



wwPDB X-ray Structure Validation Summary Report ⓘ

Jun 12, 2024 – 02:06 PM EDT

PDB ID : 3CF3
Title : Structure of P97/vcp in complex with ADP
Authors : Davies, J.M.; Delabarre, B.; Brunger, A.T.; Weis, W.I.
Deposited on : 2008-03-01
Resolution : 4.25 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

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

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

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

MolProbity : 4.02b-467
Mogul : 2022.3.0, CSD as543be (2022)
Xtrriage (Phenix) : 1.20.1
EDS : 2.36.2
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) : 2.36.2

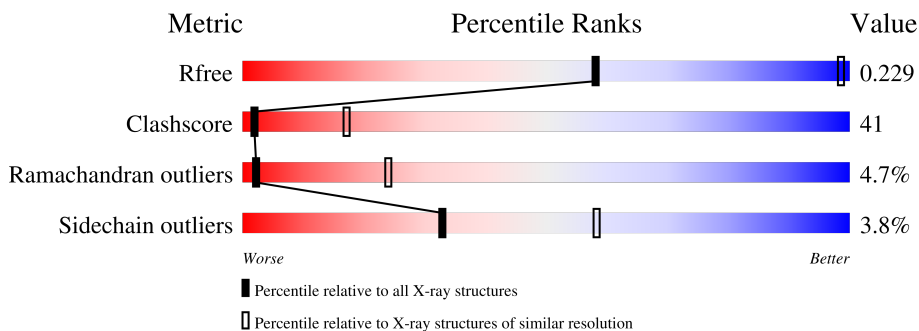
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 4.25 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	1017 (4.72-3.78)
Clashscore	141614	1059 (4.72-3.80)
Ramachandran outliers	138981	1014 (4.72-3.80)
Sidechain outliers	138945	1018 (4.72-3.78)

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 ≥ 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	806	37% (green), 48% (yellow), 5% (orange), 10% (grey)
1	B	806	37% (green), 49% (yellow), 5% (orange), 10% (grey)
1	C	806	37% (green), 47% (yellow), 5% (orange), 10% (grey)

2 Entry composition [i](#)

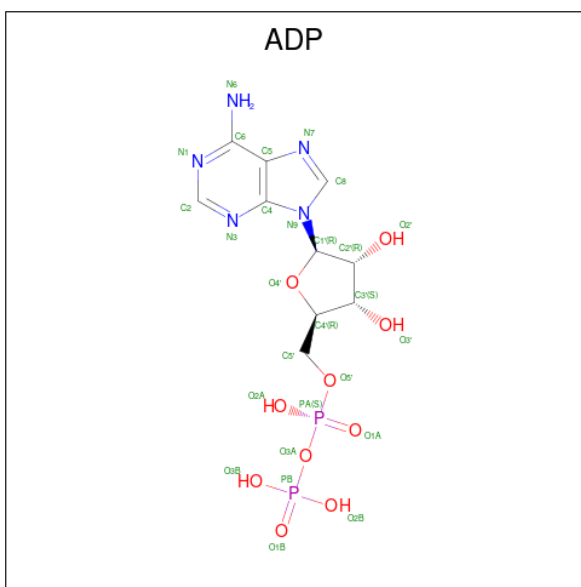
There are 2 unique types of molecules in this entry. The entry contains 17139 atoms, of which 0 are hydrogens and 0 are deuteriums.

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 Transitional endoplasmic reticulum ATPase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	723	Total 5659	C 3561	N 996	O 1072	S 30	0	0	0
1	B	723	Total 5659	C 3561	N 996	O 1072	S 30	0	0	0
1	C	723	Total 5659	C 3561	N 996	O 1072	S 30	0	0	0

- Molecule 2 is ADENOSINE-5'-DIPHOSPHATE (three-letter code: ADP) (formula: $C_{10}H_{15}N_5O_{10}P_2$).



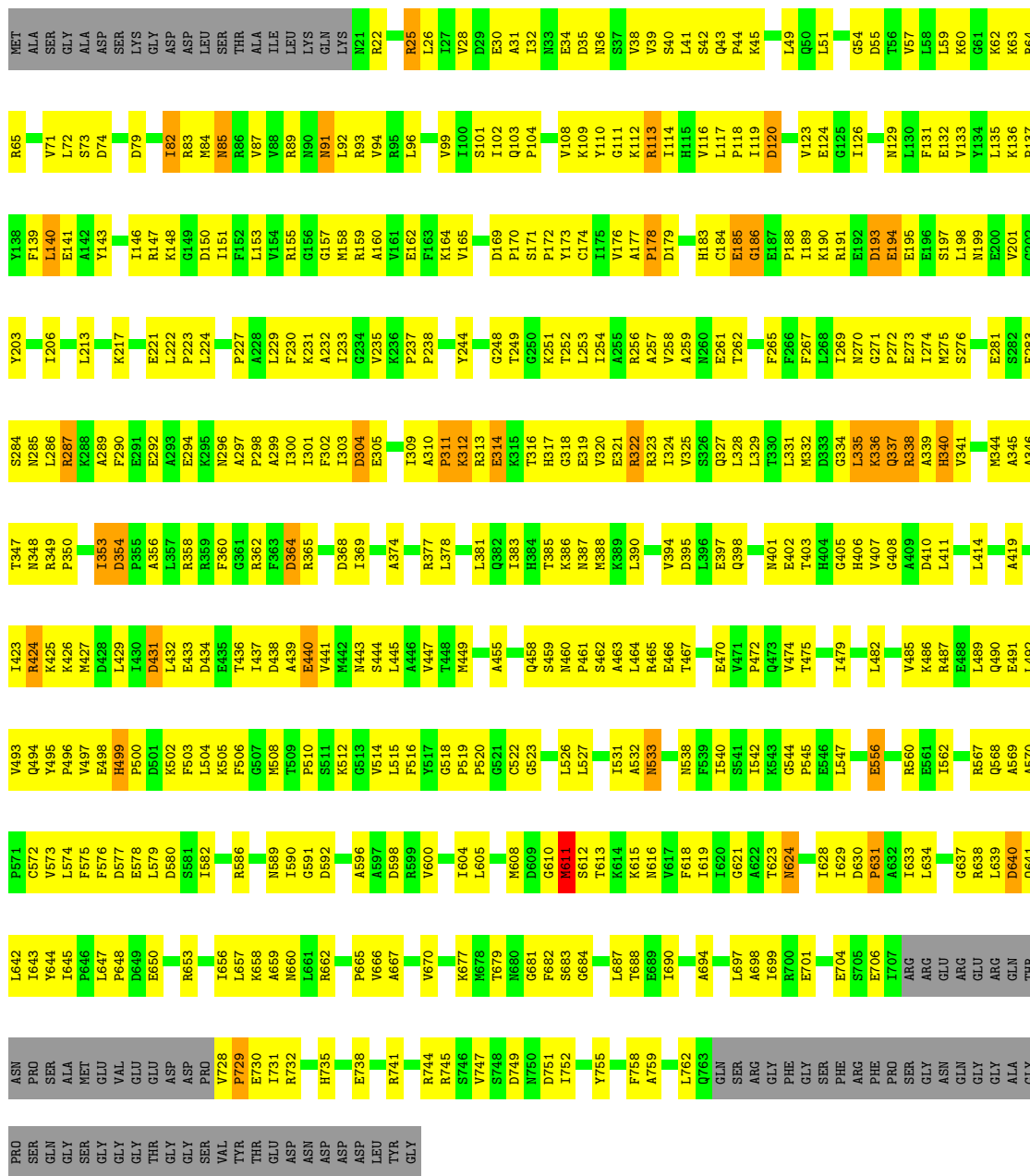
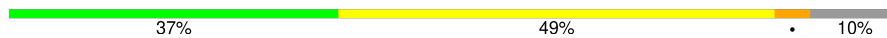
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Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
2	B	1	Total	C	N	O	P	0	0
			27	10	5	10	2		
2	C	1	Total	C	N	O	P	0	0
			27	10	5	10	2		
2	C	1	Total	C	N	O	P	0	0
			27	10	5	10	2		

GLY
THR
GLY
GLY
SER
VAL
TVR
THR
GLU
THR
ASP
ASN
ASP
ASP
ASP
ASP
LEU
TVR
GLY

• Molecule 1: Transitional endoplasmic reticulum ATPase

Chain B:



• Molecule 1: Transitional endoplasmic reticulum ATPase

Chain C:



SER	6646	R574	Y495	P350	L286	L213	E141	V71
GLY	L647	C572	P496	I353	R287	K217	A142	L72
ALA	P648	W573	V497	D354	K288		Y143	S73
MET	L649	L574	E498	P355	A289		I146	D74
THR	E650	F575	H499	A356	F290		R147	
GLY		F576	P500	D428	E291		L222	
GLY	R653	D577	D501	L429	E292		K148	
GLY		E578	K502	I430	A293		G149	
ASP	T656	L579	F503	R359	E294		D150	
VAL	L657	D580	K295	F360	K295		I151	
PRO	K658	L504	G361	L432	N296		R83	
THR	P729	S581	R362	E433	A297		M84	
GLU	A659	I582	F363		L229		N85	
ASP	M660	R586	D364		F230		R86	
ASN	L661	G587	R365		K231		V87	
ASP	R662	G588	I300		A232		V88	
ASP	K663	S511	I301		I233		R89	
ASP	S664	K512	D368		G234		N90	
ASP	P665	I590	F302		A160		A160	
LEU	V666	G591	I369		V235		N91	
TYR	A667	V514	M442		K236		L92	
		L515	M443		P237		R93	
		F516	S444		P238		V94	
		Y517	L445		F163		R95	
		L604	L446		K164		L96	
		L605	M449		V165			
		M608	A455		D169		I102	
		D609	Q458		P170		Q103	
		G610	H384		S171		P104	
		F682	T385		P172		V108	
		F683	K386		C174		K109	
		G684	N460		I175		Y110	
			P461		V176		G111	
			S462		A177		K112	
			A463		A257		R113	
			L464		V258		I114	
			R465		A259		H115	
			M533		N260		V116	
			N538		E261		L117	
			F539		C184		P118	
			L540		E185		I119	
			S541		G186		D120	
			T542		E187		T122	
			K543		P188		I189	
			G544		L268		K190	
			L547		M332		E124	
			E556		D333		R191	
			R560		G334		E192	
			E561		L335		G125	
			F563		P272		I126	
			D564		E273		M129	
			K565		E274		F131	
			A566		M275		E132	
			R567		S276		L198	
			L642		R277		N199	
			L643		L278		E200	
			Y644		A279		Y134	
			T645		G280		L135	
					E281		K136	
					S282		P137	
					E283		Y138	
					N284		F139	
					R349		L140	
SER								
ALA								
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ASN								
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GLY								
ALA								
ALA								
GLY								
PRO								
PRO								
SER								
SER								
GLN								
GLY								

4 Data and refinement statistics

Property	Value	Source
Space group	I 2 2 2	Depositor
Cell constants a, b, c, α , β , γ	163.97Å 178.93Å 320.64Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	40.00 – 4.25 29.94 – 4.25	Depositor EDS
% Data completeness (in resolution range)	86.4 (40.00-4.25) 92.9 (29.94-4.25)	Depositor EDS
R_{merge}	0.08	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.68 (at 4.26Å)	Xtrriage
Refinement program	CNS	Depositor
R, R_{free}	0.198 , 0.226 0.202 , 0.229	Depositor DCC
R_{free} test set	4669 reflections (7.33%)	wwPDB-VP
Wilson B-factor (Å ²)	143.2	Xtrriage
Anisotropy	0.395	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.26 , 189.0	EDS
L-test for twinning ²	$\langle L \rangle = 0.48$, $\langle L^2 \rangle = 0.32$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
F_o, F_c correlation	0.90	EDS
Total number of atoms	17139	wwPDB-VP
Average B, all atoms (Å ²)	205.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 8.92% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

²Theoretical 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: ADP

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	0.38	0/5751	0.87	9/7767 (0.1%)
1	B	0.37	0/5751	0.87	9/7767 (0.1%)
1	C	0.38	0/5751	0.88	9/7767 (0.1%)
All	All	0.38	0/17253	0.87	27/23301 (0.1%)

There are no bond length outliers.

The worst 5 of 27 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed($^{\circ}$)	Ideal($^{\circ}$)
1	C	322	ARG	NE-CZ-NH2	-29.67	105.46	120.30
1	A	338	ARG	NE-CZ-NH1	-29.13	105.74	120.30
1	B	287	ARG	NE-CZ-NH2	-28.38	106.11	120.30
1	A	338	ARG	NE-CZ-NH2	27.38	133.99	120.30
1	B	287	ARG	NE-CZ-NH1	27.28	133.94	120.30

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts [i](#)

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	5659	0	5731	495	0
1	B	5659	0	5731	491	0
1	C	5659	0	5731	466	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	A	54	0	24	6	0
2	B	54	0	24	4	0
2	C	54	0	24	3	0
All	All	17139	0	17265	1421	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 41.

The worst 5 of 1421 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)
1:A:206:ILE:CD1	1:A:213:LEU:HD11	1.25	1.64
1:B:206:ILE:CD1	1:B:213:LEU:HD11	1.24	1.61
1:C:206:ILE:CD1	1:C:213:LEU:HD11	1.25	1.59
1:A:206:ILE:HD11	1:A:213:LEU:CD1	1.55	1.34
1:C:206:ILE:HD11	1:C:213:LEU:CD1	1.55	1.34

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	719/806 (89%)	566 (79%)	119 (17%)	34 (5%)	2	24
1	B	719/806 (89%)	564 (78%)	123 (17%)	32 (4%)	2	24
1	C	719/806 (89%)	561 (78%)	122 (17%)	36 (5%)	2	23
All	All	2157/2418 (89%)	1691 (78%)	364 (17%)	102 (5%)	2	24

5 of 102 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	63	LYS
1	A	85	ASN
1	A	140	LEU
1	A	185	GLU
1	A	312	LYS

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	615/678 (91%)	590 (96%)	25 (4%)	30 56
1	B	615/678 (91%)	593 (96%)	22 (4%)	35 60
1	C	615/678 (91%)	592 (96%)	23 (4%)	34 59
All	All	1845/2034 (91%)	1775 (96%)	70 (4%)	33 58

5 of 70 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	C	354	ASP
1	C	436	THR
1	C	611	MET
1	A	640	ASP
1	A	624	ASN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 47 such sidechains are listed below:

Mol	Chain	Res	Type
1	B	443	ASN
1	C	285	ASN
1	B	616	ASN
1	B	660	ASN
1	C	337	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](#)

6 ligands are modelled in this entry.

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
2	ADP	A	900	-	24,29,29	1.95	7 (29%)	29,45,45	1.85	1 (3%)
2	ADP	B	900	-	24,29,29	1.59	3 (12%)	29,45,45	1.72	2 (6%)
2	ADP	C	807	-	24,29,29	1.63	4 (16%)	29,45,45	1.96	3 (10%)
2	ADP	B	807	-	24,29,29	1.88	6 (25%)	29,45,45	1.89	4 (13%)
2	ADP	A	807	-	24,29,29	2.18	7 (29%)	29,45,45	2.06	5 (17%)
2	ADP	C	900	-	24,29,29	1.90	6 (25%)	29,45,45	1.89	2 (6%)

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
2	ADP	A	900	-	-	8/12/32/32	0/3/3/3
2	ADP	B	900	-	-	8/12/32/32	0/3/3/3

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	ADP	C	807	-	-	5/12/32/32	0/3/3/3
2	ADP	B	807	-	-	4/12/32/32	0/3/3/3
2	ADP	A	807	-	-	5/12/32/32	0/3/3/3
2	ADP	C	900	-	-	6/12/32/32	0/3/3/3

The worst 5 of 33 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	807	ADP	PA-O3A	-6.22	1.52	1.59
2	A	900	ADP	O4'-C1'	5.02	1.47	1.40
2	C	900	ADP	O4'-C1'	4.92	1.47	1.40
2	B	807	ADP	C2-N3	4.27	1.38	1.32
2	B	807	ADP	O4'-C1'	4.04	1.46	1.40

The worst 5 of 17 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	807	ADP	N3-C2-N1	-8.68	116.89	128.67
2	C	900	ADP	N3-C2-N1	-8.43	117.22	128.67
2	A	900	ADP	N3-C2-N1	-8.34	117.35	128.67
2	B	807	ADP	N3-C2-N1	-8.27	117.45	128.67
2	C	807	ADP	N3-C2-N1	-8.26	117.45	128.67

There are no chirality outliers.

5 of 36 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	A	807	ADP	C5'-O5'-PA-O1A
2	A	807	ADP	C5'-O5'-PA-O2A
2	A	807	ADP	C5'-O5'-PA-O3A
2	A	900	ADP	C5'-O5'-PA-O1A
2	A	900	ADP	C5'-O5'-PA-O2A

There are no ring outliers.

6 monomers are involved in 13 short contacts:

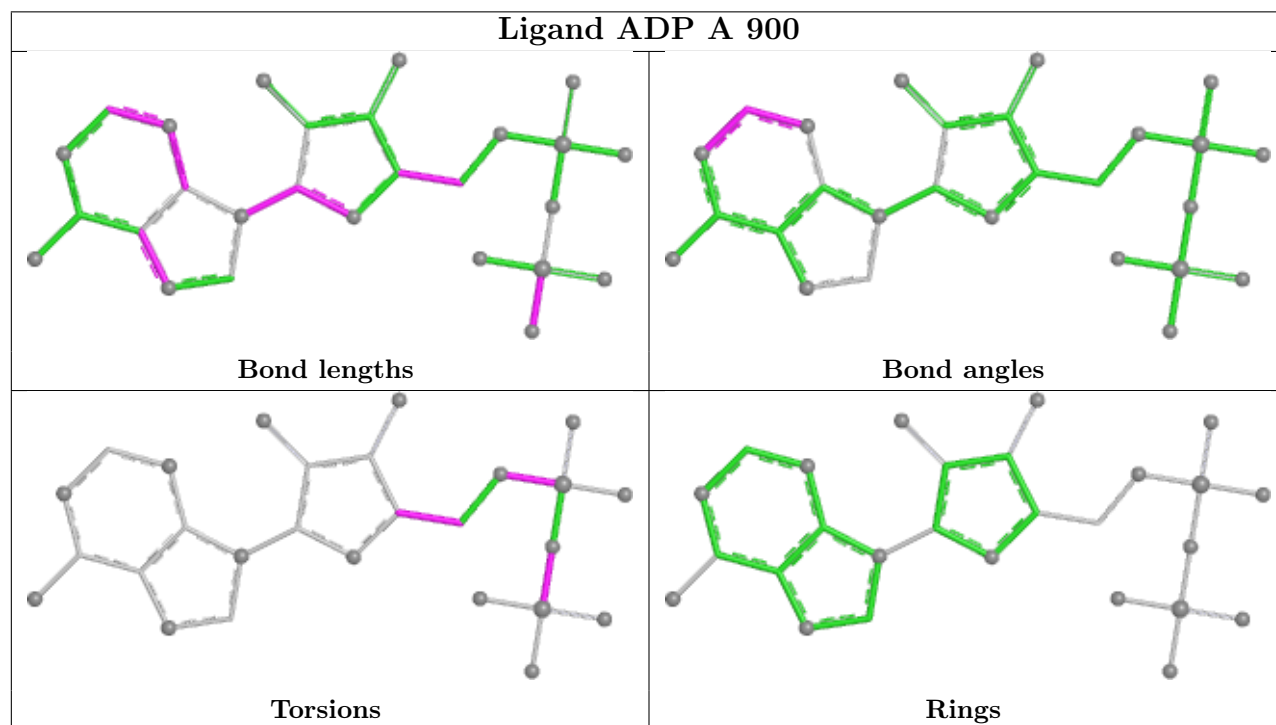
Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	A	900	ADP	2	0
2	B	900	ADP	1	0
2	C	807	ADP	1	0

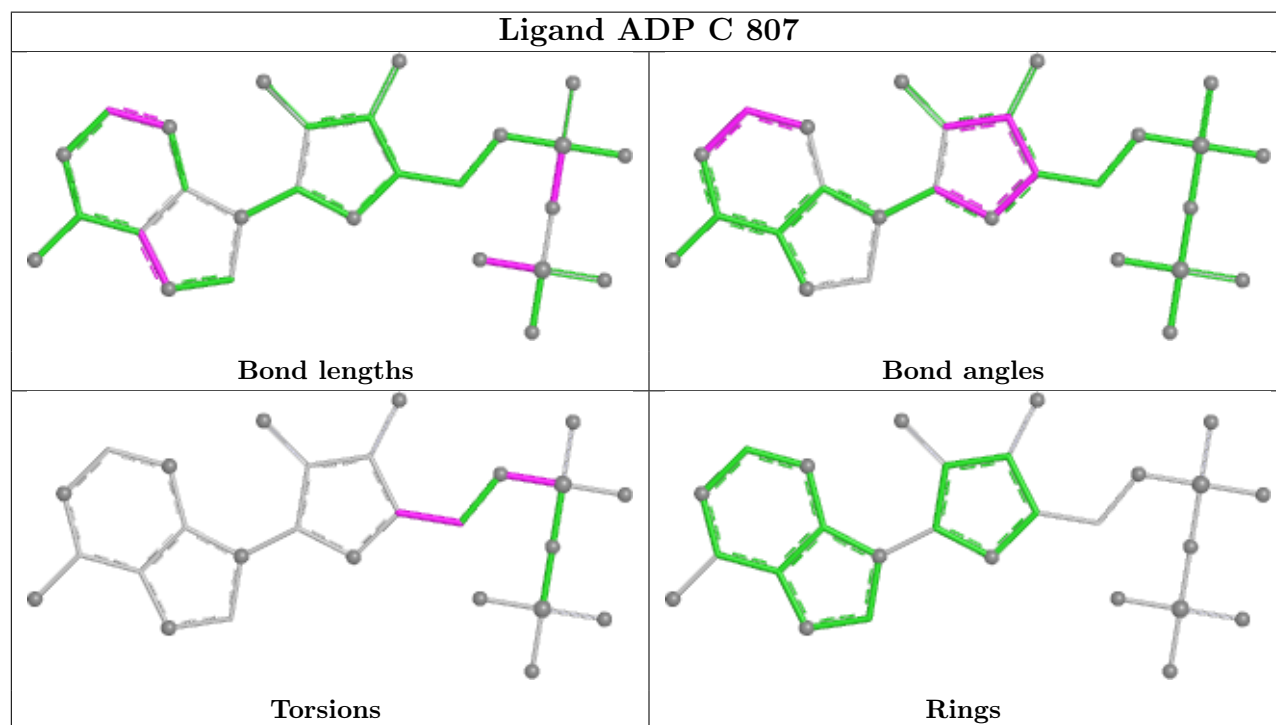
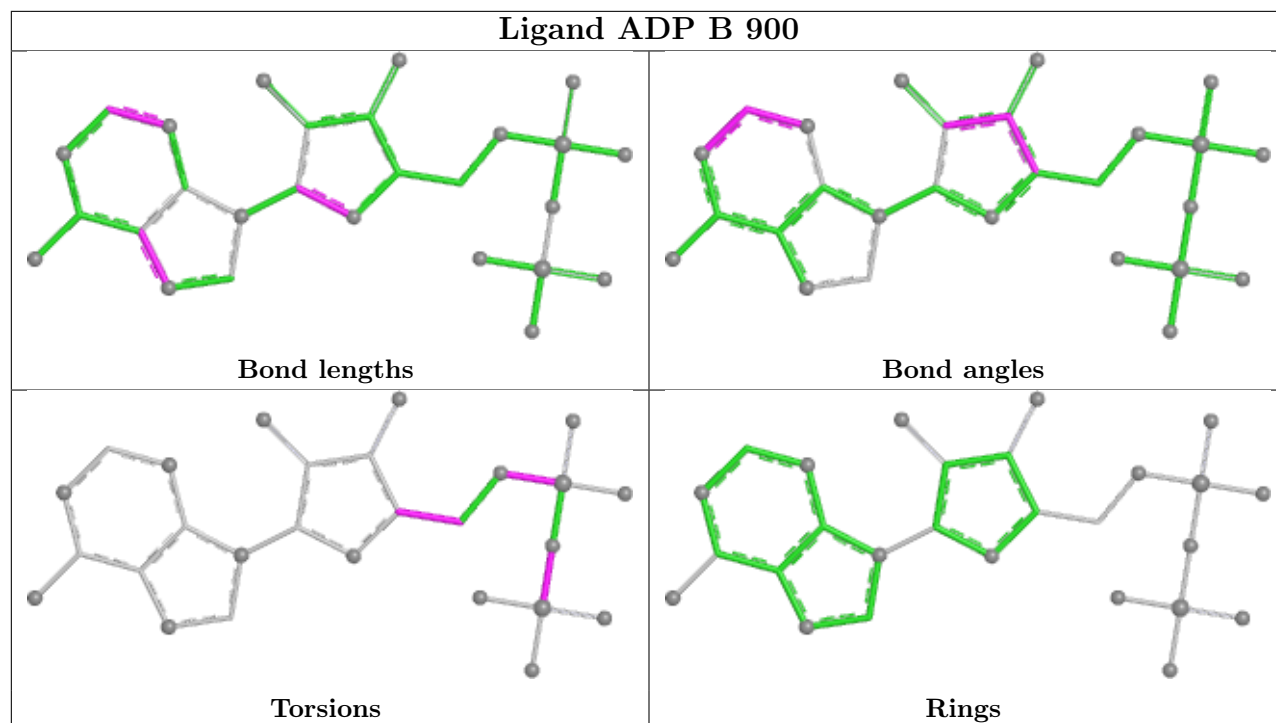
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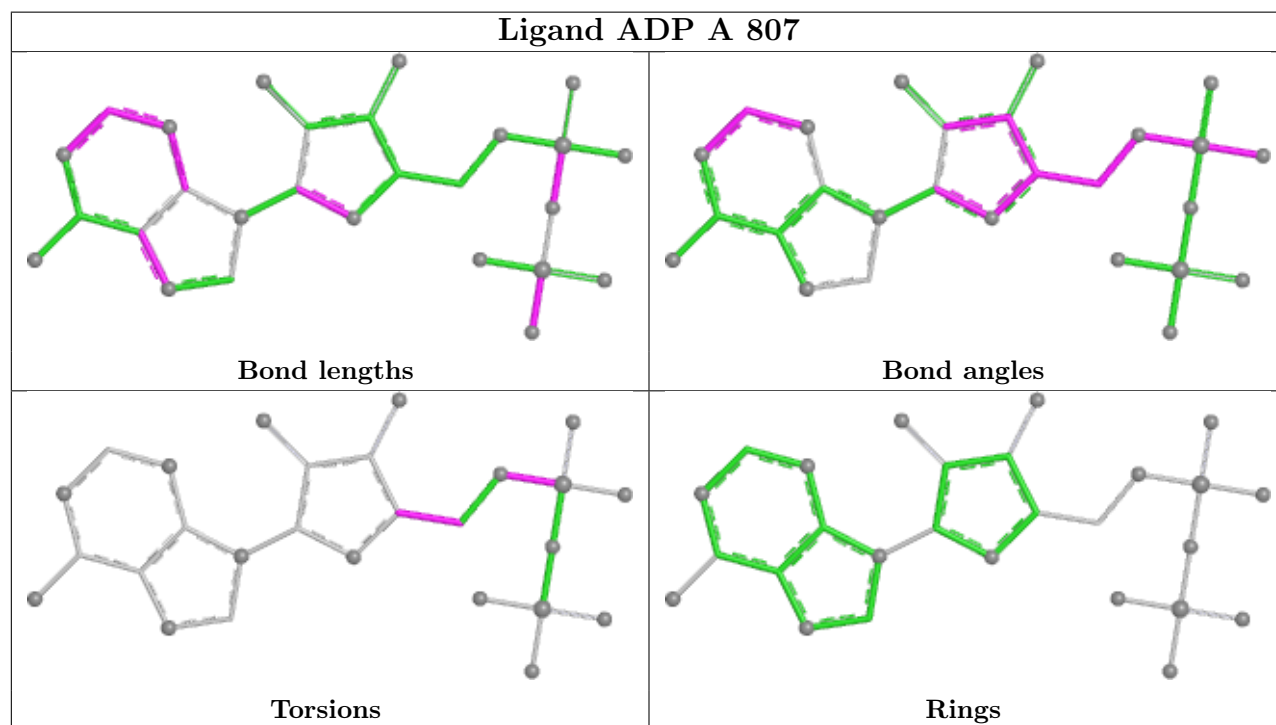
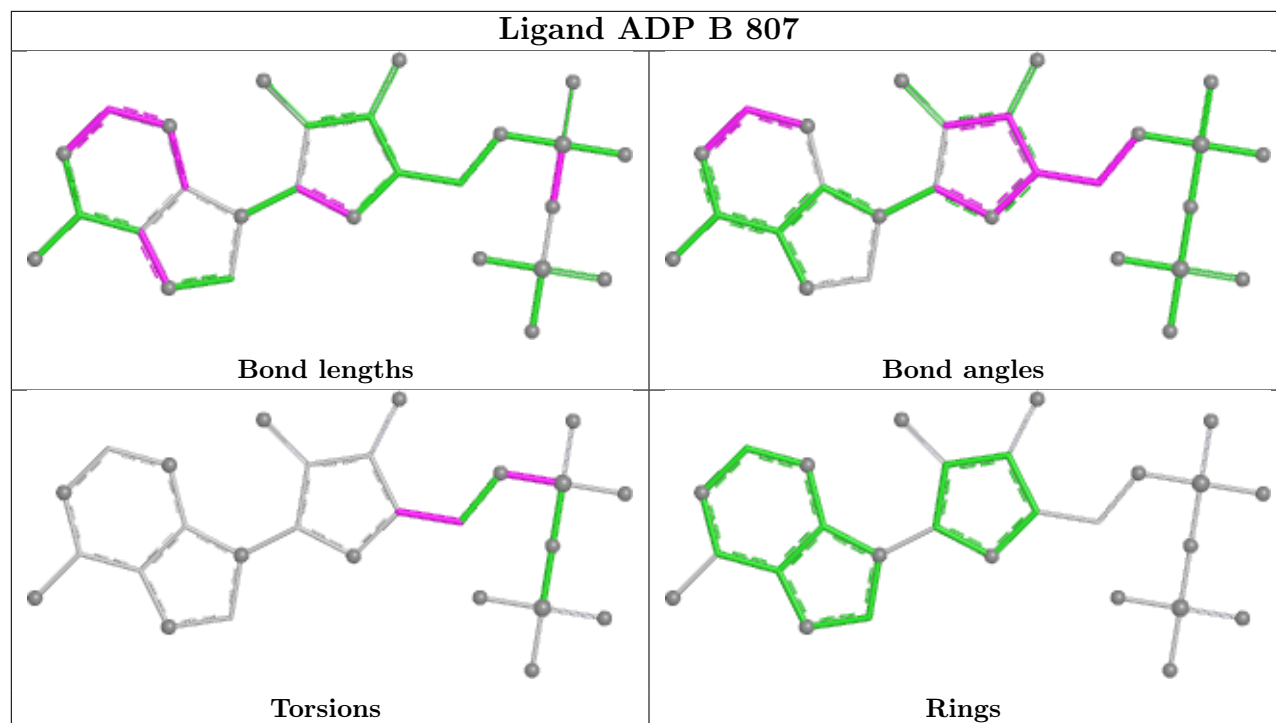
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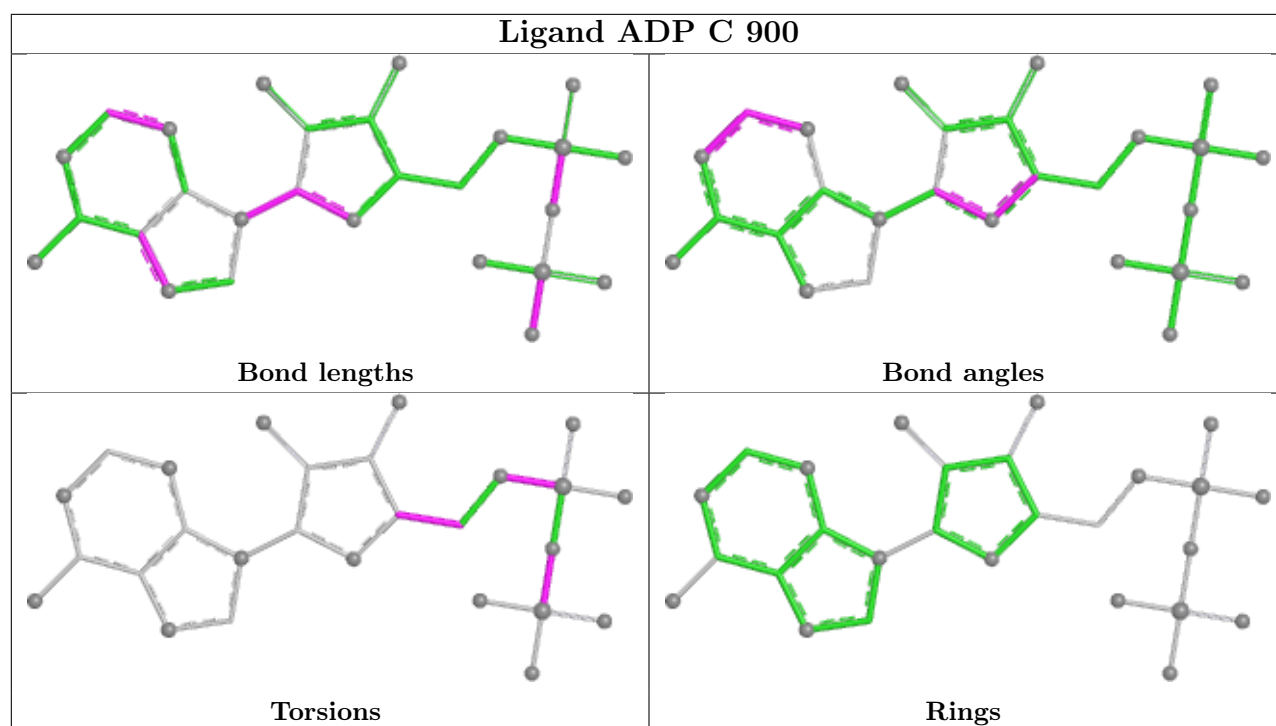
Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	B	807	ADP	3	0
2	A	807	ADP	4	0
2	C	900	ADP	2	0

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.

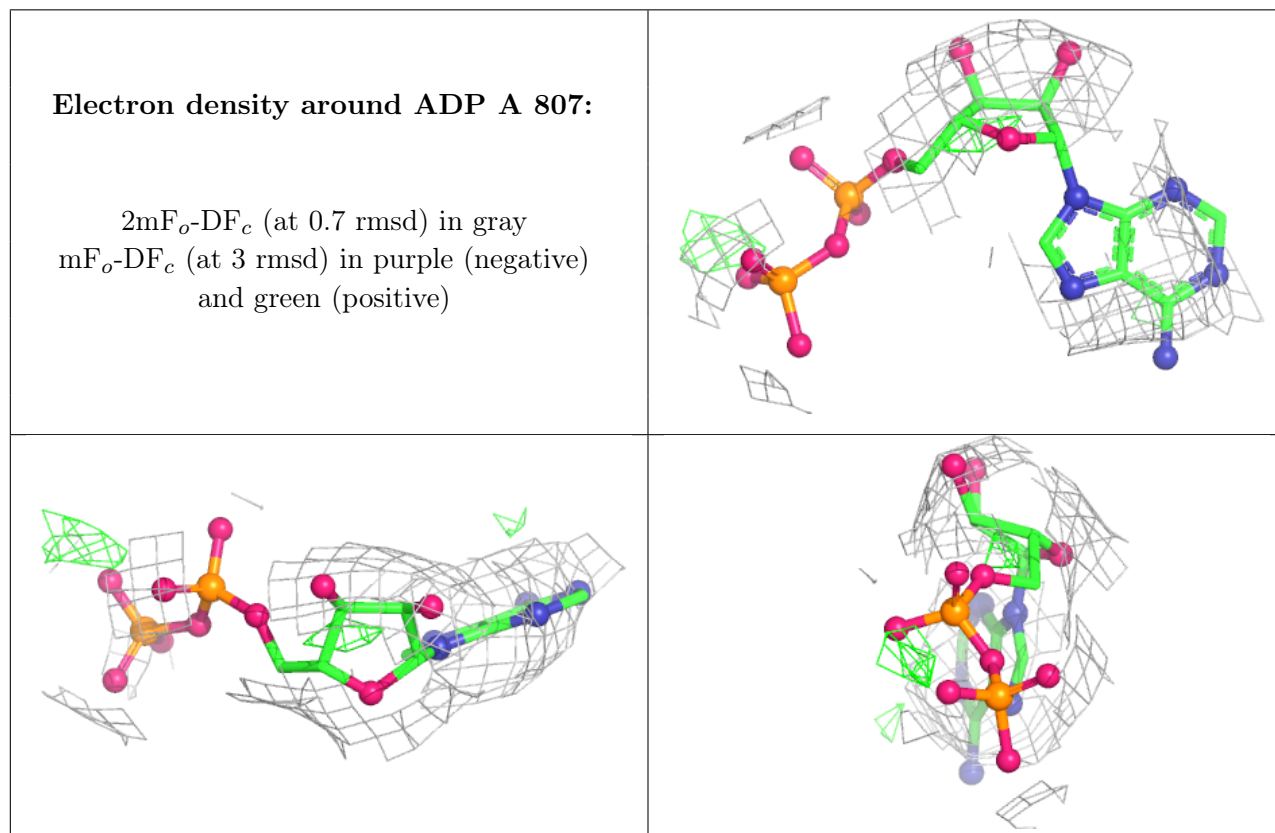
6.3 Carbohydrates [i](#)

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

6.4 Ligands [i](#)

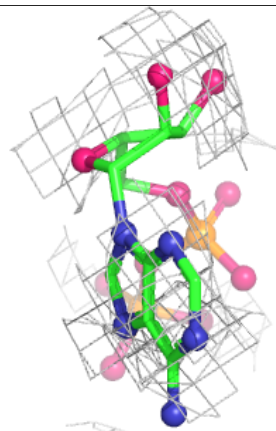
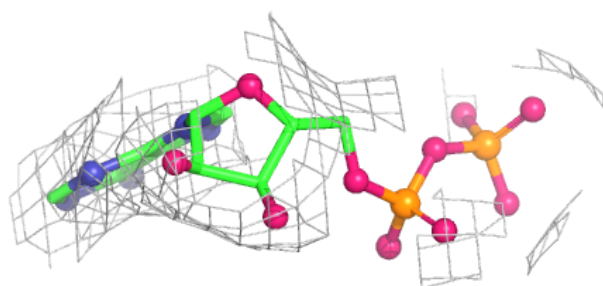
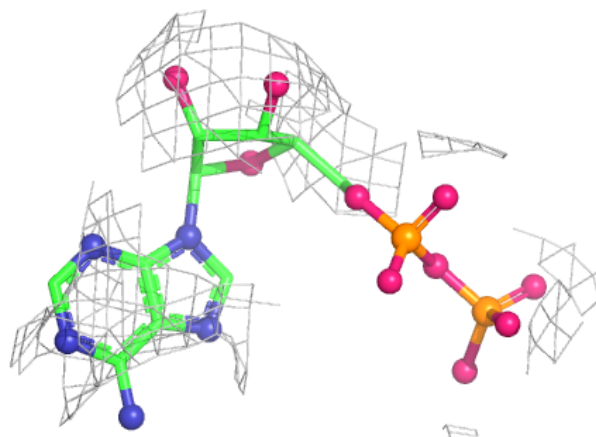
Unable to reproduce the depositors R factor - this section is therefore empty.

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.



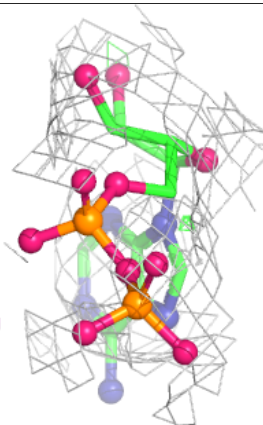
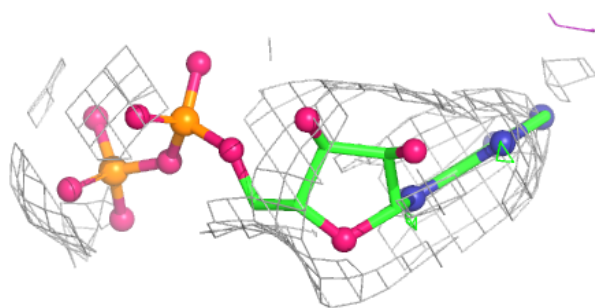
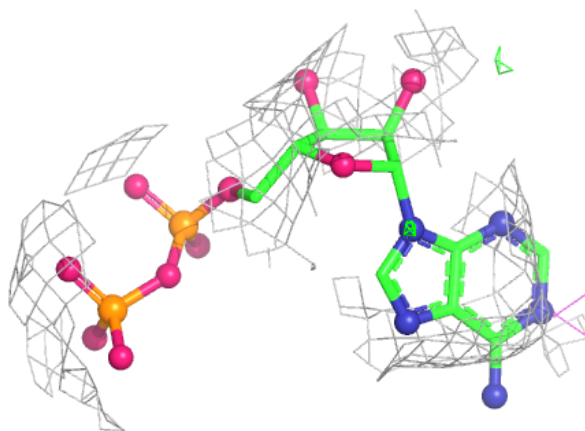
Electron density around ADP A 900:

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

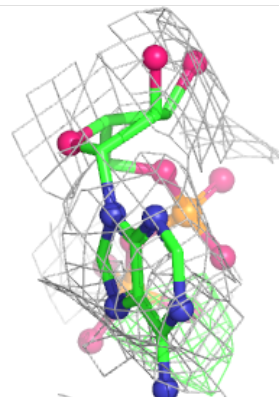
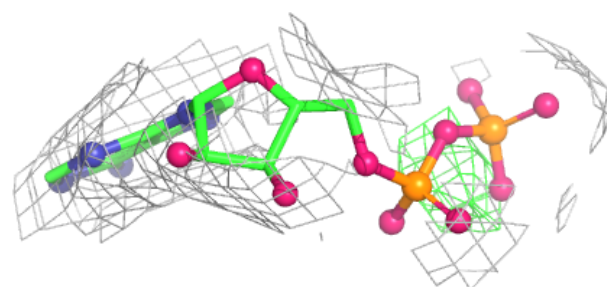
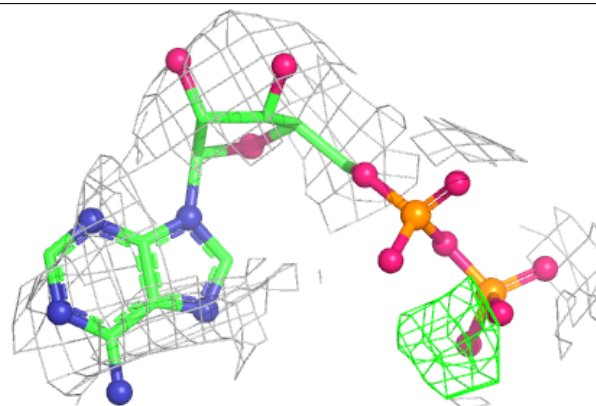


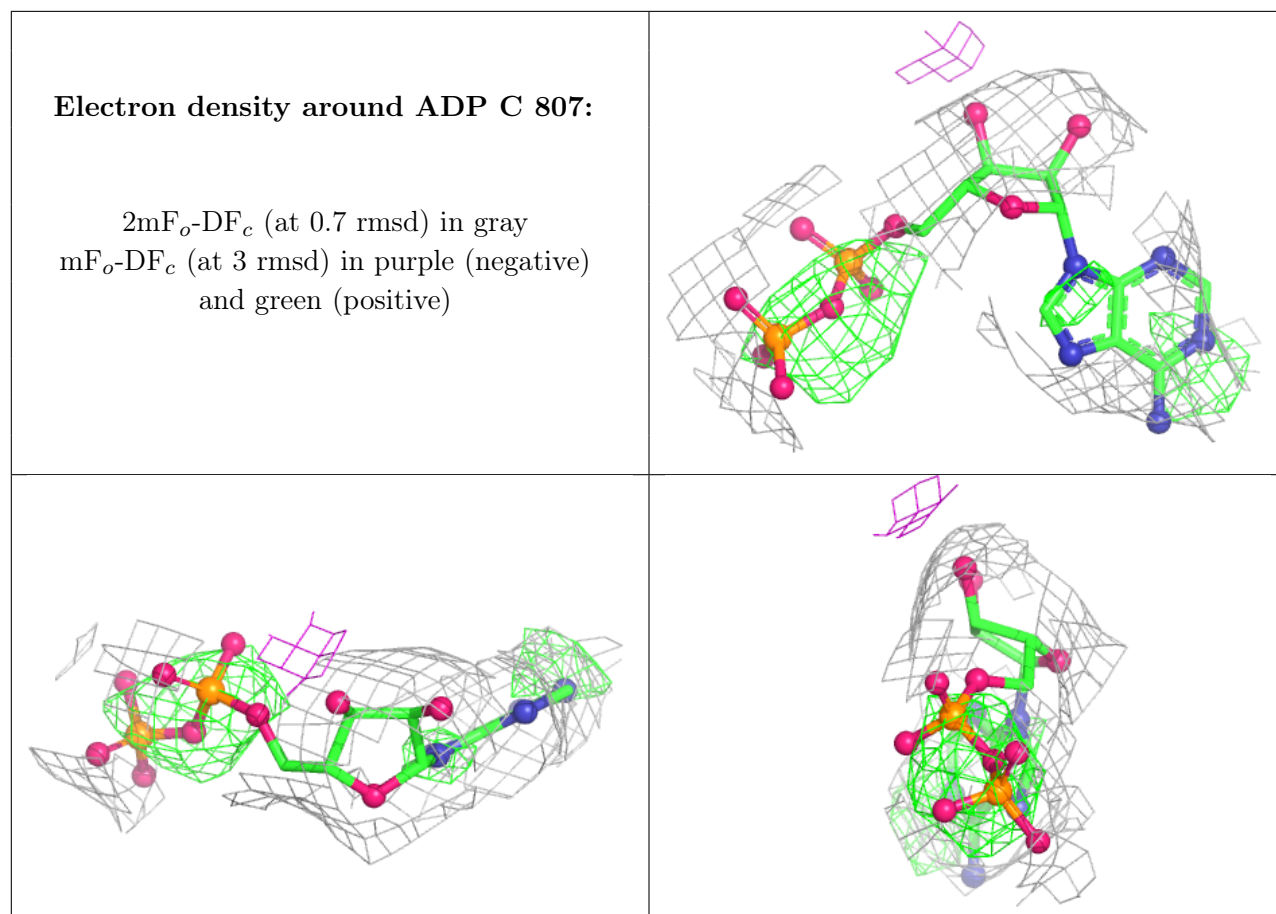
Electron density around ADP B 807:

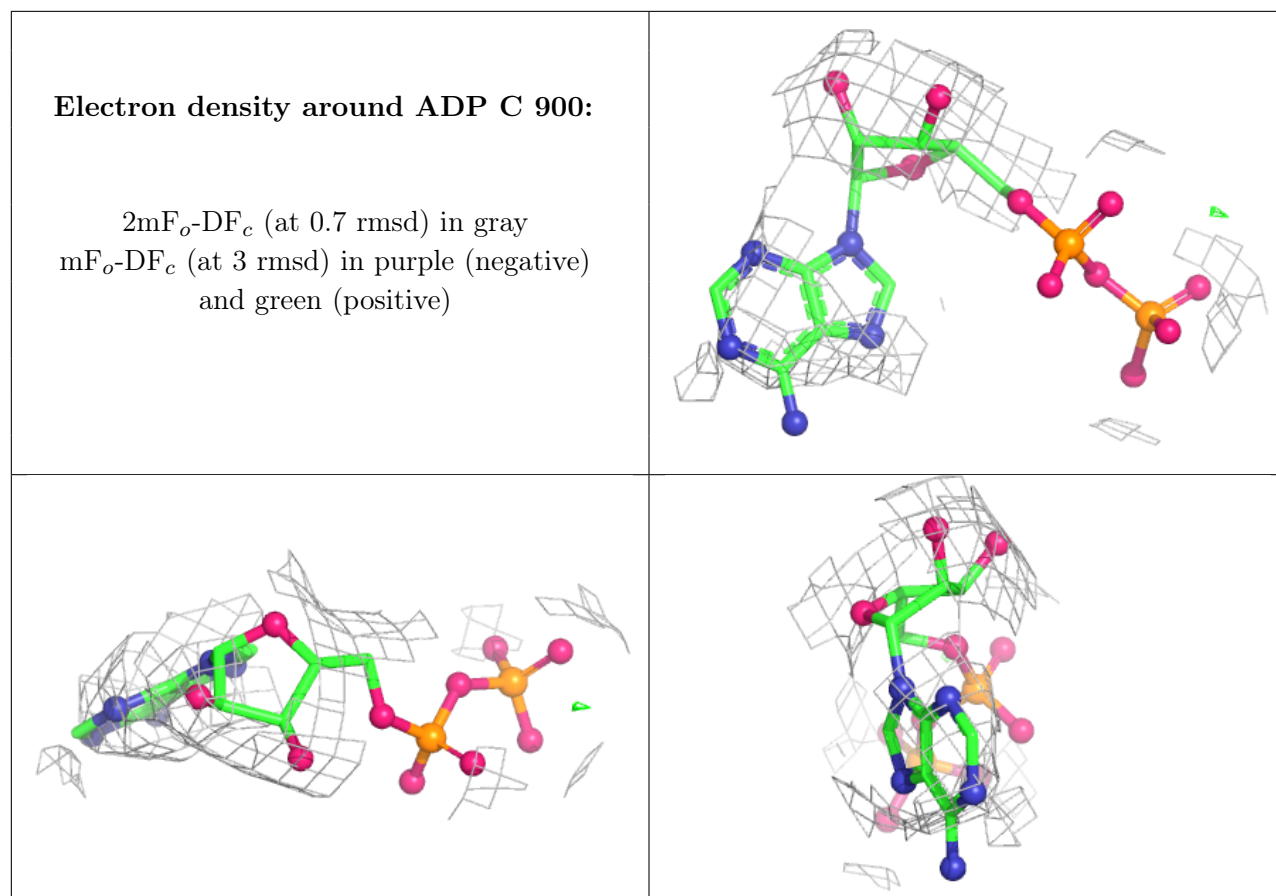
$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)

**Electron density around ADP B 900:**

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







6.5 Other polymers [i](#)

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