CLAIMS÷

1. A circuit for a charged particle detector comprising:

a storage cell configured to receive a signal representing an output of a sensing element;

a storage cell multiplexer configured to selectively transmit the signal representing the output of the sensing element to the storage cell;

a threshold detector including circuitry configured to determine an integration start signal based on a comparison of the signal representing the output of the sensing element to a threshold; and

a converter including circuitry configured to perform signal processing on a signal transmitted from the storage cell.

2. The circuit of claim 1, wherein the storage cell is one of a plurality of storage cells included in the circuit, wherein the plurality of storage cells are configured to receive signals representing outputs of the sensing element.

3. The circuit of claim 1, further comprising:

a control unit including circuitry configured to monitor a result analysis request indicator,

wherein the control unit is configured to:

in response to determining that the result analysis request indicator is set, perform the signal processing on a first storage cell, and

receive an output from the converter based on the signal processing.

4. The circuit of claim 1, further comprising:

circuitry configured to convert the output of the sensing element to an electrical signal of a different form.

5. The circuit of claim 1, wherein the multiplexer comprises a switch.

6. The circuit of claim 1, further comprising:

a switch configured to connect the storage cell to the converter, wherein the switch is configured to connect one storage cell at a time to the converter.

7. The circuit of claim 1, further comprising:

an input stage including circuitry configured to generate an output in proportion to current or charge received by the input stage from the sensing element.

8. The circuit of claim 7, wherein the input stage includes a current controlled current source

configured to output an amplified signal based on the current or charge received by the input stage from the sensing element, and the threshold detector includes a current detector configured to compare the amplified signal to a current threshold.

9. The circuit of claim 7, wherein the input stage includes a transimpedance amplifier configured to output a voltage signal based on the current or charge received by the input stage from the sensing element, and the threshold detector includes a voltage comparator configured to compare the voltage signal to a reference.

10. The circuit of claim 3, wherein the control unit is configured to

receive the integration start signal,

receive an integration stop signal based on a comparison of the signal representing the output of the sensing element to a second threshold, and

in response to receiving the integration stop signal, control the storage cell multiplexer to change a connection state between the storage cell and the sensing element.

11. The circuit of claim 10, wherein the control unit is configured to

in response to receiving the integration stop signal, set an integration circuit busy indicator, and to maintain the integration circuit busy indicator until the connection state between the storage cell and the sensing element is changed.

12. The circuit of claim 3, wherein the control unit is configured to

in response to determining that the result analysis request indicator is set, acquiring an address of a storage cell to be interrogated from an address list.

13. A non-transitory computer-readable medium storing a set of instructions that are executable by one or more processors of controller of a charged particle beam apparatus to cause the charged particle beam apparatus to perform a method comprising:

generating a charged particle beam;

when a signal representing an output of a sensing element of a detector exceeds a first threshold, integrating the signal representing the output of the sensing element using a first storage cell corresponding to a first charged particle event; and

when the signal representing the output of the sensing element exceeds the first threshold after the first charged particle event, integrating the signal representing the output of the sensing element using a second storage cell corresponding to a second charged particle event.

14. The medium of claim 13, wherein the set of instructions are executable to cause the

charged particle beam apparatus to:

generate an integration start signal when the output of the sensing element crosses the first threshold; and

generate an integration stop signal when the output of the sensing element crosses a second threshold.

15. The medium of claim 14, wherein the set of instructions are executable to cause the charged particle beam apparatus to:

generate a first time stamp for the integration start signal and a second time stamp for the integration stop signal.

16. A detector for a charged particle beam apparatus, comprising:

a plurality of sensing elements;

a circuit for each of the sensing elements, the circuit comprising:

a storage cell configured to receive a signal representing an output of a sensing element;

a multiplexer configured to selectively feed the signal representing the output of the sensing element to the storage cell;

a threshold detector including circuitry configured to determine a start of integration corresponding to a charged particle arrival event; and

a converter including circuitry configured to determine information about the charged particle arrival event.

17. The detector of claim 16, wherein the detector includes a segmented detector array.

18. The detector of claim 16, wherein the information includes an energy level of the charged particle arrival event.

19. The detector of claim 16, wherein the information includes an overflow indicator.

20. The detector of claim 19, wherein the overflow indicator indicates whether more than a predetermined number of charged particles arrived during the charged particle arrival event.