

1 JULY 2003



Aerospace Medicine

**CONTROL OF RADIOFREQUENCY
RADIATION**

COMPLIANCE WITH THIS PUBLICATION IS MANDATORY

NOTICE: This publication is available digitally on the AFDPO WWW site at:
<http://www.e-publishing.af.mil>

OPR: 30 ADOS/SGGB (Maj de Venoge)
Supersedes 30 SWI 48-102, 30 Oct 98.

Certified by: 30 MDG/CC (Col Allen)
Pages: 8
Distribution: F

This instruction provides guidance procedures, safety measures, and responsibilities for controlling radiofrequency (RF) radiation on Vandenberg Air Force Base (AFB). It provides guidance on the development and purchase of hazardous RF equipment or systems, as well as the medical examination and surveillance program. This instruction applies to all assigned, attached, and tenant units as well as contractors who use, site, construct, modify or operate RF sources on Vandenberg AFB. **Attachment 1** is a glossary of references, acronyms and terms used. The Paperwork Reduction Act of 1974 as amended in 1996 and AFI 33-360, Volume 2, *Forms Management Program*, affects this publication.

SUMMARY OF REVISIONS

This revision changes and adds several functional area responsibilities and updates Wing policy consistent with AFOSH STD 48-9, *Radiofrequency Radiation (RFR) Safety Program*. A bar (|) indicates a revision from the previous edition.

1. Responsibilities:

1.1. The Commander, 30th Medical Group:

1.1.1. Establishes policy and requirements for controlling RF radiation through the 30th Aero-medical-Dental Squadron (30 ADOS/SGGB), Bioenvironmental Engineering Flight (BEF).

1.1.2. Oversees medical examination requirements for personnel who may have been overexposed to RF radiation. Medical services for contractor personnel are per Air Force directives and support agreements.

1.2. Unit Commander Responsible for RF Radiation Emitters:

1.2.1. Provide notification to BEF, 30th Space Wing Safety (30 SW/SE), and respective tenant safety offices of intended use of new or modified RF systems.

- 1.2.2. Appoint a Unit Radiation Safety Officer (URSO) to BEF in writing annually.
- 1.2.3. Ensure operating, maintenance, and emergency procedures are reviewed annually by the respective safety offices and maintained at each RF site.
- 1.2.4. Ensure access to hazardous or suspected hazardous RF areas is controlled and identified to prevent unauthorized entrance per Air Force Occupational Safety and Health (AFOSH) Standard (STD) 48-9, *Radio Frequency Radiation (RFR) Safety Program*.
- 1.2.5. Ensure annual training is provided to all personnel working around RF devices.
- 1.2.6. Ensure personnel exposure remains below the standards outlined in Institute for Electrical and Electronic Engineers (IEEE) publication C95.3-2002, *IEEE Recommended Practice for Measurements and Computations of Radio Frequency Electromagnetic Fields With Respect to Human Exposure to Such Fields, 100 kHz-300 GHz*. Incidents involving potential overexposure of personnel are reported and investigated as required by AFOSH STD 48-9 and AFI 91-204, *Safety Investigations and Reports*.

1.3. Bioenvironmental Engineering Flight (BEF) (30 ADOS/SGGB):

- 1.3.1. Coordinates and maintains an inventory of RF emitters on Vandenberg AFB with the assistance of the RF Spectrum Management Office, 30 SCS/SCMK, 6-6695.
- 1.3.2. Reviews and approves or disapproves all RF radiation producing equipment and systems based on actual or potential personnel or environmental hazards.
- 1.3.3. Evaluates and categorizes theoretical hazard distances on all hazardous RF emitters.
- 1.3.4. Performs or reviews hazard distance calculations and field surveys prior to or during initial use. Risk-based visits will be performed to review operating parameters and safety issues thereafter.
- 1.3.5. Evaluates RF systems for toxic or inert gases associated with the system, noise hazards from power generation equipment, warning signs and labels, and ionizing radiation from high-voltage tubes in the systems.
- 1.3.6. Evaluates suspected or reported overexposure of personnel to radiofrequency electromagnetic radiation.
- 1.3.7. Assists URSOs on training issues if requested.

1.4. Public Health (PH) (30 ADOS/SGGM):

- 1.4.1. Provides briefings or other health education consultations concerning RF radiation when requested by URSOs or commanders.
- 1.4.2. Initiates action to investigate alleged or suspected RF radiation overexposure. Where required, prepares and distributes AF Forms 190, **Occupational Illness/Injury Report**, and additional documentation as required for these cases, as specified in AFI 48-101, *Aerospace Medical Operations*, and AFOSH STD 48-9.
- 1.4.3. Ensures any medical follow-up examinations for persons identified as having been overexposed are performed.
- 1.4.4. Ensures that a copy of each investigation report is placed in the involved individual's medical records.

1.5. 30th Space Wing Safety (30 SW/SE):

1.5.1. Provides explosive safety evaluations and consultation for all use of RF producing equipment and systems.

1.5.2. Reviews and approves (or disapproves) all proposed RF equipment and systems on Vandenberg AFB for radiation hazards to electro-explosive devices and volatile fuels.

1.5.3. Reviews all proposed RF equipment and system sitings to ensure established explosive clear zones and primary explosives transportation routes are not affected or violated.

1.5.4. Analyzes associated operations for flight or ground operations to ensure radars do not violate specified limits for personnel, ordnance or critical equipment.

1.5.5. Reviews and approves hazardous operation procedures.

1.6. Base Contracting Office: Ensures contractors implement AFOSH STD 48-9, IEEE C95.3-2002 and this instruction's requirements through appropriate contractual agreements and procurement actions.

1.7. 30 SW Radiofrequency Spectrum Management (FCAC, 6-9247 for 30 SCS/SCMK, 6-6695):

1.7.1. Verifies DoD radiofrequency (RF) spectrum certification (DD Form 1494) for RF devices brought to and/or installed on the Western Range.

1.7.2. Ensures RF devices are duly authorized (have assignments) to operate within a specific RF spectrum.

1.7.3. Notifies BEF when new RF systems are delivered and existing systems are modified, relocated or disposed of.

1.8. 30 SW Range Scheduling (30 RANS/DOUS, 6-8825):

1.8.1. Schedules authorized frequencies used on Vandenberg AFB, in coordination with the Range Frequency Control and Analysis Center (FCAC, 6-9247). Individual work centers are responsible for those devices that operate on an unscheduled basis, i.e., Airfield Operations, Air Route Surveillance Radar (ARSR) and communications systems.

1.9. Unit Radiation Safety Officer (URSO):

1.9.1. Prepare unit operating instructions (OI) to identify and control personnel access to areas containing hazardous RF radiation levels, and specify procedures to be followed in the event of an accidental overexposure.

1.9.2. Act as single point of contact for the unit on all RF radiation safety matters, and maintain an active liaison with BEF, 30 SW/SE and PH personnel.

1.9.3. Notify BEF prior to any change in location of an RF emitter so a hazard evaluation can be reviewed and conducted, if necessary. Notification must be in writing.

1.9.4. Notify BEF of any modification or significant operational procedure change made to an existing RF system. The notification must be provided to BEF in writing 30 days prior to the expected change.

1.9.5. Conduct RF radiation training for all personnel working in RF radiation areas. Training should include the hazards of RF radiation, control measures and emergency procedures in the

event of an accidental exposure. Training must be documented on an AF Form 55, **Employee Safety and Health Record**, for Department of Defense (DoD) personnel and personnel records for contractors.

1.9.6. Notify BEF, 30 SW/SE and Unit commanders immediately of all suspected incidents or accidents, unusual occurrences or overexposure to RF.

1.9.7. Obtain BEF and 30 SW/SE approval for all RF emitter operating procedures before initial operation.

1.9.8. Provide a detailed written description of proposed special projects to BEF and 30 SW/SE. Proposals must include all potential hazards and conditions associated with the project and applicable safety measures.

1.9.9. Maintain an inventory and accountability of all RF emitters and systems under their control. Send inventory updates to BEF and 30 SW/SE as soon as possible after a change has been made.

1.9.10. Ensure all radiation hazard areas are identified, posted per AFOSH STD 48-9, and have a controlled entry. Flashing lights near areas with easy access to potentially hazardous levels of RF radiation may be required. **NOTE:** A hazard area exists whenever radiation levels exceed the maximum permissible exposure levels established in IEEE C95.3-2002 for controlled and uncontrolled environments.

1.9.11. Ensure operating maintenance and emergency procedures for each RF emitter or system are current and maintained at the RF radiation work area.

1.9.12. Inspect transmission lines/waveguides periodically for cracks or other defects which might allow leakage.

1.9.13. Ensure the base master comprehensive planning document is updated with the location of all RF systems and equipment. **NOTE:** If the proposed RF emitter site is in an established explosive clear zone or explosive site, a plan must be submitted and approved before the system is installed.

1.10. All Users of RF Equipment and Systems:

1.10.1. Notify URSO of any modification or change to RF equipment systems.

1.10.2. Ensure all radiation hazard areas are identified, posted per AFOSH STD 48-9, and have a controlled entry.

1.10.3. Ensure unattended RF systems are secure at all times.

1.10.4. Ensure the URSO or Safety Officer is notified immediately of all suspected incidents or accidents, unusual occurrences or overexposures (if URSO or Unit Safety Officer is not available on base, BEF, PH, Unit Commanders and 30 SW/SE are notified).

1.10.5. Ensure a buddy system or two-man policy is used during maintenance of RF equipment or systems identified as hazardous or potentially hazardous.

1.10.6. Complete all training requirements.

1.10.7. Ensure operating maintenance and emergency procedures for the system are maintained at the site.

1.10.8. Comply with all posted operating maintenance and emergency procedures.

1.10.9. Inspect transmission lines periodically for cracks or other defects which might allow leakage.

2. RF Approval Procedures. All organizations developing or buying potentially hazardous RF equipment or systems must obtain written authorization from BEF and 30 SW/SE. The user will forward, by memorandum, the following information so that a theoretical hazard evaluation may be conducted and an equipment inventory maintained. (**NOTE:** Submit this data no later than 30 days prior to initial startup of the equipment. The theoretical hazard evaluation will be used as a guide for an initial survey of the installation if necessary. This review must be accomplished before the RF system is approved for normal operation.):

- 2.1. Name, location and telephone number of responsible organization.
- 2.2. Nomenclature of emitter (name, number, manufacturer and model number).
- 2.3. Frequency or frequencies of operation (MHz).
- 2.4. Mode of operation (pulsed or continuous wave).
- 2.5. If pulsed:
 - 2.5.1. Pulse width (seconds).
 - 2.5.2. Pulse repetition frequency (Hz).
- 2.6. Peak and average power output (watts). (Note: Peak and average power outputs are same for continuous wave.)
- 2.7. Gain and sweep characteristics of antenna.
- 2.8. Beam width (azimuth and elevation).
- 2.9. Voltage ratings for consideration of possible x-ray hazard.

3. Access Control. The using organization will control access to RF hazard areas on Vandenberg AFB. Violations of these areas during emitter operation may be considered an "incident" and treated as a potential overexposure.

4. Radiofrequency Safety Devices.

- 4.1. General Control Guidelines:
 - 4.1.1. Incorporate engineering control mechanisms as part of the transmitter system (such as shielding, interlocks, antenna stops, etc.).
 - 4.1.2. Deny unauthorized or transient personnel access to any exclusion area associated with a RF transmitter. Use signs, warning lights, physical barriers, interlocks or area surveillance to designate the hazardous areas wherever applicable.
 - 4.1.3. In areas where easy access to very high levels of RF radiation may exist, install a flashing light near the antenna site to indicate RF transmission.
 - 4.1.4. Post operating and emergency procedures at each transmitter site.
 - 4.1.5. Keep maintenance procedures for the specified system at the site.

4.1.6. Interlock cabinets containing high-voltage components to prevent access while high voltage is on.

4.1.7. Area visitors must be escorted and briefed to ensure they comply with established safety precautions.

4.1.8. Using RF transmitters for range estimates on non-target vehicles or aircraft is prohibited, except as authorized by the Vandenberg Base RSO (30 ADOS/SGGB, 6-7811) and 30 SW/SE.

4.1.9. Never leave an operating RF system unattended or unsecured.

4.2. Special Control Provisions. Specific control provisions may be assigned as a result of the calculation and survey authorization process. These controls reflect the degree of hazard represented by the particular system.

4.3. Associated System Hazards. A list of hazards to be considered when working with RF devices includes, but is not limited to:

4.3.1. Electrical hazards associated with high-voltage components and associated wiring.

4.3.2. X-ray radiation produced by high-voltage components.

4.3.3. Ozone concentrations produced by high-voltage components.

4.3.4. Radioactive materials contained in certain types of high-voltage tubes.

4.3.5. Infrared radiation hazards associated with communications, beacon, navigation, direction finding, tracking and missile guidance systems, etc.

4.3.6. Toxic substances.

4.3.7. Inert gases under pressure.

4.3.8. Petroleum oils and lubricants.

4.3.9. Electro-explosive devices.

4.3.10. Mechanical hazards to head, feet and arms.

5. Medical Surveillance Program:

5.1. In the event of suspected overexposure of a DoD civilian or military member, that person's medical history will be reviewed by a physician (contractors are not included within the scope of the USAF Occupational Health Program). The individual will be given an examination per AFI 48-123, *Medical Examinations and Standards*. Depending on the results and symptoms, consultations by specialists may be obtained in accordance with AFOSH STD 48-9. All incident follow-up and documentation will also be performed in accordance with AFOSH STD 48-9.

GREGORY O. ALLEN, Colonel, USAF, MSC
Commander, 30th Medical Group

Attachment 1**GLOSSARY OF REFERENCES AND SUPPORTING INFORMATION*****References***

AFI 48-101, *Aerospace Medical Operations*

AFI 48-123, *Medical Examination and Standards*

AFI 91-204, *Safety Investigations and Reports*

AFOSH STD 48-9, *Radio Frequency Radiation (RFR) Safety Program*

T.O. 31Z-10-4, *Electromagnetic Radiation Hazards*

DoD 6055.5M, *Occupational Health Surveillance Manual*

IEEE C95.3-2002, *IEEE Recommended Practice for Measurements and Computations of Radio Frequency Electromagnetic Fields With Respect to Human Exposure to Such Fields, 100 kHz-300 GHz.*

Abbreviations or Acronyms

AFB—Air Force Base

BEF—Bioenvironmental Engineering Flight

DoD—Department of Defense

IEEE—Institute for Electrical and Electronic Engineers

GHz—Gigahertz

Hz—Hertz

MHz—Megahertz

OEL—Occupational Exposure Level

OI—Operating Instruction

OSHA—Occupational Safety and Health Act

PH—Public Health

RF—Radiofrequency

RSO—Radiation Safety Officer

URSO—Unit Radiation Safety Officer

Terms

Controlled Environment—Locations where there is exposure that may be incurred by persons who are aware of the potential for exposure (occupationally exposed worker).

Hazardous—RF radiation which exceeds the standards specified in IEEE C95.3-2002 for controlled and uncontrolled environments.

NonHazardous RF Emitters—RF equipment which radiates at frequencies below 1000 MHz and

delivers less than 7 watts of power to the radiating device.

RF Emitter—Any device which is designed to generate RF energy and couple this energy into the surrounding space.

Uncontrolled Environment—Locations where there is the exposure to individuals who have no knowledge or control of their exposure (non-occupationally exposed worker).

Visitor—Any person who is not occupationally exposed to RF radiation.