Science Goals

Primary:

1-1) What is the age of the Schrödinger impact event?

Sample rough plains, veneer on peak ring, etc.

1-2) What is the nature of the dark pyroclastic material?

Sample multiple locations; study the vent

1-3) Does the inner ring consist of SPA materials? If so, what is the date of the SPA event and how does that age constrain impact flux?

Identify foreign materials of differing composition

1-4) Is there evidence of crustal or mantle degassing?

Sample along fracture, stress, and flow features

Secondary:

2-1) What is the age of the secondary impacts?

Sample multiple craters; establish origin of "strange" features

2-2) What is the nature of the interior beneath the basin and near the vent? *Install seismic array; deploy heat flow probe(s)*

Tertiary:

EVA1 TEAM 1

- 3-1) How are the rough and smooth impact melt facies different?
- 3-2) What is the nature of the "ghost" craters?

Engineering Goals

Primary:

1-1) Produce 500 g of O_2 from lunar material

Process dark mantle for illmenite-rich glass

1-2) Test a variety of lunar materials for O_2 production efficiency

Collect samples on Science EVAs and input to ISRU package

1-3) Produce 100 kg of O₂ from lunar material

After sortie crew departure, using teleoperated rover

Secondary:

- 2-1) Store 100 g of O2 for 6 months inside ISRU equipment
- 2-2) Store 50 kg of O₂ for two years in lander descent stage Could be used by future missions to Schrödinger

Tertiary:

- 3-1) Produce 100g of H₂O from lunar pyroclastic material Combine H₂ evolved from pyroclastic glass with stored O₂
- 3-2) Produce and store 10 kg of H₂O from pyroclastic material

Traverse Plans for Schrödinger Sortie Mission

Site Number	Lat/Lon	Travel time	Distance from	Site Time	Potential Extension	Elapsed Distance	Elapsed Time	Extended Time	Walkback Time	Extended Walkback	Sample/ Activity*	Sample Type	Number of	Activity Time	Site Number	Objectives Addressed
		from previous (min)	previous (m)	(min)	(min)	(m)	(min) Max: 480 min	(min) Max: 480 min	(min) (along route at 2.7 km/hr) Elapsed	(min) (along route at 2.7 km/hr) Elapsed			People	(min)		not correlated w/ activity
Landing	139.58 -75.71														Landing	
LS				60	4		60	64	N/A		Unload Survey Rover		2 2 2	15 5 40	LS	
1	139.83 -75.4	91.85	9950	35	0	9950	186.85	190.85	476.0		Suite Bulk Sample	Samples Shovel Drag	2 1 1	30 5 5	1	S 1-2 E 1-2 S 3-2
2	139.89 -75.46	18.74	2030	20	0	11980	225.58	229.58	469.6	473.6	Suite	Samples	2	20	2	S 1-2 S 3-2
3	139.99 -75.51	15.60	1690	30	0	13670	271.18	275.18	477.6	481.6	Suite	Samples Trench	2 1	25 5	3	S 1-1 S 1-2

Traverse Plans for Schrödinger Sortie Mission

EVA1 TEAM 1

Justification/Notes:

 $Reconnaissance; Traverse \ is \ expendable \ if \ there \ are \ problems \ with \ deploying \ the \ LSEP- \ Team \ 1 \ would \ assume \ responsibility \ for \ Team \ 2's \ EVA.$

Remove from LM

Initial site survey and photographs

25 min to unpack, 15 min for test drive; install camera/lights, geology package

Multiple shovel scoops of pyroclastics (majority used for ISRU; portion for sample return)

Investigate possible ghost crater- if not evident, move activity to later stop

Investigate hill for possible Schrodinger age melt materials exposed

4	140.02 -75.71	53.54	5800	35	0	19470	359.72	363.72	437.3	441.3 Drive Tub Suite Install	Samples Seismic	1 2 1	10 35 5	4	S 2-2 S 1-2 E 1-2	If drive tubes prove difficult, the sensors may all be placed in a shallow shoveled hole Person responsible for drive tubes and seismic sensors joins after completion of those tasks Install, level, and cover (mylar sheet or regolith backfill) seismic sensors, test power
LS		32.22	3490	25	26	22960	416.94	446.94	N/A	N/A Flag Downseled Pack LSEP	ct	2 2 2	10 3 12 26	LS		Video flag planting; Presidential phone call, etc. Prioritize samples and remove any superfluous samples Pack and seal sample collection; transfer to LM Additional time to help set up LSEP if not complete.
Totals		126.18		145	30	22960	416.94	446.94								Station 2 is expendable.

EVA1 TEAM 2

Totals

96.18

Number		time from previous (min)	from previous (m)	Time (min)	Extension (min)	Distance (m)	Time (min) Max: 480 min	Time (min) Max: 480 min	Time (min) (along route at 2.7 km/hr) Elapsed	Walkback (min) (along route at 2.7 km/hr) Elapsed	Activity*	Туре	of People	Time (min)	Number	Addressed not correlated with activity
LS				200	15		200	215	N/A		Unload LSEP Drill Core Samples Heat Flow ISRU Rover	Deploy Core Hand Probe Deploy	2 2 2 1 1 1 2	20 35 25 15 60 60 40	LS	
1	139.84 -75.8	32.22	3490	53	0	3490	285.22	300.22	439.2		Drive Tube Suite Install Bulk	Samples Seismic Shovel	1 2 1 1	10 40 15 3	1	S 2-2 S 1-2 E 1-2
2	139.31 -75.76	38.40	4160	35	15	7650	358.62	388.62	420.2		Drive Tube Suite Install	Samples Seismic	1 2 1	10 35 5	2	S 2-2 S 1-2 E 1-2
LS		25.57	2770	30	0	10420	414.18	444.18	N/A		ISRU Flag Downselect Pack	Test	1 2 1 1	15 10 3 12	LS	E 1-1

10420 414.18 444.18

Travel Distance Site Potential Elapsed Elapsed Extended Walkback Extended Sample/ Sample Number Activity

Traverse Plans for Schrödinger Sortie Mission

EVA1 TEAM 2

Justification/Notes:

Objectives

Reconnaissance, Installation - If scheduling conflicts arise, stops 1 and 3 may be skipped; Both EVA 4 routes will be altered to compensate for the loss of two short period seismic senors. Team 2 will begin their EVA 15 minutes prior to Team 1.

Remove from LM

Carry to site and unpack the instruments; antennas and power; set up small experiments depth: 3 m; person sampling will help extract the core; after extraction, insert Neutron Probe plus 10 min to assist in extracting core

depth: 2.3 m; 15 to drill each hole, 30 min to remove cores and emplace heat flow probes Deploy, power, and test; process samples from first EVA (leave running during crew rest) 25 min to unpack, 15 min for test drive; install camera/lights, geology package

Person responsible for drive tubes and seismic sensors joins after completion of those tasks Install, level, and cover (mylar sheet or regolith backfill) seismic sensors (broadband and S.P.) Dig hole $(1m \times 1m \times 0.5m)$ to characterize regolith; bulk sample used for ISRU (part of Suite)

Person responsible for drive tubes and seismic sensors joins after completion of those tasks Install, level, and cover (mylar sheet or regolith backfill) seismic sensors, test power

Load bulk materials into ISRU package; test working capabillity, run during crew rest Video flag planting; Presidential phone call, etc. Prioritize samples and remove any superfluous samples

Pack and seal sample collection; transfer to LM

Traverse route can be reversed to allow for "rescue" opportunity if Team 1 is in distress.

Distance Site

10400

2600

3850

3750

45

30

30

210

Elapsed

10400

8 12730

19180

5 22930

22930

Potential

Elapsed

(min)

Max:

480 min

171.00

237.51 260.51

291.51 314.51

380.05

449.66

449.66

357.05

421.66

421.66

Extended

(min)

Max:

480 min

186.00

Walkback

(min)

(along

route at

2.7 km/hr) Elapsed

460.4

440.4

N/A

Extended

Walkback

(min)

(along

route at 2.7 km/hr)

Elapsed

Sample/

Activity*

464.4 Drill Core

487.2 Suite

483.4 Suite

463.4 Suite

N/A ISRU

Pack

Bulk

Bulk

Sample

Downselect

Sample Sample Sample Number Activity

People

Samples

Drag

Trench

Samples

Shovel

Samples

Shovel

Samples

Trench

(min)

45

30

15

12

Site

Number

Objectives

Addressed

correlated

with activity

S 1-2

S 1-3

S 1-2

S 1-3

E 1-2

S 1-2

E 1-2

S 1-1

S 1-2

LS E 1-1

Travel

previous

(min)

96.00

21.51

24.00

35.54

34.62

211.66

EVA2 TEAM 1

Lat/Lon

139.29

-75.39

141.43

-75.68

139.41

-75.48

139.48

LS

Totals

-75.6

Site

Number

Traverse Plans for Schrödinger Sortie Mission

Justification/Notes:

Vent; Time for LRV samples of opportunity ~15mins depth: 3 m; person sampling will help extract the core

Dig hole (1m x 1m x 0.5m) to characterize regolith; bulk sample used for ISRU

Dig hole (1m x 1m x 0.5m) to characterize regolith; bulk sample used for ISRU

Load bulk materials into ISRU package; test working capabillity, run during crew rest Prioritize samples and remove any superfluous samples Pack and seal sample collection; transfer to LM

Traverse Plans for Schrödinger Sortie Mission

EVA2 TEAM 2

Justification/Notes:

VA2	TEAM 2	

Walkback Site Travel Distance Extended Site Objectives Lat/Lon Elapsed Elapsed Extended Sample/ Sample Number Activity Walkback Activity* Number Addressed from previous (min) (min) (min) (min) (min) (min) People not Max: (along (along correlated previous Max: 480 min 480 min with activity (min) route at route at 2.7 km/hr) 2.7 km/hr) Elapsed Elapsed 472.8 1 S 1-2 141.86 146.86 477.8 Suite 45 -75.65 Drag S 1-3 Sample

Fracture and Crater; Time for LRV samples of opportunity ~20min

Traverse Plans for Schrödinger Sortie Mission

										Drive Tube		1	10		S 2-2	
										Install	Seismic	1	5		S 3-1	Install, level, and cover (mylar sheet or regolith backfill) seismic sensors, test power
2	138.58	42.28	4580	50	5	13990	234.14	244.14	463.2	473.2 Suite	Samples	2	30	2	S 2-2	
	-75.78									Drill Core	Core	2	25			depth: 3 m; person sampling will help extract the core
										Sample	Drag	1	5			
3	138.85	29.08	3150	35	5	17140	298.22	313.22	457.3	472.3 Suite	Samples	2	30	3	S 1-2	
	-75.7									Drive Tube		1	10		S 2-2	
										Install	Seismic	1	5			Install, level, and cover (mylar sheet or regolith backfill) seismic sensors, test power
4	138.96	19.29	2090	20	5	19230	337.51	357.51	450.2	470.2 Suite	Samples	2	20	4	S 1-2	Stop is expendable
	-75.77										•				S 2-2	
LS		46.80	5070	35	10	24300	419.31	449.31	N/A	N/A ISRU		2	20	LS	E 1-3	Load bulk materials into ISRU package; test working capabillity, run during crew rest
										Downselect		2	3		E 2-2	Prioritize samples and remove any superfluous samples
										Pack		2	12			Pack and seal sample collection; transfer to LM
Totals		224.31		160	30	24300	419.31	449.31								

Totals

EVA3 TEAM 1

Site Number	Lat/Lon	Travel time from previous (min)	Distance from previous (m)	Site Time (min)	Potential Extension (min)	Elapsed Distance (m)	Elapsed Time (min) Max: 480 min	Extended Time (min) Max: 480 min	Walkback Time (min) (along route at 2.7 km/hr) Elapsed	Extended Walkback (min) (along route at 2.7 km/hr) Elapsed	Sample/ Activity*	Sample Type	Number of People	Activity Time (min)	Site Number	Objectives Addressed not correlated with activity
1	134.00 -75.98	82.62	8950	60	10	8950	142.62	152.62	459.6	469.6	Suite Drill Core	Samples Core	2 2	35 25	1	S 1-1 S 1-4 S 2-1
2	139.62 -76.02	29.26	3170	30	5	12120	201.88	216.88	448.4	463.4	Suite	Samples	2	30	2	S 1-4 S 2-1
3	139.37 -75.97	23.17	2510	30	5	14630	255.05	275.05	445.8	465.8	Suite	Samples	2	30	3	S 2-1 S 1-1
4	139.56 -75.93	17.63	1910	35	5	16540	307.68	332.68	456.0		Suite Drive Tube Install	Samples Seismic	2 1 1	30 10 5	4	S 1-1 S 2-1
5	139.57 -75.86	19.85	2150	20	0	18690	347.52	372.52	448.1	473.1	Suite	Samples	2	20	5	S 1-2

Traverse Plans for Schrödinger Sortie Mission

EVA3 TEAM 1

Justification/Notes:

depth: 3 m; person sampling will help extract the core

Install, level, and cover (mylar sheet or regolith backfill) seismic sensors, test power

LS	41.77 45	525 3	30	5	23215	419.29	449.29	N/A	N/A ISRU	2	15	L	S	E 1-3	Load bulk materials into ISRU package; test working capabillity, run during crew rest
									Downselect	2	3			E 2-2	Prioritize samples and remove any superfluous samples
									Pack	2	12				Pack and seal sample collection; transfer to LM
Totals	214.29	20)5	30	23215	419.29	449.29								

Traverse Plans for Schrödinger Sortie Mission

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EVA3	TEAM 2																	EVA3 TEAM 2
Site	Lat/Lon	Travel	Distance	Site	Potential	Elapsed	Elapsed	Extended	Walkback	Extended	Sample/	Sample	Number	Activity	Site	Ob	jectives	Justification/Notes:
Number		time	from	Time	Extension	Distance	Time	Time	Time	Walkback	Activity*	Type	of	Time	Number	· Ad	dressed	
		from	previous	(min)	(min)	(m)	(min)	(min)	(min)	(min)	•	• • •	People	(min)			not	
		previous	(m)				Max:	Max:	(along	(along			•			cor	rrelated	
		(min)					480 min	480 min	route at	route at						with	activity	
									2.7 km/hr)	2.7 km/hr)							•	
									Elapsed	Elapsed								
									-	_								
1	140.78	89.35	9680	75	15	9680	164.35	179.35	403.9	418.9 I	Drill Core	Core	2	25	1	1 :	S 1-1	depth: 3 m; person sampling will help extract the core
	-75.83									5	Suite	Samples	2	50		:	S 1-4	
2	140.63	10.71	1160	40	5	10840	215.06	235.06	428.8	448.8 \$	Suite	Samples	2	40	2	2 :	S 1-1	
	-75.84															:	S 1-4	
3	140.43	15.23	1650	40	5	12490	270.29	295.29	447.4	472.4 \$	Suite	Samples	2	40	3	3 :	S 1-1	
	-75.87									I	Bulk	Shovel	1	5		I	E 1-2	Multiple shovel scoops of pyroclastics (majority used for ISRU; portion for sample return)
																:	S 1-4	
4	140.25	12.37	1340	45	5	13830	327.66	357.66	475.0	505.0 \$	Suite	Samples	2	35	4	4 :	S 1-1	
	-75.86									I	Drive Tube		1	10		:	S 1-4	
										I	Install	Seismic	1	5				Install, level, and cover (mylar sheet or regolith backfill) seismic sensors, test power
LS		61.20	6630	30	0	20460	418.86	448.86	N/A	N/A I	ISRU		2	15	LS	5 1	E 1-3	Load bulk materials into ISRU package; test working capabillity, run during crew rest
										I	Downselect		2	3]	E 2-2	Prioritize samples and remove any superfluous samples
										I	Pack		2	12				Pack and seal sample collection; transfer to LM
Totals		188.86		230	30	20460	418.86	448.86										

Traverse Plans for Schrödinger Sortie Mission

EVA4 TEAM 1

EVA4 Site Number	TEAM 1 Lat/Lon	Travel time from previous (min)	Distance from previous (m)	Site Time (min)	Potential Extension (min)	Elapsed Distance (m)	Elapsed Time (min) Max: 480 min	Extended Time (min) Max: 480 min	Walkback Time (min) (along route at 2.7 km/hr) Elapsed	Extended Sample/ Walkback Activity* (min) (along route at 2.7 km/hr) Elapsed	Sample Type	Number of People	Activity Time (min)	Site Number	Objectives Addressed not correlated with activity
1	140.61 -75.5	92.12	9980	30	10	9980	122.12	132.12	417.0	427.0 Suite	Samples	2	30	1	S 1-1 S 1-2
2	140.47 -75.45	25.02	2710	55	10	12690	202.14	222.14	436.8	456.8 Suite Drive Tube Install	Samples Seismic Drag	2 1 1	45 10 5 5	2	S 2-2
3	140.44 -75.47	6.17	668	35	0	13358	243.30	263.30	463.1	483.1 Suite Bulk	Samples Shovel	2	35 5	3	S 1-2 E 1-2 S 3-2
4	140.22 -75.57	32.12	3480	50	10	16838	325.43	355.43	467.9	497.9 Suite Drive Tube Install	Samples Seismic Shovel	2 1 1	40 10 5	4	S 2-2 S 1-2
LS		59.17	6410	35	0	23248	419.60	449.60	N/A	N/A ISRU Downselect Pack		2 2 2	20 3 12	LS	E 1-3 E 2-2
Totals		214.60		205	30	23248	419.60	449.60							

Justification/Notes:

Install, level, and cover (mylar sheet or regolith backfill) seismic sensors, test power

Multiple shovel scoops of pyroclastics (majority used for ISRU; portion for sample return)

Install, level, and cover (mylar sheet or regolith backfill) seismic sensors, test power

Load bulk materials into ISRU package; test working capabillity, run during crew rest Prioritize samples and remove any superfluous samples Pack and seal sample collection; transfer to LM

Traverse Plans for Schrödinger Sortie Mission

Traverse Plans for Schrödinger Sortie Mission

VA4	TEAM 2
Cita	Lot/Lon

E VA4	I EANI 2															
Site	Lat/Lon	Travel	Distance	Site	Potential	Elapsed	Elapsed	Extended	Walkback	Extended	Sample/	Sample	Number	Activity	Site	Objectives
Number		time	from	Time	Extension	Distance	Time	Time	Time	Walkback	Activity*	Type	of	Time	Number	Addressed
		from	previous	(min)	(min)	(m)	(min)	(min)	(min)	(min)			People	(min)		not
		previous	(m)				Max:	Max:	(along	(along						correlated
		(min)					480 min	480 min	route at	route at						with activity
									2.7 km/hr)	2.7 km/hr)						
									Elapsed	Elapsed						
1	138.78	84.18	9120	70	10	9120	154.18	164.18	396.2	406.2	Drill Core	Core	2	25	1	S 1-2
	-75.49										Suite	Samples	2	40		S 1-3

EVA4 TEAM 2

Justification/Notes:

Fracture; Time for LRV samples of opportunity ~20mins depth: 3 m; person sampling will help extract the core

										Sample Scout	Drag	1 1	5 5		
2	138.7 -75.54	14.95	1620	45	15	10740	214.14	239.14	420.1	445.1 Suite	Samples	2	45	2	S 3-1 S 1-2 S 1-3
3	138.73 -75.6	16.25	1760	30	0	12500	260.38	285.38	427.3	452.3 Suite	Samples	2	30	3	S 1-2 S 1-1
4	139.15 -75.62	30.00	3250	35	0	15750	325.38	350.38	420.1	445.1 Suite	Samples Shovel	2	30 5	4	S 1-2 E 1-2
LS		39.32	4260	55	5	20010	419.71	449.71	N/A	N/A ISRU Downsele Pack	ect	2 2 2	40 3 12	LS	E 1-1

30 20010 419.71 449.71

Totals

184.71

235

Scout feasibility of crossing rille (access for later rovers)

Load bulk materials into ISRU package; set up for automonous operation Prioritize samples and remove any superfluous samples Pack and seal sample collection; transfer to LM

Activity* Suite (requires 2 participants and 30 minutes)

The suite of samples includes panoramic photographs at each sampling site, photographs before, during, and after sampling, and representative rake, bulk/scoop, and hand samples. The suite also includes a shovel sample of pyroclastic material for the ISRU experiment. The time span for this suite of samples combines the work time for two astronauts and includes time for a site survey, gravimeter survey, alignment of the television camera and lights, taking images in multiple filters, and unloading/loading the rover. Individual sites may require adjustment.