CLAIMS:

1. A particle detector having one or more electron emissive surfaces and/or an electron collector surface therein, the particle detector having a vacuum established thereabout and comprising an enclosure or part enclosure configured to facilitate establishing and/or maintaining a difference in the environments about (i) the electron emissive surface(s) and/or the electron collector surface and (ii) the environment immediately external to the detector, wherein the enclosure comprises one or more discontinuities, and the particle detector comprises means for interrupting a flow of a gas external the particle detector to internal the particle detector .
~~being configured such that in operation the environment about the electron emissive surface(s) and/or the electron collector surface is/are different to the environment immediately external to the detector.~~

~~2. The particle detector of claim 1, comprising an enclosure configured to facilitate establishing and/or maintaining a difference in the environments about (i) the electron emissive surface(s) and/or the electron collector surface and (ii) the environment immediately external to the detector.~~

2~~3~~. The particle detector of claim 1~~2~~ configured so as to allow for user control of the environment about the electron emissive surface(s) and/or the electron collector surface such that the environment about the electron emissive surface(s) is different to the environment immediately external to the enclosure.

3~~4~~. The particle detector of claim 1 or claim2~~any one of claims 1 to 3~~, wherein the environment about the electron emissive surface(s) and/or the electron collector surface is different to the environment immediately external to the enclosure with regard to: the presence, absence or partial pressure of a gas species in the respective environments; and/or the presence, absence or concentration of a contaminant species in the respective environments.

~~5. The particle detector of any one of claims 1 to 4, configured to decrease a vacuum conductance thereof compared with a similar or otherwise identical particle detector of the prior art that is not so configured.~~

~~6. The particle detector of any one of claims 1 to 5, configured to operate such that a gas flowing external to internal the particle detector and/or from internal to external the particle detector does not have the flow characteristics of a conventional fluid.~~

~~7. The particle detector of any one of any one of claims 1 to 6, configured to, or comprising means for lowering the pressure internal the particle detector.~~

4~~8~~. The particle detector of any one of claims 1 to 3~~claim 7~~ that is configured to, or comprises means for, lowering the gas pressure internal the particle detector sufficient to alter

the flow characteristics of the gas flowing external to internal the particle detector and/or from internal to external the particle detector.

59. The particle detector of any one of claims 1 to 42 to 8, wherein the enclosure is formed from a single piece of material.

610. The particle detector of any one of claims 1 to 52 to 9, wherein the enclosure comprises one or more discontinuities, and the particle detector comprises means for interrupting a flow of a gas external the particle detector into one or all of the one or more discontinuities.

711. The particle detector of claim 610, wherein at least one of the one or more discontinuities, or all of the one or more discontinuities, is/are dimensioned so as to limit or prevent entry of a gas external the particle detector into the particle detector.

812. The particle detector of claim 610 or claim 711, wherein at least one of the one or more discontinuities, or all of the one or more discontinuities, is/are positioned on the enclosure and/or orientated with respect to the particle detector so as to limit or prevent entry of a gas external the particle detector into the particle detector.

913. The particle detector of any one of claims 610 to 812, wherein at least one of the one or more discontinuities, or all of the one or more discontinuities has a gas flow barrier associated therewith, the gas flow barrier configured so as to limit or prevent the linear entry of a gas external the particle detector into the particle detector.

1014. The particle detector of claim 913, wherein the gas flow barrier comprise one or more walls extending outwardly from the periphery of the discontinuity.

1115. The particle detector of claim 913 or claim 1014, wherein the at least one of the gas flow barriers, or all of the gas flow barriers, is/are formed as a tube having an opening distal to the discontinuity, wherein the opening distal to the discontinuity is positioned on the tube and/or orientated with respect to the particle detector so as to limit or prevent entry of a gas external the particle detector into the particle detector.

1216. The particle detector of any one of claims 1 to 1115, comprising an internal baffle.

1317. The particle detector of claim 1216, wherein the internal baffle interrupts a line of sight through the particle detector.

1418. The particle detector of any one of claims 1 to 1317 in functional association with an off-axis input particle optic apparatus, wherein the off-axis input particle optic apparatus is configured to inhibit or prevent the stagnation of a gas about the particle detector.

15~~19~~. The particle detector of claim 14~~18~~, wherein the off-axis particle input optic apparatus is configured to allow the substantially free flow of a gas therethrough.

16~~20~~. The particle detector of claim 13~~18~~ or claim 14~~19~~, wherein the off-axis particle input optic apparatus comprises an enclosure, the enclosure comprising one or more discontinuities positioned or orientated so as to prevent the stagnation of a gas about the particle detector and/or allow the substantially free flow of a gas therethrough.

17~~21~~. The particle detector of any one of claims 1 to 16~~20~~, wherein the gas flowing external to internal the particle detector and/or from internal to external the particle detector gas is a particle carrier gas.

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~~22~~. The particle detector of claim 17~~21~~, wherein the particle carrier gas is a residual particle carrier gas of a mass spectrometer.

19~~23~~. The particle detector of any one of any one of claims 1 to 18~~22~~, configured to, or comprising means for increasing the pressure internal the particle detector.

20~~24~~. The particle detector of claim 19~~23~~ that is configured to, or comprises means for, increasing the gas pressure internal the particle detector sufficient to alter the flow characteristics of the gas flowing external to internal the particle detector and/or from internal to external the particle detector.

21~~25~~. The particle detector of any one of claims 1 to 20~~24~~, wherein the one or more emissive surfaces are arranged to form an electron multiplier.

22~~26~~. A mass spectrometer comprising the particle detector of any one of claims 1 to 21~~25~~.

~~27. A method of designing a particle detector, the method comprising the steps of:~~

~~providing a first physical or virtual particle detector having electron emissive surface(s) and/or an electron collector surface,~~

~~modifying the first physical or virtual particle detector so as to provide a second physical or virtual particle detector,~~

~~wherein the step of modifying results in the second physical or virtual particle detector demonstrating~~

~~(a) a decrease in movement of a contaminant from the environment external the first physical or virtual particle detector to the environment about the electron emissive surface(s) and/or the electron collector surface of the first physical or virtual particle detector compared to the same for the second physical or virtual particle detector, and/or~~

~~(b) a decrease in the vacuum conductance of the second physical or virtual particle detector compared to the same for the second physical or virtual particle detector.~~

28. The method of claim 27 comprising the step of fabricating and testing the second physical particle detector for the ability to decrease movement of a contaminant from the environment external the second physical particle detector to the environment about the electron emissive surface(s) and/or the electron collector surface of the second physical particle detector.

29. The method of claim 28 comprising the step of fabricating and testing the first particle detector with regard to the ability to decrease movement of a contaminant from the environment external the first particle detector to the environment about the electron emissive surface(s) and/or the electron collector surface of the first particle detector, and comparing that ability with the same ability of the second particle detector.

30. The method of claim 27 comprising the step of computer modelling and testing the second virtual particle detector for the ability to decrease movement of a contaminant from the environment external the second virtual particle detector to the environment about the electron emissive surface(s) and/or the electron collector surface of the second virtual particle detector.

31. The method of claim 30 comprising the step of computer modelling and testing the first virtual particle detector for the ability to decrease movement of a contaminant from the environment external the first virtual particle detector to the environment about the electron emissive surface(s) and/or the electron collector surface of the first virtual particle detector.

32. The method of claim 29 or 31, comprising the step of comparing the results of testing the first virtual or physical particle detector with the results of testing the second virtual or physical particle detector.

33. The method of any one of claims 27 to 32, wherein the step of modifying the first physical or virtual particle detector results in a particle detector of any one of claims 1 to 25.

34. A method of determining a parameter of a particle detector, the particle detector comprising one or more electron emissive surfaces and/or an electron collector surface therein, the method comprising the step of assessing the ability of the particle detector (or a virtual representation of the particle detector) to

(a) decrease movement of a contaminant from the environment external the physical or virtual particle detector to the environment about the electron emissive surface(s) and/or the electron collector surface, and/or

(b) decrease the vacuum conductance of the physical or virtual particle detector.

~~35. The method of claim 34, wherein the parameter is the rate and/or extent of contaminant deposit on one of the one or more electron emissive surfaces, or on the electron collector.~~

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