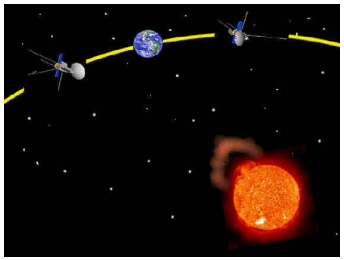
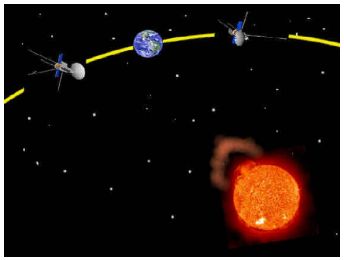


STE Door Mechanical Peer Review

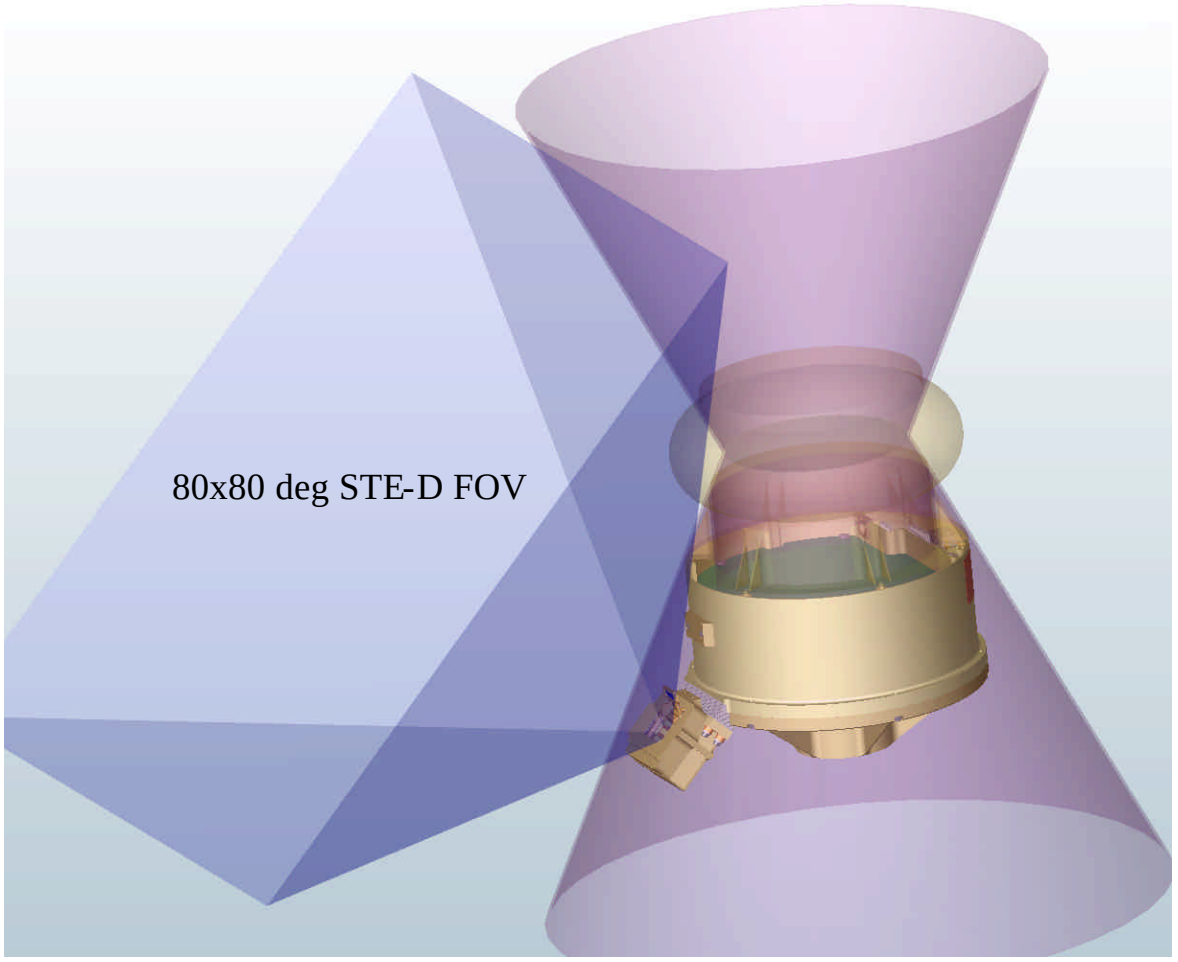
UC Berkeley, Space Sciences Lab
July 31, 2001
Paul Turin
Mechanical Engineer

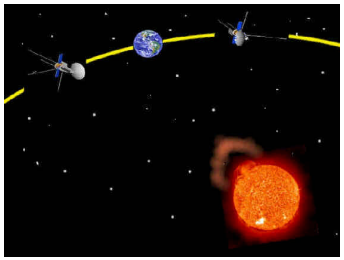


Stereo Impact STE Door Mechanism

STE-D on SWEA Pedestal

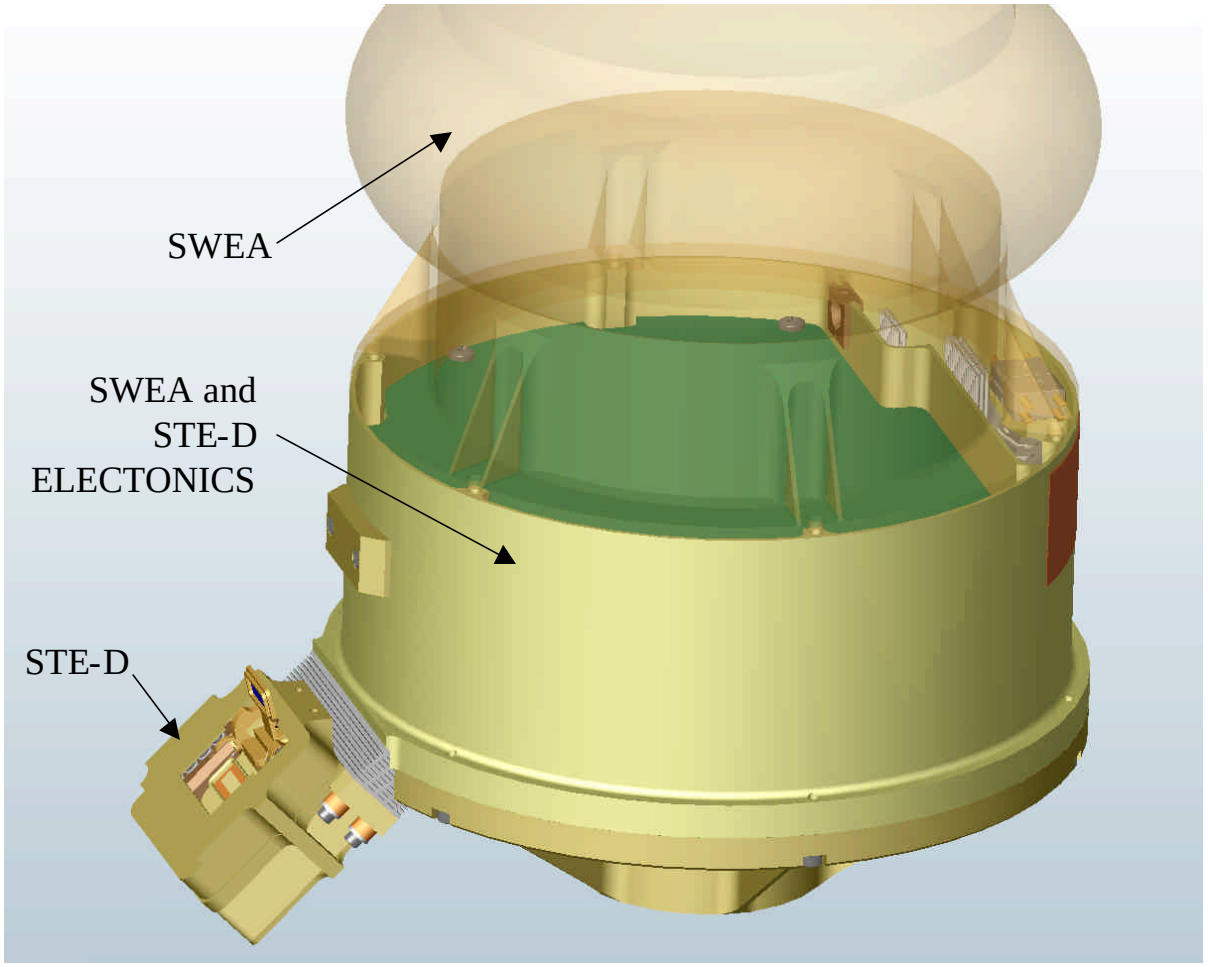
With FOVs

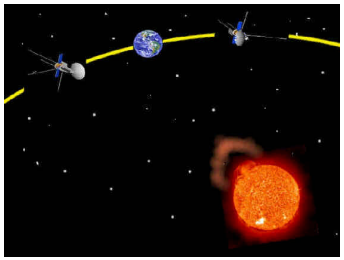




Stereo Impact STE Door Mechanism

SWEA and STE-D

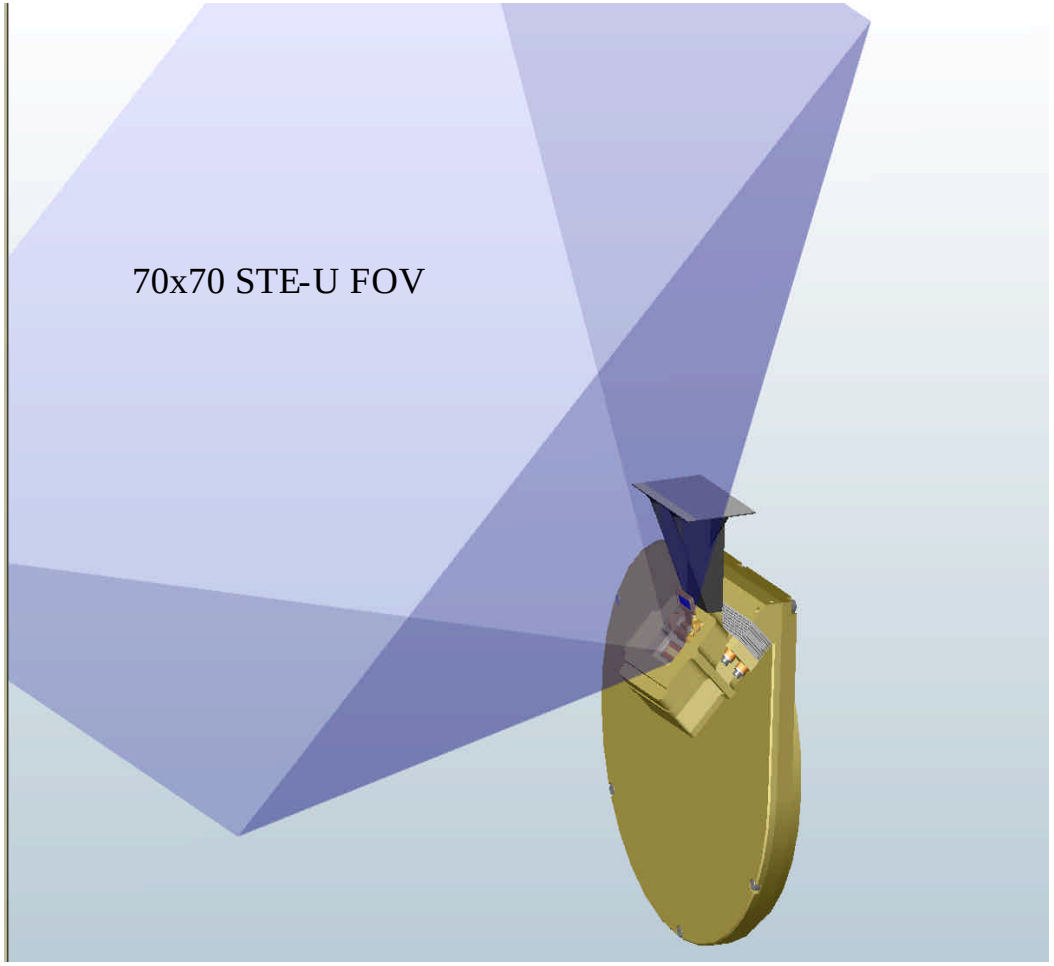


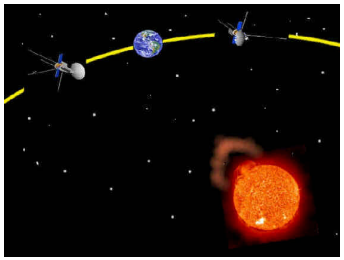


Stereo Impact STE Door Mechanism

STE-U w/FOV and Preamp

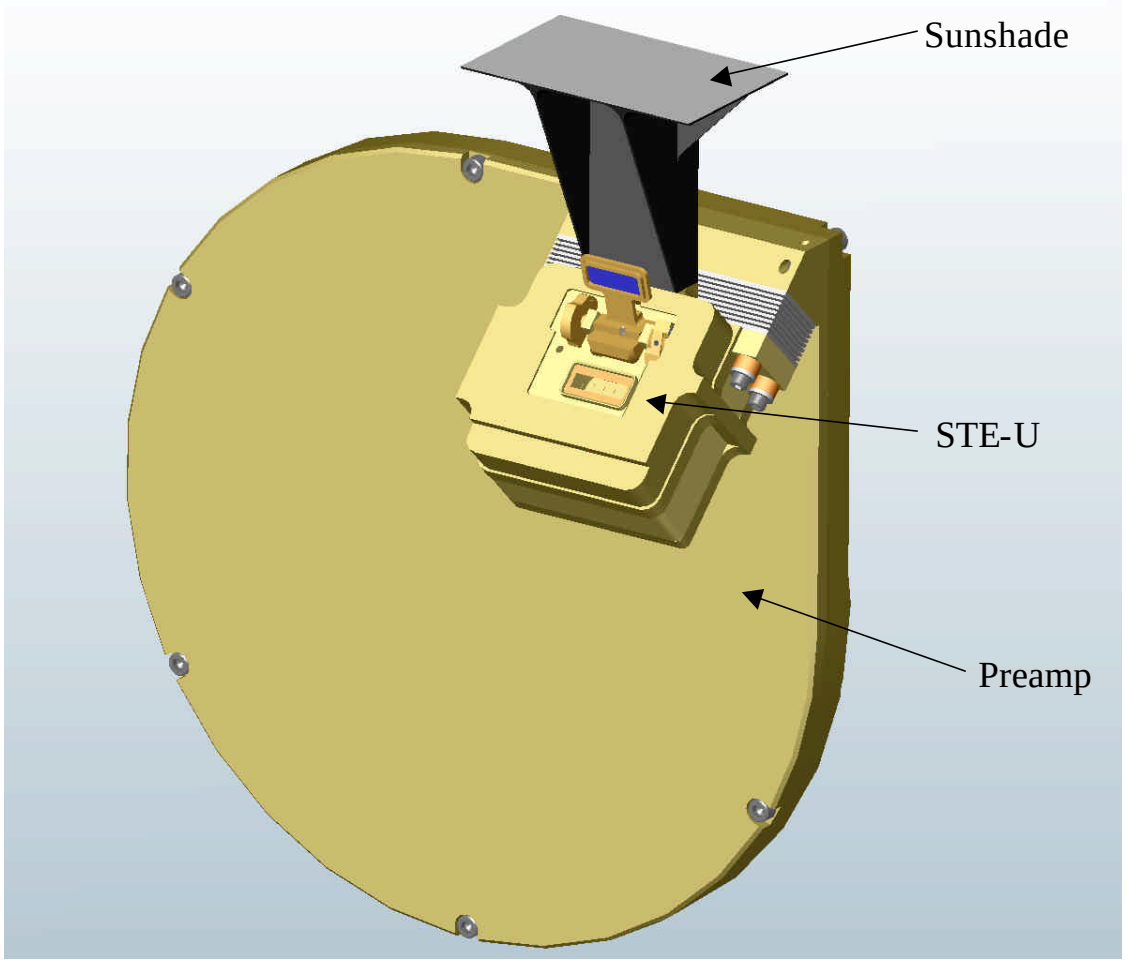
Mounts to side of IMPACT Boom

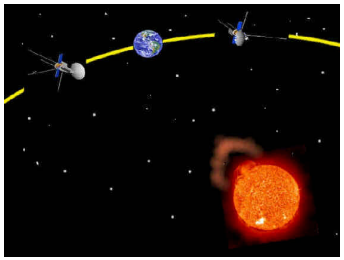




Stereo Impact STE Door Mechanism

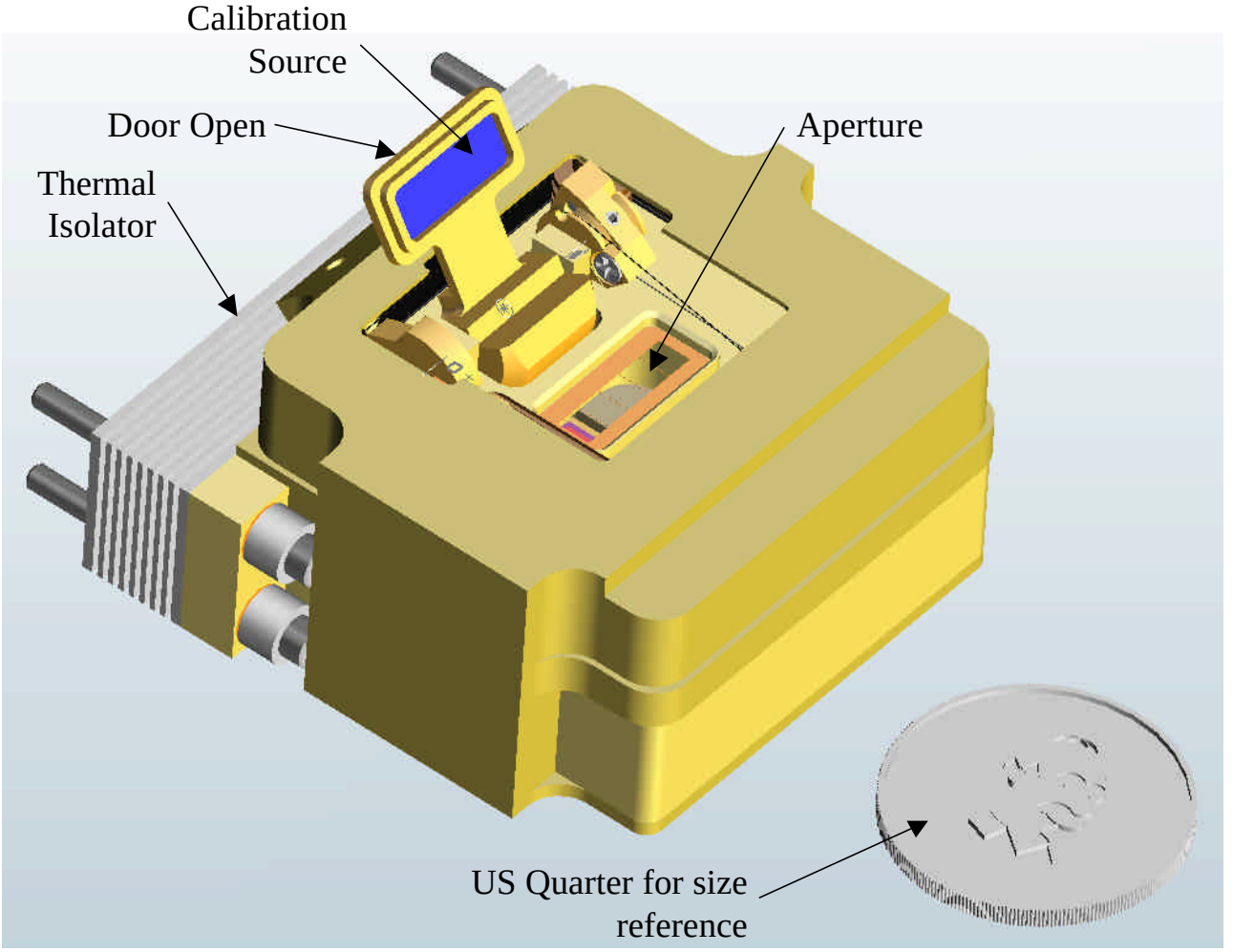
STE_U Detail

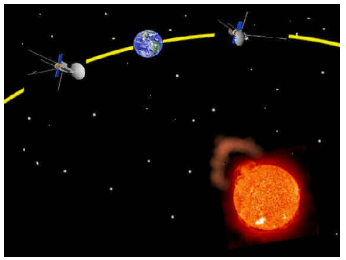




Stereo Impact STE Door Mechanism

Door in Open Position

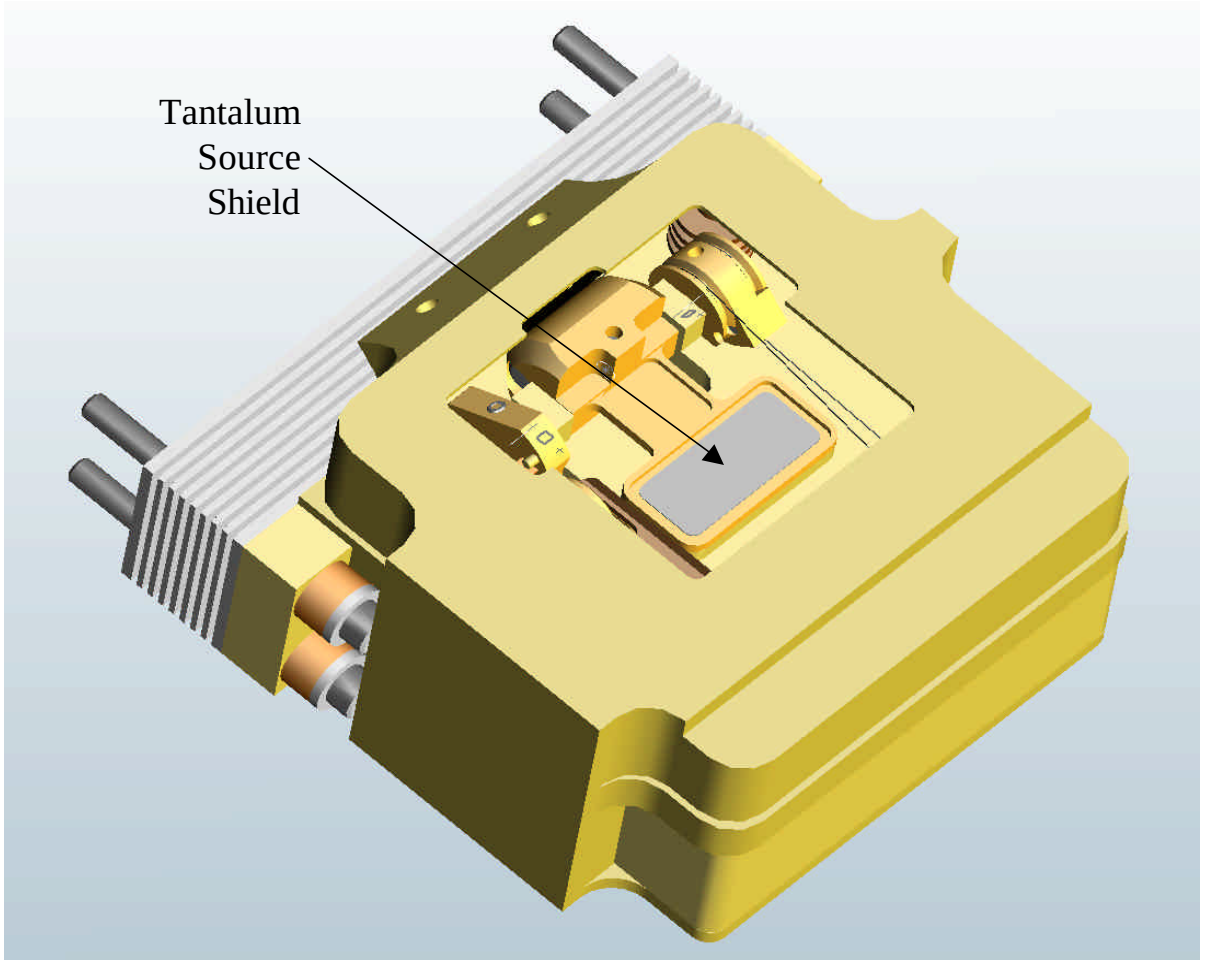


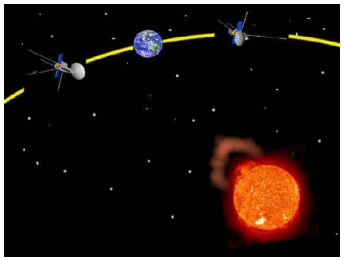


Stereo Impact STE Door Mechanism

Door in Closed Position

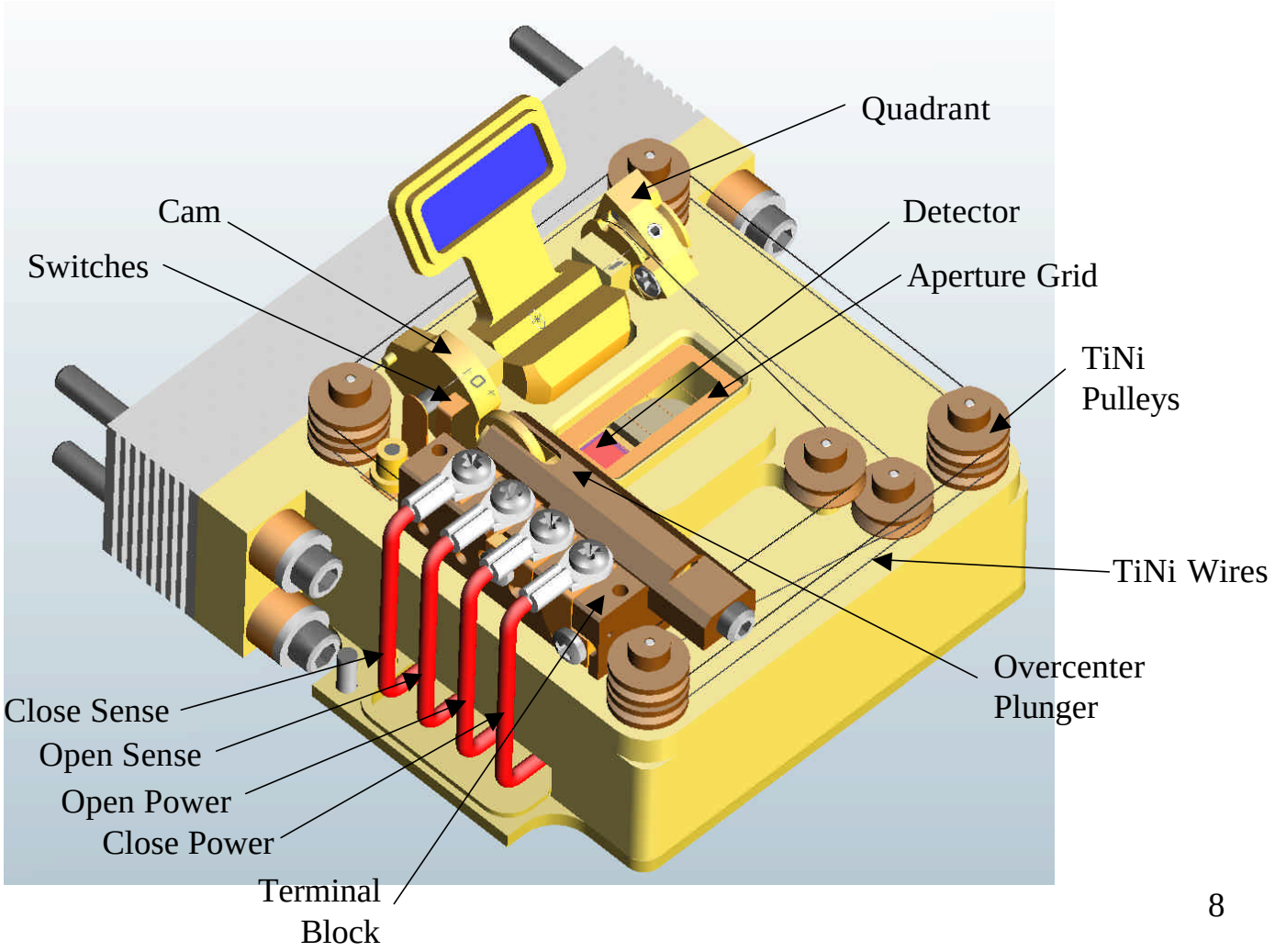
Door is balanced to minimize load on wires during launch

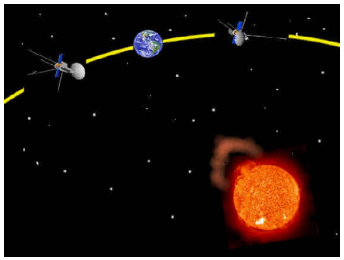




Stereo Impact STE Door Mechanism

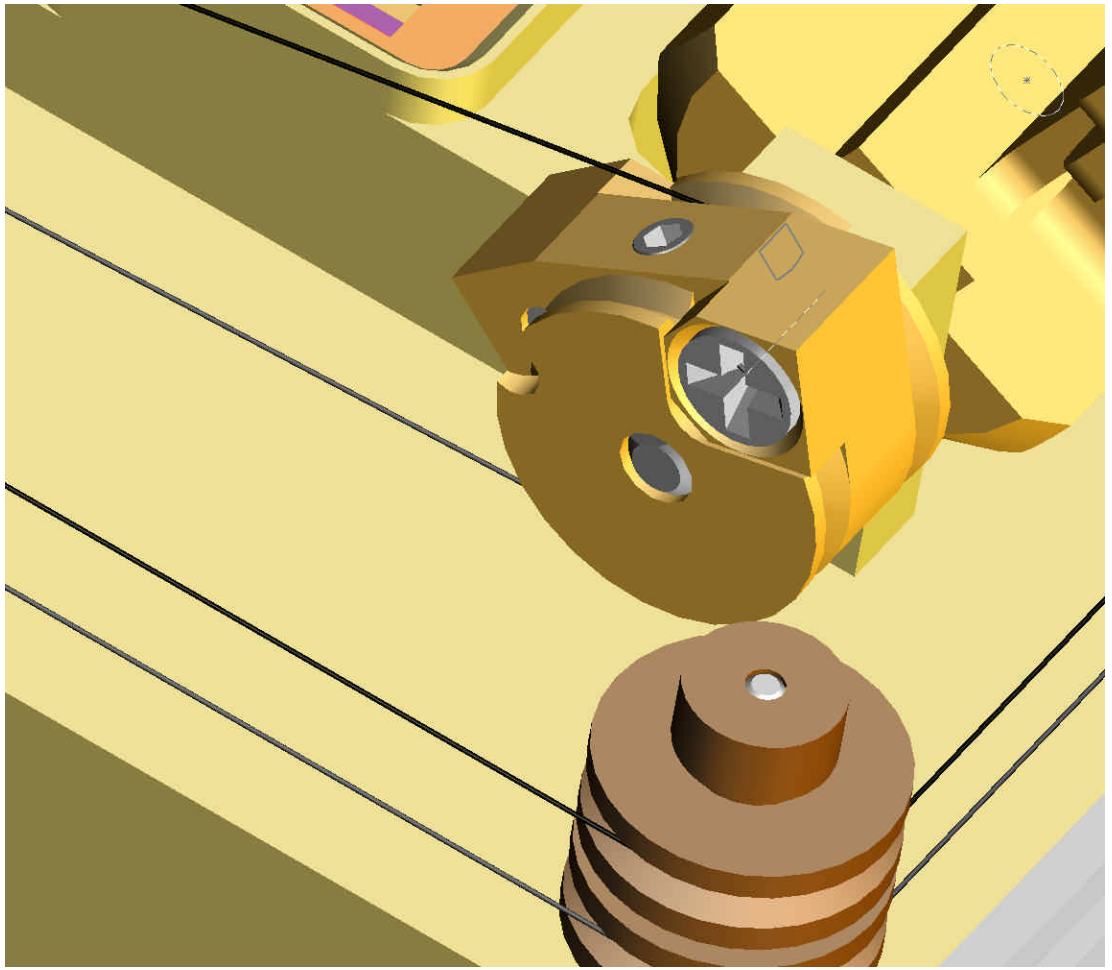
Cover Removed

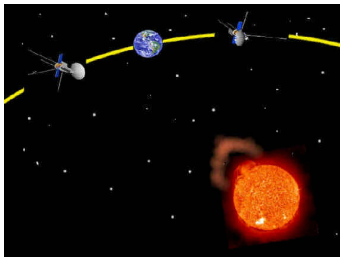




Stereo Impact STE Door Mechanism

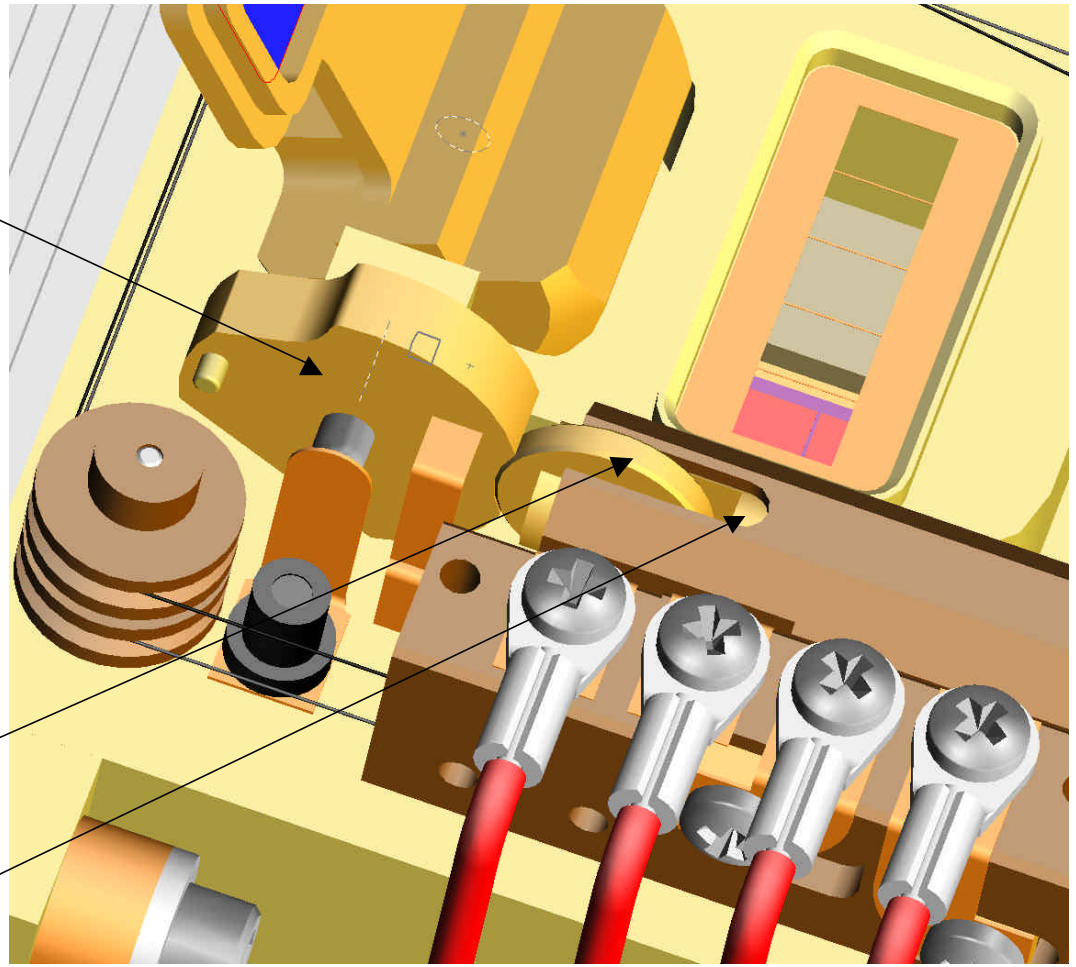
Quadrant Detail

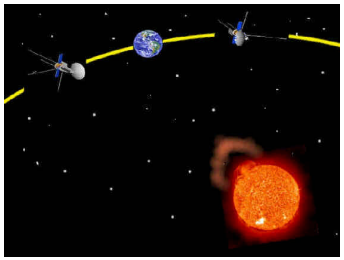




Stereo Impact STE Door Mechanism

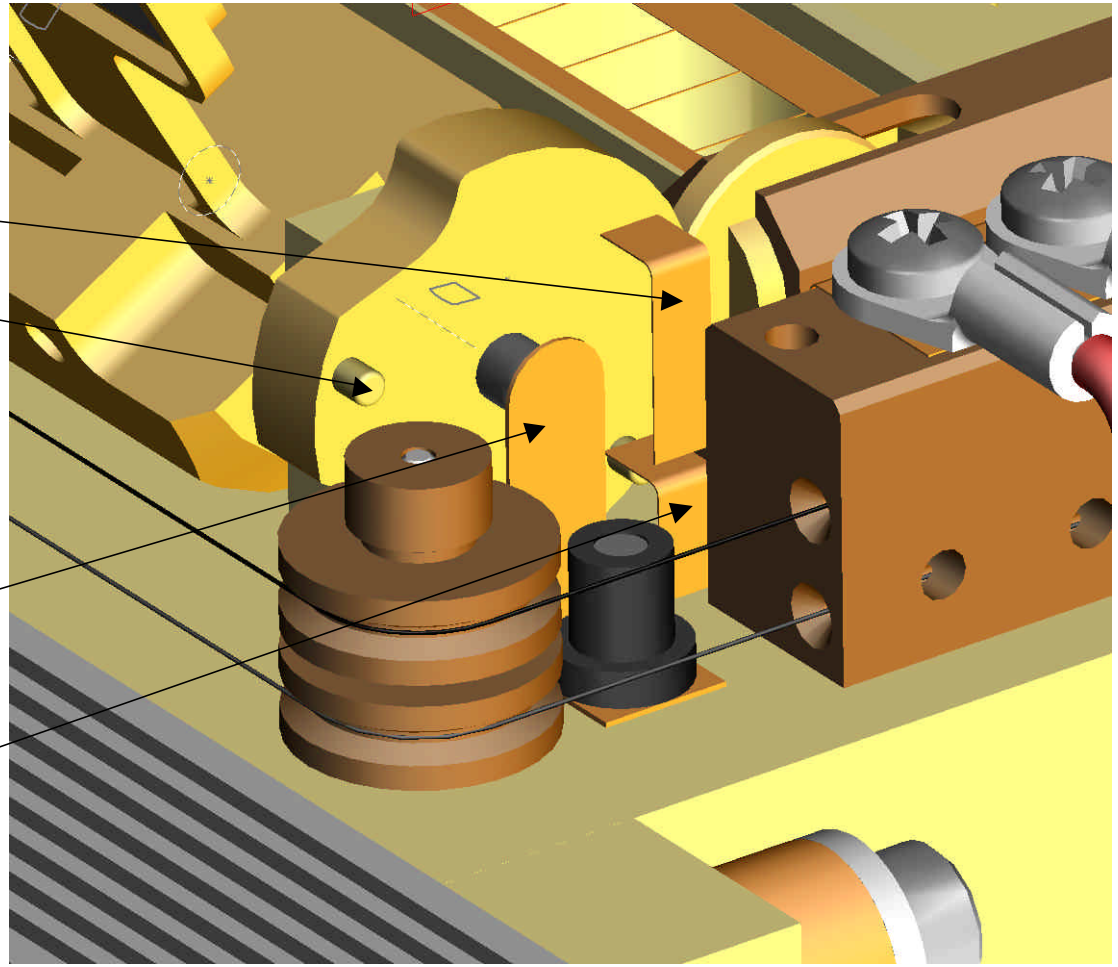
Cam and Overcenter Plunger Detail

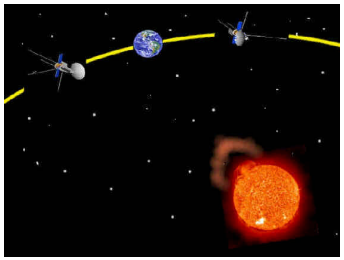




Stereo Impact STE Door Mechanism

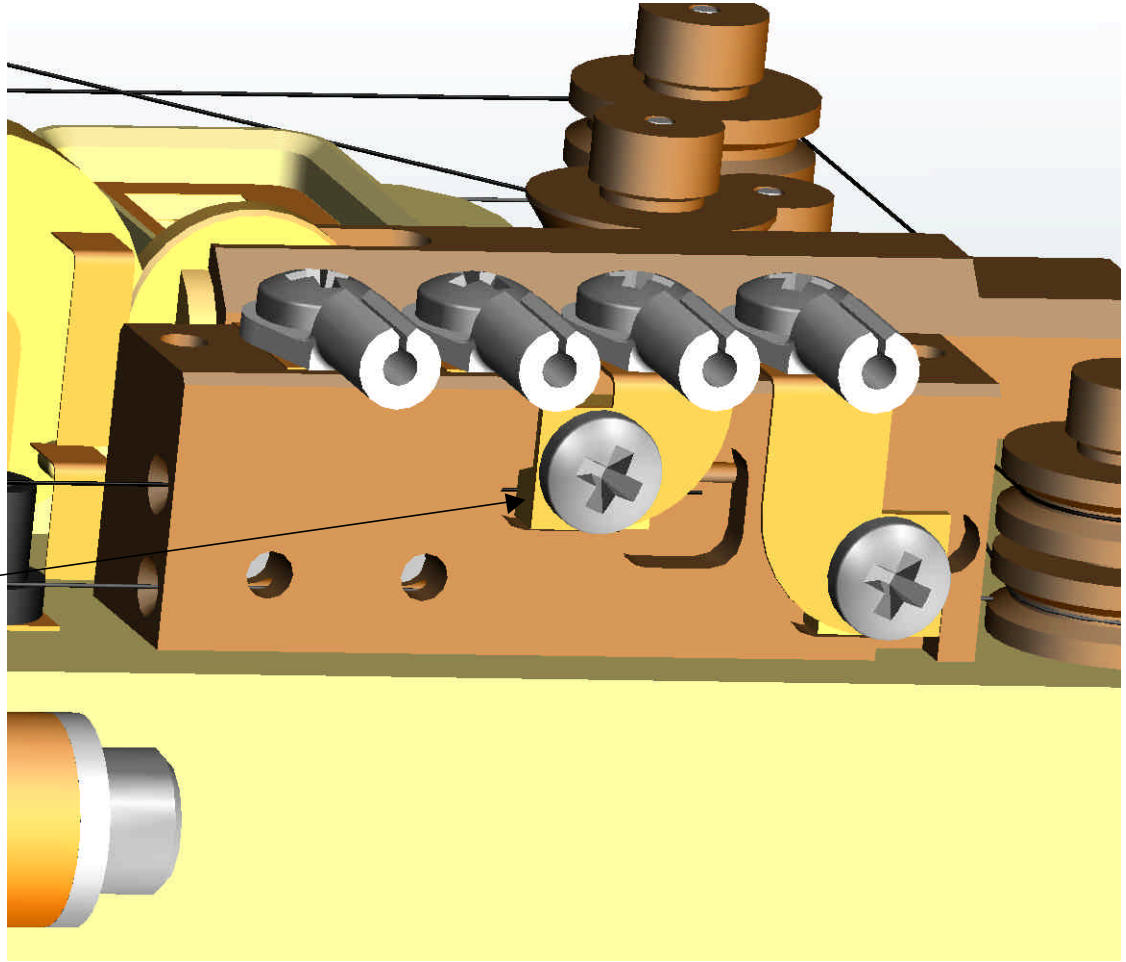
EOT Switch Detail

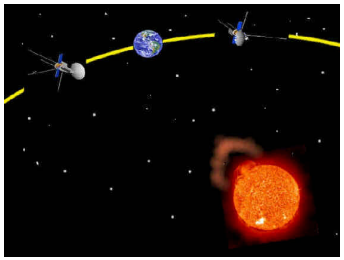




Stereo Impact STE Door Mechanism

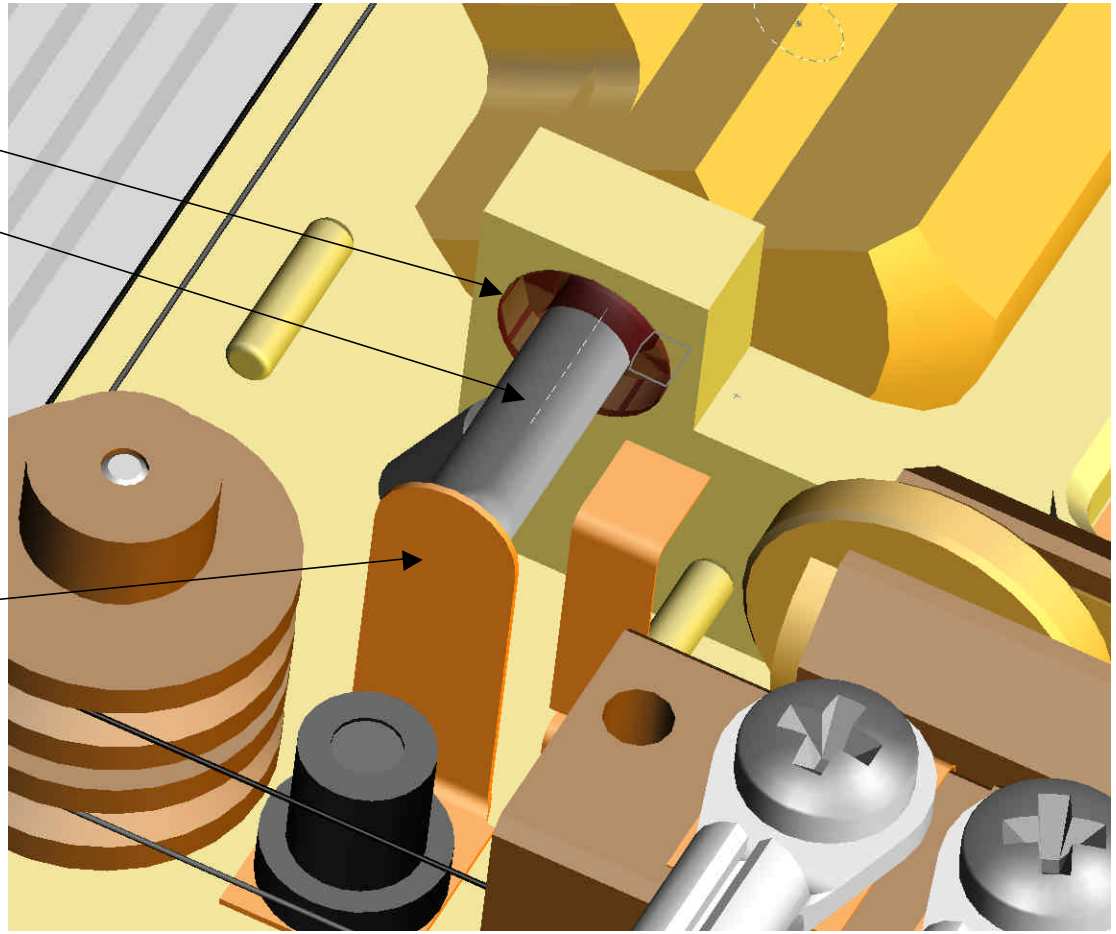
TiNi Termination Detail

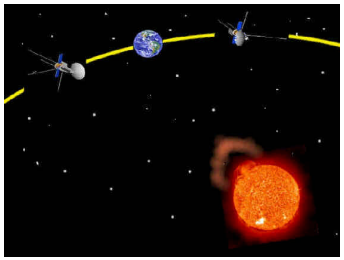




Stereo Impact STE Door Mechanism

Door Bearing Detail





Stereo Impact STE Door Mechanism

STE Thermal Isolator

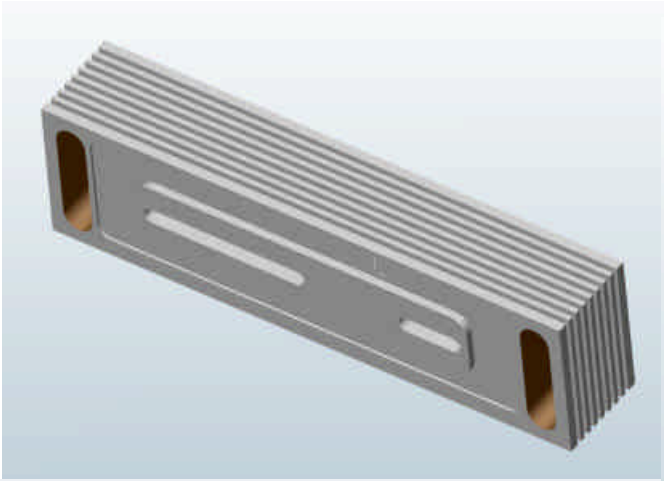
Vespel SP-1

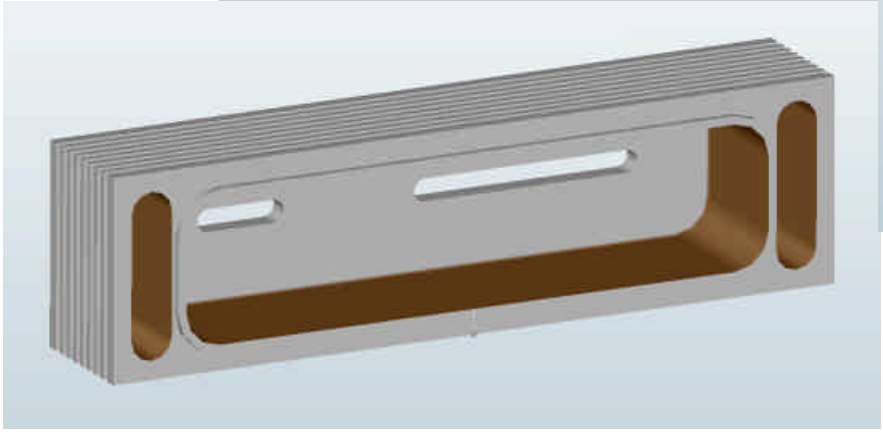
500 μm Ni Plated for surface conductivity and STE grounding

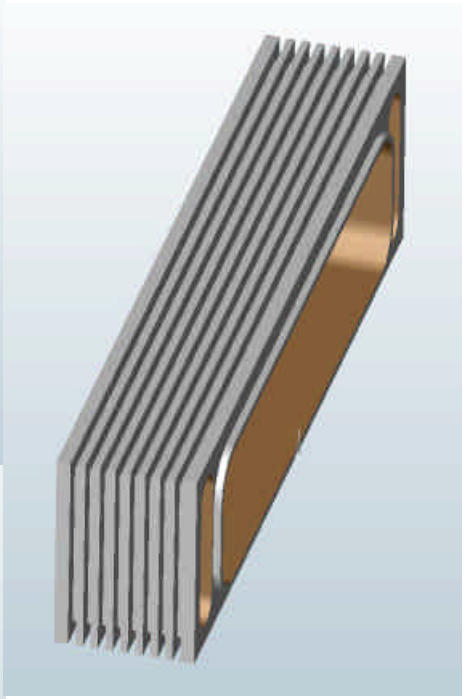
0.36W conduction for ΔT=72K

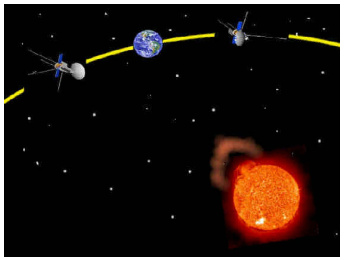
Plating machined away to min Ni conduction, taped with VDA Mylar for low ε

Grooved exterior for long Ni conduction path









Stereo Impact STE Door Mechanism

STE-D

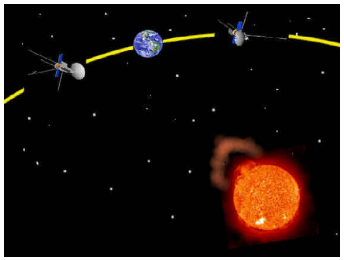
1st Order Thermal Model

Want to be as cold as possible

Dag 213 Exterior gives ε=0.9

Blanketed SWEA and Pedestal, assume transparent

STE Thermal Isolator	.375 thick	Ni Plate					
Nickel K =	1.58	W/cm/K					
Nickel K =	4.013208	W/in/K					
Nickel Thickness =	0.00005	in					
Nickel perimeter =	5.284	in.			STE radiation heat loss		
Nickel area =	0.000264	in^2					
Nickel path length =	1.175	in.			σ =	5.67E-08	W/m^2/K
Nickel Conductivity =	0.000902	W/K			σ =	3.66E-11	W/in^2/K
					A ste taped =	10	
Vespel K =	0.35	W/m/K			ε tape =	0.9	
Vespel K =	0.00889	W/in/K		In balance with:	A ste black =	0.055696	
Vespel area =	0.174	in^2			ε black =	1	
Vespel thickness =	0.375	in.			Tspace =	4	K
Vespel Conductivity =	0.004125	W/K			T ste =	181.5	K
					Q=	0.359421	W
Total Conductivity =	0.005027	W/K					
Pedestal T =	253	K	253	K			
STE T =	181.5	K	187	K			
Delta T =	71.5	K					
Total Conduction Q =	0.359455	W					
FET dissapated heat =	0.04	W					
Total Q the STE =	0.399455	W					

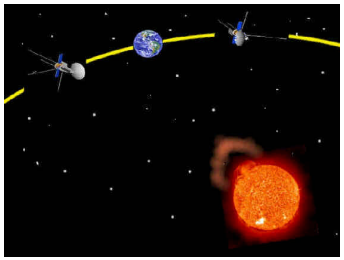


Stereo Impact STE Door Mechanism

Will wire heat adequately with STE-D very cold?

Only 10% of power is lost to Radiation

L =	6.28	in
L =	0.16	m
wire dia =	50.00	um
Wire area =	0.00	m^2
Housing "dia" =	0.30	in
Housing "dia" =	0.01	m
Housing "area" =	0.00	m^2
T wire =	373.00	K
T housing =	181.00	K
σ =	0.00	
ε wire =	0.80	
ε housing =	0.10	
Q =	19.84	mW
50μm TiNi Power Rate =	1.28	W/m
Wire L =	5.83	in
Power into wire =	189.58	mW
Power Lost to Radiation =	10.46	%



Stereo Impact STE Door Mechanism

Force Margin

Using two 50µm TiNi wires gives over 20 g for overcoming friction in the system

Two 50µm Wires		
Associated Spring # =	C0088-008-500S	
Steel Spring k =	1.100	
SS Spring k =	0.916	lb/in
Spring Free L =	0.560	in
Spring Min Compressed L =	0.530	
Spring Max Compressed L =	0.490	in
Spring F =	0.064	lb
α =	32.000	deg
F' =	0.054	lb
r' =	0.156	in
T =	0.008	in-lb
Wire Torque arm R =	0.120	in
Wire F" =	0.070	lb
	31.580	g
Recovery F =	70.000	g
Max Force from Cam =	20.84314	
Deformation F =	16	g
Net for Friction =	22.420	g