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Fundo para o Desenvolvimento das Ciências e da Tecnologia

# **Funding Scheme for Scientific Research and Innovation – Application Guidelines for Demand-Driven Applications**

## **(2026 Edition)**

### **I. Background**

To strengthen the integration of academic research and enterprise needs, encourage enterprises to conduct innovative research and development (R&D) and transform research outcomes, increase Macao's overall investment in research, and accelerate the development of emerging industries, the Science and Technology Development Fund (FDCT) has collected technological demands that are constraining the development of Macao technology enterprises accredited under the Technology Enterprise Certification Programme, along with the needs of technology enterprises in the Guangdong–Macao In-Depth Cooperation Zone in Hengqin through the Economic Development Bureau. Drawing on the expertise of specialists from the Chinese mainland, a number of projects with the potential for near-term solutions and for significantly improving the core competitiveness of enterprises have been identified and refined, and are now open to applications from research teams at higher education institutions in Macao. The scientific and technological strengths of Macao's higher education institutions, either independently or in collaboration with mainland Chinese and Macao institutions and



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enterprises, are expected to help address the key challenges these enterprises face.

## II. Overall Objective

The scheme seeks to encourage research teams at higher education institutions in Macao to conduct R&D that addresses the technological demands of technology enterprises in Macao and Hengqin. Through this, the scheme aims to foster closer collaboration among industry, universities, and research institutes, speed up the translation of research outcomes, nurture emerging industries, and support Macao in pursuing moderately diversified industrial development.

## III. Technological Demand Areas

### (i) Traditional Chinese Medicine and Big Health

#### **Direction 1: Research and Development of an Anti-inflammatory and Anti-itch Topical Ointment for Infants and Young Children**

- 1. Demand Entity:** Nam Yue Natural Medicine Co., Limited
- 2. Contact Person and Telephone Number:** Wu Jiangting; Tel: 0086-13426849448; Email: [601297743@qq.com](mailto:601297743@qq.com)

#### **3. Details of Technological Demand:**

The project focuses on common skin problems in infants and young children, such as insect bites, erythematous papules, prickly heat, and diaper rash, which are characterized by redness, swelling, heat, and pain. The proposed formulation uses mugwort leaves, mint, gardenias, honeysuckle stems, and other traditional Chinese medicinal herbs, together with mosquito repellent essential oils, as its core components. The applicant is expected to conduct studies on



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the extraction and formulation processes, the efficacy of long-acting, sustained-release mosquito repellent, quality standard formulation for finished products, and the efficacy and mechanisms of action. The ultimate goal is to develop a topical ointment that offers anti-inflammatory and anti-itch effects, repels mosquitoes and insects, and provides analgesic and soothing benefits.

**4. Key Technical Indicators:**

- (1) Prepare a research summary report that evaluates the efficacy and mechanisms of action in relation to anti-inflammatory, anti-itch, analgesic, and soothing effects.
- (2) Demonstrate that the mosquito repellent is at least 80% effective within four hours, and complete a research report verifying its efficacy.
- (3) Show that the product complies with National Class I Safety Standards for skin irritation in infants and young children, and complete a research report evaluating its skin safety.
- (4) Complete a summary report on modern extraction and formulation processes and on the long-acting, sustained-release components of mosquito repellent, and bring the formulation process to a scalable, practical application.
- (5) Establish product quality standards and put in place a stable, reproducible product quality control system.

**5. Eligibility Requirements for Applicants:** Applicants must be higher education institutions in Macao. They must demonstrate leading national or international scientific research capabilities and expertise in the relevant field. They must also have sound engineering implementation capacity, appropriate laboratory equipment and facilities, and experience in collaborative R&D with enterprises.

**6. Research Funding:** MOP500,000 to be funded from the FDCT. Upon approval, the enterprise shall provide a matching contribution at a ratio of at least 1:1.



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**7. Intellectual Property and Benefit Ownership:** Intellectual property generated in the early stage of the project shall belong to the enterprise. Scientific and technological outcomes and the resulting intellectual property jointly developed by both parties shall be jointly owned, and the revenue distribution shall be determined through a separate agreement between the parties.

**8. R&D Duration:** 24 months.

**Direction 2: Research and Development of Key Core Technologies for Cosmetic and Edible Anti-aging Ingredients and Development of Big Health Products**

**1. Demand Entity:** Guangdong Marubi Biomedical Co., Ltd.

**2. Contact Person and Telephone Number:** Xie Jiana; Tel: 0086-15818171707; Email: xie.jiana@marubi.cn

**3. Details of Technological Demand:**

The project targets cosmetic and edible anti-aging plants that can be used as food and medicine, especially those rich in gamma-aminobutyric acid (GABA), serotonin, lycopene, and other specific anti-aging components. Precision breeding and rapid propagation via tissue culture are required to produce ingredients of stable quality on an intensive scale. The applicant is also expected to develop green preparation technologies, such as high-voltage pulse-assisted supercritical extraction, to enhance extraction efficiency and enable environmentally friendly production. The project further requires the establishment of an AI-empowered multimodal high-throughput *in vivo* screening system to rapidly identify key anti-aging substance clusters and their synergistic mechanisms. In addition, the applicant should tackle sector-wide challenges such as poor active ingredient stability and low transdermal or oral absorption, by developing nano-carrier encapsulation and efficient delivery technologies that



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improve bioavailability. The project also includes flavor-modification technologies to bridge the gap between functional efficacy and a pleasant sensory experience, ultimately supporting the R&D and industrialization of anti-aging big health products.

#### **4. Key Technical Indicators:**

- (1) Precision breeding: Develop anti-aging edible/medicinal plants with increased target active component contents by 30–60%, and complete technical specifications for tissue culture-based rapid propagation and a breeding research report.
- (2) Green preparation: Adopt high-voltage pulse-assisted supercritical extraction or other green technologies to reduce energy consumption by 40–80% while retaining  $> 90\%$  of the active components, and prepare a report on the optimization and validation of the green extraction technology.
- (3) Efficient delivery: Use nano-carrier encapsulation or similar technologies to increase the stability of active components by 50% and raise oral bioavailability or transdermal absorption by  $\geq 40\%$ , and complete a report on the R&D and technical validation of the delivery system.
- (4) Flavor modulation: Improve the flavor and sensory appeal of the end products by 30%, achieve a comprehensive sensory score of  $\geq 80$  (on a 100-point scale), and compile a research report on flavor modification technologies and sensory evaluation.
- (5) Standard setting: Establish a high-throughput screening and evaluation standard for multimodal biological anti-aging efficacy, accompanied by a draft and notes on the drafting process.
- (6) Ingredients and processes: Develop 2–3 cosmetic and edible anti-aging ingredients and the corresponding large-scale production processes, and complete ingredient quality standards and process validation reports.



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- (7) End products: Develop 4–7 high-end anti-aging skincare products and 2–3 oral anti-aging health foods, and complete efficacy and safety evaluation reports for all products.
- (8) Intellectual property: File more than eight invention patent applications, at least three of which shall have entered the substantive examination stage, and jointly publish 3–5 SCI or core journal articles.
- (9) Industrialization platform: Jointly set up a Guangdong–Macao Cosmetic and Edible Anti-aging Technology Innovation and Transformation Center, complete a platform construction proposal, and document the technology transfer mechanism.

**5. Eligibility Requirements for Applicants:** Applicants must be higher education institutions in Macao. They must demonstrate leading international scientific research capabilities and expertise in cosmetic and edible ingredients and big health. They must also possess precision biological breeding and AI-assisted high-throughput anti-aging screening technologies. In addition, they should demonstrate sound engineering implementation capacity, substantial experience in university–enterprise R&D collaboration, and the ability to provide an end-to-end technical solution for the project. Joint applications with higher education institutions, R&D institutes, and enterprises from the Chinese mainland and Macao are permitted.

**6. Research Funding:** MOP5,000,000 to be funded from the FDCT. Upon approval, the enterprise shall provide a matching contribution at a ratio of at least 2:1.

**7. Intellectual Property and Benefit Ownership:** Scientific and technological outcomes and the resulting intellectual property independently developed by either party shall be owned by that party. Outcomes and the resulting intellectual property jointly developed by both parties shall be jointly owned, and the revenue distribution shall be determined through a separate agreement between the parties.



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**8. R&D Duration:** 36 months.

**Direction 3: Research on Key Technologies for Industrializing  
High-purity Exosome-Like Vesicles from Chinese Medicinal  
Herbs/Plants and Their Demonstration Applications**

**1. Demand Entity:** Zhuhai Hengqin Aoye Health Technology Co.,  
Ltd.

**2. Contact Person and Telephone Number:** Nicole Ni; Tel: 0086-13926992641; Email: [nicole.ni@aoyhealth.com](mailto:nicole.ni@aoyhealth.com)

**3. Details of Technological Demand:**

The project focuses on researching key technologies for producing high-purity exosome-like vesicles on an industrial scale from Chinese medicinal herbs/plants. The project will analyze nonlinear behavior of phase transition kinetics during process scale-up and establish a predictable and controllable constant-flow scale-up model to resolve the engineering challenge of optimizing yield, purity, and bioactivity simultaneously. The project requires the development of fast and standardized identification and quality control schemes for exosome-like vesicles obtained from different herbal or plant sources that cover physical properties, biochemical markers, and functional activity. Furthermore, the project requires the development of follow-up processing modules that integrate seamlessly with pilot-scale purification processes, ensuring that the final products meet the standards required for use as natural drug delivery carriers or high value-added cosmetic ingredients downstream.

**4. Key Technical Indicators:**



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- (1) Establish a standardized, scalable, and industrial-scale batch system for adaptive phase-change constant flow with a batch processing capacity of  $\geq 10$  liters and a production cycle of  $\leq 48$  hours, and complete validation of mass production capabilities.
- (2) Achieve a  $\geq 70\%$  recovery rate for the target exosome-like vesicles, maintain a median particle size (D50) of 80–150nm, increase membrane protein abundance by  $\geq 30\%$ , ensure a  $\leq 5\%$  residual protein content, obtain negative results from endotoxin testing, and prepare a product performance testing and validation report.
- (3) For key quality attributes, establish an online quality control solution incorporating at least three rapid detection methods to reduce the overall testing time from several days to two hours, and complete the development and validation of the quality control system.
- (4) Optimize the production process parameters for 3–5 high-potential Chinese medicinal herbs and prepare a draft technical standard for the large-scale production of exosome-like vesicles derived from Chinese medicinal herbs/plants.
- (5) Develop pre-application processing modules, including concentration, buffer exchange, and lyoprotectants, and produce validation reports on the integration of these modules with pilot-scale processes.

**5. Eligibility Requirements for Applicants:** Applicants must be higher education institutions in Macao. They must demonstrate leading national or international scientific research capabilities and expertise in exosome-like vesicle R&D based on Chinese medicinal herbs/plants. They must also have appropriate laboratory equipment and facilities, sound engineering implementation capacity, and extensive experience in collaborative R&D with enterprises. Joint applications with higher education institutions, R&D institutes, and enterprises from the Chinese mainland and Macao are permitted.



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**6. Research Funding:** MOP2,000,000 to be funded from the FDCT. Upon approval, the enterprise shall provide a matching contribution at a ratio of at least 2:1.

**7. Intellectual Property and Benefit Ownership:** Scientific and technological outcomes and the resulting intellectual property independently developed by either party shall be owned by that party. Outcomes and the resulting intellectual property jointly developed by both parties shall be jointly owned, and the revenue distribution shall be determined through a separate agreement between the parties.

**8. R&D Duration:** 36 months.

**(ii) Biomedicine**

**Direction 1: Development of Green Click Chemistry Platforms and Their Application in the Transformation of Complex Natural Products**

**1. Demand Entity:** BioMyne - Biotech Innovation and Engineering Ltd.

**2. Contact Person and Telephone Number:** Angela Gan; Tel: 0086-18163238070; Email: angelagyx@gmail.com

**3. Details of Technological Demand:**

The project proposes building click chemistry derivatization platforms based on, among others, boronate ester dynamic covalent bonding and thiol-ene click coupling reactions. Through these platforms, the applicant shall establish a heteroatom-driven modular framework for chemical derivatization. Under aqueous, mild, and metal-free conditions, this framework should support highly regioselective and predictable transformations of structurally complex natural products such as citrus polyphenols and peptide-based small molecules.

**4. Key Technical Indicators:**



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- (1) Design and synthesize 5–8 chemical modules that are compatible with click reactions, verify their compatibility with complex natural product biomolecules and, on this basis, summarize systematic design rules.
- (2) Develop mild and reproducible modular derivatization processes tailored to complex natural products, with reactions conducted in green solvents (aqueous phase or alcohol), achieving  $\geq 70\%$  transformation efficiency and  $> 80\%$  selectivity.
- (3) Use Macao food by-product extracts as starting materials to construct a library of 20–30 novel derivatives, conduct bioactivity assays (such as antioxidant and antibacterial tests), and identify 2–3 lead derivatives with novel structures.
- (4) File 1–3 invention patent applications and publish 2–5 journal articles.

**5. Eligibility Requirements for Applicants:** Applicants must be higher education institutions in Macao. They must demonstrate leading national or international scientific research capabilities and expertise in the relevant field. They must also have solid practical experience and a track record of collaborating with enterprises in Macao. Joint applications with higher education institutions, R&D institutes, and enterprises from the Chinese mainland and Macao are permitted.

**6. Research Funding:** MOP1,000,000 to be funded from the FDCT. Upon approval, the enterprise shall provide a matching contribution at a ratio of at least 1:1.

**7. Intellectual Property and Benefit Ownership:** Scientific and technological outcomes and the resulting intellectual property independently developed by either party shall be owned by that party. Outcomes and the resulting intellectual property jointly developed by



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both parties shall be jointly owned, and the revenue distribution shall be determined through a separate agreement between the parties.

**8. R&D Duration:** 24 months.

**Direction 2: Development of Engineered MSCs for the Treatment of Diabetes and Preclinical Studies**

**1. Demand Entity:** Fumei Zhongkang Medical Technology (Zhuhai Hengqin) Co., Ltd.

**2. Contact Person and Telephone Number:** Yang Yeguo; Tel: 0086-17802007394; Email: medicalyy@163.com

**3. Details of Technological Demand:**

When natural mesenchymal stem cells (MSCs) are used to treat diabetes, they have limited targeting capability, and their immunomodulatory effects are easily weakened by the *in vivo* microenvironment. To address these issues, the project will apply synthetic biology, precision gene editing, click chemistry, and related technologies to empower natural MSCs, thereby obtaining engineered MSCs with enhanced targeting and therapeutic effects.

**4. Key Technical Indicators:**

- (1) Obtain 2–3 types of engineered MSCs with enhanced targeting capability and immunomodulatory activity, and define their preparation processes and techniques.
- (2) In 2–3 diabetic rat or mouse models, demonstrate that, compared with conventional MSCs, engineered MSCs with the same genetic background improve key efficacy indicators, such as blood glucose and islet function, by at least 30%.
- (3) Evaluate dosing frequency and amount and clarify the *in vivo* engraftment and survival profiles of the engineered MSCs.



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- (4) Elucidate the immunomodulatory effects of engineered MSCs on disease-related cells and provide multi-omics evidence to support the mechanisms of action.
- (5) Demonstrate that the engineered MSCs are non-tumorigenic and exhibit low immunogenicity, and that they do not cause abnormal differentiation or immune responses *in vivo*.
- (6) Publish 2–3 journal articles and file 2–3 invention patent applications.

**5. Eligibility Requirements for Applicants:** Applicants must be higher education institutions in Macao. They must demonstrate leading national or international scientific research capabilities and expertise in the relevant field. They must also have sound engineering implementation capacity, appropriate laboratory equipment and facilities, and experience in collaborative R&D with enterprises. Joint applications with higher education institutions, R&D institutes, and enterprises from the Chinese mainland and Macao are permitted.

**6. Research Funding:** MOP1,500,000 to be funded from the FDCT. Upon approval, the enterprise shall provide a matching contribution at a ratio of at least 2:1.

**7. Intellectual Property and Benefit Ownership:** Scientific and technological outcomes and the resulting intellectual property independently developed by either party shall be owned by that party. Outcomes and the resulting intellectual property jointly developed by both parties shall be jointly owned, and the revenue distribution shall be determined through a separate agreement between the parties.

**8. R&D Duration:** 36 months.

**Direction 3: Research and Development of Key Technologies for Engineered Transplantable Organs Based on Gene Editing and Mechanical Perfusion**



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**1. Demand Entity:** Guangdong True Health Medical Technology Development Co., Ltd.

**2. Contact Person and Telephone Number:** Li Jizhao; Tel: 0086-15832113231; Email: [lijzh@truehealth.ai](mailto:lijzh@truehealth.ai)

**3. Details of Technological Demand:**

The project aims to tackle challenges in organ transplantation, including immune rejection, ischemic injury, and organ regeneration. It proposes building a full-process technical system of “gene-targeted modification—efficient delivery—*ex vivo* dynamic maintenance—functional evaluation”. Using CRISPR/Cas and epigenetic editing technologies under *ex vivo* mechanical perfusion conditions, the project will precisely knock out or silence key immunogenic genes, such as MHC-related molecules, in donor livers and kidneys. At the same time, it will develop novel lipid nanoparticle (LNP) carriers tailored to organ tissue characteristics to solve the problem of low transfection efficiency in the deep tissues of large organs. A standardized *ex vivo* mechanical perfusion system will also be established to maintain physiological activity and metabolic function during gene editing, with the goal of obtaining engineered donor organs that are low-immunogenic and high-quality.

**4. Key Technical Indicators:**

- (1) Standardized technical system: Formulate a complete set of standard operating procedures for *ex vivo* organ processing that covers gene editing, LNP delivery, and mechanical perfusion.
- (2) Delivery carrier: Develop an organ-targeted LNP that achieves  $\geq 60\%$  cell transfection efficiency under *ex vivo* perfusion conditions.
- (3) Precision editing: In *ex vivo* pig kidney and liver models, achieve  $\geq 50\%$  editing efficiency for the immune rejection-related genes B2M, CIITA, GGTA1, CMAH, and B4GALNT2, as confirmed by next-generation sequencing (NGS) and flow cytometry.



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(4) Significant reduction in immunogenicity: Achieve a  $\geq 60\%$  decrease in the levels of the inflammatory factors IFN- $\gamma$ , TNF- $\alpha$ , IL-2, and Granzyme B, and in the positive rates of the T-cell activation markers CD69 and CD25.

(5) File at least 3 patent applications and publish at least 2 journal articles.

**5. Eligibility Requirements for Applicants:** Applicants must be higher education institutions in Macao with relevant research experience. They must demonstrate leading national or international scientific research capabilities and expertise, as well as sound engineering implementation capacity. Their laboratories must be equipped to perform microscopic imaging and to measure fluorescence lifetime and spectra.

**6. Research Funding:** MOP5,000,000 to be funded from the FDCT. Upon approval, the enterprise shall provide a matching contribution at a ratio of at least 2:1.

**7. Intellectual Property and Benefit Ownership:** Scientific and technological outcomes and the resulting intellectual property independently developed by either party shall be owned by that party. Outcomes and the resulting intellectual property jointly developed by both parties shall be jointly owned.

**8. R&D Duration:** 36 months.

**(iii) Digital Technology**

**Direction 1: Research and Development of an AI Toy System with Multimodal Emotion Perception and Long-Term Memory Evolution**

**1. Demand Entity:** Macau Digit Force Technology Co., Ltd.



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**2. Contact Person and Telephone Number:** Liu Zhenfeng; Tel: 00853-66194255; Email: Macaodpower@d-power.com.cn

**3. Details of Technological Demand:**

To meet the demand for intelligent companionship, the project aims to develop AI toy systems that integrate multimodal emotion perception and long-term memory evolution. Powered by a lightweight speech-based multimodal model, the system combines spoken language understanding (SLU), emotion recognition, and tactile sensing to fully comprehend and respond to users' intent and emotional states. Through continuous learning mechanisms, these toys will develop stable personality traits through long-term interaction, enabling dynamic evolution and memory accumulation. A localized data storage and privacy protection framework will also be established to support long-term interaction memory management, delivering continued and consistent interactions, and ultimately creating an intelligent companion product capable of emotional resonance and personalized growth.

**4. Key Technical Indicators:**

Upon completion, the project will deliver an integrated algorithm and hardware prototype. The expected technical indicators are as follows:

(1) Multimodal emotion recognition: Recognize at least 6 emotion categories (e.g., joy, sadness, anger, fear, disgust, and surprise), with



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an overall accuracy of  $\geq 95\%$  and confidence level for effective output  $\geq 80\%$ .

- (2) Tactile recognition: Recognize at least 5 gesture types (e.g., gentle stroke, hard press, tap, continued stroke, and grip), with a recognition accuracy of  $\geq 85\%$  and end-to-end response delay  $\leq 0.4$  seconds.
- (3) Long-term memory system: Memory retention period  $\geq 365$  days, retrieval accuracy for past events  $\geq 95\%$ , consistency score after memory update  $\geq 0.9$  (based on BERTScore evaluation).
- (4) System performance: End-to-end latency for voice wake-up, recognition, and interaction  $\leq 1.0$  second, multimodal command execution latency (from input to action)  $\leq 1.2$  seconds, and standby power consumption  $\leq 1W$ .

**5. Eligibility Requirements for Applicants:** Applicants must be higher education institutions in Macao. They must demonstrate leading national or international scientific research capabilities and expertise in the relevant field. They must also have sound engineering implementation capacity, appropriate laboratory equipment and facilities, and experience in collaborative R&D with enterprises. Joint applications with higher education institutions, R&D institutes, and enterprises from the Chinese mainland and Macao are permitted. Applicants must have a research foundation in artificial intelligence, multimodal perception, edge computing, affective computing, or



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human-computer interaction. Experience with embedded AI deployment is preferred.

**6. Research Funding:** MOP5,000,000 to be funded from the FDCT. Upon approval, the enterprise shall provide a matching contribution at a ratio of at least 1:1.

**7. Intellectual Property and Benefit Ownership:** Scientific and technological outcomes and the resulting intellectual property independently developed by either party shall be owned by that party. Outcomes and the resulting intellectual property jointly developed by both parties shall be jointly owned, and the revenue distribution shall be determined through a separate agreement between the parties.

**8. R&D Duration:** 36 months.

**Direction 2: Research and Development of a Multimodal Sign Language Translation Foundation Model and System**

**1. Demand Entity:** Macao Newland Technology Co., Ltd.

**2. Contact Person and Telephone Number:** Wu Baihua; Tel: 0086-15920172004; Email: \*\*\*\*\*

**3. Details of Technological Demand:**

This project addresses the challenge of communication between hearing and deaf communities by developing a multimodal sign language translation foundation model validated through a prototype system. A multimodal sign language translation model will be trained



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to ensure accurate message integration from multiple modalities (e.g., videos and skeletal keypoints), enhance robustness to environmental disturbances, and guarantee semantic accuracy and fluency of translation outputs. The prototype system will include a large-scale, multi-scenario, multi-user Macao sign language corpus that covers both daily and specialized scenarios to support module validation and API calls, featuring at least 10 different sign language demonstrators.

#### **4. Key Technical Indicators:**

(1) Develop a foundation model for multimodal sign language translation that supports both RGB video frames and human skeletal keypoints ( $\geq 60$  points). Deliverables include: a Macao sign language dataset, a sign language translation foundation model, and a sign language translation prototype system. The model must achieve stable end-to-end inference at 25 FPS.

(2) Build a sign language corpus with a vocabulary of  $\geq 3,000$  signs,  $\geq 6,000$  independent sentences,  $\geq 60,000$  multi-view video segments, total duration  $\geq 144$  hours, and top-1 accuracy for skeletal keypoint detection  $\geq 88\%$ .

(3) Achieve BLEU-3  $\geq 28\%$  and ROUGE-L  $\geq 48\%$  in translation accuracy at word and sentence levels, respectively. In controlled indoor scenarios with disturbances, the degradation of core metrics shall be kept within 20%.



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**5. Eligibility Requirements for Applicants:** Applicants must be higher education institutions in Macao. They must demonstrate leading national or international scientific research capabilities and expertise in the relevant field. They must also have sound engineering implementation capacity, appropriate laboratory equipment and facilities, and experience in collaborative R&D with enterprises. Joint applications with higher education institutions, R&D institutes, and enterprises from the Chinese mainland and Macao are permitted.

**6. Research Funding:** MOP5,000,000 to be funded from the FDCT. Upon approval, the enterprise shall provide a matching contribution at a ratio of at least 1:1.

**7. Intellectual Property and Benefit Ownership:** Scientific and technological outcomes and the resulting intellectual property independently developed by either party shall be owned by that party. Outcomes and the resulting intellectual property jointly developed by both parties shall be jointly owned, and the revenue distribution shall be determined through a separate agreement between the parties.

**8. R&D Duration:** 36 months.

**Direction 3: Research and Application of Multimodal Foundation  
Model for Chinese-Portuguese Translation in Smart Cultural  
Tourism**



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**1. Demand Entity:** DeepFutureAI Technology (Hengqin, Guangdong) Co., Ltd.

**2. Contact Person and Telephone Number:** Zong Hao; Tel: 0086-13391968376; Email: 156681133@qq.com

**3. Details of Technological Demand:**

This project aims to break down language barriers between China (using Mandarin as the standard) and Portuguese-speaking countries and regions by constructing a high-quality Chinese-Portuguese multimodal parallel corpus and developing a multimodal foundation model for bidirectional Chinese-Portuguese translation in cultural tourism scenarios. It will address key challenges in cross-modal feature integration, semantic alignment, and low-latency translation for foundation models, while solving pain points specific to complex cultural tourism scenarios – such as inaccurate translation of rare proper nouns, low translation accuracy for different regional variants of Portuguese, and poor quality of real-world image translation. A smart multimodal translation system for cultural tourism will be developed and demonstrated to raise the smart travel experience for both Chinese and Portuguese-speaking tourists.

**4. Key Technical Indicators:**

(1) Develop a Chinese-Portuguese multimodal corpus for cultural tourism: bilingual parallel text corpus  $\geq 10$  million sentence pairs,



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Portuguese speech corpus  $\geq 800$  hours, and scene-text aligned corpus for cultural tourism  $\geq 100,000$  entries.

(2) Ensure the bidirectional Chinese-Portuguese text translation accuracy  $\geq 90\%$ , Word Error Rate (WER)/Character Error Rate (CER) for Chinese and Portuguese speech recognition  $< 8\%$ , Mean Opinion Score (MOS) for speech synthesis (both Brazilian Portuguese and European Portuguese)  $\geq 4$ , and end-to-end image-based multimodal translation accuracy  $\geq 90\%$ .

(3) Develop a Chinese-Portuguese multimodal translation application system for cultural tourism, with a concurrent throughput  $\geq 1,000$  QPS and a  $\leq 500$  ms API response time. The system will be deployed and demonstrated in at least 3 tourist attractions or international exhibitions.

**5. Eligibility Requirements for Applicants:** Applicants must be higher education institutions in Macao. They must demonstrate leading national or international scientific research capabilities and expertise in the relevant field. They must also have sound engineering implementation capacity, appropriate laboratory equipment and facilities, and experience in collaborative R&D with enterprises. Joint applications with higher education institutions, R&D institutes, and enterprises from the Chinese mainland and Macao are permitted.



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**6. Research Funding:** MOP3,000,000 to be funded from the FDCT.

Upon approval, the enterprise shall provide a matching contribution at a ratio of at least 2:1.

**7. Intellectual Property and Benefit Ownership:** Scientific and technological outcomes and the resulting intellectual property independently developed by either party shall be owned by that party. Outcomes and the resulting intellectual property jointly developed by both parties shall be jointly owned, and the revenue distribution shall be determined through a separate agreement between the parties.

**8. R&D Duration:** 24 months.

**Direction 4: Smart Grid Coordination and EV Charging Load Management System**

**1. Demand Entity:** Vodatel Networks Holdings Limited

**2. Contact Person and Telephone Number:** Anson Lu; Tel: 00853-63820707; Email: ansonlu@vodatelsys.com

**3. Details of Technological Demand:**

To address the need for EV charging infrastructure expansion in high-density cities like Macao, this project aims to develop charging technology that maximizes the utilization of remaining power capacity without exceeding the existing grid capacity. The system will include the following key capabilities: dynamic load sensing and capacity



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forecasting for microgrids, with real-time, accurate monitoring of total power load for target buildings or zones at second-level intervals; and a multi-objective scheduling model for multi-terminal charging demands, with a scheduling algorithm that achieves an optimal balance among utilization, fairness, embodied carbon emissions, and grid safety. The system will be deployed in high-density scenarios for demonstration.

**4. Key Technical Indicators:**

- (1) Under existing grid capacity limits, equip over 90% of parking spaces with smart charging functionality without the need for grid upgrades.  $\leq 6$  second dynamic load sensing latency for the microgrids, with a capacity forecasting accuracy of  $\geq 90\%$ .
- (2) Deploy and validate the system in 2–3 typical high-density locations in Macao (e.g., public parking lots and residential buildings), achieving a  $\geq 95\%$  grid utilization rate.
- (3) Execute fully localized control, supporting  $\geq 50$  charging points.
- (4) Able to control different brands of DC and AC chargers, with stability  $\geq 98\%$ .
- (5) Keep the system response time to load changes  $< 10$  seconds.

**5. Eligibility Requirements for Applicants:** Applicants must be higher education institutions in Macao. They must demonstrate leading national or international scientific research capabilities and expertise in the relevant field. They must also have sound engineering



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implementation capacity, appropriate laboratory equipment, and experience in collaborative R&D with enterprises. Joint applications with higher education institutions, R&D institutes, and enterprises from the Chinese mainland and Macao are permitted.

**6. Research Funding:** MOP4,500,000 to be funded from the FDCT. Upon approval, the enterprise shall provide a matching contribution at a ratio of at least 1:1.

**7. Intellectual Property and Benefit Ownership:** They belong to the enterprise or shall be determined according to the cooperation development agreement.

**8. R&D Duration:** 24 months.

**Direction 5: AI Service Perception and Alert System for Indoor Scenarios**

**1. Demand Entity:** Vastcom Technology Limited

**2. Contact Person and Telephone Number:** Jimmy Ng; Tel: 00853-66121172; Email: jimmy.hm.ng@vastcomtech.com

**3. Details of Technological Demand:**

This project aims to develop an edge computing-based multimodal perception and alert system for AI-powered services in indoor scenarios, enabling real-time perception, low-latency response, and privacy compliance during service delivery. Key capabilities include multimodal perception technology, which detects critical service



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behaviors such as customer arrival and hand-raising for assistance, analyzes customer emotional states, and generates alert notifications; low-latency decision-making technology, which generates real-time service prompts and assists staff in timely response to customer needs; data anonymization and privacy compliance following the analyze-and-destroy principle, without the storage of any raw image data or identity recognition.

**4. Key Technical Indicators:**

- (1) Multimodal perception:  $\geq 95\%$  recognition accuracy for static human states (i.e., emotion and posture) and  $\geq 90\%$  for dynamic behaviors (i.e., hand-raising for help, running, and abnormal posture), stable detection of faces with size  $\geq 80 \times 80$  pixels, and  $\geq 90\%$  recognition accuracy for static persons under occlusion or when facing away from camera.
- (2) Low-latency response:  $\leq 200$  ms per-frame recognition latency and end-to-end latency from perception to alert  $\leq 30$  seconds, with support for parallel video inference across multiple streams.
- (3) Privacy compliance: No storage of raw images or video frames (analyze-and-destroy) and cached data retention  $\leq 2$  seconds. Anonymous IDs must not be linkable across days.

**5. Eligibility Requirements for Applicants:** Applicants must be higher education institutions in Macao. They must demonstrate leading national or international scientific research capabilities and



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expertise in the relevant field. They must also have sound engineering implementation capacity, appropriate laboratory equipment and facilities, and experience in collaborative R&D with enterprises.

**6. Research Funding:** MOP3,000,000 to be funded from the FDCT. Upon approval, the enterprise shall provide a matching contribution of MOP5,000,000.

**7. Intellectual Property and Benefit Ownership:** Scientific and technological outcomes and the resulting intellectual property independently developed by either party shall be owned by that party. Outcomes and the resulting intellectual property jointly developed by both parties shall be jointly owned, and the revenue distribution shall be determined through a separate agreement between the parties.

**8. R&D Duration:** 24 months.

**Direction 6: Research and Development of an AI Disaster Early Warning System for Low-Altitude Multi-Drone Swarm Inspection**

**1. Demand Entity:** Master Equipment Co., Ltd.

**2. Contact Person and Telephone Number:** Chan To; Tel: 00853-28713600; Email: master@mastermacau.com

**3. Details of Technological Demand:**

This project aims to develop an intelligent drone inspection system with autonomous perception and multi-drone coordination capabilities



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for complex urban canyon environments such as Macao, characterized by high-density buildings and GNSS signal interference. Key objectives include: achieving technological breakthroughs in highly reliable autonomous positioning, obstacle avoidance, and dynamic mission reconfiguration for complex environments; developing lightweight edge AI models suitable for onboard drone deployment to enable real-time detection and alerting of fire risks, smoke, and public safety hazards; and building an AI early warning system for low-altitude inspection, covering the full lifecycle of perception, decision-making, and response, to support refined governance and emergency response for Macao's smart city initiatives.

**4. Key Technical Indicators:**

- (1) Support edge-based real-time detection, with a  $\geq 20$  fps object detection and recognition speed; achieve real-time object labelling and metric rendering with latency  $< 500$  ms,  $\geq 99\%$  precision in large-target recognition, recall rate  $\geq 80\%$ , and  $\geq 0.7$  small-target detection metric (10U); develop recognition algorithms for at least 3 types of inspection targets, including smoke, fire, and floating debris.
- (2) Ensure  $\geq 98\%$  low-altitude large-scene semantic recognition precision and  $\geq 60\%$  recall rate.
- (3) Support coordinated scheduling of multiple drones, coordination between drones and video surveillance, as well as smart event generation and push notification with a delivery latency  $< 1$  second;



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maintain normal operation under a maximum wind speed of 12 m/s, moderate rain, and night-time conditions.

**5. Eligibility Requirements for Applicants:** Applicants must be higher education institutions in Macao. They must demonstrate a strong research background in computer vision detection and engineering implementation capacity. Joint applications with higher education institutions, R&D institutes, and enterprises from the Chinese mainland and Macao are permitted.

**6. Research Funding:** MOP4,500,000 to be funded from the FDCT. Upon approval, the enterprise shall provide a matching contribution at a ratio of at least 1:1.

**7. Intellectual Property and Benefit Ownership:** Scientific and technological outcomes and the resulting intellectual property independently developed by either party shall be owned by that party. Outcomes and the resulting intellectual property jointly developed by both parties shall be jointly owned, and the revenue distribution shall be determined through a separate agreement between the parties.

**8. R&D Duration:** 24 months.

**Direction 7: Research on Collaborative Scheduling and Optimization Methods for Large Language Model Agents in Private Deployment**



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**1. Demand Entity:** InfoMacro Information Technology Limited

**2. Contact Person and Telephone Number:** Evan Yin; Tel: 00853-28331333; Email: enquiry@infomacro.com

**3. Details of Technological Demand:**

In recent years, private deployment of large language models (LLMs) has seen rapid adoption. However, the lack of theoretical foundations and unified mechanisms for multi-agent collaboration has led to low coordination efficiency among heterogeneous models, difficulties in complex task scheduling, and unstable knowledge fusion, which limit deep application in real-world scenarios. This project aims to investigate core scientific problems in LLM agent collaboration, scheduling, and optimization within private environments. Key research areas include self-adapting collaboration mechanisms for heterogeneous models, dynamic workflow scheduling algorithms, joint optimization of multimodal RAG retrieval and generation, and self-evolving prompt methods. The goal is to provide efficient and reliable theoretical support and algorithmic validation for scenarios such as policy interpretation, travel consulting, and complaint analysis.

**4. Key Technical Indicators:**

(1) Develop a self-adapting collaborative scheduling algorithm that supports seamless integration and dynamic scheduling of mainstream open-source models (e.g., DeepSeek), with < 500 ms model switching latency.



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- (2) Develop a reinforcement learning-based scheduling algorithm, with  $\geq 95\%$  execution accuracy, average response time  $< 1.5$  seconds, and concurrent support  $\geq 100$  in tasks such as complaint analysis and document generation.
- (3) Develop a joint retrieval-generation optimization method achieving  $\geq 0.8$  F1-score on document-based question answering tasks.
- (4) Design a meta-learning-based prompt iteration mechanism that improves prompt optimization efficiency by  $\geq 30\%$  in continuous interaction scenarios.
- (5) Support private deployment and few-shot fine-tuning.

**5. Eligibility Requirements for Applicants:** Applicants must be higher education institutions in Macao. They must demonstrate leading national or international scientific research capabilities and expertise in areas such as LLM applications, workflow engines, and RAG. They must also have sound engineering implementation capacity, appropriate laboratory equipment and facilities, and experience in collaborative R&D with enterprises. Joint applications with higher education institutions, R&D institutes, and enterprises from the Chinese mainland and Macao are permitted.

**6. Research Funding:** MOP3,000,000 to be funded from the FDCT. Upon approval, the enterprise shall provide a matching contribution at a ratio of at least 1:1.



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**7. Intellectual Property and Benefit Ownership:** Scientific and technological outcomes and the resulting intellectual property independently developed by either party shall be owned by that party. Outcomes and the resulting intellectual property jointly developed by both parties shall be jointly owned, and the revenue distribution shall be determined through a separate agreement between the parties.

**8. R&D Duration:** 24 months.

**Direction 8: Research on LLM-Based Technical Document Understanding and Intelligent Generation-Matching Technology**

**1. Demand Entity:** NetCraft Information Technology (Macau) Co., Ltd.

**2. Contact Person and Telephone Number:** Chris Lei; Tel: 00853-85387951670; Email: [chris\\_lei@netcraft.com.mo](mailto:chris_lei@netcraft.com.mo)

**3. Details of Technological Demand:**

Focusing on the construction engineering sector, this project aims to develop a core AI engine for the document review system. To automate the bid submission process, the system will use text analysis and semantic understanding technologies to parse PDF documents, extract technical parameters, and identify product information. Using database information and international standards, the project will research standardized methods for product information generation, perform semantic equivalence matching between technical requirements and



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the technical parameters in the submitted documents, improve matching accuracy, and generate material review documents.

**4. Key Technical Indicators:**

- (1) Perform text analysis and semantic understanding of multi-page technical requirement documents in PDF form, with  $\geq 90\%$  parameter extraction accuracy.
- (2) Achieve a standardized product information generation accuracy of  $\geq 90\%$ , according to the ETIM international standard.
- (3) Ensure  $\geq 95\%$  intelligent matching accuracy between technical requirement documents and submitted documents.
- (4) File 1–2 invention patent applications.

**5. Eligibility Requirements for Applicants:** Applicants must be higher education institutions in Macao. They must demonstrate leading national or international scientific research capabilities and expertise in the relevant field. They must also have sound engineering implementation capacity, appropriate laboratory equipment and facilities, and experience in collaborative R&D with enterprises.

**6. Research Funding:** MOP2,000,000 to be funded from the FDCT. Upon approval, the enterprise shall provide a matching contribution at a ratio of at least 1:1.

**7. Intellectual Property and Benefit Ownership:** Scientific and technological outcomes and the resulting intellectual property independently developed by either party shall be owned by that party.



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Outcomes and the resulting intellectual property jointly developed by both parties shall be jointly owned, and the revenue distribution shall be determined through a separate agreement between the parties.

**8. R&D Duration:** 24 months.

**Direction 9: Research and Development of RISC-V AI Edge Computing Technology for Energy Efficiency Optimization in Commercial Buildings**

- 1. Demand Entity:** Guangdong LeapFive Technology Co., Ltd.
- 2. Contact Person and Telephone Number:** Zhu Jing; Tel: 0086-13527243943; Email: jing.zhu@leapfive.com
- 3. Details of Technological Demand:**

To optimize energy efficiency in commercial buildings, this project intends to develop a holographic perception module using RISC-V-based AI edge computing technology, enabling comprehensive environmental perception via multi-source sensing and edge-device coordination. In addition, research will be conducted on lightweight AI models under limited computing resources to develop an energy quantification module for real-time state recognition and energy-saving potential assessment. It will also include the development of a multi-layer interactive intelligent decision-making and control module to enable coordinated responses across multiple devices and terminals, as well as a scalable demonstration solution for hardware-and-software



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coordination, deployable on terminals based on the proprietary, controllable RISC-V computing architecture.

**4. Key Technical Indicators:**

- (1) Holographic perception module: Support for  $\geq 3$  equipment types (e.g., HVAC and lighting), with real-time collection of  $\geq 8$  signal types, including environmental (temperature, humidity, light, and wind direction) and operational (on/off, power, voltage, and current) signals, at a  $\leq 1$  minute interval.
- (2) Energy quantification module: AI model parameter size  $\leq 10$  MB, real-time inference interval  $\leq 15$  minutes, and single inference time  $\leq 5$  seconds.
- (3) Edge-device intelligent control module: Support for  $\geq 3$  types of commercial building scenarios (e.g., hotels, restaurants, and offices), with coordinated control of  $\geq 20$  terminal devices and a year-over-year reduction in peak summer electricity consumption  $\geq 5\%$ .
- (4) End-device delivery and demonstration: Deliver RISC-V-based integrated hardware-software terminals, with demonstration across  $\geq 20$  buildings.

**5. Eligibility Requirements for Applicants:** Applicants must be higher education institutions in Macao. They must demonstrate leading national or international scientific research capabilities and expertise in the relevant field. They must also have sound engineering implementation capacity, appropriate laboratory equipment and



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facilities, and experience in collaborative R&D with enterprises. Joint applications with higher education institutions, R&D institutes, and enterprises from the Chinese mainland and Macao are permitted.

**6. Research Funding:** MOP5,000,000 to be funded from the FDCT. Upon approval, the enterprise shall provide a matching contribution at a ratio of at least 2:1.

**7. Intellectual Property and Benefit Ownership:** Scientific and technological outcomes and the resulting intellectual property independently developed by either party shall be owned by that party. Outcomes and the resulting intellectual property jointly developed by both parties shall be jointly owned, and the revenue distribution shall be determined through a separate agreement between the parties.

**8. R&D Duration:** 24 months.

**Direction 10: Research on Low-Altitude Radio Map Construction and Smart Route Planning in Hengqin and Macao**

**1. Demand Entity:** WellWin Technology Limited

**2. Contact Person and Telephone Number:** Guo Dandan; Tel: 0086-13870960560; Email: wellwin\_ent@163.com

**3. Details of Technological Demand:**

This project aims to build a digital platform for low-altitude wireless communication covering Hengqin and Macao, integrating 3D maps, signal simulation, and route planning to inform decision-making in



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flight management and network optimization. Key features include: a realistic 3D map base that incorporates building materials, water bodies, and infrastructure; gridded radio maps from sparse samples using deep learning, with visual overlay on the digital map; multi-constraint route planning and simulation via the integration of maps, weather data, and regulatory constraints, with communication assessment reports.

**4. Key Technical Indicators:**

- (1) The digital map should include high-precision 3D reconstruction, covering an airspace area of 30 square kilometers, with  $< 2$  meter positioning accuracy for low-altitude infrastructure markers,  $\geq 90\%$  segmentation accuracy for key ground features (e.g., buildings, water bodies, and vegetation), and  $\geq 95\%$  labelling accuracy for electromagnetic properties of materials.
- (2) Achieve a confidence level for sparse signal completion in radio mapping of  $> 90\%$ , with a grid resolution for signal mapping  $\leq 5 \text{ m} \times 5 \text{ m} \times 5 \text{ m}$ .
- (3) While ensuring the communication quality (cell selection criteria:  $S_{rxlev} > 0 \text{ dB}$  and  $S_{qual} > 0 \text{ dB}$ ), the route planning shall achieve a communication link interruption probability of  $\leq 5\%$ , with a  $\geq 95\%$  route planning success rate.

**5. Eligibility Requirements for Applicants:** Applicants must be higher education institutions in Macao. They must demonstrate leading national or international scientific research capabilities and expertise in



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the relevant field. They must also have project background in smart cities and visualization platforms, sound engineering implementation capacity, appropriate laboratory equipment and facilities, and experience in collaborative R&D with enterprises. Joint applications with higher education institutions, R&D institutes, and enterprises from the Chinese mainland and Macao are permitted.

**6. Research Funding:** MOP1,300,000 to be funded from the FDCT. Upon approval, the enterprise shall provide a matching contribution at a ratio of at least 2:1.

**7. Intellectual Property and Benefit Ownership:** Scientific and technological outcomes and the resulting intellectual property independently developed by either party shall be owned by that party. Outcomes and the resulting intellectual property jointly developed by both parties shall be jointly owned, and the revenue distribution shall be determined through a separate agreement between the parties.

**8. R&D Duration:** 18 months.

**(iv) Integrated Circuits**

**Direction 1: Research and Development of High-Speed, High-Resolution ADC Chips for High-End Oscilloscopes**

**1. Demand Entity:** Osens Sensor Technology (ZH) Co., Ltd.



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**2. Contact Person and Telephone Number:** Li Zhishan; Tel: 0086-18675612963; Email: zhishan.li@osensinc.com

**3. Details of Technological Demand:**

In response to the domestic need for alternative core chips used in high-end oscilloscopes, this project aims to develop a high-speed, high-resolution ADC chip to replace current high-cost imported ones. The key technical specifications of the chip will be jointly defined by the enterprise and the partnering university based on the enterprise's existing products. The university will be responsible for chip design, while the enterprise will build the validation platform. Both parties will jointly verify chip performance.

**4. Key Technical Indicators:**

(1) Deliver a taped-out and verified ADC IP, including chip design architecture, schematics, circuit diagrams, layout, GDSII data, pre- and post-layout simulation reports, and design documentation.

(2) Expected technical specifications of the chip:

- ① Process node:  $\leq 28$  nm
- ② Bandwidth (-3 dB):  $\geq 15$  GHz
- ③ Sampling rate:  $\geq 64$  GS/s
- ④ Resolution:  $\geq 9$  bit
- ⑤ Power consumption:  $\leq 400$  mW
- ⑥ SNDR @ 15 GHz:  $\geq 37$  dB
- ⑦ SFDR @ 15 GHz:  $\geq 50$  dB



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⑧ Supply voltage:  $\leq 1.1$  V

(3) Provide a third-party chip test report.

**5. Eligibility Requirements for Applicants:** Applicants must be higher education institutions in Macao. They must demonstrate leading national or international scientific research capabilities and expertise in integrated circuit design. They must also have sound engineering implementation capacity, appropriate laboratory equipment and facilities, and experience in collaborative R&D with enterprises. Joint applications with higher education institutions, R&D institutes, and enterprises from the Chinese mainland and Macao are permitted.

**6. Research Funding:** MOP5,000,000 to be funded from the FDCT. Upon approval, the enterprise shall provide a matching contribution at a ratio of at least 2:1.

**7. Intellectual Property and Benefit Ownership:** Scientific and technological outcomes and the resulting intellectual property independently developed by either party shall be owned by that party. Outcomes and the resulting intellectual property jointly developed by both parties shall be jointly owned, and the revenue distribution shall be determined through a separate agreement between the parties.

**8. R&D Duration:** 24 months.

**Direction 2: Research and Development of a Half-Bridge Isolated Driver Chip for GaN-Based IPM**



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**1. Demand Entity:** GaNext (Zhuhai) Technology Co., Ltd.

**2. Contact Person and Telephone Number:** Zhang Dajiang; Tel: 0086-13510743203; Email: [dj.zhang@ganext.com](mailto:dj.zhang@ganext.com)

**3. Details of Technological Demand:**

Traditional intelligent power module (IPM) solutions in the white goods sector are primarily based on insulated gate bipolar transistors (IGBTs), which suffer from high switching losses. Under light-load conditions, where white goods operate most of the time, the proportion of switching losses is stubbornly high, leading to poor efficiency. GaN-based IPMs represent the future of this technology as they offer low losses and high efficiency, effectively addressing the light-load loss problem. Building on the enterprise's existing GaN power chip products, this project intends to develop a half-bridge isolated driver chip, laying the foundation for the enterprise's IPM development. The key technical specifications of the chip will be jointly defined by the enterprise and the university. The university will be responsible for chip design, while the enterprise will build the validation platform. Both parties will jointly verify chip performance.

**4. Key Technical Indicators:**

(1) Deliver a taped-out and verified half-bridge isolated driver soft core, including chip design architecture, schematics, circuit diagrams, layout, GDSII data, pre- and post-layout simulation reports, and design documentation.



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(2) Expected technical specifications of the chip:

- ① Integrated driver, protection, bootstrap, and temperature detection
- ② Meet the driving requirements for three GaN devices with on-resistances of 800 mΩ (4 A), 400 mΩ (8 A), and 150 mΩ (15 A)
- ③ Maximum operating frequency  $\geq 150$  kHz
- ④ Driver quiescent current  $\leq 2.3$  mA
- ⑤ Isolation voltage rating  $\geq 5000$  Vrms
- ⑥ CMTI  $\geq 100$  kV/ $\mu$ s
- ⑦ Programmable dead time range: 20 ns to 150 ns, with a typical value of 50 ns

(3) Provide a third-party chip test report.

**5. Eligibility Requirements for Applicants:** Applicants must be higher education institutions in Macao. They must demonstrate leading national or international scientific research capabilities and expertise in integrated circuit design. They must also have sound engineering implementation capacity, appropriate laboratory equipment and facilities, and experience in collaborative R&D with enterprises. Joint applications with higher education institutions, R&D institutes, and enterprises from the Chinese mainland and Macao are permitted.

**6. Research Funding:** MOP3,000,000 to be funded from the FDCT. Upon approval, the enterprise shall provide a matching contribution at a ratio of at least 2:1.



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**7. Intellectual Property and Benefit Ownership:** Scientific and technological outcomes and the resulting intellectual property independently developed by either party shall be owned by that party. Outcomes and the resulting intellectual property jointly developed by both parties shall be jointly owned, and the revenue distribution shall be determined through a separate agreement between the parties.

**8. R&D Duration:** 18 months.

**Direction 3: Research and Development of Ultra-Low Jitter, Small-Area PLL Technology for Image Sensors**

**1. Demand Entity:** Shrpvison Electronics (ZH) Co., Ltd.

**2. Contact Person and Telephone Number:** Tiana Tian; Tel: 0086-13926960077; Email: tiana-tian@shrpvison.cn

**3. Details of Technological Demand:**

Next-generation image sensors for AR/VR applications demand extremely high levels of miniaturization, performance, and low power consumption. The phase-locked loop (PLL) serves as the clock reference source for the image sensor system, and its low jitter performance is critical to improving ADC and image quality, as well as ensuring the stability of high-speed interfaces. To meet the enterprise's need for miniaturized, high-performance image sensor products, this project will design an ultra-low jitter, small-area PLL IP.

**4. Key Technical Indicators:**



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(1) Deliver a taped-out and verified PLL IP, including chip design architecture, schematics, circuit diagrams, layout, GDSII data, pre- and post-layout simulation reports, and design documentation.

(2) Expected technical specifications of the chip:

- ① Process node: 90 nm (as specified by the enterprise)
- ② Supply voltage: 2.8 V / 1.2 V
- ③ Reference clock: 1 MHz–6 MHz, with a default of 3 MHz
- ④ Output frequency: 1.5 GHz (adjustable from 0.8 GHz to 1.8 GHz in 3 MHz steps)
- ⑤ Phase margin:  $> 45^\circ$
- ⑥ Lock time:  $< 50 \mu\text{s}$
- ⑦ Output duty cycle: 48%–52%
- ⑧ TIE jitter:  $< 20 \text{ ps}$  (tested over 30,000 cycles of the 1.5 GHz clock, with 100 mV peak-to-peak noise added to the power supply)
- ⑨ Power consumption:  $\leq 5.5 \text{ mW}$
- ⑩ IP area:  $\leq 0.07 \text{ mm}^2$

(3) Provide a third-party chip test report.

**5. Eligibility Requirements for Applicants:** Applicants must be higher education institutions in Macao. They must demonstrate leading national or international scientific research capabilities and expertise in integrated circuit design. They must also have sound engineering implementation capacity and experience in collaborative R&D with enterprises. Joint applications with higher education institutions, R&D



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institutes, and enterprises from the Chinese mainland and Macao are permitted.

**6. Research Funding:** MOP3,500,000 to be funded from the FDCT. Upon approval, the enterprise shall provide a matching contribution at a ratio of at least 2:1.

**7. Intellectual Property and Benefit Ownership:** Scientific and technological outcomes and the resulting intellectual property independently developed by either party shall be owned by that party. Outcomes and the resulting intellectual property jointly developed by both parties shall be jointly owned, and the revenue distribution shall be determined through a separate agreement between the parties.

**8. R&D Duration:** 24 months.

**Direction 4: Research and Development of Low-Power ADC IP for Robot Power and Motion Control Applications**

**1. Demand Entity:** Inbisen Semiconductor Co., Ltd.

**2. Contact Person and Telephone Number:** Wang Zhao; Tel: 0086-13828788170; Email: zhao.wang@inbisen.com

**3. Details of Technological Demand:**

Robot power and motion control SoC products consist of three core modules: battery management, magnetic angle sensor, and microcontroller unit (MCU). Each module requires a dedicated ADC for



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signal acquisition. To meet the enterprise's R&D needs, three ADC IPs will be developed.

**4. Key Technical Indicators:**

(1) Deliver three taped-out and verified ADC IPs, including chip design architecture, schematics, circuit diagrams, layout, GDSII data, pre- and post-layout simulation reports, and design documentation.

(2) Expected technical specifications of the chip:

**Battery Management ADC IP:**

- ① Resolution: 14 bits
- ② Sampling rate:  $\geq 20$  ksps
- ③ ENOB (Effective Number of Bits):  $\geq 11$  bits
- ④ Differential input voltage range: 0 V–5 V
- ⑤ INL:  $\leq \pm 2$  LSB @ 0–5 V input, no missing codes
- ⑥ Offset:  $< \pm 1$  LSB
- ⑦ Integrated IP features: bandgap reference and oscillator
- ⑧ Bandgap reference temperature drift:  $\leq 20$  ppm
- ⑨ Supply voltage: 5 V
- ⑩ Temperature range:  $-40^{\circ}\text{C}$ – $125^{\circ}\text{C}$

**Magnetic Angle Sensor ADC IP:**

- ① Resolution: 15 bits
- ② Sampling rate:  $\geq 300$  ksps
- ③ ENOB:  $\geq 12$  bit
- ④ Integrated IP features: bandgap reference and oscillator



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- ⑤ Bandgap reference temperature drift:  $\leq 20$  ppm
- ⑥ Supply voltage: 5 V
- ⑦ Temperature range:  $-40^{\circ}\text{C}$ – $125^{\circ}\text{C}$

**MCU ADC IP:**

- ① Resolution: 10 bits
- ② Sampling rate:  $\geq 10$  ksps
- ③ ENOB:  $\geq 9.5$  bit
- ④ Integrated IP features: bandgap reference and oscillator
- ⑤ Bandgap reference temperature drift:  $\leq 20$  ppm
- ⑥ Supply voltage: 5 V
- ⑦ Temperature range:  $-40^{\circ}\text{C}$ – $125^{\circ}\text{C}$

(3) Provide a third-party chip test report.

**5. Eligibility Requirements for Applicants:** Applicants must be higher education institutions in Macao. They must demonstrate leading national or international scientific research capabilities and expertise in integrated circuit design. They must also have sound engineering implementation capacity and experience in collaborative R&D with enterprises. Joint applications with higher education institutions, R&D institutes, and enterprises from the Chinese mainland and Macao are permitted.

**6. Research Funding:** MOP3,000,000 to be funded from the FDCT. Upon approval, the enterprise shall provide a matching contribution at a ratio of at least 2:1.



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**7. Intellectual Property and Benefit Ownership:** Scientific and technological outcomes and the resulting intellectual property independently developed by either party shall be owned by that party. Outcomes and the resulting intellectual property jointly developed by both parties shall be jointly owned, and the revenue distribution shall be determined through a separate agreement between the parties.

**8. R&D Duration:** 36 months.

**Direction 5: Research and Development of an End-to-End 3D Sensing-Computing Integrated Chip for Service Robots**

**1. Demand Entity:** Zhuhai Amicro Technology Co., Ltd.

**2. Contact Person and Telephone Number:** Su Wenjing; Tel: 0086-18697556656; Email: [wenjing.su@amico.com.cn](mailto:wenjing.su@amico.com.cn)

**3. Details of Technological Demand:**

To address the high latency, high bandwidth, and high power consumption issues caused by the separation of sensing and computing in service robots, this project will develop an end-to-end 3D sensing-computing integrated chip based on the company's hardware and software framework. The chip will feature wide-spectrum responses covering near-infrared and visible blue-green wavelengths. Depth extraction and point cloud voxelization will be performed on-chip, while an onboard AI engine will execute real-time feature extraction, object recognition, and decision-making, outputting control commands directly.



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#### 4. Key Technical Indicators:

(1) Deliver a taped-out and verified end-to-end 3D sensing-computing integrated chip sample, including chip design architecture, schematics, circuit diagrams, layout, GDSII data, pre- and post-layout simulation reports, and design documentation.

(2) Expected technical specifications of the chip:

- ① Pixel array size:  $\geq 256$  (W)  $\times$  64 (H)
- ② Measurement distance: 0.05 m–15 m
- ③ Measurement error:  $\leq \pm 0.015$  m
- ④ Frame rate:  $\geq 30$  fps (full frame)
- ⑤ Supported detection bands: 940 nm infrared band and 450 nm–550 nm blue-green band
- ⑥ On-chip system throughput:  $\geq 200$ –300 GOPS
- ⑦ On-chip system energy efficiency:  $\geq 0.5$  TOPS/W
- ⑧ RISC-V instruction set compatible

(3) Provide a third-party chip test report.

**5. Eligibility Requirements for Applicants:** Applicants must be higher education institutions in Macao. They must demonstrate leading national or international scientific research capabilities and expertise in integrated circuit design. They must also have sound engineering implementation capacity, appropriate laboratory equipment and facilities, and experience in collaborative R&D with enterprises. Joint



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applications with higher education institutions, R&D institutes, and enterprises from the Chinese mainland and Macao are permitted.

**6. Research Funding:** MOP1,500,000 to be funded from the FDCT. Upon approval, the enterprise shall provide a matching contribution at a ratio of at least 2:1.

**7. Intellectual Property and Benefit Ownership:** Scientific and technological outcomes and the resulting intellectual property independently developed by either party shall be owned by that party. Outcomes and the resulting intellectual property jointly developed by both parties shall be jointly owned, and the revenue distribution shall be determined through a separate agreement between the parties.

**8. R&D Duration:** 36 months.

#### IV. Contributing Experts

##### 1. Traditional Chinese Medicine and Big Health

Sun Dongmei, Vice President and Senior TCM Pharmacist at Guangdong Second Traditional Chinese Medicine Hospital (Guangdong Province Engineering Technology Research Institute of TCM)

He Fei, Professor at the School of Traditional Chinese Medicine, Southern Medical University

He Rongrong, Professor at the College of Pharmacy, Jinan University

Ma Renqiang, Deputy General Manager and Senior Pharmacist at Boji



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Medical Technology Co., Ltd.

Wang Lisheng, Professor at the School of Chinese Materia Medica,  
Guangzhou University of Chinese Medicine

## **2. Biomedicine**

Xin Xuegang, Vice Dean and Professor at the School of Medicine,  
South China University of Technology

Chen Chengbin, Chief Technology Officer and Professor-level Senior  
Engineer at Guangzhou Salustier BioSciences Co., Ltd.

Huang Gonghua, Research Fellow at Guangdong Medical University

Lian Qizhou, Professor at the Shenzhen University of Advanced  
Technology and the Shenzhen Institute of Advanced  
Technology, Chinese Academy of Sciences

Tang Shibing, Research Fellow at the Guangzhou Institutes of  
Biomedicine and Health, Chinese Academy of Sciences

## **3. Digital Technology**

Yao Qinghe, Professor at the School of Aeronautics and Astronautics  
and the School of Integrated Circuits, Sun Yat-sen University

Chen Weineng, Vice Dean and Professor at the School of Computer  
Science and Engineering, South China University of  
Technology

Liu Yi, Chairman and Research Fellow at Shenzhen Raisound  
Technology Co., Ltd.

Wen Zhiqing, Head of Intelligent Robotics, Distinguished Research



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Fellow, Professor-level Senior Engineer at Ji Hua Laboratory  
Zhou Yimin, Research Fellow at the Shenzhen Institute of Advanced  
Technology, Chinese Academy of Sciences

#### **4. Integrated Circuit**

Li Bin, Vice Dean and Professor at the School of Microelectronics,  
South China University of Technology

Chen Honglin, General Manager and Senior Engineer at Guangzhou  
Hanchen Information Technology Co., Ltd.

Wang Deming, Professor at the School of Electronic Science and  
Engineering (School of Microelectronics), South China  
Normal University

Wang Lihui, Professor-level Senior Engineer at the Institute of  
Semiconductors, Guangdong Academy of Sciences

Xu Jiang, Department Head and Professor at the Microelectronics  
Thrust, Hong Kong University of Science and Technology  
(Guangzhou)