No. R. 90   **10 February 2012**

REGULATIONS ON RADIO ASTRONOMY PROTECTION LEVELS IN ASTRONOMY ADVANTAGE AREAS DECLARED FOR THE PURPOSES OF RADIO ASTRONOMY

In terms of section 37, read with section 50, of the Astronomy Geographic Advantage Act, 2007 (Act No. 21 of 2007), I, Grace Naledi Mandisa Pandor, Minister of Science and Technology, having obtained the concurrence of the Independent Communications Authority of South Africa as required by the Act, hereby make regulations on radio astronomy protection levels in astronomy advantage areas declared for the purposes of radio astronomy, as set out in the Schedule.

G. N. M. Pandor

MRS GNM PANDOR, MP

MINISTER OF SCIENCE AND TECHNOLOGY

SCHEDULE

1. Definitions

In these regulations any word or expression to which a meaning has been assigned in the Act has the meaning so assigned and, unless the context otherwise indicates –

"ITU" means the International Telecommunications Union;

"SPDF" means Spectral Power Flux Density;

"the Act" means the Astronomy Geographic Advantage Act, 2007 (Act No. 21 of 2007).
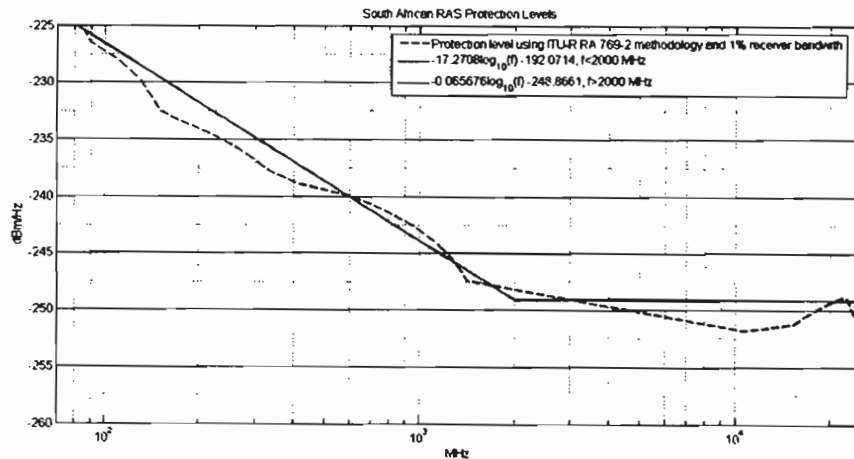
2. Protection levels

(1) The origin, derivation and references for the protection levels to be applied in astronomy advantage areas declared for the purposes of radio astronomy are as follows:

    (a) The protection levels are derived using the methodology described in ITU Recommendation ITU-R RA.769.

    (b) The technical assumptions made in the derivation are that receiver and sky temperatures are linearly interpolated from those values found in ITU-R RA.769, and that receiver bandwidth is assumed to be 1% of the observing frequency.

    (c) Derived protection levels, which are equivalent to threshold levels of interference for new generation radio astronomy observatories and are based on the methodology outlined in ITU-R RA.769, are depicted in Figure 1.

(2) The protection levels to be applied in astronomy advantage areas declared for the purposes of radio astronomy shall be as follows:

(a)   The values of the protection levels at the applicable frequencies are determined by means of a linearly piecewise function.

(b)   The said function is described by the following equations, which are to be used to calculate the required protection level at any frequency in the spectrum from 70 MHz to 25,5 GHz:

SARAS [dBm / Hz] = - 17.2708 log₁₀ (f) – 192.0714 for f < 2 GHz.

$SARAS\ [dBm\ /\ Hz] = -17.2708\ \log_{10}(f) - 192.0714\ for\ f < 2\ GHz.$

$SARAS\ [dBm\ /\ Hz] = -0.065676\ \log_{10}(f) - 248.8661\ for\ f \geq 2\ GHz.$

The values of (f) are to be in MHz.

(c)   The function is designated as the South African Radio Astronomy Service ("SARAS") protection levels.

(d)   The SARAS protection levels are reflected in Figure 1 below, together with the ITU interpolated continuum threshold levels of interference.

Figure 1. SARAS Protection Levels

(e)   Owing to the variety of units used within the electronic communications sector, the following list of unit conversions is provided (assuming an isotropic radiator):

$dB(W\ /\ m^2\ /\ Hz) \rightarrow dBm\ \ :\ \ SPFD - 20\log_{10}(f) + 10\log_{10}(\Delta f) + 188.5$

$dBm \rightarrow dBm\ /\ Hz\ \ :\ \ dBm - 10\log_{10}(\Delta f)$

$dBW \rightarrow dBm\ \ :\ \ dBW + 30$

$$dBW \rightarrow dB(W/m^2) \quad : \quad dBW + 20\log_{10}(f) - 158.5$$

The values of "f" and "Δf" are to be in Hz.

3.   Short title

These regulations are called the Radio Astronomy Protection Levels Regulations.