Titre / Title

RF ATTENUATORS COAXIAL DC – 40 GHz

DETAIL SPECIFICATION

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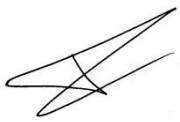
S. POIZAT	Space Project Manager	19/09/2018	
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DOCUMENTATION CHANGE NOTICE

REVISION OR ISSUE	DATE	CHANGE
1/-	02/03/2016	Initial issue
1/A	19/01/2017	Updated to change RF power: 1W instead of 2W
1/B	26/01/2017	Conditions for Operating Life testing updated (Table 4)
1/C	05/07/2017	Variant n°122 added (20dB)
1/D	19/09/2018	17.5GHz instead of 17GHz in table 1

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LIST OF TABLES AND FIGURES

1. SCOPE

This Detail Technical Sheet details the ratings and electrical characteristics for RF Attenuators, Coaxial 0-20 dB, 0 - 40 GHz

2. APPLICABLE DOCUMENT

The following documents shall be read in conjunction with this specification:

RAD-GEN-ATCH-002: General Specification: Attenuators and Loads RF Fixed Coaxial

3. TYPE VARIANT

Variant of the basic type covered by the relevant Generic Specification are given Table 1.

Table 1: *Type variants*

Var. N°	Attenuation	Maximum Input Power	Attenuation tolerance Vs frequency		Flatness	VSWR
	dB	W	0 < F ≤ 17.5 GHz (dB)	17.5 < F ≤ 31.5 GHz (dB)	dB	
101	0 (DC shunt)	5	0 / -0.55	0 / -0.55		
102	0.5	5	±0.5	±0.3		
103	1	3.5	±0.5	±0.3		
104	1.5	2.75	±0.5	±0.3		
105	2	2.25	±0.5	±0.3	F ≤ 20 GHz	
106	2.5	2	±0.5	±0.3	0.07 dB/1 GHz	0 < F ≤ 24GHz
107	3	1.5	±0.5	±0.3		< 1.20
108	3.5	1.5	±0.5	±0.3		
109	4	1.5	±0.5	±0.3		
110	4.5	1.5	±0.5	±0.3		
111	5	1.25	±0.5	±0.3		
112	5.5	1.25	±0.5	±0.3		
113	6	1.25	±0.5	±0.3	F > 20 GHz	
114	6.5	1.25	±0.5	±0.3	0.1 dB/1 GHz	24 < F < 31.5GHz
115	7	1	±0.5	±0.3		< 1.25
116	7.5	1	±0.5	±0.3		
117	8	1	±0.5	±0.3		
118	8.5	1	±0.5	±0.3		
119	9	1	±0.5	±0.3		
120	9.5	1	±0.5	±0.3		
121	10	1	±0.5	±0.3		
122	20	0.5	±0.5	±0.3		

4. MAXIMUM RATINGS

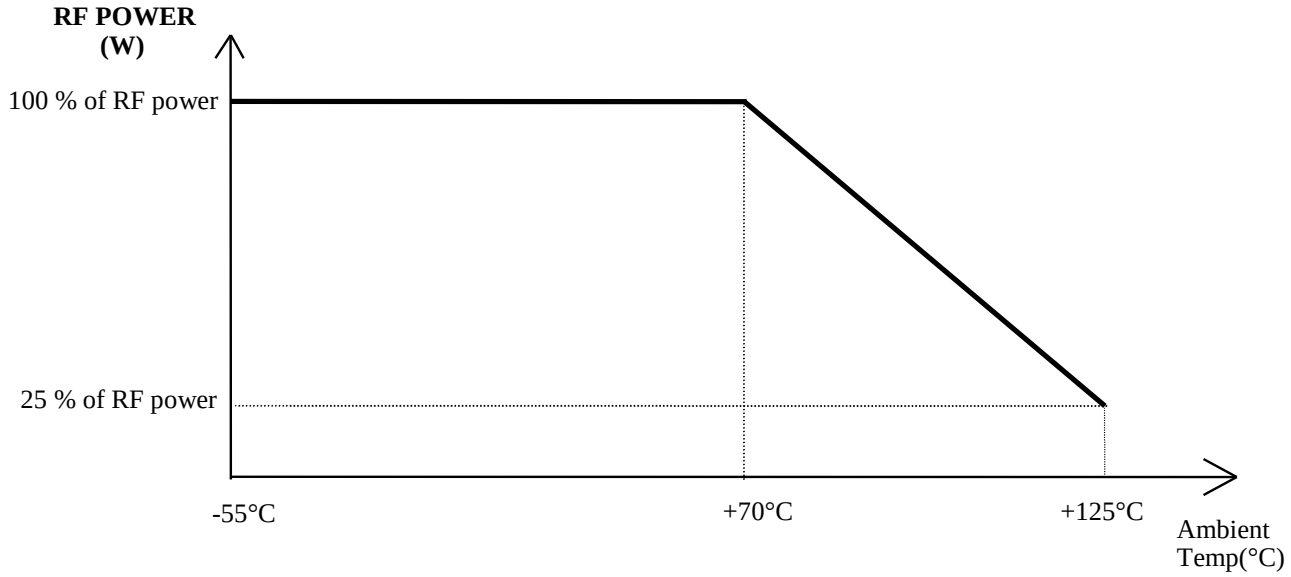
Maximum Ratings of the basic type covered by the relevant Generic Specification are given Table 2.

Table 2: *Maximum ratings*

N°	Characteristics	Symbol	Maximum Rating		Unit	Comment
			Min	Max		
1	RF Power dissipation (1)	P	-	1	W(2)	-
2	Peak Power (at 25°C) (3)	Pp	-	50	W	-
3	Operating Temperature Range	T_{op}	-55	+125	°C	-
4	Storage Temperature Range	T_{stg}	-55	+125	°C	-
5	Frequency Range	F	0	40	GHz	-
6	Impedance	Z	47.5	52.5	Ω	-
7	DC impedance		3	10	KΩ	between coaxial line and body
8	RF Leakage	E	-85	-	dBi	-
9	Coupling Nut Torque	Tq	80	120	N.cm	-
10	Glitches		0	0.05	dB	

NOTES: (1) See Table 1 for RF input Power value vs attenuation
(2) See Figure 1.
(3) Duration 1µs, cyclic rate 1ms

FIGURE 1 – *Temperature derating*



RF POWER VERSUS TEMPERATURE

5. ELECTRICAL MEASUREMENTS

The parameters to be measured at room temperature are scheduled in Table 1. Unless otherwise specified, the measurements shall be performed at T_{amb} = +22 ± 3 °C.
The measurement shall be performed with five points of frequency:

4GHz – 10GHz – 17.5GHz – 24GHz - 31.5GHz.

6. CONNECTORS REPEATABILITY:

The test shall be performed according to the following conditions:

- Attenuation shall be recorded at three points of frequency: 4GHz – 17.5GHz - 31.5GHz
- Ten complete engagements and separations shall be performed, both end separately
- Attenuators shall be rotated through the full 360° with an increment of approximately 36° for each engagement.
- Attenuation drift value: ±0.05 dB
- Side thrust is not permitted during the test
- Cleaning of connectors or reshaping of contacts was not permitted during the sequence

7. OPERATING LIFE

7.1. PARAMETER DRIFT VALUES

The parameter drift values applicable to burn-in are specified in Table 3 of this specification. Unless otherwise stated, measurements shall be performed at T_{amb} = +22 ± 3 °C. The parameter drift value (Δ) applicable to the parameters scheduled, shall not be exceeded. In additional to these drift value requirements for a given parameter, the appropriate limit value specified in Table 1 shall not be exceeded.

7.2. CONDITIONS FOR OPERATING LIFE

The condition for Operating life is given in Table 4. After test, a visual inspection shall be performed and no damage shall be appeared.

Table 3: *Parameter drift values for Operating Life*

N°	Characteristics	Symbol	Test condition	Limits	Unit
1	Attenuation Drift	ΔAtt	As per Table 1	±0.10 or ±1 (1)	dB %

NOTES: (1) Whichever is greater, % of nominal attenuation

Table 4: *Conditions for Operating Life testing*

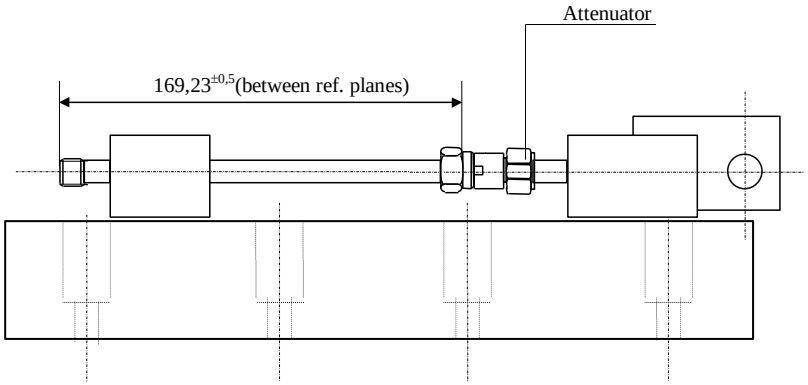
N°	Characteristics	Symbol	Limits	Unit	Note
1	RF Power	P_{in}	See Table 1	W	
2	Frequency	F	DC(1) or 10 or 18 10 or 18	GHz GHz	For attenuation ≥ 1dB For attenuation < 1dB
3	Ambient Temperature	T_{amb}	+70	°C	-

NOTES: (1) The response of the attenuation is flat over the frequency bandwidth.
The dissipated power at DC or in frequency is the same.

Test mounting for Operating life:

The DUT (attenuator under test) shall be mounted directly on the Hybrid coupler without SR cable between the coupler and the DUT.

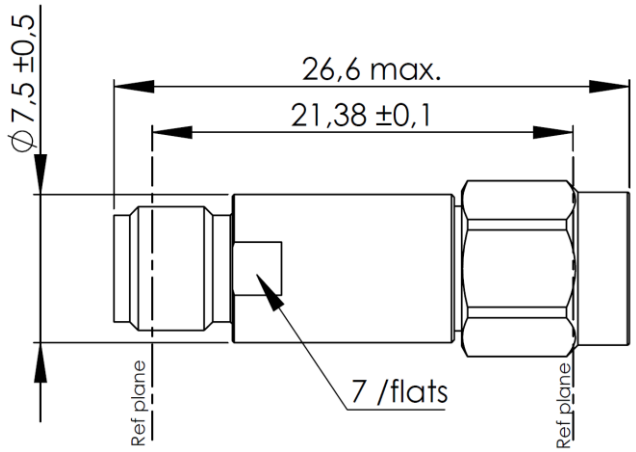
FIGURE 2 – *Circuit for electrical measurement*



Schematic for Vibration and Shock or Bump test

8. MECHANICAL DIMENSION

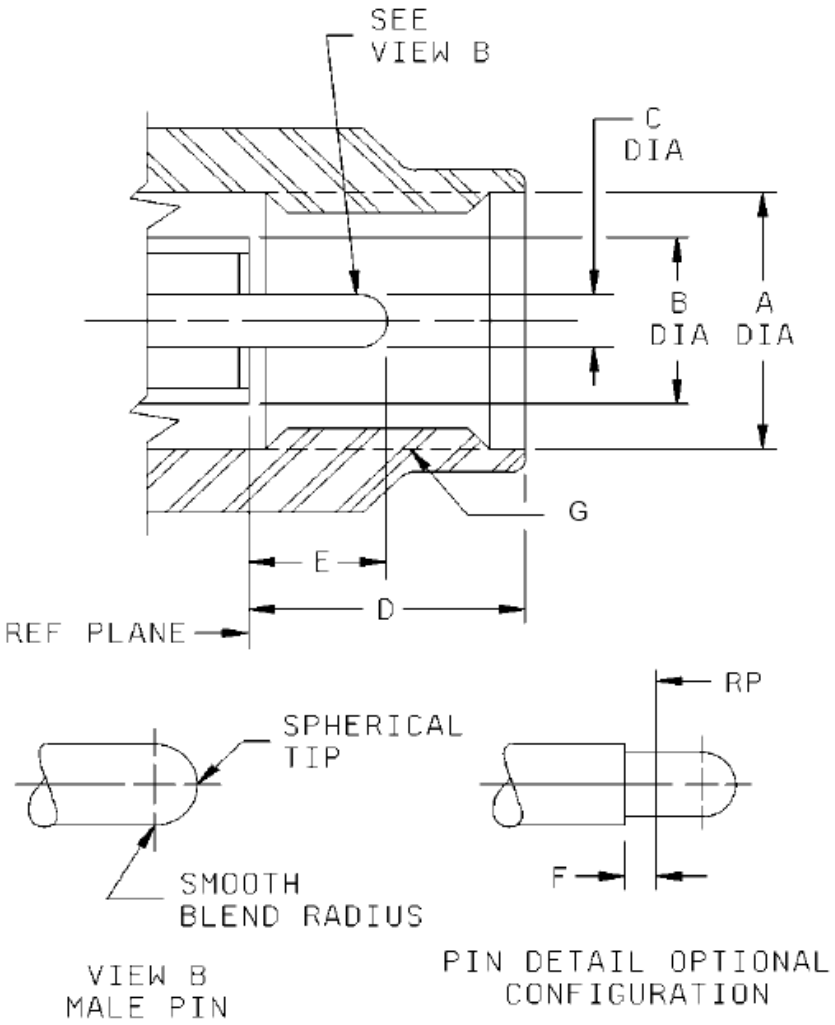
8.1. DIMENSION FOR VARIANTS 101 TO 122



General tolerance: ± 0.5 mm
Connectors: SMA2.9 Male/Female per ESCC3402
Weight: ≤ 7 grams

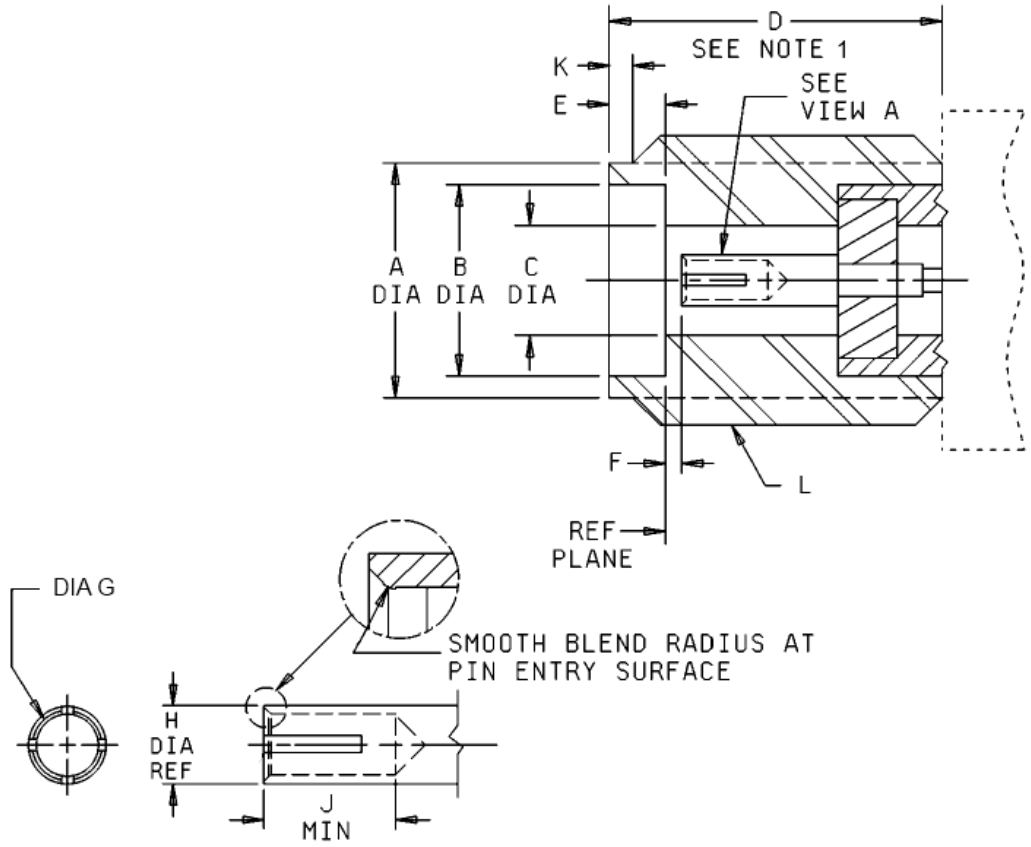
8.2. INTERCHANGEABILITY FOR SMA 2.9 SERIES

8.2.1. SMA 2.9 jack



Symbol	Millimeters		notes
	min	max	
∅A	6.60	6.70	
∅B	4.54	4.58	
∅C	0.92	0.94	
D	2.63	3.25	
E	1.40	1.65	
F	0.00	0.08	
G	¼ 36 UNS2B		

8.2.2. SMA 2.9 plug



VIEW A

Symbol	Millimeters		notes
	min	max	
∅A	5.30	5.40	
∅B	4.60	4.64	
∅C	2.905	2.945	
D	4.85	5.15	
E	1.88	1.98	
F	0.00	0.08	
∅G	For pin 0.90 to 0.94mm		
∅H	1.26	1.28	
J	2.80	3.20	
K	0.65	0.95	
L	¼ 36 UNS2A		

Note 1: Clearance for mating connector coupling nut

Table 5: *Radiall Part Number*

Variant	Radiall Reference	Designation	
101	R413300660	Attenuator SMA2.9 DC - 40GHz	0 dB
102	R413301660	Attenuator SMA2.9 DC - 40GHz	0.5 dB
103	R413302660	Attenuator SMA2.9 DC - 40GHz	1 dB
104	R413303660	Attenuator SMA2.9 DC - 40GHz	1.5 dB
105	R413304660	Attenuator SMA2.9 DC - 40GHz	2 dB
106	R413305660	Attenuator SMA2.9 DC - 40GHz	2.5 dB
107	R413306660	Attenuator SMA2.9 DC - 40GHz	3 dB
108	R413307660	Attenuator SMA2.9 DC - 40GHz	3.5 dB
109	R413308660	Attenuator SMA2.9 DC - 40GHz	4 dB
110	R413309660	Attenuator SMA2.9 DC - 40GHz	4.5 dB
111	R413310660	Attenuator SMA2.9 DC - 40GHz	5 dB
112	R413311660	Attenuator SMA2.9 DC - 40GHz	5.5 dB
113	R413312660	Attenuator SMA2.9 DC - 40GHz	6 dB
114	R413313660	Attenuator SMA2.9 DC - 40GHz	6.5 dB
115	R413314660	Attenuator SMA2.9 DC - 40GHz	7 dB
116	R413315660	Attenuator SMA2.9 DC - 40GHz	7.5 dB
117	R413316660	Attenuator SMA2.9 DC - 40GHz	8 dB
118	R413317660	Attenuator SMA2.9 DC - 40GHz	8.5 dB
119	R413318660	Attenuator SMA2.9 DC - 40GHz	9 dB
120	R413319660	Attenuator SMA2.9 DC - 40GHz	9.5 dB
121	R413320660	Attenuator SMA2.9 DC - 40GHz	10 dB
122	R413340660	Attenuator SMA2.9 DC - 40GHz	20 dB

TABLE 6: *Measurements and inspections on completion of environment and endurance tests*

N°	Radiall Generic Spec. RAD-GEN-ATCH-002		Measurements and Inspections		Symbol	Limits		Unit
	Environmental and Endurance Test (1)	Test Method and Conditions	Identification	Conditions		Min	Max	
01	Vibration	Para. 13.2.6 of Generic specification and figure 2 of this specification	**Initial measurements** Attenuation **During Last Cycle** Intermittent contact **Final measurement** Visual Examination Attenuation drift	 Table 1 >0.5ms No open or short circuits No damage Table 1	 Att - - ΔAtt	 Record values - - ±0.05 ±0.5		 - - dB or %(2)
02	Shock or Bump	Para 13.2.7 of Generic specification and figure 2 of this specification	**Initial measurements** Attenuation **Final measurement** Visual Examination Attenuation drift	 Table 1 No damage Table 1	 Att - ΔAtt	 Record values - ±0.05 ±0.5		 - dB or %(2)
03	Rapid Change of Temperature	Para 13.2.8 of Generic specification	**Initial measurements** Attenuation **Final measurement** Visual Examination Attenuation drift	 Table 1 After recovery time of 24±2hrs No damage Table 1	 Att - ΔAtt	 Record values - ±0.05 ±0.5		 - dB or %(2)
04	Climatic sequence	Para 13.2.9 of Generic specification Dry heat: para 13.2.9.1 of Generic specification Cold heat: para 13.2.9.3 of Generic specification	 Attenuation drift Attenuation drift **Final measurement** Visual Examination Attenuation drift	 At +125°C, Freq: 4 – 17.5 and 31.5GHz At -55°C, Freq 4 – 17.5 and 31.5GHz After recovery time between 1 hr and 24 hrs No damage Table 1	 ΔAtt ΔAtt - ΔAtt	 -0.1 -1.0	 7.10^{-4}(3) 7.10^{-4}(3) +0.1 +1.0	 dB/dB/°C dB/dB/°C dB or %(2)
05	Coupling proof torque	Para 13.2.10	Interface dimensions	Para 13.2.11	-	Figure of para 13.2.11		-
06	Mating and unmating forces	Para 13.2.11	Torque	Para 13.2.11	-	-	24	N.cm
07	Connector Repeatability	Para 6 of this specification	Attenuation drift	Table 1	ΔAtt	±0.05 ±0.5		dB or %(2)
08	Operating Life	Para 13.2.12 and table 3 and 4 of this specification	**Initial measurements** Attenuation **Final measurement** Visual Examination Attenuation drift	 Table 1 No damage Table 1	 Att - ΔAtt	 Record values - ±0.10 ±1		 - dB or %(2)
09	RF leakage	Para 13.2.13 of Generic specification	**RF leakage**	Para 13.2.13 DC to 40GHz	E	-	-85	DB
10	Peak power	Para 13.2.14 of Generic specification and table 2 of this specification	**Final measurement** Attenuation	Table 1	Att	Table 1		
11	Permanence of marking	Para 13.2.16 of Generic specification	**Final measurement** Visual Examination	No corrosion or obliteration of marking	-	-		-

Notes:
(1) The tests in this table refer to either para 11 and 12 of Generic specification and shall be used as applicable
(2) Whichever is greater
(3) or ±0.1dB whichever is greater.