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| Project | **IEEE 802.16 Broadband Wireless Access Working Group <http://ieee802.org/16>** |
| Title | **Rules for Co-existence of P-P and P-MP systems using different access methods in the same frequency band: ETSI TM4 Work Item DTR/TM04069** |
| Date Submitted | **2000-04-26** |
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| Re: | Liaison with ETSI – TM4 regarding work on co-existence rules.<br><br>This follows up the presentation of the ETSI-TM4 draft report on "Rules for Co-existence of P-P and P-MP systems using different access methods in the same frequency band" at Session 6 where considerable interest in this work was expressed by 802.16.2. As a result it was suggested that ETSI-TM4 supply a summary of the work which could be included in the draft Co-existence Recommended Practice.<br><br>The latest draft report is already available as liaison 802.16l-00/07r1 supplied for Session 6. |
| Abstract | Descriptive summary of work carried out under ETSI TM4 Work Item DTR/TM04069. |
| Purpose | A section and text is proposed for incorporation into the 802.16.2 Recommended Practice under the heading "Work of other Bodies". |
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# Rules for Co-existence of P-P and P-MP systems using different access methods in the same frequency band: ETSI TM4 Work Item DTR/TM04069

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## Introduction

At the Session 6 meeting in Albuquerque a liaison from ETSI TM4 was presented (See liaison contribution 802.16l-00/07r1) detailing the work carried out under Work Item DTR/04069 (Rules for Co-existence of P-P and P-MP systems using different access methods in the same frequency band ). The 802.16.2 group expressed interest in this work and therefore a summary of that work is presented here as proposed text for the Co-existence draft Recommended Practice document. A suggested paragraph heading of "Work in other Bodies " is made for section 7 of the latest draft P802.16.2/D6-00, April 2000 (Pre-Montreal).

Proposal for inclusion in the Recommended Practice:

## 7.x Work of Other Bodies

## 7.x.y ETSI WP-TM4

ETSI Working Party TM4 is developing a Technical Report for publication titled "Rules for Co-existence of P-P and P-MP systems using different access methods in the same frequency band".. This report covers the co-existence of Point to Multi-point FWA systems with other FWA systems and with Point to Point systems deployed in the same frequency band and in the same (or near) geographical area. It examines the interference scenarios and methodologies for evaluating interference, identifies critical parameters required for standards and looks at mitigation methods.

Certain key assumptions are made regarding the deployment of P-MP systems reflecting the expectation that a number of operators with frequency block assignments deploying a range of equipments utilising different multiple access methods and duplexing methods are possible. It is recognised that as a result of facilitating co-existence between the operators, some deployment constraints may result.

### 7.x.y.1 Interference Classes

Based upon typical Fixed Service frequency plans a set of interference classes are identified. These are summarised below:

| P-MP to P-MP Co-existence | | P-MP to P-P Co-existence | |
|---|---|---|---|
| Class A1 | CS interferer into victim TS *(down/down adjacency)* | Class B1 | CS interferer into victim PP receiver *(P-MP Down/PP Rx adjacency)* |
| Class A2 | TS interferer into victim CS *(up/up adjacency)* | Class B2 | PP interferer into victim CS *(PP Tx/P-MP Up adjacency* |
| Class A3 | CS interferer into victim CS *(down/up adjacency)* | Class B3 | TS interferer into victim PP receiver *(P-MP Up/PP Rx adjacency)* |
| Class A4 | TS interferer into TS victim *(up/down adjacency)* | Class B4 | PP interferer into victim TS *(PP Tx/P-MP Down adjacency)* |

Having identified the interference classes and with typical frequency plans in mind, the range of interference scenarios are examined against a number of system possibilities. For example in the case of two P-MP TDD systems deployed by adjacent operators all classes A1 to A4 above can been seen to be possible to a greater or lesser extent. For P-MP FDD systems, specific cases only of classes A1 to A4 are appropriate. For example, if

only classes A1 and A2 are appropriate. In the case of P-MP and P-P deployment classes B1 to B4 above all apply to some extent.

### 7.x.y.2 Deployment Scenario Assumptions

In order to evaluate the degree of co-existence between P-MP systems, the following assumptions are made:

- one cell from each of the two systems is considered, with a distance between hubs that can be varied from zero (completely overlapping) to a figure greater than the maximum cell dimension.
- the whole cell area is covered with the frequency channel adjacent to the frequency block (channel) assigned to another operator.
- all radio paths are in perfect LOS.

### 7.x.y.3 Methodology

Using these assumptions all the potential interference scenarios are evaluated, disregarding the potential mitigation due to sector antenna, the usage of other frequency/polarisation channels and cell pattern deployment. Expressions for the potential interference are developed using the concept of Net Filter Discrimination (NFD) in order to estimate the amount of interference (coming from the interfering channel) falling within the receiver filter of the useful system.

These expressions can then be used for each class of interference to assess the following "measures of co-existence":

- Class A1: the percentage of cell area (%KO) where the interference generated from the interferer CS towards the victim TS produces a C/I smaller than a given C/I threshold.
- Class A2: the percentage of cell area (%KO) where the interference generated from an interferer TS towards the useful CS produces a C/I smaller than a given threshold.
- Class A3: the minimum distance between the two CS's (interferer and victim) in order to achieve the C/I threshold.
- Class A4: the percentage of cell area (%KO) where the interference generated by an interferer TS towards the victim TS's produces a C/I smaller than a given threshold.

The methodology and the interference parameters summarised above enable evaluation of the co-existence (interference) problems from both the analytical perspective (one simple equation) and the numerical point of view (complete evaluation of C/I over the cell area, using a software tool).

### 7.x.y.4 Resultant Considerations

In carrying out this evaluation a number of considerations have come to light associated with the interference classes identified above. These are summarised below:
Class A1 and A2:

- Site sharing improves co-existence possibilities.
- Site sharing helps to reduce the guard band requirements (possibly zero)
- Near site sharing helps also.
- With no site sharing, at least one channel equivalent guard band required between adjacent operator assignments.
- Similar EIRP's at the Central Station reduces interference.

Class A3:

- Site sharing not possible, therefore minimum seperation required.
- Separation distance can be minimised with a guard band.

Class A4:

Additionally it is noted that use of RTPC, equal channelisation schemes and similar receiver performance reduces the guard band requirements. Defined uplink and downlink frequency sub-band planning reduces the number of interference scenarios for FDD P-MP systems.

Classes B1 and B2:

- Site sharing not possible, therefore minimum distance and angular decoupling required.
- Distance and angular separation can be minimized with a guard band.

Classes B3 and B4:

- Site sharing not possible.
- Geometrical decoupling impossible to achieve due to the spread of TS over the P-MP deployment area.
- High frequency separation required, usually more than one channel equivalent guard band.

### 7.x.y.5 Worked Examples

Finally the report provides a number of worked examples for P-MP systems in lower frequency bands and in the 26GHz band. These examples include FDD systems employing TDMA and FDMA methods and the lower frequency example examines the impact of utilising “standard” performance characteristics versus “actual” or typical characteristics. The results show a range of possibilities ranging from zero guard band for near identical systems with good co-operation between operators to the need for two equivalent channel guard bands where non-identical systems are deployed and poor co-operation exists between operators.