



TECHNICAL SPECIFICATIONS

FOR

TYPE APPROVAL OF STATIC MOBILE SIGNAL REPEATERS

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1.	INTRODUCTION	2
2.	TECHNICAL CONDITIONS FOR TYPE APPROVAL OF STATIC MOBILE SIGNAL REPEATERS.....	2
3.	REGULATORY REQUIREMENTS.....	5
4.	REFERENCES.....	5

1. INTRODUCTION

1. The Communication Authority of Kenya (CA) is the regulatory authority for the ICT industry in Kenya with responsibilities in telecommunications, e-commerce, broadcasting, postal/courier services and cyber security. CA is also responsible for managing the country's numbering and frequency spectrum resources, administering the Universal Service Fund (USF), as well as safeguarding interests of consumers of ICT services.
2. Radio spectrum is an important resource to the economic and social development of Kenya. CA (also referred hereafter as the Authority) has been mandated to manage this resource by maximizing its efficient use, control interference, and promote new technologies without adversely affecting existing ones.
3. The use of radiocommunication apparatus in Kenya is regulated under the Kenya Information and Communication Act, 1998 (Cap 411A), hence radio apparatus can only be used under the terms, provisions and limitations of a radio communications licence.
4. The Authority now permits the general use of static mobile signal repeaters subject to Type Approval and provided all conditions of the Type Approval, whose technical conditions are specified in this document, are met.
5. Static mobile phone signal repeaters are repeaters that are fixed during operations and intended for indoor use inside a building or premises which has a ceiling or a roof and which except for windows, and passageways, is wholly enclosed.
6. The installers and vendors of repeaters must comply with the Kenya Information and Communications (Type Approval and Distribution of Communications Equipment) Regulations, 2010. In the event a particular repeater model malfunctions or causes harmful interference, the device shall be decommissioned and Type Approval Authorisation will be withdrawn in accordance with the Regulations.
7. In cases where interference is reported or detected, the Authority will monitor and track down the interfering devices and take appropriate regulatory action against the offending device in accordance with the Kenya Information and Communications (Compliance Monitoring, Inspections and Enforcement) Regulations, 2010.

2. TECHNICAL CONDITIONS FOR TYPE APPROVAL OF STATIC MOBILE SIGNAL REPEATERS

8. The Authority has authorized the Type Approval of static mobile repeaters that meet the following conditions, inter alia:-
 - i. Automatic Standby/Shutoff when the device is idle;
 - ii. Anti-Oscillation to protect mobile base stations from unwanted interference;
 - iii. Automatic Gain Control to automatically adjust the amplification of the repeater relative to the strongest received signal;
 - iv. Maximum Gain and Power Limits for indoor use;
 - v. No restrictions on the number of mobile operators or mobile services the device may amplify;
 - vi. Intermodulation Attenuation;

- vii. Testing of the device to ensure it meets all the technical specifications; and
- viii. Additional regulatory measure to assist in interference resolution.

9. The minimum specifications to be met are as indicated in Table 1 below.

Table 1. Technical Conditions for Type Approval for Static Mobile Signal Repeaters

	Limit Type	Specifications			
1.	Automatic Standby/Shutoff	When the repeater is not serving and active device, after no more than 5 minutes, the repeater must reduce its output power to be no more than -70 dBm/MHz EIRP per band of operation			
2.	Anti-Oscillation Detection and Shutdown	The repeater must be able to detect and mitigate any oscillations in the uplink or downlink bands. Detection and mitigation must occur within 0.3 seconds in the uplink band and 1 second in the downlink and restart. In cases where oscillation is detected, the repeater must continue mitigation for at least one minute before restarting or reduce its output power until oscillations are no longer detected. After five such restarts, the booster must not resume operation until manually reset. If mitigations fail the device must power off completely			
3.	Frequency Bands	The amplified frequencies are limited to those that are currently used in Kenya for mobile services:			
		Frequency Band	Uplink	Downlink	
		700 MHz	758-788 MHz	703-733 MHz	
		800 MHz	832-862 MHz	791-821 MHz	
		900 MHz	880-915 MHz	925-960 MHz	
		1800 MHz	1710-1785 MHz	1805-1880 MHz	
4.	Power	Frequency Band	Technology	Maximum Uplink*	Maximum Downlink*
		700 MHz	LTE	23 dBm	17 dBm
		800 MHz	LTE	23 dBm	17 dBm
		900 MHz	GSM	33 dBm	17 dBm
		900 MHz	UMTS	23 dBm	17 dBm
		1800 MHz	GSM	24 dBm	17 dBm
		1800 MHz	LTE	23 dBm	17 dBm
		2100 MHz	UMTS	24 dBm	17 dBm
* Absolute power expressed in EIRP for in-door use.					
5.	Gain	Maximum of 100 dB for indoor use			
6.	Gain Control and Noise Limits	<p>The repeater must have automatic gain control to protect against excessive input signals that would produce output power emissions that would cause interference to a mobile base station.</p> <p>The repeater must adjust its gain in accordance to the strongest signal present in the downlink band of operation so that the noise of the repeater cannot reach the base station.</p> <p>The gain of the repeater must be adjusted so that the maximum uplink noise is less than -103dBm/MHz RSSI</p>			

	Limit Type	Specifications
		Where RSSI is the measure of Received Signal Strength (dBm) per band of operation at the input ports of the repeater. The repeater must power off if it can no longer meet this specification.
7.	Noise Figure	The repeater system noise figure shall not exceed 7 dB
8.	Mobile Network Operator configuration	Single Network Operator or Multi Network Operator
9.	Intermodulation Attenuation	The transmitted intermodulation products of the repeater at its uplink and downlink ports shall not exceed the power levels of -36 dBm in the frequency band below 1 GHz and -30 dBm above 1 GHz.
10.	Reference	EN 303 609 (GSM (2G), EN 301 908-11 (UMTS (3G) and EN 301 908-15 (LTE (4G)
11.	Authorisation regime	Subject to Type Approval and additional regulatory conditions

The technical conditions set out in Table 1 reflect the following interference protection considerations:

10. **Automatic Standby/Shutoff** – to reduce the risk of interference to other spectrum users and use the spectrum efficiently the repeater must have an automatic standby/shutoff mode. This ensures that when not in use the repeater will not contribute any unwanted emissions or electromagnetic noise in the mobile frequency uplink bands.
11. **Anti-Oscillation** – to minimise risk of interference to mobile base stations and other spectrum users the repeater must have anti-oscillation detection and mitigation features. Interference in the uplink band tends to be more detrimental to the network as a whole and as such has been prioritised. Accordingly, the device must either power off, restart, or reduce its output power until oscillations are no longer detected. If mitigations fail the device must power off completely.
12. **Frequency Band** – the repeater must only repeat signals within bands assigned for mobile use (listed in Table 1). There is no restriction on the number of operators or bands the device may amplify. Both single band single operator repeaters and multi band multi operator repeaters are considered in these specifications.
13. **Power** – a base station should not detect any difference between a repeater or mobile handset transmitting to it. In this regard, the maximum uplink power has been limited to be similar to that of the maximum power of a mobile handset per band of operation.
14. Furthermore, the maximum downlink power is limited to 17 dBm EIRP, similar to the power levels of a typical domestic Wi-Fi router which should be sufficient to allow coverage within a typical domestic home, while making interference to other users in the locality unlikely.
15. **Gain** – the repeater must be capable of offering sufficient gain to allow consumers in weak signal areas and at the fringes of coverage areas to benefit as much as possible. Should too high a gain be permitted it is likely that the risk of disruption and interference to existing users, especially the base stations on a mobile network would be unacceptable.

16. **Gain Control** - the repeater must have automatic gain control to fall within the adopted framework. This is primarily to limit the amplitude of signals received and protect base stations from unnecessary interference and disruption.
17. The gain of the repeater per band of operation is limited based on the level of the downlink signal per band of operation detected at the repeater's external antenna. The Repeater should be able to adjust its gain such that noise from the device never reaches the base station. Simply put, the device should effectively work out its relative distance from the base station serving it based on free-space loss being constant.

3. REGULATORY REQUIREMENTS

18. Type approval applications and equipment installations shall only be made by a duly licensed contractor/vendor and the application shall only be made with the support of at least one (1) mobile network operator.
19. **Quarterly Returns:** The Contractor who has obtained Type Approval for the repeaters to submit quarterly reports to the Authority on where (physical and geographical coordinates) and when they were installed.
20. **Interference Resolution:** The sirs installing of Type Approved repeaters be ready to assist in interference resolution as and when they arise and commit to regularly maintain the installed repeaters

4. REFERENCES

EN 300 609-4 V10.2.1 Global System for Mobile communications (GSM); Part4: Harmonized EN for GSM Repeaters covering the essential requirements of article 3.2 of the R&TTE Directive

EN 301 908-11 V5.2.1 IMT cellular networks; Harmonized EN covering the essential requirements of article 3.2 of the R&TTE Directive; Part 11: CDMA Direct Spread (UTRA FDD) (Repeaters)

EN 301 908-12 V4.2.1 Electromagnetic compatibility and Radio spectrum Matters (ERM); Base Stations (BS), Repeaters and User Equipment (UE) for IMT-2000 Third-Generation cellular networks; Part 12: Harmonized EN for IMT-2000, CDMA Multi-Carrier (cdma2000) (Repeaters) covering the essential requirements of article 3.2 of the R&TTE Directive

EN 301 908-15 V5.2.1 IMT cellular networks; Harmonized EN covering the essential requirements of article 3.2 of the R&TTE Directive; Part 15: Evolved Universal Terrestrial Radio Access (E-UTRA FDD) (Repeaters)