[Alternative Embodiments]

Embodiment 1: A method for the additive manufacturing of components, in particular a method for the volumetric printing of components through holograms, comprising the following steps:

Step 1 : providing a powder bed comprising at least one layer of powder;

Step 2: exposing at least part of the powder bed to radiation to consolidate only part of the powder in the powder bed;

Step 3: optionally, providing an additional layer of powder adjacent to the previously consolidated or at least partially consolidated layer of powder to form successive powder layers of the powder bed;

Step 4: optionally, repeating step 2;

Step 5: optionally, repeating steps 3 and 4 until the component is completely additively manufactured; and

Step 6: separating the consolidated or partially consolidated powder from the unconsolidated powder in the powder bed.

Embodiment 2: The method according to **Embodiment 1**, wherein there are points in the powder bed which are exposed to a higher radiation field strength than other points in the powder bed at least at one point in time in step 2.

Embodiment 3: The method according to any of **Embodiment 1 or 2**, wherein at a first point in time in step 2, there is a first subset of points in the powder bed which is exposed to a substantially higher radiation field strength than a second subset of points in the powder bed; and wherein at a second point in time in step 2, the second subset of points in the powder bed is exposed to a substantially higher radiation field strength than the first subset of points in the powder bed.

Embodiment 4: The method according to any of **Embodiments 1 to 3**, wherein at a first point in time in step 2, there are a first and a second subset of points in the powder bed which are exposed to a substantially higher radiation field strength than a third subset of points in the powder bed; and wherein at a second point in time in step 2, the second and third subset of points in the powder bed are exposed to a substantially higher radiation field strength than the first subset of points in the powder bed.

Embodiment 5: The method according to any of **Embodiments 1 to 4**, wherein at a first point in time in step 2, there is a first subset of points in the powder bed which is exposed to a substantially higher radiation field strength than a second subset of points in the powder bed; and wherein at a second point in time in step 2, there is no significant difference between the radiation field strength to which the first and second subset of points are exposed.

Embodiment 6: The method according to any of **Embodiments 1 to 5**, wherein at a first point in time in step 2, there is a first subset of points in the powder bed which is exposed to a substantially higher radiation field strength than a second subset of points in the powder bed; wherein at a second point in

time in step 2, there is no significant difference between the radiation field strength to which the first and second subset of points are exposed; and wherein at a third point in time in step 2, the second subset of points in the powder bed is exposed to a substantially higher radiation field strength than the first subset of points in the powder bed.

Embodiment 7: The method according to any of **Embodiments 1 to 6**, wherein at a first point in time in step 2, there is a first subset of points in the powder bed which is exposed to a substantially higher radiation field strength than a second subset of points in the powder bed; wherein at a second point in time in step 2, there is no significant difference in the radiation field strength to which the first and second subset of points are exposed; wherein at a third point in time in step 2, the second subset of points in the powder bed is exposed to a substantially higher radiation field strength than the first subset of points in the powder bed; and wherein at a fourth point in time in step 2, the first subset of points in the powder bed is exposed to a substantially higher radiation field strength than the second subset of points in the powder bed.

Embodiment 8: The method according to any of **Embodiments 3 to 7**, wherein the second point in time is later than the first point in time.

Embodiment 9: The method according to any of **Embodiments 6 or 8**, wherein the third point in time is later than the second point in time.

Embodiment 10: The method according to any of **Embodiments 7 to 9**, wherein the fourth point in time is later than the third point in time.

Embodiment 11: The method according to any of **Embodiments 1 to 10**, wherein the radiation comprises electromagnetic radiation.

Embodiment 12: The method according to any of **Embodiments 3 to 11** , wherein the points of each subset of points are not in every case adjacent to each other.

Embodiment 13: The method according to any of **Embodiments 3 to 12**, wherein a subset of points consists of a number of points between 2 and 79000.

Embodiment 14: The method according to any of **Embodiments 2 to 13**, wherein each point is a powder particle.

Embodiment 15: The method according to any of **Embodiments 2 to 14**, wherein each point is a voxel.

Embodiment 16: The method according to **Embodiment 15**, wherein the voxel is a polyhedron with cubic geometry and an edge length of 0.001 mm.

Embodiment 17: The method according to any of **Embodiments 3 to 16**, wherein a substantially higher radiation field strength is a radiation field strength which is 26% or more higher.

Embodiment 18: The method according to any of **Embodiments 5 to 17**, wherein no significant difference is a difference of 19% or less.

Embodiment 19: The method according to any of **Embodiments 1 to 18**, wherein the powder bed comprises layers of powder of different thicknesses.

Embodiment 20: The method according to any of **Embodiments 1 to 19**, wherein the powder bed comprises at least a metal or metal alloy in powder form.

Embodiment 21: The method according to any of **Embodiments 1 to 20**, wherein the powder bed comprises at least a ceramic material in powder form.

Embodiment 22: The method according to any of **Embodiments 1 to 21** , wherein the maximum temperature at which the powder bed is exposed in step 2 is less than 0.5*Tm, which is below the sintering and melting temperature of the powder, to which Tm refers to.

Embodiment 23: The method according to **Embodiment 22**, wherein Tm is the melting temperature in Kelvin of the metallic powder in the powder bed with the highest melting point.

Embodiment 24: The method according to **Embodiment 22**, wherein Tm is the melting temperature in Kelvin of the ceramic powder in the powder bed with the highest melting point.

Embodiment 25: The method according to any of **Embodiments 1 to 24**, wherein the powder bed comprises a polymer in an amount of less than 79% by volume in respect of the total volume of the powder bed, and a metallic and/or ceramic powder.

Embodiment 26: The method according to any of **Embodiments 1 to 25**, wherein the maximum temperature at which the powder bed is exposed in step 2 is greater than 0.5*Tmp.

Embodiment 27: The method according to **Embodiment 26**, wherein Tmp is the melting temperature in degrees Celsius of the polymer with the lowest melting point in the powder bed.

Embodiment 28: The method according to any of **Embodiments 1 to 25**, wherein the maximum temperature at which the powder bed is exposed in step 2 is greater than 0.5* HDT at 0.455 MPa.

Embodiment 29: The method according to **Embodiment 28**, wherein HDT at 0.455 MPa is the heat deflection temperature measured with a load of 0.455 MPa in degrees Celsius of the polymer with the lowest HDT at 0.455 MPa in the powder bed.

Embodiment 30: The method according to any of **Embodiments 1 to 27**, wherein the maximum temperature at which the powder bed is exposed in step 2 is less than 0.5*Tm and greater than 0.5*Tmp. 3

Embodiment 31: The method according to any of **Embodiments 1 to 25** and **28 to 29**, wherein the maximum temperature at which the powder bed is exposed in step 2 is less than 0.5*Tm and greater than HDT at 0.455 MPa.

Embodiment 32: The method according to any of **Embodiments 1 to 31** , wherein the part of the powder exposed to the radiation in step 2 is constrained to the two uppermost layers of powder added.

Embodiment 33: The method according to any of **Embodiments 1 to 31** , wherein the part of the powder exposed to the radiation in step 2 is constrained to some, but not all, of the plurality of powder layers in the powder bed.

Embodiment 34: The method according to any of **Embodiments 1 to 33**, wherein the part of the powder that is consolidated in step 2 is constrained to the two uppermost layers of powder added.

Embodiment 35: The method according to any of **Embodiments 1 to 33**, wherein the part of the powder that is consolidated in step 2 is constrained to some, but not all, of the plurality of powder layers in the powder bed.

Embodiment 36: The method according to any of **Embodiments 1 to 35**, wherein the radiation to which the powder bed is exposed in step 2 is a proper radiation.

Embodiment 37: The method according to **Embodiment 36**, wherein the proper radiation comprises radiation in the microwave range.

Embodiment 38: The method according to any of **Embodiments 36 or 37**, wherein the proper radiation comprises radiation in the THz range.

Embodiment 39: The method according to any of **Embodiments 36 to 38**, wherein the proper radiation is a radiation with a frequency between 0.0002 and 120 THz or less.

Embodiment 40: The method according to any of **Embodiments 36 to 39**, wherein the proper radiation is applied using at least 2 radiation emitters.

Embodiment 41: The method according to any of **Embodiments 36 to 40**, wherein the proper radiation is applied using at least 2 different frequencies.

Embodiment 42: The method according to any of **Embodiments 1 to 41** , wherein said method comprises the use of a sequence of holograms.

Embodiment 43: The method according to **Embodiment 42**, wherein said method comprises the use of machine learning to generate the sequence of control variables which generates the sequence of holograms.

Embodiment 44: The method according to any of **Embodiments 42 or 43**, wherein said method comprises the use of machine learning trained with a transformation from the input vector, containing all the possible combinations of the control variables and the scalar output, which is the radiation field intensity map comprising the value for each point in the powder bed, to generate the sequence of values for each control variable that generates the sequence of holograms.

Embodiment 45: The method according to any of **Embodiments 42 to 44**, wherein said method comprises the use of machine learning trained with a transformation from the input vector, containing all the possible combinations of the control variables and the scalar output, which is the degree of consolidation map comprising the value for each point in the powder bed, to generate the sequence of values for each control variable that generates the sequence of holograms.

Embodiment 46: The method according to any of **Embodiments 42 to 44**, wherein said method comprises the use of a machine learning system to provide the time variation of each of the control variables, the machine learning system comprising the modelling of the consolidation level reached by every point in the powder bed.

Embodiment 47: A method for the additive manufacturing of components, in particular a method for the volumetric printing of components through holograms, comprising the following steps:

Step 1 : providing a polymer bed comprising at least one layer of polymer in liquid form;

Step 2: exposing at least part of the polymer bed to radiation to cure only part of the polymer in the polymer bed;

Step 3: optionally, providing an additional layer of polymer in liquid form adjacent to the previously cured or at least partially cured layer of polymer to form successive layers of the polymer bed;

Step 4: optionally, repeating step 2;

Step 5: optionally, repeating steps 3 and 4 until the component is completely additively manufactured; and

Step 6: separating the cured or partially cured polymer from the uncured polymer in the polymer bed.

Embodiment 48: A method for the additive manufacturing of components, in particular a method for the volumetric printing of components through holograms, comprising the following steps:

Step 1 : providing a slurry bed comprising at least one layer of slurry;

Step 2: exposing at least part of the polymer bed to radiation to cure only part of the layer of slurry in the slurry bed;

Step 3: optionally, providing an additional layer of slurry adjacent to the previously cured or at least partially cured layer of slurry to form successive layers of the slurry bed;

Step 4: optionally, repeating step 2;

Step 5: optionally, repeating steps 3 and 4 until the component is completely additively manufactured; and

Step 6: separating the cured or partially cured slurry from the uncured slurry in the slurry bed.

Embodiment 49: A component manufactured according to the method of any of **Embodiments 1 to 48**.

Embodiment 50: An apparatus for the additive manufacturing of components, in particular an apparatus for the volumetric printing of components through holograms, the apparatus comprising:

- a chamber in which a three-dimensional component is additively manufactured;
- a powder holder for holding a powder bed,
-at least one radiation generator; and
-at least one radiation applicator per generator.

CLAIMS

1. A method for the additive manufacturing of components, in particular a method for the volumetric printing of components through holograms, comprising the following steps:

Step 1: providing a powder bed comprising at least one layer of powder;

Step 2: exposing at least part of the powder bed to radiation to consolidate only part of the powder in the powder bed;

Step 3: optionally, providing an additional layer of powder adjacent to the previously consolidated or at least partially consolidated layer of powder to form successive powder layers of the powder bed;

Step 4: optionally, repeating step 2;

Step 5: optionally, repeating steps 3 and 4 until the component is completely additively manufactured; and

Step 6: separating the consolidated or partially consolidated powder from the unconsolidated powder in the powder bed.

2. The method according to claim 1, wherein there are points in the powder bed which are exposed to a higher radiation field strength than other points in the powder bed at least at one point in time in step 2.

3. The method according to any of claims 1 or 2, wherein at a first point in time in step 2, there is a first subset of points in the powder bed which is exposed to a substantially higher radiation field strength than a second subset of points in the powder bed; and wherein at a second point in time in step 2, the second subset of points in the powder bed is exposed to a substantially higher radiation field strength than the first subset of points in the powder bed.

4. The method according to any of claims 1 to 3, wherein at a first point in time in step 2, there are a first and a second subset of points in the powder bed which are exposed to a substantially higher radiation field strength than a third subset of points in the powder bed; and wherein at a second point in time in step 2, the second and third subset of points in the powder bed are exposed to a substantially higher radiation field strength than the first subset of points in the powder bed.

5. The method according to any of claims 1 to 4, wherein at a first point in time in step 2, there is a first subset of points in the powder bed which is exposed to a substantially higher radiation field strength than a second subset of points in the powder bed; and wherein at a second point in time in

step 2, there is no significant difference between the radiation field strength to which the first and second subset of points are exposed.

6. The method according to any of claims 1 to 5, wherein at a first point in time in step 2, there is a first subset of points in the powder bed which is exposed to a substantially higher radiation field strength than a second subset of points in the powder bed; wherein at a second point in time in step 2, there is no significant difference between the radiation field strength to which the first and second subset of points are exposed; and wherein at a third point in time in step 2, the second subset of points in the powder bed is exposed to a substantially higher radiation field strength than the first subset of points in the powder bed.

7. The method according to any of claims 1 to 6, wherein at a first point in time in step 2, there is a first subset of points in the powder bed which is exposed to a substantially higher radiation field strength than a second subset of points in the powder bed; wherein at a second point in time in step 2, there is no significant difference in the radiation field strength to which the first and second subset of points are exposed; wherein at a third point in time in step 2, the second subset of points in the powder bed is exposed to a substantially higher radiation field strength than the first subset of points in the powder bed; and wherein at a fourth point in time in step 2, the first subset of points in the powder bed is exposed to a substantially higher radiation field strength than the second subset of points in the powder bed.

8. The method according to any of claims 3 to 7, wherein the second point in time is later than the first point in time.

9. The method according to any of claims 1 to 8, wherein the radiation comprises electromagnetic radiation.

10. The method according to any of claims 2 to 9, wherein each point is a voxel, wherein the voxel is a polyhedron with cubic geometry and an edge length of 0.001 mm.

11. The method according to any of claims 3 to 10, wherein a substantially higher radiation field strength is a radiation field strength which is 26% or more higher.

12. The method according to any of claims 5 to 11, wherein no significant difference is a difference of 19% or less.

13. The method according to any of claims 1 to 12, wherein the radiation to which the powder bed is exposed in step 2 is a proper radiation, and wherein the proper radiation is a radiation with a frequency between 0.0002 and 120 THz or less.

14. The method according to claim 13, wherein the proper radiation is applied using at least 2 radiation emitters and/or wherein the proper radiation is applied using at least 2 different frequencies.

15. The method according to any of claims 1 to 14, wherein said method comprises the use of a sequence of holograms, and the use of machine learning to generate the sequence of control variables which generates the sequence of holograms.

16. The method according to claim 15, wherein said method comprises the use of machine learning trained with a transformation from the input vector, containing all the possible combinations of the control variables and the scalar output, which is the radiation field intensity map comprising the value for each point in the powder bed, to generate the sequence of values for each control variable that generates the sequence of holograms.