



# Full wwPDB X-ray Structure Validation Report ⓘ

Sep 23, 2023 – 08:40 PM EDT

PDB ID : 5TSH  
Title : PilB from *Geobacter metallireducens* bound to AMP-PNP  
Authors : McCallum, M.; Tammam, S.; Khan, A.; Burrows, L.; Howell, P.L.  
Deposited on : 2016-10-28  
Resolution : 2.30 Å(reported)

This is a Full wwPDB X-ray Structure Validation 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 : 2.35.1  
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

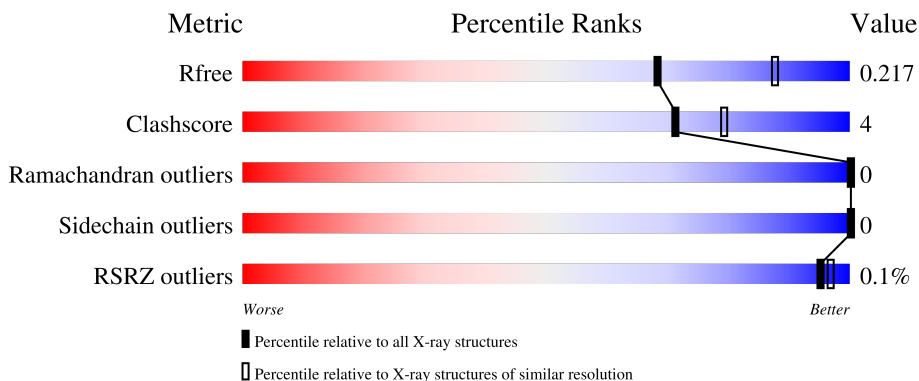
# 1 Overall quality at a glance i

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.30 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	5042 (2.30-2.30)
Clashscore	141614	5643 (2.30-2.30)
Ramachandran outliers	138981	5575 (2.30-2.30)
Sidechain outliers	138945	5575 (2.30-2.30)
RSRZ outliers	127900	4938 (2.30-2.30)

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  $\leq 5\%$ . The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density. The numeric value is given above the bar.

Mol	Chain	Length	Quality of chain
1	A	588	59% 5% 36%
1	B	588	58% 6% 36%
1	C	588	60% 5% 35%
1	D	588	59% 6% 36%
1	E	588	60% 6% 34%

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Mol	Chain	Length	Quality of chain
1	F	588	 59% 6% 35%

## 2 Entry composition [i](#)

There are 6 unique types of molecules in this entry. The entry contains 17937 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 Type IV pilus biogenesis ATPase PilB.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	375	2784	1764	479	525	16	0	0	0
1	B	376	2844	1807	489	532	16	0	0	0
1	C	382	2899	1845	499	538	17	0	0	0
1	D	379	2882	1827	497	541	17	0	1	0
1	E	387	2920	1855	506	542	17	0	0	0
1	F	382	2895	1845	498	535	17	0	0	0

There are 126 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-19	MET	-	initiating methionine	UNP Q39VU7
A	-18	GLY	-	expression tag	UNP Q39VU7
A	-17	SER	-	expression tag	UNP Q39VU7
A	-16	SER	-	expression tag	UNP Q39VU7
A	-15	HIS	-	expression tag	UNP Q39VU7
A	-14	HIS	-	expression tag	UNP Q39VU7
A	-13	HIS	-	expression tag	UNP Q39VU7
A	-12	HIS	-	expression tag	UNP Q39VU7
A	-11	HIS	-	expression tag	UNP Q39VU7
A	-10	HIS	-	expression tag	UNP Q39VU7
A	-9	SER	-	expression tag	UNP Q39VU7
A	-8	SER	-	expression tag	UNP Q39VU7
A	-7	GLY	-	expression tag	UNP Q39VU7
A	-6	LEU	-	expression tag	UNP Q39VU7
A	-5	VAL	-	expression tag	UNP Q39VU7
A	-4	PRO	-	expression tag	UNP Q39VU7
A	-3	ARG	-	expression tag	UNP Q39VU7

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Chain	Residue	Modelled	Actual	Comment	Reference
A	-2	GLY	-	expression tag	UNP Q39VU7
A	-1	SER	-	expression tag	UNP Q39VU7
A	0	HIS	-	expression tag	UNP Q39VU7
A	482	GLY	ALA	conflict	UNP Q39VU7
B	-19	MET	-	initiating methionine	UNP Q39VU7
B	-18	GLY	-	expression tag	UNP Q39VU7
B	-17	SER	-	expression tag	UNP Q39VU7
B	-16	SER	-	expression tag	UNP Q39VU7
B	-15	HIS	-	expression tag	UNP Q39VU7
B	-14	HIS	-	expression tag	UNP Q39VU7
B	-13	HIS	-	expression tag	UNP Q39VU7
B	-12	HIS	-	expression tag	UNP Q39VU7
B	-11	HIS	-	expression tag	UNP Q39VU7
B	-10	HIS	-	expression tag	UNP Q39VU7
B	-9	SER	-	expression tag	UNP Q39VU7
B	-8	SER	-	expression tag	UNP Q39VU7
B	-7	GLY	-	expression tag	UNP Q39VU7
B	-6	LEU	-	expression tag	UNP Q39VU7
B	-5	VAL	-	expression tag	UNP Q39VU7
B	-4	PRO	-	expression tag	UNP Q39VU7
B	-3	ARG	-	expression tag	UNP Q39VU7
B	-2	GLY	-	expression tag	UNP Q39VU7
B	-1	SER	-	expression tag	UNP Q39VU7
B	0	HIS	-	expression tag	UNP Q39VU7
B	482	GLY	ALA	conflict	UNP Q39VU7
C	-19	MET	-	initiating methionine	UNP Q39VU7
C	-18	GLY	-	expression tag	UNP Q39VU7
C	-17	SER	-	expression tag	UNP Q39VU7
C	-16	SER	-	expression tag	UNP Q39VU7
C	-15	HIS	-	expression tag	UNP Q39VU7
C	-14	HIS	-	expression tag	UNP Q39VU7
C	-13	HIS	-	expression tag	UNP Q39VU7
C	-12	HIS	-	expression tag	UNP Q39VU7
C	-11	HIS	-	expression tag	UNP Q39VU7
C	-10	HIS	-	expression tag	UNP Q39VU7
C	-9	SER	-	expression tag	UNP Q39VU7
C	-8	SER	-	expression tag	UNP Q39VU7
C	-7	GLY	-	expression tag	UNP Q39VU7
C	-6	LEU	-	expression tag	UNP Q39VU7
C	-5	VAL	-	expression tag	UNP Q39VU7
C	-4	PRO	-	expression tag	UNP Q39VU7
C	-3	ARG	-	expression tag	UNP Q39VU7

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Chain	Residue	Modelled	Actual	Comment	Reference
C	-2	GLY	-	expression tag	UNP Q39VU7
C	-1	SER	-	expression tag	UNP Q39VU7
C	0	HIS	-	expression tag	UNP Q39VU7
C	482	GLY	ALA	conflict	UNP Q39VU7
D	-19	MET	-	initiating methionine	UNP Q39VU7
D	-18	GLY	-	expression tag	UNP Q39VU7
D	-17	SER	-	expression tag	UNP Q39VU7
D	-16	SER	-	expression tag	UNP Q39VU7
D	-15	HIS	-	expression tag	UNP Q39VU7
D	-14	HIS	-	expression tag	UNP Q39VU7
D	-13	HIS	-	expression tag	UNP Q39VU7
D	-12	HIS	-	expression tag	UNP Q39VU7
D	-11	HIS	-	expression tag	UNP Q39VU7
D	-10	HIS	-	expression tag	UNP Q39VU7
D	-9	SER	-	expression tag	UNP Q39VU7
D	-8	SER	-	expression tag	UNP Q39VU7
D	-7	GLY	-	expression tag	UNP Q39VU7
D	-6	LEU	-	expression tag	UNP Q39VU7
D	-5	VAL	-	expression tag	UNP Q39VU7
D	-4	PRO	-	expression tag	UNP Q39VU7
D	-3	ARG	-	expression tag	UNP Q39VU7
D	-2	GLY	-	expression tag	UNP Q39VU7
D	-1	SER	-	expression tag	UNP Q39VU7
D	0	HIS	-	expression tag	UNP Q39VU7
D	482	GLY	ALA	conflict	UNP Q39VU7
E	-19	MET	-	initiating methionine	UNP Q39VU7
E	-18	GLY	-	expression tag	UNP Q39VU7
E	-17	SER	-	expression tag	UNP Q39VU7
E	-16	SER	-	expression tag	UNP Q39VU7
E	-15	HIS	-	expression tag	UNP Q39VU7
E	-14	HIS	-	expression tag	UNP Q39VU7
E	-13	HIS	-	expression tag	UNP Q39VU7
E	-12	HIS	-	expression tag	UNP Q39VU7
E	-11	HIS	-	expression tag	UNP Q39VU7
E	-10	HIS	-	expression tag	UNP Q39VU7
E	-9	SER	-	expression tag	UNP Q39VU7
E	-8	SER	-	expression tag	UNP Q39VU7
E	-7	GLY	-	expression tag	UNP Q39VU7
E	-6	LEU	-	expression tag	UNP Q39VU7
E	-5	VAL	-	expression tag	UNP Q39VU7
E	-4	PRO	-	expression tag	UNP Q39VU7
E	-3	ARG	-	expression tag	UNP Q39VU7

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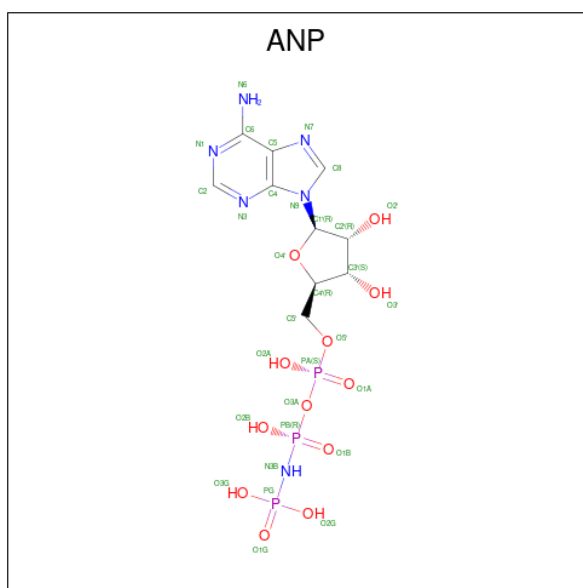
Chain	Residue	Modelled	Actual	Comment	Reference
E	-2	GLY	-	expression tag	UNP Q39VU7
E	-1	SER	-	expression tag	UNP Q39VU7
E	0	HIS	-	expression tag	UNP Q39VU7
E	482	GLY	ALA	conflict	UNP Q39VU7
F	-19	MET	-	initiating methionine	UNP Q39VU7
F	-18	GLY	-	expression tag	UNP Q39VU7
F	-17	SER	-	expression tag	UNP Q39VU7
F	-16	SER	-	expression tag	UNP Q39VU7
F	-15	HIS	-	expression tag	UNP Q39VU7
F	-14	HIS	-	expression tag	UNP Q39VU7
F	-13	HIS	-	expression tag	UNP Q39VU7
F	-12	HIS	-	expression tag	UNP Q39VU7
F	-11	HIS	-	expression tag	UNP Q39VU7
F	-10	HIS	-	expression tag	UNP Q39VU7
F	-9	SER	-	expression tag	UNP Q39VU7
F	-8	SER	-	expression tag	UNP Q39VU7
F	-7	GLY	-	expression tag	UNP Q39VU7
F	-6	LEU	-	expression tag	UNP Q39VU7
F	-5	VAL	-	expression tag	UNP Q39VU7
F	-4	PRO	-	expression tag	UNP Q39VU7
F	-3	ARG	-	expression tag	UNP Q39VU7
F	-2	GLY	-	expression tag	UNP Q39VU7
F	-1	SER	-	expression tag	UNP Q39VU7
F	0	HIS	-	expression tag	UNP Q39VU7
F	482	GLY	ALA	conflict	UNP Q39VU7

- Molecule 2 is ZINC ION (three-letter code: ZN) (formula: Zn).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
2	A	1	Total Zn 1 1	0	0
2	B	1	Total Zn 1 1	0	0
2	C	1	Total Zn 1 1	0	0
2	D	1	Total Zn 1 1	0	0
2	E	1	Total Zn 1 1	0	0
2	F	1	Total Zn 1 1	0	0

- Molecule 3 is PHOSPHOAMINOPHOSPHONIC ACID-ADENYLATE ESTER (three-letter

code: ANP) (formula: C<sub>10</sub>H<sub>17</sub>N<sub>6</sub>O<sub>12</sub>P<sub>3</sub>).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
			Total	C	N	O	P		
3	A	1	Total	C	N	O	P	0	0
			31	10	6	12	3		
3	B	1	Total	C	N	O	P	0	0
			31	10	6	12	3		
3	C	1	Total	C	N	O	P	0	0
			31	10	6	12	3		
3	D	1	Total	C	N	O	P	0	0
			31	10	6	12	3		

- Molecule 4 is MAGNESIUM ION (three-letter code: MG) (formula: Mg).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	Mg		
4	A	1	Total	Mg	0	0
			1	1		
4	C	1	Total	Mg	0	0
			1	1		

- Molecule 5 is ADENOSINE-5'-DIPHOSPHATE (three-letter code: ADP) (formula: C<sub>10</sub>H<sub>15</sub>N<sub>5</sub>O<sub>10</sub>P<sub>2</sub>).





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

- Molecule 6 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	A	97	Total	O	0	0
			97	97		
6	B	82	Total	O	0	0
			82	82		
6	C	75	Total	O	0	0
			75	75		
6	D	76	Total	O	0	0
			76	76		
6	E	96	Total	O	0	0
			96	96		
6	F	101	Total	O	0	0
			101	101		







## 4 Data and refinement statistics

Property	Value	Source
Space group	P 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	74.32Å 99.96Å 109.79Å 112.99° 106.60° 88.91°	Depositor
Resolution (Å)	45.76 – 2.30 45.76 – 2.30	Depositor EDS
% Data completeness (in resolution range)	98.2 (45.76-2.30) 94.6 (45.76-2.30)	Depositor EDS
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	0.06	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	1.22 (at 2.29Å)	Xtrriage
Refinement program	PHENIX (1.10_2155: ???)	Depositor
R, $R_{free}$	0.184 , 0.218 0.184 , 0.217	Depositor DCC
$R_{free}$ test set	2018 reflections (1.67%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	39.3	Xtrriage
Anisotropy	0.196	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.30 , 40.7	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.47$ , $\langle L^2 \rangle = 0.29$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
$F_o, F_c$ correlation	0.95	EDS
Total number of atoms	17937	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	48.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.47% 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: ANP, ADP, ZN, MG

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	0.24	0/2826	0.44	1/3831 (0.0%)
1	B	0.24	0/2887	0.42	0/3913
1	C	0.25	0/2942	0.43	0/3984
1	D	0.24	0/2927	0.44	1/3964 (0.0%)
1	E	0.24	0/2964	0.43	0/4014
1	F	0.24	0/2940	0.43	0/3986
All	All	0.24	0/17486	0.43	2/23692 (0.0%)

There are no bond length outliers.

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed( $^{\circ}$ )	Ideal( $^{\circ}$ )
1	D	447	LEU	CA-CB-CG	5.36	127.64	115.30
1	A	447	LEU	CA-CB-CG	5.04	126.89	115.30

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	2784	0	2688	16	0
1	B	2844	0	2828	23	0
1	C	2899	0	2905	19	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	D	2882	0	2860	20	0
1	E	2920	0	2924	23	0
1	F	2895	0	2899	25	0
2	A	1	0	0	0	0
2	B	1	0	0	0	0
2	C	1	0	0	0	0
2	D	1	0	0	0	0
2	E	1	0	0	0	0
2	F	1	0	0	0	0
3	A	31	0	13	1	0
3	B	31	0	13	7	0
3	C	31	0	13	4	0
3	D	31	0	13	4	0
4	A	1	0	0	0	0
4	C	1	0	0	0	0
5	E	27	0	12	2	0
5	F	27	0	12	4	0
6	A	97	0	0	0	0
6	B	82	0	0	0	0
6	C	75	0	0	1	0
6	D	76	0	0	1	0
6	E	96	0	0	3	0
6	F	101	0	0	4	0
All	All	17937	0	17180	122	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 4.

All (122) 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:B:328:GLY:H	3:B:602:ANP:HNB1	1.09	0.97
5:F:602:ADP:O2A	6:F:701:HOH:O	1.92	0.87
1:E:515:GLU:OE1	1:E:518:ARG:NH1	2.08	0.86
1:B:562:ARG:HG3	1:E:407:LYS:HD2	1.59	0.82
1:E:328:GLY:N	5:E:602:ADP:O2B	2.11	0.80
1:C:186:LEU:HD11	1:C:225:MET:HE1	1.64	0.79
1:D:332:THR:HG21	1:D:357:GLU:HG3	1.64	0.79
1:E:442:ALA:HB1	1:E:518:ARG:HG3	1.67	0.75
1:C:328:GLY:H	3:C:602:ANP:HNB1	1.36	0.73
1:E:257:ARG:NH1	6:E:702:HOH:O	2.15	0.72

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:E:558:GLU:OE2	6:E:701:HOH:O	2.07	0.71
1:D:328:GLY:H	3:D:602:ANP:HNB1	1.39	0.69
1:B:328:GLY:N	3:B:602:ANP:HNB1	1.90	0.68
1:F:328:GLY:N	5:F:602:ADP:O2B	2.20	0.67
1:E:277:THR:HG22	1:E:279:PHE:H	1.61	0.66
1:C:296:ASP:OD1	1:C:298:THR:OG1	2.13	0.65
1:B:321:VAL:HB	1:B:416:LEU:HD23	1.79	0.65
1:A:216:ARG:NE	1:D:387:ASP:OD2	2.26	0.64
1:F:549:LYS:NZ	6:F:703:HOH:O	2.29	0.63
1:E:333:VAL:HG21	5:E:602:ADP:H2'	1.81	0.62
1:F:333:VAL:HG21	5:F:602:ADP:H2'	1.82	0.61
1:D:278:LEU:HD21	1:F:356:VAL:HG21	1.81	0.61
1:D:442:ALA:O	1:D:518:ARG:NE	2.33	0.61
1:D:327:THR:HG23	3:D:602:ANP:O2G	2.02	0.60
1:C:458:CYS:HB3	1:C:461:CYS:HB2	1.84	0.59
1:E:403:GLU:O	1:E:407:LYS:HG2	2.03	0.58
1:F:201:ASP:OD2	1:F:286:ARG:HD3	2.04	0.58
1:D:189:LEU:HA	1:D:192:THR:HG22	1.86	0.57
1:E:533:GLU:OE1	1:E:536:ARG:NH2	2.33	0.57
1:A:563:VAL:HG23	1:A:564:THR:HG23	1.87	0.56
1:A:328:GLY:H	3:A:602:ANP:HNB1	1.52	0.55
1:C:333:VAL:HG21	3:C:602:ANP:H2'	1.89	0.55
1:A:480:ASP:OD1	1:A:480:ASP:N	2.33	0.55
1:D:296:ASP:OD2	1:D:298:THR:HG22	2.06	0.54
1:D:430:ARG:NH2	6:D:704:HOH:O	2.42	0.53
1:F:331:LYS:N	5:F:602:ADP:O3B	2.38	0.53
1:D:275:LEU:HD22	1:D:276:PRO:HD2	1.91	0.52
1:C:191:LEU:HD21	1:C:285:LEU:HD22	1.91	0.52
1:A:469:ILE:O	1:A:473:ILE:HG12	2.09	0.52
1:A:184:VAL:CB	1:A:238:ARG:HH12	2.22	0.52
1:B:504:ARG:HB2	3:B:602:ANP:C2	2.40	0.52
1:B:533:GLU:OE2	1:B:536:ARG:NH2	2.24	0.52
1:E:195:ILE:HD11	1:E:268:MET:HG2	1.93	0.51
1:B:442:ALA:O	1:B:518:ARG:NE	2.31	0.51
1:B:330:GLY:HA2	3:B:602:ANP:O2A	2.10	0.51
1:E:455:ARG:HA	1:E:504:ARG:HG2	1.92	0.51
1:C:563:VAL:HG23	1:C:564:THR:HG23	1.94	0.50
1:A:533:GLU:OE1	1:A:536:ARG:NH2	2.40	0.50
1:B:300:LEU:O	3:B:602:ANP:N6	2.40	0.50
1:A:395:GLU:CD	1:A:397:ARG:HE	2.14	0.49
1:B:327:THR:HG23	3:B:602:ANP:O1G	2.12	0.49

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:211:PHE:CD1	1:C:227:PRO:HG2	2.48	0.49
1:E:228:PRO:HD2	1:E:231:LEU:HD12	1.93	0.49
1:F:442:ALA:HB1	1:F:518:ARG:HG2	1.92	0.49
6:C:706:HOH:O	1:F:282:LYS:HE2	2.13	0.49
1:E:275:LEU:HD12	1:E:276:PRO:HD2	1.95	0.49
1:E:419:LEU:HD12	1:E:427:THR:HG23	1.95	0.49
1:C:395:GLU:CD	1:C:397:ARG:HH21	2.16	0.49
1:B:504:ARG:HB2	3:B:602:ANP:H2	1.94	0.48
1:A:278:LEU:HD21	1:D:367:GLN:HB2	1.96	0.48
1:C:201:ASP:OD1	1:C:286:ARG:HD3	2.14	0.48
1:E:469:ILE:O	1:E:473:ILE:HG12	2.13	0.48
1:E:533:GLU:OE2	6:E:703:HOH:O	2.20	0.48
1:C:321:VAL:HB	1:C:416:LEU:HD12	1.97	0.47
1:D:504:ARG:HB2	3:D:602:ANP:H2	1.96	0.47
1:B:459:SER:HA	1:B:462:LYS:HD2	1.95	0.47
1:E:205:GLU:HG2	1:E:282:LYS:HE3	1.96	0.47
1:D:381:ARG:NH2	1:D:400:GLU:OE2	2.43	0.47
1:B:319:GLY:HA3	1:B:446:ASN:ND2	2.30	0.46
1:A:225:MET:HE2	1:A:227:PRO:HG3	1.97	0.46
1:C:297:MET:HG2	1:C:337:SER:OG	2.15	0.46
1:E:396:ILE:HB	1:E:419:LEU:HD21	1.96	0.46
1:A:336:TYR:OH	1:A:353:GLU:OE2	2.20	0.46
1:F:213:VAL:HB	1:F:225:MET:HB3	1.96	0.46
1:C:228:PRO:HB2	1:C:230:LYS:HG2	1.98	0.46
1:C:504:ARG:O	3:C:602:ANP:H2	2.16	0.45
1:F:293:LEU:HD11	1:F:333:VAL:HG22	1.98	0.45
1:F:336:TYR:OH	1:F:353:GLU:OE2	2.27	0.45
1:D:271:ARG:HB2	1:D:288:LEU:HD21	1.98	0.45
1:A:215:TYR:CD2	1:A:224:VAL:HG11	2.53	0.44
1:B:425:PRO:HG3	1:B:511:MET:HE1	1.99	0.44
1:F:353:GLU:HB2	1:F:356:VAL:HG22	2.00	0.44
1:F:381:ARG:NH2	6:F:715:HOH:O	2.49	0.44
1:F:370:GLU:HG3	1:F:375:ASN:HB3	2.00	0.43
1:B:516:GLU:OE1	1:B:516:GLU:N	2.43	0.43
1:F:446:ASN:ND2	6:F:716:HOH:O	2.50	0.43
1:F:380:LEU:HB3	1:F:404:ILE:HG21	2.01	0.43
1:A:213:VAL:HB	1:A:225:MET:HB2	2.01	0.43
1:A:306:ALA:HB1	1:A:510:VAL:HG21	2.01	0.43
1:E:336:TYR:OH	1:E:353:GLU:OE1	2.27	0.43
1:C:206:PRO:HA	1:C:211:PHE:HD2	1.83	0.43
1:C:297:MET:HE2	1:C:297:MET:HB3	1.43	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:D:449:THR:HG22	1:D:510:VAL:HG22	2.01	0.43
1:B:286:ARG:NH1	1:E:385:ARG:O	2.52	0.42
1:C:330:GLY:HA2	3:C:602:ANP:O2A	2.19	0.42
1:F:451:GLN:HA	1:F:507:PHE:O	2.19	0.42
1:D:331:LYS:HE2	3:D:602:ANP:O2B	2.20	0.42
1:B:336:TYR:OH	1:B:353:GLU:OE1	2.36	0.42
1:F:388:PRO:HG2	1:F:413:HIS:CD2	2.54	0.42
1:F:297:MET:HE3	1:F:297:MET:HB2	1.94	0.42
1:D:456:ARG:HB2	1:D:505:VAL:HG13	2.00	0.42
1:F:225:MET:HG2	1:F:227:PRO:HD3	2.01	0.42
1:F:240:LYS:NZ	1:F:249:GLU:O	2.52	0.42
1:B:237:SER:O	1:B:241:ILE:HG13	2.20	0.42
1:B:326:PRO:HA	1:B:420:HIS:CD2	2.55	0.42
1:F:456:ARG:CZ	1:F:505:VAL:HG12	2.50	0.42
1:A:351:THR:HG22	1:A:392:MET:HB3	2.01	0.42
1:B:186:LEU:O	1:B:190:ILE:HG13	2.19	0.42
1:C:354:ASP:HA	1:C:355:PRO:HA	1.84	0.41
1:B:526:ASN:OD1	1:B:529:GLU:HG3	2.21	0.41
1:D:205:GLU:HG2	1:D:282:LYS:HE3	2.03	0.41
1:E:351:THR:HG21	1:E:353:GLU:OE2	2.20	0.41
1:C:311:LYS:HE3	1:C:341:GLU:OE2	2.20	0.41
1:F:197:ARG:NH1	1:F:497:ASN:OD1	2.45	0.41
1:F:529:GLU:H	1:F:529:GLU:HG2	1.63	0.41
1:B:456:ARG:HB2	1:B:505:VAL:HG23	2.03	0.41
1:D:515:GLU:O	1:D:519:GLU:HG2	2.20	0.41
1:F:453:LEU:HD23	1:F:453:LEU:HA	1.89	0.41
1:D:422:ASN:O	1:D:452[A]:ARG:NH2	2.54	0.40
1:B:453:LEU:HD13	1:B:504:ARG:NH1	2.35	0.40
1:A:289:ASP:OD2	1:A:290:LYS:N	2.54	0.40
1:E:380:LEU:HD21	1:E:393:ILE:HD11	2.04	0.40

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	369/588 (63%)	365 (99%)	4 (1%)	0	100	100
1	B	370/588 (63%)	366 (99%)	4 (1%)	0	100	100
1	C	376/588 (64%)	372 (99%)	4 (1%)	0	100	100
1	D	374/588 (64%)	370 (99%)	4 (1%)	0	100	100
1	E	385/588 (66%)	381 (99%)	4 (1%)	0	100	100
1	F	378/588 (64%)	376 (100%)	2 (0%)	0	100	100
All	All	2252/3528 (64%)	2230 (99%)	22 (1%)	0	100	100

There are no Ramachandran outliers to report.

### 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	276/501 (55%)	276 (100%)	0	100	100
1	B	292/501 (58%)	292 (100%)	0	100	100
1	C	300/501 (60%)	300 (100%)	0	100	100
1	D	295/501 (59%)	295 (100%)	0	100	100
1	E	301/501 (60%)	301 (100%)	0	100	100
1	F	298/501 (60%)	298 (100%)	0	100	100
All	All	1762/3006 (59%)	1762 (100%)	0	100	100

There are no protein residues with a non-rotameric sidechain to report.

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. There are no such sidechains identified.

### 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 14 ligands modelled in this entry, 8 are monoatomic - leaving 6 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
3	ANP	D	602	-	29,33,33	1.82	7 (24%)	31,52,52	1.84	8 (25%)
3	ANP	C	602	4	29,33,33	1.78	8 (27%)	31,52,52	1.90	8 (25%)
3	ANP	B	602	-	29,33,33	1.80	8 (27%)	31,52,52	1.87	8 (25%)
5	ADP	E	602	-	24,29,29	0.97	1 (4%)	29,45,45	1.43	4 (13%)
5	ADP	F	602	-	24,29,29	0.96	1 (4%)	29,45,45	1.43	4 (13%)
3	ANP	A	602	4	29,33,33	1.77	8 (27%)	31,52,52	1.81	8 (25%)

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
3	ANP	D	602	-	-	8/14/38/38	0/3/3/3
3	ANP	C	602	4	-	4/14/38/38	0/3/3/3
3	ANP	B	602	-	-	5/14/38/38	0/3/3/3
5	ADP	E	602	-	-	3/12/32/32	0/3/3/3
5	ADP	F	602	-	-	0/12/32/32	0/3/3/3
3	ANP	A	602	4	-	5/14/38/38	0/3/3/3

All (33) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	D	602	ANP	PG-N3B	4.59	1.75	1.63
3	D	602	ANP	PB-N3B	4.55	1.75	1.63
3	B	602	ANP	PB-N3B	4.51	1.75	1.63
3	B	602	ANP	PG-N3B	4.49	1.75	1.63
3	C	602	ANP	PB-N3B	4.48	1.75	1.63
3	C	602	ANP	PG-N3B	4.35	1.74	1.63
3	A	602	ANP	PB-N3B	4.31	1.74	1.63
3	A	602	ANP	PG-N3B	4.25	1.74	1.63
3	D	602	ANP	PG-O1G	3.24	1.51	1.46
3	B	602	ANP	PG-O1G	3.19	1.51	1.46
3	D	602	ANP	PB-O1B	3.17	1.51	1.46
3	A	602	ANP	PB-O1B	3.08	1.51	1.46
3	B	602	ANP	PB-O1B	3.06	1.51	1.46
3	A	602	ANP	PG-O1G	3.03	1.51	1.46
3	C	602	ANP	PG-O1G	3.00	1.50	1.46
3	C	602	ANP	PB-O1B	2.88	1.50	1.46
5	E	602	ADP	C5-C4	2.54	1.47	1.40
5	F	602	ADP	C5-C4	2.49	1.47	1.40
3	D	602	ANP	C5-C4	2.46	1.47	1.40
3	B	602	ANP	C5-C4	2.46	1.47	1.40
3	C	602	ANP	C5-C4	2.38	1.47	1.40
3	A	602	ANP	C5-C4	2.34	1.47	1.40
3	A	602	ANP	PB-O2B	-2.29	1.50	1.56
3	C	602	ANP	PG-O3G	-2.23	1.50	1.56
3	A	602	ANP	PG-O2G	-2.23	1.50	1.56
3	A	602	ANP	PG-O3G	-2.16	1.50	1.56
3	C	602	ANP	PG-O2G	-2.16	1.50	1.56
3	D	602	ANP	PB-O2B	-2.11	1.51	1.56
3	C	602	ANP	PB-O2B	-2.10	1.51	1.56
3	B	602	ANP	PB-O2B	-2.05	1.51	1.56
3	B	602	ANP	PG-O3G	-2.05	1.51	1.56
3	D	602	ANP	PG-O2G	-2.04	1.51	1.56
3	B	602	ANP	PG-O2G	-2.02	1.51	1.56

All (40) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	C	602	ANP	O1G-PG-N3B	-5.32	103.94	111.77
3	B	602	ANP	O1G-PG-N3B	-4.89	104.57	111.77
3	A	602	ANP	O1G-PG-N3B	-4.74	104.79	111.77
3	D	602	ANP	O1G-PG-N3B	-4.67	104.89	111.77
3	C	602	ANP	O2B-PB-O1B	4.30	118.93	109.92

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	D	602	ANP	O2B-PB-O1B	4.25	118.84	109.92
3	A	602	ANP	O2B-PB-O1B	4.25	118.83	109.92
3	B	602	ANP	O2B-PB-O1B	4.17	118.66	109.92
3	D	602	ANP	PB-O3A-PA	-3.75	119.39	132.62
5	E	602	ADP	PA-O3A-PB	-3.56	120.62	132.83
5	E	602	ADP	C3'-C2'-C1'	3.41	106.11	100.98
5	F	602	ADP	C3'-C2'-C1'	3.32	105.97	100.98
5	F	602	ADP	PA-O3A-PB	-3.32	121.44	132.83
3	B	602	ANP	C3'-C2'-C1'	3.28	105.91	100.98
3	C	602	ANP	N3-C2-N1	-3.19	123.69	128.68
3	B	602	ANP	PB-O3A-PA	-3.18	121.41	132.62
3	A	602	ANP	N3-C2-N1	-3.18	123.71	128.68
3	B	602	ANP	N3-C2-N1	-3.13	123.79	128.68
5	F	602	ADP	N3-C2-N1	-3.13	123.79	128.68
3	D	602	ANP	N3-C2-N1	-3.11	123.82	128.68
5	E	602	ADP	N3-C2-N1	-3.08	123.87	128.68
3	C	602	ANP	C3'-C2'-C1'	2.94	105.41	100.98
3	A	602	ANP	C3'-C2'-C1'	2.83	105.24	100.98
3	A	602	ANP	PB-O3A-PA	-2.83	122.65	132.62
3	D	602	ANP	C4-C5-N7	-2.77	106.52	109.40
3	A	602	ANP	C4-C5-N7	-2.67	106.62	109.40
5	E	602	ADP	C4-C5-N7	-2.65	106.64	109.40
5	F	602	ADP	C4-C5-N7	-2.63	106.66	109.40
3	B	602	ANP	C4-C5-N7	-2.60	106.69	109.40
3	D	602	ANP	C3'-C2'-C1'	2.59	104.89	100.98
3	C	602	ANP	C4-C5-N7	-2.58	106.71	109.40
3	C	602	ANP	PB-O3A-PA	-2.54	123.66	132.62
3	C	602	ANP	O1B-PB-N3B	-2.47	108.14	111.77
3	C	602	ANP	O2G-PG-O3G	2.43	114.11	107.64
3	B	602	ANP	O1B-PB-N3B	-2.42	108.20	111.77
3	B	602	ANP	O2G-PG-O3G	2.36	113.93	107.64
3	D	602	ANP	O2G-PG-O3G	2.26	113.66	107.64
3	A	602	ANP	O2G-PG-O3G	2.19	113.46	107.64
3	D	602	ANP	O1B-PB-N3B	-2.15	108.60	111.77
3	A	602	ANP	O1B-PB-N3B	-2.10	108.68	111.77

There are no chirality outliers.

All (25) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	A	602	ANP	PB-N3B-PG-O1G
3	A	602	ANP	PG-N3B-PB-O1B

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Mol	Chain	Res	Type	Atoms
3	A	602	ANP	PA-O3A-PB-O1B
3	A	602	ANP	PA-O3A-PB-O2B
3	B	602	ANP	PG-N3B-PB-O1B
3	B	602	ANP	C5'-O5'-PA-O2A
3	C	602	ANP	PG-N3B-PB-O1B
3	C	602	ANP	PA-O3A-PB-O1B
3	C	602	ANP	PA-O3A-PB-O2B
3	D	602	ANP	PB-N3B-PG-O1G
3	D	602	ANP	PG-N3B-PB-O1B
3	D	602	ANP	PA-O3A-PB-O1B
3	D	602	ANP	PA-O3A-PB-O2B
3	D	602	ANP	C5'-O5'-PA-O3A
3	D	602	ANP	C3'-C4'-C5'-O5'
3	D	602	ANP	O4'-C4'-C5'-O5'
3	C	602	ANP	O4'-C4'-C5'-O5'
3	D	602	ANP	C5'-O5'-PA-O1A
3	A	602	ANP	PG-N3B-PB-O3A
5	E	602	ADP	O4'-C4'-C5'-O5'
5	E	602	ADP	C3'-C4'-C5'-O5'
5	E	602	ADP	PA-O3A-PB-O2B
3	B	602	ANP	C5'-O5'-PA-O3A
3	B	602	ANP	O4'-C4'-C5'-O5'
3	B	602	ANP	C5'-O5'-PA-O1A

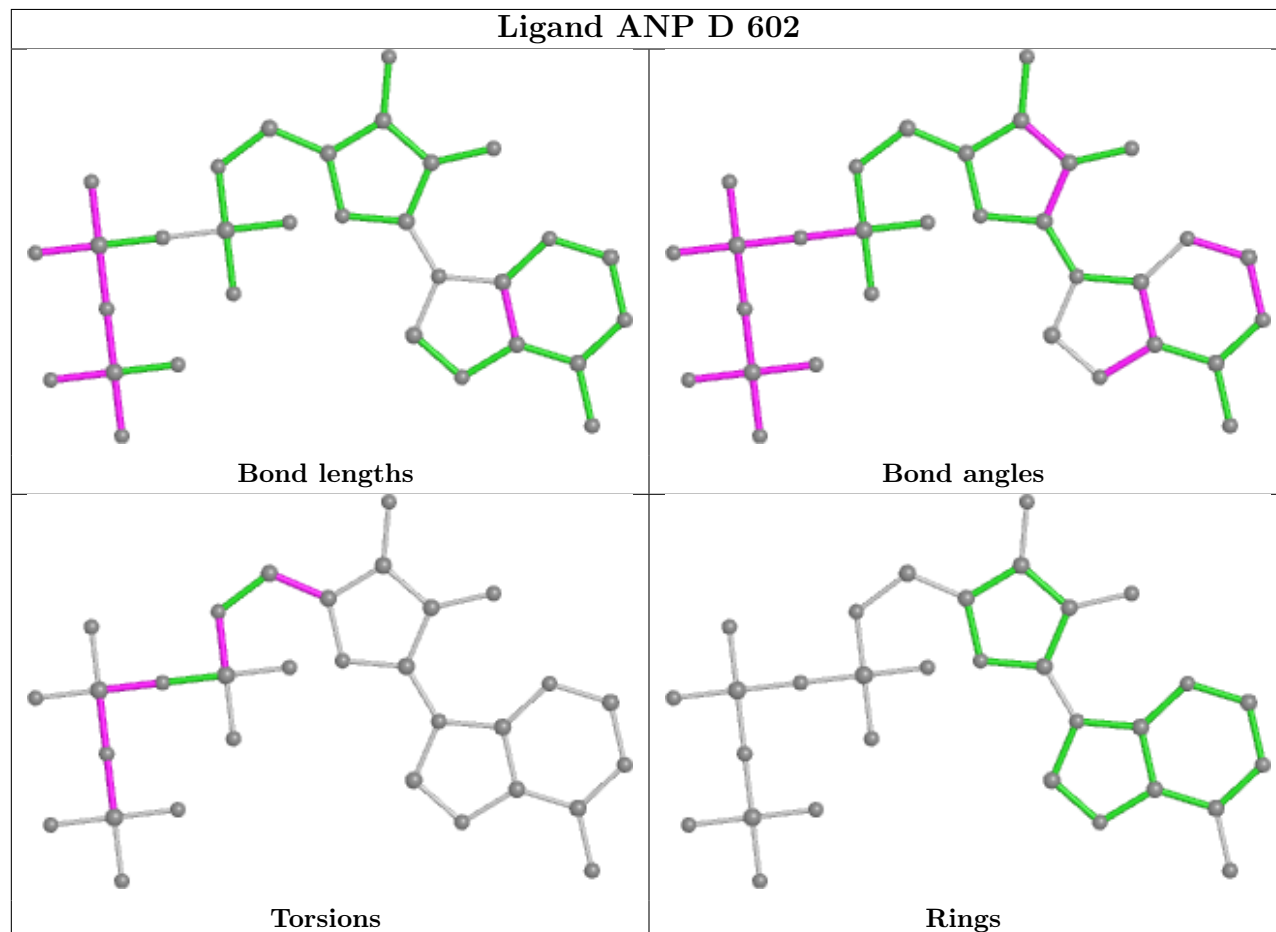
There are no ring outliers.

6 monomers are involved in 22 short contacts:

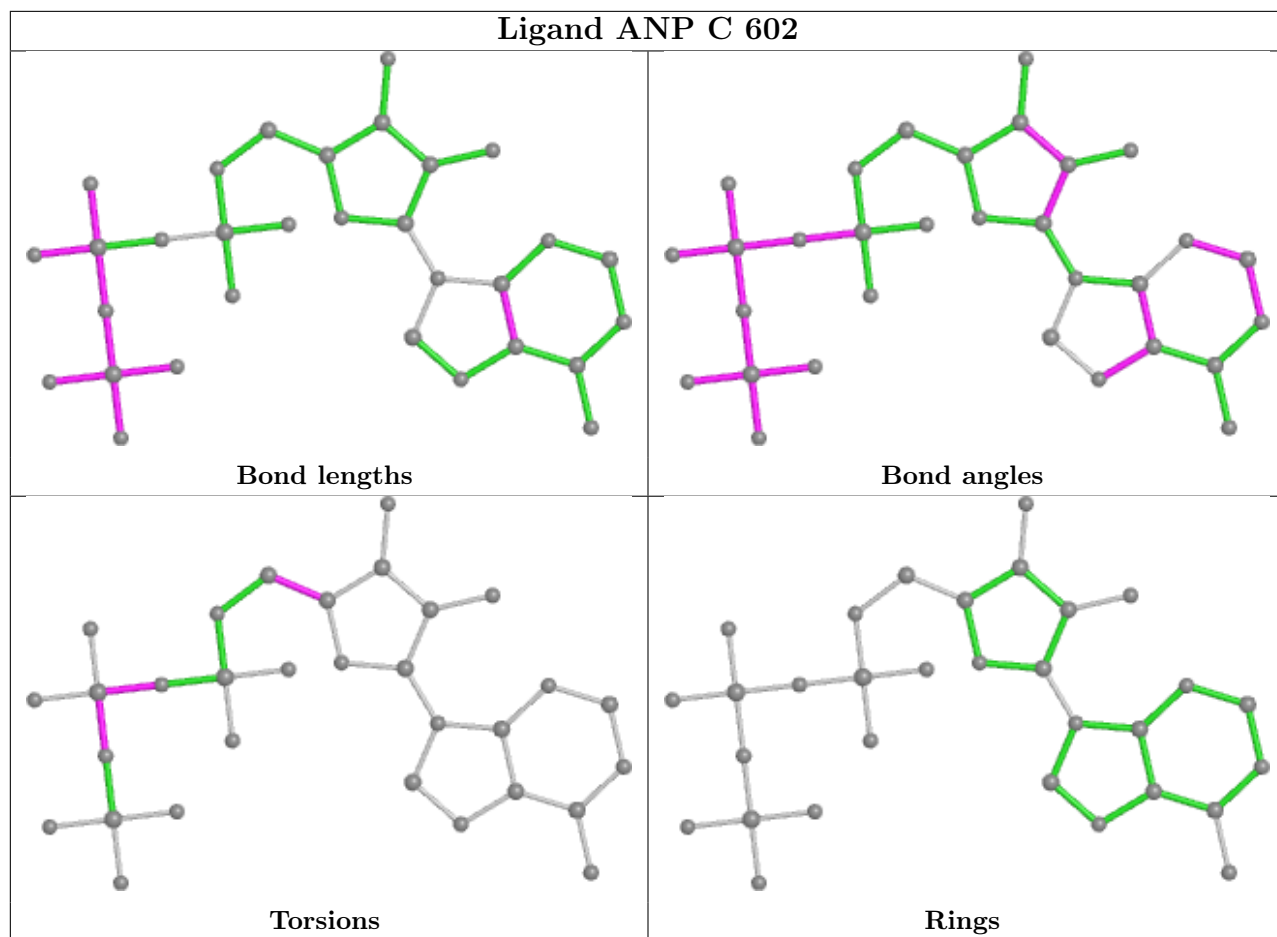
Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	D	602	ANP	4	0
3	C	602	ANP	4	0
3	B	602	ANP	7	0
5	E	602	ADP	2	0
5	F	602	ADP	4	0
3	A	602	ANP	1	0

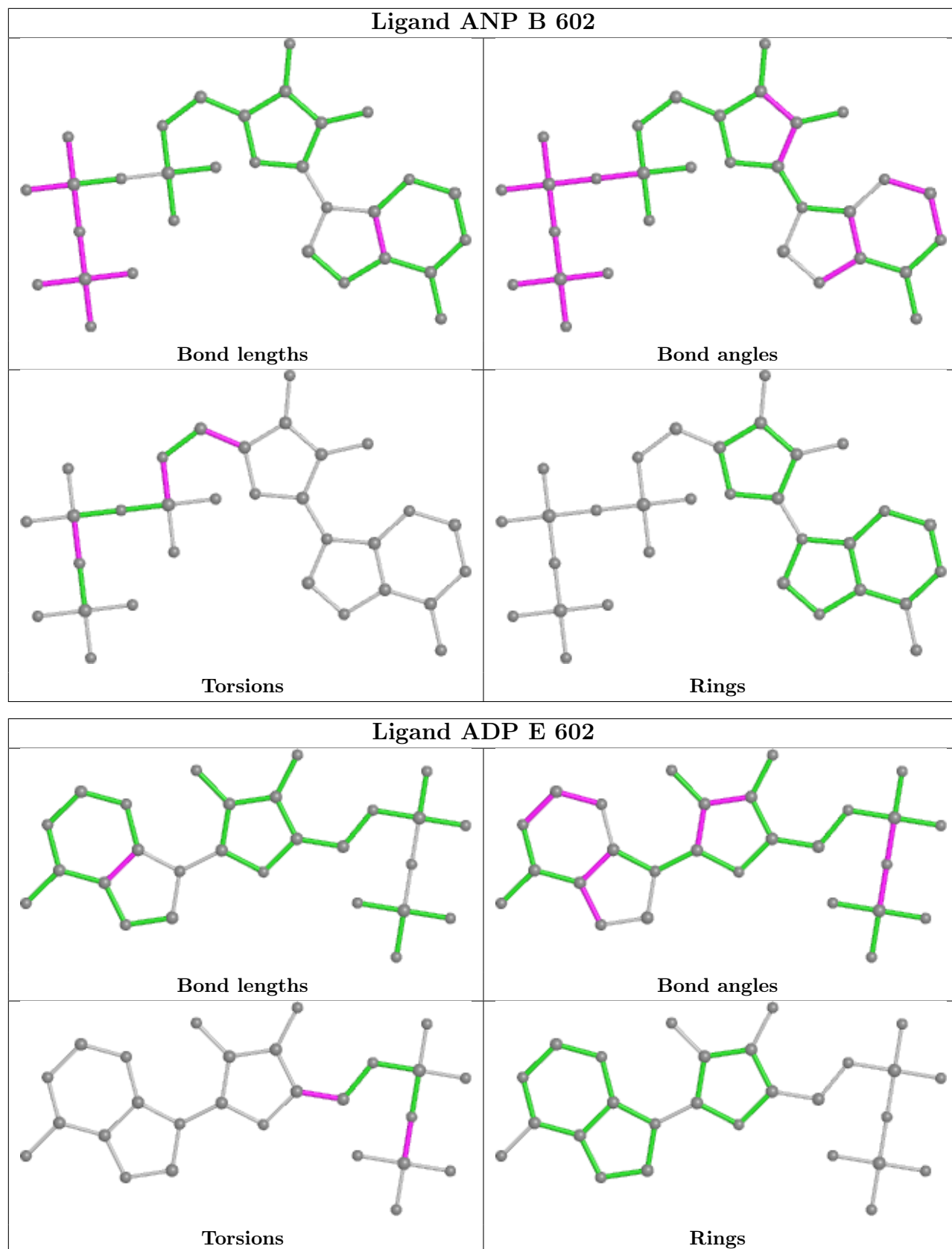
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. 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

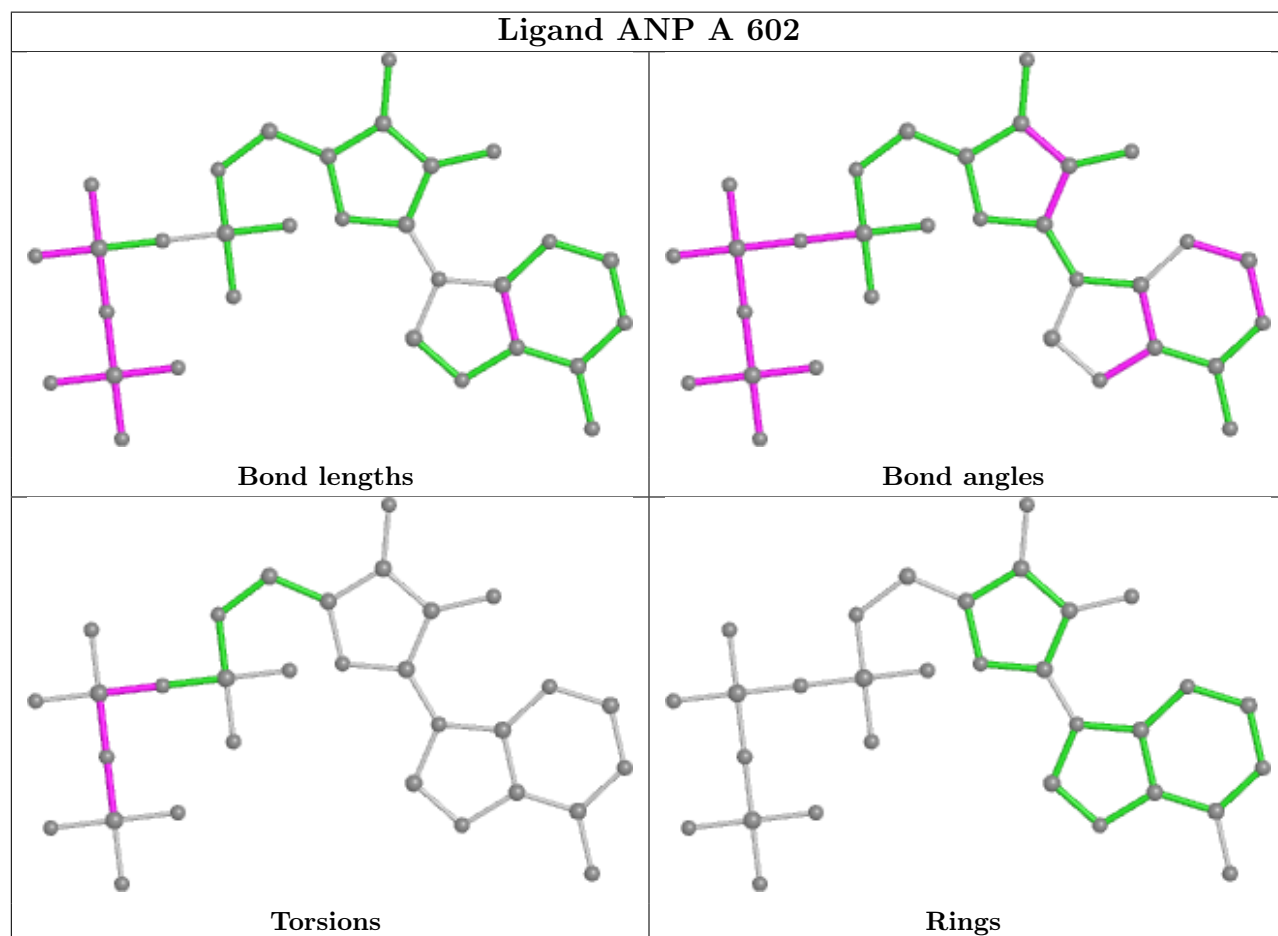
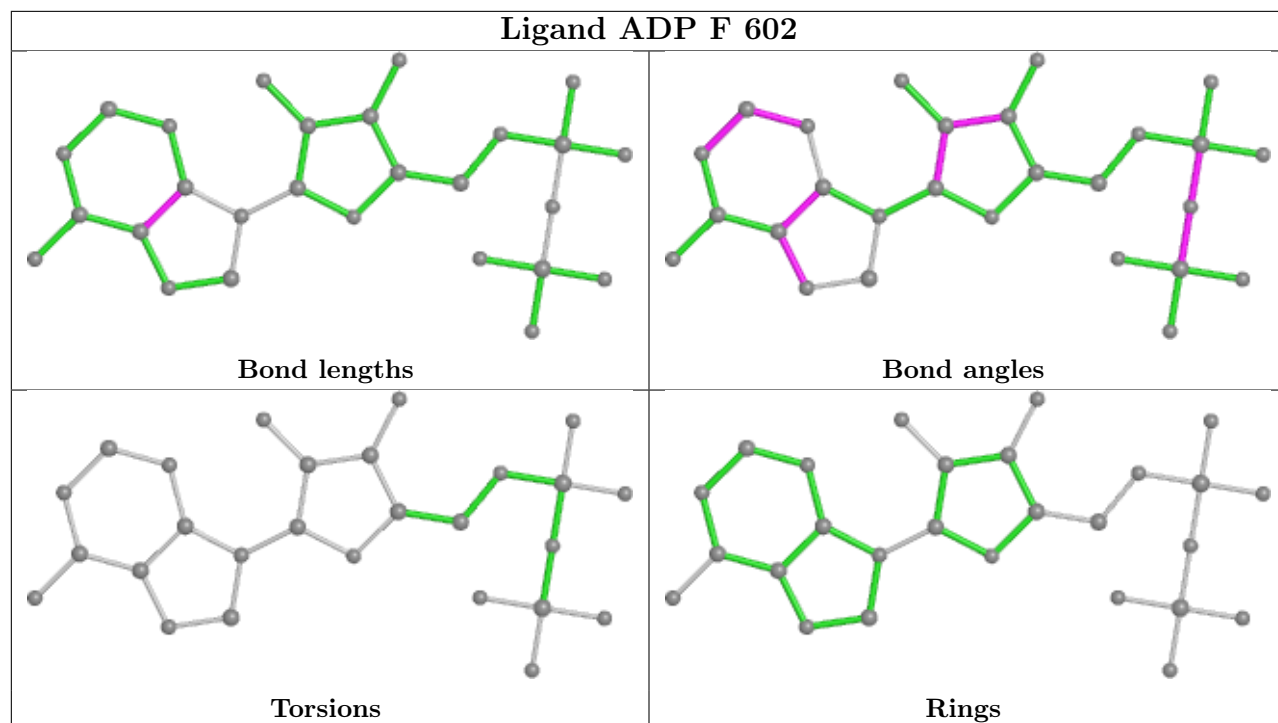
in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. The outliers 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](#)

In the following table, the column labelled '#RSRZ > 2' contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 95<sup>th</sup> percentile and maximum values of the occupancy-weighted average B-factor per residue. The column labelled 'Q < 0.9' lists the number of (and percentage) of residues with an average occupancy less than 0.9.

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2	OWAB(Å <sup>2</sup> )	Q<0.9
1	A	375/588 (63%)	-0.23	0 <a href="#">100</a> <a href="#">100</a>	26, 47, 82, 90	0
1	B	376/588 (63%)	-0.28	0 <a href="#">100</a> <a href="#">100</a>	33, 47, 69, 82	0
1	C	382/588 (64%)	-0.28	1 (0%) <a href="#">94</a> <a href="#">96</a>	31, 47, 72, 91	0
1	D	379/588 (64%)	-0.26	1 (0%) <a href="#">94</a> <a href="#">96</a>	32, 47, 70, 80	0
1	E	387/588 (65%)	-0.30	1 (0%) <a href="#">94</a> <a href="#">96</a>	28, 44, 66, 84	0
1	F	382/588 (64%)	-0.33	0 <a href="#">100</a> <a href="#">100</a>	27, 43, 66, 78	0
All	All	2281/3528 (64%)	-0.28	3 (0%) <a href="#">95</a> <a href="#">97</a>	26, 46, 72, 91	0

All (3) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	E	482	GLY	2.6
1	C	463	GLN	2.2
1	D	270	TYR	2.1

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

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

### 6.3 Carbohydrates [i](#)

There are no monosaccharides in this entry.

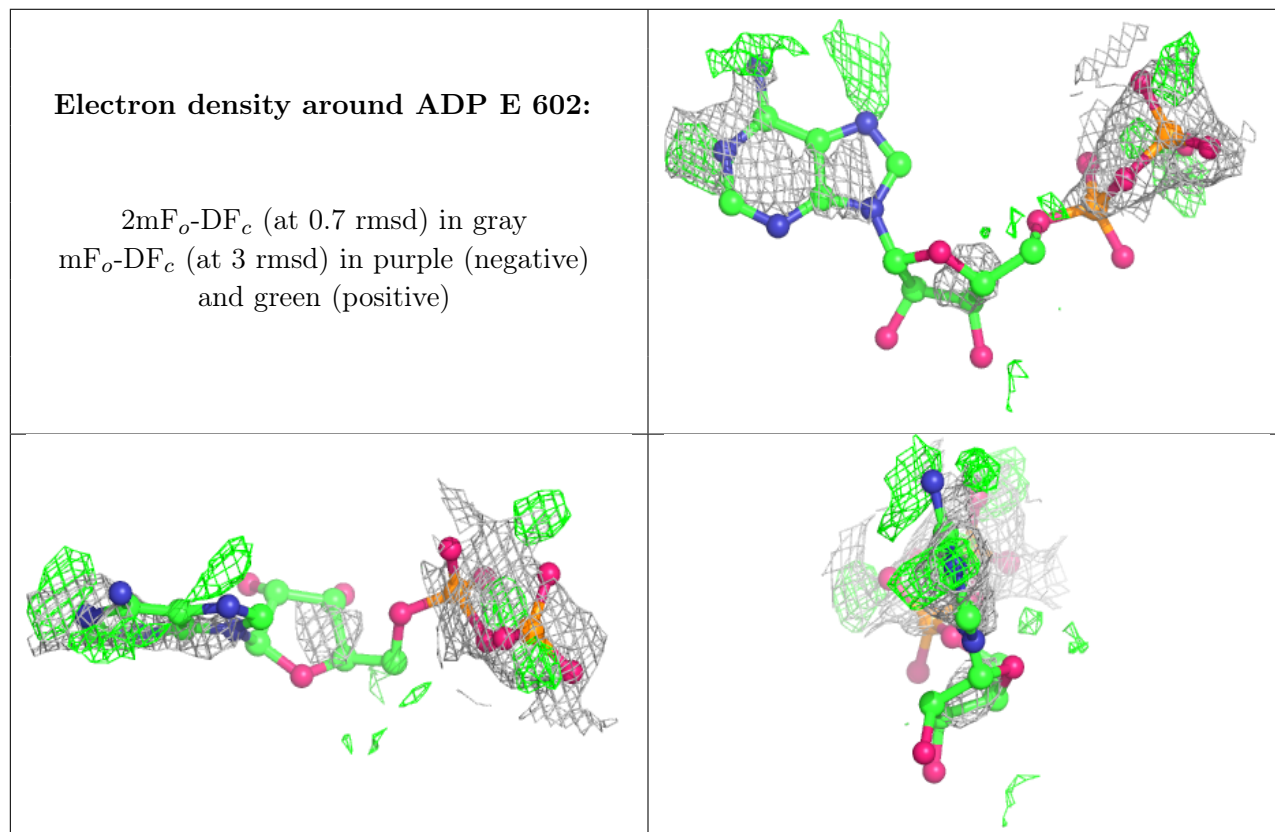
### 6.4 Ligands [i](#)

In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum,

median, 95<sup>th</sup> percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists the number of atoms with occupancy less than 0.9.

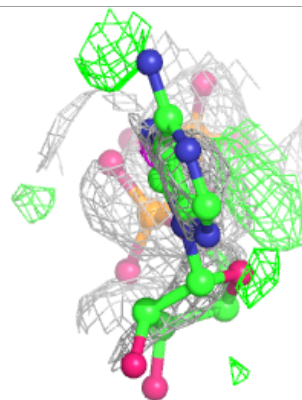
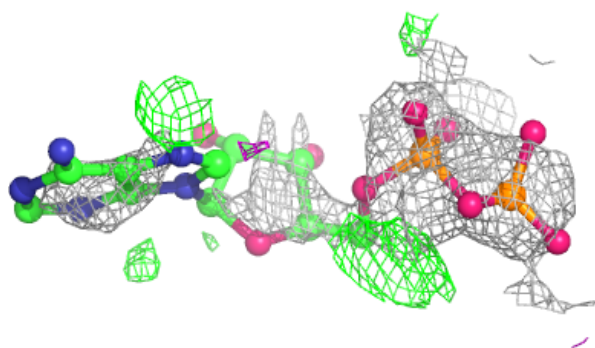
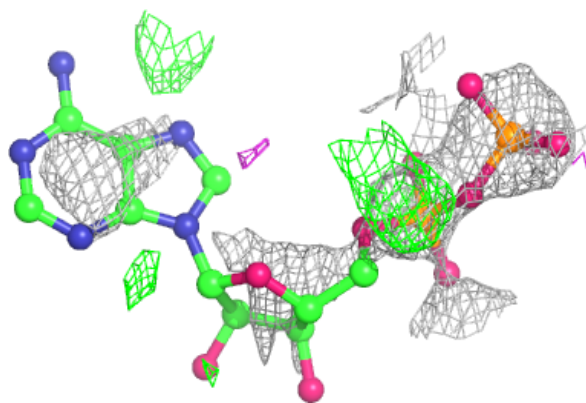
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å <sup>2</sup> )	Q<0.9
5	ADP	E	602	27/27	0.80	0.40	44,48,60,63	27
5	ADP	F	602	27/27	0.81	0.34	48,56,62,67	27
3	ANP	B	602	31/31	0.84	0.21	46,50,58,61	31
3	ANP	D	602	31/31	0.85	0.23	41,51,61,65	31
2	ZN	E	601	1/1	0.97	0.09	57,57,57,57	0
4	MG	A	603	1/1	0.97	0.14	32,32,32,32	0
2	ZN	C	601	1/1	0.97	0.23	78,78,78,78	0
3	ANP	C	602	31/31	0.97	0.16	32,37,44,51	11
2	ZN	A	601	1/1	0.98	0.04	37,37,37,37	0
2	ZN	B	601	1/1	0.98	0.05	41,41,41,41	0
3	ANP	A	602	31/31	0.98	0.14	32,33,45,61	0
4	MG	C	603	1/1	0.99	0.07	34,34,34,34	0
2	ZN	F	601	1/1	0.99	0.05	40,40,40,40	0
2	ZN	D	601	1/1	0.99	0.07	48,48,48,48	0

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.

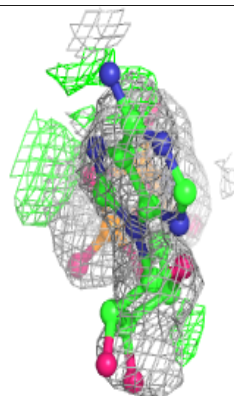
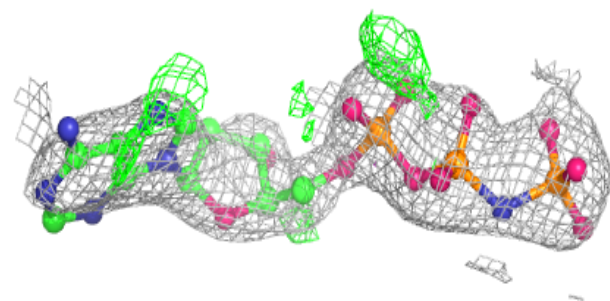
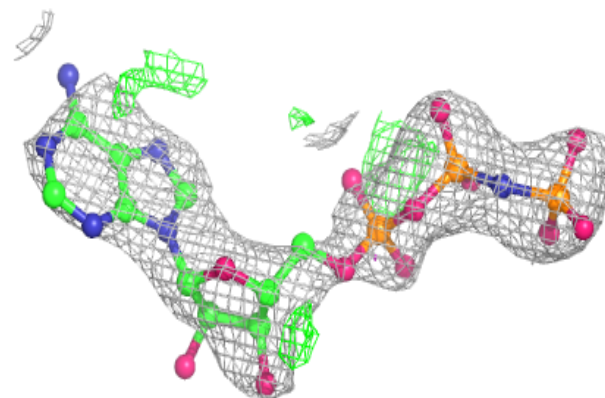


**Electron density around ADP F 602:**

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

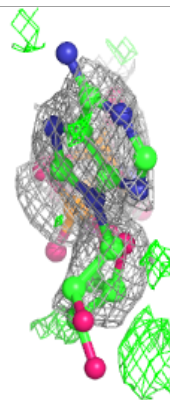
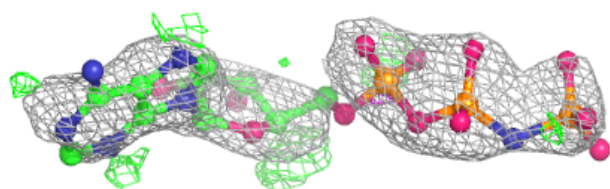
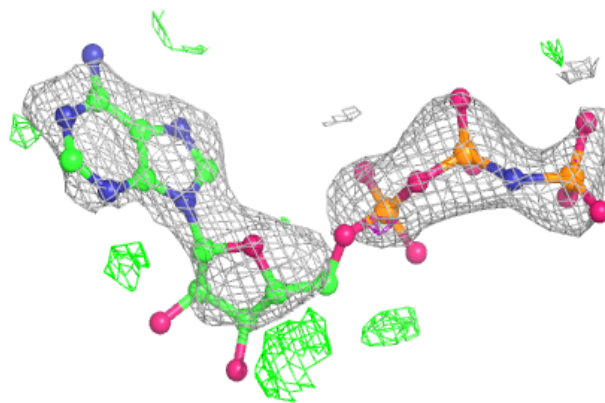
**Electron density around ANP B 602:**

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

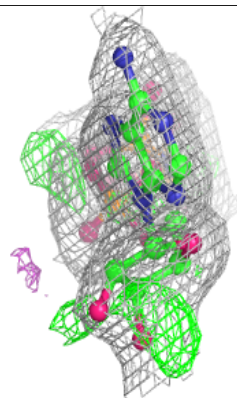
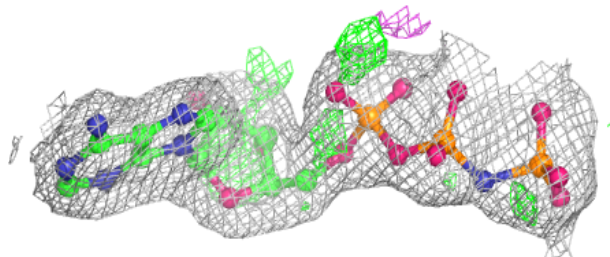
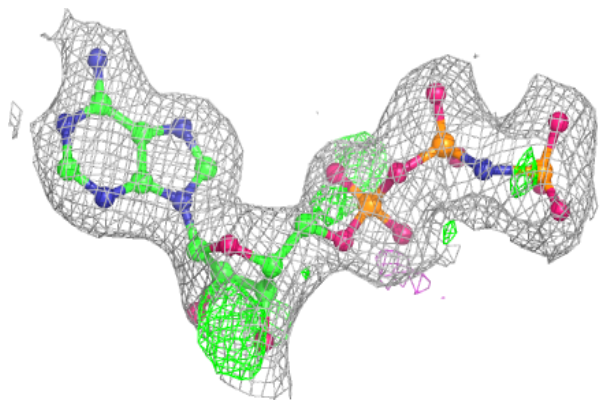


**Electron density around ANP D 602:**

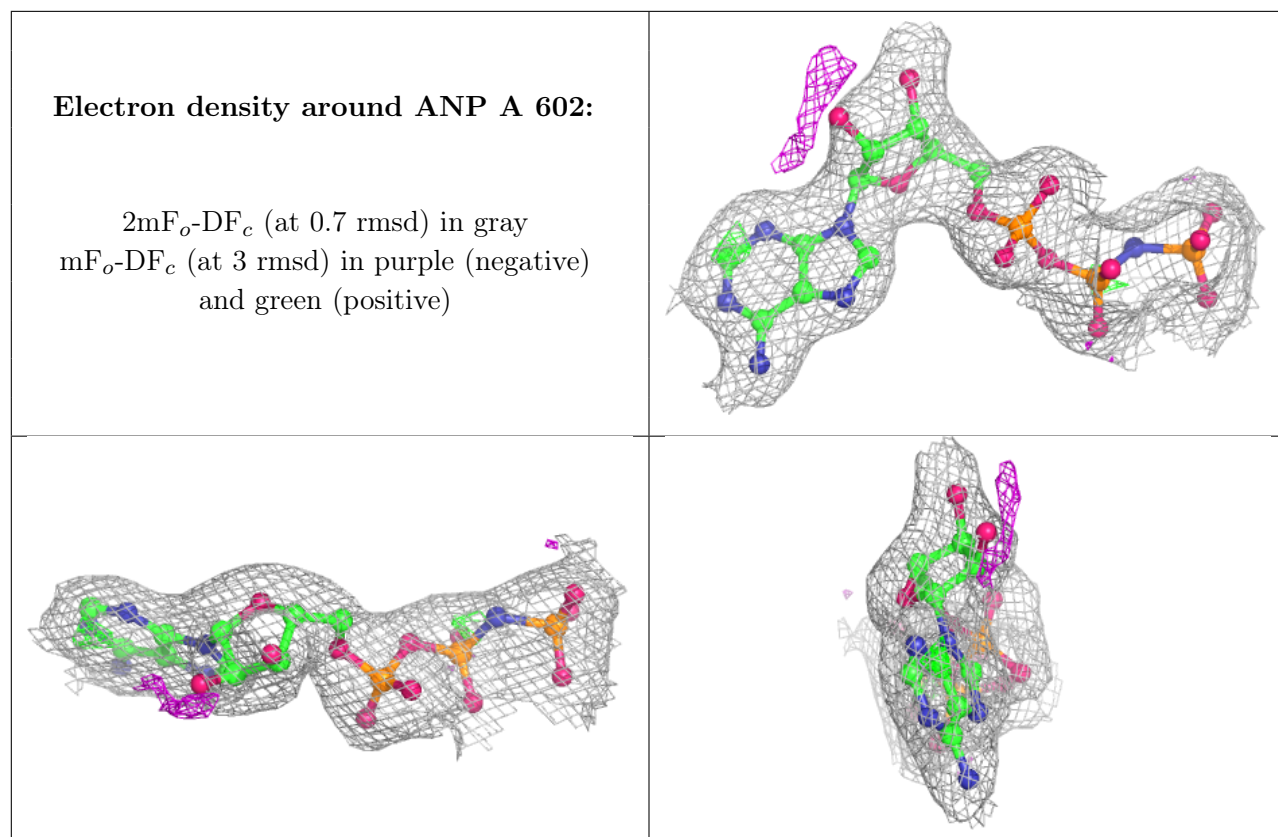
$2mF_o-DF_c$  (at 0.7 rmsd) in gray  
 $mF_o-DF_c$  (at 3 rmsd) in purple (negative)  
and green (positive)

**Electron density around ANP C 602:**

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







## 6.5 Other polymers [i](#)

There are no such residues in this entry.