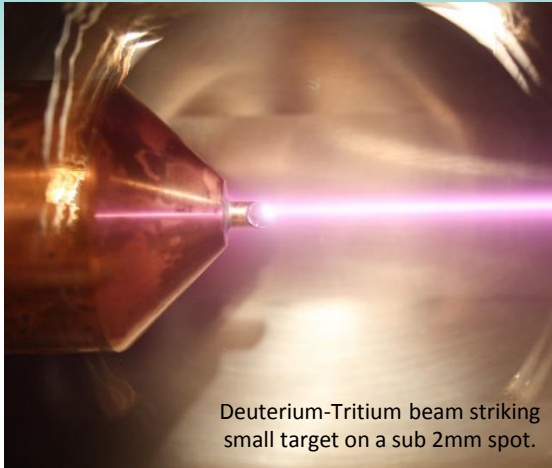




# Adelphi Technology Inc.

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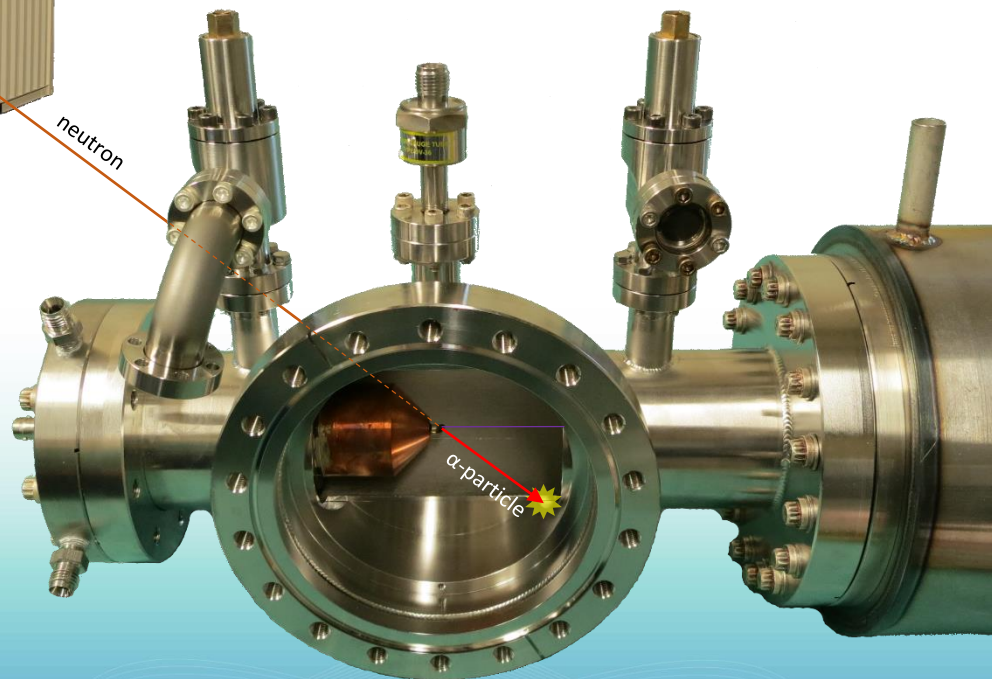
## Associated Particle Imaging (API) Neutron Generator



This Deuterium-Tritium\* (D-T) sealed system neutron generator is tailored for use as part of an Associated Particle Imaging system. The generator is 'powered' by our high efficiency Electron Cyclotron Resonance (ECR) ion source. The ions are accelerated to a small target where the D-T nuclear fusion reaction occurs. This reaction yields a neutron and an  $\alpha$ -particle, which propagate in opposite directions. The  $\alpha$ -particle is the 'associated particle' and causes a flash of light on a phosphor screen which can be detected, for example, using an image intensified camera. The direction of propagation of the neutron is deduced by projecting a line from the flash of light on the phosphor screen through the target to the object scene. The neutron from the D-T reaction interacts with the scene or object being viewed. When it does so,  $\gamma$ -rays can be emitted. Any  $\gamma$ -rays that are detected at the moment that the flash of light occurs on the scintillator, are assumed to originate from the neutron associated with the scintillator event. Adelphi Technology's API neutron generator is a key component in API systems. The very small target size results in the capability of high resolution imaging.



Target scene to be investigated using API

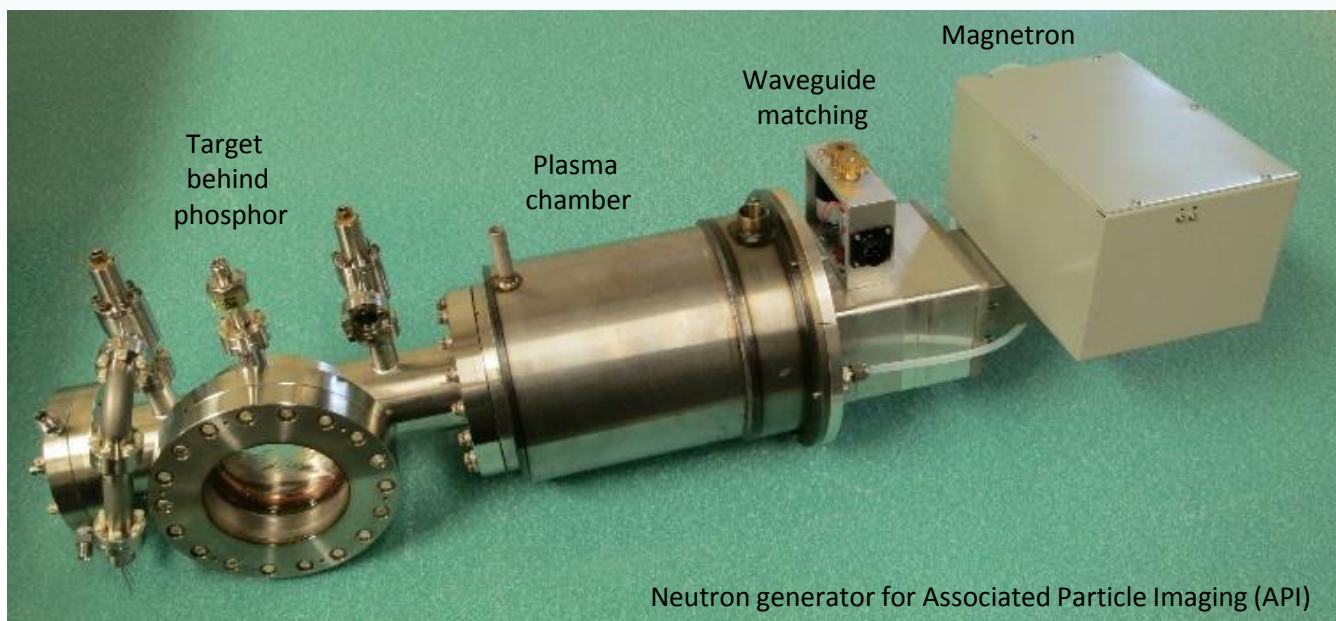


$\gamma$ -ray detectors to be used as part of an API system

- Phosphor placed in vacuum flange (above)
- Position of spot on phosphor provides neutron propagation direction
- $\gamma$ -ray detectors can then be synchronized with the optical signal from the phosphor

## ***Associated Particle Imaging Neutron Detector***

The generator is ideal for making a mapped image of gamma emission from fast neutron scattering. Both the API neutron generator and a gamma detector for detection of the activated or scattered gamma radiation (e.g. HPGe) can be located on one side of an object to be imaged, greatly simplifying the setup. The combination of neutron,  $\alpha$ -particle and  $\gamma$ -ray detection allows for the possibility of the imaging and identification of distant and concealed objects such as contraband and special nuclear materials.



The API generator is a sealed source, DT generator with an output of up to  $10^8$  neutrons/second. The generator uses a high efficiency Electron Cyclotron Resonance (ECR) ion source which is driven by a microwave magnetron. The ion beam is accelerated towards the small target by approximately 100 kV. The target spot size is very small, less than 2 mm which is important for ensuring the highest possible resolution image.

For further details and to discuss your application, please contact us at [info@adelphitech.com](mailto:info@adelphitech.com)

*\* Tritium is a radioactive gas. The U.S. Nuclear Regulator Commission regulations require that US customers possess a license authorizing possession of tritium. Further details of licensing requirements are available at <http://www.nrc.gov>*



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