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January 22, 1997

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Federal Communications Commission  
Office of the Secretary  
1919 M Street, N.W.  
Washington, D.C. 20554

Federal Communications Commission  
Office of Secretary

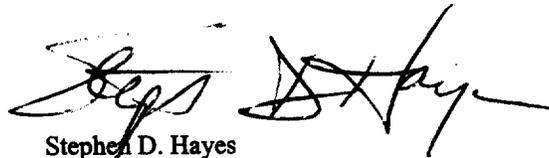
Re: ET Docket No. 95-183, RM-8553, PP Docket No. 93-253 and RM-8811

MEMORANDUM OF NON-RESTRICTED ORAL EX PARTE PRESENTATION

Advanced Radio Telecom Corp., by its attorneys W. Theodore Pierson, Jr. and Stephen D. Hayes of the above-named law firm, met on this date with Julius Genachowski of the office of FCC Chairman Hundt and Suzanne Toller and Jane Mago of the office of Commissioners Chong, at the Commission's offices. The presentations were limited to discussion of the proposed amendment of the Federal Communications Commission's Rules related to the allocation and licensing of spectrum in the 38 GHz frequency band, as contained in the Commission's *Notice of Proposed Rulemaking* in ET Docket No. 95-183, RM-8553, PP Docket No. 93-253 (released December 15, 1995) and in the *Petition for Rulemaking* in RM-8811 (filed by Motorola Satellite Systems Inc. on March 4, 1996). The materials attached hereto were distributed at the presentations and were also discussed during the course of the presentations.

Pursuant to Section 1.1206(b)(5) of the Commission's Rules, *ex parte* restrictions do not apply to the instant presentations (*see*, 47 C.F.R. 1.1206(b)(5)), however, in accord with Commission Rule Section 1.1206(a), Advanced Radio Telecom Corp. hereby files this disclosure (*see*, 47 C.F.R. 1.1206(a)). The original and six copies (two for each Docket or Rulemaking number) of this disclosure have been submitted to the Secretary's office.

Respectfully submitted,  
ADVANCED RADIO TELECOM CORP.



Stephen D. Hayes  
Its Attorney

Attachment

cc: Julius Genachowski  
Suzanne Toller  
Jane Mago

# The Motorola M-Star System

An Analysis of the Potential for Sharing  
With the Terrestrial 38 GHz Fixed Service

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Presentation to Suzanne Toller and Jane Mago  
Office of FCC Commissioner Chong

January 21, 1997

by

Ted Pierson  
Exec. VP, Industry Relations

Stephen Hayes  
Pierson & Burnett

on behalf of



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# Introduction to Advanced Radio Telecom

- ◆ Largest operating wireless local loop provider in the United States
  - 169 service areas covering 143 million people
  - 47 of the top 50 markets; 82 of the top 100 markets
- ◆ Operates in the 38.6-40.0 GHz Fixed Service (FS) bands
- ◆ Provides service to:
  - CAPs/CLECs and LECs
  - IXCs
  - ISPs
  - PCS Providers

## **Introduction to Advanced Radio Telecom**

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- ◆ Currently has 115 employees, and is growing
- ◆ Has successfully raised operational financing
  - Raised \$33 million in equity public offering in September
  - Has unused \$50 million private debt line
  - Registered \$125 million public high-yield debt
- ◆ Significant investors include Ameritech and Advent International

# Keys to 38 GHz Fixed Service

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Essential to the technical feasibility, economic viability, and long-term growth of 38 GHz FS are:

- Deploying 10,000s of links nationwide in the next six years
- Ability to deploy and redeploy links rapidly (*e.g.*, 12-24 hours) and cost effectively
- High system reliability: 99.999% design (*i.e.*, maximum outages of only 5.3 minutes per year or less than one second per day)
- Improved frequency reuse through non-horizontal elevation angles
- Cost effective use of spectrum to service large markets
- Evolution to multipoint systems for sophisticated network topologies

## **Self-Coordination Makes It Possible**

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- ◆ **Rapid deployment of FS service links has been fostered by:**
  - Self-coordination by the 38 GHz FS industry, which is essential for efficient operation
  - This self-coordination is the essence of the FCC's geographic licensing plan for 38 GHz FS
- ◆ **Motorola's spectrum sharing proposal undermines the FCC's licensing plan and removes the benefits gained from self-coordination**

## **Sharing Brings Unavoidable Interference**

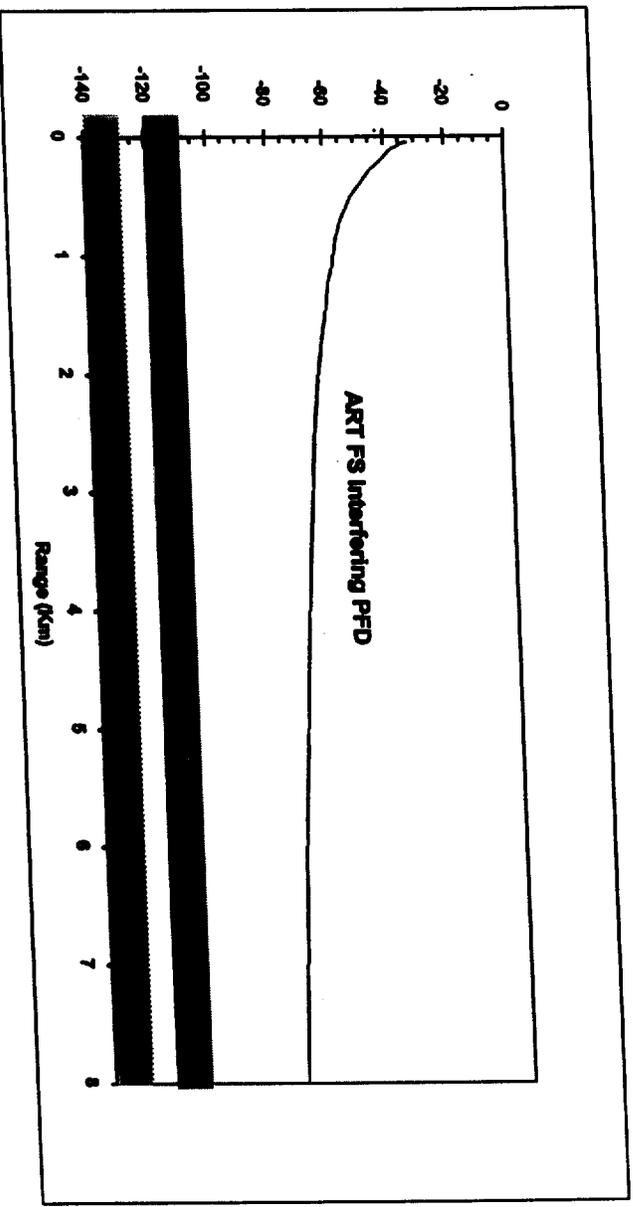
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- ◆ Sharing between the Fixed Satellite Service (FSS) and terrestrial FS in the 38.6 to 40.0 GHz band will result in interference by both services into the other
- ◆ This interference will be nearly impossible to avoid and would require impractical, or unduly expensive, methods to mitigate

# M-Star Application Interference Analysis

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- ◆ FS Interference into FSS Ground Stations
  - Motorola acknowledges interference will occur



- Motorola claims interference can be cured by:
  - » Geographic separation of FS and FSS ground sites
  - » Dynamic power controls on FS transmitters

## M-Star Application Interference Analysis (cont.)

- ◆ FSS Interference into FS Links
  - Motorola claims interference will not be a problem
  - “The M-Star system will meet the power flux density limits of Section 25.208(c) of the Commission’s rules and ITU RR S21.16.”
  - “The proposed system does not operate below a 22 degree elevation angle from the ground station, which enables it to meet the EIRP limits of Section 25.204 of the Commission’s Rules.”

# Flaws in Motorola's Analysis

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- ◆ FS into FSS Interference
  - FS power control
    - » Dynamic controls would be expensive and difficult to install and operate
    - » Power-controlled equipment does not now exist
    - » Installed base does not employ power control
    - » Power control assumed by Motorola may not be technically achievable
  - Frequency coordination
    - » Coordination is difficult, expensive and time-consuming
    - » Rapid, cost effective deployment suffers as a result
    - » Undercuts FCC's geographic licensing plan

# Flaws in Motorola's Analysis (cont.)

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## — Geographic separation

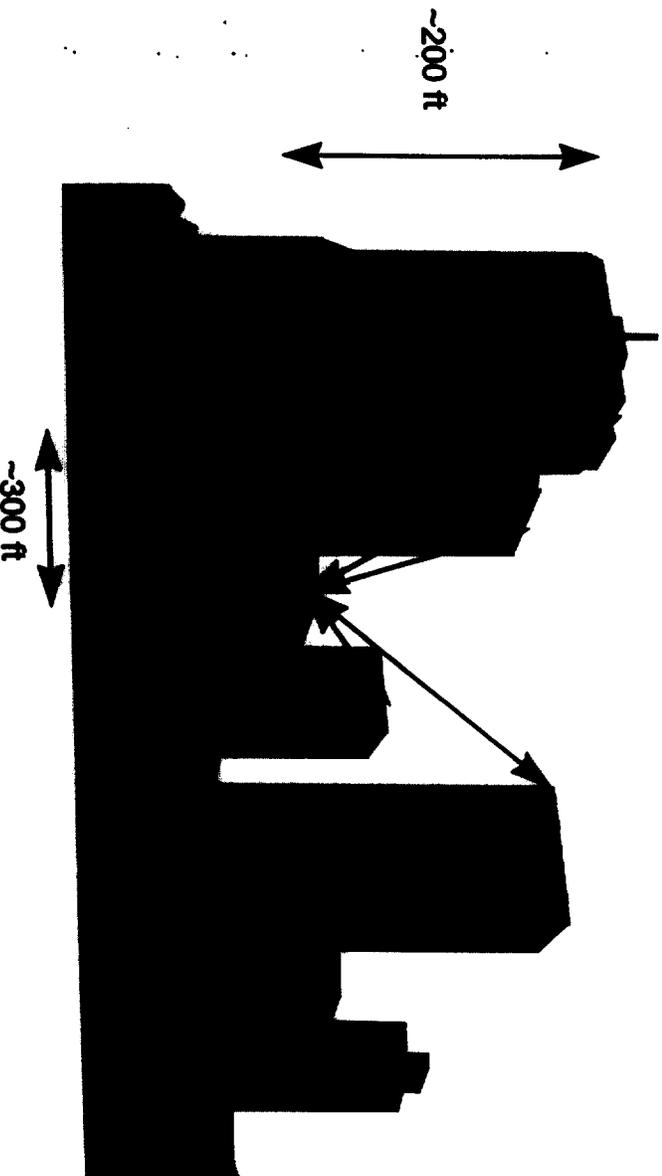
- » Numerous FS sites deployed when M-Star comes on line
- » Massive FSS ground station coordination zone around an FS site to avoid mainbeam interference (1 km separation w/ FS power control; 12-18 km separation w/o FS power control)



## Flaws in Motorola's Analysis (cont.)

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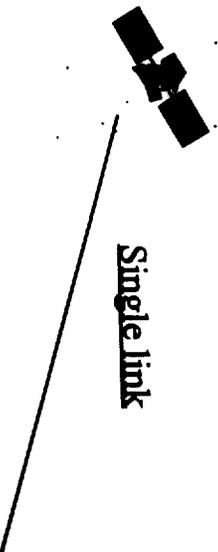
- ◆ FSS into FS Interference
  - Assumption is invalid- elevations up to 40° (or perhaps more) required for some FS installations and preferred for many to increase spectrum reuse (*i.e.*, avoid horizontal radiation)



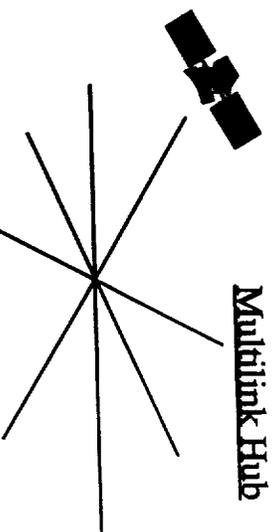
## Flaws in Motorola's Analysis (cont.)

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- ◆ FSS into FS Interference (cont.)
  - Interference will significantly decrease system reliability (99.9999% design reliability, < 1sec/day outage)
  - M-Star would prevent meeting design reliabilities for any links with elevations above 20°
    - » Outages totaling ~40 sec/day on average (243 minutes/year)
    - » Typical outage period 10 - 20 seconds
    - » Impact of outages proportionally more severe for networks using multilink hubs



Single link outage ~ 40 sec/day average



10 node hub outage ~ 400 sec/day average

## Flaws in Motorola's Analysis (cont.)

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- ◆ FSS into FS Interference (cont.)
  - Link budget analyses show C/I of -2.8 dB at 22° elevation for M-Star HRB downlink (90M0G7W)
  - At elevation angles above 20°, FSS signal strength increases
    - » +3 dB at 40° elevation, +5 dB at 60° elevation
  - M-Star rain-compensating 8 dB power increases will result in increased interference to FS sites where rain is not occurring
    - » M-Star beam footprints are 40 km to 200 km in diameter
- ◆ Cures for interference are not viable
  - Installing and managing alternate redundant routes will increase costs by at least 2.5 times

## Summary of Concerns

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- ◆ M-Star would create and receive much greater interference than stated, if FS-FSS spectrum sharing is required
- ◆ Measures to avoid interference, if available, are difficult and expensive to implement
- ◆ Sharing is at odds with the FCC's geographic licensing/self-coordination approach
- ◆ Sharing undermines the viability of the 38 GHz terrestrial industry

## **Lasting Effects on the Industry**

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- ◆ Ability to quickly and efficiently deploy and redeploy links severely reduced
- ◆ Maintaining current reliability guarantees to customers prohibitively expensive; degradation will be forced
- ◆ Improved frequency reuse, and satisfaction of certain customer demand through steeper elevation angles will be greatly limited
- ◆ Evolution to sophisticated multipoint architectures will be curtailed

## Lasting Effects on the Industry (cont.)

- ◆ Taken together, these outcomes will make the use of the allocated radio spectrum much less efficient and cost effective, leading to downturns in usage
- ◆ This will likely result in the abandonment of many existing links that would require redesign and retrofit, and the deployment of many fewer new links

## **Band Segmentation is the Right Solution**

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- ◆ In light of the tremendous difficulties imposed by sharing between FS and FSS at 38 GHz, band segmentation is the only viable solution
- ◆ The tentative segmentation plan outlined by FCC staff at the December 17 meeting of the WRC-97 Advisory Committee's Ad Hoc Working Group for Millimeter Wave Issues appears to be a workable solution that would permit both FS and FSS to operate effectively and efficiently

**REVIEW OF POSITIONS**

**IN**

**38 GHz RULEMAKING**



## **SUMMARY**

### **ART Supports The Principal Conclusions Of The *NPRM* And Interim Order.**

- The 38 GHz Band is one of the great success stories in Commission regulation. Because of the unique licensing features, and the tremendous breakthroughs in millimetric wave technology, 39 GHz will provide significant competitive alternatives to traditional exchange services. The Commission should take no action that interferes with the early realization of this promise.

### **The Interim Processing Rules Are A Reasonable Solution To The Avalanche Of Applications – So Long As The Commission Moves Quickly To Auction Open Channels And Awards Interim Point-To-Point Paths For Firm Customer Orders.**

- There are current customers, including PCS providers, who need channels now and cannot await completion of an auction. The Commission should immediately license point-to-point paths, on a grandfathered basis, for *bona-fide* customers.

### **The Commission Must Impose Stringent Bulldozer Requirements.**

- Stringent construction requirements are essential in order to: (a) ensure that the spectrum is used and not warehoused, (b) free up spectrum for other applicants and (c) remedy any abuses of the spirit of the Commission's policies that may have occurred.
- The *NPRM* construction proposal, while well-intentioned, is well beyond near-term manufacturing capacity and available capital.

Instead, the Commission should require each permittee to: (1) install *one* permanent, fully operational, revenue-producing *link* in each *2500 square kilometer* subsection of the authorized service area by the end of the first *18 months*; (2) *one link* in each *250 square kilometer* subsection by the end of the *48 months*; and (3) *two links* in each *250 square kilometer* subsection by the end of *60 months*, provided that the requirement will be reduced for less populated areas.

- The Commission's proposal to apply the construction requirement to each channel is sound. However, imposing a traffic carrying requirement is too difficult to devise and to monitor, and would interfere with innovative uses.

**The Commission Should Not Impose Any Limits On Transfers Or The Number Of Channels One Entity May Own Or Control**

- Given the total amount of bandwidth available -- 3000 MHz -- there is little danger that several entities will control sufficient bandwidth to create monopoly conditions.

**The Commission Must Adopt Liberal And Flexible Technical Rules To License The Full 37 GHz Band On A BTA Basis**

- Full flexibility to provide any fixed or mobile service demanded by the marketplace that can be provided within the applicable technical rules.
- Continuation of co-primary status for mobile operations.
- Licensing of all of the 37 GHz band as soon as rules have been adopted.
- Adoption of the same channeling plan for 37 GHz as is used in 39 GHz to facilitate equipment production.
- The Commission should use BTAs -- no regional or national channels.
- The Commission should permit entities to license discrete paths in areas that have not yet been awarded.
- No required frequency stability limit.
- No required use of Antenna Standard A

**Auctions Are The Best Method Of Awarding Licenses -**

**It Is Critically Important That Auctions Be Conducted In The 37 GHz And 39 GHz Bands Simultaneously.**

- The pioneers at 39 GHz would be artificially handicapped unless they are allowed to bid for "white" areas around their existing license areas at the same time that the BTAs at 37 GHz are being awarded.



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**MEMORANDUM**

**TO: FCC STAFF**

**FROM: W. Theodore Pierson, General Counsel** *WTP*

**SUBJECT: NPRM on 38 GHz, ET Docket No. 95-183, RM-8553; PP Docket No. 93-253 --  
Modified build-out proposal**

**DATED: 8/05/96**

In its initial comments in response to the NPRM, ART proposed a construction schedule based upon links per square kilometer. After further experience and consideration, ART has concluded that a "link" approach is antithetical to technological change and spectrum efficiency. Using links as a benchmark would not encourage spectrum efficiency because a single DS-1 would count as much as a DS-3, which has 28 times the capacity. Furthermore, applying a "link" approach would be difficult to apply when the technology moves to a point-to-multi-point environment.

For these reasons, ART urges the Commission to adopt the following "bits-per-Hertz" benchmark.

18 months ----- 1.0 Mbps per each 750,000 segment of the population

48 months ----- 3.0 Mbps/750,000 population

60 months ----- 4.0 Mbps/750,000 population.

These criteria would be applied to each authorized 38 GHz service area in the aggregate, on a channel by channel basis. In order to satisfy the criteria, the bits-per-Hertz would have to be the subject of a contract for commercial, revenue-producing in effect at the time of the benchmark.

The time lines would be measured from the date of Commission adoption of the proposal.



USER SYSTEMS, INCORPORATED

**Impact of  
FSS Interference on  
ART's FS Service  
Current Operations**

Prepared for:

Steve Hayes.

Advanced Radio Telecom Corp.

User Systems, Inc.

December 13, 1996

## **Summary**

In order to better understand the impact of Motorola's proposal to operate the M-Star system in the 37.5 - 40.5 GHz band on a co-primary basis with the existing terrestrial Fixed Service, User Systems has: 1) revisited the Link Budget analysis and incorporated specific operational information into the calculations; 2) reviewed existing FSS interference calculation (by WinStar and Biztel) and related the results to ART's operation; and, 3) incorporated ART supplied operational information and rain fade data.

Our findings are:

- **FSS operations will interfere with ART DigiWave radio performance, particularly:**
  - Link lengths would be reduced to between 1-3 km under fully faded conditions
  - High Inclination Links (< 1 km) could experience degraded reliability when operating at reduced power settings.

Even with the ITU power flux density limits, interference problems will only increase in the future as the 38 GHz FS provider systems utilize larger and larger bandwidths (> 40 MHz).