6 - Radiation Detection Equipment Overview

SAND2011-2051P

Defense Nuclear Nonproliferation

Search and Secure Workshop

Equipment Categories

- Your detection equipment has been divided into the following categories:
  - Primary (red label)
  - Secondary (green label)
  - Support (blue label)
- The items in each category should only be used for their intended purpose during orphan source searches.

Equipment Sensitivity

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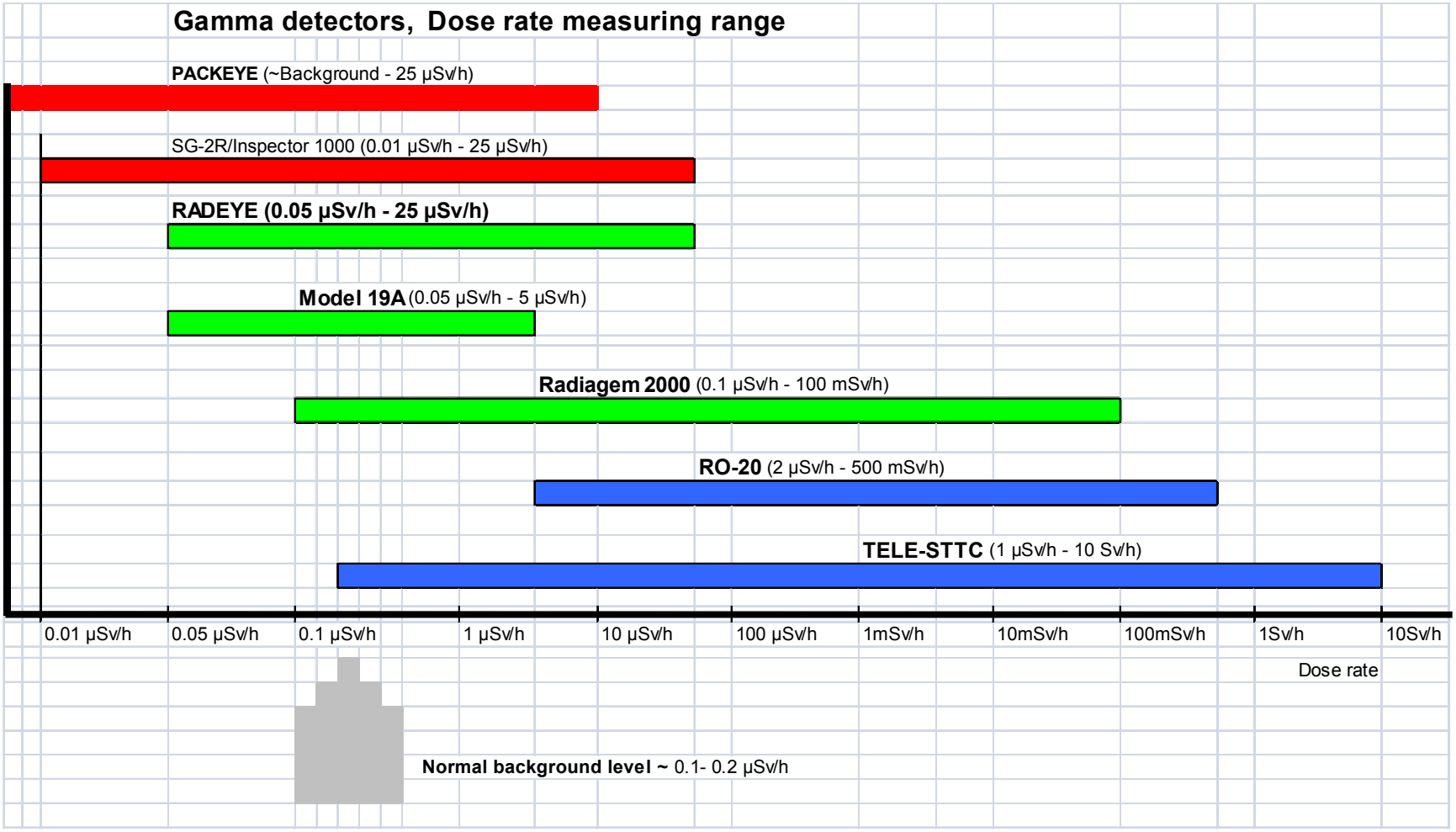

Primary Search Tools (Red Label)

- Equipment that is highly sensitive to gamma and/or neutron radiation
- Used for initial searching of broad areas
- Provides the capability to cover large areas quickly
  - Can also be used in local area searches if operated within specifications (dose rate, etc.)
- Can be portable or vehicle mounted

PACKEYE

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- Large plastic scintillator and two ^{3}He tubes
- Very sensitive to neutron and gamma radiation
- Most sensitive piece of equipment in the suite

Radiagem 2000 with SG-2R Probe

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- 2" x 2" NaI for high gamma sensitivity
- Counts per second (CPS) or Sv h^{-1} display
- High energy button: when depressed, count rate is displayed only above preset threshold
- 10 alarm setpoints for each unit stored in probe

InSpector 1000

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- 2” x 2” NaI detector
- Internal GM tube
- Dose rate range is 10 nSv h^{-1} – 100 mSv h^{-1}
- Dose range is 0.01μSv – 10 Sv
- Only detector capable of nuclide identification
- Spectrum analysis

InSpector 1000 with Neutron Probe

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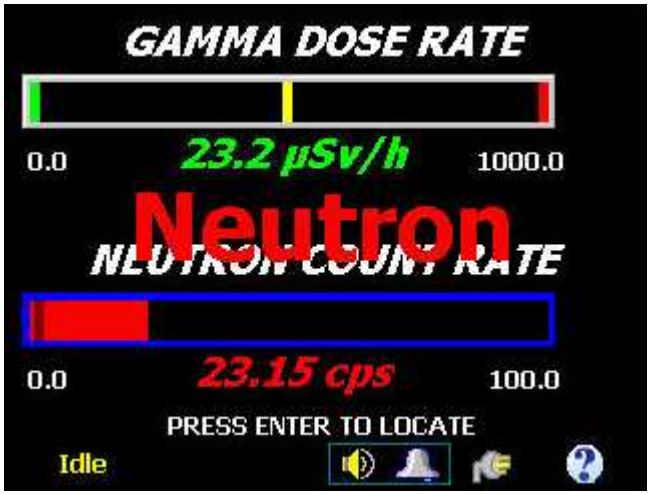
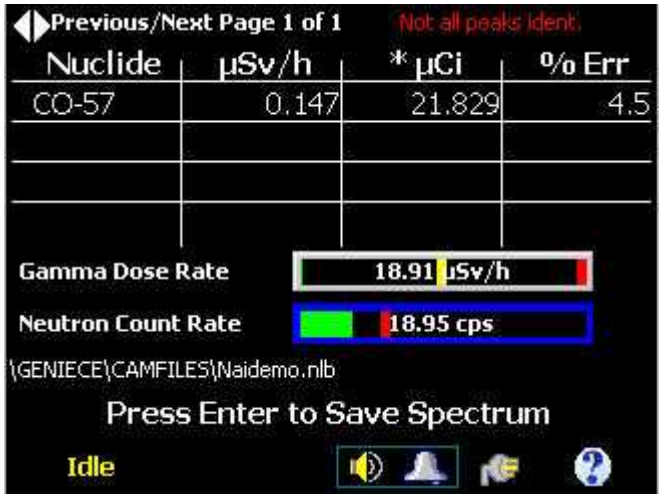
- Moderated ^{3}He tube
- Intrinsic neutron sensitivity ≈1%
  - Un-moderated ^{252}Cf
- Neutron count rate in CPS



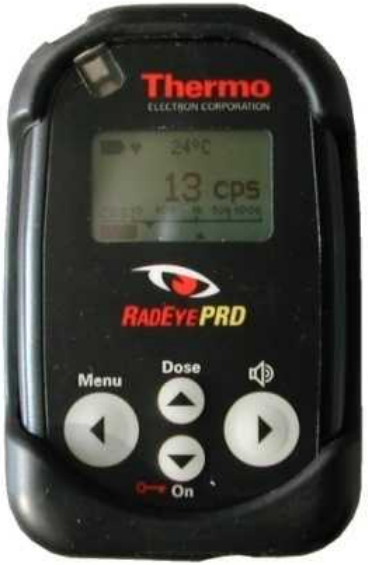


Secondary Search Tools (Green Label)

- Not as sensitive as Primary Search Tools
- Should NOT be first choice for searching
- Can be used during local area searches

RADEYE PRD

- NaI detector
- Dose rate range of 0.01 μSv h^{-1} – 250 μSv h^{-1}
- True dose rate calculation
- Automatic background update (no user action)
- Natural background rejection (NBR)
- Use in CPS mode for local area searches



Model 19A

- Dose rate range of 0.01 – 5 μSv h^{-1}
- 1” x 1” NaI detector
- 50 keV – 1.3 MeV (Gamma and x-ray)
- Stand-alone unit (no external probes)
- Best used for low-level gamma radiation

Radiagem 2000
Portable Survey Meter

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- Dose rate range of 0.1 µSv h^{-1} to 100 mSv h^{-1}
- Internal energy compensated GM tube
- 30 keV to 2 MeV
- External probes may be attached
- Best used for general radiation surveys

Support Tools (Blue Label)

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- Relatively insensitive gamma probes or contamination probes
- Should NOT be used for searching
- Used for source localization, activity estimation (point sources) or contamination monitoring

Alpha/Beta/Gamma Contamination SABG-15+

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- Used with Radiagem 2000 ratemeter
- 15 cm^2 pancake probe
- Selectable units:
  - Counts per second (c/s)
  - Becquerel (Bq)
  - Becquerel per cm^2 (Bq/cm^2)

Alpha/Beta Contamination Probe SAB-100

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- Used with Radiagem 2000 ratemeter
- 100 cm² thin plastic with ZnS(A layer
- Selectable units:
  - Counts per second (c/s)
  - Becquerel (Bq)
  - Becquerel per cm^2 (Bq/cm^2)

Ion Chamber RO-20

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- Dose rate range of 2 μSv h^{-1} – 500 mSv h^{-1}
- Air-filled ionization chamber
- 8 keV – 1.3 MeV
- Beta + Gamma measurements (open window)
- Stand-alone unit
- Best used for accurate gamma measurements
  - Estimation of activity
  - Dose rates

TELE-STTC Telescoping Probe

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- Used with Radiagem 2000 ratemeter
- Dose rate range is 0.3 μSv h^{-1} - 10 Sv h^{-1}
- Energy compensated GM
- Variable length from 1.1 – 3.335 meters
- Best used for:
  - Localizing high activity sources
  - Estimating activity

Portable Wipe Counter

- High sensitivity, 0.25mm thick plastic scintillator coated with zinc sulfide (ZnS) and covered with 0.4mg/cm^2 Mylar® .
- Detects alpha & beta/gamma radiation with simultaneous discrimination.
- Range is 1 – 500k CPM