**LFMF-SmoothEarth (P.368) SOURCE CODE**

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**Description**

This package contains integral source code for Rec P.368, “Ground-wave propagation curves for frequencies between 10 kHz and 30 MHz”. The software was written is C++ using only the standard C++ languages libraries (such as math.lib). The software has been verified that is can be compiled on Windows 7/10.

The package consists of the following:

* LFMF Source: C++ source code for LFMF, v1.1

The source code contains an optional Microsoft Visual Studio 2019 project file with defined compiler settings. Variables are named in a "pseudo-LaTeX". In general, a single underscore ('\_') represents a

subscript, while a double underscore ('\_\_') is used to label the units

on the value.

The code contains a single function:

int LFMF(double h\_tx\_\_meter, double h\_rx\_\_meter, double f\_\_mhz, double P\_tx\_\_watt,

double N\_s, double d\_\_km, double epsilon, double sigma, int pol, Result \*result)

**Inputs**

* h\_tx\_\_meter: Height of the transmitter (m); 0 ≤ h\_tx\_\_meter ≤ 50
* h\_rx\_\_meter: Height of the receiver (m); 0 ≤ h\_rx\_\_meter ≤ 50
* f\_\_mhz: Frequency (MHz); 0.01 ≤ f\_\_mhz ≤ 30
* P\_tx\_\_watt: Transmit power (W); 0 < P\_tx\_\_watt
* N\_s: Surface refractivity (N-Units); 250 ≤ N\_s ≤ 400
* d\_\_km: Distance (km); d\_\_km ≤ 10 000
* epsilon: Relative permittivity on the surface of the Earth; 1 ≤ epsilon
* sigma: Conductivity (S/m) on the surface of the Earth; 0 < sigma
* pol: Polarization

**Assumptions**

The LFMF source code implements the same assumptions that are defined in Rec P.368, specifically, that the transmit and receive antennas are short vertical monopoles on a perfectly conducting ground plane. These antenna’s each have a gain of 4.77 dBi.

**Polarization**

The source code identifies the following polarization options:

|  |  |
| --- | --- |
| **Value** | **Interpretation** |
| 0 | Horizontal polarization |
| 1 | Vertical polarization |

**Output Structure**

* double A\_btl\_\_db: Basic transmission loss (dB)
* double E\_dbuVm: Electric field strength (dB(uV/m))
* double P\_rx\_\_dbm: Received Power (dBm)
* int method: Solution method

**Solution Method**

The source code identifies the following method used in the computation of the solution:

|  |  |
| --- | --- |
| **Value** | **Interpretation** |
| 0 | Flat Earth with curve correction |
| 1 | Residue series |

**Return Codes**

The source code returns the following integer return codes:

|  |  |
| --- | --- |
| **Value** | **Interpretation** |
| 0 | SUCCESS |
| 1000 | VALIDATION ERROR: h\_tx\_\_meter out of range |
| 1001 | VALIDATION ERROR: h\_rx\_\_meter out of range |
| 1002 | VALIDATION ERROR: f\_\_mhz out of range |
| 1003 | VALIDATION ERROR: P\_tx\_\_watt out of range |
| 1004 | VALIDATION ERROR: N\_s out of range |
| 1005 | VALIDATION ERROR: d\_\_km out of range |
| 1006 | VALIDATION ERROR: epsilon out of range |
| 1007 | VALIDATION ERROR: sigma out of range |
| 1008 | VALIDATION ERROR: invalid value for pol |

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