EX PARTE OR LATE FILED

Original

RECEIVED

DEC 11 1996

FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF SECRETARY

WALTER SONNENFELDT & ASSOCIATES
4904 Ertter Drive
Rockville, Maryland 20852
301-770-3299
Telecopier: 301-468-5953

December 11, 1996

Mr. William F. Caton
Acting Secretary
Federal Communications Commission
Room 222
1919 M Street, N.W.
Washington, D.C. 20554

Re: Notice of Ex Parte Presentation
ET Docket No. 95-183
RM-8553

Dear Mr. Caton:

On December 6, 1996, undersigned counsel to BizTel, Inc. ("BizTel") attended a meeting with Jackie Chorney, legal advisor to Chairman Hundt. Also in attendance representing fixed service interests were Denis Couillard, the Chairman of the Fixed Point-to-Point Communications Section, Network Equipment Division of the Telecommunications Industry Association (the "TIA Point-to-Point Section") (also Manager, Regulatory Affairs of Harris Farinon, Inc.); and George Kizer, former Chairman of the TIA Point-to-Point Section and Product Manager of Alcatel Network Systems. Due to an inadvertent omission in the preparation of ex parte notices for several other contacts by undersigned counsel on December 6, 1996 the instant ex parte notice is being filed several days later than others for the same day.

The topic of the meeting was a discussion of the technical impracticality of employing e.i.r.p. limits and automatic transmitter power control as a technique to facilitate co-frequency sharing between fixed service and fixed satellite service systems in bands above 30 GHz. Also discussed were recent misrepresentations on the record of the above-referenced proceeding by Motorola Satellite Communications, Inc. relating to discussions and recommendations contained in TIA Bulletin TSB10-F concerning the use of automatic transmitter power control. See TIA Bulletin TSB10-F, at § 4.3 (annotated copy, at Attachment 3); see, also, November 29, 1996 letter to William Caton from

Pantelis Michalopoulos, counsel to Motorola Satellite Communications, Inc.

Given the fact that the current and former senior TIA representatives in attendance at the meeting have been directly involved in the drafting and revision of TIA Bulletin TSB10, it was quite appropriate to discuss the actual TIA views with respect to the application of automatic transmitter power control in bands above 30 GHz, all of which are negative. In fact, Mr. Kizer personally drafted major portions of Section 4.3 of TSB10, which was the portion of the Bulletin that was misrepresented by Motorola. Thus, Mr Kizer was amply able to offer specific background on the intent of Section 4.3 and deliberations that resulted in the adoption of the text in that Section, which unambiguously concludes that the use of automatic transmitter power control is not advised by TIA in bands above 12 GHz.

In accordance with Section 1.1206(a)(1) of the Commission's Rules, attached hereto is a copy of the presentation slides used in the above-described presentation. Also attached is a detailed technical study presented at the meeting, as well as a complete copy of Section 4.3 of TIA Bulletin TSB10-F. Pursuant to Section 1.1206(a)(2) of the Commission's Rules, one copy of this letter is being submitted herewith. Copies of this letter are also being simultaneously served on counsel to Motorola Satellite Communications, Inc. and delivered to the Commission representative listed below.

Kindly direct any inquiries relating to this submission to the undersigned.

Very truly yours,

Walter H. Sonnenfeldt
Counsel to BizTel, Inc.

cc: Jackie Chorney, FCC
Pantelis Michalopoulos, Steptoe & Johnson, LLP

ATTACHMENT 1

DECEMBER 6, 1996 PRESENTATION SLIDES

ISSUES IMPACTING THE TIMELY DEVELOPMENT OF EFFECTIVE MILLIMETER WAVE SPECTRUM POLICY

ET Docket No. 95-183
ET Docket No. 94-124
RM-8811

Presented to the Federal Communications Commission

December 6, 1996

OVERVIEW

- Millimeter Wave Fixed Service operations are substantial and growing rapidly
- Fixed Service & FSS requirements must be addressed in a timely fashion -- domestically and internationally
- Co-Frequency FS/FSS operations will cripple and devalue both services
- Proposed redesign of Fixed Service systems will not solve the problem
- Band segmentation is the *only* viable solution

MILLIMETER WAVE FIXED SERVICE FAR EXCEEDS EXPECTATIONS

- Service developed in fallow spectrum at extremely high risk *in less than three years*
- Most viable facilities-based competition to monopoly local service providers
- Operations in more than 100 U.S. metropolitan areas; expected to reach over 150 within 3-4 months
- Major carriers ordering links in blocks of > 1000
- Advanced systems (e.g., hubs & high data rate) deployed soon
- More than 30,000 links (U.S.- built radios) operating across Europe
- Licensing underway in Canada; coming rapidly elsewhere

FIXED SERVICE AND FSS REQUIREMENTS MUST BE ADDRESSED

- September 1996 -- First above 30 GHz FSS system proposal -- Other proposals likely to follow
- Unresolved FSS requirement creates cloud over Fixed Service
  - Impedes financing
  - Deters auction bidders
  - Serious international implications
- Overseas WRC-97 initiatives are advancing rapidly
- United States WRC-97 position deadlocked
- **6 January 1996** -- Last critical ITU-R SG meetings before WRC-97

CO-FREQUENCY SHARING ANALYSIS

- Required separation distances at 39 GHz (FSS downlink):
  - FS S/L to FSS M/B = 96.5 km
  - FS M/B to FSS S/L = 32.5 km
  - FS S/L to FSS S/L = 570 m
- Notable Assumptions (based on recent studies by FS & FSS proponents):
  - FS e.i.r.p. = > 20 dB below allowable FS power limit
  - Required FSS I_0/N_0 = - 10.5 dB (2.5 dB lower than usual - 13 dB)
  - Assumes FSS earth station antenna sidelobe performance 3 dB in excess of previously stated specifications

▲ Analysis does <u>not</u> represent plausible worst case

CO-FREQUENCY SHARING ANALYSIS, CONT'D

- Required separation distances at 49 GHz (FSS uplink):
  - FSS S/L to FS M/B = 54.6 km radius from earth station
  - Maximum required separation = over the horizon
- Required Interservice separation distances (protection zones) FAR EXCEED average proposed FSS Intraservice deployment objective of 2.62 earth stations/km^2
- Both services seek to serve same customer locations
- THEREFORE: CO-FREQUENCY SHARING WOULD CRIPPLE FIXED SERVICE <u>AND</u> FSS COVERAGE CAPABILITIES

DRASTIC REDESIGN OF FIXED SERVICE PROPOSED BY SINGLE FSS PROPONENT

- Motorola "solution" (latest proposal):
  - \- 22 dBW/MHz FS e.i.r.p. density limit
  - Assumes *44 dB* of FS Automatic Transmitter Power Control ("ATPC")
  - Assumes that FSS earth stations will "accept" (i.e., *assume secondary status*) Fixed Service interference that will *still* result within hypothetical 1 km radius from earth stations *even* with the proposed strict Fixed Service restrictions
  - Constitutes unprecedented change in FS system operation without *any* consideration of FS coverage and service requirements

"FIXED SERVICE POWER LIMITS & ATPC ARE TECHNICALLY & ECONOMICALLY UNACCEPTABLE"

- **UNANIMOUSLY OPPOSED BY MILLIMETER WAVE FIXED SERVICE PROPONENTS**
- 1000's of installed FS transmitters not equipped with ATPC
- 1000's on order or in production not equipped
- According to all leading manufacturers of Millimeter Wave Fixed Service radios, 44 dB of ATPC is not achievable with current Millimeter Wave technology

- 10 - 15 dB is maximum possible achievable ATPC capability for foreseeable future

- Costly redesign and total replacement of equipment would be required -- at least 33-50 % increase in equipment cost to achieve > 10 dB ATPC

- **MOTOROLA MISREPRESENTS TIA BULLETIN TSB 10-F**

  - TSB 10-F considers the use of ATPC practical *only* in bands below 12 GHz, and states clearly that further study is needed above that limit. See TSB 10-F, at 4-13 (*omitted* from TSB 10-F excerpt appended to Motorola November 29, 1996 ex parte submission in ET Docket No. 95-183)

- **IMPOSITION OF POWER LIMITS & ATPC WOULD EVISCERATE ESSENTIAL FIXED SERVICE COVERAGE CAPABILITIES**

  - Using available 15 dB of FS ATPC with - 22 dBW/MHz power density yields totally unacceptable Fixed Service path length of *only* 100 meters to maintain hypothetical interference protection to FSS at > 1 km radius from earth stations.

  - IF desired Fixed Service path length is maintained by increasing power, 1 km "FSS secondary zone" increases out to as much as **a 42.5 km radius**

  - Implementing ATPC requires two-way Fixed Service links - would preclude one-way service

- **ATPC WOULD SUBSTANTIALLY INCREASE INTERFERENCE INTO FS RECEIVERS**

  - Current FS systems would not be impacted by FSS downlink interference except in mainbeam coupling situations during a fading event

  - Implementation of FS ATPC would force FS receivers to operate in the equivalent of a fully faded condition at all times, rendering them susceptible to FSS downlink M/B to FS S/L interference *during a substantial percentage of every satellite pass*

- **ATPC & POWER DENSITY LIMITS WOULD PRECLUDE THE DEPLOYMENT OF ADVANCED FS SYSTEMS**

  - Existing operators and the Millimeter Wave Fixed Service industry as a whole require access to the entire available 55 dBW power limit to facilitate the use of higher order modulation schemes (e.g., 64 QAM & 256 QAM) to meet exploding demand for high data rate wireless applications, while maintaining required 99.999% availability and necessary path lengths of up to about 7 km.

  - Systems approaching 44 dBW e.i.r.p. are expected from at least one domestic manufacturer within 18-24 months.

- **CONTRARY TO MOTOROLA'S CLAIM, ATPC <u>WILL NOT</u> MAKE FS EQUIPMENT MORE RELIABLE**
  - Addition of ATPC will ADD FAILURE POINTS likely to reduce <u>not</u> increase MTBF
  - Use of PIN diodes to implement ATPC, as advocated by Motorola, will *also* require additional filtering, cost and complexity to avoid generating intermodulation and spurious interference

- **MOTOROLA'S TWO EXAMPLES OF ITS OWN MILLIMETER WAVE ATPC IMPLEMENTATIONS ARE SOLID TESTIMONIALS TO THE IMPRACTICALITY OF APPLYING ATPC TO MASS-MARKET FS TERMINALS**

  - A *multi-million* dollar 20/30 GHz band MSS feeder link earth station with *less than 20 dB of ATPC capability* (1 - 2 required to provide nationwide service)

  - What appears to be a "MILSPEC" terminal, priced under provision of a *government contract*.

- **MOTOROLA IGNORES FATAL UNCORRELATED FADING PROBLEM INHERENT TO THE APPLICATION OF ATPC**

  - The most critical problem with the application of ATPC in the Millimeter Wave bands that has been raised *repeatedly* by FS proponents, but has been consistently ignored by Motorola is uncorrelated fading of intended receivers and victim receivers (FSS *or* FS victims).

  - *"Because of the uncorrelated fading problem, the application of ATPC is very likely to increase rather than decrease interference into adjacent victim receivers, thus totally defeating any marginal benefit that might be derived from the its application as an interference mitigation technique."*

- **DOMESTIC & INTERNATIONAL BAND SEGMENTATION IS THE *ONLY* VIABLE SOLUTION**

  - Sufficient bandwidth exists to accommodate all existing and proposed services without disrupting the tremendous success of incumbent Fixed Service operators and alienating critical Millimeter Wave financing sources

  - Exclusive FS and FSS allocations will maximize the coverage capabilities, the spectral and cost efficiency of Millimeter Wave systems, *thus enhancing the inherent value of the spectrum*

  - A common international band plan will facilitate cost efficient international satellite operations and help reduce FS equipment prices

CONCLUSIONS

- CO-FREQUENCY FS/FSS OPERATIONS ARE NOT FEASIBLE WITHOUT A CATASTROPHIC IMPAIRMENT OF FS & FSS SERVICE CAPABILITIES
- MOTOROLA'S PROPOSED REDESIGN OF FIXED SERVICE SYSTEMS IS PLAINLY FLAWED
- DOMESTIC & INTERNATIONAL BAND SEGMENTATION IS THE *ONLY* VIABLE SOLUTION
- TIME IS RUNNING OUT FOR THE UNITED STATES TO DEVELOP A COHESIVE DOMESTIC AND INTERNATIONAL MILLIMETER WAVE ALLOCATION POLICY

ATTACHMENT 2

PROSPECTS FOR CO-FREQUENCY SHARING BETWEEN THE FIXED SERVICE & THE FIXED SATELLITE SERVICE IN FREQUENCY BANDS ABOVE 30 GHz

Ex Parte Submission
ET Docket No. 95-183
ET Docket No. 94-124
RM 8811
December 6, 1996

PROSPECTS FOR CO-FREQUENCY SHARING BETWEEN THE FIXED SERVICE & THE FIXED SATELLITE SERVICE IN FREQUENCY BANDS ABOVE 30 GHz

1. INTRODUCTION

This document analyzes sharing between the fixed service ("FS") and the fixed satellite service ("FSS") in frequency bands above 30 GHz, and sets forth conclusions resulting from the output of resulting calculations. The potential effectiveness of possible interference mitigation techniques are also examined.

Calculations are performed using representative FSS and FS system parameters. The results of this study effort demonstrate that a single mainbeam-coupled FSS space-to-Earth to FS receiver interference event would severely impact the operations of FS links under deep fading conditions. Study results also indicate that precluding harmful interference into FSS earth station receivers would require separation distances far in excess of a practical interservice coordination standard, given the defined operational objectives of the representative FS and FSS systems studied. Likely multiple entry events in the case of FS transmitters into victim FSS earth station receivers serve only to further exacerbate interference effects. Similarly, the separation distances required to protect FS stations from transmitting FSS earth station emissions in the 47.2 - 50.2 GHz band render prospects for viable co-frequency FS and FSS Earth-to-space operations impractical, given the assumed deployment objectives in the respective services. Use of an e.i.r.p. mask may prove effective to protect space station receivers from FS emissions, but will only serve to exacerbate the susceptibility of victim FS receivers to interference from earth station transmissions. All currently identified interference avoidance methodologies are determined ineffective as mitigation techniques.

Based on the results of the analyses conducted in this study and the high-density deployment characteristics of both fixed service and fixed satellite service systems in bands above 30 GHz, sharing between co-channel FS and FSS systems in bands above 30 GHz does not appear to be operationally or economically feasible.

2. BACKGROUND

Recent advances in millimeter wave radio technology have resulted in the commercial availability of a growing range of equipments that will support FS operations in bands above 30 GHz. A substantial and rapidly growing number of FS systems are currently in operation in several administrations utilizing channel assignments in portions of the 37.0 - 40.5 GHz band. Several other fixed service bands above 30 GHz, including the 47.2 -50.2 GHz band, have been designated by a growing number of administrations for near and mid-term future FS use. Rapidly escalating interest in FS prompted the establishment of WRC-97 agenda item 1.9.6, which calls for the Conference to consider the identification of suitable frequency bands above 30 GHz for high-density fixed service applications.

FS systems can be generally characterized as high deployment density, relatively low-cost, wireless digital broadband fixed service networks. FS systems can provide a full range of digital local broadband services directly to and from customer premise-located terminals at data rates of up to one DS-3 per 50 MHz forward and return link channel pair. FS transmission paths can range up to about 6 - 7 km, depending mainly on rain attenuation conditions. FS links may be implemented in various single-hop, multi-hop, star, or other configurations, and are regularly deployed on an on-demand basis to meet specific end-user requirements as they develop. FS systems are also utilized to provide mobile network backhaul service and for other pre-determined infrastructure overlay configurations. FS systems are often deployed in dense urban environments where transmission path elevation angles may reach up to 45° and possibly higher. FS systems are also deployed to serve a range of requirements in semi-urban, suburban, and rural population centers.

Until recently, the issue of compatibility between co-primary FS and FSS operations has not presented itself as a matter requiring immediate attention. There are currently no operational commercial FSS systems utilizing spectrum in bands above 30 GHz. The first such FSS system that would utilize spectrum in these bands was proposed in early September 1996, and comprises a planned constellation of 72 non-geostationary spacecraft, with contemplated high/medium-density service ubiquitous-coverage space-to-Earth operations in the 37.5 - 40.5 GHz range and Earth-to-space operations in the 47.2 - 50.2 GHz range. Accordingly, because there are substantial current and planned FS operations in the 37.0 - 40.5 GHz band where co-primary FSS operations have been proposed, it appears prudent at this time to develop sound technical conclusions as to the feasibility of sharing between FS and space-to-Earth FSS operations.

3. FS/FSS SHARING IN THE 37.5 - 40.5 GHz BAND

A. FS Link Budget

The characteristics of a representative DS-3 capacity FS system were selected for the link analysis. These characteristics represent the most interference-susceptible FS system currently in use. Pertinent characteristics of the representative FS DS-3 system are presented in Table 1.

The DS-3 system that was evaluated requires a minimum received signal level of -110.5 dBW to deliver a minimum required threshold BER of 1×10^{-6}. Based on this requirement and Equations 1 and 2, a link distance (d) in an assumed rain attenuation environment absent of radio interference was determined.

$$C = P_T + G_R + G_T - L_P - FM \qquad \text{Equation 1}$$

where: C = Minimum desired signal level for DS-3 system, -110.5 dBW
P_T = FS transmitter power, -15 dBW
G_R , G_T = transmitter and receiver antenna gain, 44 dBi
L_P = free space propagation path loss, dB
FM = required fade margin for 99.999% availability, dB

$$d = 10^{[LP - (20 \log f) + 27.6] / 20} \qquad \text{Equation 2}$$

where: f = FS frequency, 40 GHz

Solving Equations 1 and 2 simultaneously leads to a path length of approximately 2.9 km with a fade margin of 49.7 dB, assuming rain attenuation conditions present in ITU-R rain region K. It should be noted that, if other rain attenuation conditions are assumed, path lengths for the representative FS systems in an environment free of radio interference will be longer or shorter, depending on rain rate, ranging up to about 6 - 7 km.

For the representative DS-3 system, the required C/I to maintain a threshold BER of 1×10^{-6} is 23 dB. This means that the maximum allowable interference level [C + C/(I+N)] from all sources cannot exceed -133.5 dBW (-149.5 dBW/MHz) to maintain the minimum required threshold BER of 1×10^{-6} and a link availability of 99.999%. See Recommendation ITU-T G.826 & Recommendation ITU-T G.827.

Table 1
CHARACTERISTICS OF REPRESENTATIVE CURRENT 37.0 - 40.5 GHz DS-3 FS SYSTEM[1/]

Data Rate/Capacity	DS-3
Frequency Range (GHz)	38.6 - 40.0
Modulation Type	OQPSK
Necessary Bandwidth (MHz)	40
Transmitter Power (dBm)	15
Transmit e.i.r.p. (dBm)	54 (.33m antenna)
Receiver Sensitivity (dBW) (BER 1×10^{-6})	-110.5