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In[1]:= ProductHermitian[v1_, v2_, α_, τ_] :=
  Conjugate[v1].{ {Cos[α - τ]^2 + Sin[τ]^2, -2 I Sin[α] Sin[τ]^2},
    {2 I Sin[α] Sin[τ]^2, Cos[α + τ]^2 + Sin[τ]^2} }.Transpose[v2] Sec[α]^2
Evolution = { {Cos[τ - α], -I Sin[τ]}, {-I Sin[τ], Cos[α + τ]} } * Sec[α]
EvolutionConjugated =
  Transpose[{ {Cos[τ - α], I Sin[τ]}, {I Sin[τ], Cos[α + τ]} } * Sec[α]]
v1Probe = { {1/Sqrt[2], I/Sqrt[2]} }
v2Probe = { {1/Sqrt[2], -I/Sqrt[2]} }
v3Probe = { {Cos[ρ/2], I Sin[ρ/2]} }
cos12 = FullSimplify[(ProductHermitian[v1Probe, v2Probe, α, τ])^2 /
  (ProductHermitian[v1Probe, v1Probe, α, τ] * ProductHermitian[v2Probe, v2Probe, α, τ])]
cos13 = FullSimplify[(ProductHermitian[v1Probe, v3Probe, α, τ])^2 /
  (ProductHermitian[v1Probe, v1Probe, α, τ] *
    ProductHermitian[v3Probe, v3Probe, α, τ]), {ρ ∈ Reals}]
cos23 = FullSimplify[(ProductHermitian[v2Probe, v3Probe, α, τ])^2 /
  (ProductHermitian[v2Probe, v2Probe, α, τ] *
    ProductHermitian[v3Probe, v3Probe, α, τ]), {ρ ∈ Reals}]
Out[2]= { {Cos[α - τ] Sec[α], -I Sec[α] Sin[τ]}, {-I Sec[α] Sin[τ], Cos[α + τ] Sec[α]} }
Out[3]= { {Cos[α - τ] Sec[α], I Sec[α] Sin[τ]}, {I Sec[α] Sin[τ], Cos[α + τ] Sec[α]} }
Out[4]= { {1/Sqrt[2], I/Sqrt[2]} }
Out[5]= { {1/Sqrt[2], -I/Sqrt[2]} }
Out[6]= { {Cos[ρ/2], I Sin[ρ/2]} }
Out[7]= { {4 Sin[α]^2 Sin[2 τ]^2 / (3 + Cos[2 α] - 2 Cos[4 τ] Sin[α]^2)} }
Out[8]= { {2 (Cos[ρ/2] (Cos[α - τ]^2 + (1 + 2 Sin[α]) Sin[τ]^2) +
  Sin[ρ/2] (Cos[α + τ]^2 + (1 + 2 Sin[α]) Sin[τ]^2))^2 /
  ((Cos[α - τ]^2 + Cos[α + τ]^2 + 2 (1 + 2 Sin[α]) Sin[τ]^2) (2 + Cos[α - ρ] - Cos[α + ρ] -
    2 Cos[2 τ] Sin[α] (Sin[α] + Sin[ρ]) + Cos[ρ] Sin[2 α] Sin[2 τ]))} } }
Out[9]= { {2 (Cos[ρ/2] (Cos[α - τ]^2 + (1 - 2 Sin[α]) Sin[τ]^2) -
  Sin[ρ/2] (Cos[α + τ]^2 + (1 - 2 Sin[α]) Sin[τ]^2))^2 /
  ((Cos[α - τ]^2 + Cos[α + τ]^2 + 2 (1 - 2 Sin[α]) Sin[τ]^2) (2 + Cos[α - ρ] - Cos[α + ρ] -
    2 Cos[2 τ] Sin[α] (Sin[α] + Sin[ρ]) + Cos[ρ] Sin[2 α] Sin[2 τ]))} } }

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In[10]:= cos12F [ $\alpha_-$ ,  $\tau_-$ ,  $\rho_-$ ] :=  $\frac{4 \sin[\alpha]^2 \sin[2 \tau]^2}{3 + \cos[2 \alpha] - 2 \cos[4 \tau] \sin[\alpha]^2}$ 

cos13F [ $\alpha_-$ ,  $\tau_-$ ,  $\rho_-$ ] :=  $\left( 2 \left( \cos\left[\frac{\rho}{2}\right] \left( \cos[\alpha - \tau]^2 + (1 + 2 \sin[\alpha]) \sin[\tau]^2 \right) + \right. \right.$ 
 $\left. \sin\left[\frac{\rho}{2}\right] \left( \cos[\alpha + \tau]^2 + (1 + 2 \sin[\alpha]) \sin[\tau]^2 \right) \right)^2 \Big/$ 
 $\left( \left( \cos[\alpha - \tau]^2 + \cos[\alpha + \tau]^2 + 2 (1 + 2 \sin[\alpha]) \sin[\tau]^2 \right) (2 + \cos[\alpha - \rho] - \cos[\alpha + \rho] - \right.$ 
 $\left. 2 \cos[2 \tau] \sin[\alpha] (\sin[\alpha] + \sin[\rho]) + \cos[\rho] \sin[2 \alpha] \sin[2 \tau] \right)$ 

cos23F [ $\alpha_-$ ,  $\tau_-$ ,  $\rho_-$ ] :=  $\left( 2 \left( \cos\left[\frac{\rho}{2}\right] \left( \cos[\alpha - \tau]^2 + (1 - 2 \sin[\alpha]) \sin[\tau]^2 \right) - \right. \right.$ 
 $\left. \sin\left[\frac{\rho}{2}\right] \left( \cos[\alpha + \tau]^2 + (1 - 2 \sin[\alpha]) \sin[\tau]^2 \right) \right)^2 \Big/$ 
 $\left( \left( \cos[\alpha - \tau]^2 + \cos[\alpha + \tau]^2 + 2 (1 - 2 \sin[\alpha]) \sin[\tau]^2 \right) (2 + \cos[\alpha - \rho] - \cos[\alpha + \rho] - \right.$ 
 $\left. 2 \cos[2 \tau] \sin[\alpha] (\sin[\alpha] + \sin[\rho]) + \cos[\rho] \sin[2 \alpha] \sin[2 \tau] \right)$ 

In[13]:= vector1 =  $\left\{ \left\{ \frac{1}{\sqrt{2}}, \frac{i}{\sqrt{2}} \right\} \right\}$ 

vector2 =  $\left\{ \left\{ \frac{1}{\sqrt{2}}, -\frac{i}{\sqrt{2}} \right\} \right\}$ 

vectorRef =  $\left\{ \left\{ \cos\left[\frac{\rho}{2}\right], i \sin\left[\frac{\rho}{2}\right] \right\} \right\}$ 

Unit =  $\{ \{1, 0\}, \{0, 1\} \}$ 

Evolution =  $\{ \{ \cos[\tau - \alpha], -i * \sin[\tau] \}, \{ -i * \sin[\tau], \cos[\alpha + \tau] \} \} * \text{Sec}[\alpha]$ 

 $\tau_{\text{Perp}}$  =  $\pi/2$ 

 $\omega$  = 1

Out[13]=  $\left\{ \left\{ \frac{1}{\sqrt{2}}, \frac{i}{\sqrt{2}} \right\} \right\}$ 

Out[14]=  $\left\{ \left\{ \frac{1}{\sqrt{2}}, -\frac{i}{\sqrt{2}} \right\} \right\}$ 

Out[15]=  $\left\{ \left\{ \cos\left[\frac{\rho}{2}\right], i \sin\left[\frac{\rho}{2}\right] \right\} \right\}$ 

Out[16]=  $\{ \{1, 0\}, \{0, 1\} \}$ 

Out[17]=  $\{ \{ \cos[\alpha - \tau] \text{Sec}[\alpha], -i \text{Sec}[\alpha] \sin[\tau] \}, \{ -i \text{Sec}[\alpha] \sin[\tau], \cos[\alpha + \tau] \text{Sec}[\alpha] \} \}$ 

Out[18]=  $\frac{\pi}{2}$ 

Out[19]= 1

In[20]:= EvolutionMT =  $\{ \{ \cos[\alpha + \tau] \text{Sec}[\alpha], i \text{Sec}[\alpha] \sin[\tau] \}, \{ i \text{Sec}[\alpha] \sin[\tau], \cos[\alpha - \tau] \text{Sec}[\alpha] \} \}$ 

Out[20]=  $\{ \{ \cos[\alpha + \tau] \text{Sec}[\alpha], i \text{Sec}[\alpha] \sin[\tau] \}, \{ i \text{Sec}[\alpha] \sin[\tau], \cos[\alpha - \tau] \text{Sec}[\alpha] \} \}$ 

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In[21]:= LeftEvolutionMT =
  {{Cos[α + τ] Sec[α], -i * Sec[α] Sin[τ]}, {-i * Sec[α] Sin[τ], Sec[α] Cos[α - τ]}}
Out[21]= {{Cos[α + τ] Sec[α], -i Sec[α] Sin[τ]}, {-i Sec[α] Sin[τ], Cos[α - τ] Sec[α]}}

In[22]:= Unit = {{1, 0}, {0, 1}}
Out[22]= {{1, 0}, {0, 1}}

In[23]:= Nm = (N0 * FullSimplify[LeftEvolutionMT.EvolutionMT])
ZetaF = MatrixPower[Nm - Unit, 1/2]
Out[23]= {{N0 Sec[α]^2 (Cos[α + τ]^2 + Sin[τ]^2), -2 i N0 Sec[α] Sin[τ]^2 Tan[α]},
  {2 i N0 Sec[α] Sin[τ]^2 Tan[α], N0 Sec[α]^2 (Cos[α - τ]^2 + Sin[τ]^2)}}

Out[24]= {{(1/Sqrt[1 + Cos[2 α]]
  (-2 + 4 N0 - 2 Cos[2 α] + N0 Cos[2 α - 2 τ] - 2 N0 Cos[2 τ] + N0 Cos[2 α + 2 τ] + 2 Sqrt[2]
  Sqrt[N0^2 (6 + 2 Cos[2 α] + Cos[2 α - 2 τ] - 2 Cos[2 τ] + Cos[2 α + 2 τ]) Sin[α]^2 Sin[τ]^2])
  (4 N0 + N0 Cos[2 α - 2 τ] - 2 N0 Cos[2 τ] + N0 Cos[2 α + 2 τ] - 2 N0 Cos[α - τ]^2 Sec[α]^2 -
  2 N0 Cos[2 α] Cos[α - τ]^2 Sec[α]^2 - 2 N0 Sec[α]^2 Sin[τ]^2 -
  2 N0 Cos[2 α] Sec[α]^2 Sin[τ]^2 + 2 Sqrt[2]
  Sqrt[N0^2 (6 + 2 Cos[2 α] + Cos[2 α - 2 τ] - 2 Cos[2 τ] + Cos[2 α + 2 τ]) Sin[α]^2 Sin[τ]^2])
  (8 Sqrt[N0^2 (6 + 2 Cos[2 α] + Cos[2 α - 2 τ] - 2 Cos[2 τ] + Cos[2 α + 2 τ]) Sin[α]^2 Sin[τ]^2]) +
  (1/Sqrt[1 + Cos[2 α]] (-2 + 4 N0 - 2 Cos[2 α] + N0 Cos[2 α - 2 τ] -
  2 N0 Cos[2 τ] + N0 Cos[2 α + 2 τ] - 2 Sqrt[2]
  Sqrt[N0^2 (6 + 2 Cos[2 α] + Cos[2 α - 2 τ] - 2 Cos[2 τ] + Cos[2 α + 2 τ]) Sin[α]^2 Sin[τ]^2])
  (-4 N0 - N0 Cos[2 α - 2 τ] + 2 N0 Cos[2 τ] - N0 Cos[2 α + 2 τ] + 2 N0 Cos[α - τ]^2 Sec[α]^2 +
  2 N0 Cos[2 α] Cos[α - τ]^2 Sec[α]^2 + 2 N0 Sec[α]^2 Sin[τ]^2 +
  2 N0 Cos[2 α] Sec[α]^2 Sin[τ]^2 + 2 Sqrt[2]
  Sqrt[N0^2 (6 + 2 Cos[2 α] + Cos[2 α - 2 τ] - 2 Cos[2 τ] + Cos[2 α + 2 τ]) Sin[α]^2 Sin[τ]^2])
  (8 Sqrt[N0^2 (6 + 2 Cos[2 α] + Cos[2 α - 2 τ] - 2 Cos[2 τ] + Cos[2 α + 2 τ]) Sin[α]^2 Sin[τ]^2]),
  (i Cos[α] Cot[α] Csc[τ]^2 Sqrt[1/Sqrt[1 + Cos[2 α]]
  (-2 + 4 N0 - 2 Cos[2 α] + N0 Cos[2 α - 2 τ] - 2 N0 Cos[2 τ] + N0 Cos[2 α + 2 τ] - 2 Sqrt[2]
  Sqrt[N0^2 (6 + 2 Cos[2 α] + Cos[2 α - 2 τ] - 2 Cos[2 τ] + Cos[2 α + 2 τ]) Sin[α]^2 Sin[τ]^2])
  (4 N0 + N0 Cos[2 α - 2 τ] - 2 N0 Cos[2 τ] + N0 Cos[2 α + 2 τ] - 2 N0 Cos[α - τ]^2 Sec[α]^2 -

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$$\begin{aligned}
& \frac{2 N0 \cos[2 \alpha] \cos[\alpha - \tau]^2 \sec[\alpha]^2 - 2 N0 \sec[\alpha]^2 \sin[\tau]^2 - 2 N0 \cos[2 \alpha] \sec[\alpha]^2 \sin[\tau]^2 +}{2 \sqrt{2} \sqrt{N0^2 (6 + 2 \cos[2 \alpha] + \cos[2 \alpha - 2 \tau] - 2 \cos[2 \tau] + \cos[2 \alpha + 2 \tau]) \sin[\alpha]^2 \sin[\tau]^2}} \\
& \left(-4 N0 - N0 \cos[2 \alpha - 2 \tau] + 2 N0 \cos[2 \tau] - N0 \cos[2 \alpha + 2 \tau] + \right. \\
& \quad \left. 2 N0 \cos[\alpha - \tau]^2 \sec[\alpha]^2 + 2 N0 \cos[2 \alpha] \cos[\alpha - \tau]^2 \sec[\alpha]^2 + \right. \\
& \quad \left. 2 N0 \sec[\alpha]^2 \sin[\tau]^2 + 2 N0 \cos[2 \alpha] \sec[\alpha]^2 \sin[\tau]^2 + 2 \sqrt{2} \right. \\
& \quad \left. \sqrt{N0^2 (6 + 2 \cos[2 \alpha] + \cos[2 \alpha - 2 \tau] - 2 \cos[2 \tau] + \cos[2 \alpha + 2 \tau]) \sin[\alpha]^2 \sin[\tau]^2} \right) \Bigg) / \\
& \left(32 N0 (1 + \cos[2 \alpha]) \right. \\
& \quad \left. \sqrt{N0^2 (6 + 2 \cos[2 \alpha] + \cos[2 \alpha - 2 \tau] - 2 \cos[2 \tau] + \cos[2 \alpha + 2 \tau]) \sin[\alpha]^2 \sin[\tau]^2} \right) - \\
& \left(i \cos[\alpha] \cot[\alpha] \csc[\tau]^2 \sqrt{\left(\frac{1}{1 + \cos[2 \alpha]} \right. \right. \\
& \quad \left. \left(-2 + 4 N0 - 2 \cos[2 \alpha] + N0 \cos[2 \alpha - 2 \tau] - 2 N0 \cos[2 \tau] + N0 \cos[2 \alpha + 2 \tau] + 2 \sqrt{2} \right. \right. \\
& \quad \left. \left. \sqrt{N0^2 (6 + 2 \cos[2 \alpha] + \cos[2 \alpha - 2 \tau] - 2 \cos[2 \tau] + \cos[2 \alpha + 2 \tau]) \sin[\alpha]^2 \sin[\tau]^2} \right) \right) \Bigg) \\
& \left(4 N0 + N0 \cos[2 \alpha - 2 \tau] - 2 N0 \cos[2 \tau] + N0 \cos[2 \alpha + 2 \tau] - 2 N0 \cos[\alpha - \tau]^2 \sec[\alpha]^2 - \right. \\
& \quad \left. 2 N0 \cos[2 \alpha] \cos[\alpha - \tau]^2 \sec[\alpha]^2 - 2 N0 \sec[\alpha]^2 \sin[\tau]^2 - 2 N0 \cos[2 \alpha] \sec[\alpha]^2 \sin[\tau]^2 + \right. \\
& \quad \left. 2 \sqrt{2} \sqrt{N0^2 (6 + 2 \cos[2 \alpha] + \cos[2 \alpha - 2 \tau] - 2 \cos[2 \tau] + \cos[2 \alpha + 2 \tau]) \sin[\alpha]^2 \sin[\tau]^2} \right) \\
& \left(-4 N0 - N0 \cos[2 \alpha - 2 \tau] + 2 N0 \cos[2 \tau] - N0 \cos[2 \alpha + 2 \tau] + \right. \\
& \quad \left. 2 N0 \cos[\alpha - \tau]^2 \sec[\alpha]^2 + 2 N0 \cos[2 \alpha] \cos[\alpha - \tau]^2 \sec[\alpha]^2 + \right. \\
& \quad \left. 2 N0 \sec[\alpha]^2 \sin[\tau]^2 + 2 N0 \cos[2 \alpha] \sec[\alpha]^2 \sin[\tau]^2 + 2 \sqrt{2} \right. \\
& \quad \left. \sqrt{N0^2 (6 + 2 \cos[2 \alpha] + \cos[2 \alpha - 2 \tau] - 2 \cos[2 \tau] + \cos[2 \alpha + 2 \tau]) \sin[\alpha]^2 \sin[\tau]^2} \right) \Bigg) / \\
& \left(32 N0 (1 + \cos[2 \alpha]) \right. \\
& \quad \left. \sqrt{N0^2 (6 + 2 \cos[2 \alpha] + \cos[2 \alpha - 2 \tau] - 2 \cos[2 \tau] + \cos[2 \alpha + 2 \tau]) \sin[\alpha]^2 \sin[\tau]^2} \right) \Bigg\}, \\
& \left\{ - \left(\left(i N0 (1 + \cos[2 \alpha]) \sec[\alpha] \sin[\tau]^2 \sqrt{\left(\frac{1}{1 + \cos[2 \alpha]} \right. \right. \right. \right. \\
& \quad \left. \left(-2 + 4 N0 - 2 \cos[2 \alpha] + N0 \cos[2 \alpha - 2 \tau] - 2 N0 \cos[2 \tau] + N0 \cos[2 \alpha + 2 \tau] - 2 \sqrt{2} \right. \right. \\
& \quad \left. \left. \sqrt{N0^2 (6 + 2 \cos[2 \alpha] + \cos[2 \alpha - 2 \tau] - 2 \cos[2 \tau] + \cos[2 \alpha + 2 \tau]) \sin[\alpha]^2 \sin[\tau]^2} \right) \right. \right. \\
& \quad \left. \left. \tan[\alpha] \right) \right) / \left(2 \right. \\
& \quad \left. \sqrt{N0^2 (6 + 2 \cos[2 \alpha] + \cos[2 \alpha - 2 \tau] - 2 \cos[2 \tau] + \cos[2 \alpha + 2 \tau]) \sin[\alpha]^2 \sin[\tau]^2} \right) \Bigg) + \\
& \left(i N0 (1 + \cos[2 \alpha]) \sec[\alpha] \sin[\tau]^2 \sqrt{\left(\frac{1}{1 + \cos[2 \alpha]} \right. \right. \\
& \quad \left. \left(-2 + 4 N0 - 2 \cos[2 \alpha] + N0 \cos[2 \alpha - 2 \tau] - 2 N0 \cos[2 \tau] + N0 \cos[2 \alpha + 2 \tau] + 2 \sqrt{2} \right. \right.
\end{aligned}$$

$$\begin{aligned}
& \sqrt{N\theta^2 \left(6 + 2 \cos[2\alpha] + \cos[2\alpha - 2\tau] - 2 \cos[2\tau] + \cos[2\alpha + 2\tau] \right) \sin[\alpha]^2 \sin[\tau]^2} \Bigg) \\
& \tan[\alpha] \Bigg) / \left(2 \sqrt{N\theta^2 \left(6 + 2 \cos[2\alpha] + \cos[2\alpha - 2\tau] - 2 \cos[2\tau] + \cos[2\alpha + 2\tau] \right) \sin[\alpha]^2 \sin[\tau]^2} \right), \\
& \left(\sqrt{\left(\frac{1}{1 + \cos[2\alpha]} \left(-2 + 4 N\theta - 2 \cos[2\alpha] + N\theta \cos[2\alpha - 2\tau] - \right. \right. \right. \\
& \quad \left. \left. \left. 2 N\theta \cos[2\tau] + N\theta \cos[2\alpha + 2\tau] - 2 \sqrt{2} \right) \sqrt{N\theta^2 \left(6 + 2 \cos[2\alpha] + \cos[2\alpha - 2\tau] - 2 \cos[2\tau] + \cos[2\alpha + 2\tau] \right) \sin[\alpha]^2 \sin[\tau]^2} \right)} \right) \\
& \left(4 N\theta + N\theta \cos[2\alpha - 2\tau] - 2 N\theta \cos[2\tau] + N\theta \cos[2\alpha + 2\tau] - 2 N\theta \cos[\alpha - \tau]^2 \sec[\alpha]^2 - \right. \\
& \quad \left. 2 N\theta \cos[2\alpha] \cos[\alpha - \tau]^2 \sec[\alpha]^2 - 2 N\theta \sec[\alpha]^2 \sin[\tau]^2 - \right. \\
& \quad \left. 2 N\theta \cos[2\alpha] \sec[\alpha]^2 \sin[\tau]^2 + 2 \sqrt{2} \right. \\
& \quad \left. \sqrt{N\theta^2 \left(6 + 2 \cos[2\alpha] + \cos[2\alpha - 2\tau] - 2 \cos[2\tau] + \cos[2\alpha + 2\tau] \right) \sin[\alpha]^2 \sin[\tau]^2} \right) \Bigg) / \\
& \left(8 \sqrt{N\theta^2 \left(6 + 2 \cos[2\alpha] + \cos[2\alpha - 2\tau] - 2 \cos[2\tau] + \cos[2\alpha + 2\tau] \right) \sin[\alpha]^2 \sin[\tau]^2} \right) + \\
& \left(\sqrt{\left(\frac{1}{1 + \cos[2\alpha]} \left(-2 + 4 N\theta - 2 \cos[2\alpha] + N\theta \cos[2\alpha - 2\tau] - \right. \right. \right. \\
& \quad \left. \left. \left. 2 N\theta \cos[2\tau] + N\theta \cos[2\alpha + 2\tau] + 2 \sqrt{2} \right) \sqrt{N\theta^2 \left(6 + 2 \cos[2\alpha] + \cos[2\alpha - 2\tau] - 2 \cos[2\tau] + \cos[2\alpha + 2\tau] \right) \sin[\alpha]^2 \sin[\tau]^2} \right)} \right) \\
& \left(-4 N\theta - N\theta \cos[2\alpha - 2\tau] + 2 N\theta \cos[2\tau] - N\theta \cos[2\alpha + 2\tau] + 2 N\theta \cos[\alpha - \tau]^2 \sec[\alpha]^2 + \right. \\
& \quad \left. 2 N\theta \cos[2\alpha] \cos[\alpha - \tau]^2 \sec[\alpha]^2 + 2 N\theta \sec[\alpha]^2 \sin[\tau]^2 + \right. \\
& \quad \left. 2 N\theta \cos[2\alpha] \sec[\alpha]^2 \sin[\tau]^2 + 2 \sqrt{2} \right. \\
& \quad \left. \sqrt{N\theta^2 \left(6 + 2 \cos[2\alpha] + \cos[2\alpha - 2\tau] - 2 \cos[2\tau] + \cos[2\alpha + 2\tau] \right) \sin[\alpha]^2 \sin[\tau]^2} \right) \Bigg) / \\
& \left(8 \sqrt{N\theta^2 \left(6 + 2 \cos[2\alpha] + \cos[2\alpha - 2\tau] - 2 \cos[2\tau] + \cos[2\alpha + 2\tau] \right) \sin[\alpha]^2 \sin[\tau]^2} \right) \Bigg\}
\end{aligned}$$

In[25]:= **Evolution.Transpose[vectorRef]**

$$\begin{aligned}
\text{Out[25]} = & \left\{ \left\{ \cos\left[\frac{\rho}{2}\right] \cos[\alpha - \tau] \sec[\alpha] + \sec[\alpha] \sin\left[\frac{\rho}{2}\right] \sin[\tau] \right\}, \right. \\
& \left. \left\{ i \cos[\alpha + \tau] \sec[\alpha] \sin\left[\frac{\rho}{2}\right] - i \cos\left[\frac{\rho}{2}\right] \sec[\alpha] \sin[\tau] \right\} \right\}
\end{aligned}$$

In[26]:= **ZetaF.Evolution.Transpose[vectorRef]**

$$\begin{aligned}
\text{Out[26]} = & \left\{ \left\{ i \sin\left[\frac{\rho}{2}\right] \right. \right. \\
& \left. \left(-i \sec[\alpha] \sin[\tau] \left(\left(\sqrt{\left(\frac{1}{1 + \cos[2\alpha]} \left(-2 + 4 N\theta - 2 \cos[2\alpha] + N\theta \cos[2\alpha - 2\tau] - 2 N\theta \cos[2\tau] + \right. \right. \right. \right. \right. \right. \right. \right. \\
& \quad \left. \left. \left. \left. \left. \left. N\theta \cos[2\alpha + 2\tau] + 2 \sqrt{2} \sqrt{N\theta^2 \left(6 + 2 \cos[2\alpha] + \cos[2\alpha - 2\tau] - \right. \right. \right. \right. \right. \right. \right. \right. \\
& \quad \left. \left. \left. \left. \left. \left. 2 \cos[2\tau] + \cos[2\alpha + 2\tau] \right) \sin[\alpha]^2 \sin[\tau]^2 \right) \right) \right) \right) \right) \right) \right\}
\end{aligned}$$

$$\begin{aligned}
& \left(4 N0 + N0 \cos [2 \alpha - 2 \tau] - 2 N0 \cos [2 \tau] + N0 \cos [2 \alpha + 2 \tau] - 2 N0 \cos [\alpha - \tau]^2 \right. \\
& \quad \sec [\alpha]^2 - 2 N0 \cos [2 \alpha] \cos [\alpha - \tau]^2 \sec [\alpha]^2 - 2 N0 \sec [\alpha]^2 \sin [\tau]^2 - \\
& \quad 2 N0 \cos [2 \alpha] \sec [\alpha]^2 \sin [\tau]^2 + 2 \sqrt{2} \sqrt{N0^2 (6 + 2 \cos [2 \alpha] + \\
& \quad \cos [2 \alpha - 2 \tau] - 2 \cos [2 \tau] + \cos [2 \alpha + 2 \tau]) \sin [\alpha]^2 \sin [\tau]^2} \left. \right) \Bigg/ \left(8 \right. \\
& \quad \left. \sqrt{N0^2 (6 + 2 \cos [2 \alpha] + \cos [2 \alpha - 2 \tau] - 2 \cos [2 \tau] + \cos [2 \alpha + 2 \tau]) \sin [\alpha]^2 \sin [\tau]^2} \right) + \\
& \left(\sqrt{\left(\frac{1}{1 + \cos [2 \alpha]} \left(-2 + 4 N0 - 2 \cos [2 \alpha] + N0 \cos [2 \alpha - 2 \tau] - 2 N0 \cos [2 \tau] + \right. \right. \right. \\
& \quad N0 \cos [2 \alpha + 2 \tau] - 2 \sqrt{2} \sqrt{N0^2 (6 + 2 \cos [2 \alpha] + \cos [2 \alpha - 2 \tau] - \\
& \quad 2 \cos [2 \tau] + \cos [2 \alpha + 2 \tau]) \sin [\alpha]^2 \sin [\tau]^2} \left. \right) \left. \right) \left(-4 N0 - N0 \cos [2 \alpha - 2 \tau] + 2 N0 \cos [2 \tau] - N0 \cos [2 \alpha + 2 \tau] + 2 N0 \cos [\alpha - \tau]^2 \right. \\
& \quad \sec [\alpha]^2 + 2 N0 \cos [2 \alpha] \cos [\alpha - \tau]^2 \sec [\alpha]^2 + 2 N0 \sec [\alpha]^2 \sin [\tau]^2 + \\
& \quad 2 N0 \cos [2 \alpha] \sec [\alpha]^2 \sin [\tau]^2 + 2 \sqrt{2} \sqrt{N0^2 (6 + 2 \cos [2 \alpha] + \\
& \quad \cos [2 \alpha - 2 \tau] - 2 \cos [2 \tau] + \cos [2 \alpha + 2 \tau]) \sin [\alpha]^2 \sin [\tau]^2} \left. \right) \Bigg/ \left(8 \right. \\
& \quad \left. \sqrt{N0^2 (6 + 2 \cos [2 \alpha] + \cos [2 \alpha - 2 \tau] - 2 \cos [2 \tau] + \cos [2 \alpha + 2 \tau]) \sin [\alpha]^2 \sin [\tau]^2} \right) \Bigg) \\
& + \cos [\alpha + \tau] \sec [\alpha] \left(\left(i \cos [\alpha] \cot [\alpha] \csc [\tau]^2 \right. \right. \\
& \quad \left. \sqrt{\left(\frac{1}{1 + \cos [2 \alpha]} \left(-2 + 4 N0 - 2 \cos [2 \alpha] + N0 \cos [2 \alpha - 2 \tau] - 2 N0 \cos [2 \tau] + \right. \right. \right. \\
& \quad N0 \cos [2 \alpha + 2 \tau] - 2 \sqrt{2} \sqrt{N0^2 (6 + 2 \cos [2 \alpha] + \cos [2 \alpha - 2 \tau] - \\
& \quad 2 \cos [2 \tau] + \cos [2 \alpha + 2 \tau]) \sin [\alpha]^2 \sin [\tau]^2} \left. \right) \left. \right) \left(4 N0 + N0 \cos [2 \alpha - 2 \tau] - 2 N0 \cos [2 \tau] + N0 \cos [2 \alpha + 2 \tau] - 2 N0 \cos [\alpha - \tau]^2 \right. \\
& \quad \sec [\alpha]^2 - 2 N0 \cos [2 \alpha] \cos [\alpha - \tau]^2 \sec [\alpha]^2 - 2 N0 \sec [\alpha]^2 \sin [\tau]^2 - \\
& \quad 2 N0 \cos [2 \alpha] \sec [\alpha]^2 \sin [\tau]^2 + 2 \sqrt{2} \sqrt{N0^2 (6 + 2 \cos [2 \alpha] + \\
& \quad \cos [2 \alpha - 2 \tau] - 2 \cos [2 \tau] + \cos [2 \alpha + 2 \tau]) \sin [\alpha]^2 \sin [\tau]^2} \left. \right) \left(-4 N0 - N0 \cos [2 \alpha - 2 \tau] + 2 N0 \cos [2 \tau] - N0 \cos [2 \alpha + 2 \tau] + 2 N0 \cos [\alpha - \tau]^2 \right. \\
& \quad \sec [\alpha]^2 + 2 N0 \cos [2 \alpha] \cos [\alpha - \tau]^2 \sec [\alpha]^2 + 2 N0 \sec [\alpha]^2 \sin [\tau]^2 + \\
& \quad 2 N0 \cos [2 \alpha] \sec [\alpha]^2 \sin [\tau]^2 + 2 \sqrt{2} \sqrt{N0^2 (6 + 2 \cos [2 \alpha] + \cos [2 \alpha - 2 \tau] - \\
& \quad 2 \cos [2 \tau] + \cos [2 \alpha + 2 \tau]) \sin [\alpha]^2 \sin [\tau]^2} \left. \right) \Bigg/ \left(32 N0 (1 + \cos [2 \alpha]) \right. \\
& \quad \left. \sqrt{N0^2 (6 + 2 \cos [2 \alpha] + \cos [2 \alpha - 2 \tau] - 2 \cos [2 \tau] + \cos [2 \alpha + 2 \tau]) \sin [\alpha]^2 \sin [\tau]^2} \right) - \\
& \left(i \cos [\alpha] \cot [\alpha] \csc [\tau]^2 \sqrt{\left(\frac{1}{1 + \cos [2 \alpha]} \left(-2 + 4 N0 - 2 \cos [2 \alpha] + N0 \cos [2 \alpha - 2 \tau] - \right. \right. \right. \\
& \quad 2 N0 \cos [2 \tau] + N0 \cos [2 \alpha + 2 \tau] + 2 \sqrt{2} \sqrt{N0^2 (6 + 2 \cos [2 \alpha] + \\
& \quad \cos [2 \alpha - 2 \tau] - 2 \cos [2 \tau] + \cos [2 \alpha + 2 \tau]) \sin [\alpha]^2 \sin [\tau]^2} \left. \right) \left. \right) \left(4 N0 + N0 \cos [2 \alpha - 2 \tau] - 2 N0 \cos [2 \tau] + N0 \cos [2 \alpha + 2 \tau] - 2 N0 \cos [\alpha - \tau]^2 \right.
\end{aligned}$$

$$\begin{aligned}
& \left(\frac{\sec[\alpha]^2 - 2 N0 \cos[2\alpha] \cos[\alpha - \tau]^2 \sec[\alpha]^2 - 2 N0 \sec[\alpha]^2 \sin[\tau]^2 - 2 N0 \cos[2\alpha] \sec[\alpha]^2 \sin[\tau]^2 + 2 \sqrt{2} \sqrt{N0^2 (6 + 2 \cos[2\alpha] + \cos[2\alpha - 2\tau] - 2 \cos[2\tau] + \cos[2\alpha + 2\tau]) \sin[\alpha]^2 \sin[\tau]^2}}{32 N0 (1 + \cos[2\alpha])} \right. \\
& \left. (-4 N0 - N0 \cos[2\alpha - 2\tau] + 2 N0 \cos[2\tau] - N0 \cos[2\alpha + 2\tau] + 2 N0 \cos[\alpha - \tau]^2 \sec[\alpha]^2 + 2 N0 \sec[\alpha]^2 \sin[\tau]^2 + 2 N0 \cos[2\alpha] \sec[\alpha]^2 \sin[\tau]^2 + 2 \sqrt{2} \sqrt{N0^2 (6 + 2 \cos[2\alpha] + \cos[2\alpha - 2\tau] - 2 \cos[2\tau] + \cos[2\alpha + 2\tau]) \sin[\alpha]^2 \sin[\tau]^2}) \right) / \left(32 N0 (1 + \cos[2\alpha]) \right) \\
& \sqrt{N0^2 (6 + 2 \cos[2\alpha] + \cos[2\alpha - 2\tau] - 2 \cos[2\tau] + \cos[2\alpha + 2\tau]) \sin[\alpha]^2 \sin[\tau]^2} \Bigg) \\
& \Bigg) + \cos\left[\frac{\rho}{2}\right] \left(\cos[\alpha - \tau] \sec[\alpha] \right. \\
& \left(\sqrt{\left(\frac{1}{1 + \cos[2\alpha]} (-2 + 4 N0 - 2 \cos[2\alpha] + N0 \cos[2\alpha - 2\tau] - 2 N0 \cos[2\tau] + N0 \cos[2\alpha + 2\tau] + 2 \sqrt{2} \sqrt{N0^2 (6 + 2 \cos[2\alpha] + \cos[2\alpha - 2\tau] - 2 \cos[2\tau] + \cos[2\alpha + 2\tau]) \sin[\alpha]^2 \sin[\tau]^2} \right)} \right. \\
& \left. (4 N0 + N0 \cos[2\alpha - 2\tau] - 2 N0 \cos[2\tau] + N0 \cos[2\alpha + 2\tau] - 2 N0 \cos[\alpha - \tau]^2 \sec[\alpha]^2 - 2 N0 \sec[\alpha]^2 \sin[\tau]^2 - 2 N0 \cos[2\alpha] \sec[\alpha]^2 \sin[\tau]^2 + 2 \sqrt{2} \sqrt{N0^2 (6 + 2 \cos[2\alpha] + \cos[2\alpha - 2\tau] - 2 \cos[2\tau] + \cos[2\alpha + 2\tau]) \sin[\alpha]^2 \sin[\tau]^2}) \right) / \left(8 \sqrt{N0^2 (6 + 2 \cos[2\alpha] + \cos[2\alpha - 2\tau] - 2 \cos[2\tau] + \cos[2\alpha + 2\tau]) \sin[\alpha]^2 \sin[\tau]^2} \right) + \\
& \left(\sqrt{\left(\frac{1}{1 + \cos[2\alpha]} (-2 + 4 N0 - 2 \cos[2\alpha] + N0 \cos[2\alpha - 2\tau] - 2 N0 \cos[2\tau] + N0 \cos[2\alpha + 2\tau] - 2 \sqrt{2} \sqrt{N0^2 (6 + 2 \cos[2\alpha] + \cos[2\alpha - 2\tau] - 2 \cos[2\tau] + \cos[2\alpha + 2\tau]) \sin[\alpha]^2 \sin[\tau]^2} \right)} \right. \\
& \left. (-4 N0 - N0 \cos[2\alpha - 2\tau] + 2 N0 \cos[2\tau] - N0 \cos[2\alpha + 2\tau] + 2 N0 \cos[\alpha - \tau]^2 \sec[\alpha]^2 + 2 N0 \sec[\alpha]^2 \sin[\tau]^2 + 2 N0 \cos[2\alpha] \sec[\alpha]^2 \sin[\tau]^2 + 2 \sqrt{2} \sqrt{N0^2 (6 + 2 \cos[2\alpha] + \cos[2\alpha - 2\tau] - 2 \cos[2\tau] + \cos[2\alpha + 2\tau]) \sin[\alpha]^2 \sin[\tau]^2}) \right) / \left(8 \sqrt{N0^2 (6 + 2 \cos[2\alpha] + \cos[2\alpha - 2\tau] - 2 \cos[2\tau] + \cos[2\alpha + 2\tau]) \sin[\alpha]^2 \sin[\tau]^2} \right) \Bigg) \\
& - i \sec[\alpha] \sin[\tau] \left(\left(i \cos[\alpha] \cot[\alpha] \csc[\tau]^2 \right. \right. \\
& \left. \sqrt{\left(\frac{1}{1 + \cos[2\alpha]} (-2 + 4 N0 - 2 \cos[2\alpha] + N0 \cos[2\alpha - 2\tau] - 2 N0 \cos[2\tau] + N0 \cos[2\alpha + 2\tau] - 2 \sqrt{2} \sqrt{N0^2 (6 + 2 \cos[2\alpha] + \cos[2\alpha - 2\tau] - 2 \cos[2\tau] + \cos[2\alpha + 2\tau]) \sin[\alpha]^2 \sin[\tau]^2} \right)} \right. \\
& \left. \left. 2 \cos[2\tau] + \cos[2\alpha + 2\tau]) \sin[\alpha]^2 \sin[\tau]^2 \right) \right) \Bigg)
\end{aligned}$$

$$\begin{aligned}
& \left(4 N0 + N0 \cos[2\alpha - 2\tau] - 2 N0 \cos[2\tau] + N0 \cos[2\alpha + 2\tau] - 2 N0 \cos[\alpha - \tau]^2 \right. \\
& \quad \sec[\alpha]^2 - 2 N0 \cos[2\alpha] \cos[\alpha - \tau]^2 \sec[\alpha]^2 - 2 N0 \sec[\alpha]^2 \sin[\tau]^2 - \\
& \quad 2 N0 \cos[2\alpha] \sec[\alpha]^2 \sin[\tau]^2 + 2 \sqrt{2} \sqrt{N0^2 (6 + 2 \cos[2\alpha] + \cos[2\alpha - 2\tau] - 2 \cos[2\tau] + \cos[2\alpha + 2\tau]) \sin[\alpha]^2 \sin[\tau]^2} \left. \right) \\
& \left(-4 N0 - N0 \cos[2\alpha - 2\tau] + 2 N0 \cos[2\tau] - N0 \cos[2\alpha + 2\tau] + 2 N0 \cos[\alpha - \tau]^2 \right. \\
& \quad \sec[\alpha]^2 + 2 N0 \cos[2\alpha] \cos[\alpha - \tau]^2 \sec[\alpha]^2 + 2 N0 \sec[\alpha]^2 \sin[\tau]^2 + \\
& \quad 2 N0 \cos[2\alpha] \sec[\alpha]^2 \sin[\tau]^2 + 2 \sqrt{2} \sqrt{N0^2 (6 + 2 \cos[2\alpha] + \cos[2\alpha - 2\tau] - 2 \cos[2\tau] + \cos[2\alpha + 2\tau]) \sin[\alpha]^2 \sin[\tau]^2} \left. \right) \Bigg/ \left(32 N0 (1 + \cos[2\alpha]) \right) \\
& \sqrt{N0^2 (6 + 2 \cos[2\alpha] + \cos[2\alpha - 2\tau] - 2 \cos[2\tau] + \cos[2\alpha + 2\tau]) \sin[\alpha]^2 \sin[\tau]^2} \Bigg) - \\
& \left(i \cos[\alpha] \cot[\alpha] \csc[\tau]^2 \sqrt{\left(\frac{1}{1 + \cos[2\alpha]} (-2 + 4 N0 - 2 \cos[2\alpha] + N0 \cos[2\alpha - 2\tau] - \right. \right. \\
& \quad 2 N0 \cos[2\tau] + N0 \cos[2\alpha + 2\tau] + 2 \sqrt{2} \sqrt{N0^2 (6 + 2 \cos[2\alpha] + \cos[2\alpha - 2\tau] - 2 \cos[2\tau] + \cos[2\alpha + 2\tau]) \sin[\alpha]^2 \sin[\tau]^2} \left. \right) \Bigg) \\
& \left(4 N0 + N0 \cos[2\alpha - 2\tau] - 2 N0 \cos[2\tau] + N0 \cos[2\alpha + 2\tau] - 2 N0 \cos[\alpha - \tau]^2 \right. \\
& \quad \sec[\alpha]^2 - 2 N0 \cos[2\alpha] \cos[\alpha - \tau]^2 \sec[\alpha]^2 - 2 N0 \sec[\alpha]^2 \sin[\tau]^2 - \\
& \quad 2 N0 \cos[2\alpha] \sec[\alpha]^2 \sin[\tau]^2 + 2 \sqrt{2} \sqrt{N0^2 (6 + 2 \cos[2\alpha] + \cos[2\alpha - 2\tau] - 2 \cos[2\tau] + \cos[2\alpha + 2\tau]) \sin[\alpha]^2 \sin[\tau]^2} \left. \right) \\
& \left(-4 N0 - N0 \cos[2\alpha - 2\tau] + 2 N0 \cos[2\tau] - N0 \cos[2\alpha + 2\tau] + 2 N0 \cos[\alpha - \tau]^2 \right. \\
& \quad \sec[\alpha]^2 + 2 N0 \cos[2\alpha] \cos[\alpha - \tau]^2 \sec[\alpha]^2 + 2 N0 \sec[\alpha]^2 \sin[\tau]^2 + \\
& \quad 2 N0 \cos[2\alpha] \sec[\alpha]^2 \sin[\tau]^2 + 2 \sqrt{2} \sqrt{N0^2 (6 + 2 \cos[2\alpha] + \cos[2\alpha - 2\tau] - 2 \cos[2\tau] + \cos[2\alpha + 2\tau]) \sin[\alpha]^2 \sin[\tau]^2} \left. \right) \Bigg/ \left(32 N0 (1 + \cos[2\alpha]) \right) \\
& \sqrt{N0^2 (6 + 2 \cos[2\alpha] + \cos[2\alpha - 2\tau] - 2 \cos[2\tau] + \cos[2\alpha + 2\tau]) \sin[\alpha]^2 \sin[\tau]^2} \Bigg) \Bigg) \\
& \Bigg\}, \left\{ \cos\left[\frac{\rho}{2}\right] \left(-i \sec[\alpha] \sin[\tau] \right. \right. \\
& \left(\left(\sqrt{\left(\frac{1}{1 + \cos[2\alpha]} (-2 + 4 N0 - 2 \cos[2\alpha] + N0 \cos[2\alpha - 2\tau] - 2 N0 \cos[2\tau] + \right. \right. \right. \\
& \quad N0 \cos[2\alpha + 2\tau] - 2 \sqrt{2} \sqrt{N0^2 (6 + 2 \cos[2\alpha] + \cos[2\alpha - 2\tau] - 2 \cos[2\tau] + \cos[2\alpha + 2\tau]) \sin[\alpha]^2 \sin[\tau]^2} \left. \right) \Bigg) \\
& \left(4 N0 + N0 \cos[2\alpha - 2\tau] - 2 N0 \cos[2\tau] + N0 \cos[2\alpha + 2\tau] - 2 N0 \cos[\alpha - \tau]^2 \right. \\
& \quad \sec[\alpha]^2 - 2 N0 \cos[2\alpha] \cos[\alpha - \tau]^2 \sec[\alpha]^2 - 2 N0 \sec[\alpha]^2 \sin[\tau]^2 - \\
& \quad 2 N0 \cos[2\alpha] \sec[\alpha]^2 \sin[\tau]^2 + 2 \sqrt{2} \sqrt{N0^2 (6 + 2 \cos[2\alpha] + \cos[2\alpha - 2\tau] - 2 \cos[2\tau] + \cos[2\alpha + 2\tau]) \sin[\alpha]^2 \sin[\tau]^2} \left. \right) \Bigg/ \left(8 \right. \\
& \left. \sqrt{N0^2 (6 + 2 \cos[2\alpha] + \cos[2\alpha - 2\tau] - 2 \cos[2\tau] + \cos[2\alpha + 2\tau]) \sin[\alpha]^2 \sin[\tau]^2} \right) \Bigg) + \\
& \left(\sqrt{\left(\frac{1}{1 + \cos[2\alpha]} (-2 + 4 N0 - 2 \cos[2\alpha] + N0 \cos[2\alpha - 2\tau] - 2 N0 \cos[2\tau] + \right. \right.
\end{aligned}$$

$$\begin{aligned}
& \left(N0 \cos[2\alpha + 2\tau] + 2\sqrt{2} \sqrt{\left(N0^2 (6 + 2\cos[2\alpha] + \cos[2\alpha - 2\tau] - \right. \right.} \\
& \quad \left. \left. 2\cos[2\tau] + \cos[2\alpha + 2\tau]) \sin[\alpha]^2 \sin[\tau]^2 \right) \right) \\
& \left(-4N0 - N0 \cos[2\alpha - 2\tau] + 2N0 \cos[2\tau] - N0 \cos[2\alpha + 2\tau] + 2N0 \cos[\alpha - \tau]^2 \right. \\
& \quad \sec[\alpha]^2 + 2N0 \cos[2\alpha] \cos[\alpha - \tau]^2 \sec[\alpha]^2 + 2N0 \sec[\alpha]^2 \sin[\tau]^2 + \\
& \quad \left. 2N0 \cos[2\alpha] \sec[\alpha]^2 \sin[\tau]^2 + 2\sqrt{2} \sqrt{\left(N0^2 (6 + 2\cos[2\alpha] + \right. \right.} \\
& \quad \left. \left. \cos[2\alpha - 2\tau] - 2\cos[2\tau] + \cos[2\alpha + 2\tau]) \sin[\alpha]^2 \sin[\tau]^2 \right) \right) \Big/ \left(8 \right. \\
& \quad \left. \sqrt{N0^2 (6 + 2\cos[2\alpha] + \cos[2\alpha - 2\tau] - 2\cos[2\tau] + \cos[2\alpha + 2\tau]) \sin[\alpha]^2 \sin[\tau]^2} \right) \\
& + \cos[\alpha - \tau] \sec[\alpha] \left(- \left(\left(i N0 (1 + \cos[2\alpha]) \sec[\alpha] \sin[\tau]^2 \right. \right. \right. \\
& \quad \left. \left. \sqrt{\left(\frac{1}{1 + \cos[2\alpha]} \left(-2 + 4N0 - 2\cos[2\alpha] + N0 \cos[2\alpha - 2\tau] - 2N0 \cos[2\tau] + \right. \right. \right. \right. \\
& \quad \left. \left. \left. N0 \cos[2\alpha + 2\tau] - 2\sqrt{2} \sqrt{\left(N0^2 (6 + 2\cos[2\alpha] + \cos[2\alpha - 2\tau] - \right. \right. \right. \right. \right. \\
& \quad \left. \left. \left. 2\cos[2\tau] + \cos[2\alpha + 2\tau]) \sin[\alpha]^2 \sin[\tau]^2 \right) \right) \tan[\alpha] \right) \Big/ \left(2 \right. \\
& \quad \left. \sqrt{N0^2 (6 + 2\cos[2\alpha] + \cos[2\alpha - 2\tau] - 2\cos[2\tau] + \cos[2\alpha + 2\tau]) \sin[\alpha]^2 \sin[\tau]^2} \right. \\
& \quad \left. \right) + \left(i N0 (1 + \cos[2\alpha]) \sec[\alpha] \sin[\tau]^2 \right. \\
& \quad \left. \sqrt{\left(\frac{1}{1 + \cos[2\alpha]} \left(-2 + 4N0 - 2\cos[2\alpha] + N0 \cos[2\alpha - 2\tau] - 2N0 \cos[2\tau] + \right. \right. \right. \right. \\
& \quad \left. \left. \left. N0 \cos[2\alpha + 2\tau] + 2\sqrt{2} \sqrt{\left(N0^2 (6 + 2\cos[2\alpha] + \cos[2\alpha - 2\tau] - \right. \right. \right. \right. \right. \\
& \quad \left. \left. \left. 2\cos[2\tau] + \cos[2\alpha + 2\tau]) \sin[\alpha]^2 \sin[\tau]^2 \right) \right) \tan[\alpha] \right) \Big/ \left(2 \right. \\
& \quad \left. \sqrt{N0^2 (6 + 2\cos[2\alpha] + \cos[2\alpha - 2\tau] - 2\cos[2\tau] + \cos[2\alpha + 2\tau]) \sin[\alpha]^2 \sin[\tau]^2} \right) \Big) \\
& \left. \right) + i \sin\left[\frac{\rho}{2}\right] \left(\cos[\alpha + \tau] \sec[\alpha] \right. \\
& \left(\left(\sqrt{\left(\frac{1}{1 + \cos[2\alpha]} \left(-2 + 4N0 - 2\cos[2\alpha] + N0 \cos[2\alpha - 2\tau] - 2N0 \cos[2\tau] + \right. \right. \right. \right. \right. \\
& \quad \left. \left. \left. N0 \cos[2\alpha + 2\tau] - 2\sqrt{2} \sqrt{\left(N0^2 (6 + 2\cos[2\alpha] + \cos[2\alpha - 2\tau] - \right. \right. \right. \right. \right. \\
& \quad \left. \left. \left. 2\cos[2\tau] + \cos[2\alpha + 2\tau]) \sin[\alpha]^2 \sin[\tau]^2 \right) \right) \right) \right. \\
& \quad \left(4N0 + N0 \cos[2\alpha - 2\tau] - 2N0 \cos[2\tau] + N0 \cos[2\alpha + 2\tau] - 2N0 \cos[\alpha - \tau]^2 \right. \\
& \quad \sec[\alpha]^2 - 2N0 \cos[2\alpha] \cos[\alpha - \tau]^2 \sec[\alpha]^2 - 2N0 \sec[\alpha]^2 \sin[\tau]^2 - \\
& \quad \left. 2N0 \cos[2\alpha] \sec[\alpha]^2 \sin[\tau]^2 + 2\sqrt{2} \sqrt{\left(N0^2 (6 + 2\cos[2\alpha] + \right. \right.} \\
& \quad \left. \left. \cos[2\alpha - 2\tau] - 2\cos[2\tau] + \cos[2\alpha + 2\tau]) \sin[\alpha]^2 \sin[\tau]^2 \right) \right) \Big/ \left(8 \right. \\
& \quad \left. \sqrt{N0^2 (6 + 2\cos[2\alpha] + \cos[2\alpha - 2\tau] - 2\cos[2\tau] + \cos[2\alpha + 2\tau]) \sin[\alpha]^2 \sin[\tau]^2} \right) +
\end{aligned}$$

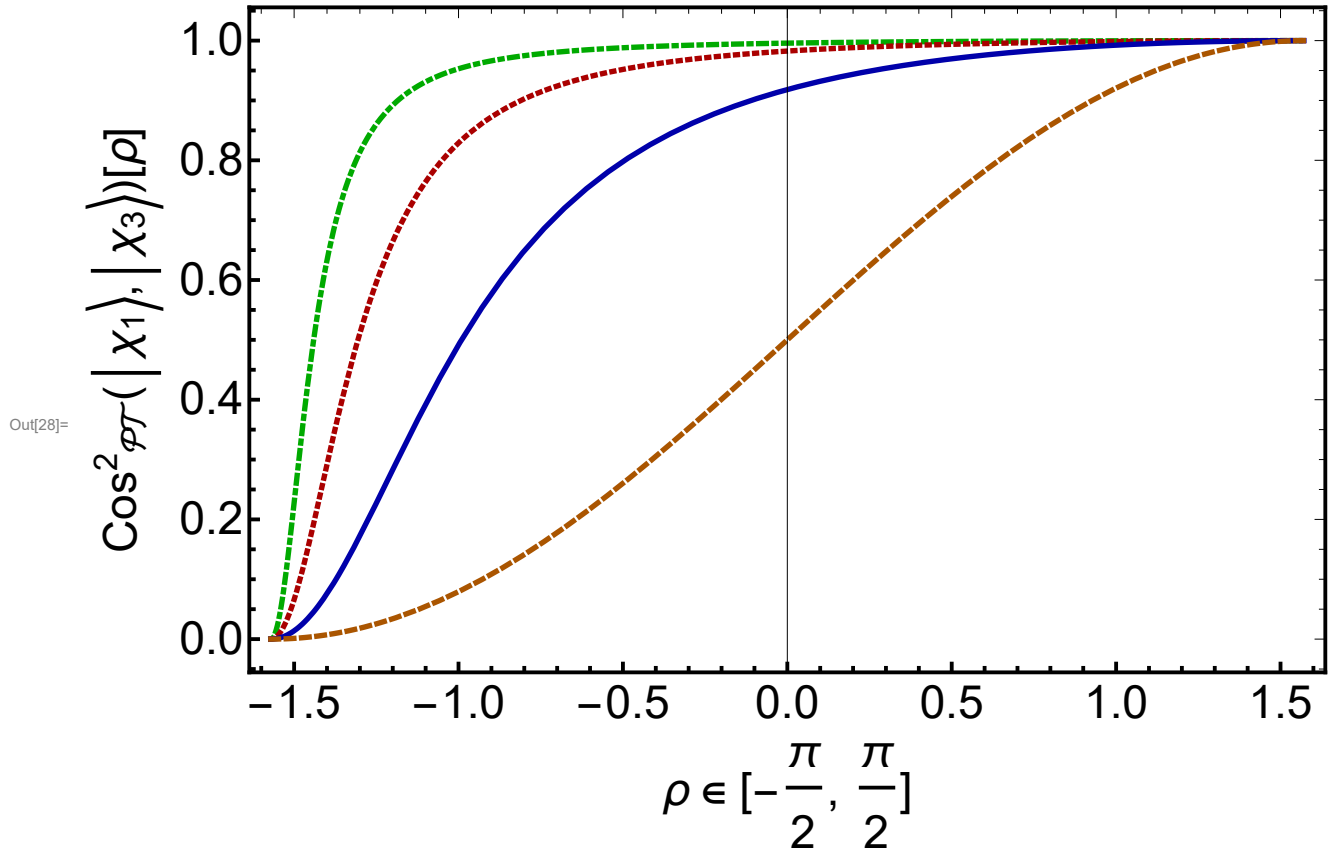
$$\begin{aligned}
& \left(\sqrt{\left(\frac{1}{1 + \cos[2\alpha]} \left(-2 + 4 N\theta - 2 \cos[2\alpha] + N\theta \cos[2\alpha - 2\tau] - 2 N\theta \cos[2\tau] + \right. \right. \right. \\
& \quad \left. \left. \left. N\theta \cos[2\alpha + 2\tau] + 2 \sqrt{2} \sqrt{N\theta^2 (6 + 2 \cos[2\alpha] + \cos[2\alpha - 2\tau] - 2 \cos[2\tau] + \cos[2\alpha + 2\tau]) \sin[\alpha]^2 \sin[\tau]^2} \right) \right)} \right. \\
& \quad \left(-4 N\theta - N\theta \cos[2\alpha - 2\tau] + 2 N\theta \cos[2\tau] - N\theta \cos[2\alpha + 2\tau] + 2 N\theta \cos[\alpha - \tau]^2 \right. \\
& \quad \left. \sec[\alpha]^2 + 2 N\theta \cos[2\alpha] \cos[\alpha - \tau]^2 \sec[\alpha]^2 + 2 N\theta \sec[\alpha]^2 \sin[\tau]^2 + \right. \\
& \quad \left. 2 N\theta \cos[2\alpha] \sec[\alpha]^2 \sin[\tau]^2 + 2 \sqrt{2} \sqrt{N\theta^2 (6 + 2 \cos[2\alpha] + \cos[2\alpha - 2\tau] - 2 \cos[2\tau] + \cos[2\alpha + 2\tau]) \sin[\alpha]^2 \sin[\tau]^2} \right) \Bigg) / \left(8 \right. \\
& \quad \left. \sqrt{N\theta^2 (6 + 2 \cos[2\alpha] + \cos[2\alpha - 2\tau] - 2 \cos[2\tau] + \cos[2\alpha + 2\tau]) \sin[\alpha]^2 \sin[\tau]^2} \right) \Bigg) \\
& - i \sec[\alpha] \sin[\tau] \left(- \left(\left(i N\theta (1 + \cos[2\alpha]) \sec[\alpha] \sin[\tau]^2 \right. \right. \right. \\
& \quad \left. \left. \left. \sqrt{\left(\frac{1}{1 + \cos[2\alpha]} \left(-2 + 4 N\theta - 2 \cos[2\alpha] + N\theta \cos[2\alpha - 2\tau] - 2 N\theta \cos[2\tau] + \right. \right. \right. \right. \right. \\
& \quad \left. \left. \left. N\theta \cos[2\alpha + 2\tau] - 2 \sqrt{2} \sqrt{N\theta^2 (6 + 2 \cos[2\alpha] + \cos[2\alpha - 2\tau] - 2 \cos[2\tau] + \cos[2\alpha + 2\tau]) \sin[\alpha]^2 \sin[\tau]^2} \right) \right) \right) \tan[\alpha] \right) / \left(2 \right. \\
& \quad \left. \sqrt{N\theta^2 (6 + 2 \cos[2\alpha] + \cos[2\alpha - 2\tau] - 2 \cos[2\tau] + \cos[2\alpha + 2\tau]) \sin[\alpha]^2 \sin[\tau]^2} \right) \\
& \quad \left. \right) + \left(i N\theta (1 + \cos[2\alpha]) \sec[\alpha] \sin[\tau]^2 \right) \Bigg) \\
& \quad \left(\sqrt{\left(\frac{1}{1 + \cos[2\alpha]} \left(-2 + 4 N\theta - 2 \cos[2\alpha] + N\theta \cos[2\alpha - 2\tau] - 2 N\theta \cos[2\tau] + \right. \right. \right. \\
& \quad \left. \left. \left. N\theta \cos[2\alpha + 2\tau] + 2 \sqrt{2} \sqrt{N\theta^2 (6 + 2 \cos[2\alpha] + \cos[2\alpha - 2\tau] - 2 \cos[2\tau] + \cos[2\alpha + 2\tau]) \sin[\alpha]^2 \sin[\tau]^2} \right) \right) \right. \\
& \quad \left. \left. \left. 2 \cos[2\tau] + \cos[2\alpha + 2\tau]) \sin[\alpha]^2 \sin[\tau]^2 \right) \right) \tan[\alpha] \right) / \left(2 \right. \\
& \quad \left. \sqrt{N\theta^2 (6 + 2 \cos[2\alpha] + \cos[2\alpha - 2\tau] - 2 \cos[2\tau] + \cos[2\alpha + 2\tau]) \sin[\alpha]^2 \sin[\tau]^2} \right) \Bigg) \\
& \quad \left. \right) \Bigg) \Bigg)
\end{aligned}$$

$$\begin{aligned}
\text{In[27]:= FirstPart}[M\theta_ , \alpha_ , \tau_ , \rho_] &:= \text{Abs} \left[i \cos[\alpha + \tau] \sec[\alpha] \sin\left[\frac{\rho}{2}\right] - i \cos\left[\frac{\rho}{2}\right] \sec[\alpha] \sin[\tau] \right]^2 + \\
&\quad \text{Abs} \left[\cos\left[\frac{\rho}{2}\right] \cos[\alpha - \tau] \sec[\alpha] + \sec[\alpha] \sin\left[\frac{\rho}{2}\right] \sin[\tau] \right]^2
\end{aligned}$$

```

In[28]:= p1 = Plot[{cos13F[ $\pi/2 - 0.5$ ,  $\pi/2$ ,  $\rho$ ], cos13F[ $\pi/2 - 0.7$ ,  $\pi/2$ ,  $\rho$ ],
  cos13F[ $\pi/2 - 1$ ,  $\pi/2$ ,  $\rho$ ], cos13F[0,  $\pi/2$ ,  $\rho$ ]}, { $\rho$ ,  $-\pi/2$ ,  $\pi/2$ }, PlotRange → All,
  PlotStyle → {Directive[Darker[Green], Thickness[0.005], DotDashed],
    Directive[Darker[Red], Thickness[0.005], Dotted], Directive[Darker[Blue],
    Thickness[0.005], Dashed[1]], Directive[Darker[Orange], Thickness[0.005], Dashed]},
  Frame → True, FrameStyle → Directive[Black, Thick], LabelStyle → Large,
  Frame → True, FrameStyle → Directive[Black, Thick], LabelStyle → Large,
  PlotStyle → {Directive[Darker[Green], Thickness[0.007]]},
  FrameLabel → {" $\rho \in [-\frac{\pi}{2}, \frac{\pi}{2}]$ ", " $\text{Cos}^2_{\varphi_T}(|\chi_1\rangle, |\chi_3\rangle)[\rho]$ "},
  LabelStyle → {FontWeight → "Bold", FontSize → 25},
  ImageSize → 650, GridLinesStyle → Directive[Thick, Gray]]

```



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In[29]:= SecondPart[M0_,  $\alpha$ _,  $\tau$ _,  $\rho$ _] :=
  Abs[ $i \sin[\frac{\rho}{2}]$ ] (- $i \sec[\alpha] \sin[\tau]$  ( (  $\sqrt{\frac{1}{1 + \cos[2\alpha]}}$  (-2 + 4 M0 - 2 Cos[2  $\alpha$ ] + M0 Cos[2  $\alpha$  - 2  $\tau$ ] -
    2 M0 Cos[2  $\tau$ ] + M0 Cos[2  $\alpha$  + 2  $\tau$ ] + 2  $\sqrt{2}$   $\sqrt{M0^2 (6 + 2 \cos[2\alpha] +$ 
    Cos[2  $\alpha$  - 2  $\tau$ ] - 2 Cos[2  $\tau$ ] + Cos[2  $\alpha$  + 2  $\tau$ ]) Sin[ $\alpha$ ]2 Sin[ $\tau$ ]2) } ) )
    ( 4 M0 + M0 Cos[2  $\alpha$  - 2  $\tau$ ] - 2 M0 Cos[2  $\tau$ ] + M0 Cos[2  $\alpha$  + 2  $\tau$ ] - 2 M0
    Cos[ $\alpha$  -  $\tau$ ]2 Sec[ $\alpha$ ]2 - 2 M0 Cos[2  $\alpha$ ] Cos[ $\alpha$  -  $\tau$ ]2 Sec[ $\alpha$ ]2 - 2 M0 Sec[ $\alpha$ ]2
    Sin[ $\tau$ ]2 - 2 M0 Cos[2  $\alpha$ ] Sec[ $\alpha$ ]2 Sin[ $\tau$ ]2 + 2  $\sqrt{2}$   $\sqrt{M0^2 (6 + 2 \cos[2\alpha] +$ 

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$$\begin{aligned}
& \left. \left(\cos[2\alpha - 2\tau] - 2\cos[2\tau] + \cos[2\alpha + 2\tau] \right) \sin[\alpha]^2 \sin[\tau]^2 \right) \Bigg) \Bigg/ \\
& \left(8\sqrt{M^2 (6 + 2\cos[2\alpha] + \cos[2\alpha - 2\tau] - 2\cos[2\tau] + \cos[2\alpha + 2\tau]) \sin[\alpha]^2 \sin[\tau]^2} \right. \\
& \quad \left. \sin[\tau]^2 \right) + \sqrt{\left(\frac{1}{1 + \cos[2\alpha]} \left(-2 + 4M - 2\cos[2\alpha] + M\cos[2\alpha - 2\tau] - \right. \right.} \\
& \quad \left. \left. 2M\cos[2\tau] + M\cos[2\alpha + 2\tau] - 2\sqrt{2} \sqrt{M^2 (6 + 2\cos[2\alpha] + \right. \right.} \\
& \quad \left. \left. \cos[2\alpha - 2\tau] - 2\cos[2\tau] + \cos[2\alpha + 2\tau]) \sin[\alpha]^2 \sin[\tau]^2 \right) \right) \Bigg) \Bigg/ \\
& \left(-4M - M\cos[2\alpha - 2\tau] + 2M\cos[2\tau] - M\cos[2\alpha + 2\tau] + 2M \right. \\
& \quad \cos[\alpha - \tau]^2 \sec[\alpha]^2 + 2M\cos[2\alpha] \cos[\alpha - \tau]^2 \sec[\alpha]^2 + 2M\sec[\alpha]^2 \\
& \quad \sin[\tau]^2 + 2M\cos[2\alpha] \sec[\alpha]^2 \sin[\tau]^2 + 2\sqrt{2} \sqrt{M^2 (6 + 2\cos[2\alpha] + \cos[2\alpha - 2\tau] - 2\cos[2\tau] + \cos[2\alpha + 2\tau]) \sin[\alpha]^2 \sin[\tau]^2} \Bigg) \Bigg/ \\
& \left(8\sqrt{M^2 (6 + 2\cos[2\alpha] + \cos[2\alpha - 2\tau] - 2\cos[2\tau] + \cos[2\alpha + 2\tau]) \sin[\alpha]^2 \sin[\tau]^2} \right) \\
& \quad \left. \sin[\alpha]^2 \sin[\tau]^2 \right) \Bigg) + \cos[\alpha + \tau] \sec[\alpha] \\
& \left(\left(i \cos[\alpha] \cot[\alpha] \csc[\tau]^2 \sqrt{\left(\frac{1}{1 + \cos[2\alpha]} \left(-2 + 4M - 2\cos[2\alpha] + M\cos[2\alpha - 2\tau] - \right. \right. \right. \right. \right. \\
& \quad \left. \left. \left. 2M\cos[2\tau] + M\cos[2\alpha + 2\tau] - 2\sqrt{2} \sqrt{M^2 (6 + 2\cos[2\alpha] + \right. \right. \right. \right. \right. \\
& \quad \left. \left. \left. \cos[2\alpha - 2\tau] - 2\cos[2\tau] + \cos[2\alpha + 2\tau]) \sin[\alpha]^2 \sin[\tau]^2 \right) \right) \right) \Bigg) \Bigg/ \\
& \left(4M + M\cos[2\alpha - 2\tau] - 2M\cos[2\tau] + M\cos[2\alpha + 2\tau] - 2M \right. \\
& \quad \cos[\alpha - \tau]^2 \sec[\alpha]^2 - 2M\cos[2\alpha] \cos[\alpha - \tau]^2 \sec[\alpha]^2 - \\
& \quad 2M\sec[\alpha]^2 \sin[\tau]^2 - 2M\cos[2\alpha] \sec[\alpha]^2 \sin[\tau]^2 + 2\sqrt{2} \\
& \quad \sqrt{M^2 (6 + 2\cos[2\alpha] + \cos[2\alpha - 2\tau] - 2\cos[2\tau] + \cos[2\alpha + 2\tau]) \sin[\alpha]^2 \sin[\tau]^2} \Bigg) \Bigg) \left(-4M - M\cos[2\alpha - 2\tau] + 2M\cos[2\tau] - M\cos[2\alpha + 2\tau] + \right. \\
& \quad \left. 2M\cos[\alpha - \tau]^2 \sec[\alpha]^2 + 2M\cos[2\alpha] \cos[\alpha - \tau]^2 \sec[\alpha]^2 + 2M\sec[\alpha]^2 \sin[\tau]^2 + 2M\cos[2\alpha] \sec[\alpha]^2 \sin[\tau]^2 + 2\sqrt{2} \sqrt{M^2 (6 + 2\cos[2\alpha] + \right. \right. \\
& \quad \left. \left. \cos[2\alpha - 2\tau] - 2\cos[2\tau] + \cos[2\alpha + 2\tau]) \sin[\alpha]^2 \sin[\tau]^2} \right) \Bigg) \Bigg/ \\
& \left(32M (1 + \cos[2\alpha]) \sqrt{M^2 (6 + 2\cos[2\alpha] + \cos[2\alpha - 2\tau] - 2\cos[2\tau] + \cos[2\alpha + 2\tau]) \sin[\alpha]^2 \sin[\tau]^2} \right) - \\
& \left(i \cos[\alpha] \cot[\alpha] \csc[\tau]^2 \sqrt{\left(\frac{1}{1 + \cos[2\alpha]} \left(-2 + 4M - 2\cos[2\alpha] + \right. \right. \right. \right. \right. \\
& \quad \left. \left. \left. M\cos[2\alpha - 2\tau] - 2M\cos[2\tau] + M\cos[2\alpha + 2\tau] + \right. \right. \right. \\
& \quad \left. \left. \left. 2\sqrt{2} \sqrt{M^2 (6 + 2\cos[2\alpha] + \cos[2\alpha - 2\tau] - 2\cos[2\tau] + \cos[2\alpha + 2\tau]) \sin[\alpha]^2 \sin[\tau]^2} \right) \right) \right) \left(4M + M\cos[2\alpha - 2\tau] - 2M\cos[2\tau] + \right. \\
& \quad \left. M\cos[2\alpha + 2\tau] - 2M\cos[\alpha - \tau]^2 \sec[\alpha]^2 - 2M\cos[2\alpha] \cos[\alpha - \tau]^2 \sec[\alpha]^2 \right. \\
& \quad \left. \sec[\alpha]^2 - 2M\sec[\alpha]^2 \sin[\tau]^2 - 2M\cos[2\alpha] \sec[\alpha]^2 \sin[\tau]^2 + \right. \\
& \quad \left. 2\sqrt{2} \sqrt{M^2 (6 + 2\cos[2\alpha] + \cos[2\alpha - 2\tau] - 2\cos[2\tau] + \cos[2\alpha + 2\tau]) \sin[\alpha]^2 \sin[\tau]^2} \right) \left(-4M - M\cos[2\alpha - 2\tau] + \right. \\
& \quad \left. 2M\cos[2\tau] - M\cos[2\alpha + 2\tau] + 2M\cos[\alpha - \tau]^2 \sec[\alpha]^2 + \right. \\
& \quad \left. 2M\cos[2\alpha] \cos[\alpha - \tau]^2 \sec[\alpha]^2 + 2M\sec[\alpha]^2 \sin[\tau]^2 + \right.
\end{aligned}$$

$$\begin{aligned}
& 2 M \theta \cos [2 \alpha] \sec [\alpha]^2 \sin [\tau]^2 + 2 \sqrt{2} \sqrt{\left(M \theta^2 (6 + 2 \cos [2 \alpha] + \right. \\
& \quad \left. \cos [2 \alpha - 2 \tau] - 2 \cos [2 \tau] + \cos [2 \alpha + 2 \tau]) \sin [\alpha]^2 \sin [\tau]^2\right)} \Big) \Big) / \\
& \left(32 M \theta (1 + \cos [2 \alpha]) \sqrt{\left(M \theta^2 (6 + 2 \cos [2 \alpha] + \cos [2 \alpha - 2 \tau] - 2 \cos [2 \tau] + \right. \right. \\
& \quad \left. \left. \cos [2 \alpha + 2 \tau]) \sin [\alpha]^2 \sin [\tau]^2\right)} \right) + \cos \left[\frac{\rho}{2}\right] \\
& \left(\cos [\alpha - \tau] \sec [\alpha] \left(\left(\sqrt{\left(\frac{1}{1 + \cos [2 \alpha]} (-2 + 4 M \theta - 2 \cos [2 \alpha] + M \theta \cos [2 \alpha - 2 \tau] - \right. \right. \right. \right. \\
& \quad \left. \left. \left. 2 M \theta \cos [2 \tau] + M \theta \cos [2 \alpha + 2 \tau] + 2 \sqrt{2} \sqrt{\left(M \theta^2 (6 + 2 \cos [2 \alpha] + \right. \right. \right. \right. \right. \\
& \quad \left. \left. \left. \cos [2 \alpha - 2 \tau] - 2 \cos [2 \tau] + \cos [2 \alpha + 2 \tau]) \sin [\alpha]^2 \sin [\tau]^2\right)} \right)} \right) \right) \right) \\
& \left(4 M \theta + M \theta \cos [2 \alpha - 2 \tau] - 2 M \theta \cos [2 \tau] + M \theta \cos [2 \alpha + 2 \tau] - 2 M \theta \right. \\
& \quad \cos [\alpha - \tau]^2 \sec [\alpha]^2 - 2 M \theta \cos [2 \alpha] \cos [\alpha - \tau]^2 \sec [\alpha]^2 - 2 M \theta \sec [\alpha]^2 \\
& \quad \sin [\tau]^2 - 2 M \theta \cos [2 \alpha] \sec [\alpha]^2 \sin [\tau]^2 + 2 \sqrt{2} \sqrt{\left(M \theta^2 (6 + 2 \cos [2 \alpha] + \right. \\
& \quad \left. \cos [2 \alpha - 2 \tau] - 2 \cos [2 \tau] + \cos [2 \alpha + 2 \tau]) \sin [\alpha]^2 \sin [\tau]^2\right)} \Big) \Big) / \\
& \left(8 \sqrt{\left(M \theta^2 (6 + 2 \cos [2 \alpha] + \cos [2 \alpha - 2 \tau] - 2 \cos [2 \tau] + \cos [2 \alpha + 2 \tau]) \right. \right. \\
& \quad \left. \left. \sin [\alpha]^2 \sin [\tau]^2\right)} \right) + \\
& \left(\sqrt{\left(\frac{1}{1 + \cos [2 \alpha]} (-2 + 4 M \theta - 2 \cos [2 \alpha] + M \theta \cos [2 \alpha - 2 \tau] - 2 M \theta \cos [2 \tau] + \right. \right. \\
& \quad \left. \left. M \theta \cos [2 \alpha + 2 \tau] - 2 \sqrt{2} \sqrt{\left(M \theta^2 (6 + 2 \cos [2 \alpha] + \cos [2 \alpha - 2 \tau] - \right. \right. \right. \right. \\
& \quad \left. \left. \left. 2 \cos [2 \tau] + \cos [2 \alpha + 2 \tau]) \sin [\alpha]^2 \sin [\tau]^2\right)} \right)} \right) \left(-4 M \theta - \right. \\
& \quad M \theta \cos [2 \alpha - 2 \tau] + 2 M \theta \cos [2 \tau] - M \theta \cos [2 \alpha + 2 \tau] + 2 M \theta \cos [\alpha - \tau]^2 \\
& \quad \sec [\alpha]^2 + 2 M \theta \cos [2 \alpha] \cos [\alpha - \tau]^2 \sec [\alpha]^2 + 2 M \theta \sec [\alpha]^2 \sin [\tau]^2 + \\
& \quad 2 M \theta \cos [2 \alpha] \sec [\alpha]^2 \sin [\tau]^2 + 2 \sqrt{2} \sqrt{\left(M \theta^2 (6 + 2 \cos [2 \alpha] + \right. \\
& \quad \left. \cos [2 \alpha - 2 \tau] - 2 \cos [2 \tau] + \cos [2 \alpha + 2 \tau]) \sin [\alpha]^2 \sin [\tau]^2\right)} \Big) \Big) / \\
& \left(8 \sqrt{\left(M \theta^2 (6 + 2 \cos [2 \alpha] + \cos [2 \alpha - 2 \tau] - 2 \cos [2 \tau] + \cos [2 \alpha + 2 \tau]) \right. \right. \\
& \quad \left. \left. \sin [\alpha]^2 \sin [\tau]^2\right)} \right) \Big) - \\
& i \sec [\alpha] \sin [\tau] \left(\left(i \cos [\alpha] \cot [\alpha] \csc [\tau]^2 \sqrt{\left(\frac{1}{1 + \cos [2 \alpha]} (-2 + 4 M \theta - \right. \right. \right. \right. \\
& \quad \left. \left. \left. 2 \cos [2 \alpha] + M \theta \cos [2 \alpha - 2 \tau] - 2 M \theta \cos [2 \tau] + M \theta \cos [2 \alpha + 2 \tau] - \right. \right. \right. \right. \\
& \quad \left. \left. \left. 2 \sqrt{2} \sqrt{\left(M \theta^2 (6 + 2 \cos [2 \alpha] + \cos [2 \alpha - 2 \tau] - 2 \cos [2 \tau] + \cos [2 \alpha + 2 \tau]) \right. \right. \right. \right. \right. \\
& \quad \left. \left. \left. \sin [\alpha]^2 \sin [\tau]^2\right)} \right)} \right) \right) \left(4 M \theta + M \theta \cos [2 \alpha - 2 \tau] - 2 M \theta \cos [2 \tau] + \right. \\
& \quad M \theta \cos [2 \alpha + 2 \tau] - 2 M \theta \cos [\alpha - \tau]^2 \sec [\alpha]^2 - 2 M \theta \cos [2 \alpha] \cos [\alpha - \tau]^2 \\
& \quad \sec [\alpha]^2 - 2 M \theta \sec [\alpha]^2 \sin [\tau]^2 - 2 M \theta \cos [2 \alpha] \sec [\alpha]^2 \sin [\tau]^2 + \\
& \quad 2 \sqrt{2} \sqrt{\left(M \theta^2 (6 + 2 \cos [2 \alpha] + \cos [2 \alpha - 2 \tau] - 2 \cos [2 \tau] + \cos [2 \alpha + 2 \tau]) \right. \\
& \quad \left. \sin [\alpha]^2 \sin [\tau]^2\right)} \Big) \left(-4 M \theta - M \theta \cos [2 \alpha - 2 \tau] + \right. \\
& \quad 2 M \theta \cos [2 \tau] - M \theta \cos [2 \alpha + 2 \tau] + 2 M \theta \cos [\alpha - \tau]^2 \sec [\alpha]^2 + \\
& \quad 2 M \theta \cos [2 \alpha] \cos [\alpha - \tau]^2 \sec [\alpha]^2 + 2 M \theta \sec [\alpha]^2 \sin [\tau]^2 + \\
& \quad 2 M \theta \cos [2 \alpha] \sec [\alpha]^2 \sin [\tau]^2 + 2 \sqrt{2} \sqrt{\left(M \theta^2 (6 + 2 \cos [2 \alpha] + \right.}
\end{aligned}$$

$$\begin{aligned}
& \left. \left(\cos[2\alpha - 2\tau] - 2\cos[2\tau] + \cos[2\alpha + 2\tau] \right) \sin[\alpha]^2 \sin[\tau]^2 \right) \Bigg) \Bigg/ \\
& \left(32 M0 (1 + \cos[2\alpha]) \sqrt{M0^2 (6 + 2\cos[2\alpha] + \cos[2\alpha - 2\tau] - 2\cos[2\tau] + \cos[2\alpha + 2\tau]) \sin[\alpha]^2 \sin[\tau]^2} \right) - \\
& \left(i \cos[\alpha] \cot[\alpha] \csc[\tau]^2 \sqrt{\left(\frac{1}{1 + \cos[2\alpha]} (-2 + 4 M0 - 2\cos[2\alpha] + \right. \right. \\
& \quad M0 \cos[2\alpha - 2\tau] - 2 M0 \cos[2\tau] + M0 \cos[2\alpha + 2\tau] + \\
& \quad 2\sqrt{2} \sqrt{M0^2 (6 + 2\cos[2\alpha] + \cos[2\alpha - 2\tau] - 2\cos[2\tau] + \cos[2\alpha + 2\tau]) \sin[\alpha]^2 \sin[\tau]^2} \Bigg) \Bigg) \left(4 M0 + M0 \cos[2\alpha - 2\tau] - 2 M0 \cos[2\tau] + \right. \\
& \quad M0 \cos[2\alpha + 2\tau] - 2 M0 \cos[\alpha - \tau]^2 \sec[\alpha]^2 - 2 M0 \cos[2\alpha] \cos[\alpha - \tau]^2 \\
& \quad \sec[\alpha]^2 - 2 M0 \sec[\alpha]^2 \sin[\tau]^2 - 2 M0 \cos[2\alpha] \sec[\alpha]^2 \sin[\tau]^2 + \\
& \quad 2\sqrt{2} \sqrt{M0^2 (6 + 2\cos[2\alpha] + \cos[2\alpha - 2\tau] - 2\cos[2\tau] + \cos[2\alpha + 2\tau]) \sin[\alpha]^2 \sin[\tau]^2} \Bigg) \left(-4 M0 - M0 \cos[2\alpha - 2\tau] + \right. \\
& \quad 2 M0 \cos[2\tau] - M0 \cos[2\alpha + 2\tau] + 2 M0 \cos[\alpha - \tau]^2 \sec[\alpha]^2 + \\
& \quad 2 M0 \cos[2\alpha] \cos[\alpha - \tau]^2 \sec[\alpha]^2 + 2 M0 \sec[\alpha]^2 \sin[\tau]^2 + \\
& \quad 2 M0 \cos[2\alpha] \sec[\alpha]^2 \sin[\tau]^2 + 2\sqrt{2} \sqrt{M0^2 (6 + 2\cos[2\alpha] + \cos[2\alpha - 2\tau] - 2\cos[2\tau] + \cos[2\alpha + 2\tau]) \sin[\alpha]^2 \sin[\tau]^2} \Bigg) \Bigg) \Bigg/ \\
& \left(32 M0 (1 + \cos[2\alpha]) \sqrt{M0^2 (6 + 2\cos[2\alpha] + \cos[2\alpha - 2\tau] - 2\cos[2\tau] + \cos[2\alpha + 2\tau]) \sin[\alpha]^2 \sin[\tau]^2} \right) \Bigg)^2 + \\
& \text{Abs}\left[\cos\left[\frac{\rho}{2}\right] \left(-i \sec[\alpha] \sin[\tau] \left(\left(\sqrt{\left(\frac{1}{1 + \cos[2\alpha]} (-2 + 4 M0 - 2\cos[2\alpha] + M0 \cos[2\alpha - 2\tau] - \right. \right. \right. \right. \right. \right. \\
& \quad 2 M0 \cos[2\tau] + M0 \cos[2\alpha + 2\tau] - 2\sqrt{2} \sqrt{M0^2 (6 + 2\cos[2\alpha] + \cos[2\alpha - 2\tau] - 2\cos[2\tau] + \cos[2\alpha + 2\tau]) \sin[\alpha]^2 \sin[\tau]^2} \Bigg) \Bigg) \right. \\
& \quad \left(4 M0 + M0 \cos[2\alpha - 2\tau] - 2 M0 \cos[2\tau] + M0 \cos[2\alpha + 2\tau] - 2 M0 \cos[\alpha - \tau]^2 \sec[\alpha]^2 - 2 M0 \cos[2\alpha] \cos[\alpha - \tau]^2 \sec[\alpha]^2 - 2 M0 \sec[\alpha]^2 \sin[\tau]^2 - 2 M0 \cos[2\alpha] \sec[\alpha]^2 \sin[\tau]^2 + \right. \\
& \quad 2\sqrt{2} \sqrt{M0^2 (6 + 2\cos[2\alpha] + \cos[2\alpha - 2\tau] - 2\cos[2\tau] + \cos[2\alpha + 2\tau]) \sin[\alpha]^2 \sin[\tau]^2} \Bigg) \Bigg) \Bigg/ \\
& \quad \left(8 \sqrt{M0^2 (6 + 2\cos[2\alpha] + \cos[2\alpha - 2\tau] - 2\cos[2\tau] + \cos[2\alpha + 2\tau]) \sin[\alpha]^2 \sin[\tau]^2} \right) + \\
& \quad \left(\sqrt{\left(\frac{1}{1 + \cos[2\alpha]} (-2 + 4 M0 - 2\cos[2\alpha] + M0 \cos[2\alpha - 2\tau] - 2 M0 \cos[2\tau] + \right. \right. \\
& \quad M0 \cos[2\alpha + 2\tau] + 2\sqrt{2} \sqrt{M0^2 (6 + 2\cos[2\alpha] + \cos[2\alpha - 2\tau] - 2\cos[2\tau] + \cos[2\alpha + 2\tau]) \sin[\alpha]^2 \sin[\tau]^2} \Bigg) \Bigg) \left(-4 M0 - \right. \\
& \quad M0 \cos[2\alpha - 2\tau] + 2 M0 \cos[2\tau] - M0 \cos[2\alpha + 2\tau] + 2 M0 \cos[\alpha - \tau]^2 \sec[\alpha]^2 + 2 M0 \cos[2\alpha] \cos[\alpha - \tau]^2 \sec[\alpha]^2 + 2 M0 \sec[\alpha]^2 \sin[\tau]^2 + \\
& \quad 2 M0 \cos[2\alpha] \sec[\alpha]^2 \sin[\tau]^2 + 2\sqrt{2} \sqrt{M0^2 (6 + 2\cos[2\alpha] + \cos[2\alpha - 2\tau] - 2\cos[2\tau] + \cos[2\alpha + 2\tau]) \sin[\alpha]^2 \sin[\tau]^2} \Bigg) \Bigg) \Bigg/
\end{aligned}$$

$$\begin{aligned}
& \left(8 \sqrt{M^2 (6 + 2 \cos[2\alpha] + \cos[2\alpha - 2\tau] - 2 \cos[2\tau] + \cos[2\alpha + 2\tau])} \right. \\
& \quad \left. \sin[\alpha]^2 \sin[\tau]^2) \right) + \\
& \cos[\alpha - \tau] \sec[\alpha] \left(- \left(\left(i M (1 + \cos[2\alpha]) \sec[\alpha] \sin[\tau]^2 \sqrt{\frac{1}{1 + \cos[2\alpha]}} \right. \right. \right. \\
& \quad \left. \left. \left(-2 + 4 M - 2 \cos[2\alpha] + M \cos[2\alpha - 2\tau] - 2 M \cos[2\tau] + M \cos[2\alpha + 2\tau] - \right. \right. \right. \\
& \quad \left. \left. 2 \sqrt{2} \sqrt{M^2 (6 + 2 \cos[2\alpha] + \cos[2\alpha - 2\tau] - 2 \cos[2\tau] + \cos[2\alpha + 2\tau])} \right. \right. \\
& \quad \left. \left. \sin[\alpha]^2 \sin[\tau]^2) \right) \right) \tan[\alpha] \Big/ \left(2 \sqrt{M^2 (6 + 2 \cos[2\alpha] + \right. \\
& \quad \left. \cos[2\alpha - 2\tau] - 2 \cos[2\tau] + \cos[2\alpha + 2\tau]) \sin[\alpha]^2 \sin[\tau]^2) \right) \Big) + \\
& \left(i M (1 + \cos[2\alpha]) \sec[\alpha] \sin[\tau]^2 \sqrt{\frac{1}{1 + \cos[2\alpha]}} \left(-2 + 4 M - \right. \right. \\
& \quad \left. \left. 2 \cos[2\alpha] + M \cos[2\alpha - 2\tau] - 2 M \cos[2\tau] + M \cos[2\alpha + 2\tau] + \right. \right. \\
& \quad \left. \left. 2 \sqrt{2} \sqrt{M^2 (6 + 2 \cos[2\alpha] + \cos[2\alpha - 2\tau] - 2 \cos[2\tau] + \right. \right. \\
& \quad \left. \left. \cos[2\alpha + 2\tau]) \sin[\alpha]^2 \sin[\tau]^2) \right) \right) \tan[\alpha] \Big/ \\
& \left(2 \sqrt{M^2 (6 + 2 \cos[2\alpha] + \cos[2\alpha - 2\tau] - 2 \cos[2\tau] + \cos[2\alpha + 2\tau])} \right. \\
& \quad \left. \sin[\alpha]^2 \sin[\tau]^2) \right) \Big) + i \sin\left[\frac{\rho}{2}\right] \\
& \left(\cos[\alpha + \tau] \sec[\alpha] \left(\left(\sqrt{\frac{1}{1 + \cos[2\alpha]}} \left(-2 + 4 M - 2 \cos[2\alpha] + M \cos[2\alpha - 2\tau] - \right. \right. \right. \right. \\
& \quad \left. \left. 2 M \cos[2\tau] + M \cos[2\alpha + 2\tau] - 2 \sqrt{2} \sqrt{M^2 (6 + 2 \cos[2\alpha] + \right. \right. \\
& \quad \left. \left. \cos[2\alpha - 2\tau] - 2 \cos[2\tau] + \cos[2\alpha + 2\tau]) \sin[\alpha]^2 \sin[\tau]^2) \right) \right) \right. \\
& \quad \left(4 M + M \cos[2\alpha - 2\tau] - 2 M \cos[2\tau] + M \cos[2\alpha + 2\tau] - 2 M \right. \\
& \quad \cos[\alpha - \tau]^2 \sec[\alpha]^2 - 2 M \cos[2\alpha] \cos[\alpha - \tau]^2 \sec[\alpha]^2 - 2 M \sec[\alpha]^2 \\
& \quad \sin[\tau]^2 - 2 M \cos[2\alpha] \sec[\alpha]^2 \sin[\tau]^2 + 2 \sqrt{2} \sqrt{M^2 (6 + 2 \cos[2\alpha] + \right. \\
& \quad \left. \cos[2\alpha - 2\tau] - 2 \cos[2\tau] + \cos[2\alpha + 2\tau]) \sin[\alpha]^2 \sin[\tau]^2) \right) \Big/ \\
& \left(8 \sqrt{M^2 (6 + 2 \cos[2\alpha] + \cos[2\alpha - 2\tau] - 2 \cos[2\tau] + \cos[2\alpha + 2\tau])} \right. \\
& \quad \left. \sin[\alpha]^2 \sin[\tau]^2) \right) + \\
& \left(\sqrt{\frac{1}{1 + \cos[2\alpha]}} \left(-2 + 4 M - 2 \cos[2\alpha] + M \cos[2\alpha - 2\tau] - 2 M \cos[2\tau] + \right. \right. \\
& \quad \left. \left. M \cos[2\alpha + 2\tau] + 2 \sqrt{2} \sqrt{M^2 (6 + 2 \cos[2\alpha] + \cos[2\alpha - 2\tau] - \right. \right. \\
& \quad \left. \left. 2 \cos[2\tau] + \cos[2\alpha + 2\tau]) \sin[\alpha]^2 \sin[\tau]^2) \right) \right) \left(-4 M - \right. \\
& \quad \left. M \cos[2\alpha - 2\tau] + 2 M \cos[2\tau] - M \cos[2\alpha + 2\tau] + 2 M \cos[\alpha - \tau]^2 \right. \\
& \quad \sec[\alpha]^2 + 2 M \cos[2\alpha] \cos[\alpha - \tau]^2 \sec[\alpha]^2 + 2 M \sec[\alpha]^2 \sin[\tau]^2 + \\
& \quad \left. 2 M \cos[2\alpha] \sec[\alpha]^2 \sin[\tau]^2 + 2 \sqrt{2} \sqrt{M^2 (6 + 2 \cos[2\alpha] + \right. \\
& \quad \left. \cos[2\alpha - 2\tau] - 2 \cos[2\tau] + \cos[2\alpha + 2\tau]) \sin[\alpha]^2 \sin[\tau]^2) \right) \Big/ \\
& \left(8 \sqrt{M^2 (6 + 2 \cos[2\alpha] + \cos[2\alpha - 2\tau] - 2 \cos[2\tau] + \cos[2\alpha + 2\tau])} \right.
\end{aligned}$$

$$\begin{aligned}
& \alpha] \left(\frac{1}{16 \sqrt{2} \sqrt{N0^2 \sin[\alpha]^2}} \sqrt{\frac{-2 + 6 N0 - 2 \cos[2 \alpha] - 2 N0 \cos[2 \alpha] - 8 \sqrt{N0^2 \sin[\alpha]^2}}{1 + \cos[2 \alpha]}} \right. \\
& \left(6 N0 - 2 N0 \cos[2 \alpha] - 2 N0 \sec[\alpha]^2 - 2 N0 \cos[2 \alpha] \sec[\alpha]^2 + \right. \\
& \left. 8 \sqrt{N0^2 \sin[\alpha]^2} - 2 N0 \tan[\alpha]^2 - 2 N0 \cos[2 \alpha] \tan[\alpha]^2 \right) + \\
& \frac{1}{16 \sqrt{2} \sqrt{N0^2 \sin[\alpha]^2}} \sqrt{\frac{-2 + 6 N0 - 2 \cos[2 \alpha] - 2 N0 \cos[2 \alpha] + 8 \sqrt{N0^2 \sin[\alpha]^2}}{1 + \cos[2 \alpha]}} \\
& \left(-6 N0 + 2 N0 \cos[2 \alpha] + 2 N0 \sec[\alpha]^2 + 2 N0 \cos[2 \alpha] \sec[\alpha]^2 + 8 \sqrt{N0^2 \sin[\alpha]^2} + \right. \\
& \left. 2 N0 \tan[\alpha]^2 + 2 N0 \cos[2 \alpha] \tan[\alpha]^2 \right) \left. \right) + i \sin\left[\frac{\rho}{2}\right] \left(-i \sec[\alpha] \right. \\
& \left. - \frac{i N0 (1 + \cos[2 \alpha]) \sec[\alpha] \sqrt{\frac{-2 + 6 N0 - 2 \cos[2 \alpha] - 2 N0 \cos[2 \alpha] - 8 \sqrt{N0^2 \sin[\alpha]^2}}{1 + \cos[2 \alpha]}} \tan[\alpha]}{4 \sqrt{2} \sqrt{N0^2 \sin[\alpha]^2}} + \right. \\
& \left. \frac{i N0 (1 + \cos[2 \alpha]) \sec[\alpha] \sqrt{\frac{-2 + 6 N0 - 2 \cos[2 \alpha] - 2 N0 \cos[2 \alpha] + 8 \sqrt{N0^2 \sin[\alpha]^2}}{1 + \cos[2 \alpha]}} \tan[\alpha]}{4 \sqrt{2} \sqrt{N0^2 \sin[\alpha]^2}} \right) - \tan[\\
& \alpha] \left(\frac{1}{16 \sqrt{2} \sqrt{N0^2 \sin[\alpha]^2}} \sqrt{\frac{-2 + 6 N0 - 2 \cos[2 \alpha] - 2 N0 \cos[2 \alpha] - 8 \sqrt{N0^2 \sin[\alpha]^2}}{1 + \cos[2 \alpha]}} \right. \\
& \left(6 N0 - 2 N0 \cos[2 \alpha] - 2 N0 \sec[\alpha]^2 - 2 N0 \cos[2 \alpha] \sec[\alpha]^2 + \right. \\
& \left. 8 \sqrt{N0^2 \sin[\alpha]^2} - 2 N0 \tan[\alpha]^2 - 2 N0 \cos[2 \alpha] \tan[\alpha]^2 \right) + \\
& \frac{1}{16 \sqrt{2} \sqrt{N0^2 \sin[\alpha]^2}} \sqrt{\frac{-2 + 6 N0 - 2 \cos[2 \alpha] - 2 N0 \cos[2 \alpha] + 8 \sqrt{N0^2 \sin[\alpha]^2}}{1 + \cos[2 \alpha]}} \\
& \left(-6 N0 + 2 N0 \cos[2 \alpha] + 2 N0 \sec[\alpha]^2 + 2 N0 \cos[2 \alpha] \sec[\alpha]^2 + \right.
\end{aligned}$$

$$\begin{aligned}
& \left(-6 N0 + 2 N0 \cos[2\alpha] + 2 N0 \sec[\alpha]^2 + 2 N0 \cos[2\alpha] \sec[\alpha]^2 + \right. \\
& \quad \left. 8 \sqrt{N0^2 \sin[\alpha]^2} + 2 N0 \tan[\alpha]^2 + 2 N0 \cos[2\alpha] \tan[\alpha]^2 \right) \Bigg/ \\
& \left(64 \sqrt{2} N0 (1 + \cos[2\alpha]) \sqrt{N0^2 \sin[\alpha]^2} \right) \Bigg) + i \sin\left[\frac{\rho}{2}\right] \left(-i \sec[\alpha] \right. \\
& \left(\frac{1}{16 \sqrt{2} \sqrt{N0^2 \sin[\alpha]^2}} \sqrt{\frac{-2 + 6 N0 - 2 \cos[2\alpha] - 2 N0 \cos[2\alpha] + 8 \sqrt{N0^2 \sin[\alpha]^2}}{1 + \cos[2\alpha]}} \right. \\
& \quad \left(6 N0 - 2 N0 \cos[2\alpha] - 2 N0 \sec[\alpha]^2 - 2 N0 \cos[2\alpha] \sec[\alpha]^2 + \right. \\
& \quad \left. 8 \sqrt{N0^2 \sin[\alpha]^2} - 2 N0 \tan[\alpha]^2 - 2 N0 \cos[2\alpha] \tan[\alpha]^2 \right) + \\
& \quad \frac{1}{16 \sqrt{2} \sqrt{N0^2 \sin[\alpha]^2}} \sqrt{\frac{-2 + 6 N0 - 2 \cos[2\alpha] - 2 N0 \cos[2\alpha] - 8 \sqrt{N0^2 \sin[\alpha]^2}}{1 + \cos[2\alpha]}} \\
& \quad \left(-6 N0 + 2 N0 \cos[2\alpha] + 2 N0 \sec[\alpha]^2 + 2 N0 \cos[2\alpha] \sec[\alpha]^2 + \right. \\
& \quad \left. 8 \sqrt{N0^2 \sin[\alpha]^2} + 2 N0 \tan[\alpha]^2 + 2 N0 \cos[2\alpha] \tan[\alpha]^2 \right) \Bigg) - \\
& \tan[\alpha] \left(\left(i \cos[\alpha] \cot[\alpha] \sqrt{\frac{-2 + 6 N0 - 2 \cos[2\alpha] - 2 N0 \cos[2\alpha] - 8 \sqrt{N0^2 \sin[\alpha]^2}}{1 + \cos[2\alpha]}} \right. \right. \\
& \quad \left(6 N0 - 2 N0 \cos[2\alpha] - 2 N0 \sec[\alpha]^2 - 2 N0 \cos[2\alpha] \sec[\alpha]^2 + 8 \sqrt{N0^2 \sin[\alpha]^2} - \right. \\
& \quad \left. 2 N0 \tan[\alpha]^2 - 2 N0 \cos[2\alpha] \tan[\alpha]^2 \right) \left(-6 N0 + 2 N0 \cos[2\alpha] + \right. \\
& \quad \left. 2 N0 \sec[\alpha]^2 + 2 N0 \cos[2\alpha] \sec[\alpha]^2 + 8 \sqrt{N0^2 \sin[\alpha]^2} + 2 N0 \tan[\alpha]^2 + \right. \\
& \quad \left. 2 N0 \cos[2\alpha] \tan[\alpha]^2 \right) \Bigg) \Bigg/ \left(64 \sqrt{2} N0 (1 + \cos[2\alpha]) \sqrt{N0^2 \sin[\alpha]^2} \right) -
\end{aligned}$$

$$\left(\frac{i \cos[\alpha] \cot[\alpha] \sqrt{\frac{-2 + 6 M0 - 2 \cos[2 \alpha] - 2 M0 \cos[2 \alpha] + 8 \sqrt{M0^2 \sin[\alpha]^2}}{1 + \cos[2 \alpha]}}}{\left(\frac{6 M0 - 2 M0 \cos[2 \alpha] - 2 M0 \sec[\alpha]^2 - 2 M0 \cos[2 \alpha] \sec[\alpha]^2 + 8 \sqrt{M0^2 \sin[\alpha]^2} - 2 M0 \tan[\alpha]^2 - 2 M0 \cos[2 \alpha] \tan[\alpha]^2}{\left(-6 M0 + 2 M0 \cos[2 \alpha] + 2 M0 \sec[\alpha]^2 + 2 M0 \cos[2 \alpha] \sec[\alpha]^2 + 8 \sqrt{M0^2 \sin[\alpha]^2} + 2 M0 \tan[\alpha]^2 + 2 M0 \cos[2 \alpha] \tan[\alpha]^2 \right)} \right) \left(64 \sqrt{2} M0 (1 + \cos[2 \alpha]) \sqrt{M0^2 \sin[\alpha]^2} \right)} \right)^2$$

```
In[31]:= DecisiveProbability[M0_, α_, τPerp_, ρ_] := (Abs[Sec[α] Sin[ρ/2] + Cos[ρ/2] Tan[α]]^2 +
  Abs[-i Cos[ρ/2] Sec[α] - i Sin[ρ/2] Tan[α]]^2) /
  (Abs[Sec[α] Sin[ρ/2] + Cos[ρ/2] Tan[α]]^2 +
  Abs[-i Cos[ρ/2] Sec[α] - i Sin[ρ/2] Tan[α]]^2 +
  Abs[Cos[ρ/2] (Tan[α] (-((i M0 (1 + Cos[2 α]) Sec[α] √((-2 + 6 M0 - 2 Cos[2 α] -
    2 M0 Cos[2 α] - 8 √(M0^2 Sin[α]^2)) / (1 + Cos[2 α])) Tan[α]) / (4 × √2
    √(M0^2 Sin[α]^2))) + (i M0 (1 + Cos[2 α]) Sec[α] √((-2 + 6 M0 - 2 Cos[2 α] -
    2 M0 Cos[2 α] + 8 √(M0^2 Sin[α]^2)) / (1 + Cos[2 α])) Tan[α]) /
    (4 × √2 √(M0^2 Sin[α]^2))) - i Sec[α] ((1 / (16 × √2 √(M0^2 Sin[α]^2)))
    √((-2 + 6 M0 - 2 Cos[2 α] - 2 M0 Cos[2 α] - 8 √(M0^2 Sin[α]^2)) / (1 + Cos[2 α]))
    (6 M0 - 2 M0 Cos[2 α] - 2 M0 Sec[α]^2 - 2 M0 Cos[2 α] Sec[α]^2 + 8 √(M0^2 Sin[α]^2) -
    2 M0 Tan[α]^2 - 2 M0 Cos[2 α] Tan[α]^2) + (1 / (16 × √2 √(M0^2 Sin[α]^2)))
    √((-2 + 6 M0 - 2 Cos[2 α] - 2 M0 Cos[2 α] + 8 √(M0^2 Sin[α]^2)) / (1 + Cos[2 α]))
    (-6 M0 + 2 M0 Cos[2 α] + 2 M0 Sec[α]^2 + 2 M0 Cos[2 α] Sec[α]^2 +
    8 √(M0^2 Sin[α]^2) + 2 M0 Tan[α]^2 + 2 M0 Cos[2 α] Tan[α]^2))) +
  i Sin[ρ/2] (-i Sec[α] (-((i M0 (1 + Cos[2 α]) Sec[α] √((-2 + 6 M0 - 2 Cos[2 α] -
    2 M0 Cos[2 α] - 8 √(M0^2 Sin[α]^2)) / (1 + Cos[2 α])) Tan[α]) /
    (4 × √2 √(M0^2 Sin[α]^2))) + (i M0 (1 + Cos[2 α]) Sec[α]
    √((-2 + 6 M0 - 2 Cos[2 α] - 2 M0 Cos[2 α] + 8 √(M0^2 Sin[α]^2)) / (1 + Cos[2 α]))
    Tan[α]) / (4 × √2 √(M0^2 Sin[α]^2))) -
  Tan[α] ((1 / (16 × √2 √(M0^2 Sin[α]^2))) √((-2 + 6 M0 - 2 Cos[2 α] -
    2 M0 Cos[2 α] - 8 √(M0^2 Sin[α]^2)) / (1 + Cos[2 α]))
    (6 M0 - 2 M0 Cos[2 α] - 2 M0 Sec[α]^2 - 2 M0 Cos[2 α] Sec[α]^2 + 8 √(M0^2 Sin[α]^2) -
    2 M0 Tan[α]^2 - 2 M0 Cos[2 α] Tan[α]^2) + (1 / (16 × √2 √(M0^2 Sin[α]^2)))
    √((-2 + 6 M0 - 2 Cos[2 α] - 2 M0 Cos[2 α] + 8 √(M0^2 Sin[α]^2)) / (1 + Cos[2 α]))
    (-6 M0 + 2 M0 Cos[2 α] + 2 M0 Sec[α]^2 + 2 M0 Cos[2 α] Sec[α]^2 +
    8 √(M0^2 Sin[α]^2) + 2 M0 Tan[α]^2 + 2 M0 Cos[2 α] Tan[α]^2)))^2 +
  Abs[Cos[ρ/2] (Tan[α] ((1 / (16 × √2 √(M0^2 Sin[α]^2))) √((-2 + 6 M0 - 2 Cos[2 α] -
    2 M0 Cos[2 α] + 8 √(M0^2 Sin[α]^2)) / (1 + Cos[2 α]))
    (6 M0 - 2 M0 Cos[2 α] - 2 M0 Sec[α]^2 - 2 M0 Cos[2 α] Sec[α]^2 + 8 √(M0^2 Sin[α]^2) -
```

$$\begin{aligned}
& \sqrt{\left(\frac{2 M0 \tan[\alpha]^2 - 2 M0 \cos[2 \alpha] \tan[\alpha]^2 + \left(\frac{1}{16 \times \sqrt{2} \sqrt{M0^2 \sin[\alpha]^2}} \right)}{\left(-2 + 6 M0 - 2 \cos[2 \alpha] - 2 M0 \cos[2 \alpha] - 8 \sqrt{M0^2 \sin[\alpha]^2} \right) / (1 + \cos[2 \alpha])} \right)} \\
& \left(-6 M0 + 2 M0 \cos[2 \alpha] + 2 M0 \sec[\alpha]^2 + 2 M0 \cos[2 \alpha] \sec[\alpha]^2 + \right. \\
& \quad \left. 8 \sqrt{M0^2 \sin[\alpha]^2} + 2 M0 \tan[\alpha]^2 + 2 M0 \cos[2 \alpha] \tan[\alpha]^2 \right) - \\
& \pm \sec[\alpha] \left(\frac{1}{64 \times \sqrt{2} M0 (1 + \cos[2 \alpha])} \sqrt{M0^2 \sin[\alpha]^2} \right) \pm \cos[\alpha] \cot[\alpha] \\
& \sqrt{\left(\frac{-2 + 6 M0 - 2 \cos[2 \alpha] - 2 M0 \cos[2 \alpha] - 8 \sqrt{M0^2 \sin[\alpha]^2}}{(1 + \cos[2 \alpha])} \right)} \\
& \left(6 M0 - 2 M0 \cos[2 \alpha] - 2 M0 \sec[\alpha]^2 - 2 M0 \cos[2 \alpha] \sec[\alpha]^2 + \right. \\
& \quad \left. 8 \sqrt{M0^2 \sin[\alpha]^2} - 2 M0 \tan[\alpha]^2 - 2 M0 \cos[2 \alpha] \tan[\alpha]^2 \right) - \\
& \left(-6 M0 + 2 M0 \cos[2 \alpha] + 2 M0 \sec[\alpha]^2 + 2 M0 \cos[2 \alpha] \sec[\alpha]^2 + \right. \\
& \quad \left. 8 \sqrt{M0^2 \sin[\alpha]^2} + 2 M0 \tan[\alpha]^2 + 2 M0 \cos[2 \alpha] \tan[\alpha]^2 \right) - \\
& \left(\frac{1}{64 \times \sqrt{2} M0 (1 + \cos[2 \alpha])} \sqrt{M0^2 \sin[\alpha]^2} \right) \pm \cos[\alpha] \cot[\alpha] \\
& \sqrt{\left(\frac{-2 + 6 M0 - 2 \cos[2 \alpha] - 2 M0 \cos[2 \alpha] + 8 \sqrt{M0^2 \sin[\alpha]^2}}{(1 + \cos[2 \alpha])} \right)} \\
& \left(6 M0 - 2 M0 \cos[2 \alpha] - 2 M0 \sec[\alpha]^2 - 2 M0 \cos[2 \alpha] \sec[\alpha]^2 + \right. \\
& \quad \left. 8 \sqrt{M0^2 \sin[\alpha]^2} - 2 M0 \tan[\alpha]^2 - 2 M0 \cos[2 \alpha] \tan[\alpha]^2 \right) - \\
& \left(-6 M0 + 2 M0 \cos[2 \alpha] + 2 M0 \sec[\alpha]^2 + 2 M0 \cos[2 \alpha] \sec[\alpha]^2 + \right. \\
& \quad \left. 8 \sqrt{M0^2 \sin[\alpha]^2} + 2 M0 \tan[\alpha]^2 + 2 M0 \cos[2 \alpha] \tan[\alpha]^2 \right) + \\
& \pm \sin[\rho/2] \left(-\pm \sec[\alpha] \left(\frac{1}{16 \times \sqrt{2} \sqrt{M0^2 \sin[\alpha]^2}} \right) \sqrt{\left(-2 + 6 M0 - \right.} \right. \\
& \quad \left. \left. 2 \cos[2 \alpha] - 2 M0 \cos[2 \alpha] + 8 \sqrt{M0^2 \sin[\alpha]^2} \right) / (1 + \cos[2 \alpha])} \right) - \\
& \left(6 M0 - 2 M0 \cos[2 \alpha] - 2 M0 \sec[\alpha]^2 - 2 M0 \cos[2 \alpha] \sec[\alpha]^2 + 8 \sqrt{M0^2 \sin[\alpha]^2} - \right. \\
& \quad \left. 2 M0 \tan[\alpha]^2 - 2 M0 \cos[2 \alpha] \tan[\alpha]^2 \right) + \left(\frac{1}{16 \times \sqrt{2} \sqrt{M0^2 \sin[\alpha]^2}} \right) \\
& \sqrt{\left(\frac{-2 + 6 M0 - 2 \cos[2 \alpha] - 2 M0 \cos[2 \alpha] - 8 \sqrt{M0^2 \sin[\alpha]^2}}{(1 + \cos[2 \alpha])} \right)} \\
& \left(-6 M0 + 2 M0 \cos[2 \alpha] + 2 M0 \sec[\alpha]^2 + 2 M0 \cos[2 \alpha] \sec[\alpha]^2 + \right. \\
& \quad \left. 8 \sqrt{M0^2 \sin[\alpha]^2} + 2 M0 \tan[\alpha]^2 + 2 M0 \cos[2 \alpha] \tan[\alpha]^2 \right) - \\
& \tan[\alpha] \left(\frac{1}{64 \times \sqrt{2} M0 (1 + \cos[2 \alpha])} \sqrt{M0^2 \sin[\alpha]^2} \right) \pm \cos[\alpha] \cot[\alpha] \\
& \sqrt{\left(\frac{-2 + 6 M0 - 2 \cos[2 \alpha] - 2 M0 \cos[2 \alpha] - 8 \sqrt{M0^2 \sin[\alpha]^2}}{(1 + \cos[2 \alpha])} \right)} \\
& \left(6 M0 - 2 M0 \cos[2 \alpha] - 2 M0 \sec[\alpha]^2 - 2 M0 \cos[2 \alpha] \sec[\alpha]^2 + \right. \\
& \quad \left. 8 \sqrt{M0^2 \sin[\alpha]^2} - 2 M0 \tan[\alpha]^2 - 2 M0 \cos[2 \alpha] \tan[\alpha]^2 \right) - \\
& \left(-6 M0 + 2 M0 \cos[2 \alpha] + 2 M0 \sec[\alpha]^2 + 2 M0 \cos[2 \alpha] \sec[\alpha]^2 + \right. \\
& \quad \left. 8 \sqrt{M0^2 \sin[\alpha]^2} + 2 M0 \tan[\alpha]^2 + 2 M0 \cos[2 \alpha] \tan[\alpha]^2 \right) - \\
& \left(\frac{1}{64 \times \sqrt{2} M0 (1 + \cos[2 \alpha])} \sqrt{M0^2 \sin[\alpha]^2} \right) \pm \cos[\alpha] \cot[\alpha] \\
& \sqrt{\left(\frac{-2 + 6 M0 - 2 \cos[2 \alpha] - 2 M0 \cos[2 \alpha] + 8 \sqrt{M0^2 \sin[\alpha]^2}}{(1 + \cos[2 \alpha])} \right)} \\
& \left(6 M0 - 2 M0 \cos[2 \alpha] - 2 M0 \sec[\alpha]^2 - 2 M0 \cos[2 \alpha] \sec[\alpha]^2 + \right. \\
& \quad \left. 8 \sqrt{M0^2 \sin[\alpha]^2} - 2 M0 \tan[\alpha]^2 - 2 M0 \cos[2 \alpha] \tan[\alpha]^2 \right) - \\
& \left(-6 M0 + 2 M0 \cos[2 \alpha] + 2 M0 \sec[\alpha]^2 + 2 M0 \cos[2 \alpha] \sec[\alpha]^2 + \right. \\
& \quad \left. 8 \sqrt{M0^2 \sin[\alpha]^2} + 2 M0 \tan[\alpha]^2 + 2 M0 \cos[2 \alpha] \tan[\alpha]^2 \right) \Big)^2
\end{aligned}$$

In[32]:= M01 = 400.

M02 = 100.

M03 = 43.85964912280702

M04 = 24.36647173489279

M05 = 15.35

M07 = 7.51

M10 = 3.3506871002735

M12 = 2.1371173469387754

Out[32]= 400.

Out[33]= 100.

Out[34]= 43.8596

Out[35]= 24.3665

Out[36]= 15.35

Out[37]= 7.51

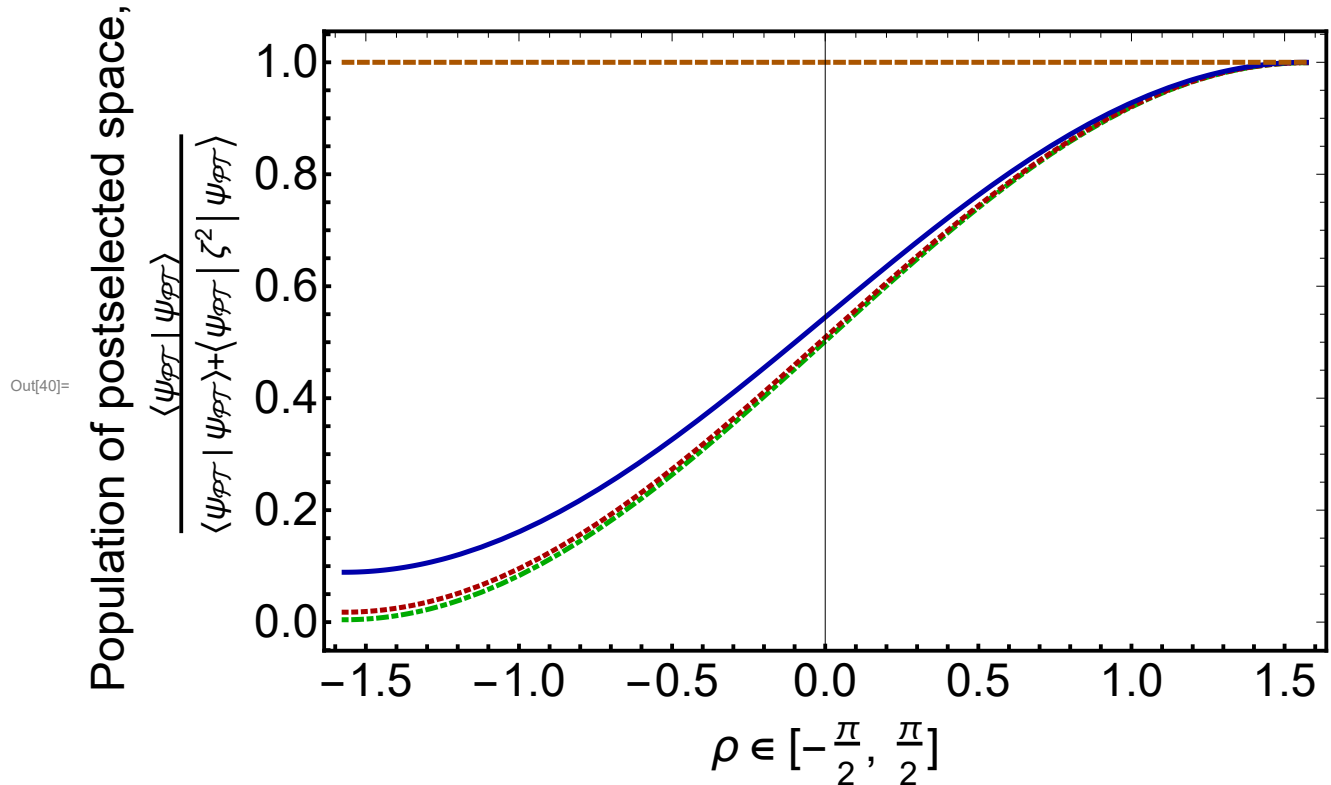
Out[38]= 3.35069

Out[39]= 2.13712

```

In[40]:= p2 = Plot[{DecisiveProbability[M05,  $\pi/2 - 0.5$ ,  $\tau_{\text{Perp}}$ ,  $\rho$ ],
  DecisiveProbability[M07,  $\pi/2 - 0.7$ ,  $\tau_{\text{Perp}}$ ,  $\rho$ ],
  DecisiveProbability[M10,  $\pi/2 - 1$ ,  $\tau_{\text{Perp}}$ ,  $\rho$ ], 1}, { $\rho$ ,  $-\pi/2$ ,  $\pi/2$ }, PlotRange → All,
  PlotStyle → {Directive[Darker[Green], Thickness[0.005], DotDashed],
    Directive[Darker[Red], Thickness[0.005], Dotted], Directive[Darker[Blue],
    Thickness[0.005], Dashed[1]], Directive[Darker[Orange], Thickness[0.005], Dashed]},
  Frame → True, FrameStyle → Directive[Black, Thick], LabelStyle → Large,
  PlotLegends → LineLegend[{" $\alpha = \frac{\pi}{2} - 0.5$ ", " $\alpha = \frac{\pi}{2} - 0.7$ ", " $\alpha = \frac{\pi}{2} - 1$ ", " $\alpha = 0$ "},
    LegendFunction → Framed], Frame → True,
  FrameStyle → Directive[Black, Thick], LabelStyle → Large,
  PlotStyle → {Directive[Darker[Green], Thickness[0.007]]}, FrameLabel →
    {" $\rho \in [-\frac{\pi}{2}, \frac{\pi}{2}]$ ", "Population of postselected space, \n  $\frac{\langle \psi_{\mathcal{PT}} | \psi_{\mathcal{PT}} \rangle}{\langle \psi_{\mathcal{PT}} | \psi_{\mathcal{PT}} \rangle + \langle \psi_{\mathcal{PT}} | \zeta^2 | \psi_{\mathcal{PT}} \rangle}$ "},
  LabelStyle → {FontWeight → "Bold", FontSize → 25}, ImageSize → 650,
  GridLinesStyle → Directive[Thick, Gray]]

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```

In[41]:= ZetaPart1[M0_,  $\alpha$ _,  $\tau$ _,  $\rho$ _] :=
   $i \sin\left[\frac{\rho}{2}\right] \left( -i \sec[\alpha] \sin[\tau] \left( \left( \sqrt{\frac{1}{1 + \cos[2\alpha]}} \left( -2 + 4 M0 - 2 \cos[2\alpha] + M0 \cos[2\alpha - 2\tau] - \right. \right. \right. \right.$ 
 $\left. \left. \left. 2 M0 \cos[2\tau] + M0 \cos[2\alpha + 2\tau] + 2 \sqrt{2} \sqrt{M0^2 (6 + 2 \cos[2\alpha] + \cos[2\alpha - 2\tau] - \right. \right. \right.$ 
 $\left. \left. \left. 2 \cos[2\tau] + \cos[2\alpha + 2\tau]) \sin[\alpha]^2 \sin[\tau]^2 \right) \right) \left( 4 M0 + M0 \cos[2\alpha - 2\tau] - \right. \right.$ 
 $\left. \left. 2 M0 \cos[2\tau] + M0 \cos[2\alpha + 2\tau] - 2 M0 \cos[\alpha - \tau]^2 \sec[\alpha]^2 - 2 M0 \cos[2\alpha] \right. \right.$ 
 $\left. \left. \cos[\alpha - \tau]^2 \sec[\alpha]^2 - 2 M0 \sec[\alpha]^2 \sin[\tau]^2 - 2 M0 \cos[2\alpha] \sec[\alpha]^2 \sin[\tau]^2 + 2 \sqrt{2} \right. \right.$ 

```

$$\begin{aligned}
& \left. \sqrt{M\theta^2 (6 + 2 \cos[2\alpha] + \cos[2\alpha - 2\tau] - 2 \cos[2\tau] + \cos[2\alpha + 2\tau]) \sin[\alpha]^2 \sin[\tau]^2} \right) \Bigg/ (8 \\
& \sqrt{M\theta^2 (6 + 2 \cos[2\alpha] + \cos[2\alpha - 2\tau] - 2 \cos[2\tau] + \cos[2\alpha + 2\tau]) \sin[\alpha]^2 \sin[\tau]^2} \Bigg) + \\
& \left(\sqrt{\left(\frac{1}{1 + \cos[2\alpha]} \left(-2 + 4 M\theta - 2 \cos[2\alpha] + M\theta \cos[2\alpha - 2\tau] - 2 M\theta \cos[2\tau] + \right. \right. \right. \\
& \quad \left. \left. \left. M\theta \cos[2\alpha + 2\tau] - 2 \sqrt{2} \sqrt{M\theta^2 (6 + 2 \cos[2\alpha] + \cos[2\alpha - 2\tau] - 2 \cos[2\tau] + \cos[2\alpha + 2\tau]) \sin[\alpha]^2 \sin[\tau]^2} \right) \right) \right. \\
& \quad \left. \left(-4 M\theta - M\theta \cos[2\alpha - 2\tau] + 2 M\theta \cos[2\tau] - M\theta \cos[2\alpha + 2\tau] + 2 M\theta \right. \right. \\
& \quad \left. \left. \cos[\alpha - \tau]^2 \sec[\alpha]^2 + 2 M\theta \cos[2\alpha] \cos[\alpha - \tau]^2 \sec[\alpha]^2 + \right. \right. \\
& \quad \left. \left. 2 M\theta \sec[\alpha]^2 \sin[\tau]^2 + 2 M\theta \cos[2\alpha] \sec[\alpha]^2 \sin[\tau]^2 + 2 \sqrt{2} \right. \right. \\
& \quad \left. \left. \sqrt{M\theta^2 (6 + 2 \cos[2\alpha] + \cos[2\alpha - 2\tau] - 2 \cos[2\tau] + \cos[2\alpha + 2\tau]) \sin[\alpha]^2 \sin[\tau]^2} \right) \right) \Bigg/ (8 \\
& \sqrt{M\theta^2 (6 + 2 \cos[2\alpha] + \cos[2\alpha - 2\tau] - 2 \cos[2\tau] + \cos[2\alpha + 2\tau]) \sin[\alpha]^2 \sin[\tau]^2} \Bigg) \Bigg) + \\
& \cos[\alpha + \tau] \sec[\alpha] \left(\left(i \cos[\alpha] \cot[\alpha] \csc[\tau]^2 \sqrt{\left(\frac{1}{1 + \cos[2\alpha]} \left(-2 + 4 M\theta - 2 \cos[2\alpha] + \right. \right. \right. \right. \right. \\
& \quad \left. \left. \left. M\theta \cos[2\alpha - 2\tau] - 2 M\theta \cos[2\tau] + M\theta \cos[2\alpha + 2\tau] - 2 \sqrt{2} \sqrt{M\theta^2 (6 + 2 \cos[2\alpha] + \cos[2\alpha - 2\tau] - 2 \cos[2\tau] + \cos[2\alpha + 2\tau]) \sin[\alpha]^2 \sin[\tau]^2} \right) \right) \right) \right. \\
& \quad \left. \left(4 M\theta + M\theta \cos[2\alpha - 2\tau] - 2 M\theta \cos[2\tau] + M\theta \cos[2\alpha + 2\tau] - 2 M\theta \cos[\alpha - \tau]^2 \right. \right. \\
& \quad \left. \left. \sec[\alpha]^2 - 2 M\theta \cos[2\alpha] \cos[\alpha - \tau]^2 \sec[\alpha]^2 - \right. \right. \\
& \quad \left. \left. 2 M\theta \sec[\alpha]^2 \sin[\tau]^2 - 2 M\theta \cos[2\alpha] \sec[\alpha]^2 \sin[\tau]^2 + 2 \sqrt{2} \right. \right. \\
& \quad \left. \left. \sqrt{M\theta^2 (6 + 2 \cos[2\alpha] + \cos[2\alpha - 2\tau] - 2 \cos[2\tau] + \cos[2\alpha + 2\tau]) \sin[\alpha]^2 \sin[\tau]^2} \right) \right. \\
& \quad \left. \left(-4 M\theta - M\theta \cos[2\alpha - 2\tau] + 2 M\theta \cos[2\tau] - \right. \right. \\
& \quad \left. \left. M\theta \cos[2\alpha + 2\tau] + 2 M\theta \cos[\alpha - \tau]^2 \sec[\alpha]^2 + 2 M\theta \cos[2\alpha] \cos[\alpha - \tau]^2 \sec[\alpha]^2 + \right. \right. \\
& \quad \left. \left. 2 M\theta \sec[\alpha]^2 \sin[\tau]^2 + 2 M\theta \cos[2\alpha] \sec[\alpha]^2 \sin[\tau]^2 + 2 \sqrt{2} \right. \right. \\
& \quad \left. \left. \sqrt{M\theta^2 (6 + 2 \cos[2\alpha] + \cos[2\alpha - 2\tau] - 2 \cos[2\tau] + \cos[2\alpha + 2\tau]) \sin[\alpha]^2 \sin[\tau]^2} \right) \right) \Bigg/ (32 M\theta (1 + \cos[2\alpha]) \\
& \sqrt{M\theta^2 (6 + 2 \cos[2\alpha] + \cos[2\alpha - 2\tau] - 2 \cos[2\tau] + \cos[2\alpha + 2\tau]) \sin[\alpha]^2 \sin[\tau]^2} \Bigg) - \\
& \left(i \cos[\alpha] \cot[\alpha] \csc[\tau]^2 \sqrt{\left(\frac{1}{1 + \cos[2\alpha]} \left(-2 + 4 M\theta - 2 \cos[2\alpha] + M\theta \cos[2\alpha - 2\tau] - \right. \right. \right. \\
& \quad \left. \left. \left. 2 M\theta \cos[2\tau] + M\theta \cos[2\alpha + 2\tau] + 2 \sqrt{2} \sqrt{M\theta^2 (6 + 2 \cos[2\alpha] + \cos[2\alpha - 2\tau] - 2 \cos[2\tau] + \cos[2\alpha + 2\tau]) \sin[\alpha]^2 \sin[\tau]^2} \right) \right) \right) \Bigg)
\end{aligned}$$

$$\begin{aligned}
& \left(4 M \theta + M \theta \cos [2 \alpha - 2 \tau] - 2 M \theta \cos [2 \tau] + M \theta \cos [2 \alpha + 2 \tau] - 2 M \theta \cos [\alpha - \tau]^2 \right. \\
& \quad \sec [\alpha]^2 - 2 M \theta \cos [2 \alpha] \cos [\alpha - \tau]^2 \sec [\alpha]^2 - \\
& \quad 2 M \theta \sec [\alpha]^2 \sin [\tau]^2 - 2 M \theta \cos [2 \alpha] \sec [\alpha]^2 \sin [\tau]^2 + 2 \sqrt{2} \\
& \quad \left. \sqrt{M \theta^2 (6 + 2 \cos [2 \alpha] + \cos [2 \alpha - 2 \tau] - 2 \cos [2 \tau] + \cos [2 \alpha + 2 \tau]) \sin [\alpha]^2 \sin [\tau]^2} \right. \\
& \quad \left. \right) \left(-4 M \theta - M \theta \cos [2 \alpha - 2 \tau] + 2 M \theta \cos [2 \tau] - \right. \\
& \quad M \theta \cos [2 \alpha + 2 \tau] + 2 M \theta \cos [\alpha - \tau]^2 \sec [\alpha]^2 + 2 M \theta \cos [2 \alpha] \cos [\alpha - \tau]^2 \sec [\alpha]^2 + \\
& \quad 2 M \theta \sec [\alpha]^2 \sin [\tau]^2 + 2 M \theta \cos [2 \alpha] \sec [\alpha]^2 \sin [\tau]^2 + 2 \sqrt{2} \\
& \quad \left. \sqrt{M \theta^2 (6 + 2 \cos [2 \alpha] + \cos [2 \alpha - 2 \tau] - 2 \cos [2 \tau] + \cos [2 \alpha + 2 \tau]) \sin [\alpha]^2 \sin [\tau]^2} \right. \\
& \quad \left. \right) \Bigg/ \left(32 M \theta (1 + \cos [2 \alpha]) \right) \\
& \quad \sqrt{M \theta^2 (6 + 2 \cos [2 \alpha] + \cos [2 \alpha - 2 \tau] - 2 \cos [2 \tau] + \cos [2 \alpha + 2 \tau]) \sin [\alpha]^2 \sin [\tau]^2} \Bigg) \Bigg) \\
& + \cos \left[\frac{\rho}{2} \right] \left(\cos [\alpha - \tau] \sec [\alpha] \left(\left(\sqrt{\left(\frac{1}{1 + \cos [2 \alpha]} \right) (-2 + 4 M \theta - 2 \cos [2 \alpha] + M \theta \right.} \right. \right. \\
& \quad \cos [2 \alpha - 2 \tau] - 2 M \theta \cos [2 \tau] + M \theta \cos [2 \alpha + 2 \tau] + 2 \sqrt{2} \sqrt{M \theta^2 (6 + 2 \cos [2 \alpha] + \\
& \quad \cos [2 \alpha - 2 \tau] - 2 \cos [2 \tau] + \cos [2 \alpha + 2 \tau]) \sin [\alpha]^2 \sin [\tau]^2} \Bigg) \Bigg) \right) \\
& \left(4 M \theta + M \theta \cos [2 \alpha - 2 \tau] - 2 M \theta \cos [2 \tau] + M \theta \cos [2 \alpha + 2 \tau] - 2 M \theta \cos [\alpha - \tau]^2 \right. \\
& \quad \sec [\alpha]^2 - 2 M \theta \cos [2 \alpha] \cos [\alpha - \tau]^2 \sec [\alpha]^2 - \\
& \quad 2 M \theta \sec [\alpha]^2 \sin [\tau]^2 - 2 M \theta \cos [2 \alpha] \sec [\alpha]^2 \sin [\tau]^2 + 2 \sqrt{2} \\
& \quad \left. \sqrt{M \theta^2 (6 + 2 \cos [2 \alpha] + \cos [2 \alpha - 2 \tau] - 2 \cos [2 \tau] + \cos [2 \alpha + 2 \tau]) \sin [\alpha]^2 \sin [\tau]^2} \right. \\
& \quad \left. \right) \Bigg/ (8 \\
& \quad \sqrt{M \theta^2 (6 + 2 \cos [2 \alpha] + \cos [2 \alpha - 2 \tau] - 2 \cos [2 \tau] + \cos [2 \alpha + 2 \tau]) \sin [\alpha]^2 \sin [\tau]^2} \Bigg) + \\
& \left(\sqrt{\left(\frac{1}{1 + \cos [2 \alpha]} \right) (-2 + 4 M \theta - 2 \cos [2 \alpha] + M \theta \cos [2 \alpha - 2 \tau] - 2 M \theta \cos [2 \tau] + \right. \\
& \quad M \theta \cos [2 \alpha + 2 \tau] - 2 \sqrt{2} \sqrt{M \theta^2 (6 + 2 \cos [2 \alpha] + \cos [2 \alpha - 2 \tau] - \\
& \quad 2 \cos [2 \tau] + \cos [2 \alpha + 2 \tau]) \sin [\alpha]^2 \sin [\tau]^2} \Bigg) \Bigg) \\
& \left(-4 M \theta - M \theta \cos [2 \alpha - 2 \tau] + 2 M \theta \cos [2 \tau] - M \theta \cos [2 \alpha + 2 \tau] + 2 M \theta \right. \\
& \quad \cos [\alpha - \tau]^2 \sec [\alpha]^2 + 2 M \theta \cos [2 \alpha] \cos [\alpha - \tau]^2 \sec [\alpha]^2 + \\
& \quad 2 M \theta \sec [\alpha]^2 \sin [\tau]^2 + 2 M \theta \cos [2 \alpha] \sec [\alpha]^2 \sin [\tau]^2 + 2 \sqrt{2} \\
& \quad \left. \sqrt{M \theta^2 (6 + 2 \cos [2 \alpha] + \cos [2 \alpha - 2 \tau] - 2 \cos [2 \tau] + \cos [2 \alpha + 2 \tau]) \sin [\alpha]^2 \sin [\tau]^2} \right. \\
& \quad \left. \right) \Bigg/ (8 \\
& \quad \sqrt{M \theta^2 (6 + 2 \cos [2 \alpha] + \cos [2 \alpha - 2 \tau] - 2 \cos [2 \tau] + \cos [2 \alpha + 2 \tau]) \sin [\alpha]^2 \sin [\tau]^2} \Bigg) \Bigg) - \\
& i \sec [\alpha] \sin [\tau] \left(\left(i \cos [\alpha] \cot [\alpha] \csc [\tau]^2 \sqrt{\left(\frac{1}{1 + \cos [2 \alpha]} \right) (-2 + 4 M \theta - 2 \cos [2 \alpha] + \right.} \right. \right.
\end{aligned}$$

$$\begin{aligned}
& \left(M0 \cos[2\alpha - 2\tau] - 2M0 \cos[2\tau] + M0 \cos[2\alpha + 2\tau] - 2\sqrt{2} \sqrt{M0^2 (6 + 2\cos[2\alpha] + \cos[2\alpha - 2\tau] - 2\cos[2\tau] + \cos[2\alpha + 2\tau]) \sin[\alpha]^2 \sin[\tau]^2} \right) \\
& \left(4M0 + M0 \cos[2\alpha - 2\tau] - 2M0 \cos[2\tau] + M0 \cos[2\alpha + 2\tau] - 2M0 \cos[\alpha - \tau]^2 \right. \\
& \quad \sec[\alpha]^2 - 2M0 \cos[2\alpha] \cos[\alpha - \tau]^2 \sec[\alpha]^2 - \\
& \quad 2M0 \sec[\alpha]^2 \sin[\tau]^2 - 2M0 \cos[2\alpha] \sec[\alpha]^2 \sin[\tau]^2 + 2\sqrt{2} \\
& \quad \left. \sqrt{M0^2 (6 + 2\cos[2\alpha] + \cos[2\alpha - 2\tau] - 2\cos[2\tau] + \cos[2\alpha + 2\tau]) \sin[\alpha]^2 \sin[\tau]^2} \right. \\
& \quad \left. \left(-4M0 - M0 \cos[2\alpha - 2\tau] + 2M0 \cos[2\tau] - \right. \right. \\
& \quad M0 \cos[2\alpha + 2\tau] + 2M0 \cos[\alpha - \tau]^2 \sec[\alpha]^2 + 2M0 \cos[2\alpha] \cos[\alpha - \tau]^2 \sec[\alpha]^2 + \\
& \quad 2M0 \sec[\alpha]^2 \sin[\tau]^2 + 2M0 \cos[2\alpha] \sec[\alpha]^2 \sin[\tau]^2 + 2\sqrt{2} \\
& \quad \left. \left. \sqrt{M0^2 (6 + 2\cos[2\alpha] + \cos[2\alpha - 2\tau] - 2\cos[2\tau] + \cos[2\alpha + 2\tau]) \sin[\alpha]^2 \sin[\tau]^2} \right) \right) / (32M0 (1 + \cos[2\alpha])) \\
& \sqrt{M0^2 (6 + 2\cos[2\alpha] + \cos[2\alpha - 2\tau] - 2\cos[2\tau] + \cos[2\alpha + 2\tau]) \sin[\alpha]^2 \sin[\tau]^2} - \\
& \left(i \cos[\alpha] \cot[\alpha] \csc[\tau]^2 \sqrt{\left(\frac{1}{1 + \cos[2\alpha]} (-2 + 4M0 - 2\cos[2\alpha] + M0 \cos[2\alpha - 2\tau] - \right. \right. \\
& \quad 2M0 \cos[2\tau] + M0 \cos[2\alpha + 2\tau] + 2\sqrt{2} \sqrt{M0^2 (6 + 2\cos[2\alpha] + \cos[2\alpha - 2\tau] - 2\cos[2\tau] + \cos[2\alpha + 2\tau]) \sin[\alpha]^2 \sin[\tau]^2} \right) \right) \\
& \left(4M0 + M0 \cos[2\alpha - 2\tau] - 2M0 \cos[2\tau] + M0 \cos[2\alpha + 2\tau] - 2M0 \cos[\alpha - \tau]^2 \right. \\
& \quad \sec[\alpha]^2 - 2M0 \cos[2\alpha] \cos[\alpha - \tau]^2 \sec[\alpha]^2 - \\
& \quad 2M0 \sec[\alpha]^2 \sin[\tau]^2 - 2M0 \cos[2\alpha] \sec[\alpha]^2 \sin[\tau]^2 + 2\sqrt{2} \\
& \quad \left. \sqrt{M0^2 (6 + 2\cos[2\alpha] + \cos[2\alpha - 2\tau] - 2\cos[2\tau] + \cos[2\alpha + 2\tau]) \sin[\alpha]^2 \sin[\tau]^2} \right. \\
& \quad \left. \left(-4M0 - M0 \cos[2\alpha - 2\tau] + 2M0 \cos[2\tau] - \right. \right. \\
& \quad M0 \cos[2\alpha + 2\tau] + 2M0 \cos[\alpha - \tau]^2 \sec[\alpha]^2 + 2M0 \cos[2\alpha] \cos[\alpha - \tau]^2 \sec[\alpha]^2 + \\
& \quad 2M0 \sec[\alpha]^2 \sin[\tau]^2 + 2M0 \cos[2\alpha] \sec[\alpha]^2 \sin[\tau]^2 + 2\sqrt{2} \\
& \quad \left. \left. \sqrt{M0^2 (6 + 2\cos[2\alpha] + \cos[2\alpha - 2\tau] - 2\cos[2\tau] + \cos[2\alpha + 2\tau]) \sin[\alpha]^2 \sin[\tau]^2} \right) \right) / (32M0 (1 + \cos[2\alpha])) \\
& \sqrt{M0^2 (6 + 2\cos[2\alpha] + \cos[2\alpha - 2\tau] - 2\cos[2\tau] + \cos[2\alpha + 2\tau]) \sin[\alpha]^2 \sin[\tau]^2} \Big) \Big)
\end{aligned}$$

In[42]:= ZetaPart2[M0_, α_, τ_, ρ_] :=

$$\begin{aligned}
& \cos\left[\frac{\rho}{2}\right] \left(-i \sec[\alpha] \sin[\tau] \left(\left(\sqrt{\left(\frac{1}{1 + \cos[2\alpha]} (-2 + 4M0 - 2\cos[2\alpha] + M0 \cos[2\alpha - 2\tau] - \right. \right. \right. \right. \right. \\
& \quad 2M0 \cos[2\tau] + M0 \cos[2\alpha + 2\tau] - 2\sqrt{2} \sqrt{M0^2 (6 + 2\cos[2\alpha] + \cos[2\alpha - 2\tau] - 2\cos[2\tau] + \cos[2\alpha + 2\tau]) \sin[\alpha]^2 \sin[\tau]^2} \right) \right) \left(4M0 + M0 \cos[2\alpha - 2\tau] - \right. \\
& \quad 2M0 \cos[2\tau] + M0 \cos[2\alpha + 2\tau] - 2M0 \cos[\alpha - \tau]^2 \sec[\alpha]^2 - 2M0 \cos[2\alpha] \\
& \quad \left. \left. \cos[\alpha - \tau]^2 \sec[\alpha]^2 - 2M0 \sec[\alpha]^2 \sin[\tau]^2 - 2M0 \cos[2\alpha] \sec[\alpha]^2 \sin[\tau]^2 + 2\sqrt{2} \right. \right. \\
& \quad \left. \left. \sqrt{M0^2 (6 + 2\cos[2\alpha] + \cos[2\alpha - 2\tau] - 2\cos[2\tau] + \cos[2\alpha + 2\tau]) \sin[\alpha]^2 \sin[\tau]^2} \right) \right) / (32M0 (1 + \cos[2\alpha])) \\
& \sqrt{M0^2 (6 + 2\cos[2\alpha] + \cos[2\alpha - 2\tau] - 2\cos[2\tau] + \cos[2\alpha + 2\tau]) \sin[\alpha]^2 \sin[\tau]^2} \Big) \Big)
\end{aligned}$$

$$\begin{aligned}
& \left. \sqrt{M\theta^2 (6 + 2 \cos[2\alpha] + \cos[2\alpha - 2\tau] - 2 \cos[2\tau] + \cos[2\alpha + 2\tau]) \sin[\alpha]^2 \sin[\tau]^2} \right) \Bigg) \Bigg/ \left(8 \right. \\
& \left. \sqrt{M\theta^2 (6 + 2 \cos[2\alpha] + \cos[2\alpha - 2\tau] - 2 \cos[2\tau] + \cos[2\alpha + 2\tau]) \sin[\alpha]^2 \sin[\tau]^2} \right) + \\
& \left(\sqrt{\left(\frac{1}{1 + \cos[2\alpha]} \left(-2 + 4 M\theta - 2 \cos[2\alpha] + M\theta \cos[2\alpha - 2\tau] - 2 M\theta \cos[2\tau] + \right. \right. \right. \\
& \quad \left. \left. M\theta \cos[2\alpha + 2\tau] + 2 \sqrt{2} \sqrt{M\theta^2 (6 + 2 \cos[2\alpha] + \cos[2\alpha - 2\tau] - 2 \cos[2\tau] + \cos[2\alpha + 2\tau]) \sin[\alpha]^2 \sin[\tau]^2} \right) \right) \right. \\
& \quad \left. \left(-4 M\theta - M\theta \cos[2\alpha - 2\tau] + 2 M\theta \cos[2\tau] - M\theta \cos[2\alpha + 2\tau] + 2 M\theta \right. \right. \\
& \quad \left. \cos[\alpha - \tau]^2 \sec[\alpha]^2 + 2 M\theta \cos[2\alpha] \cos[\alpha - \tau]^2 \sec[\alpha]^2 + \right. \\
& \quad \left. 2 M\theta \sec[\alpha]^2 \sin[\tau]^2 + 2 M\theta \cos[2\alpha] \sec[\alpha]^2 \sin[\tau]^2 + 2 \sqrt{2} \right. \\
& \quad \left. \sqrt{M\theta^2 (6 + 2 \cos[2\alpha] + \cos[2\alpha - 2\tau] - 2 \cos[2\tau] + \cos[2\alpha + 2\tau]) \sin[\alpha]^2 \sin[\tau]^2} \right) \right) \Bigg) \Bigg/ \left(8 \right. \\
& \left. \sqrt{M\theta^2 (6 + 2 \cos[2\alpha] + \cos[2\alpha - 2\tau] - 2 \cos[2\tau] + \cos[2\alpha + 2\tau]) \sin[\alpha]^2 \sin[\tau]^2} \right) \Bigg) + \\
& \cos[\alpha - \tau] \sec[\alpha] \left(- \left(\left(i M\theta (1 + \cos[2\alpha]) \sec[\alpha] \sin[\tau]^2 \sqrt{\left(\frac{1}{1 + \cos[2\alpha]} \left(-2 + 4 M\theta - 2 \cos[2\alpha] + M\theta \cos[2\alpha - 2\tau] - 2 M\theta \cos[2\tau] + \right. \right. \right. \right. \right. \right. \right. \\
& \quad \left. \left. M\theta \cos[2\alpha + 2\tau] - 2 \sqrt{2} \sqrt{M\theta^2 (6 + 2 \cos[2\alpha] + \cos[2\alpha - 2\tau] - 2 \cos[2\tau] + \cos[2\alpha + 2\tau]) \sin[\alpha]^2 \sin[\tau]^2} \right) \right) \right) \tan[\alpha] \right) \Bigg) \Bigg/ \left(2 \right. \\
& \left. \sqrt{M\theta^2 (6 + 2 \cos[2\alpha] + \cos[2\alpha - 2\tau] - 2 \cos[2\tau] + \cos[2\alpha + 2\tau]) \sin[\alpha]^2 \sin[\tau]^2} \right) \\
& \left. \right) + \left(i M\theta (1 + \cos[2\alpha]) \sec[\alpha] \sin[\tau]^2 \right. \\
& \left. \sqrt{\left(\frac{1}{1 + \cos[2\alpha]} \left(-2 + 4 M\theta - 2 \cos[2\alpha] + M\theta \cos[2\alpha - 2\tau] - 2 M\theta \cos[2\tau] + \right. \right. \right. \right. \\
& \quad \left. \left. M\theta \cos[2\alpha + 2\tau] + 2 \sqrt{2} \sqrt{M\theta^2 (6 + 2 \cos[2\alpha] + \cos[2\alpha - 2\tau] - 2 \cos[2\tau] + \cos[2\alpha + 2\tau]) \sin[\alpha]^2 \sin[\tau]^2} \right) \right) \right) \tan[\alpha] \Bigg) \Bigg/ \left(2 \right. \\
& \left. \sqrt{M\theta^2 (6 + 2 \cos[2\alpha] + \cos[2\alpha - 2\tau] - 2 \cos[2\tau] + \cos[2\alpha + 2\tau]) \sin[\alpha]^2 \sin[\tau]^2} \right) \Bigg) \Bigg) \\
& + i \sin\left[\frac{\rho}{2}\right] \left(\cos[\alpha + \tau] \sec[\alpha] \left(\left(\sqrt{\left(\frac{1}{1 + \cos[2\alpha]} \left(-2 + 4 M\theta - 2 \cos[2\alpha] + M\theta \cos[2\alpha - 2\tau] - 2 M\theta \cos[2\tau] + \right. \right. \right. \right. \right. \right. \right. \\
& \quad \left. \left. \cos[2\alpha - 2\tau] - 2 M\theta \cos[2\tau] + M\theta \cos[2\alpha + 2\tau] - 2 \sqrt{2} \sqrt{M\theta^2 (6 + 2 \cos[2\alpha] + \cos[2\alpha - 2\tau] - 2 \cos[2\tau] + \cos[2\alpha + 2\tau]) \sin[\alpha]^2 \sin[\tau]^2} \right) \right) \right) \right. \\
& \quad \left. \cos[2\alpha - 2\tau] - 2 \cos[2\tau] + \cos[2\alpha + 2\tau]) \sin[\alpha]^2 \sin[\tau]^2 \right) \Bigg) \Bigg) \\
& \left(4 M\theta + M\theta \cos[2\alpha - 2\tau] - 2 M\theta \cos[2\tau] + M\theta \cos[2\alpha + 2\tau] - 2 M\theta \cos[\alpha - \tau]^2 \right.
\end{aligned}$$

$$\begin{aligned}
& \frac{\sec[\alpha]^2 - 2 M0 \cos[2\alpha] \cos[\alpha - \tau]^2 \sec[\alpha]^2 - 2 M0 \sec[\alpha]^2 \sin[\tau]^2 - 2 M0 \cos[2\alpha] \sec[\alpha]^2 \sin[\tau]^2 + 2 \sqrt{2}}{\sqrt{M0^2 (6 + 2 \cos[2\alpha] + \cos[2\alpha - 2\tau] - 2 \cos[2\tau] + \cos[2\alpha + 2\tau]) \sin[\alpha]^2 \sin[\tau]^2}} \\
& \left. \right) \left/ \left(8 \right. \right. \\
& \left. \sqrt{M0^2 (6 + 2 \cos[2\alpha] + \cos[2\alpha - 2\tau] - 2 \cos[2\tau] + \cos[2\alpha + 2\tau]) \sin[\alpha]^2 \sin[\tau]^2} \right) + \\
& \left(\sqrt{\left(\frac{1}{1 + \cos[2\alpha]} \left(-2 + 4 M0 - 2 \cos[2\alpha] + M0 \cos[2\alpha - 2\tau] - 2 M0 \cos[2\tau] + \right. \right. \right. \\
& \left. \left. \left. M0 \cos[2\alpha + 2\tau] + 2 \sqrt{2} \sqrt{M0^2 (6 + 2 \cos[2\alpha] + \cos[2\alpha - 2\tau] - 2 \cos[2\tau] + \cos[2\alpha + 2\tau]) \sin[\alpha]^2 \sin[\tau]^2} \right) \right) \right) \\
& \left(-4 M0 - M0 \cos[2\alpha - 2\tau] + 2 M0 \cos[2\tau] - M0 \cos[2\alpha + 2\tau] + 2 M0 \right. \\
& \left. \cos[\alpha - \tau]^2 \sec[\alpha]^2 + 2 M0 \cos[2\alpha] \cos[\alpha - \tau]^2 \sec[\alpha]^2 + 2 M0 \sec[\alpha]^2 \sin[\tau]^2 + 2 M0 \cos[2\alpha] \sec[\alpha]^2 \sin[\tau]^2 + 2 \sqrt{2} \right. \\
& \left. \sqrt{M0^2 (6 + 2 \cos[2\alpha] + \cos[2\alpha - 2\tau] - 2 \cos[2\tau] + \cos[2\alpha + 2\tau]) \sin[\alpha]^2 \sin[\tau]^2} \right) \left. \right) \left/ \left(8 \right. \right. \\
& \left. \sqrt{M0^2 (6 + 2 \cos[2\alpha] + \cos[2\alpha - 2\tau] - 2 \cos[2\tau] + \cos[2\alpha + 2\tau]) \sin[\alpha]^2 \sin[\tau]^2} \right) \left. \right) - \\
& i \sec[\alpha] \sin[\tau] \left(- \left(\left(i M0 (1 + \cos[2\alpha]) \sec[\alpha] \sin[\tau]^2 \sqrt{\left(\frac{1}{1 + \cos[2\alpha]} \left(-2 + 4 M0 - 2 \cos[2\alpha] + M0 \cos[2\alpha - 2\tau] - 2 M0 \cos[2\tau] + \right. \right. \right. \right. \right. \right. \\
& \left. \left. \left. M0 \cos[2\alpha + 2\tau] - 2 \sqrt{2} \sqrt{M0^2 (6 + 2 \cos[2\alpha] + \cos[2\alpha - 2\tau] - 2 \cos[2\tau] + \cos[2\alpha + 2\tau]) \sin[\alpha]^2 \sin[\tau]^2} \right) \right) \tan[\alpha] \right) \left/ \left(2 \right. \right. \\
& \left. \sqrt{M0^2 (6 + 2 \cos[2\alpha] + \cos[2\alpha - 2\tau] - 2 \cos[2\tau] + \cos[2\alpha + 2\tau]) \sin[\alpha]^2 \sin[\tau]^2} \right) \\
& \left. \right) + \left(i M0 (1 + \cos[2\alpha]) \sec[\alpha] \sin[\tau]^2 \right. \\
& \left. \sqrt{\left(\frac{1}{1 + \cos[2\alpha]} \left(-2 + 4 M0 - 2 \cos[2\alpha] + M0 \cos[2\alpha - 2\tau] - 2 M0 \cos[2\tau] + \right. \right. \right. \\
& \left. \left. \left. M0 \cos[2\alpha + 2\tau] + 2 \sqrt{2} \sqrt{M0^2 (6 + 2 \cos[2\alpha] + \cos[2\alpha - 2\tau] - 2 \cos[2\tau] + \cos[2\alpha + 2\tau]) \sin[\alpha]^2 \sin[\tau]^2} \right) \right) \tan[\alpha] \right) \left/ \right. \\
& \left. \left(2 \sqrt{M0^2 (6 + 2 \cos[2\alpha] + \cos[2\alpha - 2\tau] - 2 \cos[2\tau] + \cos[2\alpha + 2\tau]) \sin[\alpha]^2 \sin[\tau]^2} \right) \right) \left. \right) \left. \right)
\end{aligned}$$

In[43]:= ZetaPart1[N0, α, π/2, ρ]

Out[43]= $\cos\left[\frac{\rho}{2}\right]$

$$\begin{aligned}
& \left(\tan[\alpha] \left(\frac{1}{16\sqrt{2}\sqrt{N0^2\sin[\alpha]^2}} \sqrt{\frac{-2+6N0-2\cos[2\alpha]-2N0\cos[2\alpha]+8\sqrt{N0^2\sin[\alpha]^2}}{1+\cos[2\alpha]}} \left(6N0 - \right. \right. \right. \\
& \quad \left. \left. \left. 2N0\cos[2\alpha] - 2N0\sec[\alpha]^2 - 2N0\cos[2\alpha]\sec[\alpha]^2 + 8\sqrt{N0^2\sin[\alpha]^2} - 2N0\tan[\alpha]^2 - \right. \right. \right. \\
& \quad \left. \left. \left. 2N0\cos[2\alpha]\tan[\alpha]^2 \right) + \frac{1}{16\sqrt{2}\sqrt{N0^2\sin[\alpha]^2}} \right. \right. \\
& \quad \left. \sqrt{\frac{-2+6N0-2\cos[2\alpha]-2N0\cos[2\alpha]-8\sqrt{N0^2\sin[\alpha]^2}}{1+\cos[2\alpha]}} \right. \\
& \quad \left. \left(-6N0 + 2N0\cos[2\alpha] + 2N0\sec[\alpha]^2 + 2N0\cos[2\alpha]\sec[\alpha]^2 + \right. \right. \\
& \quad \left. \left. 8\sqrt{N0^2\sin[\alpha]^2} + 2N0\tan[\alpha]^2 + 2N0\cos[2\alpha]\tan[\alpha]^2 \right) \right) - \\
& \quad i \sec[\alpha] \left(\left(i \cos[\alpha] \cot[\alpha] \sqrt{\frac{-2+6N0-2\cos[2\alpha]-2N0\cos[2\alpha]-8\sqrt{N0^2\sin[\alpha]^2}}{1+\cos[2\alpha]}} \right. \right. \\
& \quad \left(6N0 - 2N0\cos[2\alpha] - 2N0\sec[\alpha]^2 - 2N0\cos[2\alpha]\sec[\alpha]^2 + \right. \\
& \quad \left. 8\sqrt{N0^2\sin[\alpha]^2} - 2N0\tan[\alpha]^2 - 2N0\cos[2\alpha]\tan[\alpha]^2 \right) \\
& \quad \left(-6N0 + 2N0\cos[2\alpha] + 2N0\sec[\alpha]^2 + 2N0\cos[2\alpha]\sec[\alpha]^2 + 8\sqrt{N0^2\sin[\alpha]^2} + \right. \\
& \quad \left. 2N0\tan[\alpha]^2 + 2N0\cos[2\alpha]\tan[\alpha]^2 \right) \Bigg) / \left(64\sqrt{2}N0(1+\cos[2\alpha])\sqrt{N0^2\sin[\alpha]^2} \right) - \\
& \quad \left(i \cos[\alpha] \cot[\alpha] \sqrt{\frac{-2+6N0-2\cos[2\alpha]-2N0\cos[2\alpha]+8\sqrt{N0^2\sin[\alpha]^2}}{1+\cos[2\alpha]}} \right. \\
& \quad \left(6N0 - 2N0\cos[2\alpha] - 2N0\sec[\alpha]^2 - 2N0\cos[2\alpha]\sec[\alpha]^2 + 8\sqrt{N0^2\sin[\alpha]^2} - \right. \\
& \quad \left. 2N0\tan[\alpha]^2 - 2N0\cos[2\alpha]\tan[\alpha]^2 \right) \left(-6N0 + 2N0\cos[2\alpha] + 2N0\sec[\alpha]^2 + \right. \\
& \quad \left. 2N0\cos[2\alpha]\sec[\alpha]^2 + 8\sqrt{N0^2\sin[\alpha]^2} + 2N0\tan[\alpha]^2 + 2N0\cos[2\alpha]\tan[\alpha]^2 \right) \Bigg) /
\end{aligned}$$

$$\begin{aligned}
& \left(64 \sqrt{2} N0 (1 + \cos[2\alpha]) \sqrt{N0^2 \sin[\alpha]^2} \right) \Bigg) + i \sin\left[\frac{\rho}{2}\right] \\
& \left(-i \sec[\alpha] \left(\frac{1}{16 \sqrt{2} \sqrt{N0^2 \sin[\alpha]^2}} \sqrt{\frac{-2 + 6 N0 - 2 \cos[2\alpha] - 2 N0 \cos[2\alpha] + 8 \sqrt{N0^2 \sin[\alpha]^2}}{1 + \cos[2\alpha]}} \right. \right. \\
& \quad \left(6 N0 - 2 N0 \cos[2\alpha] - 2 N0 \sec[\alpha]^2 - 2 N0 \cos[2\alpha] \sec[\alpha]^2 + \right. \\
& \quad \left. 8 \sqrt{N0^2 \sin[\alpha]^2} - 2 N0 \tan[\alpha]^2 - 2 N0 \cos[2\alpha] \tan[\alpha]^2 \right) + \\
& \quad \left. \frac{1}{16 \sqrt{2} \sqrt{N0^2 \sin[\alpha]^2}} \sqrt{\frac{-2 + 6 N0 - 2 \cos[2\alpha] - 2 N0 \cos[2\alpha] - 8 \sqrt{N0^2 \sin[\alpha]^2}}{1 + \cos[2\alpha]}} \right. \\
& \quad \left(-6 N0 + 2 N0 \cos[2\alpha] + 2 N0 \sec[\alpha]^2 + 2 N0 \cos[2\alpha] \sec[\alpha]^2 + \right. \\
& \quad \left. 8 \sqrt{N0^2 \sin[\alpha]^2} + 2 N0 \tan[\alpha]^2 + 2 N0 \cos[2\alpha] \tan[\alpha]^2 \right) \Bigg) - \\
& \tan[\alpha] \left(\left(i \cos[\alpha] \cot[\alpha] \sqrt{\frac{-2 + 6 N0 - 2 \cos[2\alpha] - 2 N0 \cos[2\alpha] - 8 \sqrt{N0^2 \sin[\alpha]^2}}{1 + \cos[2\alpha]}} \right. \right. \\
& \quad \left(6 N0 - 2 N0 \cos[2\alpha] - 2 N0 \sec[\alpha]^2 - 2 N0 \cos[2\alpha] \sec[\alpha]^2 + \right. \\
& \quad \left. 8 \sqrt{N0^2 \sin[\alpha]^2} - 2 N0 \tan[\alpha]^2 - 2 N0 \cos[2\alpha] \tan[\alpha]^2 \right) \\
& \quad \left(-6 N0 + 2 N0 \cos[2\alpha] + 2 N0 \sec[\alpha]^2 + 2 N0 \cos[2\alpha] \sec[\alpha]^2 + 8 \sqrt{N0^2 \sin[\alpha]^2} + \right. \\
& \quad \left. 2 N0 \tan[\alpha]^2 + 2 N0 \cos[2\alpha] \tan[\alpha]^2 \right) \Bigg) / \left(64 \sqrt{2} N0 (1 + \cos[2\alpha]) \sqrt{N0^2 \sin[\alpha]^2} \right) - \\
& \left(i \cos[\alpha] \cot[\alpha] \sqrt{\frac{-2 + 6 N0 - 2 \cos[2\alpha] - 2 N0 \cos[2\alpha] + 8 \sqrt{N0^2 \sin[\alpha]^2}}{1 + \cos[2\alpha]}} \right. \\
& \quad \left(6 N0 - 2 N0 \cos[2\alpha] - 2 N0 \sec[\alpha]^2 - 2 N0 \cos[2\alpha] \sec[\alpha]^2 + \right. \\
& \quad \left. 8 \sqrt{N0^2 \sin[\alpha]^2} - 2 N0 \tan[\alpha]^2 - 2 N0 \cos[2\alpha] \tan[\alpha]^2 \right)
\end{aligned}$$

$$\left(\frac{-6 N0 + 2 N0 \cos[2\alpha] + 2 N0 \sec[\alpha]^2 + 2 N0 \cos[2\alpha] \sec[\alpha]^2 + 8 \sqrt{N0^2 \sin[\alpha]^2} + 2 N0 \tan[\alpha]^2 + 2 N0 \cos[2\alpha] \tan[\alpha]^2}{64 \sqrt{2} N0 (1 + \cos[2\alpha]) \sqrt{N0^2 \sin[\alpha]^2}} \right)$$

In[44]:= **Constraint1**[α _, τ _] :=

$$\frac{1 + \cos[2\alpha]}{2 - \cos[2\tau] + \cos[2\alpha] \cos[2\tau] + 2 \sin[\alpha] \sqrt{3 + \cos[2\alpha] - 2 \cos[2\tau] \sin[\alpha]^2} \sin[\tau]}$$

Constraint2[α _, τ _] :=

$$\frac{1 + \cos[2\alpha]}{2 - \cos[2\tau] + \cos[2\alpha] \cos[2\tau] - 2 \sin[\alpha] \sqrt{3 + \cos[2\alpha] - 2 \cos[2\tau] \sin[\alpha]^2} \sin[\tau]}$$

$$\text{Constraint3}[\alpha_-, \tau_-] := \frac{2 \cos[\alpha]^2 \sin[\alpha] \sqrt{3 + \cos[2\alpha] - 2 \cos[2\tau] \sin[\alpha]^2} \sin[\tau]}{1 - \cos[2\tau] \sin[\alpha]^2 - \sin[\alpha] \sqrt{3 + \cos[2\alpha] - 2 \cos[2\tau] \sin[\alpha]^2} \sin[\tau]}$$

In[47]:= **DecisiveProbabilityPrime**[α _, ρ _] := $\frac{3 - \cos[2\alpha] + 4 \sin[\alpha] \sin[\rho]}{3 - \cos[2\alpha] + 4 \sin[\alpha]}$

In[50]:= **N0** = **Constraint1**[α , $\pi/2$]
 $\tau = \pi/2$

Out[50]= $\frac{1 + \cos[2\alpha]}{3 - \cos[2\alpha] + 2 \sin[\alpha] \sqrt{3 + \cos[2\alpha] + 2 \sin[\alpha]^2}}$

Out[51]= $\frac{\pi}{2}$

In[52]:= **FullSimplify**[**ZetaF**, $-\pi/2 < \alpha < 0$]

Out[52]= $\left\{ \left\{ \sqrt{2} \sqrt{\frac{1}{-4 + (-3 + \cos[2\alpha]) \csc[\alpha]}}, i \sqrt{2} \sqrt{\frac{1}{-4 + (-3 + \cos[2\alpha]) \csc[\alpha]}} \right\}, \right.$
 $\left. \left\{ -i \sqrt{2} \sqrt{\frac{1}{-4 + (-3 + \cos[2\alpha]) \csc[\alpha]}}, \sqrt{2} \sqrt{\frac{1}{-4 + (-3 + \cos[2\alpha]) \csc[\alpha]}} \right\} \right\}$

In[53]:= **FullSimplify** $\left[\sqrt{\frac{-\sin[\alpha]}{2(1 + 2 \sin[\alpha] + \sin[\alpha]^2)}} - \sqrt{\frac{1}{-4 + (-3 + \cos[2\alpha]) \csc[\alpha]}} \right]$

Out[53]= 0

In[54]:= **ZetaF** = $\frac{\sqrt{-\sin[\alpha]}}{(1 + \sin[\alpha])} * \{\{1, i\}, \{-i, 1\}\}$

Out[54]= $\left\{ \left\{ \frac{\sqrt{-\sin[\alpha]}}{1 + \sin[\alpha]}, \frac{i \sqrt{-\sin[\alpha]}}{1 + \sin[\alpha]} \right\}, \left\{ -\frac{i \sqrt{-\sin[\alpha]}}{1 + \sin[\alpha]}, \frac{\sqrt{-\sin[\alpha]}}{1 + \sin[\alpha]} \right\} \right\}$

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In[55]:= FullSimplify[ ( (Evolution.Transpose[vectorRef]) [[1]] [[1]] ^2 +
    FullSimplify[I * (Evolution.Transpose[vectorRef]) [[2]] [[1]] ] ^2) /
    ( (Evolution.Transpose[vectorRef]) [[1]] [[1]] ^2 +
    FullSimplify[I * (Evolution.Transpose[vectorRef]) [[2]] [[1]] ] ^2 +
    FullSimplify[ (ZetaF.Evolution.Transpose[vectorRef]) [[1]] [[1]] ] ^2 +
    FullSimplify[I * (ZetaF.Evolution.Transpose[vectorRef]) [[2]] [[1]] ] ^2) ]

Out[55]= 
$$\frac{-3 + \cos[2\alpha] - 4 \sin[\alpha] \sin[\rho]}{-3 + \cos[2\alpha] + 4 \sin[\alpha]}$$


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