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In[1]:= Id = {{1, 0}, {0, 1}};

In[2]:= X = PauliMatrix[1];

In[3]:= Z = PauliMatrix[3];

In[4]:= Z01 = KroneckerProduct[Z, Z, Id];

In[5]:= Z02 = KroneckerProduct[Z, Id, Z];

In[6]:= Z12 = KroneckerProduct[Id, Z, Z];

In[7]:= UGamma1 = MatrixExp[-I G1 (3 IdentityMatrix[8] - Z01 - Z02 - Z12) / 2];

In[8]:= UGamma1Transpose = Refine[ConjugateTranspose[UGamma1], {Element[G1, Reals]}];

In[9]:= UGamma2 = MatrixExp[-I G2 (3 IdentityMatrix[8] - Z01 - Z02 - Z12) / 2];

In[10]:= UGamma2Transpose = Refine[ConjugateTranspose[UGamma2], {Element[G2, Reals]}];

In[11]:= UP = {{1}, {0}};

In[12]:= DW = {{0}, {1}};

In[13]:= Plus3 = HadamardMatrix[2^3].KroneckerProduct[UP, UP, UP];

In[14]:= RxBeta1 = MatrixExp[-I * B1 * PauliMatrix[1]];

In[15]:= RxBeta1Transpose = MatrixExp[I * B1 * PauliMatrix[1]];

In[16]:= RxBeta2 = MatrixExp[-I * B2 * PauliMatrix[1]];

In[17]:= RxBeta2Transpose = MatrixExp[I * B2 * PauliMatrix[1]];

In[18]:= RotationBeta1 = KroneckerProduct[RxBeta1, RxBeta1, RxBeta1];

In[19]:= RotationBeta1Transpose =
    KroneckerProduct[RxBeta1Transpose, RxBeta1Transpose, RxBeta1Transpose];

In[20]:= RotationBeta2 = KroneckerProduct[RxBeta2, RxBeta2, RxBeta2];

In[21]:= RotationBeta2Transpose =
    KroneckerProduct[RxBeta2Transpose, RxBeta2Transpose, RxBeta2Transpose];

In[22]:= Fa = Simplify[(1 - Simplify[ExpToTrig[Simplify[(Transpose[Plus3].UGamma1Transpose.
    RotationBeta1Transpose.UGamma2Transpose.RotationBeta2Transpose.
    (Z01).RotationBeta2.UGamma2.RotationBeta1.UGamma1.Plus3)]]]) / 2];

In[23]:=

In[24]:= Zn02 = KroneckerProduct[Z, Id, Z, Id, Id];

In[25]:= Zn12 = KroneckerProduct[Id, Z, Z, Id, Id];

In[26]:= Zn01 = KroneckerProduct[Z, Z, Id, Id, Id];

In[27]:= Zn24 = KroneckerProduct[Id, Id, Z, Id, Z];

In[28]:= Zn23 = KroneckerProduct[Id, Id, Z, Z, Id];

In[29]:= U5Gamma1 = MatrixExp[-I G1 (5 IdentityMatrix[2^5] - Zn02 - Zn01 - Zn12 - Zn24 - Zn23) / 2];

In[30]:= U5Gamma1Transpose = Refine[ConjugateTranspose[U5Gamma1], {Element[G1, Reals]}];

In[31]:= U5Gamma2 = MatrixExp[-I G2 (5 IdentityMatrix[2^5] - Zn02 - Zn01 - Zn12 - Zn24 - Zn23) / 2];

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In[32]:= U5Gamma2Transpose = Refine[ConjugateTranspose[U5Gamma2], {Element[G2, Reals]}];

In[33]:= Rotation5Beta1 = KroneckerProduct[RxBeta1, RxBeta1, RxBeta1, RxBeta1, RxBeta1];

In[34]:= Rotation5Beta1Transpose = KroneckerProduct[RxBeta1Transpose,
  RxBeta1Transpose, RxBeta1Transpose, RxBeta1Transpose, RxBeta1Transpose];

In[35]:= Rotation5Beta2 = KroneckerProduct[RxBeta2, RxBeta2, RxBeta2, RxBeta2, RxBeta2];

In[36]:= Rotation5Beta2Transpose = KroneckerProduct[RxBeta2Transpose,
  RxBeta2Transpose, RxBeta2Transpose, RxBeta2Transpose, RxBeta2Transpose];

In[37]:= PulsState5 = HadamardMatrix[2^5].KroneckerProduct[UP, UP, UP, UP, UP];

In[38]:= Fb = Simplify[ExpToTrig[
  Simplify[(Transpose[PulsState5].U5Gamma1Transpose.Rotation5Beta1Transpose.
    U5Gamma2Transpose.Rotation5Beta2Transpose.((IdentityMatrix[2^5] - Zn12)/2).
    Rotation5Beta2.U5Gamma2.Rotation5Beta1.U5Gamma1.PulsState5)]]];

In[39]:=

In[40]:= CostFunc[G1_, B1_, G2_, B2_] = Simplify[2 Fa + 4 Fb][[1, 1]];

In[41]:= FindMaximum[{CostFunc[G1, B1, G2, B2],
  0 < G1 < 3.14 && 0 < B1 < 3.14 && 0 < G2 < 3.14 && 0 < B2 < 3.14}, {G1, B1, G2, B2}]

Out[41]= {3.99411, {G1 -> 0.415866, B1 -> 0.406461, G2 -> 0.90357, B2 -> 0.147523}}

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