%% comments：

%{

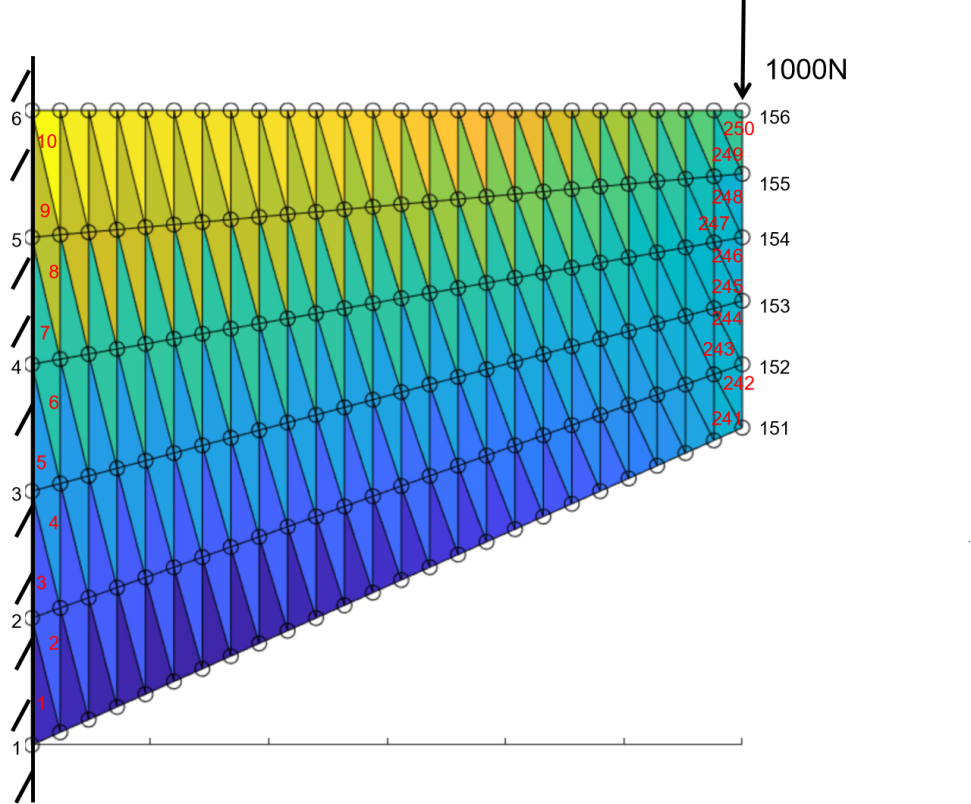
姓名：何景林 学号：S230200192

purpose：

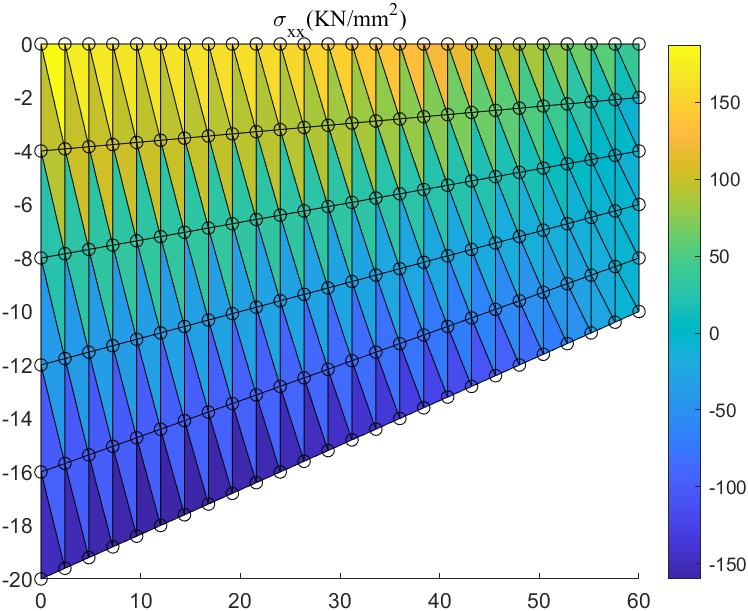
考虑一个悬臂梯形梁的平面应力问题，假设梯形下底a=20mm，上底b=10mm,梯形高h=60mm，厚度t=5mm，弹性模量为200000MPa，泊松比为0.3，

用有限元法(平面三角形单元)划分250个单元、156个节点，节点156处施加集中荷载P为1000N，梯形的下底，即编号为1、2、3、4、5、6的三个节点为固定端,求出节点位移，各单元应力和应变。

编号：



**计算结果:**

****

节点位移

Node disp\_x disp\_y

1, 0.00000e+00, 0.00000e+00

2, 0.00000e+00, 0.00000e+00

3, 0.00000e+00, 0.00000e+00

4, 0.00000e+00, 0.00000e+00

5, 0.00000e+00, 0.00000e+00

6, 0.00000e+00, 0.00000e+00

7, -1.62813e-03, -1.12428e-03

8, -1.09498e-03, -5.98493e-04

9, -4.40198e-04, -3.27578e-04

10, 2.79591e-04, -2.60410e-04

11, 1.06635e-03, -4.20717e-04

12, 2.15888e-03, -1.04885e-03

13, -3.33314e-03, -2.26390e-03

14, -2.19331e-03, -1.60942e-03

15, -8.39384e-04, -1.24362e-03

16, 6.43247e-04, -1.17713e-03

17, 2.28129e-03, -1.47072e-03

18, 4.19633e-03, -2.20397e-03

19, -5.03856e-03, -3.75505e-03

20, -3.24291e-03, -3.08141e-03

21, -1.17204e-03, -2.70699e-03

22, 1.08271e-03, -2.66951e-03

23, 3.52568e-03, -3.01362e-03

24, 6.19114e-03, -3.75344e-03

25, -6.70612e-03, -5.71490e-03

26, -4.22134e-03, -5.05613e-03

27, -1.43135e-03, -4.70380e-03

28, 1.57549e-03, -4.69284e-03

29, 4.77820e-03, -5.05048e-03

30, 8.16539e-03, -5.77662e-03

31, -8.30858e-03, -8.19168e-03

32, -5.12022e-03, -7.55705e-03

33, -1.62062e-03, -7.23161e-03

34, 2.11031e-03, -7.23923e-03

35, 6.03631e-03, -7.59665e-03

36, 1.01251e-02, -8.30439e-03

37, -9.82672e-03, -1.12065e-02

38, -5.93678e-03, -1.05969e-02

39, -1.74414e-03, -1.02950e-02

40, 2.68221e-03, -1.03145e-02

41, 7.30039e-03, -1.06664e-02

42, 1.20707e-02, -1.13542e-02

43, -1.12475e-02, -1.47694e-02

44, -6.66943e-03, -1.41838e-02

45, -1.80474e-03, -1.39011e-02

46, 3.28890e-03, -1.39281e-02

47, 8.57047e-03, -1.42720e-02

48, 1.40006e-02, -1.49389e-02

49, -1.25618e-02, -1.88868e-02

50, -7.31625e-03, -1.83242e-02

51, -1.80361e-03, -1.80578e-02

52, 3.92914e-03, -1.80893e-02

53, 9.84579e-03, -1.84238e-02

54, 1.59116e-02, -1.90688e-02

55, -1.37625e-02, -2.35638e-02

56, -7.87465e-03, -2.30241e-02

57, -1.74078e-03, -2.27722e-02

58, 4.60208e-03, -2.28067e-02

59, 1.11249e-02, -2.31307e-02

60, 1.78000e-02, -2.37528e-02

61, -1.48434e-02, -2.88052e-02

62, -8.34148e-03, -2.82888e-02

63, -1.61550e-03, -2.80508e-02

64, 5.30702e-03, -2.80873e-02

65, 1.24055e-02, -2.84002e-02

66, 1.96610e-02, -2.89981e-02

67, -1.57983e-02, -3.46152e-02

68, -8.71314e-03, -3.41229e-02

69, -1.42657e-03, -3.38989e-02

70, 6.04321e-03, -3.39370e-02

71, 1.36849e-02, -3.42380e-02

72, 2.14894e-02, -3.48106e-02

73, -1.66210e-02, -4.09970e-02

74, -8.98567e-03, -4.05299e-02

75, -1.17254e-03, -4.03203e-02

76, 6.80975e-03, -4.03600e-02

77, 1.49599e-02, -4.06485e-02

78, 2.32791e-02, -4.11943e-02

79, -1.73045e-02, -4.79524e-02

80, -9.15480e-03, -4.75118e-02

81, -8.51860e-04, -4.73173e-02

82, 7.60551e-03, -4.73585e-02

83, 1.62265e-02, -4.76338e-02

84, 2.50233e-02, -4.81515e-02

85, -1.78416e-02, -5.54810e-02

86, -9.21596e-03, -5.50684e-02

87, -4.62957e-04, -5.48897e-02

88, 8.42902e-03, -5.49326e-02

89, 1.74803e-02, -5.51940e-02

90, 2.67143e-02, -5.56819e-02

91, -1.82241e-02, -6.35802e-02

92, -9.16430e-03, -6.31970e-02

93, -4.30786e-06, -6.30351e-02

94, 9.27840e-03, -6.30796e-02

95, 1.87158e-02, -6.33262e-02

96, 2.83434e-02, -6.37828e-02

97, -1.84435e-02, -7.22437e-02

98, -8.99462e-03, -7.18917e-02

99, 5.25496e-04, -7.17474e-02

100, 1.01513e-02, -7.17935e-02

101, 1.99270e-02, -7.20244e-02

102, 2.99005e-02, -7.24478e-02

103, -1.84900e-02, -8.14616e-02

104, -8.70139e-03, -8.11426e-02

105, 1.12765e-03, -8.10168e-02

106, 1.10445e-02, -8.10641e-02

107, 2.11068e-02, -8.12779e-02

108, 3.13744e-02, -8.16660e-02

109, -1.83530e-02, -9.12188e-02

110, -8.27862e-03, -9.09351e-02

111, 1.80295e-03, -9.08287e-02

112, 1.19540e-02, -9.08764e-02

113, 2.22466e-02, -9.10710e-02

114, 3.27526e-02, -9.14214e-02

115, -1.80203e-02, -1.01495e-01

116, -7.71984e-03, -1.01249e-01

117, 2.55145e-03, -1.01162e-01

118, 1.28740e-02, -1.01209e-01

119, 2.33366e-02, -1.01382e-01

120, 3.40212e-02, -1.01691e-01

121, -1.74773e-02, -1.12260e-01

122, -7.01794e-03, -1.12055e-01

123, 3.37191e-03, -1.11990e-01

124, 1.37962e-02, -1.12033e-01

125, 2.43646e-02, -1.12180e-01

126, 3.51667e-02, -1.12445e-01

127, -1.67054e-02, -1.23476e-01

128, -6.16506e-03, -1.23317e-01

129, 4.26093e-03, -1.23274e-01

130, 1.47087e-02, -1.23312e-01

131, 2.53157e-02, -1.23429e-01

132, 3.61781e-02, -1.23646e-01

133, -1.56801e-02, -1.35085e-01

134, -5.15289e-03, -1.34979e-01

135, 5.21251e-03, -1.34963e-01

136, 1.55952e-02, -1.35001e-01

137, 2.61717e-02, -1.35090e-01

138, 3.70526e-02, -1.35259e-01

139, -1.43706e-02, -1.46998e-01

140, -3.97414e-03, -1.46952e-01

141, 6.22062e-03, -1.46981e-01

142, 1.64399e-02, -1.47049e-01

143, 2.69131e-02, -1.47143e-01

144, 3.78054e-02, -1.47283e-01

145, -1.27545e-02, -1.59058e-01

146, -2.62756e-03, -1.59075e-01

147, 7.29289e-03, -1.59194e-01

148, 1.72509e-02, -1.59396e-01

149, 2.75389e-02, -1.59643e-01

150, 3.84899e-02, -1.59889e-01

151, -1.08853e-02, -1.70982e-01

152, -1.12282e-03, -1.71036e-01

153, 8.46832e-03, -1.71302e-01

154, 1.81272e-02, -1.71875e-01

155, 2.81859e-02, -1.72831e-01

156, 3.94399e-02, -1.74352e-01

------------------------------------------------------

单元应力

element sigma\_(xx) sigma\_(yy) tau\_(xy)

1, -1.4910e+02, -4.4729e+01, -3.6035e+01

2, -9.5414e+01, -1.7984e+00, -1.0096e+01

3, -1.0027e+02, -3.0082e+01, -1.9182e+01

4, -3.9426e+01, 1.9945e+00, 1.8180e+00

5, -4.0311e+01, -1.2093e+01, -1.0499e+01

6, 2.4043e+01, 1.0640e+01, 5.6902e+00

7, 2.5604e+01, 7.6811e+00, -8.3465e+00

8, 9.3484e+01, 1.9866e+01, 2.0591e+00

9, 9.7651e+01, 2.9295e+01, -1.3485e+01

10, 1.8713e+02, 2.4093e+01, -1.2178e+01

11, -1.5227e+02, -1.8856e+01, -2.7783e+01

12, -9.8041e+01, 4.6751e+00, -1.1316e+01

13, -1.0092e+02, -1.6453e+01, -2.0261e+01

14, -3.8024e+01, 7.6449e+00, -2.9712e+00

15, -3.9461e+01, -8.4115e+00, -1.5368e+01

16, 2.8786e+01, 1.2099e+01, 2.2929e-01

17, 2.7665e+01, 1.2048e-01, -1.3734e+01

18, 1.0309e+02, 1.5637e+01, -6.4451e-01

19, 9.8651e+01, -2.4524e+00, -1.1804e+01

20, 1.7399e+02, 1.4007e+01, 1.3394e+00

21, -1.5581e+02, -1.2655e+01, -2.7145e+01

22, -9.8299e+01, 6.3421e+00, -1.2281e+01

23, -1.0017e+02, -1.0999e+01, -2.1034e+01

24, -3.6002e+01, 9.1156e+00, -5.3024e+00

25, -3.7807e+01, -7.8790e+00, -1.7336e+01

26, 3.2115e+01, 1.1628e+01, -1.7557e+00

27, 2.8953e+01, -6.6053e+00, -1.4627e+01

28, 1.0316e+02, 1.2645e+01, 7.6167e-01

29, 9.7711e+01, -8.8765e+00, -1.0600e+01

30, 1.6970e+02, 1.1558e+01, 4.8681e+00

31, -1.5839e+02, -1.1684e+01, -2.8377e+01

32, -9.7583e+01, 6.5281e+00, -1.3189e+01

33, -9.9174e+01, -9.8359e+00, -2.1947e+01

34, -3.4096e+01, 8.9192e+00, -6.4177e+00

35, -3.6268e+01, -8.8873e+00, -1.7949e+01

36, 3.3351e+01, 1.0601e+01, -2.0134e+00

37, 2.9573e+01, -9.4316e+00, -1.4402e+01

38, 1.0192e+02, 1.1137e+01, 1.9112e+00

39, 9.6533e+01, -1.0392e+01, -1.0249e+01

40, 1.6778e+02, 1.0871e+01, 5.9571e+00

41, -1.5968e+02, -1.2100e+01, -2.9740e+01

42, -9.6645e+01, 6.2636e+00, -1.3839e+01

43, -9.8220e+01, -1.0318e+01, -2.2820e+01

44, -3.2737e+01, 8.2589e+00, -6.9369e+00

45, -3.5094e+01, -9.9321e+00, -1.8190e+01

46, 3.3651e+01, 9.6723e+00, -1.8836e+00

47, 2.9816e+01, -1.0492e+01, -1.4170e+01

48, 1.0068e+02, 1.0346e+01, 2.5358e+00

49, 9.5459e+01, -1.0826e+01, -1.0299e+01

50, 1.6649e+02, 1.0630e+01, 6.3483e+00

51, -1.5984e+02, -1.2695e+01, -3.0761e+01

52, -9.5742e+01, 5.9132e+00, -1.4199e+01

53, -9.7303e+01, -1.1111e+01, -2.3580e+01

54, -3.1834e+01, 7.6045e+00, -7.2216e+00

55, -3.4229e+01, -1.0692e+01, -1.8447e+01

56, 3.3581e+01, 8.9624e+00, -1.8089e+00

57, 2.9847e+01, -1.0903e+01, -1.4169e+01

58, 9.9555e+01, 9.8733e+00, 2.7885e+00

59, 9.4475e+01, -1.0976e+01, -1.0519e+01

60, 1.6529e+02, 1.0506e+01, 6.4953e+00

61, -1.5917e+02, -1.3115e+01, -3.1409e+01

62, -9.4867e+01, 5.5886e+00, -1.4339e+01

63, -9.6341e+01, -1.1747e+01, -2.4222e+01

64, -3.1211e+01, 7.0705e+00, -7.4326e+00

65, -3.3552e+01, -1.1178e+01, -1.8809e+01

66, 3.3345e+01, 8.4354e+00, -1.8780e+00

67, 2.9744e+01, -1.1070e+01, -1.4385e+01

68, 9.8469e+01, 9.5471e+00, 2.7965e+00

69, 9.3496e+01, -1.1032e+01, -1.0815e+01

70, 1.6394e+02, 1.0409e+01, 6.5311e+00

71, -1.5788e+02, -1.3315e+01, -3.1778e+01

72, -9.3942e+01, 5.3031e+00, -1.4334e+01

73, -9.5255e+01, -1.2143e+01, -2.4769e+01

74, -3.0727e+01, 6.6422e+00, -7.6316e+00

75, -3.2957e+01, -1.1455e+01, -1.9266e+01

76, 3.3012e+01, 8.0268e+00, -2.0804e+00

77, 2.9542e+01, -1.1131e+01, -1.4757e+01

78, 9.7324e+01, 9.2884e+00, 2.6391e+00

79, 9.2441e+01, -1.1042e+01, -1.1150e+01

80, 1.6235e+02, 1.0309e+01, 6.5000e+00

81, -1.5610e+02, -1.3345e+01, -3.1961e+01

82, -9.2890e+01, 5.0398e+00, -1.4243e+01

83, -9.3985e+01, -1.2335e+01, -2.5246e+01

84, -3.0283e+01, 6.2749e+00, -7.8423e+00

85, -3.2363e+01, -1.1586e+01, -1.9788e+01

86, 3.2598e+01, 7.6798e+00, -2.3897e+00

87, 2.9260e+01, -1.1131e+01, -1.5232e+01

88, 9.6047e+01, 9.0545e+00, 2.3631e+00

89, 9.1246e+01, -1.1021e+01, -1.1502e+01

90, 1.6042e+02, 1.0195e+01, 6.4184e+00

91, -1.5389e+02, -1.3259e+01, -3.2020e+01

92, -9.1652e+01, 4.7784e+00, -1.4100e+01

93, -9.2487e+01, -1.2386e+01, -2.5675e+01

94, -2.9819e+01, 5.9279e+00, -8.0762e+00

95, -3.1721e+01, -1.1616e+01, -2.0352e+01

96, 3.2107e+01, 7.3521e+00, -2.7868e+00

97, 2.8903e+01, -1.1089e+01, -1.5772e+01

98, 9.4576e+01, 8.8190e+00, 1.9937e+00

99, 8.9859e+01, -1.0973e+01, -1.1861e+01

100, 1.5810e+02, 1.0060e+01, 6.2919e+00

101, -1.5124e+02, -1.3097e+01, -3.1991e+01

102, -9.0178e+01, 4.5023e+00, -1.3925e+01

103, -9.0725e+01, -1.2344e+01, -2.6071e+01

104, -2.9293e+01, 5.5715e+00, -8.3413e+00

105, -3.0995e+01, -1.1578e+01, -2.0944e+01

106, 3.1532e+01, 7.0146e+00, -3.2626e+00

107, 2.8469e+01, -1.1013e+01, -1.6354e+01

108, 9.2862e+01, 8.5646e+00, 1.5419e+00

109, 8.8235e+01, -1.0900e+01, -1.2220e+01

110, 1.5533e+02, 9.8987e+00, 6.1202e+00

111, -1.4811e+02, -1.2878e+01, -3.1884e+01

112, -8.8427e+01, 4.1997e+00, -1.3728e+01

113, -8.8661e+01, -1.2239e+01, -2.6440e+01

114, -2.8677e+01, 5.1859e+00, -8.6446e+00

115, -3.0162e+01, -1.1493e+01, -2.1555e+01

116, 3.0863e+01, 6.6481e+00, -3.8163e+00

117, 2.7949e+01, -1.0909e+01, -1.6964e+01

118, 9.0859e+01, 8.2797e+00, 1.0089e+00

119, 8.6332e+01, -1.0802e+01, -1.2575e+01

120, 1.5205e+02, 9.7070e+00, 5.8988e+00

121, -1.4447e+02, -1.2612e+01, -3.1698e+01

122, -8.6356e+01, 3.8617e+00, -1.3514e+01

123, -8.6257e+01, -1.2088e+01, -2.6784e+01

124, -2.7950e+01, 4.7580e+00, -8.9935e+00

125, -2.9203e+01, -1.1372e+01, -2.2179e+01

126, 3.0089e+01, 6.2399e+00, -4.4532e+00

127, 2.7333e+01, -1.0778e+01, -1.7595e+01

128, 8.8522e+01, 7.9561e+00, 3.8919e-01

129, 8.4105e+01, -1.0678e+01, -1.2923e+01

130, 1.4820e+02, 9.4812e+00, 5.6202e+00

131, -1.4022e+02, -1.2297e+01, -3.1422e+01

132, -8.3919e+01, 3.4814e+00, -1.3284e+01

133, -8.3468e+01, -1.1897e+01, -2.7100e+01

134, -2.7093e+01, 4.2784e+00, -9.3969e+00

135, -2.8101e+01, -1.1217e+01, -2.2814e+01

136, 2.9194e+01, 5.7819e+00, -5.1833e+00

137, 2.6607e+01, -1.0618e+01, -1.8243e+01

138, 8.5802e+01, 7.5887e+00, -3.2751e-01

139, 8.1507e+01, -1.0526e+01, -1.3259e+01

140, 1.4368e+02, 9.2177e+00, 5.2744e+00

141, -1.3529e+02, -1.1931e+01, -3.1041e+01

142, -8.1063e+01, 3.0522e+00, -1.3040e+01

143, -8.0241e+01, -1.1666e+01, -2.7381e+01

144, -2.6086e+01, 3.7399e+00, -9.8656e+00

145, -2.6837e+01, -1.1027e+01, -2.3455e+01

146, 2.8160e+01, 5.2697e+00, -6.0204e+00

147, 2.5750e+01, -1.0427e+01, -1.8903e+01

148, 8.2645e+01, 7.1753e+00, -1.1541e+00

149, 7.8484e+01, -1.0342e+01, -1.3579e+01

150, 1.3843e+02, 8.9133e+00, 4.8494e+00

151, -1.2958e+02, -1.1504e+01, -3.0536e+01

152, -7.7726e+01, 2.5667e+00, -1.2786e+01

153, -7.6515e+01, -1.1389e+01, -2.7621e+01

154, -2.4910e+01, 3.1367e+00, -1.0415e+01

155, -2.5394e+01, -1.0796e+01, -2.4100e+01

156, 2.6965e+01, 4.7039e+00, -6.9821e+00

157, 2.4740e+01, -1.0196e+01, -1.9570e+01

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166, 2.5580e+01, 4.0936e+00, -8.0916e+00

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242, -7.0382e+00, -7.5555e+00, -7.6142e+00

243, -5.7340e+00, -1.3147e+01, -1.5908e+01

244, -6.5054e+00, -2.8489e+01, -1.8161e+01

245, -3.9759e+00, -2.0594e+01, -1.9054e+01

246, -9.4049e+00, -6.0121e+01, -2.7004e+01

247, -7.2229e-02, -2.3826e+01, -1.8888e+01

248, -9.1121e+00, -9.8347e+01, -3.4581e+01

249, 1.2882e+01, -1.9799e+01, -1.7384e+01

250, 3.6848e+01, -1.4108e+02, -3.0706e+01

------------------------------------------------------

单元应变

element epsilon\_(xx) epsilon\_(yy) gamma\_(xy)

1, -6.7839e-04, 0.0000e+00, -4.6845e-04

2, -4.7437e-04, 1.3413e-04, -1.3125e-04

3, -4.5624e-04, 0.0000e+00, -2.4937e-04

4, -2.0012e-04, 6.9111e-05, 2.3633e-05

5, -1.8342e-04, 0.0000e+00, -1.3649e-04

6, 1.0426e-04, 1.7135e-05, 7.3973e-05

7, 1.1650e-04, 0.0000e+00, -1.0850e-04

8, 4.3762e-04, -4.0895e-05, 2.6768e-05

9, 4.4431e-04, 0.0000e+00, -1.7530e-04

10, 8.9953e-04, -1.6024e-04, -1.5831e-04

11, -7.3309e-04, 1.3413e-04, -3.6119e-04

12, -4.9722e-04, 1.7044e-04, -1.4711e-04

13, -4.7991e-04, 6.9111e-05, -2.6340e-04

14, -2.0159e-04, 9.5260e-05, -3.8626e-05

15, -1.8469e-04, 1.7135e-05, -1.9978e-04

16, 1.2578e-04, 1.7315e-05, 2.9808e-06

17, 1.3814e-04, -4.0895e-05, -1.7854e-04

18, 4.9201e-04, -7.6455e-05, -8.3787e-06

19, 4.9694e-04, -1.6024e-04, -1.5345e-04

20, 8.4894e-04, -1.9095e-04, 1.7412e-05

21, -7.6006e-04, 1.7044e-04, -3.5289e-04

22, -5.0101e-04, 1.7916e-04, -1.5965e-04

23, -4.8435e-04, 9.5260e-05, -2.7345e-04

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25, -1.7722e-04, 1.7315e-05, -2.2537e-04

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33, -4.8111e-04, 9.9581e-05, -2.8531e-04

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