Broadband over Power Line (BPL) Equipment Authorization - Detailed

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BPL Rules

- R&O (FCC 04-245) - New Part 15 Subpart G

  http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-04-245A1.pdf

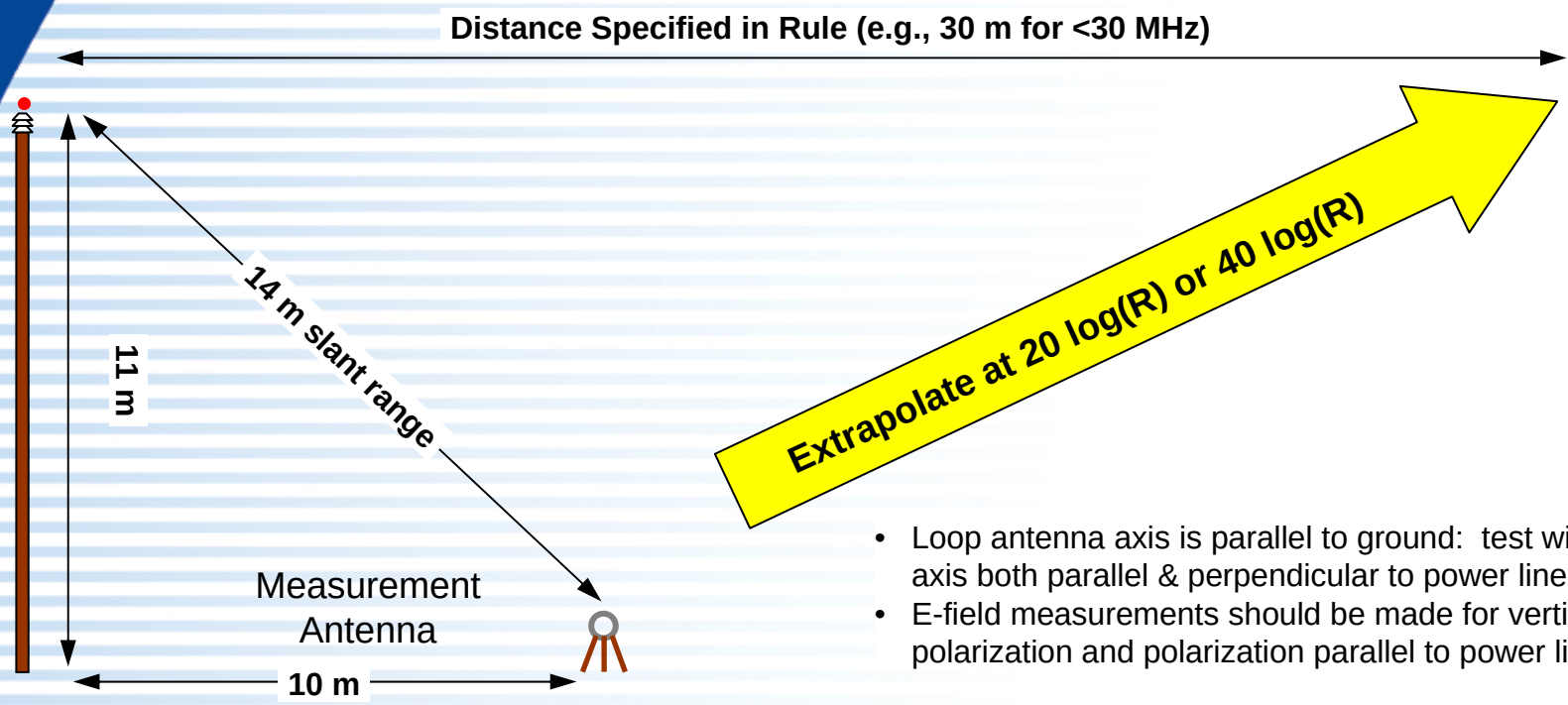
  Measurement procedures in Appendix C

  Erratum DOC-254180A1.doc
- Transition Provisions
  - New equipment must comply by July 7, 2006
  - Equipment installed by this date may operate for duration of useful life if there are no reported instances of harmful interference
- Currently, TCBs cannot authorize Access BPL devices

BPL General Information

- Access BPL - EUT defined as device (not system) requiring Certification
  - May include the electronic equipment enclosure, coupling device, and medium voltage lines that are injected (Phase and neutral if both are injected)
  - Pole ground wires not considered to be part of EUT
- All BPL system components require separate certification
- Overhead line distance correction based on Slant Range distance - measurement antenna to the closest part of the EUT

Slant Range Distance



- Loop antenna axis is parallel to ground: test with axis both parallel & perpendicular to power line
- E-field measurements should be made for vertical polarization and polarization parallel to power line

- **Preferred Measurement Distance: 10 meters horizontal**
- **Extrapolate to specified distance using slant range - overhead lines**
- 40 log(range) below 30 MHz
- 20 log(range) above 30 MHz

Operational Description

- Describe device function – injectors, extractors, repeaters, boosters, concentrators, couplers, etc.
- Describe BPL coupling of the medium voltage line (if applicable) distribution to customer premises (coupled around low voltage transformer, directly through the low voltage transformer, IEEE 802.11, other)
- Technical Characteristics - Frequency range(s), BW, Modulation, variable power setting, notch filtering, duty factor, data rates, etc.
- Configuration – setup and control, signal routing, how is device used in a BPL system
- Notch Capabilities – frequencies, 20dB BW, control, cold power-up defaults

Test Site Description

- In-Situ Testing (Part 15.31(d))– three typical overhead line installations and three typical underground line installations

- Overhead Line – photos showing unobstructed access to pole containing electronic enclosure and couplers
  - Demonstrate that for medium voltage lines measurements can be made for distance of 1 wavelength (mid-band) at a minimum 10m horizontal distance from the power line

- Underground Line – photos showing that the selected transformer is away from cable TV and telephone utility connection boxes (as best as possible)
  - 16 radials (as best as possible)

Test Setup Description

- In-situ testing does not require FCC approved test lab but

  Plot showing ambient conditions (recommended since noisy conditions cause inconclusive QP measurements)

  Antennas

  – Loop antennas: 1m antenna height, maximized from parallel to line to 90 degrees (perpendicular to line)
    - Active Loop < 30 MHz
    - Passive Loop < 30 MHz
  – Bicon > 30 MHz: Scan from 1 to 4m antenna height, H & V polarization

  External Amplifiers, low-pass and high-pass filters used to reduce AM/FM & TV broadcast band effects

Test Setup Description (Con't.)

- Describe how the maximum or near-maximum RF injection duty factor is achieved – either by creating data flow through the system or by use of a test mode
  - Data Burst Rate (description or plot)
    - 20 Hz minimum burst rate as specified in Part 15.35 (Note) Otherwise, a peak detector must be used
- Measurement distances along power line at 0, 1/4,1/2, 3/4, and 1 wavelength down the line from device, based on the mid-band frequency and any adjustments
  - Additional measurement positions are required if the mid-band frequency exceeds the lowest injection frequency by more than a factor of 2

Test Report

- Conducted emissions not required
- Radiated Emission Limits
  - Section 15.209 at frequencies < 30 MHz
  - Section 15.109 at frequencies > 30 MHz

  Note: Class A limits may be used if applicable
- QP measurements
  - Maximize the BPL data rate for uplink and downlink
  - Report the six highest radiated emissions relative to the limit
  - Sweep the band that includes the maximum emissions (Note: maximum 50 kHz sweeps for QP measurements < 30 kHz (9kHz RBW))

Test Report (Con't)

- The measurement procedures for medium voltage lines and low voltage lines are identical. Medium and low voltage lines (if applicable) must both be tested

Access BPL Certification – equipment class BPL

- FCC ID/Location – no special requirements
- Attestation Statement(s)
- External Photos
- Block Diagram
- Test Report
- Test Set-up Photos – all in-situ sites
- User's Manual – not sold to general public
  - Compliance instructions to utility operator OR Compliance letter exhibits for notch capability, power-up defaults, etc.
- Internal Photos
- Detailed Operational Description

Questions and Answers

Thanks!