

# **SECTION 1 INTRODUCTION**

## **1.1 BACKGROUND**

The National Telecommunications and Information Administration (NTIA) Phase 1 Study of Access Broadband over Power Line (BPL) systems summarized federal use of the 1.7 – 80 MHz frequency range, presented measurement and modeling results for BPL emissions, defined interference risks to radio reception in the immediate vicinity of overhead power lines used by Access BPL systems, suggested refinements to Part 15 measurement guidelines applicable to BPL systems, and identified means for mitigating local interference should it occur.<sup>[1]</sup> Propagation and aggregation of emissions from BPL systems and the associated BPL deployment models were suggested as issues requiring further study.

In comments and staff correspondence filed in response to the Federal Communications Commission (Commission or FCC) BPL Notice of Proposed Rulemaking (BPL NPRM), NTIA provided a preliminary analysis to support recommendations for refinements in the rules and measurement guidelines.<sup>[2]</sup> In its comments, NTIA proposed a number of refinements to the measurement guidelines for BPL systems, such as the measurement locations along the power line, away from the power line, and at various measurement antenna heights. NTIA's preliminary analysis of these proposals confirmed that the measurement guidelines defined in the BPL NPRM strike a reasonable balance between measurement simplicity, accuracy and repeatability. NTIA also presented a worst-case analysis of ionospheric propagation and aggregation of emissions from wide scale deployment of Access BPL systems. This preliminary analysis showed that aggregation of BPL emissions via ionospheric propagation was not a near term problem; however, NTIA indicated that it would continue to study this issue. Finally, NTIA continued to evolve its analysis of interference risks to nearby radio receivers and proposed a framework for protection of critical federal radiocommunications.

## **1.2 OBJECTIVES**

The NTIA Phase 2 Study is intended to provide additional technical background for the rules and measurement guidelines for Access BPL systems. This report combines the preliminary Phase 2 analyses presented in other NTIA contributions in the FCC's BPL proceeding with additional analyses that extend both the depth and scope of the earlier work. It also offers a case study of calculated emission levels from a model of an actual BPL network for the purpose of demonstrating the effectiveness of the BPL rules and measurement guidelines adopted by the FCC in its BPL Report and Order.<sup>[3]</sup> This case study includes an analysis of the risk of interference that a representative BPL network might present to nearby radiocommunications.

### **1.3 APPROACH**

NTIA simulated a variety of power line structures using the Numerical Electromagnetic Code (NEC) software package and determined the expected field strength over a range of distances from the power line, along the length of the power line, and at various heights above the ground.<sup>[4]</sup>

The NEC simulations were used to evaluate the effectiveness of the FCC's recently adopted measurement guidelines at achieving a reasonable level of measurement accuracy with a practical number of measurements as discussed in Section 2.

In Section 3, the interference risk to fixed and mobile base station receivers from nearby BPL devices was analyzed to formulate suitable radii recommendations for exclusion zones and consultation areas.

Using an NEC model of an elaborate power line structure, NTIA applied the measurement guidelines adopted in the BPL Report and Order to evaluate their effectiveness as a means to limit the interference risk associated with these emissions to nearby radiocommunications as discussed in Section 4.

Based on the rules and measurement guidelines for Access BPL systems, NTIA updated and expanded upon its evaluation of the aggregation of their emissions via ionospheric propagation using the Voice of America Coverage Analysis Program (VOACAP) High Frequency (HF) propagation software package as discussed in Section 5.<sup>[5]</sup>

Finally, a summary of the results from these analyses is provided Section 6.

Supplemental data from these analyses are provided in Appendices A through D contained in Volume II of this report.