

Radio Frequency Exposure Test Report

EN 62311 January 2008

**Assessment of electronic and electrical equipment related
to human exposure restrictions for electromagnetic fields
(0Hz – 300GHz) (IEC 62311:2007, modified)**

Model: SDC-MCF10G

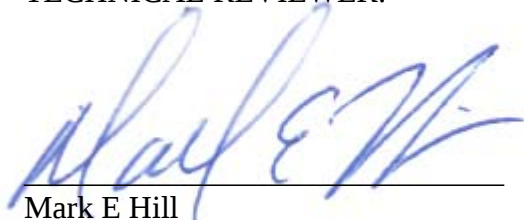
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REPORT DATE: March 23, 2012

TOTAL NUMBER OF PAGES: 14

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REVISION HISTORY

Rev#	Date	Comments	Modified By
-	03-23-2012	First release	

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SCOPE

The European Committee for Electrotechnical Standardization (CENELEC) publishes standards regarding the evaluation of the rf exposure hazard of wireless communications devices. An evaluation has been performed on the Summit Data Communications model SDC-MCF10G, pursuant to the relevant requirements of the following harmonized EN standard(s) covering essential requirements under article 3.1 of the R&TTE Directive:

- EN 62311 January 2008 “Assessment of electronic and electrical equipment related to human exposure restrictions for electromagnetic fields (0Hz – 300GHz) (IEC 62311:2007, modified)

The evaluation was performed in accordance with the standard and the following document(s):

- Council Recommendation 1999/519/EC of 12 July 1999 on the limitation of exposure of the general public to electromagnetic fields (0Hz to 300 GHz) (Official Journal L199 of 30 July 1999).

OBJECTIVE

The objective of the manufacturer is to comply with the harmonized standards identified in the previous section.

STATEMENT OF COMPLIANCE

The evaluation of Summit Data Communications model SDC-MCF10G, in the configurations detailed within this report, complied with the relevant requirements of EN 62311. Maintenance of compliance is the responsibility of the manufacturer. Any modifications to the product should be assessed to determine their potential impact on the compliance status of the device with respect to the standards detailed in this test report.

DEVIATIONS FROM THE STANDARDS

No deviations were made from the published requirements listed in the scope of this report.

EQUIPMENT UNDER TEST (EUT) DETAILS**GENERAL**

The Summit Data Communications model SDC-MCF10G is an 802.11abgn (1x1) + Bluetooth 2.1 radio module. As it has only one transmit chain, it does not support MIMO operation, but it does support SISO.

Company	Model	Description	Serial Number
Summit Data Communication	SDC-MCF10G	802.11bg module	-

OTHER EUT DETAILS

From ADT report RE950331L08A, dated Apr. 14, 2008, the antenna is a 0dBi PCB antenna.

EN 62311 ASSESSMENT METHODS

EN 62311 allows for various assessment methods, including far field calculation, near field calculation, simulation, and numerical modeling. Assessments should be made in accordance with an existing basic standard. For the purposes of the assessment detailed in this test report the basic standard EN 50383 was used. The assessment is based on power levels and antenna gains detailed in this report and taken from the following test reports against the appropriate ETSI radio standard:

Test Report	Radio Standard(s)	Issued By
RE950331L08A	EN 300 328 V1.7.1	ADT Corp. No. 47, 14 th Ling, Chia Pau Tsuen, Lin Kou Hsiang, Taipei Hsien, Taiwan, R.O.C.

The assessment has only considered the intentional signals transmitted by the device. As all other emissions complied with the limits detailed in the appropriate radio standard and were significantly lower than the intentional signal it was not considered necessary to include these signals in the assessment.

EN 50383 EVALUTATION METHODS

The evaluation method first requires a determination of the antenna region(s) in which the exposure occurs, and from this determination the appropriate evaluation method (calculation or measurement) can then be used.

ANTENNA REGION

There are three regions defined in Annex A of EN 50383 – Far field region, radiating near-field region and reactive near-field region.

For each region there is a preferred (or “reference”) evaluation method and possible alternatives. When an alternative method is used it typically provides a more conservative evaluation of the rf hazard.

The region is determined, based on the minimum separation distance from the device antennas to persons and the size/gain of the antenna. The minimum separation distance is based on either a distance specified in the installation/user’s manual or on an evaluation of intended use.

PREFERRED EVALUATION METHODS

The preferred (reference) evaluation methods, and first and second alternatives, for each region are detailed in EN 50383 Table 1 and summarized below.

FAR FIELD CALCULATION

For calculating the field in the far-field region the free space formula below is used to determine the electric field or power flux density at a distance r from the transmitting antenna.

$$E = \frac{\sqrt{30PG}}{r}$$

$$S = \frac{PG}{4\pi r^2}$$

- S = Power flux density W/m²
- E = Field Strength in V/m
- P = Power in Watts
- G = Gain of antenna (numeric gain)
- r = distance in meters

RADIATING NEAR FIELD

When human exposure is in the radiating near-field the reference method is a SAR evaluation, as detailed above. The first alternative to SAR measurements are E-field and H-field measurements. The second alternative is a calculation, and the possible calculation methods are either the synthetic model or cylindrical wave model.

The synthetic model splits the antenna into n small sources and the field is calculated using:

$$E = \sum \alpha_n \frac{\sqrt{30 \cdot P_n G_n}}{r_n} e^{j(\gamma_n + \frac{2\pi r_n}{\lambda})}$$

- E = Field Strength in V/m
- P_n = Power in Watts radiated by element n
- G_n = Gain of antenna element n
- r_n = Distance in meters from element n

The cylindrical wave model allows direct calculation of the power flux density, S , using:

$$S = \frac{P}{\pi D r} \frac{180}{\delta}$$

- S = Power flux density W/m²
- P = Power in watts radiated (W)
- D = Length of antenna (m)
- r = Distance in meters from the antenna

The cylindrical wave model is valid for a range of distances where r_c (the distance at which the Cylinder and far-field wave models give the same result) lies in the radiating

near-field, and where the distance is less than r_c . At distances greater than r_c the far field model (refer to the far-field calculation information in the previous section) is more appropriate.

REACTIVE NEAR FIELD

When human exposure is in the reactive near-field the reference method is a SAR evaluation. If the total radiated power is below limits detailed in section 7.1.2 of EN 50383 then the device is assumed to comply and measurements are not considered necessary. Further, whole-body SAR measurement methods are not currently specified and so localized SAR evaluations are used. Localized SAR evaluations are limited to operating frequencies between 0.8 and 3 GHz, antenna apertures less than 0.6m x 0.3m and investigation distances of less than 40cm.

The alternative to SAR measurements are E-field and H-field measurements.

LIMITS

The limits are taken from the reference levels detailed in either Annex II or Annex III of *Council Recommendation of 12 July 1999 on the limitation of exposure of the general public to electromagnetic fields (0 Hz to 300 GHz) (1999/519/EC)*. Annex III reference levels may only be used when the exposure is not highly localized.

Compliance with the basic restrictions is ensured where the ratio of the measured/calculated value to the basic restriction / reference level is less than or equal to 1.

MULTIPLE TRANSMITTERS

When the evaluation has to account for simultaneous transmissions from co-located devices the individual transmitters are evaluated separately. The sum of the individual ratios of measured/calculated value to basic restriction / reference level has to be less than 1 for compliance to be demonstrated.

EVALUATION RESULTS**SEPARATION DISTANCE**

The separation distance used in the assessment was 0.2m.

LIMIT

As the basis for compliance is being based on the far-field model, the reference level for equivalent plane wave power density is used as the basis for determining compliance. At the operating frequencies of the device, the limits are:

Frequency Band (MHz)	Power Density W/m ²
2400-2483.5	10

CALCULATIONS

The table below contains the calculations to determine the reactive near-field, radiating near-field and far-field boundaries. It also shows the value for r_c , the distance at which the far-field and cylindrical wave models produce the same value of power flux density.

Frequency (MHz)	2462
Wavelength (m)	0.122
Antenna Gain (dBi)	0
Antenna Gain (numeric)	1.0
Antenna Aperture (m ²)	0.04
Antenna Length (m)	0.2
Evaluation distance (m)	360
Beamwidth (degrees)	19.35
Transmit Power (dBm)	2462
Far Field Boundary	>0.03m
Radiating Near Field	0.03m < r <= 0.03m
Reactive Near-Field	r <=0.03m
r_c	0.02

For operation in the 2400-2483.5 MHz band(s) the exposure is in the far field and so the far-field model has been used to determine the power density at the observation distance, 0.2m from the antenna.

Frequency (MHz)	2462
Far-Field Estimation (W/m ²)	0.17
Limit	10
Percentage of Limit	1.71%

RESULT - SINGLE TRANSMITTER

The estimated power density at a distance of 0.2m from the transmitting antenna is 0.17 W/m². This is 1.71% of the limit, therefore the device complies with the requirements of EN 503085, based on the evaluation methods of EN 50383 and the reference levels detailed in *Council Recommendation of 12 July 1999*.

The calculations assumed the device may operate continuously. Although the interface protocol does not limit operating duty cycle, the actual operation would not typically be 100% and so the estimates are conservative.

MEASUREMENT UNCERTAINTIES

ISO Guide 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence level (based on a coverage factor (k=2) and were calculated in accordance with NAMAS document NIS 81 and M3003. They have been taken from the radio test report on which the output power measurements used in the evaluation of the device were taken.

Measurement Type	Measurement Unit	Frequency Range	Expanded Uncertainty
RF power, conducted	dBm	25 to 7000 MHz	$\pm 1.371\text{dB}$

Note – Uncertainty value from ADT report, RE950331L08A

Appendix A Test Equipment Calibration Data

The evaluation detailed in the test report was based on calculation. No test equipment was required. The test equipment and associated measurements uncertainties used to determine the output power measurements on which this evaluation was based can be found in ADT test report RE950331L08A, dated Apr 14, 2008.

Appendix B Test Configuration Photographs

The evaluation detailed in the test report was based on calculation. As no measurements were made, test configuration photographs are not applicable.

End of Report

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