Full wwPDB X-ray Structure Validation Report ⓘ

Nov 13, 2024 – 03:40 pm GMT

PDB ID	:	8RHW
Title	:	Crystal Structure of Trypanosoma brucei PTR1 in complex with the cofactor and inhibitor P31
Authors	:	Pozzi, C.; Mangani, S.; Landi, G.
Deposited on	:	2023-12-17
Resolution	:	1.70 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*
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.

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

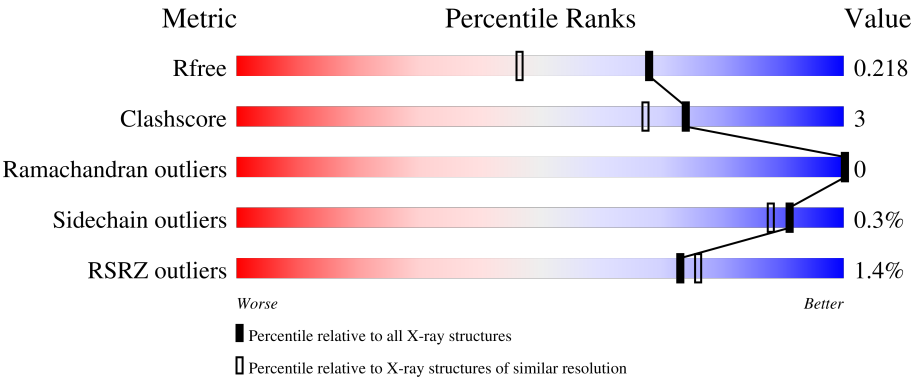
MolProbity	:	4.02b-467
Mogul	:	1.8.4, CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	3.0
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20231227.v01 (using entries in the PDB archive December 27th 2023)
CCP4	:	9.0.003 (Gargrove)
Density-Fitness	:	1.0.11
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.39

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 1.70 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}	164625	5161 (1.70-1.70)
Clashscore	180529	5671 (1.70-1.70)
Ramachandran outliers	177936	5594 (1.70-1.70)
Sidechain outliers	177891	5594 (1.70-1.70)
RSRZ outliers	164620	5159 (1.70-1.70)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments of the lower bar indicate the fraction of residues that contain outliers for >=3, 2, 1 and 0 types of geometric quality criteria respectively. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions <=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	289	80% 7% 13%
1	B	289	81% 6% 14%
1	C	289	81% 5% 14%
1	D	289	83% • 13%

2 Entry composition (i)

There are 5 unique types of molecules in this entry. The entry contains 8246 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
1	A	250	Total	C	N	O	S	0	2	0
			1861	1168	328	354	11			
1	B	249	Total	C	N	O	S	0	6	0
			1878	1184	328	355	11			
1	C	248	Total	C	N	O	S	0	4	0
			1833	1156	320	346	11			
1	D	250	Total	C	N	O	S	0	2	0
			1851	1166	325	349	11			

There are 84 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-20	MET	-	initiating methionine	UNP O76290
A	-19	GLY	-	expression tag	UNP O76290
A	-18	SER	-	expression tag	UNP O76290
A	-17	SER	-	expression tag	UNP O76290
A	-16	HIS	-	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	SER	-	expression tag	UNP O76290
A	-9	SER	-	expression tag	UNP O76290
A	-8	GLY	-	expression tag	UNP O76290
A	-7	LEU	-	expression tag	UNP O76290
A	-6	VAL	-	expression tag	UNP O76290
A	-5	PRO	-	expression tag	UNP O76290
A	-4	ARG	-	expression tag	UNP O76290
A	-3	GLY	-	expression tag	UNP O76290
A	-2	SER	-	expression tag	UNP O76290
A	-1	HIS	-	expression tag	UNP O76290
A	0	MET	-	expression tag	UNP O76290

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Chain	Residue	Modelled	Actual	Comment	Reference
B	-20	MET	-	initiating methionine	UNP O76290
B	-19	GLY	-	expression tag	UNP O76290
B	-18	SER	-	expression tag	UNP O76290
B	-17	SER	-	expression tag	UNP O76290
B	-16	HIS	-	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	SER	-	expression tag	UNP O76290
B	-9	SER	-	expression tag	UNP O76290
B	-8	GLY	-	expression tag	UNP O76290
B	-7	LEU	-	expression tag	UNP O76290
B	-6	VAL	-	expression tag	UNP O76290
B	-5	PRO	-	expression tag	UNP O76290
B	-4	ARG	-	expression tag	UNP O76290
B	-3	GLY	-	expression tag	UNP O76290
B	-2	SER	-	expression tag	UNP O76290
B	-1	HIS	-	expression tag	UNP O76290
B	0	MET	-	expression tag	UNP O76290
C	-20	MET	-	initiating methionine	UNP O76290
C	-19	GLY	-	expression tag	UNP O76290
C	-18	SER	-	expression tag	UNP O76290
C	-17	SER	-	expression tag	UNP O76290
C	-16	HIS	-	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	SER	-	expression tag	UNP O76290
C	-9	SER	-	expression tag	UNP O76290
C	-8	GLY	-	expression tag	UNP O76290
C	-7	LEU	-	expression tag	UNP O76290
C	-6	VAL	-	expression tag	UNP O76290
C	-5	PRO	-	expression tag	UNP O76290
C	-4	ARG	-	expression tag	UNP O76290
C	-3	GLY	-	expression tag	UNP O76290
C	-2	SER	-	expression tag	UNP O76290
C	-1	HIS	-	expression tag	UNP O76290
C	0	MET	-	expression tag	UNP O76290

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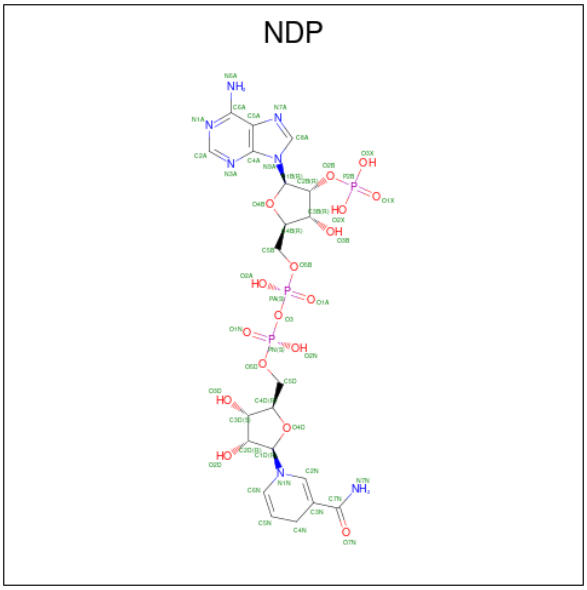
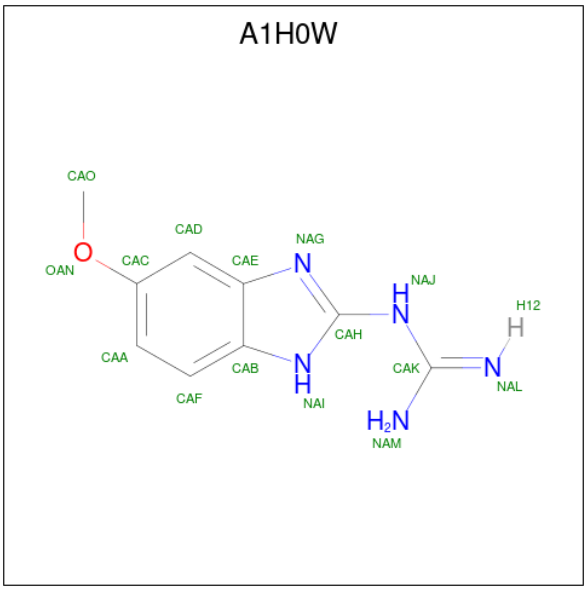
Chain	Residue	Modelled	Actual	Comment	Reference
D	-20	MET	-	initiating methionine	UNP O76290
D	-19	GLY	-	expression tag	UNP O76290
D	-18	SER	-	expression tag	UNP O76290
D	-17	SER	-	expression tag	UNP O76290
D	-16	HIS	-	expression tag	UNP O76290
D	-15	HIS	-	expression tag	UNP O76290
D	-14	HIS	-	expression 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	SER	-	expression tag	UNP O76290
D	-9	SER	-	expression tag	UNP O76290
D	-8	GLY	-	expression tag	UNP O76290
D	-7	LEU	-	expression tag	UNP O76290
D	-6	VAL	-	expression tag	UNP O76290
D	-5	PRO	-	expression tag	UNP O76290
D	-4	ARG	-	expression tag	UNP O76290
D	-3	GLY	-	expression tag	UNP O76290
D	-2	SER	-	expression tag	UNP O76290
D	-1	HIS	-	expression tag	UNP O76290
D	0	MET	-	expression tag	UNP O76290

- Molecule 2 is NADPH DIHYDRO-NICOTINAMIDE-ADENINE-DINUCLEOTIDE PHOSPHATE (three-letter code: NDP) (formula: $C_{21}H_{30}N_7O_{17}P_3$).



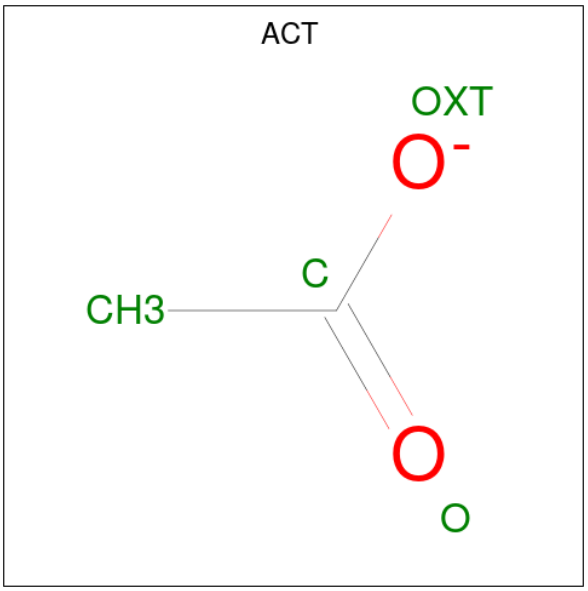
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
2	A	1	Total C N O P 48 21 7 17 3	0	0
2	B	1	Total C N O P 48 21 7 17 3	0	0
2	C	1	Total C N O P 48 21 7 17 3	0	0
2	D	1	Total C N O P 48 21 7 17 3	0	0

- Molecule 3 is 1-(5-methoxy-1 {H}-benzimidazol-2-yl)guanidine (three-letter code: A1H0W) (formula: $C_9H_{11}N_5O$) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	A	1	Total C N O 15 9 5 1	0	0
3	B	1	Total C N O 15 9 5 1	0	0
3	C	1	Total C N O 15 9 5 1	0	0
3	D	1	Total C N O 15 9 5 1	0	0

- Molecule 4 is ACETATE ION (three-letter code: ACT) (formula: $C_2H_3O_2$).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	A	1	Total C O 4 2 2	0	0
4	A	1	Total C O 4 2 2	0	0
4	B	1	Total C O 4 2 2	0	0

- Molecule 5 is water.

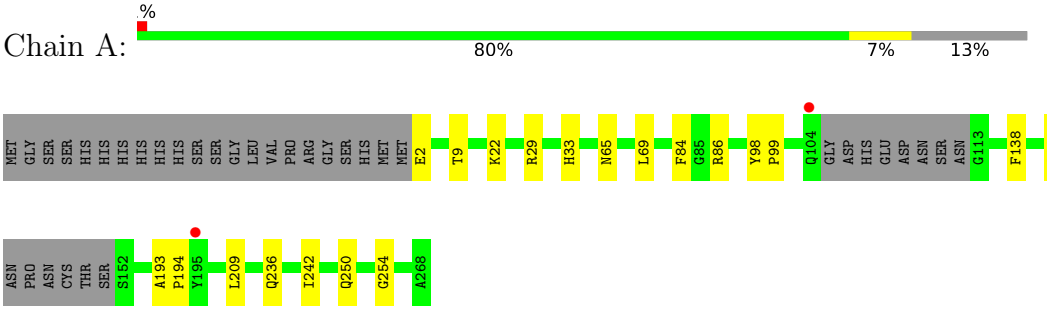
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
5	A	139	Total O 139 139	0	1
5	B	160	Total O 160 160	0	1
5	C	137	Total O 137 137	0	0
5	D	123	Total O 123 123	0	1

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.

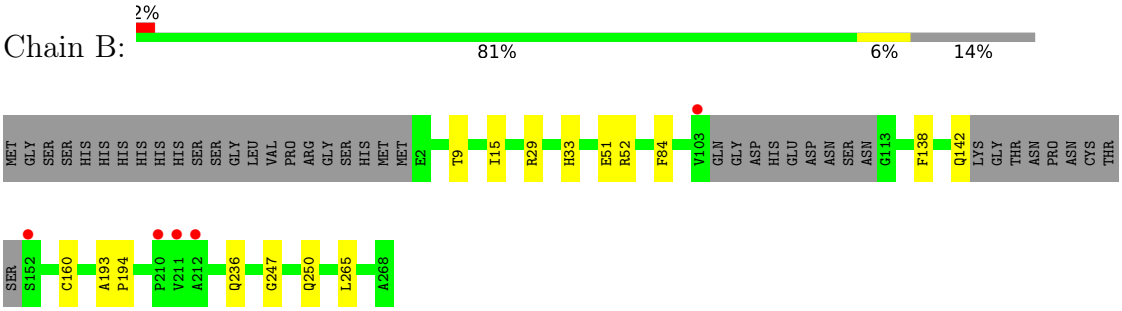
• Molecule 1: Pteridine reductase

Chain A:



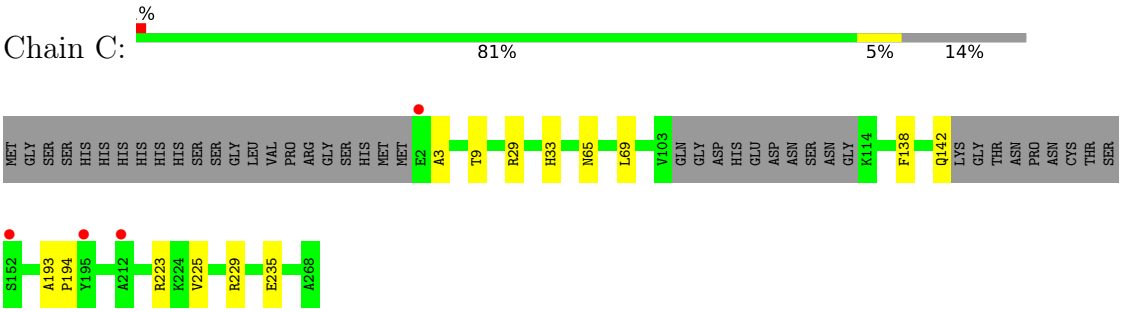
• Molecule 1: Pteridine reductase

Chain B:



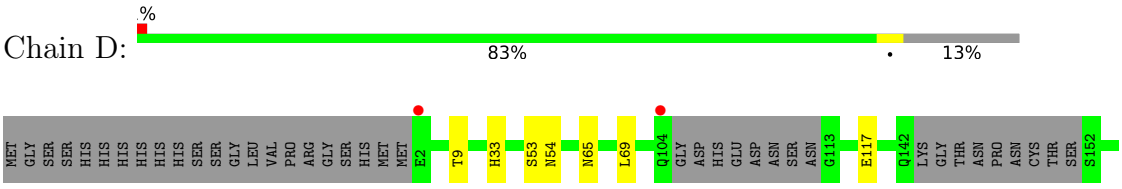
• Molecule 1: Pteridine reductase

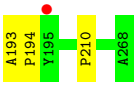
Chain C:



• Molecule 1: Pteridine reductase

Chain D:




A193
P194
Y195
P210
A268

4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α, β, γ	74.50Å 89.82Å 82.50Å 90.00° 115.44° 90.00°	Depositor
Resolution (Å)	67.27 – 1.70 67.27 – 1.70	Depositor EDS
% Data completeness (in resolution range)	100.0 (67.27-1.70) 100.0 (67.27-1.70)	Depositor EDS
R_{merge}	0.06	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	2.45 (at 1.70Å)	Xtriage
Refinement program	REFMAC 5.8.0419	Depositor
R, R_{free}	0.178 , 0.218 0.178 , 0.218	Depositor DCC
R_{free} test set	5509 reflections (5.11%)	wwPDB-VP
Wilson B-factor (Å^2)	22.2	Xtriage
Anisotropy	0.262	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.36 , 43.8	EDS
L-test for twinning[2]	$< \|L\| > = 0.48$, $< L^2 > = 0.32$	Xtriage
Estimated twinning fraction	0.009 for h,-k,-h-l	Xtriage
F_o,F_c correlation	0.97	EDS
Total number of atoms	8246	wwPDB-VP
Average B, all atoms (Å^2)	28.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The analyses of the Patterson function reveals a significant off-origin peak that is 30.73 % 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 1.2447e-03. The detected translational NCS is most likely also responsible for the elevated intensity ratio.*

[1] Intensities estimated from amplitudes.

[2] Theoretical values of $< |L| >$, $< L^2 >$ for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

5 Model quality

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: NDP, A1H0W, ACT

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	0.48	0/1894	0.87	0/2571
1	B	0.50	0/1920	0.90	0/2606
1	C	0.48	0/1869	0.84	0/2541
1	D	0.47	0/1884	0.86	0/2559
All	All	0.48	0/7567	0.87	0/10277

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

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	1861	0	1872	16	0
1	B	1878	0	1899	14	0
1	C	1833	0	1830	8	0
1	D	1851	0	1860	5	0
2	A	48	0	26	0	0
2	B	48	0	26	3	0
2	C	48	0	26	0	0
2	D	48	0	26	3	0
3	A	15	0	0	1	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
3	B	15	0	0	3	0
3	C	15	0	0	0	0
3	D	15	0	0	3	0
4	A	8	0	6	0	0
4	B	4	0	3	0	0
5	A	139	0	0	1	0
5	B	160	0	0	2	0
5	C	137	0	0	1	0
5	D	123	0	0	1	0
All	All	8246	0	7574	45	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 3.

All (45) 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:C:235:GLU:HG3	5:C:468:HOH:O	1.56	1.03
1:B:51[B]:GLU:OE2	1:B:52:ARG:HG3	1.86	0.74
5:A:477:HOH:O	1:B:250[B]:GLN:HG2	1.87	0.73
1:C:3:ALA:HB3	1:C:29:ARG:HD2	1.72	0.69
2:B:301:NDP:H41N	3:B:302:A1H0W:CAF	2.22	0.69
2:B:301:NDP:H41N	3:B:302:A1H0W:CAB	2.24	0.68
1:A:2:GLU:HG3	1:A:86:ARG:HH11	1.59	0.68
3:B:302:A1H0W:NAL	3:B:302:A1H0W:NAG	2.53	0.55
1:D:9:THR:HA	1:D:33:HIS:HB3	1.90	0.54
1:B:247:GLY:HA2	1:B:250[A]:GLN:HG3	1.90	0.53
1:C:9:THR:HA	1:C:33:HIS:HB3	1.91	0.52
1:A:22:LYS:HG2	1:A:242:ILE:HG13	1.92	0.52
1:D:210:PRO:HG3	5:D:494:HOH:O	2.09	0.52
1:A:98:TYR:HB2	1:A:99:PRO:HD2	1.93	0.51
1:A:2:GLU:HG3	1:A:86:ARG:NH1	2.24	0.51
1:D:65:ASN:HA	1:D:69:LEU:HD22	1.92	0.50
1:A:9:THR:HA	1:A:33:HIS:HB3	1.92	0.50
1:C:65:ASN:HA	1:C:69:LEU:HD22	1.92	0.50
1:A:29:ARG:HD2	1:A:84:PHE:CD1	2.50	0.47
3:A:302:A1H0W:NAL	3:A:302:A1H0W:NAG	2.62	0.47
1:B:9:THR:HA	1:B:33:HIS:HB3	1.97	0.47
1:A:250:GLN:HG3	1:B:236:GLN:HE21	1.81	0.46
1:C:193:ALA:N	1:C:194:PRO:CD	2.78	0.46
1:C:138:PHE:O	1:C:142:GLN:HG2	2.15	0.45

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:193:ALA:N	1:B:194:PRO:CD	2.79	0.45
1:B:15:ILE:HB	2:B:301:NDP:H51N	1.99	0.45
1:B:160:CYS:HB3	5:B:524:HOH:O	2.16	0.45
1:A:65:ASN:HA	1:A:69:LEU:HD22	1.99	0.44
2:D:301:NDP:H41N	3:D:302:A1H0W:CAF	2.48	0.44
1:A:250:GLN:HG3	1:B:236:GLN:NE2	2.32	0.44
1:A:138:PHE:O	1:A:142:GLN:HG2	2.17	0.44
1:D:53:SER:O	1:D:54:ASN:HB2	2.19	0.43
2:D:301:NDP:H41N	3:D:302:A1H0W:CAB	2.48	0.43
1:A:250:GLN:HG2	5:B:442:HOH:O	2.17	0.43
2:D:301:NDP:H2D	3:D:302:A1H0W:NAJ	2.34	0.42
1:A:193:ALA:N	1:A:194:PRO:CD	2.82	0.42
1:D:193:ALA:N	1:D:194:PRO:CD	2.83	0.42
1:C:225:VAL:O	1:C:229:ARG:HD3	2.20	0.42
1:A:250:GLN:CG	1:B:236:GLN:HE21	2.33	0.42
1:B:29:ARG:HD2	1:B:84:PHE:CD1	2.55	0.42
1:C:223:ARG:O	1:C:229:ARG:NH1	2.49	0.41
1:B:138:PHE:O	1:B:142:GLN:HG2	2.20	0.41
1:A:193:ALA:HB3	1:A:194:PRO:HD3	2.02	0.40
1:A:236:GLN:HE21	1:B:250[B]:GLN:HG3	1.86	0.40
1:A:254:GLY:HA3	1:B:265:LEU:HD11	2.03	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	246/289 (85%)	236 (96%)	10 (4%)	0	100	100
1	B	248/289 (86%)	242 (98%)	6 (2%)	0	100	100
1	C	245/289 (85%)	237 (97%)	8 (3%)	0	100	100
1	D	246/289 (85%)	238 (97%)	8 (3%)	0	100	100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles
All	All	985/1156 (85%)	953 (97%)	32 (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	197/232 (85%)	196 (100%)	1 (0%)	86 82
1	B	199/232 (86%)	199 (100%)	0	100 100
1	C	190/232 (82%)	190 (100%)	0	100 100
1	D	193/232 (83%)	192 (100%)	1 (0%)	86 82
All	All	779/928 (84%)	777 (100%)	2 (0%)	91 88

All (2) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	209	LEU
1	D	117	GLU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (5) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	25	GLN
1	A	186	GLN
1	A	250	GLN
1	B	236	GLN
1	D	186	GLN

5.3.3 RNA (i)

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates (i)

There are no oligosaccharides in this entry.

5.6 Ligand geometry (i)

11 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	ACT	B	303	-	3,3,3	1.04	0	3,3,3	0.76	0
4	ACT	A	304	-	3,3,3	0.84	0	3,3,3	1.01	0
4	ACT	A	303	-	3,3,3	1.06	0	3,3,3	0.82	0
3	A1H0W	B	302	-	16,16,16	2.42	7 (43%)	15,22,22	1.21	0
3	A1H0W	C	302	-	16,16,16	2.06	6 (37%)	15,22,22	1.15	2 (13%)
3	A1H0W	D	302	-	16,16,16	2.24	6 (37%)	15,22,22	1.32	3 (20%)
2	NDP	D	301	-	45,52,52	0.88	1 (2%)	53,80,80	0.96	2 (3%)
3	A1H0W	A	302	-	16,16,16	2.27	6 (37%)	15,22,22	1.07	1 (6%)
2	NDP	B	301	-	45,52,52	0.80	2 (4%)	53,80,80	0.94	2 (3%)
2	NDP	C	301	-	45,52,52	0.67	0	53,80,80	0.94	3 (5%)
2	NDP	A	301	-	45,52,52	0.69	1 (2%)	53,80,80	0.93	2 (3%)

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	A1H0W	B	302	-	-	2/4/6/6	0/2/2/2
3	A1H0W	C	302	-	-	2/4/6/6	0/2/2/2

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
3	A1H0W	D	302	-	-	2/4/6/6	0/2/2/2
2	NDP	D	301	-	-	1/30/77/77	0/5/5/5
3	A1H0W	A	302	-	-	2/4/6/6	0/2/2/2
2	NDP	B	301	-	-	1/30/77/77	0/5/5/5
2	NDP	C	301	-	-	1/30/77/77	0/5/5/5
2	NDP	A	301	-	-	1/30/77/77	0/5/5/5

All (29) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	D	302	A1H0W	CAD-CAE	-5.03	1.34	1.41
3	B	302	A1H0W	CAF-CAB	-4.77	1.33	1.41
3	A	302	A1H0W	CAD-CAE	-4.74	1.34	1.41
3	B	302	A1H0W	CAH-NAJ	-4.51	1.32	1.38
3	B	302	A1H0W	CAK-NAJ	-4.23	1.33	1.37
2	D	301	NDP	P2B-O2B	4.23	1.67	1.59
3	D	302	A1H0W	CAF-CAB	-4.04	1.34	1.41
3	A	302	A1H0W	CAH-NAJ	-4.02	1.33	1.38
3	C	302	A1H0W	CAD-CAE	-3.95	1.35	1.41
3	C	302	A1H0W	CAH-NAJ	-3.85	1.33	1.38
3	D	302	A1H0W	CAH-NAJ	-3.74	1.33	1.38
3	C	302	A1H0W	CAF-CAB	-3.60	1.35	1.41
3	A	302	A1H0W	CAF-CAB	-3.36	1.36	1.41
3	B	302	A1H0W	CAD-CAE	-3.21	1.36	1.41
2	B	301	NDP	P2B-O2B	2.92	1.64	1.59
3	A	302	A1H0W	CAK-NAJ	-2.92	1.34	1.37
3	C	302	A1H0W	CAD-CAC	2.84	1.42	1.37
3	B	302	A1H0W	CAD-CAC	2.79	1.42	1.37
2	A	301	NDP	P2B-O2B	2.78	1.64	1.59
3	D	302	A1H0W	CAF-CAA	2.48	1.41	1.36
3	A	302	A1H0W	CAD-CAC	2.42	1.41	1.37
3	A	302	A1H0W	CAF-CAA	2.36	1.41	1.36
3	D	302	A1H0W	CAK-NAJ	-2.12	1.35	1.37
3	B	302	A1H0W	CAF-CAA	2.10	1.41	1.36
3	D	302	A1H0W	CAD-CAC	2.04	1.40	1.37
2	B	301	NDP	C8A-N7A	-2.03	1.31	1.34
3	C	302	A1H0W	CAK-NAJ	-2.03	1.35	1.37
3	B	302	A1H0W	CAH-NAG	2.01	1.37	1.34
3	C	302	A1H0W	CAF-CAA	2.01	1.40	1.36

All (15) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
3	D	302	A1H0W	CAF-CAA-CAC	-2.93	116.23	120.17
2	A	301	NDP	O2B-P2B-O1X	-2.54	99.57	109.39
3	C	302	A1H0W	CAO-OAN-CAC	-2.52	112.05	117.51
2	B	301	NDP	C5A-C6A-N6A	2.46	124.09	120.35
2	A	301	NDP	C5A-C6A-N6A	2.41	124.02	120.35
2	C	301	NDP	C5A-C6A-N6A	2.40	124.00	120.35
3	C	302	A1H0W	CAF-CAA-CAC	-2.39	116.96	120.17
2	D	301	NDP	C5A-C6A-N6A	2.36	123.94	120.35
3	D	302	A1H0W	CAO-OAN-CAC	-2.36	112.40	117.51
2	D	301	NDP	C1B-N9A-C4A	-2.26	122.67	126.64
3	A	302	A1H0W	CAO-OAN-CAC	-2.19	112.75	117.51
3	D	302	A1H0W	OAN-CAC-CAD	-2.16	118.53	124.43
2	C	301	NDP	C3N-C7N-N7N	2.11	121.41	117.67
2	B	301	NDP	O2D-C2D-C3D	2.10	118.62	111.82
2	C	301	NDP	O2X-P2B-O2B	2.04	115.14	105.99

There are no chirality outliers.

All (12) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	A	302	A1H0W	CAD-CAC-OAN-CAO
3	D	302	A1H0W	CAD-CAC-OAN-CAO
3	A	302	A1H0W	CAA-CAC-OAN-CAO
3	C	302	A1H0W	CAA-CAC-OAN-CAO
3	D	302	A1H0W	CAA-CAC-OAN-CAO
3	C	302	A1H0W	CAD-CAC-OAN-CAO
2	A	301	NDP	O4D-C1D-N1N-C6N
2	C	301	NDP	O4D-C1D-N1N-C6N
2	B	301	NDP	O4D-C1D-N1N-C6N
2	D	301	NDP	O4D-C1D-N1N-C6N
3	B	302	A1H0W	CAD-CAC-OAN-CAO
3	B	302	A1H0W	CAA-CAC-OAN-CAO

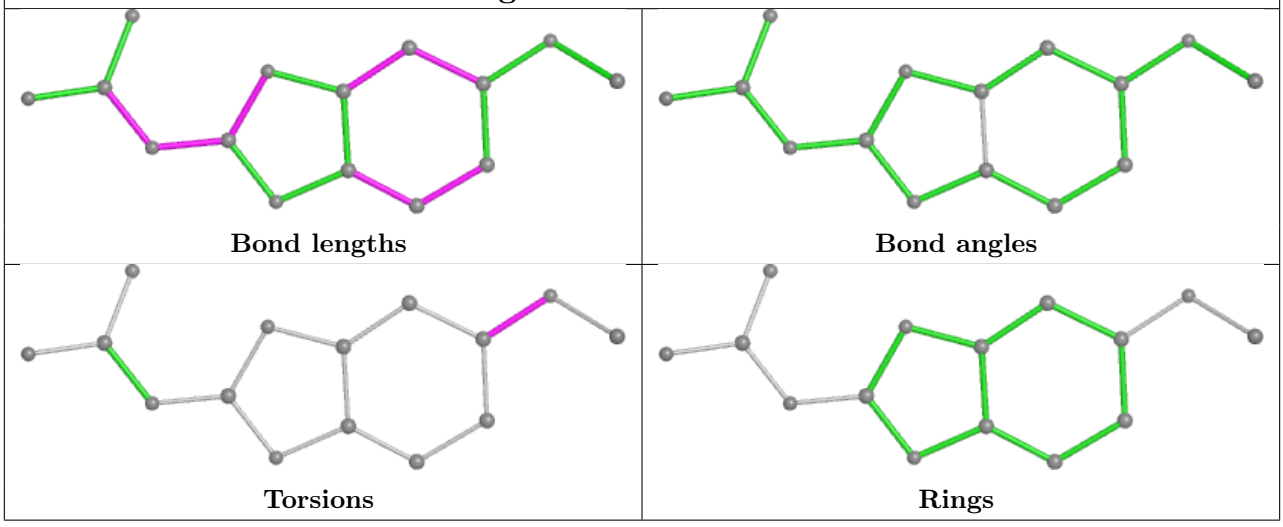
There are no ring outliers.

5 monomers are involved in 8 short contacts:

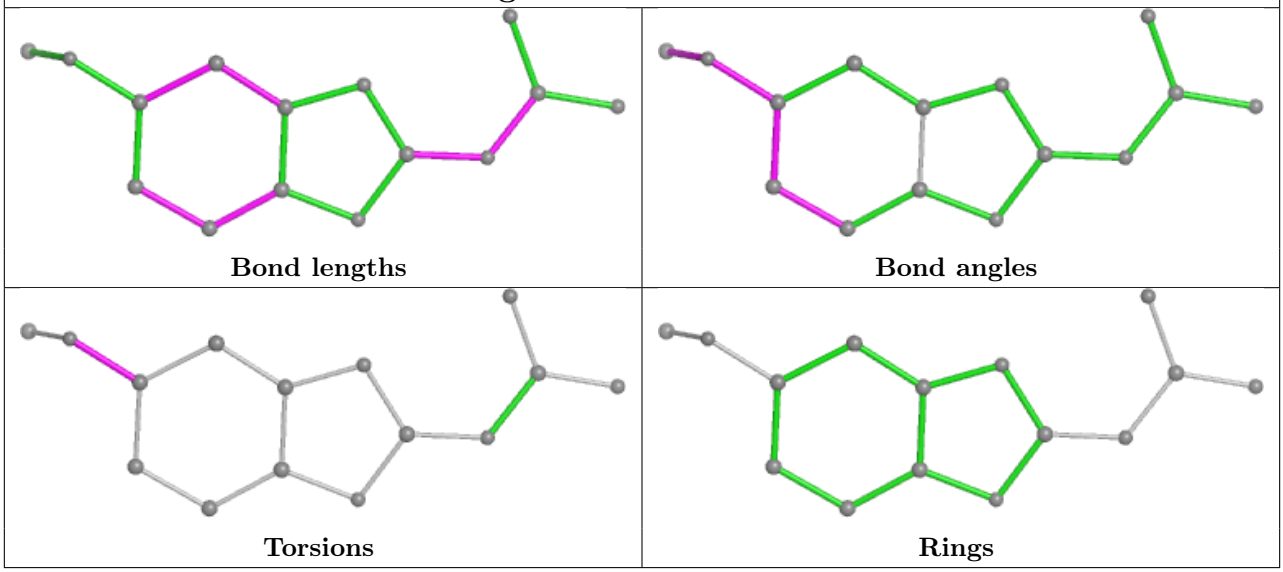
Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	B	302	A1H0W	3	0
3	D	302	A1H0W	3	0
2	D	301	NDP	3	0
3	A	302	A1H0W	1	0
2	B	301	NDP	3	0

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 then 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.

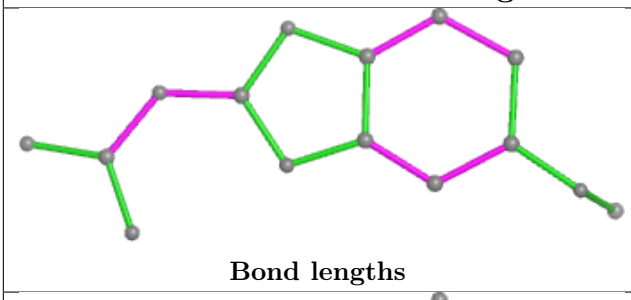
Ligand A1H0W B 302



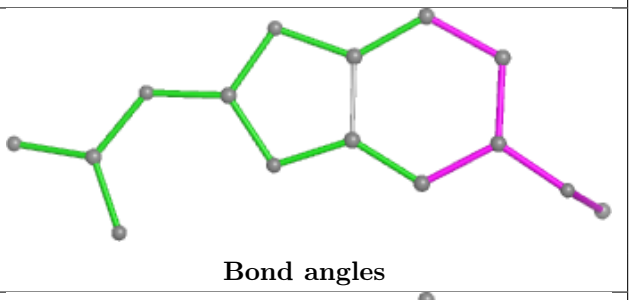
Ligand A1H0W C 302



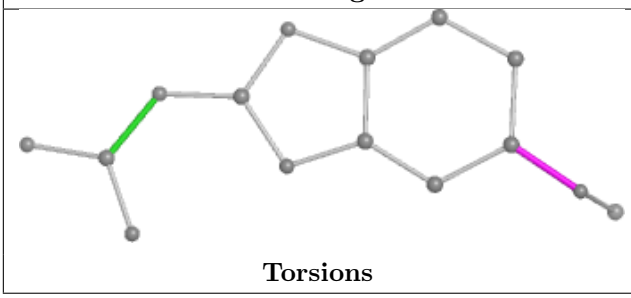
Ligand A1H0W D 302



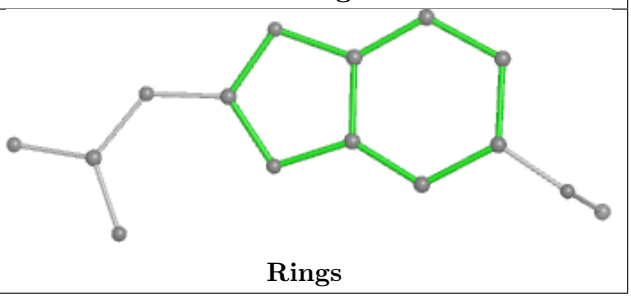
Bond lengths



Bond angles

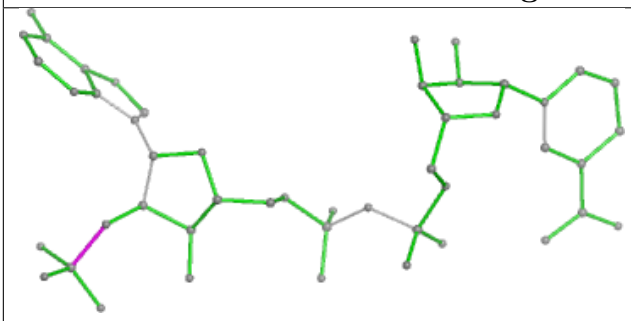


Torsions

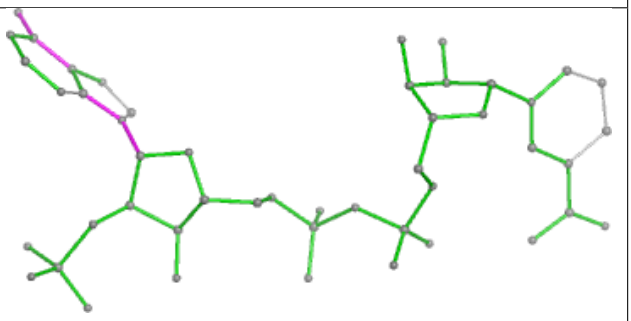


Rings

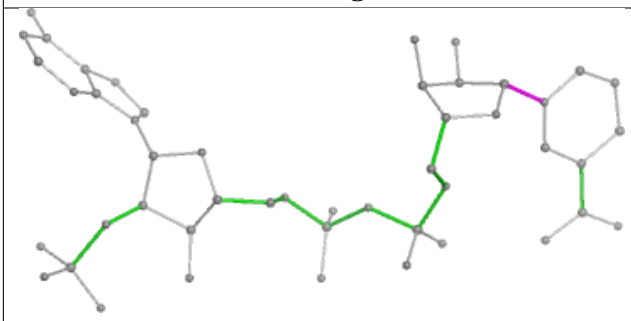
Ligand NDP D 301



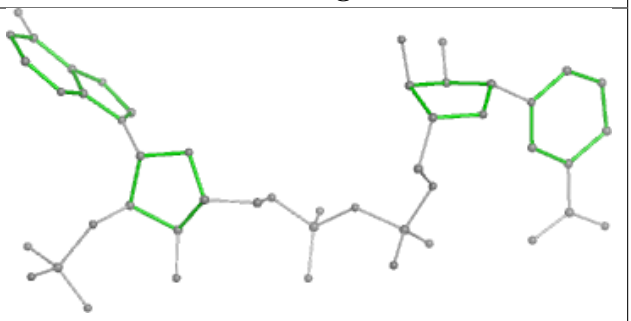
Bond lengths



Bond angles

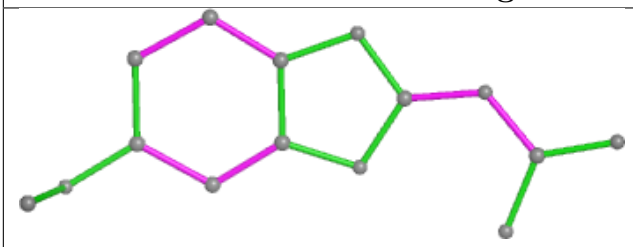


Torsions

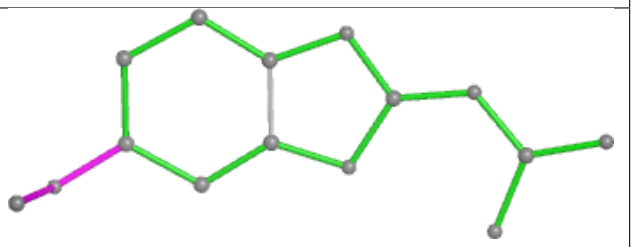


Rings

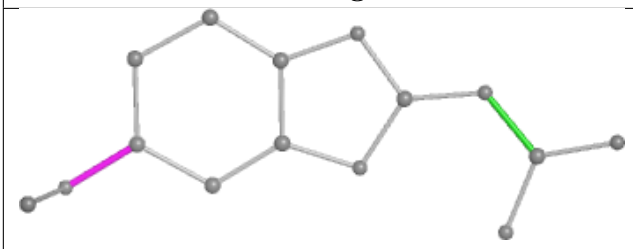
Ligand A1H0W A 302



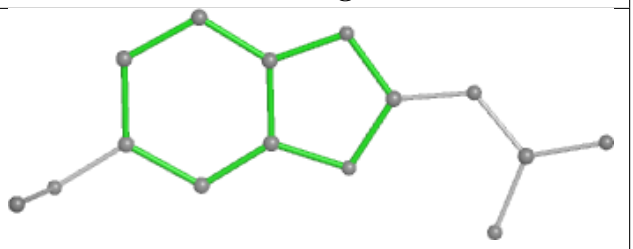
Bond lengths



Bond angles

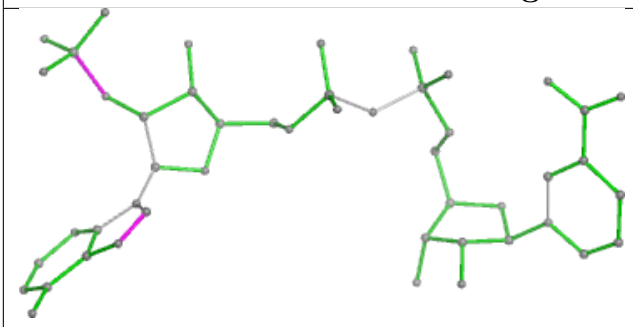


Torsions

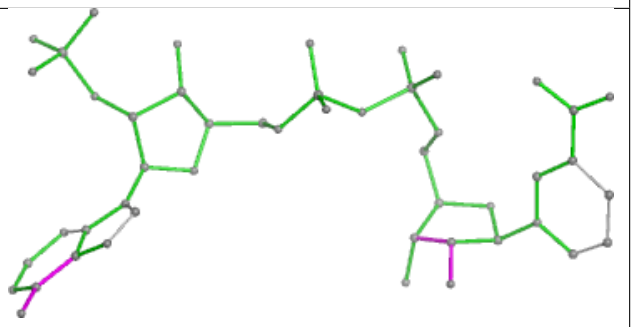


Rings

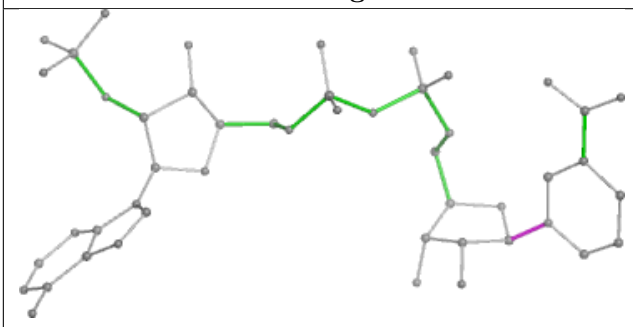
Ligand NDP B 301



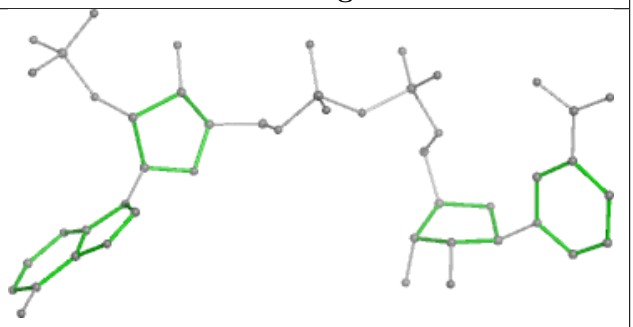
Bond lengths



Bond angles

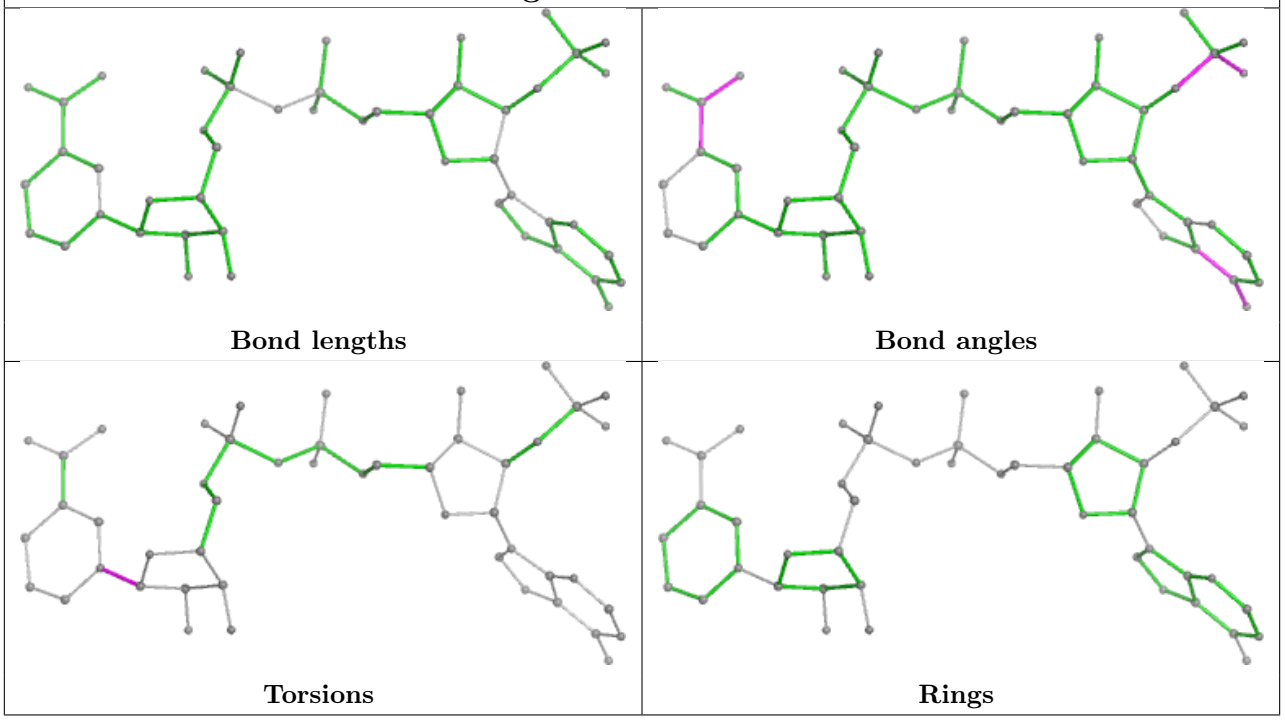


Torsions

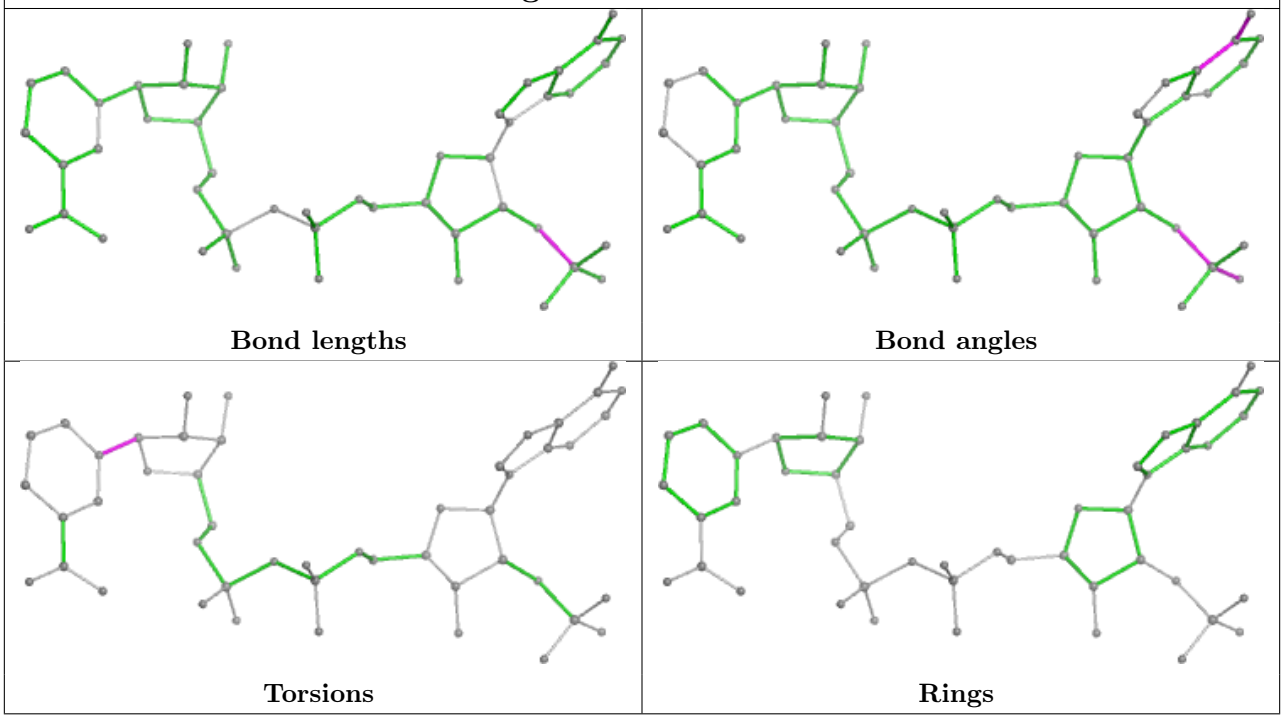


Rings

Ligand NDP C 301



Ligand NDP A 301



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^{th} 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^2)	Q<0.9
1	A	250/289 (86%)	-0.07	2 (0%)	82	85	14, 25, 38, 67	17 (6%)
1	B	249/289 (86%)	-0.07	5 (2%)	64	68	12, 24, 36, 61	19 (7%)
1	C	248/289 (85%)	0.14	4 (1%)	70	73	12, 27, 44, 63	20 (8%)
1	D	250/289 (86%)	0.03	3 (1%)	76	79	12, 26, 42, 61	16 (6%)
All	All	997/1156 (86%)	0.01	14 (1%)	73	76	12, 25, 41, 67	72 (7%)

All (14) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	C	2	GLU	3.1
1	B	152	SER	3.0
1	D	104	GLN	3.0
1	D	2	GLU	2.9
1	B	212	ALA	2.5
1	A	104	GLN	2.5
1	A	195	TYR	2.5
1	C	152	SER	2.4
1	B	210	PRO	2.4
1	D	195	TYR	2.3
1	C	212	ALA	2.1
1	B	103	VAL	2.1
1	B	211	VAL	2.0
1	C	195	TYR	2.0

6.2 Non-standard residues in protein, DNA, RNA chains

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)

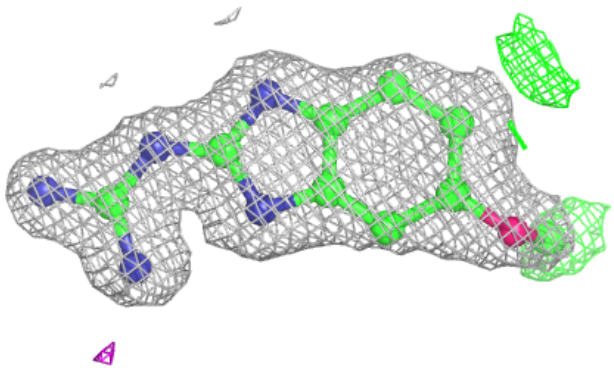
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95^{th} percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists the number of atoms with occupancy less than 0.9.

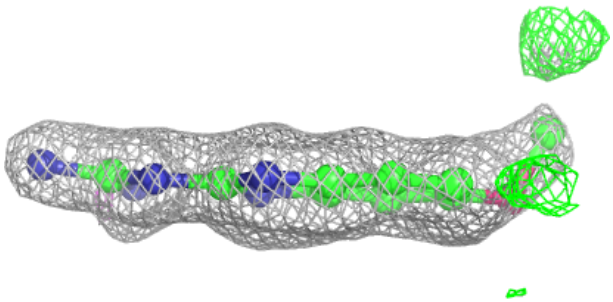
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å^2)	Q<0.9
4	ACT	A	304	4/4	0.79	0.27	30,35,36,38	4
3	A1H0W	C	302	15/15	0.86	0.12	27,34,55,55	15
3	A1H0W	D	302	15/15	0.90	0.10	31,35,55,61	0
3	A1H0W	B	302	15/15	0.92	0.10	25,27,44,52	15
3	A1H0W	A	302	15/15	0.92	0.09	28,33,61,62	0
4	ACT	B	303	4/4	0.93	0.10	26,29,31,33	4
4	ACT	A	303	4/4	0.95	0.08	25,26,27,28	4
2	NDP	B	301	48/48	0.95	0.07	22,28,33,38	0
2	NDP	C	301	48/48	0.95	0.08	20,26,31,32	48
2	NDP	D	301	48/48	0.97	0.06	20,27,33,39	0
2	NDP	A	301	48/48	0.97	0.06	21,25,29,31	0

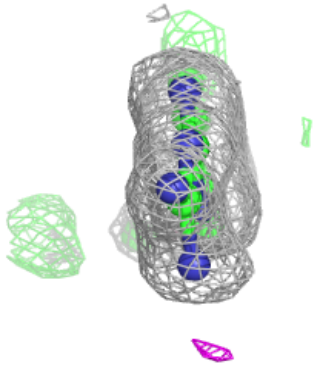
The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation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

Electron density around A1H0W C 302:

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

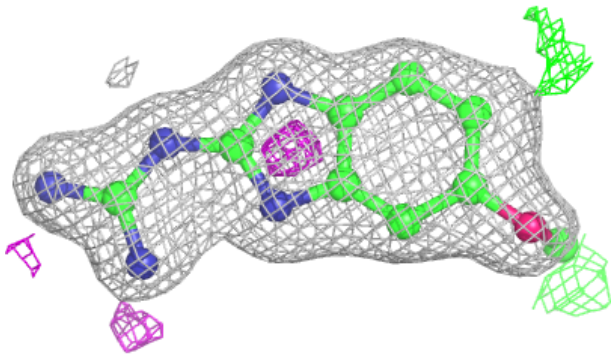


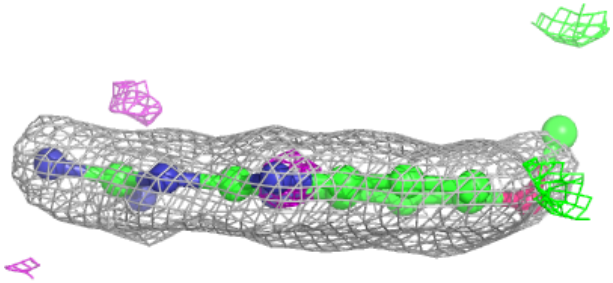


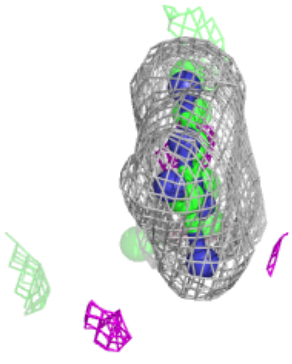


Electron density around A1H0W D 302:

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

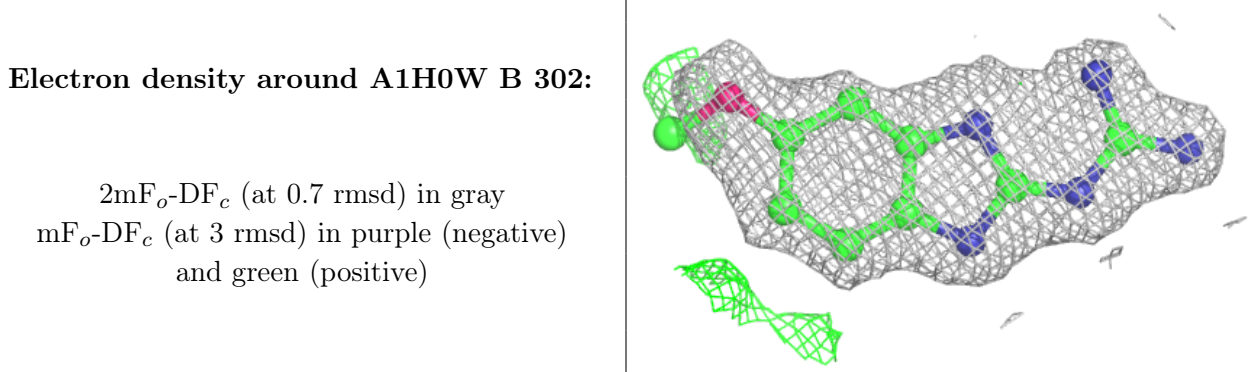


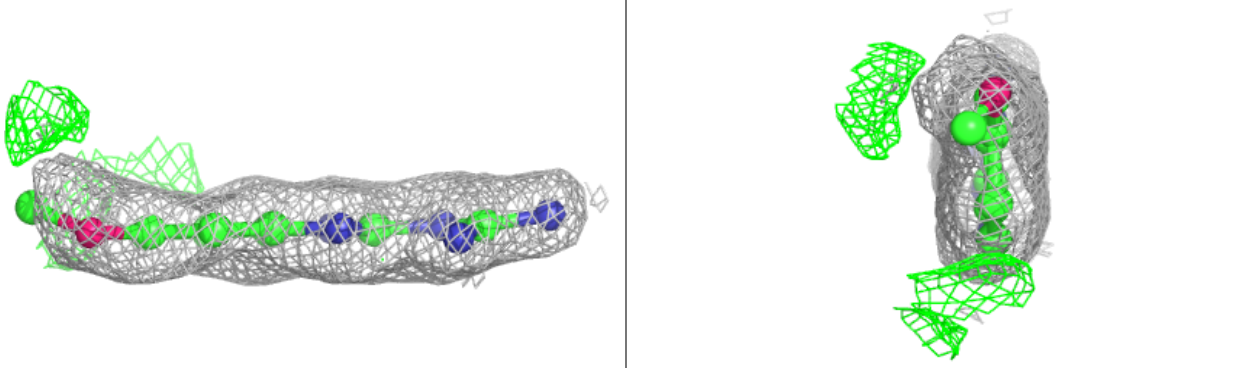




Electron density around A1H0W B 302:

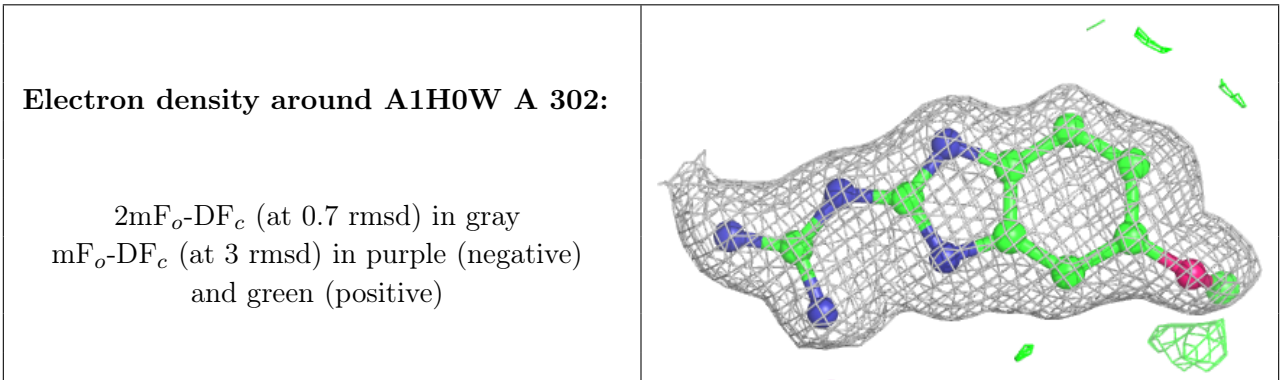
$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative) and green (positive)

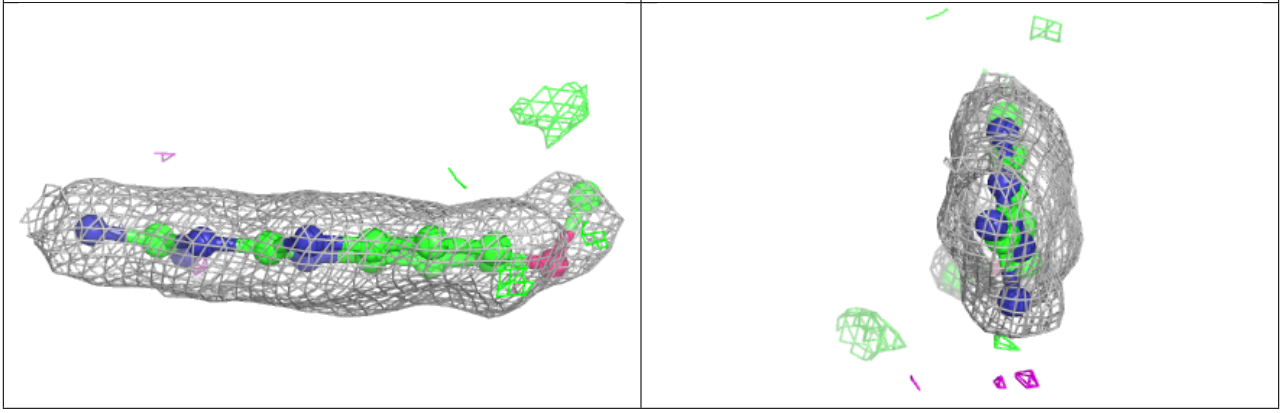




Electron density around A1H0W A 302:

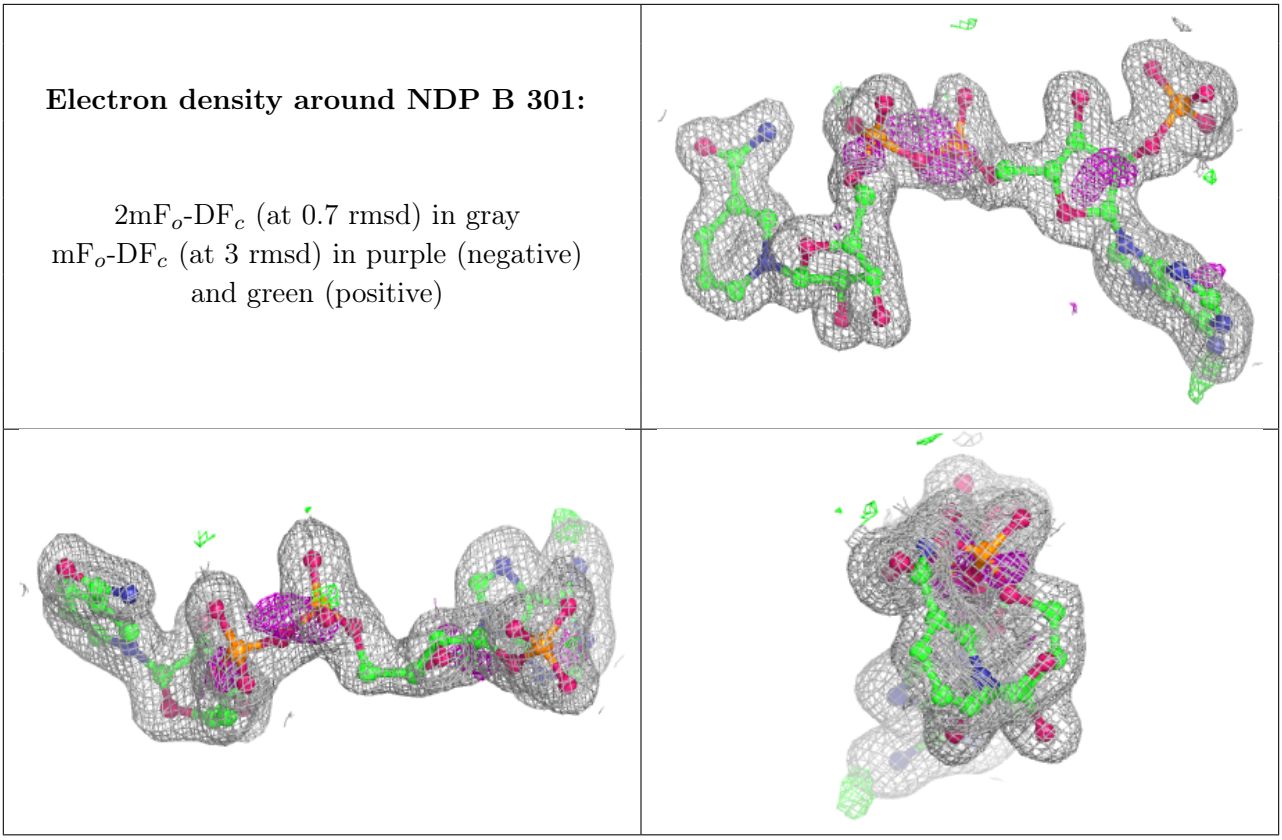
$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative) and green (positive)





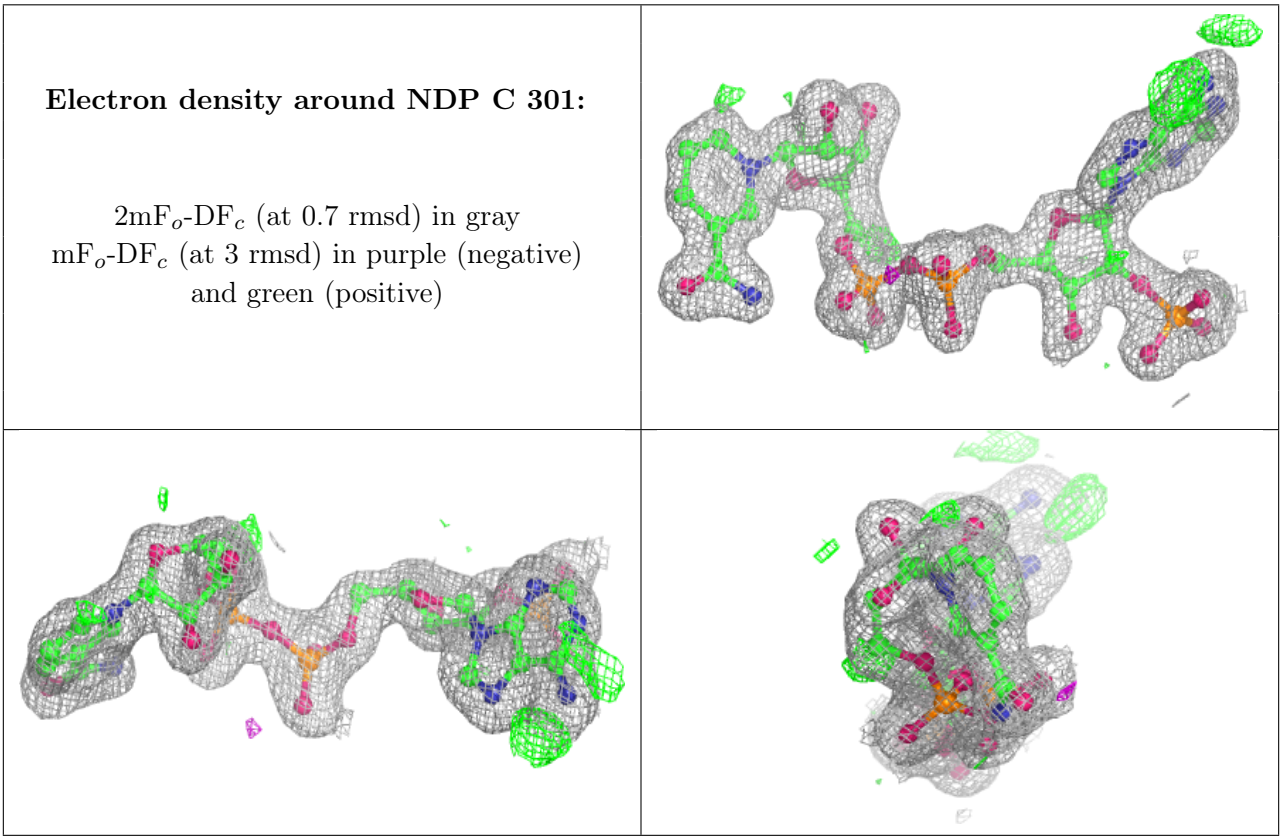
Electron density around NDP B 301:

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



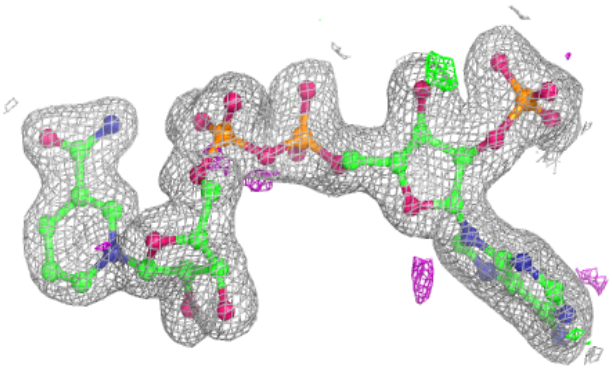
Electron density around NDP C 301:

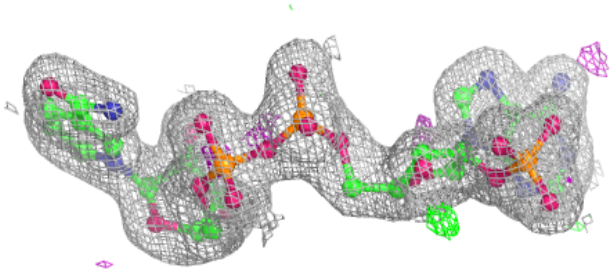
$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative) and green (positive)

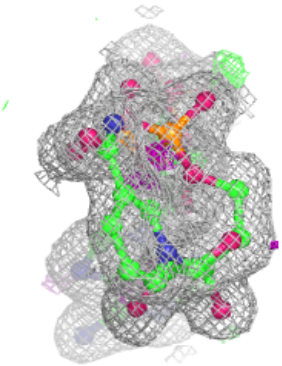


Electron density around NDP D 301:

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

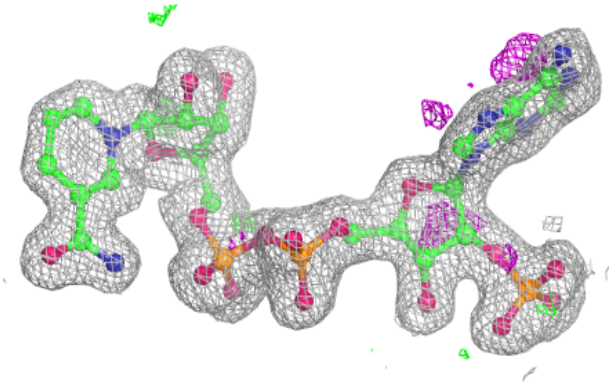


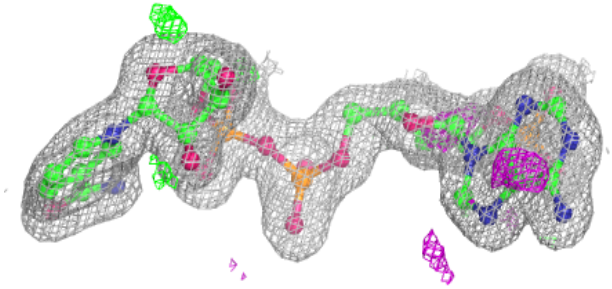


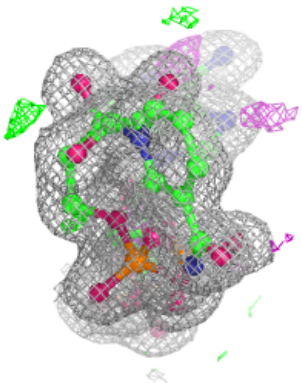


Electron density around NDP A 301:

$2mF_o$-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.