An interpretationtrial of the Fine Structure Constant formular founded by Hans de Vries

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Abstract

The formula found by Hans de Vries for the fine structure constant is very elegant and accurate but there exists no explanation for it.In this paper , i try to give an interpretation.It is also shown why we have a electromagnetic field and why we have the value for the fine structure constant.

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The Hans de Vries formular :

$$\boxed{\alpha = \Gamma^2 . e^{-\frac{\pi^2}{2}}}$$

where $\Gamma = 1 + \frac{\alpha}{(2\pi)^0}(1 + \frac{\alpha}{(2\pi)^1}(1 + \frac{\alpha}{(2\pi)^2}(1 + ...$

Someone can proof that the HdV formular is identical to

$$\alpha = \left[\sum_{n=0}^{\infty} \frac{\alpha^n}{(2\pi)^{\binom{n}{2}}}\right]^2 . e^{-\frac{\pi^2}{2}}$$

then

$$\sqrt{\alpha} = \sum_{n=0}^{\infty} \frac{\alpha^n}{(2\pi)^{\binom{n}{2}}} . e^{-\frac{\pi^2}{4}} = \underline{(1 + 1 \cdot \frac{\alpha}{(2\pi)^0} + 1 \cdot \frac{\alpha}{(2\pi)^0} \cdot \frac{\alpha}{(2\pi)^1} + 1 \cdot \frac{\alpha}{(2\pi)^0} \cdot \frac{\alpha}{(2\pi)^1} \cdot \frac{\alpha}{(2\pi)^2} + \cdots)}.\underline{e^{-\frac{\pi^2}{4}}}$$

The challenge now is to interprete this formular.
The factor $\underline{e^{-\frac{\pi^2}{4}}}$ *looks like the expectationvalue of the wrapped normaldistribution which is*

$$< z >= e^{i\mu - \frac{\sigma^2}{2}} = e^{-\frac{\pi^2}{4}} \quad \text{for } \mu = 0 \text{ and } \sigma = \frac{\pi}{\sqrt{2}}$$

see https : //en.wikipedia.org/wiki/Wrapped_normal_distribution

And the factor

$$\underline{(1 + 1 \cdot \frac{\alpha}{(2\pi)^0} + 1 \cdot \frac{\alpha}{(2\pi)^0} \cdot \frac{\alpha}{(2\pi)^1} + 1 \cdot \frac{\alpha}{(2\pi)^0} \cdot \frac{\alpha}{(2\pi)^1} \cdot \frac{\alpha}{(2\pi)^2} + \cdots)}$$

looks like the series of conditional probabilities.

more concrete (details see https : //en.wikipedia.org/wiki/Conditional_probability)

$$\sqrt{\alpha} = \sum_{n=1}^{\infty} P(A_1 \cap ... \cap A_n) = \underline{(1 + 1 \cdot \frac{\alpha}{(2\pi)^0} + 1 \cdot \frac{\alpha}{(2\pi)^0} \cdot \frac{\alpha}{(2\pi)^1} + 1 \cdot \frac{\alpha}{(2\pi)^0} \cdot \frac{\alpha}{(2\pi)^1} \cdot \frac{\alpha}{(2\pi)^2} + \cdots)}.\underline{e^{-\frac{\pi^2}{4}}}$$

with

$$P(A_1 \cap ... \cap A_n) = P(A_1).P(A_2|A_1).P(A_3|A_1 \cap A_2)...P(A_n|A_1 \cap ... \cap A_{n-1}) = \frac{\alpha^{n-1}}{(2\pi)^{\binom{n-1}{2}}} \cdot e^{-\frac{\pi^2}{4}}$$

$$P(A_1) = e^{-\frac{\pi^2}{4}}, \quad P(A_2|A_1) = \frac{\alpha}{(2\pi)^0}, \quad P(A_3|A_1 \cap A_2) = \frac{\alpha}{(2\pi)^1}, \quad P(A_n|A_1 \cap ... \cap A_{n-1}) = \frac{\alpha}{(2\pi)^{n-2}}$$

the denominator of $\frac{\alpha}{(2\pi)^i}$ *looks like the* i *– dimensional 'volume' of a torus therefore the factors* $\frac{1}{(2\pi)^i}$ *can be seen as normalizationfactors.*

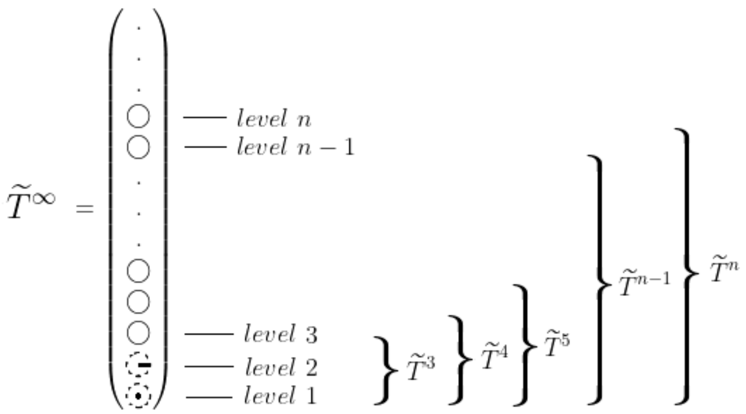
To understand the HdV formular we have to understand the two questions
1) *what is* $A_1, A_2, A_3, ...$
2) *why we have these values for the probabilities* $P(A_1 \cap ... \cap A_n)$

understanding question 1)

Normally a n−dimensional torus is defined as $T^n := S^1 \times \ldots \times S^1 = (S^1)^n$
But in our formular we have two denominators which have the dimension of a point and a line.
Therefore we define the torus as

$$\widetilde{T}^n := \{0\} \times [0,1] \times S^1 \times \ \ldots \ \times \ S^1 = \{0\} \times [0,1] \times (S^1)^{n-2}$$

The infinit torus $\widetilde{T}^\infty$ *then can be seen as infinit ladder.*



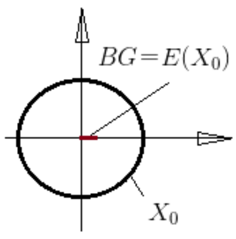
With this geometrical picture we can explain our probability sum.
$P(\text{absorbing or emitting a photon}) = P(\pm\gamma) = \sqrt{\alpha}$ *is given by the different levels of the* $\widetilde{T}^\infty$.
A photon is emitted when we climb down from one level to the prior level.
or is absorbed when we climb up on the torusladder one step from one level to the next
Our events $A_1, A_2, \ldots$ *are then*
$A_1 \ldots$ *absorbing a photon by climbing up to level 1 from vacuum or emitting a photon by climbing down from level 1 to vacuum.*
$A_2 \ldots$ *absorbing a photon by climbing up to level 2 from level 1 or emitting a photon by climbing down from level 2 to level 1.*
and so on.

$\Rightarrow$ *understood question 1)*

understanding question 2)

We call the factor $\underline{e^{-\frac{\pi^2}{4}}}$ *the Basic−Generator of the electromagnetic field (short BG).*

Explanation and visualisation of the Basic Generator BG.



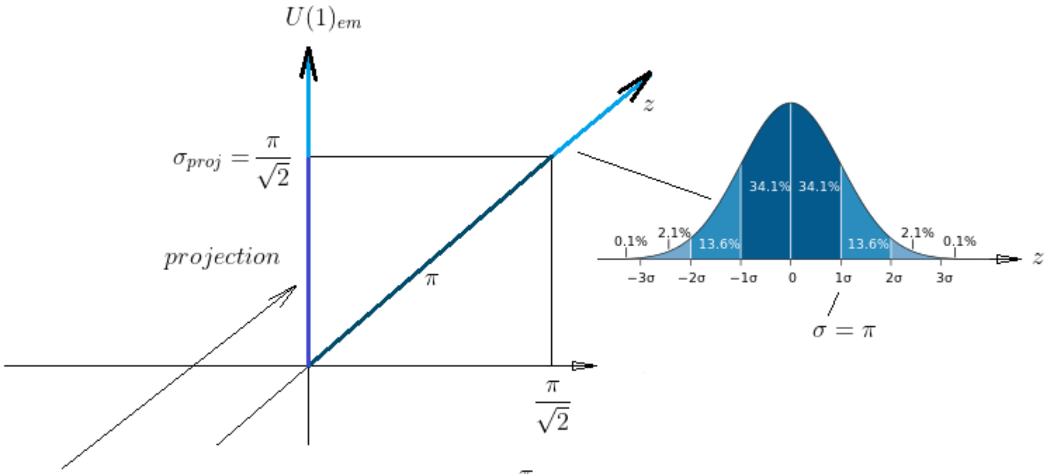
$BG{=}E(X_0)$ = *expectationvalue of the wrapped normaldistribution which is*

$$< z >= e^{i\mu - \frac{\sigma^2}{2}} = e^{-\frac{\pi^2}{4}} \quad \text{for } \mu = 0 \text{ and } \sigma = \frac{\pi}{\sqrt{2}}$$

see https://en.wikipedia.org/wiki/Wrapped_normal_distribution

We write $E(X_0) = e^{-\frac{\pi^2}{4}} \quad X_0 = \{x \mid x = e^{i\theta} \ , 0 \leqslant \theta < 2\pi\}$

The factor $\frac{\pi}{\sqrt{2}}$ *comes from a projection of a distribution with standard deviation* $\sigma = \pi$.



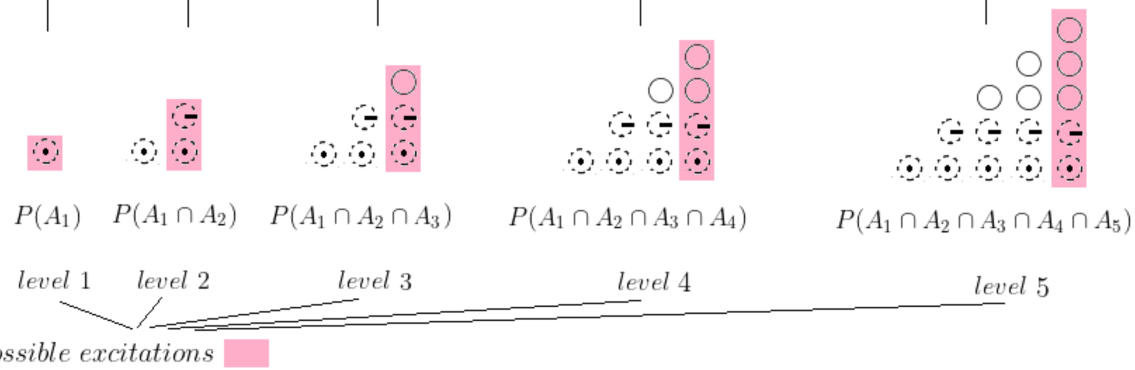
the projective normaldistribution with $\sigma = \frac{\pi}{\sqrt{2}}$
then will be wrapped.

Schematic representation of the formular and its probabilities

$P(A_5 | A_1 \cap A_2 \cap A_3 \cap A_4)$

the probability to absorb a photon is :

$$\sqrt{\alpha} = e^{-\frac{\pi^2}{4}} + e^{-\frac{\pi^2}{4}} \cdot \frac{\alpha}{(2\pi)^0} + e^{-\frac{\pi^2}{4}} \cdot \frac{\alpha}{(2\pi)^0} \cdot \frac{\alpha}{(2\pi)^1} + e^{-\frac{\pi^2}{4}} \cdot \frac{\alpha}{(2\pi)^0} \cdot \frac{\alpha}{(2\pi)^1} \cdot \frac{\alpha}{(2\pi)^2} + e^{-\frac{\pi^2}{4}} \cdot \frac{\alpha}{(2\pi)^0} \cdot \frac{\alpha}{(2\pi)^1} \cdot \frac{\alpha}{(2\pi)^2} \cdot \frac{\alpha}{(2\pi)^3} + \cdots$$



How to understand the single components, the multipliers of $P(A_1 \cap ... \cap A_n)$?

We want to restrict our examinations on the case of absorbing a photon.
For that we have to understand that a photon can only be absorbed if another source is emitting a photon.
We have two different types of possible sources.
1) *the vacuum*
2) *a second particle with EM charge*

For example the multipliers of $P(A_1 \cap A_2 \cap A_3)$
As we have seen above

$$P(A_1 \cap A_2 \cap A_3) = P(A_1).P(A_2|A_1).P(A_3|A_1 \cap A_2) = e^{-\frac{\pi^2}{4}} \cdot \frac{\alpha}{(2\pi)^0} \cdot \frac{\alpha}{(2\pi)^1}$$

We have multipliers without α *and with* α

$$e^{-\frac{\pi^2}{4}} \cdot \frac{\alpha}{(2\pi)^0} \cdot \frac{\alpha}{(2\pi)^1}$$

The first without α *has the vacuum as source for emitting a photon*
and the one with α *has another EM charged particle as source for emitting a photon.*
So we have the picture of source and sink in the HdV formular.
We observe the sink and say that we have the vacuum and another EM charged particle as possible sources.

What does the multipliers with α *express?*

To understand this we split the multipliers in two components $\frac{\alpha}{(2\pi)^i} = \frac{\sqrt{\alpha}}{(2\pi)^i}.\sqrt{\alpha}$

The first component is the probability that the sink absorbs a photon *(if the level* $= i+1$ *is already reached) and*
the second component is the probability that the source emit a photon
It does not matter on which level the source emit the photon so the probability is $\sqrt{\alpha}$.

How can we understand the probability $\frac{\sqrt{\alpha}}{(2\pi)^i}$ *(the sink absorbs a photon on level* $i+1$*)?*

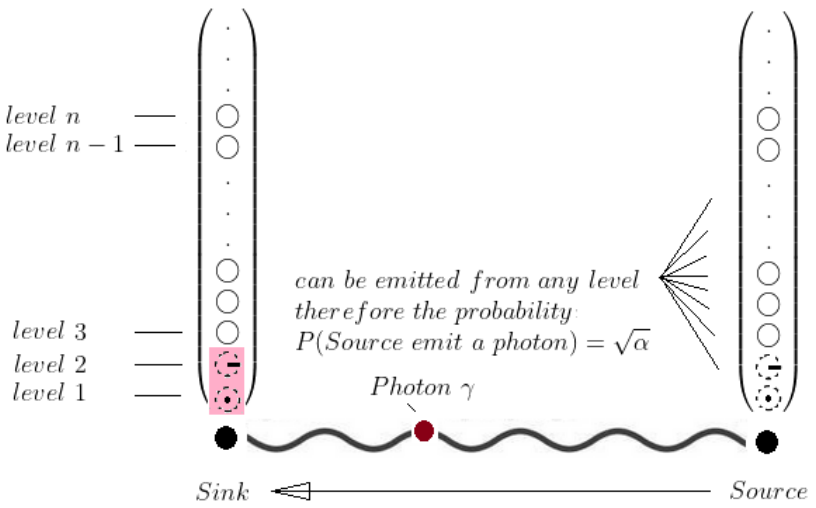
Actually i only can give a hint for that.
For the probability that the source emit a photon we can write

$$\sqrt{\alpha} = \frac{\sqrt{\alpha}}{1} = \frac{\sqrt{\alpha}}{volumne(\widetilde{T}^{i+2})}.(2\pi)^i$$

Now the sink absorbs the photon on a volumne $(2\pi)^i$ *of the torus* $\widetilde{T}^{i+2}$ *which is* $(2\pi)^i$ *times bigger as volumne* $= 1$ *so the probability is getting smaller to* $\frac{\sqrt{\alpha}}{(2\pi)^i}$

$$\sqrt{\alpha} = \frac{\sqrt{\alpha}}{1}\Big/$$

Schematic representation



the sink is in the state of level 2 before absorbing the photon.

after absorbing the photon the state is level 3 

the probability to reach level 2 is $P(A_1 \cap A_2) = e^{-\frac{\pi^2}{4}} \cdot \frac{\alpha}{(2\pi)^0}$

to climb from level 2 to level 3 the source must
1) *emit a photon by probability* $\sqrt{\alpha}$ *and*
2) *the sink must absorb the photon by probability* $\frac{\sqrt{\alpha}}{(2\pi)^1}$

therefore the probability to change the excitation from level 2 to level 3

is $\frac{\sqrt{\alpha}}{(2\pi)^1}\sqrt{\alpha}$

this explains the factor

$$P(A_1 \cap A_2 \cap A_3) = e^{-\frac{\pi^2}{4}} \cdot \frac{\alpha}{(2\pi)^0} \cdot \boxed{\frac{\alpha}{(2\pi)^1}} = e^{-\frac{\pi^2}{4}} \cdot \frac{\alpha}{(2\pi)^0} \boxed{\frac{\sqrt{\alpha}}{(2\pi)^1}\sqrt{\alpha}}$$

$\Rightarrow$ understood question 2)

Last but not least the value for the Finestructure Constant by the Hans de Vries formular.

I have cutted the sum on $n = 100$ and calculated the result by iteration.

$$\alpha = \left[\sum_{n=0}^{\infty} \frac{\alpha^n}{(2\pi)^{\binom{n}{2}}}\right]^2 . e^{-\frac{\pi^2}{2}}$$

$$\alpha \approx 0,0072973525686 \approx \frac{1}{137,035\ 999\ 096}$$

Value for α by Wikipedia

$$\alpha = 0,0072973525693(11)$$

The calculated value by the HdV formular fits very good to the empirical measurements.