

## Supporting Information

### **Fig S1. Effects of fluorescent molecule-tagging of one copy of Sid4 on equational segregation at meiosis I.**

Equational segregation frequencies of *cen2* in chiasma-forming *rec12*<sup>+</sup> (A) and chiasma-lacking *rec12*Δ cells (B). No tagging: no Sid4-RFP; Sid4-RFP: cells containing one copy of Sid4-RFP. Chromosome segregation was analyzed in >50 cells, and bars show averages of more than three independent experiments. \*P<0.05; \*\*P<0.01 (Student's *t*-test). ns: not significant. Error bars show standard error. Sid4-RFP was used instead of Sid4-GFP for analyzing effects of Sid4 tagging, because segregation patterns of GFP-visualized *cen2* cannot be assessed in cells containing GFP-visualized SPBs.

### **Fig S2. Effects of chiasma formation and impairment of the error correction mechanisms on sister centromere splitting and mobile activities of centromeres.**

(A) Sister centromere splitting frequencies in each cell. (B) Mean centromere velocities. The centromere velocities were examined at each time point based on the datasets used for Fig 2. (C) The mean of standard deviation (SD) of centromere positions relative to the SPB. The mean SDs were obtained from SDs of centromere positions in each cell. Numbers in parentheses indicate the number of centromeres examined. +: no other mutations. Error bars show standard errors. Dotted lines in graphs distinguish results of *rec12*<sup>+</sup> and *rec12*Δ cells. ns: not significant by Student's *t*-test (numbers in parenthesis indicates a P value that is between 0.05 and 0.1). (D) Mean square displacement (MSD) of centromeres relative to the SPB. Red dotted lines indicate 95% confidence intervals obtained by the bootstrap method. The two rightmost graphs demonstrate superposition of the average plots.

### **Fig S3. Distribution of distances between splitting sister centromeres with respect to angles of splitting sister centromeres**

(A) Distances between splitting sister centromeres and angles of splitting sister centromeres relative to the spindle. Drawing demonstrates the angle of the splitting sister centromeres to the spindle axis, "θ", the distance between splitting centromeres, "D", and the projected distance along the spindle axis, "D·cosθ". (B and C) 2D plots of the angles and the distances (B) or the projected distances (C). WT w/o: not including a dataset of a

wild-type cell shown in Fig. 2.

#### **Fig S4. Distances of splitting sister centromeres in various cells.**

(A) Distribution of distances between splitting sister centromeres. (B) Mean distances between splitting sister centromeres obtained by the bootstrap method. (C) Distribution of the projected splitting distances. (D) The mean projected splitting distances obtained by the bootstrap method. 60, 58, 132, 169, 22, and 109 splitting sister centromeres were examined in wild-type, *mad2Δ*, *ark1-so*, *rec12Δ*, *mad2Δ rec12Δ*, and *ark1-so rec12Δ* cells, respectively. \*P<0.05; \*\*P<0.01; ns: not significant (numbers show P values by Studentized bootstrap analysis). Differences between chiasma-forming and chiasma-lacking cells are not shown. In (B), numbers in parentheses at the top of graphs indicate the numbers of cells examined. Dotted lines in graphs distinguish results of *rec12<sup>+</sup>* and *rec12Δ* cells. WT w/o: not including a dataset of a wild-type cell shown in Fig. 2.

#### **Fig S5. Correlation analysis of centromere dynamics in *mad2Δ* and *ark1-so* cells at metaphase I.**

(A and D) Auto-correlation and cross-correlation functions of centromere velocities in *ark1-so* and *ark1-so rec12Δ* cells (A) and those in *mad2Δ* and *mad2Δ rec12Δ* cells (D). Blue lines and red dotted lines respectively indicate mean correlation values and 95% confidence intervals obtained by the bootstrap method. (B and E) P values of ACF and CCF values at the indicated time points. (C and F) P values between *ark1-so* and *ark1-so rec12Δ* CCF values (C) and between *mad2Δ* and *mad2Δ rec12Δ* CCF values (F) at the indicated time points. The numbers of examined cells and total observation times (shown in parentheses) are following. *ark1-so*: 11 cells (1432.2 s); *ark1-so rec12Δ*: 16 cells (1392.0 s); *mad2Δ*: 10 cells (749.1 s); *mad2Δ rec12Δ*: 8 cells (479.4 s).

#### **Fig S6. Spore formation and viability and recombination in *dam1Δ* cells.**

(A) Number of spores in asci. The numbers in parentheses indicate numbers of examined asci. (B) Spore viability. Spores in tetrads were dissected using a microneedle, and spore viability was examined by colony formation. Numbers of examined spores are shown in parentheses. (C) Meiotic recombination in *dam1Δ* cells. Left graph shows genetic

distance between the *leu1* and the *his2* loci examined by tetrad analysis. Numbers in parentheses indicate numbers of examined tetrads. Middle and right graphs show gene conversion rates of the *ade6-M26* (hot spot mutation) and *ade6-M375* mutations. Error bars indicate standard errors (n = 3). ns: not significant by Student's *t*-test.

**Fig S7. Ark1 localization in wild-type and *dam1Δ* cells at meiosis I.**

(A) Changes in Ark1 localization during meiosis I. Analysis of live cells producing mCherry-tagged  $\alpha$ -tubulin and GFP-tagged Ark1 at meiosis I. Numbers indicate time in minutes. Bar: 4  $\mu$ m. (B) Juxtaposition of Ark1 punctate signals with Mis12 kinetochore signals at meiosis I. Bar: 2  $\mu$ m.

**Fig S8. Dynamics of centromeres and the spindle and correlation analysis of centromere movements in *dam1Δ* cells.**

(A) Maximum spindle length at metaphase I. Numbers in parentheses indicate the number of spindles examined. (B) The mean standard deviations of centromere positions relative to the SPB. Numbers in parentheses indicate the number of examined centromeres. (C) The MSD of centromeres relative to the SPB in *dam1Δ* and *dam1Δ rec12Δ* cells. Dotted lines indicate 95% confidence intervals obtained by the bootstrap method. Grey lines indicate MSD plots of wild-type or *rec12Δ* cells. (D) Auto-correlation and cross-correlation functions of centromere velocities in *dam1Δ* and *dam1Δ rec12Δ* cells. (E and F) P values of ACF and CCF values (E) and those between *dam1Δ* and *dam1Δ rec12Δ* CCF values (F) at the indicated time points. (G) Changes in centromere–SPB and SPB–SPB distances during anaphase I in *dam1Δ rec12Δ* cells. (H) Loss of anaphase A centromere movements in *dam1Δ rec12Δ* cells. Photos show changes in centromere positions during anaphase I, and numbers show time in minutes from the start of anaphase. Dotted lines and arrowheads show positions of the SPB and centromeres, respectively. Bar: 2  $\mu$ m. Graph shows mean centromere–SPB distances during metaphase I (Meta) and anaphase I (Ana). Numbers in parentheses indicate the number of examined centromeres. Data of *rec12Δ* cells adopted from our previous published results [22]. In (B) and (C), data of wild-type and *rec12Δ* cells were adopted from Fig S2. Error bars in graphs show standard errors. In (A), (B), and (H), dotted lines in graphs distinguish results of *rec12*<sup>+</sup> and *rec12Δ* cells (A and B) or those of *rec12Δ* and *dam1Δ rec12Δ* cells (H). \*P<0.0005;

ns: not significant (Student's *t*-test). In (B) to (F), the numbers of examined cells and total observation times (shown in parentheses) are following. *dam1Δ*: 8 cells (970.2 s); *dam1Δ rec12Δ*: 8 cells (735.9 s).

**Fig S9. Possible assembly/disassembly dynamics of kMTs during centromere oscillation and elimination of erroneous attachments in mitosis and meiosis I.**

In this model, we assume that each MT bundle interacting with a single kinetochore or associated sister kinetochores undergoes assembly/disassembly switching cooperatively, whereas MT bundles interacting with different kinetochores or associated sister kinetochores undergo switching independently. In addition, MT disassembly drives centromere movements, whereas MT assembly does not. (A) Possible assembly/disassembly dynamics of properly attached kMTs. Centromere movement and kMT dynamics: direction of centromere movement and kMT dynamics. Transition state: two possible situations of kMT dynamics at the reversal of the movements. At the transition state, simultaneous disassembly of kMTs extending from opposite poles causes centromere stretch (left), whereas their simultaneous assembly causes centromere relaxation (right). These tensile changes would cause coordinated switching of kMT dynamics and reversal of homologous centromere movements. (B) A problem with the model of Aurora B-dependent elimination of improper attachments in fission yeast. Because sister centromeres separate from each other after their bipolar attachment, the orientation of kinetochores and centromeres easily changes. Consequently, when bi-oriented attachment of a single centromere or sister centromeres takes place in mitosis or meiosis I, respectively, improper attachment sites cannot approach the Aurora B-enriched region, and the kinetochore components cannot undergo Aurora B-dependent phosphorylation. Red dotted boxes indicate kinetochore–MT interactions, and predicted positions of kinetochores and the Aurora B-enriched region. (C) Possible assembly/disassembly dynamics of improperly attached kMTs in mitosis or meiosis I. In this case, one of sister centromeres (Mitosis) or one sister centromere pair (Meiosis I) is improperly attached to opposite poles, and the MT bundles interacting with different kinetochores or associated sister kinetochores extend forward or rearward of the moving centromeres during centromere oscillation. During poleward centromere movements, the leading kMTs undergo disassembly, while the trailing kMTs undergo assembly as in (A),

and in this case, attachment elimination should not occur (Centromere movement & kMT dynamics). However, there are occasions, in which one of the leading kMTs that are improperly attached undergoes assembly (b) and is selectively eliminated due to sister chromatid cohesion-dependent load (Mitosis) or a chiasma-dependent minus end-directed load (Meiosis I) (kMT detachment). Such a situation would never arise at proper attachment sites. L-kMT: leading kMT; T-kMT: tailing kMT. Assembly/disassembly dynamics of kMTs interacting with the designated kinetochores are shown in boxes at the bottom (kMT dynamics). For simplicity, only one kMT attached to each single kinetochore is shown.

**Table S1. Colocalization and position switching events of homologous centromeres**

**Table S2. Strain genotypes**

**Table S3. Strains used in figures**

**Movie S1. Centromere and SPB dynamics at metaphase I in a wild-type cell**

The movie shows time-lapse images of GFP-visualized *cen2* and SPB (Sid4) in a meiotic wild-type cell exhibiting Cut2 spindle localization. The rate of the movie is 5 frames per second.

**Movie S2. Centromere and SPB dynamics at metaphase I in a *rec12Δ* cell**

The movie shows time-lapse images of GFP-visualized *cen2* and SPB (Sid4) in a meiotic *rec12Δ* cell exhibiting Cut2 spindle localization. The rate of the movie is 5 frames per second.

**Movie S3. Centromere and SPB dynamics at metaphase I in a *mad2Δ* cell**

The movie shows time-lapse images of GFP-visualized *cen2* and SPB (Sid4) in a meiotic *mad2Δ* cell exhibiting Cut2 spindle localization. The rate of the movie is 5 frames per second.

**Movie S4. Centromere and SPB dynamics at metaphase I in a *mad2Δ rec12Δ* cell**

The movie shows time-lapse images of GFP-visualized *cen2* and SPB (Sid4) in a meiotic *mad2Δ rec12Δ* cell exhibiting Cut2 spindle localization. The rate of the movie is 5 frames per second.

**Movie S5. Centromere and SPB dynamics at metaphase I in an *ark1-so* cell**

The movie shows time-lapse images of GFP-visualized *cen2* and SPB (Sid4) in a meiotic *ark1-so* cell exhibiting Cut2 spindle localization. The rate of the movie is 5 frames per second.

**Movie S6. Centromere and SPB dynamics at metaphase I in an *ark1-so rec12Δ* cell**

The movie shows time-lapse images of GFP-visualized *cen2* and SPB (Sid4) in a meiotic *ark1-so rec12Δ* cell exhibiting Cut2 spindle localization. The rate of the movie is 5 frames per second.

**Movie S7. Centromere and SPB dynamics at metaphase I in a *dam1Δ* cell**

The movie shows time-lapse images of GFP-visualized *cen2* and SPB (Sid4) in a meiotic *dam1Δ* cell exhibiting Cut2 spindle localization. The rate of the movie is 5 frames per second.

**Movie S8. Centromere and SPB dynamics at metaphase I in a *dam1Δ rec12Δ* cell**

The movie shows time-lapse images of GFP-visualized *cen2* and SPB (Sid4) in a meiotic *dam1Δ rec12Δ* cell exhibiting Cut2 spindle localization. The movie plays at rate of 5 frames per second.

**Movie S9. Centromere and spindle dynamics at anaphase I in a wild-type cell**

The movie shows time-lapse images of GFP-visualized *cen2* and SPB (Sid4) and an *mCherry*-visualized spindle in a meiotic wild-type cell exhibiting Cut2 spindle localization. The rate of the movie is 3 frames per second.

**Movie S10. Centromere and spindle dynamics at anaphase I in a *dam1Δ* cell**

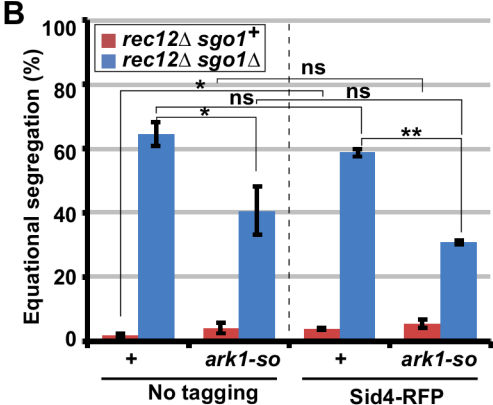
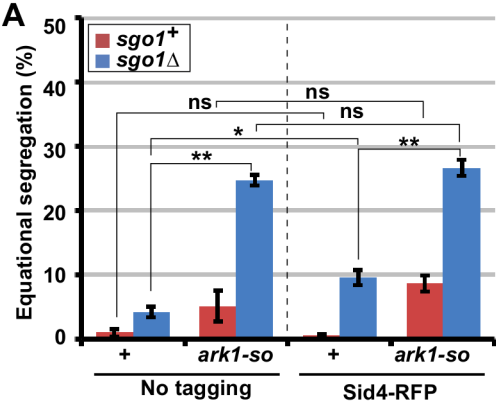
1 The movie shows time-lapse images of GFP-visualized *cen2* and SPB (Sid4) and an  
2 *mCherry*-visualized spindle in a meiotic *dam1Δ* cell. The rate of the movie is 3 frames  
3 per second.

4  
5 **Movie S11. Centromere and spindle dynamics at anaphase I in a *dam1Δ rec12Δ* cell**

6 The movie shows time-lapse images of GFP-visualized *cen2* and SPB (Sid4) and an  
7 *mCherry*-visualized spindle in a meiotic *dam1Δ rec12Δ* cell. The rate of the movie is 3  
8 frames per second.

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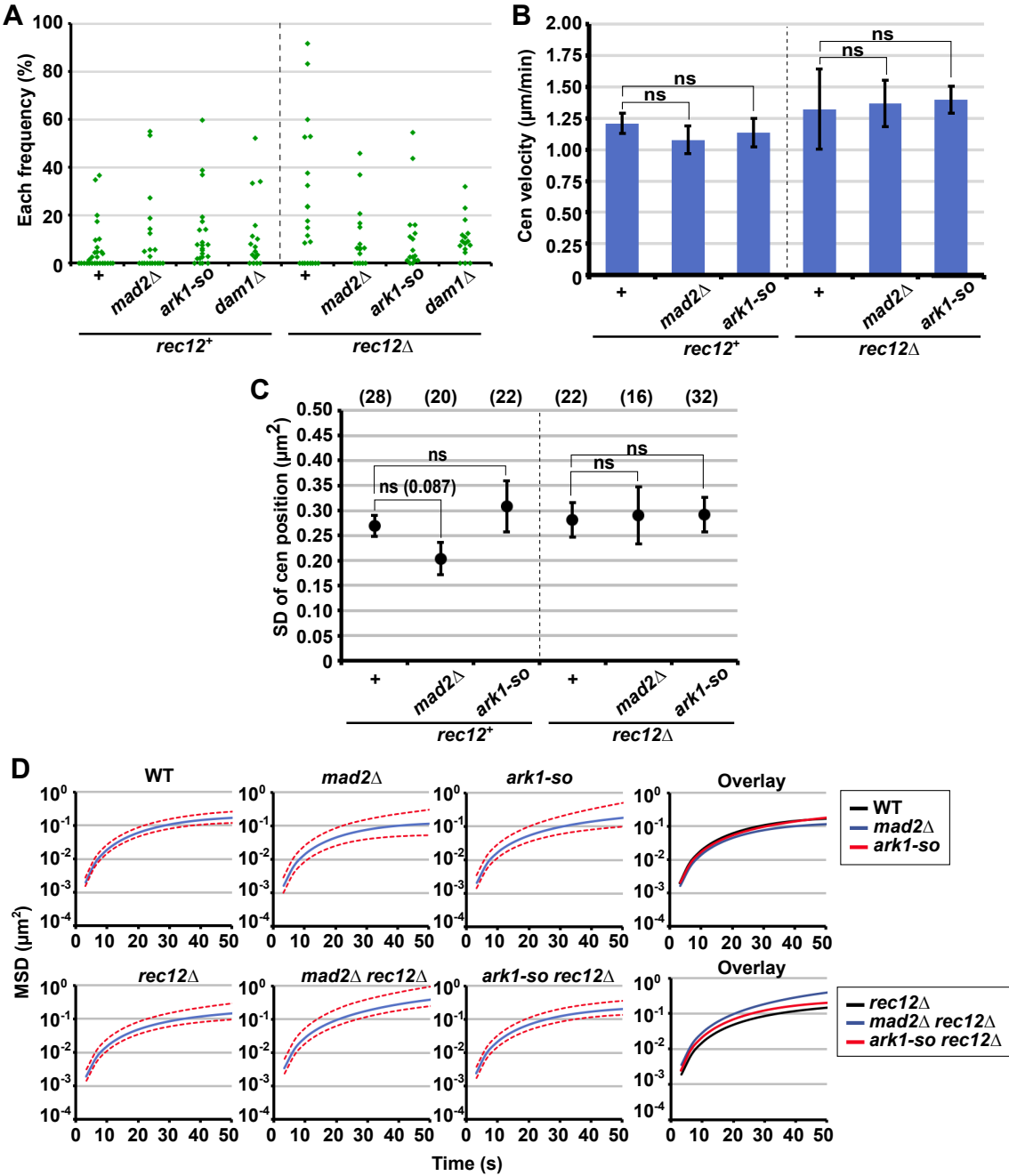
1 Fig S1





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Fig S2

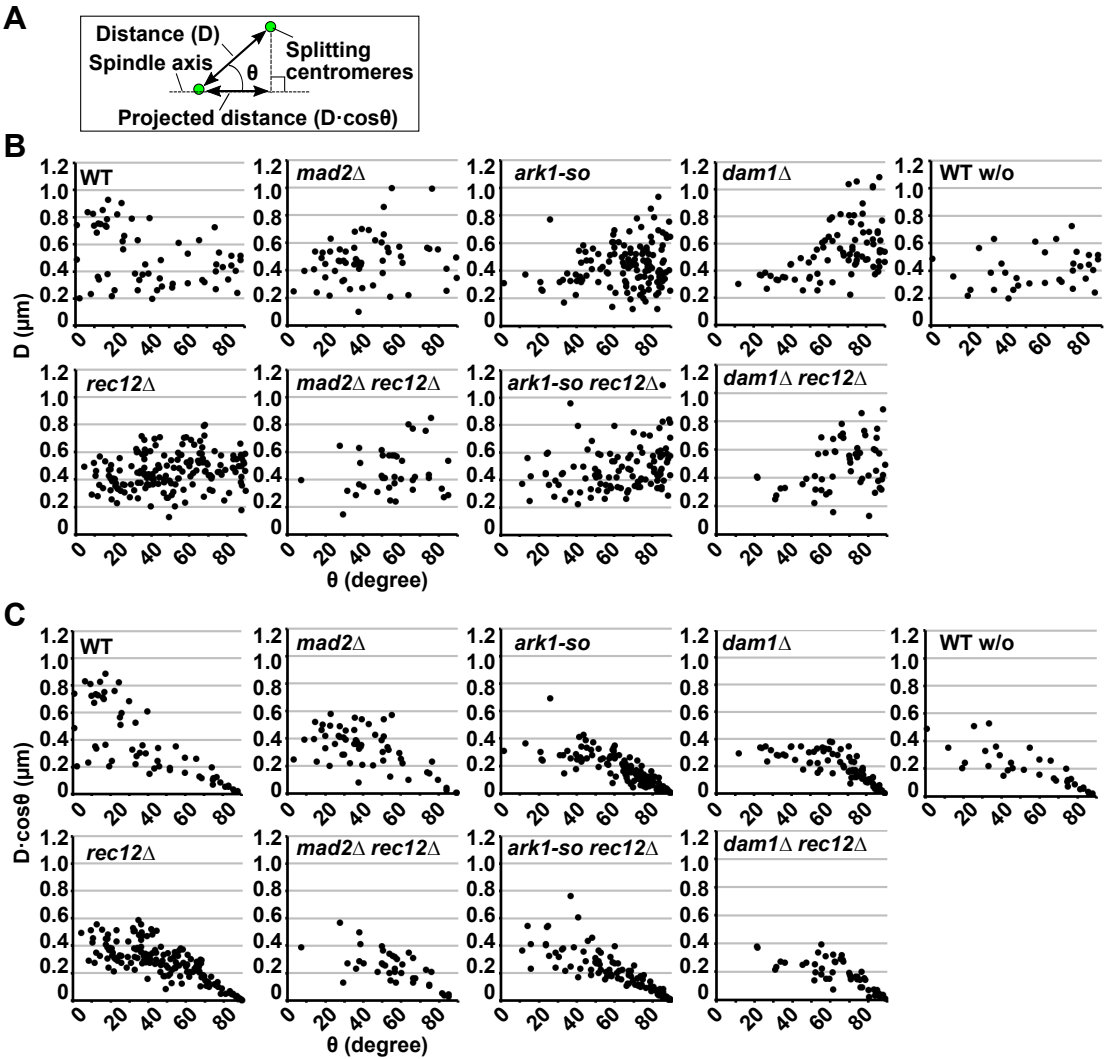


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Fig S3

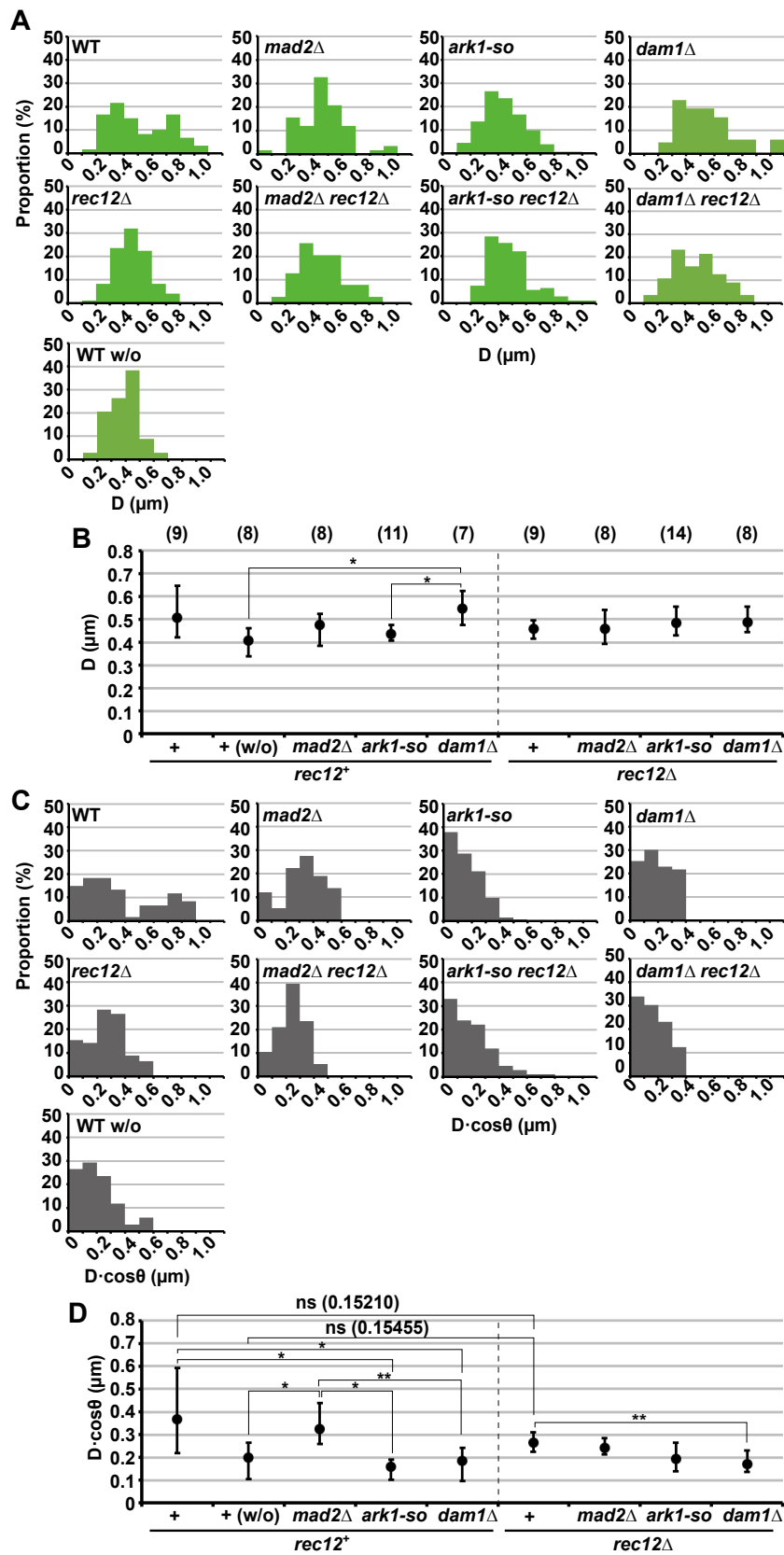


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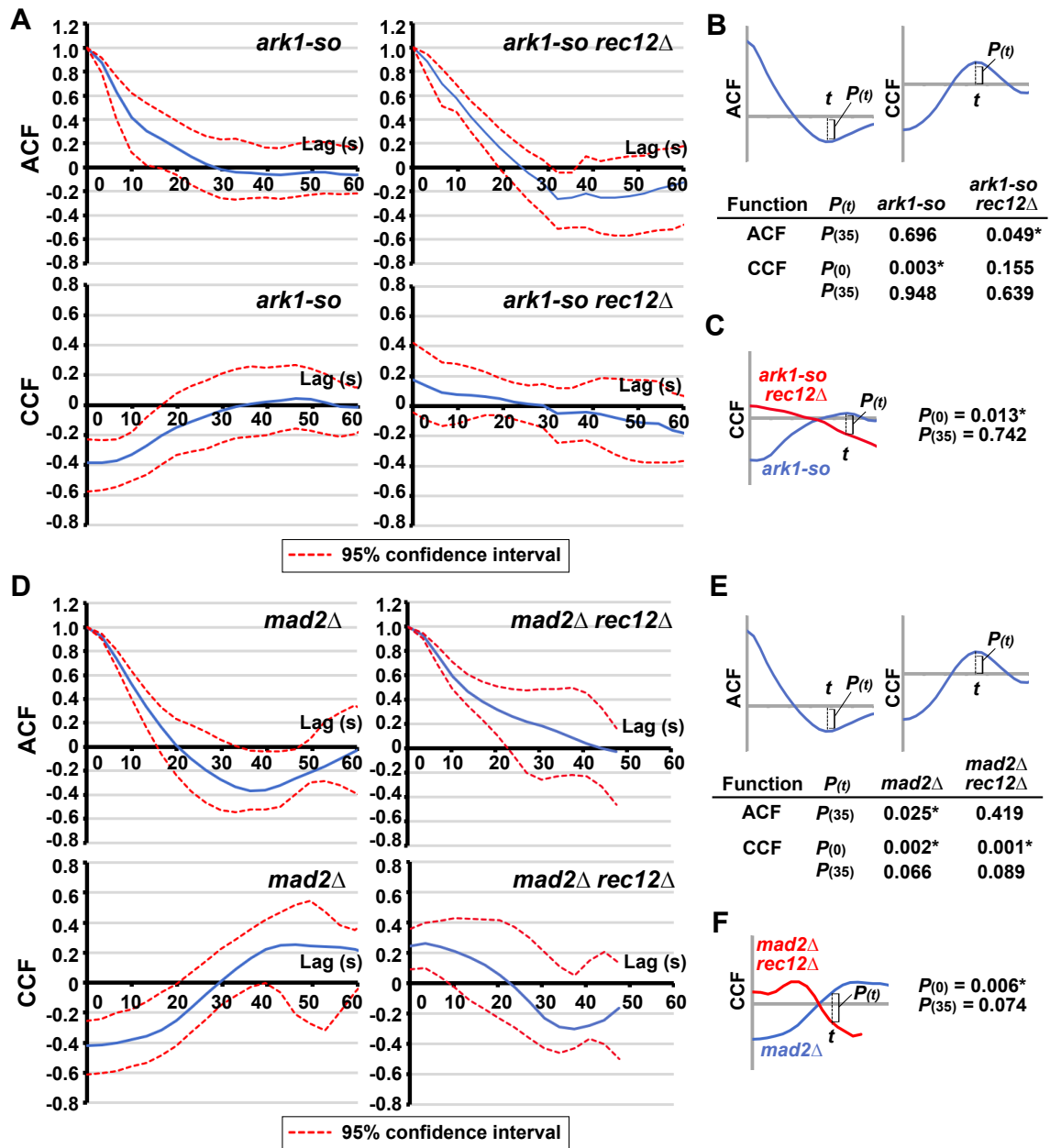
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1 Fig S4



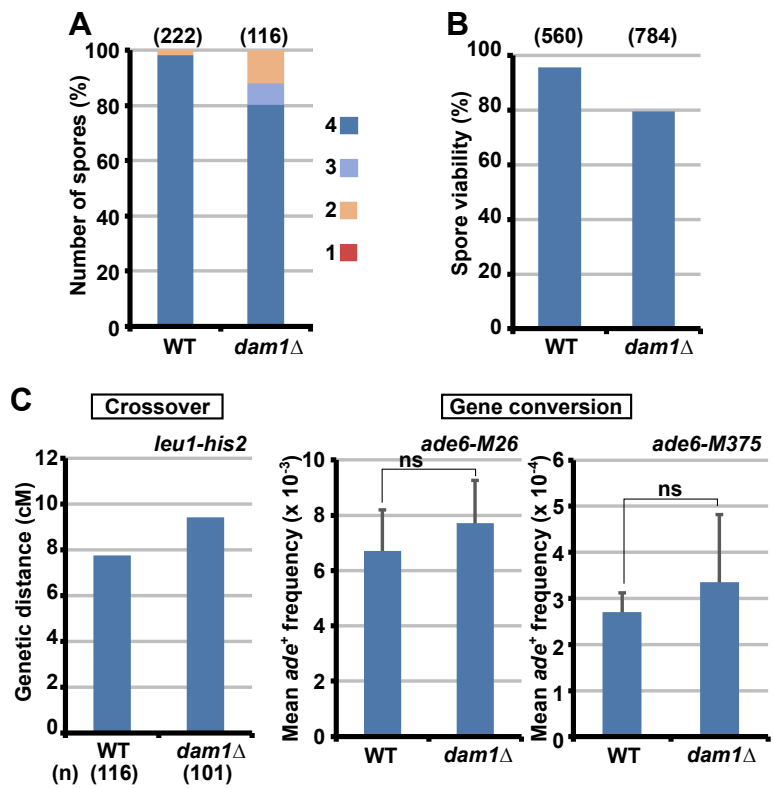
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1 Fig S5



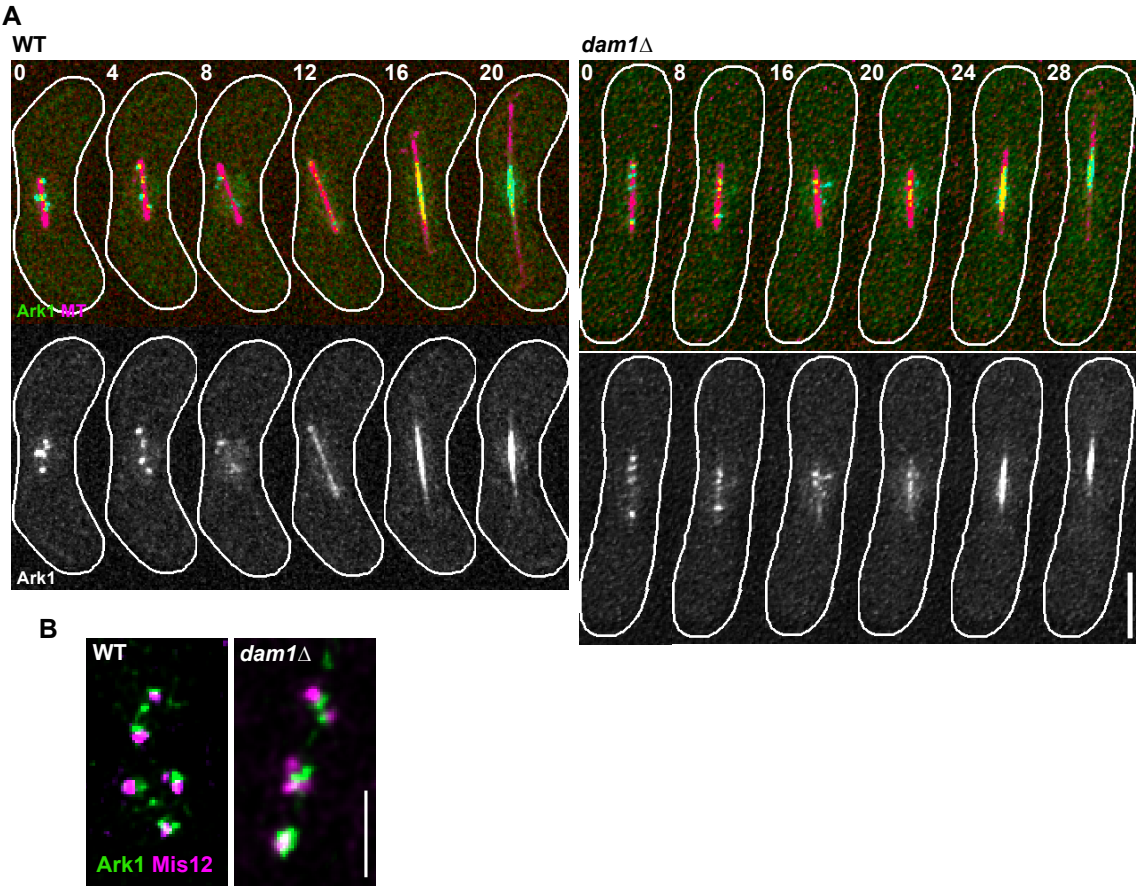
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1    Fig S6



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1    **Fig S7**

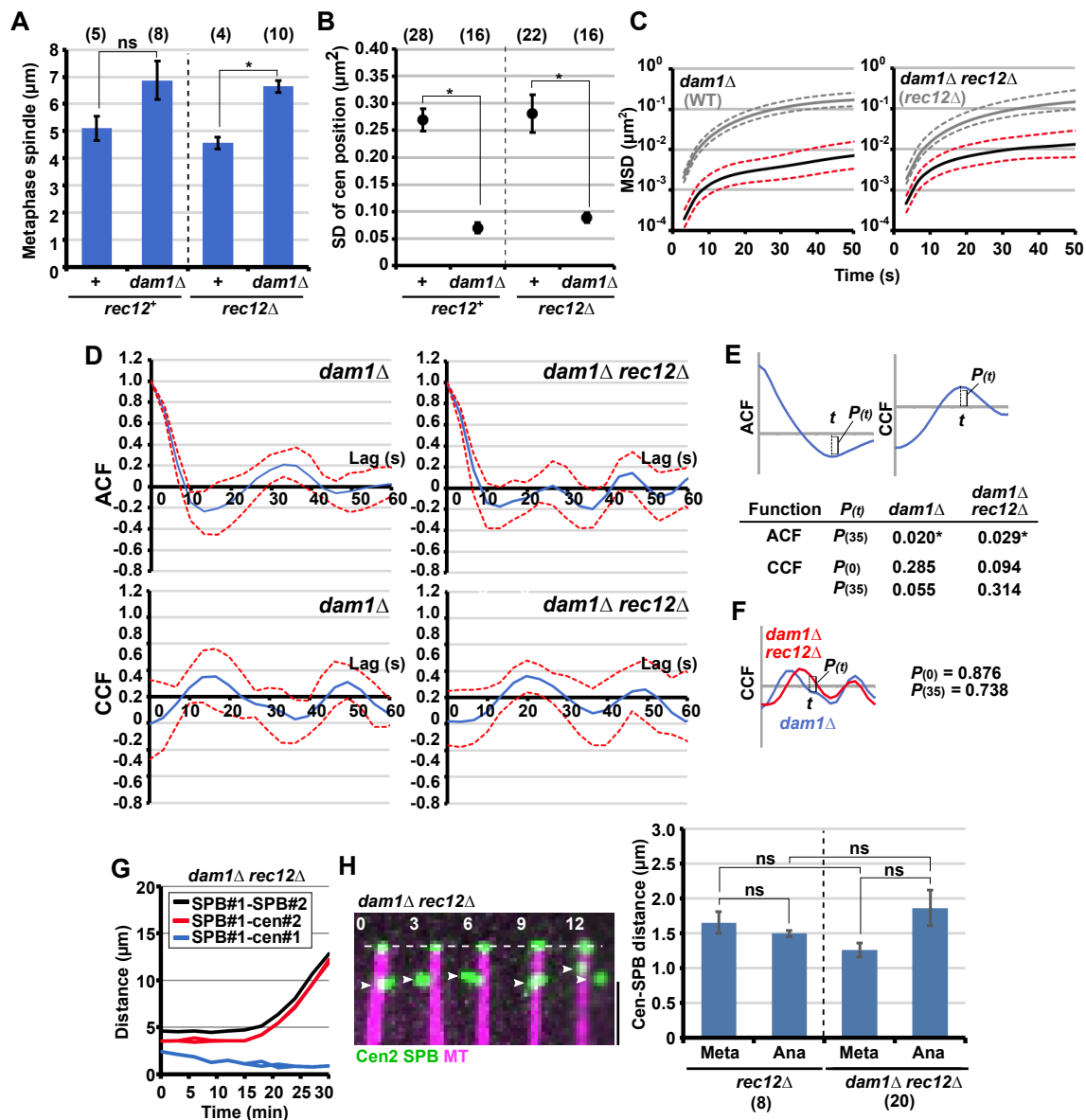


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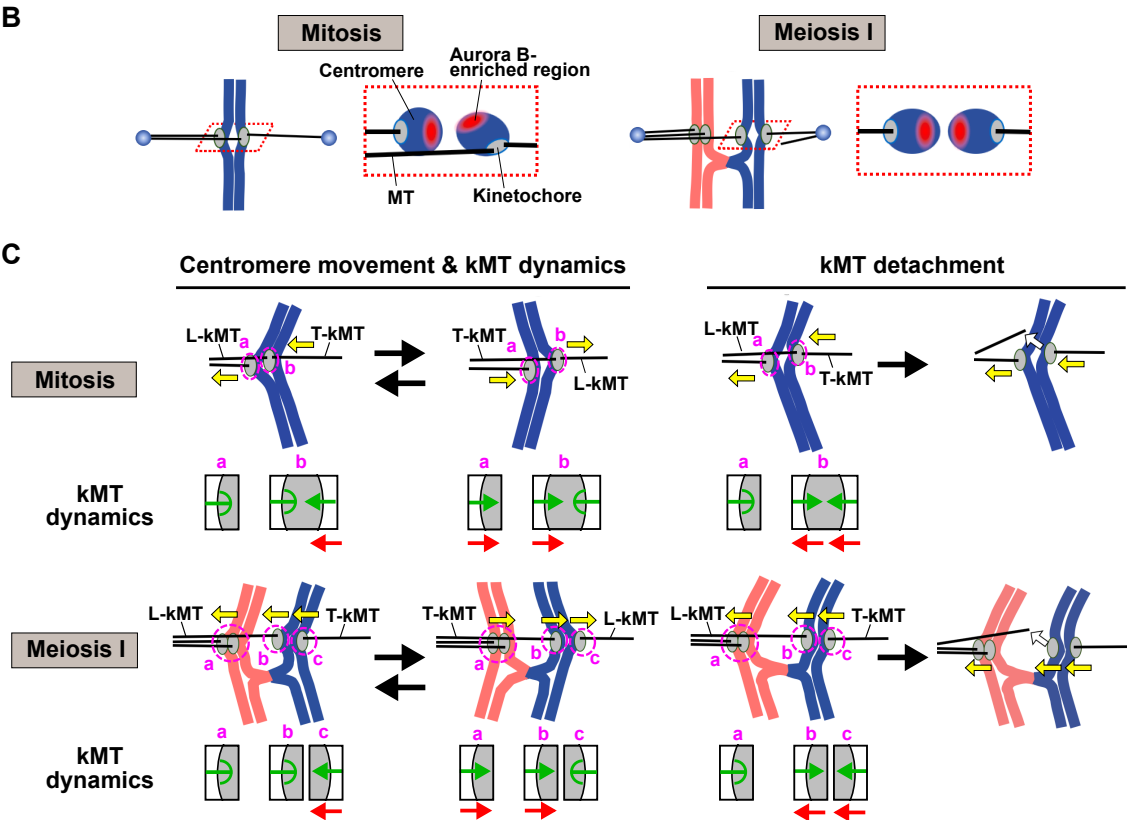
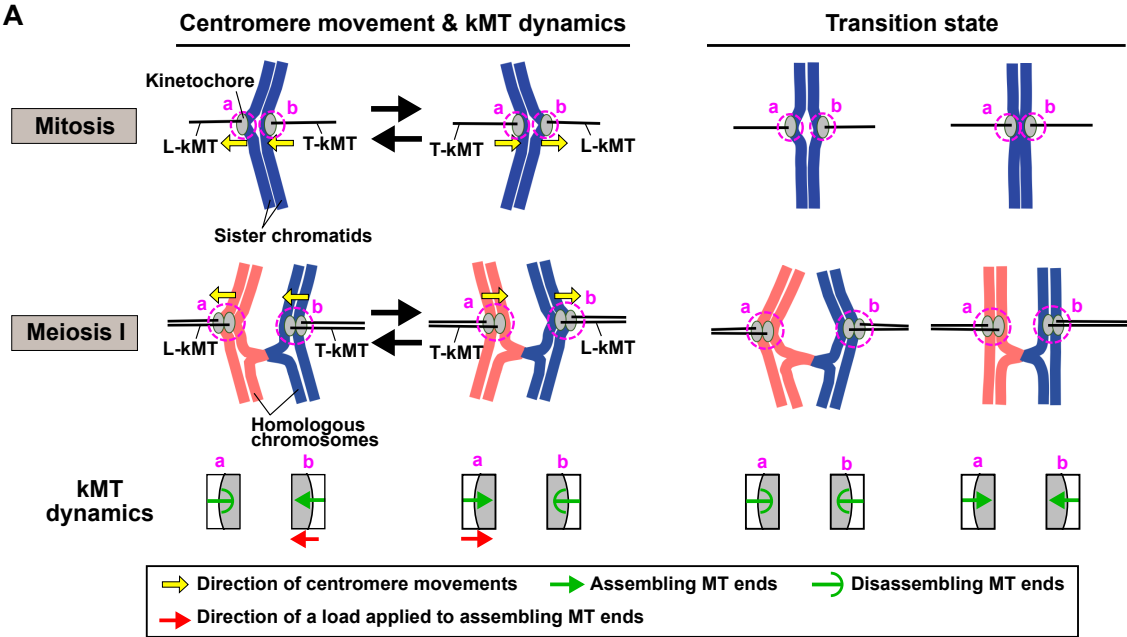
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1 Fig S8



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1 Fig S9



2



1 **Table S1. Colocalization and position switching events of homologous centromeres**

|                          | WT                          |                        |                             | <i>mad2Δ</i>                |                        |                             | <i>ark1-so</i>              |                        |                             |
|--------------------------|-----------------------------|------------------------|-----------------------------|-----------------------------|------------------------|-----------------------------|-----------------------------|------------------------|-----------------------------|
| Cell #                   | Co-localization time points | Switching events       | Observation time points     | Co-localization time points | Switching events       | Observation time points     | Co-localization time points | Switching events       | Observation time points     |
| 1                        | 0                           | 0                      | 41                          | 0                           | 0                      | 14                          | 0                           | 2                      | 38                          |
| 2                        | 0                           | 0                      | 34                          | 0                           | 0                      | 24                          | 10                          | 0                      | 50                          |
| 3                        | 0                           | 0                      | 38                          | 0                           | 0                      | 18                          | 3                           | 0                      | 36                          |
| 4                        | 0                           | 0                      | 28                          | 0                           | 0                      | 17                          | 0                           | 2                      | 28                          |
| 5                        | 0                           | 0                      | 30                          | 0                           | 0                      | 11                          | 0                           | 0                      | 53                          |
| 6                        | 0                           | 0                      | 23                          | 0                           | 0                      | 15                          | 0                           | 0                      | 49                          |
| 7                        | 0                           | 0                      | 31                          | 0                           | 0                      | 35                          | 20                          | 0                      | 52                          |
| 8                        | 0                           | 0                      | 23                          | 0                           | 0                      | 69                          | 12                          | 0                      | 51                          |
| 9                        | 0                           | 0                      | 21                          | 0                           | 0                      | 40                          | 1                           | 0                      | 46                          |
| 10                       | 0                           | 0                      | 17                          | 0                           | 0                      | 35                          | 0                           | 0                      | 57                          |
| 11                       | 0                           | 0                      | 68                          |                             |                        |                             | 0                           | 2                      | 38                          |
| 12                       | 0                           | 0                      | 40                          |                             |                        |                             |                             |                        |                             |
| 13                       | 0                           | 0                      | 52                          |                             |                        |                             |                             |                        |                             |
| 14                       | 0                           | 0                      | 40                          |                             |                        |                             |                             |                        |                             |
| Total time points/events | 0                           | 0                      | 486                         | 0                           | 0                      | 278                         | 46                          | 6                      | 498                         |
|                          | Co-localization frequency   | Total switching events | Total observation time* (s) | Co-localization frequency   | Total switching events | Total observation time* (s) | Co-localization frequency   | Total switching events | Total observation time* (s) |
| Total                    | 0.00%                       | 0                      | 1506.6                      | 0.00%                       | 0                      | 917.4                       | 9.24%                       | 6                      | 1643.4                      |

2 \*Total observation time: calculated from total time points and time intervals (3.1 s for WT and 3.3 s for *mad2Δ* and *ark1-so* cells).

| Table S2. Strain genotypes |                                                                                                                                                                      |
|----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Strain name                | Genotype                                                                                                                                                             |
| SY16-31                    | <i>h<sup>-</sup> leu1-32 lys1-131 ura4-D18 his7<sup>+</sup>::Pdis1-GFP-lacI-NLS</i>                                                                                  |
| SY6-59                     | <i>h<sup>+</sup> ade6-210 leu1-32 ura4-D18 lys1<sup>+</sup>-lacO his7<sup>+</sup>::Pdis1-GFP-lacI-NLS</i>                                                            |
| SYH129-3C                  | <i>h<sup>-</sup> leu1-32 ura4-D18 mad2::ura4<sup>+</sup> his7<sup>+</sup>::Pdis1-GFP-lacI-NLS</i>                                                                    |
| SYH129-2D                  | <i>h<sup>+</sup> leu1-32 ura4-D18 lys1<sup>+</sup>::lacO mad2::ura4<sup>+</sup> his7<sup>+</sup>::Pdis1-GFP-lacI-NLS</i>                                             |
| SYH317-13B                 | <i>h<sup>-</sup> leu1-32 ura4-D18 lys1<sup>+</sup>::lacO ark1-so::kan<sup>r</sup> his7<sup>+</sup>::Pdis1-GFP-lacI-NLS</i>                                           |
| SYH257-2B                  | <i>h<sup>+</sup> leu1-32 lys1-131 ura4-D18 ark1-so::kan<sup>r</sup> his7<sup>+</sup>::Pdis1-GFP-lacI-NLS</i>                                                         |
| SYH91-14B                  | <i>h<sup>-</sup> leu1-32 lys1-131 ura4-D18 sgo1::kan<sup>r</sup> his7<sup>+</sup>::Pdis1-GFP-lacI-NLS</i>                                                            |
| SYH91-2-11B                | <i>h<sup>+</sup> leu1-32 ura4-D18 sgo1::kan<sup>r</sup> lys1<sup>+</sup>-lacO his7<sup>+</sup>::Pdis1-GFP-lacI-NLS</i>                                               |
| SYH215-3A                  | <i>h<sup>-</sup> leu1-32 ura4-D18 mad2::ura4<sup>+</sup> sgo1::kan<sup>r</sup> lys1<sup>+</sup>::lacO his7<sup>+</sup>::Pdis1-GFP-lacI-NLS</i>                       |
| SYH215-1C                  | <i>h<sup>+</sup> lys1-131 leu1-32 ura4-D18 mad2::ura4<sup>+</sup> sgo1::kan<sup>r</sup> his7<sup>+</sup>::Pdis1-GFP-lacI-NLS</i>                                     |
| SYI15-16B                  | <i>h<sup>-</sup> leu1-32 lys1-131 ura4-D18 ark1-so::kan<sup>r</sup> sgo1::kan<sup>r</sup> his7<sup>+</sup>::Pdis1-GFP-lacI-NLS</i>                                   |
| SYI15-19B                  | <i>h<sup>+</sup> leu1-32 ura4-D18 ark1-so::kan<sup>r</sup> sgo1::kan<sup>r</sup> lys1<sup>+</sup>::lacO his7<sup>+</sup>::Pdis1-GFP-lacI-NLS</i>                     |
| SYH129-16D                 | <i>h<sup>-</sup> leu1-32 ura4-D18 rec12-152::LEU2 his7<sup>+</sup>::Pdis1-GFP-lacI-NLS</i>                                                                           |
| SYH129-3B                  | <i>h<sup>+</sup> leu1-32 ura4-D18 rec12-152::LEU2 lys1<sup>+</sup>::lacO his7<sup>+</sup>::Pdis1-GFP-lacI-NLS</i>                                                    |
| SYH129-6D                  | <i>h<sup>-</sup> leu1-32 ura4-D18 mad2::ura4<sup>+</sup> rec12-152::LEU2 his7<sup>+</sup>::Pdis1-GFP-lacI-NLS</i>                                                    |
| SYH129-3D                  | <i>h<sup>+</sup> leu1-32 ura4-D18 mad2::ura4<sup>+</sup> rec12-152::LEU2 lys1<sup>+</sup>::lacO his7<sup>+</sup>::Pdis1-GFP-lacI-NLS</i>                             |
| SYH257-1B                  | <i>h<sup>-</sup> leu1-32 lys1-131 ura4-D18 rec12-152::LEU2 ark1-so::kan<sup>r</sup> his7<sup>+</sup>::Pdis1-GFP-lacI-NLS</i>                                         |
| SYH317-16A                 | <i>h<sup>+</sup> leu1-32 ura4-D18 rec12-152::LEU2 ark1-so::kan<sup>r</sup> lys1<sup>+</sup>::lacO his7<sup>+</sup>::Pdis1-GFP-lacI-NLS</i>                           |
| SYH91-1C                   | <i>h<sup>-</sup> leu1-32 lys1-131 ura4-D18 rec12-152::LEU2 sgo1::kan<sup>r</sup> his7<sup>+</sup>::Pdis1-GFP-lacI-NLS</i>                                            |
| SYH91-15B                  | <i>h<sup>+</sup> leu1-32 ura4-D18 rec12-152::LEU2 sgo1::kan<sup>r</sup> lys1<sup>+</sup>::lacO his7<sup>+</sup>::Pdis1-GFP-lacI-NLS</i>                              |
| SYH215-2A                  | <i>h<sup>-</sup> leu1-32 ura4-D18 mad2::ura4<sup>+</sup> rec12-152::LEU2 sgo1::kan<sup>r</sup> lys1<sup>+</sup>::lacO his7<sup>+</sup>::Pdis1-GFP-lacI-NLS</i>       |
| SYH215-6A                  | <i>h<sup>+</sup> leu1-32 ura4-D18 mad2::ura4<sup>+</sup> rec12-152::LEU2 sgo1::kan<sup>r</sup> his7<sup>+</sup>::Pdis1-GFP-lacI-NLS</i>                              |
| SVV89-2D                   | <i>h<sup>-</sup> leu1-32 lys1-131 ura4-D18 ark1-so::kan<sup>r</sup> rec12-152::LEU2 sgo1::kan<sup>r</sup> his7<sup>+</sup>::Pdis1-GFP-lacI-NLS</i>                   |
| SYI15-20B                  | <i>h<sup>+</sup> leu1-32 ura4-D18 ark1-so::kan<sup>r</sup> rec12-152::LEU2 sgo1::kan<sup>r</sup> lys1<sup>+</sup>::lacO his7<sup>+</sup>::Pdis1-GFP-lacI-NLS</i>     |
| SYH19-6A                   | <i>h<sup>-</sup> leu1-32 lys1-131 ura4-D18 his7<sup>+</sup>::Pdis1-GFP-lacI-NLS</i>                                                                                  |
| SYH19-4C                   | <i>h<sup>+</sup> leu1-32 lys1-131 ura4-D18 cen2::kan<sup>r</sup>-ura4<sup>+</sup>-lacO his7<sup>+</sup>::Pdis1-GFP-lacI-NLS</i>                                      |
| SY14-48                    | <i>h<sup>-</sup> ade6-210 leu1-32 ura4-D18 mad2::ura4<sup>+</sup> his7<sup>+</sup>::Pdis1-GFP-lacI-NLS</i>                                                           |
| SY20-27                    | <i>h<sup>+</sup> ade6-210 leu1-32 lys1-131 ura4-D18 mad2::ura4<sup>+</sup> cen2::kan<sup>r</sup>-ura4<sup>+</sup>-lacO his7<sup>+</sup>::Pdis1-GFP-lacI-NLS</i>      |
| SYH258-16A                 | <i>h<sup>-</sup> ade6-216 leu1-32 lys1-131 ura4-D18 ark1-so::kan<sup>r</sup> cen2::kan<sup>r</sup>-ura4<sup>+</sup>-lacO his7<sup>+</sup>::Pdis1-GFP-lacI-NLS</i>    |
| SYH257-2B                  | <i>h<sup>+</sup> leu1-32 lys1-131 ura4-D18 ark1-so::kan<sup>r</sup> his7<sup>+</sup>::Pdis1-GFP-lacI-NLS</i>                                                         |
| SYH18-2-6A                 | <i>h<sup>-</sup> leu1-32 ura4-D18 sgo1::kan<sup>r</sup> his7<sup>+</sup>::Pdis1-GFP-lacI-NLS</i>                                                                     |
| SYH18-2-8B                 | <i>h<sup>+</sup> leu1-32 lys1-131 ura4-D18 sgo1::kan<sup>r</sup> cen2::kan<sup>r</sup>-ura4<sup>+</sup>-lacO his7<sup>+</sup>::Pdis1-GFP-lacI-NLS</i>                |
| SYI18-15D                  | <i>h<sup>+</sup> lys1-131 ura4-D18 mad2::ura4<sup>+</sup> sgo1::kan<sup>r</sup> cen2::kan<sup>r</sup>-ura4<sup>+</sup>-lacO his7<sup>+</sup>::Pdis1-GFP-lacI-NLS</i> |

|             |                                                                                                                                                                                                 |
|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SYH215-1C   | <i>h<sup>+</sup> leu1-32 lys1-131 ura4-D18 mad2::ura4<sup>+</sup> sgo1::kan<sup>r</sup> his7<sup>+</sup>::Pdis1-GFP-lacI-NLS</i>                                                                |
| SVV89-12A   | <i>h<sup>-</sup> leu1-32 ura4-D18 ark1-so::kan<sup>r</sup> sgo1::kan<sup>r</sup> his7<sup>+</sup>::Pdis1-GFP-lacI-NLS</i>                                                                       |
| SVV89-2C    | <i>h<sup>+</sup> leu1-32 ura4-D18 ark1-so::kan<sup>r</sup> sgo1::kan<sup>r</sup> cen2::kan<sup>r</sup>-ura4<sup>+</sup>-lacO his7<sup>+</sup>::Pdis1-GFP-lacI-NLS</i>                           |
| SY16-43     | <i>h<sup>-</sup> leu1-32 lys1-131 ura4-D18 rec12-152::LEU2 his7<sup>+</sup>::Pdis1-GFP-lacI-NLS</i>                                                                                             |
| SY15-26     | <i>h<sup>+</sup> leu1-32 lys1-131 rec12-152::LEU2 cen2::kan<sup>r</sup>-ura4<sup>+</sup>-lacO his7<sup>+</sup>::Pdis1-GFP-lacI-NLS</i>                                                          |
| SYH44-1-6B  | <i>h<sup>-</sup> leu1-32 lys1-131 ura4-D18 mad2::ura4<sup>+</sup> rec12-152::LEU2 his7<sup>+</sup>::Pdis1-GFP-lacI-NLS</i>                                                                      |
| SYH44-1-16A | <i>h<sup>+</sup> leu1-32 lys1-131 ura4-D18 mad2::ura4<sup>+</sup> rec12-152::LEU2 cen2::kan<sup>r</sup>-ura4<sup>+</sup>-lacO his7<sup>+</sup>::Pdis1-GFP-lacI-NLS</i>                          |
| SYH257-1B   | <i>h<sup>-</sup> leu1-32 lys1-131 ura4-D18 ark1-so::kan<sup>r</sup> rec12-152::LEU2 his7<sup>+</sup>::Pdis1-GFP-lacI-NLS</i>                                                                    |
| SYH277-1B   | <i>h<sup>+</sup> leu1-32 lys1-131 ura4-D18 ark1-so::kan<sup>r</sup> rec12-152::LEU2 cen2::kan<sup>r</sup>-ura4<sup>+</sup>-lacO his7<sup>+</sup>::Pdis1-GFP-lacI-NLS</i>                        |
| SYH18-2-6D  | <i>h<sup>-</sup> leu1-32 ura4-D18 sgo1::kan<sup>r</sup> rec12-152::LEU2 his7<sup>+</sup>::Pdis1-GFP-lacI-NLS</i>                                                                                |
| SYH18-2-1C  | <i>h<sup>+</sup> leu1-32 lys1-131 ura4-D18 sgo1::kan<sup>r</sup> rec12-152::LEU2 cen2::kan<sup>r</sup>-ura4<sup>+</sup>-lacO his7<sup>+</sup>::Pdis1-GFP-lacI-NLS</i>                           |
| SYH226-6B   | <i>h<sup>-</sup> leu1-32 lys1-131 ura4-D18 mad2::ura4<sup>+</sup> sgo1::kan<sup>r</sup> rec12-152::LEU2 cen2::kan<sup>r</sup>-ura4<sup>+</sup>-lacO his7<sup>+</sup>::Pdis1-GFP-lacI-NLS</i>    |
| SYH215-6A   | <i>h<sup>+</sup> leu1-32 lys1-131 ura4-D18 mad2::ura4<sup>+</sup> sgo1::kan<sup>r</sup> rec12-152::LEU2 his7<sup>+</sup>::Pdis1-GFP-lacI-NLS</i>                                                |
| SVV89-2D    | <i>h<sup>-</sup> leu1-32 lys1-131 ura4-D18 ark1-so::kan<sup>r</sup> sgo1::kan<sup>r</sup> rec12-152::LEU2 his7<sup>+</sup>::Pdis1-GFP-lacI-NLS</i>                                              |
| SVV89-11C   | <i>h<sup>+</sup> leu1-32 lys1-131 ura4-D18 ark1-so::kan<sup>r</sup> sgo1::kan<sup>r</sup> rec12-152::LEU2 cen2::kan<sup>r</sup>-ura4<sup>+</sup>-lacO his7<sup>+</sup>::Pdis1-GFP-lacI-NLS</i>  |
| HM4501-2    | <i>h<sup>-</sup> ura4-D18 lys1<sup>+</sup>::mat-Pc pat1-114 cen2::kan<sup>r</sup>-ura4<sup>+</sup>-lacO his7<sup>+</sup>::Pdis1-GFP-lacI-NLS</i>                                                |
| SYIT30-3    | <i>h<sup>+</sup> ura4-D18 mad2::ura4<sup>+</sup> aur1<sup>+</sup>::aur1<sup>r</sup>-mat-Mc pat1-114 cen2::kan<sup>r</sup>-ura4<sup>+</sup>-lacO his7<sup>+</sup>::Pdis1-GFP-lacI-NLS</i>        |
| SYIT18-2    | <i>h<sup>+</sup> ura4-D18 ark1-so::kan<sup>r</sup> aur1<sup>+</sup>::aur1<sup>r</sup>-mat-Mc pat1-114 cen2::kan<sup>r</sup>-ura4<sup>+</sup>-lacO his7<sup>+</sup>::Pdis1-GFP-lacI-NLS</i>      |
| SYH193-2A   | <i>h<sup>-</sup> ura4-D18 aur1<sup>+</sup>::aur1<sup>r</sup>-mat-Pc pat1-114 sgo1::kan<sup>r</sup> cen2::kan<sup>r</sup>-ura4<sup>+</sup>-lacO his7<sup>+</sup>::Pdis1-GFP-lacI-NLS</i>         |
| SYIT7-1     | <i>h<sup>-</sup> ura4-D18 mad2::ura4<sup>+</sup> lys1<sup>+</sup>::mat-Pc pat1-114 sgo1::kan<sup>r</sup> cen2::kan<sup>r</sup>-ura4<sup>+</sup>-lacO his7<sup>+</sup>::Pdis1-GFP-lacI-NLS</i>   |
| SYIT17-1    | <i>h<sup>-</sup> ura4-D18 ark1-so::kan<sup>r</sup> lys1<sup>+</sup>::mat-Pc pat1-114 sgo1::kan<sup>r</sup> cen2::kan<sup>r</sup>-ura4<sup>+</sup>-lacO his7<sup>+</sup>::Pdis1-GFP-lacI-NLS</i> |
| SMW43-22B   | <i>h<sup>-</sup> leu1-32 lys1-131 ura4-D18 his7<sup>+</sup>::Pdis1-GFP-lacI-NLS sid4<sup>+</sup>::RFP-kan<sup>r</sup></i>                                                                       |
| SMW43-9A    | <i>h<sup>-</sup> leu1-32 lys1-131 ura4-D18 sgo1::kan<sup>r</sup> his7<sup>+</sup>::Pdis1-GFP-lacI-NLS sid4<sup>+</sup>::RFP-kan<sup>r</sup></i>                                                 |
| SKY20-11B   | <i>h<sup>-</sup> leu1-32 lys1-131 ura4-D18 ark1-so::kan<sup>r</sup> sgo1::kan<sup>r</sup> sid4<sup>+</sup>::RFP-kan<sup>r</sup> his7<sup>+</sup>::Pdis1-GFP-lacI-NLS</i>                        |
| SVV89-11B   | <i>h<sup>+</sup> leu1-32 lys1-131 ura4-D18 ark1-so::kan<sup>r</sup> cen2::kan<sup>r</sup>-ura4<sup>+</sup>-lacO his7<sup>+</sup>::Pdis1-GFP-lacI-NLS</i>                                        |
| SMW43-20D   | <i>h<sup>-</sup> leu1-32 ura4-D18 rec12-152::LEU2 his7<sup>+</sup>::Pdis1-GFP-lacI-NLS sid4<sup>+</sup>::RFP-kan<sup>r</sup></i>                                                                |
| SMW43-9B    | <i>h<sup>-</sup> leu1-32 ura4-D18 sgo1::kan<sup>r</sup> rec12-152::LEU2 his7<sup>+</sup>::Pdis1-GFP-lacI-NLS sid4<sup>+</sup>::RFP-kan<sup>r</sup></i>                                          |
| SKY20-11A   | <i>h<sup>+</sup> leu1-32 lys1-131 ura4-D18 ark1-so::kan<sup>r</sup> sgo1::kan<sup>r</sup> rec12-152::LEU2 sid4<sup>+</sup>::RFP-kan<sup>r</sup> his7<sup>+</sup>::Pdis1-GFP-lacI-NLS</i>        |
| SVV89-16D   | <i>h<sup>-</sup> leu1-32 lys1-131 ura4-D18 ark1-so::kan<sup>r</sup> sgo1::kan<sup>r</sup> rec12-152::LEU2</i>                                                                                   |

|              |                                                                                                                                                                                                                                                                                          |
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|              | <i>cen2::kan<sup>r</sup>-ura4<sup>+</sup>-lacO his7<sup>+</sup>::Pdis1-GFP-lacI-NLS</i>                                                                                                                                                                                                  |
| SKKT100-a    | <i>h<sup>-</sup> ade6(-210 or -216) lys1-131 ura4-D18 cen2::kan<sup>r</sup>-ura4<sup>+</sup>-lacO his7<sup>+</sup>::Pdis1-GFP-lacI-NLS sid4<sup>+</sup>::GFP-kan<sup>r</sup> aur1<sup>+</sup>::aur1<sup>r</sup>-Pcut2-cut2<sup>+</sup>-mCherry</i>                                       |
| SY15-12      | <i>h<sup>+</sup> ade6-210 leu1-32 lys1-131 ura4-D18 cen2::kan<sup>r</sup>-ura4<sup>+</sup>-lacO his7<sup>+</sup>::Pdis1-GFP-lacI-NLS</i>                                                                                                                                                 |
| SKKT102-a    | <i>h<sup>-</sup> leu1-32 lys1-131 ura4-D18 rec12-152::LEU2 sid4<sup>+</sup>::GFP-kan<sup>r</sup> cen2::kan<sup>r</sup>-ura4<sup>+</sup>-lacO his7<sup>+</sup>::Pdis1-GFP-lacI-NLS aur1<sup>+</sup>::aur1<sup>r</sup>-Pcut2-cut2<sup>+</sup>-mCherry</i>                                  |
| SY15-26      | <i>h<sup>+</sup> leu1-32 lys1-131 rec12-152::LEU2 cen2::kan<sup>r</sup>-ura4<sup>+</sup>-lacO his7<sup>+</sup>::Pdis1-GFP-lacI-NLS</i>                                                                                                                                                   |
| SENT25-1     | <i>h<sup>-</sup> ade6(-210 or -216) leu1-32 lys1-131 ura4-D18 mad2::ura4<sup>+</sup> sid4<sup>+</sup>::GFP-kan<sup>r</sup> cen2::kan<sup>r</sup>-ura4<sup>+</sup>-lacO his7<sup>+</sup>::Pdis1-GFP-lacI-NLS aur1<sup>+</sup>::aur1<sup>r</sup>-Pcut2-cut2<sup>+</sup>-mCherry</i>        |
| SY20-27      | <i>h<sup>+</sup> ade6-210 leu1-32 lys1-131 ura4-D18 mad2::ura4<sup>+</sup> cen2::kan<sup>r</sup>-ura4<sup>+</sup>-lacO his7<sup>+</sup>::Pdis1-GFP-lacI-NLS</i>                                                                                                                          |
| SENT26-1     | <i>h<sup>-</sup> ade6(-210 or -216) leu1-32 ura4-D18 mad2::ura4<sup>+</sup> rec12-152::LEU2 sid4<sup>+</sup>::GFP-kan<sup>r</sup> cen2::kan<sup>r</sup>-ura4<sup>+</sup>-lacO his7<sup>+</sup>::Pdis1-GFP-lacI-NLS aur1<sup>+</sup>::aur1<sup>r</sup>-Pcut2-cut2<sup>+</sup>-mCherry</i> |
| SYH144-1-16A | <i>h<sup>+</sup> leu1-32 lys1-131 ura4-D18 mad2::ura4<sup>+</sup> rec12-152::LEU2 cen2::kan<sup>r</sup>-ura4<sup>+</sup>-lacO his7<sup>+</sup>::Pdis1-GFP-lacI-NLS</i>                                                                                                                   |
| SMW19-3A     | <i>h<sup>-</sup> leu1-32 lys1-131 ura4-D18 ark1-so::kan<sup>r</sup> cen2::kan<sup>r</sup>-ura4<sup>+</sup>-lacO his7<sup>+</sup>::Pdis1-GFP-lacI-NLS</i>                                                                                                                                 |
| SMW21-5A     | <i>h<sup>+</sup> leu1-32 ura4-D18 ark1-so::kan<sup>r</sup> sid4<sup>+</sup>::GFP-kan<sup>r</sup> cen2::kan<sup>r</sup>-ura4<sup>+</sup>-lacO his7<sup>+</sup>::Pdis1-GFP-lacI-NLS aur1<sup>+</sup>::aur1<sup>r</sup>-Pcut2-cut2<sup>+</sup>-mCherry</i>                                  |
| SYH277-15D   | <i>h<sup>-</sup> leu1-32 lys1-131 ura4-D18 rec12-152::LEU2 ark1-so::kan<sup>r</sup> cen2::kan<sup>r</sup>-ura4<sup>+</sup>-lacO his7<sup>+</sup>::Pdis1-GFP-lacI-NLS</i>                                                                                                                 |
| SENT28-1     | <i>h<sup>+</sup> leu1-32 lys1-131 ura4-D18 rec12-152::LEU2 ark1-so::kan<sup>r</sup> sid4<sup>+</sup>::GFP-kan<sup>r</sup> cen2::kan<sup>r</sup>-ura4<sup>+</sup>-lacO his7<sup>+</sup>::Pdis1-GFP-lacI-NLS aur1<sup>+</sup>::aur1<sup>r</sup>-Pcut2-cut2<sup>+</sup>-mCherry</i>         |
| SAH5-1C      | <i>h<sup>+</sup> leu1-32 lys1-131 ura4-D18 dam1::kan<sup>r</sup> cen2::kan<sup>r</sup>-ura4<sup>+</sup>-lacO his7<sup>+</sup>::Pdis1-GFP-lacI-NLS</i>                                                                                                                                    |
| SAH8-3D      | <i>h<sup>-</sup> leu1-32 lys1-131 ura4-D18 dam1::kan<sup>r</sup> his7<sup>+</sup>::Pdis1-GFP-lacI-NLS</i>                                                                                                                                                                                |
| SHM114-6D    | <i>h<sup>+</sup> leu1-32</i>                                                                                                                                                                                                                                                             |
| SHM115-6D    | <i>h<sup>-</sup> his2-245</i>                                                                                                                                                                                                                                                            |
| SKY7-1A      | <i>h<sup>-</sup> his2-245 dam1::kan<sup>r</sup></i>                                                                                                                                                                                                                                      |
| SKY7-5B      | <i>h<sup>+</sup> leu1-32 dam1::kan<sup>r</sup></i>                                                                                                                                                                                                                                       |
| SY5-67       | <i>h<sup>-</sup> ade6-L469</i>                                                                                                                                                                                                                                                           |
| SHM148-11A   | <i>h<sup>+</sup> ade6-M26</i>                                                                                                                                                                                                                                                            |
| SHM230-2C    | <i>h<sup>+</sup> ade6-M375</i>                                                                                                                                                                                                                                                           |
| SMW37-9A     | <i>h<sup>-</sup> ade6-L469 dam1::kan<sup>r</sup></i>                                                                                                                                                                                                                                     |
| SMW34-23D    | <i>h<sup>+</sup> ade6-M26 dam1::kan<sup>r</sup></i>                                                                                                                                                                                                                                      |
| SMW35-22D    | <i>h<sup>+</sup> ade6-M375 dam1::kan<sup>r</sup></i>                                                                                                                                                                                                                                     |
| SYH19-2-9A   | <i>h<sup>-</sup> leu1-32 lys1-131 ura4-D18 cen2::kan<sup>r</sup>-ura4<sup>+</sup>-lacO his7<sup>+</sup>::Pdis1-GFP-lacI-NLS</i>                                                                                                                                                          |
| SAH5-1D      | <i>h<sup>-</sup> leu1-32 lys1-131 ura4-D18 dam1::kan<sup>r</sup> cen2::kan<sup>r</sup>-ura4<sup>+</sup>-lacO his7<sup>+</sup>::Pdis1-GFP-lacI-NLS</i>                                                                                                                                    |
| SAH4-5D      | <i>h<sup>+</sup> leu1-32 lys1-131 ura4-D18 dam1::kan<sup>r</sup> sgo1::kan<sup>r</sup> cen2::kan<sup>r</sup>-ura4<sup>+</sup>-lacO his7<sup>+</sup>::Pdis1-GFP-lacI-NLS</i>                                                                                                              |
| SAH8-2D      | <i>h<sup>-</sup> leu1-32 lys1-131 ura4-D18 dam1::kan<sup>r</sup> sgo1::kan<sup>r</sup> his7<sup>+</sup>::Pdis1-GFP-lacI-NLS</i>                                                                                                                                                          |
| SAH5-2D      | <i>h<sup>+</sup> leu1-32 lys1-131 ura4-D18 dam1::kan<sup>r</sup> rec12-152::LEU2 cen2::kan<sup>r</sup>-ura4<sup>+</sup>-lacO his7<sup>+</sup>::Pdis1-GFP-lacI-NLS</i>                                                                                                                    |
| SAH8-8B      | <i>h<sup>-</sup> leu1-32 lys1-131 ura4-D18 dam1::kan<sup>r</sup> rec12-152::LEU2 his7<sup>+</sup>::Pdis1-GFP-lacI-NLS</i>                                                                                                                                                                |
| SAH4-6D      | <i>h<sup>+</sup> leu1-32 lys1-131 ura4-D18 dam1::kan<sup>r</sup> sgo1::kan<sup>r</sup> rec12-152::LEU2 cen2::kan<sup>r</sup>-ura4<sup>+</sup>-lacO his7<sup>+</sup>::Pdis1-GFP-lacI-NLS</i>                                                                                              |

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| SAH8-9B   | <i>h<sup>-</sup> leu1-32 lys1-131 ura4-D18 dam1::kan<sup>r</sup> sgo1::kan<sup>r</sup> rec12-152::LEU2 his7<sup>+</sup>::Pdis1-GFP-lacI-NLS</i>                                                                                                                               |
| SMW27-4D  | <i>h<sup>-</sup> ura4-D18 dam1::kan<sup>r</sup> lys1<sup>+</sup>::mat-Pc pat1-114 cen2::kan<sup>r</sup>-ura4<sup>+</sup>-lacO his7<sup>+</sup>::Pdis1-GFP-lacI-NLS</i>                                                                                                        |
| SAK20-12A | <i>h<sup>-</sup> ura4-D18 dam1::kan<sup>r</sup> lys1<sup>+</sup>::mat-Pc pat1-114 sgo1::kan<sup>r</sup> cen2::kan<sup>r</sup>-ura4<sup>+</sup>-lacO his7<sup>+</sup>::Pdis1-GFP-lacI-NLS</i>                                                                                  |
| SHM193-2C | <i>h<sup>90</sup> ark1<sup>+</sup>::GFP-hyg<sup>r</sup> lys1<sup>+</sup>::Pnda3-mCherry-atb2<sup>+</sup></i>                                                                                                                                                                  |
| SMW41-2D  | <i>h<sup>-</sup> leu1-32 lys1-131 ura4-D18 dam1::kan<sup>r</sup> ark1<sup>+</sup>::GFP-hyg<sup>r</sup></i>                                                                                                                                                                    |
| SMW41-6A  | <i>h<sup>+</sup> leu1-32 ura4-D18 dam1::kan<sup>r</sup> ark1<sup>+</sup>::GFP-hyg<sup>r</sup> lys1<sup>+</sup>::Pnda3-mCherry-atb2<sup>+</sup></i>                                                                                                                            |
| FY20781   | <i>h<sup>-</sup> leu1-32 ura4-D18 mis12<sup>+</sup>-RFP::LEU2</i>                                                                                                                                                                                                             |
| SMW36-9A  | <i>h<sup>+</sup> leu1-32 ark1<sup>+</sup>::GFP-hyg<sup>r</sup> mis12<sup>+</sup>-RFP::LEU2</i>                                                                                                                                                                                |
| SMW39-6A  | <i>h<sup>-</sup> leu1-32 lys1-131 ura4-D18 dam1::kan<sup>r</sup> ark1<sup>+</sup>::GFP-hyg<sup>r</sup> mis12<sup>+</sup>-RFP::LEU2</i>                                                                                                                                        |
| SMW39-7D  | <i>h<sup>+</sup> leu1-32 ura4-D18 dam1::kan<sup>r</sup> ark1<sup>+</sup>::GFP-hyg<sup>r</sup> mis12<sup>+</sup>-RFP::LEU2</i>                                                                                                                                                 |
| SYS2-2D   | <i>h<sup>-</sup> ade6(-210 or -216) ura4-D18 dam1::kan<sup>r</sup> sid4<sup>+</sup>::GFP-kan<sup>r</sup> cen2::kan<sup>r</sup>-ura4<sup>+</sup>-lacO his7<sup>+</sup>::Pdis1-GFP-lacI-NLS aur1<sup>+</sup>::aur1<sup>r</sup>-Pcut2-cut2<sup>+</sup>-mCherry</i>               |
| SMWT8-1   | <i>h<sup>+</sup> leu1-32 lys1-131 ura4-D18 dam1::kan<sup>r</sup> rec12-152::LEU2 sid4<sup>+</sup>::GFP-kan<sup>r</sup> cen2::kan<sup>r</sup>-ura4<sup>+</sup>-lacO his7<sup>+</sup>::Pdis1-GFP-lacI-NLS aur1<sup>+</sup>::aur1<sup>r</sup>-Pcut2-cut2<sup>+</sup>-mCherry</i> |
| SAH4-10C  | <i>h<sup>-</sup> leu1-32 lys1-131 ura4-D18 dam1::kan<sup>r</sup> rec12-152::LEU2 cen2::kan<sup>r</sup>-ura4<sup>+</sup>-lacO his7<sup>+</sup>::Pdis1-GFP-lacI-NLS</i>                                                                                                         |
| SAH43-1D  | <i>h<sup>-</sup> leu1-32 ura4-D18 lys1<sup>+</sup>::Pnda1-mCherry-atb2<sup>+</sup> cen2::kan<sup>r</sup>-ura4<sup>+</sup>-lacO his7<sup>+</sup>::Pdis1-GFP-lacI-NLS</i>                                                                                                       |
| SYI32-20B | <i>h<sup>+</sup> ade6(-210 or 216) leu1-32 lys1-131 ura4-D18 sid4<sup>+</sup>::GFP-kan<sup>r</sup> cen2::kan<sup>r</sup>-ura4<sup>+</sup>-lacO his7<sup>+</sup>::Pdis1-GFP-lacI-NLS</i>                                                                                       |
| SENT59-1  | <i>h<sup>-</sup> leu1-32 ura4-D18 dam1::kan<sup>r</sup> lys1<sup>+</sup>::Pnda1-mCherry-atb2<sup>+</sup> cen2::kan<sup>r</sup>-ura4<sup>+</sup>-lacO his7<sup>+</sup>::Pdis1-GFP-lacI-NLS</i>                                                                                 |
| SEN50-25C | <i>h<sup>+</sup> ade6(-210 or 216) leu1-32 dam1::kan<sup>r</sup> sid4<sup>+</sup>::GFP-kan<sup>r</sup> cen2::kan<sup>r</sup>-ura4<sup>+</sup>-lacO his7<sup>+</sup>::Pdis1-GFP-lacI-NLS</i>                                                                                   |
| SMWT7-1   | <i>h<sup>-</sup> leu1-32 ura4-D18 dam1::kan<sup>r</sup> rec12-152::LEU2 lys1<sup>+</sup>::Pnda1-mCherry-atb2<sup>+</sup> cen2::kan<sup>r</sup>-ura4<sup>+</sup>-lacO his7<sup>+</sup>::Pdis1-GFP-lacI-NLS</i>                                                                 |
| SMWT6-1   | <i>h<sup>+</sup> leu1-32 ura4-D18 dam1::kan<sup>r</sup> rec12-152::LEU2 lys1<sup>+</sup>::Pnda1-mCherry-atb2<sup>+</sup> cen2::kan<sup>r</sup>-ura4<sup>+</sup>-lacO his7<sup>+</sup>::Pdis1-GFP-lacI-NLS</i>                                                                 |

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| Table S3. Strains used in figures   |                               |                             |                         |
|-------------------------------------|-------------------------------|-----------------------------|-------------------------|
| Figure                              | Characteristics/genotype      |                             | Strains                 |
| Figs 1D, 1E and S1 (no tagging)     | Cen1                          | WT                          | SY6-59, SY16-31         |
|                                     |                               | <i>mad2Δ</i>                | SYH129-2D, SYH129-3C    |
|                                     |                               | <i>ark1-so</i>              | SYH317-13B, SYH257-2B   |
|                                     |                               | <i>sgo1Δ</i>                | SYH91-2-11B, SYH91-14B  |
|                                     |                               | <i>mad2Δ sgo1Δ</i>          | SYH215-3A, SYH215-1C    |
|                                     |                               | <i>ark1-so sgo1Δ</i>        | SYI15-19B, SYI15-16B    |
|                                     |                               | <i>rec12Δ</i>               | SYH129-3B, SYH129-16D   |
|                                     |                               | <i>mad2Δ rec12Δ</i>         | SYH129-3D, SYH129-6D    |
|                                     |                               | <i>ark1-so rec12Δ</i>       | SYH317-16A, SYH257-1B   |
|                                     |                               | <i>rec12Δ sgo1Δ</i>         | SYH91-15B, SYH91-1C     |
|                                     |                               | <i>mad2Δ rec12Δ sgo1Δ</i>   | SYH215-2A, SYH215-6A    |
|                                     |                               | <i>ark1-so rec12Δ sgo1Δ</i> | SVV89-2D, SYI15-20B     |
|                                     | Cen2                          | WT                          | SYH19-4C, SYH19-6A      |
|                                     |                               | <i>mad2Δ</i>                | SY20-27, SY14-48        |
|                                     |                               | <i>ark1-so</i>              | SYH258-16A, SYH257-2B   |
|                                     |                               | <i>sgo1Δ</i>                | SYH18-2-8B, SYH18-2-6A  |
|                                     |                               | <i>mad2Δ sgo1Δ</i>          | SYH215-1C, SYI18-15D    |
|                                     |                               | <i>ark1-so sgo1Δ</i>        | SVV89-2C, SVV89-12A     |
|                                     |                               | <i>rec12Δ</i>               | SY15-26, SY16-43        |
|                                     |                               | <i>mad2Δ rec12Δ</i>         | SYH44-1-16A, SYH44-1-6B |
|                                     |                               | <i>ark1-so rec12Δ</i>       | SYH277-1B, SYH257-1B    |
|                                     |                               | <i>rec12Δ sgo1Δ</i>         | SYH18-2-1C, SYH18-2-6D  |
|                                     |                               | <i>mad2Δ rec12Δ sgo1Δ</i>   | SYH215-6A, SYH226-6B    |
|                                     |                               | <i>ark1-so rec12Δ sgo1Δ</i> | SVV-89-2D, SVV89-11C    |
| Fig 1F                              | <i>pat1-114</i>               |                             | HM4501-2                |
|                                     | <i>mad2Δ pat1-114</i>         |                             | SYIT30-3                |
|                                     | <i>ark1-so pat1-114</i>       |                             | SYIT18-2                |
|                                     | <i>sgo1Δ pat1-114</i>         |                             | SYH193-2A               |
|                                     | <i>mad2Δ sgo1Δ pat1-114</i>   |                             | SYIT7-1                 |
|                                     | <i>ark1-so sgo1Δ pat1-114</i> |                             | SYIT17-1                |
| Fig S1 (Sid4-RFP)                   | WT                            |                             | SMW43-22B, SYH19-4C     |
|                                     | <i>sgo1Δ</i>                  |                             | SMW43-9A, SYH18-2-8B    |
|                                     | <i>ark1-so</i>                |                             | SKY20-11B, SVV89-11B    |
|                                     | <i>ark1-so sgo1Δ</i>          |                             | SKY20-11B, SVV89-2C     |
|                                     | <i>rec12Δ</i>                 |                             | SMW43-20D, SY15-26      |
|                                     | <i>rec12Δ sgo1Δ</i>           |                             | SMW43-9B, SYH18-2-1C    |
|                                     | <i>ark1-so rec12Δ</i>         |                             | SYH277-15D, SKY20-11A   |
|                                     | <i>ark1-so rec12Δ sgo1Δ</i>   |                             | SVV89-16D, SKY20-11A    |
| Figs 2–4, and S2 – S5, and Table S1 | WT                            |                             | SKKT100-a, SY15-12      |
|                                     | <i>rec12Δ</i>                 |                             | SY15-26, SKKT102-a      |
|                                     | <i>mad2Δ</i>                  |                             | SY20-27, SENT25-1       |
|                                     | <i>rec12Δ mad2Δ</i>           |                             | SYH44-1-16A, SENT26-1   |
|                                     | <i>ark1-so</i>                |                             | SMW19-3A, SMW21-5A      |
|                                     | <i>ark1-so rec12Δ</i>         |                             | SYH277-15D, SENT28-1    |
| Fig S6A and S6B                     | WT                            |                             | SYH19-4C, SYH19-6A      |
|                                     | <i>dam1Δ</i>                  |                             | SAH5-1C, SAH8-3D        |
| Fig S6C (Crossover)                 | WT                            |                             | SHM114-6D, SHM115-5D    |
|                                     | <i>dam1Δ</i>                  |                             | SKY7-5B, SKY7-1A        |
| Fig S6C (Gene Conversion)           | WT                            | <i>ade6-M26</i>             | SHM148-11A, SY5-67      |
|                                     |                               | <i>ade6-M375</i>            | SHM230-2C, SY5-67       |

|                                         |                           |                  |                      |
|-----------------------------------------|---------------------------|------------------|----------------------|
|                                         | <i>dam1Δ</i>              | <i>ade6-M26</i>  | SMW34-23D, SMW37-9A  |
|                                         |                           | <i>ade6-M375</i> | SMW35-22D, SMW37-9A  |
| Fig 5A                                  | WT                        |                  | SYH19-2-9A, SYH19-4C |
|                                         | <i>dam1Δ</i>              |                  | SAH5-1C, SAH5-1D     |
| Fig 5B                                  | <i>dam1Δ</i>              |                  | SAH5-1C, SAH8-3D     |
|                                         | <i>dam1Δ sgo1Δ</i>        |                  | SAH4-5D, SAH8-2D     |
|                                         | <i>dam1Δ rec12Δ</i>       |                  | SAH5-2D, SAH8-8B     |
|                                         | <i>dam1Δ rec12Δ sgo1Δ</i> |                  | SAH4-6D, SAH8-9B     |
| Fig 5C                                  | <i>dam1Δ</i>              |                  | SMW27-4D             |
|                                         | <i>dam1Δ sgo1Δ</i>        |                  | SAK20-12A            |
| Fig S7A                                 | WT                        |                  | SHM193-2C            |
|                                         | <i>dam1Δ</i>              |                  | SMW41-2D, SMW41-6A   |
| Fig S7B                                 | WT                        |                  | FY20781, SMW36-9A    |
|                                         | <i>dam1Δ</i>              |                  | SMW39-7D, SMW39-6A   |
| Figs 5D – 5I,<br>6B, 6C, and<br>S8A–S8F | <i>dam1Δ</i>              |                  | SYS-2D, SAH5-1C      |
|                                         | <i>dam1Δ rec12Δ</i>       |                  | SMWT8-1, SAH4-10C    |
| Figs 6A, 6D,<br>6E, S8G and<br>S8H      | WT                        |                  | SAH43-1D, SYI32-20B  |
|                                         | <i>dam1Δ</i>              |                  | SEN50-25C, SENT59-1  |
|                                         | <i>dam1Δ rec12Δ</i>       |                  | SMWT6-1, SMWT7-1     |

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