ERGOTEC ASSOCIATION, INC.

Human Engineering Non-Profit

P. O. Box 9571 . Arlington, Virginia 22219 . Phone-Fax (703) 516-4576

DOCKET FILE COPY ORIGINAL

MM [redacted] 97-182

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OCT 24 1997

FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF THE SECRETARY

October 24, 1997

Mr. William Caton
Secretary
FCC
1919 M Street, NW
Washington, DC 20544

Re: Complaint of Exclusion, Comments, Petition for Reconsideration
FCC 97-303, WT 97-192, ET 93-92, RM-8577, FCC 97-196, ET 94-124

Dear Mr. Caton:

Attached is Ergotec's submission to be filed in the dockets listed above. One copy has been provided for each file.

Thank you.

Sincerely,

Bert Dumpé - CEO

Attachments

cc: As noted on page 8

RECEIVED

OCT 24 1997

FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF THE SECRETARY

BEFORE THE
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In Response to:	)	
	)	
SECOND MEMORANDUM OPINION AND ORDER AND NOTICE OF PROPOSED RULEMAKING; In Matter Of:	)	FCC 97-303
	)	
Procedures for Reviewing Requests for Relief From State and Local Regulations Pursuant to Section 332(c)(7)(B)(v) of the Communications Act of 1934;	)	WT 97-192
	)	
Guidelines for Evaluating Environmental Effects of Radio Frequency Radiation;	)	ET 93-62
	)	
Petition for Rulemaking of the Cellular Telecommunications Industry Association (CTIA) Concerning Amendment of the Commission's Rules to Preempt State and Local Regulation of Commercial Mobile Radio Service (CMRS) Transmitting Facilities; AND	)	RM-8577 DA 96-2140 FCC 97-264 [104-104 Public Law]
	)	
Proposed Rulemaking of Preemption of State and Local Zoning and Land Use Restrictions on the Siting, Placement, and Construction of Broadcast Station Transmission Facilities [High Definition Digital TV (DTV)]; AND	)	FCC 97-296 MM 97-182
	)	
Petition of Sky Station International, Inc. For Amendment of the Commissions Rules To Establish Requirements for a Global Strato-spheric Telecommunications Service in the 47.2 to 48.2 GHz Frequency Bands	)	ET 94-124 CC 92-297

COMPLAINT OF EXCLUSION
COMMENTS
AND
PETITION FOR RECONSIDERATION

COMPLAINT
EXCLUSION OF PETITION FOR RECONSIDERATION

In FCC 97-303, the Commission concludes that it answered **ALL** the Petitions for Reconsideration ("Recon"). Ergotec Association maintains this is false. The Federal Communications Commission ("FCC or the Commission") never acknowledged, and therefore did not answer, Ergotec's Recon which had three (3) attachments providing absolute proof that **microwave radio frequency (RF)** ***radiation*** causes biological damage. Although the Secretary of the Commission accepted, by date-stamping, Ergotec's hand-delivered filing as a Petition for Reconsideration, the document was subsequently marked: ***considered as a Petition***, though listed under the category of *Petition for Reconsideration.* See FCC 97-303 at page 84. Due to the exclusion of its Recon dated 3 September 1996, Ergotec herewith again submits the document as a Petition for Reconsideration.

The documents Ergotec filed, and now resubmits were: (1) *Soviet Research on the Neural Effects of Microwaves*; (2) synopsis of report obtained from the Department of State on *bio-damage (thermal and athermal)* to *US Embassy (Moscow) employees* from prolonged exposure to Soviet microwave transmitters; (3) *Assessment of Health Hazard and Standard Promulgation in China*, which describes research performed by Dr. Chiang Huai of the Chekiang Medical College in Hangchow, China. The three documents show, without doubt, that microwave radiation causes a multiplicity of biological effects. Therefore, the nationwide installation of several thousand towers bearing several million microwave antennas, which emit the same type of radiation but generates stronger power densities than that found in the above studies, is a threat to public health.

The Commission is obligated to address *ALL petitions BEFORE issuing a final order.* **Ergotec awaits an answer to its Petition for Reconsideration filed timely on 3 September 1996.** The document, along with this filing, is forwarded to Congress for action and the Record.

STATEMENT OF FACT

1. Trespass against property and health by means of radio frequency emissions spewing from several million antennas nationwide, several thousand satellites, several hundred sky platforms, and other money-making high-tech luxuries will destroy humanity and Earth.

2. Congress gave the FCC ***NO AUTHORITY*** to: (1) **interfere** with the procedural due process by which State and local governments conduct their business [WT 97-192]; (2) **evaluate** the ***environmental*** **effects** of radio frequency emissions, or **determine** ***health effects*** as stipulated in the guidelines of the National Council on Radiation Protection and the American National Standards Institute (NCRP/ANSI; ET 93-62); or (3) preempt State and local laws so industry can

install microwave towers everywhere to offer CRMS [RM-8577]. Congress merely directed FCC to **adopt** *health and safety* guidelines, such as the NCRP/ANSI. While FCC readily disclaims being a health and safety agency, it took the liberty of modifying industry's requirement for compliance with the NCRP/ANSI guidelines. Health and safety agencies which recommended the NCRP guidelines were not advised.

3. The preceding points have already been made by the Local and State Government Advisory Committee (LSGAC). The LSGAC, a body of State and local officers who hold the interests of the American public at heart, advised the Commission to **DENY** the petition for declaratory ruling of the Cellular Telecommunications Industry Association (CTIA) to preempt moratoria. The need for moratoria by municipalities nationwide arose from CTIA's initial request (1994) to the Commission to preempt local and state laws so that industry could have free reign to install microwave antennas everywhere. FCC opened RM-8577 for public comments, but most public officials were not aware of industry's intent. Some State and local government officials who knew, strenuously objected to preemption as noted in their comments (RM-8577). Unable to prevail, CTIA urged FCC to take the matter to Congress. It did. Congressional members spent 1995 formulating and deliberating the Senate and House bills. After 365 days, **Congress struck preemption** from the Bill that was passed and went to President Clinton. The document President Clinton signed on 8 February 1996, which became Public Law 104-104, **did not honor preemption**. In May 1997, Congress again denied industry's plea to preempt the stop-gap measure (moratoria) municipalities instituted to protect ecosystems (DA 96-2140). So why does FCC and industry constantly insist on finding ways to preempt State and local laws?

4. America's pioneers and most of its leaders before the atomic, electronic, and telecommunications age sought to protect the people; the environment; the planet. President John F. Kennedy declared, "America will put a man on the moon in this century." America did. Since World War II and the moon landing, America's leaders have struggled to destroy the people; the environment; the universe. Electronic products, which function with charged electrons (ionic energy), produce HEAT that is converted to electricity; current. During the process of ***work***, electronic products generate OZONE. This gas is the natural byproduct of an electric charge cutting through oxygen.

5. Industry is now imploring FCC to overthrow State and local laws so they can erect 2000-foot towers nationwide to offer citizens High Definition Digital Television (DTV; FCC 97-296). And even worse, industry petitioned FCC for an amendment to its rules so it can suspend Sky Stations in the Stratosphere (ET 94-124)! This is a supreme insult to humanity. The leaders of America, in their greed and absolute bliss, clamor for more technology they do not understand and people do not need. At all costs to public health, the government continues embracing high-tech though Earth is scorched and creatures are perishing. Why? Because the Government wants only to satisfy industry, which convinced public officials that electronic products will save world economies!

FCC 97-303 -- WT 97-192

FCC 97-303 makes this statement: ...Relief from State and local regulation pursuant to Section 332(c)(7)(B)(v) of the ***Communications Act of 1934***. **Section 332(c)(7)(B)(v) is not found in the Act of 1934**. It is the **new clause** inserted in the Telecommunications Act of 1996.

In the Communications Act of 1934, as amended (February 1993), Congress holds in Section 332 [FCC 47 USC 332]: *In taking actions to manage the spectrum to be made available for use by the private land mobile services, the Commission shall consider, consistent with Section 1 of this Act, whether such actions will: (1) promote the* ***safety of life and property***... During 1995, at the behest of industry and FCC, Congress reworded and renumbered this section of the Act, so that 332 in the Telecommunications Act of 1996 reads:

(47 USC **332(c)**) is amended by adding...:

(7) Preservation of Local Zoning Authority --- *Except as provided in this paragraph,* ***nothing*** *in this Act shall* ***limit or affect the authority of a State or local government or instrumentality thereof*** *over decisions regarding the placement, construction, or modification of personal wireless facilities....*

(B) *Limitations.---*

(iv) *No State or local government or instrumentality thereof may regulate the placement, construction, and modification of personal wireless service facilities on the basis of the* ***environmental effects*** *of radio frequency emissions to the extent that such facilities comply with the Commission's regulations concerning such emissions.*

(v) Any *person adversely affected by any action or failure to act by a State or local government....commence an action in any court of competent jurisdiction. Any person adversely affected...that is inconsistent with clause* **(iv)** *may petition the Commission for relief.*

Congress, FCC and industry, in complicity against citizens, ***abolished*** **the** ***rights*** **of the people to safety of life and property** as mandated by the Communications Act of 1934. This phrase -- *safety of life and property* -- implies that State and local governments are responsible, under the laws of Food and Drug Administration (FDA) or its regional designee to *ensure the safety of life*. They must also, together with the Environmental Protection Administration (EPA) and perhaps the Occupational Safety and Health Administration (OSHA) or their regional designee, *ensure the safety of property* [private and public]. Put in perspective, the *US Constitution gives citizens the right to enjoy life, health, and ownership of property*. Without amending the Constitution, the Telecommunications Act of 1996 ***replaced*** **safety of life and property** with **environmental effects**. Thus the Act eliminates and/or transfers medical, physiological, psychological (fear), and environmental responsibilities of FDA and OSHA to EPA which is only an environmental watchdog. Unless, of course, Congress and health and safety agencies believe a person is a tree, or an environment. This is an affront to democracy. Since it removes all conscionable effort to protect humans, the Telecommunications Act of 1996 must be considered unconstitutional. If Congress does not recognize this flaw, or refuses to correct the oversight, then it is incumbent on State and local governments to take measures to protect citizens. After all, strong (healthy) ecosystems are the primary defense of the country.

Section 332(c)(7)(B)(iv) suits the whims of Congress, FCC, and industry. It does nothing for the safety of humans and their property. Is the desire or hype to *keep in touch* so imperative that Congress chooses to sacrifice the well-being of people to supposedly promote the economy? State and local governments are within rights to step in where Congress and the President have been deficient in providing for the *safety of life and property.* Subsection (v) indicates a *person* [presumed to be either corporate or individual] must seek *relief* in court *UNLESS* the grievance is *inconsistent* with *subsection (iv)*. If so, they can go to FCC for relief. Even if they were regulating facilities with respect to *safety of life and property*, State and local governments would not be and are not in violation of the Telecommunications Act of 1996, which stipulates: on the *basis of* ***environmental effects*** *of radio frequency emissions*. Since the terminology is unclear, WT 97-192 should be stricken from FCC 97-303. The item must be clarified.

States ratify constitutions that embody institutions to faithfully and effectively represent the interests of all citizens. These are process issues that form the cornerstone of every constitution of every State. Congress arbitrarily disarmed their own municipalities by instituting rules that violate State constitutions upon which citizens rely. Public officials must protect the rights of constituents. But the fact remains that FCC lacks a congressional mandate to preempt State and local laws.

FCC 97-303 -- ET 93-62

In its comments filed at FCC, the Department of Defense (DOD) asserts that hybrid NCRP/ANSI guidelines the FCC adopted are not compatible with international guidelines, and will hinder its ability to comply with the provisions of NITAA. Does DOD intend to commandeer microwave sites nationwide in times of war; do these facilities now require special engineering?

FCC decided to ***categorically deregulate*** *personal communications services (PCS), and millimeter wave antennas* (paging, cellular), based on height and "radiation center" of the antennas above ground level (item C-45; FCC 97-303). The height of an antenna, or its position on a lamppost or tower, does not alter the antenna's microwave frequency emissions and potential for harming pedestrians and people living in the shadow of the structures. Therefore, no antenna should ***categorically*** **escape** regulation.

All antenna sites must be subject to routine ***environmental evaluation*** (not defined). Moreover, all residents, school and hospital officials must be notified of industry's intention to install antennas be they PCS on lampposts, millimeter wave on lattice, monopoles, stealth or camouflaged towers; or PCS and LMDS antennas on electric transmission poles; or self-supporting or guyed lattice structures. In addition all tower sites (including stealth, camouflaged, monopoles) must display RF signs, as required by OSHA, that warn the public they are entering a radio frequency area!

What State or local government outright denied (final action) or refused an application (failed to act) proposed by industry? A moratorium is a legal delay, not an act of denial. Clause (iv) specifies "environmental effects." Dictionary defines ***environmental*** as the *ecological impact of altering the environment*. Diminution of property and aesthetics, the primary grounds on which

citizens oppose tower siting, do not constitute an *environmental effect*; neither does health and safety. FCC has **NO** ENVIRONMENTAL EFFECTS ***REGULATIONS***. It only has **RF *guidelines*** for antenna emissions, at no specific distance from the radiating source, or for an unspecified number of carriers on a tower. As a court battle of the Occupational Safety and Health Administration attests, **guidelines** cannot be upheld by courts. They only protect industry against lawsuits. Moreover, **FCC measures no RF emissions, nor monitors microwave tower sites.** FCC merely takes the word (certify) of industry that **they comply with RF emissions**. So for reasons stated in this paragraph, Subsection (iv) negates subsection (v), and renders this a moot argument; that is:

Section 332(c)(7)(B)(v) relies on Section 332(c)(7)(B)(iv). Subsection (v) states: *Any person adversely affected by any **final action** or **failure to act** by a State or local government that is inconsistent with this subparagraph, may within 30 days....commence action in any court.... Any person adversely affected by an act or failure to act by a State or local government.... that is **inconsistent with clause (iv)** may petition the Commission for relief.* Subparagraph (iv) is ill defined. It precludes *State and local government.... from regulating the placement, construction of **personal wireless service** facilities on the basis of the **environmental effects** of radio frequency to the extent that such facilities **comply** with the Commissions **regulations** regarding such emissions.* To reiterate, the FCC has no ***regulations;*** **just *guidelines***. FCC **measures *no RF* emissions**; it relies on hearsay. FCC is not a health and safety agency. FCC is not an environmental agency. FCC only issues licenses.

RM-8577

Rulemaking (RM) 8577 is a moot entry. This FCC docket was opened when, like the bombing of Pearl Harbor, industry slipped a **petition** to FCC in December 1994 -- 3 days before Christmas after Congress had recessed and Washington was virtually deserted. The petition asked FCC to **preempt State and local laws and *force*** municipalities nationwide to accept innumerable microwave towers on private and public land as dictated by industry. The opposition to FCC's intent to preempt State and local rules drew the furor of County Commissions, attorneys general, and health departments nationwide. Among anxious respondents were officials from: California, Massachusetts, Connecticut, Texas, Washington State. Having lost preemption cases in Louisiana and other States, FCC handed the matter to Congress. Bills were introduced in the House (HR-1555) and Senate (S-292). Both bills contained preemption language. State and local authorities resisted. Congress called a conference to resolve differences between House and Senate bills. Finally, a contingent conferred with the US Conference of Mayors. Agreement reached: Preemption language would be stricken from the consolidated proposed legislation that would get the President's signature.

President Clinton signed the bill (Public Law 104-104) on 8 February 1996. It contained no preemption clause or reference thereto. So why is FCC 97-303 revisiting the preemption issue under a *SECOND MEMORANDUM OPINION AND ORDER AND NOTICE OF PROPOSED RULEMAKING*? If the FCC wishes to preempt State and local law so industry can erect several hundred thousand towers, holding several million microwave antennas, nationwide the

Commission must ask Congress to amend the Telecommunications Act of 1996. FCC already attempted to do so in May 1997. Congress rejected the bid. In fact, when the matter was handed to Congress (1995), RM-8577 automatically died. This put the FCC out of the preemption equation.

FCC 97-182

The Commission is considering whether to preempt State and local laws so the broadcast industry can install skyscraper towers that are at least 200 stories (2000 feet) tall; higher than two (2) Empire State buildings! Why? So the government can force citizens to purchase new and expensive digital televisions. National Association of Broadcasters (NAB) and the Association for Maximum Service Television (AMSTV) are strong advocates of digital television (DTV).

The reasons for denying FCC 97-182 were stated above. Explicitly, FCC has **NO AUTHORITY** to preempt State and local laws for **ANY** reason. Therefore, the Commission should not even consider the petition of NAB, AMSTV, or any other entity.

It is interesting to note in this docket that petitioners *want to categorically preempt the regulations of State and local governments based on: (1)* ***environmental*** *or* ***HEALTH effects*** *of radio frequency emissions*; (2) fact that broadcast facility complies with FCC regulations and policies; (3) electromagnetic radio frequency **interference**; (4) marking and lighting if towers comply with regulations of the Federal Aviation Administration (FCC 97-182, item 7, page 3). In other words, like the telecommunications industry with cell phones and supporting structures, the broadcast industry wants to bombard the public with ultra-high frequency radiation so many people can enjoy the fruits of DTV. Since Congress failed to define it, no one can decide what Congress meant by *environmental effects*.

Evidently, the broadcast industry is also uncertain about the term *environmental effects* and equates it to **health**. So, is the FCC being asked to preempt **safety of life** or ***property***? Towers require certain markings and lighting ***if*** they are in a flight path. Has the FAA established this criteria for 2000-foot towers, which will be a new addition to the horizon? The effective radiated power (ERP) of a low power FM radio station is about 50,000 watts. Radio frequencies emanating from FM antennas generally cause interference in residential phones, television receivers, and other electronic equipment in homes. Has anyone tested the probable interference from a 2000-foot DTV tower that, in addition to television antennas, could be loaded with the antennas of several telecommunications carriers? Radio towers over say 500 feet require white strobe lights. Citizens in various parts of the country have lodged complaints about the disturbance of the flashing strobes. What type of strobe lighting does FAA require for 2000-foot towers, including those not in a flight path; how will citizens be affected? If no one can answer these questions, how can industry petition FCC to **categorically preempt regulations based on environmental and health effects of RF emissions**?

ET 94-124

Sky Station International petitioned FCC to amend its rules so they can launch microwave antenna (tower type) platforms in the stratosphere. The computer database for this

file is packed with the comments of over 390 companies. They extol the virtues of floating at least 250 microwave platforms in the stratosphere to support Local Multipoint Distribution Service (LMDS). The platforms will allow the telecommunications industry to use the stratosphere for what it has difficulty doing on Earth; erecting several thousand towers and million antennas nationwide. Industry will encounter minimal resistance, because the atmosphere is free territory and citizens cannot see the platforms which will be launched without opposition.

Among the elite institutions that filed comments (ET 94-124) applauding the creation of LMDS were: National Aeronautics and Space Administration which referenced DOD work in the ultra-high frequency range, Climate Institute, US Department of Transportation, Mercy Medical Airlift, World Wildlife Fund, Virginia Governor's Office, United Earth, National Research Council, National Academy of Sciences.

LMDS allows industry to offer high-tech addicts wireless phones, fax, video, voice mail, and practically anything that can transmit through the air and give people mobility. Since they beam to Earth from a fairly stationary point in the stratosphere, radio signals will target mobile phone antennas anywhere on Earth. For this reason FCC Commissioner Rachelle Chong told industry, "LMDS is your Independence Day!" Generous of the FCC to give industry this *freedom* to destroy our stratosphere and Earth.

Vice President Gore, author of *Earth in the Balance*, says in his book that "the environment is a spiritual thing." Somehow he forgot what he wrote. He and President Clinton are now in a race to stop global warming; a tremendous financial burden for the public. Yet they promote environmental disaster. In case the White House, Congress, and FCC have not been informed the **stratosphere *IS*** the ***OZONE* LAYER**. The stratosphere is the place the President is struggling to protect! The stratosphere is primarily composed of oxygen. When an electric charge, as from the natural solar electromagnetic spectrum and **Sky Station antennas**, cuts through the stratosphere, oxygen atoms bond into sets of three (3) atoms to form molecules of **OZONE**. That's how God made the atmosphere; to protect humans. **Ozone captures harmful solar ultraviolet rays**.

In the process of doing work ALL electronic systems (eg, Sky Station) **emit ozone**. Where will all the ozone go? Will the hole in the ozone layer rapidly expand? What environmental effect will rapid depletion of the ozone layer have on the Earth? Isn't this a point to consider BEFORE allowing the radiative Sky Station to occupy and destroy the stratosphere?

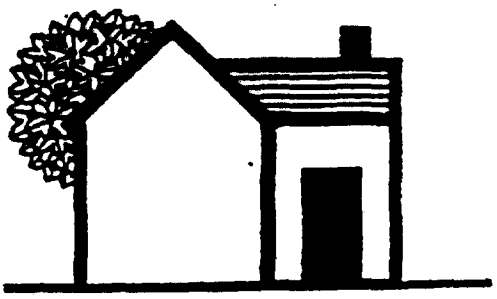
By and For: ERGOTEC ASSOCIATION
Box 9571, Arlington, VA 22219

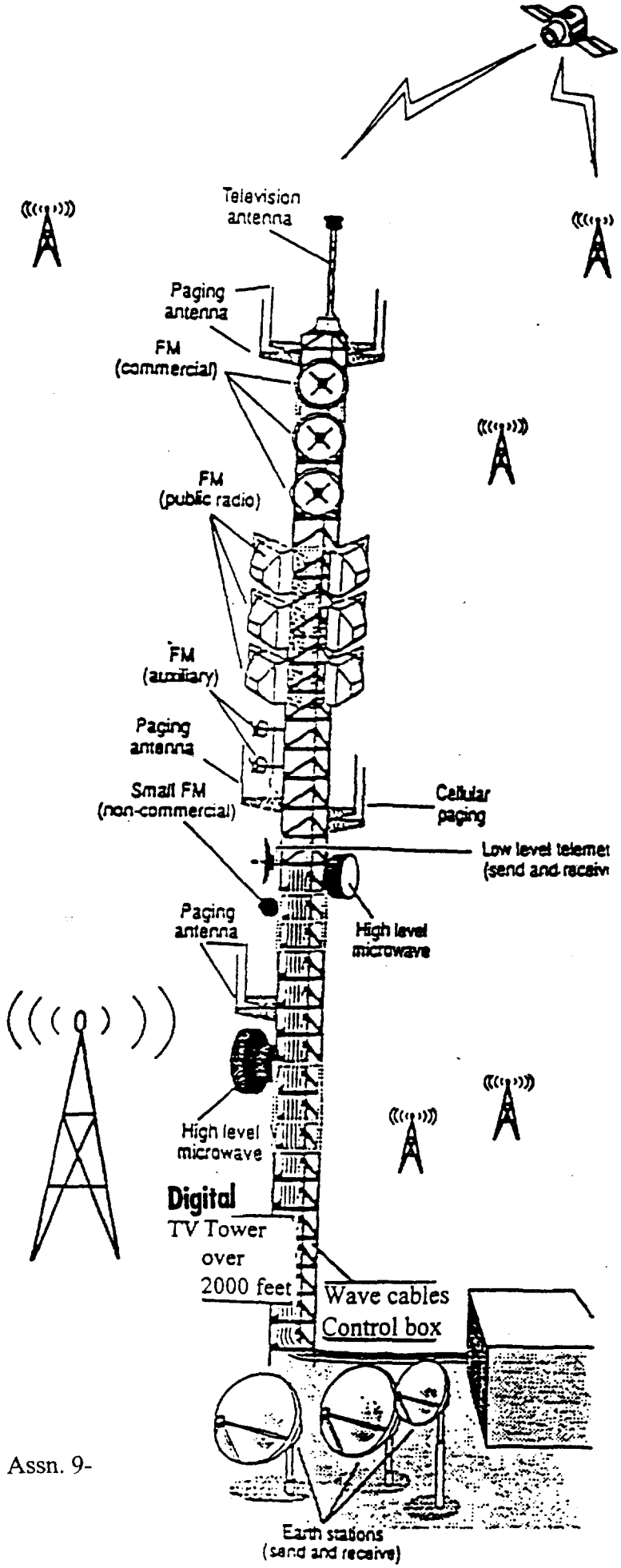
cc: Commissioners, Congress, LSGAC, Interested Parties

WIRELESS

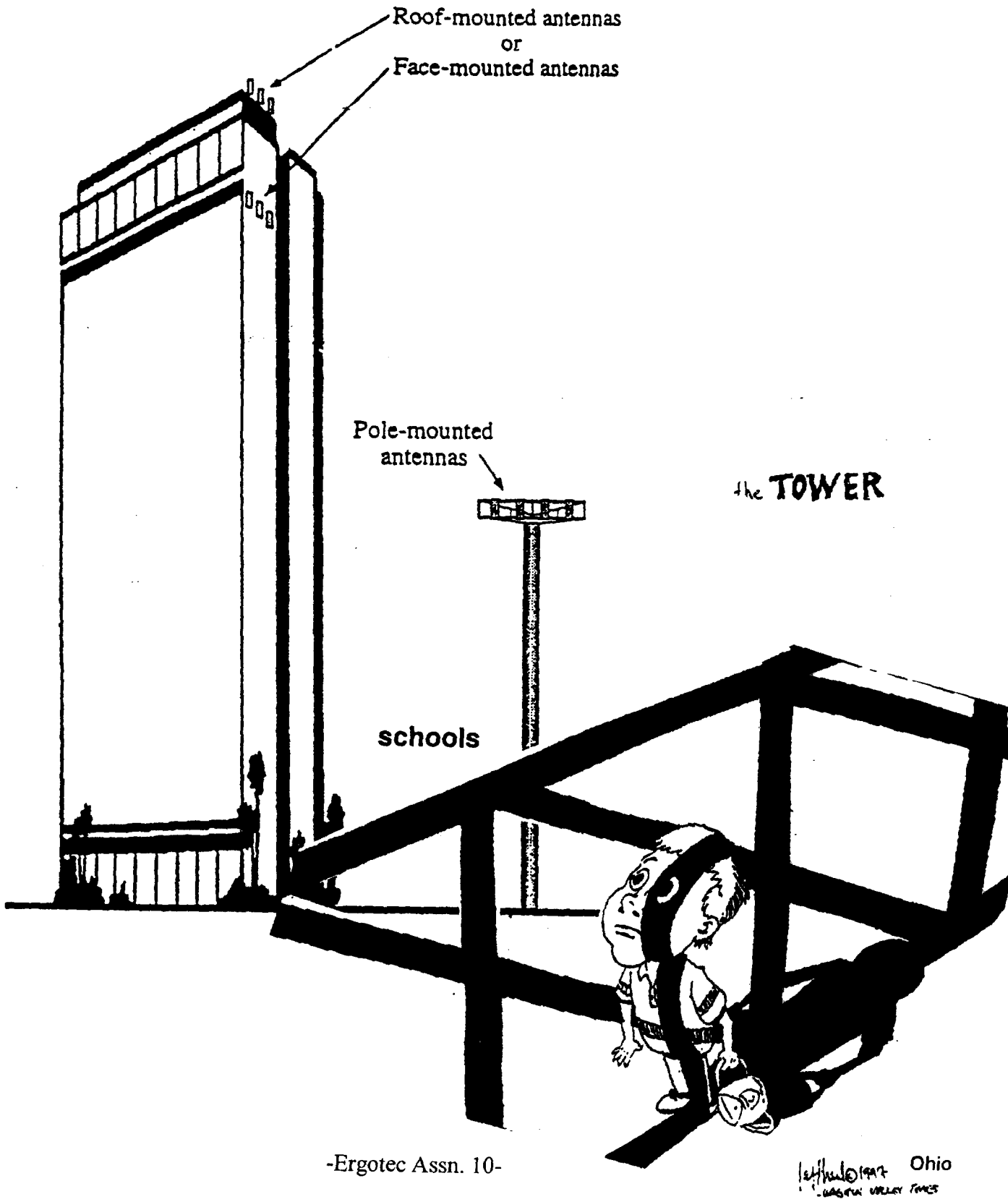
The energy is endless.

Emissions are invisible. They cannot be seen, smelled, touched, or felt.





Typical PCS Antenna Installations
- Building-Mounted & Pole-Mounted -



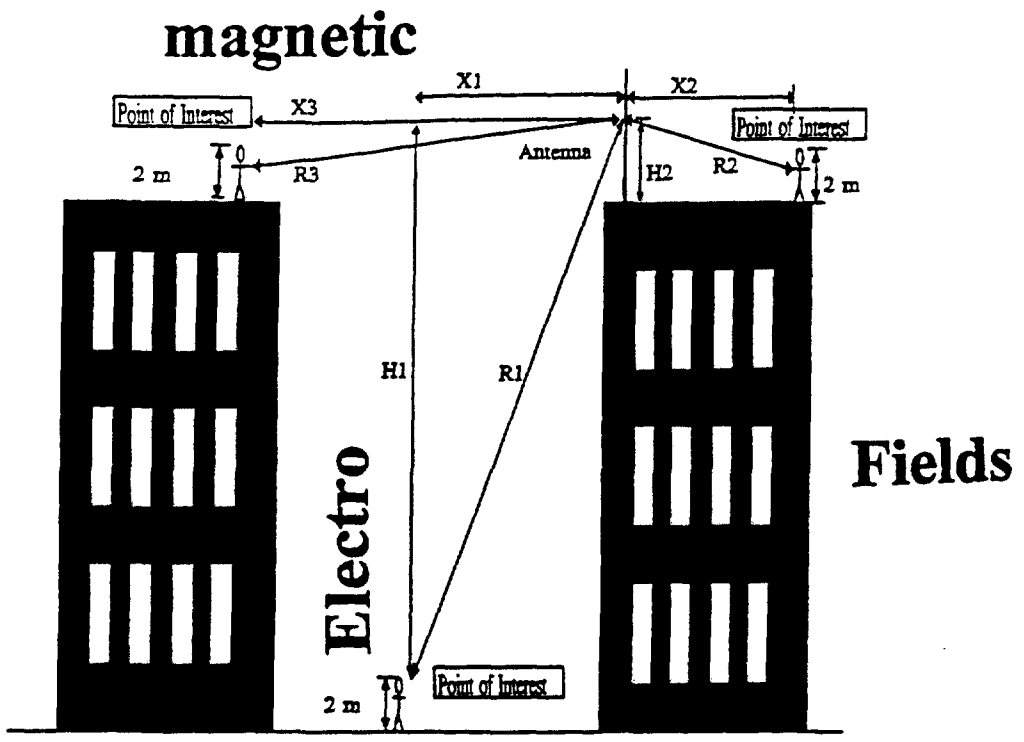


FIGURE 6. Single roof-top antenna, various exposure locations.

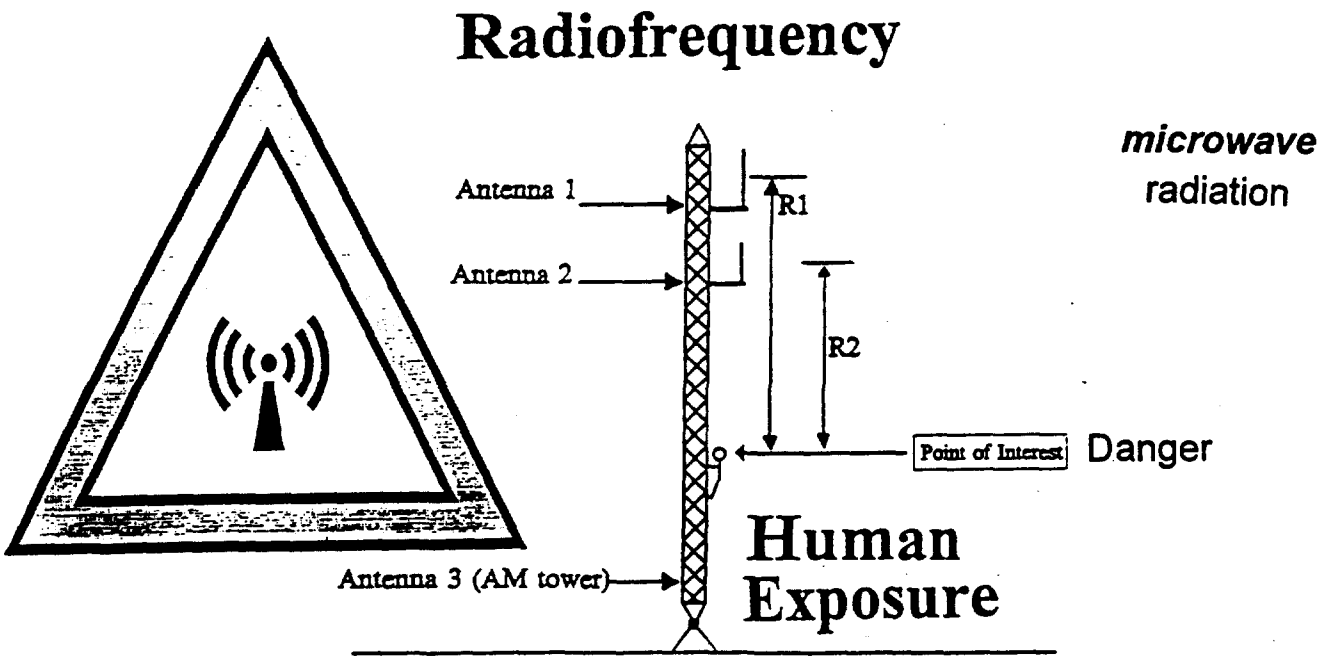


FIGURE 7. Single tower, co-located antennas, on-tower exposure.

ERGOTEC ASSOCIATION, INC.

Human Engineering Non-Profit

P. O. Box 9571 . Arlington, Virginia 22219 . Phone-Fax (703) 516-4576

93-62

William Caton, Secretary
FCC
1919 M Street, NW, #200
Washington, DC. 20554

September 3, 1996

RECEIVED

SEP 3 - 1996

FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF SECRETARY

BY HAND

Re: Report and Order – FCC 96-326 - Petition for Reconsideration

Dear Mr. Caton:

Enclosed are three documents on the bio-effects of electromagnetic radiation (EMR). Please file under the above Report and Order. (1) *Soviet Research on the Neural Effects of Microwaves*, which might have given rise to the ANSI limit of 10 mW/cm2 (page 26). (2) Pages from my book **X-Rayed Without Consent** discussing the irradiation of personnel at the US Embassy in Moscow. They were exposed to 1-15 uW/cm2, and suffered irreparable injury and death. (3) The findings of Chiang Huai, *Assessment of Health Hazard and Standard Promulgation in China*, that were presented to NATO before the Persian Gulf War. Huai also notes the bio-physiological damage in State Department personnel exposed to 1-15 uW/cm2. The human injuries highlighted in these documents deal with both thermal and non-thermal disorders.

EMR exposure limit recommended by the health and safety Interagency Group to FCC will be 1 mW/cm2. The ANSI specific absorption rate (SAR) to airborne radiation is 1.8 W/kg of tissue. Now FDA says PCS users can absorb up to 1.6 W/kg. Touching PCS phones (contact electricity), which operate at high gigahertz (GHz) frequencies whereas cellular phones function in the lower megahertz range, will induce high SARs and strong electric currents in the body for longer periods.

What will be the joint effect when EMR is absorbed directly (contact) as well as from airborne sources impinging on the biologic system? This is a major concern in view of the fact that *many carriers* will install ***many antennas*** **all over the country.**

It is not expected the Commissioners nor anyone will react to the foregoing caveat. But Ergotec along with many citizens groups nationwide goes on record to state, **"The biological and environmental outcome of ubiquitous radiation from many sources in our ecosystesm will be destructive to humanity and the US economy."**

Sincerely,

Bert Dumpé

cc: Commissioners, Interagency Group

Enclosed (New York objection to PCS antennas by Arthur Firstenberg.
This is representative of citizen opposition nationwide and worldwide.)

SOVIET RESEARCH ON THE NEURAL

EFFECTS OF MICROWAVES

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.D62

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Research Triangle Park, NC 27709

Report 66-133 7 November 1966

Surveys of Foreign Scientific and Technical Literature

SOVIET RESEARCH ON THE NEURAL EFFECTS OF MICROWAVES

ATD Work Assignment No. 79-67-1

The publication of this report does not constitute approval by any U. S. Government organization of the inferences, findings, and conclusions contained herein. It is published solely for the exchange and stimulation of ideas.

Aerospace Technology Division
Library of Congress

INTRODUCTION

The primary purpose of this report is to outline Soviet research on the effect of low-intensity microwave radiation on the central nervous system of living organisms, including man. The material presented here has been drawn exclusively from open-source technical literature, covering in the main, the period of the last decade. The report consists of several sections which may be read independently.

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1. Scope of effort: organization and individual researchers

Open source literature, especially that of the last ten years, indicates that there has been a lively and sustained Soviet interest in the interaction between high-frequency electromagnetic radiation and biological systems. To the extent to which such literature reflects actual research efforts, it must be assumed that Soviet work in this field is extensive and involves a large number of scientific personnel who are pursuing a wide range of specialized research goals. While this interest extends through the range of typical problems, such as those dealing with industrial hygiene and microwave therapy, the subject attracting the greatest attention in this field is the "unknown" or nonthermal effects of microwaves. A number of studies have dealt with this effect.

Serious interest in a given field of scientific study is usually manifested by the involvement of several institutions which normally assume the leading role in the research and pursue it in a systematic manner. There is also the usual background of less directly involved organizations and individuals who publish in a somewhat less systematic manner, sometimes perhaps as the by-product of other research, but who are always present in the aggregate and add their voice to the discussion in proportion to the significance generally ascribed to the subject. All these elements are quite evidently present in this case.

Two organizations in the USSR appear to have taken the lead in systematic research on microwave interaction with biological structures: the Central Scientific Research Institute of Health Resort Science and Physiotherapy, and the Institute of Industrial Hygiene and Occupational Diseases of the Academy of Medical Sciences USSR, both located in Moscow. The names of these organizations, however, do not preclude their interest in this field from reaching far beyond the problems of microwave therapy and the protection of workers exposed to high-intensity fields.

A. S. Presman, of the Central Scientific Institute of Health Resort Science and Physiotherapy, is the most important researcher working in the area of the effect of microwaves on living organisms. In addition to his research work, Presman is a leading interpreter of this subject and is the author of several comprehensive reviews of Soviet and non-Soviet achievements in this field. During the period 1955—1958, Presman worked in the aforementioned Institute of Industrial Hygiene and Occupational Diseases, where his research dealt with problems of indus-

trial protection against exposure to microwaves. However, sometime around 1960, Presman began writing under the byline of his present affiliation and, simultaneously, his area of interest shifted to low-intensity microwave effects, mainly concerning the central nervous system. (Emphasis on low-intensity microwave effects seems to be characteristic of the work of the Institute of Health Resort Science and Physiotherapy as a whole). A small proportion of Presman's work concerns microwave therapy.

Presman is the apparent leader of a team of workers of the Institute, consisting of Yu. I. Kamenskiy, N. A. Levitina, S. M. Rappaport, and L. A. Blyumanfel'd, who are responsible for a considerable number of research reports published in the period 1960—1965.

The byline of the Central Scientific Institute of Health Resort Science and Physiotherapy has appeared in reports on the biological action of microwaves by other authors, who may or may not be associated with Presman. Included in this group are F. L. Leytes, L. A. Skinrikhina, A. N. Obrosov, and A. Krotov, who have written a number of papers on microwave therapy.

The Institute of Industrial Hygiene and Occupational Diseases seems to have a somewhat larger group of researchers engaged in work on microwave effects. This institute's principal researchers on low-intensity microwave effects also continue to contribute reports on industrial protection against microwaves. A fairly cohesive group consisting of Z. V. Gordon, Ye. A. Lobanova, M. S. Tolgskaya, S. F. Belova, I. A. Kitsovskaya, A. A. Letavet, K. G. Knorre, B. M. Belitskiy, and S. V. Nikogosyan has been publishing steadily since 1955, mainly on experiments concerning microwave irradiation of animals. Much of the output of this group centers around the publication in 1960 of the Institute's proceedings on the biological action of ultrahigh frequencies. Although the output of the Institute of Industrial Hygiene and Occupational Diseases has fallen off somewhat during the last two years. There is some evidence that renewed activity may be contemplated.

A number of local institutes of industrial hygiene and occupational diseases not under the jurisdiction of the Academy of Medical Sciences, but under the various republic ministries of health are active in microwave research. Included are the Leningrad Institute of Industrial Hygiene and Occupational Diseases, and its Georgian,

Ukrainian, and Gor'kiy namesakes. All of these institutes have published research reports during the last decade dealing with Industrial protection against microwaves.

In spite of the diminished output of the Institute of Industrial Hygiene and Occupational Diseases over the last two years, overall Soviet research and publishing activity on the biological action of microwaves have by no means lessened. The type of research characteristic of the Gordon group was taken up in 1964 by an organization new to the scene, the Bogomolets Institute of Physiology of the Ukrainian Academy of Sciences in Kiev. The individual researchers at the Bogomolets Institute, E. L. Revutskiy, K. M. Solovtsova, S. F. Gorodetskaya, N. I. Kerova, V. S. Belokrinitskiy, and M. I. Yatsenko, were also new to the scene. The work of the Bogomolets Institute is divided between the Department of Clinical Physiology and the Biophysical Laboratory. The output of this organization has been quite steady from 1964 to the present.

A small but interesting microwave research team is associated with Yu. A. Kholodov, of the Institute of Higher Nervous Activity and Neurophysiology of the Academy of Sciences USSR in Moscow. The group, besides Kholodov, includes Z. A. Yanson and A. L. Eldarov. Since 1962, Kholodov has been engaged in experimental studies of of the effect of microwaves on the central nervous system of animals, and should be regarded as one of the most significant personalities in this field. Parallel with his microwave studies, Kholodov has worked with the effects of magnetic fields on biological systems including the central nervous system. His reports in this area date from 1958.

V. R. Faytel'berg-Blank, of the Ukrainian State Research Institute of Health Resort Science and Physiotherapy, is working on the effect of microwaves on the gastrointestinal tract.

In addition to the systematic research carried out by the several institutes described above, which clearly appear to have been charged with the major responsibility of developing microwave research, other, isolated, research papers, both with and without byline, have appeared regularly during the last decade. These papers have covered a wide range of studies from low-level microwave effects to industrial hygiene and microwave therapy. Particularly interesting is a work by N. N. Livshits, of the Institute of Biological

Physics of the Academy of Sciences USSR, published in 1957—1958 on the effect of microwaves on the central nervous system. Other significant papers are by R. A. Chishenkova, of the Institute of Higher Nervous Activity, on the effect of AC magnetic fields on rabbits, F. P. Petrov of the Laboratory of General Neuro-Muscular Physiology, on the effect of low-frequency electromagnetic fields on higher nervous activity, V. A. Pukhov, of the Kirov Military Academy, on microwave effects on the central nervous system, etc. In this group of papers with random or no institutional affiliation, each author has contributed very few articles on the subject during the past decade. The relatively large number of such papers, however, is not without significance: it is a fairly reliable indication of the widespread interest in the problems of biological effects of microwaves that apparently exists in the Soviet Union.

Several conferences have been held in the USSR on the biological effects of microwaves. The first such conference dealt with the application of short and ultrashort waves in Medicine, and was held in Moscow in 1940. Several conferences on the application of radioelectronics in biology and medicine and on industrial hygiene and the biological action of radiofrequency electromagnetic waves were held between 1957 and 1962. Unfortunately, no proceedings of these conferences are available.

Since much of the earlier Soviet material on this subject has been treated by the writer in other ATD reports*, and since very recent material reflects the history of Soviet research and development in this area, the present report will concentrate primarily on material published in the 1964—1966 period. As an index of present Soviet activity in this area one of the articles cited in this report appeared as recently as 10 October 1966.

Special emphasis will be placed on the neural (especially nonthermal) effects of EMF's, particularly in the microwave range, although some attention will also be paid to electric, magnetic, and low-frequency electromagnetic fields. Following a review of Soviet research concerning the effects of EMF's on specific neural functions and structures, this report will discuss the results of Soviet experiments on animals, the clinical and hygienic aspects of human exposure to EMF's, and finally, a summary and discussion of the ramifications of the Soviet research effort in this area.

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*Dodge, C. H. Biological and medical aspects of microwaves. ATD *Foreign Science Bulletin*, v. 1, no. 2, 1965, 7-19.

_____ The biological effects of electromagnetic fields (annotated bibliography). ATD Report P-65-17, 1 April 1965, 44 p.

_____ Biomedical microwave research (compilation of abstracts). ATD Press (Special Issue), v. 4, no. 43, 1965, 10 p.

_____ Biological effects of microwaves (compilation of abstracts). ATD Report P-65-68, 17 September 1965, 93 p.

3. Specific neural functions and structures

This section will treat those research efforts devoted to revealing specific effects of EMF's in the microwave range on the functions and morphology of various neural and neuromuscular structures. In this area, *in vitro* experiments are of particular interest because they necessitate an intimate knowledge of biophysical principles and therefore, rigid control of all physical and biological parameters, accurate dosimetry, and maximum viability of the structure under consideration. Because of these obstacles, relatively few Soviet studies have dealt with this aspect of EMF effects.

On the other hand, a considerable number of papers in the last decade have reported neural cytomorphological results of exposure to microwave-range radiation. Here, both locally and totally irradiated animals have been investigated. The findings of these studies have been fairly consistent. Tolgskaya et al. [4] compared the effects of thermal and nonthermal 10-cm waves on various organs of whole-body-irradiated rats. Exposure to thermal, 40—110 mw/cm^2 fields resulted in vascular damage to all internal organs, including the nervous system. Damage to the latter was characterized by pericellular and perivascular edema, both massive and minute cerebral hemorrhaging, and vacuolization and protoplasmic swelling of brain cells.

In animals exposed to a slightly thermal, 19—31 mw/cm^2 field of the same wavelength for 30 min, the following similar changes were noted: Perivascular and pericellular edema and hemorrhaging of neural structures, severe protoplasmic swelling of parenchymatous nerve cells, and significant cerebral microglial activity.

Of particular interest in this study were results of exposing animals to nonthermal intensities of 10-cm waves for 30 min. Animals exposed to 7.0—9.5 mw/cm^2 and killed immediately thereafter showed more pronounced vascular reactions in neural structures than in any other organ. A cerebral microglial reaction was interpreted as an indication that the brain is the first structure to exhibit a mesenchymal reaction to centimeter waves. Those authors concluded that while the severity of pathological shifts is generally a function of field intensity and exposure duration, the thalamus and hypothalamus appear to be the most sensitive structures to centimeter waves. Although the authors did not speculate on the functional ramifications of these effects, the study supports the opinions of other prominent Soviet theoreticians (Livshits [1,2], Presman [5,6], and Osipov [32]) that neural structures respond to microwave field intensities which do not result in a significant increase in body temperature.

The year after the study mentioned above [4], Lobanova [7] (a participant in the Tolgskaya study) further investigated the effects of a nonthermal, 10 mw/cm² intensity of 10-cm waves on the cytomorphology of interneuron connections. She did not specify exposure duration other than to say that it was "prolonged" and that the animals were multiply exposed. A reasonable guess of the duration of exposure would be 30 min, based on the previously mentioned study.

Using the Golgi-Bubanet method, the author revealed that the fine projections of dendrites were in the process of disappearing and, in some cases, showed thickening or swelling. Apical dendrites leading to the upper layers of the cerebral cortex were the most noticeably affected. As the number of exposures to microwaves increased, the process of dendrite formation extended deeper into the cortex toward the nerve cell itself. Lobanova theorized that these structures may be specific receptors of microwaves, although she was cautious enough to mention that these structures had shown similar reactions to aniline and lead. In general, she concluded that changes in the higher nervous activity of animals exposed to microwaves were a function of interneuron disruption and that the effects of 10 cm (10 mw/cm²) waves were basically nonthermal.

Another approach to determining the effects of EMF's on isolated neural structures involves the investigation of the bioelectrical activity of an *in vitro* or *in vivo* specimen under normal and experimental conditions. This approach is obviously complicated by the fact that rigidly controlled conditions are an absolute necessity, especially for *in vitro* specimens. Here, statistically reliable results are possible only if the parameters of irradiation can be accurately dosed and monitored. To this end, Presman and Kamenskiy [8] designed and constructed systems for irradiating neural or neuromuscular preparations, as shown in Figs. 1 and 2.

Kamenskiy [11] further refined these systems for research on specific neural preparations to provide for improved thermal control and shielding.

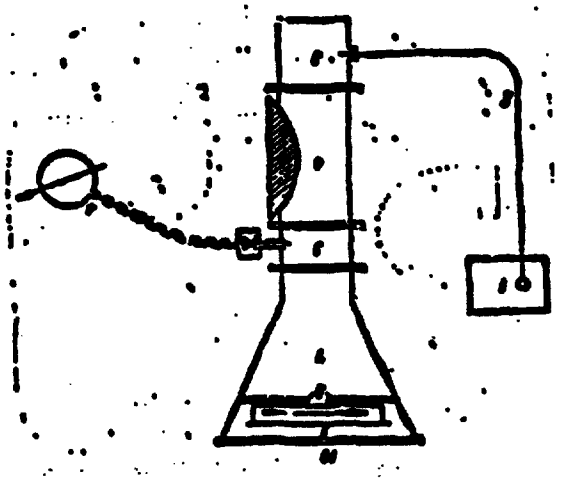

Fig. 1. Basic diagram for irradiating a neuromuscular preparation with 10-cm microwaves by dosing the power flux density

1 - Microwave generator; 2 and 3 - cable and waveguide; 4 - attenuator; 5 - power indicator; 6 - microammeter; 7 - horn; 8 - absorption plates; 9 - neuromuscular preparation; 10 - final screening absorption plate.

Fig. 2 is a variant of the device shown in Fig. 1.

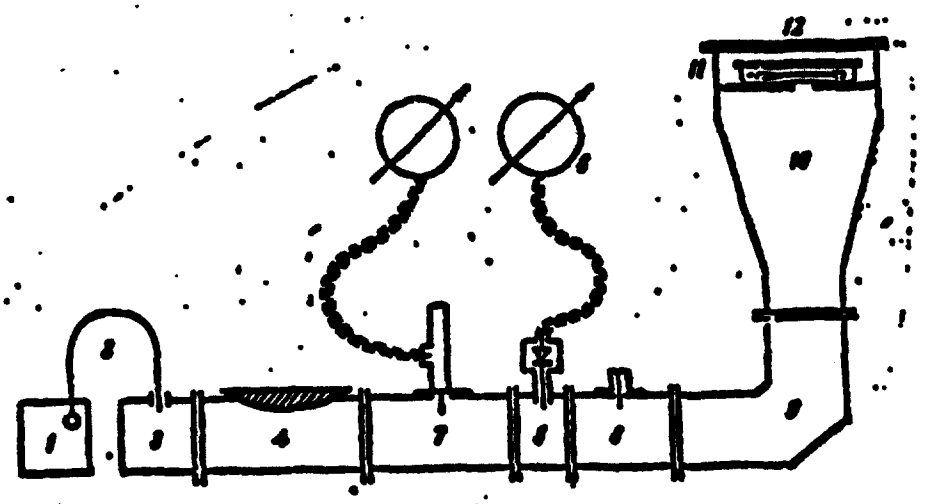

Fig. 2. Device for irradiating neuromuscular preparations with measured doses of microwave power

1 - Microwave generator; 2 - cable; 3 - waveguide pickup; 4 - attenuator; 5 - power indicator; 6 - microammeter; 7 - measuring segment; 8 - impedance transformer; 9 - bent waveguide; 10 - horn; 11 - radiation chamber; 12 - final screening absorption plate.