Is Fischbeck's RanDome Geodesic?

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The question of Fischbeck's RanDome being a geodesic structure is not a simple one. In mathematics, "given two points on a surface, the geodesic is defined as the shortest path on the surface connecting them."[1], however, the terms "Geodesic Dome" has become widely accepted even though the resulting polyhedra are not necessarily composed of "Geodesic" arcs on its surface.[2] In most cases of the Fuller type of "Geodesic Dome" a chord instead of an arc passing through two points on the sphere surface is chosen as the structural element. In those cases an infinite number of lesser circles may pass through the sphere containing the end points of the chord, thus the system would not be considered "geodesic". However, one plane containing the chord is a great circle. In this case it would be "geodesic". Generally, the structural element is placed in the great circle plane to give it depth for ease of designing nodal connectors at the vertices of the polyhedron, thus it may be considered a "geodesic" system. Even in the case of Fuller's truncateable domes, the chords are generally designed to be in their great circle planes.

One type of the Fischbeck RanDome is based on a structural plate system of a random placing of cones tangent to the surface of a sphere. Each cone is identical to the other and their size and shape are determined as described in the document section, "Icosahedral Circle Grid: circles constructed using cones of spherical excess" and calculated in the document section "Spherical Excess for Triangulated Geodesic Spheres". In this case the grid was calculated based on a geodesic geometry in the Fuller since, but not necessarily in the mathematical since. The cones are randomly placed in the vertex domain of the construction grid. The cone tangent circle lies in a lesser circle plane to the sphere; therefore, it should not be considered a geodesic structure in a mathematical since. However, to most people in the architectural and engineering fields it could be considered among the family of geodesic structures since its geometry is based on a triangulated geodesic tessellation of the sphere.

Assuming that another variation of the Fischbeck RanDome system is based on a structural frame system similar to the method described in the document section "Clinton's Equal Central Angle Conjecture", the Fischbeck RanDome could be considered a geodesic structure in the mathematical since. In this method the structural frame elements are placed in great circle planes of Goldberg's polyhedra.

It is my conclusion that the phrase "Geodesic Structures" is appropriate for describing the FischBeck RanDomes. However, they can also be included among the classic groups of sphere and circle packing systems.[3]

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[1] Weisstein, Eric W., CRC Concise Encyclopedia of Mathematics, CRC Press, New York, NY, 1999, pp727.
[2] Ibid, "A Triangulation of a Platonic Solid or other Polyhedron to produce a close approximation to a Sphere. The nth order geodesation operation replaces each polygon of the polyhedron by the projection onto the Circumsphere of the order n regular tessellation of that polygon.", pp 729.
[3] See: Tóth, Fejes, Regular Figures, Pergamon-Macmillan, New York, NY, 1964.