Project: IEEE P802.15 Working Group for Wireless Personal Area Networks

Submission Title: [FCC's Notice of Proposed Rule Making]
Date Submitted: [July 17, 2007]
Source: [Abbie Mathew] Company [NewLANS, Inc.]
Address [43 Nagog Park, Suite 200, Acton, MA 01720, U.S.A.]
Voice: [(617) 283-1363], E-Mail: [amathew@newlans.com]

Re: []

Abstract: [Update on FCC's NPRM to amend rules under Part 15.255]

Purpose: [Contribution to 802.15 SG3c at July 2007 plenary in San Francisco]

What is NPRM?

- Notice of Proposed Rule Making
  - ET Docket No. 07-113
- Created by the U.S. Congress under Administrative Procedure Act (APA)
- Forces Federal agencies to listen to comments and concerns of institutions and individuals affected by the rules
- Comment phase duration is 90 days from the date the NPRM appears in the Federal Register
  - Published daily
  - Contain publications and notices of Federal agencies
  - NPRM (ET Docket No. 07-113) will tomorrow in Federal Register
  - Comments due on October 17

Background

- WCAI filed a petition to the FCC for rule making on September 30, 2004
- Presented [15-05-0054-00] at IEEE plenary in Monterey, CA, on January 17, 2005
- Industry position to the petition filed
  - Against: IEEE, SiBEAM, Rory Van Tuyl
  - For: WCAI, Bridgewave, Proxim, CGI, Yipes
- FCC just released NPRM (see 2007-097) for comments from the industry
  - Agreed to all of WCAI's petition
  - Requires comments from the industry before final rules are passed

Format of the Presentation

For each rule….

1) Existing rule
2) Proposed rules
3) Comments required

Rule #1

Existing Rules on Emission Limits

Current Rules

- Average power density ≤ 9 μW/cm^2 at 3 m → 40 dBm EIRP
- Peak power density ≤ 18 μW/cm^2 at 3 m → 43 dBm EIRP
- Peak power into antenna ≤ 500 mW (27 dBm)

Reason

- Prevent interference between unlicensed devices
- Put a limit on a device with low antenna gain (i.e. omni)

Rule #1

Proposed Rules on Emission Limits

Proposed Rules

- Average EIRP to “82 dBm less 2 dB for every dB that the systems’ antenna gain is below 51dBi”
- Peak EIRP to “ 85 dBm less 2 dB for every dB that the systems’ antenna gain is below 51 dBi”
- Applicable for high gain outdoor or window link

Reason

- High gain antenna reduces probability of low power omni directional system located within its beam
- Emissions from high gain outdoor system attenuated by obstacles to affect indoor low gain system
- O_2 absorption and rain attenuation further reduces emissions of outdoor system

Rule #1

Comments on Emission Limits

Comment on ….

- modifying the emission limit for very high gain antenna
- interference concerns along with methods that may be suitable for mitigating such concerns
- feasibility of using extremely high gain antenna (≥ 51 dBi)

Rule #2

Existing Rules on Emission Limits in EIRP

Current Rules

- Average and peak power density specified in μW/cm^2 at 3 m

Reason

- Prevent interference between unlicensed devices
- Put a cap on a device with low antenna gain (i.e. omni)

Rule #2

Proposed Rules on Emission Limits in EIRP

Proposed Rules

- Change specifications from *$\mu W/cm^2$ at 3 m* to EIRP for high gain antenna
- Existing rules apply for low gain antenna

Reason

- 3 m is in near field for high gain antenna and, thus, “difficulty in obtaining accurate power density measurement”
- Far field power density extrapolated to 3 m “may not approximate the actual power density at 3 m”

Rule #2

Comments on Emission Limits in EIRP

Comment on …..

- amount of antenna gain above which use of the EIRP limits would be mandatory
- an alternative (i.e. EIRP) to existing power density standards
- deleting power density in favor of EIRP

Rule #3

Existing Rules on Antenna Substitution

Current Rules

- Part 15.255 makes no reference to section 15.204(c)(4)
- 15.204(c)(4) allows “intentional radiators marketed and used with any antenna that is of the same type and of equal or less directional gain as the antenna authorized with the equipment”
- Part 15 can have broad interpretation

Reason (example)

1	Aperture ø, cm [inch]	31 [12.2]	23 [9.1]
2	Antenna gain, dBi	42.9	40.3
3	HPBW, degrees	1.2	1.6
4	EIRP, dBm	48.2	43.5
5	Maximum P_{IN}, dBm	5.3	3.2
6	R_{NF}, cm	484.5	266.7
7	R_{FF}, cm	1,162.8	640.1

As per existing Part 15.255 rules

Rule #3

Proposed Rules on Antenna Substitution

Proposed Rules

- 15.204(c)(4) will not apply to “60 GHz transmission systems operating under the proposed higher EIRP limits”

Reason

- 3 m is in near field for high gain antenna and, thus, “difficulty in obtaining accurate power density measurement”
- Far field power density extrapolated to 3 m “may not approximate the actual power density at 3 m”

Rule #3

Comments on Antenna Substitution

Comment on FCC proposed rule

Rule #4

Existing Rules on Transmitter ID

Current Rules

- Applies only to emissions originating from inside a building, not outside a building
- "Within any one second interval of signal transmission, each transmitter with a peak output power equal to or greater than 0.1 mW or a peak power density equal to or greater than 3 nW/cm^2, as measured 3 meters from the radiating structure, must transmit a transmitter identification at least once"
- "….which shall be field programmable"

Reason

- A mechanism to identify an interferer

Rule #4

Proposed Rules on Transmitter ID

Proposed Rules

- Transmitter ID not required from window link

Reason

- "…reflected from the glass in a window link will be attenuated by the walls and other surrounding objects…"
- "In most cases, all equipment within the same room will be under the control of the same user"

Rule #4

Comment on Transmitter ID

Comment on ..

- the proposed rule
- eliminating transmitter ID completely

Thoughts

#	Proposed Rule	Position
1	Emission Limits	▪ Concerned of window links - should abide by indoor low power device ▪ Concerned of high power outdoor link in close proximity to low power indoor device
2	Emission Limits in EIRP	Agree with FCC - migrate from power density to EIRP- but need to need to understand implication of this decision
3	Antenna Substitute	Agree with FCC
4	Transmitter ID	Remove transmitter ID requirement

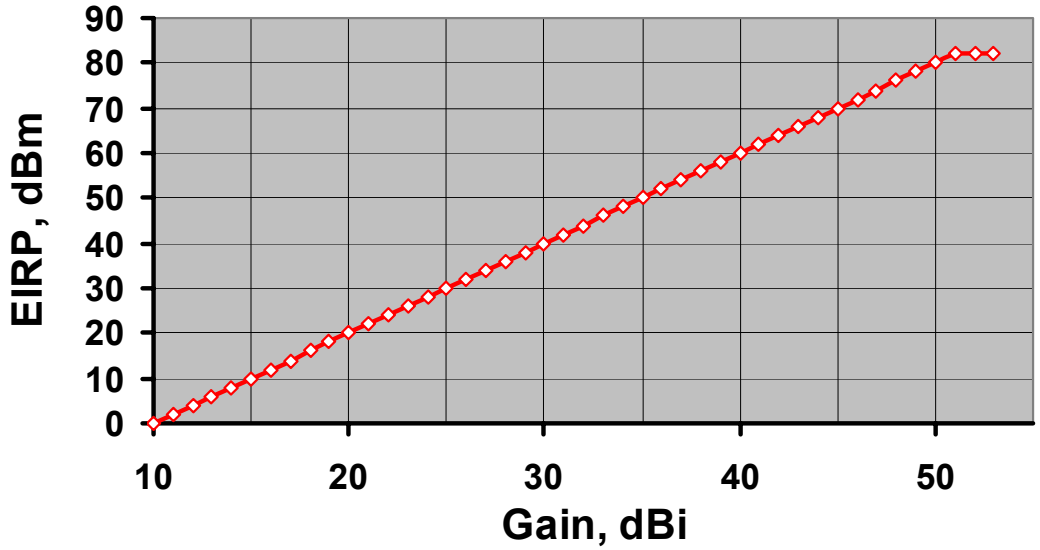
Proposed Actions

1) Review FCC's NPRM
   - Download from FCC web site (ET Docket No. 07-113)
2) Identify areas of concern
3) Make a technical case
4) Post concern and analysis to FCC's web site on or before October 17

Back Up Materials

WCAI's Proposed Emission Limits

EIRP = 82 dBm	for Gain > 51 dBi
EIRP = [(2 * Gain) – 20] dBm	for Gain ≤ 51 dBi



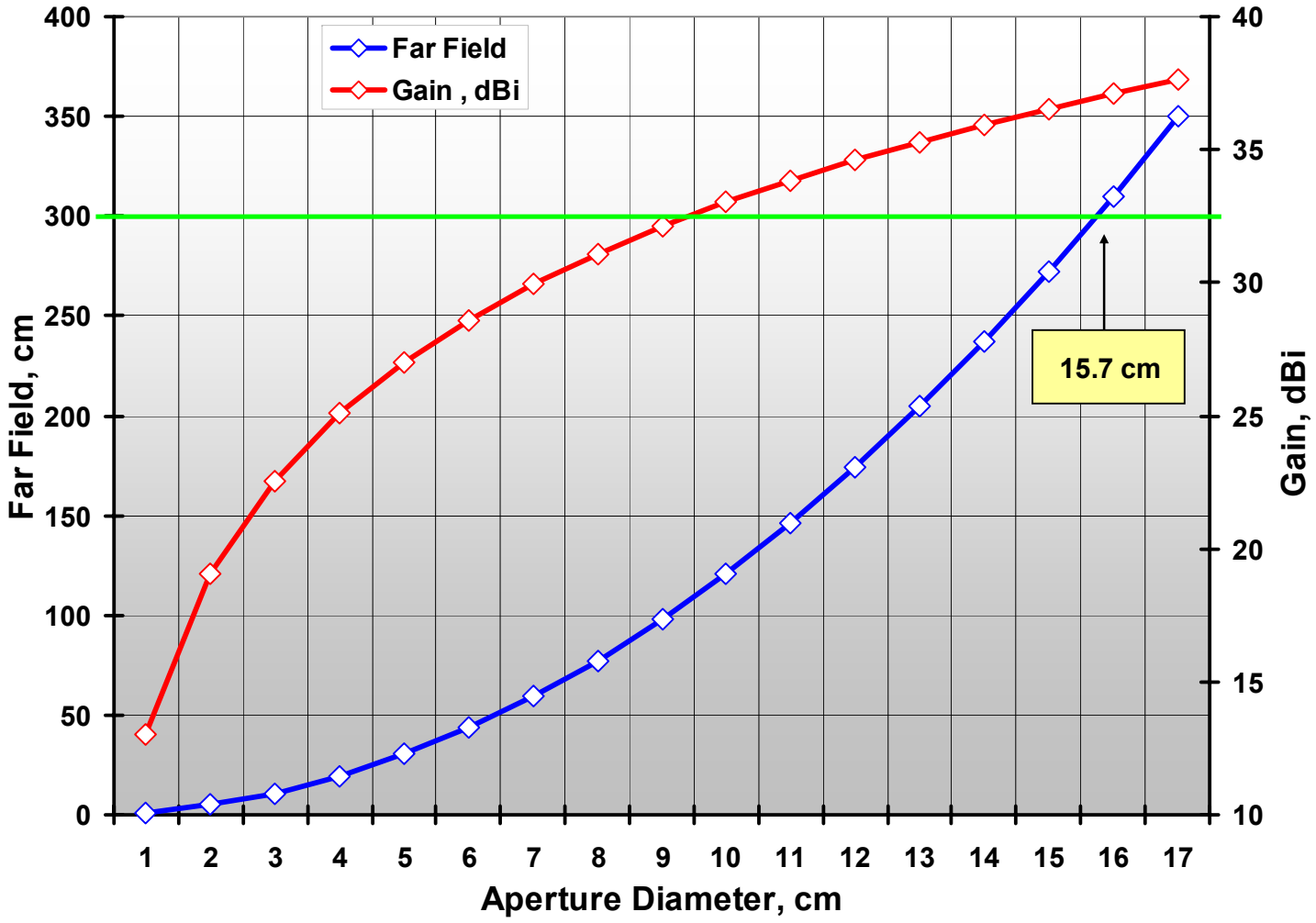
Note
51 dBi => HPWB ~0.5°, ~79 cm aperture Ø [~31.1 inches Ø]

Near & Far Fields

Aperture ϕ, cm	~ Gain, dBi	~ Θ_{3dB}	Near Field, cm	Far Field, cm
2	19.0	18.3º	2.0	4.8
7	29.9	5.2º	24.7	59.3
8	31.1	4.6º	32.3	77.4
15	36.5	2.4º	113.4	272.3
16	37.1	2.3º	129.1	309.8
24	40.6	1.5º	290.4	697.0
25	41.0	1.5º	315.1	756.3
61	48.7	0.6º	1,876.0	4,502.4

Frequency = 60.5 GHz, Aperture Efficiency = 50%

Far Field & Gain Plots



Window Link