ACR South Africa

Production Acceptance and Test Specification

Company	**:**	***ACRSA*** **a division of** ***CHELTON AVIONICS*** **(Pty) Ltd.**
Document Title	**:**	***PATS: Electronics MK II Final Assembly***
Document Number	**:**	***PH0200-0064-DPA***
Issue	**:**	**One**
Release Date	**:**	***18.07.2000***
Change Note No.	**:**	***First issue***
Originator	**:**	***CP Joubert***
Approval (CEO)	**:**	**DR DF Frost**

Applicable Documentation

Document numbers		Document titles
ISO 9001:1994	**:**	*Quality Systems - Model for quality assurance in design, development, production, installation and servicing*
PH0000-0053-DQM	**:**	*ACRSA TelluSART Quality Plan*
PH0000-0054-DQM	**:**	*ACRSA TelluSART MRI*
PH0200-0064-DTS	**:**	*Test Results Sheet: SART Electronics Final Assembly*

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Amendment No.	Page Nos.	From Issue	To Issue	Date	Incorporated By
ORIGINAL adapted from Halleria PH0200-001-2	ALL	-	1	18.07.2000	CP Joubert

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1 PART 1 : INTRODUCTION

1.1 General Description

This document identifies the Production Acceptance and Test Specification (PATS) for the TelluSART MK II Electronics Final Assembly.

The receiver sensitivity and output power specifications relate to EIRP, or Effective Isotropically Radiated Power, or the radiated power expressed in dBm over an isotropic antenna.

Figure 1 is the block diagram of the Electronic Assembly Type 3A.

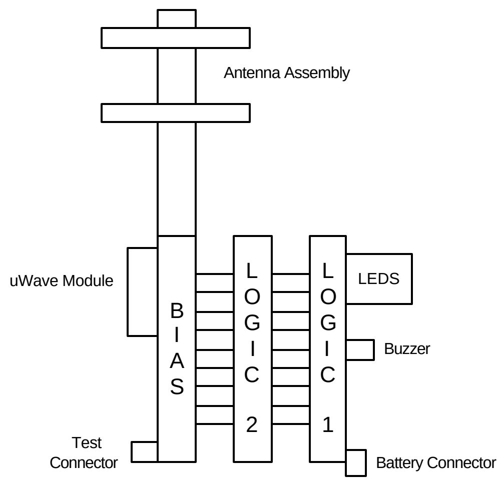

FIGURE 1: ELECTRONICS ASSEMBLY

1.1.1 List of Electronic Sub-Assemblies

PH0200-0026-AP3 : Microwave Bias Assembly

PH0200-0027-AP3 : Logic 1 Assembly

PH0200-0028-AP3 : Logic 2 Assembly

PH0200-0029-AA1 : Antenna and Bracket Assembly

1.1.2 Next Higher Assembly

PH0200-0064-AA1 : TelluSART MK II Assembly

1.1.3 Connection Details

a. **Battery supply connector**

The connection to the battery assembly is via a 3-pin, R/A, PCB mount, 0.1" spacing, MOLEX connector, PL4, located on the logic 1 pcb of the logic assembly.

pin 1	0V VBAT
pin 2	RAMP (for test purposes)
pin 3	VBAT

b. **Test connector**

A vertical, PCB mount, 4 pin, 0.1" spacing, MOLEX connector, PL3, is provided on the bias PCB assembly to facilitate further test features. Refer to para 2.3.1.d for further details.

pin 1	GND2
pin 2	RX INHIBIT
pin 3	EXT TRIGGER
pin 4	RAMP VOLTAGE

1.2 Circuit Description

The circuitry for the Electronic Assembly Type 3A can be divided into three main sub-assemblies:

a. Logic assembly

b. Microwave bias assembly

c. Antenna assembly

1.2.1 Overall Operation

When the unit is switched on, both the yellow and green LEDs flash quickly and the buzzer gives a rapid pulsed sound for about one second indicating that the unit has woken up, and the battery voltage is above 10.5 V. The unit then goes into the RECEIVE MODE, where the yellow LED flashes slowly, the green LED goes out, and the unit waits to receive a trigger pulse.In RECEIVE MODE, only the receiver section is powered, to minimize current consumption. The current consumption in this mode is approximately 40mA.

If the unit receives a single trigger pulse, the unit switches to STANDBY MODE. In this mode, current consumption increases to approximately 75mA, and the Transmitter and VCO section is enabled to reply within 500ns to the next trigger pulse received.

Any further trigger pulse received will cause the unit to switch to REPLY MODE. Again both LEDs flash quickly and the buzzer gives a rapid pulsed sound for about one second. In this mode, the unit replies to each trigger pulse by transmitting a series of 12 sawtooth shaped sweeps across the 9.2 to 9.5 GHz frequency band in a time of $\leq$ 100 µs. After each reply is completed, the unit will return to STANDBY MODE. If the unit is repetitively triggered with a period of less than one second, then the indicators will indicate REPLY MODE continually. If no more trigger pulses are received for a period of 10s, the unit returns to the RECEIVE MODE.

1.2.2 Logic Assembly

Refer to PATS, Logic 1 and Logic 2 Assembly, PH0200-0027-DPA.

The logic assembly performs all the control functions of the SART unit and provides interfacing signals to the microwave circuitry, which is part of the microwave bias assembly. The following functions are performed:

a. -7,5 V bias circuitry supply voltage to the microwave bias assembly.

b. +2,5 V LNA supply voltage.

c. +6,5 V switched supply to provide fast switch on and off of VCO and power amplifier chain of the microwave assembly.

d. -2 V negative bias supply voltage to the microwave assembly.

e. +8,5 V supply to provide bias to the video amplifier.

f. Provides a DC ramp voltage (in REPLY mode) with manual adjustment of offset voltage and range, as the tuning voltage for the VCO. (Nominal voltage range of 0 V to +4 V.)

g. Provides temperature compensation to the ramp voltage to accommodate temperature changes of the VCO.

h. In REPLY MODE, provides control so that 12 sawtooth shaped ramps are applied to the VCO. Each ramp consists of an up ramp and a down ramp.

i. Provides visual and audio indication of the mode in which the unit is presently operating.

j. Provides indication of flat battery.

k. Provides dead-time after the end of a reply pulse to prevent self-triggering.

l. Provides drive signals to operate the TX/RX diode switch.

The logic assembly interfaces with the hybrid bias assembly via a 12-way square pin header, soldered into position on each side, i.e., at each assembly. Provision is made so that a connector can be fitted in place of the direct solder method, if the need for easier re-work is required.

1.2.3 Microwave Bias Assembly

Refer to PATS, Microwave Bias Assembly, PH0200-0026-DPA. The Microwave bias assembly provides the following functions:

a. VCO and power amplifier to generate frequency in the range 9,14 to 9,56 GHz, at a power level ≥ 26 dBm.

b. A receive chain consisting of limiter, LNA, and detector diode to provide DC envelope pulses of received RF pulses.

c. A video amplifier to amplify the DC envelopepulses, and a high speed comparator to detect and latch the pulses.

d. TX/RX diode switch to provide isolation of the transmit and receive paths from the same antenna.

e. Microstrip to coaxial transition for antenna connection.

The Microwave bias assembly interfaces with the logic assembly via a 12-way square pin header, soldered into position on both assemblies. Provision is made so that a connector can be fitted in place of the direct solder method.

1.2.4 Antenna and Bracket Assembly

The antenna and bracket assembly is essentially a slotted waveguide antenna that interfaces to the Microwave bias assembly, via the coaxial transition pin. The antenna is fixed in position via the bracket and 2 studs that protrude from the bottom of the Microwave Bias Assembly.

1.3 Environmental Specification

Operating temperature range:	-20^{o}C to +55^{o}C
Storage temperature range:	-30^{o}C to +65^{o}C
Relative humidity:	Not applicable.
Operational altitude:	Not applicable.
Vibration:	MIL-STD-810D Transport vibration method 514.3.

1.4 Applicable Documents

PETP, Production Electrical Test Plan, TelluSART MK II, PH0200-0001-DPP

PATS, Logic 1 and Logic 2 Assembly, PH0200-0027-DPA

PATS, Microwave Bias Assembly, PH0200-0026-DPA

Assembly drawing, Electronics MK II Final Assembly, PH0200-0064-DM0

Burn-in Specification, TelluSART MK II, PH0200-0001-DPB

1.5 Safety Requirements

WARNING: DO NOT ALLOW EYES WITHIN 20 CENTIMETRES OF THE ANTENNA WHEN THE SART UNIT IS TRANSMITTING.

2 PART 2 : PRODUCTION ACCEPTANCE

2.1 Test Conditions

2.1.1 General

a. All tests are to be carried out at room temperature (+20°C ± 3°C) unless otherwise specified

b. Personnel must heed the warning in para. 1.5

c. The tests are to be carried out in a shielded anechoic area

d. Test Signal Description. There are a number of stimulus signals required during the tests. These are described in Appendix A - Description of Stimulus Signals

e. The received sensitivity and output power specifications are specified according to EIRP (refer to Appendix C).

f. The radome referred to in the specification refers to the top section (just above the window) cut off a standard plastic housing, CASE MOULDING, Pt.No. PH0200-0069-AM0-0. This is placed over the antenna of the UUT. Refer to part 3 for test equipment number of standard test part.

2.1.2 Test Sequence

The following sequence shall be followed when performing the tests on the unit.

a. Frequency Range Adjustment. Refer to para. 2.3.1.a (ii)

b. Acceptance Testing.

2.2 Power Requirements

The unit requires power supplies for VBAT of 10,5 V to 16,0 V, at 1 A. The supply must be able to deliver full voltage (≤ 500 mVp-p ripple) with 100 µs current pulses of 1 A at a PRF of 1 kHz. (This can be achieved by connecting a suitable reservoir capacitor across the supply terminals.) The power supply is to have an adjustable current limit.

2.3 Performance Requirements

2.3.1 Electrical

The following specifications must be met at room temperature (20°C ± 3°C) when the unit is triggered with Test Signal 1 (refer to Appendix A) and a supply voltage VBAT of 12 V ± 1 V, or unless otherwise specified.

a. **Transmitted signal parameters**

i. Sweep characteristics

These measurements can only be performed with a calibrated frequency discriminator set as follows:

Number of sweeps: 12

Sweep frequency:	Each sweep to cover the range: Bottom: 9,140 to 9,200 GHz Top: 9,500 to 9,560 GHz.
Forward sweep time:	7,5 µs ± 1 µs
Return sweep time:	400 ns ± 100 ns

ii. Transmitted frequency range

This measurement can be performed using a spectrum analyzer. The unit should be initially set up with the following frequency range:

Bottom frequency:	9,140 GHz to 9,200 GHz
Top frequency:	9,500 GHz to 9,560 GHz

The frequencies are measured at the -3 dB points relative to the average peak amplitude. Refer to Appendix B.

NOTE: This adjustment is to be performed at an ambient temperature of 20^{o}C ± 3^{o}C.

iii. Output power

The output power specification relates to the average pulse power (averaged over the pulse width) expressed in terms of EIRP, transmitted by the UUT, on the horizontal plane, centrally between the two discs of the UUT antenna.

Average pulse power: > 26 dBm (with radome)

iv. Antenna characteristics

Polar average pulse power variation:

≤ 4.0 dB ± 0.1 dB calculated from the (maximum - minimum) power levels recorded through a rotation of 360^{o}.

b. **Received signal parameters**

i. Sensitivity

The receiver sensitivity is defined as that RF power (EIRP) at the UUT antenna (when interrogated with Test Signal 1, Appendix A), that causes the average UUT transmission to drop to 75% of the value at the 100% reply rate, using an averaging time constant of 0,755 – 0,255 s.

The sensitivity specification relates to power received on the horizontal plane, centrally between the two discs, of the UUT antenna. The measurement is to be done at the position of lowest sensitivity found through a rotation of the UUT through 360^{o}.

Specification:

9,200 GHz ± 0,005 GHz
- 51,5 dBm ± 1,5 dBm with radome

9,350 GHz ± 0,005 GHz
- 51,5 dBm ± 1,5 dBm with radome

9,500 GHz ± 0,005 GHz
- 51,5 dBm ± 1,5 dBm with radome

c. **PSU current**

i. Receive mode: ≤ 45 mA

ii. Receive mode: ≤ 80 mA

iii. Reply mode: ≤ 125 mA average with test signal 1

d. **Operation of the test connector**

The 4 pin test connector PL3 on the hybrid bias assembly allows the following.

i. Inhibit triggering of the unit via the receiver

This is achieved by grounding the RX_INHIBIT signal (pin 2) to GND2 (pin 1). For normal operation, the RX_INHIBIT signal is left unconnected.

ii. Allow external triggering of the unit, using a dc trigger pulse.

This is achieved by applying the trigger pulse signal to EXT_TRIGGER (pin 3) referred to GND2 (pin 1).

The external pulse should have the following specifications:

PRF: as required (usually 1 kHz ± 0,01 kHz)

PW: 500 ns to 1 µs

Amplitude: positive pulse 1 V to 8,0 V maximum referenced to GND2.

iii. These features are most likely to be of use during burn-in, where the units need to be exercised, but the triggering of one SART by another is to be prevented.

iv. If the receiver inhibit is not used, then triggering can occur via the receiver or via the EXT_TRIGGER input.

2.3.2 Mechanical

None.

2.3.3 Interchangeability

Assemblies of the same part number and at the same issue state are completely interchangeable.

2.3.4 Installation

The Electronics MK II Final Assembly to be tested requires a test housing in which it is inserted before testing. This housing provides mechanical support and also allows easy access to the various trimpots that need to be adjusted. This practice also allows direct follow through with burn-in (when required), as the burn-in is performed with the assembly NOT assembled into the housing.

3 PART 3 : PRODUCTION TEST REQUIREMENTS

3.1 Test Equipment

a. Power supply:

Adjustable 10,5 V to 16,0 V, 1 A. Adjustable current limit. PSU must be capable of handling 100 µs 1 A pulses without excessive volt drop. A reservoir capacitor across the terminals will suffice.

b. CW generator:

Custom microwave source. Outputs 9,20 GHz / 9,35 GHz / 9,50 GHz. – TE 90553.

c. Pulse modulator:

Pulse width 500 ns. PRF 1.0 kHz. Output voltage 5,0 V into 50 - HP 11720A.

d. Power meter:

Capability of entering power offset and duty cycle. Max. input power 0 dBm. Frequency 9,0 GHz to 10,0 GHz. (HP475A) plus power sensor

e. Spectrum analyzer:

Frequency 9,0 GHz to 10,0 GHz. Image filter. 100 kHz resolution bandwidth. Frequency measurement markers. (e.g.HP8569A)

f. Circulator:

Frequency 9,0 GHz to 10,0 GHz. Isolation ≥ 20,0 dB. Insertion loss ≤ 1,0 dB

g. Horn antenna:

Standard gain horn (approx. 15 dB). Frequency 9,0 GHz to 10,0 GHz. Fitted with waveguide to coaxial adapter, SMA connector. (Narda)

h. Rotator:

For performing polar power measurement at 0°, 90°, 180°, 270°.

i. 3 dB Power Splitter:

Frequency 9,0 GHz to 10,0 GHz, SMA connector

j. Anechoic area:

500 x 500 x 500 mm with radar signal absorbent material on 3 sides – left, right and back.

k. Standard test radome:

TE93575

l. Miscellaneous:

Cables: SMA, BNC coaxial. Various discrete components and connectors.

3.2 Preparation

3.2.1 Test Connections

Figure 2 is a block diagram of the test set-up arrangements.

a. **Frequency range adjustment**

NOTE: This procedure assumes that the frequency measurement will be performed using a spectrum analyzer.

Refer to Appendix B.

i. Before commencing any tuning, ensure that the assembly has stabilized to room temperature (20^{O}C ±3^{O}C) for at least one hour.

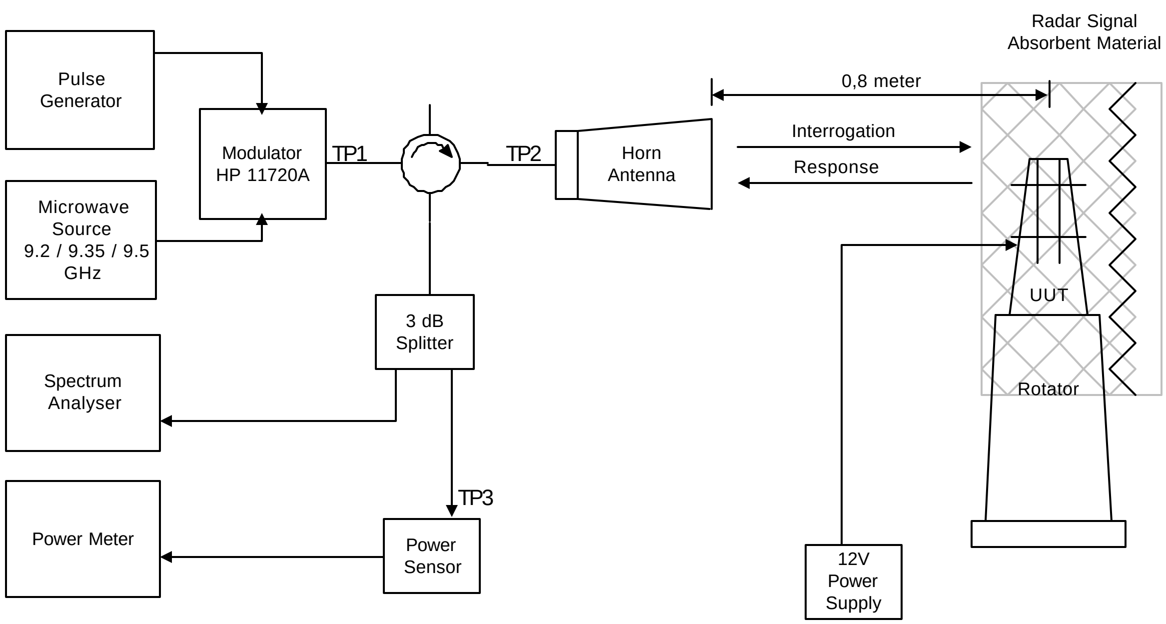

FIGURE 2: TEST STATION SET-UP

ii. Place the UUT on the rotator in the anechoic area. With the supply switched off, plug the power cable into the connector at the bottom of the assembly. 0Record the serial number of the UUT on the test result sheet.

iii. Before applying power to the assembly, set the power supply current limit to 1 A and the voltage to 12,0 V ± 0.1 V.

iv. Switch on the unit and ensure that the supply is not current limiting. If so, switch off immediately and try to ascertain where the fault is.

NOTE: The correct operation is that at switch-on the two LEDs should both flash and the buzzer give a pulsed sound for about one second, after which only the yellow LED should begin to flash slowly.

v. Interrogate the unit with test signal 1.

The two LEDs should begin to flash accompanied by a pulsed tone from the buzzer.

vi. Monitor the transmitted output on the spectrum analyzer as specified in Appendix B.

vii. Using the adjustable trimpots on the logic assembly, adjust the voltage offset and range of the ramp signal, until the spectrum is covering the 9.170 GHz to 9.530 GHz range, measured at the approximate -3 dB point, refer to Appendix B.

The trimpots on the top PCB of the logic assembly (i.e., the one with the LEDs) which need to be adjusted are as follows:

RV1 Ramp range

RV3 Ramp offset

RV4 Set to Maximum counter-clockwise.

NOTE: The two settings are not independent. Therefore altering one will affect the other.

viii. Record the upper and lower –3dB frequencies on the test result sheet.

ix. Once the unit is transmitting over the correct frequency range, the rest of the acceptance testing can continue.

b. **Setting up UUT for production acceptance testing**

i. Ensure that the acceptance test equipment has been calibrated, refer to calibration procedure in test engineering documentation.

ii. Check the orientation of the UUT. The UUT should be oriented so that the LEDs are directly facing the measurement horn antenna. This is the reference position 0^o.

iii. Ensure that the centre of the horn antenna lines up horizontally with the centre of the antenna of the UUT. Measure the distance from front edge of horn antenna to centre of UUT antenna. This is the measurement distance L_{meas}. Move the horn antenna until $L_{meas} =$ 1.00 meter.

iv. Using the RF source and the power meter, measure the total cable loss including the circulator loss, P_{cable} [dB].

v. Enter the duty cycle factor of 9.48% into the power meter.

vi. Enter the total loss factor into the power meter. The total loss factor is:

$$
\begin{aligned}
Ploss &= P_{cable} + P_{Ant} + P_{Path}\ [dB] \\
&= P_{cable} + 15\ dB - 50\ dB\ (approx.) \\
&= P_{cable} - 35\ dB\ (approx.) \\
&= -43{,}7\ dB\ (approx.)
\end{aligned}
$$

vii. Place the supplied radome over the antenna.

viii. a. Setup for interrogation with Test Signal 1. Keep interrogation OFF.

b. Switch on UUT supply. Ensure unit powers up correctly, refer to para. 3.2.1.b.iv. Switch on interrogation signal and check that the unit is triggering. Switch interrogation signal off.

The unit is now ready for the completion of the acceptance tests.

3.3 Production Acceptance Test Procedures

3.3.1 Supply Current Test

1. Monitor the current in the supply leads to the UUT.

2. Switch the unit on with NO trigger pulses.

3. Adjust RV on Microwave Bias Assembly to set $I_{receive}$ = 40 mA ± 2 mA

4. Record the average supply current $I_{receive}$ on the test result sheet.

5. Interrogate the unit with test signal 1.

6. Switch off the test signal. Record the average supply current $I_{standby}$ within 5 secs on the test result sheet.

7. Interrogate the unit with test signal 1.

8. Record the average power supply current I_{reply} on the test result sheet.

3.3.2 Transmit Power Measurement

1. Switch the interrogation signal on (f = 9,350 HGz)

2. Measure the output power on the power meter and record the result on the test result sheet.

3. Rotate the UUT through + 90 deg. Measure the output power on the power meter and record the result on the test result sheet.

4. Rotate the UUT through + 180 deg. Measure the output power on the power meter and record the result on the test result sheet.

5. Rotate the UUT through + 270 deg. Measure the output power on the power meter and record the result on the test result sheet.

6. Rotate the unit back to 0 degrees.

3.3.3 Receive Sensitivity Measurement

1. Set the interrogator frequency to 9,350 GHz.

2. Reduce the interrogation signal strength until the reply rate begins to drop. This is observed by a sudden drop of 0,2 dB or more in the reading on the power meter and by the onset of the “breaking up” of the spectrum observed on the spectrum analyser.

3. Note the output signal level (S_{meas})of the RF generator.

4. Calculate the actual sensitivity as follows:
   $$\begin{aligned} S_{actual} &= S_{meas} - P_{cable} - P_{path} \\ &= S_{meas} - 3\text{ dB (approx.)} - 50\text{ dB (approx.)} \\ &= S_{meas} - 53\text{ dB (approx.)} \end{aligned}$$

5. Record the actual sensitivity on the result sheet.

6. Set the RF signal generator to 9,200 GHz and repeat the sensitivity measurement and calculation and record the result on the result sheet.

7. Set the RF signal generator to 9,500 GHz and repeat the sensitivity measurement and calculation and record the result on the result sheet.

3.4 Test Results

3.4.1 Test Results Sheet

Test results are reported on Test Results Sheet PH0200-0064-DTS

3.4.2 Typical Results

The following is a typical set of test results:

a. **Supply current**

$I_{receive}$:	40,2 mA average
$I_{standby}$:	75,0 mA average
I_{reply}:	119 mA average

b. **Frequency range**

These results would be obtained if a spectrum analyzer was used to measure the frequency range:

Top frequency:	9,170 GHz
Bottom frequency:	9,530 GHz

c. **Horizontal polar power measurement**

Typical output power: 28 dBm ± 1 dBm.

d. **Typical receive sensitivity**

9,20 GHz:	– 55 dBm
9,35 GHz:	– 52 dBm
9,50 GHz:	– 51 dBm

APPENDIX A: DESCRIPTION OF STIMULUS SIGNALS

TEST SIGNAL 1:

Interrogate the unit with RF pulses transmitted to the UUT antenna as follows:

Frequency:	9,200 GHz; 9,350 GHz; 9,500 GHz ± 0,050 GHz. Tests are to be carried out at 9.350 GHz unless otherwise specified.
Width:	500 ns ± 50 ns (90% values)
Rise time:	20 ns ± 5 ns (10% to 90% values)
Fall time:	20 ns ± 5 ns (10% to 90% values)
PRF:	1 kHz ± 0,01 kHz
Power level:	15 dB above SART sensitivity specification, i.e., -35 dBm at the UUT antenna, unless otherwise specified. For sensitivity measurements the power level needs to be adjustable from -60 dBm to -30 dBm at the UUT antenna (EIRP values).

APPENDIX B: PERFORMING FREQUENCY RANGE MEASUREMENT ON SPECTRUM ANALYZER

The following is the recommended method for performing frequency range measurement using a spectrum analyser (Hewlett Packard HP8569A):

View the return signal on a spectrum analyser set to the following.

Centre frequency:	9,35 GHz
Span:	2 GHz (750 MHz)
Resolution BW:	2 MHz
Video BW:	2 MHz
Sweep time:	1 second
Amplitude scale:	5 dB/DIV

Measure the bottom and top frequencies at the –3 dB point. Using the display line in the TRACES menu does this. Set the display line to run through the approximate average value of the top of the signal. Bring the display line down by 3 dB using the step down button. Use the marker to determine the frequency at which the display line cuts the signal at the bottom and top points.

APPENDIX C: PATH LOSS CALCULATIONS

For the power and sensitivity measurements it will be necessary to calculate the attenuation of a signal propagating in free space, over a certain distance, or the path loss.

The formula for such a calculation is as follows:

Let distance between UUT and front of measurement horn antenna = L_{meas} [m]

Frequency = f [GHz], Path Loss = P_{loss} [dB],

$\lambda = \frac{0{,}3}{f}$ [m] where f is in GHz. $P_{loss} = 20 \log_{10} \frac{(\lambda)}{(4 \times \pi \times L_{meas})}$ [dB]

For power measurement, take the frequency as being the average frequency, which is f = 9.35 GHz. For sensitivity measurements the path loss can be calculated for each of the three frequencies 9.20, 9.35, 9.50 GHz. The table below shows the path loss at 1.0 m for frequencies of 9.20, 9.35, 9.50 GHz.

f [GHz]	L_{meas} [m]	P_{loss} [dB]
9,2	0,8	–49,77
9,35	0,8	–49,92
9,50	0,8	–50,05

EIRP: Effective Isotropically Related Power. This is a useful tool in describing the performance of a system where the antenna gain is not known, and not required.

It gives the equivalent power transmitted or received by a system if it had a perfect isotropic antenna with gain 0 dB.

APPENDIX D: SETUP AND CALIBRATION PROCEDURE FOR TELLUSART ACCEPTANCE TESTING

STEP 1. To determine the available RF power levels at the RF source output.

Set the signal source attennuators to 0.

On the HP Modulator (HP 11720) disconnect the TTL input and select COMPL on the MODE Switch. (This enables the modulator to pass a CW signal unhindered)

Connect the Power Probe of the HP Power Meter (HP 437B) directly to the OUTPUT of the Modulator. (TP1). Ensure that the Power Meter is calibrated for CW mode and zero offset. Terminate the unused output of the 3dB splitter to 50 ohm.

Record the RF power levels at the three available frequencies, 9,2 GHz, 9,35 GHz, and 9,5 GHz on the **Calibration Result Sheet**.
Typical values are –10dBm to –12dBm.

STEP 2. To determine the RF power at the input to the Transmit Antenna (+15dB Horn Antenna)

Disconnect the cable to the antenna (TP2).

Connect the Power Meter probe (still calibrated for CW mode) at TP2 and record the RF power levels at the three test frequencies, 9,2; 9,35; 9,5GHz.

STEP 3. Determine the cable loss from Modulator to Antenna (TP1 to TP2)

Calculate the cable loss at each frequency by determining the difference between the RF power available at the modulator output port (Step 1) and the RF power available at the antenna (Step 2).

Record these values of cable loss. Typical value: –3 dBm.

STEP 4. Power Level at Power Sensor

Connect the poer sensor to TP3 (normal position). Connect the antenna cable TP2 to the modulator output. Measure the available power at the power sensor and record the result on the test results sheet.

STEP 5. Cable loss from Antenna to Power Meter (TP2 to TP3)

Calculate the cable loss from the modulator to the power sensor (TP2 to TP3) by determining the difference between the power output of the modulator (Step 1) and the power at the power sensor (Step 4). The typical value is approximately 9 dB. As the power meter averages the reading across the frequency band, use the values at 9,35 GHz.

STEP 6. Setup the Power Meter for pulsed RF measurement, and taking into account the signal loss due to a finite transmission path (air and cable)

The duty cycle is determined by the on / off ratio of the transmitted RF. In this instance it is 9,45%

The RF Power offsett due to transmission loss is determined by the sum of the losses and gains that the signal experience from the point of transmission to the point of measurement. In this instance where the SART is placed at 0,8 meter from the TR – antenna the offset amounts to

Air loss over 0,8m (– 49,9 dB) + antenna gain (+ 15dB) + cable loss (eg. – 8,5 dB)

Offsett : – 49,9 dB + 15 dB – 8,5 dB = – 43,4 dB

Setup for Power meter for pulsed RF and transmission loss:

DUTY CYCLE = 9,45%
OFFSETT = 43,4 dB

Note: Signal loss through air is determined by

P_{loss} = 20 log 10 (/ (4 L_{meas}) dB

Where = (0,3m) / f (GHz)

STEP 7. Receiver sensitivity

By knowing the value of the transmitted RF power at the antenna (Horn) output, it is easy to determine what the value is of the RF power that is received by the SART antenna. This received RF at the SART antenna may be altered by introducing more or less attenuation in the RF transmit path. The amount of attenuation that is introduced above that which is necessary to set the received RF level to the –50 dBm threshold gives the margin that the receiver is better than the –50 dB threshold that is specified.

	CALIBRATION RESULTS SHEET				
	CalibrationSteps	Unit	Frequency (GHz)		
			9,2	9,35	9,5
Step 1	RF Power available at Modulator output (TP1)	dBm			
Step 2	RF Power level at 15dB Horn Antenna input port (TP2)	dBm			
Step 3	Cable Loss : TP1 to TP2 (TP2 – TP1)	dB			
Step 4	RF Power level at Power Meter (TP3)	dBm			
Step 5	Cable Loss : TP2 to TP3 (TP3 – TP1)	dB			