Electronic Supplementary Material (ESI) for Physical Chemistry Chemical Physics.

Supporting Information:

Unveiling the Effect of Electron Tunneling on the Plasmonic Resonance of Closely Spaced Gold Clusters and Nanoparticles

Pengcheng Zhang, Wenjin Jin and WanZhen Liang*

State Key Laboratory of Physical Chemistry of Solid Surfaces, Fujian Provincial Key Laboratory of Theoretical and Computational Chemistry,

and Department of Chemistry, College of Chemistry and Chemical Engineering, Xiamen University, Xiamen, Fujian 361005, People's Republic of China.

E-mail: liangwz@xmu.edu.cn

*To whom correspondence should be addressed

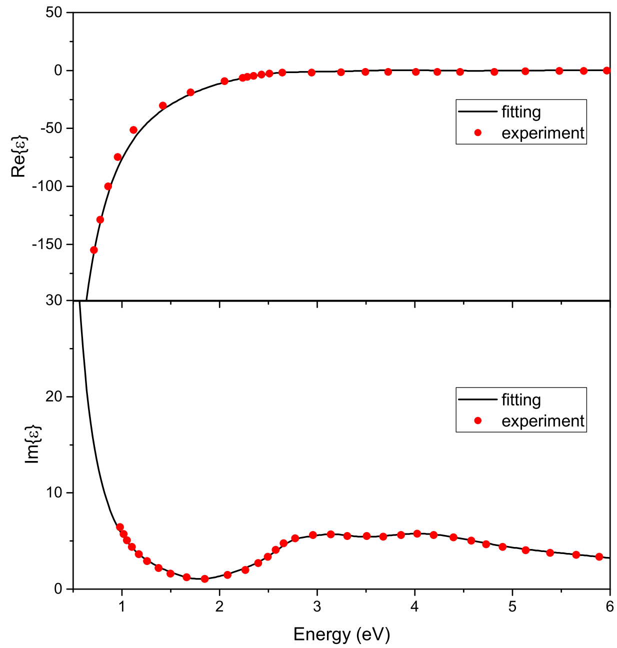


Figure S1: The experimental and fitting dielectric functions of gold.

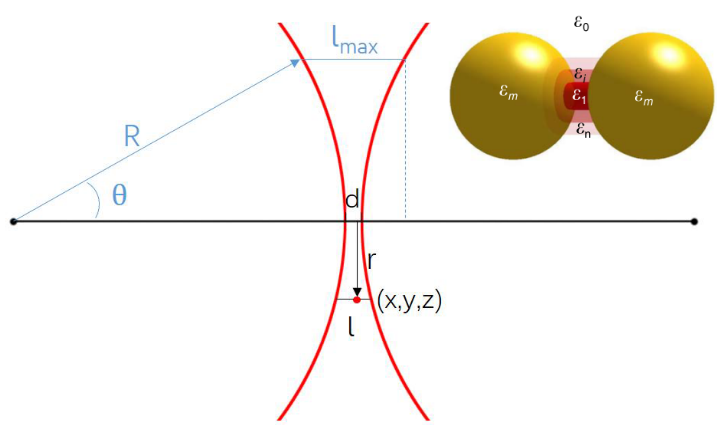


Figure S2: The illustration of the artificial material shells in Au-NP dimer gap.

We assume that the electron tunneling only happens when $l \leq l_{max} = 10$ Å . The artificial material is added in the gap, where $r \leq \sqrt{R^2 - [R - (l_{max} - d)/2]^2}$. Since in FDTD scheme, the calculation domain is discrete into grid points. Given the coordinate of the position (x, y, z), we can determine the corresponding parameters: $r = \sqrt{y^2 + z^2}, l = d + 2(R - \sqrt{R^2 - r^2})$. Then the damping factor in dielectric function can be calculated: γ_g=$\gamma_D e^{ql}$.

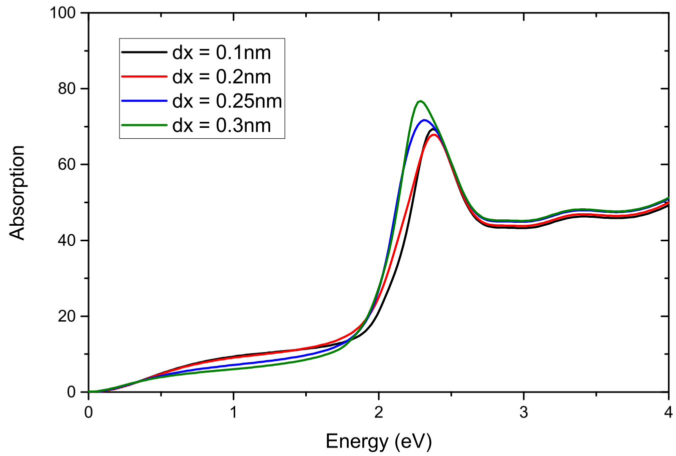
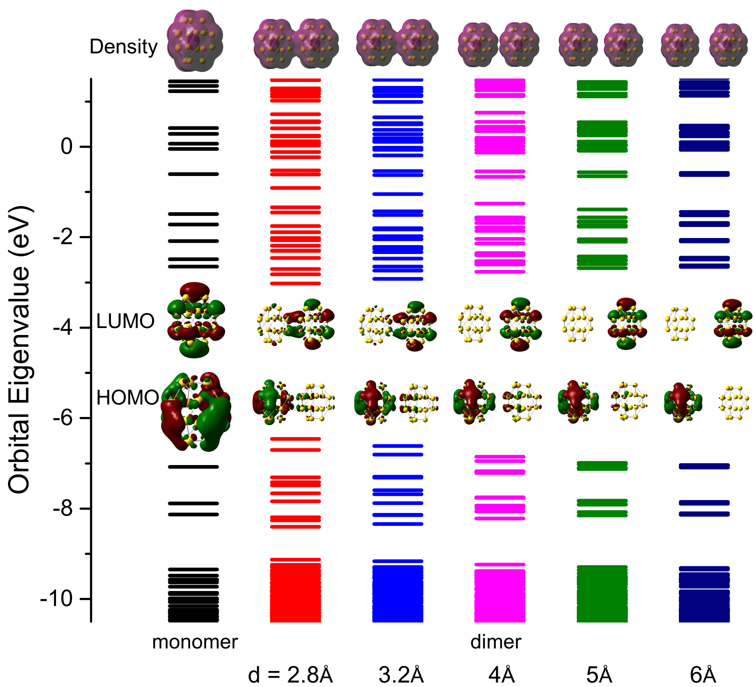
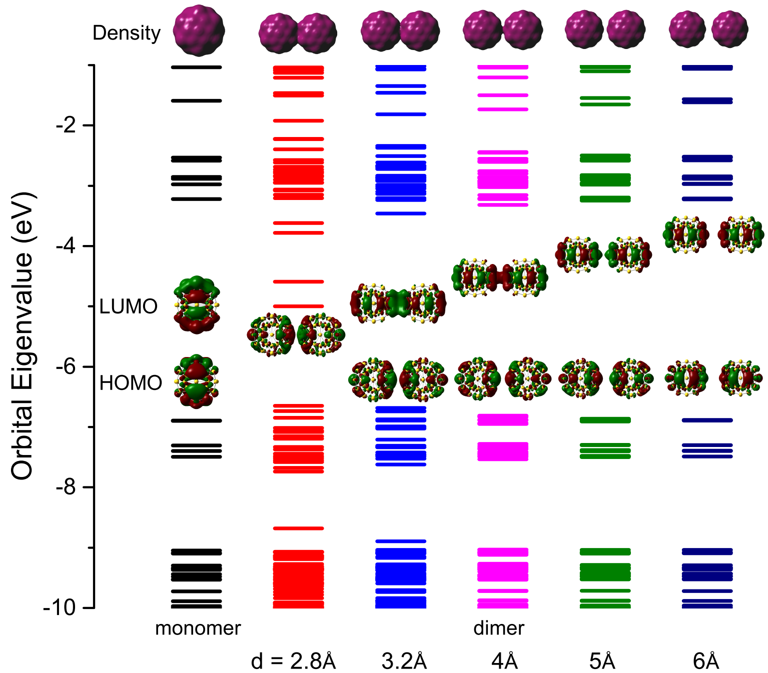


Figure S3: The absorption spectra of NP dimer ($R = 5$nm, $g = 2$Å) varied with different grid size dx.





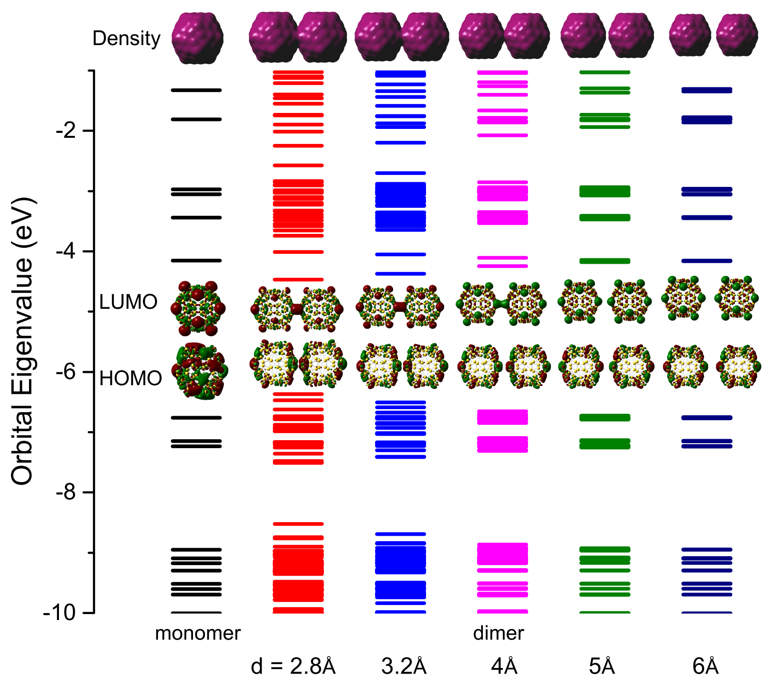


Figure S4: The ground state analysis of Au_{18},Au_{50},Au_{72}. (The plane of symmetry along dimer axis is broken in Au_{18} dimer, So the HOMO and LUMO are localized in two NPs. However, the significant overlap between LUMOs instead of HOMOs still exists when $d \leq 4$ Å . The Au_{50} dimer shows an exception when $d = 2.8$ Å , where the character of LUMO is alike to other HOMOs. The HOMO-LUMO gap is also extremely small. This may because of the ultra strong coupling.)

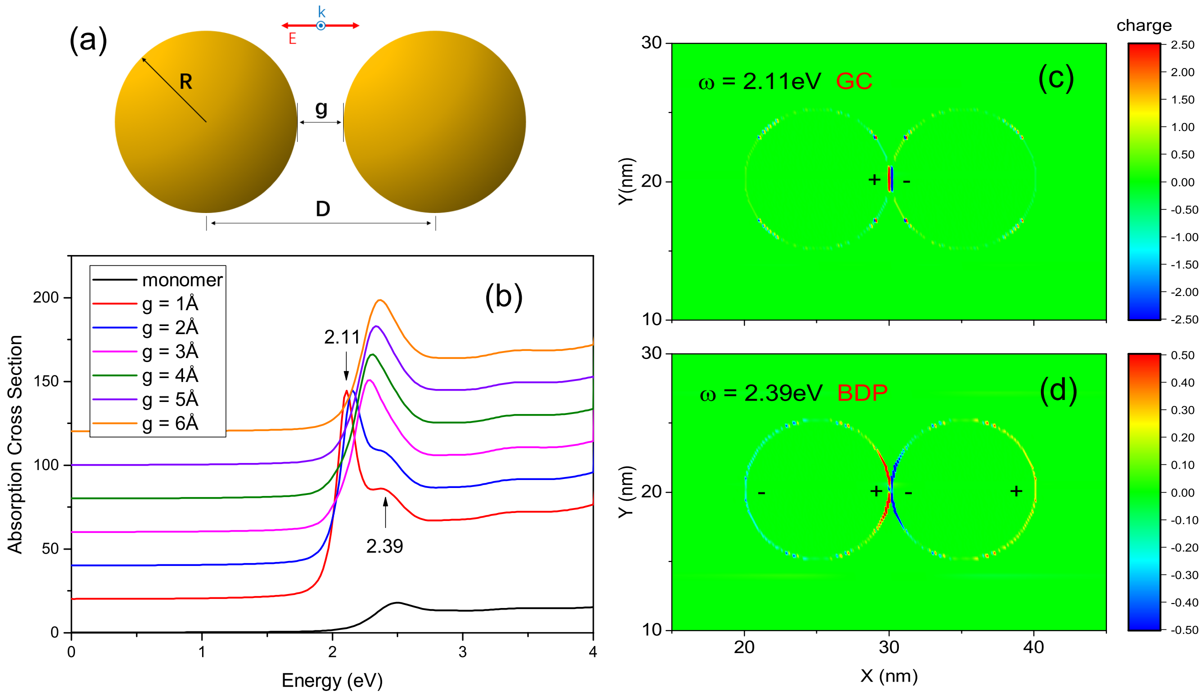


Figure S5: (a) The simulation models and (b) the absorption spectra of a series of Au nanosphere dimers of $R = 5$ nm calculated by CEM. (c) (d) The surface charge distribution of selected modes for NP dimers with $g = 1$ Å corresponding to frequencies of major plasmonic resonances.

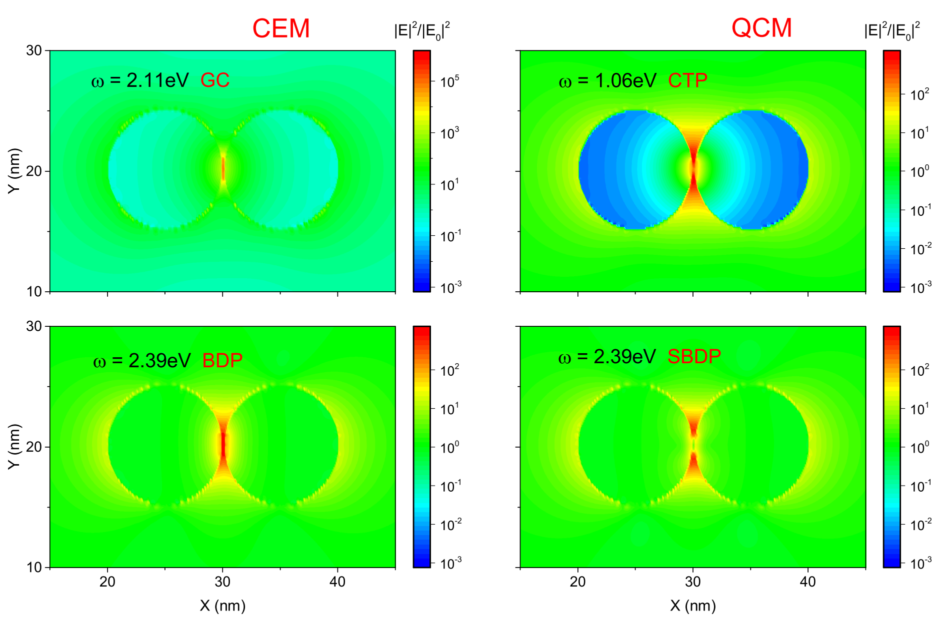


Figure S6: The field enhancement of NP dimers ($R = 5$nm, $g = 1$Å) calculated by CEM and QCM.

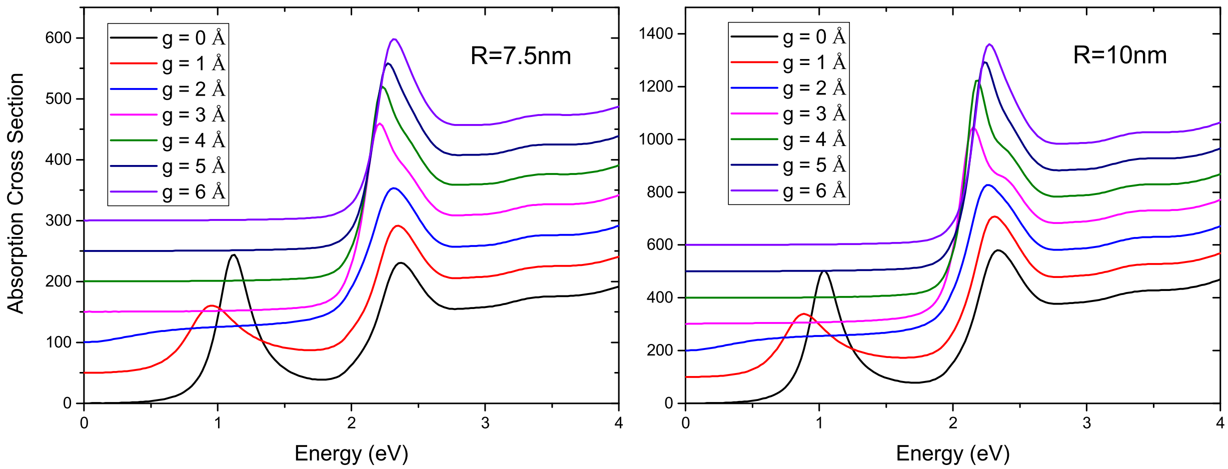


Figure S7: The absorption spectra of Au NP dimers with $R = 7.5$, 10 nm varied with d.

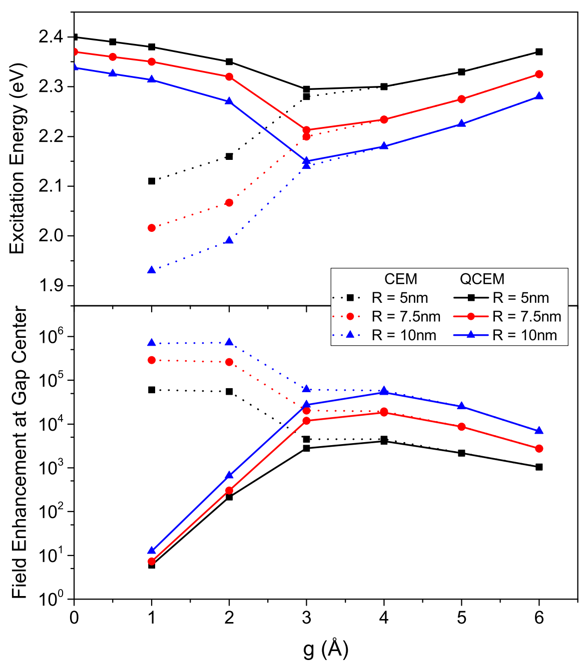


Figure S8: Upper panel: The excitation energy of strongest absorption peak varied with g and R. Lower panel: The local field enhancement of $|E|^2/|E_0|^2$ in the gap center associated with the corresponding strongest absorption peak varied with g and R.

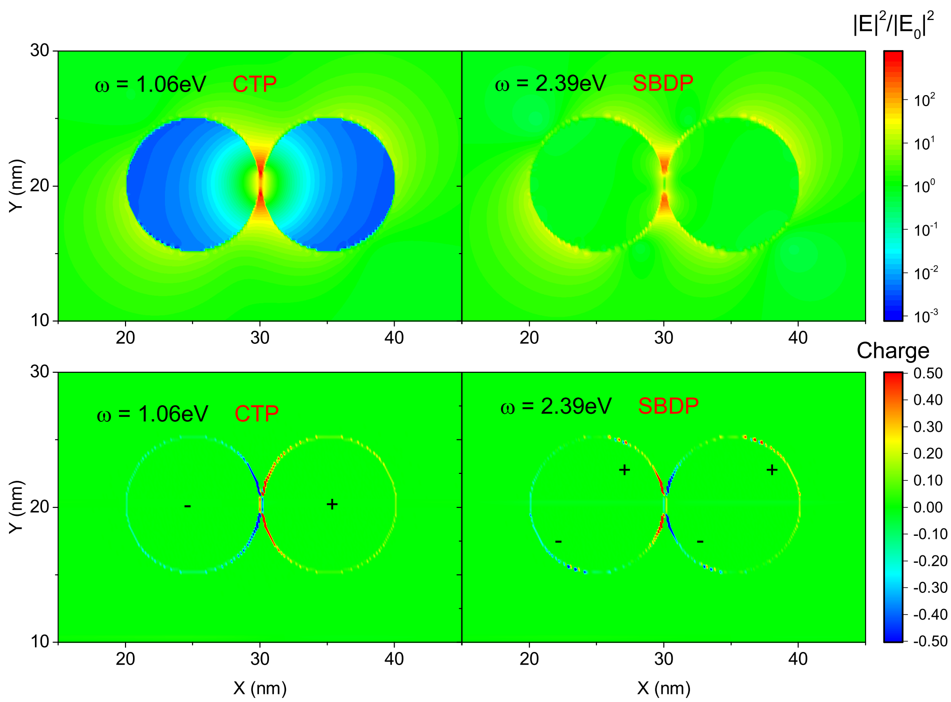


Figure S9: The field enhancement (upper panel) and charge distribution (lower panel) of NP dimers ($R = 5$nm, $g = 1$Å) under 45° polarized incident light calculated by QCM.

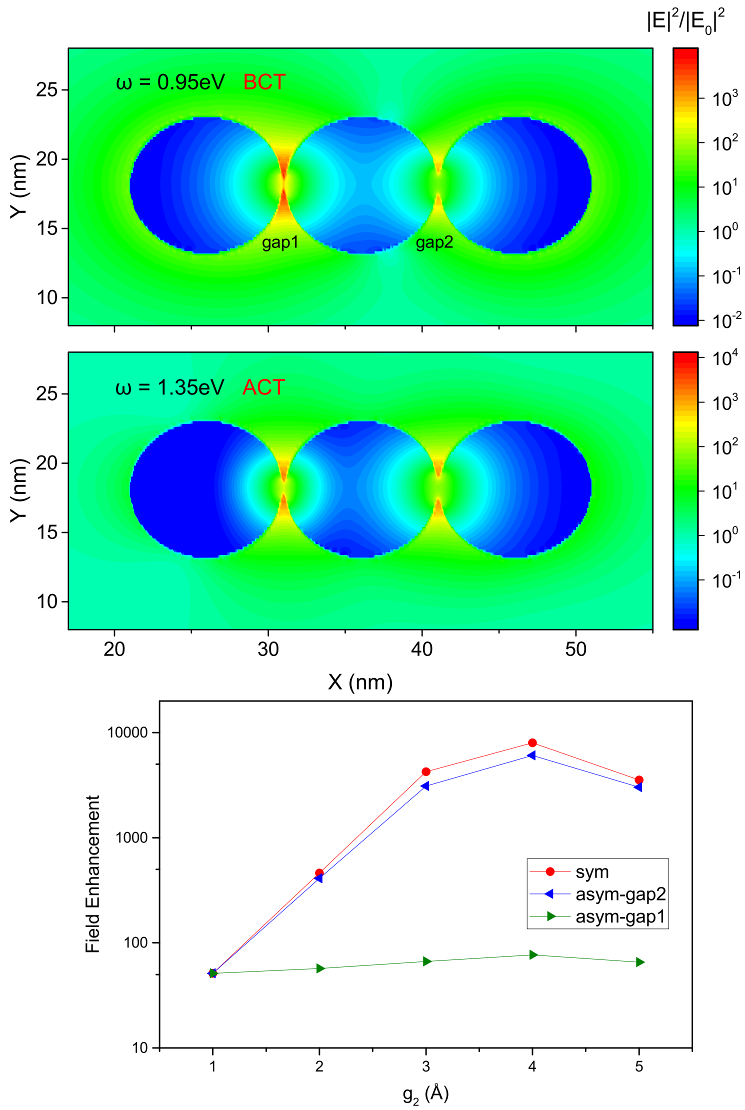
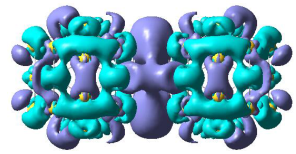
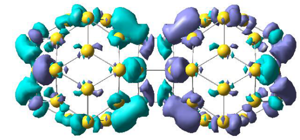
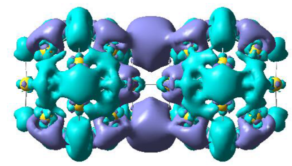
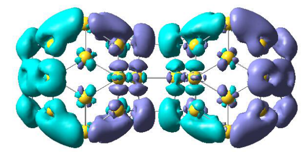
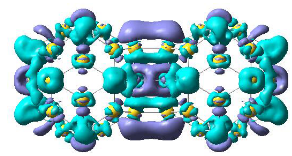
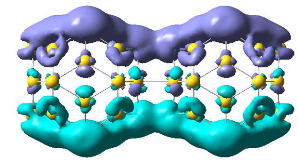
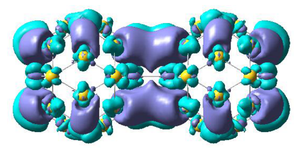
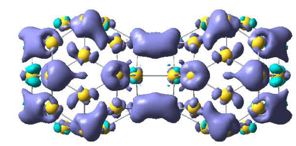
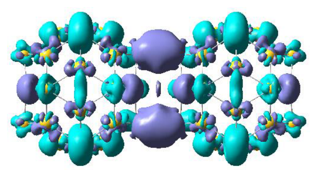
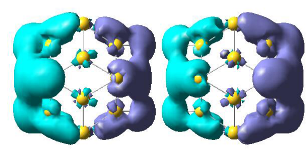
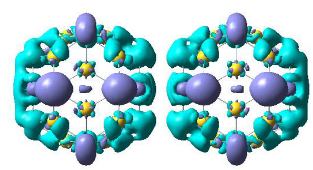
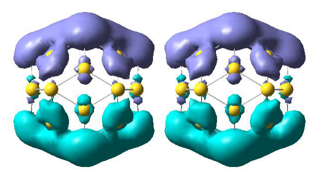
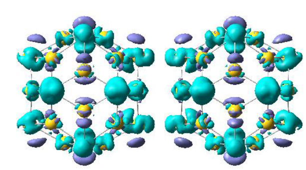
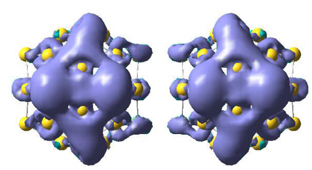
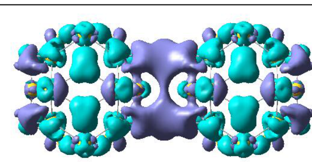
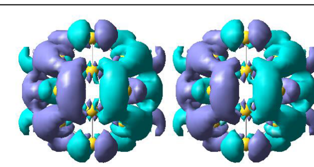
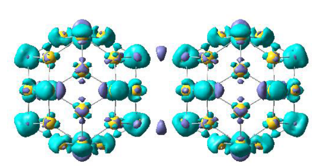
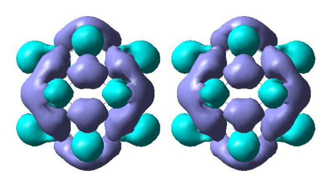
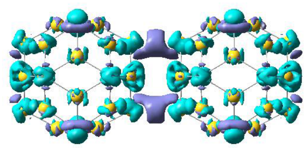
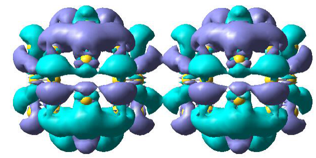
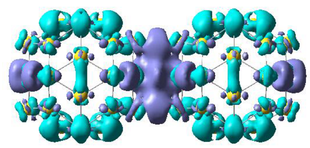
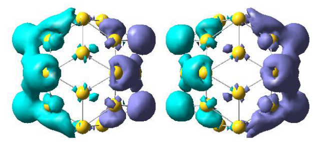
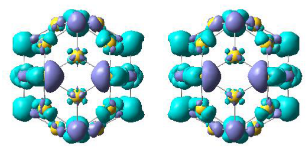
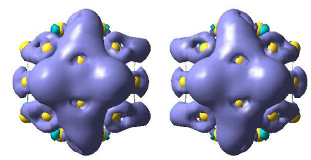
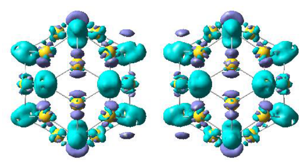
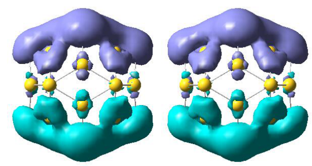
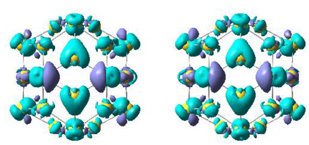
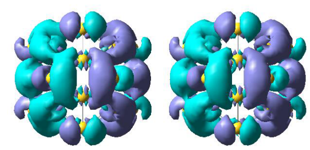
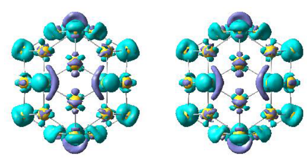
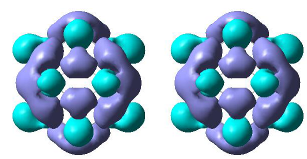
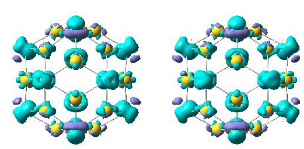
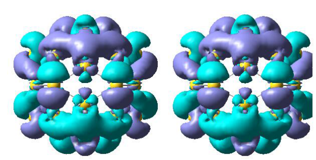
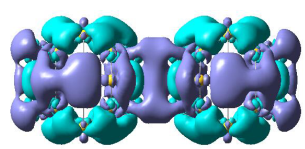
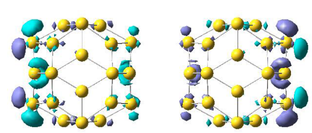
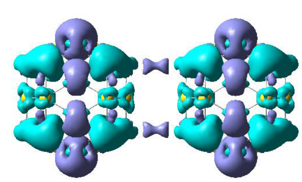
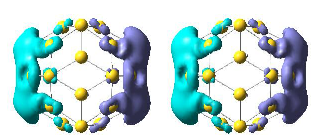
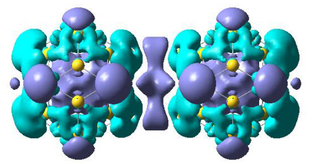
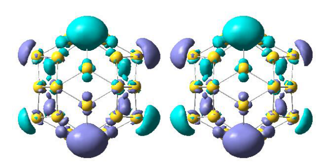
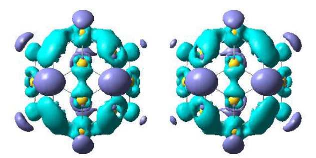
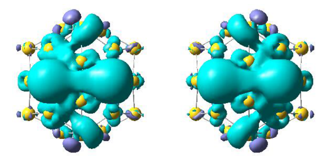
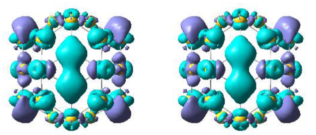
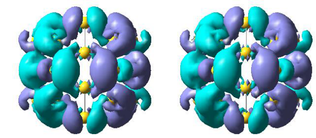
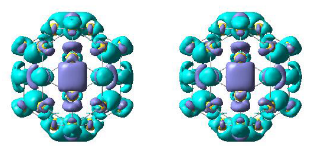
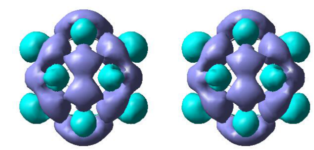
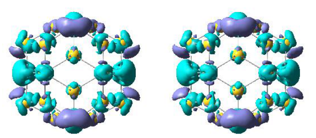
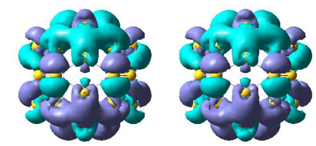
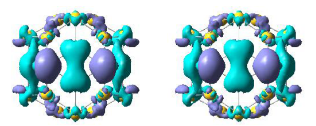
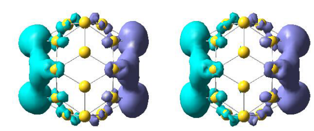
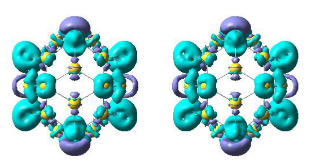
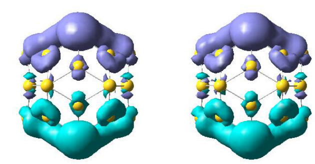
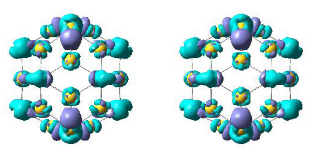
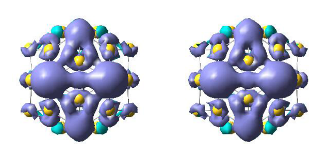
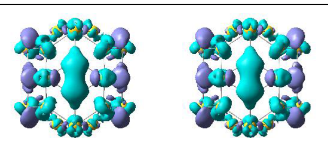
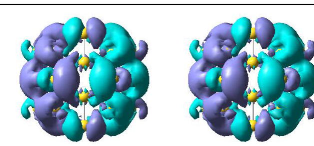
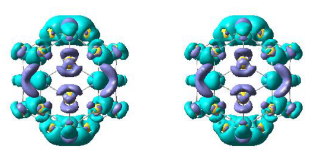
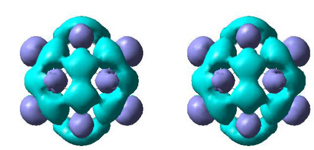


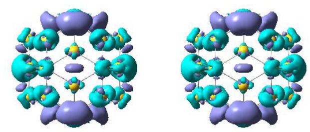
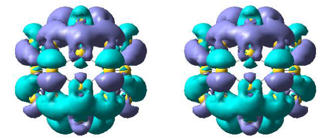
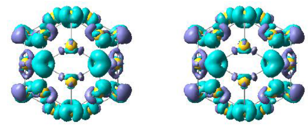
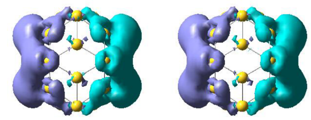
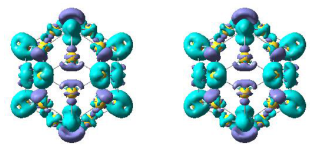
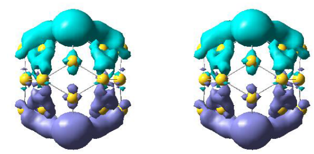
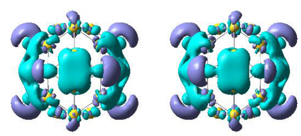
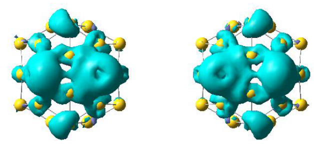
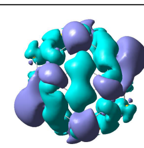
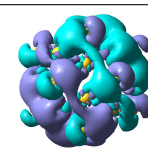
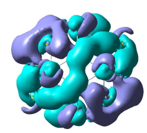
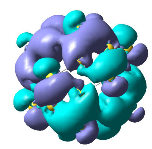
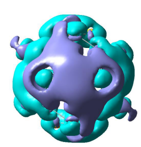
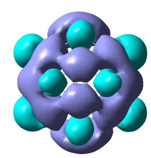
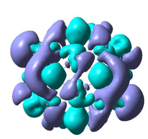
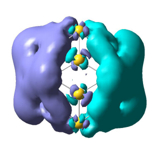
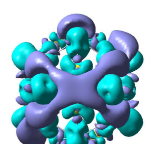
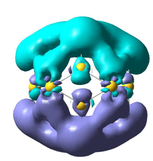
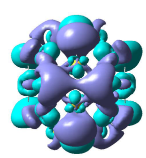
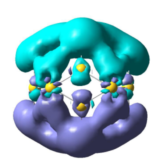
Figure S10: Upper panel: Local near field enhancements for two CT modes of symmetric trimer at $g_1 = 1$Å , $g_2 = 0$Å calculated by QCM. Lower panel: The factors of local field enhancements in two gap centers of symmetric and asymmetric trimers as a function of g_2 (the frequency is set as the corresponding SBDP peak).

Table S1: Excited states of Au_{32} dimers.

System	State	ω_{ex} (eV)	Oscillator	Difference Density*	Transition Density*
	77	2.1389	0.5932		
d=2.8Å	142	2.9331	2.6778		
(g=0Å)	235	3.5099	0.9804		
	244	3.5474	0.4085		
	145	3.0492	3.7305		
d=3.3Å	226	3.5221	0.8684		
(g=0.5Å)	227	3.5245	1.1778		
	67	2.0349	0.2242		
	70	2.1153	0.1208		

d=3.8Å	71	2.1210	0.1195		
(g=1Å)	143	3.1238	2.5643		
	223	3.5237	1.1081		
	225	3.5314	1.1869		
	67	2.0992	0.2532		
	70	2.1211	0.1269		
	71	2.1234	0.1243		
d=4.8Å	132	3.1940	0.4738		
(g=2Å)	196	3.4332	0.9741		

	218	3.5147	0.5694		
	220	3.5208	0.7820		
	67	2.1119	0.2196		
	70	2.1221	0.1303		
d=5.8Å	71	2.1228	0.1282		
(g=3Å)	184	3.4633	1.5117		
	210	3.5207	1.2715		
	211	3.5210	1.2418		
	67	2.1151	0.1995		
	70	2.1219	0.1332		

d=6.8Å	71	2.1223	0.1318		
(g=4Å)	157	3.4747	1.9311		
	182	3.5199	1.4103		
	183	3.5205	0.6859		
monomer	34	2.1204	0.0748		
	35	2.1204	0.0748		
	36	2.1204	0.0748		
	70	3.5082	0.8557		
	71	3.5082	0.8557		
	72	3.5082	0.8557		

∗The isovalues of difference density and transition density are 0.0005 and 0.002, perspectively.

Atomic coordinates of the Au_N cluster dimers

$2Au_{18}$ ($d = 2.8$Å)

Au -1.03690600 -0.90803900 3.08796200

Au 3.23629700 0.27926300 1.57309400

Au 3.26692600 1.02059200 -1.14473200

Au 1.25514400 -0.68581400 -2.27106000

Au 1.21265700 -1.70168200 1.68342400

Au 3.15361000 -1.70168200 -0.42836400

Au 0.86610700 -3.18813300 -0.72061600

Au -1.08880500 -2.15566400 -2.36715900

Au -1.25514400 0.68581400 -2.27106000

Au -1.37659700 -2.22780900 0.58745100

Au 1.37659700 2.22780900 0.58745100

Au -1.21265700 1.70168200 1.68342400

Au 1.03690600 0.90803900 3.08796200

Au -0.86610700 3.18813300 -0.72061600

Au -3.15361000 1.70168200 -0.42836400

Au -3.23629700 -0.27926300 1.57309400

Au 1.08880500 2.15566400 -2.36715900

Au -3.26692600 -1.02059200 -1.14473200

Au -1.03690600 -0.90803900 11.248

Au 3.23629700 0.27926300 9.73309

Au 3.26692600 1.02059200 7.01527

Au 1.25514400 -0.68581400 5.88894

Au 1.21265700 -1.70168200 9.84342

Au 3.15361000 -1.70168200 7.73164

Au 0.86610700 -3.18813300 7.43938

Au -1.08880500 -2.15566400 5.79284

Au -1.25514400 0.68581400 5.88894

Au -1.37659700 -2.22780900 8.74745

Au 1.37659700 2.22780900 8.74745

Au -1.21265700 1.70168200 9.84342

Au 1.03690600 0.90803900 11.248

Au -0.86610700 3.18813300 7.43938

Au -3.15361000 1.70168200 7.73164

Au -3.23629700 -0.27926300 9.73309

Au 1.08880500 2.15566400 5.79284

Au -3.26692600 -1.02059200 7.01527

$2Au_{32}$ ($d = 2.8$Å)

Au -0.00120000 -3.89210000 -2.40550000

Au 2.40550000 -0.00070000 -3.89210000

Au 3.89140000 -2.40670000 0.00000000

Au -2.40550000 0.00070000 -3.89210000

Au 0.00120000 3.89210000 2.40550000

Au -3.89140000 2.40670000 0.00000000

Au 0.00120000 3.89210000 -2.40550000

Au 3.74380000 -0.00110000 1.43000000

Au 2.31450000 2.31310000 2.31380000

Au 1.43120000 3.74340000 0.00000000

Au 2.31450000 2.31310000 -2.31380000

Au 3.74380000 -0.00110000 -1.43000000

Au 2.31310000 -2.31450000 2.31380000

Au -0.00040000 -1.43000000 3.74380000

Au 0.00040000 1.43000000 3.74380000

Au 1.42890000 -3.74430000 0.00000000

Au 2.31310000 -2.31450000 -2.31380000

Au -2.31310000 2.31450000 2.31380000

Au -1.42890000 3.74430000 0.00000000

Au -2.31310000 2.31450000 -2.31380000

Au 0.00040000 1.43000000 -3.74380000

Au -0.00040000 -1.43000000 -3.74380000

Au -2.31450000 -2.31310000 2.31380000

Au -3.74380000 0.00110000 1.43000000

Au -3.74380000 0.00110000 -1.43000000

Au -2.31450000 -2.31310000 -2.31380000

Au -1.43120000 -3.74340000 0.00000000

Au -3.89290000 -2.40430000 0.00000000

Au -2.40550000 0.00070000 3.89210000

Au -0.00120000 -3.89210000 2.40550000

Au 2.40550000 -0.00070000 3.89210000

Au 3.89290000 2.40430000 0.00000000

Au 10.2868 -3.89210000 -2.40550000

Au 12.6935 -0.00070000 -3.89210000

Au 14.1794 -2.40670000 0.00000000

Au 7.8825 0.00070000 -3.89210000

Au 10.2892 3.89210000 2.40550000

Au 6.3966 2.40670000 0.00000000

Au 10.2892 3.89210000 -2.40550000

Au 14.0318 -0.00110000 1.43000000

Au 12.6025 2.31310000 2.31380000

Au 11.7192 3.74340000 0.00000000

Au 12.6025 2.31310000 -2.31380000

Au 14.0318 -0.00110000 -1.43000000

Au 12.6011 -2.31450000 2.31380000

Au 10.2876 -1.43000000 3.74380000

Au 10.2884 1.43000000 3.74380000

Au 11.7169 -3.74430000 0.00000000

Au 12.6011 -2.31450000 -2.31380000

Au 7.9749 2.31450000 2.31380000

Au 8.8591 3.74430000 0.00000000

Au 7.9749 2.31450000 -2.31380000

Au 10.2884 1.43000000 -3.74380000

Au 10.2876 -1.43000000 -3.74380000

Au 7.9735 -2.31310000 2.31380000

Au 6.5442 0.00110000 1.43000000

Au 6.5442 0.00110000 -1.43000000

Au 7.9735 -2.31310000 -2.31380000

Au 8.8568 -3.74340000 0.00000000

Au 6.3951 -2.40430000 0.00000000

Au 7.8825 0.00070000 3.89210000

Au 10.2868 -3.89210000 2.40550000

Au 12.6935 -0.00070000 3.89210000

Au 14.1809 2.40430000 0.00000000

$2Au_{50}$ ($d = 2.8$Å)

Au 0.00000000 0.00000000 4.83780000

Au 1.39090000 2.40900000 4.30010000

Au -1.39090000 2.40900000 4.30010000

Au -2.78170000 0.00000000 4.30010000

Au -1.39090000 -2.40900000 4.30010000

Au 1.39090000 -2.40900000 4.30010000

Au 2.78170000 0.00000000 4.30010000

Au 4.08160000 -2.35650000 3.49170000

Au 0.00000000 4.82510000 0.68290000

Au 0.00000000 4.71310000 3.49170000

Au 2.32350000 4.02440000 2.08400000

Au 4.08160000 2.35650000 3.49170000

Au -2.32350000 4.02440000 2.08400000

Au -4.08160000 2.35650000 3.49170000

Au -4.64690000 0.00000000 2.08400000

Au -4.08160000 -2.35650000 3.49170000

Au -2.32350000 -4.02440000 2.08400000

Au 0.00000000 -4.71310000 3.49170000

Au 0.00000000 -4.82510000 0.68290000

Au -4.17870000 -2.41260000 0.68290000

Au -4.17870000 2.41260000 0.68290000

Au 4.17870000 -2.41260000 0.68290000

Au 4.64690000 0.00000000 2.08400000

Au 4.17870000 2.41260000 0.68290000

Au 2.32350000 -4.02440000 2.08400000

Au 0.00000000 0.00000000 -4.83780000

Au 0.00000000 -2.78170000 -4.30010000

Au 2.40900000 -1.39090000 -4.30010000

Au 2.40900000 1.39090000 -4.30010000

Au 0.00000000 2.78170000 -4.30010000

Au -2.40900000 1.39090000 -4.30010000

Au -2.40900000 -1.39090000 -4.30010000

Au -2.35650000 -4.08160000 -3.49170000

Au 2.35650000 -4.08160000 -3.49170000

Au -4.02440000 -2.32350000 -2.08400000

Au -4.71310000 0.00000000 -3.49170000

Au -4.02440000 2.32350000 -2.08400000

Au -4.82510000 0.00000000 -0.68290000

Au -2.35650000 4.08160000 -3.49170000

Au -2.41260000 4.17870000 -0.68290000

Au -2.41260000 -4.17870000 -0.68290000

Au 0.00000000 -4.64690000 -2.08400000

Au 2.41260000 -4.17870000 -0.68290000

Au 4.02440000 -2.32350000 -2.08400000

Au 4.71310000 0.00000000 -3.49170000

Au 4.82510000 0.00000000 -0.68290000

Au 4.02440000 2.32350000 -2.08400000

Au 2.35650000 4.08160000 -3.49170000

Au 2.41260000 4.17870000 -0.68290000

Au 0.00000000 4.64690000 -2.08400000

Au 12.45 0.00000000 4.83780000

Au 13.8409 2.40900000 4.30010000

Au 11.0591 2.40900000 4.30010000

Au 9.6683 0.00000000 4.30010000

Au 11.0591 -2.40900000 4.30010000

Au 13.8409 -2.40900000 4.30010000

Au 15.2317 0.00000000 4.30010000

Au 16.5316 -2.35650000 3.49170000

Au 12.45 4.82510000 0.68290000

Au 12.45 4.71310000 3.49170000

Au 14.7735 4.02440000 2.08400000

Au 16.5316 2.35650000 3.49170000

Au 10.1265 4.02440000 2.08400000

Au 8.3684 2.35650000 3.49170000

Au 7.8031 0.00000000 2.08400000

Au 8.3684 -2.35650000 3.49170000

Au 10.1265 -4.02440000 2.08400000

Au 12.45 -4.71310000 3.49170000

Au 12.45 -4.82510000 0.68290000

Au 8.2713 -2.41260000 0.68290000

Au 8.2713 2.41260000 0.68290000

Au 16.6287 -2.41260000 0.68290000

Au 17.0969 0.00000000 2.08400000

Au 16.6287 2.41260000 0.68290000

Au 14.7735 -4.02440000 2.08400000

Au 12.45 0.00000000 -4.83780000

Au 12.45 -2.78170000 -4.30010000

Au 14.859 -1.39090000 -4.30010000

Au 14.859 1.39090000 -4.30010000

Au 12.45 2.78170000 -4.30010000

Au 10.041 1.39090000 -4.30010000

Au 10.041 -1.39090000 -4.30010000

Au 10.0935 -4.08160000 -3.49170000

Au 14.8065 -4.08160000 -3.49170000

Au 8.4256 -2.32350000 -2.08400000

Au 7.7369 0.00000000 -3.49170000

Au 8.4256 2.32350000 -2.08400000

Au 7.6249 0.00000000 -0.68290000

Au 10.0935 4.08160000 -3.49170000

Au 10.0374 4.17870000 -0.68290000

Au 10.0374 -4.17870000 -0.68290000

Au 12.45 -4.64690000 -2.08400000

Au 14.8626 -4.17870000 -0.68290000

Au 16.4744 -2.32350000 -2.08400000

Au 17.1631 0.00000000 -3.49170000

Au 17.2751 0.00000000 -0.68290000

Au 16.4744 2.32350000 -2.08400000

Au 14.8065 4.08160000 -3.49170000

Au 14.8626 4.17870000 -0.68290000

Au 12.45 4.64690000 -2.08400000

$2Au_{72}$ ($d = 2.8$Å)

Au -2.06270000 -4.02790000 -4.10860000

Au 0.57790000 -4.96290000 -3.52080000

Au -1.56710000 -5.61350000 -1.84190000

Au -3.99910000 -4.12420000 -2.08760000

Au -4.09400000 -2.10190000 -4.02260000

Au -1.82840000 -1.60120000 -5.60830000

Au 2.44420000 -3.11400000 -4.65710000

Au 3.14500000 -4.64820000 -2.42150000

Au 1.06460000 -5.94440000 -0.94350000

Au -1.01550000 -5.95260000 0.94610000

Au -4.95040000 -3.54290000 0.54860000

Au -5.59710000 -1.86490000 -1.59830000

Au -3.51920000 0.53770000 -4.96850000

Au -0.94350000 1.03370000 -5.94990000

Au 0.95700000 -1.03640000 -5.94730000

Au 3.53040000 -0.53990000 -4.96030000

Au 4.67410000 -2.40750000 -3.11720000

Au 4.97960000 -3.50210000 -0.54700000

Au 1.61350000 -5.59950000 1.84450000

Au -0.53690000 -4.96590000 3.52300000

Au -3.10650000 -4.67290000 2.42360000

Au -4.65410000 -2.44460000 3.11830000

Au -5.94580000 -0.97030000 1.03250000

Au -5.95130000 0.92120000 -1.04600000

Au -4.66700000 2.40610000 -3.12880000

Au -2.43360000 3.11190000 -4.66400000

Au 1.84120000 1.59880000 -5.60480000

Au 4.10310000 2.10010000 -4.01430000

Au 5.95360000 -0.92160000 -1.03200000

Au 5.61230000 -1.81790000 1.59920000

Au 4.03300000 -4.09010000 2.08950000

Au 2.09590000 -4.00890000 4.11040000

Au -2.41840000 -3.13200000 4.65850000

Au -3.52580000 -0.56690000 4.96050000

Au -5.61590000 1.81860000 1.58560000

Au -4.97830000 3.50190000 -0.55980000

Au -3.13950000 4.64710000 -2.43060000

Au -0.56990000 4.96130000 -3.52430000

Au 2.07210000 4.02610000 -4.10570000

Au 4.00380000 4.12330000 -2.08040000

Au 5.60070000 1.86420000 -1.58640000

Au 5.94340000 0.97080000 1.04550000

Au 4.11120000 -2.06610000 4.02360000

Au 1.84160000 -1.58350000 5.60900000

Au -0.94840000 -1.04160000 5.94770000

Au -1.85430000 1.58600000 5.60410000

Au -4.12030000 2.06790000 4.01330000

Au -4.03770000 4.09100000 2.07850000

Au -1.06250000 5.94400000 -0.94850000

Au 1.57130000 5.61270000 -1.84090000

Au 4.94920000 3.54310000 0.55820000

Au 4.64700000 2.44600000 3.12780000

Au 3.51460000 0.56910000 4.96830000

Au 0.93490000 1.04420000 5.94940000

Au -2.10530000 4.01070000 4.10390000

Au -1.61760000 5.60030000 1.83830000

Au 1.01330000 5.95300000 0.94580000

Au 3.10100000 4.67400000 2.42850000

Au 2.40780000 3.13400000 4.66260000

Au 0.52890000 4.96740000 3.52200000

Au -0.00840000 3.66220000 -5.92860000

Au 5.93190000 0.02370000 -3.65680000

Au 5.92350000 0.02530000 3.67030000

Au -0.02190000 3.66480000 5.92690000

Au -3.68800000 5.91260000 -0.00550000

Au 3.68800000 -5.91260000 0.00550000

Au 3.63900000 5.94290000 0.00280000

Au 0.02190000 -3.66480000 -5.92690000

Au 0.00840000 -3.66220000 5.92860000

Au -5.93190000 -0.02370000 3.65680000

Au -5.92360000 -0.02530000 -3.67030000

Au -3.63900000 -5.94290000 -0.00280000

Au 12.5933 -4.02790000 -4.10860000

Au 15.2339 -4.96290000 -3.52080000

Au 13.0889 -5.61350000 -1.84190000

Au 10.6569 -4.12420000 -2.08760000

Au 10.562 -2.10190000 -4.02260000

Au 12.8276 -1.60120000 -5.60830000

Au 17.1002 -3.11400000 -4.65710000

Au 17.801 -4.64820000 -2.42150000

Au 15.7206 -5.94440000 -0.94350000

Au 13.6405 -5.95260000 0.94610000

Au 9.7056 -3.54290000 0.54860000

Au 9.0589 -1.86490000 -1.59830000

Au 11.1368 0.53770000 -4.96850000

Au 13.7125 1.03370000 -5.94990000

Au 15.613 -1.03640000 -5.94730000

Au 18.1864 -0.53990000 -4.96030000

Au 19.3301 -2.40750000 -3.11720000

Au 19.6356 -3.50210000 -0.54700000

Au 16.2695 -5.59950000 1.84450000

Au 14.1191 -4.96590000 3.52300000

Au 11.5495 -4.67290000 2.42360000

Au 10.0019 -2.44460000 3.11830000

Au 8.7102 -0.97030000 1.03250000

Au 8.7047 0.92120000 -1.04600000

Au 9.989 2.40610000 -3.12880000

Au 12.2224 3.11190000 -4.66400000

Au 16.4972 1.59880000 -5.60480000

Au 18.7591 2.10010000 -4.01430000

Au 20.6096 -0.92160000 -1.03200000

Au 20.2683 -1.81790000 1.59920000

Au 18.689 -4.09010000 2.08950000

Au 16.7519 -4.00890000 4.11040000

Au 12.2376 -3.13200000 4.65850000

Au 11.1302 -0.56690000 4.96050000

Au 9.0401 1.81860000 1.58560000

Au 9.6777 3.50190000 -0.55980000

Au 11.5165 4.64710000 -2.43060000

Au 14.0861 4.96130000 -3.52430000

Au 16.7281 4.02610000 -4.10570000

Au 18.6598 4.12330000 -2.08040000

Au 20.2567 1.86420000 -1.58640000

Au 20.5994 0.97080000 1.04550000

Au 18.7672 -2.06610000 4.02360000

Au 16.4976 -1.58350000 5.60900000

Au 13.7076 -1.04160000 5.94770000

Au 12.8017 1.58600000 5.60410000

Au 10.5357 2.06790000 4.01330000

Au 10.6183 4.09100000 2.07850000

Au 13.5935 5.94400000 -0.94850000

Au 16.2273 5.61270000 -1.84090000

Au 19.6052 3.54310000 0.55820000

Au 19.303 2.44600000 3.12780000

Au 18.1706 0.56910000 4.96830000

Au 15.5909 1.04420000 5.94940000

Au 12.5507 4.01070000 4.10390000

Au 13.0384 5.60030000 1.83830000

Au 15.6693 5.95300000 0.94580000

Au 17.757 4.67400000 2.42850000

Au 17.0638 3.13400000 4.66260000

Au 15.1849 4.96740000 3.52200000

Au 14.6476 3.66220000 -5.92860000

Au 20.5879 0.02370000 -3.65680000

Au 20.5795 0.02530000 3.67030000

Au 14.6341 3.66480000 5.92690000

Au 10.968 5.91260000 -0.00550000

Au 18.344 -5.91260000 0.00550000

Au 18.295 5.94290000 0.00280000

Au 14.6779 -3.66480000 -5.92690000

Au 14.6644 -3.66220000 5.92860000

Au 8.7241 -0.02370000 3.65680000

Au 8.7324 -0.02530000 -3.67030000

Au 11.017 -5.94290000 -0.00280000