

**UNITED REPUBLIC OF TANZANIA  
TANZANIA COMMUNICATIONS REGULATORY AUTHORITY  
ISO 9001: 2015 CERTIFIED**



**MINIMUM TECHNICAL SPECIFICATIONS**

**FOR**

**FM Broadcasting Station**

Document Number: [TS005](#)

Version: [1.0](#)

Date: [March 2020](#)

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## **PART 1: Introduction**

The Tanzania Communications Regulatory Authority (TCRA), established under the Tanzania Communications Regulatory Authority Act No.12 of 2003, is mandated among other duties, to license communications and broadcasting operators and type approve communication equipment for use in the United Republic of Tanzania pursuant to Section 82 of the Electronic and Postal Communications Act, No.3 of 2010 hereby stipulating as follows:

1. The Authority shall be responsible for the establishment and publication of technical standards relating to all regulated services in the United Republic of Tanzania.
2. In establishing such standards, the Authority shall-
  - (a) Where appropriate, seek submissions from other interested parties, in particular, those persons likely to be most affected by the publication of such standards; and
  - (b) Participate in standardization activities and take due account of any relevant standards prescribed by international organizations to which the United Republic belongs, such as the International Telecommunications Union and other sub-regional groupings.”

Furthermore, pursuant to Regulation 4(1) (a) and Regulation 9 (2) of the Electronic and Postal Communications (Digital and Other Broadcasting networks) Regulations 2018 empowers the Authority to determine standards for broadcasting networks in the country and from time to time review standards.

The Authority, therefore, wishes to notify all owners of FM broadcasting Stations about the minimum technical requirements and specifications for FM broadcasting stations. The specifications have been revised on grounds of technology advancement, safety requirements for peoples inside the studio and the area outside that surrounds the studio and transmission facilities.

## **PART 2: Scope and Purpose**

This document provides Minimum Technical Requirements and Specifications for the FM broadcasting station.

### **PART 3: Definitions and Abbreviations**

FM	Frequency Modulation
EMC	Electromagnetic Compatibility
IEC	International Electrotechnical Commission
HD	High Definition
STL	Studio to Transmitter Link
ITU	International Telecommunication Union
ETSI	European Telecommunication Standard Institute
DAT	Digital Audio Tape
CD	Compact Disk

### **PART 4: References**

<b>S/N</b>	<b>Reference No.</b>	<b>Title</b>
1.	IEC 60364	International Electrotechnical Commission's international standard on electrical installations of buildings
2.	IEC 60364-4-41	International Electrotechnical Commission's standard on Electrical installations of buildings - Protection for safety - Protection against electric shock
3.	IEC 61084-1	International Electrotechnical Commission's standard on Cable trunking systems and cable ducting systems for electrical installations - Part 1: General requirements.
4.	ETSI EN 302 018	Transmitting equipment for the Frequency Modulated (FM) sound broadcasting service; Harmonised Standard covering the essential requirements of article 3.2 of Directive 2014/53/EU
5.	Rec. ITU-R BS.450-4	ITU Recommendations on Transmission standards for FM sound broadcasting at VHF

6.	Rec. ITU R SM.329-7	ITU Recommendations on Unwanted emissions in the spurious domain
7.	Rec. ITU-R SM.328-10	ITU Recommendations on Spectra and bandwidth of emissions
8.	Rec. ITU-R SM.329-12	ITU Recommendations on Unwanted emissions in the spurious domain
9.	ITU-T Rec K.52	ITU Recommendation on Guidance on complying with limits for human exposure to electromagnetic fields

## PART 5: General Requirements

<b>1 Studio Rooms General Requirements</b>		
<b>S/N</b>	<b>Feature</b>	<b>Reference/Details</b>
1.1	On-Air light	Installed at entrance to On-Air Studio room, and inside to notify people about activity going on inside the studio.
		On Air light shall be <b>RED</b> and must be connected to and controlled by the Broadcasting Mixer/Console
1.2	Noise and Acoustic treatment inside the Studio rooms	Studio rooms must be acoustically treated to deal with echoes, reverberations, and noise and enhance the broadcasted sound quality, the studio shall use recommended materials to acoustically treat the room, the materials may include <ul style="list-style-type: none"> <li>• <b>Bass Traps</b> – to absorb the low frequencies</li> <li>• <b>Acoustic Panels</b> – to absorb the mid/high frequencies</li> <li>• <b>Diffusers</b> – to scatter the remaining frequencies</li> </ul>
		Studio rooms must be soundproofed with recommended materials to avoid sound penetration outside the studio. Recommended materials include: -

		<ul style="list-style-type: none"> <li>• Acoustic foam</li> <li>• Acoustic Panels/Boards</li> <li>• Acoustic Fabrics</li> <li>• Acoustic Coatings</li> <li>• Door Sealing Gaskets</li> </ul>
1.3	Room temperature control and Ventilation	<p>Broadcasting studio rooms should be well ventilated and/or temperature-controlled for the health and safety of the users and optimum operation of studio equipment.</p> <p>Air conditioners or any other acceptable electronic or electrical temperature control mechanism must be used.</p>
1.4	Security	Electronic access control shall be installed on the 'on-air' studio room and other studio rooms. This shall include among other biometrics or Smartcard Systems.
1.5	On-Air Studio room and Production room dimensions	<p>A broadcasting studio room shall have a minimum space area of <b>16 square meters (16m<sup>2</sup>)</b></p> <p>A broadcasting studio room shall have a height of least <b>2.5m</b> from the floor to the ceiling to create enough space for its operation.</p>
1.6	Power backup	A power backup system shall be installed at the studio building and transmission site to ensure the station is kept on-air even when the main power grid is not available.
1.7	Fire safety measures	There shall be firefighting equipment such as fire extinguishers at studio building and transmission site
1.8	Radio masts/Tower design	<p>The mast shall have the following items in place:</p> <ul style="list-style-type: none"> <li>• Red and white-colored markings;</li> <li>• Aircraft warning lights/Aviation warning lights; and</li> <li>• Earthing and Lightning protection.</li> </ul>

## PART 6: Technical Requirements

<b>2. Studio Rooms Electrical Safety Requirements</b>		
<b>S/N</b>	<b>Feature</b>	<b>Reference/Details</b>
2.1	Electrical Safety Requirements	The studio electrical equipment and system shall follow the standards about low voltage electrical installations ( <b>IEC 60364</b> ) series which specifies extensively the rules to comply with to ensure safety and correct operational functioning of all types of electrical installations and other accompanying standards
2.2	Isolation and Switching Mechanisms	The studio shall have isolation mechanisms to enable work to be carried out on, or in the vicinity of, parts that are normally live in service, without risk of injury or death from electric shock or electric burns. The functions of the switching mechanisms shall include  <i>a) To switch off equipment for mechanical maintenance thus enabling non-electrical work to be carried out on the equipment safely;</i> <i>b) To rapidly disconnect electricity to remove an unexpected hazard.</i>
2.3	Electrical wires and electrical sockets	There shall be no exposed electrical wires and loose electrical sockets in the studio and transmission facilities to prevent electrical Hazards and shock, as required by <b>IEC 60364-4-41 and IEC 61084-1</b>
2.4	Lightning protection equipment	Lightning protection equipment shall be installed to protect the studio and electrical equipment from destruction and to protect individuals in the said facilities from injuries.
2.5	Grounding	There shall be grounding/earthing of electrical studio equipment to prevent fire risks and damage to materials.
2.6	Surge protective devices	Surge protective devices shall be installed to protect electrical equipment from voltage spikes from power surges and lightning strikes

<b>3</b>	<b>FM Station Equipment Requirements</b>	
<b>S/N</b>	<b>Item</b>	<b>References/Details</b>
3.1	On-Air Studio room equipment	<p>The studio room shall have the equipment to be used in Broadcasting services. The equipment includes but not limited to: -</p> <ul style="list-style-type: none"> <li>• Professional Mixer/Audio Console/ radio panel/ sound panel, or sound desk (Mixer designated for radio broadcasting)</li> <li>• Microphones (One for each Presenter or host and few for a guest if required)</li> <li>• Microphone boom or arm or stands</li> <li>• Headphones (One for each Presenter or host and few for a guest if required)</li> <li>• FM tuner (Off Air Receiver)</li> <li>• Monitor speaker</li> <li>• On-air light Connected to and controlled by the Mixer Console</li> <li>• A computer installed with Playout and Automation software</li> <li>• Telephone hybrid</li> <li>• Phone Talkback system (Optional)</li> <li>• Intercom (Optional)</li> <li>• Cue/preview speakers (Optional)</li> <li>• Level Meters ( Optional)</li> </ul>
3.2	Production studio Room	<p>The production studio room may be used as a backup on-air studio room. it shall have the equipment to be used in Broadcasting services. The equipment includes but not limited to: -</p> <ul style="list-style-type: none"> <li>• Professional Mixer/Audio Console/ radio panel/ sound panel, or sound desk (Mixer designated for radio broadcasting)</li> <li>• Microphones (One for each Presenter or host and few for the guest if required)</li> <li>• Microphone boom or arm or stands</li> <li>• Headphones (One for each Presenter or host and few for the guest if required)</li> <li>• FM tuner (Off Air Receiver) and Monitor</li> </ul>



		<p>speaker</p> <ul style="list-style-type: none"> <li>• On-air light Connected to and operated by Mixer Console</li> <li>• A computer installed with Playout and Automation software</li> <li>• Telephone hybrid</li> <li>• Phone Talkback system (Optional)</li> <li>• Intercom (Optional)</li> <li>• Cue/preview speakers (Optional)</li> <li>• Level Meters ( Optional)</li> </ul>
3.3	Control room Equipment	<p>The control room shall have the equipment to be used in processing FM Signals before they are propagated. The equipment may include but not limited to: -</p> <ul style="list-style-type: none"> <li>• Broadcast Content Server</li> <li>• Studio to Transmitter Link (STL)</li> <li>• Modulation monitor/FM analyzer</li> <li>• FM stereo Generator</li> </ul>
3.4	Newsroom/Editing Room and Library	<p>It shall consist of equipment used in editing and storing of information.</p> <ul style="list-style-type: none"> <li>• Editing computer Systems</li> <li>• Storage systems</li> </ul>
<b>4</b>	<b>Studio to Transmitter Link requirements</b>	
<b>S/N</b>	<b>Item</b>	<b>Reference/ Details</b>
4.1	Installation Location	STL Transmitter shall be installed in the control room at the broadcasting studio, and the STL receiver shall be installed at the transmission site
4.2	Transmission Means	STL transmission may use either a point to point (PTP) Microwave link on another special radio frequency, optical fiber transmission system, satellite link, IP Link.
		STL Transmission may use an additional means as a backup mechanism in case there is a breakdown in the main STL transmission link
		The frequency to be used shall be within the range of <b>290-310 MHz</b> , and the antenna shall be directional

<b>5. Broadcasting Transmission System Technical Requirements</b>		
<b>S/N</b>	<b>Requirement</b>	<b>Reference/Details</b>
5.1	Transmitter Room/site	A ventilated room to host broadcasting equipment and STL receiver
5.2	Transmitting Power	The transmitting power shall be designed to avoid interference to other radio stations
5.3	Frequency range	The FM broadcast transmitter shall operate within a frequency band of <b>87.5MHz to 108 MHz</b> . The transmitter shall also be tunable to accept any assigned frequency on this range.
		The actual operating frequency of a particular stations' transmitter shall be the frequency assigned to the licensee by the authority.
5.4	Transmission Bandwidth	The bandwidth of the FM signal transmitted shall be within <b>200kHz</b>
5.5	Frequency deviation	FM Broadcasting System shall deploy a Stereophonic pilot tone system with maximum frequency deviation of <b>±75 kHz ± 3 %</b> as specified in Draft <b>ETSI EN 302 018</b>
5.6	Pre-Transmission Processing (Modulation, Pre-emphasis Baseband processing)	The transmission system shall employ Transmission standards for FM sound broadcasting at VHF as defined by Recommendation <b>ITU-R BS.450-4</b>
5.7	Unwanted Emissions Limit	Unwanted emissions (Spurious, Out-of-band emissions and cabinet radiations) shall remain within the limits indicated in Annex 1 of this document, in accordance with the provisions of Appendix 3 ( <b>Rev. WRC-12</b> ) of the ITU Radio Regulations as well as ITU-R Recommendations <b>Rec. ITU-R SM.329-7, Rec. ITU-R SM.328-10, Rec. ITU-R SM.329-12</b> and <b>Rec. ITU-R</b>

		<b>SM.1541-6</b> and European standard <b>ETSI EN 302 018-1</b> , as specified in <b>Annex 1</b>
5.8	Field Strength	The transmitter shall broadcast FM signal such that the minimum field strength at the edge of its coverage area(service area) shall be <b>54 dB<math>\mu</math>V/m</b> for the rural area, <b>66 dB<math>\mu</math>V/m</b> for Urban area and <b>74 dB<math>\mu</math>V/m</b> for large cities as specified by ITU Recommendation Rec. <b>ITU-R BS.412-9</b> . This is the threshold in which the Licensee can claim protection from interference.
5.9	Cavity filters	Cavity filters shall be installed at the output of the Transmitter to ensure compliance with unwanted emission (Spurious, Out-of-band emissions and cabinet radiations).
5.10	Electromagnetic compatibility	Where applicable, the equipment used in the transmission system shall comply to common technical requirements for Electromagnetic compatibility specified in <b>ETSI EN 302 018-1</b>
5.11	Transmitting Equipment Safety Requirement	The transmitting equipment shall comply with safety standard <b>IEC 60215:2016</b> , the requirements shall also apply to auxiliary equipment and ancillary apparatus, including combining units and matching networks and cooling systems where these form an integral part of the transmitter system.
5.12	Radio Frequency Radiation	<p>FM Broadcasting transmitter shall operate while ensuring that the specific exposure limits are in conformity with those of the International Commission on Non-Ionizing Radiation Protection (ICNIRP), which are recommended by the World Health Organization (WHO), to protect workers and the general public against excessive exposure to RF fields, as indicated in <b>ITU-T Rec K.52</b></p> <p>For the compliance of RF radiations, Annex 3 shall serve as a reference for SAR limits and reference levels.</p>

## **PART 7: Testing and Certification Requirements**

FM Stations shall comply with this minimum technical specification and other national and international standards accepted and adopted in our country.

## **PART 8: Document Administration**

### **8.1 Amendment**

TCRA may from time-to-time, review, and update or modify this document to ensure its continued service and to meet the international and/or national performance requirements as necessary

### **8.2 Enforcement**

This document is enforced by appropriate provisions of the TCRA Act, 2003, the Electronic and Postal Communications Act, 2010 and the Electronic and Postal Communications (Electronic Communications Equipment Standards) Regulations, 2018 and effective from the date it has been published.

### **8.3 Publication**

This document shall be published on the TCRA website <https://www.tcra.go.tz> for public information, compliance and reference purposes.

## Annex 1: Spurious emission requirement

Spurious emissions requirements for the frequency range from 9 kHz to 1 GHz.

### A.1: Spurious emission limits

Mean power of the transmitter	Limits Mean power absolute levels (dBm) or relative levels (dBc) below the power supplied to the antenna port in the reference bandwidth (see annex B)
$P < 9 \text{ dBW}$	36dBm
$9 \text{ dBW} \leq P < 29 \text{ dBW}$	75 dBc
$29 \text{ dBW} \leq P < 39 \text{ dBW}$	-16 dBm
$39 \text{ dBW} \leq P < 50 \text{ dBW}$	85 dBc
$50 \text{ dBW} \leq P$	-5 dBm
NOTE: Within the band 108 MHz to 137 MHz the limits above apply without exceeding the absolute limit of 25 $\mu\text{W}$ (-16 dBm).	

## Annex 2: Deviation limits requirements

Frequency deviation limits in FM Broadcasting system

**Table A.2: Deviation limits**

Maximum operating frequency deviation	Peak deviation
50 kHz	$\pm 50 \text{ kHz} \pm 3 \%$
75 kHz	$\pm 75 \text{ kHz} \pm 3 \%$

### Annex 3: Basic Restrictions and Reference Levels

This annex presents a synopsis of the limits from the guidelines for limiting exposure to time-varying electric, magnetic and electromagnetic fields (from 10MHz to 10 GHz) [b-ICNRP Guide] published by the International Commission on Non-Ionizing Radiation Protection (ICNIRP). This annex presents basic restrictions (SAR and current density) and reference levels for the fields.

#### Basic restrictions

**Table A.3 Basic limits**

Type of exposure	Frequency range	Current density for head and trunk (mA/m <sup>2</sup> ) (rms)	Whole-body average SAR (W/kg)	Localized SAR (head and trunk) (W/kg)	Localized SAR (limbs) (W/kg)
Occupational	10 MHz-10 GHz	-	0.4	10	20
General public	10 MHz-10 GHz	-	0.08	2	4

NOTE 1 – All SAR values are to be averaged over any 6-minute period.  
 NOTE 2 – The localized SAR averaging mass is any 10 g of contiguous tissue; the maximum SAR so obtained should be the value used for the estimation of exposure.

#### Reference levels

**Table A.4 – ICNIRP reference levels**

Type of exposure	Frequency range	Electric field strength (V/m)	Magnetic field strength (A/m)	Equivalent plane wave power density $S_{eq}$ (W/m <sup>2</sup> )
Occupational exposure	10-400 MHz	61	0.16	10
General public	2-300 GHz	61	0.16	10