



Reliable NEX-Beta Detector and
PRS-7-DSC Electronics

Radiation Monitor for Water and Effluent Discharge Real-Time Continuous Model - NEX-Beta

NEX-Beta allows radiation users to be good community members by controlling and measuring their effluent.

Features

- Available in Desktop 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 Betas (Low Sensitivity to Gammas)
- No Reagent Tanks to Fill
- No Waste Stream
- Easy Calibration
- Prevent Acute Health Effects
- Reduce Risk of Chronic Exposure
- World's only PAG-level β Water Monitor

Application

USERS:

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

USE FOR:

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

DETECT:

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

The PRIMARY Radioactive contaminants in water are Beta emitters. NOW there is instrumentation to detect these Beta emitters in water.

- Monitor drinking water against **any and all 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



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Real-Time Continuous

Model - NEX-Beta

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%

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, the **NEX-BETA** and **NEX-BETA-ABG**, are designed especially for this purpose of quantitating waste water and liquid effluent.

Problem

Drinking water sources are vulnerable to accidental or knowing contamination by individuals, groups, industry, medical labs, terrorists, and from naturally occurring radioactive materials (NORM). As yet very few water districts have real-time radiation monitors in place to protect the water and the public.

Solution

The **Continuous Real-Time radiation water monitor** the Model **NEX-BETA** solves this problem by continuously monitoring the water using ultra-sensitive, Beta radiation detector.

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 and measurement technology this detector measures Beta emissions from any radioactive liquids.




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DETECT	PAG LEVEL	LOWER LIMIT of SENSITIVITY	TOP OF RANGE	SENSOR / METHOD USED		MAINTENANCE for finished water
		True for both models			TIME	ACTION
Beta	K-40 30,000 pCi/l			5" dia. Dual PM Tube 1000ml chamber	3-6 mo	Replace particulate pre-filter cartridge
30 min 24 hr		30,000 pCi/l 10,000 pCi/l	2 x 10 ⁷ pCi/l	1100cm ² Beta Scintillator		
OPTIONS:		LOWER LIMIT	TOP OF RANGE			
DETECT						
Tritium		20,000pCi/l	1 x 10 ⁶ pCi/l	Crushed scintillation bed of crystals		Replace ion exchange cartridge
Radon		100pCi/liter	2000pCi/liter		1-3 mo	Clean or replace vapor trap
PRE- CONDITION						
Expel Radon					1-3 mo	Clean or replace vapor trap

Description

Model **NEX-BETA** is a Beta detector water monitor /controller for measuring of 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 Beta flow cell is 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 users 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.

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

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 hoses. The sample is viewed by a matched pair of 5" diameter photo-multiplier tubes.
- Beta Scintillation detector has 1,100cm² sensitive area.

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

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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Specifications

Alarms: Each alarm activates a relay. Relay alarms are available to the user.
Sample Temperature Standard: Up to 80° F liquid. (optional to higher temperatures)
Ambient Temperature: 65 - 100° F (wider temperatures ranges optional)
Optional: Cooler model **Cool-33** for detector & sample is used in case of higher sample or ambient temperatures

Size and Weight:

Detector

Dimensions: 10" H x 10" D x 29" W

Weight: 15 lbs

PRS-7-DSC Electronics

Dimensions: 10" L x 7" W x 10" H (25 cm L x 18 cm W x 18 cm H) Includes handle

Weight: 8 lbs including batteries

Display: Local Read Out

Computer Interface: RS-232 Optional: USB

Weight: 8 lbs (4kg) including batteries

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-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.



PRS-7-DSC
NEX-BETA Electronics



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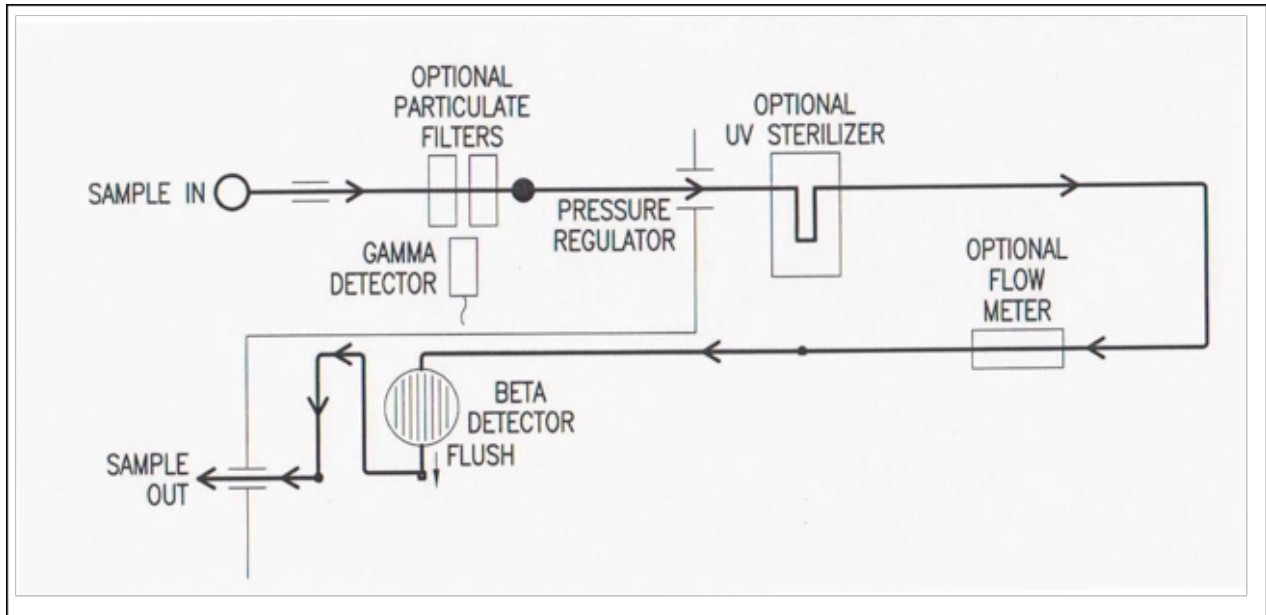
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Flow Path

- Water Inlet port
- Pressure relief valve
- Particulate Pre-Filter (with optional Gamma Detector)
- Ultra Violet Sterilizer (Optional)
- Mass Flow Meter (Optional)

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-BETA
Read-out Units (Typical)	Bq/m ³ pCi/l
Measures	Waterborne Concentration
Upgraded Hardware	Calculations by Imbedded Processor in FM-9 Electronics
Available options	Optional Electronic mass flowmeter



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Excerpt from Revisions to the Protective Action Guides (PAG) Manual for Radiological Incidents 2009

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-114m Sn-113	8.05E+03	8.26E+03	Ta-182	1.20E+05	2.97E+05			
	4.54E+04	2.33E+05	W-187	2.94E+05	7.47E+07			
	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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