



澳門特別行政區
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科學技術發展基金
Fundo para o Desenvolvimento das Ciências e da Tecnologia

Funding Scheme for Scientific Research and Innovation

Application Guidelines for Projects Type C (2024)

I. Background

To further match scientific research in universities with enterprise requirements, facilitate enterprises' innovative R&D and transformation of scientific research achievements, expand overall investment in Macao's scientific research, and accelerate the cultivation of emerging industries, the Science and Technology Development Fund (FDCT) has collected technical requirements that restrict enterprise development from Macao's technology enterprises certified under the Technology Enterprises Certification Program as well as technology enterprises in Hengqin through the Economic Development Bureau of the Guangdong-Macao In-Depth Cooperation Zone in Hengqin, with the support from the mainland experts, to select a number of projects that can solve the requirements in the near future and significantly improve the core competitiveness of enterprises, for application by the scientific research teams of Macao's universities. It is expected that the problems in enterprise development will be solved with the scientific and technological strength of Macao's universities (or in



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collaboration with universities, research institutions and enterprises in the mainland and Macao).

II. Overall Objective

To encourage scientific research teams of universities in Macao to conduct R&D catering to the technical requirements of technology enterprises in Macao and Hengqin, facilitate closer industry-university-research partnership, accelerate the transformation of scientific research achievements, and cultivate emerging industries, so as to promote the moderate and diversified development of Macao's industries.

III. Fields of Technical Requirements

(I) Biomedicine

Direction 1: R&D of mRNA-Based Drugs for Skin Wound

Repair

- 1. Requirement Proposing Unit:** Liverna Therapeutics Inc.
- 2. Contact:** Peng Saihua, Mobile: 0086-13702536641, Office Tel.: 0086-756-8856860, E-mail: 931468849@qq.com
- 3. Details of Technical Requirement:** mRNA-based drugs provide a therapy model for new diseases. mRNAs can help express different functional proteins through the body's own translational system, thus



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able to combat various diseases. mRNAs have great potential for applications in innovative products, such as infectious disease vaccines, cancer treatment, rare diseases, and medical beauty. The guidelines intend to initiate the project for the R&D of mRNA-based drugs for skin wound repair, including the relevant pharmaceutical study, pharmacological study and toxicological study, with the formal declaration for the clinical trial of one mRNA-based drug.

4. Key Technical Indicators:

- (1) Complete the formal declaration for the clinical trial of one mRNA-based drug for skin wound repair and obtain the acceptance notice of the clinical trial application.
- (2) Identify one mRNA-based drug or a combination of mRNA-based drugs that can promote the healing of deep second-degree or above skin wounds.
- (3) Complete preclinical studies on mRNA-based drugs that promote the repair of deep second-degree or above skin wounds.
- (4) Apply for 1-2 patents.
- (5) Publish 1-2 papers.

5. Eligibility: The applicant shall be universities in Macao with experience in mRNA-based drug R&D, skin wound repair study and favorable conditions for biomedical R&D, and can work in collaboration with universities, research institutions and enterprises in the mainland and Macao.



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6. Research Funding: Application for funding of MOP 5 million from FDCT; after approval, the enterprise shall invest the corresponding supporting funds no less than the FDCT funding amount (at least 1:1).

7. Ownership of Intellectual Property Rights and Interests:

Assigned to the enterprise or determined according to the cooperative development agreement.

8. R&D Cycle: 36 months

(II) Integrated Circuits

Direction 1: Research on Analog IP and Algorithm Application

Technology for Biomedicine

1. Requirement Proposing Unit: Lingyange Semiconductor Incorporated, Zhuhai.

2. Contact: Nie Yuqing, Mobile: 0086-18666991598, E-mail: Steven.Nie@lyg-semi.com

3. Details of Technical Requirement: Based on the existing 40nm process IP and MCU system solutions featuring low-power consumption and high reliability, the requirement proposing unit focuses on the key analog IP and algorithm application technology for biomedicine, to meet the future needs of biomedical chips.

4. Key Technical Indicators:



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- (1) Analog front-end design indicators: Design a dedicated analog front-end circuit based on a 40nm process for the application in signal acquisition of cranial nerves and ECG. The required voltage operating range is from 3.6 to 1.1V; the input impedance is above 100M; the noise integral at the 1Hz-10KHz input end is no more than the root mean square (RMS) $10\mu\text{V}$; the common mode rejection ratio (CMRR) is no less than 100dB; the voltage change and the gain change are less than 10% and 5% respectively; and the gain change is less than 5% when the working temperature range is 0-50°C.
- (2) ADC indicators: When the supply voltage is 1.1V, a 12-bit 5MSPS sampling rate is achieved, the effective number of bits (ENOB) is greater than 10.5 bits, the dynamic power consumption is less than 1mA, and the standby power consumption is less than $5\mu\text{A}$; when the power supply voltage is 1.5V, a 16-bit 5MSPS sampling rate is achieved, the effective number of bits (ENOB) is greater than 14 bits, the dynamic power consumption is less than 1.2mA, and the standby power consumption is less than $5\mu\text{A}$.
- (3) Algorithm indicators: The brain nerve signal compression algorithm achieves a compression rate over 60%, and the brain nerve signal classification algorithm reaches an accuracy rate of 90%. The recognition rate of ECG signals reaches over 95%.
- (4) Apply for 3 or more invention patents.
- (5) Train 5 or more talents with the master's or doctoral degrees.



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5. Eligibility: The applicant shall be universities in Macao with leading R&D capabilities in biomedical analog IP and algorithm applications in the field of biomedical electronics, as well as certain engineering implementation capabilities, experimental equipment and conditions, and experience in R&D collaboration with enterprises.

6. Research funding: Application for funding of MOP 3 million from FDCT; after approval, the enterprise shall invest the corresponding supporting funds no less than the FDCT funding amount (at least 1:1).

7. Ownership of Intellectual Property Rights and Interests: The scientific and technological achievements independently completed by each party and the consequently formed intellectual property rights are assigned solely to each party; the scientific and technological achievements jointly completed by both parties and the consequently formed intellectual property rights are assigned jointly to both parties, and the distribution of the benefits obtained is determined according to a separate agreement between the two parties.

8. R&D Cycle: 36 months

Direction 2: High-Speed and High-Precision ADC



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1. Requirement Proposing Unit: Zhuhai Amicro Semiconductor Co., Ltd.

2. Contact: Zhang Xiaoqin, Mobile: 0086-13726259841, E-mail: xiaoqin.zhang@amico.com.cn

3. Details of Technical Requirements: Based on the company's current development and technical requirements, this project aims to develop an 18-bit 4MSPS high-speed and high-precision ADC chip. The focus is on breakthroughs in high-speed and high-precision comparison technology and on-chip calibration technology.

4. Key Technical Indicators:

- (1) High-speed and high-precision comparison technology: The ADC SNR shall be $> 95\text{dB}$ and the comparator speed shall be $> 40\text{MHz}$.
- (2) On-chip calibration technology: Using 5V 180nm and below CMOS process, the on-chip DAC array is calibrated to achieve 18-bit accuracy.
- (3) ADC dynamic power consumption is less than 160mW.

5. Eligibility: The applicant shall be universities in Macao with leading scientific research level and ability both domestically and internationally in the field of integrated circuit design, as well as certain engineering implementation capabilities and experimental equipment and conditions.



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6. Research funding: Application for funding of MOP 3 million from FDCT; after approval, the enterprise shall invest the corresponding supporting funds no less than the FDCT funding amount (at least 1:1).

7. Ownership of Intellectual Property Rights and Interests: Determined according to the cooperative development agreement.

8. R&D Cycle: No more than 30 months

Direction 3: R&D of On-Chip Temperature Sensor IP Based on FinFET Advanced Process

1. Requirement Proposing Unit: Wisewave (Zhuhai) Technology Co., Ltd.

2. Contact: Han Xiaomei, Mobile: 0086-13801700554, E-mail: xiaomei.han@wisewavetech.com

3. Details of Technical Requirements: Based on the company's current development and technical requirements, this project aims to develop an on-chip temperature sensor IP based on 5nm FinFET or other advanced (less than or equal to 14nm) processes, with a focus on breakthroughs in the key technologies of temperature sensing accuracy and resolution. The applicant is mainly responsible for circuit design, simulation, and verification, while collaborating with the requirement proposing unit to optimize



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design, as well as carry out the final comprehensive simulation and tape-out verification.

4. Key Technical Indicators:

(1) Power supply: 1.2V \pm 10%; 0.75V \pm 10%.

(2) Applicable temperature range for accuracy control: -40°C ~ 125°C.

(3) Temperature sensing accuracy: \pm 4°C uncalibrated; \pm 2°C single-point calibration; \pm 1°C two-point calibration.

(4) Resolution: \sim 0.16°C.

5. Eligibility: The applicant shall be universities in Macao with leading scientific research level and ability both domestically and internationally in the field of integrated circuit design, as well as certain engineering implementation capabilities and experimental equipment and conditions.

6. Research funding: Application for funding of MOP 3 million from FDCT; after approval, the enterprise shall invest the corresponding supporting funds no less than the FDCT funding amount (at least 1:1).

7. Ownership of Intellectual Property Rights and Interests:

Intellectual property rights and interests are determined according to the cooperative development agreement. The project applicant may publish academic papers with prior consent of the enterprise, and the enterprise has the right to request authorship.



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8. R&D Cycle: 36 months

Direction 4: Development of the Gene Chip of the Electrochemical Biosensor Using Integrated Digital Microfluidics

1. Requirement Proposing Unit: Zhuhai Digifluidic Biotechnology Co., Ltd.

2. Contact: Hu Qiong, Mobile: 0086-17609055776, E-mail: joan.hu@digifluidic.com

3. Details of Technical Requirement: Based on the company's current development and technical requirements, this project aims to develop the gene chip of the electrochemical biosensor using integrated digital microfluidics to achieve high-sensitivity and high-specificity nucleic acid test and analysis. The focus is on breakthroughs in new electrochemical microelectrode array structures and processing technologies; batch cleaning and modification processing technologies for the integrated electrochemical microelectrode array, as well as technologies for nanocomposite material modification and capture probe fixation; and technology of the liquid phase system for the electrochemical sensing reaction for nucleic acid test.

4. Key Technical Indicators:

- (1) At least 8 targets on a single gene chip are detected.
- (2) The area of a single electrochemical sensor unit is less than 8×8 mm.
- (3) The detection sensitivity of a single electrochemical sensor unit is ≤ 10 pM (or the sample concentration of 5×10^5 copies/ μ L), and the specificity is $\geq 95\%$; the sample detection positive coincidence rate is $\geq 90\%$, and the negative coincidence rate is $\geq 95\%$.



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5. Eligibility: The applicant shall be universities in Macao with leading scientific research level and ability both domestically and internationally in related fields, as well as certain engineering implementation capabilities and experimental equipment and conditions.

6. Research funding: Application for funding of MOP 3.5 million from FDCT; after approval, the enterprise shall invest the corresponding supporting funds no less than the FDCT funding amount (at least 1:1).

7. Ownership of Intellectual Property Rights and Interests: Assigned to the enterprise or determined according to the cooperative development agreement.

8. R&D Cycle: 36 months

(III) Digital Technology

Direction 1: Intelligent System for Controllable Generation of Image and Video Content

1. Requirement Proposing Unit: Boardware Information System Limited

2. Contact: Ou Binkai, Mobile: 00853-8291 6096, 00853-62049988,
E-mail: benson.ou@boardware.com

3. Details of Technical Requirement: An intelligent system for controllable generation of two-dimensional images and videos is built for applications in advertising, e-commerce, live streaming and other scenarios. The system shall support the control of content generation through multimodal conditions, such as text and images,



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and fine-grained editing and modification of generated content, as well as video timing and multi-perspective consistency.

4. Key Technical Indicators:

(1) Image quality indicators: FID <30, IS >30

(2) Content generation controllability indicators: SSIM>0.9, clipingscore>0.8

(3) The generation speed of a single 4K image is less than 2 seconds.

(4) The generation is under control based on a given image or video, with a no-reference video quality assessment metric DOVER >0.8 and a timing consistency indicator GenVideo Clip >0.99.

5. Eligibility: The applicant shall have leading scientific research level and ability both domestically and internationally, rich practical experience, and experimental equipment and conditions in related fields, and can work in collaboration with universities, research institutions and enterprises in the mainland and Macao.

6. Research funding: Application for funding of MOP 4.99 million from FDCT; after approval, the enterprise shall invest the corresponding supporting funds no less than the FDCT funding amount (at least 1:1).

7. Ownership of Intellectual Property Rights and Interests:

Assigned to the enterprise.

8. R&D Cycle: 36 months



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Direction 2: Intelligent Tourism and Life Service Model in

Macao

1. Requirement Proposing Unit: Macao Newland Technology Co., Ltd.

2. Contact: Luo Qimeng, Mobile: 00853-65635457, E-mail: misty.luo@newland.com.cn

3. Details of Technical Requirement: With a focus on the Macao environment, this project develops a large model for Macao's intelligent tourism and life services by integrating Macao's multi-source and multi-dimensional data (such as geographic information, tourist attractions, transportation, public services, laws and regulations, etc.). The model can understand and generate complex information with the good inference capability, while continuously learning and adapting to social and economic development in Macao.

4. Key Technical Indicators:

(1) The large model service satisfaction is $\geq 90\%$.

(2) The personalized recommendation accuracy is $\geq 80\%$, and image recognition accuracy up to 95%. The user data security and privacy are strictly protected in accordance with laws and regulations in Macao.

(3) Functional modules include: the intelligent navigation and travel assistant, personalized travel planning, recommendation services,



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online customer service to answer questions; real-time bus inquiry, route planning and travel reservation to support intelligent travel; cross-language real-time translation to remove communication barriers; and assisting the government in big data analysis and optimizing urban management and emergency response mechanisms.

5. Eligibility: The applicant shall have leading scientific research level and ability both domestically and internationally, rich practical experience, and experimental equipment and conditions in related fields, and can work in collaboration with universities, research institutions and enterprises in the mainland and Macao.

6. Research funding: Application for funding of MOP 3 million from FDCT; after approval, the enterprise shall invest the corresponding supporting funds no less than the FDCT funding amount (at least 1:1).

7. Ownership of Intellectual Property Rights and Interests: Assigned to the enterprise or determined according to the cooperative development agreement.

8. R&D Cycle: 24 months

Direction 3: Cross-Chain Data Exchange Technology and System for Heterogeneous Blockchain

1. Requirement Proposing Unit: Zhuhai Junsheng Technology Co., Ltd.



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2. Contact: Li Xinzi, Mobile: 0086-15338190076, E-mail:
april.li@infomacro.com

3. Details of Technical Requirement: The requirements include the R&D of cross-chain data exchange technology and system for heterogeneous blockchains, and development of cross-chain communication protocols that support trust mechanisms and consensus algorithms, and are suitable for homogeneous and heterogeneous chains. It also covers the study of the direct and external verification mechanisms for cross-chain transactions, and building a DID-based cross-chain identity management system to ensure identity verifiability and trustworthiness. The privacy computing technology is integrated into cross-chain scenarios, and a comprehensive cross-chain security mechanism is established to improve the privacy and security of data transactions, and contribute to co-construction of ecology and standardization.

4. Key Technical Indicators:

(1) It supports the interoperability of at least 4 different blockchain systems and non-blockchain systems, integrates 2 different privacy computing technologies, and 3-layer security verification mechanisms, and supports different application scenarios of strong transaction consistency and eventual consistency.

(2) The delay in authentication and authorization for each request is not greater than 2 seconds. For transactions with strong consistency,



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the response time is not greater than 2 seconds. For transactions with eventual consistency, the response time is not greater than 5 seconds. The transaction success rate reaches 99.9%.

(3) A one-stop cross-chain access system is established, with the cross-chain operation startup time no more than 10 seconds. The data refresh rate is within 1 minute and the alarm response time within 30 seconds. The processing time of a single cross-chain transaction does not exceed 5 seconds (excluding the cross-chain consensus time). The concurrent processing capacity for the cross-chain transaction reaches 100tps.

5. Eligibility: The applicant shall have leading scientific research level and ability both domestically and internationally, rich practical experience, and experimental equipment and conditions in related fields, and can work in collaboration with universities, research institutions and enterprises in the mainland and Macao.

6. Research funding: Application for funding of MOP 3.5 million from FDCT; after approval, the enterprise shall invest the corresponding supporting funds no less than the FDCT funding amount (at least 1:1).

7. Ownership of Intellectual Property Rights and Interests:

Assigned to the enterprise or determined according to the cooperative development agreement.

8. R&D Cycle: 36 months



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IV. Experts Participating in the Preparation

1. Biomedicine

Liu Shuwen	Vice President of Southern Medical University
Chen Xiaoxin	Co-founder/President of Guangdong Raynovent Biotech Co., Ltd.
Xu Jing	Professor of School of Medicine, Southern University of Science and Technology
Yu Xiyong	Dean of School of Pharmaceutical Sciences, Guangzhou Medical University
Zhang Jiancun	Chairman of Guangzhou Henovcom Bioscience Co., Ltd.

2. Integrated Circuits

Xiong Xiaoming	Dean of School of Integrated Circuits, Guangdong University of Technology
Li Aijun	Senior Vice President of Shenzhen Intellifusion Technologies Co., Ltd.
Li Bin	Vice Dean of School of Microelectronics, South China University of Technology
Wang Yun	Executive Vice President of Guangdong Greater Bay Area Institute of Integrated Circuit and System
Yun Xing	General Manager of Zhuhai Xinshijie



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Semiconductor Technology Co. Ltd.

3. Digital Technology

Cheng Lianglun	Professor of School of Computer Science and Technology, Guangdong University of Technology
Gan Yuxi	General Manager of Weikang (Shenzhen) Intelligent Co., Ltd.
Gao Ying	Vice Dean of Graduate School of South China University of Technology
Mao Rui	Professor of Shenzhen University
Zhang Fan	President of Shenzhen Beidou Intelligent Technology Co., Ltd.