Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Navy	Date: February 2020
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0603542N *I Radiological Control*

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
Total Program Element	5.834	0.735	0.689	0.778	-	0.778	0.788	0.785	0.800	0.816	Continuing	Continuing
1830: *RADIAC Development*	5.834	0.735	0.689	0.778	-	0.778	0.788	0.785	0.800	0.816	Continuing	Continuing

A. Mission Description and Budget Item Justification

Mission Description: The Radiation Detection, Indication and Computation (RADIAC) Program is responsible for providing radiation monitoring instruments that detect and measure ionizing radiation. These instruments are used on all Navy, Coast Guard and Military Sealift Command vessels, and at every Navy shore installation, in order to ensure the safety of personnel, continuity of operations in radiological contingencies, and protection of the environment.

Justification: Title 10 of the Code of Federal Regulations, Part 20 (10 CFR 20) requires RADIAC instruments be used to ensure the safety of personnel who work with or who are exposed to radioactive materials in their jobs. Additionally, the Navy's mission requires personnel and ships to have the ability to operate in radiological environments and the ability to identify and interdict radiological Weapons of Mass Destruction (WMD). Navy programs that require RADIAC instruments for Occupational Safety & Health (OSH) under the provisions of 10 CFR 20 include Naval Nuclear Propulsion, Nuclear Weapons, Medical, and Radiological Affairs Support. Non-OSH programs include Radiological Defense, Consequence Management, Training, Technical (RADIAC calibration, shielding evaluation, research, etc.) and Radiological Search (maritime interdiction and radiological search missions to locate or intercept WMD).

This budget item develops, tests and evaluates new, highly reliable, more easily calibrated, easy to care and maintain, light weight and modern RADIAC instruments in order to improve the effectiveness of radiation safety, to make instruments simpler to use, and to reduce life cycle costs. The ultimate goal is to replace old, bulky, costly to maintain and repair, unreliable and obsolete instrumentation with multifunction equipment that can be automatically calibrated at greatly reduced cost.

This budget item also provides for improvement to nuclear weapons intrinsic radiation (gamma and neutron) shielding calculations, mixed field (neutron and gamma) dosimetry, and in neutron measurement. The objective is to develop less costly and more effective integral shielding for better personnel protection and safety. Improvement in personnel dosimetry and neutron measurement is also a major emphasis.

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Navy					Date: February 2020
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*			R-1 Program Element (Number/Name) PE 0603542N *I Radiological Control*		
B. Program Change Summary ($ in Millions)	**FY 2019**	**FY 2020**	**FY 2021 Base**	**FY 2021 OCO**	**FY 2021 Total**
Previous President's Budget	0.740	0.689	0.778	-	0.778
Current President's Budget	0.735	0.689	0.778	-	0.778
Total Adjustments	-0.005	0.000	0.000	-	0.000
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.005	0.000			
• Rate/Misc Adjustments	0.000	0.000	0.000	-	0.000

Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy										Date: February 2020		
Appropriation/Budget Activity 1319 / 4					R-1 Program Element (Number/Name) PE 0603542N / *Radiological Control*				Project (Number/Name) 1830 / *RADIAC Development*			
COST ($ in Millions)	**Prior Years**	**FY 2019**	**FY 2020**	**FY 2021 Base**	**FY 2021 OCO**	**FY 2021 Total**	**FY 2022**	**FY 2023**	**FY 2024**	**FY 2025**	**Cost To Complete**	**Total Cost**
1830: *RADIAC Development*	5.834	0.735	0.689	0.778	-	0.778	0.788	0.785	0.800	0.816	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Mission: The Radiation Detection, Indication and Computation (RADIAC) Program is responsible for providing radiation monitoring instruments that detect and measure radiation in accordance with the provisions of Title 10 of the Code of Federal Regulations (10 CFR 20). These instruments are used on all vessels afloat and at every shore installation in order to ensure the safety of personnel and the environment. RADIACs are also required after an act of terrorism or war that involves nuclear material in order to enable continuation of warfighting ability.

Justification: Many RADIAC instruments and dosimetry systems are decades old and approaching the end of their useful lives. In some cases the equipment and replacement parts are no longer manufactured, making the equipment logistically unsupportable. In other cases increasing failure rates due to age make replacements an economic efficiency
improvement. In all cases a technology refresh will make both economic sense in terms of lowering the total ownership costs, and will also provide increased operational capabilities.

Naval Nuclear Propulsion Program (NNPP): Instruments are developed to support the safe operation and maintenance of nuclear powered vessels and at nuclear maintenance facilities.

Non-NNPP: Instruments are developed to support other than NNPP end users, such as Explosive Ordnance Disposal, Nuclear Weapons, Medical, Industrial Radiography, Radiological Defense and Training.

Visit, Board, Search & Seizure (VBSS): The Navy has been tasked to intercept and board vessels at sea to search for nuclear or radiological materials that could be used for terrorist attacks. These instruments would have different characteristics than those used for NNPP and non-NNPP purposes and prototypes must be developed and/or tested and evaluated.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	**FY 2019**	**FY 2020**	**FY 2021 Base**	**FY 2021 OCO**	**FY 2021 Total**
Title: Primary Dosimetry	0.015	0.070	0.174	0.000	0.174
Articles:	50	50	-	-	-
Description: The need for primary dosimetry is inherent due to the Navy's operation of nuclear reactors and their emission of ionizing radiation. Title 10 CFR 20.1502 states "Each licensee shall monitor exposures to radiation and radioactive material at levels sufficient to demonstrate compliance with the occupational dose limits." A primary dosimeter must pass accreditation proficiency testing, allowing the reading obtained					

Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603542N / *Radiological Control*	**Project (Number/Name)** 1830 / *RADIAC Development*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
to become a part of an individual's permanent health record. This permanent record is used to protect the individual radiation worker's health, and also the Navy from future liability. The Navy's current primary device is the DT-702/PD, a passive Thermo Luminescence Dosimeter (TLD). Existing TLDs and newer technologies, such as Optically Stimulated Luminescence (OSL), must be continually researched to determine on-going performance parameters, cost to field and cost to maintain, since the current system is approaching the end of its useful life and must be replaced by 2030. A passive device does not provide a display of the dose being received, which can be important in certain circumstances. The dosimeter instead must be sent to a facility with a special reader to recover the dose, which is then entered in the individual's medical records. An active device displays the dose digitally in real time, providing immediate feedback in high risk scenarios. Newer passive-active systems can do both. ***FY 2020 Plans:*** NSWCCD procured 50 neutron sensitive BeO (Beryllium oxide) dosimeters in a continuation of testing of new technologies for primary dosimetry applications as a replacement for the Navy's current passive DT-702/PD system. The 50 BeO dosimeters were sent to Pacific Northwest National Laboratory for proficiency testing of Category V (Neutron/Photon) Mixtures. A final report with the results has been provided to NAVSEA 04ND. The objective was to see how well these dosimeters would perform relative to the specifications of the National Voluntary Laboratory Accreditation Program that Navy primary dosimeters must meet. NSWCCD established a Cooperative Research And Development Agreements (CRADA) with Mirion Technologies, Inc. to further test, evaluate and compare new passive-active systems as candidates for the replacement of the DT-702/PD. Passive-active has emerged as the preferred technology for a replacement solution. NSWCCD performed multiple tests under this new CRADA and the two that were previously established with Landauer, Inc. and Thermofisher Scientific. ***FY 2021 Base Plans:*** NSWCCD will test and report the results of the three CRADAs established with TFS, Landauer, Inc. and Mirion Technologies, Inc. Additional BeO testing will be performed and a report with the results will be drafted by NSWCCD and submitted to NAVSEA 04ND. ***FY 2021 OCO Plans:***					

Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603542N / *Radiological Control*	**Project (Number/Name)** 1830 / *RADIAC Development*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
N/A ***FY 2020 to FY 2021 Increase/Decrease Statement:*** The labor of a second Health Physicist will be added to test and analyze the three CRADA data. The labor of a Test Engineer will be added for the BeO testing.					
Title: Secondary Dosimetry	0.275	0.131	0.266	0.000	0.266
Articles:	1	-	2	-	2
Description: Secondary dosimetry includes the monitoring of doses to the hands, feet and eyes; extremity dosimetry. In some medical and industrial applications, there is a high risk of such local high exposures due to the handling of sources, working close to a high radiation field, or using/cleaning high-energy beta emitters. Because of this, the need to accurately measure extremity dose is of significant importance to the Navy. The legacy system currently used for hands and feet dose measurements is RADSTAR. This is an active system (see the Primary Dosimetry Overall Description task for a discussion of passive and active dosimeters), but it is no longer supported by the vendor and must be replaced. To that end the ED3 system was procured in FY18 and has been tested and a report rendered on its suitability as a replacement. This is another active system, but shortfalls noted were that it currently measures only exposure to the hands, and it is too fragile for industrial-type use. Another active system being considered is the iMUX, which has the advantage of being wireless (the other two require wires that extend from the extremities to a pager-sized device clipped to the belt or worn on the wrist), and is capable of measuring dose at both the hands and feet. Measurement of dose at the eyes is currently extrapolated from the Navy's passive primary dosimeter, the DT-702/PD. Because eyes are subject to development of cataracts with prolonged or high dose exposure to radiation, a more precise and real time measuring device is being sought in the systems being evaluated. ***FY 2020 Plans:*** NSWCCD began the testing process of Mirion Technologies, Inc. extremity dosimeter system (iMUX). ***FY 2021 Base Plans:*** NSWCCD to complete testing of iMUX and report results to NAVSEA 04ND. ***FY 2021 OCO Plans:***					

Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603542N / *Radiological Control*	**Project (Number/Name)** 1830 / *RADIAC Development*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
N/A ***FY 2020 to FY 2021 Increase/Decrease Statement:*** NSWCCD to procure an upgrade of the ED3 system. The upgrade will consist of ruggedized components and two additional probes for dose measurement at the eyes.					
Title: Visit, Board, Search & Seizure	0.015	0.063	0.063	0.000	0.063
Articles:	-	5	-	-	-
Description: The Visit, Board, Search & Seizure (VBSS) mission of the Navy is the requirement to board ships and be able to detect and identify potential radiological or nuclear Weapons of Mass Destruction (WMD). Such a sensitive mission requires leading edge technology and capabilities to ensure success. The AN/PDX-1 RADIAC Set was fielded in response to a Joint Urgent Operational Needs Statement to meet this requirement. It contains three instruments that serve different purposes: (1) a Handheld Radiation Monitor (HRM)that searches for radiological materials; (2) a Radioisotope Identifier (RID) that identifies the type of radiological material located; and (3) a Personal Radiation Detector (PRD) that displays the radiological dose the VBSS team members may be receiving so that they can be aware if they are being exposed to dangerous levels of radioactivity during the mission. Current technology dictates that the sensitivity of the detectors is directly proportional to the size of the detector element; i.e., the larger the detector, the more sensitive and capable it is. However, in VBSS there must be a tradeoff between size/weight and capability, since it is difficult and hazardous for boarding parties to carry a backpack-sized detector, along with their weapons and other gear, up a rope ladder to board a vessel on the high seas. This will be a continuing effort to find smaller, lighter instruments with enhanced sensitivity, reach-back capability, and other enhancements to provide the Navy the best and most cost effective equipment possible for this mission. ***FY 2020 Plans:*** NSWCCD procured one RID and two each of PRDs and HRMs. ***FY 2021 Base Plans:*** NSWCCD to test the five units acquired in FY20. In addition, the Navy Explosive Ordnance Disposal program has asked that their current RID be replaced with one more capable and less costly to maintain. Those requirements will be compared with VBSS requirements to find one unit to meet all Navy needs and upgrade both programs simultaneously. ***FY 2021 OCO Plans:***					

Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603542N / *Radiological Control*	**Project (Number/Name)** 1830 / *RADIAC Development*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
N/A					
Title: Radiological Detection System	0.265	0.150	0.000	0.000	0.000
Articles:	10	-	-	-	-
Description: The Radiological Detection System (RDS) is a survey meter and its associated probes (alpha, beta, gamma, and neutron) used in a wide variety of applications, and the necessary ancillary equipment such as cases, cables and technical manuals. This type of survey meter system is the single most prevalent RADIAC instrument in the Navy inventory, utilized for every Navy end use but predominantly in the Naval Nuclear Propulsion Program (NNPP) and Radiological Defense (RD) end uses. The Joint Product Leader in Radiological Nuclear Defense(JPdl-RND) is currently developing the RDS for use by all the Services. This joint effort will lower the procurement cost for all and just as significantly, for the first time enable joint interoperability in the Radiological Defense arena. The Navy's current version of this instrument is the IM-260/PD Multi-Function RADIAC (MFR), which is 30 years old and nearing the end of its useful life. Army and Marine Corps use the AN/PDR-75 system and the Air Force the ADM-300, which are both also decades old and obsolete. The NNPP end use is unique amongst the Services, since only the Navy operates nuclear reactors, and while the RDS solution should prove to be sufficient for all the Services for most of their respective applications, Navy must test and evaluate the proposed RDS to ensure the performance and specifications of a Joint solution will be sufficient to meet the requirements of the NNPP application. ***FY 2020 Plans:*** NSWCCD developed the RDS Test Plan (TP). The TP was approved by NAVSEA 04ND. First Article RDS sets were tested at NSWCCD, in accordance with the approved TP. NSWCCD submitted a technical submittal detailing the results of First Article RDS testing. ***FY 2021 Base Plans:*** N/A ***FY 2021 OCO Plans:*** N/A ***FY 2020 to FY 2021 Increase/Decrease Statement:*** Testing will be completed in 2020 and LRIP procurement will begin.					
Title: Laboratory Test Equipment	0.165	0.275	0.275	0.000	0.275
Articles:	1	2	2	-	2

Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603542N / *Radiological Control*	**Project (Number/Name)** 1830 / *RADIAC Development*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Description: Laboratory Test Equipment are used in laboratories to test and evaluate radiation detectors and dosimetry devices. The primary end users will be NSWCCD and NDC. The beta irradiators will be used throughout the development and procurement of the Navy's new primary dosimetry system to evaluate system performance. Handheld radiation detection equipment from the Radiological Detection System (RDS) can also be evaluated using the beta irradiators. The upgraded Ortec equipment will be used to analyze the new accident dosimeter after exposure to a criticality event. ***FY 2020 Plans:*** NSWCCD procured the upgrade of an existing ORTEC Spectroscopy system along with associated software which will be utilized in the testing and evaluation of the new accident dosimeter system. In addition, NSWCCD has acceptance tested the Maintenance & Calibration system for the IM-276/PD and the beta irradiator that were acquired under previously awarded effort. NSWCCD procured a low activity (10 mCi) Cs-137 source for the GC-60 irradiator. The new source has been installed and used to test multiple RADIACs at low exposure rates without the need to add attenuators. ***FY 2021 Base Plans:*** NSWCCD will acceptance test the upgraded ORTEC system to evaluate accident dosimetry. NSWCCD will develop protocols and standard operating procedures for the beta irradiator. NSWCCD will procure the replacement of the RDT&E computers used to control the GC-60 and X-80 Irradiators in order to upgrade memory space and the operating system from Windows XP to the required Windows 10. ***FY 2021 OCO Plans:*** N/A					
Accomplishments/Planned Programs Subtotals	0.735	0.689	0.778	0.000	0.778

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
• OPN 2920: *RADIAC*	8.175	6.450	10.335	-	10.335	9.306	9.263	9.389	9.847	Continuing	Continuing

Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603542N / *Radiological Control*	**Project (Number/Name)** 1830 / *RADIAC Development*

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost

Remarks

D. Acquisition Strategy

Development efforts are focused on evaluation, modification (as required to meet operational requirements) and adaptation of commercial-off-the-shelf (COTS) technology in order to minimize total ownership costs. To the maximum extent possible new contracts are targeted for fixed price efforts to control development cost.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603542N / *Radiological Control*	**Project (Number/Name)** 1830 / *RADIAC Development*

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Test & Evaluation	WR	NSWCCD : West Bethesda, MD	4.915	0.087	Jan 2019	0.421	Nov 2019	0.568	Oct 2020	-		0.568	Continuing	Continuing	Continuing
Primary Dosimetry	C/FFP	NSWCCD : West Bethesda, MD	0.315	0.003	Mar 2019	0.000		0.000		-		0.000	0.000	0.318	0.288
Secondary Dosimetry	C/FFP	NSWCCD : West Bethesda, MD	0.438	0.250	Nov 2019	0.003	Mar 2020	0.125	Mar 2021	-		0.125	0.000	0.816	0.162
VBSS	C/FFP	NSWCCD : West Bethesda, MD	0.166	0.000		0.063	Aug 2020	0.000		-		0.000	0.000	0.229	0.246
Radiological Detection System	C/FFP	NSWCCD : West Bethesda, MD	0.000	0.230	Sep 2019	0.000		0.000		-		0.000	0.000	0.230	0.063
Laboratory Test Equipment	C/FFP	NSWCCD : West Bethesda, MD	0.000	0.165	Mar 2019	0.202	Mar 2020	0.085	Mar 2021	-		0.085	0.000	0.452	-
		Subtotal	5.834	0.735		0.689		0.778		-		0.778	Continuing	Continuing	N/A

	Prior Years	FY 2019 Cost	FY 2019 Award Date	FY 2020 Cost	FY 2020 Award Date	FY 2021 Base Cost	FY 2021 Base Award Date	FY 2021 OCO Cost	FY 2021 OCO Award Date	FY 2021 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	5.834	0.735		0.689		0.778		-		0.778	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603542N / *Radiological Control*	**Project (Number/Name)** 1830 / *RADIAC Development*

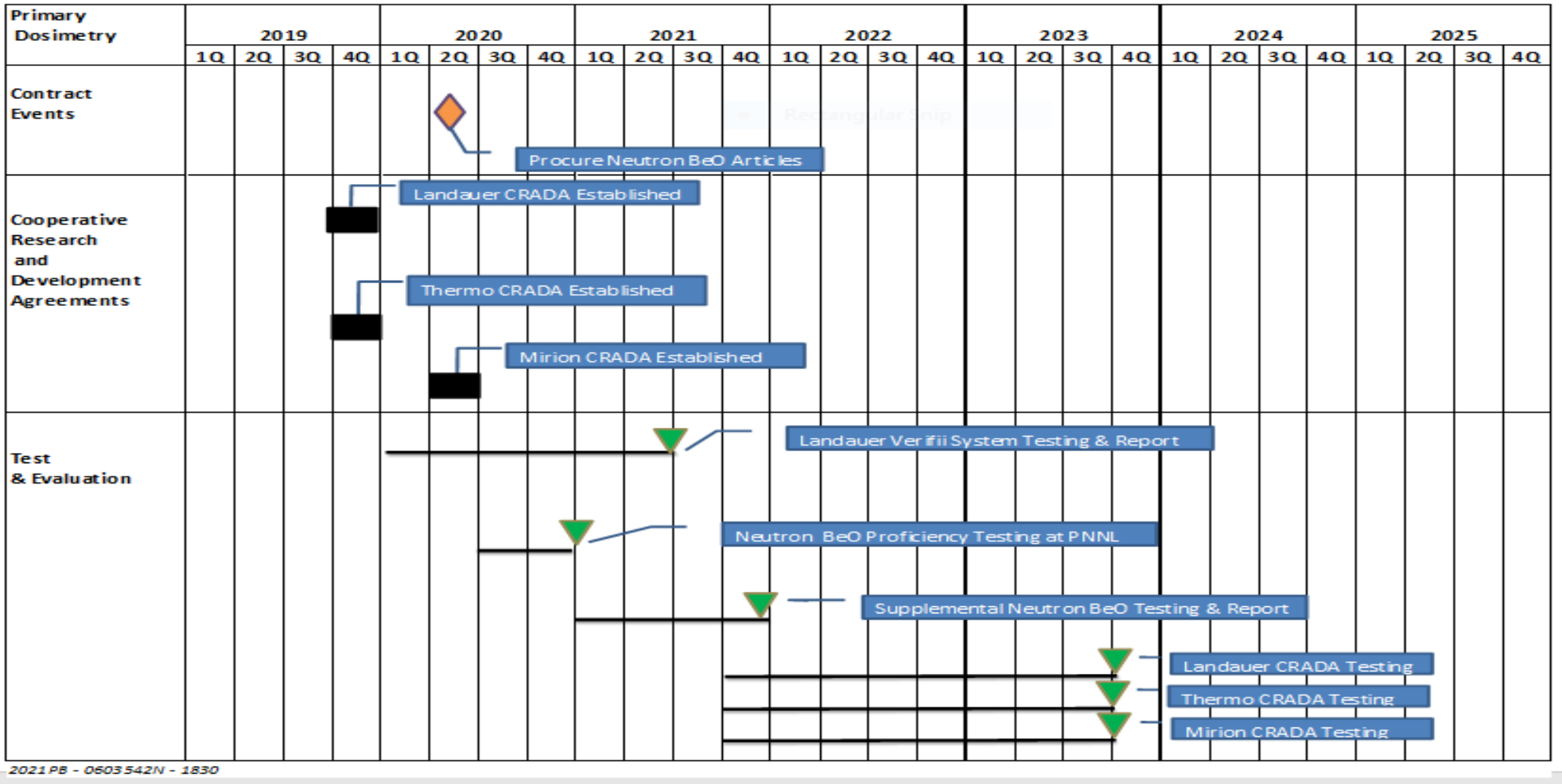

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603542N / *Radiological Control*	**Project (Number/Name)** 1830 / *RADIAC Development*

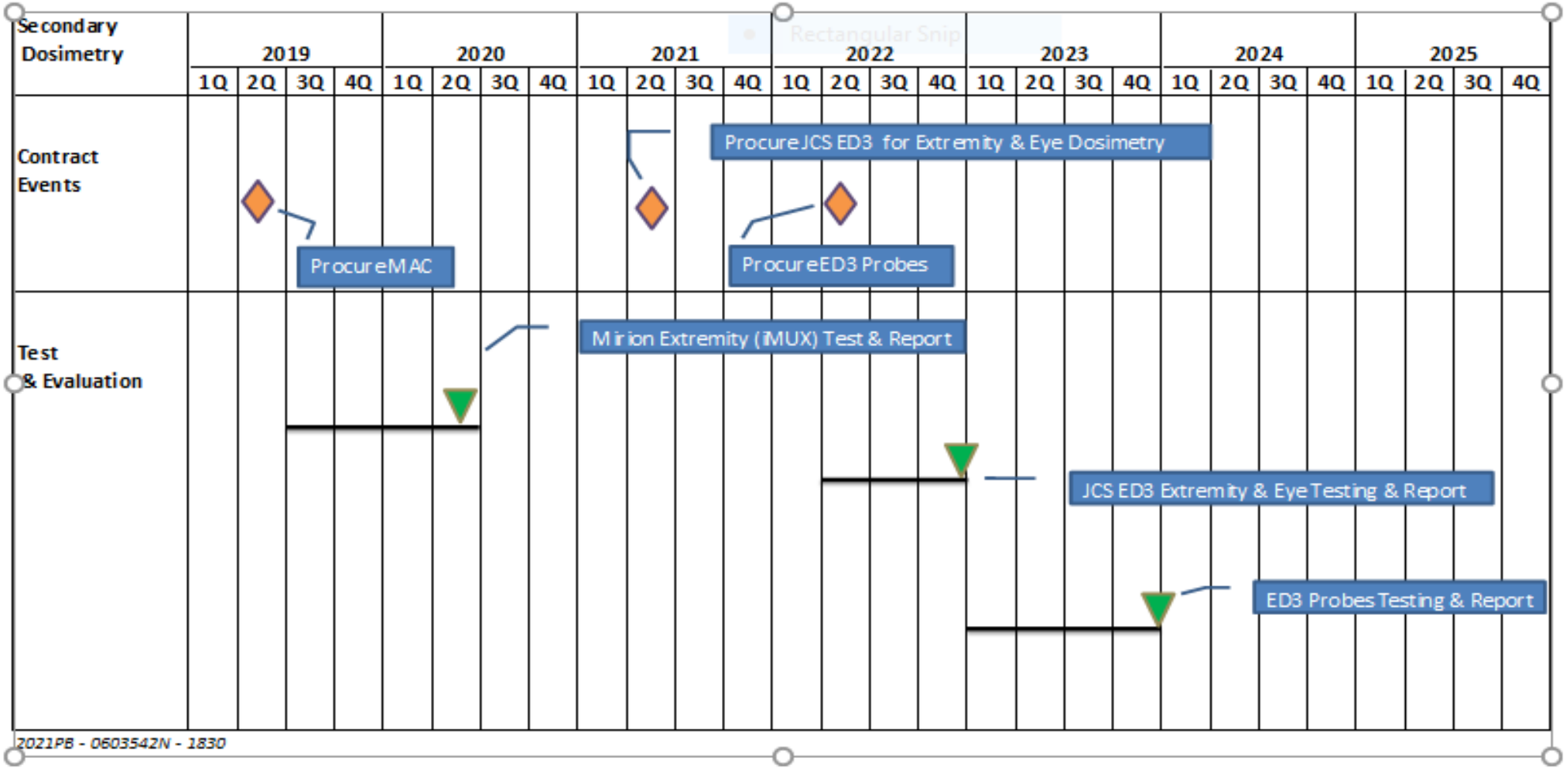

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603542N / *Radiological Control*	**Project (Number/Name)** 1830 / *RADIAC Development*

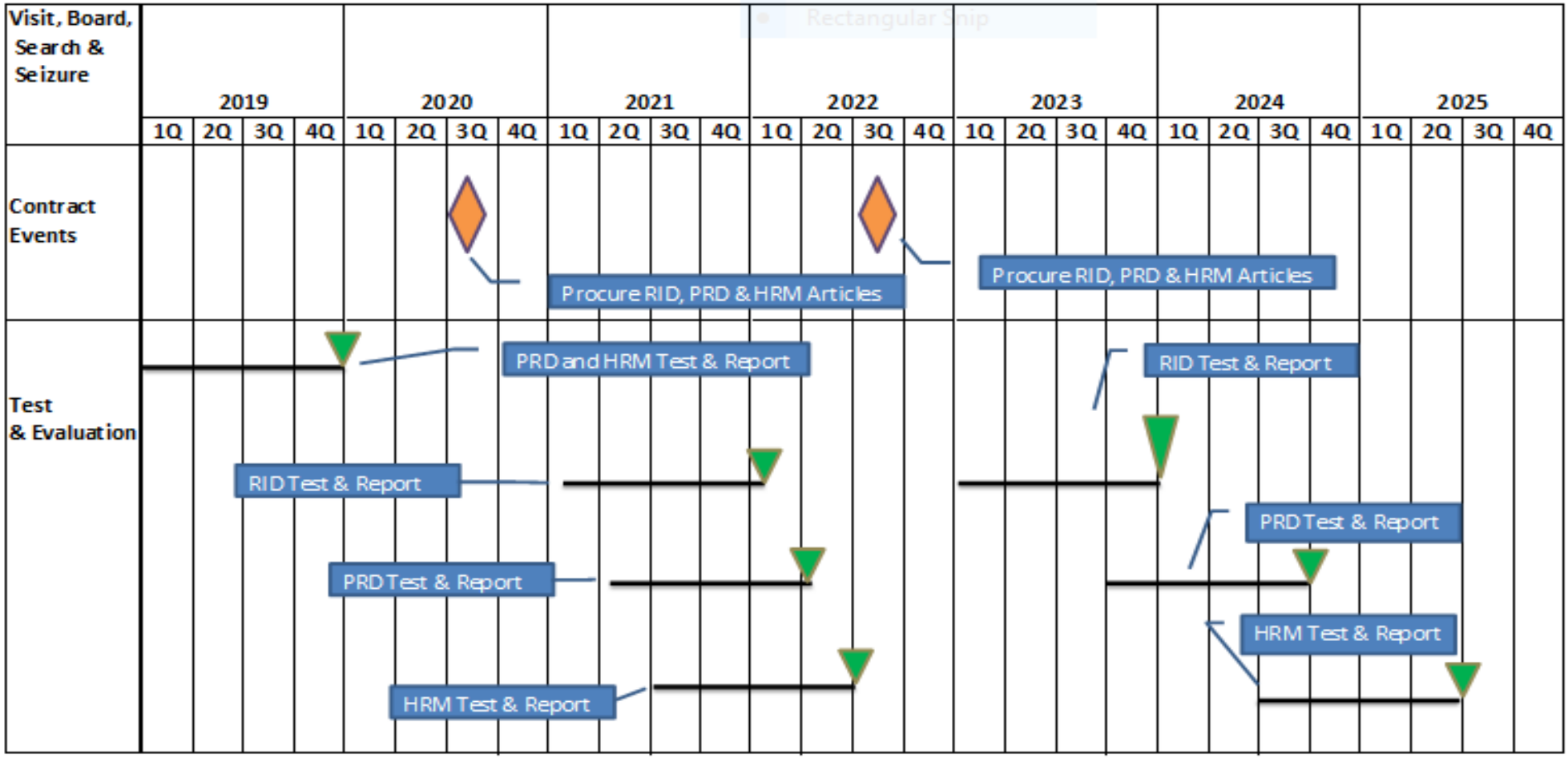

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Navy		Date: February 2020
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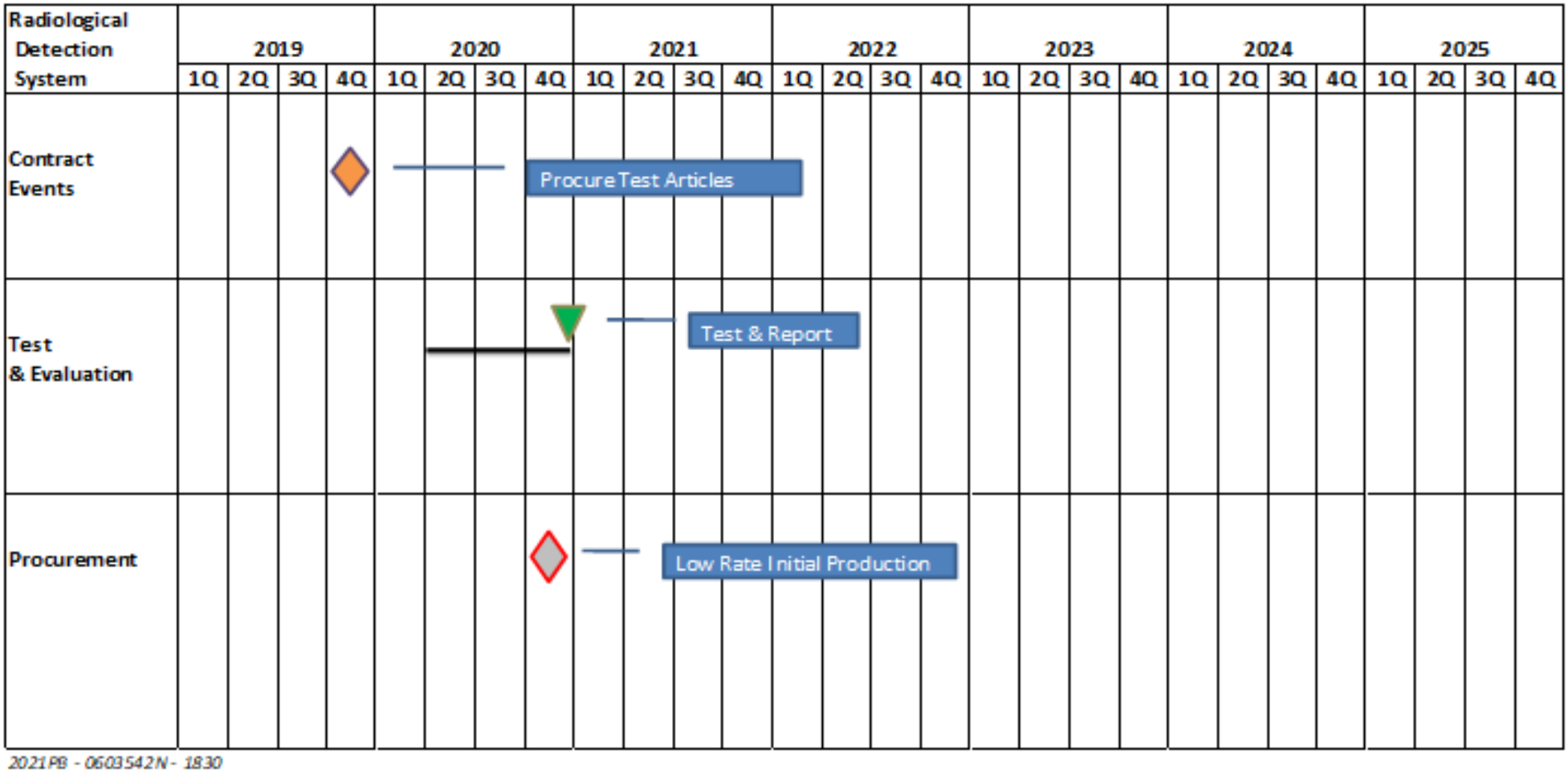

Exhibit R-4, RDT&E Schedule Profile: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603542N / *Radiological Control*	**Project (Number/Name)** 1830 / *RADIAC Development*

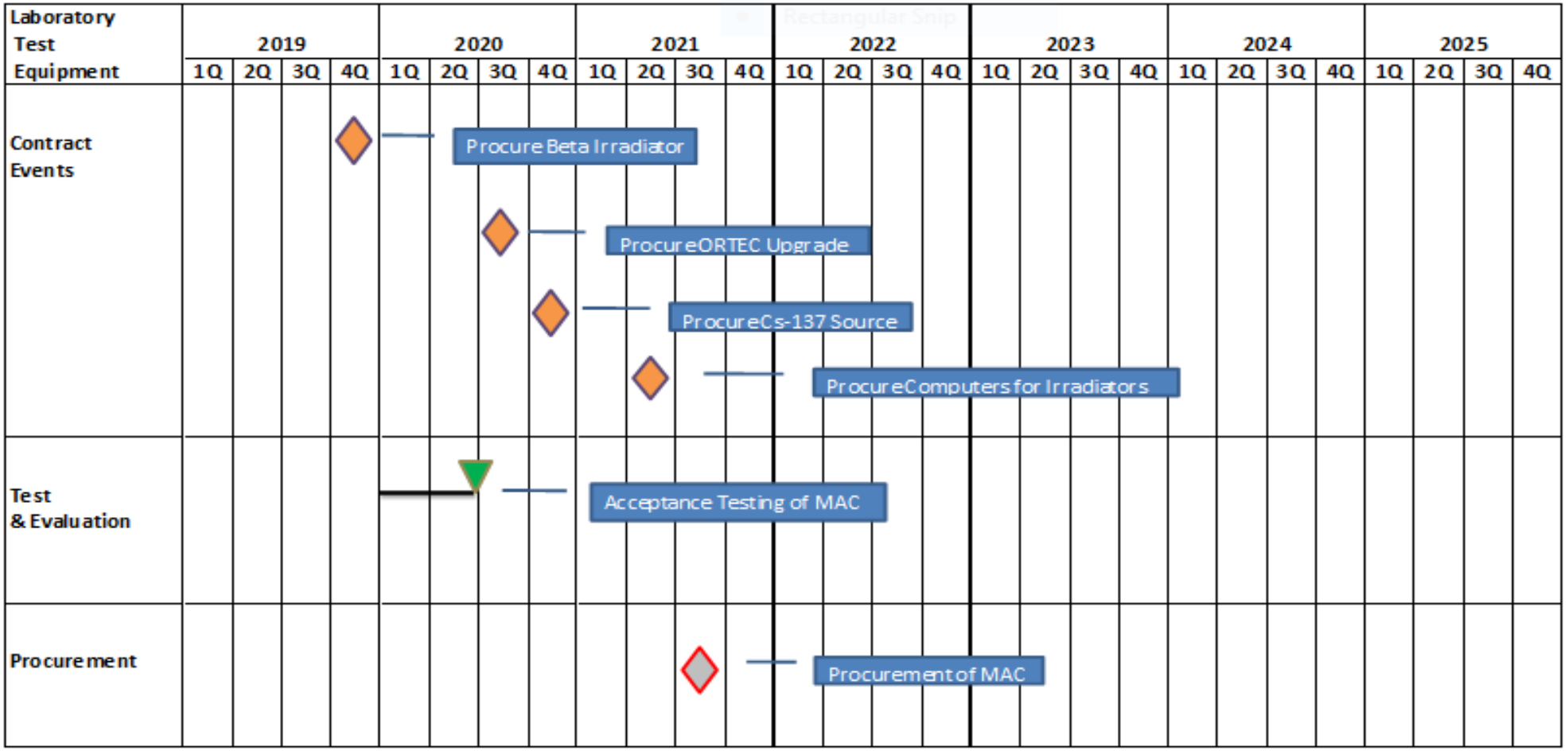

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Exhibit R-4A, RDT&E Schedule Details: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603542N / *Radiological Control*	**Project (Number/Name)** 1830 / *RADIAC Development*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Primary Dosimetry				
Test & Evaluation: Landauer Verifii Dosimeter System Test & Report	1	2020	2	2021
Test & Evaluation: Neutron BeO Dosimeter Proficiency Test & Report at PNNL	3	2020	4	2020
Test & Evaluation: Supplemental Test & Report of Neutron BeO Dosimeter	1	2021	4	2021
Test & Evaluation: Landauer CRADA Test & Report	4	2021	3	2023
Test & Evaluation: Thermo CRADA Test & Report	4	2021	3	2023
Test & Evaluation: Mirion CRADA Test & Report	4	2021	3	2023
Cooperative Research and Development Agreements: Establish CRADA With Landauer	4	2019	4	2019
Cooperative Research and Development Agreements: Establish CRADA With Thermo Fisher Scientific	4	2019	4	2019
Cooperative Research and Development Agreements: Establish CRADA With Mirion	2	2020	2	2020
Contract Events: Procure Neutron BeO Dosimeter Articles	2	2020	2	2020
Secondary Dosimetry				
Test & Evaluation: Test & Report on iMUX Extremity Dosimeter System	2	2019	2	2020
Test & Evaluation: Test & Report on ED3 Extremity Dosimeter System	2	2022	4	2022
Test & Evaluation: ED3 Probees Test & Report	1	2023	4	2023
Contract Events: Procure Maintenance & Calibration System (MAC) and Technical Data Package	2	2019	2	2019
Contract Events: Procure Extremity Dosimeter (ED3) Articles	2	2021	2	2021
Contract Events: Procure Extremity Dosimeter (ED3) Probe Articles	2	2022	2	2022
Radiological Detection System				
Test & Evaluation: Test to Meet Navy Specifications for Nuclear Propulsion Program	2	2020	4	2020
Contract Events: Procure Test Units	4	2019	4	2019

Exhibit R-4A, RDT&E Schedule Details: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603542N / *Radiological Control*	**Project (Number/Name)** 1830 / *RADIAC Development*

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Procurement: LRIP Procurement	4	2020	4	2020
Visit, Board, Search & Seizure				
Test & Evaluation: Test & Report on PRD and HRM Batch 1	1	2019	4	2019
Test & Evaluation: Test & Report on RID Batch 2	1	2021	4	2021
Test & Evaluation: Test & Report on PRD Batch 2	2	2021	1	2022
Test & Evaluation: Test & Report on HRM Batch 2	3	2021	2	2022
Test & Evaluation: Test & Report on RID Batch 3	1	2023	4	2023
Test & Evaluation: Test & Report on PRD Batch 3	4	2023	3	2024
Test & Evaluation: Test & Report on HRM Batch 3	3	2024	2	2025
Contract Events: Procure RID, PRD & HRM Articles Batch 2	3	2020	3	2020
Contract Events: Procure RID, PRD & HRM Articles Batch 3	3	2022	3	2022
Laboratory Test Equipment				
Test & Evaluation: Acceptance Testing of MAC	1	2020	2	2020
Contract Events: Procure Beta Irradiator	4	2019	4	2019
Contract Events: Procure ORTEC Upgrade	3	2020	3	2020
Contract Events: Procure Cs-137 Source	4	2020	4	2020
Procurement: Procurement of MAC	3	2021	3	2021