Annex

****Application Guidance for Application of Basic and Applied Research Joint Fund for Guangdong-Guangxi Science and Technology Cooperation for 2020-2021****

The 2020-2021 Guangdong-Guangxi Joint Fund mainly supports projects covering 27 key research directions and 38 general research directions of five sectors, namely, new materials, semiconductor and intelligent precision manufacturing, modern agriculture, resources and environment, and public health. Funding for some of these research projects can be applied only by institutions in Guangdong or Guangxi, and some of them by institutions in both Guangdong and Guangxi. Please choose the corresponding application code and discipline code for application according to the fields and directions specified in this Guidelines.

**I. New Materials**

**(I) Key Projects**

This field intends to support 4 key projects, of which Guangdong and Guangxi will support 2 respectively; 2 research directions are set, and Guangdong and Guangxi units can take the lead to apply jointly with each other.

1.High performance non-ferrous metal materials design, preparation and performance research (discipline code: E01, application code: YG10101)

Aiming at the application needs of aviation, automotive and other industries, and focusing on the key scientific issues facing the application of non-ferrous metal-based structural materials and functional materials in the Guangdong-Guizhou region. The projects aim at meeting the practical needs in the aviation, automobile and other industries: Centering on the key scientific problems in the application of non-ferrous metal-based structural materials and functional materials in the Guangdong-Guangxi region, the project can be a research in the key mechanisms and methods for improving the performance of non-ferrous metal, including its toughness, weldability and reliability; the project can be a study on the adjustment of the structural performance of aluminum alloy, and a fundamental research on the application of metal-based energy storage and thermally conductive materials and so on, in a bid to provide theoretical support for the development of non-ferrous metals in Guangdong and Guangxi.

2. Research on Key Scientific Problems of New Energy Materials (discipline code: B06, application code: YG10102)

Hot research issues in new energy fields, such as flexible/all-solid-state lithium-ion batteries, sodium-ion batteries, solar cells and diaphragm materials. The projects focus on the trending research topics in the field of new energy, such as flexible/all-solid-state lithium-ion batteries, sodium-ion batteries, solar cells, and separator materials. Applicants can carry out basic and applied fundamental research on flexible/all-solid-state lithium-ion batteries, sodium-ion battery anodes, perovskite solar cells, and separator materials, so as to sharpen the research competitive edges of Guangdong and Guangxi in new energy materials and provide theoretical support for the development of the new energy industry in the provinces.

**(2) General Projects**

This field intends to support 4 general projects, among which Guangdong and Guangxi will support 2 projects respectively; the general projects mainly support basic and applied fundamental research around the following 4 research directions, among which direction 1 to 2 are led by Guangdong units to apply, direction 3 to 4 are led by Guangxi units to apply.

1. preparation and performance research of biodegradable plastics (discipline code: E03, application code: GD20101)

2. research on polymer drug carriers and mechanisms of antitumor effects (discipline code: E03, application code: GD20102)

3. basic and applied fundamental research based on rare earth energy materials (discipline code: B06, application code: GX20103)

4. Basic Research on the Design, Preparation and Performance of Concrete Composite Materials (discipline code: E01, application code: GX20104)

**II. Semiconductor and smart precision manufacturing**

**(1) Key projects**

This field intends to support 9 key projects, of which Guangdong intends to support 5, Guangxi intends to support 4; a total of 8 research directions are set, of which direction 1 Guangdong and Guangxi units can take the lead in declaring, direction 2 ~ 5 by Guangdong units to take the lead in applying, direction 6 ~ 8 by Guangxi units to take the lead in applying.

1. special equipment advanced manufacturing and control methods (discipline code: E0510, application code: YG10201)

To deal with issues related to the manufacturing and control of high-end equipment, the projects focus on the development of digital design methods, advanced manufacturing technologies and special processes, system integration and control methods of special equipment, so as to enhance Guangdong and Guangxi provinces’ competitiveness in equipment and provide basic theoretical support for industrial upgrading in the provinces.

1. Self-learning methodology for the design and skills of high-end robotic operating mechanisms (discipline code: E0501, application code: GD10202)

The projects focus on the needs for high-end robots in intelligent manufacturing and high-risk technical operations, and study innovative mechanism design for robotics, control algorithms for precise operations, self-learning approaches to operation skills, and adaptability to a special environment, so as to help Guangdong and Guangxi gain technological advantages in intelligent manufacturing, intelligent healthcare, and special unmanned operations, and provide theoretical support for industrial upgrading in the provinces.

1. Basic research on the application of unmanned autonomous systems for collaborative operation based on 5G communication (discipline code: F0305, application code: GD10203)

The projects focus on trending research topics such as the communication and collaborative operation of unmanned autonomous systems, and study the theories about 5G-based self-organized network, communication, positioning and collaborative control of unmanned autonomous systems, as well as key technologies of unmanned aerial vehicle (UAV) flight control system and formation control, so as to enhance Guangdong and Guangxi provinces' competitiveness in basic components and control systems of unmanned autonomous systems.

4. Research on novel semiconductor materials and devices (discipline code: F04, application code: GD10204)

The projects focus on the trending issues related to new semiconductor materials and devices, and involve basic and applied fundamental research on semiconductor materials, their preparation technologies and property analysis, the design and realization of semiconductor devices, so as to further sharpen the competitive edges of Guangdong and Guangxi in semiconductors, and provide support for industrial upgrading in the provinces.

5. Techniques and Methods of Intelligent Monitoring and Control for the Safe Operation of Complex Industrial Processes (discipline code: F0307, application code: GD10205)

To cope with the safety issues in industrial operation and maintenance under complex working conditions, the projects study dynamic behavior modeling, operation risk assessment, intelligent fault diagnosis, and intelligent monitoring methods in complex industrial processes, so as to improve the early safety risk warning and risk prevention and control capabilities of industries that involve complex processes such as iron and steel smelting, petroleum refining, and nuclear power generation in Guangdong and Guangxi, and provide theoretical support for the promotion of industrial safety operation and maintenance.

6. Research on Intelligent Disease Early Warning and Diagnosis (discipline code: F02 or F05, application code: GX10206)

The projects focus on the diagnosis of tumors and other major diseases, and study the early warning and diagnosis of major diseases by applying advanced information technology, multimodal big data and fiber-optic sensing technology, so as to achieve accurate prediction and rapid diagnosis of major diseases and provide a theoretical basis for the higher diagnosis accuracy of related diseases.

7. Research on Optical Interconnection Expansion Technology (discipline code: F04, application code: GX10207)

The projects focus on the requirements of emerging technologies (e.g. IoT, AI, cloud computing) for bandwidth and speed of network communications, and study space-division multiplexing optical interconnection and expansion technologies in programmable optical networks and new types of optical fibers, modulation, and modules, and establish a large-scale optical switching system model based on programmable optical fiber devices, multi-core optical fiber space-division multiplexing technology and flexible spectrum variable optical transceiver modules, so as to achieve low-cost, high-efficiency, and large-capacity optical network communication and provide theoretical and technical support for interconnection communication.

8. Image Recognition and Image Processing in Special Scenarios (discipline code: F0305, application code: GX10208)

The projects focus on the trending research disciplines of image recognition and processing under special scenarios, and study the mechanisms and methods of remote sensing image recognition, noise reduction, and reconstruction, as well as automatic and accurate detection of dynamic targets, so as to optimize image recognition and processing technology under special scenarios in Guangdong and Guangxi.

**(2) General Projects.**

This area intends to support 8 general projects, of which 4 will be supported by Guangdong and Guangxi respectively; the general projects mainly support basic and applied fundamental research around the following 7 research directions, of which direction 1 can be led by Guangdong and Guangxi units, direction 2 to 4 by Guangdong units, and direction 5 to 7 by Guangxi units.

1. research on intelligent control methods for multi-intelligent groups (discipline code: F0307, application code: YG20201)

2. Research on monitoring methods for resource and disaster networking (discipline code: F0205, application code: GD20202)

3. Basic Research on Design and Application of Intelligent Equipment in Extreme Service Environment (discipline code: E0510, application code: GD20203)

4. Research on micro-nano sensing and detection technology (discipline code: F04, application code: GD20204)

5. Research on the Mechanisms of Animal and Poultry Breeding and Disease Prevention Based on Artificial Intelligence (discipline code: F0305, application code: GX20205)

6. Research on key technologies for 5G antenna optimization (discipline code: F04, application code: GX20206)

7. Research on Collaborative Mechanisms for Multi-robot Operation (discipline code: F0305, application code: GX20207)

**III. Modern agricultural sector**

**(1) Key Projects.**

This area intends to support 8 key projects, of which 4 will be supported by Guangdong and Guangxi respectively; there are 5 research directions, of which direction 1~3 can be led by Guangdong and Guangxi units, direction 4 will be led by Guangdong units, and direction 5 will be led by Guangxi units.

1. research on the basic theory and methods of seed selection and breeding of important crops (fruits and vegetables) in South China (discipline code: C13, application code: YG10301)

The projects focus on key theories and technologies in the selection and breeding of important crops such as rice and cassava in South China, as well as fruits and vegetables such as sugarcane, pineapple, kiwi, and tomato, and study germplasm collection and conservation, the discovery of important functional traits, stress tolerance and its genetic mechanism, molecular marker development and gene selection, and new breeding technologies for metabolic network reconstruction, so as to enhance the advantages of Guangdong and Guangxi in the modern seed industry and other fields and provide theoretical support for industrial upgrading.

2.Research on the mechanisms of pathogenesis, spread and control of important diseases and pests of specialty crops (discipline code: C14, application code: YG10302)

In order to address common issues related to critical pests and diseases of specialty crops in Guangdong and Guangxi, the projects study the occurrence, spread, and pathogenesis of critical pests and diseases, focus on the migration mechanism of grassland moth populations and the molecular mechanism of the pathogenic bacteria of banana wilt, and explore biological techniques to control invasive pests and effective control measures against critical crop pests and diseases, so as to provide theoretical and methodological support for the effective prevention and control of critical pests and diseases in Guangdong and Guangxi.

3. Mechanisms for the regulation of plant resources and traits characteristic of forestry (discipline code: C16, application code: YG10303)

In order to address the trending issues of slow growth and low yield of forest trees in Guangdong and Guangxi, the projects study germplasm collection, conservation, trait control mechanism, and efficacy utilization of key forest trees and medicinal plants, such as cinnamon, horsetail pine, tea-oil camellia, woody oilseed, and Pithecellobium clypearia, to promote the high-value utilization of forestry resources in Guangdong and Guangxi.

1. Mechanisms of nutritional control and molecular genetic mechanisms of important traits in major livestock, poultry and aquatic economic animals (discipline code: C17/C19, application code: GD10304)

The projects study nutritional and metabolic research on the formation of germplasm traits such as meat quality of major livestock, poultry, and aquatic animals in South China, as well as the genetic characteristics and molecular control mechanisms of advantageous traits such as quality and resistance of characteristic aquatic animals in South China, so as to provide a theoretical basis for the key breeding technology of premium livestock, poultry, and aquatic animals.

1. Molecular Mechanisms of Infection and Pathogenesis in Aquatic Animal Diseases (discipline code: C19, application code: GX10305)

Focusing on the pathogenic mechanisms of infection and pathogenesis of pathogenic bacteria in aquatic animals with major diseases in Guangdong and Guangxi, the projects aim to explore the key factors and immune signaling pathways of aquatic animal infections, and elucidate the molecular mechanisms of interspecies transmission and pathogenesis of nervous necrosis virus based on the molecular characteristics and pathogenicity of viruses from different hosts and the virus-host interactions, in a bid to shed new light on the development of prevention and control strategies.

**(2) General projects.**

This area intends to support 12 general projects, of which 6 will be supported by Guangdong and Guangxi respectively; the general projects mainly support basic and applied fundamental research around the following 11 research directions, of which direction 1 can be led by Guangdong and Guangxi units, direction 2~6 by Guangdong units, direction 7~11 by Guangxi units.

1. research on high value-added processing and nutritional functions of Guangdong-Guangxi specialty crops (discipline code: C20, application code: YG20301)

2. Research on the Mechanisms of Plant Resistance Gene Interaction with Soil Microorganisms (Discipline Code: C13, Application Code: GD20302)

3. Research on the Basic Theory and Methods of Selection and Breeding of New Varieties of Lingnan Fruits and Vegetables and Plants of Food and Drug Origin (discipline code: C13, application code: GD20303)

4. Research on the genomics and epigenomics of major oil tea populations in the south (discipline code: C16, application code: GD20304)

5. Research on Sexual Differentiation and Genetic Control Mechanisms in Aquatic Animals (discipline code: C19, application code: GD20305)

6. The behavior of juvenile fish and modeling of individual differences in feeding behavior in farmed fish (discipline code: C19, application code: GD20306)

7. Basic Theory and Methods of Gene Mining and Breeding of Important Vegetables (discipline code: C13, application code: GX20307)

8. Research on the mechanism of gene regulation of citrus anti-huanglong disease (discipline code: C13, application code: GX20308)

9. Research on Basic Theory and Methods of Collection and Breeding of Superior Flower Resources in South China (discipline code: C13, application code: GX20309)

10. Research on breeding traits of demersal shellfish based on ocean acidification and heat wave conditions (discipline code: C19, application code: GX20310)

11. Research on Molecular Genetic Mechanisms of Salinity Tolerance in Farmed Fish (discipline code: C19, application code: GX20311)

IV. Resource and environmental areas

**(I) Key Projects.**

There are 5 key projects to be supported in this field, including 2 projects to be supported by Guangdong and 3 projects to be supported by Guangxi; there are 6 research directions, among which directions 1 to 2 are to be reported by Guangdong units, and directions 3 to 6 are to be reported by Guangxi units.

1. Marine pollution, ecological security and prevention and control

(discipline code: D06, application code: GD10401)

With a focus on environmental pollution, harmful organisms and

other research hotspots concerning the estuaries and coastal waters of Guangdong and Guangxi, the projects aim to study marine environmental pressures and the conservation of marine ecosystems, environmental behavior and health risk assessment of typical chemical pollutants, and the mechanism and prevention of outbreaks of marine organisms, so as to enhance the competitiveness of the two provinces in the fields of marine environmental monitoring, ecological safety and environmental protection, and provide important support for the healthy and sustainable development of marine ecosystems.

2.Research on the green separation, full-component conversion and high-value utilization of bagasse biomass (discipline code: B07, application code: GD10402)

Focusing on the conversion and utilization of cellulose,

hemicellulose and lignin in bagasse, the projects aim to study the green separation of biomass from bagasse, the conversion of whole components and high-value utilization of bagasse, and explore new technologies for the co-production of chemicals and functional materials using bagasse as raw material, so as to provide theoretical and technical support for the utilization of bagasse as a resource.

3.Research on new methods for dynamic monitoring of natural resources in the two regions (discipline code: D01, application code: GX10403)

Focusing on major concerns such as crop yield, desertification, coastal zone and small watershed in Guangdong and Guangxi, the projects aim to study dynamic monitoring and evaluation of natural resources, remote sensing monitoring of crop growth and yield, monitoring of desertification control results, ecological monitoring in coastal zones, and intelligent marine pasture monitoring using big data, artificial intelligence and hyperspectral technology, so as to provide theoretical support for the sustainable use of natural resources in the two provinces.

4.Research on the utilization of marine living resources (discipline code: D06, application code: GX10404)

Focusing on the development and utilization of marine biological resources, the projects aim to explore new methods and technologies for the development and utilization of marine resources such as typical marine microorganisms, salt algae and macroalgae in Beibu Gulf, so as to enhance the research capacity of the two regions regarding the development and utilization of marine biological resources, and provide theoretical support for the development of marine biology industry and seaward economy.

5.Identification and control of typical high-risk pollutants in the water bodies of the Guangdong and Guangxi watersheds (discipline code: D01, application code: GX10405)

In view of the variety of toxic pollutants and heavy pollution in the water bodies of the two regions, the projects focus on the risk identification methods, migration and transformation mechanisms, and pollution control mechanisms of characteristic pollutants in typical watersheds, so as to improve the safety of water bodies and pollutant prevention and control in the two provinces.

6.Remediation and remediation of heavy metal pollution in non-ferrous metal mines (discipline code: B07, application code: GX10406)

Focusing on the formation, migration and transformation, and management of heavy metal pollution in non-ferrous metal mines in Guangdong and Guangxi, the projects aim to study the occurrence modes and migration and transformation mechanism of heavy metals in mining areas. The projects also explore new technologies of tailings utilization and the containment, remediation and management of heavy metal pollution in mining areas, so as to provide theoretical and technical support for the control of heavy metal pollution in non-ferrous metal mines in the two provinces.

**(2) General Projects.**

This area intends to support 6 general projects, including 4 projects in Guangdong and 2 projects in Guangxi; the general projects mainly support basic and applied fundamental research around the following 6 research directions, in which directions 1 to 4 are led by Guangdong units, and directions 5 to 6 are led by Guangxi units.

1. research on the evolution mechanism of watershed erosion (discipline code: D01, application code: GD20401)

2. Research on the Principles and Applications of Reactions for Environmental Materials and Pollutant Control (discipline code: B07, application code: GD20402)

3. Basic Research on the Utilization of Industrial Waste Resources (discipline code: B07, application code: GD20403)

4. Research on the utilization of marine active substances (discipline code: D06, application code: GD20404)

5. Research on Migration and Transformation Processes and Control Mechanisms of Marine Microplastics (discipline code: D06, application code: GX20405)

6. Basic and Appropriate Basic Research on Resource Utilization of Agricultural Waste (discipline code: B07, application code: GX20406)

**V. Population health**

**(I) Key Projects.**

There are 6 key projects to be supported in this field, including 3 projects to be supported by Guangdong and Guangxi respectively; there are 6 research directions, among which directions 1 to 3 are to be declared by Guangdong units, and directions 4 to 6 are to be declared by Guangxi units.

1.Research on new methods and modes of diagnosis and treatment of nasopharyngeal cancer (discipline code: H16, application code: GD10501)

Focusing on the urgent problems with the diagnosis and treatment of nasopharyngeal carcinoma which is highly prevalent in Guangdong and Guangxi, the projects aim to develop new methods or approaches for early screening in targeted therapy and immunotherapy of nasopharyngeal carcinoma and propose effective therapeutic efficacy prediction and prognostic models to provide fundamental support for the diagnosis and treatment of nasopharyngeal carcinoma.

1. Key molecules and mechanisms of digestive tumour metastasis (discipline code: H16, application code: GD10502)

Focusing on the distant metastasis and recurrence of tumors that are the leading causes of death in patients with gastrointestinal tumors, the projects aim to study the key molecules and signaling pathways of pro-lymphatic metastasis, the key mechanism of organ-selective metastasis and the key role of microenvironment in the metastasis of gastrointestinal tumors, and propose strategies for early intervention and timely suppression or blocking of distant metastatic pathways of malignant tumors.

1. Basic research on the efficacy of drugs in the Guangdong-Guizhou region (discipline code: H28, application code: GD10503)

The projects explore the science and efficacy mechanism of traditional Chinese medicines (TCM) indigenous to Guangdong and Guangxi, combine the theories about traditional medicine of ethnic minorities with cutting edge technologies, and study the material basis for the pharmacological effects and the refining processes of the medicines, so as to provide a scientific basis and technical foundation for the modernization and development of the traditional medicine of ethnic minorities.

1. Research on the pharmacological basis of Zhuang Yao medicine and its mechanism of action (discipline code: H28, application code: GX10504)

Based on the unique regional and ethnic characteristics of Zhuang and Yao ethnic medicine, the projects study the pharmacological basis and mechanism of the medicine's efficacy in antiviral therapy, and the treatment of tumor-related diseases and cardiovascular and cerebrovascular diseases, so as to provide theoretical support for the development of relevant Zhuang and Yao ethnic medicine.

5.Research on the development of primary liver cancer and its mechanisms (discipline code: H16, application code: GX10505)

Focusing on the key issues related to the prevention and treatment of primary liver cancer that is highly prevalent in Guangdong and Guangxi, the projects study the key molecules and mechanisms of the disease's progression, key drug resistance mechanisms and interventions in liver cancer, and the R&D and application of novel nanomaterials in the diagnosis and treatment of liver cancer, so as to provide fundamental support for improving the early diagnosis rate and therapeutic effect of primary liver cancer.

6.Research on the development of natural drug resources based on bone metabolism disease repair and functional reconstruction (discipline code: H07, application code: GX10506)

The applicants make good use of the enormous natural medicinal resources in Guangdong and Guangxi, and conduct research on the practical value and intervention strategies of natural medicine in the regulation of bone metabolism. The research may also focus on the screening of natural medicine to promote the rehabilitation and functional reconstruction of patients suffering metabolic bone diseases, as well as the mechanism of how the combination of static magnetic field impact the drugs that are used to treat metabolic bone diseases, so as to provide new methods and models for the treatment of the diseases.

(2) General Projects.

This area intends to support 10 general projects, including 4 projects in Guangdong and 6 projects in Guangxi; the general projects mainly support basic and applied fundamental research around the following 10 research directions, in which directions 1 to 4 are led by Guangdong units to declare, and directions 5 to 10 are led by Guangxi units to declare.

1. research on novel nano-drug delivery system (discipline code: H30, application code: GD20501)

2. Research on the Comprehensive Utilization of Natural Resources of Lingnan Medicines (discipline code: H28, application code: GD20502)

3. Material Basis and Mechanism of Function of Classical Chinese Medicine Formulas (discipline code: H28, application code: GD20503)

4. Research on Drug Resistance Mechanism and Intervention of Targeted Drugs in Lung Cancer (discipline code: H16, application code: GD20504)

5. Basic Research on the Application of Artificial Intelligence in Medical Imaging (discipline code: H18, application code: GX20505)

6. Research on new mechanisms and methods of tumor immunotherapy (discipline code: H16, application code: GX20506)

7. Research on the mechanism of chemosensitization of tumors (discipline code: H16, application code: GX20507)

8. Research on quality standards for Zhuang Yao drugs (discipline code: H28, application code: GX20508)

9. Research on the production process of authentic medicinal herbs in Guangdong and Guizhou (discipline code: H28, application code: GX20509)

10. Research on the excavation and application mechanism of ancestral ancestral name formula of Zhuang Yao (discipline code: H28, application code: GX20510)