



DETAIL SPECIFICATION




REF. : RAD-DET-CSRS-002

Date:
June 26th, 2015

ED/REV:
2 -

PAGE :
1/11

RADIALL DETAIL SPECIFICATION FOR Semi-Rigid Coaxial Cable Assemblies

Rédigé par / Written by	Responsabilité / Responsibility	Date	Signature
S. POIZAT	Space Project Manager	26/05/2015	
Vérifié par / Verified by			
V EUDELINÉ	Space B. U. Manager	26/05/2015	
Approuvée par / Approved by			
C.DAVENEL	Space Product Quality Assurance	26/06/2015	

	DETAIL SPECIFICATION		
	REF. : RAD-DET-CSRS-002		
	Date: June 26th, 2015	ED/REV: 2 -	PAGE : 2/11

DOCUMENTATION CHANGE NOTICE

REVISION OR ISSUE	DATE	CHANGE
1	25/08/04	Creation
1 A	26/06/06	Added SMA2.9 ESCC series in table 1 Limitation at 36GHz of the semi-rigid cable microporous .141” Added sanction in VSWR after 200 cycles during LAT or qualification test
1 B	26/08/08	Correction of Radiall P/N for SMA2.9 connector for SR.141LL R137802201 instead of R137800101
1 C	18/03/09	Added applicable minimum value in the table page 5 for SR with SMA2.9 connectors
2 -	26/06/2015	Updated with new logo of Radiall and change VSWR limit for SMA 90°: 1.35 instead of 1.3

	DETAIL SPECIFICATION		
	REF. : RAD-DET-CSRS-002		
	Date: June 26th, 2015	ED/REV: 2 -	PAGE : 3/11

TABLE OF CONTENTS

1. GENERAL	4
1.1 SCOPE	4
1.2 TYPE VARIANTS	4
1.3 POWER DERATING INFORMATION	4
1.4 PHYSICAL DIMENSIONS	4
1.4.1- dimensions of the length before forming versus reference plane	4
1.4.2- Minimum straight length between two consecutive bendings	6
1.5 STANDARD TEST CONNECTOR INTERFACE	6
2. APPLICABLE DOCUMENTS	7
3. REQUIREMENTS	7
3.1 MECHANICAL –ELECTRICAL REQUIREMENTS	7
3.1.1 Mechanical Requirements	7
3.1.1.1 Dimensions check	7
3.1.1.2 Recommended coupling nut torque	7
3.1.1.3 Mass	7
3.1.2 Electrical Requirements	7
3.1.2.1 Insertion loss	7
3.1.2.2 VSWR	8
3.1.2.3 RF Power Capability	8
3.1.2.4 RF Leakage	8
3.1.2.5 VSWR and Insertion Loss in Temperature	8
3.1.2.6 Others Electrical Parameters	8
3.1.3 Environmental Requirements	8
3.1.3.1 Cable assembly with SMA connectors	8
3.1.3.2 Cable assembly with SMA 2.9 connector / micro-porous cable	8
3.1.4 Mating / Unmating	9
3.2 MARKING	9
3.3 MATERIAL AND FINISHES	9
3-4 ASSEMBLING PROCESSES	9

LIST OF FIGURES

Figure 1: Minimum length between bents and cable extremities	4
Figure 2: Example of cabling a connector R126055500	5
Figure 3: U type bending	6
Figure 4: S type bending	6
Figure 5: Power Derating Information	10

LIST OF TABLES

Table 1: Cabling dimensions for each type of connector	5
Table 2: Minimum values applicable between two bendings	6
Table 3: Type Variant List	11

1. GENERAL

1.1 SCOPE

This specification details the ratings, physical and electrical characteristics, test and inspection data for RF Coaxial semi-rigid cable assemblies. It shall be read in conjunction with RADIALL Generic Specification RAD-GEN-CSRS-001, the requirements of which are supplemented herein.

1.2 TYPE VARIANTS

Each semi-rigid cable assembly shall use the cable and connectors defined in Radiall specifications:

-Connectors : RAD-DET-CONN-001

-Cables : RAD-DET-CABL-001

1.3 POWER DERATING INFORMATION

The power derating information applicable to the connectors specified herein is shown in Figure 1.

1.4 PHYSICAL DIMENSIONS

The physical dimensions of the cable assembly specified herein are defined by the drawing of the customer. These drawing shall be defined in accordance with the requirements below.

1.4.1- dimensions of the length before forming versus reference plane

These dimensions are defined in accordance with the parameters of the forming machine (see Figure 1)

a) Origin side : $a = 11 \text{ mm min.}$

b) End side : $b = 8.5 \text{ mm min.}$

Note: the origin side is the beginning of the forming with the machine

The end side is end of the forming before the cut of the cable

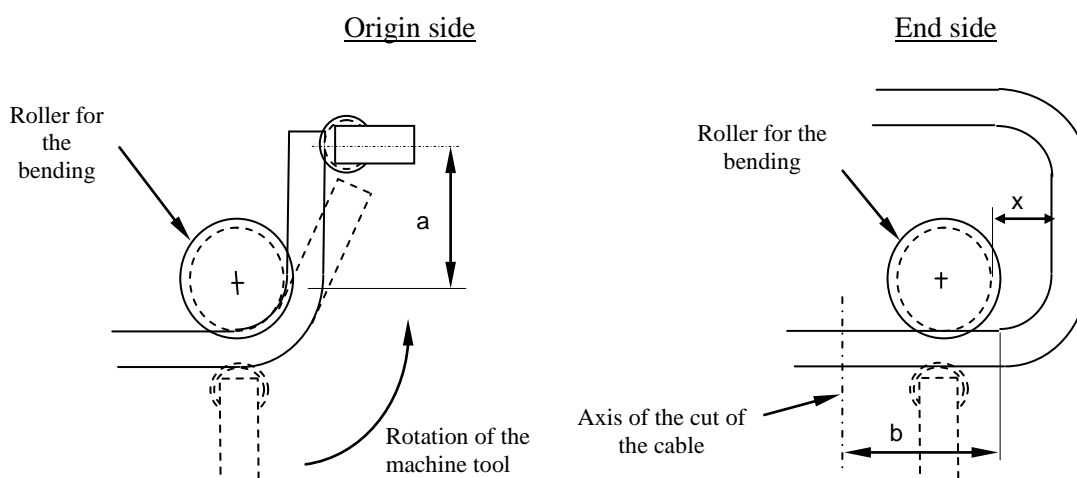


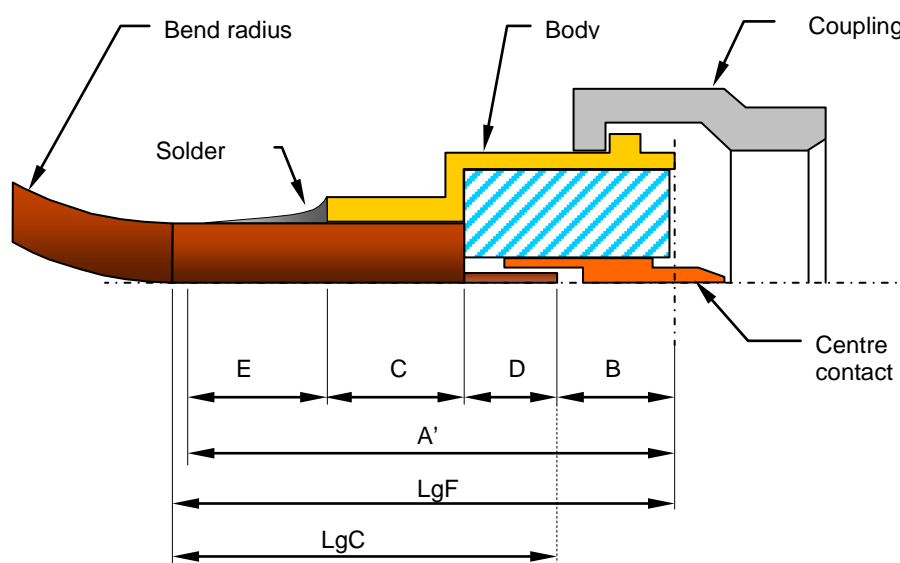
Figure 1: Minimum length between bents and cable extremities

Calculation of the minimum length :

LgF: (minimum length for the bending from reference plane)

LgC (minimum length for the bending without connector)= LgF – B

With $A' = B + C + D + E$



B= Length of the cable / reference plane

C= Length of the cable inside the body

D= stripping length maxi

E= tinning length mini

Figure 2: Example of cabling a connector R126055500

(*)Applicable minimum values

Connector	Description	cable	C	D	E	B	A'	LgF (*)	LgC (*)
SMA R126.052.500 SMA R125.052.500X	Straight plug cable .085	.085	3	3.3	5	2.2	13.5	14	11.8
SMA R126.055.500 SMA R125.055.500X	Straight plug cable .141	.141	3	3.3	5	2.27	13.6	14	11.8
SMA R126.153.000 SMA R125.153.004X	Right angle plug cable .085	.085	5.4	3.17	5	-1.35	12.2	13	14.5
SMA R126.154.000 SMA R125.154.010X	Right angle plug cable .141	.141	5.4	3.17	5	-1.35	12.2	13	14.5
SMA 2.9 R127.800.001X SMA 2.9 R137.800.001	Straight plug cable .085LL	.085LL	4	1.5	5	8.05	18.55	20	10.45
SMA 2.9 R127.800.101X SMA 2.9 R137.802.201	Straight plug cable .141LL	.141LL	4	1.5	5	8.05	18.55	20	10.45

Table 1: Cabling dimensions for each type of connector

1.4.2- Minimum straight length between two consecutive bendings

The requirements are defined for the two types of cable : .085 and .141.

Two bending types can be specified : bending « U type » and bending « S type »

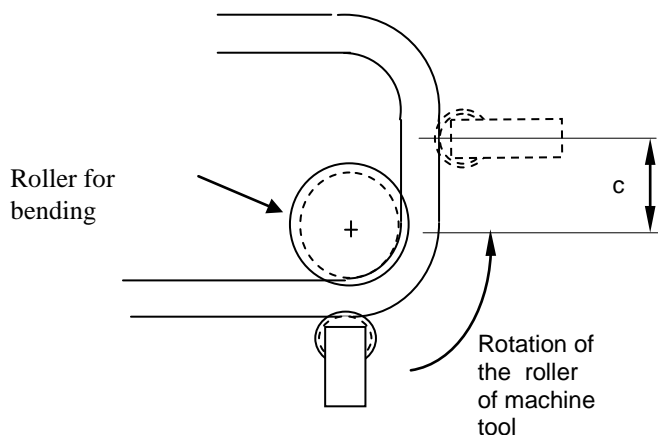


Figure 3: U type bending

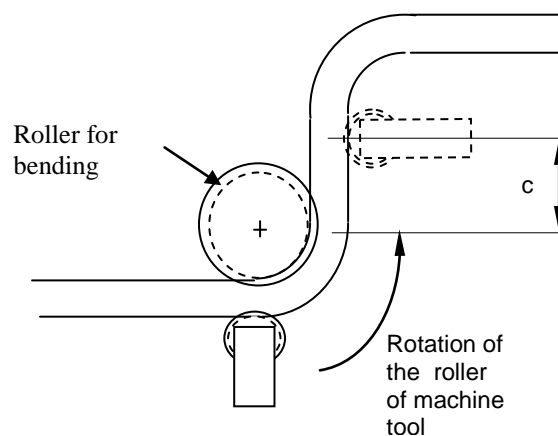


Figure 4: S type bending

Cable	.085		.141	
	U	S	U	S
Minimum values (C in mm)	10	10	10	10

Table 2: Minimum values applicable between two bendings

1.5 STANDARD TEST CONNECTOR INTERFACE

Whenever gauges are required for mating with the connectors under test, their physical dimensions shall be in accordance with those specified in detail specification RAD-DET-CONN-001.

	DETAIL SPECIFICATION	
	REF. : RAD-DET-CSRS-002	
	Date: June 26th, 2015	ED/REV: 2 -

2. APPLICABLE DOCUMENTS

The following documents form part of this specification and shall be read in conjunction with it :

- (a) RADIALL Generic Specification RAD-GEN-CSRS-001 for RF Coaxial cable assembly.
- (b) RADIALL Generic Specification RAD-GEN-CONN-001 for RF coaxial connector.
- (c) RADIALL Detail Specification RAD-DET-CONN-001 for RF coaxial connector for semi-rigid cables.
- (d) RADIALL Detail Specification RAD-DET-CABL-001 for RF semi-rigid cable.
- (e) ESCC 3402 generic specification , connectors, RF coaxial
- (f) ESCC 3402/001 detail specification, RF coaxial connectors type SMA, male contact
- (g) ESCC 3402/002 detail specification, RF coaxial connectors type SMA, female contact
- (h) ESCC 3402/021 detail specification, RF coaxial connectors type SMA2.9, male contact
- (i) ESCC 3402/022 detail specification, RF coaxial connectors type SMA2.9, female contact
- (j) ECSS-Q-70-18A the preparation , assembly and mounting of RF coaxial cables

3. REQUIREMENTS

3.1 MECHANICAL –ELECTRICAL REQUIREMENTS

3.1.1 Mechanical Requirements

3.1.1.1 Dimensions check

The dimensions of the cable assemblies shall be verified in accordance with requirements defined in the data sent by the customer.

3.1.1.2 Recommended coupling nut torque

Radiall recommends to tighten connectors with following torque:

SMA connector : 100 N.cm

3.1.1.3 Mass

The total mass of a cable assembly is calculated with the addition of semi-rigid cable, connectors and soldering.

3.1.2 Electrical Requirements

3.1.2.1 Insertion loss

cable .085 / SMA: (frequency range: DC to 18GHz)

Max. value: $< 0.035\sqrt{F} + 0.78\sqrt{F} * L + 0.004 * F * L$

Typical value: $< 0.022\sqrt{F} + 0.69\sqrt{F} * L + 0.002 * F * L$

cable .085 low loss / SMA 2.9: (frequency range: DC to 40GHz)

Max. value: $< 0.035\sqrt{F} + 0.66\sqrt{F} * L + 0.003 * F * L$

Typical value: $< 0.022\sqrt{F} + 0.595\sqrt{F} * L + 0.002 * F * L$



DETAIL SPECIFICATION

REF. : RAD-DET-CSRS-002

Date:
June 26th, 2015

ED/REV:
2 -

PAGE :
8/11

cable .141 / SMA: (frequency range: DC to 18GHz)

Max. value: $< 0.035\sqrt{F} + 0.53\sqrt{F} * L + 0.005 * F * L$

Typical value: $< 0.022\sqrt{F} + 0.39\sqrt{F} * L + 0.002 * F * L$

cable .141 low loss / SMA2.9: (frequency range: DC to 36GHz)

Max. value: $< 0.035\sqrt{F} + 0.42\sqrt{F} * L + 0.003 * F * L$

Typical value: $< 0.022\sqrt{F} + 0.345\sqrt{F} * L + 0.002 * F * L$

F = frequency in GHz

L = Length in meter

3.1.2.2 VSWR

The VSWR shall be better than:

Straight SMA connectors :	1.15 for cable assembly from DC to 12 GHz
	1.25 for cable assembly from 12 to 18 GHz
Right angle SMA connectors :	1.35 for cable assembly from DC to 12 GHz
Straight SMA 2.9 connectors .085”:	1.30 for cable assembly from DC to 40 GHz
Straight SMA 2.9 connectors .141”:	1.30 for cable assembly from DC to 36 GHz

After thermal cycles (200 cycles, §14.8 of the generic specification RAD-GEN-CSRS-001), the VSWR shall be better than:

1.50 for cable assembly with SMA connectors
1.55 for cable assembly with SMA2.9 connectors

3.1.2.3 RF Power Capability

See graphs Figure 5

3.1.2.4 RF Leakage

The RF leakage shall be better than -90 dB between DC to 18 GHz

3.1.2.5 VSWR and Insertion Loss in Temperature

The high and low temperature values are defined in the operating temperature range.

Applicable drift: 0.3%/°C

3.1.2.6 Others Electrical Parameters

Impedance :	50 Ohms
Voltage withstanding:	750 Vrms for cable assembly 0.085, 1000 Vrms for cable assembly 0.141
Insulation resistance :	5000 Mohms

3.1.3 Environmental Requirements

3.1.3.1 Cable assembly with SMA connectors

Operating temperature range : -40°C to +100°C

Storage temperature range : -40°C to +100°C

3.1.3.2 Cable assembly with SMA 2.9 connector / micro-porous cable

Operating temperature range : -40°C to +150°C

Storage temperature range : -40°C to +150°C

	DETAIL SPECIFICATION		
	REF. : RAD-DET-CSRS-002		
	Date: June 26th, 2015	ED/REV: 2 -	PAGE : 9/11

3.1.4 Mating / Unmating

Before delivery the maximum mating / unmating number authorized for each connector is 10.

3.2 MARKING

The marking of all cable assemblies shall be in accordance with the definition of generic specification

3.3 MATERIAL AND FINISHES

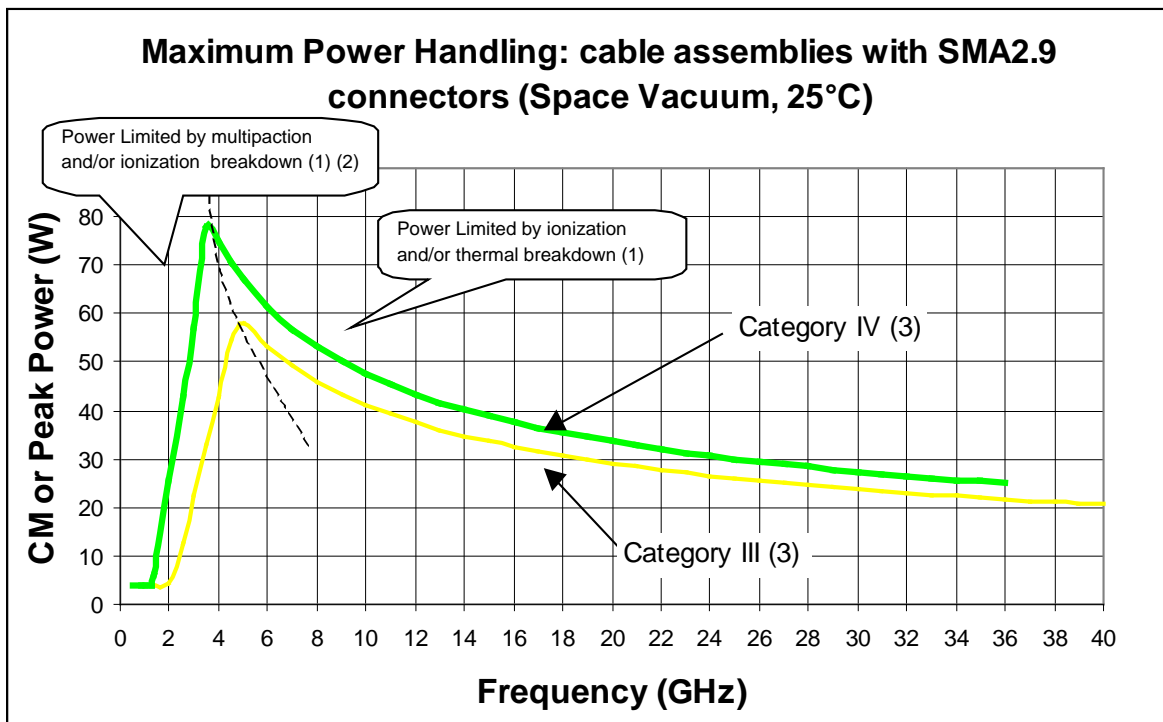
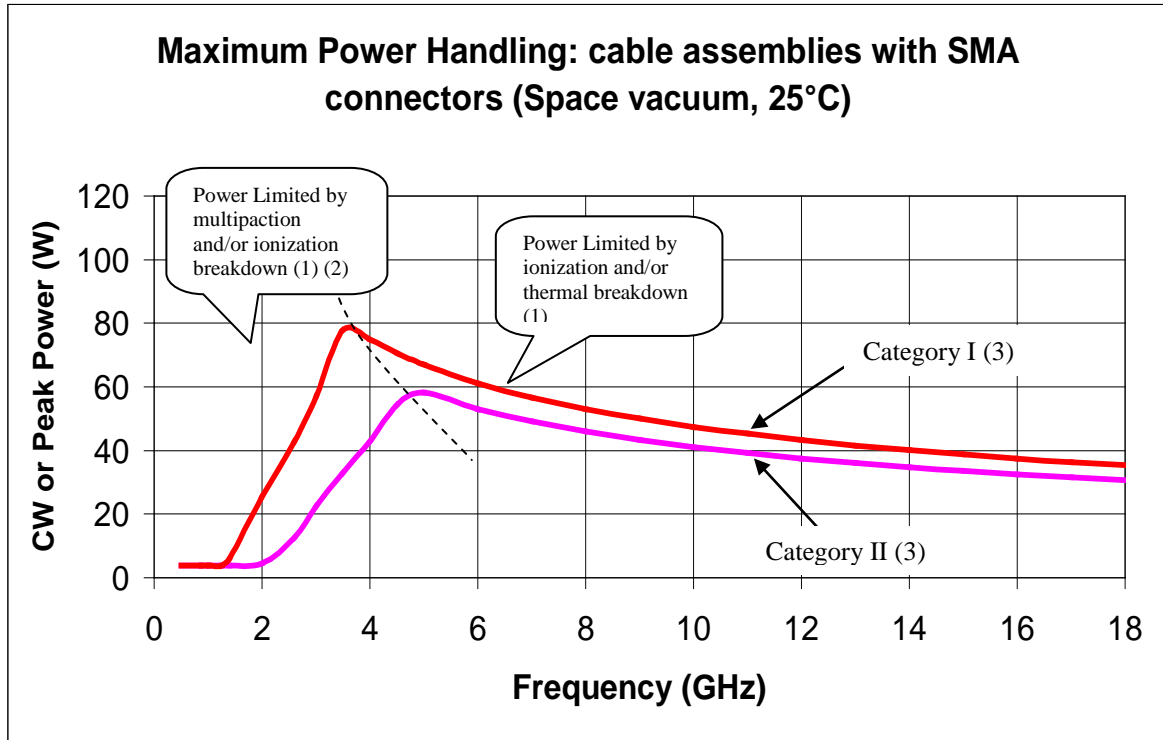
The material and finishes of the cable and connectors are defined in the detail specifications RAD-DET-CONN-001 and RAD-DET-CABL-001.

3-4 ASSEMBLING PROCESSES

The internal processes are defined for each cable assembly type in accordance with the requirements of ECSS-Q-70-18A specification.

Figure 5: Power Derating Information

FIGURE 1(a) POWER VERSUS FREQUENCY



Notes:

- 1: Load VSWR is better than 1,30:1
- 2: The part of the curve limited by multipaction takes into account a 6 dB margin as recommended by ESA
- 3: See Table 1 to know applicability of power handling categories to the different part numbers

FIGURE 1(b) POWER VERSUS TEMPERATURE



Table 3: Type Variant List

CABLE TYPE	DESIGNATION	POWER HANDLING CATEGORY
S.R. .085	SMA plug straight - SMA plug straight	II
	SMA plug straight - SMA plug right angle	II
	SMA plug right angle - SMA plug right angle	II
S.R. .141	SMA plug straight - SMA plug straight	I
	SMA plug straight - SMA plug right angle	I
	SMA plug right angle - SMA plug right angle	I
S.R. .085 micro-porous	SMA 2.9 plug straight – SMA 2.9 plug straight	III
S.R. .141 micro-porous	SMA 2.9 plug straight - SMA 2.9 plug straight	IV*

* limited at 36GHz, cut-off frequency of SR.141