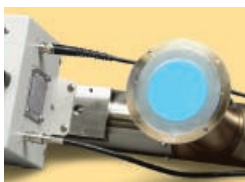


The Thermo Scientific API 120 is a compact, portable neutron generator for elemental analysis using the associated particle imaging (API) technique.

## Thermo Scientific API 120

A compact, portable neutron generator for associated particle imaging



### Applications

- Explosive detection
- Buried land mines
- Chemical weapons
- UXO analysis
- Drugs detection
- *In-Vivo* body composition

Inelastic scattering reactions are the basis for elemental imaging using the API technique. When 14 MeV neutrons are produced by the D-T reaction, an associated 3.5 MeV alpha particle is emitted that is correlated in time and space with the neutron. By detecting the correlated alpha particle, the direction of the associated neutron can be localized in a narrow "beam."

Neutrons in the "beam" interact through prompt inelastic scattering ( $n, n'\gamma$  reaction) with the elements in the material under investigation and emit gamma rays. A user-supplied time-of-flight system can determine the time between the detection of the alpha particle and the recording of the gamma ray by a photon detector such as a NaI scintillator. This time difference determines the distance traveled by the neutron before interacting with the element and producing the gamma ray.

Since the gamma rays are characteristic of individual elements, information about both the elemental composition and spatial distribution of the elements are simultaneously available.

Detection of an alpha particle requires that an alpha detector be built into the neutron tube. This places stringent requirements on the alpha detector material in that it must withstand the temperatures used in processing the neutron tube without introducing contaminants into the tube.

### Features

- Associated particle imaging
- Portable, compact; less than 15 kg (33 lb)
- Digital electronics for operational flexibility
- Low power, less than 50 watts

The base scope of the neutron generator includes the alpha detector, in the form of a fiber optic plate coated with scintillator material (either P-47 or ZnO:Ce), top-coated with aluminum. Alternately, the customer may prefer to specify and procure their own alpha detector. For compatibility with our processing, customer-provided detectors cannot contain organic or volatile materials and they need to be able to withstand high temperatures.

### Thermo Scientific API 120 Neutron Generator

#### Technical Specifications

Neutron Yield	2.0E+07 n/s
Neutron Energy	14 MeV
Subtended Neutron Angle	~60 degrees, others available
Typical Lifetime	1,200 hours @ $1 \times 10^7$ n/s
Operating Mode	Continuous only
Maximum Accelerator Voltage	90 kV
Maximum Beam Current	50 $\mu$ amps
Power Supply	Integral
Neutron Module	7.62 cm (3 in) diameter
Control Module	Integral, digital
Safety Features	Keylock: on/off Emergency: on/off Normal-open and normal-closed contacts Pressure switch
Total Weight	15 kg (33 lb)
Remote Control	RS-232/RS-422 (optional)

#### General Specifications

Software	Open source text or GUI
Electronics	Radiation tested to 80,000+ hours
Configuration	OEM-type available
Analysis Methods	Inelastic scattering, associated particle imaging
Generator Characteristic	Continuous output, built-in Alpha detector

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