CLAIMS

1. A pedestal assembly, comprising:

a platen; and

a sensor support plate below the platen, wherein the sensor support plate comprises:

a sensor compartment; and

a waveguide temperature sensor within the sensor compartment, wherein the waveguide temperature sensor comprises a temperature sensor, wherein the temperature sensor comprises a first reflector structure and a second reflector structure, and wherein the first reflector structure and the second reflector structure are separated by a gauge length.

2. The pedestal assembly of claim 1, wherein the waveguide temperature sensor comprises a strip having a rectangular cross section, wherein the rectangular cross section has a width and a length, and wherein the length is at least 10 times the width.

3. The pedestal assembly of claim 2, wherein the width is at least 5 times a wavelength of an acoustic signal to be propagated within the waveguide temperature sensor.

4. The pedestal assembly of claim 1, wherein the waveguide temperature sensor has a spiral geometry.

5. The pedestal assembly of claim 1, wherein the waveguide temperature sensor comprises a plurality of straight segments, and wherein adjacent straight segments are coupled by folds.

6. The pedestal assembly of claim 1, wherein the waveguide temperature sensor comprises a circular arc.

7. The pedestal assembly of claim 1, wherein the waveguide temperature sensor comprises a first unit and a second unit.

8. The pedestal assembly of claim 1, wherein the waveguide temperature sensor is bonded to a surface of the sensor compartment.

9. The pedestal assembly of claim 8, wherein the waveguide temperature sensor is within a groove in the surface of the sensor compartment.

10. The pedestal assembly of claim 9, wherein the waveguide temperature sensor comprises an upper edge coupled to an upper frame segment and a lower edge coupled to a lower frame segment, wherein the lower frame segment is mechanically coupled to the surface of the sensor compartment.

11. The pedestal assembly of claim 10, wherein the upper frame segment is coupled to the platen.

12. The pedestal assembly of claim 1, wherein the waveguide temperature sensor comprises a helical spiral.

13. The pedestal assembly of claim 1, wherein the waveguide temperature sensor comprises a first helical spiral portion and a second helical spiral portion above the first helical spiral portion, and wherein the second helical spiral portion is coaxial with the first helical spiral portion.

14. The pedestal assembly of claim 1, wherein the first reflector structure and the second reflector structure comprise a first groove and a second groove, respectively, on a sidewall of the waveguide temperature sensor, wherein the first groove and the second groove have a length that is at least a portion of a first width of the waveguide temperature sensor, and wherein the first groove and the second groove have a second width that is substantially equal to or greater than 1/6 of a wavelength of an acoustic signal to be propagated within the waveguide temperature sensor.

15. The pedestal assembly of claim 1, wherein the waveguide temperature sensor comprises a first material, wherein the first reflector structure and the second reflector

structure comprise a second material, wherein the first material has a first shear modulus, the second material has a second shear modulus that is different from the first shear modulus.

16. The pedestal assembly of claim 15, wherein the first material comprises any one of aluminum, stainless steel, tungsten, titanium, silica, borosilicate glasses, aluminum oxide, titanium oxides, or aluminum nitride.

17. The pedestal assembly of claim 1, wherein the waveguide temperature sensor is substantially cylindrical.

18. The pedestal assembly of claim 1, wherein the waveguide temperature sensor is an optical fiber, and wherein the optical fiber comprises a plurality of fiber Bragg grating reflector structures or a coating comprising thermographic phosphors.

19. A system, comprising:

a vacuum chamber;

a showerhead within the vacuum chamber;

a pedestal within the vacuum chamber below the showerhead, the pedestal comprising a sensor compartment;

a waveguide temperature sensor within the sensor compartment, wherein the waveguide temperature sensor comprises at least one temperature sensor, wherein the at least one temperature sensor comprises a first reflector structure and a second reflector structure, and wherein the first reflector structure and the second reflector structure are separated by a gauge length, wherein the at least one temperature sensor is collocated within the sensor compartment to coincide with one or more measurement locations; and

a transducer coupled to a terminal lead of the waveguide temperature sensor.

20. The system of claim 19, wherein the transducer is operable to couple a signal into the waveguide temperature sensor and to receive one or more return signals, and wherein the one

or more return signals are reflected from the first reflector structure and the second reflector structure to the transducer.

21. The system of claim 19, wherein the waveguide temperature sensor is a first waveguide temperature sensor, and wherein the showerhead comprises a second waveguide temperature sensor adjacent to a faceplate of the showerhead.

22. The system of claim 21, wherein a third waveguide temperature sensor is coupled to at least one surface of the vacuum chamber.

23. A method for measuring temperatures of a process, comprising:

coupling a signal pulse into a waveguide temperature sensor within a pedestal assembly, wherein the waveguide temperature sensor comprises a temperature sensor, wherein the temperature sensor comprises a first reflector structure and a second reflector structure, and wherein the first reflector structure and the second reflector structure are separated by a gauge length;

receiving a first return signal and a second return signal reflected from the first reflector structure and the second reflector structure, respectively;

measuring a first time-of-flight (TOF) of the first return signal and a second TOF of the second return signal;

calculating a difference between the second TOF and the first TOF; and

correlating the difference with a temperature of one or more surfaces.

24. The method of claim 23, wherein measuring the first TOF of the first return signal and the second TOF of the second return signal comprises correlating the first return signal and the second return signal with the first reflector structure and the second reflector structure, respectively, and wherein the first TOF of the first return signal and the second TOF of the second return signal is a function of a local pedestal temperature in a vicinity of the first and second reflector structures.

25. The method of claim 23, further comprising increasing the temperature of the one or more surfaces of the pedestal assembly to a second temperature, wherein the temperature is a first temperature, and wherein the second temperature is greater than the first temperature, wherein the difference is a first difference, and the method further comprises:

receiving a third return signal and a fourth return signal at the second temperature;

measuring a third TOF of the third return signal and a fourth TOF of the fourth return signal, wherein the third TOF and the fourth TOF are measured at the second temperature;

calculating a second difference between the fourth TOF and the third TOF;

calculating a third difference between the first difference from the second difference; and

correlating the third difference with the second temperature.