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Presentation to

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October 2, 2008

Technical Rules Must Be Guided By Core Interference Avoidance Principles

- New users of spectrum must not impede or interfere with existing uses that serve the public interest.
  - This “first in time, first in right” doctrine, which the Commission has described as “the mainstay of interference protection” has long governed the sharing of frequencies.
  - Overlooking the “first in time, first in right” doctrine would be akin to telling CMRS providers that, in order to make room for a new competitor, they are suddenly entitled to limited interference protection.
- The definition of harmful interference is not limited to blanketing interference. On its face it includes serious degradation, obstruction, or repeated interruption of a radiocommunication service. It does not depend on “averages.” 47 CFR § 2.1(c).
- The Commission must avoid leaving the impression that it first makes a decision on whether to license some new technology and then creates a justification post hoc by manipulating the way it judges harmful interference.
  - Orders such as these not only exacerbate regulatory uncertainty, they risk undermining public confidence in the Commission’s work.

The AWS-2 and AWS-3 Service Rule NPRMs Detailed the Importance of Protecting Adjacent Licensees from Interference

- "[W]e are concerned about potential interference from handsets transmitting in the 1915-1920 MHz band to PCS handsets receiving in the 1930-1990 MHz band. . . [W]e seek comment on the adoption of strict out-of-band emission limits (paragraph 91) and reduced power limits (paragraph 107) for handsets operating in the 1915-1920 MHz band." *See* FCC 04-218 at para. 86 (Sep. 24, 2004).

- "[U]plink transmissions may raise potentially significant interference issues associated with the presence of both mobile and base station transmissions in the band. We therefore seek comment on methods to address such concerns, including the use of power limits and out-of-band emissions restrictions." *See* FCC 07-164 at para. 2 (Sep. 19, 2007).

The Burden is on TDD Proponents to Conclusively Demonstrate they Will Not Interfere With Other Users

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- In the AWS-3 Service Rules NPRM, the FCC sought comment on "technical and operational rules to protect these various services from harmful interference" and repeatedly expressed concerns about interference "if we were to permit mobile transmissions in the 2155-2175 MHz band." FCC 07-164 at paras. 49-51 (Sep. 19, 2007).
  - "[A]dditional flexibility may come at the cost of additional interference protections that would severely restrict the utility of mobile transmission in the band." *Id.* at para. 11.
- In the AWS-1 rulemaking, for example, the FCC made interference protection a condition on even considering the placement of mobile transmissions in close proximity to mobile receives.
  - "If proponents of TDD *can conclusively demonstrate* that portions of this spectrum could be used for such transmission *without causing interference* to Federal government users or other licensees, we *could* revisit this issue at a future date." FCC 03-251 at para. 46 (Nov. 23, 2003) (emphasis added).
- M2Z clearly has been on notice that it will not be permitted to operate TDD unless it *conclusively demonstrates* that it will not interfere with adjacent licensees.

AWS-3 Testing Demonstrates that the FCC's Proposed Rules are Inadequate

- The Boeing Lab tests confirm that:
  - OOBE interference from AWS-3 interfering sources appears to be the most dominant interference mechanism – a fact that even M2Z now supports (See M2Z 09/23/08 ex parte filing p. 12 "There is general agreement that the OOBE are the dominant interference mechanism in nearby coupling situations....");
    - This fact completely undermines M2Z's claim that AWS-1 filters will mitigate interference from AWS-3 mobiles;
  - Interference would be present from an AWS-3 interfering source should the Commission adopt its proposed OOBE limit of 60 + 10 log P (i.e., -30 dBm/MHz);
  - Receiver overload interference, while not as significant as OOBE interference, would still be significant at or below the Commission's proposed 23 dBm/MHz power limit;
  - The received signal levels used during the testing were representative of normal operating parameters for AWS-1 systems; and
  - The interference scenarios would not be rare.
    - Should the Commission adopt its proposed technical rules, under normal operating conditions, interference to AWS-1 devices from AWS-3 operations would be widespread and prevalent.
- M2Z admits that interference will occur, but urges the Commission to accept its claim that interference events would rare and therefore tolerable.

Probabilistic Arguments Are Not an Appropriate Basis for Establishing Interference Protections

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- The FCC's sole task in this proceeding is to develop rules that prevent harmful interference from occurring. Probabilistic predictions should not form the basis for inadequate interference protections.
- M2Z's probabilistic arguments hinge on its own failure – if M2Z is successful then interference will occur; if M2Z fails then interference will not occur.
- Even assuming that probabilistic arguments are appropriate, statistical analysis incorporating many of the characteristics of real networks, such as uneven distribution of users, demonstrates widespread and persistent call failures due to interference from AWS-3 devices.
- T-Mobile's Monte Carlo simulation shows:
  - AWS-3 interference resulting in overall network capacity loss of 5.4%.
  - Home users experiencing 10.6% capacity loss.
  - Users with an AWS-3 router in their homes had a 67% change of lost calls when there was simultaneous AWS-3 transmission. Users that had a neighbor with an AWS-3 router had a 28% chance of lost calls when the AWS-3 router was transmitting.

AWS-1 Front-End Filtering Will Not Resolve AWS-3 Harmful Interference

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- Filtering technology cannot eliminate receiver overload interference to AWS-1 devices that would result from AWS-3 mobiles transmitting at 2155-2180 MHz at 23 dBm/MHz.
- Designing filters that roll off at the 2110 and 2155 MHz band edges will not eliminate this problem.
  - And, they most certainly will not address the problem of OOBE interference which M2Z now agrees is the most dominant source of interference.
- According to Avago, frequency separation is necessary for a filter to achieve the desired amount of rejection.
  - Separation should account for the steepness of filter roll off between the pass band and the desired rejection level, changes of the filter response with temperature changes, and part-to-part variation between filters arising from manufacturing process tolerances.
- According to Avago, these factors equate to about 15 MHz of necessary separation between mobile transmissions and mobile receptions. Even M2Z recognizes that about 15 MHz is needed. *See* M2Z 06/03/08 Ex Parte, attached Alion Study, p. 7
  - This fact undercuts M2Z's arguments that an AWS-1 F Block licensee operating on 10 MHz could or should internalize all adjacent band interference.

M2Z Has Not Refuted Concerns Raised By All Other Industry Observers

- Rather than engaging in reasoned technical testing and discussion, M2Z has sought to rush the Commission to judgment:
  - M2Z has consistently opposed testing of interference;
  - M2Z has provided a flawed simulation analysis based on uniform distribution of devices and other inaccurate assumptions;
  - M2Z has mistakenly characterized the findings of Ofcom; and
  - M2Z has resorted to hyperbole rather than technical showings ("faulty AWS-1 filters"; "interference from BlueTooth, WiFi, microwave ovens"; "wireless industry fear of competition"; etc.)
- The technical record before the Commission is clear – AWS-3 mobiles operating in accordance with the proposed rules for transmit power and OOBE limits will cause interference to AWS-1 mobile receivers. M2Z has completely failed to rebut this critical point.

The AWS-3 and H Block Licensees' Incentives to Reduce Interference are not Mutual to Their Neighbors

- An AWS-3 or H Block licensee permitted mobile transmissions will have less incentives than an adjacent AWS-1 or broadband PCS licensee to cooperate and avoid harmful interference.
- AWS-3 or H block mobile transmissions would impair AWS-1 or broadband PCS handsets, but not vice versa.
- Although base-to-base interference can be readily addressed by the AWS-3 licensee, mobile-to-mobile interference cannot be readily addressed by the AWS-1 licensee.
  - The AWS-3 licensee can unilaterally deploy a variety of measures to protect its base stations against interference.
  - As discussed above, the AWS-1 licensee cannot – even with highly efficient filters – protect itself from mobile-to-mobile interference from the AWS-3 band.
- M2Z's cavalier attitude about the interference it would cause, therefore, is not surprising.

Proposed H Block Rules Are Not Adequately Protective

- The Commission should not allocate or license 1915-1920 / 1995-2000 MHz band for services (*e.g.*, mobile transmissions) in a way that would cause harmful interference to existing PCS systems.
- Independent handset testing showed that the FCC's proposal would subject PCS handsets to harmful interference where H Block devices transmit 8 meters away in some instances.
- The Commission should adopt power limits on H block licensee handsets that adequately protect broadband PCS customer handsets from overload and intermodulation effects.

AWS-3 – There Are Better Alternatives in the Record

- The Commission can craft AWS-3 rules that permit valued use of the band without imposing rules that either dictate a single business plan or unnecessarily impede the prospects for adjacent licensees in the AWS-1 and MSS bands. For example:
  - The Commission could adopt the downlink-only approach it raised in the *AWS-3 Notice.*
  - The AWS-2 J Block could be combined with the AWS-3 spectrum into a single license, with the 2020-2025 MHz block used for uplink and the 2155-2180 MHz block used for downlink.
- These approaches would:
  - Provide opportunities for new and emerging broadband competitors;
  - Protect adjacent licensee broadband competitors from interference;
  - Result in valuable and efficient use of the spectrum; and
  - Facilitate international harmonization.

The FCC Must Adopt Protective Out of Band Emission Limits

- The FCC has proposed to adopt rules for the AWS-3 band that are *less* protective than those proposed for the H Block, inexplicably resulting in significantly more interference to AWS-1 devices than PCS devices.
  - The Commission proposes an OOBE limit of 90 + 10 log(P) dB on H Block transmissions into the PCS band 1930-1990, but it only proposes an OOBE limit of 60 + 10 log(P) dB on AWS-3 transmissions into the adjacent AWS-1 mobile receive band in spite of the fact that there is a 10 MHz guard band between H Block and PCS operations.