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30 May 2000

Federal Communications Commission,
Authorization & Evaluation Division,
7435 Oakland Mills Road,
Columbia, MD 21046

Attention: FCC Application Processing Branch
RE: FCC ID: GMLNSD-3AW
731 Confirmation number EA96989
Correspondence reference number: 13326

Reply to Correspondence 13326

SAR review question #1

Nokia 6185i FCC ID: GMLNSD-3AW has a provision for body-worn operations with BCH-12U belt clip with either HDC-9 headset or LPS-1 loopset (for hearing impaired customers). As two following tables indicate, Nokia 6185i complies with requirements addressing body-worn SAR. Full test report can be found attached to this document.

Body SAR Analog Mode AMPS

Meas. #	Phone position	Frequency MHz/Channel	Power [dBm]	SAR (1g)[mW/g]
1	Body worn, BCH-12U Belt Clip against flat phantom	836/383	26.5	0.77
2	Body worn, Display against flat phantom	836/383	26.5	0.96
FCC ID: GMLNSD-3AW Calculated from measured values to match 26.5 dBm conducted P _{out}		FCC LIMIT		1.60 mW/g (ANSI/IEEE)

Body SAR Digital Mode PCS CDMA

Meas #	Phone position	Frequency MHz/Channel	Power [dBm]	SAR (1g)[mW/g]
3	Body worn, BCH-12U Belt Clip against flat phantom	1880/600	22.5	0.49
4	Body worn, Display against flat phantom	1880/600	22.5	1.01
FCC ID: GMLNSD-3AW Measured values with 22.5 dBm conducted P_{out}		FCC LIMIT		1.60 mW/g (ANSI/IEEE)

Nokia 6185i was also evaluated for SAR in user hand. As following two tables show, Nokia 6185i complies also with these requirements. Test report for hand SAR evaluation is attached to this document.

Hand SAR Analog Mode AMPS

	Position	Frequency MHz/Channel	Power [dBm]	Hand SAR (10g)[mW/g]
	Back side	836/383	26.5	0.85
FCC ID: GMLNSD-3AW Calculated from measured values to match 26.5 dBm conducted P_{out}		RECOMMENDED LIMIT		4.0 mW/g

Hand SAR Digital Mode PCS CDMA

	Position	Frequency MHz/Channel	Power [dBm]	Hand SAR (10g)[mW/g]
	Back side	1880/600	22.5	2.09
FCC ID: GMLNSD-3AW Measured values with 22.5 dBm conducted P_{out}		RECOMMENDED LIMIT		4.0 mW/g

A new User Manual page with body-worn operation advisory is attached to this document.

Following text has been added to User Manual under Radio frequency (RF) signals -topic:

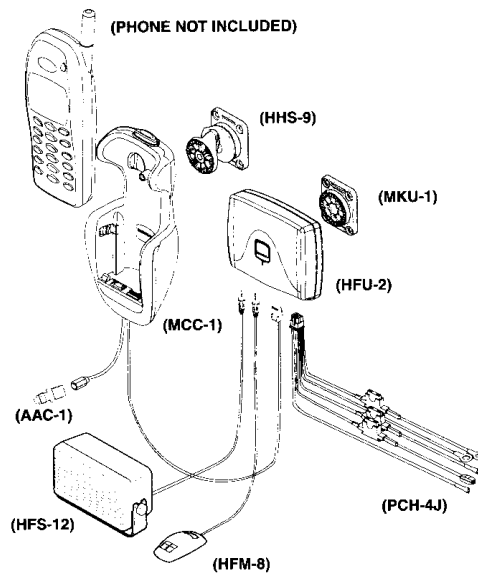
"For body worn operation, to maintain compliance with FCC RF exposure guidelines, use only Nokia approved accessories. When carrying the phone while it is on, place the phone in a Nokia approved belt clip, carrying case or holster.

Use of non-Nokia-approved accessories may violate FCC RF exposure guidelines."

SAR review question #2

Nokia 6185i (FCC ID: GMLNSD-3AW) transceiver, when properly installed with CARK-91US complete car kit and customer provided external antenna, satisfies the criteria to be considered a 'mobile device' as defined in Federal Communications Commission section 47 CFR § 2.1091 titled "Radio frequency radiation exposure evaluation: mobile devices." CARK-91US car kit includes following set of accessories:

Advanced Cradle	MCC-1
RF Adapter	AAC-1
Junction Box	HFU-2
Power Cable	PCH-4J
Mounting Plate	MKU-1
Swivel Mount	HHS-9
Microphone	HFM-8
External HF Speaker	HFS-12



CARK-91US car kit does not include external Mobile Antenna due to availability of large commercial mobile antenna model selection for different needs. Nokia recommends customer to consult the dealer to find the most suitable mobile antenna solution for their vehicle. When properly installed to a vehicle, Nokia 6185i fulfills FCC CFR 47 section § 2.1091, paragraph (b) definition of a mobile device as "a transmitting device designed to be used in other than fixed locations and to generally be used in such a way that a separation distance of at least 20 centimeters is normally maintained between the transmitter's radiating structure(s) and the body of the user or nearby persons." Nokia 6185i transceiver is intended to be installed into a vehicle according installation instructions provided with CARK-91US car kit. Nokia recommends external antenna and the car kit installation to be done by experienced professional. Based on

the general installation of external antennas, the transmitters radiating structure is more than 20 centimeters from the user.

Paragraph (c) of the same section gives the descriptions of types of mobile devices that are subject to routine environmental evaluation for RF exposure based on frequencies of operation and transmit power. Nokia 6185i operates at a transmit frequencies of 824 to 849MHz and 1850 to 1910MHz. It has maximum conducted output power of 447mW on 800MHz band and 178mW on 1900MHz band. CARK-91US car kit does not amplify Nokia 6185i transceiver signal but instead creates some loss. Commercially available mobile antenna solutions provide generally maximum antenna gain of 7dBi with minimum loss of 3dB due to antenna cable loss and coupling of antenna to the cable. Based on this information, Nokia 6185i with properly installed CARK-91US car kit and external antenna will always transmit with ERP power below 1.5 Watts on frequencies below 1.5GHz and below 3W ERP on frequencies above 1.5GHz and is therefore “categorically excluded from routine environmental evaluation” per paragraph (c), and thus MPE evaluation is not required.

SAR review question #3

New test result table can be found attached to this document.

SAR review question #4

As attached re-measured test results indicate, Nokia 6185i handset has maximum of 27.6dBm (575 mW) ERP output power with 26.5 dBm conducted output power value. This is the target conducted output power Nokia 6185i phones will be tuned to.

Same re-measured test results also show Nokia 6185i handsets to have max 24.9 dBm EIRP output power with 22.5 dBm conducted power output.

SAR review question #5

As following table show, Nokia 6185i fulfills FCC regulations regarding RF exposure compliance with conducted output power of 26.5 dBm.

Analog Mode AMPS

Meas. #	Phone position	Frequency MHz/Channel	Power [dBm]	Whip in (1g)[mW/g]	Whip up (1g)[mW/g]
1,2	90°	824/991	26.5	0.45	0.95
3,4	90°	836/383	26.5	0.81	1.02
5,6	90°	849/799	26.5	1.02	1.16
FCC ID: GMLNSD-3AW Calculated from measured values to match 26.5 dBm conducted P _{out}		FCC LIMIT		1.60 mW/g (ANSI/IEEE)	1.60 mW/g (ANSI/IEEE)

Evaluation of SAR in Body Worn Configurations GMLNSD-3AW.

Introduction

Our approach was to measure the SAR, when phone is used with body worn accessories or is against the Flat Phantom. Body worn accessory BCH-12U (Picture 1) was tested. The measurement test equipment and setup was the same as used and referred in SAR TEST REPORT of NOKIA 6185i.



Picture 1. Belt Clip BCH-12U.

Test method

Measurements were done with the Dasy 2 dosimetric assessment system DAE V2, SN: 213 and with the generic Twin Phantom version 3 from Schmid & Partner Engineering Ag. The phone was positioned in body worn accessory against Flat Phantom. Additionally, the device was positioned against the Flat Phantom i.e. display and keypad touching the phantom. The point of maximum SAR was searched. Then the SAR was measured with a 3-dimensional cube measurement. The maximum output power level in middle channel was used (836 MHz on AMPS mode and 1880 MHz on CDMA PCS mode). The method overestimates the SAR, because brain equivalent liquid was used and this has higher conductivity than tissues in the body.

Results

Graphical presentations of test positions with the highest SAR values are presented in the end of this report.

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Sami Savela

2000-4-27

Analog mode AMPS

meas. nr:	Phone position	Frequency MHz / channel	Power dBm	SAR (1g) [mW/g]
1	Body Worn, Belt Clip (BCH-12U) against Flat Phantom	836 / 383	26.0	0.69
2	Body Worn, Display against Flat Phantom	836 / 383	26.0	0.86
FCC ID: GMLNSD-3AW MEASURED: 2000-4-26/NMP		FCC limit		1.60[mW/g] (ANSI/IEEE)

Digital mode CDMA PCS

meas. nr:	Phone position	Frequency MHz / channel	Power dBm	SAR (1g) [mW/g]
3	Body Worn, Belt Clip (BCH-12U) against Flat Phantom	1880 / 600	22.5	0.49
4	Body Worn, Display against Flat Phantom	1880 / 600	22.5	1.01
FCC ID: GMLNSD-3AW MEASURED: 2000-4-26/NMP		FCC limit		1.60[mW/g] (ANSI/IEEE)

Summary

The SAR values found for the portable cellular phone (FCC ID: GMLNSD-3AW) are below the maximum recommended levels of 1.6 mW/g.

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MEAS1.MEA

$\sigma = 0.80$ [mho/m] $\epsilon_r = 44.3$ $\rho = 1.00$ [g/cm³]

Coarse Grid Dx= 20.0 Dy= 20.0 Dz= 5.0 [mm]

SAR [mW/g] Max: 0.64

SAR (1g): 0.694 [mW/g] SAR (10g): 0.508 [mW/g]

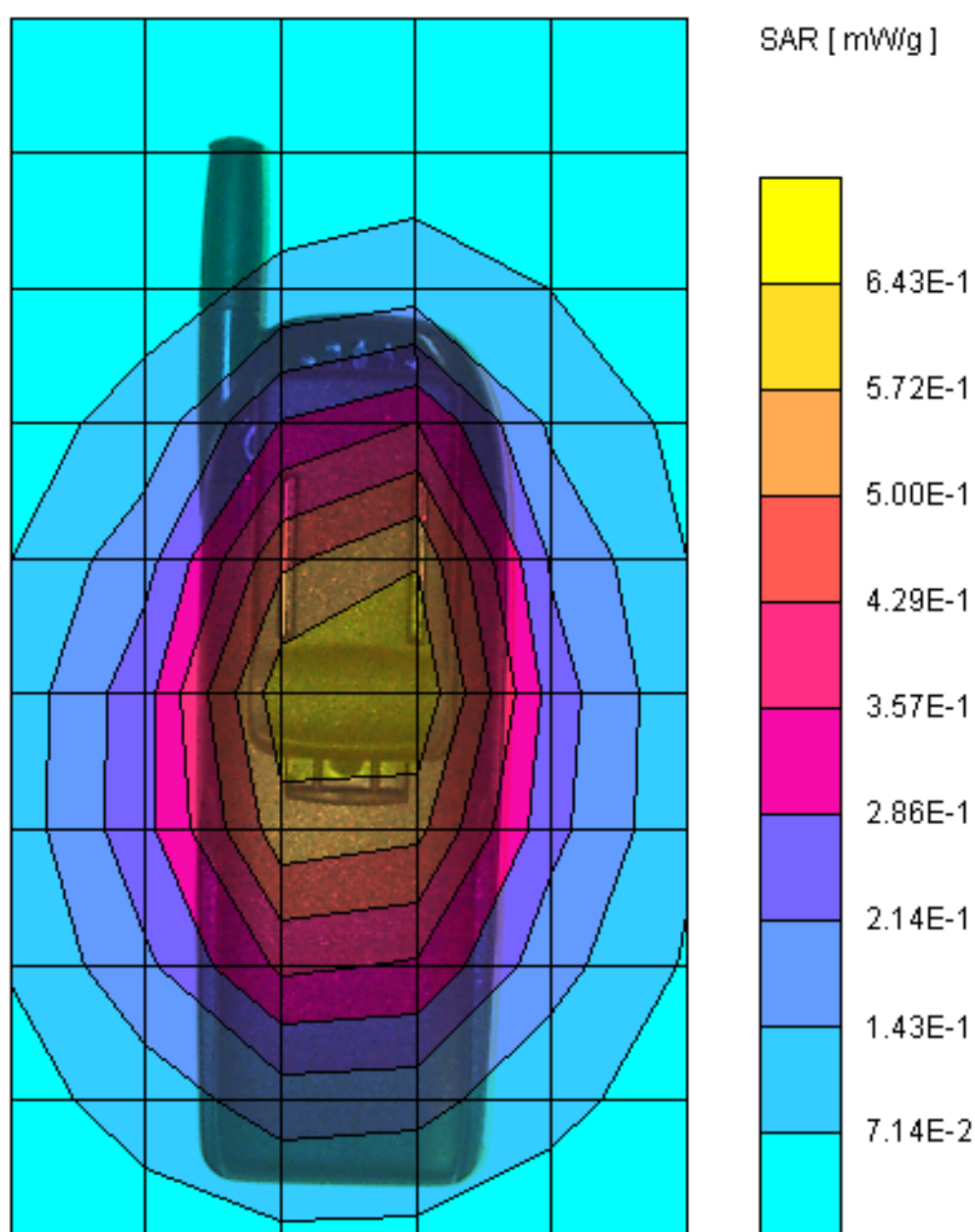


Figure 1. SAR-plot GMLNSD-3AW with Belt Clip BCH-12U

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MEAS4.MEA

$\sigma = 1.75$ [mho/m] $\epsilon_r = 41.5$ $\rho = 1.00$ [g/cm³]

Coarse Grid Dx = 15.0 Dy = 15.0 Dz = 5.0 [mm]

SAR [mW/g] Max: 1.13

SAR (1g): 1.01 [mW/g] SAR (10g): 0.571 [mW/g]

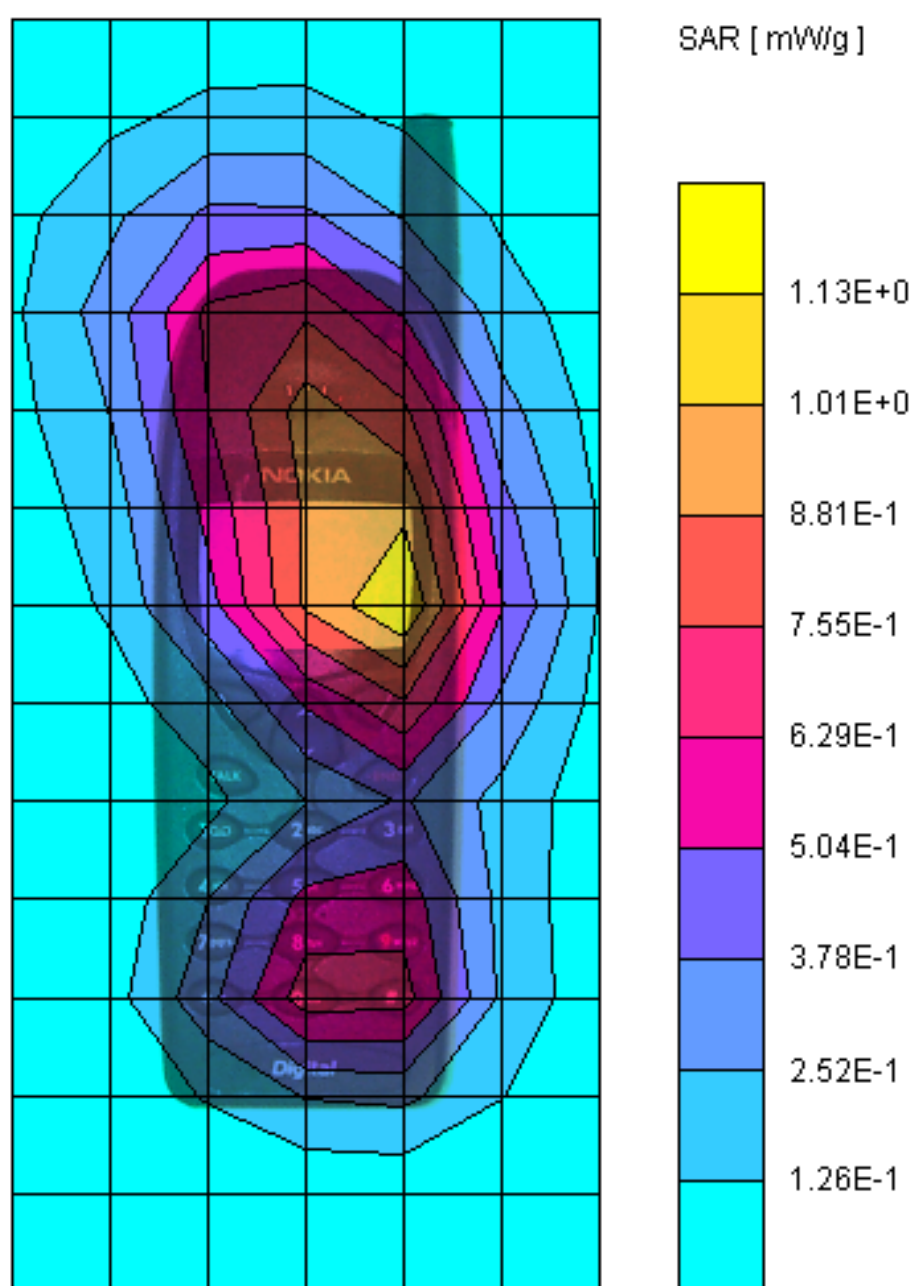


Figure 2. SAR-plot GMLNSD-3AW body worn

Evaluation of SAR in user hand for Nokia phone 6185i.**FCC ID: GMLNSD-3AW.****Introduction**

There is no internationally accepted method to measure the SAR-value in user hand, when the phone is used beside the head. The position of the hand is also difficult to determine. Our approach was to measure the maximum SAR, that can occur when hand covers the back of the phone. In practice the situation, however, is different, because the hand is touching the phone in many places and this can change the current distribution.

Test method

Measurements were done with the Dasy 2 dosimetric assessment system DAE V2, SN:213 and with the generic Twin Phantom version 3 from Schmid & Partner Engineering Ag. The phone was positioned back, i.e. antenna and battery, against the flat part of the phantom. The point of maximum SAR was searched. Then the SAR was measured in 10g mass. The maximum output power level was used. Middle channel on AMPS and TDMA PCS mode was used, because there was not big differences between SAR-values of different channels originally measured with the head phantom.

The method overestimates the SAR: The whole back of the phone, including the antenna area, was scanned for the hand SAR evaluation, even though this is not consistent with the instructions in the user's guide to not touch the antenna unnecessarily. Brain equivalent liquid was used and this has higher conductivity than tissues in the hand. Furthermore a cube for 10g mass was used, which is difficult to realize in practice.

Results**Maximum SAR in hand in 10g mass****Nokia 6185i (NSD-3AW)**

Back side (AMPS 836 MHz)	0.76 mW/g
Back side (CDMA 1880 MHz)	1.86 mW/g

Summary

The hand SAR values found for the portable cellular phone (FCC ID: GMLNSD-3AW) are below the maximum recommended levels of 4 mW/g.

When making an emergency call, remember to give all of the necessary information as accurately as possible. Remember that your wireless phone might be the only means of communication at the scene of an accident—do not terminate the call until given permission to do so.

Radio frequency (RF) signals

Your wireless handheld portable telephone is a low-power radio transmitter and receiver. When it is on, it receives and sends out radio frequency (RF) signals.

In August 1996, the Federal Communications Commission (FCC) adopted RF exposure guidelines that included safety levels for handheld wireless phones. Those guidelines are consistent with safety standards previously set by both U.S. and international standards bodies:

ANSI C95.1 (1992)*, NCRP Report 86 (1986)*, ICNIRP (1996)*.

Those standards were based on comprehensive and periodic evaluations of the relevant scientific literature. For example, over 120 scientists, engineers, and physicians from universities, government health agencies and industry reviewed the available body of research to develop the ANSI Standard (C95.1).

The design of your phone complies with the FCC guidelines (and those standards).

For body worn operation, to maintain compliance with FCC RF exposure guidelines, use only Nokia approved accessories. When carrying the phone while it is on, place the phone in a Nokia approved belt clip, carrying case or holster.

Use of non-Nokia-approved accessories may violate FCC RF exposure guidelines.

*American National Standards Institute, National Council on Radiation Protection and Measurements; International Commission on Non-Ionizing Radiation Protection.