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Before the
Federal Communications Commission
Washington, D.C. 20554

In the Matter of 1998 Biennial Regulatory Review – Amendment of Part 18 of the Commission's Rules to Update Regulations for RF Lighting Devices	))))))	ET Docket No. 98-42

To: The Commission

Comments of ADTRAN, Inc.

ADTRAN, Inc., is a manufacturer of communication devices used for the transmission of analog and digital information in wired and wireless environments. ADTRAN's interest in providing the Commission with a response to this NPR is to express concern on behalf of the users of products manufactured by ADTRAN, Inc., so that these users will not be subjected to increased levels of interference as a result of relaxing the allowable limits on electromagnetic emissions from radio frequency excited lighting devices.

ADTRAN, Inc., supports the reduction of unnecessary burdens , or "streamlining", of the Commission's Rules for RF lighting Devices, provided that the updated regulations do not cause unnecessary interference to other members of the RF community nor place additional burdens on other users of the radio frequency spectrum.

(Response to: 0.0.7, ... relax the consumer line-conducted emission limit....)

GE has requested that the line-conducted emission limit for consumer RF lighting devices be relaxed from 250 uV. to 3000 uV. in the 2.2 - 2.8 MHz. band to permit the marketing of the Electrodeless Fluorescent Lamp (EFL) at the current performance level for conducted emissions. Although it has been reported that there have been "no reported cases of interference during the 2-year period of the waiver", the absence of interference should not be used as a basis for relaxing the emission limit by more than 20 dB. There are other aspects of this request that should be

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considered before a relaxation of this magnitude is granted. This concern is based on the level of the conducted interference and the resulting harmonic components of this RF emission that would result when such devices are connected to the utility power circuits. Electrical devices that are connected to the utility power grid in residential and commercial locations use semiconductors for control and power conversion. The effect of a high-level signal in the 2.2 - 2.8 MHz. band, in combination with the non-linear characteristics of line-connected semiconductor devices, will be to create harmonic signals in spectral areas that would cause interference to communication equipment in other services. It is important to note that interference of this nature would not be observed with the EFL acting alone, it would be a complex second order effect involving the interaction of RF excited illuminating devices with other electrical equipment controlled by semiconductor devices.

Giving the manufacturer the anticipated success of this product, the problem will become more aggravated in the future when large numbers of such devices come into common use. At that late time, it will be almost impossible to eliminate the spectral contamination that will result from relaxing the level of the power line conducted emissions.

The radio frequency community has made significant strides in minimizing the potential for interference and removing contaminating sources from the power line environment. The relaxation of this specification by more than 20 dB seems inconsistent with the past work of the Commission in this area.

ADTRAN, Inc., opposes the relaxation of the consumer line-conducted emission as proposed by the Commission.

(Response to: 0.0.11, ... relax the non-consumer line-conducted emission limit for microwave lighting products....)

In business environments today, the building utility power wiring is located in close proximity to data cables used for internal communications. The data circuits are susceptible to interference caused by unwanted emissions from the electrical power wiring and any increase in the allowable emission limits can result in a reduction in the error rate performance of the data systems.

The association of RF excited lighting devices with microwave ovens is not a proper comparison when examined in view of the effect of electromagnetic interference. A microwave oven is not usually in continuous operation and, even then, the population of such ovens is quite small when compared with the number of RF excited lighting devices expected to be found in commercial environments. Except for industrial heating, microwave ovens generally operate at low duty cycle and, unlike lighting devices, microwave ovens would cause interference only for a short periods.

Just as with the EFL discussed in the response to 0.0.7 above, the increase in line conducted emissions will be likely to cause interference problems with sensitive communication equipment.

ADTRAN, Inc., agrees with the Commission's position that microwave excited lighting devices should not be exempted from line-conducted emission limits. However, ADTRAN, Inc., opposes the reduction of line-conducted emission levels for non-consumer applications of microwave lighting products by 10 dB as proposed by the Commission.

(Response to: 0.0.12, Radiated emission limits above 1 GHz.)

ADTRAN, Inc., agrees with the Commission that establishing radiated emission limits for microwave lighting products is a proper action at this time. Establishing limits on radiation from such lighting devices is consistent with protecting other communication services which share the ISM microwave bands. By placing emission limits on microwave lighting devices equivalent to the levels currently in effect for digital electronic products, the allowable emissions resulting from the application of microwave lighting products would be consistent with emission levels of other electronic devices.

(Response to: 0.0.13, The advisability of incorporating in-band radiation limits to facilitate sharing.)

ADTRAN, Inc, appreciates the Commission's concern for the need for in-band radiation limits for RF lighting devices. ADTRAN, Inc., like many other companies, has made a significant investment in the shared use of the ISM band for the wireless transmission of information. As the Commission pointed out in Para. 0.0.13, the ISM bands have been traditionally used for applications that made special use of the characteristics of RF energy application in the industrial environment and have been excused from requirements that restrict the radiation from the industrial energy applicators. The application of RF excitation of gas discharge lighting devices does not have the same constraints of use as industrial heating therefore, there is no reason to excuse lighting devices from the need to use the best available technology in restricting unintentional electromagnetic radiation.

The fact that no in-band radiation limits were placed on industrial ISM RF heating equipment has not been a significant problem since such sites are easily identified and, when necessary, corrective measures can be taken. As the technology of microwave excited lighting increases, this type of lamp will find applications at lower power levels and in larger quantities. The introduction of these devices into the marketplace without sufficient controls placed on the radiated and conducted interference will cause problems with low power communication devices sharing these RF bands as well as other communication equipment connected to utility power systems.

Given the fact that high efficiency, color corrected microwave lighting devices may become the lamp of choice for the merchant market for use in display and warehouse areas, the impact on communication systems of a large number of such lamps in constant use should be examined. A single lamp, like a single microwave oven, is not going to cause insurmountable difficulties. In a case of a single offending device, the device would be located and the needed filter components installed to suppress the interference. This will not be the case with low power lamps developed for wide use for the lighting market. Fusion Lighting has already been working with the Department of Energy to produce a microwave excited sulphur lamp for the 100 watt power level. A lamp such

as this would be well received by the merchant display market and, if it is as successful as projected, large numbers of 2.45 GHz. sources will soon be found in the ceiling of most commercial areas. A medium size department store could have from 500 to 1000 (See Appendix) lamps operating during business hours. This would raise the "noise floor" of wireless 2.45 GHz. communication receivers 27 to 30 dB over that experienced from a single lighting device. Low power, in-store wireless systems in this band could not cope with a degradation of the noise level by this magnitude.

Lighting for outdoor functions and warehousing are ideal examples of cost effective applications for microwave excited lighting. The potential application of these lamps in large numbers at relatively high power levels suggests that a "site" radiation limit, similar to that for perimeter protection systems (15.31.d), be imposed to control the combined effect of such unintentional radiators to protect nearby facilities from interference. It is further recommended that a provision be made for including a lighting "fixture" where the lamp and "fixture" comply with the emission limits even though the lamp element and possibly its corresponding power supply do not meet the limits when operating outside of the "fixture".

ADTRAN, Inc., suggests that the Commission consider placing all microwave excited lighting devices under the same radiation and conduction limits as other electronic devices. With these limits, microwave excited lighting can be used within the ISM bands with no more difficulty than using any other electronic device.

These Comments Respectfully Submitted By:

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(By:) Lonnie Mc Millian, Vice President

July 6, 1998

APPENDIX
To Comments By
ADTRAN, Inc.
Notice of Proposed Rule Making - ET Docket No. 98-42
July 6, 1998

Merchandising lighting is one of the more critical applications of lighting technology. In the marketing of colored goods, the merchant provides lighting that is a compromise between natural, outdoor sunlight and interior lighting that is based on gas discharge techniques. As always, the efficiency of the conversion of the electrical energy is an important parameter in such decisions. Fusion Lighting and GE have developed technologies that allow the use of radio frequency (RF) excited lighting devices for these applications at an attractive overall lifetime cost.

In evaluating the use of such lighting devices, one must consider the magnitude of the unintentional electromagnetic emissions produced by each lighting unit and the number of units that would be used in a typical merchandising location.

To determine the magnitude of the problem of illuminating merchandising areas, the engineering office of a local electrical utility and the store planning office of a department store chain were contacted. The information obtained was as follows:

Warehouse, Computer Wholesaler	100,000 Sq. Ft.	1.85 Watt / Sq. Ft.
Typical Office Area		3.00
Retail Discount Warehouse	100,000	3.87
Display Area of Department Store	50,000	7.50

In general, lighting is assumed to be approximately 30 percent of the connected electrical load.

With this information, assume a department store with a 40,000 Sq. Ft. display area using 7.5 Watts/ Sq. Ft. for illumination. If the lighting fixtures are uniformly distributed in a square configuration measuring 200 feet on each side, this facility would have an incandescent lighting load of 300,000 Watts (40,000 Sq. Ft. X 7.5 Watts / Sq. Ft.).

Fusion Technology is anticipating the availability of a 100 watt sulphur lamp which could be used to replace the 300 to 500 watt incandescent lamps currently being used in the ceiling fixtures of most merchandising areas. Using the efficiency projections of Fusion Technology, the lighting load using the sulphur lamp would be 75,000 Watts and, in our hypothetical 40,000 Sq. Ft. facility, 750 microwave excited sulphur lamps would be required. If the lamps were uniformly distributed throughout the facility, the lamps would be spaced at 8.3 meter (27 foot) intervals. With 750 RF lamps of 100 watts each, the residual noise floor for a 2.45 GHz. receiver operating at the center of the facility would be degraded by 29 dB (10 log 750) when compared with the interference (noise) from a single lamp.