



Full wwPDB X-ray Structure Validation Report ⓘ

Jun 23, 2026 – 01:17 AM EDT

PDB ID : 1HMP / pdb_00001hmp
Title : THE CRYSTAL STRUCTURE OF HUMAN HYPOXANTHINE-GUANINE
PHOSPHORIBOSYLTRANSFERASE WITH BOUND GMP
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Deposited on : 1994-06-03
Resolution : 2.50 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) : **NOT EXECUTED**
EDS : **NOT EXECUTED**
Buster-report : wwPDB partial adaption of 1.1.7 (2018)
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.49

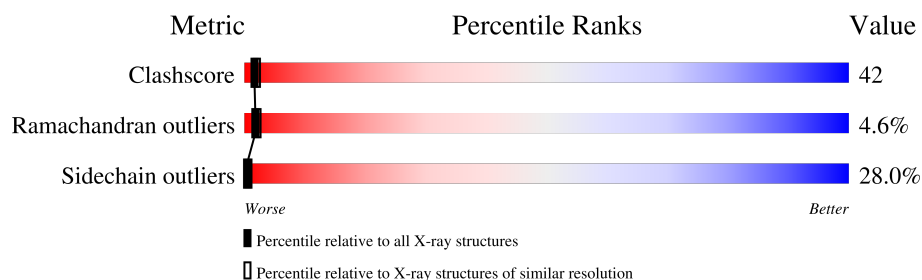
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.50 Å.

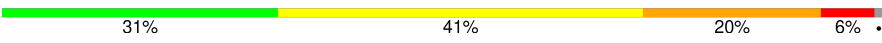
Percentile scores (ranging between 0-100) for global validation metrics of the entry are shown in the following graphic. The table shows the number of entries on which the scores are based.



Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
Clashscore	190562	6492 (2.50-2.50)
Ramachandran outliers	187476	6378 (2.50-2.50)
Sidechain outliers	187428	6380 (2.50-2.50)

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 $\leq 5\%$.

Note EDS was not executed.

Mol	Chain	Length	Quality of chain
1	A	217	
1	B	217	

2 Entry composition [i](#)

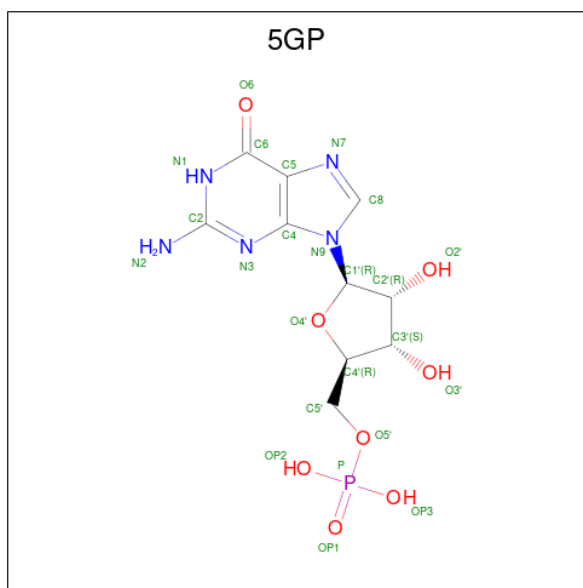
There are 3 unique types of molecules in this entry. The entry contains 3430 atoms, of which 0 are hydrogens and 0 are deuteriums.

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 HYPOXANTHINE GUANINE PHOSPHORIBOSYL-TRANSFERASE.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	214	Total	C	N	O	S	0	0	0
			1678	1072	284	312	10			
1	B	209	Total	C	N	O	S	0	0	0
			1619	1037	275	298	9			

- Molecule 2 is GUANOSINE-5'-MONOPHOSPHATE (CCD ID: 5GP) (formula: $C_{10}H_{14}N_5O_8P$).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
2	A	1	Total	C	N	O	P	0	0
			24	10	5	8	1		
2	B	1	Total	C	N	O	P	0	0
			24	10	5	8	1		

- Molecule 3 is water.

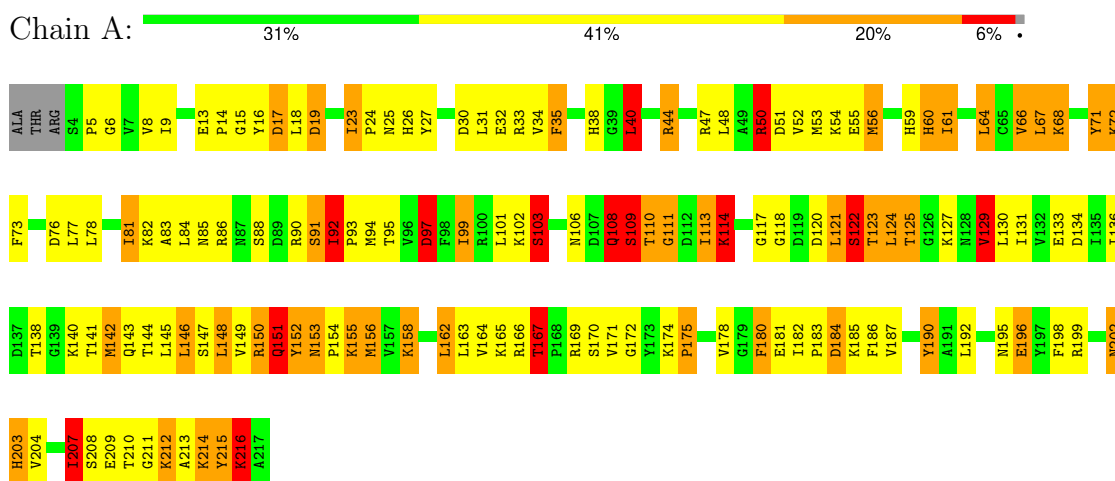
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	47	Total 47	O 47	0	0
3	B	38	Total 38	O 38	0	0

3 Residue-property plots

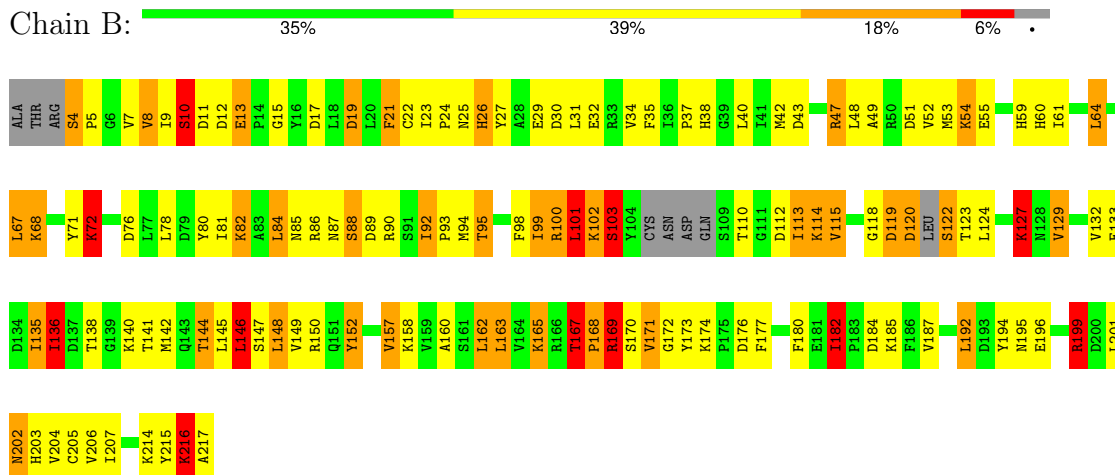
These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry. Residues are color-coded 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. 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.

Note EDS was not executed.

• Molecule 1: HYPOXANTHINE GUANINE PHOSPHORIBOSYL-TRANSFERASE



• Molecule 1: HYPOXANTHINE GUANINE PHOSPHORIBOSYL-TRANSFERASE



4 Data and refinement statistics

Xtriage (Phenix) and EDS were not executed - this section is therefore incomplete.

Property	Value	Source
Space group	P 21 21 2	Depositor
Cell constants a, b, c, α , β , γ	129.50Å 66.45Å 52.90Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	20.00 – 2.50	Depositor
% Data completeness (in resolution range)	(Not available) (20.00-2.50)	Depositor
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
Refinement program	TNT, X-PLOR	Depositor
R, R_{free}	0.186 , (Not available)	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	3430	wwPDB-VP
Average B, all atoms (Å ²)	28.0	wwPDB-VP

5 Model quality [i](#)

5.1 Standard geometry [i](#)

Bond lengths and bond angles in the following residue types are not validated in this section: 5GP

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	1.51	5/1711 (0.3%)	1.86	41/2311 (1.8%)
1	B	1.53	6/1650 (0.4%)	1.96	46/2230 (2.1%)
All	All	1.52	11/3361 (0.3%)	1.91	87/4541 (1.9%)

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	B	2	0

All (11) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	11	ASP	CA-C	-6.74	1.43	1.52
1	A	34	VAL	CA-C	-6.32	1.45	1.52
1	A	99	ILE	N-CA	-5.97	1.38	1.46
1	B	199	ARG	NE-CZ	5.90	1.39	1.33
1	B	11	ASP	C-N	-5.67	1.26	1.33
1	A	59	HIS	N-CA	-5.35	1.39	1.45
1	B	204	VAL	CA-CB	-5.29	1.47	1.54
1	A	50	ARG	NE-CZ	5.20	1.38	1.33
1	B	12	ASP	N-CA	-5.18	1.39	1.46
1	B	8	VAL	N-CA	-5.10	1.40	1.46
1	A	73	PHE	C-N	-5.07	1.27	1.33

All (87) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	216	LYS	N-CA-C	10.96	124.74	109.18
1	A	207	ILE	CB-CA-C	-10.50	99.69	111.45
1	B	4	SER	CA-C-N	10.02	130.29	119.87
1	B	4	SER	C-N-CA	10.02	130.29	119.87
1	A	67	LEU	N-CA-C	9.91	124.48	109.62
1	A	110	THR	N-CA-C	9.84	124.61	110.14
1	B	122	SER	N-CA-C	-9.26	101.25	112.54
1	A	71	TYR	N-CA-CB	-8.97	95.33	110.49
1	B	182	ILE	N-CA-C	8.32	117.07	107.84
1	A	129	VAL	N-CA-C	8.10	121.53	108.97
1	B	119	ASP	CA-C-N	7.87	135.53	122.54
1	B	119	ASP	C-N-CA	7.87	135.53	122.54
1	A	215	TYR	CA-C-N	-7.65	109.39	123.01
1	A	215	TYR	C-N-CA	-7.65	109.39	123.01
1	B	120	ASP	N-CA-C	-7.55	103.66	113.17
1	B	19	ASP	N-CA-CB	7.37	122.03	110.46
1	B	89	ASP	CA-CB-CG	-7.22	105.38	112.60
1	B	43	ASP	CA-CB-CG	7.13	119.73	112.60
1	A	34	VAL	N-CA-CB	6.90	118.05	110.53
1	A	109	SER	N-CA-CB	6.83	122.03	110.49
1	A	180	PHE	CA-CB-CG	6.78	120.58	113.80
1	B	112	ASP	N-CA-C	-6.76	104.78	113.16
1	A	110	THR	CA-C-N	6.75	134.64	121.41
1	A	110	THR	C-N-CA	6.75	134.64	121.41
1	A	99	ILE	CB-CA-C	6.75	119.53	110.42
1	B	72	LYS	N-CA-C	6.72	119.17	111.11
1	B	136	ILE	N-CA-CB	6.67	120.33	111.25
1	B	129	VAL	N-CA-C	6.66	118.18	108.53
1	B	202	ASN	N-CA-C	6.64	121.44	112.88
1	A	167	THR	CB-CA-C	-6.62	99.15	109.55
1	B	202	ASN	CA-CB-CG	-6.62	105.98	112.60
1	B	170	SER	N-CA-CB	6.60	119.80	109.83
1	A	122	SER	N-CA-C	-6.57	105.23	113.18
1	B	136	ILE	CA-CB-CG2	6.53	121.59	110.50
1	B	173	TYR	N-CA-CB	6.47	119.49	109.85
1	B	119	ASP	N-CA-C	-6.44	105.80	113.21
1	B	187	VAL	N-CA-C	6.43	118.93	108.97
1	A	5	PRO	N-CA-C	-6.35	107.36	114.92
1	B	19	ASP	N-CA-C	6.32	120.99	113.28
1	B	167	THR	CB-CA-C	-6.32	99.08	108.87
1	B	168	PRO	N-CA-C	-6.22	106.09	113.86
1	A	92	ILE	CB-CA-C	6.14	116.09	110.13
1	A	124	LEU	CB-CA-C	-6.13	99.74	109.80

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	152	TYR	CA-CB-CG	-6.13	102.87	113.90
1	B	21	PHE	N-CA-C	6.01	116.21	108.34
1	A	23	ILE	N-CA-CB	5.95	118.00	111.64
1	B	169	ARG	N-CA-CB	5.92	119.57	110.46
1	B	10	SER	N-CA-C	5.81	118.39	110.55
1	A	131	ILE	CA-C-N	-5.80	116.00	123.19
1	A	131	ILE	C-N-CA	-5.80	116.00	123.19
1	A	72	LYS	N-CA-C	5.76	120.87	111.37
1	B	127	LYS	CB-CA-C	-5.75	99.78	109.83
1	B	182	ILE	N-CA-CB	-5.70	107.90	111.83
1	B	146	LEU	N-CA-CB	5.56	118.91	110.28
1	B	148	LEU	N-CA-C	5.55	119.23	112.23
1	B	103	SER	N-CA-CB	5.53	119.84	110.49
1	A	153	ASN	CA-CB-CG	5.46	118.06	112.60
1	B	132	VAL	N-CA-C	5.44	115.92	107.28
1	A	151	GLN	N-CA-CB	5.39	117.78	109.91
1	B	114	LYS	CA-C-N	5.38	131.66	121.97
1	B	114	LYS	C-N-CA	5.38	131.66	121.97
1	A	149	VAL	CB-CA-C	-5.36	105.00	112.02
1	A	34	VAL	CB-CA-C	-5.36	104.19	111.15
1	A	143	GLN	N-CA-C	5.32	117.08	111.28
1	B	34	VAL	N-CA-C	-5.29	101.91	108.89
1	A	66	VAL	CA-C-N	5.28	129.87	122.05
1	A	66	VAL	C-N-CA	5.28	129.87	122.05
1	A	91	SER	N-CA-CB	5.27	118.12	109.95
1	B	15	GLY	CA-C-N	-5.27	113.96	122.81
1	B	15	GLY	C-N-CA	-5.27	113.96	122.81
1	A	35	PHE	CA-CB-CG	-5.27	108.53	113.80
1	A	110	THR	N-CA-CB	-5.21	102.94	110.70
1	B	51	ASP	CA-CB-CG	5.19	117.79	112.60
1	A	40	LEU	CB-CA-C	-5.16	102.78	110.88
1	A	203	HIS	CA-CB-CG	-5.16	108.64	113.80
1	A	76	ASP	CA-CB-CG	5.15	117.75	112.60
1	A	18	LEU	CA-C-N	5.13	127.67	120.28
1	A	18	LEU	C-N-CA	5.13	127.67	120.28
1	A	97	ASP	CA-CB-CG	-5.13	107.47	112.60
1	A	165	LYS	CB-CA-C	-5.09	100.92	109.53
1	B	172	GLY	N-CA-C	5.09	122.14	115.36
1	B	201	LEU	CA-C-N	-5.05	114.72	122.60
1	B	201	LEU	C-N-CA	-5.05	114.72	122.60
1	A	19	ASP	N-CA-C	5.02	117.48	111.71
1	B	113	ILE	CA-C-N	5.00	128.69	120.63

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	113	ILE	C-N-CA	5.00	128.69	120.63
1	B	122	SER	CA-C-O	5.00	125.53	119.38

All (2) chirality outliers are listed below:

Mol	Chain	Res	Type	Atom
1	B	19	ASP	CA
1	B	136	ILE	CB

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	1678	0	1675	149	0
1	B	1619	0	1597	132	0
2	A	24	0	12	3	0
2	B	24	0	11	2	0
3	A	47	0	0	6	0
3	B	38	0	0	2	0
All	All	3430	0	3295	276	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 42.

All (276) 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:54:LYS:HG3	1:A:55:GLU:HG2	1.46	0.97
1:A:56:MET:HB3	1:A:61:ILE:HD11	1.46	0.96
1:B:120:ASP:HA	1:B:124:LEU:HG	1.46	0.95
1:B:9:ILE:HG23	1:B:13:GLU:HG3	1.45	0.95
1:A:118:GLY:HA2	1:A:121:LEU:HG	1.52	0.91
1:A:54:LYS:CG	1:A:55:GLU:HG2	2.02	0.89
1:A:38:HIS:H	1:A:203:HIS:HD2	1.18	0.87

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:100:ARG:HG2	1:B:101:LEU:HD22	1.55	0.87
1:B:195:ASN:ND2	1:B:216:LYS:HA	1.90	0.86
1:A:138:THR:HG21	1:A:140:LYS:HZ1	1.42	0.84
1:A:68:LYS:HD3	2:A:300:5GP:O2'	1.78	0.84
1:A:167:THR:HG23	1:A:184:ASP:CG	2.02	0.83
1:A:121:LEU:HD12	1:A:152:TYR:CE1	2.14	0.82
1:B:38:HIS:H	1:B:203:HIS:HD2	1.29	0.81
1:B:135:ILE:HD11	1:B:165:LYS:HD2	1.62	0.80
1:B:167:THR:HG22	1:B:168:PRO:HD2	1.64	0.79
1:B:147:SER:O	1:B:150:ARG:HB3	1.84	0.78
1:B:85:ASN:O	1:B:88:SER:HB3	1.85	0.76
1:A:54:LYS:HG3	1:A:55:GLU:N	2.02	0.75
1:B:142:MET:HE2	1:B:142:MET:HA	1.68	0.74
1:B:118:GLY:C	1:B:120:ASP:H	1.93	0.74
1:B:147:SER:HA	1:B:150:ARG:NH2	2.02	0.73
1:B:147:SER:HA	1:B:150:ARG:CZ	2.17	0.73
1:A:118:GLY:HA2	1:A:121:LEU:CG	2.17	0.73
1:B:119:ASP:O	1:B:123:THR:HB	1.88	0.73
1:B:38:HIS:NE2	1:B:42:MET:HE3	2.03	0.73
1:B:199:ARG:HH11	1:B:199:ARG:HG2	1.53	0.73
1:B:67:LEU:HD23	1:B:98:PHE:CD2	2.24	0.72
1:A:51:ASP:O	1:A:54:LYS:HG2	1.89	0.72
1:B:167:THR:HG23	1:B:184:ASP:OD2	1.89	0.71
1:A:207:ILE:HD12	1:A:212:LYS:HG3	1.71	0.70
1:B:140:LYS:O	1:B:144:THR:HG23	1.92	0.70
1:A:121:LEU:HB2	1:A:152:TYR:CE2	2.28	0.69
1:A:14:PRO:O	1:A:33:ARG:HD3	1.92	0.69
1:A:196:GLU:OE2	1:B:95:THR:HB	1.92	0.69
1:A:202:ASN:OD1	1:A:202:ASN:N	2.26	0.69
1:B:38:HIS:H	1:B:203:HIS:CD2	2.11	0.69
1:B:160:ALA:HA	1:B:177:PHE:HB2	1.73	0.69
1:B:195:ASN:HD22	1:B:216:LYS:HA	1.57	0.68
1:B:199:ARG:HG2	1:B:199:ARG:NH1	2.05	0.68
1:B:113:ILE:CB	1:B:148:LEU:HD13	2.25	0.67
1:A:17:ASP:HB2	1:A:19:ASP:OD2	1.95	0.67
1:B:165:LYS:NZ	2:B:800:5GP:O6	2.28	0.67
1:A:118:GLY:HA2	1:A:121:LEU:HB2	1.76	0.66
1:A:151:GLN:O	1:A:153:ASN:N	2.28	0.66
1:B:120:ASP:C	1:B:124:LEU:H	2.03	0.66
1:B:100:ARG:CG	1:B:101:LEU:HD22	2.26	0.66
1:B:118:GLY:O	1:B:122:SER:N	2.29	0.66

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:183:PRO:O	1:A:185:LYS:N	2.29	0.66
1:A:209:GLU:OE2	1:A:212:LYS:NZ	2.29	0.65
1:A:120:ASP:O	1:A:123:THR:HB	1.97	0.65
1:A:148:LEU:O	1:A:151:GLN:HG2	1.96	0.65
1:A:153:ASN:N	1:A:154:PRO:HD3	2.11	0.65
1:A:164:VAL:O	1:A:182:ILE:N	2.29	0.65
3:A:913:HOH:O	1:B:92:ILE:HD13	1.95	0.65
1:B:129:VAL:HB	1:B:157:VAL:CG2	2.26	0.65
1:B:9:ILE:CG2	1:B:13:GLU:HG3	2.25	0.65
2:B:800:5GP:H5'2	3:B:876:HOH:O	1.97	0.64
1:B:123:THR:O	1:B:127:LYS:HD3	1.98	0.64
1:A:6:GLY:HA2	1:A:44:ARG:HH21	1.63	0.64
1:A:138:THR:HG21	1:A:140:LYS:NZ	2.12	0.63
1:A:38:HIS:H	1:A:203:HIS:CD2	2.09	0.62
1:B:59:HIS:HB2	3:B:804:HOH:O	1.99	0.62
1:B:67:LEU:HD13	1:B:67:LEU:O	2.00	0.61
1:A:190:TYR:HB2	1:A:202:ASN:O	2.00	0.61
1:B:120:ASP:CB	1:B:124:LEU:HD12	2.30	0.61
1:B:118:GLY:HA2	1:B:152:TYR:CZ	2.34	0.61
1:B:47:ARG:O	1:B:47:ARG:HD3	2.01	0.61
1:B:133:GLU:OE1	1:B:142:MET:HE3	2.00	0.61
1:B:163:LEU:HG	1:B:182:ILE:CD1	2.31	0.60
1:A:48:LEU:O	1:A:52:VAL:HG23	2.00	0.60
1:A:6:GLY:HA2	1:A:44:ARG:NH2	2.17	0.60
1:B:31:LEU:HD22	1:B:205:CYS:HB2	1.83	0.60
1:B:9:ILE:HG23	1:B:13:GLU:CG	2.28	0.59
1:A:54:LYS:HE2	3:A:827:HOH:O	2.02	0.59
1:A:166:ARG:O	1:A:184:ASP:HB2	2.02	0.59
1:A:118:GLY:HA2	1:A:121:LEU:CB	2.32	0.59
1:A:123:THR:HG22	1:A:124:LEU:N	2.16	0.59
1:B:13:GLU:OE1	1:B:13:GLU:HA	2.01	0.59
1:B:4:SER:OG	1:B:5:PRO:HD2	2.03	0.59
1:A:136:ILE:HD12	1:A:175:PRO:HG3	1.84	0.59
1:B:81:ILE:HG22	1:B:94:MET:HE1	1.83	0.58
1:B:100:ARG:O	1:B:101:LEU:HB2	2.03	0.58
1:A:164:VAL:O	1:A:181:GLU:HA	2.03	0.58
1:B:27:TYR:HA	1:B:30:ASP:OD2	2.04	0.58
1:A:56:MET:HE1	1:A:158:LYS:CB	2.33	0.58
1:A:142:MET:O	1:A:146:LEU:HD22	2.03	0.58
1:A:60:HIS:HE1	1:A:95:THR:OG1	1.86	0.58
1:B:146:LEU:HA	1:B:149:VAL:HG12	1.87	0.57

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:121:LEU:HD12	1:A:152:TYR:CZ	2.38	0.57
1:B:118:GLY:C	1:B:120:ASP:N	2.62	0.57
1:A:125:THR:HA	1:A:153:ASN:O	2.03	0.57
1:A:30:ASP:O	1:A:207:ILE:HG22	2.05	0.57
1:A:210:THR:O	1:A:214:LYS:N	2.36	0.57
1:A:50:ARG:HD3	1:A:50:ARG:C	2.30	0.56
1:A:101:LEU:O	1:A:103:SER:N	2.38	0.56
1:A:118:GLY:HA3	1:A:152:TYR:OH	2.05	0.56
1:B:142:MET:HE2	1:B:142:MET:CA	2.28	0.56
1:B:163:LEU:HG	1:B:182:ILE:HD11	1.87	0.56
1:A:196:GLU:O	1:B:93:PRO:HA	2.05	0.56
1:B:49:ALA:O	1:B:52:VAL:HB	2.04	0.56
1:B:129:VAL:HB	1:B:157:VAL:HG22	1.87	0.56
1:A:210:THR:O	1:A:214:LYS:HB3	2.05	0.55
1:B:202:ASN:N	1:B:202:ASN:OD1	2.33	0.55
1:B:81:ILE:HG22	1:B:94:MET:CE	2.37	0.55
1:B:199:ARG:HH11	1:B:199:ARG:CG	2.19	0.55
1:A:56:MET:CB	1:A:61:ILE:HD11	2.29	0.55
1:A:155:LYS:HD2	1:A:155:LYS:O	2.07	0.55
1:B:52:VAL:HG12	1:B:53:MET:N	2.17	0.55
1:B:10:SER:O	1:B:13:GLU:HB2	2.07	0.54
1:A:71:TYR:CD1	1:A:71:TYR:N	2.70	0.54
1:B:206:VAL:HG12	1:B:207:ILE:O	2.08	0.54
1:B:167:THR:HG21	1:B:169:ARG:HG2	1.90	0.54
1:A:208:SER:O	1:A:212:LYS:HB2	2.06	0.54
1:B:115:VAL:O	1:B:118:GLY:N	2.38	0.54
1:A:182:ILE:HB	1:A:183:PRO:CD	2.37	0.54
1:A:53:MET:SD	1:A:81:ILE:HG23	2.48	0.54
1:B:146:LEU:O	1:B:150:ARG:HB2	2.08	0.54
1:B:115:VAL:C	1:B:118:GLY:H	2.16	0.54
1:A:117:GLY:O	1:A:121:LEU:HG	2.07	0.54
1:B:194:TYR:CD2	1:B:215:TYR:HB2	2.43	0.54
1:A:30:ASP:HB3	1:A:211:GLY:HA3	1.89	0.54
1:A:163:LEU:HA	1:A:180:PHE:O	2.09	0.53
1:A:66:VAL:HG21	1:A:142:MET:CE	2.38	0.53
1:A:38:HIS:N	1:A:203:HIS:HD2	1.99	0.53
1:A:122:SER:O	1:A:125:THR:HG22	2.09	0.53
1:A:129:VAL:HG12	1:A:130:LEU:N	2.24	0.52
1:A:164:VAL:CG2	1:A:178:VAL:HG13	2.39	0.52
1:B:55:GLU:OE2	1:B:158:LYS:HE3	2.10	0.52
1:B:135:ILE:CD1	1:B:165:LYS:HD2	2.38	0.52

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:194:TYR:CE2	1:B:215:TYR:HB2	2.44	0.52
1:A:147:SER:HA	1:A:150:ARG:CD	2.40	0.52
1:A:71:TYR:CG	1:A:72:LYS:N	2.78	0.52
1:A:151:GLN:C	1:A:153:ASN:H	2.17	0.52
1:A:167:THR:HG21	1:A:169:ARG:HE	1.74	0.51
1:B:60:HIS:NE2	1:B:95:THR:CG2	2.73	0.51
1:A:187:VAL:HG23	1:A:192:LEU:HD12	1.92	0.51
1:B:120:ASP:HA	1:B:124:LEU:CG	2.31	0.51
1:B:171:VAL:O	1:B:171:VAL:HG13	2.10	0.51
1:A:32:GLU:O	1:A:33:ARG:HG3	2.11	0.51
1:A:118:GLY:CA	1:A:121:LEU:HB2	2.41	0.51
1:A:182:ILE:HB	1:A:183:PRO:HD2	1.93	0.51
1:B:167:THR:CG2	1:B:169:ARG:HG2	2.41	0.51
1:A:125:THR:HA	1:A:152:TYR:O	2.10	0.51
1:A:170:SER:C	1:A:172:GLY:H	2.17	0.51
1:A:9:ILE:C	1:A:166:ARG:HH22	2.18	0.50
1:A:152:TYR:CD1	1:A:152:TYR:N	2.79	0.50
1:B:165:LYS:NZ	1:B:185:LYS:O	2.30	0.50
1:A:56:MET:HE1	1:A:158:LYS:HB2	1.92	0.50
1:A:136:ILE:CD1	1:A:175:PRO:HG3	2.41	0.50
1:A:147:SER:HA	1:A:150:ARG:HD2	1.92	0.50
1:A:24:PRO:HD3	3:A:914:HOH:O	2.11	0.50
1:A:113:ILE:O	1:A:114:LYS:HB2	2.11	0.50
1:A:198:PHE:CZ	1:A:215:TYR:CE2	3.00	0.50
1:B:38:HIS:CD2	1:B:42:MET:HE3	2.46	0.50
1:A:54:LYS:HE2	1:A:55:GLU:OE2	2.10	0.50
1:A:108:GLN:O	1:A:109:SER:HB2	2.11	0.50
1:B:7:VAL:HB	1:B:180:PHE:CD2	2.47	0.50
1:B:80:TYR:O	1:B:84:LEU:HD23	2.12	0.50
1:B:72:LYS:NZ	1:B:76:ASP:OD1	2.44	0.50
1:B:47:ARG:HD3	1:B:47:ARG:C	2.37	0.49
1:B:103:SER:CB	1:B:144:THR:HG21	2.41	0.49
1:A:50:ARG:HD3	1:A:50:ARG:O	2.13	0.49
1:B:102:LYS:CB	1:B:141:THR:HG23	2.42	0.49
1:A:83:ALA:HA	1:A:86:ARG:HG3	1.94	0.49
1:B:157:VAL:HG12	1:B:157:VAL:O	2.11	0.49
1:A:66:VAL:HG21	1:A:142:MET:HE1	1.95	0.49
1:A:214:LYS:O	1:A:214:LYS:HG2	2.11	0.49
1:A:54:LYS:HG2	1:A:55:GLU:HG2	1.92	0.48
1:A:207:ILE:HD12	1:A:212:LYS:CG	2.40	0.48
1:B:129:VAL:HB	1:B:157:VAL:HG23	1.94	0.48

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:92:ILE:HA	1:B:93:PRO:HD3	1.72	0.48
1:A:60:HIS:CD2	1:A:127:LYS:NZ	2.81	0.48
1:A:167:THR:HG21	1:A:169:ARG:HH21	1.79	0.48
1:A:133:GLU:HG2	1:A:134:ASP:H	1.78	0.48
1:B:146:LEU:N	1:B:146:LEU:HD13	2.29	0.48
2:A:300:5GP:H5'1	2:A:300:5GP:H8	1.95	0.48
1:B:135:ILE:HG13	1:B:136:ILE:N	2.29	0.47
1:A:54:LYS:CG	1:A:55:GLU:N	2.75	0.47
1:A:110:THR:CG2	1:A:111:GLY:N	2.77	0.47
1:A:26:HIS:HD2	1:B:88:SER:O	1.96	0.47
1:A:186:PHE:HD2	1:A:207:ILE:HD11	1.80	0.47
1:A:15:GLY:C	1:A:33:ARG:HH11	2.23	0.47
1:A:163:LEU:HD23	1:A:180:PHE:HB2	1.96	0.46
1:B:158:LYS:HG2	1:B:177:PHE:CE2	2.50	0.46
1:B:114:LYS:HA	1:B:152:TYR:OH	2.14	0.46
1:B:100:ARG:HD3	1:B:101:LEU:CD2	2.45	0.46
1:A:148:LEU:HD23	1:A:151:GLN:HE21	1.81	0.46
1:B:54:LYS:HD2	1:B:54:LYS:HA	1.53	0.46
1:B:120:ASP:C	1:B:123:THR:N	2.68	0.46
1:B:138:THR:O	1:B:171:VAL:HG12	2.16	0.46
1:B:48:LEU:HD23	1:B:48:LEU:HA	1.74	0.46
1:B:71:TYR:CD1	1:B:71:TYR:N	2.84	0.46
1:A:61:ILE:O	1:A:61:ILE:HG22	2.15	0.46
1:A:121:LEU:CB	1:A:152:TYR:CE2	2.98	0.46
1:A:196:GLU:CD	1:B:95:THR:HB	2.40	0.46
1:A:16:TYR:CA	1:A:33:ARG:NH1	2.79	0.46
1:B:59:HIS:O	1:B:61:ILE:HG23	2.16	0.46
1:A:164:VAL:HG23	1:A:178:VAL:HG13	1.96	0.46
1:A:185:LYS:HE2	3:A:825:HOH:O	2.15	0.45
1:A:195:ASN:ND2	1:A:216:LYS:HA	2.31	0.45
1:B:162:LEU:O	1:B:162:LEU:HD22	2.16	0.45
1:A:40:LEU:HD23	1:A:40:LEU:HA	1.76	0.45
1:B:22:CYS:O	1:B:203:HIS:HE1	1.99	0.45
1:A:8:VAL:CG1	1:A:9:ILE:N	2.78	0.45
1:A:60:HIS:CD2	1:A:127:LYS:HZ1	2.34	0.45
1:B:163:LEU:HG	1:B:182:ILE:HD13	1.98	0.45
1:A:78:LEU:N	1:A:78:LEU:HD12	2.30	0.45
2:A:300:5GP:H5'2	3:A:893:HOH:O	2.16	0.45
1:A:78:LEU:N	1:A:78:LEU:CD1	2.80	0.45
1:A:147:SER:O	1:A:150:ARG:HD3	2.17	0.45
1:A:92:ILE:HD13	1:A:92:ILE:HA	1.83	0.45

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:145:LEU:HA	1:B:145:LEU:HD23	1.68	0.45
1:A:141:THR:O	1:A:144:THR:OG1	2.31	0.44
1:B:92:ILE:HD13	1:B:92:ILE:N	2.32	0.44
1:A:211:GLY:HA2	1:A:214:LYS:HD2	1.99	0.44
1:B:195:ASN:O	1:B:196:GLU:HB2	2.16	0.44
1:B:199:ARG:NH1	1:B:199:ARG:CG	2.78	0.44
1:A:53:MET:HE1	1:A:85:ASN:OD1	2.17	0.44
1:A:88:SER:C	1:A:90:ARG:H	2.24	0.44
1:A:88:SER:O	1:B:26:HIS:HD2	2.01	0.44
1:B:120:ASP:O	1:B:124:LEU:N	2.41	0.44
1:A:162:LEU:HD13	1:A:163:LEU:HG	2.00	0.43
1:B:127:LYS:HD2	1:B:127:LYS:N	2.33	0.43
1:A:17:ASP:OD1	1:A:17:ASP:N	2.51	0.43
1:A:209:GLU:O	1:A:213:ALA:N	2.36	0.43
1:B:195:ASN:HD22	1:B:216:LYS:CA	2.27	0.43
1:A:9:ILE:O	1:A:183:PRO:HG3	2.18	0.43
3:A:874:HOH:O	1:B:82:LYS:HE3	2.19	0.43
1:A:170:SER:C	1:A:172:GLY:N	2.76	0.43
1:A:82:LYS:HG2	1:A:94:MET:HE1	2.00	0.43
1:B:4:SER:HA	1:B:5:PRO:HD3	1.66	0.43
1:B:64:LEU:HB3	1:B:99:ILE:HD13	2.01	0.43
1:B:86:ARG:C	1:B:88:SER:N	2.76	0.43
1:B:31:LEU:HD22	1:B:205:CYS:CB	2.46	0.42
1:A:56:MET:HE1	1:A:158:LYS:CG	2.49	0.42
1:A:92:ILE:HA	1:A:93:PRO:HD3	1.95	0.42
1:A:138:THR:CG2	1:A:140:LYS:NZ	2.80	0.42
1:B:182:ILE:HD13	1:B:182:ILE:HG21	1.74	0.42
1:A:121:LEU:O	1:A:124:LEU:O	2.38	0.42
1:A:15:GLY:C	1:A:33:ARG:NH1	2.78	0.42
1:B:24:PRO:HG2	1:B:27:TYR:HD2	1.85	0.42
1:A:56:MET:HG2	1:A:61:ILE:HG12	2.02	0.42
1:B:138:THR:HG22	1:B:169:ARG:O	2.20	0.42
1:A:8:VAL:HG13	1:A:166:ARG:HH21	1.83	0.42
1:B:21:PHE:CD1	1:B:21:PHE:N	2.88	0.42
1:B:101:LEU:HD13	1:B:101:LEU:HA	1.90	0.42
1:B:216:LYS:HB3	1:B:217:ALA:H	1.60	0.42
1:B:113:ILE:O	1:B:118:GLY:N	2.53	0.41
1:B:192:LEU:N	1:B:192:LEU:CD1	2.84	0.41
1:A:16:TYR:N	1:A:33:ARG:HH11	2.18	0.41
1:A:163:LEU:C	1:A:164:VAL:HG23	2.46	0.41
1:A:212:LYS:HB3	1:A:212:LYS:HE2	1.14	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:138:THR:CG2	1:A:140:LYS:HZ1	2.24	0.41
1:A:129:VAL:N	1:A:156:MET:O	2.43	0.41
1:A:186:PHE:CD2	1:A:207:ILE:HD11	2.56	0.41
1:A:84:LEU:HD23	1:A:84:LEU:HA	1.79	0.41
1:A:82:LYS:HD3	1:B:199:ARG:O	2.21	0.41
1:A:88:SER:O	1:B:26:HIS:CD2	2.74	0.41
1:B:37:PRO:HA	1:B:203:HIS:CD2	2.56	0.41
1:A:27:TYR:HA	1:A:30:ASP:OD2	2.21	0.41
1:A:64:LEU:CD1	1:A:97:ASP:HB3	2.50	0.41
1:B:84:LEU:N	1:B:84:LEU:CD2	2.84	0.41
1:B:147:SER:CA	1:B:150:ARG:NH2	2.80	0.41
1:A:118:GLY:C	1:A:121:LEU:H	2.29	0.40
1:A:118:GLY:O	1:A:121:LEU:HB2	2.21	0.40
1:A:164:VAL:N	1:A:180:PHE:O	2.52	0.40
1:B:138:THR:CG2	1:B:169:ARG:HG3	2.51	0.40
1:A:82:LYS:NZ	1:B:71:TYR:OH	2.26	0.40
1:B:138:THR:HG22	1:B:169:ARG:HG3	2.03	0.40
1:A:195:ASN:C	1:A:196:GLU:CG	2.89	0.40
1:A:213:ALA:O	1:A:216:LYS:HD2	2.21	0.40
1:B:24:PRO:HG2	1:B:27:TYR:CD2	2.56	0.40
1:B:64:LEU:CD1	1:B:129:VAL:CG1	3.00	0.40
1:B:38:HIS:NE2	1:B:42:MET:CE	2.80	0.40
1:B:215:TYR:O	1:B:216:LYS:HG2	2.20	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	212/217 (98%)	172 (81%)	28 (13%)	12 (6%)	1	1
1	B	205/217 (94%)	182 (89%)	16 (8%)	7 (3%)	3	4

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
All	All	417/434 (96%)	354 (85%)	44 (11%)	19 (5%)	2	2

All (19) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	68	LYS
1	A	102	LYS
1	A	109	SER
1	A	111	GLY
1	A	114	LYS
1	A	125	THR
1	A	152	TYR
1	A	184	ASP
1	B	101	LEU
1	B	103	SER
1	A	108	GLN
1	B	216	LYS
1	A	103	SER
1	B	110	THR
1	A	190	TYR
1	B	68	LYS
1	A	175	PRO
1	B	102	LYS
1	B	115	VAL

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	183/191 (96%)	132 (72%)	51 (28%)	0	1
1	B	171/191 (90%)	123 (72%)	48 (28%)	0	0
All	All	354/382 (93%)	255 (72%)	99 (28%)	0	1

All (99) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	13	GLU
1	A	17	ASP
1	A	23	ILE
1	A	25	ASN
1	A	31	LEU
1	A	35	PHE
1	A	40	LEU
1	A	44	ARG
1	A	47	ARG
1	A	50	ARG
1	A	56	MET
1	A	60	HIS
1	A	61	ILE
1	A	64	LEU
1	A	67	LEU
1	A	77	LEU
1	A	81	ILE
1	A	91	SER
1	A	92	ILE
1	A	97	ASP
1	A	99	ILE
1	A	103	SER
1	A	106	ASN
1	A	108	GLN
1	A	113	ILE
1	A	114	LYS
1	A	121	LEU
1	A	122	SER
1	A	123	THR
1	A	129	VAL
1	A	142	MET
1	A	145	LEU
1	A	146	LEU
1	A	148	LEU
1	A	150	ARG
1	A	151	GLN
1	A	155	LYS
1	A	156	MET
1	A	158	LYS
1	A	162	LEU
1	A	167	THR
1	A	171	VAL
1	A	174	LYS

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Mol	Chain	Res	Type
1	A	196	GLU
1	A	199	ARG
1	A	202	ASN
1	A	204	VAL
1	A	207	ILE
1	A	212	LYS
1	A	214	LYS
1	A	216	LYS
1	B	8	VAL
1	B	10	SER
1	B	13	GLU
1	B	17	ASP
1	B	19	ASP
1	B	23	ILE
1	B	25	ASN
1	B	26	HIS
1	B	29	GLU
1	B	32	GLU
1	B	35	PHE
1	B	40	LEU
1	B	47	ARG
1	B	54	LYS
1	B	64	LEU
1	B	67	LEU
1	B	68	LYS
1	B	72	LYS
1	B	78	LEU
1	B	82	LYS
1	B	84	LEU
1	B	87	ASN
1	B	88	SER
1	B	90	ARG
1	B	92	ILE
1	B	95	THR
1	B	99	ILE
1	B	100	ARG
1	B	101	LEU
1	B	127	LYS
1	B	135	ILE
1	B	136	ILE
1	B	144	THR
1	B	146	LEU

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Mol	Chain	Res	Type
1	B	157	VAL
1	B	162	LEU
1	B	163	LEU
1	B	165	LYS
1	B	167	THR
1	B	169	ARG
1	B	171	VAL
1	B	174	LYS
1	B	176	ASP
1	B	182	ILE
1	B	192	LEU
1	B	199	ARG
1	B	214	LYS
1	B	216	LYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (9) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	26	HIS
1	A	60	HIS
1	A	106	ASN
1	A	108	GLN
1	A	128	ASN
1	A	203	HIS
1	B	26	HIS
1	B	195	ASN
1	B	203	HIS

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

2 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	5GP	A	300	-	26,26,26	0.78	0	39,40,40	0.86	1 (2%)
2	5GP	B	800	-	26,26,26	0.90	1 (3%)	39,40,40	1.23	3 (7%)

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	5GP	A	300	-	-	5/10/26/26	0/3/3/3
2	5GP	B	800	-	-	5/10/26/26	0/3/3/3

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	800	5GP	O3'-C3'	-2.64	1.36	1.43

All (4) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	800	5GP	C1'-N9-C8	4.02	138.16	126.73
2	B	800	5GP	C1'-N9-C4	-3.87	115.05	126.49
2	B	800	5GP	O5'-P-OP1	-2.23	100.40	106.44
2	A	300	5GP	C1'-N9-C4	-2.10	120.27	126.49

There are no chirality outliers.

All (10) torsion outliers are listed below:

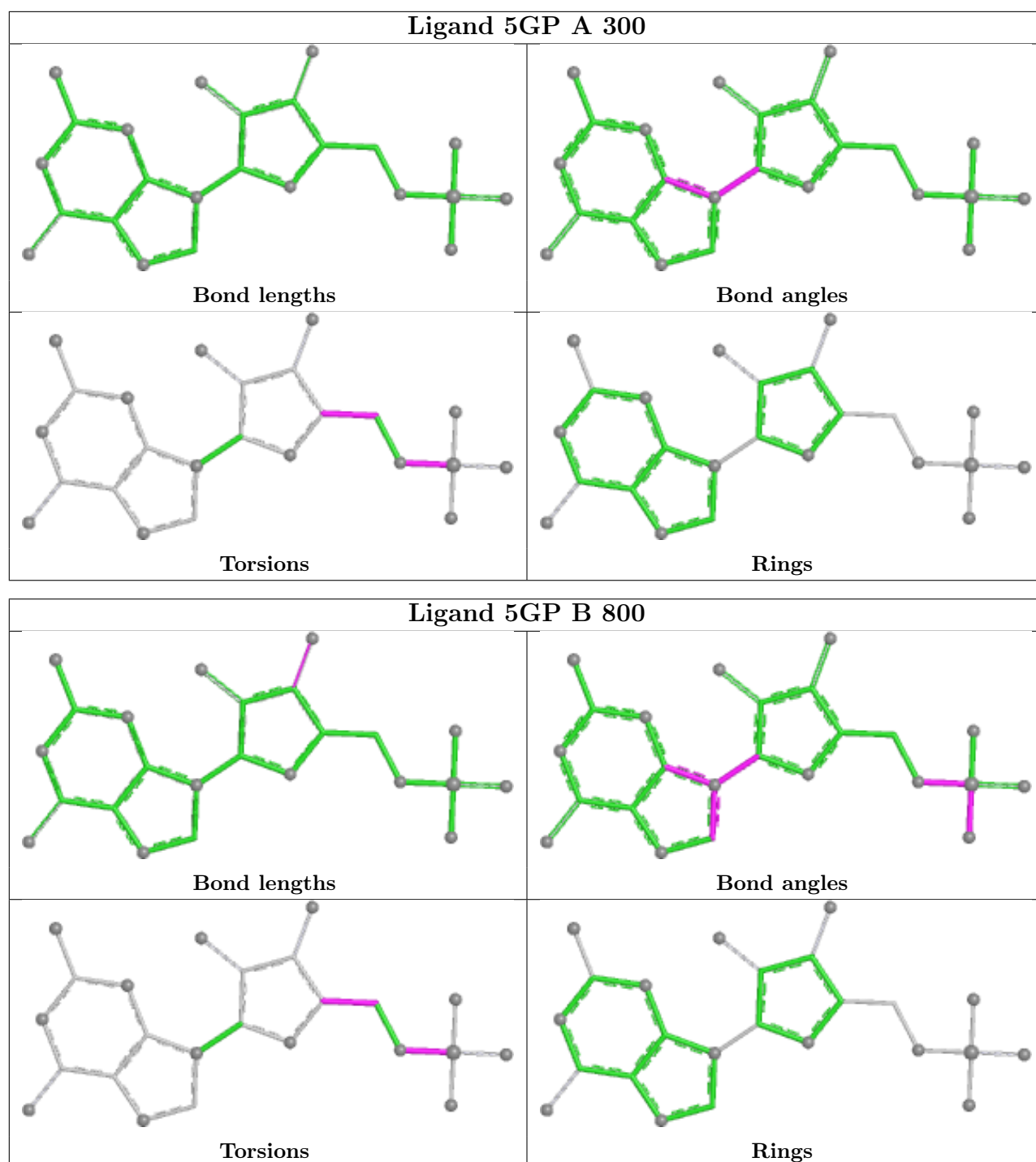
Mol	Chain	Res	Type	Atoms
2	A	300	5GP	C5'-O5'-P-OP1
2	A	300	5GP	C5'-O5'-P-OP3
2	A	300	5GP	C5'-O5'-P-OP2
2	B	800	5GP	C5'-O5'-P-OP1
2	B	800	5GP	O4'-C4'-C5'-O5'
2	A	300	5GP	C3'-C4'-C5'-O5'
2	A	300	5GP	O4'-C4'-C5'-O5'
2	B	800	5GP	C3'-C4'-C5'-O5'
2	B	800	5GP	C5'-O5'-P-OP2
2	B	800	5GP	C5'-O5'-P-OP3

There are no ring outliers.

2 monomers are involved in 5 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	A	300	5GP	3	0
2	B	800	5GP	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

6.1 Protein, DNA and RNA chains

EDS was not executed - this section is therefore empty.

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

EDS was not executed - this section is therefore empty.

6.3 Carbohydrates

EDS was not executed - this section is therefore empty.

6.4 Ligands

EDS was not executed - this section is therefore empty.

6.5 Other polymers

EDS was not executed - this section is therefore empty.