Government Office for Science

Technology and Science Insights (TSI)

GO-Science Emerging Technology Taxonomy

Key:

Text in *	S&T Framework Technologies 2022

Family Domain	Level 0	Level 1	Level 2	Level 3	Level 4	Level 5	Level 6
Electronics, Photonics and Quantum	Quantum Technologies*	Quantum Computing	Quantum Simulator				
			Quantum Annealer				
			Gate Model Quantum Computer				
			Quantum Error Correction				
			Fault Tolerant Quantum Computer				
		Quantum Communication	Quantum Cryptography				
		Quantum Networks	Quantum Networks				
		Quantum Sensing	Quantum Sensors				
			Quantum Clocks				
			Quantum Imaging				
	Materials and Photonics	Photonics	Light Emitting Diodes (LED)				
			Organic Light Emitting Diodes (OLED)				
			Photonic Integrated Circuits (PIC)				
			Radio Frequency and Emerging Photonics				
		Radiation*	Compact Visible Sensing				
			Electro-optical and Infrared Sensing				
			Photonics Sensing and Imaging				
			Radio Frequency Sensing				
			Radar Sensing				
		Semiconductors*	Silicon Semiconductor				
			Organic Semiconductors				
			Compound Semiconductors	Sn Recognition			
		Biometric Technologies*	Morphological Biometrics	Biometric Scanning			
			Biometrics Recognition	Facial Recognition			
			Behavioural Biometrics	Gait Recognition			
				Gait Analysis			
		Wireless Networks	Wireless Networks	5G Cellular Radio Access Network (RAN) Architecture			
				5G Cellular Radio Access Network (RAN) Software			
				5G Cellular Radio Access Network (RAN) Hardware			
				5G Cellular Core Network			
		Wi-Fi	Wi-Fi	Wi-Fi 6			
				Wi-Fi 7			
		Satellite Communications	Satellite Communications	Satellite Communications Receiver			
				Satellite Communications Transmitter			
		3G	Open Radio Access Network (O-RAN)				
			Radio Light Communications				
			Free Space Optical Communications				
		Cellular Modem	Cellular Mod Communications				
		Quantum Internet	Quantum Internet	Light Fidelity			
		Satellite Communications	Satellite Communications	Satellite Communications Receiver			
		Fixed Communications	Fixed Communications	Edge Computing			
				5G Cellular Wired Fronthaul Network			
		Photonics*	Quantum Photonics				
			Hyperchaos				
			Integrated Photonics	Silicon Photonics			
		Power Electronics	Power Electronics				
		Neuro Electronics*	Bioelectronics				
			Molecular Electronics				
			Photon Electronics				
	Energy Technologies and Energy Technology (EnT)	Power Generation and Energy Technology (EnT)	Carbon Capture Utilisation and Storage (CCUS)				
			Small Modular Nuclear Reactors (SMR)				
			Tidal Stream Power				
		Hydrogen					
		Methane					
		Clean Transport and Energy Storage	Atomic Clock				
		Sensors	Magnetic Field Sensor				
		Internet of Things*	Internet of Things (IoT) Connectivity				
			Internet of Things (IoT) Sensors				
		Quantum Technologies	Quantum Technologies				
		Quantum Navigation	Quantum Navigation				
		Quantum Timing	Quantum Timing				
		Quantum Sensing	Quantum Sensing				
		Cyber Security	Signals of Cybersecurity (SoC)				
		Neuromorphic	Neuromorphic Computing				
		Cyber Navigation Systems	Cyber Navigation Systems				
			Multi Sensor Cyber Navigation				
AI, Digital and Advanced Computing	Artificial Intelligence*	Machine Learning	Neural Networks	Deep Learning	Foundation Models	Large Language Models (LLM)	
						Vision Foundation Models	
						Multimodal Foundation Models	
						Diffusion Models	
		Intelligent Systems	Quantum Machine Learning	Binary Neural Networks	Reinforcement Learning		
		Automation Agents			Multi Task Learning		
		Neuro Symbolic Artificial Intelligence			Multi Model Learning		
			Explainable Artificial Intelligence	Mechanistic Interpretability	One Shot Learning		
					Zero Shot Learning		
					Meta Learning		
					Transfer Learning	Transfer Learning in Computer Vision	
					Reinforcement Learning	Deep Reinforcement Learning (DRL)	
					Supervised Learning	Computer Vision	
					Unsupervised Learning	Self Supervised Learning	
	Data Management Technologies	Big Data Infrastructure	Distributed Deployment				
			Scalable Data Processing Technology				
			Cloud Computing				
		Data Management Technology (DMT)	Secure Full Stack Data Management	Private Set Intersection (PSI)			
			Field Programmable Gate Arrays (FPGA) Accelerated Computing				
			Confidential Computing				
			Open Knowledge Graphs				
			Trusted Execution Environments (TEE)				
			Differential Privacy				
			Federated Learning				
			Synthetic Data				
	Extended Reality	Augmented Reality					
		Virtual Reality					
		Mixed Reality					
	Synthetic Environments	Digital Twin					
		Digital Timelines					
		Metaverses					
		Emulations					
		Simulations					
	Future Computing	Alternative Computing	Biological Computing				
			Neuromorphic Computing				
			Quantum Computing	Quantum Annealer			
			Analogue Computing	Quantum Computer (Gate Model)			
			Optical Computing				
			Thermodynamic Computing				
		Cloud Computing Paradigms	High Performance Computing	Supercomputing			
		Large Scale Computing	Edge Computing				
			Fog Computing				
			Cloud Computing				
		Distributed Ledger Technology (DLT)					
Biotechnology and Chemicals	Bioinformatics*	Genomics	DNA Sequencing				
		Metagenomics	Organoids				
	Omics*	Transcriptomics	Metagenomic Next Gene Sequencing				
		Proteomics	Protein Structure Prediction				
Engineering Biology	Engineering Biology*	Cell Free Systems					
		Nucleic Acid Synthesis	Synthetic Cells				
		Cellular Systems	Stem Cell Societies				
		Genome Editing Technology	Living Factories				
		Fermentation Technology					
Robotics and Smart Machines	Robotics and Autonomous Systems (RAS)	Drones*	Wave Drones	Single Rotor Drones			
			Fixed Wing Drones	Multi Rotor Drones			
			Fixed Wing Vertical Take Off and Landing (VTOL)				
			Lighter Than Air Drones				
			Tethered Drones				
			Ground Based Drones				
			Air Launched Drones				
			Large Drones	Big Heavy Lift Drones (BHLD)			
				Heavy Lift Drones (HLD)			
		Robotics*	Anthropomorphic				
			Humanoids				
			Soft Robotics				
			Nanorobots				
			Cobots				
			Swarm Robotics				
			Microrobots				
		Autonomous Transport*	Autonomous Underwater Vehicles				
			Autonomous Surface Vehicles				
			Autonomous Road Vehicles				
			Autonomous Rail Vehicles				
			Autonomous Air Vehicles				
Advanced Materials and Manufacturing	Advanced Materials	Graphene*	Recycled Alloys				
		Smart or Designer Alloys*	Powder Metallurgy Alloys				
			Titanium Alloys Aluminium Alloys				
		Advanced Composites*	Chalcogenides				
			Nickel and Cobalt Alloys				
		Metamaterials, Nanomaterials, Engineered and Functional*	Ultra High Temperature Ceramics (UHTC)				
			Electro Ceramics (EC)				
			Functional Ceramics (FC)				
			Ultra High Performance Concrete (UHPC)				
			Cement Based Composites (CBC)				
			Metamaterials				
			Metal Foams				
			Metal Matrix Composites (MMC)				
			Ceramic Matrix Composites (CMC)				
			Polymer Matrix Composites (PMC)				
		Superconductors	Superconductors				
			Low Temperature Superconductors				
		Metamaterials*	Electromagnetic Metamaterials	Photonic Metamaterials			
				Sub Terahertz and Terahertz Metamaterials			
				Microwave Metamaterials			
			Magnetic Metamaterials				
			Acoustic Metamaterials	Acoustic Metamaterials			
			Thermal Metamaterials	Thermal Metamaterials			
Additive Manufacturing	3D Printing	3D Printing					
		4D Printing	Thermal Metamaterials				
Nanotechnology*	Nanomaterials	2D Materials*	Graphene				
			Hexagonal Boron Nitride (hBN)				
			Transition Metal Dichalcogenides (TMDs)				
			Metal Organic Frameworks (MOF)				
			Covalent Organic Frameworks (COF)				
			Nanocellulose				
			Carbon Nanotubes (CNT)				
			Carbon Dots (CD)				
			Quantum Dots				
			Nanoparticles				
Clean Air and Water	Clean Air and Water*	Nanomaterials					
		Complex and Non Linear Dynamics and Systems Modelling					
		Advanced Energy Materials					
		Electrochemical Properties					
		Photocatalysis and Other Advanced Oxidation Processes					
		Solar Salts					
		Neither Propellant					
		Chemical Propellant					
		Electric Flight					
		Light Propulsion					
		Calculated Tank Transport*					
		Electrothermal Chemical Propulsion					
Terrestrial Propulsion*							
Energy and Environment Technology	Renewables	Onshore	Onshore Wind Technology				
		Offshore Wind*	Offshore Wind Technology				
		Wave Energy Technology*	Wave Energy Technology				
		Tidal Energy Technology*	Tidal Energy Technology				
		Ocean Energy Technology*	Tidal Energy				
			Ocean Thermal				
			Salinity Gradient Power (SGP)				
			Wave				
	Geoengineering	Solar Radiation Management (SRM)					
		Greenhouse Gas Removal (GGR)					
		Carbon Capture					
		Carbon Capture, Utilisation and Storage	Carbon Capture Utilisation and Storage (CCUS)				
			Direct Air Capture (DAC)				
			Bioenergy with Carbon Capture and Storage (BECCS)				
			Carbon Capture Utilisation and Storage (CCUS) Transport				
		Carbon Capture, Utilisation and Storage					
	Heating, Ventilation, Air Conditioning (HVAC)	Heat Pumps	Industrial Electrification				
			Heat Pumps				
		Hydrogen Heating	Hydrogen Heating				
	Hydrogen Production and Distribution	Hydrogen Production and Distribution	Hydrogen Production				
			Hydrogen Distribution				
			Infrastructure Stress Cracking				
	Fuel Cells	Fuel Cells	Hydrogen Fuel Cells	Proton Exchange Membrane (PEM) Fuel Cells			
				Alkaline Fuel Cells			
				Phosphoric Acid Fuel Cells			
				Solid Oxide Fuel Cells			
				Molten Carbonate Fuel Cells			
				Direct Methanol Fuel Cells			
				Metallic Fuel Cells			
				Microbial Fuel Cells			
			Low Temperature Fuel Cells				
	Nuclear Fuel Technologies	Fusion	Fusion Chain	Deuterium	Tritium Breeding Blanket (TBB)		
				Deuterium Helium 3 (D-He3)			
			Fusion to a Fission Technology	Hybrid Fusion Fission			
				Sub Critical Fusion			
		Fission	Fission to a Fusion Technology	Stop-in Fuel			
			Nuclear Fuels	Uranium Fuels			
				Recycled Carbon Fuel			
				Thorium Fuel			
	Recycling Technology	Lithium Ion Battery Recycling	Mechanical Recycling				
		Plastics Recycling	Chemical Recycling				
			Dissolution Recycling				
			Organic Recycling				
	Thermochemical Energy Storage	Mechanical Energy Storage	Thermochemical Energy Storage				
		Thermal Energy Storage	Advanced Flywheels				
			Compressed Air Energy Storage (CAES)				
			Pumped Storage Hydropower				
	Next Batteries*	Non Lithium Ion Batteries	Lithium Ion Batteries				
			Lithium Sulphur Batteries				
			Lithium Air Batteries				
			Solid State Batteries				
		Sodium Ion Batteries	Sodium Ion Batteries				
		Redox Flow Batteries	Redox Flow Batteries				
		Aluminium Batteries	Aluminium Batteries				
		Supercapacitors	Supercapacitors				
		Hybrid Capacitors	Hybrid Capacitors				
	Advanced Chemical and Electrochemical Technologies	Advanced Chemical Technologies	Electrochemical Technology	Electrochemical Energy Storage			
				Electrochemical Energy Conversion			
				Electrochemical Fuels			
	Nuclear Energy Technology	Nuclear Fusion Technology					
		Nuclear Fission Technology	Small Modular Reactors				
			Advanced Modular Reactors				
Biomedical Technology	Human Augmentation*	Artificial Organs					
		Biomedical Implants					
		Pharmaceuticals Nanomedicine	Brain Computer Interfaces	Brain Computer Interfaces Invasive			
				Brain Computer Interfaces Non Invasive			
		Neuromodulation	Bioelectronics	Electroceuticals			
		Exoskeletons		Electrochemical Medicine			
	Medical Devices*	Medical Imaging Technology	Ultrasonic Imaging	Echocardiography			
		In vitro Diagnostics	Nuclear Medical Imaging	Single Photon Emission Computed Tomography (SPECT)			
		Wearables	X-ray	Computed Tomography (CT)			
		Implantables	Magnetic Resonance Imaging (MRI)				
		Wearables					
	Therapeutics and Pharmaceuticals*	Cellular and Gene Therapy	MRNA Interference (RNAi)				
		Vaccines	Mark Vaccines				
		Pharmaceuticals	Drug Development	Computational Drug Design			
		Nuclear Medicine	Radiotherapy Systems (RTS)	Linear Accelerators (LINAC)			
				Nanoparticles			