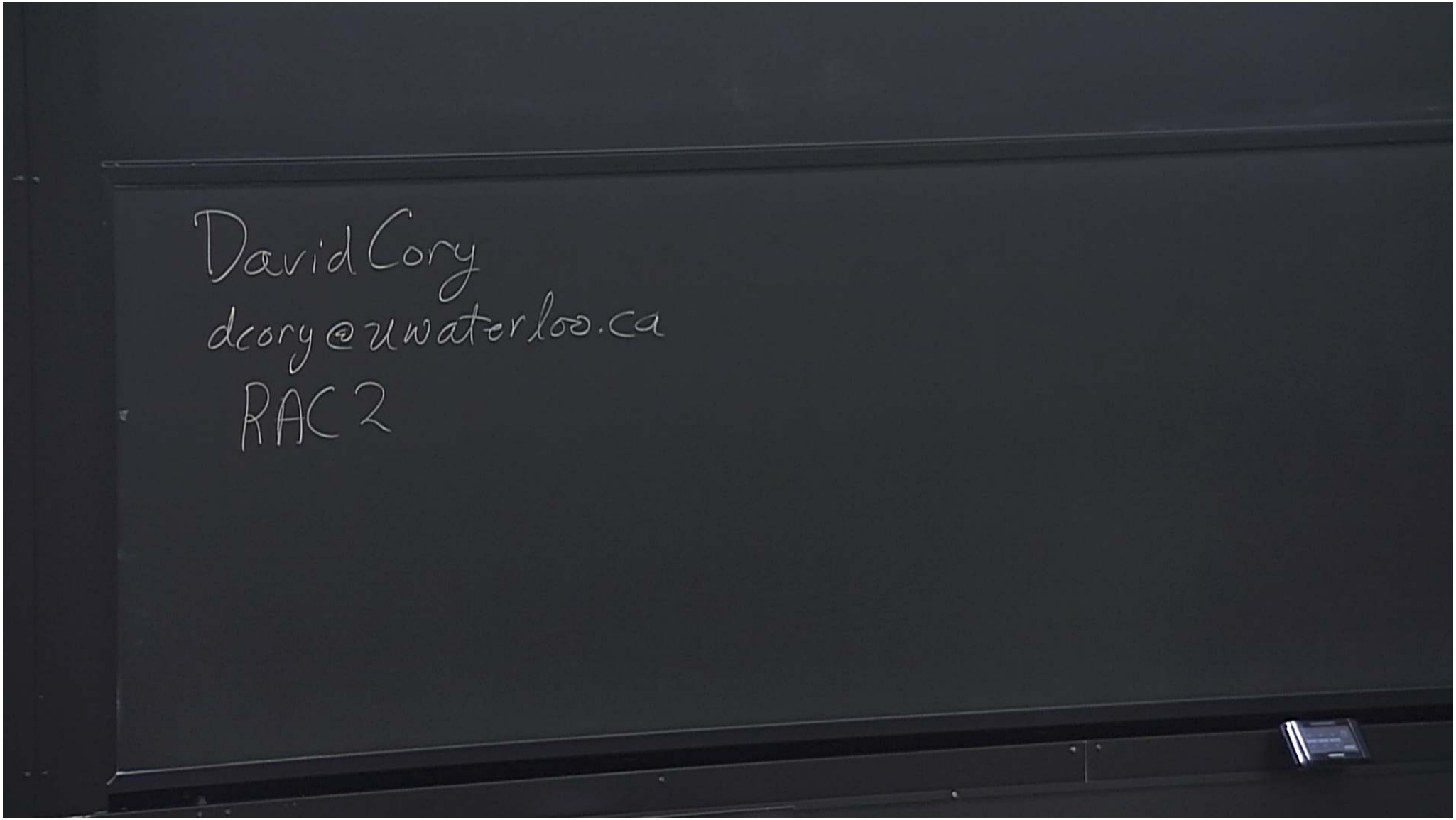
Title: Explorations in Quantum Information-1

Date: Mar 16, 2015 09:00 AM

URL: http://pirsa.org/15030018

Abstract:


David Cory
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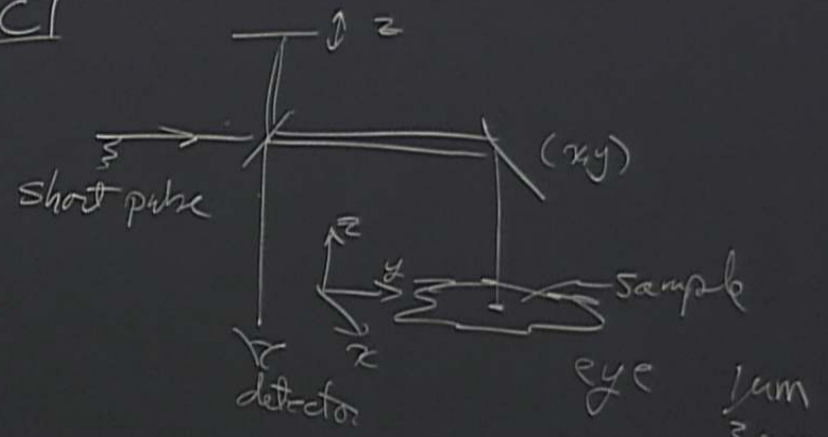
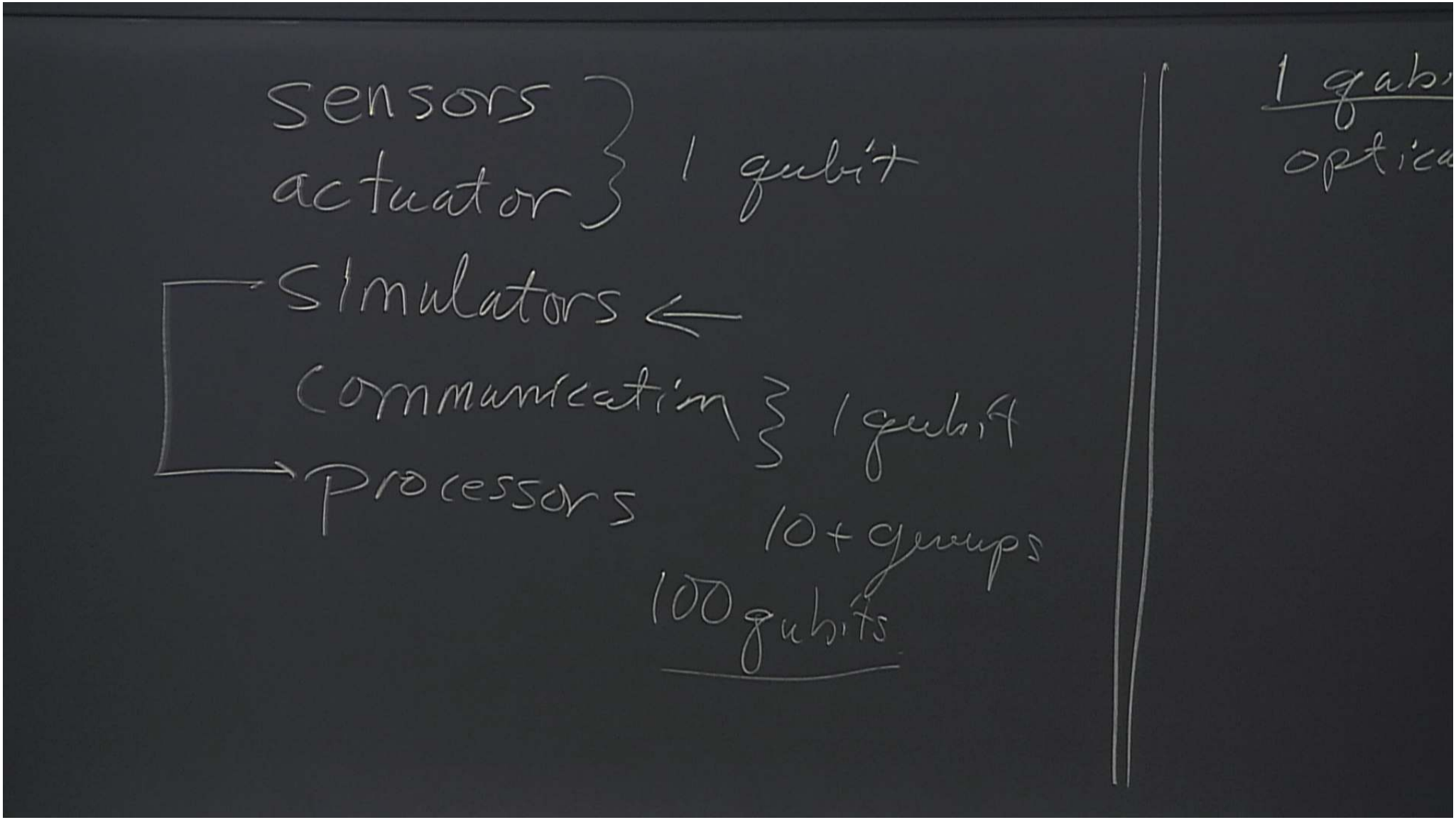
RAC 2

1 qubit
optical interferometers.

OCT



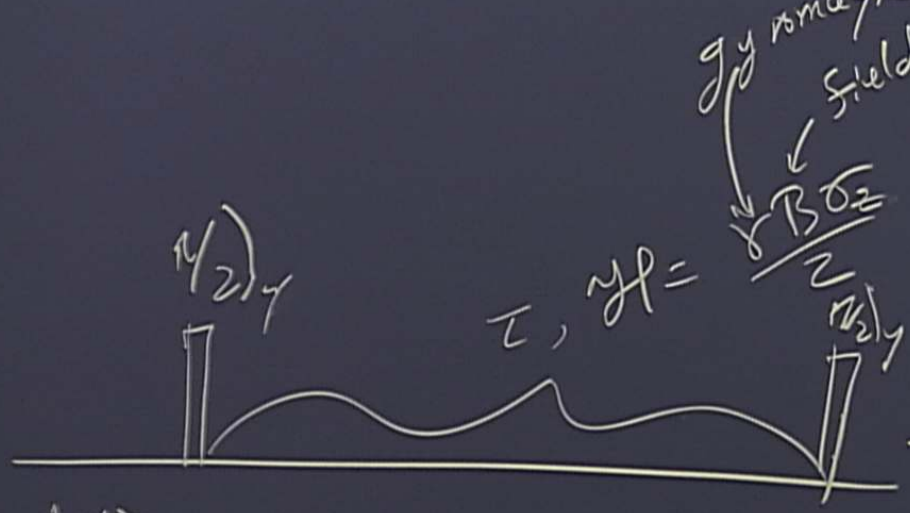

sensors
actuator
1 qubit
simulators
communicatin
1 qubit
processors
10+ groups
100 qubits
1 qubit
optica

gyromagnetic ratio

field

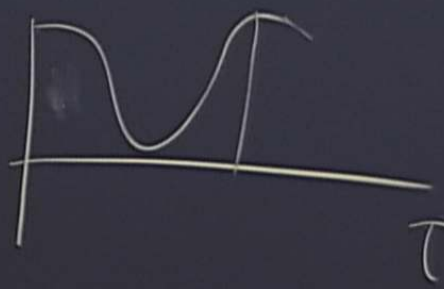
$\gamma_H = 2\pi \; 4250 \; Hz/G$

$\gamma_e = 2\pi \; 2.3 \; MHz/G$



$|+1/2\rangle \quad \frac{1}{\sqrt{2}}(|+1/2\rangle + |-1/2\rangle)$

$P_{|+1/2\rangle} = \sin^2(\gamma \frac{B}{2} \tau)$



1 qubit

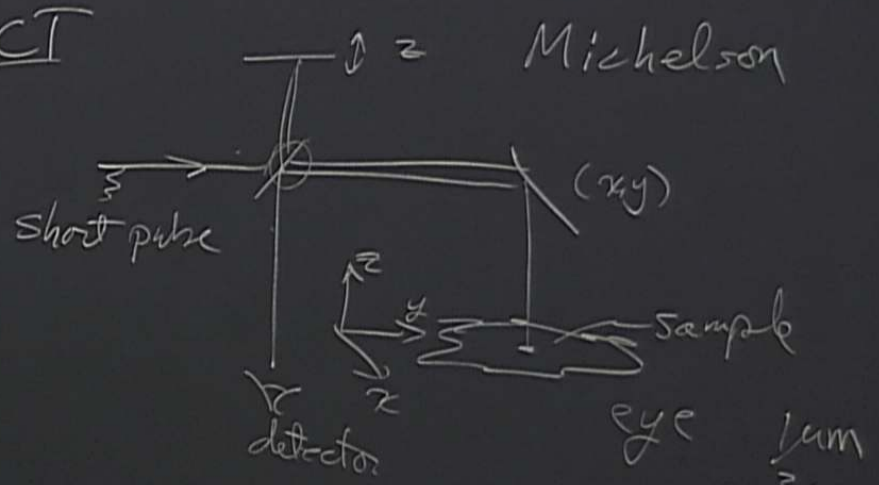
optical interferometers.

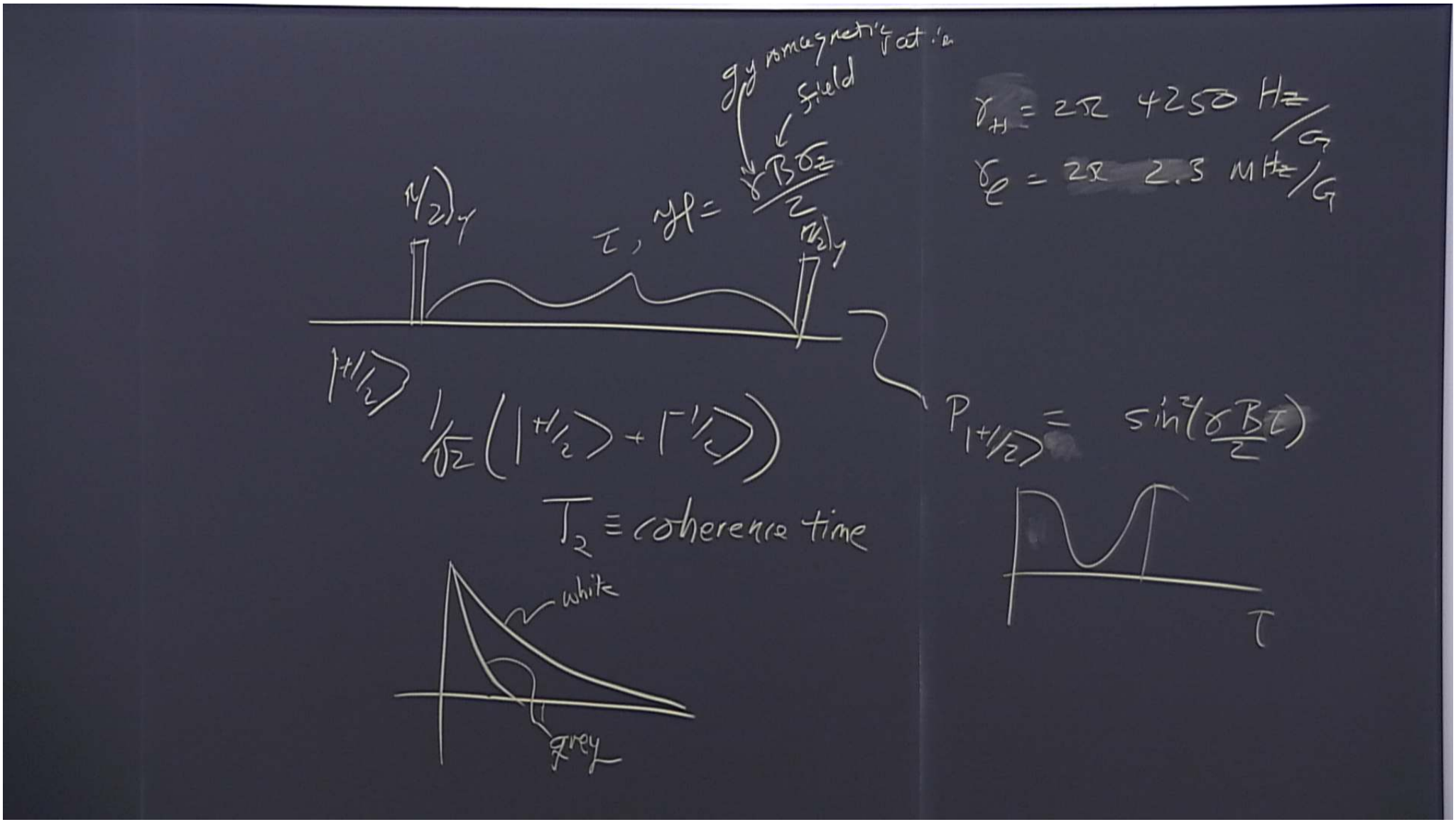
magnetic resonance (Fields)

→ MRI, water

cheese, water

OCT



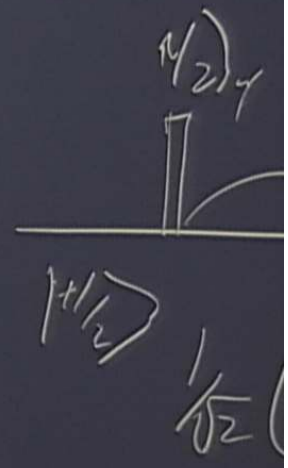

gyromagnetic ratio
field
$\gamma_H = 2\pi\ 4250\ Hz/G$
$\gamma_e = 2\pi\ 2.3\ MHz/G$
$\pi/2)_y$
τ, $\gamma\beta = \frac{\gamma B_0 z}{2}$
$\pi_2)_y$
$|+1/2\rangle$
$\frac{1}{\sqrt{2}}(|+1/2\rangle + |-1/2\rangle)$
$P_{|+1/2\rangle} = \sin^2(\frac{\gamma B \tau}{2})$
$T_2 \equiv$ coherence time
white
grey
τ

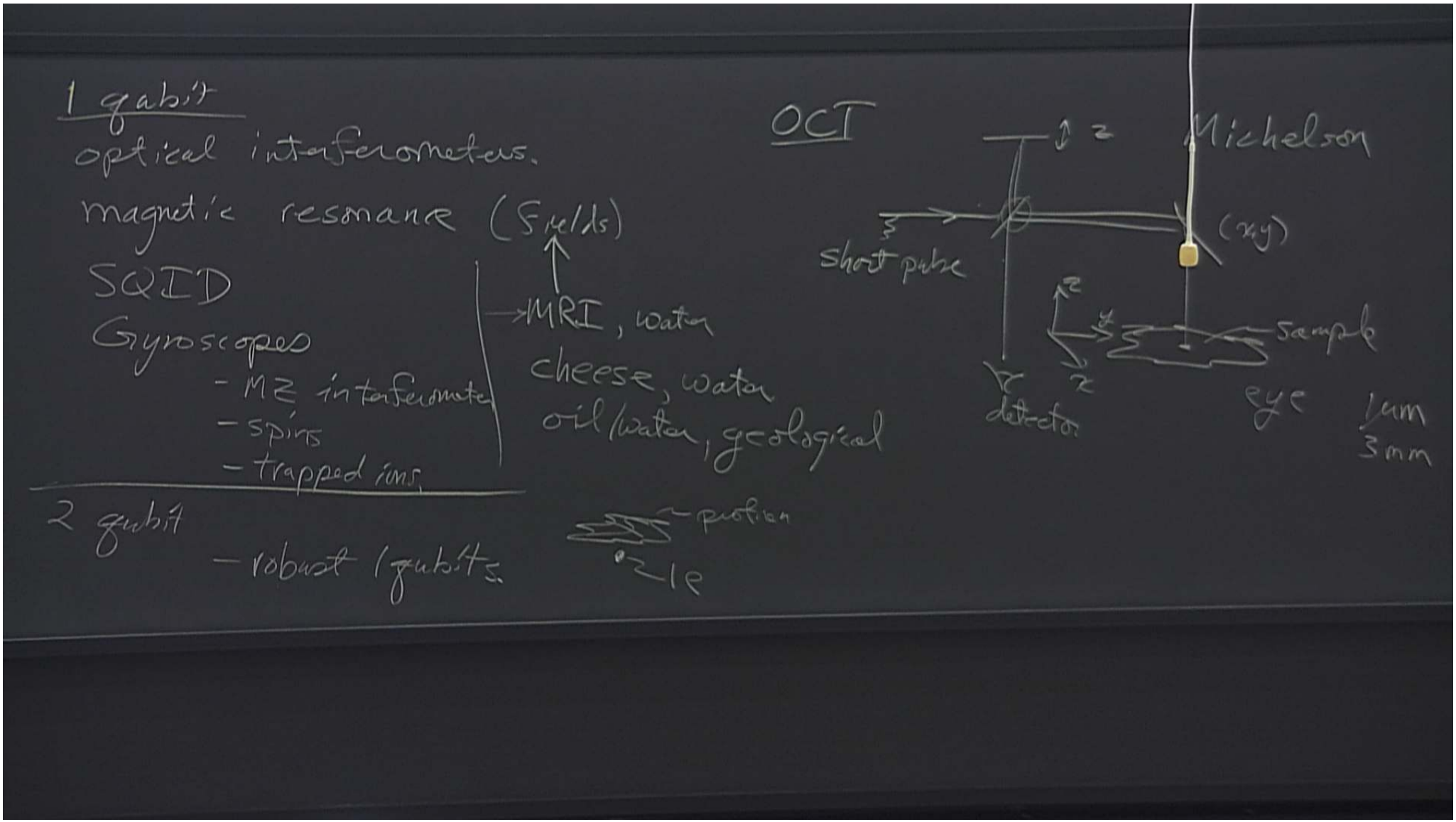
Field resolution

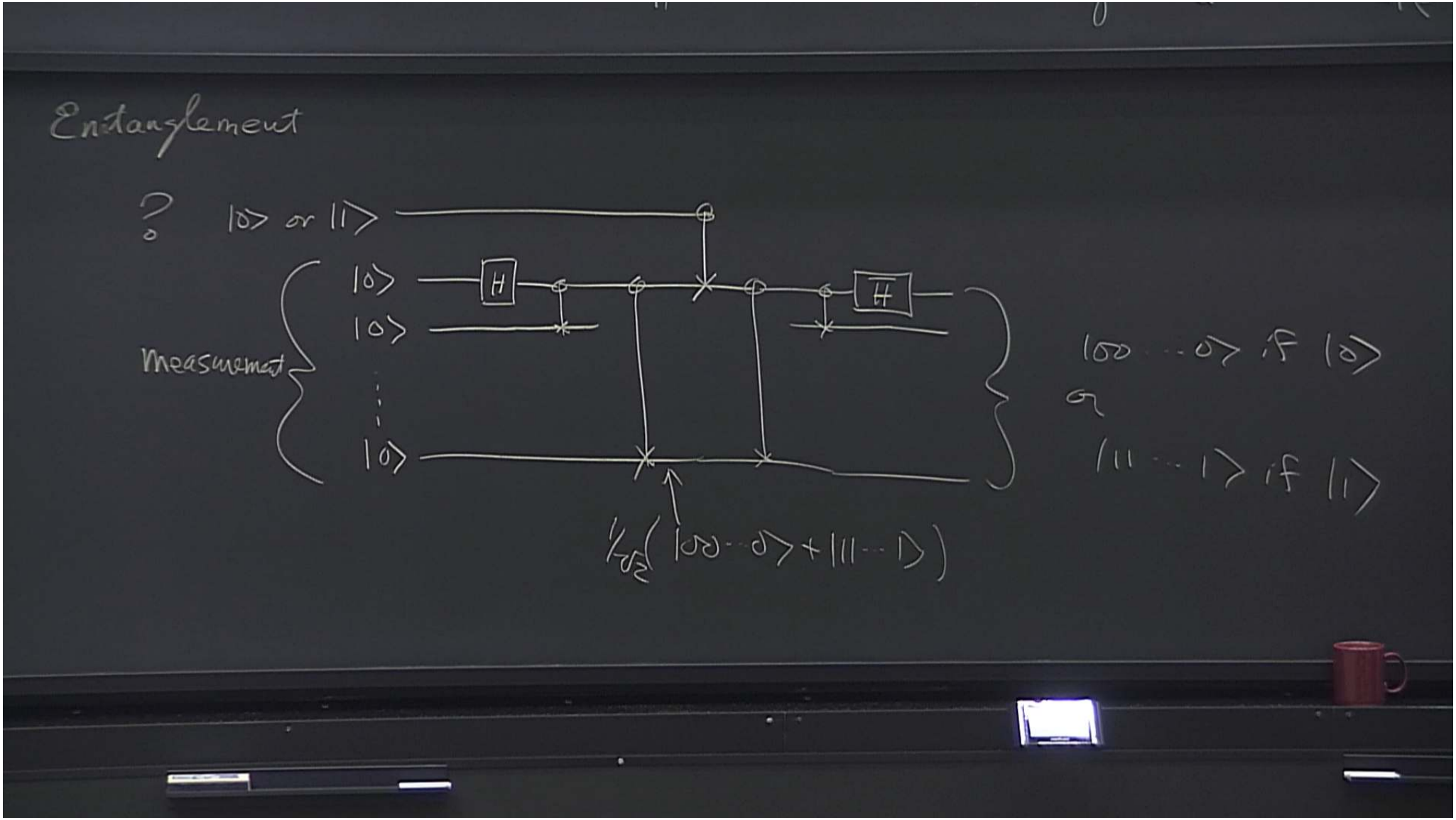
T_{long} $\gamma \Delta B \sim 2\pi$

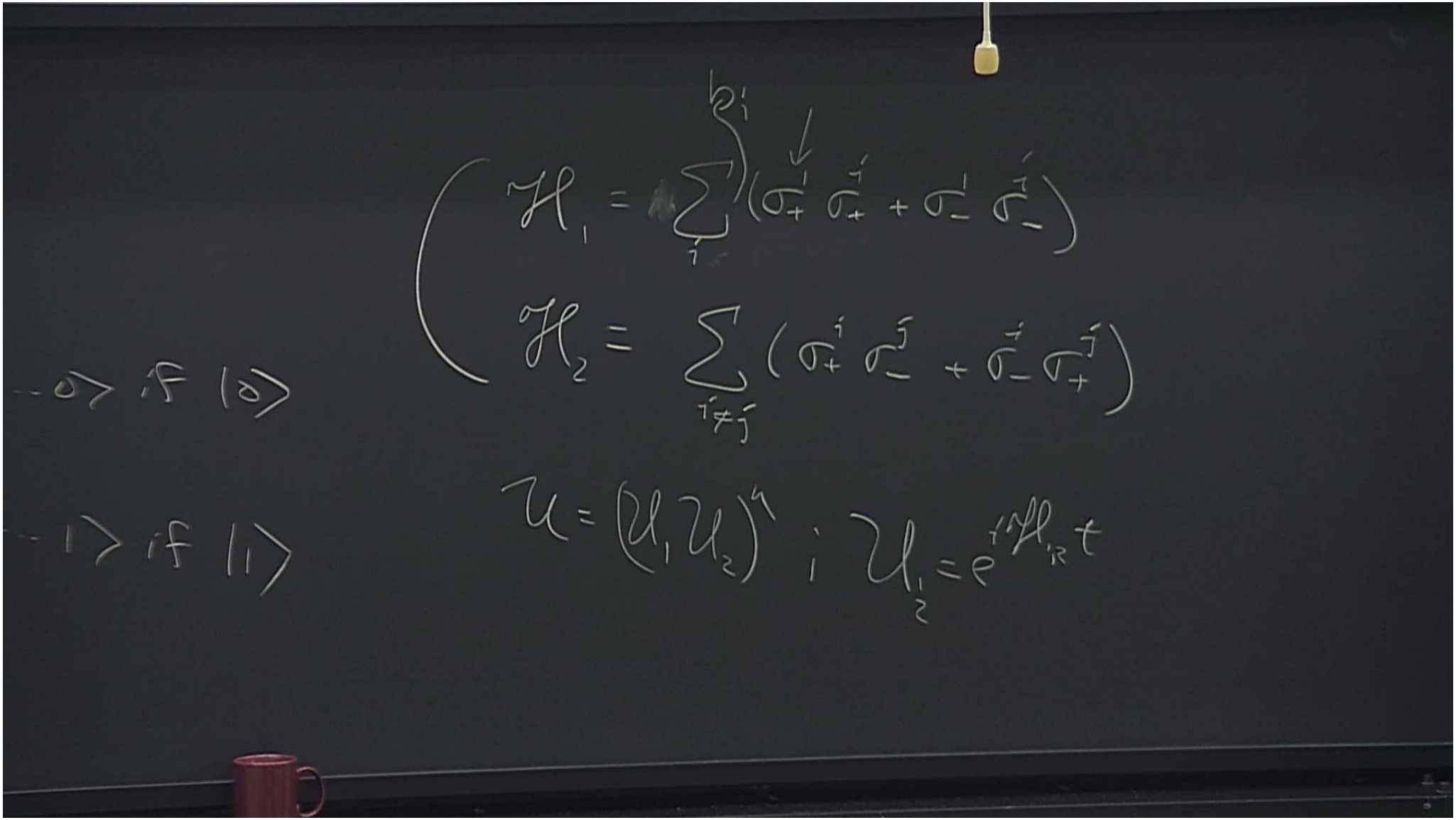
mins $2\pi 4258\ Hz/G$

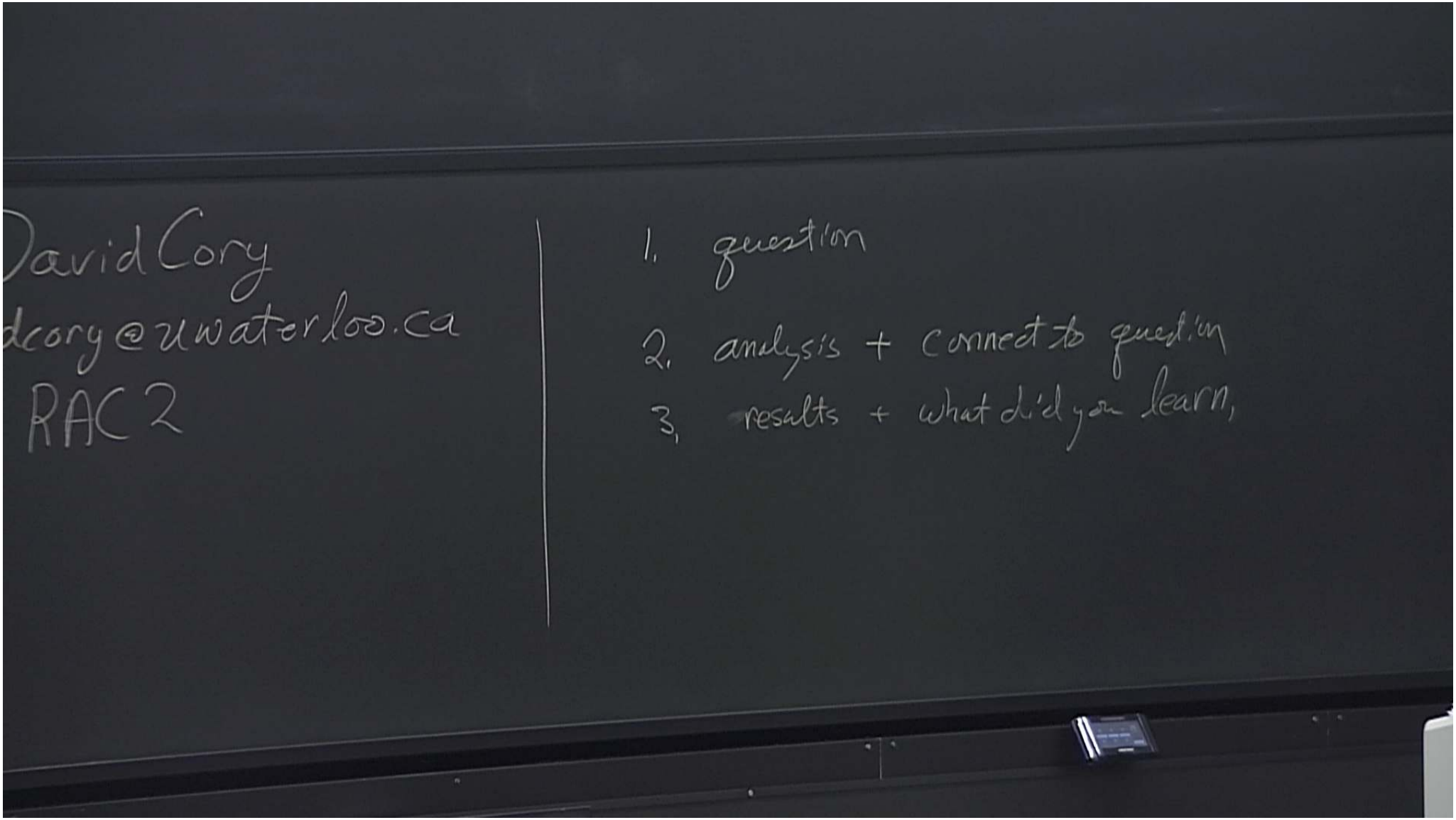
$\Delta B \sim 10 \rightarrow 100\ \mu G$




1 qubit
optical interferometers.
magnetic resonance (fields)
SQID
Gyroscopes
- MZ interferometer
- spins
- trapped ions.
MRI, water
cheese, water
oil/water, geological
2 qubit
- robust 1 qubits.
proton
1e
OCT
Michelson
z
(x,y)
short pulse
sample
detector
eye
1μm
3mm


Entanglement
? |0⟩ or |1⟩
|0⟩
|0⟩
|0⟩
H
H
Measurement
|00…0⟩ if |0⟩
or
|11…1⟩ if |1⟩
1/√2 (|00…0⟩ + |11…1⟩)


$\mathcal{H}_1 = \sum_i^{b_i} (\sigma_+^i \sigma_+^i + \sigma_-^i \sigma_-^i)$
$\mathcal{H}_2 = \sum_{i \neq j} (\sigma_+^i \sigma_-^j + \sigma_-^i \sigma_+^j)$
$|0\rangle$ if $|0\rangle$
$|1\rangle$ if $|1\rangle$
$\mathcal{U} = (\mathcal{U}_1 \mathcal{U}_2)^n$; $\mathcal{U}_{1,2} = e^{i \mathcal{H}_{1,2} t}$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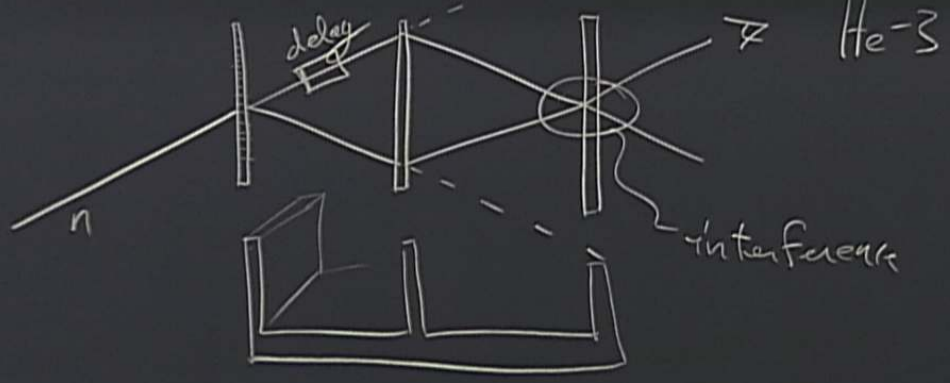
RAC2
1. question
2. analysis + connect to question
3. results + what did you learn,

$\frac{1}{\sqrt{2}}(|\uparrow\rangle + |\downarrow\rangle)$

neutron interferometry



qubits

1. path
2. spin
3. displacement
4. delay
5. orbital angular momentum