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| **Table S1. Strains used in this study** |
| **strain** | **genotype** |
| LS6 | *MATa ECO1-13MYC::KAN ade2-1 trp1-1 can1-100 leu2-3 his3-11,15 ura3-1 GAL psi+ RAD5*  |
| LS7 | *MATa RAD30-13MYC::KAN ade2-1 trp1-1 can1-100 leu2-3 his3-11,15 ura3-1 GAL psi+ RAD5*  |
| LS48 | *MATa ade2-1 trp1-1 can1-100 leu2-3,112 his3-11,15 ura3-1 GAL psi+ RAD5* |
| LS300 | *MATa CLB2-HA::HPH ade2-1 trp1-1 can1-100 leu2-3 his3-11,15 ura3-1 GAL psi+ RAD5*  |
| LS306 | *MATa rad30(S14A, T547A, T612A)-13MYC::KAN ade2-1 trp1-1 can1-100 leu2-3,112 his3-11,15 ura3-1 GAL psi+ RAD5* |
| LS307 | *MATa rad30(T547A)-13MYC::KAN ade2-1 trp1-1 can1-100 leu2-3,112 his3-11,15 ura3-1 GAL psi+ RAD5* |
| LS421 | *MATα smc1-259 rad30::KAN ade3::GALHO leu2-3,112::PGAL-SMC1-MYC-LEU2 his3-11,15::HIS3-tetR-GFP ura3-1::tetOx112-URA3 ade2-1 trp1-1 can1-100 GAL psi+ RAD5*  |
| LS446 | *MATa rad30::KAN ade2-1 trp1-1 can1-100 leu2-3 his3-11,15 ura3-1 GAL psi+ RAD5*  |
| LS451 | *MATa smc1-259 rad30(K17R, K546R, K603R)::NAT ade3::GAL-HO leu2-3,112::PGAL-SMC1-MYC-LEU2 his3-11,15::HIS3-tetR-GFP ura3-1::tetOx112-URA3 ade2-1 trp1-1 can1-100 GAL psi+ RAD5* |
| LS457 | *MATα smc1-259 rad30(K17R, K546R, K615R)::NAT ade3::GAL-HO leu2-3,112::PGAL-SMC1-MYC-LEU2 his3-11,15::HIS3-tetR-GFP ura3-1::tetOx112-URA3 ade2-1 trp1-1 can1-100 GAL psi+ RAD5* |
| LS468 | *MATα smc1-259 rad30(S14A)::NAT ade3::GALHO leu2-3,112::PGAL-SMC1-MYC-LEU2 his3-11,15::HIS3-tetR-GFP ura3-1::tetOx112-URA3 ade2-1 trp1-1 can1-100 GAL psi+ RAD5*  |
| LS474 | *MATa smc1-259 rad30(T547A)::NAT ade3::GALHO leu2-3,112::PGAL-SMC1-MYC-LEU2 his3-11,15::HIS3-tetR-GFP ura3-1::tetOx112-URA3 ade2-1 trp1-1 can1-100 GAL psi+ RAD5* |
| LS475 | *MATα smc1-259 rad30(T612A)::NAT ade3::GALHO leu2-3,112::PGAL-SMC1-MYC-LEU2 his3-11,15::HIS3-tetR-GFP ura3-1::tetOx112-URA3 ade2-1 trp1-1 can1-100 GAL psi+ RAD5* |
| LS655 | *MATa smc1-259 ade3::GALHO leu2-3,112::PGAL-SMC1-MYC-LEU2 his3-11,15::HIS3-tetR-GFP ura3-1::tetOx112-URA3 ade2-1 trp1-1 can1-100 GAL psi+ RAD5*  |
| LS656 | MAT*α smc1-259 ade3::GALHO leu2-3,112::PGAL-SMC1-MYC-LEU2 his3-11,15::HIS3-tetR-GFP ura3-1::tetOx112-URA3 ade2-1 trp1-1 can1-100 GAL psi+ RAD5* |
| LS679 | *MATa smc1-259 rad30(K546R)::NAT ade3::GALHO leu2-3,112::PGAL-SMC1-MYC-LEU2 his3-11,15::HIS3-tetR-GFP ura3-1::tetOx112-URA3 ade2-1 trp1-1 can1-100 GAL psi+ RAD5* |
| LS698 | *MATa smc1-259 rad30(S14A)-13MYC::KAN ade3::GALHO his3-11,15::HIS3-tetR-GFP ura3-1::tetOx112-URA3 ade2-1 trp1-1 can1-100 leu2-3,112 GAL psi+ RAD5*  |
| LS701 | *MATa rad30(S14A)-13MYC::KAN ade2-1 trp1-1 can1-100 leu2-3,112 his3-11,15 ura3-1 GAL psi+ RAD5* |
| LS800 | *MATα RAD30::loxP-3xFLAG-RAD30 ade3::GALHO ade2-1 trp1-1 can1-100 leu2-3,112 his3-11,15 ura3-1 GAL psi+ RAD5* |
| LS806 | *MATa rad30::KAN trp1-1::PGAL-CDC20-TRP1(K. lactis) his3-11,15::HIS3-tetR-GFP ura3-1::tetOx112-URA3 ade2-1 can1-100 leu2-3,112 GAL psi+ RAD5* |
| LS810 | *MATα rad61::NAT eco1::HPH ade2-1 trp1-1 can1-100 leu2-3,112 his3-11,15 GAL psi+ RAD5* |
| LS844 | *MATα smc1-259 rad30(K17R, K546R)::HPH ade3::GAL-HO his3-11,15::HIS3-tetR-GFP ura3-1::tetOx112-URA3 ade2-1 trp1-1 can1-100 leu2-3,112 GAL psi+ RAD5* |
| LS845 | *MATa* *smc1-259 rad30(K17R, K546R)::HPH ade3::GAL-HO leu2-3,112::PGAL-SMC1-MYC-LEU2 his3-11,15::HIS3-tetR-GFP ura3-1::tetOx112-URA3 ade2-1 trp1-1 can1-100 GAL psi+ RAD5* |
| LS846 | *MATα smc1-259 rad30(K17R, K546R)::HPH ade3::GAL-HO leu2-3,112::PGAL-SMC1-MYC-LEU2 his3-11,15::HIS3-tetR-GFP ura3-1::tetOx112-URA3 ade2-1 trp1-1 can1-100 GAL psi+ RAD5* |
| LS847 | *MATa trp1-1::PGAL-CDC20-TRP1(K. lactis) his3-11,15::HIS3-tetR-GFP ura3-1::tetOx112-URA3 ade2-1 can1-100 leu2-3,112 GAL psi+ RAD5* |
| LS855 | *MAT a smc1-259 RAD30-13MYC::KAN ade3::GALHO ade2-1 trp1-1 can1-100 leu2-3,112 his3-11,15 ura3-1 GAL psi+ RAD5* |
| LS871 | *MATa smc1-259 rad30(S14A,T612A)-13MYC::KAN ade3::GALHO his3-11,15::HIS3-tetR-GFP ura3-1::tetOx112-URA3 ade2-1 trp1-1 can1-100 leu2-3,112 GAL psi+ RAD5*  |
| LS882 | *MATa smc1-259 rad30(K7R, K17R, K137R, K272R, K287R, K351R, K373R, K498R, K532R, K537R, K542R, K546R, K603R, K615R)::HPH ade3::GAL-HO leu-3,112::PGAL-SMC1-MYC-LEU2 his3-11,15::HIS3-tetR-GFP ura3-1::tetOx112-URA3 ade2-1 trp1-1 can1-100 GAL psi+ RAD5* |
| LS894 | *MATa smc1-259 rad30(K279R, K287R, K399R, K436R, K491R)::HPH ade3::GAL-HO leu2-3,112::PGAL-SMC1-MYC-LEU2 his3-11,15::HIS3-tetR-GFP ura3-1::tetOx112-URA3 ade2-1 trp1-1 can1-100 GAL psi+ RAD5* |
| LS924 | *MATα RAD30::loxP-KanMX-PGAL1-loxP-3×FLAG-RAD30 ade2-1 trp1-1 can1-100 leu2-3,112 his3-11,15 ura3-1 GAL psi+ RAD5* |
| LS928 | *MATa rad61::KAN trp1-1::PGAL-CDC20-TRP1(K. lactis) his3-11,15::HIS3-tetR-GFP ura3-1::tetOx112-URA3 ade2-1 can1-100 leu2-3,112 GAL psi+ RAD5* |
| LS939 | *MATα scc2-4 ade2-1 trp1-1 can1-100 leu2-3 his3-11,15 ura3-1 GAL psi+ RAD5*  |
| LS940 | MATa *scc1-73 ade2-1 trp1-1 can1-100 leu2-3 his3-11,15 ura3-1 GAL psi+ RAD5*  |
| LS942 | *MATa smc1-259 ade2-1 trp1-1 can1-100 leu2-3 his3-11,15 ura3-1 GAL psi+ RAD5*  |
| LS972 | *MATα ade3::GALHO RAD30::loxP-KanMX-PGAL1-loxP-3×FLAG-RAD30 ade2-1 trp1-1 can1-100 leu2-3,112 his3-11,15 ura3-1 GAL psi+ RAD5* |
| LS975 | *MATα ade3::GALHO RAD30::loxP-KanMX-PGAL1-loxP-3×FLAG-rad30(K17R, K546R, K603R)::NAT ade2-1 trp1-1 can1-100 leu2-3,112 his3-11,15 ura3-1 GAL psi+ RAD5* |
| LS977 | *MATα ade3::GALHO RAD30::loxP-KanMX-PGAL1-loxP-3×FLAG-rad30(K17R, K546R, K615R)::NAT ade2-1 trp1-1 can1-100 leu2-3,112 his3-11,15 ura3-1 GAL psi+ RAD5* |
| LS979 | *MATα ade3::GALHO RAD30::loxP-KanMX-PGAL1-loxP-3×FLAG-rad30(K7R, K17R, K137R, K272R, K287R, K351R, K373R, K498R, K532R, K537R, K542R, K546R, K603R, K615R)::HPH ade2-1 trp1-1 can1-100 leu2-3,112 his3-11,15 ura3-1 GAL psi+ RAD5* |
| LS981 | *MATα RAD30::loxP-KanMX-PGAL1-loxP-3×FLAG-rad30(K17R, K546R, K603R)::NAT ade2-1 trp1-1 can1-100 leu2-3,112 his3-11,15 ura3-1 GAL psi+ RAD5* |
| LS982 | *MATα RAD30::loxP-KanMX-PGAL1-loxP-3×FLAG-rad30(K17R, K546R, K615R)::NAT ade2-1 trp1-1 can1-100 leu2-3,112 his3-11,15 ura3-1 GAL psi+ RAD5* |
| LS983 | *MATα RAD30::loxP-KanMX-PGAL1-loxP-3×FLAG-rad30(K7R, K17R, K137R, K272R, K287R, K351R, K373R, K498R, K532R, K537R, K542R, K546R, K603R, K615R)::HPH ade2-1 trp1-1 can1-100 leu2-3,112 his3-11,15 ura3-1 GAL psi+ RAD5* |
| LS984 | *MATα RAD30::loxP-KanMX-PGAL1-loxP-3×FLAG-rad30(K279R, K287R, K399R, K436R, K491R)::HPH ade2-1 trp1-1 can1-100 leu2-3,112 his3-11,15 ura3-1 GAL psi+ RAD5* |
| LS992 | *MATα ade3::GAL:HO RAD30::loxP-KanMX-PGAL1-loxP-3×FLAG-rad30(K279R, K287R, K399R, K436R, K491R)::HPH ade2-1 trp1-1 can1-100 leu2-3,112 his3-11,15 ura3-1 GAL psi+ RAD5* |
| LS1003 | *MATa scc2-4 rad30::KAN ade2-1 trp1-1 can1-100 leu2-3 his3-11,15 ura3-1 GAL psi+ RAD5*  |
| LS1004 | *MATa scc1-73 rad30::KAN ade2-1 trp1-1 can1-100 leu2-3 his3-11,15 ura3-1 GAL psi+ RAD5*  |
| LS1006 | *MATa smc1-259 rad30::KAN ade2-1 trp1-1 can1-100 leu2-3 his3-11,15 ura3-1 GAL psi+ RAD5*  |
| LS1009 | *MATa rad61::NAT eco1::HPH rad30::KAN ade2-1 trp1-1 can1-100 leu2-3,112 his3-11,15 GAL psi+ RAD5* |
| LS1013 | *MATα smc1-259 ade3::GALHO RAD30::NatMX-PADH-rad30(S14A)-13MYC::KAN leu2-3,112::PGAL-SMC1-MYC-LEU2 his3-11,15::HIS3-tetR-GFP ura3-1::tetOx112-URA3 ade2-1 trp1-1 can1-100 GAL psi+ RAD5* |
| LS1014 | *MATα smc1-259 ade3::GALHO RAD30::NatMX-PGPD-rad30(S14A)-13MYC::KAN leu2-3,112::PGAL-SMC1-MYC-LEU2 his3-11,15::HIS3-tetR-GFP ura3-1::tetOx112-URA3 ade2-1 trp1-1 can1-100 GAL psi+ RAD5* |
| LS1037 | *MATa RAD30::loxP-3xFLAG-rad30(K17R, K546R, K603R)::NAT, ade3::GALHO ade2-1 trp1-1 can1-100 leu2-3,112 his3-11,15 ura3-1 GAL psi+ RAD5* |
| LS1038 | *MATα RAD30::loxP-3xFLAG-rad30(K17R, K546R, K615R)::NAT ade2-1 trp1-1 can1-100 leu2-3,112 his3-11,15 ura3-1 GAL psi+ RAD5* |
| LS1039 | *MATα RAD30::loxP-3xFLAG-rad30(K7R, K17R, K137R, K272R, K287R, K351R, K373R, K498R, K532R, K537R, K542R, K546R, K603R, K615R)::HPH ade2-1 trp1-1 can1-100 leu2-3,112 his3-11,15 ura3-1 GAL psi+ RAD5* |
| LS1040 | MAT*α* *RAD30::loxP-3xFLAG-rad30(K279R, K287R, K399R, K436R, K491R)::HPH ade2-1 trp1-1 can1-100 leu2-3,112 his3-11,15 ura3-1 GAL psi+ RAD5* |
| LS1101 | *MATa smc1-259 rad30::KAN ade3::GALHO leu2-3,112::PGAL-SMC1-MYC-LEU2 his3-11,15::HIS3-tetR-GFP ura3-1::tetOx112-URA3 ade2-1 trp1-1 can1-100 GAL psi+ RAD5*  |
| LS1150 | *MATa smc1-259 ade3::GALHO RAD30::NatMX-PADH-RAD30-13MYC::KAN leu2-3,112::PGAL-SMC1-MYC-LEU2 his3-11,15::HIS3-tetR-GFP ura3-1::tetOx112-URA3 ade2-1 trp1-1 can1-100 GAL psi+ RAD5*  |
| LS1151 | *MATα RAD30::loxP-3xFLAG-RAD30 ade2-1 trp1-1 can1-100 leu2-3,112 his3-11,15 ura3-1 GAL psi+ RAD5* |
| LS1153 | *MATa* *rad61::NAT ade2-1 trp1-1 can1-100 leu2-3,112 his3-11,15 ura3-1 GAL psi+ RAD5* |
| LS1155 | *MATa rad61::NAT RAD30::loxP-3xFLAG-RAD30 ade2-1 trp1-1 can1-100 leu2-3,112 his3-11,15 ura3-1 GAL psi+ RAD5* |
| LS1160 | *MATa rad61::NAT eco1::HPH RAD30::loxP-3xFLAG-RAD30 ade2-1 trp1-1 can1-100 leu2-3,112 his3-11,15 ura3-1 GAL psi+ RAD5* |
| LS1169 | *MATa rad30(T612A)-13MYC::KAN ade2-1 trp1-1 can1-100 leu2-3,112 his3-11,15 ura3-1 GAL psi+ RAD5* |
| LS1179 | *MATa rad30::KAN rad61::NAT ade2-1 trp1-1 can1-100 leu2-3,112 his3-11,15 ura3-1 GAL psi+ RAD5* |
| LS1181 | *MATα rad61::NAT RAD30::loxP-KanMX-PGAL1-loxP-3×FLAG-RAD30 ade2-1 trp1-1 can1-100 leu2-3,112 his3-11,15 ura3-1 GAL psi+ RAD5* |
| LS1183 | *MATα rad61::NAT RAD30::loxP-KanMX-PGAL1-loxP-3×FLAG-RAD30* ade3::GALHO *ade2-1 trp1-1 can1-100 leu2-3,112 his3-11,15 ura3-1 GAL psi+ RAD5* |
| LS1185 | *MATα eco1::HPH rad61::NAT RAD30::loxP-KanMX-PGAL1-loxP-3×FLAG-RAD30* *ade2-1 trp1-1 can1-100 leu2-3,112 his3-11,15 ura3-1 GAL psi+ RAD5* |
| LS1187 | *MATα eco1::HPH rad61::NAT RAD30::loxP-KanMX-PGAL1-loxP-3×FLAG-RAD30 ade3::GALHO ade2-1 trp1-1 can1-100 leu2-3,112 his3-11,15 ura3-1 GAL psi+ RAD5* |
| LS1198 | *MATa smc1-259 ade3::GALHO RAD30::NatMX-PADH-rad30(K279R, K287R, K399R, K436R, K491R)-13MYC::KAN leu2-3,112::PGAL-SMC1-MYC-LEU2 his3-11,15::HIS3-tetR-GFP ura3-1::tetOx112-URA3 ade2-1 trp1-1 can1-100 GAL psi+ RAD5*  |
| LS499 | *MATa/α smc1-259/smc1-259 ade3::GALHO/ade3::GALHO leu2-3,112::PGAL-SMC1-MYC-LEU2/leu2-3,112::PGAL-SMC1-MYC-LEU2 his3-11,15::HIS3-tetR-GFP/his3-11,15 ura3-1::tetOx112-URA3/ura3-1 ade2-1/ade2-1 trp1-1/trp1-1 can1-100/can1-100 GAL/GAL psi+ RAD5/RAD5* |
| LS500 | *MATa/α smc1-259/smc1-259 ade3::GALHO/ade3::GALHO his3-11,15::HIS3-tetR-GFP/his3-11,15 ura3-1::tetOx112-URA3/ura3-1 ade2-1/ade2-1 trp1-1/trp1-1 can1-100/can1-100 leu2-3,112/leu2-3,112 GAL/GAL psi+ RAD5/RAD5* |

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