or smaller than, an electrode preceding it in said series that converges and focuses ions in introduced to said outlet portion.

14. The system of claim **13**, wherein said outlet portion includes an ejection gradient control that couples to a DC electrode positioned adjacent to and following said at least one second grid in said trapping portion, said ejection gradient control provides a preselected potential to said DC electrode that moves said preselected ions received from said trapping portion into said outlet portion.

15. The system of claim **13**, wherein said outlet portion includes a conductance limit electrode that couples said outlet portion to a subsequent ion stage and provides said preselected ions at a preselected pressure to said subsequent ion stage.

16. The system of claim **15**, wherein said conductance limit has an inner geometry perimeter that is equal to, or smaller than, an inner geometry perimeter of said subsequent ion stage.

17. The system of claim **1**, wherein said electrodes of said outlet portion define a converging angle for said outlet portion of about 30 degrees.

18. The system of claim **1**, wherein said ion trap has a length in the range from about 0.5 mm to about 50 mm.

19. The system of claim **1**, wherein said ion trap has an inner electrode geometry cross section selected in the range from about 0.02 mm to about 20 mm.

20. The system of claim **1**, wherein said ion trap is used as an interface between an electrostatic ion funnel and an ion analysis instrument, or a component thereof.

21. The system of claim **20**, wherein said ion trap delivers preselected dc-potentials and rf-potentials that are independent of those of said ion funnel.

22. The system of claim **20**, wherein said ion trap provides a dc-gradient that is controlled independently from a dc-gradient of said ion funnel.

23. The system of claim **22**, wherein said dc-gradient of said ion trap is between about 1 V/cm and about 5 V/cm, and said dc-gradient of said ion funnel is between about 10 V/cm and about 30 V/cm.

24. The system of claim **20**, wherein said ion trap includes an rf-frequency of about 600 kHz, an amplitude of about 55 V_{p-p}, and a pressure of between about 1 Torr and about 5 Torr.

25. The system of claim **20**, wherein said ion funnel includes a pressure selected in the range from about 0.1 Torr to about 100 Torr.

26. A method for transmission of ions between at least two operatively coupled instrument stages for analysis, comprising the steps of:

introducing ions in an ion beam from an ion source to an ion trap comprising:

an inlet portion that diverges said ions in said ion beam introduced thereto to expand same;

a trapping portion operatively coupled to said inlet portion that traps ions received from said inlet portion in said ion beam and accumulates same therein;

said trapping portion includes an entrance grid operatively coupled at a receiving end thereof that controls entry of said ions from said inlet portion into said trapping portion;

said trapping portion includes an exit grid operatively coupled to a releasing end thereof that controls outflow of ions therefrom; and

an outlet portion operatively coupled to said trapping portion that converges ions released from said trapping portion to focus same;

trapping a preselected quantity of said ions in said trapping portion for a preselected time to accumulate same; and

selecting at least one of said ions mass accumulated in said trapping portion; and

releasing said at least one of said ions at a preselected pressure for analysis of same.

27. The method of claim **26**, wherein the step of introducing ions in an ion beam from an ion source to an ion trap includes an ion source that is an electrospray ionization source (ESI), or a matrix-assisted laser desorption ionization (MALDI) source.

28. The method of claim **26**, wherein the step of introducing ions in an ion beam from an ion source to an ion trap includes an ion stage that precedes said ion trap selected from the group consisting of ion mobility spectrometry (IMS), field asymmetric waveform ion mobility spectrometry (FAIMS), longitudinal electric field-driven FAIMS, ion mobility spectrometry with alignment of dipole direction (IMS-ADD), higher-order differential ion mobility spectrometry (HOD-IMS), or combinations thereof.

29. The method of claim **26**, wherein the step of releasing said at least one of said ions at a preselected pressure for analysis of same includes an ion stage following said ion trap selected from the group consisting of ion mobility spectrometry (IMS), time-of-flight mass spectrometry (TOF-MS), quadrupole mass spectrometry (Q-MS), ion trap mass spectrometry (ITMS), and combinations thereof.

30. The method of claim **26**, wherein the step of trapping a preselected quantity of said ions in said trapping portion includes an electric field that is about 1 V/cm.

31. The method of claim **26**, wherein the step of releasing said at least one of said ions at a preselected pressure for analysis includes an electric field gradient for transmission of said ions that is about 20 V/cm.

32. The method of claim **26**, wherein the step of releasing said at least one of said ions includes a rate of ion ejection from said ion trap that is determined by dc-potentials applied to electrodes of said trapping portion and pulsed potentials applied to said entrance grid and said trapping grid, respectively.

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