

Perfectoid Quantum Physics and Diamond Nonlocality

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Diamond

1. $\mathcal{Y}_{S,E}^\diamond = S \times (\text{Spa}\mathcal{O}_E)^\diamond$ [5]

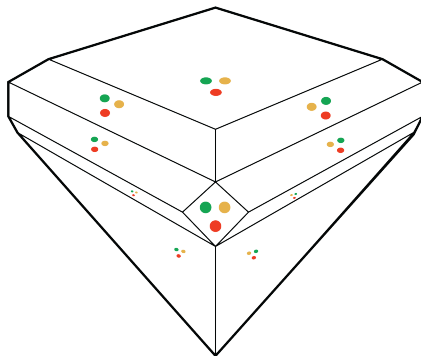


Figure: Geometric Point $\text{Spa}(C) \rightarrow \mathcal{D}$ [1]

Diamond

1. \diamond product: $SpdQ_p \times_{\diamond} SpdQ_p$ [5]

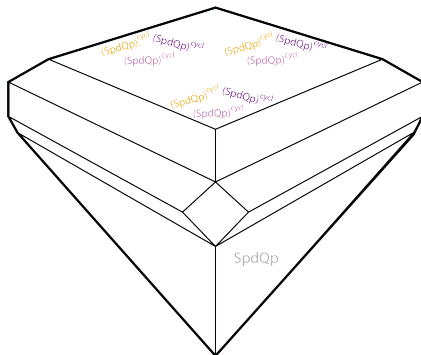


Figure: Diamond $SpdQ_p = Spa(Q_p^{cycl}) / \underline{Z_p^\times}$ [1]

Relative Fargues-Fontaine Curve, Gluing

1. Diagram of diamonds glues [5]:

$$\begin{array}{ccc} \mathcal{Y}_{S,E}^{\blacklozenge} & \xlongequal{\quad} & S \times (\mathrm{Spa} \mathcal{O}_E)^{\blacklozenge} \\ \uparrow & & \uparrow \\ Y_{S,E}^{\blacklozenge} & \xlongequal{\quad} & S \times (\mathrm{Spa} E)^{\blacklozenge} \\ \downarrow & & \downarrow \\ X_{S,E}^{\blacklozenge} & \xlongequal{\quad} & Y_{S,E}^{\blacklozenge} / \phi_S^{\blacklozenge} \end{array}$$

Figure: Diamonds Gluing [1]

Perfectoid Dictionary [2]

Quantum Physics

Hilbert space

state vectors

\otimes product

nonlocality

superposition

wavefunction collapse

holographic principal

quantum topology

operator algebra

unitarity

Perfectoid Quantum Physics

perfectoid space

geometric points $Spa(C) \rightarrow \mathcal{D}$

\diamond product $SpdQ_p \times_{\diamond} SpdQ_p$

profininitely copies of $Spa(C)$

pro-'etale sheaves on Perf; profinite sets

tilting; perfectoid modular curves S_{K^p}

six functor formalism

'etale cohomology of diamonds

non-Noetherian complete valuation ring

pro-'etale descent datum

Reconstruct Holographic Principle from Diamonds [2]

1. $K^{Efimov}(\mathcal{Y}_{S,E}^\diamond)$ [1]
2. $-\otimes_{\Lambda}^{\mathbb{L}} - : D'_{et}(X, \Lambda) \times D'_{et}(X, \Lambda) \rightarrow D'_{et}(X, \Lambda)$ [4]
3. $R\mathcal{H}om_{\Lambda}(-, -) : D'_{et}(X, \Lambda)^{op} \times D'_{et}(X, \Lambda) \rightarrow D'_{et}(X, \Lambda)$ [4]
4. $f^* : D'_{et}(X, \Lambda) \rightarrow D(Y, \Lambda)$ [4]
5. $\mathcal{R}f_* : D'_{et}(Y, \Lambda) \rightarrow D'_{et}(X, \Lambda)$ [4]
6. $\mathcal{R}f_! : D'_{et}(Y, \Lambda) \rightarrow D'_{et}(X, \Lambda)$ [4]
7. $\mathcal{R}f^! : D'_{et}(X, \Lambda) \rightarrow D'_{et}(Y, \Lambda)$ [4]

Holographic Principle

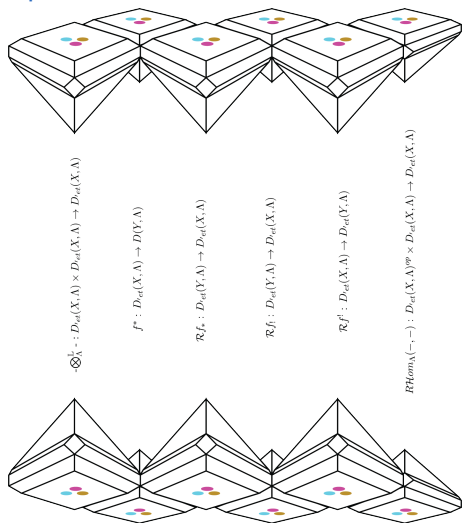


Figure: Diamond Quantum Gravity [1]

Diamond Nonlocality

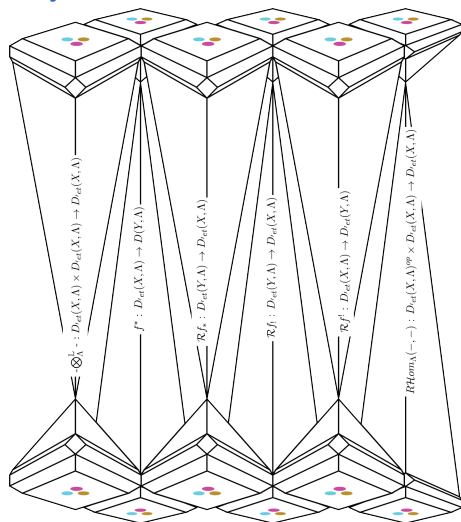







Figure: Diamond Nonlocality in Six Operations [1]

-  Dobson, S., *Efimov K-theory of Diamonds*, in preparation.
-  Dobson, S., *Perfectoid Quantum Physics and Diamond Nonlocality*, in preparation.
-  Fargues, L., *Geometrization of Local Correspondence, an Overview*, arXiv:1602.00999 [math.NT].
-  Scholze, P., *'Etale Cohomology of Diamonds*, arXiv:1709.07343 [math.AG], 2017.
-  Scholze, P. and Weinstein, J. *Berkeley Lectures on P-adic Geometry*, Princeton University Press, 2020.