

CLAIMS:

1. A self-contained particle detector comprising an enclosure formed in part by a transmission mode secondary electron emissive element, the enclosure defining an internal environment and an external environment, wherein the transmission mode secondary electron emissive element has an externally facing surface and an internally facing surface and is configured such that impact of a particle on the externally facing surface causes emission of one or more secondary electrons from the internally facing surface.
2. The self-contained particle detector of claim 1, wherein the transmission mode secondary electron emissive element has the structure and/or function of a transmission dynode.
3. The self-contained particle detector of claim 1 or claim 2, wherein the transmission mode secondary electron emissive element comprises two or more electron emissive sub-elements.
4. The self-contained particle detector of claim 3, wherein each of the two or more electron emissive sub-elements has the structure and/or function of a transmission dynode.
5. The self-contained particle detector of any one of claims 1 to 4, wherein the enclosure prevents or inhibits the movement of a contaminant from the external environment to the internal environment.
6. The self-contained particle detector of any one of claims 1 to 5, wherein the enclosure comprises a walled structure, and the transmission mode secondary electron emissive element is substantially continuous with a wall of the walled structure.
7. The self-contained particle detector of any one of claims 1 to 6, wherein the enclosure forms a sealed or a substantially sealed arrangement.

8. The self-contained particle detector of any one of claims 1 to 7, comprising electron amplification means configured to amplify a secondary electron emitted from the transmission mode secondary electron emissive element.
9. The self-contained particle detector of claim 8, wherein the electron amplification means is an electron multiplier.
10. The self-contained particle detector of claim 9, wherein the electron multiplier is a discrete dynode electron multiplier, or a continuous electron multiplier, or a multi-channel continuous electron multiplier, or a cross-field detector (such as the magneTOFTM), or a microchannel plate (MCP) detector.
11. The self-contained particle detector of any one of claims 8 to 10, wherein the detector comprises electron collection means in operable association with the electron amplification means.
12. The self-contained particle detector of claim 11, wherein the electron collection means is an anode.
13. The self-contained particle detector of claim 11 or claim 12, wherein the electron amplification means and the electron collection means are contained wholly within the enclosure.
14. The self-contained particle detector of any one of claims 1 to 13, configured as a component to replace a photomultiplier tube in a mass spectrometer or to replace a scintillation counter for radiation detection.
15. The combination of the self-contained particle detector of any one of claims 1 to 14 and a conversion dynode, wherein the conversion dynode is in operable association with the self-contained particle detector such that a secondary electron emitted by the conversion dynode is capable of impacting the externally facing side of the transmission mode secondary electron emissive element.

16. The combination of the self-contained particle detector of any one of claims 1 to 14 and electron amplification means, wherein the electron amplification means is in operable association with the self-contained particle detector such that a secondary electron emitted by the electron multiplier is capable of impacting the externally facing side of the transmission mode secondary electron emissive element.
17. A mass spectrometer comprising the self-contained particle detector of any one of claims 1 to 14, or the combination of claim 15 or claim 16.
18. A method for maintaining a mass spectrometer, the method comprising the steps of replacing a photomultiplier tube of a mass spectrometer with the self-contained particle detector of any one of claims 1 to 14.
19. A method for detecting a particle, the method comprising causing or allowing a particle to impact an externally facing side of transmission mode secondary electron emissive element which forms part of an enclosure, and causing or allowing the transmission mode secondary electron emissive element to emit a secondary electron from an internally facing side of the transmission mode secondary electron emissive element.
20. The method of claim 19, wherein the transmission mode secondary electron emissive element which forms part of an enclosure is provided by the self-contained particle detector of any one of claims 1 to 14.