



Full wwPDB EM Validation Report ⓘ

Jul 16, 2025 – 11:41 AM JST

PDB ID : 8Z9H / pdb_00008z9h
EMDB ID : EMD-39862
Title : Cryo-EM structure of Thogoto virus polymerase in a transcription elongation-reception conformation
Authors : Xue, L.; Chang, T.; Li, Z.; Zhao, H.; Li, M.; He, J.; Chen, X.; Xiong, X.
Deposited on : 2024-04-23
Resolution : 2.70 Å(reported)

This is a Full wwPDB EM 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/EMValidationReportHelp>

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:

EMDB validation analysis : **FAILED**
Mogul : 1.8.5 (274361), CSD as541be (2020)
MolProbity : 4-5-2 with Phenix2.0rc1
buster-report : 1.1.7 (2018)
Percentile statistics : 20231227.v01 (using entries in the PDB archive December 27th 2023)
MapQ : **FAILED**
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.44

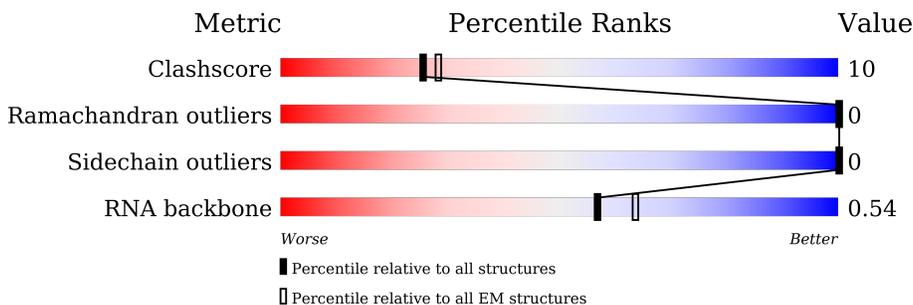
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

ELECTRON MICROSCOPY

The reported resolution of this entry is 2.70 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.



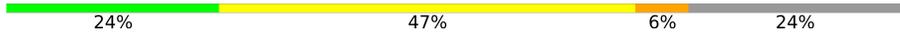
Metric	Whole archive (#Entries)	EM structures (#Entries)
Clashscore	210492	15764
Ramachandran outliers	207382	16835
Sidechain outliers	206894	16415
RNA backbone	6643	2191

The table below summarises the geometric issues observed across the polymeric chains and their fit to the map. The red, orange, yellow and green segments of the 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 $\leq 5\%$.

Mol	Chain	Length	Quality of chain
1	A	622	79% (Green), 21% (Yellow)
1	H	622	51% (Green), 21% (Yellow), 28% (Grey)
2	B	710	71% (Green), 24% (Yellow), 5% (Grey)
2	I	710	54% (Green), 27% (Yellow), 18% (Grey)
3	C	827	70% (Green), 20% (Yellow), 10% (Grey)
3	J	827	6% (Green), 90% (Grey)
4	D	18	22% (Green), 44% (Yellow), 33% (Grey)
5	E	17	12% (Green), 18% (Yellow), 71% (Grey)

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Mol	Chain	Length	Quality of chain
5	F	17	
6	G	9	
6	K	9	

2 Entry composition [i](#)

There are 7 unique types of molecules in this entry. The entry contains 26469 atoms, of which 0 are hydrogens and 0 are deuteriums.

In the tables below, 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 Polymerase acidic protein.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
1	A	621	Total	C	N	O	S	0	0
			5021	3172	874	947	28		
1	H	449	Total	C	N	O	S	0	0
			3616	2290	630	675	21		

There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	471	GLU	GLY	conflict	UNP P27194
H	471	GLU	GLY	conflict	UNP P27194

- Molecule 2 is a protein called RNA-directed RNA polymerase catalytic subunit.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
2	B	676	Total	C	N	O	S	0	0
			5422	3447	943	996	36		
2	I	580	Total	C	N	O	S	0	0
			4631	2954	790	854	33		

There are 4 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	7	LEU	ARG	conflict	UNP O41353
B	230	TRP	CYS	conflict	UNP O41353
I	7	LEU	ARG	conflict	UNP O41353
I	230	TRP	CYS	conflict	UNP O41353

- Molecule 3 is a protein called Polymerase basic protein 2.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
3	C	748	Total	C	N	O	S	3	0
			6024	3812	1052	1125	35		

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Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
3	J	79	649	422	109	116	2	0	0

There are 116 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
C	770	LEU	-	expression tag	UNP Q9YNA4
C	771	GLU	-	expression tag	UNP Q9YNA4
C	772	VAL	-	expression tag	UNP Q9YNA4
C	773	LEU	-	expression tag	UNP Q9YNA4
C	774	PHE	-	expression tag	UNP Q9YNA4
C	775	GLN	-	expression tag	UNP Q9YNA4
C	776	GLY	-	expression tag	UNP Q9YNA4
C	777	PRO	-	expression tag	UNP Q9YNA4
C	778	GLY	-	expression tag	UNP Q9YNA4
C	779	HIS	-	expression tag	UNP Q9YNA4
C	780	HIS	-	expression tag	UNP Q9YNA4
C	781	HIS	-	expression tag	UNP Q9YNA4
C	782	HIS	-	expression tag	UNP Q9YNA4
C	783	HIS	-	expression tag	UNP Q9YNA4
C	784	HIS	-	expression tag	UNP Q9YNA4
C	785	HIS	-	expression tag	UNP Q9YNA4
C	786	HIS	-	expression tag	UNP Q9YNA4
C	787	SER	-	expression tag	UNP Q9YNA4
C	788	ALA	-	expression tag	UNP Q9YNA4
C	789	ASP	-	expression tag	UNP Q9YNA4
C	790	TYR	-	expression tag	UNP Q9YNA4
C	791	LYS	-	expression tag	UNP Q9YNA4
C	792	ASP	-	expression tag	UNP Q9YNA4
C	793	ASP	-	expression tag	UNP Q9YNA4
C	794	ASP	-	expression tag	UNP Q9YNA4
C	795	ASP	-	expression tag	UNP Q9YNA4
C	796	LYS	-	expression tag	UNP Q9YNA4
C	797	GLY	-	expression tag	UNP Q9YNA4
C	798	GLY	-	expression tag	UNP Q9YNA4
C	799	TRP	-	expression tag	UNP Q9YNA4
C	800	SER	-	expression tag	UNP Q9YNA4
C	801	HIS	-	expression tag	UNP Q9YNA4
C	802	PRO	-	expression tag	UNP Q9YNA4
C	803	GLN	-	expression tag	UNP Q9YNA4
C	804	PHE	-	expression tag	UNP Q9YNA4
C	805	GLU	-	expression tag	UNP Q9YNA4

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Chain	Residue	Modelled	Actual	Comment	Reference
C	806	LYS	-	expression tag	UNP Q9YNA4
C	807	GLY	-	expression tag	UNP Q9YNA4
C	808	GLY	-	expression tag	UNP Q9YNA4
C	809	GLY	-	expression tag	UNP Q9YNA4
C	810	SER	-	expression tag	UNP Q9YNA4
C	811	GLY	-	expression tag	UNP Q9YNA4
C	812	GLY	-	expression tag	UNP Q9YNA4
C	813	GLY	-	expression tag	UNP Q9YNA4
C	814	GLY	-	expression tag	UNP Q9YNA4
C	815	SER	-	expression tag	UNP Q9YNA4
C	816	GLY	-	expression tag	UNP Q9YNA4
C	817	GLY	-	expression tag	UNP Q9YNA4
C	818	SER	-	expression tag	UNP Q9YNA4
C	819	ALA	-	expression tag	UNP Q9YNA4
C	820	TRP	-	expression tag	UNP Q9YNA4
C	821	SER	-	expression tag	UNP Q9YNA4
C	822	HIS	-	expression tag	UNP Q9YNA4
C	823	PRO	-	expression tag	UNP Q9YNA4
C	824	GLN	-	expression tag	UNP Q9YNA4
C	825	PHE	-	expression tag	UNP Q9YNA4
C	826	GLU	-	expression tag	UNP Q9YNA4
C	827	LYS	-	expression tag	UNP Q9YNA4
J	761	LEU	-	expression tag	UNP Q9YNA4
J	762	GLU	-	expression tag	UNP Q9YNA4
J	763	VAL	-	expression tag	UNP Q9YNA4
J	764	LEU	-	expression tag	UNP Q9YNA4
J	765	PHE	-	expression tag	UNP Q9YNA4
J	766	GLN	-	expression tag	UNP Q9YNA4
J	767	GLY	-	expression tag	UNP Q9YNA4
J	768	PRO	-	expression tag	UNP Q9YNA4
J	769	GLY	-	expression tag	UNP Q9YNA4
J	770	HIS	-	expression tag	UNP Q9YNA4
J	771	HIS	-	expression tag	UNP Q9YNA4
J	772	HIS	-	expression tag	UNP Q9YNA4
J	773	HIS	-	expression tag	UNP Q9YNA4
J	774	HIS	-	expression tag	UNP Q9YNA4
J	775	HIS	-	expression tag	UNP Q9YNA4
J	776	HIS	-	expression tag	UNP Q9YNA4
J	777	HIS	-	expression tag	UNP Q9YNA4
J	778	SER	-	expression tag	UNP Q9YNA4
J	779	ALA	-	expression tag	UNP Q9YNA4
J	780	ASP	-	expression tag	UNP Q9YNA4

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Chain	Residue	Modelled	Actual	Comment	Reference
J	781	TYR	-	expression tag	UNP Q9YNA4
J	782	LYS	-	expression tag	UNP Q9YNA4
J	783	ASP	-	expression tag	UNP Q9YNA4
J	784	ASP	-	expression tag	UNP Q9YNA4
J	785	ASP	-	expression tag	UNP Q9YNA4
J	786	ASP	-	expression tag	UNP Q9YNA4
J	787	LYS	-	expression tag	UNP Q9YNA4
J	788	GLY	-	expression tag	UNP Q9YNA4
J	789	GLY	-	expression tag	UNP Q9YNA4
J	790	TRP	-	expression tag	UNP Q9YNA4
J	791	SER	-	expression tag	UNP Q9YNA4
J	792	HIS	-	expression tag	UNP Q9YNA4
J	793	PRO	-	expression tag	UNP Q9YNA4
J	794	GLN	-	expression tag	UNP Q9YNA4
J	795	PHE	-	expression tag	UNP Q9YNA4
J	796	GLU	-	expression tag	UNP Q9YNA4
J	797	LYS	-	expression tag	UNP Q9YNA4
J	798	GLY	-	expression tag	UNP Q9YNA4
J	799	GLY	-	expression tag	UNP Q9YNA4
J	800	GLY	-	expression tag	UNP Q9YNA4
J	801	SER	-	expression tag	UNP Q9YNA4
J	802	GLY	-	expression tag	UNP Q9YNA4
J	803	GLY	-	expression tag	UNP Q9YNA4
J	804	GLY	-	expression tag	UNP Q9YNA4
J	805	GLY	-	expression tag	UNP Q9YNA4
J	806	SER	-	expression tag	UNP Q9YNA4
J	807	GLY	-	expression tag	UNP Q9YNA4
J	808	GLY	-	expression tag	UNP Q9YNA4
J	809	SER	-	expression tag	UNP Q9YNA4
J	810	ALA	-	expression tag	UNP Q9YNA4
J	811	TRP	-	expression tag	UNP Q9YNA4
J	812	SER	-	expression tag	UNP Q9YNA4
J	813	HIS	-	expression tag	UNP Q9YNA4
J	814	PRO	-	expression tag	UNP Q9YNA4
J	815	GLN	-	expression tag	UNP Q9YNA4
J	816	PHE	-	expression tag	UNP Q9YNA4
J	817	GLU	-	expression tag	UNP Q9YNA4
J	818	LYS	-	expression tag	UNP Q9YNA4

- Molecule 4 is a RNA chain called RNA (5'-R(*AP*GP*AP*GP*AP*AP*AP*UP*CP*AP*AP*GP*GP*CP*AP*GP*UP*U)-3').

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	P		
4	D	12	260	118	55	76	11	0	0

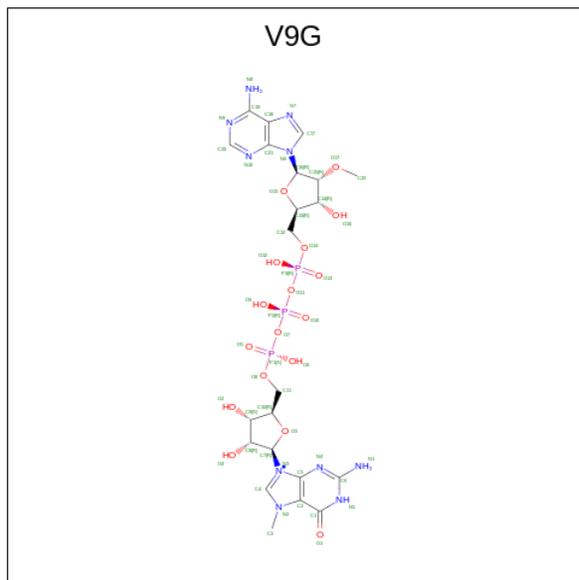
- Molecule 5 is a RNA chain called RNA (5'-R(*GP*AP*CP*UP*GP*CP*CP*UP*GP*UP*UP*UP*UP*GP*CP*U)-3').

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	P		
5	E	5	103	46	14	38	5	0	0
5	F	13	269	120	38	98	13	0	0

- Molecule 6 is a RNA chain called RNA (5'-R(P*GP*CP*AP*AP*AP*AP*AP*AP*CP*A)-3').

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	P		
6	G	9	195	88	41	57	9	0	0
6	K	9	195	88	41	57	9	0	0

- Molecule 7 is 7-METHYL-GUANOSINE-5'-TRIPHOSPHATE-5'-(2'-O-METHYL)-ADENOSINE (CCD ID: V9G) (formula: C₂₂H₃₂N₁₀O₁₇P₃) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms					AltConf
			Total	C	N	O	P	
7	G	1	52	22	10	17	3	0

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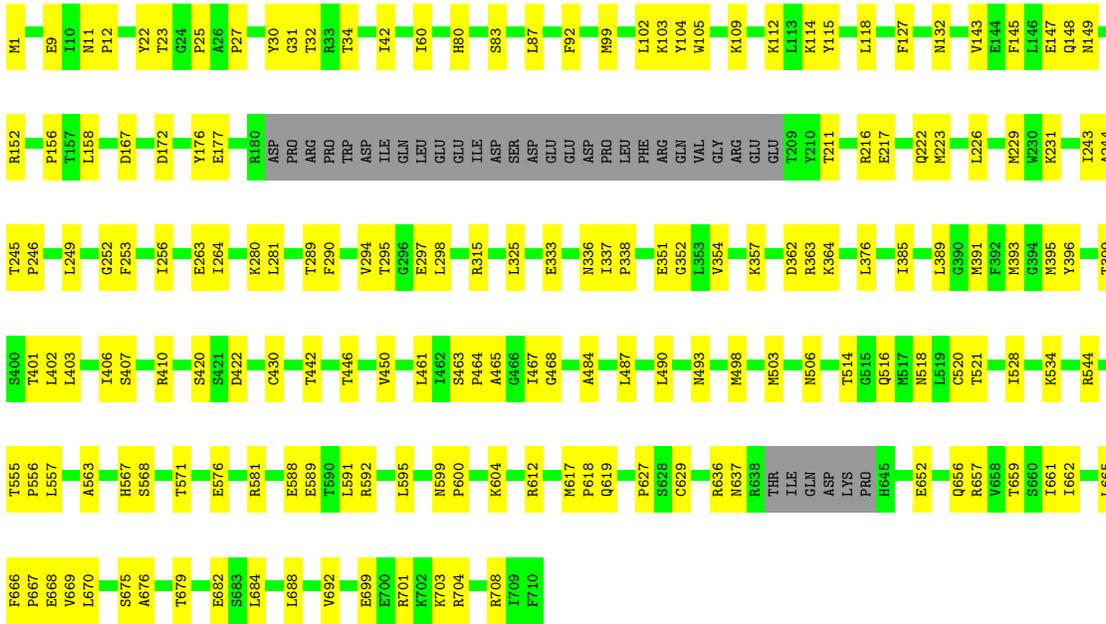
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Mol	Chain	Residues	Atoms					AltConf
			Total	C	N	O	P	
7	K	1	32	11	5	13	3	0



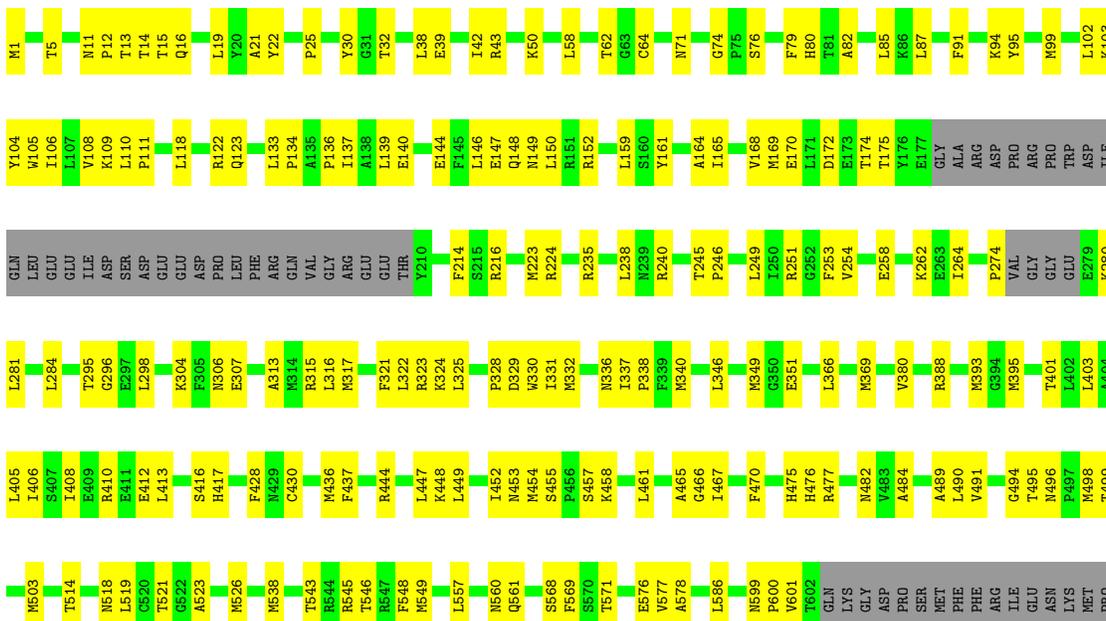
- Molecule 2: RNA-directed RNA polymerase catalytic subunit

Chain B: 71% 24% 5%



- Molecule 2: RNA-directed RNA polymerase catalytic subunit

Chain I: 54% 27% 18%



- Molecule 6: RNA (5'-R(P*GP*CP*AP*AP*AP*AP*AP*CP*A)-3')

Chain K:  33% 44% 22%



4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	80060	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	PHASE FLIPPING AND AMPLITUDE CORRECTION	Depositor
Microscope	TFS KRIOS	Depositor
Voltage (kV)	300	Depositor
Electron dose ($e^-/\text{\AA}^2$)	50	Depositor
Minimum defocus (nm)	600	Depositor
Maximum defocus (nm)	2400	Depositor
Magnification	Not provided	
Image detector	TFS FALCON 4i (4k x 4k)	Depositor

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: V9G

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	0.11	0/5136	0.29	1/6967 (0.0%)
1	H	0.12	0/3697	0.32	0/5011
2	B	0.12	0/5532	0.31	0/7468
2	I	0.11	0/4730	0.30	0/6396
3	C	0.11	0/6161	0.34	1/8332 (0.0%)
3	J	0.12	0/666	0.37	0/905
4	D	0.10	0/293	0.32	0/456
5	E	0.08	0/113	0.14	0/173
5	F	0.10	0/297	0.23	0/459
6	G	0.10	0/219	0.14	0/339
6	K	0.12	0/219	0.35	0/339
All	All	0.11	0/27063	0.31	2/36845 (0.0%)

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
3	C	0	1

There are no bond length outliers.

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	109	PRO	CA-N-CD	-5.67	104.06	112.00
3	C	94	SER	CB-CA-C	-5.59	110.12	116.54

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
3	C	418	GLU	Peptide

5.2 Too-close contacts [i](#)

In the following table, the Non-H and H(model) columns list the number of non-hydrogen atoms and hydrogen atoms in the chain respectively. The H(added) column lists the number of hydrogen atoms added and optimized by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, whereas Symm-Clashes lists symmetry-related clashes.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	5021	0	4960	99	0
1	H	3616	0	3614	91	0
2	B	5422	0	5493	126	0
2	I	4631	0	4662	139	0
3	C	6024	0	6029	122	0
3	J	649	0	657	23	0
4	D	260	0	133	6	0
5	E	103	0	53	2	0
5	F	269	0	137	11	0
6	G	195	0	100	4	0
6	K	195	0	100	5	0
7	G	52	0	0	0	0
7	K	32	0	0	0	0
All	All	26469	0	25938	527	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 (527) 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)
2:I:253:PHE:HB3	2:I:338:PRO:HG3	1.57	0.86
1:A:396:THR:HG21	5:E:16:C:H41	1.40	0.85
1:A:538:MET:HE1	1:A:546:MET:HE2	1.62	0.79
2:B:656:GLN:NE2	3:C:44:TYR:O	2.17	0.77
2:I:102:LEU:HD23	2:I:264:ILE:HD13	1.68	0.75
2:I:538:MET:HB3	2:I:543:THR:HG21	1.68	0.74
3:C:150:ARG:O	3:C:489:GLN:NE2	2.20	0.73
1:H:436:VAL:HG23	1:H:441:ASP:HB2	1.71	0.73
2:B:253:PHE:HB3	2:B:338:PRO:HG3	1.68	0.73
2:I:304:LYS:HB3	2:I:307:GLU:HB2	1.72	0.71

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:C:183:ASP:OD1	3:C:186:ARG:NH2	2.21	0.71
1:H:180:ARG:HG3	1:H:184:LYS:HE3	1.71	0.70
3:J:119:LEU:HD12	3:J:123:ARG:HH12	1.57	0.70
2:B:32:THR:HG22	2:B:34:THR:H	1.57	0.69
1:H:340:GLU:OE2	1:H:458:LYS:NZ	2.18	0.69
3:C:417:ILE:HG22	3:C:419:PRO:HD2	1.76	0.68
1:H:574:MET:HE3	2:I:467:ILE:HG22	1.74	0.67
2:I:599:ASN:ND2	2:I:601:VAL:O	2.27	0.67
2:B:396:TYR:HB3	2:B:399:THR:HB	1.75	0.67
2:I:306:ASN:ND2	2:I:393:MET:SD	2.68	0.67
3:C:317:ARG:NH1	3:C:323:SER:O	2.27	0.67
3:C:46:THR:HG22	3:C:47:SER:H	1.61	0.66
3:C:706:THR:OG1	3:C:708:ASP:O	2.13	0.66
3:C:99:ALA:HB1	3:C:103:VAL:HG21	1.77	0.66
3:C:331:ARG:HG3	3:C:332:SER:H	1.59	0.66
1:H:189:TRP:HB2	2:I:315:ARG:HH22	1.59	0.66
3:C:747:ASP:OD1	3:C:750:ARG:NH2	2.29	0.66
2:I:246:PRO:HD3	2:I:395:MET:HE1	1.78	0.66
2:I:467:ILE:HA	2:I:475:HIS:O	1.94	0.66
2:B:362:ASP:OD2	2:B:364:LYS:NZ	2.28	0.66
2:I:538:MET:HE3	3:J:52:VAL:HG12	1.77	0.65
1:H:618:PRO:HB2	1:H:621:TYR:HE1	1.60	0.65
3:C:157:PRO:HD3	3:C:237:THR:HG21	1.77	0.65
1:H:321:TRP:HB2	2:I:369:MET:HE1	1.79	0.65
2:I:251:ARG:HA	2:I:254:VAL:HG22	1.79	0.65
1:A:110:THR:HG22	1:A:111:SER:H	1.60	0.65
1:A:255:HIS:NE2	1:A:282:GLN:OE1	2.29	0.64
2:B:87:LEU:HD13	2:B:407:SER:HA	1.79	0.64
3:C:691:GLN:HE21	3:C:727:PHE:HB3	1.63	0.64
2:B:589:GLU:OE2	3:C:113:GLN:NE2	2.30	0.64
1:H:528:GLN:OE1	1:H:535:GLN:NE2	2.31	0.64
2:I:16:GLN:HA	2:I:19:LEU:HD23	1.80	0.64
2:B:148:GLN:NE2	2:B:176:TYR:O	2.30	0.64
2:B:627:PRO:HB3	3:C:122:ILE:HD13	1.78	0.64
3:C:237:THR:HG22	3:C:239:GLU:H	1.62	0.63
3:C:360:THR:HG22	3:C:362:PRO:HD3	1.79	0.63
1:H:469:VAL:O	1:H:472:LYS:HB2	1.97	0.63
3:C:547:ASP:OD2	1:H:248:GLN:NE2	2.22	0.63
3:C:576:GLU:OE2	3:C:599:LYS:NZ	2.27	0.62
2:B:104:TYR:HE1	2:B:109:LYS:HE3	1.64	0.62
3:C:77:LEU:HD23	3:C:78:VAL:HG23	1.82	0.62

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:I:1:MET:HE1	2:I:19:LEU:HD11	1.82	0.62
3:C:572:ASN:HA	3:C:577:TYR:HB2	1.81	0.62
1:A:190:ASP:O	2:B:315:ARG:NH2	2.33	0.61
1:A:232:LEU:HD13	1:A:390:LYS:HE3	1.83	0.61
3:J:61:THR:OG1	3:J:87:ARG:NH1	2.32	0.61
1:A:146:CYS:HB3	3:C:691:GLN:OE1	2.00	0.61
1:A:538:MET:HE3	1:A:542:GLN:HG3	1.83	0.61
2:B:351:GLU:HG2	2:B:363:ARG:HD3	1.81	0.61
3:C:691:GLN:NE2	3:C:693:GLY:O	2.30	0.60
2:I:106:ILE:HD13	2:I:110:LEU:HD13	1.83	0.60
1:A:229:ARG:NH2	4:D:4:G:OP2	2.35	0.60
1:A:517:ASN:ND2	3:C:143:TYR:O	2.32	0.60
2:B:290:PHE:O	3:C:394:LYS:NZ	2.35	0.60
2:I:148:GLN:NE2	2:I:149:ASN:OD1	2.35	0.60
3:C:270:GLU:OE1	3:C:274:ARG:NH1	2.35	0.60
1:A:110:THR:OG1	1:A:116:ASP:OD2	2.19	0.59
2:B:60:ILE:HD11	2:B:389:LEU:HD11	1.84	0.59
2:B:333:GLU:O	2:B:337:ILE:HG12	2.02	0.59
2:B:701:ARG:NH2	2:B:704:ARG:HH22	2.00	0.59
1:A:576:ARG:O	1:A:580:MET:HG3	2.02	0.59
3:J:118:ASP:O	3:J:121:VAL:N	2.35	0.59
3:C:284:THR:O	3:C:288:ASN:ND2	2.34	0.59
2:I:410:ARG:NH1	2:I:412:GLU:OE2	2.36	0.59
2:B:132:ASN:ND2	5:F:6:C:OP1	2.33	0.59
1:H:604:ASN:HB3	1:H:607:VAL:HB	1.84	0.59
2:B:376:LEU:HB3	2:B:385:ILE:HD11	1.84	0.59
2:B:514:THR:HG22	2:B:516:GLN:HE21	1.68	0.59
1:A:264:ARG:NH2	1:A:459:TYR:O	2.36	0.59
2:B:701:ARG:HH22	2:B:704:ARG:HH22	1.51	0.58
3:C:418:GLU:O	3:C:423:GLN:NE2	2.36	0.58
1:A:71:ILE:HG21	3:C:752:LEU:HD21	1.85	0.58
2:B:699:GLU:OE1	2:B:703:LYS:NZ	2.31	0.58
1:A:324:ALA:HB2	2:B:354:VAL:HG13	1.85	0.58
1:H:559:ASN:HD21	1:H:604:ASN:HD22	1.49	0.58
1:H:235:ALA:HB2	1:H:344:LEU:HD12	1.84	0.58
2:B:555:THR:HG23	2:B:557:LEU:HG	1.85	0.58
3:C:127:ASP:O	3:C:131:GLN:OE1	2.22	0.57
1:A:44:LEU:HD21	3:C:738:GLU:HG3	1.86	0.57
2:B:231:LYS:HE2	5:F:7:C:H41	1.68	0.57
1:A:430:LEU:HD12	1:A:446:LEU:HD23	1.86	0.57
1:H:203:ARG:NH1	1:H:204:ILE:O	2.38	0.57

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:I:578:ALA:HB1	3:J:121:VAL:HG21	1.86	0.57
2:B:103:LYS:HE3	2:B:325:LEU:HD22	1.85	0.57
1:H:451:MET:HE1	1:H:464:VAL:HG22	1.85	0.57
1:H:368:ALA:HB2	2:I:519:LEU:HD12	1.87	0.57
1:A:56:GLN:OE1	1:A:134:ARG:NH2	2.37	0.57
1:A:344:LEU:O	1:A:384:VAL:HG23	2.04	0.57
3:C:69:MET:O	3:C:97:THR:OG1	2.20	0.57
1:H:273:VAL:HG23	1:H:478:LEU:HD13	1.87	0.57
2:I:38:LEU:HD21	2:I:366:LEU:HD22	1.87	0.57
3:C:365:ARG:HD2	3:C:388:ARG:HH22	1.70	0.56
3:C:72:SER:O	3:C:85:LYS:NZ	2.39	0.56
1:H:181:THR:O	1:H:185:ARG:HD3	2.05	0.56
2:B:652:GLU:OE2	3:C:46:THR:N	2.26	0.56
1:H:260:ILE:HG21	1:H:274:ILE:HG12	1.87	0.56
2:I:133:LEU:HB3	2:I:137:ILE:HD11	1.86	0.56
1:A:89:ASP:O	1:A:93:ALA:HA	2.05	0.56
2:I:91:PHE:HB3	2:I:321:PHE:HZ	1.71	0.56
3:C:670:ARG:HE	3:C:672:ILE:HD11	1.69	0.56
2:I:545:ARG:HG2	2:I:549:MET:HE1	1.86	0.56
2:I:22:TYR:OH	2:I:484:ALA:O	2.15	0.55
3:C:25:LYS:NZ	3:C:26:GLU:OE2	2.33	0.55
2:B:463:SER:OG	2:B:464:PRO:HD3	2.05	0.55
1:H:397:ARG:NH1	1:H:413:PRO:O	2.40	0.55
2:B:656:GLN:HE22	3:C:45:THR:HG22	1.72	0.55
3:C:670:ARG:NH2	1:H:470:GLU:OE1	2.40	0.55
2:B:692:VAL:HG22	3:C:13:LEU:HD22	1.87	0.55
3:J:61:THR:HA	3:J:87:ARG:HD2	1.88	0.55
2:I:295:THR:O	2:I:465:ALA:N	2.40	0.55
1:A:128:SER:O	1:A:132:VAL:HG23	2.06	0.54
1:H:417:ARG:NH1	1:H:423:CYS:SG	2.79	0.54
2:B:80:HIS:ND1	2:B:83:SER:OG	2.34	0.54
2:B:667:PRO:O	2:B:670:LEU:HB3	2.07	0.54
2:I:332:MET:O	2:I:336:ASN:ND2	2.39	0.54
2:B:289:THR:HG21	3:C:371:LYS:HD2	1.89	0.54
3:J:60:MET:N	3:J:88:THR:O	2.39	0.54
1:A:384:VAL:HG11	1:A:548:LEU:HG	1.88	0.54
1:H:180:ARG:O	1:H:184:LYS:HG3	2.08	0.54
1:A:71:ILE:HD13	3:C:752:LEU:HD21	1.90	0.54
1:H:434:HIS:ND1	1:H:434:HIS:O	2.41	0.54
1:A:356:GLU:OE1	2:B:534:LYS:NZ	2.40	0.54
2:B:102:LEU:HD22	2:B:264:ILE:HD11	1.89	0.54

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:636:ARG:NH1	2:B:637:ASN:OD1	2.41	0.54
1:H:430:LEU:HD12	1:H:446:LEU:HD23	1.89	0.54
2:B:668:GLU:HG3	3:C:723:GLN:HG2	1.90	0.54
1:H:519:LEU:HD21	1:H:521:LEU:HG	1.89	0.54
3:J:118:ASP:OD1	3:J:119:LEU:N	2.41	0.54
2:B:105:TRP:HH2	2:B:256:ILE:HG23	1.72	0.53
3:C:700:ARG:O	3:C:717:ARG:NH2	2.41	0.53
1:H:586:PHE:HB2	2:I:461:LEU:HB3	1.89	0.53
2:I:403:LEU:HD12	2:I:406:ILE:HD11	1.90	0.53
3:C:163:ASN:N	3:C:305:ASP:OD1	2.41	0.53
2:B:172:ASP:OD1	2:B:216:ARG:NH2	2.39	0.53
1:A:375:TYR:O	1:A:379:VAL:HG22	2.09	0.53
2:B:112:LYS:HD2	2:B:112:LYS:N	2.24	0.53
3:C:189:HIS:HD2	3:C:297:ARG:HH11	1.55	0.53
3:C:341:ASP:O	3:C:512:ASN:ND2	2.41	0.53
1:A:215:LEU:HG	1:A:579:MET:HE1	1.90	0.53
3:C:405:GLU:HG2	3:C:406:PRO:HD3	1.90	0.53
2:B:662:ILE:HG12	2:B:684:LEU:HD11	1.89	0.53
3:C:46:THR:O	3:C:47:SER:OG	2.23	0.53
3:C:211:SER:O	3:C:215:ILE:HD12	2.08	0.53
2:B:604:LYS:NZ	5:F:17:U:OP1	2.36	0.53
2:B:667:PRO:HB2	3:C:176:CYS:SG	2.49	0.53
2:I:111:PRO:HA	2:I:159:LEU:HD23	1.91	0.53
2:I:410:ARG:HB2	2:I:413:LEU:HD12	1.91	0.53
2:B:699:GLU:O	2:B:703:LYS:HG2	2.08	0.53
2:I:39:GLU:O	2:I:43:ARG:HG3	2.09	0.53
2:I:62:THR:HG22	2:I:64:CYS:H	1.74	0.53
1:H:192:ILE:HD12	2:I:332:MET:HB3	1.90	0.53
3:C:462:LEU:O	3:C:477:LYS:NZ	2.32	0.52
2:I:405:LEU:HD13	2:I:408:ILE:HD11	1.91	0.52
2:B:657:ARG:HD3	3:C:23:ALA:HA	1.91	0.52
1:H:353:ILE:HG21	1:H:376:ILE:HD12	1.91	0.52
1:A:41:ILE:HD11	1:A:145:LEU:HD21	1.91	0.52
2:I:102:LEU:HD11	2:I:325:LEU:HD22	1.90	0.52
2:B:152:ARG:NH2	2:B:167:ASP:OD2	2.43	0.52
2:B:229:MET:SD	2:B:243:ILE:HG13	2.49	0.52
2:I:557:LEU:HD12	2:I:586:LEU:HD23	1.91	0.52
1:A:482:SER:HB2	4:D:3:A:H1'	1.91	0.52
3:J:50:TYR:O	3:J:54:LYS:N	2.42	0.52
2:B:403:LEU:HG	2:B:450:VAL:HG11	1.91	0.52
2:B:229:MET:HE1	2:B:245:THR:HG22	1.90	0.52

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:C:344:ARG:NH1	3:C:413:TYR:O	2.35	0.52
1:A:496:ARG:HG2	2:B:490:LEU:HD22	1.90	0.52
2:I:428:PHE:HB2	2:I:436:MET:HE2	1.92	0.52
2:I:545:ARG:HH12	2:I:561:GLN:HA	1.75	0.52
3:J:117:GLU:HA	3:J:120:LYS:NZ	2.25	0.52
1:A:89:ASP:O	1:A:93:ALA:N	2.43	0.52
1:H:558:ASN:HB3	2:I:25:PRO:HD2	1.92	0.52
1:A:610:LEU:HD22	2:B:1:MET:HE2	1.90	0.51
2:B:145:PHE:O	2:B:149:ASN:ND2	2.38	0.51
3:C:393:ILE:HB	3:C:481:VAL:HG22	1.91	0.51
2:I:223:MET:HE1	2:I:249:LEU:HB2	1.90	0.51
1:A:89:ASP:O	1:A:93:ALA:CA	2.58	0.51
2:B:391:MET:HE2	2:B:393:MET:O	2.10	0.51
2:I:12:PRO:HA	2:I:15:THR:HG22	1.91	0.51
2:I:455:SER:HB3	2:I:458:LYS:HB2	1.91	0.51
1:H:378:ILE:HG13	1:H:379:VAL:HG13	1.93	0.51
2:I:148:GLN:NE2	2:I:175:THR:O	2.34	0.51
1:A:344:LEU:HA	1:A:383:LYS:HB3	1.93	0.51
3:C:543:ASP:OD1	3:C:543:ASP:N	2.42	0.51
2:B:518:ASN:N	2:B:521:THR:OG1	2.44	0.51
1:H:334:PRO:HG2	1:H:605:PRO:HB3	1.92	0.51
1:H:515:GLU:OE1	1:H:516:ASN:ND2	2.42	0.51
2:I:568:SER:N	2:I:571:THR:OG1	2.39	0.51
3:C:599:LYS:O	3:C:603:GLN:HG2	2.11	0.51
1:H:218:LEU:HD23	1:H:614:TRP:CD1	2.45	0.51
1:H:232:LEU:HB2	1:H:391:TRP:CE2	2.46	0.51
1:H:263:ILE:HD11	1:H:466:SER:HB2	1.93	0.51
1:A:560:PRO:HD3	2:B:27:PRO:HB3	1.93	0.51
2:B:226:LEU:HD23	2:B:246:PRO:HB3	1.93	0.51
2:B:659:THR:HG23	3:C:38:TYR:HE1	1.75	0.51
2:I:21:ALA:O	2:I:235:ARG:NH2	2.44	0.51
2:B:567:HIS:HE1	2:B:576:GLU:HB2	1.76	0.51
1:H:216:PRO:HB3	1:H:594:GLU:HB3	1.93	0.51
2:I:296:GLY:HA3	2:I:436:MET:HE1	1.93	0.51
2:I:494:GLY:HA2	3:J:48:LEU:HD22	1.93	0.51
1:A:402:LEU:HB3	1:A:485:ARG:HD3	1.93	0.50
6:G:7:A:H2'	6:G:8:A:C8	2.45	0.50
2:I:105:TRP:CD1	2:I:110:LEU:HD12	2.46	0.50
3:C:299:MET:HA	3:C:302:VAL:HG12	1.94	0.50
2:I:74:GLY:O	2:I:448:LYS:NZ	2.44	0.50
1:A:46:SER:HB2	1:A:57:TYR:HB2	1.94	0.50

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:242:CYS:HB2	1:A:423:CYS:HB2	1.94	0.50
2:I:136:PRO:O	2:I:140:GLU:HG2	2.11	0.50
2:B:42:ILE:HB	2:B:376:LEU:HD11	1.94	0.50
3:C:171:LEU:HD23	3:C:213:VAL:HG13	1.93	0.50
2:B:675:SER:O	3:C:725:ARG:NH1	2.32	0.50
2:B:665:LEU:HD21	2:B:688:LEU:HD13	1.93	0.49
2:I:32:THR:HG22	2:I:351:GLU:HB2	1.94	0.49
2:B:295:THR:O	2:B:465:ALA:N	2.43	0.49
3:C:83:LYS:NZ	3:C:85:LYS:O	2.40	0.49
1:H:371:LEU:HD21	1:H:509:VAL:HG11	1.93	0.49
1:A:160:GLU:OE1	1:A:160:GLU:N	2.40	0.49
2:I:161:TYR:O	2:I:165:ILE:HG12	2.12	0.49
2:I:444:ARG:HA	2:I:454:MET:HE3	1.95	0.49
1:H:208:ARG:NH2	2:I:437:PHE:HB3	2.26	0.49
1:H:273:VAL:HG11	1:H:480:ILE:HD11	1.94	0.49
1:H:372:VAL:HG21	2:I:523:ALA:HB3	1.94	0.49
2:I:349:MET:HE1	2:I:380:VAL:HG22	1.95	0.49
2:B:143:VAL:O	2:B:147:GLU:HG2	2.12	0.49
1:H:183:LEU:HD23	2:I:340:MET:HG3	1.94	0.49
1:A:605:PRO:HG2	1:A:606:ILE:HD12	1.95	0.49
2:B:617:MET:HE3	2:B:619:GLN:HB2	1.95	0.49
2:I:546:THR:HA	2:I:549:MET:HE2	1.94	0.49
2:I:50:LYS:HE3	2:I:71:ASN:HA	1.93	0.49
2:I:146:LEU:HD12	2:I:164:ALA:HB1	1.95	0.49
2:B:493:ASN:O	3:C:57:LEU:HD22	2.13	0.48
1:H:373:ASP:O	1:H:376:ILE:N	2.46	0.48
2:B:490:LEU:O	2:B:490:LEU:HD23	2.12	0.48
2:B:556:PRO:HB2	2:B:563:ALA:HB2	1.95	0.48
2:B:666:PHE:O	2:B:669:VAL:HG12	2.13	0.48
3:C:708:ASP:C	3:C:710:GLY:H	2.19	0.48
2:B:595:LEU:HD12	3:C:119:VAL:HG13	1.95	0.48
1:H:194:THR:HG22	2:I:323:ARG:HH12	1.78	0.48
1:H:269:THR:O	1:H:463:SER:OG	2.31	0.48
2:I:238:LEU:O	2:I:240:ARG:NH1	2.46	0.48
2:I:245:THR:OG1	2:I:251:ARG:NH2	2.45	0.48
1:A:462:HIS:NE2	1:A:479:LYS:HD2	2.28	0.48
2:B:31:GLY:HA3	4:D:7:A:O3'	2.14	0.48
3:C:145:ARG:O	3:C:145:ARG:HD3	2.14	0.48
1:H:270:PRO:O	1:H:273:VAL:HG22	2.14	0.48
2:I:518:ASN:H	2:I:521:THR:HG1	1.61	0.48
3:C:265:ASP:OD2	3:C:310:LEU:HB3	2.14	0.48

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:307:GLN:O	1:A:311:GLN:HG3	2.13	0.48
2:I:103:LYS:HA	2:I:106:ILE:HG22	1.96	0.48
3:C:134:PHE:O	1:H:308:GLU:HG2	2.14	0.48
3:C:667:THR:OG1	3:C:669:ASN:OD1	2.24	0.48
3:C:701:CYS:HB2	3:C:719:CYS:SG	2.53	0.48
3:C:299:MET:HE3	3:C:303:LEU:HG	1.96	0.47
2:I:80:HIS:CE1	2:I:82:ALA:HB3	2.49	0.47
3:J:56:TRP:HB3	3:J:89:ARG:HB3	1.96	0.47
2:B:568:SER:H	2:B:571:THR:HG1	1.57	0.47
3:C:593:THR:HB	3:C:639:GLN:HA	1.96	0.47
2:I:106:ILE:HD11	2:I:331:ILE:HD12	1.96	0.47
2:I:548:PHE:HE2	3:J:96:ASP:HB3	1.78	0.47
2:B:127:PHE:HB2	2:B:222:GLN:HB3	1.96	0.47
3:C:332:SER:OG	3:C:376:ASN:ND2	2.47	0.47
1:H:528:GLN:HB3	1:H:535:GLN:HE21	1.79	0.47
2:I:447:LEU:HD12	2:I:452:ILE:HG21	1.95	0.47
1:A:326:TYR:CZ	4:D:7:A:H8	2.33	0.47
1:H:418:ASP:HB3	1:H:424:GLN:NE2	2.30	0.47
2:I:105:TRP:CZ3	2:I:109:LYS:HE2	2.50	0.47
2:I:494:GLY:HA2	3:J:48:LEU:HD13	1.96	0.47
1:A:499:ILE:HD11	2:B:528:ILE:HD12	1.96	0.47
2:B:294:VAL:HB	2:B:430:CYS:O	2.14	0.47
3:C:573:MET:HE1	3:C:630:GLY:HA3	1.97	0.47
5:F:8:U:H2'	5:F:9:G:H8	1.79	0.47
3:C:118:VAL:HG13	3:C:206:VAL:HG11	1.97	0.47
1:H:226:SER:HA	1:H:331:MET:HE2	1.96	0.47
2:I:13:THR:HG21	2:I:476:HIS:HB2	1.97	0.47
2:B:401:THR:OG1	2:B:420:SER:O	2.24	0.46
1:H:211:GLN:NE2	1:H:212:MET:O	2.47	0.46
3:C:90:ASP:O	3:C:96:ARG:HG2	2.15	0.46
1:A:365:ASP:O	1:A:369:GLU:HG2	2.16	0.46
2:B:410:ARG:HH11	2:B:446:THR:HG22	1.79	0.46
2:I:623:ASP:OD2	2:I:625:SER:OG	2.31	0.46
1:A:538:MET:CE	1:A:546:MET:HE2	2.40	0.46
2:B:32:THR:HG21	2:B:352:GLY:O	2.16	0.46
1:H:342:VAL:HG12	1:H:345:ARG:HH22	1.81	0.46
1:H:375:TYR:CE2	1:H:502:ALA:HB2	2.50	0.46
1:H:543:TRP:O	1:H:547:ILE:HG12	2.15	0.46
3:C:365:ARG:HD2	3:C:388:ARG:NH2	2.31	0.46
1:H:525:PRO:HD2	1:H:540:LEU:HD22	1.97	0.46
2:I:475:HIS:NE2	2:I:477:ARG:O	2.49	0.46

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:402:LEU:O	2:B:406:ILE:HG23	2.15	0.46
1:A:568:ASN:OD1	1:A:571:ARG:NH2	2.43	0.46
2:B:422:ASP:OD1	2:B:422:ASP:N	2.49	0.46
1:H:265:GLU:OE1	1:H:271:ALA:HB2	2.16	0.46
2:I:317:MET:HG3	2:I:406:ILE:HD13	1.98	0.46
3:C:438:SER:HA	3:C:441:MET:HG2	1.97	0.46
3:C:585:VAL:HG13	3:C:627:ILE:HG23	1.97	0.46
2:I:274:PRO:HA	2:I:280:LYS:HE3	1.98	0.46
2:I:601:VAL:HG13	3:J:60:MET:SD	2.54	0.46
3:C:517:LEU:HG	3:C:518:ILE:HG13	1.98	0.46
2:I:523:ALA:HA	2:I:526:MET:HG2	1.97	0.46
1:A:126:GLU:O	1:A:130:ALA:N	2.46	0.45
1:A:557:TYR:CG	1:A:606:ILE:HD13	2.51	0.45
2:B:600:PRO:HG2	3:C:74:GLU:HB2	1.98	0.45
2:I:172:ASP:H	2:I:216:ARG:HH21	1.64	0.45
1:A:483:PHE:HD2	1:A:488:LEU:HG	1.80	0.45
1:A:614:TRP:HB2	2:B:1:MET:HG3	1.99	0.45
2:I:322:LEU:HD23	2:I:325:LEU:HD21	1.98	0.45
1:A:512:ARG:NH1	2:B:9:GLU:OE2	2.50	0.45
2:B:612:ARG:HB2	2:B:618:PRO:HA	1.98	0.45
3:C:348:LYS:NZ	3:C:360:THR:HG21	2.30	0.45
3:C:669:ASN:OD1	3:C:670:ARG:N	2.50	0.45
2:I:489:ALA:HB1	2:I:491:VAL:HG12	1.98	0.45
2:I:576:GLU:HG2	2:I:577:VAL:N	2.31	0.45
2:B:393:MET:HE2	2:B:395:MET:HG2	1.98	0.45
3:C:530:LEU:HD11	3:C:544:ILE:HG22	1.97	0.45
2:B:391:MET:HE3	2:B:396:TYR:HD1	1.81	0.45
3:C:334:LYS:HE2	3:C:375:GLN:HE21	1.82	0.45
3:C:683:LYS:HE3	3:C:713:MET:HA	1.98	0.45
2:I:11:ASN:OD1	2:I:14:THR:HG23	2.17	0.45
2:I:122:ARG:HG2	2:I:123:GLN:H	1.82	0.45
1:A:450:ILE:HA	1:A:475:LEU:O	2.17	0.45
2:B:298:LEU:HB2	2:B:461:LEU:HD13	1.98	0.45
1:H:583:ARG:HH12	2:I:466:GLY:HA3	1.81	0.45
1:A:185:ARG:NH1	2:B:217:GLU:OE2	2.43	0.45
1:A:191:VAL:O	2:B:336:ASN:ND2	2.50	0.45
1:A:353:ILE:HD12	1:A:380:GLY:HA2	1.98	0.45
2:B:105:TRP:HB2	2:B:263:GLU:HG2	1.99	0.45
3:C:189:HIS:CD2	3:C:297:ARG:HH11	2.34	0.45
6:G:3:C:H2'	6:G:4:A:C8	2.52	0.45
2:I:85:LEU:HD21	2:I:316:LEU:HD11	1.99	0.45

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:83:ASP:OD1	1:A:83:ASP:N	2.50	0.44
1:H:508:VAL:O	1:H:511:SER:HB3	2.18	0.44
2:B:281:LEU:HB3	3:C:150:ARG:NH1	2.31	0.44
3:C:414:GLY:HA3	3:C:416:PHE:CZ	2.52	0.44
2:I:58:LEU:O	2:I:388:ARG:NH1	2.49	0.44
2:I:165:ILE:HA	2:I:168:VAL:HG12	2.00	0.44
2:I:499:THR:O	2:I:503:MET:HG2	2.16	0.44
1:A:232:LEU:HB2	1:A:391:TRP:CE2	2.53	0.44
3:C:185:LYS:HZ3	3:C:708:ASP:CG	2.25	0.44
3:C:464:LEU:HD22	3:C:481:VAL:HG11	1.99	0.44
1:H:374:LYS:O	1:H:378:ILE:HG12	2.17	0.44
2:B:357:LYS:HB2	2:B:357:LYS:HE3	1.81	0.44
3:C:582:GLU:O	3:C:586:GLN:HG3	2.17	0.44
3:C:690:VAL:HG23	3:C:692:THR:OG1	2.18	0.44
1:H:614:TRP:HB2	2:I:1:MET:HG2	1.98	0.44
2:I:99:MET:HA	2:I:102:LEU:HG	1.98	0.44
3:C:424:THR:HG22	3:C:426:GLY:H	1.82	0.44
3:C:520:PRO:O	3:C:521:THR:OG1	2.33	0.44
2:I:495:THR:OG1	2:I:496:ASN:N	2.49	0.44
3:J:56:TRP:HH2	3:J:74:LYS:HB3	1.81	0.44
1:A:103:ASP:OD2	1:A:105:SER:OG	2.27	0.44
5:F:15:G:H2'	5:F:16:C:C6	2.52	0.44
1:H:581:GLU:OE2	1:H:583:ARG:HD2	2.18	0.44
2:I:94:LYS:HG2	2:I:95:TYR:H	1.81	0.44
2:I:545:ARG:HH22	2:I:561:GLN:HA	1.82	0.44
1:A:3:ASP:OD1	1:A:3:ASP:N	2.48	0.44
1:A:418:ASP:OD1	1:A:422:ASN:N	2.51	0.44
1:A:3:ASP:HB3	2:B:104:TYR:HE2	1.83	0.44
2:B:592:ARG:NE	3:C:114:THR:O	2.50	0.44
1:H:496:ARG:HG2	2:I:490:LEU:HD12	1.99	0.44
1:A:577:HIS:ND1	2:B:12:PRO:HD2	2.32	0.44
3:C:142:ARG:O	3:C:249:HIS:HA	2.16	0.44
2:I:324:LYS:HB3	2:I:324:LYS:HE3	1.78	0.44
1:A:139:GLN:OE1	3:C:733:ILE:HG12	2.18	0.43
1:A:577:HIS:CE1	2:B:11:ASN:HB2	2.53	0.43
2:B:177:GLU:O	2:B:177:GLU:HG3	2.18	0.43
3:C:49:LYS:NZ	6:G:4:A:OP1	2.49	0.43
1:H:520:ASN:HB3	1:H:523:VAL:HG13	2.00	0.43
2:I:150:LEU:HG	2:I:152:ARG:HG2	2.00	0.43
1:A:543:TRP:CE2	1:A:547:ILE:HD11	2.53	0.43
2:B:544:ARG:NH1	5:E:14:U:OP1	2.50	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:C:29:LYS:C	3:C:31:MET:H	2.27	0.43
2:I:174:THR:O	2:I:214:PHE:N	2.50	0.43
1:A:442:ASN:HB3	1:A:482:SER:HB3	2.00	0.43
3:C:274:ARG:HB3	3:C:541:PHE:CE1	2.54	0.43
1:H:566:LEU:O	1:H:570:ARG:HG3	2.18	0.43
2:I:39:GLU:HA	2:I:42:ILE:HG22	2.01	0.43
2:I:79:PHE:HA	2:I:449:LEU:O	2.18	0.43
2:B:22:TYR:O	2:B:23:THR:OG1	2.24	0.43
1:A:343:LEU:C	1:A:345:ARG:H	2.26	0.43
2:B:581:ARG:NH2	3:C:120:ASN:OD1	2.46	0.43
6:G:3:C:H2'	6:G:4:A:H8	1.83	0.43
1:A:228:TRP:NE1	1:A:232:LEU:O	2.45	0.43
2:B:246:PRO:HD3	2:B:393:MET:HE1	2.00	0.43
2:I:258:GLU:O	2:I:262:LYS:HG3	2.19	0.43
1:A:465:PHE:CE1	1:A:478:LEU:HD23	2.54	0.43
1:A:582:ARG:HH22	1:A:621:TYR:HB3	1.83	0.43
1:H:179:PHE:HZ	2:I:337:ILE:HD13	1.83	0.43
1:H:451:MET:HE3	1:H:475:LEU:HB3	2.00	0.43
2:I:76:SER:H	2:I:453:ASN:CG	2.27	0.43
2:I:284:LEU:HD11	2:I:416:SER:HB3	2.01	0.43
1:A:344:LEU:HG	1:A:384:VAL:HG22	2.00	0.43
1:A:487:LYS:HG2	2:B:25:PRO:HB3	2.00	0.43
3:C:182:LEU:HD13	3:C:729:TYR:CE1	2.54	0.43
1:H:180:ARG:HH22	1:H:190:ASP:HB2	1.84	0.43
2:I:146:LEU:HD11	2:I:165:ILE:HD13	2.00	0.43
2:B:280:LYS:HB3	2:B:280:LYS:HE2	1.83	0.43
2:B:498:MET:H	2:B:498:MET:HG2	1.69	0.43
2:I:144:GLU:O	2:I:147:GLU:HG3	2.19	0.43
2:I:430:CYS:SG	2:I:436:MET:HG3	2.59	0.43
2:I:600:PRO:HB2	3:J:60:MET:SD	2.58	0.43
1:A:65:ARG:HH12	1:A:81:GLU:HA	1.83	0.42
1:A:454:ASP:CG	1:A:464:VAL:HG21	2.44	0.42
2:B:506:ASN:ND2	5:F:14:U:O5'	2.52	0.42
3:C:210:GLU:OE2	5:F:17:U:H5''	2.19	0.42
3:C:339:ASN:HD21	3:C:371:LYS:HE2	1.84	0.42
1:A:375:TYR:HA	1:A:378:ILE:HG12	2.00	0.42
1:A:440:THR:OG1	5:F:5:G:O6	2.30	0.42
1:A:468:LYS:HE3	1:A:471:GLU:HA	2.01	0.42
2:B:588:GLU:HA	2:B:591:LEU:HB2	2.00	0.42
3:C:66:PRO:HD2	3:C:100:ASN:HA	2.01	0.42
2:I:122:ARG:HG2	2:I:123:GLN:N	2.34	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:H:617:MET:HE1	2:I:5:THR:HG21	2.02	0.42
2:I:118:LEU:HD22	2:I:139:LEU:HD13	2.01	0.42
2:I:298:LEU:HD13	2:I:461:LEU:HB2	2.01	0.42
3:J:63:SER:O	3:J:76:LYS:NZ	2.52	0.42
3:C:690:VAL:HG23	3:C:692:THR:HG1	1.84	0.42
1:H:571:ARG:CZ	2:I:458:LYS:HG2	2.49	0.42
2:I:328:PRO:HB2	2:I:330:TRP:CD1	2.54	0.42
3:C:65:TRP:HB3	3:C:98:ARG:HB3	2.01	0.42
2:I:104:TYR:CE1	2:I:108:VAL:HG21	2.55	0.42
1:A:35:GLU:HB3	1:A:62:TRP:HZ2	1.84	0.42
1:A:451:MET:HB2	1:A:475:LEU:HB2	2.02	0.42
3:C:728:GLN:HG3	3:C:728:GLN:O	2.19	0.42
1:H:383:LYS:O	1:H:387:VAL:HG23	2.20	0.42
2:I:224:ARG:O	2:I:346:LEU:N	2.45	0.42
2:I:408:ILE:HD12	2:I:417:HIS:HB3	2.00	0.42
1:A:239:TYR:HA	1:A:425:PHE:O	2.18	0.42
2:B:118:LEU:HD21	2:B:252:GLY:HA2	2.02	0.42
2:I:32:THR:H	6:K:7:A:H5'	1.84	0.42
2:I:281:LEU:HD12	2:I:470:PHE:HB3	2.02	0.42
2:I:498:MET:HE1	2:I:630:PHE:HB2	2.02	0.42
2:B:30:TYR:HB3	4:D:8:U:H1'	2.01	0.42
1:H:231:LEU:HG	1:H:232:LEU:HD22	2.02	0.42
1:H:334:PRO:HA	1:H:335:PRO:HD3	1.96	0.42
2:I:87:LEU:HD12	2:I:406:ILE:O	2.20	0.42
5:F:8:U:H2'	5:F:9:G:C8	2.54	0.42
1:A:4:ARG:HG3	1:A:13:TRP:CG	2.54	0.41
3:C:365:ARG:NH2	3:C:366:PHE:O	2.50	0.41
3:C:417:ILE:CG2	3:C:419:PRO:HD2	2.49	0.41
1:H:402:LEU:HD11	1:H:488:LEU:HD12	2.02	0.41
1:H:429:VAL:HG23	1:H:447:ILE:HG12	2.02	0.41
1:H:583:ARG:NH1	2:I:467:ILE:HG13	2.35	0.41
3:J:58:ILE:O	3:J:90:ALA:N	2.43	0.41
1:A:506:SER:HB3	2:B:520:CYS:HB3	2.02	0.41
1:A:577:HIS:CD2	2:B:467:ILE:HD13	2.55	0.41
2:B:115:TYR:HA	2:B:158:LEU:HD13	2.03	0.41
1:H:572:LEU:HD11	1:H:597:VAL:HG21	2.02	0.41
1:H:596:LYS:HD3	2:I:457:SER:HB2	2.02	0.41
2:I:329:ASP:O	2:I:332:MET:HB2	2.20	0.41
2:I:560:ASN:OD1	2:I:560:ASN:N	2.52	0.41
1:A:58:ASP:OD1	1:A:88:TYR:HB3	2.20	0.41
1:A:538:MET:CE	1:A:542:GLN:HG3	2.50	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:J:60:MET:O	3:J:87:ARG:HB3	2.20	0.41
1:A:583:ARG:HA	2:B:464:PRO:HG2	2.01	0.41
3:C:350:VAL:HA	3:C:360:THR:HG23	2.03	0.41
1:H:481:THR:HA	6:K:2:G:O2'	2.21	0.41
2:I:79:PHE:CG	2:I:313:ALA:HB2	2.55	0.41
2:I:482:ASN:HD22	2:I:514:THR:HB	1.86	0.41
2:I:496:ASN:OD1	2:I:499:THR:HB	2.20	0.41
2:B:484:ALA:HA	2:B:487:LEU:HG	2.03	0.41
2:B:661:ILE:HD13	3:C:19:GLU:HB3	2.03	0.41
3:C:109:LYS:HG2	3:C:110:TYR:H	1.86	0.41
3:C:716:SER:O	3:C:717:ARG:HG3	2.21	0.41
1:H:236:ASP:O	1:H:451:MET:HA	2.20	0.41
2:I:134:PRO:HD2	2:I:137:ILE:HD11	2.01	0.41
2:I:401:THR:O	2:I:405:LEU:HD23	2.20	0.41
1:H:208:ARG:HE	1:H:209:TRP:N	2.19	0.41
1:H:508:VAL:O	1:H:512:ARG:HG2	2.21	0.41
6:K:3:C:H42	6:K:8:A:H61	1.68	0.41
2:B:92:PHE:CD2	2:B:99:MET:HG3	2.55	0.41
3:C:147:LEU:HB3	3:C:380:GLN:NE2	2.36	0.41
1:H:462:HIS:NE2	1:H:479:LYS:HD2	2.36	0.41
2:B:223:MET:HG3	2:B:249:LEU:HB2	2.03	0.41
1:A:48:MET:HG3	3:C:736:TRP:CE2	2.55	0.41
1:A:64:ASP:OD2	3:C:753:LYS:NZ	2.52	0.41
1:A:71:ILE:O	1:A:75:LYS:NZ	2.52	0.41
1:A:468:LYS:HD3	1:A:473:GLN:NE2	2.36	0.41
1:A:586:PHE:HE2	2:B:463:SER:HB3	1.86	0.41
2:B:114:LYS:HD2	2:B:156:PRO:HB2	2.03	0.41
2:B:244:ALA:O	5:F:7:C:H1'	2.21	0.41
2:B:708:ARG:NE	3:C:14:ARG:HH12	2.19	0.41
2:I:30:TYR:HB2	6:K:7:A:H2	1.85	0.41
2:I:50:LYS:HE2	2:I:50:LYS:HB3	1.92	0.41
2:I:498:MET:HE2	2:I:631:LYS:HG2	2.01	0.41
3:C:210:GLU:HG2	3:C:211:SER:N	2.36	0.41
1:H:175:VAL:HG23	1:H:179:PHE:HD2	1.86	0.41
2:I:519:LEU:HD13	2:I:569:PHE:CE2	2.56	0.41
3:J:60:MET:HE3	3:J:94:VAL:HG11	2.03	0.41
1:A:374:LYS:HE3	1:A:374:LYS:HB3	1.90	0.40
1:A:520:ASN:HB3	1:A:523:VAL:HG13	2.02	0.40
2:B:297:GLU:OE2	2:B:468:GLY:HA3	2.20	0.40
3:C:691:GLN:HE21	3:C:727:PHE:CB	2.32	0.40
5:F:7:C:H2'	5:F:8:U:H6	1.86	0.40

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:H:208:ARG:HH22	2:I:437:PHE:HB3	1.86	0.40
1:H:309:LYS:HE2	6:K:10:A:N1	2.36	0.40
1:H:375:TYR:HA	1:H:378:ILE:HG12	2.03	0.40
1:H:389:GLU:O	1:H:393:ILE:HG12	2.21	0.40
3:J:91:ASN:OD1	3:J:92:ILE:N	2.51	0.40
1:A:390:LYS:HD2	1:A:426:TRP:CE3	2.56	0.40
1:A:546:MET:HA	1:A:549:CYS:SG	2.62	0.40
2:B:708:ARG:HG3	3:C:17:VAL:HG11	2.03	0.40
1:H:232:LEU:HB2	1:H:391:TRP:NE1	2.37	0.40
1:H:242:CYS:HB2	1:H:423:CYS:HB2	2.02	0.40
1:H:448:ALA:HA	1:H:477:SER:O	2.22	0.40
2:I:467:ILE:HG12	2:I:476:HIS:HD2	1.86	0.40
1:A:269:THR:HG21	1:A:478:LEU:O	2.20	0.40
1:A:430:LEU:HB2	1:A:446:LEU:HB3	2.03	0.40
1:A:449:GLU:HG2	1:A:477:SER:HB2	2.03	0.40
1:A:560:PRO:HD2	4:D:5:A:OP1	2.21	0.40
2:B:679:THR:HG23	2:B:682:GLU:H	1.86	0.40
2:B:177:GLU:OE1	2:B:211:THR:OG1	2.33	0.40
2:B:442:THR:O	2:B:446:THR:HG23	2.20	0.40
2:B:493:ASN:ND2	2:B:503:MET:SD	2.94	0.40
2:B:599:ASN:HD22	2:B:629:CYS:HB3	1.86	0.40
2:B:676:ALA:HB3	3:C:35:PHE:CD2	2.56	0.40
1:H:577:HIS:ND1	2:I:12:PRO:HD2	2.36	0.40
2:I:169:MET:SD	2:I:170:GLU:HG2	2.61	0.40
3:J:119:LEU:HA	3:J:122:GLN:NE2	2.37	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 PDB entries followed by that with respect to all EM entries.

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	619/622 (100%)	598 (97%)	21 (3%)	0	100 100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	H	447/622 (72%)	426 (95%)	21 (5%)	0	100	100
2	B	670/710 (94%)	643 (96%)	27 (4%)	0	100	100
2	I	572/710 (81%)	547 (96%)	25 (4%)	0	100	100
3	C	748/827 (90%)	696 (93%)	52 (7%)	0	100	100
3	J	75/827 (9%)	75 (100%)	0	0	100	100
All	All	3131/4318 (72%)	2985 (95%)	146 (5%)	0	100	100

There are no Ramachandran outliers to report.

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 PDB entries followed by that with respect to all EM entries.

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	560/561 (100%)	560 (100%)	0	100	100
1	H	403/561 (72%)	403 (100%)	0	100	100
2	B	600/633 (95%)	600 (100%)	0	100	100
2	I	513/633 (81%)	513 (100%)	0	100	100
3	C	676/736 (92%)	676 (100%)	0	100	100
3	J	73/736 (10%)	73 (100%)	0	100	100
All	All	2825/3860 (73%)	2825 (100%)	0	100	100

There are no protein residues with a non-rotameric sidechain to report.

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (30) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	25	GLN
1	A	351	ASN
1	A	486	ASN
1	A	500	GLN
1	A	577	HIS

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Mol	Chain	Res	Type
2	B	55	GLN
2	B	129	HIS
2	B	433	HIS
2	B	598	ASN
2	B	619	GLN
2	B	656	GLN
3	C	100	ASN
3	C	209	GLN
3	C	249	HIS
3	C	288	ASN
3	C	375	GLN
3	C	376	ASN
3	C	380	GLN
3	C	423	GLN
3	C	469	ASN
3	C	509	GLN
3	C	562	HIS
3	C	639	GLN
1	H	435	HIS
1	H	528	GLN
1	H	535	GLN
1	H	577	HIS
2	I	46	GLN
2	I	163	GLN
2	I	476	HIS

5.3.3 RNA [i](#)

Mol	Chain	Analysed	Backbone Outliers	Pucker Outliers
4	D	11/18 (61%)	2 (18%)	1 (9%)
5	E	4/17 (23%)	1 (25%)	0
5	F	12/17 (70%)	1 (8%)	0
6	G	8/9 (88%)	0	0
6	K	8/9 (88%)	3 (37%)	1 (12%)
All	All	43/70 (61%)	7 (16%)	2 (4%)

All (7) RNA backbone outliers are listed below:

Mol	Chain	Res	Type
4	D	6	A
4	D	12	G

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Mol	Chain	Res	Type
5	E	17	U
5	F	17	U
6	K	6	A
6	K	7	A
6	K	8	A

All (2) RNA pucker outliers are listed below:

Mol	Chain	Res	Type
4	D	11	A
6	K	7	A

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](#)

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
7	V9G	G	1	6	46,57,57	4.10	21 (45%)	46,89,89	2.61	8 (17%)
7	V9G	K	1	6	26,34,57	3.98	9 (34%)	31,53,89	3.07	6 (19%)

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
7	V9G	G	1	6	-	11/26/94/94	0/6/6/6
7	V9G	K	1	6	-	9/20/40/94	0/3/3/6

All (30) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
7	G	1	V9G	C14-C15	-11.54	1.27	1.52
7	K	1	V9G	C14-C15	-11.47	1.27	1.52
7	G	1	V9G	O3-C7	11.38	1.57	1.41
7	K	1	V9G	O15-C16	11.12	1.56	1.41
7	G	1	V9G	O15-C16	11.09	1.56	1.41
7	G	1	V9G	C9-C8	-7.64	1.32	1.53
7	K	1	V9G	O15-C13	-7.15	1.29	1.45
7	G	1	V9G	O15-C13	-7.11	1.29	1.45
7	G	1	V9G	O3-C10	-6.13	1.31	1.45
7	G	1	V9G	C14-C13	6.01	1.68	1.53
7	K	1	V9G	C14-C13	5.93	1.68	1.53
7	G	1	V9G	C6-N4	5.61	1.46	1.33
7	G	1	V9G	C5-N4	4.71	1.48	1.37
7	G	1	V9G	C19-N8	4.47	1.50	1.34
7	K	1	V9G	C19-N8	4.45	1.50	1.34
7	G	1	V9G	C6-N1	4.29	1.44	1.34
7	G	1	V9G	C9-C10	4.13	1.63	1.53
7	G	1	V9G	O17-C15	3.72	1.52	1.42
7	K	1	V9G	O17-C15	3.70	1.52	1.42
7	G	1	V9G	C1-N5	3.43	1.43	1.37
7	G	1	V9G	C2-C1	3.30	1.53	1.45
7	K	1	V9G	P1-O8	3.10	1.66	1.54
7	G	1	V9G	O4-C8	2.96	1.49	1.43
7	G	1	V9G	C6-N5	2.91	1.44	1.37
7	G	1	V9G	C20-N10	2.89	1.36	1.32
7	K	1	V9G	C20-N10	2.82	1.36	1.32
7	K	1	V9G	C18-C21	-2.33	1.34	1.40
7	G	1	V9G	C18-C21	-2.27	1.34	1.40
7	G	1	V9G	O1-C1	-2.18	1.18	1.23
7	G	1	V9G	C4-N3	2.04	1.36	1.33

All (14) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
7	K	1	V9G	C18-C19-N8	12.41	139.21	120.35

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
7	G	1	V9G	C18-C19-N8	12.38	139.17	120.35
7	K	1	V9G	N8-C19-N9	-8.56	100.80	118.57
7	G	1	V9G	N8-C19-N9	-8.54	100.85	118.57
7	K	1	V9G	N10-C20-N9	-5.54	120.02	128.68
7	G	1	V9G	N10-C20-N9	-5.47	120.13	128.68
7	K	1	V9G	C16-N6-C21	-2.96	121.44	126.64
7	G	1	V9G	C6-N5-C1	-2.85	119.84	125.10
7	G	1	V9G	P2-O11-P3	-2.71	123.52	132.83
7	G	1	V9G	C16-N6-C21	-2.64	122.00	126.64
7	K	1	V9G	P2-O7-P1	-2.51	124.20	132.83
7	K	1	V9G	P2-O11-P3	-2.38	124.64	132.83
7	G	1	V9G	C9-C8-C7	2.28	104.42	100.98
7	G	1	V9G	P1-O7-P2	-2.20	125.28	132.83

There are no chirality outliers.

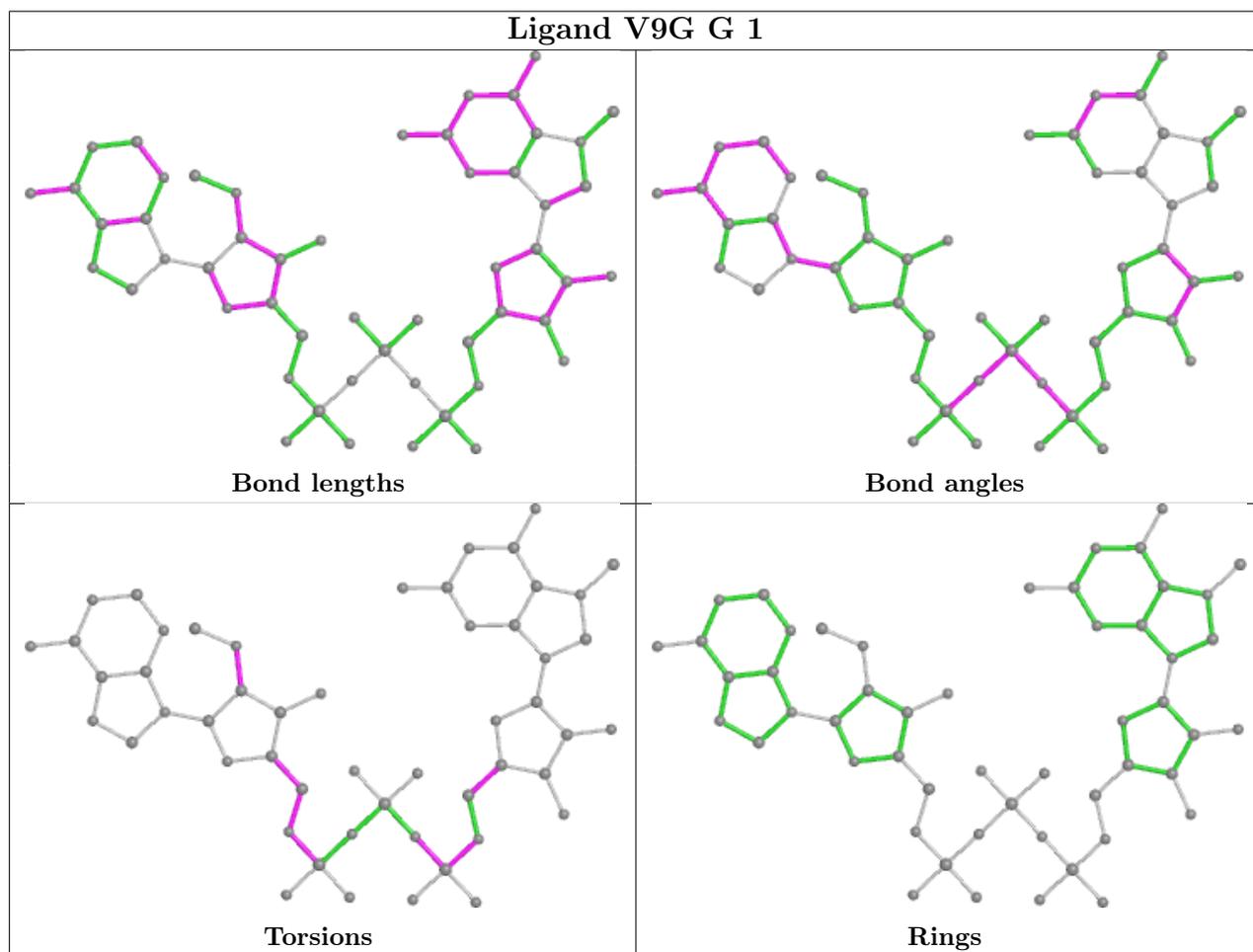
All (20) torsion outliers are listed below:

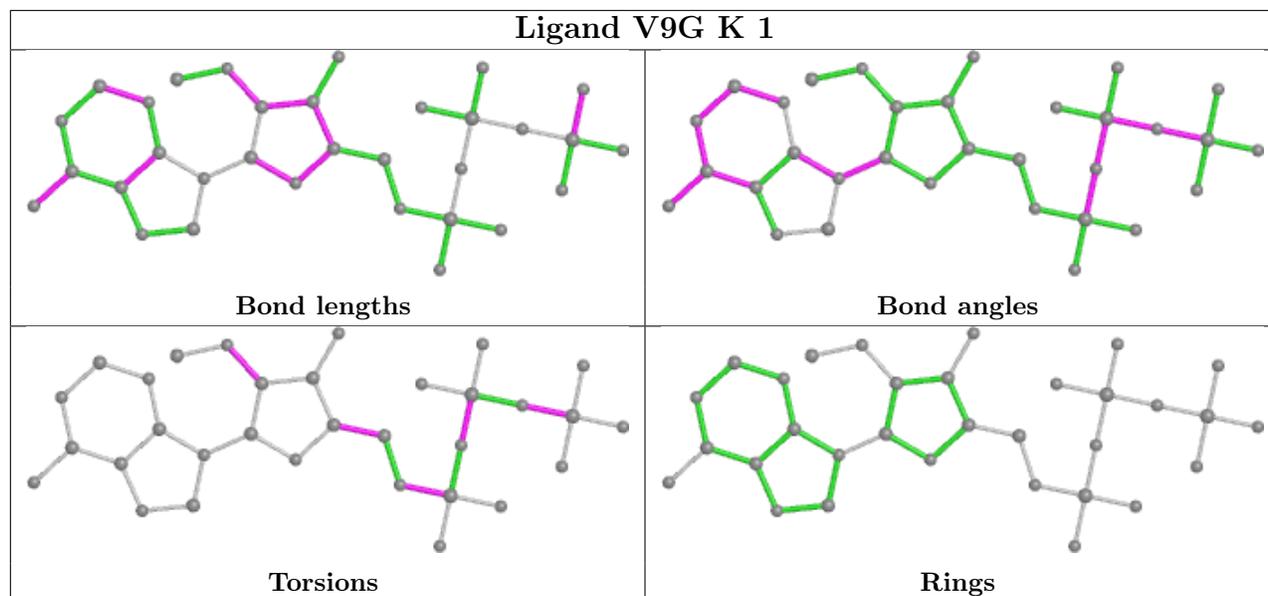
Mol	Chain	Res	Type	Atoms
7	G	1	V9G	O14-C12-C13-O15
7	G	1	V9G	C16-C15-O17-C22
7	G	1	V9G	C12-O14-P3-O13
7	G	1	V9G	C12-O14-P3-O12
7	K	1	V9G	C16-C15-O17-C22
7	K	1	V9G	C12-O14-P3-O13
7	K	1	V9G	C12-O14-P3-O12
7	K	1	V9G	P2-O7-P1-O6
7	G	1	V9G	O3-C10-C11-O8
7	G	1	V9G	O14-C12-C13-C14
7	K	1	V9G	O14-C12-C13-O15
7	G	1	V9G	C9-C10-C11-O8
7	K	1	V9G	O14-C12-C13-C14
7	G	1	V9G	P2-O7-P1-O8
7	K	1	V9G	C12-O14-P3-O11
7	K	1	V9G	P2-O7-P1-O5
7	K	1	V9G	P3-O11-P2-O10
7	G	1	V9G	C13-C12-O14-P3
7	G	1	V9G	C12-O14-P3-O11
7	G	1	V9G	C11-O8-P1-O5

There are no ring outliers.

No monomer is involved in short contacts.

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.