Suzhou Demand List for Achieving Breakthroughs in Core Technologies in Key Fields Under International "Open Competition Mechanism to Select the Best Candidates" 2024

I. 202401 Title of Technical Requirement: Research and Development of Key Technologies for High-Performance HBA Card for Server

(I). Task Description:

To address the demands of high-end computer systems for data storage solution for high bandwidth, low latency, and multi-scenario access, this project aims to develop a multi-port general-purpose HBA card based on SOC architecture. Functionally, the card shall support the common types of storage interfaces such as NVMe, SAS, and SATA, as well as RAID 0/1/5 fault tolerance configuration and SAS Expander extension. It shall also support secure boot based on cryptographic algorithms. Performance-wise, it shall meet the performance requirements of mainstream server systems, and achieve the functionality and performance standards of the current mainstream HBA cards. With respect to industrialization, the goal is to achieve large-scale validation and batch usage in key industries.

(II). Key Performance Indicators:

1. Functional Indicators:

(1) Support NVMe/SAS/SATA (on the same LANE).
(2) Support SAS Expander extension.
(3) Support secure boot.
(4) Support RAID 0/1/5 configuration.

2. Performance Indicators:

(1) At upstream host side, its maximum bandwidth shall be no less than 12GB. At downstream device side, it shall be able to support up to 16 ports.
(2) Read/Write Speed: NVMe -16Gb/s; SAS -12Gb/s; SATA - 6Gb/s.
(3) 4k random reads: no less than 3 million IOPS at the peak.

3. Industrialization Indicators:

(1) Compatibility certification with at least three mainstream OEMs for the self-developed HBA card.
(2) Capability to produce and deploy at least 100,000 units of self-developed HBA chips/cards for practical application (installation).

III. Deliverables:

(1) Provide chip schematic diagrams and PCB layout diagrams of the self-developed high-performance HBA card, along with relevant intellectual property documentation.
(2) Provide physical samples of the self-developed high-performance HBA chip and HBA card.
(3) Provide third-party test reports on the functionality and performance indicators of the self-developed high-performance HBA card.

IV. Project Deadline: June 30, 2027.

V. Funding Allocation: 20 million RMB.

II. 202402 Title of Technical Requirement: Breakthroughs in Advanced Chip Technology Development for Real-Time Three-Dimensional 4D Transesophageal Echocardiography (4D-TEE) Probe

(I). Task Description:

4D Transesophageal Echocardiography (4D-TEE) is designed to dynamically monitor the real-time three-dimensional multi-plane cardiac tissue structure information and blood flow information. It is widely used in rapid bedside cardiovascular system imaging assessment and interventional surgeries. This project aims to advance the technologies behind 4D-TEE probes. Specifically, the focus will be on the development of two-dimensional array transducer, mirror body, real-time three-dimensional ultrasound scanning and imaging technology, and front-end simulation and beam-forming technology. The objective of this project is to develop a 2D array analog front-end (AFE) semiconductor

chip and establish a stacking interconnection process between chips and 2D piezoelectric ceramic transducers, with an aim to overcome the critical technical challenges associated with integrating ultra-dense 2D array ultrasonic transducers and AFE chips.

(II). Key Performance Indicators:

(1) Operating Frequency Range: 2MHz-9MHz.

(2) Piezoelectric Ceramic Transducer and CMOS Chip Stacking Process: 3072 elements.

(3) ASIC Chip Specifications: Maximum transmit voltage of no less than 60V. Delay accuracy in sub-region beam-forming of no greater than 30ns. Total power consumption of no greater than 2W.

(4) System Imaging Modes: Support 2D, 3D, Color Flow (CF), Pulsed Wave (PW), and Continuous Wave (CW) imaging.

III. Deliverables:

(1) Two-dimensional array analog front-end ASIC chip samples and quality test reports issued by third-party institutions.

(2) Two-dimensional array transducer samples integrated with ASIC chips and process performance reports.

(3) Image validation report approved by the entrusting party.

IV. Project Deadline: June 30, 2027.

V. Funding Allocation: 20 million RMB.

III. 202403 Title of Technical Requirement: Bispecific-Antibody Single-Payload and Monoclonal-Antibody Dual-Payload ADC Drug Technology Platform

(I). Task Description:

With the high specificity of novel antibody drugs and the potent cytotoxic capacity of traditional small molecule drugs, antibody-drug conjugates (ADCs) have emerged as a promising agents in anti-cancer drug development. This project aims to develop First-in-Class/Best-in-Class (FIC/BIC) bispecific-antibody single-payload and monoclonal-antibody dual-payload ADC molecules. The aim is to incorporate highly efficient and safe cytotoxic payloads (i.e., toxins) into antibody molecules without the need for structural modification. The conjugation process shall be noted for its simplicity and efficiency, making it easily scalable for industrial production. It shall also allow for flexible adjustment of the drug-to-antibody ratio (DAR), ensure linker stability in circulation, and effectively mask the hydrophobic nature of small molecule toxins, thus overcoming limitations seen in existing platforms. The anticipated outcome is a substantial improvement in both efficacy and safety. Leveraging the existing antibodies provided by the requesting entity, the goal is to achieve 1-2 Investigational New Drug (IND) applications within three years and have one molecule enter Phase I clinical trials to gather early efficacy signals and safety data for patients.

(II). Key Performance Indicators:

(1) Precise control over various DARs, including DAR4 and DAR8, with an allowable measured DAR error of no more than 0.5 and an overall yield of no less than 70%.

(2) Ensure that DAR8 ADCs demonstrate a tolerable dose of no less than 40 mg/kg in cynomolgus monkeys.

(3) Achieve a tumor inhibition rate of no less than 80% in mouse tumor models at doses ranging from 1 to 3 mg/kg.

(4) DAR reduction of no more than 30% in plasma stability testing.

III. Deliverables:

(1) A complete ADC preparation process and key detection indicators, including DAR, size-exclusion chromatography (SEC), and small molecule toxin residue data. The developability data package shall meet the requirements of both the enterprise and the drug regulatory authorities, enabling scalable production in the Company's Chemistry, Manufacturing, and Controls (CMC) process.

(2) A well-defined route for small molecule toxin preparation with clear intellectual property (IP) delineation.

(3) ADC efficacy and stability data.

IV. Project Deadline: June 30, 2027.

V. Funding Allocation: 30 million RMB.

IV. 202404 Title of Technical Requirement: Development of Highly Stable Novel Functional Probiotic Strains for Infants and Toddlers

(I). Task Description:

Probiotic products are extensively used in the realm of infant and toddler foods and dietary supplements. This project is open to technical teams worldwide, with an aim to develop probiotics beneficial for infant and toddler health. Leveraging high-throughput gene sequencing and other cutting-edge techniques, this project aims to screen probiotic strains with potential health benefits for infants and toddlers, assess the safety and bioactivity of these strains, conduct clinical trials to confirm their efficacy, and develop probiotic formulations that enhance infant and toddler health. The objective is to establish precise functional strain screening technologies and efficient probiotic preparation processes, thereby developing highly active and highly stable functional probiotic products for infants and toddlers. This initiative seeks to break through the technical bottlenecks of "dependency on imported strains for infants and toddlers" and "low activity and stability of existing probiotic offerings".

(II). Key Performance Indicators:

(1) From the requesting entity's collection of 30,000 strains, at least 20 candidate strains will be identified using high-throughput sequencing and other technologies. The basic characteristics of these strains, such as bile salt and acid tolerance, shall be comparable to or surpass those of the internationally renowned strains Bb-12 and LGG. The activity and stability of the 20 candidate strains will be evaluated.

(2) Through clinical trials, the specific benefits of the candidate strains for infants and toddlers will be verified. At least three products will be developed in three functional areas, i.e., enhancing infant and toddler's growth and development, alleviating diarrhea and constipation, and improving sleep quality. The functionality of these strains shall match or surpass that of the internationally renowned strains Bb-12 and LGG.

(3) A minimum of three clinical research results will be published in international SCI journals.

III. Deliverables:

(1) A complete screening report for all 30,000 strains and a comparative analysis report for the 20 candidate strains.

(2) Safety and activity evaluation reports for the three candidate strains chosen for clinical studies.

(3) Formulations for a new generation of infant and toddler health products.

(4) Clinical reports and evidence of paper publication in reputable journals.

IV. Project Deadline: June 30, 2027.

V. Funding Allocation: 15 million RMB.

V. 202405 Title of Technical Requirement: Development of Polymer Materials for Valve Leaflets, Skirts, and Sutures for Transcatheter Aortic Valve Replacement

(I). Task Description:

This project aims to address the critical need for highly durable and biocompatible heart valve materials for transcatheter aortic valve replacement (TAVR). By emulating the structure of autologous human valve leaflets, this project intends to develop composite polymer leaflet materials using a multi-layered biomimetic composite woven structure. The project will include rigorous safety and efficacy evaluations of these materials. Additionally, it seeks to create polymer skirt and suture materials that meet the requirements, establish scalable production processes for polymer leaflets, skirts and suture materials, and set processing specifications and quality standards. These polymer leaflet materials are expected to replace the current mainstream biological materials, addressing issues related to short service life and high costs, while the polymer skirt and suture materials are expected to replace imported alternatives.

(II). Key Performance Indicators:

(1) Polymer Leaflet Materials:

Thickness: 60μm ≤ leaflet material thickness ≤ 120μm

Surface Roughness: Ra ≤ 1.0μm

Tensile Strength: ≥ 20MPa

Fatigue durability in physiological environment: ≥ 200 million cycles

Flexibility: < 100mN.

(2) Polymer Skirt Materials:

Thickness: ≤ 40μm

Water Permeability: ≤ 200mL/cm^2/min

Tensile Strength: ≥ 5.5N/mm

Fatigue durability in physiological environment: ≥ 200 million cycles.

(3) Polymer Suture Materials:

Breaking Strength:

6-0 sutures: ≥ 1.08N

5-0 sutures: ≥ 2.26N

4-0 sutures: ≥ 4.51N

Fatigue durability in physiological environment: ≥ 200 million cycles

III. Deliverables:

(1) Polymer leaflet materials along with corresponding inspection reports issued by nationally recognized third-party institutions.

(2) Biocompatibility evaluation reports for polymer leaflet, skirt, and suture materials, issued by nationally recognized third-party institutions.

(3) Polymer skirt materials along with corresponding inspection reports issued by nationally recognized third-party institutions.

(4) Polymer suture materials along with corresponding inspection reports issued by nationally recognized third-party institutions.

IV. Project Deadline: June 30, 2027.

V. Funding Allocation: 20 million RMB.

VI. 202406 Title of Technical Requirement: General-Purpose ADC Single-Enzyme One-Step Site-Specific Conjugation Technology

(I). Task Description:

The development of antibody-drug conjugates (ADCs) in China is gaining momentum, yet it still lags behind developed countries, particularly in core conjugation technologies. The domestic industry faces a significant gap in proprietary site-specific conjugation techniques, which poses a risk of technological bottlenecks. This project aims to develop a next-generation of site-specific conjugation technologies to facilitate the creation of safer, more effective, and accessible ADC products, thereby enhancing the overall level of ADC research and development in China..

(II). Key Performance Indicators:

(1) Target Product Purity: > 97% under Size-Exclusion Chromatography (SEC) .

(2) Target Product DAR (Antibody-Drug Conjugation Ratio): 1.8-2.0.

(3) DAR2 Component Purity in Target Product: > 90%.

(4) Develop 1-2 sets of rapid screening kits for site-specifically conjugated ADCs, enabling efficient production of ADCs with uniform DAR values.

III. Deliverables:

(1) Inspection reports issued by accredited third-party institutions confirming compliance with the key performance indicators.

(2) ADC site-specific conjugation rapid screening kits.

IV. Project Deadline: December 31, 2026.
V. Funding Allocation: 10 million RMB.

VII. 202407 Title of Technical Requirement: Research and Development of Key Technologies for Sorting and Utilization of Steel Slag Resources

(I). Task Description:

With the implementation of the newly issued national standard *General Purpose Portland Cement* (GB175-2023), which stipulates that steel slag is no longer to be included as a primary composition in cement, the cement industry - which accounts for 50-80% of steel slag consumption - faces a critical challenge. This project aims to address the urgent need for key technologies to facilitate the sorting and utilization of steel slag resources.

This project will encompass the analysis and classification of the physicochemical properties of steel slag, performance evaluation of steel slag and utilization scheme optimization, as well as technology development for sorting and utilization of steel slag resources. The objective is to establish an integrated process for comprehensive and environmentally safe utilization of steel slag resources. Given the fact that the enterprise has an annual production of 800,000 tons, this project will formulate flexible and adjustable comprehensive utilization schemes based on the varying characteristics of steel slag, with an aim to optimize steel slag performance and ensure efficient utilization.

(II). Key Performance Indicators:

(1) Steel Slag Aggregate:
Free calcium oxide content: < 2.0%
Water immersion expansion rate: < 2.0%
Expansion rate of mixed materials prepared from steel slag during a first 3-day water immersion: < 0.5%.

(2) Steel Slag-Based Cementitious Materials:
Steel slag content: ≥ 20%
Initial setting time: ≥ 3 hours, final setting time: ≤10 hours
Compressive strength: ≥ 15 MPa (at the age of 3 days), ≥ 45 MPa (at the age of 28 days)
Flexural strength : ≥ 3 MPa (at the age of 3 days), ≥ 7.5 MPa (at the age of 28 days)
Product cost reduction compared to P.O 42.5 cement: > 30%

III. Deliverables:

(1) Standards and Performance Control Indicators:
Develop steel slag sorting standards and performance control indicators
Promote the formation or improvement of at least one complete set of industry norm or standard to guide users in the standardized use of steel slag products, thereby enhancing comprehensive utilization of steel slag.

(2) Research Report:
Provide a comprehensive research report on sorting and utilization of steel slag, including details on processing technologies and product development schemes.

(3) Market Promotion Plan:
Develop a market promotion plan for a series of steel slag comprehensive utilization products.

IV. Project Deadline: December 31, 2026.
V. Funding Allocation: 5 million RMB.

VIII. 202408 Title of Technical Requirement: Research and Development of Key Technologies for Preparation of Ultra-Pure Tertiarybutylphosphine and Tertiarybutylarsine for MOCVD Epitaxy

(I). Task Description:

Ultra-pure tertiarybutylphosphine (TBP) and tertiarybutylarsine (TBAs) are critical materials for Metal-Organic Chemical Vapor Deposition (MOCVD) low-temperature epitaxial growth due to their low toxicity, safety profile, ability to

decompose at low temperatures, and capacity to meet the needs for low-temperature high-stress structure growth. This project aims to develop a comprehensive technical route for synthesizing crude TBAs and TBP, establish methods for rectification and purification of 6N electronic-grade TBAs and TBP, and create detection and analysis methods for these materials. Additionally, the project will focus on designing a safe packaging process for TBAs and TBP, and creating a toxic gas detection system. The ultimate goal is to design a production line capable of safely mass-producing TBAs and TBP, establish testing standards for these materials, and meet the requirements for semiconductor laser chip preparation via MOCVD epitaxy.

(II). Key Performance Indicators:

Product	Indicator	Indicator Requirements
TBP	Appearance and properties	Colorless liquid
	Melting point	(4±0.5)℃
	Boiling point	(54±0.5)℃
	Density	0.7g/mL
	Solubility	Easily soluble in ether solvents
	Vapor pressure	(197±10)mbar at 10℃
	Purity	Inorganic purity ≥99.9999%, organic purity ≥99.8%
TBAs	Appearance and properties	Colorless liquid
	Melting point	(-1±0.5)℃
	Boiling point	(65-67)±0.5°C
	Density	1.08 g/cm3
	Solubility	Easily soluble in ether solvents
	Vapor pressure	(100±10)mbar at 10°C
	Purity	Inorganic purity ≥99.9999%, organic purity ≥99.8%

III. Deliverables:

(1) Provide samples of ultra-pure tertiarybutylphosphine (TBP) and tertiarybutylarsine (TBAs) weighing over 100 grams.

(2) Supply testing and analysis methods for TBAs and TBP, along with third-party test reports.

(3) Deliver material safety analysis reports for TBAs and TBP..

IV. Project Deadline: December 31, 2026.

V. Funding Allocation: 10 million RMB.

IX. 202409 Title of Technical Requirement: Development of Key Technologies for Ultra-Pure Synthetic Quartz Preparation

(I). Task Description:

Ultra-pure synthetic quartz glass is a critical material for high-precision optical instruments, which require extremely stringent specifications for quartz materials. This project aims to achieve the development of ultra-pure synthetic quartz by focusing on researching and developing techniques for ensuring high uniformity, ultra-low stress, minimal metal impurity content, defect control, and hydrogen infusion.

(II). Key Performance Indicators:

(1) Optical uniformity of quartz glass: ≤ 1 ppm

(2) Internal transmittance of quartz glass: ≥ 99.5%/cm@193nm

(3) Stress birefringence of quartz glass: ≤1 nm/cm

(4) Striations in quartz glass (3D): absence of visible striations

(5) Total impurity content in quartz glass: ≤ 10 ppb

(6) Hydrogen molecule content: ≥ $1\times10^{16}/cm^3$.

III. Deliverables:

(1) Quartz material test report.

(2) Quartz material process report.

(3) Study reports on quartz material uniformity, stress birefringence, defect control, and metal impurity control.

IV. Project Deadline: June 30, 2027.

V. Funding Allocation: 8 million RMB.

X. 202410 Title of Technical Requirement: Research and Development and Industrialization of Key Technologies for Ultra-Precision Vertical Ultrasonic-Assisted Grinding Centers with Full Hydrostatic Bearings

(I). Task Description:

This project aims to advance the design and production of ultra-precision vertical ultrasonic-assisted grinding centers with full hydrostatic bearings. The initiative includes designing and developing the overall structure and key components, such as five-axis ultra-precision grinding equipment, ultra-precision liquid hydrostatic bearing rotary components, and ultrasonic spindle coupling mechanisms. Additionally, it will involve performance verification of key functional components for the machining center and evaluation of machining space accuracy. The ultimate goal is to achieve high-precision, high-efficiency, and high-reliability processing in the ultra-precision vertical grinding center, addressing the challenges of low precision and poor stability in batch processing of difficult-to-machine materials, especially complex contour and special-shaped profile parts.

(II). Key Performance Indicators:

(1) Linear Motion Axis of the Precision Vertical Ultrasonic-Assisted Grinding Center:
Motion straightness: ≤ 0.0001mm/100mm
Straightness within the entire travel range: ≤ 0.0015 mm
Positioning error: ≤ 0.002 mm
Repeat positioning error: ≤ 0.001 mm
Stiffness: ≥ 1,000,000 N/mm

(2) Worktable of the Precision Vertical Ultrasonic-Assisted Grinding Center:
Runout error: ≤ 0.0015 mm (Φ1250mm)
Positioning error: ≤ 5″
Stiffness: ≥ 1,000,000 N/mm.

(3) Ultrasonic Spindle:
Dimensions consistent with the existing grinding spindles
Speed range: 20,000-30,000 r/min
Vibration mode: Longitudinal vibration
Adjustable operating frequency range: 15 kHz-70 kHz
Amplitude: ≥ 0.005 mm
Power: ≥ 100 W.

(4) Error Measurement and Compensation for the Precision Vertical Ultrasonic-Assisted Grinding Center:
Space Error: ≤ 0.02 mm within the entire travel range

(5) Standards Development:
Creation of design specifications, assembly process specifications, and testing specifications and standard for the Precision Vertical Ultrasonic-Assisted Grinding Center: 1 complete set each.

(6) Prototype Localization:
Localization rate of over 90% for the prototype.

III. Deliverables:

(1) Provide one prototype incorporating relevant technologies, along with an identification report.

(2) Deliver design specifications, assembly process specifications, and testing specifications for the Precision Vertical

Ultrasonic-Assisted Grinding Center: 1 complete set each.

(3) Supply test reports issued by authoritative third-party on the performance indicators of the Precision Vertical Ultrasonic-Assisted Grinding Center.

IV. Project Deadline: June 30, 2027.

V. Funding Allocation: 10 million RMB.

XI. 202411 Title of Technical Requirement: Development of Friction Stir Additive Process Equipment for High-Strength Aluminum/Titanium Alloy Structural Components

(I). Task Description:

Friction stir additive manufacturing (FSAM) represents an ideal technological solution for efficient, high-performance, and cost-effective production of aluminum and titanium alloy components. This project aims to develop and optimize key technologies including additive process control, specialized additive stirring tools, intelligent continuous feeding mechanisms, atmosphere protection devices, and optimization of additive process parameters for large-scale components. The ultimate goal is to achieve efficient manufacturing of high-strength aluminum and titanium alloy structural components.

(II). Key Performance Indicators:

(1) Equipment Capabilities:
The FSAM equipment must be capable of continuous solid-phase additive manufacturing for aluminum and titanium alloys, and shall enable online monitoring and process control of both force and temperature.

(2) Tool Lifespan:
Lifespan of tools used for aluminum alloy additive manufacturing: ≥ 1000 meters.
Lifespan of tools used for titanium alloy additive manufacturing: ≥ 100 meters..

(3) Component Strength and Quality:
The strength of aluminum alloy additive components shall be at least 70% of the original material's strength.
The strength of titanium alloy additive components shall be at least 80% of the original material's strength.
Additive components shall have a relative density of at least 99.9%, with no cracks, delamination, segregation, aggregation, non-metallic inclusions or other defects.

(4) Manufacturing Efficiency:
The equipment shall be capable of manufacturing components with maximum dimensions of no less than 3000mm x 4000mm x 1000mm.
The additive manufacturing efficiency shall be at least 8 kg/h for aluminum alloys and 2 kg/h for titanium alloys.

III. Deliverables:

(1) Develop and deliver a complete set of friction stir continuous solid-phase additive manufacturing equipment.

(2) Provide third-party performance test reports for the FSAM equipment.

(3) Provide third-party performance test reports for aluminum and titanium alloy additive components.

IV. Project Deadline: June 30, 2027.

V. Funding Allocation: 20 million RMB.

XII. 202412 Title of Technical Requirement: Development of Ultra-Wide FOV Integrated Intelligent 3D LiDAR Technology

(I). Task Description:

In the realm of intelligent robotics, the demand for 3D perception and interactive capabilities has experienced a significant surge. LiDAR, often referred to as the 'ocular system' of machine, plays a pivotal role in achieving perception-based mapping, obstacle detection, precise localization and navigation, and environmental context recognition. This project aims to address current challenges associated with 3D liDAR technology, including limited field

of view (FOV), unwieldy product dimensions, insufficient resistance to interference, and high costs. The project's approach involves the development of critical technologies, including highly integrated chip designs for discrete electronic components and multifunctional modules, as well as active anti-interference techniques based on optical coding.

(II). Key Performance Indicators:

(1) Field of View (FOV) Specifications:
Horizontal FOV: 360° with angular resolution < 0.6°
Vertical FOV: > 40° with angular resolution < 3°
Long-range visibility: > 30 meters at 10% reflectivity
Close-range visibility: < 0.15 meters

(2) Point Cloud Specifications:
Ranging frequency: ≥ 100 kHz
Azimuth scanning frequency: ≥ 5 Hz

(3) Accuracy Targets:
Ranging accuracy: ± 3.0 cm to 1σ (sigma)
Ranging precision: ± 3.0 cm

(4) Other Specifications:
Operational lifespan: ≥ 4000 hours
Anti-ambient light: Function under ≥ 100k Lux ambient light

(5) Dimension and Cost Requirements:
Volume: ≤ 0.25 dm^3
Product cost: ≤ 1000 RMB per unit.

III. Deliverables:

(1) Produce a complete set of products meeting key technical specifications.

(2) Provide a test report confirming compliance with all KPIs of the product.

(3) Supply certification documents issued by IEC60825 CB, Reach, RoHs, POPs, and California Proposition 65, along with an IP67 (or above) Rating Certification .

IV. Project Deadline: December 31, 2025.

V. Funding Allocation: 8 million RMB.