Exhibit R-2, RDT&E Budget Item Justification: PB 2025 Air Force											Date: March 2024	
Appropriation/Budget Activity 3600: *Research, Development, Test & Evaluation, Air Force* / BA 2: *Applied Research*					R-1 Program Element (Number/Name) PE 0602605F / *Directed Energy Technology*							
COST ($ in Millions)	**Prior Years**	**FY 2023**	**FY 2024**	**FY 2025 Base**	**FY 2025 OCO**	**FY 2025 Total**	**FY 2026**	**FY 2027**	**FY 2028**	**FY 2029**	**Cost To Complete**	**Total Cost**
Total Program Element	-	104.085	129.961	114.962	0.000	114.962	98.603	109.335	125.913	123.493	Continuing	Continuing
624866: *Lasers & Imaging Technology*	-	21.740	26.254	7.115	0.000	7.115	7.158	7.451	7.501	7.587	Continuing	Continuing
624867: *Advanced Weapons & Survivability Technology*	-	52.317	80.652	49.909	0.000	49.909	37.884	40.754	44.667	43.099	Continuing	Continuing
625173: *Laser Technology*	-	30.028	23.055	57.938	0.000	57.938	53.561	61.130	73.745	72.807	Continuing	Continuing

A. Mission Description and Budget Item Justification

This program covers research in Directed Energy (DE) technologies, primarily High Energy Lasers (HEL) and High Power Electromagnetics (HPEM). High Energy Lasers (HEL) research includes moderate to high continuous power laser devices that are applicable to a wide range of applications, optical technologies to propagate laser beams through the atmosphere, and integration of these technologies into demonstration packages. High power microwaves research examines technologies for applications such as counter-electronics and nonlethal weapons. This program conducts research into other novel Directed Energy applications; conducts Directed Energy vulnerability/lethality assessments; develops protection technologies versus Directed Energy; conducts research into other advanced non-conventional/ innovative weapons; develops and uses tools to compare solutions to determine the most effective and efficient Directed Energy technologies to meet Air Force needs; coordinates efforts through the Department of Defense Science and Technology Executive Committee process to harmonize efforts and eliminate duplication.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver science & technology capabilities. The use of program funds in this PE would be in addition to the civilian pay expenses budgeted in program elements 0601102F, 0602102F, 0602201F, 0602202F, 0602203F, 0602204F, 0602602F, 0602788F, 1206601SF, and 0602298F.

This program element may include necessary expenses to support the operation and maintenance of facilities to manage, execute, and deliver science and technology capabilities.

Funds in this PE may be used to investigate specified technology advancements in air, space and/or cyber domains.

This program is in Budget Activity 2, Applied Research because this budget activity includes studies, investigations, and non-system specific technology efforts directed toward general military needs with a view toward developing and evaluating the feasibility and practicality of proposed solutions and determining their parameters.

Exhibit R-2, RDT&E Budget Item Justification: PB 2025 Air Force	Date: March 2024
Appropriation/Budget Activity 3600: *Research, Development, Test & Evaluation, Air Force* / BA 2: *Applied Research*	**R-1 Program Element (Number/Name)** PE 0602605F / *Directed Energy Technology*

B. Program Change Summary ($ in Millions)	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total
Previous President's Budget	120.947	129.961	125.474	0.000	125.474
Current President's Budget	104.085	129.961	114.962	0.000	114.962
Total Adjustments	-16.862	0.000	-10.512	0.000	-10.512
• Congressional General Reductions	0.000	0.000			
• Congressional Directed Reductions	0.000	0.000			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	0.000	0.000			
• Congressional Directed Transfers	0.000	0.000			
• Reprogrammings	-10.540	0.000			
• SBIR/STTR Transfer	-2.126	0.000			
• Other Adjustments	-4.196	0.000	-10.512	0.000	-10.512

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2023	FY 2024
Project: 625173: *Laser Technology*		
Congressional Add: *Program Increase - directed energy research*	5.000	-
Congressional Add: *Program increase - counter-UAS directed energy effectiveness*	5.000	-
Congressional Add: *Program increase - early detection of threats*	10.000	-
Congressional Add Subtotals for Project: 625173	20.000	-
Congressional Add Totals for all Projects	20.000	-

Change Summary Explanation

Decrease in FY 2025 funding is due to re-prioritization to meet the nation's future security needs.

Exhibit R-2A, RDT&E Project Justification: PB 2025 Air Force			Date: March 2024
Appropriation/Budget Activity 3600 / 2	R-1 Program Element (Number/Name) PE 0602605F / *Directed Energy Technology*	Project (Number/Name) 624866 / *Lasers & Imaging Technology*	

COST ($ in Millions)	Prior Years	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total	FY 2026	FY 2027	FY 2028	FY 2029	Cost To Complete	Total Cost
624866: *Lasers & Imaging Technology*	-	21.740	26.254	7.115	0.000	7.115	7.158	7.451	7.501	7.587	Continuing	Continuing

A. Mission Description and Budget Item Justification

This project explores the technical feasibility of moderate to high power lasers, including beam control, for applications such as aircraft protection, force protection, and precision engagement from the Department of the Air Force platforms. This project investigates the effects of laser weapons on a wide range of systems and components as well as producing, modifying, validating and applying Directed Energy and non-Directed Energy concept development and assessment tools to determine which technology solutions to pursue.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2023	FY 2024	FY 2025
Title: High Energy Laser Technologies and Directed Energy Assessments	21.740	26.254	7.115

Description: This effort explores the technical feasibility of moderate to high power lasers, including beam control, for applications such as aircraft protection, force protection, and precision engagement from the Department of the Air Force platforms. This project investigates the effects of laser weapons on a wide range of systems and components as well as producing, modifying, validating and applying Directed Energy and non-Directed Energy concept development and assessment tools to determine which technology solutions to pursue.

FY 2024 Plans:

Continue assessment and development of sources for beacon/tracking illuminator lasers and associated tracking and pointing improvements. Continue planning to demonstrate 100 Watt average power for beacon illuminating laser used for target acquisition. Continue development of fiber optic amplifiers that are more resistant to nonlinear effects.

FY 2025 Plans:

- Continue the assessment and development of sources for beacon/tracking illuminator lasers and associated tracking and pointing improvements
- Terminate plan to demonstrate 100 Watt average power for beacon illuminating laser used for target acquisition.
- Terminate the development of fiber optic amplifiers that are more resistant to nonlinear effects to demonstrate 100 Watt average power for beacon illuminating laser used for target acquisition.

In FY 2025, PE 0602605F, Directed Energy Technology, Project 624867, Advanced Weapon & Survivability Technology partial efforts were transferred to PE 0602605F, Directed Energy Technology Project 625173, Laser Technology, in order to align funding and work.

FY 2024 to FY 2025 Increase/Decrease Statement:

Exhibit R-2A, RDT&E Project Justification: PB 2025 Air Force		Date: March 2024
Appropriation/Budget Activity 3600 / 2	**R-1 Program Element (Number/Name)** PE 0602605F / *Directed Energy Technology*	**Project (Number/Name)** 624866 / *Lasers & Imaging Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2023	FY 2024	FY 2025
FY 2025 decreased compared to FY 2024 by 19.139 million. Funding decreased due to realignment of funding and work in PE 0602605F, Directed Energy Technology Project 625173, Laser Technology.			
Accomplishments/Planned Programs Subtotals	21.740	26.254	7.115

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2025 Air Force			Date: March 2024
Appropriation/Budget Activity 3600 / 2	R-1 Program Element (Number/Name) PE 0602605F / *Directed Energy Technology*	Project (Number/Name) 624867 / *Advanced Weapons & Survivability Technology*	

COST ($ in Millions)	Prior Years	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total	FY 2026	FY 2027	FY 2028	FY 2029	Cost To Complete	Total Cost
624867: *Advanced Weapons & Survivability Technology*	-	52.317	80.652	49.909	0.000	49.909	37.884	40.754	44.667	43.099	Continuing	Continuing

A. Mission Description and Budget Item Justification

This project explores the use of High Power Microwave and other unconventional/innovative weapon concepts to support applications on the Department of the Air Force platforms such as base defense and electronic warfare including disruption, degradation, and damage of electronic infrastructure. This research includes weapon technology that can provide covert effects and/or no collateral or human damage. The project also investigates the effects of potential adversary High Power Microwave weapons and how to mitigate those effects on US assets, as well as producing and applying Directed Energy and non-Directed Energy concept development and assessment tools to determine which technology solutions to pursue. This project includes but is not limited to high power microwaves, plasmas, particle beams, and millimeter waves

B. Accomplishments/Planned Programs ($ in Millions)	FY 2023	FY 2024	FY 2025
Title: High Power Microwave and Unconventional Weapon Technologies	20.208	38.417	23.773
Description: Investigate technologies for High Power Microwave and unconventional weapon components. Investigate High Power Microwave and other unconventional weapon concepts using innovative technologies. Investigate advanced technologies that support force protection tactical applications, including non-kinetic/non-lethal counter-electronics applications.			
FY 2024 Plans: Complete effects testing and propagation experiments to define the performance requirements to develop an ultra-short pulsed laser system. Complete design and develop high power microwave technology that could be integrated into an airborne platform for the next generation Department of the Air Force airborne high power microwave technology demonstration. Continue developing smaller, higher power source technology with all support components to enable the next generation Department of the Air Force high power microwave demonstration. Continue testing high power microwave components for ground and aerial high power microwave demonstrators. Continue supporting the modeling, simulation, and analysis tools that have been transitioned to the broader modeling, simulation, and analysis community. Initiate research to build sources to address high priority, real-word events. Initiate increased effort to research microwave propagation through arctic environments and effects to support future airborne applications.			
FY 2025 Plans: - Terminate the development of smaller, higher power source technology with all support components to enable the next generation Department of the Air Force (DAF) high power microwave demonstration; ensure technology fits in the size and weight restrictions of relevant platforms.			

Exhibit R-2A, RDT&E Project Justification: PB 2025 Air Force		Date: March 2024
Appropriation/Budget Activity 3600 / 2	**R-1 Program Element (Number/Name)** PE 0602605F / *Directed Energy Technology*	**Project (Number/Name)** 624867 / *Advanced Weapons & Survivability Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2023	FY 2024	FY 2025
- Complete the testing of high power microwave components for ground and aerial high power microwave demonstrators; test components in relevant environments to ensure their functionality; work towards reduced logistic requirements to ease maintenance of the systems. - Continue supporting the modeling, simulation, and analysis tools that have been transitioned to the broader modeling, simulation, and analysis community. - Reduce research effort to build sources to address high priority, real-word events; design sources that can increase the target set of high power microwave systems. - Terminate research of microwave propagation through arctic environments and effects to support future applications; evaluate required power and range for operationally relevant capabilities in those environments. - Initiate in-house government evaluation of mission sets for particle beam technologies. - Initiate the development of solid state devices for pulse power systems and radio frequency generation. - Initiate in-house government exploration of new and novel antenna designs to reduce size, weight, and infrastructure while maintaining performance. ***FY 2024 to FY 2025 Increase/Decrease Statement:*** FY 2025 decreased compared to FY 2024 by $14.644 million. Funding decreased due to re-prioritization to meet the nation's future security needs.			
Title: High Power Microwave Effects	32.109	42.235	26.136
Description: Assess the effects/lethality of High Power Microwave technologies. Develop and apply sophisticated models to enhance the development of High Power Microwave and related technology. Develop tools and perform assessments which allow comparisons among Directed Energy concepts and tradeoffs between Directed Energy and non-Directed Energy solutions. ***FY 2024 Plans:*** Complete the transition of software applications hosted in the directed energy High Performance Computing Software Applications Institute for a broad spectrum directed energy sources. Continue populating the database of high power sources to include solid-state sources. Initiate increased effort conducting military utility assessments of high power microwave weapon technology integrated into the kill-chain for multiple target engagements using end-to-end mission level modeling. Continue assessing synergistic weapon concepts that merge kinetic energy and non-kinetic high power microwave weapon capabilities into one weapon system. Continue supporting the modeling, simulation, and analysis tools that have been transitioned to the broader modeling, simulation, and analysis community. Complete validation of the modeling, simulation, and analysis tools that have been transitioned to the broader modeling, simulation, and analysis community. Complete transitioning of the validated modeling, simulation, and analysis tools to the broader modeling, simulation, and analysis community. ***FY 2025 Plans:***			

Exhibit R-2A, RDT&E Project Justification: PB 2025 Air Force		Date: March 2024
Appropriation/Budget Activity 3600 / 2	**R-1 Program Element (Number/Name)** PE 0602605F / *Directed Energy Technology*	**Project (Number/Name)** 624867 / *Advanced Weapons & Survivability Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2023	FY 2024	FY 2025
- Reduce effort in populating the database of high power sources to include solid-state sources; focus on new frequencies and waveforms to increase potential target list susceptible to high power microwaves. - Terminate the military utility assessments of high power microwave weapon technology integrated into the kill-chain for multiple target engagements using end-to-end mission level modeling. - Terminate assessing synergistic weapon concepts that merge kinetic energy and non-kinetic high power microwave weapon capabilities into one weapon system; perform engagement and mission level modeling to determine military utility. - Initiate in-house government development of modeling and simulation tools to decrease the time required for each run while also reducing the processing power required to perform a run. - Continue supporting the modeling, simulation, and analysis tools that have been transitioned to the broader modeling, simulation, and analysis community; collaborating with Corporate Model Analyze (CMA) at enterprise level and with The Technical Cooperation Program (TTCP) at international level. ***FY 2024 to FY 2025 Increase/Decrease Statement:*** FY 2025 decreased compared to FY 2024 by $16.099 million. Funding decreased due to re-prioritization to meet the nation's future security needs.			
Accomplishments/Planned Programs Subtotals	52.317	80.652	49.909

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

Not Applicable

Exhibit R-2A, RDT&E Project Justification: PB 2025 Air Force											Date: March 2024	
Appropriation/Budget Activity 3600 / 2					R-1 Program Element (Number/Name) PE 0602605F / *Directed Energy Technology*				Project (Number/Name) 625173 / *Laser Technology*			
COST ($ in Millions)	**Prior Years**	**FY 2023**	**FY 2024**	**FY 2025 Base**	**FY 2025 OCO**	**FY 2025 Total**	**FY 2026**	**FY 2027**	**FY 2028**	**FY 2029**	**Cost To Complete**	**Total Cost**
625173: *Laser Technology*	-	30.028	23.055	57.938	0.000	57.938	53.561	61.130	73.745	72.807	Continuing	Continuing

A. Mission Description and Budget Item Justification

This project explores the technical feasibility of moderate to high continuous power lasers, including beam control, for applications such as aircraft protection, base protection, and precision engagement from the Department of the Air Force platforms. This project investigates the effects of laser weapons on a wide range of systems and components as well as producing, modifying, validating and applying Directed Energy and non-Directed Energy concept development and assessment tools to determine which technology solutions to pursue.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2023	FY 2024	FY 2025
Title: Laser Technology	10.028	23.055	57.938
Description: Develop and demonstrate High Energy Laser device technologies for the Department of the Air Force applications. Develop and demonstrate laser beam control technologies including atmospheric propagation and pointing and tracking. Perform laser system level modeling and simulation validated by laser effects and vulnerability testing. Develop tools and perform assessments which allow comparisons among concepts and tradeoffs between Directed Energy and non-Directed Energy solutions. Integrate optical beam control technologies with laser device technologies and demonstrate the combined technologies. Develop and use modeling, testing and diagnostic technologies to better understand the vulnerability of adversary weapon systems to High Energy Lasers.			
FY 2024 Plans: Continue development and validation of the predictive physics-based end-to-end model that covers all elements of laser weapon systems (LWS)-photon "birth to death". Initiate increase emphasis assessment of electric laser sources for all Air Force Directed Energy applications. Continue and increase effort on developing laser vulnerability models for high-priority emerging threat systems. Continue transitioning models to the Department of Defense and industry modeling, simulation, and analysis community. Continue tabletop exercises and focused wargames to develop concepts of employment for directed energy weapons in representative scenarios and vignettes.			
FY 2025 Plans: - Reduce effort for development and validation of the predictive physics-based end-to-end model that covers all elements of laser weapon systems (LWS)-photon "birth to death" to in-house government personnel. - Continue emphasis on assessment of electric laser sources for all Air Force Directed Energy applications with inhouse effort. - Reduce effort on developing laser vulnerability models for high-priority emerging threat systems to in-house government personnel. - Reduce effort on transitioning models to the Department of Defense and industry modeling, simulation, and analysis community.			

Exhibit R-2A, RDT&E Project Justification: PB 2025 Air Force		Date: March 2024
Appropriation/Budget Activity 3600 / 2	**R-1 Program Element (Number/Name)** PE 0602605F / *Directed Energy Technology*	**Project (Number/Name)** 625173 / *Laser Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2023	FY 2024	FY 2025
- Continue tabletop exercises and focused wargames to develop concepts of employment for directed energy weapons in representative scenarios and vignettes. - Reduce effort on tabletop exercises and focused wargames to develop concepts of employment for directed energy weapons in representative scenarios and vignettes - Reduce development of fiber optic amplifiers that are more resistant to nonlinear effects. - In FY 2025, PE 0602605F, Directed Energy Technology, Project 624867, Advanced Weapon & Survivability Technology partial efforts were transferred to PE 0602605F, Directed Energy Technology Project 625173, Laser Technology, in order to align funding and work. ***FY 2024 to FY 2025 Increase/Decrease Statement:*** FY 2025 funding increased compared to FY 2024 by 34.883 million due to re-prioritization to meet the nation's future security needs and to account for civilian pay.			
Accomplishments/Planned Programs Subtotals	10.028	23.055	57.938

	FY 2023	FY 2024
Congressional Add: Program Increase - directed energy research ***FY 2023 Accomplishments:*** Conduct Congressional directed efforts.	5.000	-
Congressional Add: Program increase - counter-UAS directed energy effectiveness ***FY 2023 Accomplishments:*** Conduct Congressional directed efforts.	5.000	-
Congressional Add: Program increase - early detection of threats ***FY 2023 Accomplishments:*** Conduct Congressional directed efforts.	10.000	-
Congressional Adds Subtotals	20.000	-

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

Non Applicable