The Hilbert Book Model

A simple model of fundamental physics

http://www.e-physics.eu

[Logic](#)

Fundament

- The Hilbert Book Model (HBM) is strictly based on **traditional quantum logic**.
- This foundation is lattice isomorphic with the set of closed subspaces of an infinite dimensional **separable Hilbert space**.

Correspondences

- ≈1930 Garret Birkhoff and John von Neumann discovered the lattice isomorphy:
- Infinite, but countable number of atoms / base vectors

Quantum logic	Hilbert space
Propositions: a, b	Vectors: $\|a\rangle, \|b\rangle$
atoms c, d	Base vectors: $\|c\rangle, \|d\rangle$
Relational complexity: $C_{omplexity}(a \cap b)$	Inner product: $\langle a\|b\rangle$
Inclusion: $(a \cup b)$	Sum: $\|a\rangle + \|b\rangle$
For atoms c_i: $\bigcup_i c_i$	Subspace $\left\{\sum_i \alpha_i \|c_i\rangle\right\}_{\forall \alpha_i}$

Atoms & base vectors

- ***Atom***
  - Contents not important
  - Set is unordered
  - Many sets possible
- ***Logic***
  - Lattice
    - Only relations important

Atoms & base vectors

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  - Contents not important
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- ***Base vector***
  - Set is unordered
  - Many sets possible
  - Can be ***eigenvector***
    - Eigenvalue
      - Real
      - Complex
      - Quaternionic
- ***Logic***
  - Lattice
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- ***Hilbert space***
  - Inner product
    - Real
    - Complex
    - Quaternionic

Constantin Piron:
Inner product $\langle x|y\rangle$ must be real, complex or quaternionic

$\langle a|Pa\rangle = \langle a|pa\rangle = \langle a|a\rangle p$

The eigenvalues are the same type of numbers as the inner products

Implementing dynamics

The sub-models can only implement

a static status quo

Representation

Quantum logic

Hilbert space

}

- Cannot represent dynamics
- Can only implement a ***static status quo***

Solution:

An ordered sequence of sub-models

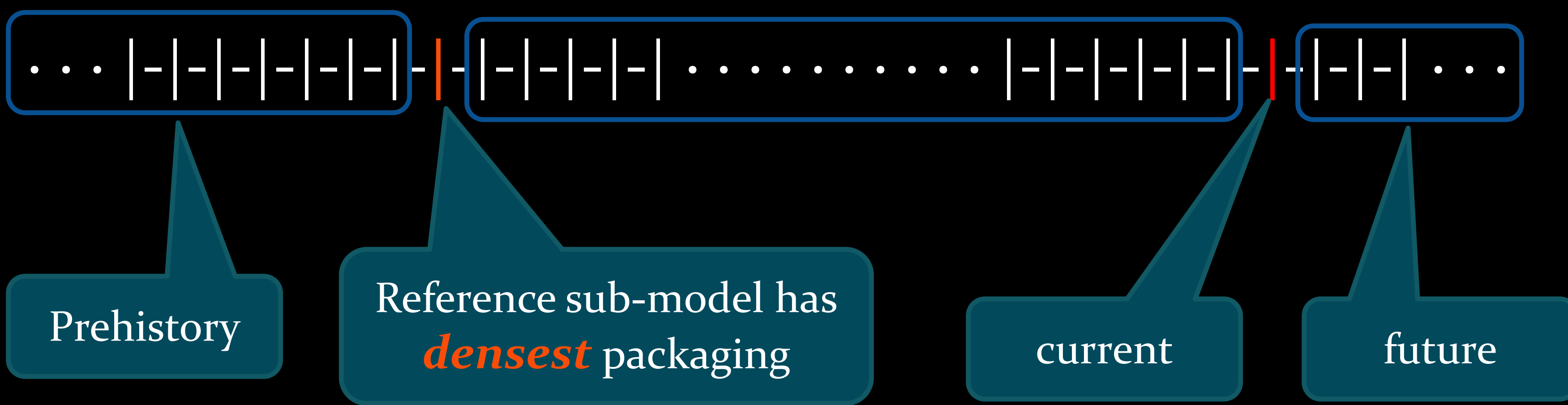
The model looks like a book where the sub-models are the pages.

The Hilbert book model

- Sequence ⇔ book ⇔ HBM
- Sub-models ⇔ sequence members ⇔ pages
- Sequence number ⇔page number
  ⇔ progression parameter

- *Correlation vehicle*
  - must establish sufficient coherence between pages
  - Coherence must not be too stiff
  - Requires identification of atoms / base vectors
  - Implemented by:
    - Enumeration operator
    - Enumeration function

Sequence



Reference Hilbert space delivers via its enumeration operator the
“flat” **Rational Quaternionic Enumerators**

Gelfand triple of reference Hilbert space delivers via its enumeration operator the ***reference continuum***

HBM has no Big Bang!

Correlation vehicle

- Must install ***sufficient cohesion*** between the subsequent sub-models
- Coherence must ***not be too stiff***, otherwise no dynamics occurs
- Must ***not introduce extra functionality or properties*** for the enumerated objects

Correlation vehicle

- Requires ID's for atoms
- ID generator
  - Dedicated enumeration operator
    - Eigenvalues ⇒ rational quaternions ⇒ enumerators
  - Enumeration function
    - Maps enumerators onto ***reference continuum***

RQE = **Rational**

Quaternionic

Enumerator

Reference continuum

- Select a reference Hilbert space
- Criterion is densest packaging of enumerators*.
- Take its Gelfand triple (rigged “Hilbert space”)
  - Has over-countable number of dimensions/base vectors
  - Has operators with continuum eigenspaces
- Select equivalent of enumeration operator in Hilbert space
- Use its eigenspace as reference continuum

*(****Cyclic****: Densest with respect to reference continuum)*

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- ***Hilbert space***
  - Inner product
    - Real
    - Complex
    - Quaternionic
  - Enumerator operator
    - Eigenvalues
      - Rational quaternionic enumerators (RQE's)
    - Enumerates atoms

Enumeration

- ***Hilbert space***
  - Enumerator operator
    - Eigenvalues
      - Rational quaternionic enumerators (RQE's)

Enumeration

- ***Hilbert space***
  - Enumerator operator
    - Eigenvalues
      - Rational quaternionic enumerators (RQE's)
- ***Model***
  - Enumeration function $\mathcal{P}$
    - Parameters
      - RQE's
    - Image
      - Qtargets

Enumeration

- ***Hilbert space***
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- Function $\mathcal{P} = \wp \circ \psi$
  - Blurred $\mathcal{P}$
  - Sharp $\wp$
  - Blur ψ

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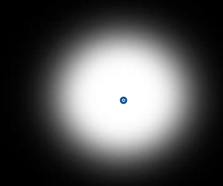
Enumeration function $\mathcal{P}$

- Function $\mathcal{P} = \wp \circ \psi$

  - Blurred $\mathcal{P}$ $\Rightarrow$ Produces **QPAD** $\Rightarrow$ ***Qtarget***
  - Sharp $\wp$ $\Rightarrow$ Produces ***Qpatch***
  - Blur ψ $\Rightarrow$ Produces ***Qpattern***

- **QPAD**
  - **Quaternionic Probability Amplitude Distribution**



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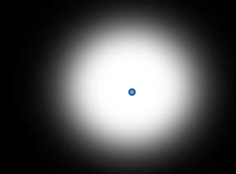
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Only exists at instance of detection

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Curved space

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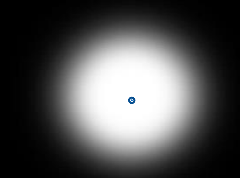

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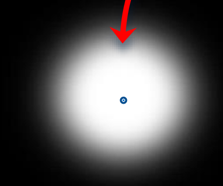

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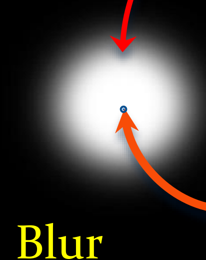


Only exists at instance of detection

Generations per step

- Per progression step only ONE Qtarget is generated per Qpattern
- Generation of the whole Qpattern takes a large amount of progression steps
- When the Qpatch moves, then the pattern spreads out
- When an event (creation, annihilation) occurs, the enumeration generation changes its mode

Why blurred (1D)?

- Real Hilbert space model $\Rrightarrow$ No problem
  - Progression separated
  - Use rational numbers
  - Cohesion not too stiff (otherwise no dynamics!)
    - Keep sufficient interspacing
    - Lowest rational
  - May introduce scaling as function of progression
  - Fixed progression steps

Why blurred (1+1D) ?

- Complex Hilbert space model $\Rightarrow$ No problem
  - Progression at real axis
  - Use rational complex numbers
  - Cohesion not too stiff (otherwise no dynamics!)
    - Keep sufficient interspacing
    - Lowest rational at both axes (separately)
  - May introduce scaling as function of progression
    - No scaling at progression axis

Why blurred (1+3D)?

- Quaternionic Hilbert space model $\Rightarrow$ **Blur required**
  - Progression at real axis
  - Use rational quaternions
  - Cohesion not too stiff (otherwise no dynamics!)
    - Keep sufficient interspacing
    - Lowest rational at all axes (same for imaginary axes)
  - May introduce scaling as function of progression
    - No scaling at progression axis
- Blur installed by enumeration generator

Why blurred (1+3D)?

- Enumerated objects (atoms) are not ordered
  - No origin
    - Affine space
- Enumeration must not introduce extra properties
  - No preferred directions

Solution (no preferred directions)

- Random enumerator generation at lowest scales
- Let Poisson process produce smallest scale enumerator
  - Follow this Poisson process with a binomial process
  - This is installed by a 3D spread function
  - This generates a 3d "Gaussian" distribution

  The distribution represents an isotropic potential of the form

$$\frac{Erf(r)}{r}$$ ***(form of gravitation field)***

  - This quickly reduces to $1/r$ (form of gravitational potential)
  - The result is a ***Qpattern***

Enumerator function $\mathcal{P}$

Convolution

- Blurred function $\mathcal{P} = \wp \circ \psi$
  - Sharp $\wp$ maps ***RQE's*** $\Rightarrow$ ***Qpatches***
  - Blur ψ maps **RQE's** $\Rightarrow$ ***Qtargets***

- Function $\mathcal{P}$
  - Produces **QPAD's**
- Blur ψ
  - Produces ***Qpatterns***
  - ❖ Produces gravitation $(1/r)$
- Sharp $\wp$
  - ❖ Describes space curvature
  - ❖ Delivers metric $d\wp$

Enumerator function $\mathcal{P}$

$$\mathcal{P} = \wp \circ \psi$$

$$\{RQE\} \Longrightarrow \mathcal{P} \Longrightarrow QPAD$$

$$\{RQE\} \Longrightarrow \mathcal{P} \Longrightarrow \{Qtarget\}$$

$$\{RQE\} \Longrightarrow \wp \Longrightarrow \{Qpatch\}$$

$$\{RQE\} \Longrightarrow \psi \Longrightarrow Qpattern$$

$$Palestra = (\{Qpatch\})$$

Palestra

- Curved space
- Represents universe

$$(\{Qpatch\})$$

Embedded in reference continuum

Collection of Qpatches

Mapping

$$\mathcal{P} = \wp \circ \psi$$

Quantum fluid dynamics

Space curvature

Quantum physics

GR

Quaternionic metric

$d\mathcal{P}$

16 partial derivatives

No tensor needed

- Continuity equation
  $\nabla\psi = \phi$
- Dirac equation
  $\nabla_0[\psi] + \boldsymbol{\nabla}\boldsymbol{\alpha}[\psi]$
- In quaternion format
  $\nabla\psi = m\psi *$

Quaternionic physics

How to use

Quaternionic Distributions

and

Quaternionic Probability Amplitude Distributions

The HBM is a quaternionic model

- The HBM concerns quaternionic physics rather than complex physics.
- The peculiarities of the quaternionic Hilbert model are supposed to bubble down to the complex Hilbert space model and to the real Hilbert space model
- The complex Hilbert space model is considered as an abstraction of the quaternionic Hilbert space model
  - This can only be done properly in the right circumstances

Continuous Quaternionic Distributions

- Quaternions

$a = a_0 + \boldsymbol{a}$

$c = ab = a_0 b_0 - \langle \boldsymbol{a}, \boldsymbol{b} \rangle + a_0 \boldsymbol{b} + b_0 \boldsymbol{a} + \boldsymbol{a} \times \boldsymbol{b}$

Two equations

- Quaternionic distributions
  - Differential equation

$g = \nabla f = \nabla_0 f_0 - \langle \boldsymbol{\nabla}, \boldsymbol{f} \rangle + \nabla_0 \boldsymbol{f} + \boldsymbol{\nabla} b_0 + \boldsymbol{\nabla} \times \boldsymbol{b}$

$$\begin{cases} g_0 = \nabla_0 f_0 - \langle \boldsymbol{\nabla}, \boldsymbol{f} \rangle \\ \mathbf{g} = \nabla_0 \boldsymbol{f} + \boldsymbol{\nabla} b_0 + \boldsymbol{\nabla} \times \boldsymbol{b} \end{cases}$$

Three kinds

Differential
Coupling
Continuity
} equation

$\phi = \nabla \psi = m\, \varphi$

Field equations

- $\phi = \nabla\psi$
  - $\phi_0 = \nabla_0\psi_0 - \langle\boldsymbol{\nabla}, \psi\rangle$
  - $\boldsymbol{\phi} = \nabla_0\psi + \boldsymbol{\nabla}\psi_0 + \boldsymbol{\nabla} \times \psi$

Spin of a field:

$$\boldsymbol{\Sigma}_{field} = \int_V \mathfrak{E} \times \boldsymbol{\psi} \, dV$$

- $\mathfrak{E} \equiv \nabla_0\boldsymbol{\psi} + \boldsymbol{\nabla}\psi_0$
- $\mathfrak{B} \equiv \boldsymbol{\nabla} \times \boldsymbol{\psi}$
- $\boldsymbol{\phi} = \mathfrak{E} + \mathfrak{B}$
- $E \equiv |\phi| = \sqrt{\phi_0\phi_0 + \langle\boldsymbol{\phi}, \boldsymbol{\phi}\rangle}$

  $= \sqrt{\phi_0\phi_0 + \langle\mathfrak{E}, \mathfrak{E}\rangle + \langle\mathfrak{B}, \mathfrak{B}\rangle + 2\langle\mathfrak{E}, \mathfrak{B}\rangle}$

Is zero ?

QPAD's

- Quaternionic distribution
  - $f = f_0 + \boldsymbol{f}$

Scalar potential

Vector potential

- Quaternionic Probability Amplitude Distribution
  - $\psi = \psi_0 + \boldsymbol{\psi} = \rho_0 + \rho_0 \boldsymbol{v}$

Density distribution

Current density distribution

QPAD's

- A QPAD represents a Hilbert vector and vice versa
- A QPAD represents a linear proposition and vice versa
- QPAD's have inner product
  - $\langle a|b\rangle = \int_V a\ b\ dV$
- Parseval holds
  - $\langle a|b\rangle = \langle \mathcal{F}a|\mathcal{F}b\rangle = \langle \tilde{a}|\tilde{b}\rangle = \int_{\tilde{V}} \tilde{a}\ \tilde{b}\ d\tilde{V}$
- QPAD's have a norm
  - $|a| = \sqrt{\langle a|a\rangle}$

Coupling equation

- Differential

$$\phi = \nabla\psi = m\varphi$$

$$\psi_0 = \varphi_0$$

$$|\boldsymbol{\psi}| = |\boldsymbol{\varphi}|$$

- Integral

$$\int_V |\psi|^2 \, dV = \int_V |\varphi|^2 \, dV = 1$$

$$\int_V |\phi|^2 \, dV = m^2$$

ψ and φ are normalized

m = total energy = rest mass + kinetic energy

Flat space

Coupling in Fourier space

$$\nabla\psi = \phi = m\,\varphi$$
$$\mathcal{M}\tilde{\psi} = \tilde{\phi} = m\,\tilde{\varphi}$$
$$\langle\tilde{\psi}|\mathcal{M}\tilde{\psi}\rangle = m\,\langle\tilde{\psi}|\tilde{\varphi}\rangle$$

$$\mathcal{M} = \mathcal{M}_0 + \boldsymbol{M}$$
$$\mathcal{M}_0\tilde{\psi}_0 - \langle\boldsymbol{M},\tilde{\boldsymbol{\psi}}\rangle = m\,\tilde{\varphi}_0$$
$$\mathcal{M}_0\boldsymbol{\psi} + \boldsymbol{M}\tilde{\psi}_0 + \boldsymbol{M}\times\tilde{\boldsymbol{\psi}} = m\,\tilde{\boldsymbol{\varphi}}$$

$$\int_{\tilde{V}}\tilde{\phi}^2\,d\tilde{V} = \int_{\tilde{V}}\left(\widetilde{\mathcal{M}\psi}\right)^2 d\tilde{V} = m^2$$

In general $|\tilde{\psi}\rangle$ is not an eigenfunction of operator $\mathcal{M}$.

That is only true when $|\tilde{\psi}\rangle$ and $|\tilde{\varphi}\rangle$ are equal.

For elementary particles they are equal apart from their difference in discrete symmetry.

Dirac equation

Flat space

$$\nabla_0[\psi] + \boldsymbol{\nabla\alpha}[\psi] = m\beta[\psi]$$

- Spinor $[\psi]$
- Dirac matrices $\boldsymbol{\alpha}$, β
  - $\nabla_0\psi_R + \boldsymbol{\nabla}\psi_R = m\psi_L$
  - $\nabla_0\psi_L - \boldsymbol{\nabla}\psi_L = m\psi_R$
- In quaternion format
  - $\nabla\psi = m\psi^*$
  - $\nabla^*\psi^* = m\psi$

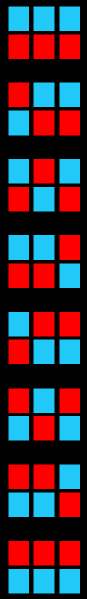
$$\psi_R = \psi_L^* = \psi_0 + \boldsymbol{\psi}$$

Qpattern

Elementary particles

- Coupling equation
  - $\nabla\psi^x = m\,\psi^y$
  - $(\nabla\psi^x)^* = m\,(\psi^y)^*$
- Coupling occurs between pairs
  - $\{\psi^x, \psi^y\}$
- Colors
  - N, R, G, B, $\overline{\text{R}}$, $\overline{\text{G}}$, $\overline{\text{B}}$, W
- Right and left handedness
  - **R,L**

Sign flavors



$\boldsymbol{\psi}^{\textcircled{0}}$ N **R**

$\boldsymbol{\psi}^{\textcircled{1}}$ R **L**

$\boldsymbol{\psi}^{\textcircled{2}}$ G **L**

$\boldsymbol{\psi}^{\textcircled{3}}$ B **L**

$\boldsymbol{\psi}^{\textcircled{4}}$ $\bar{B}$ **R**

$\boldsymbol{\psi}^{\textcircled{5}}$ $\bar{G}$ **R**

$\boldsymbol{\psi}^{\textcircled{6}}$ $\bar{R}$ **R**

$\boldsymbol{\psi}^{\textcircled{7}}$ $\bar{N}$ **L**

Discrete symmetries

Spin

- HYPOTHESIS : Spin relates to the fact whether the coupled Qpattern is the reference Qpattern.
- Each generation has its own reference Qpattern.
- Fermions couple to the reference Qpattern.
- Fermions have half integer spin.
- Bosons have integer spin.
- The spin of a composite equals the sum of the spins of its components.

Electric charge

- HYPOTHESIS : Electric charge depends on the difference and direction of the base vectors for the Qpattern pair.
- Each sign difference stands for one third of a full electric charge.
- Further it depends on the fact whether the handedness differs.
- If the handedness differs then the sign of the count is changed as well.

Color charge

- HYPOTHESIS : Color charge is related to the direction of the anisotropy of the considered Qpattern with respect to the reference Qpattern.
- The anisotropy lays in the discrete symmetry of the imaginary part.
- The color charge of the reference Qpattern is white.
- The corresponding anti-color is black.
- The color charge of the coupled pair is determined by the colors of its members.

- All composite particles are black or white.
- The neutral colors black and white correspond to isotropic Qpatterns.

- Currently, color charge cannot be measured.
- In the Standard Model the existence of color charge is derived via the Pauli principle.

Total energy

- Mass is related to the number of involved Qpatches.
- It is directly related to the square root of the volume integral of the square of the local field energy E.
- Any internal kinetic energy is included in E.
- The same mass rule holds for composite particles.
- The fields of the composite particles are dynamic superpositions of the fields of their components.

Leptons

Pair	s-type	e-charge	c-charge	Handed ness	SM Name
$\{\psi^{⑦}, \psi^{⓪}\}$	fermion	-1	N	LR	electron
$\{\psi^{⓪}, \psi^{⑦}\}$	Anti-fermion	+1	W	RL	positron

Quarks

Pair	s-type	e-charge	c-charge	Handedness	SM Name
$\{\psi^{①}, \psi^{⓪}\}$	fermion	-1/3	R	LR	down-quark
$\{\psi^{⑥}, \psi^{⑦}\}$	Anti-fermion	+1/3	$\bar{R}$	RL	Anti-down-quark
$\{\psi^{②}, \psi^{⓪}\}$	fermion	-1/3	G	LR	down-quark
$\{\psi^{⑤}, \psi^{⑦}\}$	Anti-fermion	+1/3	$\bar{G}$	RL	Anti-down-quark
$\{\psi^{③}, \psi^{⓪}\}$	fermion	-1/3	B	LR	down-quark
$\{\psi^{④}, \psi^{⑦}\}$	Anti-fermion	+1/3	$\bar{B}$	RL	Anti-down-quark
$\{\psi^{④}, \psi^{⓪}\}$	fermion	+2/3	$\bar{B}$	RR	up-quark
$\{\psi^{③}, \psi^{⑦}\}$	Anti-fermion	-2/3	B	LL	Anti-up-quark
$\{\psi^{⑤}, \psi^{⓪}\}$	fermion	+2/3	$\bar{G}$	RR	up-quark
$\{\psi^{②}, \psi^{⑦}\}$	Anti-fermion	-2/3	G	LL	Anti-up-quark
$\{\psi^{⑥}, \psi^{⓪}\}$	fermion	+2/3	$\bar{R}$	RR	up-quark
$\{\psi^{①}, \psi^{⑦}\}$	Anti-fermion	-2/3	R	LL	Anti-up-quark

Reverse quarks

Pair	s-type	e-charge	c-charge	Handedness	SM Name
$\{\psi^{⓪},\psi^{①}\}$	fermion	+1/3	R	RL	down-r-quark
$\{\psi^{⑦},\psi^{⑥}\}$	Anti-fermion	-1/3	$\bar{R}$	LR	Anti-down-r-quark
$\{\psi^{⓪},\psi^{②}\}$	fermion	+1/3	G	RL	down-r-quark
$\{\psi^{⑦},\psi^{⑤}\}$	Anti-fermion	-1/3	$\bar{G}$	LR	Anti-down-r-quark
$\{\psi^{⓪},\psi^{③}\}$	fermion	+1/3	B	RL	down-r-quark
$\{\psi^{⑦},\psi^{④}\}$	Anti-fermion	-1/3	$\bar{B}$	LR	Anti-down-r_quark
$\{\psi^{⓪},\psi^{④}\}$	fermion	-2/3	$\bar{B}$	RR	up-r-quark
$\{\psi^{⑦},\psi^{③}\}$	Anti-fermion	+2/3	B	LL	Anti-up-r-quark
$\{\psi^{⓪},\psi^{⑤}\}$	fermion	-2/3	$\bar{G}$	RR	up-r-quark
$\{\psi^{⑦},\psi^{②}\}$	Anti-fermion	+2/3	G	LL	Anti-up-r-quark
$\{\psi^{⓪},\psi^{⑥}\}$	fermion	-2/3	$\bar{R}$	RR	up-r-quark
$\{\psi^{⑦},\psi^{①}\}$	Anti-fermion	+2/3	R	LL	Anti-up-r-quark

W-particles

$\{\psi^{\textcircled{6}},\psi^{\textcircled{1}}\}$	**boson**	**-1**	$\bar{R}R$	**RL**	W_{-}
$\{\psi^{\textcircled{1}},\psi^{\textcircled{6}}\}$	Anti-boson	+1	$R\bar{R}$	LR	W_{+}
$\{\psi^{\textcircled{6}},\psi^{\textcircled{2}}\}$	boson	-1	$\bar{R}G$	RL	W_{-}
$\{\psi^{\textcircled{2}},\psi^{\textcircled{6}}\}$	Anti-boson	+1	$G\bar{R}$	LR	W_{+}
$\{\psi^{\textcircled{6}},\psi^{\textcircled{3}}\}$	boson	-1	$\bar{R}B$	RL	W_{-}
$\{\psi^{\textcircled{3}},\psi^{\textcircled{6}}\}$	Anti-boson	+1	$B\bar{R}$	LR	W_{+}
$\{\psi^{\textcircled{5}},\psi^{\textcircled{1}}\}$	boson	-1	$\bar{G}G$	RL	W_{-}
$\{\psi^{\textcircled{1}},\psi^{\textcircled{5}}\}$	Anti-boson	+1	$G\bar{G}$	LR	W_{+}
$\{\psi^{\textcircled{5}},\psi^{\textcircled{2}}\}$	boson	-1	$\bar{G}G$	RL	W_{-}
$\{\psi^{\textcircled{2}},\psi^{\textcircled{5}}\}$	Anti-boson	+1	$G\bar{G}$	LR	W_{+}
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$\{\psi^{\textcircled{4}},\psi^{\textcircled{1}}\}$	boson	-1	$\bar{B}R$	RL	W_{-}
$\{\psi^{\textcircled{1}},\psi^{\textcircled{4}}\}$	Anti-boson	+1	$R\bar{B}$	LR	W_{+}
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$\{\psi^{⑤}, \psi^{⑥}\}$	Anti-boson	0	$\overline{\mathrm{G}}\overline{\mathrm{R}}$	RR	Z
$\{\psi^{③}, \psi^{①}\}$	boson	0	BR	LL	Z
$\{\psi^{④}, \psi^{⑥}\}$	Anti-boson	0	$\overline{\mathrm{R}}\overline{\mathrm{B}}$	RR	Z
$\{\psi^{③}, \psi^{②}\}$	boson	0	BR	LL	Z
$\{\psi^{④}, \psi^{⑤}\}$	Anti-boson	0	$\overline{\mathrm{R}}\overline{\mathrm{B}}$	RR	Z
$\{\psi^{①}, \psi^{②}\}$	boson	0	RG	LL	Z
$\{\psi^{⑥}, \psi^{⑤}\}$	Anti-boson	0	$\overline{\mathrm{R}}\overline{\mathrm{G}}$	RR	Z
$\{\psi^{①}, \psi^{③}\}$	boson	0	RB	LL	Z
$\{\psi^{⑥}, \psi^{④}\}$	Anti-boson	0	$\overline{\mathrm{R}}\overline{\mathrm{B}}$	RR	Z
$\{\psi^{②}, \psi^{③}\}$	boson	0	RB	LL	Z
$\{\psi^{⑤}, \psi^{④}\}$	Anti-boson	0	$\overline{\mathrm{R}}\overline{\mathrm{B}}$	RR	Z

Neutrinos

type	s-type	e-charge	c-charge	Handedness	SM Name
$\{\psi^{⑦}, \psi^{⑦}\}$	fermion	0	NN	RR	neutrino
$\{\psi^{⓪}, \psi^{⓪}\}$	Anti-fermion	0	WW	LL	neutrino
$\{\psi^{⑥}, \psi^{⑥}\}$	boson?	0	$\overline{R}\overline{R}$	RR	neutrino
$\{\psi^{①}, \psi^{①}\}$	Anti- boson?	0	RR	LL	neutrino
$\{\psi^{⑤}, \psi^{⑤}\}$	boson?	0	$\overline{G}\overline{G}$	RR	neutrino
$\{\psi^{②}, \psi^{②}\}$	Anti- boson?	0	GG	LL	neutrino
$\{\psi^{④}, \psi^{④}\}$	boson?	0	$\overline{B}\overline{B}$	RR	neutrino
$\{\psi^{③}, \psi^{③}\}$	Anti- boson?	0	BB	LL	neutrino

Photons & gluons

type	s-type	e-charge	c-charge	Handedness	SM Name
$\{\psi^{⑦}\}$	boson	0	N	R	photon
$\{\psi^{⓪}\}$	boson	0	W	L	photon
$\{\psi^{⑥}\}$	boson	0	$\overline{R}$	R	gluon
$\{\psi^{①}\}$	boson	0	R	L	gluon
$\{\psi^{⑤}\}$	boson	0	$\overline{G}$	R	gluon
$\{\psi^{②}\}$	boson	0	G	L	gluon
$\{\psi^{④}\}$	boson	0	$\overline{B}$	R	gluon
$\{\psi^{③}\}$	boson	0	B	L	gluon

Photons & gluons

Photons and gluons are better interpreted as Qpatterns in the canonical conjugated space

Generation modes

- Qpatterns can be generated
  - in configuration space
  - in canonical conjugated space
- Quantum state functions of particles are generated in configuration space
- Photons and gluons are generated in the canonical conjugated space
- The coupled field is not generated
  - It is constituted from the tails of quantum state functions of distant particles

Quanta

The noise of low dose imaging

Low dose X-ray imaging

Film of cold cathode emission