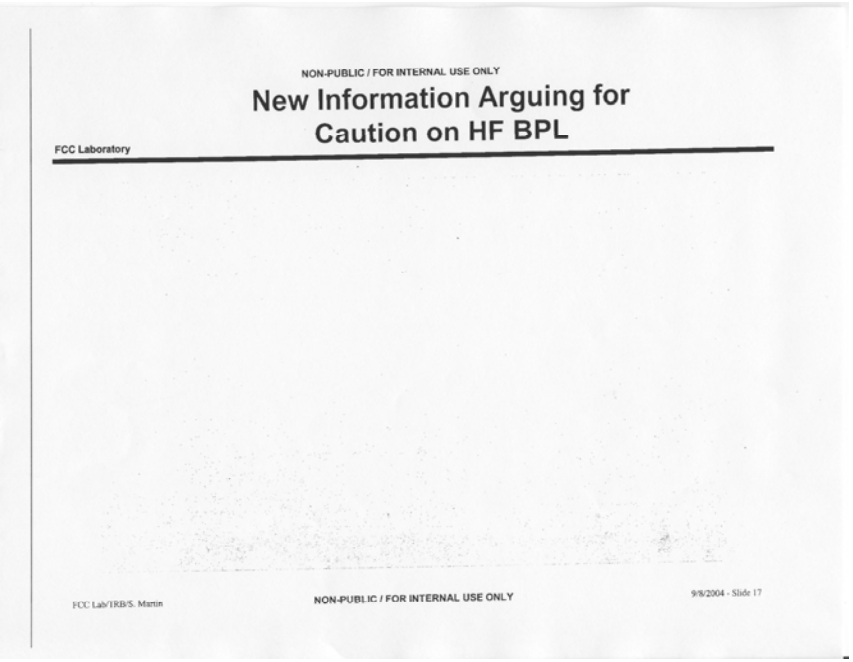
Arguing for Caution – Redacted Version



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New Information Arguing for Caution on HF BPL

FCC Laboratory

FCC Lab/ERB/S. Martin

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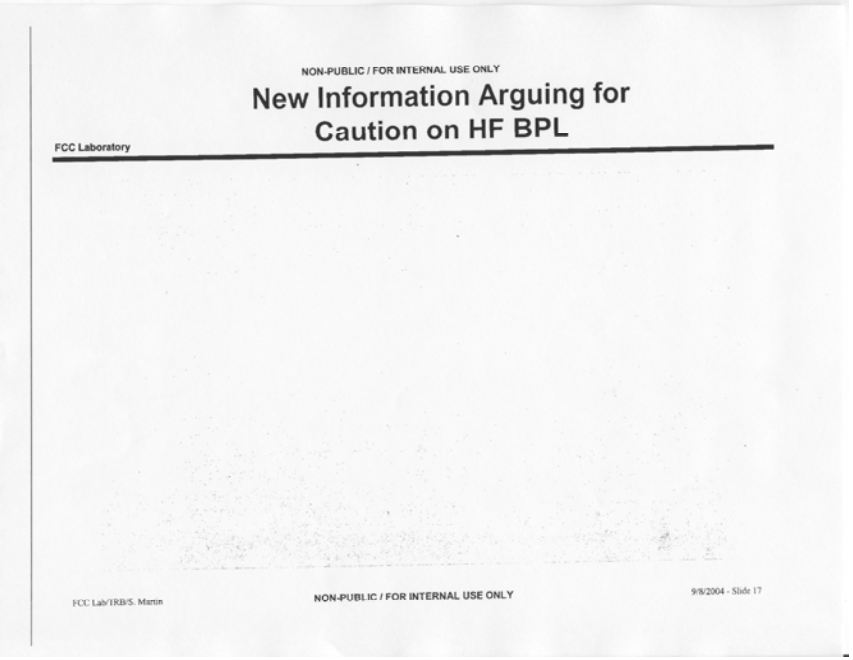
Redacted vs. Unredacted



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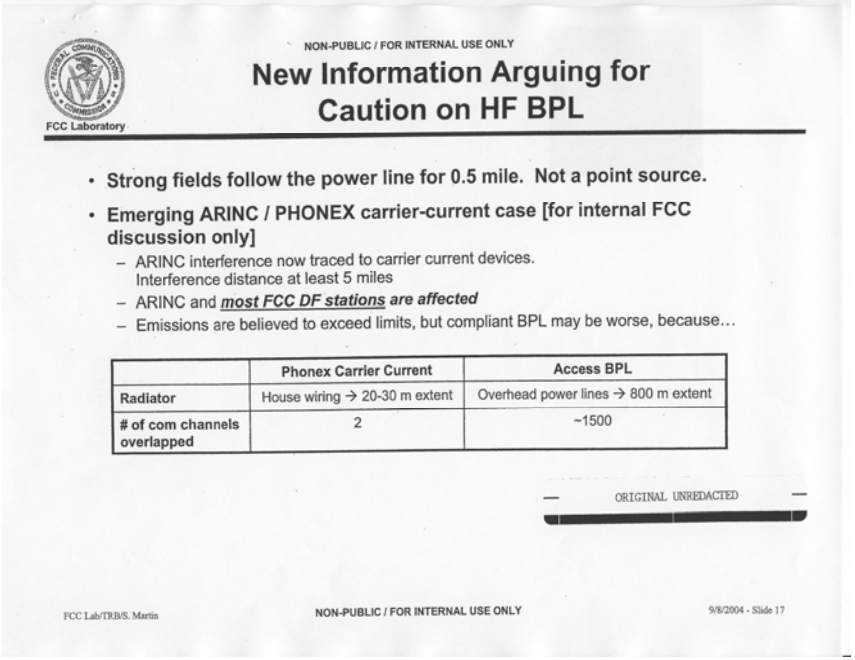

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New Information Arguing for Caution on HF BPL

FCC Laboratory

- **Strong fields follow the power line for 0.5 mile. Not a point source.**
- **Emerging ARINC / PHONEX carrier-current case [for internal FCC discussion only]**
  - ARINC interference now traced to carrier current devices. Interference distance at least 5 miles
  - ARINC and ***most FCC DF stations*** ***are affected***
  - Emissions are believed to exceed limits, but compliant BPL may be worse, because…

	Phonex Carrier Current	Access BPL
Radiator	House wiring → 20-30 m extent	Overhead power lines → 800 m extent
# of com channels overlapped	2	~1500

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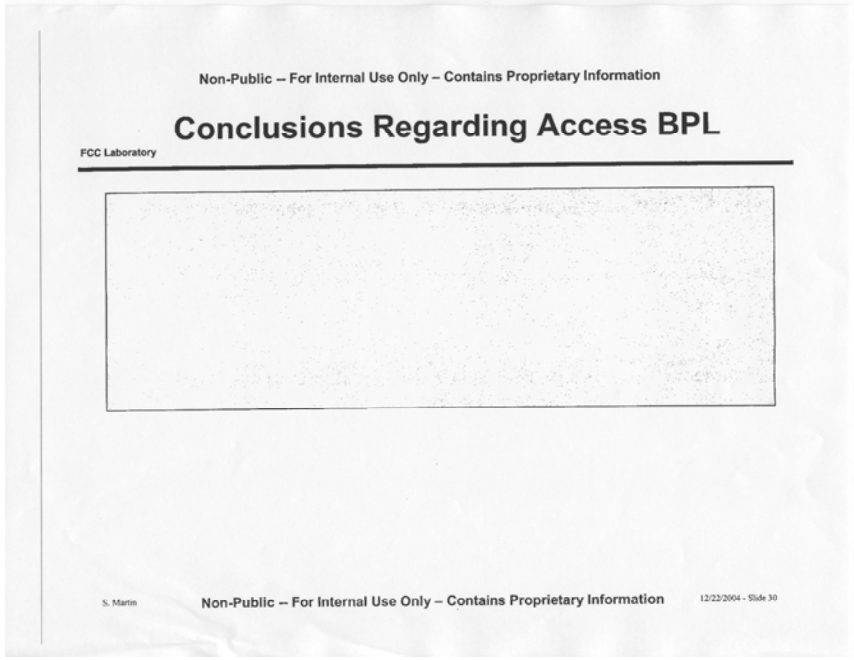
Access BPL Conclusions



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Conclusions Regarding Access BPL

FCC Laboratory

S. Martin

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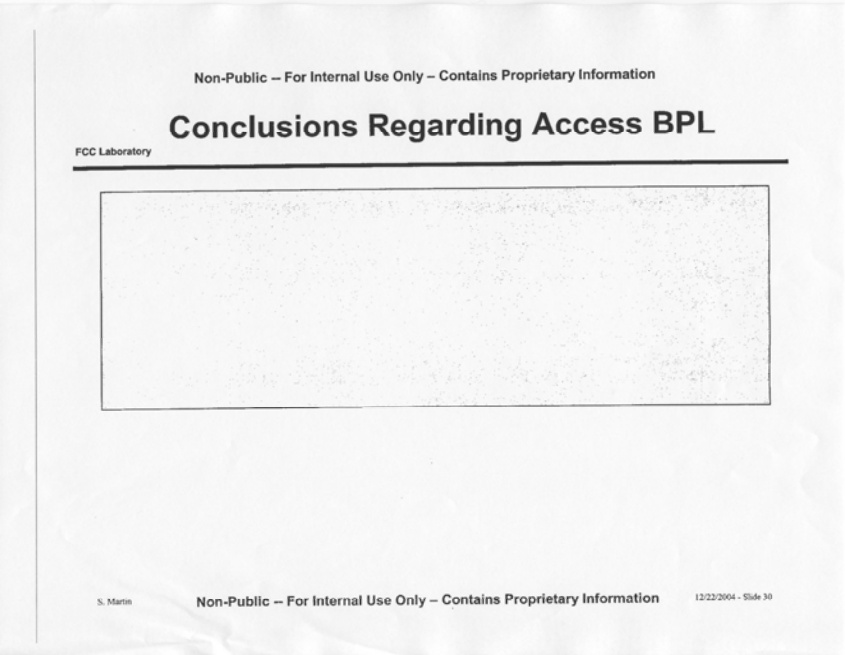
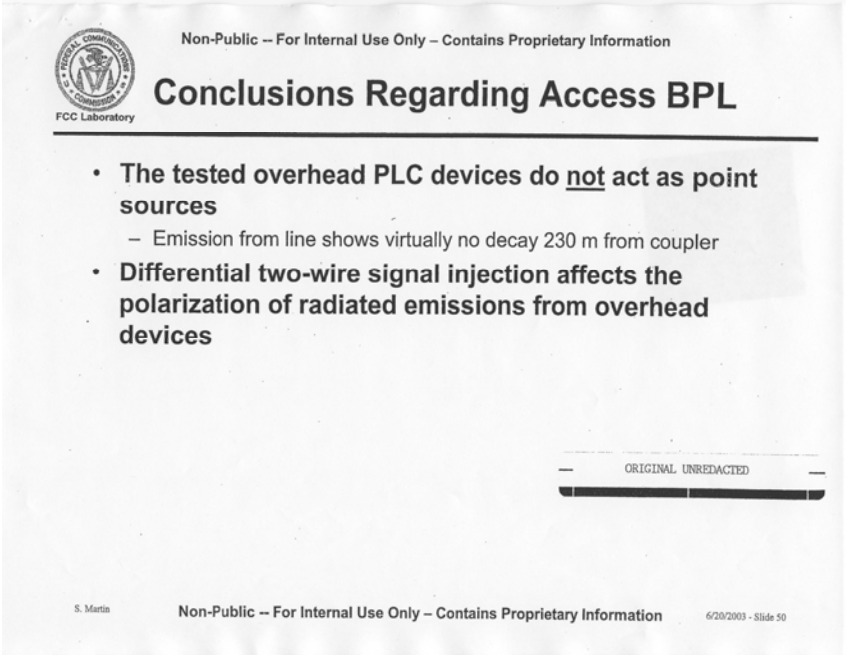
Redacted vs. Unredacted





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Conclusions Regarding Access BPL

- **The tested overhead PLC devices do not act as point sources**
  - Emission from line shows virtually no decay 230 m from coupler
- **Differential two-wire signal injection affects the polarization of radiated emissions from overhead devices**

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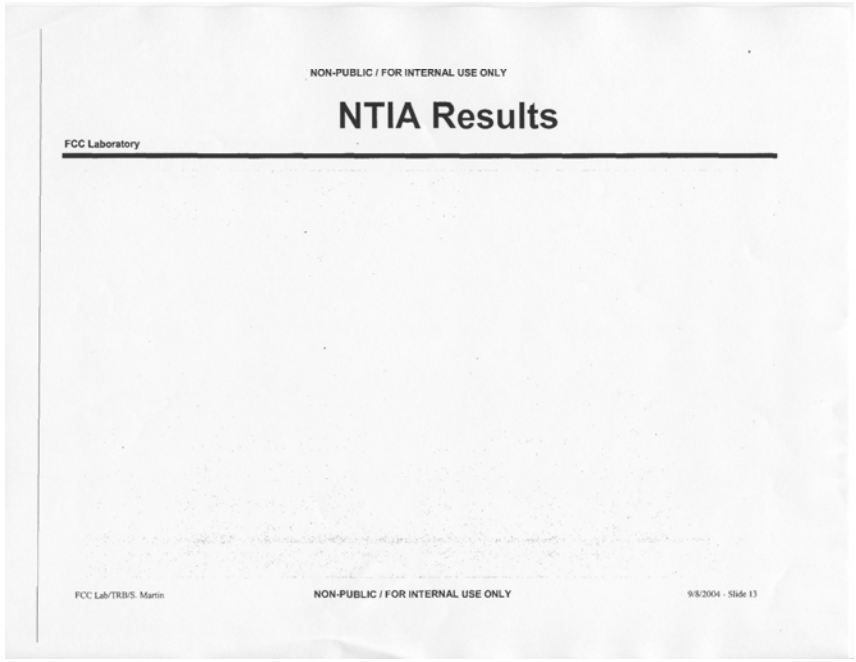
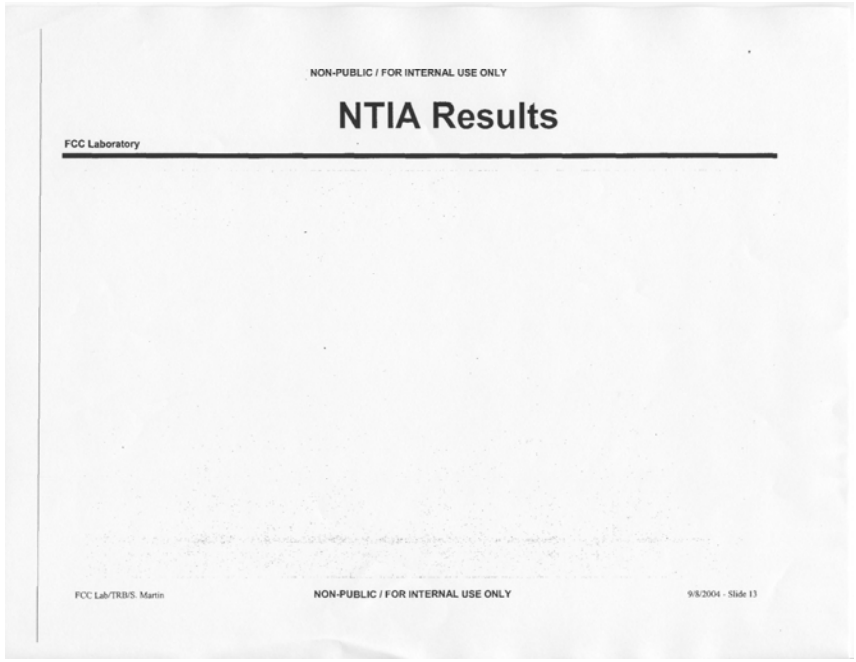
NTIA Results – Redacted Version



Redacted vs. Unredacted



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NTIA Results

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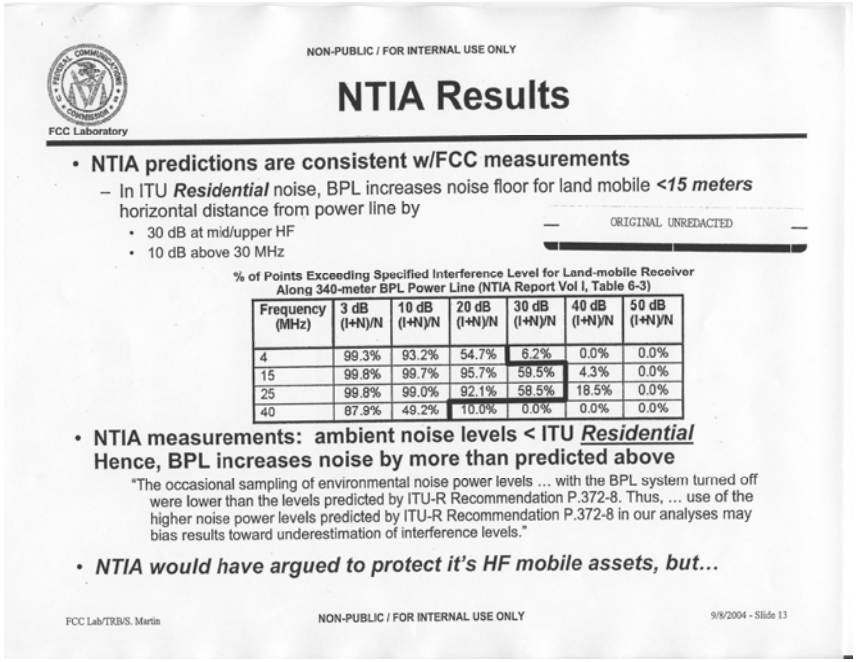

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NTIA Results

FCC Laboratory

- **NTIA predictions are consistent w/FCC measurements**
  - In ITU ***Residential*** noise, BPL increases noise floor for land mobile ***<15 meters*** horizontal distance from power line by
    - 30 dB at mid/upper HF
    - 10 dB above 30 MHz

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% of Points Exceeding Specified Interference Level for Land-mobile Receiver Along 340-meter BPL Power Line (NTIA Report Vol I, Table 6-3)

Frequency (MHz)	3 dB (I+N)/N	10 dB (I+N)/N	20 dB (I+N)/N	30 dB (I+N)/N	40 dB (I+N)/N	50 dB (I+N)/N
4	99.3%	93.2%	54.7%	6.2%	0.0%	0.0%
15	99.8%	99.7%	95.7%	59.5%	4.3%	0.0%
25	99.8%	99.0%	92.1%	58.5%	18.5%	0.0%
40	87.9%	49.2%	10.0%	0.0%	0.0%	0.0%

- **NTIA measurements: ambient noise levels < ITU *Residential***
  Hence, BPL increases noise by more than predicted above

  "The occasional sampling of environmental noise power levels … with the BPL system turned off were lower than the levels predicted by ITU-R Recommendation P.372-8. Thus, … use of the higher noise power levels predicted by ITU-R Recommendation P.372-8 in our analyses may bias results toward underestimation of interference levels."

- ***NTIA would have argued to protect it's HF mobile assets, but…***

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FCC Laboratory

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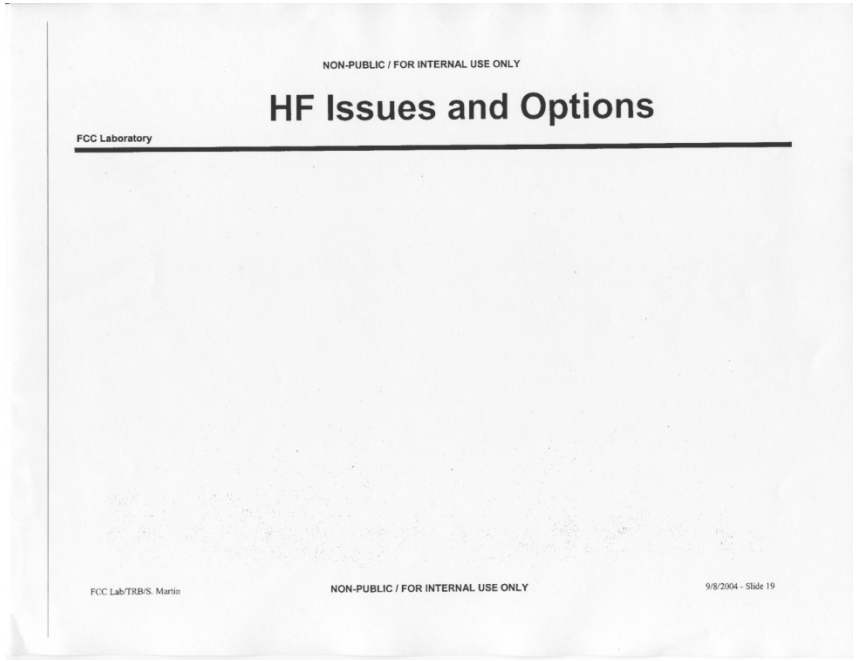
HF Options – Redacted Version



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HF Issues and Options

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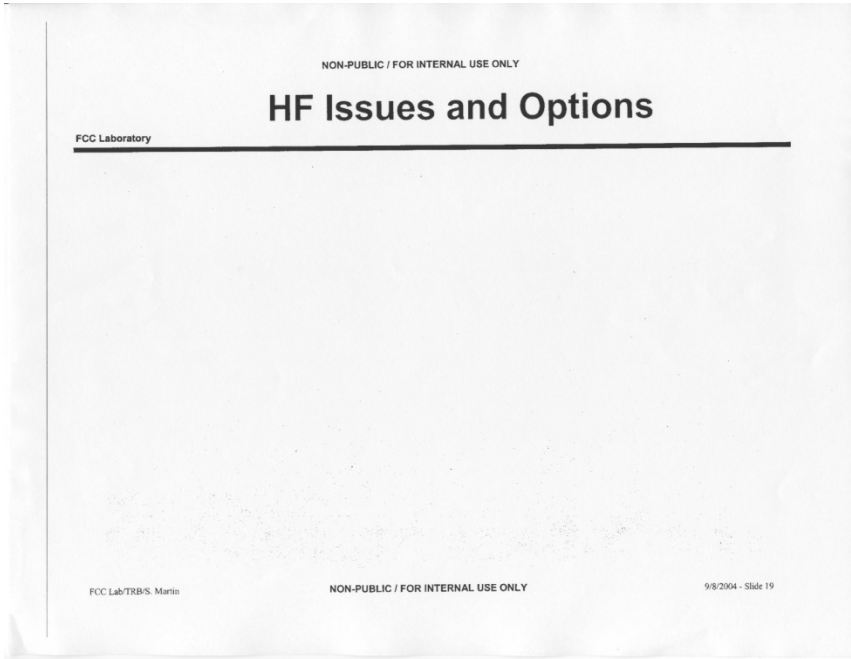
Redacted vs. Unredacted



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FCC Laboratory

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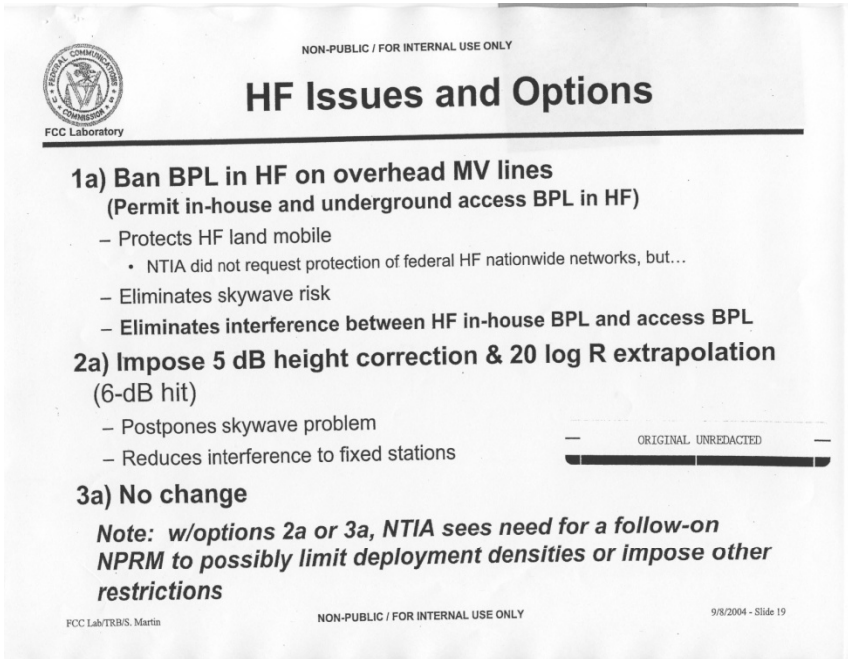

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HF Issues and Options

FCC Laboratory

1a) Ban BPL in HF on overhead MV lines
(Permit in-house and underground access BPL in HF)
- Protects HF land mobile
  - NTIA did not request protection of federal HF nationwide networks, but…
- Eliminates skywave risk
- **Eliminates interference between HF in-house BPL and access BPL**

2a) Impose 5 dB height correction & 20 log R extrapolation
(6-dB hit)
- Postpones skywave problem
- Reduces interference to fixed stations

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3a) No change

Note: w/options 2a or 3a, NTIA sees need for a follow-on NPRM to possibly limit deployment densities or impose other restrictions

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FCC Laboratory

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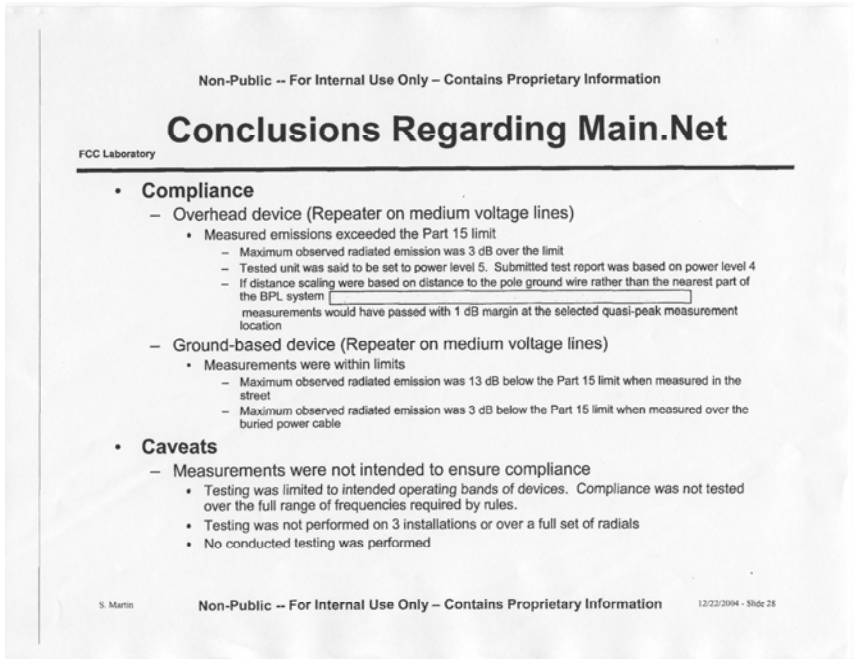
Main.net



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Conclusions Regarding Main.Net

FCC Laboratory

- **Compliance**
  - Overhead device (Repeater on medium voltage lines)
    - Measured emissions exceeded the Part 15 limit
      - Maximum observed radiated emission was 3 dB over the limit
      - Tested unit was said to be set to power level 5. Submitted test report was based on power level 4
      - If distance scaling were based on distance to the pole ground wire rather than the nearest part of the BPL system [redacted] measurements would have passed with 1 dB margin at the selected quasi-peak measurement location
  - Ground-based device (Repeater on medium voltage lines)
    - Measurements were within limits
      - Maximum observed radiated emission was 13 dB below the Part 15 limit when measured in the street
      - Maximum observed radiated emission was 3 dB below the Part 15 limit when measured over the buried power cable
- **Caveats**
  - Measurements were not intended to ensure compliance
    - Testing was limited to intended operating bands of devices. Compliance was not tested over the full range of frequencies required by rules.
    - Testing was not performed on 3 installations or over a full set of radials
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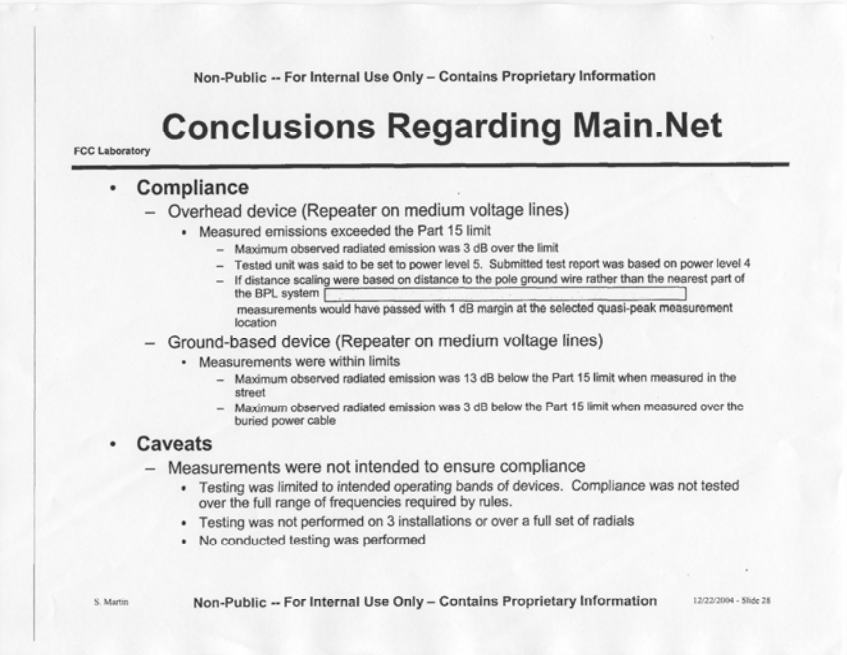
Redacted vs. Unredacted



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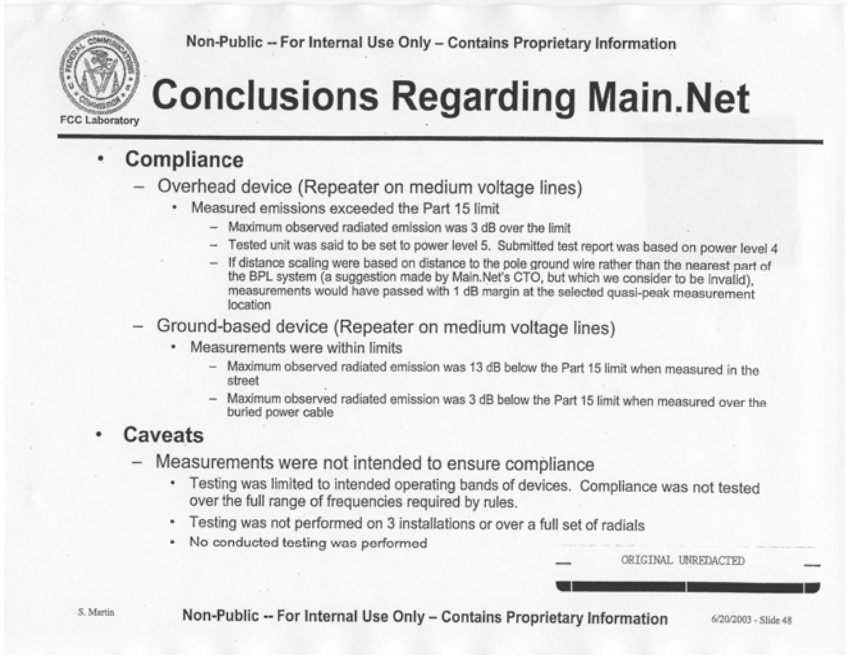

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