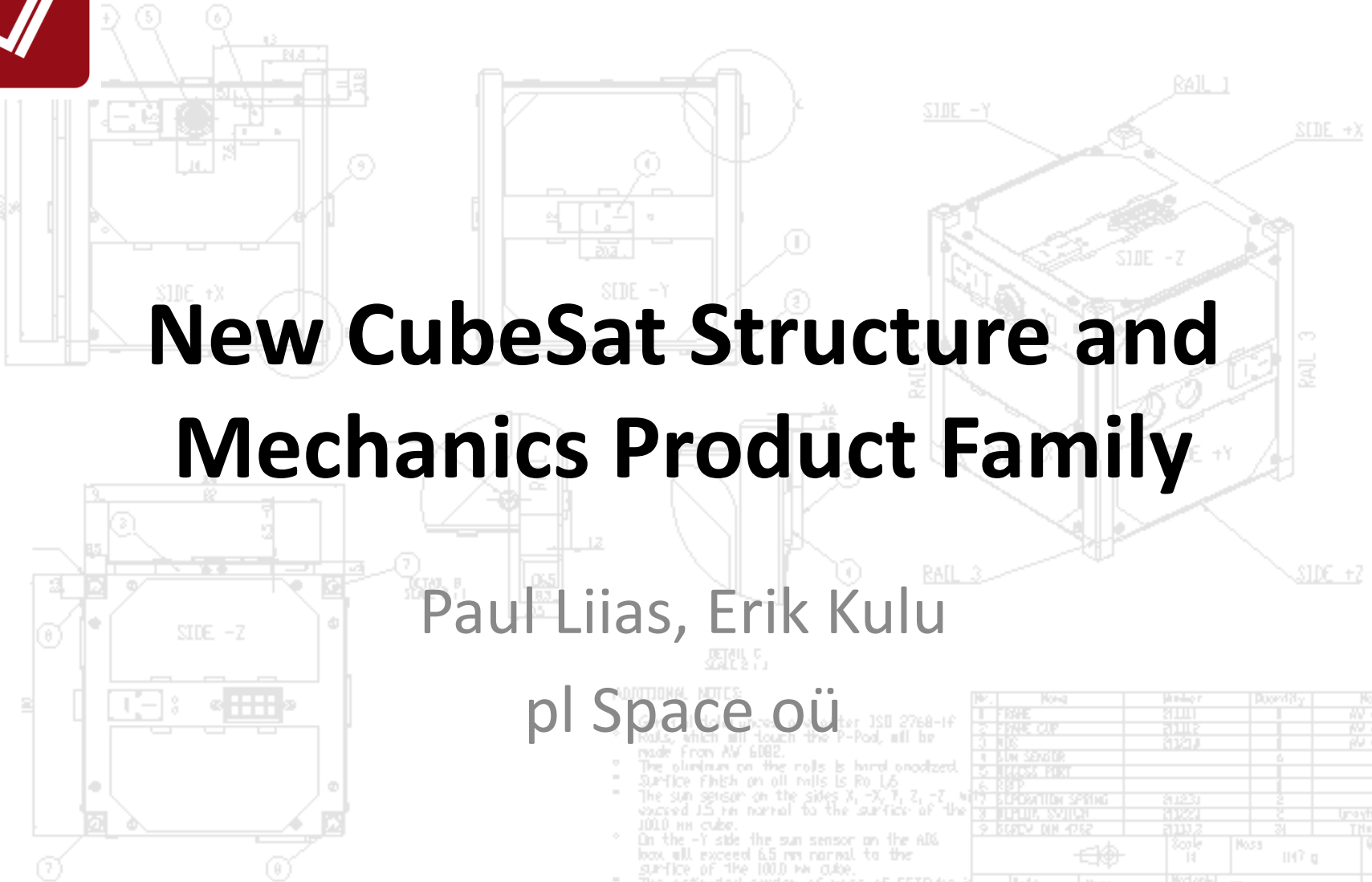




New CubeSat Structure and Mechanics Product Family

Paul Liias, Erik Kulu

pl Space oü

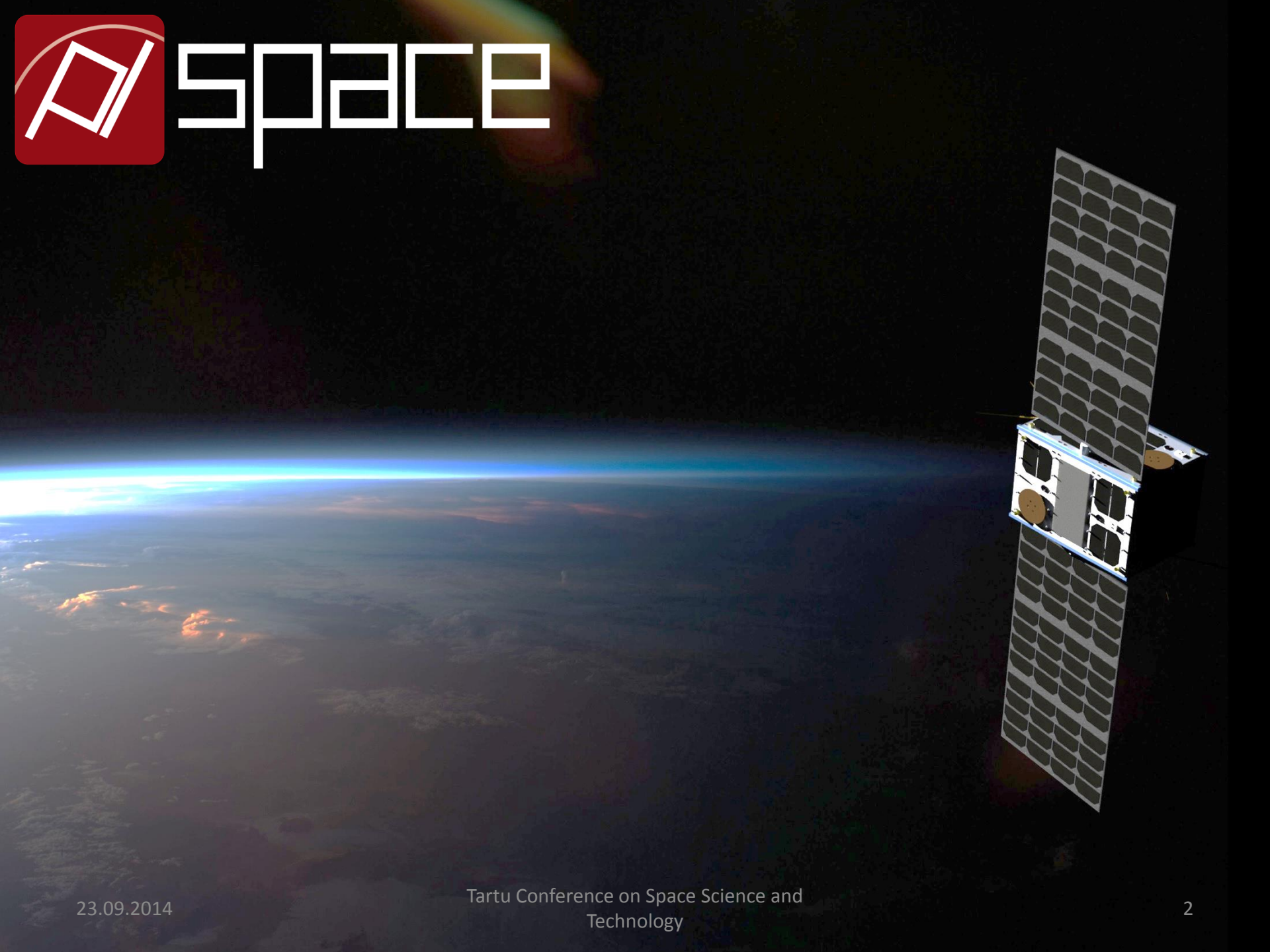


- ADDITIONAL NOTES:**
- The sun sensor on the sides X, -X, Y, Z, -Z will exceed 15 mm normal to the surface of the 1000 mm cube.
 - On the -Y side the sun sensor on the AD6 box will exceed 6.5 mm normal to the surface of the 1000 mm cube.
 - The estimated center of mass of ESTCube is located inside a sphere of 20 mm from its geometric center.
 - The used separation springs are from Heinrich Klop Werk with the product number 03021-05
 - The mass of the satellite is a estimate

No.	Name	Number	Quantity	Note
1	FRAME	21101	1	AV 6801
2	FRAME CUP	21102	1	AV 6801
3	RIS	21201	1	AV 6801
4	SUN SENSOR		4	
5	SEPARATION SPRING	21251	8	
6	ISDP			
7	SEPARATION SPRING	21251	8	
8	REPLUG SWITCH	21221	2	Unassembled
9	REPLUG DIN 4162	21332	21	Thanks
		Scale 1:1	Mass 1147 g	Quantity --
Date	Name	Worked		
04.05.2014	P. Liias	None		
04.05.2014	E. Kulu	None		
04.05.2014	M. Poorno	None		
Project	ESTCube-1		Drawing No.	62
			ESTCube - 21100JF	No. 1



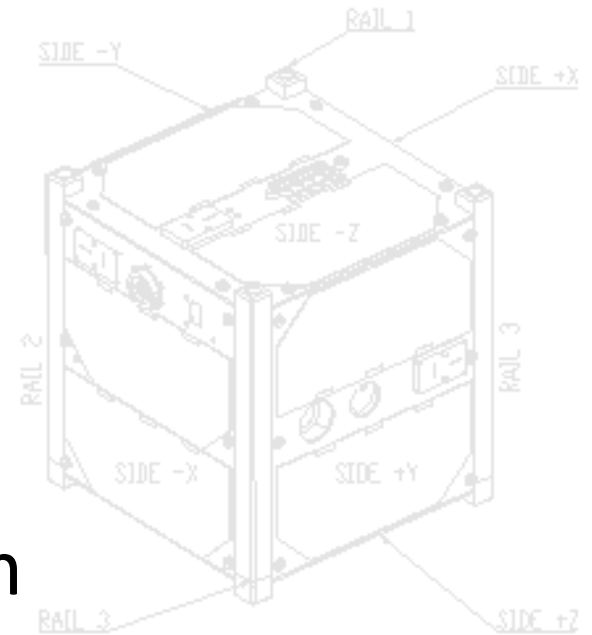
space





Agenda

1. pl space
2. Design and Development
3. CubeSat Structure Family
4. Antenna Deployment System
5. Solar Panel Deployment System
6. Testing



ADDITIONAL NOTES:

- General tolerances are after ISO 2768-1F
- Rails, which will touch the P-Pod, will be made from AV 6082.
- The alignment on the rails is hard anodized.
- Surface finish on all rails is Ra 1,6
- The sun sensor on the sides X, -X, Y, Z, -Z, will exceed 15 m normal to the surface of the 100.0 mm cube.
- On the -Y side the sun sensor on the ADG box will exceed 6.5 mm normal to the surface of the 100.0 mm cube.
- The estimated center of mass of ESTCube is located inside a sphere of 20 mm from its geometric center.
- The used separation springs are from Heinrich Kipp Werk with the product number 03021-06
- The mass of the satellite is a estimate number.

№	Name	Number	Quantity	Note
1	FRAME	21111	1	AV 6081
2	FRAME CUP	21112	1	AV 6081
3	WIG	21212	1	AV 6081
4	SUN SENSOR		6	
5	ACCESS PORT		1	
6	DBP		1	
7	SEPARATION SPRING	03021	6	
8	RELEASE SWITCH	03021	2	Gravim 299
9	RELEASE PIN 4762	21112	24	Titanium

Scale	Mass	Quantity
1:1	1147 g	...

Date	Name	Version
2014/09/23	P. Likus	1
2014/09/23	J. Voormans	1
2014/09/23	R. Poormo	1

Project	Drawing №	№. 1 sheet
ESTCube-1	ESTCube - 21110JF	62



pl space

Spin-off from ESTCube
Founded in November 2013



Vision - pl space will be a recognized space systems developer for space upstream and downstream sectors.

Supported by



ADDITIONAL NOTES:

- General tolerances are after ISO 2768-1F
- Rails, which will touch the P-Pod, will be made from AV 6082.
- The alignment on the rails is hard anodized.
- Surface finish on oil mills is Ra 1.6

Number 03021-06
* The mass of the satellite is a estimate number.

№	Name	Number	Quantity	Note
1	FRAME	21111	1	AV 6081
2	FRAME CUP	21112	1	AV 6081
3	WIG	21212	1	AV 6081
4	SUN SENSOR		6	
5	ATTITUDE SENS		1	
6	GPS		1	
7	PROPAGATION SPRING	21223	2	
8	PROPAG. SWITCH	21222	2	Uravil 295
9	ESTCUB DMI 4762	21112	21	Titanium
		Scale	1:1	Mass
			1117 g	Quantity
				...
№	Name	Material		
14	ESTCUB/21112 P. Links	None		
15	ESTCUB/21112 R. Voormuuk	ESTCube Interface		
19	ESTCUB/21112 R. Poormo			
Project	ESTCube-1	Drawing №:	ESTCube - 21110JF	№: 1 sheet/21



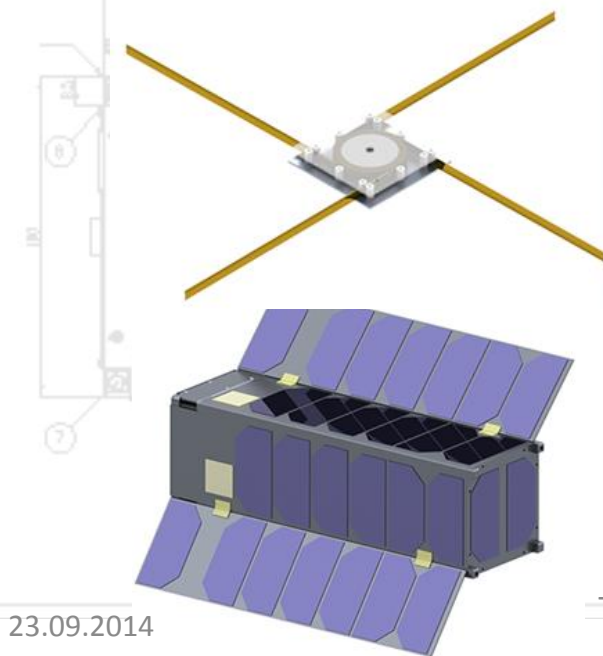
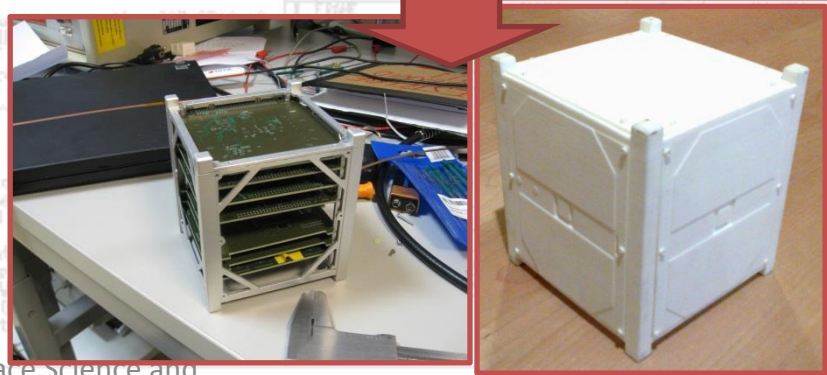
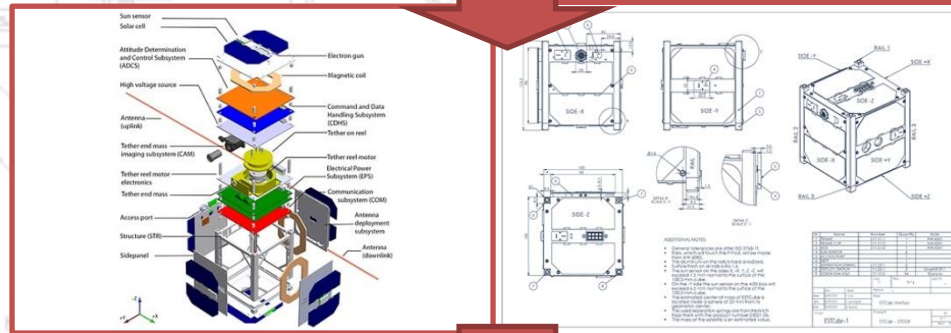
pl space

Products



Services

4.2. Structure	
ESEO-SYS-REQ-1201	The mass of the system must not exceed 580 g
ESEO-SYS-REQ-1202	The optical payload must fit in a 1.7 liter volume
ESEO-SYS-REQ-1203	A minimum of 10 mm free space around connectors
ESEO-SYS-REQ-1204	Openings into the payload shall be covered on delivery
ESEO-SYS-REQ-1205	The payload shall have no mounting contacts with the bottom plate
ESEO-SYS-REQ-1206	A minimum of M4 grade A2-70 mounting bolts between the P/L and S/C
ESEO-SYS-REQ-1207	A minimum of 4 mounting bolts shall be used
ESEO-SYS-REQ-1208	All mounting points in a common plane shall be within 0.05 mm
ESEO-SYS-REQ-1209	Maximum contact area roughness of 3.2 μm
ESEO-SYS-REQ-1210	Minimum contact area of 250 mm ²
ESEO-SYS-REQ-1211	The contact surface shall be coated with Alodine 1200



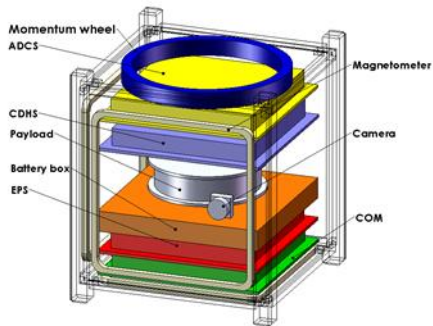
ADDITIONAL

- General tolerances
- Rails, which are made from Al
- The clearance of surface finish
- The sun sensor is located inside the estimated geometric center
- The used separator is number 03021-1
- The mass of the

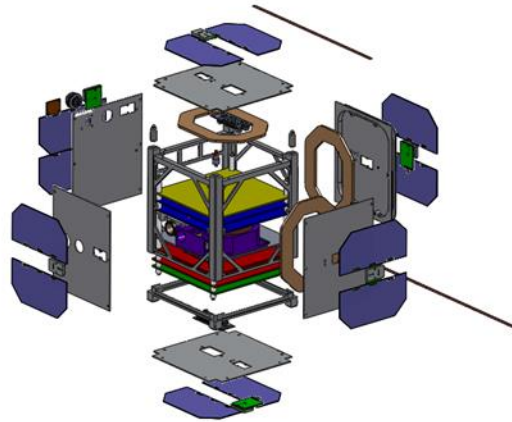


ESTCube-1 STR

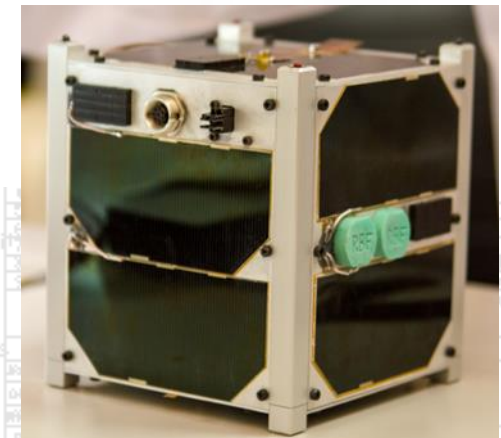
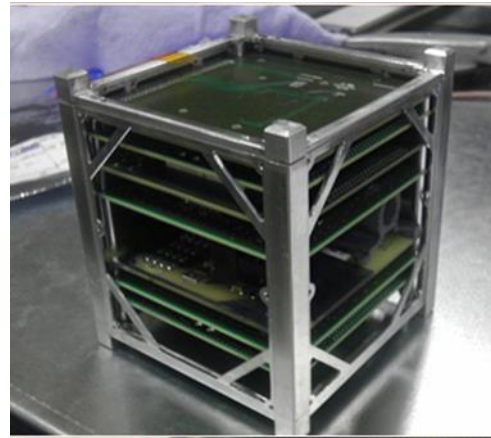
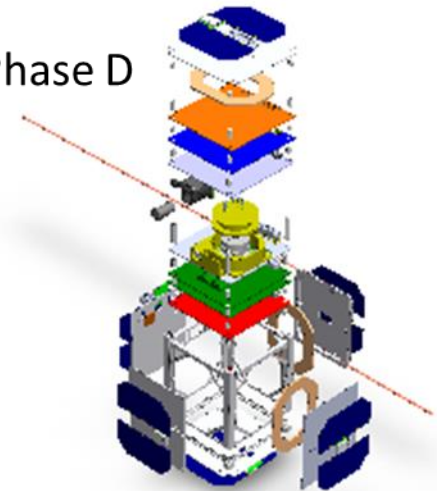
Phase 0/A



Phase C

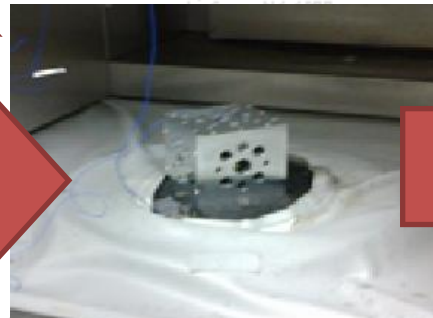
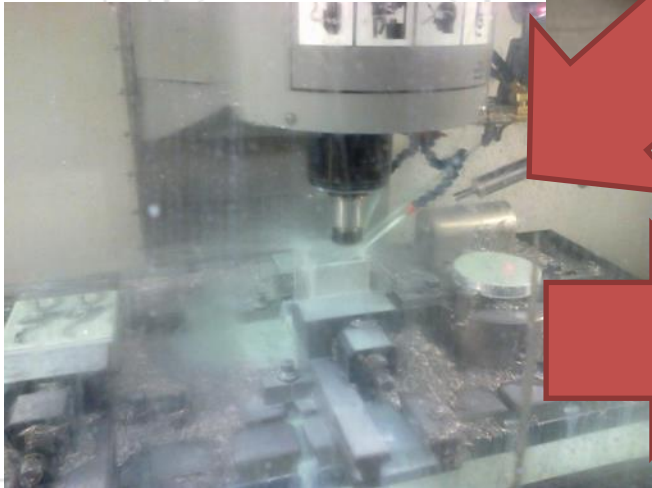
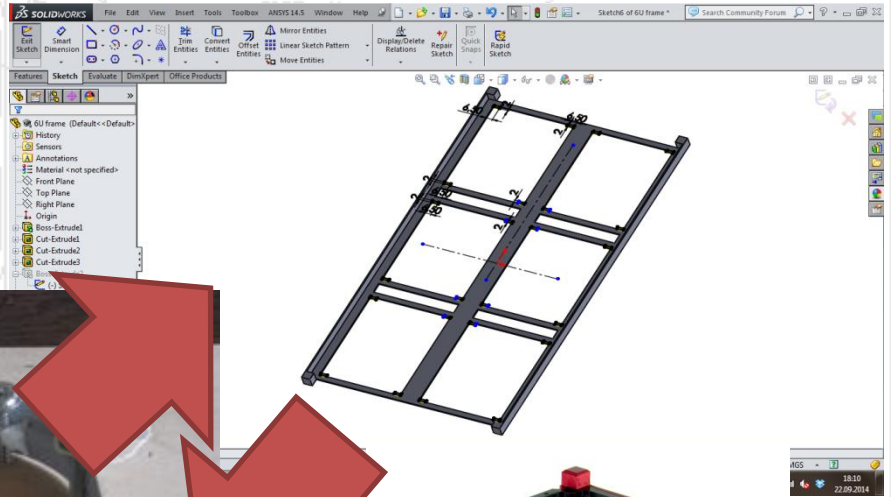
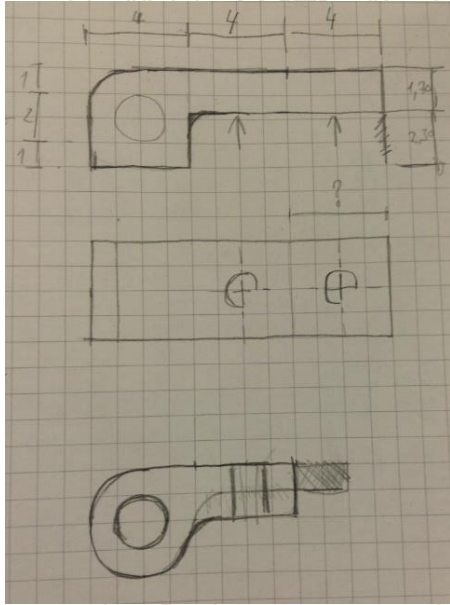


Phase D





Design and Development



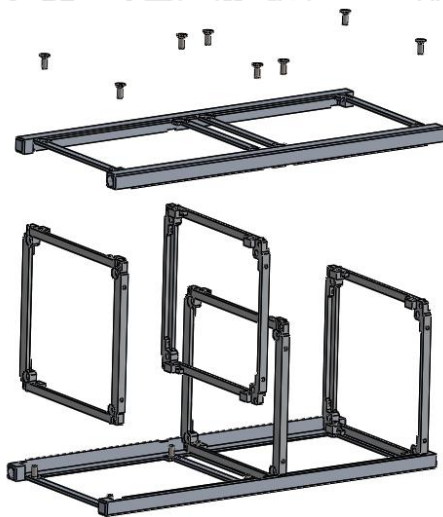
23.09.2014

Tarfa Conference on Space Science and Technology



CubeSat Structure Family

- From 1U to 12U
- Non-ferromagnetic
- Material AW 6082-T6 (EC1)
- Different coatings



ADDITIONAL NOTES:

- General tolerances are as follows
- Rails, which will touch the P-nose from AW 6082.
- The clearance on the rails is 0.1 mm.
- The surface finish on all rails is Ra 0.4.
- The sun sensor on the sides is located 15 mm normal to the 100.0 mm cube.
- On the -Y side the sun sensor box will exceed 6.5 mm normal surface of the 100.0 mm cube.
- The estimated center of mass is located inside a sphere of 1 mm geometric center.
- The used separation springs Heinrich Kipp Werk with the number 03021-06.
- The mass of the satellite is 1.5 kg.



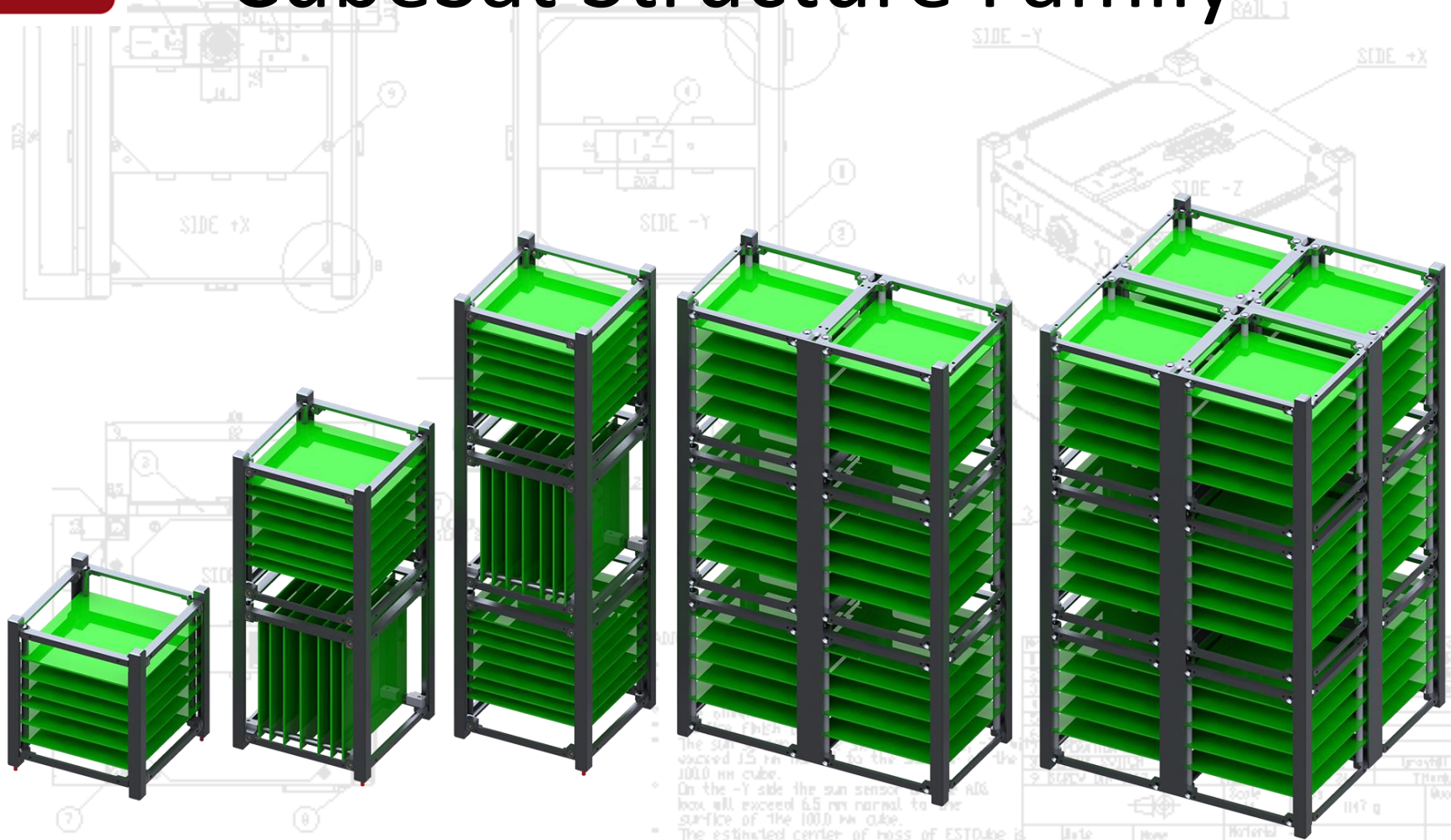
Fe
301
301
301

11.29
sun
lonality

62
16.1
sheet 01



CubeSat Structure Family



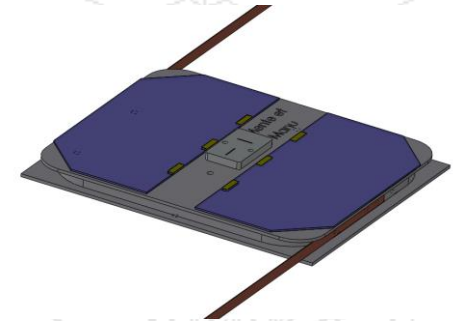
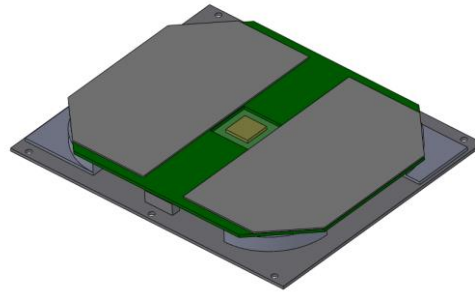
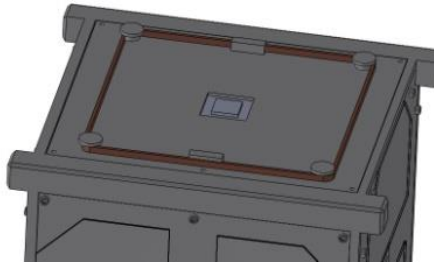
- The 3D model shows the structure of the 1000 mm cube.
- On the -Y side the sun sensor will exceed 6.5 mm normal to the surface of the 1000 mm cube.
- The estimated center of mass of ESTCube is located inside a sphere of 20 mm from its geometric center.
- The used separation springs are from Heinrich Kipp Werk with the product number 03021-06
- The mass of the satellite is a estimate number.

Date	Name	Worked	Weight
08/11/2014	P. Liik		1147 g
08/11/2014	J. Voormann		
08/11/2014	R. Pooma		

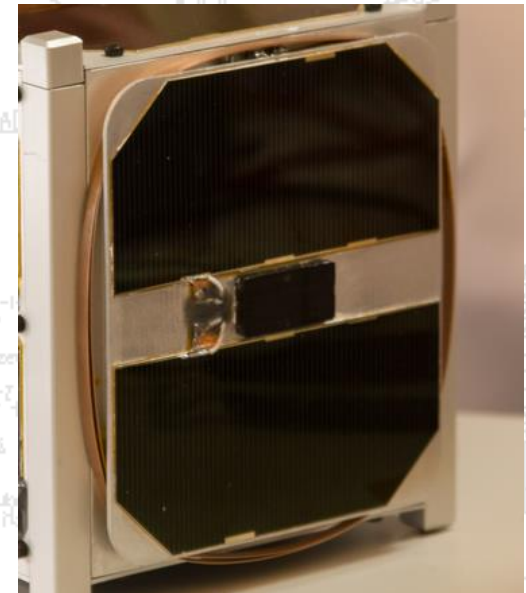
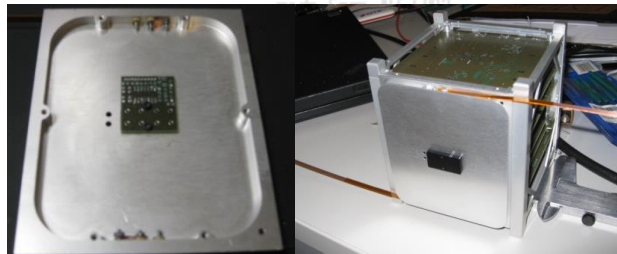
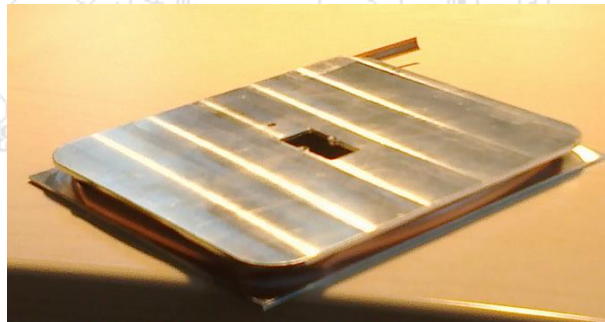
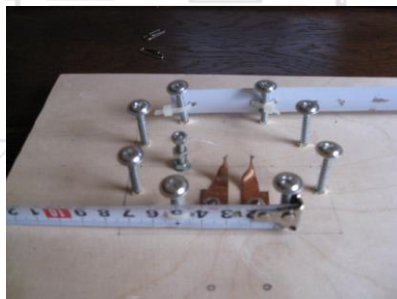
Project	ESTCube-1	Drawing Nr.	ESTCube - 211100JF	62
				16.1
				sheet/21



Antenna Deployment System



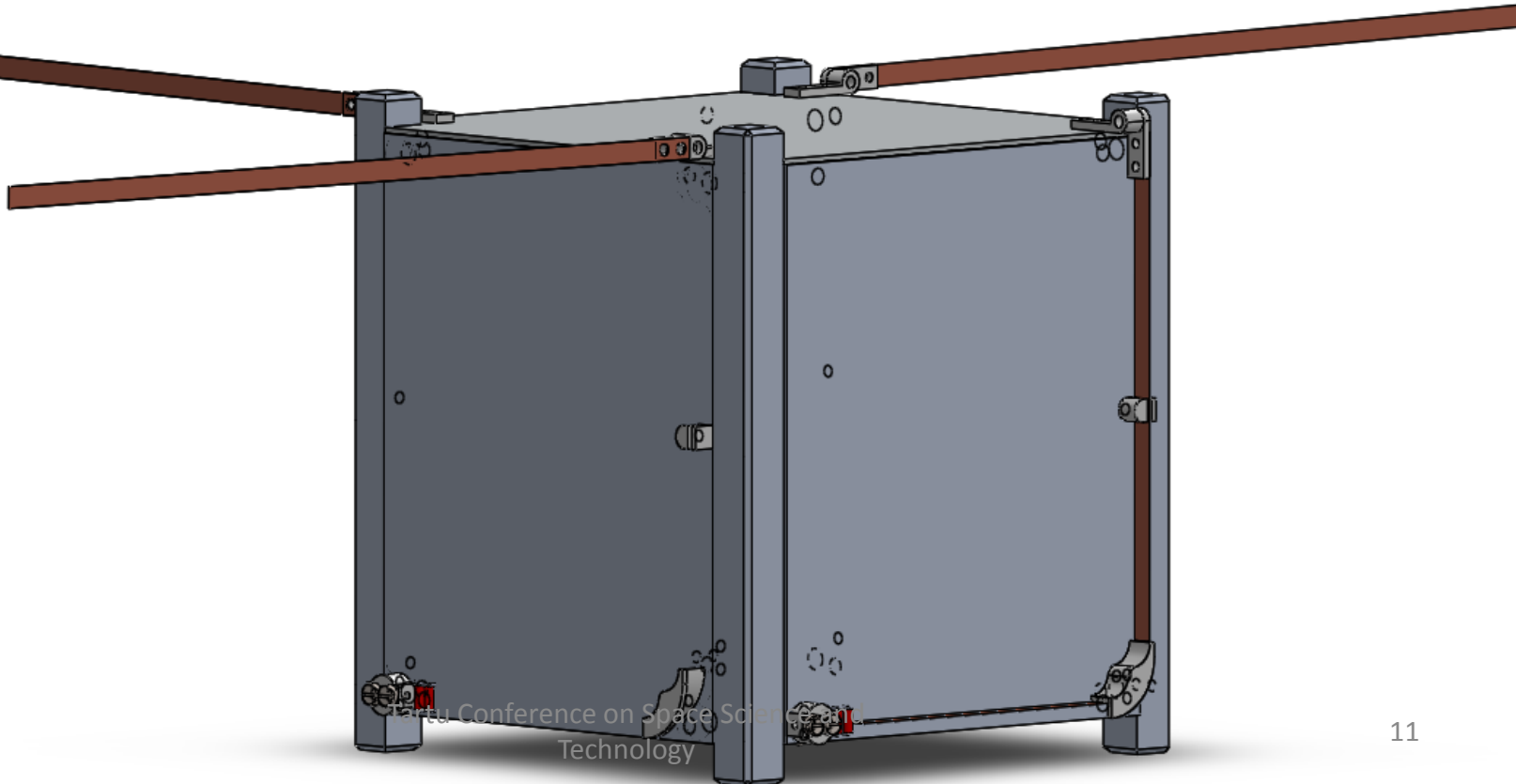
begin with tests early and try to keep the system simple!





Antenna Deployment System

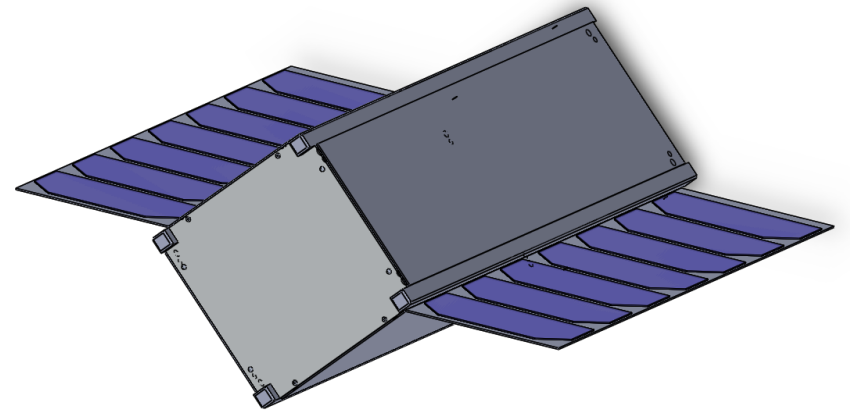
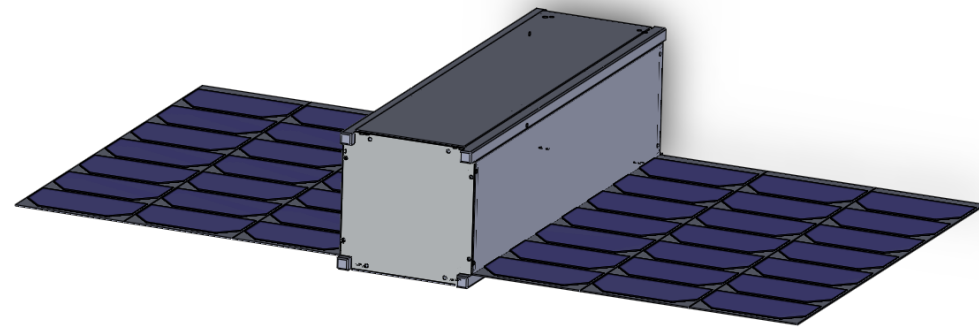
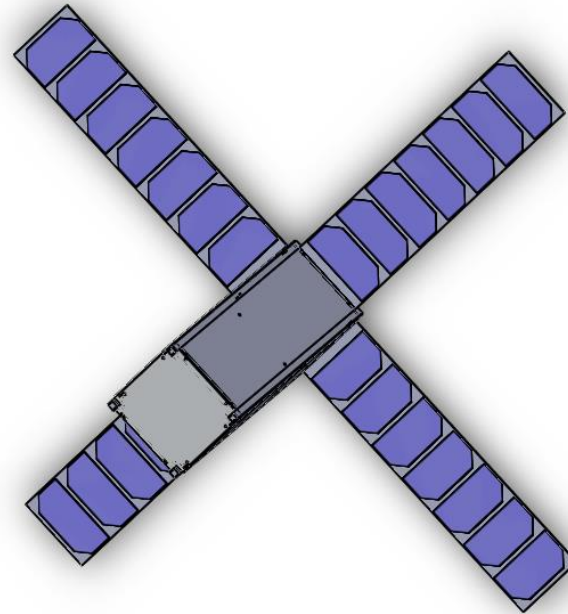
- UHF/VHF antennas
- profiled BeCu (EC1)
- more space inside SC
- mounted on the sides
- reusable melting mech.
- starting from 1U





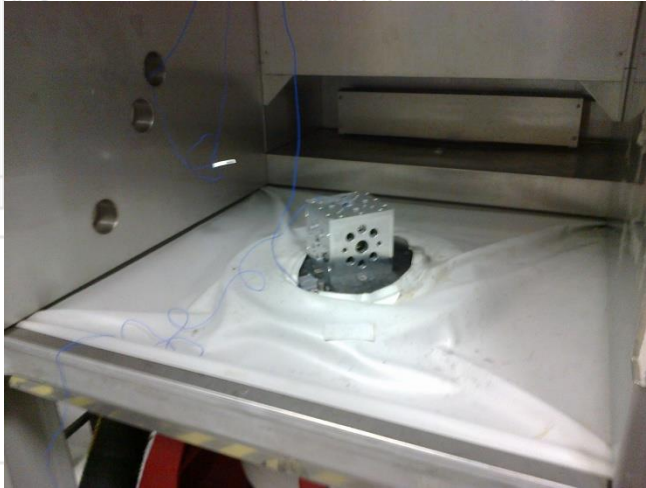
Solar Panel Deployment System

- 90° and 135°
- launch lock
- starting from 1U
- reusable melting mech.





Testing



ADDITIONAL NOTES:

- General tolerances are after ISO 2768-14
- Rolls, which will touch the P-Pod, will be made from AV 6082.
- The glimmer on the rolls is hard anodized.
- Surface finish on all mills is Ra 1.6
- The sun sensor on the sides X, -X, Y, Z, -Z, is located 15 mm normal to the surface of the 100.0 mm cube.
- On the -Y side the sun sensor on the AD6 box will exceed 6.5 mm normal to the surface of the 100.0 mm cube.
- The estimated center of mass of ESTCube is located inside a sphere of 20 mm from its geometric center.
- The used separation springs are from Heinrich Klop Werk with the product number 03021-06
- The mass of the satellite is a estimate number.

№	Name	Number	Quantity	Note
1	FRAME	21111	1	AV 6801
2	FRAME CLIP	21112	1	AV 2861
3	WIG	21212	1	AV 6801
4	SUN SENSOR		6	
5	ACCESS PORT		1	
6	OSP		1	
7	SEPARATION SPRING	03021	2	
8	SEPARATION SWITCH	03021	2	Gravim (29%)
9	RECEIVE DIN 4762	21112	21	Titania

		Scale	Mass	Quantity
		1:1	1147 g	...
State	ESTCube-1	Author	None	
DATE	18/11/2012	Project	ESTCube Interface	
DESIGNER	18/11/2012	Project	ESTCube - 21100JF	
Project		Drawing No.	62	
ESTCube-1		ESTCube - 21100JF		No. 1 sheet/27



Thank you for your attention

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Contact:



paul@plspace.eu



paul.liias

All JCS:
 • The sun sensor on the rolls is hard anodized.
 • Surface finish on all mills is Ra 1.6.
 • The sun sensor on the sides X, -X, Y, Z, -Z, is vacuumed 15 mm normal to the surface of the 100.0 mm cube.
 • On the -Y side the sun sensor on the ADG box will exceed 6.5 mm normal to the surface of the 100.0 mm cube.
 • The estimated center of mass of ESTCube is located inside a sphere of 20 mm from its geometric center.
 • The used separation springs are from Heinrich Kipp Werk with the product number 03021-06.
 • The mass of the satellite is a estimate number.

Item	Desc	Number	Quantity	Note
1	FRAME	21111	1	AV 2801
2	FRAME CUP	21112	1	AV 2801
3	ADG	21212	1	AV 2801
4	SUN SENSOR		6	
5	SEPARATION SPRING	03021	6	
6	ADG			
7	SEPARATION SPRING	03021	6	Unsym (29%)
8	SEPARATION SPRING	03021	6	
9	SEPARATION SPRING	03021	6	

Scale	1:1	Mass	1147 g	Quantity	...
Date	ESTCube-1	Author	P. Liias	Name	
Drawn	ESTCube-1	Checked	A. Voormans	ESTCube Interface	
Project	ESTCube-1	Drawing No.	ESTCube - 21100JF	No. 1 sheet of 1	