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.