

European Carriers Agitated with US DECT 6.0 Infiltration:

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US DECT 6.0 Infiltration:

How Does One Find Them?

Introduction

Use of DECT 6.0 phones in Europe by U.S. and Canadian expatriates have been noticed to cause significant interference in the uplink bands of the European UMTS licensed services. This paper discusses the problem and proposes a detection-based strategy for preventing such use of DECT 6.0 phones. The proposed approach consists of monitoring and locating such phones, thereby helping network operators minimize incremental operating costs due to interference. The technologies for realizing this are relatively simple and in existence today. Monitoring records of Base Transceiver Stations (BTS) already compile lists of such sources within each cell which can be traced to neighborhoods or city blocks. The technology for the actual location of DECT 6.0 phones (as well as cell phones) is also in existence. A family of such devices are produced by Berkeley Varitronics Systems in Metuchen, New Jersey, consisting of, among others, a scanning narrow-band receiver equipped with a multi-band high-gain directional antenna capable of guiding the user to within an arm's reach of the culprit phone(s).

Discussion of the Problem

The Digital Enhanced Cordless Telecommunications standard, better known as **DECT**, was developed by ETSI in Europe. It is used for creating cordless phone systems primarily for homes and small offices. DECT phones have been developed and marketed in Europe, Australia, South America and North America. The introduction of the DECT standard to North America was delayed because U.S. FCC regulations required a slightly different frequency allocation. This resulted in the development of the **DECT 6.0** standard for North America which assigned the 1920-1930 MHz band to cordless phone voice channels only. As a result, DECT 6.0 phones are highly immune to interference from other wireless applications (e.g., baby monitors, wireless networks, etc.). The frequency allocations for DECT, DECT 6.0 and UMTS up link bands in the E.U. and North America are listed in Table 1:

Table 1. DECT, DECT 6.0 and UMTS Up-link Frequency Allocations for Europe and North America

Region	DECT Phone Band (MHz)	UMTS Service Up-Link Band (MHz)
Europe	1880 - 1900	1920 - 1980
N. America	1920 - 1930	1850 - 1910



The careful frequency allocation of DECT and DECT 6.0 phones in the E.U. and North America assures that these phones will neither cause nor be susceptible to Electromagnetic Interference (EMI) with respect to other licensed wireless services, as long as the phones are deployed in their respective geographic region(s) for which they were designed for. However, when DECT 6.0 phone systems are deployed in the E.U., their RF signals can interfere with some of the up-link channels of European UMTS services because the two bands overlap (see Table 1). DECT 6.0 systems are particularly potent EMI sources for several reasons:

1. The system uses the same frequency band (1920-1930MHz) for both of its uplink and downlink channels.
2. All handsets and base unit will contribute to the cumulative level of EMI simultaneously.
3. Except for the few "green" versions, most DECT systems keep the RF signal always on.
4. Unlike cell phones, the RF output level from cordless phones and base is fixed.




According to some European network operators, a signal level of only -97 dBm or higher in the UMTS uplink band is considered as interference. If the UMTS phone(s) are located within the confines of the same city block, transmission(s) from a DECT 6.0 phone can very easily exceed this threshold. This may be demonstrated by considering the estimated free-space path loss for electromagnetic

waves, as a function of distance d :

$$\text{Loss(dB)} = 20 \log_{10} (d_0/d_1)$$

where d_0 and d_1 represent the transmit and receive antenna positions respectively in the same units of length. Thus, signals originating from a DECT phone located 1 meter from a point of reference to a point 1 Kilometer from the same point of reference would attenuate by 60dB. If the RF power level near the antenna was -10dBm (this is a conservative output level for a typical cordless phone) the DECT 6.0 uplink signal level has the potential to exceed the -97dBm threshold over an area equivalent to a small city block or over an apartment complex with hundreds of residents only after allowing for propagation loss as well as attenuation caused by typical obstacles (walls, doors, trees, etc) between the DECT phone and the point of observation. Other wireless devices do not present the same type of challenge as a result of their inherent operating schemes (see Table 2).

Table 2. Relative Likelihood of Interference from Different Devices

Device	Mechanism
 Cell Phones	The risk of interference from cell phones to UMTS services is insignificant. The cell phone firmware must first passively detect the local cell BTS and recognize it as a "valid" host. Then it will attempt to register over a channel assigned by the BTS. Cell phone RF power output levels are purposefully kept to a bare minimum by the BTS in order to maximize frequency re-use over each cell.
 WiFi Access Point	Laptops connected to local WiFi hot spots in the E.U. or elsewhere pose no risk of interference because the up-link frequencies for them are defined and controlled by the local hot spot(s).
 Cordless Phones (DECT 6.0 & other)	DECT 6.0 and other cordless phones brought from the U.S. for personal use in Europe pose a serious risk of interference in GSM/UMTS services on the 900 ¹ and 1900 MHz up link bands. Aggravating factors: same frequency band used for up and down link channels, RF signal level fixed, handset(s) and base contribute to EMI simultaneously.

The interference problem discussed here has amply been observed and documented in the U.K.. The problem could proliferate if in addition to U.S. expatriates, growing numbers of locals start to use DECT

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6.0 phones purchased cheaply on-line. According to some wireless operators in the U.K., sites where this kind of interference is occurring right now is readily identified from BTS records for each cell.

Proposed Solution

Network operators in the U.K. routinely identify lists of sites where DECT 6.0 and other cordless phones have been causing interference to licensed UMTS services over the 900MHz up-link (880-915MHz) and 1900MHz uplink (1920-1980MHz) frequency bands. There is a clear need for routinely locating these sources of interference after they have been identified from the BTS monitoring records down to the last few hundred feet. The technology for locating undesirable DECT or cell phones is already in existence. One such family of devices has been developed by Berkeley Varitronics Systems of Metuchen, New Jersey. The **Wolfhound™-PRO** is a hand-held lightweight instrument consisting of a scanning narrow-band receiver equipped with a high-gain directional broadband antenna capable of guiding the user to the culprit sources; be they cellphones or cordless phones (including DECT and DECT 6.0). The **WatchHound™** product is a wall-mounted networked version equipped with a multi-band omni-directional antenna which can be networked over a wired LAN to upload chronological data in real-time for round-the-clock monitoring of same.

Wolfhound-PRO cell phone detector with DF Direction Finding antenna



WatchHound cell phone monitor is networked via LAN & wall-mountable