KLA-Tencor

ADDENDUM TO TEST REPORT 98979-9

AM FOUP
Model: AF100

Tested to The Following Standards:

FCC Part 15 Subpart C Section(s)

15.207 & 15.209

Report No.: 98979-9A

Date of issue: October 28, 2016

ACCREDITED
Testing Certificates:
803.01, 803.02, 803.05, 803.06

This test report bears the accreditation symbol indicating that the testing performed herein meets the test and reporting requirements of ISO/IEC 17025 under the applicable scope of EMC testing for CKC Laboratories, Inc.

We strive to create long-term, trust based relationships by providing sound, adaptive, customer first testing services. We embrace each of our customers' unique EMC challenges, not as an interruption to set processes, but rather as the reason we are in business.

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ADMINISTRATIVE INFORMATION

Test Report Information

REPORT PREPARED FOR:

KLA-Tencor
One Technology Drive
Milpitas, CA 95035

Representative: Jim Bella
Customer Reference Number: 20878859

REPORT PREPARED BY:

Dianne Dudley
CKC Laboratories, Inc.
5046 Sierra Pines Drive
Mariposa, CA 95338

Project Number: 98979

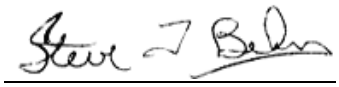
DATE OF EQUIPMENT RECEIPT: August 25, 2016
DATE(S) OF TESTING: August 25-27, 2016

Revision History

Original: Testing of the AM FOUP, Model: AF112 to FCC Part 15 Subpart C Sections 15.207 & 15.209.
Addendum A: To change Model number from AF112 to AF100 per manufacturer request.

Report Authorization

The test data contained in this report documents the observed testing parameters pertaining to and are relevant for only the sample equipment tested in the agreed upon operational mode(s) and configuration(s) as identified herein. Compliance assessment remains the client's responsibility. This report may not be used to claim product endorsement by A2LA or any government agencies. This test report has been authorized for release under quality control from CKC Laboratories, Inc.



Steve Behm
Director of Quality Assurance & Engineering Services
CKC Laboratories, Inc.

Test Facility Information

Our laboratories are configured to effectively test a wide variety of product types. CKC utilizes first class test equipment, anechoic chambers, data acquisition and information services to create accurate, repeatable and affordable test results.

TEST LOCATION(S):
CKC Laboratories, Inc.
5046 Sierra Pines Drive
Mariposa, CA 95338

Software Versions

CKC Laboratories Proprietary Software	Version
EMITest Emissions	5.03.02

Site Registration & Accreditation Information

Location	CB #	TAIWAN	CANADA	FCC	JAPAN
Mariposa A	US0103	SL2-IN-E-1147R	3082A-2	90477	A-0136

SUMMARY OF RESULTS

Standard / Specification: FCC Part 15 Subpart C - 15.207 &15.209

Test Procedure	Description	Modifications	Results
15.215(c)	Occupied Bandwidth	NA	Pass
15.209	Field Strength of Fundamental	MOD. 1	Pass
15.209	Field Strength of Spurious Emissions	MOD. 1	Pass
15.207	AC Conducted Emissions	NA	Pass

NA= Not Applicable

Modifications During Testing

This list is a summary of the modifications made to the equipment during testing.

Summary of Conditions
Modification 1: Ferrite, Wurtz electronics, 742.711.32 installed on Manual mission cable, Mode B only.

Modifications listed above must be incorporated into all production units.

Modification 1: Ferrite, Wurtz electronics, 742.711.32

Conditions During Testing

This list is a summary of the conditions noted to the equipment during testing.

Summary of Conditions
None

EQUIPMENT UNDER TEST (EUT)

During testing numerous configurations may have been utilized. The configurations listed below support compliance to the standard(s) listed in the Summary of Results section.

Configuration 1

Equipment Tested:

Device	Manufacturer	Model #	S/N
FOUP Controller	KLA-Tencor	0596649-003	NA
SA Wafer Module -A300	KLA-Tencor	0626494-000	NA
SA Wafer Module -Spectra	KLA-Tencor	0636365-000	NA
AM FOUP	KLA-Tencor	AF100	NA

Support Equipment:

Device	Manufacturer	Model #	S/N
Semiconductor Wafers	Wafer-Net	300mm P+ Substrate	NA
External Power Supply	ECO-EURO	EC-12-3.3	NA
Semiconductor Wafer	KLA-Tencor	3540D-12-8000	HT95380
Semiconductor Wafer	KLA-Tencor	3440D-12-8301	D45511

General Product Information:

Product Information	Manufacturer-Provided Details
Equipment Type:	Stand-Alone Equipment
Modulation Type(s):	OOK
Maximum Duty Cycle:	100%
Antenna Type(s) and Gain:	coil, Gain: NA
Antenna Connection Type:	Integral
Nominal Input Voltage:	7.4V on battery, 110VAC charger.
Firmware / Software used for Test:	NA*

Note: Device transmit in mode A and B, mode A charging and communicated with wafer, mode B low power communication with wafer. Freq range 1.4-1.9MHz, freq selection is wafer resonant freq dependent as determined by the physical characteristic of the wafer. The freq cannot be precisely tuned for testing.

* The device does not have special firmware/software for operation or test mode.

FCC Part 15 Subpart C

15.215(c) Occupied Bandwidth (20dB BW)

Test Setup/Conditions			
Test Location:	Mariposa Lab A	Test Engineer:	E. Wong
Test Method:	ANSI C63.10 (2013)	Test Date(s):	8/25/2016
Configuration:	1		
Test Setup:	The EUT is placed on the wooden table with Styrofoam lining Two wafers are installed in the EUT. Freq: 1.487MHz, 1.52MHz Modulation: OOK Protocol: Proprietary WiFi is Disabled. Mode A: FOUP charging Wafer (Using a SA Utilities) (Continuous Wafer Charge Power) Custom SA Software for FOUP Modules tunes RF power immediately (upon wafer insertion) Modules then applies Continuous Charge power FOUP remains in this mode until the SW is replaced (or until the wafer is removed) Mode B: Wafer/Module Wafer Communication (Using SA utilities)(ContinuousDataXferWafertoModule) Custom SA software for FOUP. Automation HT-350 or EtchTemp Wafer(s) o FOUP Module continuously performs following operations: o Mounts wafer o Precharges to 4.0V if necessary o Downloads wafer datastore (always downloads entire datastore regardless of whether it is populated) o Tops wafer up to 4.0V if necessary o Remounts wafer and repeats steps above o Process will continue as long as wafer is in FOUP The EUT is connected to a charger during the evaluation. Frequency range of measurement = 9kHz - 1000MHz. 9kHz -150 kHz; RBW=200 Hz, VBW=200 Hz;150 kHz-30 MHz; RBW=9 kHz, VBW=9 kHz, 30 MHz-1000 MHz; RBW=120 kHz, VBW=120 kHz,1000 MHz. Note: Fundamental measured with RBW=30Hz, VBW=91Hz as determined during evaluation of 20dB BW at 1 meter distance due to the presence of ambient signal. It was verified at 1 meter distance that the variation of RBW did not change the measured amplitude of the transmit signal.		

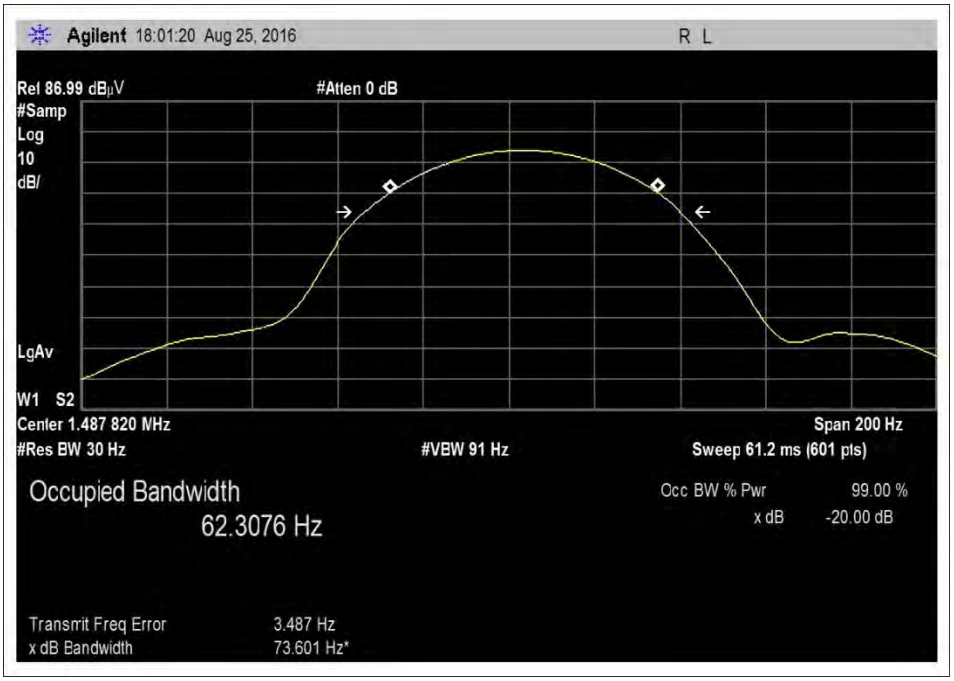
Environmental Conditions			
Temperature (ºC)	28	Relative Humidity (%):	38

Test Equipment					
Asset #	**Description**	**Manufacturer**	**Model**	**Cal Date**	**Cal Due**
02672	Spectrum Analyzer	Agilent	E4446A	9/30/2015	9/30/2017
00226	Loop Antenna	EMCO	6502	4/4/2016	4/4/2018
P06230	Cable	Andrew	CXTA04A-50	3/3/2016	3/3/2018
P06847	Cable	Times Microwave Systems	LMR195-FR-6	7/9/2015	7/9/2017
P06884	Cable	TMS	LMR195-FR-4	10/27/2015	10/27/2017
P04249	Cable - Site A Underground	Andrew		3/3/2016	3/3/2018

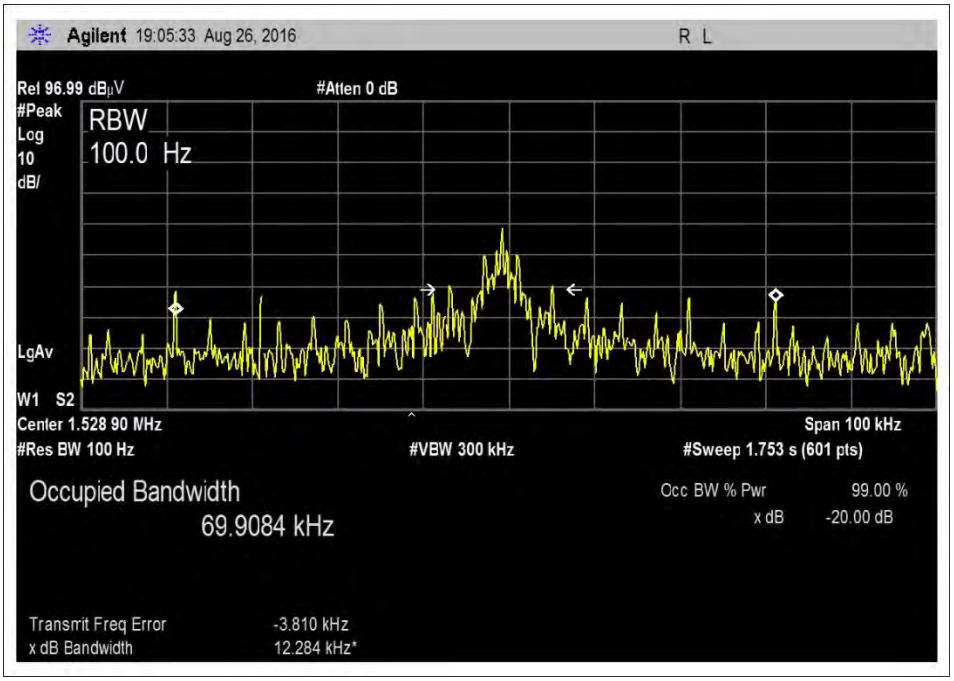
Test Data Summary					
Frequency (MHz)	**Antenna Port**	**Modulation**	**Measured (kHz)**	**Limit (kHz)**	**Results**
1.48	1	OOK / Mode A	0.07361	None	NA
1.52	1	OOK/ Mode B	12.28	None	NA

Note: RBW of 1%-5% EBW could not be achieved due to CW like nature of the signal.

Plot(s)

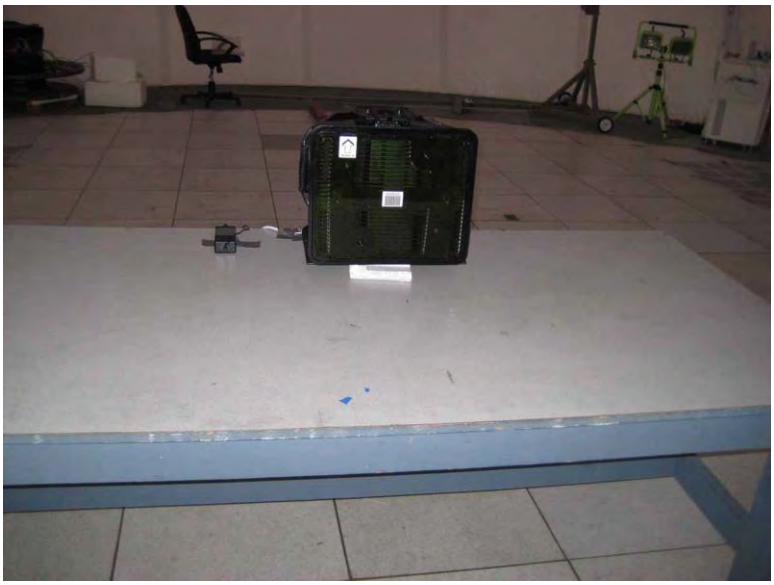


Mode A



Mode B

Test Setup Photo(s)



15.209 Field Strength of Fundamental

Test Setup/Conditions			
Test Location:	Mariposa Lab A	Test Engineer:	E. Wong
Test Method:	ANSI C63.10 (2013)	Test Date(s):	8/25/2016
Configuration:	1		
Test Setup	The EUT is placed on the wooden table with Styrofoam lining Two wafers are installed in the EUT. Freq: 1.487MHz Modulation: OOK Protocol: Proprietary WiFi is Disabled. Mode A: FOUP charging Wafer (Using a SA Utilities) (Continuous Wafer Charge Power) Custom SA Software for FOUP Modules tunes RF power immediately (upon wafer insertion) Modules then applies Continuous Charge power FOUP remains in this mode until the SW is replaced (or until the wafer is removed) Mode B: Wafer/Module Wafer Communication (Using SA utilities)(ContinuousDataXferWafertoModule) Custom SA software for FOUP. Automation HT-350 or EtchTemp Wafer(s) o FOUP Module continuously performs following operations: o Mounts wafer o Precharges to 4.0V if necessary o Downloads wafer datastore (always downloads entire datastore regardless of whether it is populated) o Tops wafer up to 4.0V if necessary o Remounts wafer and repeats steps above o Process will continue as long as wafer is in FOUP The EUT is connected to a charger during the evaluation. Frequency range of measurement = 9kHz - 1000MHz. 9 kHz -150 kHz; RBW=200 Hz, VBW=200 Hz;150 kHz-30 MHz; RBW=9 kHz, VBW=9 kHz, 30 MHz-1000 MHz; RBW=120 kHz, VBW=120 kHz,1000 MHz- Note: Fundamental measured with RBW=30Hz, VBW=91Hz as determined during evaluation of 20dB BW at 1 meter distance due to the presence of ambient signal. It was verified at 1 meter distance that the variation of RBW did not change the measured amplitude of the transmit signal.		

Environmental Conditions			
Temperature (ºC)	28	Relative Humidity (%):	38

Test Equipment					
Asset #	**Description**	**Manufacturer**	**Model**	**Cal Date**	**Cal Due**
02672	Spectrum Analyzer	Agilent	E4446A	9/30/2015	9/30/2017
00226	Loop Antenna	EMCO	6502	4/4/2016	4/4/2018
P06230	Cable	Andrew	CXTA04A-50	3/3/2016	3/3/2018
P06847	Cable	Times Microwave Systems	LMR195-FR-6	7/9/2015	7/9/2017
P06884	Cable	TMS	LMR195-FR-4	10/27/2015	10/27/2017
P04249	Cable - Site A Underground	Andrew		3/3/2016	3/3/2018

Test Data Summary - Voltage Variations					
Frequency (MHz)	**Modulation / Ant Port**	**$V_{Minimum}$ (dBuV/m)**	**$V_{Nominal}$ (dBuV/m)**	**$V_{Maximum}$ (dBuV/m)**	**Max Deviation from $V_{Nominal}$ (dB)**
1.48	OOK / Mode A/ 1	16.9	16.9	16.9	0
1.52	OOK/ Mode B / 1	8.5	8.5	8.5	0

Test performed using operational mode with the highest output power, representing worst case.

Parameter Definitions:

Measurements performed at input voltage Vnominal ± 15%.

Parameter	Value
$V_{Nominal}$:	110 VAC
$V_{Minimum}$:	93.5VAC
$V_{Maximum}$:	126.5.00 VAC

In addition, power output tests were performed using a fresh battery at 7.4 dc.

Test Data Summary - Voltage Variations

This equipment is battery powered. Power output tests were performed using a fresh battery.

Test Data Summary – Radiated Field Strength Measurement					
Frequency (MHz)	**Modulation**	**Ant. Type**	**Measured (dBuV/m @ 3m)**	**Limit (dBuV/m @ 3m)**	**Results**
1.48	OOK	Integral	16.9	≤24.1	Pass
1.53	OOK	Integral	8.5	≤23.9	Pass

Note: Mode A

Fundamental measured with RBW=30Hz, VBW=91Hz as determined during evaluation of 20dB BW at 1-meter distance due to the presence of ambient signal. It was verified at 1-meter distance that the variation of RBW did not change the measured amplitude of the transmit signal.

Mode

Measurement at 1 meter due to extreme low level of intentional signal.

Test Data

Test Location:	CKC Laboratories, Inc. • 5046 Sierra Pines Drive • Mariposa, CA 95338 • (209) 966-5240		
Customer:	**KLA-Tencor**		
Specification:	**15.209 Radiated Emissions**		
Work Order #:	**98979**	Date:	8/26/2016
Test Type:	**Radiated Scan**	Time:	19:58:40
Tested by:	E. Wong	Sequence#:	3
Software:	EMITest 5.03.02		

Equipment Tested:

Device	Manufacturer	Model #	S/N
config 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
config 1			

Test Conditions / Notes:

The EUT is placed on the wooden table with Styrofoam lining Two wafers are installed in the EUT.

Freq: 1.487MHz
Modulation: OOK
Protocol: Proprietary

WiFi is Disabled.

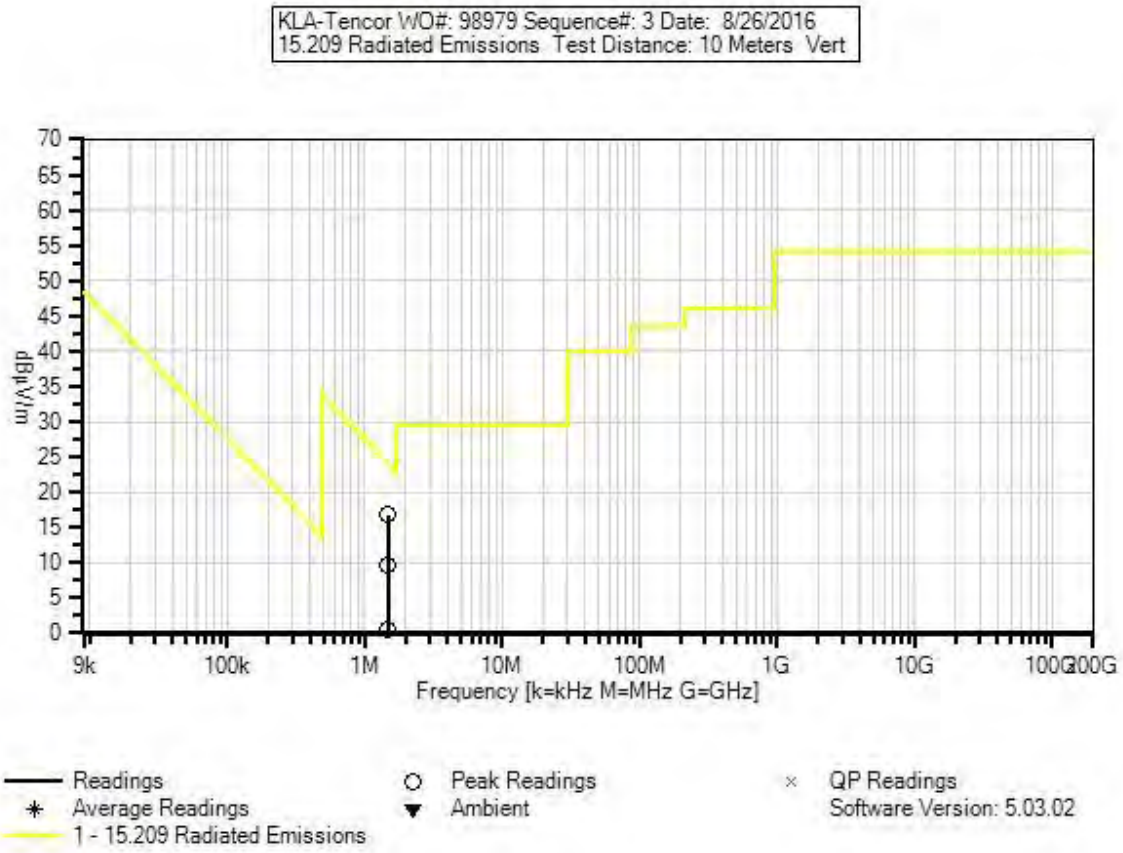
Mode A:
FOUP charging Wafer (Using a SA Utilities) (Continuous Wafer Charge Power)
Custom SA Software for FOUP
Modules tunes RF power immediately (upon wafer insertion)
Modules then applies Continuous Charge power
FOUP remains in this mode until the SW is replaced (or until the wafer is removed)

The EUT is connected to a charger during the evaluation.

Frequency range of measurement = Fundamental
150 kHz-30 MHz; RBW=9 kHz, VBW=9 kHz*

Test environment conditions: Temperature: 28°C, Relative Humidity: 38%, Atmospheric Pressure: 100kPa

Note:
*Fundamental measured with RBW=30Hz, VBW=91Hz as determined during evaluation of 20dB BW at 1 meter distance due to the presence of ambient signal. It was verified at 1 meter distance that the variation of RBW did not change the measured amplitude of the transmit signal.


KLA-Tencor WO#: 98979 Sequence#: 3 Date: 8/26/2016
15.209 Radiated Emissions Test Distance: 10 Meters Vert
70
65
60
55
50
45
40
35
30
25
20
15
10
5
0
dBµV/m
9k
100k
1M
10M
100M
1G
10G
100G
Frequency [k=kHz M=MHz G=GHz]
Readings
Average Readings
1 - 15.209 Radiated Emissions
Peak Readings
Ambient
QP Readings
Software Version: 5.03.02

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02672	Spectrum Analyzer	E4446A	9/30/2015	9/30/2017
T1	ANP04249	Cable	CXTA04A-50	3/3/2016	3/3/2018
T2	ANP06230	Cable	CXTA04A-50	3/3/2016	3/3/2018
T3	ANP06847	Cable	LMR195-FR-6	7/9/2015	7/9/2017
T4	ANP06884	Cable	LMR195-FR-4	10/27/2015	10/27/2017
T5	AN00226	Loop Antenna	6502	4/4/2016	4/4/2018

Measurement Data: Reading listed by margin. Test Distance: 10 Meters

#	Freq	Rdng	T1 T5	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV/m	dBµV/m	dB	Ant
1	1.488M	25.7	+0.1 +10.1	+0.1	+0.0	+0.0	-19.1	16.9	24.1 Fundamental	-7.2	Paral
2	1.488M	18.4	+0.1 +10.1	+0.1	+0.0	+0.0	-19.1	9.6	24.1 Fundamental	-14.5	Perpe
3	1.488M	9.4	+0.1 +10.1	+0.1	+0.0	+0.0	-19.1	0.6	24.1 Fundamental	-23.5	Groun

Test Location:	CKC Laboratories, Inc. • 5046 Sierra Pines Drive • Mariposa, CA 95338 • (209) 966-5240		
Customer:	**KLA-Tencor**		
Specification:	**15.209 Radiated Emissions**		
Work Order #:	**98979**	Date:	8/26/2016
Test Type:	**Radiated Scan**	Time:	19:10:37
Tested by:	E. Wong	Sequence#:	4
Software:	EMITest 5.03.02		

Equipment Tested:

Device	Manufacturer	Model #	S/N
Config1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Config1			

Test Conditions / Notes:

The EUT is placed on the wooden table with Styrofoam lining Two wafers are installed in the EUT.

Freq: 1.528MHz
Modulation: OOK
Protocol: Proprietary

WiFi is Disabled.

Mode B: Wafer/Module Wafer Communication (Using SA utilities)(ContinuousDataXferWafertoModule) Custom SA software for FOUP. Automation HT-350 or EtchTemp Wafer(s)

- FOUP Module continuously performs following operations:
- Mounts wafer
- Precharges to 4.0V if necessary
- Downloads wafer datastore (always downloads entire datastore regardless of whether it is populated).
- Tops wafer up to 4.0V if necessary.
- Remounts wafer and repeats steps above.
- Process will continue as long as wafer is in FOUP.

The EUT is connected to a charger during the evaluation.

Frequency range of measurement = Fundamental
150 kHz-30 MHz; RBW=9 kHz, VBW=9 kHz

Test environment conditions: Temperature: 28°C, Relative Humidity: 38%, Atmospheric Pressure: 100kPa

Note: Fundamental measured at 1 meter distance due to the extremely weak signal strength.

Modification 1 was in place during testing.


KLA-Tencor WO#: 98979 Sequence#: 4 Date: 8/26/2016
15.209 Radiated Emissions Test Distance: 1 Meter Parallel
70
60
50
40
30
20
10
0
-10
-20
-30
dBµV/m
9k
100k
1M
10M
100M
1G
10G
100G
200G
Frequency [k=kHz M=MHz G=GHz]
Readings
Average Readings
1 - 15.209 Radiated Emissions
Peak Readings
Ambient
QP Readings
Software Version: 5.03.02

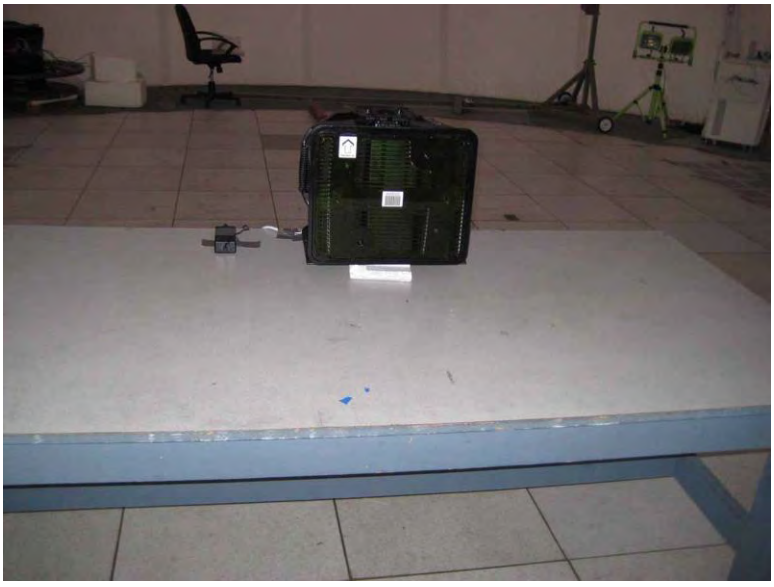
Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02672	Spectrum Analyzer	E4446A	9/30/2015	9/30/2017
T2	ANP04249	Cable	CXTA04A-50	3/3/2016	3/3/2018
T3	ANP06230	Cable	CXTA04A-50	3/3/2016	3/3/2018
T4	ANP06847	Cable	LMR195-FR-6	7/9/2015	7/9/2017
T5	ANP06884	Cable	LMR195-FR-4	10/27/2015	10/27/2017
T6	AN00226	Loop Antenna	6502	4/4/2016	4/4/2018
T7	ANP06231	Cable	CXTA04A-70	3/3/2016	3/3/2018
T8	ANP06232	Cable	CXTA04A-35	3/3/2016	3/3/2018

Measurement Data: Reading listed by margin. Test Distance: 1 Meter

#	Freq	Rdng	T1	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
			T5	T6	T7	T8					
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV/m	dBµV/m	dB	Ant
1	1.528M	57.1	+0.0	+0.1	+0.1	+0.0	-59.1	8.5	23.9	-15.4	Groun
			+0.0	+10.1	+0.1	+0.1			Fundamental		
2	1.529M	35.8	+0.0	+0.1	+0.1	+0.0	-59.1	-12.8	23.9	-36.7	Paral
			+0.0	+10.1	+0.1	+0.1			Fundamental		
3	1.529M	21.5	+0.0	+0.1	+0.1	+0.0	-59.1	-27.1	23.9	-51.0	Perpe
			+0.0	+10.1	+0.1	+0.1			Fundamental		

Test Setup Photo(s)



15.209 Radiated Emissions

Test Setup/Conditions			
Test Location:	Mariposa Lab A	Test Engineer:	E. Wong
Test Method:	ANSI C63.10 (2013)	Test Date(s):	8/25/2016
Configuration:	1		

Environmental Conditions			
Temperature (ºC)	28	Relative Humidity (%):	38

See data sheets for test setup and test equipment.

Test Data

Test Location: CKC Laboratories, Inc. • 5046 Sierra Pines Drive • Mariposa, CA 95338 • (209) 966-5240
Customer: **KLA-Tencor**
Specification: **15.209 Radiated Emissions**
Work Order #: **98979** Date: 8/26/2016
Test Type: **Radiated Scan** Time: 19:58:40
Tested by: E. Wong Sequence#: 3
Software: EMITest 5.03.02

Equipment Tested:

Device	Manufacturer	Model #	S/N
config 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
config 1			

Test Conditions / Notes:

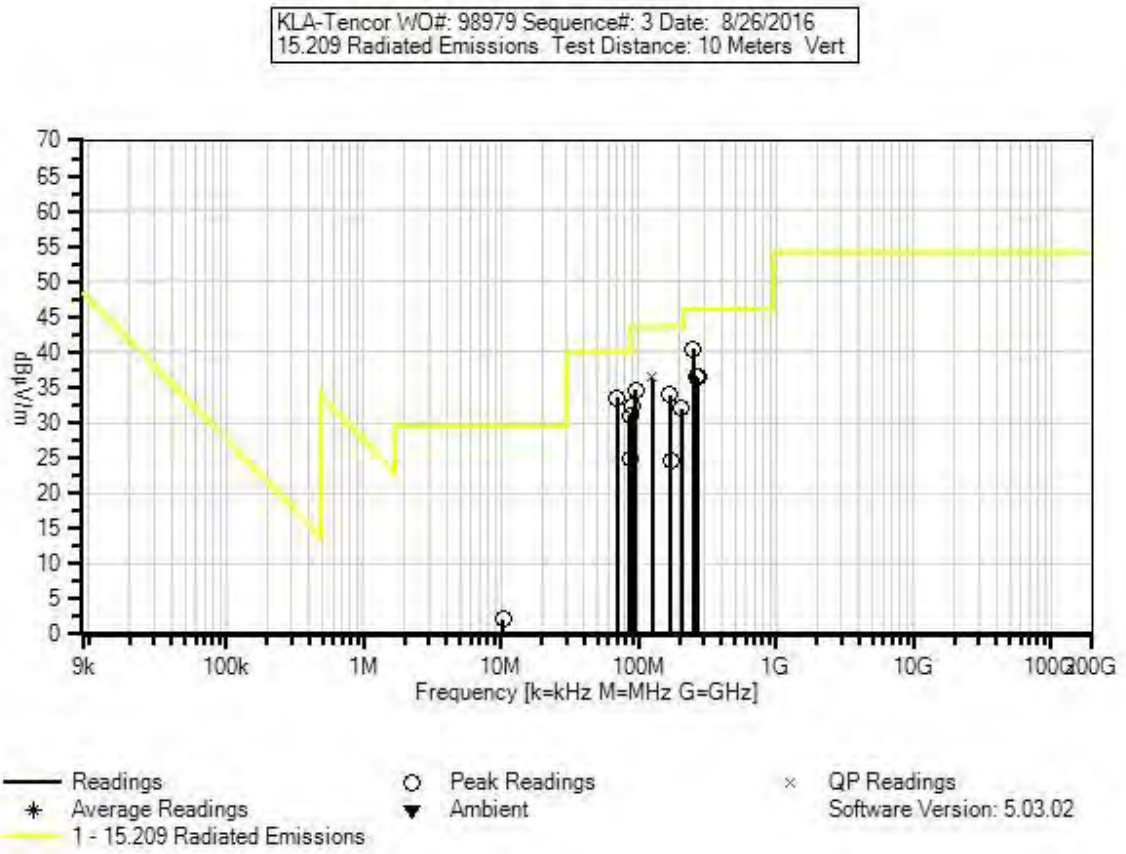
The EUT is placed on the wooden table with Styrofoam lining two wafers are installed in the EUT.

Freq: 1.487MHz
Modulation: OOK
Protocol: Proprietary

WiFi is Disabled.

Mode A:
FOUP charging Wafer (Using a SA Utilities) (Continuous Wafer Charge Power)
Custom SA Software for FOUP
Modules tunes RF power immediately (upon wafer insertion)
Modules then applies Continuous Charge power
FOUP remains in this mode until the SW is replaced (or until the wafer is removed)

The EUT is connected to a charger during the evaluation.
Frequency range of measurement = 9kHz - 1000MHz.
9 kHz -150 kHz; RBW=200 Hz, VBW=200 Hz;150 kHz-30 MHz; RBW=9 kHz, VBW=9 kHz, 30 MHz-1000 MHz; RBW=120 kHz, VBW=120 kHz,1000 MHz-
Test environment conditions: Temperature: 28°C, Relative Humidity: 38%, Atmospheric Pressure: 100kPa


KLA-Tencor WO#: 98979 Sequence#: 3 Date: 8/26/2016
15.209 Radiated Emissions Test Distance: 10 Meters Vert
dBµV/m
70
65
60
55
50
45
40
35
30
25
20
15
10
5
0
9k
100k
1M
10M
100M
1G
10G
100G
200G
Frequency [k=kHz M=MHz G=GHz]
Readings
Average Readings
1 - 15.209 Radiated Emissions
Peak Readings
Ambient
QP Readings
Software Version: 5.03.02

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02672	Spectrum Analyzer	E4446A	9/30/2015	9/30/2017
T2	AN01993	Biconilog Antenna	CBL6111C	3/11/2016	3/11/2018
T3	ANP05656	Attenuator	PE7004-6	12/22/2015	12/22/2017
T4	ANP04249	Cable	CXTA04A-50	3/3/2016	3/3/2018
T5	ANP06230	Cable	CXTA04A-50	3/3/2016	3/3/2018
T6	ANP06847	Cable	LMR195-FR-6	7/9/2015	7/9/2017
T7	AN00449	Preamp-Top Amp (dB)	8447F	2/18/2016	2/18/2018
T8	ANP06884	Cable	LMR195-FR-4	10/27/2015	10/27/2017
T9	AN00226	Loop Antenna	6502	4/4/2016	4/4/2018

Measurement Data: Reading listed by margin. Test Distance: 10 Meters

#	Freq	Rdng	T1 T5 T9	T2 T6	T3 T7	T4 T8	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV/m	dBµV/m	dB	Ant
1	250.001M	33.5	+0.0 +1.9 +0.0	+12.9 +0.4	+6.0 -26.3	+1.3 +0.3	+10.5	40.5	46.0	-5.5	Horiz
2	69.776M	37.1	+0.0 +1.0 +0.0	+5.0 +0.2	+6.0 -27.1	+0.7 +0.1	+10.5	33.5	40.0	-6.5	Vert
3	126.096M QP	32.5	+0.0 +1.3 +0.0	+11.8 +0.3	+6.0 -27.0	+0.9 +0.2	+10.5	36.5	43.5	-7.0	Vert
^	126.096M	34.7	+0.0 +1.3 +0.0	+11.8 +0.3	+6.0 -27.0	+0.9 +0.2	+10.5	38.7	43.5	-4.8	Vert
5	94.833M	33.6	+0.0 +1.1 +0.0	+9.3 +0.2	+6.0 -27.0	+0.8 +0.2	+10.5	34.7	43.5	-8.8	Vert
6	86.377M	31.0	+0.0 +1.0 +0.0	+8.5 +0.2	+6.0 -27.1	+0.8 +0.2	+10.5	31.1	40.0	-8.9	Vert
7	262.317M	29.4	+0.0 +1.9 +0.0	+13.1 +0.4	+6.0 -26.3	+1.3 +0.3	+10.5	36.6	46.0	-9.4	Horiz
8	168.033M	31.3	+0.0 +1.5 +0.0	+9.8 +0.3	+6.0 -26.6	+1.0 +0.2	+10.5	34.0	43.5	-9.5	Vert
9	269.634M	29.2	+0.0 +2.0 +0.0	+13.2 +0.4	+6.0 -26.5	+1.3 +0.3	+10.5	36.4	46.0	-9.6	Horiz

10	90.369M	31.8	+0.0 +1.1 +0.0	+8.8 +0.2	+6.0 -27.1	+0.8 +0.2	+10.5	32.3	43.5	-11.2	Vert
11	206.331M	29.0	+0.0 +1.7 +0.0	+9.7 +0.3	+6.0 -26.5	+1.1 +0.3	+10.5	32.1	43.5	-11.4	Horiz
12	85.933M	24.9	+0.0 +1.0 +0.0	+8.4 +0.2	+6.0 -27.1	+0.8 +0.2	+10.5	24.9	40.0	-15.1	Vert
13	172.106M	22.2	+0.0 +1.5 +0.0	+9.5 +0.3	+6.0 -26.6	+1.0 +0.2	+10.5	24.6	43.5	-18.9	Horiz
14	10.310M	10.6	+0.0 +0.4 +9.8	+0.0 +0.1	+0.0 +0.0	+0.2 +0.1	-19.1	2.1	29.5	-27.4	Perpe

Test Location:	CKC Laboratories, Inc. • 5046 Sierra Pines Drive • Mariposa, CA 95338 • (209) 966-5240		
Customer:	**KLA-Tencor**		
Specification:	**15.209 Radiated Emissions**		
Work Order #:	**98979**	Date:	8/26/2016
Test Type:	**Radiated Scan**	Time:	19:10:37
Tested by:	E. Wong	Sequence#:	4
Software:	EMITest 5.03.02		

Equipment Tested:

Device	Manufacturer	Model #	S/N
Config1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Config1			

Test Conditions / Notes:

The EUT is placed on the wooden table with Styrofoam lining Two wafers are installed in the EUT.

Freq: 1.528MHz
Modulation: OOK
Protocol: Proprietary

WiFi is Disabled.

Mode B: Wafer/Module Wafer Communication (Using SA utilities)(ContinuousDataXferWafertoModule) Custom SA software for FOUP. Automation HT-350 or EtchTemp Wafer(s)

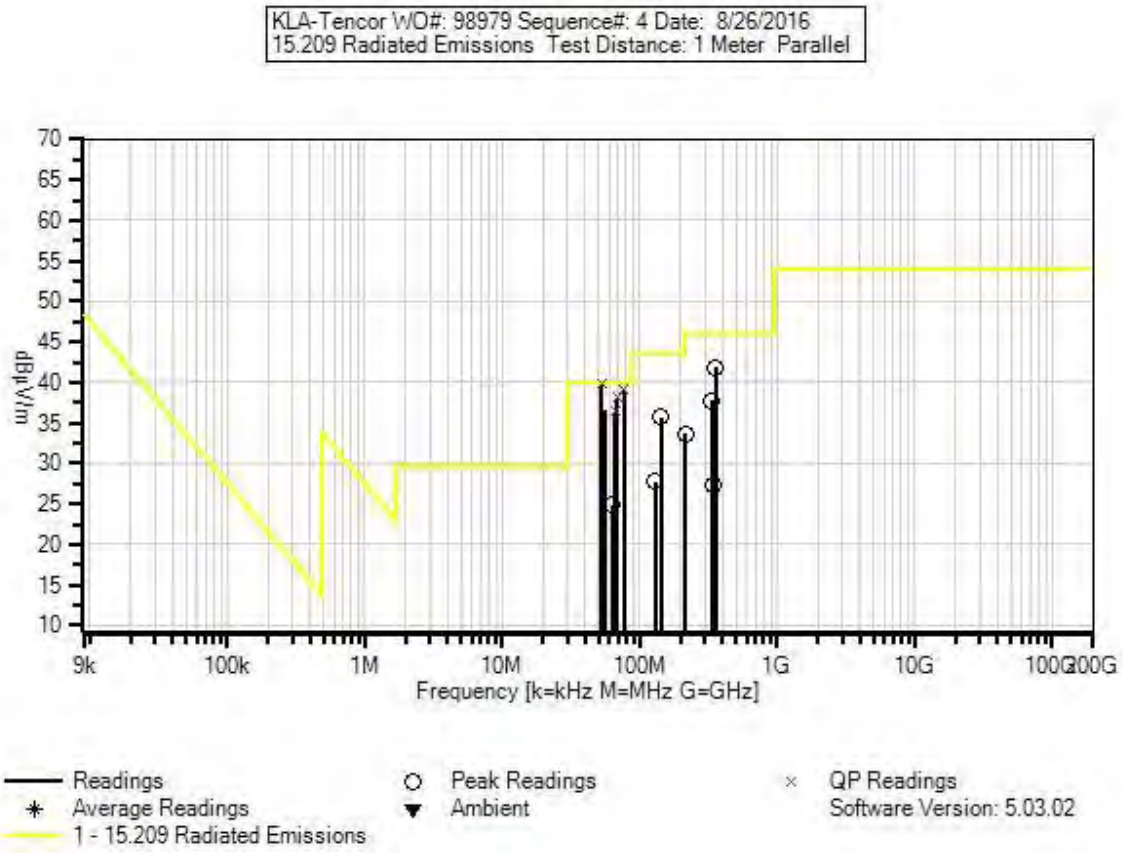
- o FOUP Module continuously performs following operations:
- o Mounts wafer
- o Precharges to 4.0V if necessary
- o Downloads wafer datastore (always downloads entire datastore regardless of whether it is populated)
- o Tops wafer up to 4.0V if necessary
- o Remounts wafer and repeats steps above
- o Process will continue as long as wafer is in FOUP

The EUT is connected to a charger during the evaluation.

Frequency range of measurement = 9kHz - 1000MHz.
9 kHz-150 kHz; RBW=200 Hz, VBW=200 Hz;150 kHz-30 MHz; RBW=9 kHz, VBW=9 kHz, 30 MHz-1000 MHz; RBW=120 kHz, VBW=120 kHz,1000 MHz-

Test environment conditions: Temperature: 28°C, Relative Humidity: 38%, Atmospheric Pressure: 100kPa

Modification 1 was in place during testing.


KLA-Tencor WO#: 98979 Sequence#: 4 Date: 8/26/2016
15.209 Radiated Emissions Test Distance: 1 Meter Parallel
70
65
60
55
50
45
40
35
30
25
20
15
10
dBµV/m
9k
100k
1M
10M
100M
1G
10G
100G
200G
Frequency [k=kHz M=MHz G=GHz]
Readings
Average Readings
1 - 15.209 Radiated Emissions
Peak Readings
Ambient
QP Readings
Software Version: 5.03.02

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02672	Spectrum Analyzer	E4446A	9/30/2015	9/30/2017
T2	AN01993	Biconilog Antenna	CBL6111C	3/11/2016	3/11/2018
T3	ANP05656	Attenuator	PE7004-6	12/22/2015	12/22/2017
T4	ANP04249	Cable	CXTA04A-50	3/3/2016	3/3/2018
T5	ANP06230	Cable	CXTA04A-50	3/3/2016	3/3/2018
T6	ANP06847	Cable	LMR195-FR-6	7/9/2015	7/9/2017
T7	AN00449	Preamp-Top Amp (dB)	8447F	2/18/2016	2/18/2018
T8	ANP06884	Cable	LMR195-FR-4	10/27/2015	10/27/2017
	AN00226	Loop Antenna	6502	4/4/2016	4/4/2018
T9	ANP05494	Dipole Antenna	VHAP	12/11/2014	12/11/2016
	ANP06231	Cable	CXTA04A-70	3/3/2016	3/3/2018
	ANP06232	Cable	CXTA04A-35	3/3/2016	3/3/2018

Measurement Data: Reading listed by margin. Test Distance: 1 Meter

#	Freq	Rdng	T1 T5 T9	T2 T6	T3 T7	T4 T8	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV/m	dBµV/m	dB	Ant
1	53.117M	41.4	+0.0	+7.4	+6.0	+0.6	+10.5	39.8	40.0	-0.2	Vert
	QP		+0.8	+0.2	-27.2	+0.1					
			+0.0								
^	53.117M	43.0	+0.0	+7.4	+6.0	+0.6	+10.5	41.4	40.0	+1.4	Vert
			+0.8	+0.2	-27.2	+0.1					
			+0.0								
3	76.647M	40.6	+0.0	+7.0	+6.0	+0.7	+10.5	39.1	40.0	-0.9	Vert
	QP		+1.0	+0.2	-27.1	+0.2					
			+0.0								
^	76.647M	43.3	+0.0	+7.0	+6.0	+0.7	+10.5	41.8	40.0	+1.8	Vert
			+1.0	+0.2	-27.1	+0.2					
			+0.0								
5	69.067M	41.6	+0.0	+5.1	+6.0	+0.7	+10.5	38.1	40.0	-1.9	Vert
	QP		+1.0	+0.2	-27.1	+0.1					
			+0.0								
^	69.067M	45.2	+0.0	+5.1	+6.0	+0.7	+10.5	41.7	40.0	+1.7	Vert
			+1.0	+0.2	-27.1	+0.1					
			+0.0								
7	56.138M	31.5	+0.0	+0.0	+6.0	+0.6	+10.5	36.6	40.0	-3.4	Vert
	Dipole QP		+0.8	+0.2	-27.1	+0.1					
			+14.0								
^	56.138M	33.7	+0.0	+0.0	+6.0	+0.6	+10.5	38.8	40.0	-1.2	Vert
	Dipole		+0.8	+0.2	-27.1	+0.1					
			+14.0								

9	66.017M QP	39.6	+0.0 +1.0 +0.0	+5.4 +0.2	+6.0 -27.1	+0.7 +0.1	+10.5	36.4	40.0	-3.6	Vert
^	66.017M	42.6	+0.0 +1.0 +0.0	+5.4 +0.2	+6.0 -27.1	+0.7 +0.1	+10.5	39.4	40.0	-0.6	Vert
11	357.210M	32.1	+0.0 +2.3 +0.0	+15.2 +0.5	+6.0 -26.6	+1.5 +0.4	+10.5	41.9	46.0	-4.1	Vert
12	142.579M	31.7	+0.0 +1.4 +0.0	+11.5 +0.3	+6.0 -26.9	+1.0 +0.2	+10.5	35.7	43.5	-7.8	Vert
13	333.830M	28.9	+0.0 +2.1 +0.0	+14.6 +0.4	+6.0 -26.5	+1.4 +0.3	+10.5	37.7	46.0	-8.3	Vert
14	213.850M	29.6	+0.0 +1.7 +0.0	+10.3 +0.4	+6.0 -26.4	+1.2 +0.3	+10.5	33.6	43.5	-9.9	Vert
15	63.100M	27.9	+0.0 +0.9 +0.0	+5.7 +0.2	+6.0 -27.1	+0.7 +0.1	+10.5	24.9	40.0	-15.1	Horiz
16	130.520M	23.8	+0.0 +1.3 +0.0	+11.7 +0.3	+6.0 -27.0	+0.9 +0.2	+10.5	27.7	43.5	-15.8	Horiz
17	341.500M	18.0	+0.0 +2.2 +0.0	+14.8 +0.5	+6.0 -26.5	+1.5 +0.4	+10.5	27.4	46.0	-18.6	Horiz

Test Setup Photo(s)

15.207 AC Conducted Emissions

Test Setup/Conditions			
Test Location:	Mariposa Lab A	Test Engineer:	E. Wong
Test Method:	ANSI C63.10 (2013)	Test Date(s):	8/27/2016
Configuration:	1		

Environmental Conditions			
Temperature (ºC)	27	Relative Humidity (%):	39

See data sheets for test setup and test equipment.

Test Data

Test Location: CKC Laboratories, Inc. • 5046 Sierra Pines Drive • Mariposa, CA 95338 • (209) 966-5240
Customer: **KLA-Tencor**
Specification: **15.207 AC Mains - Average**
Work Order #: **98979** Date: 8/27/2016
Test Type: **Conducted Emissions** Time: 17:08:07
Tested by: E. Wong Sequence#: 20
Software: EMITest 5.03.02 110V 60Hz

Equipment Tested:

Device	Manufacturer	Model #	S/N
Config1			

Support Equipment:

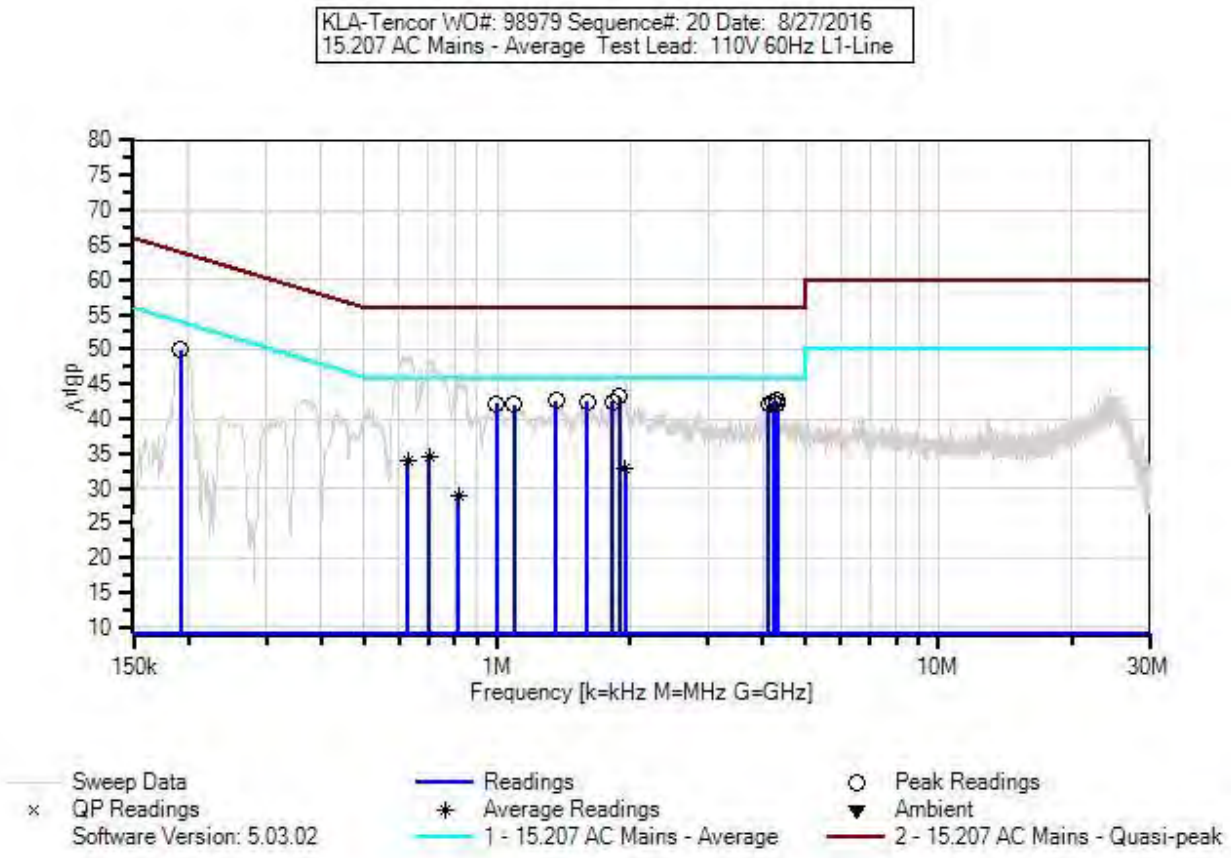
Device	Manufacturer	Model #	S/N
Config1			

Test Conditions / Notes:

The EUT is placed on the wooden table. Two wafers are installed in the EUT.
Freq: 1.487MHz
Modulation: OOK
Protocol: Proprietary
WiFi is Disabled.

Mode A:
FOUP charging Wafer (Using a SA Utilities) (Continuous Wafer Charge Power)
Custom SA Software for FOUP
Modules tunes RF power immediately (upon wafer insertion)
Modules then applies Continuous Charge power
FOUP remains in this mode until the SW is replaced (or until the wafer is removed)
The EUT is connected to a charger during the evaluation.
Frequency range of measurement = 150kHz- 30MHz.
150 kHz-30 MHz; RBW=9 kHz, VBW=9kHz

Test environment conditions: Temperature: 27°C, Relative Humidity: 38%, Atmospheric Pressure: 100kPa


KLA-Tencor WO#: 98979 Sequence#: 20 Date: 8/27/2016
15.207 AC Mains - Average Test Lead: 110V 60Hz L1-Line
80
75
70
65
60
55
50
45
40
35
30
25
20
15
10
dBµV
150k
1M
10M
30M
Frequency [k=kHz M=MHz G=GHz]
Sweep Data
QP Readings
Software Version: 5.03.02
Readings
Average Readings
1 - 15.207 AC Mains - Average
Peak Readings
Ambient
2 - 15.207 AC Mains - Quasi-peak

Test Equipment:

ID	Asset	Description	Model	Calibration Date	Cal Due Date
T1	AN02672	Spectrum Analyzer	E4446A	9/30/2015	9/30/2017
T2	AN02609	High Pass Filter	HE9615-150K-50-720B	2/18/2016	2/18/2018
T3	ANP06884	Cable	LMR195-FR-4	10/27/2015	10/27/2017
T4	AN06231	Cable	CXTA04A-70	3/3/2016	3/3/2018
T5	ANP06232	Cable	CXTA04A-35	3/3/2016	3/3/2018
T6	ANP06847	Cable	LMR195-FR-6	7/9/2015	7/9/2017
T7	ANP05624	Attenuator	PE7010-10	1/15/2015	1/15/2017
T8	AN00374	50uH LISN-Line (dB)	8028-TS-50-BNC	1/4/2016	1/4/2017
	AN00374	50uH LISN-Return (dB)	8028-TS-50-BNC	1/4/2016	1/4/2017

Measurement Data: Reading listed by margin. Test Lead: L1-Line

#	Freq	Rdng	T1 T5	T2 T6	T3 T7	T4 T8	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV	dBµV	dB	Ant
1	1.889M	32.7	+0.0 +0.1	+0.2 +0.0	+0.0 +9.9	+0.1 +0.1	+0.0	43.1	46.0	-2.9	L1-Li
2	1.358M	32.2	+0.0 +0.1	+0.2 +0.0	+0.0 +9.9	+0.1 +0.1	+0.0	42.6	46.0	-3.4	L1-Li
3	4.296M	32.1	+0.0 +0.1	+0.1 +0.1	+0.0 +9.9	+0.2 +0.1	+0.0	42.6	46.0	-3.4	L1-Li
4	1.600M	32.1	+0.0 +0.1	+0.2 +0.0	+0.0 +9.9	+0.1 +0.1	+0.0	42.5	46.0	-3.5	L1-Li
5	1.826M	32.0	+0.0 +0.1	+0.2 +0.0	+0.0 +9.9	+0.2 +0.1	+0.0	42.5	46.0	-3.5	L1-Li
6	4.220M	31.9	+0.0 +0.1	+0.1 +0.1	+0.0 +9.9	+0.2 +0.1	+0.0	42.4	46.0	-3.6	L1-Li
7	4.322M	31.7	+0.0 +0.1	+0.1 +0.1	+0.0 +9.9	+0.2 +0.1	+0.0	42.2	46.0	-3.8	L1-Li
8	996.281k	31.8	+0.0 +0.1	+0.2 +0.0	+0.0 +9.9	+0.1 +0.1	+0.0	42.2	46.0	-3.8	L1-Li
9	4.109M	31.6	+0.0 +0.1	+0.1 +0.1	+0.0 +9.9	+0.2 +0.1	+0.0	42.1	46.0	-3.9	L1-Li
10	192.177k	39.7	+0.0 +0.0	+0.2 +0.0	+0.0 +9.9	+0.0 +0.1	+0.0	49.9	53.9	-4.0	L1-Li
11	1.090M	31.7	+0.0 +0.0	+0.2 +0.0	+0.0 +9.9	+0.1 +0.1	+0.0	42.0	46.0	-4.0	L1-Li
12 Ave	703.404k	24.2	+0.0 +0.0	+0.3 +0.0	+0.0 +9.9	+0.1 +0.1	+0.0	34.6	46.0	-11.4	L1-Li
13 Ave	703.404k	24.1	+0.0 +0.0	+0.3 +0.0	+0.0 +9.9	+0.1 +0.1	+0.0	34.5	46.0	-11.5	L1-Li

14	703.404k	24.0	+0.0	+0.3	+0.0	+0.1	+0.0	34.4	46.0	-11.6	L1-Li
	Ave		+0.0	+0.0	+9.9	+0.1					
^	703.403k	38.1	+0.0	+0.3	+0.0	+0.1	+0.0	48.5	46.0	+2.5	L1-Li
			+0.0	+0.0	+9.9	+0.1					
16	629.229k	23.5	+0.0	+0.3	+0.0	+0.1	+0.0	33.9	46.0	-12.1	L1-Li
	Ave		+0.0	+0.0	+9.9	+0.1					
^	629.228k	38.7	+0.0	+0.3	+0.0	+0.1	+0.0	49.1	46.0	+3.1	L1-Li
			+0.0	+0.0	+9.9	+0.1					
18	1.949M	22.4	+0.0	+0.2	+0.0	+0.2	+0.0	32.9	46.0	-13.1	L1-Li
	Ave		+0.1	+0.0	+9.9	+0.1					
^	1.949M	35.4	+0.0	+0.2	+0.0	+0.2	+0.0	45.9	46.0	-0.1	L1-Li
			+0.1	+0.0	+9.9	+0.1					
20	819.030k	18.5	+0.0	+0.3	+0.0	+0.1	+0.0	28.9	46.0	-17.1	L1-Li
	Ave		+0.0	+0.0	+9.9	+0.1					
^	819.029k	35.4	+0.0	+0.3	+0.0	+0.1	+0.0	45.8	46.0	-0.2	L1-Li
			+0.0	+0.0	+9.9	+0.1					

Test Location:	CKC Laboratories, Inc. • 5046 Sierra Pines Drive • Mariposa, CA 95338 • (209) 966-5240		
Customer:	**KLA-Tencor**		
Specification:	**15.207 AC Mains - Average**		
Work Order #:	**98979**	Date:	8/27/2016
Test Type:	**Conducted Emissions**	Time:	17:14:18
Tested By:	E. Wong	Sequence#:	21
Software:	EMITest 5.03.02		110V 60Hz

Equipment Tested:

Device	Manufacturer	Model #	S/N
Config1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Config1			

Test Conditions / Notes:

The EUT is placed on the wooden table. Two wafers are installed in the EUT.

Freq: 1.487MHz
Modulation: OOK
Protocol: Proprietary

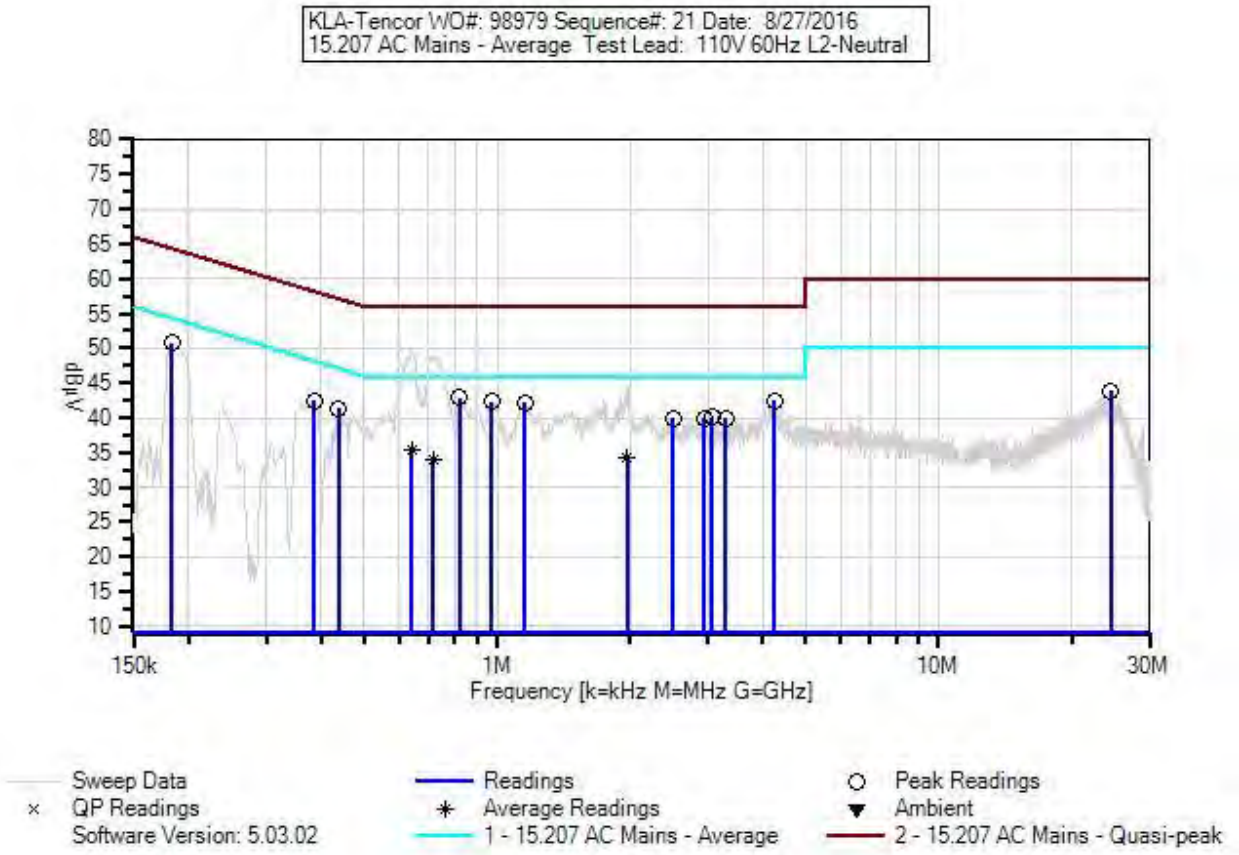
WiFi is Disabled.

Mode A:
FOUP charging Wafer (Using a SA Utilities) (Continuous Wafer Charge Power)
Custom SA Software for FOUP
Modules tunes RF power immediately (upon wafer insertion)
Modules then applies Continuous Charge power
FOUP remains in this mode until the SW is replaced (or until the wafer is removed)

The EUT is connected to a charger during the evaluation.

Frequency range of measurement = 150kHz- 30MHz.
150 kHz-30 MHz; RBW=9 kHz, VBW=9kHz

Test environment conditions: Temperature: 27°C, Relative Humidity: 38%, Atmospheric Pressure: 100kPa


KLA-Tencor WO#: 98979 Sequence#: 21 Date: 8/27/2016
15.207 AC Mains - Average Test Lead: 110V 60Hz L2-Neutral
80
75
70
65
60
55
50
45
40
35
30
25
20
15
10
dBµV
150k
1M
10M
30M
Frequency [k=kHz M=MHz G=GHz]
Sweep Data
QP Readings
Software Version: 5.03.02
Readings
Average Readings
1 - 15.207 AC Mains - Average
Peak Readings
Ambient
2 - 15.207 AC Mains - Quasi-peak

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02672	Spectrum Analyzer	E4446A	9/30/2015	9/30/2017
T1	AN02609	High Pass Filter	HE9615-150K-50-720B	2/18/2016	2/18/2018
T2	ANP06884	Cable	LMR195-FR-4	10/27/2015	10/27/2017
T3	AN06231	Cable	CXTA04A-70	3/3/2016	3/3/2018
T4	ANP06232	Cable	CXTA04A-35	3/3/2016	3/3/2018
T5	ANP06847	Cable	LMR195-FR-6	7/9/2015	7/9/2017
T6	ANP05624	Attenuator	PE7010-10	1/15/2015	1/15/2017
	AN00374	50uH LISN-Line (dB)	8028-TS-50-BNC	1/4/2016	1/4/2017
T7	AN00374	50uH LISN-Return (dB)	8028-TS-50-BNC	1/4/2016	1/4/2017

Measurement Data: Reading listed by margin. Test Lead: L2-Neutral

#	Freq	Rdng	T1 T5	T2 T6	T3 T7	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV	dBµV	dB	Ant
1	821.211k	32.5	+0.3 +0.0	+0.0 +9.9	+0.1 +0.1	+0.0	+0.0	42.9	46.0	-3.1	L2-Ne
2	183.451k	40.4	+0.3 +0.0	+0.0 +9.9	+0.0 +0.2	+0.0	+0.0	50.8	54.3	-3.5	L2-Ne
3	4.241M	31.9	+0.1 +0.1	+0.0 +9.9	+0.2 +0.2	+0.1	+0.0	42.5	46.0	-3.5	L2-Ne
4	970.764k	31.9	+0.2 +0.0	+0.0 +9.9	+0.1 +0.1	+0.1	+0.0	42.3	46.0	-3.7	L2-Ne
5	1.154M	31.8	+0.2 +0.0	+0.0 +9.9	+0.1 +0.1	+0.1	+0.0	42.2	46.0	-3.8	L2-Ne
6	385.614k	32.3	+0.2 +0.0	+0.0 +9.9	+0.0 +0.1	+0.0	+0.0	42.5	48.2	-5.7	L2-Ne
7	437.246k	31.0	+0.2 +0.0	+0.0 +9.9	+0.1 +0.1	+0.0	+0.0	41.3	47.1	-5.8	L2-Ne
8	3.072M	29.6	+0.1 +0.1	+0.0 +9.9	+0.2 +0.1	+0.1	+0.0	40.1	46.0	-5.9	L2-Ne
9	2.497M	29.6	+0.1 +0.0	+0.0 +9.9	+0.2 +0.1	+0.1	+0.0	40.0	46.0	-6.0	L2-Ne
10	3.288M	29.3	+0.1 +0.1	+0.0 +9.9	+0.3 +0.2	+0.1	+0.0	40.0	46.0	-6.0	L2-Ne
11	2.940M	29.4	+0.1 +0.1	+0.0 +9.9	+0.2 +0.1	+0.1	+0.0	39.9	46.0	-6.1	L2-Ne
12	24.601M	31.7	+0.3 +0.1	+0.1 +9.9	+0.7 +0.7	+0.3	+0.0	43.8	50.0	-6.2	L2-Ne

13	639.410k	25.0	+0.3	+0.0	+0.1	+0.0	+0.0	35.4	46.0	-10.6	L2-Ne
	Ave		+0.0	+9.9	+0.1						
^	639.409k	39.3	+0.3	+0.0	+0.1	+0.0	+0.0	49.7	46.0	+3.7	L2-Ne
			+0.0	+9.9	+0.1						
15	1.974M	23.7	+0.2	+0.0	+0.2	+0.1	+0.0	34.2	46.0	-11.8	L2-Ne
	Ave		+0.0	+9.9	+0.1						
^	1.974M	33.9	+0.2	+0.0	+0.2	+0.1	+0.0	44.4	46.0	-1.6	L2-Ne
			+0.0	+9.9	+0.1						
17	717.948k	23.6	+0.3	+0.0	+0.1	+0.0	+0.0	34.0	46.0	-12.0	L2-Ne
	Ave		+0.0	+9.9	+0.1						
^	717.947k	38.5	+0.3	+0.0	+0.1	+0.0	+0.0	48.9	46.0	+2.9	L2-Ne
			+0.0	+9.9	+0.1						

Test Location:	CKC Laboratories, Inc. • 5046 Sierra Pines Drive • Mariposa, CA 95338 • (209) 966-5240		
Customer:	**KLA-Tencor**		
Specification:	**15.207 AC Mains - Average**		
Work Order #:	**98979**	Date:	8/27/2016
Test Type:	**Conducted Emissions**	Time:	17:35:54
Tested by:	E. Wong	Sequence#:	23
Software:	EMITest 5.03.02		110V 60Hz

Equipment Tested:

Device	Manufacturer	Model #	S/N
Config1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Config1			

Test Conditions / Notes:

The EUT is placed on the wooden table. Two wafers are installed in the EUT.

Freq: 1.487MHz
Modulation: OOK
Protocol: Proprietary

WiFi is Disabled.

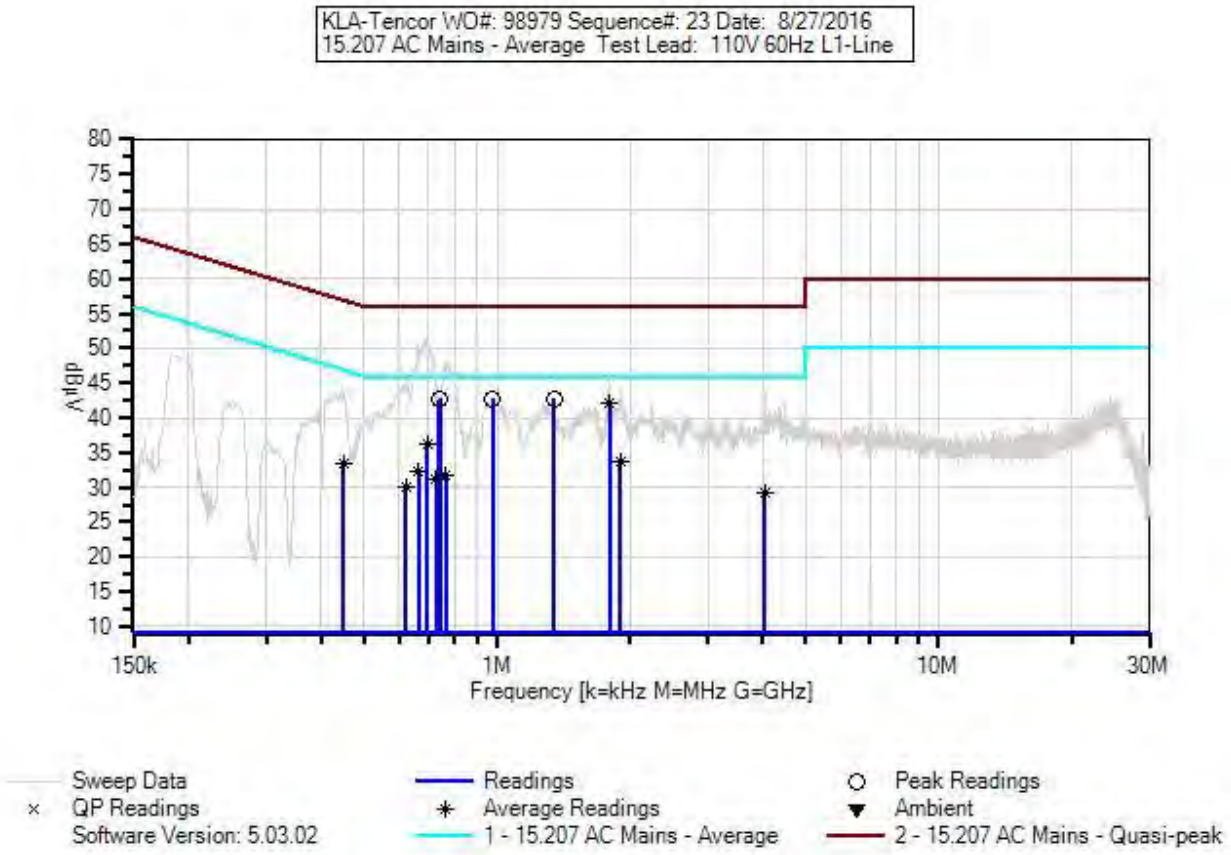
Mode B: Wafer/Module Wafer Communication (Using SA utilities)(ContinuousDataXferWafertoModule) Custom SA software for FOUP. Automation HT-350 or EtchTemp Wafer(s)

- o FOUP Module continuously performs following operations:
- o Mounts wafer
- o Precharges to 4.0V if necessary
- o Downloads wafer datastore (always downloads entire datastore regardless of whether it is populated)
- o Tops wafer up to 4.0V if necessary
- o Remounts wafer and repeats steps above
- o Process will continue as long as wafer is in FOUP

The EUT is connected to a charger during the evaluation.

Frequency range of measurement = 150kHz- 30MHz.
150 kHz-30 MHz; RBW=9 kHz, VBW=9kHz

Test environment conditions: Temperature: 27°C, Relative Humidity: 38%, Atmospheric Pressure: 100kPa


KLA-Tencor WO#: 98979 Sequence#: 23 Date: 8/27/2016
15.207 AC Mains - Average Test Lead: 110V 60Hz L1-Line
80
75
70
65
60
55
50
45
40
35
30
25
20
15
10
dBµV
150k
1M
10M
30M
Frequency [k=kHz M=MHz G=GHz]
Sweep Data
QP Readings
Software Version: 5.03.02
Readings
Average Readings
1 - 15.207 AC Mains - Average
Peak Readings
Ambient
2 - 15.207 AC Mains - Quasi-peak

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02672	Spectrum Analyzer	E4446A	9/30/2015	9/30/2017
T1	AN02609	High Pass Filter	HE9615-150K-50-720B	2/18/2016	2/18/2018
T2	ANP06884	Cable	LMR195-FR-4	10/27/2015	10/27/2017
T3	AN06231	Cable	CXTA04A-70	3/3/2016	3/3/2018
T4	ANP06232	Cable	CXTA04A-35	3/3/2016	3/3/2018
T5	ANP06847	Cable	LMR195-FR-6	7/9/2015	7/9/2017
T6	ANP05624	Attenuator	PE7010-10	1/15/2015	1/15/2017
T7	AN00374	50uH LISN-Line (dB)	8028-TS-50-BNC	1/4/2016	1/4/2017
	AN00374	50uH LISN-Return (dB)	8028-TS-50-BNC	1/4/2016	1/4/2017

Measurement Data: Reading listed by margin. Test Lead: L1-Line

#	Freq	Rdng	T1 T5	T2 T6	T3 T7	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV	dBµV	dB	Ant
1	979.270k	32.3	+0.2 +0.0	+0.0 +9.9	+0.1 +0.1	+0.1	+0.0	42.7	46.0	-3.3	L1-Li
2	1.345M	32.4	+0.2 +0.0	+0.0 +9.9	+0.1 +0.1	+0.0	+0.0	42.7	46.0	-3.3	L1-Li
3	742.672k	32.4	+0.2 +0.0	+0.0 +9.9	+0.1 +0.1	+0.0	+0.0	42.7	46.0	-3.3	L1-Li
4	738.309k	32.3	+0.2 +0.0	+0.0 +9.9	+0.1 +0.1	+0.0	+0.0	42.6	46.0	-3.4	L1-Li
5	740.491k	32.3	+0.2 +0.0	+0.0 +9.9	+0.1 +0.1	+0.0	+0.0	42.6	46.0	-3.4	L1-Li
6	1.796M Ave	31.6	+0.2 +0.0	+0.0 +9.9	+0.2 +0.1	+0.1	+0.0	42.1	46.0	-3.9	L1-Li
^	1.792M	35.8	+0.2 +0.0	+0.0 +9.9	+0.2 +0.1	+0.1	+0.0	46.3	46.0	+0.3	L1-Li
8	693.223k Ave	25.8	+0.3 +0.0	+0.0 +9.9	+0.1 +0.1	+0.0	+0.0	36.2	46.0	-9.8	L1-Li
^	693.222k	40.9	+0.3 +0.0	+0.0 +9.9	+0.1 +0.1	+0.0	+0.0	51.3	46.0	+5.3	L1-Li
10	1.902M Ave	23.3	+0.2 +0.0	+0.0 +9.9	+0.2 +0.1	+0.1	+0.0	33.8	46.0	-12.2	L1-Li
11	1.902M Ave	23.3	+0.2 +0.0	+0.0 +9.9	+0.2 +0.1	+0.1	+0.0	33.8	46.0	-12.2	L1-Li
^	1.902M	33.6	+0.2 +0.0	+0.0 +9.9	+0.2 +0.1	+0.1	+0.0	44.1	46.0	-1.9	L1-Li
13	448.640k Ave	23.2	+0.2 +0.0	+0.0 +9.9	+0.1 +0.1	+0.0	+0.0	33.5	46.9	-13.4	L1-Li
^	446.700k	34.1	+0.2 +0.0	+0.0 +9.9	+0.1 +0.1	+0.0	+0.0	44.4	46.9	-2.5	L1-Li

15	664.862k	22.0	+0.3	+0.0	+0.1	+0.0	+0.0	32.4	46.0	-13.6	L1-Li
	Ave		+0.0	+9.9	+0.1						
^	664.861k	39.9	+0.3	+0.0	+0.1	+0.0	+0.0	50.3	46.0	+4.3	L1-Li
			+0.0	+9.9	+0.1						
17	763.762k	21.2	+0.3	+0.0	+0.1	+0.0	+0.0	31.6	46.0	-14.4	L1-Li
	Ave		+0.0	+9.9	+0.1						
^	763.761k	37.6	+0.3	+0.0	+0.1	+0.0	+0.0	48.0	46.0	+2.0	L1-Li
			+0.0	+9.9	+0.1						
19	727.402k	20.9	+0.3	+0.0	+0.1	+0.0	+0.0	31.3	46.0	-14.7	L1-Li
	Ave		+0.0	+9.9	+0.1						
^	727.401k	35.3	+0.3	+0.0	+0.1	+0.0	+0.0	45.7	46.0	-0.3	L1-Li
			+0.0	+9.9	+0.1						
^	731.764k	34.0	+0.3	+0.0	+0.1	+0.0	+0.0	44.4	46.0	-1.6	L1-Li
			+0.0	+9.9	+0.1						
22	621.229k	19.7	+0.3	+0.0	+0.1	+0.0	+0.0	30.1	46.0	-15.9	L1-Li
	Ave		+0.0	+9.9	+0.1						
^	621.229k	34.9	+0.3	+0.0	+0.1	+0.0	+0.0	45.3	46.0	-0.7	L1-Li
			+0.0	+9.9	+0.1						
24	4.037M	18.6	+0.1	+0.0	+0.2	+0.1	+0.0	29.1	46.0	-16.9	L1-Li
	Ave		+0.1	+9.9	+0.1						
^	4.037M	33.0	+0.1	+0.0	+0.2	+0.1	+0.0	43.5	46.0	-2.5	L1-Li
			+0.1	+9.9	+0.1						

Test Location:	CKC Laboratories, Inc. • 5046 Sierra Pines Drive • Mariposa, CA 95338 • (209) 966-5240		
Customer:	**KLA-Tencor**		
Specification:	**15.207 AC Mains - Average**		
Work Order #:	**98979**	Date:	8/27/2016
Test Type:	**Conducted Emissions**	Time:	17:28:36
Tested by:	E. Wong	Sequence#:	22
Software:	EMITest 5.03.02		110V 60Hz

Equipment Tested:

Device	Manufacturer	Model #	S/N
Config1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Config1			

Test Conditions / Notes:

The EUT is placed on the wooden table. Two wafers are installed in the EUT.

Freq: 1.487MHz
Modulation: OOK
Protocol: Proprietary

WiFi is Disabled.

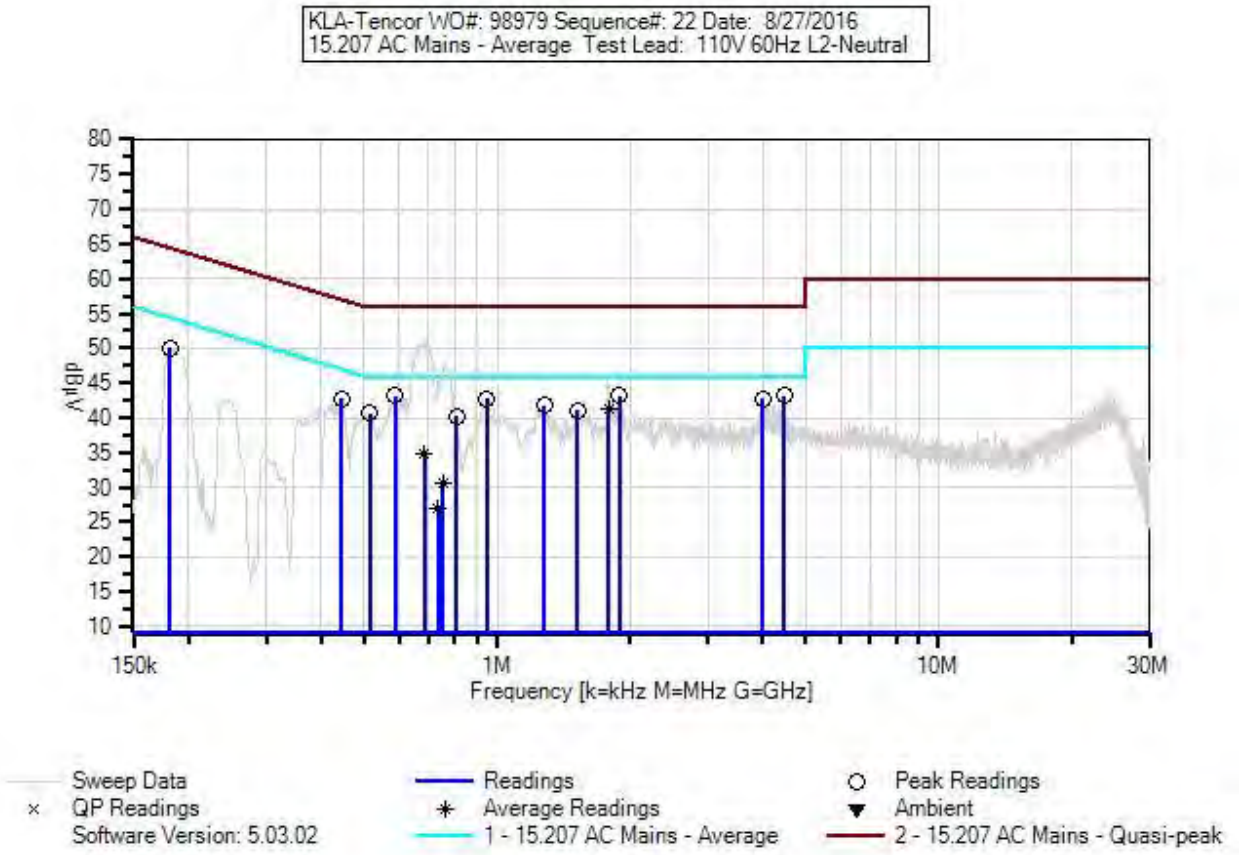
Mode B: Wafer/Module Wafer Communication (Using SA utilities)(ContinuousDataXferWafertoModule) Custom SA software for FOUP. Automation HT-350 or EtchTemp Wafer(s)

- o FOUP Module continuously performs following operations:
- o Mounts wafer
- o Precharges to 4.0V if necessary
- o Downloads wafer datastore (always downloads entire datastore regardless of whether it is populated)
- o Tops wafer up to 4.0V if necessary
- o Remounts wafer and repeats steps above
- o Process will continue as long as wafer is in FOUP

The EUT is connected to a charger during the evaluation.

Frequency range of measurement = 150kHz- 30MHz.
150 kHz-30 MHz; RBW=9 kHz, VBW=9kHz

Test environment conditions: Temperature: 27°C, Relative Humidity: 38%, Atmospheric Pressure: 100kPa


KLA-Tencor WO#: 98979 Sequence#: 22 Date: 8/27/2016
15.207 AC Mains - Average Test Lead: 110V 60Hz L2-Neutral
dBµV
80
75
70
65
60
55
50
45
40
35
30
25
20
15
10
150k
1M
10M
30M
Frequency [k=kHz M=MHz G=GHz]
Sweep Data
QP Readings
Software Version: 5.03.02
Readings
Average Readings
1 - 15.207 AC Mains - Average
Peak Readings
Ambient
2 - 15.207 AC Mains - Quasi-peak

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02672	Spectrum Analyzer	E4446A	9/30/2015	9/30/2017
T1	AN02609	High Pass Filter	HE9615-150K-50-720B	2/18/2016	2/18/2018
T2	ANP06884	Cable	LMR195-FR-4	10/27/2015	10/27/2017
T3	AN06231	Cable	CXTA04A-70	3/3/2016	3/3/2018
T4	ANP06232	Cable	CXTA04A-35	3/3/2016	3/3/2018
T5	ANP06847	Cable	LMR195-FR-6	7/9/2015	7/9/2017
T6	ANP05624	Attenuator	PE7010-10	1/15/2015	1/15/2017
	AN00374	50uH LISN-Line (dB)	8028-TS-50-BNC	1/4/2016	1/4/2017
T7	AN00374	50uH LISN-Return (dB)	8028-TS-50-BNC	1/4/2016	1/4/2017

Measurement Data: Reading listed by margin. Test Lead: L2-Neutral

#	Freq	Rdng	T1 T5	T2 T6	T3 T7	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV	dBµV	dB	Ant
1	4.462M	32.6	+0.1 +0.1	+0.0 +9.9	+0.2 +0.2	+0.1	+0.0	43.2	46.0	-2.8	L2-Ne
2	588.505k	32.7	+0.3 +0.0	+0.0 +9.9	+0.1 +0.1	+0.0	+0.0	43.1	46.0	-2.9	L2-Ne
3	1.889M	32.7	+0.2 +0.0	+0.0 +9.9	+0.1 +0.1	+0.1	+0.0	43.1	46.0	-2.9	L2-Ne
4	4.003M	32.2	+0.1 +0.1	+0.0 +9.9	+0.2 +0.2	+0.1	+0.0	42.8	46.0	-3.2	L2-Ne
5	949.501k	32.3	+0.2 +0.0	+0.0 +9.9	+0.1 +0.1	+0.1	+0.0	42.7	46.0	-3.3	L2-Ne
6	1.281M	31.4	+0.2 +0.0	+0.0 +9.9	+0.1 +0.1	+0.1	+0.0	41.8	46.0	-4.2	L2-Ne
7	445.245k	32.5	+0.2 +0.0	+0.0 +9.9	+0.1 +0.1	+0.0	+0.0	42.8	47.0	-4.2	L2-Ne
8	181.269k	39.6	+0.3 +0.0	+0.0 +9.9	+0.0 +0.2	+0.0	+0.0	50.0	54.4	-4.4	L2-Ne
9	1.788M Ave	30.9	+0.2 +0.0	+0.0 +9.9	+0.2 +0.1	+0.1	+0.0	41.4	46.0	-4.6	L2-Ne
^	1.783M	34.8	+0.2 +0.0	+0.0 +9.9	+0.2 +0.1	+0.1	+0.0	45.3	46.0	-0.7	L2-Ne
11	1.524M	30.6	+0.2 +0.0	+0.0 +9.9	+0.1 +0.1	+0.1	+0.0	41.0	46.0	-5.0	L2-Ne
12	513.603k	30.3	+0.2 +0.0	+0.0 +9.9	+0.1 +0.1	+0.0	+0.0	40.6	46.0	-5.4	L2-Ne
13	808.121k	29.8	+0.3 +0.0	+0.0 +9.9	+0.1 +0.1	+0.0	+0.0	40.2	46.0	-5.8	L2-Ne

14	683.042k	24.4	+0.3	+0.0	+0.1	+0.0	+0.0	34.8	46.0	-11.2	L2-Ne
	Ave		+0.0	+9.9	+0.1						
^	683.041k	40.5	+0.3	+0.0	+0.1	+0.0	+0.0	50.9	46.0	+4.9	L2-Ne
			+0.0	+9.9	+0.1						
16	755.035k	20.3	+0.2	+0.0	+0.1	+0.0	+0.0	30.6	46.0	-15.4	L2-Ne
	Ave		+0.0	+9.9	+0.1						
^	755.035k	37.5	+0.2	+0.0	+0.1	+0.0	+0.0	47.8	46.0	+1.8	L2-Ne
			+0.0	+9.9	+0.1						
18	734.674k	16.6	+0.2	+0.0	+0.1	+0.0	+0.0	26.9	46.0	-19.1	L2-Ne
	Ave		+0.0	+9.9	+0.1						
^	734.673k	34.9	+0.2	+0.0	+0.1	+0.0	+0.0	45.2	46.0	-0.8	L2-Ne
			+0.0	+9.9	+0.1						

Test Setup Photo(s)

SUPPLEMENTAL INFORMATION

Measurement Uncertainty

Uncertainty Value	Parameter
4.73 dB	Radiated Emissions
3.34 dB	Mains Conducted Emissions
3.30 dB	Disturbance Power

Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k=2. Compliance is deemed to occur provided measurements are below the specified limits.

Emissions Test Details

TESTING PARAMETERS

Unless otherwise indicated, the following configuration parameters are used for equipment setup: The cables were routed consistent with the typical application by varying the configuration of the test sample. Interface cables were connected to the available ports of the test unit. The effect of varying the position of the cables was investigated to find the configuration that produced maximum emissions. Cables were of the type and length specified in the individual requirements. The length of cable that produced maximum emissions was selected.

The equipment under test (EUT) was set up in a manner that represented its normal use, as shown in the setup photographs. Any special conditions required for the EUT to operate normally are identified in the comments that accompany the emissions tables.

The emissions data was taken with a spectrum analyzer or receiver. Incorporating the applicable correction factors for distance, antenna, cable loss and amplifier gain, the data was reduced as shown in the table below. The corrected data was then compared to the applicable emission limits. Preliminary and final measurements were taken in order to ensure that all emissions from the EUT were found and maximized.

CORRECTION FACTORS

The basic spectrum analyzer reading was converted using correction factors as shown in the highest emissions readings in the tables. For radiated emissions in dBµV/m, the spectrum analyzer reading in dBµV was corrected by using the following formula. This reading was then compared to the applicable specification limit. Individual measurements were compared with the displayed limit value in the margin column. The margin was calculated based on subtracting the limit value from the corrected measurement value; a positive margin represents a measurement exceeding the limit, while a negative margin represents a measurement less than the limit.

SAMPLE CALCULATIONS		
	Meter reading	(dBµV)
+	Antenna Factor	(dB/m)
+	Cable Loss	(dB)
-	Distance Correction	(dB)
-	Preamplifier Gain	(dB)
=	Corrected Reading	(dBµV/m)

TEST INSTRUMENTATION AND ANALYZER SETTINGS

The test instrumentation and equipment listed were used to collect the emissions data. A spectrum analyzer or receiver was used for all measurements. Unless otherwise specified, the following table shows the measuring equipment bandwidth settings that were used in designated frequency bands. For testing emissions, an appropriate reference level and a vertical scale size of 10 dB per division were used.

MEASURING EQUIPMENT BANDWIDTH SETTINGS PER FREQUENCY RANGE			
TEST	BEGINNING FREQUENCY	ENDING FREQUENCY	BANDWIDTH SETTING
CONDUCTED EMISSIONS	150 kHz	30 MHz	9 kHz
RADIATED EMISSIONS	9 kHz	150 kHz	200 Hz
RADIATED EMISSIONS	150 kHz	30 MHz	9 kHz
RADIATED EMISSIONS	30 MHz	1000 MHz	120 kHz
RADIATED EMISSIONS	1000 MHz	>1 GHz	1 MHz

SPECTRUM ANALYZER/RECEIVER DETECTOR FUNCTIONS

The notes that accompany the measurements contained in the emissions tables indicate the type of detector function used to obtain the given readings. Unless otherwise noted, all readings were made in the "positive peak" detector mode. Whenever a "quasi-peak" or "average" reading was recorded, the measurement was annotated with a "QP" or an "Ave" on the appropriate rows of the data sheets. In cases where quasi-peak or average limits were employed and data exists for multiple measurement types for the same frequency then the peak measurement was retained in the report for reference, however the numbering for the affected row was removed and an arrow or caret ("^") was placed in the far left-hand column indicating that the row above takes precedence for comparison to the limit. The following paragraphs describe in more detail the detector functions and when they were used to obtain the emissions data.

Peak

In this mode, the spectrum analyzer or receiver recorded all emissions at their peak value as the frequency band selected was scanned. By combining this function with another feature called "peak hold," the measurement device had the ability to measure intermittent or low duty cycle transient emission peak levels. In this mode the measuring device made a slow scan across the frequency band selected and measured the peak emission value found at each frequency across the band.

Quasi-Peak

Quasi-peak measurements were taken using the quasi-peak detector when the true peak values exceeded or were within 2 dB of a quasi-peak specification limit. Additional QP measurements may have been taken at the discretion of the operator.

Average

Average measurements were taken using the average detector when the true peak values exceeded or were within 2 dB of an average specification limit. Additional average measurements may have been taken at the discretion of the operator. If the specification or test procedure requires trace averaging, then the averaging was performed using 100 samples or as required by the specification. All other average measurements are performed using video bandwidth averaging. To make these measurements, the test engineer reduces the video bandwidth on the measuring device until the modulation of the signal is filtered out. At this point the measuring device is set into the linear mode and the scan time is reduced.