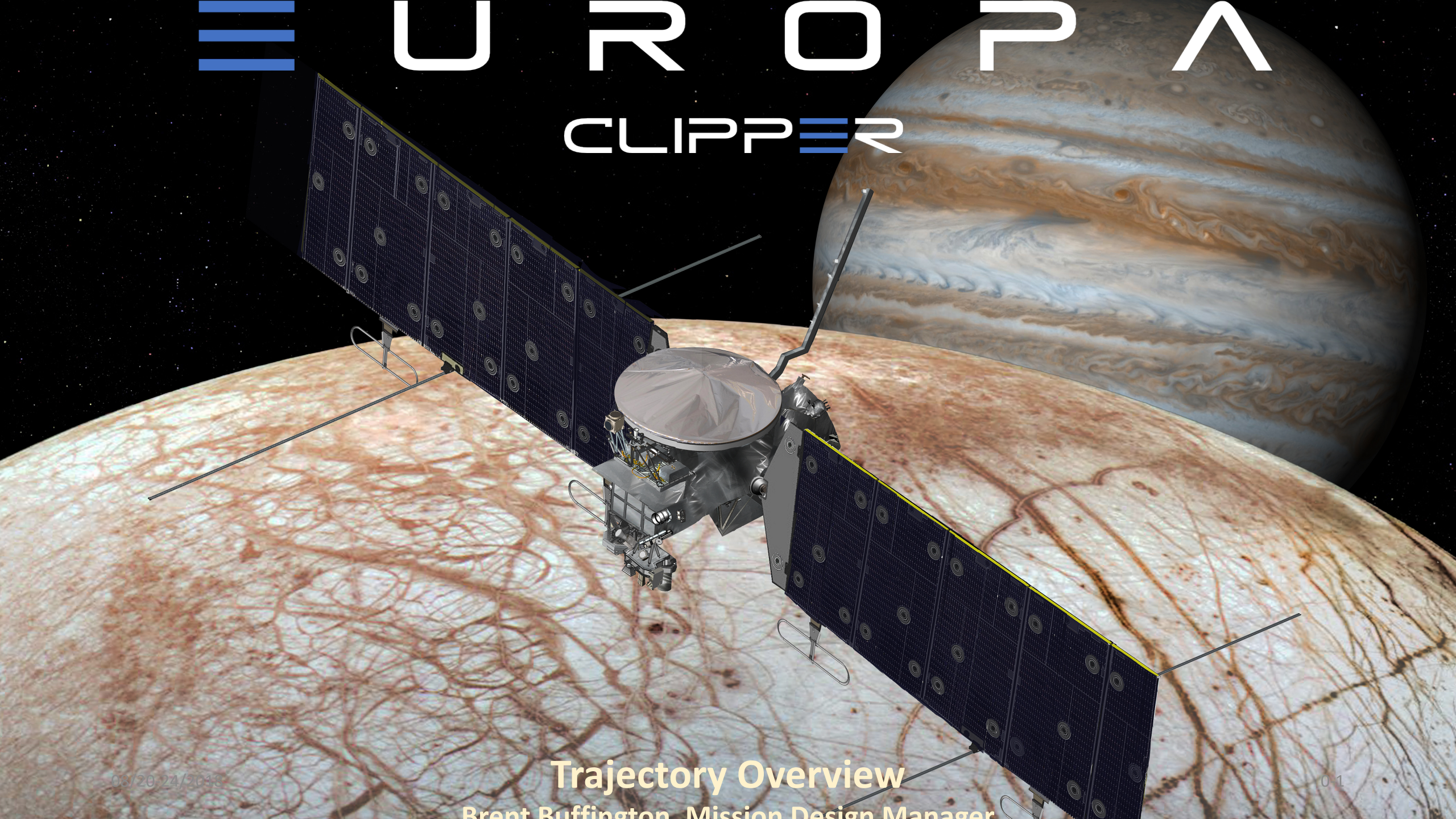
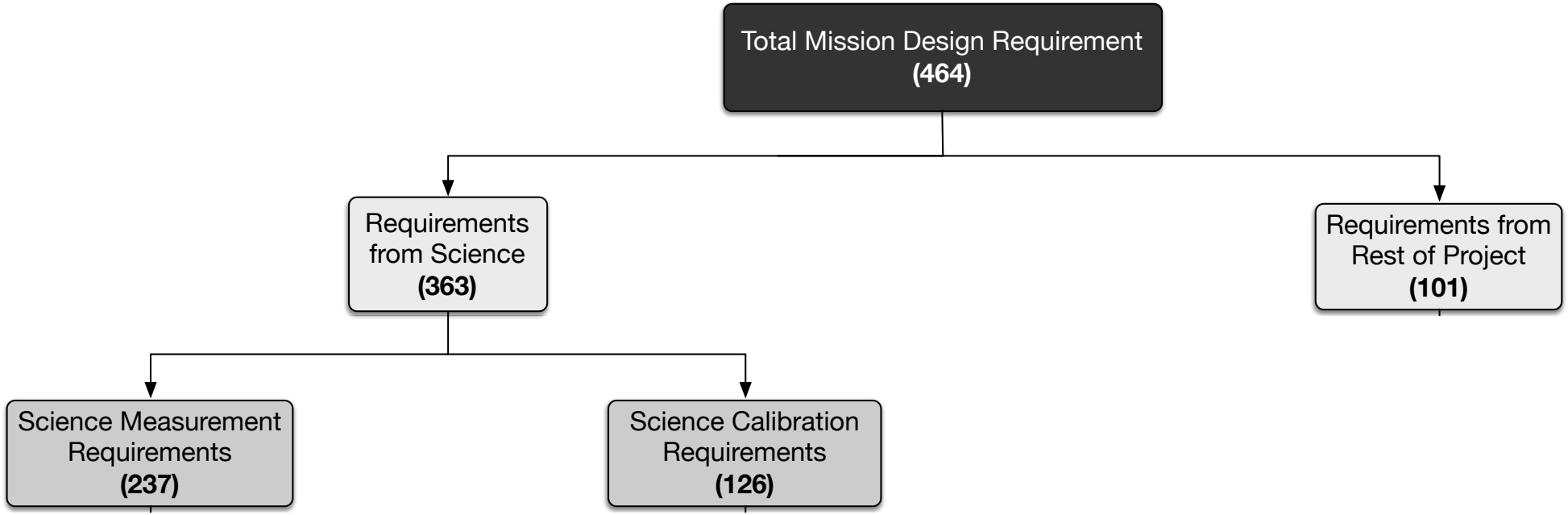


Trajectory Overview

Brent Buffington, Mission Design Manager

Mission Design Requirements Breakdown



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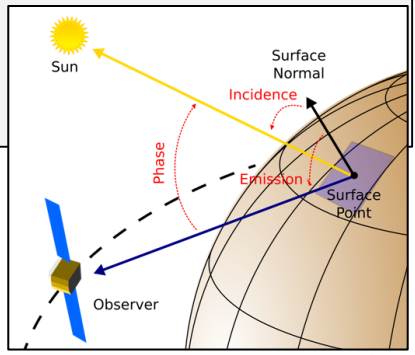
Science Measurement Req. Visualizations

EIS

INSTRUMENT DATASET	Global-Scale Imaging			Regional-Scale Imaging			Small-Scale Imaging		Local-Scale Imaging		Limb Profile	Geodesy		Activity Plume Search		Recent Activity	
	Pan (mono)	Pan (stereo)	Color (mono)	Pan (mono)	Pan (stereo)	Color (mono)	Pan (mono)	Color (mono)	Pan (mono)	Pan (stereo)	Pan (mono)	Belts	Connections	Teminator	Limb	Color	Pan
ALTITUDE	≤ 10,000 km (EIS.096)			≤ 2500 km (EIS.095)			≤ 1000 km (EIS.097)		≤ 100 km (EIS.045)		40,000 - 100,000 km (EIS.018)	≤ 200,000 km (EIS.084)	≤ 5000 km (EIS.087)	3,000 km - 1,000,000 km (EIS.070)		≤50,000 km (EIS.099)	
GROUND SPEED									< 4.5 km/s (EIS.046)								
SOLAR PHASE ANGLE	< 135° (EIS.008)						< 75° (EIS.009)				< 180° (EIS.017)		< 135° (EIS.008)	90-120° (EIS.066)	130- 150° (EIS.067)	>150-170° (EIS.067)	< 45° (EIS.055)	Sample each bin <1, 1–7, >7–20, >20–45° and at least two of the bins >45–74, >74–104, >104–134, >134–170° (EIS.056)
INCIDENCE ANGLE	20-80° for Latitudes 0-80° (EIS.006)												20-80° (EIS.006)				20-80° (EIS.006)	
EMISSION ANGLE	<75° (EIS.007)												<75° (EIS.007)				<75° (EIS.007)	
SPACIAL COVERAGE AND DISTRIBUTION	≥80% of surface (EIS.034)	≥30% of surface (EIS.036)		≥ 50 landforms (EIS.028)	≥ 30 landforms (EIS.029)	≥ 20 landforms (EIS.032,EIS.040)	≥ 10 landforms (EIS.041)		≥ 20 landforms (EIS.044)		≥ 8 profiles in anti-Jovian hem (EIS.016)	≥ 2 in 90 +/- 20° long. (EIS.086)		≥20 observations (EIS.066)	≥20 observations (EIS.067)	≥ 50% overlap with Galileo and Voyager imaging (EIS.052)	≥2 sites (EIS.057)
	All latitudes with separation < 10° (EIS.013)			All latitudes with separation < 30° (EIS.026)					≥40 sites (EIS.043, EIS.047)		≥ 8 profiles in sub-Jovian hem (EIS.016)	≥ 2 in 270+/- 20° long. (EIS.086)	Latitude w/in 30° from equator (EIS.089)			≥10% of EIS repeat coverage (≥2 times) with minimum time interval of 1/2 Earth year (EIS.053)	
	All longitudes with separation < 10° (EIS.035)			All longitudes with separation < 30° (EIS.027)							All longitudes with equatorial separation < 45° (EIS.015)	All longitudes with equatorial separation < 10° (EIS.035)	Longitude 0 to 360° (EIS.088)	The range in longitude between all the frames in a connection shall be < 90° (EIS.093)	All longitudes separation < 10° within 60° of equator (EIS.069)		
				≥ 30% of surface (EIS.025)									≥1 zonal belt within each true anomaly ranges of 90+/-30° and 270+/-30° (EIS.023)	Same Europa orbital true anomaly of the zonal belts +/- 30° (EIS.094)	Sample true anomaly every 30° (EIS.068)		



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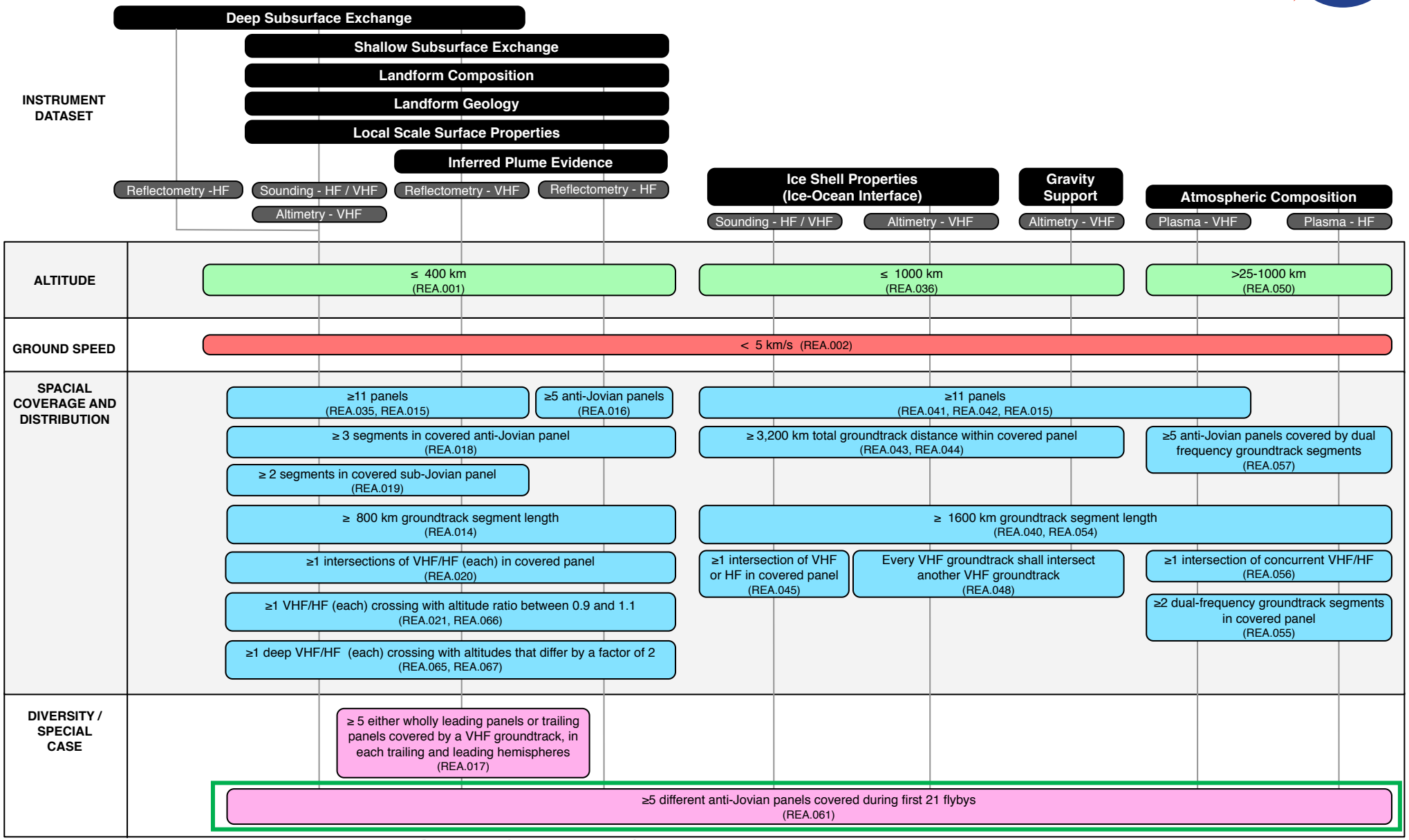
Science Measurement Req. Visualizations

REASON



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Baseline Trajectory: 17F12_V2

(Comparison with SRR/MDR baseline trajectory, 15F10)

Tour	15F10	17F12_V2
Launch Date	6/14/2022	**6/4/2022**
Arrival Date	3/5/2025	**12/24/2024**
Tour Duration (years)[1]	3.4	**3.7**
Number of Flybys		
Europa	42	**46**
Ganymede	4	**4**
Callisto	8	**9**
No. of Night Side Europa Flybys	5	**9**
No. of Jupiter Orbits[1]	79	**72**
Time between Flybys (days)		
Maximum (not including capture orbit)	50.1	**229**
Minimum	8.3	**5.4**
Minimum (Europa-to-Europa)	10.6	**10.1**
Deterministic Tour ΔV, post-PRM (m/s)	118	**182**
Maximum Inclination (deg.)	21.2	**18.9**
No. of Solar Eclipses (due to Jupiter)	48	**47**
Maximum Eclipse Duration (hours)	8.8	**9.15**
Total Ionizing Dose (Mrad)[2]	2.86	**2.50**

(1) From **G0** to spacecraft disposal
(2) Calculated using **GIRE-2p** model from **G0** to end of Prime Mission (last Europa flyby); **Si** behind 100 mil **Al**; spherical shell

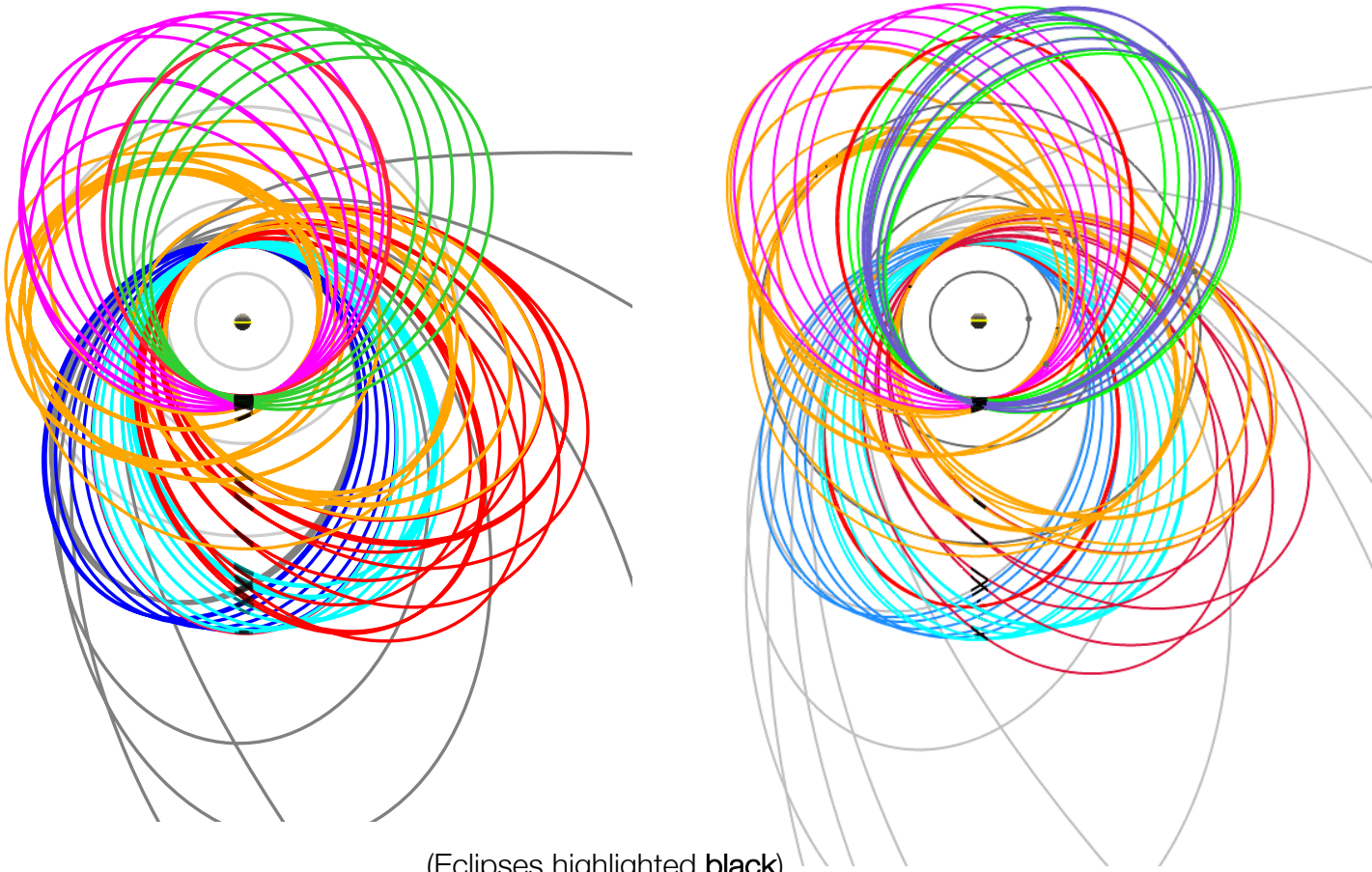
Baseline at SRR/MDR

15F10

Sun

Baseline for PDR

17F12_V2



(Eclipses highlighted **black**)

400-1000 km 100-400 km 50-100 km 25-50 km

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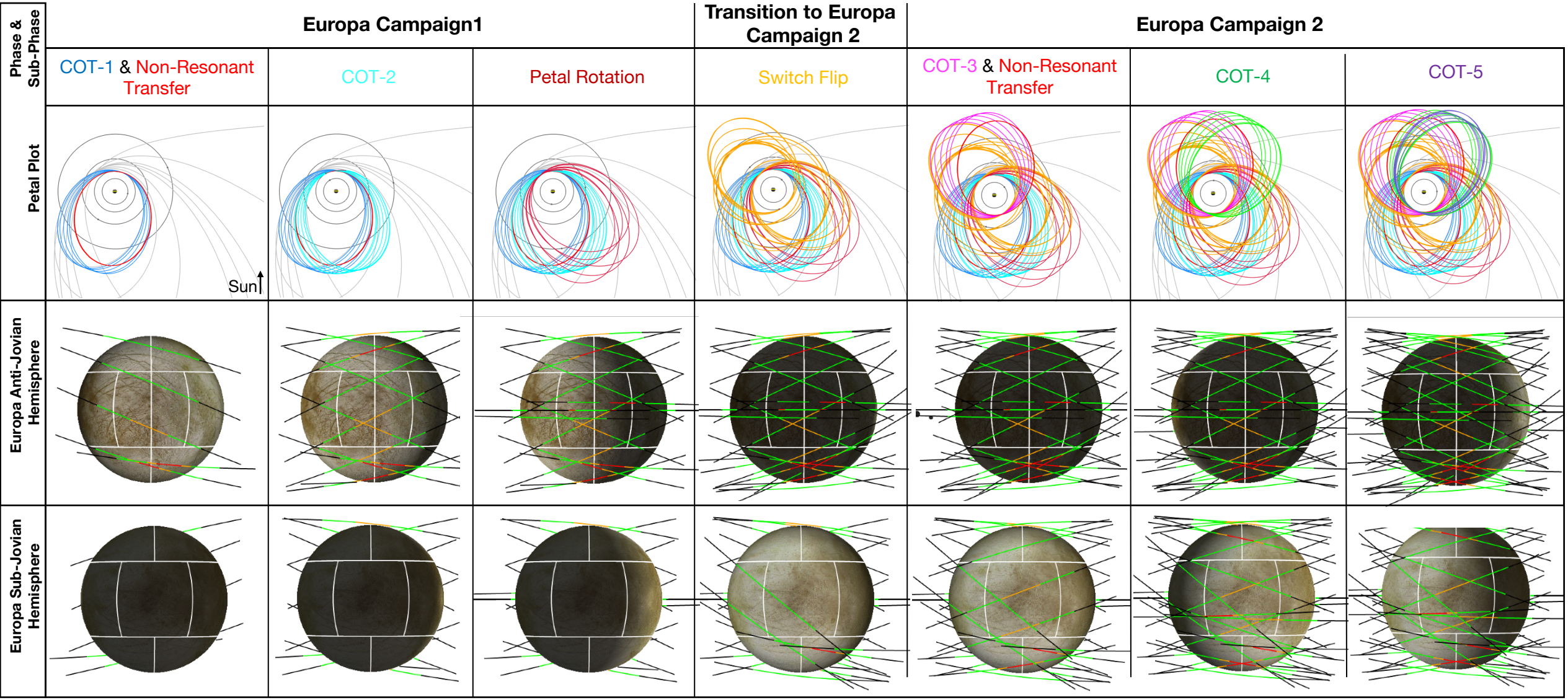
17F12_V2 Trajectory



Europa Flyby Trajectory Color Legend (color contoured by altitude): 400-1000 km | 100-400 km | 50-100 km | 25-50 km

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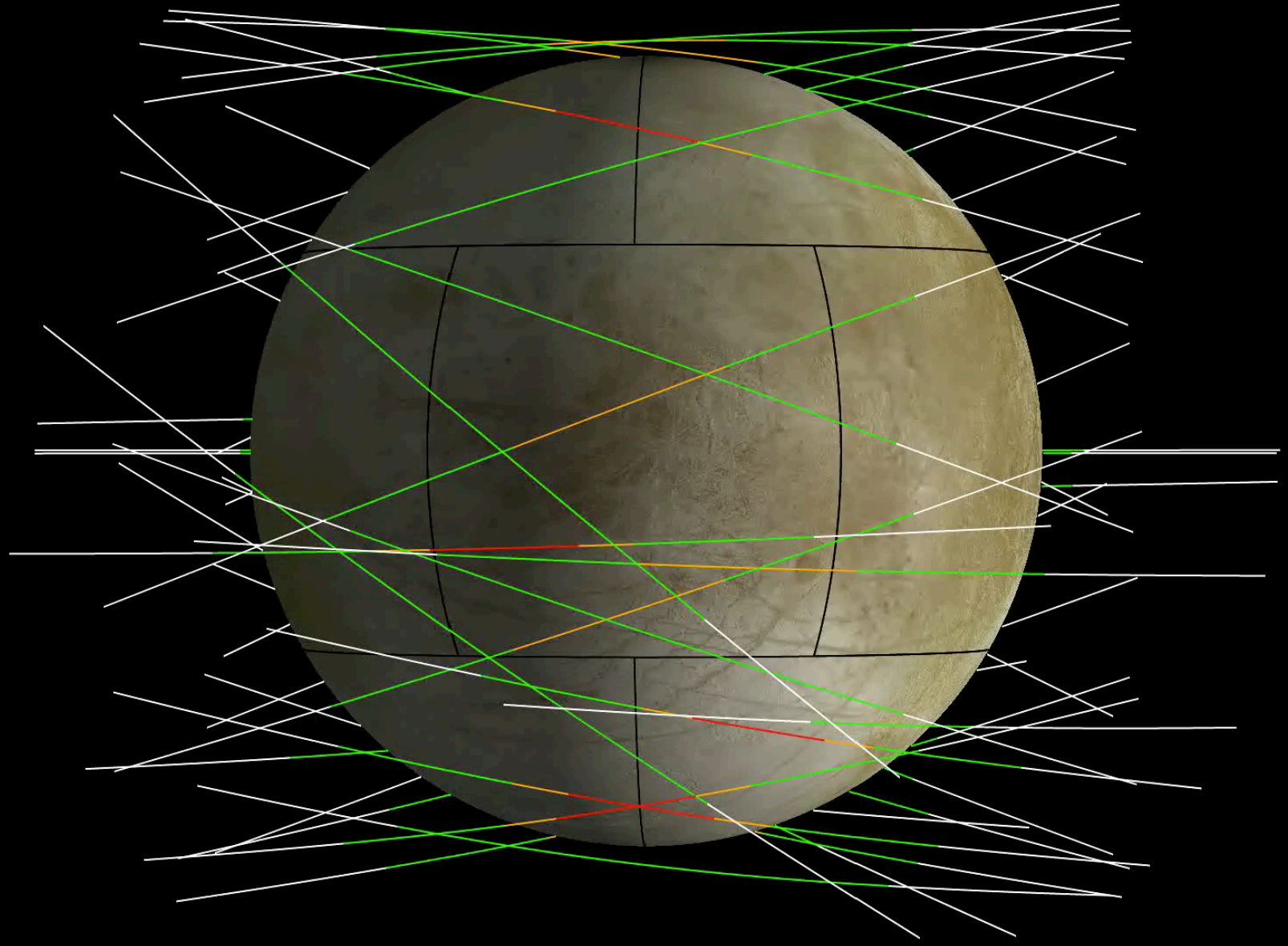
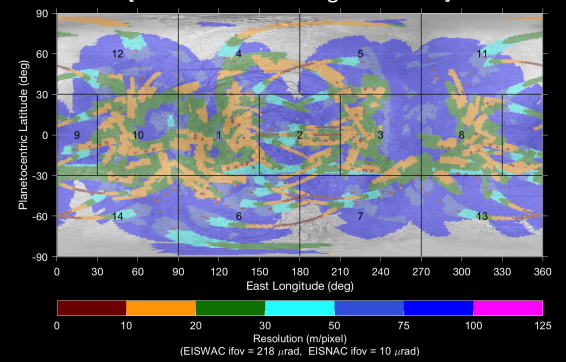
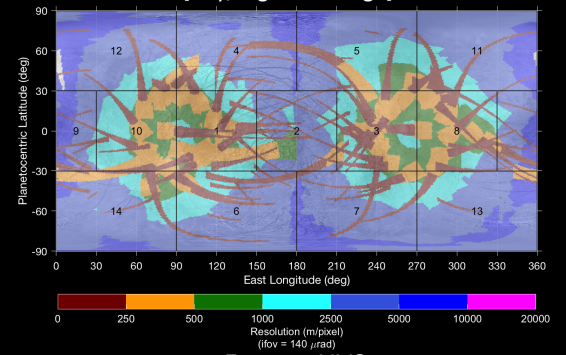
THE EUROPA CLIPPER MISSION



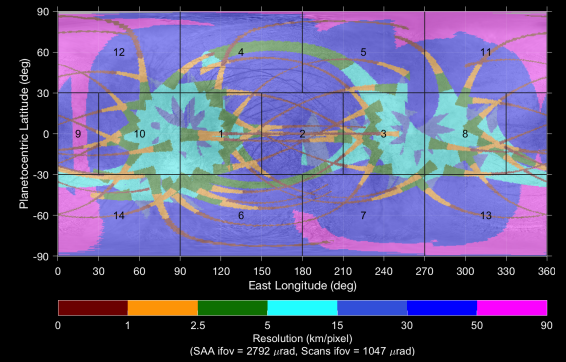
EIS
[WAC + NAC: Framing Pan Mono]



ETHEMIS
[Day/Night Coverage]



Europa-UVS
[Total Daytime Coverage]



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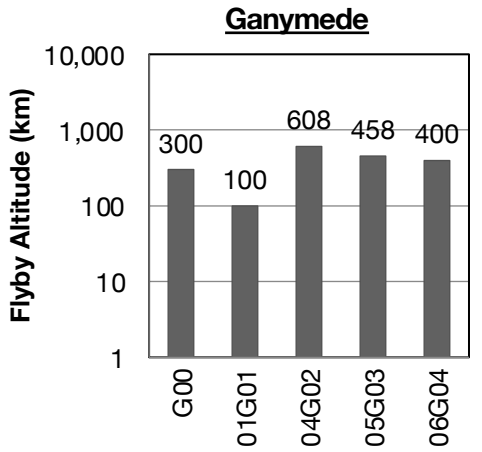
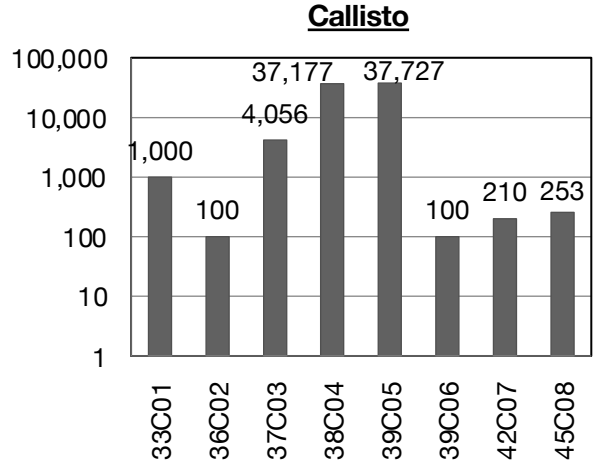
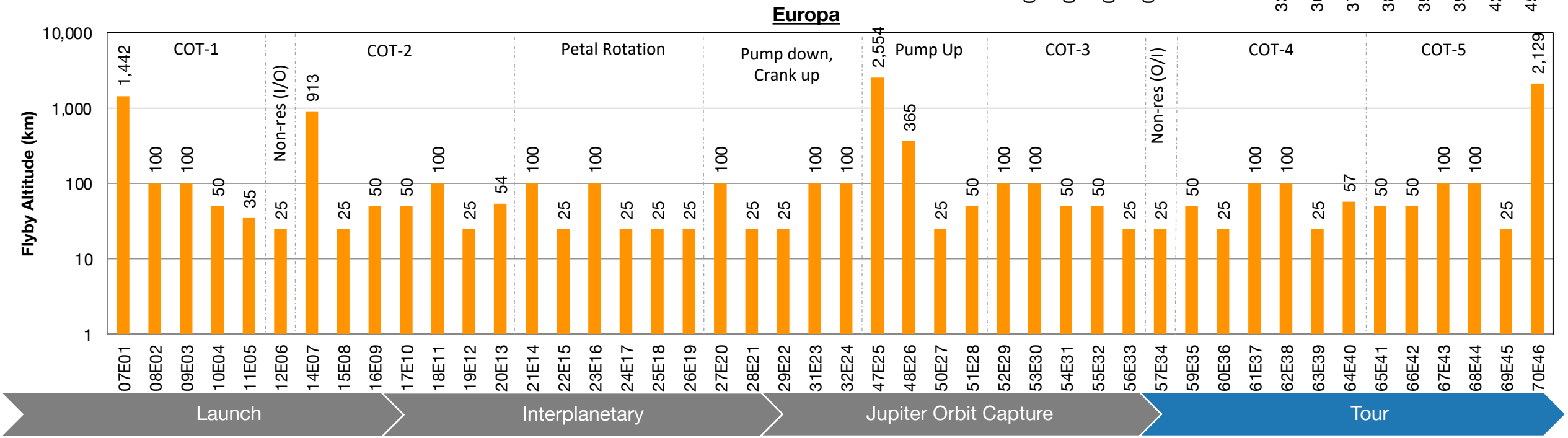
17F12_V2 Flyby Altitude Profile

Europa Altitude Bin	17F12_V2
>1000 km	3
100 – 1000 km	16
50 – 99 km	11
25 – 49 km	16







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Mission Agility: 17F13 Trajectory

- A tour design strategy has been developed that builds in an agility option to react to discoveries
  - Adds a *potential* additional COT sequence between COT-2 and the petal rotation portion of the tour
  - Meets ΔV*, TID, and other mission requirements and constraints

*****Some variations require utilization of the encumbered ΔV margin

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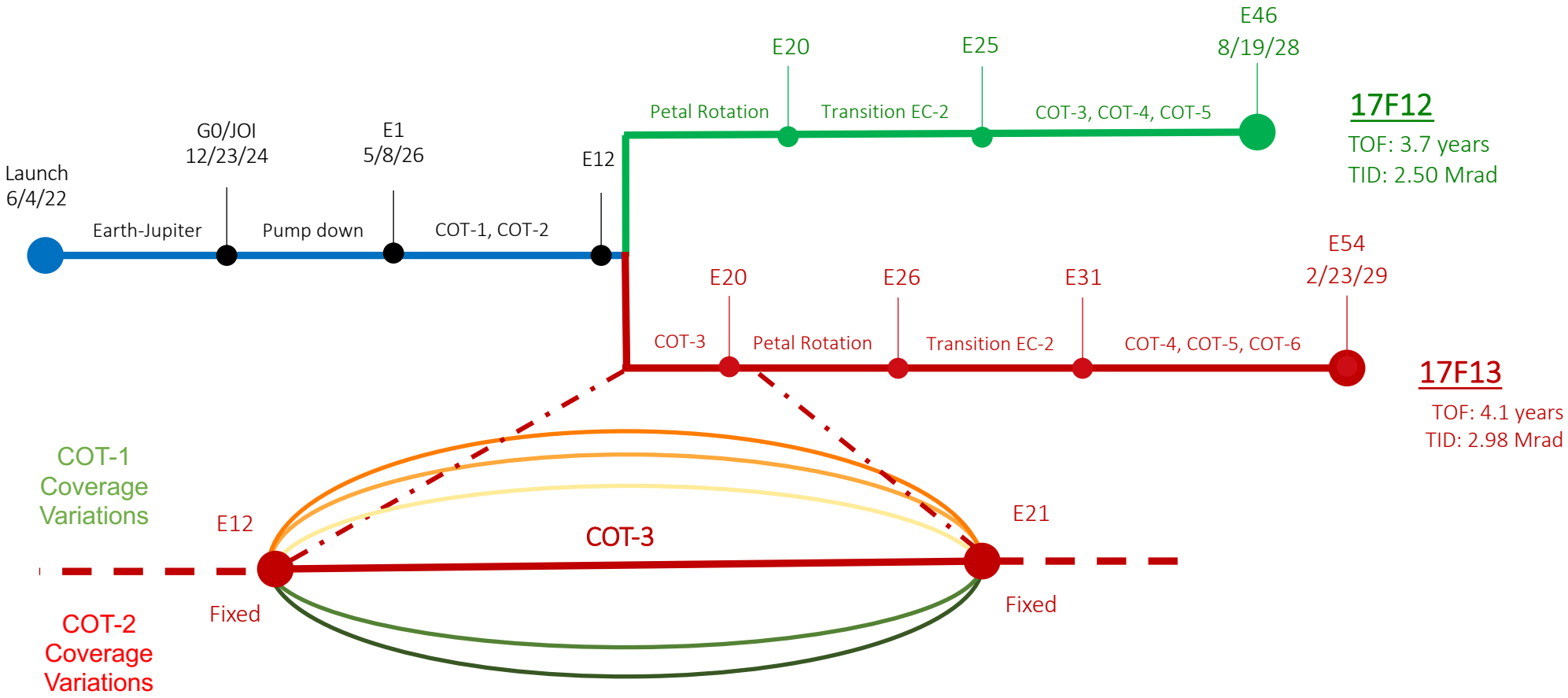
17F12 vs. 17F13 Timeline



COT = Crank-over-the-top
EC = Europa Campaign

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Mission Agility: 17F13 Trajectory

- Benefits/Options of Additional COT Sequence
  1. To make-up missed sunlit Europa anti-Jupiter hemisphere flyby(s) during COT-1 or COT-2 to meet Level-1 science objectives due to off nominal operations
  2. Ability to repeat one or more groundtracks in COT-1 or COT-2 to quickly react to major science discoveries
  3. Ability to react to major science discoveries during COT-1 or COT-2 (i.e., plume discovery via distant high phase observations) that require flying over new anti-Jovian hemisphere terrain not covered by COT-1 or COT-2

Note: There's always the option to forgo the additional COT if the Project doesn't want to spend the additional TID, ΔV, and time-of-flight.

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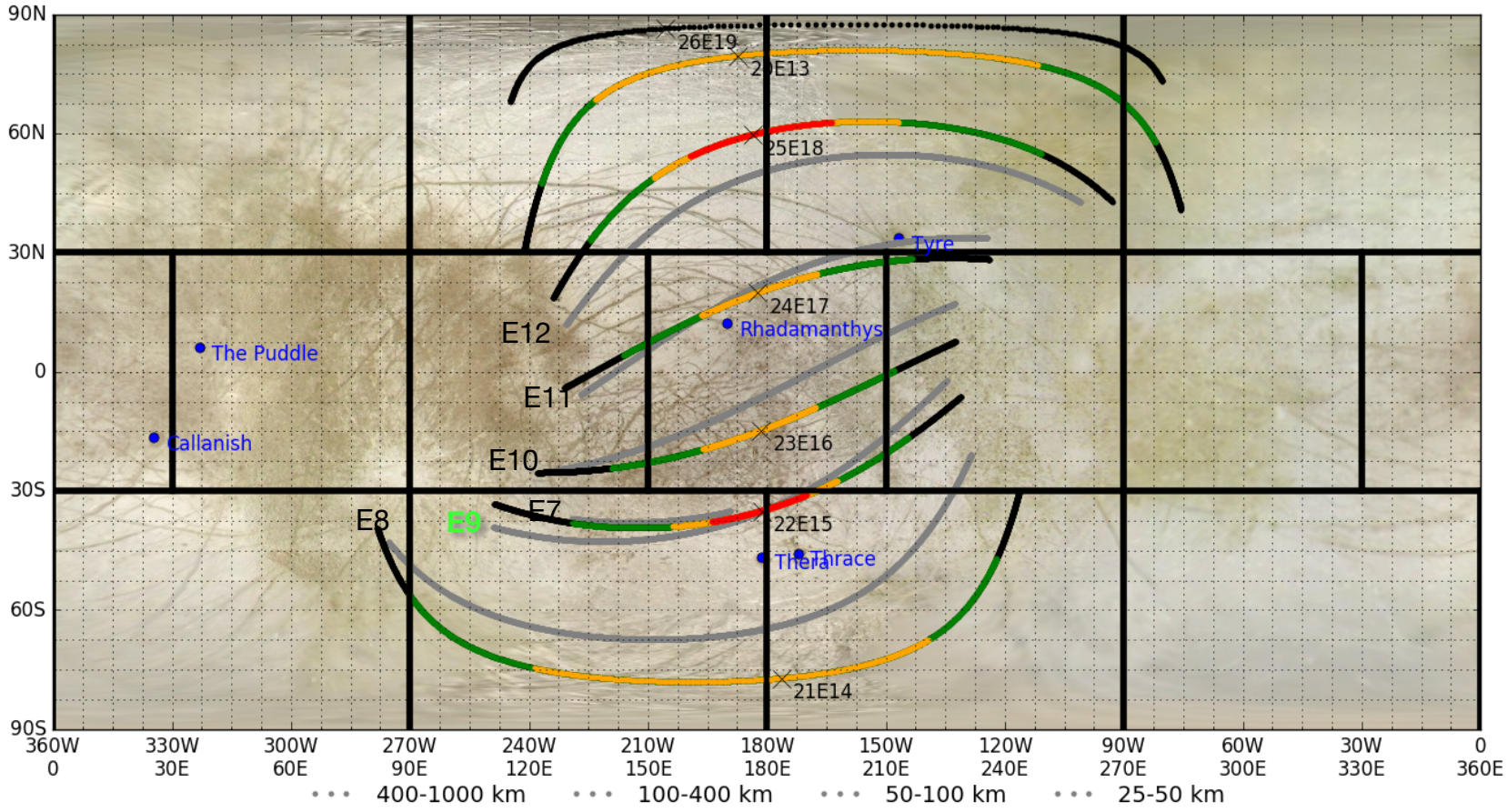
17F13 COT-3: Coverage Variations

COT-2

Repeated Flyby highlighted in Green



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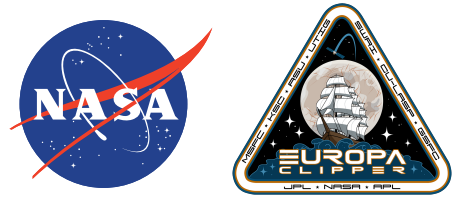
Mission Timelines



EUROPA CLIPPER

		2022												2023												2024												2025												2026												2027											
		J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
SLS	2022																																																																									
	2023																																																																									
	2024																																																																									
	2025																																																																									
Non-SLS ELV	2022																																																																								
	2023																																																																								
	2024																																																																								
	2025																																																																								

LANDER

		2022												2023												2024												2025												2026												2027											
		J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
SLS	2026																																																																								
	2028																																																																								

EUROPA CLIPPER

		2028												2029												2030												2031												2032												2033											
		J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
SLS	2022																																																																						
	2023									EC 2																																																													
	2024								EC 1																		EC 2																																											
	2025																									EC 1													EC 2																																
Non-SLS ELV	2022																														EC 1																								EC 2																
	2023																														EC 1																								EC 2																
	2024																																																																									
	2025																																																																				EC 1					

LANDER

		2028												2029												2030												2031												2032												2033											
		J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
SLS	2026																																																																							
	2028																																																																							

▼ LS Selection

▼ Landing

Key
I.P. (Early Arrival)
I.P. (Late Arrival)
Trans. to Europa Campaign 1 or 2
Europa Science Tour

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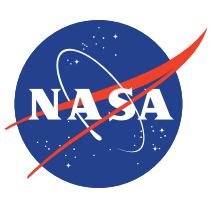
Europa Clipper as Lander Relay



- Communication relay only
  - Fairly straight-forward
  - Con-Ops:
    1. Potential extended Europa science campaign(s) [could be many years!]
    2. Get out of radiation
    3. Align orbit for relay
    4. Execute a number of ~3:1 resonant transfers for repeated comm. passes

- DDL support
  - Very difficult to setup (further study needed)
  - Con-Ops:
    1. Potential extended Europa science campaign(s)
    2. Get out of radiation
    3. Align orbit for DDL
    4. Continue in ~3:1 resonant transfers for repeated comm. passes

- Nonetheless, both options would take away resources from Europa science extended missions

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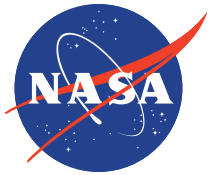

BACK UP

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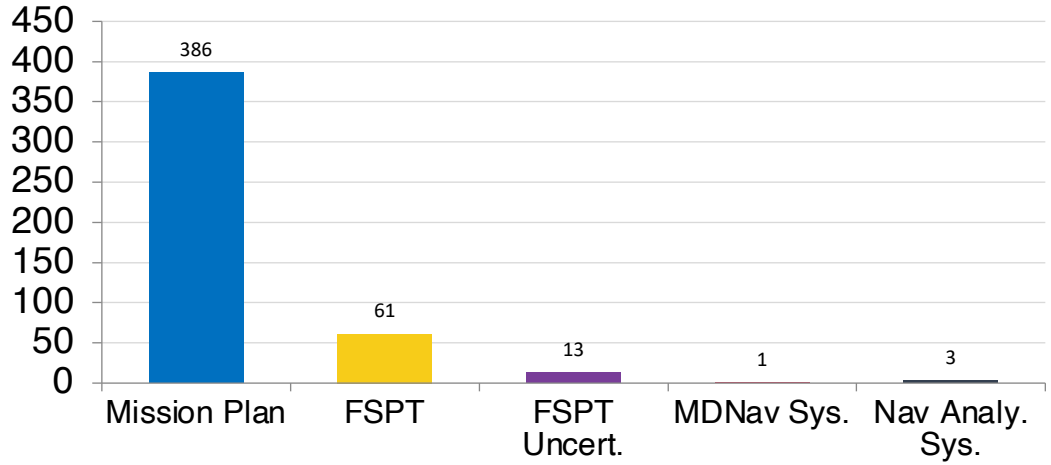
Mission Design Requirements Summary

Completeness Metrics	Value
Total Requirements	473
Requirements at Baseline	464 (98%)
Total TBDs	0 (0%)
Total TBCs/TBRs	2 (0.4%)
Key Assessment Completeness	464 (100%)
Driving Assessment Completeness	464 (100%)
Verification Method Completeness	464 (100%)
Total Key	291 (63%)
Total Driving	28 (6%)
Total Key & Driving	28 (6%)

Allocation to Sub-Element (Baseline Rqs. Only)	**# RQ**
Mission Plan	386
Flight System Planned Trajectory	61
Flight System Planned Trajectory Uncertainties	13
MDNav System	1
Navigation Analysis System	3



Refer to: Project Requirements Document, JPL D-92259, Rev. G, Release Date: 2018-07-23

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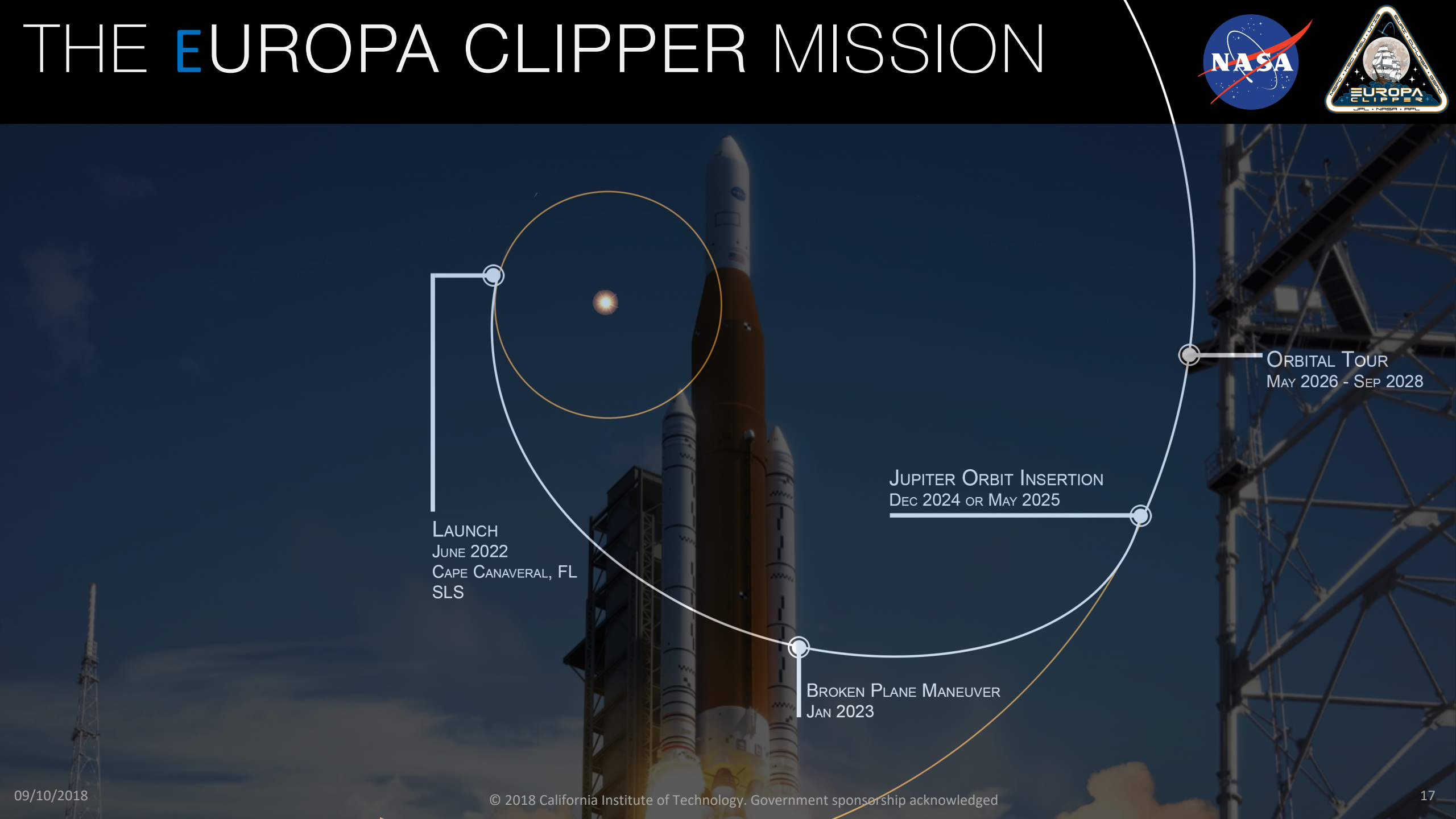
THE EUROPA CLIPPER MISSION



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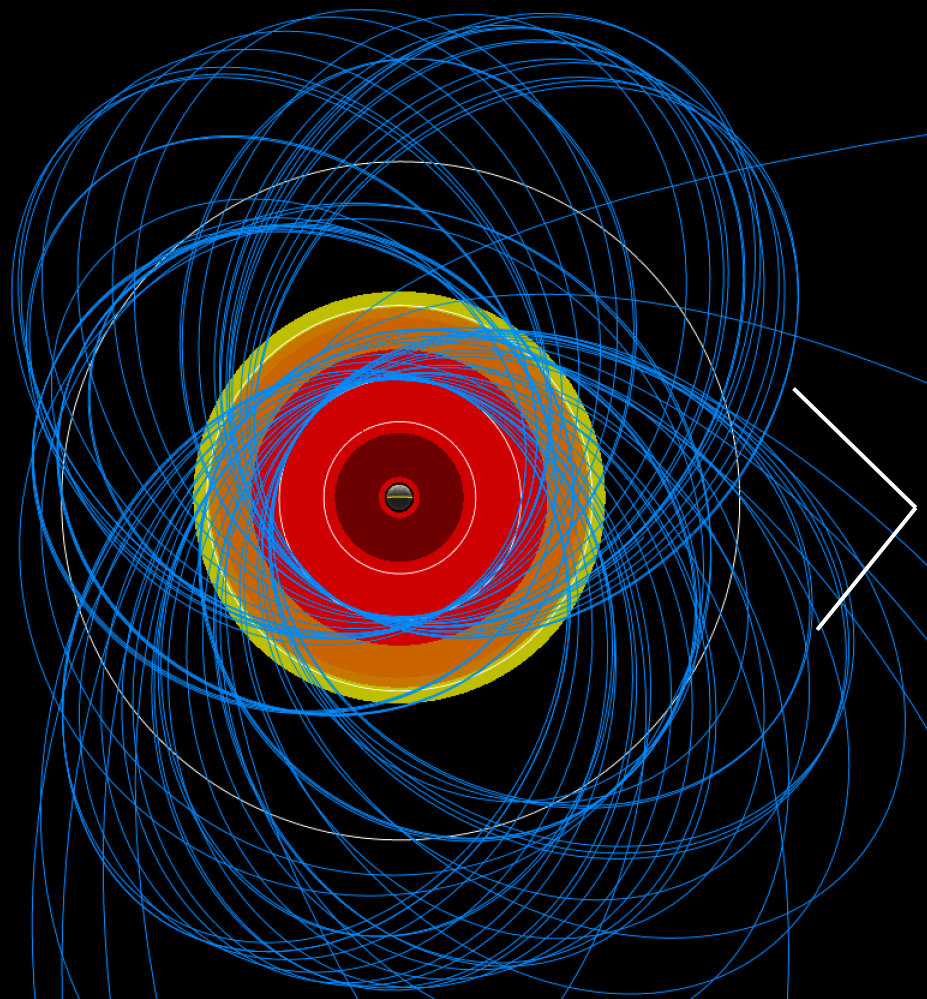
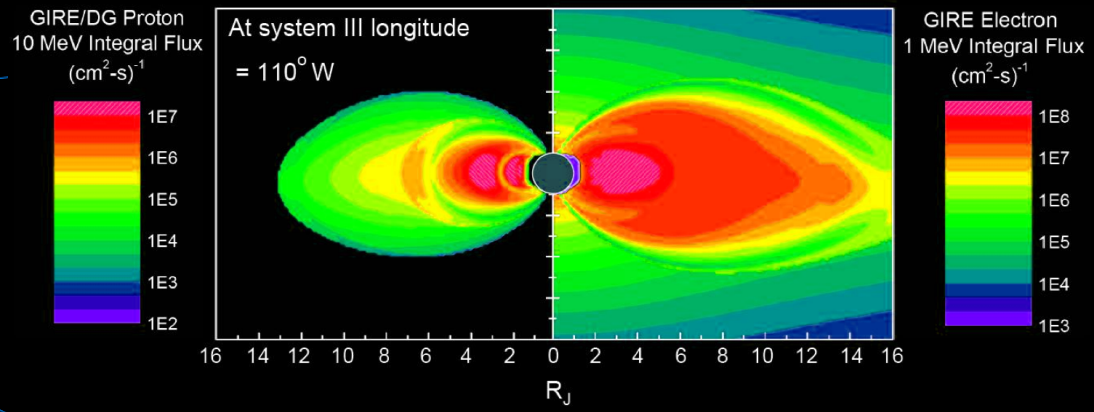
THE EUROPA CLIPPER MISSION



Entire Trajectory



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Baseline Trajectory: 17F12_V2

- 17F12_V2 - key changes from 15F10:
  - Implements new pump down strategy that builds in inherent robustness to a JOI anomaly of ≤ 50 m/s
  - A more time and TID efficient tour compared to 15F10
    - Fewer empty revs (i.e., orbits without a flyby)
  - The number of “low altitude” Europa flybys (25-35 km) tuned to number desired by PSG
  - Groundtracks during the switch-flip setup are placed in Europa’s southern hemisphere
  - Additional 5th COT sequence consisting of night-side anti-Jupiter hemisphere Europa flybys

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17F12_V2 Tour Details

Mission Phase		Flyby	I/O	Date ET	Alt. km	B-Plane deg	V-Inf km/s	V km/s	LST hh:mm	Lat. deg	Lon. deg	SEP deg	Phase deg	TRA deg	Incl. deg	RP RJ	RA RJ	Body Rev	S/C Rev	Period days	TOF days	Elasped days	TID Mrad	Europa TRA deg	Sys III LON deg
Transition to Europa Campaign 1	Capture Orbit	G00	I	23-Dec-2024 11:06:10	300	0	8.04	8.45	16:45:50	-0.5	240.6	162.1	71.5	-48.0	6.0	12.1	267.3	28.3	1.3	203.9	202.1	0	0.00	-110	75
	Pump Down	01G01	O	13-Jul-2025 14:21:48	100	-134	6.21	6.77	02:12:13	45.8	308.6	13.8	123.8	46.4	4.2	12.5	132.8	32	3	76.5	229.0	202	0.01	11	240
		04G02	O	27-Feb-2026 15:21:56	608	-157	6.54	6.99	23:53:05	23.1	288.0	126.2	155.5	59.6	2.5	11.3	76.3	5	1	35.8	35.8	431	0.04	-1	295
		05G03	O	04-Apr-2026 09:50:00	458	-152	6.55	7.02	23:08:44	28.6	280.0	91.3	147.7	70.2	0.5	10.4	51.9	3	1	21.5	21.5	467	0.06	52	117
		06G04	O	25-Apr-2026 20:53:29	400	-166	6.55	7.03	22:25:48	13.7	271.2	72.5	152.4	83.1	0.6	9.3	37.4	1.8	0.8	13.9	13.0	488	0.08	83	154
Europa Campaign 1	COT-1	07E01	O	08-May-2026 21:08:12	1,442	-64	3.76	4.04	10:16:41	63.9	170.4	61.8	66.1	9.6	1.7	9.3	38.2	4	1	14.3	14.2	501	0.11	-29	268
		08E02	O	23-May-2026 02:39:37	100	-55	3.86	4.33	10:57:58	52.2	179.3	50.4	53.4	9.5	4.0	9.3	38.1	4	1	14.3	14.2	516	0.15	-16	123
		09E03	O	06-Jun-2026 07:35:08	100	-24	3.86	4.33	10:51:32	20.0	178.8	39.5	25.8	4.2	4.9	9.3	38.1	4	1	14.2	14.2	530	0.20	-5	357
		10E04	I	20-Jun-2026 12:31:27	50	12	3.86	4.35	10:44:51	-13.2	178.2	28.8	23.0	-2.8	4.2	9.3	38.1	4	1	14.2	14.2	544	0.25	5	231
		11E05	I	04-Jul-2026 17:29:25	35	48	3.86	4.34	10:38:59	-46.7	177.7	18.2	50.2	-8.7	2.0	9.3	38.1	4	1	14.2	14.2	558	0.29	16	103
	Non-Res	12E06	I	18-Jul-2026 22:09:13	25	46	3.87	4.36	11:58:56	-46.4	199.8	7.8	46.6	-14.9	0.3	9.2	34.3	7.1	2.1	12.5	25.2	572	0.34	26	346
	COT-2	14E07	O	13-Aug-2026 03:44:37	913	38	3.95	4.26	11:07:38	-37.8	151.0	10.8	39.7	18.9	1.2	9.3	38.1	4	1	14.2	14.2	598	0.43	81	18
		15E08	O	27-Aug-2026 08:30:36	25	67	3.96	4.44	13:01:29	-64.6	181.3	21.4	65.6	14.5	3.9	9.3	38.0	4	1	14.2	14.2	612	0.48	90	257
		16E09	O	10-Sep-2026 13:26:48	50	40	3.97	4.44	12:51:08	-35.0	179.7	32.2	37.0	9.8	5.6	9.4	37.9	4	1	14.2	14.2	626	0.53	101	131
		17E10	O	24-Sep-2026 18:23:56	50	10	3.98	4.45	12:44:12	-6.5	178.9	43.3	12.7	2.9	5.9	9.5	37.9	4	1	14.2	14.2	640	0.57	111	4
		18E11	I	08-Oct-2026 23:21:50	100	-21	3.98	4.44	12:37:03	21.6	178.1	54.7	23.6	-4.3	4.9	9.4	38.0	4	1	14.2	14.2	655	0.62	122	236
		19E12	I	23-Oct-2026 04:17:53	25	-51	3.97	4.45	12:29:40	49.7	177.3	66.6	50.4	-10.2	2.6	9.4	38.0	4	1	14.2	14.2	669	0.66	133	110
		20E13	I	06-Nov-2026 09:16:13	54	-83	3.95	4.43	11:46:03	81.1	167.2	79.0	81.4	-13.0	0.7	9.4	38.2	4.1	1.1	14.3	14.5	683	0.71	144	342
	Petal Rotation	21E14	O	20-Nov-2026 21:46:39	100	5	4.11	4.56	12:55:00	-5.37	153.5	92.4	14.6	14.5	0.5	9.4	45.4	4.9	0.9	17.7	17.6	697	0.75	-171	332
		22E15	I	08-Dec-2026 11:00:22	25	0	4.08	4.55	14:39:20	-0.2	201.8	109.4	39.8	-13.8	0.5	9.3	38.2	4.1	1.1	14.3	14.6	715	0.80	-178	153
		23E16	O	23-Dec-2026 00:13:10	100	0	4.09	4.54	13:44:03	-0.2	154.0	124.3	26.0	13.2	0.5	9.4	45.4	4.9	0.9	17.7	17.6	730	0.84	-131	120
		24E17	I	09-Jan-2027 13:31:18	25	0	4.08	4.55	15:27:34	0.2	201.7	143.3	51.9	-14.6	0.5	9.3	38.2	4.1	1.1	14.3	14.5	747	0.89	-139	298
		25E18	O	24-Jan-2027 02:35:26	25	0	4.04	4.51	14:35:20	0.2	155.4	159.6	38.8	11.9	0.5	9.4	45.5	5.0	1.0	17.7	17.6	762	0.93	-94	271
		26E19	I	10-Feb-2027 16:14:50	25	-6	4.06	4.53	16:18:00	5.5	201.4	178.9	64.7	-14.8	0.8	9.2	38.2	4.1	1.1	14.3	14.5	779	0.98	-99	78
	Pump Down, Crank Up	27E20	O	25-Feb-2027 04:23:30	100	83	3.90	4.36	17:26:40	-81.0	189.1	163.8	88.0	11.9	2.1	9.3	38.0	4	1	14.2	14.2	794	1.03	-59	80
		28E21	O	11-Mar-2027 09:17:45	25	50	3.90	4.38	16:41:28	-46.2	179.0	148.0	76.0	8.8	4.3	9.3	38.1	4	1	14.2	14.2	808	1.07	-49	315
		29E22	O	25-Mar-2027 13:54:19	25	52	3.88	4.37	17:57:48	-42.8	200.4	132.8	89.0	2.5	6.4	9.3	34.0	7	2	12.5	24.8	822	1.12	-39	199
		31E23	O	19-Apr-2027 10:04:01	100	145	3.90	4.36	02:40:02	-25.7	334.8	107.9	133.1	1.7	7.6	9.3	29.8	3	1	10.7	10.7	847	1.21	-23	173
		32E24	O	30-Apr-2027 01:40:22	100	177	3.90	4.37	02:58:51	1.7	340.6	97.9	135.3	9.8	7.7	9.2	27.0	1.5	0.49	9.5	5.4	858	1.25	-15	262

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17F12_V2 Tour Details

[cont.]

Mission Phase		Flyby	I/O	Date ET	Alt. km	B-Plane deg	V-Inf km/s	V km/s	LST hh:mm	Lat. deg	Lon. deg	SEP deg	Phase deg	TRA deg	Incl. deg	RP RJ	RA RJ	Body Rev	S/C Rev	Period days	TOF days	Elasped days	TID Mrad	Europa TRA deg	Sys III LON deg
Transition to Europa Campaign 2	Switch Flip	33C01	I	05-May-2027 10:55:10	1,000	-97	2.68	3.38	21:10:26	58.6	79.8	93.1	113.3	-166.9	15.9	13.2	27.1	2	3	11.2	33.3	863	1.29	175	70
		36C02	I	07-Jun-2027 18:35:35	100	-102	2.68	3.60	20:39:08	29.1	75.8	64.7	124.5	-149.3	18.4	24.4	28.3	1	1	16.7	16.6	896	1.32	-24	223
		37C03	I	24-Jun-2027 09:55:07	4,056	-51	2.69	3.08	15:16:12	4.4	357.5	51.4	49.3	-79.8	18.9	25.5	26.6	0.5	0.5	16.4	8.3	913	1.32	-122	137
		38C04	I	02-Jul-2027 17:23:33	37,177	33	2.75	2.82	04:58:48	-2.6	24.3	44.7	105.2	-15.4	18.8	25.6	27.1	0.5	0.5	16.7	8.3	921	1.33	4	281
		39C05	I	11-Jul-2027 01:13:38	37,727	-156	2.66	2.73	02:07:44	4.0	162.7	38.6	148.0	-159.3	18.8	26.0	27.2	0.5	0.5	17.0	8.3	930	1.33	133	52
		39C06	O	19-Jul-2027 08:07:17	100	-87	2.72	3.63	22:26:48	24.9	289.2	32.1	147.1	161.9	17.3	13.9	26.3	2	3	11.1	33.3	938	1.33	-99	217
		42C07	O	21-Aug-2027 16:10:02	210	-39	2.73	3.59	02:55:31	36.9	359.8	7.2	126.0	159.8	10.0	12.2	27.9	2	3	11.1	33.3	971	1.34	64	357
		45C08	O	23-Sep-2027 23:42:21	253	-128	2.72	3.57	18:23:21	53.6	235.8	18.0	94.4	162.9	0.2	8.8	26.8	0.9	1.6	9.3	15.0	1005	1.38	-132	154
Europa Campaign 2	Pump Up	47E25	O	09-Oct-2027 00:21:17	2,554	18	4.27	4.45	02:20:02	-17.8	126.4	29.6	140.4	32.1	0.5	8.9	29.8	2.8	0.8	10.5	10.1	1020	1.46	-40	259
		48E26	I	19-Oct-2027 01:48:35	365	147	4.13	4.51	16:17:31	-32.5	36.6	37.6	67.7	-27.0	1.7	9.1	34.4	7	2	12.5	24.8	1030	1.51	-92	80
		50E27	I	12-Nov-2027 22:03:08	25	137	4.16	4.62	15:09:53	-42.0	23.1	58.0	58.5	-21.8	3.6	9.2	38.1	4	1	14.2	14.2	1054	1.61	-75	52
		51E28	I	27-Nov-2027 03:52:01	50	-76	3.97	4.44	01:26:05	74.3	174.5	70.3	106.3	-15.7	0.8	9.2	38.1	4	1	14.2	14.2	1069	1.65	-61	257
	COT-3	52E29	I	11-Dec-2027 09:07:00	100	-105	3.90	4.37	14:01:24	74.4	3.0	83.1	78.3	-14.0	2.0	9.2	38.2	4	1	14.3	14.2	1083	1.70	-49	121
		53E30	I	25-Dec-2027 14:03:22	100	-136	3.89	4.36	13:41:55	41.4	359.1	96.5	49.0	-9.5	3.9	9.3	38.1	4	1	14.2	14.2	1097	1.74	-39	355
		54E31	I	08-Jan-2028 19:02:34	50	-171	3.88	4.36	13:35:16	5.9	358.2	110.5	25.0	-1.9	4.2	9.3	38.0	4	1	14.2	14.2	1111	1.79	-28	227
		55E32	O	22-Jan-2028 23:30:27	50	158	3.86	4.34	13:21:41	-22.6	357.8	125.1	28.7	4.2	2.9	9.3	38.1	4	1	14.2	14.2	1126	1.83	-20	116
		56E33	O	06-Feb-2028 04:30:07	25	119	3.86	4.35	13:11:42	-60.0	356.0	140.3	59.6	10.7	0.4	9.2	38.0	4	1	14.2	14.1	1140	1.87	-9	347
	Non-Res	57E34	O	20-Feb-2028 07:43:41	25	167	3.71	4.22	11:40:49	-13.3	341.5	155.9	12.3	9.8	0.5	9.2	34.0	6.9	1.9	12.4	24.6	1154	1.92	-5	276
	COT-4	59E35	I	15-Mar-2028 21:31:19	50	164	3.72	4.22	11:56:33	-15.8	16.0	176.0	13.8	-10.9	1.2	9.3	38.1	4	1	14.2	14.1	1178	2.01	-16	94
		60E36	I	30-Mar-2028 00:49:14	25	119	3.87	4.36	10:22:42	-59.6	0.4	160.5	60.5	-11.2	3.7	9.3	38.1	4	1	14.2	14.2	1193	2.05	-12	20
		61E37	I	13-Apr-2028 05:46:17	100	153	3.87	4.33	10:13:40	-23.4	359.1	145.1	33.4	-5.0	4.8	9.3	38.1	4	1	14.2	14.2	1207	2.10	-1	253
		62E38	O	27-Apr-2028 10:46:39	100	-167	3.86	4.33	10:07:39	14.1	358.3	130.2	32.2	3.3	4.1	9.3	38.1	4	1	14.2	14.2	1221	2.14	10	125
		63E39	O	11-May-2028 15:46:04	25	-128	3.87	4.36	10:00:47	51.8	357.3	116.1	59.6	10.4	1.8	9.2	38.2	4	1	14.2	14.2	1235	2.18	21	357
		64E40	O	25-May-2028 20:48:16	57	-93	3.9	4.38	08:41:39	86.6	338.1	102.6	90.0	14.2	1.2	9.2	38.2	4	1	14.2	14.2	1249	2.23	32	227
	COT-5	65E41	O	09-Jun-2028 01:44:34	50	-64	3.92	4.40	22:09:09	61.2	180.9	89.8	117.4	13.1	3.8	9.3	38.1	4	1	14.3	14.2	1264	2.27	43	101
		66E42	O	23-Jun-2028 06:34:03	50	-35	3.93	4.4	21:59:37	30.5	180.0	77.5	139.9	8.1	5.3	9.4	38.0	4	1	14.2	14.2	1278	2.32	53	338
		67E43	O	07-Jul-2028 11:24:21	100	-4	3.94	4.40	21:52:44	1.0	179.7	65.8	148.2	1.1	5.3	9.4	38.0	4	1	14.2	14.2	1292	2.36	64	215
		68E44	I	21-Jul-2028 16:00:04	100	35	3.95	4.41	21:37:10	-34.3	178.2	54.4	130.3	-7.0	3.8	9.3	38.0	4	1	14.2	14.2	1306	2.41	73	99
		69E45	I	04-Aug-2028 20:49:25	25	68	3.96	4.44	21:17:47	-66.0	174.8	43.3	105.7	-12.2	1.1	9.3	38.1	4	1	14.2	14.2	1320	2.45	83	337
		70E46	I	19-Aug-2028 02:03:55	2,129	146	3.95	4.16	11:07:31	-33.8	21.9	32.3	33.7	-10.7	0.6	9.3	40.2	9.3	2.4	15.2	33.0	1335	2.50	94	200
Disposal		72C09	O	21-Sep-2028 01:01:17	0	-75	5.35	5.88	00:38:00	74.7	85.8	7.5	107.3	131.1	8.1	10.5	42.0	--	--	16.6	--	1368	2.59	-139	92

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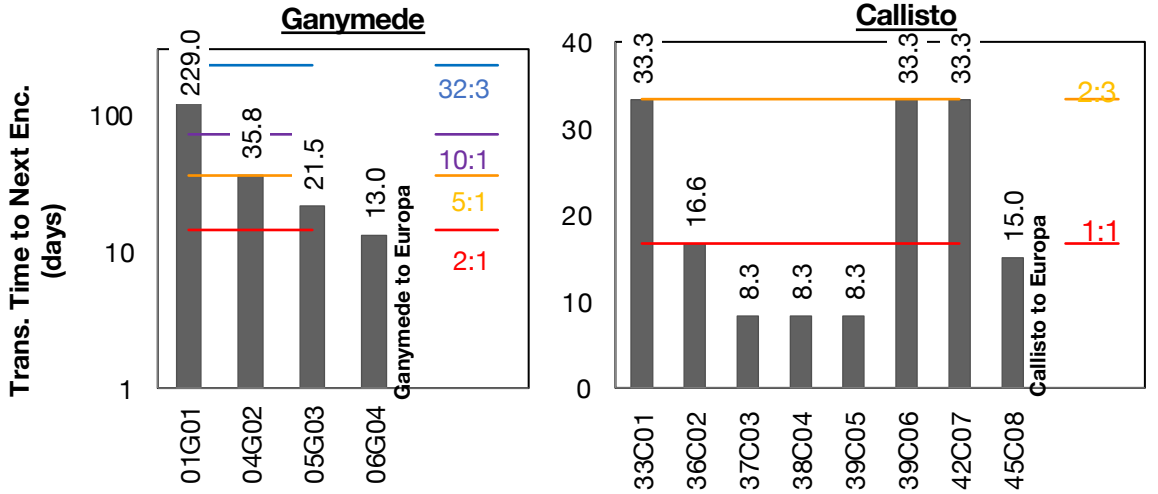
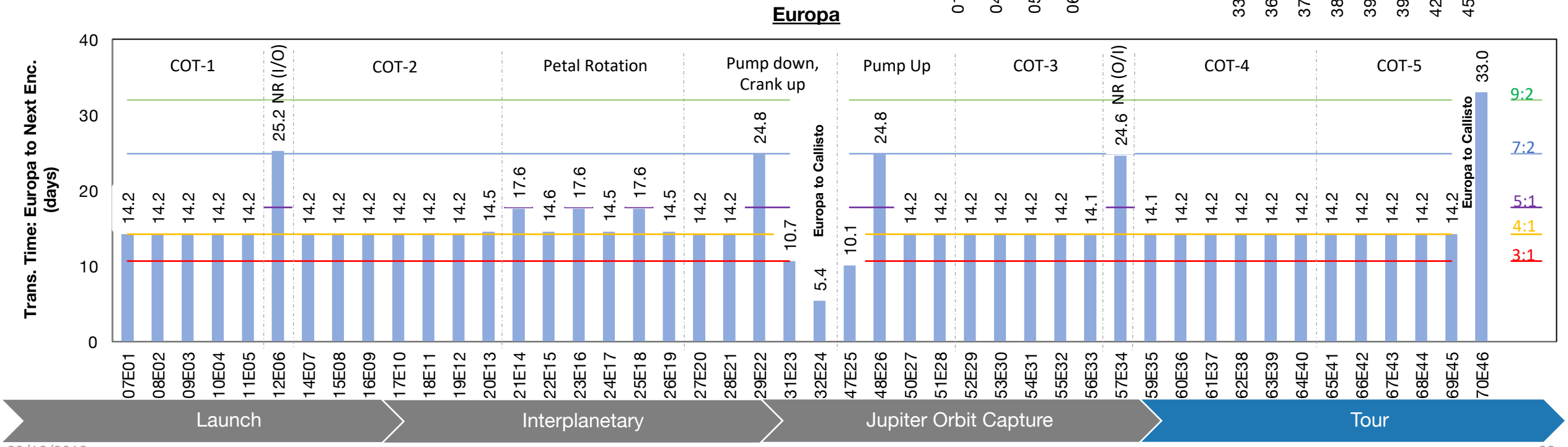
17F12_V2 Flyby Altitude Profile

Europa-to-Europa Trans. Bin	17F12_V2
< 14.2 days	2
≅ 14.2 days	35
> 14.2 days	7





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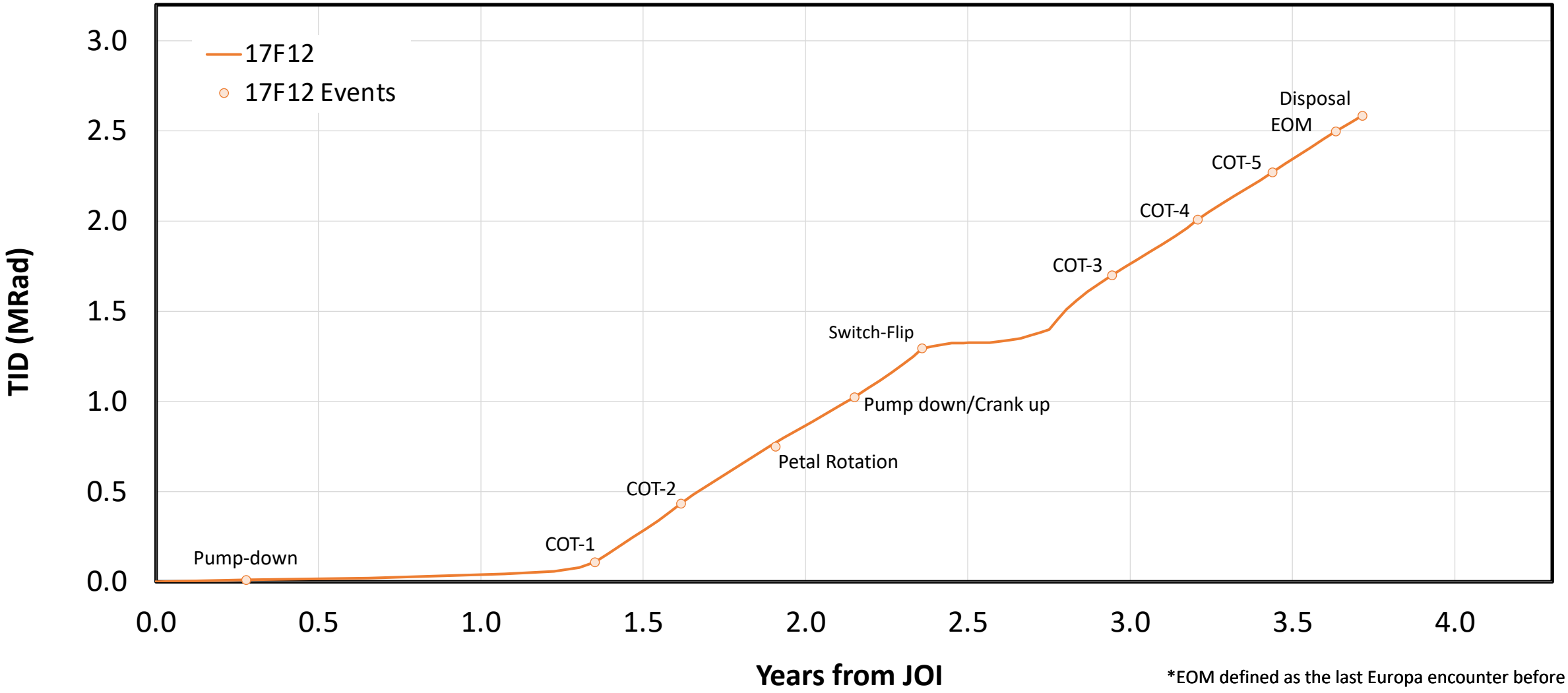
17F12_V2 TID Build-up



*EOM defined as the last Europa encounter before disposal

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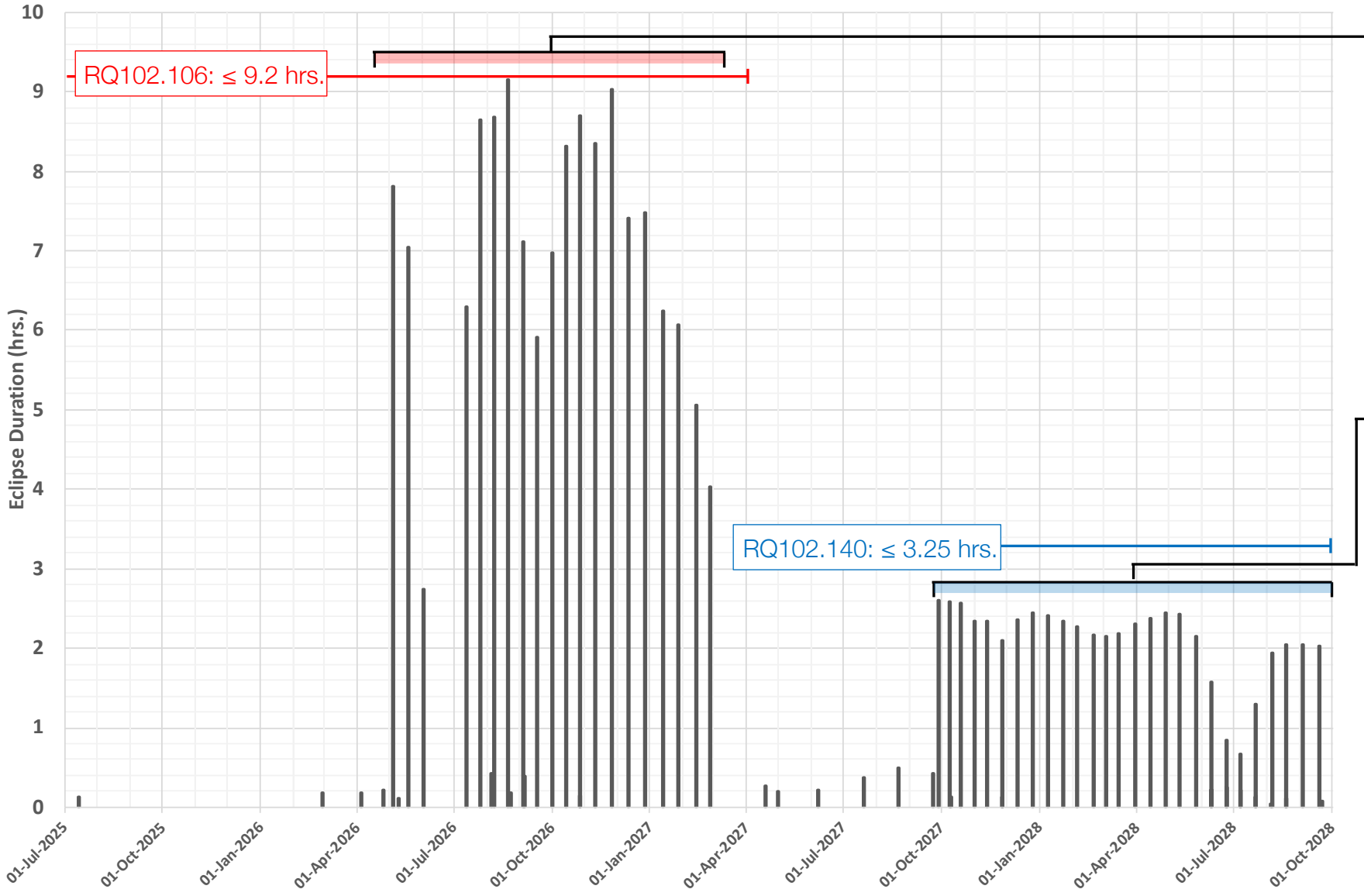
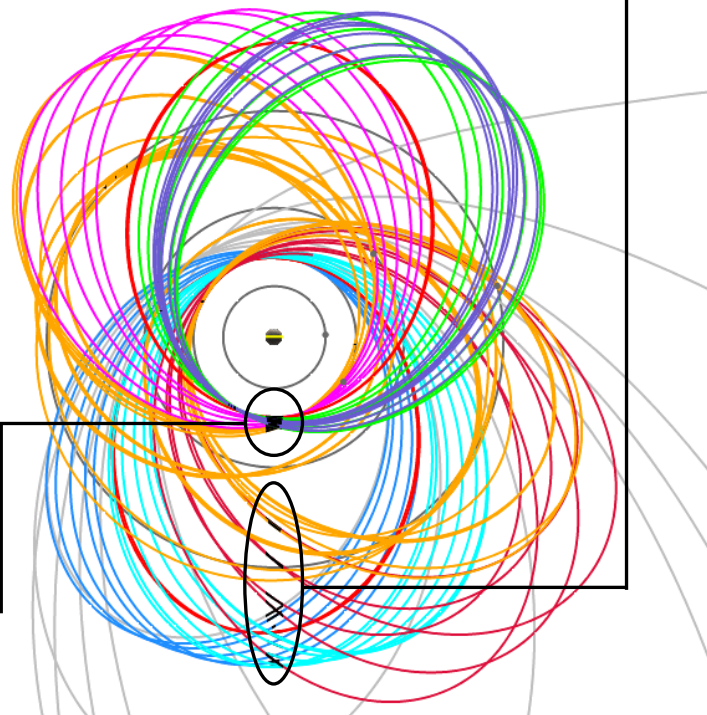
17F12_V2 Eclipses





(Eclipses highlighted **black**)

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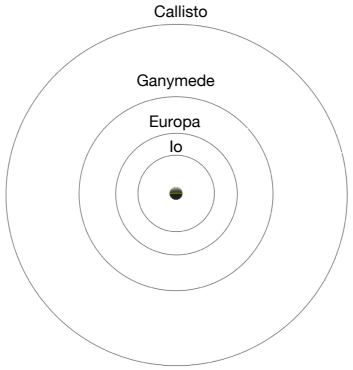
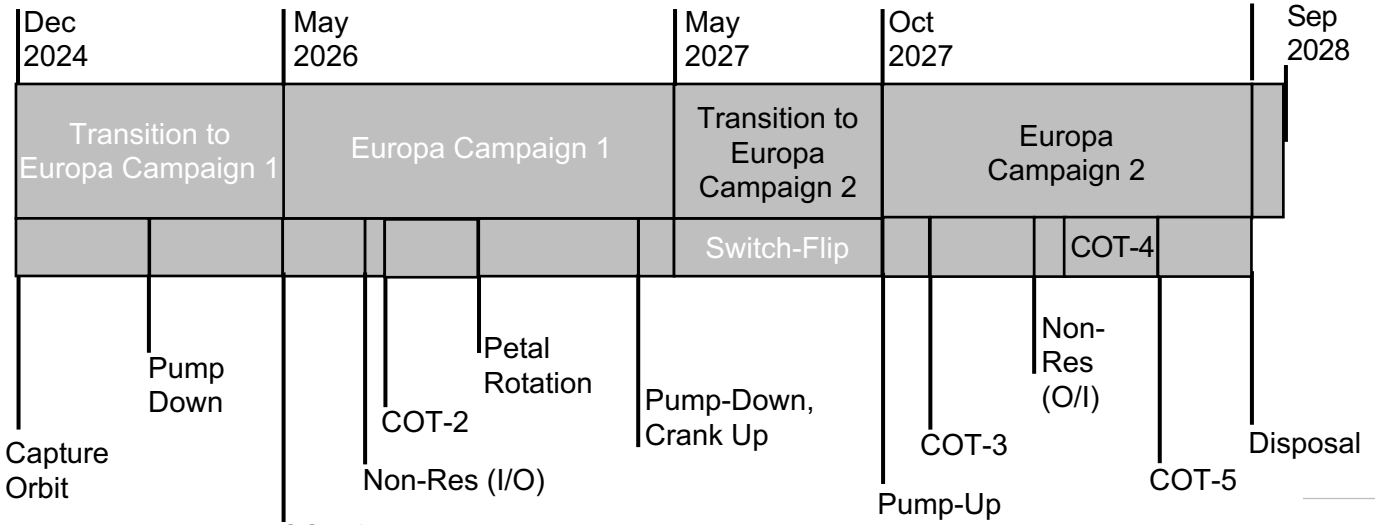
17F12_V2 Trajectory

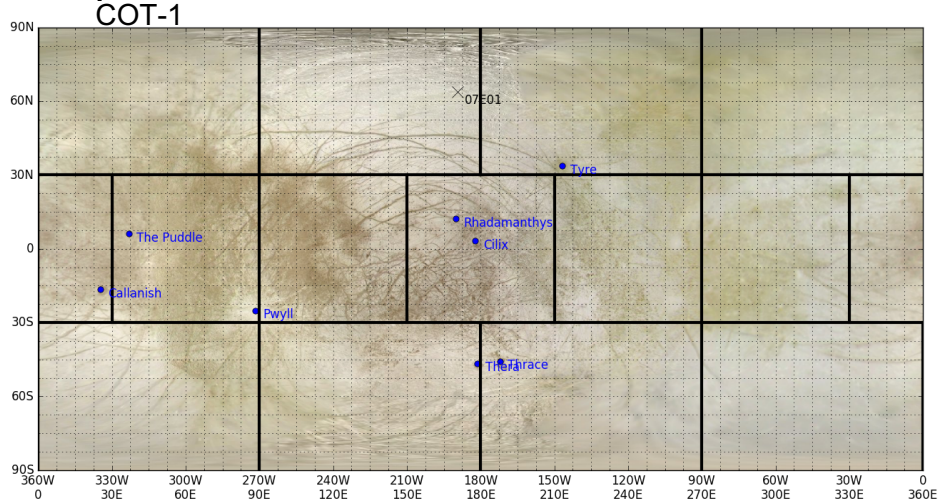
Sun

COT: Crank-over-the-top sequence
Non-Res: Non-resonant transfer



Mission Phases





Anti-Jupiter Hemisphere

Sub-Jupiter Hemisphere

Launch | Interplanetary | Jupiter Orbit Capture | Tour

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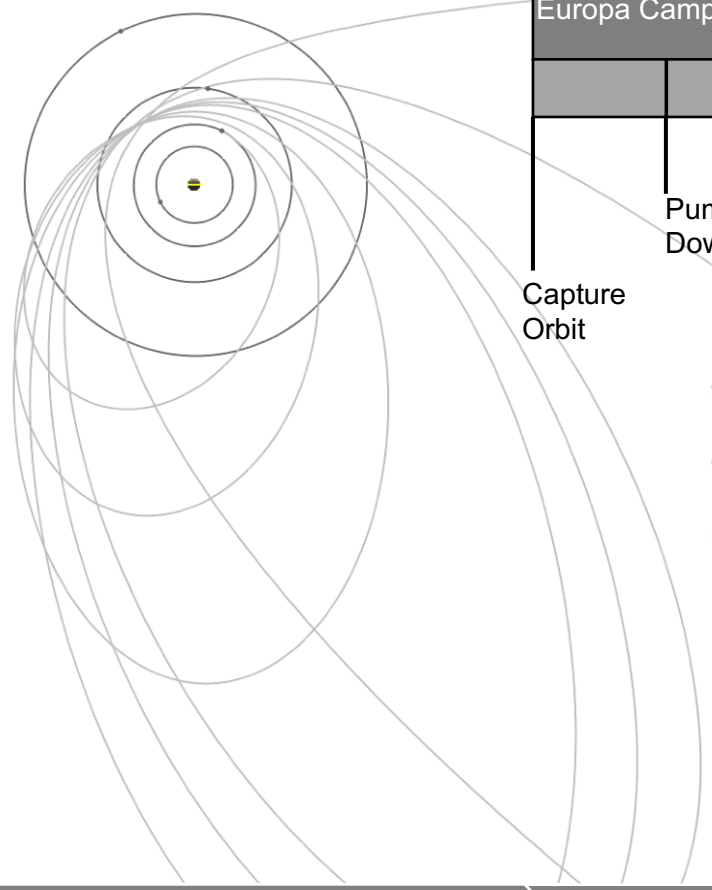
17F12_V2 Trajectory

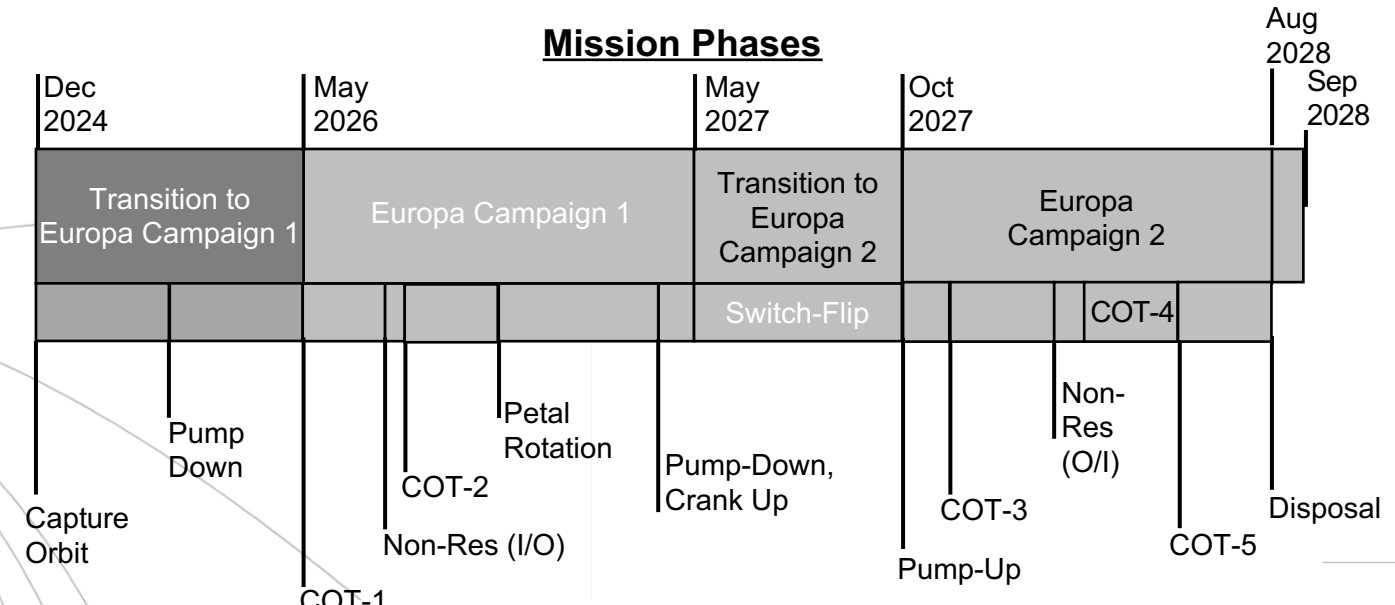
[Pump Down]

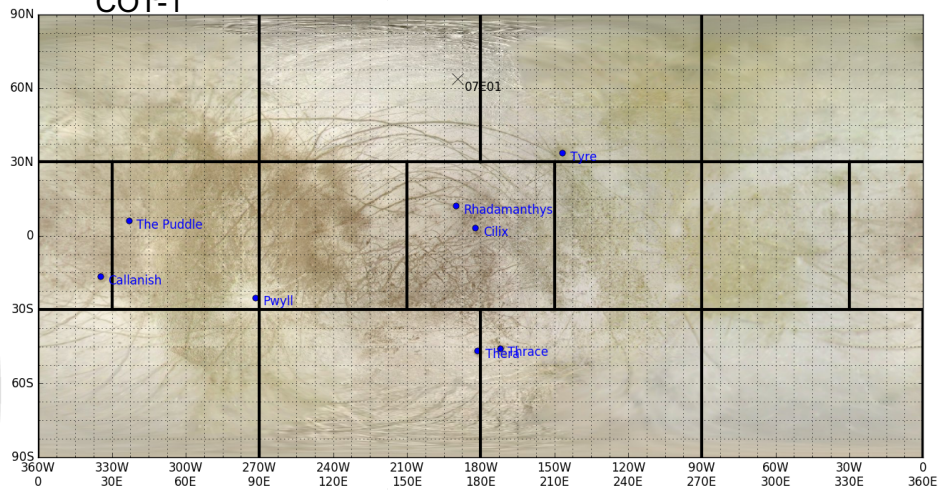
Sun

COT: Crank-over-the-top sequence
Non-Res: Non-resonant transfer



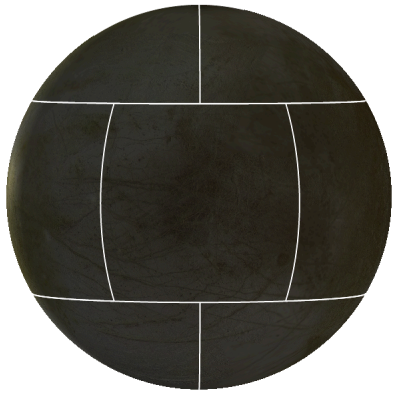
Mission Phases





Anti-Jupiter Hemisphere

Sub-Jupiter Hemisphere



Launch | Interplanetary | Jupiter Orbit Capture | TEC1 | EC1 | TEC2 | EC2

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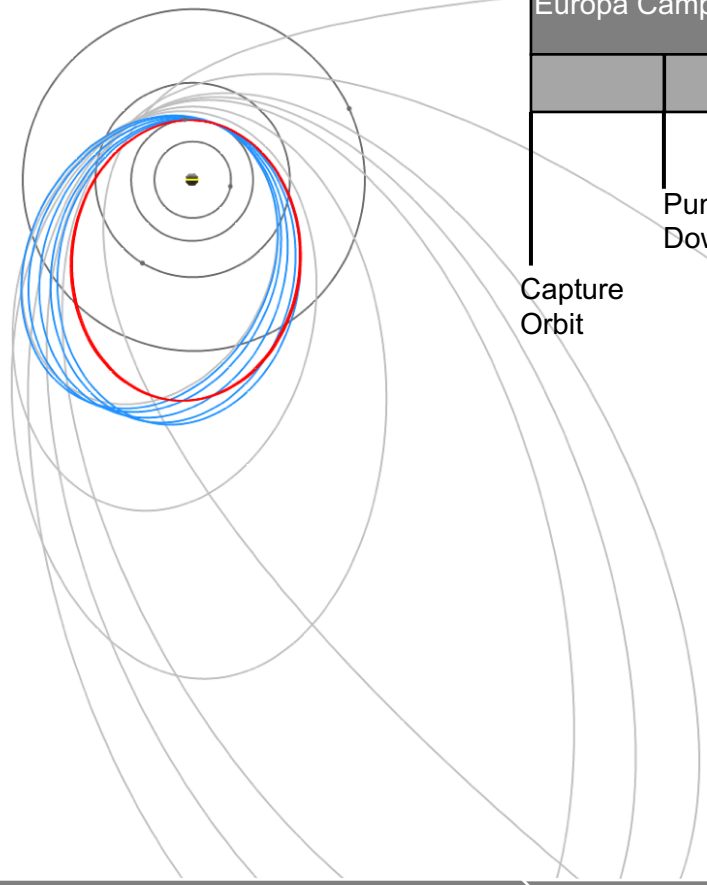
17F12_V2 Trajectory

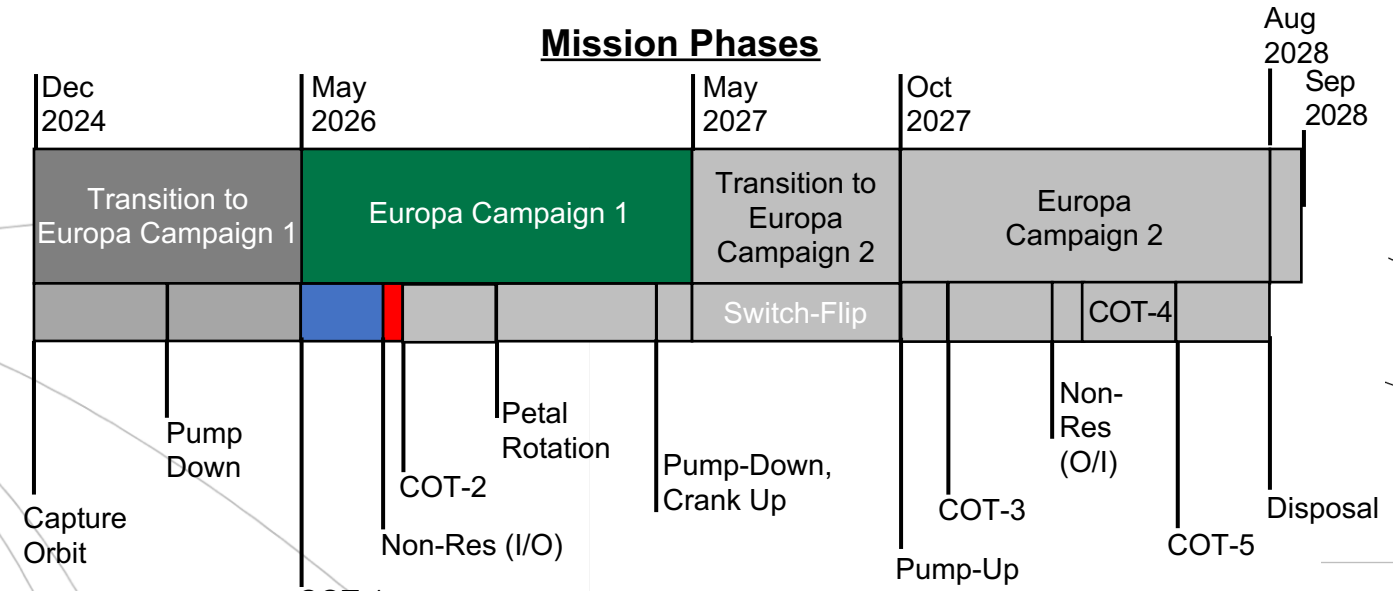
[COT-1 & Non-res (I/O)]

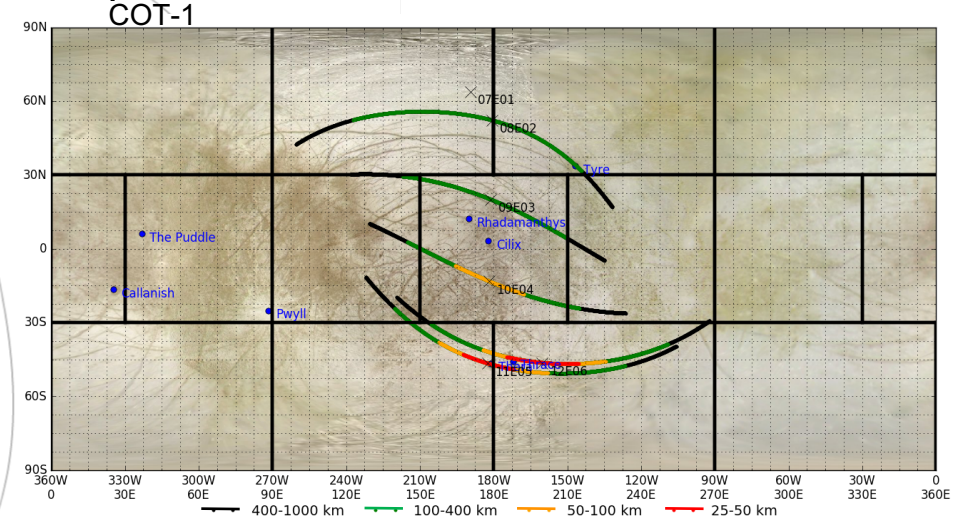
Sun

COT: Crank-over-the-top sequence
Non-Res: Non-resonant transfer

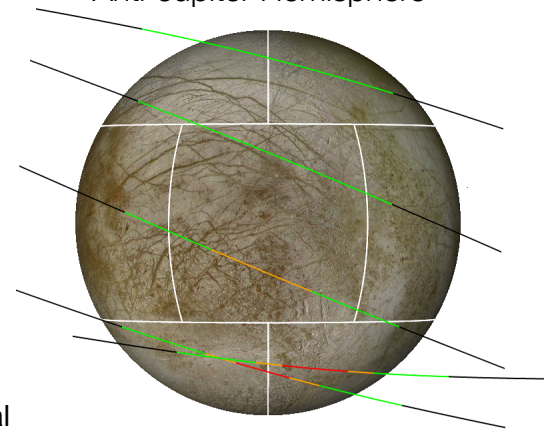


Mission Phases

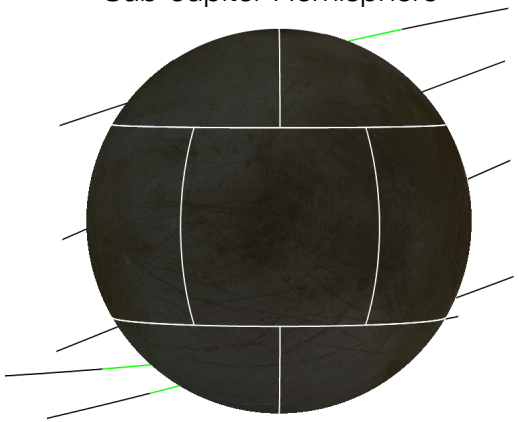




Anti-Jupiter Hemisphere



Sub-Jupiter Hemisphere



Launch | Interplanetary | Jupiter Orbit Capture | TEC1 | EC1 | TEC2 | EC2

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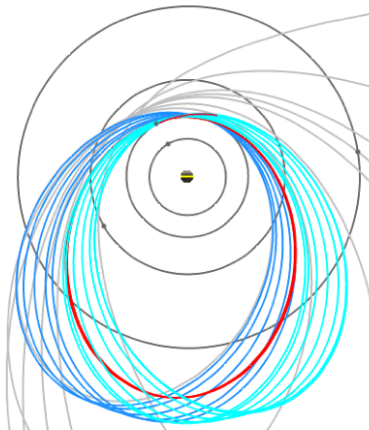
17F12_V2 Trajectory

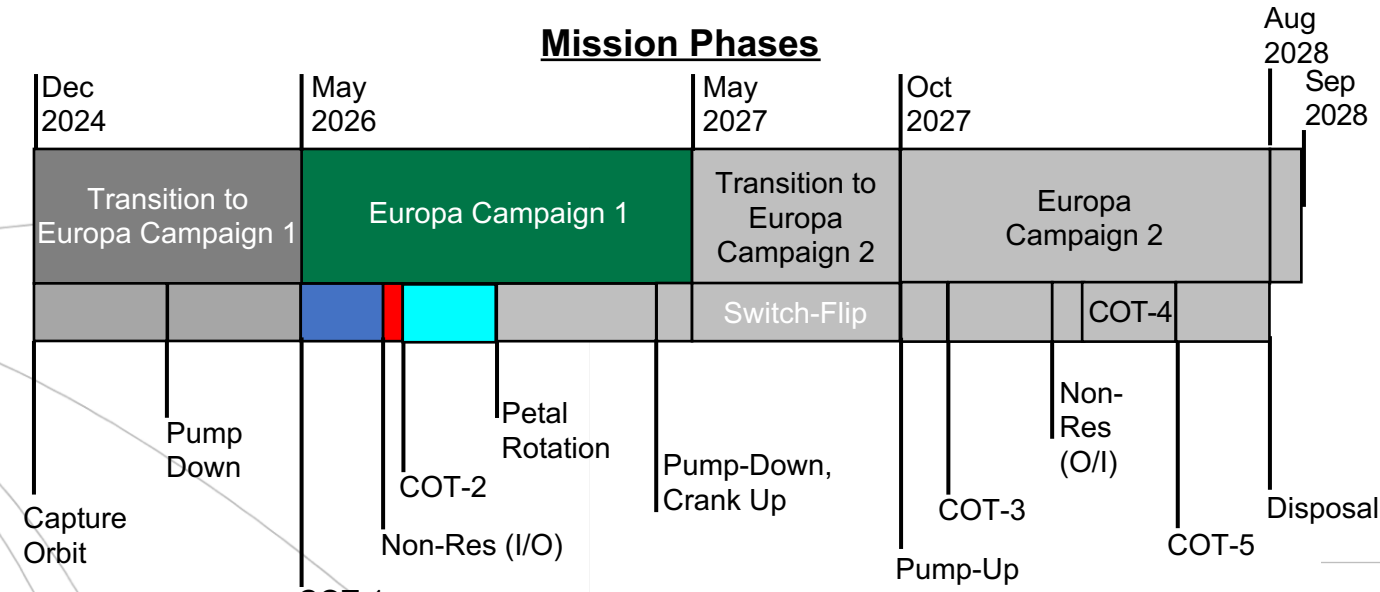
[COT-2]

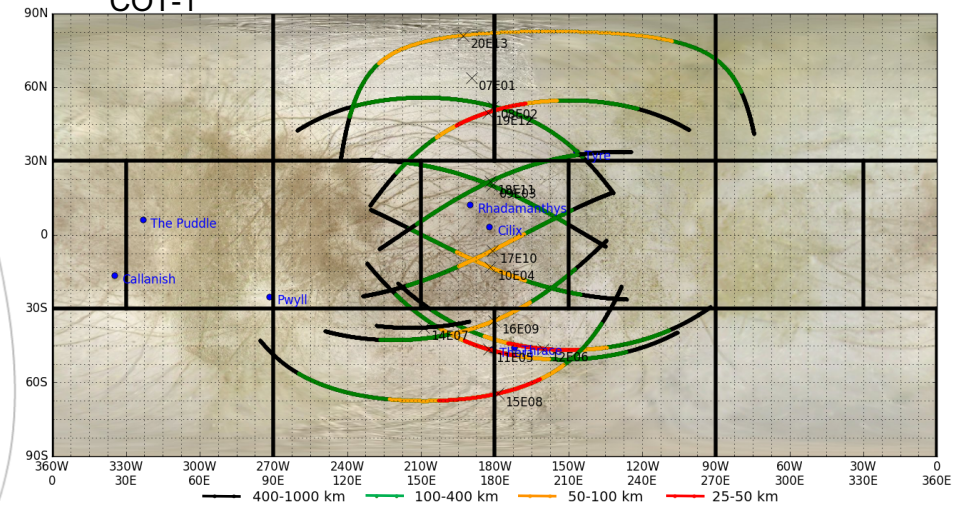
Sun

COT: Crank-over-the-top sequence
Non-Res: Non-resonant transfer

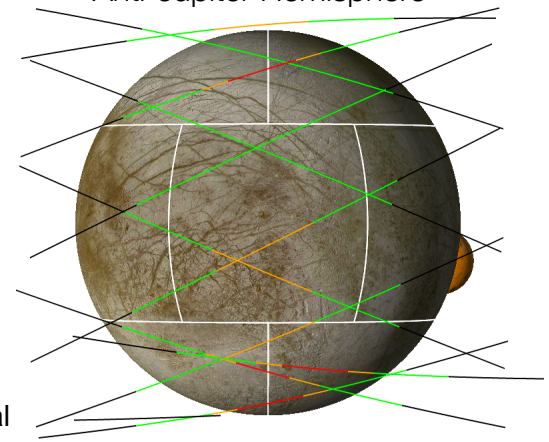


Mission Phases

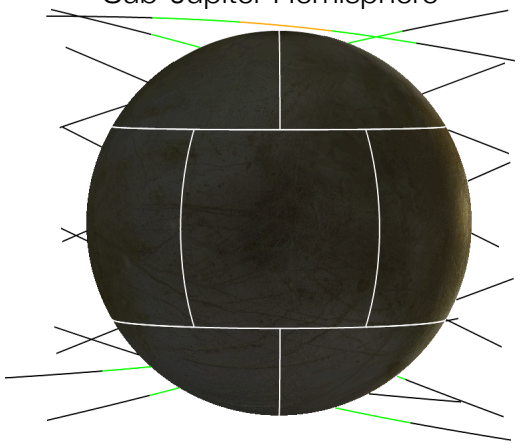




Anti-Jupiter Hemisphere



Sub-Jupiter Hemisphere



Launch | Interplanetary | Jupiter Orbit Capture | TEC1 | EC1 | TEC2 | EC2

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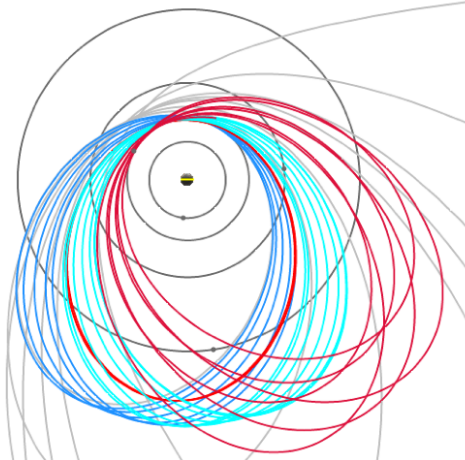
17F12_V2 Trajectory

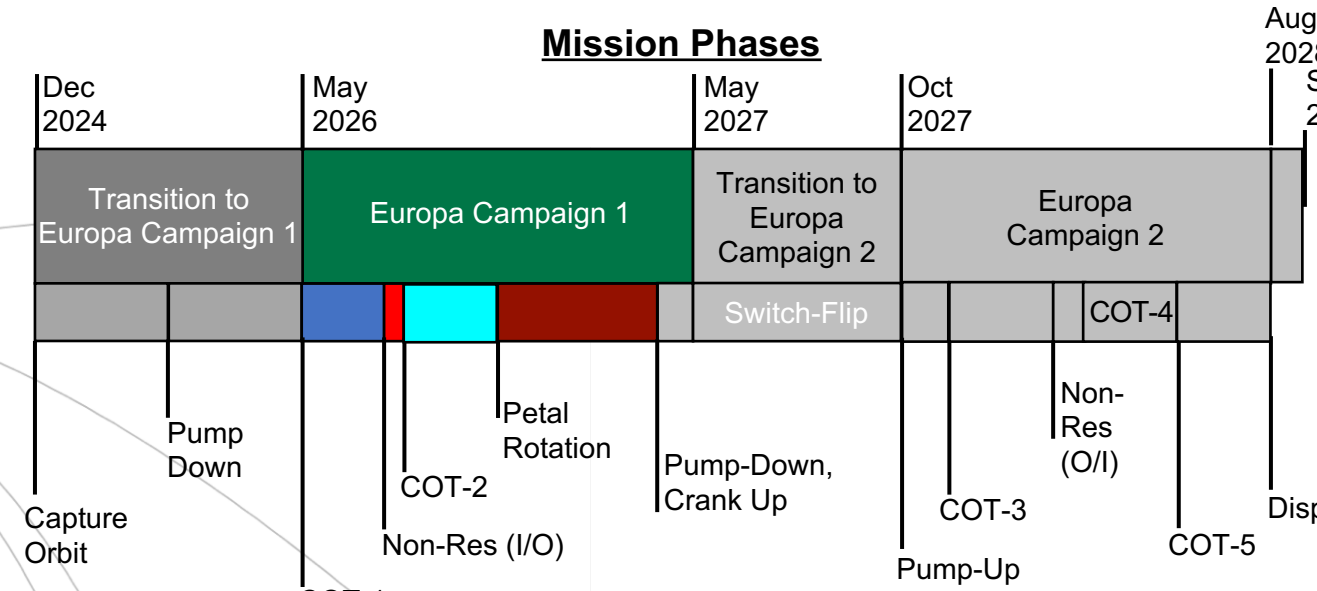
[Petal Rotation]

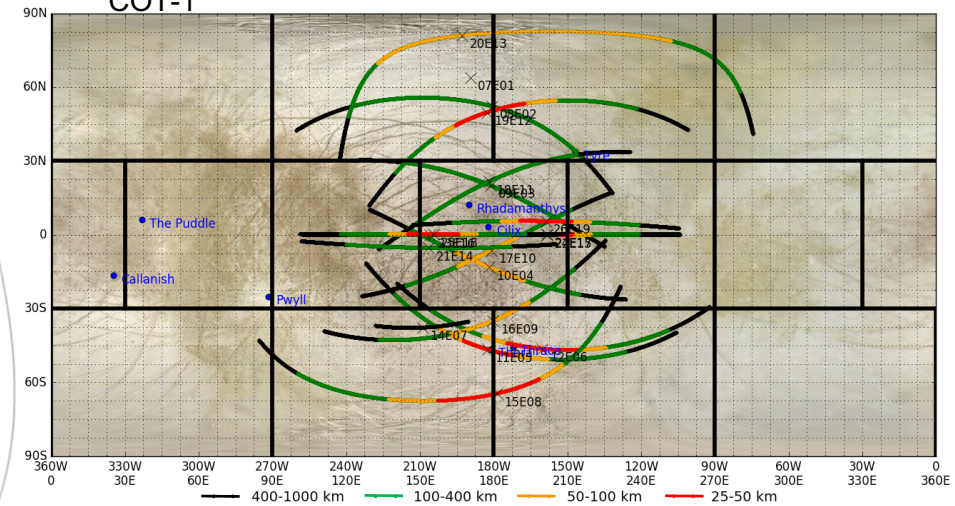
Sun

COT: Crank-over-the-top sequence
Non-Res: Non-resonant transfer

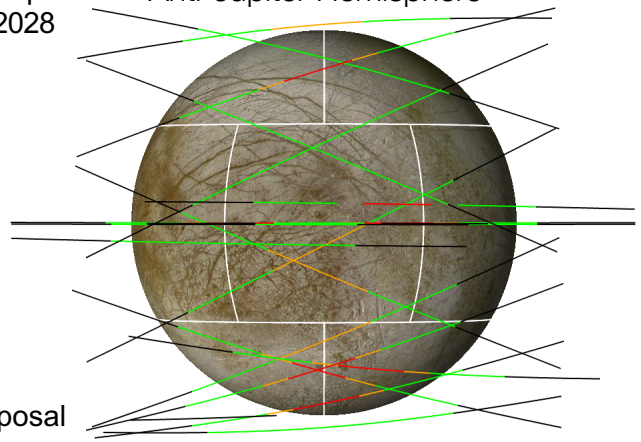


Mission Phases

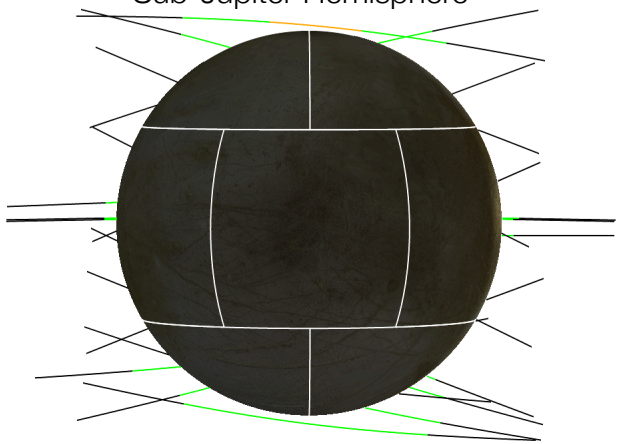




Anti-Jupiter Hemisphere



Sub-Jupiter Hemisphere



Launch | Interplanetary | Jupiter Orbit Capture | TEC1 | EC1 | TEC2 | EC2

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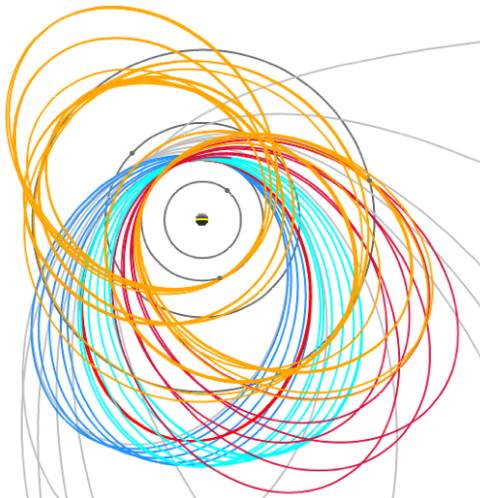
17F12_V2 Trajectory

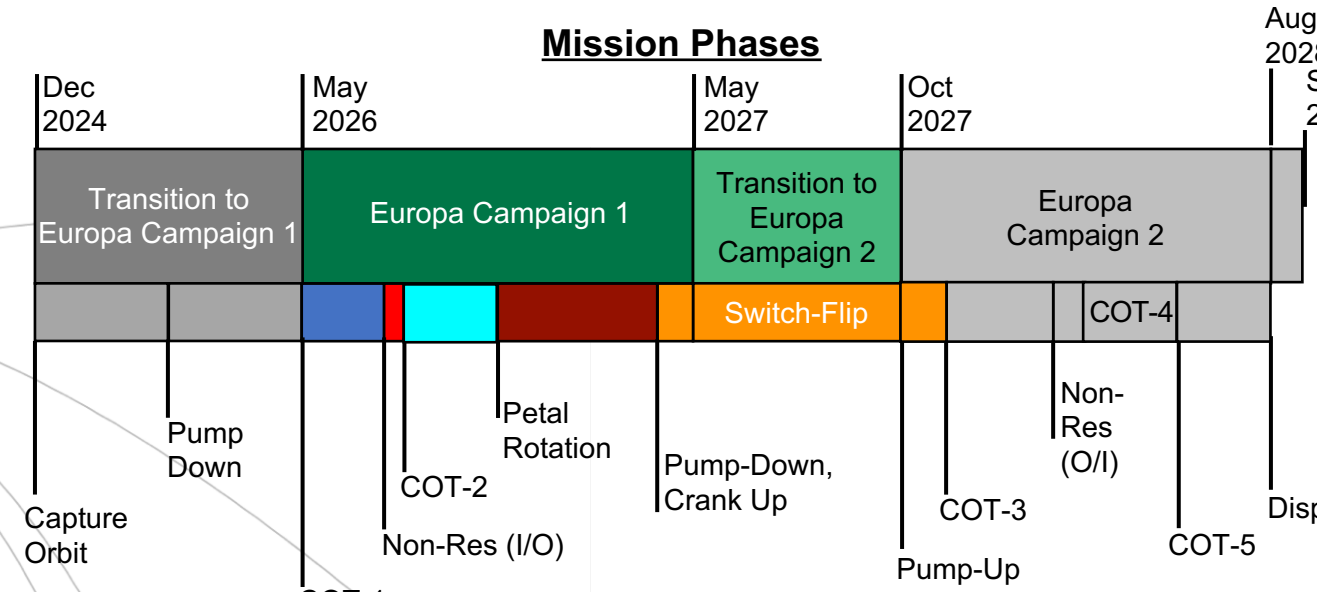
[Switch-flip]

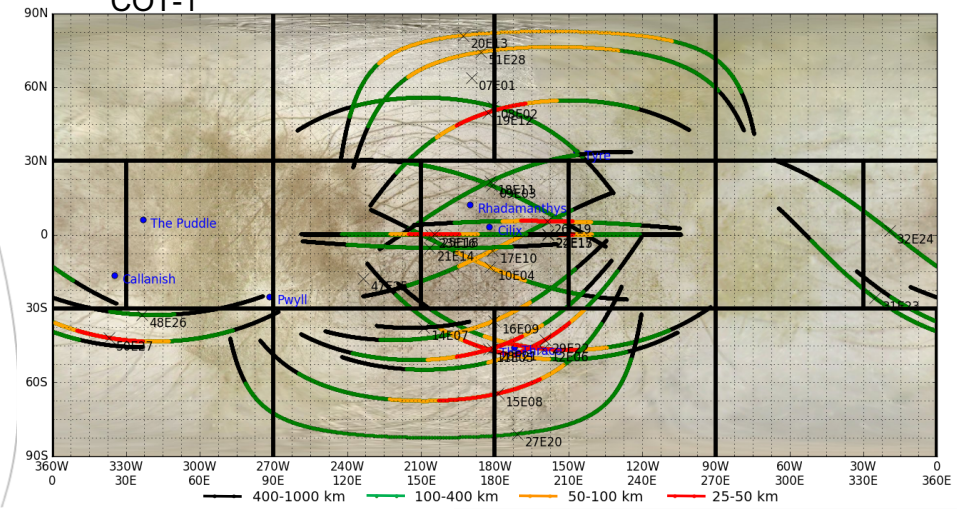
Sun

COT: Crank-over-the-top sequence
Non-Res: Non-resonant transfer

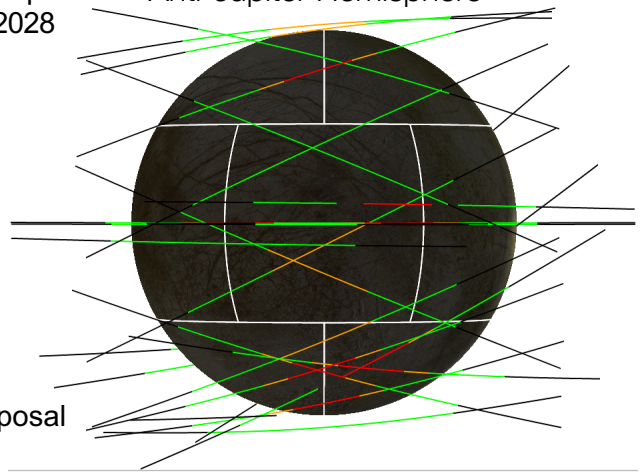


Mission Phases

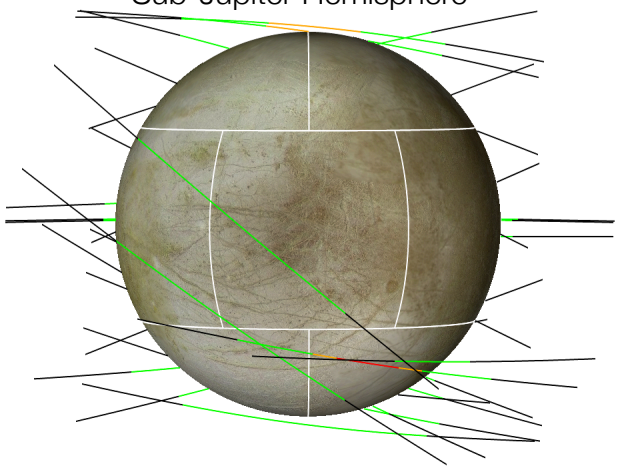




Anti-Jupiter Hemisphere



Sub-Jupiter Hemisphere



Launch | Interplanetary | Jupiter Orbit Capture | TEC1 | EC1 | TEC2 | EC2

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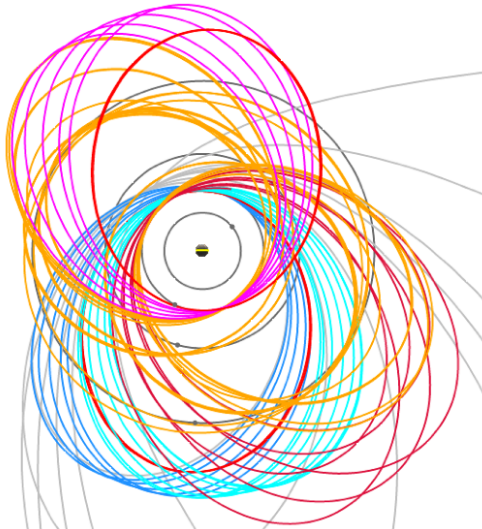
17F12_V2 Trajectory

[COT-3 & Non-res (O/I)]

Sun

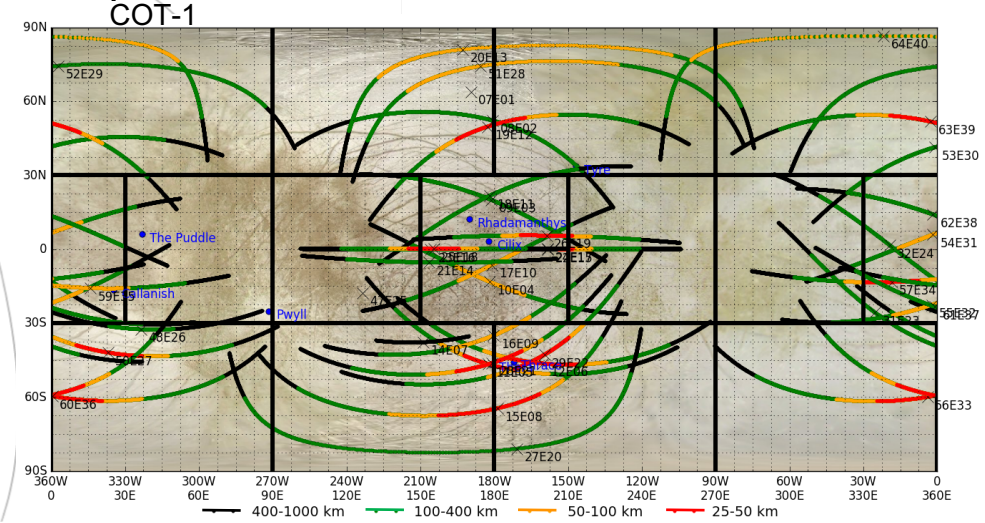
COT: Crank-over-the-top sequence
Non-Res: Non-resonant transfer



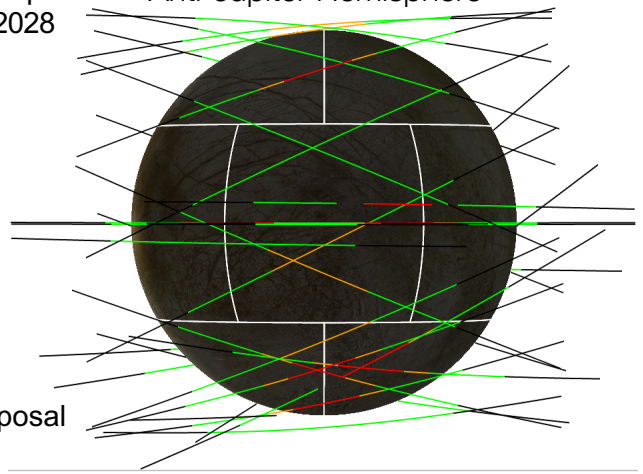
Mission Phases

Dec 2024 | May 2026 | May 2027 | Oct 2027 | Aug 2028 | Sep 2028

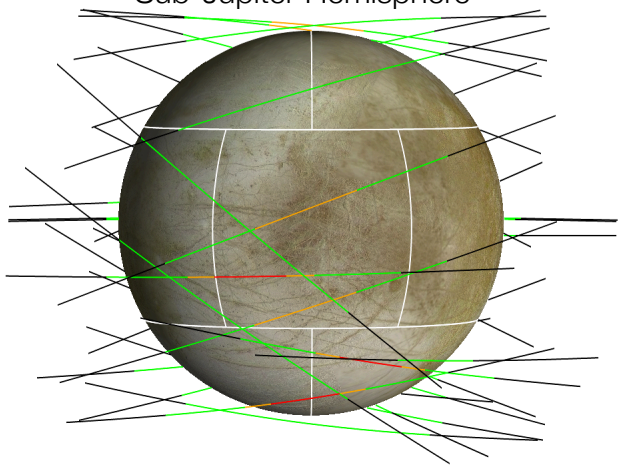
- Transition to Europa Campaign 1
- Europa Campaign 1
- Transition to Europa Campaign 2
- Europa Campaign 2
- Capture Orbit
- Pump Down
- COT-1
- COT-2
- Non-Res (I/O)
- Petal Rotation
- Pump-Down, Crank Up
- Switch-Flip
- Pump-Up
- COT-3
- Non-Res (O/I)
- COT-4
- COT-5
- Disposal



Anti-Jupiter Hemisphere



Sub-Jupiter Hemisphere



Launch | Interplanetary | Jupiter Orbit Capture | TEC1 | EC1 | TEC2 | EC2

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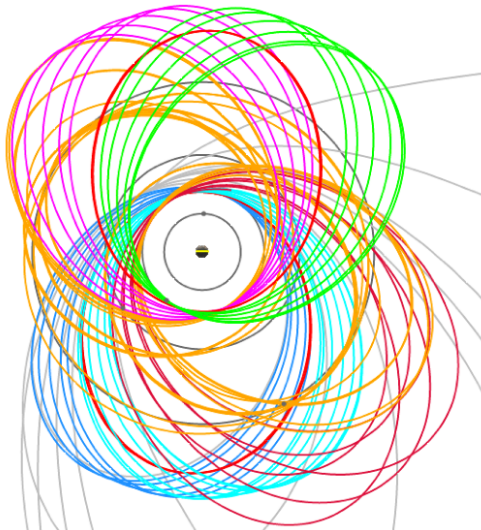
17F12_V2 Trajectory

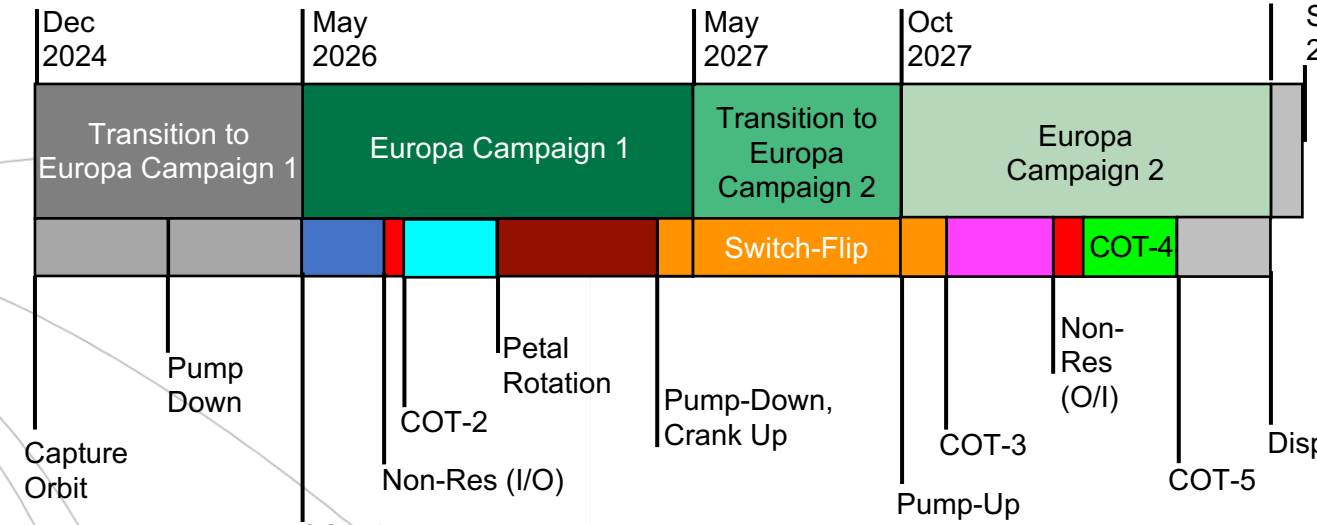
[COT-4]

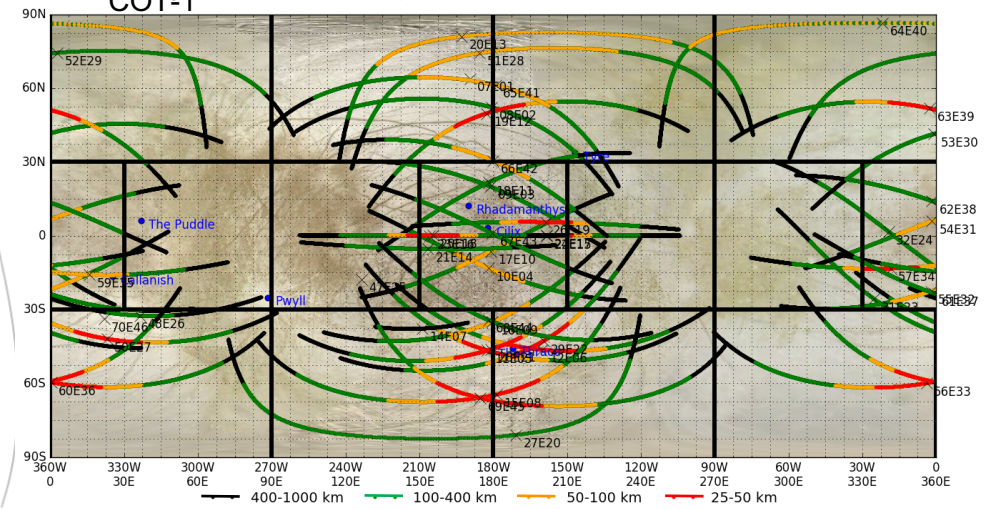
Sun

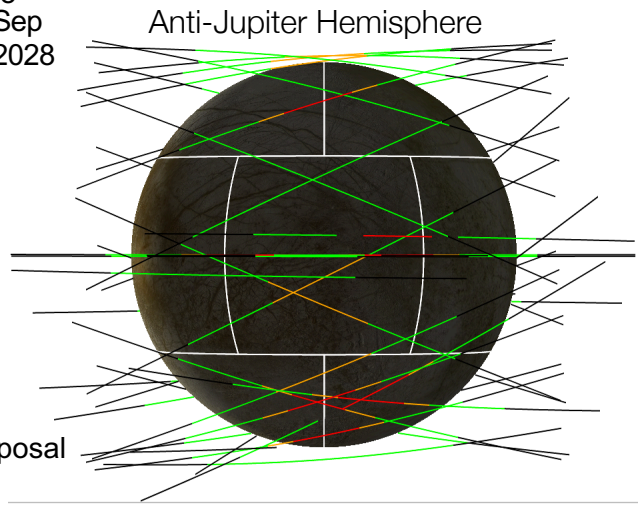
COT: Crank-over-the-top sequence
Non-Res: Non-resonant transfer

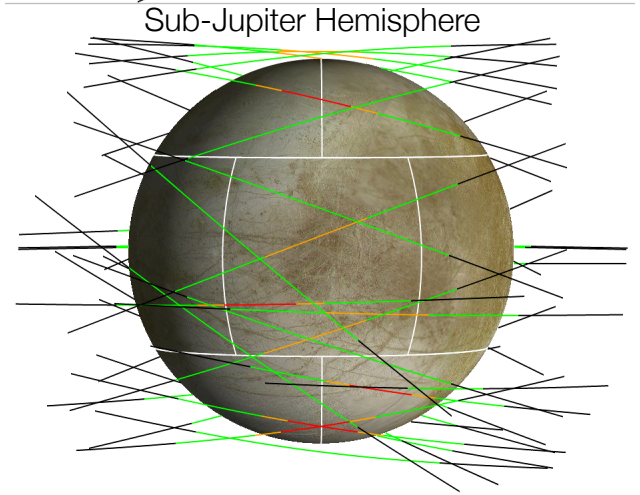


Mission Phases









Launch | Interplanetary | Jupiter Orbit Capture | TEC1 | EC1 | TEC2 | EC2

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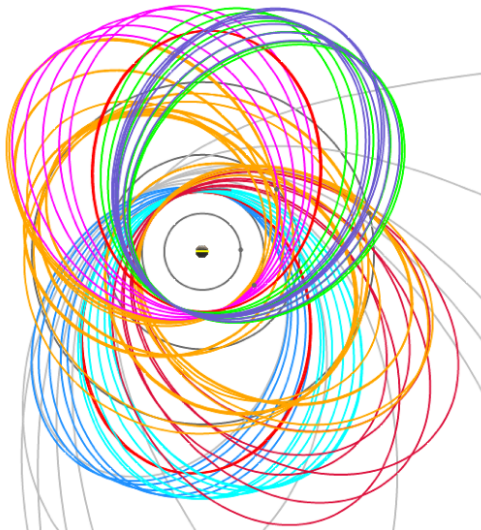
17F12_V2 Trajectory

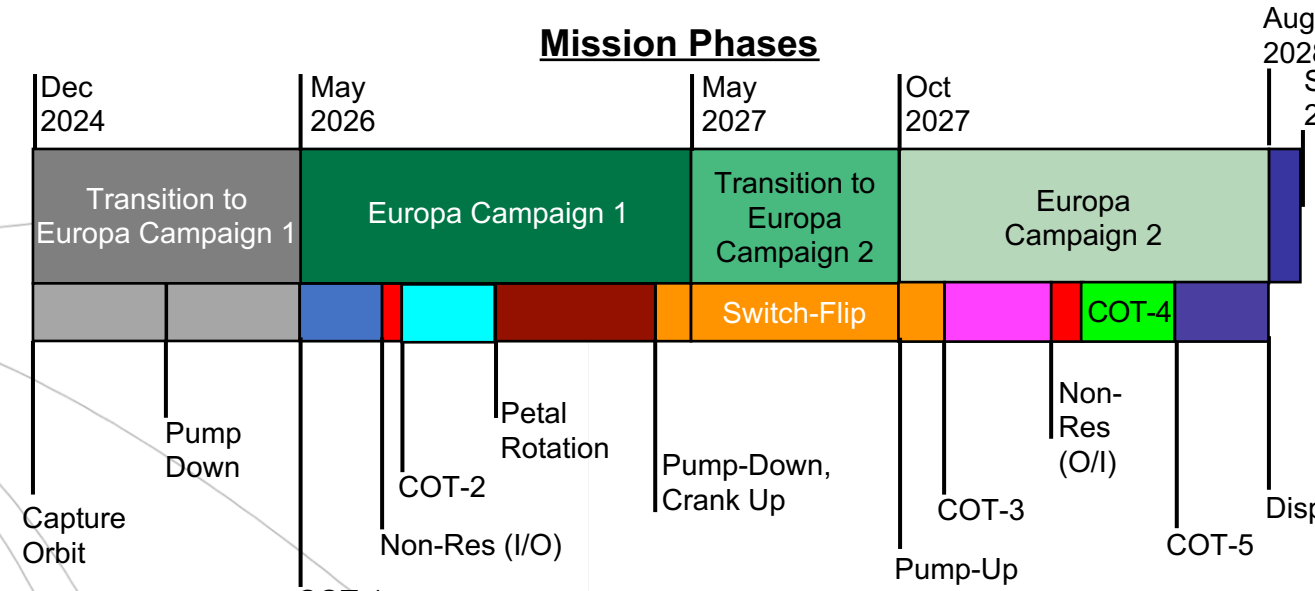
[COT-5]

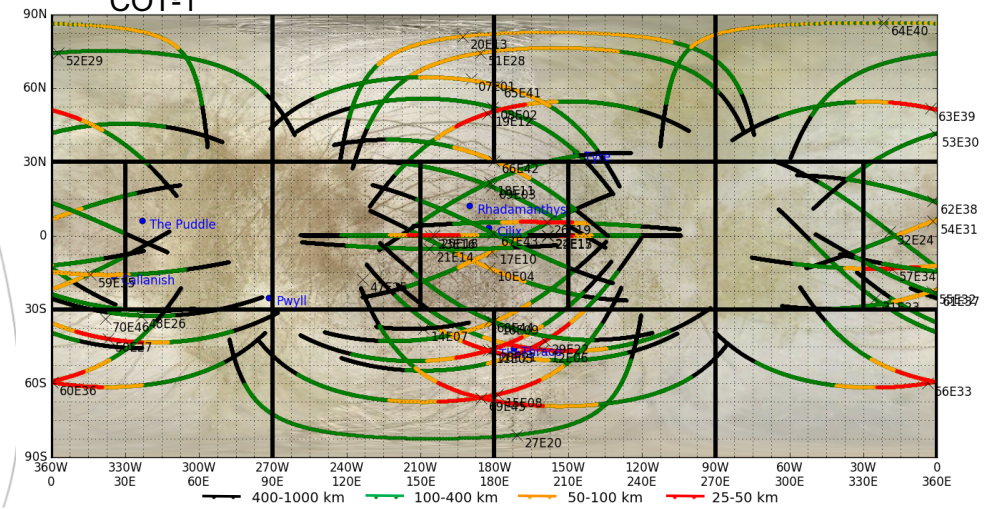
Sun

COT: Crank-over-the-top sequence
Non-Res: Non-resonant transfer

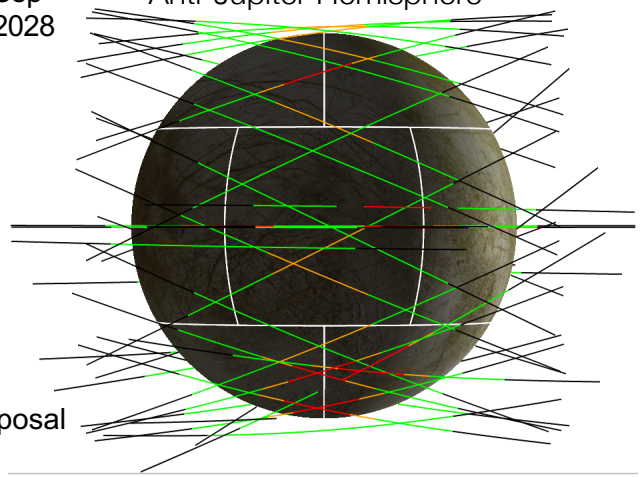


Mission Phases

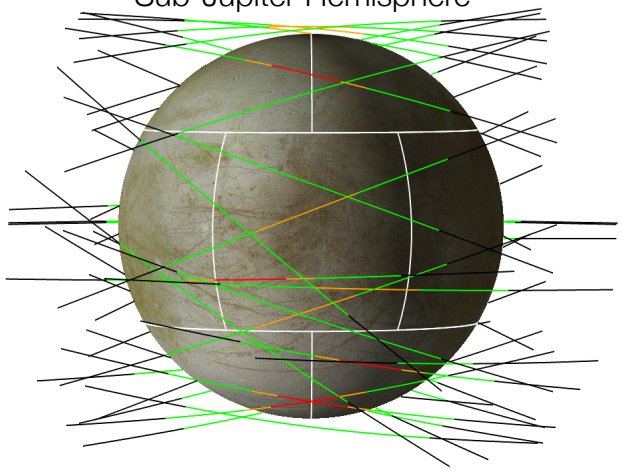




Anti-Jupiter Hemisphere



Sub-Jupiter Hemisphere



Launch | Interplanetary | Jupiter Orbit Capture | TEC1 | EC1 | TEC2 | EC2

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17F13 Tour Details

Mission Phase		Flyby	I/O	Date ET	Alt. km	B-Plane deg	V-Inf km/s	V km/s	LST hh:mm	Lat. deg	Lon. deg	SEP deg	Phase deg	TRA deg	Incl. deg	RP RJ	RA RJ	Body Rev	S/C Rev	Period days	TOF days	Elasped days	TID Mrad	Europa TRA deg	Sys III LON deg
Transition to Europa Campaign 1	Capture Orbit	G00	I	23-Dec-2024 11:06:10	300	0	8.04	8.45	16:45:50	-0.5	240.6	162.1	71.5	-48.0	6.0	12.1	267.3	28.3	1.3	203.9	202.1	0	0.00	-110	75
	Pump Down	01G01	O	13-Jul-2025 14:21:47	100	-134	6.21	6.77	02:12:13	45.8	308.6	13.8	123.8	46.4	4.2	12.5	132.8	32	3	76.5	229.0	202	0.01	11	240
		04G02	O	27-Feb-2026 15:21:56	608	-157	6.54	6.99	23:53:04	23.1	288.0	126.2	155.5	59.6	2.5	11.3	76.3	5	1	35.8	35.8	431	0.04	-1	295
		05G03	O	04-Apr-2026 09:50:00	458	-152	6.55	7.02	23:08:44	28.6	280.0	91.3	147.7	70.2	0.5	10.4	51.9	3	1	21.5	21.5	467	0.06	52	117
		06G04	O	25-Apr-2026 20:53:29	400	-166	6.55	7.03	22:25:48	13.7	271.2	72.5	152.4	83.1	0.6	9.3	37.4	1.8	0.8	13.9	13.0	488	0.08	83	154
Europa Campaign 1	COT-1	07E01	O	08-May-2026 21:08:12	1,442	-64	3.76	4.04	10:16:42	63.9	170.5	61.8	66.1	9.6	1.7	9.3	38.2	4	1	14.3	14.2	501	0.11	-29	268
		08E02	O	23-May-2026 02:39:39	100	-55	3.86	4.33	10:57:59	52.2	179.3	50.4	53.4	9.6	4.0	9.3	38.1	4	1	14.3	14.2	516	0.15	-16	123
		09E03	O	06-Jun-2026 07:35:10	100	-24	3.86	4.33	10:51:33	20.0	178.8	39.5	25.8	4.2	4.9	9.3	38.1	4	1	14.2	14.2	530	0.20	-5	357
		10E04	I	20-Jun-2026 12:31:28	50	12	3.86	4.35	10:44:51	-13.2	178.2	28.8	23.0	-2.8	4.2	9.3	38.1	4	1	14.2	14.2	544	0.25	5	231
		11E05	I	04-Jul-2026 17:29:22	35	48	3.86	4.34	10:38:58	-46.6	177.7	18.2	50.2	-8.7	2.1	9.3	38.1	4	1	14.2	14.2	558	0.29	16	104
	Non-Res	12E06	I	18-Jul-2026 22:09:06	25	46	3.87	4.36	11:58:56	-46.4	199.9	7.8	46.6	-14.9	0.3	9.2	34.3	7.1	2.1	12.5	25.2	572	0.34	26	346
	COT-2	14E07	O	13-Aug-2026 03:44:35	903	38	3.95	4.26	11:07:47	-38.0	151.1	10.8	39.9	18.9	1.2	9.3	38.1	4	1	14.2	14.2	598	0.43	81	18
		15E08	O	27-Aug-2026 08:30:42	25	67	3.96	4.44	13:01:29	-64.5	181.3	21.4	65.5	14.5	3.9	9.3	38.0	4	1	14.2	14.2	612	0.48	90	257
		16E09	O	10-Sep-2026 13:26:56	50	40	3.97	4.44	12:51:09	-35.0	179.7	32.2	36.9	9.8	5.6	9.4	37.9	4	1	14.2	14.2	626	0.53	101	131
		17E10	O	24-Sep-2026 18:24:01	50	10	3.98	4.45	12:44:13	-6.4	178.9	43.3	12.7	2.9	5.9	9.5	37.9	4	1	14.2	14.2	640	0.57	111	4
		18E11	I	08-Oct-2026 23:21:55	100	-21	3.98	4.44	12:37:05	21.7	178.1	54.7	23.6	-4.3	4.9	9.4	38.0	4	1	14.2	14.2	655	0.62	122	236
		19E12	I	23-Oct-2026 04:17:53	25	-51	3.97	4.45	12:29:40	49.7	177.3	66.6	50.4	-10.2	2.7	9.4	38.0	4	1	14.2	14.2	669	0.66	133	110
	Non-Res	20E13	I	06-Nov-2026 09:24:22	355	-79	3.93	4.34	12:10:54	77.1	172.9	79.0	77.4	-12.5	0.6	9.4	38.0	4.1	1.1	14.2	14.4	683	0.71	144	338
	COT-3	21E14	O	20-Nov-2026 19:53:26	957	-81	3.81	4.13	14:38:48	80.6	187.5	92.3	83.1	9.5	2.2	9.4	37.9	4	1	14.2	14.2	697	0.75	-180	33
		22E15	O	05-Dec-2026 01:28:40	100	-55	3.89	4.36	14:14:22	52.1	179.6	106.0	59.6	9.5	4.5	9.5	37.9	4	1	14.2	14.2	712	0.79	-166	245
		23E16	O	19-Dec-2026 06:30:50	100	-24	3.91	4.37	14:08:06	20.3	178.7	120.4	37.6	3.9	5.5	9.5	37.8	4	1	14.2	14.2	726	0.84	-154	116
		24E17	I	02-Jan-2027 11:32:07	100	8	3.91	4.37	14:04:39	-9.5	178.5	135.5	32.3	-3.1	5.0	9.5	37.8	4	1	14.2	14.2	740	0.88	-143	346
		25E18	I	16-Jan-2027 16:16:30	35	47	3.93	4.41	13:51:30	-46.1	177.0	151.2	51.7	-10.8	3.0	9.4	38.0	4	1	14.2	14.2	754	0.93	-133	226
		26E19	I	30-Jan-2027 21:16:09	50	80	3.91	4.39	13:28:31	-78.8	172.1	167.3	79.0	-13.9	0.2	9.3	38.1	4.1	1.1	14.3	14.5	768	0.97	-122	98
	Petal Rotation	27E20	O	14-Feb-2027 09:24:01	50	-4.22	4.03	4.5	14:17:55	4.34	155.0	175.9	34.8	12.0	0.4	9.4	45.5	4.94	0.94	17.7	17.6	783	1.02	-81	100
		28E21	I	03-Mar-2027 22:47:15	100	0	4.08	4.53	16:02:11	-0.2	202.6	156.2	60.5	-15.6	0.5	9.2	38.3	4.1	1.1	14.3	14.6	800	1.06	-87	276
		29E22	O	18-Mar-2027 11:54:23	25	0	4.02	4.49	15:08:25	-0.2	155.6	140.3	47.1	12.1	0.5	9.3	45.5	4.95	0.95	17.7	17.6	815	1.11	-43	247
		30E23	I	05-Apr-2027 01:35:19	83	0	4.03	4.49	16:51:00	0.2	201.5	122.0	72.8	-14.4	0.5	9.2	38.4	4.1	1.1	14.3	14.5	833	1.16	-49	53
		31E24	O	19-Apr-2027 14:28:57	25	0	4.01	4.49	15:58:51	0.2	155.8	107.7	59.7	12.8	0.5	9.3	45.6	4.95	0.95	17.8	17.6	847	1.20	-4	32
		32E25	I	07-May-2027 04:10:41	68	-6	4.02	4.48	17:41:59	6.0	201.8	91.4	85.6	-13.5	0.8	9.2	38.3	4.1	1.1	14.3	14.5	865	1.25	-10	197
	Pump Down, Crank Up	33E26	O	21-May-2027 16:56:12	50	84	4.00	4.47	19:13:34	-82.2	192.7	78.7	91.4	16.6	2.3	9.2	38.1	4	1	14.2	14.2	879	1.30	34	181
		34E27	O	04-Jun-2027 21:48:04	50	59	4.00	4.47	18:21:49	-54.4	181.0	66.8	92.3	13.9	4.6	9.3	38.0	4	1	14.2	14.2	893	1.34	44	57
		35E28	O	19-Jun-2027 02:29:54	50	65	3.99	4.46	20:01:47	-52.3	208.0	55.4	107.1	9.0	7.0	9.3	34.0	7	2	12.4	24.8	908	1.39	53	298
		37E29	O	13-Jul-2027 22:40:36	857	74	3.99	4.31	21:36:17	-49.0	235.4	36.2	121.0	5.0	8.7	9.4	29.7	3	1	10.7	10.6	932	1.48	70	272
		38E30	O	24-Jul-2027 14:06:49	2,008	99	4.00	4.22	00:22:58	-44.4	278.9	28.2	134.0	3.7	9.8	9.4	26.5	1.4	0.5	9.4	4.9	943	1.52	76	6

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17F13 Tour Details

Mission Phase		Flyby	I/O	Date ET	Alt. km	B-Plane deg	V-Inf km/s	V km/s	LST hh:mm	Lat. deg	Lon. deg	SEP deg	Phase deg	TRA deg	Incl. deg	RP RJ	RA RJ	Body Rev	S/C Rev	Period days	TOF days	Elasped days	TID Mrad	Europa TRA deg	Sys III LON deg
Transition to Europa Campaign 2	Switch Flip	39C01	I	29-Jul-2027 11:40:18	3,237	-45	2.55	3.01	19:15:50	35.1	23.5	24.7	106.0	-179.3	13.8	11.0	26.4	3	5	10.0	50.0	948	1.57	-141	241
		44C02	O	17-Sep-2027 12:11:47	800	-29	2.56	3.32	19:55:15	13.1	38.2	12.9	118.3	166.3	14.6	15.7	27.7	3	4	12.5	50.0	998	1.66	-75	254
		48C03	O	06-Nov-2027 12:23:34	2,679	-43	2.57	3.07	22:48:51	20.9	86.7	52.5	153.8	129.9	15.2	22.0	30.6	1	1	16.7	16.6	1048	1.70	-10	279
		49C04	O	23-Nov-2027 03:42:28	293	-106	2.55	3.44	04:54:34	16.2	180.5	66.7	106.1	78.0	18.0	26.2	26.7	0.5	0.5	16.8	8.3	1065	1.70	-110	194
		51C05	I	01-Dec-2027 09:40:58	6,323	177	2.57	2.87	16:49:32	5.7	181.7	74.2	72.6	-66.0	17.6	24.8	27.9	1.0	1.0	16.7	16.6	1073	1.71	12	32
		52C06	I	18-Dec-2027 00:58:29	100	-126	2.58	3.52	16:33:43	29.4	180.1	89.5	72.1	-88.8	12.4	20.5	32.3	1	1	16.7	16.6	1090	1.71	-88	308
		53C07	I	03-Jan-2028 16:18:39	414	-27	2.60	3.44	22:57:29	30.2	278.4	105.5	147.8	-134.9	8.7	12.5	27.8	2	3	11.2	33.3	1106	1.71	168	222
		56C08	I	05-Feb-2028 23:56:41	1,629	-11	2.58	3.19	01:40:49	14.9	323.1	140.3	151.8	-164.8	7.1	9.3	26.4	0.25	0.5	9.3	4.2	1140	1.76	-28	16
Europa Campaign 2	Crank Down, Mini Petal	56E31	O	10-Feb-2028 04:04:40	1,740	66	3.61	3.87	23:42:52	-50.2	110.4	144.7	127.7	9.3	5.6	9.3	29.8	3	1	10.7	10.6	1144	1.76	38	165
		57E32	O	20-Feb-2028 19:20:03	50	100	3.61	4.12	19:37:15	-65.9	51.6	156.4	97.9	7.9	2.6	9.3	34.0	7	2	12.4	24.8	1154	1.81	44	265
		59E33	O	16-Mar-2028 15:31:04	25	123	3.62	4.14	15:40:18	-56.9	356.0	175.3	70.0	10.1	0.1	9.3	34.0	6.9	1.9	12.4	24.6	1179	1.90	61	238
		61E34	I	10-Apr-2028 06:05:58	25	-174	3.71	4.22	15:09:25	6.2	15.6	148.3	48.0	-8.7	0.2	9.3	38.0	4.0	1.0	14.2	14.3	1204	1.99	53	31
	COT-4	62E35	O	24-Apr-2028 13:05:07	100	43	3.65	4.14	02:35:38	-43.0	179.5	133.2	122.9	1.8	1.8	9.4	37.9	4	1	14.2	14.3	1218	2.03	72	199
		63E36	O	08-May-2028 19:20:21	100	-14	3.66	4.15	02:51:23	14.8	178.8	118.9	135.9	0.7	1.0	9.4	38.0	4	1	14.3	14.3	1232	2.08	88	30
		64E37	O	23-May-2028 02:16:15	100	-54	3.68	4.17	03:24:44	54.0	179.7	105.2	113.6	3.3	1.5	9.4	37.9	4	1	14.2	14.1	1247	2.13	107	200
	Mini Petal	65E38	I	06-Jun-2028 05:09:12	650	94	3.78	4.14	16:42:30	-85.8	28.8	92.4	86.4	-7.5	1.4	9.4	38.0	4.0	1.0	14.3	14.4	1261	2.17	109	139
		66E39	O	20-Jun-2028 13:49:49	100	-160	3.79	4.27	14:26:02	20.0	339.9	79.9	42.2	12.6	0.4	9.3	34.0	6.9	1.9	12.4	24.5	1275	2.21	136	253
	COT-5	68E40	I	15-Jul-2028 02:13:25	25	-144	3.92	4.40	14:47:36	35.9	21.8	59.7	54.7	-14.4	1.4	9.4	38.0	4	1	14.2	14.2	1300	2.30	121	116
		69E41	I	29-Jul-2028 06:37:02	100	-124	3.97	4.43	13:10:03	53.2	0.7	48.4	57.5	-10.7	3.7	9.4	38.0	4	1	14.2	14.2	1314	2.35	129	7
		70E42	I	12-Aug-2028 11:37:43	100	-154.82	3.96	4.42	13:01:30	21.5	359.2	37.4	28.3	-4.3	4.7	9.4	37.9	4	1	14.2	14.2	1328	2.39	140	238
		71E43	O	26-Aug-2028 16:39:40	50	169	3.96	4.43	12:56:59	-12.6	358.6	26.6	17.4	3.6	4.1	9.4	37.9	4	1	14.2	14.2	1342	2.43	151	108
		72E44	O	09-Sep-2028 21:41:44	25	133	3.97	4.45	12:50:15	-46.3	357.5	15.8	45.2	10.8	1.9	9.4	38.0	4	1	14.2	14.2	1356	2.47	163	338
	Non-Res	73E45	O	24-Sep-2028 02:33:56	25	129	3.98	4.46	11:31:20	-51.4	339.0	5.1	49.3	15.9	0.5	9.3	35.3	10.9	2.9	13.0	38.7	1371	2.51	173	214
	COT-6	76E46	I	01-Nov-2028 20:04:18	1,438	160	3.89	4.16	11:50:22	-20.0	20.5	25.2	17.6	-13.1	0.9	9.4	38.0	3.98	0.98	14.2	14.2	1409	2.65	166	304
		77E47	I	15-Nov-2028 23:37:44	25	109	4.05	4.52	10:11:09	-69.2	2.5	36.6	69.0	-15.3	3.6	9.4	38.0	4	1	14.2	14.2	1424	2.69	171	222
		78E48	I	30-Nov-2028 04:37:03	100	134	4.03	4.48	09:56:28	-41.8	359.6	48.3	48.0	-10.8	5.5	9.4	37.9	4	1	14.2	14.2	1438	2.73	-178	94
		79E49	I	14-Dec-2028 09:38:07	100	163	4.02	4.47	09:50:14	-12.8	358.7	60.4	33.7	-3.8	6.1	9.5	37.9	4	1	14.2	14.2	1452	2.78	-166	325
		80E50	O	28-Dec-2028 14:39:14	100	-164	4.02	4.47	09:44:31	16.7	357.9	72.9	38.6	4.0	5.3	9.4	37.9	4	1	14.2	14.2	1466	2.82	-155	195
		81E51	O	11-Jan-2029 19:39:09	25	-132	4.02	4.50	09:38:41	46.3	357.1	85.9	58.0	10.7	3.2	9.4	38.0	4.0	1.0	14.2	14.2	1480	2.86	-144	67
		82E52	O	26-Jan-2029 00:39:37	100	-106	4.05	4.50	09:17:45	73.0	352.6	99.3	79.8	15.0	0.5	9.3	37.9	4.0	1.0	14.2	14.0	1495	2.90	-133	298
Disposal		83E53	I	09-Feb-2029 01:10:15	8,152	-173	3.83	3.92	08:26:40	7.3	359.4	113.2	54.2	-1.7	0.4	9.3	38.0	4.0	1.0	14.2	14.3	1509	2.94	-142	313
		84E54	O	23-Feb-2029 07:21:02	6,239	-171	3.83	3.94	07:55:40	9.4	347.4	127.8	62.0	5.3	0.3	9.3	37.5	12.5	3.4	14.0	44.4	1523	2.98	-126	147
		87C09	O	08-Apr-2029 16:50:46	0	-61	4.99	5.55	22:13:50	60.0	78.0	175.7	119.1	131.8	7.9	11.4	40.9	nan	nan	16.5	nan	1567	3.12	86	149

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