Full wwPDB X-ray Structure Validation Report ⓘ

Sep 23, 2025 – 10:13 pm BST

PDB ID	:	7ZHU / pdb_00007zhu
Title	:	Leishmania donovani Glucose 6-Phosphate Dehydrogenase complexed with NADP(H)
Authors	:	Fritz-Wolf, K.; Berneburg, I.
Deposited on	:	2022-04-07
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:

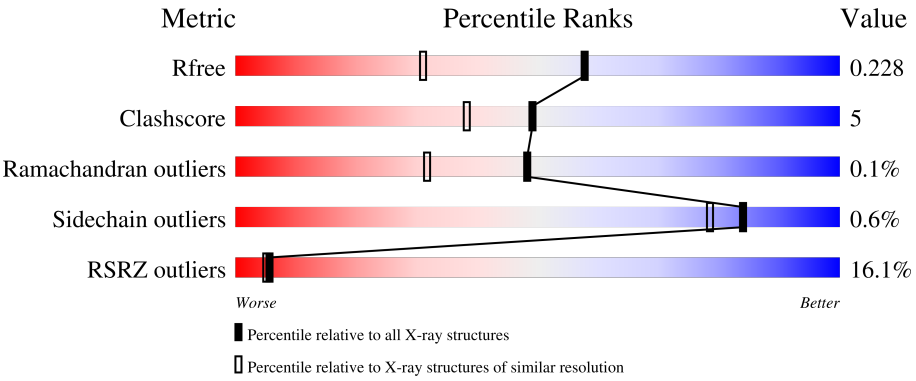
MolProbity	:	4-5-2 with Phenix2.0
Mogul	:	1.8.4, CSD as541be (2020)
Xtriage (Phenix)	:	2.0
EDS	:	3.0
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20231227.v01 (using entries in the PDB archive December 27th 2023)
CCP4	:	9.0.010 (Gargrove)
Density-Fitness	:	1.0.12
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.46

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	562	17% 83% 11% 5%
1	B	562	14% 88% 9% .

2 Entry composition

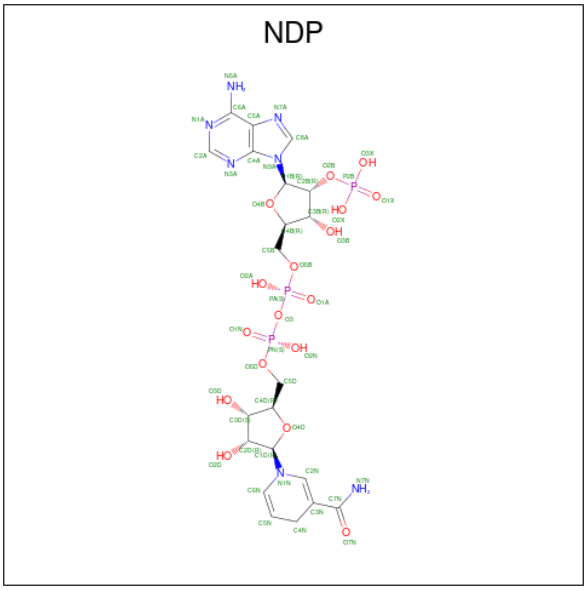
There are 7 unique types of molecules in this entry. The entry contains 9764 atoms, of which 0 are hydrogens and 0 are deuteriums.

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 Glucose-6-phosphate 1-dehydrogenase.

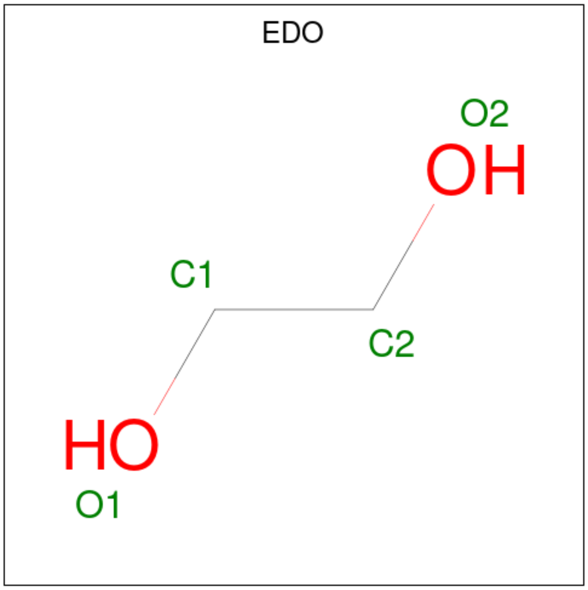
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	534	Total	C	N	O	S	0	3	0
			4248	2699	730	800	19			
1	B	543	Total	C	N	O	S	0	6	0
			4343	2756	749	819	19			

- 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		

- Molecule 3 is 1,2-ETHANEDIOL (CCD ID: EDO) (formula: $C_2H_6O_2$).



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

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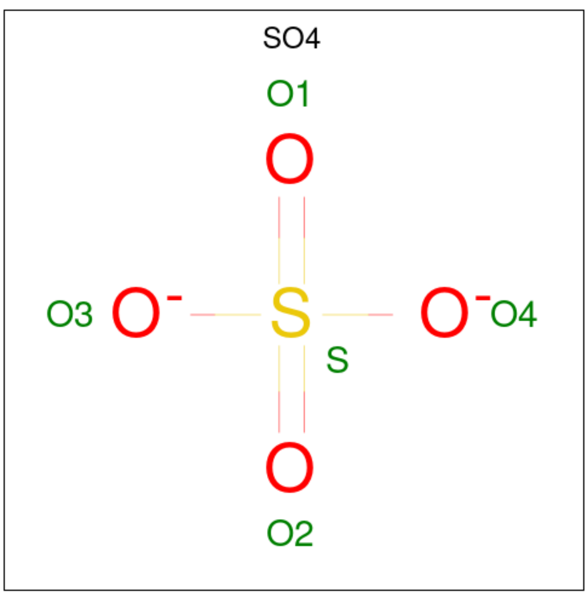
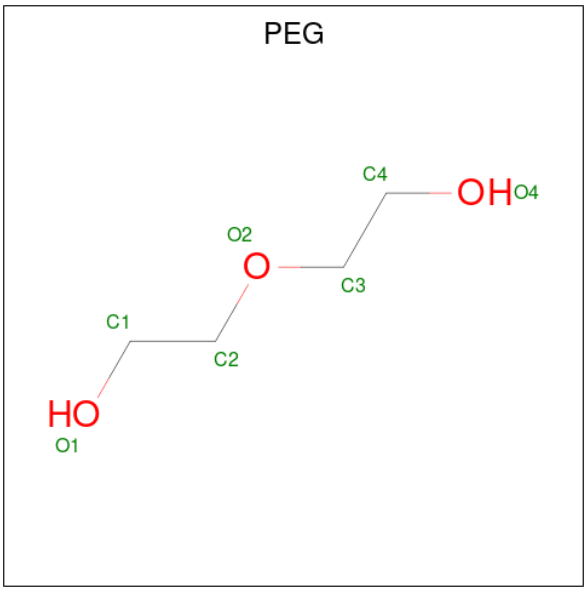
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	B	1	Total C O 4 2 2	0	0
3	B	1	Total C O 4 2 2	0	0
3	B	1	Total C O 4 2 2	0	0
3	B	1	Total C O 4 2 2	0	0
3	B	1	Total C O 4 2 2	0	0
3	B	1	Total C O 4 2 2	0	0
3	B	1	Total C O 4 2 2	0	0
3	B	1	Total C O 4 2 2	0	0
3	B	1	Total C O 4 2 2	0	0
3	B	1	Total C O 4 2 2	0	0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

- Molecule 4 is SULFATE ION (CCD ID: SO4) (formula: O_4S).



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

- Molecule 5 is DI(HYDROXYETHYL)ETHER (CCD ID: PEG) (formula: $C_4H_{10}O_3$).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
5	A	1	Total C O 7 4 3	0	0
5	A	1	Total C O 7 4 3	0	0
5	A	1	Total C O 7 4 3	0	0
5	B	1	Total C O 7 4 3	0	0
5	B	1	Total C O 7 4 3	0	0

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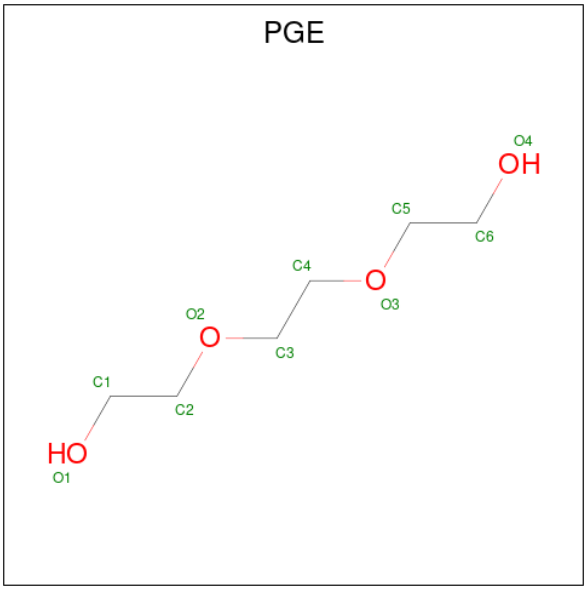
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
5	B	1	Total C O 7 4 3	0	0

- Molecule 6 is TRIETHYLENE GLYCOL (CCD ID: PGE) (formula: $C_6H_{14}O_4$).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
6	A	1	Total C O 10 6 4	0	0

- Molecule 7 is water.

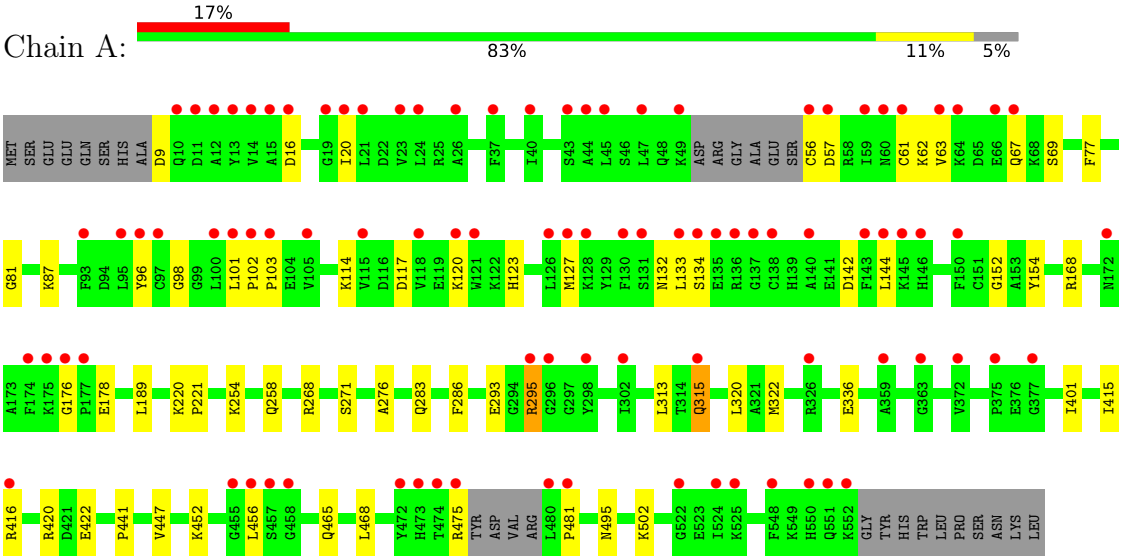
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
7	A	441	Total O 441 441	0	0
7	B	449	Total O 449 449	0	0

3 Residue-property plots (i)

These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and electron density. Residues are color-coded according to the number of geometric quality criteria for which they contain at least one outlier: green = 0, yellow = 1, orange = 2 and red = 3 or more. A red dot above a residue indicates a poor fit to the electron density (RSRZ > 2). Stretches of 2 or more consecutive residues without any outlier are shown as a green connector. Residues present in the sample, but not in the model, are shown in grey.

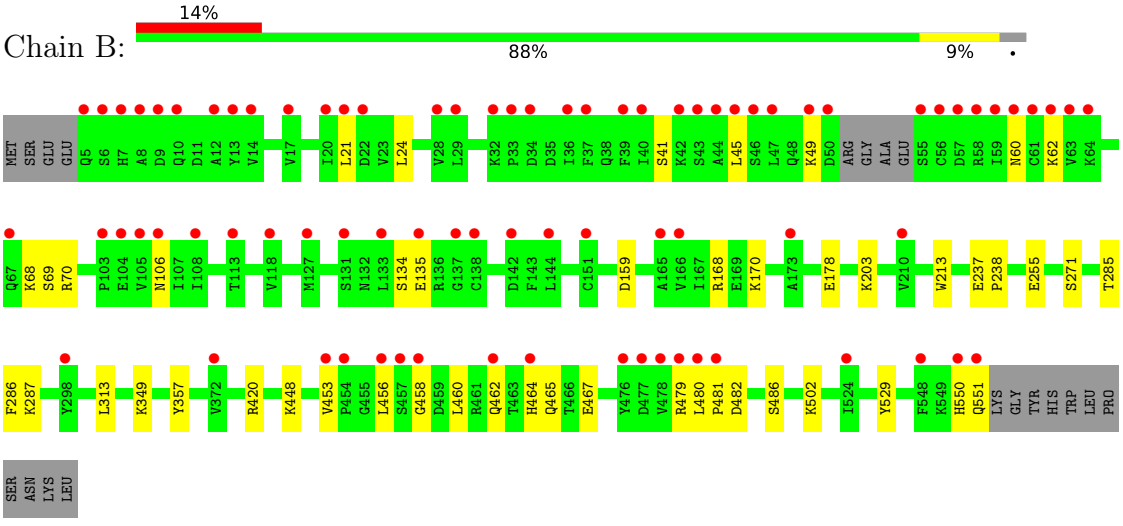
• Molecule 1: Glucose-6-phosphate 1-dehydrogenase

Chain A:



• Molecule 1: Glucose-6-phosphate 1-dehydrogenase

Chain B:



4 Data and refinement statistics (i)

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α, β, γ	223.23Å 65.65Å 119.25Å 90.00° 120.53° 90.00°	Depositor
Resolution (Å)	48.07 – 1.70 48.07 – 1.70	Depositor EDS
% Data completeness (in resolution range)	97.8 (48.07-1.70) 97.9 (48.07-1.70)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	1.00 (at 1.70Å)	Xtriage
Refinement program	PHENIX 1.19.2_4158, PHENIX 1.19.2_4158	Depositor
R, R_{free}	0.197 , 0.227 0.197 , 0.228	Depositor DCC
R_{free} test set	12794 reflections (8.00%)	wwPDB-VP
Wilson B-factor (Å^2)	33.5	Xtriage
Anisotropy	0.341	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.32 , 42.4	EDS
L-test for twinning[2]	$< \|L\| > = 0.50$, $< L^2 > = 0.33$	Xtriage
Estimated twinning fraction	0.014 for -h-2*l,-k,l	Xtriage
F_o,F_c correlation	0.97	EDS
Total number of atoms	9764	wwPDB-VP
Average B, all atoms (Å^2)	49.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.33% of the height of the origin peak. No significant pseudotranslation is detected.*

[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: SO4, PEG, PGE, NDP, EDO

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	0.28	0/4337	0.49	0/5863
1	B	0.27	0/4438	0.48	0/6003
All	All	0.28	0/8775	0.48	0/11866

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	4248	0	4222	56	0
1	B	4343	0	4310	37	0
2	A	48	0	26	2	0
2	B	48	0	26	0	0
3	A	48	0	72	10	0
3	B	52	0	78	3	0
4	A	20	0	0	0	0
4	B	15	0	0	0	0
5	A	21	0	29	6	0
5	B	21	0	30	6	0
6	A	10	0	14	2	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
7	A	441	0	0	14	2
7	B	449	0	0	5	2
All	All	9764	0	8807	94	2

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

All (94) 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:A:168:ARG:HH12	3:A:612:EDO:H12	1.40	0.86
1:B:159:ASP:OD2	7:B:701:HOH:O	2.04	0.76
1:B:349:LYS:HE3	5:B:606:PEG:H22	1.68	0.76
1:B:502:LYS:NZ	7:B:703:HOH:O	2.23	0.72
1:A:465:GLN:NE2	7:A:704:HOH:O	2.21	0.72
1:A:152:GLY:HA2	5:A:611:PEG:H32	1.73	0.69
1:B:168:ARG:HH12	3:B:617:EDO:H11	1.57	0.69
5:A:611:PEG:O4	7:A:701:HOH:O	2.09	0.68
1:B:420[A]:ARG:NH1	7:B:706:HOH:O	2.28	0.66
1:A:502:LYS:NZ	7:A:706:HOH:O	2.25	0.65
1:B:213:TRP:HE1	5:B:612:PEG:H31	1.61	0.65
5:A:605:PEG:H32	1:B:460:LEU:HD22	1.77	0.65
1:A:416:ARG:NH1	7:A:709:HOH:O	2.28	0.65
1:A:283:GLN:HG3	1:A:401:ILE:HB	1.80	0.64
1:B:349:LYS:HE2	5:B:606:PEG:H31	1.80	0.64
1:A:123:HIS:HD2	1:A:127:MET:HE1	1.62	0.63
1:B:69:SER:OG	1:B:178:GLU:OE2	2.16	0.62
1:A:315:GLN:HG2	3:A:610:EDO:O1	2.01	0.61
1:A:132:ASN:C	1:A:134:SER:H	2.08	0.60
1:A:114:LYS:HZ2	5:A:607:PEG:H12	1.65	0.60
1:A:271:SER:HB3	3:A:621:EDO:H22	1.85	0.58
1:A:221:PRO:HD3	3:A:616:EDO:H12	1.86	0.57
1:A:220:LYS:NZ	7:A:716:HOH:O	2.34	0.56
1:A:117:ASP:CG	1:A:120:LYS:HG2	2.31	0.56
1:A:481:PRO:HG2	1:B:456:LEU:CD2	2.36	0.55
1:B:60:ASN:O	1:B:62:LYS:HG3	2.06	0.55
1:A:69:SER:O	1:A:178:GLU:HB2	2.08	0.54
1:A:77:PHE:HB3	1:A:189:LEU:HD11	1.89	0.54
5:A:607:PEG:O1	7:A:702:HOH:O	2.18	0.53
1:A:87:LYS:NZ	2:A:601:NDP:H71N	2.07	0.53
1:B:271:SER:HB3	3:B:615:EDO:H11	1.90	0.52

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:123:HIS:CD2	1:A:127:MET:HE1	2.43	0.52
1:B:135:GLU:N	1:B:135:GLU:OE1	2.43	0.52
1:B:453:VAL:HG22	1:B:462:GLN:O	2.10	0.52
1:A:117:ASP:OD2	1:A:120:LYS:HG2	2.10	0.52
1:B:349:LYS:CE	5:B:606:PEG:H31	2.40	0.52
1:A:268:ARG:HH12	3:A:620:EDO:H11	1.74	0.51
1:A:441:PRO:HB2	1:A:475:ARG:HG3	1.92	0.51
1:A:315:GLN:HG3	7:A:746:HOH:O	2.10	0.51
1:B:482:ASP:HA	7:B:1000:HOH:O	2.11	0.50
1:A:456:LEU:HD23	1:B:481:PRO:HG2	1.94	0.49
1:A:452:LYS:NZ	1:B:255:GLU:OE1	2.42	0.49
1:B:49:LYS:HA	1:B:49:LYS:HE2	1.94	0.49
1:B:458:GLY:HA2	1:B:462:GLN:OE1	2.13	0.49
1:A:456:LEU:HD11	1:B:486:SER:CB	2.43	0.49
1:A:16:ASP:O	1:A:20:ILE:HG13	2.14	0.48
1:A:176:GLY:N	7:A:725:HOH:O	2.45	0.48
1:B:479:ARG:O	1:B:481:PRO:HD3	2.14	0.48
1:B:70:ARG:NH2	1:B:178:GLU:OE1	2.46	0.48
1:A:81:GLY:HA3	2:A:601:NDP:H52A	1.95	0.48
1:B:134:SER:HB2	1:B:135:GLU:OE1	2.15	0.47
1:A:9:ASP:N	1:A:9:ASP:OD1	2.46	0.47
1:B:21:LEU:HD23	1:B:24:LEU:HD12	1.97	0.47
1:B:285:THR:HG22	1:B:287:LYS:HG3	1.96	0.47
3:B:613:EDO:O1	7:B:702:HOH:O	2.20	0.47
1:B:480:LEU:HD12	1:B:480:LEU:O	2.16	0.46
1:A:293:GLU:C	1:A:295:ARG:H	2.22	0.46
3:A:606:EDO:H11	3:A:615:EDO:H12	1.98	0.45
1:A:422:GLU:OE1	6:A:614:PGE:H6	2.17	0.45
1:B:213:TRP:HE1	5:B:612:PEG:H22	1.81	0.45
3:A:615:EDO:H21	7:A:1027:HOH:O	2.17	0.44
1:A:276:ALA:HB3	3:A:613:EDO:H21	2.00	0.44
1:B:68:LYS:HE3	1:B:68:LYS:HB2	1.54	0.44
1:A:268:ARG:HH22	3:A:620:EDO:H22	1.82	0.44
1:A:258:GLN:NE2	7:A:730:HOH:O	2.51	0.44
1:A:67:GLN:NE2	7:A:718:HOH:O	2.36	0.44
1:B:286:PHE:HB2	1:B:313:LEU:HD21	1.99	0.44
1:A:254:LYS:HE2	1:A:254:LYS:HB2	1.90	0.44
3:A:606:EDO:O1	7:A:703:HOH:O	2.21	0.43
1:A:127:MET:HE2	1:A:144:LEU:HD11	2.00	0.43
1:A:320:LEU:HD11	1:A:415:ILE:CG2	2.48	0.43
1:A:142:ASP:OD1	7:A:705:HOH:O	2.22	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:322:MET:HB2	1:A:336:GLU:HB3	2.00	0.43
1:A:154:TYR:CZ	1:A:189:LEU:HD21	2.54	0.43
1:B:237:GLU:N	1:B:238:PRO:HD2	2.34	0.42
1:B:448:LYS:HG2	1:B:467:GLU:HG2	2.01	0.42
1:B:465:GLN:OE1	1:B:551:GLN:NE2	2.46	0.42
1:A:96:TYR:HB2	1:A:101:LEU:HD12	2.01	0.42
1:A:420:ARG:HH21	6:A:614:PGE:H3	1.84	0.42
1:A:420:ARG:HD2	7:A:996:HOH:O	2.20	0.42
1:A:495:ASN:HD21	5:A:605:PEG:H42	1.85	0.41
1:A:286:PHE:HB2	1:A:313:LEU:HD21	2.01	0.41
1:A:102:PRO:HA	1:A:103:PRO:HD3	1.92	0.41
1:A:320:LEU:HD11	1:A:415:ILE:HG21	2.02	0.41
1:A:456:LEU:HA	1:A:456:LEU:HD13	1.90	0.41
1:B:106:ASN:OD1	1:B:170:LYS:HB3	2.21	0.41
1:B:357:TYR:HB3	1:B:529:TYR:CZ	2.55	0.41
1:A:61:CYS:SG	1:A:63:VAL:HG22	2.61	0.41
1:A:254:LYS:O	1:A:258:GLN:HG3	2.21	0.41
1:A:456:LEU:HD11	1:B:486:SER:HB2	2.02	0.41
1:A:447:VAL:HG22	1:A:468:LEU:HB2	2.03	0.41
1:A:56:CYS:SG	1:A:57:ASP:N	2.93	0.40
1:A:62:LYS:HD3	1:A:98:GLY:O	2.20	0.40
1:B:550:HIS:NE2	5:B:609:PEG:O2	2.45	0.40

All (2) symmetry-related close contacts are listed below. The label for Atom-2 includes the symmetry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
7:A:1004:HOH:O	7:B:738:HOH:O[4_556]	2.09	0.11
7:A:836:HOH:O	7:B:1024:HOH:O[4_546]	2.11	0.09

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	531/562 (94%)	513 (97%)	17 (3%)	1 (0%)	44 29
1	B	545/562 (97%)	535 (98%)	10 (2%)	0	100 100
All	All	1076/1124 (96%)	1048 (97%)	27 (2%)	1 (0%)	48 32

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	133	LEU

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	461/482 (96%)	459 (100%)	2 (0%)	89 85
1	B	472/482 (98%)	468 (99%)	4 (1%)	79 71
All	All	933/964 (97%)	927 (99%)	6 (1%)	84 78

All (6) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	295	ARG
1	A	315	GLN
1	B	41	SER
1	B	45	LEU
1	B	203	LYS
1	B	464	HIS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (7) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	38	GLN
1	A	301	ASN
1	A	356	GLN
1	A	517	HIS

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Mol	Chain	Res	Type
1	B	202	HIS
1	B	356	GLN
1	B	489	ASN

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

41 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	$\#\|Z\| > 2$
3	EDO	A	604	-	3,3,3	0.50	0	2,2,2	0.51	0
3	EDO	B	608	-	3,3,3	0.47	0	2,2,2	0.39	0
3	EDO	B	605	-	3,3,3	0.60	0	2,2,2	0.04	0
3	EDO	B	617	-	3,3,3	0.45	0	2,2,2	0.21	0
5	PEG	A	605	-	6,6,6	0.81	0	5,5,5	0.26	0
5	PEG	A	611	-	6,6,6	0.78	0	5,5,5	0.28	0
6	PGE	A	614	-	9,9,9	0.80	0	8,8,8	0.30	0
3	EDO	B	610	-	3,3,3	0.45	0	2,2,2	0.35	0
2	NDP	A	601	-	45,52,52	3.87	18 (40%)	53,80,80	2.11	6 (11%)
3	EDO	A	606	-	3,3,3	0.46	0	2,2,2	0.30	0
4	SO4	A	619	-	4,4,4	0.12	0	6,6,6	0.09	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\#\|Z\|>2$	Counts	RMSZ	$\#\|Z\|>2$
3	EDO	A	612	-	3,3,3	0.46	0	2,2,2	0.21	0
4	SO4	A	617	-	4,4,4	0.15	0	6,6,6	0.05	0
3	EDO	B	619	-	3,3,3	0.48	0	2,2,2	0.32	0
5	PEG	B	612	-	6,6,6	0.73	0	5,5,5	0.34	0
3	EDO	A	613	-	3,3,3	0.53	0	2,2,2	0.49	0
4	SO4	B	618	-	4,4,4	0.15	0	6,6,6	0.07	0
3	EDO	B	604	-	3,3,3	0.49	0	2,2,2	0.26	0
3	EDO	A	616	-	3,3,3	0.49	0	2,2,2	0.32	0
4	SO4	A	618	-	4,4,4	0.15	0	6,6,6	0.05	0
3	EDO	A	620	-	3,3,3	0.45	0	2,2,2	0.35	0
3	EDO	B	611	-	3,3,3	0.47	0	2,2,2	0.29	0
5	PEG	A	607	-	6,6,6	0.71	0	5,5,5	0.27	0
5	PEG	B	606	-	6,6,6	0.74	0	5,5,5	0.55	0
3	EDO	B	614	-	3,3,3	0.37	0	2,2,2	0.63	0
2	NDP	B	601	-	45,52,52	3.78	18 (40%)	53,80,80	2.01	5 (9%)
3	EDO	B	616	-	3,3,3	0.46	0	2,2,2	0.47	0
5	PEG	B	609	-	6,6,6	0.77	0	5,5,5	0.47	0
3	EDO	A	610	-	3,3,3	0.66	0	2,2,2	0.22	0
3	EDO	A	621	-	3,3,3	0.66	0	2,2,2	0.14	0
3	EDO	A	615	-	3,3,3	0.47	0	2,2,2	0.17	0
3	EDO	A	602	-	3,3,3	0.47	0	2,2,2	0.29	0
3	EDO	B	615	-	3,3,3	0.48	0	2,2,2	0.29	0
4	SO4	A	603	-	4,4,4	0.20	0	6,6,6	0.24	0
3	EDO	A	608	-	3,3,3	0.47	0	2,2,2	0.43	0
3	EDO	B	613	-	3,3,3	0.44	0	2,2,2	0.37	0
3	EDO	B	602	-	3,3,3	0.46	0	2,2,2	0.32	0
3	EDO	B	620	-	3,3,3	0.62	0	2,2,2	0.10	0
4	SO4	B	607	-	4,4,4	0.16	0	6,6,6	0.19	0
4	SO4	B	603	-	4,4,4	0.17	0	6,6,6	0.29	0
3	EDO	A	609	-	3,3,3	0.48	0	2,2,2	0.22	0

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
3	EDO	A	604	-	-	0/1/1/1	-
3	EDO	B	608	-	-	0/1/1/1	-
3	EDO	B	605	-	-	1/1/1/1	-
3	EDO	B	617	-	-	0/1/1/1	-
5	PEG	A	605	-	-	0/4/4/4	-

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
5	PEG	A	611	-	-	2/4/4/4	-
6	PGE	A	614	-	-	4/7/7/7	-
3	EDO	B	610	-	-	1/1/1/1	-
2	NDP	A	601	-	-	4/30/77/77	0/5/5/5
3	EDO	A	606	-	-	0/1/1/1	-
3	EDO	A	612	-	-	0/1/1/1	-
3	EDO	B	619	-	-	0/1/1/1	-
5	PEG	B	612	-	-	0/4/4/4	-
3	EDO	A	613	-	-	0/1/1/1	-
3	EDO	B	604	-	-	0/1/1/1	-
3	EDO	A	616	-	-	1/1/1/1	-
3	EDO	A	620	-	-	0/1/1/1	-
3	EDO	B	611	-	-	0/1/1/1	-
5	PEG	A	607	-	-	2/4/4/4	-
5	PEG	B	606	-	-	2/4/4/4	-
3	EDO	B	614	-	-	0/1/1/1	-
2	NDP	B	601	-	-	5/30/77/77	0/5/5/5
3	EDO	B	616	-	-	0/1/1/1	-
5	PEG	B	609	-	-	2/4/4/4	-
3	EDO	A	610	-	-	0/1/1/1	-
3	EDO	A	621	-	-	1/1/1/1	-
3	EDO	A	615	-	-	0/1/1/1	-
3	EDO	A	602	-	-	0/1/1/1	-
3	EDO	B	615	-	-	0/1/1/1	-
3	EDO	A	608	-	-	0/1/1/1	-
3	EDO	B	613	-	-	0/1/1/1	-
3	EDO	B	602	-	-	0/1/1/1	-
3	EDO	B	620	-	-	0/1/1/1	-
3	EDO	A	609	-	-	1/1/1/1	-

All (36) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	601	NDP	O4B-C1B	13.02	1.59	1.41
2	A	601	NDP	O4B-C1B	12.90	1.59	1.41
2	A	601	NDP	C6N-C5N	11.99	1.54	1.33
2	B	601	NDP	C6N-C5N	11.87	1.54	1.33
2	A	601	NDP	O4D-C1D	7.33	1.59	1.42
2	B	601	NDP	O4D-C1D	7.20	1.59	1.42
2	A	601	NDP	C2D-C1D	-7.09	1.30	1.53
2	B	601	NDP	C2D-C1D	-6.96	1.31	1.53

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	601	NDP	O4D-C4D	-6.79	1.29	1.45
2	A	601	NDP	O4B-C4B	-6.36	1.30	1.45
2	B	601	NDP	O4B-C4B	-6.02	1.31	1.45
2	B	601	NDP	O4D-C4D	-5.85	1.31	1.45
2	A	601	NDP	C2N-C3N	5.23	1.49	1.34
2	B	601	NDP	C2N-C3N	4.99	1.48	1.34
2	A	601	NDP	C4N-C3N	4.58	1.58	1.49
2	A	601	NDP	O2D-C2D	4.22	1.52	1.43
2	B	601	NDP	O2D-C2D	4.20	1.52	1.43
2	B	601	NDP	C4N-C3N	4.20	1.58	1.49
2	A	601	NDP	C6N-N1N	3.61	1.46	1.37
2	B	601	NDP	C7N-N7N	3.46	1.42	1.33
2	A	601	NDP	P2B-O2B	3.45	1.65	1.59
2	A	601	NDP	C7N-N7N	3.36	1.42	1.33
2	A	601	NDP	C6A-N6A	3.29	1.46	1.34
2	B	601	NDP	C6A-N6A	3.28	1.46	1.34
2	B	601	NDP	P2B-O2B	3.23	1.65	1.59
2	A	601	NDP	C4N-C5N	3.21	1.57	1.48
2	B	601	NDP	C4N-C5N	3.11	1.57	1.48
2	B	601	NDP	C6N-N1N	3.03	1.44	1.37
2	B	601	NDP	C2A-N3A	2.92	1.36	1.32
2	A	601	NDP	C2A-N3A	2.65	1.36	1.32
2	B	601	NDP	C5D-C4D	2.46	1.59	1.51
2	A	601	NDP	C5D-C4D	2.41	1.59	1.51
2	A	601	NDP	C5A-C4A	-2.38	1.34	1.40
2	B	601	NDP	C5A-C4A	-2.31	1.34	1.40
2	A	601	NDP	PA-O5B	2.04	1.67	1.59
2	B	601	NDP	PA-O5B	2.04	1.67	1.59

All (11) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	A	601	NDP	C5A-C6A-N6A	8.59	133.40	120.35
2	B	601	NDP	C5A-C6A-N6A	8.27	132.91	120.35
2	A	601	NDP	C1B-N9A-C4A	-7.76	113.01	126.64
2	B	601	NDP	C1B-N9A-C4A	-7.19	114.01	126.64
2	A	601	NDP	N6A-C6A-N1A	-5.89	106.35	118.57
2	B	601	NDP	N6A-C6A-N1A	-5.67	106.81	118.57
2	B	601	NDP	N3A-C2A-N1A	-5.25	120.47	128.68
2	A	601	NDP	N3A-C2A-N1A	-5.13	120.66	128.68
2	A	601	NDP	C5B-C4B-C3B	-2.09	107.35	115.18
2	B	601	NDP	PN-O3-PA	-2.08	125.68	132.83

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Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	A	601	NDP	O4D-C1D-N1N	-2.03	104.08	108.06

There are no chirality outliers.

All (26) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	A	601	NDP	C2B-O2B-P2B-O1X
2	B	601	NDP	C2B-O2B-P2B-O1X
5	B	609	PEG	C1-C2-O2-C3
5	B	606	PEG	O2-C3-C4-O4
5	B	606	PEG	O1-C1-C2-O2
6	A	614	PGE	O1-C1-C2-O2
6	A	614	PGE	O3-C5-C6-O4
5	A	611	PEG	C1-C2-O2-C3
5	B	609	PEG	O2-C3-C4-O4
3	A	616	EDO	O1-C1-C2-O2
3	B	610	EDO	O1-C1-C2-O2
5	A	607	PEG	O2-C3-C4-O4
3	B	605	EDO	O1-C1-C2-O2
2	A	601	NDP	PN-O3-PA-O1A
6	A	614	PGE	O2-C3-C4-O3
6	A	614	PGE	C4-C3-O2-C2
5	A	607	PEG	O1-C1-C2-O2
2	B	601	NDP	O4D-C1D-N1N-C6N
2	A	601	NDP	O4D-C1D-N1N-C6N
2	B	601	NDP	PN-O3-PA-O2A
2	A	601	NDP	C2D-C1D-N1N-C6N
2	B	601	NDP	C2D-C1D-N1N-C6N
3	A	621	EDO	O1-C1-C2-O2
2	B	601	NDP	PN-O3-PA-O1A
5	A	611	PEG	C4-C3-O2-C2
3	A	609	EDO	O1-C1-C2-O2

There are no ring outliers.

19 monomers are involved in 29 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	B	617	EDO	1	0
5	A	605	PEG	2	0
5	A	611	PEG	2	0
6	A	614	PGE	2	0

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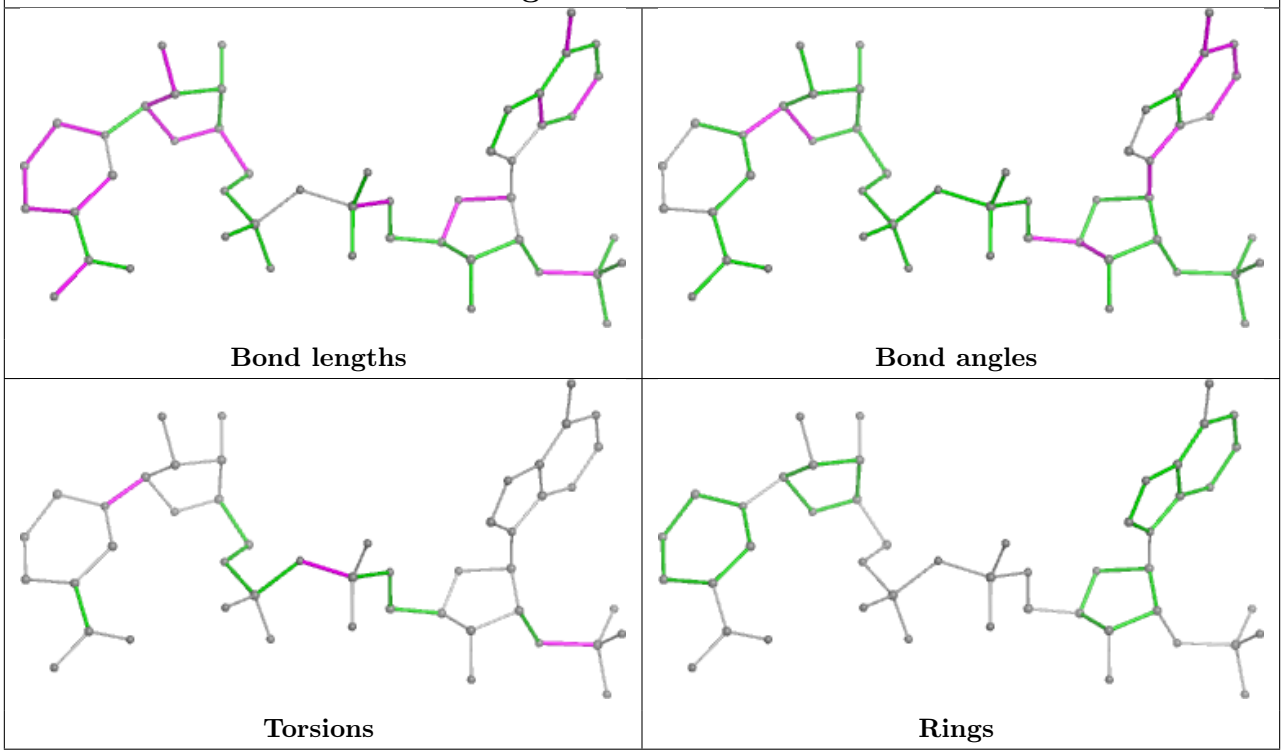
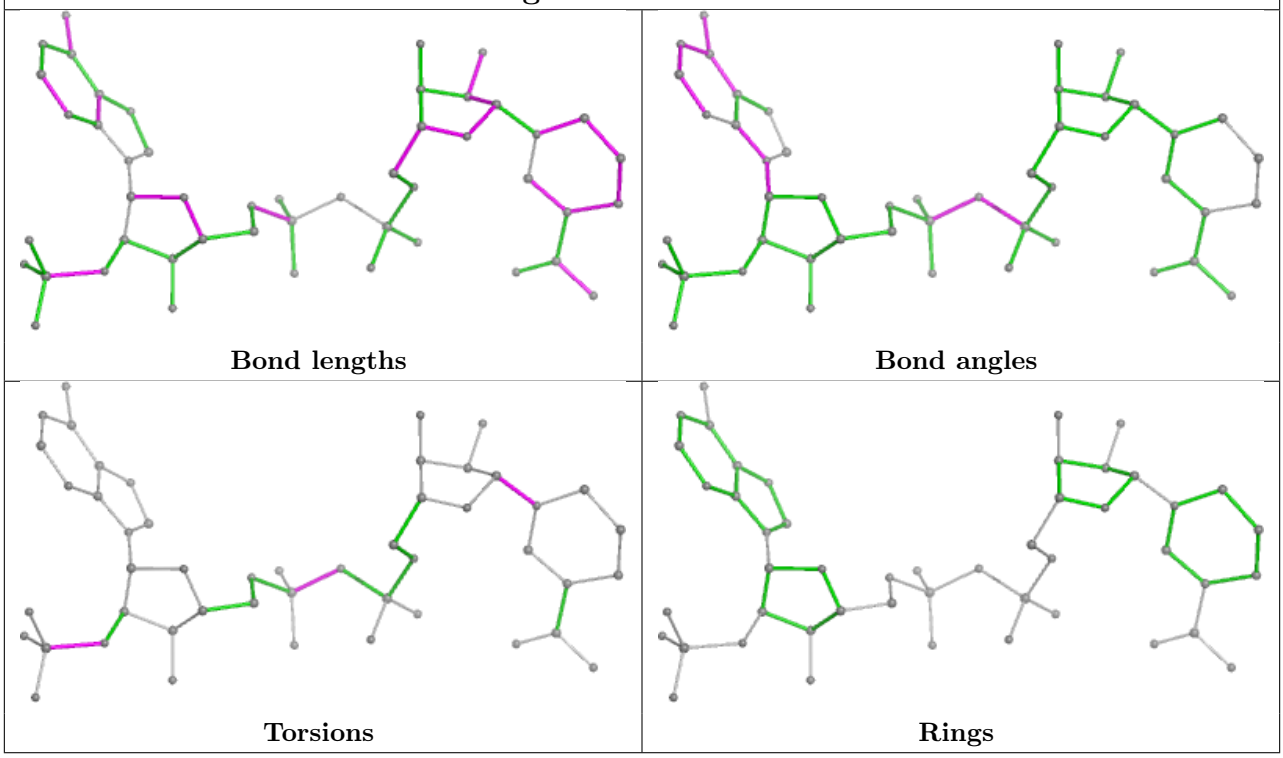
Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	A	601	NDP	2	0
3	A	606	EDO	2	0
3	A	612	EDO	1	0
5	B	612	PEG	2	0
3	A	613	EDO	1	0
3	A	616	EDO	1	0
3	A	620	EDO	2	0
5	A	607	PEG	2	0
5	B	606	PEG	3	0
5	B	609	PEG	1	0
3	A	610	EDO	1	0
3	A	621	EDO	1	0
3	A	615	EDO	2	0
3	B	615	EDO	1	0
3	B	613	EDO	1	0

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 A 601



Ligand NDP B 601



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	534/562 (95%)	0.86	93 (17%)	5 4	14, 42, 84, 107	3 (0%)
1	B	543/562 (96%)	0.86	80 (14%)	7 6	14, 42, 91, 120	6 (1%)
All	All	1077/1124 (95%)	0.86	173 (16%)	5 5	14, 42, 88, 120	9 (0%)

All (173) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	480	LEU	7.0
1	B	480	LEU	6.7
1	A	456	LEU	6.2
1	A	550	HIS	6.1
1	A	298	TYR	5.9
1	B	56	CYS	5.7
1	B	59	ILE	5.6
1	B	36	ILE	5.3
1	B	481	PRO	5.1
1	B	37	PHE	5.0
1	A	47	LEU	4.6
1	A	12	ALA	4.5
1	A	133	LEU	4.5
1	B	456	LEU	4.4
1	B	478	VAL	4.3
1	A	481	PRO	4.1
1	B	40	ILE	4.1
1	B	458	GLY	4.1
1	A	59	ILE	4.0
1	A	551	GLN	4.0
1	B	47	LEU	3.9
1	B	39	PHE	3.9
1	B	138	CYS	3.8
1	B	29	LEU	3.8

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Mol	Chain	Res	Type	RSRZ
1	B	8	ALA	3.7
1	A	14	VAL	3.6
1	A	548	PHE	3.6
1	A	13	TYR	3.5
1	B	67	GLN	3.5
1	B	550	HIS	3.5
1	A	56	CYS	3.5
1	B	548	PHE	3.4
1	B	45	LEU	3.4
1	A	176	GLY	3.4
1	B	137	GLY	3.4
1	A	372	VAL	3.3
1	A	49	LYS	3.3
1	A	45	LEU	3.3
1	A	23	VAL	3.3
1	A	177	PRO	3.3
1	A	130	PHE	3.2
1	B	479	ARG	3.2
1	A	115	VAL	3.2
1	B	524	ILE	3.2
1	B	551	GLN	3.2
1	A	137	GLY	3.2
1	B	50	ASP	3.1
1	A	121	TRP	3.1
1	A	15	ALA	3.1
1	A	144	LEU	3.1
1	A	455	GLY	3.1
1	A	40	ILE	3.0
1	A	458	GLY	3.0
1	B	60	ASN	3.0
1	A	63	VAL	3.0
1	B	6	SER	3.0
1	A	64	LYS	3.0
1	A	24	LEU	3.0
1	B	9	ASP	3.0
1	B	133	LEU	2.9
1	B	10	GLN	2.9
1	B	43	SER	2.9
1	B	55	SER	2.9
1	A	67	GLN	2.9
1	A	474	THR	2.9
1	A	135	GLU	2.9

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Mol	Chain	Res	Type	RSRZ
1	B	63	VAL	2.9
1	B	372	VAL	2.9
1	A	315	GLN	2.9
1	A	295	ARG	2.8
1	A	475	ARG	2.8
1	B	21	LEU	2.8
1	A	19	GLY	2.8
1	A	473	HIS	2.8
1	A	20	ILE	2.8
1	B	453	VAL	2.8
1	A	524	ILE	2.7
1	A	10	GLN	2.7
1	B	103	PRO	2.7
1	B	28	VAL	2.7
1	B	13	TYR	2.7
1	B	298	TYR	2.7
1	A	416	ARG	2.7
1	A	138	CYS	2.7
1	B	12	ALA	2.7
1	B	173	ALA	2.7
1	B	14	VAL	2.7
1	B	104	GLU	2.7
1	B	22	ASP	2.7
1	B	34	ASP	2.7
1	A	118	VAL	2.7
1	A	472	TYR	2.7
1	B	7	HIS	2.7
1	A	145	LYS	2.7
1	A	102	PRO	2.6
1	B	17	VAL	2.6
1	B	58	ARG	2.6
1	B	118	VAL	2.6
1	A	11	ASP	2.6
1	A	296	GLY	2.6
1	B	457	SER	2.6
1	A	66	GLU	2.6
1	A	96	TYR	2.6
1	B	454	PRO	2.6
1	A	21	LEU	2.6
1	A	134	SER	2.6
1	A	175	LYS	2.6
1	B	20	ILE	2.6

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Mol	Chain	Res	Type	RSRZ
1	B	46	SER	2.5
1	B	477	ASP	2.5
1	A	457	SER	2.5
1	B	462	GLN	2.5
1	B	44	ALA	2.5
1	A	101	LEU	2.4
1	A	103	PRO	2.4
1	A	377	GLY	2.4
1	B	32	LYS	2.4
1	A	37	PHE	2.4
1	A	143	PHE	2.4
1	B	135	GLU	2.4
1	A	552	LYS	2.4
1	A	136	ARG	2.4
1	A	359	ALA	2.4
1	B	49	LYS	2.3
1	A	61	CYS	2.3
1	A	97	CYS	2.3
1	B	5	GLN	2.3
1	A	44	ALA	2.3
1	A	126	LEU	2.3
1	B	61	CYS	2.3
1	B	33	PRO	2.3
1	B	108	ILE	2.3
1	A	363	GLY	2.3
1	A	522	GLY	2.3
1	B	127	MET	2.2
1	A	120	LYS	2.2
1	A	525	LYS	2.2
1	A	93	PHE	2.2
1	A	150	PHE	2.2
1	A	174	PHE	2.2
1	A	326	ARG	2.2
1	B	105	VAL	2.2
1	A	146	HIS	2.2
1	A	127	MET	2.2
1	B	62	LYS	2.2
1	B	210	VAL	2.2
1	A	26	ALA	2.2
1	A	43	SER	2.2
1	A	128	LYS	2.1
1	B	64	LYS	2.1

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Mol	Chain	Res	Type	RSRZ
1	B	165	ALA	2.1
1	B	464	HIS	2.1
1	A	95	LEU	2.1
1	A	105	VAL	2.1
1	B	166	VAL	2.1
1	B	57	ASP	2.1
1	B	42	LYS	2.1
1	B	151	CYS	2.1
1	B	113	THR	2.1
1	A	302	ILE	2.1
1	A	131	SER	2.1
1	B	131	SER	2.1
1	A	57	ASP	2.1
1	B	142	ASP	2.1
1	A	100	LEU	2.1
1	A	140	ALA	2.0
1	A	60	ASN	2.0
1	B	144	LEU	2.0
1	B	476	TYR	2.0
1	A	16	ASP	2.0
1	A	172	ASN	2.0
1	B	106	ASN	2.0
1	A	375	PRO	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, 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.

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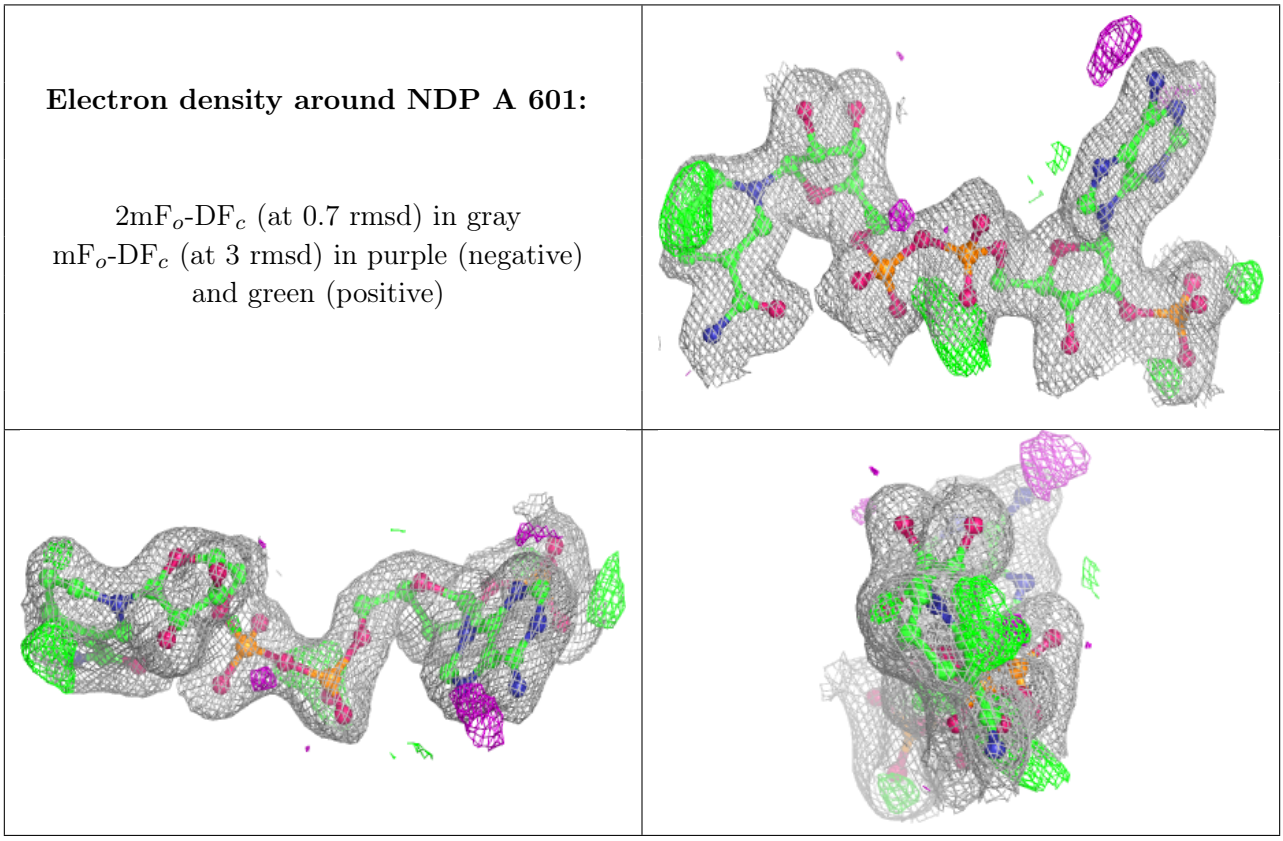
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å^2)	Q<0.9
3	EDO	B	619	4/4	0.51	0.20	76,81,84,85	0
3	EDO	A	609	4/4	0.64	0.23	70,72,77,79	0
5	PEG	B	609	7/7	0.65	0.22	61,64,72,77	0
4	SO4	B	618	5/5	0.76	0.11	86,89,95,107	0
5	PEG	A	607	7/7	0.76	0.24	49,55,71,72	0
3	EDO	A	616	4/4	0.76	0.23	54,57,64,73	0
3	EDO	A	620	4/4	0.79	0.19	56,59,65,79	0
3	EDO	B	617	4/4	0.79	0.20	63,65,66,69	0
4	SO4	A	619	5/5	0.80	0.15	53,74,83,83	0
3	EDO	A	602	4/4	0.80	0.20	70,74,78,78	0
5	PEG	B	606	7/7	0.81	0.19	46,53,61,61	0
5	PEG	A	611	7/7	0.83	0.19	41,49,57,59	0
5	PEG	A	605	7/7	0.83	0.19	40,48,50,60	0
3	EDO	B	614	4/4	0.83	0.23	51,51,74,83	0
6	PGE	A	614	10/10	0.83	0.19	39,66,72,72	0
5	PEG	B	612	7/7	0.85	0.18	45,56,74,81	0
3	EDO	B	610	4/4	0.85	0.15	71,72,80,84	0
3	EDO	A	613	4/4	0.86	0.14	38,46,58,60	0
4	SO4	A	618	5/5	0.87	0.13	60,61,63,66	0
3	EDO	A	621	4/4	0.87	0.20	31,38,42,46	0
3	EDO	A	615	4/4	0.88	0.17	46,47,56,67	0
3	EDO	B	605	4/4	0.89	0.15	47,49,50,53	0
3	EDO	B	613	4/4	0.90	0.14	45,45,54,62	0
3	EDO	A	606	4/4	0.91	0.14	48,51,53,53	0
3	EDO	B	604	4/4	0.91	0.12	47,53,54,55	0
3	EDO	B	616	4/4	0.91	0.13	47,47,49,51	0
3	EDO	A	612	4/4	0.91	0.14	42,51,53,60	0
3	EDO	A	608	4/4	0.91	0.12	43,44,49,54	0
3	EDO	B	615	4/4	0.92	0.22	28,38,43,48	0
3	EDO	B	608	4/4	0.92	0.14	41,45,45,47	0
2	NDP	A	601	48/48	0.95	0.09	38,44,55,59	0
4	SO4	A	617	5/5	0.95	0.10	56,60,64,66	0
2	NDP	B	601	48/48	0.95	0.09	34,43,49,67	0
3	EDO	B	602	4/4	0.95	0.10	36,39,39,41	0
4	SO4	B	603	5/5	0.96	0.08	40,45,49,52	0
4	SO4	B	607	5/5	0.96	0.09	50,52,55,55	0
3	EDO	A	604	4/4	0.97	0.08	41,42,43,44	0
3	EDO	B	620	4/4	0.97	0.08	35,35,36,36	0
4	SO4	A	603	5/5	0.97	0.07	40,47,49,56	0
3	EDO	A	610	4/4	0.97	0.11	33,34,35,38	0
3	EDO	B	611	4/4	0.98	0.07	38,42,42,42	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.

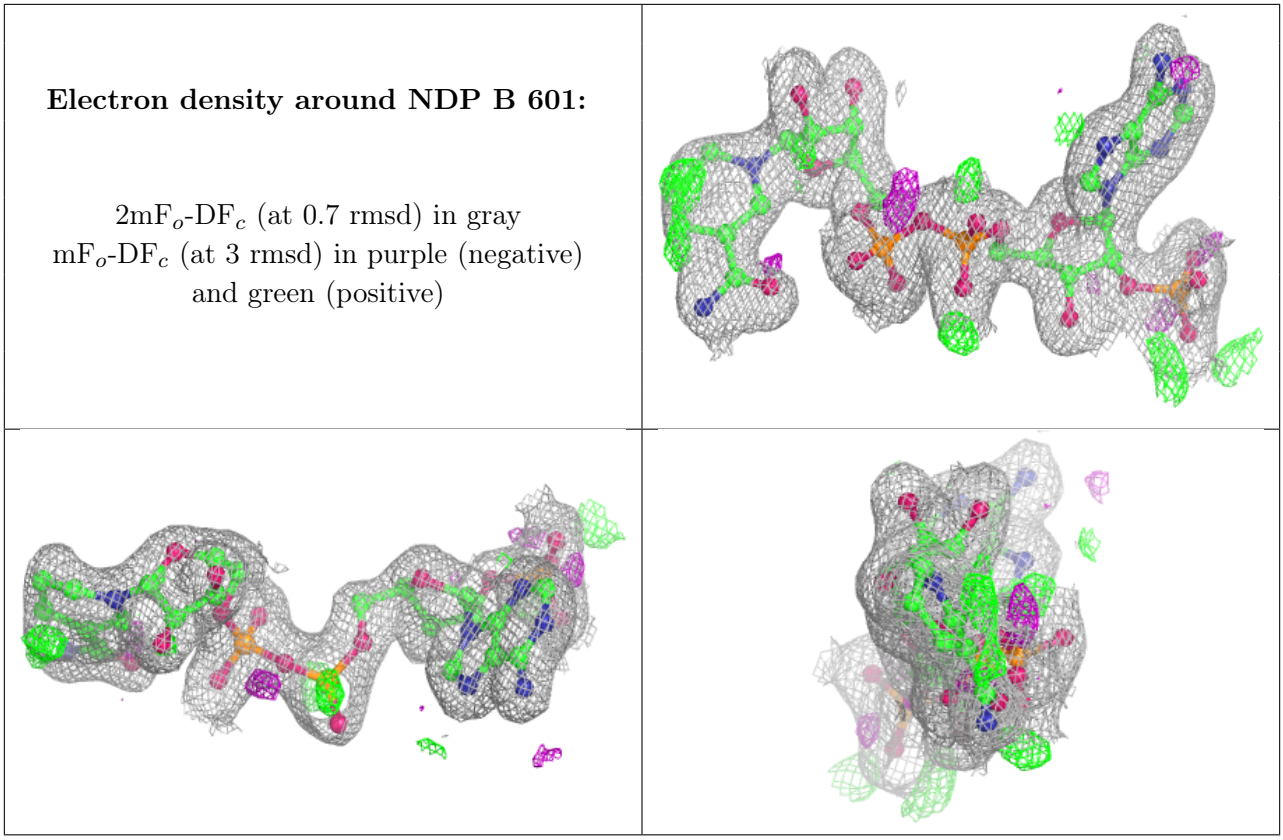
Electron density around NDP A 601:

$2mF_o$-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 601:

$2mF_o$-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.