In[1]:=
```
Import["https://quest.qtechtheory.org/QuEST.m"]
```

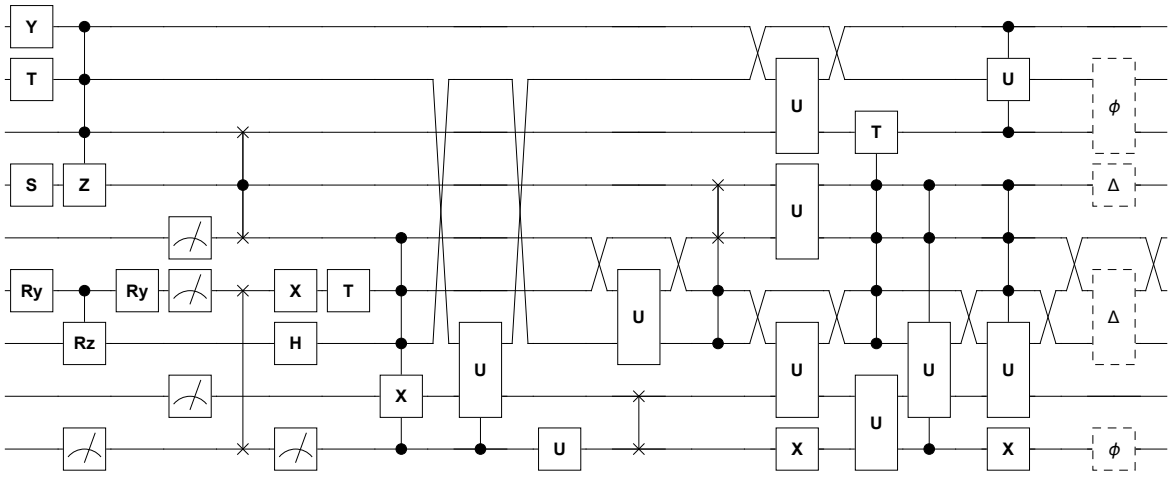
Circuit drawing can be performed right away, since generated locally in Mathematica.

In[2]:=
```
m = ( 0      i
      Exp[.3 i]  0 );

u[θ_] := Circuit[
    S5 T7 Y8 ×
     Ry3[θ] C3[Rz2[θ]] C8,7,6[Z5] M0 Ry3[θ] M1,3,4 SWAP0,3 C5[SWAP4,6]
     M0 H2 X3 T3 C0,2,3,4[X1] C0[U1,7] U0[m] U2,4 SWAP0,1 C2,3[SWAP4,5] U3,1
     U4,5 U6,8 X0 U0,1 C2,3,4,5[T6] C0,4,5[U1,2] C2,4,5[U1,3] X0 C6,8[U7[m]]
     Depol2,4[θ/100] Deph0[θ/200] Depol5[θ/300] Deph6,7[θ/400]];
```

In[4]:=
```
DrawCircuit @ u[θ]
```

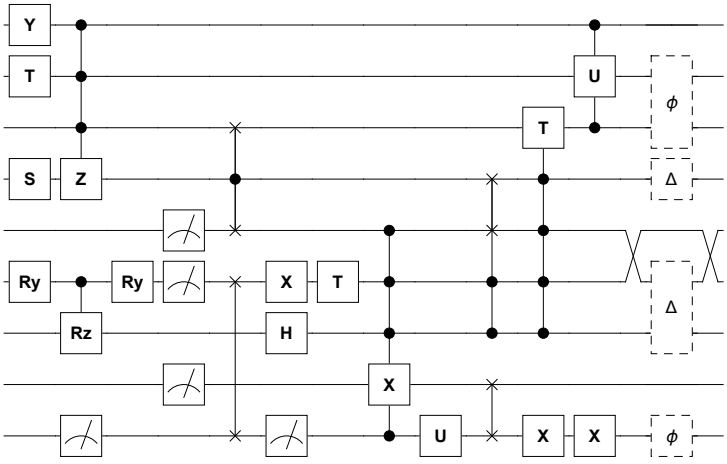
Out[4]=



Here we remove the gates which aren't supported by the simulator (2-qubit unitaries)

In[5]:=
```
v[θ_] := DeleteCases[u[θ], U_Integer,_Integer | C__Integer[U_Integer,_Integer]]
DrawCircuit @ v[θ]
```

Out[6]=



We connect to a QuEST environment, which can be local or remote (for *local*, we require

quest_link is in this directory)

In[7]:=
```
env = CreateLocalQuESTEnv[];
```

In[8]:=
```
? QuEST`*
```

▼ QuEST`

ApplyCircuit	H
ApplyOneQubitDephaseError	InitClassicalState
ApplyOneQubitDepolariseError	InitPlusState
ApplyTwoQubitDephaseError	InitPureState
ApplyTwoQubitDepolariseError	InitStateFromAmps
CalcFidelity	InitZeroState
CalcProbOfOutcome	M
Circuit	Operator
CloneQureg	PackageExport
CreateDensityQureg	Rx
CreateLocalQuESTEnv	Ry
CreateQureg	Rz
CreateRemoteQuESTEnv	S
Deph	SetMatrix
Depol	SWAP
DestroyAllQuregs	T
DestroyQuESTEnv	U
DestroyQureg	X
DrawCircuit	Y
GetAllQuregs	Z
GetMatrix	

We can now simulate our sanitised circuit

In[9]:=
```
ρ = CreateDensityQureg[9];
ψ = CreateQureg[9];
```

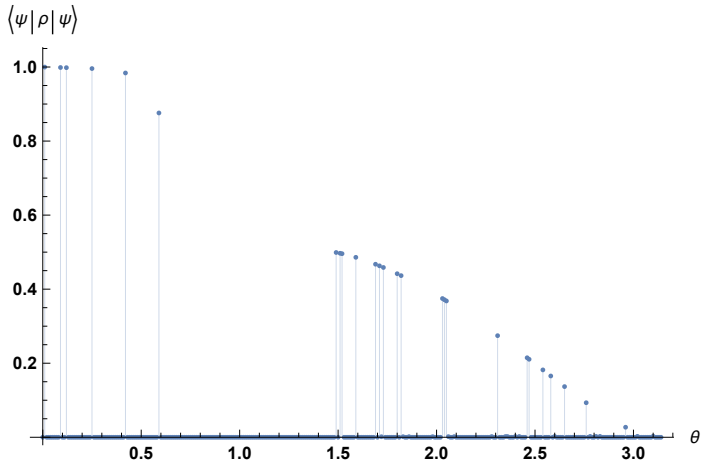
In[11]:=
```
ApplyCircuit[v[0], InitPlusState @ ψ];
```

In[12]:=
```
params = Range[0, π, .01];
fids = Table[
       ApplyCircuit[v[θ], InitPlusState @ ρ];
       CalcFidelity[ρ, ψ],
       {θ, params}
  ];
```

Note the results here are *random* since our circuit contains projective measurement gates.

In[14]:=
```
ListPlot[
      Transpose[{params, fids}],
      AxesLabel → {"θ", "⟨ψ|ρ|ψ⟩"},
      Filling → Bottom
]
```

Out[14]=



Finally, we free the state-vectors from our machine and disconnect from **quest_link** (killing the process)

In[15]:=
```
DestroyAllQuregs[];
```

In[16]:=
```
DestroyQuESTEnv[env];
```