



# wwPDB X-ray Structure Validation Summary Report ⓘ

Aug 19, 2023 – 05:50 PM EDT

PDB ID : 2HLD  
Title : Crystal structure of yeast mitochondrial F1-ATPase  
Authors : Kabaleswaran, V.; Puri, N.; Walker, J.E.; Leslie, A.G.; Mueller, D.M.  
Deposited on : 2006-07-06  
Resolution : 2.80 Å(reported)

This is a wwPDB X-ray Structure Validation Summary Report for a publicly released PDB entry.

We welcome your comments at [validation@mail.wwpdb.org](mailto:validation@mail.wwpdb.org)

A user guide is available at

<https://www.wwpdb.org/validation/2017/XrayValidationReportHelp>

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

<http://www.wwpdb.org/validation/2017/FAQs#types>.

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The following versions of software and data (see [references ⓘ](#)) were used in the production of this report:

MolProbity : 4.02b-467  
Mogul : 1.8.5 (274361), CSD as541be (2020)  
Xtriage (Phenix) : 1.13  
EDS : 2.35  
buster-report : 1.1.7 (2018)  
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)  
Refmac : 5.8.0158  
CCP4 : 7.0.044 (Gargrove)  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.35

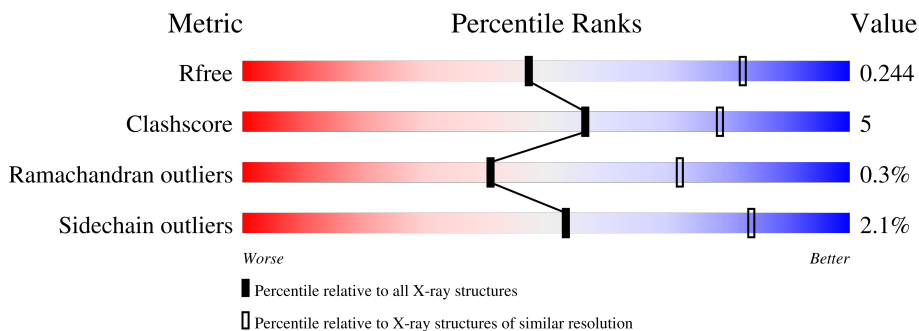
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.80 Å.

Percentile scores (ranging between 0-100) for global validation metrics of the entry are shown in the following graphic. The table shows the number of entries on which the scores are based.























Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
$R_{free}$	130704	3140 (2.80-2.80)
Clashscore	141614	3569 (2.80-2.80)
Ramachandran outliers	138981	3498 (2.80-2.80)
Sidechain outliers	138945	3500 (2.80-2.80)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments of the lower bar indicate the fraction of residues that contain outliers for  $\geq 3$ , 2, 1 and 0 types of geometric quality criteria respectively. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions  $\leq 5\%$ .

Mol	Chain	Length	Quality of chain
1	A	510	
1	B	510	
1	C	510	
1	J	510	
1	K	510	
1	L	510	
1	S	510	

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Mol	Chain	Length	Quality of chain
1	T	510	 82% 12% • 6%
1	U	510	 83% 10% • 6%
2	D	478	 87% 11% ••
2	E	478	 84% 14% •
2	F	478	 84% 13% ••
2	M	478	 83% 15% ••
2	N	478	 87% 10% ••
2	O	478	 87% 10% ••
2	V	478	 85% 12% ••
2	W	478	 85% 13% •
2	X	478	 80% 17% •
3	G	278	 73% 21% • 5%
3	P	278	 65% 19% • 13%
3	Y	278	 55% 17% 28%
4	H	138	 78% 8% • 13%
4	Q	138	 56% 5% 39%
4	Z	138	 12% 88%
5	1	61	 38% 7% 56%
5	I	61	 69% 8% • 21%
5	R	61	 52% • 44%

## 2 Entry composition [i](#)

There are 9 unique types of molecules in this entry. The entry contains 72841 atoms, of which 0 are hydrogens and 0 are deuteriums.

In the tables below, the ZeroOcc column contains the number of atoms modelled with zero occupancy, the AltConf column contains the number of residues with at least one atom in alternate conformation and the Trace column contains the number of residues modelled with at most 2 atoms.

- Molecule 1 is a protein called ATP synthase alpha chain, mitochondrial.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	482	Total 3664	C 2314	N 648	O 699	S 3	0	0	0
1	B	483	Total 3669	C 2317	N 649	O 700	S 3	0	0	0
1	C	484	Total 3674	C 2319	N 650	O 702	S 3	0	0	0
1	J	481	Total 3655	C 2309	N 646	O 697	S 3	0	0	0
1	K	486	Total 3684	C 2326	N 652	O 703	S 3	0	0	0
1	L	482	Total 3664	C 2314	N 648	O 699	S 3	0	0	0
1	S	480	Total 3651	C 2307	N 645	O 696	S 3	0	0	0
1	T	481	Total 3659	C 2311	N 647	O 698	S 3	0	0	0
1	U	481	Total 3659	C 2311	N 647	O 698	S 3	0	0	0

- Molecule 2 is a protein called ATP synthase beta chain, mitochondrial.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
2	D	470	Total 3549	C 2250	N 604	O 689	S 6	0	0	0
2	E	468	Total 3536	C 2243	N 602	O 685	S 6	0	0	0
2	F	469	Total 3543	C 2247	N 603	O 687	S 6	0	0	0
2	M	470	Total 3549	C 2250	N 604	O 689	S 6	0	0	0
2	N	470	Total 3549	C 2250	N 604	O 689	S 6	0	0	0

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Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	O	468	Total	C	N	O	S	0	0	0
			3538	2244	602	686	6			
2	V	470	Total	C	N	O	S	0	0	0
			3549	2250	604	689	6			
2	W	467	Total	C	N	O	S	0	0	0
			3531	2240	601	684	6			
2	X	469	Total	C	N	O	S	0	0	0
			3543	2247	603	687	6			

- Molecule 3 is a protein called ATP synthase gamma chain, mitochondrial.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
3	G	265	Total	C	N	O	S	0	0	0
			2031	1277	355	389	10			
3	P	243	Total	C	N	O	S	0	0	0
			1851	1165	322	355	9			
3	Y	200	Total	C	N	O	S	0	0	0
			1517	944	273	291	9			

- Molecule 4 is a protein called ATP synthase delta chain, mitochondrial.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
4	H	120	Total	C	N	O	S	0	0	0
			758	475	134	147	2			
4	Q	84	Total	C	N	O		0	0	0
			436	262	87	87				
4	Z	17	Total	C	N	O		0	0	0
			85	51	17	17				

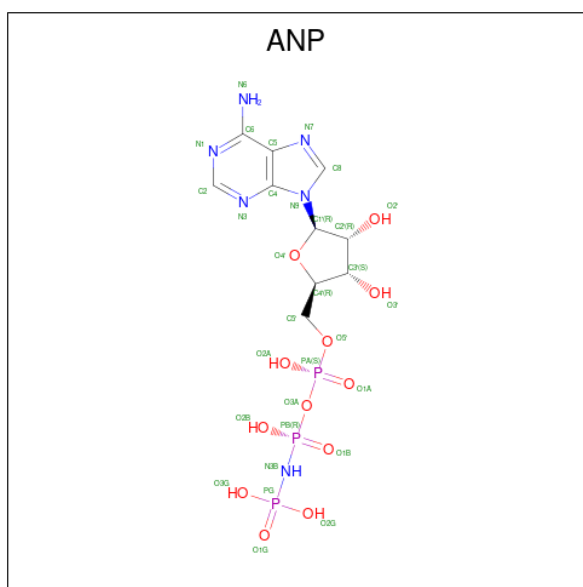
- Molecule 5 is a protein called ATP synthase epsilon chain, mitochondrial.

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
5	I	48	Total	C	N	O	0	0	0
			324	201	56	67			
5	R	34	Total	C	N	O	0	0	0
			170	102	34	34			
5	1	27	Total	C	N	O	0	0	0
			135	81	27	27			

- Molecule 6 is MAGNESIUM ION (three-letter code: MG) (formula: Mg).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
6	A	1	Total Mg 1 1	0	0
6	B	1	Total Mg 1 1	0	0
6	C	1	Total Mg 1 1	0	0
6	D	1	Total Mg 1 1	0	0
6	F	1	Total Mg 1 1	0	0
6	J	1	Total Mg 1 1	0	0
6	K	1	Total Mg 1 1	0	0
6	L	1	Total Mg 1 1	0	0
6	M	1	Total Mg 1 1	0	0
6	O	1	Total Mg 1 1	0	0
6	S	1	Total Mg 1 1	0	0
6	T	1	Total Mg 1 1	0	0
6	U	1	Total Mg 1 1	0	0
6	V	1	Total Mg 1 1	0	0
6	X	1	Total Mg 1 1	0	0

- Molecule 7 is PHOSPHOAMINOPHOSPHONIC ACID-ADENYLATE ESTER (three-letter code: ANP) (formula:  $C_{10}H_{17}N_6O_{12}P_3$ ).



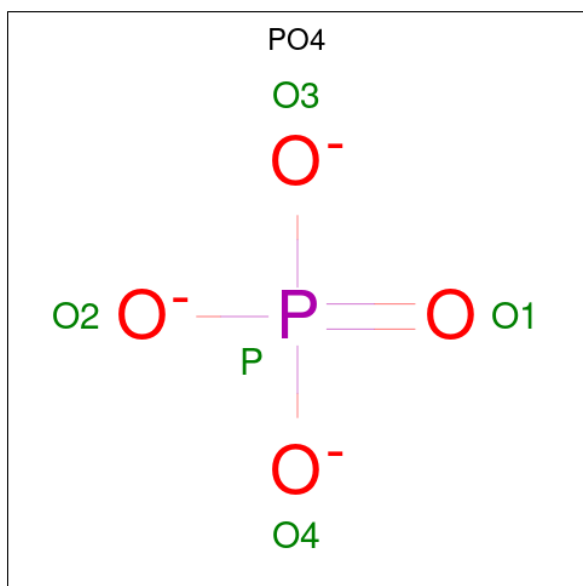
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
			Total	C	N	O	P		
7	A	1	Total 31	10	6	12	3	0	0
7	B	1	Total 31	10	6	12	3	0	0
7	C	1	Total 31	10	6	12	3	0	0
7	D	1	Total 31	10	6	12	3	0	0
7	F	1	Total 31	10	6	12	3	0	0
7	J	1	Total 31	10	6	12	3	0	0
7	K	1	Total 31	10	6	12	3	0	0
7	L	1	Total 31	10	6	12	3	0	0
7	M	1	Total 31	10	6	12	3	0	0
7	O	1	Total 31	10	6	12	3	0	0
7	S	1	Total 31	10	6	12	3	0	0
7	T	1	Total 31	10	6	12	3	0	0
7	U	1	Total 31	10	6	12	3	0	0
7	V	1	Total 31	10	6	12	3	0	0

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Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	
			Total	C	N	O			P
7	X	1	31	10	6	12	3	0	0

- Molecule 8 is PHOSPHATE ION (three-letter code: PO4) (formula: O<sub>4</sub>P).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
			Total	O	P		
8	N	1	5	4	1	0	0

- Molecule 9 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
9	A	26	Total	O	0	0
			26	26		
9	B	18	Total	O	0	0
			18	18		
9	C	13	Total	O	0	0
			13	13		
9	D	20	Total	O	0	0
			20	20		
9	E	13	Total	O	0	0
			13	13		
9	F	11	Total	O	0	0
			11	11		
9	G	3	Total	O	0	0
			3	3		

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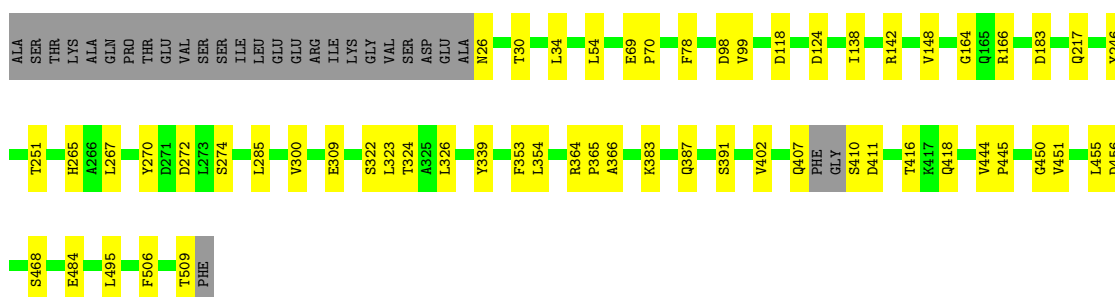
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
9	J	17	Total 17	O 17	0	0
9	K	4	Total 4	O 4	0	0
9	L	19	Total 19	O 19	0	0
9	M	9	Total 9	O 9	0	0
9	N	8	Total 8	O 8	0	0
9	O	7	Total 7	O 7	0	0
9	P	2	Total 2	O 2	0	0
9	Q	1	Total 1	O 1	0	0
9	S	6	Total 6	O 6	0	0
9	T	1	Total 1	O 1	0	0
9	U	3	Total 3	O 3	0	0
9	X	2	Total 2	O 2	0	0

### 3 Residue-property plots [i](#)


These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry. Residues are color-coded according to the number of geometric quality criteria for which they contain at least one outlier: green = 0, yellow = 1, orange = 2 and red = 3 or more. Stretches of 2 or more consecutive residues without any outlier are shown as a green connector. Residues present in the sample, but not in the model, are shown in grey.

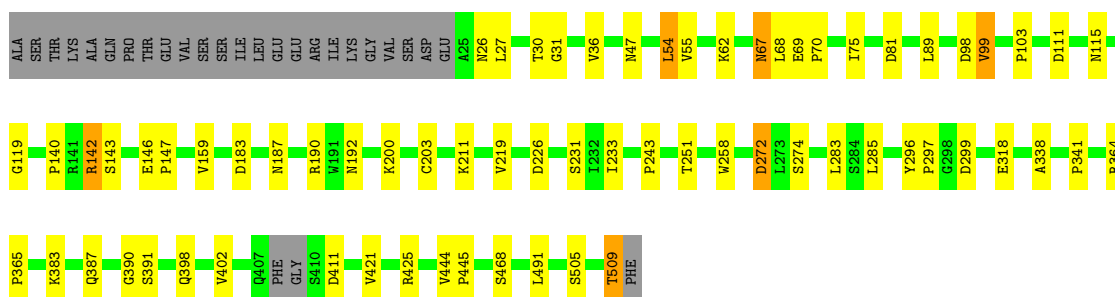
- Molecule 1: ATP synthase alpha chain, mitochondrial

Chain A:  83% 11% 5%




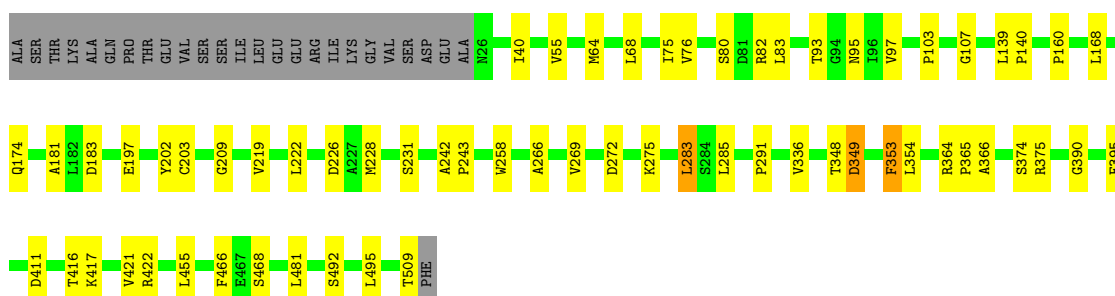
- Molecule 1: ATP synthase alpha chain, mitochondrial

Chain B:  81% 12% 5%




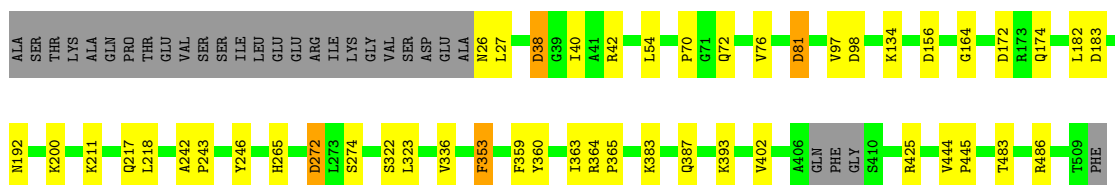
- Molecule 1: ATP synthase alpha chain, mitochondrial

Chain C:  82% 12% 5%




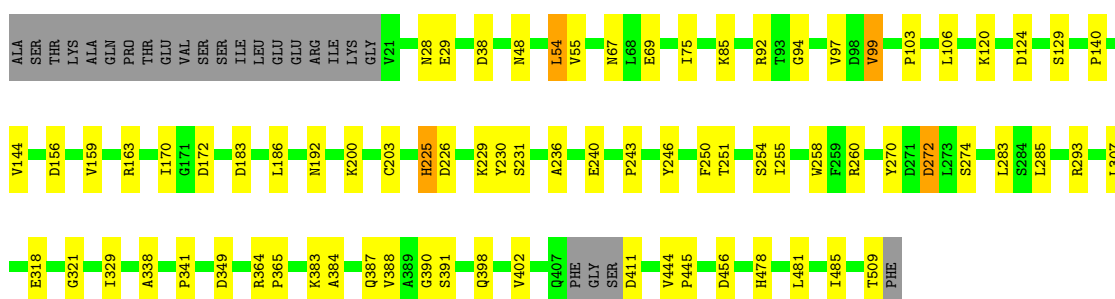
- Molecule 1: ATP synthase alpha chain, mitochondrial

Chain J:  85% 9% 6%




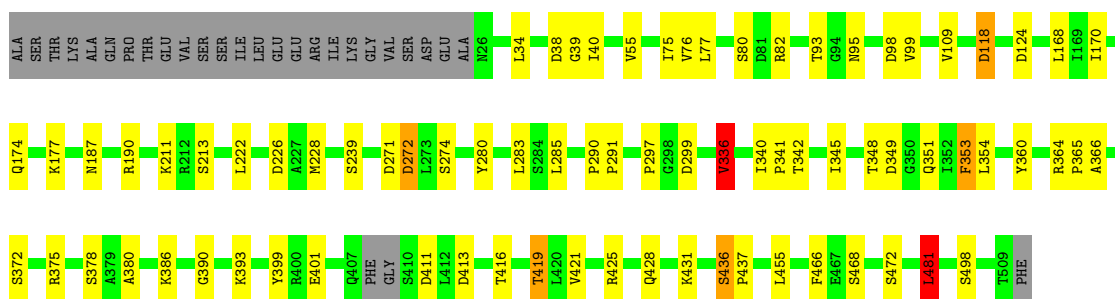
- Molecule 1: ATP synthase alpha chain, mitochondrial

Chain K:  80% 14% 5%




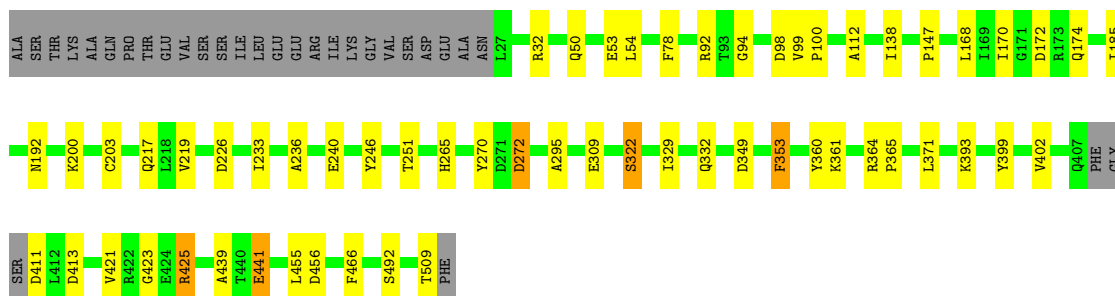
- Molecule 1: ATP synthase alpha chain, mitochondrial

Chain L:  79% 14% 5%

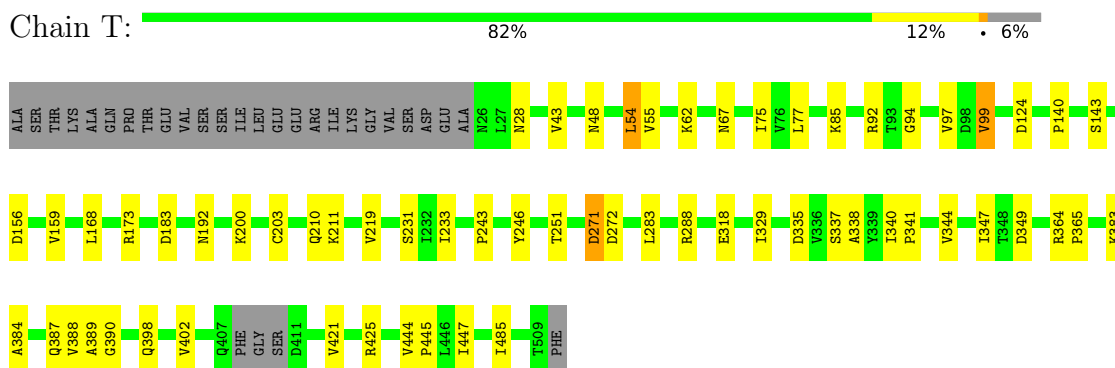


- Molecule 1: ATP synthase alpha chain, mitochondrial

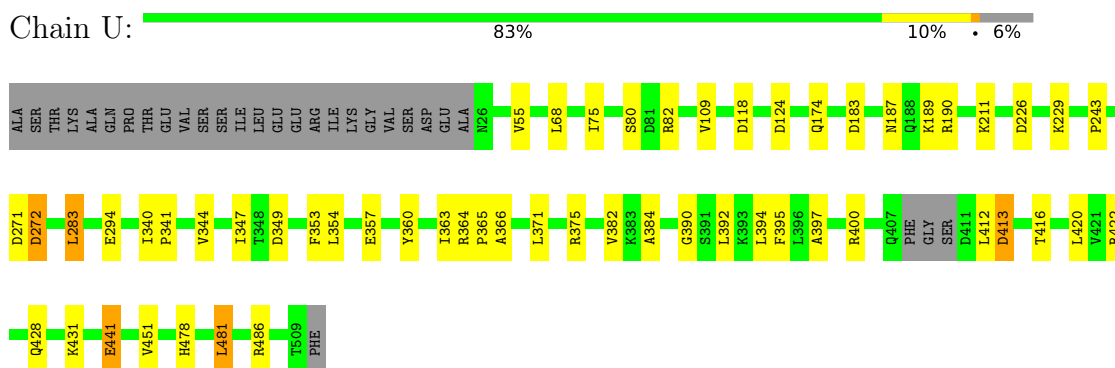
Chain S:  83% 11% 6%



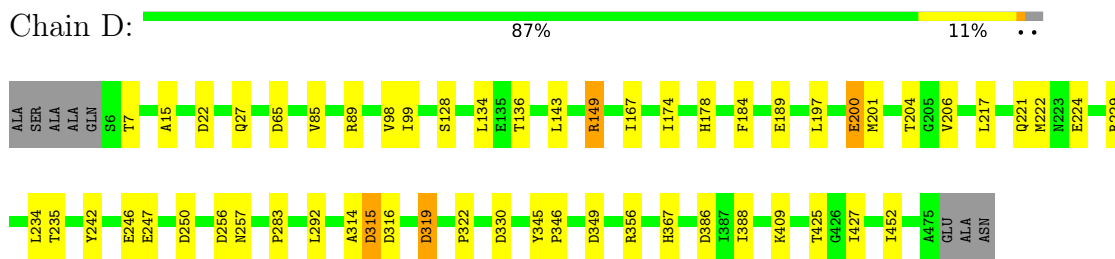
- Molecule 1: ATP synthase alpha chain, mitochondrial



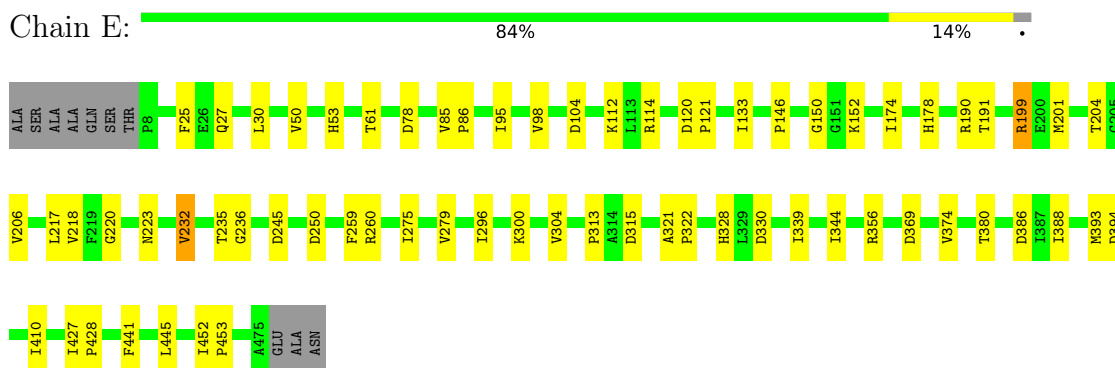
- Molecule 1: ATP synthase alpha chain, mitochondrial



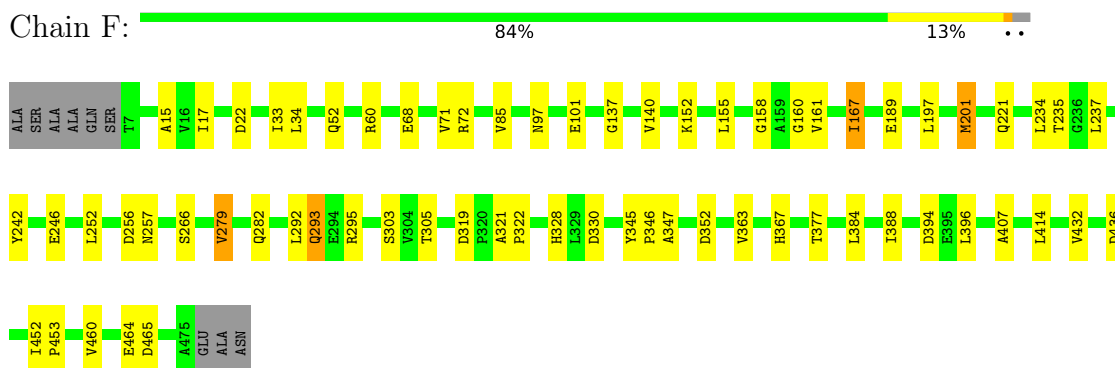
- Molecule 2: ATP synthase beta chain, mitochondrial



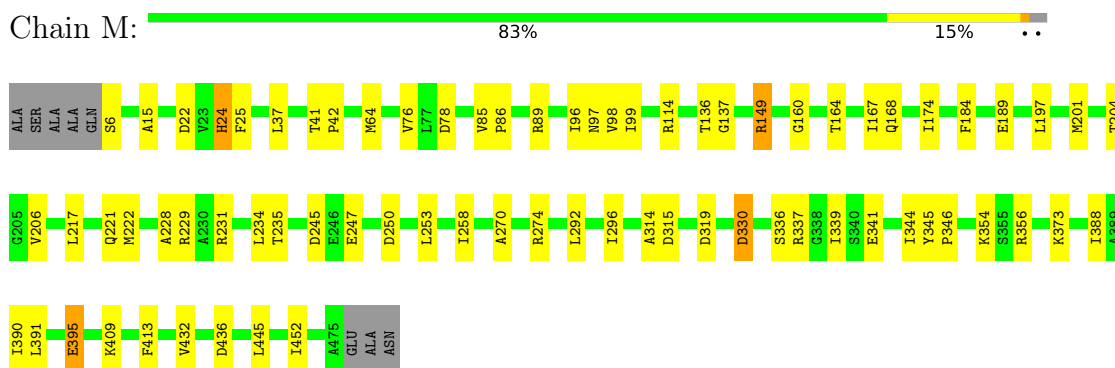
- Molecule 2: ATP synthase beta chain, mitochondrial



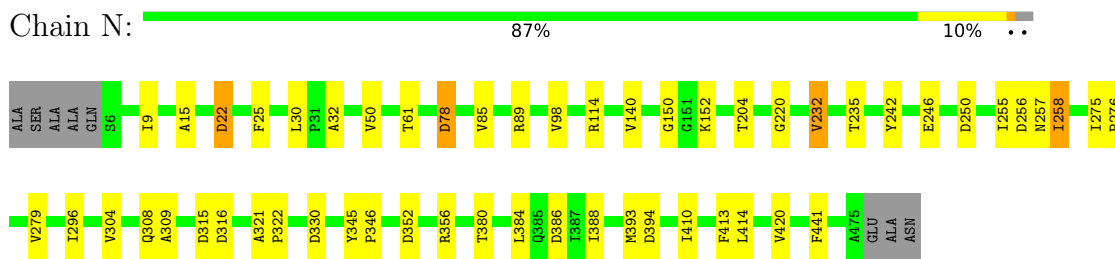
- Molecule 2: ATP synthase beta chain, mitochondrial



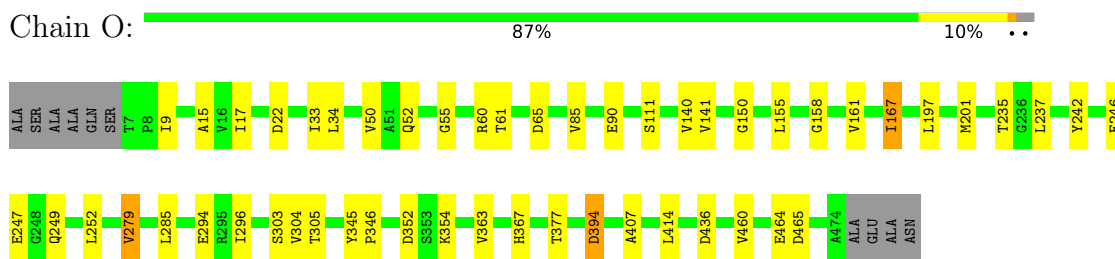
- Molecule 2: ATP synthase beta chain, mitochondrial



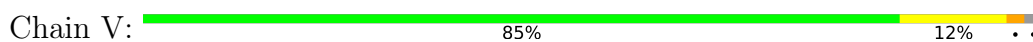
- Molecule 2: ATP synthase beta chain, mitochondrial

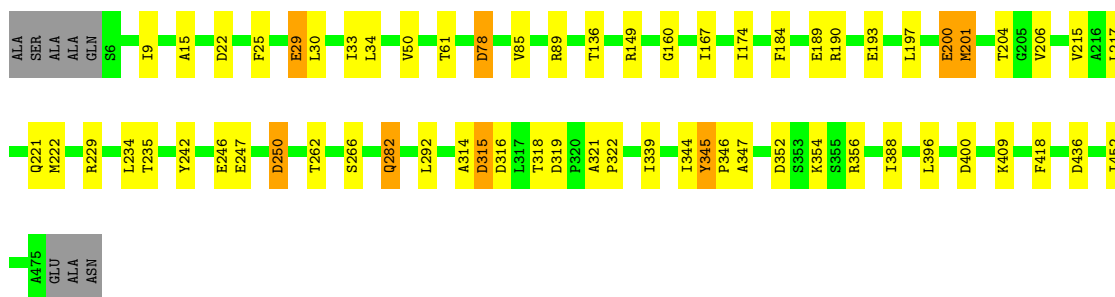


- Molecule 2: ATP synthase beta chain, mitochondrial



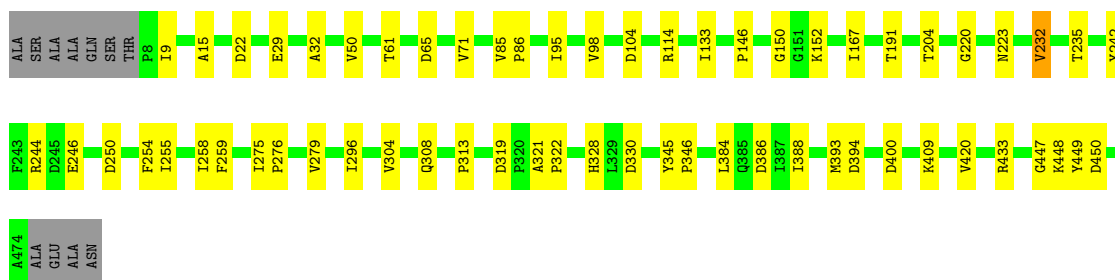
- Molecule 2: ATP synthase beta chain, mitochondrial





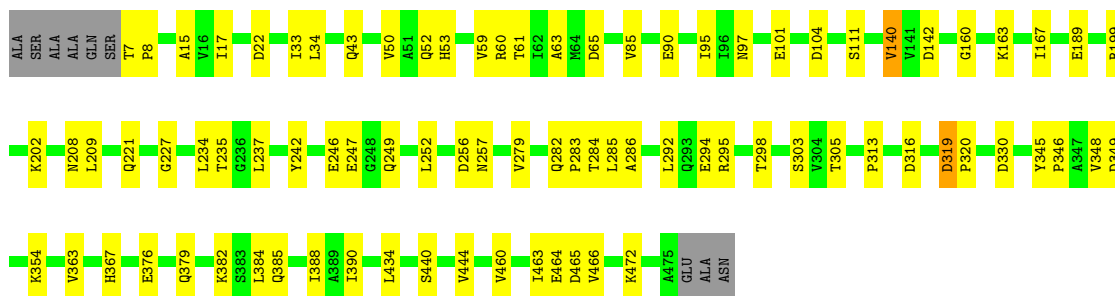
- Molecule 2: ATP synthase beta chain, mitochondrial

Chain W: 85% 13%



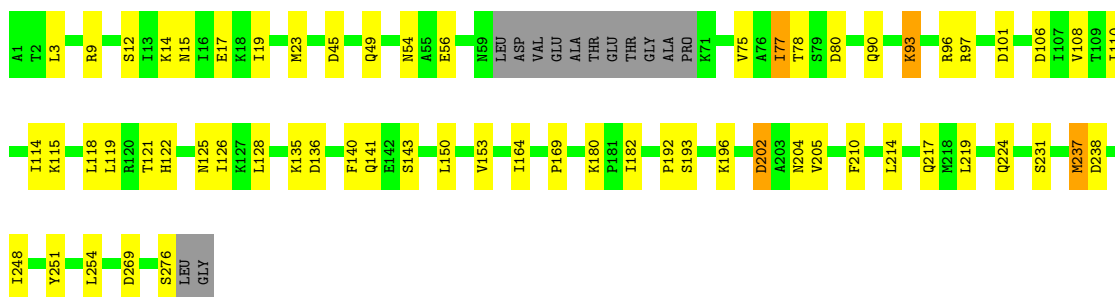
- Molecule 2: ATP synthase beta chain, mitochondrial

Chain X: 80% 17%



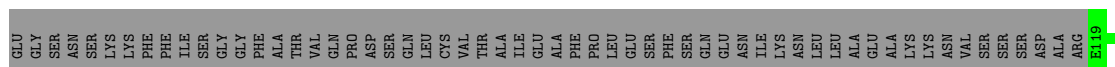
- Molecule 3: ATP synthase gamma chain, mitochondrial

Chain G: 73% 21% 5%



- Molecule 3: ATP synthase gamma chain, mitochondrial





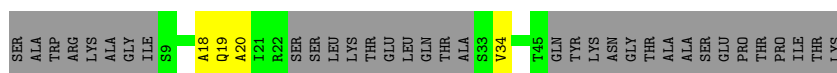
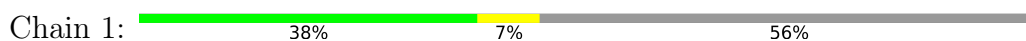
- Molecule 5: ATP synthase epsilon chain, mitochondrial



- Molecule 5: ATP synthase epsilon chain, mitochondrial



- Molecule 5: ATP synthase epsilon chain, mitochondrial





## 4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	111.52Å 294.13Å 190.43Å 90.00° 101.67° 90.00°	Depositor
Resolution (Å)	20.00 – 2.80 19.99 – 2.80	Depositor EDS
% Data completeness (in resolution range)	99.9 (20.00-2.80) 99.9 (19.99-2.80)	Depositor EDS
$R_{merge}$	0.07	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	2.35 (at 2.79Å)	Xtrriage
Refinement program	REFMAC 5.2.0019	Depositor
R, $R_{free}$	0.207 , 0.244 0.211 , 0.244	Depositor DCC
$R_{free}$ test set	5938 reflections (2.03%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	72.1	Xtrriage
Anisotropy	0.101	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.28 , 80.5	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.49$ , $\langle L^2 \rangle = 0.32$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
$F_o, F_c$ correlation	0.91	EDS
Total number of atoms	72841	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	71.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 1.86% of the height of the origin peak. No significant pseudotranslation is detected.*

<sup>1</sup>Intensities estimated from amplitudes.

<sup>2</sup>Theoretical values of  $\langle |L| \rangle$ ,  $\langle L^2 \rangle$  for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

## 5 Model quality i

### 5.1 Standard geometry i

Bond lengths and bond angles in the following residue types are not validated in this section: PO4, MG, ANP

The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with  $|Z| > 5$  is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	# Z  >5	RMSZ	# Z  >5
1	A	0.64	0/3718	0.79	6/5032 (0.1%)
1	B	0.57	0/3723	0.76	6/5039 (0.1%)
1	C	0.57	0/3729	0.76	5/5048 (0.1%)
1	J	0.55	0/3709	0.74	7/5020 (0.1%)
1	K	0.46	0/3738	0.69	9/5060 (0.2%)
1	L	0.62	1/3718 (0.0%)	0.81	13/5032 (0.3%)
1	S	0.47	0/3705	0.72	8/5014 (0.2%)
1	T	0.38	0/3713	0.64	5/5025 (0.1%)
1	U	0.41	0/3713	0.68	6/5025 (0.1%)
2	D	0.57	0/3605	0.81	9/4889 (0.2%)
2	E	0.56	0/3592	0.76	10/4870 (0.2%)
2	F	0.54	0/3599	0.78	5/4881 (0.1%)
2	M	0.55	0/3605	0.80	5/4889 (0.1%)
2	N	0.48	0/3605	0.74	7/4889 (0.1%)
2	O	0.50	0/3594	0.75	4/4874 (0.1%)
2	V	0.43	0/3605	0.75	8/4889 (0.2%)
2	W	0.40	0/3587	0.69	6/4863 (0.1%)
2	X	0.42	0/3599	0.70	5/4881 (0.1%)
3	G	0.48	0/2056	0.74	6/2767 (0.2%)
3	P	0.47	0/1868	0.70	2/2508 (0.1%)
3	Y	0.37	0/1527	0.63	2/2048 (0.1%)
4	H	0.47	0/766	0.64	0/1051
4	Q	0.41	0/434	0.55	0/595
4	Z	0.42	0/84	0.51	0/116
5	I	0.38	0/133	0.44	0/183
5	I	0.55	0/326	0.69	0/445
5	R	0.45	0/168	0.51	0/232
All	All	0.51	1/73219 (0.0%)	0.74	134/99165 (0.1%)

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand. A planarity outlier is detected

by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
1	S	0	1
2	D	0	1
2	V	0	1
2	W	0	1
All	All	0	4

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	L	353	PHE	CB-CG	-5.87	1.41	1.51

The worst 5 of 134 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	V	345	TYR	C-N-CD	-13.32	91.28	120.60
2	D	22	ASP	CB-CG-OD2	10.23	127.51	118.30
2	F	436	ASP	CB-CG-OD2	7.85	125.37	118.30
1	C	283	LEU	CA-CB-CG	7.74	133.09	115.30
2	M	319	ASP	CB-CG-OD2	7.57	125.11	118.30

There are no chirality outliers.

All (4) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
2	D	7	THR	Peptide
1	S	147	PRO	Peptide
2	V	345	TYR	Peptide
2	W	447	GLY	Peptide

## 5.2 Too-close contacts

In the following table, the Non-H and H(model) columns list the number of non-hydrogen atoms and hydrogen atoms in the chain respectively. The H(added) column lists the number of hydrogen atoms added and optimized by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, whereas Symm-Clashes lists symmetry-related clashes.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	3664	0	3748	27	0
1	B	3669	0	3752	40	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	C	3674	0	3756	39	0
1	J	3655	0	3739	31	0
1	K	3684	0	3758	43	0
1	L	3664	0	3747	45	0
1	S	3651	0	3740	35	0
1	T	3659	0	3745	35	0
1	U	3659	0	3745	29	0
2	D	3549	0	3620	29	0
2	E	3536	0	3610	39	0
2	F	3543	0	3615	40	0
2	M	3549	0	3620	52	0
2	N	3549	0	3621	33	0
2	O	3538	0	3610	31	0
2	V	3549	0	3620	38	0
2	W	3531	0	3605	37	0
2	X	3543	0	3615	49	0
3	G	2031	0	2084	31	0
3	P	1851	0	1893	39	0
3	Y	1517	0	1561	28	0
4	H	758	0	602	9	0
4	Q	436	0	215	3	0
4	Z	85	0	45	0	0
5	1	135	0	70	1	0
5	I	324	0	249	2	0
5	R	170	0	87	0	0
6	A	1	0	0	0	0
6	B	1	0	0	0	0
6	C	1	0	0	0	0
6	D	1	0	0	0	0
6	F	1	0	0	0	0
6	J	1	0	0	0	0
6	K	1	0	0	0	0
6	L	1	0	0	0	0
6	M	1	0	0	0	0
6	O	1	0	0	0	0
6	S	1	0	0	0	0
6	T	1	0	0	0	0
6	U	1	0	0	0	0
6	V	1	0	0	0	0
6	X	1	0	0	0	0
7	A	31	0	13	0	0
7	B	31	0	13	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
7	C	31	0	13	1	0
7	D	31	0	13	0	0
7	F	31	0	13	2	0
7	J	31	0	13	0	0
7	K	31	0	13	1	0
7	L	31	0	13	1	0
7	M	31	0	13	6	0
7	O	31	0	13	0	0
7	S	31	0	13	1	0
7	T	31	0	13	0	0
7	U	31	0	13	0	0
7	V	31	0	13	3	0
7	X	31	0	13	4	0
8	N	5	0	0	0	0
9	A	26	0	0	2	0
9	B	18	0	0	0	0
9	C	13	0	0	0	0
9	D	20	0	0	0	0
9	E	13	0	0	1	0
9	F	11	0	0	0	0
9	G	3	0	0	0	0
9	J	17	0	0	0	0
9	K	4	0	0	0	0
9	L	19	0	0	0	0
9	M	9	0	0	0	0
9	N	8	0	0	0	0
9	O	7	0	0	0	0
9	P	2	0	0	0	0
9	Q	1	0	0	2	0
9	S	6	0	0	0	0
9	T	1	0	0	0	0
9	U	3	0	0	0	0
9	X	2	0	0	0	0
All	All	72841	0	73267	728	0

The all-atom clashscore is defined as the number of clashes found per 1000 atoms (including hydrogen atoms). The all-atom clashscore for this structure is 5.

The worst 5 of 728 close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:V:85:VAL:HG11	2:V:235:THR:HG23	1.26	1.16
2:E:85:VAL:HG11	2:E:235:THR:HG23	1.27	1.12
2:N:85:VAL:HG11	2:N:235:THR:HG23	1.28	1.11
2:D:85:VAL:HG11	2:D:235:THR:HG23	1.25	1.11
3:G:96:ARG:HE	3:G:121:THR:HG21	1.10	1.09

There are no symmetry-related clashes.

### 5.3 Torsion angles [i](#)

#### 5.3.1 Protein backbone [i](#)

In the following table, the Percentiles column shows the percent Ramachandran outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

The Analysed column shows the number of residues for which the backbone conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	A	478/510 (94%)	465 (97%)	13 (3%)	0	100	100
1	B	479/510 (94%)	462 (96%)	17 (4%)	0	100	100
1	C	482/510 (94%)	469 (97%)	12 (2%)	1 (0%)	47	78
1	J	477/510 (94%)	466 (98%)	11 (2%)	0	100	100
1	K	482/510 (94%)	469 (97%)	13 (3%)	0	100	100
1	L	478/510 (94%)	458 (96%)	19 (4%)	1 (0%)	47	78
1	S	476/510 (93%)	461 (97%)	15 (3%)	0	100	100
1	T	477/510 (94%)	466 (98%)	10 (2%)	1 (0%)	47	78
1	U	477/510 (94%)	462 (97%)	14 (3%)	1 (0%)	47	78
2	D	468/478 (98%)	452 (97%)	16 (3%)	0	100	100
2	E	466/478 (98%)	446 (96%)	19 (4%)	1 (0%)	47	78
2	F	467/478 (98%)	445 (95%)	19 (4%)	3 (1%)	25	56
2	M	468/478 (98%)	449 (96%)	19 (4%)	0	100	100
2	N	468/478 (98%)	454 (97%)	13 (3%)	1 (0%)	47	78
2	O	466/478 (98%)	446 (96%)	19 (4%)	1 (0%)	47	78
2	V	468/478 (98%)	448 (96%)	20 (4%)	0	100	100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
2	W	465/478 (97%)	450 (97%)	14 (3%)	1 (0%)	47	78
2	X	467/478 (98%)	448 (96%)	18 (4%)	1 (0%)	47	78
3	G	261/278 (94%)	235 (90%)	23 (9%)	3 (1%)	14	41
3	P	229/278 (82%)	201 (88%)	21 (9%)	7 (3%)	4	14
3	Y	188/278 (68%)	172 (92%)	16 (8%)	0	100	100
4	H	110/138 (80%)	98 (89%)	10 (9%)	2 (2%)	8	28
4	Q	74/138 (54%)	59 (80%)	12 (16%)	3 (4%)	3	9
4	Z	15/138 (11%)	13 (87%)	2 (13%)	0	100	100
5	1	23/61 (38%)	20 (87%)	1 (4%)	2 (9%)	1	1
5	I	42/61 (69%)	35 (83%)	5 (12%)	2 (5%)	2	7
5	R	30/61 (49%)	23 (77%)	5 (17%)	2 (7%)	1	3
All	All	9481/10323 (92%)	9072 (96%)	376 (4%)	33 (0%)	41	72

5 of 33 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
3	G	135	LYS
5	I	31	THR
5	R	31	THR
5	R	32	ALA
3	G	204	ASN

### 5.3.2 Protein sidechains [i](#)

In the following table, the Percentiles column shows the percent sidechain outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

The Analysed column shows the number of residues for which the sidechain conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	388/412 (94%)	382 (98%)	6 (2%)	65	89
1	B	388/412 (94%)	380 (98%)	8 (2%)	53	84
1	C	389/412 (94%)	382 (98%)	7 (2%)	59	86
1	J	387/412 (94%)	382 (99%)	5 (1%)	69	91
1	K	388/412 (94%)	379 (98%)	9 (2%)	50	82

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	L	388/412 (94%)	378 (97%)	10 (3%)	46	79
1	S	387/412 (94%)	378 (98%)	9 (2%)	50	82
1	T	388/412 (94%)	382 (98%)	6 (2%)	65	89
1	U	388/412 (94%)	381 (98%)	7 (2%)	59	86
2	D	380/384 (99%)	374 (98%)	6 (2%)	62	88
2	E	378/384 (98%)	373 (99%)	5 (1%)	69	91
2	F	379/384 (99%)	374 (99%)	5 (1%)	69	91
2	M	380/384 (99%)	372 (98%)	8 (2%)	53	84
2	N	380/384 (99%)	373 (98%)	7 (2%)	59	86
2	O	379/384 (99%)	376 (99%)	3 (1%)	81	94
2	V	380/384 (99%)	372 (98%)	8 (2%)	53	84
2	W	378/384 (98%)	374 (99%)	4 (1%)	73	92
2	X	379/384 (99%)	374 (99%)	5 (1%)	69	91
3	G	219/236 (93%)	206 (94%)	13 (6%)	19	49
3	P	198/236 (84%)	183 (92%)	15 (8%)	13	36
3	Y	163/236 (69%)	157 (96%)	6 (4%)	34	68
4	H	54/112 (48%)	52 (96%)	2 (4%)	34	68
4	Q	5/112 (4%)	5 (100%)	0	100	100
5	I	23/48 (48%)	20 (87%)	3 (13%)	4	13
All	All	7566/8144 (93%)	7409 (98%)	157 (2%)	53	84

5 of 157 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	S	353	PHE
2	W	258	ILE
1	S	441	GLU
1	U	412	LEU
2	X	472	LYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 33 such sidechains are listed below:

Mol	Chain	Res	Type
2	X	52	GLN

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Mol	Chain	Res	Type
2	X	379	GLN
3	Y	141	GLN
1	L	220	GLN
1	L	174	GLN

### 5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

### 5.4 Non-standard residues in protein, DNA, RNA chains [i](#)

There are no non-standard protein/DNA/RNA residues in this entry.

### 5.5 Carbohydrates [i](#)

There are no monosaccharides in this entry.

### 5.6 Ligand geometry [i](#)

Of 31 ligands modelled in this entry, 15 are monoatomic - leaving 16 for Mogul analysis.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with  $|Z| > 2$  is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z  > 2	Counts	RMSZ	# Z  > 2
7	ANP	D	600	6	29,33,33	1.62	8 (27%)	31,52,52	1.93	8 (25%)
7	ANP	J	600	6	29,33,33	1.76	8 (27%)	31,52,52	2.24	7 (22%)
7	ANP	S	600	6	29,33,33	1.91	6 (20%)	31,52,52	2.08	12 (38%)
7	ANP	V	600	6	29,33,33	1.84	7 (24%)	31,52,52	1.91	6 (19%)
7	ANP	L	600	6	29,33,33	1.79	7 (24%)	31,52,52	2.16	8 (25%)
7	ANP	M	600	6	29,33,33	1.71	7 (24%)	31,52,52	2.08	7 (22%)
8	PO4	N	800	-	4,4,4	0.88	0	6,6,6	0.76	0
7	ANP	X	600	6	29,33,33	1.68	5 (17%)	31,52,52	2.34	8 (25%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z  > 2	Counts	RMSZ	# Z  > 2
7	ANP	O	600	6	29,33,33	1.84	8 (27%)	31,52,52	1.82	8 (25%)
7	ANP	C	600	6	29,33,33	1.68	8 (27%)	31,52,52	2.15	7 (22%)
7	ANP	U	600	6	29,33,33	1.82	7 (24%)	31,52,52	1.84	8 (25%)
7	ANP	A	600	6	29,33,33	1.99	9 (31%)	31,52,52	1.96	8 (25%)
7	ANP	F	600	6	29,33,33	1.67	7 (24%)	31,52,52	1.99	6 (19%)
7	ANP	K	600	6	29,33,33	1.73	7 (24%)	31,52,52	2.07	9 (29%)
7	ANP	B	600	6	29,33,33	1.69	7 (24%)	31,52,52	2.06	6 (19%)
7	ANP	T	600	6	29,33,33	1.94	9 (31%)	31,52,52	1.81	5 (16%)

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
7	ANP	D	600	6	-	4/14/38/38	0/3/3/3
7	ANP	J	600	6	-	2/14/38/38	0/3/3/3
7	ANP	S	600	6	-	3/14/38/38	0/3/3/3
7	ANP	V	600	6	-	3/14/38/38	0/3/3/3
7	ANP	L	600	6	-	2/14/38/38	0/3/3/3
7	ANP	M	600	6	-	4/14/38/38	0/3/3/3
7	ANP	X	600	6	-	9/14/38/38	0/3/3/3
7	ANP	O	600	6	-	8/14/38/38	0/3/3/3
7	ANP	C	600	6	-	2/14/38/38	0/3/3/3
7	ANP	U	600	6	-	3/14/38/38	0/3/3/3
7	ANP	A	600	6	-	2/14/38/38	0/3/3/3
7	ANP	F	600	6	-	3/14/38/38	0/3/3/3
7	ANP	K	600	6	-	4/14/38/38	0/3/3/3
7	ANP	B	600	6	-	3/14/38/38	0/3/3/3
7	ANP	T	600	6	-	3/14/38/38	0/3/3/3

The worst 5 of 110 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
7	S	600	ANP	PG-O1G	4.98	1.54	1.46
7	S	600	ANP	PG-N3B	4.72	1.75	1.63
7	T	600	ANP	PB-N3B	4.49	1.75	1.63

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
7	O	600	ANP	PG-N3B	4.48	1.75	1.63
7	S	600	ANP	PB-N3B	4.42	1.74	1.63

The worst 5 of 113 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
7	J	600	ANP	O1G-PG-N3B	-8.93	98.62	111.77
7	B	600	ANP	O1G-PG-N3B	-7.20	101.17	111.77
7	C	600	ANP	O1G-PG-N3B	-7.10	101.31	111.77
7	L	600	ANP	O1G-PG-N3B	-6.95	101.54	111.77
7	M	600	ANP	O1G-PG-N3B	-6.43	102.30	111.77

There are no chirality outliers.

5 of 55 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
7	A	600	ANP	PB-N3B-PG-O1G
7	A	600	ANP	PG-N3B-PB-O1B
7	B	600	ANP	PB-N3B-PG-O1G
7	B	600	ANP	PG-N3B-PB-O1B
7	C	600	ANP	PB-N3B-PG-O1G

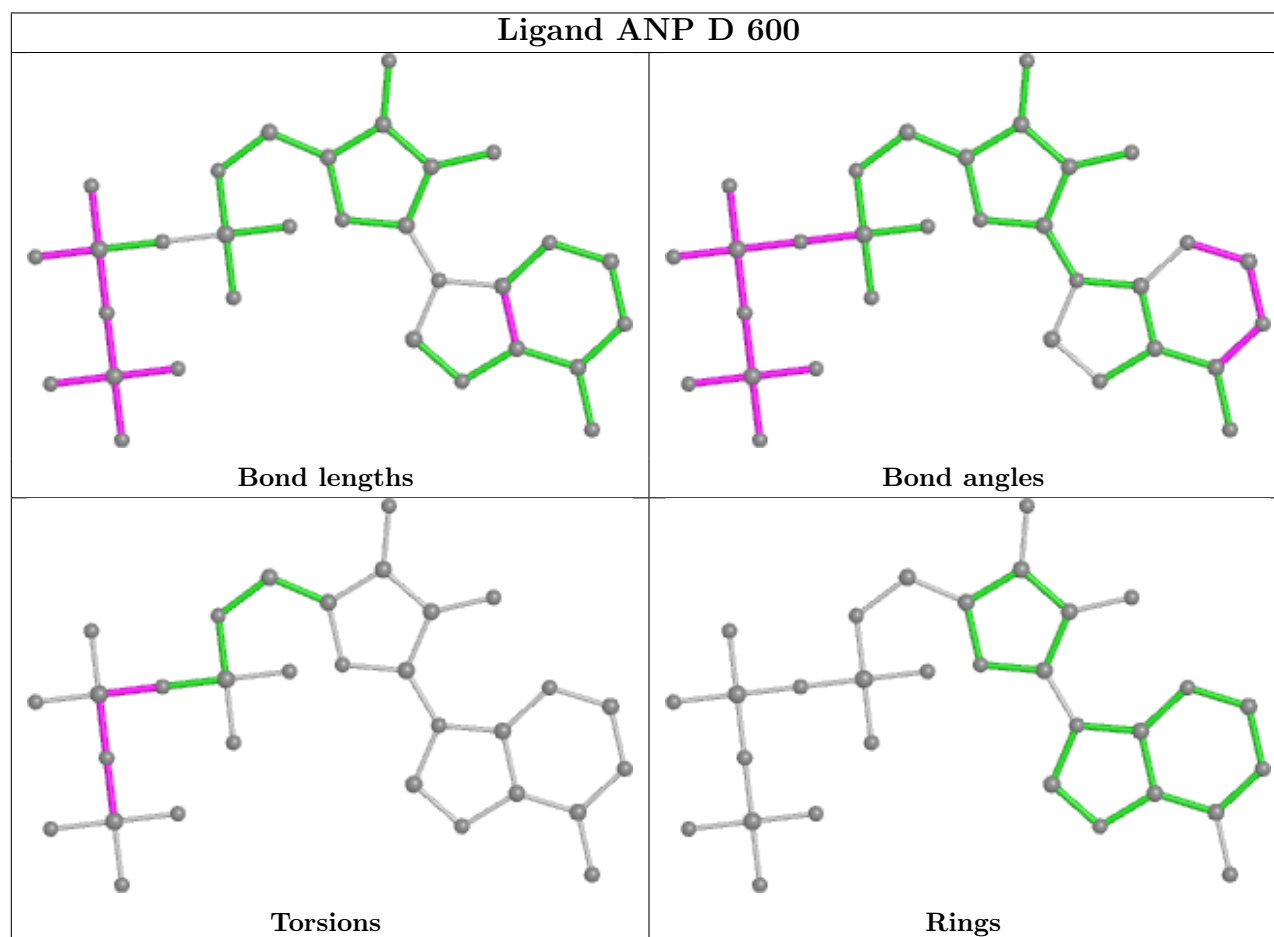
There are no ring outliers.

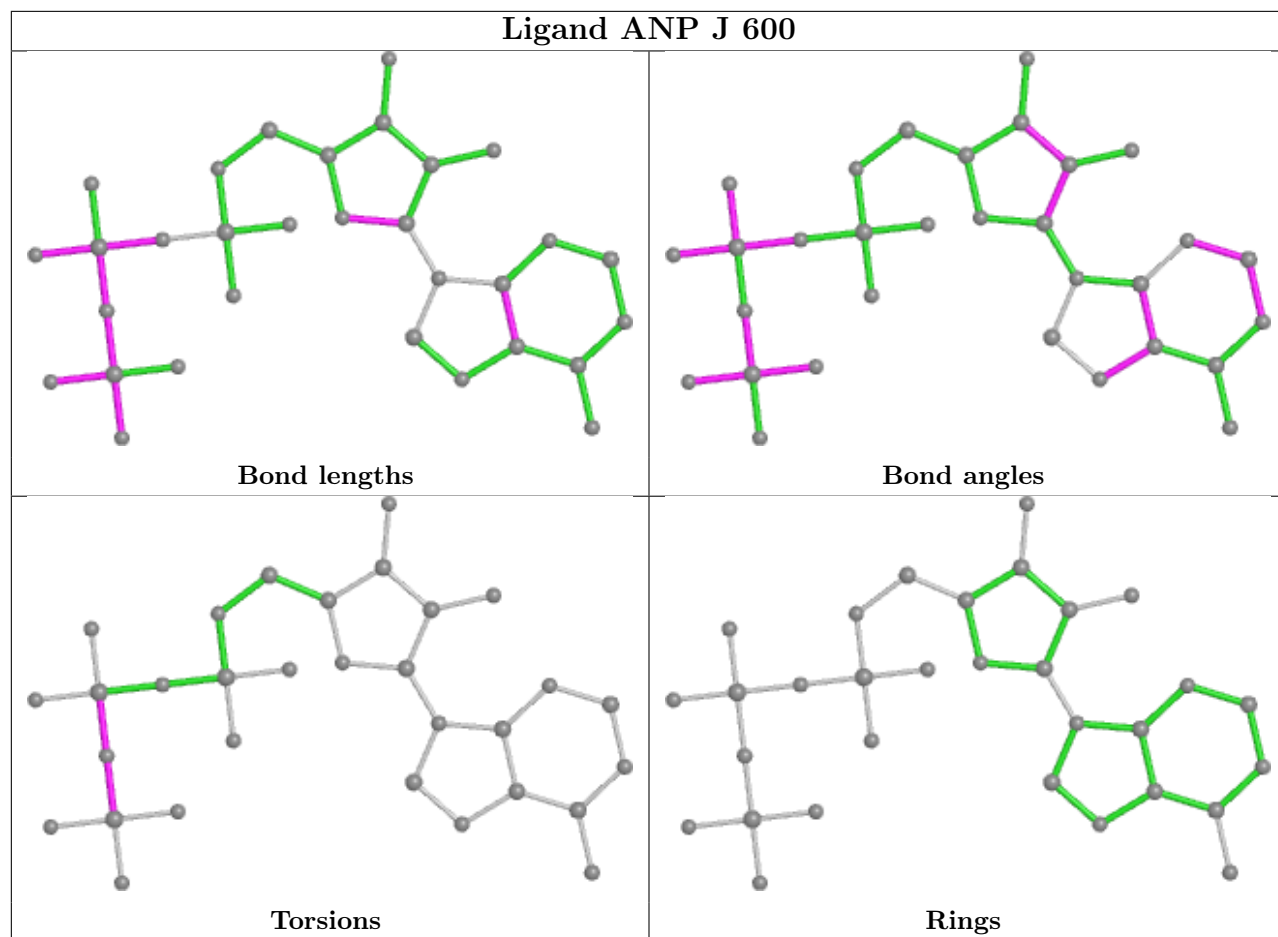
8 monomers are involved in 19 short contacts:

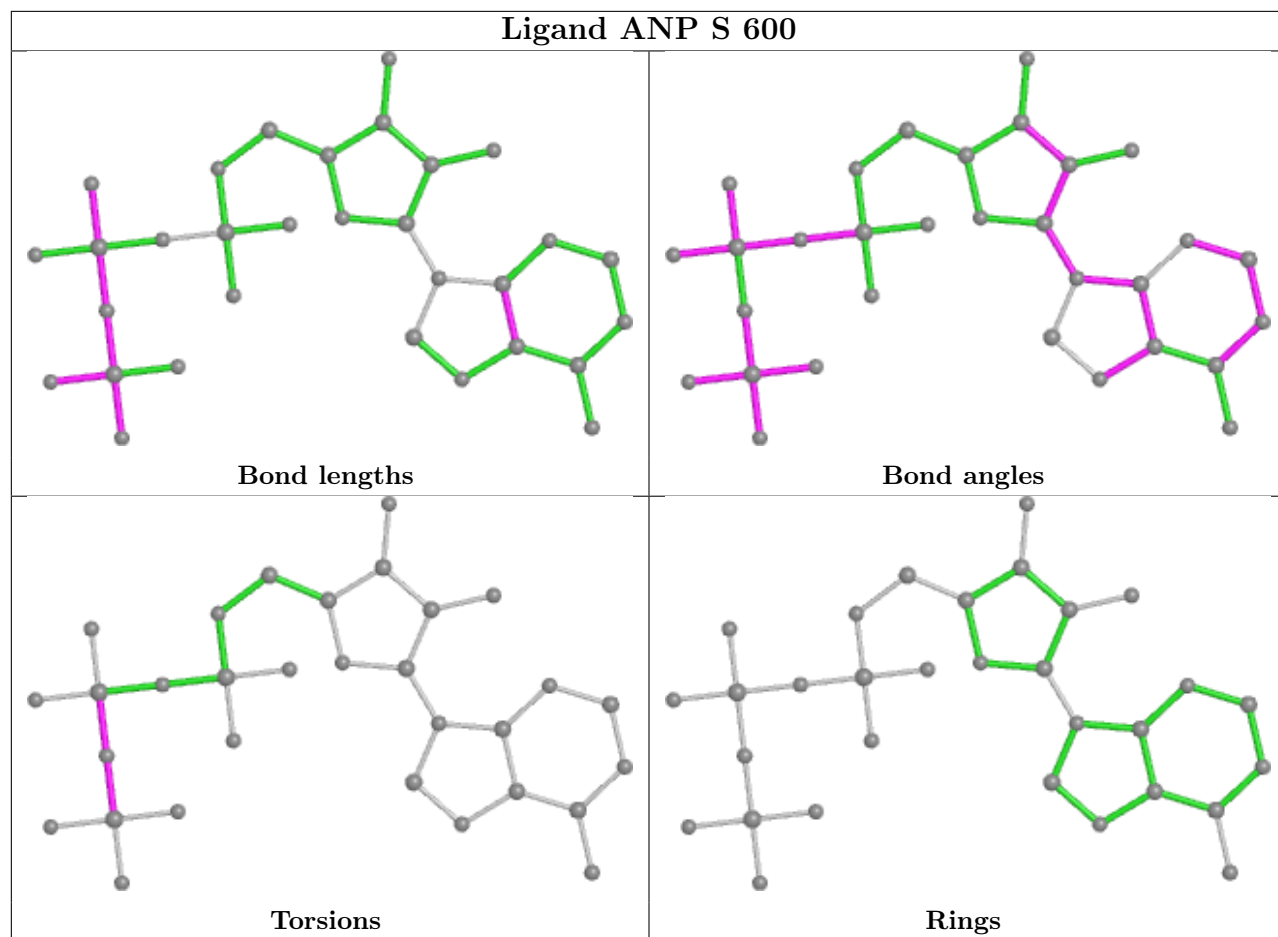
Mol	Chain	Res	Type	Clashes	Symm-Clashes
7	S	600	ANP	1	0
7	V	600	ANP	3	0
7	L	600	ANP	1	0
7	M	600	ANP	6	0
7	X	600	ANP	4	0
7	C	600	ANP	1	0
7	F	600	ANP	2	0
7	K	600	ANP	1	0

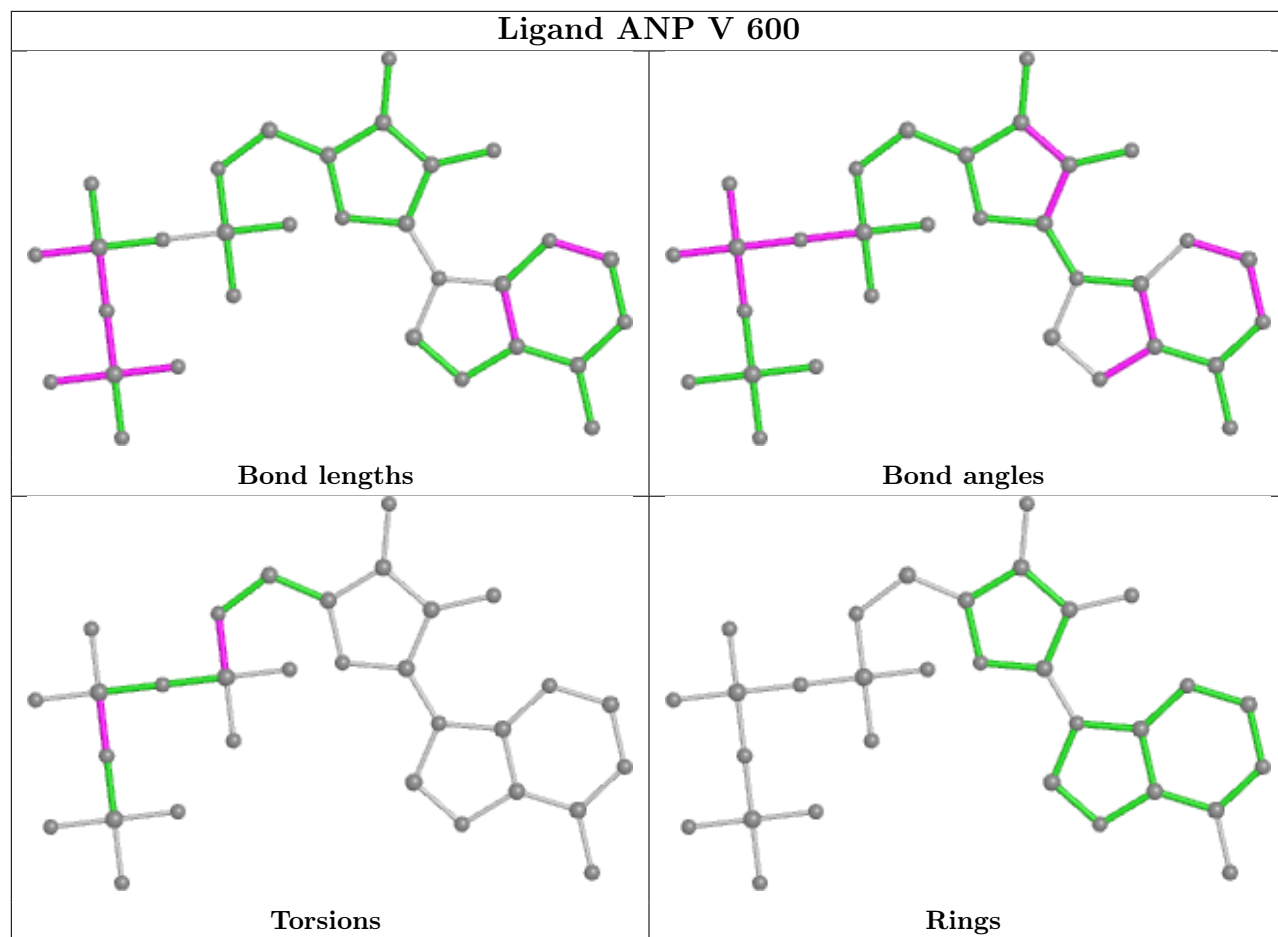
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less than 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be

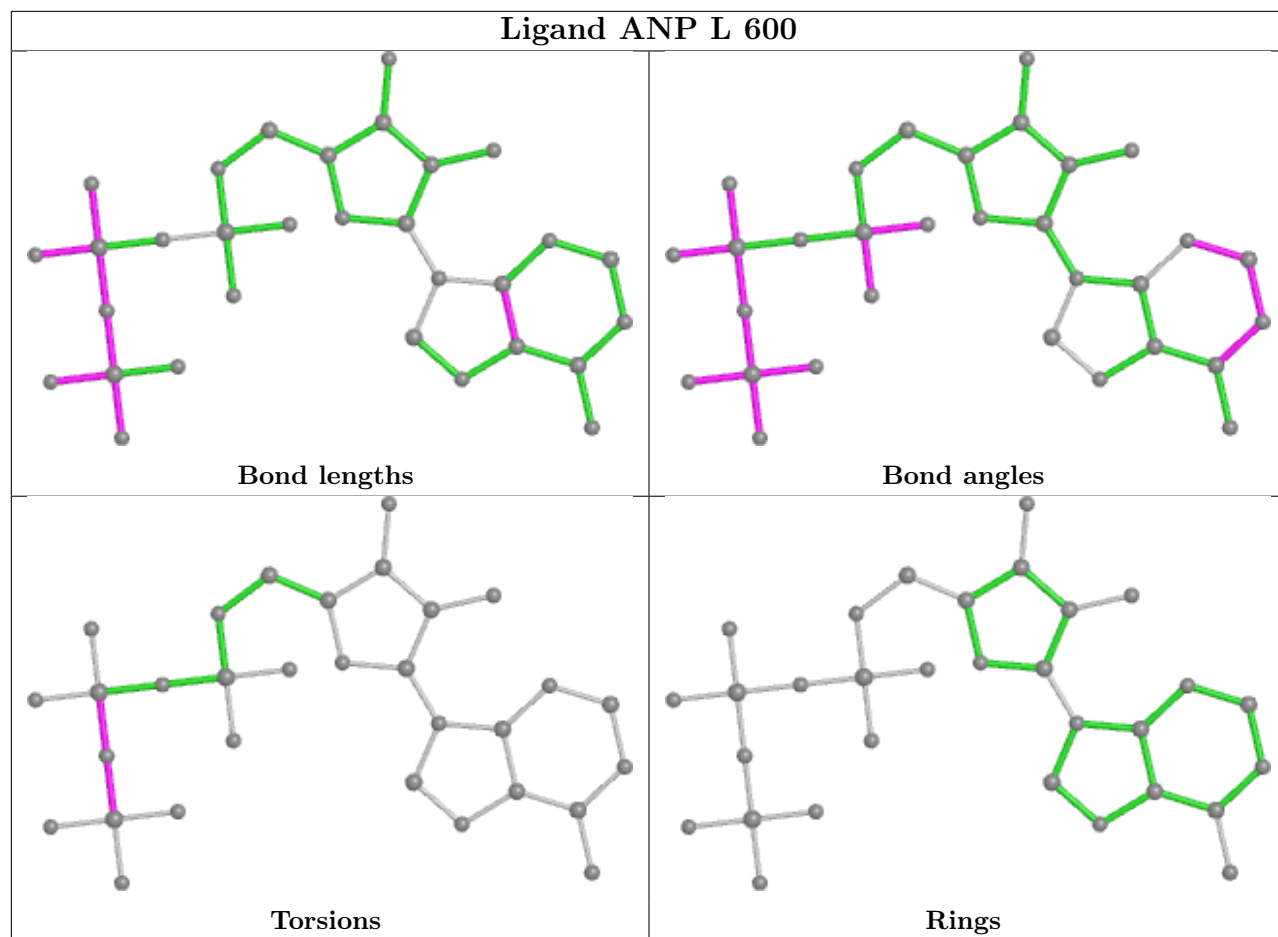
highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.



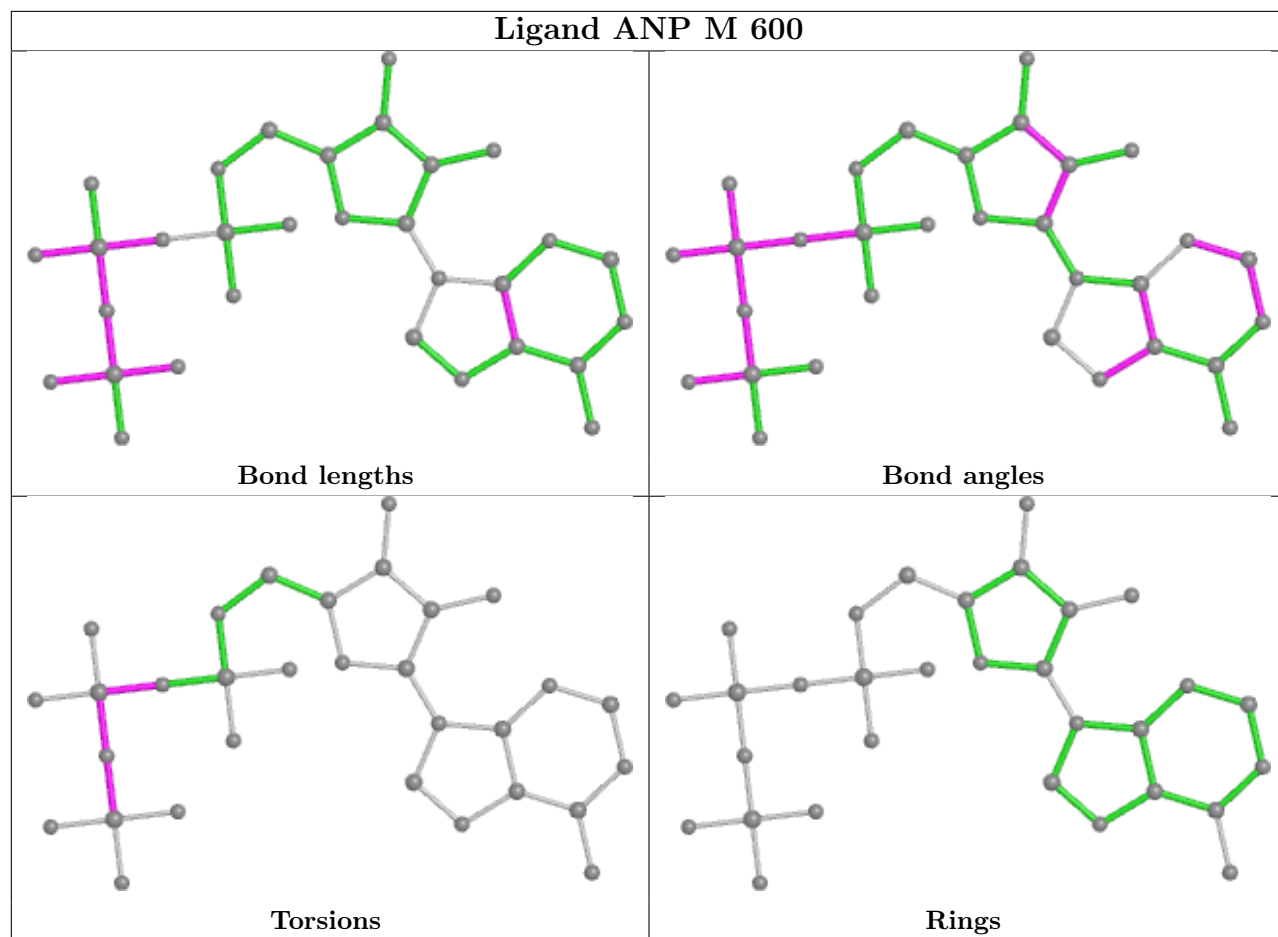


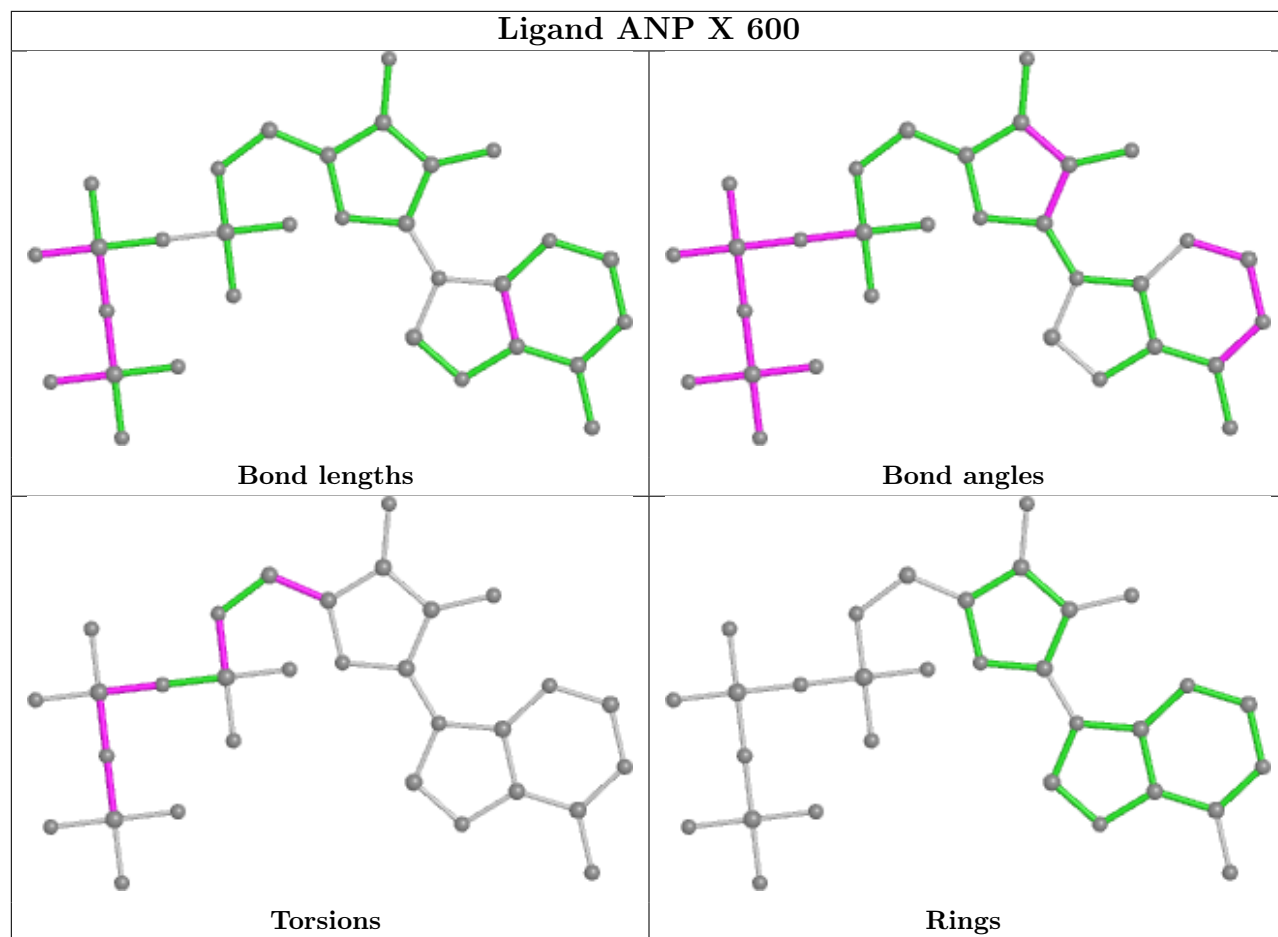


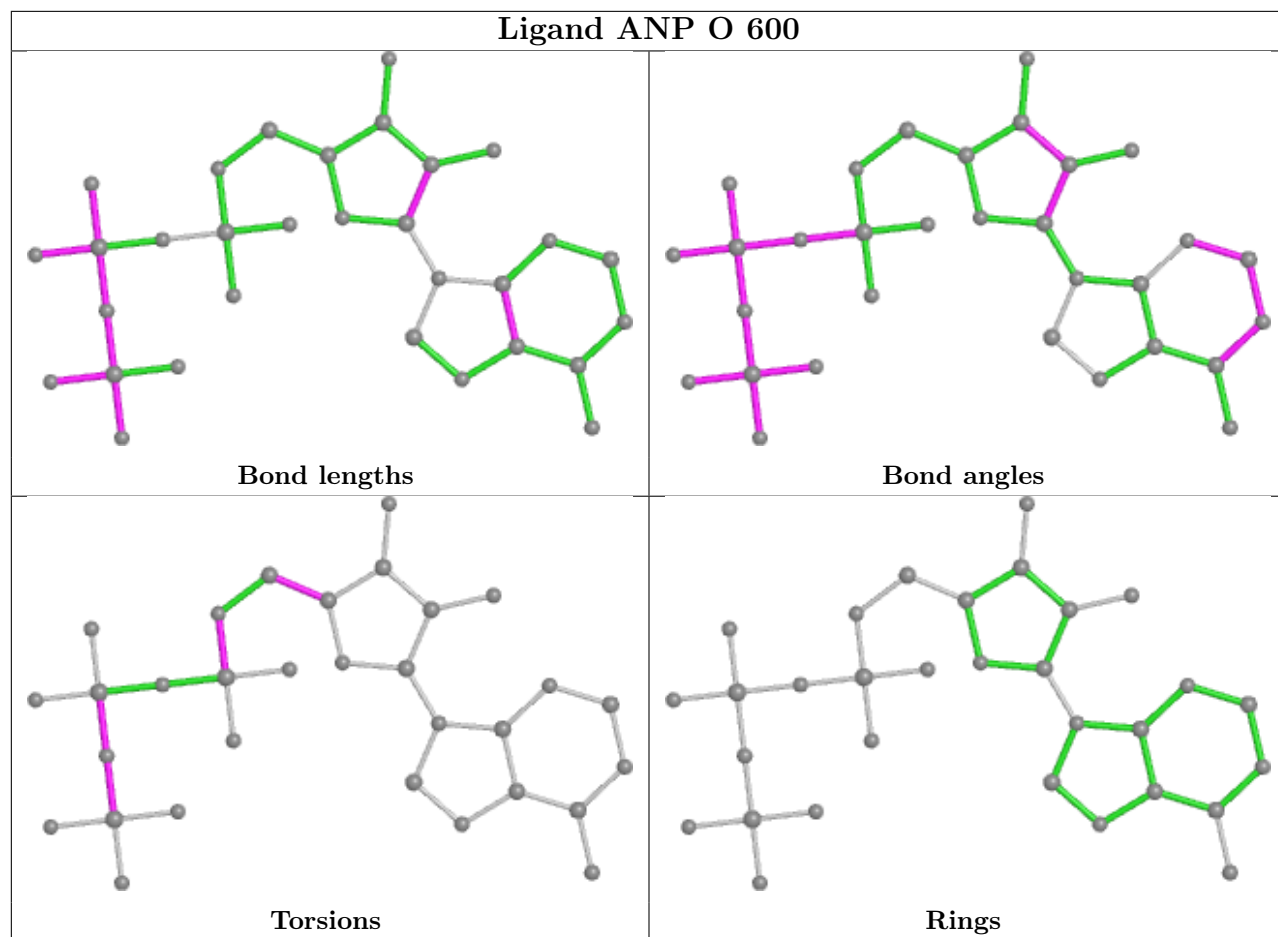


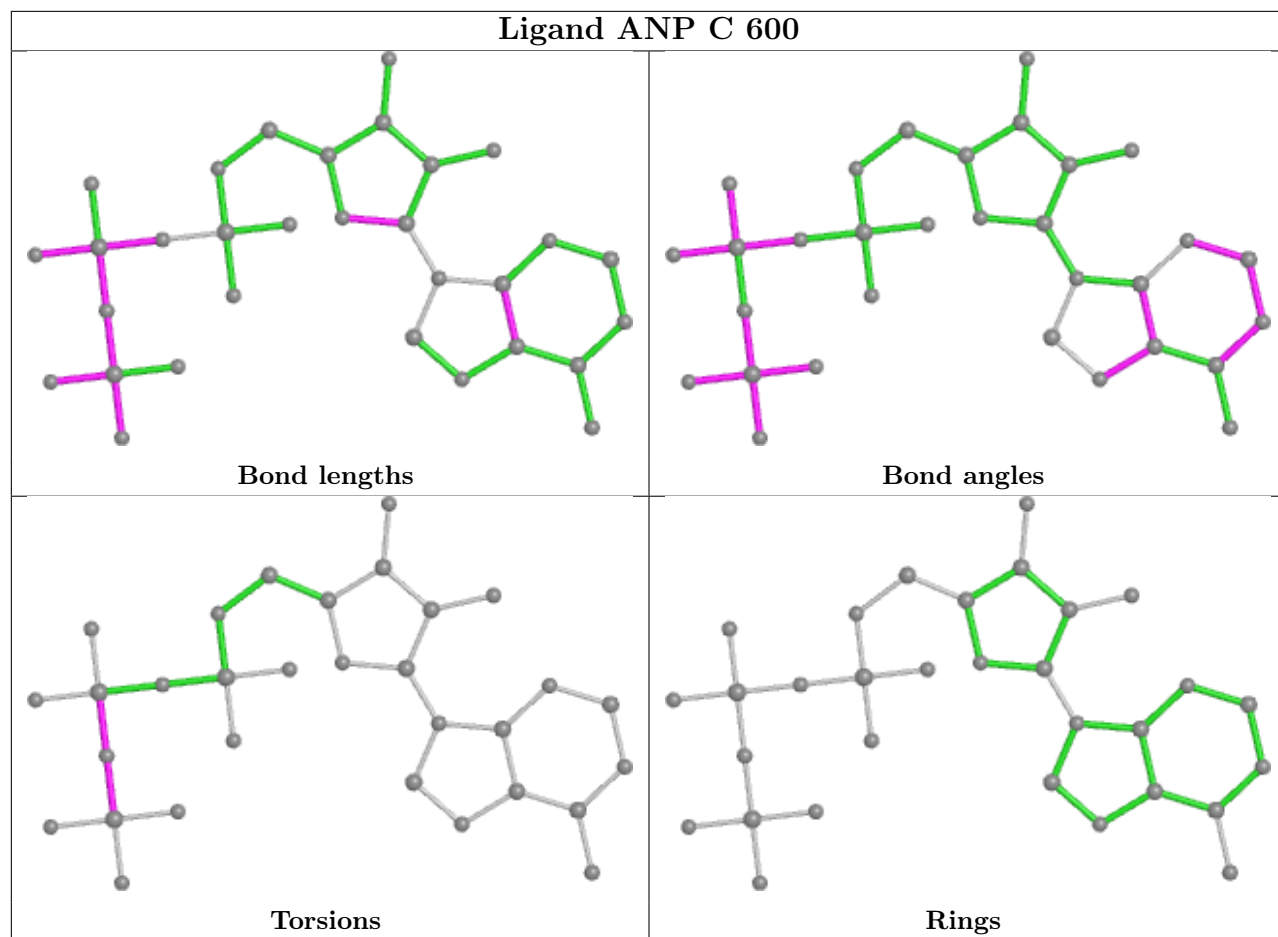


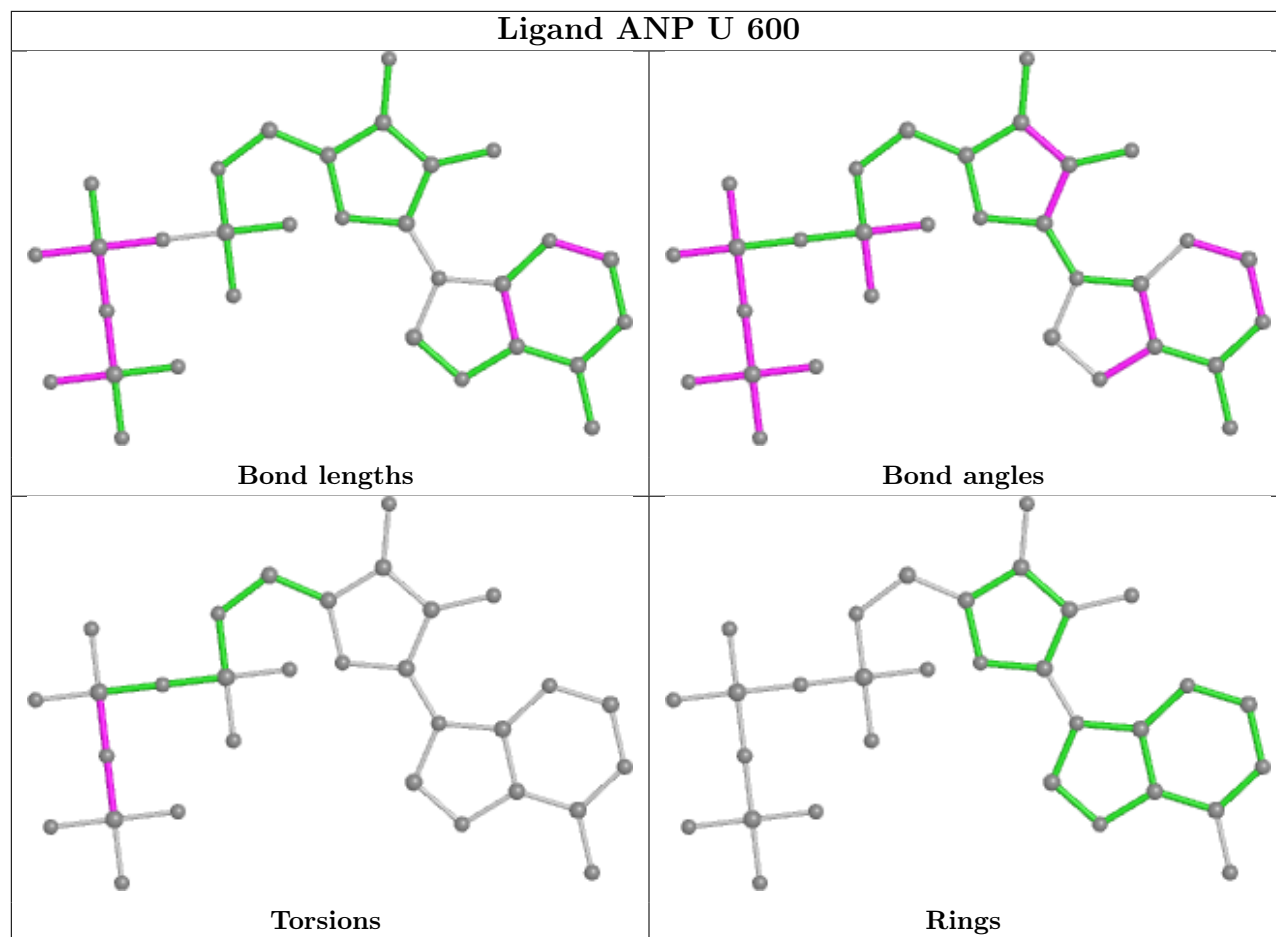


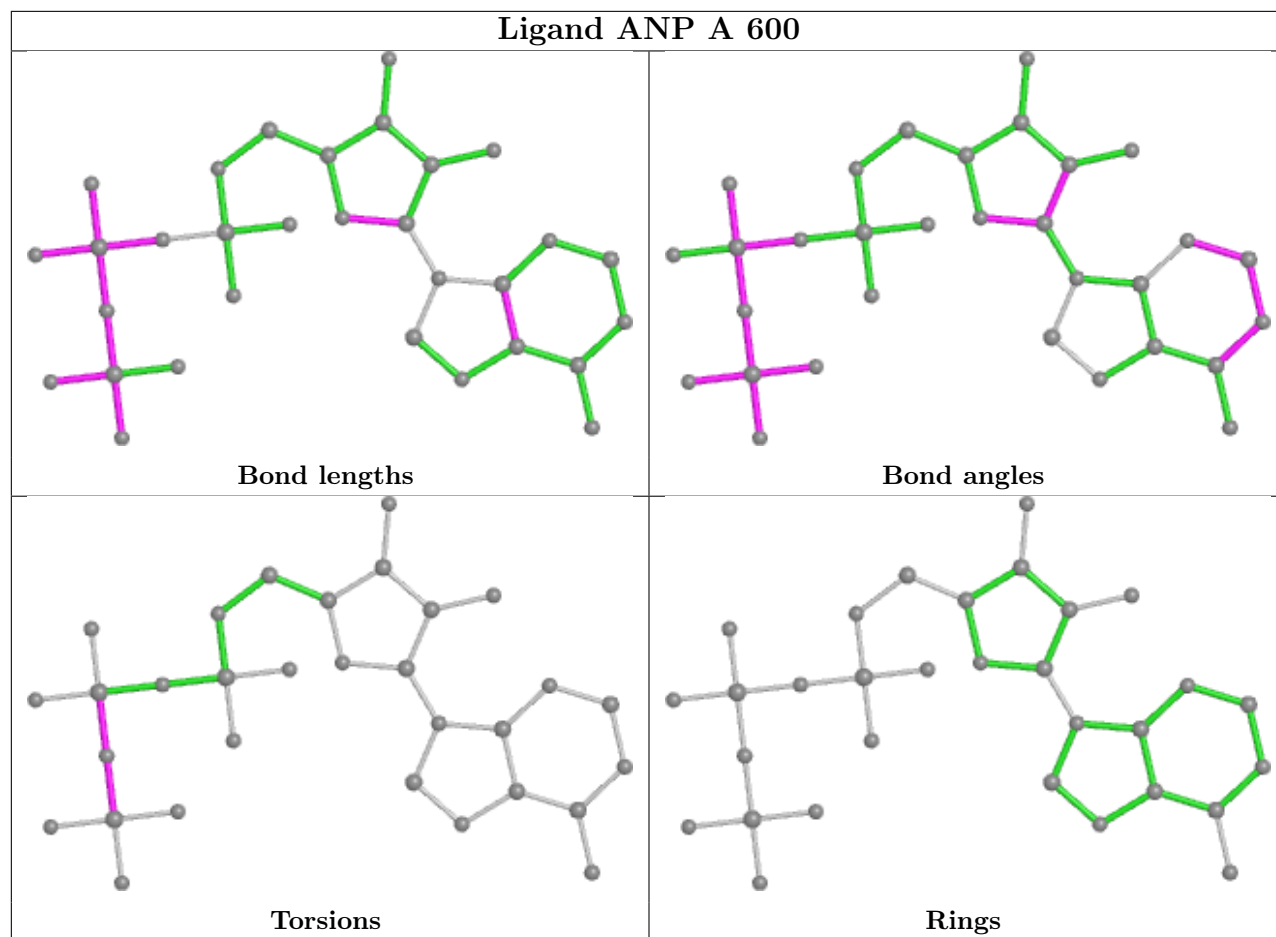


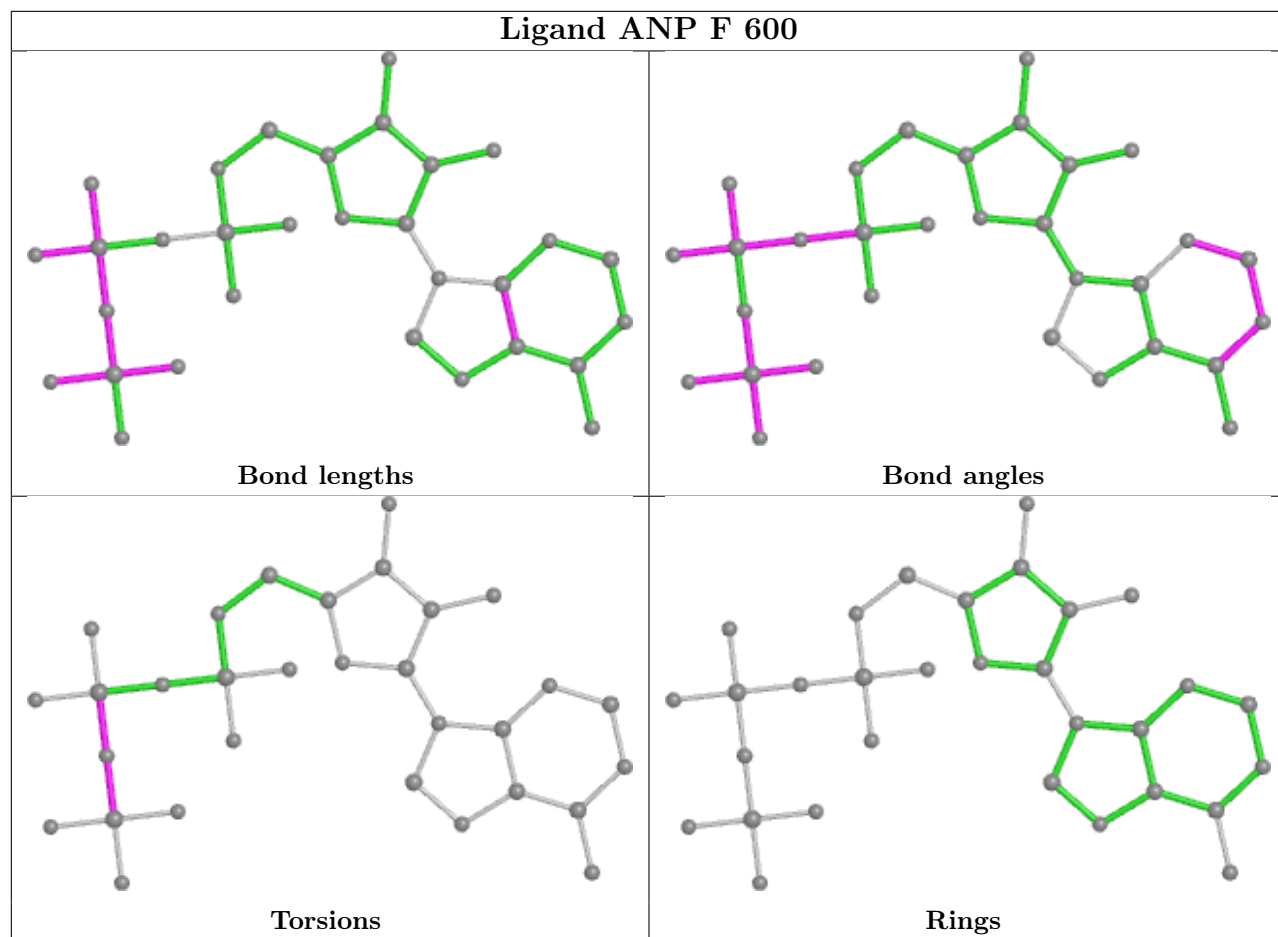


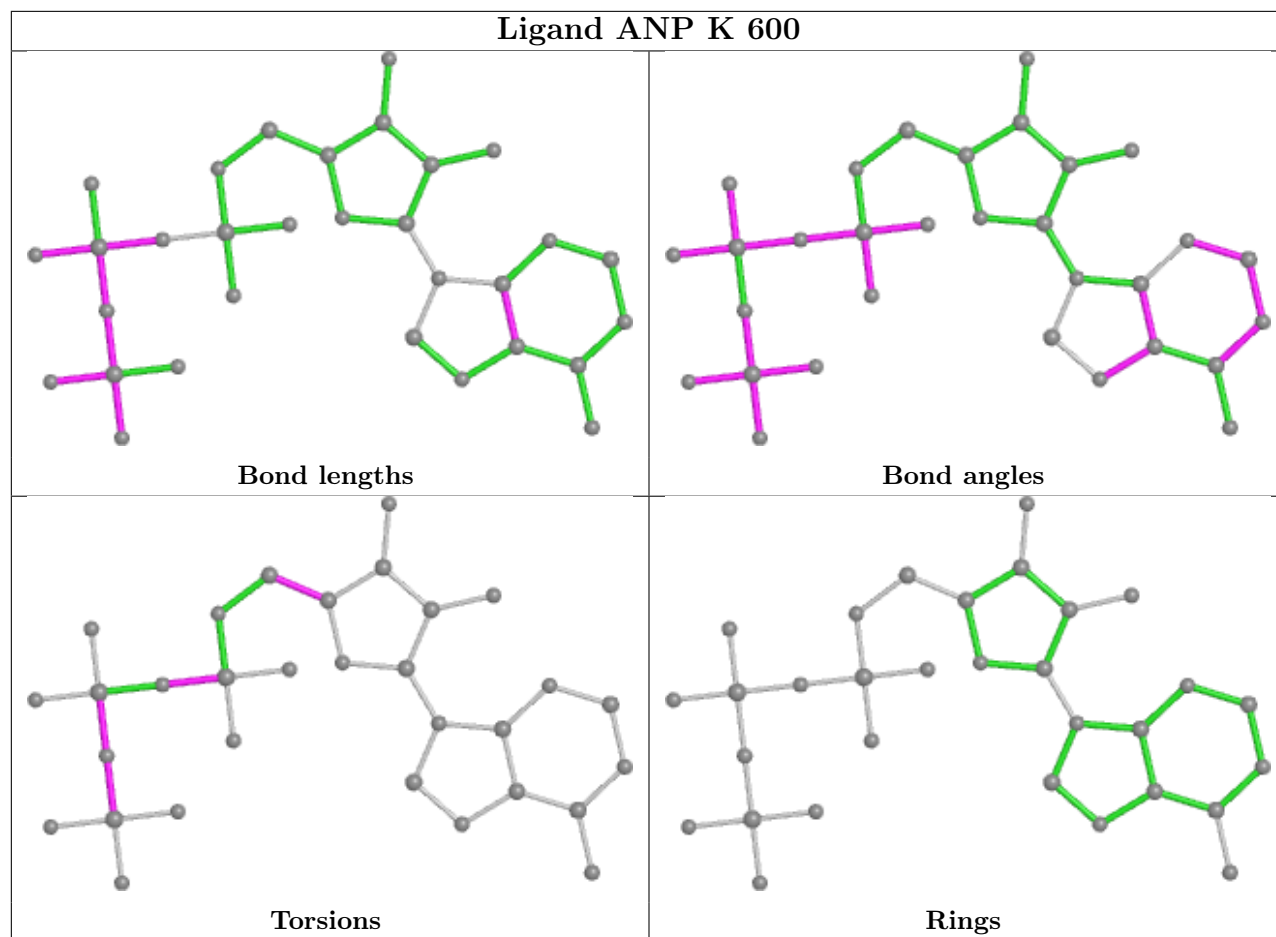




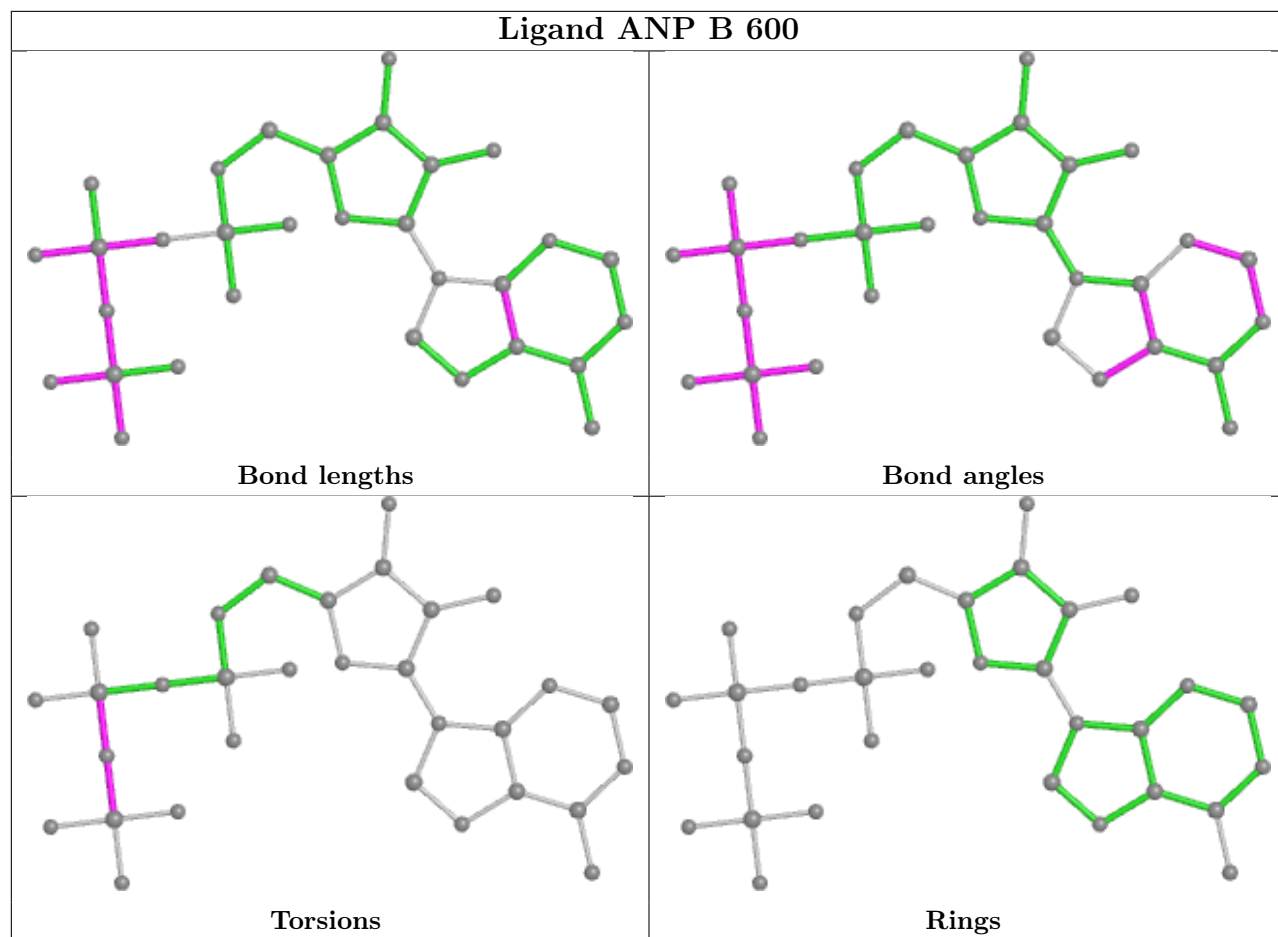


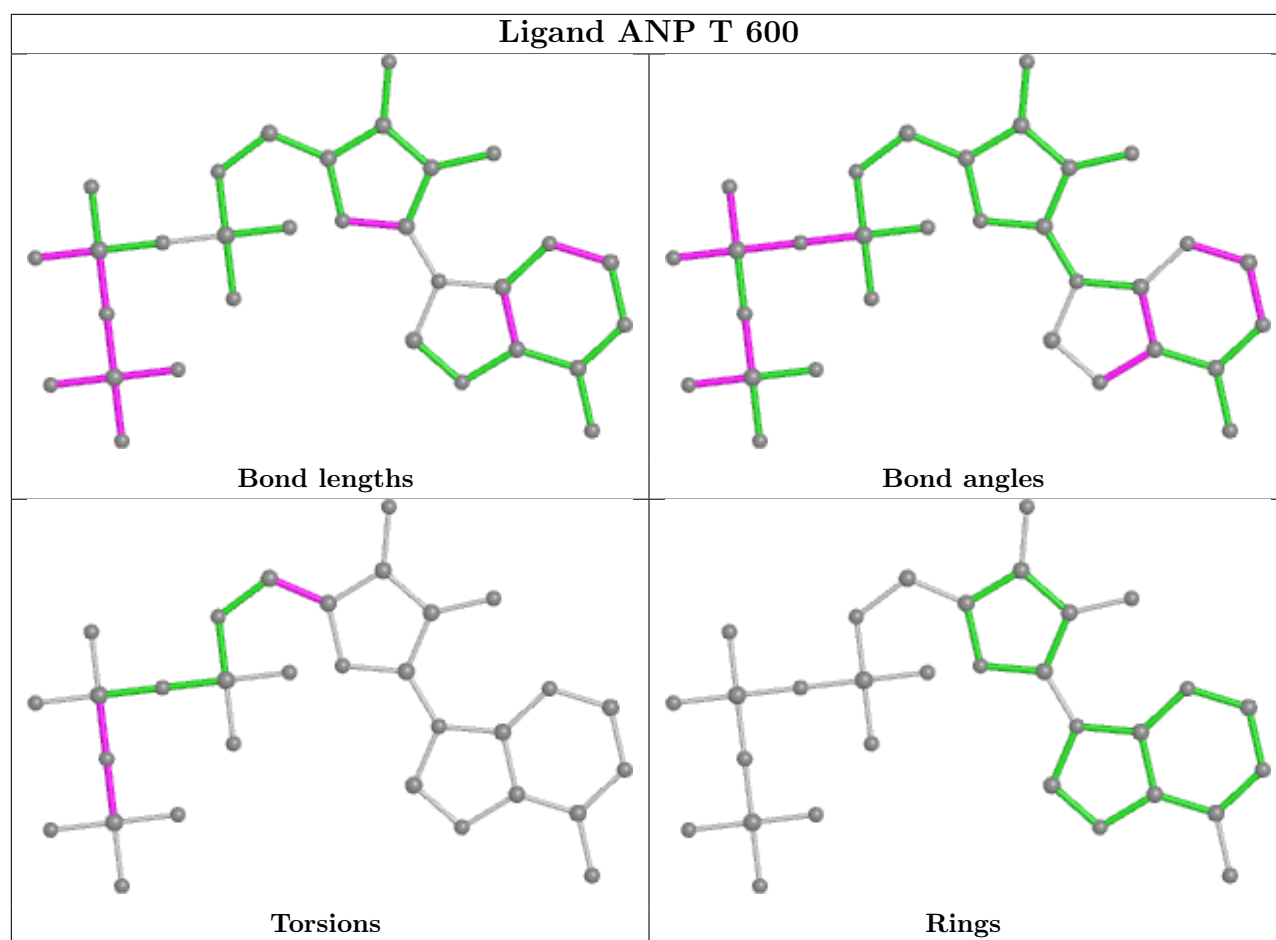












## 5.7 Other polymers [i](#)

There are no such residues in this entry.

## 5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

## 6 Fit of model and data [i](#)

### 6.1 Protein, DNA and RNA chains [i](#)

Unable to reproduce the depositors R factor - this section is therefore empty.

### 6.2 Non-standard residues in protein, DNA, RNA chains [i](#)

Unable to reproduce the depositors R factor - this section is therefore empty.

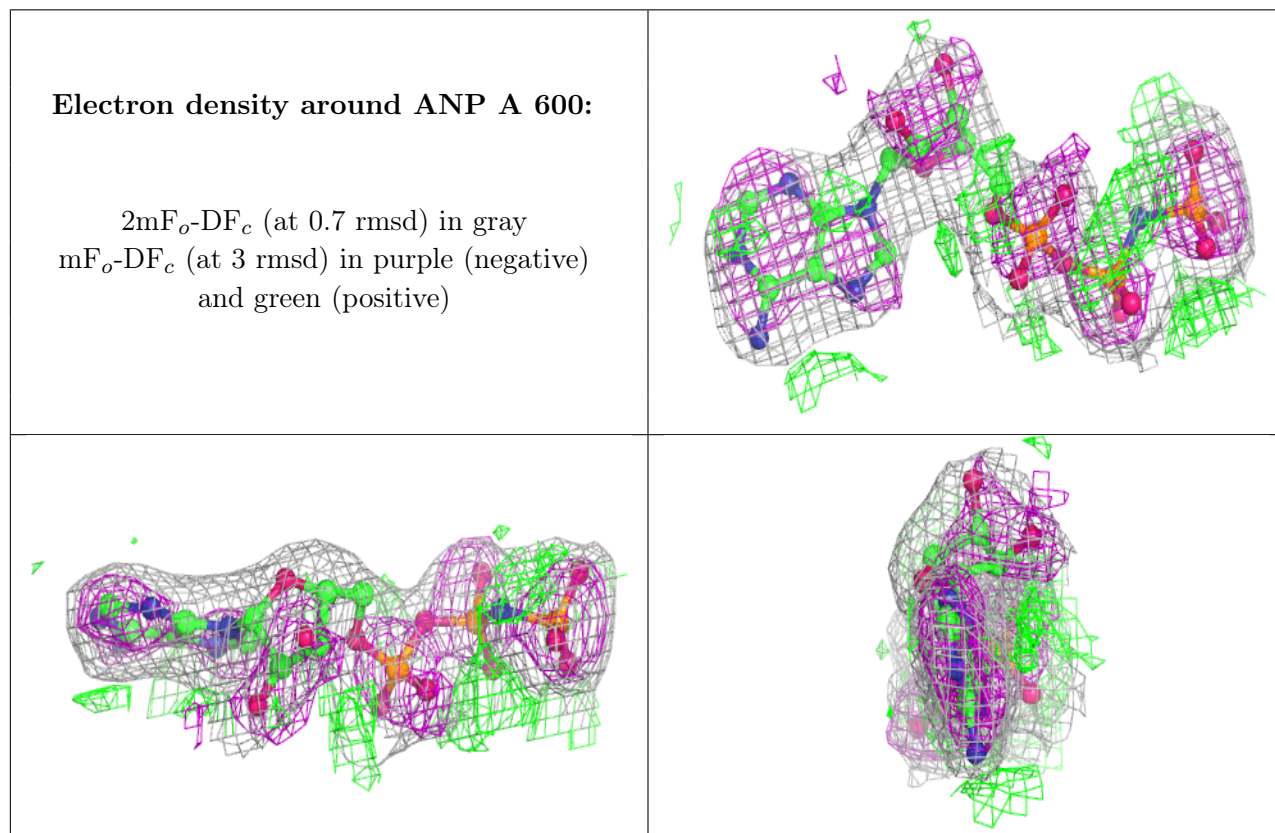
### 6.3 Carbohydrates [i](#)

Unable to reproduce the depositors R factor - this section is therefore empty.

### 6.4 Ligands [i](#)

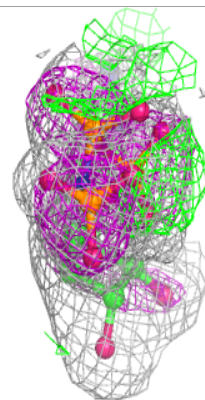
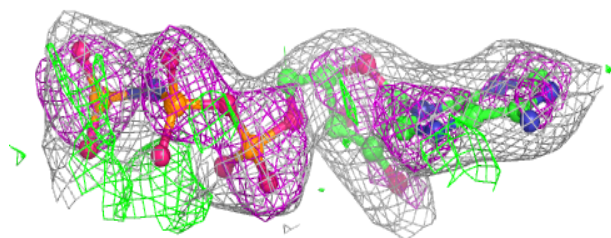
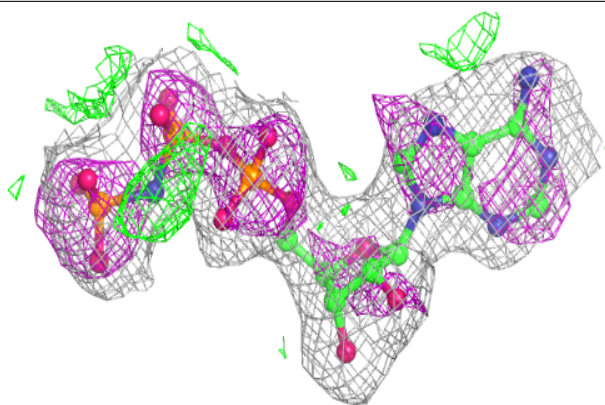
Unable to reproduce the depositors R factor - this section is therefore empty.

The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation to approximate a three-dimensional view.

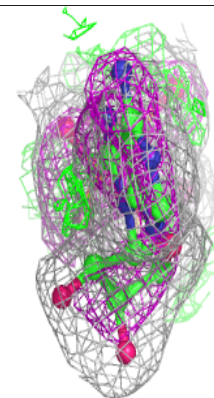
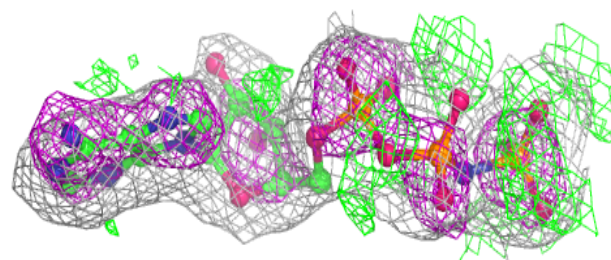
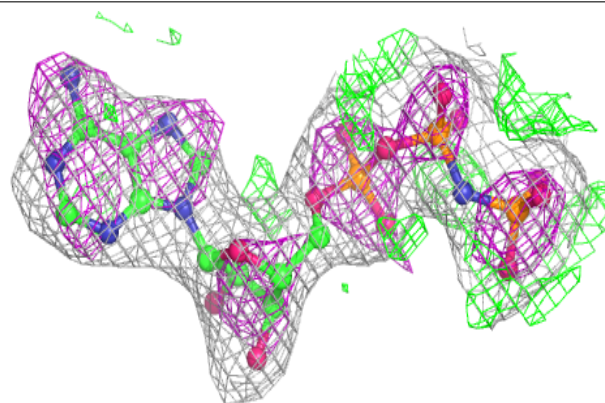


**Electron density around ANP B 600:**

$2mF_o-DF_c$  (at 0.7 rmsd) in gray  
 $mF_o-DF_c$  (at 3 rmsd) in purple (negative)  
and green (positive)

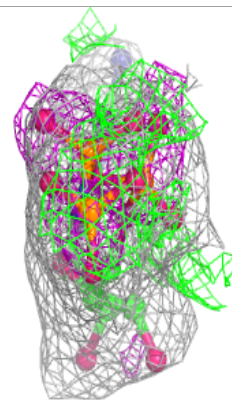
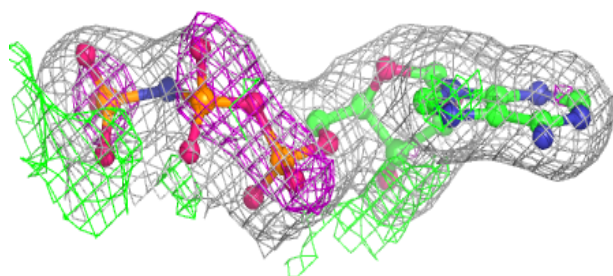
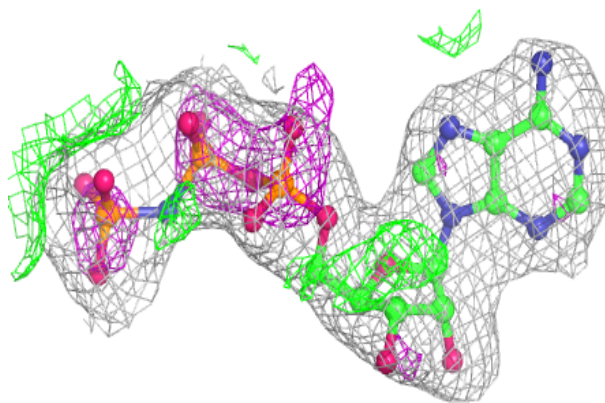
**Electron density around ANP C 600:**

$2mF_o-DF_c$  (at 0.7 rmsd) in gray  
 $mF_o-DF_c$  (at 3 rmsd) in purple (negative)  
and green (positive)

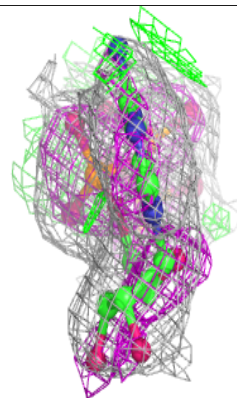
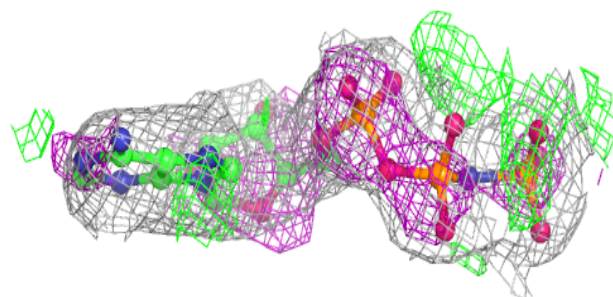
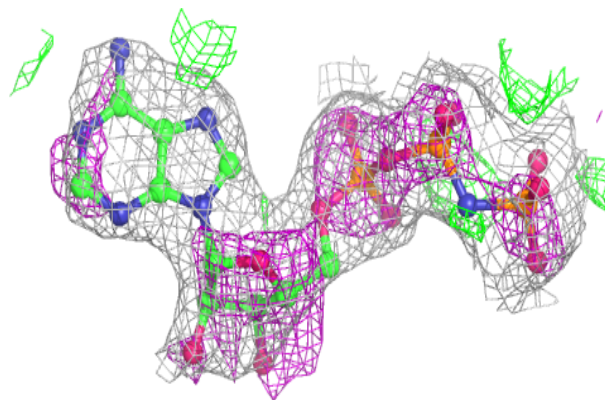


**Electron density around ANP D 600:**

$2mF_o-DF_c$  (at 0.7 rmsd) in gray  
 $mF_o-DF_c$  (at 3 rmsd) in purple (negative)  
and green (positive)

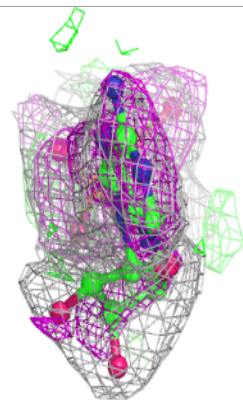
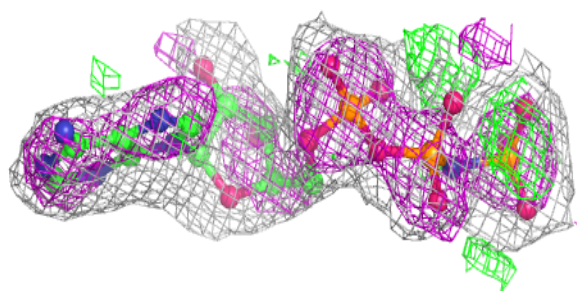
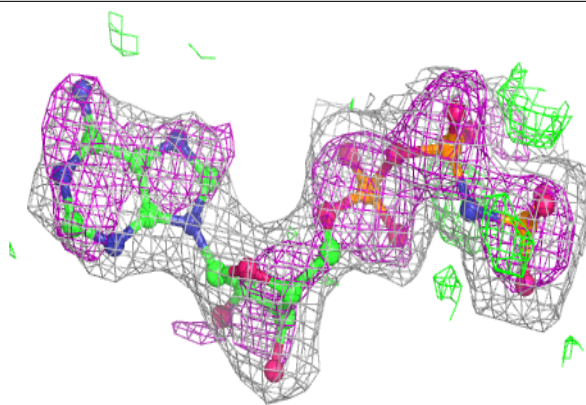
**Electron density around ANP F 600:**

$2mF_o-DF_c$  (at 0.7 rmsd) in gray  
 $mF_o-DF_c$  (at 3 rmsd) in purple (negative)  
and green (positive)

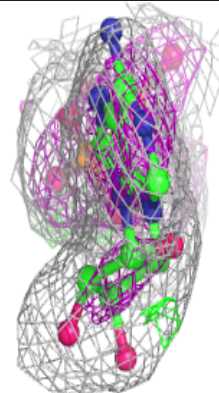
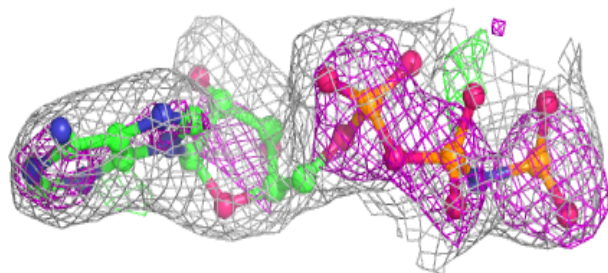
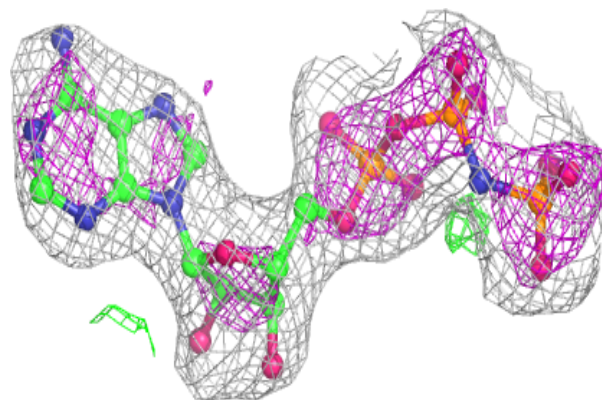


**Electron density around ANP J 600:**

$2mF_o-DF_c$  (at 0.7 rmsd) in gray  
 $mF_o-DF_c$  (at 3 rmsd) in purple (negative)  
and green (positive)

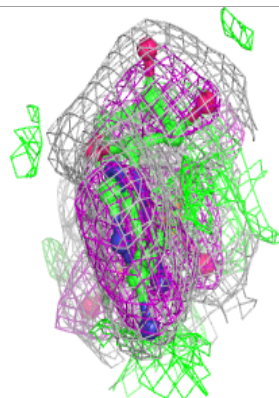
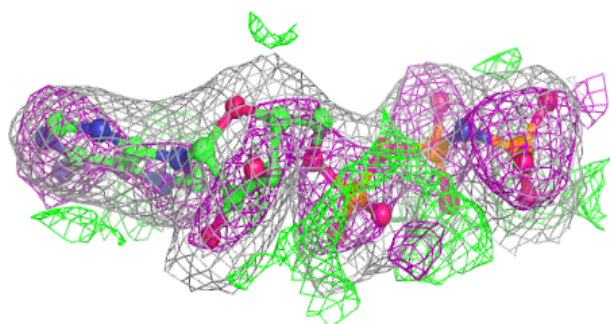
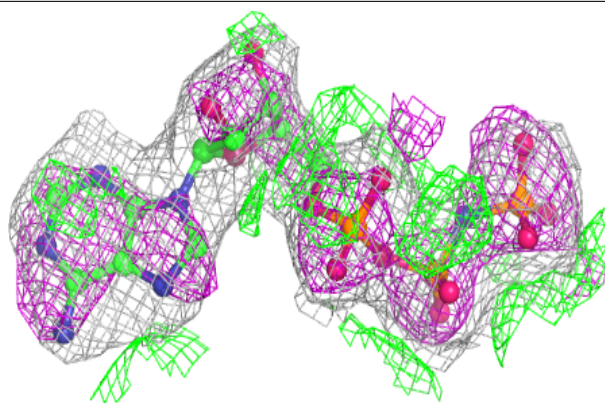
**Electron density around ANP K 600:**

$2mF_o-DF_c$  (at 0.7 rmsd) in gray  
 $mF_o-DF_c$  (at 3 rmsd) in purple (negative)  
and green (positive)

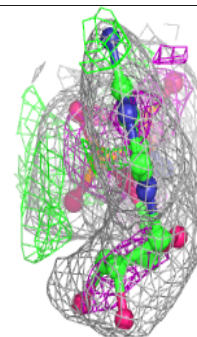
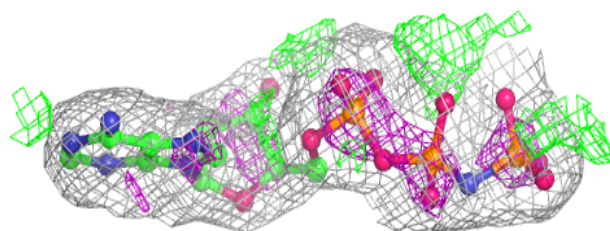
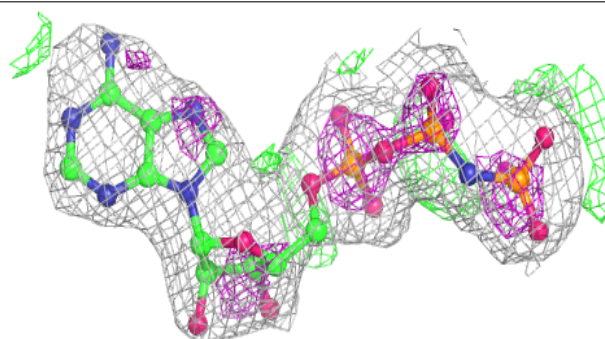


**Electron density around ANP L 600:**

$2mF_o-DF_c$  (at 0.7 rmsd) in gray  
 $mF_o-DF_c$  (at 3 rmsd) in purple (negative)  
and green (positive)

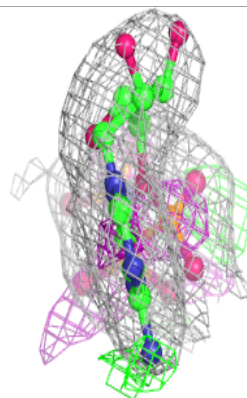
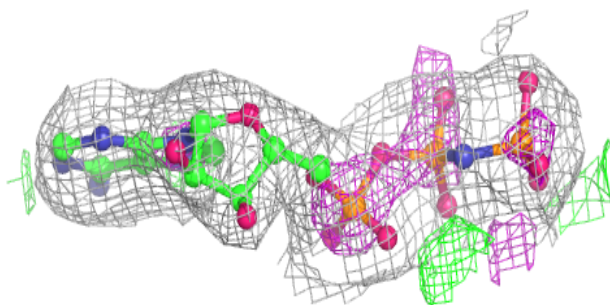
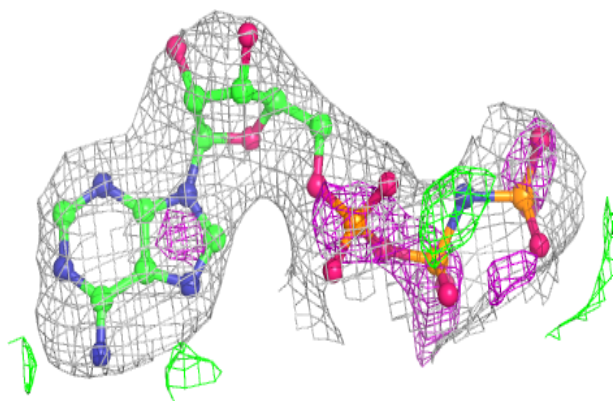
**Electron density around ANP M 600:**

$2mF_o-DF_c$  (at 0.7 rmsd) in gray  
 $mF_o-DF_c$  (at 3 rmsd) in purple (negative)  
and green (positive)

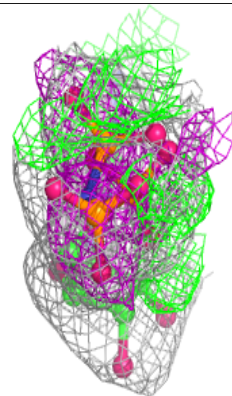
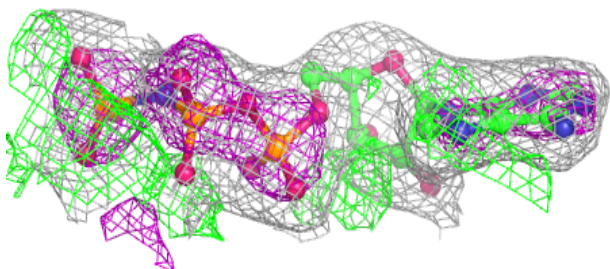
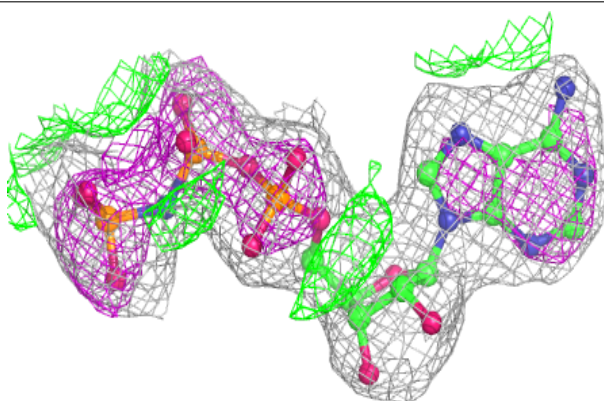


**Electron density around ANP O 600:**

$2mF_o-DF_c$  (at 0.7 rmsd) in gray  
 $mF_o-DF_c$  (at 3 rmsd) in purple (negative)  
and green (positive)

**Electron density around ANP S 600:**

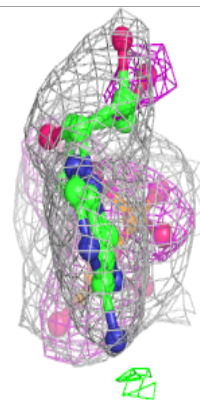
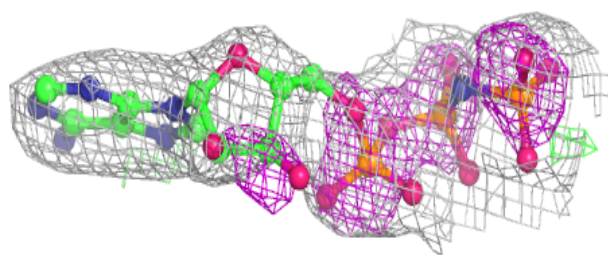
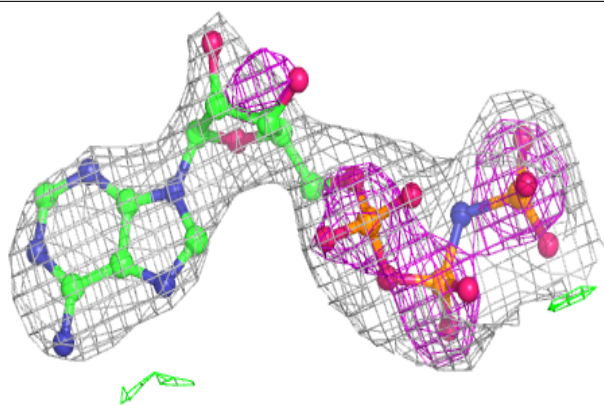
$2mF_o-DF_c$  (at 0.7 rmsd) in gray  
 $mF_o-DF_c$  (at 3 rmsd) in purple (negative)  
and green (positive)



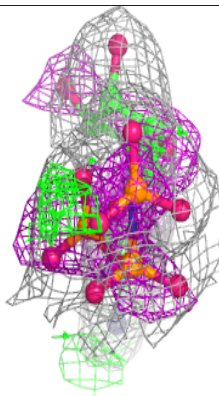
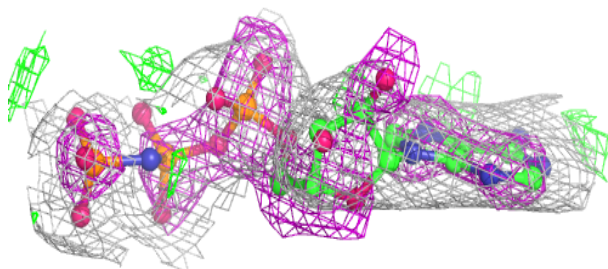
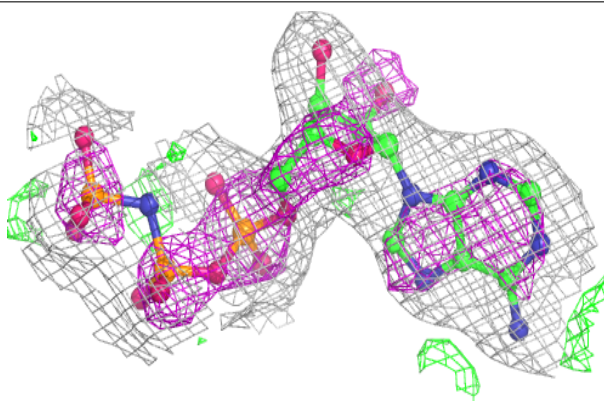


**Electron density around ANP T 600:**

$2mF_o-DF_c$  (at 0.7 rmsd) in gray  
 $mF_o-DF_c$  (at 3 rmsd) in purple (negative)  
and green (positive)

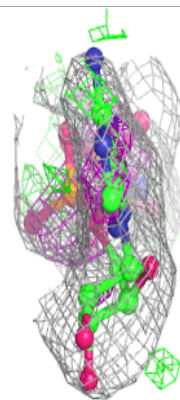
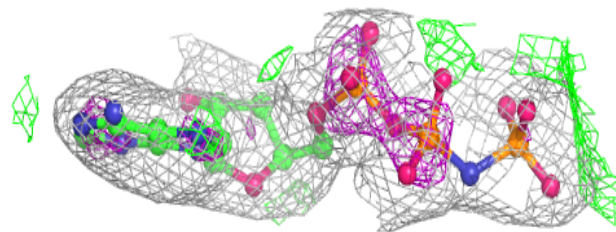
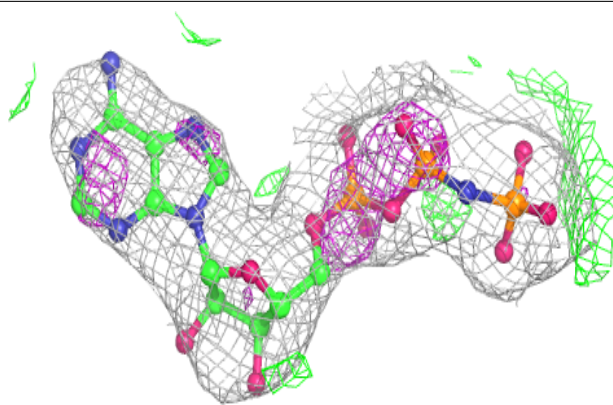
**Electron density around ANP U 600:**

$2mF_o-DF_c$  (at 0.7 rmsd) in gray  
 $mF_o-DF_c$  (at 3 rmsd) in purple (negative)  
and green (positive)

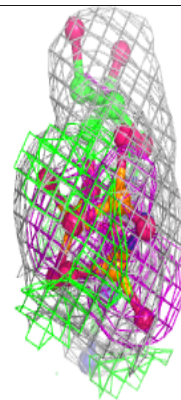
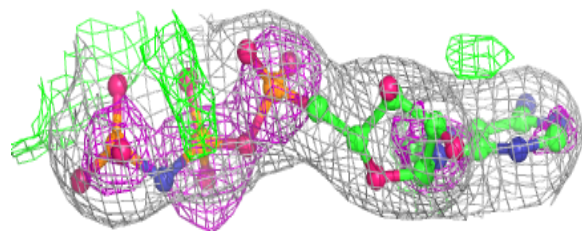
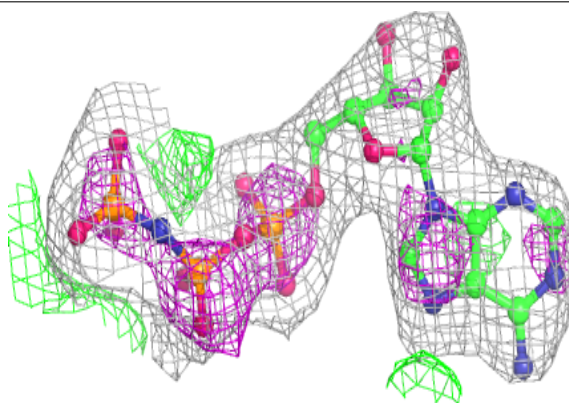


**Electron density around ANP V 600:**

$2mF_o-DF_c$  (at 0.7 rmsd) in gray  
 $mF_o-DF_c$  (at 3 rmsd) in purple (negative)  
and green (positive)

**Electron density around ANP X 600:**

$2mF_o-DF_c$  (at 0.7 rmsd) in gray  
 $mF_o-DF_c$  (at 3 rmsd) in purple (negative)  
and green (positive)



## 6.5 Other polymers

Unable to reproduce the depositors R factor - this section is therefore empty.