Implementing Arrangement Number 02

Delivery and Support

of a

10V Programmable Josephson Voltage Standard

(10V PJVS)

to the

Guidelines for a Cooperative Program in Physical Sciences

between the

TAIPEI ECONOMIC AND CULTURAL REPRESENTATIVE OFFICE IN THE UNITED STATES

and the

AMERICAN INSTITUTE IN TAIWAN

for

TECHNICAL COOPERATION

associated with

Delivery and Support of a 10V Programmable Josephson Voltage Standard

ARTICLE I - SCOPE

This Implementing Arrangement describes the cooperative scientific, technical, engineering and administrative activities to be undertaken by the American Institute in Taiwan (AIT) through its designated representative, the National Institute of Standards and Technology (NIST), to provide a 10V Programmable Josephson Voltage standard system and associated training and support (hereinafter referred to as the 10VPJVS). The 10VPJVS is a cooperative effort between the Taipei Economic and Cultural Representative Office in the United States (TECRO), through its designated representative the Center for Measurement Standards of the Industrial Technology Research Institute (ITRI) and AIT, through its designated representative NIST. This Implementing Arrangement pertains to the Guidelines for a Cooperative Program in Physical Sciences between TECRO and AIT (dated January, 1997, hereinafter referred to as the TECRO-AIT Guidelines) for Technical Cooperation associated with the Delivery and Support of a 10V Programmable Josephson Voltage Standard and is a part of the TECRO-AIT Guidelines.

ARTICLE II - AUTHORIZATION

The activities described in this Implementing Arrangement will be carried out under the general terms and conditions established by the TECRO-AIT Guidelines. The TECRO-AIT Guidelines were entered into by the parties pursuant to the Taiwan Relations Act of April 10, 1979, Public Law 96-8 (22 USC 3301 et seq.).

ARTICLE III - SERVICES

The 10VPJVS provides TECRO's designated representative, ITRI, through the Center for Measurement Standards, with a state-of-the-art adjustable voltage reference and measurement system for use in calibrating instruments and for participating in international voltage measurement intercomparisons. The ongoing success of the 10VPJVS is dependent on technical cooperation and technology transfer between the designated representatives of TECRO and AIT in accordance with the terms and conditions of the TECRO-AIT Guidelines, this Implementing Arrangement, and future Implementing Arrangements to be agreed upon by the parties.

The technical cooperation to be undertaken under the auspices of this Implementing Arrangement is defined by the tasks described in the attached Statement of Work. Task details, including specific work to be performed, performance period, and estimated cost for each task are contained in the attached Statement of Work.

ARTICLE IV - FINANCIAL PROVISIONS

TECRO will reimburse AIT and AIT will make necessary arrangements to transfer such funds to its designated representative, NIST, for all costs incurred in association with this Implementing Arrangement. NIST's costs for this technical, as well as training and delivery schedules, are included in the Statement of Work. The deliverables are divided into two parts, and ITRI has agreed to payment in advance prior to NIST beginning work on these parts.

ARTICLE V - INTELLECTUAL PROPERTY CONSIDERATIONS

The deliverables produced under the auspices of this Implementing Arrangement shall be the sole property of TECRO and its designated representative, ITRI. AIT's designated representative, NIST, shall have the right to reference these documents in scientific publications and other reports as necessary. Any intellectual property solely created by NIST will remain the property of NIST. Pursuant to 17 USC 105, any work of a Federal employee is not subject to copyright in the United States and shall be in the public domain.

TECRO and its designated representative, ITRI, own deliverables under this Implementing Arrangement including a copy of the NIST software, which grants them a license for full use of the NIST software in the 10VPJVS. The NIST software remains the intellectual property of AIT's designated representative, NIST.

ARTICLE VI - CONFIDENTIAL AND/OR PROPRIETARY INFORMATION

No proprietary information will be exchanged during this Implementing Arrangement. Additionally, AIT's designated representative, NIST, may refuse to receive any information at any time, and TECRO's designated representative, ITRI shall honor such request.

ARTICLE VII - EFFECTIVE DATE, AMENDMENT, AND TERMINATION

This Implementing Arrangement takes effect on the date of signature and the completion time of tasks described in this Implementing Arrangement is within 34 months after ITRI receives the invoice from NIST. This Implementing Arrangement may be amended and/or terminated in accordance with the terms and conditions of the TECRO-AIT Guidelines.

FOR THE TAIPEI ECONOMIC AND CULTURAL REPRESENTATIVE OFFICE IN THE UNITED STATES	FOR THE AMERICAN INSTITUTE IN TAIWAN
Name of person signing	Name of person signing
Deputy Representative	Managing Director
Position	Position
July 6, 2010	6/30/2010
Date	Date

Statement of Work

Associated with
Implementing Arrangement Number 02

Delivery and Support of a
10V Programmable Josephson Voltage Standard

Subject to the TECRO-AIT Guidelines between the
Taipei Economic and Cultural Representative Office in the United States
and the
American Institute in Taiwan
for Technical Cooperation associated with
Delivery and Support of a 10V Programmable Josephson Voltage Standard

Objectives: AIT's designated representative, NIST, will construct one Programmable Josephson Voltage Standard System (PJVS), provide training on it at NIST in Boulder, and deliver it to TECRO's designated representative, ITRI. NIST has already developed similar prototype systems for its own use. The PJVS constructed for ITRI will be based on the latest NIST system design that is state-of-the-art in 2010. Some components will be fabricated by NIST according to existing and established fabrication protocols, and will meet performance specifications comparable to those expected for the NIST PJVS. Where components are commercially available, NIST will use components that are the same or equivalent to those used in existing NIST systems. Training in the maintenance and use of this PJVS will be on-site at NIST in Boulder. The cost to procure or fabricate components, to assemble and test the completed system, to train a new operator, and to provide consultation and support have been determined by prior experience.

Within 7 months after NIST receives the first payment

1) Research and development to improve the chip and system design for improved operating margins and performance.
2) Acquisition of commercial instrumentation and construction of custom hardware, including output driver amplifiers and cryoprobe.
3) Testing and selection of 10V PJVS chip.
4) Cost: $99,000.

Within 34 months after ITRI receives the invoice from NIST

1) Acquire liquid He dewar, flex bond chip and complete system integration, including software user interface. Detailed system description is described below.
2) Thirty days training in Boulder, beginning after the system is constructed, as determined through mutual scheduling discussion between ITRI and NIST researchers. Travel costs for this training are not included in this proposal.
3) Preparation of 10V PJVS system delivery. ITRI will provide and arrange for "EX-WORKS Boulder" shipping and insurance.

4) Technical assistance, consultation and support as needed within 34 months after ITRI receives the invoice from NIST, including up to 3 replacement chips.

Cost: $125,000.

Description of delivered system:

10 V Programmable Josephson Voltage Standard

The purpose of the PJVS is to generate a set of stable, quantum-accurate, programmable voltages over the range from –10 V to +10 V. The system will be designed, built, and tested by NIST. The system will include the item description listed below, including operator training to be performed at NIST. NIST will not provide a microwave source (Agilent E8257D) or nanovoltmeter (Agilent 34420), because they both will be provided by ITRI.

Primary technical specifications are:

1) Operating voltage range –10 V to +10 V and >1mA operating margins.
2) Operating frequency range DC to 500 Hz.
3) Operation in 100 liter liquid helium storage dewar (with 0.5 inch diameter auxiliary fill port and helium level meter).
4) Desktop computer controlled automation software for Labview (license not included).

Item	Major Components	Qty
01	Flex-packaged 10 V JJ array chip	1
02	Cryoprobe	1
03	DC programmable bias electronics	1
04	Microwave amplifier	1
05	Microwave cables and connectors kit	1
06	Agilent 33250A arbitrary waveform generator	1
07	Desktop PC with Windows XP	1
08	19" Flat Panel LCD Monitor	1
09	AC-PJVS control software (executable and source-code on CD, does not include Labview license)	1
10	GPIB-USB-HS, NI-488.2 for Windows Vista/2000/XP	1
11	3each-Type X2 double-shielded GPIB cable, (various lengths)	1
12	100 liter liquid helium dewar, with 0.5 inch diameter auxiliary fill port and helium level meter)	1

Total cost of Research proposal and delivered system: $224,000 USD

Bill to: ITRI through AIT
1700 N. Moore Street
Suite 1700
Arlington, VA 22209
Tel: 703-525-8474
Fax: 703-841-1385

Ship directly to: ITRI
Center for Measurement Standards
Industrial Technology Research Institute
E100, Bldg. 16, No. 321, Section 2,
Kuang Fu Road
Hsinchu, 30011, Taiwan
Tel: 886-3-573 2114
Fax: 886-3-572 6445

Proposed payment and delivery details:

- **Total Price:** $224,000 expressed in U.S. Dollars.
- **Shipping Terms:** Net 45 days, EX-WORKS Boulder
- **Payment terms: Cash in Advance** - through TECRO and AIT, wire transfer to NIST, in two payments of $99,000 and $125,000. Work cannot commence until first payment is received, which must be within one month after ITRI receives the invoice from NIST to ensure completion of first stage of development. Second payment must be received within 7 months after the first payment in order to begin second development stage.
- **Destination Airport**: In Taiwan, location to be determined.
- **Mode of Transport and Shipment Instructions:** EX-WORKS Boulder. ITRI assumes all shipment responsibilities, including air transportation and insurance, upon pick up at Boulder.
- **Delivery time:** The system construction will be completed within 10 months after the first payment. Training to begin after the system is constructed. System will be ready for pick up in Boulder within 30 days from completion of training. Estimated delivery time (at NIST, Boulder pickup) is one year after the first payment.
- **Technical Assistance:** Training for system operation will be provided in Boulder as well as consultation and support as needed within 34 months after ITRI receives the invoice from NIST.
- **Exporter:** NIST, 325 Broadway, Boulder, CO 80305
  Phone: 303 497-3670
- **Quote Expiration Date:** 09/30/2010
- **Period of Performance:** End date is 34 months after ITRI receives the invoice from NIST.