

# CONCERT - Antenna on Rosetta - S/C

## Test Report

### Properties

RO-OCN-TR-3002

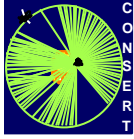
Issue: 1

Revision:

16.07.1999

Prepared by:

W.Boogaerts



# Consert-Antenna

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## Approval Sheet

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prepared by: *W.Boogaerts / H.Perplies* (signature/date)

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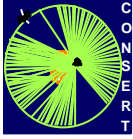
approved by: Technical Department *W.Engelhardt / J.Wedekind* (signature/date)

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approved by: Consert antenna Management *Dr. Nielsen* (signature/date)

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approved by: QA/PA *W.Boogaerts* (signature/date)



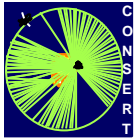
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## Document Change Record

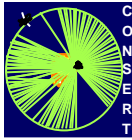
Iss./Rev.	Date	Pages affected	Description
1/-	16-07-1999	all	





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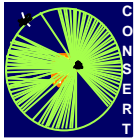
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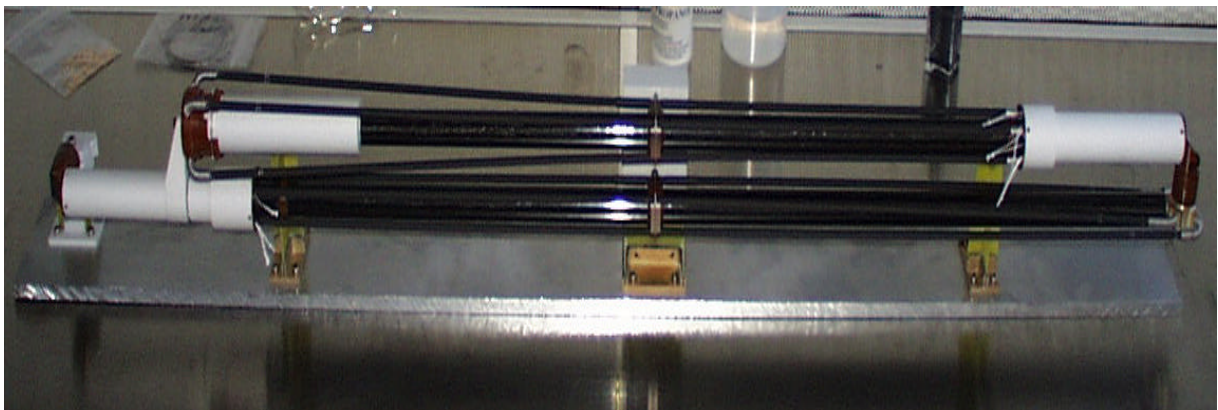
## 1 General aspects

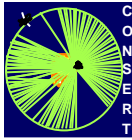
### 1.1 Scope

This Testprocedure covers Project :  
Consert-Antenna (STM) on Rosetta - S/C

### 1.2 Antenna Folded on Attachment Plate

Fig. 1 Antenna folded on Attachment plate





## 1.3 Introduction

The purpose of this test is to determine the properties of the Consert-Antenna i.e. dimensions , reference point , interface pattern measurements , surface flatness of attachment plate, mass , centre of gravity , natural frequencies , electrical verification , etc..

## 1.4 Applicable Documents

Table 1 Applicable Documents

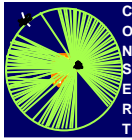
no.	document name	document number	Iss./Rev.
AD1	Consert Orbiter Antenna MICD	RO-OCN-DW-3001	2/E
AD2	General Background on Handling of the Orbiter Antenna and on Terminology Consult	RO-OCN-DW-3019	Version 1.3
AD3			

## 1.5 Reference Documents

Table 2 Reference Documents

no.	document name	document number	Iss./Rev.
RD1	EIDA	RO-EST-RS-3001	2/0
RD2	EIDB	RO-EST-RS-3001	1/0
RD3	EIDC	RO-EST-RS-3001	1/1
RD4	Space Engineering	ECSS-E-10-03 / 5.1.16	Draft 01F
RD5	Payload units STM build standard description	TOS-MMS/1998/550/In/JCS	0
RD6	STM-test objective and built-standard definition	RO-DSS-TN-1027	2





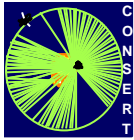
## 1.6 Test Equipment

Table 3 Test Equipment

Nr.	Instr. / Equipment Description	Manufacturer	Model/Type-Nr.	Inv. Nr.	Calibration	
					Last	Next
1	Digital Caliper Rule	Minimax	K/03 20118	94096		
2	Knife Edge Straight-Edge	Hauser				
3	Thickness Gauge	Orion/Germany				DIN 2275
4	Balance	Sartorius		86070100		
5	Centre Microscope	Hensold	65576			
6	X/Y/Z-Digital Table	Heidenhain	PT855			
7	Multimeter	Keithly		90011200		
8	Low-Resistance Measurement	Keithly	195			
9	Moment of Inertia	MPAE				
10	Centre of Gravity	<ul style="list-style-type: none"> <li>• Sartorius Balance</li> <li>• MPAE-Equipment</li> </ul>	BaBa200			

## 1.7 Acronyms

MPAe	Max-Planck-Institut für Aeronomie
STM	Structural and Thermal Model
AD	Applicable Document
RD	Reference Document
FM	Flight Model
Hz	Hertz
Q-Level	Qualification Level
M	Mass
mm	millimeter
g	Acceleration
wrt.	with respect to
I/F	Interface
URF	Unit Reference Frame



# Consert-Antenna

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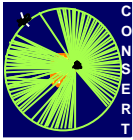
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## 2 Equipment under Test

The Structural and Thermal Model (STM) of the Consert Antenna is mass and thermal representative of the Consert Antenna (FM). The size of the Antenna is 1135 mm x 100 mm x 125 mm. The Antenna weight is **1.45** kg.

## 3 Test Conditions

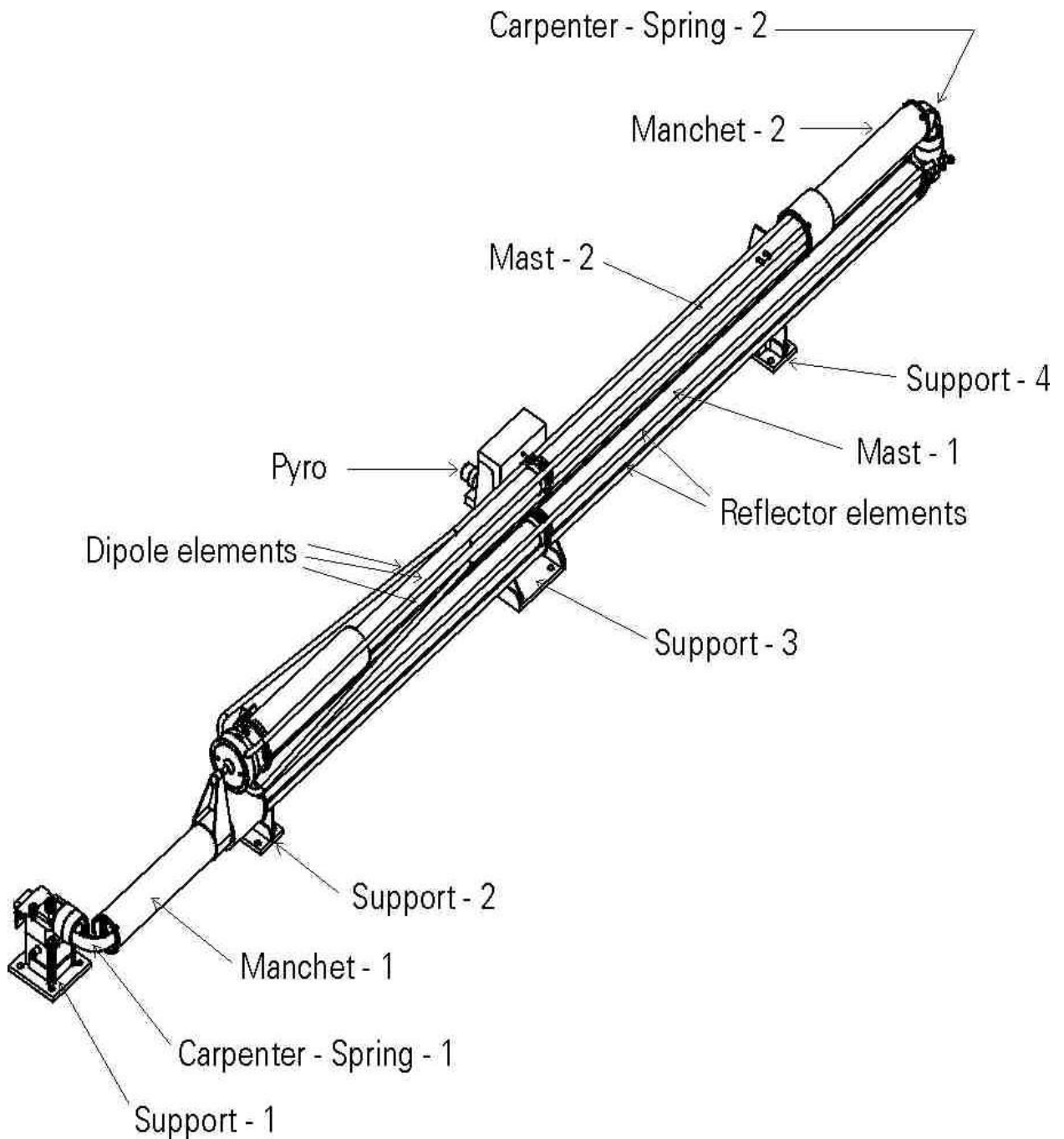
Cleanliness:	100 000
Temperature:	20 °C
Humidity:	< 50 %

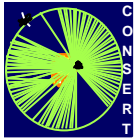


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Fig. 2 Antenna Overview

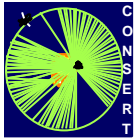




## 4 Test Requirements

### 4.1 Visual Inspection

4.1.1 Identification Labels	<table border="1" style="margin: auto;"> <tr><td colspan="2" style="text-align: center;"><b>Rosetta</b></td></tr> <tr><td colspan="2" style="text-align: center;"><b>CONCERT</b></td></tr> <tr><td style="text-align: center;"><b>OCN</b></td><td style="text-align: center;"><b>STM</b></td></tr> <tr><td colspan="2" style="text-align: center;"><b>Serial-Nr.: A13AA</b></td></tr> </table>	<b>Rosetta</b>		<b>CONCERT</b>		<b>OCN</b>	<b>STM</b>	<b>Serial-Nr.: A13AA</b>		
<b>Rosetta</b>										
<b>CONCERT</b>										
<b>OCN</b>	<b>STM</b>									
<b>Serial-Nr.: A13AA</b>										
4.1.2 General Appearance	OK									
4.1.3 Thermal Finish	Plasmocer <u>Black</u> and <u>White</u> Iridite ; PUI Black Paint									
4.1.4 Connectors	See Partslist									
4.1.5 Connector Savers	N/A for STM									
4.1.6 Protective Covers	None									
4.1.7 Test Covers	None									
4.1.8 Harness	See Material List									
4.1.9 Cleanliness	Visible Clean									
4.1.10 Safety Devices	<ul style="list-style-type: none"> <li>• Safety Caps on Connectors JA2 / JA3 for Pyro-Connection</li> <li>• Safety Strings and Red Tags on Supports 2 and 4</li> </ul>									
4.1.11 Handling Provisions	To be handled by hand with gloves in class 100000 clean room									

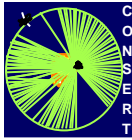


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## 4.2 I/F Measurements

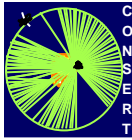
Step		Specification	Actual	Deviation
4.2.1	Envelope	L 1135 mm	1140	0,4 %
	Dimensions	W 100 mm	104	4 %
	(Folded Antenna)	H 125 mm	125	0 %



# Consert-Antenna

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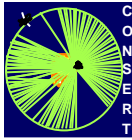
4.2.2 Support 1		(Holes-Nr. Clockwise from upside)			
4.2.2.1 Transport Plate Hole Position URF  Tol.: ± 0,1 mm	1	<u>X<sub>u</sub></u>	<u>Y<sub>u</sub></u>	<u>X<sub>u</sub></u>	<u>Y<sub>u</sub></u>
	2	0	36	-0,14	36,13
	3	36	36	35,98	36,01
	4(R)	36	0	36,12	0,16
				0	0
4.2.2.2 Mounting Hole Position  Tol.: ± 0.1 mm	1	<u>X<sub>u</sub></u>	<u>Y<sub>u</sub></u>	<u>X<sub>u</sub></u>	<u>Y<sub>u</sub></u>
	2	0	36		36,03
	3	36	36	35,98	36,04
	4(R)	36	0	36,02	
		0	0	0	0
4.2.2.3 Hole Diameter	1	4,3 <sup>-0/+0,1</sup> mm		4,3	
	2	4,3 <sup>-0/+0,1</sup> mm		4,3	
	3	4,3 <sup>-0/+0,1</sup> mm		4,3	
	4	4,3 <sup>-0/+0,1</sup> mm		4,3	
4.2.2.4 Spot Face Diameter	1				
	2				
	3	N/A			
	4				
4.2.2.5 Mounting Feet Dimensions	1				
	2				
	3				
	4				
4.2.2.6 Mounting Feet Thickness	1	4 <sup>0/0,1</sup> mm		4,06	
	2	4 <sup>0/0,1</sup> mm		4,04	
	3	4 <sup>0/0,1</sup> mm		4,06	
	4	4 <sup>0/0,1</sup> mm		4,05	
4.2.2.7 Mounting Feet Contact Area	1				
	2				
	3				
	4				
4.2.2.8 Isolation Bushes		None			
4.2.2.9 Surface Flatness		100 μ			



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Step	Specification	Actual	Remarks
4.2.3 Support 2	(Holes-Nr. Clockwise from upside)		
4.2.3.1 Transport Plate Hole Position URF  Tol.: ± 0,1 mm	Xu Yu	Xu Yu	1 – 3 refer to 4(r) 4(r) refer to 4(R) at support 1
	1 0 41	-0,10 40,99	
	2 20 41	19,93 40,95	
	3 20 0	19,99 -0,05	
4(r) 233 -33	0 0		
4.2.3.2 Mounting Hole Position  Tol.: ± 0.1 mm	Xu Yu	Xu Yu	
	1 0 41	0 40,98	
	2 20 41	20,05 41,05	
	3 20 0	20,10 0	
4(r) 0 0	0 0		
4.2.3.3 Hole Diameter	1 4,3 <sup>-0/+0,1</sup> mm	4,35	
	2 4,3 <sup>-0/+0,1</sup> mm	4,34	
	3 4,3 <sup>-0/+0,1</sup> mm	4,35	
	4 4,3 <sup>-0/+0,1</sup> mm	4,35	
4.2.3.4 Spot Face Diameter	1		
	2	N/A	
	3		
	4		
4.2.3.5 Mounting Feet Dimensions	1		
	2		
	3		
	4		
4.2.3.6 Mounting Feet Thickness	1 4 <sup>0/0,1</sup> mm	4,05	
	2 4 <sup>0/0,1</sup> mm	4,00	
	3 4 <sup>0/0,1</sup> mm	4,01	
	4 4 <sup>0/0,1</sup> mm	3,98	
4.2.3.7 Mounting Feet Contact Area	1		
	2		
	3		
	4		
4.2.3.8 Isolation Bushes	None		
4.2.3.9 Surface Flatness	100 μ		

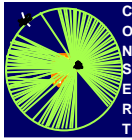


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Step	Specification	Actual	Remarks	
4.2.4 Support 3	(Holes-Nr. Clockwise from upside)			
4.2.4.1 Transport Plate Hole Position URF  Tol.: ± 0,1 mm	1	$\bar{X}_u$ $\bar{Y}_u$ 0        41	$\bar{X}_u$ $\bar{Y}_u$ -0,01    41,03	1 – 3 refer to 4(r) 4(r) refer to 4(R) at support 1 x' = 578.15 y' = 32.93
	2	40        41	39,98    41,12	
	3	40        0	40,01    0,07	
	4(r)	578      -33	0        0	
4.2.4.2 Mounting Hole Position  Tol.: ± 0.1 mm	1	$\bar{X}_u$ $\bar{Y}_u$ 0        41	$\bar{X}_u$ $\bar{Y}_u$ 40,97	
	2	40        41	40,08    41,12	
	3	40        0	39,99	
	4(r)	0        0	0        0	
4.2.4.3 Hole Diameter	1	4,3 <sup>-0/+0,1</sup> mm	4,3	
	2	4,3 <sup>-0/+0,1</sup> mm	4,3	
	3	4,3 <sup>-0/+0,1</sup> mm	4,3	
	4	4,3 <sup>-0/+0,1</sup> mm	4,3	
4.2.4.4 Spot Face Diameter	1	N/A		
	2			
	3			
	4			
4.2.4.5 Mounting Feet Dimensions	1			
	2			
	3			
	4			
4.2.4.6 Mounting Feet Thickness	1	4 <sup>0/0,1</sup> mm	4,05	
	2	4 <sup>0/0,1</sup> mm	4,07	
	3	4 <sup>0/0,1</sup> mm	4,04	
	4	4 <sup>0/0,1</sup> mm	4,07	
4.2.4.7 Mounting Feet Contact Area	1			
	2			
	3			
	4			
4.2.4.8 Isolation Bushes	None			
4.2.4.9 Surface Flatness	100 μ			

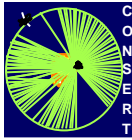




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Step		Specification		Actual		Remarks	
4.2.5 Support 4		(Holes-Nr. Clockwise from upside)					
4.2.5.1 Mounting PlateHole Position URF  Tol.: ± 0,1 mm	1	<u>Xu</u>	<u>Yu</u>	<u>Xu</u>	<u>Yu</u>	1 – 3 refer to 4(r) 4(r) refer to 4(R) at support 1	
	2	0	41	0,06	40,97		
	3	20	41	19,90	40,98		
	4(r)	20	0	20,01	0,05		
	4(r)	908	-33	0	0		
4.2.5.2 Mounting Hole Position  Tol.: ± 0.1 mm	1	<u>Xu</u>	<u>Yu</u>	<u>Xu</u>	<u>Yu</u>		
	2	0	41	0	41,10		
	3	20	41	20,04	41,05		
	4(r)	20	0	19,99	0		
	4(r)	0	0	0	0		
4.2.5.3 Hole Diameter	1	4,3 <sup>-0/+0,1</sup> mm		4,32			
	2	4,3 <sup>-0/+0,1</sup> mm		4,34			
	3	4,3 <sup>-0/+0,1</sup> mm		4,32			
	4	4,3 <sup>-0/+0,1</sup> mm		4,33			
4.2.5.4 Spot Face Diameter	1						
	2						
	3		N/A				
	4						
4.2.5.5 Mounting Feet Dimensions	1						
	2						
	3						
	4						
4.2.5.6 Mounting Feet Thickness	1	4 <sup>0/0,1</sup> mm		3,98			
	2	4 <sup>0/0,1</sup> mm		3,99			
	3	4 <sup>0/0,1</sup> mm		4,01			
	4	4 <sup>0/0,1</sup> mm		4,00			
4.2.5.7 Mounting Feet Contact Area	1						
	2						
	3						
	4						
4.2.5.8 Isolation Bushes		None					
4.2.5.9 Surface Flatness		100 μ					



## 4.3 Physical Properties

### 4.3.1 Mass Properties

See RO-OCN-DW-3001	STM Mass Breakdown (grams) (actual)	FM Mass predicted	Remarks
	1447	1450 ±10	With Cabling

### 4.3.2 CoG / MoI

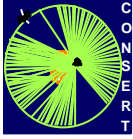
		STM Measured	FM Predicted	Diff. In %
Total Mass	M			
CoG	X	540,5 mm	502 mm.	+7,67
	Y	* <sup>1</sup>	-22 mm.	
	Z	65,0 mm	63 mm.	+3
MoI (wrt. CoG)	I <sub>xx</sub>	* <sup>1</sup>	1.6 x 10 <sup>-3</sup> Kgm <sup>2</sup>	
	I <sub>yy</sub>	* <sup>1</sup>	1.6 x 10 <sup>-1</sup> Kgm <sup>2</sup>	
	I <sub>zz</sub>	1.6 x 10 <sup>-1</sup> kg m <sup>2</sup>	1.6 x 10 <sup>-1</sup> Kgm <sup>2</sup>	0

\*<sup>1</sup> DUT (antenna) is too big for the actual MPAE-test equipment. A more capable Test-equipment for these sizes is in progress at MPAE.

### 4.3.3 Natural Frequencies

See Vibration report **RO-OCN-TR-3021**

	STM	Predicted for FM
1 <sup>st</sup> Natural Frequency X-Axis	320	320
1 <sup>st</sup> Natural Frequency Y-Axis	145	145
1 <sup>st</sup> Natural Frequency Z-Axis	150	150



## 4.4 Electrical Verifications

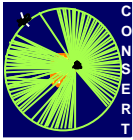
### 4.4.1 Deployment Indicators

Each Carpenter-Spring is supplied with an Resistor(R) to provide a deployment-check.

See connector Location 4.4.3

Table 4 Deployment Indicators

	Folded Antenna			Deployed Antenna (to be measured after Deployment-Test)	
	Connector JA4	Specification	Actual Value	Specification	Actual Value
Carpenter Spring 1	P7 P2	$R < 50 \Omega$	0.4 $\Omega$	$R > 1 \text{ M}\Omega$	$> 1 \text{ M}\Omega$
Carpenter Spring 2	P9 P4	$R < 50 \Omega$	0.4 $\Omega$	$R > 1 \text{ M}\Omega$	$> 1 \text{ M}\Omega$



## 4.4.2 Grounding

Fig. 3 Grounding Schematic

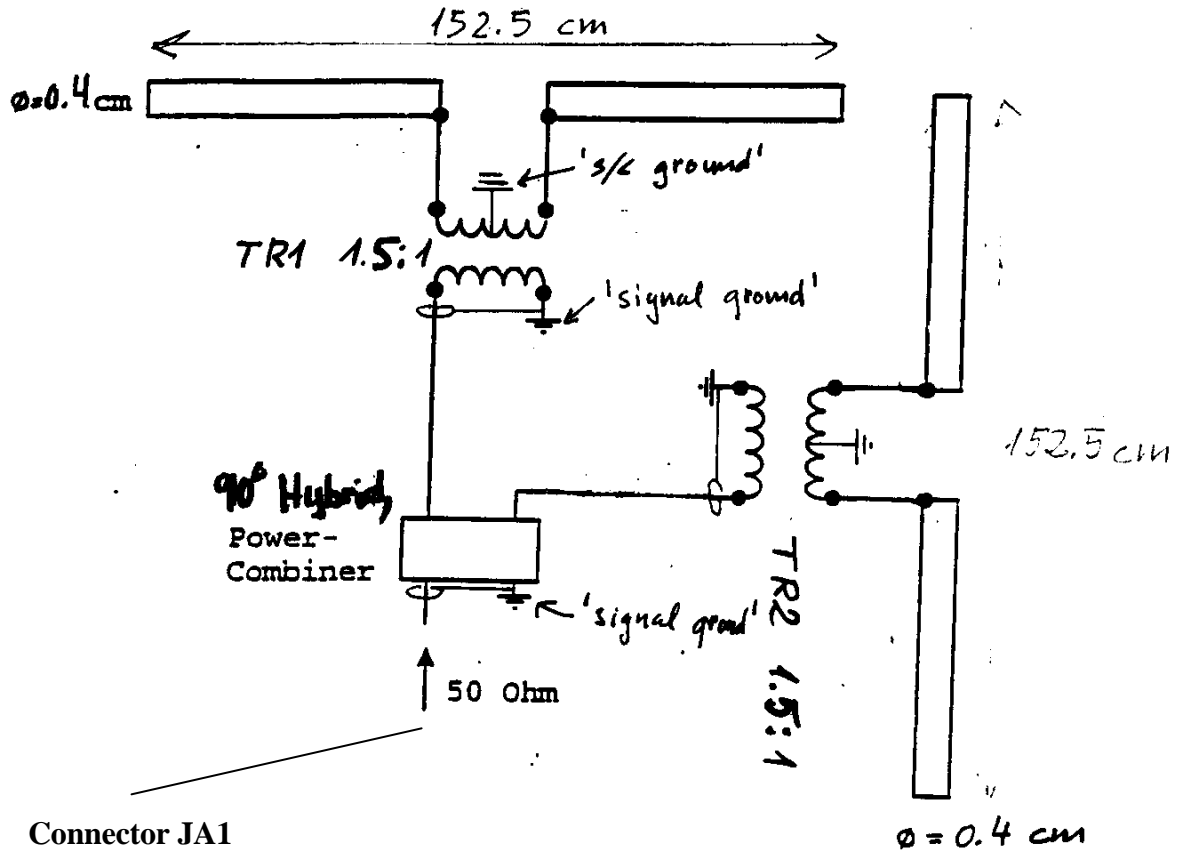
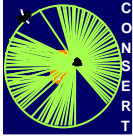


Table 5 Grounding Values

Description	Specification	Actual
Dipoles / Mast-2	$\leq 25 \text{ m}\Omega$	
Mast-2 / Manchet-2	$\leq 25 \text{ m}\Omega$	
Mast-2 / Mast-1	$\leq 25 \text{ m}\Omega$	
Mast-1 / Manchet-1	$\leq 25 \text{ m}\Omega$	
Mast-1 / Support-1	$\leq 25 \text{ m}\Omega$	
Support-1 / Spacecraft	$\leq 10 \text{ m}\Omega$	
Support-2 / Spacecraft	$\leq 10 \text{ m}\Omega$	
Support-3 / Spacecraft	$\leq 10 \text{ m}\Omega$	
Support-4 / Spacecraft	$\leq 10 \text{ m}\Omega$	
Ground Stud /Spacecraft	$\leq 2.5 \text{ m}\Omega$	
Surfaces / ...	$< 1 \text{ k}\Omega$	



## 4.4.3 Connector Locations ( JA4 / JA1 / JA2 / JA3

Fig. 4 Connector Location on Support - 1

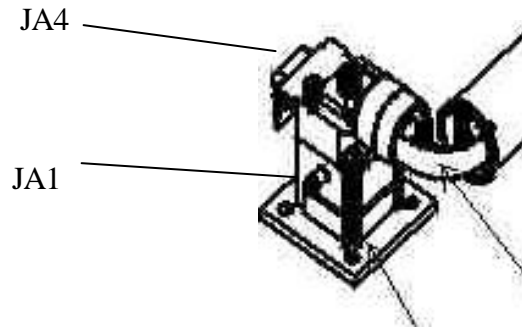
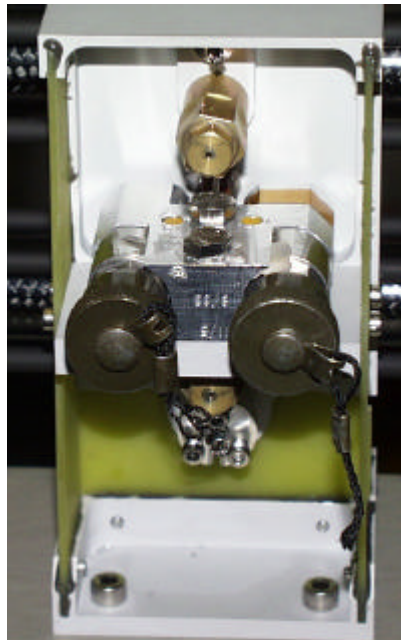
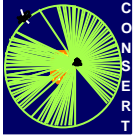


Fig. 5 Connectors JA2 / JA3 on Pyro with Safety Caps on Support 3





## 4.5 Safety Harness : Strings and Red Tag Items

Fig. 6 Safety Strings and Red Tag Items

