CLAIMS

1. A system for capturing full resolution ion mobility data, comprising:

an ion mobility separation device configured to receive a stream of ions, guide at least a portion of the stream of ions through the ion mobility separation device, and separate the ions of the portion based on ion mobility;

an ion detector configured to receive the portion of the stream of ions from the ion mobility separation device, detect ions having a predefined mass-to-charge ratio during a first time period, and generate one or more signals in response to detection of ions having the predefined mass-to-charge ratio;

a data acquisition system configured to receive the one or more signals from the ion detector and generate a time dependent ion signal based on the one or more signals received from the ion detector, the time dependent ion signal being representative of an intensity of the one or more signals at a plurality of different arrival time periods during the first time period; and

a controller in communication with the ion mobility separation device, the ion detector, and the data acquisition system.

2. The system of Claim 1, wherein the data acquisition system is a high bandwidth data acquisition system.

3. The system of Claim 2, wherein the high bandwidth data acquisition system is an analog-to-digital converter and the one or more signals generated by the ion detector is an analog signal.

4. The system of Claim 3, wherein the analog-to-digital converter has a resolution of at least eight bits.

5. The system of Claim 1, wherein the data acquisition system is configured to separate the first time period into a plurality of sub-periods, separately sum the received one or more signals for each of the plurality of sub-periods, and generate the time dependent ion signal based on the sums and the plurality of sub-periods.

6. The system of Claim 5, wherein the data acquisition system has a bandwidth of greater than 1 kHz.

7. The system of Claim 1, wherein the ion mobility separation device is configured to generate a traveling drive potential that is configured to guide the ions through the ion mobility separation device and separate the ions based on ion mobility.

8. The system of Claim 1, wherein the ion mobility separation device includes an accumulation region and an ion mobility separation path, the accumulation region configured to accumulate the ions into one or more ion packets and pulse the one or more ion packets into the ion mobility separation path.

9. A method for capturing full resolution ion mobility data, comprising:

introducing a stream of ions into an ion mobility separation device;

guiding, by the ion mobility separation device, at least a portion of the stream of ions through the ion mobility separation device to an ion detector;

separating, by the ion mobility separation device, the ions of the portion based on ion mobility;

receiving, by the ion detector, the ions;

detecting, by the ion detector, ions having a predefined mass-to-charge ratio during a first time period;

generating, by the ion detector, one or more signals in response to detection of ions having the predefined mass-to-charge ratio;

receiving, by a data acquisition system, the one or more signals from the ion detector; and

generating, by the data acquisition system, a time dependent ion signal based on the one or more signals received from the ion detector, the time dependent ion signal being representative of an intensity of the one or more signals at a plurality of different arrival time periods during the first time period.

10. The method of Claim 9, comprising a controller in communication with the ion mobility separation device, the ion detector, and the data acquisition system.

11. The method of Claim 9, wherein the data acquisition system is a high bandwidth data acquisition system.

12. The method of Claim 11, wherein the high bandwidth data acquisition system is an analog-to-digital converter and the one or more signals generated by the ion detector is an analog signal.

13. The method of Claim 12, wherein the analog-to-digital converter has a resolution of at least eight bits.

14. The method of Claim 9, comprising:

separating, by the data acquisition system, the first time period into a plurality of sub-periods;

summing the received one or more signalss for each of the plurality of sub-periods separately; and

generating the time dependent ion signal based on the sums and the plurality of sub-periods.

15. The method of Claim 14, wherein the data acquisition system has a bandwidth of greater than 1 kHz.

16. The method of Claim 9, comprising:

generating, by the ion mobility separation device, a traveling drive potential that guides the ions through the ion mobility separation device and separates the ions based on ion mobility.

17. The method of Claim 9, wherein the ion mobility separation device includes an accumulation region and an ion mobility separation path, the accumulation region configured to accumulate the ions into one or more ion packets and pulse the one or more ion packets into the ion mobility separation path.

18. A system for performing multi-analyte targeted data acquisition, comprising:

an ion mobility separation device configured to receive a stream of ions, guide at least a first portion of the stream of ions through the ion mobility separation device, and separate the ions of the first portion based on ion mobility;

an ion detector configured to receive the first portion of the stream of ions from the ion mobility separation device, and perform a first scan of the received ions including detecting first ions having a first mass-to-charge ratio during a first arrival time and detecting second ions having a second mass-to-charge ratio during a second arrival time; and

a controller in communication with the ion mobility separation device and the ion detector,

wherein the ion detector switches from detecting the first mass-to-charge ratio during the first arrival time of the first scan to detecting the second mass-to-charge ratio during the second arrival time of the first scan.

19. The system of Claim 18, wherein:

the ion mobility separation device is configured to guide a second portion of the stream of ions through the ion mobility separation device, and separate the ions of the second portion based on ion mobility,

the ion detector is configured to receive the second portion of the stream of ions from the ion mobility device and perform a second scan of the received ions including detecting third ions having a third mass-to-charge ratio during the first arrival time, and

the ion detector switches from detecting one of the first mass-to-charge ratio and the second mass-to-charge ratio to detecting the third mass-to-charge ratio.

20. The system of Claim 19, wherein data detected during the first scan is combined with data detected during the second scan to form a multi-analyte data plot.

21. The system of Claim 19, comprising a computing device storing a data set, the data set including data for ions of the first portion of the stream of ions and the second portion of the stream of ions.

22. The system of Claim 21, wherein the computing device is configured to determine the first ions to be detected during the first scan, the second ions to be detected during the first scan, and the third ions to be detected during the second scan based on the data set.

23. The system of Claim 22, wherein the data includes one or more of arrival time and mass-to-charge ratio.

24. The system of Claim 21, wherein the computing device is configured to group the ions into the first, second, and third scans based on the data.

25. The system of Claim 19, wherein the ion mobility separation device includes an accumulation region and an ion mobility separation path, the accumulation region configured to accumulate the ions into one or more ion packets and pulse the one or more ion packets into the ion mobility separation path.

26. The system of Claim 25, wherein the first scan is performed on a first packet of the one or more ion packets, and the second scan is performed on a second packet of the one or more ion packets.

27. The system of Claim 18, wherein the ion mobility separation device is configured to generate a traveling drive potential that is configured to guide the ions through the ion mobility separation device and separate the ions based on ion mobility.

28. A method for multi-analyte targeted data acquisition, comprising:

introducing a stream of ions into an ion mobility separation device;

guiding, by the ion mobility separation device, at least a first portion of the stream of ions through the ion mobility separation device to an ion detector;

separating, by the ion mobility separation device, the ions of the first portion based on ion mobility;

receiving, by the ion detector, the first portion of the stream of ions; and

performing, by the ion detector, a first scan of the received ions including detecting first ions having a first mass-to-charge ratio during a first arrival time and detecting second ions having a second mass-to-charge ratio during a second arrival time, the ion detector switching from detecting the first mass-to-charge ratio during the first arrival time of the first scan to detecting the second mass-to-charge ratio during the second arrival time of the first scan

29. The method of Claim 28, comprising:

guiding, by the ion mobility separation device, a second portion of the stream of ions through the ion mobility separation device to the ion detector;

separating, by the ion mobility separation device, the ions of the second portion based on ion mobility,

receiving, by the ion detector, the second portion of the stream of ions; and

performing, by the ion detector, a second scan of the received ions including detecting third ions having a third mass-to-charge ratio during the first arrival time, the ion detector switching from detecting one of the first mass-to-charge ratio and the second mass-to-charge ratio to detecting the third mass-to-charge ratio.

30. The method of Claim 29, comprising:

combining data detected during the first scan with data detected during the second scan to form a multi-analyte data plot.

31. The method of Claim 29, comprising:

storing, by a computing device, a data set, the data set including data for ions of the first portion of the stream of ions and the second portion of the stream of ions.

32. The method of Claim 31, comprising:

determining, by the computing device, the first ions to be detected during the first scan, the second ions to be detected during the first scan, and the third ions to be detected during the second scan based on the data set.

33. The method of Claim 32, wherein the data includes one or more of arrival time and mass-to-charge ratio.

34. The method of Claim 31, comprising:

grouping, by the computing device, the ions into the first, second, and third scans based on the data.

35. The method of Claim 29, wherein the ion mobility separation device includes an accumulation region and an ion mobility separation path, the accumulation region configured to accumulate the ions into one or more ion packets and pulse the one or more ion packets into the ion mobility separation path.

36. The method of Claim 35, wherein the first scan is performed on a first packet of the one or more ion packets, and the second scan is performed on a second packet of the one or more ion packets.

37. The system of Claim 28, wherein the ion mobility separation device is configured to generate a traveling drive potential that is configured to guide the ions through the ion mobility separation device and separate the ions based on ion mobility.

CLAIMS

1. A system for capturing full resolution ion mobility data, comprising:

an ion mobility separation device configured to receive a stream of ions, guide at least a portion of the stream of ions through the ion mobility separation device, and separate the ions of the portion based on ion mobility;

an ion detector configured to receive the portion of the stream of ions from the ion mobility separation device, detect ions having a predefined mass-to-charge ratio during a first time period, and generate one or more signals in response to detection of ions having the predefined mass-to-charge ratio;

a data acquisition system configured to receive the one or more signals from the ion detector and generate a time dependent ion signal based on the one or more signals received from the ion detector, the time dependent ion signal being representative of an intensity of the one or more signals at a plurality of different arrival time periods during the first time period; and

a controller in communication with the ion mobility separation device, the ion detector, and the data acquisition system.

2. A system according to Claim 1, in which the data acquisition system is a high bandwidth data acquisition system.

3. A system according to Claim 2, in which the high bandwidth data acquisition system is an analog-to-digital converter and the one or more signals generated by the ion detector is an analog signal.

4. A system according to Claim 3, in which the analog-to-digital converter has a resolution of at least eight bits.

5. A system according to Claim 1, in which the data acquisition system is configured to separate the first time period into a plurality of sub-periods, separately sum the received one or more signals for each of the plurality of sub-periods, and generate the time dependent ion signal based on the sums and the plurality of sub-periods.

6. A system according to Claim 5, in which the data acquisition system has a bandwidth of greater than 1 kHz.

7. A system according to Claim 1, in which the ion mobility separation device is configured to generate a traveling drive potential that is configured to guide the ions through the ion mobility separation device and separate the ions based on ion mobility.

8. A system according to Claim 1, in which the ion mobility separation device includes an accumulation region and an ion mobility separation path, the accumulation region configured to accumulate the ions into one or more ion packets and pulse the one or more ion packets into the ion mobility separation path.

9. A method for capturing full resolution ion mobility data, comprising:

introducing a stream of ions into an ion mobility separation device;

guiding, by the ion mobility separation device, at least a portion of the stream of ions through the ion mobility separation device to an ion detector;

separating, by the ion mobility separation device, the ions of the portion based on ion mobility;

receiving, by the ion detector, the ions;

detecting, by the ion detector, ions having a predefined mass-to-charge ratio during a first time period;

generating, by the ion detector, one or more signals in response to detection of ions having the predefined mass-to-charge ratio;

receiving, by a data acquisition system, the one or more signals from the ion detector; and

generating, by the data acquisition system, a time dependent ion signal based on the one or more signals received from the ion detector, the time dependent ion signal being representative of an intensity of the one or more signals at a plurality of different arrival time periods during the first time period.

10. A method according to Claim 9, comprising a controller in communication with the ion mobility separation device, the ion detector, and the data acquisition system.

11. A method according to Claim 9, in which the data acquisition system is a high bandwidth data acquisition system.

12. A method according to Claim 11, in which the high bandwidth data acquisition system is an analog-to-digital converter and the one or more signals generated by the ion detector is an analog signal.

13. A method according to Claim 12, in which the analog-to-digital converter has a resolution of at least eight bits.

14. A method according to Claim 9, comprising:

separating, by the data acquisition system, the first time period into a plurality of sub-periods;

summing the received one or more signals for each of the plurality of sub-periods separately; and

generating the time dependent ion signal based on the sums and the plurality of sub-periods.

15. A method according to Claim 14, in which the data acquisition system has a bandwidth of greater than 1 kHz.

16. A method according to Claim 9, comprising:

generating, by the ion mobility separation device, a traveling drive potential that guides the ions through the ion mobility separation device and separates the ions based on ion mobility.

17. A method according to Claim 9, in which the ion mobility separation device includes an accumulation region and an ion mobility separation path, the accumulation region configured to accumulate the ions into one or more ion packets and pulse the one or more ion packets into the ion mobility separation path.