CLAIMS

1. A method for modulating a laser beam provided by a laser system comprising at least one seed laser device and a coherent beam combining (CBC) system configured to receive seed beam/s of the seed laser device/s and to selectively provide an amplified laser beam; the CBC system comprising:

a plurality of phase modulators configured in optical connections with:

the seed beam/s, at least one beam splitter configured to split the seed beam to plurality of beams all having same wavelength, plurality of optical amplifiers, and optionally at least one beam combiner;

all arranged to enable constructive or destructive beam interference, at a CBC point; and

at least one control circuitry, configured to monitor the beam interference, at the CBC point, and to accordingly control at least one of the phase modulators;

the method comprising steps of:

activating the laser beam by controlling relative phases of beams in the laser system to provide the constructive beam interference, at the CBC point, thereby providing the laser beam;

deactivating the laser beam by controlling relative phases of beams in the laser system to provide the destructive beam interference at the CBC point, thereby preventing the laser beam;

wherein the laser system comprising a fast optical modulator (FOM), configured to receive the seed beam of the seed laser device and modulate a bandwidth thereof;

and wherein the method steps of:

activating comprises controlling the FOM to provide the seed beam with a first

bandwidth ($\Delta\omega 1$) configured to enable a constructive interference, at a CBC point of the CBC system, thereby providing the laser beam;

deactivating comprises controlling the FOM to provide the seed beam with a second bandwidth ($\Delta\omega 2$, where $\Delta\omega 2 > \Delta\omega 1$) configured to disable a constructive interference, at the CBC point, thereby preventing the laser beam.

2. The method according to claim 1, wherein the steps of:

activating comprises controlling the phase modulators to provide the constructive beam interference, at the CBC point, thereby providing the laser beam;

deactivating comprises controlling the phase modulators to provide the destructive beam interference at the CBC point, thereby preventing the laser beam.

3. The method according to claim 2, wherein the step of activating by controlling the phase modulators to provide the constructive beam interference comprises tuning the phase modulators to provide the constructive beam interference with maximum intensity.

4. The method according to claim 3, wherein the step of deactivating by controlling the phase modulators to provide the destructive interference comprises controlling half of the tuned phase modulators to add a half phase (π) to their beams.

5. The method according to claim 3, wherein the step of deactivating by controlling the phase modulators to provide the destructive interference comprises modifying some of the tuned phase modulators.

6. The method according to claim 5, wherein each of the tuned phase modulators is differently modified.

7. The method according to claim 3, further comprising a step of tuning the laser beam, by modifying some of the phase modulators, which were tuned to provide maximum beam intensity, the modifying is configured to cause the intensity of the laser beam to equal to a predetermined percentage of the maximum intensity.

8. The method according to claim 2, the step of deactivating by controlling the phase modulators to provide the destructive beam interference comprises tuning the phase modulators to provide the beam interference with minimum intensity.

9. A method for modulating a laser beam provided by a laser system comprising at least one seed laser device and a coherent beam combining (CBC) system configured to receive seed beam/s of the seed laser device/s and to selectively provide an amplified laser beam; the CBC system comprising:

a plurality of phase modulators configured in optical connections with:

the seed beam/s, at least one beam splitter configured to split the seed beam to plurality of beams all having same wavelength, plurality of optical amplifiers, and optionally at least one beam combiner;

all arranged to enable constructive or destructive beam interference, at a CBC point; and

at least one control circuitry, configured to monitor the beam interference, at the CBC point, and to accordingly control at least one of the phase modulators;

the method comprising steps of:

activating the laser beam by controlling relative phases of beams in the laser system to provide the constructive beam interference, at the CBC point, thereby providing the laser beam;

deactivating the laser beam by controlling relative phases of beams in the laser system to provide the destructive beam interference at the CBC point, thereby preventing the laser beam;

wherein the laser system (1500) comprising:

the seed laser device configured to provide a first seed laser beam having a first bandwidth ($\Delta\omega 1$);

a second seed laser device, configured to provide a second seed laser beam having a second bandwidth ($\Delta\omega 2$), larger than the first bandwidth ($\Delta\omega 2 > \Delta\omega 1$); and

an optical switch configured to link only one of the first and second seed beams to the CBC system;

wherein the first bandwidth ($\Delta\omega 1$) is configured to enable a constructive beam interference, at a CBC point of the CBC system, and wherein the second bandwidth ($\Delta\omega 2$) is configured to disable a constructive beam interference, at the CBC point;

and wherein the method steps of:

activating comprises controlling the optical switch to link the first seed laser beam to the CBC system, thereby enabling a constructive interference and providing the laser beam;

deactivating comprises controlling the optical switch to link the second seed laser beam to the CBC system, thereby disabling a constructive interference and preventing the laser beam.

10. The method according to claim 9, wherein the steps of:

activating comprises controlling the phase modulators to provide the constructive beam interference, at the CBC point, thereby providing the laser beam;

deactivating comprises controlling the phase modulators to provide the destructive beam interference at the CBC point, thereby preventing the laser beam.

11. The method according to claim 10, wherein the step of activating by controlling the phase modulators to provide the constructive beam interference comprises tuning the phase modulators to provide the constructive beam interference with maximum intensity.

12. The method according to claim 11, wherein the step of deactivating by controlling the phase modulators to provide the destructive interference comprises controlling half of the tuned phase modulators to add a half phase (π) to their beams.

13. The method according to claim11, wherein the step of deactivating by controlling the phase modulators to provide the destructive interference comprises modifying some of the tuned phase modulators.

14. The method according to claim 13, wherein each of the tuned phase modulators is differently modified.

15. The method according to claim 11, further comprising a step of tuning the laser beam, by modifying some of the phase modulators, which were tuned to provide maximum beam intensity, the modifying is configured to cause the intensity of the laser beam to

equal to a predetermined percentage of the maximum intensity.

16. The method according to claim 10, the step of deactivating by controlling the phase modulators to provide the destructive beam interference comprises tuning the phase modulators to provide the beam interference with minimum intensity.

17. A method for modulating a laser beam provided by a laser system comprising:

at least one seed laser device;

an optical polarization combiner (OPC), configured to receive a seed laser beam of the seed laser device and to modulate polarization directions thereof; wherein the modulation comprises providing the seed beam with at least two polarization components, wherein one of the polarization components comprising a predetermined polarization direction (P1);

a coherent beam combining (CBC) system, configured to receive the polarization modulated seed beam and provide an amplified laser beam; the CBC system comprising:

plurality of phase modulators configured in optical connections with: the polarization modulated seed beam, plurality of optical amplifiers, at least one beam splitter, and optionally at least one beam combiner; all arranged to enable a constructive beam interference, at a CBC point; and

at least one control circuitry, configured to monitor the beam interference, at the CBC point, and to accordingly control at least one of the phase modulators;

a polarization beam splitter (PBS) configured to receive the amplified laser beam and transmit only beams having the predetermined polarization direction (P1) to output of the laser system and reflect beams having other polarization directions, thereby

selectively provide the laser beam;

the method comprising steps of:

activating the laser beam by controlling the OPC to provide the beam component having the predetermined polarization direction (P1) with an intensity (I1) larger than 50% of the overall intensity of the seed laser beam, thereby providing the laser beam;

deactivating the laser beam by controlling the OPC to provide the beam component having the predetermined polarization direction (P1) with an intensity (I1) equal or smaller than 50% of the overall intensity of the seed laser beam, thereby averting the laser beam; and

controlling the phase modulators to provide the constructive beam interference, at the CBC point, at least during the step of activating.

18. The method according to claim 17, further comprising a step of tuning the laser beam, by controlling the OPC to provide the beam component having the predetermined polarization direction (P1) with an intensity (I1) equal to a predetermined percentage of the overall intensity of the seed laser beam.

19. The method according to claim 17 or 18, wherein the OPC comprises:

a beam splitting assembly, configured to receive an input beam with a first polarization direction (P1) and to output a first beam (B1(I1,P1)) having the first polarization direction (P1) and a first intensity (I1) and a second beam (B2(I2,P1)) having the first polarization direction (P1) and a second intensity (I2), wherein the sum of the first and second intensities (I1+I2) equals to the intensity of the input beam;

a polarization convertor configured to receive one of the beam splitting assembly output beams (B1 or B2) and to convert its polarization; and

a polarization beam splitter (PBS) (1840A) configured to receive the first output beam (B1(I1, P1)) and the second converted output beam (B2(I2, P2)) and to combine them into a third beam, provided as an input to the CBC system; or, a coupler configured to receive the first output beam (B1(I1, P1)) and the second converted output beam (B2(I2, P2)), combine them, and split them into two output beams, wherein only one of the two output beams is provided as an input to the CBC system.

20. The method according to claim 19, wherein the beam splitting assembly comprises:

a beam splitter configured to receive an input beam and split the input beam into two beams;

a phase modulator configured to modulate the phase of one of the two beams;

a coupler configured to receive the two beams and to provide their interference at two locations, thereby to provide the first output beam (B1(I1, P1)) and the second output beam (B2(I2, P1));

an electronic controller, configured to monitor one of the two interference locations and control the phase modulator to accordingly enable a constructive or a destructive beam interference, at the monitored location, and wherein the non-monitored interference location is thereby provided with a destructive or a constructive beam interference, respectively;

and wherein the steps of controlling the OPC comprising controlling the phase modulator.