**Table S1: Yeast Strains**

| Strain | Genotype | Source |
| --- | --- | --- |
| W303 | *leu2-3,112/leu2-3,112 trp1-1/trp1-1 can1-100/can1-100 ura3-1/ura3-1 ade2-1/ade2-1 his3-11,15/his3-11,15* | Ralser et al. 2012 |
| BY4743 | *his3Δ1/his3Δ1 leu2Δ0/leu2Δ0 LYS2/lys2Δ0 MET15/met15Δ0 ura3Δ0/ura3Δ0* | Winzeler et al. 1999 |
| JHUy868 | BY4743 *MRE11/mre11∆::kanMX4* | Winzeler et al. 1999 |
| JHUy761 | *his3Δ1/his3Δ1 leu2Δ0/leu2Δ0 lys2Δ0/lys2Δ0 met15Δ0/met15Δ0 trp1Δ63/trp1Δ63 ura3Δ0/ura3Δ0* | Ma and Greider 2009 |
| yYM242 | JHUy761 *TEL1/tel1Δ::2FLAG-TEL1 MEC1/mec1Δ::LEU2 SML1/sml1Δ::TRP1* | Ma and Greider 2009 |
| yYM256 | JHUy761 *TEL1/tel1Δ::2FLAG-TEL1 XRS2/xrs2Δ::XRS2-13myc-kanMX6* | Ma and Greider 2009 |
| JHUy816, 817 | JHUy761 *MEC1/mec1Δ::kanMX4 TEL1/tel1Δ::hphMX4 SML1/sml1Δ::TRP1* | Ma and Greider 2009 |
| JHUy937-1 | JHUy817 *CRT1/crt1∆::LEU2* | This Study |
| yRK1 | JHUy761 *MRE11/mre11Δ::MRE11-3HA-URA3 RAD50/rad50Δ::RAD50-G6-V5-LEU2* | This Study |
| yRK26 | JHUy761 *MRE11/mre11Δ::mre11 S94A T377A S564A S578A-3HA-URA3 RAD50/rad50Δ::rad50 S245A S395A S402A S434A T466A T568A S753A T890A S1036A S1300A-G6-V5-TRP1* | This Study |
| yRK35 | JHUy761 *MRE11/mre11Δ::MRE11-3HA-URA3 RAD50/rad50Δ::RAD50-G6-V5-LEU2 XRS2/xrs2∆::XRS2-13myc-hphMX4* | This Study |
| yRK36, 56 | JHUy761 *MRE11/mre11Δ::mre11 S94A T377A S564A S578A-3HA-URA3 RAD50/rad50Δ::rad50 S245A S395A S402A S434A T466A T568A S753A T890A S1036A S1300A-G6-V5-TRP1 XRS2/xrs2Δ::xrs2 T128A S480A T661A S729A-13myc-hphMX4* | This Study |
| yRK60, 102 | *his3Δ1 leu2Δ0 lys2Δ0 met15Δ0 trp1Δ63 ura3Δ0 mre11∆::MRE11-3HA-URA3 rad50∆::RAD50-G6-V5-LEU2 xrs2∆::XRS2-13myc-hphMX4* | This Study |
| yRK72 | JHUy761 *MRE11/mre11Δ::mre11 S94A T377A S564A S578A-3HA-URA3 RAD50/rad50Δ::rad50 S245A S395A S402A S434A T466A T568A S753A T890A S1036A S1300A-G6-V5-TRP1 XRS2/xrs2Δ::xrs2 S480A T661A S729A-13myc-hphMX4 MEC1/mec1∆::kanMX4 SML1/sml1∆::TRP1* | This Study |
| yRK73 | JHUy761 *MRE11/mre11Δ::mre11 S94A T377A S564A S578A-3HA-URA3 RAD50/rad50Δ::rad50 S245A S395A S402A S434A T466A T568A S753A T890A S1036A S1300A-G6-V5-TRP1 XRS2/xrs2Δ::xrs2 T128A S480A T661A S729A-13myc-hphMX4* *MEC1/mec1∆::kanMX4 SML1/sml1∆::TRP1* | This Study |
| yRK79, 80 | JHUy761 *MRE11/mre11Δ::MRE11-3HA-URA3 RAD50/rad50Δ::RAD50-G6-V5-LEU2 XRS2/xrs2∆::XRS2-13myc-hphMX4 MEC1/mec1∆::kanMX4 SML1/sml1∆::TRP1* | This Study |
| yRK81 | JHUy761 *MRE11/mre11Δ::mre11 S94A T377A S564A S578A-3HA-URA3 RAD50/rad50Δ::rad50 S245A S395A S402A S434A T466A T568A S753A T890A S1036A S1300A-G6-V5-TRP1 XRS2/xrs2Δ::xrs2 T128A S480A T661A S729A-13myc-hphMX4* *MEC1/mec1∆::LEU2 SML1/sml1∆::TRP1 TEL1/2FLAG-TEL1* | This Study |
| yRK83 | JHUy761 *MRE11/mre11Δ::mre11 S94A T377A S564A S578A-3HA-URA3 RAD50/rad50Δ::rad50 S245A S395A S402A S434A T466A T568A S753A T890A S1036A S1300A-G6-V5-TRP1 XRS2/xrs2Δ::xrs2 T128A S480A T661A S729A-13myc-hphMX4* *MEC1/mec1∆::LEU2 SML1/sml1∆::TRP1* | This Study |
| yRK86, 87 | JHUy761 *MRE11/mre11Δ::MRE11-3HA-URA3 RAD50/rad50Δ::RAD50-G6-V5-LEU2 XRS2/xrs2∆::XRS2-13myc-hphMX4 MEC1/mec1∆::kanMX4 SML1/sml1∆::TRP1 TEL1/tel1∆::HIS3* | This Study |
| yRK88, 89 | JHUy761 *MRE11/mre11Δ::mre11 S94A T377A S564A S578A-3HA-URA3 RAD50/rad50Δ::rad50 S245A S395A S402A S434A T466A T568A S753A T890A S1036A S1300A-G6-V5-TRP1 XRS2/xrs2Δ::xrs2 T128A S480A T661A S729A-13myc-hphMX4* *MEC1/mec1∆::LEU2 SML1/sml1∆::TRP1 TEL1/tel1∆::HIS3* | This Study |
| yRK90 | *his3Δ1 leu2Δ0 lys2Δ0 met15Δ0 trp1Δ63 ura3Δ0 tel1∆::2FLAG-TEL1 mre11Δ::mre11 S94A T377A S564A S578A-3HA-URA3 rad50Δ::rad50 S245A S395A S402A S434A T466A T568A S753A T890A S1036A S1300A-G6-V5-TRP1 xrs2Δ::xrs2 T128A S480A T661A S729A-13myc-hphMX4* | This Study |
| yRK92, 93 | *his3Δ1 leu2Δ0 lys2Δ0 met15Δ0 trp1Δ63 ura3Δ0 mre11Δ::mre11 S94A T377A S564A S578A-3HA-URA3 rad50Δ::rad50 S245A S395A S402A S434A T466A T568A S753A T890A S1036A S1300A-G6-V5-TRP1 xrs2Δ::xrs2 T128A S480A T661A S729A-13myc-hphMX4 mec1∆::LEU2 sml1∆::TRP1* | This Study |
| yRK94 | *his3Δ1 leu2Δ0 lys2Δ0 met15Δ0 trp1Δ63 ura3Δ0 mre11Δ::mre11 S94A T377A S564A S578A-3HA-URA3* | This Study |

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| Strain | Genotype | Source |
| yRK104, 141 | *his3Δ1 leu2Δ0 lys2Δ0 met15Δ0 trp1Δ63 ura3Δ0 mre11∆::MRE11-3HA-URA3 rad50∆::RAD50-G6-V5-LEU2 xrs2∆::XRS2-13myc-hphMX4 mec1∆::kanMX4 sml1∆::TRP1* | This Study |
| yRK106 | *his3Δ1 leu2Δ0 lys2Δ0 met15Δ0 trp1Δ63 ura3Δ0 mre11Δ::MRE11-3HA-URA3* | This Study |
| yRK114, 2113-5, 6008-1, 6008-2 | *his3Δ1 leu2Δ0 lys2Δ0 met15Δ0 trp1Δ63 ura3Δ0* | This Study |
| yRK122 | *his3Δ1 leu2Δ0 lys2Δ0 met15Δ0 trp1Δ63 ura3Δ0 mec1Δ::kanMX4 tel1Δ::hphMX4 sml1Δ::TRP1* | This Study |
| yRK126 | *his3Δ1 leu2Δ0 lys2Δ0 met15Δ0 trp1Δ63 ura3Δ0 tel1Δ::hphMX4* | This Study |
| yRK128 | *his3Δ1 leu2Δ0 lys2Δ0 met15Δ0 trp1Δ63 ura3Δ0 mec1Δ::kanMX4 sml1Δ::TRP1* | This Study |
| yRK133 | *his3Δ1 leu2Δ0 lys2Δ0 met15Δ0 trp1Δ63 ura3Δ0 xrs2∆::XRS2-13myc-hphMX4* | This Study |
| yRK135 | *his3Δ1 leu2Δ0 lys2Δ0 met15Δ0 trp1Δ63 ura3Δ0 xrs2Δ::xrs2 T128A S480A T661A S729A-13myc-hphMX4* | This Study |
| yRK138 | *his3Δ1 leu2Δ0 lys2Δ0 met15Δ0 trp1Δ63 ura3Δ0 rad50∆::RAD50-G6-V5-LEU2* | This Study |
| yRK139 | *his3Δ1 leu2Δ0 lys2Δ0 met15Δ0 trp1Δ63 ura3Δ0 rad50Δ::rad50 S245A S395A S402A S434A T466A T568A S753A T890A S1036A S1300A-G6-V5-TRP1* | This Study |
| yRK1006 | JHUy761 *MRE11/mre11∆::MRE11-3HA-URA3* | This Study |
| yRK1018, 1019 | *his3Δ1 leu2Δ0 ura3Δ0 mre11∆::kanMX4* | This Study |
| yRK1052 | JHUy761 *MRE11/mre11∆::mre11-S94A T377A S564A S578A-3HA-URA3* | This Study |
| yRK2024 | *his3Δ1 leu2Δ0 ura3Δ0 rad50∆::kanMX4* | This Study |
| yRK2040 | JHUy761 *RAD50/rad50∆::RAD50-G6-V5-LEU2* | This Study |
| yRK2082 | JHUy761 *RAD50/rad50∆::rad50 S245A S395A S402A S434A T466A T568A S753A T890A S1036A S1300A-G6-V5-TRP1* | This Study |
| yRK2112-5, 2116-5 | *his3Δ1 leu2Δ0 lys2Δ0 met15Δ0 trp1Δ63 ura3Δ0 rad50∆::rad50S* | This Study |
| yRK2118-5, 2120-5 | *his3Δ1 leu2Δ0 lys2Δ0 met15Δ0 trp1Δ63 ura3Δ0 rad50∆::rad50S tel1∆::hphMX4* | This Study |
| yRK2121-5 | *his3Δ1 leu2Δ0 lys2Δ0 met15Δ0 trp1Δ63 ura3Δ0 tel1∆::hphMX4* | This Study |
| yRK2122-5, 2123-5 | *his3Δ1 leu2Δ0 lys2Δ0 met15Δ0 trp1Δ63 ura3Δ0 rad50∆::rad50S mre11∆::kanMX4* | This Study |
| yRK2124-5 | *his3Δ1 leu2Δ0 lys2Δ0 met15Δ0 trp1Δ63 ura3Δ0 mre11∆::kanMX4* | This Study |
| Strain | Genotype | Source |
| yRK2125-5, 2126-5 | *his3Δ1 leu2Δ0 lys2Δ0 met15Δ0 trp1Δ63 ura3Δ0 rad50∆::rad50S tel1∆::TEL1-hy909-HIS3* | This Study |
| yRK2127-5, 2128-5 | *his3Δ1 leu2Δ0 lys2Δ0 met15Δ0 trp1Δ63 ura3Δ0 tel1∆::TEL1-hy909-HIS3* | This Study |
| yRK3018 | JHUy761 *XRS2/xrs2Δ::xrs2 T128A S480A T661A S729A-13myc-hphMX4* | This Study |
| yRK5028, 5059 | JHUy957-1 *TEL1/tel1∆::TEL1-hy909-HIS3* | This Study |
| yRK5053 | yYM242 *TEL1/tel1∆::2xFLAG-TEL1-hy909-HIS3* | This Study |
| yRK5055 | JHUy816 *tel1∆::TEL1-hy909-HIS3/tel1∆::hphMX4* | This Study |
| yRK5063, 5064 | yRK5053 *MRE11/mre11∆::kanMX4* | This Study |
| yRK5065, 5066 | yRK5053 *RAD50/rad50∆::kanMX4* | This Study |
| yRK5069, 5070 | W303 *TEL1/tel1∆::TEL1-hy909-HIS3 MRE11/mre11∆::kanMX4* | This Study |
| yRK5071, 5072 | W303 *TEL1/tel1∆::TEL1-hy909-HIS3 RAD50/rad50∆::kanMX4* | This Study |
| yRK5073, 5074 | W303 *TEL1/tel1∆::TEL1-hy909-HIS3 XRS2/xrs2∆::kanMX4* | This Study |
| yRK5089, 5090 | yRK5053 *SAE2/sae2∆::kanMX4* | This Study |
| yRK5093, 5094 | yRK5053 *EXO1/exo1∆::kanMX4* | This Study |
| yRK5101 | yRK5053 *XRS2/xrs2∆::kanMX4* | This Study |
| yRK5148, 5149 | JHUy937-1 *tel1∆::hygroMX4/tel1∆::TEL1-hy909-HIS3* | This Study |
| yRK5150, 5151 | yRK5089 *MRE11/mre11∆::URA3* | This Study |
| yRK5152, 5153 | yRK5093 *MRE11/mre11∆::URA3* | This Study |
| yRK5177 | *TEL1/tel1Δ::2xFLAG-TEL1-hy909-HIS3 MEC1/mec1Δ::LEU2 RAD53/rad53∆::kanMX4 CRT1/crt1∆::URA3* | This Study |
| yRK6002, 6003 | JHUy937-1 *RAD53/rad53∆::HIS3* | This Study |
| yRK6007 | JHUy937-1 *RAD53/rad53∆::rad53 T5A T8A T12A T15A S473A S480A S485A S489A-3xFLAG-HIS3* | This Study |
| yRK6009-1, 6009-2 | *his3Δ1 leu2Δ0 lys2Δ0 met15Δ0 trp1Δ63 ura3Δ0 rad53∆::RAD53-3xFLAG-HIS3* | This Study |
| yRK6010-1, 6010-2 | *his3Δ1 leu2Δ0 lys2Δ0 met15Δ0 trp1Δ63 ura3Δ0 rad53∆::RAD53-3xFLAG-HIS3 crt1∆::LEU2* | This Study |
| yRK6011-1, 6011-2 | *his3Δ1 leu2Δ0 lys2Δ0 met15Δ0 trp1Δ63 ura3Δ0 rad53∆::rad53 T5A T8A T12A T15A S473A S480A S485A S489A-3xFLAG-HIS3 crt1∆::LEU2* | This Study |
| yRK6012-1, 6012-2 | *his3Δ1 leu2Δ0 lys2Δ0 met15Δ0 trp1Δ63 ura3Δ0 rad53∆::rad53 T5A T8A T12A T15A S473A S480A S485A S489A-3xFLAG-HIS3 crt1∆::LEU2 tel1∆::hphMX6* | This Study |
| yRK6013-1, 6013-2 | *his3Δ1 leu2Δ0 lys2Δ0 met15Δ0 trp1Δ63 ura3Δ0 tel1∆::hphMX6 crt1∆::LEU2* | This Study |

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| Strain | Genotype | Source |
| yRK6014-1, 6014-2 | *his3Δ1 leu2Δ0 lys2Δ0 met15Δ0 trp1Δ63 ura3Δ0 rad53∆::rad53 T5A T8A T12A T15A S473A S480A S485A S489A-3xFLAG-HIS3* *mec1∆::kanMX4 crt1∆::LEU2* | This Study |
| yRK6015-1, 6015-2 | *his3Δ1 leu2Δ0 lys2Δ0 met15Δ0 trp1Δ63 ura3Δ0 mec1∆::kanMX4 crt1∆::LEU2* | This Study |