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EMC Aspects of the Square Kilometre Array in South Africa

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***Abstract*— The Square Kilometre Array (SKA) will be the most sensitive radio telescope ever built [1]. This paper describes elements of electromagnetic compatibility (EMC) that have been considered in the development of South Africa's SKA site in the northwest of the country. Possible self-generated radio frequency interference (RFI) has to be addressed vigorously at every stage of the project. Specific EMC measures taken relate to the: power provision; site infrastructure, including shielding properties of the processor buildings; telescope interfaces and grounding; pre-build testing of the aforementioned.**

Keywords-EMC, MeerKAT, metrology, Square Kilometre Array

I. INTRODUCTION

The SKA will become the largest radio astronomy telescope in the world [1]. The instrument will be at least 50 times more sensitive than existing systems. The mid-band and telescope arrays will be built in the Karoo of South Africa and the low-band array in the Murchison Valley of Australia. RFI may well prove to be a limiting factor in the science that can be achieved by the three distributed arrays. This paper overviews the general EMC aspects of the Karoo work, but will give specific focus to some of the projects by way of illustration. General references to this can be found in [2], but more detail will be provided in the presentation on: the power provision; the hardening measures of the partially-underground Karoo Array Processor Building (KAPB) – in the throes of construction at the time of writing; the shielding effectiveness (SE) properties of the soil berm arising from the excavation of the KAPB; some of the Karoo Array Telescope (KAT) modeling and measurement; general techniques and equipment.

II. INFRASTRUCTURAL EMC

A. Power provision

An early development to the site was the 22 kV power line which has since been up-rated to 33 kV. The line was designed not to spark. Modeling and measurement findings added to the decision to point the power lines away from the site core. Fig. 1 shows the evolving layout of the core where power lines are underground and hills are used for shielding.

B. Karoo Array Processor Building and Soil Berm

Fig. 2 shows the KAPB at a mid-construction phase. The excavated soil was exploited to form a shielding berm. The earth mat, bond ring conductor, reinforcing connections and cable entry points were carefully designed and checked.

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C. Modeling and Metrology

Many of the systems have been the subject of physical scale, analytical and computational modeling. Measurements in both time and frequency domains has been undertaken. Cutting-edge technology in the KAT processing systems has been exploited for the time instruments.

III. CONCLUSION

A brief outline of the EMC aspects of the South African SKA project has been given. The conference presentation will expand on the highlighted topics.

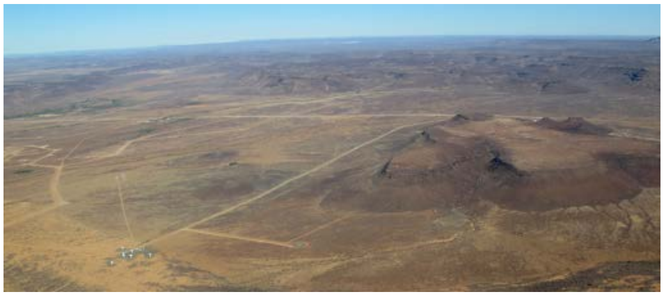

Figure 1. South African SKA site showing the first seven Karoo Array Telescopes (KAT-7), the foundations of some MeerKAT telescopes (mid-left), and the flat topped hill called Losberg. The site base with data processing and power rooms is situated directly behind Losberg.

Figure 2. The mid-phases of the Karoo Array Processor Building (KAPB) construction showing soil berm from earth excavation, some connected reinforcing, the ground level with earth mat and bond-ring conductor.

REFERENCES

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