



Prüfbericht-Nr.: <i>Test report no.:</i>	60385253 001	Auftrags-Nr.: <i>Order no.:</i>	238114490	Seite 1 von 23 <i>Page 1 of 23</i>
Kunden-Referenz-Nr.: <i>Client reference no.:</i>	N/A	Auftragsdatum: <i>Order date:</i>	10-Jan-2020	
Auftraggeber: <i>Client:</i>	Pamex Inc. PAMEX INC, 4680 VINITA CT, CHINO, CA, 91710, UNITED STATES			
Prüfgegenstand: <i>Test item:</i>	Enkore			
Bezeichnung / Typ-Nr.: <i>Identification / Type no.:</i>	KE1-INP35A, KE1-D7P1A			
Auftrags-Inhalt: <i>Order content:</i>	FCC Part 15C Test report (13.56MHz)			
Prüfgrundlage: <i>Test specification:</i>	FCC 47CFR Part 15: Subpart C Section 15.225			
Wareneingangsdatum: <i>Date of sample receipt:</i>	03-Jun-2020			
Prüfmuster-Nr.: <i>Test sample no.:</i>	A002839446-005			
Prüfzeitraum: <i>Testing period:</i>	03-Jul-2020~07-Jul-2020			
Ort der Prüfung: <i>Place of testing:</i>	EMC/RF Laboratory Taipei			
Prüflaboratorium: <i>Testing laboratory:</i>	Taipei Testing laboratories			
Prüfergebnis*: <i>Test result*:</i>	Pass			
überprüft von: <i>reviewed by:</i>		genehmigt von: <i>authorized by:</i>		
Datum: 09-Jul-2020 <i>Date:</i>	Mars Y.J. Lin	Datum: 09-Jul-2020 <i>Date:</i>	Ryan W.T. Chen	
Stellung / Position:	Project Engineer	Stellung / Position:	Project Manager	
Sonstiges / Other:	KE1-INP35A, KE1-D7P1A use the same parts and RF chip, only the appearance of the door handle is different, the measurement is directly carried out with the worst model. After evaluation, KE1-INP35A is the worst model.			
Zustand des Prüfgegenstandes bei Anlieferung: <i>Condition of the test item at delivery:</i>	Prüfmuster vollständig und unbeschädigt <i>Test item complete and undamaged</i>			
* Legende:	1 = sehr gut P(ass) = entspricht o.g. Prüfgrundlage(n)	2 = gut F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	3 = befriedigend N/A = nicht anwendbar	4 = ausreichend N/T = nicht getestet
* Legend:	1 = very good P(ass) = passed a.m. test specification(s)	2 = good F(ail) = failed a.m. test specification(s)	3 = satisfactory N/A = not applicable	4 = sufficient N/T = not tested
Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens. <i>This test report only relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any test mark.</i>				

V05

TEST SUMMARY

5.1.1 ANTENNA REQUIREMENT

RESULT: Passed

5.1.2 FIELD STRENGTH OF FUNDAMENTAL

RESULT: Passed

5.1.3 FREQUENCY STABILITY

RESULT: Passed

5.1.4 99% BANDWIDTH

RESULT: Passed

5.1.5 SPURIOUS EMISSION

RESULT: Passed

6.1.1 ELECTROMAGNETIC FIELDS

RESULT: Passed

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1. General Remarks

1.1 Complementary Materials

All attachments are integral parts of this test report. This applies especially to the following appendix:

Appendix P: Photo Documentation
(File Name: 60385253 001 Appendix P)

Appendix D: Test Result of Radiated Emissions
(File Name: 60385253 001 Appendix D)

Appendix X: Photographs of the Test Set-Up
(File Name: 60385253 001 Appendix X)

Test Specifications

The following standards were applied (in bold: product standards, otherwise: basic standards).

Table 1: Applied Standard and Test Levels

Radio
FCC 47CFR Part 15: Subpart C Section 15.225
ANSI C63.10:2013

1.2 Complementary Materials

The decision rule of conformity of this test report is following the requirements of the requested standard in the quotation, and agreed among testing laboratory and manufacturer (applicant) to exclude the consideration of Measurement Uncertainty, unless it is required by the specific standard.

2. Test Sites

2.1 Test Laboratory

Taipei Testing Laboratories

11F. No.758, Sec. 4, Bade Rd., Songshan Dist.
Taipei City 105
Taiwan (R.O.C.)

2.2 Test Facility

Taipei Testing Laboratories

No.458-18, Sec. 2, Fenliao Rd., Linkou Dist.,
New Taipei City 244
Taiwan (R.O.C.)
(Conducted Test & Radiated Spurious Emissions)
FCC Registration No.: 226631
ISED Registration No.: 25563



2.3 List of Test and Measurement Instruments

Table 2: List of Test and Measurement Equipment

Equipment	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due Date
EMI Test Receiver	R&S	ESR7	102109	2020/4/17	2021/4/16
Spectrum Analyzer	R&S	FSV40	101508	2020/3/16	2021/3/15
Pre-Amplifier	Agilent	8447D	2727A05146	2020/2/17	2021/2/16
Pre-Amplifier	EMCI	EMC051845SE	980635	2020/2/11	2021/2/10
Pre-Amplifier	EMCI	EMC184045SE	980656	2020/2/11	2021/2/10
Bilog Antenna	SCHWARZBECK	VULB-9168	00950	2020/1/20	2021/1/19
Horn Antenna	ETS-Lindgren	3117	00218929	2019/11/27	2020/11/26
Horn Antenna	SCHWARZBECK	BBHA 9170	00896	2020/1/17	2021/1/16
Loop Antenna	EMCI	LPA600	287	2019/12/20	2020/12/19
Test Software	Audix	e3	Ver. 9	N/A	N/A
Test Cable	HUBER+SUHNER	SUCOFLEX 104EA	800057/4EA	2020/3/25	2021/3/24
Test Cable	HUBER+SUHNER	SUCOFLEX 104	802244/4	2020/3/25	2021/3/24
Test Cable	HUBER+SUHNER	SUCOFLEX 104	MY37203/4	2020/3/25	2021/3/24
Test Cable	HUBER+SUHNER	SUCOFLEX 102EA	800897/2EA	2020/3/25	2021/3/24
Test Cable	HUBER+SUHNER	SUCOFLEX 102EA	800902/2EA	2020/3/25	2021/3/24

2.4 Traceability

All measurement equipment calibrations are traceable to NML(Taiwan)/NIST(USA) or where calibration is performed outside Taiwan, to equivalent nationally recognized standards organizations.

2.5 Calibration

Equipment requiring calibration is calibrated periodically by the manufacturer or according to manufacturer's specifications. Additionally all equipment is verified for proper performance on a regular basis using in house standards or comparisons.

2.6 Measurement Uncertainty

The estimated combined standard uncertainty for radiated emissions and conducted emissions measurements are ± 3 dB.

Table 3: Emission Measurement Uncertainty

Parameter	Uncertainty
Radio Frequency	$\pm 1 \times 10^{-7}$
RF power, conducted	± 1.5 dB
Radiated emission of transmitter, valid up to 26 GHz	± 6 dB
Radiated emission of receiver, valid up to 26 GHz	± 6 dB
Temperature	± 2 °C
Humidity	± 10 %

3. General Product Information

3.1 Product Function and Intended Use

The EUT is Enkore working at 13.56 MHz with RFID function.
For details refer to the User Guide, Data Sheet and Block Diagram.

3.2 Ratings and System Details

Table 4: Basic Information of EUT

Item	EUT information
Kind of Equipment/Test Item	Enkore
Type Identification	KE1-INP35A, KE1-D7P1A
FCC ID	2AQ8A-KE1-DNI-A

Table 5: Technical Specification of EUT

Technical Specification	Value
Operating Frequency	13.56 MHz
Operation Voltage	6Vdc
Modulation	ASK
Antenna Type	Refer to 5.1.1

3.3 Independent Operation Modes

Basic operation modes are:

- A. Transmitting

3.4 Noise Generating and Noise Suppressing Parts

Refer to the Circuit Diagram.

3.5 Submitted Documents

- Circuit Diagram
- Instruction Manual
- Rating Label
- Technical Description

4. Test Set-up and Operation Modes

4.1 Principle of Configuration Selection

The equipment under test (EUT) was configured to measure its maximum emission level. The test modes were adapted accordingly in reference to the instructions for use.

4.2 Test Operation and Test Software

Setup for testing: Test samples are provided with a test mode firmware which makes it possible to transmit signal when switched on the power.

The samples were used as follows:

A002839446-005

Full test was applied on all test modes, but only worst case was shown.

4.3 Special Accessories and Auxiliary Equipment

The product has been tested together with the following additional accessories:
N/A

Support Unit

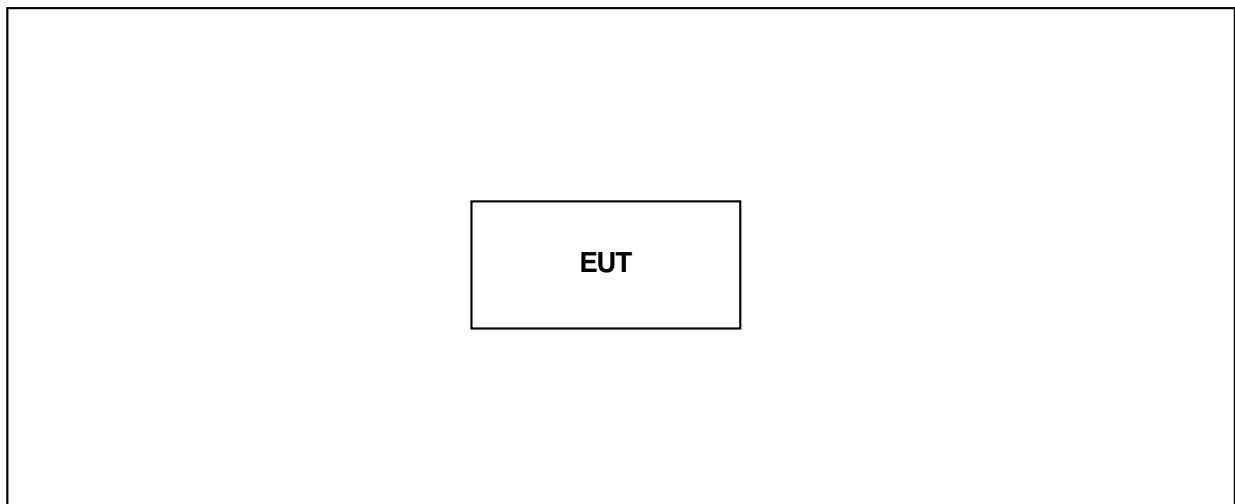
N/A

4.4 Countermeasures to achieve EMC Compliance

The test sample which has been tested contained the noise suppression parts as described in the Constructional Data Form or the Technical Construction File. No additional measures were employed to achieve compliance.

4.5 Test Setup Diagram

Diagram of Measurement Configuration for Radiation Test



5. Test Results

5.1 Transmitter Requirement & Test Suites

5.1.1 Antenna Requirement

RESULT:**Passed**

Standard : Part 15.203
Requirement : use of approved antennas only

The antenna is a printed PCB trace with no possibility of replacement with a non-approved antenna by the end-user. Therefore, the EUT is considered to comply with this provision.

Refer to EUT photo for details.

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5.1.2 Field strength of fundamental

RESULT:

Passed

Test standard : FCC Part 15.225
Basic standard : ANSI C63.10:2013

Test setup

Test Frequency : 13.56 MHz
Operation Mode : A
Ambient temperature : 22-26°C
Relative humidity : 50-65%
Atmospheric pressure : 100-103kPa

For details refer to Appendix D.

5.1.3 Frequency Stability

RESULT:
Passed

Test standard : FCC Part 15. 225(e)
 Basic standard : ANSI C63.10:2013
 Kind of test site : Shielded room

Test setup

Test Frequency : 13.56 MHz
 Operation Mode : A
 Relative humidity : 50-65%
 Atmospheric pressure : 100-103kPa

Table 6: Test result of Frequency Stability

Frequency (MHz)		13.56							
Condition		Test Time	Test Time	Test Time	Test Time	Freq Error (ppm)	Freq Error (ppm)	Freq Error (ppm)	Freq Error (ppm)
Extreme	Modulation Mode	0min	2min	5min	10 min	0min	2min	5min	10 min
T _{20°C} V _{max}	CW	13.55991	13.55991	13.55991	13.55991	-6.64	-6.64	-6.64	-6.64
T _{20°C} V _{min}	CW	13.55992	13.55992	13.55992	13.55992	-5.90	-5.90	-5.90	-5.90
T _{50°C} V _{nom}	CW	13.55985	13.55985	13.55985	13.55983	-11.06	-11.06	-11.06	-12.54
T _{40°C} V _{nom}	CW	13.55988	13.55988	13.55987	13.55987	-8.85	-8.85	-9.59	-9.59
T _{30°C} V _{nom}	CW	13.55991	13.55990	13.55990	13.55990	-6.64	-7.37	-7.37	-7.37
T _{20°C} V _{nom}	CW	13.55991	13.55991	13.55990	13.55990	-6.64	-6.64	-7.37	-7.37
T _{10°C} V _{nom}	CW	13.55993	13.55993	13.55994	13.55995	-5.16	-5.16	-4.42	-3.69
T _{0°C} V _{nom}	CW	13.55995	13.55995	13.55996	13.55996	-3.69	-3.69	-2.95	-2.95
T _{10°C} V _{nom}	CW	13.55997	13.55997	13.55997	13.55997	-2.21	-2.21	-2.21	-2.21
T _{20°C} V _{nom}	CW	13.55996	13.55997	13.55996	13.55995	-2.95	-2.21	-2.95	-3.69
Limit (ppm)		-				100			
Result		Pass							

5.1.4 99% Bandwidth

RESULT:**Passed**

Test standard : FCC Part 15.215 (c)
Basic standard : ANSI C63.10:2013
Kind of test site : Shielded room

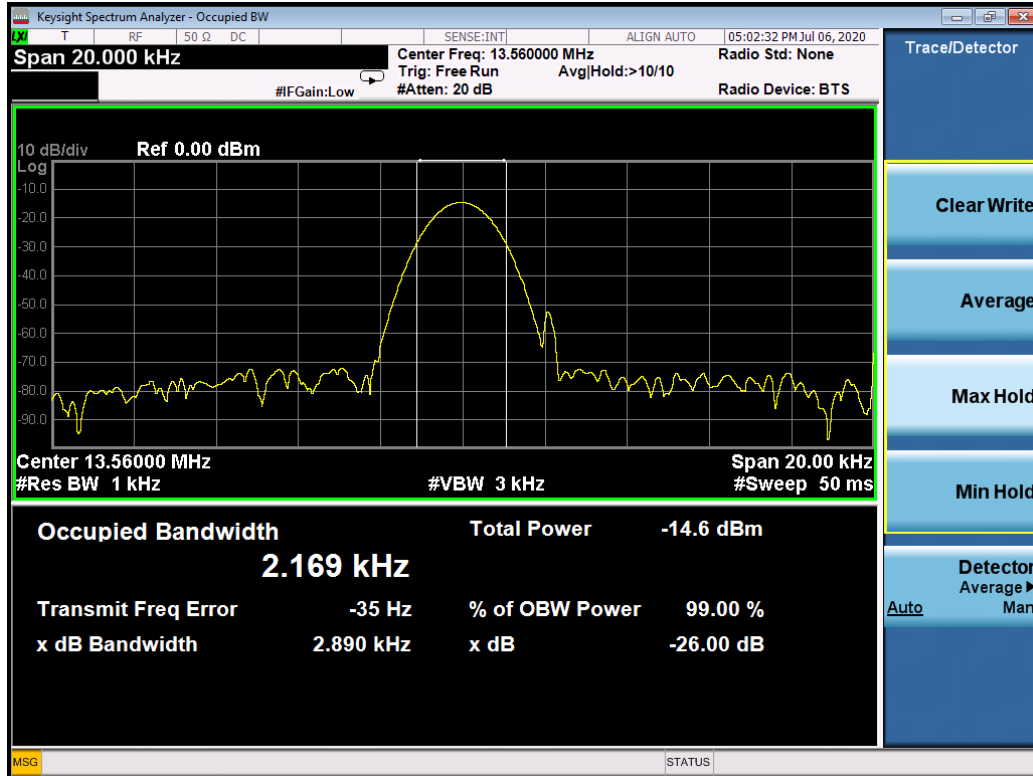
Test setup

Operation Mode : A
Ambient temperature : 22-26°C
Relative humidity : 50-65%
Atmospheric pressure : 100-103kPa

Table 7: Test result of 99% Bandwidth

Frequency (MHz)	99% Bandwidth (kHz)
13.56	2.169

Test Plot of 99% Bandwidth



5.1.5 Spurious Emission

RESULT:**Passed**

Test standard : FCC part 15.209, FCC part 15.225
Basic standard : ANSI C63.10:2013
Kind of test site : 3m Semi-Anechoic Chamber
Limits : The field strength of any emissions appearing outside of the 13.110–14.010 MHz band shall not exceed the general radiated emission limits in § 15.209.

Test setup

Operation mode : A
Ambient temperature : 22-26°C
Relative humidity : 50-65%
Atmospheric pressure : 100-103kPa

Factor (dB/m)=Antenna Factor(dB/m)+Cable loss (dB)

Level(dBuV/m)=Reading(dBuV)+ Factor(dB/m)

Testing was carried out within frequency range 9kHz to the tenth harmonic. For details refer to Appendix D. The Radiated Emissions testing was performed in the X, Y and Z axis orientation. The worst-case Axis orientation is recorded in this test report.

6. Safety Human exposure

6.1 Radio Frequency Exposure Compliance

6.1.1 Electromagnetic Fields

RESULT:**Passed**

Test standard : FCC KDB Publication 447498 D01 Appendix C

The Power calculation formula is as follows:

$$EIRP = p_t \times g_t = (E \times d)^2 / 30$$

 p_t is the transmitter output power in watts g_t is the numeric gain of the transmitting antenna (dimensionless) E is the electric field strength in V/m d is the measurement distance in meters (m)

The electric field strength in V/m is 59.99dBu V/m@3m = 0.000999V/m@3m

The d is 3m

$$(0.000999 \times 3)^2 / 30 = 2.99E-07W$$

FCC:

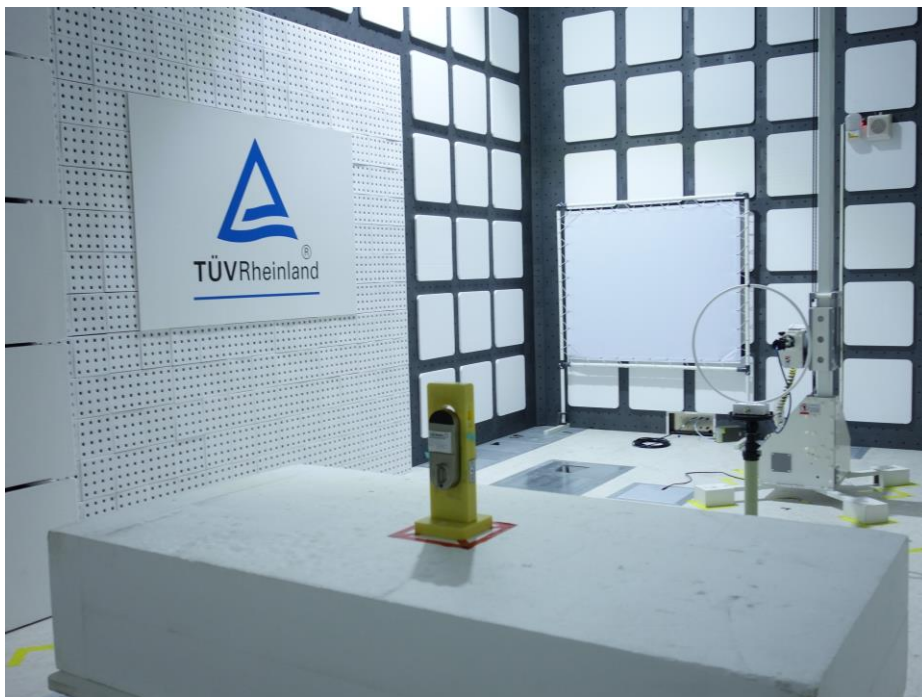
Since the transmitter's maximum peak output power is 2.99E-07W is much less than the limit, the EUT is excluded from the SAR assessment according to FCC KDB publication 447498: Mobile Portable RF Exposure

7. Photographs of the Test Set-Up

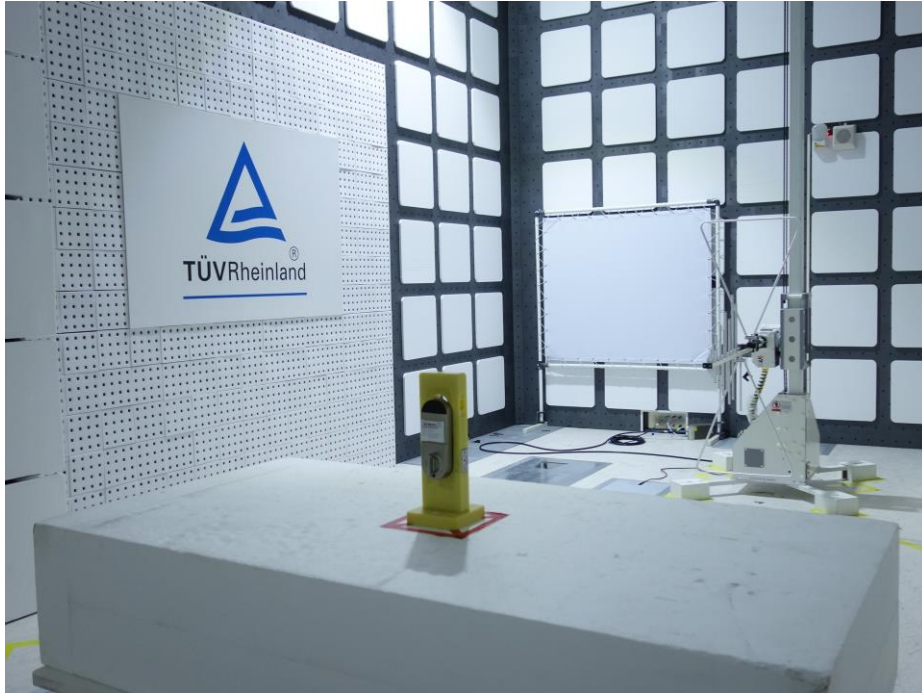
Photograph 1: Set-up for Spurious Emissions (Front View)



Photograph 2: Set-up for Spurious Emissions (Back View 1)



Photograph 3: Set-up for Spurious Emissions (Back View 2)



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