



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 5, 2026 – 12:53 PM UTC

PDB ID : 7XWI / pdb_00007xwi
Title : structure of patulin-detoxifying enzyme with NADPH
Authors : Dai, L.; Li, H.; Hu, Y.; Guo, R.T.; Chen, C.C.
Deposited on : 2022-05-26
Resolution : 2.22 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 : 4-5-2 with Phenix2.0
Mogul : 2022.3.0, CSD as543be (2022)
Xtriage (Phenix) : 2.0
EDS : 3.0
Buster-report : wwPDB partial adaption of 1.1.7 (2018)
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4 : 9.0.010 (Gargrove)
Density-Fitness : 1.0.12
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.49

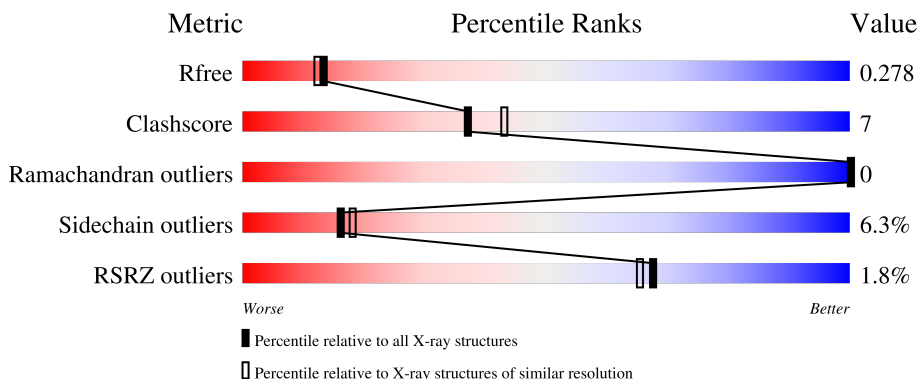
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.22 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}	180053	7682 (2.24-2.20)
Clashscore	190562	8402 (2.24-2.20)
Ramachandran outliers	187476	8303 (2.24-2.20)
Sidechain outliers	187428	8304 (2.24-2.20)
RSRZ outliers	180081	7683 (2.24-2.20)

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 $\leq 5\%$. 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	261	2% 69% 13% 15%
1	B	261	2% 71% 14% 14%
1	C	261	2% 70% 13% 15%
1	D	261	2% 64% 18% 15%

2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 7683 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 Short-chain dehydrogenase/reductase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	223	Total	C	N	O	S	0	0	0
			1726	1109	287	329	1			
1	B	224	Total	C	N	O	S	0	0	0
			1734	1114	288	330	2			
1	C	221	Total	C	N	O	S	0	0	0
			1710	1100	285	324	1			
1	D	223	Total	C	N	O	S	0	0	0
			1726	1109	287	329	1			

There are 44 discrepancies between the modelled and reference sequences:

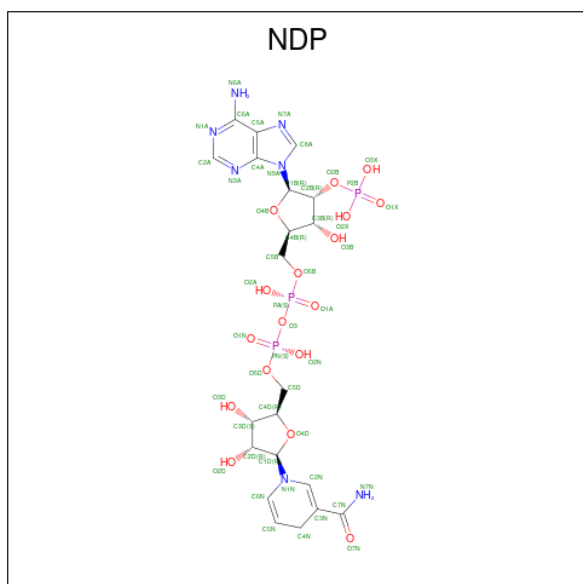
Chain	Residue	Modelled	Actual	Comment	Reference
A	-10	GLY	-	expression tag	UNP A0A888VSF1
A	-9	ALA	-	expression tag	UNP A0A888VSF1
A	-8	GLY	-	expression tag	UNP A0A888VSF1
A	-7	ALA	-	expression tag	UNP A0A888VSF1
A	-6	GLY	-	expression tag	UNP A0A888VSF1
A	-5	ALA	-	expression tag	UNP A0A888VSF1
A	-4	GLY	-	expression tag	UNP A0A888VSF1
A	-3	ALA	-	expression tag	UNP A0A888VSF1
A	-2	GLY	-	expression tag	UNP A0A888VSF1
A	-1	ALA	-	expression tag	UNP A0A888VSF1
A	0	GLY	-	expression tag	UNP A0A888VSF1
B	-10	GLY	-	expression tag	UNP A0A888VSF1
B	-9	ALA	-	expression tag	UNP A0A888VSF1
B	-8	GLY	-	expression tag	UNP A0A888VSF1
B	-7	ALA	-	expression tag	UNP A0A888VSF1
B	-6	GLY	-	expression tag	UNP A0A888VSF1
B	-5	ALA	-	expression tag	UNP A0A888VSF1
B	-4	GLY	-	expression tag	UNP A0A888VSF1
B	-3	ALA	-	expression tag	UNP A0A888VSF1
B	-2	GLY	-	expression tag	UNP A0A888VSF1
B	-1	ALA	-	expression tag	UNP A0A888VSF1

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Chain	Residue	Modelled	Actual	Comment	Reference
B	0	GLY	-	expression tag	UNP A0A888VSF1
C	-10	GLY	-	expression tag	UNP A0A888VSF1
C	-9	ALA	-	expression tag	UNP A0A888VSF1
C	-8	GLY	-	expression tag	UNP A0A888VSF1
C	-7	ALA	-	expression tag	UNP A0A888VSF1
C	-6	GLY	-	expression tag	UNP A0A888VSF1
C	-5	ALA	-	expression tag	UNP A0A888VSF1
C	-4	GLY	-	expression tag	UNP A0A888VSF1
C	-3	ALA	-	expression tag	UNP A0A888VSF1
C	-2	GLY	-	expression tag	UNP A0A888VSF1
C	-1	ALA	-	expression tag	UNP A0A888VSF1
C	0	GLY	-	expression tag	UNP A0A888VSF1
D	-10	GLY	-	expression tag	UNP A0A888VSF1
D	-9	ALA	-	expression tag	UNP A0A888VSF1
D	-8	GLY	-	expression tag	UNP A0A888VSF1
D	-7	ALA	-	expression tag	UNP A0A888VSF1
D	-6	GLY	-	expression tag	UNP A0A888VSF1
D	-5	ALA	-	expression tag	UNP A0A888VSF1
D	-4	GLY	-	expression tag	UNP A0A888VSF1
D	-3	ALA	-	expression tag	UNP A0A888VSF1
D	-2	GLY	-	expression tag	UNP A0A888VSF1
D	-1	ALA	-	expression tag	UNP A0A888VSF1
D	0	GLY	-	expression tag	UNP A0A888VSF1

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

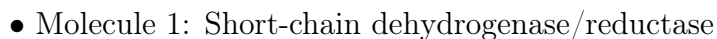
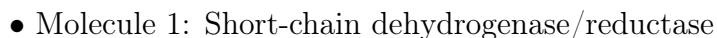


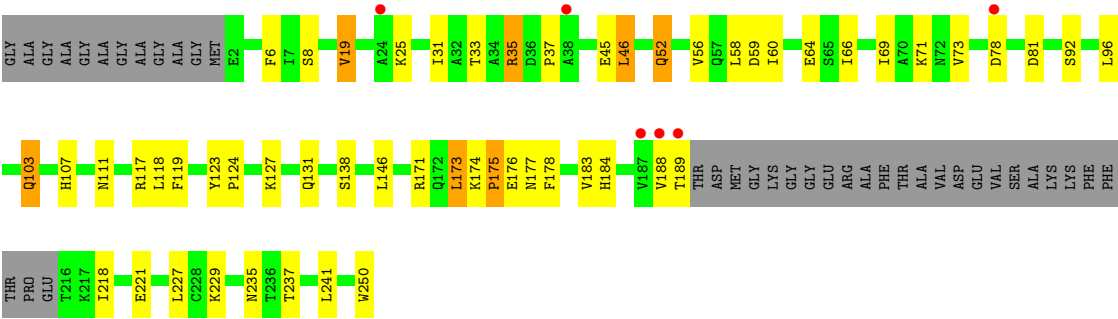
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
2	A	1	Total	C	N	O	P	0	0
			48	21	7	17	3		
2	B	1	Total	C	N	O	P	0	0
			48	21	7	17	3		
2	C	1	Total	C	N	O	P	0	0
			48	21	7	17	3		
2	D	1	Total	C	N	O	P	0	0
			48	21	7	17	3		

- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	185	Total	O	0	0
			185	185		
3	B	173	Total	O	0	0
			173	173		
3	C	114	Total	O	0	0
			114	114		
3	D	123	Total	O	0	0
			123	123		

- Molecule 1: Short-chain dehydrogenase/reductase





4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	85.01Å 64.82Å 88.81Å 90.00° 107.17° 90.00°	Depositor
Resolution (Å)	34.96 – 2.22 34.96 – 2.22	Depositor EDS
% Data completeness (in resolution range)	99.8 (34.96-2.22) 99.8 (34.96-2.22)	Depositor EDS
R_{merge}	0.15	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.90 (at 2.22Å)	Xtriage
Refinement program	REFMAC 5.8.0238	Depositor
R, R_{free}	0.198 , 0.277 0.205 , 0.278	Depositor DCC
R_{free} test set	2298 reflections (5.00%)	wwPDB-VP
Wilson B-factor (Å ²)	22.8	Xtriage
Anisotropy	0.582	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.36 , 36.0	EDS
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.33$	Xtriage
Estimated twinning fraction	0.000 for l,-k,h	Xtriage
F_o, F_c correlation	0.94	EDS
Total number of atoms	7683	wwPDB-VP
Average B, all atoms (Å ²)	29.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 12.13% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

²Theoretical 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

5.1 Standard geometry

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	1.17	3/1760 (0.2%)	1.46	5/2385 (0.2%)
1	B	1.10	1/1768 (0.1%)	1.45	1/2395 (0.0%)
1	C	1.09	0/1744	1.51	3/2363 (0.1%)
1	D	1.12	3/1760 (0.2%)	1.50	5/2385 (0.2%)
All	All	1.12	7/7032 (0.1%)	1.48	14/9528 (0.1%)

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand. A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
1	A	0	1

All (7) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	139	SER	CA-CB	-10.77	1.34	1.53
1	A	139	SER	CA-C	10.65	1.65	1.52
1	A	138	SER	CA-CB	9.84	1.65	1.53
1	B	249	PRO	C-O	-7.08	1.15	1.23
1	D	37	PRO	C-O	-6.34	1.15	1.24
1	D	175	PRO	C-O	-5.10	1.17	1.24
1	D	119	PHE	C-O	5.03	1.29	1.24

All (14) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	138	SER	CB-CA-C	-7.11	105.52	114.40
1	A	138	SER	N-CA-CB	-7.04	100.30	108.96

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	D	237	THR	CA-CB-OG1	-5.70	101.05	109.60
1	B	186	GLY	CA-C-O	-5.68	117.34	122.57
1	A	139	SER	CA-C-O	-5.60	114.72	120.99
1	C	242	SER	CA-C-N	5.59	128.55	120.38
1	C	242	SER	C-N-CA	5.59	128.55	120.38
1	C	145	ASN	CA-CB-CG	-5.47	107.13	112.60
1	A	250	TRP	CA-C-O	-5.29	111.81	120.80
1	A	186	GLY	CA-C-O	-5.20	117.79	122.57
1	D	229	LYS	CA-C-N	5.18	127.17	120.44
1	D	229	LYS	C-N-CA	5.18	127.17	120.44
1	D	19	VAL	CA-C-N	5.13	127.16	120.28
1	D	19	VAL	C-N-CA	5.13	127.16	120.28

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	138	SER	Mainchain

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	1726	0	1743	27	0
1	B	1734	0	1755	22	0
1	C	1710	0	1730	19	0
1	D	1726	0	1743	36	0
2	A	48	0	26	8	0
2	B	48	0	26	2	0
2	C	48	0	26	6	0
2	D	48	0	26	7	0
3	A	185	0	0	6	0
3	B	173	0	0	4	0
3	C	114	0	0	2	0
3	D	123	0	0	2	0
All	All	7683	0	7075	100	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 7.

All (100) 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:D:52:GLN:HE21	1:D:52:GLN:H	1.11	0.97
1:C:188:VAL:HG22	2:C:301:NDP:N7N	1.90	0.84
1:C:188:VAL:HG22	2:C:301:NDP:H72N	1.43	0.83
1:D:188:VAL:HG22	2:D:301:NDP:H72N	1.44	0.81
1:B:174:LYS:HE3	3:B:541:HOH:O	1.81	0.78
1:B:174:LYS:CE	3:B:541:HOH:O	2.34	0.74
1:D:92:SER:HB2	1:D:103:GLN:HG2	1.69	0.73
1:D:69:ILE:O	1:D:73:VAL:HG23	1.88	0.73
1:A:188:VAL:HG12	2:A:301:NDP:N7N	2.04	0.72
1:D:123:TYR:OH	1:D:176:GLU:OE1	2.08	0.72
2:C:301:NDP:O1N	3:C:401:HOH:O	2.11	0.68
1:D:107:HIS:O	1:D:111:ASN:HB2	1.95	0.66
1:A:35:ARG:HD3	2:A:301:NDP:O2X	1.97	0.65
1:D:92:SER:CB	1:D:103:GLN:HG2	2.25	0.65
1:D:184:HIS:ND1	2:D:301:NDP:H5N	2.12	0.65
1:D:188:VAL:HG22	2:D:301:NDP:N7N	2.11	0.65
1:A:188:VAL:HG12	2:A:301:NDP:C7N	2.27	0.64
1:D:52:GLN:HE21	1:D:52:GLN:N	1.92	0.63
1:B:188:VAL:HA	1:B:218:ILE:O	2.01	0.61
1:B:188:VAL:HG22	2:B:301:NDP:N7N	2.16	0.60
1:D:174:LYS:N	1:D:175:PRO:CD	2.64	0.60
1:A:236:THR:HG22	3:A:445:HOH:O	2.02	0.60
1:A:10:ALA:HB1	1:A:19:VAL:HG21	1.84	0.59
1:A:173:LEU:HB3	1:A:178:PHE:HB2	1.84	0.59
1:C:107:HIS:O	1:C:111:ASN:HB2	2.01	0.59
1:A:25:LYS:NZ	1:A:232:GLU:OE1	2.35	0.59
1:A:138:SER:O	2:A:301:NDP:H6N	2.03	0.58
1:A:52:GLN:HG2	3:A:508:HOH:O	2.03	0.58
1:D:173:LEU:HB3	1:D:178:PHE:HB2	1.85	0.58
1:D:138:SER:O	2:D:301:NDP:H6N	2.03	0.57
1:D:92:SER:HB2	1:D:103:GLN:CG	2.33	0.57
1:C:186:GLY:O	2:C:301:NDP:H42N	2.05	0.57
1:C:103:GLN:HG3	3:C:470:HOH:O	2.05	0.56
3:A:407:HOH:O	1:D:171:ARG:HD2	2.06	0.56
1:A:188:VAL:HA	1:A:218:ILE:O	2.06	0.55
1:A:69:ILE:O	1:A:73:VAL:HG23	2.06	0.55
1:B:60:ILE:O	1:B:66:ILE:HD11	2.09	0.53

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:173:LEU:HB3	1:B:178:PHE:HB2	1.91	0.53
1:D:188:VAL:HA	1:D:218:ILE:O	2.09	0.52
1:D:177:ASN:ND2	3:D:404:HOH:O	2.41	0.52
1:B:14:ILE:HD13	1:B:185:PRO:HB2	1.92	0.52
1:A:78:ASP:OD1	1:A:78:ASP:N	2.43	0.52
1:C:35:ARG:HD3	2:C:301:NDP:O2X	2.10	0.52
1:D:184:HIS:CE1	2:D:301:NDP:H5N	2.45	0.51
1:D:235:ASN:ND2	3:D:405:HOH:O	2.42	0.51
1:B:25:LYS:NZ	1:B:232:GLU:OE1	2.43	0.51
1:C:88:ALA:HB3	2:C:301:NDP:H3D	1.92	0.50
1:D:35:ARG:HD3	2:D:301:NDP:O3X	2.11	0.50
1:D:66:ILE:HG21	1:D:117:ARG:HB3	1.93	0.50
1:A:88:ALA:HB3	2:A:301:NDP:H3D	1.95	0.49
1:A:135:PHE:CZ	1:A:231:PHE:HA	2.49	0.48
1:C:10:ALA:HB1	1:C:19:VAL:HG21	1.95	0.48
1:D:123:TYR:HB3	1:D:124:PRO:HD3	1.96	0.48
1:A:174:LYS:HE2	3:A:551:HOH:O	2.15	0.47
1:B:171:ARG:NH2	1:C:151:ASP:OD1	2.47	0.47
1:C:10:ALA:CB	1:C:32:ALA:HB1	2.44	0.47
1:B:174:LYS:HE2	3:B:541:HOH:O	2.09	0.46
1:C:173:LEU:HB3	1:C:178:PHE:HB2	1.96	0.46
1:D:59:ASP:HA	2:D:301:NDP:N1A	2.30	0.46
1:A:188:VAL:HG12	2:A:301:NDP:H72N	1.79	0.46
1:B:133:LYS:HE2	1:B:234:LEU:O	2.15	0.46
1:D:33:THR:HA	1:D:56:VAL:O	2.15	0.46
1:D:183:VAL:HA	1:D:241:LEU:O	2.16	0.46
1:D:60:ILE:O	1:D:66:ILE:HD11	2.16	0.46
1:C:60:ILE:O	1:C:66:ILE:HD11	2.15	0.46
1:B:107:HIS:O	1:B:111:ASN:HB2	2.16	0.45
1:C:96:LEU:C	1:C:96:LEU:HD23	2.41	0.45
1:C:116:ILE:O	1:C:120:GLN:HG3	2.17	0.45
1:A:7:ILE:HD13	1:A:84:VAL:HB	1.99	0.45
1:D:58:LEU:HD21	1:D:118:LEU:HD13	1.99	0.44
1:B:33:THR:HA	1:B:56:VAL:O	2.17	0.44
1:C:69:ILE:HD12	1:C:69:ILE:HA	1.86	0.44
1:D:19:VAL:HG12	1:D:46:LEU:HD13	1.99	0.44
1:D:31:ILE:HD13	1:D:31:ILE:N	2.32	0.44
1:B:188:VAL:O	1:B:189:THR:HG23	2.18	0.44
1:D:227:LEU:HD23	1:D:227:LEU:HA	1.86	0.44
1:B:151:ASP:OD1	3:B:401:HOH:O	2.21	0.44
1:D:8:SER:HA	1:D:33:THR:OG1	2.18	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:186:GLY:O	2:A:301:NDP:H42N	2.19	0.43
1:B:188:VAL:HG22	2:B:301:NDP:C7N	2.48	0.43
1:A:188:VAL:CG1	2:A:301:NDP:N7N	2.76	0.43
1:D:81:ASP:HB3	1:D:131:GLN:HG2	2.00	0.43
1:B:144:LEU:HB3	1:C:250:TRP:HB3	2.02	0.42
1:B:10:ALA:HB1	1:B:19:VAL:HG21	2.02	0.42
1:B:167:LYS:NZ	1:C:144:LEU:O	2.51	0.42
1:A:230:LEU:HD23	1:A:230:LEU:HA	1.88	0.41
1:B:66:ILE:HG21	1:B:117:ARG:HB3	2.02	0.41
1:A:89:ILE:HG23	1:A:110:THR:HG21	2.02	0.41
1:A:112:VAL:O	1:A:115:PRO:HD2	2.20	0.41
1:B:50:ASN:HB3	1:B:52:GLN:OE1	2.21	0.41
1:C:8:SER:HA	1:C:33:THR:OG1	2.21	0.41
1:A:24:ALA:HB2	3:A:469:HOH:O	2.20	0.41
1:A:94:GLY:HA2	1:A:151:ASP:HB2	2.03	0.41
1:A:68:LYS:HD2	3:A:528:HOH:O	2.20	0.41
1:A:144:LEU:HB3	1:D:250:TRP:HB3	2.03	0.41
1:B:18:VAL:O	1:B:22:LEU:HG	2.20	0.41
1:D:6:PHE:CD1	1:D:6:PHE:C	2.99	0.41
1:A:116:ILE:HG12	1:D:96:LEU:HD11	2.02	0.41
1:D:81:ASP:HB3	1:D:131:GLN:CG	2.51	0.41
1:C:169:LEU:CD1	1:C:173:LEU:HD22	2.52	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	219/261 (84%)	212 (97%)	7 (3%)	0	100	100
1	B	220/261 (84%)	214 (97%)	6 (3%)	0	100	100
1	C	217/261 (83%)	208 (96%)	9 (4%)	0	100	100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	D	219/261 (84%)	214 (98%)	5 (2%)	0	100	100
All	All	875/1044 (84%)	848 (97%)	27 (3%)	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	187/208 (90%)	175 (94%)	12 (6%)	16	18
1	B	188/208 (90%)	180 (96%)	8 (4%)	26	33
1	C	185/208 (89%)	172 (93%)	13 (7%)	14	15
1	D	187/208 (90%)	173 (92%)	14 (8%)	12	13
All	All	747/832 (90%)	700 (94%)	47 (6%)	16	18

All (47) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	2	GLU
1	A	46	LEU
1	A	52	GLN
1	A	71	LYS
1	A	78	ASP
1	A	146	LEU
1	A	173	LEU
1	A	189	THR
1	A	217	LYS
1	A	229	LYS
1	A	230	LEU
1	A	232	GLU
1	B	46	LEU
1	B	102	GLU
1	B	128	LYS
1	B	146	LEU

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Mol	Chain	Res	Type
1	B	173	LEU
1	B	179	ILE
1	B	230	LEU
1	B	236	THR
1	C	7	ILE
1	C	29	LYS
1	C	46	LEU
1	C	48	LYS
1	C	56	VAL
1	C	71	LYS
1	C	146	LEU
1	C	173	LEU
1	C	187	VAL
1	C	188	VAL
1	C	216	THR
1	C	217	LYS
1	C	236	THR
1	D	25	LYS
1	D	35	ARG
1	D	45	GLU
1	D	46	LEU
1	D	52	GLN
1	D	64	GLU
1	D	71	LYS
1	D	78	ASP
1	D	103	GLN
1	D	127	LYS
1	D	146	LEU
1	D	173	LEU
1	D	189	THR
1	D	221	GLU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (8) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	98	ASN
1	A	145	ASN
1	B	50	ASN
1	C	98	ASN
1	D	52	GLN
1	D	75	GLN
1	D	103	GLN

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Mol	Chain	Res	Type
1	D	177	ASN

5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

4 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	-	51,52,52	0.81	3 (5%)	71,80,80	0.95	1 (1%)
2	NDP	A	301	-	51,52,52	0.71	0	71,80,80	0.76	1 (1%)
2	NDP	D	301	-	51,52,52	0.86	2 (3%)	71,80,80	0.86	3 (4%)
2	NDP	B	301	-	51,52,52	1.07	2 (3%)	71,80,80	0.68	1 (1%)

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	-	-	7/34/77/77	0/5/5/5
2	NDP	A	301	-	-	6/34/77/77	0/5/5/5
2	NDP	D	301	-	-	9/34/77/77	0/5/5/5
2	NDP	B	301	-	-	8/34/77/77	0/5/5/5

All (7) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	301	NDP	P2B-O2X	-3.85	1.40	1.54
2	B	301	NDP	P2B-O3X	-3.16	1.43	1.54
2	D	301	NDP	P2B-O3X	-3.09	1.43	1.54
2	C	301	NDP	P2B-O2X	-2.78	1.44	1.54
2	C	301	NDP	P2B-O3X	-2.27	1.46	1.54
2	C	301	NDP	P2B-O2B	2.12	1.63	1.59
2	D	301	NDP	P2B-O2X	-2.02	1.47	1.54

All (6) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	C	301	NDP	O4D-C1D-C2D	-3.64	98.83	106.62
2	D	301	NDP	O2B-P2B-O1X	-3.11	98.26	109.33
2	D	301	NDP	P2B-O2B-C2B	-2.61	116.47	123.43
2	D	301	NDP	C3B-C2B-C1B	-2.41	98.20	102.81
2	B	301	NDP	C3B-C2B-C1B	-2.36	98.28	102.81
2	A	301	NDP	C3B-C2B-C1B	-2.27	98.45	102.81

There are no chirality outliers.

All (30) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	A	301	NDP	C5D-O5D-PN-O1N
2	B	301	NDP	C5B-O5B-PA-O1A
2	D	301	NDP	C5B-O5B-PA-O2A
2	D	301	NDP	C5B-O5B-PA-O3
2	D	301	NDP	C5D-O5D-PN-O3
2	D	301	NDP	C5D-O5D-PN-O1N
2	C	301	NDP	O4D-C1D-N1N-C6N
2	C	301	NDP	O4B-C4B-C5B-O5B
2	C	301	NDP	O4D-C4D-C5D-O5D
2	C	301	NDP	C3D-C4D-C5D-O5D
2	B	301	NDP	O4B-C4B-C5B-O5B

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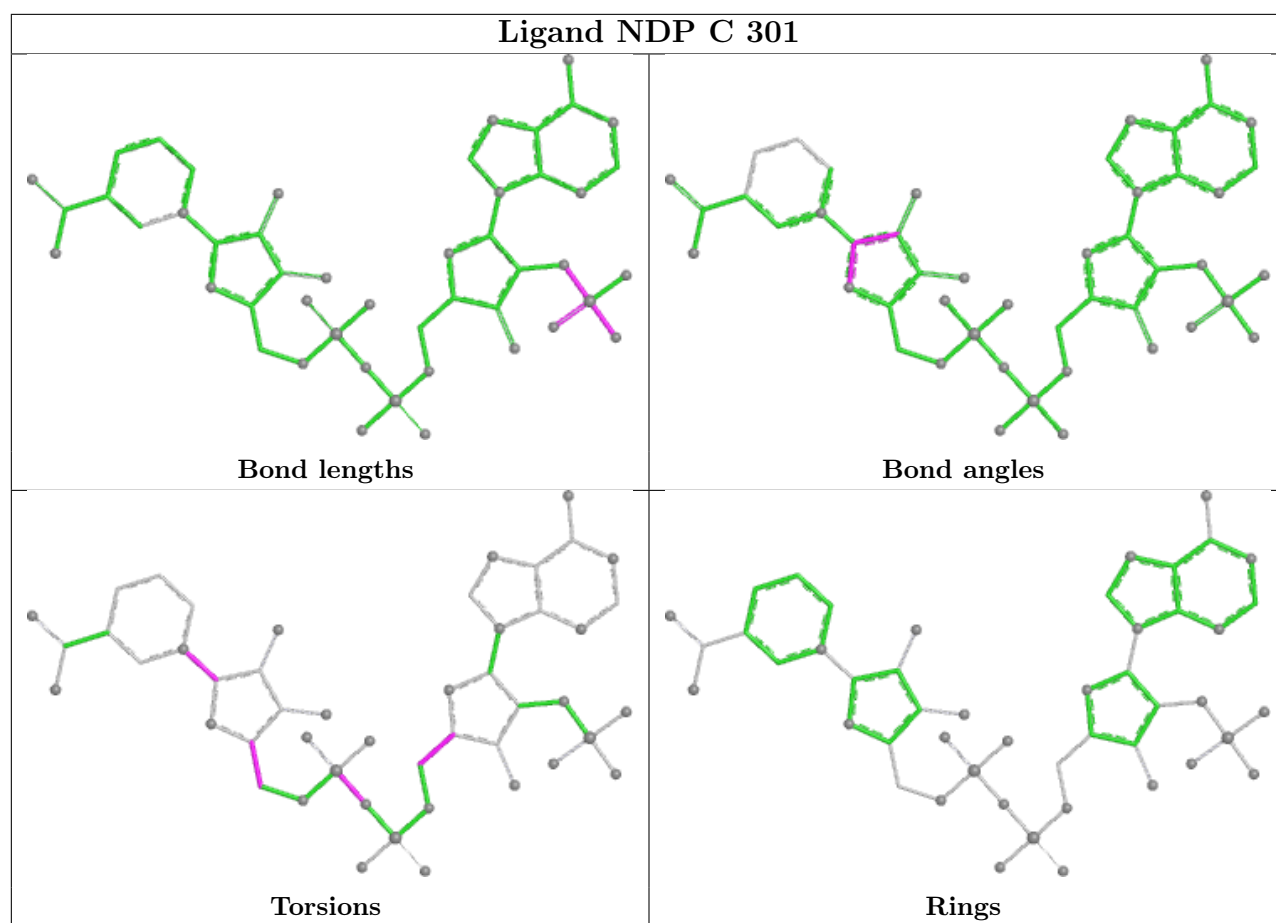
Mol	Chain	Res	Type	Atoms
2	C	301	NDP	C3B-C4B-C5B-O5B
2	D	301	NDP	O4B-C4B-C5B-O5B
2	B	301	NDP	O4D-C1D-N1N-C6N
2	D	301	NDP	C3B-C4B-C5B-O5B
2	D	301	NDP	O4D-C1D-N1N-C6N
2	B	301	NDP	C3B-C4B-C5B-O5B
2	B	301	NDP	PN-O3-PA-O1A
2	C	301	NDP	PA-O3-PN-O2N
2	A	301	NDP	O4D-C1D-N1N-C6N
2	A	301	NDP	C5D-O5D-PN-O3
2	A	301	NDP	C5D-O5D-PN-O2N
2	B	301	NDP	C5B-O5B-PA-O3
2	D	301	NDP	C5B-O5B-PA-O1A
2	D	301	NDP	C5D-O5D-PN-O2N
2	B	301	NDP	PN-O3-PA-O2A
2	B	301	NDP	O4D-C4D-C5D-O5D
2	A	301	NDP	PN-O3-PA-O2A
2	C	301	NDP	PA-O3-PN-O1N
2	A	301	NDP	O4B-C4B-C5B-O5B

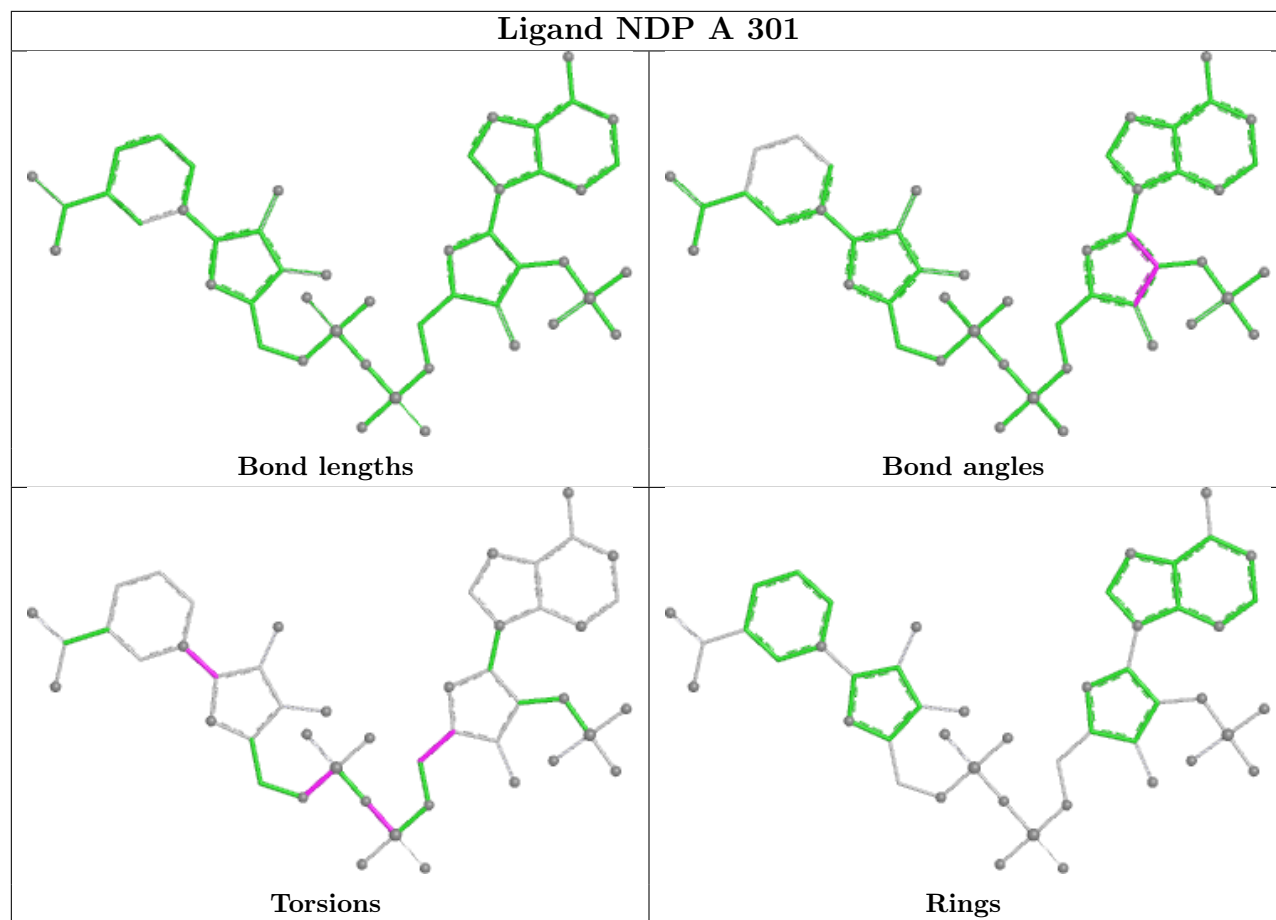
There are no ring outliers.

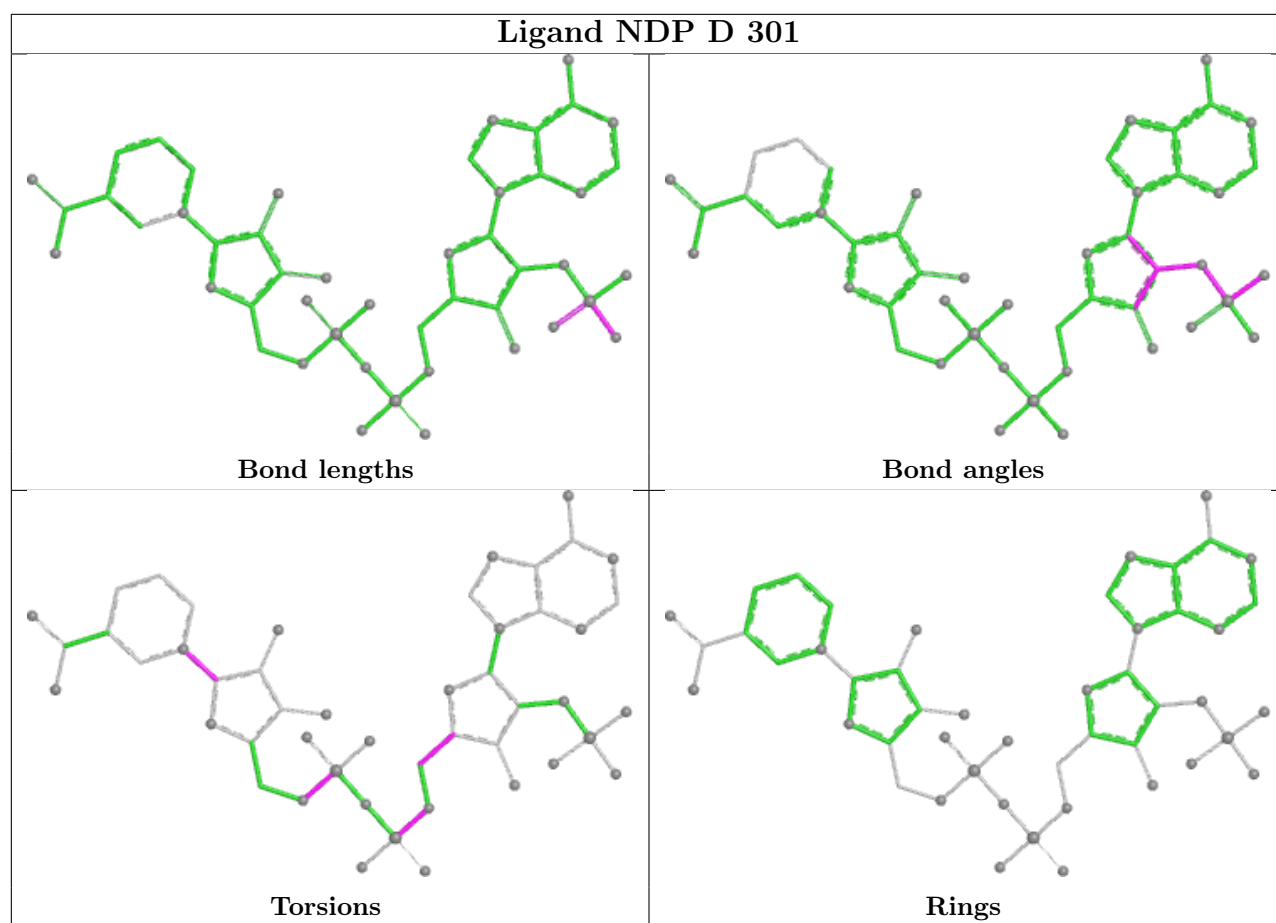
4 monomers are involved in 23 short contacts:

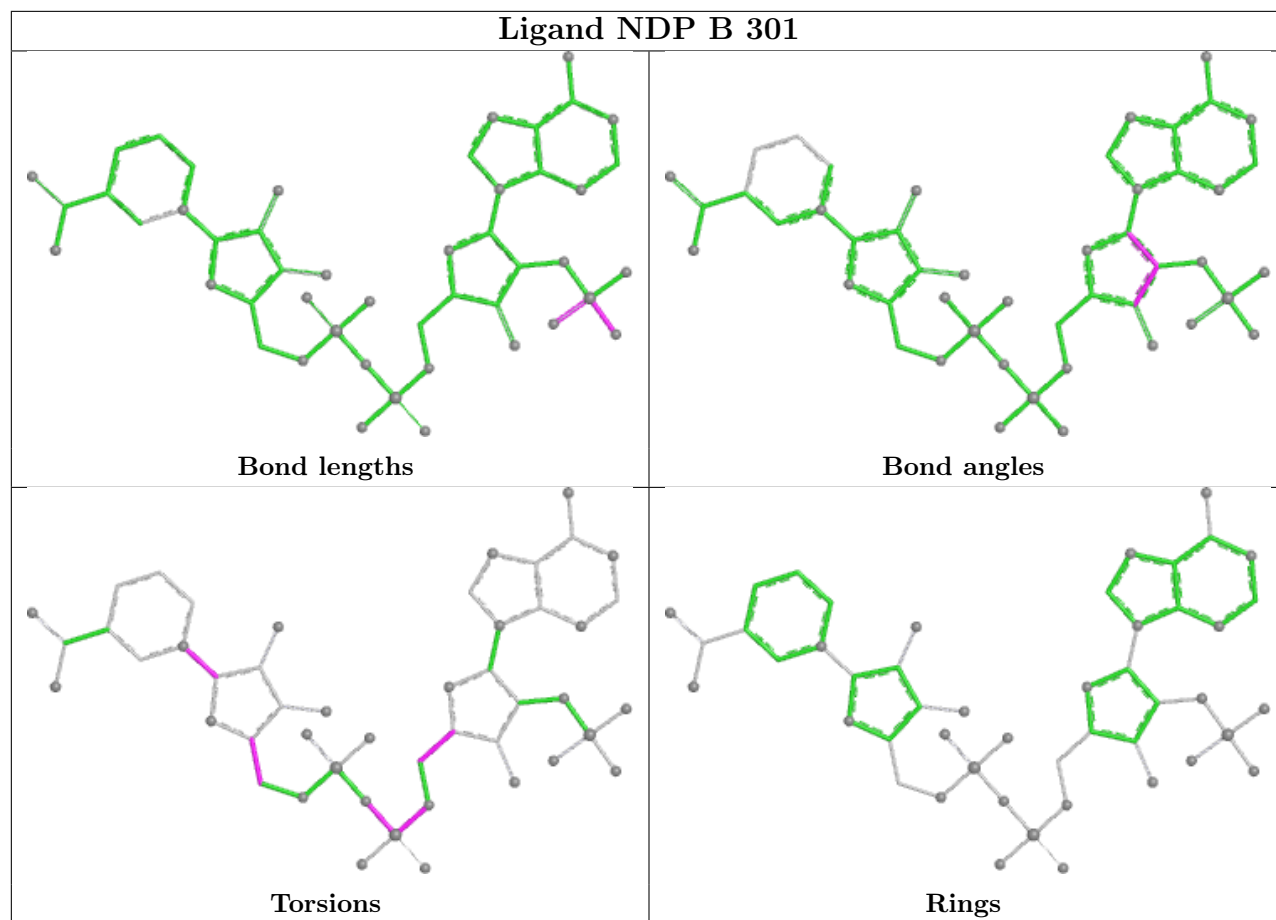
Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	C	301	NDP	6	0
2	A	301	NDP	8	0
2	D	301	NDP	7	0
2	B	301	NDP	2	0

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 [i](#)

6.1 Protein, DNA and RNA chains [i](#)

In the following table, the column labelled ‘#RSRZ > 2’ contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 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	223/261 (85%)	-0.15	2 (0%) 81 79	15, 22, 37, 71	0
1	B	224/261 (85%)	-0.16	2 (0%) 81 79	15, 21, 36, 68	0
1	C	221/261 (84%)	0.25	6 (2%) 56 53	14, 30, 54, 75	0
1	D	223/261 (85%)	0.29	6 (2%) 56 53	15, 30, 54, 69	0
All	All	891/1044 (85%)	0.06	16 (1%) 67 65	14, 24, 50, 75	0

All (16) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	189	THR	3.7
1	D	24	ALA	3.6
1	A	216	THR	3.0
1	C	216	THR	2.9
1	D	188	VAL	2.8
1	C	27	GLY	2.8
1	D	187	VAL	2.8
1	B	189	THR	2.7
1	C	188	VAL	2.7
1	D	189	THR	2.6
1	C	38	ALA	2.5
1	C	187	VAL	2.3
1	C	48	LYS	2.2
1	B	1	MET	2.1
1	D	78	ASP	2.1
1	D	38	ALA	2.0

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

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

6.3 Carbohydrates [i](#)

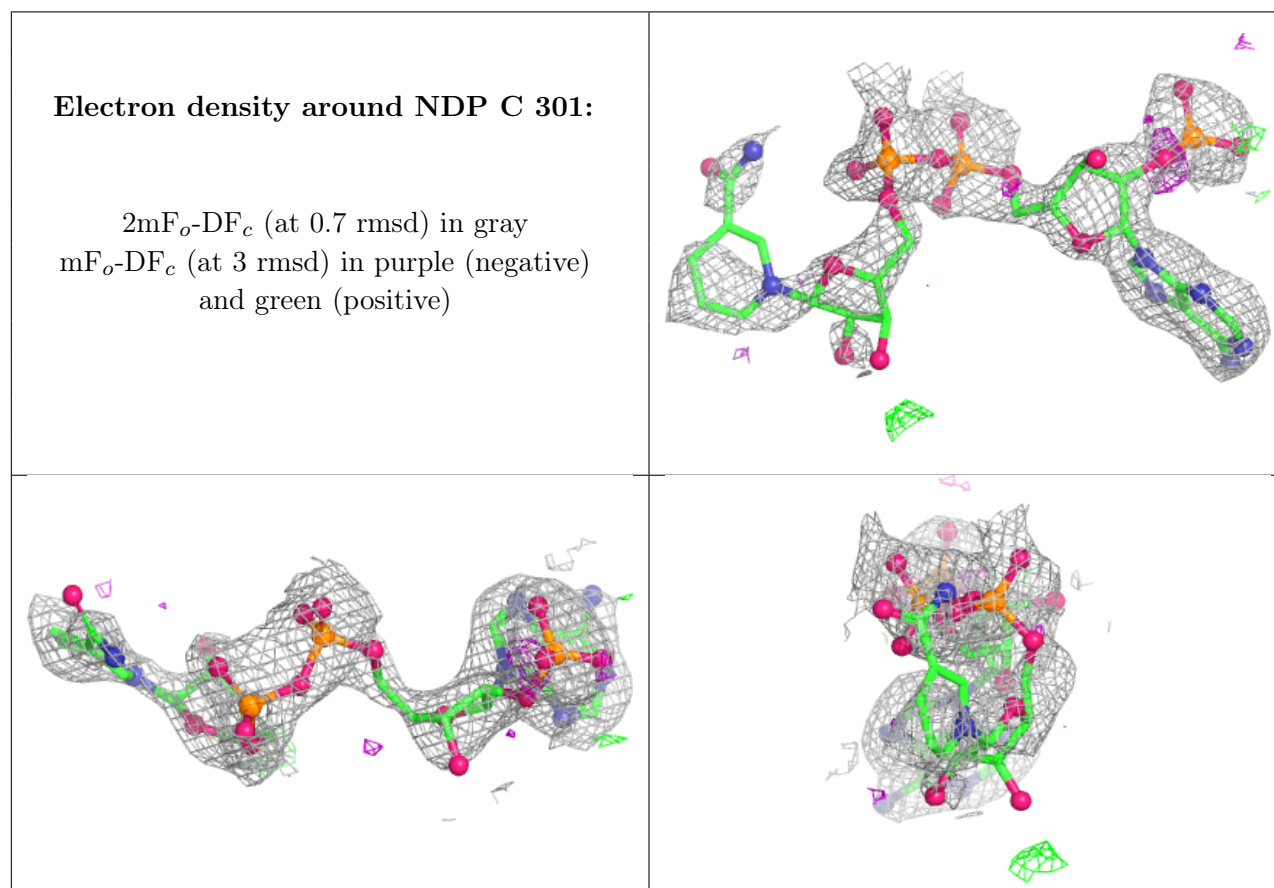
There are no oligosaccharides in this entry.

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, 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.

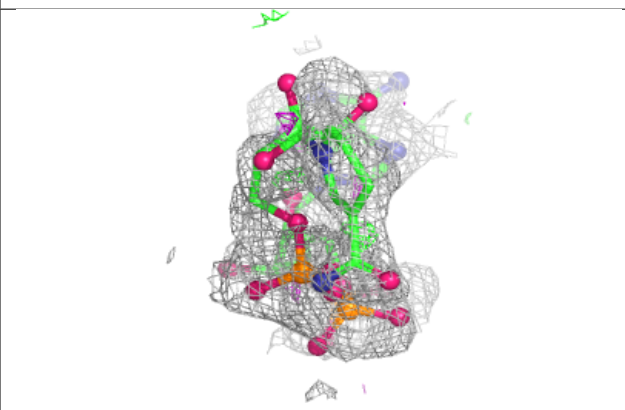
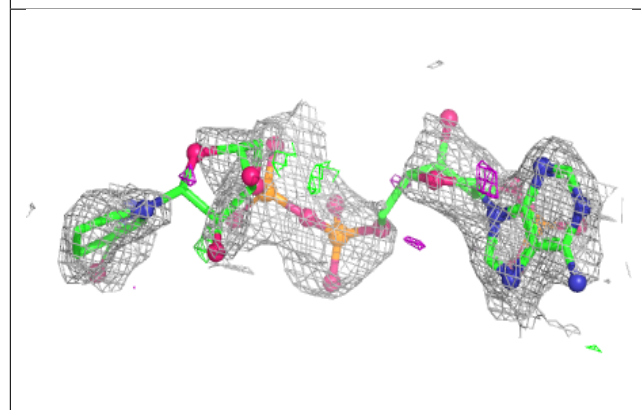
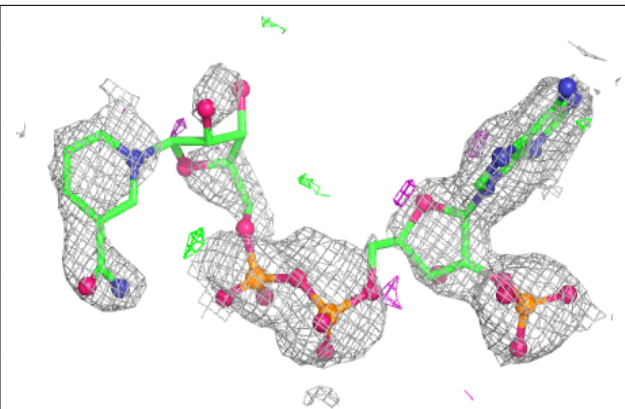
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
2	NDP	C	301	48/48	0.79	0.16	38,80,97,99	0
2	NDP	D	301	48/48	0.85	0.16	41,76,118,122	0
2	NDP	B	301	48/48	0.91	0.09	25,37,44,50	0
2	NDP	A	301	48/48	0.92	0.09	24,36,46,50	0

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.

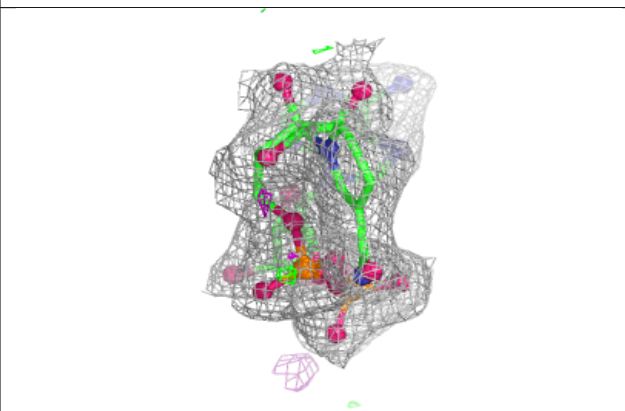
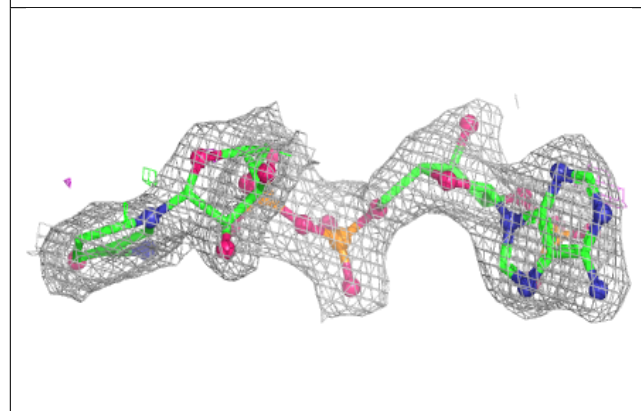
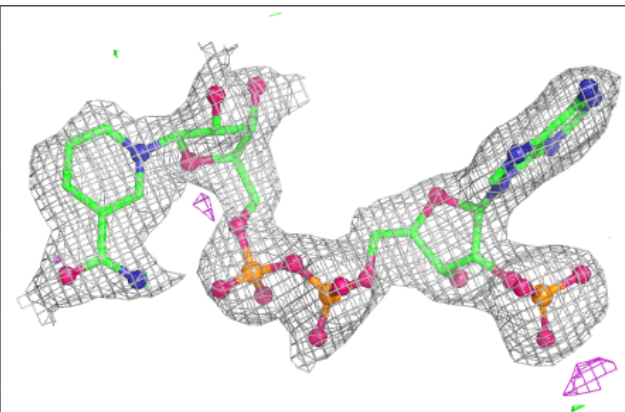


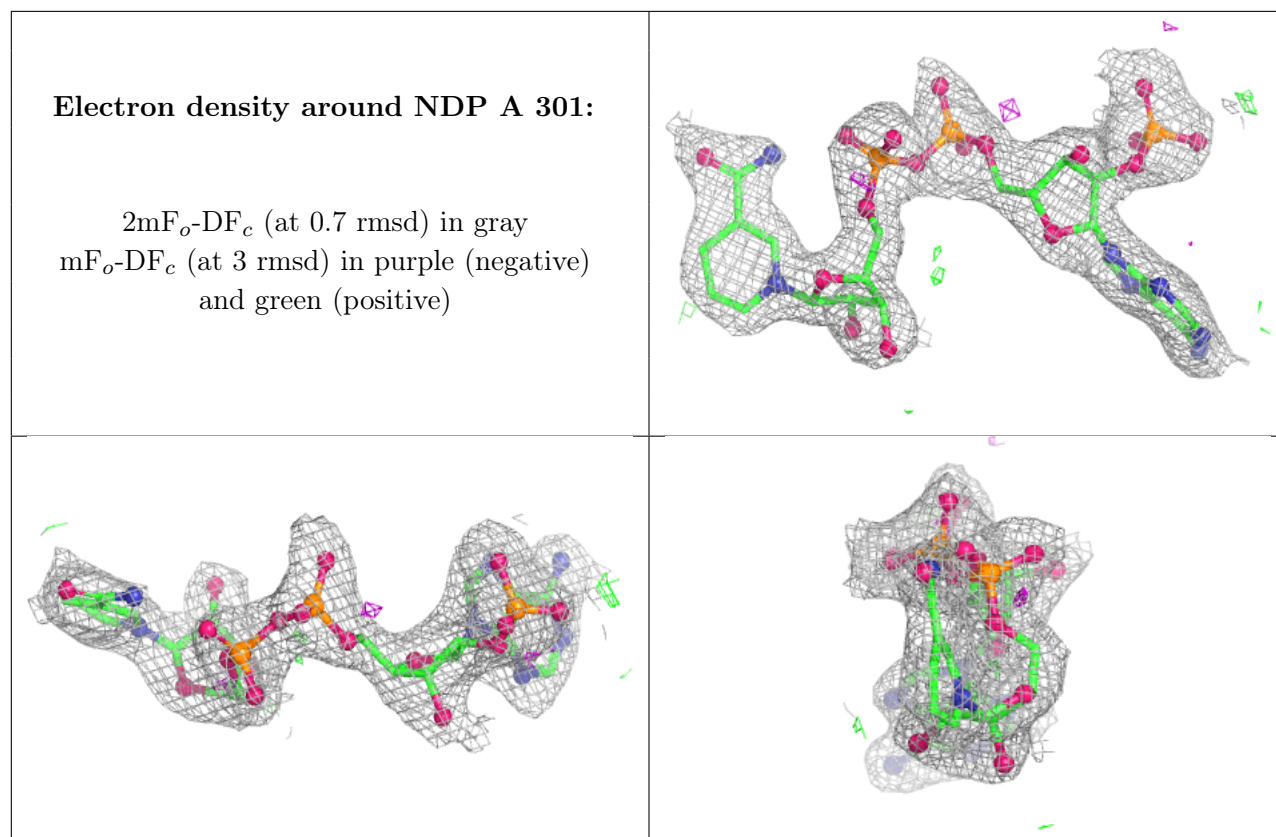
Electron density around NDP D 301:

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

**Electron density around NDP 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)





6.5 Other polymers [i](#)

There are no such residues in this entry.