47 CFR Part 15 Subpart C Section 15.249 Test Report

Product : Transmitter Trade Name : Pursuit Model Number : 4360997 FCC ID : ELVATUA

Prepared for

Nutek Corporation

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Prepared by

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Statement of Compliance

Applicant:	Nutek Corporation
Manufacturer:	Nutek Corporation
Product:	Transmitter
Model No.:	4360997
Tested Power Voltage:	DC 3V
Date of Final Test:	Nov. 17, 2020
Revision of Report:	Rev. 04

Configuration of Measurements and Standards Used 3

FCC Rules and Regulations Part 15 Subpart C

I HEREBY CERTIFY THAT: The data shown in this report were made in accordance with the procedures given in ANSI C63.10, and the energy emitted by the device was founded to be within the limits applicable. I assume full responsibility for accuracy and completeness of these data.

Note: 1. The result of the testing report relate only to the item tested.

- 2. This report shall not be partial reproduced without written approval by Interocean EMC Technology Corporation.
- 3. Judgment of conformity is based on test result, regardless of measurement uncertainty.

Report Issued: 2020/11/18

Ivan Wang Approved: KC

Project Engineer:

Ivan Wang

K.C. Chen

1 General Information

1.1 Description of Equipment Under Test

Product	:	Transmitter
Model Number	:	4360997
Applicant	:	Nutek Corporation No.167, Lane 235, Bauchiau Rd., Xindian District, New Taipei City 23145, Taiwan
Manufacturer	:	Nutek Corporation No.167, Lane 235, Bauchiau Rd., Xindian District, New Taipei City 23145, Taiwan
Operating Frequency	:	2402 MHz - 2480 MHz
Output Power	:	84.88 dBµV/m
Channel Number	:	40
Type of Modulation	:	ASK
Antenna Description	:	PCB Antenna. maximum Peak gain: 0dBi.
Measurement Software	:	e3; Ver: 8.120803a7-2
Date of Test	:	Oct. 06 ~ Nov. 17, 2020
Additional Description	:	 The test model is "4360997" and included in this report. For more detail specification about EUT, please refer to the user's manual.

1.2 Table for Carrier Frequencies

Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
Unanner	(MHz)	Onamici	(MHz)	Onamer	(MHz)		(MHz)
1	2402	11	2422	21	2442	31	2462
2	2404	12	2424	22	2444	32	2464
3	2406	13	2426	23	2446	33	2466
4	2408	14	2428	24	2448	34	2468
5	2410	15	2430	25	2450	35	2470
6	2412	16	2432	26	2452	36	2472
7	2414	17	2434	27	2454	37	2474
8	2416	18	2436	28	2456	38	2476
9	2418	19	2438	29	2458	39	2478
10	2420	20	2440	30	2460	40	2480

1.3 Test Facility

Site Description	: ⊠Chamber 3				
Name of Firm	: Interocean EMC Technology Corp.				
Company web	http://www.ietc.com.tw				
Location	: No. 5-2, Lin 1, Tin-Fu, Lin-Kou Dist., New Taipei City, Taiwan 244, R.O.C.				
Site Filing	 Federal Communication Commissions – USA Designation No.: TW1020 (Test Firm Registration #: 651092) Designation No.: TW1113 (Test Firm Registration #: 959554) Innovation, Science and Economic Development Canada (ISED) CAB identifier: TW1113 (Ref. No 14962756) Voluntary Control Council for Interference by Information Technology Equipment (VCCI) – Japan Member No.: 1349 Registration No. (Conducted Room): C-11094 Registration No. (Conducted Room): T-11562 Registration No. (OATS 1): R-11040 Registration No. (Chamber 3): G-20080 				
Site Accreditation	 Bureau of Standards and Metrology and Inspection (BSMI) – Taiwan, R.O.C. Accreditation No.: SL2-IN-E-0026 for CNS 13438 / CISPR 22 SL2-R1-E-0026 for CNS 13439 / CISPR 13 SL2-R2-E-0026 for CNS 13439 / CISPR 13 SL2-L1-E-0026 for CNS 14115 / CISPR 15 Taiwan Accreditation Foundation (TAF) Accreditation No.: 1113 American Association for Laboratory Accreditation (A2LA) Certificate Number: 4891.01 Vehicle Safety Certification Center (VSCC) Approval No.: TW16-11 				

1.4 Test Equipment

Instrument	Manufacturer	Model	Serial No.	Next Cal. Date	
EMI Test Receiver	R&S	ESI7	830154/002	2021/05/05	
Spectrum Analyzer	R&S	FSP30	100002	2021/05/12	
Bilog Antenna	ETC	MCTD 2786B	BLB17S04020	2021/05/04	
Horn Antenna	Schwarzbeck	BBHA9120	9120D-1051	2021/08/03	
Horn Antenna	Schwarzbeck	BBHA9170	BBHA9170213	2021/07/08	
Pre-Amplifier	EMCI	EMC001150	980130	2021/08/02	
Pre-Amplifier	EMCI	EMC051845	980110	2021/07/02	
Pre-Amplifier	Agilent	83050A	3950M00225	2021/02/16	
RF Cable	HARBOUR	27478LL142	CBL65	2021/07/28	
RF Cable	Marvelous Microwave	MCBL-LL266.50	CBL70	2021/07/28	
RF Cable Junkosha		MWX241	CBL58	2021/10/22	
Measurement Software	AUDIX-e3				

Note: The above equipments are within the valid calibration period.

1.5 Measurement Uncertainty

Item	Value			
Chamber 3:				
Radiated Emission Test (9 kHz to 30 MHz)	3.2 dB			
Radiated Emission Test (30 MHz to 200 MHz)	4.6 dB			
Radiated Emission Test (200 MHz to 1 GHz) (Antenna: without tilting)	5.9 dB			
Radiated Emission Test (1 GHz to 18 GHz)	5.0 dB			
Radiated Emission Test (18 GHz to 40 GHz)5.4 dB				
The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95%				

1.6 Summary of Measurement

Test Parameter	Reference Document CFR47 Part15	Results			
RF Radiated spurious emission test	§15.205, §15.209 §15.249	Pass			
Emission on the Band Edge	§15.249(d)	Pass			
AC Power Line Conducted Emission test	§15.207(a)	N/A			
20 dB Bandwidth	§15.215(c)	Pass			
Note: N/A is an abbreviation for Not Applicable.					

2 Test Specifications

2.1 Test Standard

The EUT was performed according to FCC Part 15 Subpart C Section 15.249 procedure and setup followed by ANSI C63.10-2013 requirements.

2.2 Operation Mode

By preliminary testing and verifying three axis (X, Y and Z) position of EUT transmitted status, it was found that "Y axis" position was the worst, then the final test was executed the worst condition and test data were recorded in this report.

2.3 Test Step of EUT

- 2.3.1 Setup the fixture to EUT for power supplying.
- 2.3.2 Turn on the power of all equipment.
- 2.3.3 Let the EUT continuous transmission.
- 2.3.4 Executed the test.

3 20dB Bandwidth test

3.1 Limit

Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§ 15.217 through 15.257 and in Subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated.

3.2 Test Procedure

The 20dB bandwidth per FCC §15.215 was measured using spectrum analyzer with the resolutions bandwidth set at 100 kHz, the video bandwidth \ge RBW, and the SPAN may equal to approximately 2 to 3 time the 20 dB bandwidth.

3.3 Test Result

PASS.

The final test data is shown as following pages.

Т	est CH	20dB Bandwidth (MHz)		
Modulation Frq. (MHz)				
	2402	0.264		
ASK	2440	0.262		
	2480	0.260		



2402MHz 20dB BW

Date: 17.NOV.2020 21:08:14



2440MHz 20dB BW

Date: 17.NOV.2020 21:02:21



2480MHz 20dB BW

Date: 17.NOV.2020 21:12:29

4 RF Radiated spurious emission test

4.1 Limit

According to §15.249 (a), the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental	Field strength of fundamental	Field strength of harmonics		
frequency	(millivolts/meter)	(microvolts/meter)		
902 - 928 MHz	50	500		
2400 - 2483.5 MHz	50	500		
5725 - 5875 MHz	50	500		
24.0 - 24.25 GHz	250	2500		

For intentional radiator, the radiated emission shall comply with §15.209(a).

Frequency (MHz)	Field strength dB(μV/m)	Measurement distance (meters)		
1.705 - 30.0	29.5	30		
30 - 88	40	3		
88 - 216	43.5	3		
216 - 960	46	3		
Above 960	54	3		

4.2 Configuration of Measurement

Measurement Frequency under 1 GHz



Measurement Frequency above 1 GHz



4.3 Test Procedure

The EUT was setup to ANSI C63.10-2013.

Radiated emission measurements were performed from 30 MHz to 25 GHz. Spectrum Analyzer set as below: For frequency range from 30 MHz to 1 GHz: RBW=100 kHz or greater. For frequencies above 1 GHz: set RBW=VBW=1 MHz for peak detector and RBW=1 MHz, VBW=10 Hz for average detector.

The EUT for testing is arranged on a wooden turntable. If some peripherals apply to the EUT, the peripherals will be connected to EUT and the whole system. During the test, all cables were arranged to produce worst-case emissions. The signal is maximized through rotation. The height of antenna and polarization is changing constantly for exploring for maximum signal level. The height of antenna can be up to 4 meter and down to 1 meter.

4.4 The description of operation mode

Setup EUT to continuously transmit signal with 100% duty cycle during the test period.

4.5 Test Result

PASS.

The frequency range from 9 kHz to 30 MHz was pre-scanned and the results were 20 dB lower than the limit line which according to FCC 15.31(o) needs not be recorded. The final test emission data is shown as following tables.

Radiated Emission Below 1 GHz CLIENT: Nutek Corporation

EUT: Transmitter

MODEL: 4360997

RATING: DC 3V

COMMENT: High Channel

Data:34

OPERATOR: ScottTEST SITE: Chamber 3TEST DISTANCE: 3 mPOLARIZATION: HORIZONTALTEMP/HUM: 26.4°C/45%



1	31.940	68.26	-31.59	36.67	40.00	-3.33	QP
2	64.920	66.78	-37.12	29.66	40.00	-10.34	QP
3	95.960	62.93	-34.00	28.93	43.50	-14.57	QP
4	241.460	53.10	-32.31	20.79	46.00	-25.21	QP
5	479.110	53.49	-26.99	26.50	46.00	-19.50	QP
6	585.810	51.51	-26.20	25.31	46.00	-20.69	QP

- Remark : Corrected Level = Reading + Correction Factor Preamp Correction Factor = Antenna Factor + Cable Loss Margin = Corrected Level – Limits
 - "* " Mark indicated Background Noise Level

CLIENT: Nutek Corporation	OPERATOR	: Scott
EUT: Transmitter	TEST SITE	: Chamber 3
MODEL: 4360997	TEST DISTANCE	: 3 m
RATING: DC 3V	POLARIZATION	: VERTICAL
COMMENT: High Channel	TEMP/HUM	: 26.4℃/45%
Data:35		2020-10-06



- Remark : Corrected Level = Reading + Correction Factor Preamp Correction Factor = Antenna Factor + Cable Loss Margin = Corrected Level – Limits
 - "* " Mark indicated Background Noise Level

Radiated Emission Above 1 GHz **CLIENT: Nutek Corporation OPERATOR** : Scott **EUT: Transmitter** TEST SITE : Chamber 3 MODEL: 4360997 TEST DISTANCE : 3 m RATING: DC 3V POLARIZATION : HORIZONTAL **COMMENT: Low Channel** : 26.4°C/45% **TEMP/HUM** Data:29 2020-10-06



Remark: Corrected Level = Reading + Correction Factor - Preamp

Correction Factor = Antenna Factor + Cable Loss

Margin = Corrected Level – Limits

" * " Mark indicated Background Noise Level

Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency. Measurements above show only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20dB from the applicable limit) and considered that's already beyond the background noise floor.

CLIENT: Nutek Corporation	OPERATOR	: Scott
EUT: Transmitter	TEST SITE	: Chamber 3
MODEL: 4360997	TEST DISTANCE	: 3 m
RATING: DC 3V	POLARIZATION	: VERTICAL
COMMENT: Low Channel	TEMP/HUM	: 26.4°C/45%
Data:28		2020-10-06



Correction Factor = Antenna Factor + Cable Loss

Margin = Corrected Level – Limits

"* " Mark indicated Background Noise Level

Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency. Measurements above show only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20dB from the applicable limit) and considered that's already beyond the background noise floor.

CLIENT: Nutek Corporation	OPERATOR	: Scott
EUT: Transmitter	TEST SITE	: Chamber 3
MODEL: 4360997	TEST DISTANCE	: 3 m
RATING: DC 3V	POLARIZATION	: HORIZONTAL
COMMENT: Mid Channel	TEMP/HUM	: 26.4℃/45%
Data:30		2020-10-06



Correction Factor = Antenna Factor + Cable Loss

Margin = Corrected Level – Limits

"* " Mark indicated Background Noise Level

Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency. Measurements above show only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20dB from the applicable limit) and considered that's already beyond the background noise floor.

CLIENT: Nutek Corporation	OPERATOR	: Scott
EUT: Transmitter	TEST SITE	: Chamber 3
MODEL: 4360997	TEST DISTANCE	: 3 m
RATING: DC 3V	POLARIZATION	: VERTICAL
COMMENT: Mid Channel	TEMP/HUM	: 26.4℃/45%
Data:31		2020-10-06



Correction Factor = Antenna Factor + Cable Loss

Margin = Corrected Level – Limits

"* " Mark indicated Background Noise Level

Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency. Measurements above show only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20dB from the applicable limit) and considered that's already beyond the background noise floor.

CLIENT: Nutek Corporation	OPERATOR	: Scott
EUT: Transmitter	TEST SITE	: Chamber 3
MODEL: 4360997	TEST DISTANCE	: 3 m
RATING: DC 3V	POLARIZATION	: HORIZONTAL
COMMENT: High Channel	TEMP/HUM	: 26.4 °C/ 45%
Data:26		2020-10-06



Correction Factor = Antenna Factor + Cable Loss

Margin = Corrected Level – Limits

"* " Mark indicated Background Noise Level

Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency. Measurements above show only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20dB from the applicable limit) and considered that's already beyond the background noise floor.

CLIENT: Nutek Corporation	OPERATOR	: Scott
EUT: Transmitter	TEST SITE	: Chamber 3
MODEL: 4360997	TEST DISTANCE	: 3 m
RATING: DC 3V	POLARIZATION	: VERTICAL
COMMENT: High Channel	TEMP/HUM	: 26 .4°C/45%
Data:27		2020-10-06



Correction Factor = Antenna Factor + Cable Loss

Margin = Corrected Level – Limits

"* " Mark indicated Background Noise Level

Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency. Measurements above show only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20dB from the applicable limit) and considered that's already beyond the background noise floor.

5 Emission on the Band Edge test

5.1 Limit

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

5.2 Configuration of Measurement

Measurement Frequency above 1 GHz



5.3 Test Procedure

The EUT was setup to ANSI C63.10-2013.

The EUT for testing is arranged on a wooden turntable. If some peripherals apply to the EUT, the peripherals will be connected to EUT and the whole system. During the test, all cables were arranged to produce worst-case emissions. The signal is maximized through rotation. The height of antenna and polarization is changing constantly for exploring for maximum signal level. The height of antenna can be up to 4 meter and down to 1 meter.

5.4 Test Result

PASS.

The final test data is shown on as following pages.

Band edge

CLIENT: Nutek Corporation EUT: Transmitter MODEL: 4360997 RATING: DC 3V COMMENT: Peak

OPERATOR	: Scott
TEST SITE	: Chamber 3
TEST DISTANCE	: 3 m
POLARIZATION	: HORIZONTAL
TEMP/HUM	: 26.4°C/45%

Data:18



CLIENT: Nutek Corporation	OPERATOR	: Scott
EUT: Transmitter	TEST SITE	: Chamber 3
MODEL: 4360997	TEST DISTANCE	: 3 m
RATING: DC 3V	POLARIZATION	: HORIZONTAL
COMMENT: Avg	TEMP/HUM	: 26.4 ℃/45%



CLIENT: Nutek Corporation	OPERATOR	: Scott
EUT: Transmitter	TEST SITE	: Chamber 3
MODEL: 4360997	TEST DISTANCE	: 3 m
RATING: DC 3V	POLARIZATION	: VERTICAL
COMMENT: Peak	TEMP/HUM	: 26.4°C/45%



CLIENT: Nutek Corporation	OPERATOR	: Scott
EUT: Transmitter	TEST SITE	: Chamber 3
MODEL: 4360997	TEST DISTANCE	: 3 m
RATING: DC 3V	POLARIZATION	: VERTICAL
COMMENT: Avg	TEMP/HUM	: 26.4℃/45%



CLIENT: Nutek Corporation	OPERATOR	: Scott
EUT: Transmitter	TEST SITE	: Chamber 3
MODEL: 4360997	TEST DISTANCE	: 3 m
RATING: DC 3V	POLARIZATION	: VERTICAL
COMMENT:	TEMP/HUM	: 26.4℃/45%



CLIENT: Nutek Corporation	OPERATOR	: Scott
EUT: Transmitter	TEST SITE	: Chamber 3
MODEL: 4360997	TEST DISTANCE	: 3 m
RATING: DC 3V	POLARIZATION	: VERTICAL
COMMENT:	TEMP/HUM	: 26.4°C/45%



CLIENT: Nutek Corporation	OPERATOR	: Scott
EUT: Transmitter	TEST SITE	: Chamber 3
MODEL: 4360997	TEST DISTANCE	: 3 m
RATING: DC 3V	POLARIZATION	: HORIZONTAL
COMMENT:	TEMP/HUM	: 26.4 °C/ 45%



CLIENT: Nutek Corporation	OPERATOR	: Scott
EUT: Transmitter	TEST SITE	: Chamber 3
MODEL: 4360997	TEST DISTANCE	: 3 m
RATING: DC 3V	POLARIZATION	: HORIZONTAL
COMMENT:	TEMP/HUM	: 26.4 °C/ 45%

