

# **ASSESSMENT OF EMF RADIATION LEVELS IN TANZANIA**

Presented by:

THE COMMITTEE TO ASSESS EMF RADIATION LEVELS IN TANZANIA

**PROGRESS REPORT FOR 2013-2014**

**NOVEMBER 2014**

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## LIST OF ABBREVIATIONS

<b>CENELEC</b>	Comité Européen de Normalisation Électrotechnique
<b>EMF</b>	Electromagnetic Fields
<b>FM</b>	Frequency Modulation
<b>GSM</b>	Global System for Mobile Communication
<b>ICNIRP</b>	International Commission on Non-Ionizing Radiation Protection
<b>IEC</b>	International Electrotechnical Commission
<b>IEEE</b>	Institute of Electric and Electronics Engineers
<b>ITU</b>	International Telecommunication Union
<b>ITU-T</b>	ITU-Telecommunication
<b>MCST</b>	Ministry of Communications Science and Technology
<b>MoDANS</b>	Ministry of Defense and National Service
<b>MoU</b>	Memorandum of Understanding
<b>MW</b>	Medium Wave
<b>NEMC</b>	National Environmental Management Council
<b>RBW</b>	Resolution Bandwidth
<b>SAR</b>	Specific Absorption Rate
<b>SRM</b>	Selective Radiation Meter
<b>TAEC</b>	Tanzania Atomic Energy Commission
<b>TBS</b>	Tanzania Bureau of Standards
<b>TCRA</b>	Tanzania Communications Regulatory Authority
<b>UDOM</b>	University of Dodoma
<b>UDSM</b>	University of Dar es Salaam
<b>UHF</b>	Ultra High Frequency
<b>UMTS</b>	Universal Mobile Telecommunications System
<b>VHF</b>	Very High Frequency
<b>ZBC</b>	Zanzibar Broadcasting Commission

## EXECUTIVE SUMMARY

The Committee to assess electromagnetic field (EMF) radiation levels in Tanzania was formed following signing of Memorandum of Understanding (MoU) between the Tanzania Atomic Energy Commission (TAEC) and the Tanzania Communications Regulatory Authority (TCRA) on 4<sup>th</sup> October, 2011. The 2011/12 implementation report was presented and submitted to the managements of TCRA and TAEC on 5<sup>th</sup> and 27<sup>th</sup> September, 2012 respectively. The report was also published in TCRA and TAEC websites [1] during 2011/12 financial year. This report presents the implementation of the activities planned for 2013/14 and provides the plan for 2014/15. The implementation of the third year (2013/14) planned activities was preceded by the successful implementation of the second year (2012/13) activities as described in the 2012/13 implementation progress report of which the achievements were:

- (i) Public awareness on EMF radiation issues has increased due to several organized awareness programs, such as radio, TV and workshop.
- (ii) EMF measurements carried out in Mwanza, Mbeya, North Pemba and South Pemba have further established the fact that radiation levels are well below the recommended ICNIRP [2,3] guideline limits. Hence, minimizing public concerns on the risk perception of EMF radiation.

During the year 2013/14 the Committee carried out the following activities:

- (i) Conducted public awareness on EMF issues
- (ii) Carried out EMF radiation measurements in Morogoro region
- (iii) Conducted two Committee Meetings
- (iv) Identified research agenda in EMF radiation issues
- (v) Proposed Sub-Committee to draft EMF regulations
- (vi) Purchased twenty (20) mobile phones from local market and sent them to UK for SAR measurement

Some of the planned activities for the financial year 2013/14 were not accomplished due to financial and/or time constraints and will be done in the 2014/15 financial year if financial status will be feasible. The committee planned to carry out the following activities for the financial year 2014/15:

- (i) Presentation of 2012/13 and 2013/14 reports to TAEC and TCRA managements
- (ii) Public awareness and education
- (iii) Continuation of EMF measurements in Tanga, Singida, Shinyanga and Mtwara.
- (iv) Conduct at least four working committee meetings.
- (v) Formulation of research topics from research agendas on environment and EMF radiation.
- (vi) Drafting EMF regulations.



# 1 INTRODUCTION

The Committee to assess electromagnetic field (EMF) radiation levels in Tanzania was formed following signing of Memorandum of Understanding (MoU) between the Tanzania Atomic Energy Commission (TAEC) and the Tanzania Communications Regulatory Authority (TCRA) on 4<sup>th</sup> October, 2011. The aim was to cooperate/collaborate in the non-ionizing radiations issues especially in regulatory control; inspections; standards; enforcement; research; training/workshops/seminars; public awareness; complaints handling; public and environmental protection as well as in consultation/consultancy. The Committee includes members from TCRA, TAEC, University of Dar es Salaam (UDSM), University of Dodoma (UDOM), Zanzibar Broadcasting Commission (ZBC), National Environment Management Council (NEMC) and Ministry of Defense and National Services (MoDANS).

Among the activities of the Committee is to address public concern over possible adverse health effect due to EMF radiated from mobile phone base stations, radio and TV stations and associated equipment. Since its establishment, the Committee has performed measurement of EMF radiation levels in different places and results have been made available to the public as per the International Telecommunications Union (ITU) recommendation [4–7] through TCRA and TAEC websites, radios and TVs programs.

The Committee is in its third year of implementation (2013/14) and this report presents the implementation of the activities planned for 2013/14 and provides the plan for 2014/15. The implementation of the third year planned activities was preceded by the successful implementation of the second year (2012/13) activities as described in the 2012/13 implementation progress report. In the second year of the implementation, the following were the major achievements:

- (i) Public awareness on EMF radiation issues has increased due to several organized awareness programs, such as radio, TV and workshop.
- (ii) EMF measurements carried out in Mwanza, Mbeya, North Pemba and South Pemba has further confirmed the fact that radiation levels are well below the rec-

ommended ICNIRP [2,3] guideline limits. Hence, minimizing public concerns on the risk perception of EMF radiation [4, 8, 9].

Based on the planned activities and what has been achieved for the second year of implementation, the implementation rate is about 95%.

The planning for the 2013/14 activities was done based on the achievements made during the 2012/13 year of implementation. This report therefore describes in details the 2013/14 planned activities, their implementation and achievements. The report also outlines the planned activities for 2014/15.

Some of the planned activities for the financial year 2013/14 were not accomplished due to financial and/or time constraints. For example the EMF committee could not conduct the planned seminars to members of parliaments and members of House of Representative for the financial year 2014/15 due to shortage of funds. Similarly, the workshops to stakeholders were not executed due to time constraints.

The EMF committee is planning to conduct seminars to either Parliamentary Infrastructure Committee or Parliamentary Social Services Committee and House of Representative in the year 2014/15 if the financial status will allow. Workshops are planned to be implemented in the 2014/15 financial year. Likewise, TV and Radio Programs for public awareness will be implemented in collaboration with TCRA's "Mwasiliano na Maendeleo" TV and radio programs. Updated Brochures and Fliers with findings from current measurements will be available.

## 2 PLANNED ACTIVITIES FOR THE YEAR 2013-14

The committee met twice in 2013/14 financial year. The objectives of the meetings included analysis of measurement results, review of committee work plan and its implementation. The Committee planned the following:-

- (a) Presentation of progress report for 2012/13 to TAEC and TCRA managements
- (b) Public awareness and education
  - (i) To publish EMF measurement results in the TCRA and TAEC websites
  - (ii) Presentation of EMF issues to members of Parliament and House of Representative
  - (iii) Exhibition of EMF issues during Nane Nane and Saba Saba festivals
  - (iv) Conduct workshop to stake holders
  - (v) Conduct TV and Radio programs
  - (vi) Produce and distribute Brochures/fliers to stake holders
- (c) Continuation of EMF measurements
- (d) Acquisition of an antenna (probe) for measurement of EMF from MW radio band
- (e) Identification of research agenda on EMF issues
- (f) Development of EMF regulations
- (g) Measurement of Specific Absorption Rate (SAR) for various mobile phones

### 3 IMPLEMENTATION OF PLANNED ACTIVITIES

#### 3.1 Presentation of the work progress to TCRA and TAEC managements

The progress report for the year 2012/13 could not be presented to TCRA and TAEC managements as planned. Instead it was presented together with the progress report for the year 2013/14 in the 2014/15 financial year.

#### 3.2 Public Awareness on EMF Issues

(a) To Publish measurement results in the TCRA and TAEC websites

Measurement results of EMF radiation levels of FM radio, VHF TV, UHF TV, GSM 900/1800, UMTS obtained from 19 locations in Morogoro region will be published in TCRA and TAEC websites during 2014/15 financial year. The details of the measurement are given in APPENDIX I of this report (Section 6).

(b) Presentation of EMF issues to members of Parliament and House of Representative:

This activity was not executed due to financial constraints. However, the committee is planning to conduct seminars to either Parliamentary Infrastructure Committee or Parliamentary Social Services Committee and House of Representative in the year 2014/15 should financial status become feasible.

(c) Exhibitions during National festivals

This activity was successful carried out in the 2013 Agricultural Sector Exhibition - Nane Nane in Dodoma from 1<sup>st</sup> to 8<sup>th</sup> August, 2013. Participated Committee members were able to provide education to the general public on issues related to EMF radiation exposure, and publicized results of the study of EMF measurements in public areas around the country.

(d) Workshop to Stakeholders

This activity was not executed due to time constraints. However, this activity will be implemented during 2014/15 financial year.

(e) TV and Radio Programs for public awareness

This activity was not implemented. However, it will be implemented through TCRA's "Mawasiliano na Maendeleo" TV and radio programs.

(f) Brochures and Fliers

Brochures and Fliers are available and will be updated to include findings from current measurements.

### 3.3 EMF Measurements

In 2013/14, EMF measurements were conducted in Morogoro region. Methods, conditions and equipment used in the measurements were the same as those described in the 2011/12 progress report [1]. Detailed EMF measurement results are shown in Figures 1 to 6 in Section 4.2. Based on the measurement results, it has been established that radiation levels in Morogoro region are well below the recommended ICNIRP [2,3] guideline limits (Table 4).

### 3.4 Acquisition of Antenna (probe)

The antenna for measuring EMF from MW radio band was not purchased due to financial constraints. However, the Committee recommends purchasing the antenna in the 2014/15 financial year.

### 3.5 Identification of Research Agenda in EMF Radiation Issues

The following research agenda were identified:-

(i) Public awareness and social issues for EMF Radiation

(ii) EMF exposure versus human health effects

### 3.6 Development of EMF Regulations

The Sub-Committee to draft EMF regulations was proposed. The members are as shown in Table 1

**Table 1:** Composition of Sub-Committee Members to Draft EMF Regulations

S/N	Member	Institution
1	Dr. M.M Nyaruba	TAEC
2	Legal officer	TAEC
3	Dr. A.Y. Simba	TCRA/MCST
4	Eng. Ikuja Jumanne	TCRA
5	Dr. M. M. Kissaka	UDSM
6	One officer from NEMC	NEMC
7	Legal Officer	TCRA
8	One officer	TBS
9	Eng. Ali Ayoub	ZBC

The proposed Sub-Committee is to be formalized by the Director General of TCRA in consultation with TAEC Director General.

### 3.7 Mobile Phone SAR Measurements

#### 3.7.1 *Purchase of Mobile Phones*

In order to conduct SAR measurements, twenty (20) mobile phones were purchased from local markets. The phones were purchased from different locations in Dar es Salaam namely; Posta, Mwenge, Ubungo, Kariakoo and Mlimani City. Price ranges for the purchased mobile phones are given in Table 2

**Table 2:** Price Ranges and Quantities of the Purchased Mobile Phone

S/N	Price Range (TZS)	Quantity(Pcs)
1	Less than 80,000	8
2	80,000 –160,000	5
3	160,000 – 300,000	5
4	More than 300,000	2

Different prices were considered in order to capture low, medium and high-end mobile phone products in Tanzanian market. Many mobile phones in the low and medium-end categories were purchased because the majority of Tanzanians use them and it is also perceived that they are counterfeit and/or of low quality. On the other hand, the phones in the high-end category were purchased to cover all users' categories.

### 3.7.2 *Measurement Exercise*

The purchased mobile phones were sent to TUV SUD Product Service based in Fareham, Hampshire in the United Kingdom for SAR measurement. The measurement for each phone was carried out for about 2 days. Two (2) EMF committee members witnessed the exercise for two days at TUV SUD Product Service laboratory. Table 3 shows a summary of SAR measurement results as well as declared values from manufacturers' operational manuals and websites [10,11]. SAR values for some phones could not be obtained. The detailed reports including measurement procedures and results are published in TCRA and TAEC websites.

**Table 3:** Mobile Phones' Body and Head SAR Values

S/N	Make and Model	SAR Body (W/kg)			SAR Head (W/kg)		
		Declared	Measured	Difference (Meas.- Declared)	Declared	Measured	Difference (Meas. - Declared)
1	Nokia 206 Dual Sim	0.78	0.409	-0.371	0.93	0.766	-0.164
2	TECNO 611S		0.572			0.552	
3	TECNO M3		0.928			0.633	
4	TECNO T340		0.273			0.362	
5	Huawei Ascend Y 220	0.46	0.488	0.028	0.644	0.394	-0.25
6	Nokia 105	0.66	0.341	-0.319	1.48	1.396	-0.084
7	Nokia Asha 210	0.54	0.273	-0.267	0.62	0.523	-0.097
8	Nokia 101		0.440		1.28	1.233	-0.047
9	Nokia Lumia 520	0.97	0.428	-0.542	1.09	0.609	-0.481
10	Samsung Galaxy pocket GT-S5301	0.276	0.359	0.083	0.699	0.941	0.242
11	Samsung Galaxy pocket Duos GT- S5303	0.548	0.259	-0.289	0.938	0.736	-0.202
12	Samsung Duos GT-E1207T	0.399	0.542	0.143	0.92	1.202	0.282
13	BlackBerry Curve 9220 smartphone (model no. REX41GW)	1.01	0.704	-0.306	1.61	1.224	-0.386



14	Nokia 112 Dual SIM	0.65	0.543	-0.107	1.3	1.336	0.036
15	Nokia Asha 200 Dual SIM	0.74	0.646	-0.094	0.89	0.934	0.044
16	Nokia 111	0.43	0.479	0.049	1.46	1.299	-0.161
17	Samsung GT-E1205T	0.352	0.481	0.129	0.873	1.089	0.216
18	Nokia 107	0.65	0.449	-0.201	1.27	1.574	0.304
19	TECNO T612 Dual SIM		0.427			0.710	
20	Samsung GT-E2222		0.218		0.611	0.404	-0.207

## 4 FINDINGS

### 4.1 Public Awareness

Many questions were raised during the Radio and TV programs as well as workshops. The committee was able to respond and educate the public about EMF issues. However, it was noted that during these events, similar questions were repeatedly asked. The questions included the following:

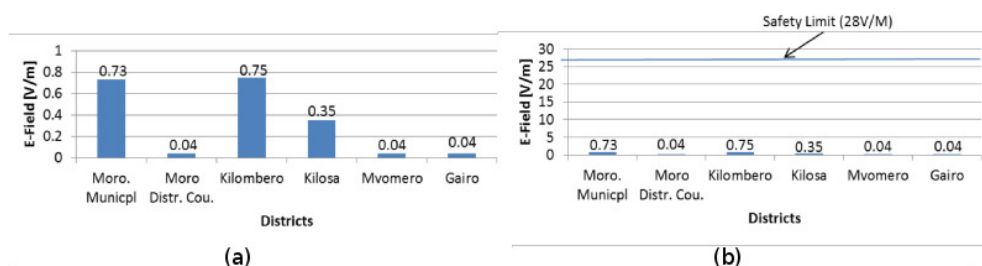
- (i) Does mobile phone radiation cause cancer?
- (ii) Is there any health effect when you sleep with mobile phone?
- (iii) Is there any health effect if you put mobile phone on the chest, mostly for women?
- (iv) Is there any effect of living near mobile phone communication towers?

- (v) Is there any relationship between the use of mobile phone and lightning strike?
- (vi) Is there any relationship between erectile dysfunction and the use of mobile phone?
- (vii) Is there any relationship between miscarriages and EMF exposure?
- (viii) Does erection of mobile phone towers cause rain shortage?
- (ix) Does mobile phone use causes sleep disorder?
- (x) Which side of the head is safe to use mobile phone?
- (xi) How to distinguish counterfeit phones from genuine ones?

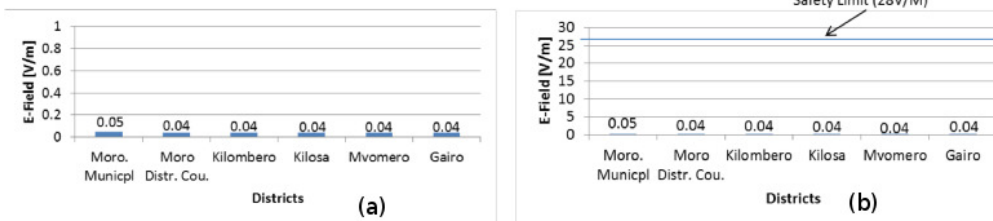
## 4.2 EMF Measurement Results

EMF measurement in Morogoro region was done according to the methods indicated in the 2011/12 report [1]. Figures 1(a) and (b) show the measured EMF levels for FM frequency band. In Figure 1(a), maximum E-field levels obtained in the districts where measurements were carried out are compared. In Figure 1(b) these measured maximum values are compared against the EMF safety limit. It is clearly observed that the measured values of EMF levels are by far smaller than the safety level recommended by the ICNIRP guidelines [2, 3, 6, 7, 9].

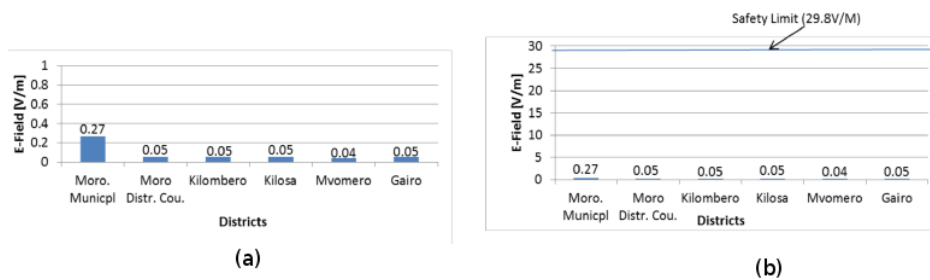
Figures 1 to 6 show the results obtained for FM, VHF-TV, UHF-TV, GSM 900, GSM 1800 and UMTS frequency bands, respectively.



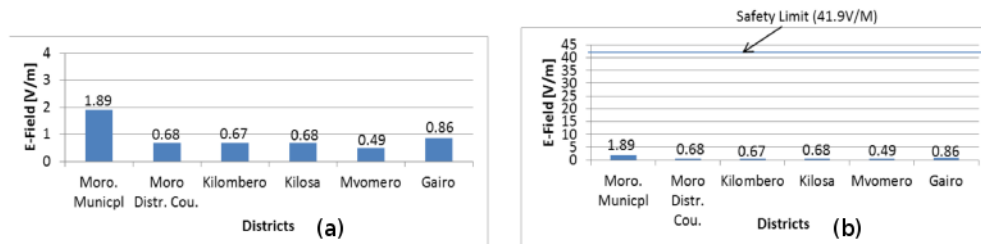
**Figure 1:** (a) Maximum E-field measured in different districts at FM frequency band, (b) Comparison between E-fields in (a) with the ICNIRP safety limit



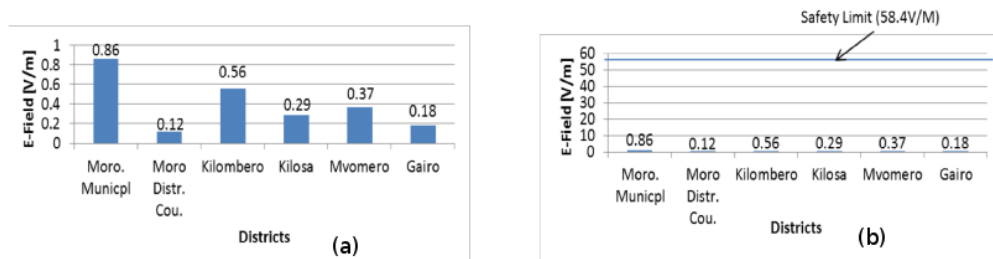
**Figure 2:** (a) Maximum E-field measured in different districts at VHF TV band, (b) Comparison between E-fields in (a) with the ICNIRP safety limit.



**Figure 3:** (a) Maximum E-field measured in different districts at UHF frequency band, (b) Comparison between E-fields in (a) with the ICNIRP safety limit.

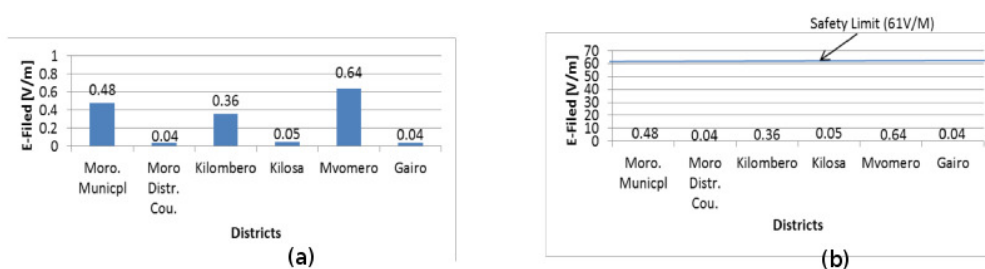


**Figure 4:** (a) Maximum E-field measured in different districts at GSM 900 frequency band, (b) Comparison between E-fields in (a) with the ICNIRP safety limit.



**Figure 5:** (a) Maximum E-field measured in different districts at GSM 1800 frequency band, (b) Comparison between E-fields in (a) with the ICNIRP safety limit.

Table 4 summarizes maximum values measured in each band from different locations and the safety limit values recommended by the ICNIRP for the particular frequency band. Note that in all measured areas, UHF-TV and VHF-TV bands, the detected val-



**Figure 6:** (a) Maximum E-field measured in different districts at UMTS frequency band, (b) Comparison between E-fields in (a) with the ICNIRP safety limit.

**Table 4:** Maximum Exposure Obtained in Different Districts

Frequency Band	Location of Maximum Exposure	Maximum Exposure [V/m]	ICNIRP Limit E-Field [V/m]
FM	Ifakara (Kilombero)	0.75	28
GSM 900	Msamvu Stand (Morogoro Municipal Council)	1.89	41.9
GSM 1800	Msamvu Stand (Morogoro Municipal Council)	0.86	58.4
UMTS	Mzumbe (Mvomero)	0.64	61

ues were negligible. Detailed measurements from the measured sites are attached as APPENDIX I.

#### 4.3 SAR Measurements

- Measurements were performed in all 20 mobile phones
- SAR values for some of the mobile phones were not declared in the manufacturers' operation manuals.
- Differences in measured and declared SAR values were observed as indicated in Table 3. There was no major discrepancies between measured and declared SAR values.

- (d) The maximum 10g volume averaged SAR levels measured for all the test performed did not exceed the 2.0 W/kg levels defined for limiting the exposure of the general population to time varying electric and magnetic field by ICNIRP [2, 3], which is the relevant standard for testing according to CENELEC EN 62209-1: 2006 test method.

## 5 ACHIEVEMENTS

Public awareness on EMF radiation issues has increased due to several organized awareness campaigns such as radio and TV programs and workshops.

EMF measurements carried out in Morogoro region have further confirmed that, radiation levels from base stations in Tanzania are well below the recommended ICNIRP [2, 3] guideline limits, which in turn minimizes public concerns on the risk perception of EMF radiation.

SAR measurements on the selected 20 mobile phones were compared with the declared SAR values. The levels of SAR results revealed in this small sample size of the mobile phones was confirmed to be within the acceptable limit.

## 6 PLANNED ACTIVITIES FOR 2014/15

The committee has planned to carry out the following activities in 2014/15 financial year. However, implementation will be prioritized based on the availability of funds. Some of these activities are continuous and others are new ones/emerging.

- (i) Presentation of 2012/13 and 2013/14 reports to TAEC and TCRA managements.
- (ii) Public awareness and education:
  - (a) To publish results in the TCRA and TAEC websites
  - (b) Presentation to members of Parliaments and House of Representative
  - (c) Exhibition at National festivals such as Nane Nane
  - (d) Workshop to stakeholders
  - (e) TV and Radio programs (To appear in the TCRA TV and Radio program)
  - (f) Brochures/fliers
- (iii) Continuation of EMF measurement in Tanga, Singida, Shinyanga and Mtwara.
- (iv) Conduct maximum of four working committee meetings.
- (v) Formulation of research topics from research agendas on environment and EMF radiation.
- (vi) Drafting of EMF regulations.

## REFERENCES

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- [10] SAR Information. <http://www.samsung.com/sar/sarMain.do>.
- [11] Find the SAR value for your phone. <http://www.microsoft.com/en/mobile/about-us/people-and-planet/emf-health/sar/sar-information/>.



## APPENDIX I

## EMF EXPOSURE LEVELS

**Table 5:** Measured EMF Exposure Levels in Morogoro region

DISTRICT	AREA	FREQUENCY BANDS (MHz)	AVERAGE (V/m)	ICNIRP [%]
MOROGORO MUNICIPAL	MOROGORO HOSPITAL	87 –108 (FM RADIO)	0.73	2.61
		174 - 230 (VHF BAND TV)	0.04	0.14
		470 -790 (UHF BAND TV)	0.21	0.70
		930 - 960 (DL -GSM 900)	0.77	1.84
		1805 - 1880 (DL-GSM 1800)	0.41	0.70
		2110 - 2170 (DL -WCDMA)	0.21	0.35
	CENTRAL POLICE	87 - 108 (FM RADIO)	0.63	2.26
		174 - 230 (VHF BAND TV)	0.04	0.15
		470 -790 (UHF BAND TV)	0.14	0.47
		930 - 960 (DL -GSM 900)	0.79	1.89
		1805 - 1880 (DL-GSM 1800)	0.49	0.84
		2110 - 2170 (DL -WCDMA)	0.14	0.22
	KINGOLWIRA	87 - 108 (FM RADIO)	0.34	1.20
		174 - 230 (VHF BAND TV)	0.04	0.14
		470 -790 (UHF BAND TV)	0.16	0.54
		930 - 960 (DL -GSM 900)	0.67	1.61
		1805 - 1880 (DL-GSM 1800)	0.14	0.25
		2110 - 2170 (DL -WCDMA)	0.05	0.08
		87 - 108 (FM RADIO)	0.11	0.39

DISTRICT	AREA	FREQUENCY BANDS (MHz)	AVERAGE (V/m)	ICNIRP [%]
KILOMBERO		174 - 230 (VHF BAND TV)	0.05	0.18
		470 - 790 (UHF BAND TV)	0.27	0.90
		930 - 960 (DL -GSM 900)	1.89	4.50
		1805 - 1880 (DL-GSM 1800)	0.86	1.48
		2110 - 2170 (DL -WCDMA)	0.48	0.79
	SUA MAZIMBU	87 - 108 (FM RADIO)	0.05	0.17
		174 - 230 (VHF BAND TV)	0.05	0.17
		470 - 790 (UHF BAND TV)	0.05	0.18
		930 - 960 (DL -GSM 900)	0.96	2.30
		1805 - 1880 (DL-GSM 1800)	0.58	0.99
		2110 - 2170 (DL -WCDMA)	0.29	0.47
	KILOMBERO	IFAKARA	87 - 108 (FM RADIO)	0.75
174 - 230 (VHF BAND TV)			0.04	0.14
470 - 790 (UHF BAND TV)			0.05	0.16
930 - 960 (DL -GSM 900)			0.67	1.60
1805 - 1880 (DL-GSM 1800)			0.56	0.95
2110 - 2170 (DL -WCDMA)			0.36	0.59
ST. FRANCIS HOSPITAL -IFAKARA		87 - 108 (FM RADIO)	0.04	0.15
		174 - 230 (VHF BAND TV)	0.04	0.14
		470 - 790 (UHF BAND TV)	0.05	0.16
		930 - 960 (DL -GSM 900)	0.26	0.61
		1805 - 1880 (DL-GSM 1800)	0.16	0.27
		2110 - 2170 (DL -WCDMA)	0.07	0.11

DISTRICT	AREA	FREQUENCY BANDS (MHz)	AVERAGE (V/m)	ICNIRP [%]
	IFAKARA SOKONI	87 - 108 (FM RADIO)	0.05	0.17
		174 - 230 (VHF BAND TV)	0.04	0.14
		470 - 790 (UHF BAND TV)	0.05	0.17
		930 - 960 (DL -GSM 900)	0.48	1.15
		1805 - 1880 (DL-GSM 1800)	0.15	0.26
		2110 - 2170 (DL -WCDMA)	0.09	0.15
	KILOMBERO SUGAR-ILOVO	87 - 108 (FM RADIO)	0.04	0.13
		174 - 230 (VHF BAND TV)	0.04	0.13
		470 - 790 (UHF BAND TV)	0.05	0.16
		930 - 960 (DL -GSM 900)	0.67	1.61
		1805 - 1880 (DL-GSM 1800)	0.42	0.72
		2110 - 2170 (DL -WCDMA)	0.13	0.21
	MIKUMI VETA	87 - 108 (FM RADIO)	0.04	0.14
		174 - 230 (VHF BAND TV)	0.04	0.14
		470 - 790 (UHF BAND TV)	0.05	0.17
		930 - 960 (DL -GSM 900)	0.46	1.10
		1805 - 1880 (DL-GSM 1800)	0.29	0.49
		2110 - 2170 (DL -WCDMA)	0.07	0.11
	KILOSA STAND	87 - 108 (FM RADIO)	0.11	0.40
		174 - 230 (VHF BAND TV)	0.04	0.13
		470 - 790 (UHF BAND TV)	0.05	0.16
		930 - 960 (DL -GSM 900)	0.68	1.63
		1805 - 1880 (DL-GSM 1800)	0.28	0.48

DISTRICT	AREA	FREQUENCY BANDS (MHz)	AVERAGE (V/m)	ICNIRP [%]
		2110 - 2170 (DL -WCDMA)	0.04	0.07
		87 - 108 (FM RADIO)	0.35	1.25
	MAZINYUNGU	174 - 230 (VHF BAND TV)	0.04	0.14
		470 -790 (UHF BAND TV)	0.05	0.16
		930 - 960 (DL -GSM 900)	0.36	0.87
		1805 - 1880 (DL-GSM 1800)	0.25	0.43
		2110 - 2170 (DL -WCDMA)	0.05	0.08
	DUMILA	87 - 108 (FM RADIO)	0.04	0.14
		174 - 230 (VHF BAND TV)	0.04	0.14
		470 -790 (UHF BAND TV)	0.05	0.16
		930 - 960 (DL -GSM 900)	0.23	0.55
		1805 - 1880 (DL-GSM 1800)	0.12	0.20
MVOMERO	MZUMBE	2110 - 2170 (DL -WCDMA)	0.04	0.06
		87 - 108 (FM RADIO)	0.04	0.16
		174 - 230 (VHF BAND TV)	0.04	0.14
		470 -790 (UHF BAND TV)	0.05	0.16
		930 - 960 (DL -GSM 900)	0.39	0.94
		1805 - 1880 (DL-GSM 1800)	0.37	0.63
	WAMI DAKAWA	2110 - 2170 (DL -WCDMA)	0.64	1.06
		87 - 108 (FM RADIO)	0.04	0.13
		174 - 230 (VHF BAND TV)	0.04	0.13
		470 -790 (UHF BAND TV)	0.05	0.16
		930 - 960 (DL -GSM 900)	0.49	1.17

DISTRICT	AREA	FREQUENCY BANDS (MHz)	AVERAGE (V/m)	ICNIRP [%]
		1805 - 1880 (DL-GSM 1800)	0.17	0.29
		2110 - 2170 (DL -WCDMA)	0.04	0.06
	TURIANI	87 - 108 (FM RADIO)	0.04	0.13
		174 - 230 (VHF BAND TV)	0.04	0.14
		470 -790 (UHF BAND TV)	0.04	0.15
		930 - 960 (DL -GSM 900)	0.44	1.06
		1805 - 1880 (DL-GSM 1800)	0.24	0.42
		2110 - 2170 (DL -WCDMA)	0.04	0.06
MOROGORO DISTRICT COUNCIL	MIKESE	87 - 108 (FM RADIO)	0.04	0.14
		174 - 230 (VHF BAND TV)	0.04	0.14
		470 -790 (UHF BAND TV)	0.05	0.16
		930 - 960 (DL -GSM 900)	0.29	0.69
		1805 - 1880 (DL-GSM 1800)	0.03	0.05
		2110 - 2170 (DL -WCDMA)	0.04	0.06
	NGERENGERE	87 - 108 (FM RADIO)	0.04	0.13
		174 - 230 (VHF BAND TV)	0.04	0.13
		470 -790 (UHF BAND TV)	0.05	0.15
		930 - 960 (DL -GSM 900)	0.68	1.63
		1805 - 1880 (DL-GSM 1800)	0.12	0.21
		2110 - 2170 (DL -WCDMA)	0.04	0.07
GAIRO	GAIRO	87 - 108 (FM RADIO)	0.04	0.13
		174 - 230 (VHF BAND TV)	0.04	0.13
		470 -790 (UHF BAND TV)	0.05	0.15

<b>DISTRICT</b>	<b>AREA</b>	<b>FREQUENCY BANDS (MHz)</b>	<b>AVERAGE (V/m)</b>	<b>ICNIRP [%]</b>
		930 - 960 (DL -GSM 900)	0.86	2.06
		1805 - 1880 (DL-GSM 1800)	0.18	0.31
		2110 - 2170 (DL -WCDMA)	0.04	0.06