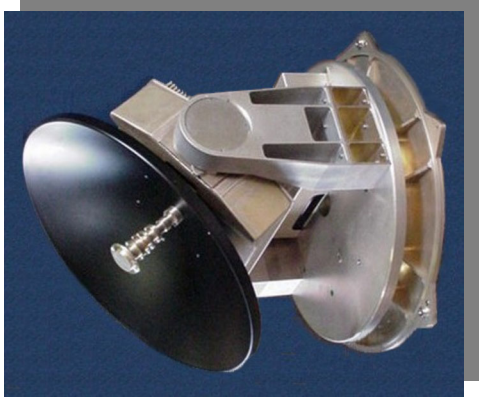


GENERAL DYNAMICS

C4 Systems

Satcom-On-The-Move™
Licensing Request Clarification



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

• Tracking Requirements Are:

Tracking Accuracy $< 0.2^\circ$

If Tracking Exceeds 0.5° , Transmissions Cease

Until Tracking Error $< 0.2^\circ$

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

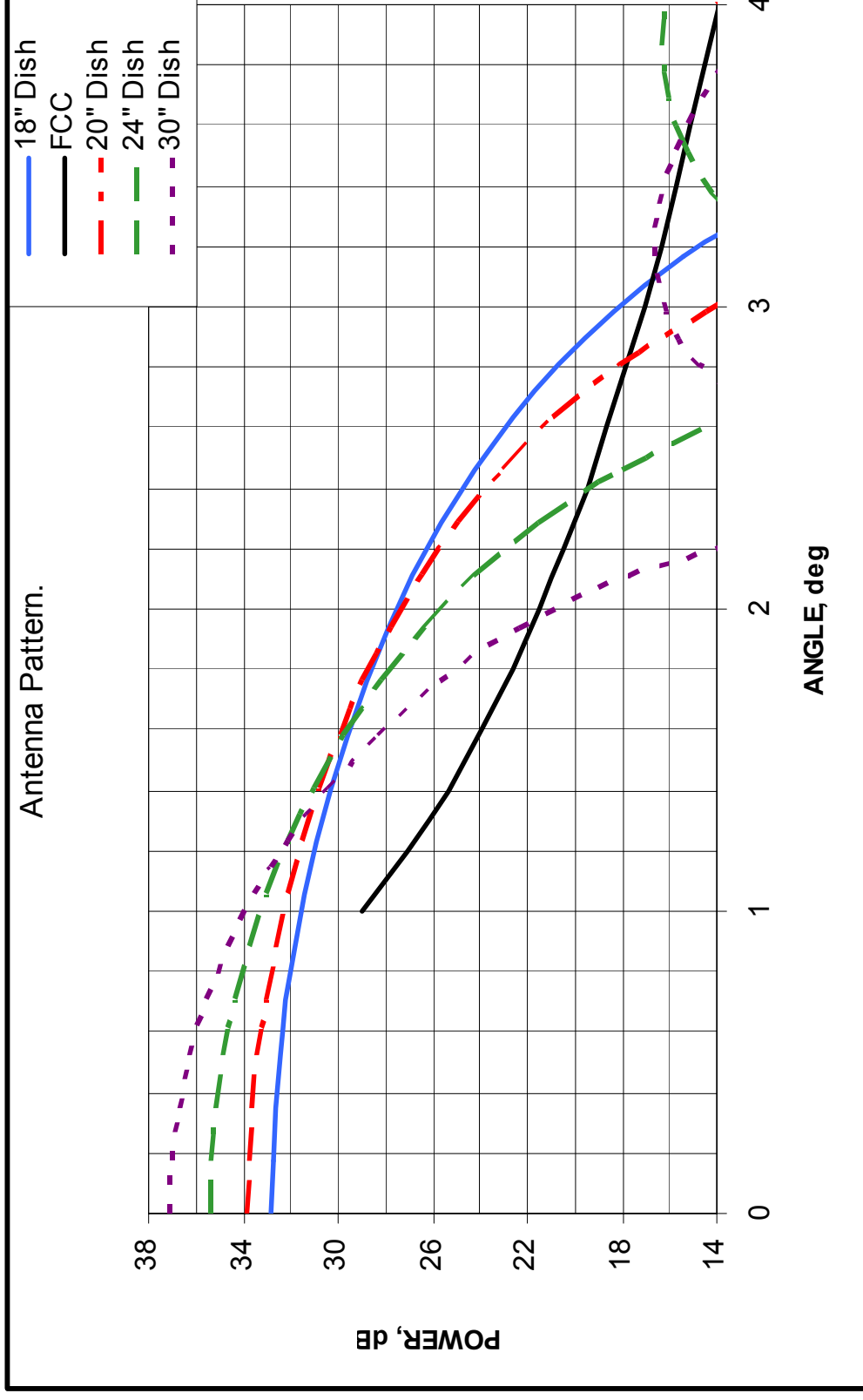
Input Power Density Would Be Reduced To Limit EIRP Density

- “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

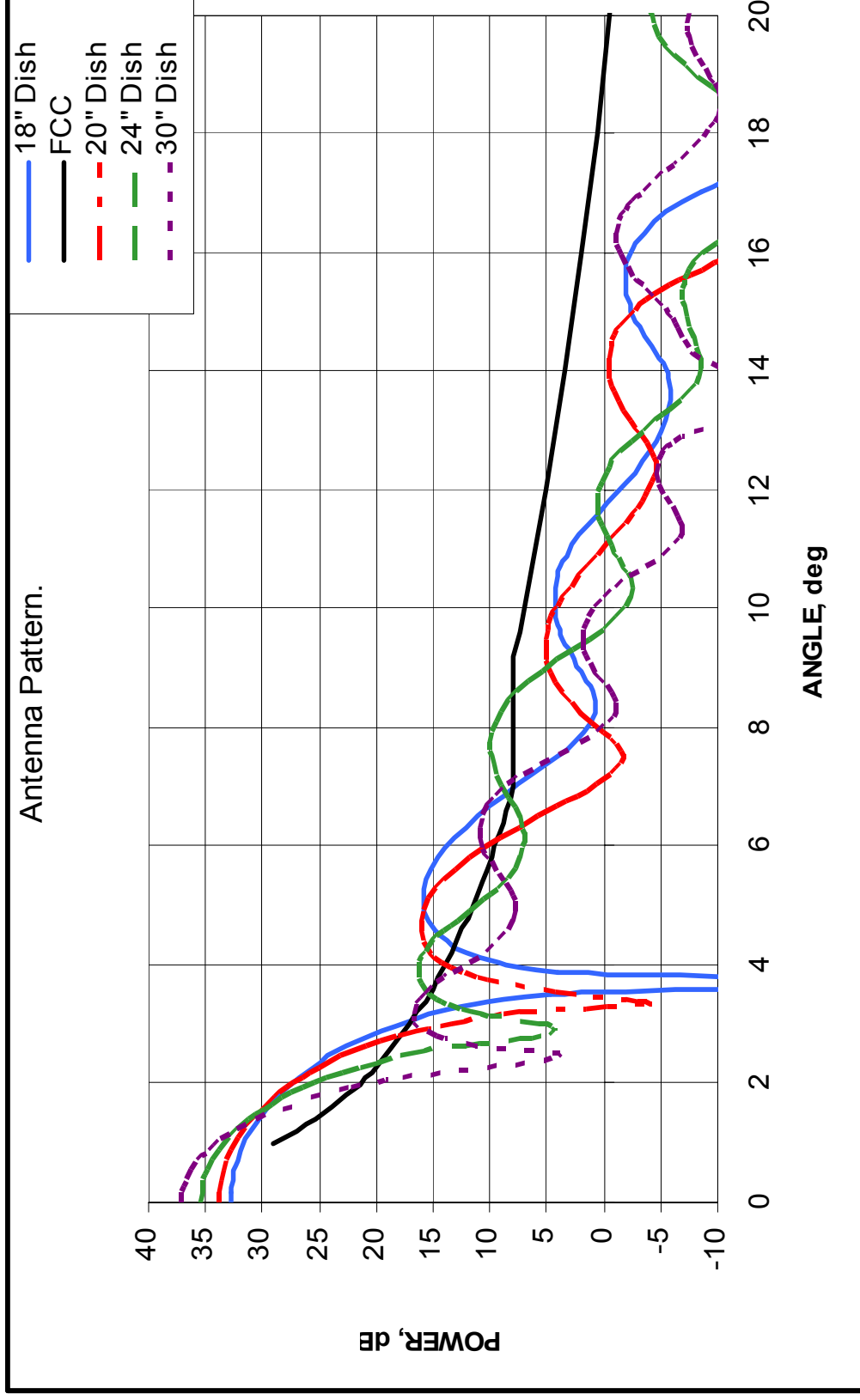
Representative EIRP Densities Are Illustrated on Following Slides

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

Tracking Requirements Are:

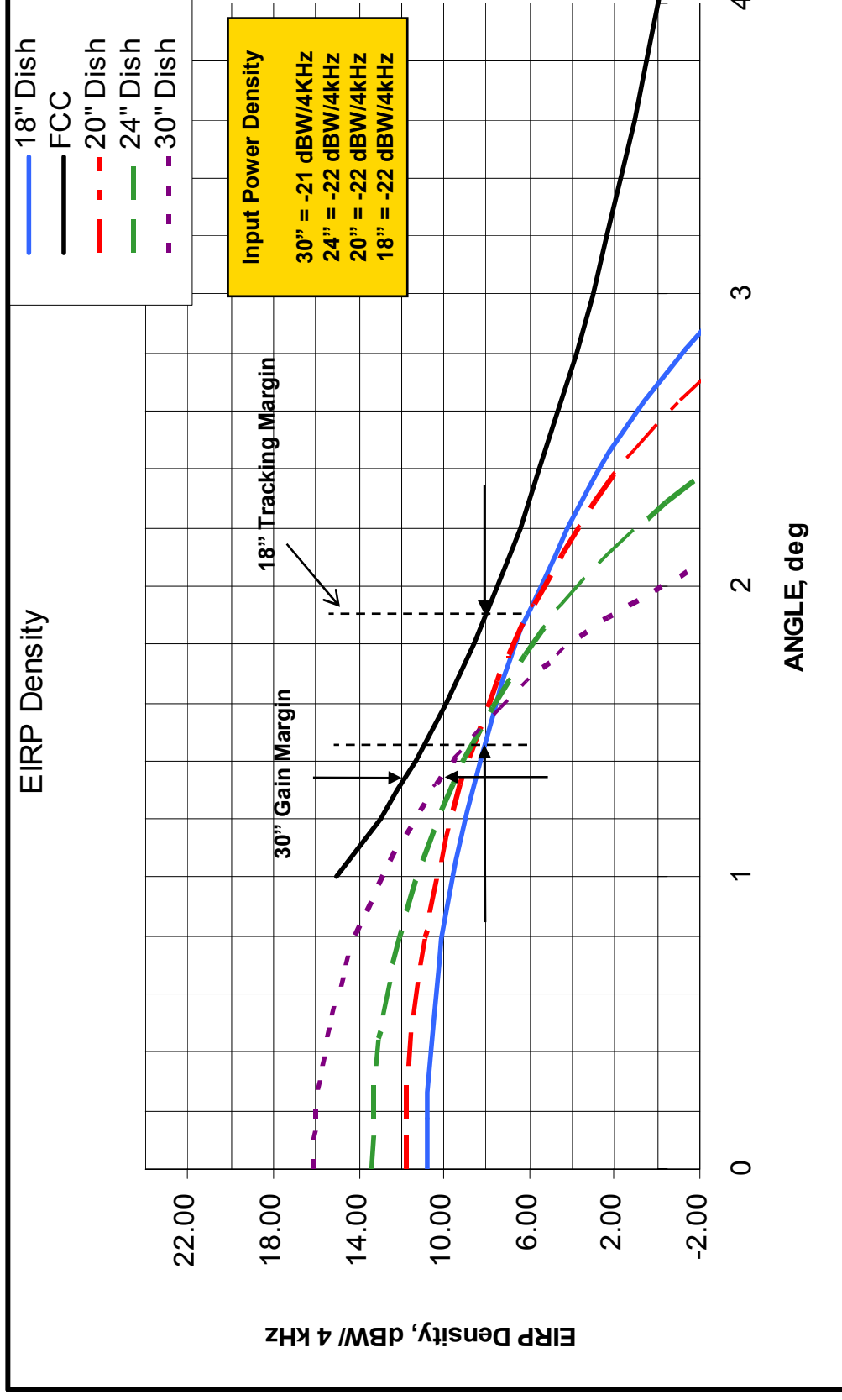
- Tracking Accuracy $< 0.2^\circ$
- If Tracking Exceeds 0.5° , Transmissions Cease
- Until Tracking Error $< 0.2^\circ$

Specific Input Power Density Based On Antenna Gain Pattern

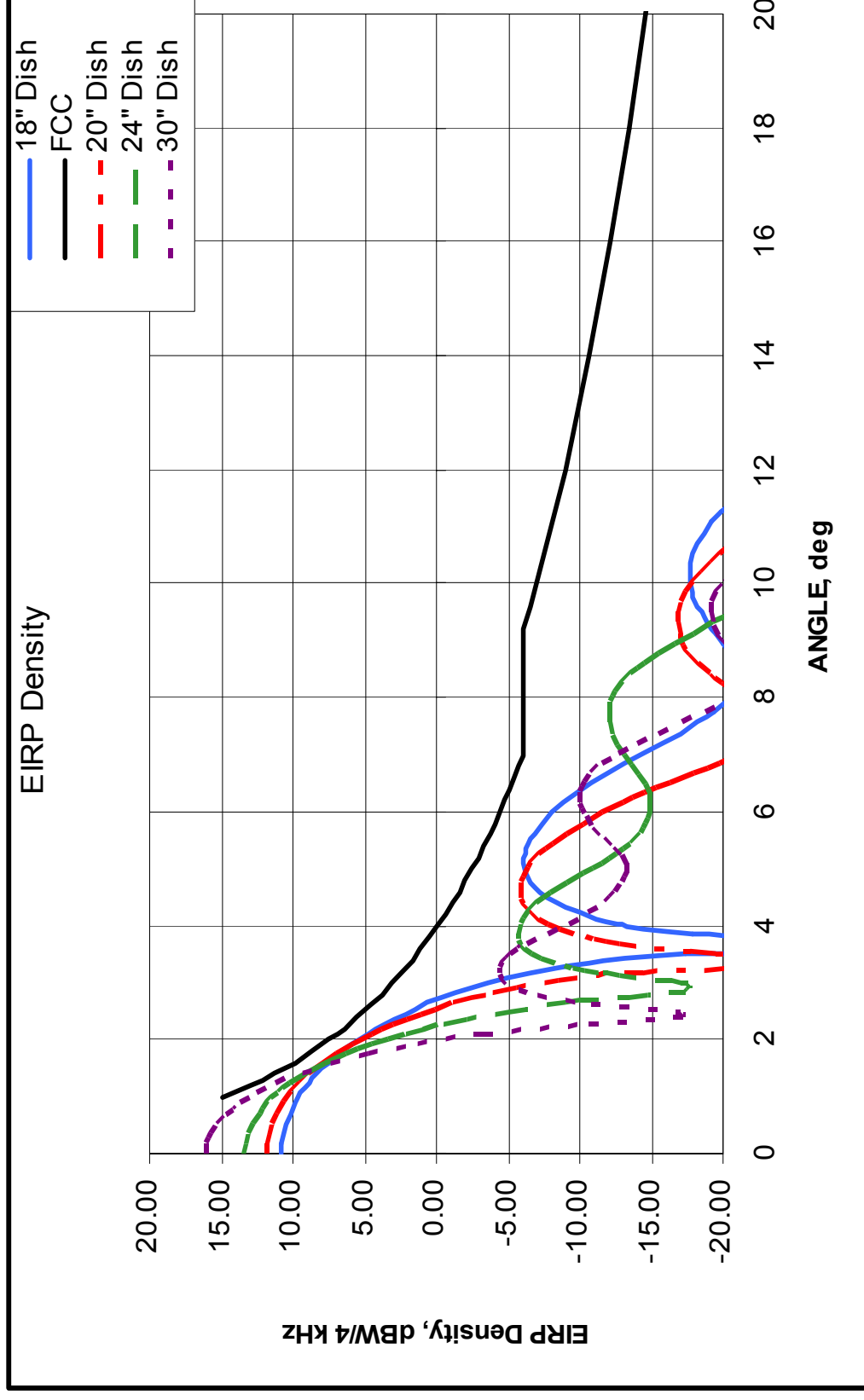
Resultant EIRP Densities Are Illustrated on Following Slides

- 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