



# Full wwPDB X-ray Structure Validation Report ⓘ

May 24, 2020 – 06:33 am BST

PDB ID : 6GCL  
Title : Trypanosoma brucei PTR1 in complex with inhibitor 3a (F020)  
Authors : Landi, G.; Pozzi, C.; Mangani, S.  
Deposited on : 2018-04-18  
Resolution : 1.95 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.

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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 : 2.11  
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) : 2.11

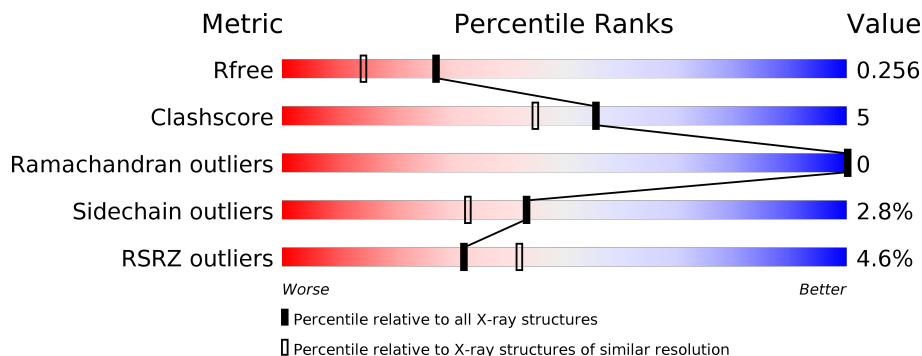
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 1.95 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	2580 (1.96-1.96)
Clashscore	141614	2705 (1.96-1.96)
Ramachandran outliers	138981	2678 (1.96-1.96)
Sidechain outliers	138945	2678 (1.96-1.96)
RSRZ outliers	127900	2539 (1.96-1.96)

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 on 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	288	
1	B	288	
1	D	288	
2	C	288	

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit crite-

ria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
4	EUE	A	302	-	X	-	-
4	EUE	D	302	-	X	-	-

## 2 Entry composition

There are 5 unique types of molecules in this entry. The entry contains 7980 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 Pteridine reductase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	250	Total 1828	C 1149	N 324	O 344	S 11	0	0	0
1	B	249	Total 1821	C 1148	N 314	O 348	S 11	0	0	0
1	D	249	Total 1826	C 1150	N 322	O 343	S 11	0	0	0

There are 60 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-19	MET	-	initiating methionine	UNP O76290
A	-18	GLY	-	expression tag	UNP O76290
A	-17	SER	-	expression tag	UNP O76290
A	-16	SER	-	expression tag	UNP O76290
A	-15	HIS	-	expression tag	UNP O76290
A	-14	HIS	-	expression tag	UNP O76290
A	-13	HIS	-	expression tag	UNP O76290
A	-12	HIS	-	expression tag	UNP O76290
A	-11	HIS	-	expression tag	UNP O76290
A	-10	HIS	-	expression tag	UNP O76290
A	-9	SER	-	expression tag	UNP O76290
A	-8	SER	-	expression tag	UNP O76290
A	-7	GLY	-	expression tag	UNP O76290
A	-6	LEU	-	expression tag	UNP O76290
A	-5	VAL	-	expression tag	UNP O76290
A	-4	PRO	-	expression tag	UNP O76290
A	-3	ARG	-	expression tag	UNP O76290
A	-2	GLY	-	expression tag	UNP O76290
A	-1	SER	-	expression tag	UNP O76290
A	0	HIS	-	expression tag	UNP O76290
B	-19	MET	-	initiating methionine	UNP O76290
B	-18	GLY	-	expression tag	UNP O76290
B	-17	SER	-	expression tag	UNP O76290

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Chain	Residue	Modelled	Actual	Comment	Reference
B	-16	SER	-	expression tag	UNP O76290
B	-15	HIS	-	expression tag	UNP O76290
B	-14	HIS	-	expression tag	UNP O76290
B	-13	HIS	-	expression tag	UNP O76290
B	-12	HIS	-	expression tag	UNP O76290
B	-11	HIS	-	expression tag	UNP O76290
B	-10	HIS	-	expression tag	UNP O76290
B	-9	SER	-	expression tag	UNP O76290
B	-8	SER	-	expression tag	UNP O76290
B	-7	GLY	-	expression tag	UNP O76290
B	-6	LEU	-	expression tag	UNP O76290
B	-5	VAL	-	expression tag	UNP O76290
B	-4	PRO	-	expression tag	UNP O76290
B	-3	ARG	-	expression tag	UNP O76290
B	-2	GLY	-	expression tag	UNP O76290
B	-1	SER	-	expression tag	UNP O76290
B	0	HIS	-	expression tag	UNP O76290
D	-19	MET	-	initiating methionine	UNP O76290
D	-18	GLY	-	expression tag	UNP O76290
D	-17	SER	-	expression tag	UNP O76290
D	-16	SER	-	expression tag	UNP O76290
D	-15	HIS	-	expression tag	UNP O76290
D	-14	HIS	-	expression tag	UNP O76290
D	-13	HIS	-	expression tag	UNP O76290
D	-12	HIS	-	expression tag	UNP O76290
D	-11	HIS	-	expression tag	UNP O76290
D	-10	HIS	-	expression tag	UNP O76290
D	-9	SER	-	expression tag	UNP O76290
D	-8	SER	-	expression tag	UNP O76290
D	-7	GLY	-	expression tag	UNP O76290
D	-6	LEU	-	expression tag	UNP O76290
D	-5	VAL	-	expression tag	UNP O76290
D	-4	PRO	-	expression tag	UNP O76290
D	-3	ARG	-	expression tag	UNP O76290
D	-2	GLY	-	expression tag	UNP O76290
D	-1	SER	-	expression tag	UNP O76290
D	0	HIS	-	expression tag	UNP O76290

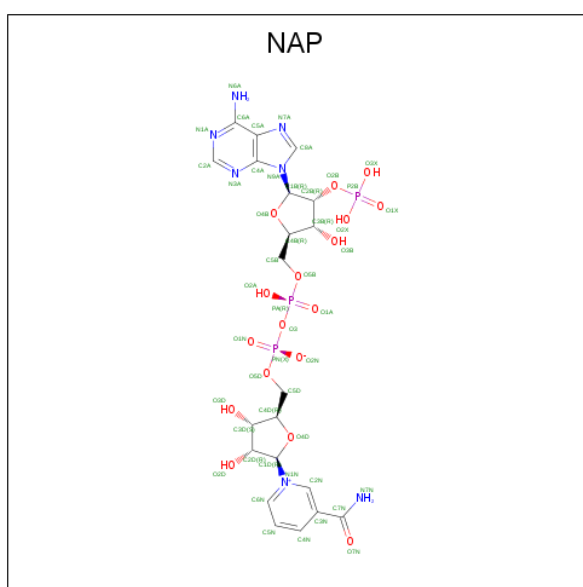
- Molecule 2 is a protein called Pteridine reductase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
2	C	248	1796	1129	313	343	11	0	0	0

There are 20 discrepancies between the modelled and reference sequences:

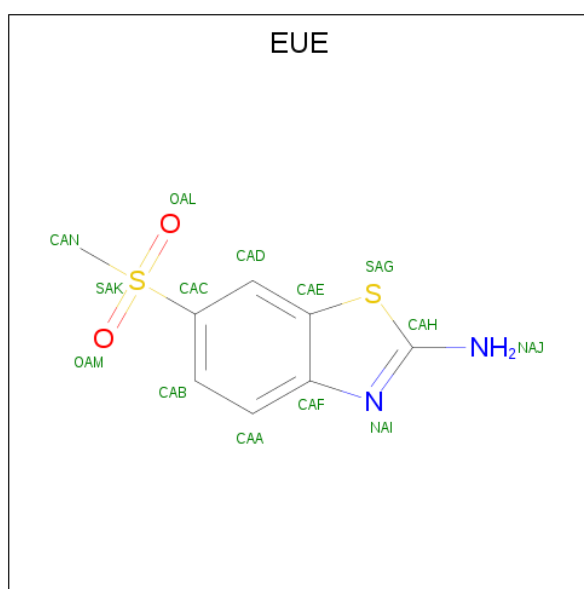
Chain	Residue	Modelled	Actual	Comment	Reference
C	-19	MET	-	initiating methionine	UNP O76290
C	-18	GLY	-	expression tag	UNP O76290
C	-17	SER	-	expression tag	UNP O76290
C	-16	SER	-	expression tag	UNP O76290
C	-15	HIS	-	expression tag	UNP O76290
C	-14	HIS	-	expression tag	UNP O76290
C	-13	HIS	-	expression tag	UNP O76290
C	-12	HIS	-	expression tag	UNP O76290
C	-11	HIS	-	expression tag	UNP O76290
C	-10	HIS	-	expression tag	UNP O76290
C	-9	SER	-	expression tag	UNP O76290
C	-8	SER	-	expression tag	UNP O76290
C	-7	GLY	-	expression tag	UNP O76290
C	-6	LEU	-	expression tag	UNP O76290
C	-5	VAL	-	expression tag	UNP O76290
C	-4	PRO	-	expression tag	UNP O76290
C	-3	ARG	-	expression tag	UNP O76290
C	-2	GLY	-	expression tag	UNP O76290
C	-1	SER	-	expression tag	UNP O76290
C	0	HIS	-	expression tag	UNP O76290

- Molecule 3 is NADP NICOTINAMIDE-ADENINE-DINUCLEOTIDE PHOSPHATE (three-letter code: NAP) (formula:  $C_{21}H_{28}N_7O_{17}P_3$ ).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
3	A	1	Total	C	N	O	P	0	0
			48	21	7	17	3		
3	B	1	Total	C	N	O	P	0	0
			48	21	7	17	3		
3	C	1	Total	C	N	O	P	0	0
			48	21	7	17	3		
3	D	1	Total	C	N	O	P	0	0
			48	21	7	17	3		

- Molecule 4 is 6-methylsulfonyl-1,3-benzothiazol-2-amine (three-letter code: EUE) (formula:  $C_8H_8N_2O_2S_2$ ).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
4	A	1	Total	C	N	O	S	0	0
			14	8	2	2	2		
4	B	1	Total	C	N	O	S	0	0
			14	8	2	2	2		
4	C	1	Total	C	N	O	S	0	0
			14	8	2	2	2		
4	D	1	Total	C	N	O	S	0	0
			14	8	2	2	2		

- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	102	Total	O	0	0
			102	102		

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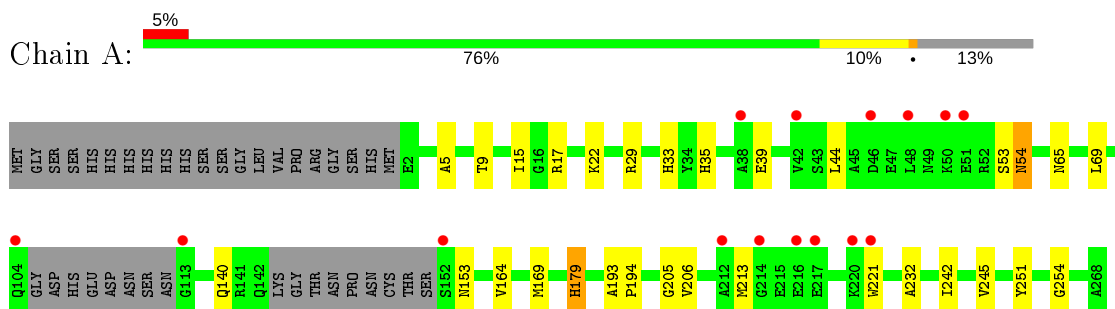
<b>Mol</b>	<b>Chain</b>	<b>Residues</b>	<b>Atoms</b>		<b>ZeroOcc</b>	<b>AltConf</b>
5	B	129	Total 129	O 129	0	0
5	C	102	Total 102	O 102	0	0
5	D	128	Total 128	O 128	0	0



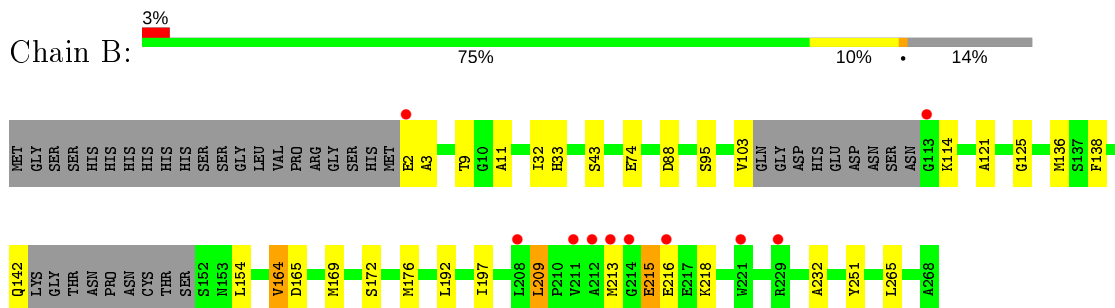
### 3 Residue-property plots [i](#)

These plots are drawn for all protein, RNA and DNA 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.

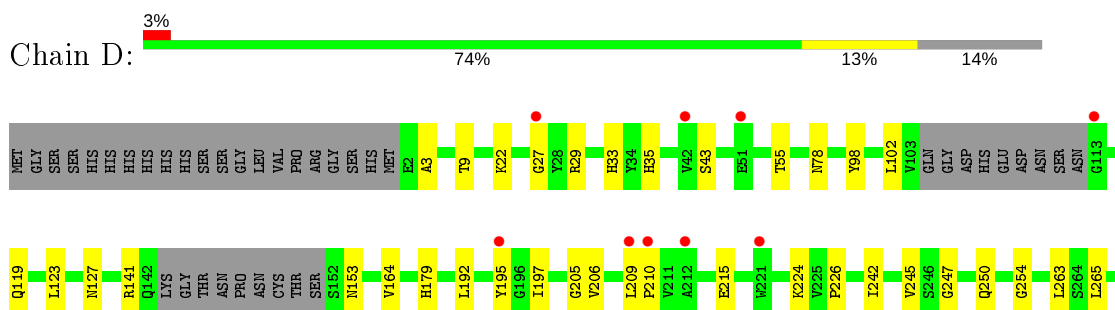
- Molecule 1: Pteridine reductase



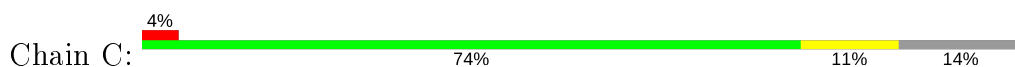
- Molecule 1: Pteridine reductase

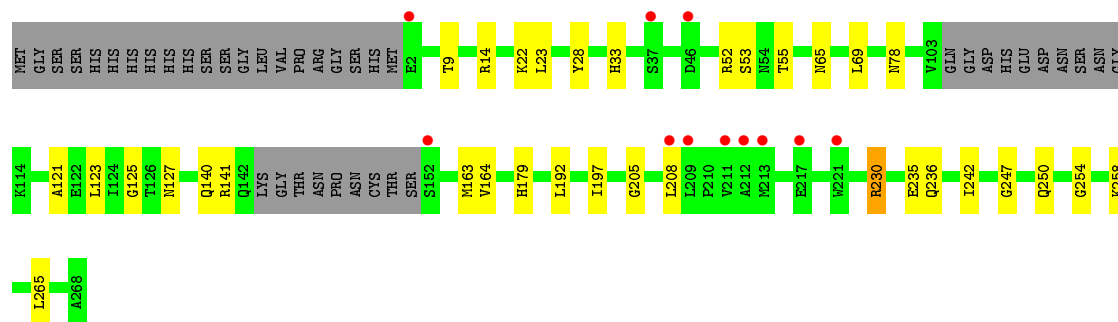


- Molecule 1: Pteridine reductase



- Molecule 2: Pteridine reductase





## 4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	74.87Å 91.06Å 83.08Å 90.00° 115.92° 90.00°	Depositor
Resolution (Å)	33.26 – 1.95 31.58 – 1.95	Depositor EDS
% Data completeness (in resolution range)	99.8 (33.26-1.95) 99.8 (31.58-1.95)	Depositor EDS
$R_{merge}$	0.07	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	2.43 (at 1.95Å)	Xtrriage
Refinement program	REFMAC 5.8.0158	Depositor
R, $R_{free}$	0.189 , 0.243 0.208 , 0.256	Depositor DCC
$R_{free}$ test set	3558 reflections (4.88%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	23.2	Xtrriage
Anisotropy	0.536	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.37 , 55.6	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.50$ , $\langle L^2 \rangle = 0.33$	Xtrriage
Estimated twinning fraction	0.000 for h,-k,-h-l	Xtrriage
$F_o, F_c$ correlation	0.94	EDS
Total number of atoms	7980	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	36.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The analyses of the Patterson function reveals a significant off-origin peak that is 61.90 % of the origin peak, indicating pseudo-translational symmetry. The chance of finding a peak of this or larger height randomly in a structure without pseudo-translational symmetry is equal to 1.2228e-05. The detected translational NCS is most likely also responsible for the elevated intensity ratio.*

<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: EUE, NAP, OCS

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	0.84	0/1855	0.86	0/2522
1	B	0.88	0/1848	0.87	0/2512
1	D	0.88	0/1853	0.86	0/2519
2	C	0.87	0/1813	0.89	0/2469
All	All	0.86	0/7369	0.87	0/10022

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	1828	0	1815	19	0
1	B	1821	0	1809	22	0
1	D	1826	0	1832	20	0
2	C	1796	0	1763	21	0
3	A	48	0	25	3	0
3	B	48	0	25	1	0
3	C	48	0	25	3	0
3	D	48	0	25	2	0
4	A	14	0	0	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
4	B	14	0	0	0	0
4	C	14	0	0	1	0
4	D	14	0	0	1	0
5	A	102	0	0	0	0
5	B	129	0	0	1	0
5	C	102	0	0	4	0
5	D	128	0	0	1	0
All	All	7980	0	7319	75	0

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

All (75) 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:169:MET:HE1	5:D:444:HOH:O	1.81	0.81
2:C:205:GLY:O	3:C:301:NAP:H4N	1.89	0.72
2:C:179:HIS:ND1	5:C:401:HOH:O	2.22	0.72
1:A:53:SER:O	1:A:54:ASN:ND2	2.21	0.69
1:A:65:ASN:HA	1:A:69:LEU:HD22	1.76	0.68
1:B:215:GLU:HG2	1:B:218:LYS:HE2	1.76	0.67
2:C:230:ARG:HH11	2:C:236:GLN:HE21	1.44	0.65
2:C:230:ARG:HD3	2:C:236:GLN:HE22	1.62	0.65
2:C:230:ARG:HD3	2:C:236:GLN:NE2	2.11	0.65
1:A:179:HIS:ND1	5:C:401:HOH:O	2.29	0.64
2:C:22:LYS:HG2	2:C:242:ILE:HG13	1.81	0.62
1:D:164:VAL:HG22	1:D:179:HIS:CD2	2.35	0.62
1:A:22:LYS:HG2	1:A:242:ILE:HG13	1.82	0.61
1:B:2:GLU:N	5:B:402:HOH:O	2.35	0.59
1:A:232:ALA:HB2	1:B:251:TYR:CE2	2.40	0.57
1:B:2:GLU:HG2	1:B:3:ALA:H	1.70	0.56
3:C:301:NAP:O2A	4:C:302:EUE:NAJ	2.39	0.56
2:C:65:ASN:HA	2:C:69:LEU:HD22	1.88	0.56
1:A:164:VAL:HG22	1:A:179:HIS:CD2	2.42	0.54
1:B:121:ALA:O	1:B:125:GLY:HA3	2.07	0.54
2:C:78:ASN:OD1	2:C:141:ARG:NH1	2.41	0.54
1:B:172:SER:O	1:B:176:MET:HG3	2.08	0.53
1:D:210:PRO:HD3	4:D:302:EUE:CAN	2.39	0.52
1:B:9:THR:HA	1:B:33:HIS:HB3	1.92	0.52
1:B:2:GLU:CG	1:B:3:ALA:H	2.22	0.52
1:D:205:GLY:O	3:D:301:NAP:H4N	2.10	0.51

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:C:265:LEU:HD11	1:D:254:GLY:HA3	1.93	0.51
2:C:9:THR:HA	2:C:33:HIS:HB3	1.92	0.51
1:B:2:GLU:HG2	1:B:3:ALA:N	2.26	0.50
1:D:35:HIS:HB2	3:D:301:NAP:C2A	2.42	0.50
1:D:123:LEU:O	1:D:127:ASN:HB2	2.13	0.48
1:D:247:GLY:HA2	1:D:250:GLN:HG3	1.95	0.48
1:D:9:THR:HA	1:D:33:HIS:HB3	1.96	0.48
1:A:254:GLY:HA3	1:B:265:LEU:HD11	1.95	0.47
1:A:17:ARG:HG3	1:A:44:LEU:HD22	1.95	0.47
2:C:254:GLY:HA3	1:D:265:LEU:HD11	1.98	0.46
1:B:136:MET:HG3	1:D:102:LEU:O	2.14	0.46
1:A:9:THR:HA	1:A:33:HIS:HB3	1.97	0.46
2:C:163:MET:HE1	5:C:426:HOH:O	2.15	0.45
1:B:11:ALA:HB3	1:B:32:ILE:HG23	1.97	0.45
2:C:14:ARG:HB3	2:C:208:LEU:HD12	1.99	0.45
2:C:14:ARG:NH2	3:C:301:NAP:O2N	2.48	0.45
1:D:29:ARG:HG2	1:D:55:THR:HG22	1.98	0.45
1:B:95:SER:HB3	3:B:301:NAP:H3D	1.98	0.45
1:D:98:TYR:HE1	1:D:119:GLN:HG2	1.81	0.45
1:A:232:ALA:HB2	1:B:251:TYR:CD2	2.52	0.45
1:D:153:ASN:ND2	1:D:245:VAL:O	2.49	0.45
2:C:121:ALA:O	2:C:125:GLY:HA3	2.16	0.44
1:B:209:LEU:HD22	1:B:213:MET:HE1	1.99	0.44
1:A:205:GLY:O	3:A:301:NAP:H4N	2.18	0.44
1:B:103:VAL:HG21	1:D:195:TYR:CZ	2.53	0.43
1:B:192:LEU:HB3	1:B:197:ILE:HB	1.99	0.43
1:A:5:ALA:HA	1:A:29:ARG:O	2.18	0.43
1:A:213:MET:CE	1:A:221:TRP:HD1	2.31	0.43
1:B:138:PHE:O	1:B:142:GLN:HG2	2.18	0.43
1:B:164:VAL:CG1	1:B:165:ASP:N	2.80	0.43
1:D:192:LEU:HB3	1:D:197:ILE:HB	2.00	0.43
1:A:15:ILE:HB	3:A:301:NAP:H51N	2.01	0.42
1:B:88:ASP:O	1:B:154:LEU:HA	2.19	0.42
2:C:52:ARG:HB2	2:C:55:THR:HG21	2.01	0.42
1:A:193:ALA:HB3	1:A:194:PRO:HD3	2.01	0.42
2:C:258:LYS:HD3	5:C:472:HOH:O	2.19	0.42
1:D:22:LYS:HG2	1:D:242:ILE:HG13	2.01	0.42
1:A:213:MET:HE3	1:A:221:TRP:CD1	2.54	0.41
1:D:78:ASN:OD1	1:D:141:ARG:NH1	2.52	0.41
1:D:3:ALA:HB1	1:D:27:GLY:O	2.19	0.41
1:A:35:HIS:HB2	3:A:301:NAP:C2A	2.51	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:C:192:LEU:HB3	2:C:197:ILE:HB	2.03	0.41
2:C:23:LEU:O	2:C:28:TYR:HB2	2.20	0.41
1:D:224:LYS:O	1:D:226:PRO:HD3	2.21	0.41
2:C:247:GLY:HA2	2:C:250:GLN:HG3	2.02	0.41
1:A:251:TYR:CE2	1:B:232:ALA:HB2	2.56	0.40
1:A:153:ASN:ND2	1:A:245:VAL:O	2.54	0.40
1:D:206:VAL:HG23	1:D:263:LEU:HD22	2.04	0.40
2:C:123:LEU:O	2:C:127:ASN:HB2	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	244/288 (85%)	233 (96%)	11 (4%)	0	100	100
1	B	243/288 (84%)	232 (96%)	11 (4%)	0	100	100
1	D	243/288 (84%)	233 (96%)	10 (4%)	0	100	100
2	C	241/288 (84%)	228 (95%)	13 (5%)	0	100	100
All	All	971/1152 (84%)	926 (95%)	45 (5%)	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	187/231 (81%)	181 (97%)	6 (3%)	39	27
1	B	187/231 (81%)	180 (96%)	7 (4%)	34	22
1	D	190/231 (82%)	187 (98%)	3 (2%)	62	58
2	C	182/230 (79%)	177 (97%)	5 (3%)	44	34
All	All	746/923 (81%)	725 (97%)	21 (3%)	43	33

All (21) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	39	GLU
1	A	54	ASN
1	A	140	GLN
1	A	169	MET
1	A	179	HIS
1	A	206	VAL
1	B	43	SER
1	B	74	GLU
1	B	114	LYS
1	B	164	VAL
1	B	209	LEU
1	B	215	GLU
1	B	216	GLU
2	C	53	SER
2	C	140	GLN
2	C	164	VAL
2	C	230	ARG
2	C	235	GLU
1	D	43	SER
1	D	209	LEU
1	D	215	GLU

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (3) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	179	HIS
2	C	179	HIS
2	C	236	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](#)

1 non-standard protein/DNA/RNA residue is 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	OCS	C	59	2	7,8,9	2.78	2 (28%)	6,11,13	1.70	3 (50%)

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	OCS	C	59	2	-	1/4/7/9	-

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	C	59	OCS	OD3-SG	6.40	1.63	1.45
2	C	59	OCS	CB-SG	-2.91	1.66	1.77

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	C	59	OCS	OD2-SG-CB	2.34	109.47	105.74
2	C	59	OCS	OD1-SG-CB	2.17	109.52	106.94
2	C	59	OCS	OD3-SG-CB	2.09	109.43	106.94

There are no chirality outliers.

All (1) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	C	59	OCS	N-CA-CB-SG

There are no ring outliers.

No monomer is involved in short contacts.

## 5.5 Carbohydrates [i](#)

There are no carbohydrates in this entry.

## 5.6 Ligand geometry [i](#)

8 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
4	EUE	D	302	-	12,15,15	2.55	5 (41%)	18,23,23	2.89	8 (44%)
4	EUE	B	302	-	12,15,15	2.21	4 (33%)	18,23,23	2.83	6 (33%)
4	EUE	A	302	-	12,15,15	2.52	5 (41%)	18,23,23	3.03	10 (55%)
3	NAP	B	301	-	45,52,52	1.41	8 (17%)	56,80,80	1.30	6 (10%)
3	NAP	C	301	-	45,52,52	1.06	4 (8%)	56,80,80	1.44	8 (14%)
4	EUE	C	302	-	12,15,15	2.30	3 (25%)	18,23,23	2.17	7 (38%)
3	NAP	A	301	-	45,52,52	1.16	5 (11%)	56,80,80	1.29	7 (12%)
3	NAP	D	301	-	45,52,52	1.06	4 (8%)	56,80,80	1.27	6 (10%)

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
4	EUE	D	302	-	-	6/6/6/6	0/2/2/2
4	EUE	B	302	-	-	4/6/6/6	0/2/2/2

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
4	EUE	A	302	-	-	4/6/6/6	0/2/2/2
3	NAP	B	301	-	-	1/31/67/67	0/5/5/5
3	NAP	C	301	-	-	8/31/67/67	0/5/5/5
4	EUE	C	302	-	-	4/6/6/6	0/2/2/2
3	NAP	A	301	-	-	2/31/67/67	0/5/5/5
3	NAP	D	301	-	-	1/31/67/67	0/5/5/5

All (38) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	D	302	EUE	CAC-SAK	-5.71	1.71	1.77
4	B	302	EUE	OAL-SAK	4.91	1.57	1.44
4	C	302	EUE	OAM-SAK	4.48	1.56	1.44
4	C	302	EUE	CAA-CAF	-4.40	1.34	1.41
4	A	302	EUE	CAC-SAK	-4.36	1.72	1.77
4	A	302	EUE	OAM-SAK	3.88	1.54	1.44
4	A	302	EUE	CAA-CAF	-3.86	1.35	1.41
3	B	301	NAP	C5A-C4A	3.78	1.50	1.40
4	D	302	EUE	CAA-CAF	-3.55	1.35	1.41
4	A	302	EUE	OAL-SAK	3.46	1.53	1.44
4	C	302	EUE	OAL-SAK	3.42	1.53	1.44
4	D	302	EUE	OAL-SAK	3.34	1.53	1.44
4	D	302	EUE	OAM-SAK	3.26	1.53	1.44
4	B	302	EUE	OAM-SAK	3.14	1.52	1.44
3	C	301	NAP	C5A-C4A	3.04	1.49	1.40
3	B	301	NAP	P2B-O2B	2.94	1.64	1.59
3	A	301	NAP	C2A-N3A	2.93	1.36	1.32
4	B	302	EUE	CAA-CAF	-2.91	1.36	1.41
3	A	301	NAP	C5A-C4A	2.87	1.48	1.40
3	A	301	NAP	P2B-O2B	2.82	1.64	1.59
4	A	302	EUE	CAD-CAC	2.74	1.41	1.36
3	B	301	NAP	C2A-N3A	2.65	1.36	1.32
3	C	301	NAP	P2B-O2B	2.64	1.64	1.59
3	D	301	NAP	P2B-O2B	2.58	1.64	1.59
3	B	301	NAP	C2A-N1A	2.53	1.38	1.33
4	B	302	EUE	CAD-CAC	2.51	1.41	1.36
3	B	301	NAP	C2N-N1N	2.47	1.38	1.35
3	D	301	NAP	C2A-N3A	2.30	1.35	1.32
3	D	301	NAP	C5A-C4A	2.29	1.47	1.40
4	D	302	EUE	CAD-CAC	2.26	1.40	1.36
3	A	301	NAP	C2N-N1N	2.22	1.37	1.35

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	B	301	NAP	C2N-C3N	2.20	1.42	1.39
3	B	301	NAP	C4A-N3A	2.17	1.38	1.35
3	C	301	NAP	O4B-C1B	2.13	1.44	1.41
3	C	301	NAP	C2N-N1N	2.07	1.37	1.35
3	D	301	NAP	C6A-C5A	2.07	1.51	1.43
3	A	301	NAP	C6A-C5A	2.04	1.50	1.43
3	B	301	NAP	C6A-C5A	2.02	1.50	1.43

All (58) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	D	302	EUE	CAN-SAK-CAC	7.13	113.00	104.58
4	A	302	EUE	CAN-SAK-CAC	6.94	112.78	104.58
4	A	302	EUE	OAM-SAK-OAL	-6.91	106.02	117.92
4	B	302	EUE	CAN-SAK-CAC	6.10	111.79	104.58
4	B	302	EUE	OAL-SAK-CAC	5.96	113.10	108.25
4	D	302	EUE	CAD-CAC-SAK	5.56	123.57	119.08
4	B	302	EUE	OAM-SAK-CAC	-5.06	104.12	108.25
4	D	302	EUE	OAM-SAK-OAL	-4.39	110.35	117.92
4	B	302	EUE	OAM-SAK-OAL	-4.13	110.80	117.92
4	D	302	EUE	CAB-CAC-SAK	-3.95	115.92	119.58
4	C	302	EUE	OAM-SAK-OAL	-3.90	111.21	117.92
3	B	301	NAP	C1B-N9A-C4A	-3.71	120.13	126.64
3	A	301	NAP	C4A-C5A-N7A	-3.64	105.61	109.40
4	C	302	EUE	CAN-SAK-CAC	3.57	108.80	104.58
3	B	301	NAP	PN-O3-PA	-3.54	120.69	132.83
3	A	301	NAP	N3A-C2A-N1A	-3.53	123.15	128.68
3	B	301	NAP	N3A-C2A-N1A	-3.36	123.43	128.68
4	D	302	EUE	CAE-CAF-NAI	3.31	115.74	108.04
3	C	301	NAP	C3N-C7N-N7N	3.25	121.65	117.75
3	A	301	NAP	PN-O3-PA	-3.23	121.73	132.83
4	C	302	EUE	CAD-CAC-SAK	3.23	121.69	119.08
3	D	301	NAP	C4A-C5A-N7A	-3.13	106.14	109.40
3	D	301	NAP	N3A-C2A-N1A	-3.10	123.83	128.68
4	C	302	EUE	CAF-CAE-SAG	-3.08	107.76	111.85
4	A	302	EUE	CAE-CAF-NAI	3.04	115.11	108.04
3	C	301	NAP	PN-O3-PA	-3.00	122.54	132.83
4	C	302	EUE	CAE-CAF-NAI	2.99	115.00	108.04
4	A	302	EUE	CAF-CAE-SAG	-2.95	107.94	111.85
4	A	302	EUE	OAM-SAK-CAN	2.94	112.72	108.49
4	A	302	EUE	OAL-SAK-CAC	-2.93	105.86	108.25
3	C	301	NAP	C4A-C5A-N7A	-2.86	106.41	109.40

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	D	301	NAP	PN-O3-PA	-2.80	123.22	132.83
4	A	302	EUE	OAM-SAK-CAC	2.74	110.48	108.25
4	B	302	EUE	NAJ-CAH-NAI	2.72	126.71	123.19
4	A	302	EUE	CAD-CAE-SAG	2.68	130.46	125.10
4	B	302	EUE	CAE-CAF-NAI	2.65	114.20	108.04
3	D	301	NAP	C1B-N9A-C4A	-2.56	122.15	126.64
3	C	301	NAP	O2B-C2B-C3B	2.47	120.63	111.68
3	C	301	NAP	N3A-C2A-N1A	-2.44	124.87	128.68
3	B	301	NAP	C4A-C5A-N7A	-2.43	106.86	109.40
3	C	301	NAP	C3D-C2D-C1D	2.42	104.62	100.98
4	C	302	EUE	OAM-SAK-CAC	2.40	110.21	108.25
3	A	301	NAP	C1B-N9A-C4A	-2.38	122.45	126.64
3	C	301	NAP	O4D-C4D-C5D	2.36	117.14	109.37
3	C	301	NAP	O3B-C3B-C2B	2.35	117.84	111.17
4	D	302	EUE	CAD-CAE-SAG	2.35	129.80	125.10
3	A	301	NAP	O2B-P2B-O1X	-2.34	100.35	109.39
4	C	302	EUE	CAD-CAE-SAG	2.33	129.77	125.10
4	D	302	EUE	CAF-CAE-SAG	-2.32	108.77	111.85
3	D	301	NAP	O2X-P2B-O1X	2.30	119.70	110.68
3	B	301	NAP	C2A-N1A-C6A	2.22	122.55	118.75
4	A	302	EUE	CAA-CAB-CAC	-2.22	116.68	119.74
3	D	301	NAP	O3B-C3B-C2B	2.21	117.45	111.17
3	B	301	NAP	O4D-C1D-C2D	-2.20	103.71	106.93
4	A	302	EUE	CAB-CAA-CAF	2.20	123.61	120.84
3	A	301	NAP	O2X-P2B-O1X	2.15	119.11	110.68
4	D	302	EUE	CAA-CAF-NAI	-2.08	124.76	130.78
3	A	301	NAP	O3B-C3B-C2B	2.03	116.92	111.17

There are no chirality outliers.

All (30) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
4	D	302	EUE	CAD-CAC-SAK-CAN
4	D	302	EUE	CAB-CAC-SAK-CAN
3	C	301	NAP	C5B-O5B-PA-O3
3	C	301	NAP	C2B-O2B-P2B-O2X
4	B	302	EUE	CAD-CAC-SAK-CAN
4	B	302	EUE	CAB-CAC-SAK-CAN
3	C	301	NAP	C3B-C4B-C5B-O5B
4	B	302	EUE	CAB-CAC-SAK-OAL
4	A	302	EUE	CAB-CAC-SAK-OAM
4	C	302	EUE	CAB-CAC-SAK-OAM

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Mol	Chain	Res	Type	Atoms
4	A	302	EUE	CAD-CAC-SAK-OAM
4	C	302	EUE	CAD-CAC-SAK-OAM
4	B	302	EUE	CAD-CAC-SAK-OAL
4	C	302	EUE	CAB-CAC-SAK-CAN
4	D	302	EUE	CAB-CAC-SAK-OAL
3	C	301	NAP	O4B-C4B-C5B-O5B
4	D	302	EUE	CAD-CAC-SAK-OAL
4	A	302	EUE	CAB-CAC-SAK-CAN
4	C	302	EUE	CAD-CAC-SAK-CAN
3	A	301	NAP	C2B-O2B-P2B-O2X
3	C	301	NAP	C5B-O5B-PA-O1A
3	C	301	NAP	C5B-O5B-PA-O2A
4	A	302	EUE	CAD-CAC-SAK-CAN
3	D	301	NAP	O4D-C4D-C5D-O5D
3	C	301	NAP	C3D-C4D-C5D-O5D
4	D	302	EUE	CAD-CAC-SAK-OAM
3	B	301	NAP	O4D-C4D-C5D-O5D
4	D	302	EUE	CAB-CAC-SAK-OAM
3	C	301	NAP	C5D-O5D-PN-O1N
3	A	301	NAP	C5B-O5B-PA-O1A

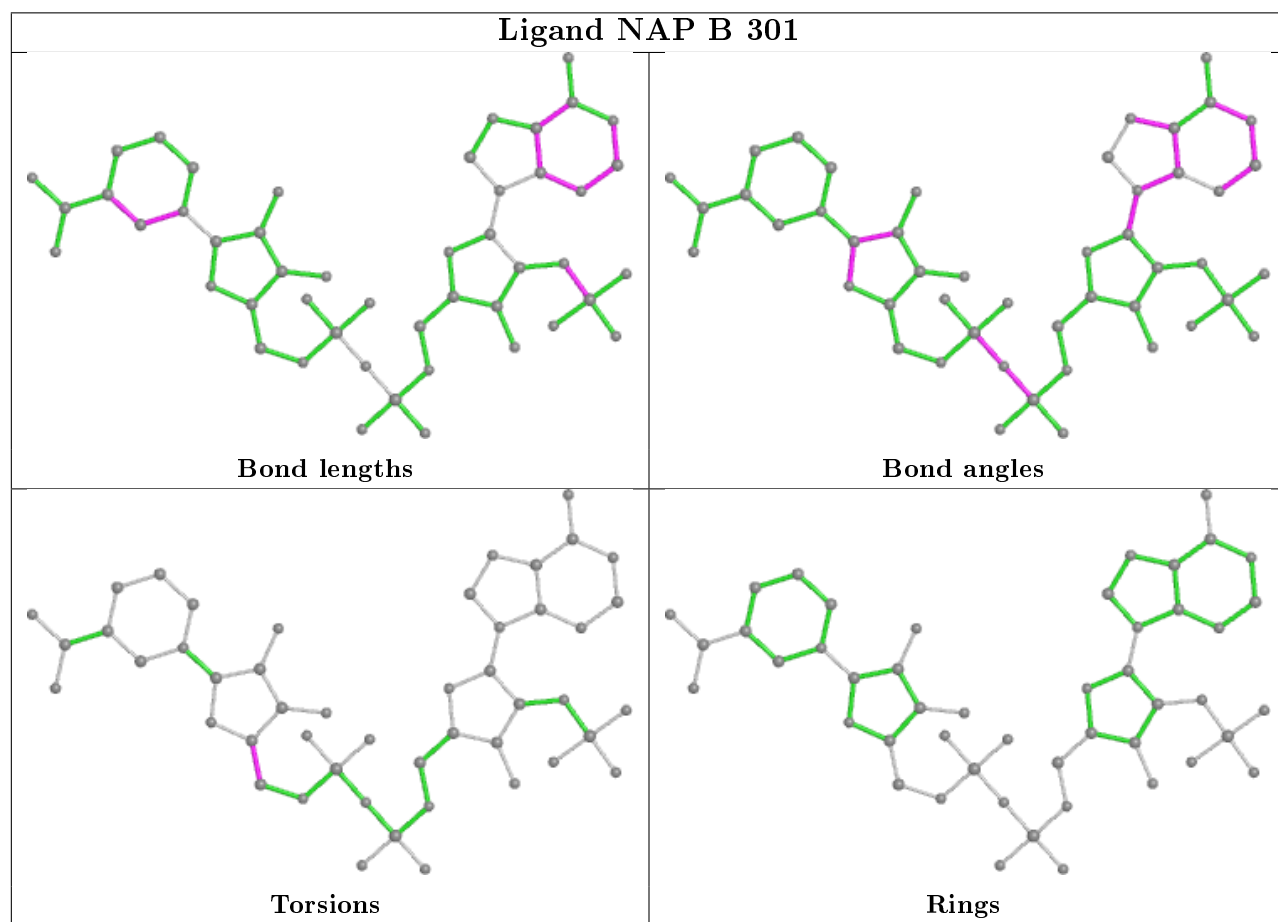
There are no ring outliers.

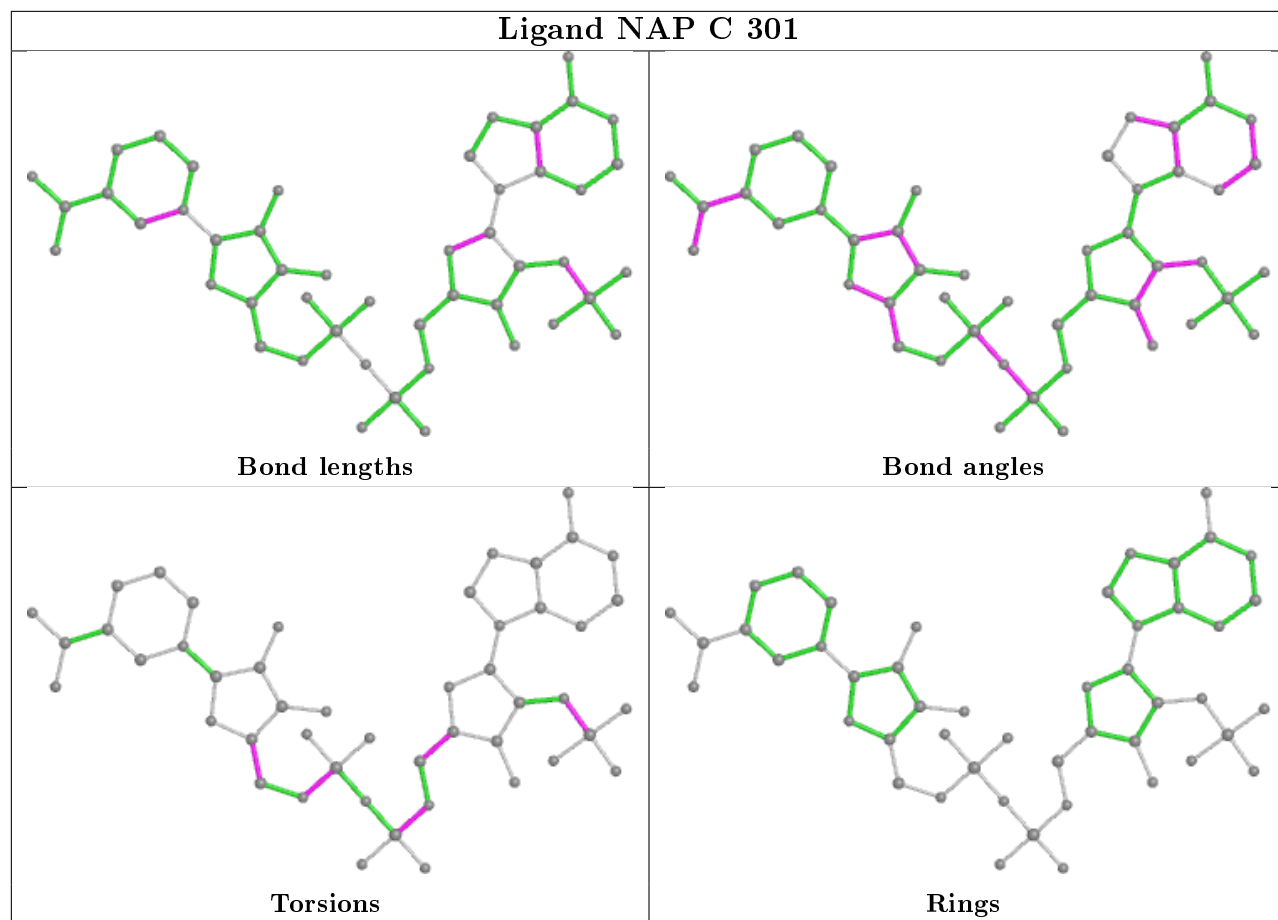
6 monomers are involved in 10 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	D	302	EUE	1	0
3	B	301	NAP	1	0
3	C	301	NAP	3	0
4	C	302	EUE	1	0
3	A	301	NAP	3	0
3	D	301	NAP	2	0

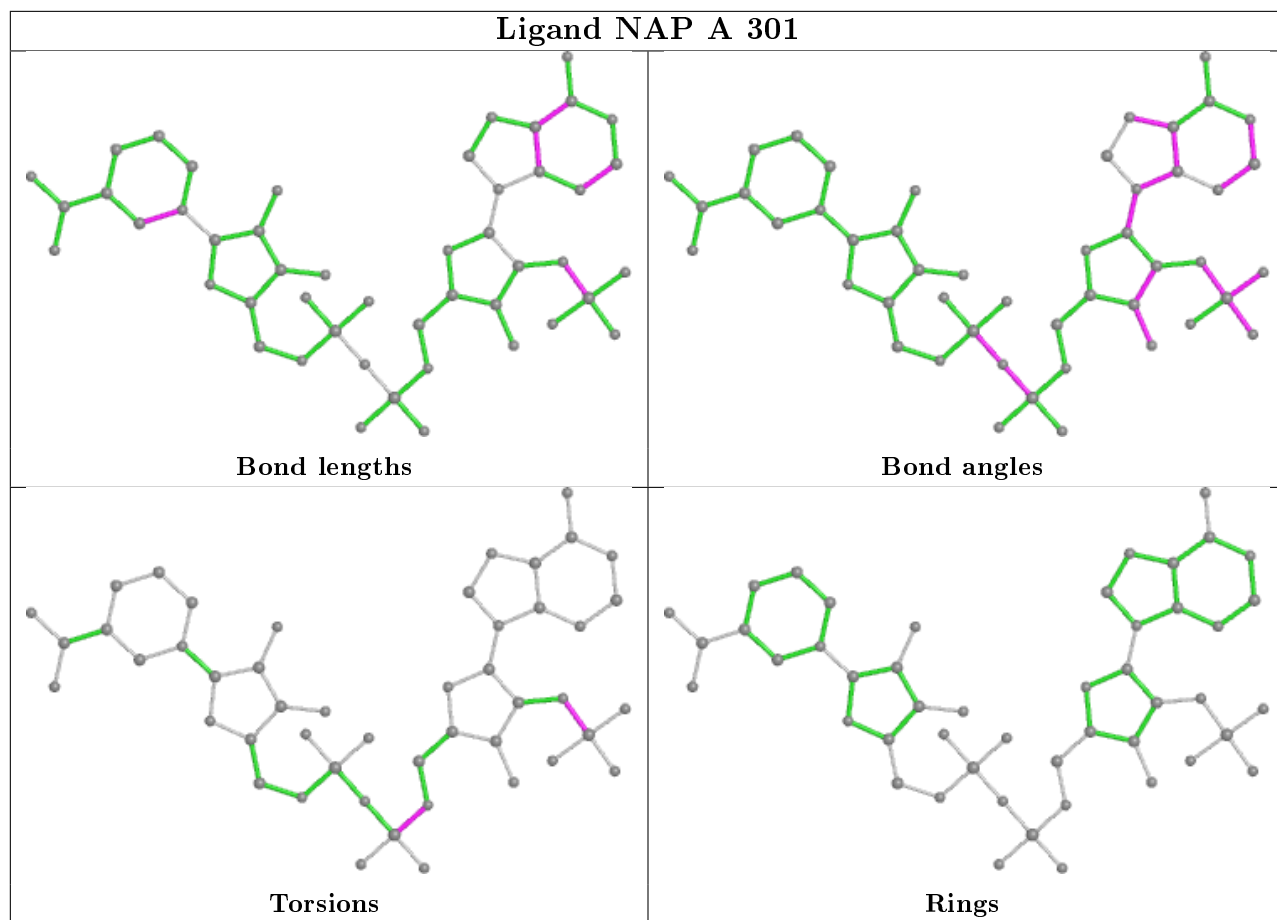
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included.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

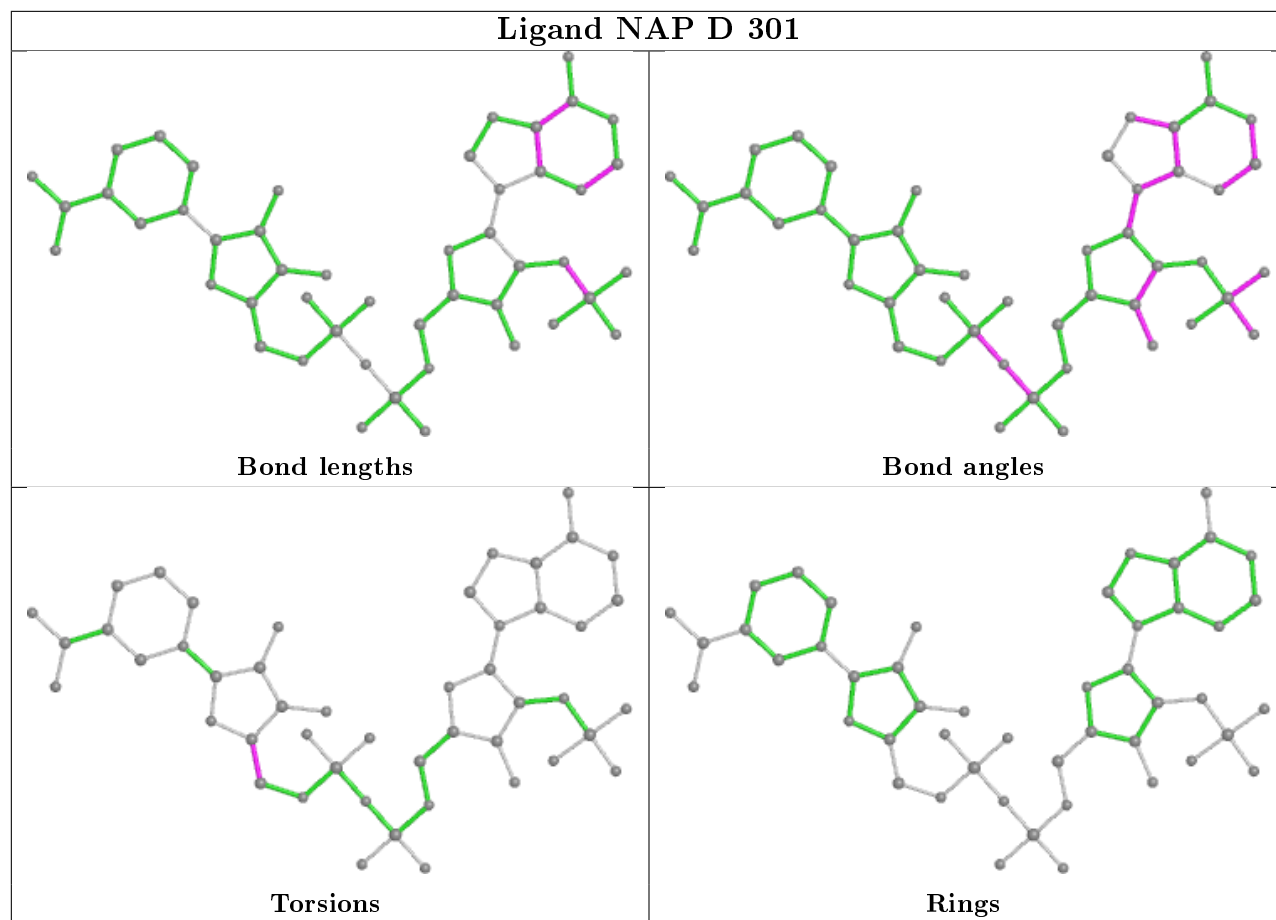
The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.











## 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

### 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	250/288 (86%)	0.30	15 (6%) 21 30	16, 34, 62, 78	2 (0%)
1	B	249/288 (86%)	0.08	10 (4%) 38 48	17, 29, 66, 116	1 (0%)
1	D	249/288 (86%)	0.14	10 (4%) 38 48	17, 32, 62, 78	1 (0%)
2	C	247/288 (85%)	0.29	11 (4%) 33 43	18, 33, 84, 119	2 (0%)
All	All	995/1152 (86%)	0.20	46 (4%) 32 42	16, 32, 66, 119	6 (0%)

All (46) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	C	221	TRP	10.2
2	C	212	ALA	9.9
1	B	212	ALA	6.5
1	A	212	ALA	5.7
1	B	113	GLY	5.6
1	B	211	VAL	4.6
1	D	113	GLY	4.6
2	C	208	LEU	4.4
1	A	113	GLY	4.3
1	A	221	TRP	4.1
1	B	216	GLU	3.8
2	C	217	GLU	3.8
1	B	221	TRP	3.4
1	A	104	GLN	3.3
2	C	213	MET	3.3
2	C	211	VAL	3.1
1	A	38	ALA	3.1
1	A	217	GLU	3.0
1	D	42	VAL	2.9
1	D	221	TRP	2.8
2	C	2	GLU	2.5

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Mol	Chain	Res	Type	RSRZ
1	B	213	MET	2.5
1	A	214	GLY	2.5
1	A	42	VAL	2.5
1	B	229	ARG	2.5
1	A	50	LYS	2.4
1	A	48	LEU	2.4
1	A	46	ASP	2.4
1	D	210	PRO	2.4
2	C	152	SER	2.4
1	A	220	LYS	2.4
1	D	27	GLY	2.4
1	D	268	ALA	2.3
2	C	37	SER	2.3
2	C	46	ASP	2.3
1	D	212	ALA	2.2
1	B	214	GLY	2.2
2	C	209	LEU	2.1
1	D	195	TYR	2.1
1	B	208	LEU	2.1
1	D	209	LEU	2.1
1	A	51	GLU	2.1
1	A	152	SER	2.0
1	A	216	GLU	2.0
1	B	2	GLU	2.0
1	D	51	GLU	2.0

## 6.2 Non-standard residues in protein, DNA, RNA chains [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
2	OCS	C	59	9/10	0.95	0.11	33,37,38,43	0

## 6.3 Carbohydrates [i](#)

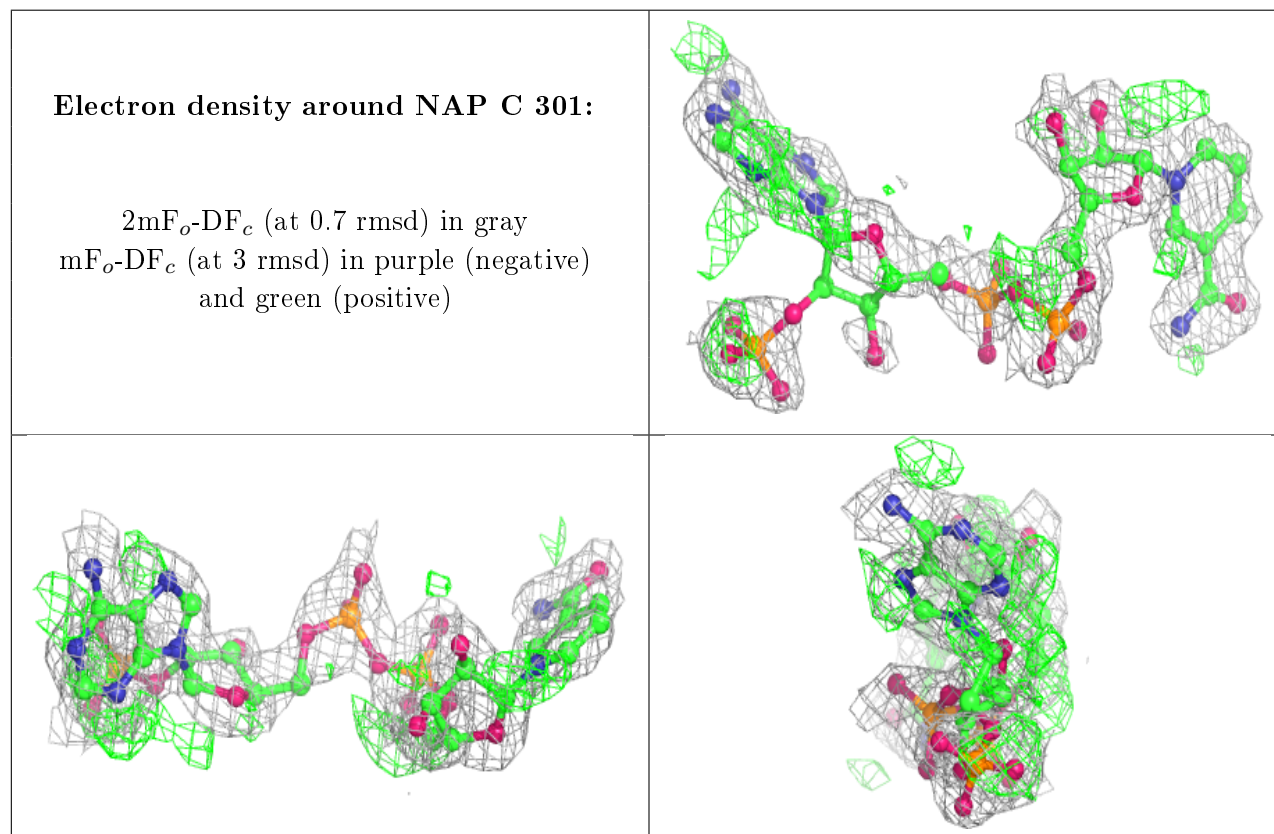
There are no carbohydrates in this entry.

## 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.

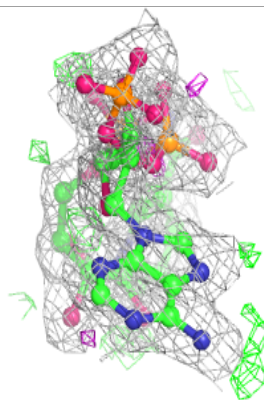
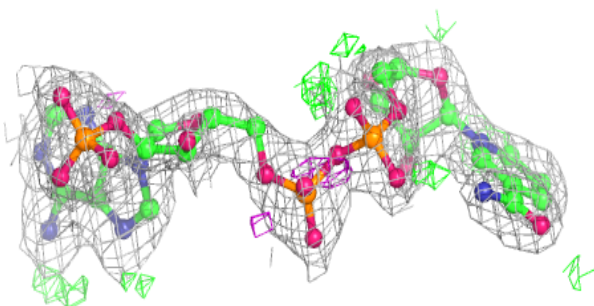
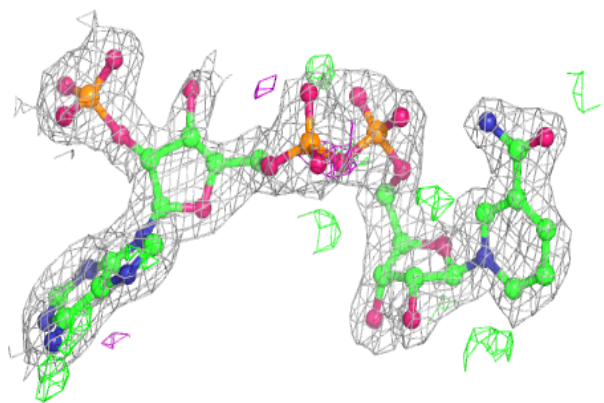
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å <sup>2</sup> )	Q<0.9
3	NAP	C	301	48/48	0.80	0.28	23,29,39,44	48
4	EUE	C	302	14/14	0.86	0.19	31,36,45,46	14
4	EUE	A	302	14/14	0.94	0.13	38,42,47,50	14
3	NAP	B	301	48/48	0.94	0.11	28,35,42,44	48
4	EUE	D	302	14/14	0.94	0.11	27,33,42,45	14
4	EUE	B	302	14/14	0.94	0.14	32,37,43,45	14
3	NAP	A	301	48/48	0.94	0.10	28,33,41,46	48
3	NAP	D	301	48/48	0.94	0.13	23,26,34,35	48

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.

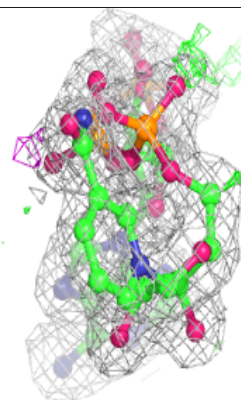
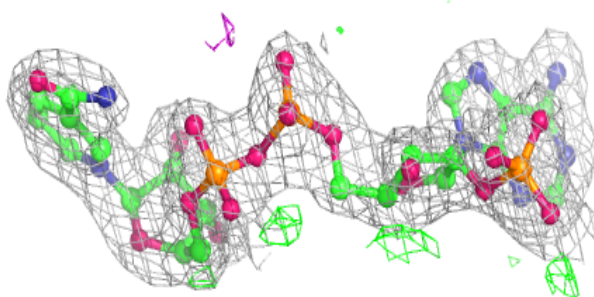
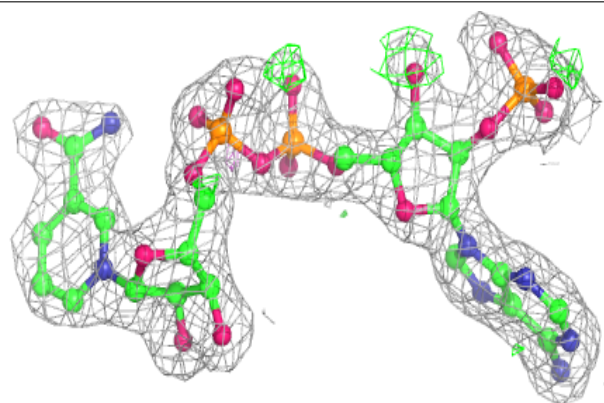


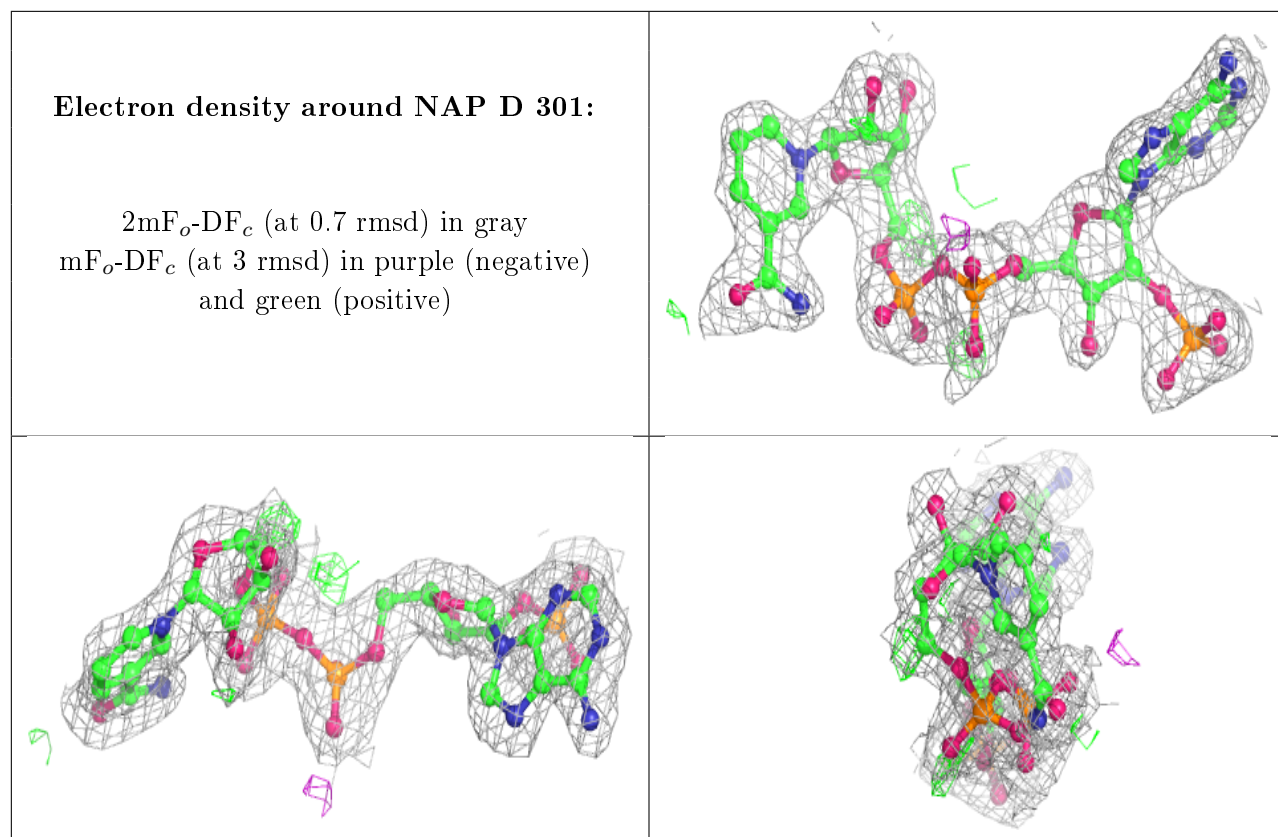
**Electron density around NAP B 301:**

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

**Electron density around NAP A 301:**

$2mF_o-DF_c$  (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.