

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



**MINIMUM TECHNICAL SPECIFICATIONS**

**FOR**

**DIGITAL AUDIO BROADCASTING RECEIVERS**

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Approved by	Title	Signature	Date
Dr. Jabiri .K. Bakari	Director General		17.07.2024

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## **PART 1: Introduction**

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 electronic communications equipment for use in the United Republic of Tanzania

Furthermore, pursuant to Section 82 of the Electronic and Postal Communications Act. (Principal Legislation) Revised Edition 2022 and Regulation 4(1) of the Electronic and Postal Communications (Electronic Communications Equipment Standards and E-Waste Management) Regulations, 2020 empowers the Authority to determine standards for Electronic Communications Equipment in the country and review them from time to time.

The Authority therefore wishes to notify all manufacturers and importers of Digital Radio, Content Services Providers and the general public the minimum technical requirements and specifications for devices which can receive digital audio broadcasting (DAB+) signals. Technical Specifications are guidelines for equipment manufacturers and/or suppliers who wish to sell radio receivers and all other products which have built-in radio receivers, aimed at providing guidance to ensure quality products imported in the United Republic of Tanzania.

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

This specification shall apply to all manufacturers, importers and retailers who wish to import and sell radio receivers and all other products which have built-in radio receivers in the United Republic of Tanzania. It shall be used to assess the eligibility of DAB+ product to be used in the country.

The document details the requirements for domestic, portable and automotive DAB receivers.

## **PART 3: Terms and Definitions**

For the purposes of this document unless stated otherwise: -

- **Receiver** refers to an Automotive, Domestic and Portable DAB+ Radio Receiver. Automotive receiver is the radio receiver (detachable or built in) that is designed specifically for use within a vehicle.
- **Adaptor** refers to a device that provides a DAB+ capability to another device, for example an analogue radio (AM or FM) that does not have that capability.

- **Adequate audio reception** refers to error rate of the output data stream of the Viterbi decoder is equal to or better than  $10^{-4}$  when decoding a 128 kbit/s DAB+ (HE-AACv2) audio service transmitted with error protection level EEP-3A.

## Abbreviations

AAC	Advanced Audio Coding
AM	Amplitude Modulation
DAB	Digital Audio Broadcasting
EEP	Equal Error Protection
ETSI	European Telecommunications Standards Institute
FM	Frequency Modulation
ITU	International Telecommunication Union
MPEG	Moving Pictures Expert Group
OEM	Original Equipment Manufacturer
PAD	Programme Associated Data
PI	Programme Identification code
RDS	Radio Data System
RF	Radio Frequency
Sid	Service Identifier
SPI	Service and Programme Information
TCRA	Tanzania Communications Regulatory Authority
TMC	Traffic Message Channel
UHF	Ultra High Frequency
VHF	Very High Frequency

## PART 4: References

For the technical requirements captured in this specification, references have been made to the following standards. Where versions are not indicated, implementation of this specification shall be based on current and valid versions of these standards published by the respective standards development organizations

<b>ETSI TS 103 461</b>	Digital Audio Broadcasting (DAB); Domestic and in-vehicle digital radio receivers; Minimum requirements and Test specifications for technologies and products
<b>ETSI EN 300 401</b>	Radio Broadcasting Systems; Digital Audio Broadcasting (DAB) to mobile, portable and fixed receivers
<b>ETSI TS 101 756</b>	Digital Audio Broadcasting (DAB); Registered Tables

<b>ETSI TS 103 176</b>	Digital Audio Broadcasting (DAB); Rules of implementation; Service information features
<b>ETSI ETS 300 799</b>	Digital Audio Broadcasting (DAB); Distribution interfaces; Ensemble Transport Interface
<b>ETSI ETS 300 384</b>	Radio broadcasting systems; Very High Frequency (VHF), frequency modulated, sound broadcasting transmitters
<b>IEC 315-1</b>	Methods of measurements on radio receivers for various classes of emission
<b>IEC 60958-3</b>	Digital audio interface, Part 3: Consumer Applications
<b>IEC 62104:2015</b>	Characteristics of DAB receivers
<b>IEC 60169-10</b>	Radio-frequency connectors. Part 10: R.F. coaxial connectors with inner diameter of outer conductor 3 mm (0.12 in) with snap-on coupling - Characteristic impedance 50 ohms (Type SMB)
<b>EN 301 489-1</b>	Electro Magnetic Compatibility (EMC) standard for radio equipment and services; Part 1: Common technical requirements; Harmonised Standard for ElectroMagnetic Compatibilit
<b>IEC 62368</b>	Audio/video, information and communication technology equipment - Part 1: Safety requirements
<b>EN 55032 / CISPR 32</b>	Electromagnetic compatibility of multimedia equipment - Emission requirements.
<b>EN 55035 / CISPR 35</b>	EN 55035 / CISPR 35 is titled "Electromagnetic compatibility of multimedia equipment - Immunity requirements.

## **PART 5: General Requirements and Technical Specifications**

Digital radio receiver products comprise many types of receiver, including vehicle, portable and larger devices, and receivers incorporated in equipment such as mobile phones and computers. This includes adapters, whose main function is to add a digital radio capability to another device. Products may be mains, battery powered, or both. They may have a telescopic antenna, a flexible wire antenna, an earphone antenna, an antenna integrated into the receiver, or they may be supplied without an antenna.

All automotive, domestic and portable radio receivers shall be able to receive terrestrial transmitted DAB+ sound broadcasting services and shall comply with the requirements in table below.

<b>1</b>	<b>General Requirements</b>	
<b>S/N</b>	<b>Feature</b>	<b>Reference/ Details</b>
1.1	Output for audio	The receiver shall output the audio signal to loudspeakers and/or provide outputs to one of the interfaces specified in Clause 5 of IEC 62104:2015 The receiver may optionally provide an output of the selected audio service component according to <b>IEC 60958-3</b> .
1.2	Power supply requirements	AC: 220V±10%, 50±1Hz DC: 12V
1.3	Plug Type	D and G
1.4	Environmental attributes	Operating Temperature 0~45°C Operating humidity Up to 90%
<b>2</b>	<b>RF Requirements</b>	
2.1	Frequency range	174 to 230 MHz (VHF Band III)
2.2	RF Performance	The receiver must comply with the Band III provisions of <b>IEC 62104:2015</b> with the exceptions that the thresholds for Gaussian Sensitivity, Rayleigh Sensitivity and Adjacent Channel Interference shall be taken from this document.
2.3	RF Input - domestic and portable receivers	UHF FEMALE 75 Ohm as defined in IEC 61169-2:2007 or- Type F FEMALE 75 Ohm as defined in <b>IEC 61169-24</b>
2.4	RF Input - automotive receivers	Shall be fitted with an antenna connection as follows: - RF standard core: Type SMB MALE 50 Ohm as defined in <b>IEC 60169-10</b> or - Headshell, latch: Type Fakra (SMA) with latch as defined in <b>ISO 20860-1</b>
2.5	RF - Gaussian sensitivity – Automotive receivers	(a) Automotive Receiver that is sold packaged or installed with an antenna must provide Adequate Audio Reception when receiving a DAB+ signal with a field strength signal greater than FSGmin in a Gaussian transmission channel.  The value of FSGmin frequency dependent and is calculated from: $FSGmin = [29.2 + 20\log(F/220)] \text{ dB}\mu\text{V/m}$ , where <i>F</i> is the frequency in MHz  (b) Receivers supplied without an antenna shall be capable of providing adequate audio Reception with an input power level

		<p>of -97,7 dBm when fed by a DAB+ signal with Gaussian transmission channel characteristics.</p> <p>The external antenna will require a gain of -2,9 dBi or greater to produce this power at the required minimum field strength.</p> <p>Automotive receivers should have an input impedance of 50 Ohms.</p>
2.6	RF - Gaussian sensitivity – Domestic and portable receivers	<p>(a) A domestic receiver that is sold with an antenna must provide Adequate Audio Reception when receiving a DAB+ signal with a field strength signal greater than FSG<sub>min</sub> in a Gaussian transmission channel.</p> <p>The value FSG<sub>min</sub> is frequency dependent and is calculated from:  <math>FSG_{min} = [34,4 + 20\log(F/220)] \text{ dB}\mu\text{V/m}</math>, where <i>F</i> is the frequency in MHz.</p> <p>(b) Receivers supplied without an antenna shall be capable of providing Adequate Audio Reception with an input power level of -97,7dBm when fed by a DAB+ signal with Gaussian transmission channel characteristics.</p> <p>This external antenna will require a gain of -8.1dBi or greater to produce this power at the required minimum field strength. Domestic receivers should have an input impedance of 75 Ohms.</p>
2.7	RF - Maximum input power for a Gaussian Channel	<p>For the maximum input power test, the minimum requirements in VHF band III for different types of DAB+ receivers defined in <b>IEC 62104:2015</b> are:</p> <ul style="list-style-type: none"> <li>✓ <b>Domestic</b> receivers &amp; <b>Automotive accessory</b>: <b>-10dBm</b></li> <li>✓ <b>Portable</b> receivers: <b>-5dBm</b></li> <li><b>OEM Automotive</b> receivers: <b>+10dBm</b></li> </ul>
2.8	RF - Rayleigh sensitivity - Automotive receivers	<p>(a) Automotive Receiver that is sold with an antenna must provide Adequate Audio Reception when receiving a DAB+ signal with a field strength signal greater than FSR<sub>min</sub> in a Rayleigh transmission channel.</p> <p>The value of FSR<sub>min</sub> frequency dependent and is calculated from:  <math>FSG_{min} = [34.7 + 20\log(F/220)] \text{ dB}\mu\text{V/m}</math>, where <i>F</i> is the frequency in MHz</p> <p>(b) Receivers supplied without an antenna shall be capable of providing Adequate Audio Reception with an input power level of <b>-92.2dBm</b> when fed by a DAB+ signal with Rayleigh transmission channel characteristics.</p>

		<p>This external antenna will require a gain of -2.9 dB or greater to produce this power at the required minimum field strength.</p> <p>The Rayleigh fading channel characteristics will be as specified in <i>IEC 62104:2015</i>.</p>
2.9	RF - Rayleigh sensitivity – Domestic and portable receivers	<p>(a) Automotive Receiver that is sold with an antenna must provide Adequate Audio Reception when receiving a DAB+ signal with a field strength signal greater than <math>FSR_{min}</math> in a Rayleigh transmission channel. The value of <math>FSR_{min}</math> frequency dependent and is calculated from: <math>FSG_{min} = [39.9 + 20\log(F/220)] \text{ dB}\mu\text{V/m}</math>, where <math>F</math> is the frequency in MHz</p> <p>(b) Receivers supplied without an antenna shall be capable of providing Adequate Audio Reception with an input power level of <b>-92,2dBm</b> when fed by a DAB+ signal with Rayleigh transmission channel characteristics.</p> <p>This external antenna will require a gain of -8,1dBi or greater to produce this power at the required minimum field strength.</p> <p>The Rayleigh fading channel characteristics will be as specified in <b>IEC 62104:2015</b>.</p>
<b>3</b>	<b>DAB+ Channel Decoding Requirements</b>	
3.1	Decoding – general	Receivers must be capable of decoding at least one audio sub-channel.
3.2	Decoding – DAB+	A receiver shall be able to decode a DAB+ audio service contained in a sub-channel of a size up to and including 144 Capacity Units (e.g. 192 kbps@EEP3A, 96kbps@EEP1A).
3.3	Decoding – Audio Service	Stereo, parametric stereo and spectral band replication shall be supported
<b>4</b>	<b>Audio Decoding Requirements</b>	
4.1	Audio decoding	According to ETSI EN 300 401 Section 7 – Audio Coding; All clauses except 7.4.1.1 (Dynamic Range Control), 7.4.5.1 (MSC Data Groups in X-PAD), 7.4.5.2 (Dynamic Label Segment)
4.2	Audio decoding for DAB+	MPEG -4 HE AACv2 According to ETSI TR 102 563 - all sections are relevant
4.3	Audio decoding – general	According to ETSI TR 101 496 part 2 Section 3 – Implementation and Operation of System Features; Clauses 3.1 (Introduction), 3.2 (Data Transport Mechanisms), 3.2.2 (Stream Mode), 3.4 (Audio Coding).



<b>5</b>	<b>Functionality and User Interface</b>	
5.1	Retuning – scan	A receiver which has a stored list of service labels from many ensembles should automatically update its stored service list or provide the user with the option of manually scanning the whole Band III band to update its stored service list when required.
5.2	Retuning - updates	Receivers which only display the services on the current ensemble should update the displayed list of audio services if the selected ensemble reconfigures to add, remove or rename services automatically or manually. This rescan / retune feature must be able to cope with the following changes: <ol style="list-style-type: none"> <li>1. Service moves to a different multiplex</li> <li>2. New multiplex launches</li> <li>3. Multiplex changes its frequency</li> <li>4. New Service appears</li> <li>5. Service changes name</li> <li>6. Service disappears</li> </ol> Multiple Instances of the same programme content with the same Service ID on different frequencies and with varying signal levels
5.3	Text display	Automotive receiver shall have a means of displaying text to the user and this is also highly recommendable for other receiver types; alternative options for user interaction could exist for special receiver types.
5.4	Text display - basic presentation	The text display shall display the audio service name (the Component Label). The text display must be able to display the following graphic symbols, correctly mapped, visually well-formed and clear: ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyz0123456789  Lower case characters may be mapped to upper case equivalents and therefore show only: ABCDEFGHIJKLMNOPQRSTUVWXYZ0123456789
5.5	Text display – full range presentation	For displays wishing to display the full range of Dynamic Label text, including these symbols as specified in <b>ETSI EN 300 401</b> , and if the receiver cannot display these graphic symbols correctly, then the graphical symbol shown shall be a “space” or “□” or, in any case, a similar distinctly non alpha / numeric character.
5.6	Text display - labels	Receivers shall receive labels from ensembles and audio services, and display long form labels in preference to short form labels.
5.7	Text display – labels preference	The receiver shall display the Component Label, in preference to the Service Label, as it is possible to have two audio channels sharing the same Service Label. If a Component Label is not broadcast, the Service Label shall be used.

5.8	Text display – Component label	The text display shall display the Component label in either its short form (8 characters long) or its long form (16 characters long). It is not permissible for the receiver to truncate the label to any other length.
5.9	Text display – Dynamic Label Service	Receivers shall receive the Dynamic Label Service from up to 48 bytes of the X-PAD of the currently received service and display it to the user legibly. Receivers should treat the special characters 0x0A and 0x0B as specified and apply such formatting as is possible on the display. The Receiver shall act upon the Command to remove the label from the display by immediately removing the label, even if it has only been partially displayed.
5.10	Text display – Automotive receivers	To avoid taking unnecessary attention from the driver Automotive receivers shall not animate or scroll the dynamic label by default.
<b>6</b>	<b>Announcement signalling and switching, service labels</b>	
6.1	Announcement switching	Automotive receiver shall support announcement switching as defined in ETSI 300 401. This feature instructs the receiver to select an alternative audio source only for the duration of an audio announcement, before returning to the original source.
6.2	Traffic Announcement	Automotive receiver shall vector from the selected service to an audio service carrying a Traffic Announcement if all the following conditions are met: <ul style="list-style-type: none"> <li>• The selected service is signalled as supporting announcements by means of a Fig 0/18 in the Service Information with ASu flag bit 1 set to indicated “Traffic” and is provided with a Cluster Id.</li> <li>• An announcement is raised by another service on the same ensemble with the same Cluster Id.</li> <li>• The user has not selected a menu option to disable the announcement feature.</li> </ul>
6.3	Traffic Announcement on same Programme Identifier (PI)	Automotive receivers shall not switch to Traffic Announcements received on an FM service if that FM service has the same Programme Identifier (PI) Code as the Service ID (SID) of the original signal.
6.4	Services support	Automotive receiver shall support all aspects of service following as specified in the ETSI document ETSI TS 103 176 Digital Audio Broadcasting (DAB); Rules of implementation; Service information features.
<b>7</b>	<b>User Information and Accessories</b>	
7.1	Easy to Use and Simple Documentation	Receivers shall be simple to set up and operate and be provided with clear easy to understand user documentation (manual) which must be English Language and also a version of Kiswahili language being recommended.

7.2	Accessories	The following peripheral items shall be included within a baseline package: <ul style="list-style-type: none"> <li>• Batteries for Remote control (if included)</li> <li>• Reception antenna(s) for supported band(s) (if antenna is not integrated). Note: not mandatory for automotive receivers.</li> </ul>
<b>8</b>	<b>Safety</b>	
8.1	General Safety	DAB receivers shall be designed to be safe in terms of electrical, thermal, mechanical, and radiation aspects as per <b>IEC 62368</b>
<b>9</b>	<b>Electromagnetic Compatibility (EMC)</b>	
9.1	General and specific EMC Requirements	DAB receivers shall comply with the <b>EN 301 489-1</b> standard to ensure general EMC compliance
9.2	Electromagnetic interference requirements.	DAB receivers shall be tested as per EN 55032 / CISPR 32 standard which addresses the limits and methods of measurement of radio disturbance characteristics of multimedia equipment, ensuring that DAB receivers do not emit excessive electromagnetic interference.
9.3	Immunity Requirements	DAB receivers shall be tested as per EN 55035 / CISPR 35 standard which specify the immunity requirements for multimedia equipment, ensuring that DAB receivers can operate correctly in the presence of electromagnetic disturbances.

## PART 6: Testing and Certification Requirements

The requirements for the test equipment and test conditions under which the tests should be performed along with the required receiver performance levels has been elaborated in ETSI TS 103 461 and other applicable test standards and specifications specified in this document.

Manufacturers and importers may include additional features or increased performance compared to the minimum requirements specified in this document.

## PART 7: Document Administration

### 7.1 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.

## 7.2 Compliance

This document is enforced by appropriate provisions of the TCRA Act, 2003, The Electronic and Postal Communications Act. (Principal Legislation) Revised Edition 2022 and The Electronic and Postal Communications (Electronic Communications Equipment Standards and E-Waste Management) Regulations, 2020 effectively from the date it has been published.

## 7.3 Publication

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