A circularly polarized photon has a quantum state $(1/\sqrt{2})|0\rangle + (i/\sqrt{2})|90\rangle$. It is incident on a 90 degree polarizer. What is the probability that it will be transmitted?

A) 0

B) 1

C) 1/2

D) -1/2

E) $(i/\sqrt{2})^2$

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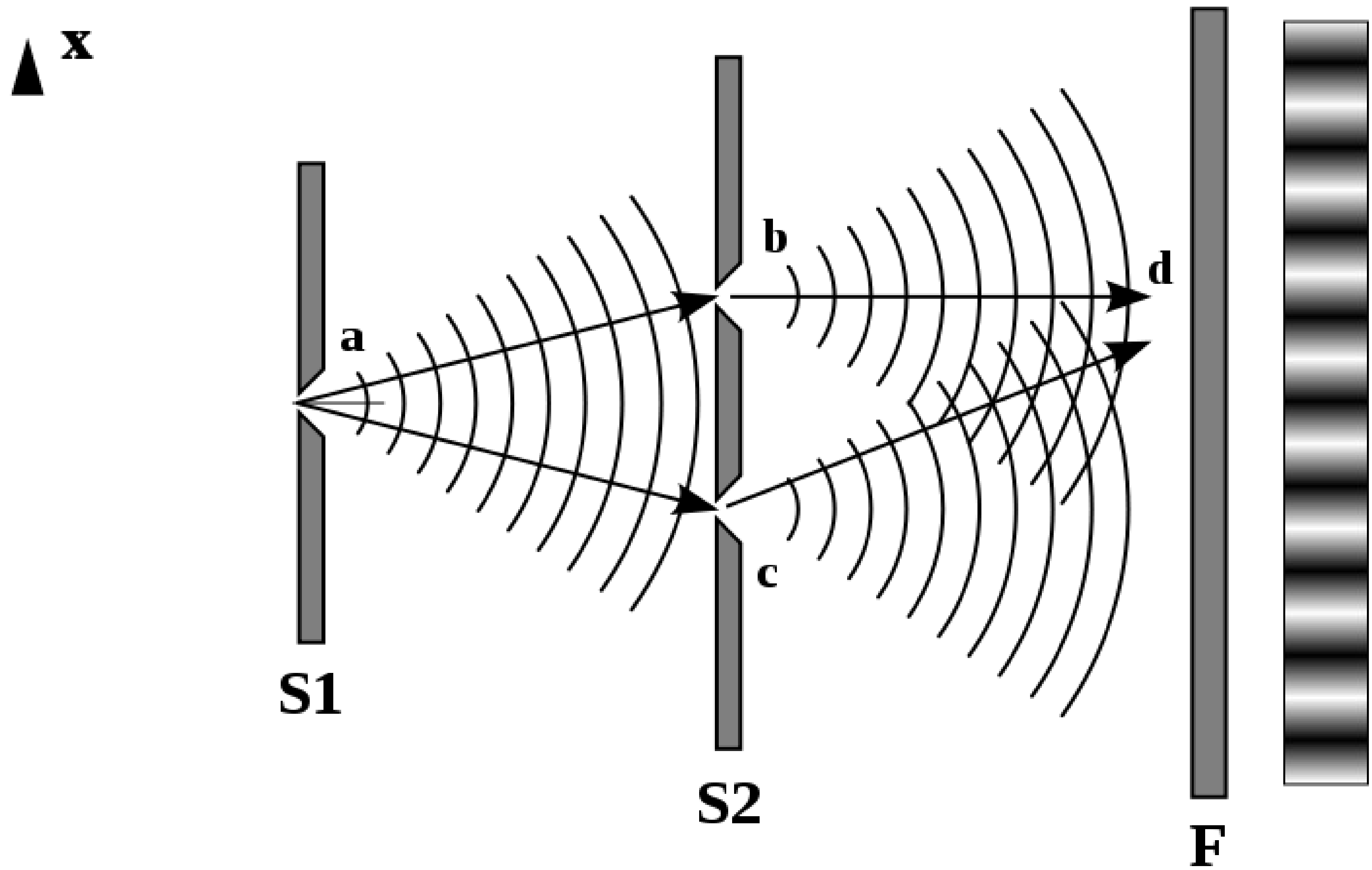
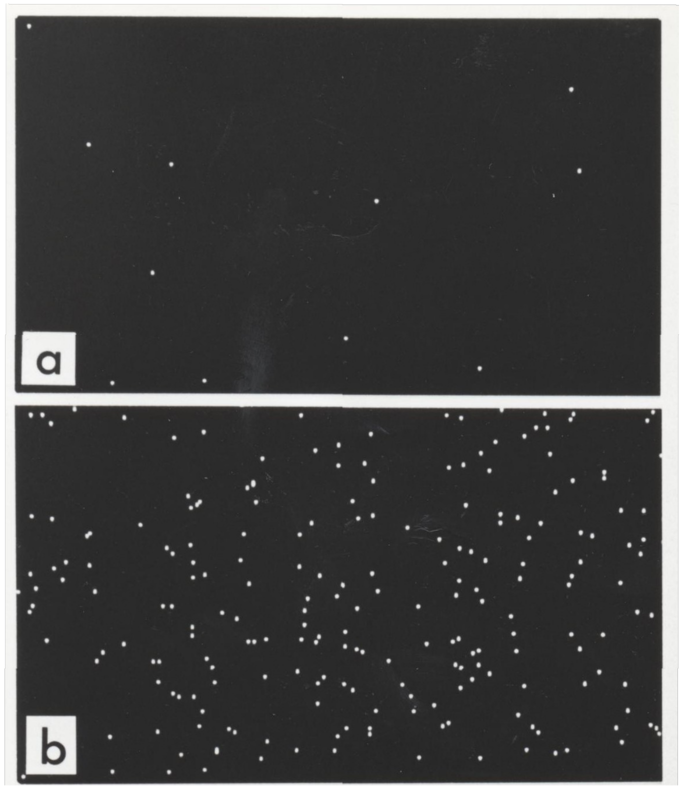
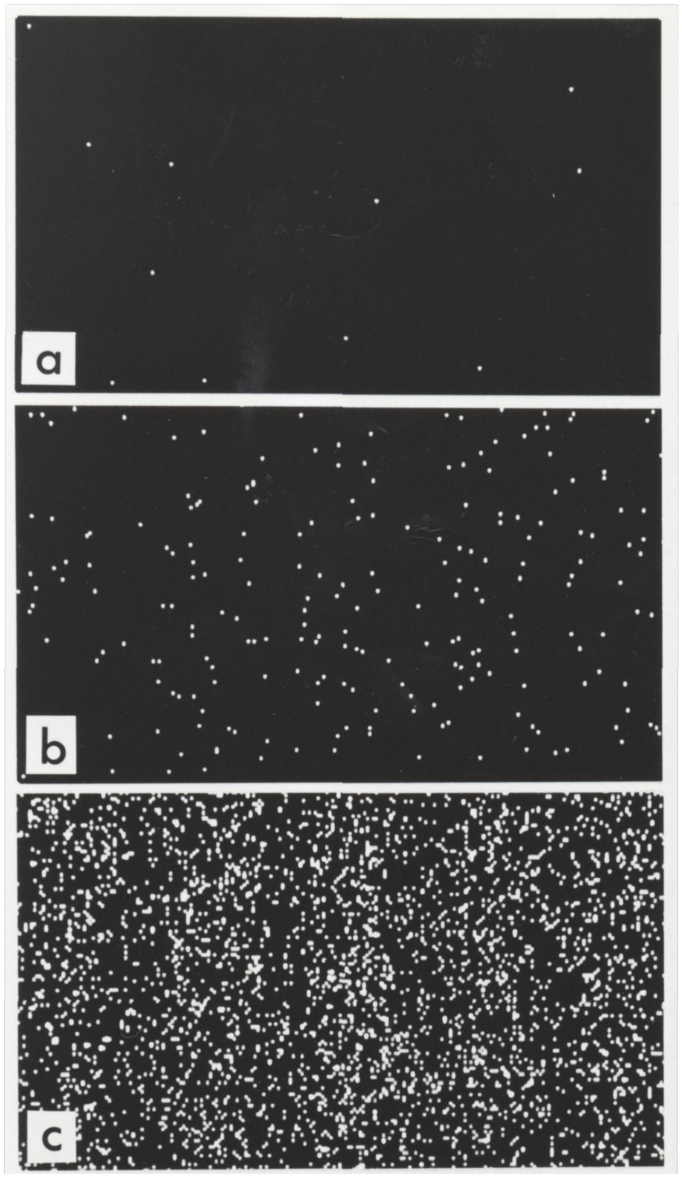
The magnitude of $i/\sqrt{2}$ is $1/\sqrt{2}$
The square of the magnitude is 1/2
therefore the probability is 1/2

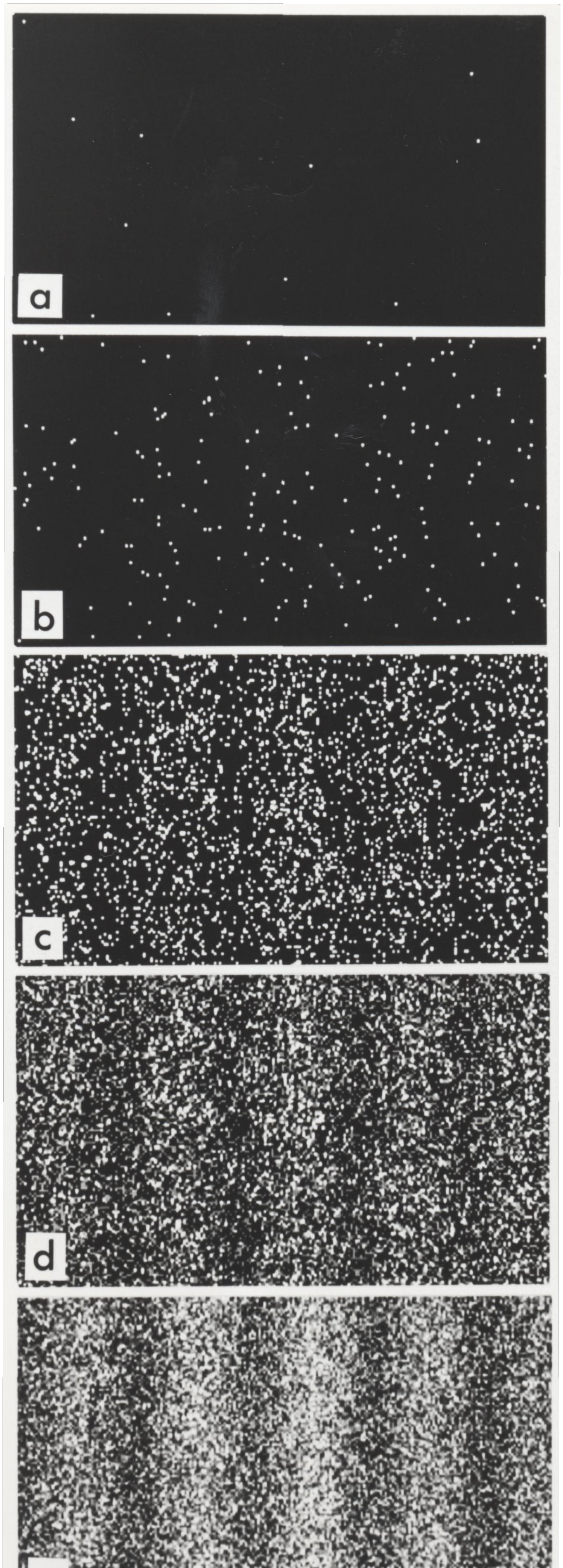


x
a
b
c
d
S1
S2
F


a


a
b


a
b
c


a
b
c
d
e

Which option best explains the result that we get the same interference pattern when just one photon goes through at a time?

A) Each photon interferes with other photons which have gone through before it.

B) Each photon spreads its energy on the screen according to the interference pattern

C) Each photon hits the screen at a specific spot, but the probabilities for different locations are somehow related to the classical intensity distribution.

D) None of the above (I have my own theory!)

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A photon is in a state quantum superposition state

$$a_1|x_1> + a_2|x_2>$$

This state describes:

A) One photon at x_1 and another at x_2

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What do you think happens to the interference pattern if we only open one slot at a time (choosing the slot randomly)

A) we get the same pattern

B) the pattern changes somewhat but there are still fringes

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The fringes are a result of the quantum state having two components, corresponding to the photon passing through each slot.
If you only have one slot open, there is only one component in the photon quantum state and there are no fringes.

The photon does go through both slits!