

# Makago® Electronics, Inc. *Turning ideas into products!*

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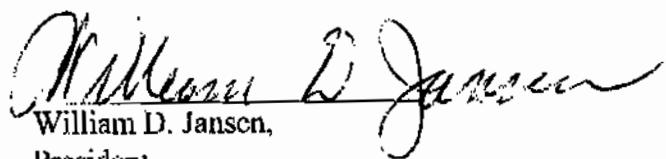
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January 6, 2006

TUV America, Inc. TCB  
10040 Mesa Rim Road  
San Diego, CA 92921

Makago Electronics grants permission to Tanner Racing Products by Mittler Bros. dba Mittler Corporation to use the test report SC502203-08.

By:



William D. Jansen,  
President

**MEASUREMENT AND TECHNICAL REPORT**

MAKAGO ELECTRONICS INCORPORATED  
16980 Via Tazan, Suite 140  
San Diego, CA 92127

**DATE: 13 May 2005**

<b>This Report Concerns:</b>	<input type="checkbox"/> Original Grant: X	<input type="checkbox"/> Class II Change:
<b>Equipment Type:</b>	Ultimate RF Scale Transceiver Board	
<b>Deferred grant requested per 47 CFR 0.457(d)(1)(ii)?</b>	<input type="checkbox"/> Yes: <input type="checkbox"/> Defer until:	<input type="checkbox"/> No: X
<b>Company Name agrees to notify the Commission by:</b> of the intended date of announcement of the product so that the grant can be issued on that date.	N/A	
<b>Transition Rules Request per 15.37?</b>	<input type="checkbox"/> Yes:	<input type="checkbox"/> No: X*
<b>(*) FCC Part 15, Paragraph(s) 15.109(a), 15.209(a), and 15.249(a)</b>		
<b>Report Prepared by:</b>	<b>TÜV AMERICA, INC</b> 10040 Mesa Rim Road San Diego, CA 92121-2912 Phone: 858 678 1400 Fax: 858 546 0364	

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## 1.0 GENERAL INFORMATION

### 1.1 Product Description

None

### 1.2 Related Submittal Grant

None

### 1.3 Tested System Details

The FCC ID's for all equipment, plus descriptions of all cables used in the tested system are:

None

### 1.4 Test Methodology

Purpose of Test: To demonstrate compliance with the following tests.

Test Summary					
Test Description	Paragraph Number	Summary of Results			Pass/Fail
		Low Channel	Mid Channel	High Channel	
Radiated Fundamental Field Strength	15.249(a)	93.82 dB $\mu$ V/m pk 90.8 dB $\mu$ V/m av	92.98 dB $\mu$ V/m pk 91.6 dB $\mu$ V/m av	94.51 dB $\mu$ V/m pk* 91.1 dB $\mu$ V/m av	Pass
Radiated Spurious Emissions (30 MHz to 10 GHz)	15.249(a)/ 15.209(a)	-0.86 dB @ 1806 MHz	-0.79 dB @ 1830 MHz	-0.96 dB @ 1849 MHz	Pass
Receiver Spurious Emissions	15.109(a)	No emissions detected	No emissions detected	No emissions detected	Pass

(\*) Quasi Peak results indicate level at 93.7 dB $\mu$ V/m.

Testing was performed according to the procedures in FCC/ANSI C63.4 and CSA 108.8-M1983.

### 1.5 Test Facility

The open area test site and conducted measurement data were tested by:

TÜV AMERICA, INC  
10040 Mesa Rim Road  
San Diego, CA 92121-2912  
Phone: 858 678 1400  
Fax: 858 546 0364

The Test Site Data and performance comply with ANSI C63.4 and are registered with the FCC, 7435 Oakland Mills Road, Columbia Maryland 21046. All Measurement Data is acquired according to the content of FCC Measurement Procedure and ANSI C63.4, unless supplemented with additional requirements as noted in the test report.

**2.0 SYSTEM TEST CONFIGURATION**

**2.1 Justification**

The EUT was initially tested for FCC emissions in the following configuration:

See Test Setup Photos Exhibit

**2.2 EUT Exercise Software**

None

**2.3 Special Accessories**

None

**2.4 Equipment Modifications**

None

**2.5 Configuration of Test System**

See Test Setup Photos Exhibit

**3.0 RECEIVER SPURIOUS EMISSIONS EQUIPMENT/DATA  
RADIATED EMISSIONS EQUIPMENT/DATA  
RADIATED SPURIOUS EMISSIONS EQUIPMENT/DATA**

**Test Conditions: RECEIVER SPURIOUS EMISSIONS: FCC Part 15.109(a)  
RADIATED EMISSIONS: FCC Part 15.209(a)  
RADIATED SPURIOUS EMISSIONS: FCC Part 15.249(a)**

**The following measurements were performed at the San Diego Testing Facility:**

- Test not applicable

- - Roof (Small Open Area Test Site)
- - Canyon #1 (10- and 30-Meter Open Area Test Site), Carroll Canyon, San Diego

**Test Equipment Used:**

<b>Model No.</b>	<b>Prop. No.</b>	<b>Description</b>	<b>Manufacturer</b>	<b>Serial No.</b>	<b>Date Cal'ed</b>
E4440A	7500	Spectrum Analyzer	Hewlett Packard	MY43362168	12/04
8566B	744	Spectrum Analyzer	Hewlett Packard	2618A02913	02/05
AMF-5D-010180-35-10P	719	Preamplifier	Miteq	549460	VBU*
FF6548-2	877	2000 MHz High Pass Filter	Sage	005	VBU*
FF6549-1	783	900 MHz High Pass Filter	Sage	008	VBU*
3115	251	Double Ridge Guide Antenna	EMCO	2495	VBU*
3146	244	Log Periodic Dipole Antenna	EMCO	1063	07/04

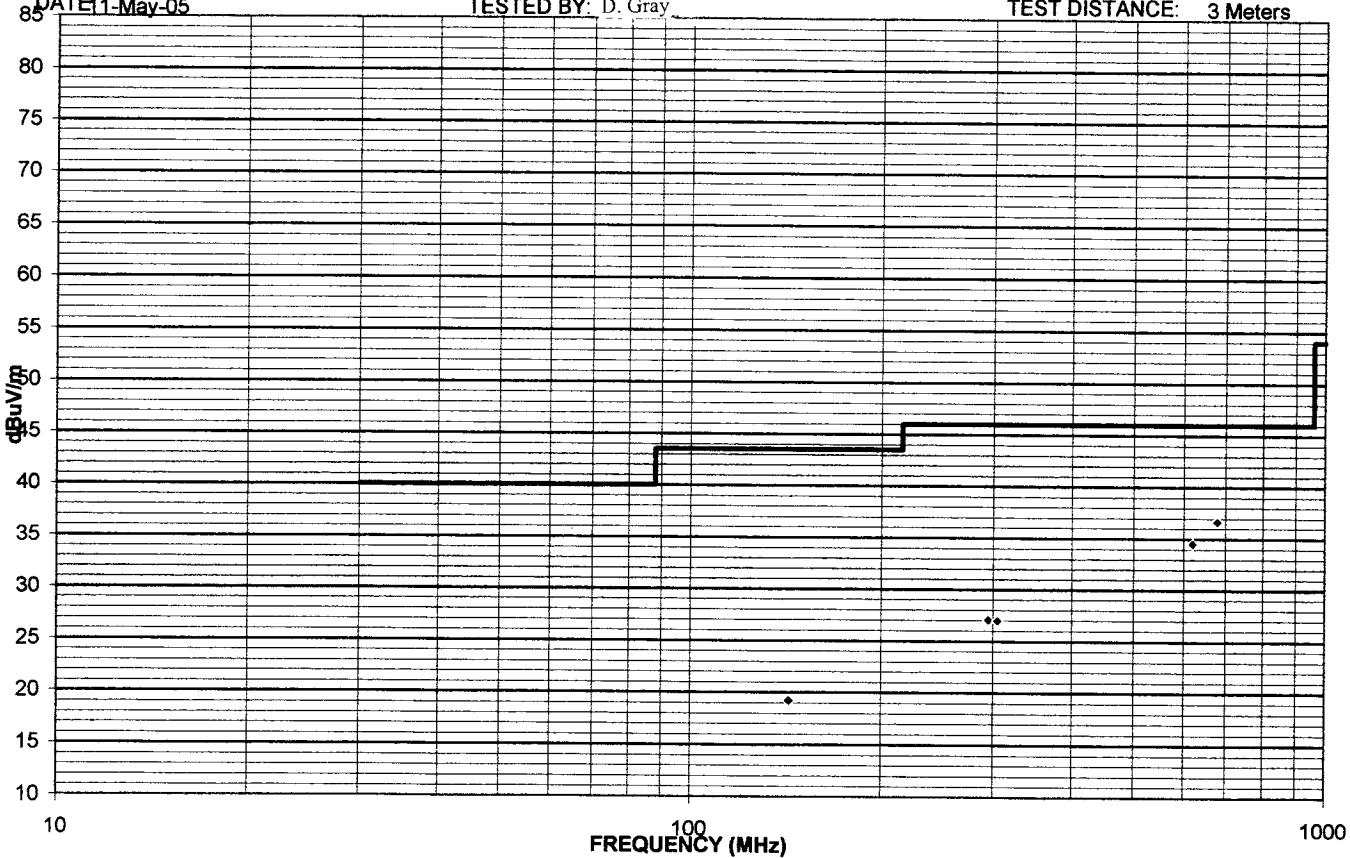
**Remarks:** One year calibration cycle for all test equipment and sites. (\*) Verified Before Use.

REPORT NO. SC502203  
COMPANY: Makago Electronics  
EUT: Ultimate RF Scale  
EUT MODE: Transmit - 915MHz  
DATE: 11-May-05

SPEC: FCC Part 15 para 15.109(a)

TESTED BY: D. Gray

TEST DISTANCE: 3 Meters



REPORT No: SC502203 TESTER: D. Gray SPEC: FCC Part 15 para 15.249/209

CUSTOMER: Makago Electronics TEST DIST: 3 Meters

EUT: Ultimate RF Scale Transceiver Board TEST SITE: Room

EUT MODE: Transmitting on 903 MHz BICONICAL: 491

DATE: May 11, 2005 LOG: 244

NOTES: No other detectable emissions to 10GHz OTHER: 251

above 1GHz: RBW & VBW 1 MHz for Pk; RBW 1MHz and VBW 10Hz for AVG

below 1GHz: RBW & VBW 1 MHz for Pk, RBW 1MHz and VBW 10Hz for AVG

CE = Antenna Factor + Cable Loss - Preamplifier Gain + Preselector Loss

#### 4.0 ATTESTATION STATEMENT

##### GENERAL REMARKS:

EUT's transmit and receive is on the same frequency. Results indicated are for both modes.

##### SUMMARY:

All tests were performed per CFR 47, Part(s) 15.109(a), 15.209(a), and 15.249(a)

■ - Performed

The Equipment Under Test

■ - **Fulfills** the requirements of CFR 47, Part(s) 15.109(a), 15.209(a), and 15.249(a)

Testing Start Date: 11 May 2005

Testing End Date: 11 May 2005

- TÜV AMERICA, INC. -

Responsible Engineer:



David Gray  
(EMC Engineer)

Mittler Bros. Ultimate RF Scale  
**Testing the SMA vs. Reverse SMA Antenna Connector**

July 5, 2005

### Summary

These test show that changing from SMA connector to reverse SMA connector will (if anything) very slightly reduce the output power.

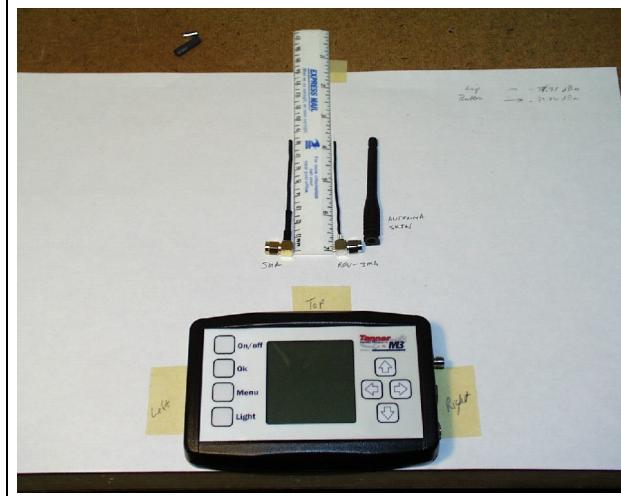
### Test Setup

The normal SMA connector is shown on the left. The reverse SMA connector is shown on the right. The two antennas wires are the same length, 3.25".

The reverse SMA connector's antenna wire will be tested with and without the rubber antenna skin shown far right.

One Ultimate RF Scale's display box will be used to test both antenna connectors.

The masking tape marks the position of the display box on the test bench.



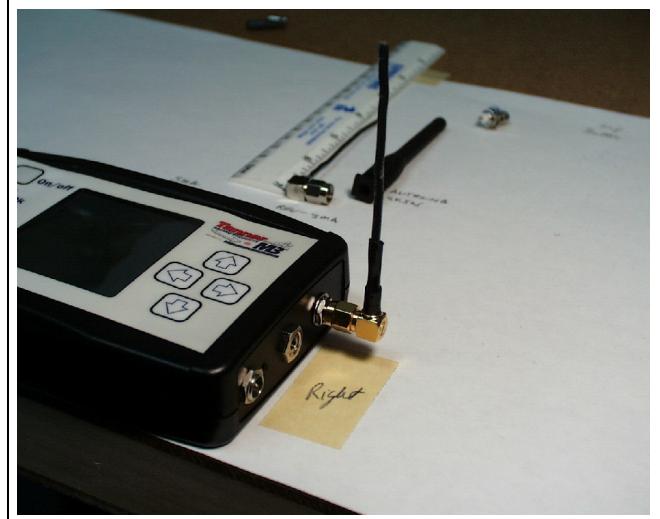
The test bench with the display box and spectrum analyzer.



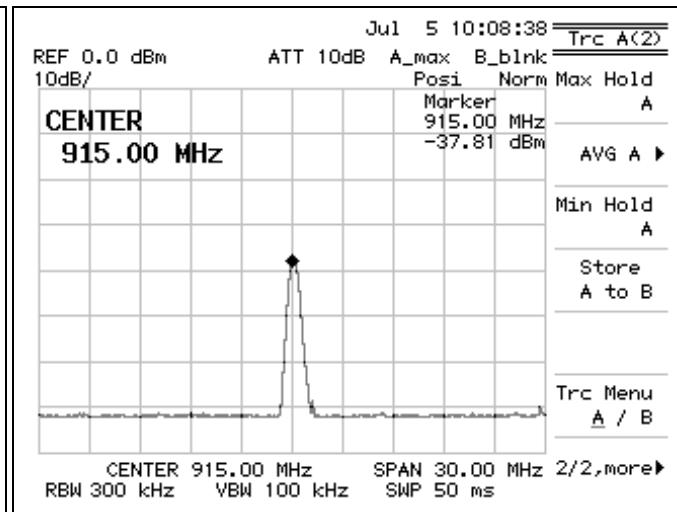
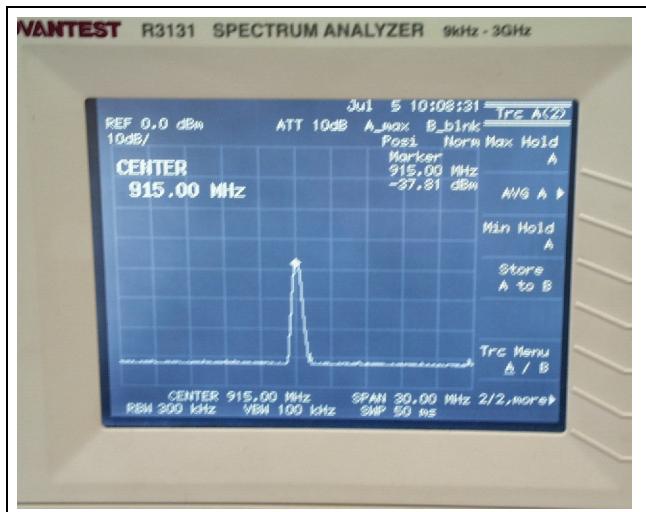
Mittler Bros. Ultimate RF Scale  
Testing the SMA vs. Reverse SMA Antenna Connector  
July 5, 2005

### SMA Connector

The SMA connector attached to display box.



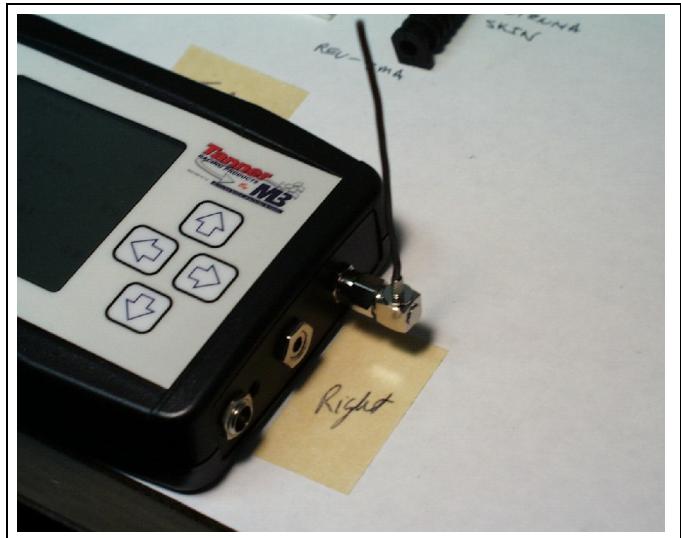
The spectrum analyzer is set to maximum hold. The relative signal strength is -37.81 dBm, shown in both a picture of the spectrum analyzer and a screen print.



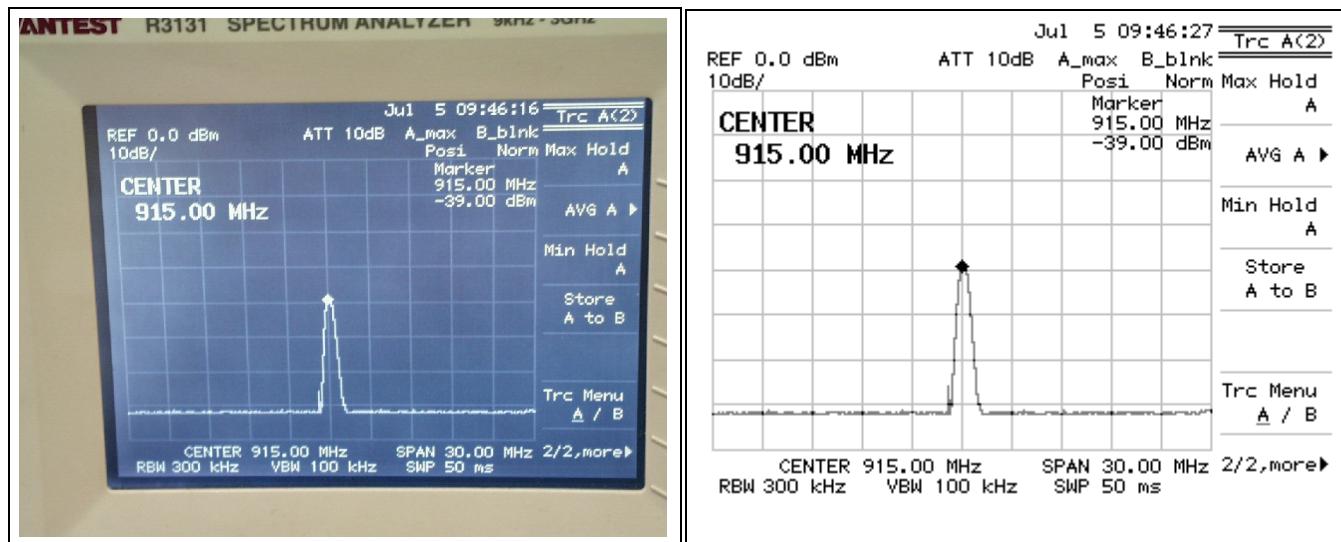
Mittler Bros. Ultimate RF Scale  
Testing the SMA vs. Reverse SMA Antenna Connector  
July 5, 2005

### Reverse SMA Connector

The reverse SMA connector is used to connect the antenna wire without the rubber antenna skin.



The spectrum analyzer is set to maximum hold. The relative signal strength is -39.00 dBm, shown on the left in a picture of the spectrum analyzer and on the right in a screen print.

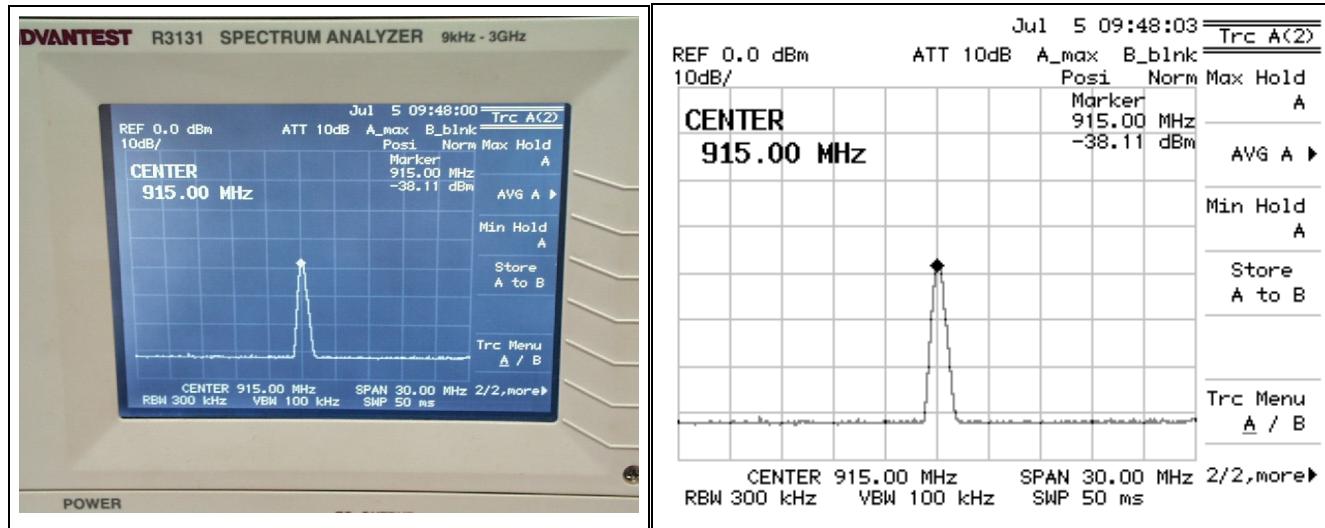


Mittler Bros. Ultimate RF Scale  
**Testing the SMA vs. Reverse SMA Antenna Connector**  
July 5, 2005

The reverse SMA connector is used to connect the antenna wire with the rubber antenna skin.



The spectrum analyzer is set to maximum hold. The relative signal strength is -38.11 dBm, shown on the left in a picture of the spectrum analyzer and on the right in a screen print.



Mittler Bros. Ultimate RF Scale  
**Testing the SMA vs. Reverse SMA Antenna Connector**  
July 5, 2005

**Table of SMA vs. Reverse SMA**

Connector	Spectrum Analyzer	Reverse SAM relative to SMA
SMA	-37.81 dBm	
Reverse SMA without rubber antenna skin	-39.00 dBm	-1.19 dBm
Reverse SMA with rubber antenna skin	-38.11 dBm	-0.30 dBm

**Conclusion**

The original FCC testing done with the SMA connector. These test show that changing from SMA connector to reverse SMA connector with or without the rubber antenna skin will (if anything) very slightly reduce the output power.