COMMISSION OF THE EUROPEAN COMMUNITIES

COM(90) 565 final
Brussels, 23 November 1990

COMMUNICATION FROM THE COMMISSION

on the coordinated introduction of the Pan-European Digital Cellular Mobile Communications System

---

(Report on the implementation of Council Recommendation 87/371/EEC and Council Directive 87/372/EEC)

CONTENTS

SUMMARY

I. Introduction

II. Background

III. Memorandum of Understanding (MoU)

IV. Progress on Standards

V. Frequencies

VI. Planning in Member States

VII. Major issues encountered

1. Free circulation within the Community / trans-European system implementation

    1.1 Type approval / mutual recognition of licensing

    1.2 Pan-European Roaming

    1.3 Carriage in Aircraft

    1.4. Testing Issues

    1.5 Intellectual Property Rights

    1.6 Electromagnetic Interference

2. Developing the potential of the system

    2.1 Accelerated Implementation of Phase II

    2.2 Extension of GSM Technology

    2.3 Additional Frequencies

3. Expanding trans-European use / Central and Eastern Europe

4. Tariff issues

5. Data Protection and protection of privacy

VIII. Conclusions

SUMMARY

According to Council Recommendation 87/371/EEC[1] and Council Directive 87/372/EEC[2], pan-European digital cellular mobile communications will be introduced in the Community during 1991. The introduction of the system should end a period which was characterised by incompatibility of public national cellular mobile systems and the inability to use the systems beyond national boundaries. The system is now widely known as "GSM" (Groupe Spécial Mobile) system after the working group of the European Conference of Postal and Telecommunications Administrations (CEPT). Recently the standard has been renamed Global Standard for Mobile communications in recognition of its potential in world-wide markets.

This report shows substantial progress in the implementation of GSM but also points to issues which still have to be resolved.

The implementation of the system has advanced substantially. A Memorandum of Understanding on the start up of service in 1991 has been signed by 22 European telecommunications organisations, amongst them telecommunications organisations in all Community Member States.

The standardisation process has progressed rapidly. The European Telecommunications Standards Institute is developing the standards for the system. The "Phase I" issue of the standards has now been circulated for public enquiry and is due for approval in early 1991. However, since all European interests have participated in the development of the standards, and manufacturers are at the same time developing their equipment, GSM equipment should be available soon after the final approval of the standards.

Phase I equipment will provide basic voice telephony, emergency services, and some simple supplementary services such as call forwarding. Phase II equipment will provide a full range of voice and non-voice services and the application of GSM at 1800 MHz, and will be compatible with Phase I equipment.

Council Directive 87/372/EEC on the frequency bands to be made available for pan-European digital cellular mobile communications has clearly been a crucial element in the development and implementation of the system. The certainty of the provision of common frequency bands for the system throughout the Community provided the confidence for industry to make the substantial investments required for the development of the standard and the equipment.

---

1 Council Recommendation of 25 June 1987 on the coordinated introduction of public pan-European cellular digital land-based mobile communications in the Community (87/371/EEC), O.J. L 196, 17.07.1987, p. 81.

2 Council Directive of 25 June 1987 on the frequency bands to be reserved for the coordinated introduction of public pan-European cellular digital land-based mobile communications in the Community (87/372/EEC), O.J. L 196, 17.07.1987, p. 85.

According to the Directive, the system will operate in the 905-914 MHz and the 950-959 MHz frequency bands, with later extension to the whole of the bands 896-915 MHz and 935-960 MHz.

While progress up to now has been satisfactory and is in line with the Council Recommendation, this Communication identifies however a number of critical issues which must now be addressed to ensure the further successful implementation of the system:

- A key feature of the pan-European digital cellular system must be the ability to use the service throughout Europe, overcoming the current fragmented and diverse cellular market.

  To allow for the provision of a truly pan-European service it will be necessary to harmonise type approval and licensing regimes in all participating countries, and to ensure that national authorities, in particular customs authorities, recognise these arrangements.

  Given the tight time-schedule for the introduction of the system by mid-1991, systems for type-approval and mutual recognition are now the most critical factor in the successful introduction of GSM. It is urgent to establish an interim approval scheme for GSM terminals until the general procedures foreseen in the Council Directive, currently in discussion, on the approximation of the laws of the Member States concerning telecommunications terminal equipment including the mutual recognition of their conformity, which will also apply to mobile terminal equipment, will be fully in place.

  Regarding the vital question of the free circulation and use of mobile stations, the Commission notes the current work in CEPT on the development of a recommendation on this issue. However, a recent study shows that substantial problems exist. The Commission will conduct shortly an inquiry with all Member States, in order to establish if on the basis of the procedures envisaged, Member States are able to guarantee the free circulation and use of mobile stations throughout the Community.

  Depending on the results of this inquiry, the Commission will propose measures as required.

  It must also be emphasised that the success and full use of GSM technology is vulnerable to any excessive restraints placed by owners of intellectual property rights (IPRs) on patents for component hardware and software. While recent agreements in this respect seem to indicate pragmatic solutions to this problem, the work in ETSI, addressing the general aspects of this problem, needs to be successfully completed.

- Given the world-wide competition in the field of public digital mobile communications, which has grown substantially over the last year, with the announcement of competing Japanese and U.S. systems, the full technological potential of the European system must be rapidly developed.

  This should concern the accelerated research on the introduction of a half-rate codec which will enhance further the frequency efficiency of the system, as well as the accelerated introduction of other features, in particular facsimile and data transmission capabilities.

  It should also concern the rapid development of the use of the system in higher (1800 MHz) frequency bands, such as in the new Personal Communications Network (PCN) systems which will apply GSM technology to a mass market far beyond the current prime use in car telephony.

In the context of the joint preparation of the Member States for the 1992 World Administrative Radio Conference (WARC'92) of the International Telecommunications Union, it will be essential to work towards the allocation of further frequencies for mobile communications in the 2 GHz band.

- Given the fact that due to their lack of an adequate terrestrial telecommunications infrastructure the countries of Central and Eastern Europe - within their current reconstruction of their economies - aim at building up rapidly mobile systems in order to cover the most urgent needs for business communications, it will be crucial to ensure in this area future compatibility to plan for true pan-European systems within the larger European dimension.

  It will be vital to undertake rapid action both by industry and the Community to make the advantages of the new pan-European system fully known to these countries. It will also be necessary to work towards the lifting of any obstacles concerning the export of GSM digital cellular technology to the countries of Central and Eastern Europe which may still result from the COCOM commitments of the Member States.

- The value of the system to the European user will be largely determined by appropriate tariff and accounting procedures. This aspect will need careful attention and it must be ensured that tariff arrangements between the Telecommunications Organisations for offering the service are in line with Community competition rules.

  As recalled in the draft guide-lines on the application of Community competition rules in the telecommunications sector, the notification procedures foreseen under Regulation 17 provide a formal procedure for clearing cooperation agreements in this area.

- In the building up of the system, social concerns must be adequately taken into account. The Commission has set forth, in its recent proposals on data protection necessary measures in this field[3], concerning in particular also data protection and protection of privacy in digital mobile systems.

  Finally, it will be essential to have in place a Europe-wide regulatory framework which will encourage a vigorous mobile communications market throughout the Community. While the regulatory environment of mobile communications was set aside in the Green Paper on the development of the common market for telecommunications services and equipment, the Commission intends to address this central issue for the overall future development of mobile communications in a Green Paper to be published before the end of 1991.

  GSM is the first of a series of pan-European telecommunications developments which will offer common services across the single market. The coordinated introduction of the GSM pan-European digital cellular mobile system is a main component of the Community's overall approach towards mobile communications, together with the introduction of the pan-European land-based public radio paging system (ERMES) and the introduction of Digital European Cordless Telecommunications (DECT), currently in discussion in Council and the European Parliament. It will be essential to make further rapid progress, in order to lay a firm foundation in this field for true trans-European services.

---

3 See COM(90) 314, in particular Proposal for a Council Directive concerning the protection of personal data and privacy in the context of public digital telecommunications networks, in particular the Integrated Services Digital Network (ISDN) and public digital mobile networks.

I. Introduction

In June 1987 the Council approved a Recommendation[4] on the coordinated introduction of public pan-European digital cellular land-based mobile communications in the Community and an associated Directive[5] on the frequency bands to be reserved for its operation. This system is commonly known as GSM (from the name of the standardisation committee - Groupe Spécial Mobile) and will be referred to as such in this Communication.

The Recommendation recommends the introduction of the GSM service from 1991, and this date was also included in a Memorandum of Understanding (MoU) signed by Telecommunications operators in September 1987. This MoU is now signed by 22 Telecommunications operators in 18 European countries.

The Directive requires common frequency bands to be reserved exclusively for a GSM service by 1 January 1991.

The Commission therefore considers it an appropriate time to advise the Council and the European Parliament, in this Communication, of the current state of the development and implementation of GSM, highlighting the key issues which may influence its success as a truly pan-European system.

This Communication is based on the national reports submitted by Member States, the current status of work in the European Telecommunications Standards Institute (ETSI), and reports prepared for the Commission by external consultants.

II. Background

Mobile communications is one of the most rapidly expanding sectors of telecommunications. Estimates of the subscriber base of cellular radio networks in Western Europe - currently mainly car telephony - indicate an annual growth in excess of 50 %. It has been estimated that at the end of 1989 there were 2.3 million cellular subscribers in Western Europe.

However, the growth of mobile car telephone systems in Europe has been characterised by incompatible systems. By the end of the eighties, there were five incompatible systems established in the Member States. Communications are normally constrained to within national boundaries. It was this situation which gave rise to the development of the single standard GSM pan-European digital cellular system and the adoption by Council in 1987 of the Council Recommendation and Directive referred to above.

All Member States are in agreement that in the years to come GSM will play a major role in the evolution of mobile telecommunications. The Recommendation reflects the recognition that only with the co-ordinated introduction of GSM across Europe, will many of the benefits be obtained. For this reason the Recommendation not only aims at initiation of a number of concrete activities in the Member States but also at the development of a political commitment to pursue actively the following major objectives:

---

4 Council Recommendation of 25 June 1987 on the coordinated introduction of public pan-European cellular digital land-based mobile communications in the Community (87/371/EEC), O.J. L 196, 17.07.1987, p. 81.

5 Council Directive of 25 June 1987 on the frequency bands to be reserved for the coordinated introduction of public pan-European cellular digital land-based mobile communications in the Community (87/372/EEC), O.J. L 196, 17.07.1987, p. 85.

- to break down the incompatibility of the various national systems and to enable European Industry to benefit from the technological opportunities that the development and manufacture of a GSM system would create;

- to support an implementation programme for the GSM network with the following key dates;

  . Commercial Service (1991) to be preceded by a preoperational trials period;

  . Coverage of capitals and airports (1993);

  . Coverage of transport routes between capitals (1995).

- To establish a closer cooperation at Community level between Telecommunications Administrations, ETSI and Network Operators to ensure that the above timescales are adhered to;

- To ensure the timely completion of a single system standard which is an issue of paramount importance;

- To promote the timely provision of equipment by manufacturers who must gear themselves to manufacture equipment following the ETSI specification in the shortest possible time-scale.

Bearing in mind these objectives, the Recommendation has placed emphasis on the following means:

- stimulating the process for the creation of technical standards for the infrastructure and associated terminals;

- a fully coordinated approach to the implementation of GSM, thus using the opportunity to transform the current un-coordinated development of national cellular networks into a community - wide approach;

- promoting the use of GSM hand-held terminals.

The associated Council Directive 87/372/EEC on the frequency bands to be reserved for the coordinated introduction of public pan-European cellular digital land-based mobile communications in the Community, requires Member States to reserve specific frequency bands for the digital cellular service.

The GSM network has been conceived as a truly pan-European service and will allow calls to be routed through to a roaming subscriber anywhere within the GSM service area.

For example, a London-based businessman will be able to take his GSM handset with him to Paris and on arrival at the airport switch it on and receive calls from calling parties who would not need to know his location, and without any need for him to inform the network of his location.

III. The Memorandum of Understanding (MoU)

In response to Council Recommendation 87/371/EEC, a Memorandum of Understanding (MoU) has been signed by 22 European telecommunications organisations, including all Community Telecommunications Administrations. The signatories of the MoU committed themselves to implementing a 900 MHz pan-European public digital cellular mobile service with full international roaming by 1991, in line with the Council Recommendation and Directive.

The rapid subsequent progress towards agreed GSM specifications bears witness to this commitment, as does the support which all Member States have given to the goal that the technical specifications be finalised by early 1990.

All the Member States have recognised that an early date for a commercial service is essential, both in terms of ensuring enough operators are ready to move in concert to open a service, and provide equipment to maximise the benefit to European manufacturing industry.

The signatories to the MOU and the European telecommunications industry agreed to provide all the technical resources required to establish the technical standards within the European Telecommunications Standards Institute (ETSI). It was also agreed that the procurement policies of the operators should encourage a strong European industrial manufacturing base for the digital cellular technology taking into account any constraints imposed by GATT and the responsibility of the individual operators to secure the most cost effective solution for their respective organisations. Also competition was to be encouraged in the provision of mobile stations, base stations, handportables and mobile switching equipment.

The Annex to the MOU indicated the network implementation phases and related milestones. Five phases were agreed. Phase 0 included the production and validation of the ETSI technical standards. Phase 1 related to the procurement activity and Phase 2 involved the complete system development, validation and implementation. Phase 3 defined the opening of a commercial service with sufficient capacity and coverage to attract enough paying customers. Phase 4 defined the expansion of the commercial services with the objective of covering all the capital cities including the principal airports and transport routes between the Member States.

Contracts have now been placed by the principle MoU operators for the provision of GSM network equipment. In most cases these contracts have been placed with pan-European manufacturer consortia as shown below:

Operator	Manufacturing Consortium
Racal Vodafone (UK)	Orbitel/Ericsson
Cellnet (UK)	Motorola/Nokia
DBP (D)	ECR 900, DMCS 900, Siemens
Mannesmann Mobilfunk (D)	Siemens/Ericsson
France Telecom (F)	ECR 900,Matra/Ericsson/Orbitel
SIP (I)	Telettra/Alcatel
PTT Nederland (NL)	ECR 900
RTT (B)	DMCS 900, Siemens

ECR 900 comprises Alcatel, AEG and Nokia; DMCS 900 comprises Bosch, ANT and PKI (Philips).

The implementation of the MoU is now fully underway. Progress on the development of the standard is presented in the following section.

IV. Progress on Standards

The successful implementation of the MoU is dependent upon the early availability of common technical specifications.

During 1989 the GSM committee developing the GSM standard was transferred from the European Conference of Postal and Telecommunications Administrations (CEPT) to the European Telecommunications Standards Institute (ETSI) which includes Telecommunications Organisations, European industry and users.

In accordance with the tight time schedule laid down for the implementation of GSM in the MoU referred to above, validation tests have been completed by June 1990. Equipment for these tests was produced by a number of manufacturers, sometimes in consortia. The results of the tests required some amendments to the GSM standard. The standard consists of a total of 164 recommendations, 121 of which have now been stabilised (Phase 1) and have been circulated by ETSI Secretariat for public enquiry. These constitute a consolidated set of available GSM approved recommendations describing the GSM Phase 1 standard. The public enquiry process can take up to 9 months which will mean that the standard will become available as an approved ETSI standard in early 1991, assuming the public enquiry does not result in the need to make significant changes to the standard. This should not impact the start of service, however, since the initial equipment will be based on the current draft recommendations. As all European interested parties have participated in the development of the GSM standard in ETSI, it is unlikely that the public enquiry will result in major changes to the GSM approved standard.

These specifications of Phase 1 include all aspects of the air interface, and inter-working between the fixed network, base stations, mobile stations, and handportable stations, including all the switching and networking aspects. The remaining 43 Recommendations (Phase 2) include the supplementary services, additional services, half-rate codec and use of extension bands. These will be completed by December 1991 as part of the Phase 2 work programme.

The recommendations relating to the mobile station will become a mandatory standard (currently designated NET 10) in the context of the mutual recognition of type approval, as is currently discussed in Council[6]. In the context of the mutual agreements between the Community and EFTA countries in this area, it may also become mandatory in these countries.

A number of service features intended for GSM are not included in the initial (Phase 1) standard. Phase 1 services will be limited to basic voice telephony, emergency services, and some simple supplementary services such as call forwarding. Phase 2 equipment will be compatible with Phase 1 equipment.

---

6 Proposal for a Council Directive on the approximation of the laws of the Member States concerning telecommunications terminal equipment, including the mutual recognition of their conformity (89/30/EEC). O.J. C 211, 17.08.1989, p. 12.

V. Frequencies

The firm designation of frequency bands for the system is a key pre-condition for the availability of the system in all Member States.

Council Directive 87/372/EEC requires the Member States to reserve specific frequency bands for the pan-European digital mobile cellular system.

Article 1 of this Directive states that the 905 - 914 and 950 - 959 MHz frequency bands or equivalent parts in the 890 - 915 and 935 - 960 MHz be reserved exclusively for a public pan-European cellular digital mobile communications service by 1 January 1991. In addition, Member States shall ensure that the necessary plans are prepared for the public cellular digital service to occupy the whole of the 890 - 915 and 935 - 960 MHz bands according to commercial demand as quickly as possible.

In accordance with the procedures of the Directive, Member States have to inform the Commission of the measures taken to reserve the frequency bands in question. The Commission considers that up to now nine Member States have fully complied with this obligation. The remaining Member States have announced their intention to do so soon. The Commission is currently examining if the measures taken fulfil all the requirements of Directive 87/372/EEC and it will initiate the relevant procedures under the Treaty, where required.

With the emergence of the Personal Communication Network (PCN) concept, work has started to use the GSM technology also in the 1800 MHz bands. Recently, ETSI has begun work in this area for extending the GSM standard to operate also in this higher frequency band (Digital Cellular System - DCS 1800). CEPT has identified the frequency band 1710-1880 MHz to be a candidate for DCS 1800.

VI. Progress in the Member States

This section describes the progress on the introduction of the GSM system per Member State, as reported by the Member States to the Commission in accordance with Article 8 of the Recommendation.

1. Belgium

A fully commercial service will be provided from end 1991 - start 1992. It will provide 1000 voice channels with 50 base stations and will initially cover the frontiers with neighbouring countries, the national airports and the major roads.

The remainder of the country (the rural areas) will be covered mid-1992 and will use 600 channels and a further 57 base stations.

The tariff structure has not yet been fixed. Handportables will be available for use on the network by mid-1992.

2. Denmark

Denmark intends to implement a GSM system by mid-1991 provided that Intellectual Property Rights (IPR) issues can be resolved.

The initial coverage from the 1st July 1991 will be as follows:

Copenhagen : 2 base stations covering city centre and main Airport (Kastrup) ; Aarhus : 1 base station ; Aalborg : 1 base station ; Odense : 1 base station ; Kollund : 1 base station. This corresponds to a traffic capacity of 90 Erlangs and an initial subscriber base of 5000.

It is envisaged to introduce essential (E 1) services as from 1st July 1991. The system will thus exceed the MoU minimum requirements.

The tariffs have not been agreed upon and the Danish GSM operator will not do so until the start of 1991 considering the current commercial situation. The price levels cannot be judged either, but it is expected that these are likely to be influenced by the competition offered by the analogue NMT system currently in use and which will offer similar facilities as GSM in the initial phase.

The Danish GSM operator feels unable to judge the probability of hand portable GSM stations being available in 1991 as this is entirely in the hands of the potential suppliers to the open Danish market.

On 3rd October 1990 a proposed Act on public mobile communications (GSM mobile network) was submitted to Parliament by the Danish Government. The proposal authorizes the Minister of Communications to grant a licence to install and operate an alternative public GSM mobile communications network in competition with the corresponding network of the existing regional telecoms companies. According to the proposal such alternative network may become operational on 1st March 1992, at the earliest.

3. France

France supports the MoU and the implementation of the GSM system.

At the moment France Telecom has two pilot systems, implemented by different manufacturing consortia, which are currently under evaluation.

4. Federal Republic of Germany

There will be two operators for the GSM system in the Federal Republic of Germany.

- "D1-system": Deutsche Bundespost TELEKOM
- "D2-system": Mannesmann Mobilfunk GmbH

Both operators will provide an operational network by mid-1991.

No information on tariffs is given due to the competitive situation in the Federal Republic of Germany.

No information is given regarding the supply of hand-portables as both operators maintain that this is the responsibility of the potential suppliers of mobile stations.

Given the difficulties in reserving the frequency bands for the GSM system in the former German Democratic Republic due to their current use by Warsaw Pact forces, the Commission has foreseen for these parts of the Federal Republic of Germany a temporary derogation from the application of the Directive until 31 December 1992.

5. Greece

Greece is currently undertaking the preparations for the implementation of its first cellular mobile communications system based on the GSM standard.

6. Ireland

Telecom Eireann is planning to introduce the service in line with the MoU. In the preliminary stages of network development, Dublin including the national airport and the relevant transport route will be covered.

7. Italy

The service will commence in Italy in accordance with the foreseen timescales. Initially it will cover the major cities and the motorways.

The system will be operational mid 1991.

No information is given on tariffs.

No information is given on handportables.

8. Luxembourg

The P&T will provide the infrastructure for coverage of the whole country by the end of 1991.

9. Netherlands

PTT Telecom intends to follow the milestones as laid down in the MoU.

The first phase of implementation will include the major cities and two international motorways to the Belgian and German border. The initial network will consist of one mobile switching centre, 8 base station controllers and 50 base transceiver stations.

Opening of the network is scheduled for mid-1991.

Extension to the coverage will take place in three sub-phases, with the end of 1992 as the completion date.

PTT Telecom is at present the only service provider for the GSM network in the Netherlands.

Nation-wide coverage can only be offered at the earliest by end 1993.

The commercial positioning of the GSM system has not yet taken place. Therefore no indication can be given on tariff structures.

It is assumed that handportables on a sufficient basis will not be available at the time of opening of the system (mid 1991).

10. Portugal

Portugal intends to introduce the GSM system in June 1991 according to the MoU, probably beginning by covering the capital of the country. Two network operators (CTT and TLP), having signed the MoU, are preparing themselves to enter in the market fully implementing the GSM recommendations. Competition will be introduced according to the licensing procedures recently approved by the Government.

11. Spain

Spain has confirmed that a commercial service will be introduced in Madrid by 1 June 1991. There will be one network operator (TELEFONICA) which has already purchased two experimental systems to conduct testing.

Spain is fully committed to the MoU and intends to follow the implementation as scheduled. Spain also intends to introduce two experimental systems - one for the Olympic Games in Barcelona (1992) and another one to cover the Sevilla World Exhibition (1992). This will involve some 20,000 mobiles and 6 base stations.

At the moment there is no tariff structure announced.

By 1992 there will be a commercial service in 3 cities but there are currently no plans for extending the coverage to other areas.

12. United Kingdom

Two competing networks will be licensed for the GSM operation. These will be Racal Vodafone Limited and Telecom Securicor Cellular Radio Limited (Cellnet).

The principles and objectives of the MoU are fully supported and the two competing operators will share the spectrum available equally. Network airtime is planned to be retailed by a number of competing service providers.

Both operators are fully committed to the milestones for commercial service agreed in the MoU. The initial service will be in place by mid-1991.

In view of the highly competitive structure of the UK market, neither operator is ready at this time to announce tariffs.

VII. Major issues encountered

While substantial progress is confirmed by the reports both on standardisation and implementation, a number of issues are encountered which will need resolution in order to develop the GSM system into a true pan-European mobile communications system and to use its full potential on the world market.

1. Free circulation within the Community / trans-European system implementation

The ability to use the system throughout Europe is seen as one of the key features of GSM. With the creation of the single market in 1992, this feature will have particular significance. Its degree of success will have a major impact on the development of the other pan-European mobile communications systems which will follow GSM.

1.1 Type approval / Mutual recognition of licensing

The provision of a Europe-wide service will, however, require unprecedented cooperation between national authorities, in particular in the following areas:

- mutual recognition of type approval;
- cross border licensing;
- cross border billing.

The full mutual recognition of type approval between Member States is an essential for a pan-European mobile communications systems. It would be a severe imposition on manufacturers if they were required to obtain type approval for their mobile equipment in each Member State.

It would mean that the pan-European roaming capability would be dependent on the number of countries where mobile equipment manufacturers decide to apply for approval.

Given the tight time-schedule for the introduction of the system by mid-1991, systems for type-approval and mutual recognition are therefore now the most critical factor in the successful introduction of GSM.

Given the central role of NET10 in this context, ETSI should commit itself to a specific completion date and an interim approval scheme for GSM terminals should be established.

One possible option would be to consider bringing forward the implementation of the principles of the Council Directive on the approximation of the laws of the Member States concerning telecommunications terminal equipment including the mutual recognition of their conformity[7] (taking account of Article 17), which will also apply to mobile terminal equipment and which is currently in discussion in Council, for GSM terminals only as a special case.

A related issue is the reciprocal licensing of mobile units. Again, the pan-European roaming facility would be severely restricted if subscribers, or their service providers, were required to obtain a licence for mobiles to operate in each Member State. CEPT is working out a recommendation on this issue, on the basis either "circulation cards" or the recognition of equipment type approval marks only.

It will be necessary to ensure that customs authorities recognise and accept these arrangements as authority to allow the free circulation of GSM mobiles within the Community.

A recent survey of the applicability of this scheme has been conducted for the Commission which concludes that substantial problems exist.

The Commission will therefore conduct shortly an inquiry with all Member States, in order to establish if on the basis of the procedures envisaged, Member States are able to guarantee the free circulation and use of mobile stations throughout the Community.

---

[7] Common Position adopted by the Council on 24 July 1990 with a view to the adoption of a Directive on the approximation of the laws of the Member States concerning telecommunications terminal equipment, including the mutual recognition of their conformity.

Depending on the results of this inquiry, the Commission will propose measures as required, such as a Council Regulation or Directive, in order to guarantee the free circulation and use of GSM mobile equipment in the Community.

1.2 Pan-European Roaming

The provision of pan-European roaming is dependant on a dedicated intelligent network. The signalling will use CCITT Signalling System no.7 (SS#7). The SS#7 signalling used by GSM is known as the Mobile Application Part (MAP). SS#7 has been implemented in different ways in many European countries, and currently there are only limited facilities across network interfaces. In addition MAP has not yet been fully tested between different infrastructure suppliers. This could result in inefficient routeing of calls to and from mobiles when roaming and could result in high international call charges to roaming subscribers. The international routeing part of the total call charge to a mobile will be charged to the mobile subscriber (since the calling party may be unaware of the subscribers location). This could therefore result in some initial reluctance to use this service feature, until the introduction of ISDN in the Community overcomes this difficulty.

The alternative would be for the GSM network operators to overlay a dedicated SS#7 network but this would substantially increase overall costs.

The issue will have to be addressed urgently by the working parties responsible for these issues in the context of the GSM implementation.

1.3 Carriage in Aircraft

Current airline security precautions prohibit the use of mobile telephones on aircraft in flight since there is a strong possibility of interference between high power-output handportables and aircraft avionics. In addition the mobile could interfere with hundreds of cells from a high altitude resulting in a reduction of system capacity.

Adequate precautions must therefore be taken to avoid such use, however, these should not inconvenience travellers to the extent that they deter the carriage of GSM handportables on business trips, and restrict the take-up of the roaming facility.

1.4 Testing Issues

The System Simulator for the full testing of mobiles is currently being developed. Six operators have ordered system simulators at a cost of ECU 3 million each. In addition the Conformance Testing Service (CTS) is partly funding the establishment of an independent type approval centre which will be situated in Copenhagen. However, this testing service will not be available until late 1991.

Since testing of GSM mobile units will take between 3 and 6 months there is the danger of a delay in the availability of mobile units.

This problem could be addressed in the context of the working out of an interim approval scheme as set out above.

A number of problems will have to be tackled.

As shown above, a variety of manufacturers and consortia are involved in the provision of GSM network equipment. Although all MoU signatories have agreed to implement GSM based on the same version of the recommendations, interpretations may differ. Resulting incompatibilities could cause some delay in introducing the service, although the use of a single standard system simulator will help to overcome this problem.

1.5 Intellectual Property Rights

The development of GSM is vulnerable to any abusive restraints placed by owners of intellectual property rights (IPRs) on patents for component hardware and software.

Considerable difficulty has been experienced in relation to IPRs accruing to the various manufacturers that have contributed to the development of the GSM standard. Recent agreements between manufacturers seem to indicate that a pragmatic solution can be found. It should, however, be noted that until now no solutions have been found concerning third party IPR's, i.e. IPR's owned by non-ETSI members and this puts network operators and especially independent mobile station manufacturers at substantial risk, which cannot easily be appraised.

However, it remains important to find soon a general solution to this problem in the context of the current work on this issue in the ETSI IPR Committee.

1.6 Electromagnetic Interference

Another technical issue which must be kept in mind relates to possible adverse side effects of the use of GSM. The digital time division multiple access (TDMA) technique used by GSM can cause a buzzing noise in hearing aids and other audio equipment in close proximity to mobiles.

According to the provisions of the Council Directive on electromagnetic compatibility[8] from 1992 all equipment must not only not cause interference to other equipment, but must also have an adequate level of immunity from such interference. The relevant standards are being developed by CENELEC and it is important to ensure that the susceptibility limits for hearing aids and other audio equipment will be sufficient to provide an adequate level of immunity to such interference.

It is essential that ETSI takes account in all relevant work of the necessary requirements concerning user safety and avoidance of harmful interference. The Commission is supporting current ETSI work in this area.

2. Developing the potential of the system

A successful European home market for GSM will provide the basis for extension into the world market.

On the world market, GSM competition will come from the US digital cellular system (D-AMPS), and a Japanese system which has recently been specified in outline. It appears that these two systems have a number of common features and are not as technically sophisticated as GSM.

---

[8] Council Directive on the approximation of the laws of Member States relating to electromagnetic compatibility (89/336/EEC), O.J. L 139, 23.05.1989, p. 19.

The Commission notes with satisfaction that the advantages of the GSM technology are recognised in other parts of the world. The Australian telecommunications agency AUSTEL has recommended the GSM standard, and a positive response to this recommendation will be a major boost for GSM on the world stage.

The technical and operational advantages of a digital cellular system like GSM have been outlined previously, however, these will not all become immediately apparent. The additional features which GSM will be able to offer compared with analogue cellular systems will not all be available with the Phase I equipment, and the frequency spectrum utilisation advantage will not be fully apparent until the half-rate codec is available.

However, with Phase II equipment, lower costs, and the increasing congestion of analogue services, the long term success of GSM in Europe seems to be assured.

2.1 Accelerated Implementation of Phase II

GSM has the potential to offer a higher capacity than current analogue systems due to its ability to sustain higher interference levels. This potential can only be fully realised, however, when the so called half-rate voice codec becomes available. This will double the number of voice channels available per radio channel. Initially GSM will use a 13 kbs codec and considerable research is being conducted to develop a half-rate codec which will provide the same voice quality as the full-rate codec.

It has not been decided whether future codecs will operate on both full-rate and half-rate or only half-rate. The former would make half-rate products more desirable as their use would not be limited to the coverage roll-out of the half-rate codec service, and might make it unnecessary to provide this service in all areas. On the other hand this alternative may result in an extra cost penalty and possibly a quality penalty. It is currently predicted that without the half-rate codec the system could be reaching saturation in some major urban areas by 1994. Consideration should therefore be given to increasing the effort in this area to ensure its early availability.

Greater resources should also be applied to the early introduction of Phase II facilities, in particular facsimile and data transmission.

2.2 Extension of GSM Technology

ETSI has recently decided to develop a modified GSM standard for operation in the 1800 MHz band and known as DCS 1800 (Digital Cellular System - 1800 MHz). As explained earlier, the capacity of cellular systems can be increased if the mobile units all operate at lower power, decreasing cell size and reuse distance. This DCS 1800 standard is therefore being designed for low power handportable mobiles only. The standard will need to allow for cost saving options to ensure the commercial viability of providing a mass market system at this frequency.

DCS 1800 will ease the possible saturation of 900 MHz cellular services in large urban areas which could occur if there is further delay in the availability of the GSM half-rate codec. It will also permit the licensing of additional network operators in those countries such as the UK, where the cellular market is sufficiently buoyant to support a high level of competition. The initial application of this standard will be in the UK where three licences have been issued to PCN (Personal Communications Network) operators.

2.3 Additional frequencies

The success of these initiatives is dependent on the work of CEPT in identifying the frequency bands which can most easily be introduced throughout Europe. This is obviously a critical element in the provision of a Europe-wide service and in response to the Council Resolution on the strengthening of the Europe-wide cooperation on radio frequencies[9] CEPT is reorganising its structure to ensure that this task is conducted as efficiently as possible with the establishment of the European Radiocommunications Office in Copenhagen, later this year.

This reorganisation is intended to reduce the time taken to identify common European frequency bands for new pan-European services, and will provide for wider consultation to determine the priorities for provision of radio frequency spectrum in Europe, as well as the European common proposals to the World Administrative Radio Conference in 1992 (WARC-92).

The Commission will closely follow this reorganisation and endeavour to ensure that the objectives of the Council Resolution are met, and advise the Council and the European Parliament accordingly.

The agenda for WARC-92 includes consideration of the allocation of a world-wide frequency band for future mobile communications. The CCIR (International Radio Consultative Committee) is currently studying the characteristics of a future system and is likely to request of WARC'92 an allocation of 230 MHz, preferably in the 1 to 3 GHz band, to be made available for the system as from 1998.

The Commission intends to participate in this work in CCIR, the European preparations for WARC'92, and the conference itself, in order to promote and support the technical and operational requirements identified by ETSI and the RACE Mobile Project.

3. Expanding trans-European use / Central and Eastern Europe

The Commission recently submitted to the Council and the European Parliament a Communication on the role of telecommunications in the Community's relations with the countries of Central and Eastern Europe[10]. This indicated the importance that telecommunications development can play in the integration of Europe as a whole. In particular it is recognised that mobile communications offers the considerable advantage of enabling a rapid roll-out of service compared with the fixed network. Waiting lists of subscribers for fixed telephone lines currently extend for more than 10 years in most countries, and the penetration is around 10 lines per 100 inhabitants compared with the Community's average of 37 per 100. Although large investments are foreseen progress will be slow. Hungary for example intends to invest 5.3 billion ECU to increase its penetration to 27 lines per 100 inhabitants by the year 2000. This implies a cost of over 2000 ECU per line.

---

9 Council Resolution of 28 June 1990 on the strengthening of the Europe-wide cooperation on radio frequencies, in particular with regard to services with a pan-European dimension, O.J. C 166 of 07.07.1990, p. 4.

10 Communication from the Commission to the Council and the European Parliament on the Community's relations with the countries of Central and Eastern Europe - the role of telecommunications, COM(90) 258 of 19.06.1990.

In the UK both cellular networks provided coverage of 90% of the UK population after just three years of service. The cost of the network per subscriber has been estimated at around 1000 ECU based on a subscriber base of 400,000.

Although service and equipment costs need to be considered together with connection costs, it would appear that mobile communications offers an immediate alternative to the lengthy delays inherent in the provision of fixed lines, at a reasonable economic premium. The Commission, therefore, intends to conduct further studies in this area.

COCOM rules restrict the export to Eastern Europe of technology which might have military applications. Although there was a relaxation of some of these restrictions agreed in June 1990, there may still remain a restriction in the case of some of the techniques used by GSM and so a further relaxation of the current rules, or review of these techniques, may be necessary for its export to Eastern Europe.

While current use of the required frequencies for Warsaw Pact purposes in a number of the countries of Central and Eastern Europe may make the immediate start of the GSM system in certain cases more difficult, it is essential for ensuring Europe-wide mobile services that plans foresee a progressive migration to the GSM standards within a foreseeable future.

4. Tariff issues

Network operators are discussing the commercial arrangements for cross-border billing in a group known as the Billing and Accounting Rapporteur Group (BARG). The systems required to support these arrangements are being specified by the Transferred Account Data Interchange group (TADIG). It has been agreed that roaming subscribers will be billed by their home network operator. Network operators will bill each other for roaming services at a rate agreed on a bilateral basis. Since both the home and visiting operator will add their margin to the basic call costs, call charges for roaming subscribers will be at a premium. The interoperator charging agreements which are essential for allowing international roaming, will have to be agreed urgently.

A complicating issue is the different application of VAT in different countries. The UK operators will charge VAT at the standard rate on interoperator bills. If the home operator is within the Community then this VAT can be reclaimed by the operator from the UK authorities, and the VAT applicable in the home country will then be added to the bill to the subscriber. If the home operator is outside the Community, the subscriber will be charged the call rate plus UK VAT, plus local tax levied on the combined total.

VAT will not be charged on interoperator bills in France, Netherlands or Germany.

In Denmark VAT will be charged on interoperator bills although this can be reclaimed by the subscriber. It is not clear how this will work in practice since the subscriber's bill will be in a different currency.

Although this difference in the application of VAT is not an issue which will prevent international roaming, it is an added complication. Consideration should, therefore, be given to formulating a common approach.

As mentioned previously interoperator charges will be determined by bilateral agreements between the operators. It is important that tariffs for roaming subscribers are offered at a minimal premium compared with normal call rates in order not to deter use of this facility. Tariffs should be transparent and the operator bilateral agreements should not be used with the objective of directing roaming traffic towards one operator, in preference to others.

It will be vital that tariffs comply with Community competition rules. As set out in the draft guide-lines on the application of Community competition rules in the telecommunications sector, the notification procedures foreseen under Regulation 17 provide a formal procedure for clearing cooperation agreements in this area.

5. Data protection and protection of privacy

Mobile cellular communications systems are by definition intelligent networks, with access to large amounts of personal data. The Commission has analysed this and takes it fully into account in its proposals for data protection. It has set forth, in its recent proposals for Directives[11] in this field, necessary measures, relating in particular also to public digital mobile networks.

VIII. Conclusions

The Commission considers that substantial progress has been made on the basis of Council Recommendation 87/371/EEC and Council Directive 87/372/EEC with the implementation of the pan-European digital mobile cellular GSM system.

However, a number of issues, as set out, will have to be tackled in order to make truly trans-European mobile services a reality and to develop the potential of the GSM system fully. Many of them are currently being addressed in the context of the work of the European Telecommunications Standards Institute and the working parties which have been established in the context of the implementation of the GSM Memorandum of Understanding.

Additionally, in a number of critical areas, Community action is required.

These areas are in particular:

- establishment of an interim approval scheme for GSM terminals.

  It should, in particular, be investigated if it would be possible to implement the principles of the Council Directive on the mutual recognition of conformity on a provisional basis for GSM terminals only as a special case, before the formal procedures foreseen in this Directive for terminals in general are fully in place.

- implementation of mutual recognition of licences for the operation of GSM terminals in all Member States.

  The Commission notes the current work in CEPT on a recommendation on this issue. It will conduct an inquiry with all Member States, in order to establish if on the basis of the procedures envisaged, Member States are able to guarantee the free circulation

---

[11] See COM(90) 314, in particular Proposal for a Council Directive concerning the protection of personal data and privacy in the context of public digital telecommunications networks, in particular the Integrated Services Digital Network (ISDN) and public digital mobile networks.

and use of mobile stations throughout the Community.

- promotion of the rapid extension of the technological potential, and development of the use of the system in higher frequency bands such as foreseen for the new Personal Communications Network (PCN) systems, in order to create new mass markets for GSM.

- promotion of the use of the GSM system in the countries of Central and Eastern Europe which aim - within their current reconstruction of their economies - at rapidly building up mobile systems.

- monitoring the setting up of appropriate tariff and accounting arrangements, concerning in particular the inter-operator agreements which are needed to support international operation and use of mobile terminals.

  The notification procedures foreseen under Regulation 17 provide a formal procedure for clearing cooperation agreements and ensuring their conformity with Community competition rules.

- required measures concerning data protection, in accordance with the measures submitted by the Commission to the Council in the proposed Directive concerning the protection of personal data and privacy in the context of public digital telecommunications networks, inter alia the public digital mobile networks.

More generally, it will be essential to develop in Europe the conditions which will encourage a vigorous mobile communications market throughout the Community, both by taking the necessary regulatory measures as well as by extending the benefits of mobile communications also to peripheral areas of the Community using fully the applicable instruments for promoting such a development, such as the STAR programme. The Commission intends to address the overall future development of mobile communications in a Green Paper to be published before the end 1991.

The pan-European public digital cellular mobile GSM system has the promise to become the first of a series of pan-European telecommunications developments which will offer common services across the single market, and to end a decade of incompatibility between national public mobile systems. It is now up to the Community, the European Conference of Postal and Telecommunications Administrations, the European Telecommunications Standards Institute and, most of all, to the operators and industry to overcome the remaining issues on the way to a successful start of service in 1991.