

# A Comparative Study of Radiation Levels Emitted by Samsung and Nokia Cell Phones

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## Abstract

In the world market, numbers of mobile phones are available equipped with smart applications. While purchasing any cell phone, we must be aware of its safety standards by considering SAR Value which refers to Specific Absorption Rate. In this paper, we have compared the level of radiations emitted by two manufacturing companies' viz. Samsung and Nokia using an Electro Smog Meter and discussed the significance of SAR.

## Keywords

FCC, ICNIRP, SAR, Cell Phone Radiations, Electromagnetic Field

## I. Introduction

Mobile phones are very important part of the human life, we cannot survive without it. It has enormous benefits to human. With the numeral benefits of mobile phones, it has many disadvantages too, about which people are unaware. Since, the electromagnetic radiations are absorbed by our body; it has significant effects on the cells and tissues [7].

Toward realizing ubiquitous computing environments, wireless technology is enhancing the mobility of ubiquitous devices [8]. Cell Phones are like Cigarettes of 21st century due to their harmful effects [9]. Most of the People are not aware of Mobile Phone and Cell Tower Radiations which are very harmful due to electromagnetic radiation (EMR) exposure [10]. So, for self-protection we should be aware about the radiations emitted by mobile phones. Mobile phones have a SAR value which is discussed in the next section which will conclude the significance of SAR.

## II. Specific Absorption Rate (SAR)

SAR is the Specific Absorption Rate which is a measure of the amount of radio frequency energy absorbed by body when using a mobile phone. The SAR value is determined at the highest certified power level [1]. Every mobile phone is having SAR value i.e. if any phone is having its SAR value less than the limit than it can be easily sold in the U.S. and is known as the safe phone. It is mostly measured in the W/kg and FCC limit for public exposure from cellular telephones is an SAR level of 1.6 watts per kilogram.

It is mainly defined as the power absorbed per mass of tissues, has it units of watts per kilogram (W/kg) [2]. Mainly SAR measure exposure to the energy fields between 100 kHz to 10 GHz. Local SAR is determined over a mass of 10g. For a phone to receive FCC Certification and be sold in United States, its maximum SAR value should be 1.6 watts per kilogram. Buying a phone with less SAR value makes you more comfortable, but there is no guaranty that it will be safer. The FCC requires that cell phone manufacturers conduct their SAR testing to include the severe and worst-case i.e. highest power operating conditions for all the frequency bands used in the USA for cell phones [3]. The SAR values recorded on the FCC's authorization and in the cell phone manual to demonstrate compliance with Commission

rules indicate only the highest single measurement taken for each frequency range that the particular model uses. FCC approval means that the device will never exceed the maximum levels of consumer RF exposure permitted by federal guidelines, but it does not indicate the amount of RF exposure consumers experience during normal use of the device [4]. While only the maximum SAR values are used for FCC approval, all test reports submitted by the manufacturer are available in full for public inspection on the Commission's website [5].

## III. SAR Testing in India

Specific Absorption Rate (SAR) testing procedure is being finalized by Telecom Engineering Centre (TEC). The SAR test laboratory is also being set up in TEC, Delhi, for testing of revised SAR standards of mobile handsets imported or manufactured in India. SAR testing uses standardized models of the human head and body that are filled with liquids that simulate the RF absorption characteristics of different human tissues. In order to determine compliance, each cell phone is tested while operating at its highest power level in all the frequency bands in which it operates, and in various specific positions against the dummy head and body, to simulate the way different users' typically hold a cell phone, including to each side of the head.

## IV. Comparison of Two Manufacturing Companies and Their SAR Values

### A. Device Used

CORNET ED-75, Electro smog Meter, RF/LF Field Strength power meter (100MHz-6GHz)/ (50Hz-10 KHz)

### 1. Meter Indications for Various Readings

-5dbm.....Red  
 -10dbm.....Red  
 -15dbm.....Red  
 -20dbm.....Yellow  
 -25dbm.....Yellow  
 -30dbm.....Yellow  
 -35dbm.....Green  
 -40dbm.....Green

Table 1: Samsung SAR Values

Sr. No.	Phone Name	SAR Value [W/kg]
1.	Galaxy Ace S5830	0.69
2.	Galaxy Y S5360	0.57
3.	Galaxy Note II N7100	0.23
4.	Galaxy Ace Advance S6800	0.61
5.	Galaxy Ace Plus S7500	0.49
6.	Galaxy Ace Duos I589	0.43
7.	Galaxy Ace 2 I8160	0.52

Table 2: Samsung Cell Phone Readings by Electro Smog Meter

Model	Galaxy Ace 5830i	
SAR (US)	0.69 W/Kg	
During Call	Dial	-0.5 to +3.0 dBm
	Receive	-0.3 to +3.0 dBm
SMS	-2.5 dBm	
Distance	2 cm	

Table 3: Nokia SAR values

Sr. No.	Phone Name	SAR Value
1.	Lumia 510	0.85
2.	5110	0.69
3.	5510	0.74
4.	6100	0.6
5.	6210	0.82
6.	7250i	0.6
7.	7260	0.51

Table 4: Nokia Cell Phone Readings by Electro Smog Meter

Model	Nokia X2-00	
SAR (US)	1.28 W/Kg	
During Call	Dial	+2.0 to +5.0 dBm
	Receive	+2.7 to +5.0 dBm
SMS	+0.2 dBm	
Distance	2 cm	

## B. Result

A comparison has been conducted between Samsung and Nokia Cell phone by using Electro Smog meter by performing the operations of Calling and SMS at a distance of 2 cm. which indicates that Samsung Cell Phones are having lesser SAR values and accordingly radiation level is also less in case of Samsung cell phones.

## V. New Guidelines by Indian Government

- All the new design of mobile handsets shall comply with the Specific Absorption Rate (SAR) values of 1.6 W/kg averaged over 1 gram of human tissue w.e.f. 1st Sept. 2012.
- The mobile handsets with existing designs which are compliant with 2.0 W/kg averaged over 10 gram of human tissue, will continue to co-exist up to 31st August 2013. From 1st Sept. 2013, only the mobile handsets with revised SAR value of 1.6 W/kg would be permitted to be manufactured or imported in India.
- SAR value information display on the mobile handsets like IMEI (International Mobile Equipment Identity) display. The information on SAR values to be made available to the consumer at the point of sale.
- Mobile hand set manufactured and sold in India or imported from other countries shall be checked on random basis for compliance of SAR limit after TEC SAR Laboratory is set up by end of 2012. Test results from international accredited labs will be acceptable in the interim period.
- The manufacturers in India will provide self-declaration of SAR value of the handset.
- Manufacturer's mobile handset booklet will contain safety precautions.
- All cell phone handsets sold in the market in India will comply

with relevant standards and shall be available in hand free mode [6].

## VI. Conclusion

As Technology is becoming advance, new cell phones are coming in market which are equipped with latest applications. Everyone check out that application but one should also analyze the SAR value which indicates the radiation standard of particular cell phone. In this paper, we had compared the SAR values of Samsung and Nokia Cell Phones along with their radiation levels in case of Calling and SMS.

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