The effect of the unitary operator in the state is the following:

This unitary operator needs to be applied multiple times in some cases. For example:

It can be proven that

In order to prove this first lets define the remainder operator. For each and we define as the remainder divided by . More formally

, where and

The repeating operator can be rewritten as

**Proof #1:**

We can rewrite and as:

Therefore

**Proof #2**:

We can rewrite and as:

Factoring N from the expression we get:

Therefore

Given the unitary operator for we have:

Applying proof 2 we get:

This is exactly the same as:

Using the same method it can be proven for , up to using induction

Therefore:

This means that this operator can be applied only once given the fact that it can be implemented for any given value