Programs of Joint Funds

The joint funds set up by NSFC and other relevant government departments, provincial governments and industrial sectors aim at supporting basic research in agreed scientific areas.

The joint funds are designed to play a guiding role of the National Natural Science Fund, guide and integrate social resources in basic research, promote cooperation of relevant departments, industries and regions with universities and research institutes, foster scientific and technological talents and enhance China's indigenous innovation capabilities in relevant areas, industries and regions.

In 2016, the joint funds in the Guide to Programs include NSAF Joint Fund, Join Fund of Astronomy, Joint fund of Research on Major Science Facilities, Iron and Steel Joint Fund, NSFC-General Technology Joint Fund on Basic Research, NSFC-Yunnan Joint Fund, NSFC-Xinjiang Joint Fund, Joint Fund for Promoting S&T Cooperation across the Taiwan Strait, NSFC-Liaoning Joint Fund, NSFC-Zhejiang Joint Fund for the Fusion of Informationization and Industrialization, and NSFC-Shanxi Joint Fund for Coal-Based Low Carbon Research.

The joint funds are managed according to NSFC's regulations, NSFC's Rules on Joint Fund Management and project selection procedures.

Applicants for the Joint Funds should be:

(1) Have the experience of conducting basic research;

(2) Have senior professional position (title) or PhD;

(3) Meet other requirements in the Guide to Programs.

Applicants shall only apply for the Joint Fund with the same name once a year. If in the previous year the applicant received funding for the Joint Fund, he or she can not apply for the Joint Fund with the same name as the principle investigator again this year.

For any research achievements of the Joint Fund, NSFC's contribution and support to the project should be acknowledged in a prominent place and in an appropriate form according to the Guide to Programs with the name of the joint fund and the project number.

Applicants for the joint funds should be prepared according to relevant project type (such as General Program or Key Program) outlines. Please select "Joint Fund" for funding category, "Fostering Program Project" or "Key Program Project" or "Foster Local Talents" or "Center Project" for sub categories, and select the name of the joint fund in the notes section. Applicantions without correct selection will not be accepted.

NSAF Joint Fund

Jointly set up by NSFC and the China Academy of Engineering Physics (CAEP), the Fund is aimed to encourage scientists in related fields to carry out basic and applied researches for national security, so as to explore new research directions, discover new phenomena and laws, upgrade the innovative ability of science and technology in national defense, and foster young professionals in this area.

In 2016, this joint fund plans to fund two types of projects, namely "Key Program Project" and "Fostering Program Project". The Key Program project has 10 directions, with average direct cost funding of 2.4-3 million yuan per project for 4 years. There are 15 encouraged research directions for Fostering Program Project, and 80 projects with defined targets are planned to be funded with an average funding of 640,000 yuan per project for 3 years.

I. Directions for Key Program Project

ZD1. Research on computation method for multi media fluid dynamics in high energy and density conditions

ZD2. Research on laws of relative motion between reversing layers under complex loading conditions

ZD3. Research on high pressure phase change of HMX crystals

ZD4. Research on atto second X-ray radiation generated by high power strong laser target interactions

ZD5. Research on non equilibrium physics of high temperature radiation field plasma interactions

ZD6. Research on quantum verification mechanism based on physically non clone-able micro nano photon structures

ZD7. Precision regulation and characterization of strong corelated f electron region properties

ZD8. Research on the electron structure and surface reaction behaviors of uranium nitrates

ZD9. Highly efficient computation method for problems in partial differential equations with extreme physical properties

ZD10. Research on material phase change dynamical properties in high pressure conditions driven by strong laser

Note: CAEP researchers can apply for or participate in applying for this program. Collaboration among two or three institutions is encouraged.

II. Directions and Projects for Fostering Program Projects

1. Projects for encouraged research directions

GL1. Research on generation and optimization of 3-D non structural mixed grids including complex boundaries

GL2. Studies on high power efficient beam transformation mechanism based on photon crystal structures

GL3. Studies on heat transfer stability of plate fuel accelerator cores

GL4. Studies on analysis and optimization of parallel programming based on big data technology

GL5. Risk analysis of internal network leakage based on human and data behavior trace

GL6. Studies on the impact of plasma instability on BRA process

GL7. Studies on methodology of low gamma dosage radiation effects

GL8. Research on the structure design and mechanism of vibration reduction of polymer composite damping materials

GL9. Studies on synthesis of energy materials in extreme conditions

GL10. Studies on performance and mechanism of friction wear of high strength temperature resistant lubrication composite materials

GL11. Studies on solid cells using solid ion theory

GL12. Studies on design and preparation of gradient functional ceramic materials

GL13. Studies on synthesis and quantum devices of single layer 2-D MoS2 semiconductor materials

GL14. Studies on key problems of data system modeling for multi disciplinary coordination

GL15. Studies on the method of security evaluation of measurement and control system software with high security level

Note: CAEP researchers may not apply, but may be a participant.

2. Projects with defined targets

(1) Studies on reaction flow model of solid explosives and precision calibration of parameters
(2) Studies on theory and application of metal explosive driving
(3) Studies on direct numerical simulation and mixing mechanism of compressible Rayleigh Taylor instability
(4) Signal separation and imagine processing based on low order matrix recovery
(5) Studies on mechanical mechanism of radiation damage of TiN gradient coating
(6) Studies on simulation of acoustic vibration of structure in under wide band excitation
(7) Studies on validation of dynamical models with function output
(8) Studies on high temperature high pressure phase change of TATB explosives exposed to laser radiation
(9) 3-D grid-spring model of brittle materials during impact process
(10) Studies on non destructive testing of polymer viscous explosive residues
(11) Studies on efficient ultrasonic milling technology of small glass tools
(12) Studies on manufacture of high elasticity precision grid structure
(13) Studies on analysis and safety evaluation of structural defects under coupling conditions of multiple factors
(14) Studies on numerical simulation of plastic deformation fractures of high strength vanadium alloy
(15) Analysis of multi scale coupling of FBAR mechanism
(16) Studies on high temperature phonon spectrum of beryllium and its non elastic neutron scattering
(17) Studies on stopping ability of laser driven charged particles in low Z dense plasmas
(18) Studies on selenium group nano crystal radiation detection materials
(19) Studies on credible covariance of neuron cross section and number of neutrons in fission nuclei
(20) Studies on method of evaluation of reaction data of neutron and unsteady nuclei
(21) Studies on theoretical analysis and design of micro multi channel cooling flow field
(22) Studies on detection of trace in tight and small space
(23) Studies on ion beam of molybdenum diffusion in molybdenum based hydrogen titanium membrane
(24) Studies on controls and design of dynamic programmable THz functional devices

(25) Studies on quantum point single photon source of nitrates in room temperature
(26) Studies on leakage mechanism of GaN base HEMTs buffer layer
(27) Studies on optimal design and damage mechanism of high threshold super wide band laser membrane dispersions
(28) Studies on damage resistance LBO crystal membrane technology in continuous working conditions
(29) Studies on error tolerant variable structural flight control method
(30) Studies on surface charging of vacuum ceramics and its impact on pulse characteristics
(31) Studies on cyclic trace synthesis radar imaging and motion compensation technology
(32) Studies on arc evolution behaviour of trigger type vacuum switch
(33) Studies on radiation properties and spectrum detection method of negative corona discharge
(34) Studies on multi coupling mechanism of radio micro floating induction in high impact conditions
(35) Studies on total MEMS antenna based on flexible materials
(36) Studies on interference resistant short range pulse laser based on smoke particle size distribution function optimization
(37) Studies on integration of multi phase power driven and its energy transportation
(38) Theoretical studies on restoring surface texture by THz imaging
(39) 3-D imaging of near target based on coarse arrays
(40) Studies on wide band stealth technology of low RCS platform antenna
(41) Studies in efficient electro magnetic computation method for target echo in complex environment
(42) Studies on composite interaction technology for large network controls
(43) Studies in multi source data merging analysis technology for large physical experiment
(44) Studies on mechanism of interaction of vortex light field and silicon materials
(45) Studies on the laws of physics of raising damage threshold of quartz by surface enhancement
(46) Studies on super narrow stopping membrane technology with high damage resistant propertied in continuous working conditions
(47) Damage properties of optical membrane device laser with micro nano structures
(48) Technology of high acceleration gradient super conductive cavity mismatch mechanism and controls
(49) Analysis of micro disturbance properties of low loss materials in high quality quasi cavities
(50) Electrolysis dynamics of burnt fuel salts
(51) Mechanism of copper glass forming based on high energy beam and its properties of strong laser absorption
(52) Macro/micro mechanism and modeling of squeeze forming process sub stable liquid state alloy
(53) Electrode reaction process of typical fracture element in chloride molten salts
(54) Theory and experiment studies of molecular reaction of cerium atom and its clusters with typical gas
(55) Computer simulation of chemistry of water solution of neptunium compound
(56) New method of synthesis of nitrate explosives based on micro chip structure controls
(57) Design and mechanism of PBX in situ 3-D composite interface enhancement

based on energy containing binders
(58) Elastic water repellent wide temperature range thermal control materials and its mechanism of heat isolation
(59) Transport process of lithium ion/electron in multiple layer in micro lithium batteries
(60) Low temperature alloy welding of PZT ceramics and its evolution mechanism on interface
(61) Optimization of properties of carbon fiber enhanced aluminum based material and its application in optical mechanical structures
(62) Studies on fast solution of large scale explosion based on image source method
(63) Mechanism of impact of minor element on the strength of chrome molybdenum alloy
(64) Studies on the method of load coupling characterization and design technology in acceleration field with multiple axial changes
(65) Studies on mesoscale damage of polymers with particle enhancements during low speed impact
(66) Studies on robust control and optimal end guidance for small portable air crafts
(67) Studies on mechanism of SPDT defect formation in KDP crystals based on in situ measurement
(68) Hard X-ray single energy imaging technology based on spherical lens crystal
(69) Total field dynamic measurement of internal temperature distribution of semiconductor materials
(70) Ultra fast dynamics of semiconductor carrier based on nonlinear effect
(71) Dark mechanism and devices of high power Ytterbium doped optical fiber
(72) Multi photon effect mechanism and devices of femto second laser induced photon crystal grate
(73) Super wide angle ASE absorption laser membrane
(74) Studies on the improvement of penetration capacity on high voltage electrode surface
(75) Conformal array manifold modeling and dimension reduction techniques based on wave field models
(76) TMulti bit reverse effect mechanism in ultra deep sub micro CMOS IC
(77) Key technology of safety control of virtual machine
(78) Bio chemical mechanism of producing deuterium from micro algae
(79) Simulation of molecular dynamics of phase shift properties of transition metals in high temperature
(80) Studies on nonlinear random vibration analysis of structures in high temperature

Note: CAEP researchers may not apply, but may participate in projects.

Please refer to separate publications or the CAEP website (http://www.caep.ac.cn) for detailed information on specific content and form of research results, etc.

Joint Fund of Astronomy

NSFC and the Chinese Academy of Sciences (CAS) jointly set up the Joint Fund of Astronomy, which opens to all universities and research institutions in China (especially non-astronomy research ones), combine NSFC's strength in evaluation, funding and management with the function and roles of the national research platforms (observation bases) in astronomical fields that have already been established by the Chinese Academy of Sciences. This combination will promote the effective use of these facilities to conduct

astronomical research by researchers in universities and other research institutions, develop astronomical methods and technology, improve observation capacity of these facilities, foster research talents in related areas, improve innovation capabilities and academic positions internationally, and make astronomical research in China better serve the national strategic needs.

The Joint Fund of Astronomy includes “Fostering Program Project” and “Key Program Project”. Key Program Project will not specify project titles and applicants may decide their project titles, research contents, research schemes and research funding according to the following 1-5 important scientific issues. The sixth issue is not within the scope of Key Program Project. In 2016, the Joint Fund of Astronomy plans to fund about 6-9 Key Program projects.

As a part of the National Natural Science Fund, the application, evaluation and management of the Joint Fund of Astronomy comply with the regulations of NSFC and the agreement signed between NSFC and CAS. In 2016, for the Fostering Program Project, the average direct cost funding will be 500,000 yuan per project for 3 years, and for Key Program Project, the average direct cost funding will be 2.5 million yuan per project for 4 years.

Funding areas in 2016

(1) Use of observation facilities of all wave band and data to conduct observation and theoretical research on cosmology, galaxies, stars, the sun and solar systems and other basic astronomical areas by scientists from research institutions and universities outside CAS astronomical observatory system (researchers in CAS astronomical observatory system are not allowed to apply as PIs, but may participate in the research as principal members of the research group).

(2) Focus on observation techniques for space programs, including new observation techniques, new methods in space and pre-studies on key techniques of astronomical satellite, etc.

(3) High energy, ultraviolet, optical, infrared and radio techniques related to astronomical observations, including high energy X, gamma imaging technology, high resolution detector technology (position resolution and energy resolution) and polarized measurement, the detection of week photoelectric signals, storage and transmission techniques, high energy, optical, infrared and radio techniques related to astronomical telescopes, automated control techniques and machinery, etc.

(4) Applied basic research on problems in major astronomical projects such as data, computation and information access, etc., including storage and sharing of mass astronomical data, data mining, high performance computation and virtual observatory techniques.

(5) Basic astronomical methods (astronomical measurement and celestial mechanics) and key scientific issues originated from national strategic needs.

(6) Pre-studies on scientific problems and technical schemes in large astronomic observation facilities that are under planning, including frontier scientific problems to be studied, assessment on proposed technical scheme for planned observation facilities, clarify technical parameters of the facilities, and verification of scientific targets according to the capability of the planned observation facilities (only Fostering Projects are accepted in this area).

Joint Fund of Research on Major Science Facilities

NSFC and the Chinese Academy of Sciences (CAS) have jointly set up the Joint Fund of Research on Major Science Facilities, which aims at making use of NSFC's strength in evaluation, funding and management to attract researchers in universities and research institutes to conduct frontier, multidisciplinary and intercrossing researches by using national major science facilities built by the CAS, foster research talents of major science facilities, develop new research directions, bring into full play the overall capability of these major science facilities, promote the exchange and opening up, upgrade our innovation capability in basic science and creativity in frontier science areas and improve international standings of China, and make Chinese basic research better serve the national strategic needs.

As a part of the National Natural Science Fund, the application, evaluation and management of the Joint Fund of Research on Major Science Facilities comply with the regulations of NSFC and the agreement signed between NSFC and CAS. The major science facilities referred to in this joint fund are BEPC and BES in Beijing, HIRFL-CSR in Lanzhou, SSRF in Shanghai (including protein facilities), and NSRL and SHMFF in Hefei.

The Joint Fund of Research on Major Science Facilities includes "Fostering Program Project" and "Key Program Project. In 2016, the average direct cost funding for a Key Program Project is 2.4-2.6 million yuan per project for 4 years and that for Fostering Program Project is not less than 540,000 yuan per project for 3 years.

I. Three Major Funding Areas

(1) Research using general equipment, focusing on multi-disciplinary research in physical sciences, information sciences, material sciences and environmental sciences, etc. and the development of new research directions.

(2) Research using special devices, such as high energy physics research on BESIII and nuclear physical research on HIRFL-CSR in Lanzhou.

(3) Research on techniques and methods that improve the experimental capability of major facilities and the development and key technology for small specialized devices.

II. Priority Research Areas in 2016

Fostering Program Project

Multidisciplinary research on synchrotron radiation in physics, chemistry, life sciences, medical sciences, environmental sciences, material sciences, geology, agriculture, metrology, microelectronics and micromechanics; experimental studies on τ-charm physics on BESII and basic research on relevant software and data analysis; nuclear physics experimental studies on HIRFL-CSR in Lanzhou and applied basic research on heavy ions; studies on ion beam in life sciences, medical sciences, material sciences and semiconductor defect engineering; new technology and methodology of beam line; key technology of advanced X ray detector; particle accelerator and key technology, method and equipment for particle detectors, magnetic resonant technology and new method of preparation for functional materials in steady high magnetic field.

Key Program Project

Research areas are more than funded projects in number. Applicants may decide the project title, research content and research scheme according to their own situation. It is encouraged that applicants collaborate with researchers working in labs of facilities.

1. Research on scientific problems based on Synchrotron Radiation Facility

(1) Transit and transfer process of environmental pollutants
(2) Structure and property of energy materials
(3) Structure and physical properties of complex materials
(4) Structure and functions of macro biomacromolecular complexes and membrane protein
(5) Fine structure of cells and bio tissues
(6) New catalyst and mechanism of catalysis
(7) Structure of matters inside the earth

2. Research on scientific problems based on Steady State Strong Magnetic Field Facilities

(8) Correlated materials in strong magnetic field conditions (≥20 T)
(9) Studies on mechanisms related to life activities based on strong magnetic field resonant spectroscopy and imaging
(10) Chemical synthesis, material preparation and properties under high magnetic field (≥20 T)

3. Frontier physics and expanded studies based on BEPCII and HIRFL

(11) New resonant state in Tau-charmonium energy region
(12) Hadron spectroscopy in Tau-charmonium energy region
(13) Singular nuclei reaction and structure
(14) Highly ionized ion and fine spectroscopy
(15) Heavy ion radiation effects

4. New principles, new methods and key technology for the facilities

(16) New method and new technology of HIRFL experiments
(17) Experimental method, key technology and devices for beam station
(18) New theory and methods of imaging
(19) New principles, new methods and new technology and key components for accelerator
(20) Key technology of detector and electronics
(21) Method and software of experimental data analysis and processing
(22) Self (ferro magnetic) resonance method in strong magnetic field
(23) New theory and key technology of advanced light sources

Joint Fund of Iron and Steel Research

The Joint Fund of Iron and Steel Research is financially supported by NSFC and Baosteel Group Corporation. Aiming at common basic issues and key technology in the development of Chinese iron and steel industry, it funds prospective and innovative research that can speed up the advance of new technologies in metallurgy and material. In 2016 the direct cost will be 0.5 to 0.8 million yuan per project for 3 years with the Fostering Program, and 2 to 3.8 million yuan per project for 4 years with the Key Program.

Nationwide the Joint Fund's funding range covers new metallurgical technologies and relevant techniques, materials, energy, environment, equipment, to information sciences, etc. Proposals should be submitted to the Department of Engineering and Materials Sciences of NSFC.

I. Areas encouraged with the Fostering Program

1. Process of coke consumption in blast furnace and its influence factors
2. Basis of new process and technology for comprehensive treatment of gas from

sintering or coke oven

3. Refining mechanism and key technology of high performance welding wire steel
4. Manufacturing fundamentals of homogeneous high-toughnesssuper-thick polar-ship steel plate
5. Basic issues of advanced high-strength automotive steel
6. High strengthening and high toughening mechanism and process basis of Cr13 martensite stainless steel
7. Hot dipped interface reaction kinetics of free pickling hot rolling sheet
8. Ultra fast cooling uniformity and process control of hot rolling sheet strip
9. Controlled cooling model and microstructure transformation behavior of hot rolling seamless steel pipe
10. Microbiological corrosion mechanism of marine steel
11. Delayed cracking mechanism of medium manganese steel
12. Manufacturing basis of electric vehicle body framework using lightweight steel and process
13. Strengthening and torsional fracture mechanism of high strength bridge cable wire
14. Fabrication, strengthening and toughening mechanism of bainite dual phase high speed train wheel steel
15. Toughening mechanism and process control of micro-nitrogen alloyed, high hardness and long life hot die steel
16. Plasticity improvement mechanism and rolling basis of 6.5 wt% high silicon steel strip
17. Steel supply chain collaborative optimization and flexible manufacturing basis

II. Areas supported with the Key Program

1. Contaminant formation mechanism and control technology in the sintering process of iron ore resources (E0414)
2. Basic theory related to continuous casting mold flux of high manganese and high aluminum steel (E0412)
3. Alloying mechanism and key properties of high temperature ferrite stainless steel for new-generation automobile (E0101)
4. Microstructure design principle and weldability evaluation of low-activation high-temperature ferrite steel for nuclear power (E041607)
5. Multi-step real-time intelligent optimization scheduling theory, method and application for steel production line (E042205)
6. New process and technology for iron and steel industry, and related energy and environmental protection basic theory and method (E0422)

In the above 6 areas about 5-8 projects will be funded according to application and evaluation situations.

NSFC-GenerTec Joint Fund for Basic Research

The NSFC-GenerTec Joint Fund for Basic Research was jointly established by NSFC and China Academy of General Technology in 2015. The joint fund aims at pooling talented scientists and research teams to solve major scientific issues and key technical problems for China Academy of General Technology in serving the country and fulfilling its mission, and promoting research and team building in related disciplines.

The NSFC-GenerTec Joint Fund for Basic Research is open to all Chinese researchers and is an integral part of the National Natural Science Fund. NSFC is responsible for the application, evaluation and management of the joint fund in accordance with NSFC's Rules on Joint Fund Management and the Agreement on NSFC-GenerTec Joint Fund for Basic Research.

In 2016, the NSFC-GenerTec Joint Fund for Basic Research calls for proposals for "Key Program Project" and "Fostering Program Project". Average funding (direct cost) for each "Key Program Project" will be 2.55 million yuan for 4 years and the funding could be increased for projects of exceptionally high quality. Average funding (direct cost) for each "Fostering Program Project" will be 0.68 million yuan for 3 years.

1. Themes for Key Program Project

(1) Mainstream media content-aware, interaction analysis and presentation technologies in a big data environment
(2) Key technologies for semantic analysis and quantitative calculation of sentiment in a big data environment
(3) Bigdata-driven target tracking and localization technology
(4) Technology of privacy protection and risk management for network users in a big data environment
(5) Technology of information hiding, covert channel exploitation and countermeasures based on big data
(6) Scenario deduction and early warning of specific international events based on big data
(7) External data acquisition and analysis of integration applicationfor target behaviors
(8) Identification, transcription, comparison and translation of specific signal or media
(9) Theory, methodology and key technology of information hiding
(10) Vulnerability analysis and countermeasures of mobile network and terminal
(11) Covert channel detection and countermeasures of mobile network
(12) Vulnerability analysis of backbone network and core network devices
(13) Measurement theory of chip data leakage and vulnerability analysis method
(14) Theories and key technologies of novel cryptosystem in a cloud computing environment
(15) Key technologies of sensor network security
(16) Integrative testing technology for anonymous network communication
(17) Immunity-based active network security technology
(18) Technology for behavior analysis of mobile network users

2. Themes for Fostering Program Project

(1) Network big data platform and data acquisition technology

New methods and technologies for the acquisition, aggregation and analysis of open network data, and technologies for the acquisition, storage and management of multi-source, heterogeneous, massive data, including key technologies for anonymous cloud storage in mobile network.

(2) Big data preprocessing technology

Automatic identification and transliteration of speech data, including feature extraction of speech in a noisy environment, training technology for acoustic models based on massive data, and encoders/decoders that can support ultra large scale acoustic models or language models; theories and key technologies of multispectral video processing, including coordinated expression, collaborative sensing and target identification and tracking technology for video data; automatic analysis, recognition and processing technology for images and texts, including text and image recognition technology for Chinese, English, Tibetan, Uighur and other languages; ID identification and verification based on lip-reading.

(3) Big data analysis technology

Data fusion techniques, correlation analysis, early warning analysis, camouflaging techniques, authenticity analysis for big data, including statistical analysis and modeling of network user behaviors, theory and modeling methods of intelligent search in cyberspace, evidence forensics and tracking technology for the new generation of network, automatic sentiment identification for specific fields, mobile internet encrypted data analysis and mining, identification of spam and false information, and measurement of the distortion of big data during transmission.

(4) Big data presentation and utilization technology

Modeling theory of network graph based on big data and large-scale networks, information exchange and transmission mechanism of different network graph models, technology for virtual and real object correspondence in online and offline network graph, cognitive convergence in visualization and interactive analysis of video big data.

(5) Technologies of analysis and utilization for mobile communication

Miniaturization and diversification of mobile terminal devices and battery technology, analysis of mobile communication protocol and analysis of intelligent devices security, intelligent terminal forensics and anti-forensics, mobile terminal user behavior analysis, and covert communication technology in mobile applications.

(6) Steganography and steganalysis

New theories, methods and technologies of steganography and counter measures for big data, including theories and technologies of secure steganography and steganalysis of behavior data, theories and technologies of steganalysis without prior knowledge, theories and technologies of attack-resistant steganography, and theories and technologies of stealth signals.

(7) Vulnerability analysis and countermeasures

Methods and technologies of software vulnerability analysis based on topological invariants; software steganography, anti-tracking and anti-debugging technologies based on different operating systems or carriers; new models and methods of malicious code detection for multi-source data; firmware security analysis technologies and etc.

(8) Cryptography technology

High strength password and cryptanalysis technologies, especially cryptanalysis based on reconfigurable symmetric cryptography algorithms, quantum attack-resistant cryptography theories, side-channel analysis of public-key cryptographic algorithms in the post-quantum era, vulnerability analysis of network security protocols and cryptosystems, security analysis of cryptographic protocols and codes and deciphering techniques, security analysis technologies for white-box cryptography and cryptographic obfuscation.

(9) Signal and information processing

Technologies of information acquisition and transmission in complex and isolated network environment; key technologies of decoding, monitoring and locating wireless signals; position information acquisition and locating technology based on visible light; signal modeling, analysis and screening technologies based on physiological characteristics.

(10) Effectiveness, reliability and security of mega-data center network

Studies on new network topology, routing and forwarding technologies for mega-data center to meet the requirements of non-blocking, high-speed, low-delay, reliable and secure transmission of data center; studies on measures to solve the problem of super-linear increase of costs and energy consumption of Ethernet, IP-based network and other implementation technologies of the data center; studies on problems arising from the exponential growth of data center volume due to the development of cloud computing and big data.

NSFC-Yunnan Joint Fund

The NSFC-Yunnan Joint Fund is jointly established by NSFC and the Yunnan Provincial Government to implement the National Medium-and Long-Term Program for Science and Technology Development 2006-2020, the guidelines of the National Conference on Science and Technology and the Action Plan on Building an Innovation-Oriented Yunnan. It aims at pooling talented scientists across the country to carry out basic researches on important scientific issues and key technical problems that are closely related to the socio-economic and scientific development of Yunnan and surrounding regions, boosting the development of science and technology and the growth of scientific talents in Yunnan, improving indigenous innovation capability and international competitiveness, and promoting the sustainable development of regional economy and society.

The NSFC-Yunnan Joint Fund is open to all Chinese researchers and is an integral part of the National Natural Science Fund. NSFC is responsible for the application, evaluation and management of the joint fund in accordance with NSFC's Rules on Joint Fund Management.

In 2016, the NSFC-Yunnan Joint Fund calls for proposals of "Key Program Project" in 4 priority research areas. Average funding (direct costs) for each project will be 2.4 million yuan for 4 years. Qualified researchers all over the country are welcomed to apply for this fund according to the research scope and requirements listed in this Guide.

I. Biodiversity conservation

1. Biodiversity

Studies on the biodiversity of important animals, plants and micro organisms in the plateau regions of Yunnan at the molecular, genetic, species and ecosystem levels.

Main research orientations:

(1) Studies on the biodiversity of important ecosystems in Yunnan;

(2) Studies on the exploitation and protection of endemic species and medical plants and animal resources in Yunnan;

(3) Studies on the adaptive evolution mechanism of endemic species in Yunnan.

2. Agricultural and forest resources

Main research orientations:

(1) Genetic analysis and application of good traits of important economic animals and plants in Yunnan;

(2) Basic researches on the pathogenic mechanism and prevention and treatment of important diseases and insect pests of main plants in Yunnan;

(3) Mechanism of controlling water and soil erosion through new crop cultivation methods;

(4) Basic researches on the prevention and treatment of main diseases of livestock and poultry.

3. Nutrition analysis and exploitation of special food in Yunnan

II. Population and health

1. Basic researches on discovery of active substances aiming at major human diseases by using typical resources in Yunnan

Main research orientations:

(1) Studies on the discovery, structure, function and functional mechanism of new natural active substances based on special resources in Yunnan;

(2) Studies on the material basis and functional mechanism of ethnic medicine and

featured Chinese medicine in Yunnan.

2. Basic researches on the pathogenesis, prevention and treatment of major diseases in Yunnan

Main research orientations:

(1) Basic researches on high incidence diseases and endemic diseases in Yunnan;

(2) Basic researches on the epidemiology, pathogenesis, prevention and treatment of insect-borne tropical diseases and major infectious diseases in Yunnan and surrounding areas;

(3) Disease modeling using special animals in Yunnan and related basic researches.

III. Resources and environment

1. Environmental changes and eco-environmental effect in Yunnan-Guizhou Plateau

Main research orientations:

(1) Studies on the evolution mechanism of ecosystem in key geological period in Yunnan;

(2) Studies on the changes of climate, vegetation and soil in dry-hot valley and sustainable utilization of related resources;

(3) Studies on the migration and transformation mechanisms and regulatory mechanisms of nutrients and pollutants in plateau lake basins;

(4) Studies on the distribution of carbon and nitrogen and key distribution processes in typical forest ecosystems in Yunnan.

2. Formation mechanisms and early warning of major natural hazards in Yunnan

Main research orientations:

(1) Causes and forecast of meteorological disasters in low latitude plateau;

(2) Mechanisms and early warning of major geological disasters in Yunnan;

(3) Mechanism and monitoring of strong earthquake and secondary disasters in Yunnan and surrounding regions.

3. Metallic mineralization and mining risk management of metallic mineral deposit in Yunnan

Main research orientations:

(1) Metallogenetic mechanism and conditions of typical mineral deposit in Yunnan and surrounding regions;

(2) Control of environmental risk and environmental remediation in exploitation of non-ferrous metal resources.

IV. Comprehensive utilization of mineral resources and new materials

Researches are expected to be focused on theories, methods and cutting-edge technologies that meet the demand of comprehensively utilizing the mineral resources of Yunnan and developing advanced material industries with special features.

1. Comprehensive utilization of mineral resources

Main research orientations:

(1) Enrichment and extraction of nonferrous metal minerals;

(2) Comprehensive control and recycling of solid wastes from mining and metallurgy industries;

(3) Studies on the low-toxic and innocuous treatment of toxic and hazardous wastes from nonferrous metallurgy.

2. Basic researches on the development and application of new materials

Main research orientations:

(1) New battery materials and application;
(2) Precious metal materials and application;
(3) New photo-electron conversion devices based on silicon, germanium and other new materials.

3. Material preparation and process control

Main research orientations:

(1) New theories, methods and technologies of deep processing of nonferrous metal materials;
(2) Basic researches on key technologies of 3D printing with metal.

NSFC-Xinjiang Joint Fund

The second phase of the NSFC-Xinjiang Joint Fund is jointly established by NSFC and the Government of Xinjiang Uygur Autonomous Region for the period from 2016 to 2020 to implement the guidelines of the National Working Conference on Scientific and Educational Assistance to Xinjiang. It aims at making full use of the guiding role of the National Natural Science Fund, attracting a number of talented scientists to work in Xinjiang, boosting the development of science and technology and the growth of scientific talents in Xinjiang, improving innovation capabilities of universities and research institutes in Xinjiang, and promoting the sustainable development of regional economy and society.

The NSFC-Xinjiang Joint Fund is open to all Chinese researchers. It is an integral part of the National Natural Science Fund as well as a platform for providing scientific and technological assistance to Xinjiang. NSFC is responsible for the application, evaluation and management of the joint fund in accordance with NSFC's Rules on Joint Fund Management.

In 2016, the NSFC-Xinjiang Joint Fund calls for proposals of "Fostering Program Project", "Key Program Project" and "Special Grant for Local Young Talents" in 4 priority research areas. For "Fostering Program Project", the average funding (direct costs) for each project will be 600,000 yuan for 3 years; for "Key Program Project", the average funding (direct costs) for each project will be 2.8 million yuan for 4 years. "Special Grant for Local Young Talents" supports researchers with good research achievements in Xinjiang to conduct innovative research within the scope outlined in the Guide. It supports up to 2 outstanding local young researchers under the age 45 in each research area, with a funding of 900,000 yuan (direct costs) for 4 years. Qualified researchers are welcomed to apply for this fund according to the research scope and requirements listed in the Guide.

I. Agriculture, biodiversity and biological resources

1. Agriculture

Proposals are expected to be basic researches on the varieties, quality, special features, product safety and control of diseases and insect pests of livestock and agricultural and forestry products to support the sustainable development of agriculture and animal husbandry in Xinjiang.

Main research orientations:

(1) Biological basis of the formation of good traits of featured fruits and vegetables in Xinjiang;
(2) Changes of nutritional ingredients and the formation mechanism and control of hazardous substances in the processing and storage of featured fruit products in Xinjiang;

(3) Occurrence regularity, mechanism and control of major diseases and insect pests of agriculture and forestry;
(4) Genetic basis of the essential traits of important livestock and poultry in Xinjiang.

2. Biodiversity and bioresources

Proposals are expected to be basic researches on conservation and sustain able utilization of special bioresources in deserts and oases of Xinjiang or on biodiversity and utilization of important species and ecosystems in Xinjiang.

Main research orientations:
(1) Structure and function of desert ecosystems in Xinjiang;
(2) Biodiveristy of steppe ecosystems in Xinjiang;
(3) Basic researches on the analysis and utilization of main components of featured bioresources in Xinjiang;
(4) Reproductive and evolutionary ecology of wild flower resources in Xinjiang;
(5) Molecular mechanism and exploitation of environmental stress resistance of desert plants in Xinjiang.

II. Water resources and mineral resources

1. Water resources

Proposals are expected to be basic researches on water resources and environment to guarantee water security in Xinjiang.

Main research orientations:
(1) The impact of global change on water resources and ecosystems in arid regions;
(2) The temporal-spatial process and ecological effect of surface-shallow ground water exchange in desert oasis;
(3) Snow cover changes and changes of mountain-desert ecosystem in Xinjiang;
(4) Glacier changes and formation mechanism of dam-break floods in Xinjiang.

2. Basic researches on geology of mineral deposit

Proposals are expected to respond to the demands of guaranteeing of security of national resources and building a mineral resources base in Northwest China, focus on advantageous mineral resources in Xinjiang and neighboring areas, conduct researches on tectonic changes, metallogenic mechanism and prognosis of the main metallogenic belt in Xinjiang and provide guidance and support to mineral exploration.

Main research orientations:
(1) Metallogenic system and mechanism of typical mineral deposit in the main metallogenic belt in Xinjiang;
(2) Evolution and metallogenic mechanism of ancient Xinjiang block;
(3) Phanerozoic geological evolution and metallogenic mechanism of the West Kunlun-Karakorum Mountains;
(4) Compound orogenic process and metallogenic mechanism of the Altun Mountains;
(5) Evolution and metallogenic mechanism of Paleozoic volcanic rocks in northern Xinjiang;
(6) Metallogenic prognosis of large-scale ore-concentration area based on big data;
(7) Metallogenic system and continental dynamics of unconventional energy.

III. Information security

Proposals are expected to focus on the complexity of the multilingual network environment in Xinjiang, especially the dissemination of multilingual information, analysis of cyberspace security based on network traffic big data, and language production and perception mechanism of ethic languages.

(1) Analysis, identification and prediction of network behavior patterns in complex multilingual network environment;
(2) Network traffic big data analysis and visualization techniques for cyber security;
(3) Theories and key technologies of identification of ethnic languages and speeches.

IV. Population and health

Proposals are expected to focus on pathologic mechanism and control of high incidence diseases in Xinjiang, influences of local environment on human body and medicine with resource advantages and ethnic characteristics in Xinjiang.

Main research orientations:

(1) Pathogenesis and control of skin diseases such as vitiligo, Kaposi's sarcoma and etc.;
(2) Impact of environmental and genetic factors on neurological diseases, respiratory diseases and high incidence cancers and related pathologic mechanisms;
(3) Mechanisms of the pathophysiological impact of local environment of Xinjiang on human body and control of related diseases;
(4) Basic and applied basic researches on the epidemiology and etiology of important natural focal diseases in Xinjiang;
(5) Material basis and functional mechanism of the effective substances of ethnic medicine in Xinjiang.

Joint Fund to Promote Cross-Strait Scientific and Technological Cooperation

The second phase of the Joint Fund to Promote Cross-strait Scientific and Technological Cooperation is jointly established by NSFC and Fujian Provincial Government for the period from 2016 to 2020. It aims at making full use of the guiding role of the National Natural Science Fund to guide social S&T resources into basic research, attracting and gathering scientists across the Taiwan Strait to conduct S&T cooperation, solving major scientific problems and key technological problems of mutual concerned by Fujian and Taiwan, boosting the growth of scientific talents, improving innovation capabilities of the cross-strait economic zone, and promoting the sustainable development of regional economy and society.

The joint fund is open to all Chinese researchers on a fair and competitive basis. It is an integral part of the National Natural Science Fund. NSFC is responsible for the application, evaluation and management of the joint fund in accordance with NSFC's Rules on Joint Fund Management.

In 2016, the joint fund calls for proposals of "Key Program Project" in 4 priority research areas. Average funding (direct costs) for each project will be 2.8 million yuan for 4 years. Qualified researchers all over the country are welcomed to apply for this fund according to the research scope and requirements listed in the Guide.

I. Agriculture

(1) Molecular mechanism of the formation of agronomic traits of important economic crops in Fujian and Taiwan
(2) Reproductive and developmental mechanisms of main economic crops in Fujian and Taiwan
(3) Occurrence regularity and control mechanism of major diseases of featured

economic plants in Fujian and Taiwan
(4) Biological basis of processing of featured agricultural products in Fujian and Taiwan
(5) Basic researches on the breeding of featured aquatic species in Fujian and Taiwan
(6) Occurrence regularity and control of diseases of important economic animals (livestock, poultry and aquatic animals) in Fujian and Taiwan

II. New materials and manufacturing

(1) Design, manufacture and application of materials and devices of new lithium batteries and all-solid-state supercapacitor
(2) Organic phtovoitaic materials and devices
(3) High spatial-temporal resolution surface and interface characterization methods for energy materials
(4) Basic researches on design and application of advanced structure-function integrated materials
(5) Basic researches on extraction, purification and functionalization of cellulose
(6) Basic researches on the preparation of high performance recycled concrete and its application in marine environment
(7) Design, preparation and application of new materials for industrial waste water treatment and drinking water purification
(8) 3D manufacturing technology for complex structures
(9) Preparation of semiconductor quantum dot materials and perovskite nano crystalline materials and studies on optoelectronic devices

III. Population and health

(1) Researches on innovative drug using featured resources of Fujian and Taiwan
(2) Basic researches on craniofacial tissue and organ regeneration and repair by induced differentiation of stem cells
(3) Researches on the pathogenesis of cardiovascular diseases
(4) Researches on the pathogenesis and intervention strategies of high incidence malignant tumors in Fujian and Taiwan
(5) Immune regulation and regulation mechanism of related diseases
(6) New biological materials and new technologies of precise diagnosis and treatment

IV. Electronic information

(1) Theories and key technologies of cloud computing and trustworthy network
(2) Theories and techniques of big data analysis
(3) Key technologies of visual perception and augmented reality
(4) New laser and optic field manipulation technology
(5) Basic researches on application of photoelectric technology in biology and medicine
(6) Theories and techniques of architecture and access of heterogeneous underwater acoustic sensor network

NSFC-Liaoning Joint Fund

The NSFC-Liaoning Joint Fund is jointly established by NSFC and the Liaoning Provincial Government for the period from 2015 to 2019. It aims at making full use of the guiding role of the National Natural Science Fund to guide social S&T resources into basic research, attracting and gathering a number of talented scientists, solving major scientific problems and key technological problems in the industrial development of Liaoning,

improving innovation capabilities of Liaoning, and promoting the revitalization of old industrial base.

The NSFC-Liaoning Joint Fund is open to all Chinese researchers. It is an integral part of the National Natural Science Fund. NSFC is responsible for the application, evaluation and management of the joint fund in accordance with NSFC's Rules on Joint Fund Management.In 2016, the NSFC-Liaoning Joint Fund calls for proposals of "Key Program Project" in 4 priority research areas. Average funding (direct costs) for each project will be 2.5 million yuan for 4 years. Qualified researchers all over the country are welcomed to apply for this fund according to the research scope and requirements listed in the Guide.

I. High-end equipment manufacturing

1. Theories and methods of high-end equipment design

Proposals are expected to be oriented to the development needs of Liaoning's equipment manufacturing industry, focus on the design and performance improvements of products such as large-scale machinery and equipment, high-performance compressor, ultra high voltage converter transformer and etc., conduct researches on the theories and technologies of collaborative design, reliability-based design and dynamics analysis of mechanical and electrical equipment and support indigenous innovation of the equipment manufacturing industry of Liaoning.

Main research orientations:

(1) Theories and methods of multidisciplinary collaborative design for large and complex mechanical and electrical equipment;
(2) Dynamics analysis of key functional components of large high-speed rotating machinery in unsteady flows;
(3) Vibration failure mechanism and reliability-based design of large centrifugal compressor;
(4) Theories and key technologies of the design and manufacturing of ultra-high voltage converter transformer.

2. Theories and technologies of precise and efficient processing of high-performance components

Proposals are expected to be oriented to the demands of the revitalization and development of equipment manufacturing industry in Liaoning, aim at solving difficult problems in the high quality and efficiency processing of key components of high-end equipment in aviation, energy and petrochemical industries, focus on high quality and efficiency processing of difficult-to-cut materials and components, functional surfaces of components and etc., research on basic theories and key technologies, and improve high-end equipment manufacturing capability of Liaoning province.

Main research orientations:

(1) Basic research on theories and technologies of single crystal components processing technology;
(2) Mechanism and regulation techniques of surface hardening of aeronautical thin-walled workpiece by laser shock;
(3) Theories and technologies of ultra-low temperature processing of components made of difficult-to-process materials;
(4) Research on the structure-activity relationship, design and manufacturing techniques of bionic functional surface of important equipment.

3. Robot technology

Proposals are expected to be in line with the intelligent manufacturing strategy proposed by Made in China 2025 and oriented to the advantages and development needs of intelligent manufacturing industry of Liaoning, focus on basic theories and key technologies of visual

sensing techniques of a new generation of industrial robots, aerial and ground multi-robot cooperation and etc., and improve the robot and intelligent equipment industry of Liaoning.

Main research orientations:

(1) Theories and key technologies of visual sensing and control of industrial robots for human-robot cooperation;

(2) Theories and the system of aerial and ground multi-robot cooperation.

II. New materials

1. Clean separation and efficient recycling of rare and noble metal resources

Proposals are expected to focus on rare and noble metal resources that are needed urgently by industries of Liaoning, conduct researches on the basic theories and key technologies of clean extraction-separation and efficient recycling of rare and noble metal, and promote the eco-friendly development of relevant industries.

Main research orientations:

(1) Efficient separation and extraction of rare and noble metal from waste high-temperature alloy;

(2) Basic theories and technologies of bioleaching and clean extraction of low-grade, fine-grained and mixed nonferrous metal.

2. New technologies for the design and preparation of advanced structural materials

Proposals are expected to be oriented to the transformation and upgrading of equipment manufacturing industry of Liaoning, conduct basic researches on new technologies for the design and preparation of advanced structural materials, and improve greatly the performance of traditional-structure materials.

Main research orientations:

(1) Mechanism of the influence of nanostructure on the performance of engineering alloys;

(2) Design and preparation technology of alloys for laser additive manufacturing;

(3) Basic researches on clean smelting and fine-grain casting of high-quality aluminum-lithium alloy.

3. Basic biomedical materials

Proposals are expected to focus on biomedical materials to provide basis for the development of biomedical industry of Liaoning.

Main research orientations: regulation of molecular weight of medical Chitosan/Chitooligosaccharades and related physiochemical process

III. Fine chemical industry

1. Synthesis of fine chemicals

Main research orientations:

(1) Methods (process) of precision synthesis of chiral intermediates of important drugs;

(2) Methods of efficient and clean synthesis of fine chemicals and novel functional dye.

2. Chemical engineering of functional materials

Main research orientations:

(1) Scientific basis of membrane materials for high-performance flow battery;

(2) Scientific basis of process intensification and regulation bymicrochannel reactor.

IV. Medicine and pharmacology

1. Targeting effect evaluation and drug delivery system of drugs for breast cancer

Main research orientations:

(1) Targeted drug delivery system of drugs for breast cancer treatment with drug transporters as new targets;
(2) Targeted anti-tumor effect and immune mechanism of epitope of breast cancer associated antigen.

2. Drug metabolism and pharmacokinetics

Main research orientations: effective substances and pharmacokinetics of high-quality local medicinal materials of Liaoning

NSFC-Zhejiang Joint Fund for the Integration of Industrialization and Informatization

The NSFC-Zhejiang joint fund for the integration of industrialization and informatization is jointly established by NSFC and the Zhejiang Provincial Government for the period from 2015 to 2019. It aims at attracting and gathering talented scientists across the country, solving major scientific problems and key technological problems related to the integration of industrialization and informatization in the social, economic and scientific & technological development in Zhejiang National Demonstration Zone of Integration of industrialization and informatization and neighboring regions, and promoting the scientific and technological development and the building of talent teams in the region.

The joint fund is open to all Chinese researchers. It is an integral part of the National Natural Science Fund. NSFC is responsible for the application, evaluation and management of the joint fund in accordance with NSFC's Rules on Joint Fund Management.

In 2016, the NSFC-Zhejiang Joint Fund for the Integration of Industrialization and Informatization calls for proposals of "Key Program Project" in 5 priority research areas. Average funding (direct costs) for each project will be 2.1 million yuan for 4 years. Qualified researchers all over the country are welcomed to apply for this fund according to the research scope and requirements listed in the Guide.

I. High-end industrial automation

Proposals are expected to be oriented to needs of the integration of industrialization and informatization in areas such as medical and pharmaceutical industry, chemical engineering, papermaking, textile, equipment manufacturing and etc., focus on "saving manpower by using machines" and "intelligent factory", give emphasis to basic theories and key technologies of advanced industrial automation, improve the application of automatic, intelligent and network-based systems in enterprises, and facilitate the transition from "made in Zhejiang" to "created in Zhejiang"

Main research orientations:

(1) Precise modeling and quality optimization in the production process of advanced polymer materials;
(2) Methods and key technologies of skill learning and perception based on intelligent programming of industrial robot;
(3) Methods and key technologies of real-time optimization in industrial equipment based on independent platform;
(4) Basic theories and key technologies of motion control system based on real-time industrial Ethernet;
(5) Methods and key technologies of intelligent optimization and control of emission from combustion;
(6) Theories and key technologies of sensing in real-time control of micro-nano

manufacturing process.

II. Industrial cyber-physical system

For the reason that Zhejiang has numerous small and medium enterprises and industrial data is dispersed and characterized by heterogeneity, uncertainty, correlative coupling and complexity in spatial and temporal distribution, proposals are expected to be oriented to the needs of industrial transformation and upgrading and acceleration of industrialization-informatization integration in Zhejiang, conduct researches on basic theories and key technologies of industrial cyber-physical system, and comprehensively improve the intelligent level of industrial production of Zhejiang.

Main research orientations:

(1) Application basis and key technologies of the integration of quantum communication protocol and classic communication protocol;
(2) Active defense mechanism and technologies of dynamic networks;
(3) High-resolution, high-sensitivity, quick responding fluorescent sensor for the Internet of Things;
(4) Core technologies of STT-MRAM non-volatile memory chip;
(5) Theories and key technologies of reliable and safe chip for solid-state memory controller;
(6) High-end industry-oriented control equipment and system.

III. Intelligent manufacturing

Proposals are expected to be oriented to the needs of transformation and development of manufacturing industry in Zhejiang, focus on a broad range of industries such as equipment manufacturing, light industry, textile, chemical engineering, medical industry, electric power, building materials, metallurgy, automobile, shipbuilding, logistics and etc., develop high and new technologies, take the integration of industrialization and informatization as the means, give emphasis to key theories and technologies of intelligent manufacturing such as network-based collaborative design, manufacturing and service, intelligent industrial robot, intelligent equipment, intelligent basic components and etc., and push forward the upgrading of equipment manufacturing industry in Zhejiang by promoting digitized, network-based and intelligent production process, components and equipment products.

Main research orientations:

(1) Basic theories and key technologies of network-based individualized textile customization;
(2) Kinematics, dynamics and control of macro/micro operation robots for precision manufacturing;
(3) 3D printing in biomedical applications;
(4) Precision laser processing of complex components/curved surfaces;
(5) Design and manufacturing of intelligent flow metering device.

IV. Smart city

Proposals are expected to be oriented to the major needs of the sustainable development of smart cities in Zhejiang, take typical cities of Zhejiang as the research objects, aim at improving the management and decision-making capability of these cities by information technology, focus on basic theories and key technologies of smart city for which major breakthroughs are urgently needed, improve the use of ICT in city management in Zhejiang, set up smart city management and service networks based on big data, cloud computing and the Internet of Things, and provide technological support to the application of ICT in city

management and various industries.

Main research orientations:

(1) Theories and key technologies of intelligent multi-mode integrated circuits for emerging network systems of smart city;
(2) Modeling and visualization of multi-source and heterogeneous data in city management;
(3) Basic theories and semantic integration technologies of big data analysis in smart healthcare;
(4) Calculation and analysis methods of visual mobile e-commerce experience.

V. Intelligent ocean

Intelligent ocean is an important strategy for Zhejiang to perceive the ocean, utilize marine resources and protect the ocean. Proposals are expected to be oriented to the needs emerged from the development of National Marine Economy Demonstration Zone of Zhejiang province, focus on themes such as application of remote sensing in marine industries, intelligent marine monitoring technology, pre-warning and forecasting of marine environmental disasters, new theories and methods of on-site and remote sensing technology for sea surface and underwater targets in the ocean-land integrated monitoring of marine environment security and etc., promote the application of digital technology in marine environment detection and socialization of marine information service, facilitate the development of marine information industry and provide theoretical and methodological support to the development of marine economy.

Main research orientations:

(1) Offshore environment and environmental disasters;
(2) New mechanism and technology of real-time security detection system for offshore environment;
(3) Application methods and key technologies of satellite remote sensing in offshore fishing industry.

NSFC-Shanxi Joint Fund for Coal-based Low-Carbon Technology

The NSFC-Shanxi Joint Fund for Coal-based Low-carbon Technology is jointly established by NSFC and the Shanxi Provincial Government for the period from 2015 to 2019. It aims at attracting and gathering talented scientists across the country, solving major scientific problems and key technological problems of coal-based low-carbon energy in Shanxi, and promoting S&T development and team building in the region.

The joint fund is open to all Chinese researchers. It is an integral part of the National Natural Science Fund. NSFC is responsible for the application, evaluation and management of the joint fund in accordance with NSFC's Rules on Joint Fund Management.

In 2016, the NSFC-Shanxi Joint Fund for Coal-based Low-carbon Technology calls for proposals of "Key Program Project" and "Fostering Program Project" in 4 priority research areas. For the "Key Program Project", the average funding (direct costs) for each project will be 2.9 million yuan for 4 years. For the "Fostering Program Project", the average funding (direct costs) for each project will be 670,000 yuan for 3 years. Qualified researchers all over the country are welcomed to apply for this fund according to the research scope and requirements listed in the Guide.

I. Coal chemical industry

1. Key program project

(1) Basic researches on coal coking process and high value-added utilization of coking products;
(2) Chemical basis of direct conversion of coal into light hydrocarbon and fuel oil;
(3) Key basic scientific issues in enhanced wastewater treatment and recycling in coal chemical industry.

2. Fostering program project

Priorities include composition and structure, activation and transformation mechanism and new high-efficiency utilization technology of coal conversion solid wastes (include coal gangue); composition, structure, catalytic and thermal conversion mechanism of coal tar and coal pitch and high value-added utilization of coal tar; catalyst and chemical reaction engineering basis of directional conversion of syngas.

II. Coal machinery

1. Key program project

(1) Forecasting of performance degradation, mechanical failure and endurance of key components of coal machinery;
(2) Basic researches on intelligent sensing and control for single machine or multi-machine collaboration;
(3) Basic researches on intelligent monitoring, diagnosis and control of high-speed, long-distance and large-capacity belt conveyor.

2. Fostering program project

Proposals are expected to be oriented to the demand of safe, highly efficient, environmental friendly and intelligent mining, focus on key equipment and production process such as mining, excavating, transportation and hoisting, conduct basic researches on the mechanical properties of the coal cutting and fragmentation process and optimization of working mechanism, dynamic characteristics of equipment, new composite transmission, collaborative analysis and design, intelligent monitoring and control, green manufacturing and energy-saving operation, dust suppression and etc., and provide theoretical basis to the improvement of energy efficiency, reliability, endurance and intelligent level of coal machinery.

III. New materials

1. Key program project

(1) Structural design, controllable preparation and functionalization of advanced coal-based carbon materials;
(2) Design, preparation and formation of low-cost high-performance magnesium alloy;
(3) Preparation and processing of stainless steel materials for ultra-supercritical power plants and microstructure evolution and mechanical properties of stainless steel materials under working conditions.

2. Fostering program project

Priorities include preparation of controllable functional carbon materials for high-efficiency CO_2 capture and storage by using elements from coal by fractional extraction; preparation and processing of special new metal material for low-temperature service in the transportation and storage of liquid natural gas; and basic researches on the design and preparation, structure and properties, forming and processing, toughening mechanism and service performance of advanced magnesium-based materials for the production of low-cost and high value-added magnesium products.

IV. Coal power and new energy

1. Key program project

(1) Basic researches on pollutant removal mechanism, pollutant migration and transformation mechanism, and high-efficiency low-cost control of pollutants for ultra-low emission of coal-fired power plants

(2) Engineering basis of high-efficiency clean combustion of low calorific value coal and pollutant control

(3) Basic theories and key technologies of safe operation of smart power distribution systems in coal mines

2. Fostering program project

Priorities include basic researches on precise identification and control of gaseous pollutants, thermal convertion and utilization of ash in the power generation process of low calorific value coal; applied basic researches on high-efficiency conversion and utilization of low-concentration coalbed methane for power generation and electrochemical energy conversion; basic researches on peak load regulation of coal-fired power units and high-efficiency low-cost operation of large ultra-supercritical air-cooled coal-fired power plants; mechanism and technical basis of CO_2 convertion and utilization through artificial photosynthesis to reduce CO_2 emission; research on new energy storage devices, wind power and energy storage, coordinated control of solar power generators for the integration of large scale new energy with the grid.