

1. Alice pick $x \leftarrow \mathbb{Z}_q$ and send g^x to Bob

The Adversary gets g^x from Alice, picks $x' \leftarrow \mathbb{Z}_q$ and sends $g^{x'}$ to Bob.

Bob picks $y \leftarrow \mathbb{Z}_q$ and sends to g^y to Alice

The Adversary gets g^y from Bob, picks $y' \leftarrow \mathbb{Z}_q$ and sends $g^{y'}$ to Alice

Alice thinks the key is $k_A = (g^{y'})^x$ and Bob thinks the key is $k_B = (g^{x'})^y$

2. Given the knowledge of x , compute $\frac{(C_1)^x}{C_2}$

$$\text{If } b=0, \frac{(C_1)^x}{C_2} = \frac{(g^y)^x}{h^y} = \frac{g^{xy}}{(g^x)^y} = 1$$

$$\text{If } b=1, \frac{(C_1)^x}{C_2} = \frac{g^{xy}}{g^z} \neq 1 \text{ unless } z=xy \text{ which has negligible probability}$$

4. $s := k \oplus r$

$$u := s \oplus t = k \oplus r \oplus t$$

$$w := u \oplus r = k \oplus r \oplus t \oplus r = k \oplus t$$

$$k := w \oplus t = k \oplus t \oplus t = k$$

so Alice and Bob has the same key

The eavesdropper knows s, u, w , and $k := s \oplus u \oplus w$.

Thus, the eavesdropper can compute the key, the scheme is not secure

3.

