Exhibit F – Test Report
BancTec, Inc.
RFID System Assembly, Model 853223

Project Number: 02318-10

Prepared for:

BANCTEC, INC.
2701 E. Grauwyler Road MS69.
Irving, TX 75061

By

Professional Testing (EMI), Inc.
1601 FM 1460, Suite B
Round Rock, Texas 78664

February 2002

CERTIFICATION
Electromagnetic Interference
Test Report

BANCTEC, INC.
RFID System Assembly, Model 853223
(Intentional Radiator Portion)

Table of Contents

Figures

Appendices

Certificate of Compliance

Applicant:	BancTec, Inc.
Applicant's Address:	2701 E. Grauwyler Road MS69 Irving, TX 75061
Model:	RFID System Assembly, Model 853223
Serial Number:	X11010074
Project Number:	02318-10

I, Jeffrey A. Lenk, for Professional Testing (EMI), Inc., being familiar with the FCC rules and test procedures have reviewed the test setup, measured data and this report. I believe them to be true and accurate.

The **BancTec, Inc. RFID System Assembly, Model 853223** was tested to and found to be in compliance with FCC Part 15 Subpart C for an Intentional Radiator.

The highest emissions generated by the above equipment are listed below:

	Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)
Fundamental	13.56	63.7	105.6	-41.9
Spurious	135.6	38.8	43.5	-4.7

_____

Jeffrey A. Lenk
President

This report has been reviewed and accepted by BancTec, Inc.. The undersigned is responsible for ensuring that the **RFID System Assembly, Model 853223** will continue to comply with the FCC rules.

_____

1.0 EUT Description

The Equipment Under Test (EUT) is the **BancTec, Inc. RFID System Assembly, Model 853223**. The **RFID System Assembly, Model 853223** consisted of TI Model (RI-STU-TRDC-02) Reader Module PCB configured with TI model (MEDIOA-VSA) Antenna. Data and power connection to Reader was made through header connector provided on the Reader through a 5-wire unshielded cable. Two wires of the cable were connected to AC/DC power adapter for Reader DC supply, and a shielded DB-9 cable was used to extend communication from the laptop PC. The EUT operates at 13.56 MHz and is designed for compliance with 47 CFR 15.225 of the FCC rules. Specific test requirements for this device include the following:

47 CFR 15.225	Fundamental Transmit Power
47 CFR 15.225, 15.205 & 15.209	Spurious Radiated Power
47 CFR 15.225 & 2.1049	Occupied Bandwidth (2.989 used as Procedural Reference)
47 CFR 15.203	Antenna Requirement

The system tested consisted of the following:

Manufacturer & Model	**Serial #**	**FCC ID #**	**Description**
BancTec, Inc., RFID System Assembly, 853223	X11010074	P82-53223-RTM	Reader Module

1.1 EUT Operation

The **RFID System Assembly, Model 853223** is a TI RFID Reader model (RI-STU-TRDC-02) with model MEDIOA-VSA Antenna that is, intended to be installed into BancTec, Inc. reader sorters to allow intelligent recognition of expendable/consumable products used inside document processor systems. Reader/Antenna was tested in stand-alone configuration to simulate a worst-case emissions profile. TI S6350 Reader Utility software was used to place Reader into continuous read/transmit mode during testing. Setup and operational modes cover worst-case configuration and operational modes for the device. The frequency of the transmitting signal is 13.56 MHz.

2.0 Electromagnetic Emissions Testing

Professional Testing (EMI), Inc. (PTI), follows the guidelines of NIST for all uncertainty calculations, estimates and expressions thereof for EMC testing.

Radiated emission measurements were made of the Fundamental and Spurious Emission levels for the **RFID System Assembly, Model 853223**. Measurements of the occupied bandwidth were also made for the equipment.

Measurements of the maximum emission levels for the fundamental and the spurious/harmonic emissions of the **RFID System Assembly, Model 853223** were made at the Professional Testing "Open Field" Site 3, located in Round Rock, Texas to determine the radio noise radiated from the

EUT. A "Description of Measurement Facilities" has been submitted to the FCC and approved pursuant to Section 2.948 of CFR 47 of the FCC rules.
Tests of the fundamental for the device were performed to determine the worst-case polarization of the devices. The fundamental emissions of the device were measured with the antennas of the devices vertical and horizontal to the ground plane.

2.1 Test Procedure

The EUT was placed on a non-conductive table 0.8 meters above the ground plane. The table was centered on a motorized turntable, which allows 360-degree rotation. For measurements of the fundamental signal, a measurement antenna was positioned at a distance of 3 meters as measured from the closest point of the EUT. For spurious/harmonic measurements above 1 GHz, the measurement antenna was placed 1 meter from the EUT. The radiated emissions were maximized by configuring the EUT, by rotating the EUT, and by raising and lowering the antenna from 1 to 4 meters.

A Spectrum Analyzer with peak detection was used to find the maximums of the radiated emissions during the variability testing. A drawing showing the test setup is given as Figure 1.

2.2 Test Criteria

The requirements for an intentional radiator operating in the band from 13.553 to 13.567 MHz are covered in FCC Part 15.225. The field strength within the above band shall not exceed 10,000 uV/m at 30 meters. The field strength of any emission outside the above band shall not exceed the general radiated emission limits shown below from 15.209.

The table below shows FCC Part 15.209 & 15.225 radiated limits. In addition to these requirements, the EUT must meet the restricted emission band requirements of §15.205. For this frequency range, the unintentional receiver radiated emission limits of §15.109 for 9kHz radiator is higher than the restricted band limits of §15.205. The limit of §15.205 was used for the spurious emission test. The spurious measurements of the harmonic were performed to the 10th harmonics of the fundamental. The reference distance for each limit is also shown in this table.

Frequency	Test Distance	Field Strength	
MHz	(Meters)	(μV/m)	(dBμV/m)
0.009-0.490	300	2400/F (kHz)	
0.490-1.705	30	24000/F (kHz)	
1.705 to 30.0	30	30	29.5
30 to 88	3	100	40.0
88 to 216	3	150	43.5
216 to 960	3	200	46.0
Above 960	3	500	54.0

2.3 Test Results

The radiated test data for the fundamental is included in Appendix A. The radiated emission test data for the harmonics is included in Appendix B. The emissions were maximized at each

3.0 Frequency Stability Testing

Frequency Stability measurements were made to determine whether or not the criteria of + or – .01 % is maintained over temperature and line voltage variations. The power supply is connected to public utility lines and provides power to the **RFID System Assembly, Model 853223.**

3.1 Test Procedure

The EUT was placed in a Thermotron 2800 temperature chamber together with a near field probe. The near field probe was connected to the HP 8591E spectrum analyzer. The spectrum analyzer frequency counter function was used to measure the crystal frequency of the EUT which was twice it's output frequency. The temperature was changed in 10 degree increments and a measurement was made after allowing 10 to 15 minutes at each new temperature for the frequency to stabilize. For the voltage stability part of the test, the temperature was held at 20 degrees C. and frequency readings were taken while the line voltage was changed both plus and minus 15 percent by use of a Varriac. The results of the above tests were recorded and are shown in a table with the frequency variations calculated in percent.

3.2 Test Criteria

The frequency tolerance of the carrier was maintained within +-0.01% of the operating frequency over a temperature range from –20 to +50 degrees C at normal supply voltage, and from 85% to 115% of nominal supply voltage at 20 degrees C.

3.3 Test Results

Frequency Stability with Temperature				
Minutes	FREQ	FREQ	Error	TEMP
from Start	MHz	Error	Percent	Deg. C
0	27.1193	-0.0007	-0.00026	25
5	27.11929	-0.00071	-0.00026	50
20	27.11922	-0.00078	-0.00029	50
29	27.1193	-0.0007	-0.00026	40
38	27.11937	-0.00063	-0.00023	40
41	27.11939	-0.00061	-0.00022	30
50	27.11953	-0.00047	-0.00017	30
52	27.11954	-0.00046	-0.00017	20
62	27.11969	-0.00031	-0.00011	20
64	27.11971	-0.00029	-0.00011	10
75	27.11985	-0.00015	-0.00006	10
77	27.11986	-0.00014	-0.00005	0
86	27.11997	-0.00003	-0.00001	0
89	27.11998	-0.00002	-0.00001	-10
98	27.12005	0.00005	0.00002	-10
101	27.12005	0.00005	0.00002	-20
110	27.12006	0.00006	0.00002	-20
125	27.11968	-0.00032	-0.00012	25
128	27.11969	-0.00031	-0.00011	25

Frequency Stability with Voltage variations				
Voltage	FREQ	FREQ	Error	TEMP
Line Input	MHz	Error	Percent	Deg. C
122.3	27.11969	-0.00031	-0.00011	20
140.65	27.11969	-0.00031	-0.00011	20
103.95	27.11968	-0.00032	-0.00012	20

Note: Operating frequency error will be half of that shown in table due to crystal frequency divided by 2 to derive fundamental.

3.0 Antenna Requirement

An analysis of the **RFID System Assembly, Model 853223** was performed to determine compliance with Section 15.203 of the Rules. This section requires specific handling and control of antennas used for devices subject to regulations under the Intentional Radiator portions of Part 15.

4.1 Evaluation Procedure

The structure and application of the **RFID System Assembly, Model 853223** were analyzed with respect to the rules. The antenna for this unit is an external antenna, which is soldered onto the main board and is not accessible by the user. An auxiliary antenna port is not present.

4.2 Evaluation Criteria

Section 15.203 of the rules states that the subject device must meet at least one of the following criteria:

(a) Antenna be permanently attached to the unit.

(b) Antenna must use a unique type of connector to attach to the EUT.

(c) Unit must be professionally installed. Installer shall be responsible for verifying that the correct antenna is employed with the unit.

4.3 Evaluation Results

The **RFID System Assembly, Model 853223** meets the criteria of this rule by virtue of having an external antenna permanently attached to the unit. The EUT is therefore compliant with §15.203.

5.0 Modifications to Equipment

The following modifications were made on the **RFID System Assembly, Model 853223** during the performance of the test program in order to meet the FCC criteria.

1. Added one Ferrite bead (Fair-Rite P/N 0443167251) to 5- wire unshielded cable at connector to Reader with (2 loops through bead).
2. Added metal standoffs (1/2”) to PCB of Reader to connect ground layer of PCB to metal mounting plate.
3. Tie-wrapped excess unshielded cable in serpentine-wrap to reduce open cable area.

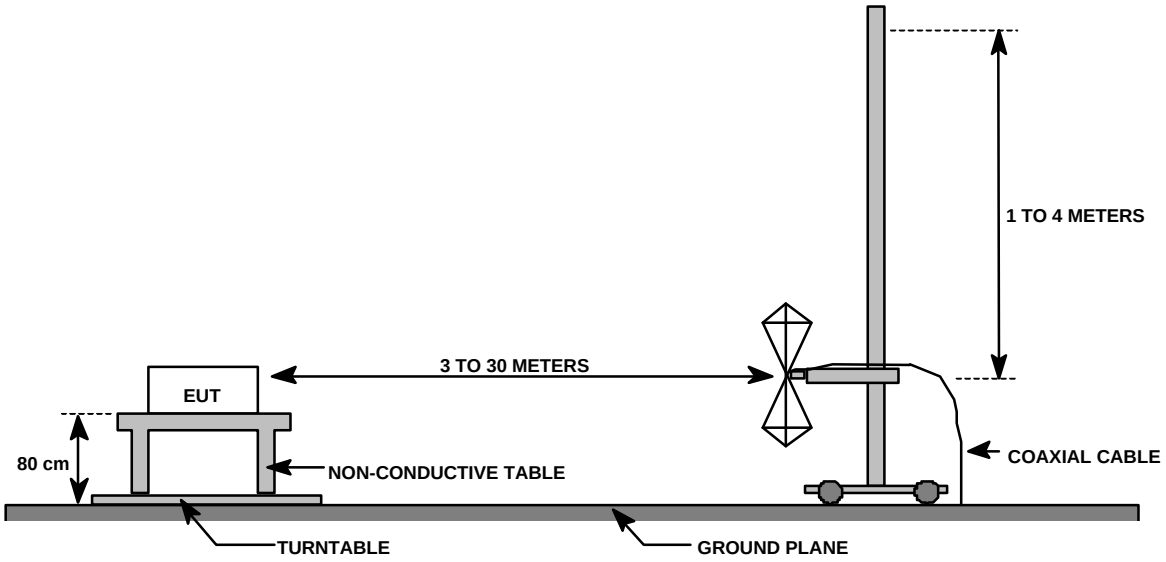
6.0 List of Test Equipment

A list of the test equipment utilized to perform the testing is given below. The date of calibration is given for each.

Electromagnetic Emissions Test Equipment

Device	Description	Calibration Due
HP 8591E	Spectrum Analyzer	April 2002
SOLAR 8012-50-R24-BNC	LISN	August 2002
HP 85662A	Unit Display	March 2002
HP 85650A	Quasi Peak Adapter	March 2002
HP 8447F	Preamp	November 2002
EMCO 6502	Active Loop Antenna	March 2002
EMCO 3146	Log Antenna	November 2002
Compliance Design B-100	Biconical Antenna	November 2002
Cond. EMI 3146	RG-223	November 2002
HP 8447D	Preamp	November 2002
LambdaMetrics LM 100	Biconical Antenna	November 2002
Advantest R3265	Spectrum Analyzer	February 2002
Tektronix 2706	RF Preselector	October 2002
HP 8567A	Spectrum Analyzer	March 2002
Thermotron 2800	Temperature Chamber	Not Required

FIGURE 1: Radiated Emissions Test Setup



Appendix A Radiated Emissions Data Sheets

Fundamental Radiated Data Sheet

BancTec, Inc.
RFID System Assembly, Model 853223

SERIAL #: X11010074
DATE: February 28, 2002
PROJECT #: 02318-10

MEASUREMENT DISTANCE (m): 3
DETECTOR FUNCTION: Quasi-Peak

Corrected Level = Recorded Level - Amplifier Gain + Antenna Factor + Cable Loss

Antenna Horizontal

Freq. (MHz)	EUT Dir (Deg.)	Antenna Elevation (Meters)	Recorded Level (dBuV)	Amplifier Gain (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Corrected Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
13.56	270	1	36.1	0.0	9.5	0.8	46.4	101	-54.6
13.56	270	0	56.2	0.0	-6.7	0.8	50.3	105.6	-55.3

Note: First measurement was taken with a Loop antenna and second measurement was taken with a vertical rod antenna, and EUT horizontal. Limit was adjusted 21dB/decade for loop antenna, and 25.6 dB/decade for vertical rod antenna.

Antenna Vertical

Freq. (MHz)	EUT Dir (Deg.)	Antenna Elevation (Meters)	Recorded Level (dBuV)	Amplifier Gain (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Corrected Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
13.56	270	1	47.1	0.0	9.5	0.8	57.4	101	-43.6
13.56	60	0	69.6	0.0	6.7	0.8	63.7	105.6	-41.9

Note: First measurement was taken with a Loop antenna and second measurement was taken with a vertical rod antenna, and EUT vertical. Limit was adjusted 21dB/decade for loop antenna, and 25.6 dB/decade for vertical rod antenna.

TEST ENGINEER: Bob Ripley

Appendix B

Spurious Radiated Emissions Data Sheets

Spurious Radiated Data Sheet

BancTec, Inc.
RFID System Assembly, Model 853223

SERIAL #: X11010074
DATE: February 28, 2002
PROJECT #: 02318-10

MEASUREMENT DISTANCE (m): 1
ANTENNA POLARIZATION: Horizontal
DETECTOR FUNCTION: Peak

Corrected Level = Recorded Level - Amplifier Gain + Antenna Factor + Cable Loss

Freq. (MHz)	EUT Dir (Deg.)	Antenna Elevation (Meters)	Recorded Level (dBuV)	Amplifier Gain (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Corrected Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
27.12	Noise	Floor	62.9	26.6	3.4	1.1	40.8	55.6	-14.8

COMMENT #1:

TEST ENGINEER: Bob Ripley

Spurious Radiated Data Sheet

BancTec, Inc.
RFID System Assembly, Model 853223

SERIAL #: X11010074
DATE: February 28, 2002
PROJECT #: 02318-10

MEASUREMENT DISTANCE (m): 1
ANTENNA POLARIZATION: Vertical
DETECTOR FUNCTION: Peak

Corrected Level = Recorded Level - Amplifier Gain + Antenna Factor + Cable Loss

Freq. (MHz)	EUT Dir (Deg.)	Antenna Elevation (Meters)	Recorded Level (dBuV)	Amplifier Gain (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Corrected Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
27.12	Noise	Floor	62.9	26.6	3.4	1.1	40.8	50.5	-9.7
40.68	Noise	Floor	33.5	26.6	11.5	2.9	21.3	40	-18.7
54.24	0	1	41.4	26.6	10.6	3.2	28.6	40	-11.4
67.8	0	1	34.4	26.6	6.9	3.6	18.3	40	-21.7
81.36	0	1	45.1	26.5	8.1	3.9	30.6	40	-9.4
94.92	Noise	Floor	34.9	26.5	10.8	4.2	23.5	43.5	-20.0
108.48	0	1	32.9	26.5	12.0	4.7	23.2	43.5	-20.3
122.04	45	1	28.5	26.5	12.2	5.0	19.2	43.5	-24.3
135.6	340	1	48.4	26.6	11.3	5.7	38.8	43.5	-4.7

COMMENT #1:

TEST ENGINEER: Bob Ripley