

## **VIA ELECTRONIC FILING**

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### **ENCINA COMMUNICATIONS CORPORATION COMMENTS REGARDING GN DOCKET NUMBERS 18-122 AND 17-183 EXPANDING FLEXIBLE USE IN MID-BAND SPECTRUM**

#### **I. INTRODUCTION**

1. There is a critical need for more spectrum, and because spectrum cannot be manufactured the only solution is to use existing spectrum more efficiently.
2. To do otherwise would not solve the problem -- it would be disruptive to existing Part 101 license holders and would simply “rob Peter to pay Paul.” With the spectrum crisis it is now time to operate smarter.
3. Under this proposal new licensees can deploy broadband networks with dramatically improved efficiencies and existing licensees can operate as they are, or choose to upgrade.
4. Today Part 101 licensees only operate PtP in the frequency domain. The solution is to operate in three domains: Frequency, Time and Space. This makes it possible for Part 101 licensees to deploy additional Fixed Service (FS) microwave links, unlicensed Wi-Fi and 5G mobile networks without causing harmful interference to existing FS operators, new FS applicants, and Fixed Satellite Service (FSS) operators.

#### **II. MORE EFFICIENT AND COST-EFFECTIVE USE OF MICROWAVE SPECTRUM**

##### **A. Licensed Fixed Station(s) Communicating with other Licensed Fixed Stations**

5. Increased Efficiency -- Microwave links operating PtP-FDD have traffic loads which for very large percentages of the time are a small fraction of the link’s capacity, which means that for a very large percent of the time the spectrum is significantly underutilized. By operating a licensed station PtMP-TDMA-MIMO the station can

dramatically increase the effective use of spectrum making it possible to dramatically increase the number of served fixed locations.

6. No Interference -- Prior to licensing, Stations 1 and 2 of a PtP link would have had to comply with the frequency coordination procedures (Rule 101.103) and to have shown that the radiated power (EIRP) at all angles around each station would not cause harmful interference to existing licensees and applicants with previously filed applications.

7. Multi-Point Operation – When a link is operated PtP it only uses the EIRP on the antenna centerline; the EIRP at other angles is unused, it is wasted. By using TDMA the licensee can communicate with other licensed station locations (which were previously shown by prior coordination notices to cause no harmful interference) on the center line and at other angles around Stations 1 and 2.

8. Conserving Spectrum -- It has been shown above that operators of licensed PtP stations can significantly increase the number of served locations by putting to productive use off-centerline radiation and thereby conserve precious Part 101 spectrum.

#### **B. Licensed Fixed Stations Communicating with Unlicensed Nomadic (WiFi) and/or Mobile Devices**

9. Safe Operation -- Unlicensed nomadic or mobile devices can be safely operated by a PtP licensee from either or both of the licensed Stations 1 and 2 provided:

i. The unlicensed nomadic and mobile devices are only permitted to transmit after they are connected to a licensed station identifying itself as having the capability of communicating with unlicensed nomadic or mobile devices,

ii. The maximum antenna gain of the unlicensed device is limited to 6 dBi,

iii. The unlicensed device EIRP is limited to 36 dBm,

iv. The interference from any unlicensed device arriving at a licensed or new license applicant's station is less than the interference from the licensed Stations 1 or 2.

10. Secondary Status – The unlicensed devices are secondary and therefore must accept all interference.

#### **C. Antennas**

11. Minimize Blocking -- To take full advantage of the more efficient and effective use of spectrum, network operators need to be able to deploy sector and small directional antennas (especially in the 4 GHz and 6 GHz bands) to: (a) minimize the blockage of new license applicants, (b) lower costs, (c) mitigate aesthetic issues, and (d) minimize wind loading issues.

12. Sector Antennas -- It is well known by the industry that (for the same EIRP) it is much more difficult to prior coordinate a wide beam sector antenna than a narrow beam antenna, but it is not generally understood that once coordinated and licensed, a sector antenna serving multiple stations blocks far fewer new applicants than the use of multiple narrow beam antennas -- because the higher gain of narrow beam antennas prevents new licensed applicants from successfully prior coordinating.

13. Minimal Rule Change -- For the reasons given in paragraphs 11 and 13 above, we recommend the following minor changes to Rule 101.115(a):

*~~"Unless otherwise authorized upon specific request by the applicant, each s~~ Stations ~~authorized under the rules of this part must employ a directional antenna adjusted with the center of the major lobe of radiation in the horizontal plane directed toward the receiving station with which it communicates: provided, however, where a station communicates with more than one point, a multi- or omni-directional antenna may be is~~ authorized if necessary. New Periscope antenna systems will not, under ordinary circumstances, be authorized."*

14. Small Directional Antennas -- Rule 101.115(b) addresses the use of directional antennas and Exhibit A shows how antennas of any size can be safely deployed and permitted by simply adding the following footnote:

*15. "Non-compliant antennas (antennas not meeting Category A specifications) are authorized on the condition that they must not cause harmful interference and must accept harmful interference pursuant to Rules 101.103 and 101.115(c). When Rule 101.115(c) requires the licensee of a station using a non-compliant antenna system to upgrade to a higher performance antenna, the licensee must comply with the requirement within thirty (30) days."*

16. By this simple footnote, the Commission would safely allow smaller antennas that will not cause harmful interference to existing licensed stations or block new applicants.

#### **D. Minimum Path Length**

17. Rule 101.143 -- We recommend that for PtMP networks, the EIRP below the minimum path length specified in Rule 101.143 be changed to a maximum of 50 dBm, to make it possible to operate at all distances below the minimum path length.

### **III. SUMMARY**

18. Because of the severity of the spectrum crisis, we must use existing spectrum much more efficiently (as described above). To do otherwise would not solve the problem.

Respectfully submitted.

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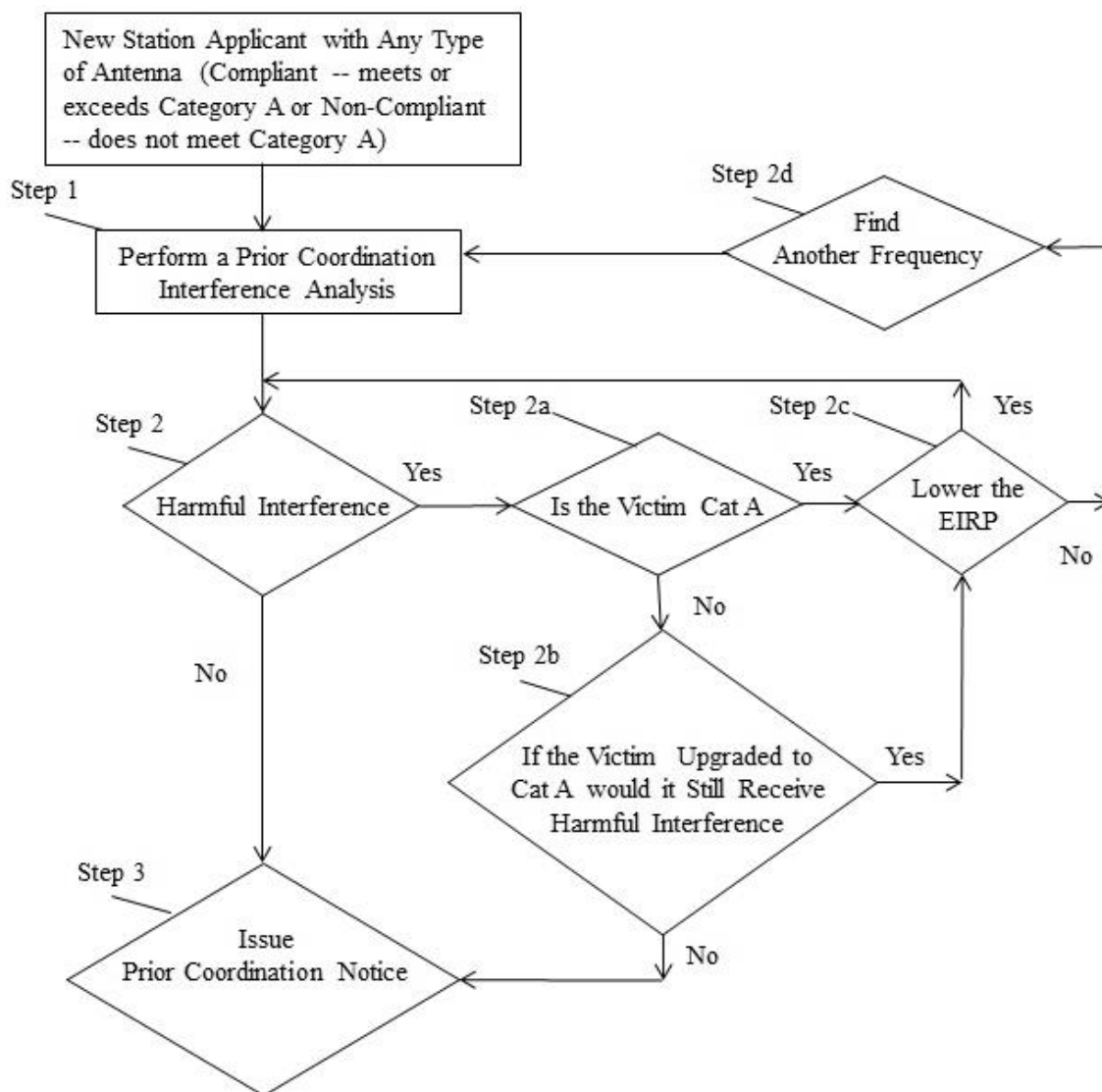
## **EXHIBIT A**

A review of the Rules using the decision tree flow diagrams shows that small (non-compliant) antennas with any antenna pattern and size can be safely used under existing Rules 101.103 and 101.115.

### **Review of Existing Rules**

A walk-through of Figure 1 is given below.

**Figure 1: Initial Prior Coordination Successful/Unsuccessful**



Step 1.

The new applicant, with any type of antenna, performs a prior coordination interference analysis in accordance with Rule 101.103.

Step 2.

If the prior coordination interference analysis showed no interference issues, the applicant would proceed to Step 3 and issue a Prior Coordination Notice (PCN).

If the prior coordination interference analysis showed there was harmful interference, the applicant would proceed to Step 2a.

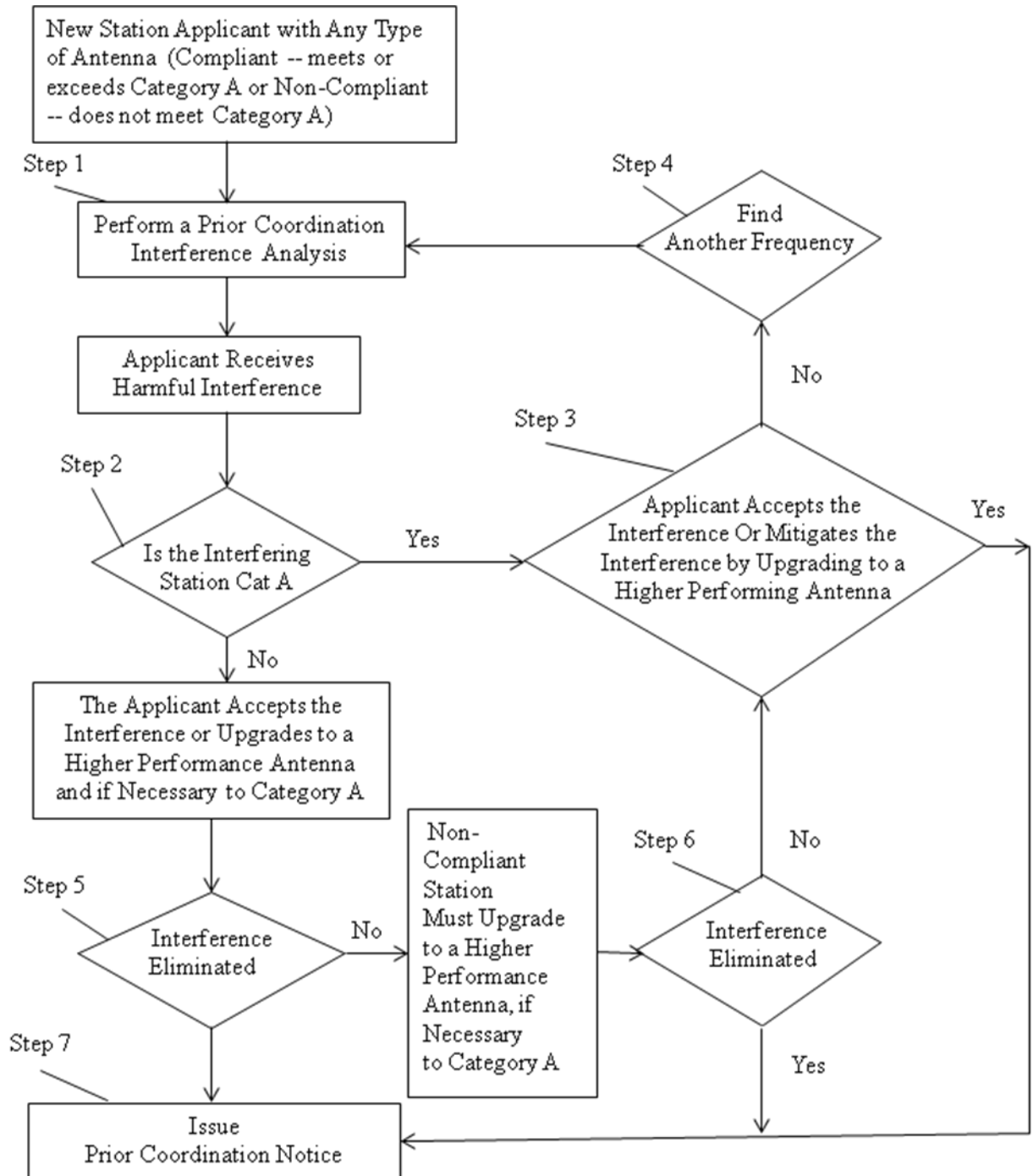
Step 2a.

If the victim station(s) were authorized with compliant (Category A) antennas, the applicant would proceed to Step 2c where the applicant would have to decide if the interference could be eliminated by increasing the applicant's antenna performance (size) or by reducing the power applied to the antenna (or both), and still meet the new applicant's path performance and/or cost requirements. If yes, the applicant would proceed via Step 2 to Step 3 and issue a PCN. If the answer was no, the applicant would proceed to Step 2d and find another frequency before returning to Step 1.

If the victim station were authorized with a non-compliant antenna, the victim would, as required by Rule 101.115 (c), (including the proposed footnote) have to either accept the interference or upgrade the antenna performance, if necessary to Category A. If this eliminated the interference issue, the applicant would proceed to Step 3. However, if the victim upgraded to a Category A antenna and the interference still existed, the applicant would proceed to Step 2c. If at Step 2c the applicant could not lower the EIRP and meet the applicant's path performance and/or cost requirements, the applicant would have to proceed to Step 2d and choose another frequency before returning to Step 1.

The case where the new applicant has shown through the prior coordination process that it will not *cause* harmful interference, but that it would *receive* harmful interference, is addressed in Figure 2. A walkthrough of Figure 2 is given below.

**Figure 2: Applicant Does Not Cause Interference but Receives Interference**



**Step 1.**

The new applicant, with any type of antenna, performs a prior coordination interference analysis in accordance with Rule 101.103. The prior coordination interference analysis shows interference into the applicant's receiver. The applicant proceeds to Step 2.

**Step 2.**

The applicant determines if the interfering station is authorized with a compliant (Category A) or a non-compliant antenna. If a Category A antenna, the applicant proceeds to Step 3.

**Step 3.**

Applicant must either accept the interference or attempt to eliminate the interference by upgrading to a higher performance (larger) antenna. If the applicant can accept the interference or can accept a higher performance (larger) antenna then the applicant proceeds to Step 7 (Issue PCN). If the applicant cannot accept the interference or a higher performance (larger) antenna, the applicant must proceed via Step 4 (Find Another Frequency) to Step 1. If at Step 2 the interfering station was determined to be authorized with a non-compliant antenna, because the new applicant is also using a non-compliant antenna, the new applicant must either accept the interference or attempt to mitigate the interference by upgrading to a higher performance (larger) antenna, including up to Category A. If at Step 5 the interference was eliminated, proceed to step 7 (Issue PCN). If having upgraded to Category A the new applicant still receives harmful interference, then pursuant to Rule 101.115 (c) the non-compliant station is required to upgrade the antenna performance, if necessary to Category A. If the interference is eliminated, the applicant proceeds to Step 7 and issues a PCN. If the interference is not eliminated with a Category A antenna, the applicant proceeds to Step 3.

**Summary and Conclusions**

A review of the Rules using the decision tree flow diagrams shows that small (non-compliant) antennas with any antenna pattern and size can be safely used under existing Rules 101.103 and 101.115.