This document was generated in response to a request for additional technical information by Martin Perrine in regards to the type approval of the KWC-2235. The information included in related to the total 13 specific topics discussed in the following email received by Lin Lu on Nov. 1, 2001:

From: oetech@fccsun34w.fcc.gov
Date: Thu, 1 Nov 2001 14:40:58 -0500 (EST)
To: llu@qcpi.com
Subject: Request for additional information

To: Lin Lu, QCP, Inc. Representing Kyocera Wireless Corp.
From: Martin Perrine
mperrine@fcc.gov
FCC Application Processing Branch
Re: FCC ID OVFKWC-2235
Applicant: Kyocera Wireless Corp
Correspondence Reference Number: 21126
731 Confirmation Number: EA102451

In regards to your recent application referenced above we kindly request that you provide the following additional information.

1) Exact location in the FCC EAS system of the radiated spurious emissions referenced in test report exhibit 12. This data could not be located. Please note substitution method should be used, per TIA/EIA-603.

2) New data for radiated power measurements (exhibits 4 and 5) using the "substitution method". TIA/EIA-603 has standardized on the substitution method for these tests.

3) Clarification on what type of data is reported in test report exhibit 8, radiated or conducted. Additional data to supplement results in exhibit 8. Measurements should be made to the 10th harmonic, per CFR 47 section 2.1057 (a)1.

4) Photographs of the radiation test setups, per CFR 47 section 2.947 (e).

SAR
The FCC has standardized on Supplement C of OET Bulletins 65 which was recently updated. This standard contains both test procedures and reporting recommendations. There are numerous changes that testing companies will need to address to fulfill this standard. This application as been evaluated to the extent possible in accordance with Supplement C.

In regards to your recent application referenced above we kindly request that you provide the following additional information.

1) Crest factors used in and the "power drift" measured by the DASY3 system for each test.

2) Liquid temperatures during the test and for validation, per Supplement C Appendix B II9.

3) Confirmation that the phantom used by the DASY3 manufacturer and your company for validation were the same model.

4) Date(s) validation tests were performed?

5) Total system accuracy measurement calculation, per Supplement C Appendix B II9.

6) A single table consolidating the various liquid dielectric parameters used for the key steps of this test. Please include the permitivity and conductivity for all pertinent frequencies and for both head and body. Please also include the parameters used by the manufacturer for calibration and validation, as well as those you used for validation and for the

SAR test. Numerous values are noted throughout the report/plots with various levels of agreement, making the report difficult to evaluate. Please include all dates values were measured.

7) Composition of the liquid, per Supplement C Appendix B II3.

8) Detailed drawings or description of telephone placement relative to the phantom. Position information should be complete enough to facilitate accurate repetition of the test positions, per Supplement C Appendix B II6. Please provide a drawing that clearly illustrates telephone and phantom positioning reference points, and relative positions including critical placement angles.

9) Liquid depth, per Supplement C Appendix B II.

1) Radiated spurious emissions test report -- Exhibit 12

The data was missing while the transmission. We have reloaded the radiated spurious emission test report as a separate attachment, named “Exhibit 12_Radiated Emission”, via OET Laboratory Division Electronic Filing Site.

2) New data for radiated power measurements (exhibits 4 and 5) using the "substitution method", per TIA/EIA-603

TIA/EIA-603 specifies the substitution method for radiated spurious emission measurement. There is no specification on how to measure the radiated power at fundamental frequencies. As far as a handset radiated power, since we can accurately measure the conducted power at the antenna port (i.e., a known RF source), and calibrate the maximum antenna gain by a CAL phone designed by KWC, the maximum ERP and EIRP can be determined as Conducted Power + Antenna Gain.

FM mode --

Carrier Frequency (MHz)	Channel Number	Conducted power (dBm)	Antenna Gain (dBd)	ERP (dBm)
824.04	991	25.75	1.65	27.40
836.49	383	25.72	1.19	26.91
848.97	799	25.75	1.07	26.82

Cellular CDMA mode --

Carrier Frequency (MHz)	Channel Number	Conducted power (dBm)	Antenna Gain (dBd)	ERP (dBm)
824.7	1013	24.24	1.60	25.84
836.49	383	24.23	1.28	25.51
848.31	777	24.24	1.05	25.29

PCS CDMA mode --

Carrier Frequency (MHz)	Channel Number	Conducted power (dBm)	Antenna Gain (dBi)	EIRP (dBm)
1851.25	25	22.50	3.06	25.56
1880	600	22.51	2.82	25.33
1908.75	1175	22.48	2.89	25.37

The test setup and the measurement procedures are as follows.

Test Setup –

Calibrated Antenna Range

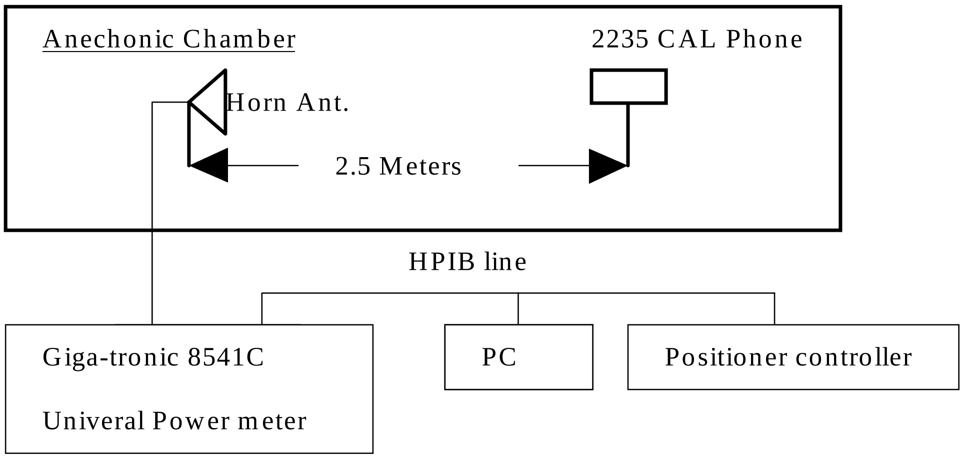
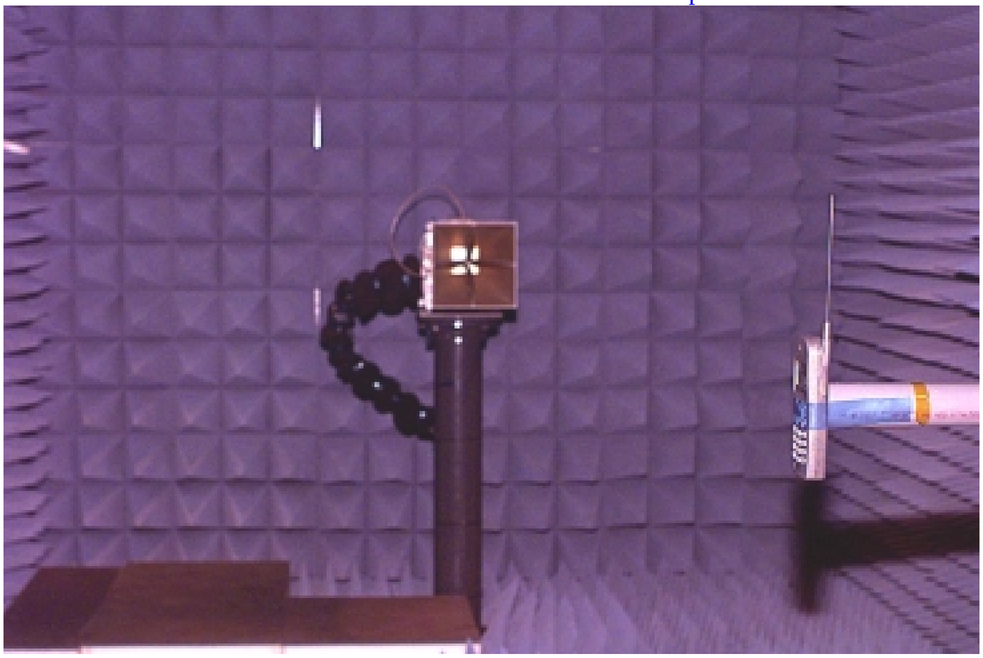


Photo of Antenna Calibration test setup



Measurement Method –

Mount KWC 2235 CAL phone on PVC pipe inside the chamber and feed a know RF power ($P_{conducted}$) into the input of 2235 antenna system, rotate the CAL phone 360degree in azimuth and elevation. The horn antenna receives the CAL phone signal from 2.5 meters away. The computer will record the maximum radiated power ($P_{radiated}$) taking into consideration of all path losses. The entire measurement is controlled by 959 automated antenna measurement workstation software by Flam & Russel Inc. The antenna gain can be determined as $G\ (dBi) = P_{radiated}\ (dBm) - P_{conducted}\ (dBm)$.

We believe our measurements above are valid and reflect the actual the maximum ERP and EIRP of KWC 2235.

3) Clarification on what type of data is reported in test report exhibit 8, radiated or conducted. Additional data to supplement results in exhibit 8. Measurements should be made to the 10th harmonic, per CFR 47 section 2.1057 (a)1.

The data reported in test report exhibit 8 was the conducted measurement data. This test was performed per CFR 47 section 22.917 Emission Limitation for Cellular.

Per CFR section 2.1057 (a) 1, test report exhibit 10 & 11 provided up to 10^{th} harmonic measurement results for all three modes, i.e., FM, Cellular CDMA and PCS CDMA and low, mid, high channel per mode. The test was performed to screen any spurious and harmonics at the antenna port up to 10^{th} harmonic. The highest 10 emissions were recorded in the tables in Exhibit 10 and 11.

4) Photographs of the radiation test setups, per CFR 47 section 2.947 (e).

All the radiated tests were performed at TUV in San Diego. The photographs were included in the appropriate reports from TUV, which have uploaded with this response.

SAR

1) Crest factors used in and the "power drift" measured by the DASY3 system for each test.

Crest factors used in all tests is 1.

In fact, the “power drift” for each test and the conducted power level before each scan and after each scan were measured. We provided the conducted power level before each scan and after each scan in the original report. It has just been noticed that the “power drift” line was mistakenly removed from the graphic template so it did not show on each plot. We have corrected the graphic format and re-printed all of plots. See separate attachment, named “SAR plots with power drift”, for the new plots. Below is a copy of the SAR result summary from the initial report (Exhibit 22).

Brain SAR Test Results

FREQ. MHZ	CH.#	SERIAL NUMBER	MODULATION	CONDUCTED POWER BEFORE TEST	ANTENNA POSITION	1 GRAM AVG.SAR (MW/G)	CONDUCTED POWER AFTER TEST
824	991	BWXV0122151617	ANALOG	26.39 dBm	Ext	1.25	26.44 dBm
824	991	BWXV0122151617	ANALOG		Ret	0.964	
836.5	383	BWXV0122151617	ANALOG	26.35 dBm	Ext	1.25	26.42 dBm
836.5	383	BWXV0122151617	ANALOG		Ret	1.14	
849	799	BWXV0122151617	ANALOG	26.35 dBm	Ext	1.34	26.43 dBm
849	799	BWXV0122151617	ANALOG		Ret	1.27	
848.3	777	BWXV0122151617	Cellular CDMA	24.91 dBm	Ext	1.02	25.11 dBm
848.3	777	BWXV0122151617	Cellular CDMA		Ret	0.984	
1851.25	25	BWXV0122151617	PCS CDMA	23.16 dBm	Ext	1.26	23.27 dBm
1851.25	25	BWXV0122151617	PCS CDMA		Ret	1.40	
1880	600	BWXV0122151617	PCS CDMA	23.19 dBm	Ext	1.13	23.56 dBm
1880	600	BWXV0122151617	PCS CDMA		Ret	1.25	
1908.75	1175	BWXV0122151617	PCS CDMA	23.17 dBm	Ext	1.05	23.42 dBm
1908.75	1175	BWXV0122151617	PCS CDMA		Ret	1.16	

The highest SAR (at head) in the cellular band is 1.34 mW/g. The highest SAR (at head) in PCS band is 1.40 mW/g.

Body-worn SAR Test Results (with beltclip)

FREQ. MHZ	CH.#	SERIAL NUMBER	MODULATION	CONDUCTED POWER BEFORE TEST	ANTENNA POSITION	1 GRAM AVG.SAR (MW/G)	CONDUCTED POWER AFTER TEST
824	991	BWXV0122151617	ANALOG	26.39 dBm	Ext	0.496	26.44 dBm
824	991	BWXV0122151617	ANALOG		Ret	0.443	
836.5	383	BWXV0122151617	ANALOG	26.35 dBm	Ext	0.512	26.42 dBm
836.5	383	BWXV0122151617	ANALOG		Ret	0.403	
849	799	BWXV0122151617	ANALOG	26.35 dBm	Ext	0.657	26.43 dBm
849	799	BWXV0122151617	ANALOG		Ret	0.432	
828.3	777	BWXV0122151617	Cellular CDMA	24.91 dBm	Ext	0.516	25.11 dBm
828.3	777	BWXV0122151617	Cellular CDMA		Ret	0.342	
1851.25	25	BWXV0122151617	PCS CDMA	23.16 dBm	Ext	0.323	23.35 dBm
1851.25	25	BWXV0122151617	PCS CDMA		Ret	0.341	
1880	600	BWXV0122151617	PCS CDMA	23.19 dBm	Ext	0.271	23.56 dBm
1880	600	BWXV0122151617	PCS CDMA		Ret	0.290	
1908.75	1175	BWXV0122151617	PCS CDMA	23.17 dBm	Ext	0.257	23.42 dBm
1908.75	1175	BWXV0122151617	PCS CDMA		Ret	0.266	

The highest SAR (at waist) in the cellular band is 0.657 mW/g. The highest SAR (at waist) in PCS band is 0.341 mW/g.

Body-worn SAR Test Results (with 22.5 mm air space)

FREQ. MHZ	CH.#	SERIAL NUMBER	MODULATION	CONDUCTED POWER BEFORE TEST	ANTENNA POSITION	1 GRAM AVG.SAR (MW/G)	CONDUCTED POWER AFTER TEST
824	991	BWXV0122151617	ANALOG	26.39 dBm	Ext	0.532	26.44 dBm
824	991	BWXV0122151617	ANALOG		Ret	0.509	
836.5	383	BWXV0122151617	ANALOG	26.35 dBm	Ext	0.512	26.42 dBm
836.5	383	BWXV0122151617	ANALOG		Ret	0.486	
849	799	BWXV0122151617	ANALOG	26.35 dBm	Ext	0.512	26.43 dBm
849	799	BWXV0122151617	ANALOG		Ret	0.424	
836.5	383	BWXV0122151617	Cellular CDMA	24.89 dBm	Ext	0.356	25.07 dBm
836.5	383	BWXV0122151617	Cellular CDMA		Ret	0.394	
1851.25	25	BWXV0122151617	PCS CDMA	23.16 dBm	Ext	0.273	23.35 dBm
1851.25	25	BWXV0122151617	PCS CDMA		Ret	0.296	
1880	600	BWXV0122151617	PCS CDMA	23.19 dBm	Ext	0.243	23.56 dBm
1880	600	BWXV0122151617	PCS CDMA		Ret	0.248	
1908.75	1175	BWXV0122151617	PCS CDMA	23.17 dBm	Ext	0.205	23.42 dBm
1908.75	1175	BWXV0122151617	PCS CDMA		Ret	0.214	

2) Liquid temperatures during the test and for validation, per Supplement C Appendix B II9.

The liquid temperature during the test and for validation is in the range from 22 ^{o}C to 26 ^{o}C.

3) Confirmation that the phantom used by the DASY3 manufacturer and your company for validation were the same model.

The phantoms used by the DASY3 manufacture and Kyocera Wireless Corp (KWC) for validation were the same model.

4) Date(s) validation tests were performed?

The data(s) validation tests were performed showed on the validation plots located in Exhibit 22_KWC2235 SAR test report, page 14, Section 7. For 900MHz and 1800MHz brain tissues, the validation test results reported in the original report were performed on September 10 and 13 of 2001, respectively, just before the submitted brain SAR data were taken. The 835MHz and 1800MHz muscle tissues were calibrated by HP85070B dielectric measurement system on September 10 and 11 of 2001, respectively, when the submitted body-wore SAR data were taken.

5) Total system accuracy measurement calculation, per Supplement C Appendix B II9.

The Schmid and Partners Engineering has performed a study of SAR repeatability due to many different uncertainties of DASY3 system. Below is the uncertainty budget determined for the DASY3 measurement system by Schmid and Partners and the test device by KWC, according to the NIS81 and the NIST1297 document.

Uncertainty Description	Error	Distrib.	Weight	Std. Dev.
Probe Uncertainty				
axial isotropy	+/- 0.2dB	U-shape	0.5	+/- 2.4%
spherical isotropy	+/- 0.4dB	U-shape	0.5	+/- 4.8%
isotropy from gradient	+/- 0.5dB	U-shape	0	
spatial resolution	+/- 0.5%	normal	1	+/- 0.5%
linearity error	+/- 0.2dB	rectang.	1	+/- 2.7%
caliabration error	+/- 3.3%	normal	1	+/- 3.3%
SAR Evaluation Uncertainty				
data acquisition error	+/- 1%	rectang.	1	+/- 0.6%
ELF and RF disturbances	+/- 0.25%	normal	1	+/- 0.25%
conductivity assessment	+/- 10%	rectang.	1	+/- 5.8%
Spatial Peak SAR Evaluation Uncertainty				
extrapol boundary effect	+/- 3%	normal	1	+/- 3%
probe positioning error	+/- 0.1mm	normal	1	+/- 1%
integrat. And cube orient	+/- 3%	normal	1	+/- 3%
cube shape inaccuracies	+/- 2%	rectang.	1	+/- 1.2%
devices positioning	+/- 6%	normal	1	+/- 6%
RF Source Error (test device)	+/- 2%	normal	1	+/- 2%
Combined Uncertainties				+/- 11.9%

The extended uncertainty (K=2) was assessed to be +/- 23.8%.

As FCC Type Acceptance application, the conducted power level for SAR testing was set to 0.7dB higher than the nominal manufacture Tx power set point to include errors/uncertainties that we were expecting. After properly incorporating the extended uncertainty assessed above, the KWC 2235 mode is still in compliance with FCC requirement.

- In the initial Type Acceptance application report, the nominal conducted power level was set to 25.7dBm in FM mode, 24.2dBm in cellular CDMA mode and 22.5dBm in PCS CDMA mode (as shown in the initial KWC2235_part 22&24 test report, Exhibit 4 and 5). However, the conducted power levels set for SAR testing were increased to 26.4dBm in FM mode, 24.9dBm in cellular CDMA mode and 23.2dBm in PCS CDMA mode (as shown in the initial report, Exhibit 22, page 12, Table 3 and 4).

- 0.7dB can be expressed as 17.5%. The maximum spatial peak SAR reported in the initial report was 1.4mW/g, which already included the 17.5% uncertainty. As calculated above, the expended uncertainty (K=2) was +/- 23.8%. Therefore, the rest 6.3% (23.8%-17.5%) uncertainty should be taken into account. It results in that the maximum SAR value averaged over one-gram is 1.49 mW/g (1.4mW/g +6.3%), which shows in compliance with FCC requirement even if the worst case uncertainty of the system has to be added to the assessed value.

We believe that all practical precautionary measures have been taken to minimize test errors/uncertainties and to ensure the compliance of the product.

6) A single table consolidating the various liquid dielectric parameters used for the key steps of this test. Please include the permitivity and conductivity for all pertinent frequencies and for both head and body. Please also include the parameters used by the manufacturer for calibration and validation, as well as those you used for validation and for the SAR test. Numerous values are noted throughout the report/plots with various levels of agreement, making the report difficult to evaluate. Please include all dates values were measured.

Per your request, below is the table consolidating the various liquid parameters used by the manufacturer validation and our validation. The table also contains the target validation values (provided by the manufacturer), the actual validation values, and the dates our validation values were measured.

	Freq.	Brain Liquid Parameters		Validation value when input power=10mW	Validation Date	Muscle Liquid Parameters	
		ε	σ			ε	σ
manufacturer validation	900MHz	42.3	0.85 mho/m	0.0944 mW/g		n/a	n/a
manufacturer validation	1800MHz	39.5	1.70 mho/m	0.399 mW/g		n/a	n/a
Our validation	900MHz	42.8	0.85 mho/m	0.0902 mW/g	9/10/01	n/a	n/a
Our validation	1800MHz	41.2	1.68 mho/m	0.386 mW/g	9/13/01	n/a	n/a
Our SAR test	835MHz*	43.5	0.85 mho/m	--	9/10/01	56.7 **	0.93 mho/m**
Our SAR test	1800MHz	41.2	1.68 mho/m	--	9/11/01	54.7 **	1.54 mho/m**

Note:

* Since in Cellular band, the center frequency of the lowest channel that phone 2235 operates is 824.04MHz, and the center frequency of the highest channel is 848.97MHz, using liquid parameters at 835MHz for our SAR testing should be closer to reflect the actual application. (Note, we have to validate the system at 900MHz, instead 835MHz, since the manufacturer only provides the target validation values at 900MHz and 1800MHz. However, the validation at 900MHz is valid for 835MHz measurement, per Supplement C Appendix D System Verification.)

** We used the muscle liquid, specified in the Supplement C Appendix C, for the muscle SAR testing in both 835MHz and 1800MHz frequency bands. The liquid parameters were calibrated by HP85070B dielectric measurement system on the dates the SAR values were measured. All liquid parameters were within +/- 5% of the values contained in the Revised Supplement C.

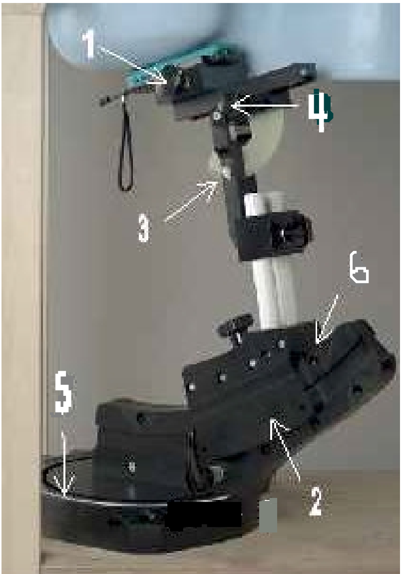
7) Composition of the liquid, per Supplement C Appendix B II3.

Per DASY3 user's manual, The composition of the liquid consists of water, sugar, cellulose, salt, preservative (proventol D-7).

8) Description of telephone placement relative to the phantom and position information for facilitating accurate repetition of the test positions, per Supplement C Appendix B II6.

As the illustration in next page, the DASY3 holder was used to position the phone. The positioning procedures were,

- Put the phone in the clamp mechanism (1) and hold it straight while tightening. (note, the ear piece was in the symmetry plane of the clamp).
- Adjust the sliding carriage (2) to 90 degree (i.e. the stand is normal to the flat phantom and ground). Then adjust the phone holder angle (3) until the reference line of the phone is horizontal (parallel to the flat phantom bottom). The phone reference line is defined as the front tangetial line between the ear piece and center of the device bottom.
- Shift the phone clamp (4) so that the ear piece is exactly below the ear marking of the phantom.
- Adjust the device position angles (rotation scale (5)) to C1 which denotes the intended use position (plane through ear openings and mouth).
- After fixing the device angle (5), move the phone fixture straight up until the phone touches the ear marking.
- Rotate the phone up alone scale (6) until any point on the phone is in contact with a phantom point below the ear (cheek). Now the phone is in the position specified in IEEE P1528 and ready for testing.


1
4
3
6
5
2

9) Liquid depth, per Supplement C Appendix B II.

While SAR testing, the liquid depth was about 13cm from the deepest point of the phantom to the surface of the liquid.