

Wordline propagator

$N!$ Feynman graphs

The diagrammatic equation shows a wordline propagator on the left, represented as a horizontal cylinder with an incoming arrow on the left and an outgoing arrow on the right. Below the cylinder, there are two vertical lines labeled '12' and 'N', connected by a dashed line. This is followed by an equals sign and a sum of three terms. The first term is a diagram with a horizontal line and two vertical lines labeled '12' and 'N', with a dashed line between them. The second term is a similar diagram but with an 'X' over the horizontal line. The third term is a diagram with a horizontal line and two vertical lines labeled '12' and 'N', with a dashed line between them, and a circled 'X' over the horizontal line. The text '(perms)' is written between the second and third terms.

$$\text{Wordline propagator} = \text{Diagram 1} + \text{Diagram 2} + (\text{perms}) + \text{Diagram 3}$$

master formula = sum of all symmetric insertions

"details" for spinor QED : see Edwards & Schubert