

Technical Report 001

Results of the  
EBU questionnaire on spectrum requirements  
for SAB/SAP & ENG/OB applications



EBU **TECHNICAL**

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## Results of the EBU questionnaire on spectrum requirements for SAB/SAP and ENG/OB applications

**Keywords:** Spectrum requirements, SAB/SAP, ENG/OB.

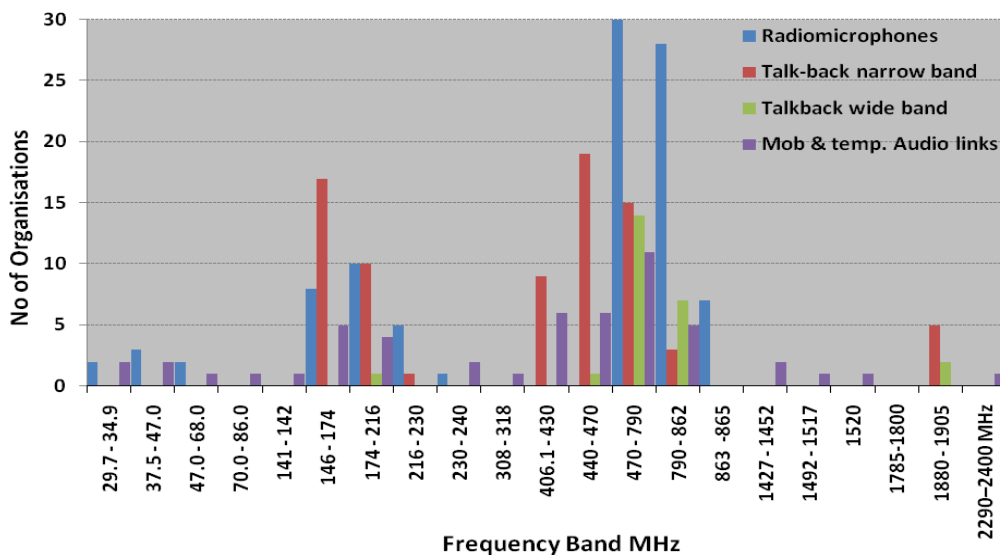
This document analyses the replies to the EBU questionnaire on SAB/SAP and ENG/OB spectrum requirements submitted to EBU Members. The summary of the replies is included in Annex 1. 32 replies from 22 different European countries were received.

### 1. Use of frequency bands

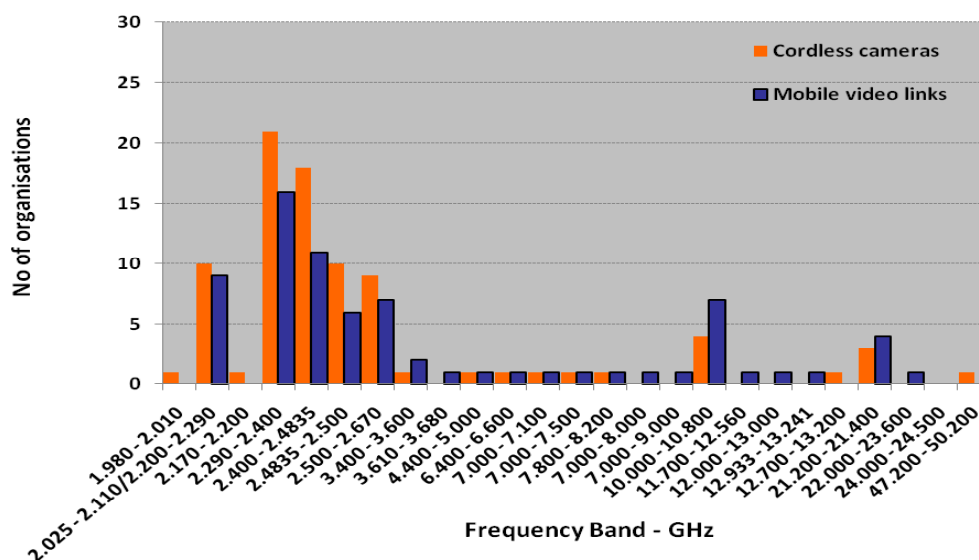
The replies show that Bands IV/V (470-862 MHz) are of great importance for SAB/SAP services. For all broadcasters it is the primary band for radiomicrophones, in-ear monitoring and portable audio links, talk-back and wireless intercom, mobile and temporary audio links.

It should be noted that, within the Bands IV/V, for some broadcasters only the 790-862 MHz band is used for SAB/SAP services.

The 1785-1800 MHz band, opened recently by the CEPT for radiomicrophones, in-ear monitoring and portable audio links, is not used.



The 2-2.6 GHz band remains the most used band for cordless cameras, portable video links and mobile video links (including airborne in some countries).



## 2. Difficulties encountered by broadcasters

Broadcasters indicate a lack of frequencies allocated for SAB/SAP applications to satisfy all requirements and difficulties in finding frequencies within the tuning range of the equipment. The main reasons are:

- Other users now use some of the frequency bands used by SAB/SAP services and therefore less spectrum is available for SAB/SAP applications.
- There are more and more operators requesting frequencies.
- Events are getting more complex and require more spectrum (more equipment needed per event and HD applications which require larger bandwidths).

Broadcasters also mention interference problems as an added difficulty in those frequency bands that are more crowded.

The 470-862 MHz band is one of the bands with major difficulties. Bands IV/V are crowded with analogue TV, DVB-T and other services and it is difficult to find enough frequencies in some areas (big cities) for large events. The increased number of DVB-T operators using the band (DVB-T is more spectrum efficient and more TV services are possible) increases the difficulties to find enough frequencies for all SAB/SAP users.

In some countries, there are reserved channels within the 790-862 MHz band for audio applications (radiomicrophones, in-ear monitoring, portable audio links and talkback equipment). In case that in the future this sub-band is allocated to non-broadcasting services and cannot be used for these audio applications anymore, equipment may have to be replaced or modified to operate on other frequencies. This will create additional costs, of which it is to be defined who will pay for.

There is also a similar situation regarding the 2-2.6 GHz bands, which are highly used for cordless camera and portable and mobile video links. The problem is twofold: on one side there is a growing demand for wireless studio camera's and at the same time there is an increase in the demand for frequencies to be used for other applications (e.g. for public safety) as well as for new applications

(e.g. UMTS, WiMAX). For example, the band 2500-2670 - actually available for these SAB/SAP applications - will have to be cleared for broadband wireless access.

Half of the replies also indicated problems of finding frequencies for telecommand and remote control of cameras (and other equipment). Technical difficulties are mentioned in relation to the use of unlicensed frequency bands; sharing is difficult when a large number of users share unlicensed frequency bands and when there is a lack of coordination. In certain countries, there is an expected growth of requirements, which may require extra (exclusive) frequencies and broadcasters expect to have difficulties to find them.

### 3. Solutions and proposals received from broadcasters

- Broadcasters would like more regulation and enforcement for SAB/SAP services (e.g. dedicated channels assigned to each operator for exclusive use and additional channels allocated on a shared basis).
- Better equipment specification/standardisation and certification would also be an advantage (i.e. type approval of SAB/SAP equipment).
- Equipment should be capable of working in wider frequency ranges in order to give further flexibility to operations.
- Interference should be eliminated through careful frequency planning and choice of antenna.
- It is highly recommended not to allow unlicensed services in UHF white spaces.

### 4. Estimated spectrum requirements for SAB/SAP services

For most SAB/SAP applications, there is a unanimous expectation of future growth of spectrum requirements. SAB/SAP applications are also used for ENG operations. Broadcasters believe that ENG operations will also increase in the future.

Compared with the CEPT ECC Report 2, published in 2002, most broadcasters' prognoses of channel requirements for the future are higher. The figures for total demand have to be taken with caution as these are based on estimations. However, they give an overview of what can be the situation in the coming years.

#### Radiomicrophones, in-ear monitoring and portable audio links

Typical studio production-Microphones and in ear	CEPT Prognoses - ECC Report 2, Lisbon'02	Broadcasters Prognoses -October 2008
Wideband channels - 200 kHz <sup>1</sup>	20	20 to 50 (25 average)
Narrow band channels - 15 kHz	None	0 to 10 (2 average)

ENG for TV-Microphones	CEPT Prognoses - ECC Report 2, Lisbon'02	Broadcasters Prognoses -October 2008
Wideband channels - 200 kHz	25 to 50	5 to 50 (34 average)
Narrow band channels - 15 kHz	None	0 to 2 (1 average)

<sup>1</sup> It should be noted that the bandwidth requirement for professional in-ear monitoring equipment is up to 300 kHz. Therefore the spectrum requirement could be slightly higher if there is intense use of this equipment.

Sound broadcasting SAB/SAP	CEPT Prognoses - ECC Report 2, Lisbon'02	Broadcasters Prognoses -October 2008
Wideband channels for microphones - 200 kHz	5 to 10	5 to 60 (9 average)
Narrow band channels for microphones - 15 kHz	None	0 to 10 (1 average)
Wideband channels for audio links - 200 kHz	5 to 10	0 to 15 (8 average)

Sport events or similar outside broadcast: typical	CEPT Prognoses - ECC Report 2, Lisbon'02	Broadcasters Prognoses -October 2008
Wideband channels for microphones - 200 kHz	10 to 15	5 to 30 (14 average)
Narrow band channels for microphones - 15 kHz	None	0 to 10 (1 average)
Wideband channels for audio links - 200 kHz	2 to 5	0 to 10 (4 average)

Sport events or similar outside broadcast: major events - peak demand	CEPT Prognoses - ECC Report 2, Lisbon'02	Broadcasters Prognoses -October 2008
Wideband channels for microphones - 200 kHz	20 to 80	20 to 150 (55 average)
Narrow band channels for microphones - 15 kHz	None	0 to 15 (2 average)
Wideband channels for audio links - 200 kHz	10 to 20	0 to 50 (16 average)

#### Talkback and wireless intercom

Typical studio production-Talkback	CEPT Prognoses - ECC Report 2, Lisbon'02	Broadcasters Prognoses -October 2008
Wide band channels - 200 kHz	None	0 to 18 (2 average)
Narrow band channels - 12.5 kHz	5 to 10	3 to 40 (10 average)

ENG for TV - Talkback	CEPT Prognoses - ECC Report 2, Lisbon'02	Broadcasters Prognoses -October 2008
Wide band channels - 200 kHz	None	0 to 40 (2 average)
Narrow band channels - 12.5 kHz	30 to 60	2 to 60 (38 average)

Sound broadcasting SAB/SAP - Talkback	CEPT Prognoses - ECC Report 2, Lisbon'02	Broadcasters Prognoses -October 2008
Wide band channels - 200 kHz	None	0 to 12 (1 average)
Narrow band channels - 12.5 kHz	5	5 to 20 (6 average)

Sport events or similar OB: typical Talkback	CEPT Prognoses - ECC Report 2, Lisbon'02	Broadcasters Prognoses -October 2008
Wide band channels - 200 kHz	None	0 to 18 (2 average)
Narrow band channels - 12.5 kHz	10 to 15	3 to 30 (13 average)

Sport events or similar OB: - peak demand-Talkback	CEPT Prognoses - ECC Report 2, Lisbon'02	Broadcasters Prognoses -October 2008
Wide band channels - 200 kHz	None	0 to 50 (4 average)
Narrow band channels - 12.5 kHz	Not estimated	5 to 70 (29 average)

The above estimations of channel requirements for audio links (radiomicrophones, in-ear monitoring, portable audio links, talkback and wireless intercom) could be translated into spectrum demands. In order to do this, it is necessary to know the performance of the equipment in terms of



how much spectrum is needed per audio link and how many audio links can be accommodated in an 8 MHz channel (or alternatively in two contiguous 8 MHz channels or another configuration).

In ECC Report 002 'SAB/SAP (including ENG/OB) spectrum use and future requirements' (Lisbon, February 2002) there is a comparison of performance of analogue radiomicrophones with estimated performance of future digital radiomicrophones. It is mentioned in the report that due to limited information available at that time it was not possible to make a reliable estimate. The comparison is then based on analytically predicted as well as manufacturers estimated performance of digital radiomicrophones. It is now necessary to reconsider the performance of current digital radiomicrophones in order to confirm the results and define the exact correspondence between channels requirements and spectrum requirements.

#### Cordless cameras and portable video links

Cordless cameras and wireless video links (including the mobile and airborne links) - 10 MHz	CEPT Prognoses - ECC Report 2, Lisbon'02	Broadcasters Prognoses -October 2008
Typical studio production	None foreseen	0 to 6 (4 average)
ENG for TV	10 to 15	5 to 20 (12 average)
Sport events or similar OB - typical	8 to 10	5 to 10 (9 average)
Sport events or similar OB - peak	10 to 20	5 to 30 (16 average)

The widespread use of analogue wireless cameras is to be particularly noted.

## 5. Conclusions

The analysis of the replies highlights the challenges that broadcasters face in satisfying all their existing requirements for SAB/SAP applications. In addition, estimations of future requirements indicate that growth of spectrum demand is generally expected in the foreseeable future. In order to ease the current situation broadcasters have indicated the need for clear regulation to protect SAB/SAP operations.

In the analogue TV world there were generally only difficulties in finding adequate amounts of spectrum at large events, and solutions were adopted on a case-by-case basis. With the introduction of DVB-T the amount of spectrum potentially available is reduced and it is proving more difficult to find solutions.

For audio applications (radiomicrophones and in-ear monitoring; portable, mobile and temporary links; talkback and intercom), bands IV/V (470-862 MHz) are the most intensively used. For wide band audio currently there seems to be no alternative frequency bands to meet the current and future demands. It is considered that regulated use of these bands is needed to provide certainty of use for SAB/SAP.

For cordless cameras and portable and mobile video links 2.2-2.5 GHz remains the most used band. It is to be noted the important spectrum need for cordless cameras is in the range 5 to 20 (typical demand), 5 to 30 (peak demand) channels of 10 MHz. Taking into account the increasing demands by other applications using these frequency bands, it is expected that it will be difficult to find sufficient capacity for cordless cameras and video links. The rapid growth of HDTV and associated production that requires higher bandwidths further adds to the spectrum requirements.

New frequency allocations for mobile services (e.g. 790-862 MHz, 2.6 GHz band) may imply that some spectrum bands currently used by SAB/SAP services will not be available in the future. This,

together with the increasing need for HD equipment which requires higher bandwidths and with the fact that events to be covered are getting technically more complex (to meet viewer's expectations), broadcasters are concerned that adequate amount of spectrum for SAB/SAP applications may not be available in the future.

It is to be noted that around half of the respondents were generally satisfied with the role of their national regulator even though some replies indicated that regulators do not seem to always understand broadcasters' needs.

## **6. Recommendations**

Broadcasters have made their prognoses in number of channels required in the future for all different applications. The prognoses show an increase in the peak demands compared with existing CEPT prognoses of 2002. The predicted channel requirements now need to be translated into spectrum requirements.

The EBU believes that it is desirable for spectrum studies to be performed within the CEPT as it provides a unique forum where the manufacturers and other stake holders can participate. Furthermore, CEPT Administrations are best positioned to assess overall spectrum requirements for SAB/SAP, i.e. beyond the requirements of the broadcasting community.

Technical studies based on current and next generation equipment are necessary in order to determine the number of equipment units that could be used simultaneously at one location, and within a given frequency block.

CEPT is recommended to review the regulatory environment for SAB/SAP services in order to ensure continuation of SAB/SAP operations.

## Annex 1: Summary of replies to the EBU questionnaire on spectrum requirements for SAB/SAP & ENG/OB<sup>1</sup> applications

### Background

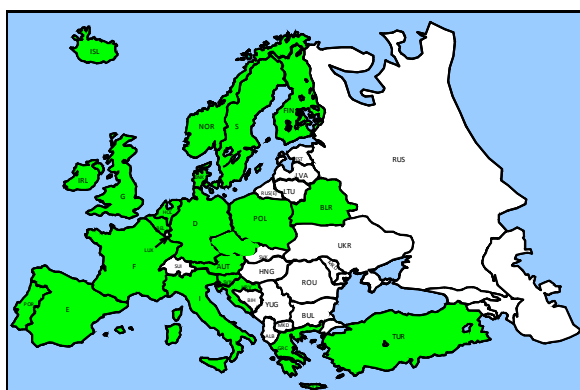
Broadcasters use a wide range of frequencies for SAB/SAP and ENG/OB applications. This usage includes wireless microphones, intercom systems, wireless cameras, remote camera controls, airborne audio and video links, etc. Whilst the use of wireless production tools is increasing, EBU members have concerns on the future access to adequate spectrum for these kinds of applications.

The broadcasting bands are planned more densely for digital broadcasting than previously for analogue and in many countries there is a debate on releasing spectrum for other services as a result of the digital spectrum dividend. Additional spectrum is also likely to be cleared for wireless broadband access such as WiMAX. Consequently the availability of these frequencies for SAB/SAP applications becomes uncertain. The recently announced closure of the band 2.5-2.7 GHz for temporary video links by OFCOM in UK is just one example of this.

It is important that these concerns are brought to the attention of the administrations. For these concerns to have any impact they must be supported by a realistic estimation of spectrum needs for SAB/SAP and ENG/OB applications.

The EBU has sent its Members a questionnaire on spectrum requirements for SAB/SAP and ENG/OB applications. This questionnaire was intended to generate an up-to-date perspective of the broadcasters spectrum requirements for their production-related applications. A similar exercise was carried out by the CEPT in the past, but these results are now over 8 years old and could therefore be outdated. The CEPT questionnaire also focused more on the numbers of equipment in use, and less on the total frequency requirements.

This report summarises the results of the questionnaire. 32 broadcasters from 22 different European countries replied to the questionnaire as shown in the figure below.



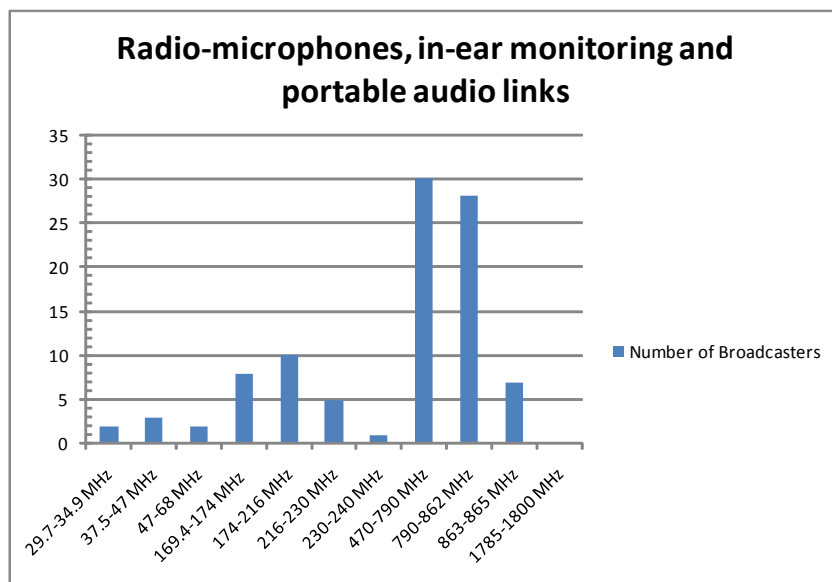
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<sup>1</sup> SAB/SAP: Services Ancillary to Broadcasting/Services Ancillary to Programme making  
ENG/OB: Electronic News Gathering/Outside Broadcast applications.

See Appendix 1 for definitions of various SAB/SAP applications.

# 1. Radiomicrophones, in-ear monitoring and portable audio links

1.1 Please indicate for each of the following frequency bands if you use them for wireless microphones or in-ear monitoring (including portable audio links) within your broadcasting organisation.



1.2 What is the typical number of frequencies you simultaneously use for this application within your organisation? Please give figures for a normal production and for peak demand at major events or exceptional occasions (e.g. Eurovision Song Contest or Tour de France)

	# channels normal production	# channels peak demand
29.7 - 68 MHz	2 to 6 (4 average)	6 to 12 (8 average)
169.4 - 240 MHz	2 to 6 (3 average)	3 to 15 (7 average)
470 - 865 MHz	2 to 45 (17 average)	6 to 120 (44 average)
1785 - 1800 MHz	0	0
Other (please specify)	-	-

1.3 The previous questions were focussed on your own use. In some occasions, there are also other users present at the same location (e.g. shared studio complex, sports events...). Can you give an estimate of the total number of required frequencies for all users together? If you have no idea, please indicate “unknown”.

	# channels normal production	# channels peak demand
29.7 - 68 MHz	0	7
169.4 - 240 MHz	4 to 20 (7 average)	10 to 40 (23 average)
470 - 865 MHz	10 to 90 (30 average)	20 to 300 (116 average)
1785 - 1800 MHz	0	0
Other: 1400 - 1785 MHz	-	6
1990 - 2600 MHz	-	23
3600 - 3800 MHz	-	7

#### **1.4 Do you encounter problems in finding enough frequencies for this application? What is the nature of the problems?**

17 replies out of 24 indicated having problems in finding frequencies for radio microphones or in-ear monitoring (including portable audio links). In most cases the problem is in the 470-862 MHz band where the spectrum is crowded with analogue TV, DVB-T and other services and it is difficult to find enough frequencies in some areas (big cities) for major events. The increased number of operators using the band (DVB-T is more spectrum efficient and more TV services are possible) increases the difficulties to find enough frequencies for radio microphones for all operators. In some cases, interference (sometimes intermodulation) and break up occur.

In some countries, reserved channels for those applications are allocated within the 790-862 MHz band. In cases where this sub-band is allocated to non-broadcasting services, equipment may have to be replaced or modified to operate on other frequencies creating additional costs.

#### **1.5 Do you expect a growth in use of wireless microphones, in-ear monitoring or portable audio links in the future?**

25 replies out of 27 indicated an expected growth in use of radio microphones or in-ear monitoring (including portable audio links) in the future. First, wireless microphones and IEMs will become more common as more and more TV presenters are demanding cable-free operation. Second, sports and entertainment events are becoming more ambitious and require more microphones, IEMs and talkback channels.

The amount of growth is difficult to predict and varies from broadcaster to broadcaster. In general broadcasters indicated a 50 - 100% growth for major events (peak demand) and 10 - 30% growth for normal events.

Sometimes it may require extra frequencies. New technology is helping to make better use of the traditional spectrum, but broadcasters face a potentially severe reduction in available bandwidth for which there is no answer at present. Although more efficient planning and digital equipment with higher tolerance towards intermodulation enables more efficient use of bands, broadcasters expect increasingly difficulties to find frequencies.

#### **1.6 Do you use wireless microphones or in-ear monitoring also for ENG applications:**

##### **1.6.1 If yes: does this require extra (exclusive) frequencies? If yes: How many?**

27 replies out of 27 indicated the use of radio microphones or in-ear monitoring (including portable audio links) for ENG applications. 9 broadcasters indicate a need of extra frequencies for ENG applications the amount varying a lot from one broadcaster to another: 2, 3, 10, 15, 30, 32, >50 (for major events) were indicated.

**1.7 CEPT ECC report 2, published in 2002, contains prognoses of frequency requirements in 2012. The results are summarised below. If your prognosis is different from these values please present your own prognosis.**

Typical studio Production- Microphones and in ear	CEPT Prognoses - ECC Report 2, Lisbon'02	Broadcasters Prognoses -October 2008
Wideband channels - 200 kHz <sup>1</sup>	20	20 to 50 (25 average)
Narrow band channels - 15 kHz	None	0 to10 (2 average)

ENG for TV-Microphones	CEPT Prognoses - ECC Report 2, Lisbon'02	Broadcasters Prognoses -October 2008
Wideband channels - 200 kHz	25 to 50	5 to 50 (34 average)
Narrow band channels - 15 kHz	None	0 to 2 (1 average)

Sound broadcasting SAB/SAP	CEPT Prognoses - ECC Report 2, Lisbon'02	Broadcasters Prognoses -October 2008
Wideband channels for microphones - 200 kHz	5 to 10	5 to 60 (9 average)
Narrow band channels for microphones - 15 kHz	None	0 to 10 (1 average)
Wideband channels for audio links - 200 kHz	5 to 10	0 to 15 (8 average)

Sport events or similar outside broadcast: typical	CEPT Prognoses - ECC Report 2, Lisbon'02	Broadcasters Prognoses -October 2008
Wideband channels for microphones - 200 kHz	10 to 15	5 to 30 (14 average)
Narrow band channels for microphones - 15 kHz	None	0 to 10 (1 average)
Wideband channels for audio links - 200 kHz	2 to 5	0 to 10 (4 average)

Sport events or similar outside broadcast: major events - peak demand	CEPT Prognoses - ECC Report 2, Lisbon'02	Broadcasters Prognoses -October 2008
Wideband channels for microphones - 200 kHz	20 to 80	20 to 150 (55 average)
Narrow band channels for microphones - 15 kHz	None	0 to 15 (2 average)
Wideband channels for audio links - 200 kHz	10 to 20	0 to 50 (16 average)

Compared with the CEPT ECC Report 2, published in 2002, broadcaster's prognoses of frequency requirements are slightly higher in particular for narrow band channels for radio microphones.

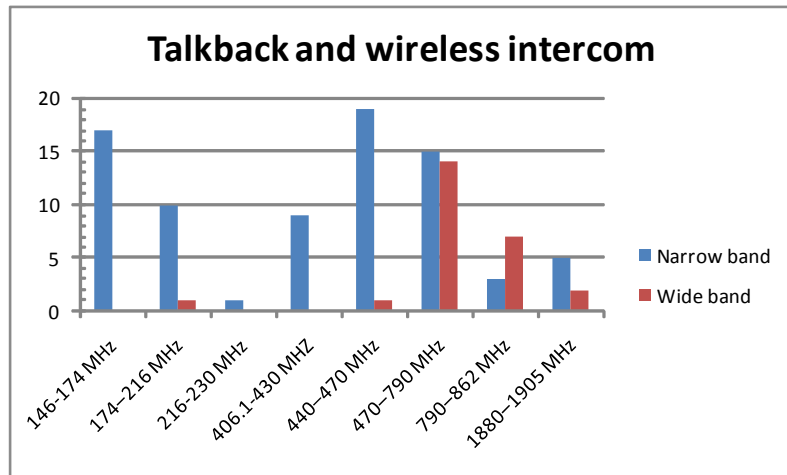
It should be noted that the prognosis vary from broadcaster to broadcaster. Large broadcasters have higher frequency needs and are reflected in their prognosis.

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<sup>1</sup> It should be noted that the bandwidth requirement for professional in-ear monitoring equipment is up to 300 kHz. Therefore the spectrum requirement could be slightly higher in case of use of many of that equipment.

## 2. Talk-back and wireless intercom

2.1 Please indicate for the each of the following frequency bands if you use them for talk-back or intercom within your broadcasting organisation. Please differentiate between narrow-band (<5 kHz audio bandwidth - telephone quality) and wide-band (up to 20 kHz audio bandwidth) applications.



2.2 What is the typical number of frequencies you simultaneously use for this application within your organisation? Please give figures for a normal production and for peak demand at major events or exceptional occasions (e.g. Eurovision Song Contest or Tour de France)

	# channels normal production		# channels peak demand	
	Narrow band	Wide band	Narrow band	Wide band
146 - 174 MHz	2 to 10 (5 average)	0	2 to 25 (9 average)	0
174 - 230 MHz	2 to 15 (6 average)	0 to 1	6 to 20 (9 average)	0
406.1 - 470 MHz	2 to 16 (8 average)	1 to 4 (3 average)	2 to 40 (17 average)	2 to 10 (6 average)
470 - 862 MHz	1 to 35 (7 average)	1 to 24 (8 average)	3 to 40 (18 average)	2 to 50 (17 average)
1880 - 1905 MHz	1 to 4 (3 average)	6	3 to 32 (12 average)	10
Other (please specify)	-	-	-	-

**2.3 The previous questions were focussed on your own use. In some occasions, there are also other users present at the same location (e.g. shared studio complex, sports events ...). Can you give an estimate of the total number of required frequencies for all users together? If you have no idea, please indicate “unknown”.**

	# channels normal production		# channels peak demand	
	Narrow band	Wide band	Narrow band	Wide band
146 - 174 MHz	2 to 10 (7 average)	Unknown	2 to 85 (30 average)	Unknown
174 - 230 MHz	4 to 8 (6 average)	4	8 to 12 (10 average)	8
406.1 - 470 MHz	6 to >24 (13 average)	10	16 to 128 (47 average)	Unknown
470 - 862 MHz	5 to 30 (13 average)	1 to 50 (17 average)	10 to 45 (25 average)	3 to 100 (51 average)
1880 - 1905 MHz	Unknown	Unknown	0	Unknown
Other (please specify)	-	-		

**2.4 Do you encounter problems in finding enough frequencies for this application?**

**2.4.1 What is the nature of the problems?**

12 replies out of 22 indicate having problems in finding frequencies for talk-back and inter-com applications within the tuning range of the equipment. For peak demand at large events it is very difficult for the Regulatory Authority to satisfy all the requirements of the interested users. The major problem is again located in the 470-862 MHz band where the band is crowded and the transition from analogue to digital TV decreases the number of frequencies available. In addition, in some countries part of the band is allocated to non-broadcasting services that require a special permission to use the frequencies.

Some broadcasters also indicated an absence of wide band channels in lower frequencies and the difficulties to find intermodulation-free channels available.

**2.5 Do you expect a growth in use of talkback or wireless intercom applications in the future? If yes: What increase do you expect? Does this require extra frequencies? Do you expect to have difficulties obtaining these extra frequencies?**

19 replies out of 24 indicated an expected growth in use of talk-back and inter-com applications. As productions become more complex to include various groups of users (e.g. more cameras, runners, lighting and security) in addition to main production channels there is a need for more intercom.

It is difficult to put a figure on this growth and varies from broadcaster to broadcaster but there are two issues. The big events will get ever more complex and the number of basic events requiring these facilities will rise. In general broadcasters indicated a 50 to 100% growth for major events and 5 to 20 % growth for normal events.

It may require extra frequencies in some cases and it is expected to have difficulties to find them.



**2.6 Do you also use talk-back and wireless intercom for ENG applications: If yes: does this require extra (exclusive) frequencies? If yes: How many?**

22 replies out of 26 indicated the use of talk-back and wireless intercom for ENG applications. 9 broadcasters indicate a need of extra frequencies for ENG applications the amount varying a lot from one broadcaster to another: 2, 3, 4, 6 and 10 were indicated.

**2.7 CEPT ECC report 2, published in 2002, contains prognoses of frequency requirements in 2012. The results are summarised below. If your prognosis is different from these values please present your own prognosis?**

Typical studio Production-Talkback	CEPT Prognoses - ECC Report 2, Lisbon'02	Broadcasters Prognoses -October 2008
Wide band channels - 200 kHz	None	0 to 18 (2 average)
Narrow band channels - 12.5kHz	5 to 10	3 to 40 (10 average)

ENG for TV - Talkback	CEPT Prognoses - ECC Report 2, Lisbon'02	Broadcasters Prognoses -October 2008
Wide band channels - 200 kHz	None	0 to 40 (2 average)
Narrow band channels - 12.5 kHz	30 to 60	2 to 60 (38 average)

Sound broadcasting SAB/SAP - Talkback	CEPT Prognoses - ECC Report 2, Lisbon'02	Broadcasters Prognoses -October 2008
Wide band channels - 200 kHz	None	0 to 12 (1 average)
Narrow band channels - 12.5 kHz	5	5 to 20 (6 average)

Sport events or similar OB: typical Talkback	CEPT Prognoses - ECC Report 2, Lisbon'02	Broadcasters Prognoses -October 2008
Wide band channels - 200 kHz	None	0 to 18 (2 average)
Narrow band channels - 12.5 kHz	10 to 15	3 to 30 (13 average)

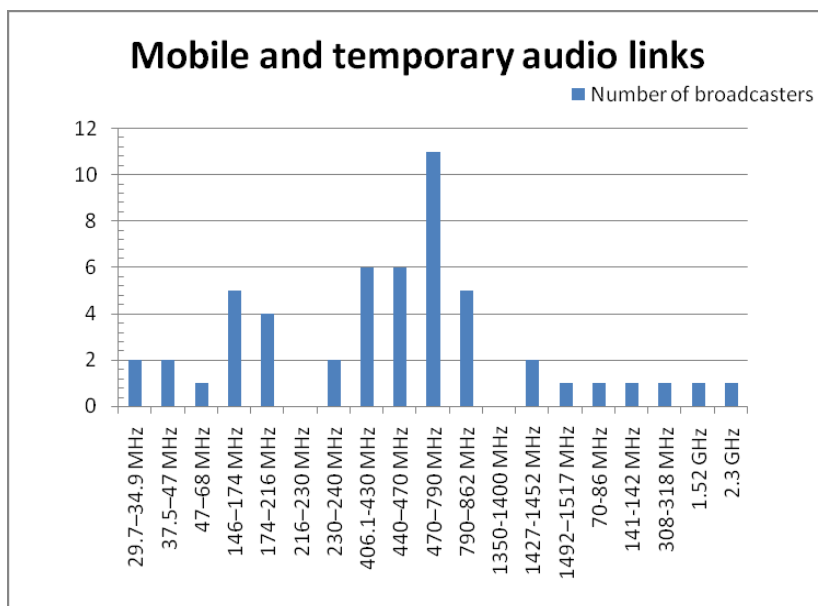
Sport events or similar OB: - peak demand - Talkback	CEPT Prognoses - ECC Report 2, Lisbon'02	Broadcasters Prognoses -October 2008
Wide band channels - 200 kHz	None	0 to 50 (4 average)
Narrow band channels - 12.5 kHz	Not estimated	5 to 70 (29 average)

Compared with the CEPT ECC Report 2, published in 2002, the broadcaster's current prognosis of frequency requirements is higher in almost all cases and in particular for wide band channels for talkback.

It should be noted that the prognosis vary from broadcaster to broadcaster. Large broadcaster's prognoses of frequency requirements are higher and are reflected in their prognosis.

### 3. Mobile and temporary audio links

3.1 Please indicate for the each of the following frequency bands if you use them for mobile or temporary audio links within your broadcasting organisation.



3.2 What is the typical number of frequencies you simultaneously use for this application within your company? Please give figures for a normal production and for peak demand at major events or exceptional occasions (e.g. Tour de France).

	# channels normal production	# channels peak demand
29.7 - 68 MHz	10	3 to 10
146 - 174 MHz	1 to 2 (2 average)	2 to 4 (3 average)
174 - 230 MHz	2 to 4 (3 average)	4 to 8 (6 average)
406.1 - 470 MHz	2 to 12 (4 average)	2 to 24 (8 average)
470 - 862 MHz	1 to 10 (4 average)	3 to 20 (8 average)
1350 - 1517 MHz	0	0
Other		
70 - 86 MHz	3	3
141 - 142 MHz	3	
308 - 318 MHz	4 to 8	10
1.52 GHz	2	3

**3.3 The previous questions were focussed on your own use. In some occasions, there are also other users present at the same location (e.g. shared studio complex, sports events ...). Can you give an estimate of the total number of required frequencies for all users together? If you have no idea, please indicate “unknown”.**

	# channels normal production	# channels peak demand
29.7 - 68 MHz	20	50
146 - 174 MHz	4	20
174-230 MHz	2	16
406.1 - 470 MHz	2, 6 or 24	16 or 120
470 - 862 MHz	2 to 20 (8 average)	4, 12, 20 or 100
1350 - 1517 MHz	3	Unknown
Other		
70 -8 6 MHz	3	15
1.52 GHz	4	6

**3.4 Do you encounter problems in finding enough frequencies for this application?  
If yes:**

**3.4.1 What is the nature of the problems?**

6 replies out of 13 indicate having problems in finding frequencies for mobile and temporary audio links within the tuning range of the equipment. There is an increase in the demand and at the same time a lack of available frequencies. The major problem is again located in the 470-862 MHz band where the band is crowded and the transition from analogue to digital TV decreases the number of frequencies available. It is also mentioned that due to the high-power-nature of the application, the frequencies are bound to small parts of each UHF (TV) channel (upper 1 MHz-gap).

Some broadcasters also indicated an absence of wide band channels in lower frequencies and in particular outside UHF TV-band. UHF TV-band is not usable for helicopter links due to interference from and to TV-transmitters.

**3.5 Do you expect a growth in use of temporary and mobile audio links in the future?  
If yes: What increase do you expect? Does this require extra frequencies? Do you expect to have difficulties obtaining these extra frequencies?**

5 replies out of 15 indicated an expected growth in use of temporary and mobile audio links. Replacement of narrow band audio with wide band will increase the requirements.

It is difficult to put a figure on this growth and varies from broadcaster to broadcaster. In general broadcasters indicate a 5-10% growth in average.

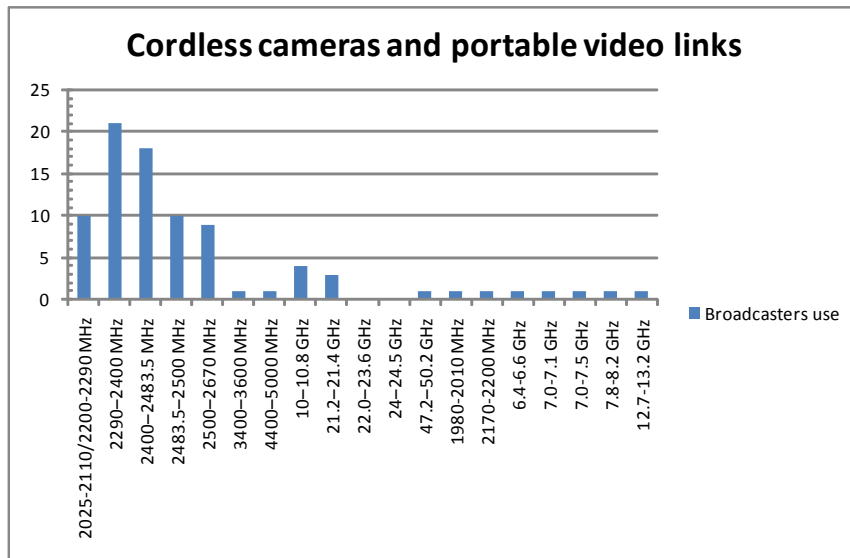
It may require extra frequencies in some cases and it is expected to have difficulties to find interference-free channels in particular in the UHF band.

**3.6 Do you also use audio links for ENG applications: If yes: does this require extra (exclusive) frequencies? If yes: How many?**

10 replies out of 15 indicated the use of audio links for ENG applications. 4 broadcasters indicate a need of extra frequencies for ENG applications the amount varying a lot from one broadcaster to another: 2, 3, and 6 were indicated.

**4. Cordless cameras and portable video links**

**4.1 Please indicate for the each of the following frequency bands if you use them for cordless cameras or portable video links within your broadcasting organisation.**



**4.2 What is the typical number of frequencies you simultaneously use for this application within your company?**

	# channels normal production	# channels peak demand
2025 - 2670 MHz	1 to 6 (3 average)	2 to 16 (7 average)
3400 - 3600 MHz		
4400 - 5000 MHz	1	2
10 - 10.8 GHz	2	3, 4
21.2 - 24.5 GHz	1 or 3	1, 2, or 5
47.2 - 50.2 GHz	2	4
Other		
1980 - 2010/2170 - 2200 MHz	2	
6.4 - 6.6/7.0 - 7.1/12.7 - 13.2 GHz	6	25
7.0 - 7.5 GHz	2	8

**4.3 The previous questions were focussed on your own use. In some occasions, there are also other users present at the same location (e.g. shared studio complex, sports events ...). Can you give an estimate of the total number of required frequencies for all users together? If you have no idea, please indicate “unknown”.**

	# channels normal production	# channels peak demand
2025 - 2670 MHz	2 to 10 (5 average)	6 to 33 (19 average)
3400 - 3600 MHz	Unknown	5 to 8 (7 average)
4400 - 5000 MHz	Unknown	Unknown
10 - 10.8 GHz	6	10
21.2 - 24.5 GHz	10	4 to 15 (10 average)
47.2 - 50.2 GHz	Unknown	Unknown
Other		
1980 - 2010/2170 - 2200 MHz	2	6
6.4 - 6.6/7.0 - 7.1/12.7 - 13.2 GHz	12	40
7.0 - 7.5 GHz		

**4.4 Do you encounter problems in finding enough frequencies for this application?  
If yes: What is the nature of the problems?**

14 replies out of 25 indicate having problems in finding frequencies for cordless cameras and portable video links within the tuning range of the equipment.

The problem is twofold: on one side there is a growing demand for wireless studio camera's and at the same time there is an increase in the demand of frequencies for other applications (e.g. for public safety) as well as for new applications (e.g. UMTS, WiMAX). For example, the band 2500-2670 - actually available for these applications - will have to be cleared for broadband wireless access.

Certain frequency bands are allocated to users and are not available anymore for cordless cameras and portable video links. The number of frequencies licensed for cordless cameras is not enough to satisfy the demand neither to studio productions nor to outside broadcasting (OB). Prospectively a perceptible increase in bandwidth will happen with the entry of cordless HD-Cameras in production (20 MHz or more instead of 8 MHz today).

It is difficult to allocate frequencies for regular use, and this could endanger coverage of large events. So there is a need for more frequencies for those peak demands.

In some countries, there is no clear regulation. Slots are not defined for different users who have to simultaneously use and share the frequencies. Lack of equipment specification /standardisation and certification is also a difficulty.

Some broadcasters also mention break-up and interference.

**4.5 Do you expect a growth in use of cordless cameras and portable video links in the future? If yes: What increase do you expect? Does this require extra frequencies? Do you expect to have difficulties obtaining these extra frequencies?**

24 replies out of 26 indicated an expected growth in use of cordless cameras and portable video links. The need for multiple wireless cameras for each production and the bandwidth of the video links (including HD-Applications which will require larger bandwidths) requires additional frequencies.

It is difficult to put a figure on this growth and varies from broadcaster to broadcaster. In general broadcasters indicate a 5 to 20% growth in average for normal events and of 50 to 100% for major events.

It may require extra frequencies in some cases and it is expected to have difficulties to find interference-free channels.

Frequencies will probably become very costly and programme budgets do not currently support this cost.

**4.6 Do you also use cordless cameras for ENG applications? If yes: does this require extra (exclusive) frequencies? If yes: How many?**

16 replies out of 26 indicated the regular use of audio links for ENG applications. 9 broadcasters indicate a need of extra frequencies for ENG applications the amount varying a lot from one broadcaster to another: 1, 2, 4-5, and 10 were indicated.

**4.7 CEPT ECC report 2, published in 2002, contains prognoses of frequency requirements in 2012. The results are summarised below. If your prognosis is different from these values please present your own prognosis?**

Cordless cameras and wireless video links (including the mobile and airborne links) - 10 MHz	CEPT Prognoses - ECC Report 2, Lisbon'02	Broadcasters Prognoses -October 2008
Typical studio production	None foreseen	0 to 6 (4 average)
ENG for TV	10 to 15	5 to 20 (12 average)
Sport events or similar OB-typical	8 to 10	5 to 10 (9 average)
Sport events or similar OB-peak	10 to 20	5 to 30 (16 average)

Compared with the CEPT ECC Report 2, published in 2002, broadcaster's prognosis of frequency requirements is slightly higher in almost all cases and in particular for typical studio production.

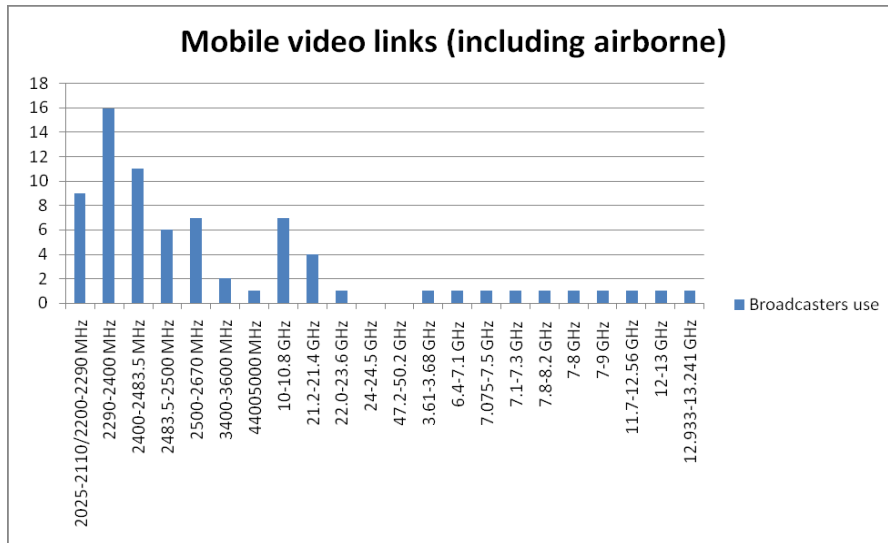
It should be noted that the prognosis vary from broadcaster to broadcaster. Large broadcasters have obviously higher frequency needs and are reflected in their prognosis.

**4.8 All the questions above suppose that only digital links are used. Is this correct, or do you still use analogue video links or analogue wireless cameras?**

7 replies out of 22 indicated the use of a few analogue video links or analogue wireless cameras. Only one indicated the exclusive use of analogue links; all the rest use primary digital links. The main advantage of analogue links is that they are smaller and lighter.

## 5. Mobile video links (including airborne)

5.1 Please indicate for the each of the following frequency bands if you use them for mobile video links within your broadcasting organisation.



5.2 What is the typical number of frequencies you simultaneously use for this application within your company?

	# channels normal production	# channels peak demand
2025 - 2670 MHz	1 to 12 (4 average)	3 to 18 (8 average)
3400 - 3600 MHz	8	3 or 8
4400 - 5000 MHz	2	4
10 - 10.8 GHz	1 to 6 (3 average)	2 to 10 (5 average)
21.2 - 24.5 GHz	1, 2 or 4	3 or 4
47.2 - 50.2 GHz	Unknown	Unknown
Other		
3.61 - 3.68 GHz	1	4
6.4 - 7.1 GHz	2	10
7.075 - 7.5 GHz	3	3
7.1 - 7.3 GHz	5	
7.8 - 8.2 GHz	6	20
7 - 8 GHz	2 to 4	8
7 - 9 GHz	4	
11.7 - 12.56 GHz	2	6
12 - 13 GHz	2 to 4	8
12.933 - 13.241 GHz	1	2

**5.3 The previous questions were focussed on your own use. In some occasions, there are also other users present at the same location (e.g. shared studio complex, sports events ...). Can you give an estimate of the total number of required frequencies for all users together? If you have no idea, please indicate “unknown”.**

	# channels normal production	# channels peak demand
2025 - 2670 MHz	2 to 24 (8 average)	5 to 36 (16 average)
3400 - 3600 MHz	3	3, 6 or 8
4400 - 5000 MHz	Unknown	Unknown
10 - 10.8 GHz	2 or 6	2 or 10
21.2 - 24.5 GHz	Unknown	Unknown
47.2 - 50.2 GHz	Unknown	Unknown
Other		
7.0 - 7.5 GHz	6	20
7.8 - 8.2 GHz	2	12

**5.4 Do you encounter problems in finding enough frequencies for this application? If yes: What is the nature of the problems?**

11 replies out of 15 indicate having problems in finding frequencies for mobile video links (including airborne) within the tuning range of the equipment.

The main problem is new applications (UMTS, WiMAX...) asking frequencies. In addition, in certain countries some of the frequency bands have to be shared with wifi signals or with other operators. The remaining frequencies are not enough to satisfy all broadcast requirements particularly those coming from commercial stations.

One broadcaster mentioned that in their country airborne frequencies are now situated between 3.4 and 3.6 GHz. Airborne frequencies will have to move to 2025 - 2075 / 2220 - 2285 MHz because 3.4 - 3.6 GHz will be allocated to broadband wireless access. But also the portable cameras have to operate there, which gives a conflict for covering major sport events.

In some countries, there is no clear regulation. Slots are not defined for different users who have to simultaneously use and share the frequencies. Lack of equipment specification/standardisation and certification is also a difficulty.

**5.5 Do you expect a growth in use of mobile video links in the future? If yes: What increase do you expect? Does this require extra frequencies? Do you expect to have difficulties obtaining these extra frequencies?**

14 replies out of 15 indicated an expected growth in use of mobile video links. The need for more uplinks to helicopter in cycling events, more wireless cameras for sports events, requires additional frequencies. In addition, the HD-Application will lead to bigger bandwidths. New comers, mainly commercial stations are also expected.

It is difficult to put a figure on this growth and varies from broadcaster to broadcaster. In general broadcasters indicate a 5 to 10% growth in average for normal events and of 30 to 50% for major events.



It may require extra frequencies in some cases and it is expected to have difficulties to find interference-free channels.

Frequencies will probably become very costly and programme budgets do not currently support this cost.

**5.6 Do you also use mobile video links for ENG applications If yes: does this require extra (exclusive) frequencies? If yes: How many?**

12 replies out of 14 indicated the regular use of audio links for ENG applications. 8 broadcasters indicate a need of extra frequencies for ENG applications the amount varying a lot from one broadcaster to another: 1, 2-3, 4, 6 and 15 were indicated.

Other News organisations will use similar numbers at the same venue.

**5.7 All the questions above suppose that only digital links are used. Is this correct, or do you still use analogue video links or analogue wireless cameras?**

9 replies out of 13 indicated the use of a few analogue video links or analogue wireless cameras. Only one indicated the exclusive use of analogue links; all the rest use primary digital links. Analogue links are used seldom and will soon be phased out.

**6. Telecommand and Remote control of camera (and other) equipment**

**6.1 Which frequency bands do you use for these applications:**

	YES	NO	Don't know
Unlicensed frequency bands for short range devices (SRD). <sup>1</sup>	16	7	8
Other (licensed) frequencies			
70 - 87 MHz			
156 MHz			
180 - 185 MHz			
380 - 512 MHz			
406.1 - 430 MHz			
406.1 - 470 MHz			
415 - 470 MHz			
430 - 475 MHz	5	3	23
450 - 470 MHz			
452 MHz			
455 - 456 MHz			
456.xxx MHz			
459.xxx MHz			
462 MHz			
466.xxx MHz			
491 - 429 MHz			

<sup>1</sup> 26.957-27.283 MHz; 40.66-40.70 MHz; 49.50-50.00 MHz; 138.2-138.45 MHz; 433.05-434.79 MHz; 863-870 MHz; 2400-2483.5 MHz; 5725-5875 MHz; 24.0-24.25 GHz; 61.0-61.5 GHz.

## **6.2 Do you encounter problems in finding enough frequencies for this application? If yes: What is the nature of the problems?**

8 replies out of 15 indicate having problems in finding frequencies for telecommand and remote control of camera (and other equipment) within the tuning range of the equipment.

It is indicated that apart from the fact that there are not enough frequencies licensed for such applications, the frequencies implemented by the manufacturers are not always assigned for the applications.

From the technical side it is mentioned that unlicensed frequency bands often don't allow enough RF power, that frequency rasters of equipment are often not flexible enough to be compatible with frequency rasters of PMR and that there is normally problems with different frequencies nearby (too high level carrier too close). Sharing is difficult and too many users share unlicensed frequency bands; there is a lack of coordination.

## **6.3 Do you expect a growth in use of remote control of equipment in the future? Does this require extra frequencies? If yes: What increase do you expect? Do you expect to have difficulties obtaining these extra frequencies?**

16 replies out of 17 indicated an expected growth in use of remote control of equipment.

It is difficult to put a figure on this growth and varies from broadcaster to broadcaster. Growth will match use the growth in radio camera usage. In general broadcasters indicate a 5 to 20% growth in average for normal events and of 50 to 100% for major events.

It may require extra frequencies in some cases and it is expected to have difficulties to find channels.

## **7. Role of the Administrations**

### **7.1 Are you satisfied with the way your Administration controls your spectrum usage for SAB/SAP?**

Ten replies out of 23 indicated that they are satisfied with the way their Administration controls the spectrum usage for SAB/SAP; eight indicated that in general they were satisfied but the Administration did not seem to always understand broadcasters needs. Five replies indicated that they are not satisfied.

New frequency allocations for mobile services (e.g. 790-862 MHz, 2.6 GHz band) may imply that some spectrum bands currently used by SAB/SAP services will not be available in the future. This, together with the increased need for HD equipment which requires higher bandwidths and with the fact that events to be covered are getting technically more complex (to meet viewers expectations), broadcasters are concerned that adequate amounts of spectrum for SAB/SAP applications may not be available in the future.

In the analogue TV world, there were generally only difficulties in finding adequate amounts of spectrum when covering large events; solutions were adopted on a case-by-case basis. With the

introduction of DVB-T the amount of spectrum that is potentially available is reduced and it is proving more difficult to find solutions. If channels above 61 are allocated to MS, the frequencies and channels below 61 will be more crowded; difficulties will increase.

The re-allocation of spectrum may require changing equipment that only works in a defined narrow band creating additional costs for broadcasters.

## **7.2 If no: which improvements you would like to see (aspects are for instance: legislation, regulation, certification, law enforcement and type approval)**

Different proposals are mentioned:

- Speed up the process to get a license (in some cases the average time is about 1 year)
- National regulation for each specified band, assigning specific frequencies for each operator
- Exclusive frequencies for wireless cameras
- All aspects mentioned above: better legislation and regulation, certification of equipment and type approval.
- It is highly recommended not allow unlicensed services below Ch 61 in white spaces.
- National Regulators to update their national tables of frequency allocations to be consistent with the CEPT European Common Allocation table (ECA) including acknowledgement of related CEPT reports such as Recommendation ERC/REC 25-10 ("Frequency ranges for the use of temporary terrestrial audio and video SAP/SAB links-including ENG/OB").
- Standardisation of equipment (power, frequency range) and type approval in UE.



## Appendix 1: Glossary of Terms

The following definitions are assumed in describing the technology layer of various SAP/SAB applications

Radiomicrophone	Handheld or body worn microphone with integrated or body worn transmitter.
In-ear monitor	Body-worn miniature receiver with earpieces for personal monitoring of single or dual channel sound track.
Portable audio link	Body-worn transmitter used with one or more microphones and with a longer operating range than that of a radiomicrophone.
Mobile audio link	Audio transmission system employing radio transmitter mounted in/on motorcycles, pedal cycles, cars, racing cars, boats, etc. One or both link terminals may be used while moving.
Temporary point-to-point audio link	Temporary link between two points (e.g. part of a link between an OB site and a studio), used for carrying broadcast quality audio or for carrying service (voice) signals. Link terminals are mounted on tripods, temporary platforms, purpose built vehicles or hydraulic hoists. Two-way links are often required.
Cordless camera	Handheld or otherwise mounted camera with integrated transmitter, power pack and antenna for carrying broadcast-quality video together with sound signals over short-ranges.
Portable video link	Handheld camera with separate body-worn transmitter, power pack and antenna.
Mobile airborne video link	Video transmission system employing radio transmitter mounted on helicopters or other airships.
Mobile vehicular video link	Video transmission system employing radio transmitter mounted in/on motorcycles, pedal cycles, and cars, racing cars or boats. One or both link terminals may be used while moving.
Temporary point-to-point video links	Temporary link between two points (e.g. part of a link between an OB site and a studio), used for carrying broadcast quality video/audio signals. Link terminals are mounted on tripods, temporary platforms, purpose built vehicles or hydraulic hoists. Two-way links are often required.
Talk-back	For communicating the instructions of the director instantly to all those concerned in making the programme; these include presenters, interviewers, cameramen, sound operators, lighting operators and engineers. A number of talkback channels may be in simultaneous use to cover those different activities. Talkback usually employs constant transmission.
Telecommand/remote control	Radio links for the remote control of cameras and other programme making equipment and for signalling.