CLAIMS

What is claimed is:

1. An electrostatic discharge mitigation tubing segment comprising a porous non-conductive interior surface and a conductive portion, wherein ~~adjacent~~ the conductive portion is configured to transfer electrostatic charge generated by a charged fluid passing through the tubing segment to ground such that electrostatic discharge can be mitigated.

2. The electrostatic discharge mitigation tubing segment of claim 1, wherein the porous non-conductive interior surface is a foam layer, a perforated layer, a layer comprising apertures, or a layer comprising charge transfer conduits.

3 The electrostatic discharge mitigation tubing segment of claim 1, wherein the porous ~~interior~~ non-conductive interior surface is a perforated layer of non-conductive polymer and the conductive portion comprises a layer of conductive polymer disposed over and in contact with the perforated layer.

4. The electrostatic discharge mitigation tubing segment of claim 3, wherein the non-conductive polymer comprises a fluoropolymer, and the conductive polymer comprises ~~the~~a perfluoropolymer filled with a conductive material.

5. The electrostatic discharge mitigation tubing segment of claim 4, wherein the perfluoropolymer is perfluoroalkoxy alkane (PFA).

6. The electrostatic discharge mitigation tubing segment of any one of claims 1-5, further comprising an outer layer.

7. The electrostatic discharge mitigation tubing segment of claim 1, wherein the porous~~,~~ non-conductive interior surface is defined by a non-conductive polymer portion and the conductive portion comprises one or more stripes of conductive polymer embedded within the non-conductive polymer portion between an interior surface and an exterior surface of the tubing segment.

8. The electrostatic discharge mitigation tubing segment of claim 7, further comprising an outer conductive polymer layer in charge transfer contact with the one or more stripes of conductive polymer.

9. The electrostatic discharge mitigation tubing segment of claim 1, wherein the porous~~,~~ non-conductive interior surface is defined by a non-conductive polymer portion and the conductive portion comprises one or more stripes of conductive polymer disposed adjacent to and in contact with an outer surface of the non-conductive polymer portion, the one or more stripes of conductive polymer ~~stripes~~ extending a-long a length of the tubing segment in a direction along a longitudinal axis.

10. The electrostatic discharge mitigation tubing segment of claim 9, further comprising an outer layer.

11. The electrostatic discharge mitigation tubing segment of any one of claims 7-9, wherein the one or more stripes of conductive ~~stripes~~ polymer comprise a fluoropolymer filled with a conductive material.

12. The electrostatic discharge mitigation tubing segment of claim 11, wherein the non-conductive polymer portion comprises a fluoropolymer.

13 The electrostatic discharge mitigation tubing segment of claim 12, wherein the porous non-conductive interior surface comprises apertures, holes, channels, fluid passages, or charge transfer conduits.

14. A fluid circuit for a predetermined fluid flow passageway having at least one inlet and at least one outlet, the fluid circuit comprising:

a plurality of electrostatic discharge mitigation tubing segments according to any one of claims 1, 7 or 9 and a plurality of operative components, each operative component comprising a body portion with an internal fluid flow passageway and a plurality of tubing connector fittings, the operative components connecting the plurality of electrostatic discharge mitigation tubing segments at selected tubing connector fittings, the plurality of electrostatic discharge mitigation tubing segments and operative components providing the internal fluid flow passageway through the fluid circuit;

wherein each of the electrostatic discharge mitigation tubing segments comprises ~~s~~ i) a non-conductive polymer portion defining the fluid passageway and ii) one or more conductive portions of conductive fluoropolymer extending axially to ends of each of the respective electrostatic discharge mitigation tubing segments, and

wherein each operative component body portion comprises a conductive fluoropolymer that extends between each of the plurality of tubing connector fittings, and

wherein each of the tubing connector fittings conductively connects ~~the~~ a respective conductor of the body portion to the one or more ~~interior~~ stripes of conductive ~~stripes~~ polymer between an interior surface and an exterior surface of the respective electrostatic discharge mitigation tubing segment.

15. The fluid circuit of claim 14, wherein the plurality of operative components includes any one of a valve, a straight connector, a T-connector, an elbow connector, a multi-connector manifold, a filter, a heat exchanger, or a sensor.