# HIGH RELIABILITY

## SEMI-RIGID

### COAXIAL CABLE ASSEMBLIES

<table>
<thead>
<tr>
<th>Rédigé par / Written by</th>
<th>Responsabilité / Responsibility</th>
<th>Date</th>
<th>Signature</th>
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</thead>
<tbody>
<tr>
<td>S. POIZAT</td>
<td>Space Project Manager</td>
<td>25/10/2016</td>
<td></td>
</tr>
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<table>
<thead>
<tr>
<th>Vérifié par / Verified by</th>
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<tr>
<td>V EUDELINE</td>
<td>Space B. U. Manager</td>
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<tr>
<th>Approuvée par / Approved by</th>
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<tbody>
<tr>
<td>C. DAVENEL</td>
<td>Space Quality Manager</td>
</tr>
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</table>
## DOCUMENTATION CHANGE NOTICE

<table>
<thead>
<tr>
<th>REVISION OR ISSUE</th>
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<tr>
<td>1</td>
<td>21/09/04</td>
<td>Creation</td>
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<tr>
<td>1 A</td>
<td>24/03/06</td>
<td>Updated with change of the reference of PAQ-A 010 by PAQP-A 020 in §2 Applicable Documents</td>
</tr>
<tr>
<td>2</td>
<td>06/07/07</td>
<td>Updated cable assembly part number paragraph 18</td>
</tr>
<tr>
<td>3</td>
<td>10/06/14</td>
<td>-Updated with new Radiall codification (§18): added two digits at the end</td>
</tr>
<tr>
<td>3 A</td>
<td>19/08/15</td>
<td>Updated with new level of vibration (random and sine in §14.5) to be compliant with ESCC specification</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Random: 38.5grms instead of 15grms</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Sine: 30grms instead of 15grms</td>
</tr>
<tr>
<td>4</td>
<td>25/10/201</td>
<td>Marking change: The Serial number configuration is modified (see §6.3)</td>
</tr>
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</table>
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1. SCOPE

This specification covers the general requirements for procurement, including final production, lot acceptance and qualification testing, and delivery of semi-rigid coaxial cable assemblies to be used in « HI-REL » applications.

This specification contains the appropriate inspection and test schedules and also specifies the data documentation requirements.
Cable assemblies are delivered under RADIALL Quality Assurance Label.

2. APPLICABLE DOCUMENTS

The latest issue for these documents is applicable:

<table>
<thead>
<tr>
<th>Document</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>RQM</td>
<td>RADIALL Quality manual</td>
</tr>
<tr>
<td>PAQP-A 0020</td>
<td>High Reliability Active Quality Assurance Plan</td>
</tr>
<tr>
<td>MIL C 17</td>
<td>Cables, Radio frequency, Flexible and semi-rigid, General specification for</td>
</tr>
<tr>
<td>MIL-STD-348</td>
<td>Radio Frequency connector - Interfaces</td>
</tr>
<tr>
<td>ECSS-Q-70-18A</td>
<td>Preparation assembly and mounting of RF coaxial cables</td>
</tr>
<tr>
<td>ESCC 3402</td>
<td>Connectors RF coaxial</td>
</tr>
<tr>
<td>RAD-GEN-CONN-001</td>
<td>Connectors RF coaxial, Radiall generic specification</td>
</tr>
</tbody>
</table>
3. **PIECE PART TECHNICAL DESIGN**

3.1. **Coaxial Connector**

All the technical requirements and dimensions are described in RADIALL detail Specification for coaxial connectors RAD-DET-CONN-001

3.2. **Semi-rigids Coaxial Cable**

All the technical requirements, dimensions, electrical and mechanical parameters are described in RADIALL Technical Specification for SHF coaxial cable RAD-DET-CABL-001

4. **PIECE PART PROCUREMENT**

4.1. **Connector**

<table>
<thead>
<tr>
<th>Piece part</th>
<th>Inspection and control</th>
<th>Document reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connector</td>
<td>Visual</td>
<td>PAQ A 010 for all cable assemblies</td>
</tr>
<tr>
<td></td>
<td>Conformity of plating</td>
<td>ESCC 3402 for cable assemblies with ESCC connectors</td>
</tr>
<tr>
<td></td>
<td>Dimensions</td>
<td>RADIALL specif. RAD-GEN-CONN-001 for cable assemblies with other Hi-Rel connectors</td>
</tr>
<tr>
<td></td>
<td>Electrical tests</td>
<td></td>
</tr>
</tbody>
</table>

4.2. **Semi-rigid coaxial cable**

<table>
<thead>
<tr>
<th>Piece part</th>
<th>Inspection and control</th>
<th>Document reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Semi-rigid Cable</td>
<td>Visual</td>
<td>RADIALL specif. RAD-APP-CABL-001</td>
</tr>
<tr>
<td></td>
<td>Dimensions</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Inspection tests</td>
<td></td>
</tr>
</tbody>
</table>

5. **INSPECTION & RIGHTS**

RADIALL shall be responsible of inspections performed during the complete manufacturing, the Final Production Tests and Lot Acceptance Tests.

6. **REQUIREMENTS**

The test requirements for procurement of qualified components shall only comprise Final Production Tests.

Connectors and cables could be also provided from different identified batches of previous manufacturing lots.

For LAT test (shall be specified in the order), the applicable tests shall included Final Production Test and LAT Tests. In case of several connector manufacturing lots, the LAT samples shall be constituted with connectors of each lot.

For Qualification (shall be specified in the order), the applicable tests shall included Final Production Tests and Qualification tests.
6.1. **Specifications**

Procurement and delivery of components shall be in conformity with this specification which shall apply in total unless otherwise specified in Detail Specification.

6.1.1. **Conditions and Methods of Test**

The conditions and methods of test shall be defined in § 14

6.1.2. **Manufacturer’s responsibility for performance of tests and inspections**

RADIALL shall be responsible for the performance of tests and inspections. These tests and inspections shall be performed in house. For qualification and Lot acceptance tests, tests could be performed by agreed external facilities.

6.2. **Deliverable components**

Cable assemblies delivered to this specification shall be processed in accordance with the relevant Product Quality Plan. Each delivered coaxial cable shall be traceable to its production lot. Coaxial cables delivered to this specification shall have completed satisfactorily all tests with the relevant testing level. If required in the order, Lot Acceptance Testing shall be performed after the complete manufacturing (assembly and final production tests).

6.3. **Marking**

Unless otherwise specified by the customer, the cable assemblies shall be marked with the following data:

- Radiall P/N: RXXXXXXXXXXXXXX or Customer Part Number if existing
- The lot number: year + week (4 digits) followed by Serial number (7 to 9 digits)

Example: R29408404000019  
1643 7830368

The serial number corresponds at the reference of Radiall order production. For each Radiall order production, there is ONLY one cable assembly. In this case, this number is unique. The number of the Radiall order production is incremented automatically by the Radiall ERP for each cable assembly to be manufactured.

**Note 1:**
For cable diameter .141 the marking is made on space qualified heat shrink tubes at the middle of the cable.  
For cable diameter .085 the marking is made on a label attached by a wire

7. **PRODUCTION CONTROL**

The minimum requirements for production control are defined in the Product Quality Plan.
8. **FINAL PRODUCTION TESTS**

8.1. **General**
All cable assemblies delivered and those submitted to Lot Acceptance Tests or qualification, shall be subjected to tests and inspections in accordance with the Paragraph 12 of this specification.

8.2. **Test Methods and Conditions**
Test methods and conditions are completely specified in the Product Quality Plan. The test sequence is described in the paragraph 12 (Final Production Test chart).

8.3. **Documentation**
Documentation of Final Production Test data shall be in accordance with the requirements of Para. 16 of this specification.

9. **FAILURES**
A component shall be counted as a failure in any of the following cases:
- Mechanical failure,
- Handling failure,
- Lost components
- Electrical failure

9.1. **Lot Failure during Final Production Tests:**
In case of failure, the manufacturer shall alert the Orderer within 2 working days.

9.2. **Lot Failure during Sample Testing for Qualification and Lot Acceptance Tests:**
A lot shall be considered as failed if the number of allowable failures during sample testing in accordance with General Inspection Level II of IEC Publication No. 410 is exceeded.
A component shall be counted as a limit failure if one or more parameters exceed the limit shown in the Detail specification.
If lot failure occurs, a 100 % testing may be performed with the relevant lot failure criteria.

9.3. **Failure Criteria**
The following criteria shall apply to qualification testing and to Lot acceptance tests

- **Environmental and Mechanical Test Failures:**
  Components which fail during tests for which the pass/fail criteria are inherent in the test method, e.g.; vibration, etc.

- **Electrical Failures:**
The following shall be counted as component failures: Components subjected to electrical measurement on completion of environmental and endurance tests which results are not in accordance with the Detail Specification.
10. QUALIFICATION TESTS

10.1. Qualification Testing

10.1.1. Sample Size
The sample sizes of the qualification and the applicable test requirements are specified in the paragraph 13 Qualification test Flow CHART.

10.1.2. Distribution within the Sample Lot for Qualification Testing
Cable assemblies from a same manufacturing batch, with a same coaxial cable part number as defined in paragraph 3 and same connector's interchangeability are considered as similar and belonging to a same family of cable assemblies. Sampling must be considered for each family.

10.1.3. Qualification Testing
The test sequence is described in the paragraph 13 (qualification Test flow chart).

10.2. Documentation
In the case of Qualification testing, the data shall be documented in accordance with the requirements of Para. 16.

11. LOT ACCEPTANCE TESTS

11.1. Lot Acceptance Testing
The sample size of the Lot Acceptance and the applicable test requirements are specified in the paragraph 13 Lot Acceptance Flow chart.
In case of several connector manufacturing lots, the LAT samples shall be constituted with connectors of each lot.

11.2. Documentation
In the case of Lot Acceptance testing, the data shall be documented in accordance with the requirements of Para. 16.
12. **FINAL PRODUCTION TEST FLOW CHART (100% TESTING)**

```
Connector interchangeability dimensions
  Ref. plane / center contact
  Ref. plane / insulator

Dimensions

Weight

Marking § 6.3

Insulation resistance § 14.10

Dielectric Withstanding Voltage § 14.2

V.S.W.R. § 14.3

Insertion loss § 14.4

External visual inspection § 14.1

Mating and unmating record

X Ray (1) § 14.7
```

(1) Test applied on the first cable assembly each working day
13. QUALIFICATION AND LOT ACCEPTANCE TEST FLOW CHART

**QUALIFICATION**
4 samples
(1 sample kept as a reference before vibration)

- Visual Inspection
  Para. 14.1

- X Ray
  Par.14.7

- Dielectric Withstanding Voltage
  Para.14.2

- VSWR
  Para. 14.3

- Insertion Loss
  Para.14.4

- Vibrations
  Para. 14.5

- Thermal Cycling
  (200 Cycles)
  Para. 14.8

- Insertion Loss and VSWR in T°C
  Para. 14.6

- Microsection
  (1 sample)
  Para.14.9

**LAT**
2 samples

---

**Note:**
1/ To cover the different type of connectors for 1 cable type, it is allowed to mix several types of connectors (straight, or right angle).

2/ The tests shown in this chart are considered to be destructive and therefore components so tested **shall not be used as flight models**
14. TESTS, METHODS AND PROCEDURES

14.1. Visual Inspection

This inspection shall be done by naked eyes (NE):

- Aspect of cable shall be free of any visual defect like stripes, pleats, notches that could impact the good working of the cable assembly.
- The marking on the thermal sleeves shall meet the requirements.
- Aspect of connectors shall meet the criteria required in MIL-PRF-39012 or ESCC 3402 specification when applicable (visual inspection of connector interfaces for plating damage, contamination and excessive wear should be carried out).
- All parts of cable assembly shall be cleaned, particularly in the connector interface areas.
- Connector orientation in accordance with customer requirements.
14.2. **Dielectric Withstanding Voltage**

*Method*
- Test according to MIL C 17 -
- Test voltage :AC 50 Hz, according to cable assembly Detail Specification.

*Requirement*
No breakdown after 1mn.

14.3. **VSWR Measurement**

The reflection coefficient or VSWR shall be measured in accordance with one of the following methods:

- Scalar method (test set-up shown in Figure 1
- Vector method (test set-up shown in Figure 2 or 3,

Across the full frequency range by the swept frequency technique or, alternatively, at fixed frequencies, equally spaced points (7 minimum) across the frequency range. The measured values shall not exceed those given in the Detail Specification.

The cable assembly must be connected to the standard precision adapter No. 3 (see figure 2 or 3). In the event of dispute, the vector method shall be used with the test set-up shown in Figure 2.
**Figure 1: SWEPT FREQUENCY TEST SET-UP - SCALAR METHOD**

![Diagram](image)

**Notes:**
1. In the case of swept frequency technique, the coupler No. 1 and the frequency meter are optional.
2. Or reflectometer bridge with a directivity better than 35 dB.
3. The reflection coefficient of the termination must be better than 0.017 (-35dB) in the test frequency range.

**Figure 2: SWEPT FREQUENCY TEST SET-UP – VECTORIAL METHOD (2 PORTS)**

1: Vector network analyser with RF generator and S parameter test set.
2-5: Cable assemblies.
3-4: Standard precision adapters

POSSIBLE CALIBRATION PLANES OF FULL TWO PORTS CALIBRATION
14.4. **Insertion Loss Measurement**

The cable assemblies shall be tested as shown in Figure 4 or 5. This measure includes the reflection losses of the cable assembly and dissipating losses.

In the event of dispute, the vector method shall be used with the test set-up shown in Figure 5.

**Procedure:**

The equipment is calibrated. Insert the cable assembly between the two ports. The insertion losses of the cable assembly are measured and the values are recorded. Measurement shall be performed across the full frequency range by the swept frequency technique or, alternatively, at fixed frequencies, equally spaced points (7 minimum) across the frequency range.

**Requirement:**

According to Detail Specification of cable assemblies.
Figure 4: SCALAR METHOD OF RF INSERTION LOSS MEASUREMENT

Notes: The attenuators 1, 2, 3 must be chosen so that the ratio of P1 to P2 is close to 1 (balanced power in the 2 arms of the test set-up).
The attenuators values must be large enough (6dB minimum) to cancel the reflections due to measurement accessories.
For example, selected attenuators might be as follows:
Attenuator 1 = 10 dB - Attenuator 2 = 10 dB - Attenuator 3 = 20 dB.

Figure 5: VECTORIAL METHOD OF RF INSERTION LOSS MEASUREMENT

1 : Vector network analyser with RF generator and S parameter test set.
2-5 : Cable assemblies.
3-4 : Standard precision adapters

POSSIBLE CALIBRATION PLANES OF FULL TWO PORTS CALIBRATION
14.5. Vibrations

According to MIL-PRF 39 012 § 4.6.15
REQUIREMENT: No discontinuity greater than 1 µs shall appear during the test. No visible damage on the cable assembly shall appear. During these tests, any continuity between the central and external conductors shall be checked, under a current of 100 mA max.

14.5.1. Sine Vibrations

According to ESA specification:

<table>
<thead>
<tr>
<th>SINE VIBRATION</th>
<th>Perpendicular to Mating plane (AXIS Z)</th>
<th>Parallel to Mating plane (AXIS X &amp; Y)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>5 to 26 Hz</td>
<td>11 mm (0 to Pk)</td>
</tr>
<tr>
<td></td>
<td>26 to 100 Hz</td>
<td>30g</td>
</tr>
<tr>
<td></td>
<td>2 oct/min</td>
<td>2 oct/min</td>
</tr>
</tbody>
</table>

Sweep frequency: 10-100-10Hz. For the entire frequency range of 10 to 100Hz and return to 10Hz, The slope rate shall be 2 oct/mn maximum
Total number of cycles: 9 (3 times in each of the 3 mutually perpendicular axes)

Tolerance: Amplitude: ± 10% m/s² Peak
Frequencies: ±2% or ±0.5Hz below 20Hz

14.5.2. Random vibrations

<table>
<thead>
<tr>
<th>RANDOM LEVELS</th>
<th>Perpendicular to Mating Plane (Axis Z)</th>
<th>Parallel to Mating Plane (Axis X and Y)</th>
</tr>
</thead>
<tbody>
<tr>
<td>RANGE (Hz)</td>
<td>LEVEL (Hz)</td>
<td>LEVEL (Hz)</td>
</tr>
<tr>
<td>20-50</td>
<td>+6dB/oct</td>
<td>20-50</td>
</tr>
<tr>
<td>50-400</td>
<td>2 g²/Hz</td>
<td>50-400</td>
</tr>
<tr>
<td>400-800</td>
<td>-6dB/oct</td>
<td>400-800</td>
</tr>
<tr>
<td>800-1000</td>
<td>0.5 g²/Hz</td>
<td>800-1000</td>
</tr>
<tr>
<td>1000-2000</td>
<td>-6dB/oct</td>
<td>1000-2000</td>
</tr>
<tr>
<td>GLOBAL : 38.5 grms</td>
<td>GLOBAL : 38.5 grms</td>
<td></td>
</tr>
</tbody>
</table>

Test duration: 3 mn per axis

Tolerances frequency: ± 1.5dB for 20 Hz ≤ f ≤ 300 Hz,
± 3 dB for 300 Hz ≤ f ≤ 2000 Hz,
± 1dB overall.
14.6. **Insertion Loss and VSWR in temperature**

**Method**
The cable assembly shall be submitted to the following cycles:
- 1 hour at maximum operating range ± 5°C
- Measurement according to Radiall procedure FIQL-ES-114
- 1 hour at minimum temperature range ± 3°C
- Measurement according to Radiall procedure FIQL-ES-114
- 3 cycles shall be made

- The insertion loss drift requirement in temperature shall be calculated using the following formula:

\[
\Delta \alpha_0 = \alpha_{25\,^\circ C} \times (\theta - 25) \times 0.25 \times 0.25 \times 100
\]

Room Temperature

With
- \( \Delta \alpha_0 \) = Insertion loss drift at temperature \( \theta \) (°C) in dB
- \( \alpha_{25\,^\circ C} \) = Insertion loss at 25°C in dB
- \( \theta \) = Temperature in °C (high or low)

- For each cable assembly, the insertion loss drift is calculated with the following formula:

\[
\Delta \alpha_{(dB)} = \alpha_0 - \alpha_{25\,^\circ C}
\]

With \( \alpha_0 \) = Insertion loss(dB) in temperature (°C)

**Requirement**
- According to Detail Specification of cable assemblies.
- Interface dimensions.

14.7. **X-Ray**

- Radiographs shall be taken of the solder joints between the outer conductor of the cable and the connector and the pin and centre conductor.
- The solder in the joint between the pin and the cable centre conductor shall be in contact with at least 50% of the available surfaces between the pin and the centre conductor.
- The centre conductor of cable shall be inserted into the contact hole for a minimum of 80% of the allowable length.
- The outer conductor of the cable to the body soldered joint shall show evidence of continuous fill at the cable end. The joint shall be soldered with a maximum of 30% voids. The voids being assessed as two time the area of the voids on the radiograph.
14.8. **Thermal Cycling**

- **VSWR**
  - Para. 14.3

- **Insertion-Loss**
  - Para. 14.4

**THERMAL CYCLING**
- 200 Cycles
  - Para. 14.8

- **VSWR**
  - Para. 14.3

- **Insertion-Loss**
  - Para. 14.4

**Connectors Interface Dimensions**

**Process:**
- Each connector shall be connected with its mating part (connector for general purpose).
- Temperature range: Operating Temperature Range as defined in Detail Specification of cable assemblies.
- 15 mn at each extreme temperature.
- Temperature variation: 10°C/mn max.

14.9. **Microsection**

Microsection shall be performed on a longitudinal axis. A visual inspection is performed and no visible damage shall appear.
14.10. **Insulation Resistance**

Insulation resistance shall be tested in accordance with MIL-C-17. The insulation resistance between the inner and outer conductor of each cable assembly shall be not less than 200 MΩ under a voltage of 500Vdc. The measurements shall be read after 1 minute of voltage application.

15. **PACKAGING**

Each cable assembly is delivered in a waterproof bag static free, with a desiccator. Each connector shall be protected by a cap (no PVC should be used).

In addition, the static bag shall be packed in a second bag with a rigid cardboard.

16. **DELIVERABLE DOCUMENTS**

For each flight model deliverable unit, an End Item Data Package (EIDP) shall be compiled. Unless otherwise specified by the customer, as minimum, the EIDP will contain:
- Record of mating and unmating
- Record of VSWR and insertion loss (numeric or graphic),
- Final inspection record,
- Non conformance reports,
- Radiographs (if required)
- Certificate of conformance

For LAT and qualification model a complete test report shall be compiled for each item.

17. **POWER HANDLING UNDER VACUUM**

One or more mechanisms may limit the power capability of a coaxial cable assembly during high power operation. The most common limiting phenomenon is thermal breakdown. This is caused by heating within the cable and connectors due to power dissipation. In addition under low pressure environment like space vacuum, the power can be also limited by multipaction and ionization effects.

**Thermal Breakdown:**
Thermal Breakdown is due to overheating: The temperature of the cable assembly is the result of the balance between heating due to power dissipation (linked to Loss) and thermal dissipation (Thermal conduction through center conductor and insulator and outer conductor + radiant emission towards environment).
Power Limitation due to thermal breakdown decreases with frequency because insertion loss increases at high frequency. In Radiall SR cable assembly, this limit is given by cable power handling and depends on cable type. Power derating curves for each type of cable assembly are given in Detail Specification RAD-DET-CSRS-002.
Ionization and multipactor breakdown:
These phenomena are electron discharges that may occur in a 50 ohm coaxial line in the presence of a periodic RF/ Microwave field under low pressure. Both are limited by the presence of dielectric so the critical area in cable assemblies are usually air gaps between outer and inner conductors inside coaxial connectors. They are linked to the frequency-gap product to they decrease when frequency increases or/and when size of connector increases.
Multipaction requires a high vacuum condition (below $10^{-5}$ torr) so it is more common than ionization which requires partial pressure conditions that are unlikely to occur in space (except in case of outgassing).

In summary, the power handling of a cable assembly in space conditions is limited by multipactor effect at low frequency then by thermal and/or ionization breakdown when frequency increases. The power derating curves of different cable assemblies are given in Detail Specification RAD-DET-CSRS-002.

Power handling and multipactor testing are not included in qualification and LAT tests sequences: The results of this kind of test depend on frequency and signal configuration (single carrier, multi carriers…) and it is impossible to verify the complete derating curve by a test.
Based on margin analysis, the customer can decide that a test in real condition of the program is necessary, cost and conditions have to be discussed with the customer.
18. CABLE ASSEMBLY PART NUMBER:

First part

\[ R \ 2 \ 9 \ 4-XX\ Y\ Y\ Z\ Y\ Z-B\ B\ B\ B \]

Cable P/N

<table>
<thead>
<tr>
<th>Connector 1 P/N / serie</th>
<th>Connector 2 P/N / serie</th>
</tr>
</thead>
<tbody>
<tr>
<td>Y : Series</td>
<td>Y : Series</td>
</tr>
<tr>
<td>Z : Type</td>
<td>Z : Type</td>
</tr>
</tbody>
</table>

(1): One Radiall P/N correspond at one cable assembly configuration including the type of cable, the type of each connectors, the length and 3D design of the cable assembly, the angle between the connectors, frequency range.

Cables P/N (2) - XX

<table>
<thead>
<tr>
<th>Cables P/N (2) - XX</th>
</tr>
</thead>
<tbody>
<tr>
<td>08 : SR cable UT85 C M17</td>
</tr>
<tr>
<td>09 : SR cable UT85 C LL</td>
</tr>
<tr>
<td>14 : SR cable UT141 HA M17</td>
</tr>
<tr>
<td>15 : SR cable UT141 C LL</td>
</tr>
<tr>
<td>25 : SR cable UT250A M17</td>
</tr>
</tbody>
</table>

(2) As described in RADIALL technical specification for SR cables: RAD-DET-CABL-001

<table>
<thead>
<tr>
<th>Connector P/N – Series (3) - Y</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 : Not used</td>
</tr>
<tr>
<td>1 : Not used</td>
</tr>
<tr>
<td>2 : Not used</td>
</tr>
<tr>
<td>3 : Not used</td>
</tr>
<tr>
<td>4 : ESCC SMA</td>
</tr>
<tr>
<td>5 : ESCC SMA 2.9</td>
</tr>
<tr>
<td>6 : ESCC TNC DC-18GHz**</td>
</tr>
<tr>
<td>7 : Radiall High power TNC</td>
</tr>
<tr>
<td>8 : Radiall SMA</td>
</tr>
<tr>
<td>9 : Radiall SMA2.9</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Connector P/N – Type - Z</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 : Straight plug</td>
</tr>
<tr>
<td>1 : Right angle plug</td>
</tr>
<tr>
<td>2 : Swept plug</td>
</tr>
<tr>
<td>3 : Straight jack</td>
</tr>
</tbody>
</table>

(3) As described in RADIALL technical specification for coaxial connectors: RAD-DET-CONN-001