

A1 3G mobile

A1.1 The 3G concept

3G technology is intended to revolutionise the capabilities of mobile communications. Equipped with high speed data capabilities 3G should offer users advanced services on the move.

1G cellular mobile telecommunications systems were based on analogue technology, providing simple voice telephony, using either handheld or vehicle mounted terminals.

2G systems, which in Europe are based on the GSM standard, offered digital cellular communications for the first time, allowing for improved frequency efficiency and the provision of narrowband data services as well as voice telephony. GSM was developed as a common European standard and operates in harmonised spectrum across Europe. The initial spectrum designated across Europe for GSM was in the 900 MHz band. Additional spectrum was then identified at 1800 MHz, and the GSM standard expanded to incorporate GSM 1800 operation (also known as DCS 1800). Expansion spectrum for GSM at 900 MHz was also identified (the “Extended GSM” or “E-GSM” bands). In many countries across Europe, this is the same spectrum which is used for analogue cellular, and migration of the analogue networks to digital is required to utilise it.

The basic data rate over GSM is 9.6 kbps, allowing users to access a number of data based services including fax, e-mail and low speed internet access. The ETSI Special Mobile Group (“ETSI SMG”) committee is standardising a number of additional features that will facilitate higher data rates over GSM.

The main candidate for upgrading GSM networks at present appears to be the General Packet Radio Service (“GPRS”), which will offer packet switched services on GSM at speeds up to 115 kbps. A number of announcements on the introduction of GPRS have already been made by operators and equipment manufacturers. Also being considered is High Speed Circuit Switched Data (“HSCSD”), which will offer circuit switched services on GSM at speeds of up to 64 kbps. In order to achieve this bit rate, however, operators will have to combine channels up to the full capacity of a transceiver and, therefore, implementation will place additional pressure on spectrum capacity.

Another possible GSM standardisation upgrade is EDGE (“Enhanced Data for GSM Evolution”), currently being considered within ETSI SMG, which uses a higher order modulation scheme to enable higher data rates than are possible with the current GSM modulation scheme. This is envisaged to increase the bit rate up to a maximum of 384 kbps, although the range is reduced, making this data rate likely to be technically capable of implementation only in micro and pico cells.

2G systems such as GSM are now well established worldwide. Apart from GSM, there are a number of other 2G technologies in use across the world - for instance, the Personal Communications Systems (PCS) in the USA and other countries, and the Personal Handyphone System (PHS) in Japan. The widespread use of these 2G systems has led to the

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market for these types of systems expanding significantly over recent years. Service requirements have also evolved, with applications involving, for example, multimedia now being demanded.

3G mobile is expected to provide more enhanced services than are possible over existing cellular systems, including higher bit rates services and greater capacity and service capability. On a global level, the definition of 3G mobile systems has been led within the ITU, within the project known as IMT-2000.

A1.2 IMT-2000

The services envisaged to be delivered by 3G mobile systems, and the consequential technology, operational and spectrum related requirements have been studied by the ITU (see Section A2.1).

These studies led to the identification of spectrum at 2 GHz for IMT-2000 at WARC-92. This spectrum was subsequently designated within the CEPT according to ERC/DEC/97(07).

At a global level, the ITU has also co-ordinated the definition of IMT-2000, by inviting the submission of candidate radio technologies from national or regional standards organisations. IMT-2000 has been considered as encompassing a family of compatible technologies as fully harmonised as possible. The culmination of an extensive technology evaluation process was the agreement in principle in March 1999 of the key characteristics of the IMT-2000 radio interfaces. This recommendation is expected to be approved by ITU-R Study Group 8 in November 1999. Based on the key characteristics, work continues on the definition of the detailed radio specifications for the IMT-2000 radio interfaces. A summary of the candidate terrestrial technologies submitted to the ITU is given in Section A1.4.

The process of harmonisation of these technologies, towards a minimum set of radio interfaces, is still underway, in particular in relation to the work of 3GPP and 3GPP2.

A1.3 European implementation of IMT-2000

A1.3.1 Role of ETSI

ETSI is a non-profit making organisation, set up to produce and publish European telecommunications standards. Members of ETSI include national administrations, manufacturers, network operators, service providers and users. The standards produced by ETSI are largely voluntary, although some standards are subsequently adopted as the basis of regulatory or other regimes for equipment approval. Standardisation within ETSI is normally carried out within technical committees. The development of 3G mobile standards in ETSI was originally the responsibility of ETSI SMG, which is also the responsible committee for maintenance of the GSM specifications. Following the creation of 3GPP in 1998, ETSI SMG's role is now to approve specifications developed in 3GPP for publication as ETSI standards.

ETSI is currently reviewing its mission and mandate, competing technologies, new business opportunities, its legal and financial status and new working procedures.

A1.3.2 Role of 3GPP

The 3GPP has been set up to produce specifications for terrestrial UMTS, including the UMTS Terrestrial Radio Access (“UTRA”) candidate for IMT-2000 (see Section A1.3.3 below). Membership of 3GPP is open to members of the partner standards development organisations (ARIB, CWTS, ETSI, TTA, TTC, T1) as well as industry groups. Once the specifications are agreed in 3GPP, the individual organisations approve and publish them as their own standards.

A1.3.3 ETSI's activities in 3G mobile

As a partner in 3GPP, ETSI is involved in the development of technical specifications for UMTS. 3GPP also influences the ITU, through individual members, on the development of its recommendations on radio key characteristics and specifications. The first complete set of UMTS specifications (Release 99) is scheduled to be available at the end of this year.

UTRA is the radio interface of the UMTS specification being elaborated in 3GPP. It combines two modes of operation: Frequency Division Duplex (“FDD”) utilising paired radio spectrum and Time Division Duplex (“TDD”) utilising unpaired spectrum.

The decision on the UTRA technology was taken by ETSI in January 1998, based on consensus within the ETSI membership. It combines the use of Wideband CDMA (“W-CDMA”) with Time Division CDMA (“TD-CDMA”). Brief descriptions of these technologies are provided in Sections A3.1 and A3.2.

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A1.4 Relationship to other 3G standards

The ITU received 10 terrestrial candidate technologies in response to the request for submissions for IMT-2000; these are shown in the table below.

TABLE A1: RADIO TRANSMISSION TECHNOLOGY (RTT) PROPOSALS

Proposal	Description	Source
DECT	Digital enhanced cordless telecommunications	ETSI Project (EP) DECT
UWC-136	Universal wireless communications	United States, TIA TR45.3
WIMS W-CDMA	Wireless multimedia and messaging services	United States, TIA TR46.1
TD-SCDMA	Time-division synchronous CDMA	China Academy of Telecommunication Technology (CATT)
W-CDMA	Wideband CDMA	Japan, ARIB
CDMA II	Asynchronous DS-SS-CDMA	Republic of Korea, TTA
UTRA	UMTS terrestrial radio access	ETSI SMG2
NA:W-CDMA	North American: wideband CDMA	United States, T1P1-ATIS
cdma 2000	Wideband CDMA (IS-95)	United States, TIA TR45.5
CDMA 1	Multiband synchronous DS-SS-CDMA	Republic of Korea, TTA

The ITU aims to complete recommendations on the detailed radio specifications for IMT-2000 by November 1999, based on the work within the 3GPPs.

A2 3G mobile services

A2.1 Projected 3G mobile services

As a result of the increased data transmission rates and improved technology discussed in Section A1.2, it is expected that 3G mobile will be able to provide a wide range of telecommunications services not currently available over mobile networks. The capabilities of existing data related services are also likely to be significantly improved. 3G mobile should, therefore, be capable of offering services such as:

- video telephony and teleconferencing;
- high speed internet access and electronic mailing;
- interactive user services, such as online banking or shopping; and
- entertainment such as audio or video on demand and video games.

One of the key goals in the development of 3G mobile is the creation of the “Virtual Home Environment” whereby users can be provided with the same set of personal services at home, in the office or on the move. Service charging and billing may also be combined. This personalised service may also be available to the user on a consistent basis when roaming onto other 3G mobile networks abroad.

The services available over 3G mobile need not be restricted to mobile multimedia and cellular mobile services. It could potentially be used as an alternative to wired access and private network provision such as wireless office PBXs, corporate intranets or cordless systems with local mobility. The 3G mobile concept also incorporates a satellite element that will operate alongside the terrestrial networks and so users with combined satellite/terrestrial terminals will have access to terrestrial and satellite networks that will enable improved global coverage. Licences to use the spectrum allocated to 3G satellite are not included in the Auction. Use of spectrum for satellite services is co-ordinated internationally, but it is not yet known when the spectrum designated for 3G satellite services will be made available.

A2.1.1 Wireless Application Protocol

The introduction of advanced services is likely to be accelerated by the introduction of Wireless Application Protocol (“WAP”), which enables internet content to be distributed to and displayed in standard mobile phones. WAP was drawn up in February 1998 by Ericsson, Motorola, Nokia and Phone.com (formerly Unwired Planet) who intended to provide a mechanism that can deliver internet content to existing wireless devices.

WAP is not dependent on specific radio interface standards or mobile devices. It can therefore be used over any digital network (including GSM or GPRS) and the information content can be optimised for display on any particular mobile device. The typical mobile phone, with its small screen and limited memory is not well-suited to displaying websites containing high resolution graphics. However, such phones could show some useful information, and software houses are developing “microbrowsers” that use the WAP standard to achieve this aim.

A2.2 Data rates

3G mobile radio interfaces are being standardised with the intention of achieving transmission rate capabilities of at least 144 kbps for full mobility applications in all environments, 384 kbps for limited mobility applications and 2 Mbps for low mobility applications, the latter particularly in micro and pico cellular environments. The bit rate offered to 3G mobile users will, however, depend on operators’ network deployment strategies and radio planning. The total spectrum allocation per operator may also impact on the operators’ ability to provide the highest 3G mobile data rates.

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A3 Technical standards

When the radio interface technologies for 3G mobile were considered, they were evaluated in Europe by ETSI SMG2 on the basis of a number of defined 3G mobile requirements. These requirements included:

- support for high data rate transmission (384 kbps with wide area coverage and 2 Mbps with local area coverage);
- high service flexibility, i.e. support of variable user bit rates;
- capacity/coverage; and
- efficient utilisation of the frequency spectrum.

At the ETSI SMG meeting of 28th to 29th January 1998, it was agreed that the system should adopt:

- W-CDMA (FDD) in the paired band; and
- TD-CDMA (TDD) in the unpaired band.

This agreement assumed the paired and unpaired bands as outlined in Section A4.1.

A3.1 W-CDMA / paired spectrum

Following agreement at ETSI SMG, W-CDMA technology has been elaborated as UTRA FDD mode.

Direct-sequence CDMA permits multiple users to access a single radio frequency carrier by allocating a discrete code to each. This code is used to spread the user's data stream over a wide bandwidth for transmission over the radio link. The receiver uses the appropriate code to "despread" the user's required signal to reproduce the original data stream. The use of codes to distinguish individual channels also allows adjacent base stations to use the same carrier. In all cases, for bi-directional communication, separate radio frequency carriers are used for uplink (mobile station to base station) and downlink (base station to mobile station). UTRA FDD is designed to operate with uplink carriers in the sub-band 1920 - 1980 MHz and downlink carriers in the sub-band 2110 - 2170 MHz, although this does not preclude deployment in other frequency bands.

During 1998, work to elaborate the UTRA FDD air interface progressed within ETSI SMG2 and its sub-groups. From January 1999, the work moved to the Technical Specification Group for the Radio Access Network ("TSG-RAN") in 3GPP.

The latest releases of UTRA FDD specifications agreed by TSG-RAN are available from the 3GPP website at <ftp://ftp.3gpp.org/specs/>.

A3.2 TD-CDMA / unpaired spectrum

Following the ETSI SMG agreement, TD-CDMA has been elaborated as the UTRA TDD mode. The TD-CDMA concept includes both a TDMA component and a CDMA component. The TDMA component defines discrete time slots and within each time slot CDMA codes define individual traffic channels. Each timeslot can be allocated to either uplink or downlink thus allowing TDD mode to be used for bidirectional communication on a single carrier. In any configuration, at least one time slot will be allocated to the downlink and at least one timeslot will be allocated to the uplink.

Work on the UTRA TDD mode was progressed in ETSI SMG2 during 1998 and moved to TSG-RAN in January 1999. The latest releases of UTRA TDD specifications agreed by TSG-RAN in 3GPP are available from the 3GPP website at <ftp://ftp.3gpp.org/specs/>.

A3.3 IPR situation

The ETSI Special Report SR 000 314 identifies patents and patent applications that have been notified to ETSI as being essential, or potentially essential, to ETSI standards. Most members have indicated that where they hold patents essential to UTRA, they are prepared to grant licences for these patents on a fair, reasonable and non-discriminatory basis in accordance with the terms and conditions set forth in Clause 6.1 of the ETSI IPR Policy. ETSI is awaiting a promised updated declaration from Qualcomm on its policy regarding IPRs that are essential to the UTRA specifications.

Similar requirements on IPR declaration also apply within the ITU. Declarations are required to indicate IPRs essential to technologies contained within ITU-R Recommendations and the relevant companies must declare to the ITU that they are prepared to grant licences of these IPRs on a fair, reasonable and non-discriminatory basis in accordance with the ITU's terms and conditions. Declarations must be in writing to the ITU before a new Recommendation can be published. If IPRs pertaining to a particular technology are being withheld for any reason, the technology must either be omitted from the Recommendation or the Recommendation cannot be approved until the IPR issue has been resolved. In the development of the ITU-R Recommendations on IMT-2000, Qualcomm and Ericsson initially did not meet the ITU-R's requirements on IPR declaration. The RA has been informed that the relevant declarations have now been made, but these are not yet available.

The situation outlined above may change in the future.

A3.4 European timetable for finalisation of technical standards

3GPP is defining UMTS using a phased approach and within each phase there will be annual releases. For Phase 1, two releases have been identified: Release 99 and Release 2000, to be available in December 1999 and December 2000 respectively. Once 3GPP has published the specifications, ETSI will convert them into ETSI standards.

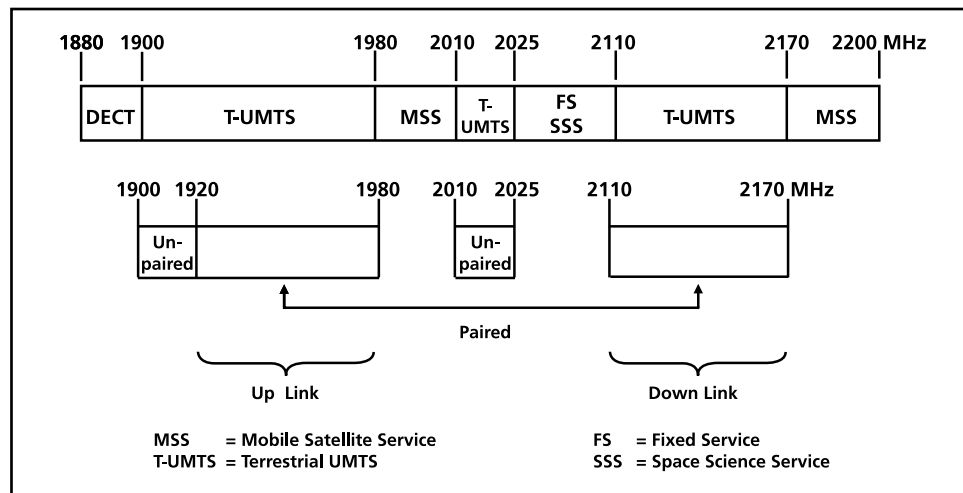
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A4 Spectrum for 3G mobile

A4.1 European spectrum plan in the 2 GHz band

Based on the spectrum identified in the Radio Regulations for IMT-2000, the European band plan for the 2 GHz band is as shown below.

FIGURE A1: EUROPEAN BAND PLAN



NB: Within the UK, other terrestrial IMT-2000 technologies, as well as UMTS, may be used in the spectrum reserved for UMTS.

A4.2 Designation and utilisation of 3G spectrum in Europe

The Radio Regulations currently identify the bands 1885 - 2025 MHz and 2110 - 2200 MHz for use, on a worldwide basis, for IMT-2000. Within these bands, the Radio Regulations allocate the portions 1980 - 2010 MHz and 2170 - 2200 MHz to the Mobile Satellite Service ("MSS") on a worldwide basis, for use by the satellite component of IMT-2000.

The ERC Decision ERC/DEC/(97)07 of 30th June 1997 on the frequency bands for the introduction of UMTS designated 155 MHz of spectrum for UMTS in Europe and the frequency bands 1900 - 1980 MHz, 2010 - 2025 MHz and 2110 - 2170 MHz to terrestrial UMTS applications. It is envisaged that the bands will be used as shown in the diagram above. This allows for the sub-band 1920 - 1980 MHz to be paired with 2110 - 2170 MHz while the sub-bands 1900 - 1920 MHz and 2010 - 2025 MHz have no pairing. Currently, the 1885 - 1900 MHz portion of the global IMT-2000 spectrum is only available in Europe for DECT, which has been allocated 1880 - 1900 MHz.

To facilitate harmonised use of the spectrum identified in ERC Decision ERC/DEC/97(07) and to allow for both FDD and TDD deployment, TG1 has recently developed a new ERC Decision on the harmonised use of the UMTS spectrum. This was approved by the ERC in

March 1999 for public enquiry, to be completed in October 1999. This new Decision covers paired and unpaired spectrum arrangements for FDD and TDD use, requirements to protect adjacent services according to the diagram above and the identification of spectrum for Licence Exempt use.

A4.3 Band clearance programme

The bands identified for terrestrial 3G mobile have been used for a variety of purposes in the past, both in the UK and overseas. The RA has been active in removing previous users from the bands and identifying potential interference to 3G mobile.

A4.3.1 RA monitoring activity

The RA has surveyed thirty representative sites across the UK for interference in 3G mobile bands. Few in-band signals have been recorded apart from licensed BT links. The surveys on the south east coast have included monitoring of signal levels from the continent. Again very few in-band signals have been recorded, all at low level. Results from the RA survey of the 3G mobile bands will be available separately to Bidders on CD-ROM on request.

A4.3.2 BT fixed links

The 3G mobile bands are currently being used for a limited number of BT fixed links. The RA has agreed with BT a timescale for removal of these links from the band. By 1st January 2001 BT will close down links in 3G mobile bands in urban areas, with rural areas to follow by 1st January 2002. The WT Act Licences will include any consequential geographical exclusion zones that 3G operators will be required to respect for these periods. A clause in each affected WT Act Licence will prohibit the licensees from operating base stations within the exclusion zones before the specified dates. The exclusion zones are of sufficient size that the 3G licensees should not suffer material interference from the fixed links. For illustrative purposes, maps showing the exclusion zones for each WT Act Licence are in Appendix H.

The RA has studied the impact of the remaining Channel Islands fixed links and concluded that they will not interfere with 3G operation on the UK mainland.

A4.3.3 The Government

The RA confirms that no other public body uses spectrum in such a way as to impact materially on the 3G mobile bands anywhere in the UK. Normal site clearance procedures for base stations will be followed but it is expected that, in view of the frequency separation, any restrictions on siting base stations should be limited to the immediate vicinity of a very small number of sites (see Section A4.3.5 below).

A4.3.4 Transhorizon links

There are three transhorizon links in the 3G bands. These links are based in north-east Scotland, to the north of Aberdeen and are directed away from land. One link affects Licence

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A spectrum in the upper paired band. Appendix G gives an indication of the areas (by 10x10km grid squares) in which 3G mobile systems operating in Licence A spectrum could receive interference from this transhorizon link for at least 5% of the year. The map is derived from RA calculations based on a mobile terminal up to 10m above ground level and using the UMTS characteristics available at January 1999. This link will be removed by 31st December 2000. The remaining two transhorizon links affect carriers in the upper unpaired band (which are expected to be used for Licence Exempt purposes). Again, the RA has calculated that these links would cause interference to UMTS systems across the whole of Aberdeenshire for at least 5% of the year. It is expected that one will close by 1st January 2002 while the other will remain in use until at least 2005.

A4.3.5 Site clearance

The site clearance procedure is triggered when radio equipment is intended to be used with power levels equal to or greater than 17 dBW ERP (effective radiated power) or the antenna height is greater than 30m above ground level. In these cases, the relevant licensee must apply to the RA, which would circulate the request to other public bodies with an interest. There is then a 28-day period for objections to be raised. If no comments or objections are received, a site clearance certificate is automatically generated. In cases where there are objections or more information is requested, site clearance is put on hold. The procedure can only continue if negotiation between the affected parties overcomes any objections or difficulties.

A4.3.6 Overseas

The RA is engaged in discussions with the administrations of neighbouring countries to agree procedures for co-ordination between UK 3G mobile systems and the systems licensed by those administrations. The outcomes of these discussions will take the form of a Memorandum of Understanding ("MoU") between the UK and each foreign administration. The MoUs will place restrictions on the permissible field strength at the neighbouring administration's border or coastline due to 3G transmissions from the UK. In the 2010 - 2025 MHz band, the agreed limit is a field strength of 27 dBmV/m at the French coast. Limits have still to be agreed for the other bands and the border with Ireland. There are expected to be reciprocal restrictions on operators in neighbouring countries. The requirement to comply with MoUs is in the WT Act Licences. ERC TG1 is currently developing a European approach for cross-border co-ordination for UMTS.

In Ireland and France, the terrestrial 3G mobile bands have also been used for fixed links. In Ireland, most of these links have now been removed and it is expected that the remainder will be cleared by the end of 1999. France has indicated that it will start removing links from 1900 - 1980 MHz from 2002 and plans to remove the links by 2005. These links will be considered (if appropriate) in the MoUs.

Manx Telecom has been awarded a telecommunications licence for 3G services by the Isle of Man Government. The RA is involved in discussions on the requirements for a WT Act Licence to cover the Isle of Man. Should the RA license 3G operation on the Isle of Man, it is expected that some technical constraints would be imposed on both Manx Telecom and the 3G operators to prevent mutual interference between their systems.

A5 Frequency planning and spectrum packaging

A5.1 Spectrum packaging for the Auction

The total number of transmission channels that can be accommodated in the available 155 MHz spectrum for 3G mobile systems, and therefore the number of spectrum packages on offer in the Auction, depends on the carrier spacing and the guard bands required at the band edges.

In order to determine the spectrum requirement per operator for 3G mobile services, the RA employed Quotient Communications Limited and Ovum Ltd to consider spectrum requirements for 3G mobile. Ovum estimated market demand for 3G mobile services in selected urban conurbations in the UK by examining particular service types (e.g. low speed data, highly interactive multimedia). They were then translated into traffic estimates by Quotient to determine the amount of spectrum required to support the projected traffic levels. Spectrum estimates were made assuming multiple cell layers (i.e. macro, micro and pico).

The spectrum requirements were further refined by Quotient following the initial study to determine the minimum spectrum allocation per operator. This work was carried out in consultation with the UK Third Generation Advisory Group (UKTAG). During the course of the work, comparison was also made between Quotient's results and similar work being carried out in Europe within the UMTS Forum Spectrum Aspects Group (SAG).

The initial work carried out by Quotient concluded that, based on the market estimates provided by Ovum and assuming the technical characteristics of UMTS (e.g. W-CDMA technology, nominal 5 MHz channels, FDD and TDD operation), an operator in the UK would require 1 macro cell carrier, 1 micro cell carrier and 2 pico cell carriers, to ensure the provision of services to the UK population with high grade of service and low transmission delay. The requirement for 2 pico cell carriers resulted in part from the assumption that a proportion of high speed indoor multimedia services would have to be supported with a good grade of service (i.e. delays encountered by a user in accessing such services should be very short).

Further work carried out by Quotient indicated that a reasonable grade of service can be achieved in many, though not all, situations where an operator is provided with one rather than 2 pico cell carriers. This assumes that delays in accessing multimedia services are less than 20 seconds, which was seen to be acceptable from the user's perspective in most circumstances. On this evidence, therefore, Quotient concluded that the technical minimum spectrum allocation from a network implementation point of view was 2 paired carriers (1 macro, 1 micro) and 1 unpaired carrier (pico).

On this basis, and taking account of the wider objectives of the Auction, in particular the desire to stimulate further competition in the UK mobile market, the Government announced in May 1999 that five 3G WT Act Licences would be offered in the Auction.

In order to develop the 3G mobile spectrum plan for the Auction, there were a number of specific spectrum planning issues which had to be addressed:

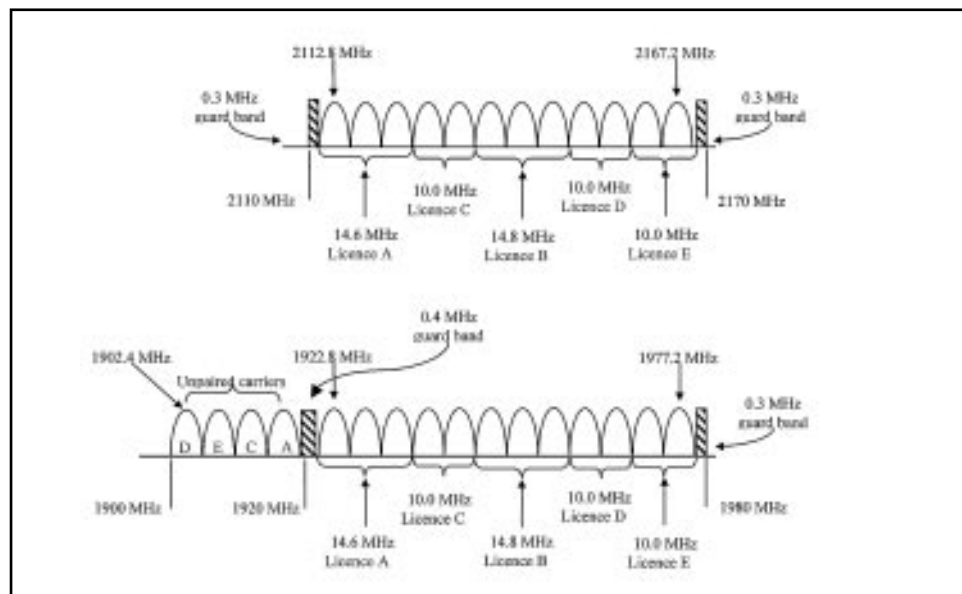
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- i) whether 12 paired carriers of 5 MHz spacing would fit into the paired bands 1920 - 1980 MHz and 2110 - 2170 MHz, taking account of whether some spectrum would be lost either due to increased spacing required to ensure sufficient isolation between carriers, or guard bands required to protect adjacent services; and
- ii) whether the carriers positioned next to the boundary between the paired and unpaired bands at 1920 MHz would require additional spacing in order to avoid interference.

Spacing of paired carriers in the bands 1920 - 1980 MHz and 2110 - 2170 MHz was studied within UKTAG. Compatibility between 3G mobile and services in the adjacent spectrum and guard bands that may be required to avoid interference between UMTS and adjacent services was studied in Task Group 1 of ERC. This study culminated in the publication in May 1999 of ERC Report 65, "Adjacent band compatibility between UMTS and other services in the 2 GHz band". Developments in 3GPP on spectrum parameters for UMTS have required that assumptions contained in Report 65 to be re-visited. Work is underway to issue a revised Report 65 ("Revision 1"), which is expected to be completed by December 1999.

Consideration of these studies enabled the band plan in Figure A.2 to be developed for the Auction. The RA will continue to monitor progress in the relevant national, European and international bodies responsible for defining the relevant spectrum and technical parameters associated with the channel plan. In the event that parameters are changed that impact directly on the channel plan, it may need to be amended, in which case a change to the Regulations would need to be made. Changes would most likely occur to either the outermost frequency limits of the packages or, in a less likely scenario, the position of the packages within the overall band plan.

FIGURE A.2: LICENCE ALLOCATION IN THE UK



A5.2 European frequency planning

All of the spectrum currently identified for 3G mobile in the UK is being offered in the Auction (other than that for guard bands and provisionally allocated for Licence Exempt). However, it is recognised that additional spectrum will be required to meet demand in the longer term.

The total spectrum requirements for terrestrial mobile services in Europe have been studied by the UMTS Forum, who concluded that the total spectrum requirement was 582 MHz by the year 2010. This total requirement includes the spectrum already designated in Europe according to ERC/DEC/97(07), that is used by 2G mobile systems (GSM and DECT) and an additional requirement forecast to meet the expected demand for services by 2010.

The ITU-R TG8/1 concluded at its meeting in March 1999 that the additional spectrum requirement for terrestrial IMT-2000 in the 3 ITU Regions was 160 MHz. This requirement has been included in a new ITU-R Report, "*Spectrum requirements for IMT-2000*", which is planned to be approved for publication in November 1999. Taking account of changes in some of the original parameters, the total spectrum requirement for Europe is identified in the Report to be 555 MHz. This total spectrum requirement is forecast for dense urban traffic areas of major cities and, therefore, it is recognised that the total requirement may not be needed in all geographic areas.

As noted earlier in the Memorandum, the WRC-2000 will consider the identification of additional spectrum for IMT-2000 and seek to find spectrum to meet the additional requirement forecast in the ITU-R Report. In the UK, the total additional spectrum required and the timing of availability of this spectrum, will depend on the development of the 3G mobile market beyond initial deployment. It is, however, envisaged that the additional spectrum requirement for the UK in the longer term will be of the order of 160 MHz.