About the QFLCA Project

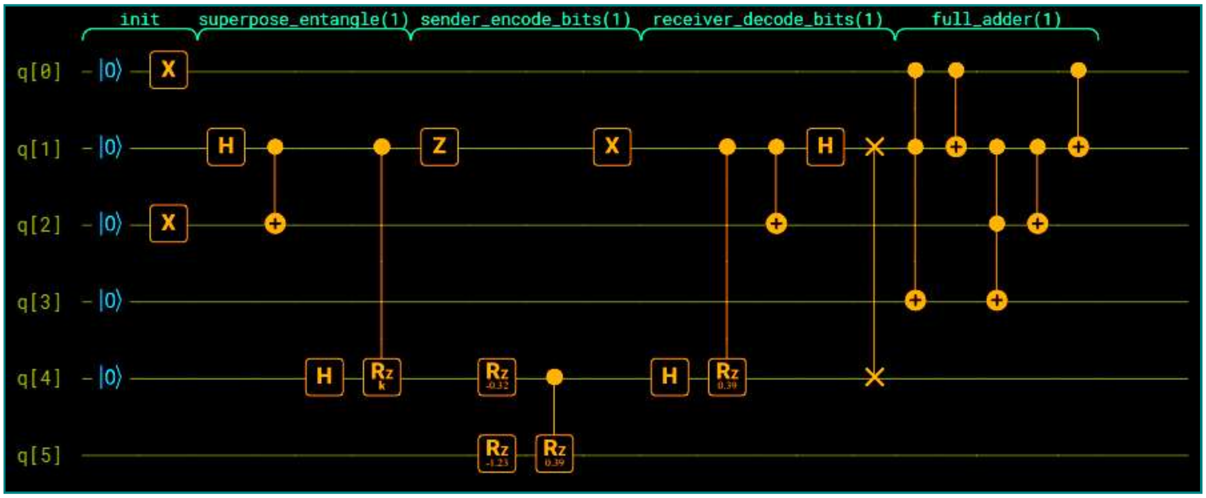
Project Overview

For a similar QDF measurement example, see [Fig. 16 on this page](#)

The QFLCA project is presented as follows:

- QFLCA as Quantum AI for System Simulation.
- QFLCA as an intelligent decision support simulator/solution (IDSS) for users active in industry 4.0 systems, law, forensics, security systems, medicine, physics, engineering, computing, and other fields of science.
- QFLCA can be used to detect system states and make strong state predictions through quantum double-field analysis. That is, using quantum scalar field technique to double the probability ($\mathcal{P}$) of each system state in its state transition from one fom to another.
- Uses quantum superposition and entanglement, predicts and suggests new energy paths for the user to take and make the system more efficient in its performance and evolution involving particles on any scale.
- Among other features of the QFLCA project is making the environment more sustainable on quantum and macro levels such as climate, human body (medical treatments such as cancer, viruses, etc.) based on strong predictions of $\mathcal{P}$'s projected between quantum fields within each systems for alternative efficient paths to take (to reduce uncertainty) intelligently as its main goal and objectives.

Progress and Expected Outcomes



Show: QDF Circuit | Circuit Histogram | Stop Fade Animation: ☑

Fig. 1: A quantum double-field (QDF) circuit with a strong prediction of system states, as the circuit's histogram on expected $\mathcal{P}$'s, from [1]. A QDF is developed from a single field particle (SF) transformation under a scalar κ, as discussed in Refs. [1], [2], and [3].

A scalar κ associated with a particle field Ψ by a sum (factor) of doubles of the speed of light c through superposition and entanglement as $2nc$. A photon field of Φ based on photon-particle interaction can transform Ψ via scalar κ as $|\kappa\Phi \longrightarrow \Psi^2 d^2|$. This doubles the probability and distance correlation between a particle pair in their pairwise fields $\Psi\Phi$ which can be measured with the assumption of having at least one superposed qubit between an input state and output state with an energy change needed to cause a phase transition. This makes a strong prediction of an event or a set of events possible, also rerouting energy states and their transition (events known as a phase transition of one matter state to another) for better efficiency of the system at every point in space achievable. In major, system efficiency such as cooling vs. heating, symmetry, equilibrium can be measured by employing this metric into a system as one determines input/output states by sensors and thus their distances based on $2d = 2nct$, where t is the time of an event occurrence (state transition) on any thermodynamic system scale. The animated screenshot below from the website title incorporates this field's sum concept in the quantum double-field (QDF) circuit. Click on the video, or gif button, to play the 1D (one-dimensional) QDF circuit example in a loop, or run both, the video and gif in parallel:

QDF circuit target and achievement:

1. The fraction result e.g., $\{⅓,\ ½,\ ⅔, \ldots ¹⁄\}$ for $\mathcal{N} \geq 3$ particles from the adder Hamiltonian count is of the uncertainty in counting how many qubits have collapsed as classical bits now counted (right side of circuit resulted from the circuit's left side input) based on superposition. QDF dataset on this count must have:

   `{superposition-based positive integer as part of fraction count from a QDF}={greater entropy ∨ greater event's uncertainty} ⟶ (0, ∞].`

   where '∨' denotes logical OR which implies either condition can be true approaching (denoted by '⟶') values > 0 and infinity, as a true outcome.

2. The positive integer result for $\mathcal{N} \geq 3$ particles as $\{⅓ \longrightarrow ½ \longrightarrow ⅔ \longrightarrow 1, \ldots, \longrightarrow 2, \ldots, \longrightarrow 3, \ldots \longrightarrow \mathcal{N}\}$ from the adder Hamiltonian count is of the certainty in counting how many qubits have collapsed as classical bits now counted (the right side of the circuit results from the left side of circuit's input) based on entanglement. The QDF dataset on this count depends on measuring entanglement entropy as follows:

   `{entanglement-based positive integer count from a QDF}={approaches zero entropy ∧ reducing event's uncertainty} ⟶ 0.`

   where '∧' denotes logical AND which implies both conditions need to be true approaching (denoted by '⟶') 0, as a true outcome. Otherwise, it is an error in the QDF measurement of the circuit and applies to one of the conditions in #1 target above (superposition).

   Achievement: This entanglement is developed after superposition predicting the opposite state within a QDF of particle-pair (two particles) not one in superposition. Thus, a full collapse of a qubit is predicted prior to count number of expected success probabilities $\langle \mathcal{P}_{\text{success}} \rangle$ of 1 or 100% predicted. See [2], as an expected outcome exemplified in Fig. 2.

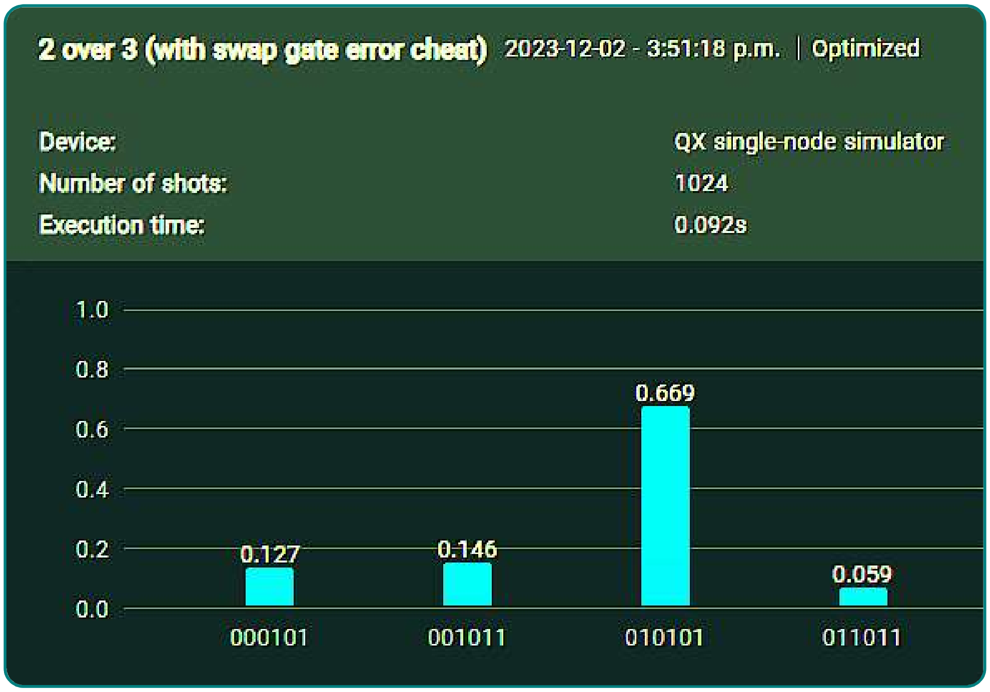


Fig. 2: Figure 1's Histogram as a dataset example showing a "desired Hamiltonian" (target state as circuit's expected outcome) [1] for a qubit-pair with a $\mathcal{P} \geq ½$. For different datasets denoting different circuit outcomes based on recorded $\mathcal{P}$'s (scenarios), visit the QFLCA Workflow page for demo and code run in python.

3. Plotting between the two scenarios is absolutely kappa (κ) scalar dependent on the transformation as denoted by the QDF circuit in any form of 1D, 2D connected circuit and more. The main equation is formulated throughout Refs. [1]-[3] as Eq. (53) from [3] to validate input results for each QDF dataset. See this QDF equation (formulaic) input below in the Project Objectives section to try this measurement.

Reset Animation

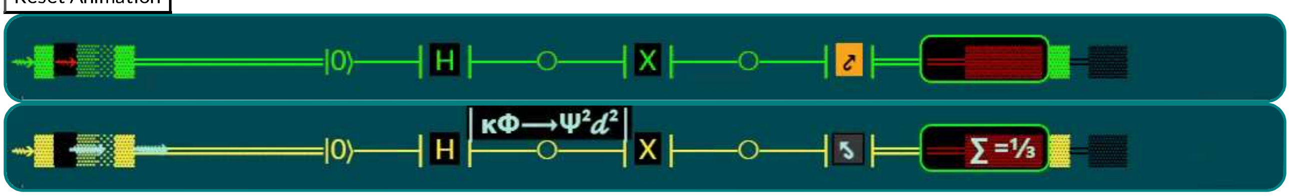
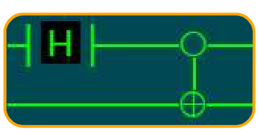


Fig. 3: 1D SF-to-QDF incomplete circuits running in parallel. The complete QDF circuit is Fig. 1 expanding the incomplete circuit for a configuration with expected probabilities ≥ 2/3 (Fig. 2).

▼ i QDF circuit legend and animation. . .

- | H | Hadamard quantum logic gate. See circuit layout of its use and description on p. of [2].
- | X | Pauli-X (or the NOT classical gate) quantum logic gate. See circuit layout of its use and description in Figs. 5 and 6 of [1].
- 

  CNOT (or Controlled NOT) gate creating entanglement between qubits

  This applies to more than one 1D *connected parallel lines* within a complete QDF circuit [1]. The *complete QDF circuit* includes a | Z | gate and can be viewed via this link 🔗. The current section's circuit figure denotes this.

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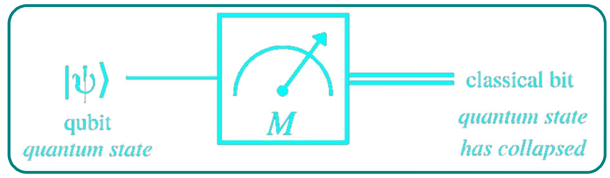
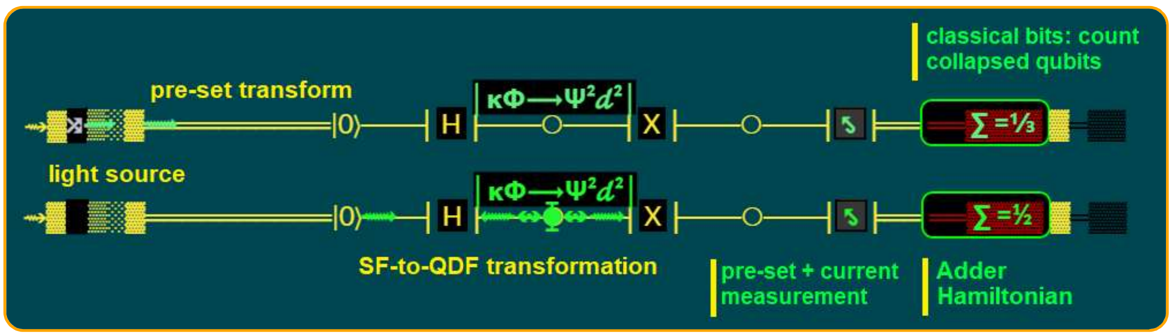
|0⟩ initialized qubit in state 0.	◓ a definite state e.g., ground state, spin up or 0. For a photon, vertically polarized.	◒ a definite state e.g., excited state, spin down or 1. For a photon, horizontally polarized.

| ↰ | quantum circuit measurement (qubit gauge) occurring.
| ↱ | no measurement done, yet prepared to operate, or done. The latter time-step is after measurement when event results are recorded as a QFLCA dataset.
Conventional symbol used elsewhere:



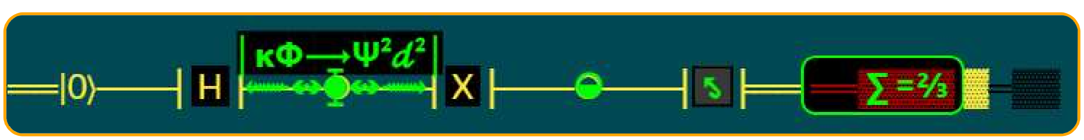
: An SF-to-QDF product as a photon-particle interaction ( ), resulting in a qubit-pair state observation. This is the expected measurement outcome based on a strong prediction outcome to reduce the uncertainty i.e., mapping from achievement #1 to achievement #2.

: A QDF-to-classical bit product as a photon readout from the qubit-pair ( ), resulting in a classical state observation. This is the expected measurement outcome based on a strong state prediction/certainty as achievement #2.

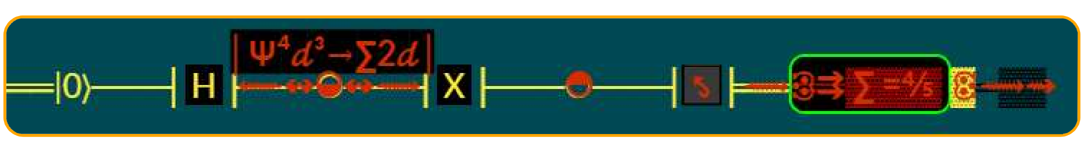
- 

Upper circuit: 1D SF-to-QDF incomplete circuit. Preset photonic measurement prior to scalar κ transformation of a particle field Ψ as as $|\kappa\Phi\longrightarrow\Psi^2 d^2|$. From the left, the photon from a light source (described by a proposed heat engine in [1, Fig. 1]) as a photonic field Φ projects on the particle field Ψ for an SF-to-QDF transformation, where at first uncertainty and superposition is expected (achievement #1) during measurement (right side).

Bottom circuit: same circuit performing post measurement after "superpositions, randomness, and interference" (via $|H|$) between gates (qubit pairs). This is assuming entanglement is created (achievement #2) by $|H|$ and a CNOT gate (not seen here) according to the QDF circuit configuration, or see current section's circuit figure. Direct link to view this circuit in detail is Fig. 5 or 6 of [1].

- 

Certainty measure against uncertainty by doubling the field in ST $\mathcal{P}$'s as $\langle\mathcal{P}\rangle \geq 2\times⅓ \geq ⅔$, expected during a scalar κ transformation of a particle field Ψ as $|\kappa\Phi\longrightarrow\Psi^2 d^2|$. This is mapping from achievement #1 to achievement #2, or entanglement developed from superposition satisfying certainty per expected measurement outcome (adder Hamiltonian output).

- 

Strong prediction measure of $\langle\mathcal{P}_{\text{success}}\rangle \longrightarrow 1$, expected after a scalar κ transformation of a particle field Ψ via Φ as $|\Psi^4 d^3 \rightarrow \sum 2d|$. This is achievement #2.

▼ i QDF's one-to-more parallel circuit description. . .

When both the gif and video versions run, asynchronous/synchronous transformations of the single-field (SF) to QDF are observed [1] and [2].

- ⚠ Note on the QDF circuit: ✅ Undertaking the simulation of the above parallel runs, frame-by-frame, can provide useful information to suggest a QAI input/output map to the user using this quantum circuit as an IDSS [2].
- ⚠ Note on the QDF circuit expected outcomes: ◆ A future presentation of this page for this level of programming using "cases" or "if-else statements" for particular sync and async frames in javascript or python for each QDF transformation is the expected outcome of this project.

▼ i Expand/Collapse All. . .

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* Click  Expand All  to view all code blocks from QAI-LCode_QFLCC.py on this page.
* Click  Collapse All  to selectively view a code block from QAI-LCode_QFLCC.py on this page.
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Expand All | Collapse All

Summary of progress and application: Prediction of combustion events as a phase transition occurring in the system, is detected by using photonic probes and sensors once atoms are sampled within a quantum heat engine. The engine incorporates a quantum double-field (QDF) lens function [1], as a new function which focuses/defocuses probability distribution values in the system. In major, system efficiency such as cooling vs. heating, symmetry, equilibrium can be measured by employing this quantum field distance metric into a system as one determines input/output states by sensors and predict their distances to reduce uncertainty (entropy) over time for an event occurrence (state transition) on any system scale. Its distance metrics makes accurate event predictions (data sampling and analysis from a quantum atomic/molecular scale) on a macro (large) scale in any heat engine built as a final product in numerous industries e.g. medicine (prediction on e.g., cells prone to cancer as a dynamical phase transition), aviation, automobiles, processors, meteorology, etc. The algorithm predicts events as an intelligent decision (support) simulator/solution (IDSS) [2], suggesting alternative energy paths to the user by visualizing (image-based map) real-time data with feedback addressing atomic (non)-interactions from one point to another. This is all about assuring quality in terms of maximizing system efficiency and performance.

QFLCA technical summary: Maximize system efficiency in determining the scalar behavior of entanglement (discussed in EE scaling and Eq. (16) from [1]) by a κ-based QDF transformation [1] and strong prediction doubling the state transition (ST) probability in the density matrix [3]. This is step #4 of the algorithm from p. 9 of the published article:

[1] Quantum field lens coding and classification algorithm to predict measurement outcomes
Philip B. Alipour and T. Aaron Gulliver

For validation purposes of the QFLCA dataset, this operational step correlates to the 4th objective below in the strong prediction [3] context.

OBJ Project Objectives

The current QFLCA simulates and predict system events which should achieve the following research goal (4th objective) and objectives (first three objectives):

1. Employ system simulation models as the 1st objective, which is a quantum field theory (QFTh) simulation method. The method simulates QFTh to construct physical models that measure e.g., particle interactions.
2. Compare models' limitations and strengths as the 2nd objective.
3. Visualize events, their probabilities and predict them reliably to determine system efficiency, and suggest alternative energy paths to achieve a desired Hamiltonian [1] (target state) of the system.
4. The goal is to achieve a universal QFCM (UQFCM) [2] for the strongest system state prediction based on the results of model comparisons from the 1st through 3rd objectives.

Extracted from:

[2] Quantum AI and hybrid simulators for a Universal Quantum Field Computation Model
Philip B. Alipour and T. Aaron Gulliver

Input QDF ST probability value (formula):

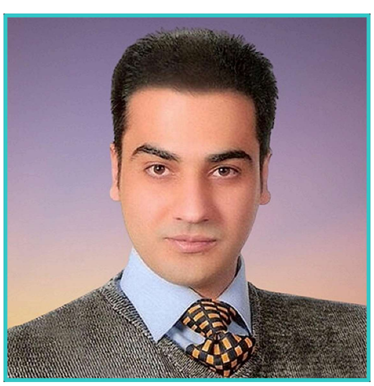
(4(N-1)^2)/(9(N*(N-1)/2)*ν) where N >= 3, 1 >= ν >= 8/9

Input value & calculate | Input default value & calculate | Input default range & plot

Equation (53) for strong QDF ST predictions is from:

[3] Quantum Double-field Model and Application
Philip B. Alipour and T. Aaron Gulliver

ⓘ About the Author



Dr. Philip Baback Alipour with a multicultural background and multiple citizenships (Canadian, mix of Persian and else), lived in different countries, was born in the Philippines, raised in the USA and now an active researcher in interdisciplinary fields of Computational, Electrical Engineering and Quantum Physics in Canada, USA and Sweden. Since his BSc (Hons) degree in the UK relative to postgraduate studies, he received his MSc and PhD respectively in Computer Science, Electrical Engineering and Quantum Physics from Lincoln University in the UK, BTH in Sweden, and Victoria University (UVic) in Canada . He has been active within the norms of physics, mathematics, engineering and applied sciences in a homogeneous manner (unification of their fields rather than treating them heterogeneously). The pragmatics of his quantum models, books and journal publications, has promoted concepts useful to global needs, advances in cutting-edge technologies (sustainable energy solutions, AI, quantum computing, etc.), ethics and well-being.

Current focus: Scalar quantum double-field (QDF) and distance metrics as a novel idea contribute in advances of science being made today over a decade ago. One can measure the key distance of two events (pairwise) by a new quantum lens function which focuses/defocuses probability distribution values in the system. In major, system efficiency such as cooling vs. heating, symmetry, equilibrium can be measured by employing this quantum field distance metric into a system as one determines input/output states by sensors and predict their distances to reduce uncertainty (entropy) over time for an event occurrence (state transition) on any system scale. See current project's expected outcomes.

Research interests are as follows: Mathematical, Physical, Computer Science, Software, Electrical Engineering, Knowledge Engineering and Business Intelligence. For more information on research notes, inventions, awards and publications see Author's ORCID for profile and research work information: 0000-0003-1037-018X

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P. B. A. and Dr. T. Aaron Gulliver thank Dr. T. Lu for comments on scalar fields, dimensions and photonics, Dr. M. Laca for comments on equations that contribute to system state probabilities, Dr. N. Neumann remarks on QAI classifiers [1], Dr. K. S. Søilen for classical prediction ideas to weigh $\mathcal{P}$'s and their certainty correlation, adding a dimension to the QAI map (witch the QDF Game Demo) to enhance strong prediction projections from combined datasets, and the late Dr. F. Diacu for his input on phase transitions to parameterize their quantum probabilities in the QDF model employing datasets.

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