ENGINEERING TEST REPORT

Wireless Lavatory Faucet
Model: ERF-885

FCC ID: TTW-ERF885

Applicant:

Sloan Valve Company
10500 Seymour Ave.
Franklin Park, IL 60131

In Accordance With

Federal Communications Commission (FCC)
Part 15, Subpart C, Section 15.209
Low Power Transmitter operating at 131 kHz

UltraTech's File No.: SMCS-001F15C209

This Test report is Issued under the Authority of Tri M. Luu, Professional Engineer, Vice President of Engineering UltraTech Group of Labs Date: December 7, 2005	
Report Prepared by: Dan Huynh Issued Date: December 7, 2005	Tested by: Hung Trinh, RFI Technician Test Dates: November 17, 2005

- *The results in this Test Report apply only to the sample(s) tested, and the sample tested is randomly selected.*
- *This report must not be used by the client to claim product endorsement by NVLAP or any agency of the US Government.*

UltraTech

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EXHIBIT 1: SUBMITTAL CHECK LIST

Annex No.	Exhibit Type	Description of Contents	Quality Check (OK)
--	Test Report	▪ Exhibit 1: Submittal check lists ▪ Exhibit 2: Introduction ▪ Exhibit 3: Performance Assessment ▪ Exhibit 4: EUT Operation and Configuration during Tests ▪ Exhibit 5: Summary of test Results ▪ Exhibit 6: Measurement Data ▪ Exhibit 7: Measurement Uncertainty	OK
1	Test Setup Photos	Radiated Emissions Setup Photos	OK
2	External EUT Photos	External EUT Photos	OK
3	Internal EUT Photos	Internal EUT Photos	OK
4	Cover Letters	▪ Cover Letter ▪ Letter from the Applicant to appoint Ultratech to act as an agent ▪ Confidentiality Filing Request Letter	OK
5	Attestation Statements	--	--
6	ID Label/Location Info	▪ ID Label ▪ Location of ID Label	OK
7	Block Diagrams	Block Diagram	OK
8	Schematic Diagrams	Schematic	OK
9	Parts List/Tune Up Info	--	--
10	Operational Description	Operational Description	OK
11	RF Exposure Info	N/A	N/A
12	Users Manual	Installation Instructions	OK

EXHIBIT 2: INTRODUCTION

2.1. SCOPE

Reference:	FCC Part 15, Subpart C, Section 15.209 – Unlicensed Low Power Transmitter
Title:	Code of Federal Regulations (CFR), Title 47 - Telecommunication, Part 15
Purpose of Test:	To obtain FCC Equipment Authorization for Unlicensed Low Power Transmitter Operating at 131 kHz.
Test Procedures:	Both conducted and radiated emissions measurements were conducted in accordance with American National Standards Institute ANSI C63.4 - American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.
Environmental Classification:	• Commercial, industrial or business. • Residential

2.2. RELATED SUBMITTAL(S)/GRANT(S)

None.

2.3. NORMATIVE REFERENCES

Publication	Year	Title
FCC CFR Parts 0-15	2005	Code of Federal Regulations – Telecommunication
ANSI C63.4	2003	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 KHz to 40 GHz
CISPR 22 CISPR 22 +A1 EN 55022	2003-04-10 2004-10-14 2003	Information Technology Equipment - Radio Disturbance Characteristics – Limits and Methods of Measurement
CISPR 16-1-1	2003	Specification for radio disturbance and immunity measuring apparatus and methods. Part 1-1: Measuring Apparatus
CISPR 16-2-1	2004	Specification for radio disturbance and immunity measuring apparatus and methods. Part 2-1: Conducted disturbance measurement

EXHIBIT 3: PERFORMANCE ASSESSMENT

3.1. CLIENT INFORMATION

APPLICANT	
Name:	Sloan Valve Company
Address:	10500 Seymour Ave. Franklin Park, IL 60131 United States
Contact Person:	Mr. Peter Jahrling Phone #: 847-671-4300 Fax #: 847-671-6944 Email Address: pjahrling@sloanvalve.com

MANUFACTURER	
Name:	Smart Wave Technologies Corp.
Address:	151 Carlingview Drive, Suite 3 Toronto, Ontario Canada M9W 5S4
Contact Person:	Mr. Peter Zosimadis Phone #: 416-679-5050/ext.101 Fax #: 416-679-9283 Email Address: peter@smartwave.ca

3.2. EQUIPMENT UNDER TEST (EUT) INFORMATION

The following information (with the exception of the Date of Receipt) has been supplied by the applicant.

Brand Name:	Sloan Valve Company
Product Name:	Wireless Lavatory Faucet
Model Name or Number:	ERF-885
Serial Number:	Test Sample
Type of Equipment:	Low Power Transmitter Below 1705 kHz
Power Input Source:	3 Volt Battery (DL1234)
Primary User Functions of EUT:	Touchless (hands-free) faucet

3.3. EUT'S TECHNICAL SPECIFICATIONS

TRANSMITTER	
Equipment Type:	Fixed
Intended Operating Environment:	• Commercial, industrial or business • Residential
Power Supply Requirement:	3 Volt Battery (DL1234)
RF Output Power Rating:	60.48 dBµV/m peak at 3 meters
Operating Frequency Range:	131 kHz
Duty Cycle:	Continuous
99% Bandwidth:	27.5 kHz
Modulation Type:	AM, pulse operation
Antenna Connector Type:	Integral (the antenna component is located inside the enclosure)
Antenna Description:	Manufacturer: Smart Wave Technologies Corp. Type: Ferrite Coil Model: 39121 Frequency Range: 126 – 136 kHz Gain: -80 dB estimated

3.4. LIST OF EUT'S PORTS

None.

3.5. ANCILLARY EQUIPMENT

None.

3.6. GENERAL TEST SETUP

Stand-alone

Sloan Valve Company
Wireless Lavatory Faucet
Model: ERF-885
(EUT)

EXHIBIT 4: EUT OPERATING CONDITIONS AND CONFIGURATIONS DURING TESTS

4.1. CLIMATE TEST CONDITIONS

The climate conditions of the test environment are as follows:

Temperature:	21°C
Humidity:	51%
Pressure:	102 kPa
Power Input Source:	3 Volt Battery (DL1234)

4.2. OPERATIONAL TEST CONDITIONS & ARRANGEMENT FOR TESTS

Operating Modes:	The transmitter was operated continuously.
Special Test Software:	None.
Special Hardware Used:	None
Transmitter Test Antenna:	The EUT is tested with the antenna fitted in a manner typical of normal intended use as integral antenna equipment.

Transmitter Test Signals:	
Frequency(ies) Tested:	131 kHz

EXHIBIT 5: SUMMARY OF TEST RESULTS

5.1. LOCATION OF TESTS

All of the measurements described in this report were performed at Ultratech Group of Labs located in the city of Oakville, Province of Ontario, Canada.

- AC Powerline Conducted Emissions were performed in UltraTech's shielded room, 24'(L) x 16'(W) x 8'(H).

- Radiated Emissions were performed at the Ultratech's 3-10 TDK Semi-Anechoic Chamber situated in the Town of Oakville, province of Ontario. This test site been calibrated in accordance with ANSI C63.4, and found to be in compliance with the requirements of Sec. 2.948 of the FCC Rules. The descriptions and site measurement data of the Oakville 3-10 TDK Semi-Anechoic Chamber has been filed with FCC office (FCC File No.: 31040/SIT 1300B3) and Industry Canada office (Industry Canada File No.: IC2049-1). Last Date of Site Calibration: June. 20, 2005.

5.2. APPLICABILITY & SUMMARY OF EMC EMISSION TEST RESULTS

FCC Section (s)	Test Requirements	Compliance (Yes/No)
2.1049	Occupied Bandwidth	Yes
15.203	Antenna Requirement	Yes
15.107(a) &15. 207	AC Power Line Conducted Emissions	N/A, employ battery power
15.109(a) & 15.209	General Radiated Emission Requirements.	Yes

5.3. MODIFICATIONS INCORPORATED IN THE EUT FOR COMPLIANCE PURPOSES

None.

EXHIBIT 6: MEASUREMENTS, EXAMINATIONS & TEST DATA FOR EMC EMISSIONS

6.1. TEST PROCEDURES

This section contains test results only. Details of test methods and procedures can be found in Ultratech Test Procedures, File # ULTR P001-2004 and ANSI C63.4.

6.2. MEASUREMENT UNCERTAINTIES

The measurement uncertainties stated were calculated in accordance with requirements of UKAS Document NIS 81 with a confidence level of 95%. Please refer to Exhibit 7 for Measurement Uncertainties.

6.3. MEASUREMENT EQUIPMENT USED

The measurement equipment used complied with the requirements of the Standards referenced in the Methods & Procedures ANSI C63.4, 47 CFR 15.209 and CISPR 16-1.

6.4. ESSENTIAL/PRIMARY FUNCTIONS AS DECLARED BY THE MANUACTURER

Touchless (hands-free) faucet.

6.5. COMPLIANCE WITH FCC PART 15 – GENERAL TECHNICAL REQUIREMENTS

FCC Section	FCC Rules	Comments
15.203	Described how the EUT complies with the requirement that either its antenna is permanently attached, or that it employs a unique antenna connector, for every antenna proposed for use with the EUT. The exception is in those cases where EUT must be professionally installed. In order to demonstrate that professional installation is required, the following 3 points must be addressed: • The application (or intended use) of the EUT • The installation requirements of the EUT • The method by which the EUT will be marketed	Conform. Antenna is integral, located inside the enclosure.

6.6. OCUPPIED BANDWIDTH [§ 2.1049]

6.6.1. Limit

Section 2.1049.

6.6.2. Method of Measurements

The transmitter output was loosely coupled to the spectrum analyzer through a receiving antenna and the bandwidth of bandwidth of the fundamental frequency was measured with the spectrum analyzer with the resolution bandwidth of the spectrum analyzer set per ANSI 63.4.

6.6.3. Test Equipment List

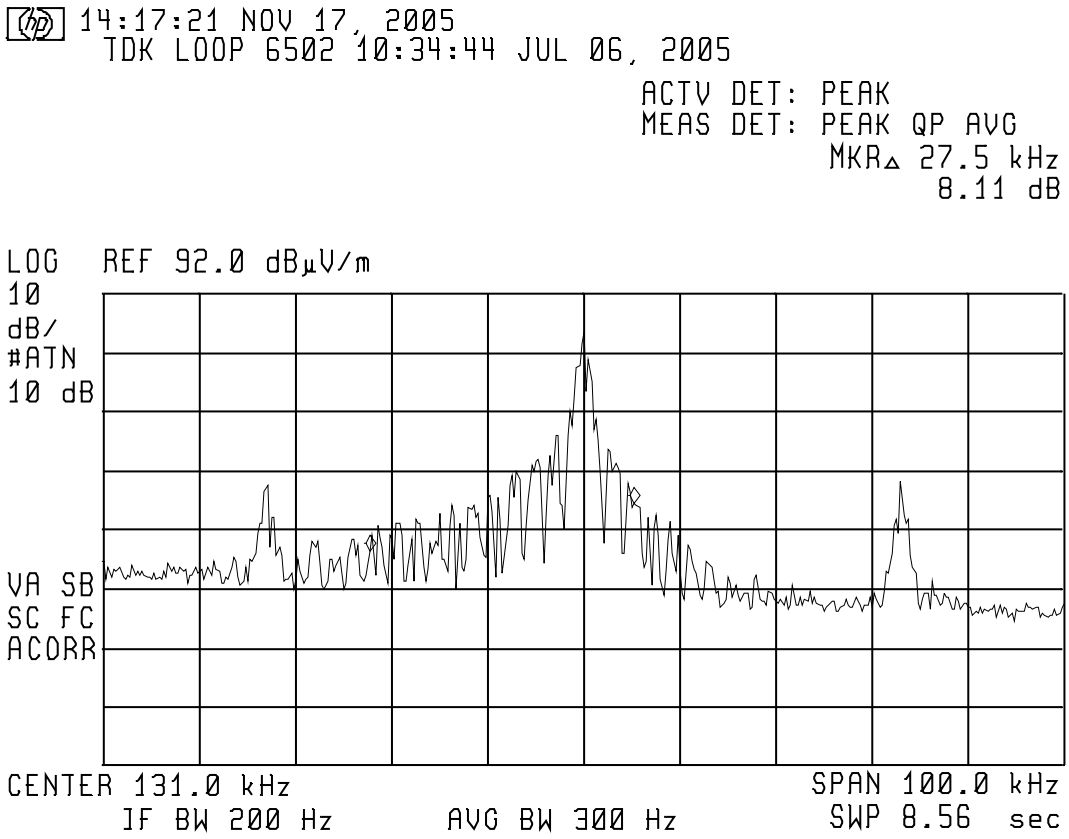
Test Instruments	Manufacturer	Model No.	Serial No.	Frequency Range
EMI Receiver System/ Spectrum Analyzer	Hewlett Packard	HP 8546A	3520A00248	9 kHz – 5.6 GHz with external mixer
Active Loop Antenna	EMCO	6502	2611	10 kHz-30 MHz

6.6.4. Test Data

Frequency (kHz)	99% Bandwidth (kHz)
131 kHz	27.5 kHz

*See the following plot for details.

Plot 6.6.4.1
99% Occupied Bandwidth (Radiated Method)
Test Frequency: 131 kHz
Modulation: AM



6.7. TRANSMITTER RADIATED EMISSIONS [§§ 15.109, 15.209 & 15.205]

6.7.1. Limit

Section 15.209(a) – General Radiated Emission Limits

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009–0.490	2400/F(kHz)	300
0.490–1.705	24000/F(kHz)	30
1.705–30.0	30	30
30–88	100 **	3
88–216	150 **	3
216–960	200 **	3
Above 960	500	3
** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54–72 MHz, 76– 88 MHz, 174–216 MHz or 470–806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g., §§ 15.231 and 15.241.		

6.7.2. Method of Measurements

Refer to ULTRATECH Test Procedures, File # ULTR P001-2004 & ANSI C63.4.

6.7.3. Test Equipment List

Test Instruments	Manufacturer	Model No.	Serial No.	Frequency Range
EMI Receiver System/ Spectrum Analyzer	Hewlett Packard	HP 8546A	3520A00248	9 kHz – 5.6 GHz with external mixer
Active Loop Antenna	EMCO	6502	2611	10 kHz-30 MHz

6.7.4. Test Data

Frequency (MHz)	Peak E-Field @ 3m (dBµV/m)	*Peak E-Field @ 300m (dBµV/m)	Antenna Orientation	Limit at 300m (dBµV/m)	Margin (dB)
0.131	60.48	-19.52	90 degrees	25.26	-44.78

* Measured value at 3 meters was extrapolated to 300 meters by using the square of an inverse linear distance extrapolation factor of 40 dB/decade.

** The emissions were scanned from 10 kHz to 30 MHz at 3 meters distance, no other significant emissions were found.

EXHIBIT 7: MEASUREMENT UNCERTAINTY

The measurement uncertainties stated were calculated in accordance with the requirements of NIST Technical Note 1297 and NIS 81 (1994)

7.1. LINE CONDUCTED EMISSION MEASUREMENT UNCERTAINTY

CONTRIBUTION (Line Conducted)	PROBABILITY DISTRIBUTION	UNCERTAINTY (dB)	
		9-150 kHz	0.15-30 MHz
EMI Receiver specification	Rectangular	$\pm$1.5	$\pm$1.5
LISN coupling specification	Rectangular	$\pm$1.5	$\pm$1.5
Cable and Input Transient Limiter calibration	Normal (k=2)	$\pm$0.3	$\pm$0.5
Mismatch: Receiver VRC Γ_1 = 0.03 LISN VRC Γ_R = 0.8(9 kHz) 0.2 (30 MHz) Uncertainty limits 20Log(1$\pm\Gamma_1\Gamma_R$)	U-Shaped	$\pm$0.2	$\pm$0.3
System repeatability	Std. deviation	$\pm$0.2	$\pm$0.05
Repeatability of EUT	--	--	--
Combined standard uncertainty	Normal	$\pm$1.25	$\pm$1.30
Expanded uncertainty U	Normal (k=2)	$\pm$2.50	$\pm$2.60

Sample Calculation for Measurement Accuracy in 150 kHz to 30 MHz Band:

$u_c(y) = \sqrt{\sum_{i=1}^{m} u_i^2(y)} = \pm \sqrt{(1.5^2 + 1.5^2)/3 + (0.5/2)^2 + (0.05/2)^2 + 0.35^2} = \pm 1.30$ dB

$U = 2u_c(y) = \pm 2.6$ dB

7.2. RADIATED EMISSION MEASUREMENT UNCERTAINTY

CONTRIBUTION (Radiated Emissions)	PROBABILITY DISTRIBUTION	UNCERTAINTY (± dB)	
		3 m	10 m
Antenna Factor Calibration	Normal (k=2)	±1.0	±1.0
Cable Loss Calibration	Normal (k=2)	±0.3	±0.5
EMI Receiver specification	Rectangular	±1.5	±1.5
Antenna Directivity	Rectangular	+0.5	+0.5
Antenna factor variation with height	Rectangular	±2.0	±0.5
Antenna phase center variation	Rectangular	0.0	±0.2
Antenna factor frequency interpolation	Rectangular	±0.25	±0.25
Measurement distance variation	Rectangular	±0.6	±0.4
Site imperfections	Rectangular	±2.0	±2.0
Mismatch: Receiver VRC Γ_1 = 0.2 Antenna VRC Γ_R = 0.67(Bi) 0.3 (Lp) Uncertainty limits 20Log(1±$\Gamma_1\Gamma_R$)	U-Shaped	+1.1 -1.25	±0.5
System repeatability	Std. Deviation	±0.5	±0.5
Repeatability of EUT		-	-
Combined standard uncertainty	Normal	+2.19 / -2.21	+1.74 / -1.72
Expanded uncertainty U	Normal (k=2)	+4.38 / -4.42	+3.48 / -3.44

Calculation for maximum uncertainty when 3m biconical antenna including a factor of k = 2 is used:

$U = 2u_c(y) = 2x(+2.19) = +4.38$ dB And $U = 2u_c(y) = 2x(-2.21) = -4.42$ dB