FEDERAL COMMUNICATIONS COMMISSION
Laboratory Division
7435 Oakland Mills Road
Columbia, MD 21046

OET 65 Supplement C EAB Part 22/24 SAR Review Reminder Sheet 01/2002 (enhanced 5-2003)

Date Dec. 18, 2003	Engr. Init. CRH
Product Name:	Product Description D-Link PCMCIA 802.11b/g
EA #	Applicant Name: D-Link FCC ID : KA22003090016-2
Battery options (standard, extended, other): n/a	Quantity and type accessories supplied with device: belt clip/holster options - any metal?; body-worn spacing; headset/earphone options
Transmits with flip cover closed (Y/N)?n/a	Antenna type, location, fixed/retractable: embedded
Max ERP 800 (SAR report & EMC report)n/a	Max EIRP 1900 (SAR report & EMC report)n/a
Max ERP/EIRP CDMA-800 or OTHER (SAR report & EMC report) n/a	Max P conducted (SAR report & EMC report) 19.69 in EMC , 19.75dBm in SAR OK

OK	OK	REVIEW ITEM	COMMENTS
		1) Output power	
Y		a) Powers in SAR report must agree with EMC report and tune-up procedure	
Y		b) Conducted power in SAR report should be greater than or equal to what's in EMC report, but not exceeding tune-up/tolerance	
Y		c) Scaling up or down 5% is allowed	
Y		d) Maximum output power (conducted) or SAR drift measured at same position in liquid before and after each SAR test?	
		2) Users Manual	
Y		a) Check for accessories and battery options – should test any accessories containing metal, and with	

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		all possible combinations; need justification if limited or "worst-case" combinations only tested	
Y		b) To comply with RF safety requirements use the specific belt clip. All other belt clips should be avoided and may not comply with RF safety requirements (for fair-trade do not exclude 3rd party accessories)	
Y		c) Check for RF Safety statements. Users must be clearly informed of the compliance requirements for device use, especially regarding body-worn configurations.	
n/a		d) Check that FCC ID and SAR numbers in manual are correct	
y		e) Do not allow any unsupported compliance claims	
		3) GENERAL REPORT INFORMATION	
Y		a) FCC ID listed (see 47 CFR §2.909)?	
Y		b) statement of compliance with FCC RF exposure included (§2.1093)?	
Y		c) mobile or portable transmitter device category identified?	
Y		d) testing for Occupational/Controlled OR General Population/Uncontrolled limits?	
Y		e) test device is production unit or identical prototype (47 CFR §2.908)?	
		4) DEVICE OPERATING CONFIGURATIONS AND TEST CONDITIONS	
Y		a) brief description of the test device operating configurations included? For example:	
Y		i) operating modes and operating frequency range(s)	
Y		ii) maximum device rating for each operating mode and frequency range, both test sample and production units	
Y		iii) antenna type and operating positions	
Y		iv) applicable body-worn configurations	
n/a		v) battery options that could affect the SAR results	
y		vi) test positions for other accessories, e.g., earphones	
y		b) procedures to establish the test signals described (put phone on a call, e.g., base-station simulator vs internal test codes)? This may include a test equipment list or test codes	
y		c) Multiple modes – CDMA, TDMA, GPRS, GSM, Bluetooth, etc?	
y		d) applicable source-based time-averaging duty factor and tested duty factor listed?	
		5) SAR Measurement system and site description	

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Y		a) Brief description of the SAR scanning measurement system included?	
Y		b) Brief description of the test setup included: handset holders, phantom orientation, surroundings, absorber, noise floor, etc.	
		6) Electric field probe calibration	
Y		a) description of the probe – including tip diameter, internal sensor offset from tip, etc	
Y		b) description of the probe measurement errors included?	
Y		c) Description of probe calibration errors/uncertainties?	
Y		d) most recent calibration date and calibration certificate showing all factors used in report?	
Y		e) Check for consistency of probe factor and correspondent tissue parameters thru report	
Y		f) crest factor (peak-to-average voltage) parameters shown or needed, and/or addressed in calibration?	
		7) SAR system verification with flat phantom and reference source	
Y		a) brief description of the reference source (e.g., 900, 1800 MHz dipoles) used to verify the SAR system performance – prefer center frequency within the operating frequency range of the handset, dipole/source return loss, etc.	
Y		b) verification frequency(s) must be within ± 100 MHz of device center frequency(s)	
Y		c) manufacturer/calibration reference dipole data	
Y		d) list of measured tissue dielectric parameters, ambient and tissue temperatures – check for consistency with values used in system manufacturer's reference test (ε, σ within 5% of those used in reference data)	
Y		e) forward power input to the reference source/dipole	
Y		f) target and measured peak and 1-g SAR (target usually given by SAR system supplier, or IEEE Std 1528) – agree within 10%	
Y		g) at least one dipole test for each device frequency band	
Y		h) dipole test results for each date of device testing	
Y		i) dipole SAR plots included – check for reasonable symmetry	
Y		j) system validation with head liquid OK for device testing in muscle	
		8) Phantom description	
Y		a) include description of head (SAM) and body phantoms used in the tests, including shell thickness and other tolerances	

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Y		b) thickness 2 ± 0.2 mm for head and body pantoms	
Y		c) photos or z-axis scans to show 15 cm LIQUID DEPTH included?	
Y		d) Phantom supporting structures and stands – phantom support structures should be spaced at least one device width away and non-metallic in transverse directions	
		9) Tissue liquid dielectric properties	
Y		a) Composition, ingredients, and amounts for tissue liquid listed	
Y		b) liquid dielectric parameters and temperature measured at device mid-band frequencies	
Y		c) liquid temperatures during SAR testing stay within ± 2° C	
Y		d) check for consistency in liquid parameters in calibration, system verification, and device testing	
		10) Device positioning	
Y		a) includes description of the handset holder or similar fixtures used to position the test device in the specified test configurations	
Y		b) holder must not surroud, enclose, cover, or obstruct antenna	
Y		c) describes the positioning procedures used to evaluate the highest exposure expected under normal operating configurations	
Y		e) diagrams or photos showing device positions with respect to the phantom; including separation distances and angles as needed, if regular touch and tilt positions not achievable; diagrams should clearly show reference points/lines/planes on EUT and phantom	
Y		f) description of the antenna operating positions, extended, retracted or stowed etc. and the configurations tested in the SAR evaluation	
Y		g) Body – prefer 1.5 cm, may allow 2.5 cm (Suppl C) spacing from flat phantom	
		11) Coarse-scan to find SAR peaks	
Y		a) descriptions of coarse area scan procedures, including grid size, area shape and size	
Y		b) descriptions of interpolation procedures used to locate peak SARs at a finer spatial resolution	
Y		c) specify which peak SAR location(s) were used to evaluate max 1-g SAR(s)	
Y		d) report probe tip distance to phantom inner surface	
		12) One-gram averaged SAR	
Y		a) descriptions of high-resolution cube volume or “zoom” scan procedures used for local scan; list	

OK	OK	REVIEW ITEM	COMMENTS
		measurement and interpolation resolutions	
Y		b) descriptions of extrapolation procedures used to estimate SAR values adjacent to phantom surface (unreachable due to probe case and boundary effects)	
Y		e) descriptions of within-cube interpolation procedures to get 1 mm or 2 mm SAR grid	
Y		f) description of averaging (integration) procedures to get 1-g SAR from final interpolated grid	
Y		g) entire "hot spot" captured?	
Y		h) Check for "peak outside scan area" conditions – no clipped peaks	
		13) Total measurement uncertainty (MUST BE REPORTED – BUT "NOMINAL" REVIEW ONLY UNTIL IEEE Std 1528 IS COMPLETED)	
Y		a) a tabulated list of the error components and uncertainty values contributing to the total measurement uncertainty (Suppl C App. D)	
Y		b) reporting the combined standard uncertainty and expanded uncertainty (for *k*=2) of each test – 30% or less expected	
		14) Test results required for determining SAR compliance	
Y		a) Prefer that all SAR plots are included	
Y		b) if the channels tested for each configuration (left, right, cheek, tilt/ear, extended, retracted etc.) have similar SAR distributions, a plot of the highest SAR for each test configuration should be sufficient; otherwise additional plots should be included to document the different SAR distributions – purpose is to identify peak locations relative to device and phantom	
Y		c) all measured SAR values should be reported in a tabular format for all test configurations, i.e., low/mid/high frequencies, antenna in/out, flip cover open/closed; repeat of these for all battery and belt-clip/holster types; repeat of these for all modes (AMPS, CDMA-800, PCS)	
Y		d) hand SAR typically not needed	
Y		e) check crest factor (examples TDMA=3, GSM=8, CDMA=1, iDEN/data=1.44, iDEN/2-way=6, iDEN/TDMA=3, AMPS=1, GPRS=4, etc.); use whatever inverse-duty-factor ratio is appropriate for EUT maximum "on-time"	
n/a		f) repeat for all batteries, belt-clips, other metallic accessories etc	
y		g) accessories with metal must be tested; test not required for accessories that have no metal and provide larger spacing to body	
		15) Plots – quantity and content	

OK	OK	REVIEW ITEM	COMMENTS
Y		a) Crest factor correct?	
Y		b) date of test on all plots	
Y		c) Liquid parameters listed (typically ρ =1)	
Y		d) Device description and position (touch/tilt, body)	
Y		e) Ambient and liquid temperatures	
Y		f) Antenna position	
Y		g) Frequency channel	
Y		h) Numeric values used to get avg SAR (optional)	
Y		i) Peak and average SAR values and locations indicated	
Y		j) Phantom used (optional)	
Y		k) z-axis scan at max SAR location	
Y		l) show relative location of hot spot on device, or outline of device on plot	
Y		m) PLOTS MUST SHOW PROBE FACTORS (e.g., ConvF)	

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ITEMS REQUIRING ADDITIONAL ATTENTION DURING TCB REVIEW OF APPLICATIONS THAT INCLUDE SAR DATA

When auditing the supporting data for grants issued by a TCB that include SAR data, the FCC will be reviewing test reports to confirm that the following information has been verified by the TCB, according to Supplement C 01-01. The FCC Laboratory will be looking for this information to establish a basis of comparison between the various types of test systems. This information will allow the FCC Laboratory to compare the results from various SAR systems on the market and to make adjustments or recommendations to the standards making organizations, if appropriate.

1) Probe Calibration -- The test report should show that the probe was calibrated by the equipment manufacturer in accordance with Supplement C and IEEE (P1528) recommendations. A copy of the calibration certificate should be included in the test report to identify the test parameters, calibration procedures and conditions. The test report should identify the probe specifications that are applicable for testing the transmitter (DUT), including linearity, axial and spherical isotropy, boundary effect error and calibration uncertainty. Information demonstrating that a probe can accurately measure the SAR produced by the signal modulations of a DUT should also be reviewed. The probe operating parameters, such as crest factors or effective diode compression point implemented for specific systems, probe integration and response time, specific probe positioning and operating requirement should be appropriate for testing the DUT. The probe must be calibrated for all the frequencies used during the SAR tests, according to the tissue dielectric parameters specified in Supplement C.

2) SAR Measurement Uncertainty – TCB should confirm how measurement uncertainty analysis was performed for the uncertainty components specified in Supplement C. The uncertainty analysis for device testing and system verification should be in accordance with the procedures recommended by P1528, or the SAR measurement system manufacturer when modified procedures are necessary. DUT and site specific uncertainty items should be analyzed independently for the specific tests and identified in the test report. TCBs should contact test laboratories or system manufacturers to assure that the appropriate procedures have been used to analyze measurement uncertainty.

(Note: Probe Angle -- In view of the following disclaimer, which has been included (proposed) in P1528 for its up-coming re-circulation ballot, to identify that when the probe angle is greater than 30 degrees, additional uncertainty procedures not included in the standard are needed to account for such uncertainty. This means the end user has the responsibility to address the additional uncertainty issues when choosing to do measurements in those conditions.

"The angle between the probe axis and the surface normal line is recommended but not required to be less than 30 degree. If this angle is larger than 30 degrees and the closest point on the probe tip housing to the phantom surface is closer than a probe diameter, the boundary effect may become larger and polarization dependent. This additional uncertainty needs to be analyzed and

taken into account, for which modified test procedures and additional uncertainty analysis not described in this recommended practice may be required.)"

3) Test Protocol Requirements – The test report should confirm that all tests have been performed in accordance with Supplement C requirements and SAR system manufacturer recommendations.

4) SAR Scan Procedures – The following area and zoom scan parameters should be verified:

- probe tip diameter is < 8 mm to meet spatial resolution requirements
- the distance between the measurement point at the probe sensor location (geometric center behind the probe tip) and the phantom surface is < 8.0 mm and maintained at a constant distance of ± 1.0 mm during an area scan to determine peak SAR locations
- when probe boundary effect compensation is not used the probe tip should be positioned at least half a probe tip diameter from the phantom surface during area and zoom scans
- the first two measurement points in a zoom scan, closest to the phantom surface, should be within 1cm of the surface
- the dimensions of the area and zoom scan regions and the spatial resolutions of the measured and interpolated points of each scan should be in accordance with Supplement C (page 49)

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