



## MODULAR BUILDING FOR THE KAROO MEASUREMENT FACILITY

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### DOCUMENT HISTORY

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A	30 Mar 2020	A. Kotze	Draft
01	28 May 2020	A. Kotze	Submit for RFQ
02	22 October 2020	A. Kotze	Updated the Measurement Facility Electrical Specifications and the Conceptual layout. Submit for RFQ.
03	19 August 2021	A. Kotze	Updated the Earthing Requirements.

### DOCUMENT DISTRIBUTION

Publish in eB and Distribute to all signatories on the document and the relevant line managers.

### DOCUMENT SOFTWARE

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### COMPANY DETAILS

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## ABBREVIATIONS

AC	Alternating Current
CFI	Client Furnished Item
CoC	Certificate of Conformance
COTS	Commercial-off-the-shelf
DC	Direct Current
EMC	Electromagnetic compatibility
EUT	Equipment Under Test
FAT	Factory Acceptance Test
LED	Light-Emitting Diode
LUF	Lowest Usable Frequency
NRF	National Research Foundation
RF	Radio Frequency
RFI	Radio Frequency Interference
RVC	Reverberation Chamber
SARAO	South African Radio Astronomy Observatory
SAT	Site Acceptance Testing

## TERMINOLOGY

Validation	<p>A process of confirming that <u>requirements for a system are correct and complete</u> before being allocated to lower-level item. Acceptable means of validation is one or more of the following:</p> <ul style="list-style-type: none"> <li>● Test (including demonstration and inspection)</li> <li>● Analysis (including reviews)</li> <li>● Similarity (to proven design)</li> </ul>
Verification	<p>A process of confirming that the designed or manufactured item <u>meets a specific requirement</u>. Acceptable means of showing compliance to a requirement is one or more of the following:</p> <ul style="list-style-type: none"> <li>● Test (including demonstration and inspection)</li> <li>● Analysis (including reviews)</li> <li>● Similarity (to proven design)</li> </ul>
Qualification	<p>A process of gathering configured<sup>1</sup> justification evidence that a <u>design</u> meets a specified requirement.</p>
Acceptance	<p>A process of gathering configured justification evidence that <u>each production item</u> performs specified functional requirements. (The acceptance test is a derived subset of the qualification test).</p>
Item	<p>A system, segment, subsystem, assembly or component.</p>
Should	<p>A statement implying a recommendation.</p>
Shall	<p>A statement implying a compulsory requirement.</p>

<sup>1</sup> In this context, configured means: aligned with the Qualification baseline.

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# 1 INTRODUCTION

This document describes the modular building requirements for a Measurement Facility located at the Klerefontein Support Base in the Karoo, Northern Cape.

## 1.1 INTENDED USE OF THIS DOCUMENT

This requirements specification document:

- [1] Defines the physical, services, interface, regulatory and environmental requirements which are input to the engineering and development of the item.

## 1.2 APPLICABLE AND REFERENCED DOCUMENTS

### 1.2.1 Applicable Documents

The following documents are applicable to the extent stated herein. In the event of conflict between the contents of the applicable documents and this document, the applicable documents shall take precedence.

- [1] **Karoo Measurement Facility Requirement Specification**  
A. Kotze, SSA-008N-04B-001, Rev 04, 19 August 2021.
- [2] **Foundation for the Karoo Measurement Facility**  
A. Kotze, SSA-008N-04B-002, Rev 02, 23 October 2020.
- [3] **Electrical Requirements for the Karoo Measurement Facility**  
A. Kotze, SSA-008N-04B-003, Rev 03, 19 August 2021.

### 1.2.2 Referenced Documents

The following documents are referenced in this document. In the event of conflict between the contents of the referenced documents and this document, this document shall take precedence.

- [4] **None**

## 2 BACKGROUND

The South African Radio Astronomy Observatory (SARAO) Radio Frequency Interference (RFI) team operate and manages a reverberation chamber at the Black River Park office in Cape Town to facilitate the verification of RFI requirements for MeerKAT radio telescope equipment. There is a need to establish a similar facility at the Klerefontein Support Base in the Karoo, Northern Cape.

### 2.1 LOCATION

#### 2.1.1 Klerefontein Support Base

The Klerefontein Support Base is located at the following GPS location:

GPS: 30°58'10.75" S 21°59'20.46" E

#### 2.1.2 Proposed Location

The proposed location of the Measurement Facility at the Klerefontein Support Base – Area 1 is shown in Figure 1.



Area 1: 15m x 10m  
Karoo Measurement Facility

Area 2: 15m x 8m  
Office Area, with carport for RFI Bakkie & Storage

**Figure 1: Measurement Facility proposed location**

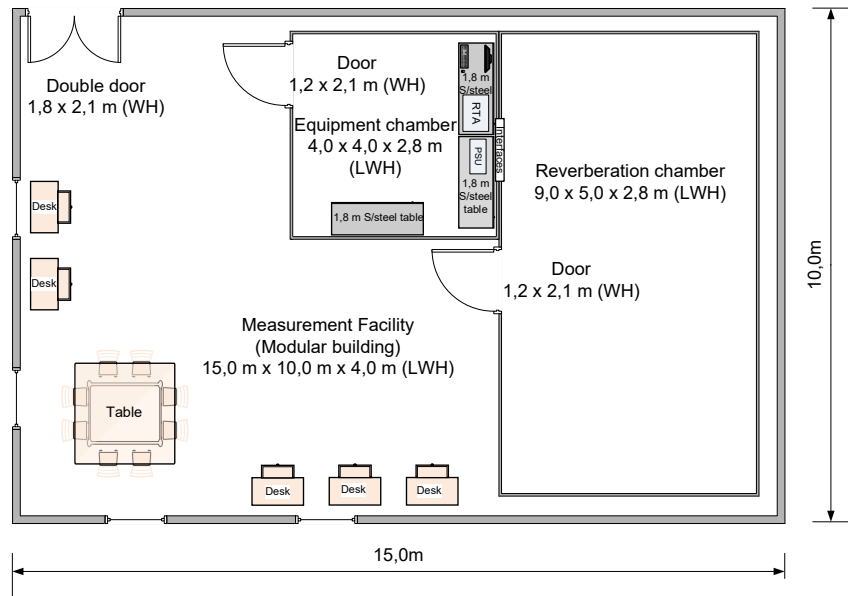
## 2.2 KAROO MEASUREMENT FACILITY

### 2.2.1 Description

The Karoo Measurement Facility will consist of a modular building for environmental protection that will contain a reverberation chamber (RVC) and an equipment chamber, that are both shielded rooms made up of steel modular panels. The RVC is used to measure radiation from the equipment under test (EUT), while the equipment chamber is used to house the measurement equipment and the workstations. The modular building will cover an area of 150 m<sup>2</sup>. The weight of the modular building is not known at this stage, but the shielded rooms alone will contribute an estimated 8 - 9 tons spread over an area of 61 m<sup>2</sup>.

### 2.2.2 Conceptual layout

The conceptual layout for the Measurement Facility is shown in Figure 2.

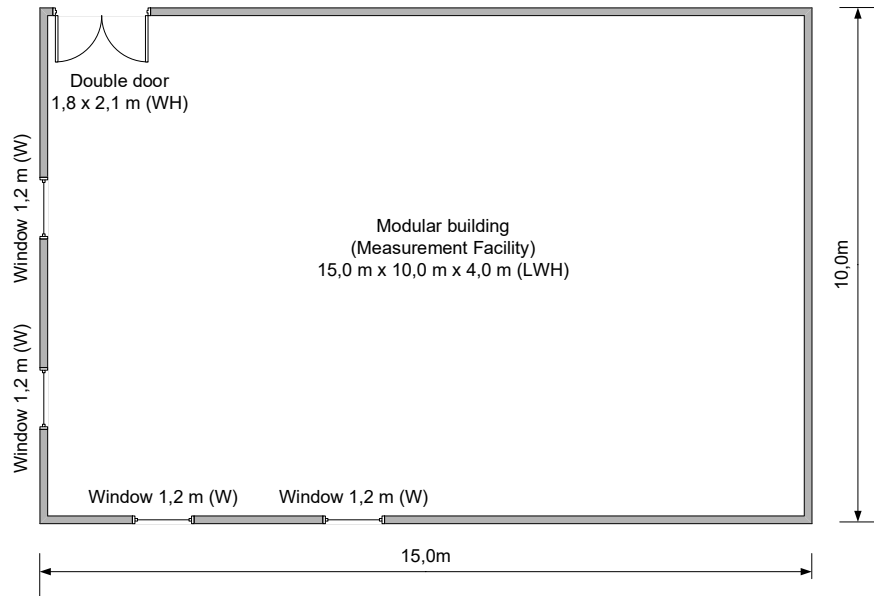


**Figure 2: Conceptual layout**



### 3 MEASUREMENT FACILITY REQUIREMENTS

The modular building requirements are listed below and the proposed floor plan is shown in Figure 3.



**Figure 3: Floor plan**

#### 3.1 PHYSICAL REQUIREMENTS

##### 3.1.1 Dimensions

[R1] The building shall have the following dimensions: 15,0 m x 10,0 m x 4,0 m (LWH).

[R2] The building shall have a double door and windows as shown in Figure 3.

##### 3.1.2 Insulation

[R3] The building shall be insulated to protect its contents.

#### 3.2 TRANSPORT

##### 3.2.1 Transport of the modular building

[R4] The modular building components shall be transported to the Klerefontein Support Base. See the location in 2.1.

#### 3.3 ELECTRICAL REQUIREMENTS

##### 3.3.1 General Electrical Supply

[R5] The building shall be supplied with a distribution board.

[R6] The building shall connect to the Klerefontein Support Base electrical power distribution according to national building regulation standards.

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[R7] The building shall provide access to the building mains supply for the following isolatable electrical interfaces.

[R7.1] Six power plug interfaces supplying single phase 220 Vac at 20 A per power interface inside the office area for office equipment.

### 3.3.2 Lights

[R8] LED lights shall provide light inside Measurement Facility.

[R8.1] Four EMC Approved LED tubes in the office area.

### 3.3.3 Earthing

[R9] Earth leakage protection is required on the inside of the measurement facility.

[R10] Signal earth - There shall be an earth connection of less than 1 Ohm.

[R11] The initial phase of the contract shall include a detailed design approval.

## 3.4 ENVIRONMENTAL REQUIREMENTS

### 3.4.1 Ventilation

[R12] The building shall provide fresh air inside both chambers to enable personnel to do EUT and measuring equipment operations.

### 3.4.2 Operating Temperature

[R13] The internal temperature of the building shall be maintained at 22°C ±2°C.











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Final Audit Report


2021-08-25


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