



## SPECIFICATION

### High efficiency introduction system

#### 1. Scope

This Specification describes the requirements a new generation hydrofluoric acid resistant high efficiency sample introduction for introducing uranium and plutonium solutions at ultra-trace concentration levels into a Neptune Plus multi-collector ICP-MS (MC-ICP-MS) instrument (hereinafter referred to as “the system”).

#### 2. Definitions, Acronyms, and Abbreviations

The following definitions, acronyms, and abbreviations shall apply throughout this Specification unless defined otherwise hereinafter:

MC-ICP-MS shall mean Multi-collector Inductively Coupled Plasma Mass Spectrometer;

HF shall mean Hydrofluoric Acid;

HNO<sub>3</sub> shall mean Nitric Acid; and

QC shall mean Quality Control

#### 3. Requirements

##### 3.1. Functional and Performance Requirements

The System shall meet the following functional and performance requirements:

- a) Compatible with self-aspirating PFA nebulizer (sample uptake rate of ca 100  $\mu$ L/min) provided by either Saville Corporation or Elemental Scientific;
- b) Increases sensitivity by a minimum of 5 times and up to 20 times in comparison to conventional sample introduction systems, for instance; sensitivity for U-238 shall be greater than 8 Mcps when aspirating a 1ng/ml natural uranium solution at a flow rate of ca. 0.1ml/min (measured with MC-ICP-MS Neptune Plus, Thermo Fisher Scientific, Germany); and
- c) The full tuning and control of the system shall be performed using specific software on a computer.

##### 3.2. Technical Requirements

The System shall meet the following technical requirements:

- a) Heated PFA spray chamber for high sample transport efficiency
- b) Heated PTFE membrane desolvator for lowest oxide and hydride levels;
- c) Two built-in remote controlled gas mass-flow controllers calibrated for nitrogen gas and for argon sweep gas;
- d) Two adjustable remote controlled temperature controllers with temperature indication for spray chamber and membrane desolvator;

- e) Built-in acid resistant spray chamber drain pump; and
- f) The software shall be compatible with the Neptune Plus MC-ICP-MS software.

#### **4. Marking**

The System shall have all safety markings in English language.

#### **5. Packing**

The System, for the shipment to the IAEA, shall be packed in accordance with international standards that are applicable for the shipment of this kind of equipment.

#### **6. Quality Requirements**

- 6.1. The System shall be manufactured, shipped and installed in accordance with the Contractor's ISO quality assurance system or an equivalent quality assurance system.
- 6.2. The Contractor shall document the compliance with this quality assurance system.

#### **7. Testing and Acceptance**

The System, prior to shipment, shall be tested for conformance of the System with manufacturer's performance specifications and the minimum requirements specified herein.

The results of the testing of the System shall be documented by the Contractor in an acceptance protocol that shall be signed by the IAEA.

#### **8. Installation and Training**

The System shall be installed and connected to the Neptune Plus MC-ICP-MS at the IAEA Environmental Sample Laboratory in Seibersdorf, Austria.

The Contractor shall provide one day training for up to three staff of the IAEA in the operation and maintenance of the System at the IAEA Seibersdorf location immediately after the installation of the System.

#### **9. Deliverable Data Items**

The Contractor shall provide two complete sets of operation and servicing manuals and technical drawings in the English language.

The Contractor shall provide a list of all spare parts and reference.

The Contractor shall provide a cleaning kit and a set of spare part for 1 year of operation.