**CLAIMS**

1. A system comprising:

a first connector including first contacts and a first optical assembly to transmit and receive free space optical signals, the first optical assembly including at least one free space optical transceiver, an optical housing that encompasses the at least one free space optical transceiver, and an optical lens secured in an opening in the optical housing, in which a gap between the at least one free space optical transceiver and an inner surface of the optical housing is filled with air or a medium that has a refractive index that closely matches a refractive index of the optical lens; and

a second connector including second contacts and a second optical assembly to transmit and receive the free space optical signals, the second optical assembly including at least one free space optical transceiver, an optical housing that encompasses the at least one free space optical transceiver, and an optical lens secured in an opening of the optical housing, in which a gap between the at least one free space optical transceiver and an inner surface of the optical housing is filled with air or a medium that has a refractive index that closely matches a refractive index of the optical lens, at least one contact from the first contacts and at least one contact from the second contacts that aligns with the at least one contact from the first contacts being made from a self-passivating transition metal that has a property of forming a non-conductive outer layer when subjected to an adverse environment, the first and second connectors being configured to be coupled to substantially align and enclose the first and second optical assemblies, in which when the first and second connectors are subjected to the adverse environment, a fluid-filled gap is formed between the first optical assembly and the second optical assembly in response to mating the first and second connectors .

2. A system according to Claim 1, in which when the first contacts are mated with the second contacts when subjected to the adverse environment, at least a portion of the non-conductive outer layer is removed from the at least one contact from the first contacts and from the at least one contact from the second contacts via scraping to form an electrically conductive connection.

3. A system according to Claim 2, in which the self-passivating transition metal is selected from a group comprising niobium, tantalum, titanium, zirconium, molybdenum, ruthenium, rhodium, palladium, hafnium, tungsten, rhenium, osmium, and iridium.

4. A system according to Claim 1, in which the first optical assembly includes a first processor communicatively connected to the at least one free space optical transceiver of the first optical assembly and the second optical assembly includes a second processor communicatively connected to the at least one free space optical transceiver of the second optical assembly, the first and second processors processing the free space optical signals.

5. A system according to Claim 1, in which the lens is selected from the group consisting of sapphire, acrylic, soda lime, quartz, and borosilicate.

6. A system according to Claim 1, further comprising status indicators situated on an outer portion or an inner portion of the first connector and/or the second connector.

7. A high-bandwidth underwater electrical connector comprising:

a first connector including first contacts having at least one first self-passivating transition metal contact that forms a non-conductive outer layer when immersed in adverse environment to transmit power and a first free space optical assembly to transmit and receive free space optical signals, the first free space optical assembly including at least one free space optical transceiver, an optical housing that encompasses the at least one free space optical transceiver, and an optical lens secured in an opening in the optical housing, in which a gap between the at least one free space optical transceiver and an inner surface of the optical housing is filled with air or a medium that has a refractive index that closely matches a refractive index of the optical lens; and

a second connector including second contacts having at least one second self-passivating transition metal contact that forms a non-conductive outer layer when immersed in the adverse environment to receive power and a second free space optical assembly to transmit and receive the free space optical signals, the second free space optical assembly including at least one free space optical transceiver, an optical housing that encompasses the at least one free space optical transceiver, and an optical lens secured in an opening of the optical housing, in which a gap between the at least one free space optical transceiver and an inner surface of the optical housing is filled with air or a

medium that has a refractive index that closely matches a refractive index of the optical lens, the first and second connectors being configured to be coupled to substantially align and enclose the first and second free space optical assemblies,

in which a fluid-filled gap is formed between the first and second free space optical assemblies in response to fastening the first and second connectors while submerged in the adverse environment and where the first and second free space optical assemblies transmit and receive the free space optical signals.

8. A high-bandwidth underwater electrical connector according to Claim 7, in which the first free space optical assembly includes a first processor communicatively connected to the at least one free space optical transceiver of the first free space optical assembly and the second free space optical assembly includes a second processor communicatively connected to the at least one free space optical transceiver of the second free space optical assembly, the first and second processors processing the data transmitted between the first and second connectors.

9. A high-bandwidth underwater electrical connector according to Claim 7, in which the lens is selected from the group consisting of sapphire, acrylic, soda lime, quartz, and borosilicate.

10. A high-bandwidth underwater electrical connector according to Claim 7, in which when the first connector is mated with the second connector while immersed in the adverse environment, at least a portion of the non-conductive outer layer is removed from the at least one first self-passivating transition metal contact and from the at least one second self-passivating transition metal contact via scraping to form an electrically conductive connection.

11. A high-bandwidth underwater electrical connector according to Claim 7, further comprising status indicators situated on an outer portion or an inner portion of the first connector and/or the second connector.

12. A high-bandwidth underwater electrical connector according to Claim 7, in which the self-passivating transition metal is selected from a group comprising niobium, tantalum, titanium, zirconium, molybdenum, ruthenium, rhodium, palladium, hafnium, tungsten, rhenium, osmium, and iridium.

13. A method for transmitting free space optical signals carrying data, the method comprising:

immersing a first connector and a second connector in an adverse environment, the first connector comprising first contacts having at least one contact made from a self-passivating transition metal that forms a non-conductive outer layer when immersed in the adverse environment and a first free space optical transceiver, the first free space optical transceiver housed in an optical housing, in which a gap between the first free space optical transceiver and the optical housing is filled with air or a medium that has a refractive index that closely matches a refractive index of an optical lens of the first free space optical transceiver, the second connector comprising second contacts having at least one contact made from the self-passivating transition metal that forms a non-conductive outer layer when immersed in the fluid and a second free space optical transceiver, the second free space optical transceiver housed in an optical housing, in which a gap between the second free space optical transceiver and the optical housing is filled with air or a medium that has a refractive index that closely matches a refractive index of an optical lens of the second free space optical transceiver; and

mating the first and second connectors to provide an electrical connection between the first contacts and the second contacts to conduct power between the first and second connectors and to form a fluid-filled gap between the first free space optical transceiver and the second free space optical transceiver, the first and second free space optical transceivers transmitting and receiving the free space optical signals through the fluid-filled gap, in which the at least one first self-passivating transition metal contact being aligned with and connected to the at least one second self-passivating transition metal contact.

14. A method according to Claim 13, in which when the first connector is mated with the second connector while immersed in the adverse environment, at least a portion of the non-conductive outer layer is removed from the at least one first self-passivating transition metal contact and from the at least one second self-passivating transition metal contact via scraping to form an electrically conductive connection.

15. A method according to Claim 13, in which the self-passivating transition metal is selected from a group comprising niobium, tantalum, titanium, zirconium, molybdenum, ruthenium, rhodium, palladium, hafnium, tungsten, rhenium, osmium, and iridium.