INTRODUCTORY COMMENTS

- Generality of decays
  $\sim 10^{-23}$ sec to "thousands of years"

- Higgs : a nice example

- QM and QFT

- QM $\mapsto$ "Schrödinger cat"

- $p(t) = e^{-t/\gamma} = e^{-\Gamma t}$: "exponential decay" is not exact.
  Deviations exist. They have been measured in recent experiment.

- Mathematics : complex plane ; pole mass ; the example of the "σ pole", so important for QCD.

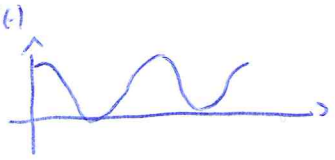
  $\rightsquigarrow$ Residue

  $\rightsquigarrow$ Riemann surfaces

2-level-system

O'

- QM



Rabi oscillations

" " " with zero effect → Itano et al

2 level → n level → ∞ nr of dense packed states: "real unstable system"

Lee Hamiltonian: a simplified version of QFT at the QM-level

same problems, similar discussions, but easier to solve

→ complex plane! → Lee model = many application (optic, quantum comp ...)

General proof that the decay law is not exponential 

Experiments of Rainer et al, → non-exp. decay in an unstable system

↳ Quantum zeno effect

- QFT

$\mathcal{L} = g S\varphi^2$ 

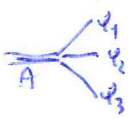
Decay and spectral function.

other lagrangians, applications to mesons

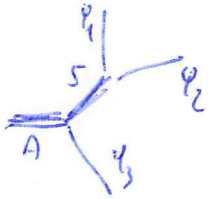
$\mathcal{L} = g\, H\, \bar{\psi}\psi$ 

other lagrangians, application to baryons

Three-body decay

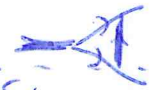


$g A \varphi_1 \varphi_2 \varphi_3$ $\quad g_1 A S\varphi_3 + g_2 S\varphi_1\varphi_2$



application to hadrons; spectral function

Higher-order processes

$\mathcal{L} = g S\varphi^2$  (vertex-correction)

Eventually: GSI already!