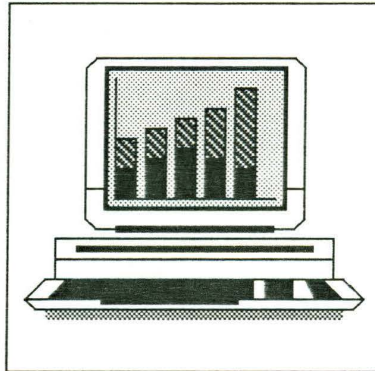


**Comparison of
Radiological Emission
from VDT's and Appliances**



Jerry Choryan

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by Jerry Choryan

Technology in video display terminals (VDT's), otherwise known as computers, has brought this product into widespread use. Years ago, VDT's were thought to be a machine of big business, but advances in production and manufacturing have brought many into small businesses and homes.

Each year the number of computer operators increase. In 1986 there were an estimated 13 million operators on the job. By the end of 1990, a predicted 40 million people will be operating a computer. As these numbers grow so does the concern for prolonged exposure to harmful radiation.

Radiation exposure has always been a public concern. This is why the Bureau of Radiological Health has set standards for consumer protection from harmful radiation of VDT's, household appliances, and other related electronic devices. The problem is people don't realize these standards and continue to believe VDT's emit harmful radiation. The proceeding information will compare radiation emission from VDT's to common household appliances and also inform consumers there is no cause for concern.

Computers and Appliances

Computers and household appliances are uniquely similar. But how can you compare a blender with a sophisticated, complex computer? Both products emit energy in the electromagnetic spectrum. They begin with an electrical current. Inside the computer is a structure called a flyback transformer. It is responsible for generating the necessary voltage to run the terminal. A transformer produces a pulsed very low frequency energy up to 25 KV. This is run at a known frequency of 60 Hz, about the same as a television set. An electrical motor, the heart of most appliances operates at a frequency ranging from 10^{11} to 10^{15} Hz. It is these energies which generate radiation in the electromagnetic spectrum but are safely contained under strict standards set by the Bureau of Radiological Health. Figure 1 illustrates a comprehensive comparison of VDT and appliance radiation to these set standards.

Electromagnetic Spectrum

Electromagnetic Spectrum, as mentioned, is a system that includes all types of radiation. Any object or device that operates electronically or from electric current can and will emit some form of this radiation. This includes devices such as hand mixers, food processors, microwaves, and similar products used throughout the home.

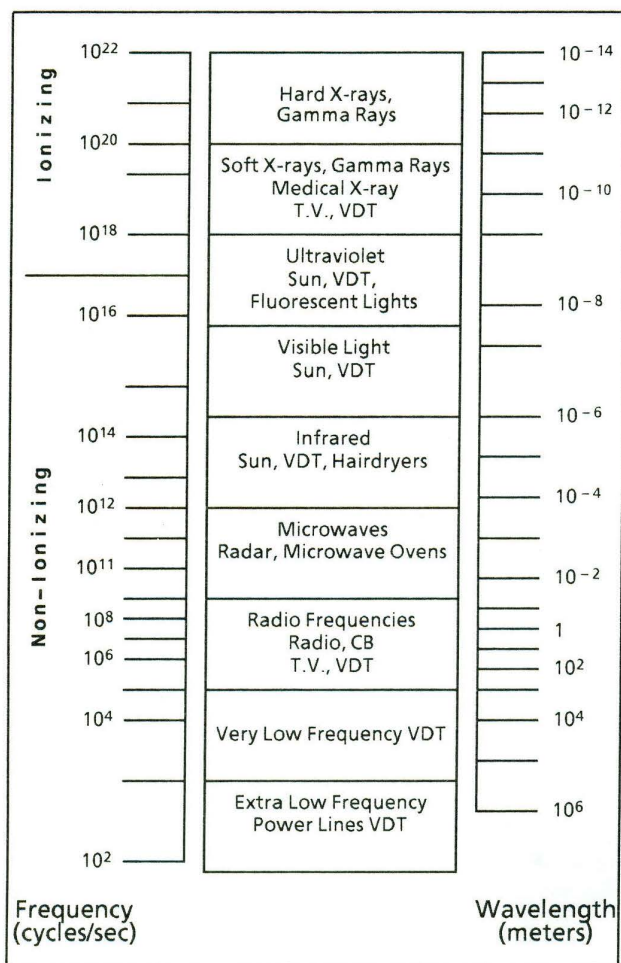
There are approximately 9 categories in the electromagnetic spectrum. Each type of radiation is specified by wavelength or unit of energy. Figure 2 illustrates the electromagnetic spectrum along with related appliances.



"All this talk about harmful VDT emission is such media hype...I've been working with computers for over 25 years, and I haven't suffered any side effects."

Radiation Type	Wavelength/ Energy	Standards	Comparison Sources	Measured Amount VDT	Measured Amount Comparison Source	Source Concern
Extremely low frequency	Volts < 1MHz or $\lambda > 300\text{m}$.10 a/m .60 v/m	Power Lines VDT's Electrical Motors	More studies needed	More studies needed. Some concern with high power lines	Low levels emitted Further study needed
Radio	1 – MHz or 300 m – 1m	.10 mW/cm ²	T.V., Radio, CB, VDT's	2.6×10^{-8} mW/cm ²	.001 mW/cm ² – .120 mW/cm ²	Well below U.S. standards
Microwaves	300MHz – 300GHz or 1m – 1mm	10 mW/cm ² /Industrial 5 mW/cm ² @ 5 cm/Home	Radar, ovens e.g. home/industrial	Not Detected	less than 10 mW/cm ²	No measurable amount to be concerned about
Infrared	A 760 – 1400nm B 1400 – 3000nm C 3000nm – 1mm	10mW/cm ²	VDT's Transfer Heat Lamps, Hairdryers	Not Detected	1 mW/cm ²	No measurable amount to be concerned about
Visible	.16eV – 0.33eV or 760nm – 380	10 mW/cm ²	VDT Sun	Not Detected	Less than 1 mW/cm ² total visible	No measurable amount to be concerned about
Ultraviolet	A 315 – 400nm B 280 – 315nm C 100 – 280nm	1mW/cm ²	VDT, Sun Lamps, Fluorescent Lights	.005 mW/cm ²	0.6 mW/cm ² – .035 mW/cm ²	Exposure levels several times below U.S. standards
X-Radiation	120eV – 12×10^7 or 10 – 10 – 5 nm	2.5 mR/h	VDT, Medical X-ray, T.V.	Not Detected	Less than 2.0 mR/hr worst case	No measurable amount to be concerned about

Comparison of VDT Radiation
Figure 1



The Electromagnetic Spectrum

Figure 2.

Summary

Radiation in the extremely low frequency range raises concern due to proposed adverse biological effects. A study by M.A. Stuchly (et al) states that ELF emissions from VDT's are at least 1000 times below the levels shown to cause potentially hazardous biological effects. In that same study, it was shown that common household appliances also fall several magnitudes below hazardous amounts.

Radio waves, which come from VDT's, C.B.'s, radio stations, T.V.'s and similar appliances have a set standard emission of 10 mW/cm². The comparison sources measured amounts are more than 100 times below this standard. VDT radiation surpasses this standard at more than 100,000 times below the norm.

There are two separate ratings for microwaves. Industrial microwaves such as those used in factories as drying ovens

have a standard of 10 mW/cm². Household microwave ovens must operate at 5 mW/cm² @ 5 cm maximum emission with the door closed. VDT emission in this range has not been detected and the comparison sources, as above, are well below the maximum emission allowed. In fact, Nancy Shute, a Smithsonian Science Writer, states that a microwave is probably among the safest appliances you can buy.

Infrared radiation, which we attribute to thermal sensations, comes from hair dryers, VDT's, heat lamps, and other heat emitting devices. The measured radiation is about 1 mW/cm². This is well below the 10 mW/cm² standard. Infrared radiation from VDT's has not been detected, obviously not a device to warm cold hands.

Visible radiation is a more tangible subject. T.V.'s and VDT's create a visible display which emits a measured radiation 10 times below the 10 mW/cm² standard.

Ultraviolet radiation is mostly associated with tanning. VDT's, sun lamps, and fluorescent lights are of main concern since they are part of most peoples daily life. Standard emittance must not exceed 1 mW/cm² which compared to VDT emittance of .005 mW/cm² show levels well below this initial set standard. Comparison sources emit anywhere from 10 to 100 times below these limits. Obviously, overuse of items such as U.V. tanning devices can produce adverse tissue effects, but used properly under strict guidelines set by the manufacturer, satisfying results can be achieved.

X-radiation has not been detected from VDT's. The comparison sources such as medical x-rays, T.V.'s and related items, at the most, emit less than 2.0 mR/hr. Much less than the standard of 2.5 mR/hr. For instance, cataract development begins at 200 rad. If you are exposed to 72 mR/yr (.0082 mR/hr) such as from dental and medical x-rays, it would take 2,778 years to develop a cataract. Obviously well beyond human life expectancy.

Conclusion

The question about harmful VDT radiation is frequently raised. It can be concluded that harmful radiation emissions from VDT's or appliances either do not exist or are emitted at levels well below the Bureau of Radiological Health's standards. It seems the term "good housekeeping" could be "safe housekeeping" where VDT's and appliances are concerned.

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