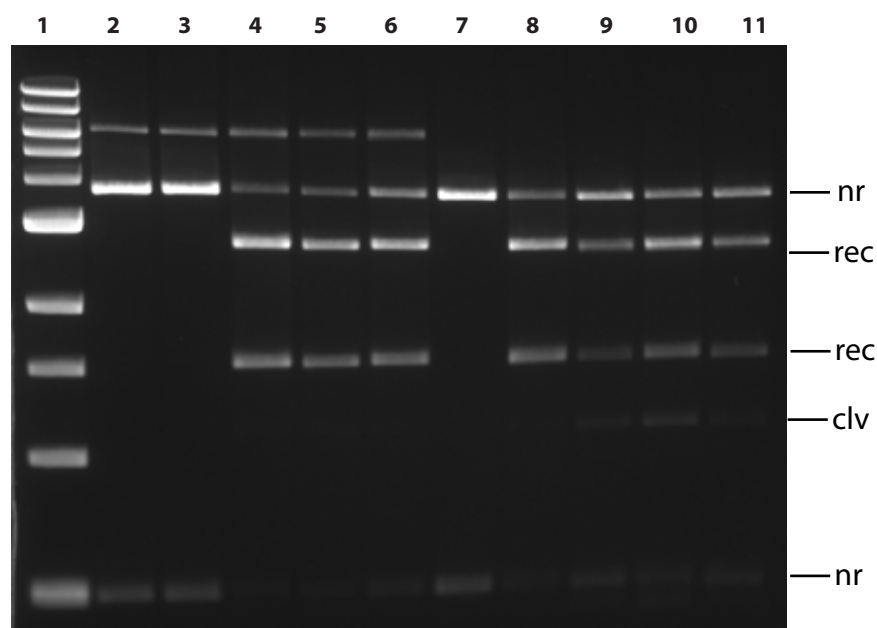


### A) $\phi$ C31-Int-RDF fusions



1. 1kb ladder

#### **attR x attL**

2. PDB

3.  $\phi$ C31-Int

4.  $\phi$ C31-Int- $\phi$ C31-RDF Fusion

5.  $\phi$ C31-Int- $\phi$ BT1-RDF Fusion

6.  $\phi$ C31-Int-TG1-RDF Fusion

#### **attP x attB**

7. PDB

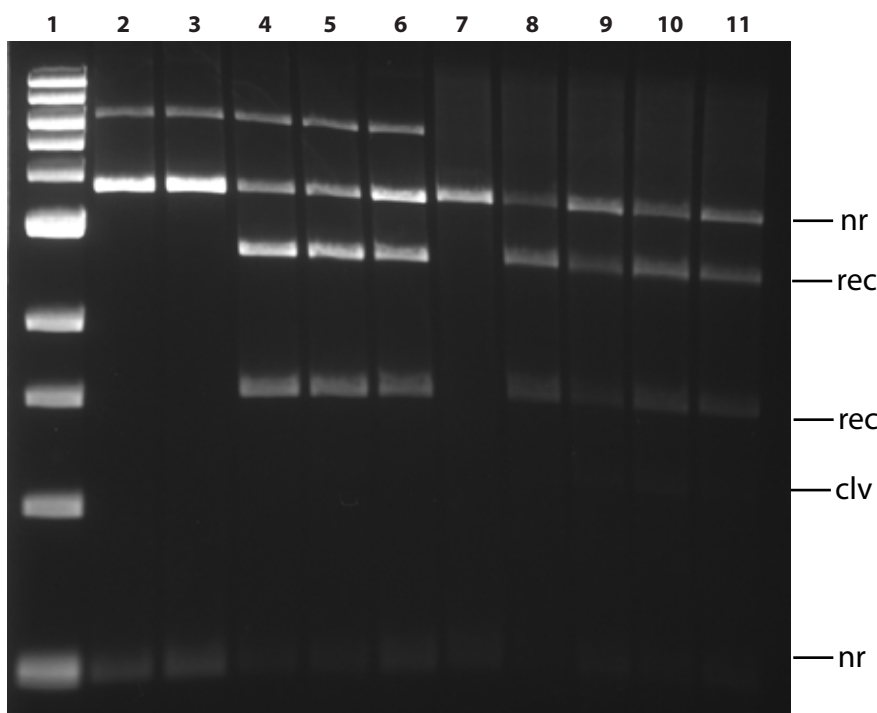
8.  $\phi$ C31-Int

9.  $\phi$ C31-Int- $\phi$ C31-RDF Fusion

10.  $\phi$ C31-Int- $\phi$ BT1-RDF Fusion

11.  $\phi$ C31-Int-TG1-RDF Fusion

### B) $\phi$ C31-Int and RDFs as separate proteins



1. 1kb ladder

#### **attR x attL**

2. PDB

3.  $\phi$ C31-Int

4.  $\phi$ C31-Int +  $\phi$ C31-RDF

5.  $\phi$ C31-Int +  $\phi$ BT1-RDF

6.  $\phi$ C31-Int + TG1-RDF

#### **attP x attB**

7. PDB

8.  $\phi$ C31-Int

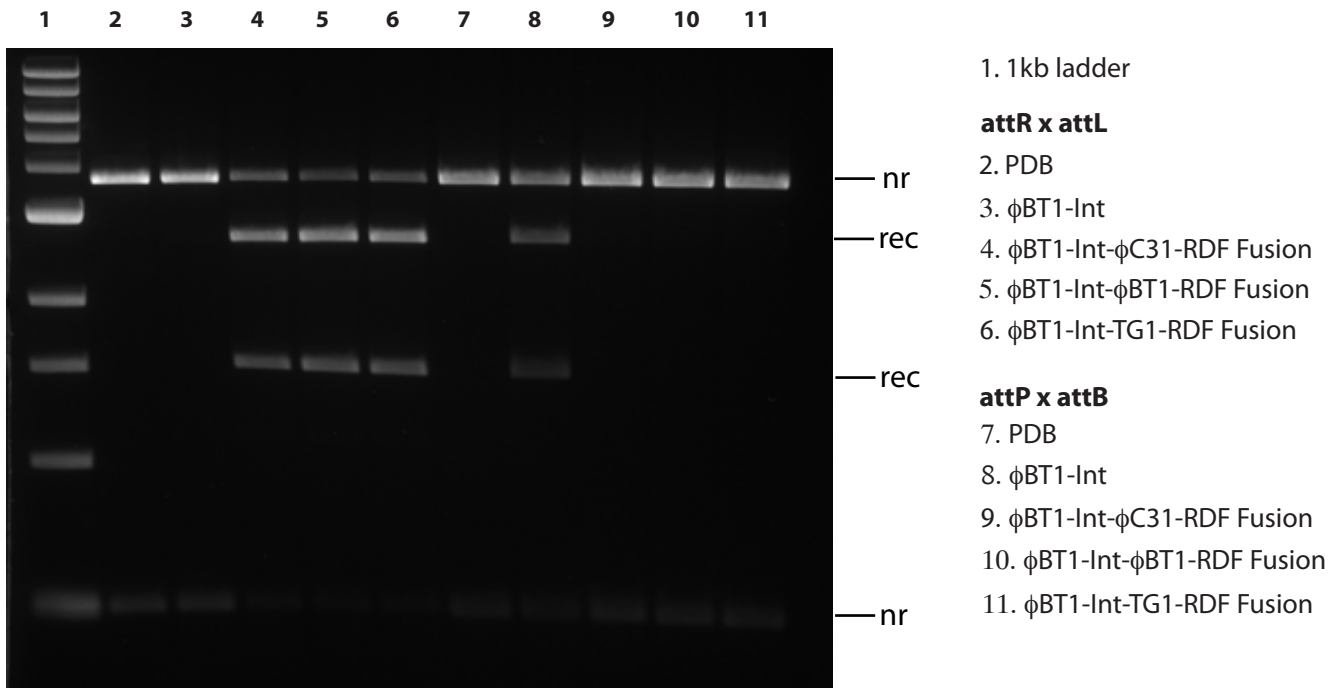
9.  $\phi$ C31-Int +  $\phi$ C31-RDF

10.  $\phi$ C31-Int +  $\phi$ BT1-RDF

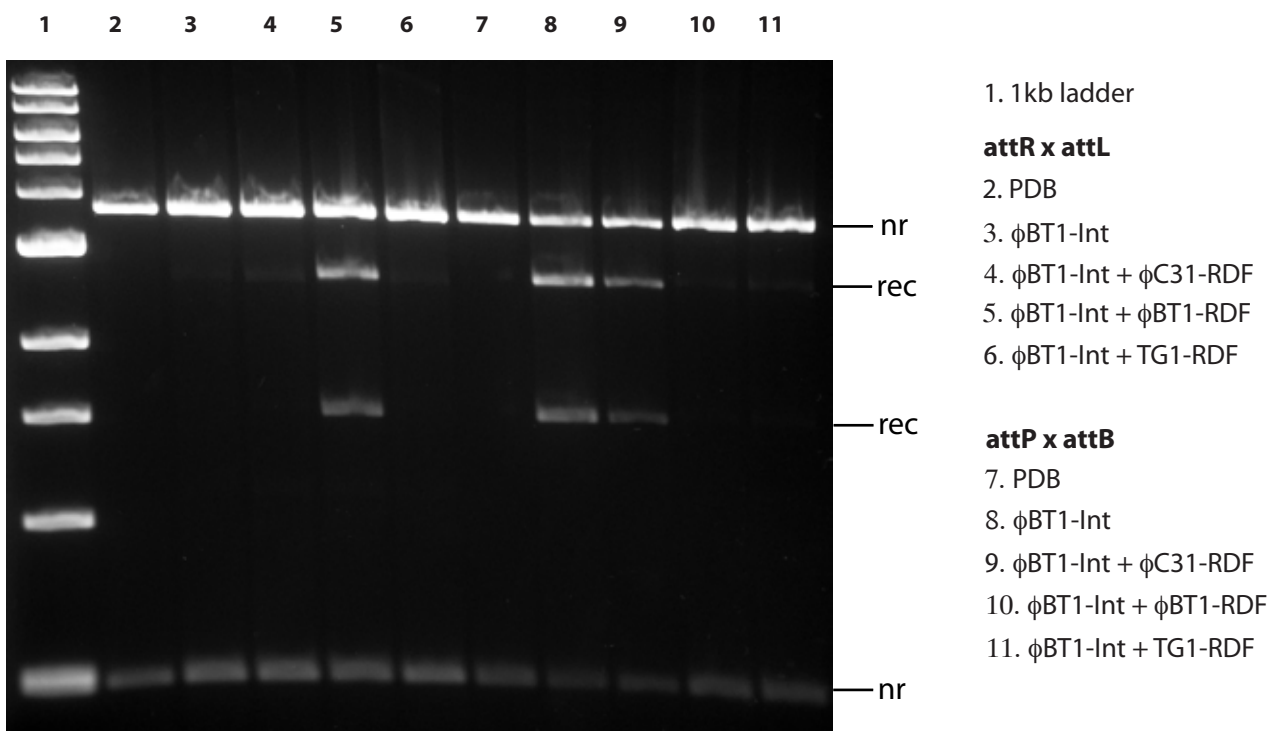
11.  $\phi$ C31-Int + TG1-RDF

**Figure S1: In vitro recombination reactions of  $\phi$ C31 integrase**

**A)  $\phi$ BT1-Int-Fusion\_RL\_PB**

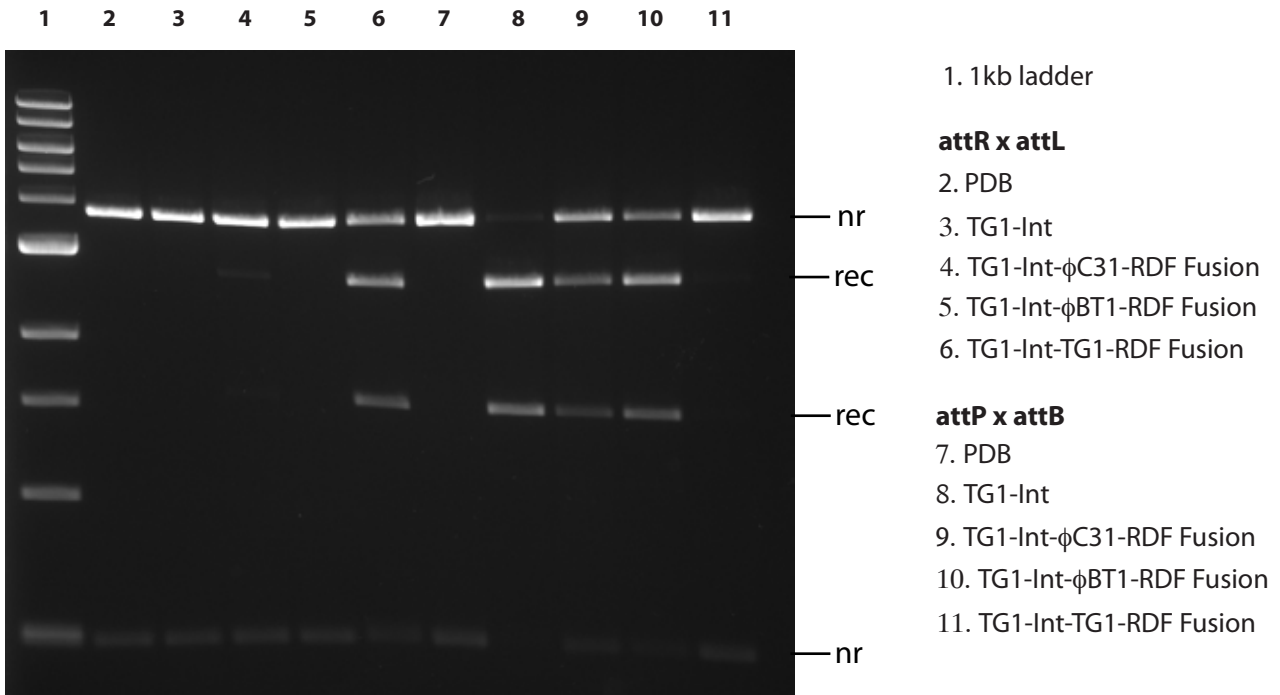


**B)  $\phi$ BT1-Int and RDFs as separate proteins**

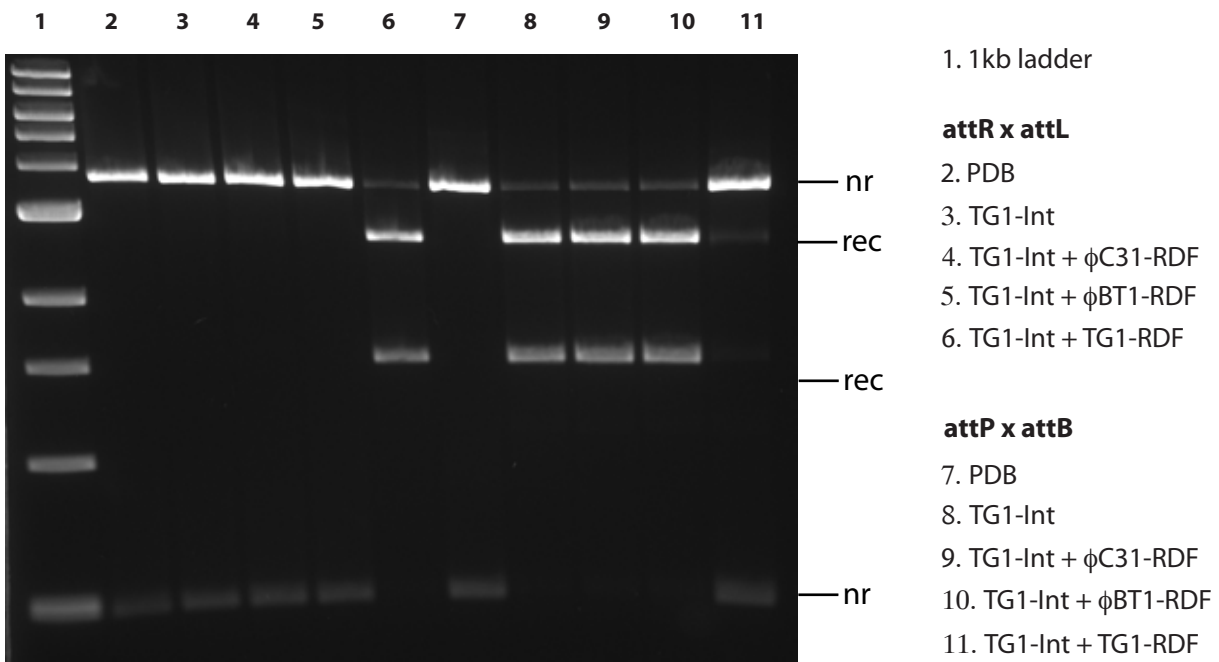


**Figure S2: In vitro recombination reactions of  $\phi$ BT1 integrase**

### A) TG1-Int-RDF fusions



### B) TG1-Int and RDFs as separate proteins



**Figure S3: In vitro recombination reactions of TG1 integrase**