SAFETY SPECIFICATION FOR THE PULSED FAST NEUTRON ANALYSIS (PFNA) CARGO INSPECTION SYSTEM AT YSleta PORT OF ENTRY COMMERCIAL CARGO FACILITY

BY     JAMES SPACCO (SENSOR CONCEPTS & APPLICATIONS, INC.)

STEPHEN HAIMBACH (NSWCDD COUNTERDRUG TECHNOLOGY PROGRAM OFFICE)

SYSTEMS RESEARCH AND TECHNOLOGY DEPARTMENT

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6. AUTHOR(s)
James Spacco (Sensor Concepts & Applications, Inc.)
Stephen Haimbach (NSWCDD)

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
Commander
Naval Surface Warfare Center
Dahlgren Division (Code B07)
17320 Dahlgren Road
Dahlgren, VA 22448-5100

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This document provides safety procedures for the Pulsed Fast Neutron Analysis (PFNA) Cargo Inspection System at Ysleta Port of Entry Commercial Cargo Facility located in El Paso, Texas.

PFNA technology will be used for determining the presence of contraband, drugs, and weapons, etc., in cargo containers and trucks. This technology measures the elemental contents (e.g., oxygen, nitrogen, etc.) within volume segments of a scanned object. These measurements are used to generate three-dimensional "maps" of the object's elemental composition. The amounts and relative concentrations of key elements are used to identify specific substances of interest (e.g., explosives, narcotics, etc.). A system has been designed to use this technology for inspecting vehicles, such as trucks and tractor trailers.

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FOREWORD

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PFNA technology will be used for determining the presence of contraband, drugs and weapons, etc., in cargo containers and trucks. This technology measures the elemental contents (e.g., oxygen, nitrogen, etc.) within volume segments of a scanned object. These measurements are used to generate three-dimensional “maps” of the object’s elemental composition. The amounts and relative concentrations of key elements are used to identify specific substances of interest (e.g., explosives, narcotics, etc.). A system has been designed to use this technology for inspecting vehicles, such as trucks and tractor trailers.

Approved by:

R. NEAL CAIN, Deputy Department Head
Systems Research and Technology Department
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1. RADIATION SAFETY REQUIREMENTS

The accelerator shall be operated in accordance with standards specified in Chapter 10, Part 20, of the Code of Federal Regulations (10 CFR 20).

The maximum permissible whole body dose for a radiation worker shall be no more than 5 rem/year. Technicians who perform maintenance on the Pulsed Fast Neutron Analysis (PFNA) Cargo Inspection System (hereafter referred to as the “PFNA”) will be “Radiation Workers” to whom this higher occupational level applies.

The PFNA shall be capable of being operated under normal circumstances without a radiation worker present. The PFNA Operator shall work in a location where the exposure is less than 50 microrem/hour.

2. SHIELDING AND SAFETY DESIGN REQUIREMENTS

The accelerator installation shall be provided with such primary and secondary barriers as are necessary to assure radiation exposure shall not exceed 50 microrem/hour above natural background radiation at any point five (5.0) centimeters or greater outside the vertical surfaces of the facility.

The accelerator installation shall be provided with such primary and secondary barriers as are necessary to assure the effect of skyshine or other reflected radiation maintains the less than 50-microrem level above natural background radiation as measured five (5.0) centimeters or greater outside the vertical surfaces of the facility.

The maximum exposure to a person inadvertently exposed to radiation inside the tunnel shall be less than 100 millirem/single-side vehicle scan. The speed of the vehicle through the PFNA, the speed of the scan arm of the PFNA, and the beam intensity shall be monitored, and the generation of the PFNA external neutron beam stopped automatically should the system be operating at levels that exceed normal parameters or that approach the levels of this requirement. Images and controls shall be in place to ensure that the PFNA Operator declares the vehicle clear of personnel before the vehicle is released or sent for additional PFNA scans.

A tow vehicle that encounters an out-of-specification operating condition shall stop.

3. PARTICLE ACCELERATOR CONTROLS AND INTERLOCK SYSTEMS

Instrumentation, readouts, and controls on the particle accelerator control console shall be identified and discernible.

Doors to the areas of the facility where an individual could receive a radiation dose in excess of 50 microrem/hour shall be provided with safety interlocks that shut down generation of the PFNA external neutron beam under conditions of barrier penetration or opening(s). Safety interlocks shall accommodate PFNA Cargo Inspection Equipment
maintenance modes that differ from the PFNA Cargo Inspection Equipment operating mode. Maintenance workers could receive a radiation dose that is consistent with performing their duties under the “Federal Radiation Standards.”

Each safety interlock shall be on a circuit that shall allow it to operate independently of all other safety interlocks, meet building code requirements, and be installed per manufacturer’s recommended procedures.

All safety interlocks shall operate within specifications. Any out-of-specification condition shall stop the generation of the PFNA external neutron beam.

When a safety interlock system has been tripped, it shall only be possible to resume operation of the accelerator by manually resetting controls at the position where the safety interlock has been tripped and, lastly, at the main control console.

An E-STOP button or other emergency cutoff device shall be located and easily identifiable in all high-radiation areas and at each entrance into the inspection tunnel. Such a cutoff switch shall include a manual reset so that the generation of the PFNA external neutron beam cannot be restarted from the operator’s console without resetting the cutoff device.

An E-STOP button or other emergency cutoff device shall be located and easily identifiable on the control panel of the PFNA system. This shall be used (1) if an individual is in an area of high radiation, (2) if the speed of the tow mechanism is too slow, (3) if the beam strength is too high, (4) if the scan arm rate is too low or (5) if any combination of these events would expose a person inadvertently to radiation in excess of 100 millirem/hour. Such a cutoff device shall include a manual reset.

4. WARNING DEVICES

Each location where an individual could receive a radiation dose in excess of 50 microrem/hour and entrances to these locations shall be equipped with easily observable warning lights that operate when, and only when, radiation is being produced.

All areas shall have observable indicators that the PFNA system is on but not generating an external neutron beam.

Except in facilities designed for human exposure, each area where an individual could receive a radiation dose in excess of 50 microrem/hour shall have both visible and audible warning devices that shall be activated for 15 seconds prior to the generation of the PFNA external neutron beam. Such warning devices shall be clearly discernible in and near all affected areas.

Prior to generation of the PFNA external neutron beam, the PFNA Operator shall visually verify that the tunnel area is empty of personnel, and the access doors shall be closed and the interlock switches set. There shall be a physical input by the PFNA Operator to verify that this inspection has been done before the scan can proceed.
Barriers, temporary or otherwise, and pathways leading to areas where an individual could receive a radiation dose in excess of 50 microrem/hour shall be posted in accordance with current radiation safety standards and regulations.

5. OPERATING REQUIREMENTS

To prevent unauthorized use, a control panel key and password shall be required to operate the PFNA system.

A copy of the current operating and the emergency procedures shall be supplied with the PFNA Inspection System and shall be considered part of the control panel.

The safety camera system shall have a port that allows an operator to attach video equipment to record camera output.

6. RADIATION-MONITORING REQUIREMENTS

Radiation levels inside the (1) inspection tunnel and (2) accelerator room shall be monitored, and monitors shall provide readouts at the control panel.

All monitoring devices shall be electrically independent of the accelerator control and safety interlock systems and shall meet code requirements.

7. VENTILATION SYSTEMS

Ventilation systems shall be provided to ensure that personnel entering any area where airborne tritium may be produced shall not be exposed to airborne tritium in excess of an effective dose equivalent limit of 10 millirem/year.

The PFNA facility shall not vent, release, or otherwise discharge airborne tritium to the surrounding environs such that any individual could receive a resulting dose in excess of 10 millirem/year.

The design of the venting system shall assure that all vented tritium is in compliance with the U.S. Environmental Protection Agency (EPA) “exempt” air concentration limit. Compliance shall be determined using the release and design parameters (stack height, activity, air volume, etc.) in running the EPA “Comply” computer code.

8. NOISE-LEVEL REQUIREMENTS

All noise levels, as measured outside the PFNA facility during operation, shall be below 85 decibels and in total compliance with Federal standards and regulations, specifically those of the Occupational Health and Safety Administration (OSHA).
9. STORAGE-OF-HAZARDOUS-MATERIALS REQUIREMENTS

All non-radiological hazardous material stored in or on the PFNA facility shall be in a properly labeled fire-retardant locked cabinet or other approved container in compliance with Federal regulations and standards, specifically the EPA and OSHA.

Prior to disposal as Low-Level Radioactive Waste (LLRW), all radiological material stored in the PFNA facility shall be stored in a lead-lined storage container to maintain radiation exposure levels in compliance with Federal Radiation Standards.

10. INDUSTRIAL SAFETY REQUIREMENTS

Safety standards for most industrial environments are well established (OSHA 29 CFR 1910), and this section merely points out certain specific industrial hazards that are often found in accelerator facilities.

Electric circuits and interconnections shall be wired and installed in accordance with accepted electrical building codes.

Fire extinguishers of the appropriate type to combat electrical or solvent fires shall be conspicuously installed around the PFNA facility.
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