

RADIATION MONITOR FOR WATER & EFFLUENT DISCHARGE REAL-TIME CONTINUOUS

Model ~ NEX-ALPHA - NEX-ALPHA-R & NEX-BETA

FEATURES:

- AVAILABLE: IN-LINE, BENCH TOP OR PORTABLE SYSTEMS
- MEASURES AT OR BELOW EPA/DHS PAG LEVELS
Protective Action Guideline levels and Military Drinking water limits
- REAL TIME, IN-LINE, CONTINUOUS
- HIGH SENSITIVITY TO ALPHAS AND RADON
(NEX-ALPHA & NEX-ALPHA-R) (Low Sensitivity to Gammas)
- HIGH SENSITIVITY TO BETAS (NEX-BETA)
- ELECTRONICS – PRS-7
 - SINGLE CHANNEL ANALYZER
 - RS232 OPTIONAL USB
- NO REAGENT TANKS TO FILL
- NO WASTE STREAM
- EASY CALIBRATION
- PREVENT ACUTE HEALTH EFFECTS
- REDUCE RISK OF CHRONIC EXPOSURE
- WORLD'S ONLY PAG-LEVEL ALPHA WATER MONITOR
- WORLD'S ONLY PAG-LEVEL BETA WATER MONITOR



NEX-ALPHA, NEX-ALPHA-R, & NEX-BETA monitors allow radiation users to be good community members by controlling & measuring water effluent.

APPLICATION:

USERS:

- Hospitals
- Power Plants
- Oil & Gas Extraction
- National Laboratories

USE FOR:

- Internal Testing
- Locate Problems / Leaks
- Develop Compliance Strategies

DETECT:

NEX-ALPHA AND NEX-ALPHA-R: All Alphas and Radon in Water

NEX-BETA: I-131, Sr-90, Sr-89, Cs-137, Cs-134 etc.



PRS-7 ELECTRONICS



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Divisions of



US NUCLEAR CORP

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TICKER UCLE

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- Monitor drinking water against Alpha emitter contaminants including Radon.
- Monitor drinking water against Beta emitter contaminants except H-3, C-14, S-35.
- Monitor for contamination in ground or surface water.
- Monitor liquid-waste-stream from laboratory or plant.

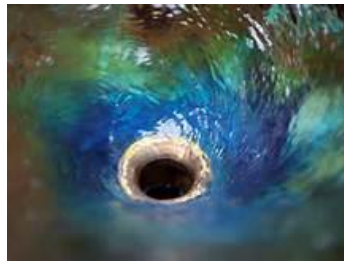
APPLICATION:

Many labs, universities, hospitals, government and pharmaceutical facilities handle some liquid radioactivity.

Some portion of this is collected as radioactive waste and sent for storage or burial. But a significant portion goes down the drain directly or into short term storage tanks. More and more of this is being seen as a hazard by regulators or community members.

The solution is for the various facilities to quantitate these materials to make sure the liquid effluent or waste water is being disposed of into the correct flow path.

Technical Associates' Models **NEX-ALPHA, NEX-ALPHA-R, NEX-BETA, NEX-BETA-ABG** are designed especially for this purpose of quantitating waste water and liquid effluent.



PROBLEM:

Ground water and drinking water sources are vulnerable to contaminants coming from a variety of sources.

These include but are not limited to hospitals, power plants, oil exploration and other industrial uses, accidental or knowing contamination by individuals and groups. Beta isotopes: I-131, Sr-90/Y-90, and Cs-137, can be released. Naturally occurring radioactive materials (NORM) in water such as Radon pose a significant health risk.

As yet very few water districts have real-time radiation monitors in place to protect the water and the public.

SOLUTION:

For the first time in a **Continuous Real-Time radiation water monitor** the Technical Associates' Models **NEX-ALPHA, NEX-ALPHA-R, NEX-BETA, NEX-BETA-ABG** solve this problem by continuously monitoring the water using ultra-sensitive Alpha and Beta radiation detectors.

The information from this detector is analyzed and displayed in units of picoCuries per liter. The count times are user settable & calculations are automatically updated every 2 minutes, every hour and every day. Measurements of radiation concentration and total discharge are logged 24 hr/day, 7 day/week.

The longer update times correspond with greater precision and increased sensitivity. Sensitivities in the daily updates each meet or exceed the DHS Protective Action Guideline Levels (PAG) for drinking water. Please see attached chart of measurements.

Using TA Tried and True sample collection & measurement technology this detector measures ALPHA &



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BETA emissions from any radioactive liquids.

DESCRIPTION:

Models **NEX-ALPHA, NEX-ALPHA-R, NEX-BETA** are water detectors /controllers for measuring of Alpha and Beta emitting radio nuclides. The electronics are microprocessor with LED/LCD display with plug in modules facilitating quick change or addition of functions at a later date. Modular design allows for rapid repair by module replacement in the field.

The modular system is covered by TA's unique exchange warranty system in addition to the full one-year warranty. On-site service contracts available in many areas.

The Alpha and Beta flow cells are easily changed via quick disconnect fittings. All connections are sealed against leaks. The standard water moving system is based on a high precision pump. It has a 10 liter per minute capacity. System can also be operated using city water pressure in which case no pump is required.

A wide range of pump capacities are available to meet user's specific needs. The system electronics is mounted in a rugged cabinet. It comes complete with all cabling tubing and connectors in place and is ready to operate.

105 Volt 60Hz is standard; 220 Volt 50/60 Hz is optional.

Alpha Detector Assembly:

- Alpha Detector: Consists of a light-tight detector assembly which interfaces with the sample via quick disconnect coax cables and medical grade tubing. The sample is viewed by a matched pair of 5" diameter photo-multiplier tubes.
- Alpha Scintillation detector has 1,100 cm² sensitive area.

The Alpha pulse analysis portion of this system conditions and analyzes the output from the photo-multiplier tubes by pulse height and duration.

In this way the system is able to eliminate counting most background and noise counts.

Beta Detector Assembly:

- Beta Detector: Consists of a light-tight detector assembly which interfaces with the sample via quick disconnect coax cables and medical grade tubing. The sample is viewed by a matched pair of 5" diameter photo-multiplier tubes.
- Beta Scintillation detector has a 1,100 cm² sensitive area.

The Beta pulse analysis portion of this system conditions and analyzes the output from the photo-multiplier tubes by pulse height and duration.

In this way the system is able to eliminate counting most background and noise counts.

Sensitivity is enhanced by the use of stochastic resonance plus high gain, low noise PM tubes and pre-amps.



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ALPHA DETECTION

Detect	PAG Level	Lower Limit of Sensitivity	Top of Range	Sensor Method Used		Maintenance
					Time	Action
ALPHA	U-238 3,000 pCi/l			Special Alpha Scintillator	3 mos	Replace Particulate Filter Cartridge
U-238	30 min. 24 hr	2,000 pCi/l 500 pCi/l	2 x 10 ⁷ pCi/l			
Po-210	30 min. 24 hr	2,000 pCi/l 500 pCi/l	2 x 10 ⁷ pCi/l			
OPTIONS:		LOWER LIMIT	TOP OF RANGE			
DETECT						
Radon		100pCi/liter	2000pCi/liter	NEX-ALPHA-R SPECIALIZED FOR RADON	1-3 mo	Clean or replace vapor trap
PRE- CONDITION						
Expel Radon					1-3 mo	Clean or replace vapor trap

BETA DETECTION

Detect	PAG Level	Lower Limit of Sensitivity	Top of Range	Sensor Method Used		Maintenance
					Time	Action
BETA	K-40 30,000 pCi/l			5" Dia Dual PM Tube 1,000 ml chamber 1,100 cm ³ Beta Scintillator	3 mos	Replace Particulate Filter Cartridge
30 min			2 x 10 ⁷ pCi/l			
OPTIONS:		LOWER LIMIT	TOP OF RANGE			
DETECT						
Tritium		20,000 pCi/l	1 x 10 ⁶ pCi/l	Crushed scintillation bed of crystals		



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NUCLIDE	BETA ENERGY	SECONDARY BETA
Sr-89	1,481 KeV	
Sr-90	546 KeV	
Y-90	2270 KeV	
Mo-90	1230 KeV	
Tc-99	292 KeV	
I-131	606 KeV	
Cs-134	662 KeV	
Cs-136	341 KeV	650 KeV 7%
Cs-137	514 KeV	1176 KeV 7%

SPECIFICATIONS:

Alarms: Three relay alarms. Each alarm activates a relay.
Sample temperature standard: Up to 80° F liquid. (**Optional** to higher temperatures)
Ambient temperature: 65 - 100 ° F (**Optional** wider temperatures ranges)
Optional:
 Cooler model **Cool-33** for detector & sample is used in case of higher sample or ambient temperatures.

SIZE AND WEIGHT:

Dimensions: One assembly: 14" wide x 29" tall including wheels
 Electronics may be separated from detector electronics.
Electronics: 7" wide x 10" tall (23lbs)
Shipping weight: Standard unit: 22Kg - excluding optional shielding

NOTE: Optional thin Lead Sheet for shielding can be shipped with or shipped separately or overseas customers may wish to buy the lead sheet locally.

Data: - Analysis – Display - Archive ~ NEX-ALPHA, NEX-ALPHA-R, NEX-BETA The concentration and total activity released and MDA levels are continuously calculated and recorded.

All data can be saved to the hard drive in spreadsheet format.



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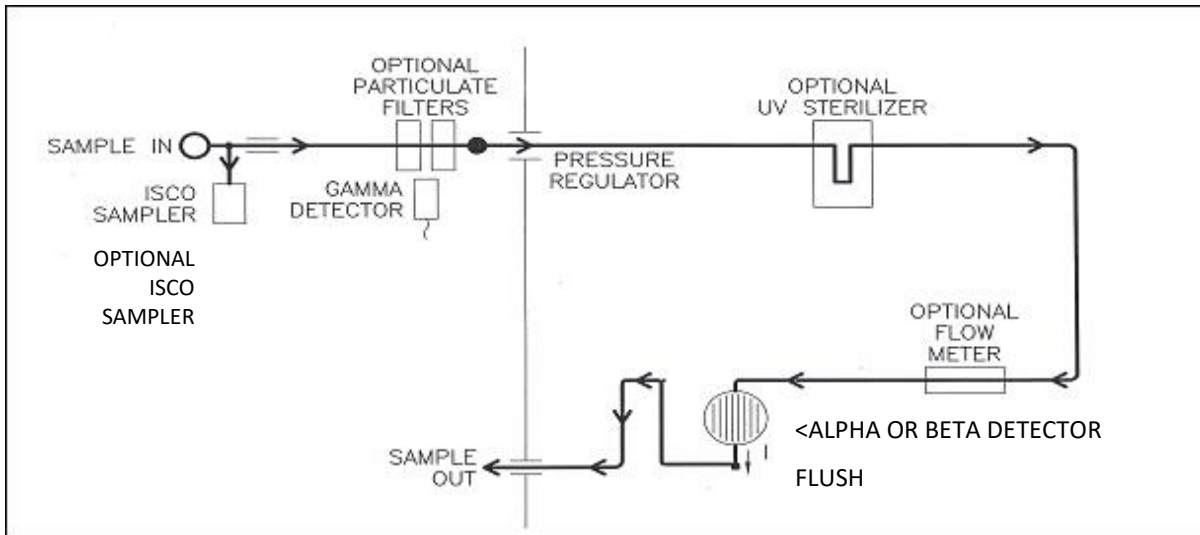
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Flow Path

- Water Inlet port
- Optional ISCO Sampler
- Particulate Pre-Filter (with optional Gamma Detector)
- Pressure Regulator Valve
- Ultra Violet Sterilizer (Optional)
- Mass Electronic Flow Meter (Optional)
- Alpha Detector or Beta Detector
- Flush
- Sample Out

Discharge water is clean and can go back into drinking water line.

No liquid scintillant or reagents are added

No toxic or radioactive waste of any kind.

	NEX-ALPHA & NEX-BETA
Read-out Units (Typical)	Bq/m ³ pCi/l
Measures	Waterborne Concentration
Available options	Electronic Mass Flowmeter USB & Data Retrieval & Archive Software for PC



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Table 4-1. Derived Response Levels (DRLs) Associated with a Committed Effective Dose (CED) of 0.5 rem Resulting from 1 Year of Ingestion

DRLs (pCi/L)			DRLs (pCi/L)			DRLs (pCi/L)		
Column 1: Radionuclide	Column 6: Without Radioactive Decay	Column 7: With Radioactive Decay Only	Column 1: Radionuclide	Column 6: Without Radioactive Decay	Column 7: With Radioactive Decay Only	Column 1: Radionuclide	Column 6: Without Radioactive Decay	Column 7: With Radioactive Decay Only
H-3	4.42E+06	4.54E+06	Sn-125	6.01E+04	1.58E+06	Hg-203	9.69E+04	5.29E+05
C-14	3.19E+05	3.19E+05	Sn-126	3.87E+04	3.87E+04	Tl-204	1.56E+05	1.70E+05
Na-22	5.80E+04	6.61E+04	Sb-124	7.29E+04	3.11E+05	Pb-210	2.65E+02	2.70E+02
P-32	7.71E+04	1.37E+06	Sb-126	7.53E+04	1.54E+06	Bi-207	1.46E+05	1.47E+05
P-33	7.53E+05	7.50E+06	Sb-127	1.11E+05	7.28E+06	Bi-210	1.41E+05	7.11E+06
S-35	2.39E+05	7.31E+05	Te-127	1.10E+06	7.12E+08	Po-210	1.53E+02	3.33E+02
Cl-36	1.99E+05	1.99E+05	Te-129	2.94E+06	1.53E+10	Ra-226	6.59E+02	6.59E+02
K-40	3.00E+04	3.00E+04	Te-129m	6.23E+04	4.68E+05	Ac-227	5.76E+02	5.85E+02
Ca-45	2.60E+05	5.13E+05	Te-131m	9.49E+04	1.92E+07	Th-227	2.05E+04	2.77E+05
Sc-46	1.25E+05	3.97E+05	Te/I-132	4.86E+04	3.78E+06	U-235	3.96E+03	3.96E+03
Ti-44	3.19E+04	3.20E+04	I-125	1.20E+04	5.12E+04	U-238	4.15E+03	4.15E+03
V-48	9.34E+04	1.46E+06	I-129	1.75E+03	1.75E+03	Np-237	1.73E+03	1.73E+03
Cr-51	4.79E+06	4.37E+07	I-131	8.49E+03	2.67E+05	Np-239	2.32E+05	2.49E+07
Mn-54	2.57E+05	3.74E+05	Cs-134	9.63E+03	1.13E+04	Pu-236	2.13E+03	2.40E+03
Fe-55	5.57E+05	6.31E+05	Cs-136	6.01E+04	1.16E+06	Pu-238	8.12E+02	8.15E+02
Fe-59	1.03E+05	5.91E+05	Cs/Ba-137	1.36E+04	1.38E+04	Pu-239	7.37E+02	7.37E+02
Co-58	2.47E+05	9.09E+05	Ba-133	1.21E+05	1.25E+05	Pu-240	7.37E+02	7.37E+02
Co-60	5.39E+04	5.76E+04	Ba-140	7.12E+04	1.41E+06	Pu-241	3.89E+04	3.99E+04
Ni-63	1.22E+06	1.22E+06	La-140	9.16E+04	1.38E+07	Pu-242	7.77E+02	7.77E+02
Zn-65	4.69E+04	7.54E+04	Ce-141	2.60E+05	2.03E+06	Am-241	9.07E+02	9.08E+02
Ge-68	1.44E+05	2.16E+05	Ce-143	1.65E+05	3.04E+07	Am-242m	9.69E+02	9.71E+02
Se-75	7.09E+04	1.70E+05	Ce/Pr-144	3.53E+04	5.33E+04	Am-243	9.12E+02	9.12E+02
Rb-86	6.59E+04	8.92E+05	Nd-147	1.71E+05	3.94E+06	Cm-242	1.58E+04	3.12E+04
Sr-89	7.20E+04	3.63E+05	Pm-145	1.60E+06	1.63E+06	Cm-243	1.24E+03	1.26E+03
Sr-90	6.65E+03	6.73E+03	Pm-147	7.09E+05	8.07E+05	Cm-244	1.51E+03	1.53E+03
Y-90	6.88E+04	6.53E+06	Pm-149	1.86E+05	2.13E+07	Cm-245	8.90E+02	8.90E+02
Y-91	7.81E+04	3.41E+05	Pm-151	2.53E+05	5.41E+07	Cm-246	8.94E+02	8.94E+02
Zr-93	1.67E+05	1.67E+05	Sm-151	1.89E+06	1.89E+06	Cf-252	1.95E+03	2.21E+03
Zr-95	1.92E+05	7.73E+05	Eu-152	1.35E+05	1.39E+05			
Nb-94	1.06E+05	1.06E+05	Eu-154	9.07E+04	9.43E+04			
Nb-95	3.14E+05	2.26E+06	Eu-155	5.66E+05	6.07E+05			
Mo-99	3.06E+05	2.81E+07	Gd-153	6.65E+05	1.07E+06			
Tc-99	2.88E+05	2.88E+05	Tb-160	1.15E+05	4.15E+05			
Ru-103	2.52E+05	1.62E+06	Ho-166m	9.34E+04	9.35E+04			
Ru/Rh-106	2.64E+04	3.65E+04	Tm-170	1.40E+05	3.20E+05			
Ag-110m	6.65E+04	1.06E+05	Yb-169	2.60E+05	2.06E+06			
Cd-109	9.26E+04	1.20E+05	Hf-181	1.65E+05	9.84E+05			
Cd-113m In-	8.05E+03	8.26E+03	Ta-182	1.20E+05	2.97E+05			
114m Sn-	4.54E+04	2.33E+05	W-187	2.94E+05	7.47E+07			
113	2.51E+05	6.20E+05	Ir-192	1.35E+05	4.77E+05			
Sn-123	8.82E+04	2.01E+05	Au-198	1.80E+05	1.69E+07			



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