

ANNEX 5: TYPICAL NUMBERS BASED ON EXAMPLES FROM DIFFERENT KINDS OF EVENTS

Table 2: TYPICAL NUMBERS BASED ON EXAMPLES FROM DIFFERENT KINDS OF EVENTS

Parameter	Data for different kinds of events				
	EURO-2012 (in Ukraine)	Olympic games 2012	Paralympics 2012	Tour de France	Sochi 2014
Dates of event	08.06 to 01.07.2012	27.07 to 12.08.2012	29.08 to 09.09.2012	30.07 to 22.072012	07.02 to 24.02.2014
Number of TV viewers	Several billion	4.8 billion	3.4 billion	Several billion	3.5 billion
Number of TV broadcasters				15	
Number of TV broadcaster rebroadcasting the event				~ 100	~ 200
Number of stadiums/arenas covered	4	38	18	38 cities	11
Beginning of frequency authorisation process, months before event	5	3	3	5	
Deadline for frequency applications, months before event	1,5	7	4.5	1	
Number of applications received prior the deadline, %	45	83	42	50	
Number of applications received after the start of event, %	more than 10	17	58	1	
Total number of applied foreign companies	83			15 (Radio+TV)	
Total number of applications of foreign companies, including:	3773			539 (foreign and national companies)	
▪ portable stations	1163			250	

Parameter	Data for different kinds of events				
	EURO-2012 (in Ukraine)	Olympic games 2012	Paralympics 2012	Tour de France	Sochi 2014
▪ TETRA portable stations	920			0	
▪ base stations	229			0	
▪ radio microphones and in-ear-monitors	1199	See Table 3		477	
▪ wireless camera frequencies		See Table 3		32	
▪ SNG stations	134	See Table 3		30	
Total number of licenses issued	3610	See Table 3		750	2 296;
Monitoring activity during event (MD – match day)	MD-2 - MD	1 month before start	2 weeks before start	All day long	19
Total number of fixed monitoring stations involved	8	65	40	3 by city	11
Total number of mobile monitoring stations and walking groups involved	18	35	25	1	28
Total number of handheld direction finders used	13	40	40	2	25
Number of interference cases eliminated before and during event	105	182	42	11	
Number of frequencies allocated during event		See Table 3		80	More than 14 000
Hotline operation	2 week before event end of event	1 month before start until end of Olympics	After Olympics until end of Paralympics	3 days before event end of event	

Table 3: Overview of the Licenses and Licensed Frequencies for London 2012¹

Application	Licences	Licensed Frequencies
Wireless Camera	452	631
Wireless Microphone	1 958	6 052
Talkback	946	3 037
Land Mobile Radio	1 412	3 026
Telemetry and Telecommand	331	444
In Ear Monitor	496	1 468
Maritime Mobile Radio	18	44
Microwave Mobile Link	116	134
Fixed Link	76	90
Permanent Earth Station	20	n/a
Transportable Earth Station	28	1 439
WCATV	4	5
Games PMR Network (Apollo)	1	206
Total Games	5 858	16 576
Outside venue clearances in coordination zones. (Games related use, but not in main venue)	n/a	13 237
Total Frequencies Licensed		29 813

¹ This reflects combined numbers for both the London 2012 Olympic and Paralympic Games. Many assignments (licensed frequencies) issued for the Olympics remained in situ for the Paralympics, and as a result no separation was made for licences issued and assignments made, between the two events.

ANNEX 6: MONITORING STATION POSITIONS IN THE EVENTS

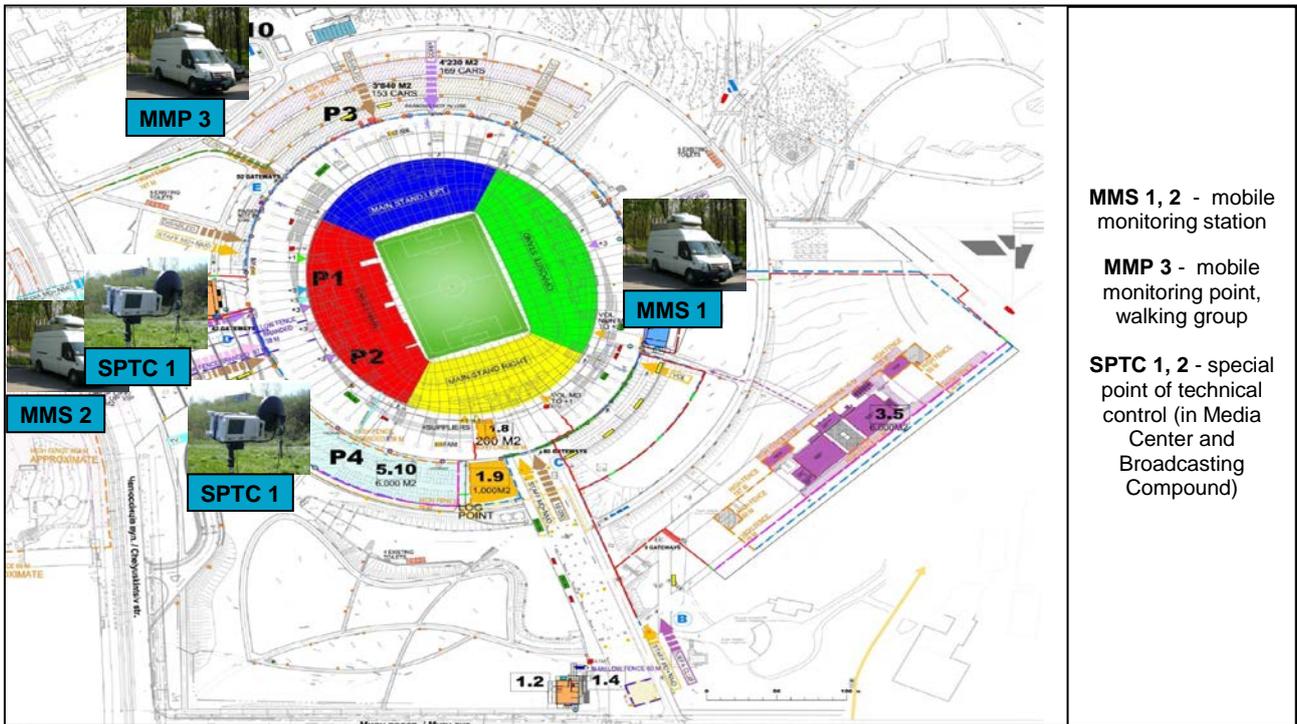


Figure 4: Example set up of monitoring stations during the UEFA Euro 2012 in Ukraine



Figure 5: Arrangement diagram of the Sochi 2014 Automated Radio Monitoring System elements in the territory of the Greater Sochi



Figure 6: Arrangement diagram of the Sochi 2014 Automated Radio Monitoring System elements in the territory of the Coastal Cluster

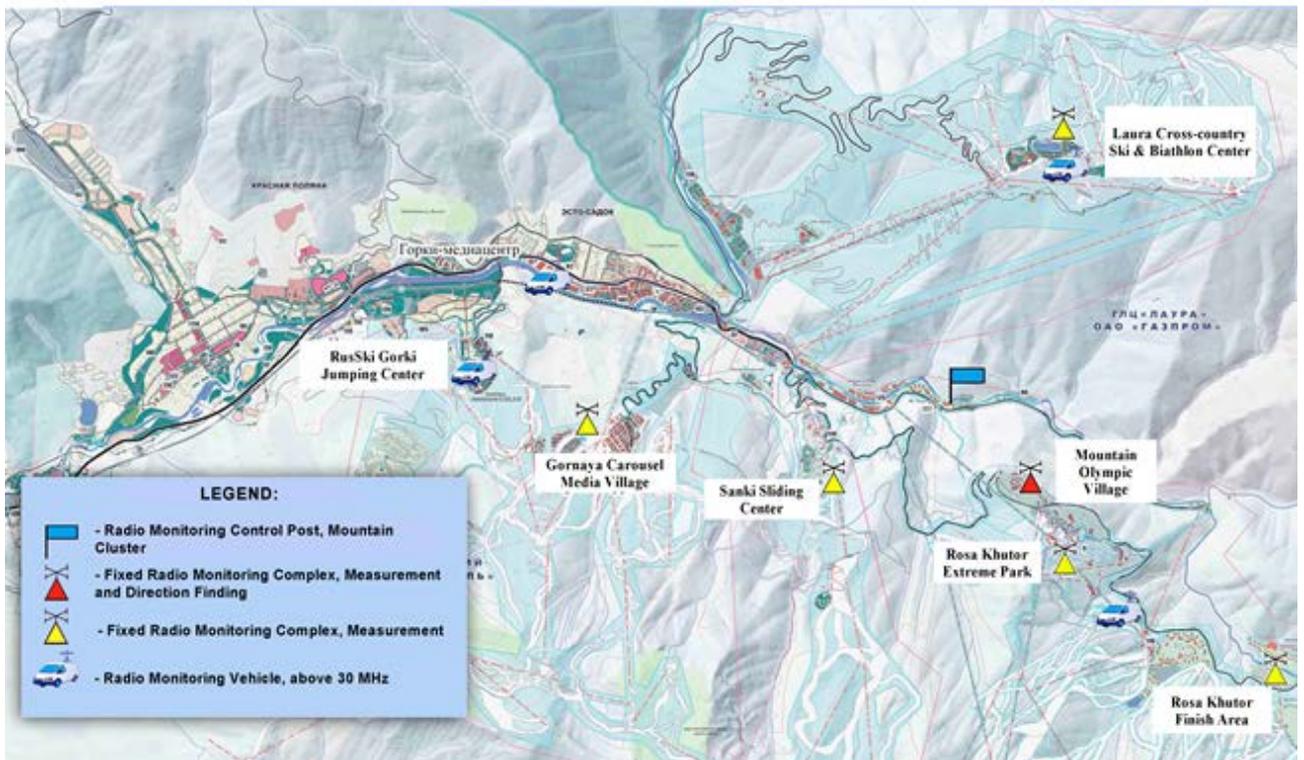


Figure 7: Arrangement diagram of the Sochi 2014 Automated Radio Monitoring System elements in the territory of the Mountain Cluster

ANNEX 7: EXAMPLE OF WIRELESS USE: CORDLESS CAMERA



Figure 8: Typical cordless camera

A conventional cordless camera transmitter docks on the back of a traditional camera. The audio is integrated with the pictures on the cordless camera link either from an on-board microphone or from a separate wireless microphone receiver mounted on the camera. Remote control of the camera for colour balance and exposure can also be by radio telemetry via a separate wireless channel received on the camera.



Figure 9: Cordless camera and interviewer

Cordless cameras are routinely deployed close to the action and can be handheld or mounted on moving vehicles. The link may be made to a central receive point in a football stadium, or may be relayed to an airborne receiver for onward linking. The advantages of wireless operation include the ability to follow the action: in a stadium, cabled cameras have very limited mobility due to requirements to route cables safely; in a road race, the camera is likely to be mounted on a motorbike; at a golf course, the camera can move from tee to tee. In addition, interviewing the athletes is common in modern production. The rugged nature and reliability of digital cordless camera links has also led to much greater usage during sporting events.

ANNEX 8: LIST OF REFERENCE

- [1] ECC Report 044 Guidance for radio usage at special events (February 2004 edition) – superseded by the present Report
- [2] ECC Report 204: Spectrum use and future requirements for PMSE