



# Full wwPDB X-ray Structure Validation Report ⓘ

Mar 18, 2024 – 12:40 PM JST

PDB ID : 6AC9  
Title : Crystal structure of human Vaccinia-related kinase 1 (VRK1) in complex with AMP-PNP  
Authors : Ngow, Y.S.; Sreekanth, R.; Yoon, H.S.  
Deposited on : 2018-07-25  
Resolution : 2.07 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)  
Xtrriage (Phenix) : 1.13  
EDS : 2.36  
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

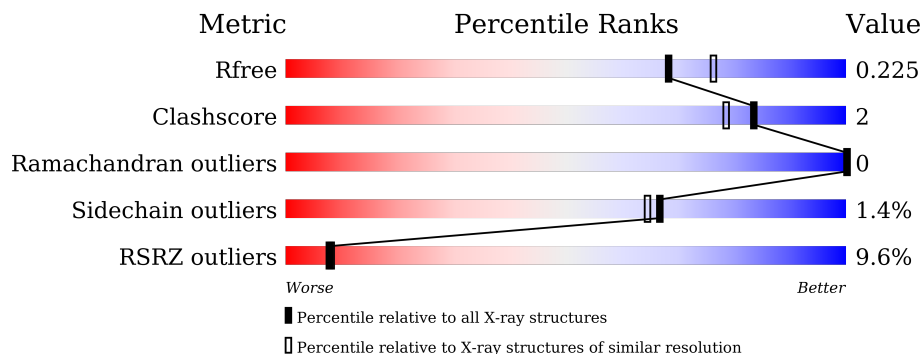
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.07 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	2684 (2.08-2.04)
Clashscore	141614	2801 (2.08-2.04)
Ramachandran outliers	138981	2768 (2.08-2.04)
Sidechain outliers	138945	2768 (2.08-2.04)
RSRZ outliers	127900	2646 (2.08-2.04)

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	370	 4% 81% 14%
1	B	370	 6% 79% 15% 6%
1	C	370	 12% 77% 17% 6%
1	D	370	 10% 75% 17% 7%

## 2 Entry composition [i](#)

There are 8 unique types of molecules in this entry. The entry contains 11080 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 Serine/threonine-protein kinase VRK1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	317	2542	1625	434	470	13	0	1	0
1	B	316	2546	1628	437	468	13	0	2	0
1	C	307	2450	1569	420	449	12	0	1	0
1	D	306	2448	1569	418	448	13	0	1	0

There are 68 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	34	ALA	LYS	engineered mutation	UNP Q99986
A	35	ALA	LYS	engineered mutation	UNP Q99986
A	36	ALA	GLU	engineered mutation	UNP Q99986
A	212	ALA	GLU	engineered mutation	UNP Q99986
A	214	ALA	LYS	engineered mutation	UNP Q99986
A	215	ALA	GLU	engineered mutation	UNP Q99986
A	292	ALA	GLU	engineered mutation	UNP Q99986
A	293	ALA	LYS	engineered mutation	UNP Q99986
A	295	ALA	LYS	engineered mutation	UNP Q99986
A	359	ALA	LYS	engineered mutation	UNP Q99986
A	360	ALA	LYS	engineered mutation	UNP Q99986
A	365	HIS	-	expression tag	UNP Q99986
A	366	HIS	-	expression tag	UNP Q99986
A	367	HIS	-	expression tag	UNP Q99986
A	368	HIS	-	expression tag	UNP Q99986
A	369	HIS	-	expression tag	UNP Q99986
A	370	HIS	-	expression tag	UNP Q99986
B	34	ALA	LYS	engineered mutation	UNP Q99986
B	35	ALA	LYS	engineered mutation	UNP Q99986
B	36	ALA	GLU	engineered mutation	UNP Q99986
B	212	ALA	GLU	engineered mutation	UNP Q99986

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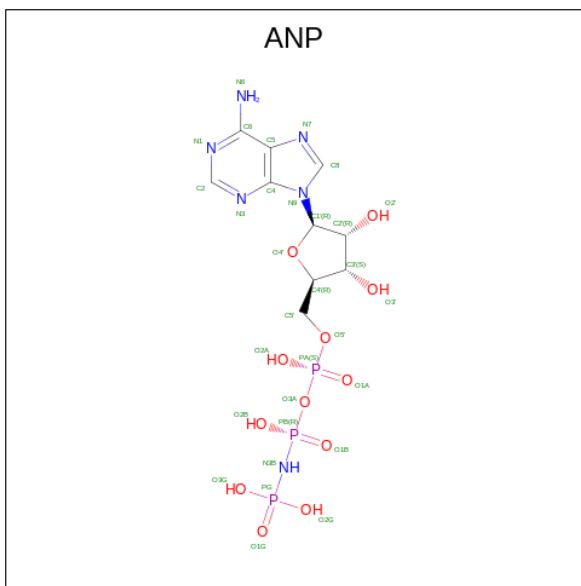
Chain	Residue	Modelled	Actual	Comment	Reference
B	214	ALA	LYS	engineered mutation	UNP Q99986
B	215	ALA	GLU	engineered mutation	UNP Q99986
B	292	ALA	GLU	engineered mutation	UNP Q99986
B	293	ALA	LYS	engineered mutation	UNP Q99986
B	295	ALA	LYS	engineered mutation	UNP Q99986
B	359	ALA	LYS	engineered mutation	UNP Q99986
B	360	ALA	LYS	engineered mutation	UNP Q99986
B	365	HIS	-	expression tag	UNP Q99986
B	366	HIS	-	expression tag	UNP Q99986
B	367	HIS	-	expression tag	UNP Q99986
B	368	HIS	-	expression tag	UNP Q99986
B	369	HIS	-	expression tag	UNP Q99986
B	370	HIS	-	expression tag	UNP Q99986
C	34	ALA	LYS	engineered mutation	UNP Q99986
C	35	ALA	LYS	engineered mutation	UNP Q99986
C	36	ALA	GLU	engineered mutation	UNP Q99986
C	212	ALA	GLU	engineered mutation	UNP Q99986
C	214	ALA	LYS	engineered mutation	UNP Q99986
C	215	ALA	GLU	engineered mutation	UNP Q99986
C	292	ALA	GLU	engineered mutation	UNP Q99986
C	293	ALA	LYS	engineered mutation	UNP Q99986
C	295	ALA	LYS	engineered mutation	UNP Q99986
C	359	ALA	LYS	engineered mutation	UNP Q99986
C	360	ALA	LYS	engineered mutation	UNP Q99986
C	365	HIS	-	expression tag	UNP Q99986
C	366	HIS	-	expression tag	UNP Q99986
C	367	HIS	-	expression tag	UNP Q99986
C	368	HIS	-	expression tag	UNP Q99986
C	369	HIS	-	expression tag	UNP Q99986
C	370	HIS	-	expression tag	UNP Q99986
D	34	ALA	LYS	engineered mutation	UNP Q99986
D	35	ALA	LYS	engineered mutation	UNP Q99986
D	36	ALA	GLU	engineered mutation	UNP Q99986
D	212	ALA	GLU	engineered mutation	UNP Q99986
D	214	ALA	LYS	engineered mutation	UNP Q99986
D	215	ALA	GLU	engineered mutation	UNP Q99986
D	292	ALA	GLU	engineered mutation	UNP Q99986
D	293	ALA	LYS	engineered mutation	UNP Q99986
D	295	ALA	LYS	engineered mutation	UNP Q99986
D	359	ALA	LYS	engineered mutation	UNP Q99986
D	360	ALA	LYS	engineered mutation	UNP Q99986
D	365	HIS	-	expression tag	UNP Q99986

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Chain	Residue	Modelled	Actual	Comment	Reference
D	366	HIS	-	expression tag	UNP Q99986
D	367	HIS	-	expression tag	UNP Q99986
D	368	HIS	-	expression tag	UNP Q99986
D	369	HIS	-	expression tag	UNP Q99986
D	370	HIS	-	expression tag	UNP Q99986

- Molecule 2 is PHOSPHOAMINOPHOSPHONIC ACID-ADENYLATE ESTER (three-letter code: ANP) (formula:  $C_{10}H_{17}N_6O_{12}P_3$ ) (labeled as "Ligand of Interest" by depositor).



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

- Molecule 3 is MAGNESIUM ION (three-letter code: MG) (formula: Mg).

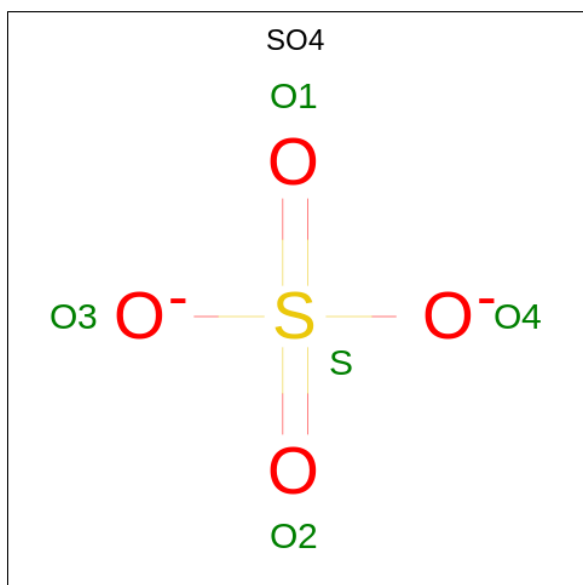
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	Mg		
3	A	1	Total	Mg	0	0
			1	1		
3	B	1	Total	Mg	0	0
			1	1		

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Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	C	1	Total Mg 1 1	0	0
3	D	1	Total Mg 1 1	0	0

- Molecule 4 is SULFATE ION (three-letter code: SO4) (formula: O<sub>4</sub>S).

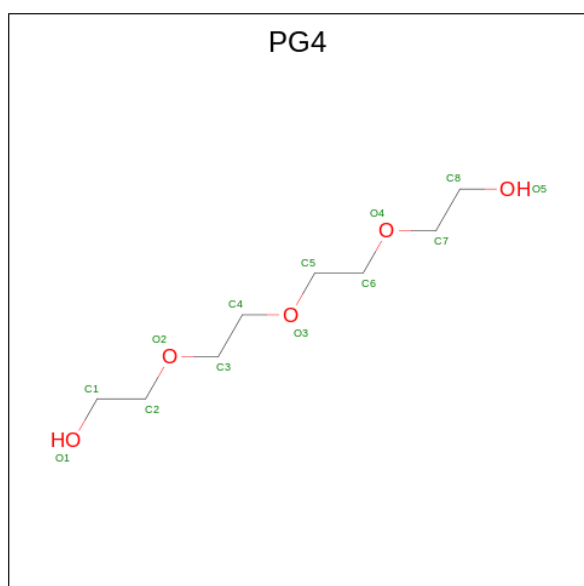


Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	A	1	Total O S 5 4 1	0	0
4	A	1	Total O S 5 4 1	0	0
4	B	1	Total O S 5 4 1	0	0
4	B	1	Total O S 5 4 1	0	0
4	B	1	Total O S 5 4 1	0	0
4	C	1	Total O S 5 4 1	0	0
4	D	1	Total O S 5 4 1	0	0

- Molecule 5 is CHLORIDE ION (three-letter code: CL) (formula: Cl).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
5	A	1	Total Cl 1 1	0	0
5	B	1	Total Cl 1 1	0	0
5	C	1	Total Cl 1 1	0	0
5	D	1	Total Cl 1 1	0	0

- Molecule 6 is TETRAETHYLENE GLYCOL (three-letter code: PG4) (formula: C<sub>8</sub>H<sub>18</sub>O<sub>5</sub>).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
6	A	1	Total C O 13 8 5	0	0
6	B	1	Total C O 13 8 5	0	0

- Molecule 7 is GLYCEROL (three-letter code: GOL) (formula: C<sub>3</sub>H<sub>8</sub>O<sub>3</sub>).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
7	C	1	Total C O 6 3 3	0	0
7	D	1	Total C O 6 3 3	0	0

- Molecule 8 is water.

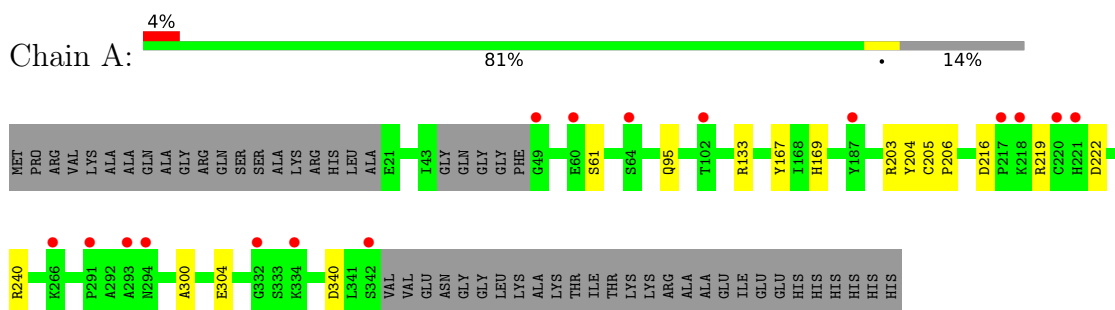
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
8	A	241	Total O 241 241	0	0
8	B	230	Total O 230 230	0	0
8	C	210	Total O 210 210	0	0
8	D	208	Total O 208 208	0	0



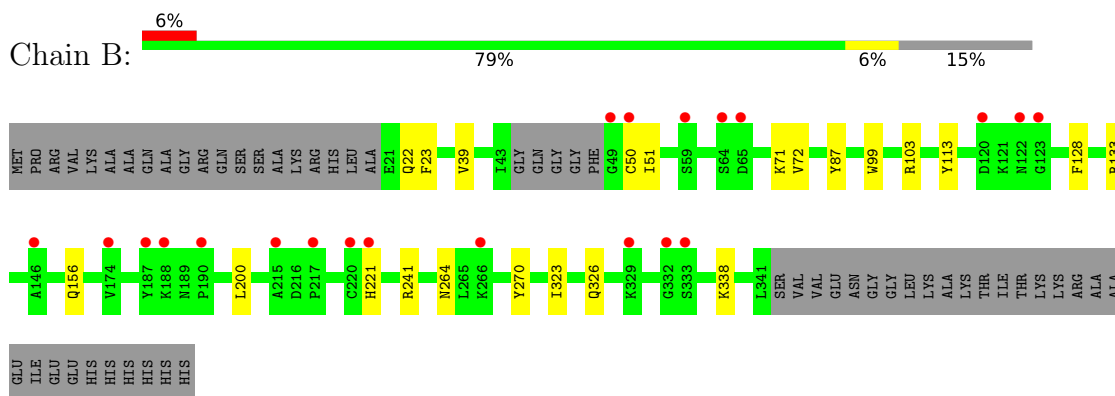
### 3 Residue-property plots [i](#)

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 and electron density. 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. A red dot above a residue indicates a poor fit to the electron density ( $RSRZ > 2$ ). 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.

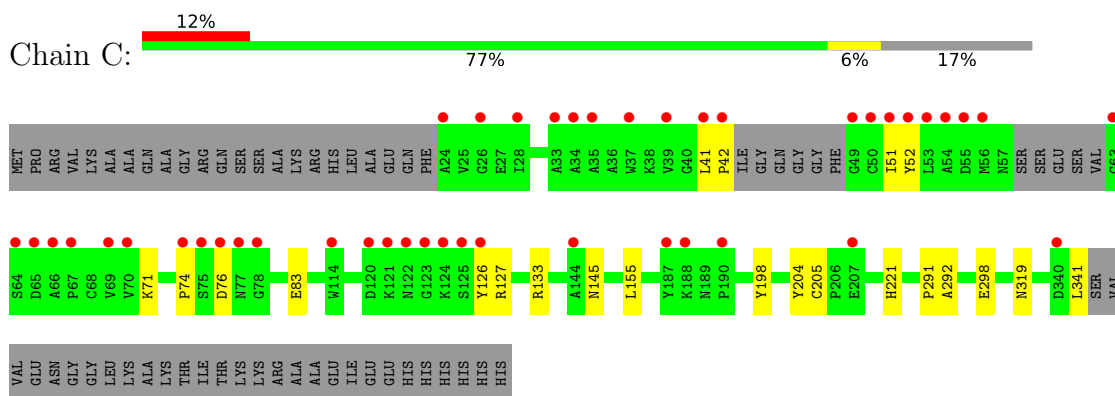
- Molecule 1: Serine/threonine-protein kinase VRK1



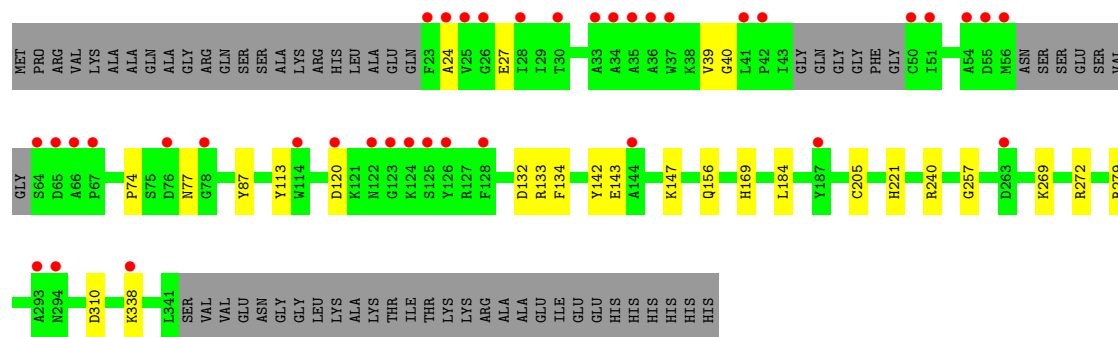
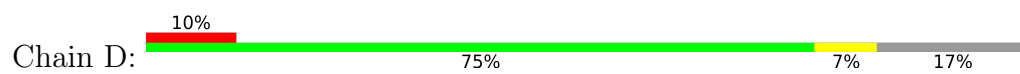
- Molecule 1: Serine/threonine-protein kinase VRK1



- Molecule 1: Serine/threonine-protein kinase VRK1



- Molecule 1: Serine/threonine-protein kinase VRK1



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	92.60Å 96.85Å 192.52Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	20.00 – 2.07 19.86 – 2.07	Depositor EDS
% Data completeness (in resolution range)	99.5 (20.00-2.07) 99.5 (19.86-2.07)	Depositor EDS
$R_{merge}$	0.11	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	5.61 (at 2.07Å)	Xtrriage
Refinement program	BUSTER 2.10.2	Depositor
R, $R_{free}$	0.186 , 0.223 0.188 , 0.225	Depositor DCC
$R_{free}$ test set	5014 reflections (4.76%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	30.2	Xtrriage
Anisotropy	0.587	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.35 , 61.1	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.48$ , $\langle L^2 \rangle = 0.31$	Xtrriage
Estimated twinning fraction	0.021 for k,h,-l	Xtrriage
$F_o, F_c$ correlation	0.96	EDS
Total number of atoms	11080	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	41.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.58% 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: SO4, PG4, GOL, MG, ANP, CL

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	0.53	0/2604	0.64	0/3520
1	B	0.51	0/2611	0.63	0/3528
1	C	0.48	0/2510	0.64	0/3394
1	D	0.51	0/2509	0.63	0/3394
All	All	0.51	0/10234	0.63	0/13836

There are no bond length outliers.

There are no bond angle outliers.

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	2542	0	2514	7	0
1	B	2546	0	2529	14	0
1	C	2450	0	2411	10	0
1	D	2448	0	2399	16	0
2	A	31	0	13	0	0
2	B	31	0	13	0	0
2	C	31	0	13	0	0
2	D	31	0	13	3	0
3	A	1	0	0	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
3	B	1	0	0	0	0
3	C	1	0	0	0	0
3	D	1	0	0	0	0
4	A	10	0	0	0	0
4	B	15	0	0	0	0
4	C	5	0	0	0	0
4	D	5	0	0	0	0
5	A	1	0	0	0	0
5	B	1	0	0	0	0
5	C	1	0	0	0	0
5	D	1	0	0	0	0
6	A	13	0	18	4	0
6	B	13	0	18	3	0
7	C	6	0	8	0	0
7	D	6	0	8	0	0
8	A	241	0	0	1	0
8	B	230	0	0	0	0
8	C	210	0	0	1	0
8	D	208	0	0	0	0
All	All	11080	0	9957	48	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 2.

All (48) 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:241:ARG:HH22	6:B:407:PG4:H51	1.45	0.80
6:A:406:PG4:H42	8:A:702:HOH:O	1.81	0.80
1:B:22:GLN:HG3	1:B:72:VAL:HG11	1.78	0.66
1:C:51:ILE:HG12	1:C:71:LYS:HG2	1.79	0.65
1:A:203:ARG:HB3	6:A:406:PG4:H82	1.79	0.63
1:B:51:ILE:HG12	1:B:71:LYS:HG2	1.87	0.57
1:B:23:PHE:HB2	1:B:39:VAL:HG11	1.88	0.56
1:D:24:ALA:HB3	1:D:27:GLU:HB2	1.88	0.55
1:B:323:ILE:O	1:B:326:GLN:HG2	2.07	0.54
1:B:241:ARG:HH22	6:B:407:PG4:C5	2.16	0.54
1:B:241:ARG:NH2	6:B:407:PG4:H51	2.17	0.53
1:C:319:ASN:HB3	8:C:636:HOH:O	2.09	0.52
1:D:269:LYS:HZ2	1:D:272:ARG:HH22	1.59	0.51
1:D:87:TYR:HB3	1:D:113:TYR:HB2	1.92	0.51

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:300:ALA:O	1:A:304:GLU:HG2	2.11	0.51
1:B:200:LEU:HD13	1:B:221:HIS:CG	2.47	0.50
1:A:216:ASP:HB3	1:A:219:ARG:HB3	1.94	0.50
1:B:156:GLN:HG3	1:B:338:LYS:O	2.12	0.49
1:C:76:ASP:H	1:C:127:ARG:HH22	1.59	0.48
1:C:204:TYR:CE1	1:C:205:CYS:HB2	2.49	0.48
1:C:291:PRO:O	1:C:292:ALA:HB3	2.13	0.48
2:D:402:ANP:H8	2:D:402:ANP:O5'	2.14	0.48
1:D:39:VAL:HG12	1:D:40:GLY:H	1.80	0.47
1:D:269:LYS:NZ	1:D:272:ARG:HH22	2.14	0.45
1:D:134:PHE:HB2	1:D:184:LEU:HD23	1.99	0.45
6:A:406:PG4:C2	1:D:279:ARG:HH22	2.30	0.45
1:C:155:LEU:HD21	1:C:298:GLU:HG3	1.99	0.45
1:D:39:VAL:HG12	1:D:40:GLY:N	2.33	0.44
1:D:184:LEU:HD11	2:D:402:ANP:H2'	1.99	0.43
1:C:74:PRO:HA	1:C:126:TYR:HD1	1.82	0.43
1:B:264:ASN:HB3	1:B:270:TYR:CD2	2.54	0.43
1:C:221:HIS:HD2	1:D:221:HIS:HD2	1.67	0.42
1:A:204:TYR:CE1	1:A:205:CYS:HB2	2.54	0.42
1:A:206:PRO:HG3	6:A:406:PG4:H81	2.01	0.42
1:C:83:GLU:HG3	1:C:198:TYR:HB2	2.02	0.41
1:D:169:HIS:CG	1:D:240:ARG:HG2	2.55	0.41
1:B:71:LYS:O	1:B:128:PHE:HA	2.20	0.41
1:D:134:PHE:O	2:D:402:ANP:H2	2.20	0.41
1:D:143:GLU:HG2	1:D:147:LYS:HE3	2.03	0.41
1:A:95:GLN:HG3	1:A:167:TYR:OH	2.21	0.41
1:D:156:GLN:HG3	1:D:338:LYS:O	2.20	0.41
1:A:169:HIS:CG	1:A:240:ARG:HG2	2.56	0.41
1:B:99:TRP:CE2	1:B:103[B]:ARG:HG3	2.55	0.41
1:B:23:PHE:CE2	1:B:72:VAL:HG21	2.56	0.40
1:C:42:PRO:HA	1:C:52:TYR:HA	2.02	0.40
1:D:74:PRO:HG2	1:D:77:ASN:HB2	2.04	0.40
1:B:87:TYR:HB3	1:B:113:TYR:HB2	2.03	0.40
1:D:142:TYR:OH	1:D:257:GLY:HA2	2.22	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	314/370 (85%)	305 (97%)	9 (3%)	0	100	100
1	B	314/370 (85%)	306 (98%)	8 (2%)	0	100	100
1	C	302/370 (82%)	291 (96%)	11 (4%)	0	100	100
1	D	301/370 (81%)	291 (97%)	10 (3%)	0	100	100
All	All	1231/1480 (83%)	1193 (97%)	38 (3%)	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	269/310 (87%)	265 (98%)	4 (2%)	65	62
1	B	270/310 (87%)	268 (99%)	2 (1%)	84	84
1	C	254/310 (82%)	250 (98%)	4 (2%)	62	59
1	D	254/310 (82%)	249 (98%)	5 (2%)	55	51
All	All	1047/1240 (84%)	1032 (99%)	15 (1%)	67	64

All (15) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	61	SER
1	A	133	ARG

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Mol	Chain	Res	Type
1	A	222	ASP
1	A	340	ASP
1	B	50	CYS
1	B	133	ARG
1	C	41	LEU
1	C	133	ARG
1	C	145	ASN
1	C	341	LEU
1	D	120	ASP
1	D	132	ASP
1	D	133	ARG
1	D	205	CYS
1	D	310	ASP

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (1) such sidechains are listed below:

Mol	Chain	Res	Type
1	C	319	ASN

### 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 23 ligands modelled in this entry, 8 are monoatomic - leaving 15 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
6	PG4	A	406	-	12,12,12	0.14	0	11,11,11	0.26	0
4	SO4	A	403	-	4,4,4	0.15	0	6,6,6	0.08	0
4	SO4	B	403	-	4,4,4	0.19	0	6,6,6	0.15	0
2	ANP	B	401	3	29,33,33	2.45	4 (13%)	31,52,52	1.02	4 (12%)
4	SO4	B	405	-	4,4,4	0.19	0	6,6,6	0.29	0
7	GOL	C	401	-	5,5,5	0.13	0	5,5,5	0.25	0
2	ANP	A	401	3	29,33,33	1.79	2 (6%)	31,52,52	1.02	4 (12%)
4	SO4	D	404	-	4,4,4	0.11	0	6,6,6	0.11	0
6	PG4	B	407	-	12,12,12	0.19	0	11,11,11	0.16	0
4	SO4	C	403	-	4,4,4	0.12	0	6,6,6	0.18	0
2	ANP	D	402	3	29,33,33	0.61	0	31,52,52	0.82	1 (3%)
4	SO4	A	404	-	4,4,4	0.15	0	6,6,6	0.20	0
2	ANP	C	402	3	29,33,33	1.86	2 (6%)	31,52,52	0.90	2 (6%)
7	GOL	D	403	-	5,5,5	0.13	0	5,5,5	0.31	0
4	SO4	B	404	-	4,4,4	0.13	0	6,6,6	0.09	0

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
6	PG4	A	406	-	-	4/10/10/10	-
2	ANP	B	401	3	-	3/14/38/38	0/3/3/3
7	GOL	C	401	-	-	0/4/4/4	-
2	ANP	A	401	3	-	3/14/38/38	0/3/3/3
6	PG4	B	407	-	-	3/10/10/10	-
7	GOL	D	403	-	-	0/4/4/4	-
2	ANP	D	402	3	-	2/14/38/38	0/3/3/3
2	ANP	C	402	3	-	4/14/38/38	0/3/3/3

All (8) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	C	402	ANP	PG-O1G	8.55	1.59	1.46
2	B	401	ANP	PG-O1G	8.21	1.59	1.46

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	401	ANP	PB-O1B	8.08	1.59	1.46
2	A	401	ANP	PB-O1B	8.00	1.58	1.46
2	A	401	ANP	PB-O2B	-4.05	1.45	1.56
2	B	401	ANP	PG-O3G	-4.04	1.45	1.56
2	C	402	ANP	PG-O3G	-4.02	1.45	1.56
2	B	401	ANP	PB-O2B	-4.02	1.45	1.56

All (11) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	C	402	ANP	O1G-PG-N3B	-2.38	108.26	111.77
2	C	402	ANP	C5-C6-N6	2.26	123.78	120.35
2	A	401	ANP	C5-C6-N6	2.25	123.78	120.35
2	B	401	ANP	O2B-PB-O3A	2.25	112.14	104.64
2	D	402	ANP	C5-C6-N6	2.21	123.71	120.35
2	B	401	ANP	C5-C6-N6	2.21	123.71	120.35
2	A	401	ANP	O2B-PB-O3A	2.20	111.97	104.64
2	B	401	ANP	O1B-PB-N3B	-2.16	108.58	111.77
2	B	401	ANP	O1G-PG-N3B	-2.11	108.66	111.77
2	A	401	ANP	O3G-PG-O1G	-2.09	108.20	113.45
2	A	401	ANP	O2G-PG-O1G	-2.08	108.22	113.45

There are no chirality outliers.

All (19) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	A	401	ANP	PB-N3B-PG-O1G
2	A	401	ANP	PG-N3B-PB-O3A
2	A	401	ANP	PA-O3A-PB-O1B
2	B	401	ANP	PB-N3B-PG-O1G
2	C	402	ANP	PB-N3B-PG-O1G
2	D	402	ANP	PG-N3B-PB-O1B
2	D	402	ANP	PA-O3A-PB-O1B
6	B	407	PG4	O2-C3-C4-O3
6	B	407	PG4	O1-C1-C2-O2
2	C	402	ANP	PB-O3A-PA-O5'
6	B	407	PG4	C4-C3-O2-C2
6	A	406	PG4	C6-C5-O3-C4
6	A	406	PG4	C3-C4-O3-C5
6	A	406	PG4	C5-C6-O4-C7
2	C	402	ANP	C5'-O5'-PA-O1A
2	B	401	ANP	PG-N3B-PB-O1B

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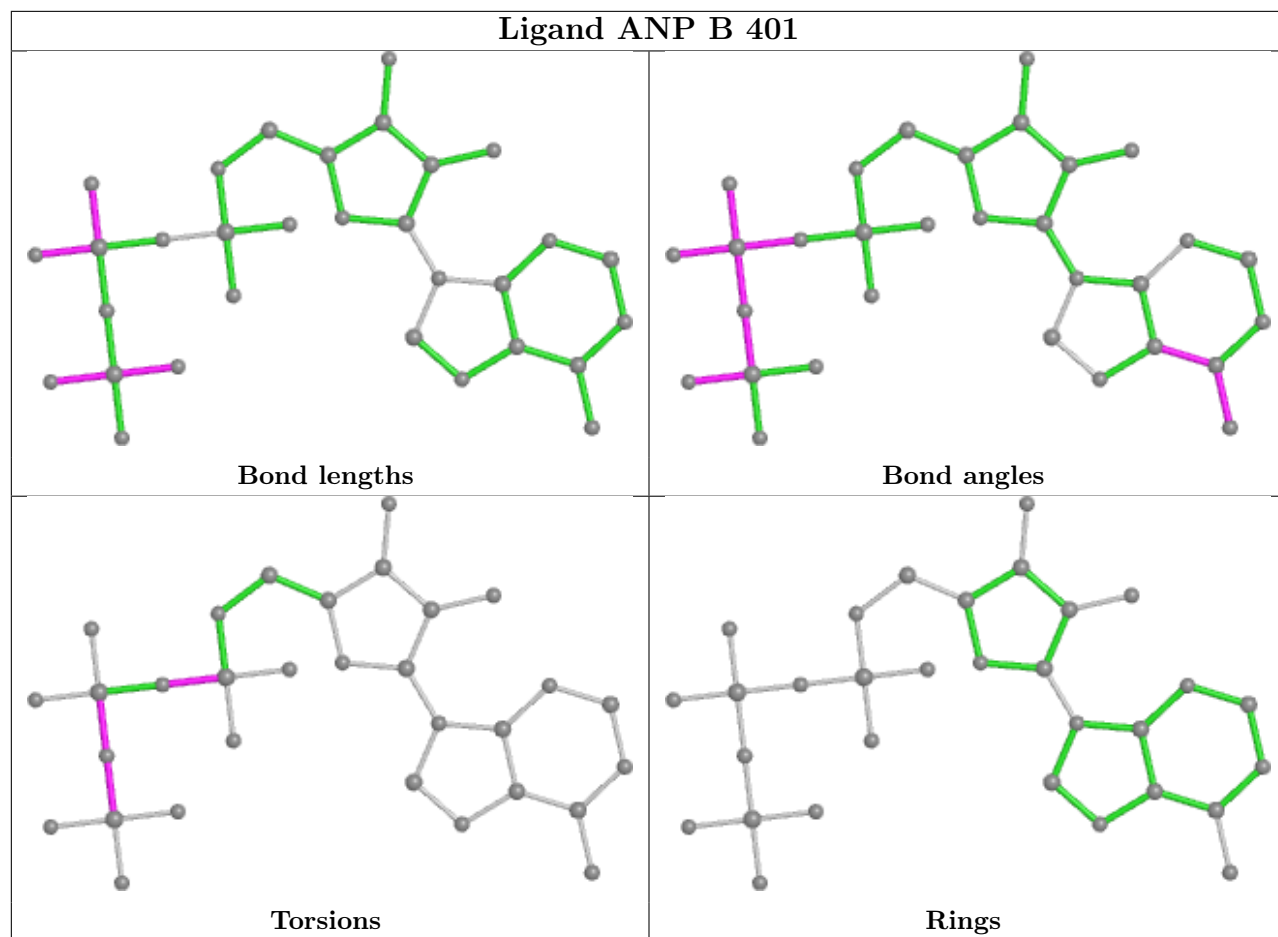
Mol	Chain	Res	Type	Atoms
2	B	401	ANP	PB-O3A-PA-O2A
2	C	402	ANP	C5'-O5'-PA-O3A
6	A	406	PG4	O3-C5-C6-O4

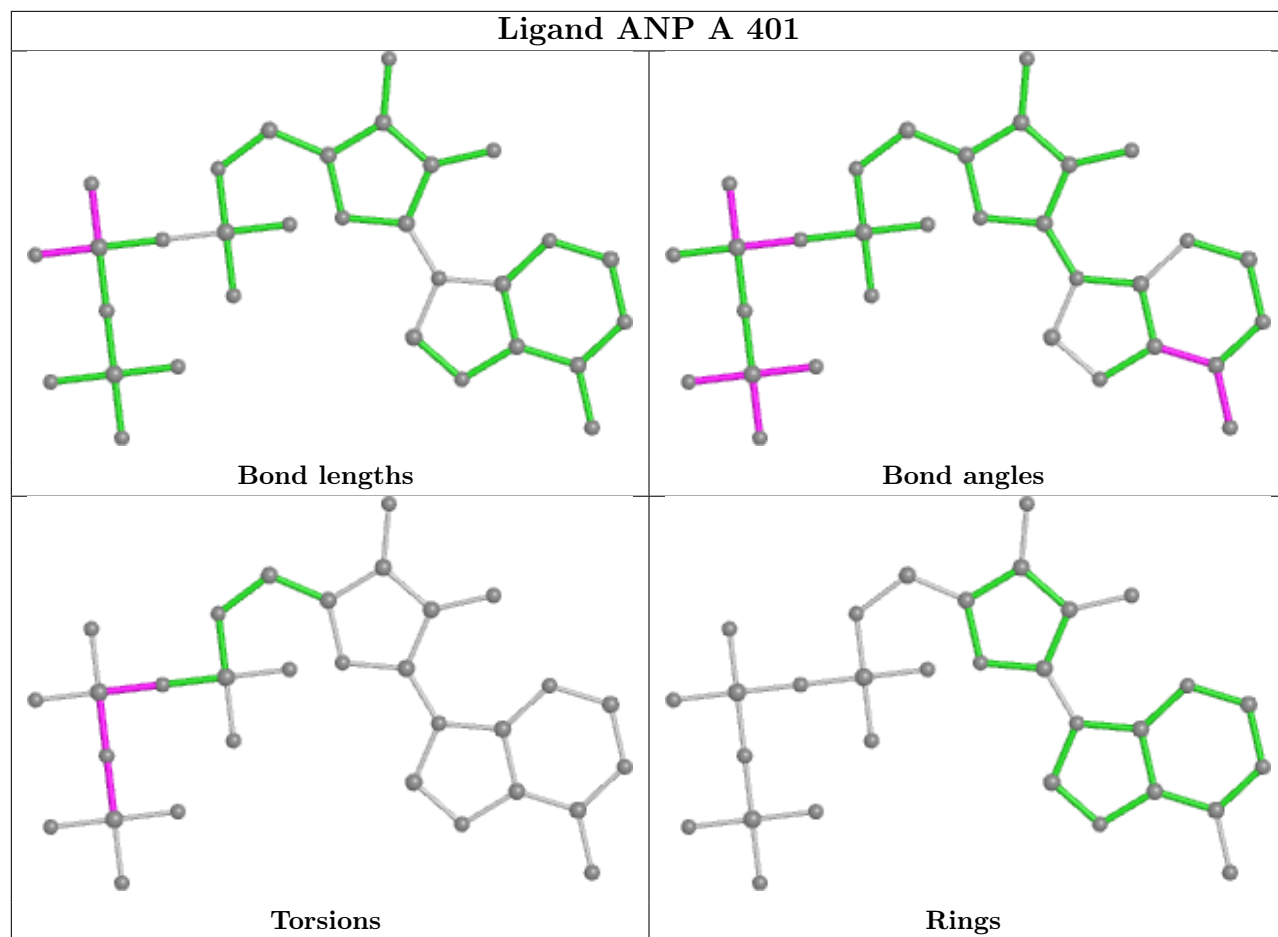
There are no ring outliers.

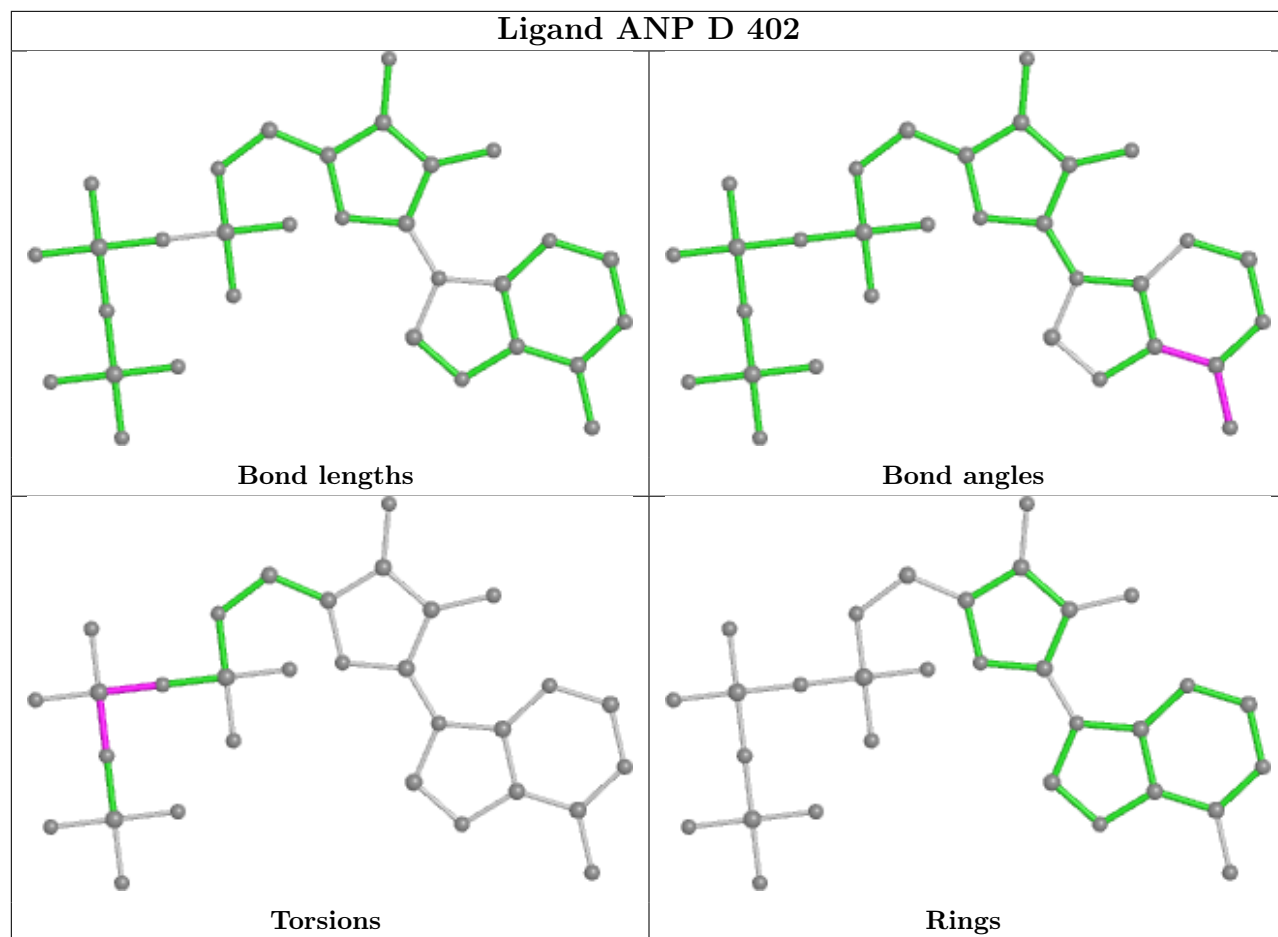
3 monomers are involved in 10 short contacts:

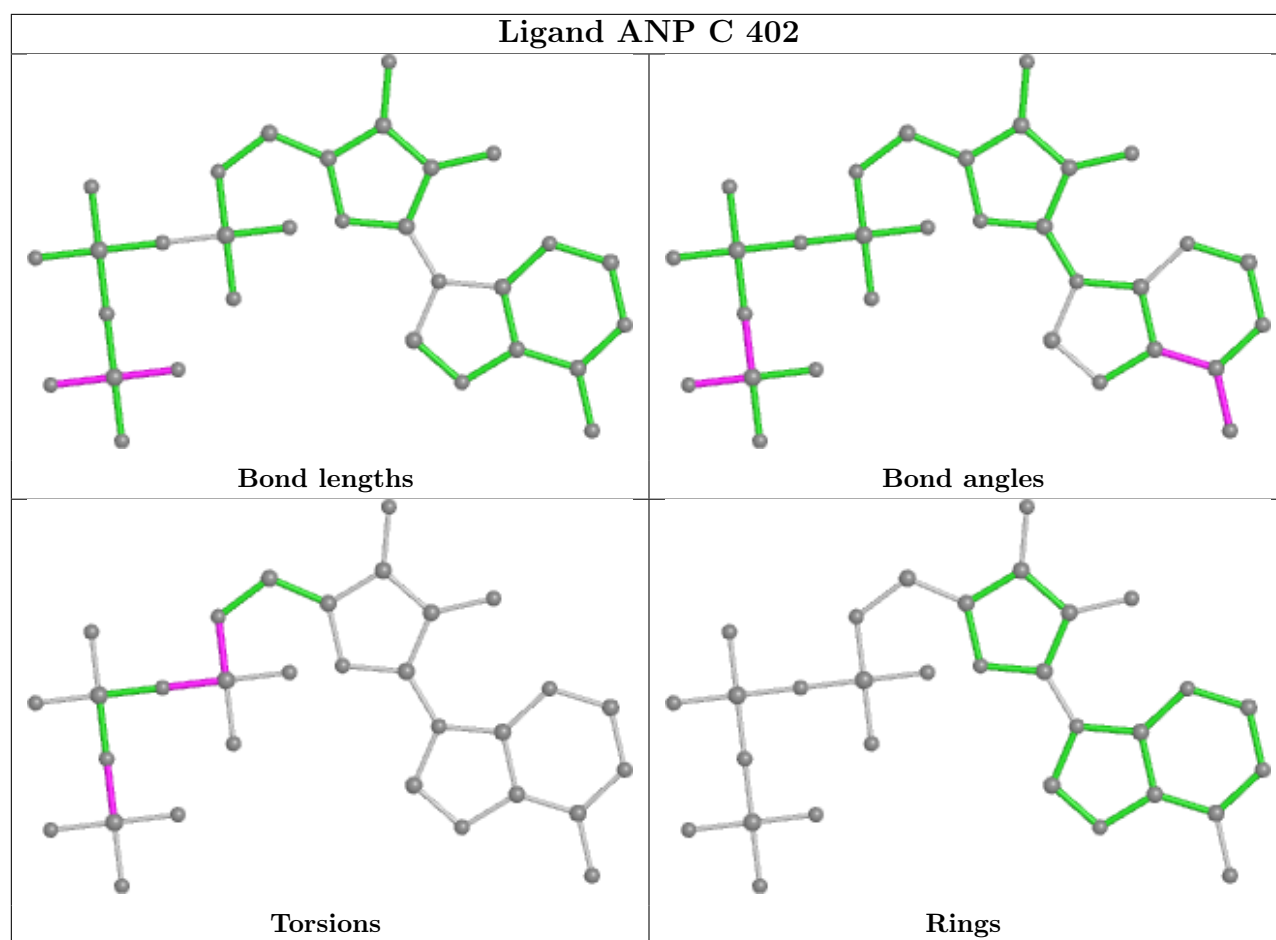
Mol	Chain	Res	Type	Clashes	Symm-Clashes
6	A	406	PG4	4	0
6	B	407	PG4	3	0
2	D	402	ANP	3	0

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

### 6.1 Protein, DNA and RNA chains

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	317/370 (85%)	0.10	16 (5%) 28 29	20, 34, 61, 98	0
1	B	316/370 (85%)	0.13	21 (6%) 18 18	19, 35, 66, 82	0
1	C	307/370 (82%)	0.45	44 (14%) 2 2	19, 38, 82, 108	0
1	D	306/370 (82%)	0.48	38 (12%) 4 3	17, 36, 86, 107	0
All	All	1246/1480 (84%)	0.29	119 (9%) 8 8	17, 36, 79, 108	0

All (119) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	C	76	ASP	6.6
1	B	220	CYS	6.6
1	D	25	VAL	6.5
1	D	26	GLY	6.2
1	C	121	LYS	6.1
1	C	41	LEU	5.8
1	C	50	CYS	5.8
1	C	77	ASN	5.7
1	C	33	ALA	5.7
1	D	34	ALA	5.6
1	C	63	GLY	5.6
1	D	28	ILE	5.5
1	C	64	SER	5.5
1	A	217	PRO	5.4
1	A	49	GLY	5.4
1	D	123	GLY	5.2
1	D	126	TYR	5.1
1	C	34	ALA	5.0
1	B	49	GLY	5.0
1	D	76	ASP	5.0
1	D	30	THR	5.0

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>	<b>RSRZ</b>
1	D	36	ALA	4.9
1	C	187	TYR	4.7
1	C	122	ASN	4.7
1	C	65	ASP	4.6
1	D	35	ALA	4.4
1	D	65	ASP	4.3
1	B	217	PRO	4.2
1	C	123	GLY	4.2
1	A	220	CYS	4.2
1	D	122	ASN	4.0
1	C	67	PRO	4.0
1	B	187	TYR	4.0
1	C	24	ALA	3.9
1	C	126	TYR	3.8
1	A	221	HIS	3.8
1	C	35	ALA	3.8
1	C	75	SER	3.7
1	C	55	ASP	3.7
1	B	221	HIS	3.7
1	C	120	ASP	3.6
1	C	66	ALA	3.5
1	D	294	ASN	3.5
1	B	64	SER	3.5
1	C	49	GLY	3.4
1	C	28	ILE	3.4
1	D	37	TRP	3.4
1	C	188	LYS	3.3
1	D	67	PRO	3.3
1	D	144	ALA	3.3
1	D	50	CYS	3.2
1	C	56	MET	3.1
1	C	42	PRO	3.1
1	D	24	ALA	3.1
1	D	55	ASP	3.1
1	B	122	ASN	3.0
1	B	123	GLY	3.0
1	D	293	ALA	3.0
1	D	64	SER	3.0
1	D	125	SER	3.0
1	B	188	LYS	2.9
1	A	187	TYR	2.9
1	C	52	TYR	2.9

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>	<b>RSRZ</b>
1	D	56	MET	2.9
1	B	65	ASP	2.9
1	A	291	PRO	2.9
1	C	74	PRO	2.9
1	D	33	ALA	2.9
1	A	293	ALA	2.8
1	D	187	TYR	2.8
1	A	332	GLY	2.8
1	C	26	GLY	2.7
1	B	59	SER	2.7
1	C	124	LYS	2.7
1	B	333	SER	2.6
1	B	332	GLY	2.6
1	A	64	SER	2.6
1	D	124	LYS	2.5
1	D	23	PHE	2.5
1	D	128	PHE	2.5
1	C	53	LEU	2.5
1	B	266	LYS	2.5
1	D	120	ASP	2.5
1	D	41	LEU	2.5
1	C	51	ILE	2.5
1	C	114	TRP	2.4
1	C	70	VAL	2.4
1	C	190	PRO	2.4
1	B	146	ALA	2.4
1	D	54	ALA	2.4
1	B	329	LYS	2.4
1	A	334	LYS	2.3
1	D	42	PRO	2.3
1	C	340	ASP	2.3
1	D	66	ALA	2.3
1	A	294	ASN	2.2
1	C	37	TRP	2.2
1	D	114	TRP	2.2
1	D	338	LYS	2.2
1	A	218	LYS	2.2
1	B	215	ALA	2.2
1	C	78	GLY	2.2
1	C	69	VAL	2.2
1	C	144	ALA	2.2
1	C	39	VAL	2.2

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Mol	Chain	Res	Type	RSRZ
1	C	207	GLU	2.2
1	D	78	GLY	2.2
1	A	266	LYS	2.2
1	A	342	SER	2.2
1	D	51	ILE	2.1
1	B	190	PRO	2.1
1	B	120	ASP	2.1
1	C	54	ALA	2.1
1	B	174	VAL	2.1
1	A	102	THR	2.1
1	D	263	ASP	2.1
1	A	60	GLU	2.0
1	C	125	SER	2.0
1	B	50	CYS	2.0

## 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.

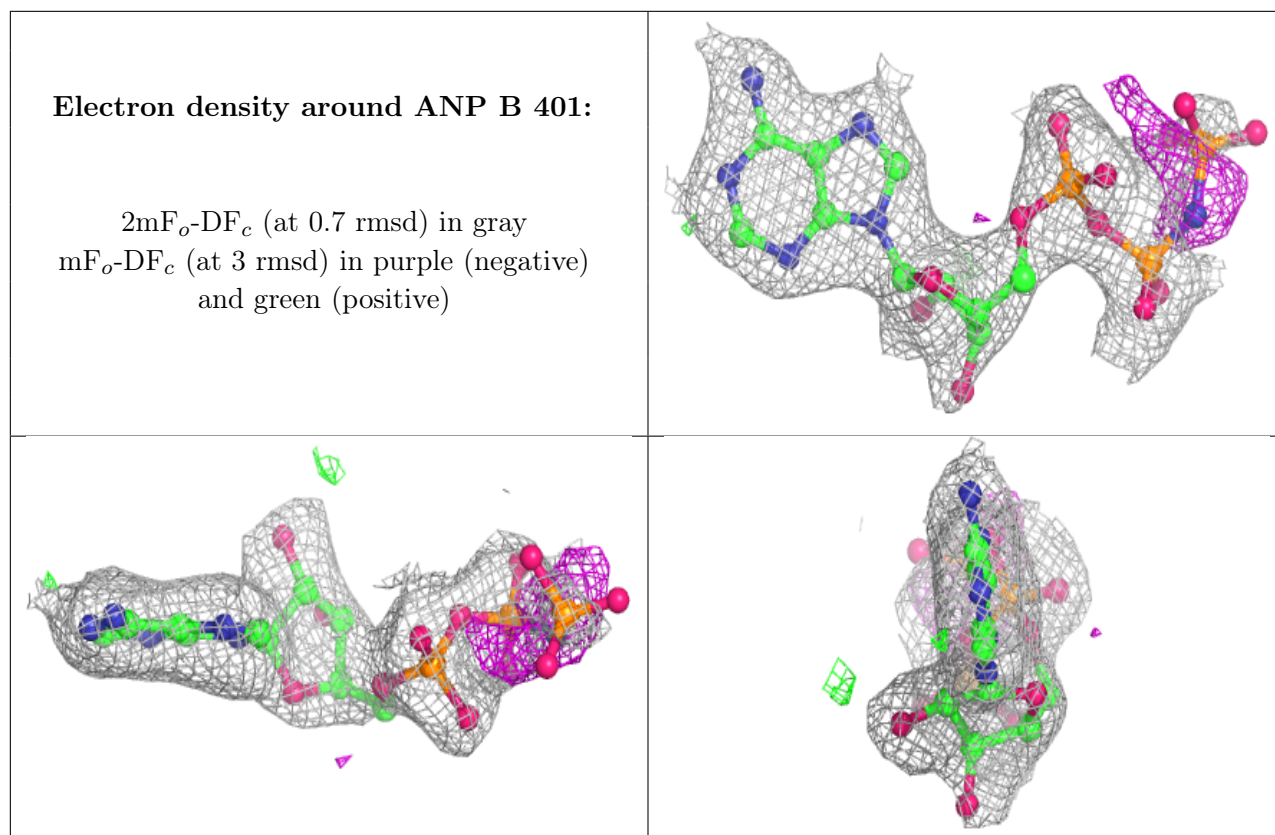
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å <sup>2</sup> )	Q<0.9
6	PG4	B	407	13/13	0.54	0.33	63,83,86,86	0
6	PG4	A	406	13/13	0.72	0.22	48,63,69,70	0
4	SO4	A	403	5/5	0.75	0.25	120,121,121,122	0
2	ANP	B	401	31/31	0.76	0.24	33,77,130,131	0
2	ANP	C	402	31/31	0.78	0.23	40,71,122,123	0
4	SO4	B	404	5/5	0.79	0.32	125,126,127,127	0
7	GOL	C	401	6/6	0.80	0.20	61,64,66,66	0
7	GOL	D	403	6/6	0.80	0.24	52,64,67,69	0
2	ANP	D	402	31/31	0.81	0.22	40,59,102,104	0

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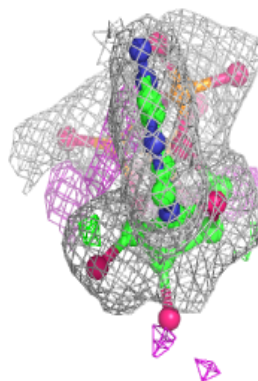
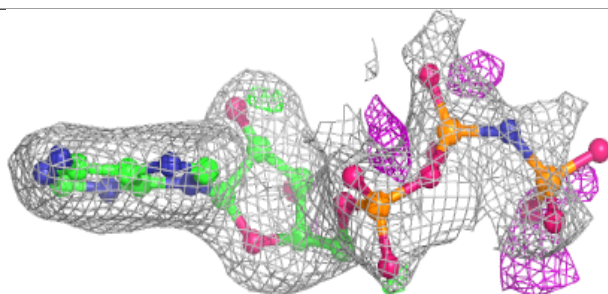
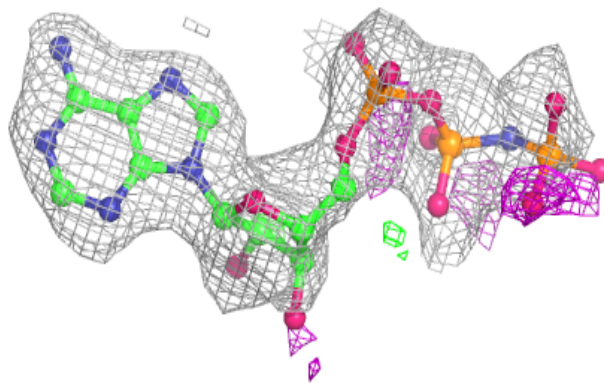
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors( $\text{\AA}^2$ )	Q<0.9
5	CL	C	404	1/1	0.83	0.09	67,67,67,67	0
2	ANP	A	401	31/31	0.87	0.21	30,66,121,122	0
5	CL	A	405	1/1	0.89	0.06	68,68,68,68	0
5	CL	B	402	1/1	0.90	0.06	79,79,79,79	0
4	SO4	B	403	5/5	0.90	0.17	95,96,97,98	0
4	SO4	A	404	5/5	0.91	0.21	81,81,82,83	0
4	SO4	D	404	5/5	0.92	0.29	94,95,96,97	0
5	CL	D	405	1/1	0.92	0.20	61,61,61,61	0
4	SO4	C	403	5/5	0.93	0.24	94,94,95,96	0
3	MG	B	406	1/1	0.93	0.10	51,51,51,51	0
3	MG	C	405	1/1	0.94	0.11	53,53,53,53	0
3	MG	D	401	1/1	0.95	0.14	54,54,54,54	0
3	MG	A	402	1/1	0.96	0.06	56,56,56,56	0
4	SO4	B	405	5/5	0.96	0.15	55,57,58,61	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.

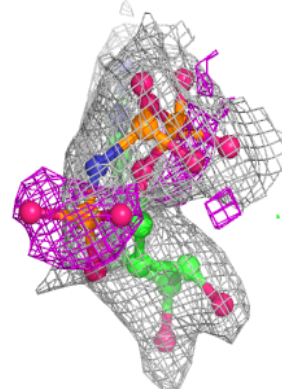
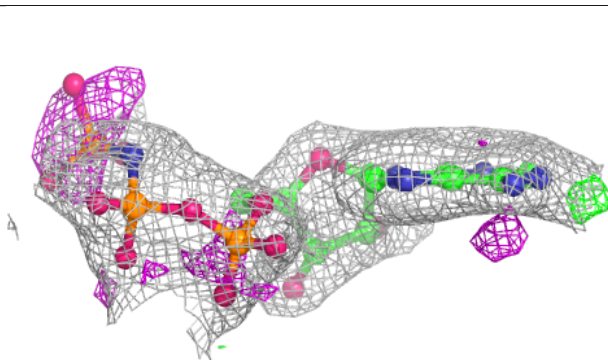
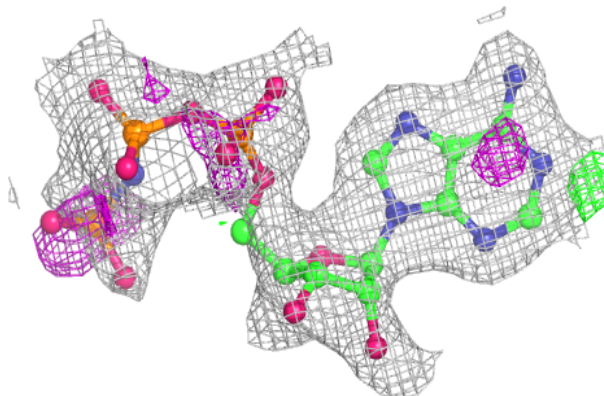


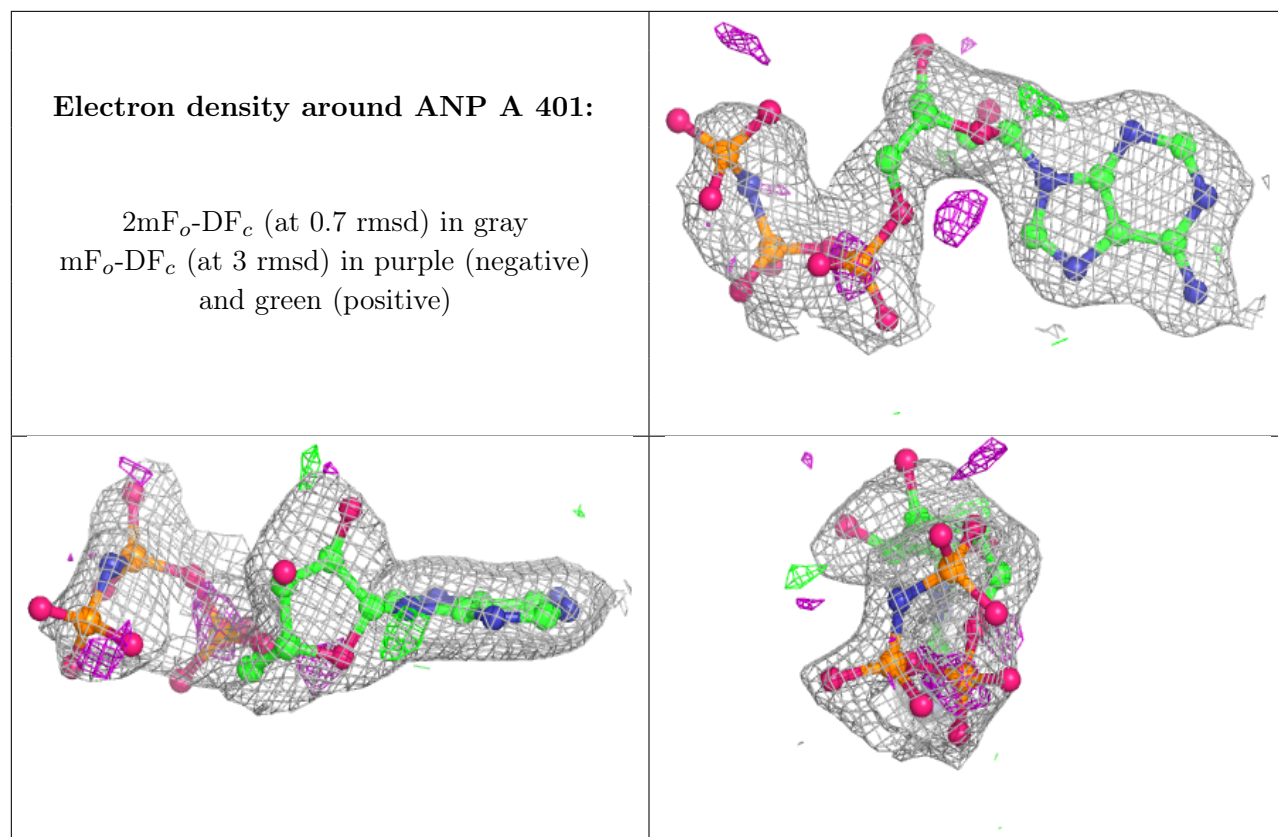
**Electron density around ANP C 402:**

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

**Electron density around ANP D 402:**

$2mF_o-DF_c$  (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.