

行政院所屬各機關因公出國人員出國報告書
(出國類別：實習)

無線用戶迴路應用之研究

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壹、前言

寬頻通訊時代來臨，不論有線無線皆蓬勃發展，各國為提高電話分佈密度，無不積極加速電信基本建設，其中無線用戶迴路（Wireless Local Loop）技術挾其鋪設迅速、成本低廉等特性，受到電信業者高度重視，未來前景看好。

台灣的面積雖然不大，但由於地形複雜，要建設全面性又廉價的電信網路，必須花費相當多的時間與金錢，尤其是提供偏遠地區或鄉村地區的電信服務。為了讓新固網業者可以快速興建網路，電信總局已制訂「可供固網經營者申請使用之無線頻譜及頻譜核配原則與程序」，讓民營業者可以快速地興建所謂「最後一哩」的電話網路，完成民國九十年七月開始營業的時程目標。

再者，隨著社會的快速變遷，民眾對無線電頻率需求急遽增加，頻譜管理工作日益複雜且繁重，許多作業諸如電波涵蓋的分析、干擾分析、頻率指配以及頻譜資料庫管理等，均應逐步電腦化與自動化，以發揮頻率資源的使用效率，提昇電波應用的服務品質。

本次出國實習的主要目的在於了解德國無線用戶迴路頻譜規劃、無線用戶迴路的相關技術發展，以及頻譜管理系統之應用，以供我國頻譜管理工作之參考。

貳、實習行程

本次實習行程自 89 年 11 月 12 日至 89 年 11 月 25 日止，含行程共 14 天，主要是赴德國 L&S 及 Siemens 公司研習。

參、實習心得

一、無線用戶迴路的優點

- 系統建設容易，可以在最短時間以最低價格完成
- 無線用戶迴路系統可逐步擴充線路以提高用戶數，讓經營者依序投資以獲得利潤
- 維運成本遠低於有線系統，且可容易地重新架設以提供其他地區的服務。
- 無線傳輸方式不易受地形影響，因此在用戶密集的市區及用戶分散之鄉村都能有效的工作
- 無纜線的佈放，不易受到天然災害的破壞，如洪水、山崩等

二、無線用戶迴路技術發展

依據 ITU-R 的規定，無線接取（wireless access，亦稱為無線用戶迴路, wireless local loop），係指以無線方式連接電信網路從機房至用戶端的末端部分。依據用戶端與機房間相對位置的關係，無線接取可大致區分為下列三種：

- 固定式無線接取（Fixed Wireless Access, 以下簡稱 FWA）：用戶端與機房的位置均固定，FWA 可以利用點對點（point to point）、點對多點（point to multi point）及多點對多點（multipoint to multipoint）三種架構提供。
- 行動式無線接取（Mobile Wireless Access, MWA）：用戶

端為行動電臺。

- 游牧式無線接取 (Nomadic Wireless Access, NWA)：用戶端的位置會隨時間改變，但使用時為固定不動，如 U-NII 或 HIPERLAN 就可視為 NWA 的一種。

無線用戶迴路系統應用並不是要取代既有的有線網路，而是要針對佈線的死角和適用的場合，與有線網路相輔相成。以傳輸速率來區分，無線用戶迴路系統可大致區分如下：

- narrowband 無線用戶迴路系統—傳輸速率 ≤ 64 Kbps
- wideband 無線用戶迴路系統— 64 Kbps \leq 傳輸速率 ≤ 2 Mbps
- broadband 無線用戶迴路系統— 2 Mbps \leq 傳輸速率

無線用戶迴路並不像數位無線電話或數位行動電話一樣，有統一的標準規範，因為它通常是附屬於固定網路的一部份，而且在各種使用環境中，如市區、鄉鎮、郊區、偏遠地區，以及在傳輸距離、用戶密度、通訊語音品質、數據傳輸能力上，也有不同的需求。各電信設備供應商以其既有的無線及有線技術，發展個種 WLL 產品，使用者則面臨如何選擇適用 WLL 產品的窘境，依據使用環境、傳輸技術及系統功能的不同，無線用戶迴路可以歸納成四種主要的系統，包括：

(一) 點對多點無線用戶迴路系統：

點對多點微波系統的技術發展甚早，因此被廣泛地應用在世界各國較偏遠的鄉村地區。而因為微波傳輸特性，必須使用碟形天線，且天線必須位於視線範圍(Line of

Sight)。

(二) 低功率式無線用戶迴路系統：

以數位式低功率無線電話系統構成的無線用戶迴路為例，此種系統提供小功率、小服務區、高容量、高品質且價格低廉的無線用戶迴路系統，包括歐規的 CT-2 及 DECT、日規的 PHS 及美規的 PACS，都可以用來建構無線用戶迴路系統。

DECT 系統是目前無線用戶迴路系統最感興趣的技術之一，DECT 提供普遍的空中介面而且可以支援既有及未來的類比和數位服務，以 DECT 技術為基礎的無線用戶迴路系統可提供完整的公眾電話交換網路各項服務，並支援高品質且加密的語音傳輸。

有些用戶迴路系統可裝設於市郊及鄉村地區，包含點對多點及 DECT 系統，此種系統的每一個網路由座落於地方局的一個中央站 (central station) 及若干遠端站 (remote station) 組成，遠端站裝設在用戶較為密集的地區，中央站與遠端站間以點對點或點對多點微波系統連接，最後再經由 DECT 技術連接至用戶終端設備。

(三) 蜂巢式無線用戶迴路系統：

由於蜂巢式無線電系統在全世界廣泛的應用，市場接收度較高，使得該技術成為無線用戶迴路系統的一種理想方式，使新電信業者可以建設較為便宜且高品質的接取網路，並提供用戶多種廉價的終端設備。但由於蜂巢式系統是一種移動性的服務，專門設計給行動用戶使用，這意謂

著該系統必須包含提供細胞間訊息轉送所需的軟硬體及追蹤用戶所在位置，這些都是無線用戶系統所不需要的，因此將蜂巢式系統技術應用到無線用戶迴路系統時，在技術上需作一些修改。

這類用戶迴路系統又可區分為類比式蜂巢（Analog Cellular）及數位式蜂巢（Digital Cellular）技術。類比式蜂巢技術目前已廣泛地應用於現有的行動通信系統，包括 AMPS、NMT 及 TACS，優點是在經濟因素的考量下，市場接收度高，且涵蓋面積較數位式蜂巢技術大，適合中、低用戶密度的電信市場；但缺點是網路容量較低。

數位式蜂巢技術主要分為 GSM 及 CDMA 兩系統，優點為網路容量大，但語音品質較類比式系統差。其中 CDMA 系統可以提供的通訊容量大（約為類比式蜂巢系統的 8~10 倍），語音品質佳，將是 WLL 的明日之星。

（四）衛星無線用戶迴路系統

由於衛星的成本過高，一般而言，如無迫切需要並不會架設。

三、西門子公司無線用戶迴路產品-WALKair 簡介

（一）系統特性

- 為點對多點無線用戶迴路系統
- 使用頻段包括 3.5 GHz、10.5 GHz 及 26GHz 頻段
- 傳輸距離

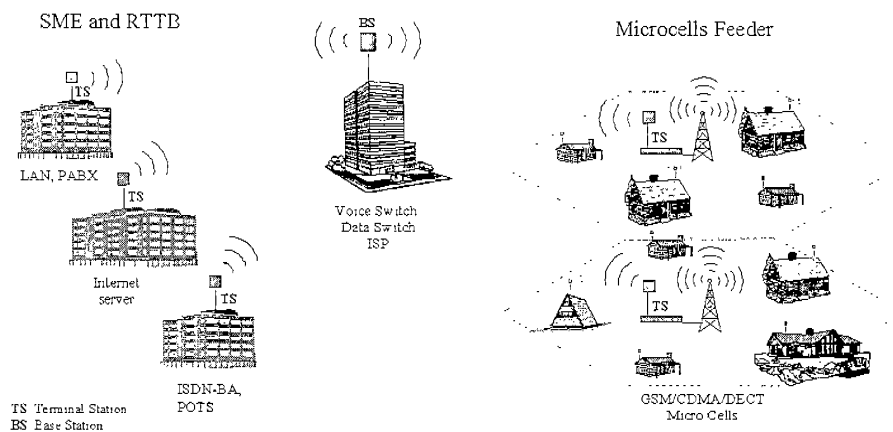
3.5GHz 及 10.5GHz 頻段產品：小於 10 公里

26 GHz 頻段產品：小於 3 公里

- 載波頻寬：1.75 MHz
- 頻率使用效率：2.5 bits/s/Hz，故每個頻道的最大傳輸容量為 4.3 Mbits/s
- 每個 sector 的最大容量可達 32E1
- TDMA / Multi carrier / FDD
- 隨機頻寬分配 (Dynamic bandwidth allocation)
- availability 99.999%
- BER 10^{-9}
- 利用 automatic frequency adaption 避免系統干擾

(二) WALKair 系統架構

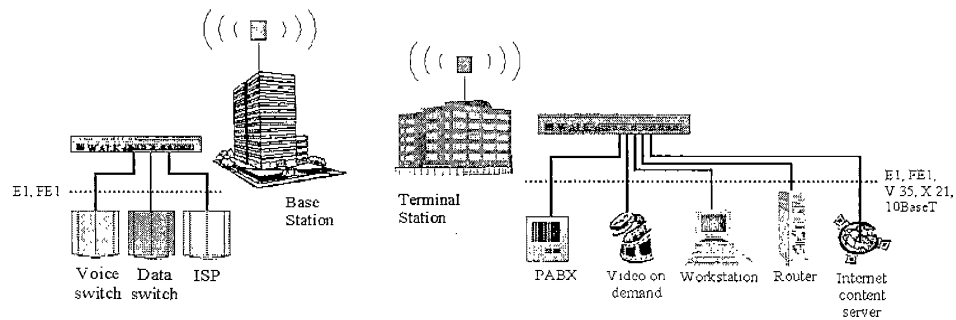
WALKair:
The PMP wireless access system for different applications



(三) WALKair 在中小企業的應用

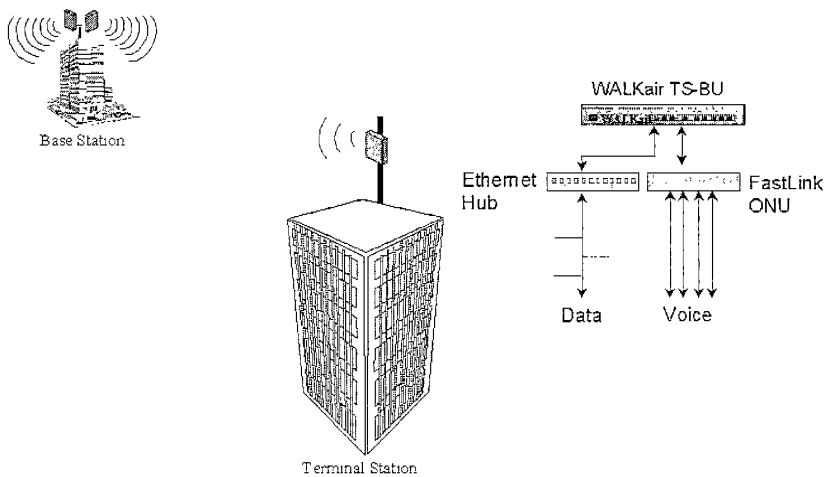
Small and Medium Enterprise (SME) Application Connecting business customers

- Voice & data services
- Net capacity: up to 4 Mbit/s per single user
- User capacity varies dynamically based on traffic



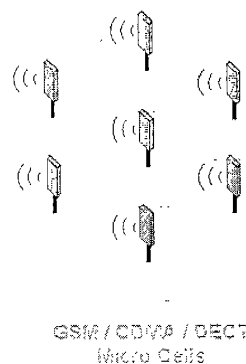
(四) Radio to The Building 應用

Radio To The Building (RTTB) application Voice and Data services for offices and residential customers



(五) Feeder 應用

Feeder Application Feeding WLL/Mobile Base Stations



- Suitable for large area coverage
- Cost effective compared to PTP and Leased Lines
- Efficient BW utilization
- Flexible bandwidth allocation per micro cell
- Few access points due to large cell coverage
- Fast deployment

四、歐盟有關 FWA 頻譜規劃

(一) 歐盟 FWA 頻譜規劃原則

1. 目前 ITU-R 已完成在 FS 頻段內點對點微波系統的頻道規劃 (channel plan)，但由於在 ITU-R 的頻道規劃中，每個上、下鏈頻道的頻寬都一樣，並不能適用於所有的 FWA 系統。
2. 由於多媒體無線通信服務的特性，頻譜規劃必須考量上、下鏈頻段的不對稱性。上、下鏈頻段的不對稱性可以幾種方式達成：

- (1) 分配上、下鏈頻道不同的頻寬。

僅適用於當上、下鏈容量的不對稱性很穩定的情況（即上、下鏈容量及所需頻寬的比例，不會隨時間有很大的變動）；在上、下鏈容量比例隨時間有大幅變化的環境中，採用第一種方法的頻率使用效率較差。

(2) 上、下鏈使用不同的調變方式。

在上、下鏈容量比例隨時間變化的情況下，採用此種方法的頻率使用效率較高。

(3) 採用不對稱 TDD 技術。

TDD 系統可將不同的時間分配供上、下鏈使用，適合應用於上、下鏈容量不對稱的情況。

在 ITU-R 規劃的 paired spectrum 中，指配頻率供 TDD 系統使用時應考量下列因素：

(1) 若 FDD 系統上、下鏈使用不同的頻寬，如上鏈使用 m 個頻道，下鏈使用 n 個頻道，則可指配剩餘的 $|m-n|$ 個頻道供 TDD 系統使用。

(2) 當 TDD 與 FDD 系統使用同一頻段時，需考量兩個系統間可能產生的干擾問題

(二) 頻率指配原則

1. 應分配給業者足夠的頻寬，使業者更具競爭力。
2. 為了提昇頻譜使用效率，應指配給每個業者連續的頻譜。

3. 核配頻譜供 FDD 系統使用時，應採一致性的上鏈/下鏈頻道規劃（一般下鏈頻率使用較高頻段）。
4. 核配頻譜供 TDD 系統使用時，須考量因上、下鏈都在同一頻段所可能產生的干擾問題。
5. 考量點對點及點對多點系統在同一頻段中(如 24.5-26.5 GHz 頻段)使用的情況下，建議規劃不同的 sub-band 供兩種系統使用（如點對點系統由 24.5 GHz 開始往高頻指配，點對多點系統由 26.5 GHz 開始往低頻指配）。

(三)規劃供 FWA 使用的頻段（附件一 CEPT/ERC/REC 13-04 E）

目前歐盟規劃 3.4-3.6 GHz（詳附件二）、10.15-10.3 GHz / 10.5-10.68 GHz（詳附件三），24.5-26.5 GHz（詳附件四）及 27.5-29.5 GHz 中部份頻段供 FWA 業務使用。ERO 的報告中指出，未來 FWA 的頻率使用應朝高頻頻段（高於 3.4 GHz）規劃，低於 3 GHz 頻段應保留專供行動通信業務使用；惟在行動電話使用者較為稀少的地方，亦可考慮將 800 MHz 及 1800 MHz 頻段規劃供 FWA 業務使用，如：芬蘭及瑞典的行動通信業者便積極規劃利用 GSM900 及 NMT450 行動通信網路，在偏遠地區提供 FWA 服務。

包括瑞典、德國、法國、義大利、西班牙…等大部份歐洲國家，均已分配 3.4-3.6 GHz 頻段供 FWA 使用，不過由於民眾對服務及頻寬的需求日益增加，因此也考慮將增配 3.4 GHz 及 10 GHz 頻段中部份頻譜供 FWA 業務使用。

(三)德國無線區域迴路頻譜規劃

目前德國規劃供 WLL 使用的頻段分別是 2540-2670 MHz、3400-3600 MHz 及 24.5-26.5 GHz (部份頻段) 三個頻段,但由於 WRC-2000 已將 2500-2690 MHz 頻段規劃供 IMT-2000/UMTS 業務使用,因此 2.6 GHz 頻段僅可使用至公元 2007 年 12 月 31 日止。

五、歐盟有關 MWS 之頻譜規劃

(一) 歐盟 MWS 頻譜規劃原則

多媒體無線通信系統 (Multimedia Wireless Systems, 以下簡稱 MWS) 係指利用點對多點 (point to multipoint) 或多點對多點 (multipoint to multipoint) 系統,提供終端用戶各種互動的多媒體 FWA,如:遠距學習、MVDS、遠距醫療、高品質的視訊會議、隨選視訊服務、視訊電話...等應用,而為了滿足不同類型的應用,MWS 必須有彈性地上分配上鏈、下鏈頻寬(如下表所示)。

服務類型	上/下載頻寬	Bit rate		Bit rate 型式	
		下載	上載	下載	上載
視訊會議	不對稱	2~6 Mbit/s	≤2Mbit/s	固定或可變	可變
上網	不對稱	≈2 Mbit/s	64 Kbits	可變	可變
視訊電話	對稱/不對稱	0.25-25 Mbit/s	0.5-25 Mbit/s	固定或可變	固定或可變

為了滿足未來對無線寬頻接取網路的需求,歐盟方面決議規劃 40.5-43.5 GHz 供 MWS 使用(詳附件五),其中包括 Multipoint Video Distribution Systems, MVDS。依據目前的規劃,MWS 可提供的傳輸速率從 144 kbit/s 到 25 Mbit/s,真正達到多媒體無線通信的願景。

目前 ITU 無線電規則中並無特定的業務分類供多媒體通信服務使用，因此目前 MWS 可使用分配供固定業務或廣播業務的頻段。若 MWS 只是像 Multipoint Video Distribution System, MVDS 單純提供分送訊號的服務，則可使用廣播業務頻段；若 MWS 提供了上載/下載戶動式的服務，則使用同時分配固定業務及廣播業務使用的頻段。以 40.5-42.5 GHz 為例，該頻段依據 ITU 無線電規則係同時分配供固定業務及廣播業務使用，因此 MVDS 或互動式 MWS 均可使用 40.5-42.5 GHz。至於 42.5-43.5 GHz 頻段僅分配供固定業務使用，並未分配供廣播業務使用，因此單純提供訊號分送服務的系統便不可使用 42.5-43.5 GHz 頻段。

(二) MWS 管理上的難題

依據目前 ITU 無線電管理規則規定，正式的頻率指配須登錄在「Master International Frequency Register」上，以利之後欲使用相同頻段的使用者進行頻率協調，所需登錄的電台或微波鏈路基本資料包括：

- 固定業務：須包括發射電台與接收電台位置
- 廣播業務：服務區域範圍(接收電台可能所在的範圍)

若 MWS 使用廣播業務頻段，並不需要登錄所有的接收電台位置，且所有在服務區域範圍內的接收電台都受到保障。但若 MWS 使用同時分配供固定業務/衛星固定業務頻段，則有可能因 MWS 的站台數量過多而無法與衛星業務和諧共用的問題，所以歐盟方面也正在研究如何管理 MWS 電台的問題。

除了頻譜的問題外，如何發照也是一個未來要討論的問題。目前大部份國家的電信業務與廣播業務係分屬於兩個單位負責管理，因此歐盟正針對此問題積極研究電信與廣播業務整合（convergence）方面的事宜。

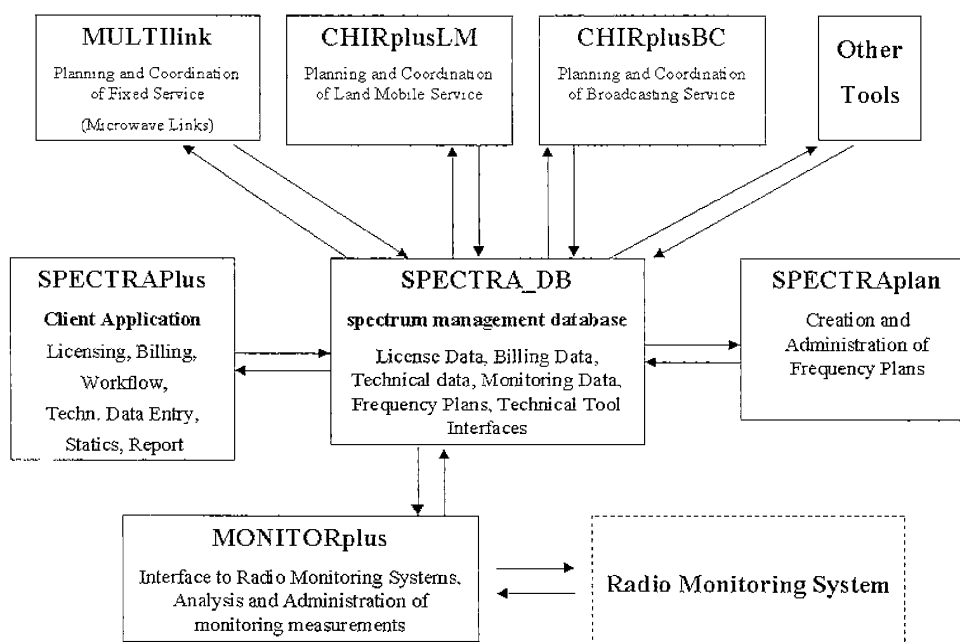
六、頻譜管理系統之應用

L&S Hochfrequenzenchnik 公司於 1991 年由 Leberz 及 Schone 兩位博士於德國創立，L&S 公司主要發展無線通信系統分析及頻譜管理系統軟體，由於在電信服務軟體發展方面極為成功，該公司於 1998 年時更名為 L&S Radio Communication，主要提供的服務包括：網路設計施工、頻率規劃、頻率協調分析、無線系統網路分析與最佳化等。包括德國、瑞典、丹麥、埃及、義大利及我國的頻譜管理機構及電信、廣播業者，都使用 LS Telecom 公司的頻譜管理系統。

（一）頻譜管理系統功能

- 證照核發
- 頻率指配
- 開立規費收據
- 國際間頻率協調
- 型式認證
- 頻譜監測及無線電定向
- 國際規範，如 ITU 無線電規則

(二) 頻譜管理系統架構



1. SPECTRA_DB

頻譜管理系統的技術分析及行政管理工作中最基本的一環就是完整的資料庫，LS Telcom 公司的頻譜管理系統資料庫 SPECTRA_DB 包括了頻率分配資料，所有發射機/接收機的所有技術性資料，如：發射機/接收機所在位置經緯度、發射/接收頻率、頻寬、電功率、天線型式…等，以及核發證照、收費、電台管理時所須的行政資料。

2. SPECTRAplus

SPECTRAplus 主要是負責資料的輸出/輸入，一些行政管理的工作如：證照核發、收費的流程控管，各種表件的列印與統計資料的分析。

3. 技術分析軟體

LS Telecom 根據無線電通信業務的性質，發展出一系列的技術分析軟體：

- MULTIlink：負責點對點及點對多點微波的網路規劃
- CHIRplus_LM：負責陸地行動通信業務的頻率規劃。
- CHIRplus_BC：廣播電台的規劃與頻率協調
- CHIRplus_SAT：衛星鏈路的規劃與分析

各個技術分析軟體主要的功能如下：

- 計算電場強度分佈圖
- 計算自由空間損失 (free space loss)、雨衰損失 (rain attenuation)、大氣吸收損失 (atmospheric absorption loss)、衰落損失 (clear air fading loss)
- 計算 availability
- 干擾分析

3. MONITORplus

由電子地圖上顯示由頻譜管理系統資料庫中選出的發射機或接收機後，可以看到相關站台的監測資料；接著比對監測資料與頻譜管理資料庫中合法電台資料，便可查出非法電台的位置

肆、結語

- (一) ERO 的報告中指出，未來 FWA 的頻率使用應朝高頻頻段（高於 3.4 GHz）規劃，低於 3 GHz 頻段應保留專供行動通信業務使用，此點與我國有關 WLL 頻譜規劃原則相符。（我國已規劃 3.4-3.7 GHz、4.41-4.43 / 4.71-4.43 GHz 及 24-42 GHz 頻段供固網業者申請建設 WLL 使用）
- (二) 寬頻網路(Broadband Networking)及無線接取(Wireless Access)是網路改革及市場機會的下一個主要發展階段及潮流。為了因應新知識經濟時代的來臨，歐盟正針對「新通訊管理組織架構」及「電信、媒體與資訊整合(Convergence)」的議題進行研究，建請本局密切注意國外相關寬頻無線接取技術發展、頻譜規劃、管理方式，俾供本局未來管理相關業務參考。

CEPT/ERC/RECOMMENDATION 13-04 E (Tallin 1998)

**PREFERRED FREQUENCY BANDS FOR FIXED WIRELESS ACCESS
IN THE FREQUENCY RANGE BETWEEN 3 AND 29.5 GHz**

Recommendation proposed by the Working Group "Frequency Management" (WGFM)

Text of the Recommendation adopted by the "European Radiocommunications Committee" (ERC):

INTRODUCTION

Fixed Wireless Access (FWA) is encompassed by the definition of Wireless Access (WA), also known as Wireless Local Loop (WLL), recently developed by ITU-R. WA is 3 fold: FWA, Mobile Wireless Access (MWA) and Nomadic Wireless Access (NWA). The latter two variants are not considered in this Recommendation. The ITU defines Wireless Access as "end user radio connection(s) to core networks".

This recommendation covers only FWA in frequency bands between 3 and 29.5 GHz. Multimedia Wireless Systems (MWS) above 29.5 GHz are catered for in separate ERC Decisions and Recommendations. The MWS band at 40.5 -43.5 GHz is so designated. This Recommendation should be complemented, as necessary, by other Recommendations or Decisions covering the other aspects of MWS.

This Recommendation has been prepared in the light of guidance from CEPT that it is urgently needed by CEPT administrations. However, due to the rapid evolution of the telecommunication environment, a review of this Recommendation will be necessary within the next 2 years.

FWA can be provided by using the technologies based on infrastructure of cordless, cellular, point-to-point, point-to-multipoint, and multipoint-to-multipoint systems. In most cases FWA systems in the frequency range 3-29.5 GHz can be provided by using either point-to-multipoint or multipoint-to-multipoint technology operating in frequency bands allocated to the fixed service. However, in some cases, point-to-point FWA technology can be used to connect subscribers. FWA technology can provide data rates from 9.6kbit/sec up to several Mbit/sec.

This Recommendation identifies preferred frequency bands for FWA in order to encourage Administrations to progress towards a harmonised situation.

Currently it is recognised that, in some cases, due to the use of the proposed preferred bands by other applications, it is not possible to accommodate the spectrum requirements for FWA in a well-defined set of harmonised bands in CEPT countries. For this reason a flexible approach with the identification of different frequency bands has been adopted in this Recommendation, allowing room to adapt to specific national situations and needs and giving firm guidelines to administrations, operators and manufacturers.

FWA technologies may be used for telecommunications services (telephone, video telephones, interactive TV, data transmission, etc.) as well as for MWS (interactive TV, fast Internet, etc.). At present Administrations will provide regulations in each country to identify the appropriate bands for such services. The process of convergence will help to achieve harmonised/optimised solutions.

"The European Conference of Postal and Telecommunications Administrations,

considering

- a) that in Europe requirements were identified for the provision of harmonised frequency spectrum for FWA systems, especially in frequency bands above 3 GHz;
- b) that in Europe a band has been designated around 40 GHz as the home for broadband, ~~broadcast-quality~~, multimedia wireless services;
- c) that the use of harmonised frequency bands would ease frequency co-ordination between adjacent countries and with other radio services, that these requirements may vary considerably from country to country;
- d) that at present a single common harmonised frequency band is not available and may not be appropriate;
- e) that the identification of a number of frequency bands allocated to the fixed service is necessary to provide for the flexible accommodation of the spectrum requirements of individual CEPT-countries;
- f) that in some CEPT-countries, one or the other band or parts of a particular band may not be available for FWA applications;
- g) that for the time being full harmonisation of FWA frequency bands can not be accomplished;
- h) that a choice of a limited number of preferred frequency bands should satisfy initial market demands and help to reduce the cost of equipment;
- i) that there are a number of different multipoint¹ access technologies that may be used, for which different channelling and/or frequency allocation schemes may be appropriate,

noting

- a) that equipment standards for point-to-multipoint fixed service systems have been and continue to be developed by ETSI covering inter alia the frequency ranges 3 - 11 GHz and 24.5 - 29.5 GHz;
- b) that harmonised channel arrangements for point-to-multipoint fixed service systems that could be used for FWA applications have already been developed within CEPT for the frequency bands 3.4 - 3.6 GHz (CEPT/ERC/REC 14-03), 3.6-3.8 GHz (CEPT/ERC/REC 12-08, Annex B, part 2) and 10.15 - 10.30 GHz, 10.50 - 10.65 GHz (CEPT/ERC/REC 12-05);
- c) that the provision of the frequency bands 3.4 - 3.6 GHz, 3.6 - 3.8 GHz (within countries where high/medium capacity channel plan uses only the frequency band 3.8 - 4.2 GHz – see ECA Table and CEPT/ERC/REC 12-08) and 10.15 - 10.30 GHz/10.50 - 10.65 GHz would facilitate the deployment of point-to-multipoint fixed service systems serving typical areas with low and medium subscriber densities;
- d) that within the harmonised channel arrangements for point-to-point FS systems for the ranges 24.5 - 26.5 and 27.5 - 29.5 GHz (ERC Recommendation T/R 13-02), point-to-multipoint fixed service systems providing FWA access can also be accommodated;
- e) that the provision of spectrum within the bands 24.5 - 26.5 and 27.5 - 29.5 GHz would facilitate the deployment of FWA systems serving typical areas with high subscriber density,

¹ In this Recommendation, "multipoint" refers to both point-to-multipoint and multipoint-to-multipoint technologies.

- f) that within the band 24.5 - 26.5 GHz multipoint, as well as point-to-point, systems could be implemented in adjacent band segments according to the individual country allocation / segmentation plan;
- g) that in parts of the band 27.5 - 29.5 GHz multipoint, as well as point-to-point, systems could be implemented taking into account sharing requirements with other services;
- h) that in some countries not all the bands mentioned above may be available for the accommodation of FWA applications;
- i) that Article S5 of the Radio Regulations allocates the band 10.6 - 10.68 GHz to the Fixed, Earth Exploration Satellite (passive), Radio Astronomy, and Space Research services;
- j) that in some countries co-ordination is required between the Fixed and Radioastronomy services in the 10.6 - 10.68 GHz band (see ERC Report 36);
- k) that other channelisation/allocation plans might need to be developed to enable alternative multipoint access technologies,

recommends

- 1) that the frequency bands 3.400 - 3.600 GHz, 10.15 - 10.30 GHz/10.50 - 10.65 GHz, be identified as preferred bands for FWA applications within CEPT;
- 2) that parts of the frequency band 24.5 - 26.5 GHz be identified as preferred bands for FWA applications within CEPT, where not required by Administrations for conventional point-to-point fixed links, taking into account the sharing requirements of point-to-point fixed links in neighbouring Administrations;
- 3) that parts of the band 27.5 - 29.5 GHz be identified as preferred bands for FWA applications, taking into account sharing requirements with other services. CEPT has still to take a final decision on the sharing conditions within this band. In the meantime, CEPT Administrations should not take any final decisions on its utilisation.

CEPT/ERC/RECOMMENDATION 14-03 E (Turku 1996, Podebrady 1997)

**HARMONISED RADIO FREQUENCY CHANNEL ARRANGEMENTS AND BLOCK ALLOCATIONS
FOR LOW AND MEDIUM CAPACITY SYSTEMS IN THE BAND 3400 MHz TO 3600 MHz**

Recommendation adopted by the Working Group "Spectrum Engineering" (WGSE)

"The European Conference of Postal and Telecommunications Administrations,

considering

1. that CEPT has a long term objective to harmonise the use of frequencies throughout Europe,
2. that CEPT should develop radio frequency channel arrangements and block allocation rules in order to make the most effective use of the spectrum for point to point (P-P), point to multipoint (P-MP) and ENG/OB applications,
3. that CEPT/ERC Recommendation 25-10 designates this band as a tuning range for ENG/OB,
4. that the band 3400 MHz to 3410 MHz is used by land, airborne and naval military radars,
5. that the achievement of harmonisation requires the adoption of a limited number of channel arrangements and block allocation rules,

noting

- a) that the table of frequency allocations in the Radio Regulations allocates the band 3400 MHz to 3600 MHz on a primary basis to the Fixed and Fixed - Satellite services and on a secondary basis to the Radiolocation and Mobile services,
- b) that countries desire to deploy different combinations of P-P, P-MP and ENG/OB systems on a primary basis in this band,
- c) that there is an ITU-R Recommendation (F-635) for P-P wide band applications incorporating this band for some administrations,
- d) that frequency separation may be required for uncoordinated deployment of current and future systems,
- e) that cellular deployment of P-MP systems preferably requires the allocation of continuous spectrum to the operator,

recommends

- 1) that frequency assignments should in all cases be based on 0.25 MHz slots within the 3410 MHz to 3600 MHz band,

the frequency of the lower edge of any slot shall be defined by the general equation:

$$f_s = 3410 + 0.25 N \text{ MHz}$$

where

$$0 \leq N \leq 759$$

- 2) that administrations should assign all or part of the band to any system or combination of the three systems in accordance with Annex A and/or B.”

ANNEX A

50 MHz ARRANGEMENTS

.1

.2

A1 Point to multipoint systems

P-MP systems may be operated in the ranges 3410-3500 MHz and 3500-3600 MHz.

Where a frequency duplex allocation is required, the spacing between the lower edges of the paired sub-bands shall be 50 MHz. The edges of each sub-band are defined as follows:

3410 MHz - 3500 MHz

Lower sub-band:	0.25 $N + 3410$ to 0.25 $(N + k) + 3410$	MHz
Upper sub-band:	0.25 $(N + 200) + 3410$ to 0.25 $(N + k + 200) + 3410$	MHz MHz
$1 \leq k \leq 160, 0 \leq N \leq 159, k + N \leq 160$		

3500 MHz - 3600 MHz

Lower sub-band	0.25 $N + 3410$ to 0.25 $(N + k) + 3410$	MHz
Upper sub-band	0.25 $(N + 200) + 3410$ to 0.25 $(N + k + 200) + 3410$	MHz
$1 \leq k \leq 200, 360 \leq N \leq 559, k + N - 360 \leq 200$		

In the tables above, k defines the width of each sub-band and N defines the lower edge of each sub-band.

P-MP equipment may be used having a duplex spacing other than exactly 50 MHz. However, such equipment must conform to the limits of the block allocation as defined above.

A2 Point to point systems with a duplex spacing of 50 MHz

Channel centre frequencies are defined at the edges of 0.25 MHz slots as follows:

A2.1 Systems with 1.75 MHz channel spacing

3410 MHz - 3500 MHz

Lower sub-band	$f_{c,n} = 3410 + 1.75 n$ MHz	$n = 1, 2, \dots, 22$
Upper sub-band	$f_{c,n} = 3410 + 1.75 n$ MHz	

3500 MHz - 3600 MHz

Lower sub-band	$f_{c,n} = 3500 + 1.75 n$ MHz	$n = 1, 2, \dots, 28$
Upper sub-band	$f_{c,n} = 3550 + 1.75 n$ MHz	

A2.2 Systems with 3.5 MHz channel spacing

3410 MHz - 3500 MHz

Lower sub-band	$f_{c,n} = 3408.25 + 3.5 n$ MHz	$n = 1, 2, \dots, 10$
Upper sub-band	$f_{c,n} = 3458.25 + 3.5 n$ MHz	

3500 MHz - 3600 MHz

Lower sub-band	$f_{c,n} = 3498.25 + 3.5 n$ MHz	$n = 1, 2, \dots, 14$
Upper sub-band	$f_{c,n} = 3548.25 + 3.5 n$ MHz	

A2.3 Systems with 7 MHz channel spacing

3410 MHz - 3500 MHz

Lower sub-band	$f_{c,n} = 3406.5 + 7 n$ MHz	$n = 1, 2, \dots, 5$
Upper sub-band	$f_{c,n} = 3456.5 + 7 n$ MHz	

3500 MHz - 3600 MHz

Lower sub-band	$f_{c,n} = 3496.5 + 7 n$ MHz	$n = 1, 2, \dots, 7$
Upper sub-band	$f_{c,n} = 3546.5 + 7 n$ MHz	

A2.4 Systems with 14 MHz channel spacing

3410 MHz - 3500 MHz

Lower sub-band	$f_{c,n} = 3403 + 14 n$ MHz	$n = 1, 2$
Upper sub-band	$f_{c,n} = 3453 + 14 n$ MHz	

3500 MHz - 3600 MHz

Lower sub-band	$f_{c,n} = 3493 + 14 n$ MHz	$n = 1, 2$
Upper sub-band	$f_{c,n} = 3543 + 14 n$ MHz	

A3 ENG/OB systems

ENG/OB systems shall be assigned contiguous 0.25 MHz slots, as appropriate for the channel spacings and amount of spectrum required. Exact channel centre frequencies will be allocated within the slots depending on the equipment used.

Where the band 3410-3600 MHz is shared between ENG/OB and P-P or P-MP services by an administration, ENG/OB services will operate within either the range 3410-3500 or 3500-3600 MHz, with P-P and P-MP services in the other part of the band, to minimise co-ordination problems between the services.

ANNEX B

100 MHz ARRANGEMENTS

B1 Point to multipoint systems

P-MP systems may be operated in the range 3410-3500 MHz paired with 3500-3600 MHz.

Where a frequency duplex allocation is required, the spacing between the lower edges of each paired sub-band shall be 100 MHz. The edges of each sub-band are defined as follows:

Lower sub-band	0.25 $N + 3410$ to 0.25 $(N + k) + 3410$	MHz
Upper sub-band	0.25 $(N + 400) + 3410$ to 0.25 $(N + k + 400) + 3410$	MHz
$1 \leq k \leq 360, 0 \leq N \leq 359, k + N \leq 360$		

In the table above, k defines the width of each sub-band and N defines the lower edge of each sub-band.

P-MP equipment may be used having a duplex spacing other than exactly 100 MHz. However, such equipment must conform to the limits of the block allocation as defined above.

B2 Point to point systems with a duplex spacing of 100 MHz

Channel centre frequencies are defined at the edges of 0.25 MHz slots as follows:

.2.1

B2.1 Systems with 1.75 MHz channel spacing

.2.2

Lower sub-band	$f_{c,n} = 3410 + 1.75 n$ MHz	$n = 1, 2, \dots, 50$
Upper sub-band	$f_{c,n} = 3510 + 1.75 n$ MHz	

B2.2 Systems with 3.5 MHz channel spacing

Lower sub-band	$f_{c,n} = 3408.25 + 3.5 n$ MHz	$n = 1, 2, \dots, 25$
Upper sub-band	$f_{c,n} = 3508.25 + 3.5 n$ MHz	

B2.3 Systems with 7 MHz channel spacing

Lower sub-band	$f_{c,n} = 3406.5 + 7 n$ MHz	$n = 1, 2, \dots, 12$
Upper sub-band	$f_{c,n} = 3506.5 + 7 n$ MHz	

B2.4 Systems with 14 MHz channel spacing

Lower sub-band	$f_{c,n} = 3403 + 14 n$ MHz	$n = 1, 2, \dots, 6$
Upper sub-band	$f_{c,n} = 3503 + 14 n$ MHz	

B3 ENG/OB systems

ENG/OB systems shall be assigned contiguous blocks of 0.25 MHz slots, as appropriate for the channel spacings and amount of spectrum required. Exact channel centre frequencies will be assigned within the slots depending on the equipment used.

CEPT/ERC/RECOMMENDATION 12-05 E (Rome 1996)

**HARMONISED RADIO FREQUENCY CHANNEL ARRANGEMENTS FOR DIGITAL
TERRESTRIAL FIXED SYSTEMS OPERATING IN THE BAND 10.0 - 10.68 GHz**

Text of the Recommendation adopted by Working Group "Spectrum Engineering" (WG SE):

the European Conference of Postal and Telecommunications Administrations,

considering

1. that CEPT has a long term objective to harmonise the use of frequencies throughout Europe,
2. that CEPT should develop radio frequency channel arrangements in consultation with organisations developing standards for radio systems, in order to make the most effective use of the spectrum available.
3. that any radio frequency channel arrangement should incorporate a provision for the future introduction of improved equipment standards,

noting

- a) that CEPT/ERC Report 25 allocates the paired bands 10.15 - 10.3 and 10.5 - 10.65 GHz for fixed systems including point to multipoint, and the removal of the Mobile service from the band 10.5 - 10.68 GHz,
- b) that Article S5 of the Radio Regulations allocates the band 10 - 10.45 GHz on an equal primary basis to the Fixed and Radiolocation services, and the band 10.6 - 10.68 GHz to the Fixed, Earth Exploration Satellite (passive), Radio Astronomy, and Space Research services.
- c) that CEPT/ERC has defined the band 10.0 - 10.68 GHz as one of the harmonised tuning ranges for ENG/OB equipment,
- d) that in some countries sharing studies indicate sharing between Fixed and Radar systems is feasible,
- e) that in some countries it is not currently practicable to implement the paired band 10.15 - 10.3 and 10.5 - 10.65 GHz due to military requirements,
- f) that in some countries coordination is required between the Fixed and Radioastronomy services in the 10.6 - 10.68 GHz band (see CEPT/ERC Report 36),

recommends

1. that CEPT Administrations which have the paired bands 10.15 - 10.3 and 10.5 - 10.65 GHz available for the Fixed service should follow the recommended radio frequency channel arrangements given in Annex A,
2. that administrations which have different paired bands available may allow the current channel arrangements to remain unchanged until the year 2015, and may determine, on a national basis, the degree of protection given. International coordination between existing and new systems shall be in accordance with article S11 of the Radio Regulations,
3. that administrations may choose to allocate certain parts of the bands to one way links, for example ENG/OB links within the tuning range 10.0 - 10.68 GHz, in agreement to the recommended radio frequency channel arrangements given in Annex A,
4. that further sharing studies between Fixed and Radar systems in these bands need to be completed.”

Annex A

DERIVATION OF RADIO FREQUENCY CHANNELS

The radio frequency channel arrangements for the 10 to 10.68 Hz band are based on channel slots of 0.5 Hz and are derived as follows:

$$f_p = f_0 - 1701 + 0.5p \text{ (MHz)}$$

where p ranges from 0 to 1359

Let f_0 be the reference frequency of the pattern = 11701 MHz

and f_p be the lower edge frequency (MHz) of each slot

Within the band 10.15 - 10.3 Hz ($p = 300$ to 599) paired with 10.5 - 10.65 Hz ($p = 1000$ to 1299) equipment will utilise a duplex spacing of 350 Hz.

For point-to-multipoint systems discrete channel centre frequencies can be obtained from within the 0.5 Hz slots.

For other systems the channel centre frequencies could be derived by multiplication of the 0.5 Hz slots as indicated below:

Let f_0 be the reference frequency of the pattern = 11701 MHz

f_n be the centre frequency (MHz) of a radio frequency channel in the lower half of the band

f'_n be the centre frequency (MHz) of a radio frequency channel in the upper half of the band

The frequencies of individual channels are expressed by the following relationships:

- (a) For systems with a carrier spacing of 28 Hz
Lower half of band: $f_n = (f_0 - 1561 + 28n)$ Hz
Upper half of band: $f'_n = (f_0 - 1211 + 28n)$ Hz
where $n = 1, 2 \dots 5$
- (b) For systems with a carrier spacing of 14 Hz
Lower half of band: $f_n = (f_0 - 1554 + 14n)$ Hz
Upper half of band: $f'_n = (f_0 - 1204 + 14n)$ Hz
where $n = 1, 2 \dots 10$
- (c) For systems with a carrier spacing of 7 Hz
Lower half of band: $f_n = (f_0 - 1550.5 + 7n)$ Hz
Upper half of band: $f'_n = (f_0 - 1200.5 + 7n)$ Hz
where $n = 1, 2 \dots 20$
- (d) For systems with a carrier spacing of 3.5 Hz
Lower half of band: $f_n = (f_0 - 1552.25 + 3.5n)$ Hz
Upper half of band: $f'_n = (f_0 - 1202.25 + 3.5n)$ Hz
where $n = 1, 2 \dots 42$

Table 1. Calculated parameters according to ITU-R Recommendation F 746

X_S MHz	n	f_1 MHz	f_n MHz	f'_1 MHz	f'_n MHz	Z_1S MHz	Z_2S MHz	Y_S MHz	DS MHz
28	1,2 ... 5	10168	10280	10518	10630	18	20	238	350
14	1,2 ... 10	10161	10287	10511	10637	11	13	224	350
7	1,2 ... 20	10157.5	10290.5	10507.5	10640.5	7.5	9.5	217	350
3.5	1,2 ... 42	10152.25	10295.75	10502.25	10645.75	2.25	4.25	206.5	350

X_S Separation between centre frequencies of adjacent channels

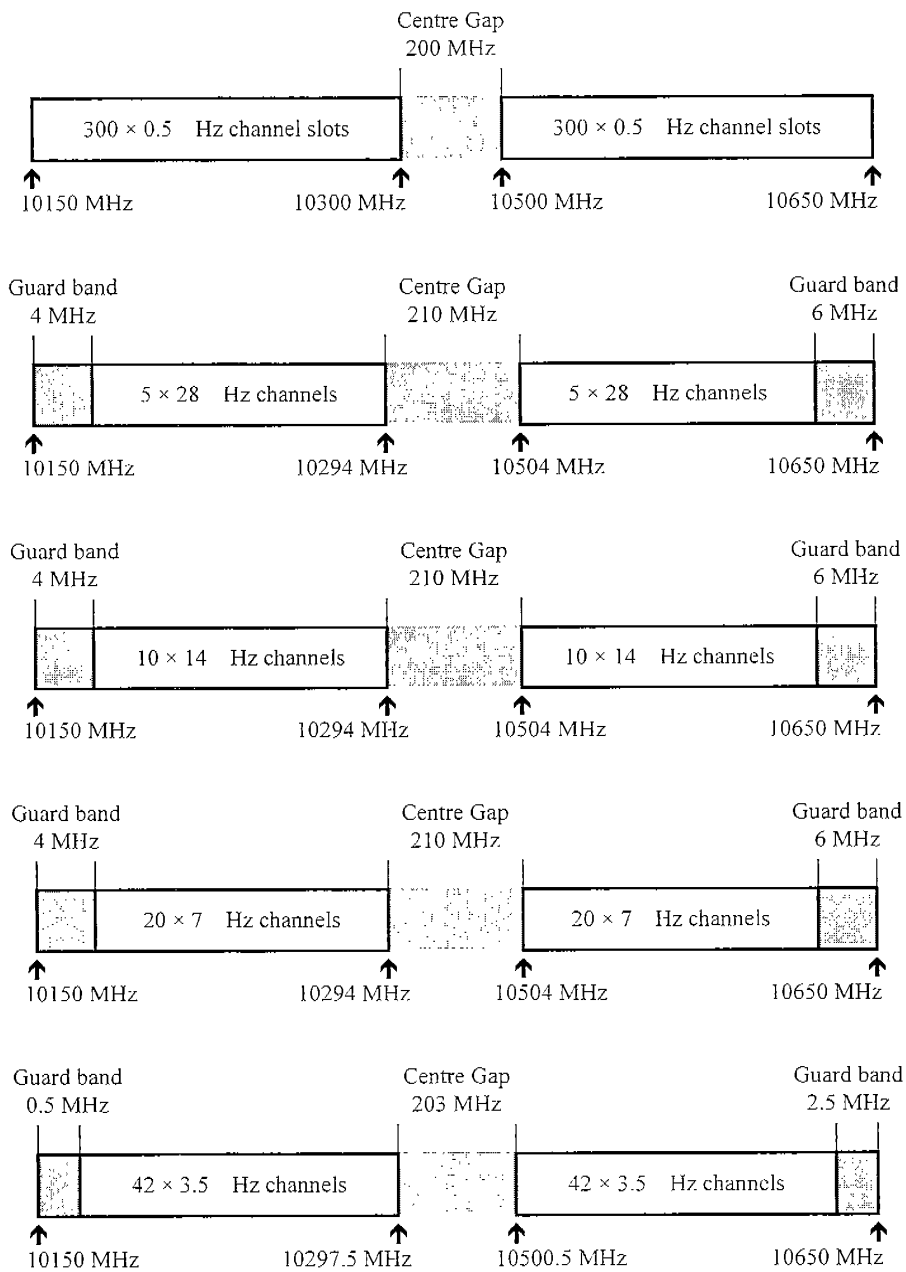
Y_S Separation between centre frequencies of the closest go and return channels

Z_1S Separation between the lower band edge and the centre frequency of the first channel

Z_2S Separation between the centre frequency of the final channel and the upper band edge

DS Duplex Spacing ($f'_n - f_n$)

Table 2. Occupied spectrum: 10.15 - 10.65 GHz band



European Radiocommunications Committee (ERC)
Within the European Conference of Postal and Telecommunications Administrations (CEPT)

ERC RECOMMENDATION (00)05

USE OF THE BAND 24.5 - 26.5 GHz FOR FIXED WIRELESS ACCESS

Recommendation adopted by the Working Group "Spectrum Engineering" (SE)

INTRODUCTION

Point-to-Multipoint (PMP) systems, developed in accordance with ETSI EN 301 213 - 1 - 2 - 3 can vary significantly in their system characteristics and design (e.g. access scheme, duplex method and modulation), thus having different impact on each other.

In order to avoid interference of systems operating on the same frequency or in the same geographical area measures must be introduced which allow for a coexistence of systems independent from their specific system characteristics and design.

This Recommendation aims to assist Administrations in the assignment of frequency blocks for the operation of Fixed Wireless Access (FWA) systems in the band 24.5 - 26.5 GHz.

It should be noted that the measures in this Recommendation which are aimed to ensure coexistence, namely the size of the necessary guard band and the guard distance between neighbouring assignments were derived from studies ERC Report 99, considering only systems using 4 level modulation schemes and channel sizes up to 28 MHz which are considered so far to be the most common.

Administrations when applying this Recommendation should therefore consider that the measures, which are recommended for this specific but so far most common set of systems, correspond to the actual systems being deployed.

It should further be noted that for systems using higher level modulation and channel sizes of more than 28 MHz the size of the guard band and the guard distance is likely to be different, but it has not yet been possible to analyse those systems.

In order to further assist in the assignment for FWA systems Administrations should consider the ERC Report 97 on "FWA spectrum engineering and management guidelines".

"The European conference of Postal and Telecommunications Administrations,

considering

- a) that within CEPT the use of the band 24.5 - 26.5 GHz along with other bands has also been identified as suitable for the implementation of Fixed Wireless Access systems (ERC/REC/13-04).
- b) that Fixed Wireless Access Systems in the range 24.5 - 26.5 GHz are expected to provide telecommunication services to the user with capacity requirements of up to several Mbit/s, carrying e.g. circuit- or packet-oriented traffic;
- c) that within CEPT/ERC several administrations have introduced or will introduce also Point-to-Point fixed links in the band 24.5 - 26.5 GHz, following the channel plan recommended in ERC T/R 13-02;
- d) that sufficient capacity and flexibility for deployment of multiple systems within a desired service area can be achieved by the aggregation of contiguous frequency slots from a homogeneous pattern;

- e) that it would be beneficial if such a homogeneous pattern can be made compatible with the channel plan proposed in ERC-Recommendation T/R 13-02 for fixed service;
- f) that the slot size considered for the deployment of FWA in order to satisfy the needs of the operators is 28 MHz in each duplex subband, which would be in line with ERC-Recommendation T/R 13-02;
- g) that operators may advantageously deploy equipment with a variety of central frequencies and bandwidths within their block 28 MHz assignment to meet their operational needs;
- h) that both time division duplex (TDD) systems and frequency division duplex (FDD) FWA systems could be accommodated, provided that appropriate co-existence criteria are met;
- i) that to ensure coexistence between systems operating in the same area and in the adjacent frequency blocks, guard bands would have to be introduced between neighbouring FWA systems;
- j) that the estimated size of the guard band needed is equal to the greater channel used by the two neighbouring systems;
- k) that through appropriate regulations and co-operation between neighbouring operators the size of the guard bands could be reduced;
- l) that guidance material is available to assist administrations with the assignment of frequency blocks to operators for fixed wireless access systems (see ERC Reports 99 and 97).
- m) that to ensure coexistence between systems operating in the same frequency blocks but neighbouring areas, separation guard distances would have to be introduced between neighbouring FWA systems;

noting

- 1 that the number of 28 MHz slots required by a system to provide service will depend on the channel width and cellular structure; it is expected that a minimum of 1 or 2 slots would be required;

recommends

- 1 that those administrations planning to implement FWA in the band 24.5 - 26.5 GHz, or parts of this band, should assign frequency blocks comprising slots aligned with the 28 MHz channel raster identified in T/R 13-02;
- 2 that the minimum number of 28 MHz slots assigned to an operator should be 1 or 2 (see noting 1);
- 3 that in the case of deployment of FDD systems the upper subband should be used for the transmission from the terminals to the central station (hub) and the lower for the transmission from the central station to the terminals;
- 4 that in the case of systems operating in adjacent frequency blocks in the same area, adequate inter-assignment protection should be ensured through the introduction of guard bands between neighbouring block assignments; such guard band may be explicit outside the blocks allocated to the operators or included within such blocks;
- 5 that the size of the guard bands to ensure adequate inter-assignment protection of FDD systems should be at least equal to 28 MHz (NOTE 1, NOTE 2); the guard band may consist of one unused slot of frequency, or of slots used only with one polarisation, adjacent to slots used on the opposite polarisation (see the figures in annex 1);
- 6 that, for deployment of TDD systems alongside TDD or FDD systems, the guard band should be 2x28 MHz (NOTE 1, NOTE 2);
- 7 that, when TDD systems are accommodated and the size of the guard bands is 1x28MHz, a TDD hub must be at least 500m from any other hub;
- 8 that those administrations intending to leave to the neighbouring operators the responsibility of the inter-operator protection required by Recommends 5, 6 or 7 should consider adequate increased spectrum requirements (as specified in Recommends 4) within the assigned blocks (see annex 2);

- 9 that administrations encourage co-operation between operators in neighbouring frequency blocks and the guard band could then be considered as an "edge" band: this means that guard band may become usable by the operators by the means of mutual co-ordination involving in particular co-site or near site sharing and co-ordinated cell planning;
- 10 that in the case of systems operating in the same frequency block in neighbouring areas, adequate inter-assignment protection should be ensured through the introduction of reasonable guard distances between the boundaries of the neighbouring assignment areas where the same frequency block has been assigned; the size of guard distance should be chosen so that there is a minimum distance of 20 km between central stations and terminals and 40 km between central stations of neighbouring systems. (For further information on required and reasonable guard distances see section 5 of the ERC Report 99);
- 11 that administrations encourage co-operation between operators in the same frequency block in neighbouring areas to reduce the size of guard distances through co-ordinated deployment and advantageous use of specific topographical or operational detail."

Note:

Please check the ERO web site (www.ero.dk) under "Documentation / Implementation" for the up to date position on the implementation of this and other ERC Decisions.

NOTE 1: that if an alternative pattern based on 3.5, 7 or 14 MHz slots is envisaged in some portions of the band, then the appropriate inter-assignment guard band is to be evaluated on a case by case basis.

NOTE 2: that administrations facing the introduction of systems using channels broader than 28 MHz (e.g. 56 MHz) should take into account that the relative guard bands should be enlarged proportionally.

Annex 1

A possible arrangements for the guard band, with or without using XPD (Cross Polar Discrimination) protection, is shown in figure 1

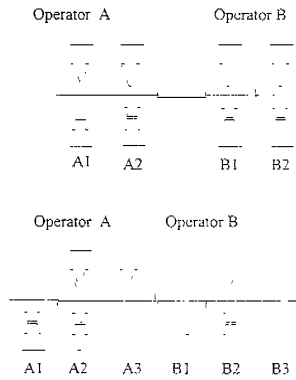


Figure 1

A possible frequency allocation example with guard bands outside the blocks is shown in figure 2

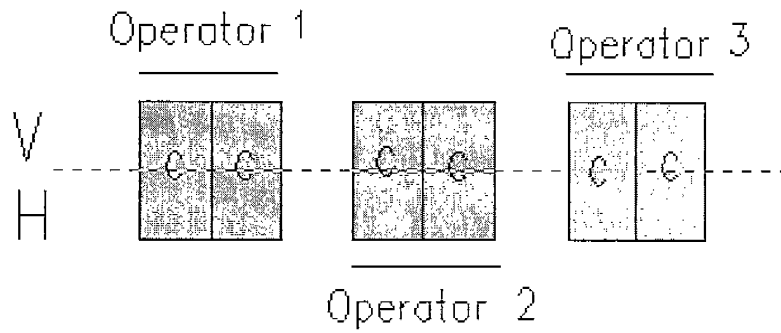
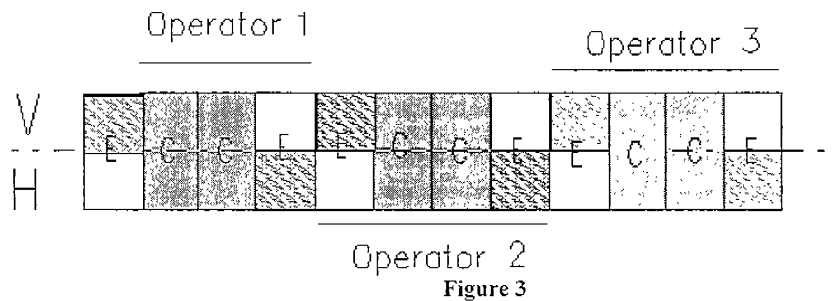


Figure 2

Annex 2

A possible frequency allocation example with guard bands inside the blocks is shown in figure 3



- each Operator has 2x28MHz „interference free“ slots plus 2x28MHz edge slots
- Operators are pushed finding a degree of co-ordination needed in order to fully or partially utilise the „edge (E)“ frequency slots
- Operators have the flexibility to start deployment using the „interference free (C)“ frequency slots and to choose the best co-operation solution with no constraints and without being in a hurry

C = centre frequency: E = edge frequency

An other example of possible reuse of the guard band is shown in figure 4

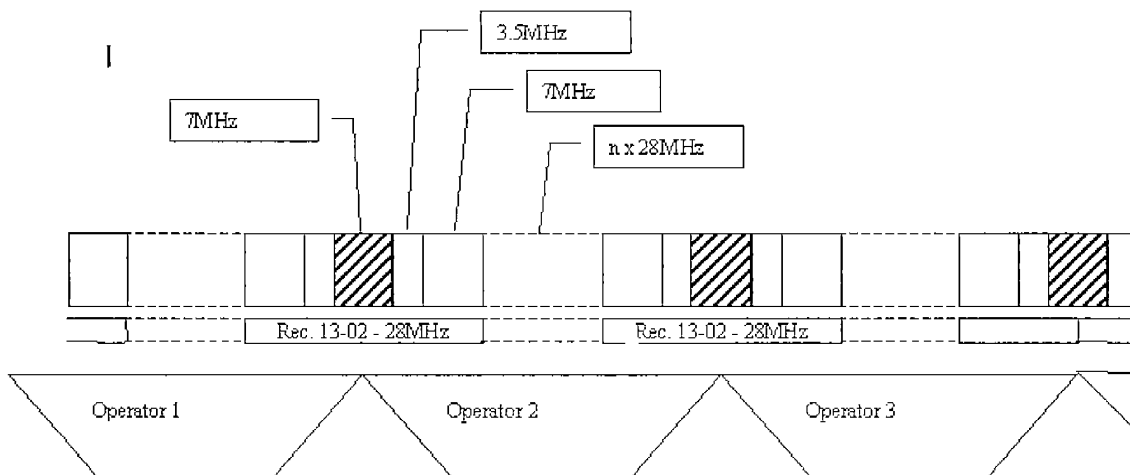


Figure 4

EUROPEAN RADIOCOMMUNICATIONS COMMITTEE

ERC Decision
of 1 June 1999
on the designation of the harmonised frequency band
40.5 to 43.5 GHz for the introduction of
Multimedia Wireless Systems (MWS),
including Multipoint Video Distribution Systems (MVDS)
(ERC/DEC/(99)15)



EXPLANATORY MEMORANDUM

1 INTRODUCTION

In 1996, the ERC adopted ERC/DEC/(96)05, "on the harmonised frequency band to be designated for the introduction of the Multipoint Video Distribution Systems (MVDS)". This Decision harmonised the band 40.5 - 42.5 GHz for the distribution of television programmes, commonly termed Multipoint Video Distribution Systems (MVDS). A typical MVDS consisted of a point-to-multipoint distribution system covering subscribers' premises within particular areas or "cells". The system was used as an alternative to cable television distribution networks or as an extension to a cable network and additionally allowed a small degree of interactivity.

In 1998, the ERC recognised a need to take into account the requirements of MWS and to encourage the use of digital technologies and so initiated the revision of ERC/DEC/(96)05. MWS systems will utilise several bands. This new Decision addresses the band 40.5 - 43.5 GHz.

For the purpose of this Decision, Multimedia Wireless Systems are defined as terrestrial multipoint¹ systems which have their origin in telecommunication and/or broadcasting, including MVDS, and which provide fixed wireless access direct to the end user for multimedia services. These MWS systems may offer different degrees of interactivity.

2 BACKGROUND

In 1996, the ERC agreed Decision ERC/DEC/(96)05, which identified frequency bands for MVDS, providing a viable means of local delivery of direct-to-home television programmes to geographic areas which were uneconomic to cable, or to provide a broadcasting service where conventional systems were deficient. It was also used to support the development of cable network and to provide additional "off air" programming. After careful consideration of a number of bands including 29, 38, 42 and 60 GHz, the ERC published Recommendation T/R52-01 which recommends that the band 40.5-42.5 GHz be used for MVDS. Subsequently the ERC Report 25 endorsed this choice. In ITU Region 1 the band has also been allocated to the broadcasting-satellite, broadcasting and fixed services.

Subsequent development of the market for interactive multimedia services has led to demand for greater provision of return-path communication, over and above that originally provided by the first version of the original Decision. The potential market for these systems has also broadened beyond the original idea of distributing television services, to include, inter alia, broadband data services, video conferencing, video-on-demand, etc.

3 REQUIREMENT FOR AN ERC DECISION

The allocation of radio frequencies in CEPT countries is laid down by law, regulation or administrative action. The ERC recognises that for MWS to be introduced successfully throughout Europe, manufacturers and operators must be given the confidence to make the necessary investment in the new pan-European radio communications systems and services. Commitment by CEPT countries to implement an ERC Decision will provide a clear indication that the required frequency bands will be made available on time and on a CEPT-wide basis. The Decision also provides for CEPT member countries to introduce into their national regime, the ETSI standards and the CEPT mechanism for enabling free circulation.

The ERC Rules of Procedure state that if an ERC Decision is amended, it must be replaced and the old Decision abrogated. Therefore this Decision dictates abrogation of ERC/DEC/(96)05.

**ERC Decision
of 1 June 1999**

**on the designation of the harmonised frequency band 40.5 to 43.5 GHz
for the introduction of Multimedia Wireless Systems (MWS)
including Multipoint Video Distribution Systems (MVDS)**

(ERC/DEC/(99)15)

The European Conference of Postal and Telecommunications Administrations.

considering

- a) that the band 40.5-42.5 GHz has been allocated by the ITU, in Region 1, on a co-primary basis to the broadcasting, broadcasting-satellite and fixed services;
- b) that the band 42.5-43.5 GHz has been allocated by the ITU, in Region 1, on a co-primary basis to the Fixed, Fixed-Satellite, Mobile (excluding aeronautical mobile) and Radio Astronomy services;
- c) that in designating the band 40.5-42.5 GHz to MVDS, in the Broadcasting Service, the ERC has given a clear priority to terrestrial services;
- d) that in the band 42.5-43.5 GHz, sharing between the Radio Astronomy service and MWS is feasible on a geographical basis;
- e) that the band 40.5-43.5 GHz should provide a sufficient amount of spectrum to facilitate Multimedia Wireless Systems for a number of competing operators;
- f) that technical convergence of MWS applications could be better facilitated by using digital technology;
- g) the digital technology being developed has the potential to increase the range of services that can be carried in a spectrally efficient manner;
- h) that MWS can offer a variety of user bit rates including those from Primary Rate (144 kbit/s) up to as high as 25 Mbit/s, or more, in flexible bandwidth arrangements;
- i) that the return channels for MWS could if necessary also be accommodated in other bands.

DECIDES

1. that for the purpose of this Decision Multimedia Wireless Systems (MWS) shall mean terrestrial multipoint systems which have their origin in telecommunication and/or broadcasting, including MVDS, and which provide fixed wireless access direct to the end user for multimedia services, and comply with the relevant European Telecommunications Standards. These MWS systems may offer different degrees of interactivity.
2. to designate the frequency band 40.5-43.5 GHz for MWS as from 4 June 1999.
3. that all MWS introduced in this band after the date-of-adoption of this Decision shall be digital;
4. that the CEPT Member Administrations shall communicate the national measures implementing this Decision to the ERC Chairman and the ERO when the Decision is nationally implemented.

Note:

Please check the ERO web site (www.ero.dk) under "Documentation / Implementation" for the up to date position on the implementation of this and other ERC Decisions..