

Exploiting The Business Potential Of

INTEGRATING GSM & DCS 1800

C10

- Examining the viability of GSM/DCS 1800 integration to increase capacity and the potential of roaming
- Exploring the technical challenges and marketing potential of roaming between GSM, DCS 1800 and PCS 1900
- Developing cost effective dual band handsets
- Examining the network and RF implications of integration
- Devising effective handset marketing and distribution strategies

Tuesday 24th & Wednesday 25th September 1996

The Regents Park Marriott, London

MULTI-MODE MULTI-BAND HANDSET DEVELOPMENT

- Examining and overcoming the major challenges of developing dual rate, dual band GSM/DCS 1800 & GSM/PCS 1900 and dual mode GSM/DECT handsets
- Developing an integrated cellular/satellite handset
- Forecasting the future development of multi-mode multi-band handsets

Thursday 26th September 1996

The Copthorne Tara, London

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Exploiting The Business Potential Of **INTEGRATING GSM & DCS 1800**

Tuesday 24th & Wednesday 25th September 1996, London

Dear Colleague,

With the demand for mobile telephony services far exceeding even the most optimistic forecasts, the race is on not only to increase the available capacity but also offer greater potential for roaming. Integrating GSM and DCS 1800 is now recognised as one of the key solutions to both these challenges. The enhanced capacity of DCS 1800 coupled with GSM's potential for roaming and lower coverage costs make their integration an attractive proposition.

But exactly how do you make the business case for integrating GSM and DCS 1800? How does it compare with other strategies to optimise capacity? What factors are influencing the availability of dual band handsets and when are they likely to be resolved? When will dual band licences become available? How will you market the benefits of a dual band network and distribute the handsets? What market potential is there for an integrated GSM/PCS 1900 handset? And how does GSM/DCS 1800 integration fit into the evolution of UMTS?

If these are the questions on your mind at the moment then you should not miss this unique and exciting new conference. IIR have carried out extensive research in this area and have brought together an unrivalled panel of experts who will answer all the above questions and more besides. By attending you will leave armed with up-to-date information on the economic and technical viability of integrating GSM and DCS 1800 and of the key inhibitors in its development - dual band licence awards and dual band handsets.




And don't miss the one day post-conference briefing on:

MULTI-MODE MULTI-BAND HANDSET DEVELOPMENT

Thursday 26th September 1996

This information packed one day event is designed to tackle one of the most critical issues facing telecoms operators and manufacturers today. What will drive handset development? What are the technical and commercial challenges of developing fully integrated multi-mode multi-band handsets? Grasp this opportunity to gain a critical insight into the future and debate potentially revolutionary issues with both the speakers and delegates. This day is bookable separately from the 2 day Integrating GSM and DCS 1800 conference but you will receive a £100 discount if you book for all three days!

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Both myself and the speakers look forward to meeting you there!

Yours sincerely

Claire Paterson

Claire Paterson, Conference Producer - Telecoms and Technology

Tuesday 24th September 1996

9.00 Registration & Coffee

9.30 Chairman's Opening Address

John Darnbrough
Senior Consultant
ANALYSYS

9.40 **Examining The Key Drivers And Benefits To GSM And DCS 1800 Operators Of Integrating GSM And DCS 1800 Interfaces: Is Integration Really Needed?**

- * Who is driving take-up of this integration? Identifying and quantifying the benefits for each system
- * Evaluating the key drivers for the integration:
 - to overcome GSM spectrum shortage
 - to enable greater potential for national and international roaming
 - to provide lower cost rural coverage
- * To what extent will the integration of GSM and DCS 1800 be a short term solution to capacity constraints?
 - what are the other options and how do they compare?
- * What additional services will the integrated network be able to support?
 - will an integrated GSM/DCS 1800 network make it easier to support Internet and broadband services?
- * Examining the latest progress on work within ETSI to enable widescale interface interoperability
 - understanding the need to maintain open interfaces and protocols

Ali Pourtaheri

Director, Global Product Line Management GSM & DCS
ERICSSON RADIO SYSTEMS

10.20 **Examining Telia Mobitel's Strategy For Integrating GSM and DCS 1800 To Optimise Network Capacity**

- * Clarifying the situation today
- * Evaluating possible solutions
 - to what extent do they offer a long term solution?
- * Dual band operation: the only way forward?

Tommy Ljunggren

Head of Radio Network Planning and Optimisation
TELIA MOBITEL

11.00 Morning Coffee

11.20 **GSM/DCS 1800 Dual Band Handsets: Examining The Technical Challenges And Factors Affecting Their Development**

- * Determining the current status of dual band handset development and plans for the future
- * Analysing the technical challenges of developing the radio module of a dual band handset
- * Determining the adaptations necessary to the control baseband hardware
- * Examining the factors affecting the size, bulk and implications for battery life of a GSM/DCS 1800 handset
- * Will the new GSM speech encoder be included in the dual band handset?
- * What developments are currently taking place for integrating SIM cards and what further developments will be required?
- * Determining the drivers and inhibitors of developing GSM/DCS 1800 handsets

Dr George Sigl

Private Communications Systems
SIEMENS AG

12.00 **Examining The European Regulatory Environment And The Factors That Will Determine The Award Of GSM And DCS 1800 Licences**

- * Determining when additional DCS 1800 licences will be awarded and the factors that will be used to determine the award of dual band licences
- * Examining the differences in frequency allocation policy between countries within Europe and how this will change pre and post 1998

- * Clarifying the spectrum licensing situation in the UK, Germany and Sweden
 - what further DCS 1800 licences are likely to become available in the UK and Germany ?
 - what were the drivers behind the recent Swedish licence awards?
- * To what extent will allowing dual band licences impact competition within a country and the development of current networks?

Rainer Wegner

Frequency Manager

FEDERAL MINISTRY OF POSTS AND TELECOMMUNICATIONS, GERMANY

12.40 Lunch

2.00 **Examining The Market Potential Of Dual Band Networks**

- * Comparing and contrasting GSM and DCS 1800 from a commercial perspective
- * Forecasting cellular growth in Europe, US and selected Asia-Pacific countries
- * Determining the commercial opportunities for GSM and DCS 1800 integration, including pricing strategies and roaming opportunities

Keith Joseph

Senior Consultant

OVUM

2.40 **Dual Band Services - A Means Of Removing Capacity Bottlenecks Or Opportunities For Delivering New Services?**

- * Examining the changing needs and expectations of mobile users
 - estimating and characterising demand for capacity
- * Forecasting bottlenecks in Europe
 - where and when will demand exceed spectrum availability?
- * What demand will there be for new, capacity hungry mobile services?
- * What demand will there be for inter-technology roaming such as GSM/DCS 1900?
- * To what extent will mergers or alliances be likely between GSM and DCS 1800 operators?
- * What do regulators have to gain from offering dual band licences?

John Darnbrough

Senior Consultant

ANALYSYS

3.20 Afternoon Tea

3.40 **Examining Different Cell Architectures And The Planning Challenges Of A GSM/DCS 1800 Network: Achieving Effective Handovers Between Bands**

- * Identifying and evaluating different cell architectures for an integrated GSM/DCS 1800 network and the factors that impact their suitability in different operating environments
- * Assessing the likelihood and drivers for integrating GSM/DCS 1800 with a microcellular and picocellular system
 - how will the RF planning be affected?
- * Are there any idle-mode considerations?
- * Identifying the RF planning challenges of incorporating a GSM/DECT overlay
- * Identifying and examining the key handover parameters
- * Determining the strategies that a dual band operator can use to overcome the challenge of performing rapid handovers for in car use
- * Examining strategies for measuring and managing the handover performance

David Hills

Market Development Manager, Microcellular

MOTOROLA

4.20 Chairman's Closing Comments

4.30 End of Day One

To Register Call

Wednesday 25th September 1996

9.00 Registration and Coffee

9.30 Chairman's Opening Address

9.40 Developing Innovative Distribution and Marketing Strategies For Dual Band Services

- * Examining the challenges of promoting the use of a dual band network:
 - ensuring sufficient take up of handsets
- * How can you sell the benefits of a dual band network to the customer?
- * How will customers perceive the change?
- * Evaluating the appropriateness and cost effectiveness of alternative handset distribution strategies:
 - heavily subsidising them to new and existing customers
 - selling only dual band handsets to new customers
 - offering free dual band handsets to the best customers
- * Examining methodologies for segmenting the market and selecting your best customers
 - how will customers who are not given new handsets react?
- * Balancing the costs of subsidising handsets with the long term benefits of increased capacity, potential revenue from roaming and the lower costs of roll-out/coverage for DCS 1800 operators

William Ostrom

Head of Corporate Affairs
CELLNET

10.20 Examining The Technical Feasibility And Commercial Viability Of The Integration Of PCS 1900 Systems With GSM and/or DCS 1800

- * Examining the development of PCS 1900 in the US;
 - drivers & inhibitors
 - marketing and distribution strategies
 - customer awareness and acceptance
- * Examining the role and potential of SIM cards in PCS 1900 handsets
- * Learning from case studies of US PCS network operators and examining the global roaming strategies of APC and Vodafone
- * To what extent will plastic roaming satisfy the needs of the international traveller?
- * Examining the challenges of dual or triple band integration: GSM/DCS 1800/PCS 1900

Peter Nighswander

Senior Consultant
MTA-EMCI (USA)

11.00 Morning Coffee

11.20 Planning An Integrated GSM/DCS 1800 Network: Examining The Alternative Network Architectures And The Extent To Which Existing Infrastructure Can Be Used

- * Examining the extent to which existing infrastructure can be used;
 - BSCs, MSCs, BSSs, antennas, switching subsystem
- * Determining the software requirements of an integrated network
- * Examining the technical pros and cons and appropriateness of alternative roll-out strategies:
 - implementing two independent networks in close proximity
 - rolling out a GSM network with DCS 1800 in the hot spots
- * To what extent do the operational and maintenance challenges of a dual band network compare to those of a single network?

Inka Oksanen

System Marketing Manager
NOKIA TELECOMMUNICATIONS

12.00 Examining The Performance Of Dual Band Base Station Antennas: What Progress Is Being Made?

- * Analysing the relative performance of separate versus integrated antennas in the dual band network
- * Comparing and contrasting the business case for separate or integrated antennas
 - balancing the costs with the predicted performance improvement of the integrated antenna
- * Identifying the technical challenges of developing an integrated antenna and examining the progress to date
- * To what extent do the operational and maintenance challenges of dual band networks?
- * To what extent will environmental factors determine the choice?

Claes Beckman

Research Engineer, Base Station Antennas
ALLGON SYSTEMS AB

12.40 Lunch

2.00 Examining Swiss Telecom's Multi-Band Multi-Mode Network Strategy: GSM/DCS 1800/DECT

- * Determining the drivers for multi-band multi-mode networks:
 - comparing the performance and cost effectiveness of a dual band and dual mode network for in-building coverage and capacity increase
 - integrating GSM, DCS 1800 and DECT
 - combined numbering plans and services for fixed and mobile applications
- * Examining combined IN solutions for fixed and mobile applications
- * Determining the potential of operating DECT, GSM and DCS 1800 on a single GSM platform and the future market for multi-mode terminals and networks
 - when is it applicable to integrate the standards?
- * Examining private user applications:
 - mobile services with existing PSTN numbers
 - single bills for fixed and mobile services
- * Examining commercial usage for multi-band multi-mode networks:
 - PBX numbering plans in the network
 - least cost routing
- * Determining the need for terminals capable of supporting an integrated network solution

Peter Zbären

Project Manager
SWISS TELECOM

2.40 The Dual Band GSM/DCS 1800 Path to Increased Capacity - Comparing And Contrasting The Cost Effectiveness With Alternative Capacity Optimisation Strategies

- * Predicting future capacity requirements and the factors that will influence growth
- * Comparing and contrasting the key alternative strategies for increasing capacity:
 - integrating GSM and DCS 1800 networks
 - GSM micro/picocellular systems
 - GSM/DECT or DCS 1800/DECT integration
 - cell splitting and cell sectorisation
 - half rate
 - frequency re-use techniques
- * Quantifying each strategy's initial network and handset and ongoing operational and maintenance costs and balancing them with expected capacity gains and potential revenue
- * Evaluating the short and long term economic viability of implementing combined cell architectures or integrating GSM and DCS 1800 in both the long and short term

Per-Ola Backman

Product Manager, Radio Network
ERICSSON RADIO SYSTEMS

3.10 Afternoon Tea

3.30 Determining The Potential Of Dual Band Networks For The Provision Of Broadband Services

- * To what extent will the combined GSM/DCS 1800 network provide the capacity to offer broadband services?
 - understanding the current limiting factors and possible solutions that an integrated network would enable
- * Qualifying the market for value added services and identifying the key applications that will be enabled over an integrated GSM/DCS 1800 network

Paul Simmons

Senior Manager, Strategic Product Planning
NORTEL GSM WIRELESS NETWORKS

4.10 Examining The Role Of GSM/DCS 1800 Integration In The Evolution To UMTS

- * Defining UMTS and examining the potential of GSM and DCS 1800 as a basis for the UMTS standard
- * Examining the benefits and key features that alternative standards have to offer in the development of UMTS:
 - GSM, DCS 1800 & 1900, DECT, CDMA and satellite
 - will the new standard be fully interoperable with GSM/DCS 1800?
- * How does the evolution to UMTS affect the business case for developing dual mode networks and handsets
 - is it worth investing in?
 - how adaptable will it be in the future?

Nigel Walcot

Consultant
PA CONSULTING GROUP

4.50 Closing Summary And Comments From The Chairman

5.00 Close Of Conference

HANDSET DEVELOPMENT

Thursday 26th September 1996

9.00 Registration And Coffee

9.30 Chairman's Opening Address

Mike Barclay

Senior Consultant, RF and Mobile Communications
SCIENTIFIC GENERICS

9.40 **Examining The Business Drivers and Commercial Challenges Of Developing Dual Band GSM/DCS 1800 Handsets**

* Examining the operators' requirements of a GSM/DCS 1800 handset:

- a cost competitive fully integrated handset
- lightweight
- long battery life

* Determining the importance of accurate forecasts of volume sales of handsets to their commercial development

* Balancing the costs of handset development with the anticipated product life-cycle

- will the new GSM speech encoder be included in the dual band handset?

* Examining the latest progress in gaining type approvals and certification

Björn Krylander

Director Product Development

ERICSSON MOBILE COMMUNICATIONS

10.20 **Examining The Performance Of Dual Band Antennas: GSM/DCS 1800 And GSM/PCS 1900**

* Examining the operators' antenna requirements

* Comparing and contrasting the cost and performance factors of fixed and retractable antennas

* Examining the pros and cons of common or dual feed antenna connections

* Matching and diplexor considerations

* Examining the trade-off between antenna size and performance

Gunnar Engblom

Manager Research Group

ALLGON TA

Robert Berg

Manager RF Group

ALLGON TA

10.50 Morning Coffee

11.20 **Dual Mode Handsets: Learning From The Experience Of Developing a GSM/DECT Handset**

* Examining the implications of GSM/DECT handovers on the radio module

* What are the frequency generation considerations?

* Comparing and contrasting the challenges of integrating DECT with GSM and DCS 1800

- to what extent is it simpler with DCS 1800?

* Clarifying the likely cost and size of a dual mode handset and timescale for commercial production

* Examining the challenges of developing a triple mode GSM/DCS 1800/DECT handset

* Examining the latest progress in gaining type approvals and certification

* Examining the business cases for dual mode handsets;

- the operators' view
- the end-users' view

Dr Heinrich Flügel

Project Manager, Dual Mode Pre-development

HAGENUK TELECOM GMBH

12.00 Lunch

1.20 **Examining The Challenges Of Developing A Mobile Satellite Handset**

* Identifying and overcoming the key technical challenges of developing an economically viable GSM/satellite handset:

- size and cost of the terminal
- power and battery life

* How can the inherent incompatibility of TDMA and CDMA be overcome?

- what adaptations to the data structure are needed?

* Examining the economic considerations impacting the development of GSM/satellite handsets

- size of the market
- to what extent will the price of the handset be subsidised to

attract new customers?

* Examining ETSI's progress on the standard for GSM/satellite integration and its impact on the future of UMTS

* How are the administration, billing and customer care systems hindering the integration of GSM and satellite services

Dr Terence Dodgson

Principal Engineer

ORBITEL MOBILE COMMUNICATIONS

2.00 **Comparing and Contrasting Homodyne and Heterodyne Transceiver Architectures.**

* What must go in a multi-band transceiver?

* Examining how this is addressed by homodyne and heterodyne architectures

* Which is theoretically more cost effective?

* Identifying and overcoming the practical problems;

- LO signal leakage
- DC offsets and matching
- spurious responses
- dynamic range and linearity

* Which represents the best route from the outset of a design?

- design risk and cost
- time to market
- unit cost

Mike Barclay

Senior Consultant, RF and Mobile Communications

SCIENTIFIC GENERICS

Hans-Joachim Jentschel

Professor

TECHNICAL UNIVERSITY OF DRESDEN, GERMANY

3.15 Afternoon Tea

3.35 **Forecasting The Future Development Of Multi-Mode, Multi-Band Handsets**

* Which standards are most likely to be integrated into multi-mode multi-band handsets?

- GSM, DCS 1800 & 1900, CDMA, DECT, PHS, Satellite?

* Overcoming the challenges of developing an integrated GSM/DCS/CDMA handset and pinpointing the key technical challenges:

- the codec, modulation techniques and the transmitter

* Determining the key business considerations of developing an economically viable multi-mode multi-band handset

- how can you forecast the size of the market?
- how much are people prepared to pay for multi-mode multi-band handsets?

- who is going to subsidise the handsets?

* Examining the latest progress in gaining type approvals and certification

Speaker to be announced

4.15 Closing Comments From The Chairman

4.25 Close Of Briefing

PROFILE OF THE SPONSORS

Ericsson is the world leader in key areas of telecommunications, recognised for its advanced systems and products for fixed and mobile networks.

Based on the well-proven and almost universally-accepted GSM standard, Ericsson's GSM900, DCS 1800 and PCS 1900 systems offer the wireless operator a reliable, efficient and cost-effective solution with a wide range of subscriber services. Already today an integrated system for GSM 900 and DCS 1800 is available, including a common BSC with handover functions between the two frequencies. Integrated terminals are also under development.

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Tuesday 24th & Wednesday 25th September 1996
Multi-Mode Multi-Band Handset Development
Thursday 26th September 1996 **G24761**

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DATES: Integrating GSM & DCS 1800
24th & 25th September 1996

Handset Development
26th September 1996

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DUAL BAND BASE STATION ANTENNAS

Claes Beckman

Allgon System AB, 183 25 Täby, Sweden.

The recent growth in cellular communications has rapidly created a need for more radio channels. In order to make better use of the available frequency bands new access techniques such as TDMA (Time Division Multiple Access), FDMA (Frequency DMA) and CDMA (Code DMA) have been introduced. Still, the need for new channels is strong and new frequency bands have therefore been allocated for future wireless communication systems. These new communication systems, e.g. the European Personal Communication Network (PCN: 1710-1880MHz) and the North American Personal Communication System (PCS: 1850-1990MHz), use frequencies about twice as high as their predecessors (e.g. AMPS: 824-894MHz and GSM: 880-960MHz). However, at a time when our downtown areas already are littered with basestation antennas, operators are not keen to install more. Therefore, dual-band antennas have gained an increased interest. They would allow the operators to replace two antennas for separate frequency bands with one only, thus, reducing the windload of the towers and perhaps most importantly reducing the cost of installation.

Base station antennas

The first basestation antennas deployed for cellular communications were omni directional in the horizontal plane. However, as the need for capacity increased the networks were soon reconfigured to sectorized systems. Today a variety of sector antennas are offered with horizontal beam widths from about 30 to 120 degrees and gains from about 10 to 20 dBi.

Many different antenna elements are used in base station antennas. Important characteristics are of course good match over the band of interest and a wide enough horizontal diagram. Allgon's most popular antenna for AMPS, the so called ALP antenna is based on log-periodic elements (Allgon Log-Periodic). For a long time dipoles have been in use. Recently microstrip elements have become increasingly popular as they require less space and therefore may be built into much slimmer antennas.

Through the choice of antenna length and the selection of vertical element positions and excitations a broad range of antenna gains and vertical beam patterns can be achieved. The gain is mainly determined by the vertical and horizontal beam widths but reduced by losses in the feed network. The vertical beam width may approximately be determined through the equation λ/D , where λ is the wavelength and D is the length of the antenna.

In the vertical pattern special interest is put on (see fig 1): a rapid roll-off above the beam peak to a deep wide null, suppression of the first upper side lobe, slow roll-off and null fills below the beam peak and an electrical downward beam tilt. The rapid roll-off above the beam peak and the suppression of the first upper side lobe are to minimize interference into co-channel cells. The slow roll-off and null-fills below the beam peak ensures coverage very close to the cell site. The electrical down tilt is needed to provide good coverage within the desired cell and is preferred to mechanical down tilt as it is independent of horizontal angle. Adjustable electrical down tilt is also available today and may be of great importance in systems that are expanding their capacity through sectorization.

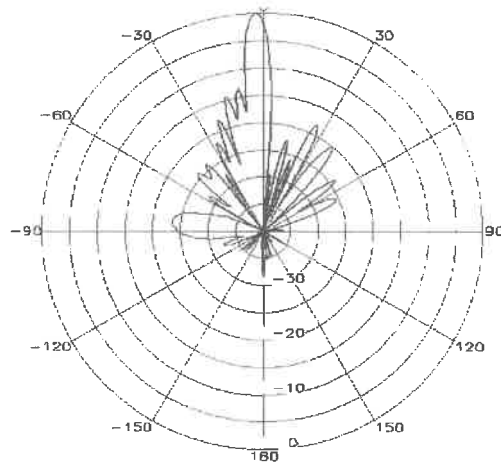


Figure 1. Typical elevation pattern for an Allgon METRO base station antenna with 65° horizontal beamwidth and 20 dBi gain.

All these features put high requirements on the feed network determining the excitations of the elements. The relative phases and amplitudes should not vary within in the band, which for cellular applications is typically about 10%. Two main types of feed networks can be found in base station antennas: corporate and series.

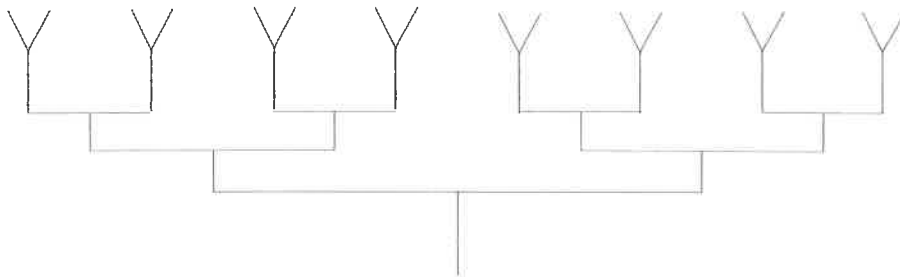


Figure 2. Corporate antenna feed network.

In corporate feed networks (Fig. 2) the antenna elements are fed by corporate power dividers. Such networks have far wider bandwidth and better power handling than series networks. Tough requirements are actually put on the power dividers and phase shifters even in single band base station antennas where the bandwidth is limited. If the requirements are not met the results may be higher side lobes and beam "squint" (the beam points in different directions for different frequencies).

Dual band antennas

A variety of dual band element designs have been suggested for base station antennas such as double dipoles, multilayer stacked discs, stacked patches, patches loaded with diodes, etc. Independent of the choice of element, the radiation patterns for both bands should be similar. In many previous dual band designs the ratio between the two frequency bands of interest have been less than about 1.5. However, in the applications discussed here the ratio is closer

to 2. This combined with a necessary bandwidth of almost 10% for each band makes the design even more complicated. Furthermore, if the element is to be used in an antenna array it has to be thin, easy to manufacture and of course cheap.

With an element that has about the same radiation patterns for both bands it is quite simple to build a base station antenna consisting of one element only. Such antennas are today of great interest for indoor coverage where e.g. GSM and DECT systems can be in use simultaneously. The stacked disc antenna element is an example of an element that can be used for this application even though it has a null in one direction (fig. 3).

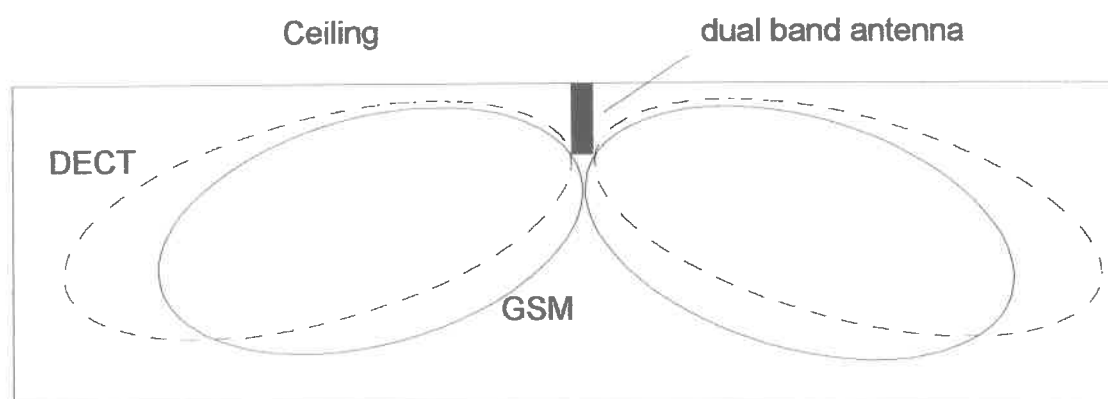


Figure 3. Illustration of a ceiling mounted dual band indoor antenna for GSM and DECT

Designing a base station antenna with high vertical gain is, however, a whole different "ball game". First of all the element diagram can not have any nulls. Remembering from above that the vertical beamwidth is mainly determined by the length of the antenna and the wavelength. As the wavelengths for the two frequencies differ with about a factor of 2 this means that if the same antenna length is to be used the two diagrams will have different beam widths. Furthermore, when the elements are vertically stacked in the aperture their intermediate distances in wavelengths will also be different for the two frequencies. As mentioned above the elements vertical positions and their excitations determine the vertical beam patterns, which means that there are some difficulties in achieving the desired features such as roll-off, null-fills, etc., for both beams. Depending on the design, the element can have either one or two inputs (i.e. one for each frequency). In the latter case one may choose to design two separate feed networks. However, feed networks require space and cost money and a single network may therefore be preferred.

Passive intermodulation is another problem present not mentioned above. These requirements are not easy to fulfill even for a single band base station antennas. In dual band antennas the upper frequency band is about a factor of 2 higher than the lower. Here, 2nd order harmonics may cause a real problem.

Conclusion

In this short paper I have tried to describe some of the benefits and technical challenges associated with dual band base station antennas. The benefits are great and so are indeed some of the technical difficulties. But, who said that designing antennas should be easy.