FCC TEST REPORT

REPORT NO.: RF980325H07A

MODEL NO.: M20

RECEIVED: Mar. 25, 2009

TESTED: Mar. 29, 2009

ISSUED: Dec. 14, 2009

APPLICANT: Cisco-Linksys LLC

ADDRESS: 121 Theory Drive Irvine, CA 92617(USA)

ISSUED BY: Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch

LAB LOCATION: No. 81-1, Lu Liao Keng, 9th Ling, Wu Lung Tsuen, Chiung Lin Hsiang, Hsin Chu Hsien 307, Taiwan

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1. CERTIFICATION

PRODUCT :	Wireless-N Gigabit Router
MODEL NO.:	M20
BRAND :	CISCO
APPLICANT :	Cisco-Linksys LLC
TESTED :	Mar. 29, 2009
TEST SAMPLE :	ENGINEERING SAMPLE
STANDARDS :	FCC Part 15, Subpart C (Section 15.247), ANSI C63.4-2003 (only tested radiated emission below 1GHz)

The above equipment (Model: M20) has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

PREPARED BY : _____ , **DATE:** *Dec. 14, 2009*
(Claire Kuan, Specialist)

TECHNICAL ACCEPTANCE : _____ , **DATE:** *Dec. 14, 2009*
(Hank Chung, Deputy Manager)

APPROVED BY : _____ , **DATE:** *Dec. 14, 2009*
(May Chen, Deputy Manager)

2. SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

APPLIED STANDARD: FCC Part 15, Subpart C			
STANDARD SECTION	**TEST TYPE AND LIMIT**	**RESULT**	**REMARK**
15.207	AC Power Conducted Emission	NT	Not Tested
15.247(a)(2)	Spectrum Bandwidth of a Direct Sequence Spread Spectrum System Limit : min. 500kHz	NT	Not Tested
15.247(b)	Maximum Peak Output Power Limit: max. 30dBm	NT	Not Tested
15.247(d)	Transmitter Radiated Emissions Limit: Table 15.209	PASS	Meet the requirement of limit. Minimum passing margin is -1.55dB at 250.01MHz.
15.247(e)	Power Spectral Density Limit: max. 8dBm	NT	Not Tested
15.247(d)	Band Edge Measurement Limit: 20dB less than the peak value of fundamental frequency	NT	Not Tested

2.1 MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

Measurement	**Value**
Radiated emissions (30MHz-1GHz)	3.94 dB

3. GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

PRODUCT	Wireless-N Gigabit Router
MODEL NO.	M20
FCC ID	Q87-M20
POWER SUPPLY	DC 12V from power adapter
MODULATION TYPE	CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM
MODULATION TECHNOLOGY	DSSS, OFDM
TRANSFER RATE	802.11b: 11 / 5.5 / 2 / 1Mbps 802.11g: 54 / 48 / 36 / 24 / 18 / 12 / 9 / 6Mbps Draft 802.11n (20MHz): 130 / 117 / 104 / 78 / 52 / 39 / 26/ 13 / 65 / 58.5 / 52 / 39 / 26 / 19.5 /13 / 6.5Mbps Draft 802.11n (40MHz): 270 / 243 / 216 / 162 / 108 /81 / 54 / 27 /135 / 121.5 / 108 / 81 /54 / 40.5 / 27 / 13.5Mbps
FREQUENCY RANGE	2412 ~ 2462MHz
NUMBER OF CHANNEL	11 for 802.11b, 802.11g, draft 802.11n (20MHz) 7 for draft 802.11n (40MHz)
ANTENNA TYPE	Please see note 1
DATA CABLE	NA
I/O PORT	WAN Port x 1, LAN Port x 4
ASSOCIATED DEVICES	Adapter x 1

NOTE:

1. There are three antennas provided to this EUT, please refer to the following table:

Transmitter Circuit	Antenna Type	Gain (dBi)	Antenna Connector	Note
Chain(0)	PIFA	1.5	NA	Tx function
Chain(1)	PIFA	1.5	NA	Tx function
Chain(2)	PIFA	2.2	NA	Rx function

2. The EUT must be supplied with a power adapter and following different models could be chosen:

Adapter 1	
Brand:	Bestec
Model No.:	EA0121WAA
Input power :	AC100-240V, 0.5A, 50/60Hz
Output power :	DC 12V, 1A DC output cable (Unshielded, 1.5m)
Adapter 2	
Brand:	LEADER
Model No.:	MU12-G120100-A1
Input power :	AC100-240V, 0.5A, 50/60Hz
Output power :	DC 12V, 1A DC output cable (Unshielded, 1.5m)

3. The EUT was pre-tested in chamber under the following modes:

Test Mode	**Description**
Mode A	Level-set (Put on tabletop)
Mode B	**Tower-set (Wall-mounted)**

From the above modes, the worst case was found in **Mode B**. Therefore only the test data of the modes were recorded in this report.

4. The LAN/WAN function of EUT was pre-tested in chamber under the following modes:

Test Mode	**Description**
Mode A	10 Mbps
Mode B	100 Mbps
Mode C	**1000 Mbps**

From the above modes, the worst case was found in **Mode C**. Therefore only the test data of the modes were recorded in this report.

5. The above EUT information was declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications or user's manual.

6. DESCRIPTION OF TEST MODES

Eleven channels are provided for 802.11b, 802.11g, draft 802.11n (20MHz):

CHANNEL	FREQUENCY	CHANNEL	FREQUENCY
1	2412MHz	7	2442MHz
2	2417MHz	8	2447MHz
3	2422MHz	9	2452MHz
4	2427MHz	10	2457MHz
5	2432MHz	11	2462MHz
6	2437MHz		

Seven channels are provided for draft 802.11n (40MHz):

CHANNEL	FREQUENCY	CHANNEL	FREQUENCY
1	2422MHz	5	2442MHz
2	2427MHz	6	2447MHz
3	2432MHz	7	2452MHz
4	2437MHz		

3.2 DESCRIPTION OF TEST MODES

3.2.1 TEST MODE APPLICABILITY AND TESTED CHANNEL DETAIL

EUT CONFIGURE MODE	APPLICABLE TO				DESCRIPTION
	PLC	RE < 1G	RE ³ 1G	APCM	
-	NT	√	NT	NT	-

Where **PLC:** Power Line Conducted Emission **RE < 1G:** Radiated Emission below 1GHz

RE ³ 1G: Radiated Emission above 1GHz **APCM:** Antenna Port Conducted Measurement

☒ Following channel(s) was (were) selected for the final test as listed below.

MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
802.11g	1 to 11	1	OFDM	BPSK	6

3.3 GENERAL DESCRIPTION OF APPLIED STANDARDS

The EUT is a RF product. According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

FCC Part 15, Subpart C. (15.247)

ANSI C63.4-2003

(only tested radiated emission below 1GHz)

All test items have been performed and recorded as per the above standards.

NOTE: The EUT is also considered as a kind of computer peripheral, because the connection to computer is necessary for typical use. It has been verified to comply with the requirements of FCC Part 15, Subpart B, Class B (DoC). The test report has been issued separately.

3.4 DESCRIPTION OF SUPPORT UNITS

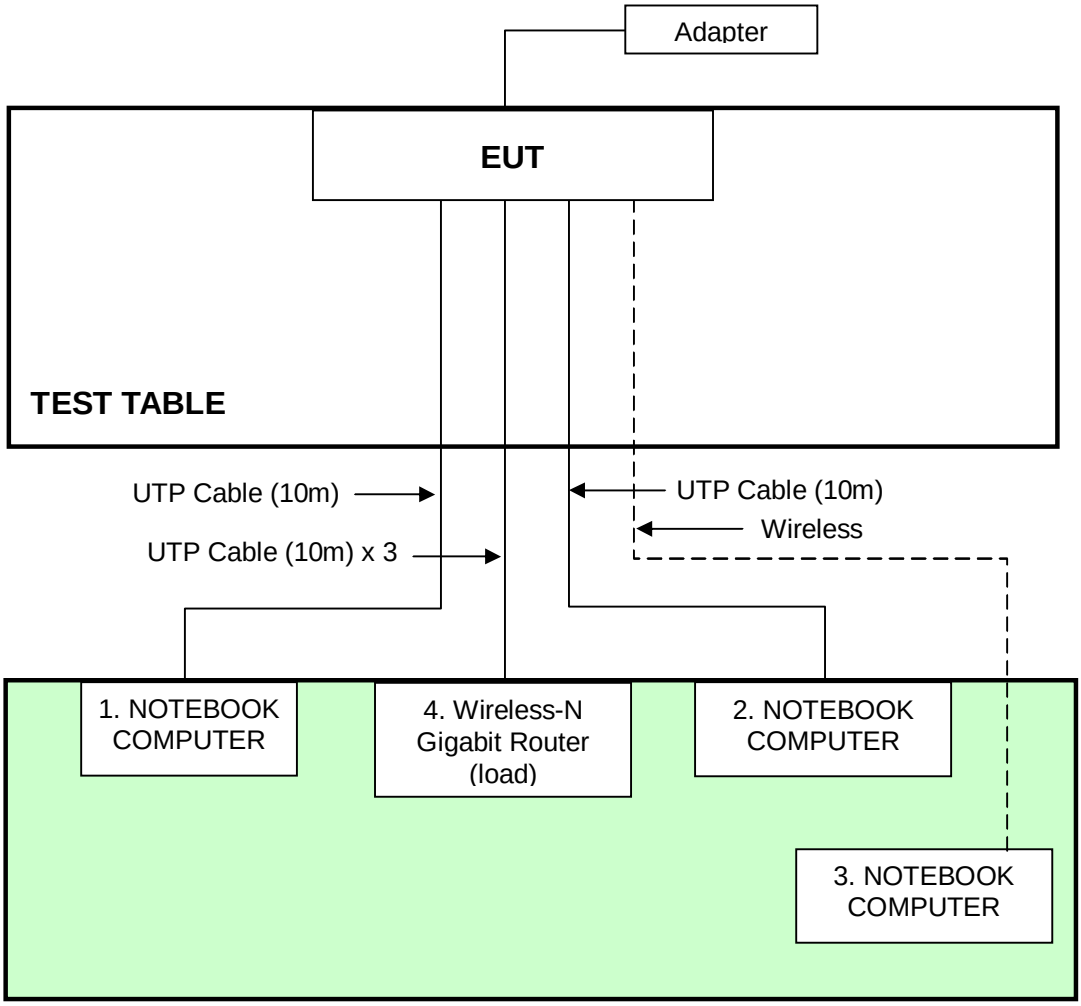
The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

NO.	PRODUCT	BRAND	MODEL NO.	SERIAL NO.	FCC ID
1	NOTEBOOK COMPUTER	DELL	D600	CN-0G5152-48643-49C-8226	NA
2	NOTEBOOK COMPUTER	DELL	D600	CN-0G5152-48643-49C-8398	NA
3	NOTEBOOK COMPUTER	DELL	D600	CN-0G5152-48643-487-0213	NA
4	Wireless-N Gigabit Router	Linksys	M20	NA	NA

NO.	SIGNAL CABLE DESCRIPTION OF THE ABOVE SUPPORT UNITS
1	NA
2	NA
3	NA
4	NA

NOTE: All power cords of the above support units are non shielded (1.8m).

3.5 CONFIGURATION OF SYSTEM UNDER TEST



4. TEST TYPES AND RESULTS

4.1 RADIATED EMISSION MEASUREMENT

4.1.1 LIMITS OF RADIATED EMISSION MEASUREMENT

Emissions radiated outside of the specified bands, shall be according to the general radiated limits in 15.209 as following:

FREQUENCIES (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

NOTE:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
3. As shown in 15.35(b), for frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation.

4.1.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
ROHDE & SCHWARZ Spectrum Analyzer	FSP40	100036	Dec. 09, 2008	Dec. 08, 2009
HP Pre_Amplifier	8449B	3008A01923	Nov. 10, 2008	Nov. 09, 2009
ROHDE & SCHWARZ Test Receiver	ESCS30	847124/029	Sep. 09, 2008	Sep. 08, 2009
SCHWARZBECK TRILOG Broadband Antenna	VULB 9168	138	April 30, 2008	April 29, 2009
Schwarzbeck Horn_Antenna	BBHA9120	D124	Dec. 09, 2008	Dec. 08, 2009
Schwarzbeck Horn_Antenna	BBHA 9170	BBHA9170153	Jan. 22, 2009	Jan. 21, 2010
R&S Loop Antenna	HFH2-Z2	100070	Jan. 14, 2008	Jan. 13, 2010
RF Switches	EMH-011	08009	Oct. 07, 2008	Oct. 06, 2009
RF CABLE (Chaintek)	Sucoflex 106	28077	Aug. 15, 2008	Aug. 14, 2009
RF Cable	8DFB	STCCAB-30M-1GHz	Oct. 07, 2008	Oct. 06, 2009
Software	ADT_Radiated_V7.6.15.9.2	NA	NA	NA
CT Antenna Tower & Turn Table	NA	NA	NA	NA

Note: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The horn antenna, HP preamplifier (model: 8449B) and Spectrum Analyzer (model: FSP40) are used only for the measurement of emission frequency above 1GHz if tested.
3. The test was performed in Open Site No. C.
4. The FCC Site Registration No. is 656396.
5. The VCCI Site Registration No. is R-1626.
6. The CANADA Site Registration No. is IC 7450G-3.

4.1.3 TEST PROCEDURES

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 10 meters open area test site. The table was rotated 360 degrees to determine the position of the highest radiation.

b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

c. The antenna is a broadband antenna, and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

f. If the emission level of the EUT in peak mode was lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

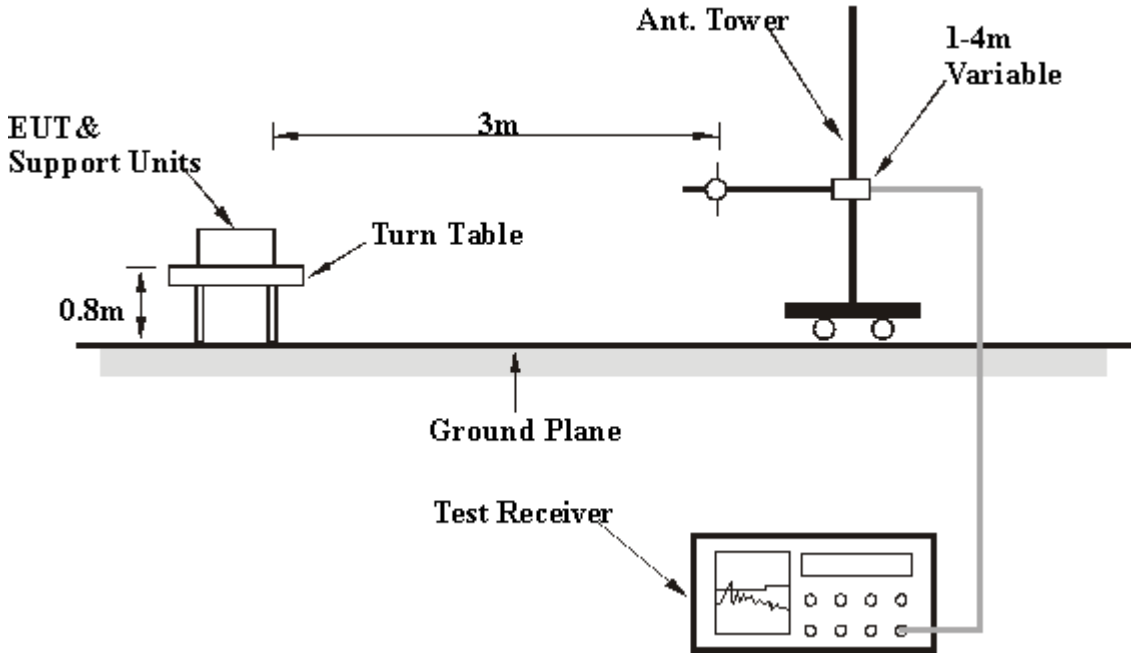
NOTE:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Peak detection (PK) and Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth is 1MHz and video bandwidth of test receiver/spectrum analyzer is 3MHz for Peak detection at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 10Hz for Average detection (AV) at frequency above 1GHz.

4.1.4 DEVIATION FROM TEST STANDARD

No deviation

4.1.5 TEST SETUP



For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

4.1.6 EUT OPERATING CONDITIONS

a. Placed the EUT on testing table.

b. Prepared other computer systems (support units 1 ~ 3) to act as communication partners and placed them outside of testing area.

c. The communication partners run test program “Ping.exe” to enable EUT under transmission/receiving condition continuously via UTP cables and wireless transmission.

d. Three RJ 45 ports of the EUT were connected to the support unit 4 (Wireless-N Gigabit Router) as one load via three UTP cables.

4.1.7 TEST RESULTS

EUT TEST CONDITION		MEASUREMENT DETAIL	
INPUT POWER (SYSTEM)	120Vac, 60 Hz	**FREQUENCY RANGE**	Below 1000MHz
ENVIRONMENTAL CONDITIONS	18deg. C, 70%RH 960hPa	**DETECTOR FUNCTION**	Quasi-Peak
TESTED BY	Moris Lin		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	**FREQ. (MHz)**	**EMISSION LEVEL (dBuV/m)**	**LIMIT (dBuV/m)**	**MARGIN (dB)**	**ANTENNA HEIGHT (m)**	**TABLE ANGLE (Degree)**	**RAW VALUE (dBuV)**	**CORRECTION FACTOR (dB/m)**
1	118.010	32.79 QP	43.50	-10.71	1.54 H	75	19.30	13.49
2	120.900	34.05 QP	43.50	-9.45	1.59 H	79	20.17	13.88
3	125.010	38.91 QP	43.50	-4.59	2.16 H	247	24.79	14.12
4	176.610	27.63 QP	43.50	-15.87	1.43 H	60	13.09	14.54
5	**250.010**	**44.45 QP**	**46.00**	**-1.55**	**1.29 H**	**244**	**29.03**	**15.42**
6	375.020	39.82 QP	46.00	-6.18	1.01 H	16	19.72	20.10
7	500.020	41.34 QP	46.00	-4.66	1.36 H	163	18.68	22.66
8	600.000	35.85 QP	46.00	-10.15	1.17 H	342	11.08	24.77
9	625.000	37.66 QP	46.00	-8.34	1.10 H	16	12.32	25.34
10	875.000	38.47 QP	46.00	-7.53	1.94 H	274	7.75	30.72
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	**FREQ. (MHz)**	**EMISSION LEVEL (dBuV/m)**	**LIMIT (dBuV/m)**	**MARGIN (dB)**	**ANTENNA HEIGHT (m)**	**TABLE ANGLE (Degree)**	**RAW VALUE (dBuV)**	**CORRECTION FACTOR (dB/m)**
1	75.600	35.53 QP	40.00	-4.47	1.00 V	358	23.17	12.36
2	125.010	37.98 QP	43.50	-5.52	1.00 V	129	23.86	14.12
3	191.000	33.31 QP	43.50	-10.19	1.00 V	283	19.63	13.68
4	250.010	42.62 QP	46.00	-3.38	1.02 V	298	27.20	15.42
5	280.510	29.88 QP	46.00	-16.12	1.07 V	294	13.46	16.42
6	375.020	38.92 QP	46.00	-7.08	1.15 V	309	18.82	20.10
7	500.020	36.96 QP	46.00	-9.04	1.04 V	208	14.30	22.66
8	625.030	36.10 QP	46.00	-9.90	1.50 V	0	10.76	25.34
9	875.000	42.95 QP	46.00	-3.05	1.05 V	293	12.23	30.72

REMARKS: 1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB/m).

2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB).

3. The other emission levels were very low against the limit.

4. Margin value = Emission level – Limit value.

5. INFORMATION ON THE TESTING LABORATORIES

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are accredited and approved by the following approval agencies according to ISO/IEC 17025.

USA	FCC, NVLAP
Germany	TUV Rheinland
Japan	VCCI
Norway	NEMKO
Canada	INDUSTRY CANADA , CSA
R.O.C.	TAF, BSMI, NCC
Netherlands	Telefication
Singapore	GOST-ASIA(MOU)
Russia	CERTIS(MOU)

Copies of accreditation certificates of our laboratories obtained from approval agencies can be downloaded from our web site: www.adt.com.tw/index.5/phtml. If you have any comments, please feel free to contact us at the following:

Linko EMC/RF Lab:
Tel: 886-2-26052180
Fax: 886-2-26052943

Hsin Chu EMC/RF Lab:
Tel: 886-3-5935343
Fax: 886-3-5935342

Hwa Ya EMC/RF/Safety Telecom Lab:
Tel: 886-3-3183232
Fax: 886-3-3185050

Web Site: www.adt.com.tw

The address and road map of all our labs can be found in our web site also.

6. APPENDIX - A MODIFICATIONS RECORDERS FOR ENGINEERING CHANGES TO THE EUT BY THE LAB

No any modifications are made to the EUT by the lab during the test.

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