In [2]:

```python
import numpy as np

# Function to calculate transmitted light intensity
def transmitted_light(I_0, alpha, d):
    """
    Calculates transmitted light intensity through a material.

    Parameters:
    I_0 (float): Initial light intensity (W/m^2)
    alpha (float): Absorption coefficient (1/m)
    d (float): Thickness of material (m)

    Returns:
    float: Transmitted light intensity
    """
    return I_0 * np.exp(-alpha * d)

# Function to calculate reflected light intensity at an interface
def reflected_light(I_0, n1, n2):
    """
    Calculates reflected light intensity at an interface.

    Parameters:
    I_0 (float): Incident light intensity (W/m^2)
    n1 (float): Refractive index of the first material
    n2 (float): Refractive index of the second material

    Returns:
    float: Reflected light intensity
    """
    R = ((n2 - n1) / (n2 + n1))**2  # Reflection coefficient
    return R * I_0  # Reflected intensity

I_0 = 10  # Initial light intensity (W/m^2)
n_air = 1.00  # Air refractive index
n_PMMA = 1.489  # PMMA refractive index
n_water = 1.333  # Water refractive index
n_polymer = 1.46  # New polymer refractive index

beta_PMMA = 0.132  # Absorption coefficient (1/m)
beta_polymer = .132
beta_water = .097

d_PMMA = 0.005  # Thickness of PMMA (5 mm)
d_polymer = 0.01  # Thickness of new polymer (10 mm)

# Step-by-step calculations
I_1 = I_0 - reflected_light(I_0, n_air, n_PMMA)  # Air → PMMA
I_2 = transmitted_light(I_1, alpha_PMMA, d_PMMA)  # Transmission through PMMA
I_3 = I_2 - reflected_light(I_2, n_PMMA, n_water)  # PMMA → Water
I_4 = I_3 - reflected_light(I_3, n_water, n_polymer)  # Water → Polymer
I_5 = transmitted_light(I_4, alpha_polymer, d_polymer)  # Transmission through P
I_6 = I_5 - reflected_light(I_5, n_polymer, n_PMMA)  # Polymer → PMMA
I_7 = transmitted_light(I_6, alpha_PMMA, d_PMMA)  # Transmission through last PM
I_final = I_7 - reflected_light(I_7, n_PMMA, n_air)  # PMMA → Air

    print(f"Final Transmitted Light Intensity: {I_final:.4f} W/m^2")
```

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  File "<ipython-input-2-28ad8d99f815>", line 57
    print(f"Final Transmitted Light Intensity: {I_final:.4f} W/m^2")
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```

In [ ]: