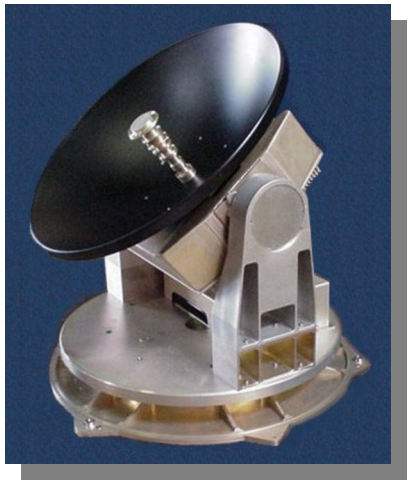
GENERAL DYNAMICS

C4 Systems

Satcom-On-The-Move$_{TM}$ Licensing Request Clarification



October 26, 2005

Description of Licensing Approach

General Dynamics Currently Operates Licensed SOTM$_{TM}$ Terminals

- Special Temporary Authorization Initially
- Experimental License Granted
- 24-Inch Terminals Are Licensed

Government Users Desire Additional SOTM$_{TM}$ Antenna Types

- Smaller Apertures such as 20 and 18-Inch
- Even Smaller Apertures Are Desired By Users
- Larger Apertures such as 30-Inch Are Also Desired
- General Dynamics Is Producing Various Different Apertures

General Dynamics Understands the FCC's Licensing Constraints

- Combination of -14 dBW/4 kHz Input Power And Compliant Antenna Patterns
- This Approach Is Proven Effective for Earth Stations on Vessels
- This Approach Meets ITU Recommendations and Satellite Operator Requirements

General Dynamics Requests a More Flexible SOTM$_{TM}$ License

- Precludes the Need for New Licenses For Every New Antenna Type
- Reduces Administrative Burden While Still Meeting Operational Requirements

Request for Specific Implementation

General Dynamics Will Comply With EIRP Density Requirements

- As Defined for Earth Stations on Vessels
- Including EIRP Density and Antenna Tracking Requirements

- EIRP Density Limits Are:

15 – 25log(θ) dBW/4kHz	for	$1.25° \leq \theta \leq 7.0°$
-6 dBW/4kHz	for	$7.0° < \theta \leq 9.2°$
18 – 25log(θ) dBW/4kHz	for	$9.2° < \theta \leq 48°$
-24 dBW/4kHz	for	$48° < \theta \leq 180°$

- Tracking Requirements Are:
  - Tracking Accuracy < 0.2 °
  - If Tracking Exceeds 0.5 °, Transmissions Cease
    - Until Tracking Error < 0.2°

General Dynamics Requests More General Authorization

- Specifically Without Antenna Aperture Limitation
- In All Cases, EIRP Density and Tracking Requirements Would Be Satisfied
- This Would Ensure Adjacent Satellite Interference Limits Are Always Observed

Explanation of Approach

Consider Representative SOTM$_{TM}$ Antenna Patterns

- Provided On The Following Slides, Isotropic Gain Is Illustrated
- Smaller Antennas Have Lower Gains and Wider 3dB Beamwidth
- FCC Regulation Curve from Section 25.209 Is Also Illustrated

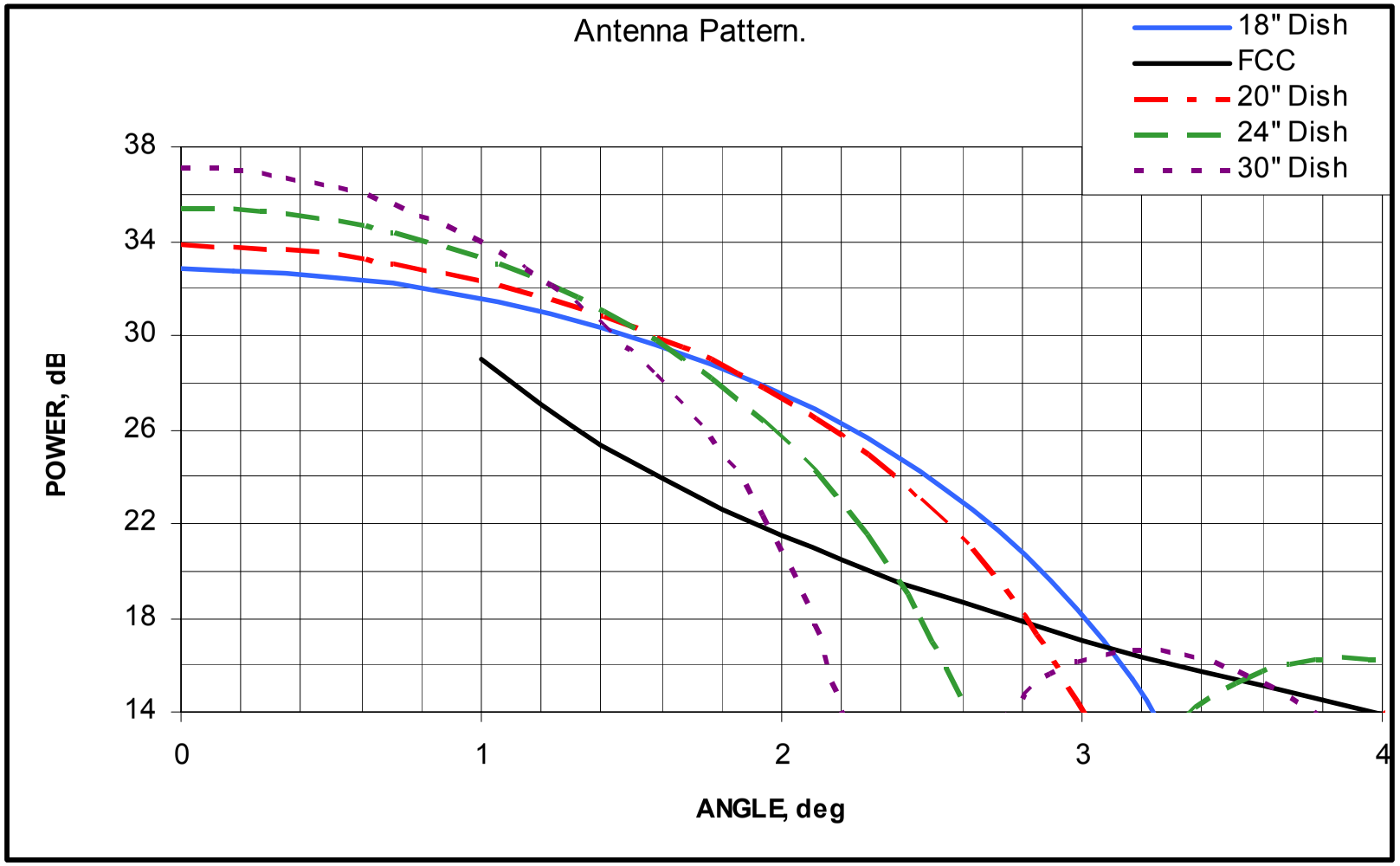
Input Power Density Would Be Reduced To Limit EIRP Density

- "Compliant" Antennas Routinely Licensed with – 14 dBW/4KHz Input Power Density
- Lower Input Power Densities Ensure Compliant EIRP Density, at All Angles
- Suitable Input Power Densities Include Antenna Pattern Excess of "Compliance" Plus Any Margin For Tracking Error

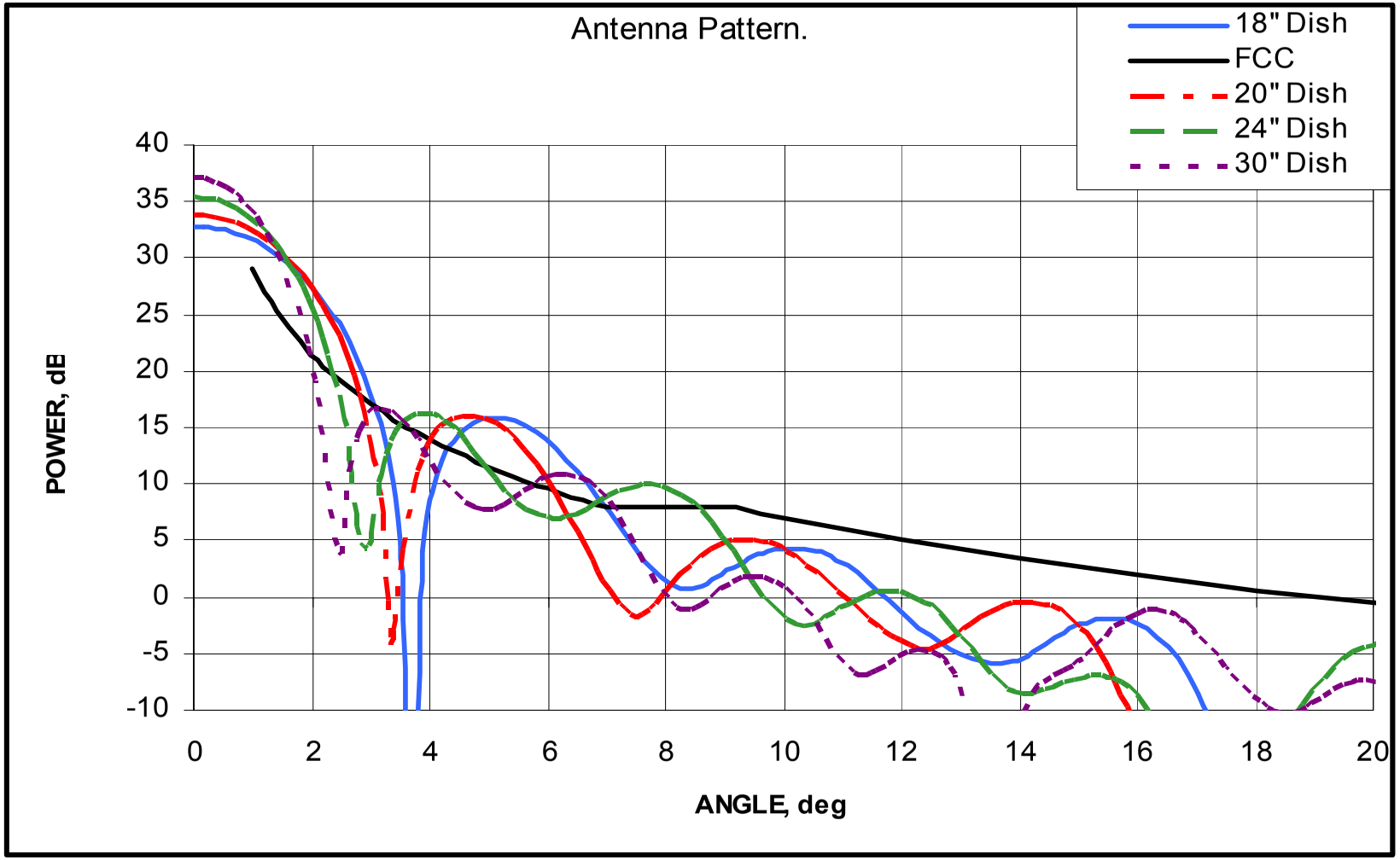
Representative EIRP Densities Are Illustrated on Following Slides

- EIRP Densities for 18, 20, 24, and 30-Inch Apertures Are Illustrated
- EIRP Density Limits For Earth Stations on Vessels Are Also Illustrated

SOTM Antenna Patterns – Close In



SOTM Antenna Patterns – Up to 20 Degrees



Proposed Compliance Approach

Input Power Density Is Reduced To Limit EIRP Density

- In All Cases, EIRP Density Limits for Earth Stations On Vessels at Ku-Band Are Met

EIRP Density Limits Are:

15 – 25log(θ) dBW/4kHz	for	1.25° ≤ θ ≤ 7.0°
-6 dBW/4kHz	for	7.0° < θ ≤ 9.2°
18 – 25log(θ) dBW/4kHz	for	9.2° < θ ≤ 48°
-24 dBW/4kHz	for	48° < θ ≤ 180°

Tracking Requirements Are:

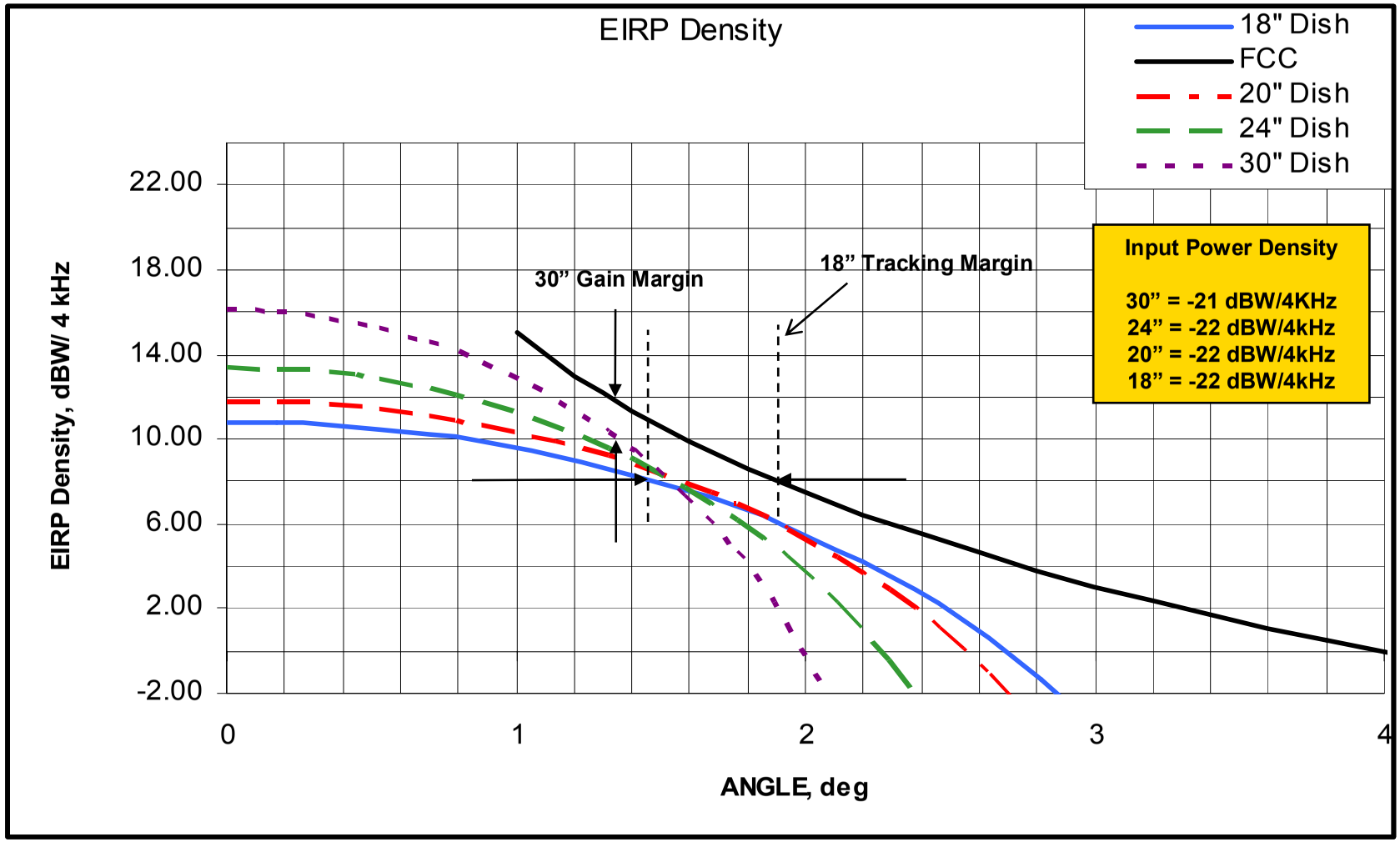
Tracking Accuracy < 0.2 °
If Tracking Exceeds 0.5 °, Transmissions Cease
Until Tracking Error < 0.2°

Specific Input Power Density Based On Antenna Gain Pattern

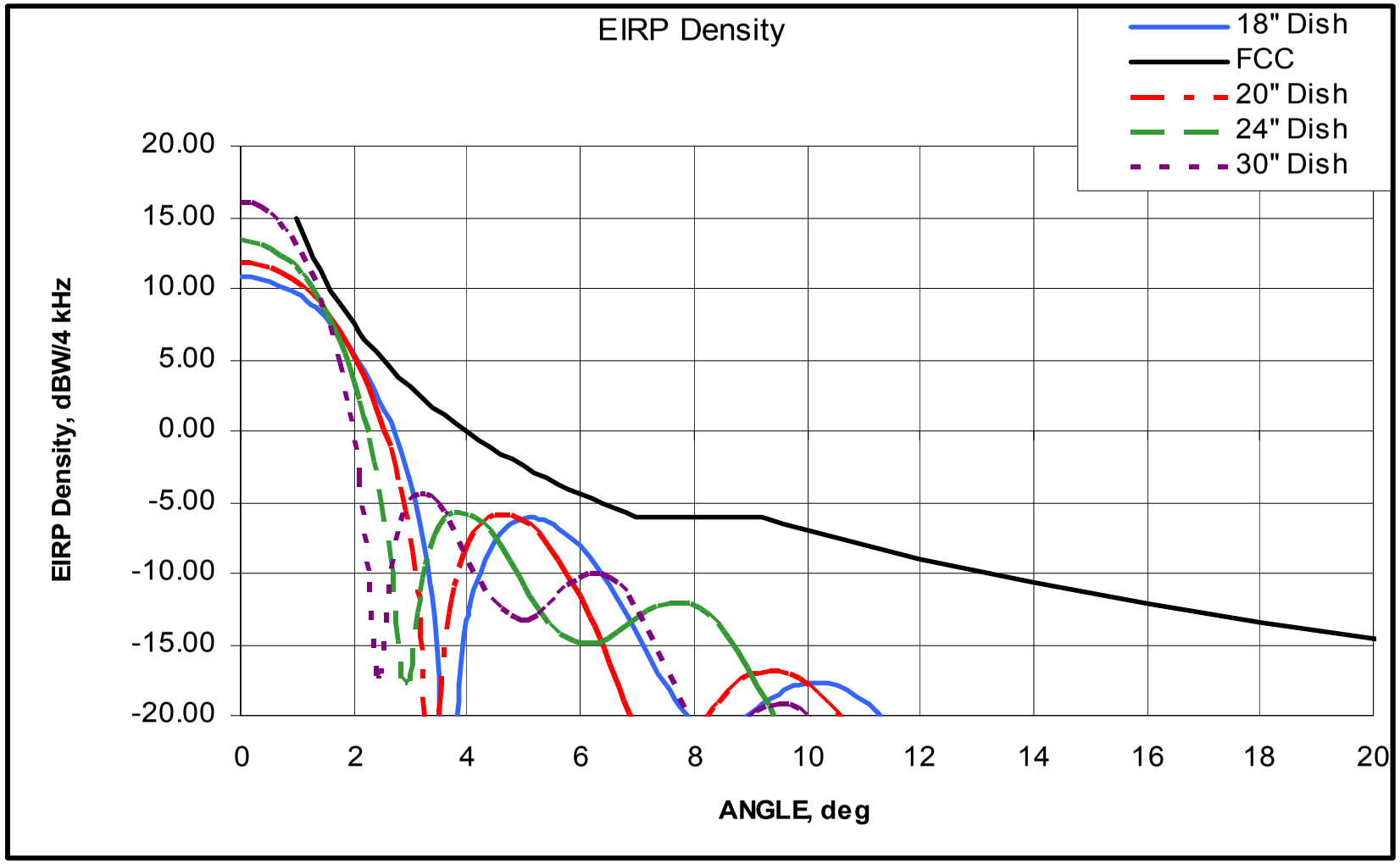
Resultant EIRP Densities Are Illustrated on Following Slides

- For 30-Inch Antenna – Input Power Density Limited to -21 dBW/4kHz
- For 24-Inch Antenna – Input Power Density Limited to -22 dBW/4kHz
- For 20-Inch Antenna – Input Power Density Limited to -22 dBW/4kHz
- For 18-Inch Antenna – Input Power Density Limited to -22 dBW/4kHz

Operating EIRP Density – Close In



Operating EIRP Density – Up to 20 Degrees



Conclusion

Proposed Approach Meets EIRP Regulatory Requirements By Limiting EIRP Density Toward Adjacent Satellites

- In All Cases, For All Modulation Types
- Depends Upon Known Antenna Gain Performance and Known Tracking

On-Axis EIRP Density Is Also Limited

- But Still Provides Useful Satellite Communications Link Performance

Operating Margin Is Provided

- For Antenna Gain Pattern Deviations
- For Antenna Tracking Accuracy Better Than 0.5 Degrees

Future System Enhancements Are Permitted

- Flexibly Supports Future Requirements
  - Improved Modem Waveform Performance
  - Various Generic Antenna Enhancements