

High Frequency radio waves Propagation: AEROPVS024

High Frequency (HF) radio waves (3–30 MHz) propagate primarily via skywave, refracting off the ionosphere for long-distance, over-the-horizon communication. Tools like **vsTASKER** simulate this propagation—accounting for mountainous terrain, atmospheric layers, and solar conditions—to model specific telecommunication data transfer and link reliability.

Key Propagation Modes for HF

- **Skywave (Skip):** Signals are refracted by the ionized layers of the upper atmosphere (E and F layers), allowing waves to "bounce" back to Earth and travel thousands of kilometers. This is highly dependent on day/night cycles and solar activity.
- **Ground Wave:** Signals travel directly along the curvature of the Earth's surface. This mode works best at lower HF frequencies over highly conductive surfaces like saltwater.
- **Line-of-Sight (Direct):** The wave travels in a direct, unobstructed path from transmitter to receiver, though HF is rarely used for this due to the need for large antennas and limited bandwidth.

vsTASKER Simulation Applications

vsTASKER provides high-fidelity modeling and simulations that integrate radio propagation models with specific operational constraints. Its capabilities include:

- **Terrain Profiling:** Running predictive analyses over complex, irregular geographies (e.g., mountainous regions) to determine exact signal shadows and path loss.
- **Ionospheric Interactions:** Simulating how skywave propagation changes based on the time of day, frequency selection, and signal power.
- **Link Performance:** Testing different user-defined communication protocols to gauge exact data transfer rates, latency, and full/half-duplex operations.

Would you like to know more about the specific **ionospheric layers** that affect HF propagation, or are you interested in how **vsTASKER** configures specific **frequency and power parameters** for simulation?

High Frequency radio waves Propagation

by VirtualSim

Use of vsTASKER to simulate high frequency radio waves propagation on a mountainous terrain. The purpose of this simulation is to qualify telecommunications based on portable low powered (5-50 watts) radio equipment. Radio devices characteristics are used for transmission and reception capacities while radio waves physics are computed for propagation, attenuation, topographic obstructions (...) according to the emitting power, selected frequency and atmospheric settings.

With the received signal strength (RSS), we are able to evaluate the quality of the reception (SNR) and the effectiveness of the radio equipment for a specific configuration of use, either in urban area, semi-urban, open field, wide hilly terrain, coastal situation, etc.

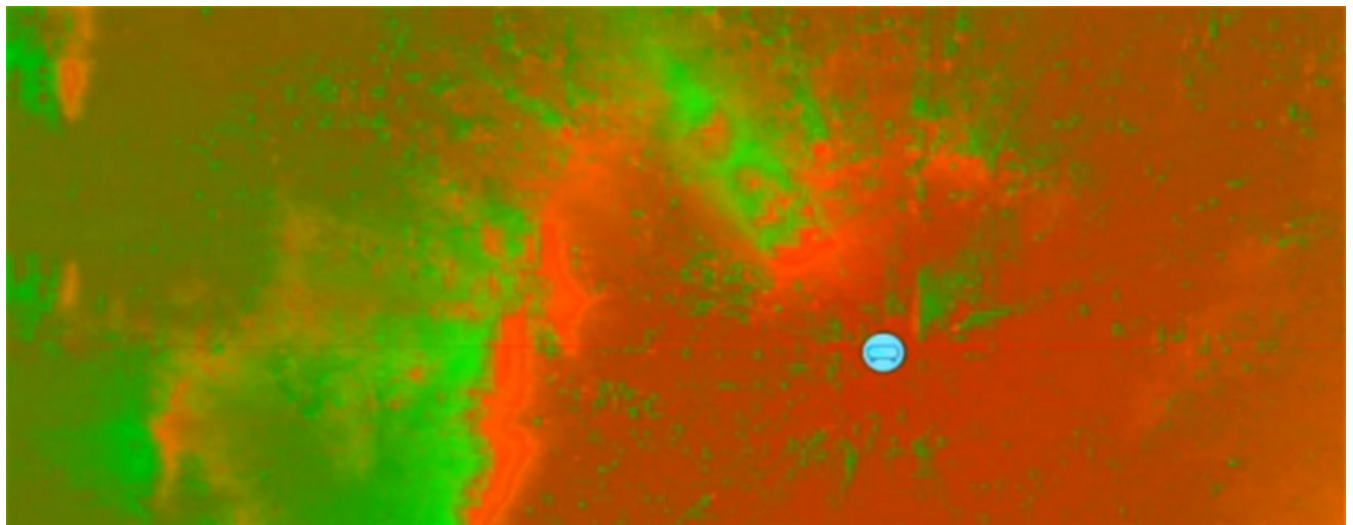
This prediction models combines the attenuation of the signal in free space with the attenuation sum based on ray-tracing mechanisms, to include the terrain and features obstruction and diffraction effects between the emitter and the receiver. Doing so, the terrain can change in real-time with immediate result on the signal strength. The terrain illumination shown in this demo is for validation of the prediction model. During a simulation run, only point to point link assessments are necessary.

Terrain illumination is not a real-time process. In this demo, the terrain is 1600 square kilometers and the accuracy is 100 meters. 16 millions of queries to the radio propagation prediction model are requested to produce a single image. The actual model is a point to point link prediction whose computation time depends greatly on the terrain profile between the two points (and the efficiency of the terrain server to respond to numerous ray-tracing calls).

Features:

- Radio wave propagation physics
- Real-time point-to-point signal attenuation prediction

- Radio network simulation
- Elevation data DTED
- Polygonal terrain (OSG, OpenFlt)
- Satellite communications
- Non real-time heatmap generation mechanism



OS & HARDWARE SUPPORT	INDUSTRY APPLICATION

Note: ** Specifications are copied from manufacturer data. Please contact before buying.