Exact topological quantization of a physical observable is a phenomenon which occurs in some idealized well-known systems. In the field of condensed matter physics, there are principally two effects given rise to such a quantization outlined by an integer topological number called first Chern number (or Chern index): the AC Josephson Effect (ACJE) and miscellaneous quantum Hall conductances (e.g. Integer Quantum Hall Effect — IQHE — in 2D and 3D, Spin Hall Effect). Due to the topological nature of the Chern index, these quantum process present an intrinsic robustness towards unavoidable experimental imperfections. This is why they are de facto strongly interesting for metrological purposes.

In order to redefine physical standards, one of the actual challenges is to close the so-called metrological triangle which vertices are the ultra-precisely known unit of time (second), and the electrical units of voltage (Volt) and current (Ampère). Volt and second are linked by the ACJE, whereas the IQHE converts Volt into Ampère. It remains to relate Ampère to second. While some researches focus on normal single electron pumps or hybrid single electron transistors, one studies an entire superconducting quantum circuit named Cooper Pair Pump (CPP), polarized in phase [1]. This is simply composed of two islands each submitted to a gate voltage (resp. $V_{g1}$ and $V_{g2}$) included in a phase polarized (through a transverse magnetic field of strength $B$) array of three Josephson junctions. That is, the evolution of the CPP is controlled by three parameters defining a parameter space $\mathcal{P}$ of triplets ($V_{g1}, V_{g2}, B$). Some points in this space exhibit a ground state degeneracy which is a topological defect with respect to the “globally non-degenerate ground-state band structure”, assigning a non-zero Chern index to some surfaces in $\mathcal{P}$. One has theoretically demonstrated the possibility of an ultra-precise charge transfer of Cooper pairs while operating adiabatic cycles through resonant toroidal helices lying on a bidimensional torus $\mathbb{T}$ which encloses a single degeneracy in $\mathcal{P}$ [2]. More precisely, the pump is susceptible to generate a current $I = 2e c_1(\mathbb{T}) \nu$, where $\nu$ is the operating frequency and $c_1(\mathbb{T})$ is the Chern index of the torus.
