



Full wwPDB X-ray Structure Validation Report ⓘ

Sep 13, 2026 – 06:13 PM JST

PDB ID : 23JV / pdb_000023jv
Title : Crystal structure of human cytosolic NADP(+)-dependent malic enzyme in complex with small molecules
Authors : Huang, S.J.; Wen, W.Y.
Deposited on : 2026-02-09
Resolution : 2.03 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	:	1.8.5 (274361), CSD as541be (2020)
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	:	9.0.015 (Gargrove)
Density-Fitness	:	1.0.12
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.50

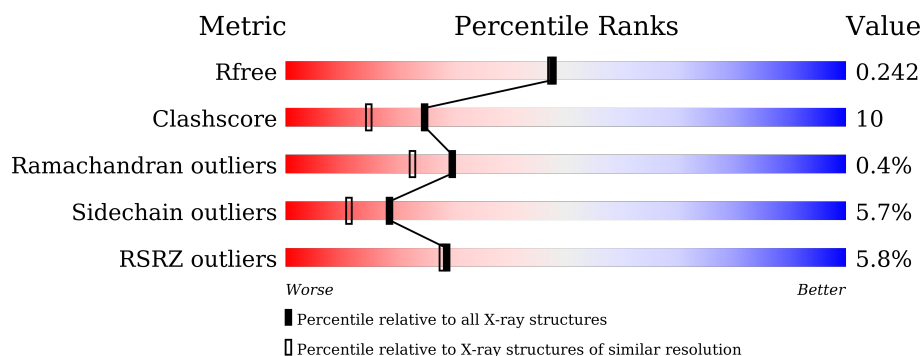
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.03 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	13299 (2.04-2.00)
Clashscore	190562	1022 (2.02-2.02)
Ramachandran outliers	187476	1014 (2.02-2.02)
Sidechain outliers	187428	1014 (2.02-2.02)
RSRZ outliers	180081	13314 (2.04-2.00)

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	572	% 84% 14% ..
1	B	572	3% 81% 16% ..
1	C	572	12% 70% 24% . ..
1	D	572	6% 80% 17% ...

2 Entry composition ⓘ

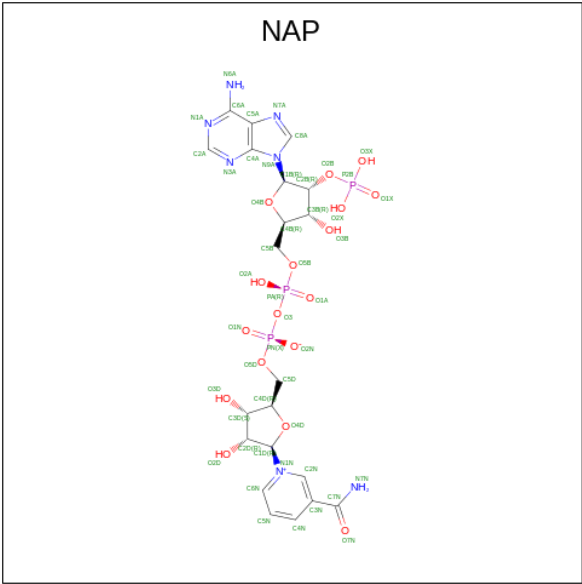
There are 5 unique types of molecules in this entry. The entry contains 19256 atoms, of which 0 are hydrogens and 0 are deuteriums.

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 NADP-dependent malic enzyme.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	564	Total	C	N	O	S	0	0	0
			4447	2831	764	832	20			
1	C	563	Total	C	N	O	S	0	0	0
			4440	2827	763	830	20			
1	B	563	Total	C	N	O	S	0	0	0
			4442	2828	763	831	20			
1	D	564	Total	C	N	O	S	0	0	0
			4451	2834	765	832	20			

- Molecule 2 is NADP NICOTINAMIDE-ADENINE-DINUCLEOTIDE PHOSPHATE (CCD ID: NAP) (formula: C₂₁H₂₈N₇O₁₇P₃).



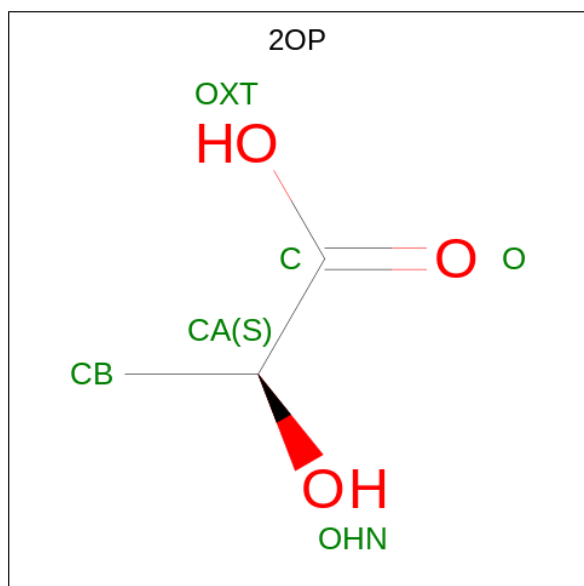
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Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
2	B	1	Total	C	N	O	P	0	0
			48	21	7	17	3		
2	D	1	Total	C	N	O	P	0	0
			48	21	7	17	3		

- Molecule 3 is MANGANESE (II) ION (CCD ID: MN) (formula: Mn).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	1	Total	Mn	0	0
			1	1		
3	C	1	Total	Mn	0	0
			1	1		
3	B	1	Total	Mn	0	0
			1	1		
3	D	1	Total	Mn	0	0
			1	1		

- Molecule 4 is (2S)-2-HYDROXYPROPANOIC ACID (CCD ID: 2OP) (formula: C₃H₆O₃) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
4	C	1	Total	C	O	0	0
			6	3	3		
4	D	1	Total	C	O	0	0
			6	3	3		

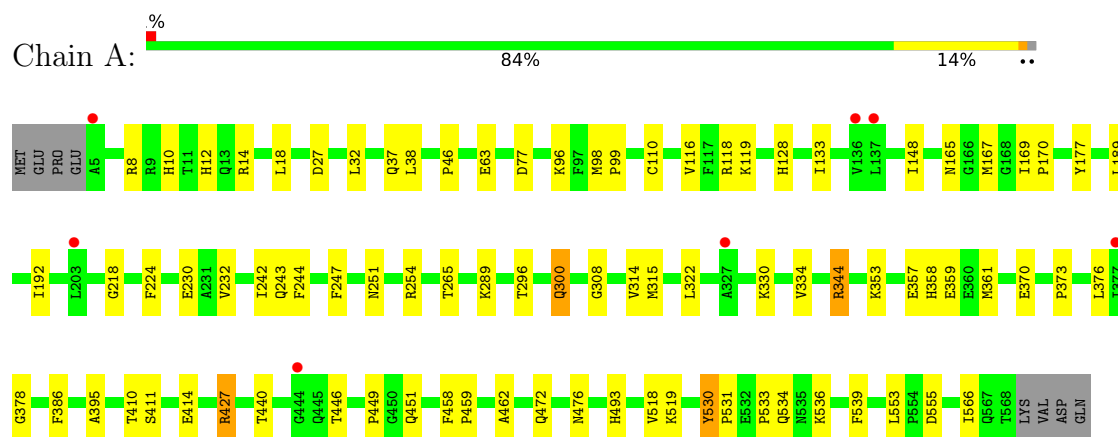
- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	404	Total 404	O 404	0	0
5	C	310	Total 310	O 310	0	0
5	B	283	Total 283	O 283	0	0
5	D	271	Total 271	O 271	0	0

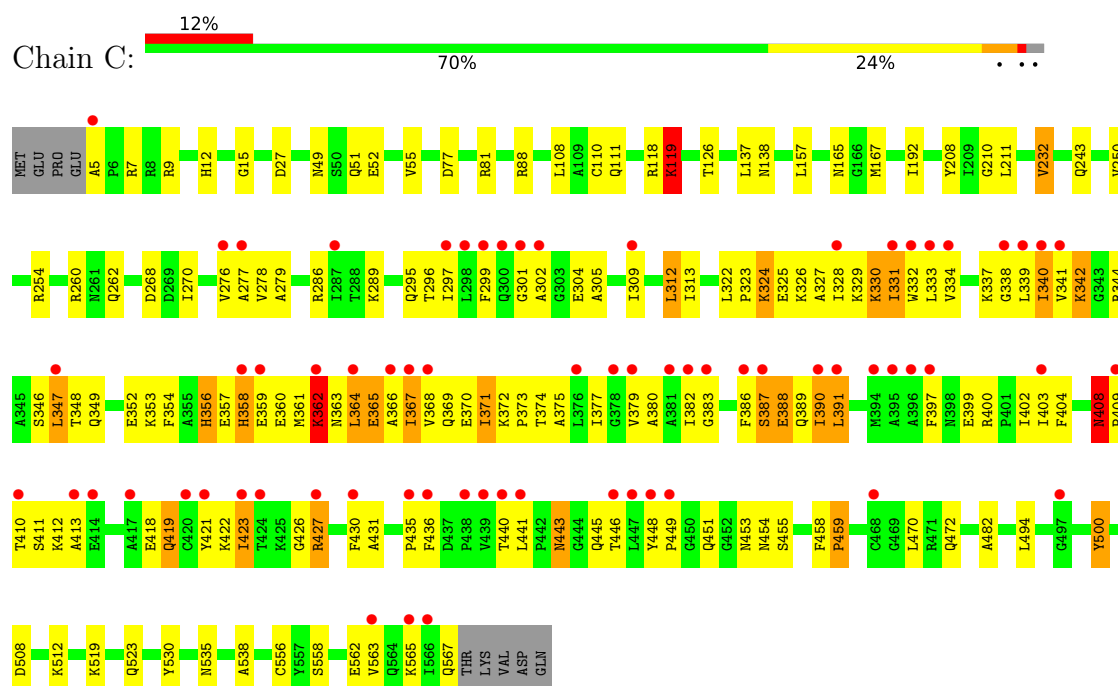
3 Residue-property plots

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.

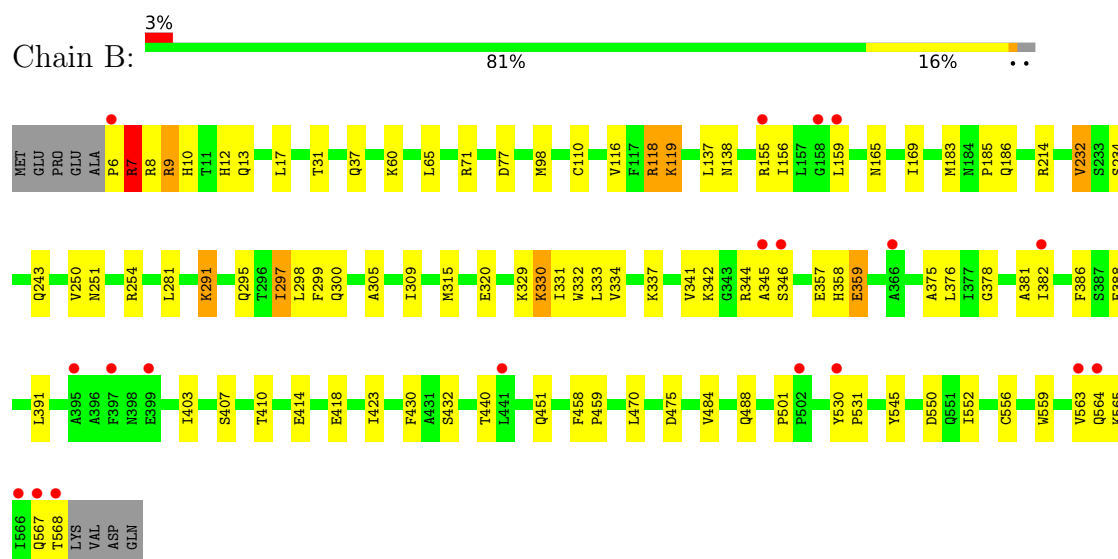
• Molecule 1: NADP-dependent malic enzyme



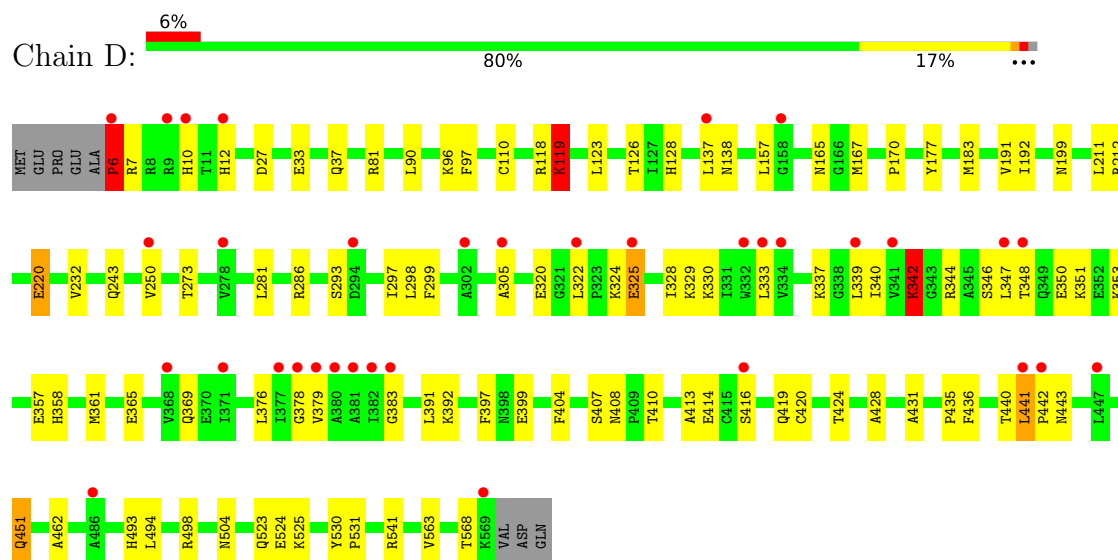
• Molecule 1: NADP-dependent malic enzyme



• Molecule 1: NADP-dependent malic enzyme



• Molecule 1: NADP-dependent malic enzyme



4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	70.55Å 180.59Å 108.04Å 90.00° 106.09° 90.00°	Depositor
Resolution (Å)	32.96 – 2.03 32.96 – 2.03	Depositor EDS
% Data completeness (in resolution range)	90.6 (32.96-2.03) 91.1 (32.96-2.03)	Depositor EDS
R_{merge}	0.10	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.04 (at 2.03Å)	Xtriage
Refinement program	REFMAC 5.8.0258	Depositor
R, R_{free}	0.177 , 0.238 0.188 , 0.242	Depositor DCC
R_{free} test set	7504 reflections (4.46%)	wwPDB-VP
Wilson B-factor (Å ²)	34.7	Xtriage
Anisotropy	0.050	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.34 , 34.5	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtriage
Estimated twinning fraction	0.022 for h,-k,-h-l	Xtriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	19256	wwPDB-VP
Average B, all atoms (Å ²)	45.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.42% 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: 2OP, MN, NAP

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	1.08	2/4534 (0.0%)	1.37	5/6139 (0.1%)
1	B	1.10	1/4529 (0.0%)	1.39	1/6131 (0.0%)
1	C	1.11	4/4527 (0.1%)	1.43	18/6129 (0.3%)
1	D	1.12	3/4538 (0.1%)	1.42	15/6142 (0.2%)
All	All	1.10	10/18128 (0.1%)	1.40	39/24541 (0.2%)

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	C	0	1

All (10) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	C	500	TYR	C-N	14.38	1.50	1.33
1	C	119	LYS	C-N	12.65	1.49	1.33
1	D	119	LYS	C-N	11.50	1.48	1.33
1	D	408	ASN	C-N	8.32	1.50	1.34
1	C	455	SER	C-O	-7.75	1.14	1.24
1	B	501	PRO	C-O	-7.53	1.18	1.24
1	C	459	PRO	C-O	-6.20	1.15	1.24
1	D	191	VAL	C-O	5.80	1.29	1.24
1	A	308	GLY	C-O	5.52	1.30	1.23
1	A	449	PRO	C-O	-5.21	1.17	1.23

All (39) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	C	500	TYR	O-C-N	-12.73	113.56	121.71
1	C	119	LYS	CA-C-N	10.70	130.82	119.90
1	C	119	LYS	C-N-CA	10.70	130.82	119.90
1	D	119	LYS	CA-C-N	10.62	130.70	119.76
1	D	119	LYS	C-N-CA	10.62	130.70	119.76
1	C	500	TYR	CA-C-N	10.02	130.70	120.38
1	C	500	TYR	C-N-CA	10.02	130.70	120.38
1	D	119	LYS	CB-CA-C	-9.37	102.00	110.44
1	D	27	ASP	CB-CA-C	-8.05	105.06	116.34
1	A	27	ASP	CB-CA-C	-6.76	108.76	116.54
1	C	27	ASP	CB-CA-C	6.33	123.03	110.42
1	A	344	ARG	CG-CD-NE	-6.31	98.12	112.00
1	D	407	SER	O-C-N	6.20	130.17	122.86
1	B	6	PRO	CA-N-CD	-6.19	103.33	112.00
1	D	451	GLN	CA-C-N	5.69	125.74	120.34
1	D	451	GLN	C-N-CA	5.69	125.74	120.34
1	D	524	GLU	CA-C-O	-5.57	112.54	119.28
1	C	455	SER	CA-C-O	-5.51	112.15	119.10
1	A	530	TYR	CB-CA-C	5.43	117.28	108.87
1	C	119	LYS	CB-CA-C	-5.39	104.83	110.33
1	D	119	LYS	O-C-N	-5.36	115.43	120.85
1	C	448	TYR	CB-CA-C	5.34	115.78	110.33
1	C	232	VAL	CB-CA-C	5.29	118.95	112.02
1	C	387	SER	N-CA-C	5.25	121.98	110.80
1	A	218	GLY	CA-C-N	5.22	127.28	120.28
1	A	218	GLY	C-N-CA	5.22	127.28	120.28
1	D	408	ASN	O-C-N	5.17	126.52	121.66
1	C	49	ASN	CA-CB-CG	5.13	117.73	112.60
1	C	386	PHE	CA-C-N	5.11	131.31	121.54
1	C	386	PHE	C-N-CA	5.11	131.31	121.54
1	C	530	TYR	CB-CA-C	5.09	116.76	108.87
1	C	119	LYS	O-C-N	-5.08	115.45	120.83
1	D	410	THR	CA-C-N	5.06	127.57	120.28
1	D	410	THR	C-N-CA	5.06	127.57	120.28
1	D	6	PRO	CA-N-CD	-5.06	104.92	112.00
1	C	363	ASN	CA-C-N	5.05	131.19	121.54
1	C	363	ASN	C-N-CA	5.05	131.19	121.54
1	D	199	ASN	CA-C-N	5.01	126.96	120.44
1	D	199	ASN	C-N-CA	5.01	126.96	120.44

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	C	408	ASN	Peptide

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	4447	0	4474	53	0
1	B	4442	0	4470	73	0
1	C	4440	0	4467	164	0
1	D	4451	0	4483	74	0
2	A	48	0	25	0	0
2	B	48	0	25	0	0
2	C	48	0	25	4	0
2	D	48	0	25	6	0
3	A	1	0	0	0	0
3	B	1	0	0	0	0
3	C	1	0	0	0	0
3	D	1	0	0	0	0
4	C	6	0	4	2	0
4	D	6	0	4	2	0
5	A	404	0	0	13	0
5	B	283	0	0	20	0
5	C	310	0	0	17	0
5	D	271	0	0	22	0
All	All	19256	0	18002	354	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 10.

All (354) close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:337:LYS:O	1:C:362:LYS:HG3	1.35	1.23
1:B:331:ILE:HA	5:B:716:HOH:O	1.49	1.12
1:A:37:GLN:HG3	5:A:1048:HOH:O	1.51	1.07
1:C:296:THR:H	1:C:374:THR:HG22	1.02	1.06
1:C:361:MET:HE1	1:C:370:GLU:HG2	1.34	1.06

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:296:THR:H	1:C:374:THR:CG2	1.69	1.05
1:D:416:SER:HB3	5:D:1218:HOH:O	1.59	1.01
1:C:250:VAL:HG13	5:C:888:HOH:O	1.66	0.94
1:B:138:ASN:HB3	1:D:10:HIS:CD2	2.03	0.93
1:D:305:ALA:HB2	2:D:601:NAP:H52N	1.49	0.91
1:C:119:LYS:HB2	5:C:718:HOH:O	1.72	0.89
1:C:296:THR:N	1:C:374:THR:HG22	1.86	0.89
1:C:556:CYS:SG	5:D:1011:HOH:O	2.30	0.88
1:A:361:MET:HE1	1:A:370:GLU:HG2	1.57	0.87
5:A:863:HOH:O	1:B:568:THR:HA	1.73	0.86
1:B:358:HIS:CE1	5:B:726:HOH:O	2.28	0.86
1:B:358:HIS:HE1	5:B:726:HOH:O	1.56	0.86
1:C:332:TRP:CG	1:C:371:ILE:HD13	2.10	0.85
1:C:435:PRO:HA	1:C:451:GLN:HE22	1.39	0.85
1:A:358:HIS:NE2	1:A:361:MET:HE2	1.90	0.85
1:C:500:TYR:HE1	5:C:706:HOH:O	1.59	0.85
1:C:329:LYS:HA	1:C:356:HIS:NE2	1.92	0.83
1:C:361:MET:CE	1:C:370:GLU:HG2	2.08	0.83
1:D:305:ALA:CB	2:D:601:NAP:H52N	2.07	0.83
1:C:361:MET:HE1	1:C:370:GLU:CG	2.08	0.82
1:A:358:HIS:NE2	1:A:361:MET:CE	2.42	0.82
1:D:123:LEU:HD21	1:D:137:LEU:HD12	1.59	0.82
1:C:348:THR:O	1:C:352:GLU:HG2	1.78	0.82
1:C:295:GLN:HA	1:C:374:THR:HG21	1.60	0.81
1:B:330:LYS:HD2	5:B:798:HOH:O	1.78	0.81
5:A:970:HOH:O	1:B:556:CYS:SG	2.37	0.80
1:C:297:ILE:CG2	1:C:377:ILE:HD12	2.12	0.78
1:C:391:LEU:HD22	1:C:391:LEU:H	1.48	0.78
1:A:119:LYS:HB3	5:A:753:HOH:O	1.84	0.77
1:A:118:ARG:HD3	5:A:715:HOH:O	1.84	0.77
1:C:295:GLN:CA	1:C:374:THR:HG21	2.14	0.77
1:C:332:TRP:CG	1:C:371:ILE:CD1	2.67	0.76
1:B:342:LYS:HE3	1:B:357:GLU:HG2	1.67	0.76
1:D:157:LEU:HD23	4:D:602:2OP:HA	1.67	0.76
1:C:409:PRO:HD2	1:C:412:LYS:HG3	1.68	0.75
1:D:138:ASN:HB2	5:D:1222:HOH:O	1.87	0.75
1:B:12:HIS:CD2	5:B:929:HOH:O	2.41	0.73
1:C:348:THR:HG21	5:C:983:HOH:O	1.88	0.73
1:C:440:THR:HG22	1:C:446:THR:HG22	1.71	0.72
2:D:601:NAP:H6N	2:D:601:NAP:H3D	1.71	0.72
1:C:15:GLY:HA3	1:D:12:HIS:CE1	2.25	0.71

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:388:GLU:HA	1:B:423:ILE:HD13	1.73	0.71
1:C:366:ALA:HB2	1:C:390:ILE:HG13	1.71	0.71
1:C:567:GLN:C	5:C:827:HOH:O	2.34	0.70
1:C:331:ILE:HD13	1:C:354:PHE:HE1	1.57	0.70
1:B:382:ILE:HB	5:B:816:HOH:O	1.91	0.70
1:C:364:LEU:HD12	1:C:364:LEU:O	1.92	0.69
1:B:155:ARG:HD2	5:B:743:HOH:O	1.93	0.69
1:C:404:PHE:CG	1:C:431:ALA:HB3	2.27	0.69
1:B:118:ARG:CG	1:B:118:ARG:HH11	2.05	0.69
1:D:220:GLU:HG3	5:D:1224:HOH:O	1.91	0.69
1:C:361:MET:O	1:C:361:MET:HG3	1.92	0.69
1:C:391:LEU:HD22	1:C:391:LEU:N	2.08	0.69
1:C:277:ALA:HB3	1:C:309:ILE:HG12	1.74	0.68
1:C:296:THR:N	1:C:374:THR:CG2	2.50	0.68
1:C:332:TRP:CD1	1:C:371:ILE:HD13	2.26	0.68
1:B:118:ARG:HH11	1:B:118:ARG:HG2	1.59	0.68
1:D:320:GLU:HG3	1:D:320:GLU:O	1.92	0.68
1:C:118:ARG:HD2	5:B:812:HOH:O	1.94	0.68
1:C:391:LEU:H	1:C:391:LEU:CD2	2.05	0.68
1:D:305:ALA:HB2	2:D:601:NAP:C5D	2.23	0.68
1:D:358:HIS:HE1	5:D:1210:HOH:O	1.76	0.67
1:B:65:LEU:O	1:B:71:ARG:NH2	2.28	0.67
1:D:416:SER:HA	1:D:436:PHE:CZ	2.30	0.67
1:B:567:GLN:HE22	1:D:212:ARG:HH21	1.41	0.66
1:D:118:ARG:HD2	5:D:1160:HOH:O	1.94	0.66
1:C:305:ALA:HB3	1:C:379:VAL:HG21	1.77	0.66
1:B:138:ASN:HB3	1:D:10:HIS:CG	2.31	0.66
1:C:375:ALA:CB	1:C:402:ILE:HB	2.26	0.66
1:A:128:HIS:CD2	1:C:563:VAL:HG21	2.32	0.65
1:D:435:PRO:HA	1:D:451:GLN:HE22	1.62	0.65
1:B:300:GLN:HE21	1:B:300:GLN:HA	1.63	0.64
1:C:443:ASN:HD22	1:C:443:ASN:H	1.45	0.64
1:B:98:MET:HE3	5:B:789:HOH:O	1.96	0.63
1:C:443:ASN:HD22	1:C:443:ASN:N	1.96	0.63
1:C:366:ALA:CB	1:C:390:ILE:HG13	2.27	0.63
1:C:332:TRP:CD2	1:C:371:ILE:HD11	2.34	0.63
1:C:337:LYS:C	1:C:362:LYS:HG3	2.21	0.63
1:C:262:GLN:HB2	5:C:967:HOH:O	2.00	0.61
1:C:408:ASN:HD22	1:C:409:PRO:HA	1.65	0.61
1:C:270:ILE:HA	2:C:601:NAP:H71N	1.65	0.61
1:C:369:GLN:HA	1:C:397:PHE:CZ	2.35	0.61

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:427:ARG:CG	1:C:427:ARG:HH11	2.13	0.61
1:C:297:ILE:CG2	1:C:377:ILE:CD1	2.79	0.61
1:C:427:ARG:HH11	1:C:427:ARG:HG3	1.66	0.61
5:B:820:HOH:O	1:D:10:HIS:CD2	2.52	0.61
1:D:339:LEU:HD22	1:D:361:MET:HE3	1.83	0.61
1:C:305:ALA:CB	1:C:379:VAL:HG21	2.30	0.61
1:D:123:LEU:CD2	1:D:137:LEU:HD12	2.31	0.61
1:B:9:ARG:O	1:B:9:ARG:HG2	1.99	0.61
1:B:391:LEU:HD12	1:B:423:ILE:HD12	1.83	0.60
1:C:361:MET:HE1	1:C:370:GLU:CB	2.31	0.60
1:D:157:LEU:CD2	4:D:602:2OP:HA	2.31	0.60
1:C:403:ILE:O	1:C:430:PHE:HA	2.02	0.60
1:B:346:SER:N	5:B:702:HOH:O	2.34	0.60
5:A:872:HOH:O	1:B:37:GLN:HG3	2.01	0.59
1:D:167:MET:HE2	1:D:192:ILE:HG22	1.85	0.59
1:D:391:LEU:HD13	1:D:420:CYS:HA	1.85	0.59
1:B:9:ARG:O	1:B:552:ILE:HA	2.02	0.59
1:B:484:VAL:O	1:B:488:GLN:HG2	2.03	0.59
1:A:395:ALA:O	1:A:427:ARG:NH1	2.34	0.59
1:C:254:ARG:NH2	5:C:703:HOH:O	2.34	0.59
1:B:559:TRP:H	1:B:564:GLN:NE2	2.01	0.59
1:B:110:CYS:O	1:B:165:ASN:HB3	2.02	0.58
1:A:493:HIS:CD2	5:A:873:HOH:O	2.55	0.58
1:D:299:PHE:CD2	5:D:1036:HOH:O	2.52	0.58
1:A:110:CYS:O	1:A:165:ASN:HB3	2.03	0.58
1:C:362:LYS:HB3	1:C:362:LYS:HZ3	1.68	0.58
1:D:392:LYS:NZ	5:D:1005:HOH:O	2.37	0.58
1:C:338:GLY:HA3	1:C:362:LYS:CG	2.33	0.57
1:B:295:GLN:O	1:B:330:LYS:HG3	2.04	0.57
1:C:322:LEU:HD12	1:C:323:PRO:HD2	1.86	0.57
1:C:427:ARG:HB2	1:C:427:ARG:NH1	2.19	0.57
1:D:177:TYR:HE2	1:D:462:ALA:HB2	1.69	0.57
1:C:404:PHE:CD1	1:C:431:ALA:HB3	2.40	0.57
1:A:119:LYS:HE2	1:D:81:ARG:HB2	1.87	0.57
1:C:286:ARG:CZ	1:C:494:LEU:HD11	2.35	0.57
1:C:419:GLN:HE21	1:C:419:GLN:HA	1.70	0.56
1:D:297:ILE:C	5:D:1036:HOH:O	2.48	0.56
1:D:297:ILE:HG22	5:D:1036:HOH:O	2.04	0.56
1:C:330:LYS:HZ3	1:C:330:LYS:HB2	1.70	0.56
1:A:12:HIS:HE1	1:C:138:ASN:OD1	1.89	0.56
1:C:535:ASN:ND2	1:C:538:ALA:H	2.04	0.56

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:375:ALA:HB2	1:C:402:ILE:HD12	1.87	0.56
1:C:435:PRO:HG2	5:C:730:HOH:O	2.05	0.56
1:A:361:MET:CE	1:A:370:GLU:HG2	2.34	0.56
1:B:116:VAL:O	1:B:118:ARG:HG3	2.06	0.55
1:D:383:GLY:O	1:D:413:ALA:O	2.24	0.55
1:C:167:MET:HE2	1:C:192:ILE:HG22	1.87	0.55
1:C:295:GLN:CB	1:C:374:THR:HG21	2.36	0.55
1:D:337:LYS:HD2	1:D:346:SER:HB2	1.86	0.55
1:C:421:TYR:OH	1:C:449:PRO:HA	2.07	0.55
1:C:423:ILE:N	1:C:423:ILE:HD13	2.20	0.55
1:A:32:LEU:HD23	1:B:564:GLN:HE21	1.72	0.55
1:C:371:ILE:HG22	1:C:373:PRO:HD3	1.89	0.54
1:D:441:LEU:HB2	1:D:442:PRO:HD2	1.90	0.54
1:C:383:GLY:HA2	1:C:413:ALA:O	2.07	0.54
1:B:299:PHE:HB2	1:B:333:LEU:HD23	1.88	0.54
1:D:286:ARG:CZ	1:D:494:LEU:HD11	2.38	0.54
1:D:504:ASN:HB2	5:D:1244:HOH:O	2.07	0.54
1:C:391:LEU:HB2	1:C:423:ILE:HG21	1.89	0.54
1:A:376:LEU:HG	1:A:386:PHE:CZ	2.43	0.54
5:C:917:HOH:O	1:D:37:GLN:HG3	2.06	0.53
1:C:427:ARG:CB	1:C:427:ARG:CZ	2.85	0.53
1:C:250:VAL:CG1	5:C:888:HOH:O	2.40	0.53
1:C:342:LYS:O	1:C:342:LYS:HD3	2.09	0.53
1:C:367:ILE:HG23	1:C:367:ILE:O	2.08	0.53
1:B:9:ARG:HH22	1:B:186:GLN:HE22	1.57	0.53
1:C:332:TRP:CD2	1:C:371:ILE:CD1	2.92	0.53
1:B:251:ASN:OD1	1:B:254:ARG:NH2	2.42	0.53
1:C:339:LEU:CD2	1:C:361:MET:HB3	2.39	0.53
1:C:338:GLY:HA3	1:C:362:LYS:CB	2.39	0.52
1:C:365:GLU:OE2	1:C:365:GLU:HA	2.09	0.52
2:D:601:NAP:H6N	2:D:601:NAP:C3D	2.40	0.52
1:C:77:ASP:OD1	1:C:119:LYS:HE2	2.10	0.52
1:A:77:ASP:OD1	1:D:119:LYS:NZ	2.37	0.52
1:C:362:LYS:CB	1:C:362:LYS:NZ	2.72	0.52
1:B:315:MET:SD	1:B:475:ASP:HB3	2.50	0.52
1:C:372:LYS:HD3	1:C:397:PHE:CD1	2.44	0.52
1:C:399:GLU:HG3	1:C:400:ARG:HG2	1.92	0.52
1:C:324:LYS:HA	1:C:327:ALA:HB3	1.92	0.52
1:C:458:PHE:CD1	1:C:459:PRO:HD3	2.45	0.52
1:C:427:ARG:NH1	1:C:427:ARG:CB	2.73	0.51
1:C:348:THR:HG21	5:C:991:HOH:O	2.10	0.51

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:567:GLN:HB2	5:C:768:HOH:O	2.10	0.51
1:A:566:ILE:HD11	1:B:31:THR:HG22	1.90	0.51
1:C:157:LEU:HD23	4:C:602:2OP:HA	1.92	0.51
1:C:369:GLN:HA	1:C:397:PHE:HZ	1.76	0.51
1:D:37:GLN:NE2	5:D:1011:HOH:O	2.44	0.51
1:A:46:PRO:HB3	1:D:126:THR:HG21	1.92	0.51
1:A:119:LYS:HB2	5:A:1034:HOH:O	2.10	0.51
1:A:169:ILE:HB	1:A:170:PRO:HD3	1.91	0.51
1:C:349:GLN:O	1:C:353:LYS:HD3	2.09	0.51
1:D:348:THR:HG22	1:D:351:LYS:HB2	1.92	0.51
1:C:339:LEU:HD22	1:C:361:MET:HG2	1.92	0.51
1:A:472:GLN:HG2	5:A:1019:HOH:O	2.10	0.51
1:C:334:VAL:HG22	1:C:339:LEU:HD12	1.93	0.51
1:A:177:TYR:HE1	1:A:462:ALA:HB2	1.76	0.51
1:B:530:TYR:HA	1:B:531:PRO:C	2.36	0.51
1:C:341:VAL:HG11	1:C:360:GLU:H	1.77	0.50
1:B:298:LEU:HB3	1:B:376:LEU:HD12	1.92	0.50
1:C:15:GLY:HA3	1:D:12:HIS:HE1	1.76	0.50
1:C:329:LYS:HG2	1:C:356:HIS:HD2	1.77	0.50
1:C:427:ARG:CG	1:C:427:ARG:NH1	2.72	0.50
1:D:340:ILE:HD11	1:D:351:LYS:HD3	1.93	0.50
1:B:403:ILE:O	1:B:430:PHE:HA	2.12	0.50
1:C:302:ALA:HB2	1:C:333:LEU:HB3	1.93	0.50
1:A:167:MET:HE2	1:A:192:ILE:HG22	1.94	0.49
1:C:349:GLN:HA	1:C:352:GLU:HG3	1.93	0.49
1:D:365:GLU:HG3	5:D:1239:HOH:O	2.11	0.49
1:D:138:ASN:ND2	5:D:1010:HOH:O	2.44	0.49
1:C:443:ASN:H	1:C:443:ASN:ND2	2.10	0.49
1:A:10:HIS:HD2	1:A:553:LEU:O	1.96	0.49
5:B:820:HOH:O	1:D:10:HIS:HD2	1.93	0.49
1:B:118:ARG:HB2	1:B:119:LYS:HD3	1.95	0.49
1:C:379:VAL:HG13	1:C:379:VAL:O	2.11	0.48
1:A:118:ARG:NH1	5:A:715:HOH:O	2.45	0.48
1:C:208:TYR:CZ	1:C:210:GLY:HA3	2.49	0.48
1:A:98:MET:N	1:A:99:PRO:HD2	2.29	0.48
1:C:297:ILE:HD12	1:C:375:ALA:HB3	1.96	0.48
1:D:110:CYS:O	1:D:165:ASN:HB3	2.13	0.48
1:C:297:ILE:HG21	1:C:377:ILE:CD1	2.43	0.48
1:B:331:ILE:CA	5:B:716:HOH:O	2.26	0.48
1:A:230:GLU:HB3	5:A:1041:HOH:O	2.14	0.48
1:C:329:LYS:HG2	1:C:356:HIS:CD2	2.49	0.48

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:426:GLY:HA3	1:C:441:LEU:CD1	2.43	0.48
1:B:298:LEU:HB3	1:B:376:LEU:CD1	2.43	0.47
1:D:404:PHE:CD1	1:D:431:ALA:HB3	2.49	0.47
1:D:344:ARG:O	1:D:347:LEU:HG	2.14	0.47
1:A:322:LEU:HD21	1:A:330:LYS:CE	2.45	0.47
1:C:12:HIS:HD2	5:D:1131:HOH:O	1.96	0.47
1:A:116:VAL:O	1:A:118:ARG:HG3	2.14	0.47
1:C:375:ALA:HB2	1:C:402:ILE:HB	1.97	0.47
1:D:325:GLU:O	1:D:328:ILE:HG22	2.15	0.46
1:B:332:TRP:N	5:B:716:HOH:O	2.47	0.46
1:C:110:CYS:O	1:C:165:ASN:HB3	2.16	0.46
1:A:358:HIS:HD2	1:A:359:GLU:O	1.98	0.46
1:B:381:ALA:HA	1:B:407:SER:HB3	1.98	0.46
1:C:309:ILE:HG22	1:C:313:ILE:HD11	1.97	0.46
1:B:8:ARG:HH21	1:B:10:HIS:HE1	1.63	0.46
1:D:96:LYS:HD3	1:D:97:PHE:CZ	2.50	0.46
1:D:293:SER:O	1:D:330:LYS:NZ	2.49	0.46
1:D:441:LEU:HB2	1:D:442:PRO:CD	2.45	0.46
1:B:77:ASP:OD1	1:B:119:LYS:NZ	2.23	0.46
1:A:96:LYS:HE2	5:A:709:HOH:O	2.17	0.46
1:A:242:ILE:O	1:A:265:THR:HA	2.15	0.46
1:C:567:GLN:CB	5:C:768:HOH:O	2.63	0.45
1:D:419:GLN:HB2	5:D:1218:HOH:O	2.16	0.45
1:C:388:GLU:OE2	1:C:419:GLN:OE1	2.35	0.45
1:C:436:PHE:H	1:C:451:GLN:NE2	2.14	0.45
1:C:369:GLN:HA	1:C:397:PHE:CE2	2.52	0.45
1:C:126:THR:HB	1:C:211:LEU:HD11	1.97	0.45
1:C:299:PHE:CE1	1:C:377:ILE:HG21	2.52	0.45
1:B:13:GLN:NE2	5:B:703:HOH:O	2.36	0.45
1:C:304:GLU:HG3	2:C:601:NAP:H72N	1.81	0.45
1:C:358:HIS:HB3	1:C:359:GLU:H	1.65	0.45
1:B:156:ILE:HG23	1:B:169:ILE:HG13	1.98	0.45
1:B:432:SER:O	1:B:451:GLN:HA	2.16	0.45
1:C:325:GLU:HG2	1:C:329:LYS:HE3	1.99	0.45
1:C:372:LYS:HG2	1:C:397:PHE:CZ	2.52	0.45
1:C:277:ALA:CB	1:C:309:ILE:CD1	2.94	0.45
1:C:339:LEU:HD23	1:C:361:MET:HB3	1.97	0.45
1:C:342:LYS:HD3	1:C:342:LYS:C	2.42	0.45
1:B:119:LYS:HB2	5:B:788:HOH:O	2.15	0.45
1:D:126:THR:HB	1:D:211:LEU:HD11	1.99	0.45
1:D:541:ARG:HG3	5:D:1074:HOH:O	2.17	0.45

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:12:HIS:HD2	5:B:959:HOH:O	2.00	0.45
1:C:372:LYS:HG2	1:C:397:PHE:CE2	2.52	0.45
1:D:530:TYR:HA	1:D:531:PRO:C	2.41	0.45
1:C:295:GLN:HB3	1:C:297:ILE:HD11	1.99	0.44
1:D:342:LYS:HA	1:D:342:LYS:HD3	1.63	0.44
1:B:9:ARG:HG2	1:B:552:ILE:HG22	2.00	0.44
1:C:51:GLN:O	1:C:55:VAL:HG23	2.17	0.44
1:C:367:ILE:HA	1:C:367:ILE:HD12	1.42	0.44
1:A:458:PHE:N	1:A:459:PRO:CD	2.80	0.44
1:B:291:LYS:HB2	1:B:320:GLU:OE2	2.17	0.44
1:C:388:GLU:N	1:C:391:LEU:HD23	2.33	0.44
1:A:378:GLY:HA3	1:A:414:GLU:HG2	1.99	0.44
1:C:331:ILE:HD13	1:C:354:PHE:CE1	2.44	0.44
1:C:333:LEU:CB	1:C:340:ILE:HG13	2.48	0.44
1:C:443:ASN:N	1:C:443:ASN:ND2	2.66	0.44
1:A:18:LEU:C	1:A:18:LEU:HD23	2.43	0.44
1:A:296:THR:HB	1:A:373:PRO:HA	1.99	0.44
1:A:322:LEU:HD21	1:A:330:LYS:HE3	2.00	0.44
1:C:388:GLU:CD	1:C:419:GLN:OE1	2.61	0.44
1:D:399:GLU:HG3	5:D:1268:HOH:O	2.17	0.43
1:A:8:ARG:NH1	1:A:555:ASP:OD1	2.52	0.43
1:C:51:GLN:NE2	1:C:88:ARG:HE	2.16	0.43
2:C:601:NAP:H5N	5:C:942:HOH:O	2.17	0.43
1:C:52:GLU:OE1	1:C:88:ARG:NH2	2.49	0.43
1:C:278:VAL:HG21	1:C:312:LEU:HB3	2.00	0.43
1:A:518:VAL:HG12	1:A:536:LYS:HG3	2.00	0.43
1:C:295:GLN:HB3	1:C:374:THR:HG21	1.99	0.43
1:A:410:THR:HG23	1:A:411:SER:N	2.33	0.43
1:C:458:PHE:CG	1:C:459:PRO:HD3	2.54	0.43
1:D:33:GLU:O	1:D:37:GLN:HG2	2.18	0.43
1:A:244:PHE:HD2	1:A:247:PHE:CE1	2.37	0.42
1:D:493:HIS:CD2	1:D:498:ARG:HD2	2.54	0.42
1:C:404:PHE:CE1	1:C:431:ALA:HB2	2.54	0.42
1:C:435:PRO:HA	1:C:451:GLN:NE2	2.21	0.42
1:D:167:MET:O	1:D:170:PRO:HD2	2.20	0.42
1:D:378:GLY:C	1:D:414:GLU:OE2	2.63	0.42
1:C:118:ARG:CD	5:B:812:HOH:O	2.58	0.42
1:C:268:ASP:CG	1:C:454:ASN:HD22	2.28	0.42
1:C:278:VAL:HG21	1:C:312:LEU:CB	2.50	0.42
1:B:185:PRO:HD2	1:B:545:TYR:CD1	2.54	0.42
1:C:108:LEU:HA	1:C:111:GLN:HE21	1.84	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:279:ALA:HB2	1:C:482:ALA:HA	2.02	0.42
1:C:332:TRP:CG	1:C:371:ILE:HD11	2.49	0.42
1:C:391:LEU:HB2	1:C:423:ILE:CG2	2.50	0.42
1:B:7:ARG:NH1	5:B:711:HOH:O	2.41	0.42
1:B:137:LEU:HD21	1:B:232:VAL:HG23	2.00	0.42
1:C:365:GLU:HB3	1:C:366:ALA:H	1.69	0.42
1:B:563:VAL:HG21	1:D:128:HIS:CD2	2.55	0.42
1:C:260:ARG:O	1:C:472:GLN:HG3	2.20	0.42
1:B:214:ARG:HG3	5:B:944:HOH:O	2.20	0.42
1:B:341:VAL:O	1:B:344:ARG:HB2	2.19	0.42
1:B:359:GLU:H	1:B:359:GLU:HG3	1.52	0.42
1:A:148:ILE:HG12	1:A:189:LEU:HB3	2.01	0.42
1:A:530:TYR:HA	1:A:531:PRO:C	2.45	0.42
1:C:494:LEU:HD23	1:C:494:LEU:HA	1.86	0.42
1:B:315:MET:HE2	1:B:315:MET:HB3	1.88	0.42
1:B:386:PHE:CG	1:B:414:GLU:HB3	2.55	0.42
1:B:297:ILE:HA	1:B:375:ALA:O	2.20	0.41
1:B:559:TRP:H	1:B:564:GLN:HE21	1.66	0.41
1:B:17:LEU:HD23	1:B:17:LEU:HA	1.89	0.41
1:A:133:ILE:HD11	1:A:224:PHE:CE1	2.54	0.41
1:C:344:ARG:HB3	1:C:347:LEU:HD22	2.03	0.41
1:D:369:GLN:HA	1:D:397:PHE:CZ	2.56	0.41
1:A:251:ASN:OD1	1:A:254:ARG:NH2	2.38	0.41
1:C:380:ALA:HB1	2:C:601:NAP:C4A	2.51	0.41
1:D:273:THR:HG21	2:D:601:NAP:C5N	2.50	0.41
1:A:315:MET:HE2	1:A:315:MET:HB3	1.89	0.41
1:D:333:LEU:HB2	1:D:340:ILE:HD12	2.03	0.41
1:B:337:LYS:HE3	1:B:346:SER:OG	2.20	0.41
1:B:391:LEU:HD12	1:B:423:ILE:CD1	2.48	0.41
1:D:298:LEU:HD23	1:D:376:LEU:HD13	2.03	0.41
1:B:305:ALA:O	1:B:309:ILE:HG13	2.21	0.41
1:B:458:PHE:N	1:B:459:PRO:CD	2.83	0.41
1:D:329:LYS:HE3	5:D:1250:HOH:O	2.19	0.41
1:C:5:ALA:N	5:C:733:HOH:O	2.54	0.41
1:A:378:GLY:C	1:A:414:GLU:OE2	2.64	0.41
1:A:440:THR:HG22	1:A:446:THR:OG1	2.20	0.41
5:A:863:HOH:O	1:B:568:THR:CA	2.51	0.41
1:C:508:ASP:HB2	5:C:797:HOH:O	2.21	0.41
1:B:9:ARG:NH1	1:B:550:ASP:OD2	2.54	0.41
1:D:119:LYS:H	1:D:119:LYS:HG2	1.76	0.41
1:C:299:PHE:CZ	1:C:377:ILE:HD13	2.55	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:300:GLN:HB3	1:B:378:GLY:HA2	2.03	0.41
1:D:322:LEU:HD12	1:D:322:LEU:HA	1.95	0.41
1:D:424:THR:HG21	1:D:428:ALA:HB2	2.01	0.41
1:C:279:ALA:HB2	1:C:482:ALA:O	2.20	0.40
1:C:297:ILE:HG23	1:C:377:ILE:HD12	1.96	0.40
1:C:347:LEU:HA	1:C:347:LEU:HD12	1.85	0.40
1:C:367:ILE:O	1:C:367:ILE:CG2	2.68	0.40
1:D:12:HIS:CG	5:D:1113:HOH:O	2.74	0.40
1:D:348:THR:HG23	1:D:351:LYS:H	1.86	0.40
1:A:14:ARG:HD2	1:A:38:LEU:HA	2.04	0.40
1:A:300:GLN:HE21	1:A:300:GLN:HA	1.86	0.40
1:A:533:PRO:HG3	1:A:539:PHE:CD2	2.56	0.40
1:C:362:LYS:CG	1:C:362:LYS:O	2.69	0.40
1:D:6:PRO:N	5:D:1034:HOH:O	2.55	0.40
1:A:300:GLN:HB3	1:A:378:GLY:HA2	2.02	0.40
1:C:119:LYS:HE3	1:B:77:ASP:OD1	2.22	0.40
4:C:602:2OP:HB3	5:C:942:HOH:O	2.22	0.40
1:B:341:VAL:CG1	1:B:358:HIS:HB3	2.51	0.40
1:B:376:LEU:HG	1:B:386:PHE:CZ	2.55	0.40
1:C:342:LYS:C	1:C:342:LYS:CD	2.93	0.40
1:D:541:ARG:CG	5:D:1074:HOH:O	2.69	0.40

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	562/572 (98%)	548 (98%)	14 (2%)	0	100	100
1	B	561/572 (98%)	545 (97%)	14 (2%)	2 (0%)	30	22
1	C	561/572 (98%)	524 (93%)	31 (6%)	6 (1%)	11	5
1	D	562/572 (98%)	544 (97%)	16 (3%)	2 (0%)	30	22

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
All	All	2246/2288 (98%)	2161 (96%)	75 (3%)	10 (0%)	30	22

All (10) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	C	362	LYS
1	C	364	LEU
1	C	387	SER
1	C	356	HIS
1	C	410	THR
1	B	7	ARG
1	B	345	ALA
1	D	342	LYS
1	D	7	ARG
1	C	301	GLY

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	482/490 (98%)	467 (97%)	15 (3%)	35	31
1	B	482/490 (98%)	459 (95%)	23 (5%)	23	15
1	C	481/490 (98%)	433 (90%)	48 (10%)	7	2
1	D	483/490 (99%)	460 (95%)	23 (5%)	23	15
All	All	1928/1960 (98%)	1819 (94%)	109 (6%)	18	11

All (109) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	63	GLU
1	A	232	VAL
1	A	243	GLN
1	A	289	LYS
1	A	300	GLN

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Mol	Chain	Res	Type
1	A	314	VAL
1	A	334	VAL
1	A	344	ARG
1	A	353	LYS
1	A	357	GLU
1	A	427	ARG
1	A	451	GLN
1	A	476	ASN
1	A	519	LYS
1	A	534	GLN
1	C	7	ARG
1	C	9	ARG
1	C	81	ARG
1	C	119	LYS
1	C	137	LEU
1	C	232	VAL
1	C	243	GLN
1	C	276	VAL
1	C	289	LYS
1	C	312	LEU
1	C	324	LYS
1	C	326	LYS
1	C	328	ILE
1	C	330	LYS
1	C	331	ILE
1	C	340	ILE
1	C	342	LYS
1	C	346	SER
1	C	347	LEU
1	C	357	GLU
1	C	358	HIS
1	C	362	LYS
1	C	365	GLU
1	C	367	ILE
1	C	368	VAL
1	C	371	ILE
1	C	382	ILE
1	C	388	GLU
1	C	389	GLN
1	C	390	ILE
1	C	391	LEU
1	C	408	ASN

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Mol	Chain	Res	Type
1	C	411	SER
1	C	418	GLU
1	C	419	GLN
1	C	422	LYS
1	C	423	ILE
1	C	427	ARG
1	C	443	ASN
1	C	445	GLN
1	C	453	ASN
1	C	470	LEU
1	C	512	LYS
1	C	519	LYS
1	C	523	GLN
1	C	558	SER
1	C	562	GLU
1	C	565	LYS
1	B	7	ARG
1	B	9	ARG
1	B	60	LYS
1	B	118	ARG
1	B	119	LYS
1	B	159	LEU
1	B	183	MET
1	B	232	VAL
1	B	234	SER
1	B	243	GLN
1	B	250	VAL
1	B	281	LEU
1	B	291	LYS
1	B	297	ILE
1	B	329	LYS
1	B	330	LYS
1	B	334	VAL
1	B	359	GLU
1	B	410	THR
1	B	418	GLU
1	B	440	THR
1	B	470	LEU
1	B	565	LYS
1	D	6	PRO
1	D	90	LEU
1	D	119	LYS

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Mol	Chain	Res	Type
1	D	183	MET
1	D	220	GLU
1	D	232	VAL
1	D	243	GLN
1	D	250	VAL
1	D	281	LEU
1	D	324	LYS
1	D	325	GLU
1	D	342	LYS
1	D	350	GLU
1	D	353	LYS
1	D	357	GLU
1	D	379	VAL
1	D	440	THR
1	D	441	LEU
1	D	443	ASN
1	D	523	GLN
1	D	525	LYS
1	D	563	VAL
1	D	568	THR

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (56) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	10	HIS
1	A	12	HIS
1	A	61	ASN
1	A	66	ASN
1	A	186	GLN
1	A	262	GLN
1	A	300	GLN
1	A	389	GLN
1	A	445	GLN
1	A	487	GLN
1	C	12	HIS
1	C	39	ASN
1	C	51	GLN
1	C	111	GLN
1	C	186	GLN
1	C	249	ASN
1	C	251	ASN
1	C	262	GLN

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Mol	Chain	Res	Type
1	C	290	ASN
1	C	389	GLN
1	C	408	ASN
1	C	419	GLN
1	C	443	ASN
1	C	451	GLN
1	C	454	ASN
1	C	523	GLN
1	C	535	ASN
1	C	567	GLN
1	B	12	HIS
1	B	49	ASN
1	B	66	ASN
1	B	186	GLN
1	B	213	GLN
1	B	239	ASN
1	B	262	GLN
1	B	300	GLN
1	B	358	HIS
1	B	369	GLN
1	B	389	GLN
1	B	419	GLN
1	B	443	ASN
1	B	488	GLN
1	B	564	GLN
1	D	12	HIS
1	D	39	ASN
1	D	61	ASN
1	D	66	ASN
1	D	79	GLN
1	D	111	GLN
1	D	186	GLN
1	D	249	ASN
1	D	363	ASN
1	D	389	GLN
1	D	451	GLN
1	D	472	GLN
1	D	488	GLN

5.3.3 RNA ⓘ

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](#)

Of 10 ligands modelled in this entry, 4 are monoatomic - leaving 6 for Mogul analysis.

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	NAP	C	601	-	49,52,52	0.62	0	69,80,80	1.16	5 (7%)
2	NAP	A	601	-	49,52,52	0.90	2 (4%)	69,80,80	0.82	3 (4%)
4	2OP	C	602	3	5,5,5	0.95	0	4,6,6	0.45	0
4	2OP	D	602	3	5,5,5	1.23	1 (20%)	4,6,6	1.30	1 (25%)
2	NAP	D	601	-	49,52,52	0.97	2 (4%)	69,80,80	0.88	2 (2%)
2	NAP	B	601	-	49,52,52	0.88	2 (4%)	69,80,80	0.78	2 (2%)

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	NAP	C	601	-	-	13/35/67/67	0/5/5/5
2	NAP	A	601	-	-	4/35/67/67	0/5/5/5
4	2OP	C	602	3	-	0/4/4/4	-
4	2OP	D	602	3	-	2/4/4/4	-
2	NAP	D	601	-	-	10/35/67/67	0/5/5/5
2	NAP	B	601	-	-	5/35/67/67	0/5/5/5

All (7) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	D	601	NAP	O4D-C1D	3.83	1.46	1.41
2	D	601	NAP	C2N-N1N	3.32	1.39	1.35
4	D	602	2OP	OXT-C	-2.60	1.22	1.30
2	A	601	NAP	P2B-O2X	-2.35	1.45	1.54
2	B	601	NAP	P2B-O2X	-2.28	1.46	1.54
2	B	601	NAP	P2B-O3X	-2.11	1.46	1.54
2	A	601	NAP	P2B-O3X	-2.03	1.47	1.54

All (13) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	C	601	NAP	C3N-C2N-N1N	-4.21	116.31	120.43
2	C	601	NAP	C6N-N1N-C2N	-3.90	118.42	121.97
2	D	601	NAP	C6N-N1N-C2N	-3.29	118.97	121.97
2	C	601	NAP	O4D-C1D-C2D	-3.11	102.38	106.93
2	C	601	NAP	C3B-C2B-C1B	-2.61	97.98	102.89
2	B	601	NAP	O2B-P2B-O1X	-2.53	99.62	109.39
2	A	601	NAP	C3B-C2B-C1B	-2.47	98.24	102.89
2	D	601	NAP	O3D-C3D-C2D	2.38	119.52	111.82
2	A	601	NAP	C6N-N1N-C2N	-2.21	119.96	121.97
2	B	601	NAP	C6N-N1N-C2N	-2.19	119.97	121.97
4	D	602	2OP	CB-CA-C	2.19	115.59	110.63
2	A	601	NAP	O2B-C2B-C3B	2.14	119.42	111.68
2	C	601	NAP	C2D-C3D-C4D	-2.06	98.64	102.64

There are no chirality outliers.

All (34) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	A	601	NAP	O4D-C1D-N1N-C6N
2	C	601	NAP	C5B-O5B-PA-O2A
2	C	601	NAP	C2D-C1D-N1N-C2N
2	C	601	NAP	C2D-C1D-N1N-C6N
2	C	601	NAP	C2N-C3N-C7N-O7N
2	C	601	NAP	C2N-C3N-C7N-N7N
2	B	601	NAP	C2B-O2B-P2B-O1X
2	D	601	NAP	C2B-O2B-P2B-O1X
2	D	601	NAP	O4D-C4D-C5D-O5D
2	D	601	NAP	O4D-C1D-N1N-C6N
2	C	601	NAP	C4N-C3N-C7N-N7N
2	C	601	NAP	C4N-C3N-C7N-O7N

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Mol	Chain	Res	Type	Atoms
2	A	601	NAP	C3B-C2B-O2B-P2B
2	C	601	NAP	C3B-C2B-O2B-P2B
2	D	601	NAP	C3D-C4D-C5D-O5D
2	B	601	NAP	C1B-C2B-O2B-P2B
2	D	601	NAP	C1B-C2B-O2B-P2B
2	B	601	NAP	C3B-C2B-O2B-P2B
2	D	601	NAP	C3B-C2B-O2B-P2B
2	A	601	NAP	C1B-C2B-O2B-P2B
2	C	601	NAP	C3D-C4D-C5D-O5D
2	C	601	NAP	O4D-C4D-C5D-O5D
2	B	601	NAP	C2B-O2B-P2B-O3X
2	D	601	NAP	PN-O3-PA-O1A
4	D	602	2OP	OXT-C-CA-CB
2	A	601	NAP	O4B-C4B-C5B-O5B
2	C	601	NAP	O4B-C4B-C5B-O5B
4	D	602	2OP	O-C-CA-CB
2	C	601	NAP	C5B-O5B-PA-O3
2	D	601	NAP	C2D-C1D-N1N-C2N
2	D	601	NAP	O4B-C4B-C5B-O5B
2	D	601	NAP	PN-O3-PA-O2A
2	C	601	NAP	C5B-O5B-PA-O1A
2	B	601	NAP	O4B-C4B-C5B-O5B

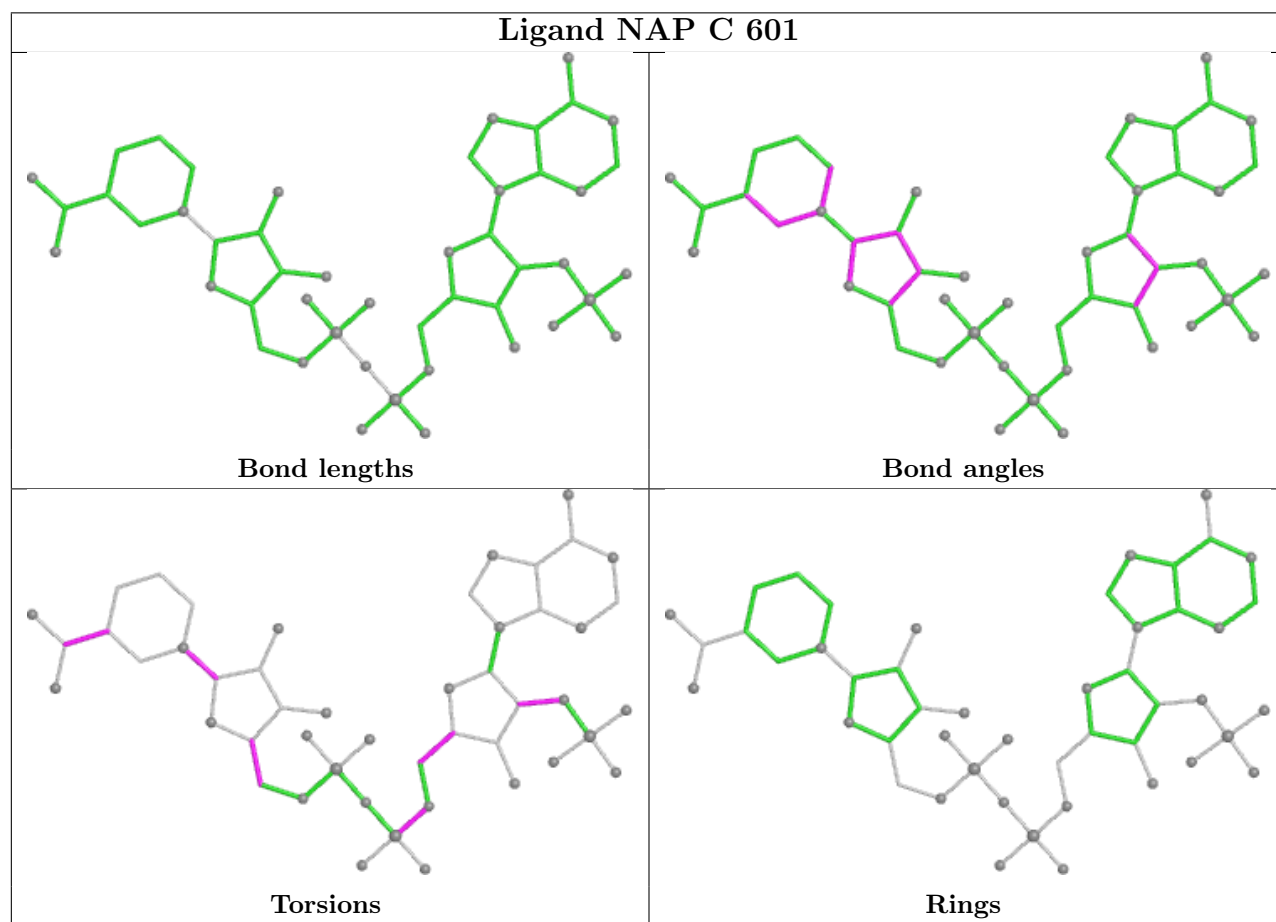
There are no ring outliers.

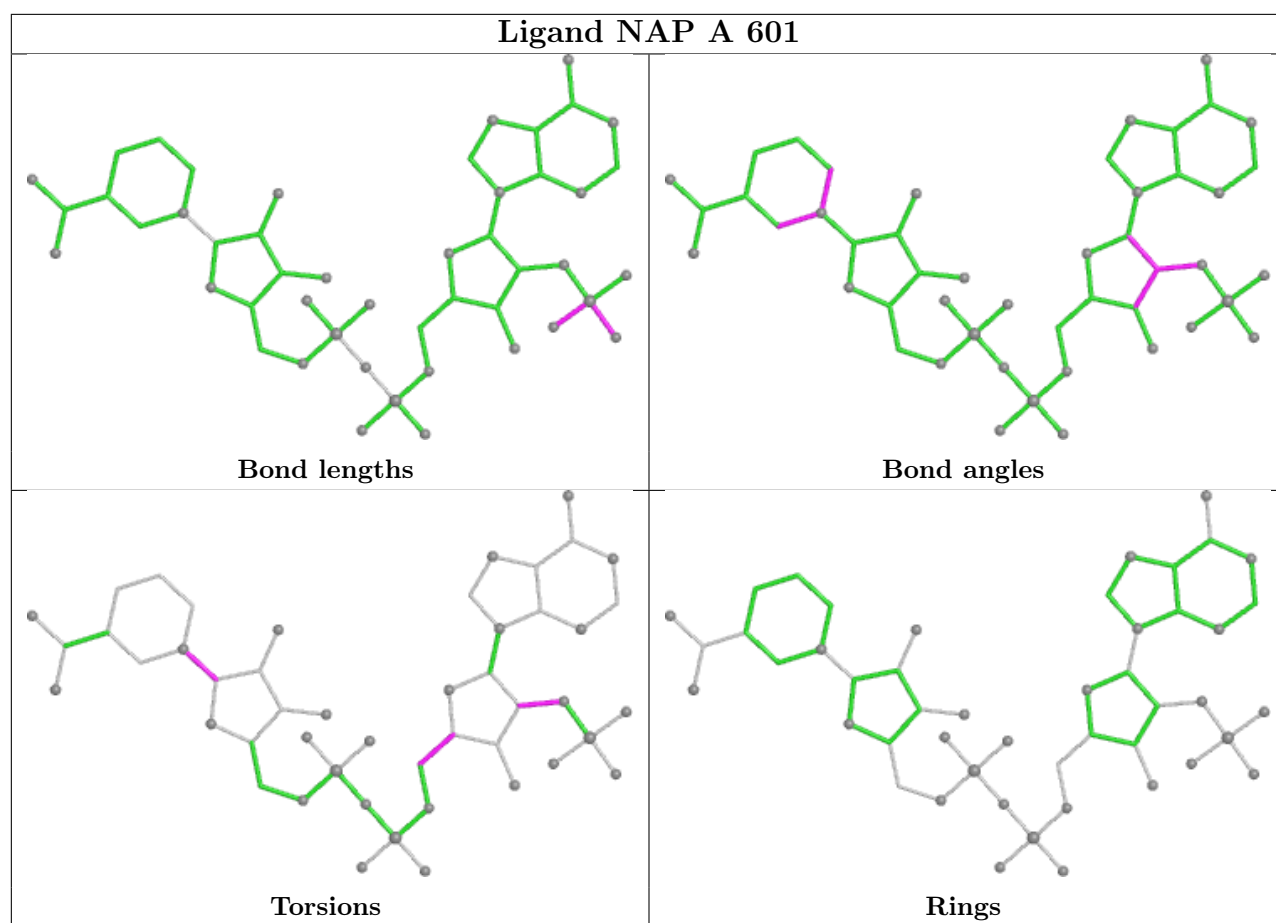
4 monomers are involved in 14 short contacts:

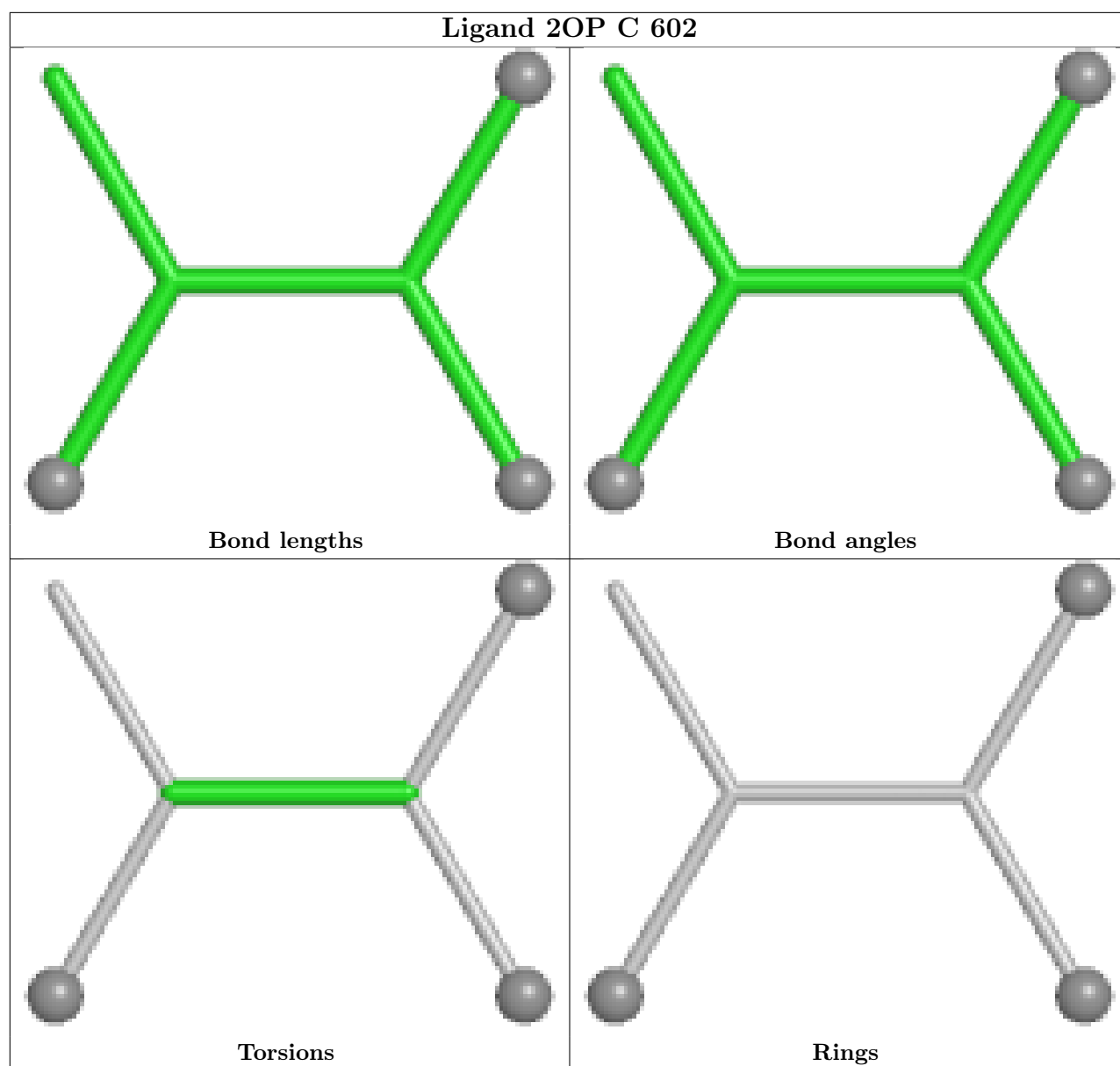
Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	C	601	NAP	4	0
4	C	602	2OP	2	0
4	D	602	2OP	2	0
2	D	601	NAP	6	0

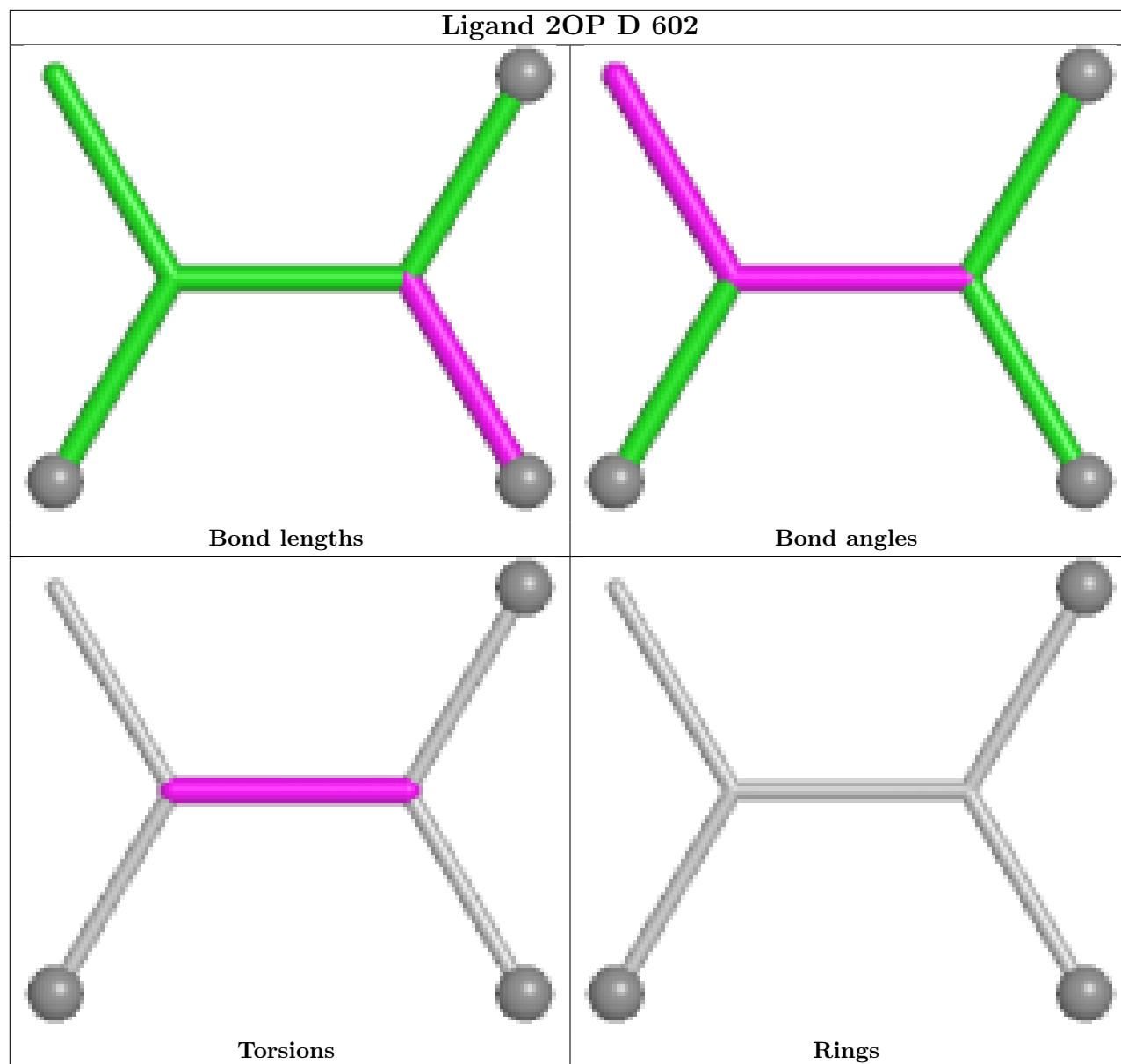
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less than 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier.

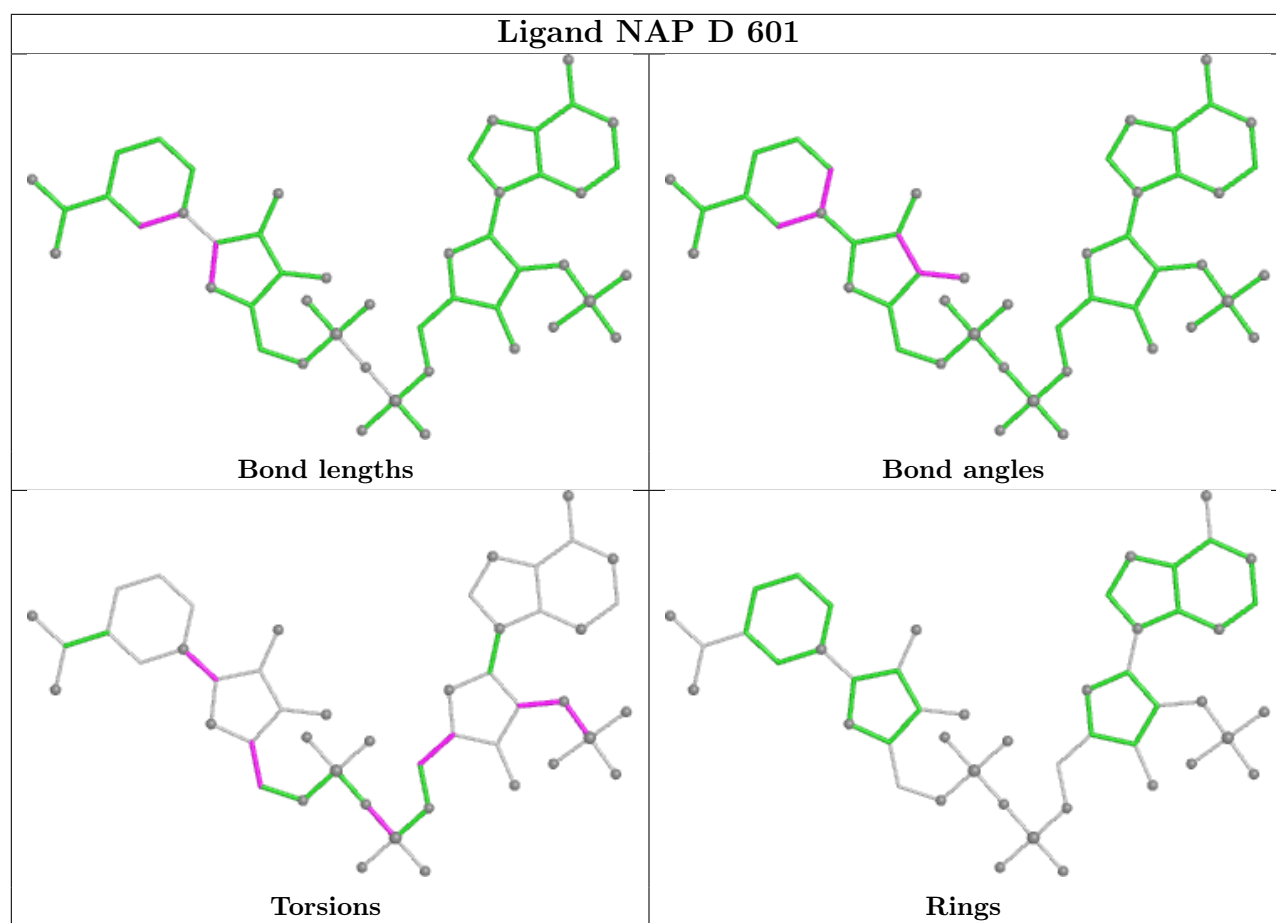
The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.

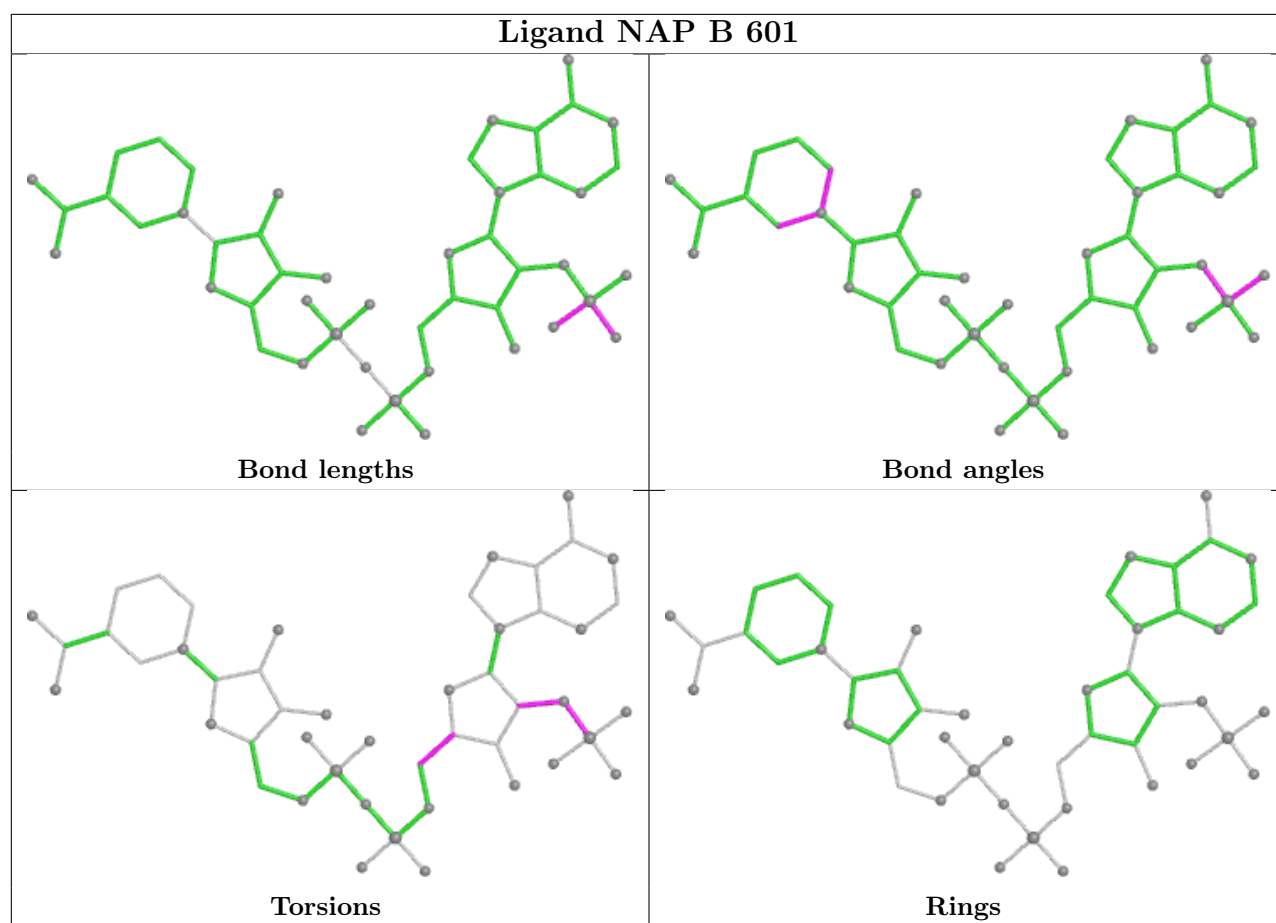












5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

6 Fit of model and data ⓘ

6.1 Protein, DNA and RNA chains ⓘ

In the following table, the column labelled ‘#RSRZ > 2’ contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 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	564/572 (98%)	-0.00	7 (1%) 76 76	24, 35, 56, 70	0
1	B	563/572 (98%)	0.29	19 (3%) 48 47	24, 43, 66, 89	0
1	C	563/572 (98%)	0.57	69 (12%) 8 7	24, 41, 93, 116	0
1	D	564/572 (98%)	0.47	35 (6%) 26 25	24, 43, 73, 93	0
All	All	2254/2288 (98%)	0.33	130 (5%) 29 28	24, 40, 75, 116	0

All (130) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	345	ALA	7.6
1	C	563	VAL	5.2
1	C	364	LEU	4.8
1	C	368	VAL	4.4
1	C	332	TRP	4.4
1	B	159	LEU	4.4
1	B	366	ALA	4.1
1	C	367	ILE	4.0
1	C	449	PRO	3.9
1	D	441	LEU	3.9
1	D	382	ILE	3.9
1	A	136	VAL	3.8
1	B	530	TYR	3.8
1	C	430	PHE	3.8
1	C	331	ILE	3.8
1	C	383	GLY	3.7
1	D	377	ILE	3.7
1	C	339	LEU	3.6
1	C	386	PHE	3.6
1	C	338	GLY	3.6
1	C	358	HIS	3.6

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Mol	Chain	Res	Type	RSRZ
1	C	366	ALA	3.6
1	D	334	VAL	3.5
1	C	382	ILE	3.5
1	B	6	PRO	3.5
1	D	332	TRP	3.4
1	C	441	LEU	3.4
1	C	302	ALA	3.4
1	C	566	ILE	3.4
1	C	447	LEU	3.4
1	C	446	THR	3.3
1	D	302	ALA	3.3
1	D	379	VAL	3.3
1	C	394	MET	3.3
1	B	566	ILE	3.2
1	D	6	PRO	3.2
1	C	421	TYR	3.2
1	B	567	GLN	3.1
1	C	417	ALA	3.1
1	C	497	GLY	3.1
1	C	362	LYS	3.1
1	C	340	ILE	3.1
1	C	440	THR	3.0
1	C	409	PRO	3.0
1	C	468	CYS	3.0
1	C	276	VAL	3.0
1	D	278	VAL	3.0
1	C	379	VAL	2.9
1	C	410	THR	2.9
1	C	309	ILE	2.8
1	B	155	ARG	2.8
1	B	564	GLN	2.8
1	C	381	ALA	2.8
1	C	438	PRO	2.8
1	C	395	ALA	2.8
1	A	137	LEU	2.8
1	C	423	ILE	2.8
1	D	569	LYS	2.8
1	C	397	PHE	2.8
1	B	158	GLY	2.8
1	D	339	LEU	2.8
1	D	381	ALA	2.7
1	C	378	GLY	2.7

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Mol	Chain	Res	Type	RSRZ
1	C	413	ALA	2.7
1	C	435	PRO	2.6
1	C	387	SER	2.6
1	C	297	ILE	2.6
1	D	486	ALA	2.6
1	C	333	LEU	2.5
1	C	359	GLU	2.5
1	C	298	LEU	2.5
1	C	301	GLY	2.5
1	C	376	LEU	2.5
1	B	395	ALA	2.4
1	C	391	LEU	2.4
1	D	383	GLY	2.4
1	C	414	GLU	2.4
1	D	341	VAL	2.4
1	C	5	ALA	2.4
1	D	10	HIS	2.4
1	D	12	HIS	2.4
1	A	203	LEU	2.4
1	D	347	LEU	2.4
1	C	300	GLN	2.4
1	B	346	SER	2.4
1	C	396	ALA	2.3
1	A	377	ILE	2.3
1	D	380	ALA	2.3
1	C	341	VAL	2.3
1	C	424	THR	2.3
1	D	348	THR	2.3
1	D	442	PRO	2.3
1	D	322	LEU	2.3
1	D	447	LEU	2.3
1	C	565	LYS	2.3
1	C	439	VAL	2.3
1	B	563	VAL	2.3
1	D	416	SER	2.2
1	C	334	VAL	2.2
1	D	294	ASP	2.2
1	D	378	GLY	2.2
1	C	347	LEU	2.2
1	B	397	PHE	2.2
1	A	444	GLY	2.2
1	A	5	ALA	2.2

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Mol	Chain	Res	Type	RSRZ
1	B	441	LEU	2.2
1	B	502	PRO	2.2
1	D	371	ILE	2.2
1	D	250	VAL	2.2
1	D	158	GLY	2.2
1	C	277	ALA	2.2
1	C	427	ARG	2.2
1	C	448	TYR	2.2
1	C	328	ILE	2.1
1	C	403	ILE	2.1
1	B	399	GLU	2.1
1	C	390	ILE	2.1
1	B	382	ILE	2.1
1	D	368	VAL	2.1
1	D	9	ARG	2.1
1	D	333	LEU	2.1
1	D	325	GLU	2.1
1	C	299	PHE	2.1
1	C	436	PHE	2.1
1	A	327	ALA	2.1
1	C	287	ILE	2.1
1	D	305	ALA	2.0
1	D	137	LEU	2.0
1	C	420	CYS	2.0
1	B	568	THR	2.0

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

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

6.3 Carbohydrates ⓘ

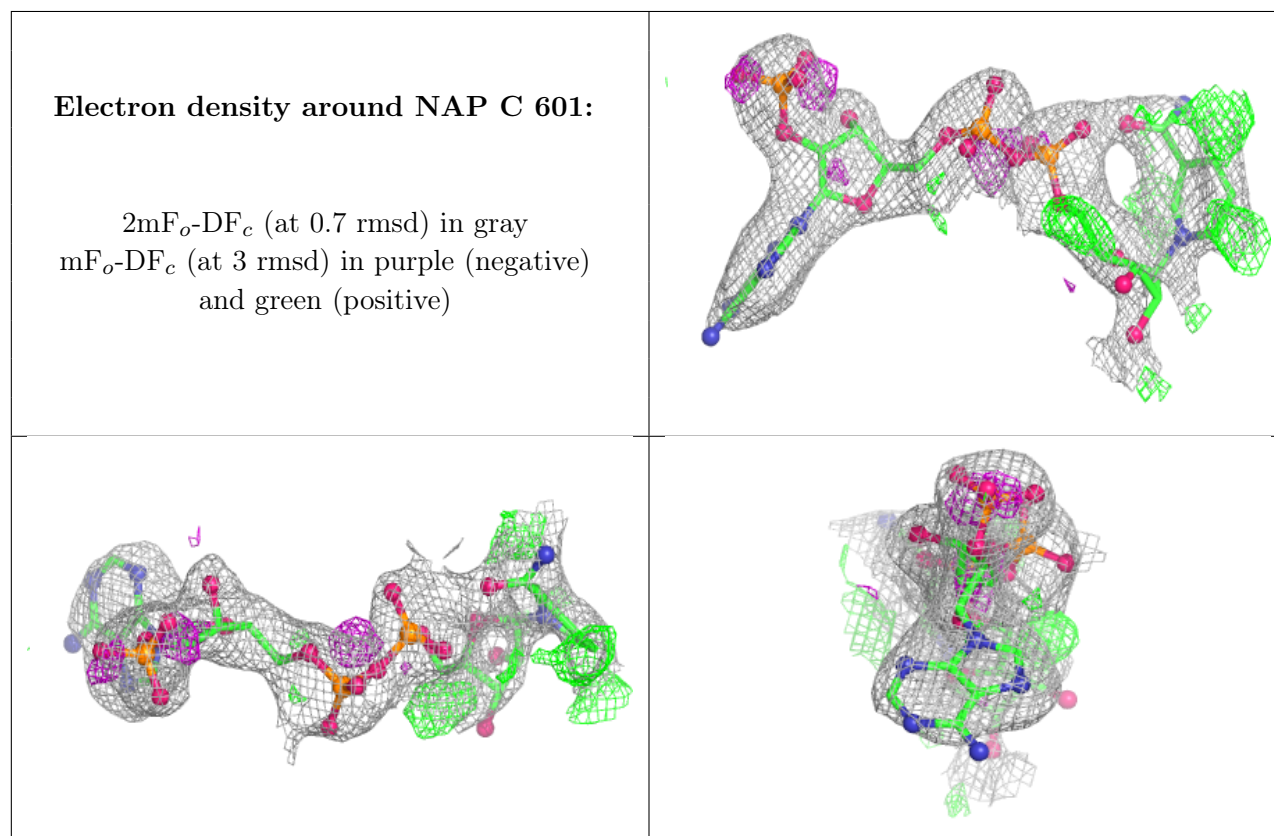
There are no oligosaccharides in this entry.

6.4 Ligands ⓘ

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.

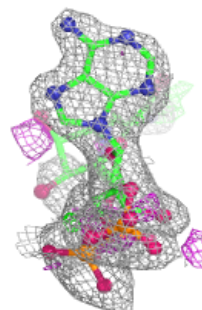
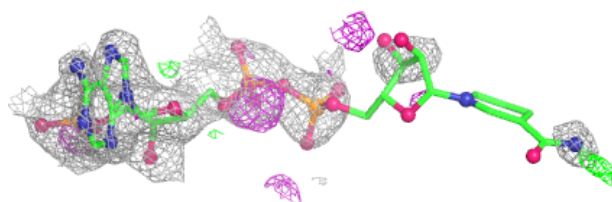
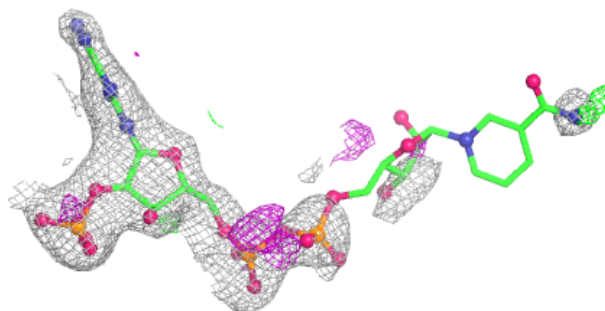
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
2	NAP	C	601	48/48	0.71	0.16	50,86,121,128	0
2	NAP	D	601	48/48	0.81	0.15	57,80,142,151	0
4	2OP	C	602	6/6	0.90	0.13	37,52,54,58	0
4	2OP	D	602	6/6	0.90	0.12	41,47,49,54	0
2	NAP	B	601	48/48	0.94	0.08	34,43,47,56	0
2	NAP	A	601	48/48	0.97	0.06	29,35,40,42	0
3	MN	C	603	1/1	0.98	0.03	34,34,34,34	0
3	MN	D	603	1/1	0.99	0.04	37,37,37,37	0
3	MN	B	602	1/1	1.00	0.04	40,40,40,40	0
3	MN	A	602	1/1	1.00	0.02	31,31,31,31	0

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



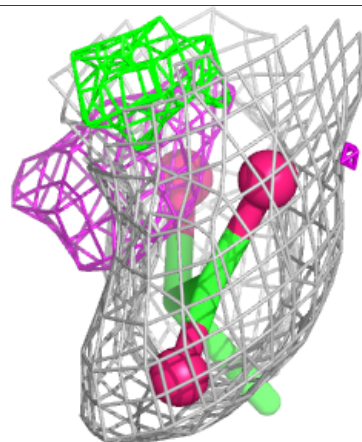
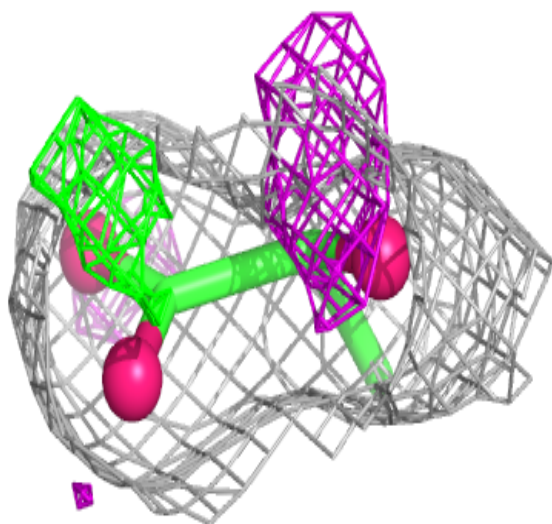
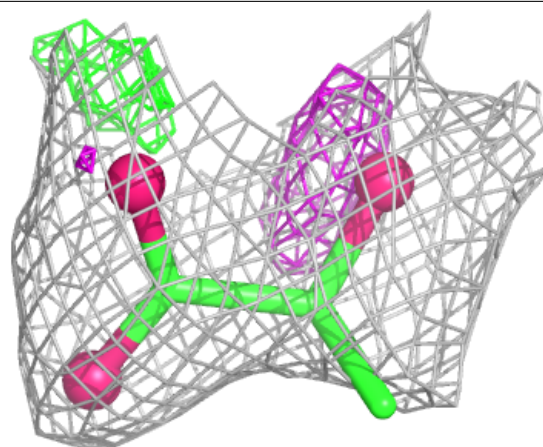
Electron density around NAP D 601:

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



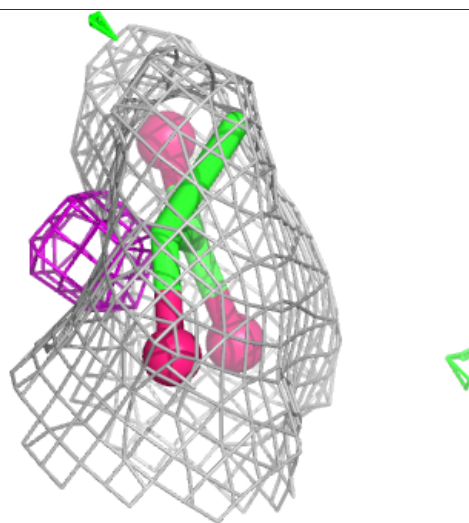
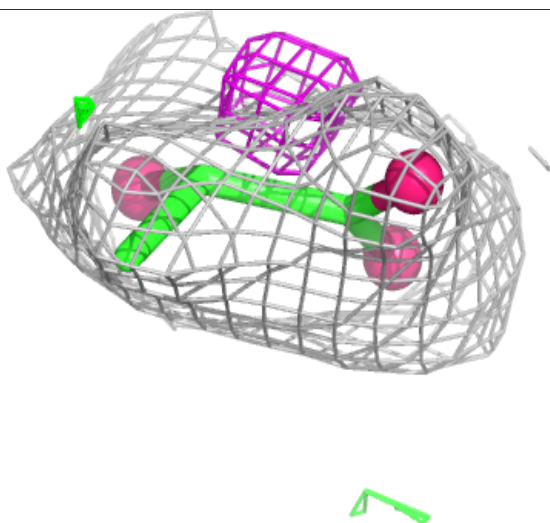
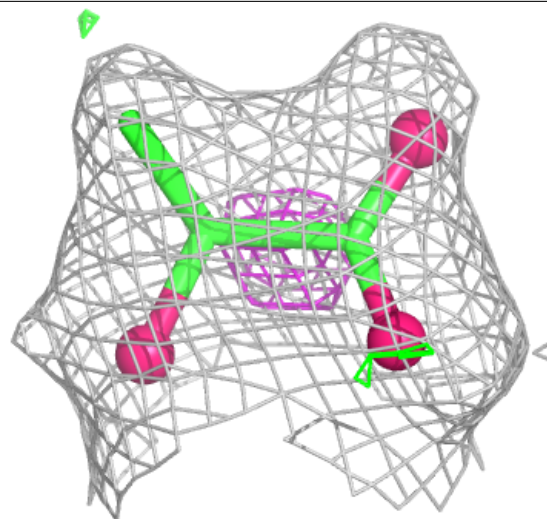
Electron density around 2OP C 602:

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



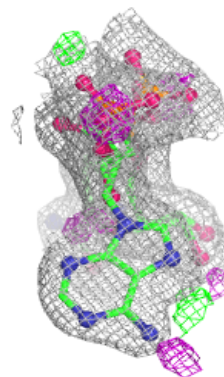
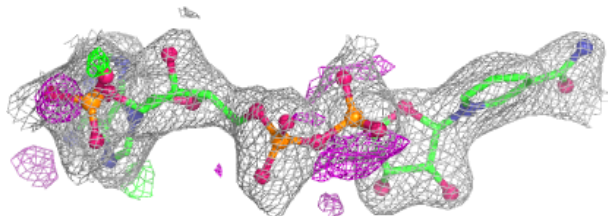
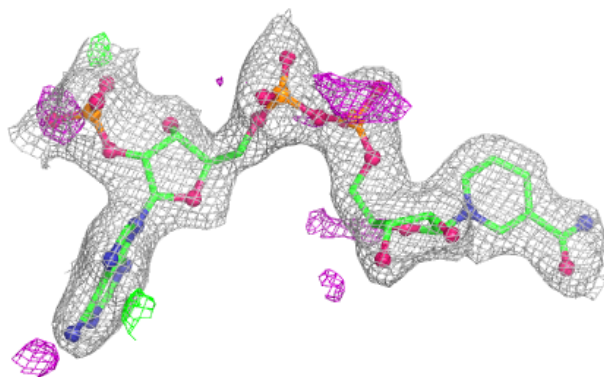
Electron density around 2OP D 602:

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

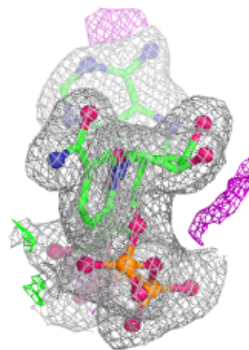
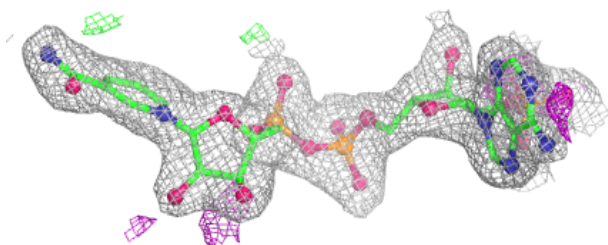
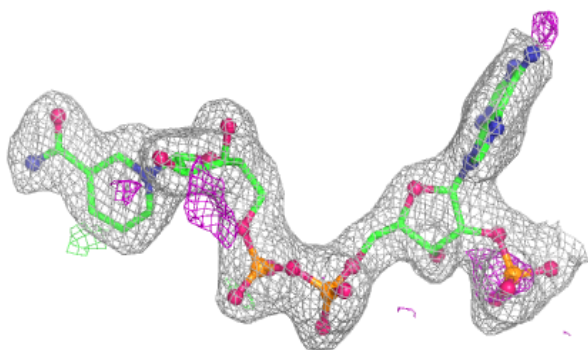


Electron density around NAP B 601:

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

**Electron density around NAP 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)



6.5 Other polymers [i](#)

There are no such residues in this entry.