ALTAMIRA

Unique Qualifications & Capabilities:

- Quantum Process Characterization
  - Gate Set Tomography (GST)
  - Randomized Benchmarking
  - Mutually Unbiased Bases
  - Error bars and statistics
  - Compressive sensing
- Multi-Qubit Simulations & Choreography
  - Dynamically, actively controlled
  - Open-system, chain-boson model
  - Markovian and non-Markovian
- Selected References
  - March Meeting T38.00005 (2015)
  - arXiv:1303.3490 (2013)
  - JMP, 50, 012107 (2009)
  - PRB, 78, 014302 (2008)
  - PRL, 90, 087901 (2003)

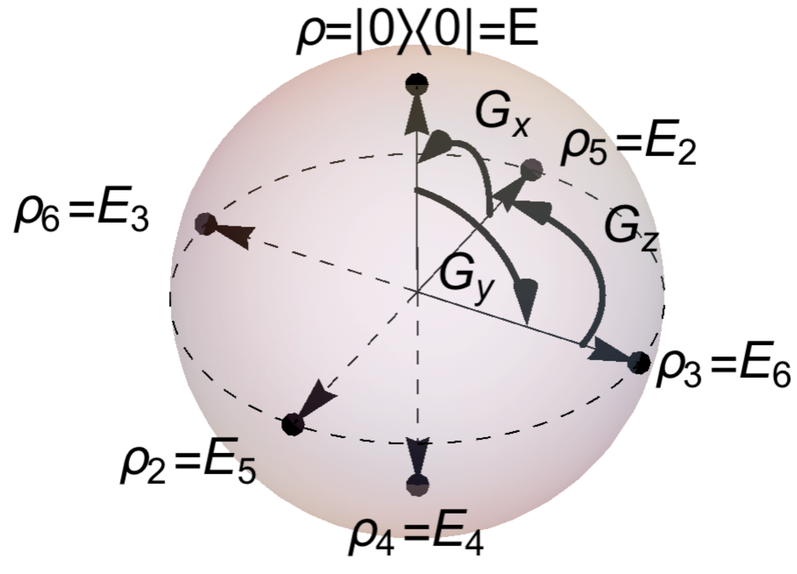
We are interested in supporting:

- Full characterization of multi-qubit errors
  - Experiment design and statistics
  - Maximum likelihood with error bars
  - Including correlations and crosstalk
- Simulations to understand and fix errors
  - Open-system master equations
  - Time dependent, non-Markovian
  - Dynamically controlled, corrected
- Computer Aided Design & Choreography
  - Higher fidelity physical qubits
  - Open-loop qubit control during ops
  - Closed-loop feedback scheduling

Figure: GST on the Bloch Sphere

Gates: G_k={Null, G_x, G_y, G_z, Idle}

Fiducials: F_i={Null, G_x, G_y, G_x^2, G_x^3, G_y^3}



Tómos: $D_{ijk} \approx \mathrm{Tr}[E\ F_i(G_k(F_j(\rho)))] \equiv \langle\langle E_i|G_k|\rho_j\rangle\rangle$

$\langle\langle E_i|G_k^n|\rho_j\rangle\rangle$, $\langle\langle E_i|(G_k G_l)^n|\rho_j\rangle\rangle$, $\langle\langle E_i|(G_k G_l G_m)^n|\rho_j\rangle\rangle$

Areas of interest:

- Non-Markovian correlations, crosstalk
  - Boson exchange
  - Residual entanglement
  - Active resets
- Protective collective behavior
  - Sub- and/or super-radiance
  - Meta-stable logical states
- Quantum error correction & control
  - Open loop
  - Active, closed-loop
  - Autonomous

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Full Spectrum Innovation

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