Title: Explorations in Quantum Information-3

Date: Mar 18, 2015 09:00 AM

URL: http://pirsa.org/15030020

Abstract:

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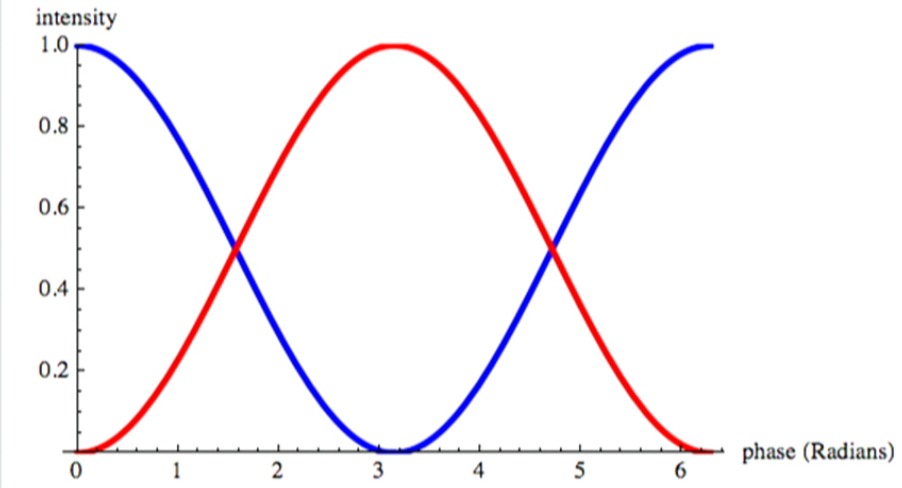
```
Plot[M2H[a, b], {a, 0, 2 π}, {AxesLabel → {"phase (Radians)", "intensity" },
  PlotStyle → {RGBColor[1, 0, 0], Thickness[0.01]}, PlotRange → {0, 1}}]],
{b, 0, 2 π}, AnimationRunning → False, SaveDefinitions → True]
```

b



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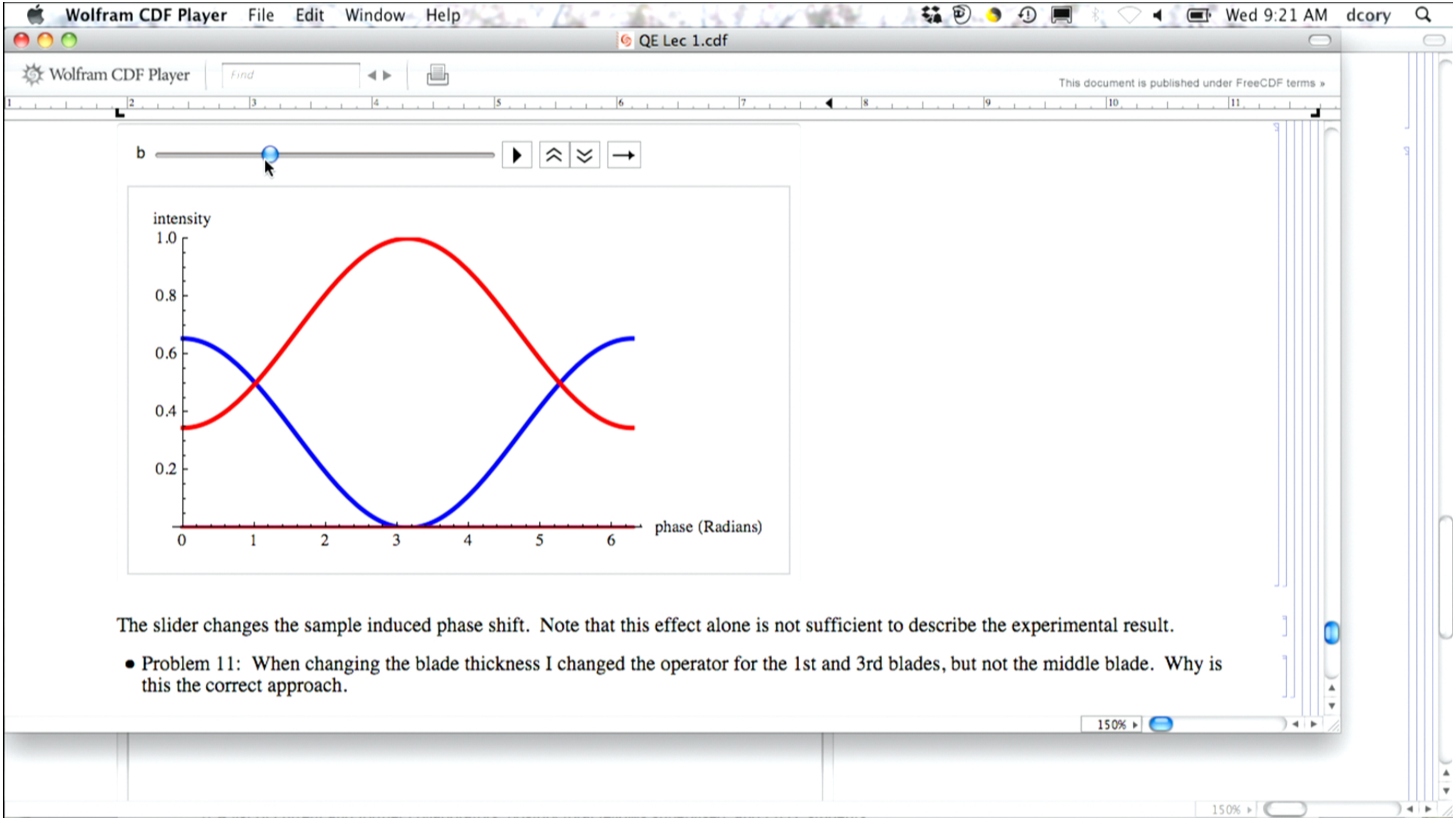
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b
intensity
1.0
0.8
0.6
0.4
0.2
0
1
2
3
4
5
6
phase (Radians)
The slider changes the sample induced phase shift. Note that this effect alone is not sufficient to describe the experimental result.
• Problem 11: When changing the blade thickness I changed the operator for the 1st and 3rd blades, but not the middle blade. Why is this the correct approach.
150%
150%

Visibility

- did not create equal superposition
- initial state, not eigenstate
- purity of detectors

Visibility

- did not create equal superposition
- initial state, not eigenstate
- purity of detectors

Projector

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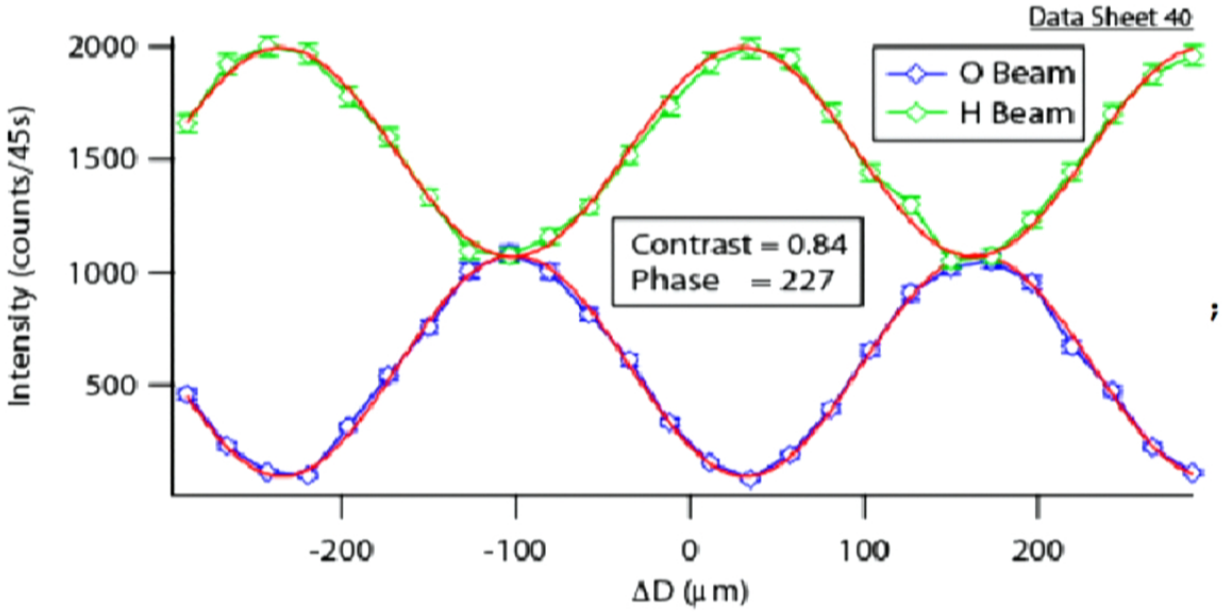
at least one blade.

- Problem 10: Here is a set of experimental data. The horizontal axis is given in terms of the difference in path length of silica blades placed in the two paths. What width of silica corresponds to a π phase shift in this experiment? Suggest a few possible reasons for the differences between the experiment and theory. We will explore some of these next.



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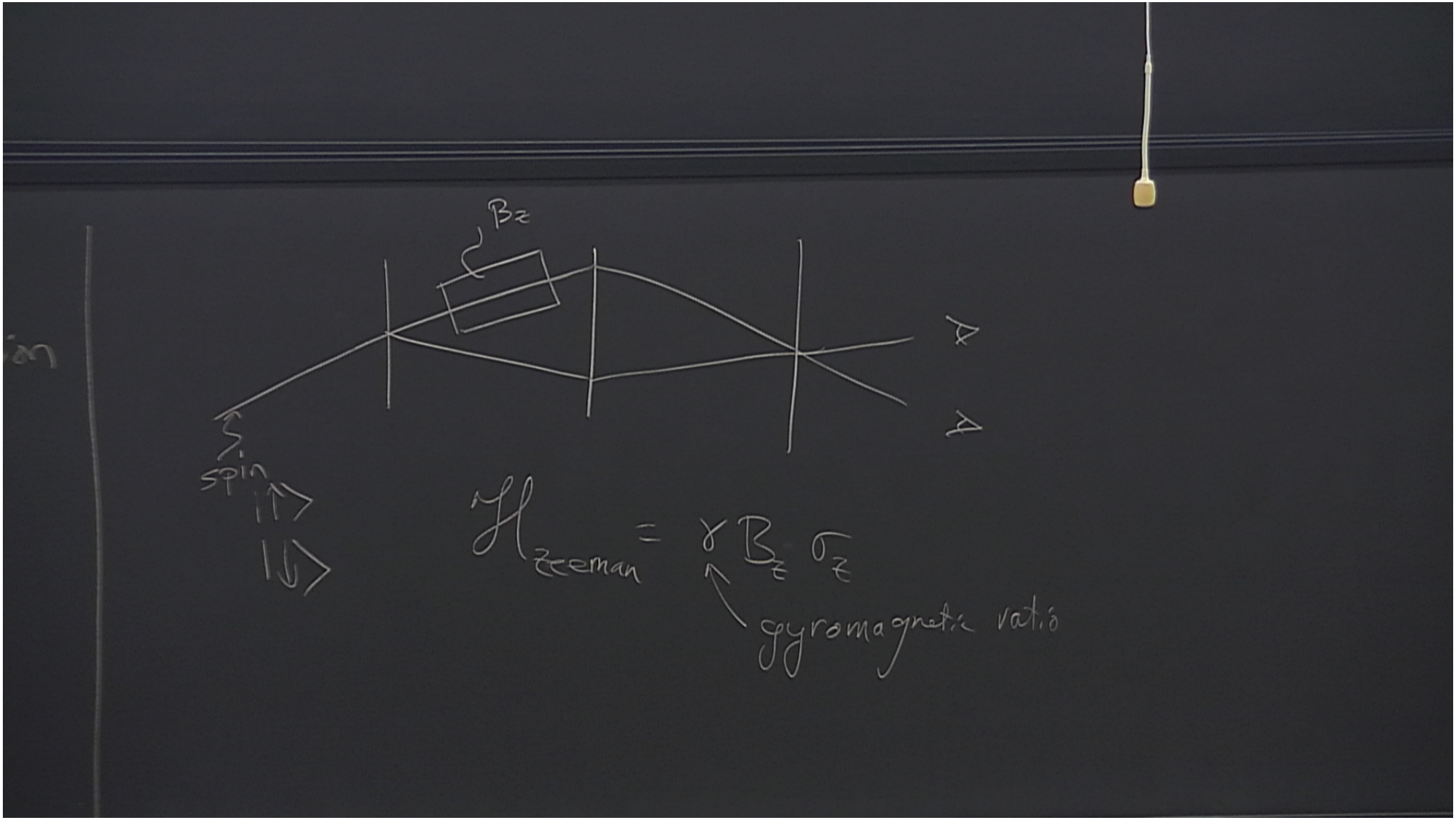
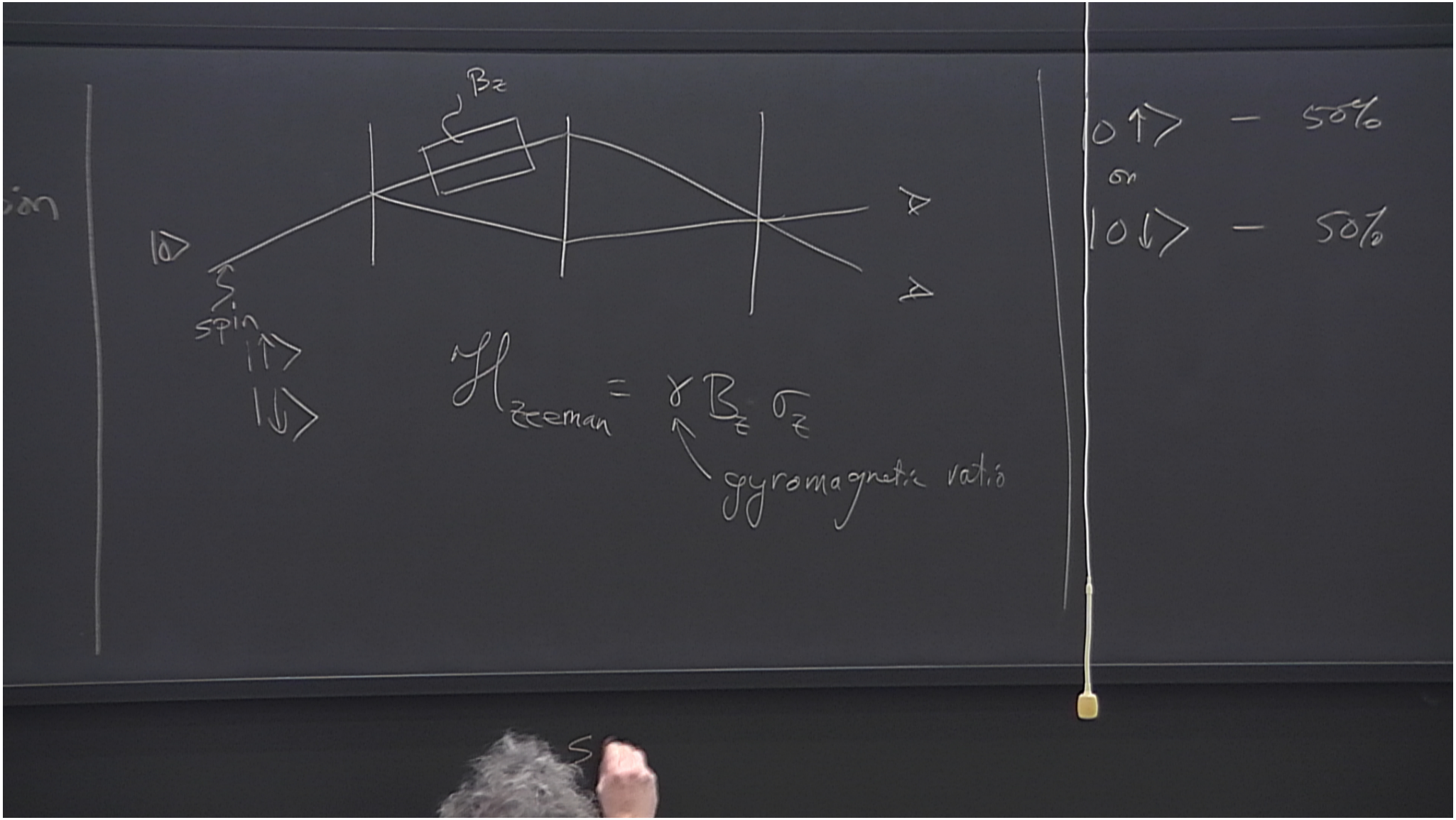
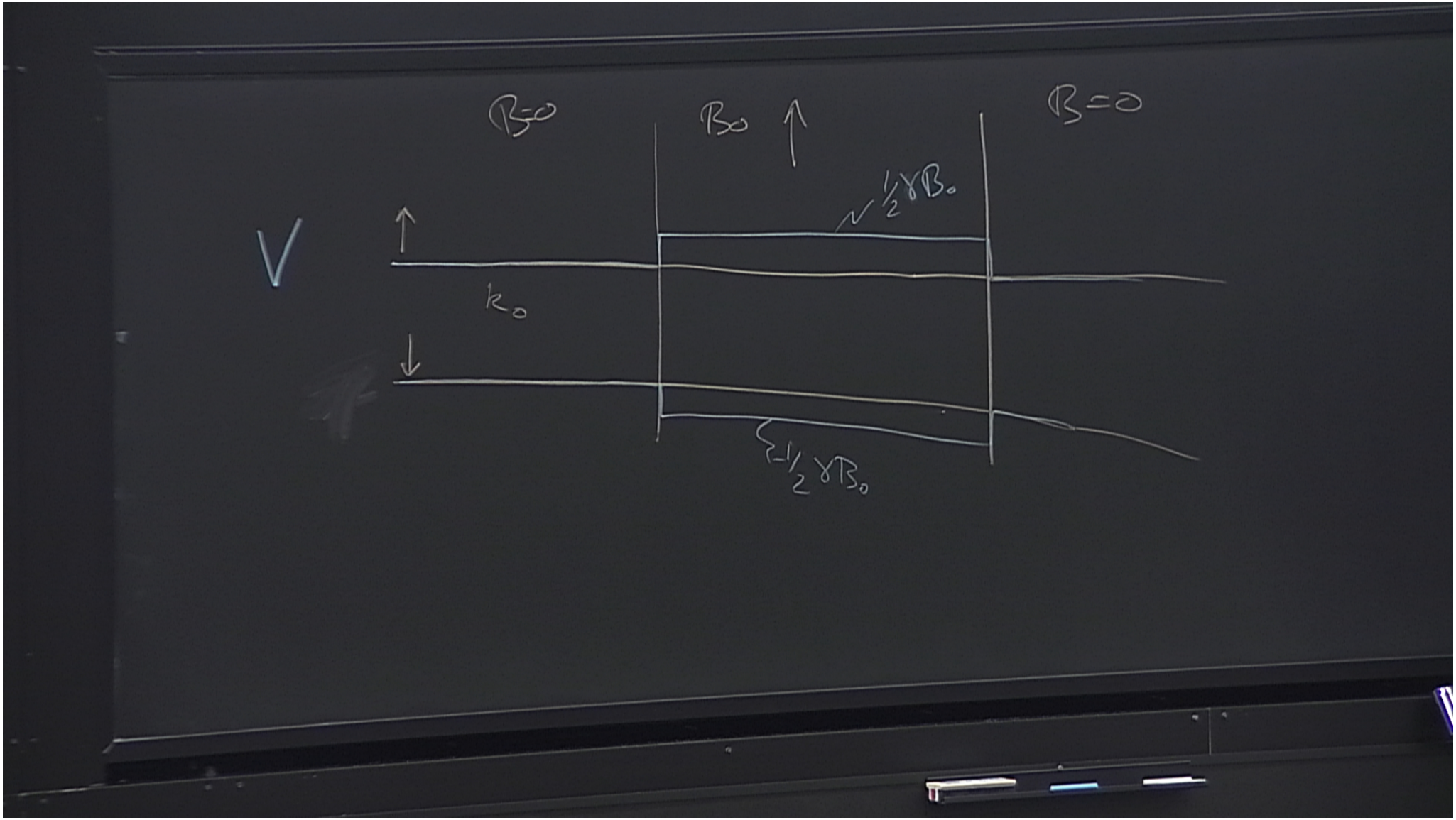
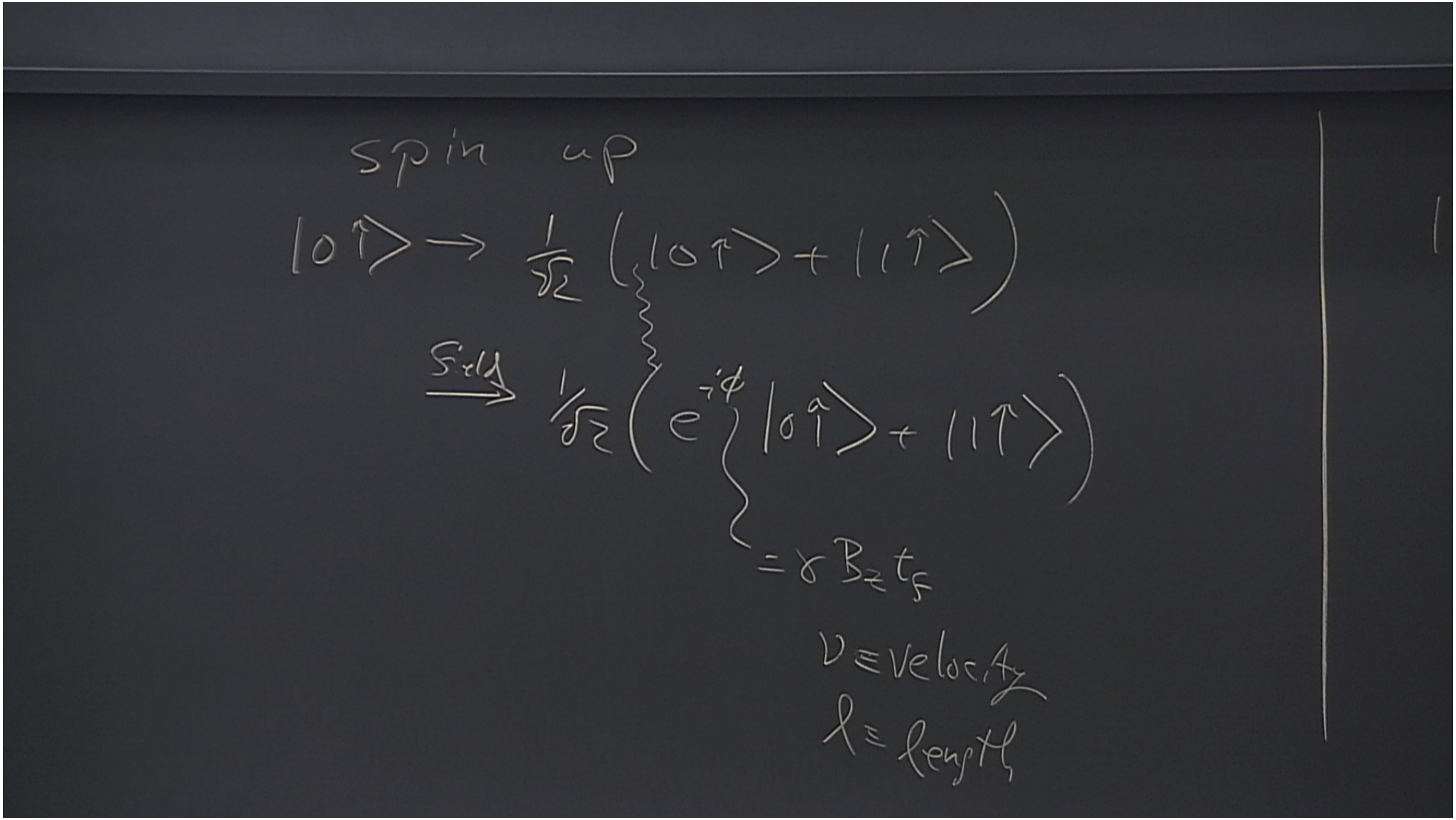
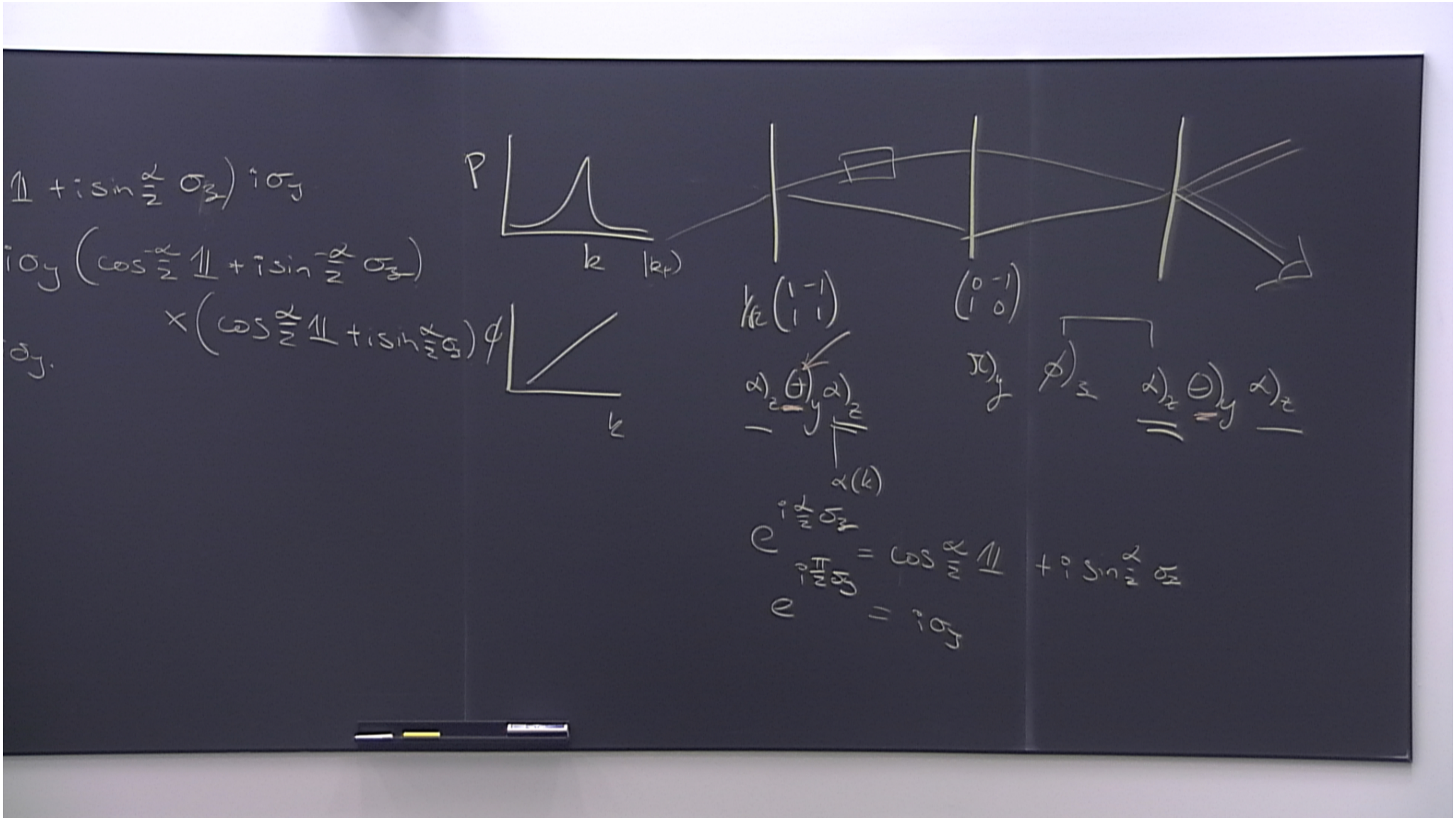

B_z
spin
$|\uparrow\rangle$
$|\downarrow\rangle$
$\mathcal{H}_{zeeman} = \gamma B_z \sigma_z$
gyromagnetic ratio


Bz
|0⟩
spin
|↑⟩
|↓⟩
$\mathcal{H}_{zeeman} = \gamma B_z \sigma_z$
gyromagnetic ratio
|0↑⟩ – 50%
or
|0↓⟩ – 50%

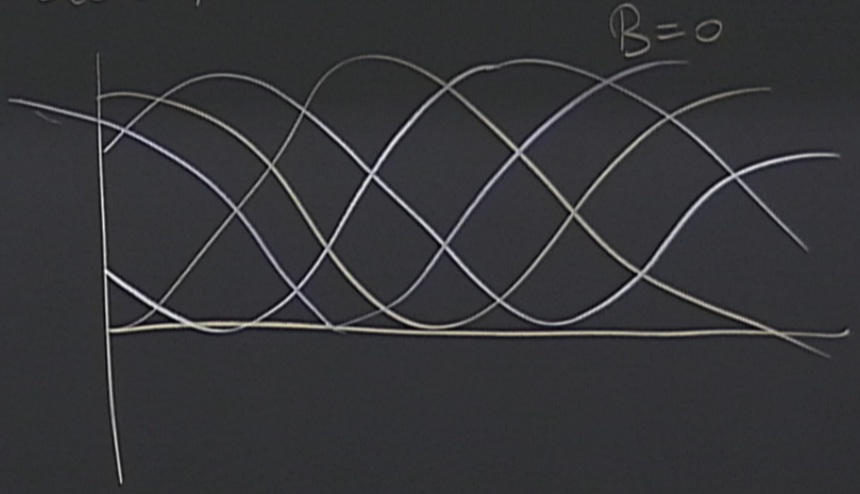

B=0
B₀
B=0
V
k₀
½γB₀
-½γB₀


spin up
$|0\uparrow\rangle \rightarrow \frac{1}{\sqrt{2}}(|0\uparrow\rangle + |1\uparrow\rangle)$
Still
$\frac{1}{\sqrt{2}}(e^{-i\phi}|0\uparrow\rangle + |1\uparrow\rangle)$
$= \gamma B_z t_s$
$v \equiv$ velocity
$l \equiv$ length


P
k
k_F
$\alpha(k)$
$e^{i\frac{\alpha}{2}\sigma_z} = \cos\frac{\alpha}{2}\mathbb{1} + i\sin\frac{\alpha}{2}\sigma_z$
$e^{i\frac{\pi}{2}\sigma_y} = i\sigma_y$

spin down

$\rightarrow \frac{1}{\sqrt{2}}(|0\downarrow\rangle + |1\downarrow\rangle)$



Still

ϕ at the detector depends on spin state

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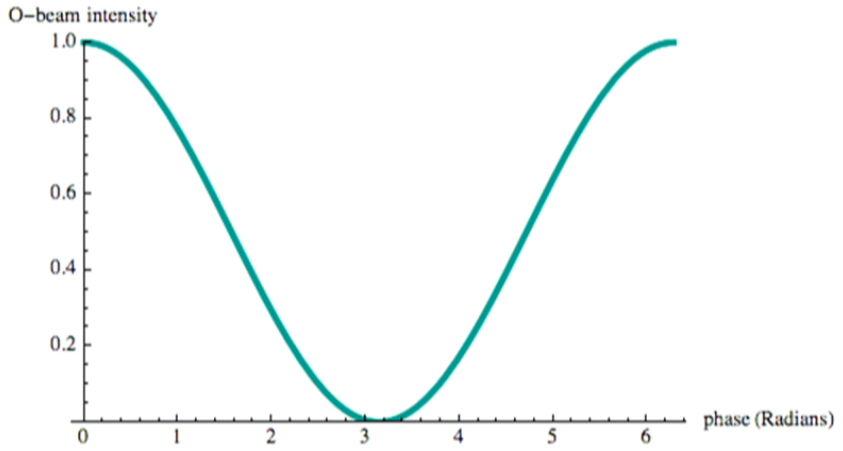
Continue with updated styling

Revert to older styling

Do this for all notebooks

```
PlotRange → {0, 1}}]], {b, 0, 2 π}, SaveDefinitions → True]
```

b



200%

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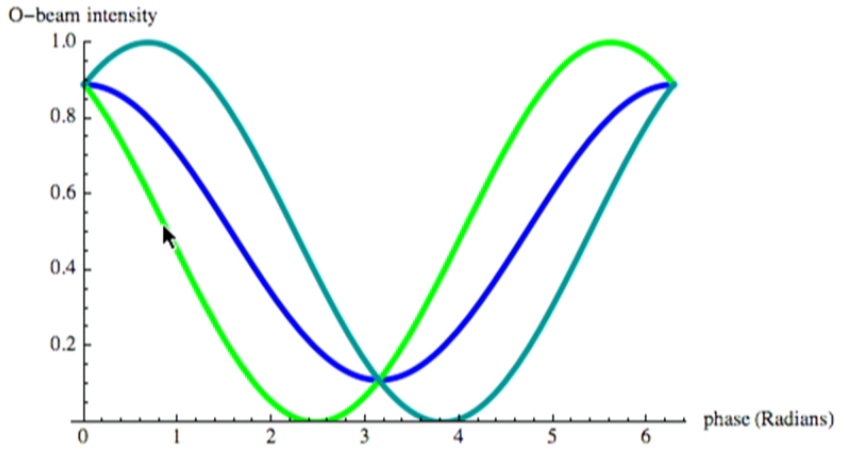
```
PlotRange → {0, 1}}]], {b, 0, 2 π}, SaveDefinitions → True]
```

b



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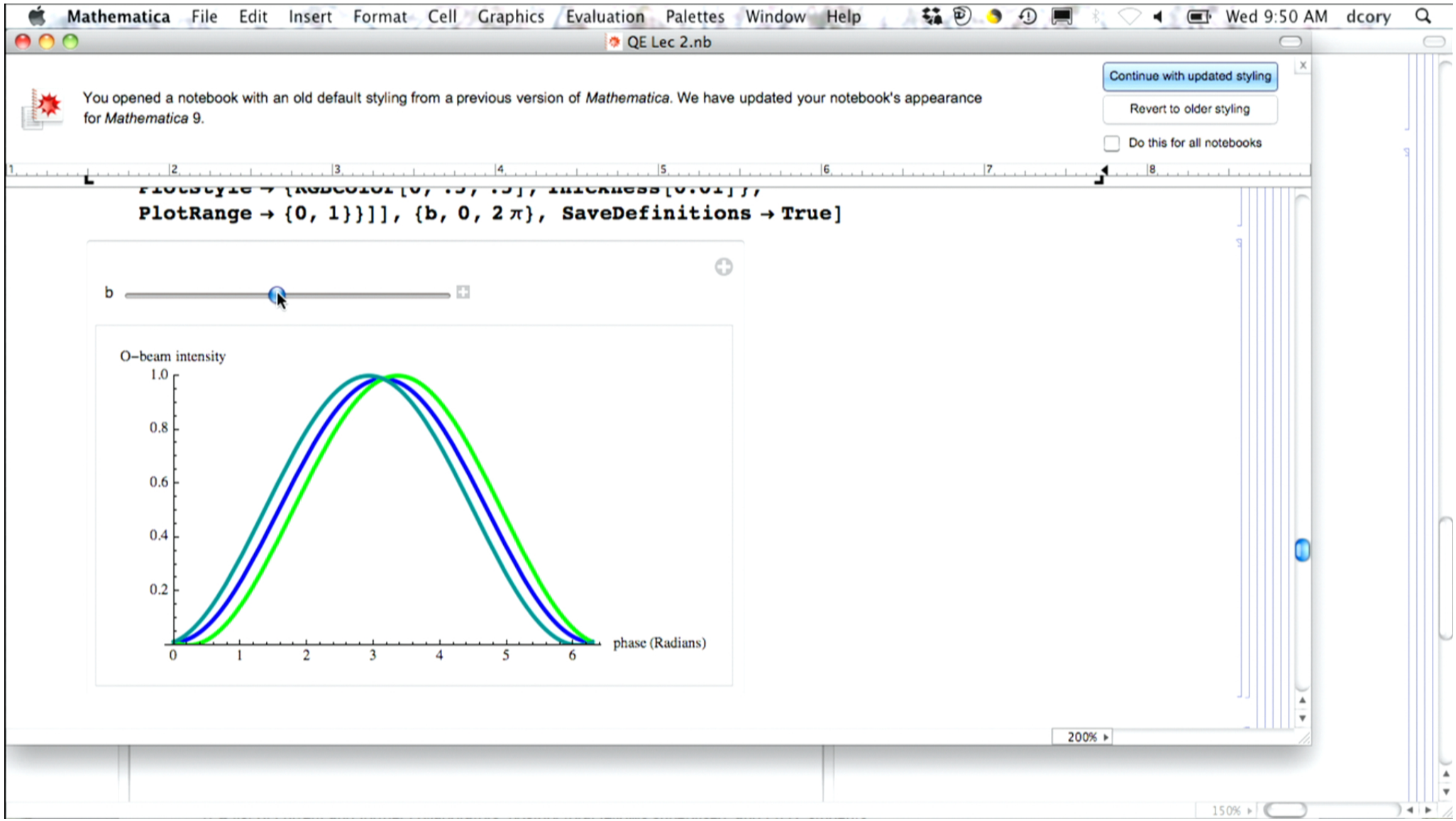
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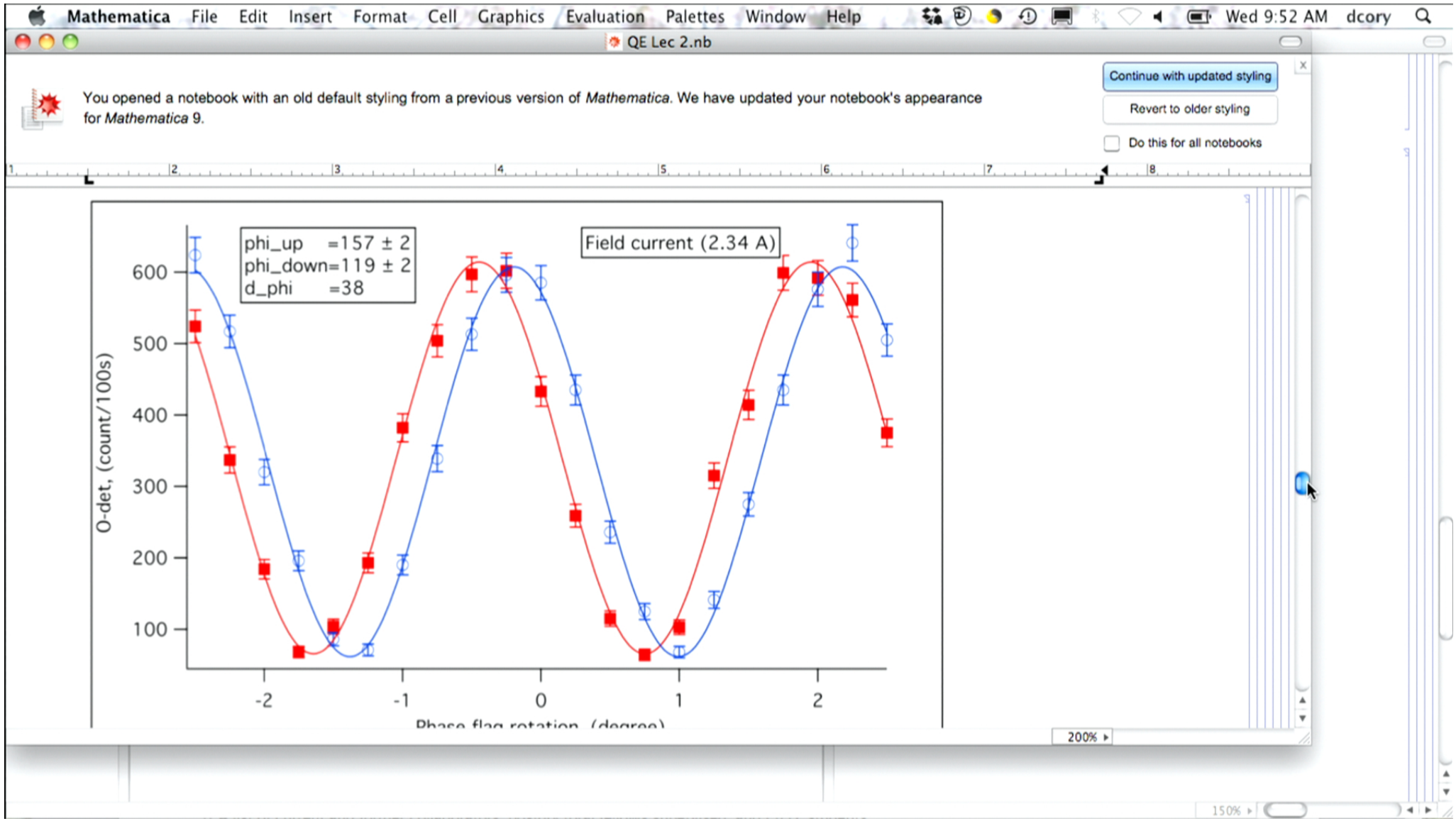
Do this for all notebooks
PlotRange → {0, 1}}]], {b, 0, 2 π}, SaveDefinitions → True]
b
O−beam intensity
1.0
0.8
0.6
0.4
0.2
0
1
2
3
4
5
6
phase (Radians)
200%
150%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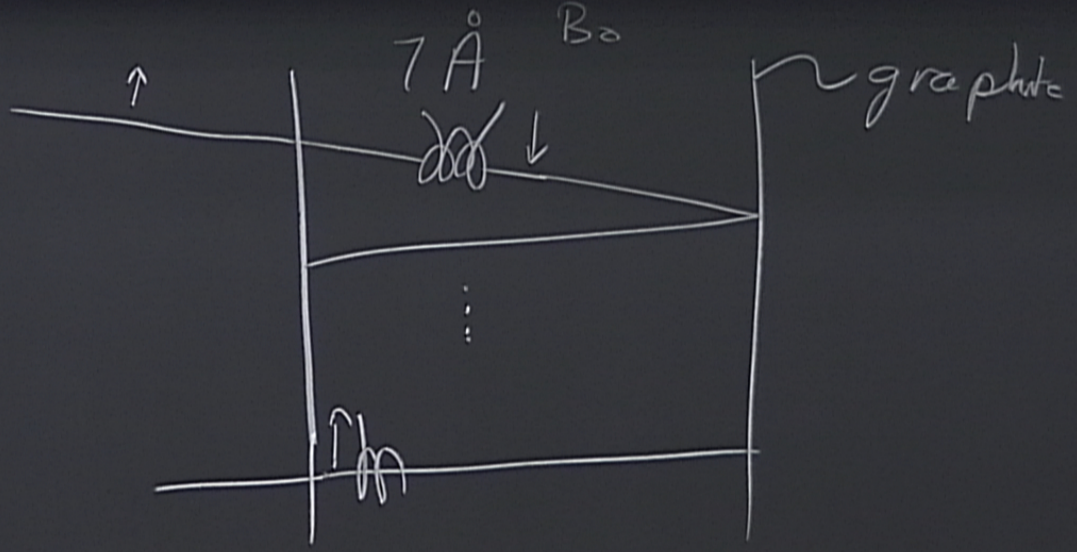
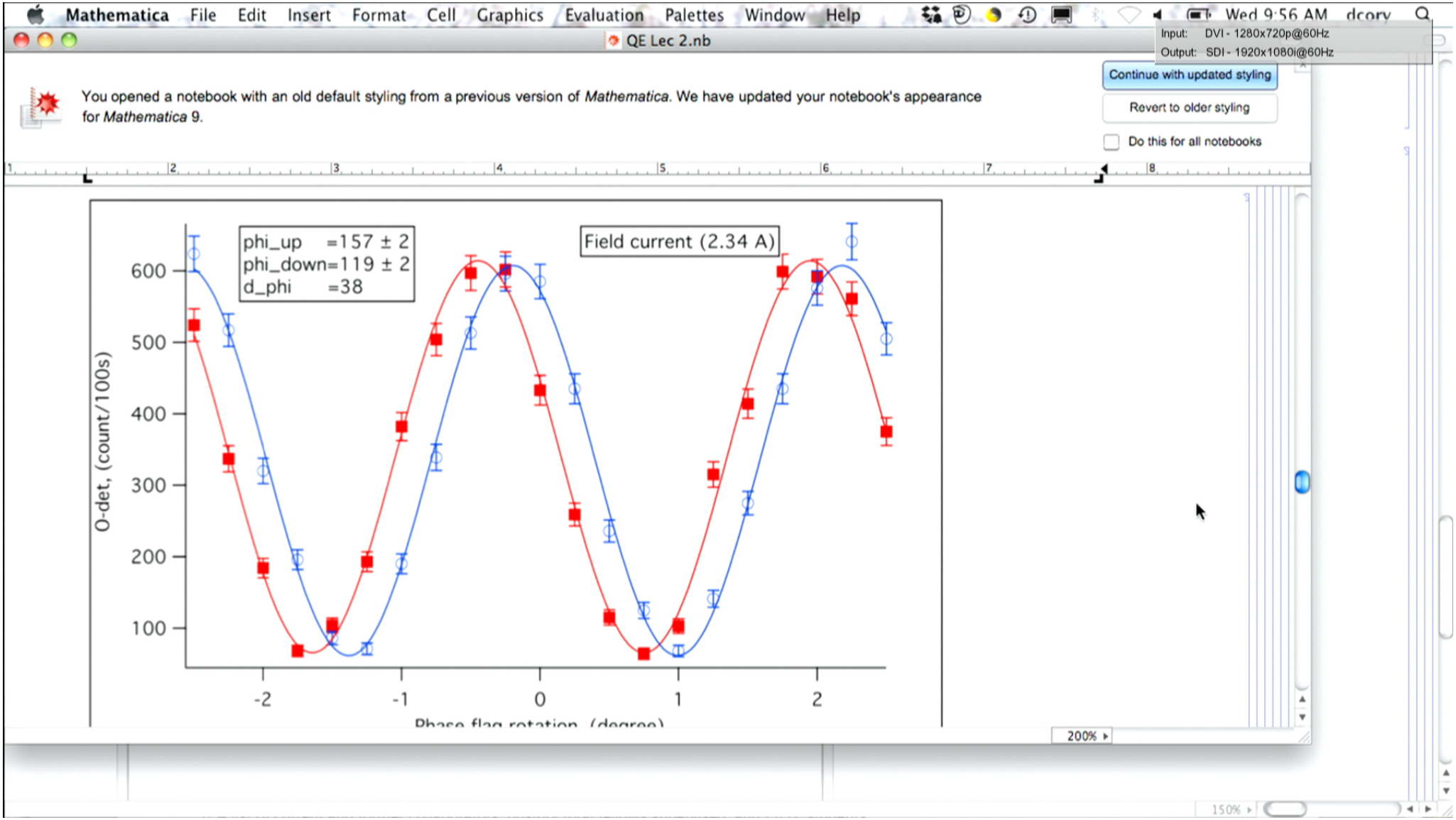
Revert to older styling
Do this for all notebooks
phi_up =157 ± 2
phi_down=119 ± 2
d_phi =38
Field current (2.34 A)
O-det, (count/100s)
600
500
400
300
200
100
-2
-1
0
1
2
200%
150%

$v \equiv$ velocity

$\ell \equiv$ length

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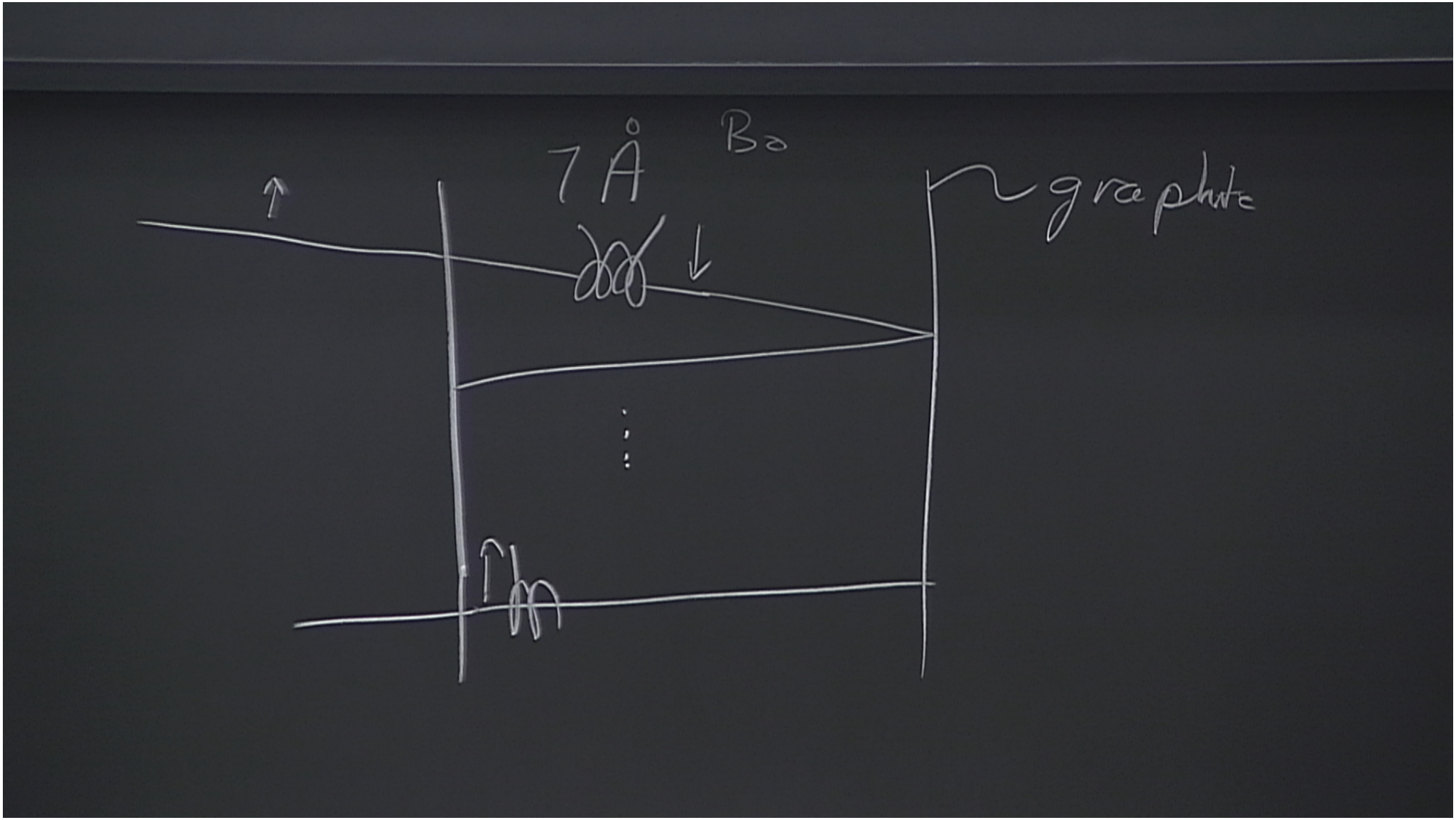
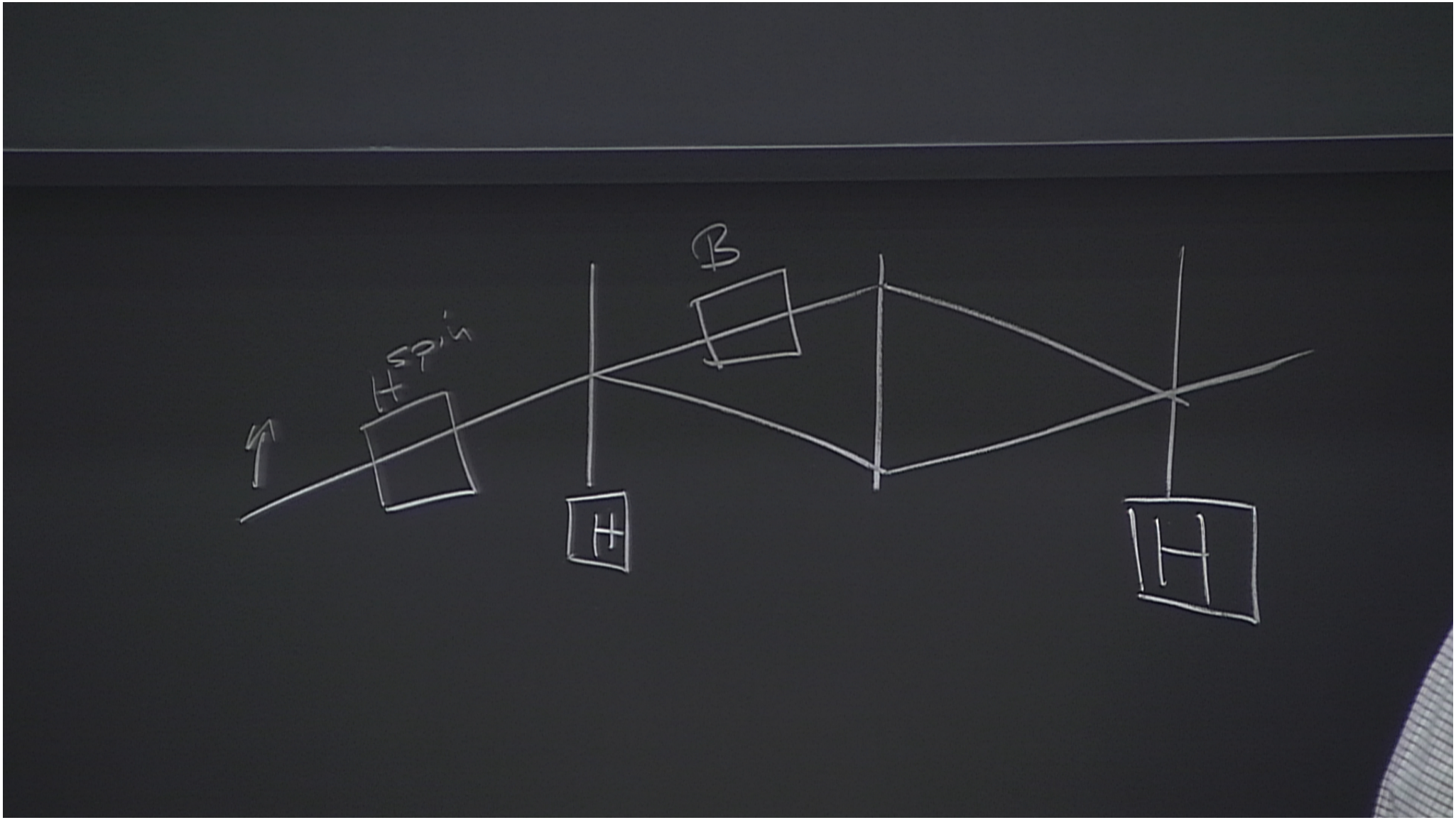
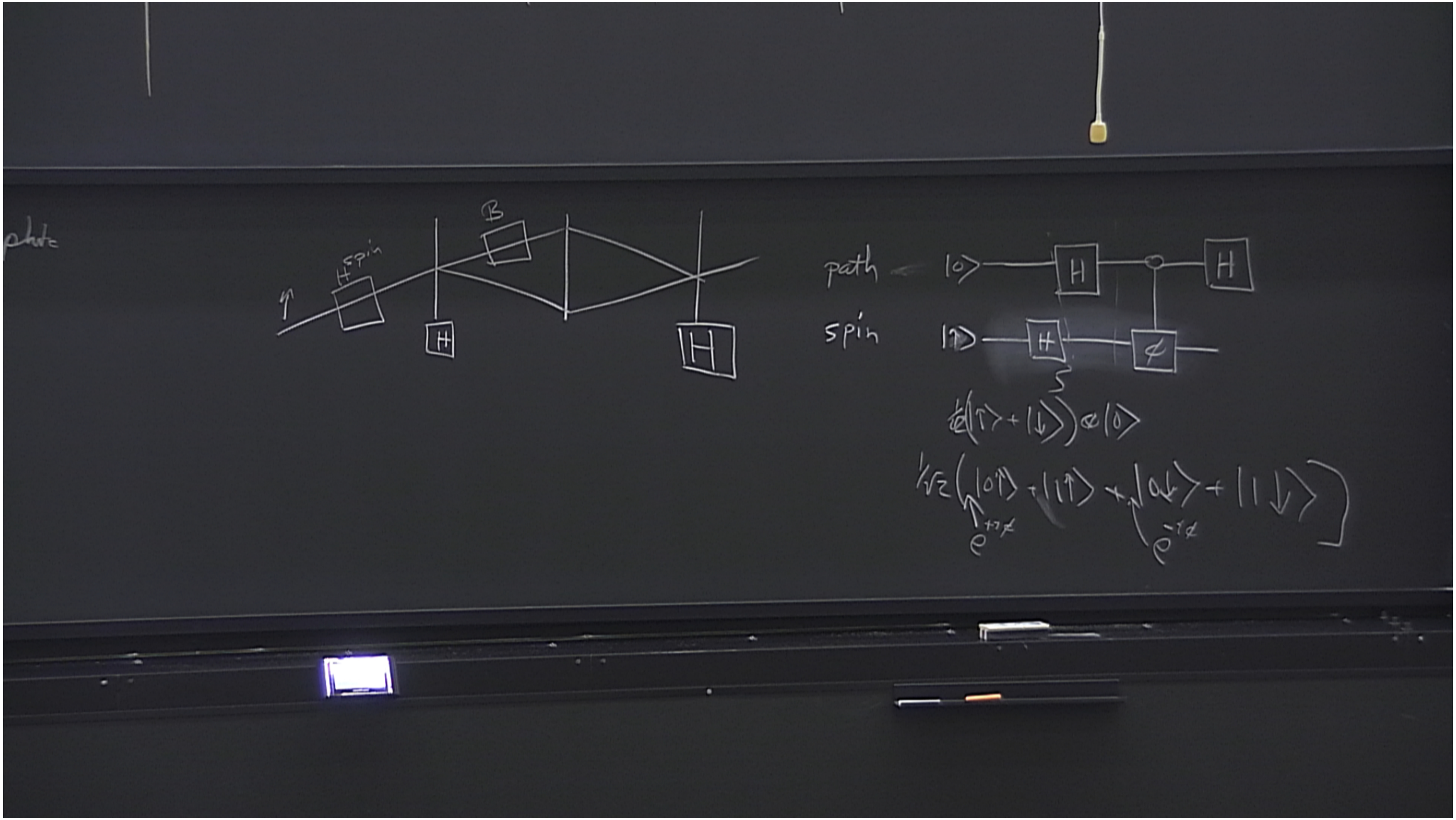
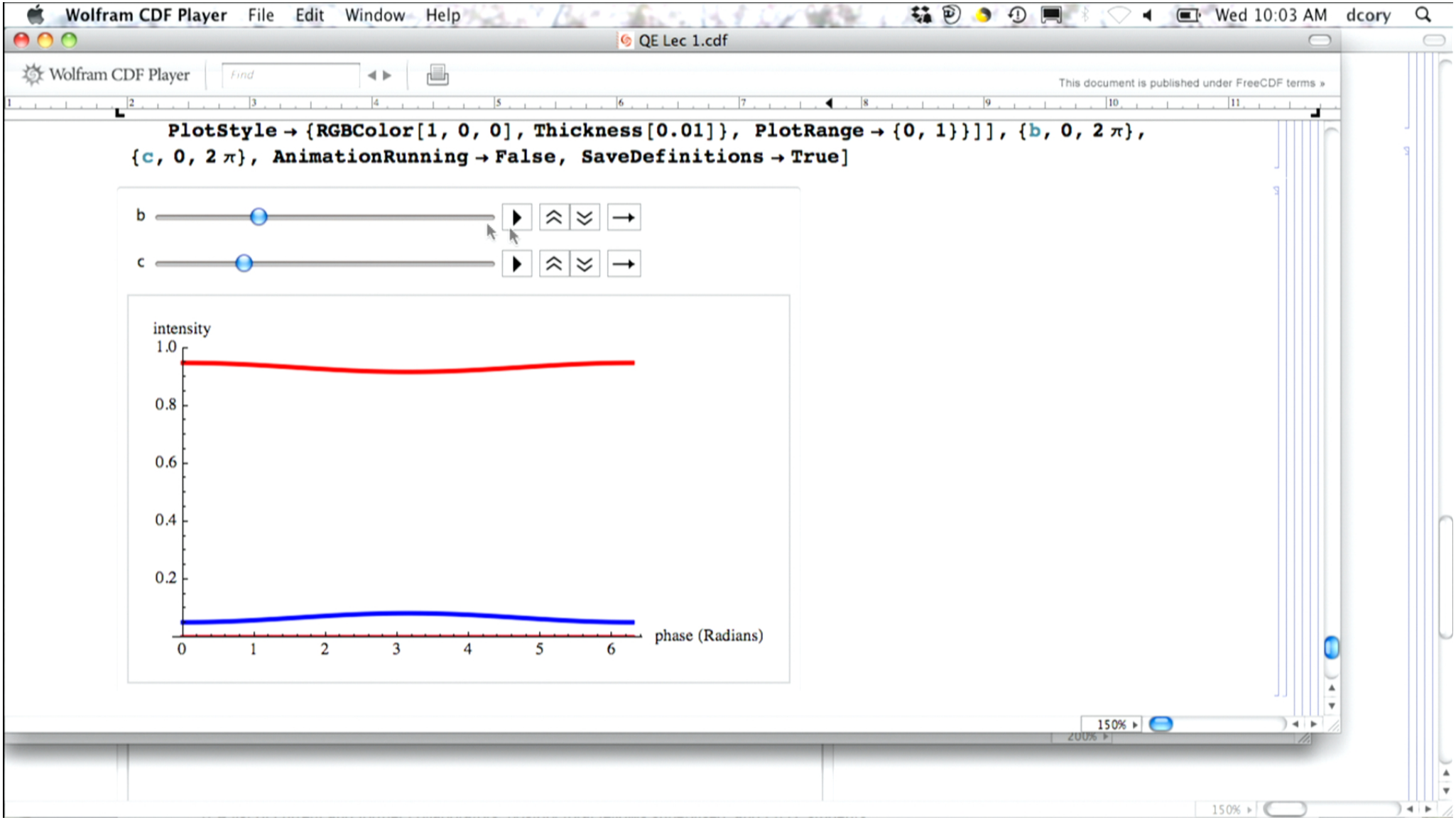
QE Lec 2.nb
Input: DVI - 1280x720p@60Hz
Output: SDI - 1920x1080i@60Hz
You opened a notebook with an old default styling from a previous version of Mathematica. We have updated your notebook's appearance for Mathematica 9.
Continue with updated styling
Revert to older styling
Do this for all notebooks
phi_up =157 ± 2
phi_down=119 ± 2
d_phi =38
Field current (2.34 A)
O-det, (count/100s)
600
500
400
300
200
100
-2
-1
0
1
2
200%
150%


7 Å
B_0
graphite


B
H spin
H
H


photon
spin
B
H
H
H
path
spin
H
H
H
$\frac{1}{\sqrt{2}}(|\uparrow\rangle+|\downarrow\rangle)\otimes|0\rangle$
$\frac{1}{\sqrt{2}}(e^{+i\alpha}|0\uparrow\rangle+|1\uparrow\rangle+|0\downarrow\rangle+|1\downarrow\rangle)$
$e^{+i\alpha}$
$e^{-i\alpha}$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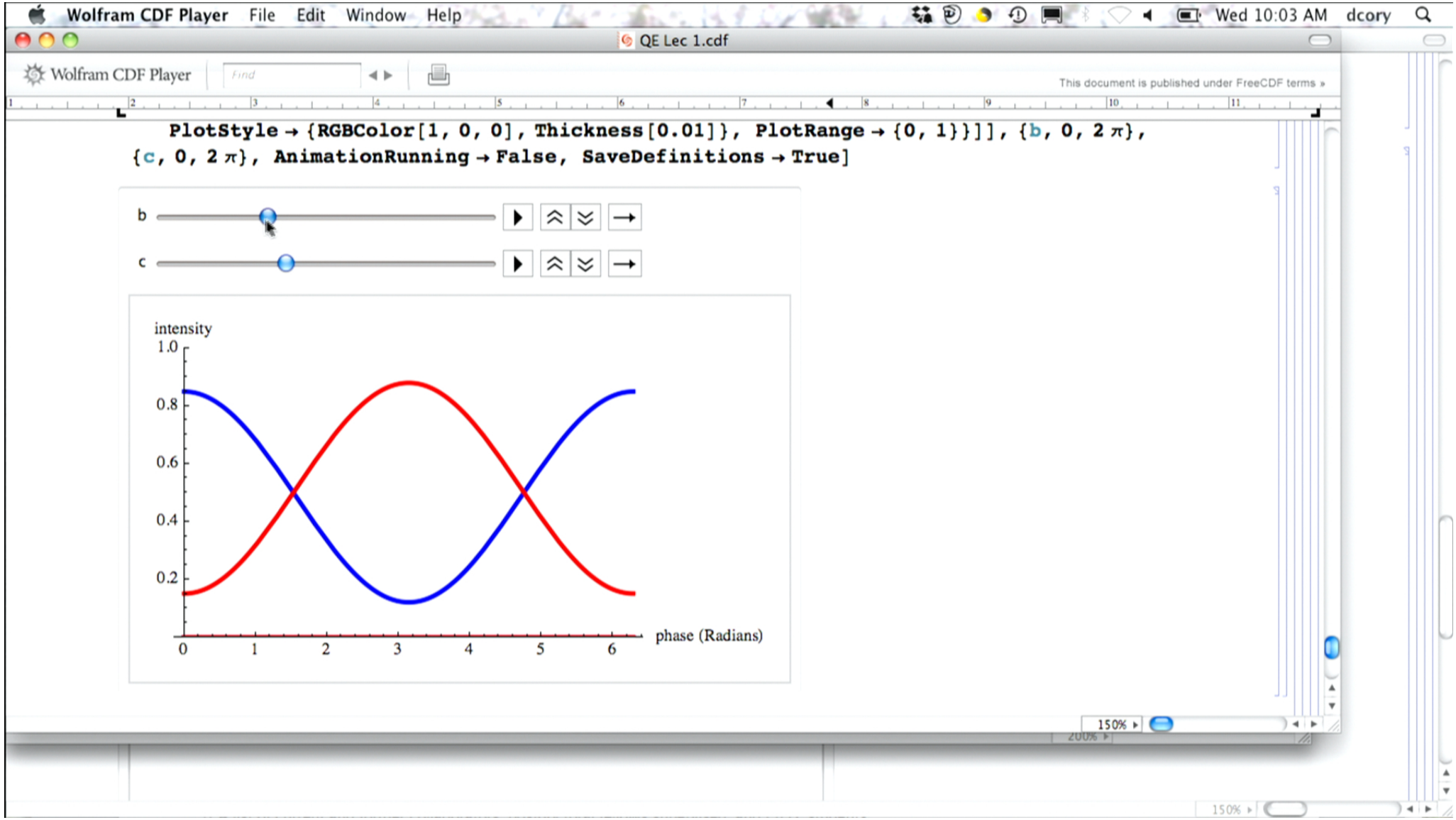
PlotStyle → {RGBColor[1, 0, 0], Thickness[0.01]}, PlotRange → {0, 1}}]], {b, 0, 2 π},
{c, 0, 2 π}, AnimationRunning → False, SaveDefinitions → True]
b
c
intensity
1.0
0.8
0.6
0.4
0.2
0
1
2
3
4
5
6
phase (Radians)
150%
150%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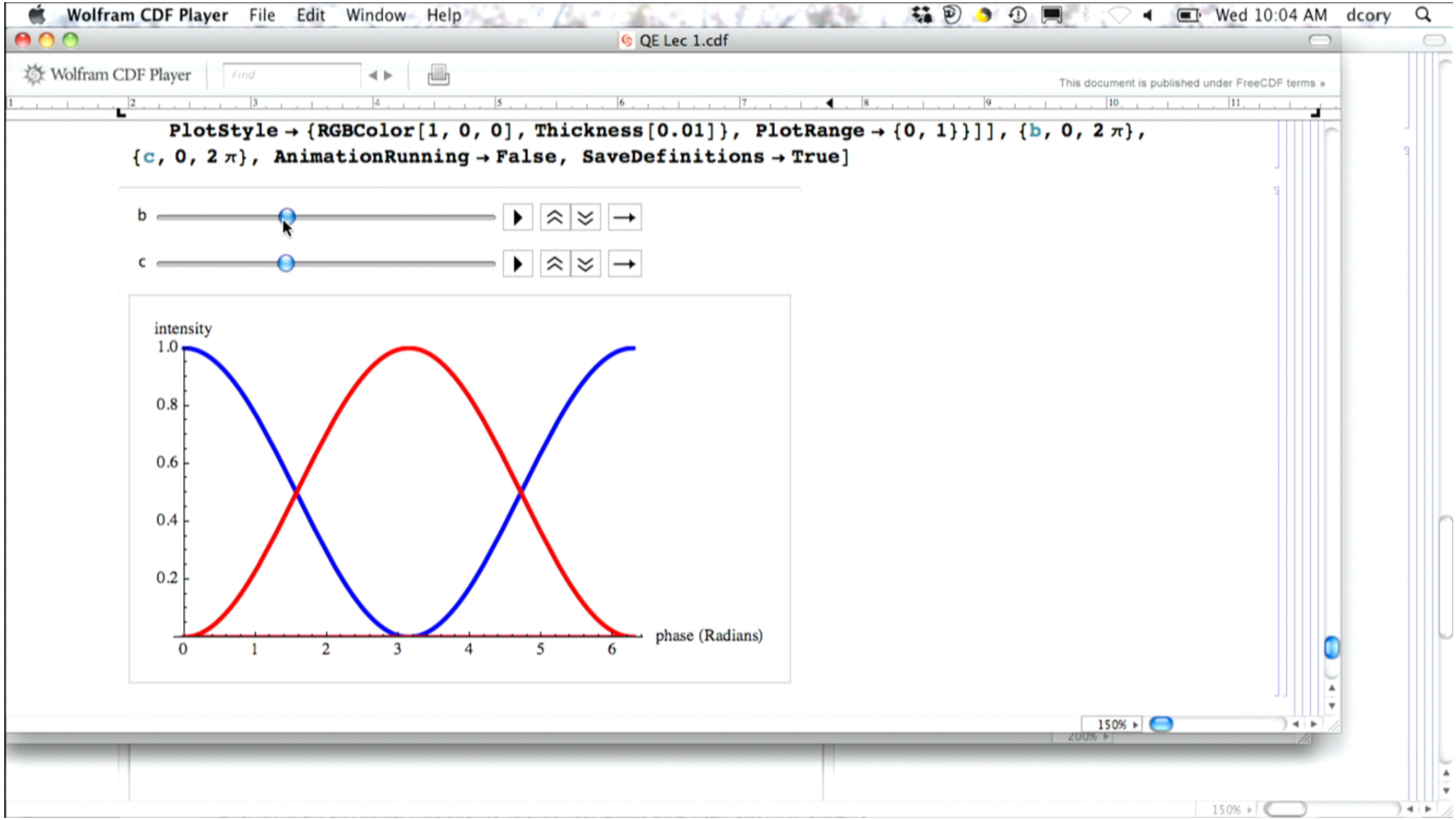
PlotStyle → {RGBColor[1, 0, 0], Thickness[0.01]}, PlotRange → {0, 1}}]], {b, 0, 2 π},
{c, 0, 2 π}, AnimationRunning → False, SaveDefinitions → True]
b
c
intensity
1.0
0.8
0.6
0.4
0.2
0
1
2
3
4
5
6
phase (Radians)
150%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PlotStyle → {RGBColor[1, 0, 0], Thickness[0.01]}, PlotRange → {0, 1}}]], {b, 0, 2 π},
{c, 0, 2 π}, AnimationRunning → False, SaveDefinitions → True]
b
c
intensity
1.0
0.8
0.6
0.4
0.2
0
1
2
3
4
5
6
phase (Radians)
150%
150%