



Full wwPDB EM Validation Report ⓘ

Jul 15, 2025 – 08:57 PM JST

PDB ID : 8Z6H / pdb_00008z6h
EMDB ID : EMD-39799
Title : Structure of Polycystin-1/Polycystin-2 complex with Phosphatidylglycerol-bo
und
Authors : Chen, M.Y.; Su, Q.; Shi, Y.G.
Deposited on : 2024-04-19
Resolution : 3.10 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

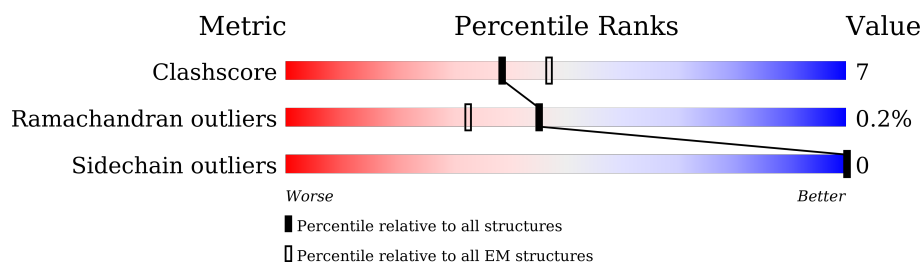
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

ELECTRON MICROSCOPY

The reported resolution of this entry is 3.10 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

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	1262	52% 10% 38%
2	B	1007	42% 5% 53%
2	C	1007	41% 6% 53%
2	D	1007	37% 9% 54%

2 Entry composition

There are 4 unique types of molecules in this entry. The entry contains 17665 atoms, of which 76 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 Polycystin-1.

Mol	Chain	Residues	Atoms					AltConf	Trace
1	A	784	Total	C	N	O	S	0	0
			5794	3736	1051	987	20		

There are 10 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	3043	MET	-	initiating methionine	UNP P98161
A	3044	ASP	-	expression tag	UNP P98161
A	3045	TYR	-	expression tag	UNP P98161
A	3046	LYS	-	expression tag	UNP P98161
A	3047	ASP	-	expression tag	UNP P98161
A	3048	ASP	-	expression tag	UNP P98161
A	3049	ASP	-	expression tag	UNP P98161
A	3050	ASP	-	expression tag	UNP P98161
A	3051	LYS	-	expression tag	UNP P98161
A	4304	LEU	-	expression tag	UNP P98161

- Molecule 2 is a protein called Polycystin-2.

Mol	Chain	Residues	Atoms					AltConf	Trace
2	B	474	Total	C	N	O	S	0	0
			3913	2582	618	692	21		
2	C	475	Total	C	N	O	S	0	0
			3928	2594	619	694	21		
2	D	463	Total	C	N	O	S	0	0
			3819	2521	601	677	20		

There are 117 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	-38	MET	-	initiating methionine	UNP Q13563
B	-37	GLY	-	expression tag	UNP Q13563
B	-36	ALA	-	expression tag	UNP Q13563

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Chain	Residue	Modelled	Actual	Comment	Reference
B	-35	SER	-	expression tag	UNP Q13563
B	-34	SER	-	expression tag	UNP Q13563
B	-33	ALA	-	expression tag	UNP Q13563
B	-32	TRP	-	expression tag	UNP Q13563
B	-31	SER	-	expression tag	UNP Q13563
B	-30	HIS	-	expression tag	UNP Q13563
B	-29	PRO	-	expression tag	UNP Q13563
B	-28	GLN	-	expression tag	UNP Q13563
B	-27	PHE	-	expression tag	UNP Q13563
B	-26	GLU	-	expression tag	UNP Q13563
B	-25	LYS	-	expression tag	UNP Q13563
B	-24	GLY	-	expression tag	UNP Q13563
B	-23	GLY	-	expression tag	UNP Q13563
B	-22	GLY	-	expression tag	UNP Q13563
B	-21	SER	-	expression tag	UNP Q13563
B	-20	GLY	-	expression tag	UNP Q13563
B	-19	GLY	-	expression tag	UNP Q13563
B	-18	GLY	-	expression tag	UNP Q13563
B	-17	SER	-	expression tag	UNP Q13563
B	-16	GLY	-	expression tag	UNP Q13563
B	-15	GLY	-	expression tag	UNP Q13563
B	-14	SER	-	expression tag	UNP Q13563
B	-13	ALA	-	expression tag	UNP Q13563
B	-12	TRP	-	expression tag	UNP Q13563
B	-11	SER	-	expression tag	UNP Q13563
B	-10	HIS	-	expression tag	UNP Q13563
B	-9	PRO	-	expression tag	UNP Q13563
B	-8	GLN	-	expression tag	UNP Q13563
B	-7	PHE	-	expression tag	UNP Q13563
B	-6	GLU	-	expression tag	UNP Q13563
B	-5	LYS	-	expression tag	UNP Q13563
B	-4	GLY	-	expression tag	UNP Q13563
B	-3	SER	-	expression tag	UNP Q13563
B	-2	ALA	-	expression tag	UNP Q13563
B	-1	ALA	-	expression tag	UNP Q13563
B	0	ALA	-	expression tag	UNP Q13563
C	-38	MET	-	initiating methionine	UNP Q13563
C	-37	GLY	-	expression tag	UNP Q13563
C	-36	ALA	-	expression tag	UNP Q13563
C	-35	SER	-	expression tag	UNP Q13563
C	-34	SER	-	expression tag	UNP Q13563
C	-33	ALA	-	expression tag	UNP Q13563

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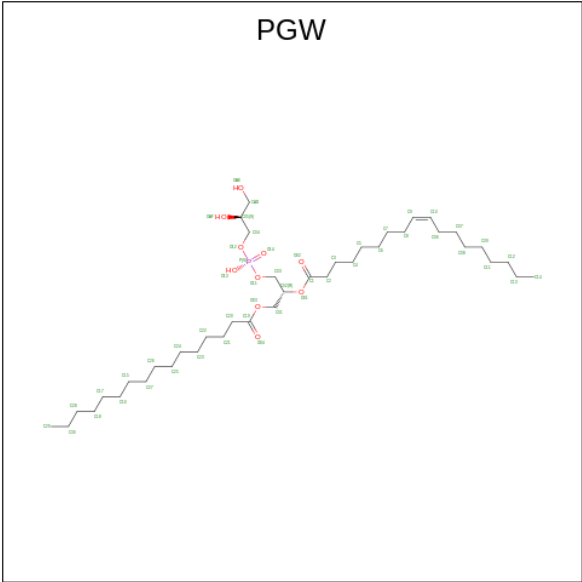
Chain	Residue	Modelled	Actual	Comment	Reference
C	-32	TRP	-	expression tag	UNP Q13563
C	-31	SER	-	expression tag	UNP Q13563
C	-30	HIS	-	expression tag	UNP Q13563
C	-29	PRO	-	expression tag	UNP Q13563
C	-28	GLN	-	expression tag	UNP Q13563
C	-27	PHE	-	expression tag	UNP Q13563
C	-26	GLU	-	expression tag	UNP Q13563
C	-25	LYS	-	expression tag	UNP Q13563
C	-24	GLY	-	expression tag	UNP Q13563
C	-23	GLY	-	expression tag	UNP Q13563
C	-22	GLY	-	expression tag	UNP Q13563
C	-21	SER	-	expression tag	UNP Q13563
C	-20	GLY	-	expression tag	UNP Q13563
C	-19	GLY	-	expression tag	UNP Q13563
C	-18	GLY	-	expression tag	UNP Q13563
C	-17	SER	-	expression tag	UNP Q13563
C	-16	GLY	-	expression tag	UNP Q13563
C	-15	GLY	-	expression tag	UNP Q13563
C	-14	SER	-	expression tag	UNP Q13563
C	-13	ALA	-	expression tag	UNP Q13563
C	-12	TRP	-	expression tag	UNP Q13563
C	-11	SER	-	expression tag	UNP Q13563
C	-10	HIS	-	expression tag	UNP Q13563
C	-9	PRO	-	expression tag	UNP Q13563
C	-8	GLN	-	expression tag	UNP Q13563
C	-7	PHE	-	expression tag	UNP Q13563
C	-6	GLU	-	expression tag	UNP Q13563
C	-5	LYS	-	expression tag	UNP Q13563
C	-4	GLY	-	expression tag	UNP Q13563
C	-3	SER	-	expression tag	UNP Q13563
C	-2	ALA	-	expression tag	UNP Q13563
C	-1	ALA	-	expression tag	UNP Q13563
C	0	ALA	-	expression tag	UNP Q13563
D	-38	MET	-	initiating methionine	UNP Q13563
D	-37	GLY	-	expression tag	UNP Q13563
D	-36	ALA	-	expression tag	UNP Q13563
D	-35	SER	-	expression tag	UNP Q13563
D	-34	SER	-	expression tag	UNP Q13563
D	-33	ALA	-	expression tag	UNP Q13563
D	-32	TRP	-	expression tag	UNP Q13563
D	-31	SER	-	expression tag	UNP Q13563
D	-30	HIS	-	expression tag	UNP Q13563

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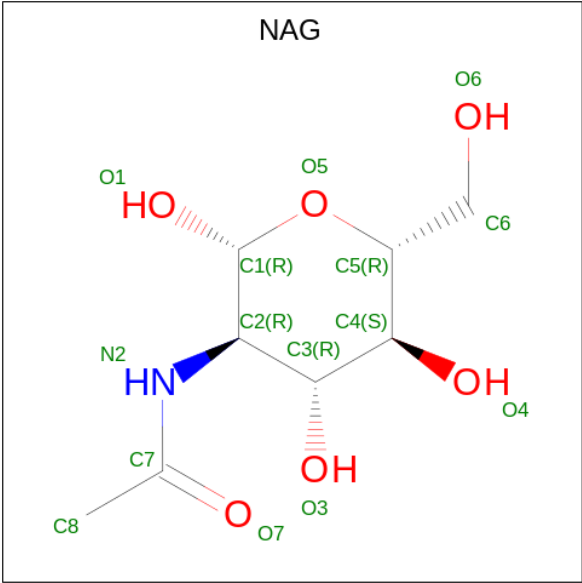
Chain	Residue	Modelled	Actual	Comment	Reference
D	-29	PRO	-	expression tag	UNP Q13563
D	-28	GLN	-	expression tag	UNP Q13563
D	-27	PHE	-	expression tag	UNP Q13563
D	-26	GLU	-	expression tag	UNP Q13563
D	-25	LYS	-	expression tag	UNP Q13563
D	-24	GLY	-	expression tag	UNP Q13563
D	-23	GLY	-	expression tag	UNP Q13563
D	-22	GLY	-	expression tag	UNP Q13563
D	-21	SER	-	expression tag	UNP Q13563
D	-20	GLY	-	expression tag	UNP Q13563
D	-19	GLY	-	expression tag	UNP Q13563
D	-18	GLY	-	expression tag	UNP Q13563
D	-17	SER	-	expression tag	UNP Q13563
D	-16	GLY	-	expression tag	UNP Q13563
D	-15	GLY	-	expression tag	UNP Q13563
D	-14	SER	-	expression tag	UNP Q13563
D	-13	ALA	-	expression tag	UNP Q13563
D	-12	TRP	-	expression tag	UNP Q13563
D	-11	SER	-	expression tag	UNP Q13563
D	-10	HIS	-	expression tag	UNP Q13563
D	-9	PRO	-	expression tag	UNP Q13563
D	-8	GLN	-	expression tag	UNP Q13563
D	-7	PHE	-	expression tag	UNP Q13563
D	-6	GLU	-	expression tag	UNP Q13563
D	-5	LYS	-	expression tag	UNP Q13563
D	-4	GLY	-	expression tag	UNP Q13563
D	-3	SER	-	expression tag	UNP Q13563
D	-2	ALA	-	expression tag	UNP Q13563
D	-1	ALA	-	expression tag	UNP Q13563
D	0	ALA	-	expression tag	UNP Q13563

- Molecule 3 is (1R)-2-[[[(S)-{[(2S)-2,3-dihydroxypropyl]oxy}(hydroxy)phosphoryl]oxy}-1-[(hexadecanoyloxy)methyl]ethyl (9Z)-octadec-9-enoate (CCD ID: PGW) (formula: C₄₀H₇₇O₁₀P) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms					AltConf
3	A	1	Total	C	H	O	P	0
			127	40	76	10	1	

- Molecule 4 is 2-acetamido-2-deoxy-beta-D-glucopyranose (CCD ID: NAG) (formula: C₈H₁₅NO₆).



Mol	Chain	Residues	Atoms				AltConf
4	B	1	Total	C	N	O	0
			14	8	1	5	
4	B	1	Total	C	N	O	0
			14	8	1	5	

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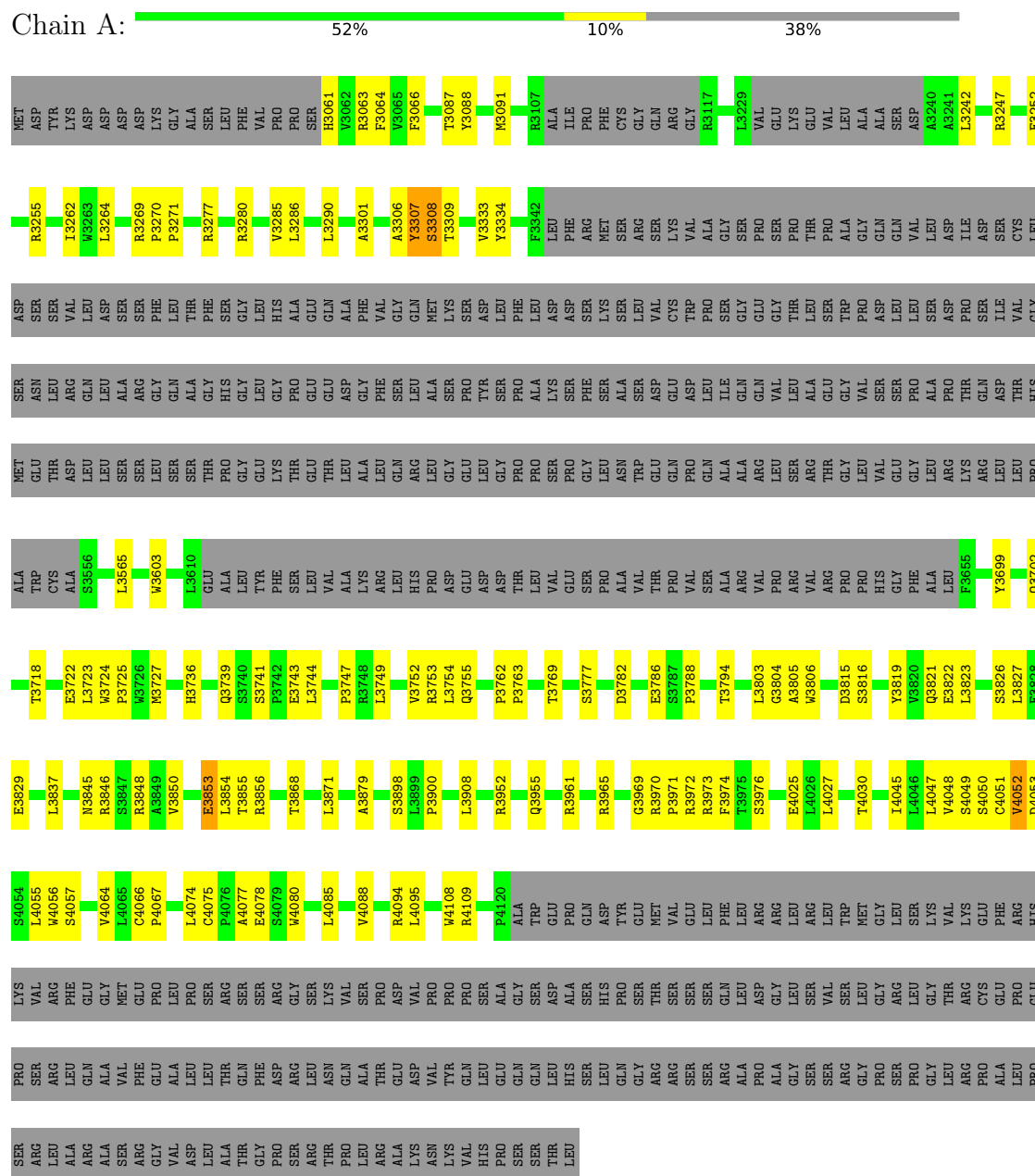
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Mol	Chain	Residues	Atoms				AltConf
4	C	1	Total	C	N	O	0
			14	8	1	5	
4	C	1	Total	C	N	O	0
			14	8	1	5	
4	D	1	Total	C	N	O	0
			14	8	1	5	
4	D	1	Total	C	N	O	0
			14	8	1	5	

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.

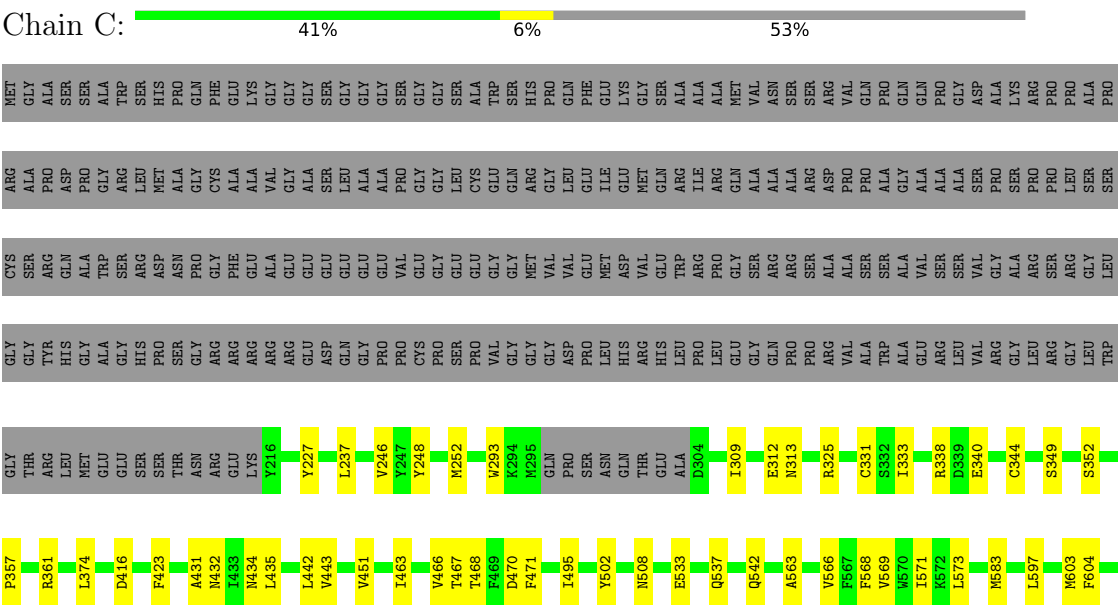
- Molecule 1: Polycystin-1



- Molecule 2: Polycystin-2



● Molecule 2: Polycystin-2



4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	852238	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	NONE	Depositor
Microscope	FEI TITAN KRIOS	Depositor
Voltage (kV)	300	Depositor
Electron dose ($e^-/\text{\AA}^2$)	50	Depositor
Minimum defocus (nm)	1400	Depositor
Maximum defocus (nm)	2000	Depositor
Magnification	Not provided	
Image detector	GATAN K3 BIOQUANTUM (6k 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: NAG, PGW

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	0.12	0/5932	0.32	2/8100 (0.0%)
2	B	0.11	0/4016	0.27	0/5447
2	C	0.11	0/4032	0.29	0/5469
2	D	0.11	0/3920	0.30	0/5321
All	All	0.11	0/17900	0.30	2/24337 (0.0%)

There are no bond length outliers.

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	3853	GLU	CA-C-N	-5.11	115.47	121.90
1	A	3853	GLU	C-N-CA	-5.11	115.47	121.90

There are no chirality outliers.

There are no planarity outliers.

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	5794	0	5615	103	0
2	B	3913	0	3865	36	0
2	C	3928	0	3881	50	0
2	D	3819	0	3772	78	0
3	A	51	76	76	7	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
4	B	28	0	26	0	0
4	C	28	0	26	1	0
4	D	28	0	26	6	0
All	All	17589	76	17287	248	0

The all-atom clashscore is defined as the number of clashes found per 1000 atoms (including hydrogen atoms). The all-atom clashscore for this structure is 7.

All (248) 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:D:375:ASN:HD21	4:D:1002:NAG:C1	1.04	1.55
2:D:527:TYR:CZ	2:D:531:ASN:ND2	2.36	0.93
2:D:375:ASN:HD21	4:D:1002:NAG:C2	1.86	0.89
1:A:3064:PHE:HE2	1:A:3066:PHE:CD1	1.92	0.87
2:D:375:ASN:CG	4:D:1002:NAG:C1	2.53	0.81
1:A:3739:GLN:HE22	1:A:3856:ARG:HH22	1.31	0.78
2:B:677:LEU:HD11	2:C:677:LEU:HD23	1.65	0.78
2:D:527:TYR:CE1	2:D:531:ASN:ND2	2.52	0.77
1:A:3064:PHE:CE2	1:A:3066:PHE:CD1	2.72	0.77
1:A:4045:ILE:HA	1:A:4048:VAL:HG12	1.66	0.77
1:A:4064:VAL:HG11	1:A:4095:LEU:HD12	1.67	0.76
1:A:3755:GLN:HB3	1:A:3777:SER:HB2	1.68	0.75
1:A:3064:PHE:HE2	1:A:3066:PHE:CE1	2.06	0.73
2:D:253:MET:HE1	2:D:428:VAL:HG21	1.69	0.72
1:A:4064:VAL:CG1	1:A:4095:LEU:HD12	2.19	0.71
1:A:3821:GLN:HG3	1:A:3837:LEU:HD21	1.72	0.71
1:A:3064:PHE:CE2	1:A:3066:PHE:HD1	2.09	0.68
2:D:396:SER:H	2:D:402:THR:HG22	1.58	0.68
1:A:3064:PHE:CE2	1:A:3066:PHE:CE1	2.82	0.67
2:B:349:SER:HG	2:B:352:SER:HG	1.41	0.67
2:C:434:ASN:HD21	2:C:463:ILE:HB	1.60	0.67
2:B:434:ASN:HD21	2:B:463:ILE:HB	1.61	0.66
2:D:292:TYR:OH	2:D:402:THR:HG21	1.95	0.66
1:A:3782:ASP:HA	1:A:3794:THR:H	1.62	0.65
2:D:517:LEU:HD21	2:D:564:VAL:HG13	1.78	0.64
1:A:3822:GLU:CD	1:A:3972:ARG:HD2	2.23	0.64
2:D:458:GLN:HG3	2:D:552:ALA:HB1	1.80	0.64
2:B:690:ASP:OD1	2:B:691:LEU:N	2.32	0.63
1:A:3822:GLU:OE1	1:A:3972:ARG:HD2	1.99	0.62
2:C:694:GLN:O	2:C:698:MET:HG2	2.00	0.62

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:3269:ARG:HB3	1:A:3277:ARG:HH21	1.65	0.61
1:A:3952:ARG:NH1	1:A:3955:GLN:OE1	2.32	0.61
3:A:4401:PGW:O02	3:A:4401:PGW:H4	2.00	0.61
1:A:3306:ALA:C	1:A:3308:SER:H	2.07	0.61
2:D:227:TYR:OH	2:D:569:VAL:O	2.20	0.60
1:A:3064:PHE:CE1	1:A:3301:ALA:HB1	2.36	0.60
2:C:309:ILE:HB	2:C:313:ASN:HB2	1.84	0.59
2:C:639:ILE:HG12	2:C:644:ILE:HD13	1.83	0.59
1:A:3307:TYR:O	1:A:3309:THR:N	2.35	0.59
2:C:293:TRP:CD2	2:C:309:ILE:O	2.56	0.59
2:D:335:GLN:OE1	2:D:338:ARG:NH1	2.36	0.58
1:A:3269:ARG:HE	1:A:3277:ARG:HH21	1.52	0.58
2:D:314:LEU:HB2	2:D:429:TYR:HB3	1.84	0.58
1:A:4094:ARG:HG2	1:A:4094:ARG:HH11	1.67	0.58
1:A:3804:GLY:O	1:A:3816:SER:OG	2.20	0.58
2:C:646:PHE:HA	2:C:649:ILE:HG12	1.85	0.58
2:D:436:PHE:O	2:D:459:PRO:HA	2.03	0.58
2:D:479:ILE:HA	2:D:482:PHE:CE1	2.39	0.58
2:D:420:ARG:HH12	2:D:447:ALA:HA	1.68	0.57
1:A:4051:CYS:HB2	1:A:4074:LEU:HB3	1.86	0.57
1:A:3736:HIS:HB2	1:A:3827:LEU:HD12	1.86	0.57
1:A:3965:ARG:O	1:A:3973:ARG:NH2	2.37	0.56
1:A:4025:GLU:OE2	2:D:684:TYR:OH	2.21	0.56
2:C:677:LEU:HD21	2:D:677:LEU:HD22	1.86	0.56
1:A:3754:LEU:HD22	1:A:3848:ARG:HD3	1.86	0.56
1:A:3087:THR:O	1:A:3091:MET:HG2	2.04	0.56
3:A:4401:PGW:H3	2:D:680:ILE:HD12	1.88	0.56
2:B:340:GLU:HG2	2:B:341:ILE:HG23	1.87	0.56
1:A:3723:LEU:HD22	1:A:3871:LEU:HD12	1.88	0.55
1:A:4080:TRP:H	1:A:4080:TRP:CD1	2.24	0.55
2:C:431:ALA:HB2	2:D:341:ILE:HD13	1.89	0.55
1:A:3262:ILE:HG13	1:A:3280:ARG:HG3	1.89	0.55
2:D:436:PHE:HB2	2:D:460:LEU:O	2.06	0.55
2:B:498:HIS:CG	2:B:499:LYS:H	2.25	0.55
1:A:3854:LEU:HA	1:A:3974:PHE:HE1	1.71	0.55
1:A:4055:LEU:HD11	1:A:4074:LEU:HD11	1.88	0.54
2:D:460:LEU:HD13	2:D:551:LEU:HD23	1.88	0.54
1:A:4050:SER:HA	2:D:247:TYR:CD1	2.43	0.54
2:C:641:LEU:HD22	2:D:642:GLY:HA2	1.89	0.54
2:C:293:TRP:CE2	2:C:309:ILE:O	2.61	0.54
2:C:357:PRO:HB2	2:C:361:ARG:HE	1.72	0.54

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:3306:ALA:C	1:A:3308:SER:N	2.66	0.54
2:C:597:LEU:HD13	2:D:671:ILE:HD12	1.90	0.54
2:D:293:TRP:CD1	2:D:312:GLU:HB3	2.43	0.54
1:A:3805:ALA:HB3	1:A:3806:TRP:CE3	2.43	0.53
2:D:466:VAL:HG13	2:D:467:THR:HG23	1.90	0.53
2:C:349:SER:OG	2:C:352:SER:OG	2.27	0.53
2:D:273:LEU:HD22	2:D:278:ASP:HB3	1.91	0.53
1:A:3854:LEU:HG	1:A:3855:THR:H	1.72	0.53
1:A:3064:PHE:HE2	1:A:3066:PHE:HD1	1.43	0.53
2:B:466:VAL:HG12	2:B:467:THR:HG23	1.88	0.53
2:C:502:TYR:HE2	2:C:508:ASN:HB3	1.73	0.53
1:A:3741:SER:HB2	1:A:3856:ARG:NH2	2.24	0.52
3:A:4401:PGW:H3	2:D:680:ILE:CD1	2.40	0.52
2:B:319:PRO:HG2	2:B:395:LEU:HD12	1.91	0.52
2:D:619:PHE:HZ	2:D:657:GLY:HA2	1.75	0.52
1:A:3727:MET:HE1	1:A:3749:LEU:HD11	1.91	0.52
1:A:3854:LEU:HA	1:A:3974:PHE:CE1	2.45	0.52
1:A:3747:PRO:HG2	1:A:3823:LEU:HD22	1.91	0.52
2:C:604:PHE:HD1	2:C:672:LEU:HD13	1.75	0.52
1:A:3306:ALA:O	1:A:3308:SER:N	2.43	0.51
2:D:375:ASN:OD1	4:D:1002:NAG:C1	2.57	0.51
2:C:542:GLN:NE2	2:D:340:GLU:OE2	2.38	0.51
2:D:315:LEU:HD21	2:D:319:PRO:HD3	1.93	0.51
2:B:498:HIS:HD2	2:B:499:LYS:HD3	1.76	0.51
2:C:312:GLU:OE1	2:C:432:ASN:ND2	2.43	0.51
1:A:3286:LEU:HD11	1:A:3565:LEU:HD22	1.92	0.50
2:C:502:TYR:CE2	2:C:508:ASN:HB3	2.46	0.50
2:B:487:TYR:O	2:B:491:GLU:HG2	2.11	0.50
1:A:4052:VAL:HG23	1:A:4053:ASP:H	1.76	0.50
2:D:648:GLU:CD	2:D:648:GLU:H	2.19	0.50
1:A:3753:ARG:HB2	1:A:3819:TYR:HE2	1.76	0.50
2:B:498:HIS:CD2	2:B:499:LYS:HD3	2.46	0.50
1:A:4045:ILE:HD13	1:A:4085:LEU:HD11	1.94	0.49
3:A:4401:PGW:H01	2:D:673:LEU:HB3	1.93	0.49
2:D:434:ASN:HB3	2:D:462:LEU:HD21	1.94	0.49
1:A:3753:ARG:HG2	1:A:3846:ARG:HG3	1.94	0.49
2:C:583:MET:HE3	2:D:603:MET:HE3	1.94	0.49
2:B:619:PHE:HB3	2:B:623:VAL:HG21	1.94	0.49
2:D:293:TRP:HD1	2:D:312:GLU:HB3	1.77	0.49
2:C:619:PHE:HZ	2:C:657:GLY:HA2	1.77	0.49
2:D:288:LEU:O	2:D:399:ARG:NH1	2.45	0.49

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:3269:ARG:HB3	1:A:3277:ARG:NH2	2.27	0.49
2:B:591:SER:O	2:B:595:LYS:NZ	2.39	0.49
1:A:3252:GLU:HG2	1:A:3255:ARG:HD3	1.93	0.49
2:B:238:THR:HA	2:B:241:MET:HG2	1.95	0.49
2:B:306:ARG:NH1	2:C:340:GLU:OE2	2.45	0.49
2:D:539:LEU:H	2:D:539:LEU:HD23	1.78	0.49
1:A:3753:ARG:HB3	1:A:3777:SER:HB3	1.96	0.48
2:B:247:TYR:CZ	2:B:251:ARG:HD2	2.49	0.48
2:D:474:ALA:O	2:D:478:ILE:HG23	2.13	0.48
1:A:3699:TYR:O	1:A:3702:GLN:HG3	2.13	0.48
2:C:227:TYR:HE2	2:C:573:LEU:HD13	1.78	0.48
2:B:309:ILE:HD12	2:B:428:VAL:HG11	1.96	0.48
2:C:566:VAL:HA	2:C:569:VAL:HG12	1.96	0.48
2:D:580:ASN:OD1	2:D:581:ARG:NH1	2.46	0.48
1:A:4047:LEU:O	1:A:4050:SER:OG	2.31	0.48
2:D:394:ASP:OD1	2:D:394:ASP:N	2.43	0.48
1:A:3290:LEU:HB3	1:A:3333:VAL:HG21	1.95	0.47
1:A:4051:CYS:HB3	1:A:4075:CYS:H	1.79	0.47
2:D:582:THR:O	2:D:585:GLN:HG2	2.14	0.47
1:A:3064:PHE:CE2	1:A:3066:PHE:HE1	2.32	0.47
1:A:3307:TYR:O	1:A:3308:SER:C	2.57	0.47
1:A:3854:LEU:HG	1:A:3855:THR:N	2.29	0.47
2:B:432:ASN:HA	2:C:344:CYS:SG	2.54	0.47
2:D:557:GLN:O	2:D:561:ILE:HG12	2.15	0.47
2:B:227:TYR:OH	2:B:569:VAL:O	2.32	0.47
2:B:638:ARG:HD2	2:C:646:PHE:CD2	2.49	0.47
2:C:248:TYR:O	2:C:252:MET:HG2	2.14	0.47
1:A:4066:CYS:HB3	1:A:4088:VAL:HA	1.97	0.47
2:C:495:ILE:HB	2:C:502:TYR:CE1	2.50	0.47
2:D:292:TYR:N	2:D:292:TYR:CD2	2.82	0.47
2:D:258:LEU:HD21	2:D:455:TRP:CD2	2.50	0.47
2:D:664:PHE:O	2:D:668:MET:HB2	2.15	0.47
1:A:3752:VAL:O	1:A:3848:ARG:HB2	2.15	0.47
1:A:4066:CYS:HB2	1:A:4067:PRO:HD2	1.97	0.47
2:D:233:VAL:O	2:D:236:ILE:HG22	2.15	0.47
2:D:527:TYR:OH	2:D:531:ASN:ND2	2.47	0.47
1:A:4025:GLU:OE2	2:D:688:LYS:NZ	2.40	0.46
4:D:1002:NAG:O3	4:D:1002:NAG:H82	2.15	0.46
2:C:533:GLU:O	2:C:537:GLN:HG3	2.16	0.46
1:A:3088:TYR:CD1	1:A:3285:VAL:HG21	2.51	0.46
1:A:3970:ARG:N	1:A:3971:PRO:HD3	2.29	0.46

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:3718:THR:HA	1:A:3879:ALA:HB3	1.98	0.46
2:C:466:VAL:HG12	2:C:467:THR:HG23	1.98	0.45
2:B:443:VAL:HG13	2:B:451:VAL:HG13	1.98	0.45
2:B:563:ALA:HB1	2:C:614:LEU:HD12	1.99	0.45
1:A:4094:ARG:HG2	1:A:4094:ARG:NH1	2.30	0.45
1:A:3307:TYR:C	1:A:3309:THR:N	2.74	0.45
1:A:3898:SER:HB3	1:A:3900:PRO:HD2	1.98	0.45
1:A:4064:VAL:HG13	1:A:4095:LEU:HD12	1.96	0.45
2:D:263:SER:HB2	2:D:266:GLU:OE1	2.17	0.45
3:A:4401:PGW:H5A	3:A:4401:PGW:H8A	1.81	0.45
2:B:593:CYS:HB3	2:B:683:THR:HG21	1.99	0.45
2:B:248:TYR:O	2:B:252:MET:HG2	2.16	0.45
2:D:479:ILE:O	2:D:483:PHE:HD2	2.00	0.45
1:A:3747:PRO:HA	1:A:3854:LEU:HB3	1.99	0.45
2:C:693:GLN:C	2:C:693:GLN:CD	2.86	0.44
1:A:3061:HIS:O	1:A:3061:HIS:CD2	2.70	0.44
1:A:3974:PHE:CE2	1:A:3976:SER:HB3	2.52	0.44
2:D:291:LEU:HB3	2:D:292:TYR:CD2	2.52	0.44
1:A:3826:SER:HB3	1:A:3829:GLU:HG2	1.98	0.44
1:A:3908:LEU:HD23	1:A:3908:LEU:HA	1.86	0.44
2:D:432:ASN:OD1	2:D:433:ILE:N	2.50	0.44
1:A:3290:LEU:HD21	1:A:3565:LEU:HD21	2.00	0.44
1:A:3845:ASN:ND2	1:A:3846:ARG:HG2	2.32	0.44
1:A:3969:GLY:O	1:A:3973:ARG:NH2	2.46	0.44
2:D:375:ASN:ND2	4:D:1002:NAG:O5	2.43	0.44
1:A:3270:PRO:HA	1:A:3271:PRO:HD3	1.91	0.44
2:C:568:PHE:HA	2:C:571:ILE:HG12	1.99	0.43
1:A:3786:GLU:OE2	1:A:3788:PRO:HD3	2.18	0.43
3:A:4401:PGW:O02	3:A:4401:PGW:H01A	2.18	0.43
2:D:319:PRO:HG2	2:D:395:LEU:HD12	1.99	0.43
1:A:3805:ALA:HB1	1:A:3815:ASP:HA	1.99	0.43
1:A:4109:ARG:HA	1:A:4109:ARG:HD3	1.85	0.43
2:C:563:ALA:HB1	2:D:614:LEU:HD12	2.00	0.43
2:B:327:ARG:NH2	2:B:351:SER:O	2.51	0.43
2:B:610:ALA:O	2:B:613:GLN:HG3	2.19	0.43
2:C:443:VAL:HG13	2:C:451:VAL:HG13	2.00	0.43
2:C:641:LEU:HD21	2:D:669:PHE:HE2	1.83	0.43
1:A:3061:HIS:O	1:A:3061:HIS:CG	2.70	0.43
2:B:498:HIS:CG	2:B:499:LYS:N	2.86	0.43
1:A:3803:LEU:HB2	1:A:3961:ARG:NH2	2.33	0.43
2:C:374:LEU:HD23	4:C:1002:NAG:H82	2.01	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:D:258:LEU:HD21	2:D:455:TRP:CG	2.54	0.42
2:D:393:LEU:HD21	2:D:405:GLN:NE2	2.33	0.42
2:D:514:ILE:HD11	2:D:568:PHE:HB3	2.01	0.42
1:A:3242:LEU:O	1:A:3247:ARG:NH2	2.29	0.42
2:D:538:PHE:CE2	2:D:546:PRO:HB3	2.54	0.42
2:B:306:ARG:HD2	2:C:340:GLU:OE2	2.18	0.42
2:D:319:PRO:HG2	2:D:395:LEU:HB2	2.00	0.42
1:A:3724:TRP:HB2	1:A:3725:PRO:HD3	2.01	0.42
1:A:3850:VAL:HG22	1:A:3871:LEU:HB2	2.01	0.42
2:B:312:GLU:HG2	2:B:432:ASN:ND2	2.34	0.42
2:B:319:PRO:HB3	2:B:426:PHE:HB3	2.01	0.42
2:D:250:THR:HG21	2:D:459:PRO:HD3	2.01	0.42
1:A:3063:ARG:HB3	1:A:3064:PHE:H	1.54	0.42
1:A:4049:SER:O	2:D:247:TYR:HD1	2.03	0.42
2:C:423:PHE:CE2	2:C:442:LEU:HD13	2.55	0.42
2:D:396:SER:OG	2:D:397:ARG:N	2.53	0.42
1:A:4095:LEU:O	3:A:4401:PGW:CAD	2.68	0.42
2:D:291:LEU:HB3	2:D:292:TYR:CE2	2.54	0.42
1:A:3763:PRO:HB2	2:D:311:TYR:CE2	2.54	0.42
1:A:4077:ALA:O	1:A:4078:GLU:HG3	2.20	0.41
2:B:570:TRP:NE1	2:C:613:GLN:OE1	2.52	0.41
1:A:3762:PRO:HA	1:A:3763:PRO:HD3	1.94	0.41
2:D:519:VAL:HA	2:D:522:ILE:HG22	2.00	0.41
2:B:498:HIS:CD2	2:B:499:LYS:H	2.38	0.41
1:A:4108:TRP:CZ2	2:D:688:LYS:HG2	2.56	0.41
2:C:331:CYS:HB2	2:C:344:CYS:HB3	1.90	0.41
2:D:315:LEU:HD12	2:D:315:LEU:HA	1.94	0.41
2:D:507:TRP:CD2	2:D:575:LYS:HG3	2.55	0.41
1:A:4045:ILE:HG21	1:A:4085:LEU:HD11	2.03	0.41
2:C:246:VAL:HG13	2:C:435:LEU:HD21	2.01	0.41
2:C:333:ILE:O	2:C:338:ARG:NH2	2.42	0.41
2:D:476:CYS:HA	2:D:479:ILE:HG12	2.01	0.41
1:A:3744:LEU:O	1:A:3744:LEU:HD23	2.20	0.41
1:A:3754:LEU:HB2	1:A:3848:ARG:HG3	2.02	0.41
1:A:3853:GLU:OE1	1:A:3868:THR:HG23	2.21	0.41
2:C:468:THR:HA	2:C:471:PHE:HD2	1.86	0.41
2:D:619:PHE:CZ	2:D:657:GLY:HA2	2.55	0.41
1:A:3264:LEU:O	1:A:3264:LEU:HD23	2.20	0.40
2:C:566:VAL:HG11	2:D:617:LEU:HD12	2.02	0.40
2:D:462:LEU:H	2:D:462:LEU:HD23	1.86	0.40
1:A:3334:TYR:HE2	1:A:3603:TRP:CG	2.39	0.40

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:491:GLU:OE2	2:B:511:ASP:HB3	2.21	0.40
2:C:325:ARG:HH22	2:C:416:ASP:HB2	1.87	0.40
2:C:467:THR:OG1	2:C:470:ASP:OD2	2.35	0.40
2:D:522:ILE:HD12	2:D:522:ILE:HA	1.92	0.40
1:A:4027:LEU:O	1:A:4030:THR:HG22	2.22	0.40
2:C:237:LEU:HD23	2:C:237:LEU:HA	1.92	0.40
1:A:3722:GLU:C	1:A:3725:PRO:HD2	2.46	0.40
1:A:3743:GLU:O	1:A:3855:THR:HG23	2.22	0.40
1:A:4056:TRP:CD1	1:A:4057:SER:H	2.39	0.40
2:B:227:TYR:HE2	2:B:573:LEU:HD13	1.86	0.40
2:B:574:PHE:HE1	2:C:603:MET:HB3	1.86	0.40
2:C:639:ILE:HG12	2:C:644:ILE:HG21	2.03	0.40
2:B:574:PHE:CD1	2:B:577:ILE:HD11	2.57	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	774/1262 (61%)	703 (91%)	67 (9%)	4 (0%)	25	58
2	B	470/1007 (47%)	436 (93%)	34 (7%)	0	100	100
2	C	471/1007 (47%)	441 (94%)	30 (6%)	0	100	100
2	D	459/1007 (46%)	439 (96%)	19 (4%)	1 (0%)	44	74
All	All	2174/4283 (51%)	2019 (93%)	150 (7%)	5 (0%)	45	74

All (5) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	3308	SER
1	A	3307	TYR

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Mol	Chain	Res	Type
1	A	4052	VAL
1	A	3769	THR
2	D	534	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 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	544/1042 (52%)	544 (100%)	0	100	100
2	B	428/860 (50%)	428 (100%)	0	100	100
2	C	430/860 (50%)	430 (100%)	0	100	100
2	D	418/860 (49%)	418 (100%)	0	100	100
All	All	1820/3622 (50%)	1820 (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 (19) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	3061	HIS
1	A	3096	HIS
1	A	3261	HIS
1	A	3739	GLN
1	A	4081	HIS
2	B	412	ASN
2	B	432	ASN
2	B	498	HIS
2	B	508	ASN
2	B	653	ASN
2	C	412	ASN
2	C	498	HIS
2	C	557	GLN
2	C	681	ASN
2	D	313	ASN

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Mol	Chain	Res	Type
2	D	375	ASN
2	D	531	ASN
2	D	559	ASN
2	D	645	ASN

5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

7 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	$\# Z > 2$
4	NAG	B	1002	2	14,14,15	0.28	0	17,19,21	0.61	0
4	NAG	B	1001	2	14,14,15	0.26	0	17,19,21	0.47	0
4	NAG	C	1002	2	14,14,15	0.25	0	17,19,21	0.46	0
4	NAG	D	1002	2	14,14,15	0.30	0	17,19,21	0.62	0
4	NAG	C	1001	2	14,14,15	0.24	0	17,19,21	0.53	0
4	NAG	D	1001	2	14,14,15	0.30	0	17,19,21	0.62	0
3	PGW	A	4401	-	50,50,50	0.94	4 (8%)	53,56,56	0.92	3 (5%)

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
4	NAG	B	1002	2	-	2/6/23/26	0/1/1/1
4	NAG	B	1001	2	-	0/6/23/26	0/1/1/1
4	NAG	C	1002	2	-	2/6/23/26	0/1/1/1
4	NAG	D	1002	2	-	3/6/23/26	0/1/1/1
4	NAG	C	1001	2	-	3/6/23/26	0/1/1/1
4	NAG	D	1001	2	-	4/6/23/26	0/1/1/1
3	PGW	A	4401	-	-	25/55/55/55	-

All (4) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	A	4401	PGW	O01-C02	-2.62	1.40	1.46
3	A	4401	PGW	O03-C19	2.39	1.40	1.33
3	A	4401	PGW	O03-C01	-2.13	1.40	1.45
3	A	4401	PGW	O01-C1	2.09	1.40	1.34

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	A	4401	PGW	O01-C1-C2	3.84	119.77	111.50
3	A	4401	PGW	O03-C19-C20	2.71	120.40	111.91
3	A	4401	PGW	O13-P-O14	-2.28	100.97	112.24

There are no chirality outliers.

All (39) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	A	4401	PGW	C04-C05-CAD-OAE
3	A	4401	PGW	C03-O11-P-O13
3	A	4401	PGW	C03-O11-P-O14
3	A	4401	PGW	C04-O12-P-O11
3	A	4401	PGW	C04-O12-P-O13
3	A	4401	PGW	C04-O12-P-O14
4	B	1002	NAG	C8-C7-N2-C2
4	B	1002	NAG	O7-C7-N2-C2
4	D	1002	NAG	C3-C2-N2-C7
4	D	1002	NAG	C8-C7-N2-C2

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Mol	Chain	Res	Type	Atoms
4	D	1002	NAG	O7-C7-N2-C2
3	A	4401	PGW	O04-C19-O03-C01
3	A	4401	PGW	C20-C19-O03-C01
4	C	1002	NAG	O5-C5-C6-O6
3	A	4401	PGW	C27-C15-C16-C17
4	D	1001	NAG	C8-C7-N2-C2
4	D	1001	NAG	O5-C5-C6-O6
4	D	1001	NAG	O7-C7-N2-C2
4	C	1001	NAG	O5-C5-C6-O6
3	A	4401	PGW	C03-O11-P-O12
4	C	1001	NAG	C4-C5-C6-O6
3	A	4401	PGW	C3-C4-C5-C6
3	A	4401	PGW	C22-C23-C24-C25
3	A	4401	PGW	C21-C22-C23-C24
3	A	4401	PGW	C07-C08-C09-C11
3	A	4401	PGW	OAF-C05-CAD-OAE
3	A	4401	PGW	C11-C12-C13-C14
3	A	4401	PGW	C2-C1-O01-C02
3	A	4401	PGW	O02-C1-O01-C02
3	A	4401	PGW	C07-C06-C10-C9
3	A	4401	PGW	C6-C7-C8-C9
3	A	4401	PGW	C10-C06-C07-C08
4	C	1002	NAG	C4-C5-C6-O6
3	A	4401	PGW	C18-C28-C30-C29
3	A	4401	PGW	C25-C26-C27-C15
3	A	4401	PGW	C06-C07-C08-C09
4	C	1001	NAG	C3-C2-N2-C7
4	D	1001	NAG	C4-C5-C6-O6
3	A	4401	PGW	C5-C6-C7-C8

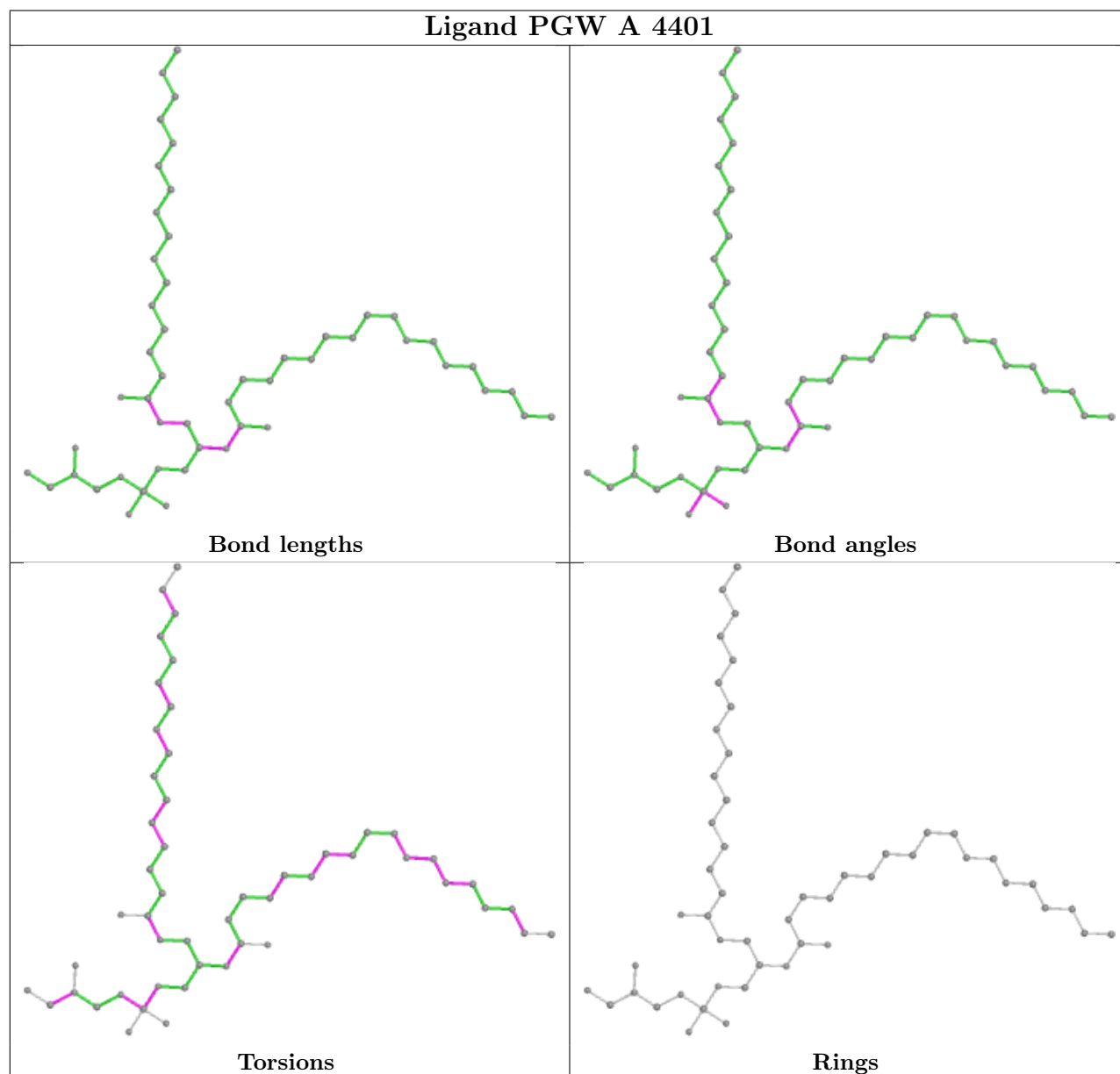
There are no ring outliers.

3 monomers are involved in 14 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	C	1002	NAG	1	0
4	D	1002	NAG	6	0
3	A	4401	PGW	7	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 ⓘ

There are no chain breaks in this entry.