

L3Harris Technologies, Inc.
FCC Form 312
C-Band Temporary Fixed Earth Station License Request
Galliano, LA (GAO_RTR)
Page 1 of 1

L3Harris Technologies, Inc. ("L3Harris") hereby requests permanent authority to install and operate a 2.4m Flyaway C-Band terminal located at the Galliano, LA heliport (29.414148°/-90.295413° to allow critical FAA air traffic communications to be uplinked via the L3Harris satellite network back to the FAA Houston Air Route Control Center and the New Orleans airport (MSY).

L3Harris is currently operating the 2.4m Flyaway C-Band terminal under Special Temporary Authority ("STA")¹ owing to damage caused to existing terrestrial communications as well as extensive structural damage to the FAA Remote Communications Air to Ground facility at Grand Isle, LA (GNI RCAG) from Hurricane Ida. The FAA to ensure the safety of the flying public normally requires that diverse delivery paths (either diverse terrestrial paths, or microwave, or satellite) exist for all air traffic control. The FAA facility GNI RCAG, is a FCC licensed C-Band site and lost the ability to send voice and data both terrestrially and via satellite. Specifically, as a result of damage from Hurricane Ida, existing FAA² terrestrial communications transmitting voice and data traffic to the FAA Houston Air Route Control Center and the New Orleans airport (MSY) were rendered inoperable, requiring L3Harris to deploy a Prodelin 2.4m C-Band Flyaway antenna system at the Galliano, LA heliport to carry voice and data traffic back to the FAA Houston Air Route Control Center and the New Orleans airport (MSY). The Flyaway system at Galliano, LA carries the voice and data traffic formerly handled by the GNI RCAG facility. Deployment of the 2.4m Flyaway C-Band terminal is allowing critical air traffic communications to be uplinked via the L3Harris satellite network back to the FAA Houston Air Route Control Center and the New Orleans airport (MSY) until the existing terrestrial system can be repaired and/or replaced.

Based on current construction and service restoration projections, the existing FAA facility GNI RCAG is not projected to be restored for both terrestrial and satellite communications until Jul-Sep 2022. Owing to this projection, L3Harris seeks permanent authority to operate a 2.4m Flyaway C-Band terminal at the Galliano, LA heliport.

The C-Band operations have been successfully coordinated and the completed coordination is attached hereto. Also attached please find the SES-2 satellite link budget analysis.

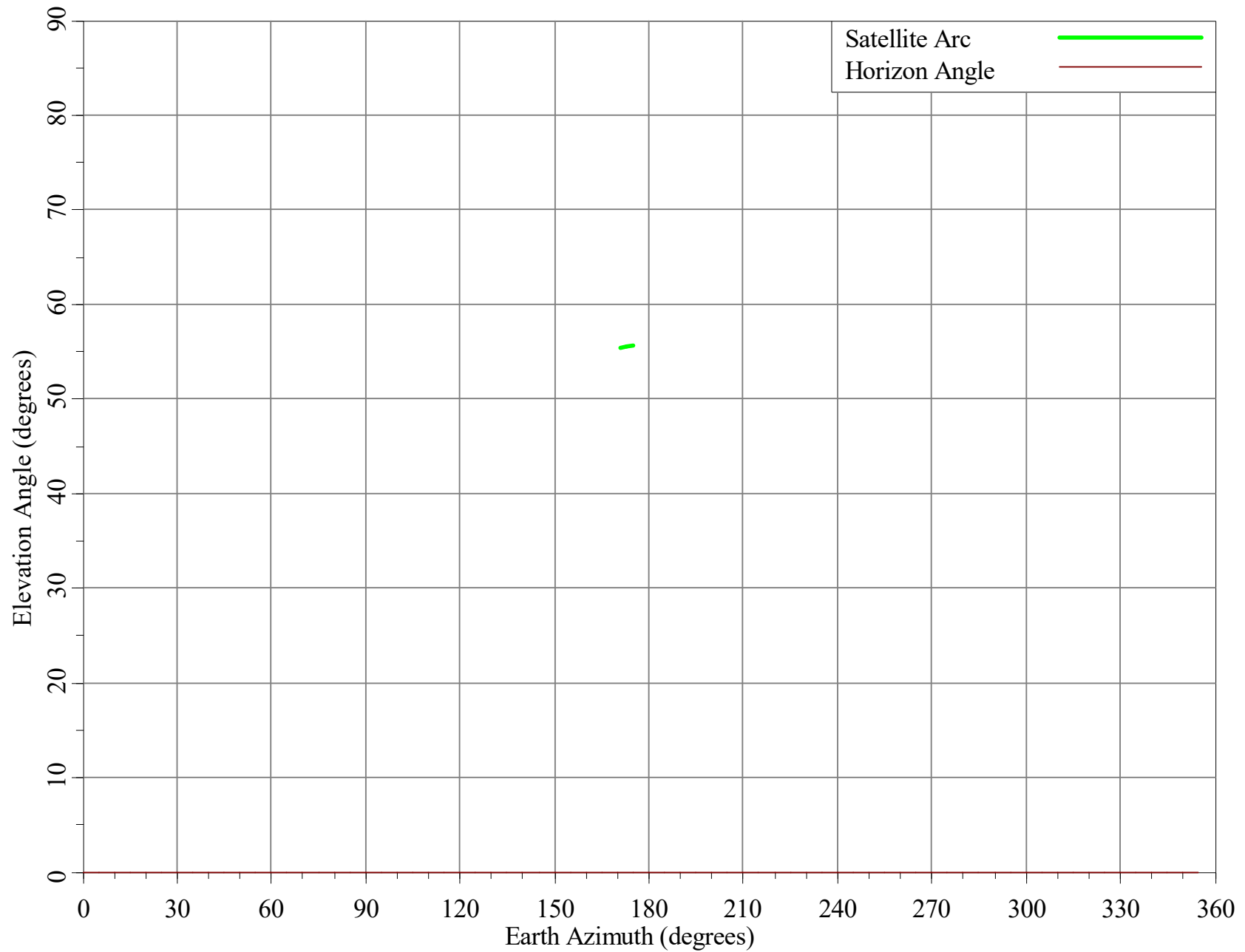
L3Harris submits that a grant of this FCC Form 312 license application will serve the public interest because it will assist the FAA's mission of ensuring flight safety.

¹ See FCC File Nos. File #SES-STA-20210914-01569 and SES-STA-20211012-01704. An additional STA extension request is being filed concurrently with this Form 312 application.

² L3Harris Technologies, Inc. serves as the current FAA Telecommunications Infrastructure contractor

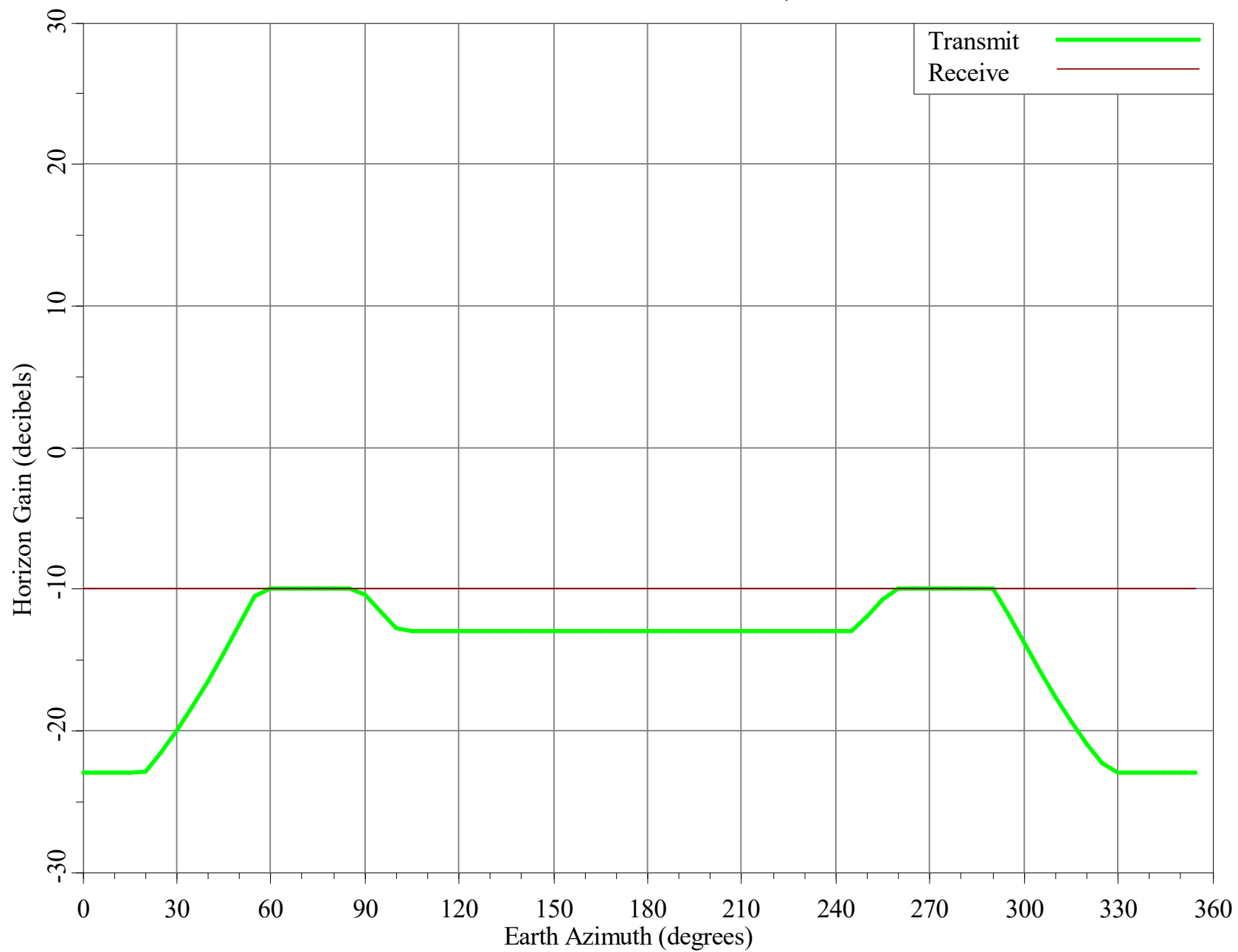
Graphs

Horizon Angle & Satellite Arc for GAO_RTR, LA Micronet Communications, Inc.

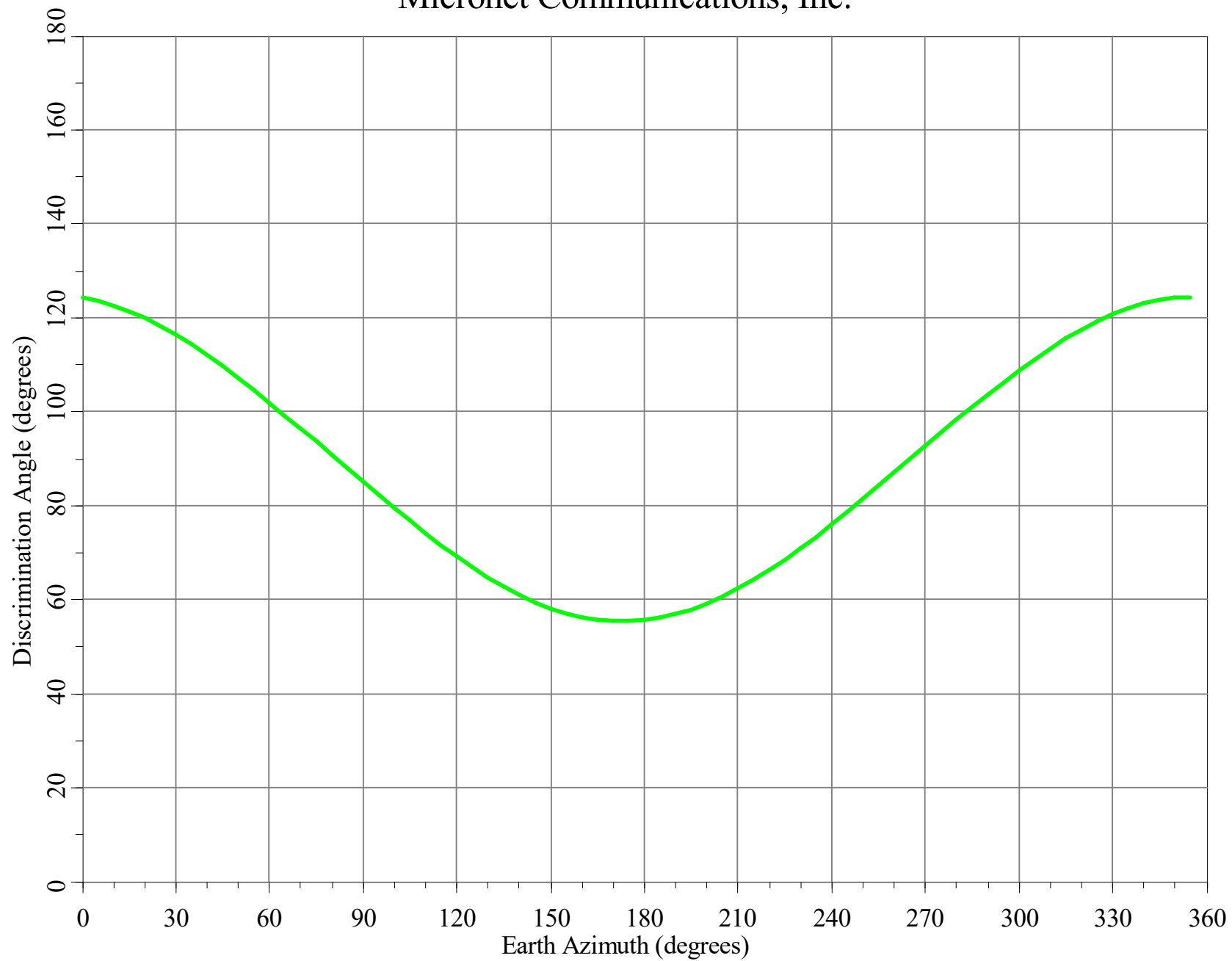


Horizon Gain for GAO_RTR, LA

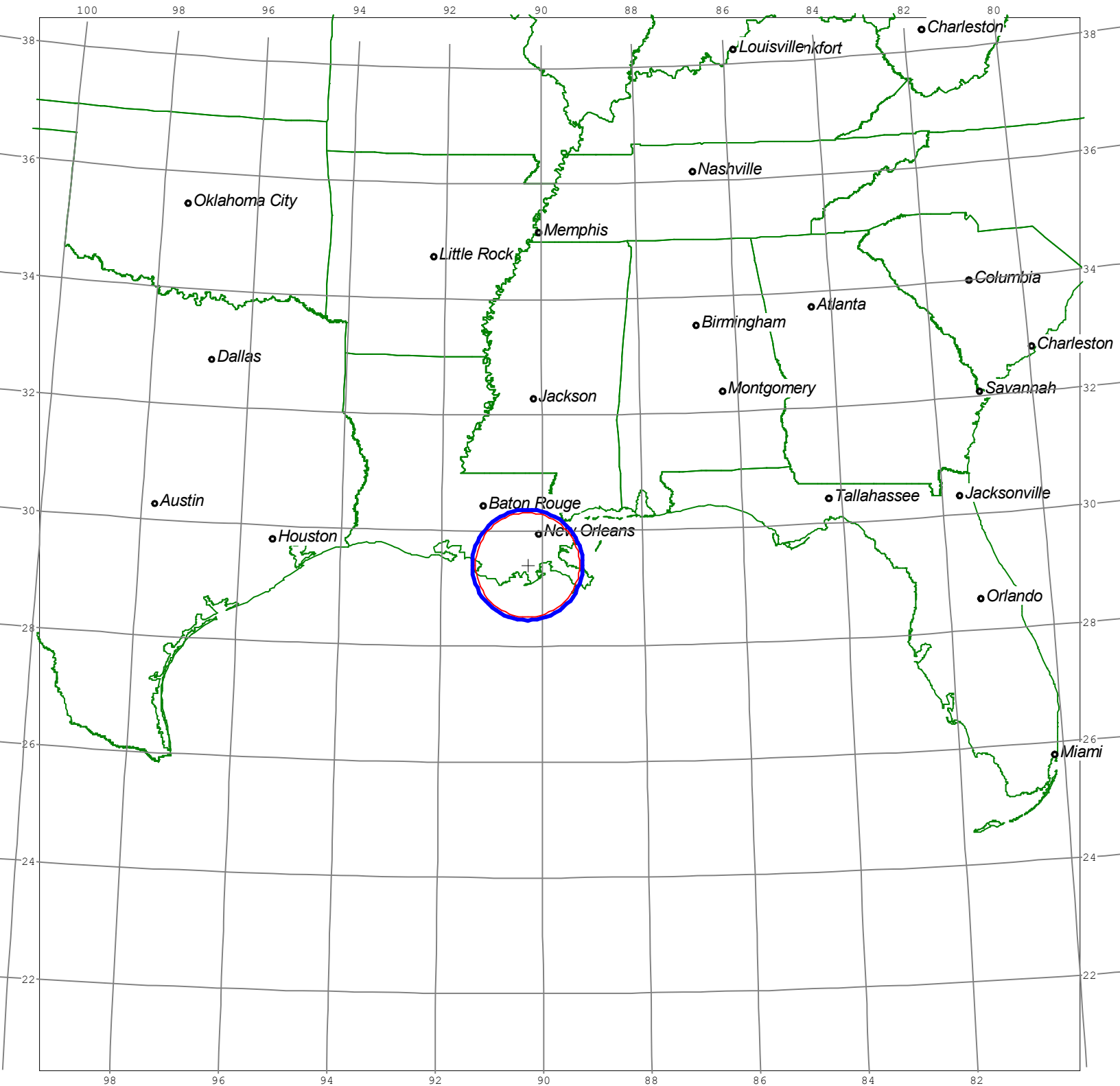
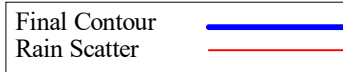
Micronet Communications, Inc.



Minimum Discrimination Angles for GAO_RTR, LA
Micronet Communications, Inc.



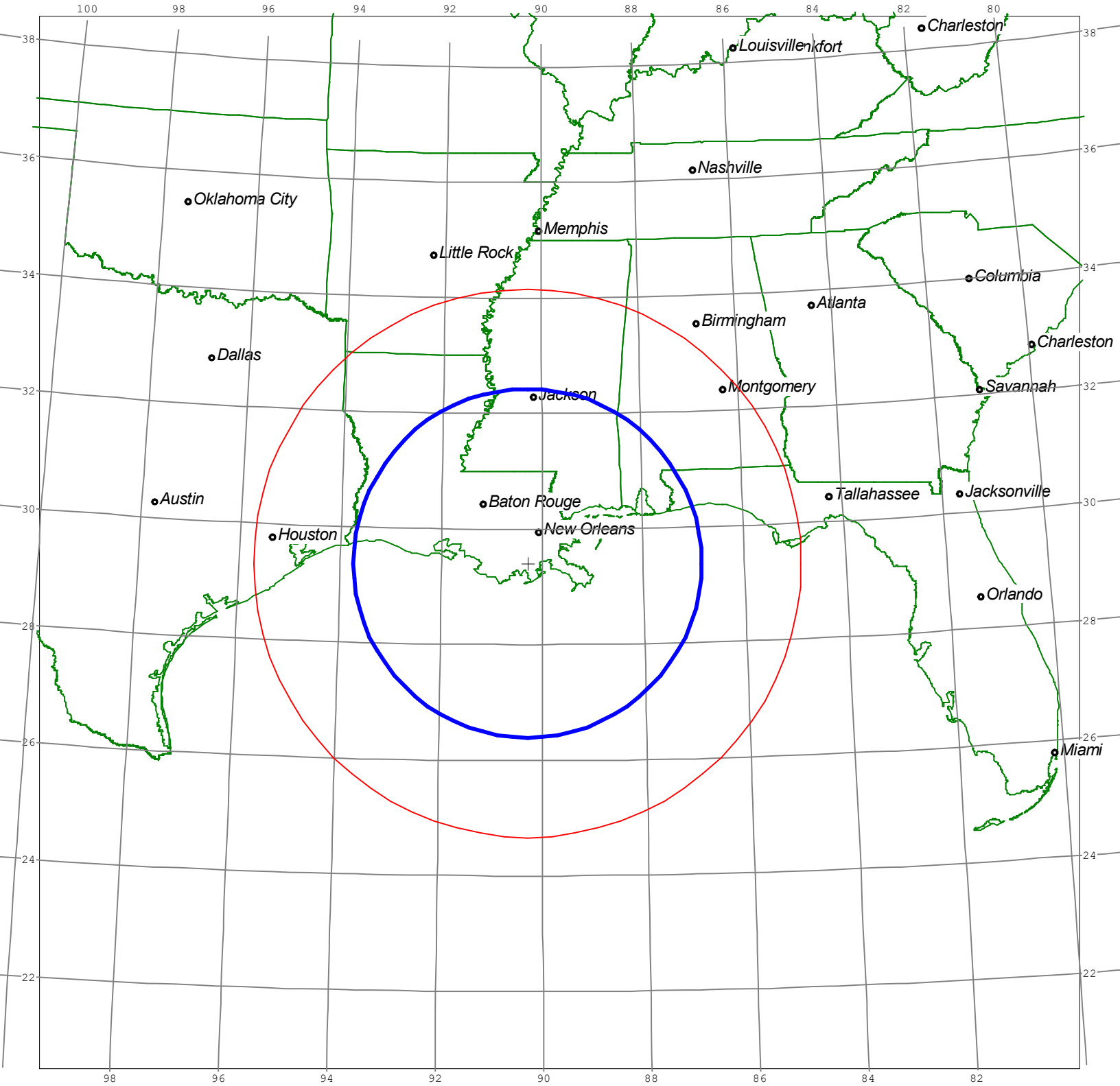
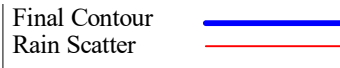
Final Contour & Rain Scatter for GAO_RTR, LA - Transmit



SCALE - 1:10000000 1 inch = 157.8 miles

Final Contour & Rain Scatter for GAO RTR, LA - Receive

SCALE - 1:10000000 1 inch = 157.8 miles



SES-2

Link Budget Analysis

SES LINK BUDGET ANALYSIS



PREPARED BY
Nick Brown
DATE
10-Sep-21
BUSINESS PARTNER

PROJECT
FTISAT Current Eb/No Readings
REVISION
Current Eb/No Readings

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Satellite	SES-2
Orbital location	°E -87.00
Transponder information	
Transponder ID	21C
Center frequency and polarisation (U/D)	MHz 6345 VLP / 4120 HLP
Bandwidth	MHz 36.00
Transponder Dlk Saturation EIRP Towards Beam-Peak	dBW 43.47
Transponder Beam-Peak G/T	dB/K 3.64
Saturation flux density, Beam-peak	dBW/m² -90.85
Operational mode	Multiple Carrier, [IBO: -5.5 dB OBO: -4 dB]
Inclined (Yes,No)	No

AGGREGATE RESOURCE REQUIREMENTS

Capacity Balanced / BW / PWR Limited	
Number of carriers in transponder	2
Required bandwidth	MHz 0.3
Allocated bandwidth	MHz 0.32
PEB of carriers	MHz 0.27

ANALYSIS HIGHLIGHTS ACROSS ALL SITES IN ANALYSIS

Link margin review [over sites]	
Site with highest clear sky link margin	USA-WBN-004 6175.0/3950.0 Woodbine C5 (CSM, SES-2)>USA-33454 at GAO : 0.0 dB
Site with lowest clear sky link margin	USA-33454 at GAO >USA-WBN-004 6175.0/3950.0 Woodbine C5 (CSM, SES-2) : 0.0 dB
Link availability review [over sites]	
Site with highest link availability	-
Site with lowest link availability	-

Calculation type	Clear sky only	Clear sky only
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Carrier Name	GAO C GW	GAO C RM
Carrier PEB	MHz 0.20	0.06
Carrier Predicted Total C/(N+I)	dB 11.16	11.16
Link total Eb/No	dB 9.40	9.40
Required Eb/No (including implementation and additional margin)	dB 9.40	9.40
Link closes? [2 out of 2, 100 %]	Yes	Yes
Link margin in clear sky (For ACM carriers, residual margin in CS)	dB 0.00	0.00
Target Link Availability	% yr clear weather only	clear weather only
Achieved Link Availability	% yr clear weather only	clear weather only
Availability Requirement Satisfied? [0 out of 2, 0 %]	clear weather only	clear weather only
ALC: Is the overdrive limit exceeded ?	Not computed	Not computed
Balanced/Power/Bandwidth limited	PWR Lim	BW Lim
Carrier PEB to allocated bandwidth ratio	1.27	0.40
Compliance to SES Coordination constraints	No CoCos	No CoCos
Summary of carrier emission levels		
Carrier power density at transmit antenna flange	dBW/Hz -63.31	-53.98
Carrier Uplink EIRP density	dBW/Hz -7.33	-11.69
Carrier power flux spectral density	dBW/m²/Hz -169.89	-174.95
Carrier Downlink EIRP density at beam peak	dBW/Hz -34.09	-39.15

EARTH STATIONS

Tx earth station ID		USA-WBN-004 6175.0/3950	USA-33454 at GAO
Latitude	°N	39.38	29.41
Longitude	°E	-77.08	-90.30
Antenna diameter	m	11.10	2.40
Skew angle at transmit location	deg.	11.79	5.81
Effective (Refracted) Elevation	deg.	43.49	55.70
Uplink aspect correction	dB	0.02	0.91
Receive earth station ID		USA-33454 at GAO	USA-WBN-004 6175.0/3950.0 Woodbine C5 (CSM, SES-2)
Latitude	°N	29.41	39.38
Longitude	°E	-90.30	-77.08
Antenna diameter	m	2.40	11.10
Skew angle at receive location	deg.	5.81	11.79
Effective (Refracted) Elevation	deg.	55.70	43.49
Effective G/T at the carrier frequency (Clear-Sky)	dB/K	18.65	30.03
Downlink aspect correction	dB	1.27	1.59

CARRIER INFORMATION

Carrier uplink centre frequency	MHz	6345.00	6345.00
Carrier downlink centre frequency	MHz	4120.00	4120.00
Number of carriers		1.00	1.00
Modem			
Modulation setting name (clear sky)		QPSK_0.750	QPSK_0.750
Information rate (clear sky)	Mbps	0.19	0.19
Symbol rate	Mbps	0.13	0.13
Aggregate code rate (clear sky)		0.75	0.75
Noise Bandwidth	MHz	0.13	0.13
Spreading Factor		1.00	1.00
Allocated bandwidth	MHz	0.16	0.16
Power Equivalent Bandwidth	MHz	0.20	0.06

ACM analysis (constant SR)

Spectral efficiency in clear sky	b/sym	1.50	1.50
Clear sky throughput	Mbps	0.19	0.19
Clear sky achievable modulation setting		QPSK_0.750	QPSK_0.750

SES LINK BUDGET ANALYSIS

Is the minimum recommended TPD OBO exceeded ?			
Under fade: Spectral efficiency at required availability	b/sym	N/A	N/A
Under fade: Throughput when meeting the required availability	Mbps	N/A	N/A
Under fade : Mod Cod meeting the required availability		N/A	N/A

LINK BUDGET

Uplink Calculations			
Carrier Input Backoff in clear sky	dB	-27.99	-33.05
Carrier FD from Uplink E/S	dBW/m ²	-118.80	-122.97
C/N _{UP,Thermal} : Uplink Thermal Noise ratio (clear sky)	dB	24.84	19.79
C/(N+I) _{UP, NO ASI} : Uplink Thermal Noise and interference ratio prior to ASI (clear sky)	dB	22.01	18.69
C/(N+I)_{UP} Uplink Thermal Noise and interference ratio (clear sky)	dB	17.71	13.22
Total propagation loss considering uplink rain fade	dB		
C/(N+I) _{UP} Uplink Thermal Noise and Interference ratio (UL under fade)	dB		
Resulting uplink path availability	% yr	clear weather only	clear weather only
Downlink Calculations			
Carrier Downlink EIRP towards Receive E/S	dBW	15.70	10.33
Carrier Downlink EIRP at beam peak	dBW	16.98	11.92
Carrier Output Backoff (clear sky)	dB	-26.49	-31.55
C/(N+I) _{DN, NO ASI} : Downlink Thermal Noise and interference ratio prior to ASI (clear sky)	dB	14.54	16.00
C/N _{DN,Thermal} : Downlink Thermal Noise ratio (clear sky)	dB	15.78	21.59
C/(N+I)_{DN} Downlink Thermal Noise and interference ratio (clear sky)	dB	12.25	15.39
Total propagation loss considering downlink rain fade	dB		
C/(N+I) _{DN} Downlink Thermal Noise and Interference ratio (DL under fade)	dB		
Resulting downlink path availability	% yr	clear weather only	clear weather only

NOISE CONTRIBUTION ANALYSIS

Limiting factor		Downlink Thermal Noise	Uplink Adjacent Satellite Interference
Total C/(N+I) clear sky	dB	11.16	11.16
Total Eb/No clear sky	dB	9.40	9.40
Total C/(N+I) (UL fade, DL clear)	dB		
Total C/(N+I) (DL fade, UL clear)	dB		
Total C/(N+I), excluding ASI, clear sky	dB	13.82	14.13
Required C/N (including implementation and additional margin)	dB	11.16	11.16
Required Eb/No (including implementation and additional margin)	dB	9.40	9.40
Link margin in clear sky (For ACM carriers, residual margin in CS)	dB	0.00	0.00

POWER DENSITY REVIEW

Carrier power density at antenna flange (clear sky)	dBW/Hz	-63.31	-53.98
Uplink EIRP density	dBW/Hz	-7.33	-11.69
Skew angle at transmit location	deg.	11.79	5.81
Uplink off-axis EIRP density at 2 deg.	dBW/Hz	-41.84	-32.51
Downlink EIRP density at beam peak	dBW/Hz	-34.09	-39.15

HPA Sizing

Total number of carriers		1.00	1.00
Total EIRP required from E/S	dBW	43.75	39.38
UPC Range	dB	0.00	0.00
HPA type/mode		Not Defined Multi Carrier	Not Defined Multi Carrier
Required backoff	dB	-4.00	-4.00
Required HPA capability	W	0.20	1.50
Recommended HPA size (for a single carrier)	W	HPA type not supplied	HPA type not supplied
Recommended HPA size (to support all carriers)	W	HPA type not supplied	HPA type not supplied

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