VERSION 2

DEC 03, 2019

OPEN ACCESS

DOI:

dx.doi.org/10.17504/protocols.io.92gh8bw

Protocol Citation: Eftychis Frangedakis, Susana Sauret-Gueto, Anthony West, Nicola Patron, Marta Tomaselli, Marius Rebmann, Jim Haseloff 2019. Loop L1 (odd level) BsaI type IIS cloning into pCk vectors. **protocols.io** <https://dx.doi.org/10.17504/protocols.io.92gh8bw>

License: This is an open access protocol distributed under the terms of the [Creative Commons Attribution License](https://creativecommons.org/licenses/by/4.0/), which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited

Protocol status: Working
We use this protocol and it's working

Created: Dec 03, 2019

Last Modified: Dec 03, 2019

PROTOCOL integer ID:
30504

Loop L1 (odd level) BsaI type IIS cloning into pCk vectors V.2

Version 1 is forked from [Loop L1 \(odd level\) type IIS cloning - pCk-ye vectors](#)

Eftychis Frangedakis¹, Susana Sauret-Gueto², Anthony West³, Nicola Patron⁴, Marta Tomaselli², Marius Rebmann², Jim Haseloff²

¹University of Cambridge;

²Plant Sciences, University of Cambridge, OpenPlant;

³previously at Earlham Institute, Norwich; ⁴Earlham Institute, Norwich

OpenPlant Project

Susana Sauret-Gueto

Plant Sciences, University of Cambridge, OpenPlant

ABSTRACT

Protocol based on:

[Pollak B, Cerda A, Delmans M, et al \(2019\) Loop assembly: a simple and open system for recursive fabrication of DNA circuits. New Phytol 222:628–640](#)

<https://doi.org/10.1111/nph.15625>

MATERIALS

MATERIALS

⊗ BsaI - 5,000 units **New England Biolabs Catalog #R0535L**

⊗ T4 DNA Ligase - 20,000 units **New England Biolabs Catalog #M0202S**

⊗ Sterile water **Contributed by users**

⊗ BSA, molecular biology grade, 20 mg/ml **New England Biolabs Catalog #B9000S**

⊗ 10X NEB T4 DNA ligase buffer **New England Biolabs**

Loop pCk vectors

1

Loop vectors for nuclear transformation: pCks (A) and for chloroplast transformation pCkchlo (B).

Loop fusion sites in the pCk vectors to assemble different L0 parts into a L1 construct using a pCk vector and BsaI are: A (GGAG) and F (CGCT).

Loop fusion sites in the pCk vectors to assemble different L1 constructs into a L2 construct using a pCs vector and SapI are: a (ATC), b (GCA), d (TAC), e (CAG) and o (GCT).

Left (LB) and right border (RB) repeats from nopaline C58 T-DNA for Agrobacterium-mediated nuclear transformation. KanR: kanamycin bacterial resistance cassette. LacZ: lacZ α cassette for blue-white screening of colonies.

Example of assembly of L0 parts into a transcription unit (L..

2

Loop assembly of multiple L0 parts into a transcription unit (L1) using a pCk plasmid and BsaI.

Protocol for assembly of L0 parts into a transcription unit (...)

- 3 Determine the concentrations of each DNA plasmid needed (L0 plasmids and pCk acceptor plasmid) by spectrophotometry (Nanodrop).
In the example in step 2, determine concentration of plasmids L0_PROM5, L0_CDS, L0_3TERM and pCk1.
- 4 Prepare aliquots for each plasmid at a concentration of 15 nM for the L0 plasmids and of 7.5 nM for the acceptor pCk vector. With this final concentration, 1 µL of each plasmid is added to the plasmids mix (see step 6).

To calculate the concentration in ng/µL:

- For a final concentration of 15 nM, the concentration in [ng/ul] equals N (the length in bp of the plasmid) divided by 110. This is an approximation of the formula:

$15 \cdot 10^{-9} \text{ mol/L} \times ((607.4 \times N) + 157.9) \text{ g/mol} \times 10^{-6} \text{ L/}\mu\text{L} \times 10^9 \text{ ng/g} = \text{concentration (ng/}\mu\text{L)}$

- For a final concentration of 7.5 nM, the concentration in [ng/ul] equals N divided by 220.

- 5** Prepare Loop assembly Level 1 reaction master mix (MM) according to Table , if four or less number of L0 parts are assembled into a pCk vector (otherwise see step 8)

Com pone nts	Volu me (μ L)
Steril e water	3
10x T4 ligase buffer (NEB)	1
1 mg/mL bovin e seru m album in (NEB)	0.5
T4 DNA ligase at 400 U/ μ L (NEB)	0.25
10 U/ μ L Bsal (NEB)	0.25
Final volum e	5

- 6** Prepare plasmids mix by adding in a 0.2 mL tube: 1 μ L of each L0 plasmid , 1 μ L of the pCk vector (see step 4), and sterile water up to 5 μ L. Mix well.

When 4 L0 parts are assembled into a pCk plasmid, the volume of the plasmid mix is 5 μ L, and thus no volume of water is added.

- 7** Add 5 μL of MM (step 5) to the 5 μL of plasmids mix (step 6), to a final volume of 10 μL . Mix well.
- 8** If more than 4 L0 parts are to be assembled into a pCk vector, reduce the water volume in the MM by 1 μL (step 5) for each extra 1 μL of DNA part added in the plasmids mix (step 6).
- 9** Place samples in a thermocycler and use the following program:
Assembly: 26 cycles of 37 °C for 3 min and 16 °C for 4 min.
Termination and enzyme denaturation: 50 °C for 5 min and 80 °C for 10 min.
- 10** Transform 20 μL of chemically competent *E. coli* cells (transformation efficiency of 1×10^7 transformants/ μg plasmid DNA) using 2 μL of the Loop assembly reaction and then plate on LB agar plates containing 50 $\mu\text{g}/\text{mL}$ kanamycin and 40 $\mu\text{g}/\text{mL}$ of X-gal for blue-white screening.
- 11** Incubate overnight at 37 °C.
- 12** Colonies with white color are likely to contain an L1 insert cloned into the pCk vector (In the example in step 2: PROM5:CDS-3TERM)
Blue color colonies will contain undigested pCk vector with LacZ
- 13** Confirm the presence of the correct insert with Sanger sequencing using the primers pC_F (GCAACGCTCTGTCATCGTTAC) and pC_R (GTAACCTTAGGACTTGTGCGACATGTC) for pCk vectors, and pC_F and pC_R2 (CAATCTGCTCTGATGCCGCATAGTTAAG) for pCkchlo vectors.