

1 **Coexistence CG's Recommendation to IEEE 802.20 WG**

2

3 **1 Background**

4 In its July meeting, 802.20 WG chose to form a Coexistence Correspondence Group
5 (CCG) to "study and create a consensus recommendation on how to address the issues of
6 coexistence of future 802.20 systems with other wireless technologies deployed in the
7 licensed bands below 3.5 GHz." The goal of the CCG, therefore, was to come up with a
8 recommendation on the best way to address coexistence within the WG. The coexistence
9 analyses themselves are outside the scope of the CCG and are left to the coexistence-
10 related document(s) that the WG is likely to produce.

11 **2 Organization and method of the coexistence work**

12 Due to the importance of coexistence and its role in the success of the future 802.20
13 standard, it is recommended that the 802.20 WG establish a Study Group (SG) to develop
14 a Coexistence PAR and a charter for a Coexistence Task Group (CTG) that would focus
15 on performing coexistence analyses and providing deployment guidelines. As a first step,
16 it is recommended that the 802.20 WG at its November 2003 Plenary session, form a
17 Coexistence Study Group (CSG), with the goal of developing the PAR and CTG charter.

18 **2.1 Coexistence Study Group**

19 It is recommended that the CSG start its work at January interim session. The CSG will
20 draft a PAR and submit it to the 802 Executive Committee for approval. It is, therefore,
21 recommended that the WG task the CSG to draft a PAR as its first assignment.

22 **2.2 Coexistence Task Group**

23 The CSG should also propose a charter for the CTG which, in addition to working on a
24 Coexistence specification, shall include the establishment of liaisons with relevant
25 entities in a timely manner with the purpose of communicating the work progress and
26 exchanging information. It is anticipated that coexistence issues between technologies
27 specified by other SDOs will be resolved in a cooperative manner.
28

29 **2.3 Document structure**

30 It is recommended that the "Scope" section of the PAR to be drafted by CSG include, as
31 a minimum, all of the elements recommended in this document. The document(s) to be
32 produced by the CTG should also reflect the same. Specifically, they should include the
33 elements contained in section 4 of this document. The internal structure of the
34 document(s) is recommended to be left to the CTG to decide.

35 **3 Scope of coexistence task group**

36 The 802.20 PAR envisions both TDD and FDD variants for the upcoming standards. It is
37 likely that technologies based on these two variants will be deployed in bands below 3.5

1 GHz that allow such operation. It is also likely that 802.20 TDD and FDD systems will
2 be deployed as co-channel in geographically adjacent areas or as adjacent-channel in
3 spectrally adjacent manner in the same area. Since such adjacency could cause
4 coexistence problems it is, therefore, recommended that the coexistence work undertaken
5 by 802.20 include coexistence of 802.20 TDD and FDD variants.
6

7 The spectrum below 3.5 GHz allocated to the Mobile Service is mostly occupied by
8 incumbents. It is likely that future 802.20 systems share at least some of the bands with
9 these incumbents as co-channel in geographically adjacent areas or in spectrally adjacent
10 manner in the same area. Since it would be impractical to analyze coexistence of future
11 802.20 systems with every existing technology deployed below 3.5 GHz, it is, therefore,
12 recommended that the coexistence task group work will undertake include coexistence of
13 802.20 systems with other technologies deployed in “target bands”. “Target bands” are
14 the bands that 802.20 systems are more likely to be deployed in, in the near future.
15 Coexistence in all of these “target bands” will be included in the scope of the coexistence
16 document produced by the CTG.
17

18 **4 Elements of coexistence work**

19 **4.1 Equipment characteristics**

20 Base station, repeater and mobile terminal characteristics, including the following basic
21 characteristics, shall be provided to and utilized by the CTG to perform coexistence
22 analyses

23 **4.1.1 Receiver**

24 FER Sensitivity (dBm)
25 Antenna gain (dBi)
26 Co-channel rejection ratio (dB)
27 Adjacent channel immunity (dBm)
28 Intermodulation immunity (dBm)
29 Blocking immunity (dBm)
30 IF filter characteristics (ENBW)

31 **4.1.2 Transmitter**

32 Occupied bandwidth (MHz)
33 Adjacent and alternate adjacent channel power (dBm)
34 Out of band emission mask
35 Spurious emissions (dBm)
36 Antenna gain (dBi)

37 **4.2 Interference scenarios**

38 It is recommended that the 802.20 coexistence document include section(s) on possible
39 interference scenarios both among 802.20 variants as well as between 802.20 and non-
40 802.20 systems in the “target bands”.

1 **4.3 Deployment guidelines**

2 It is recommended that the CTG perform necessary calculations and simulations to arrive
3 at deployment guidelines that reduce or eliminate unacceptable interference for the
4 analyzed coexistence scenarios in “target bands”.

5 **4.4 References to the works of other bodies**

6 It is recommended that the 802.20 coexistence document include references to the works
7 of other bodies, inside or outside 802, which are relevant to the coexistence work in
8 802.20.
9

10 **5 Relationship of coexistence with other ongoing work in** 11 **802.20**

12 **5.1 Coexistence and requirements**

13 Coexistence guidelines and coordination processes depend on the regulatory regime of
14 the countries that future 802.20 systems will be deployed in. These regulatory regimes
15 often put restrictions on or otherwise require coexistence or coordination processes for
16 various bands and services. Future 802.20 systems, therefore, are required to comply with
17 those regulatory regimes. It is, therefore, recommended that the requirements CG take
18 into consideration the need for 802.20 systems to meet specific regulatory requirements
19 in the markets in which they are deployed.

20 **5.2 Coexistence and evaluation criteria**

21 The Correspondence Group discussed differing views on this issue at length but did not
22 reach consensus on the issue of requiring the inclusion of coexistence into the proposal
23 evaluation process. The Evaluation Criteria CG, however, may want to take this issue
24 into consideration in their development of the criteria for evaluating future proposals for
25 the 802.20 standard.
26

27 The two differing viewpoints the CG received on this issue are included in the Appendix.

28 **5.3 Coexistence and channel modeling**

29 Future coexistence work of 802.20 is not expected to have an impact on the selection of
30 channel models for testing the 802.20 specifications. The output of the channel model
31 CG, however, could be used in the process of selecting propagation model(s) for the
32 specified coexistence scenarios.

33 **5.4 Coexistence and traffic modeling**

34 Future coexistence work of 802.20 is not expected to have an impact on the selection of
35 traffic models for testing the 802.20 specifications.
36

1 **5.5 Coexistence and minimum performance standards**

2 The 802.20 minimum performance specifications are an essential input for the
3 coexistence work that will be undertaken under an "802.20 Coexistence PAR". We
4 believe that these specifications, however, must be created by the 802.20 Working Group
5 in the process of developing the 802.20 standard. The document produced under the
6 separate "802.20 Coexistence PAR" would not include the minimum performance
7 standards.

8 **Appendix**

9 This appendix contains comments submitted to the Coexistence CG regarding section 5.2.

10

11 Joanne Wilson:

12 How would this be demonstrated? Would technology proponents have to identify
13 which technologies they could coexist with and would they then have to provide a
14 coexistence analysis and/or simulations to back up this claim. This sounds like a
15 large burden on proponents without a meaningful way of comparing results. For
16 example, what if two proposals included claims that they each could coexist well,
17 but with different technologies in the adjacent band. There would be no basis of
18 comparing those two claims and incorporating that into the evaluation of the
19 systems.

20 Joanne Wilson:

21 The Evaluation CG may want to take this point into consideration in their
22 development of the criteria for evaluating future proposals for the 802.20
23 standard.

24

25 Jim Tomcick:

26 The third sentence states co-existence is seldom considered as an air interface
27 evaluation criterion in licensed bands. I disagree with this statement. Other
28 organization do review co-existence in evaluating the feasibility of emerging
29 standards proposals. It is an integral part of the air interface development process.
30 For example ITU-R has produced M.1225 which details methods for evaluating
31 technology proposals. The guidelines could be incorporated into the 802.20
32 evaluation and proposal process.

33

34 Coexistence Considerations are an Integral Part of the 802.20 Evaluation and
35 Technology Selection Process.

36

37 Coexistence considerations can have negative impacts on spectral efficiency if
38 (for example) large guard bands are needed to insure that already deployed
39 systems are not adversely impacted. This may reduce the ability of proposed
40 systems to meet the spectral efficiency requirements currently in debate by the
41 requirements CG.

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46

If, instead 802.20 systems have to coexist by reducing radiated power, this may also reduce the ability of a proposed technology to meet the cell-site reuse requirement in the 802.20 project documents.

Different technologies proposed for 802.20 standardization may indeed have different coexistence characteristics and this fact can influence whether or not a candidate technology is favored or eventually selected for the 802.20 standard. I have stated previously that coexistence needs to be addressed in the Evaluation criteria. I continue to hold that view.

I believe that our (coex CG's) recommendation to the Evaluation Criteria CG is that the evaluation criteria needs to contain:

- a. a list of several likely incumbent technologies where 802.20 technology proposers will be required to provide coexistence evaluations. I suggest that we evaluate 802.20 against IS-95, cdma2000, and WCDMA (both FDD and TDD versions).
 - b. definition of the detailed coexistence scenarios of interest for the technologies selected in (a). There is a great deal of previous work in this area, so this is more of a "selection" from the possibilities, than a development of new work.
 - c. definition of canonical rf transmitter/receiver modeling structures so that coexistence studies may be performed in a coherent manner (there is much material on this in existence)
 - d. definition of the coexistence parameters to be reported to assure that 802.20 systems are deployable, and when deployed, that they will meet the promised requirements of the PAR without adverse impact to already deployed systems.
 - e. a requirement that technology proposers provide an accounting of how their proposed technology will coexist under the defined conditions, with an incumbent system.
- For example each technology proposer could be required to provide 2 items for each technology/coexistence scenario; (1) a mapping of Capacity Degradation vs. Adjacent Channel Interference Ratio (ACIR), and (2) a mapping of ACIR to center frequency spacing. This will allow evaluation of the needed guard bands to achieve a required capacity degradation.
- f. A metric for evaluation of different proposals, such as the number of "carriers" that could be deployed in a given frequency block.

We should also include a section on impacts of coexistence on the eventual 802.20 specification. It will be necessary at some point to define basic RF

1 parameters and minimum performance for anticipated deployments of 802.20.
2 These should be included (as far as we know them) in the written 802.20
3 standard. As new bands/deployment possibilities emerge, future amendments to
4 the baseline 802.20 specification may be made to accommodate different
5 regulatory domains and anticipated deployments. There is ample precedent for
6 this approach in other 802 working groups.
7

8 Joanne Wilson:

9 I continue to disagree with Jim Tomcik's proposal for how to
10 incorporate coexistence analysis into the evaluation of candidate technologies.
11 Now that he's added more detail, it should be fairly obvious that it tremendously
12 increases the amount of work required to create a technology proposal for the
13 802.20 standard. Additionally, Jim does not propose how all this information
14 would be used in the evaluation process or how there would be any assurance that
15 the comparisons with the various other systems would be done consistently and
16 accurately.
17

18