# Mobile QTOF Trace Detector with Low Temperature Plasma Ion Source for the Detection of Explosives

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## Aim

The intention was to develop a novel plasma ionisation source which could be coupled with analytical instruments for the detection of explosives from searches of buildings and areas.

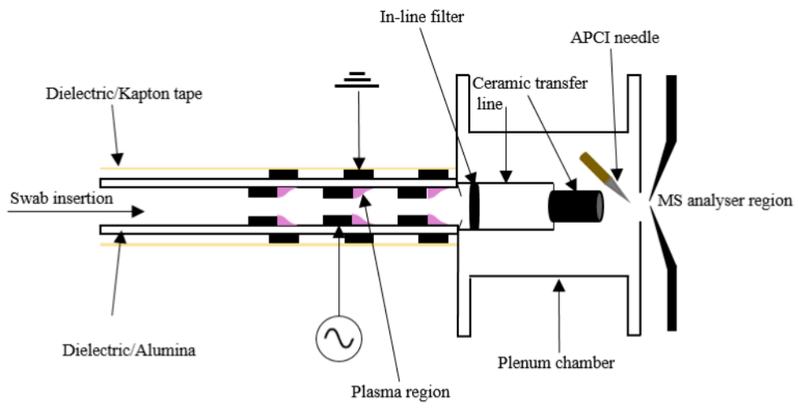


**Figure 1: Schematic of DBD ionisation source with plenum chamber and APCI needle**

## DBD Ion Source

The dielectric barrier discharge (DBD) ion source consists of two alumina sheets, each with 3 'plasma actuators'. It produces an 'ionic wind', propelling ions towards the mass spectrometer.

## Project Summary

A working prototype of a (DBD) plasma ion source was developed and successfully integrated to both a Sciex API 2000 and a Sciex X500R QTOF. The DBD ion source operates in air without the need for additional gases or adduct forming reagents.

**Explosives of four different types were detected at low levels of detection (LODs) in both polarities; RDX 100 pg, PETN 100 pg, HMTD 1 ng, TNT, 5ng.**

## X500R QTOF

The X500R QTOF provides the ability to detect unknown substances, not just pre-determined targets by utilising a new method of analysis, known as SWATH. SWATH generates a TOFMS scan of precursor masses . The mass range is divided into 'windows', and ions in each window are fragmented. This makes it possible to derive structural information and allow simultaneous identification of a virtually unlimited number of compounds with extremely high confidence.

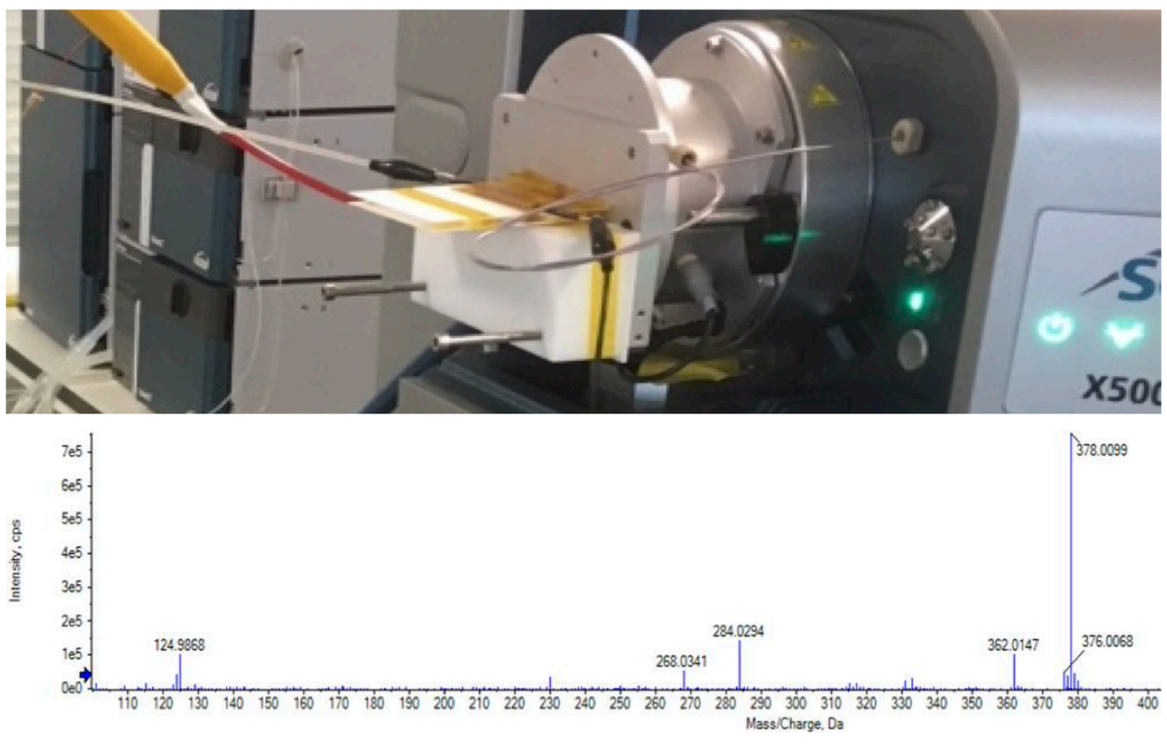


**Figure 2: DBD integrated to Sciex X500R QTOF (top) and a TOF MS scan from a swabbed glass slide contaminated with Semtex (bottom)**

## Conclusions

The DBD demonstrated a low LOD across all explosive types studied from multiple surfaces and swabbing media. It operates without any solvents, gases or adduct forming reagents. This in turn reduces environmental impact, consumable costs and sample preparation; whilst increasing sample throughput and detection confidence levels. Equally, it may be possible to integrate the DBD to cheaper analytical techniques (e.g. ion mobility).

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