

Co-ordination between Broadband Fixed Wireless Access systems in the 28 and 42 GHz frequency bands

11th February 2000

Structure of the presentation

- ◆ Study objective and approach
- ◆ BFWA characteristics
- ◆ Interference analysis (worst case)
- ◆ Statistical modelling and analysis
- ◆ Conclusions and recommendations



Objective of the Study

To determine co-existence requirements for BFWA services:

- ◆ sharing the same spectrum in adjacent geographic areas
- ◆ using adjacent spectrum in the same geographic area



Approach taken

- ◆ Identify the various BFWA technologies, network architectures and services
- ◆ Determine worst case interference scenarios and co-ordination distances / guard bands
- ◆ Statistical modelling to determine realistic practical co-ordination criteria



BWFA Characteristics

- ◆ TDMA or FDMA
- ◆ TDD or FDD
- ◆ Symmetric or Asymmetric
- ◆ PMP or Mesh

Need to develop generic criteria to cater for all potential BWFA implementations



Interference Scenarios

- ◆ PMP Base station to PMP base station
- ◆ PMP Base station to subscriber station
- ◆ Subscriber station to subscriber station
- ◆ Subscriber station to PMP base station
- ◆ Between very high density networks

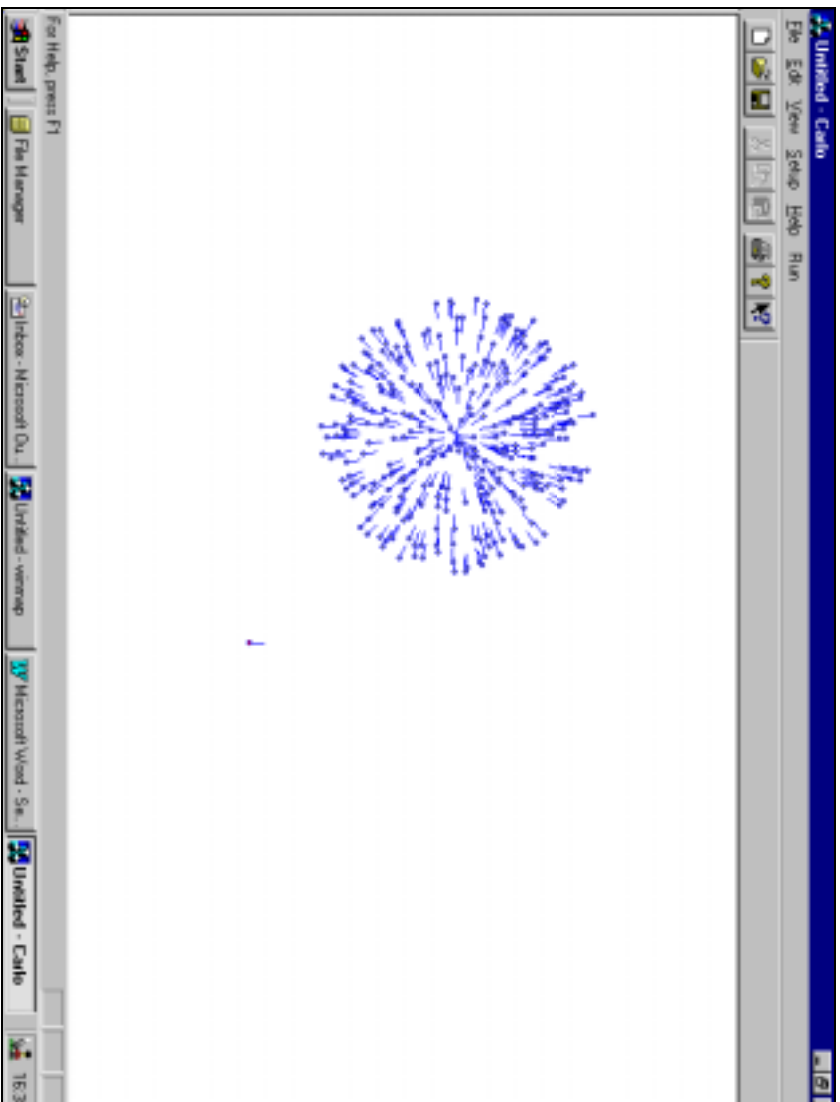


Worst Case Interference Scenario

- ◆ TDD into TDD (unsynchronised)
- ◆ Subscriber station into subscriber station (highest EIRP and antenna gain)
- ◆ BUT, probability is very low
- ◆ Worst case in practice likely to PMP Base to PMP Base, though high density subscriber networks may be significant



Monte Carlo Modelling (1)



AEGIS
spectrum engineering



Monte Carlo Modelling (2)

- ◆ Free space propagation assumed
- ◆ Various LOS probabilities considered
- ◆ All 5 interference scenarios analysed



Base Stn to Base Stn Interference

- ◆ Both stations elevated - high probability of line of sight interference path
- ◆ Wide antenna beams: 60 to 360 degrees
- ◆ ATPC means limited interference margin
- ◆ Interference knocks out whole cell, not just a single subscriber



Base to Base Co-ordination: 1

Reference base station parameters:

- ◆ 15 dBW EIRP in 28 MHz
(equals 0.5 dBW / MHz)
- ◆ 15 dBi antenna gain
- ◆ Single line of sight interferer
- ◆ Interference limit 10 dB below noise floor

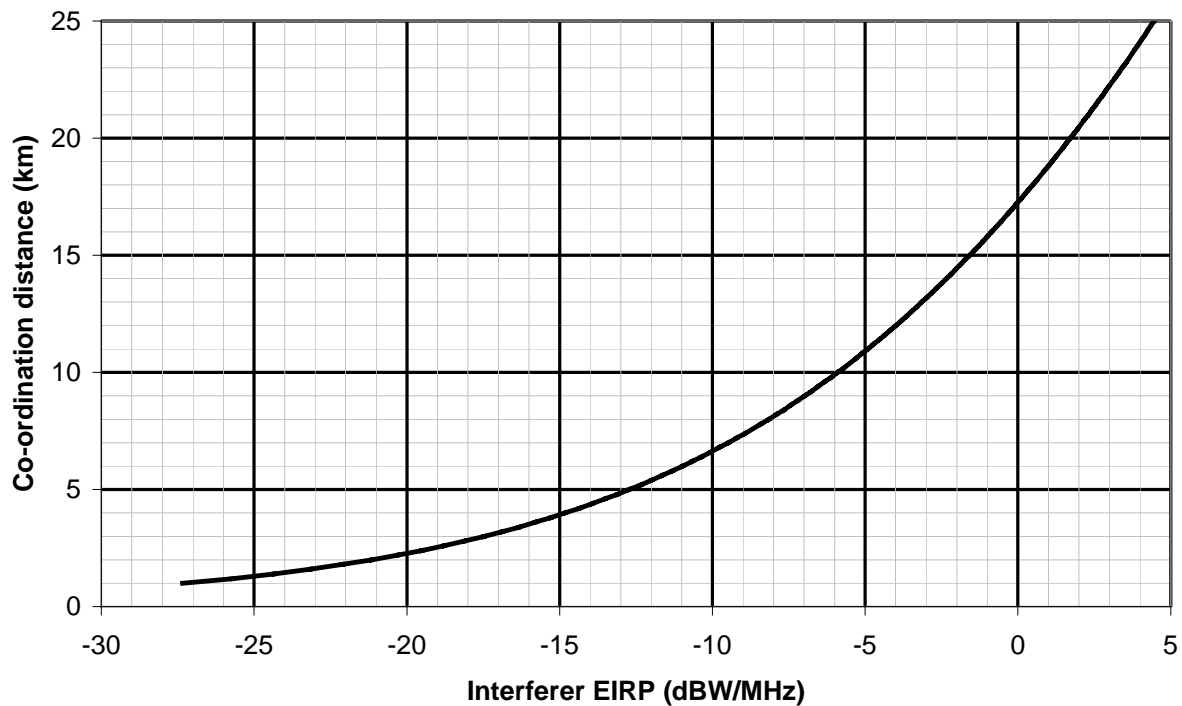


Base to Base Co-ordination: 2

- ◆ For reference base station, PFD limit *at the service area boundary* should not exceed:
 - 102.5 dBW/MHz/m² at 42 GHz
 - 98.5 dBW/MHz/m² at 28 GHz
- ◆ LOS Co-ordination distance from boundary:
 - 18 km at 42 GHz
 - 27.5 km at 28 GHz



Co-ordination distance vs EIRP



(42 GHz)

Subscriber station interference

- ◆ Same PFD limits apply but line of sight probability much lower
- ◆ Uplink ATPC further reduces risk
- ◆ With ATPC, LOS co-ordination distances from the service area boundary are:
 - 10 km at 42 GHz**
 - 16 km at 28 GHz**



Interference from very high density networks

- ◆ Co-ordination distances are smaller due to smaller cells and lower EIRPs
- ◆ To minimise co-ordination of individual stations, operators should avoid co-channel, co-polar operation within 5 km of adjoining service area boundaries



Interference between networks operating in the same region

- ◆ Unsynchronised TDD represents worst case
- ◆ Statistical modelling suggests guard band of one channel spacing per operator for mixed channel spacings, half this where the channel spacing is the same
- ◆ Improvements to transmit mask and receiver CW interference performance recommended



Conclusions: 1

- ◆ Co-ordination of individual stations required if boundary PFD exceeds:
 - ⇒ **-102.5 dBW/MHz/m² at 42 GHz**
 - ⇒ **- 98.5 dBW/MHz/m² at 28 GHz**
- ◆ Typical Line of Sight co-ordination distances:
 - ⇒ **18 km at 42 GHz**
 - ⇒ **27.5 km at 28 GHz**

Conclusions: 2

- ◆ Typical subscriber LOS co-ordination distance, with ATPC:
 - ⇒ **10 km at 42 GHz**
 - ⇒ **16 km at 28 GHz**
- ◆ Co-channel, co-polar operation should be avoided within **5 km** of service boundary

Conclusions: 3

◆ Guard band requirements:

⇒ Single channel spacing per operator where channel widths differ significantly

⇒ Half channel spacing where channel width the same

⇒ Improvements to transmitter mask floor (**to -56 dBc**) and receiver CW interf. performance (**apply beyond $\pm 2.5 f_c$**) recommended



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