Supplemental Materials

Genome-wide screen uncovers novel pathways for tRNA processing and nuclear-cytoplasmic dynamics

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Oligonucleotides
Probe 1 (JW0048, $tRNA^{Ile}_{UAU}$ 5' exon and intron; employed for Northern analyses):
5'- GGCACAGAAACTTCGGAAACCGAATGTTGCTATAAGCACGAAGCTCTAACC ACTGAGCTACACGAGC -3'

Probe KC031 ($tRNA^{Tyr}$ complementary to 5' and 3' exons and intron; employed for Northern analyses):
5'-CCCGATCTCAAGATTTCGTAGTGATAAATTACAGTCTTGCGCCTTAAACC-3'

Probe SRIM15 ($tRNA^{Tyr}$ mature sequence; employed for FISH):
5'- GCGAGTCGAACGCCCGATCTCAAGATTTACAGTCTTGCGCCTTAAACCAAC TTGGCTACC-3'

Probe SRIM04 ($tRNA^{Ile}_{UAU;}$ mature sequences employed for FISH):
5'GTGGGGATTGAACCCACGACGGTCGCGTTATAAGCACGAAGCTCTAACCACTGAGCT ACA-3'

Probe SRIM03 ($tRNA^{Ile}_{UAU;}$ intron-specific employed for FISH):
5'CGTTGCTTTTAAAGGCCTGTTTGAAAGGTCTTTGGCACAGAAACTTCGGAAACCGAAT GTTGCTAT-3'

Table S1. Mutations of unessential genes affecting tRNA biology in the MATa deletion collection				
Gene Name	Systemic Name	Phenotypes[1]	Northern data location (Figure #, gel#)	Confirmation
AMD1	YML035C	Type 1/2	S1-3, JW 196	MATa vs. MATα
AMD2	YDR242W	Type 1/2	S1-3, JW 198	MATa vs. MATα
APL5	YPL195W	Type 1/2	S1-2, JW 190	MATa vs. MATα
ARA1	YBR149W	Type 1/2	S1-3, JWI 196	MATa vs. MATα
ARL1	YBR164C	Type 1/2	S1-3, JW 196	MATa vs. MATα
ATG15	YCR068W	Type 1/2	S1-2, JW 194	MATa vs. MATα
BDF1	YLR399C	Type 1/2	S1-3, JW 198	MATa vs. MATα
BMH1	YER177W	Type 1/2	S1-3, JW 197	MATa vs. MATα
BRE1	YDL074C	Type 1/2	S1-3, JW 198	MATa vs. MATα
BRE2	YLR015W	Type 1/2	S1, AB 119	MATa vs. MATα
BUD26	YDR241W	Type 1/2	S1-2, JW 191	MATa vs. MATα
BUD31	YCR063W	Type 4/5/6	S1-3, JW 198	MATa vs. MATα
BUL2	YML111W	Type 1/2	S1-3, JW 198	MATa vs. MATα
CKA2	YOR061W	Type 1/2	S1-1, AB 117	MATa vs. MATα
COA1	YIL157C	Type 1/2	S1-3, JW 195	MATa vs. MATα
COX5A	YNL052W	Type 1/2	S1-3, JW 195	MATa vs. MATα
CPT1	YNL130C	Type 1/2	S1-3, JW 195	MATa vs. MATα
CTP1	YBR291C	Type 1/2	S1-2, JW 193R	MATa vs. MATα
DUG2	YBR281C	Type 1/2	S1-2, JW 193R	MATa vs. MATα
DUS2	YNR015W	Type 1/2	S1-2, JW 194	MATa vs. MATα
DUS3	YLR401C	Type 9	2I; S1, AB 119	MATa vs. MATα
EAF7	YNL136W	Type 1/2	S1-3, JW 195	MATa vs. MATα
ECM33	YBR078W	Type 1/2	S1-3, JW 199	MATa vs. MATα
FMP21	YBR269C	Type 1/2	S1-2, JW 193R	MATa vs. MATα
FUN12	YAL035W	Type 1/2	S1, AB 119	MATa vs. MATα
GCN5	YGR252W	Type 1/2	2A; S1-3, JW 199	Complementation
GDS1	YOR355W	Type 1/2	S1-1, AB 117	MATa vs. MATα
GLN3	YER040W	Type 1/2 and an extra band below I	2B; S1-2, JW 190	Complementation
GLO3	YER122C	Type 1/2	S1-3, JW 199	MATa vs. MATα
GPB1	YOR371C	Type 1/2	S1-1, AB 117	MATa vs. MATα
HLR1	YDR528W	Type 1/2	S1-3, JW 197	MATa vs. MATα
HOS2	YGL194C	Type 1/2	S1-2, JW 192	MATa vs. MATα
HXT12	YIL170W	Type 1/2	S1-3, JW 195	MATa vs. MATα
ISC10	YER180C	Type 1/2	S1-3, JW 197	MATa vs. MATα

ISR1	YPR106W	Type 1/2	S1-2, JW 191	MATa vs. MATα
IST1	YIR005W	Type 1/2	S1-3, JW 195	MATa vs. MATα
LEM3	YNL323W	Type 1/2	S1-1, AB 116	MATa vs. MATα
LOS1	YKL205W	Type 4/5/6	NA	MATa vs. MATα
LSM1	YJL124C	Type 4/5/6	S1-2, JW 193L	MATa vs. MATα
MAL33	YBR297W	Type 1/2	S1-2, JW 193R	MATa vs. MATα
MET10	YFR030W	Type 1/2	S1-3, JW 196	MATa vs. MATα
MET17	YLR303W	Type 1/2	S1-2, JW 192	MATa vs. MATα
MNN2	YBR015C	Type 1/2	S1-3, JW 195	MATa vs. MATα
MRPL35	YDR322W	Type 1/2	S1-2, JW 192	MATa vs. MATα
NCS2	YNL119W	Type 1/2	S1-3, JW 195	MATa vs. MATα
NGG1	YDR176W	Type 1/2	S1-2, JW 192	MATa vs. MATα
NPP1	YCR026C	Type 1/2	S1-2, JW 194	MATa vs. MATα
NUP133	YKR082W	Type 4/5/6	S1-2, JW 192	MATa vs. MATα
NUP170	YBL079W	Type 4/5/6	S1-2, JW 191	MATa vs. MATα
NUP2	YLR335W	Type 1/2	S1-2, JW 191	MATa vs. MATα
OCA1	YNL099C	Type 1/2	S1-3, JW 195	MATa vs. MATα
OCA2	YNL056W	Type 1/2	S1-3, JW 195	MATa vs. MATα
OCA4	YCR095C	Type 1/2	S1-3, JW 196	MATa vs. MATα
OPT3	YGL114W	Type 1/2	S1-3, JW 197	MATa vs. MATα
PCA1	YBR295W	Type 1/2	S1-2, JW 193R	MATa vs. MATα
PEX32	YBR168W	Type 1/2	S1-3, JW 196	MATa vs. MATα
PPM1	YDR435C	Type 1/2	S1-2, JW 190	MATa vs. MATα
PSP1	YDR505C	Type 1/2	S1-3, JW 197	MATa vs. MATα
RBK1	YCR036W	Type 1/2	S1-2, JW 194	MATa vs. MATα
REX1	YGR276C	Type 2*	2C; S1-3, JW 198	MATa vs. MATα
RNP1	YLL046C	Type 1/2	S1, AB 119	MATa vs. MATα
RPB4	YJL140W	Type 4/5/6	S1-3, JW 199	Complementation
RPL34B	YIL052C	Type 4/5/6	S1-2, JW 192	MATa vs. MATα
RPL40A	YIL148W	Type 1/2	S1-3, JW 195	MATa vs. MATα
RPS21B	YJL136C	Type 1/2	S1-3, JW 196	MATa vs. MATα
RPS6A	YPL090C	Type 1/2	S1-2, JW 191	MATa vs. MATα
RPS8A	YBL072C	Type 4/5/6	S1-2, JW 191	MATa vs. MATα
RRT12	YCR045C	Type 1/2	S1-2, JW 194	MATa vs. MATα
SAM37	YMR060C	Type 4/5/6	S1-2, JW 193L	Complementation
SAP155	YFR040W	Type 1/2	S1-2, JW 192	MATa vs. MATα
SAP190	YKR028W	Type 1/2	S1-3, JW 196	MATa vs. MATα
SET3	YKR029C	Type 1/2	S1-3, JW 196	MATa vs. MATα
SHG1	YBR258C	Type 1/2	S1-2, JW 190	MATa vs. MATα
SPT8	YLR055C	Type 1/2	S1, AB 119	MATa vs. MATα
SSA2	YLL024C	Type 1/2	S1, AB 119	MATa vs. MATα

SWI4	YER111C	Type 1/2	S1-3, JW 197	MATa vs. MATα
TOM70	YNL121C	Type 4/5/6	2G,H; S1-3, JW 195	Complementation
TRK1	YJL129C	Type 1/2	S1-2, JW 190; S1-3, JW 196	MATa vs. MATα
TYR1	YBR166C	Type 1/2	S1-3, JW 196	MATa vs. MATα
UBX3	YDL091C	Type 1/2	S1-3, JW 197	MATa vs. MATα
UME6	YDR207C	Type 1/2	S1-2, JW 192	MATa vs. MATα
URA7	YBL039C	Type 1/2	S1-2, JW 191	MATa vs. MATα
VBA1	YMR088C	Type 1/2	S1-2, JW 193L	MATa vs. MATα
VPS55	YJR044C	Type 1/2	S1-3, JW 197	MATa vs. MATα
XRN1	YGL173C	Type 7	Wu & Hopper, 2014	Complementation
YAF9	YNL107W	Type 1/2	S1-3, JW 195	MATa vs. MATα
YAP1	YML007W	Type 1/2	S1-1, AB 116	MATa vs. MATα
	YCR025C	Type 1/2	S1-2, JW 194	MATa vs. MATα
	YCR050C	Type 1/2	S1-2, JW 194	MATa vs. MATα
	YCR061W	Type 1/2	S1-2, JW 194	MATa vs. MATα
	YCR087C-A	Type 1/2	S1-2, JW 194	MATa vs. MATα
	YCR087W	Type 1/2	S1-2, JW 194	MATa vs. MATα
	YDR417C	Type 4/5/6	S1-3, JW 199	MATa vs. MATα
	YDR444W	Type 1/2	S1-3, JW 198	MATa vs. MATα
	YER152C	Type 1/2	S1-3, JW 197	MATa vs. MATα
	YER181C	Type 1/2	S1-3, JW 197	MATa vs. MATα
	YIR043C	Type 1/2	S1-3, JW 196	MATa vs. MATα
	YLR012C	Type 1/2	S1, AB 119	MATa vs. MATα
	YLR111W	Type 1/2	S1, AB 119	MATa vs. MATα
	YML002W	Type 1/2	S1-1, AB 116	MATa vs. MATα
	YML083C	Type 1/2	S1, AB 119	MATa vs. MATα
	YMR254C	Type 1/2	S1-1, AB 117	MATa vs. MATα
	YNR014W	Type 1/2	S1-1, AB 116	MATa vs. MATα
	YOR072W	Type 1/2	S1-1, AB 117	MATa vs. MATα
	YOR186W	Type 1/2	S1-2, JW 190	MATa vs. MATα

[1.] See Fig. 1 for an explanation of the various types of mutants; NA, not applicable as *los1Δ* is a control for most gels.

Table S2. ts Mutations from Boone collection affecting tRNA biology				
Gene/allele	Systemic name	Phenotypes[1]	Northern data location (Figure #, gel#)	Confirmation
abf1-102	YKL112W	Type 1/2	S2, AB 74	Boone vs. Hieter
abf1-103	YKL112W	Type 1/2	S2-1, AB 83	Boone vs. Hieter
act1-101	YFL039C	Type 4/5/6	2F; S2, AB 73; S2-1, AB 92	Complementation
arp4-G161D	YJL081C	Type 1/2	S2-1, AB 118	Boone vs. Hieter
bos1-1	YLR078C	Type 4/5/6	S2, AB 73	Boone vs. Hieter
brl1-2221	YHR036W	Type 4/5/6	S2-1, AB 118	Boone vs. Hieter; Multiple alleles
brl1-3231	YHR036W	Type 4/5/6	S2-1, AB 118	Boone vs. Hieter; Multiple alleles
brl1-C371R	YHR036W	Type 4/5/6	S2-1, AB 118	Boone vs. Hieter; Multiple alleles
brl1-C371S	YHR036W	Type 4/5/6	S2-1, AB 118	Boone vs. Hieter; Multiple alleles
cca1-1	YER168C	Type 3	2D; S3	Boone vs. Hieter
cdc28-4	YBR160W	Type 1/2	S2-1, AB 92	Complementation
cdc34-1	YDR054C	Type 4/5/6	S2, AB 72	Boone vs. Hieter
cdc60-ts	YPL160W	Type 4/5/6	S2, AB 81	Boone vs. Hieter
cks1-38	YBR135W	Type 1/2	S2-1, AB 83	Repetition
crm1-1	YGR218W	Type 4/5/6	S2-1, AB 83	Boone vs. Hieter
dbf4-ts	YDR052C	Type 4/5/6	S2, AB 73	Boone vs. Hieter
dcp2-7Δ	YNL118C	Type 4/5/6	S2, AB 80; S2-1, AB 118; S2-1, AB 97	Complementation
dna2-2	YHR164C	Type 1/2	S2, AB 74; S2-1, AB 97	Complementation
hrp1-4	YOL123W	Type 1/2	S2, AB 81; S2-1, AB 118; S2-1, AB 92	Complementation
hyp2-1	YEL034W	Type 4/5/6	S2, AB 80	Boone vs. Hieter; Multiple alleles
hyp2-ts	YEL034W	Type 4/5/6	S2, AB 80	Boone vs. Hieter; Multiple alleles
lcb2-19	YDR062W	Type 4/5/6	S2, AB 79	Boone vs. Hieter
ils1-1	YBL076C	Type 4/5/6	S2-1, KC	Repetition
mex67-ts5	YPL169C	Type 4/5/6	2E; S2, AB 81	Boone vs. Hieter; Complementation
myo2-14	YOR326W	Type 4/5/6	S2, AB 73; S2-1, AB 92	Complementation

ndc1-4	YML031W	Type 4/5/6	S2, AB 73; S2-1, AB 92	Complementation
nog2-1	YNR053C	Type 4/5/6	S2-1, AB 83; S2-1, AB 97	Complementation
nop4-3	YPL043W	Type 4/5/6	S2, AB 80	Boone vs. Hieter
nup159-1	YIL115C	Type 4/5/6	S2, AB 79; S2-1, AB92	Complementation
nup192-15	YJL039C	Type 4/5/6	S2, AB 74	Boone vs. Hieter
pfy1-13	YOR122C	Type 4/5/6	S2, AB 73	Boone vs. Hieter; Multiple alleles
pfy1-4	YOR122C	Type 4/5/6	S2, AB 73	Boone vs. Hieter; Multiple alleles
prp43-ts2	YGL120C	Type 1/2	S2, AB 79	Boone vs. Hieter
prt1-1	YOR361C	Type 4/5/6	S2, AB72	Boone vs. Hieter
rap1-1	YNL216W	Type 4/5/6	S2, AB 79	Boone vs. Hieter
rap1-2	YNL216W	Type 4/5/6	S2, AB 79	Boone vs. Hieter
rmp1-ts	YLR145W	Type 4/5/6	S2, AB 81	Boone vs. Hieter
rna1-1	YMR235C	Type 4/5/6	S2, AB 73	Boone vs. Hieter
rpc34-1	YNR003C	Type 1/2	S2-1, AB 118; S2-1, AB 97	Complementation
rpg1-1	YBR079C	Type 4/5/6	S2-1, AB 120	Boone vs. Hieter
rpn1-821	YHR027C	Type 4/5/6	S2, AB 73	Repitition
rpo31-698	YOR116C	Type 1/2	S2, AB 81; S2-1, AB 92	Complementation
rsp5-1	YER125W	Type 4/5/6	S2, AB 73	Boone vs. Hieter
sec13-1	YLR208W	Type 4/5/6	S2, AB 72	Boone vs. Hieter
sec18-1	YBR080C	Type 4/5/6	S2, AB 72	Boone vs. Hieter
sec20-1	YDR498C	Type 4/5/6	S2, AB 72	Boone vs. Hieter
sec22-1	YLR268W	Type 4/5/6	S2, AB 74	Complementation
sec5-24	YDR166C	Type 4/5/6	S2-1, AB 92	Complementation
sen2-1	YLR105C	Type 4/5/6	S2, AB 80	Boone vs. Hieter
snu114-40	YKL173W	Type 1/2	S2, AB 80	Boone vs. Hieter; Multiple alleles
snu114-60	YKL173W	Type 1/2	S2, AB 80	Boone vs. Hieter; Multiple alleles
srm1-ts	YGL097W	Type 4/5/6	S2, AB 81	Boone vs. Hieter
sth1-2	YIL126W	Type 1/2	S2, AB 74	Complementation
sup35-td	YDR172W	Type 4/5/6	S2, AB 72; S2-1, AB 92	Complementation
sup45-ts	YBR143C	Type 4/5/6	S2-1, AB 120	Boone vs. Hieter
ura6-4	YKL024C	Type 1/2	S2-1, AB 118	Boone vs. Hieter; Multiple alleles
ura6-5	YKL024C	Type 1/2	data not shown	Boone vs. Hieter; Multiple alleles

ura6-6	YKL024C	Type 1/2	data not shown	Boone vs. Hieter; Multiple alleles
yef3-F650S	YLR249W	Type 4/5/6	S2, AB 79; S2-1, AB 118; S2-1, AB 92	Complementation
yrb1-51	YDR002W	Type 4/5/6	S2, AB 79	Boone vs. Hieter

[1.] See Fig. 1 for an explanation of the various types of mutants

Table S3. ts Mutations from Hieter collection affecting tRNA biology				
Gene	Systemic name	Phenotypes[1]	Northern data location (Figure #, gel#)	Confirmation
ALG14	YBR070C	Type 1/2	S3	Complementation
CCA1	YER168C	Type 3	2D; S3	Complementation
CSE1	YGL238W	Type 1/2	S3	Complementation
ERG27	YLR100W	Type 4/5/6	S3	Complementation
FRS2	YFL022C	Type 4/5/6	S3	Complementation
GLN4	YOR168W	Type 4/5/6	S3	Complementation
GPN2	YOR262W	Type 1/2	S3	Complementation
GUK1	YDR454C	Type 1/2	S3	Complementation
MTR2	YKL186C	Type 4/5/6	S3	Complementation
NUP57	YGR119C	Type 4/5/6	S3	Complementation
POP3	YNL282W	Type 1/2	S3	Repetition
POP7	YBR167C	Type 1/2	S3	Repetition
PRP46	YPL151C	Type 1/2	S3	Complementation
RPC11	YDR045C	Type 1/2	S3	Complementation
RPC25	YKL144C	Type 1/2	S3	Complementation
RRN5	YLR141W	Type 1/2	S3	Complementation
RSC6	YCR052W	Type 1/2	S3	Complementation
SNP1	YIL061C	Type 1/2	S3	Complementation
TFC8	YPL007C	Type 1/2	S3	Complementation
THS1	YIL078W	Type 4/5/6	S3	Complementation

1. See Fig. 1 for an explanation of the various types of mutants

Supplementary figures

Fig. S1. Verification of the mutants from *MATa* deletion collection by Northern analysis utilizing probe 1. The *MATa* candidates (a) were compared with the strains containing a deletion of the same gene in the independently constituted *MATα* deletion collection (α). The verified mutants are highlighted in red. Different exposure times of each gel are shown. In S1, the top band represents the primary tRNA transcript, second band the end-matured intron-containing tRNA and the third band the mature tRNA. In S1-1, S1-2 and S1-3, the top band represents the primary tRNA transcript, and the bottom the end-matured intron-containing tRNA.

Fig. S2. Verification of the mutants from C. Boone ts collection by Northern analysis utilizing probe 1. RNAs were isolated from candidate mutants shifted to at 37^{o}C for 2 hr. The C. Boone ts candidates (B.) were compared with the strains containing the same allele in the P. Hieter ts collection (H.). The remaining mutants which do not have either the same allele in different genetic backgrounds or multiple alleles were assessed by complementation assays utilizing the vectors from the yeast genomic tiling collection (T) or the MoBY-ORF collection (M) and empty vector (EV). The verified mutants are highlighted in red. The top band represents the primary tRNA transcript and the bottom the end-matured intron-containing tRNA. Different exposure times of each gel are shown.

Fig. S3 Mutants from P. Heiter ts collection. A. Repeated Northern analyses of RNAs isolated from candidate mutants incubated for 2 hr at 37^{o}C utilizing probe 1. B. Example Northern analyses of complementation confirmation. EV, cells contain vector only; M, cells contain a plasmid from the MoBY-ORF collection that encodes the wt version of the relevant gene. P, primary tRNA transcript; I, end-matured intron-containing tRNA; M, mature tRNA^{Ile}. Equal loading for each lane was assessed by EtBr staining of 5S rRNA. The verified mutants are highlighted in red. The red asterisks highlight aberrant species.

Fig. S4. The growth defect of *crm1-1* is suppressed when Crm1 is exogenously expressed from a multi-copy plasmid. Serial dilutions of *crm1-1* containing empty vector and *crm1-1* containing plasmid encoded Crm1 grown on selective media at 23°C and 37°C for 2 days.

Fig. S5. $tRNA^{Ile}_{UAU}$ accumulate at the nuclear periphery in *crm1-1* cells. A. FISH analyses employing probe SRIM04 ($tRNA^{Ile}_{UAU;}$ mature sequences). *rna1-1* and *crm1-1* cells were cultured at 23°C, shifted to 37°C, and harvested at 0 and 4 hr after the temperature shift. Nuclei were visualized by DAPI staining of DNA highlighted in blue in the overlay panels. Arrowheads highlight example cells with tRNA signal at the nuclear periphery. B. The same cells as for A. were employed and FISH analyses were conducted employing $tRNA^{Ile}_{UAU}$ intron-specific probe SRIM03.

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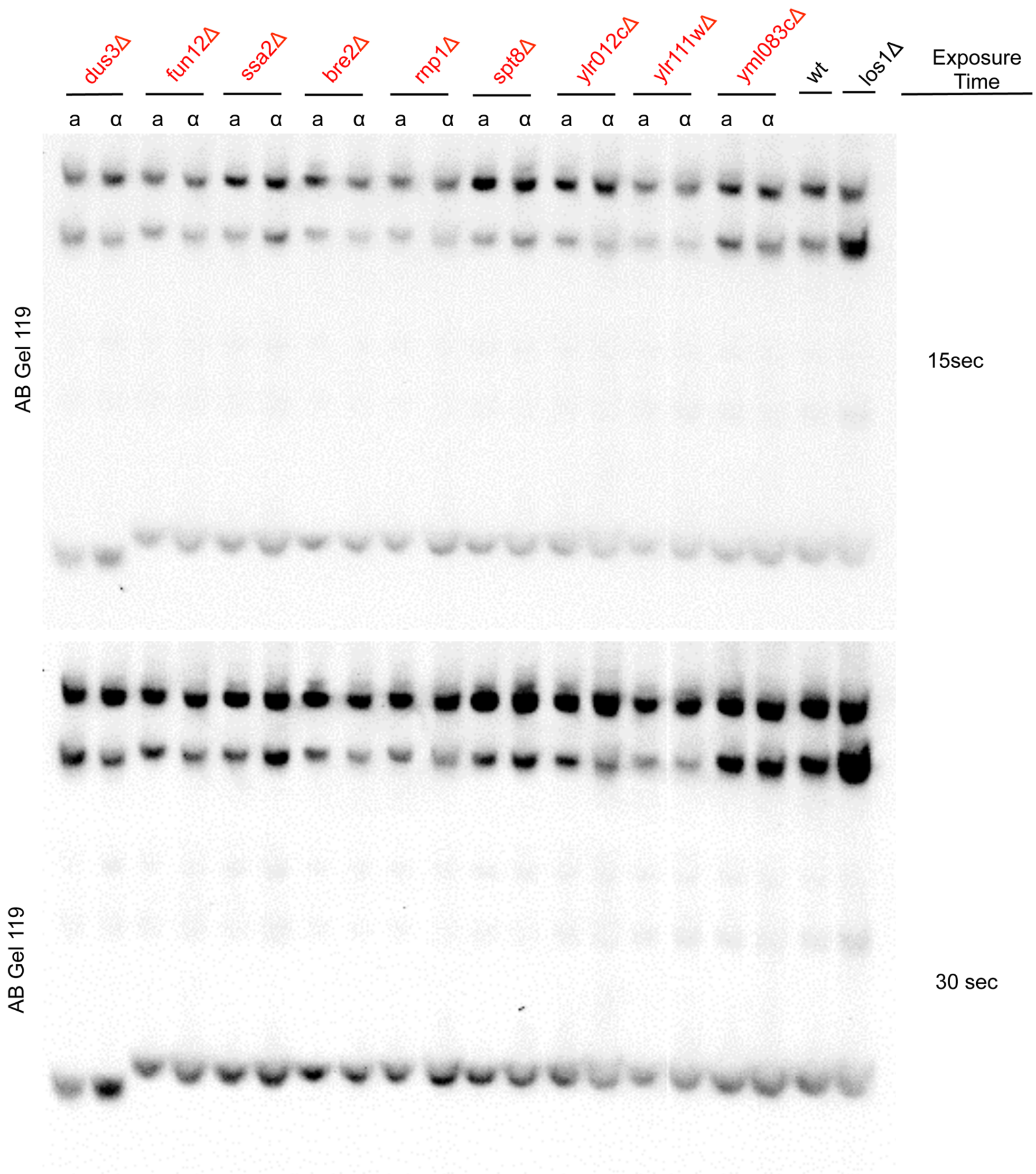

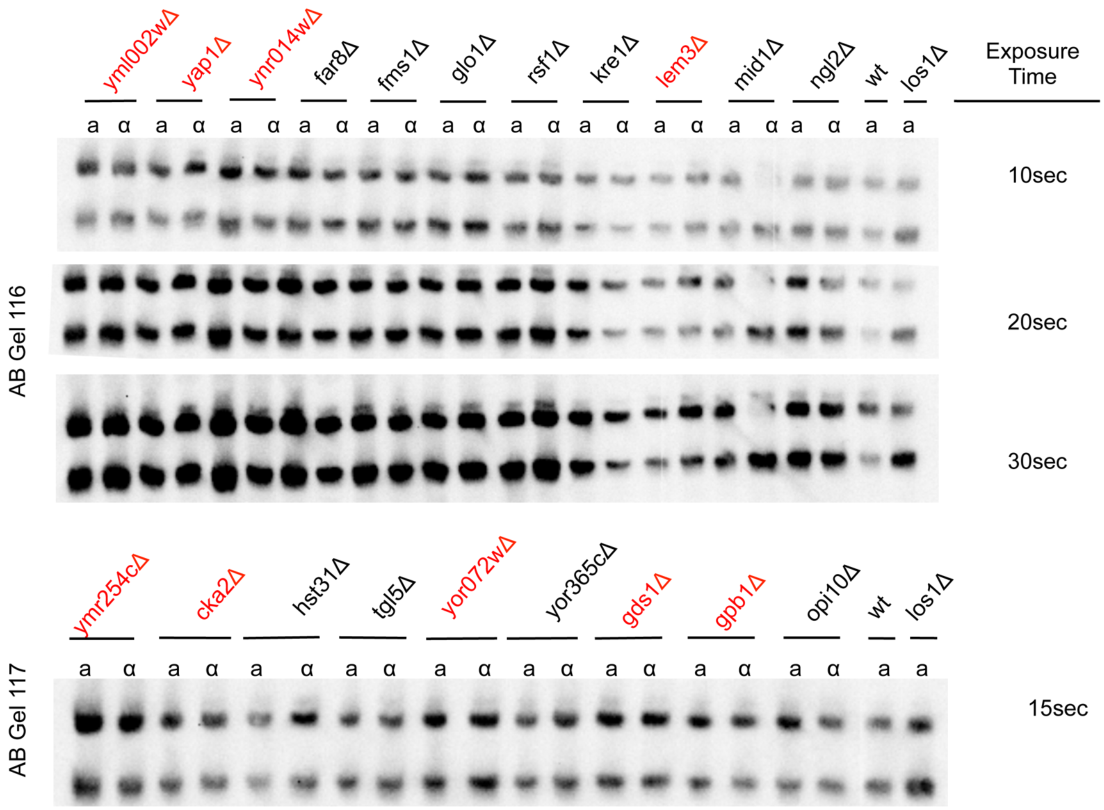
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wt
los1Δ
Exposure Time
10sec
20sec
30sec
AB Gel 116
ymr254cΔ
cka2Δ
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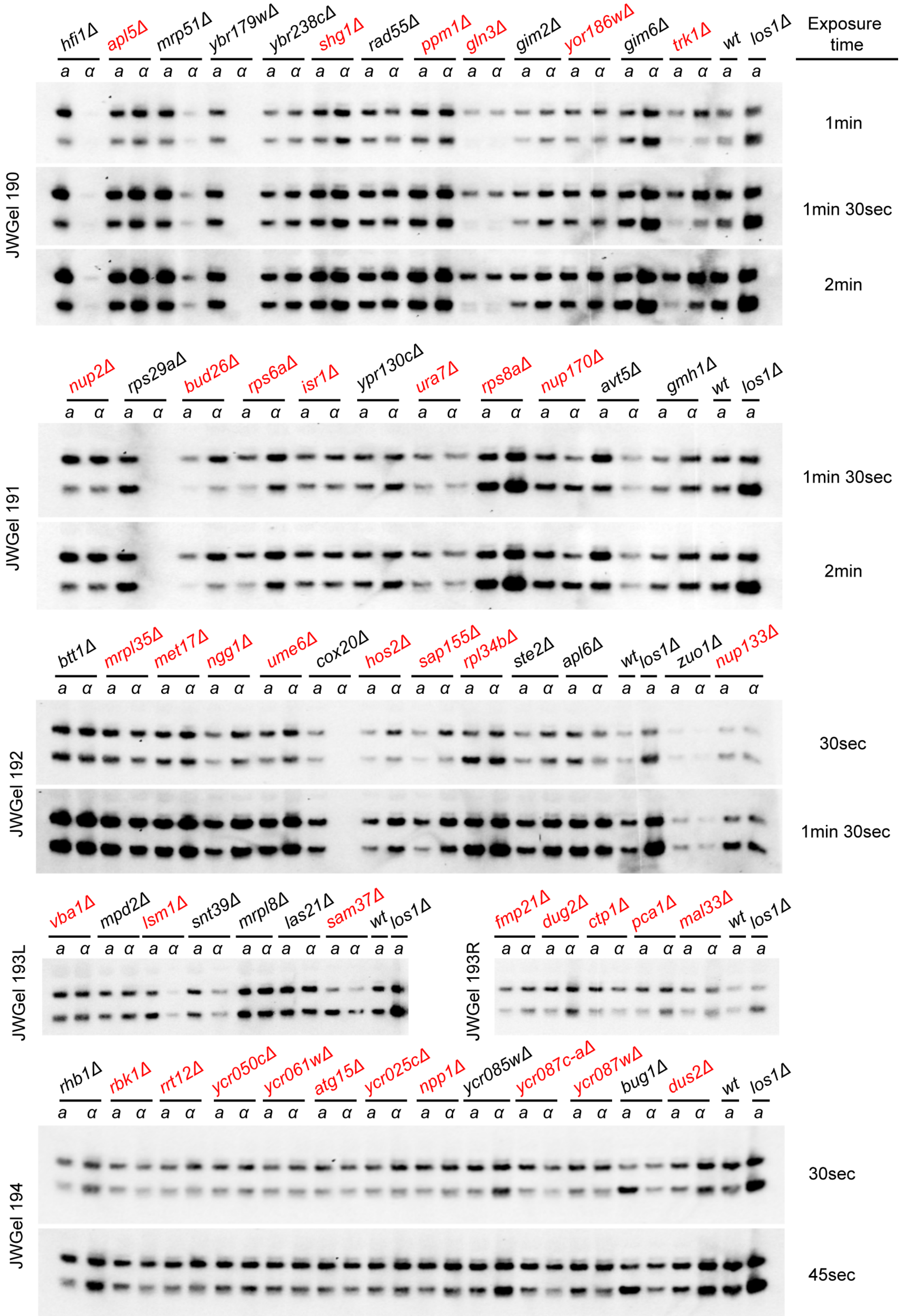
AB Gel 117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Exposure time
JWGel 190
1min
1min 30sec
2min
nup2Δ rps29aΔ bud26Δ rps6aΔ isr1Δ ypr130cΔ ura7Δ rps8aΔ nup170Δ avt5Δ gmh1Δ wt los1Δ
JWGel 191
1min 30sec
2min
btt1Δ mrpl35Δ met17Δ ngg1Δ ume6Δ cox20Δ hos2Δ sap155Δ rpl34bΔ ste2Δ apl6Δ wt los1Δ zuo1Δ nup133Δ
JWGel 192
30sec
1min 30sec
vba1Δ mpd2Δ lsm1Δ snt39Δ mrpl8Δ las21Δ sam37Δ wt los1Δ
JWGel 193L
fmp21Δ dug2Δ ctp1Δ pca1Δ mal33Δ wt los1Δ
JWGel 193R
rhb1Δ rbk1Δ rrt12Δ ycr050cΔ ycr061wΔ atg15Δ ycr025cΔ npp1Δ ycr085wΔ ycr087c-aΔ ycr087wΔ bug1Δ dus2Δ wt los1Δ
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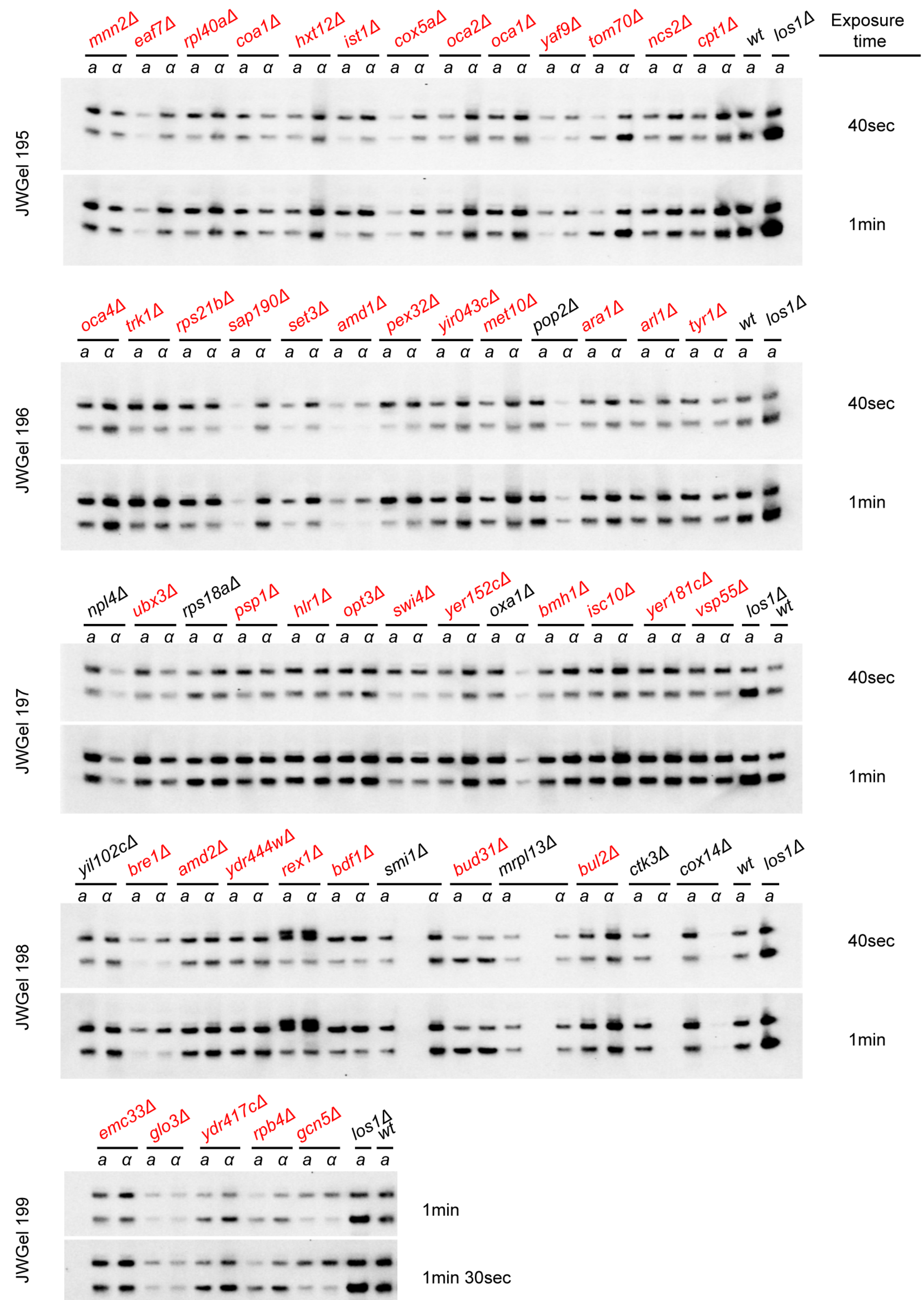
45sec



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Exposure time
JWGel 195
40sec
1min
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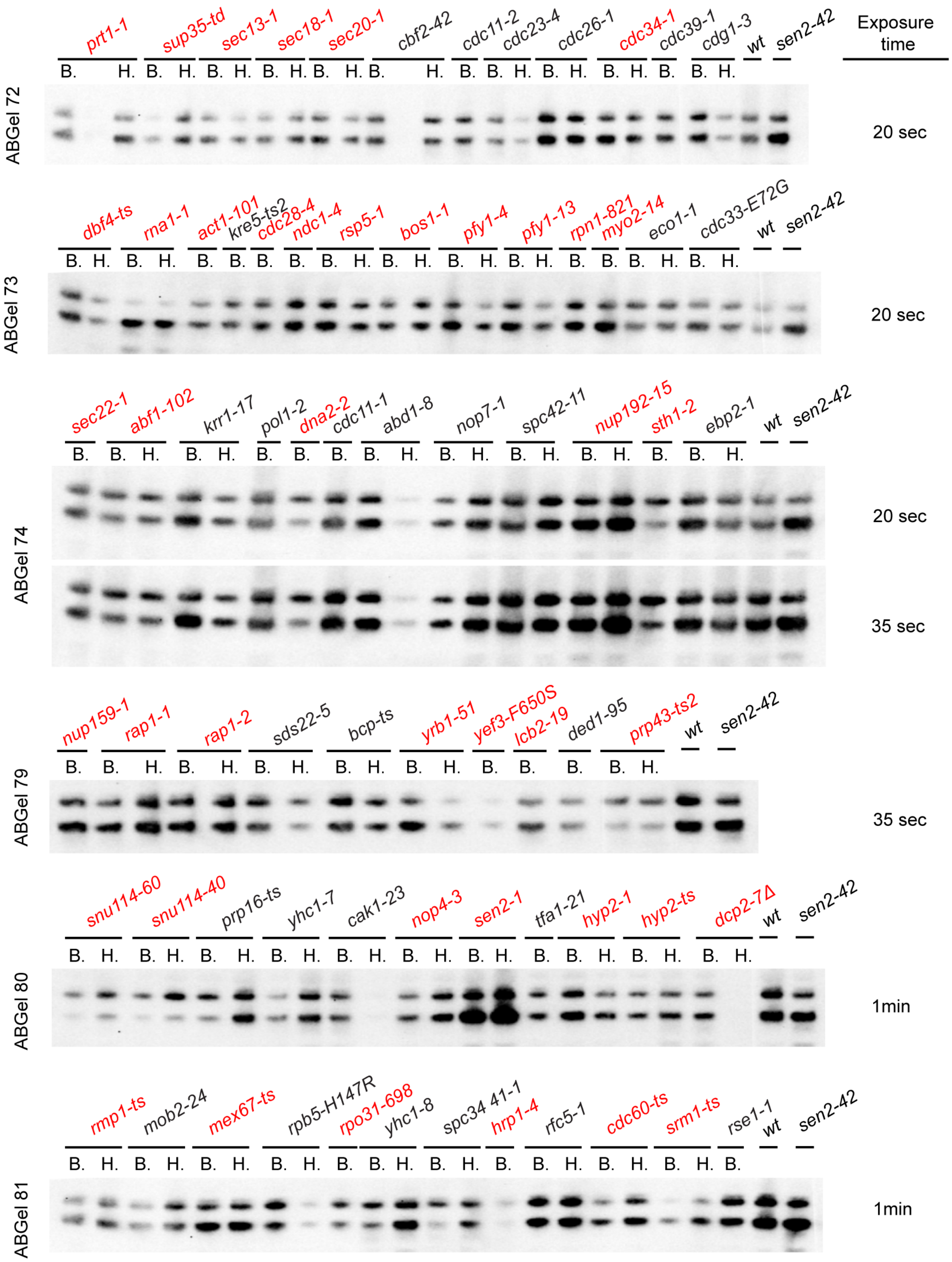
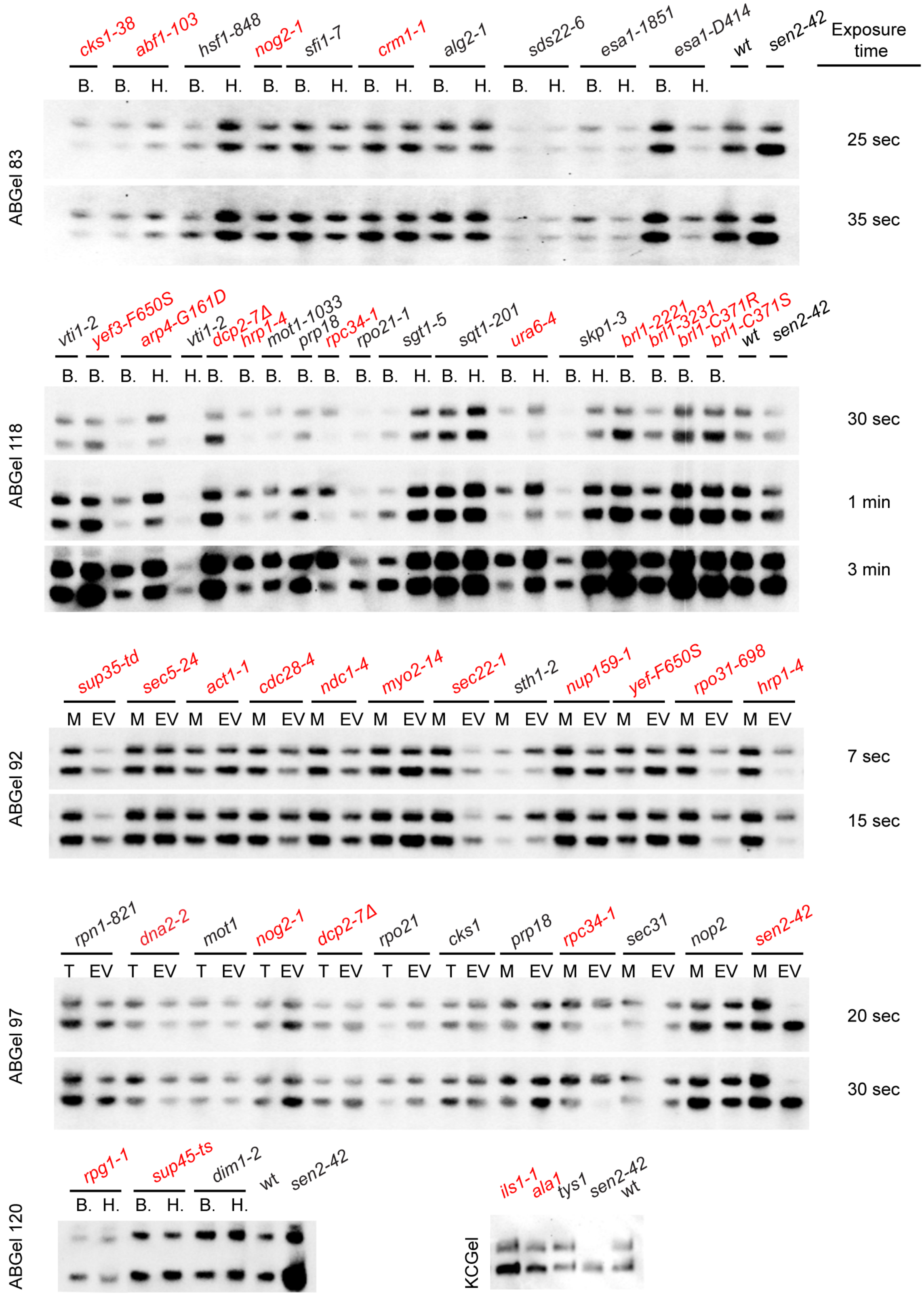
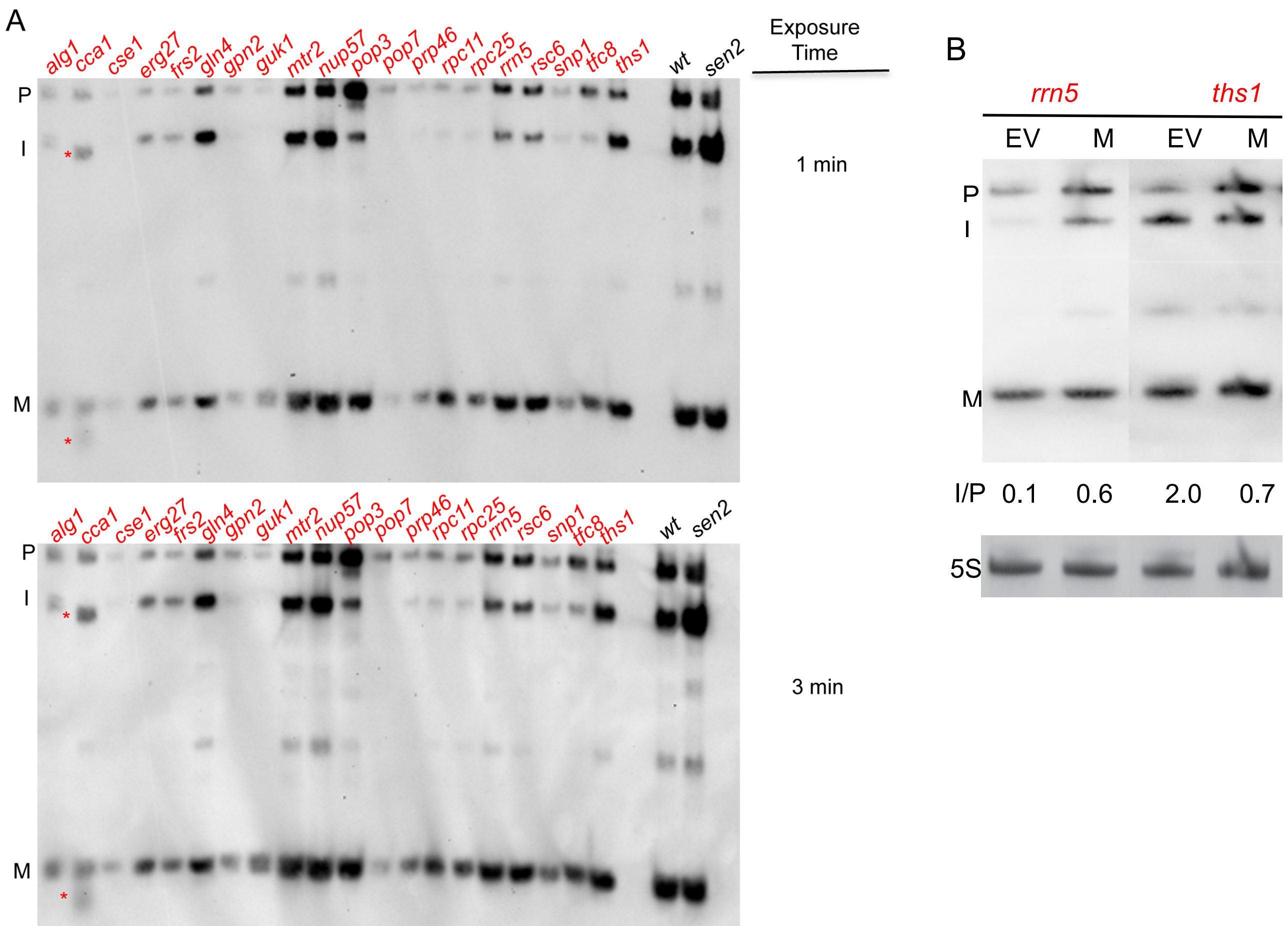
JWGel 196
40sec
1min
npl4Δ ubx3Δ rps18aΔ psp1Δ hlr1Δ opt3Δ swi4Δ yer152cΔ oxa1Δ bmh1Δ isc10Δ yer181cΔ vsp55Δ los1Δ wt
JWGel 197
40sec
1min
yil102cΔ bre1Δ amd2Δ ydr444wΔ rex1Δ bdf1Δ smi1Δ bud31Δ mrpl13Δ bul2Δ ctk3Δ cox14Δ wt los1Δ
JWGel 198
40sec
1min
emc33Δ glo3Δ ydr417cΔ rpb4Δ gcn5Δ los1Δ wt
JWGel 199
1min
1min 30sec

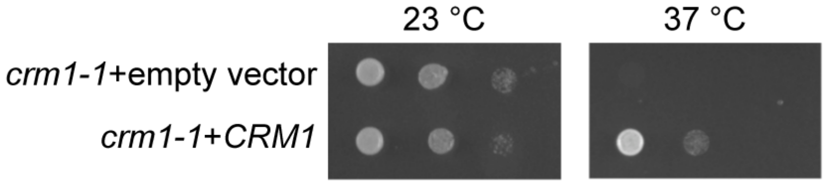
Wu *et al.*, Fig. S2

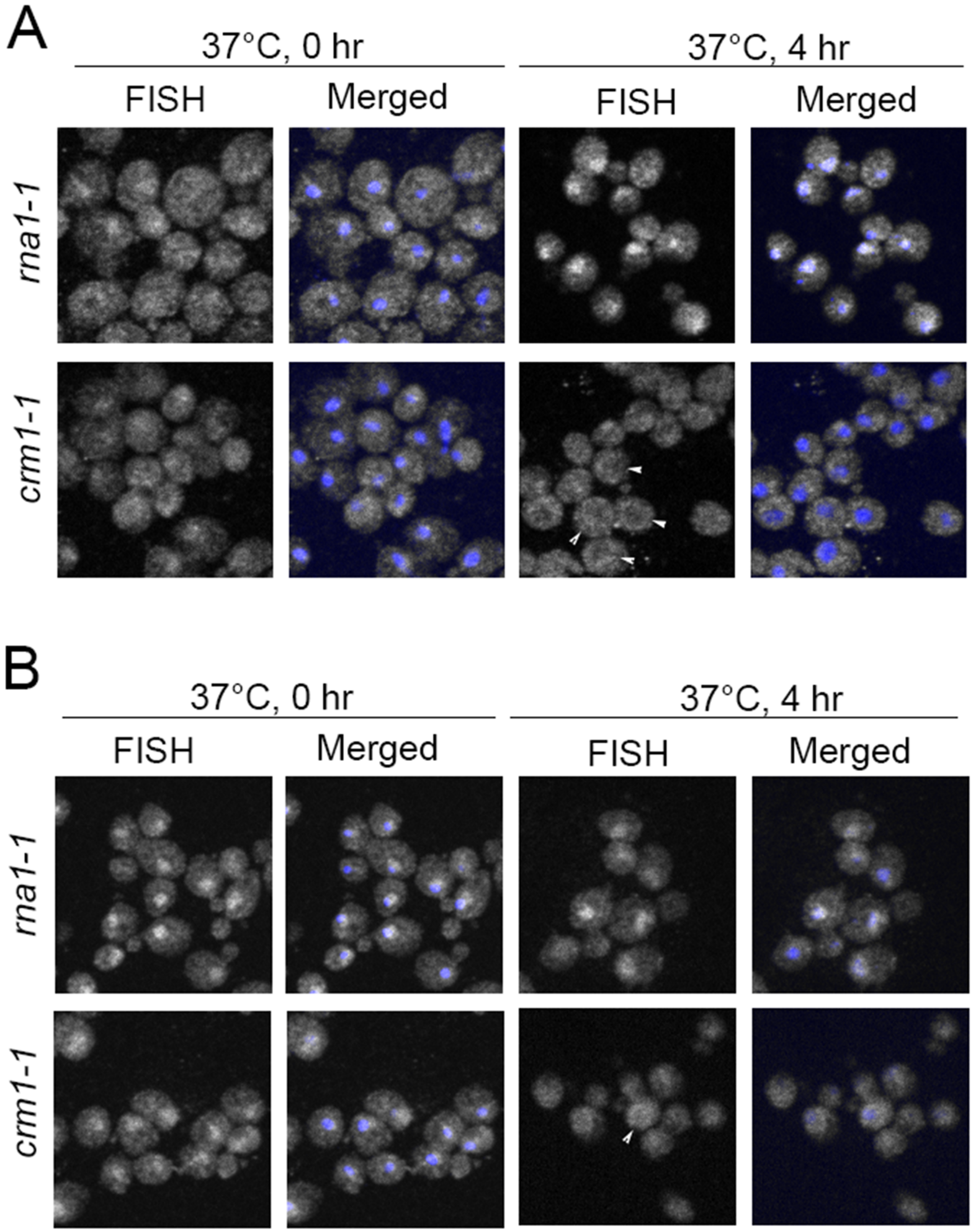


Wu *et al.*, Fig. S2-1




A
alg1 cca1 cse1 erg27 frs2 gln4 gpn2 guk1 mtr2 nup57 pop3 pop7 prp46 rpc11 rpc25 rrn5 rsc6 snp1 tfc8 ths1 wt sen2
Exposure Time
P
I
M
1 min
3 min
B
rrn5
ths1
EV
M
EV
M
P
I
M
I/P 0.1 0.6 2.0 0.7
5S


23 °C
37 °C
crm1-1+empty vector
crm1-1+*CRM1*


A
37°C, 0 hr
37°C, 4 hr
FISH
Merged
FISH
Merged
rna1-1
crm1-1
B
37°C, 0 hr
37°C, 4 hr
FISH
Merged
FISH
Merged
rna1-1
crm1-1