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ORIGINAL FEDERAL COMMUNICATIONS COMMISSION  
OFFICE OF THE SECRETARY

December 12, 2000

Office of the Secretary  
Ms. Magalie Roman Salas  
Federal Communications Commission  
445 12<sup>th</sup> Street, SW  
Washington, DC 20554

EX PARTE OR LATE FILED

In Re: WT Docket No. 99-168: Service Rules for the 746-764 and 776-794  
MHz Bands and Revisions to Part 27 of the Commission's Rules

WT Docket No. 96-86: The Development of Operational, Technical,  
and Spectrum Requirements for Meeting Federal, State and Local  
Public Safety Communications Requirements Through the Year 2010

Dear Ms. Salas

On December 8, 2000, representatives from Motorola met with FCC staff from the Wireless Telecommunications Bureau (WTB) and the Office of Engineering and Technology (OET) to discuss technical issues relevant to the above-referenced proceedings. Please associate this notification in the relevant docket files and please include the attached slides that were distributed at this meeting.

Attending this meeting were Stu Overby, Bernie Olson, and Steve Sharkey of Motorola as well as Michael Lewis of Wiley, Rein & Fielding. FCC attendees were Stan Wiggins, Martin Liebman and William Lane of the WTB and Julius Knapp of OET. During this meeting, Motorola reiterated its position, originally expressed in its *Petition for Reconsideration or Clarification*<sup>1</sup> filed in response to the *Memorandum Opinion and Order and Further Notice of Proposed Rulemaking*<sup>2</sup> in WT Docket No. 99-168, that recent changes to the 700 MHz band plan threaten 700 MHz public safety systems and commercial operations with a substantial increase in harmful interference. More specifically, the FCC's decision adopted on reconsideration to provide commercial operators with additional technical flexibility to locate high powered base transmitters in

<sup>1</sup> *Petition of Motorola for Reconsideration or Clarification*, WT Docket No. 99-168, filed August 11, 2000 (Motorola Petition).

<sup>2</sup> *In the Matter of Service Rules for the 746-764 and 776-794 MHz Bands, and Revisions to Part 27 of the Commission's Rules*, WT Docket No. 99-168, *Memorandum Opinion and Order and Further Notice of Proposed Rulemaking*, released June 10, 2000, 15 FCC Rcd. 11000, 11001 (2000) (List ABCDE) (hereinafter *MO&O*).

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either segment of the band threatens to reduce public safety coverage area by as much as **33 percent** even when the affected systems are separated by 2.3 miles. Neither the existing out-of-band emission requirements nor the “700 MHz guard bands” will adequately protect public safety operations. Therefore, Motorola strongly urges the FCC to take immediate additional steps to better protect 700 MHz public safety systems.

The attached slides quantify Motorola’s concern. They show that even a “state-of-the art” filter would be incapable of reducing the out-of-emissions of commercial transmitters operating in the 777-792 MHz band to adequately protect public safety base station receivers located a mere 2 MHz away. The effect on public safety system coverage area would be cataclysmic – a commercial transmitter located within 1000 feet of public safety base station would reduce the public safety system coverage by some 95 percent. Such geographical spacings would not be uncommon considering the number of cell sites commercial providers typically deploy across a metropolitan area. Thus, in the name of “technical flexibility”, the FCC has greatly increased the likelihood that 700 MHz public safety systems will be seriously degraded by commercial operations. The existing out of band emissions requirements are incapable of mitigating the impact.

Note also that the technical flexibility for commercial operators to locate high powered base stations in either segment of this allocation also threatens other commercial carriers by allowing one carrier’s base transmitter to be operating in spectrum directly adjacent to another carrier’s base receiver. As an example, a carrier operating on the 700 MHz D block and choosing to use the conventional pairing would face significant interference from the carrier operating on the 700 MHz C block who chooses to reverse the pairing or deploy time division duplex (TDD) technology. This possibility should not be ignored by carriers preparing to bid millions in the upcoming auction.

During the meeting on December 8th, Motorola and the FCC staff discussed several ways in which to reduce these probabilities. First, Motorola believes that the FCC should greatly reduce the amount of energy that commercial transmission systems place into the public safety bands. As shown in the attached slides, increasing the required out-of-band emission requirements will reduce the negative impact on public safety systems even when base sites are located within 1000 feet of each other. Motorola is, of course, sensitive to ensuring that these specifications are achievable for commercial wireless equipment. We believe that our recommended maximum commercial base station out-of-band emissions into the public safety 794-806 base receive and 764-776 MHz mobile receive band is readily achievable by commercial transmitters operating in the 747-762 MHz band with a post transmitter filter. However, these specifications, and the ability to minimize interference to public safety, is much more difficult for commercial base stations operating in the 777-792 MHz band.

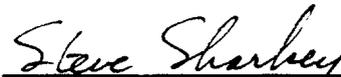
Second, Motorola and the FCC staff discussed other ways that public safety systems could be protected including mandatory coordination between public safety and commercial operators and requiring commercial operators to further attenuate emissions from specific problematic transmitters. Motorola would be interested in further pursuing these options but believes that specific standards should be well articulated by the Commission now so as to minimize burdens and costs later.

Generally, Motorola supports the FCC's position on technical flexibility whenever appropriate. Experience in other frequency bands has shown, however, that an organized and structured band plan minimizes post-licensing interference problems that can be extremely complicated to resolve. For example, the Commission is well aware of interference issues involving CMRS and public safety licensees in the 800 MHz band. There, despite the best efforts of carriers, public safety licensees and equipment manufacturers who all meet the Commission's rules, interference exists. CMRS carriers and public safety users must expend significant time and expense in attempts to resolve interference after the fact. Motorola believes that the FCC must take the necessary steps at the outset to avoid interference to the maximum extent possible. Public safety users, prospective CMRS operators and band managers deserve the Commission's best efforts to minimize interference in the 746 MHz band.

Some have argued in this proceeding that technical flexibility is necessary in this band in order to maximize commercial operations by avoiding potential interference from incumbent channel 59 TV stations. Further, with respect to interference from broadcast stations, we believe the proper solution is to address the television incumbency issue directly. The incumbency issue should not be sidestepped by establishing inadvisable technical rules that would continue to cause harmful interference to public safety and other commercial carriers long after television stations are removed from the band.

Motorola looks forward to working closely with the FCC staff to ensure that the technical rules for the 700 MHz allocation maximize its vast potential to serve the public interest. To this end, the FCC must, at a minimum, reconsider its decision to allow commercial base transmitters to operate in the 777-792 MHz band.

Respectfully Submitted,



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Steve Sharkey

Director, Telecommunications Regulation  
Motorola, Inc.  
1350 I Street, NW  
Washington, DC 20005  
(202) 371-6900

Attachment

CC:

Clint Odom, Office of the Chairman

Mark Schneider, Office of Commissioner Ness

Peter Tenhula, Office of Commissioner Powell

Bryan Tramont, Office of Commissioner Furthgott-Roth

Adam Krinsky, Office of Commissioner Tristani

Thomas Sugrue, Chief, Wireless Telecommunications Bureau

Bruce Franca, Acting Chief, Office of Engineering and Technology

Julius Knapp, Chief, Policy and Rules Division, OET

Marty Liebman, WTB

Stan Wiggins, WTB

William Lane, WTB



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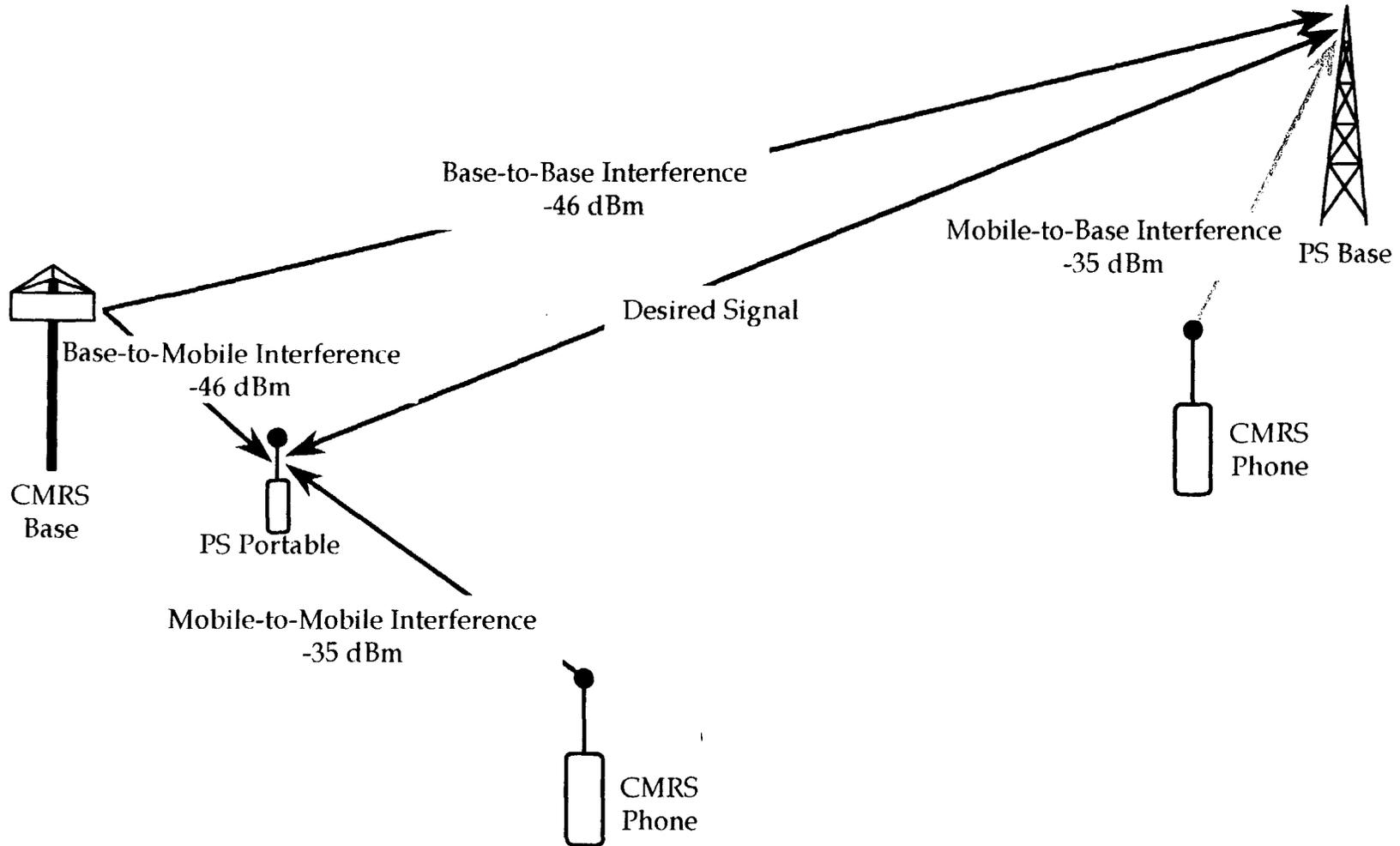
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# **746 MHz Interference Impact**

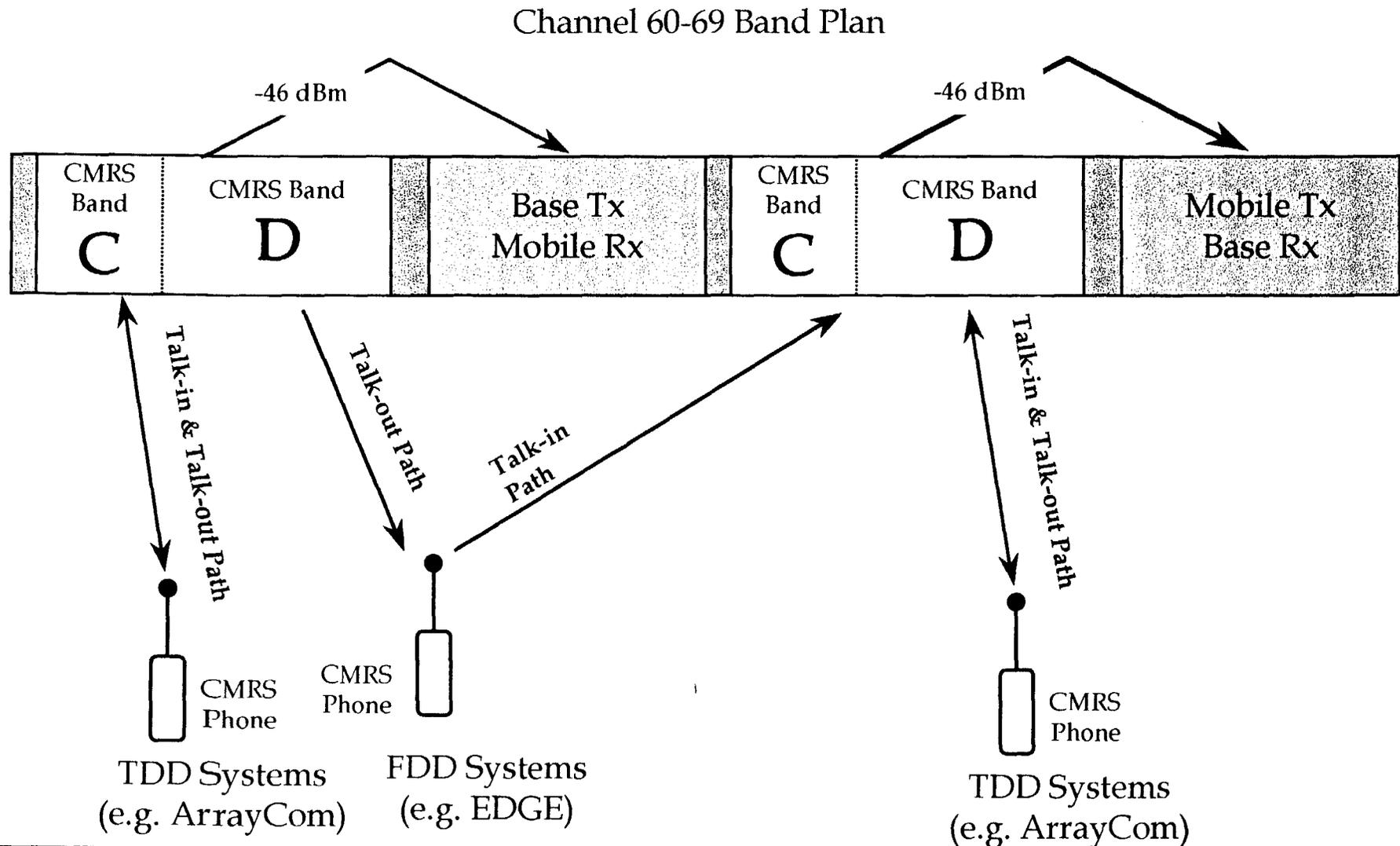
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# Interference Mechanisms

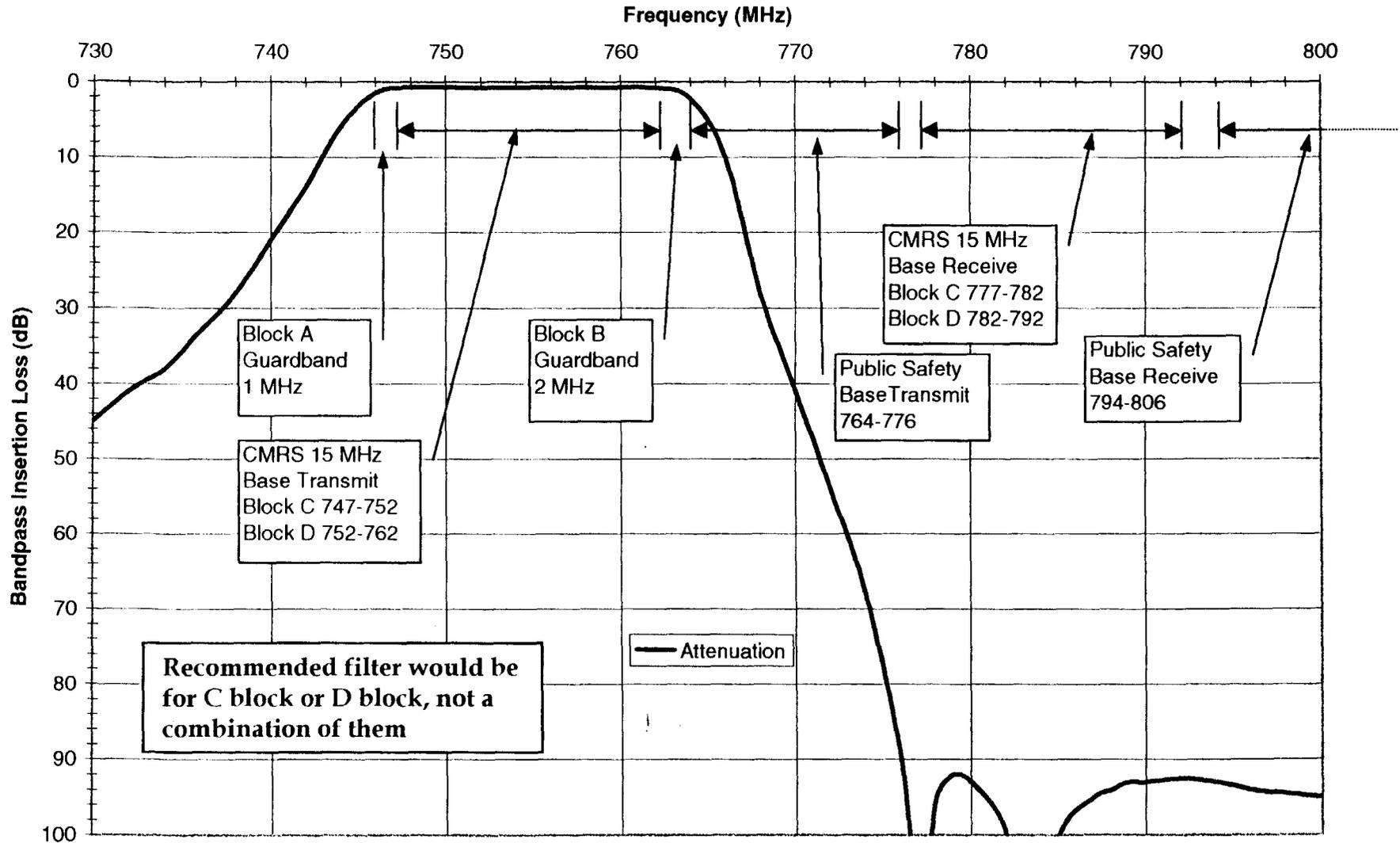


# Time Domain Duplex (TDD) changed the interference scenarios



**Feasible Wide band C/D block filter to protect Public Safety base receive. If deployed 777 to 792 MHz, insufficient protection of the Public Safety Base Receive band would occur**

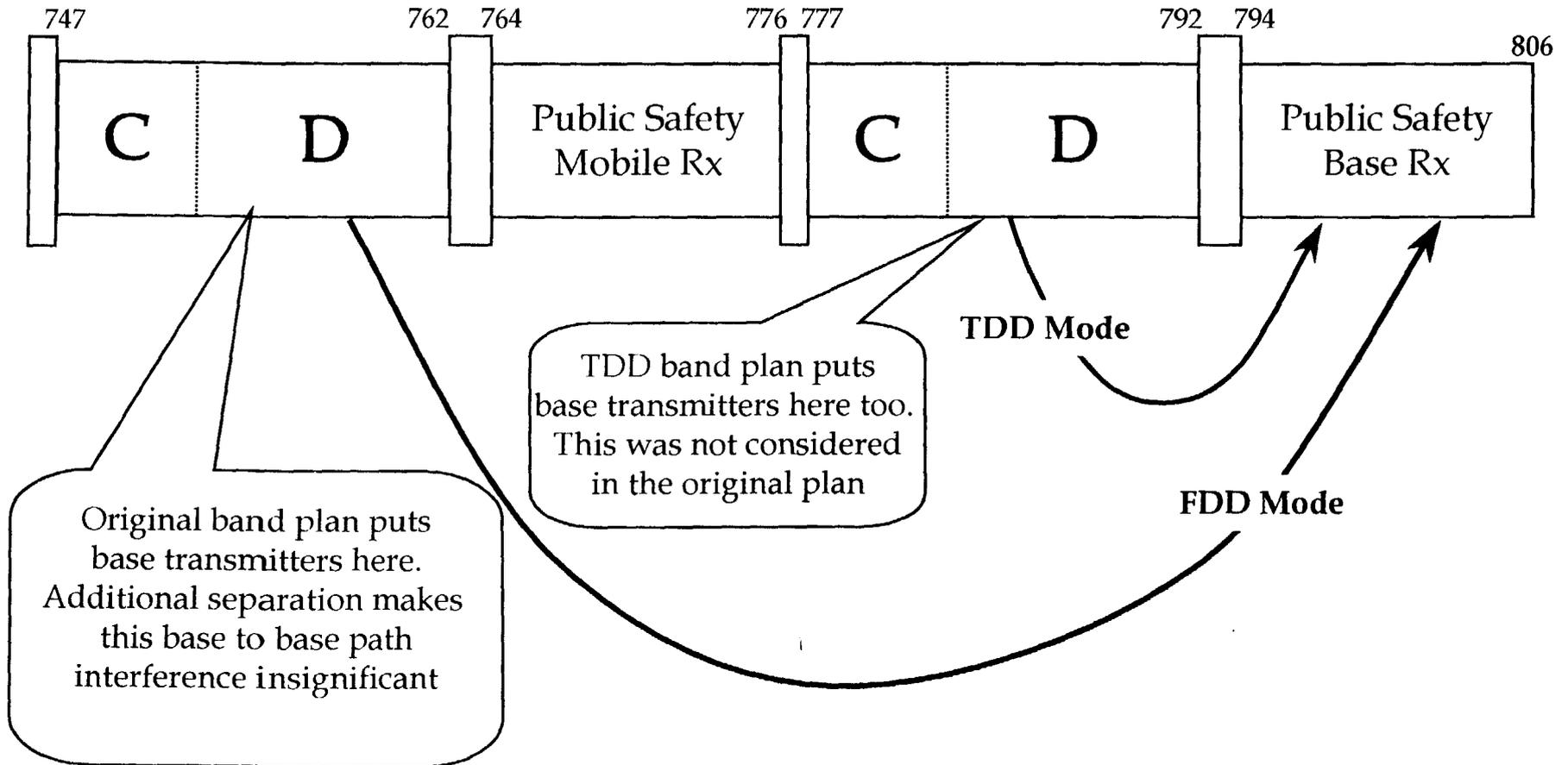
### CDMA Transmitter Filter Response

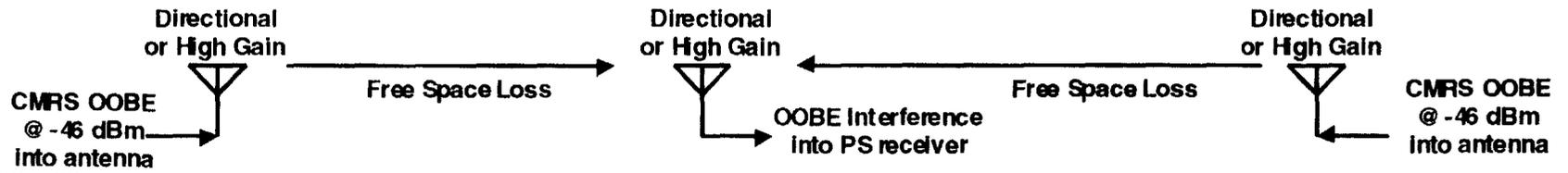


# Base-to-Base Interference Scenarios

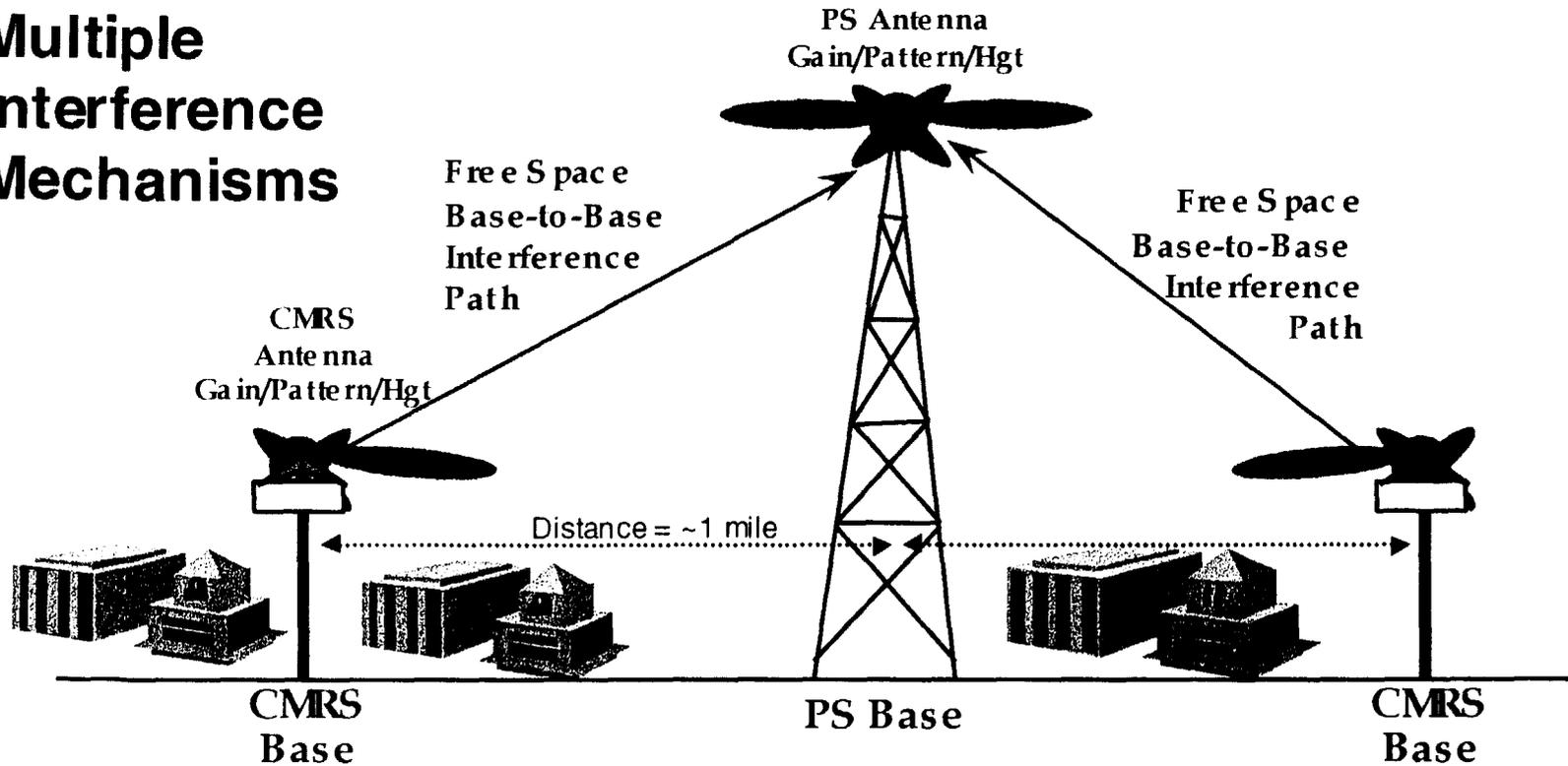


This shows which CMRS bands



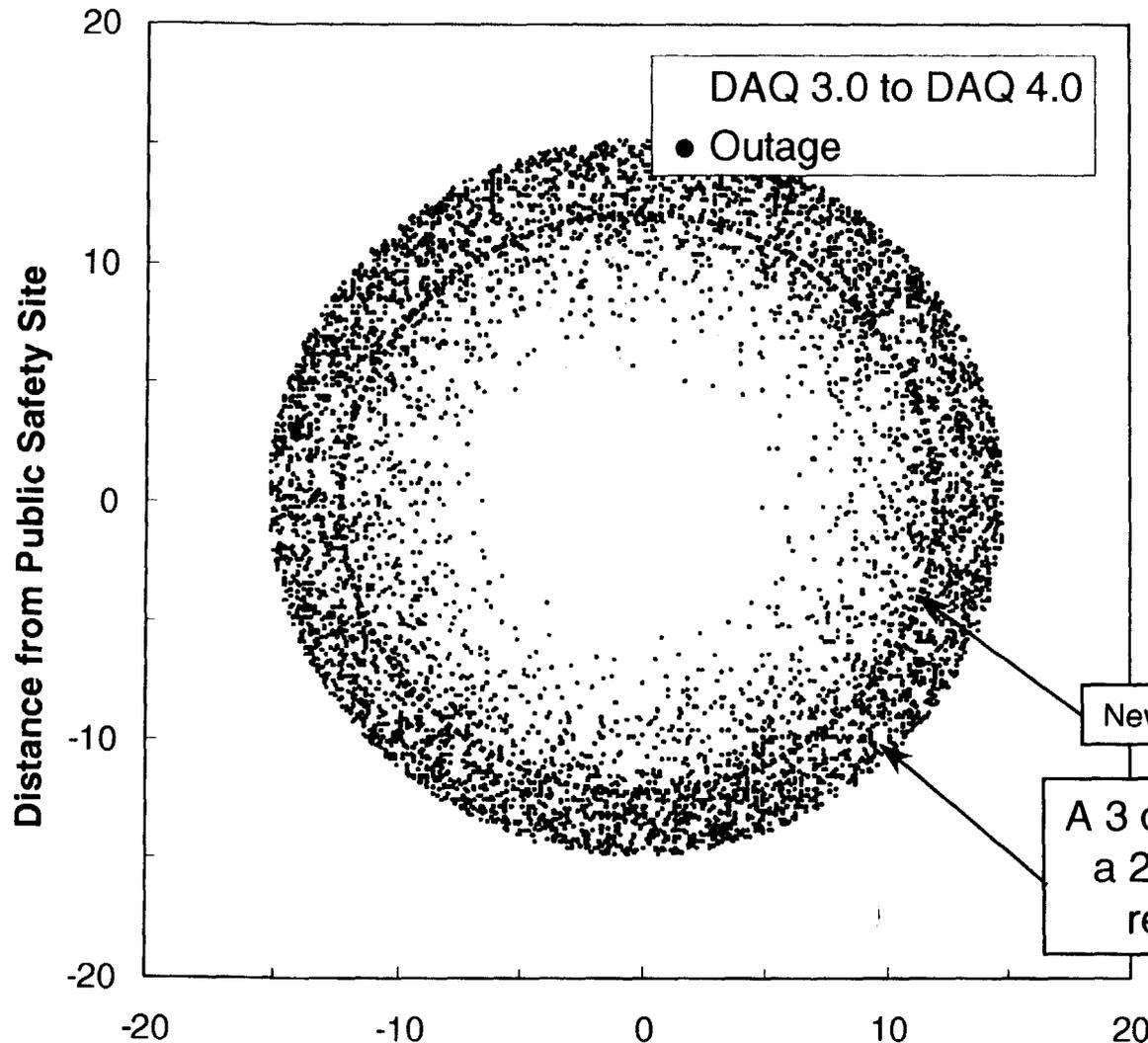


## Multiple Interference Mechanisms



Multiple CMRS sites create multiple interference signals which must be summed together in the PS receiver, increasing the composite noise floor.

# Audio Quality w/ Noise & Base-to-Base Interference



- **Base-to-Base Interference is Constant**
- **Results in Reduction of Range in Public Safety System**
- **Range Reduction is Proportional to the Increase in Noise Floor of the Public Safety System**



# Cost/Performance Tradeoffs: Base-to-Base

Description	Emission Specification	Site Separation Required for 33% PS Area Loss	PS area Loss at 1000' Site Separation
Current FCC Rule	-46 dBm in 6.25 kHz	2.3 miles	95 %
Partial Protection	-68 dBm in 6.25 kHz	1000' feet	33 %
Motorola's Recommendation	-80 dBm in 6.25 kHz	250' feet	5 %

Distances & levels based on:

-126 dBm noise floor for public Safety receiver

10 dBd antenna gain at CMRS site

7 dBd antenna gain at public safety site\*

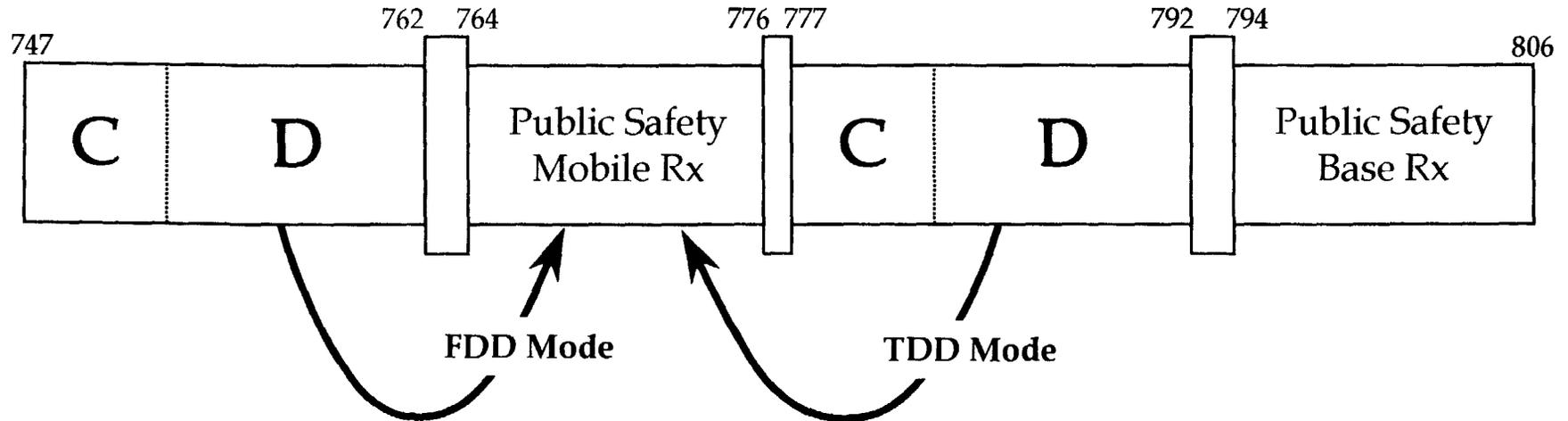
Free space propagation between base station antennas

3 dB rise in noise floor results in 33% area loss

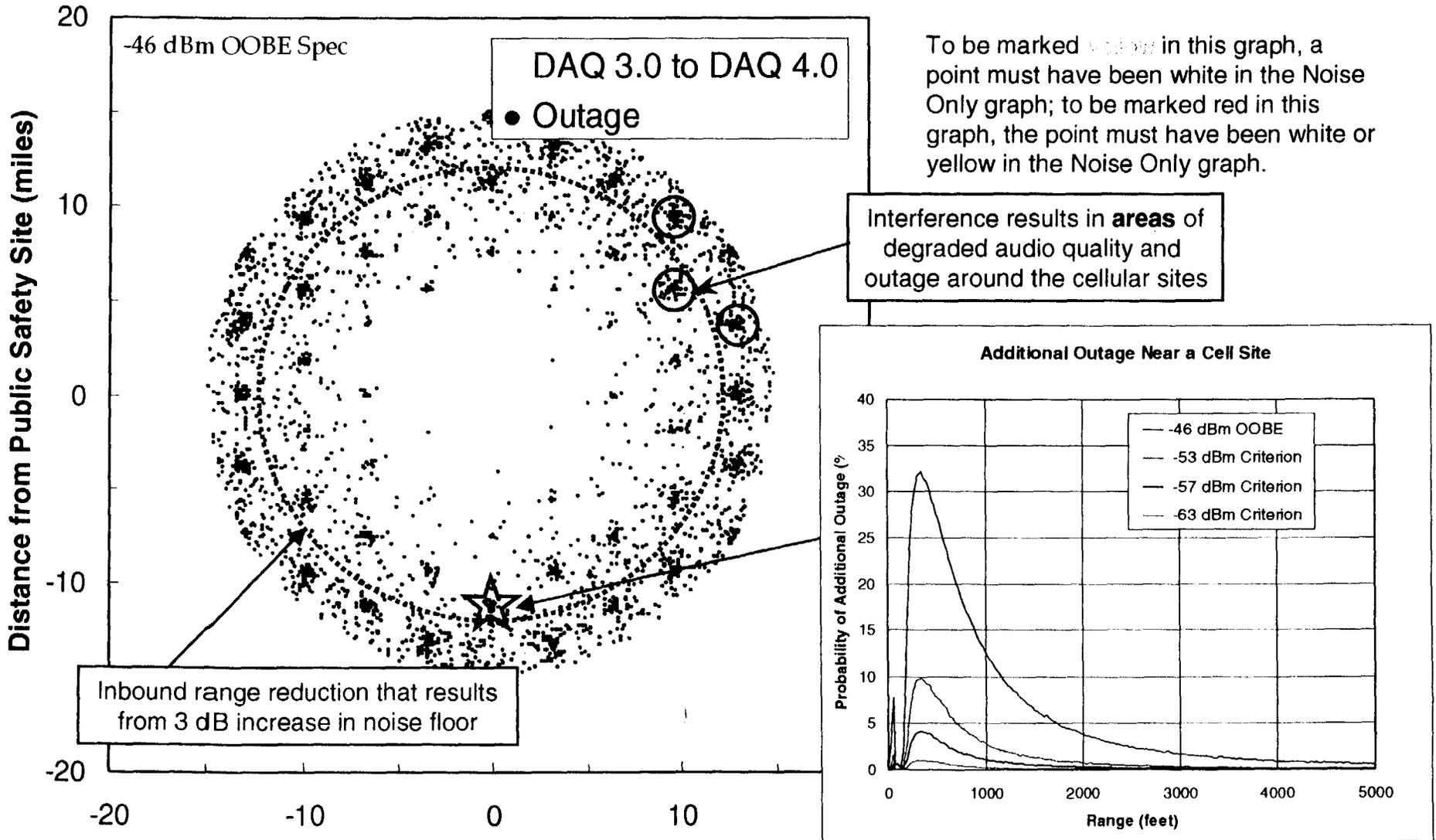
Emission Specifications are "out-of-transmitter" specs

- **Observation: The -80 dBm specification is easy to meet from the 747-762 MHz band using a transmitter post filter, but very hard to meet from the 777-792 MHz band due to the close frequency separation**

# Base-to-Mobile Interference Scenarios



# Audio Quality w/ Base-to-Mobile Interference Alone





# Cost/Performance Tradeoffs: Base-to-Mobile

Description	Emission Specification	PS Outage at 350' from CMRS Site: DAQ < 3.0
Current FCC Rule	-46 dBm in 6.25 kHz	30%
Motorola's initial FCC Input	-57 dBm in 6.25 kHz	5%
Motorola Proposal (4 CDMA1 carriers/5 MHz)	-53 dBm in 6.25 kHz	10%
Motorola Proposal (3 CDMA1 carriers/5 MHz)	-63 dBm in 6.25 kHz	1%

Distances & levels based on:

DAQ 3.0 = 16.5 dB CNR

5 dBd vertical and 5 dBd azimuth antenna gain at CMRS site

PS mobile at appx. 80% range for 95% reliability in noise only

Okumura propagation from PS site

Free space + 6 dB clutter loss from CMRS site

Emission Specifications are "out-of-transmitter" specs

## Conclusions



**MOTOROLA**

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- **Key Issue is OOB from CMRS base transmit to Public Safety base and mobile receivers**
- **CMRS Base OOB spec needs to be tailored by band:**
  - **-63 dBm to 764 MHz - 776 MHz band.**
  - **-80 dBm to 794 MHz - 806 MHz band.**
- **These limits are achievable with CMRS base transmit at 747-762 MHz, but not with CMRS base transmit at 777-792 MHz**
- **Mixing uncoordinated CMRS base transmit and base receive in adjacent blocks will produce interference between CMRS licensees**
- **External filters for base transmitters are required to meet the OOB requirements**