

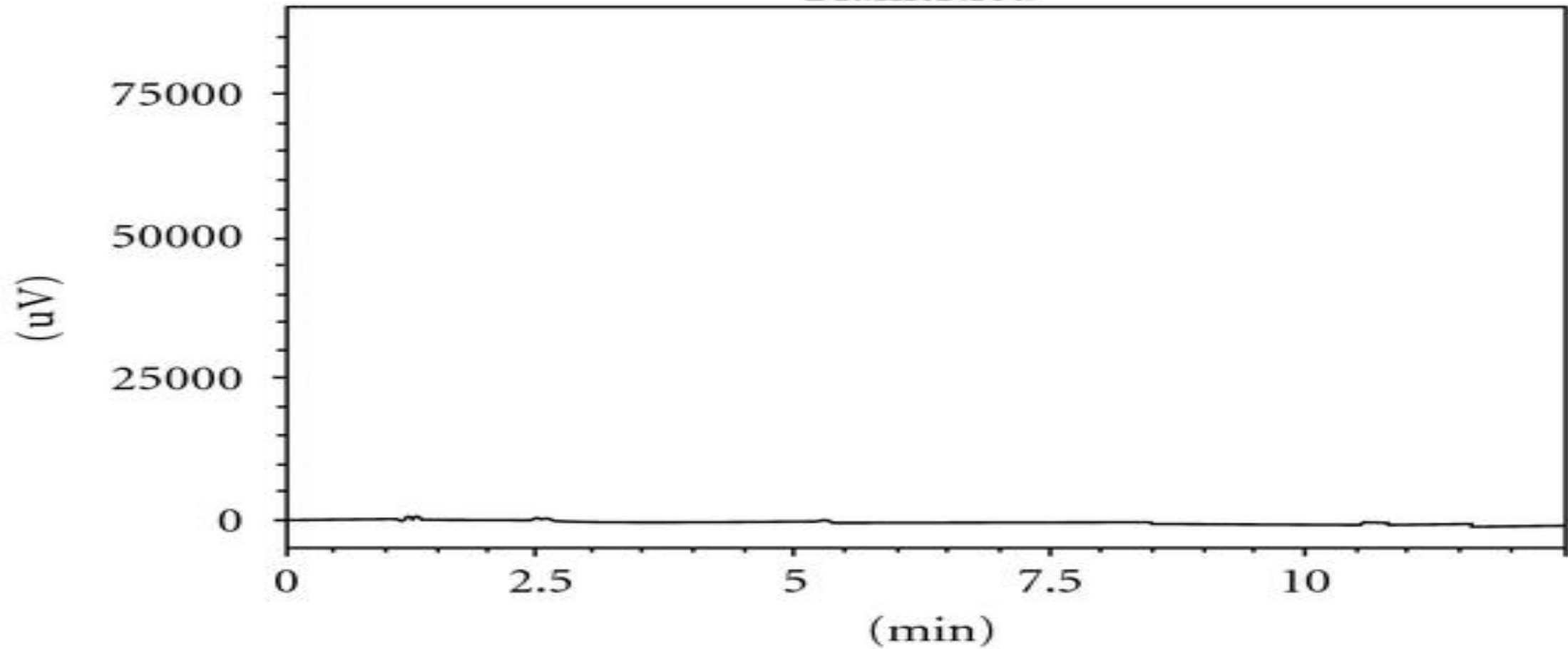


# Welcome to today's' Environmental Analysis Summit

Advancements in Universal Detection for Liquid Chromatography  
- Charged Aerosol Detection -



Summary (compound)  
Blank1.lcd



- There are known knowns. These are things we know that we know. There are known unknowns. That is to say, there are things that we know we don't know. But there are also unknown unknowns. There are things we don't know we don't know.
- Donald Rumsfeld

- Introduction to Charged Aerosol Detection
- CAD History and Success Story
- Applications and Publications
- Unique Applications for the Pharmaceutical Industry
- Inverse Gradient Solution for Uniform Response
- Quantification and Confirmation Solution for Impurities



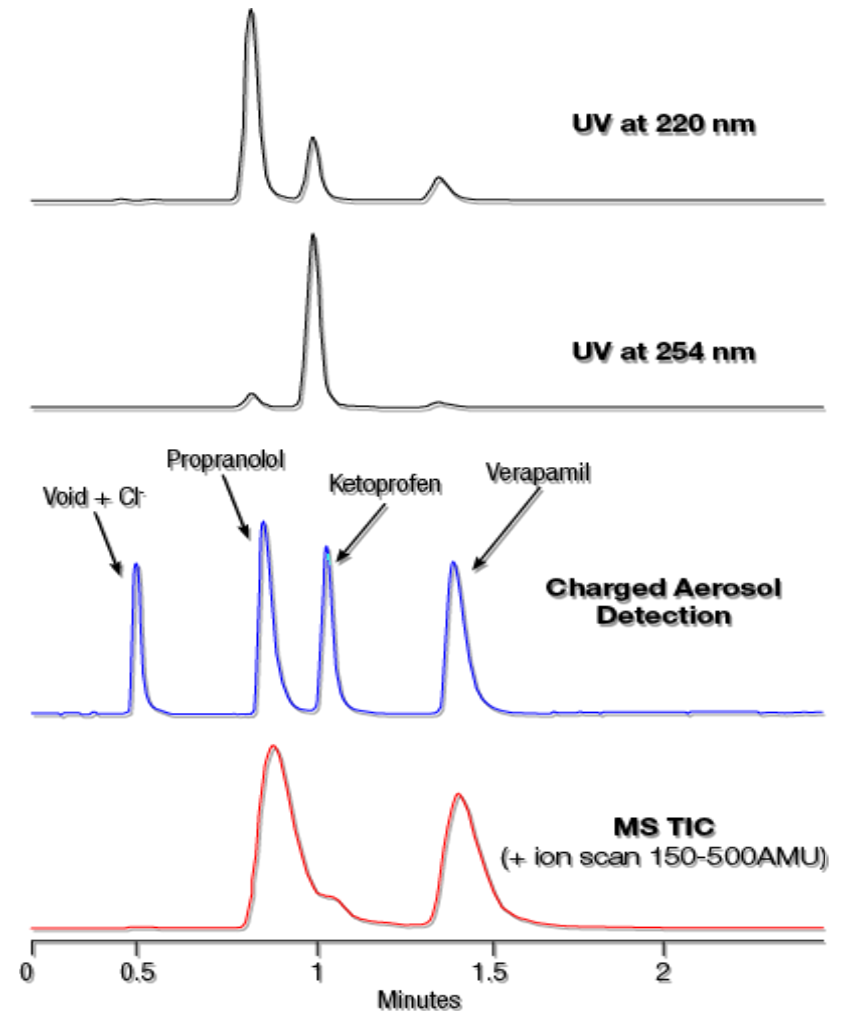
Vanquish System with LightPipe DAD and CAD

# Universal Detection in Liquid Chromatography

- Universal detector (in chromatography) IUPAC definition
  - “A detector which responds to every component in the column effluent (eluent) except the mobile phase”
  - LC - wide diversity of column eluents (solvents, additives, contaminants)
- Uniform (or universal) response
  - Equivalent magnitude of response vs. analyte amount among a wide diversity of analytes
- Need some level of selectivity – analyte vs. eluent
  - If eluent (e.g., acetonitrile) and analyte are both detected and with comparable sensitivity, then little to no useful (differential) signal is obtained
  - LC aerosol detectors – selectivity is based solely on relative volatility

# Introduction to Charged Aerosol Detection

- Used to quantitate any non-volatile and most semi-volatile analytes with LC
- Provides consistent analyte response independent of chemical structure
- Neither a chromophore, nor the ability to ionize, is required for detection
- Dynamic range of over four orders of magnitude from a single injection (*sub-ng to  $\mu\text{g}$  quantities on column*)

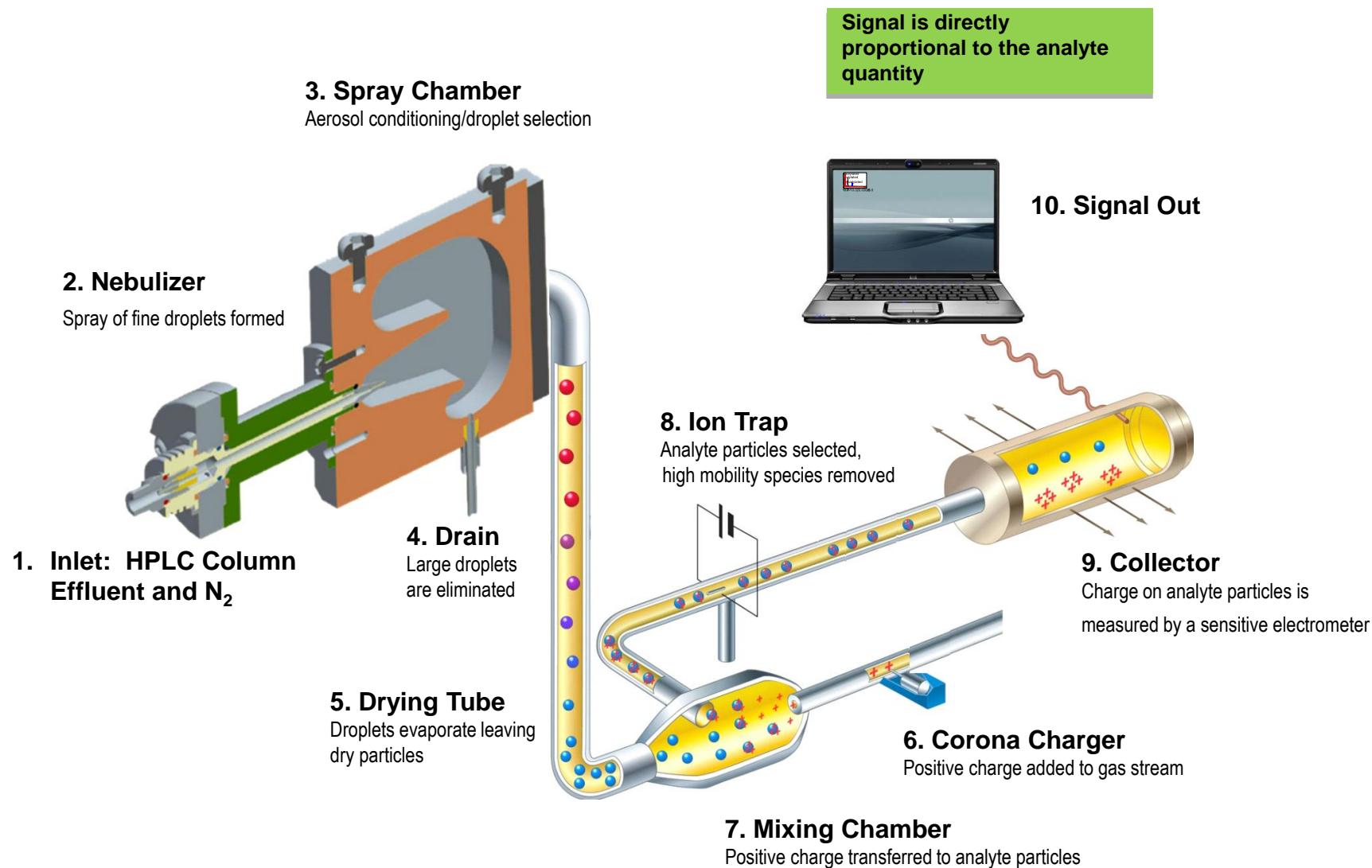


Comparison of Charged Aerosol Detection to UV and MS

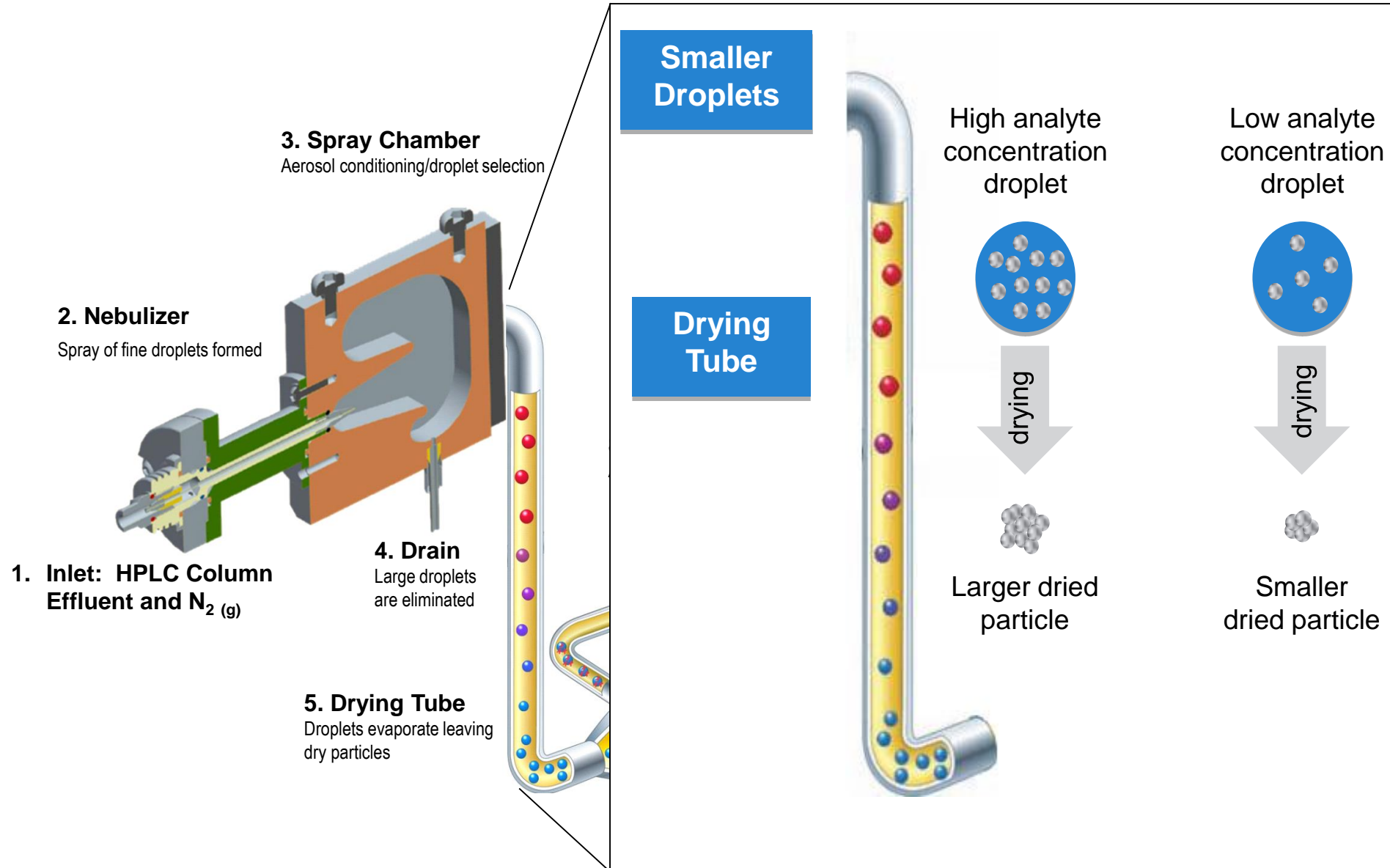
# Introduction to Charged Aerosol Detection - Key concepts



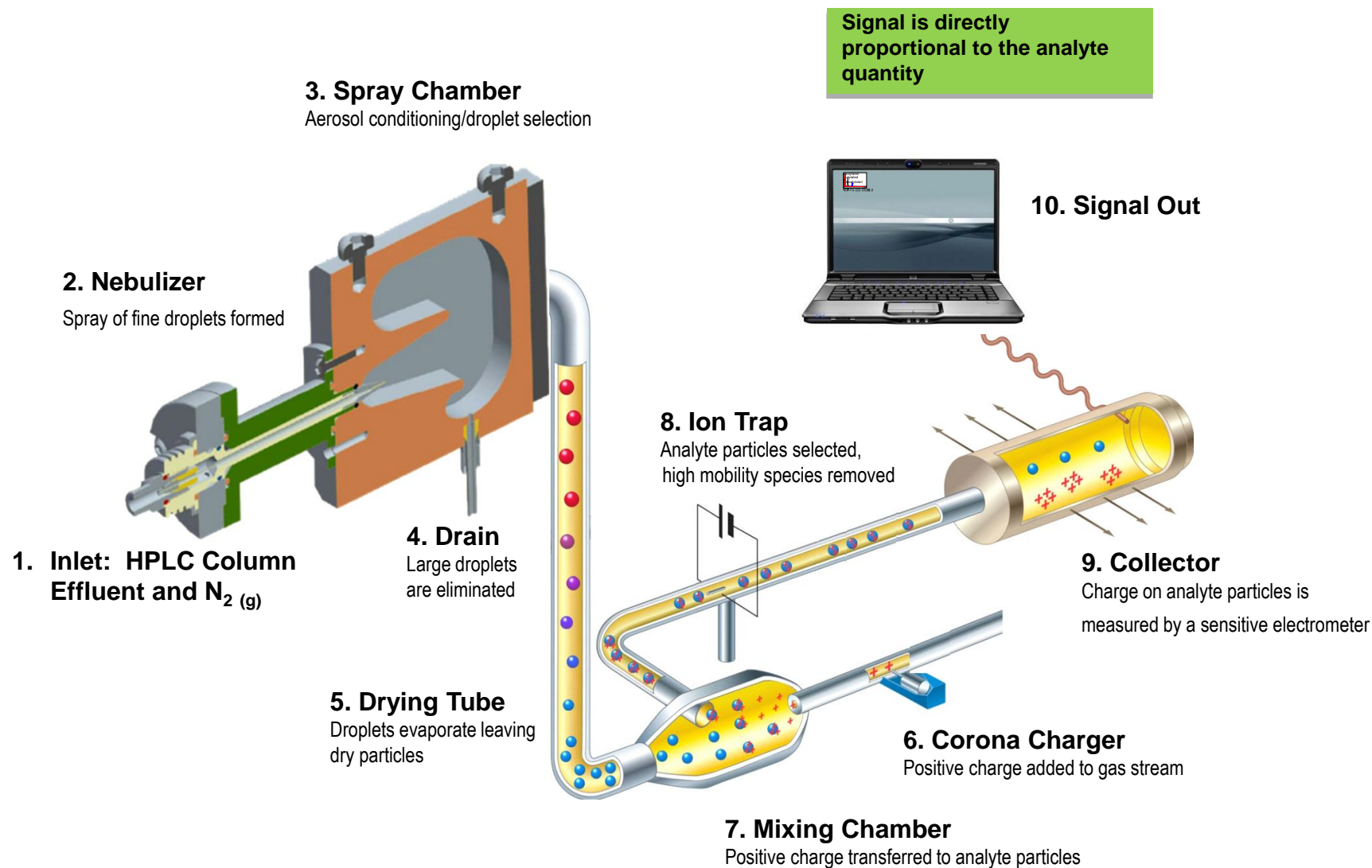
# How the Charged Aerosol Detection Technology Works



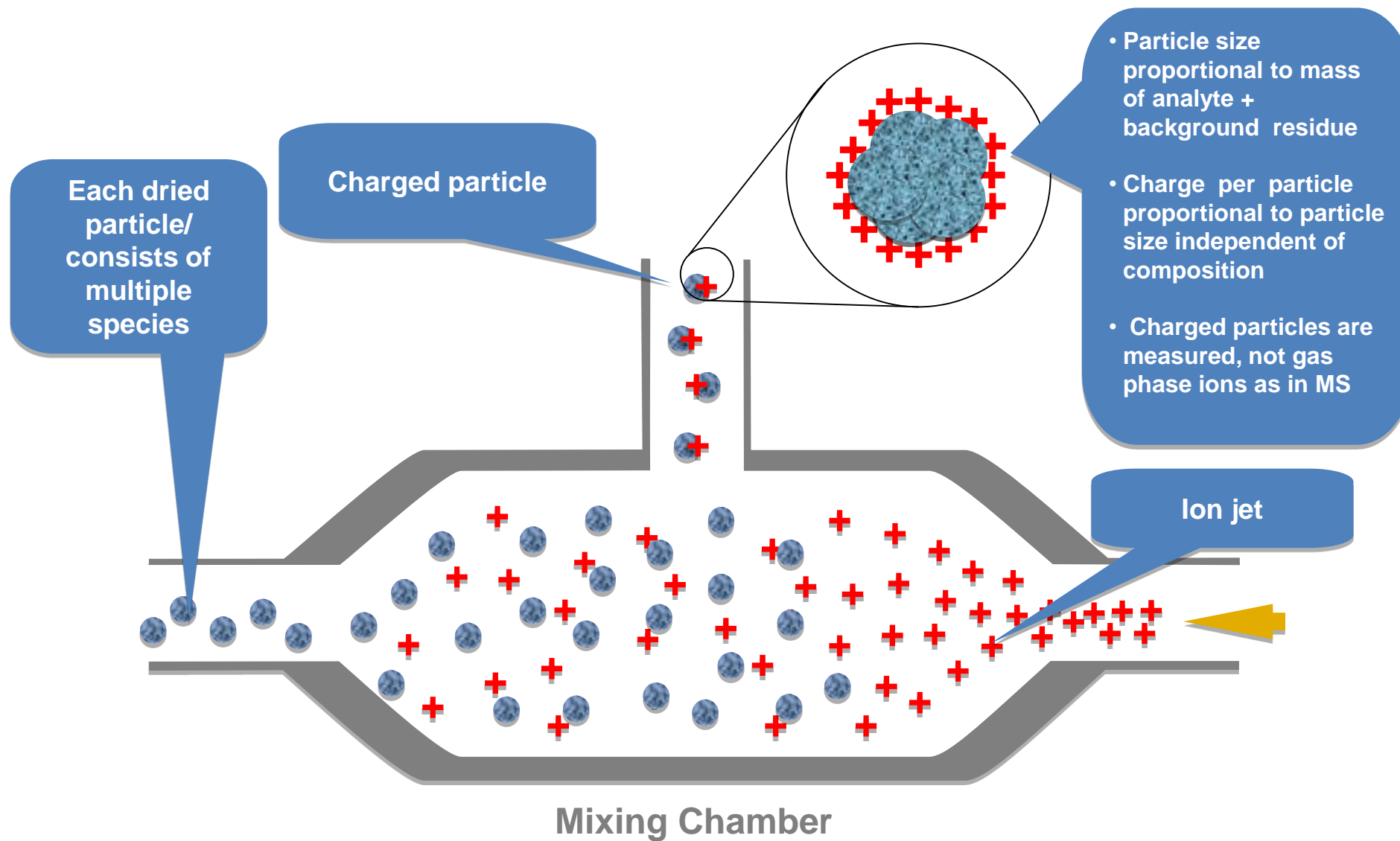
# How the Charged Aerosol Detection Technology Works



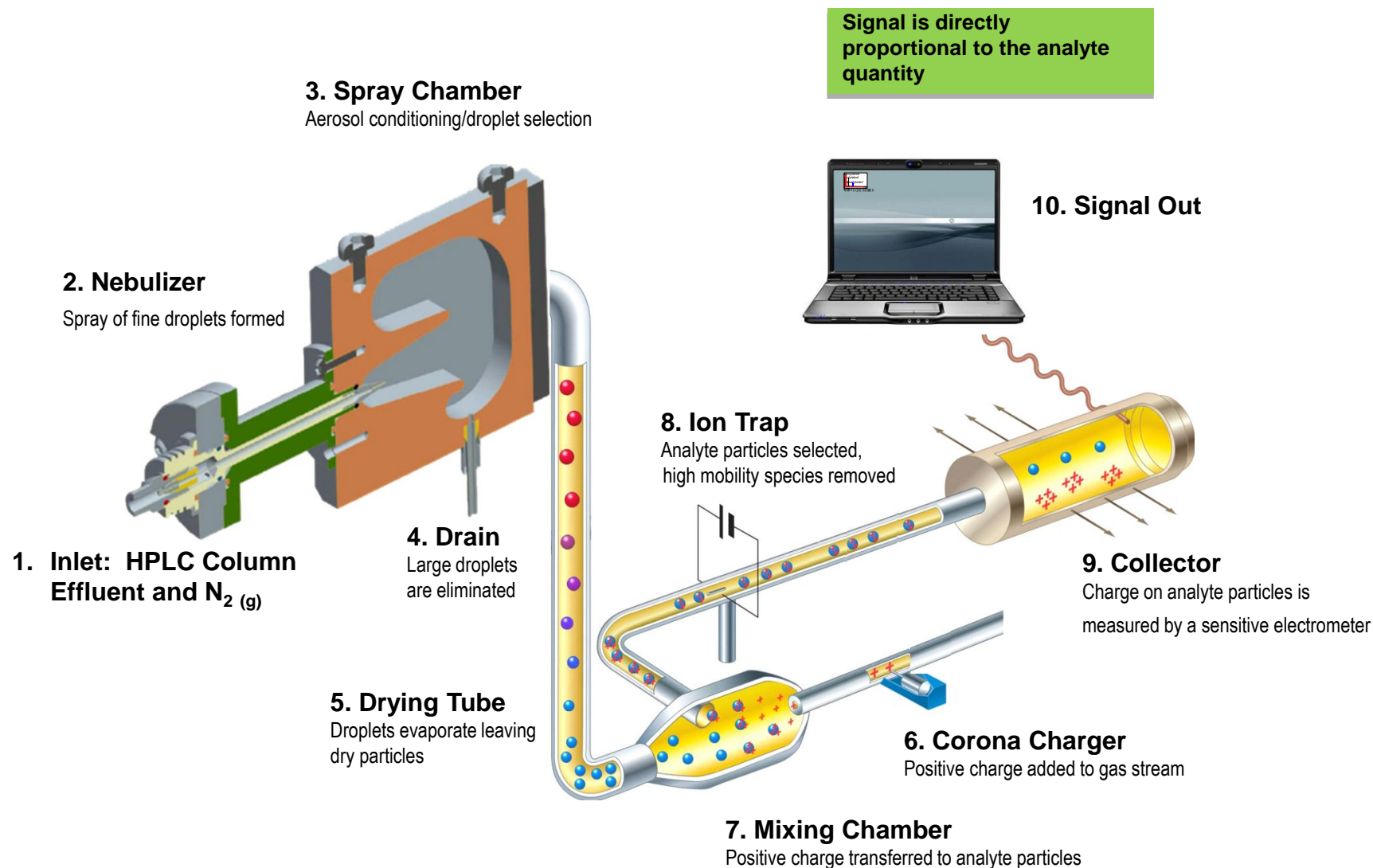
# How the Charged Aerosol Detection Technology Works



# Particle Charging for Charged Aerosol Detection



# How the Charged Aerosol Detection Technology Works

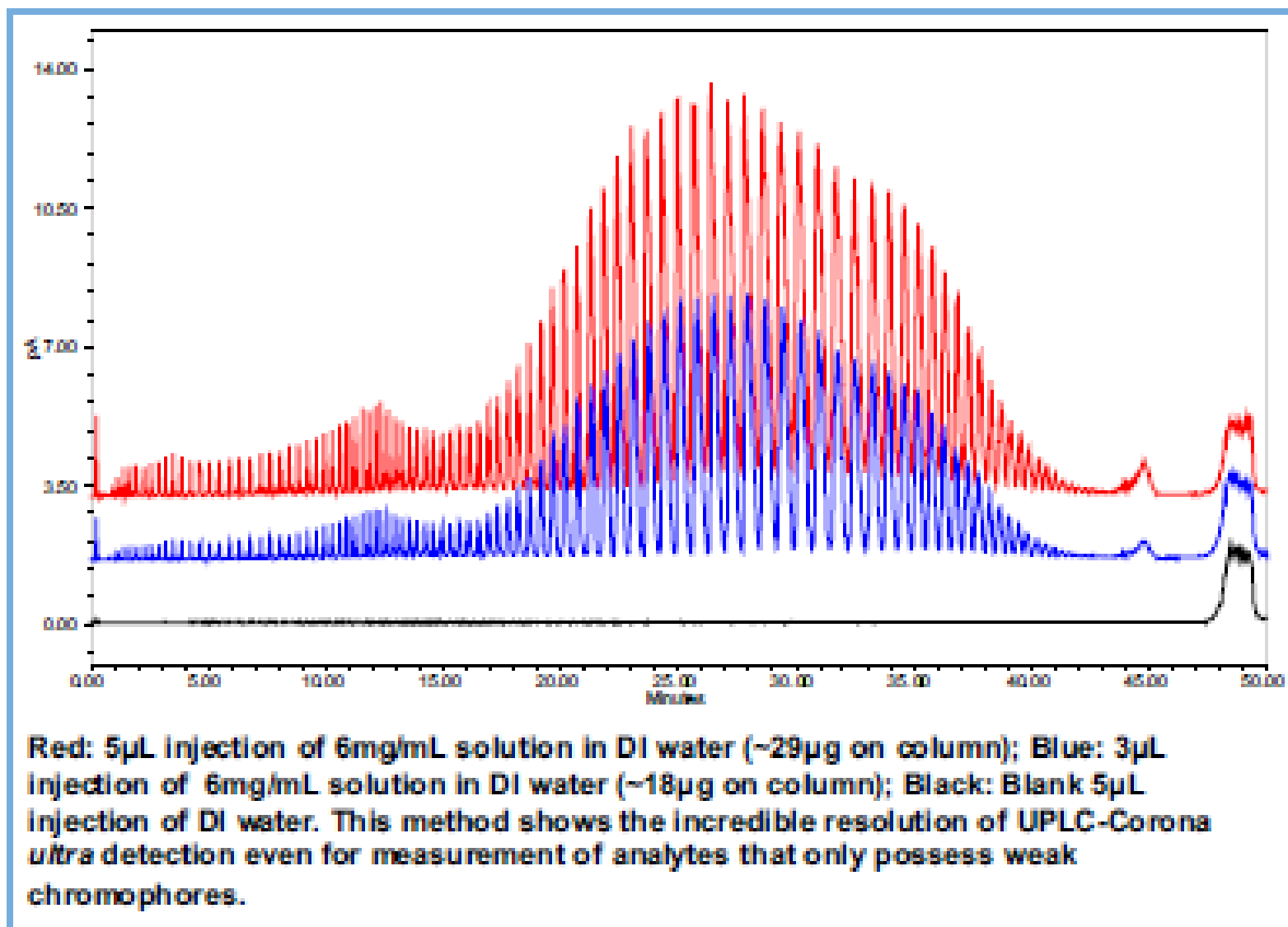


# Publication Areas and Applications

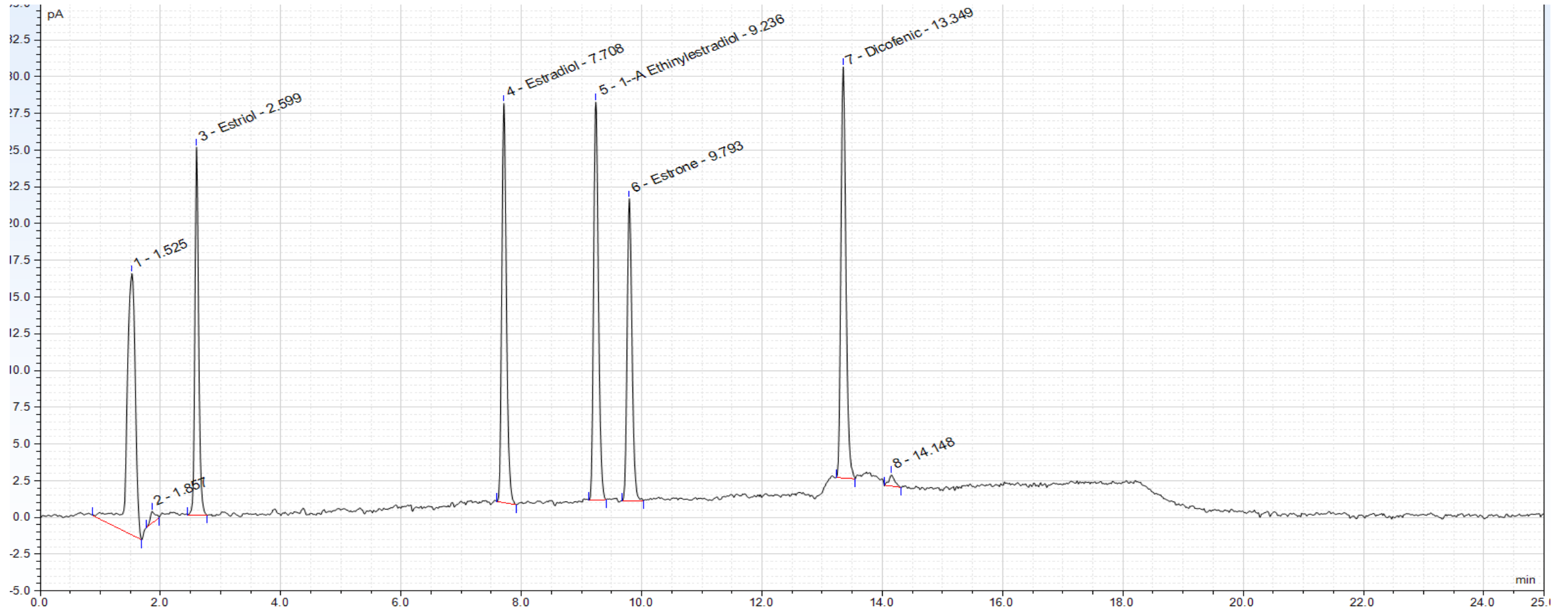
- Impurity Measurement
- Mass Balance
- Degradation/Stability Testing
- Lot to lot variability
- Cleaning Validation
- Formulation
- Surfactants/excipients
- Extractables/leachables
- Adjuvant analysis
- PEGylation
- Glycan Analysis
- siRNA Delivery Vehicles



# Environmental Applications (Analysis of PRG Species)



# Compounds



# Charged Aerosol Detector – Success Story

- Uses the fastest growing and most rapidly adopted universal LC detection technology since diode array detection (*PDA or DAD*)



Thermo Scientific™ Dionex™ Corona™ Veo™ Charged Aerosol Detector

# Thermo Scientific Vanquish Corona CAD

- Seamless integration into the Thermo Scientific™ Vanquish™ UHPLC system
- Adjustable evaporation temperature control up to 100 degrees
- 200 Hz data collection rate to ensure full compatibility with high speed chromatography



# Thermo Scientific Vanquish UHPLC System Features

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