2021 NTIA Spectrum Policy Symposium

Standardizing Mid-Band Propagation Models

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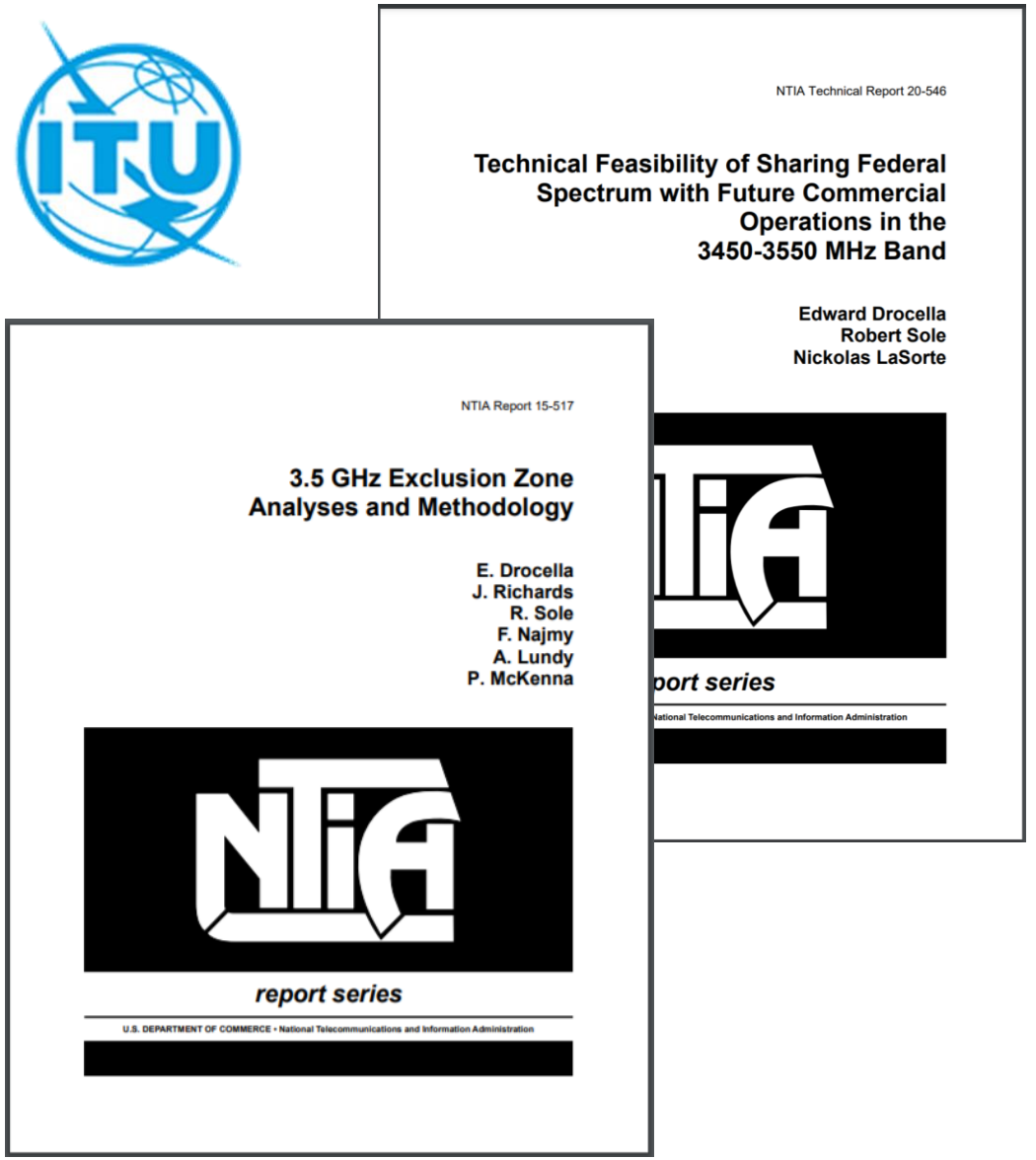
Background

- ITU-R Study Group 3 (Radiowave Propagation): ITS leads process of technical inputs, negotiation, and development of ITU Recommendations
- National spectrum policy and management: ITS provides technical expertise to build consensus on appropriate propagation models
  - NTIA-led Inter-agency (3.5 GHz and 3.4 GHz JWG) spectrum-sharing feasibility studies
  - Industry-government spectrum-sharing technology development, e.g., CBRS SAS and ESC
  - Inter-agency spectrum-sharing technology development, e.g., DSO SST&D AWS-3 portal



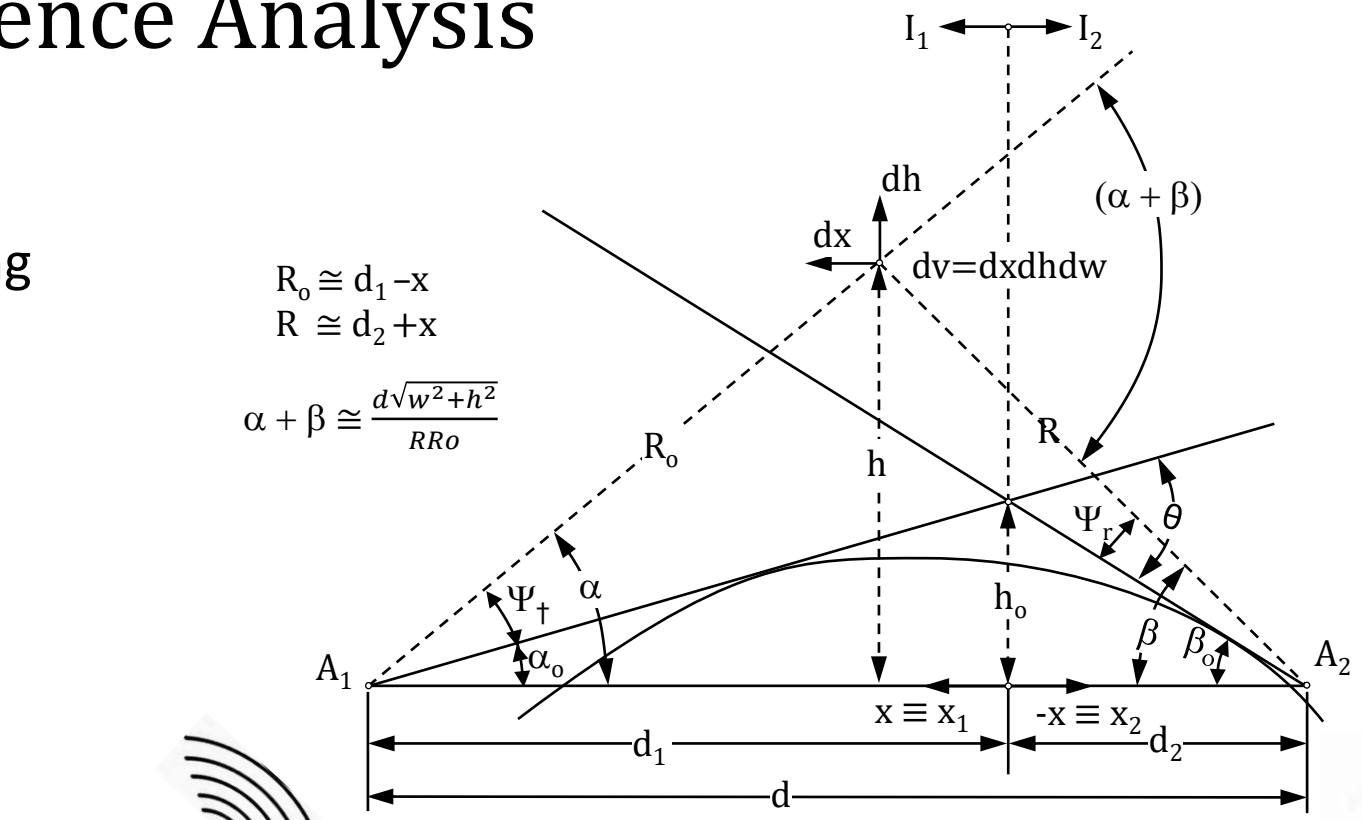
Use Case: Interference Analysis

- Long-distance over-the-horizon propagation involving terrain diffraction and troposphere forward scattering
- Clutter propagation loss due to man-made and natural obstacles
- Propagation models are statistical

$R_o \cong d_1 - x$

$R \cong d_2 + x$

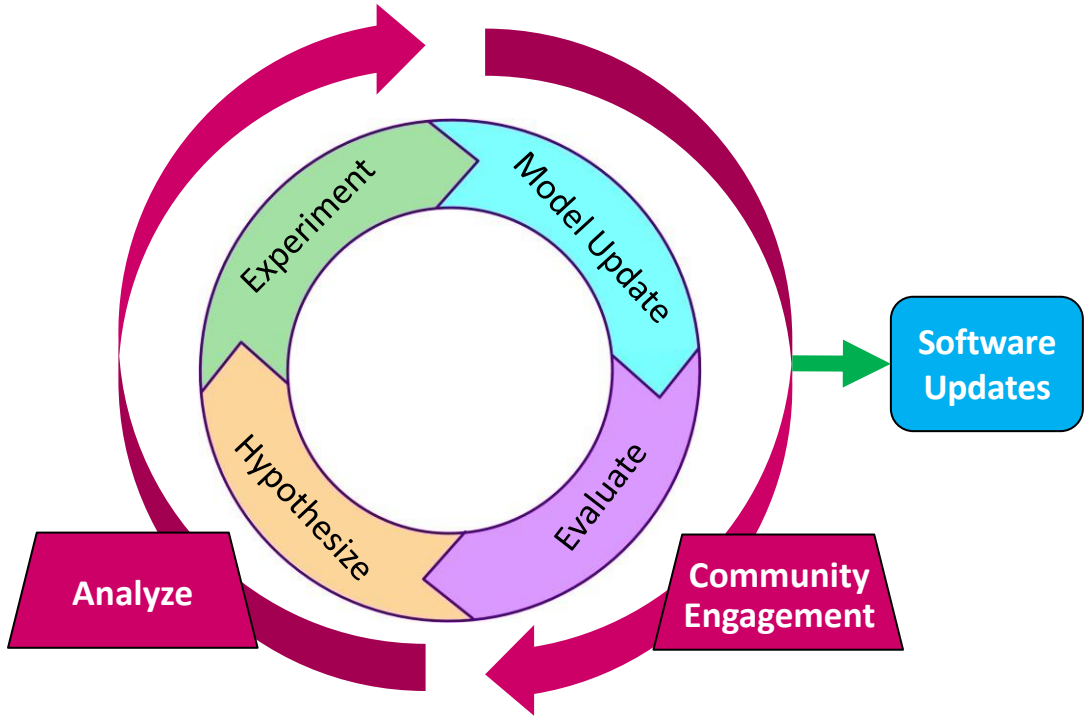
$\alpha + \beta \cong \frac{d\sqrt{w^2+h^2}}{RRo}$



Overarching Philosophy

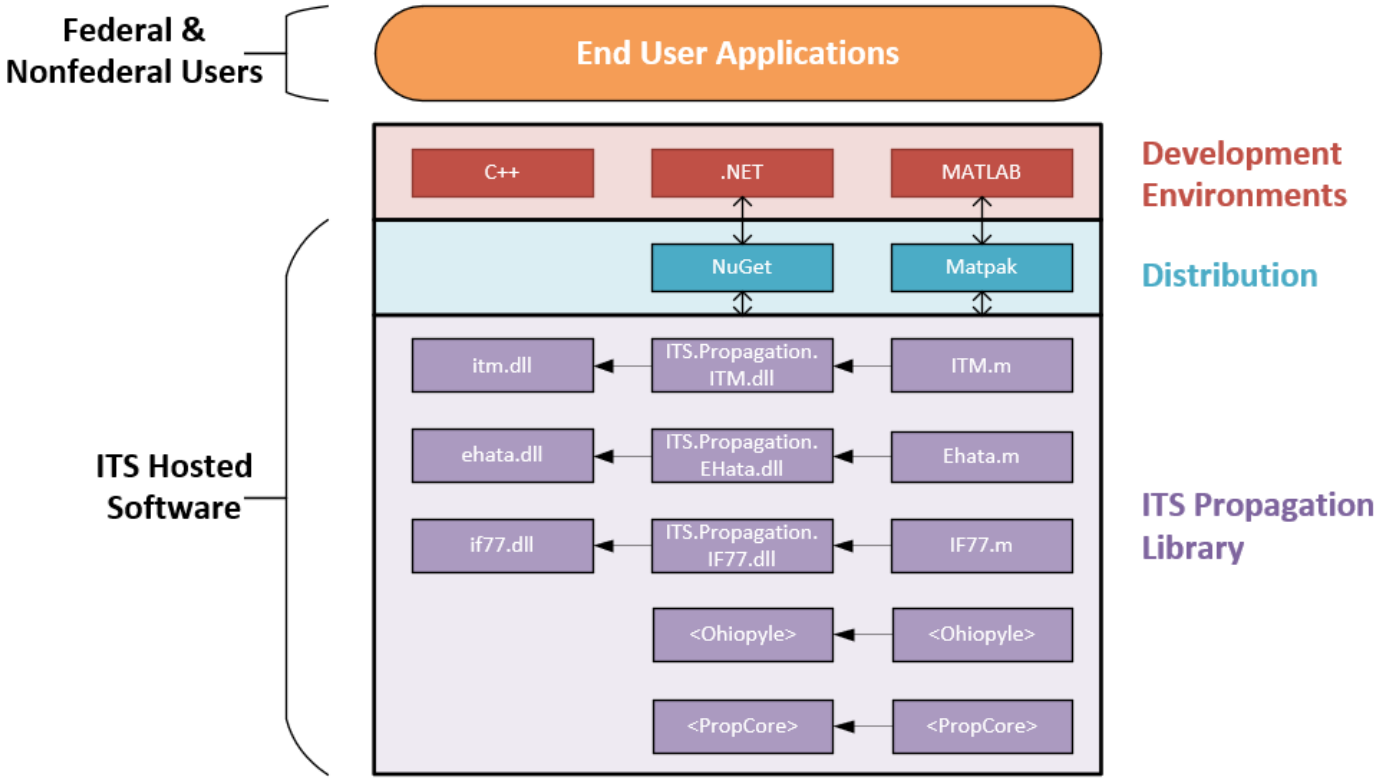
https://github.com/NTIA

- Bring the spectrum community together in an open collaborative way
- Focus collective effort to improve modeling
- Maintain a rigorous scientific process for improvements



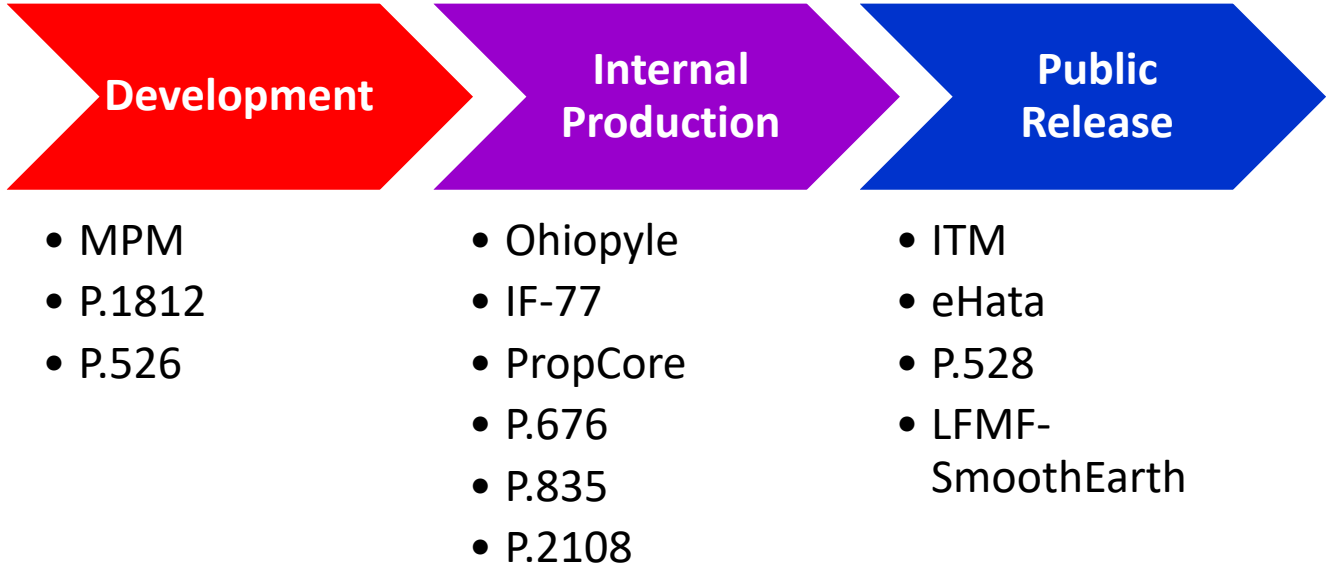
ITS Propagation Code Library (proplib)

- Unified Code Base
  - Common across all languages/platforms
  - Wrapper code to expose functionality into additional languages
- Trusted Foundation
  - Theoretical underpinnings backed by publications
  - Software integrity through code signing and package distribution
- Community Engagement
  - Google/WInnForum GitHub interactions
  - ICAO adopting P.528 and requesting improvements
  - Ofcom Switzerland pull request for LFMF



Software Maturity Pipeline

- Development
  - Actively being developed
  - Locally published (restricted users)
- Internal Production
  - Suitable for stable development
  - Published NTIA-wide
- Public Release
  - Fully open-source software
  - Publicly supported



New Mid-Band Propagation Model Initiative

- Sponsor: DOD/CIO (Spectrum Relocation Fund)
- Goal: To establish an improved and community-accepted mid-band (i.e., 3100–4200 MHz) radio frequency propagation model framework to predict basic transmission loss for a diverse range of link geometries, e.g., clutter, terrain, air/ground, over-water, long distance
- Period of performance: 5 years, start Oct 21
- ITS Program Manager: Billy Kozma (wkozma@ntia.gov, 303-497-6082)
- Three phases:
  - Phase 1 (FY22): Planning, Initial Measurements, Prototyping, and Program Design
  - Phase 2: Extended Capability Measurements, and Data Analysis
  - Phase 3: Model Development
- Approach:
  - Model development priorities will drive experimental design and measurement requirements
  - Experimental results and measurement validations will drive model updates

Expanded Outreach

Red Team

- Propagation expert group consisting of broad coalition organizations across government, industry, and academia
- Purpose: Peer review and collaboration to build consensus during all stages of program execution
  - Debate model development priorities
  - Review measurement plans and results
  - Provide critical review of modeling progress
  - Develop proplib use cases and end-user apps
  - Contribute in-kind and complimentary theory and data when available

Propagation Stakeholders Group

- Open webinars, meetings at events, and Requests for Information (RFI)
- Purpose:
  - Provide updates on modeling and measurement plans, conclusive results from on-going experiments, updates on resultant propagation codes
  - Get feedback and recommendations from community