Variant FCC SAR Test Report

Report No.	:	**SA991230C03A**
Applicant	:	**BANDRICH INC.**
Address	:	**6F., No. 71, Zhouzi St., Neihu Dist., Taipei City 11493, Taiwan (R.O.C.)**
Product	:	**LTE USB Modem**
FCC ID	:	**UZI-C505A**
Brand	:	**BandLuxe**
Model No.	:	**C505A**
Standards	:	**FCC 47 CFR Part 2 (2.1093) / IEEE C95.1:1991 / IEEE 1528:2003** **FCC OET Bulletin 65 Supplement C (Edition 01-01)** **KDB 447498 D01 v04 / KDB 447498 D02 v02 / KDB 941225 D01 v02** **KDB 941225 D05 v01**
Date of Testing	:	**Aug. 08, 2012 ~ Aug. 20, 2012**

CERTIFICATION: The above equipment have been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch - Taiwan HwaYa Lab**, 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 SAR characteristics under the conditions specified in this report. It should not be reproduced except in full, without the written approval of our laboratory. The client should not use it to claim product certification, approval, or endorsement by TAF or any government agencies.

This report is issued as a supplementary report of BV ADT report no.: SA991230C03. The difference compared with the original SAR report is adding LTE band 12 capability, and remove RF components for GPRS/EDGE.

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Testing Laboratory 2021

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Release Control Record

Issue No.	Reason for Change	Date Issued
R01	Original release	Aug. 30, 2012

1. Summary of Maximum SAR Value

Mode / Band	Test Position	SAR-1g (W/kg)
WCDMA Band II	**Body (0.5 cm Gap)**	**0.728**
WCDMA Band IV	**Body (0.5 cm Gap)**	**0.541**
WCDMA Band V	**Body (0.5 cm Gap)**	**0.599**
LTE Band 4	**Body (0.5 cm Gap)**	**0.605**
LTE Band 12	**Body (0.5 cm Gap)**	**0.404**
LTE Band 17	**Body (0.5 cm Gap)**	**0.237**

Note: The SAR limit **(1.6 W/kg)** for general population/uncontrolled exposure is specified in FCC 47 CFR part 2 (2.1093) and ANSI/IEEE C95.1-1991.

2. Description of Equipment Under Test

EUT Type	LTE USB Modem
FCC ID	UZI-C505A
Brand Name	BandLuxe
Model Name	C505A
Tx Frequency Bands (Unit: MHz)	WCDMA Band II : 1850 ~ 1910 WCDMA Band IV : 1712.4 ~1752.6 WCDMA Band V : 824 ~ 849 LTE Band 4 : 1710 ~ 1755 LTE Band 12 : 699 ~ 716 LTE Band 17 : 704 ~ 716
Uplink Modulations	WCDMA : QPSK LTE : QPSK, 16QAM
Maximum AVG Conducted Power (Unit: dBm)	WCDMA Band II : 23.07 WCDMA Band IV : 23.43 WCDMA Band V : 23.20 LTE Band 4 : 22.86 LTE Band 12 : 22.17 LTE Band 17 : 23.12
Antenna Type	Embedded Monopole Antenna
EUT Stage	Identical Prototype

Note:

1. The above EUT information is declared by manufacturer and for more detailed features description please refers to the manufacturer's specifications or User's Manual.
2. This report is issued as a supplementary report of BV ADT report no.: SA991230C03 issued on Mar. 04, 2011 (FCC ID: UZI-C505). The difference compared with the original SAR report is adding LTE band 12 capability, and remove RF components for GPRS/EDGE.

List of Accessory:

USB Cable	**Signal Line Type**	0.5 meter shielded cable with ferrite core

3. SAR Measurement System

3.1 Definition of Specific Absorption Rate (SAR)

SAR is related to the rate at which energy is absorbed per unit mass in an object exposed to a radio field. The SAR distribution in a biological body is complicated and is usually carried out by experimental techniques or numerical modeling. The standard recommends limits for two tiers of groups, occupational/controlled and general population/uncontrolled, based on a person's awareness and ability to exercise control over his or her exposure. In general, occupational/controlled exposure limits are higher than the limits for general population/uncontrolled.

The SAR definition is the time derivative (rate) of the incremental energy (dW) absorbed by (dissipated in) an incremental mass (dm) contained in a volume element (dv) of a given density (ρ). The equation description is as below:

$$\mathrm{SAR} = \frac{d}{dt}\left(\frac{dW}{dm}\right) = \frac{d}{dt}\left(\frac{dW}{\rho dv}\right)$$

SAR is expressed in units of Watts per kilogram (W/kg)

SAR measurement can be related to the electrical field in the tissue by

$$\mathrm{SAR} = \frac{\sigma|E|^2}{\rho}$$

Where: σ is the conductivity of the tissue, ρ is the mass density of the tissue and E is the RMS electrical field strength.

3.2 SPEAG DASY System

DASY system consists of high precision robot, probe alignment sensor, phantom, robot controller, controlled measurement server and near-field probe. The robot includes six axes that can move to the precision position of the DASY4/5 software defined. The DASY software can define the area that is detected by the probe. The robot is connected to controlled box. Controlled measurement server is connected to the controlled robot box. The DAE includes amplifier, signal multiplexing, AD converter, offset measurement and surface detection. It is connected to the Electro-optical coupler (ECO). The ECO performs the conversion form the optical into digital electric signal of the DAE and transfers data to the PC.

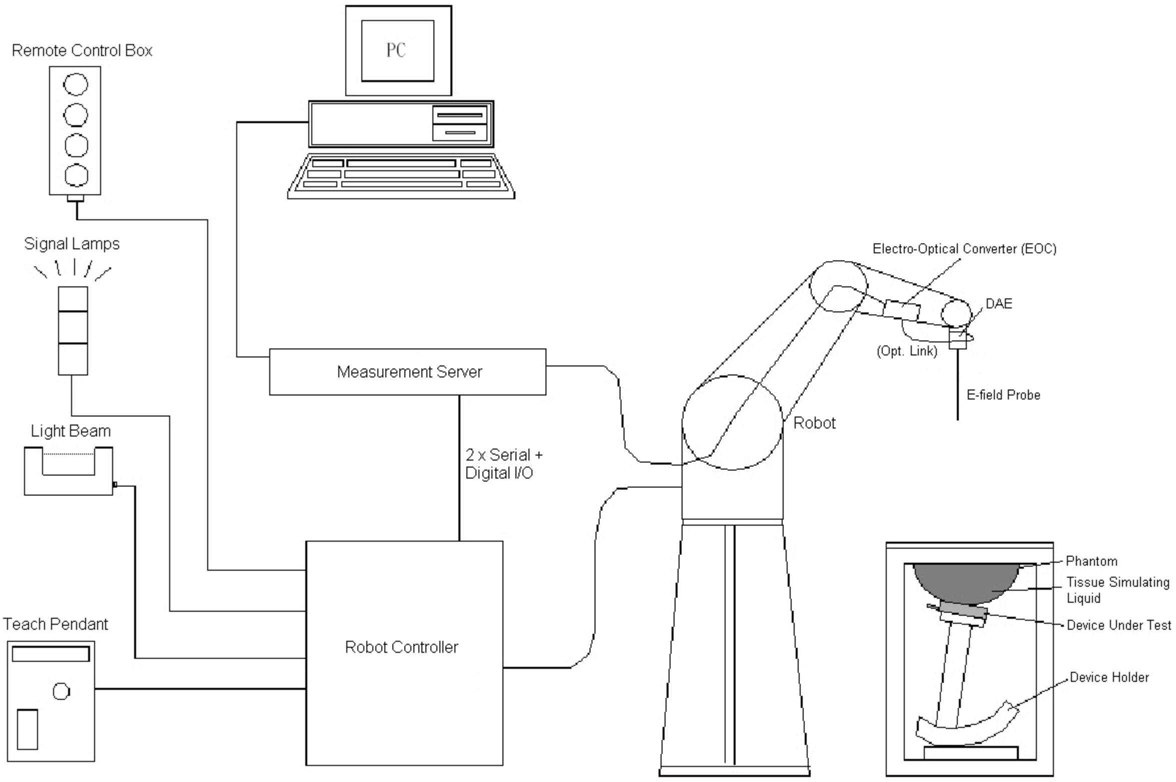

Fig-3.1 DASY System Setup

3.2.1 Robot

The DASY system uses the high precision robots from Stäubli SA (France). For the 6-axis controller system, the robot controller version (DASY4: CS7MB; DASY5: CS8c) from Stäubli is used. The Stäubli robot series have many features that are important for our application:

- High precision (repeatability ±0.035 mm)
- High reliability (industrial design)
- Jerk-free straight movements
- Low ELF interference (the closed metallic construction shields against motor control fields)

Fig-3.2 DASY4

Fig-3.3 DASY5

3.2.2 Probes

The SAR measurement is conducted with the dosimetric probe. The probe is specially designed and calibrated for use in liquid with high permittivity. The dosimetric probe has special calibration in liquid at different frequency.

Model	EX3DV4
Construction	Symmetrical design with triangular core. Built-in shielding against static charges. PEEK enclosure material (resistant to organic solvents, e.g., DGBE).
Frequency	10 MHz to 6 GHz Linearity: ± 0.2 dB
Directivity	± 0.3 dB in HSL (rotation around probe axis) ± 0.5 dB in tissue material (rotation normal to probe axis)
Dynamic Range	10 µW/g to 100 mW/g Linearity: ± 0.2 dB (noise: typically < 1 µW/g)
Dimensions	Overall length: 337 mm (Tip: 20 mm) Tip diameter: 2.5 mm (Body: 12 mm) Typical distance from probe tip to dipole centers: 1 mm

Model	ES3DV3
Construction	Symmetrical design with triangular core. Interleaved sensors. Built-in shielding against static charges. PEEK enclosure material (resistant to organic solvents, e.g., DGBE).
Frequency	10 MHz to 4 GHz Linearity: ± 0.2 dB
Directivity	± 0.2 dB in HSL (rotation around probe axis) ± 0.3 dB in tissue material (rotation normal to probe axis)
Dynamic Range	5 µW/g to 100 mW/g Linearity: ± 0.2 dB
Dimensions	Overall length: 337 mm (Tip: 20 mm) Tip diameter: 3.9 mm (Body: 12 mm) Distance from probe tip to dipole centers: 2.0 mm

3.2.3 Data Acquisition Electronics (DAE)

Model	DAE3, DAE4
Construction	Signal amplifier, multiplexer, A/D converter and control logic. Serial optical link for communication with DASY4/5 embedded system (fully remote controlled). Two step probe touch detector for mechanical surface detection and emergency robot stop.
Measurement Range	-100 to +300 mV (16 bit resolution and two range settings: 4mV, 400mV)
Input Offset Voltage	< 5µV (with auto zero)
Input Bias Current	< 50 fA
Dimensions	60 x 60 x 68 mm

3.2.4 Phantoms

Model	Twin SAM	
Construction	The shell corresponds to the specifications of the Specific Anthropomorphic Mannequin (SAM) phantom defined in IEEE 1528 and IEC 62209-1. It enables the dosimetric evaluation of left and right hand phone usage as well as body mounted usage at the flat phantom region. A cover prevents evaporation of the liquid. Reference markings on the phantom allow the complete setup of all predefined phantom positions and measurement grids by teaching three points with the robot.	
Material	Vinylester, glass fiber reinforced (VE-GF)	
Shell Thickness	2 ± 0.2 mm (6 ± 0.2 mm at ear point)	
Dimensions	Length: 1000 mm Width: 500 mm Height: adjustable feet	
Filling Volume	approx. 25 liters	

Model	ELI	
Construction	Phantom for compliance testing of handheld and body-mounted wireless devices in the frequency range of 30 MHz to 6 GHz. ELI is fully compatible with the IEC 62209-2 standard and all known tissue simulating liquids. ELI has been optimized regarding its performance and can be integrated into our standard phantom tables. A cover prevents evaporation of the liquid. Reference markings on the phantom allow installation of the complete setup, including all predefined phantom positions and measurement grids, by teaching three points. The phantom is compatible with all SPEAG dosimetric probes and dipoles.	
Material	Vinylester, glass fiber reinforced (VE-GF)	
Shell Thickness	2.0 ± 0.2 mm (bottom plate)	
Dimensions	Major axis: 600 mm Minor axis: 400 mm	
Filling Volume	approx. 30 liters	

3.2.5 Device Holder

Model	Mounting Device
Construction	In combination with the Twin SAM Phantom or ELI4, the Mounting Device enables the rotation of the mounted transmitter device in spherical coordinates. Rotation point is the ear opening point. Transmitter devices can be easily and accurately positioned according to IEC, IEEE, FCC or other specifications. The device holder can be locked for positioning at different phantom sections (left head, right head, flat).
Material	POM

Model	Laptop Extensions Kit
Construction	Simple but effective and easy-to-use extension for Mounting Device that facilitates the testing of larger devices according to IEC 62209-2 (e.g., laptops, cameras, etc.). It is lightweight and fits easily on the upper part of the Mounting Device in place of the phone positioner.
Material	POM, Acrylic glass, Foam

3.2.6 System Validation Dipoles

Model	D-Serial
Construction	Symmetrical dipole with l/4 balun. Enables measurement of feed point impedance with NWA. Matched for use near flat phantoms filled with tissue simulating solutions.
Frequency	750 MHz to 5800 MHz
Return Loss	> 20 dB
Power Capability	> 100 W (f < 1GHz), > 40 W (f > 1GHz)

3.2.7 Tissue Simulating Liquids

For SAR measurement of the field distribution inside the phantom, the phantom must be filled with homogeneous tissue simulating liquid to a depth of at least 15 cm. For head SAR testing, the liquid height from the ear reference point (ERP) of the phantom to the liquid top surface is larger than 15 cm. For body SAR testing, the liquid height from the center of the flat phantom to the liquid top surface is larger than 15 cm. The nominal dielectric values of the tissue simulating liquids in the phantom and the tolerance of 5% are listed in Table-3.1.

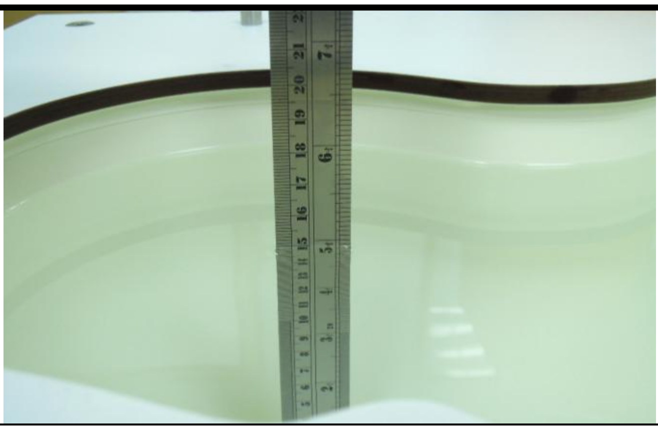	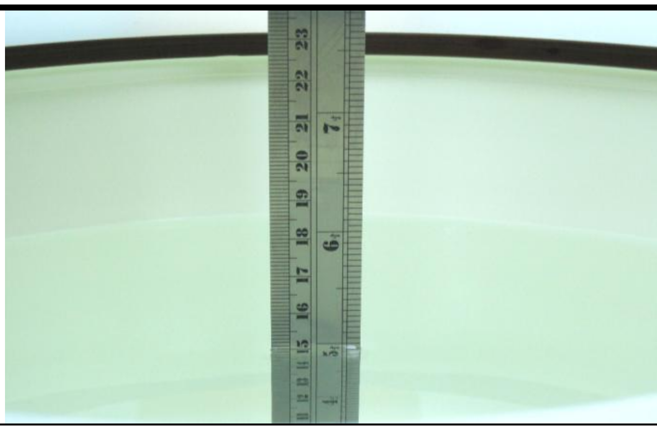
Photo of Liquid Height for Head Position	**Photo of Liquid Height for Body Position**

The dielectric properties of the head tissue simulating liquids are defined in IEEE 1528 and FCC OET 65 Supplement C Appendix C. For the body tissue simulating liquids, the dielectric properties are defined in FCC OET 65 Supplement C Appendix C. The dielectric properties of the tissue simulating liquids were verified prior to the SAR evaluation using an Agilent 85070D Dielectric Probe Kit and an Agilent Network Analyzer.

Table-3.1 Targets of Tissue Simulating Liquid

Frequency (MHz)	Target Permittivity	Range of ±5%	Target Conductivity	Range of ±5%
For Body				
750	55.5	52.7 ~ 58.3	0.96	0.91 ~ 1.01
835	55.2	52.4 ~ 58.0	0.97	0.92 ~ 1.02
1750	53.4	50.7 ~ 56.1	1.49	1.42 ~ 1.56
1900	53.3	50.6 ~ 56.0	1.52	1.44 ~ 1.60

The following table gives the recipes for tissue simulating liquids.

Table-3.2 Recipes of Tissue Simulating Liquid

Tissue Type	Bactericide	DGBE	HEC	NaCl	Sucrose	Triton X-100	Water	Diethylene Glycol Mono-hexylether
B750	0.2	-	0.2	0.8	48.8	-	50.0	-
B835	0.2	-	0.2	0.9	48.5	-	50.2	-
B1750	-	31.0	-	0.2	-	-	68.8	-
B1900	-	29.5	-	0.3	-	-	70.2	-

3.3 SAR System Verification

The system check verifies that the system operates within its specifications. It is performed daily or before every SAR measurement. The system check uses normal SAR measurements in the flat section of the phantom with a matched dipole at a specified distance. The system verification setup is shown as below.

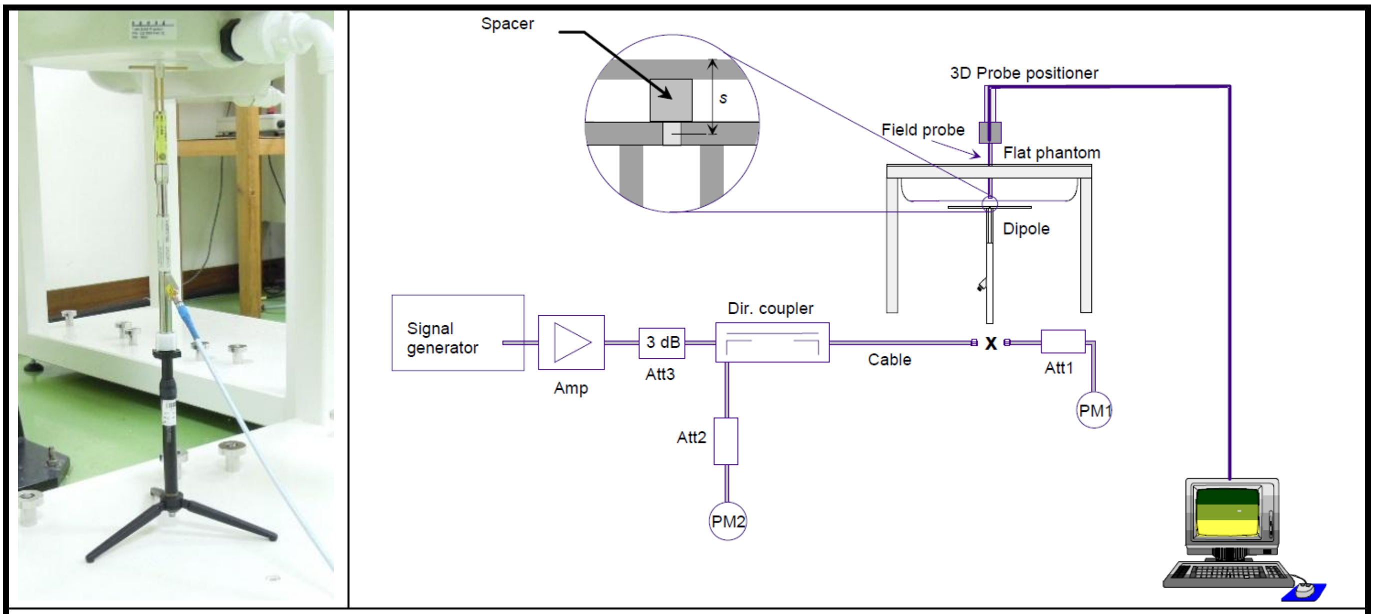

Fig-3.4 System Verification Setup

The validation dipole is placed beneath the flat phantom with the specific spacer in place. The distance spacer is touch the phantom surface with a light pressure at the reference marking and be oriented parallel to the long side of the phantom. The power meter PM1 measures the forward power at the location of the system check dipole connector. The signal generator is adjusted for the desired forward power (250 mW is used for 700 MHz to 3 GHz, 100 mW is used for 3.5 GHz to 6 GHz) at the dipole connector and the power meter PM2 is read at that level. After connecting the cable to the dipole, the signal generator is readjusted for the same reading at power meter PM2.

After system check testing, the SAR result will be normalized to 1W forward input power and compared with the reference SAR value derived from validation dipole certificate report. The deviation of system check should be within 10 %.

3.4 SAR Measurement Procedure

According to the SAR test standard, the recommended procedure for assessing the peak spatial-average SAR value consists of the following steps:

(a) Power reference measurement
(b) Area scan
(c) Zoom scan
(d) Power drift measurement

The SAR measurement procedures for each of test conditions are as follows:

(a) Make EUT to transmit maximum output power
(b) Measure conducted output power through RF cable
(c) Place the EUT in the specific position of phantom
(d) Perform SAR testing steps on the DASY system
(e) Record the SAR value

3.4.1 Area & Zoom Scan Procedure

First Area Scan is used to locate the approximate location(s) of the local peak SAR value(s). The measurement grid within an Area Scan is defined by the grid extent, grid step size and grid offset. Next, in order to determine the EM field distribution in a three-dimensional spatial extension, Zoom Scan is required. The Zoom Scan measures 5x5x7 points with step size 8, 8 and 5 mm for below 3 GHz, and 7x7x9 points with step size 4, 4 and 2.5 mm for above 5 GHz. The Zoom Scan is performed around the highest E-field value to determine the averaged SAR-distribution over 10 g.

3.4.2 Volume Scan Procedure

The volume scan is used for assess overlapping SAR distributions for antennas transmitting in different frequency bands. It is equivalent to an oversized zoom scan used in standalone measurements. The measurement volume will be used to enclose all the simultaneous transmitting antennas. For antennas transmitting simultaneously in different frequency bands, the volume scan is measured separately in each frequency band. In order to sum correctly to compute the 1g aggregate SAR, the EUT remain in the same test position for all measurements and all volume scan use the same spatial resolution and grid spacing. When all volume scan were completed, the software, SEMCAD postprocessor can combine and subsequently superpose these measurement data to calculating the multiband SAR.

3.4.3 Power Drift Monitoring

All SAR testing is under the EUT install full charged battery and transmit maximum output power. In DASY measurement software, the power reference measurement and power drift measurement procedures are used for monitoring the power drift of EUT during SAR test. Both these procedures measure the field at a specified reference position before and after the SAR testing. The software will calculate the field difference in dB. If the power drift more than 5%, the SAR will be retested.

3.4.4 Spatial Peak SAR Evaluation

The procedure for spatial peak SAR evaluation has been implemented according to the test standard. It can be conducted for 1g and 10g, as well as for user-specific masses. The DASY software includes all numerical procedures necessary to evaluate the spatial peak SAR value.

The base for the evaluation is a "cube" measurement. The measured volume must include the 1g and 10g cubes with the highest averaged SAR values. For that purpose, the center of the measured volume is aligned to the interpolated peak SAR value of a previously performed area scan.

The entire evaluation of the spatial peak values is performed within the post-processing engine (SEMCAD). The system always gives the maximum values for the 1g and 10g cubes. The algorithm to find the cube with highest averaged SAR is divided into the following stages:

(a) Extraction of the measured data (grid and values) from the Zoom Scan
(b) Calculation of the SAR value at every measurement point based on all stored data (A/D values and measurement parameters)
(c) Generation of a high-resolution mesh within the measured volume
(d) Interpolation of all measured values form the measurement grid to the high-resolution grid
(e) Extrapolation of the entire 3-D field distribution to the phantom surface over the distance from sensor to surface
(f) Calculation of the averaged SAR within masses of 1g and 10g

3.4.5 SAR Averaged Methods

In DASY, the interpolation and extrapolation are both based on the modified Quadratic Shepard’s method. The interpolation scheme combines a least-square fitted function method and a weighted average method which are the two basic types of computational interpolation and approximation.

Extrapolation routines are used to obtain SAR values between the lowest measurement points and the inner phantom surface. The extrapolation distance is determined by the surface detection distance and the probe sensor offset. The uncertainty increases with the extrapolation distance. To keep the uncertainty within 1% for the 1 g and 10 g cubes, the extrapolation distance should not be larger than 5 mm.

4. SAR Measurement Evaluation

4.1 EUT Configuration and Setting

The EUT is a data transmitter device. Confirming the LTE transmitter follows 3GPP standards, is category 3, BW 5/10 MHz, band 4/12/17, supports QPSK / 16QAM modulations, and supports data transmission only. Tested per 3GPP 36.521 maximum transmit procedures for both QPSK / 16QAM.

LTE Maximum Power Reduction in accordance with 3GPP 36.101: Power Reduction in accordance to 3GPP is active all times during LTE operation.

Modulation	Channel bandwidth / Transmission bandwidth configuration (RB)		3GPP Requirement (dB)	LTE MPR Setting (dB)
	BW 5 MHz	BW 10 MHz		
QPSK	> 8	> 12	<= 1	1
16QAM	<= 8	<= 12	<= 1	1
16QAM	> 8	> 12	<= 2	2

Note: MPR is according to the standard and implemented in the circuit (mandatory).

In addition, the device is compliant with A-MPR requirements defined in 36.101 section 6.2.4 that may be required to meet 3GPP Adjacent Channel Leakage Ratio (“ACLR”) requirements. A-MPR was disabled for all FCC compliance testing.

For WWAN SAR testing, the EUT was linked and controlled by base station emulator. Communication between the EUT and the emulator was established by air link. The distance between the EUT and the communicating antenna of the emulator is larger than 50 cm and the output power radiated from the emulator antenna is at least 30 dB smaller than the output power of EUT. The EUT was set from the emulator to radiate maximum output power during SAR testing.

The EUT is communicated with base station simulator (Agilent E5515C is used for WCDMA, and Anritsu MT8820C is used for LTE) by air link. During SAR testing, the base station simulator is set to make the EUT to radiate maximum output power.

For WCDMA, head and body SAR is tested under 12.2k RMC mode with power control set all up bits. SAR for AMR is not required since its power is less than 1/4 dB higher than RMC. SAR for HSDPA/HSUPA is not required since its power is less than 1/4 dB higher than RMC without HSDPA/HSUPA.

For LTE, set the related parameters of operating band, channel bandwidth, uplink channel number, modulation type, and RB in base station simulator. When the EUT has registered and communicated to base station simulator, set the simulator to make EUT transmitting the maximum radiated power. The steps for system simulator (Anritsu MT8820C) setup are as below.

1. Press the “Std” button to select “LTE 22.20S” function
2. Choose the “Screen Select” item to “Fundamental Measurement”
3. Enter the “Common” item
4. Set the Operating Band
5. Set the Channel Bandwidth
6. Set the UL Channel & Frequency
7. Set the Modulation
8. Set the RB number and RB shift
9. Press “Start Call” button when EUT register to the system simulator
10. Set the TX-1 Max. Power to make the EUT transmit maximum output power

4.2 EUT Testing Position

This EUT was tested in four different USB configurations. They are “direct laptop plug-in for configuration 2 and 4”, “USB cable plug-in for configuration 1 and 3”, and “direct laptop plug-in for EUT Tip Mode” shown as below. Both direct laptop plug-in and USB cable plug-in test configurations are tested with 5 mm separation between the particular dongle orientation and the flat phantom.

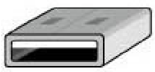	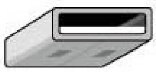	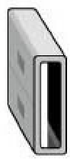	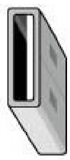
Configuration 1 (Horizontal Up)	**Configuration 2 (Horizontal Down)**	**Configuration 3 (Vertical Front)**	**Configuration 4 (Vertical Back)**

Fig-4.1 Illustration for USB Connector Orientations

4.3 Tissue Verification

The measuring results for tissue simulating liquid are shown as below.

Tissue Type	Frequency (MHz)	Liquid Temp. (℃)	Measured Conductivity (σ)	Measured Permittivity (ε_r)	Target Conductivity (σ)	Target Permittivity (ε_r)	Conductivity Deviation (%)	Permittivity Deviation (%)	Test Date
B750	750	21.4	0.966	55.257	0.96	55.5	0.63	-0.44	Aug. 08, 2012
B750	750	21.7	0.969	55.4	0.96	55.5	0.94	-0.18	Aug. 09, 2012
B750	750	20.8	0.966	55.257	0.96	55.5	0.63	-0.44	Aug. 20, 2012
B835	835	20.8	0.973	55.021	0.97	55.2	0.31	-0.32	Aug. 20, 2012
B1750	1750	20.7	1.47	53.682	1.49	53.4	-1.34	0.53	Aug. 20, 2012
B1900	1900	20.7	1.544	52.838	1.52	53.3	1.58	-0.87	Aug. 20, 2012

Note:

The dielectric properties of the tissue simulating liquid must be measured within 24 hours before the SAR testing and within ±5% of the target values. Liquid temperature during the SAR testing must be within ±2 ℃.

4.4 System Verification

The measuring results for system check are shown as below.

Test Date	Frequency (MHz)	1W Target SAR-1g (W/kg)	Measured SAR-1g (W/kg)	Normalized to 1W SAR-1g (W/kg)	Deviation (%)	Dipole S/N	Probe S/N	DAE S/N
Aug. 08, 2012	750	8.76	2.26	9.04	3.20	1013	3590	579
Aug. 09, 2012	750	8.76	2.33	9.32	6.39	1013	3650	861
Aug. 20, 2012	750	8.76	2.31	9.24	5.48	1013	3650	910
Aug. 20, 2012	835	9.60	2.38	9.52	-0.83	4d021	3650	910
Aug. 20, 2012	1750	37.00	9.22	36.88	-0.32	1023	3650	910
Aug. 20, 2012	1900	38.90	9.61	38.44	-1.18	5d036	3650	910

Note:

Comparing to the reference SAR value provided by SPEAG, the validation data should be within its specification of 10 %. The result indicates the system check can meet the variation criterion and the plots can be referred to Appendix A of this report.

4.5 Conducted Power Results

The measuring conducted power (Unit: dBm) are shown as below.

Band	WCDMA Band II			WCDMA Band V		
Channel	9262	9400	9538	4132	4182	4233
Frequency (MHz)	1852.4	1880.0	1907.6	826.4	836.4	846.6
RMC 12.2K	22.62	**23.07**	22.56	23.16	**23.20**	23.03

Band	WCDMA AWS			-		
Channel	1312	1412	1513	-	-	-
Frequency (MHz)	1712.4	1732.4	1752.6	-	-	-
RMC 12.2K	23.38	23.23	**23.43**	-	-	-

LTE Band 4									
BW	Modulation	CH	Frequency (MHz)	RB	RB Offset	Target Power	MPR	Measured Power	Actual Reducing Power
5 MHz	QPSK	19975	1712.5	1	0	22.8	0	22.65	-0.15
		20175	1732.5	1	0	22.8	0	22.64	-0.16
		20375	1752.5	1	0	22.8	0	22.63	-0.17
		19975	1712.5	1	24	22.8	0	22.69	-0.11
		20175	1732.5	1	24	22.8	0	22.67	-0.13
		20375	1752.5	1	24	22.8	0	22.65	-0.15
		19975	1712.5	12	6	22.8	1	21.88	-0.92
		20175	1732.5	12	6	22.8	1	21.96	-0.84
		20375	1752.5	12	6	22.8	1	21.81	-0.99
		19975	1712.5	25	0	22.8	1	21.87	-0.93
		20175	1732.5	25	0	22.8	1	21.86	-0.94
		20375	1752.5	25	0	22.8	1	21.89	-0.91
	16QAM	19975	1712.5	1	0	22.8	1	21.64	-1.16
		20175	1732.5	1	0	22.8	1	21.69	-1.11
		20375	1752.5	1	0	22.8	1	21.68	-1.12
		19975	1712.5	1	24	22.8	1	21.61	-1.19
		20175	1732.5	1	24	22.8	1	21.61	-1.19
		20375	1752.5	1	24	22.8	1	21.67	-1.13
		19975	1712.5	12	6	22.8	2	20.72	-2.08
		20175	1732.5	12	6	22.8	2	20.73	-2.07
		20375	1752.5	12	6	22.8	2	20.88	-1.92
		19975	1712.5	25	0	22.8	2	20.90	-1.90
		20175	1732.5	25	0	22.8	2	20.82	-1.98
		20375	1752.5	25	0	22.8	2	20.95	-1.85
10 MHz	QPSK	20000	1715	1	0	22.8	0	22.63	-0.17
		20175	1732.5	1	0	22.8	0	22.69	-0.11
		20350	1750	1	0	22.8	0	22.68	-0.12
		20000	1715	1	49	22.8	0	**22.86**	0.06
		20175	1732.5	1	49	22.8	0	22.80	0.00
		20350	1750	1	49	22.8	0	22.74	-0.06
		20000	1715	25	12	22.8	1	21.66	-1.14
		20175	1732.5	25	12	22.8	1	21.68	-1.12
		20350	1750	25	12	22.8	1	21.69	-1.11
		20000	1715	50	0	22.8	1	21.64	-1.16
		20175	1732.5	50	0	22.8	1	21.64	-1.16
		20350	1750	50	0	22.8	1	21.65	-1.15
	16QAM	20000	1715	1	0	22.8	1	21.87	-0.93
		20175	1732.5	1	0	22.8	1	21.70	-1.10
		20350	1750	1	0	22.8	1	21.84	-0.96
		20000	1715	1	49	22.8	1	21.88	-0.92
		20175	1732.5	1	49	22.8	1	21.84	-0.96
		20350	1750	1	49	22.8	1	21.86	-0.94
		20000	1715	25	12	22.8	2	20.92	-1.88
		20175	1732.5	25	12	22.8	2	20.92	-1.88
		20350	1750	25	12	22.8	2	20.88	-1.92
		20000	1715	50	0	22.8	2	20.90	-1.90
		20175	1732.5	50	0	22.8	2	20.85	-1.95
		20350	1750	50	0	22.8	2	20.91	-1.89

LTE Band 12									
BW	Modulation	CH	Frequency (MHz)	RB	RB Offset	Target Power	MPR	Measured Power	Actual Reducing Power
5 MHz	QPSK	23035	701.5	1	0	22.2	0	22.07	-0.13
		23095	707.5	1	0	22.2	0	22.09	-0.11
		23155	713.5	1	0	22.2	0	22.05	-0.15
		23035	701.5	1	24	22.2	0	22.06	-0.14
		23095	707.5	1	24	22.2	0	22.07	-0.13
		23155	713.5	1	24	22.2	0	22.06	-0.14
		23035	701.5	12	6	22.2	1	21.04	-1.16
		23095	707.5	12	6	22.2	1	21.11	-1.09
		23155	713.5	12	6	22.2	1	21.00	-1.20
		23035	701.5	25	0	22.2	1	21.09	-1.11
		23095	707.5	25	0	22.2	1	21.04	-1.16
		23155	713.5	25	0	22.2	1	21.24	-0.96
	16QAM	23035	701.5	1	0	22.2	1	21.36	-0.84
		23095	707.5	1	0	22.2	1	21.36	-0.84
		23155	713.5	1	0	22.2	1	21.16	-1.04
		23035	701.5	1	24	22.2	1	21.32	-0.88
		23095	707.5	1	24	22.2	1	21.36	-0.84
		23155	713.5	1	24	22.2	1	21.31	-0.89
		23035	701.5	12	6	22.2	2	20.00	-2.20
		23095	707.5	12	6	22.2	2	20.18	-2.02
		23155	713.5	12	6	22.2	2	20.01	-2.19
		23035	701.5	25	0	22.2	2	20.28	-1.92
		23095	707.5	25	0	22.2	2	20.26	-1.94
		23155	713.5	25	0	22.2	2	20.27	-1.93
10 MHz	QPSK	23060	704	1	0	22.2	0	22.00	-0.20
		23095	707.5	1	0	22.2	0	22.09	-0.11
		23130	711	1	0	22.2	0	22.07	-0.13
		23060	704	1	49	22.2	0	22.17	-0.03
		23095	707.5	1	49	22.2	0	22.07	-0.13
		23130	711	1	49	22.2	0	22.02	-0.18
		23060	704	25	12	22.2	1	21.00	-1.20
		23095	707.5	25	12	22.2	1	21.02	-1.18
		23130	711	25	12	22.2	1	21.08	-1.12
		23060	704	50	0	22.2	1	21.02	-1.18
		23095	707.5	50	0	22.2	1	21.03	-1.17
		23130	711	50	0	22.2	1	21.08	-1.12
	16QAM	23060	704	1	0	22.2	1	21.01	-1.19
		23095	707.5	1	0	22.2	1	21.06	-1.14
		23130	711	1	0	22.2	1	21.06	-1.14
		23060	704	1	49	22.2	1	21.05	-1.15
		23095	707.5	1	49	22.2	1	21.20	-1.00
		23130	711	1	49	22.2	1	21.30	-0.90
		23060	704	25	12	22.2	2	20.39	-1.81
		23095	707.5	25	12	22.2	2	20.38	-1.82
		23130	711	25	12	22.2	2	20.24	-1.96
		23060	704	50	0	22.2	2	20.29	-1.91
		23095	707.5	50	0	22.2	2	20.08	-2.12
		23130	711	50	0	22.2	2	20.05	-2.15

LTE Band 17									
BW	Modulation	CH	Frequency (MHz)	RB	RB Offset	Target Power	MPR	Measured Power	Actual Reducing Power
5 MHz	QPSK	23755	706.5	1	0	23	0	23.07	0.07
		23790	710	1	0	23	0	23.01	0.01
		23825	713.5	1	0	23	0	22.91	-0.09
		23755	706.5	1	24	23	0	22.85	-0.15
		23790	710	1	24	23	0	22.83	-0.17
		23825	713.5	1	24	23	0	22.82	-0.18
		23755	706.5	12	6	23	1	21.92	-1.08
		23790	710	12	6	23	1	22.16	-0.84
		23825	713.5	12	6	23	1	21.92	-1.08
		23755	706.5	25	0	23	1	21.89	-1.11
		23790	710	25	0	23	1	21.84	-1.16
		23825	713.5	25	0	23	1	21.89	-1.11
	16QAM	23755	706.5	1	0	23	1	22.20	-0.80
		23790	710	1	0	23	1	22.13	-0.87
		23825	713.5	1	0	23	1	22.14	-0.86
		23755	706.5	1	24	23	1	22.10	-0.90
		23790	710	1	24	23	1	22.02	-0.98
		23825	713.5	1	24	23	1	21.93	-1.07
		23755	706.5	12	6	23	2	21.17	-1.83
		23790	710	12	6	23	2	21.12	-1.88
		23825	713.5	12	6	23	2	21.18	-1.82
		23755	706.5	25	0	23	2	21.14	-1.86
		23790	710	25	0	23	2	21.16	-1.84
		23825	713.5	25	0	23	2	21.12	-1.88
10 MHz	QPSK	23780	709	1	0	23	0	23.12	0.12
		23790	710	1	0	23	0	22.96	-0.04
		23800	711	1	0	23	0	23.00	0.00
		23780	709	1	49	23	0	22.87	-0.13
		23790	710	1	49	23	0	22.84	-0.16
		23800	711	1	49	23	0	22.89	-0.11
		23780	709	25	12	23	1	22.13	-0.87
		23790	710	25	12	23	1	22.10	-0.90
		23800	711	25	12	23	1	22.12	-0.88
		23780	709	50	0	23	1	22.09	-0.91
		23790	710	50	0	23	1	22.03	-0.97
		23800	711	50	0	23	1	22.00	-1.00
	16QAM	23780	709	1	0	23	1	22.16	-0.84
		23790	710	1	0	23	1	22.18	-0.82
		23800	711	1	0	23	1	22.01	-0.99
		23780	709	1	49	23	1	21.90	-1.10
		23790	710	1	49	23	1	21.85	-1.15
		23800	711	1	49	23	1	21.88	-1.12
		23780	709	25	12	23	2	21.13	-1.87
		23790	710	25	12	23	2	21.16	-1.84
		23800	711	25	12	23	2	21.15	-1.85
		23780	709	50	0	23	2	21.13	-1.87
		23790	710	50	0	23	2	21.17	-1.83
		23800	711	50	0	23	2	21.13	-1.87

4.6 SAR Testing Results

4.6.1 SAR Results for Body

Plot No.	Band	Mode	Test Position	Separation Distance (cm)	Channel	RB	RB Offset	SAR-1g (W/kg)
602	WCDMA II	RMC12.2K	Horizontal Down	0.5	9400	-	-	**0.728**
603	WCDMA IV	RMC12.2K	Horizontal Up	0.5	1412	-	-	**0.541**
601	WCDMA V	RMC12.2K	Horizontal Down	0.5	4182	-	-	**0.599**
605	LTE 4	QPSK_10M	Horizontal Up	0.5	20000	1	49	**0.605**
201	LTE 12	QPSK_10M	Horizontal Up	0.5	23060	25	12	0.138
206	LTE 12	QPSK_10M	Horizontal Up	0.5	23060	1	0	0.15
211	LTE 12	QPSK_10M	Horizontal Up	0.5	23060	1	49	0.198
202	LTE 12	QPSK_10M	Horizontal Down	0.5	23060	25	12	0.25
207	LTE 12	QPSK_10M	Horizontal Down	0.5	23060	1	0	0.296
212	LTE 12	QPSK_10M	Horizontal Down	0.5	23060	1	49	**0.404**
203	LTE 12	QPSK_10M	Vertical Front	0.5	23060	25	12	0.074
208	LTE 12	QPSK_10M	Vertical Front	0.5	23060	1	0	0.085
213	LTE 12	QPSK_10M	Vertical Front	0.5	23060	1	49	0.118
204	LTE 12	QPSK_10M	Vertical Back	0.5	23060	25	12	0.157
209	LTE 12	QPSK_10M	Vertical Back	0.5	23060	1	0	0.193
214	LTE 12	QPSK_10M	Vertical Back	0.5	23060	1	49	0.266
205	LTE 12	QPSK_10M	Tip Mode	0.5	23060	25	12	0.00589
210	LTE 12	QPSK_10M	Tip Mode	0.5	23060	1	0	0.00802
215	LTE 12	QPSK_10M	Tip Mode	0.5	23060	1	49	0.019
218	LTE 12	16QAM_10M	Horizontal Down	0.5	23060	25	12	0.207
219	LTE 12	16QAM_10M	Horizontal Down	0.5	23060	1	0	0.238
220	LTE 12	16QAM_10M	Horizontal Down	0.5	23060	1	49	0.337
604	LTE 17	QPSK_10M	Horizontal Down	0.5	23780	25	12	**0.237**

Note:

1. SAR was verified on the worst condition of original report.
2. SAR is performed on the highest power channel. When the SAR value of highest power channel is less than 0.8 W/kg, SAR testing for optional channel is not required.
2. According to KDB 941225, the LTE SAR testing for 100% RB is not required since the maximum SAR of 50% RB is less than 1.45 W/kg.
3. According to KDB 941225, the LTE SAR testing was performed on largest channel bandwidth, and SAR for other channel bandwidths is not required since the maximum power of smaller channel bandwidth is within 1/2 dB higher or lower of measured for the largest channel bandwidth and maximum SAR of largest channel bandwidth is less than 1.45 W/kg.

Test Engineer： Morrison Huang, and Match Tsui

5. Calibration of Test Equipment

Equipment	Manufacturer	Model	SN	Cal. Date	Cal. Interval
System Validation Kit	SPEAG	D750V3	1013	Apr. 25, 2012	Annual
System Validation Kit	SPEAG	D835V2	4d021	Apr. 20, 2012	Annual
System Validation Kit	SPEAG	D1750V2	1023	Jun. 20, 2012	Annual
System Validation Kit	SPEAG	D1900V2	5d036	Jan. 26, 2012	Annual
Dosimetric E-Field Probe	SPEAG	EX3DV4	3590	Feb. 23, 2012	Annual
Dosimetric E-Field Probe	SPEAG	EX3DV4	3650	Oct. 26, 2011	Annual
Data Acquisition Electronics	SPEAG	DAE3	579	Apr. 27, 2012	Annual
Data Acquisition Electronics	SPEAG	DAE4	861	Aug. 29, 2011	Annual
Data Acquisition Electronics	SPEAG	DAE4	910	Dec. 07, 2011	Annual
SAM Phantom	SPEAG	QD000P40CD	TP-1654	N/A	N/A
SAM Phantom	SPEAG	QD000P40CD	TP-1653	N/A	N/A
ELI Phantom	SPEAG	QDOVA001B	TP-1043	N/A	N/A
Radio Communication Tester	Agilent	E5515C	MY50266628	Sep. 26, 2011	Biennial
Radio Communication Analyzer	Anritsu	MT8820C	6201010284	Aug. 01, 2011	Biennial
ENA Series Network Analyzer	Agilent	E5071C	MY46214281	May 14, 2012	Annual
MXG Analog Signal Generator	Agilent	N5181A	MY50143868	May 06, 2012	Annual
Power Meter	Anritsu	ML2495A	1218009	May 07, 2012	Annual
Power Sensor	Anritsu	MA2411B	1207252	May 07, 2012	Annual
EXA Spectrum Analyzer	Agilent	N9010A	MY52100136	Apr. 23, 2012	Annual
Dielectric Probe Kit	Agilent	85070D	E2-020018	May 14, 2012	Annual
Thermometer	YFE	YF-160A	110600361	Feb. 21, 2012	Annual
Directional Coupler	Woken	0110A05602O-10	11122702	Apr. 19, 2012	Annual
Power Amplifier	AR	5S1G4	0339656	Apr. 23, 2012	Annual
Power Amplifier	Mini-Circuit	ZVE-8G	001000422	Apr. 23, 2012	Annual
Attenuator	Woken	00800A1G01L-03	N/A	Apr. 19, 2012	Annual

6. Measurement Uncertainty

Error Description	Uncertainty Value (±%)	Probability Distribution	Divisor	Ci (1g)	Standard Uncertainty (1g)	Vi
Measurement System						
Probe Calibration	6.0	Normal	1	1	± 6.0 %	∞
Axial Isotropy	4.7	Rectangular	√3	0.7	± 1.9 %	∞
Hemispherical Isotropy	9.6	Rectangular	√3	0.7	± 3.9 %	∞
Boundary Effects	1.0	Rectangular	√3	1	± 0.6 %	∞
Linearity	4.7	Rectangular	√3	1	± 2.7 %	∞
System Detection Limits	1.0	Rectangular	√3	1	± 0.6 %	∞
Readout Electronics	0.6	Normal	1	1	± 0.6 %	∞
Response Time	0.0	Rectangular	√3	1	± 0.0 %	∞
Integration Time	1.7	Rectangular	√3	1	± 1.0 %	∞
RF Ambient Noise	3.0	Rectangular	√3	1	± 1.7 %	∞
RF Ambient Reflections	3.0	Rectangular	√3	1	± 1.7 %	∞
Probe Positioner	0.5	Rectangular	√3	1	± 0.3 %	∞
Probe Positioning	2.9	Rectangular	√3	1	± 1.7 %	∞
Max. SAR Eval.	2.3	Rectangular	√3	1	± 1.3 %	∞
Test Sample Related						
Device Positioning	3.9	Normal	1	1	± 3.9 %	31
Device Holder	2.7	Normal	1	1	± 2.7 %	19
Power Drift	5.0	Rectangular	√3	1	± 2.9 %	∞
Phantom and Setup						
Phantom Uncertainty	4.0	Rectangular	√3	1	± 2.3 %	∞
Liquid Conductivity (Target)	5.0	Rectangular	√3	0.64	± 1.8 %	∞
Liquid Conductivity (Meas.)	5.0	Normal	1	0.64	± 3.2 %	29
Liquid Permittivity (Target)	5.0	Rectangular	√3	0.6	± 1.7 %	∞
Liquid Permittivity (Meas.)	5.0	Normal	1	0.6	± 3.0 %	29
Combined Standard Uncertainty					± 11.7 %	
Expanded Uncertainty (K=2)					**± 23.4 %**	

Uncertainty budget for frequency range 300 MHz to 3 GHz

7. 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 according to ISO/IEC 17025.

Copies of accreditation and authorization certificates of our laboratories obtained from approval agencies can be downloaded from our web site. If you have any comments, please feel free to contact us at the following:

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

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