CLAIMS

What is claimed is:

1. A method for performing DA (Dynamic Alignment) beam calibration in a plasma processing system, said method comprising:

acquiring a positional difference, said positional difference is acquired using an optical imaging approach, said optical imaging approach comprising:

positioning said wafer on said end effector,

taking a still image of said wafer on said end effector,

processing said still image to ascertain said center of said wafer and an end effector-defined center defined by said end effector,

determining said positional difference between said center of said wafer and said end effector-defined center defined by said end effector,

centering a wafer with respect to an end effector by compensating for said positional difference between said wafer and said end effector with robot movement compensation;

moving said wafer and said end effector through DA beams associated with a plasma processing module; and

obtaining a reference DA beam pattern by recording a break-and-make pattern of said DA beams, said break-and-make pattern occurring as said wafer and said end effector move through said DA beams.

2. The method of claim 1 further comprising providing a first visual indicator on said end effector for enabling a processing unit to determine from said still image said end effector-defined center, said first visual indicator representing a reference mark employed to derive said end effector-defined center.

3. The method of claim 1 further comprising providing a first visual indicator on said wafer for enabling a processing unit to determine from said still image said center of said wafer, said first visual indicator employed to ascertain the circle that is described by said first visual indicator, thereby enabling said center of said wafer to be determined.

4. The method of claim 1 further comprising employing an image acquisition device to take said still image of said wafer and said end effector such that said DA beams are calibrated in production conditions.

5. The method of claim 4 wherein at least a portion of said image acquisition device is implemented inside a plasma processing chamber.

6. The method of claim 1 further comprising acquiring said still image through an optical access that permits said still image to include both at least a portion of an image of a first visual indicator of said end effector and at least a portion of an image of a first visual indicator of said wafer, said first visual indicator of said end effector representing a reference mark employed to derive said end effector-defined center and said first visual indicator of said wafer employed to ascertain the circle that is described by said first visual indicator of said wafer.

7. A system for performing DA (Dynamic Alignment) beam calibration in a plasma processing system, said system comprising:

a robot controller, said robot controller configured to perform at least one of

centering a wafer with respect to an end effector by compensating for a positional difference between said wafer and said end effector with robot movement compensation,

moving said wafer and said end effector through DA beams associated with a plasma processing module;

an image acquisition device, said image acquisition device configured to take one ore more still images of at least one of said wafer and said end effector;

an processing unit for performing at least processing said one ore more still images to ascertain said end effector-defined center and said center of said wafer, and determine said positional difference between said center of said end effector-defined center and said center of said wafer, wherein said positional difference is acquired using an in-situ optical imaging approach; and

a logic module, said logic module configured for obtaining a reference DA beam pattern by recording a break-and-make pattern of said DA beams, said break-and-make pattern occurring as said wafer and said end effector moves through said DA beams.

8. The system of claim 7 wherein said end effector is provided with a first visual indicator, thereby enabling said processing unit to determine from said one or more still images said end effector-defined center, said first visual indicator representing a reference mark employed to derive said end effector-defined center.

9. The system of claim 7 wherein said wafer is provided with a first visual indicator, thereby enabling said processing unit to determine from said one or more still images said center of said wafer, said first visual indicator employed to ascertain the circle that is described by said first visual indicator, thereby enabling said center of said wafer to be determined.

10. The system of claim 7 wherein at least a portion of said image acquisition device is implemented inside a plasma processing chamber of said processing system.

11. The system of claim 7 wherein said one or more still images is acquired through an optical access that permits said one ore more still image to include both at least a portion of an image of a first visual indicator of said end effector and at least a portion of an image of a first visual indicator of said wafer, said first visual indicator of said end effector representing a reference mark employed to derive said end effector-defined center and said first visual indicator of said wafer employed to ascertain the circle that is described by said first visual indicator of said wafer.

12. A plasma processing system for performing DA (Dynamic Alignment) beam calibration, said plasma processing system comprising:

a robot controller, said robot controller configured for at least

centering a wafer with respect to an end effector by compensating for a positional difference between said wafer and said end effector with robot movement compensation,

moving said wafer and said end effector through DA beams associated with a plasma processing module;

an optical imaging system, said in-situ optical system configured to acquire said positional difference;

a logic module, said logic module configured for obtaining a reference DA beam pattern by recording a break-and-make pattern of said DA beams, said break-and-make pattern occurring as said wafer and said end effector moves through said DA beams.

13. The system of claim 12 wherein said in-situ optical imaging system configured to include at least

an optical imaging system, said optical imaging system configured to acquire one ore more still images of said wafer and said end effector;

a processing unit, said processing unit configured to ascertain said center of said wafer and said end effector-defined center; and

a logic module, said logic module configured to determine said positional difference between said end effector-defined center and said center of said wafer.

14. The system of claim 13 wherein said end effector is provided with a first visual indicator, thereby enabling said processing unit to determine from said one or more still images said end effector-defined center, said first visual indicator representing a reference mark employed to derive said end effector-defined center.

15. The system of claim 14 wherein said first visual indicator is a scribe line, said scribe line configured to be an arc of a circle such that the center of said circle coincides with said end effector-defined center.

16. The system of claim 13 wherein said wafer is provided with a first visual indicator, thereby enabling said processing unit to determine from said one or more still images said center of said wafer, said first visual indicator employed to ascertain a circle that is described by said first visual indicator, thereby enabling said center of said wafer to be determined.

17. The system of claim 16 wherein said first visual indicator is an outer periphery of said wafer.

18. The system of claim 13 wherein at least a portion of said optical imaging system is implemented inside a plasma processing chamber.

19. The system of claim 13 wherein said one or more still image is acquired through an optical access that permits said one or more still image to include both at least a portion of an image of a first visual indicator of said end effector and at least a portion of an image of a first visual indicator of said wafer, said first visual indicator of said end effector representing a reference mark employed to derive said end effector-defined center and said first visual indicator of said wafer employed to ascertain the circle that is described by said first visual indicator of said wafer.

CLAIMS

What is claimed is:

1. A method for performing DA (Dynamic Alignment) beam calibration in a plasma processing system, said method comprising:

providing a first visual indicator on an end effector, wherein said first visual indicator is an arc of a circle such that the center of said circle coincides with an end effector-defined center defined by said end effector;

acquiring a positional difference, said positional difference is acquired using an optical imaging approach, said optical imaging approach comprising:

positioning said wafer on said end effector,

taking a still image of said wafer on said end effector,

processing said still image to ascertain said center of said wafer and said end effector-defined center,

determining said positional difference between said center of said wafer and said end effector-defined center defined by said end effector,

centering a wafer with respect to said end effector by compensating for said positional difference between said wafer and said end effector with robot movement compensation;

moving said wafer and said end effector through DA beams associated with a plasma processing module; and

obtaining a reference DA beam pattern by recording a break-and-make pattern of said DA beams, said break-and-make pattern occurring as said wafer and said end effector move through said DA beams.

2. The method of claim 1 further comprising using said first visual indicator to determine from said still image said end effector-defined center, said first visual indicator representing a reference mark employed to derive said end effector-defined center.

3. The method of claim 1 further comprising using said first visual indicator to determine from said still image said center of said wafer, said first visual indicator employed to ascertain the circle that is described by said first visual indicator, thereby enabling said center of said wafer to be determined.

4. The method of claim 1 further comprising employing an image acquisition device to take said still image of said wafer and said end effector such that said DA beams are calibrated in production conditions.

5. The method of claim 4 wherein at least a portion of said image acquisition device is implemented inside a plasma processing chamber.

6. The method of claim 1 further comprising acquiring said still image through an optical access that permits said still image to include both at least a portion of an image of a first visual indicator of said end effector and at least a portion of an image of a first visual indicator of said wafer, said first visual indicator of said end effector representing a reference mark employed to derive said end effector-defined center and said first visual indicator of said wafer employed to ascertain the circle that is described by said first visual indicator of said wafer.

7. A system for performing DA (Dynamic Alignment) beam calibration in a plasma processing system, said system comprising:

an end effector including at least a first visual indicator, wherein said first visual indicator includes an arc of a circle such that the center of said circle coincides with an end effector-defined center defined by said end effector;

a robot controller, said robot controller configured to perform at least one of

centering a wafer with respect to said end effector by compensating for a positional difference between said wafer and said end effector with robot movement compensation,

moving said wafer and said end effector through DA beams associated with a plasma processing module;

an image acquisition device, said image acquisition device configured to take one ore more still images of at least one of said wafer and said end effector;

an processing unit for performing at least processing said one ore more still images to ascertain said end effector-defined center and said center of said wafer, and determine said positional difference between said center of said end effector-defined center and said center of said wafer, wherein said positional difference is acquired using an in-situ optical imaging approach; and

a logic module, said logic module configured for obtaining a reference DA beam pattern by recording a break-and-make pattern of said DA beams, said break-and-make pattern occurring as said wafer and said end effector moves through said DA beams.

8. The system of claim 7 wherein at least an image of said first visual indicator is included in said one or more still images.

9. The system of claim 7 wherein at least a portion of said image acquisition device is implemented inside a plasma processing chamber of said processing system.

10. The system of claim 7 wherein said one or more still images is acquired through an optical access that permits said one ore more still image to include both at least a portion of an image of a first visual indicator of said end effector and at least a portion of an image of a first visual indicator of said wafer, said first visual indicator of said end effector representing a reference mark employed to derive said end effector-defined center and said first visual indicator of said wafer employed to ascertain the circle that is described by said first visual indicator of said wafer.

11. A plasma processing system for performing DA (Dynamic Alignment) beam calibration, said plasma processing system comprising:

an end effector including at least a first visual indicator, wherein said first visual indicator includes a scribe line, said scribe line being an arc of a circle such that the center of said circle coincides with an end effector-defined center defined by said end effector;

a robot controller, said robot controller configured for at least

centering a wafer with respect to said end effector by compensating for a positional difference between said wafer and said end effector with robot movement compensation,

moving said wafer and said end effector through DA beams associated with a plasma processing module;

an optical imaging system, said in-situ optical system configured to acquire said positional difference;

a logic module, said logic module configured for obtaining a reference DA beam pattern by recording a break-and-make pattern of said DA beams, said break-and-make pattern occurring as said wafer and said end effector moves through said DA beams.

12. The system of claim 11 wherein said in-situ optical imaging system configured to include at least

an optical imaging system, said optical imaging system configured to acquire one ore more still images of said wafer and said end effector;

a processing unit, said processing unit configured to ascertain said center of said wafer and said end effector-defined center; and

a logic module, said logic module configured to determine said positional difference between said end effector-defined center and said center of said wafer.

13. The system of claim 12 wherein at least an image of first visual indicator is included in said one or more still images.

14. The system of claim 12 wherein said wafer is provided with a first visual indicator, thereby enabling said processing unit to determine from said one or more still images said center of said wafer, said first visual indicator employed to ascertain a circle that is described by said first visual indicator, thereby enabling said center of said wafer to be determined.

15. The system of claim 14 wherein said first visual indicator is an outer periphery of said wafer.

16. The system of claim 12 wherein at least a portion of said optical imaging system is implemented inside a plasma processing chamber.

17. The system of claim 12 wherein said one or more still image is acquired through an optical access that permits said one or more still image to include both at least a portion of an image of a first visual indicator of said end effector and at least a portion of an image of a first visual indicator of said wafer, said first visual indicator of said end effector representing a reference mark employed to derive said end effector-defined center and said first visual indicator of said wafer employed to ascertain the circle that is described by said first visual indicator of said wafer.