



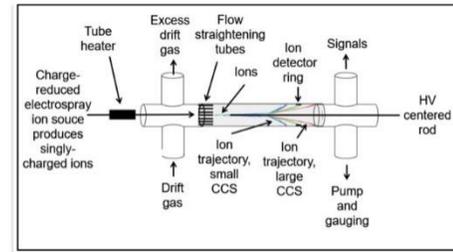
# Ion Mobility Spectrometry

Based on the current industry drive for accelerated drug development, there is heightened need for screening native protein and other biological modalities. Atmospheric pressure Ion Mobility Spectrometry (IMS) is an emerging analytical technology that addresses this challenge. IonDX Inc. has developed a bench-top analytical system, IMgenius™, based on this technique.

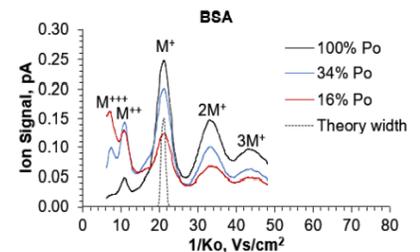
Our patented spectrometer simultaneously measures five important attributes of biotherapeutics:

- Size distribution
- Structural heterogeneity
- Stability
- Comparability
- Purity

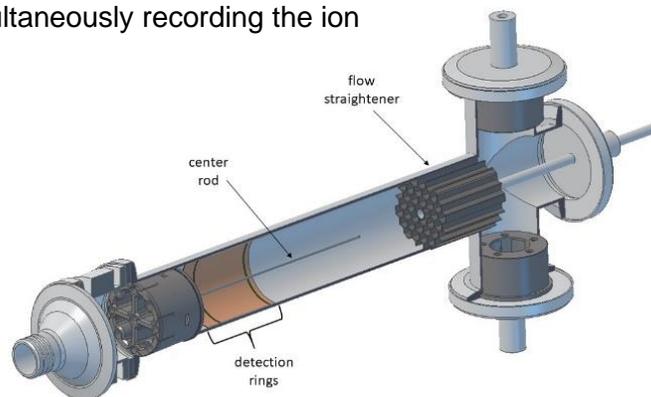
A critical design feature of IMgenius system is charge reduction. A charge-reducing electrospray ion source (Fig. 1) is connected to the inlet of the spectrometer. The electrospray ion source houses a Polonium source. Alpha particles released by the decaying Po generate a cloud of bi-polar air ions which effectively reduce the charge on electrospray droplets to a single charge. Reducing the charge on electrospray ions provides a way to study ions in their near native conformation and precludes coulombic distortion of the ions that accompanies highly-charged electrospray ions. A shutter control provides a way for users to control the amount of charge reduction (Fig.2). Charge reduced ions land on detector rings (shown below) that have a custom-designed electrometer attached to them. "Scans" are generated by applying voltage onto the center rod while simultaneously recording the ion current.



**Figure 1.** A simplified schematic of the ion mobility spectrometer, as operated in fixed voltage mode. The colored lines represent singly-charged antibody light chains (light blue), antibody heavy chains (dark blue), antibody monomers (green) and antibody dimers (red).



**Figure 2.** Mobility spectra of BSA, including an inserted peak (dashed line) showing the theoretical resolution of the instrument. Resolution at  $1/K_o = 21$  is 20. The 100, 34, and 16 percentage values in the legend correspond to no aperture, a 34 percent transmitting aperture and a 16 percent transmitting aperture, respectively, that blocked alpha particles released by the sealed Po source.



## Native protein analysis

Non-denaturing method that preserves native structures of biological samples

## Charge-reduced electrospray

Efficient charge neutralization that utilizes a soft ionization process

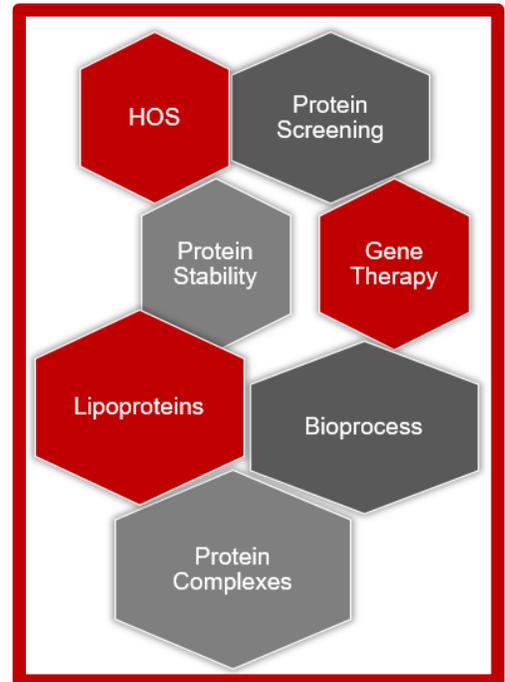
## <5-minute analysis time

Average scan time of 2-5 mins with minimal sample preparation that utilizes simple buffer exchange



IonDX's industry-wide collaborations have allowed us to develop analytical solutions across many classes of biotherapeutics, including the characterization of:

- non-covalent protein complexes
- high molecular weight aggregates
- megadalton mRNA
- plasmid DNA
- glycoproteins
- CRISPR-Cas
- virus particles
- lipid nanoparticles



## Simple, easy to use

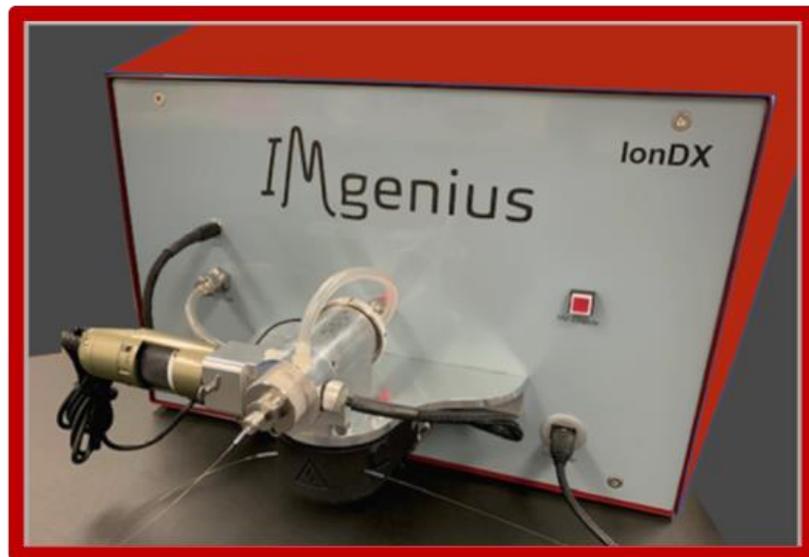
No calibration required and minimal instrument training/maintenance

## No special laboratory requirements or modifications

Atmospheric-pressure based hence no vacuum needs and lab requirements

## Quick results

Results generated instantaneously on Ion Browser™ software



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