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December 6, 2001

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FEDERAL COMMUNICATIONS COMMISSION
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Magalie Roman Salas
Secretary
Federal Communications Commission
The Portals
445 Twelfth Street, S.W.
Washington, DC 20554

Re: ***Notice of Ex Parte Presentation***:
IB Docket No. 01-185

Dear Ms. Salas:

On December 4, 2001, Alan Auckenthaler, General Counsel of Inmarsat Ventures plc, Don Kennedy, Director, International Regulatory Affairs of Inmarsat Ltd., Gary Epstein of Latham and Watkins, and the undersigned, met with Bruce Franca and Julius Knapp of the Office of Engineering and Technology. The topics of discussion were those described in the enclosed set of presentation materials and the Inmarsat positions of record in this proceeding.

An original and one copy are enclosed.

Respectfully submitted,

John P. Janka

cc: Bruce A. Franca
Julius P. Knapp

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# PRESENTATION TO

# THE FEDERAL COMMUNICATIONS COMMISSION

# INMARSAT VENTURES PLC

IB Docket No. 01-185

December 2001

INMARSAT

# Overview of Inmarsat

- Privatized in 1999
  - formerly an Intergovernmental Organization (IGO)
- Currently operates nine geostationary MSS spacecraft around the world
- Annual revenues of over $400 Million
- Over 220,000 registered user terminals
- Provides essential mobile satellite services to
  - almost every major commercial airline around the world
  - all cargo ships over 300 GRT, all passenger ships travelling internationally, US Navy and US Coast Guard
  - media organizations, governments, aid organizations, and other commercial businesses

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# Inmarsat Services

- Aeronautical services include
  - cockpit communications, aircraft position monitoring, air traffic control
  - weather information
  - voice, data, Internet access, news and video feeds
- Maritime services include
  - distress messaging and safety communications
  - weather information
  - voice, data, Internet access, news and video feeds
- Land-based services include
  - remote news reporting
  - remote operations and monitoring of facilities
  - restoration of failed terrestrial networks (e.g., September 11 rescue)
- Currently supporting US war efforts
  - service to US military
  - live feeds by news organizations

# Inmarsat's Planned New Offerings

- US market access just granted October 2001
  - allows Inmarsat to enter as a new competitor in the US market
    - currently operating through US distributors
  - allows Inmarsat to provide many new services in the US
- Investing $1.72 Billion in next generation Inmarsat-4 network
  - supports high speed services
    - up to 432 kbps MSS (3x the top speed offered today)
  - spacecraft launches start in 2003
  - employs cutting-edge digital technology
  - provides highly efficient spectrum reuse

# FCC's Terrestrial Flexibility Rulemaking

- Ancillary terrestrial uses proposed for
  - L-Band
  - 1.6/2.4 GHz (Big LEO) band
  - 2 GHz band
- Ancillary authorization being considered for
  - Space system licensees
  - Independent terrestrial operators
- Inmarsat's main issue is terrestrial use of the L-Band
  - Also interference from terrestrial users in adjacent 1.6 GHz (Big LEO) band

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# Terrestrial Uses at L-Band Create Insurmountable Problems

- Terrestrial uses of the L-band are a fundamentally different use than the MSS uses that Inmarsat has coordinated and designed its satellite network to share with
- Terrestrial uses would interfere with existing and planned Inmarsat services
  - both inside the US and outside the US
- Terrestrial uses would violate existing US international obligations
  - 1996 Mexico City MOU on L-band coordination
  - ITU Table of Frequency Allocations in Radio Regulations
- Terrestrial uses would exacerbate the current shortage of MSS spectrum
  - Motient's self-interference from terrestrial services would increase its spectrum needs beyond what Motient requires for true MSS services

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# International Law Problems

- Authorizing terrestrial uses at L-band would violate US obligations under its coordination agreement with the UK, Canada, Mexico and Russia
  - the 1996 Mexico City MOU contemplates solely MSS use of the L-band
  - L-band spectrum that one system no longer needs for MSS is to be made available for the other MSS systems
    - not for a new terrestrial service
    - Motient/TMI clearly do not use all their spectrum assignments under MOU
- The ITU Table of Frequency Allocations does not support proposed terrestrial services in North America
  - the proposed terrestrial services would interfere with MSS uses that conform to the ITU Table

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# Terrestrial Interference Problems

- Three main interference problems exist:
  - terrestrial transmitters would cause much more interference into Inmarsat satellites than ever would be generated by satellite terminals
    - "In band" interference into Inmarsat uplink beams serving non-US areas
    - "Out of band " interference into Inmarsat uplink beams serving the US
  - powerful in-band signals from nearby terrestrial base stations would overwhelm Inmarsat mobile receivers
    - Inmarsat receivers are designed to receive much weaker signals from space---22,300 miles away
  - nearby terrestrial base stations also would produce harmful out-of-band emissions that would interfere with Inmarsat receivers
    - filtering out these emissions would waste spectrum that otherwise could be used for MSS

# No Feasible Solution for the Terrestrial Interference Threat

- Natural "shielding" in urban areas does not preclude Inmarsat spacecraft from receiving terrestrial interference
- Motient's assertions that "average shielding" will protect Inmarsat are flawed
  - the median shielding value is much lower than asserted
  - in any event, signals from 50% of terrestrial users will be shielded much less
    - and some 30% will not be shielded at all
- Current PCS rules are not designed to manage interference from terrestrial transmitters into satellite receivers
- There is no practical way for Motient to monitor the interference it generates into Inmarsat

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# Terrestrial Services Must Be Excluded At L-Band

- Terrestrial interference threatens essential safety and business services provided by Inmarsat
- Inmarsat system not designed to coexist with the terrestrial services proposed in the U.S.
- "Shielding" from buildings, other structures and trees will not solve the interference problem
- Cannot rely on Motient to "measure" the interference that Inmarsat will suffer
- Terrestrial services at L-band are inconsistent with existing US international obligations
- Motient's purported business needs for ubiquitous service can be addressed through commercial means that do not create these issues

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# Terrestrial Uses of the L-Band

## *Spectrum and Interference Issues*

## INMARSAT VENTURES PLC

IB Docket No. 01-185

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# L-band Spectrum and Interference Issues-Introduction

- The performance of Inmarsat mobile satellite services must be protected for at least for 99.9% of the time to meet IMO requirements for safety-related communications
- Shielding of signals in urban areas averages 3dB (NASA/JPL Handbook, Ch. 10, Vogel and Goldhirsh)
- High shielding occurs only with small probability and small attenuation occurs with high probability
  - Therefore, when averaged geographically, a large number of interfering signals experience small amounts of attenuation, and not enough to provide protection to Inmarsat uplinks

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# Introduction- Continued

- Motient claims that shielding will protect Inmarsat uplinks and quotes an average figure for urban areas that is unrealistically high
- Shielding attenuation is very low for a high probability of occurrence, particularly in:
  - suburban areas, where Motient proposes to deploy terrestrial mobiles, and
  - urban areas, in those directions toward GSO spacecraft that are aligned with streets
- Downlink interference problems also remain insoluble

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# Signal Attenuation Will Not Protect Inmarsat Uplinks

- JPL/NASA 'Handbook of Propagation Effects for Vehicular and Personal Mobile Satellite Systems', by Goldhirsh and Vogel, Ch.10, Fig 10-4 shows signal attenuation vs. cumulative probabilities in urban areas:
  - There is a 50% chance that attenuation is less than 3dB; this is the median attenuation, which approximates the average value
  - There is a 30% chance that attenuation is equal to or less than 0dB
  - This means 1 of every 2 terrestrial signals will be attenuated only 3 dB or less
  - Motient is wrong when it claims 17dB to 22 dB of attenuation is "average"
- See also ITU-R Rec. P.681-5 on Propagation Data

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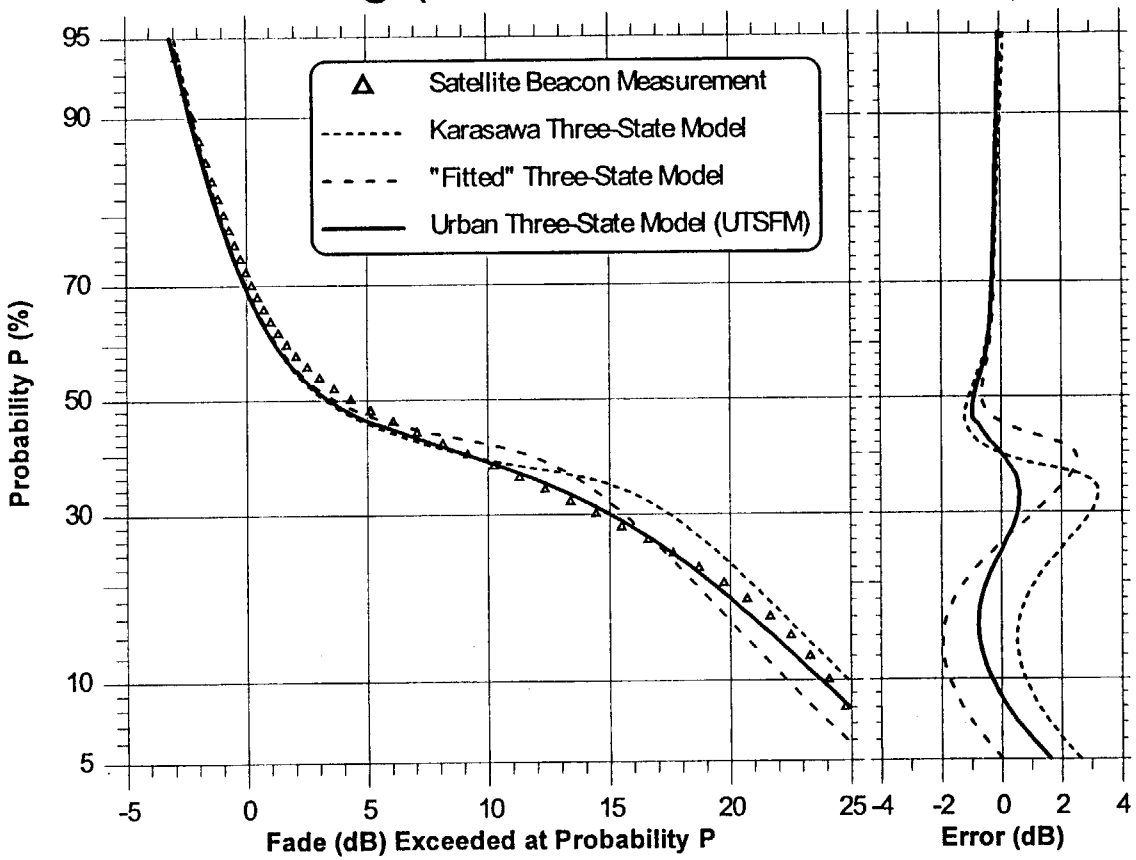
# Examples of L-band Signal Attenuation

- Model of Urban Fading (measured in Tokyo)




JPL/NASA 'Handbook of Propagation Effects for Vehicular and Personal Mobile Satellite Systems', by Goldhirsh and Vogel, Ch.10, Fig 10-4

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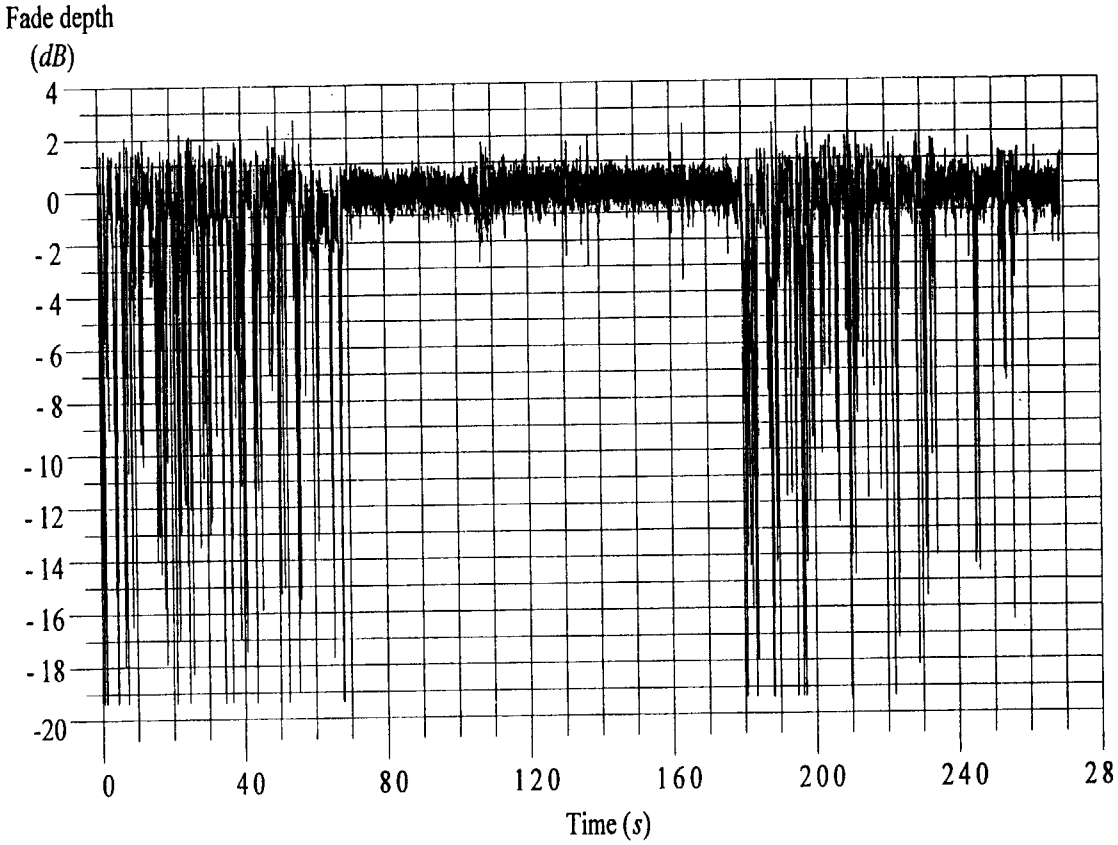
# Examples of L-band Signal Attenuation

- Measured Inmarsat satellite signal strength in suburban environment

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# Downlink Problems Not Solvable

- Problems with the downlink also exist
  - Out-of-band emissions from terrestrial base stations will cause harmful interference
  - Sensitive Mobile Earth Station receivers will be stopped from receiving distant satellite signals by strong nearby base station emissions (i.e. by overloading)
  - Base station transmit filtering not feasible to protect services in the MSS band

# Motient Cannot Protect Inmarsat or Itself From Interference

- Motient agrees that interference will occur and proposes to monitor the level to control it
  - their monitoring cannot measure interference to Inmarsat and therefore cannot protect Inmarsat services
- Interference will also be caused to Motient's own satellites
  - no frequency reuse will be possible between satellite and terrestrial components, because the Motient satellite has insufficient antenna discrimination toward its own service area
- This self-interference and lack of re-use will certainly lead to increased L-band spectrum requirements for Motient

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# Technical Problems Preclude L-band ATC Services

- Shielding provides Inmarsat inadequate protection from interference from most terrestrial users
- Large amounts of attenuation are present for only small percentages of terrestrial users
- Motient will suffer serious self-interference and will be unable to protect Inmarsat by monitoring Motient's own signals
- Motient will require access to more L-band spectrum than it needs for true MSS service
- Downlink interference problems remain insoluble

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