WORLDWIDE wwPDB PROTEIN DATA BANK

wwPDB X-ray Structure Validation Summary Report (i)

Oct 15, 2024 – 12:56 PM JST

PDB ID	:	8Z9G
Title	:	Crystal structure of glyoxylate reductase from Acetobacter aceti in complex with NADPH
Authors	:	Majumder, T.R.; Yoshizawa, T.; Inoue, M.; Aono, R.; Matsumura, H.; Mihara, H.
Deposited on	:	2024-04-23
Resolution	:	1.68 Å(reported)

The following versions of software and data (see references (i)) 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	:	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 ⓘ

The following experimental techniques were used to determine the structure:
X-RAY DIFFRACTION

The reported resolution of this entry is 1.68 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.
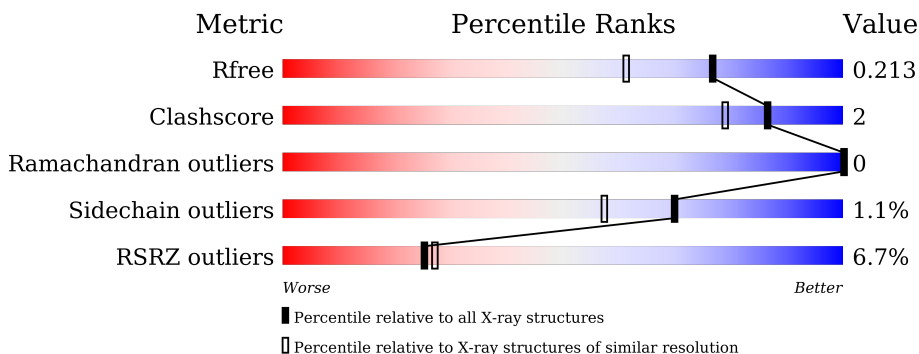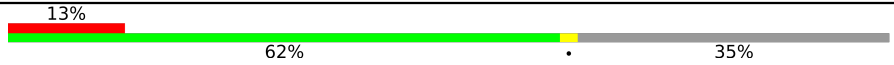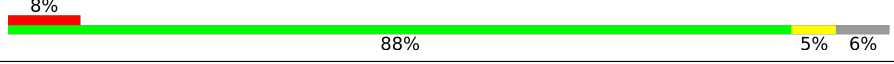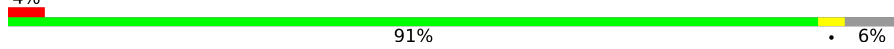

Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	164625	8422 (1.70-1.66)
Clashscore	180529	1005 (1.68-1.68)
Ramachandran outliers	177936	9065 (1.70-1.66)
Sidechain outliers	177891	9064 (1.70-1.66)
RSRZ outliers	164620	8421 (1.70-1.66)

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	313	4% / 90% / · 7%
1	B	313	6% / 88% / 5% 6%
1	C	313	7% / 89% / · 8%
1	D	313	5% / 88% / 5% 6%
1	E	313	% / 90% / · 7%

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Mol	Chain	Length	Quality of chain
1	F	313	13% 62% · 35%
1	G	313	8% 88% 5% 6%
1	H	313	4% 91% · 6%

2 Entry composition (i)

There are 3 unique types of molecules in this entry. The entry contains 17538 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 3-hydroxyisobutyrate dehydrogenase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	291	Total 2110	C 1327	N 366	O 406	S 11	0	0	0
1	B	293	Total 2127	C 1336	N 370	O 410	S 11	0	0	0
1	C	287	Total 2084	C 1311	N 361	O 401	S 11	0	0	0
1	D	293	Total 2127	C 1336	N 370	O 410	S 11	0	0	0
1	E	291	Total 2110	C 1327	N 366	O 406	S 11	0	0	0
1	F	202	Total 1476	C 925	N 260	O 284	S 7	0	0	0
1	G	293	Total 2126	C 1335	N 369	O 411	S 11	0	0	0
1	H	293	Total 2127	C 1336	N 370	O 410	S 11	0	0	0

There are 136 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-15	MET	-	initiating methionine	UNP A0A6S6PLJ6
A	-14	ASN	-	expression tag	UNP A0A6S6PLJ6
A	-13	HIS	-	expression tag	UNP A0A6S6PLJ6
A	-12	LYS	-	expression tag	UNP A0A6S6PLJ6
A	-11	VAL	-	expression tag	UNP A0A6S6PLJ6
A	-10	HIS	-	expression tag	UNP A0A6S6PLJ6
A	-9	HIS	-	expression tag	UNP A0A6S6PLJ6
A	-8	HIS	-	expression tag	UNP A0A6S6PLJ6
A	-7	HIS	-	expression tag	UNP A0A6S6PLJ6
A	-6	HIS	-	expression tag	UNP A0A6S6PLJ6
A	-5	HIS	-	expression tag	UNP A0A6S6PLJ6
A	-4	ILE	-	expression tag	UNP A0A6S6PLJ6
A	-3	GLU	-	expression tag	UNP A0A6S6PLJ6

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Chain	Residue	Modelled	Actual	Comment	Reference
A	-2	GLY	-	expression tag	UNP A0A6S6PLJ6
A	-1	ARG	-	expression tag	UNP A0A6S6PLJ6
A	0	HIS	-	expression tag	UNP A0A6S6PLJ6
A	297	TYR	-	expression tag	UNP A0A6S6PLJ6
B	-15	MET	-	initiating methionine	UNP A0A6S6PLJ6
B	-14	ASN	-	expression tag	UNP A0A6S6PLJ6
B	-13	HIS	-	expression tag	UNP A0A6S6PLJ6
B	-12	LYS	-	expression tag	UNP A0A6S6PLJ6
B	-11	VAL	-	expression tag	UNP A0A6S6PLJ6
B	-10	HIS	-	expression tag	UNP A0A6S6PLJ6
B	-9	HIS	-	expression tag	UNP A0A6S6PLJ6
B	-8	HIS	-	expression tag	UNP A0A6S6PLJ6
B	-7	HIS	-	expression tag	UNP A0A6S6PLJ6
B	-6	HIS	-	expression tag	UNP A0A6S6PLJ6
B	-5	HIS	-	expression tag	UNP A0A6S6PLJ6
B	-4	ILE	-	expression tag	UNP A0A6S6PLJ6
B	-3	GLU	-	expression tag	UNP A0A6S6PLJ6
B	-2	GLY	-	expression tag	UNP A0A6S6PLJ6
B	-1	ARG	-	expression tag	UNP A0A6S6PLJ6
B	0	HIS	-	expression tag	UNP A0A6S6PLJ6
B	297	TYR	-	expression tag	UNP A0A6S6PLJ6
C	-15	MET	-	initiating methionine	UNP A0A6S6PLJ6
C	-14	ASN	-	expression tag	UNP A0A6S6PLJ6
C	-13	HIS	-	expression tag	UNP A0A6S6PLJ6
C	-12	LYS	-	expression tag	UNP A0A6S6PLJ6
C	-11	VAL	-	expression tag	UNP A0A6S6PLJ6
C	-10	HIS	-	expression tag	UNP A0A6S6PLJ6
C	-9	HIS	-	expression tag	UNP A0A6S6PLJ6
C	-8	HIS	-	expression tag	UNP A0A6S6PLJ6
C	-7	HIS	-	expression tag	UNP A0A6S6PLJ6
C	-6	HIS	-	expression tag	UNP A0A6S6PLJ6
C	-5	HIS	-	expression tag	UNP A0A6S6PLJ6
C	-4	ILE	-	expression tag	UNP A0A6S6PLJ6
C	-3	GLU	-	expression tag	UNP A0A6S6PLJ6
C	-2	GLY	-	expression tag	UNP A0A6S6PLJ6
C	-1	ARG	-	expression tag	UNP A0A6S6PLJ6
C	0	HIS	-	expression tag	UNP A0A6S6PLJ6
C	297	TYR	-	expression tag	UNP A0A6S6PLJ6
D	-15	MET	-	initiating methionine	UNP A0A6S6PLJ6
D	-14	ASN	-	expression tag	UNP A0A6S6PLJ6
D	-13	HIS	-	expression tag	UNP A0A6S6PLJ6
D	-12	LYS	-	expression tag	UNP A0A6S6PLJ6

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Chain	Residue	Modelled	Actual	Comment	Reference
D	-11	VAL	-	expression tag	UNP A0A6S6PLJ6
D	-10	HIS	-	expression tag	UNP A0A6S6PLJ6
D	-9	HIS	-	expression tag	UNP A0A6S6PLJ6
D	-8	HIS	-	expression tag	UNP A0A6S6PLJ6
D	-7	HIS	-	expression tag	UNP A0A6S6PLJ6
D	-6	HIS	-	expression tag	UNP A0A6S6PLJ6
D	-5	HIS	-	expression tag	UNP A0A6S6PLJ6
D	-4	ILE	-	expression tag	UNP A0A6S6PLJ6
D	-3	GLU	-	expression tag	UNP A0A6S6PLJ6
D	-2	GLY	-	expression tag	UNP A0A6S6PLJ6
D	-1	ARG	-	expression tag	UNP A0A6S6PLJ6
D	0	HIS	-	expression tag	UNP A0A6S6PLJ6
D	297	TYR	-	expression tag	UNP A0A6S6PLJ6
E	-15	MET	-	initiating methionine	UNP A0A6S6PLJ6
E	-14	ASN	-	expression tag	UNP A0A6S6PLJ6
E	-13	HIS	-	expression tag	UNP A0A6S6PLJ6
E	-12	LYS	-	expression tag	UNP A0A6S6PLJ6
E	-11	VAL	-	expression tag	UNP A0A6S6PLJ6
E	-10	HIS	-	expression tag	UNP A0A6S6PLJ6
E	-9	HIS	-	expression tag	UNP A0A6S6PLJ6
E	-8	HIS	-	expression tag	UNP A0A6S6PLJ6
E	-7	HIS	-	expression tag	UNP A0A6S6PLJ6
E	-6	HIS	-	expression tag	UNP A0A6S6PLJ6
E	-5	HIS	-	expression tag	UNP A0A6S6PLJ6
E	-4	ILE	-	expression tag	UNP A0A6S6PLJ6
E	-3	GLU	-	expression tag	UNP A0A6S6PLJ6
E	-2	GLY	-	expression tag	UNP A0A6S6PLJ6
E	-1	ARG	-	expression tag	UNP A0A6S6PLJ6
E	0	HIS	-	expression tag	UNP A0A6S6PLJ6
E	297	TYR	-	expression tag	UNP A0A6S6PLJ6
F	-15	MET	-	initiating methionine	UNP A0A6S6PLJ6
F	-14	ASN	-	expression tag	UNP A0A6S6PLJ6
F	-13	HIS	-	expression tag	UNP A0A6S6PLJ6
F	-12	LYS	-	expression tag	UNP A0A6S6PLJ6
F	-11	VAL	-	expression tag	UNP A0A6S6PLJ6
F	-10	HIS	-	expression tag	UNP A0A6S6PLJ6
F	-9	HIS	-	expression tag	UNP A0A6S6PLJ6
F	-8	HIS	-	expression tag	UNP A0A6S6PLJ6
F	-7	HIS	-	expression tag	UNP A0A6S6PLJ6
F	-6	HIS	-	expression tag	UNP A0A6S6PLJ6
F	-5	HIS	-	expression tag	UNP A0A6S6PLJ6
F	-4	ILE	-	expression tag	UNP A0A6S6PLJ6

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Chain	Residue	Modelled	Actual	Comment	Reference
F	-3	GLU	-	expression tag	UNP A0A6S6PLJ6
F	-2	GLY	-	expression tag	UNP A0A6S6PLJ6
F	-1	ARG	-	expression tag	UNP A0A6S6PLJ6
F	0	HIS	-	expression tag	UNP A0A6S6PLJ6
F	297	TYR	-	expression tag	UNP A0A6S6PLJ6
G	-15	MET	-	initiating methionine	UNP A0A6S6PLJ6
G	-14	ASN	-	expression tag	UNP A0A6S6PLJ6
G	-13	HIS	-	expression tag	UNP A0A6S6PLJ6
G	-12	LYS	-	expression tag	UNP A0A6S6PLJ6
G	-11	VAL	-	expression tag	UNP A0A6S6PLJ6
G	-10	HIS	-	expression tag	UNP A0A6S6PLJ6
G	-9	HIS	-	expression tag	UNP A0A6S6PLJ6
G	-8	HIS	-	expression tag	UNP A0A6S6PLJ6
G	-7	HIS	-	expression tag	UNP A0A6S6PLJ6
G	-6	HIS	-	expression tag	UNP A0A6S6PLJ6
G	-5	HIS	-	expression tag	UNP A0A6S6PLJ6
G	-4	ILE	-	expression tag	UNP A0A6S6PLJ6
G	-3	GLU	-	expression tag	UNP A0A6S6PLJ6
G	-2	GLY	-	expression tag	UNP A0A6S6PLJ6
G	-1	ARG	-	expression tag	UNP A0A6S6PLJ6
G	0	HIS	-	expression tag	UNP A0A6S6PLJ6
G	297	TYR	-	expression tag	UNP A0A6S6PLJ6
H	-15	MET	-	initiating methionine	UNP A0A6S6PLJ6
H	-14	ASN	-	expression tag	UNP A0A6S6PLJ6
H	-13	HIS	-	expression tag	UNP A0A6S6PLJ6
H	-12	LYS	-	expression tag	UNP A0A6S6PLJ6
H	-11	VAL	-	expression tag	UNP A0A6S6PLJ6
H	-10	HIS	-	expression tag	UNP A0A6S6PLJ6
H	-9	HIS	-	expression tag	UNP A0A6S6PLJ6
H	-8	HIS	-	expression tag	UNP A0A6S6PLJ6
H	-7	HIS	-	expression tag	UNP A0A6S6PLJ6
H	-6	HIS	-	expression tag	UNP A0A6S6PLJ6
H	-5	HIS	-	expression tag	UNP A0A6S6PLJ6
H	-4	ILE	-	expression tag	UNP A0A6S6PLJ6
H	-3	GLU	-	expression tag	UNP A0A6S6PLJ6
H	-2	GLY	-	expression tag	UNP A0A6S6PLJ6
H	-1	ARG	-	expression tag	UNP A0A6S6PLJ6
H	0	HIS	-	expression tag	UNP A0A6S6PLJ6
H	297	TYR	-	expression tag	UNP A0A6S6PLJ6

- Molecule 2 is NADPH DIHYDRO-NICOTINAMIDE-ADENINE-DINUCLEOTIDE PHOSPHATE (three-letter code: NDP) (formula: $C_{21}H_{30}N_7O_{17}P_3$) (labeled as "Ligand of Interest" by depositor).

NDP

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

- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	113	Total	O	0	0
			113	113		
3	B	109	Total	O	0	0
			109	109		
3	C	110	Total	O	0	0
			110	110		
3	D	113	Total	O	0	0
			113	113		
3	E	121	Total	O	0	0
			121	121		

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Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	F	89	Total 89	O 89	0	0
3	G	121	Total 121	O 121	0	0
3	H	139	Total 139	O 139	0	0

3 Residue-property plots ⓘ

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.
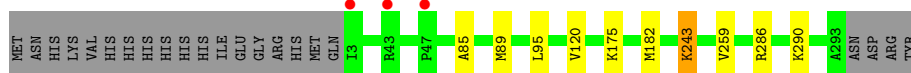
- Molecule 1: 3-hydroxyisobutyrate dehydrogenase

Chain A:

- Molecule 1: 3-hydroxyisobutyrate dehydrogenase

Chain B:

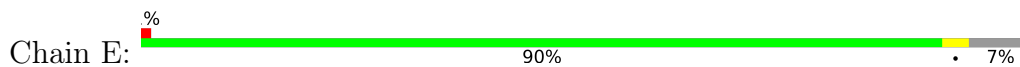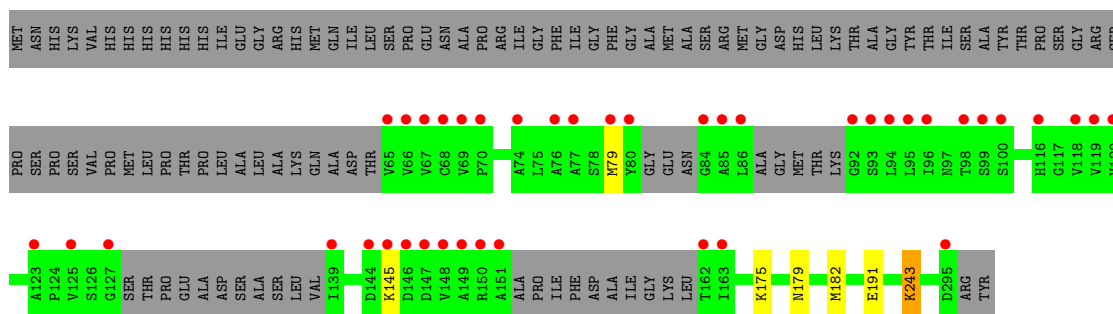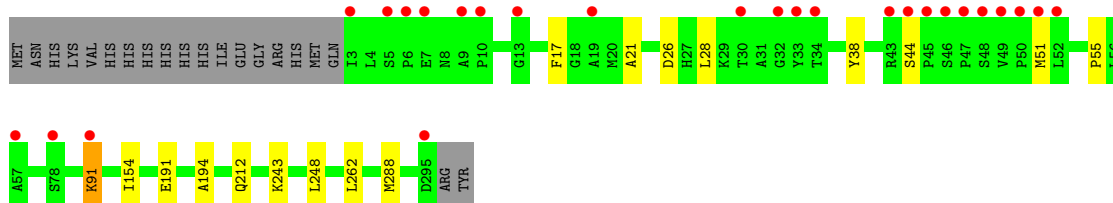- Molecule 1: 3-hydroxyisobutyrate dehydrogenase

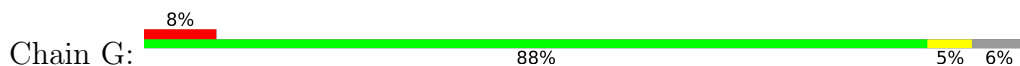Chain C:

- Molecule 1: 3-hydroxyisobutyrate dehydrogenase

Chain D:

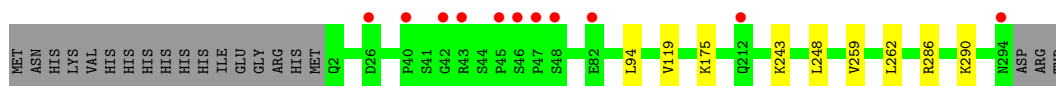H164 K175 K243 L248 V259 L262 K290 N294 ASP ARG TYR

• Molecule 1: 3-hydroxyisobutyrate dehydrogenase

Chain E:

MET ASN HIS LYS VAL HIS HIS HIS HIS HIS ILE GLU GLY ARG MET GLN I3 R43 P47 A85 M89 L95 V120 K175 M182 K243 V259 R286 K290 A293 ASN ASP TYR
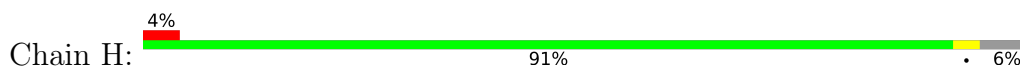
• Molecule 1: 3-hydroxyisobutyrate dehydrogenase

Chain F:

MET ASN HIS LYS VAL HIS HIS HIS HIS HIS ILE GLU GLY ARG MET GLN LEU SER PRO GLU ASN ALA PRO ARG ILE GLY PHE ILE GLY PHE GLY ALA MET ALA SER ARG MET GLY ASP HIS LEU LYS THR ALA GLY TYR THR ILE SER ALA TYR THR PRO SER GLY ARG SER

PRO SER PRO SER VAL PRO MET LEU PRO THR PRO LEU ALA LEU ALA LYS GLN ALA ASP THR V65 V66 V67 C68 V69 P70 A74 L75 A76 A77 S78 M79 Y80 GLY GLU ASN G84 A85 L86 ALA GLY MET THR LYS G92 S93 L94 L95 I96 N97 T98 S99 S100 H116 G117 V118 V119 V120

A123 P124 V125 S126 G127 SER THR PRO GLU ALA ASP SER SER ALA SER LEU VAL I139 D144 K145 D146 D147 V148 A149 R150 A151 ALA PRO ILE PHE ASP ALA ILE GLY LYS LEU T162 I163 K175 N179 M182 E191 K243 D295 ARG TYR

• Molecule 1: 3-hydroxyisobutyrate dehydrogenase

Chain G:

MET ASN HIS LYS VAL HIS HIS HIS HIS HIS ILE GLU GLY ARG MET GLN I3 L4 S5 P6 E7 N8 A9 P10 G13 F17 G18 A19 M20 A21 D26 H27 L28 K29 T30 A31 G32 Y33 T34 Y38 R43 S44 P45 S46 P47 S48 V49 P50 M51 L52 P55 L56

A57 S78 K91 I154 E191 A194 Q212 K243 L248 L262 M288 D295 ARG TYR

• Molecule 1: 3-hydroxyisobutyrate dehydrogenase

Chain H:

MET ASN HIS LYS VAL HIS HIS HIS HIS HIS ILE GLU GLY ARG MET GLN Q2 D26 P40 S41 G42 R43 S44 P45 S46 P47 S48 E82 L94 V119 K175 Q212 K243 L248 V259 L262 R286 K290 N294 ASP ARG TYR

4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α, β, γ	57.51Å 191.75Å 117.72Å 90.00° 95.09° 90.00°	Depositor
Resolution (Å)	49.16 – 1.68 49.16 – 1.68	Depositor EDS
% Data completeness (in resolution range)	99.8 (49.16-1.68) 99.8 (49.16-1.68)	Depositor EDS
R_{merge}	0.23	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	1.99 (at 1.68Å)	Xtriage
Refinement program	PHENIX 1.19.2_4158	Depositor
R, R_{free}	0.199 , 0.214 0.198 , 0.213	Depositor DCC
R_{free} test set	285481 reflections (0.70%)	wwPDB-VP
Wilson B-factor (Å^2)	17.6	Xtriage
Anisotropy	0.320	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.37 , 33.3	EDS
L-test for twinning[2]	$< |L| > = 0.49$, $< L^2 > = 0.32$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.95	EDS
Total number of atoms	17538	wwPDB-VP
Average B, all atoms (Å^2)	22.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 18.94% of the height of the origin peak. No significant pseudotranslation is detected.*

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[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 (i)

5.1 Standard geometry (i)

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

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	0.36	0/2146	0.61	0/2918
1	B	0.36	0/2163	0.59	0/2941
1	C	0.35	0/2117	0.60	0/2876
1	D	0.36	0/2163	0.61	0/2941
1	E	0.38	0/2146	0.61	0/2918
1	F	0.33	0/1492	0.58	0/2020
1	G	0.35	0/2162	0.58	0/2940
1	H	0.36	0/2163	0.59	0/2941
All	All	0.36	0/16552	0.60	0/22495

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	2110	0	2164	6	0
1	B	2127	0	2178	11	0
1	C	2084	0	2135	7	0
1	D	2127	0	2178	13	0
1	E	2110	0	2164	9	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	F	1476	0	1515	5	0
1	G	2126	0	2174	10	0
1	H	2127	0	2178	7	0
2	A	48	0	26	2	0
2	B	48	0	26	2	0
2	C	48	0	26	2	0
2	D	48	0	26	5	0
2	E	48	0	26	2	0
2	G	48	0	26	1	0
2	H	48	0	26	3	0
3	A	113	0	0	0	0
3	B	109	0	0	2	0
3	C	110	0	0	1	0
3	D	113	0	0	1	0
3	E	121	0	0	1	0
3	F	89	0	0	0	0
3	G	121	0	0	1	0
3	H	139	0	0	0	0
All	All	17538	0	16868	66	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.

The worst 5 of 66 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:E:290:LYS:NZ	3:E:401:HOH:O	1.76	1.17
1:G:91:LYS:HD2	1:G:91:LYS:H	1.37	0.88
1:E:175:LYS:HZ1	2:E:301:NDP:H5N	1.43	0.82
1:E:175:LYS:NZ	2:E:301:NDP:H5N	1.96	0.81
1:A:175:LYS:HZ1	2:A:301:NDP:H5N	1.44	0.80

There are no symmetry-related clashes.

5.3 Torsion angles ⓘ

5.3.1 Protein backbone ⓘ

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	289/313 (92%)	285 (99%)	4 (1%)	0	100	100
1	B	291/313 (93%)	288 (99%)	3 (1%)	0	100	100
1	C	283/313 (90%)	278 (98%)	5 (2%)	0	100	100
1	D	291/313 (93%)	287 (99%)	4 (1%)	0	100	100
1	E	289/313 (92%)	286 (99%)	3 (1%)	0	100	100
1	F	192/313 (61%)	189 (98%)	3 (2%)	0	100	100
1	G	291/313 (93%)	287 (99%)	4 (1%)	0	100	100
1	H	291/313 (93%)	287 (99%)	4 (1%)	0	100	100
All	All	2217/2504 (88%)	2187 (99%)	30 (1%)	0	100	100

There are no Ramachandran outliers to report.

5.3.2 Protein sidechains ⓘ

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	223/244 (91%)	220 (99%)	3 (1%)	65	50
1	B	225/244 (92%)	223 (99%)	2 (1%)	75	66
1	C	219/244 (90%)	216 (99%)	3 (1%)	62	47
1	D	225/244 (92%)	224 (100%)	1 (0%)	89	85
1	E	223/244 (91%)	221 (99%)	2 (1%)	75	66
1	F	156/244 (64%)	153 (98%)	3 (2%)	52	34
1	G	225/244 (92%)	221 (98%)	4 (2%)	54	36
1	H	225/244 (92%)	224 (100%)	1 (0%)	89	85
All	All	1721/1952 (88%)	1702 (99%)	19 (1%)	70	57

5 of 19 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	G	26	ASP
1	G	243	LYS
1	H	243	LYS
1	G	212	GLN
1	D	243	LYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 6 such sidechains are listed below:

Mol	Chain	Res	Type
1	B	83	ASN
1	F	179	ASN
1	G	212	GLN
1	B	2	GLN
1	A	212	GLN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates ⓘ

There are no oligosaccharides in this entry.

5.6 Ligand geometry ⓘ

7 ligands are modelled in this entry.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	#$|Z|$ > 2	Counts	RMSZ	#$|Z|$ > 2
2	NDP	C	301	-	45,52,52	2.28	5 (11%)	53,80,80	1.66	9 (16%)
2	NDP	E	301	-	45,52,52	2.01	3 (6%)	53,80,80	1.59	11 (20%)
2	NDP	H	301	-	45,52,52	2.07	3 (6%)	53,80,80	1.60	11 (20%)
2	NDP	D	301	-	45,52,52	2.17	4 (8%)	53,80,80	1.62	11 (20%)
2	NDP	A	301	-	45,52,52	2.08	4 (8%)	53,80,80	1.70	11 (20%)
2	NDP	B	301	-	45,52,52	2.18	5 (11%)	53,80,80	1.65	10 (18%)
2	NDP	G	301	-	45,52,52	2.21	4 (8%)	53,80,80	1.68	10 (18%)

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	NDP	C	301	-	-	6/30/77/77	0/5/5/5
2	NDP	E	301	-	-	5/30/77/77	0/5/5/5
2	NDP	H	301	-	-	4/30/77/77	0/5/5/5
2	NDP	D	301	-	-	4/30/77/77	0/5/5/5
2	NDP	A	301	-	-	6/30/77/77	0/5/5/5
2	NDP	B	301	-	-	9/30/77/77	0/5/5/5
2	NDP	G	301	-	-	9/30/77/77	0/5/5/5

The worst 5 of 28 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	C	301	NDP	P2B-O2B	13.00	1.83	1.59
2	D	301	NDP	P2B-O2B	12.47	1.82	1.59
2	G	301	NDP	P2B-O2B	12.18	1.82	1.59
2	B	301	NDP	P2B-O2B	12.08	1.82	1.59
2	E	301	NDP	P2B-O2B	11.43	1.80	1.59

The worst 5 of 73 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	301	NDP	PN-O3-PA	-5.93	112.48	132.83
2	G	301	NDP	PN-O3-PA	-5.88	112.66	132.83
2	A	301	NDP	PN-O3-PA	-5.49	114.00	132.83
2	C	301	NDP	PN-O3-PA	-5.42	114.22	132.83
2	H	301	NDP	PN-O3-PA	-4.91	115.99	132.83

There are no chirality outliers.

5 of 43 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	A	301	NDP	C2B-O2B-P2B-O3X
2	B	301	NDP	C2B-O2B-P2B-O3X
2	D	301	NDP	C2B-O2B-P2B-O3X
2	G	301	NDP	C2B-O2B-P2B-O3X
2	H	301	NDP	C2B-O2B-P2B-O3X

There are no ring outliers.

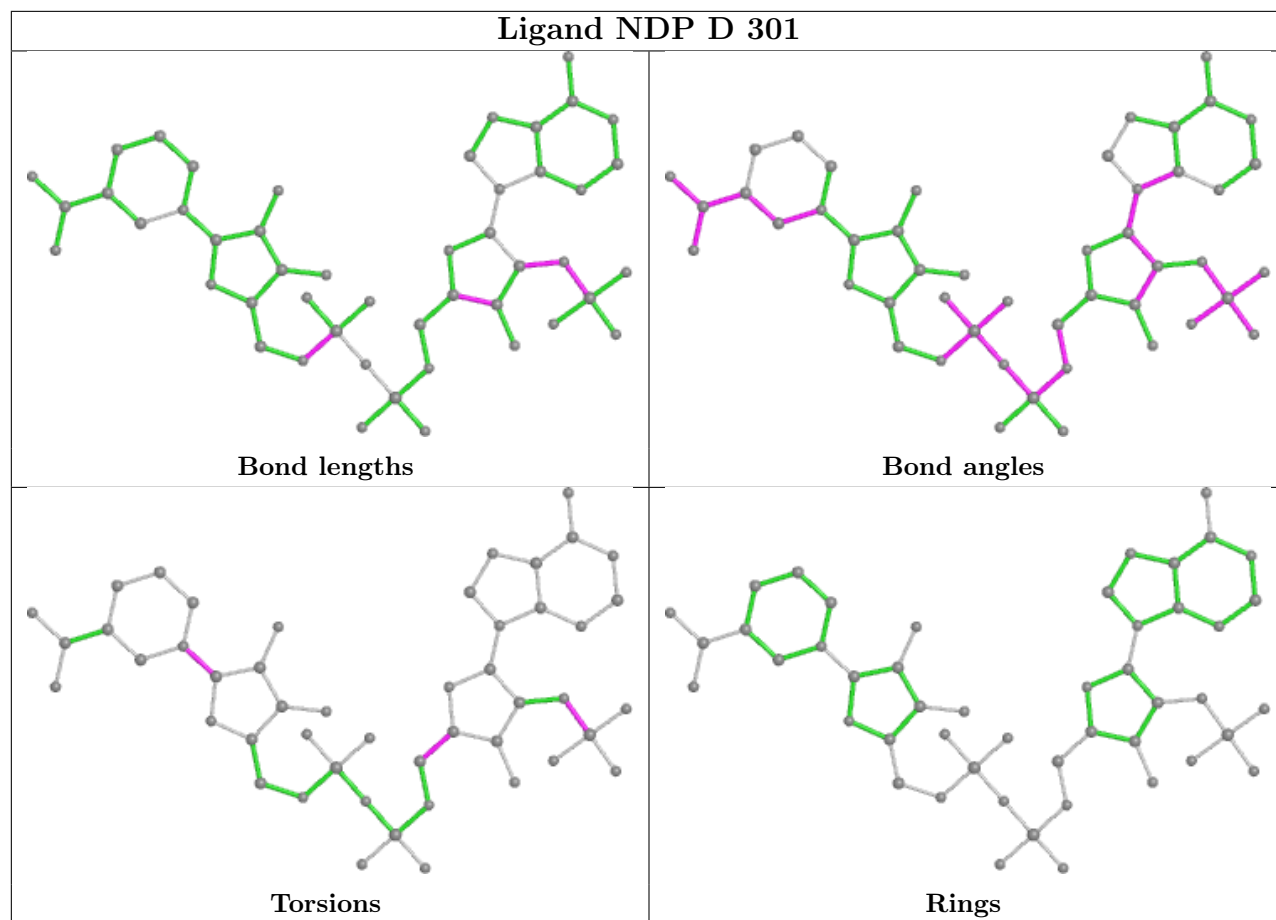7 monomers are involved in 17 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	C	301	NDP	2	0
2	E	301	NDP	2	0
2	H	301	NDP	3	0
2	D	301	NDP	5	0
2	A	301	NDP	2	0
2	B	301	NDP	2	0
2	G	301	NDP	1	0

The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less 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 NDP C 301

Bond lengths

Bond angles

Torsions

Rings

Ligand NDP E 301

Bond lengths

Bond angles

Torsions

Rings

Ligand NDP H 301

Bond lengths

Bond angles

Torsions

Rings

Ligand NDP D 301

Bond lengths

Bond angles

Torsions

Rings

Ligand NDP A 301

Bond lengths

Bond angles

Torsions

Rings

Ligand NDP B 301

Bond lengths

Bond angles

Torsions

Rings

Ligand NDP G 301

Bond lengths

Bond angles

Torsions

Rings
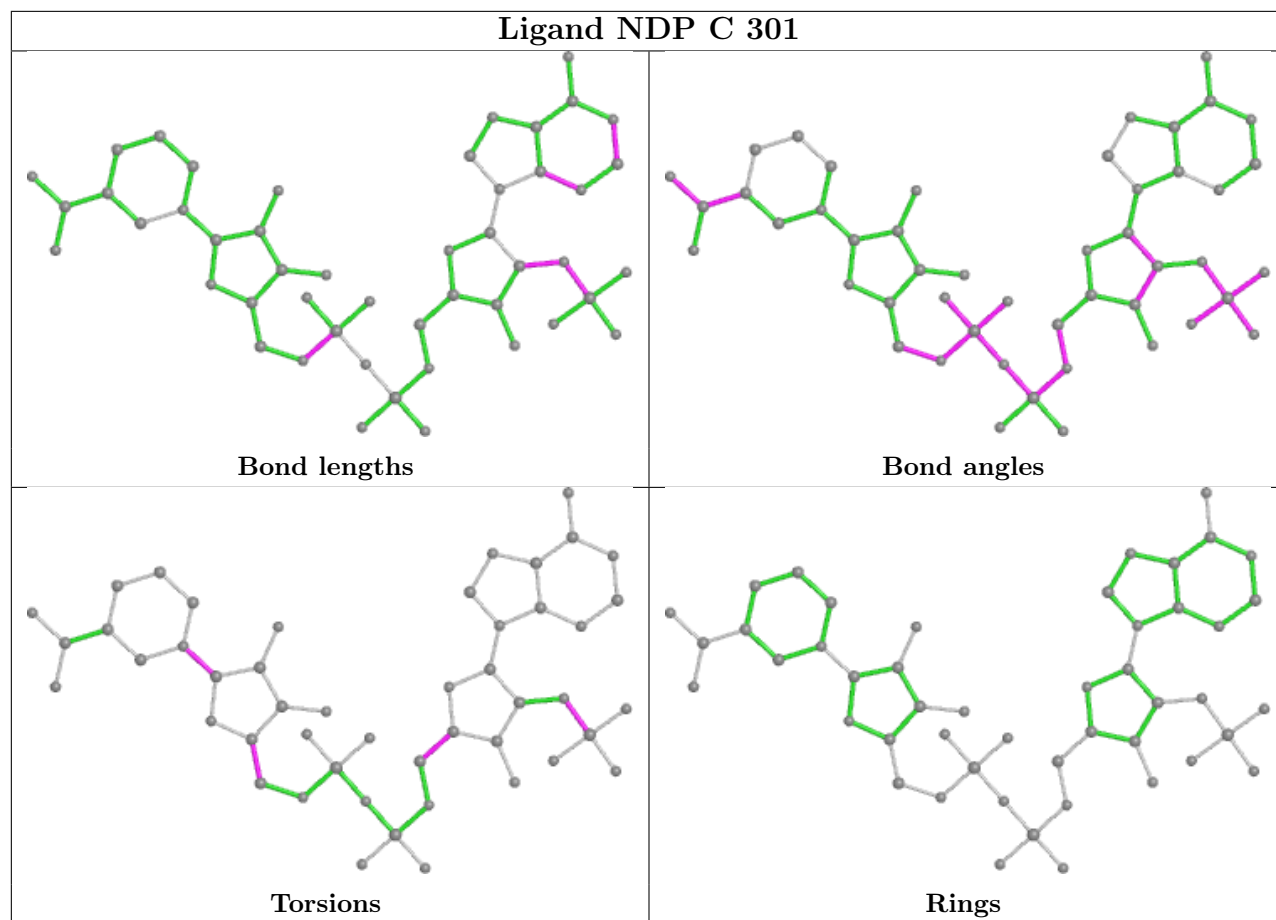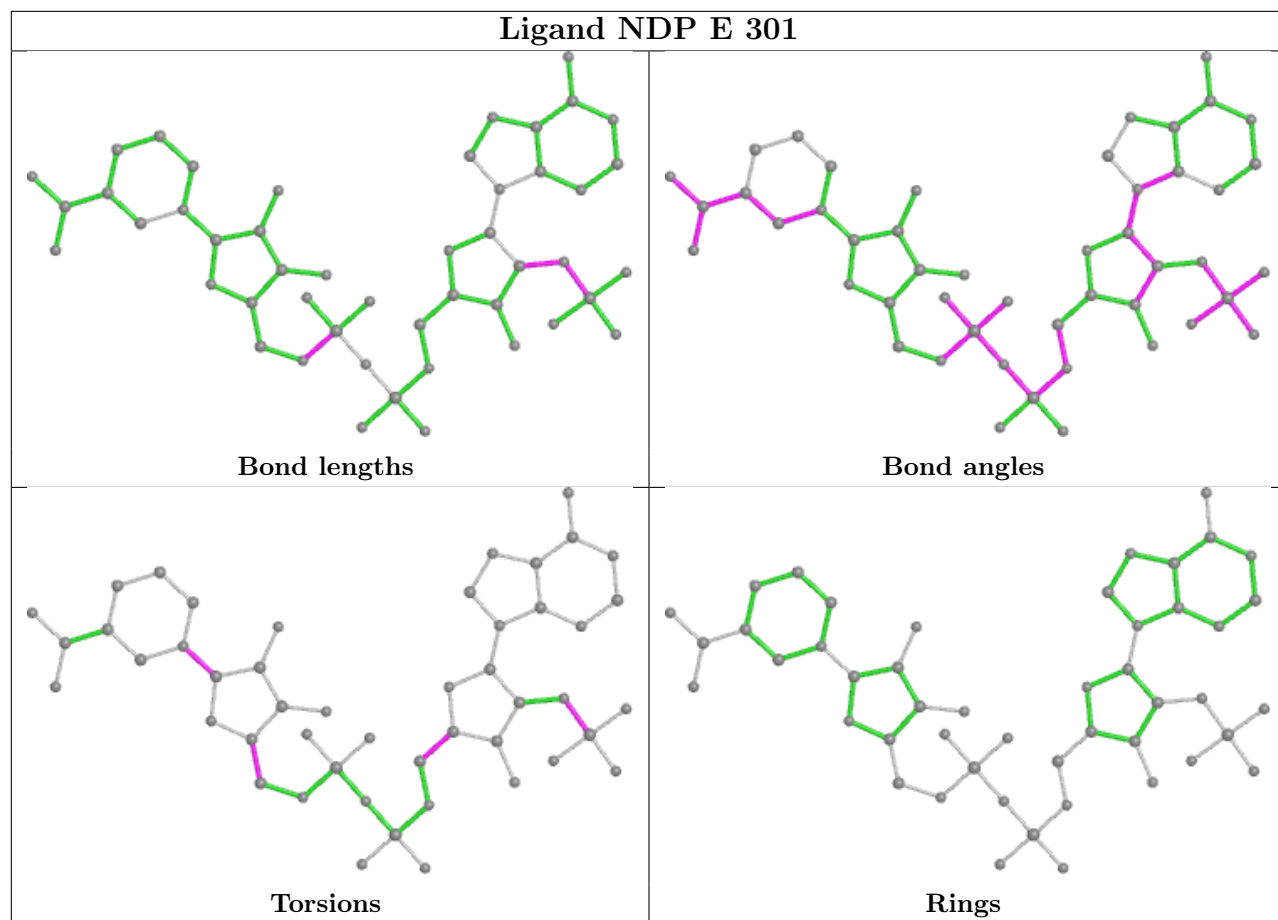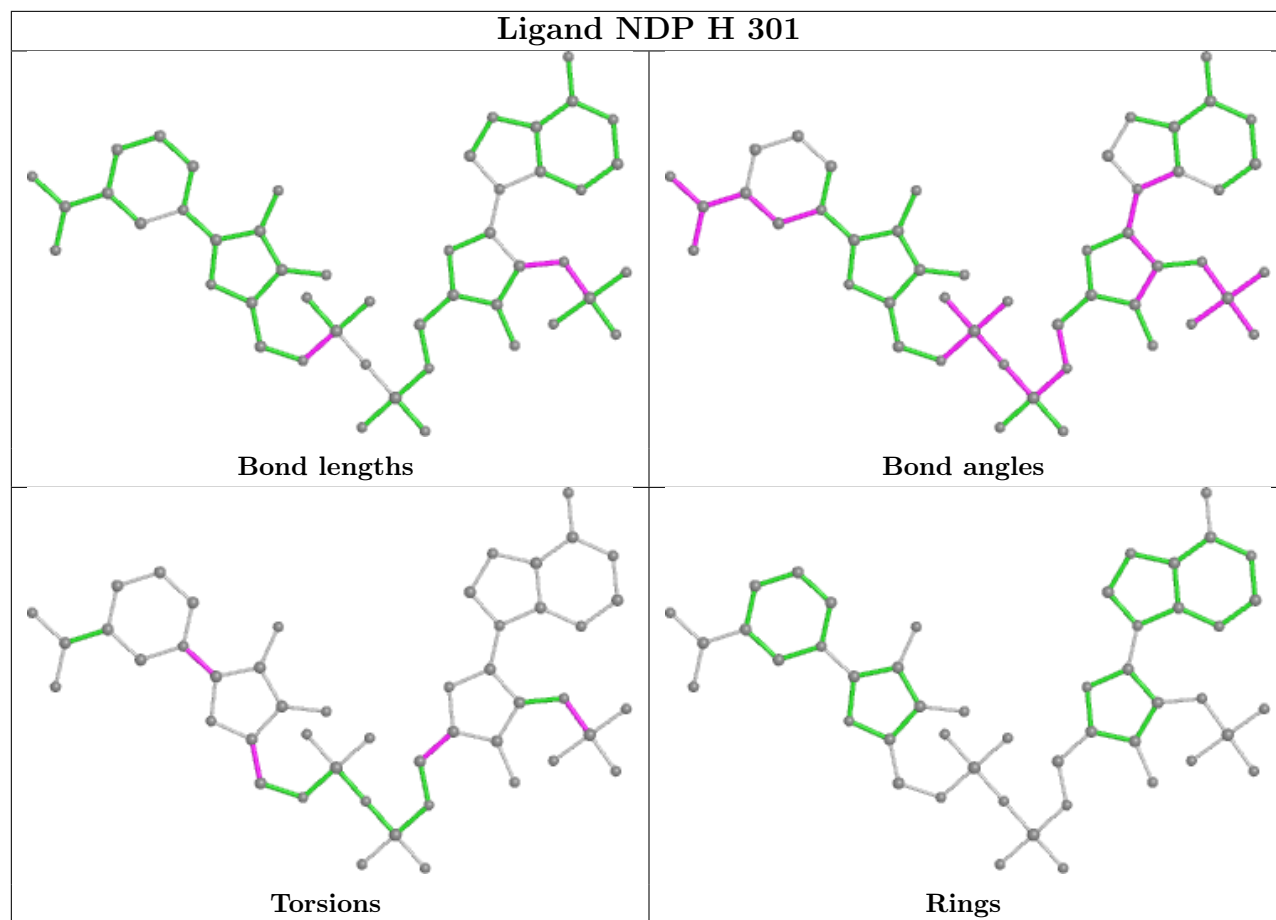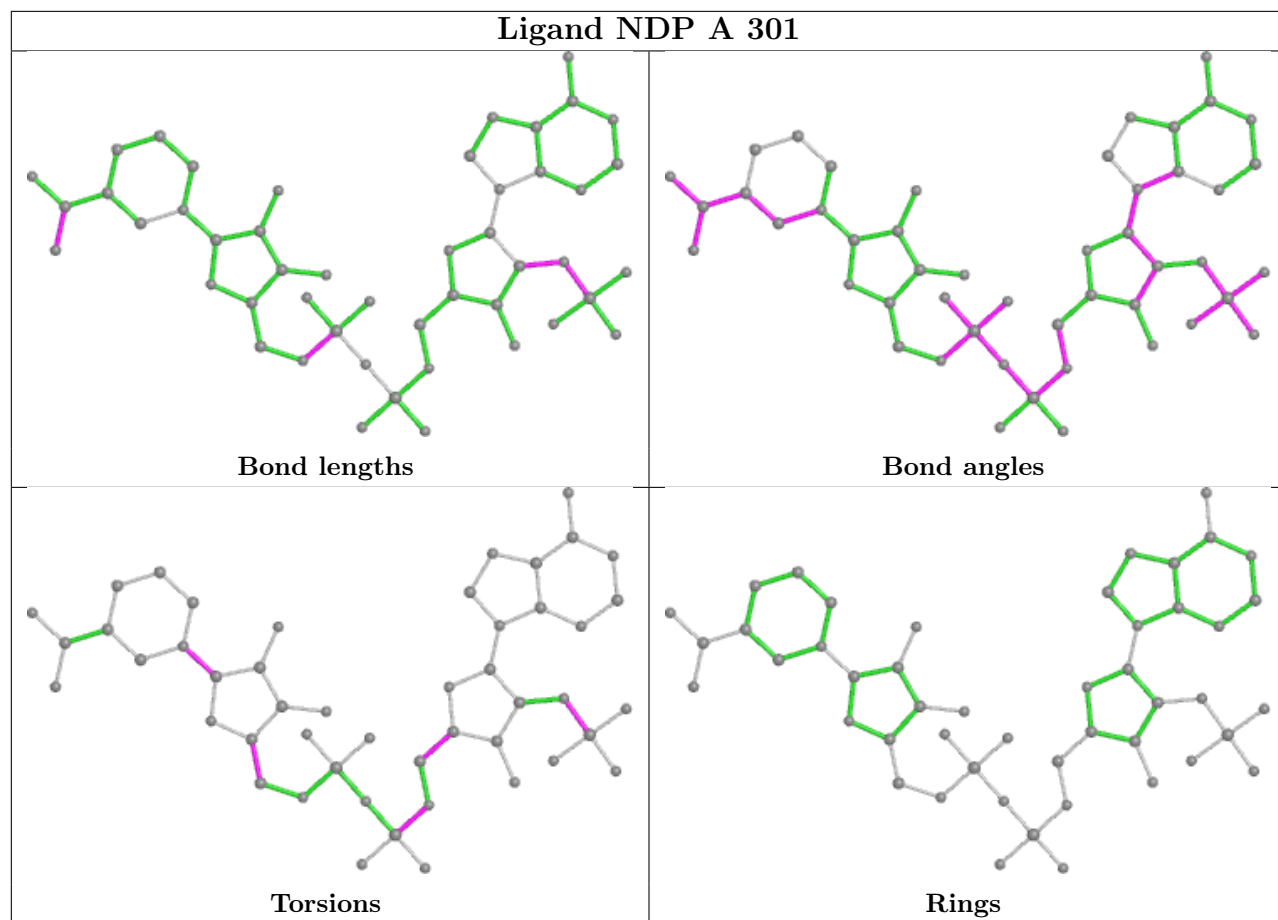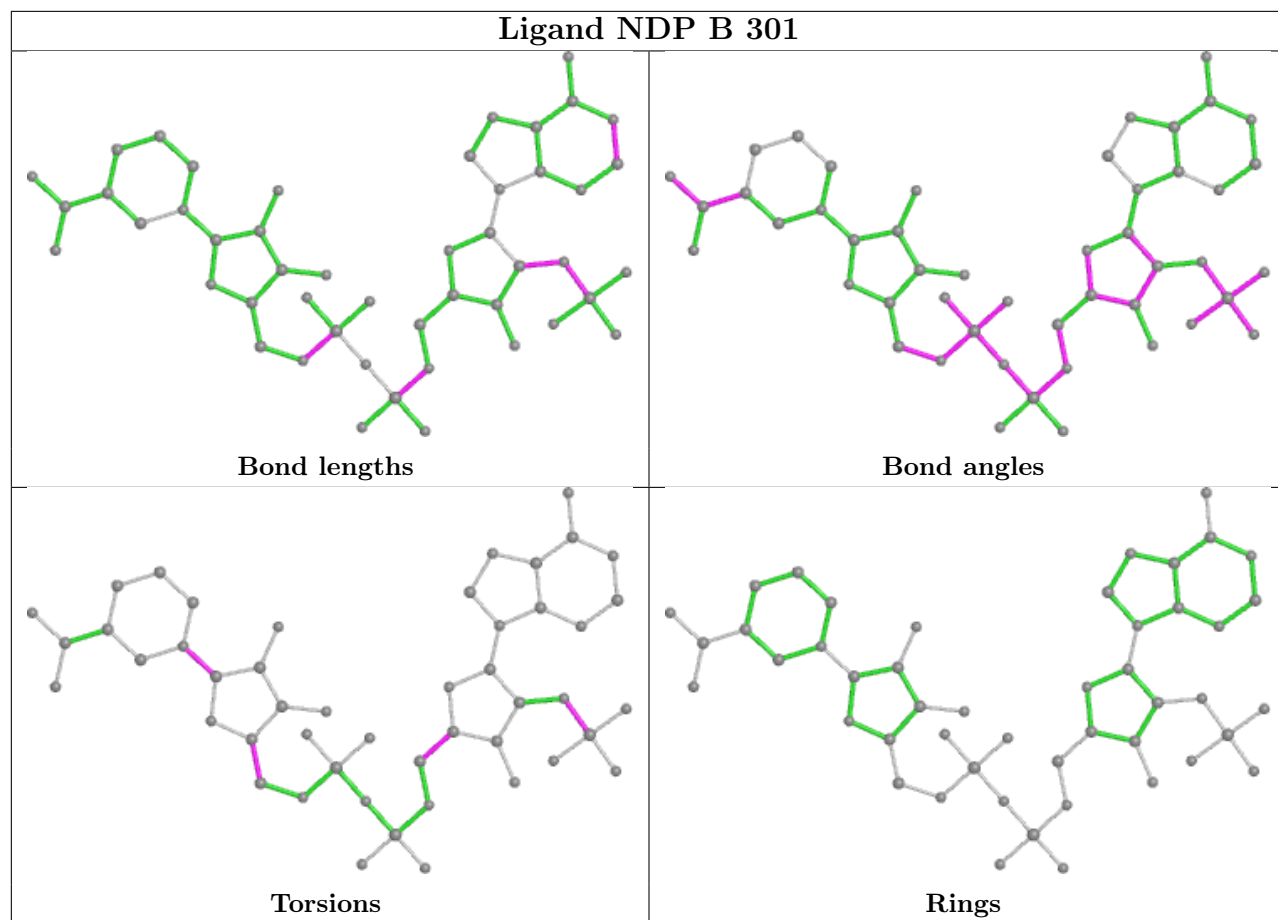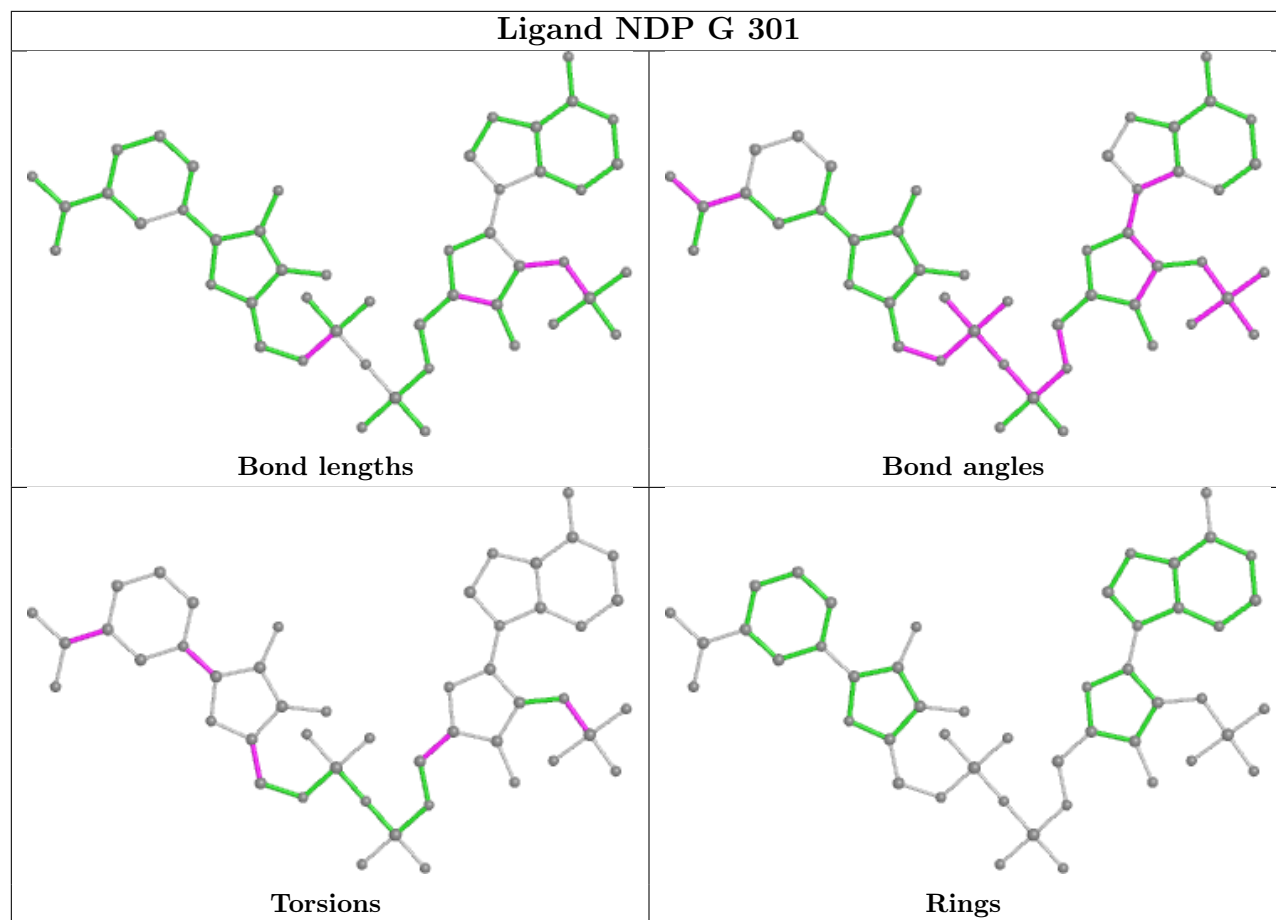
5.7 Other polymers ⓘ

There are no such residues in this entry.

5.8 Polymer linkage issues ⓘ

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, 95th 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	291/313 (92%)	0.29	12 (4%)	42	45	10, 20, 35, 47	0
1	B	293/313 (93%)	0.35	19 (6%)	26	28	10, 21, 37, 49	0
1	C	287/313 (91%)	0.47	22 (7%)	21	22	12, 22, 38, 45	0
1	D	293/313 (93%)	0.23	16 (5%)	32	34	11, 20, 36, 48	0
1	E	291/313 (92%)	-0.11	3 (1%)	79	82	10, 18, 28, 38	0
1	F	202/313 (64%)	0.59	41 (20%)	3	3	11, 19, 45, 52	0
1	G	293/313 (93%)	0.49	26 (8%)	17	17	10, 23, 41, 52	0
1	H	293/313 (93%)	0.12	11 (3%)	44	48	10, 19, 32, 46	0
All	All	2243/2504 (89%)	0.29	150 (6%)	25	27	10, 20, 38, 52	0

The worst 5 of 150 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	3	ILE	6.7
1	F	151	ALA	5.7
1	G	45	PRO	5.1
1	F	149	ALA	4.9
1	B	45	PRO	4.8

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 ⓘ

There are no monosaccharides in this entry.

WORLDWIDE
wwPDB
PROTEIN DATA BANK

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, 95th 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
2	NDP	B	301	48/48	0.88	0.12	21,31,38,41	0
2	NDP	G	301	48/48	0.89	0.11	24,31,39,43	0
2	NDP	C	301	48/48	0.90	0.10	23,30,42,44	0
2	NDP	A	301	48/48	0.92	0.10	20,26,33,36	0
2	NDP	D	301	48/48	0.94	0.08	20,24,31,35	0
2	NDP	H	301	48/48	0.94	0.08	16,23,29,33	0
2	NDP	E	301	48/48	0.95	0.07	15,20,27,30	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 NDP B 301:

$2mF_o\text{-}DF_c$ (at 0.7 rmsd) in gray
$mF_o\text{-}DF_c$ (at 3 rmsd) in purple (negative) and green (positive)
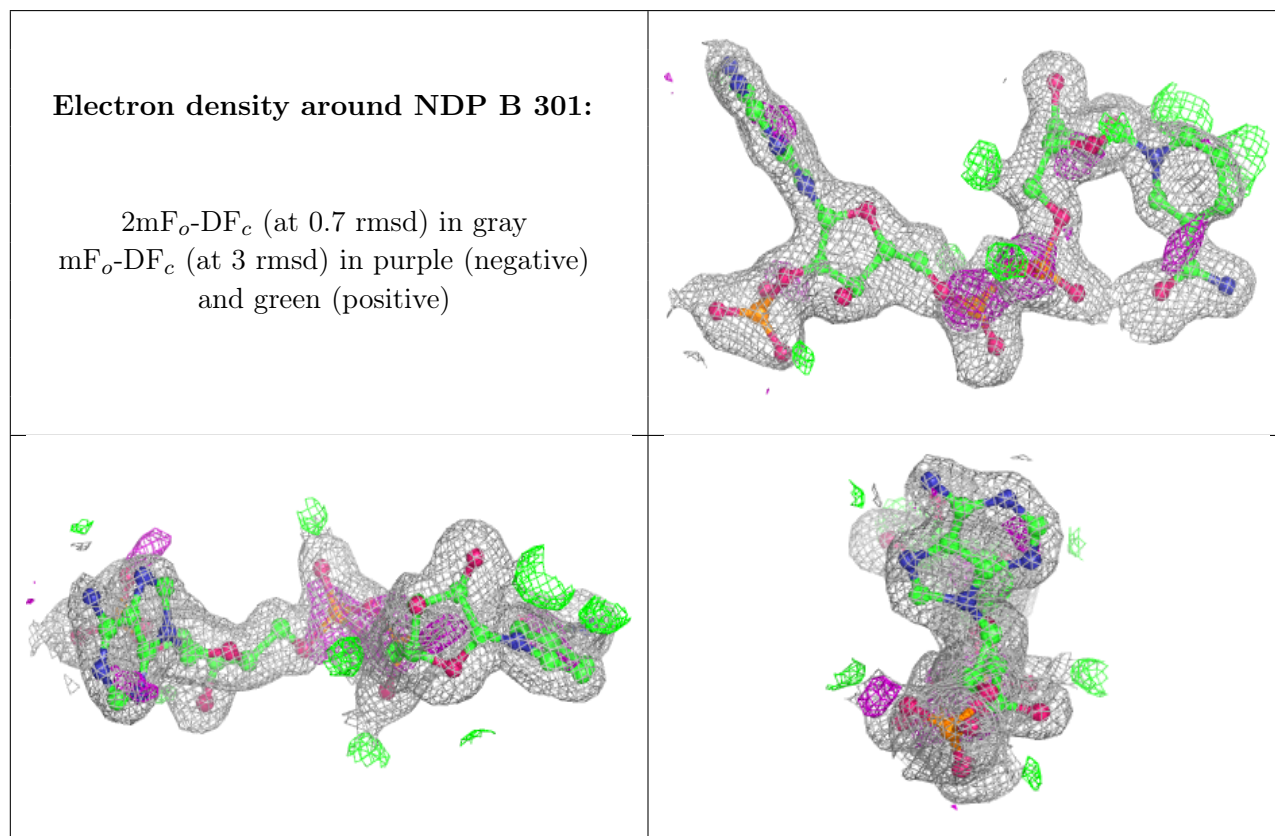
Electron density around NDP G 301:

$2mF_o\text{-}DF_c$ (at 0.7 rmsd) in gray
$mF_o\text{-}DF_c$ (at 3 rmsd) in purple (negative)
and green (positive)
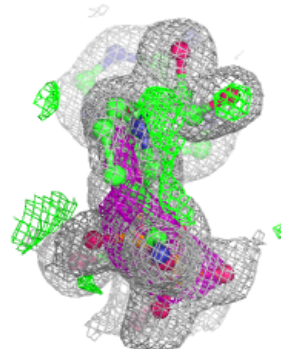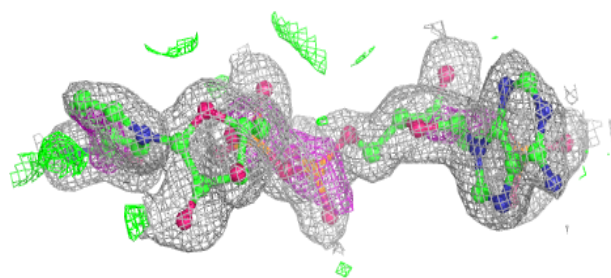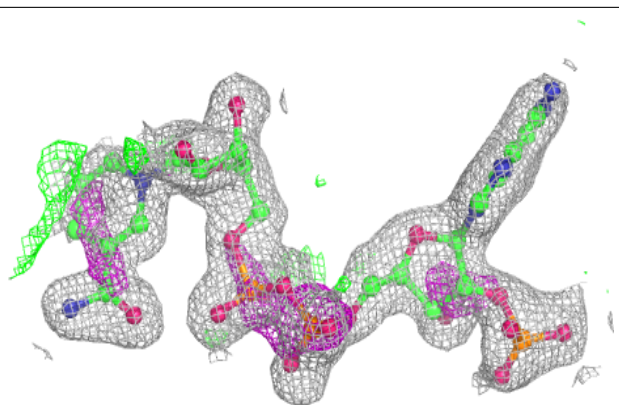
Electron density around NDP C 301:

$2mF_o\text{-}DF_c$ (at 0.7 rmsd) in gray
$mF_o\text{-}DF_c$ (at 3 rmsd) in purple (negative)
and green (positive)
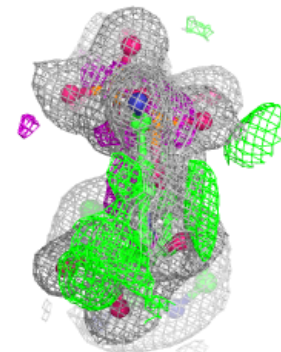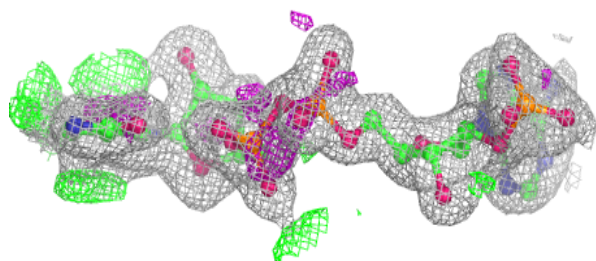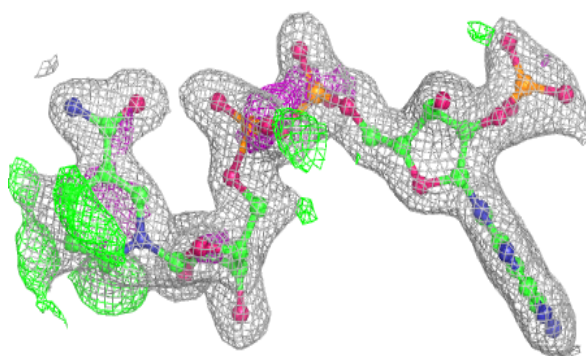
Electron density around NDP A 301:

$2mF_o$-DF_c (at 0.7 rmsd) in gray
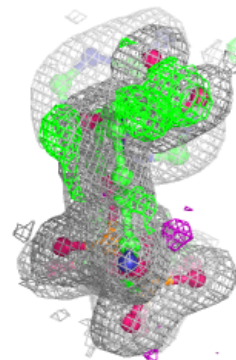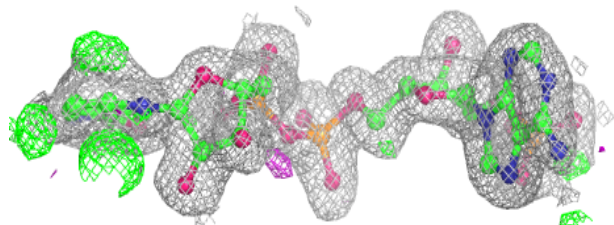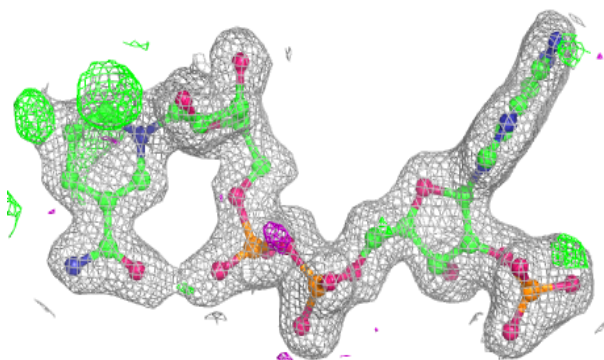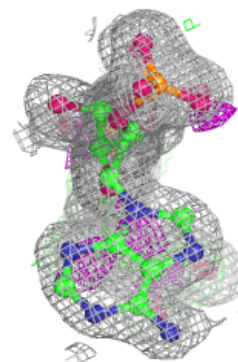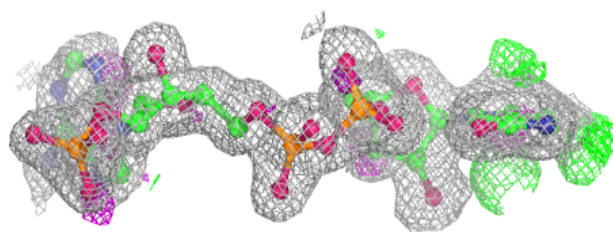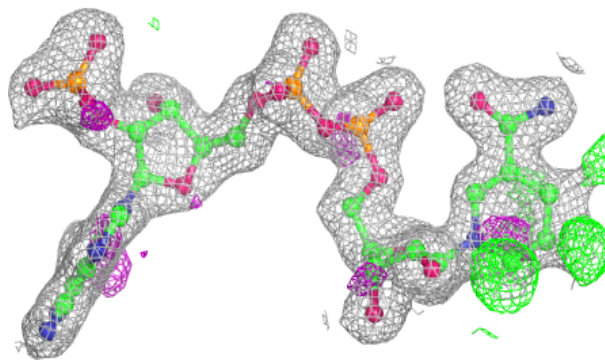mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)
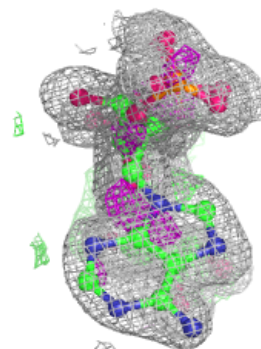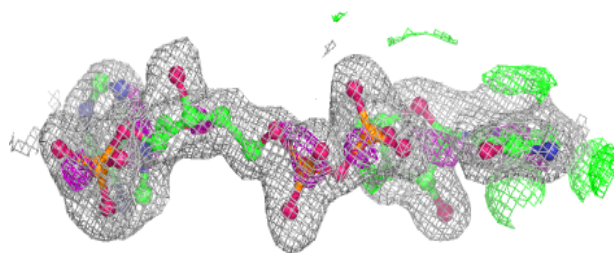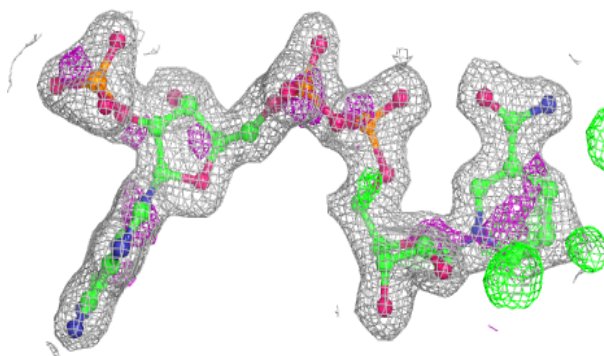
Electron density around NDP D 301:

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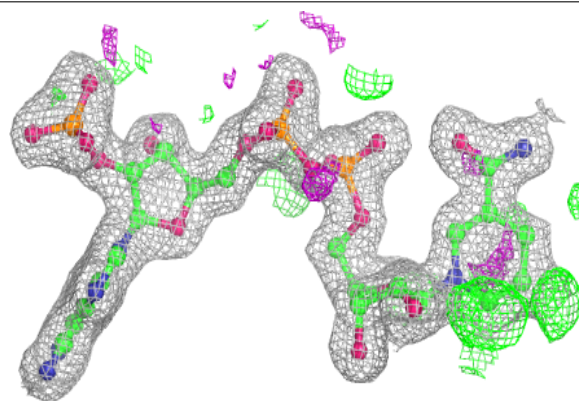and green (positive)

Electron density around NDP H 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 E 301:

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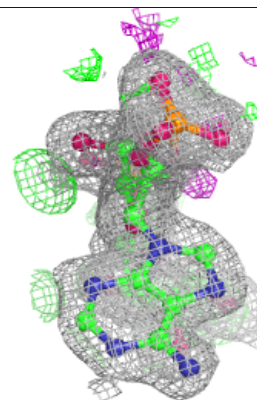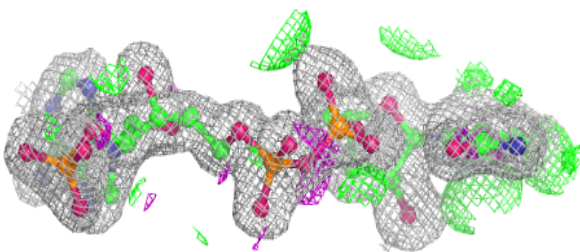
6.5 Other polymers (i)

There are no such residues in this entry.