

Wireframes, Surfaceframes, Volumes, etc.

[Geometric volumes](#) needed for [calculation of force strengths](#) include:

Force	M	Vol(M)
gravity	S^4	$8\pi^2/3$ - S^4 is a 4-dim solid
color	CP^2	$8\pi^2/3$ - CP^2 is a 4-dim solid
weak	$S^2 \times S^2$	$2 \times 4\pi$ - S^2 is a 2-dim boundary of 3-dim ball $4\text{-dim } S^2 \times S^2 =$ $=$ topological boundary of 6-dim 2-polyball Shilov Boundary of 6-dim 2-polyball = $S^2 + S^2 =$ $=$ 2-dim surface frame of 4-dim $S^2 \times S^2$
e-mag	T^4	$4 \times 2\pi$ - S^1 is 1-dim boundary of 2-dim disk $4\text{-dim } T^4 = S^1 \times S^1 \times S^1 \times S^1 =$ $=$ topological boundary of 8-dim 4-polydisk Shilov Boundary of 8-dim 4-polydisk = $= S^1 + S^1 + S^1 + S^1 =$ $=$ 1-dim wire frame of 4-dim T^4

Also note that:

[For U\(1\) electromagnetism, whose photon carries no charge, the factors Vol\(Q\) and Vol\(D\) do not apply and are set equal to 1.](#)

From another point of view, [the link manifold to the target vertex is trivial for the abelian neutral U\(1\) photons of Electromagnetism, so we take QE and DE to be equal to unity.](#)

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