Minister's Approval for Discovery Early Career Researcher Award for Funding Commencing in 2022 Schedule

Approved Organisation, Approved Research Program Leader of Approved Research Program		Estimated and Approved Expenditure ($)			Indicative Funding ($)	Total ($)
(Columns 1 and 2)	(Column 3)	2021-22 (Column 4)	2022-23 (Column 5)	2023-24 (Column 6)	2024-25* (Column 7)	(Column 8)
New South Wales						
Macquarie University						
DE220101272	**Giving quantum systems a voice: quantum optoacoustics on a nanoscale**	72,500.00	146,000.00	147,000.00	73,500.00	439,000.00
Schmidt, Dr Mikolaj K	This project aims to build a complete and scalable platform for the new paradigm of quantum acoustics, ready for immediate deployment as a critical component of a hybrid quantum computing architecture. Using a combination of theoretical techniques at the boundary of quantum physics, nanoscale electromagnetism, classical theory of elasticity, and advanced numerical methods, I will design a complete suite of quantum acoustic devices and protocols to enable interfacing between state-of-the-art quantum devices. This project will strengthen the leading position of Australian researchers in the race towards quantum technologies by offering practical solutions to a critical bottleneck in designing large-scale quantum technologies.					
	National Interest Test Statement Quantum technologies promise a revolution in the way we develop drugs, design new materials for high-tech industries, and secure our data. This fellowship aims to aid in the development of these capabilities, by providing a missing component of the quantum hardware - a quantum interface, implemented by harnessing the non-classical nature of high-frequency mechanical vibrations. When developed, this component will allow multiple platforms, created at Australian universities, to be effectively combined into multi-faceted hybrid quantum architectures. As such, this project has the potential to significantly accelerate the scaling and deployment of commercial quantum devices, bringing commercial and economic benefit to the emerging Australian quantum industry. Furthermore, it will generate IP, patents and stimulate media coverage, reinforcing the image of Australia as a diverse hub for quantum technologies. This will provide cultural benefits to the Australian public and scientific community.					
	Macquarie University	72,500.00	146,000.00	147,000.00	73,500.00	439,000.00
The University of Sydney						
DE220100225	**Unmasking dark matter: from the laboratory to the Milky Way**	70,537.50	140,277.50	139,385.00	69,645.00	419,845.00
O'Hare, Dr Ciaran	The unknown nature of the dark matter that fills our galaxy is one of the biggest problems in physics today. This project aims to connect the particle and astrophysics of dark matter so as to accelerate us towards its first detection in the lab. The expected outcomes are 1) new experimental concepts to test the widening landscape of viable theories and 2) robust predictions for signals in those experiments backed up by the latest surveys of our Milky Way. These outcomes should benefit experiments across the world on the quest to fill a major gap in our understanding of the Universe. The grand scope of this research aims to place Australia in the vanguard of one of the most active pursuits of new physics in the modern era.					
	National Interest Test Statement Dark matter is central to understanding why the Universe looks the way it does, so unmasking it will surely transport us to a new era of physics. Human progress is often measured by how we have been able to resolve the grandest mysteries about our world. This project addresses one of these mysteries, and in doing so will push Australian research over the frontier of human knowledge. The direct benefit will be seen in the advancement of Australia's reputation as a leader in basic research. This project will also inspire younger generations to take up STEM fields. Fundamental science is a driving force in the field of education and in the subsequent development of industry, economic innovation, and future technology. Many of the devices that run our lives were built on theoretical concepts like the ones explored in this project, that could only have been imagined in a setting of blue-sky research. This project situates Australia as a leader in the science that will build tomorrow's world; and by promoting fundamental research to younger generations, this project will also inspire those who will build it.					
	The University of Sydney	70,537.50	140,277.50	139,385.00	69,645.00	419,845.00
	New South Wales	143,037.50	286,277.50	286,385.00	143,145.00	858,845.00

* Note - Indicative funding for approved projects will be made available through a funding variation under section 54 of the ARC Act

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Queensland						
Griffith University						
DE220101082	**Heralded entangled photons to enable quantum networking and computation**	71,097.00	143,844.00	145,494.00	72,747.00	433,182.00
Tischler, Dr Nora	This project aims to advance quantum networking and quantum computation by developing the science of new heralded, i.e. nondestructively verified, entangled states of photons. Despite great potential, photonic quantum technologies have been held back by the lack of key resources in the form of heralded entangled states of photons. Expected outcomes of the project include novel experimental capabilities of heralded state generation and powerful new theoretical methods for photonic circuit design. This should enable the realisation of quantum protocols with a genuine advantage, a critical step towards practical quantum technologies underlying the next generation of cybersecurity.					
	National Interest Test Statement The proposed research aims to produce key resources for the quantum internet of the future, in which quantum computers are connected to form quantum information networks. These networks promise a level of security and privacy unachievable through any classical means, making them of profound significance to the future technology, infrastructure, and cybersecurity needs of Australia's information-based society. The outputs of the project are expected to enable a critical step towards harnessing these unique advantages of quantum information in real-life, practical settings. The project will also provide world-class training to grow future leaders in the domestic quantum industry sector, which has the widely recognised potential to become a major economic powerhouse.					
	Griffith University	71,097.00	143,844.00	145,494.00	72,747.00	433,182.00
	Queensland	71,097.00	143,844.00	145,494.00	72,747.00	433,182.00

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Victoria						
Swinburne University of Technology						
DE220100241	**Discovering the origin of gravitational waves**	70,780.00	140,865.00	139,990.00	69,905.00	421,540.00
Stevenson, Dr Simon P	This project aims to discover the astrophysical origin of gravitational waves. This project expects to calculate the properties of neutron stars and black holes in binaries, using state-of-the-art simulations performed on the largest Australian supercomputers. Expected outcomes of this project include comparisons between gravitational-wave observations and theory using advanced statistical and machine learning techniques, providing new and unique insights into the most massive stars in the Universe. This project should provide significant benefits such as answering key questions about the Universe, cementing Australia's place in the international astronomical community and inspiring and training future generations of Australia's workforce.					
	National Interest Test Statement					
	Gravitational waves are an exciting scientific discovery, and Australian scientists play a leading role in this field of astronomy. This project aims to discover the origin of gravitational waves, using Australian supercomputers combined with advanced machine-learning techniques. It will generate a positive cultural and social impact through producing high-impact, high-engagement scientific results that engage the Australian public. The findings will help cement Australia’s lead in understanding the big questions of astronomy, informing new discoveries that add to the scientific wealth of the country, and providing a return on the Australian government’s investment in astronomical science. The innovative data analysis techniques researched during this project may also have significant commercial benefits for Australian businesses and industries.					
DE220100819	**Localised fast radio bursts as new probes of cosmology**	72,500.00	145,000.00	145,000.00	72,500.00	435,000.00
Caleb, Dr Manisha P	This project aims to utilise fast radio bursts to study observationally the structure of the Universe in an entirely new way, and potentially investigate the era in which the first stars were formed. This project utilises the e-MERLIN and LBA telescopes along with other multi-wavelength facilities in the world to unveil the engines driving fast radio bursts and also pinpoint their host galaxies. The research should result in the use of fast radio bursts as new cosmological probes, complementary to supernovae and galaxies. It also aims to lead to a better understanding of the extragalactic/intergalactic media, and greater public engagement in science by incorporating this phenomenon into a comprehensive public outreach programme.					
	National Interest Test Statement					
	Australia is a world leader in astronomy and the science around fast radio bursts, and this project will take us even further by using fast radio bursts to investigate the nature of stars and matter outside our Galaxy. The high-impact results of this research will enhance Australia’s profile in the international community and provide a return on the Australian government’s investment in astronomy. It will train scientists in cutting edge data-science techniques, providing future benefits for a wide range of Australian industries, including Big Data and the emerging Australian Space industry. Its outputs will also benefit Australian society and culture through public engagement with augmented reality videos, citizen science projects and public talks.					
	Swinburne University of Technology	143,280.00	285,865.00	284,990.00	142,405.00	856,540.00
	Victoria	143,280.00	285,865.00	284,990.00	142,405.00	856,540.00
		357,414.50	**715,986.50**	**716,869.00**	**358,297.00**	**2,148,567.00**

* Note - Indicative funding for approved projects will be made available through a funding variation under section 54 of the ARC Act