

NEW DATA BASE FOR FSS EARTH STATION ANTENNA PATTERNS

The XIX Meeting of the Permanent Consultative Committee: Radiocommunications,

DECIDES:

To request the Executive Secretary to send the attached Draft resolution inviting administrations to comment on the database format and structure to the XX Meeting of Permanent Consultant Committee III: Radiocommunications. The XX Meeting will continue developing a new resolution on the creation of a database for FSS earth station antenna pattern.

APPENDIX 1

DRAFT RESOLUTION FOR NEW DATA BASE FOR EARTH STATION ANTENNA PATTERNS USED IN THE FIXED-SATELLITE SERVICE

The XX Meeting of Permanent Consultative Committee III – Radiocommunications,

CONSIDERING:

- a) That CITEL administrations have a need to make calculations of interference levels for conducting fixed-satellite service (FSS) network coordinations and facilitating sharing between their FSS earth stations and between FSS earth stations and terrestrial services;
- b) That for these calculations, information on the earth station antenna patterns are needed;
- c) That earth station antenna characteristics, including either the measured radiation pattern of the antenna or the reference radiation pattern to be used for coordination, are part of the Appendix S4 data submitted to the ITU;
- d) That more detailed information on earth station antenna characteristics than that provided in the Appendix S4 data may be useful to CITEL administrations when considering the deployment of earth stations;
- e) That it is preferable this kind of information be made available in a common database to which all interested and involved administrations could access, and
- f) That this common database would only be feasible if some kind of standardization could be established for antenna pattern submission,

¹ Document PCC.III/doc.2112/01

RESOLVES:

1. To request the Executive Secretary of CITEL to establish, within a one-year period, a new database for FSS earth station antenna radiation pattern information such as measured patterns, theoretical patterns, sidelobe masks or sidelobe envelopes.
2. To allow the submission of any radiation pattern information to this database by any regulatory agency, satellite service provider, earth station equipment supplier or integrator, antenna manufacturer and others participating in CITEL.
3. To apply a standard file format for these pattern data submissions as described in ANNEX, identifying administration and manufacturer or supplier name in the comments (lines 2 or 3).

INVITES:

Regulatory agencies, satellite service providers, earth station equipment suppliers or integrators, antenna manufacturers and others participating in CITEL to supply the radiation pattern data of the antennas used by their FSS earth stations based on the standard file format.

ANNEX

DRAFT DATA FORMAT FOR EARTH STATION ANTENNA PATTERN

1. GENERIC DESCRIPTION

The basic file types considered here are block structured. These data blocks are detailed in the next sections.

In all files, HEADER has to be formatted in accordance with:

Line	Description / Content
1	Title
2	Comments
3	Comments
4	File identification code

Maximum number of characters:

- Title: 52 characters
- Comments: 80 characters

1.1. File identification code

Code	File type
200	3D Fields – co-polar, cross-polar
201	3D Fields – rectangular coordinates
202	3D Fields – cylindrical coordinates
203	3D Fields – spherical coordinates

NOTE: For the purpose of this application only File Code 200 will be considered and described in details

1.2. Block structured files

For the block structured files a fifth row has to be used containing the total number of blocks.

Line	Description / Content
5	Total number of blocks

After row 5 the sequence of blocks is included with the main function data.

A single file block has a generic structure as following:

<i>Control line</i>			
<i>n</i>	<i>m</i>		
$a_{1,1}$	$a_{1,2}$...	$a_{1,m}$
$a_{2,1}$	$a_{2,2}$...	$a_{2,m}$
...
...
$a_{n,1}$	$a_{n,2}$...	$a_{n,m}$

Where:

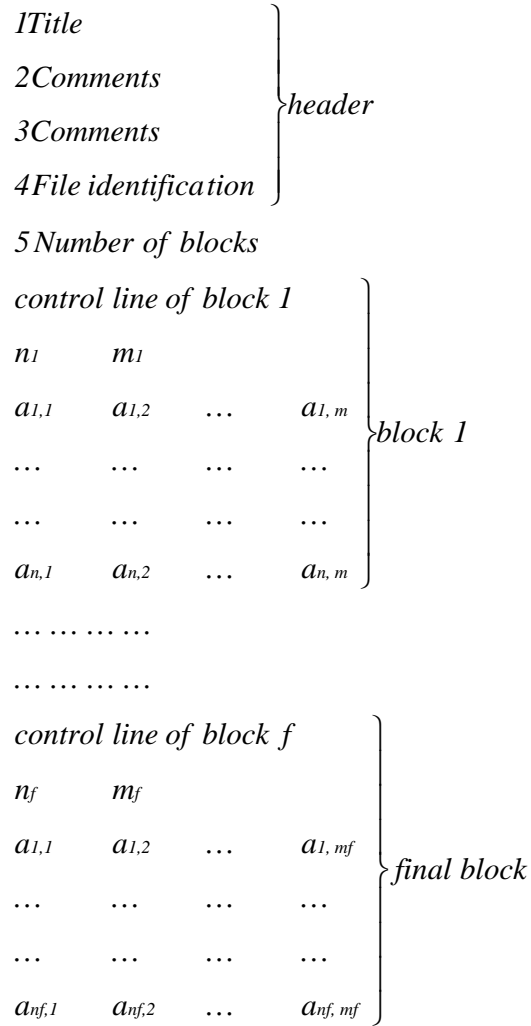
Control line = Contains relevant data concerning the specific block (see details in the following sections);

n = number of block rows,

m = number of block columns.

1.2.1. File general structure

The general structure of a block structured file is described as following:



2. 3D Fields - Block Structured Files

In this section the content of field data is described only for the file type 200 (**3D Fields – Co-polar and Cross-polar**). See figure 1 as a reference for parameters described below.

Title

Comments

Comments

id pol orientation freq

Number of blocks

$$\left. \begin{array}{cccc}
 \phi_k & r_j & & \\
 n & m & & \\
 \theta_1 & |C\alpha(\theta_1, \phi_k, r_j)| & \angle C\alpha(\theta_1, \phi_k, r_j) & |X(\theta_1, \phi_k, r_j)| \quad \angle X(\theta_1, \phi_k, r_j) \\
 \dots & \dots & \dots & \dots \\
 \dots & \dots & \dots & \dots \\
 \theta_n & |C\alpha(\theta_n, \phi_k, r_j)| & \angle C\alpha(\theta_n, \phi_k, r_j) & |X(\theta_n, \phi_k, r_j)| \quad \angle X(\theta_n, \phi_k, r_j)
 \end{array} \right\} \text{block}$$

Where:

- *id*, file identification, is 200,
- *pol*, antenna polarization, assumes values 1 (linear); 2 (circular/elliptical) or 0 (non determined),
- *orientation*:
 - when *pol* = 1, “orientation” indicates plane ϕ which contains the main component of the electric field (preferably 90°);
 - when *pol* = 2, “orientation” is 1 (for *left-hand* circular/elliptical polarization) , or 2 (for *right-hand* circular/elliptical polarization),
 - For non-determined cases use *pol* = 0 and orientation = 0;
- *freq*, frequency (in GHz). Not relevant in case of general sidelobe masks or envelopes.
- ϕ_k , pattern cut half plane angle ϕ (in degrees) , related to block data, (use $\phi = 90$ for **upper elevation** cut). Varies from 0 to 360°.
- θ_i , Angular direction (in degrees) relative to the antenna boresight ($\theta_i = 0^\circ$) which shall indicate satellite pointing and maximum gain direction.

- r_j , radial distance \mathbf{r} in meters related to specific block, (this value can be suppressed if data relates to far-field region)
- n , number of block rows, i.e., number of θ_i samples (where θ varies from 0 to 180°). Value of n shall be adequate to allow pattern resolution for data plotting or for use in coordination and interference calculations.
- m , number of block columns (for the 200 type file $m = 5$),
- $|Co(\theta_i, \phi_k, r_j)|$, co-polar field amplitude in dB or dBi, at the point (θ_i, ϕ_k, r_j) ,
- $\angle Co(\theta_i, \phi_k, r_j)$, co-polar field phase (in degrees), at the point (θ_i, ϕ_k, r_j) ,
- $|X(\theta_i, \phi_k, r_j)|$, cross-polar field amplitude in dB or dBi, at the point (θ_i, ϕ_k, r_j) ,
- $\angle X(\theta_i, \phi_k, r_j)$, cross-polar field phase (in degrees), at the point (θ_i, ϕ_k, r_j) ,

When amplitudes are indicated in dB, the antenna maximum gain (dBi) value must be supplied (use comments lines). When phase values are not available or not relevant, insert 0.0 (not blanks).

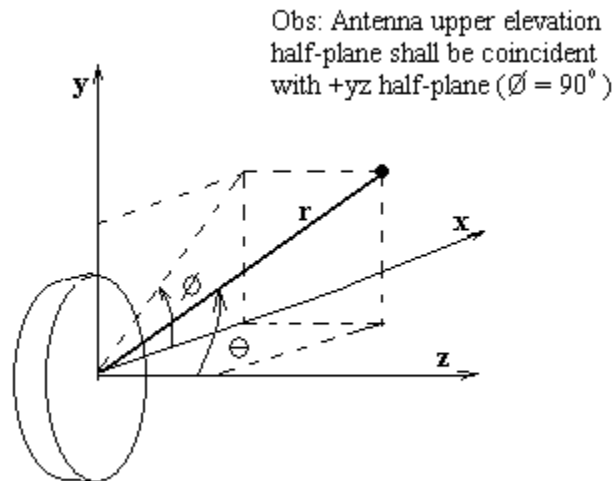


Figure 1 – Example of a reflector antenna in a spherical coordinate system as per the proposed standard file format