BB84 Depolarization_Noise_Map

November 3, 2021

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```python
[1]: %config InlineBackend.print_figure_kwargs={'facecolor' : "w"}
     import matplotlib.pyplot as plt
     from matplotlib.ticker import (AutoMinorLocator, MultipleLocator)
     fig, ax = plt.subplots(figsize=(10, 5))
     fig.suptitle('|0> Depolarisation error BB84 Protocol Using H Basis with␣
      ↪variable I Gate as Quantum Channel',fontsize=15)
     # naming the x axis
     plt.xlabel('Varying Error Probability ',fontsize=14)
     # naming the y axis
     plt.ylabel('Probabilities',fontsize=14)
     # giving a title to my graph
     # Set axis ranges; by default this will put major ticks every 25.
     #ax.set_xlim(0, 300)
     #ax.set_ylim(0, 1)
     ax.set_xlim(10, 500)
     ax.set_ylim(0.8,1)
     fig = plt.figure(figsize=(8,5))


     # line 1 points
     y1 = [0.961834716796875,0.96029052734375,0.959222412109375,0.957647705078125,0.
      ↪95540771484375,0.953936767578125,0.95242919921875,0.950286865234375,0.
      ↪948883056640625,0.94627685546875,0.945953369140625,0.945513916015625,0.
      ↪941314697265625,0.941656494140625,0.939080810546875,0.937994384765625,0.
      ↪93525390625,0.935565185546875,0.932366943359375,0.93211669921875,0.
      ↪929736328125,0.927105712890625,0.9283447265625,0.92535400390625,0.
      ↪92359619140625,0.9223876953125,0.920111083984375,0.92056884765625,0.
      ↪91741943359375,0.91571044921875,0.914593505859375,0.913983154296875,0.
      ↪912225341796875,0.91072998046875,0.908758544921875,0.90775146484375,0.
      ↪9058349609375,0.9046630859375,0.9036376953125,0.900579833984375,0.
      ↪900421142578125,0.8983154296875,0.897589111328125,0.89774169921875,0.
      ↪89383544921875,0.89403076171875,0.89112548828125,0.89002685546875,0.
      ↪888067626953125,0.887615966796875]
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x1 = [10, 20, 30, 40, 50, 60, 70, 80, 90, 100, 110, 120, 130, 140, 150, 160,␣
 ↪170, 180, 190, 200, 210, 220, 230, 240, 250, 260, 270, 280, 290, 300, 310,␣
 ↪320, 330, 340, 350, 360, 370, 380, 390, 400, 410, 420, 430, 440, 450, 460,␣
 ↪470, 480, 490, 500]

# plotting the line 2 points
ax.plot(x1, y1, label = "|0>'s Probability")

# line 2 points

y2 =[0.961700439453125,0.9594970703125,0.95830078125,0.95635986328125,0.
 ↪9560302734375,0.953326416015625,0.953472900390625,0.94970703125,0.
 ↪948876953125,0.947216796875,0.9469970703125,0.94407958984375,0.
 ↪9421630859375,0.940814208984375,0.93870849609375,0.937554931640625,0.
 ↪935443115234375,0.933746337890625,0.932659912109375,0.932318115234375,0.
 ↪9297607421875,0.928057861328125,0.926708984375,0.9259521484375,0.
 ↪9236083984375,0.92198486328125,0.9207763671875,0.918939208984375,0.
 ↪917828369140625,0.91558837890625,0.914288330078125,0.912567138671875,0.
 ↪91258544921875,0.910845947265625,0.908050537109375,0.906658935546875,0.
 ↪90601806640625,0.905596923828125,0.903179931640625,0.901641845703125,0.
 ↪899908447265625,0.897918701171875,0.8967529296875,0.89478759765625,0.
 ↪8939453125,0.89112548828125,0.890435791015625,0.8913818359375,0.
 ↪887872314453125,0.8884765625]

x2 = [10, 20, 30, 40, 50, 60, 70, 80, 90, 100, 110, 120, 130, 140, 150, 160,␣
 ↪170, 180, 190, 200, 210, 220, 230, 240, 250, 260, 270, 280, 290, 300, 310,␣
 ↪320, 330, 340, 350, 360, 370, 380, 390, 400, 410, 420, 430, 440, 450, 460,␣
 ↪470, 480, 490, 500]

# plotting the line 2 points
ax.plot(x2, y2, label = "|1>'s Probability")

#ax.axes.xaxis.set_ticks([])
# show a legend on the plot
ax.legend()
```
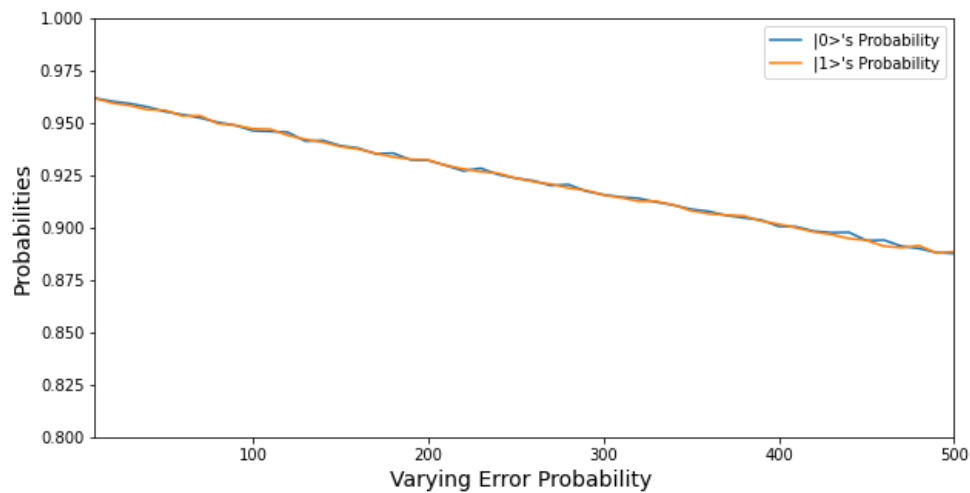
[1]: <matplotlib.legend.Legend at 0x7f50f881b390>

|0> Depolarisation error BB84 Protocol Using H Basis with variable I Gate as Quantum Channel


```
<Figure size 576x360 with 0 Axes>
```

[2]:
```python
%config InlineBackend.print_figure_kwargs={'facecolor' : "w"}
import matplotlib.pyplot as plt
from matplotlib.ticker import (AutoMinorLocator, MultipleLocator)
fig, ax = plt.subplots(figsize=(10, 5))
fig.suptitle('|0> Depolarisation error BB84 Protocol Using Z Basis with␣
 ↪variable I Gate as Quantum Channel',fontsize=15)
# naming the x axis
plt.xlabel('Varying Error Probability ',fontsize=14)
# naming the y axis
plt.ylabel('Probabilities',fontsize=14)
# giving a title to my graph
# Set axis ranges; by default this will put major ticks every 25.
#ax.set_xlim(0, 300)
#ax.set_ylim(0, 1)
ax.set_xlim(10, 500)
ax.set_ylim(0.8,1)
fig = plt.figure(figsize=(8,5))
```

```python
y1= [0.962823486328125,0.960784912109375,0.959136962890625,0.956842041015625,0.
→95548095703125,0.9537353515625,0.95216064453125,0.9505126953125,0.
→949151611328125,0.947259521484375,0.945220947265625,0.944940185546875,0.
→942718505859375,0.94139404296875,0.940093994140625,0.937371826171875,0.
→935986328125,0.935870361328125,0.9339111328125,0.931805419921875,0.
→929193115234375,0.928472900390625,0.927093505859375,0.9249755859375,0.
→922735595703125,0.923370361328125,0.921331787109375,0.919866943359375,0.
→919256591796875,0.915936279296875,0.914288330078125,0.915289306640625,0.
→912091064453125,0.911126708984375,0.9103271484375,0.907110595703125,0.
→9041748046875,0.90364990234375,0.903704833984375,0.903179931640625,0.
→900537109375,0.89874267578125,0.89566650390625,0.894903564453125,0.
→894708251953125,0.8938720703125,0.891351318359375,0.8913330078125,0.
→887640380859375,0.8892333984375]

x1 = [10, 20, 30, 40, 50, 60, 70, 80, 90, 100, 110, 120, 130, 140, 150, 160,␣
→170, 180, 190, 200, 210, 220, 230, 240, 250, 260, 270, 280, 290, 300, 310,␣
→320, 330, 340, 350, 360, 370, 380, 390, 400, 410, 420, 430, 440, 450, 460,␣
→470, 480, 490, 500]

# plotting the line 1 points
ax.plot(x1, y1, label = "|0>'s Probability")

# line 2 points

y2= [0.96158447265625,0.960919189453125,0.95849609375,0.95745849609375,0.
→955999755859375,0.9537353515625,0.95257568359375,0.951239013671875,0.
→948651123046875,0.948150634765625,0.945892333984375,0.944195556640625,0.
→943682861328125,0.941119384765625,0.940478515625,0.937481689453125,0.
→93656005859375,0.933685302734375,0.933251953125,0.930615234375,0.
→93021240234375,0.928826904296875,0.9273193359375,0.92501220703125,0.
→92384033203125,0.92303466796875,0.921240234375,0.918292236328125,0.
→917498779296875,0.91727294921875,0.9136474609375,0.912969970703125,0.
→91279296875,0.91107177734375,0.9088134765625,0.906817626953125,0.
→905731201171875,0.904449462890625,0.901751708984375,0.90037841796875,0.
→899212646484375,0.899072265625,0.89652099609375,0.89420166015625,0.
→89498291015625,0.8927490234375,0.892645263671875,0.888671875,0.
→889349365234375,0.8857421875]
x2 = [10, 20, 30, 40, 50, 60, 70, 80, 90, 100, 110, 120, 130, 140, 150, 160,␣
→170, 180, 190, 200, 210, 220, 230, 240, 250, 260, 270, 280, 290, 300, 310,␣
→320, 330, 340, 350, 360, 370, 380, 390, 400, 410, 420, 430, 440, 450, 460,␣
→470, 480, 490, 500]

# plotting the line 2 points
ax.plot(x2, y2, label = "|1>'s Probability")

#ax.axes.xaxis.set_ticks([])
# show a legend on the plot
```
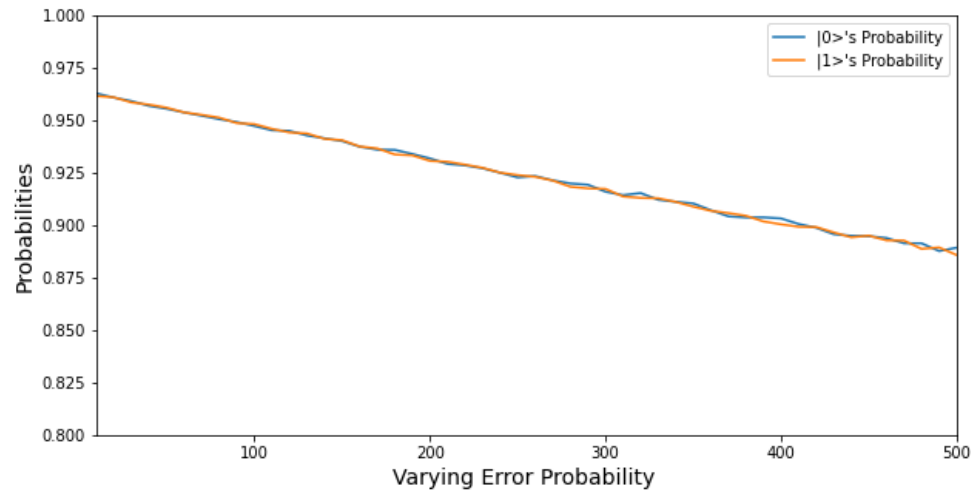
```
ax.legend()
```

<matplotlib.legend.Legend at 0x7f50f8757950>

|0> Depolarisation error BB84 Protocol Using Z Basis with variable I Gate as Quantum Channel

<Figure size 576x360 with 0 Axes>

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