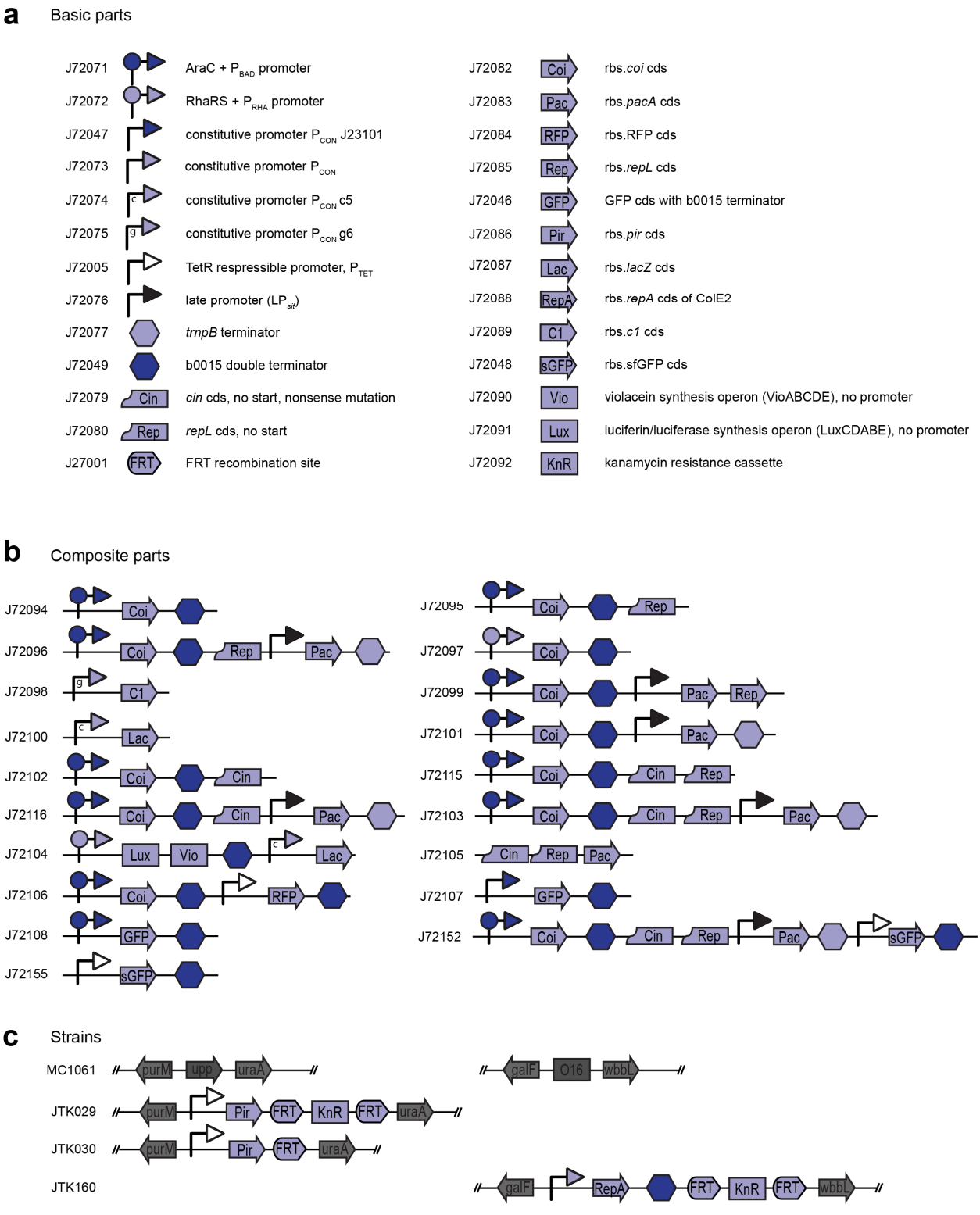

Figure S1 - Illustration of parts and strains used in the study

Sequences for the basic parts, composite parts, vectors, and strains are listed in tables S1-S4, and sequences are available in the Registry of Standard Biological Parts (http://partsregistry.org).

Table S1 – Basic Parts used in the study

Registry #	Description	Description/Source
bba_J72071	*araC*-P_{BAD}	Arabinose responsive regulator and corresponding promoter from *E. Coli* (*30*)
bba_J72072	*rhaRS*-P_{RHA}	Rhamnose responsive regulators and corresponding promoter from *E. Coli* (*31*)
bba_J72047	P_{CON} J23101	BglBrick standard version of Bba_J23101, synthetic constitutive promoter (see http://partsregistry.org/wiki/index.php?title=Part:BBa_J23101)
bba_J72073	P_{CON}	Synthetic constitutive promoter
bba_J72074	P_{CON}-c5	Synthetic constitutive promoter
bba_J72075	P_{CON}-g6	Synthetic constitutive promoter
bba_J72005	P_{TET}	BglBrick standard version of BBa_R0040,TetR repressible promoter (see http://partsregistry.org/Part:BBa_R0040)
bba_J72076	LP_{sit}	Late promoter, Bacteriophage P1 (6)
bba_J72077	*trnpB* terminator	Terminator from *E. coli* DH1
bba_J72049	double terminator	Tandem terminators; BglBrick standard version of Bba_B0015 (see http://partsregistry.org/Part:BBa_B0015)
bba_J72079	*cin*, no start, frameshift	Derived from Bacteriophage P1 (6)
bba_J72080	*repL*, no start	Lytic replication origin, Bacteriophage P1 (6)
bba_J27001	FRT	FLP recombinase recognition site, *Saccharomyces cerevisiae* (*32*)
bba_J72082	rbs.*coi*	Repressor inactivator, Bacteriophage P1 (6)
bba_J72083	rbs.*pacA*	DNA packaging enzyme subunit and DNA packaging sites, Bacteriophage P1 (6)
bba_J72084	rbs.mRFP1	Monomeric red fluorescent protein derivative (*33*)
bba_J72085	rbs.*repL*	Initiates lytic replication, Bacteriophage P1 (6)
bba_J72046	rbs.GFP.double terminator	BglBrick standard version of (BBa_E0040 joined with BBa_B0015)
bba_J72086	rbs.*pir*	Factor required for replication of gamma origin of *E. coli* plasmid R6K (*34*)
bba_J72087	rbs.*lacZ*	Beta-galactosidase from *E. coli* MG1655
bba_J72088	rbsC.ColE2 *repA*	Replication initiator of *E. coli/Shigella* plasmid ColE2-P9 (*35*), used to support replication of vector J72111 (referred to as pBjk2741 in (*36*))
bba_J72089	rbs.*c1*	Master repressor, Bacteriophage P1 (6)
bba_J72090	*vioABCDE*	Synthetic (recoded) violacein synthesis operon from *Chromobacterium violaceum.* BglBrick standard version of BBa_K274002 (see http://partsregistry.org/Part:BBa_K274002)
bba_J72091	*luxCDABE*	Luciferase and substrate synthesis operon from *Photorhabdus luminescens*(ATCC 29999) (*37*)
bba_J72092	kanamycin resistance cassette	
bba_J72048	rbs.sfGFP	Superfolder GFP mutant (*38*). BglBrick standard version of BBa_I746916 (see http://partsregistry.org/Part:BBa_I746916)

Table S2 – Composite Parts used in the study

Registry #	Description	Composition
bba_J72094	P_{BAD} driven, *coi* only phagemid	bba_J72071.bba_J72082.bba_J72049
bba_J72095	P_{BAD} driven, *coi* + *repL* phagemid	bba_J72071.bba_J72082.bba_J72049.bba_J72080
bba_J72096	P_{BAD} driven, *coi* + *repL* + *pacA* phagemid	bba_J72071.bba_J72082.bba_J72049.bba_J72080.bba_J72076.bba_J72083. bba_J72085
bba_J72097	P_{RHA} driven, *coi* only phagemid	bba_J72072.bba_J72082.bba_J72049
bba_J72098	Constitutively expressed *c1*	bba_J72075.bba_J72089
bba_J72099	P_{BAD} driven, *coi* + *repL*+*pacA* phagemid for library fragment insertion	bba_J72071.bba_J72082.bba_J72049.bba_J72076.bba_J72083.bba_J72085
bba_J72100	Constitutively expressed *lacZ*	bba_J72074.bba_J72087

bba_J72101	P_{BAD} driven, *coi* + *pacA* phagemid	bba_J72071.bba_J72082.bba_J72049.bba_J72076.bba_J72083.bba_J72077
bba_J72102	P_{BAD} driven, *coi* + *cin* phagemid	bba_J72071.bba_J72082.bba_J72049.bba_J72079
bba_J72115	P_{BAD} driven, *coi* + *cin* + *repL* phagemid	bba_J72071.bba_J72082.bba_J72049.bba_J72079.bba_J72080
bba_J72116	P_{BAD} driven, *coi* + *cin* + *pacA* phagemid	bba_J72071.bba_J72082.bba_J72049.bba_J72079.bba_J72076.bba_J72083. bba_J72077
bba_J72103	P_{BAD} driven, *coi* + *repL* + *cin* + *pacA* phagemid	bba_J72071.bba_J72082.bba_J72049.bba_J72079.bba_J72080.bba_J72076. bba_J72083.bba_J72077
bba_J72104	P_{RHA} driven *lux* + *vio* operons, constitutive *lacZ* expression	bba_J72072.bba_J72091.bba_J72090.bba_J72049.bba_J72074.bba_J72087
bba_J72105	Competitor phagemid; *cin* + *repL* + *pacA*	bba_J72079.bba_J72080.bba_J72083
bba_J72106	P_{BAD} driven, *coi* + RFP phagemid	bba_J72071.bba_J72082.bba_J72049.bba_J72005.bba_J72084.bba_J72049
bba_J72107	Reference promoter driving expression of GFP	bba_J72047.bba_J72046
bba_J72108	P_{BAD} driven GFP	bba_J72071.bba_J72046
bba_J72152	P_{BAD} driven, *coi* + *repL* + *cin* + *pacA* phagemid expressing GFP	bba_J72071.bba_J72082.bba_J72049.bba_J72079.bba_J72080.bba_J72076. bba_J72083.bba_J72077.bba_J72005.bba_J72048.bba_J72049
bba_J72155	GFP expression cassette	bba_J72005.bba_J72048.bba_J72049

Table S3 – Vectors used in the study

Registry #	Description
bba_J72109	ampicillin resistant pUC vector
bba_J72110	ampicillin + chloramphenicol resistant p15A vector
bba_J72153	ampicillin + kanamycin resistant p15A vector
bba_J72154	kanamycin + chloramphenicol resistant p15A vector
bba_J72111	spectinomycin resistant split ColE2 vector
bba_J72112	spectinomycin resistant split R6K vector
bba_J72113	chloramphenicol resistant p15A vector
bba_J72114	complete, arabinose inducible phagemid, chloramphenicol resistant, p15a vector

Table S4 – Strains used in the study

Registry #	Description	Composition	Name in text
BBa_J72136	MC1061 *upp*::*pir*+FRT-kanR-FRT Cassette encoding constitutive expression of *pir* and kanamycin resistance inserted between *purM* and *uraA*	*purM* - bba_J72005.bba_J72086. bba_J72001.bba_J72092. bba_J72001 - *uraA*	JTK029
BBa_J72137	MC1061 *upp*::*pir*+FRT Cassette encoding constitutive expression of *pir* inserted between *purM* and *uraA*	*purM* - bba_J72005.bba_J72086. bba_J72001 - *uraA*	JTK030
BBa_J72138	MC1061 O16::*repA*+FRT Casette encoding constitutive expression of *repA* (from ColE2) and kanamycin resistance inserted between *galF* and *wbbL*	*galF* - bba_J72073.bba_J72088. bba_J72049.bba_J72001. bba_J72092.bba_J72001 - *wbbL*	JTK160C

Supplemental References

30. Guzman, L. M., Belin, D., Carson, M. J., and Beckwith, J. (1995) Tight regulation, modulation, and high-level expression by vectors containing the arabinose PBAD promoter, *J Bacteriol 177*, 4121-4130.
31. Tobin, J. F., and Schleif, R. F. (1987) Positive regulation of the Escherichia coli L-rhamnose operon is mediated by the products of tandemly repeated regulatory genes, *J Mol Biol 196*, 789-799.
32. Babineau, D., Vetter, D., Andrews, B. J., Gronostajski, R. M., Proteau, G. A., Beatty, L. G., and Sadowski, P. D. (1985) The FLP protein of the 2-micron plasmid of yeast. Purification of the protein from Escherichia coli cells expressing the cloned FLP gene, *J Biol Chem 260*, 12313-12319.
33. Shaner, N. C., Campbell, R. E., Steinbach, P. A., Giepmans, B. N., Palmer, A. E., and Tsien, R. Y. (2004) Improved monomeric red, orange and yellow fluorescent proteins derived from Discosoma sp. red fluorescent protein, *Nat Biotechnol 22*, 1567-1572.
34. Metcalf, W. W., Jiang, W., and Wanner, B. L. (1994) Use of the rep technique for allele replacement to construct new Escherichia coli hosts for maintenance of R6K gamma origin plasmids at different copy numbers, *Gene 138*, 1-7.
35. Hiraga, S., Sugiyama, T., and Itoh, T. (1994) Comparative analysis of the replicon regions of eleven ColE2-related plasmids, *J Bacteriol 176*, 7233-7243.
36. Kittleson, J. T., Cheung, S., and Anderson, J. C. (2011) Rapid optimization of gene dosage in E. coli using DIAL strains, *Journal of biological engineering 5*, 10.
37. Winson, M. K., Swift, S., Hill, P. J., Sims, C. M., Griesmayr, G., Bycroft, B. W., Williams, P., and Stewart, G. S. (1998) Engineering the luxCDABE genes from Photorhabdus luminescens to provide a bioluminescent reporter for constitutive and promoter probe plasmids and mini-Tn5 constructs, *FEMS Microbiol Lett 163*, 193-202.
38. Pedelacq, J. D., Cabantous, S., Tran, T., Terwilliger, T. C., and Waldo, G. S. (2006) Engineering and characterization of a superfolder green fluorescent protein, *Nat Biotechnol 24*, 79-88.