Full wwPDB EM Validation Report ⓘ

Jul 15, 2025 – 10:12 PM JST

PDB ID	:	8JAL / pdb_00008jal
EMDB ID	:	EMD-36129
Title	:	Structure of CRL2APPBP2 bound with RxxGP degron (dimer)
Authors	:	Zhao, S.; Zhang, K.; Xu, C.
Deposited on	:	2023-05-06
Resolution	:	3.30 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:

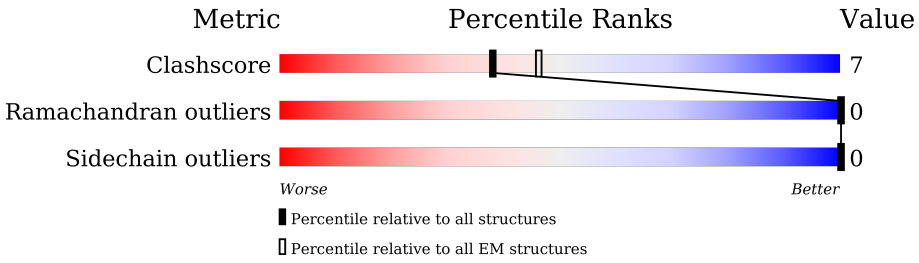
EMDB validation analysis	:	FAILED
MolProbity	:	4-5-2 with Phenix2.0rc1
Percentile statistics	:	20231227.v01 (using entries in the PDB archive December 27th 2023)
MapQ	:	FAILED
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	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 3.30 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 <=5%

Mol	Chain	Length	Quality of chain
1	A	585	83% 15% .
1	B	585	81% 17% .
2	E	745	27% 10% 62%
2	I	745	31% 7% 62%
3	C	118	65% 24% 11%
3	G	118	61% 20% 19%
4	D	112	64% 21% 14%
4	H	112	56% 29% 14%
5	F	11	55% 9% 36%

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Mol	Chain	Length	Quality of chain
5	S	11	36% 27% 36%

2 Entry composition

There are 6 unique types of molecules in this entry. The entry contains 17226 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 Amyloid protein-binding protein 2.

Mol	Chain	Residues	Atoms					AltConf	Trace
1	A	571	Total	C	N	O	S	0	0
			4613	2946	796	850	21		
1	B	573	Total	C	N	O	S	0	0
			4630	2955	799	855	21		

- Molecule 2 is a protein called Cullin-2.

Mol	Chain	Residues	Atoms					AltConf	Trace
2	E	282	Total	C	N	O	S	0	0
			2382	1526	407	432	17		
2	I	282	Total	C	N	O	S	0	0
			2382	1526	407	432	17		

There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
E	1	THR	-	expression tag	UNP Q13617
I	1	THR	-	expression tag	UNP Q13617

- Molecule 3 is a protein called Elongin-B.

Mol	Chain	Residues	Atoms					AltConf	Trace
3	C	105	Total	C	N	O	S	0	0
			830	525	140	161	4		
3	G	96	Total	C	N	O	S	0	0
			758	479	129	147	3		

- Molecule 4 is a protein called Elongin-C.

Mol	Chain	Residues	Atoms					AltConf	Trace
4	D	96	Total	C	N	O	S	0	0
			760	487	122	145	6		

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Mol	Chain	Residues	Atoms					AltConf	Trace
4	H	96	Total	C	N	O	S	0	0
			760	487	122	145	6		

- Molecule 5 is a protein called LEU-THR-ARG-ASN-LYS-GLY-PRO.

Mol	Chain	Residues	Atoms				AltConf	Trace
5	S	7	Total	C	N	O	0	0
			55	33	12	10		
5	F	7	Total	C	N	O	0	0
			55	33	12	10		

- Molecule 6 is ZINC ION (CCD ID: ZN) (formula: Zn) (labeled as "Ligand of Interest" by depositor).

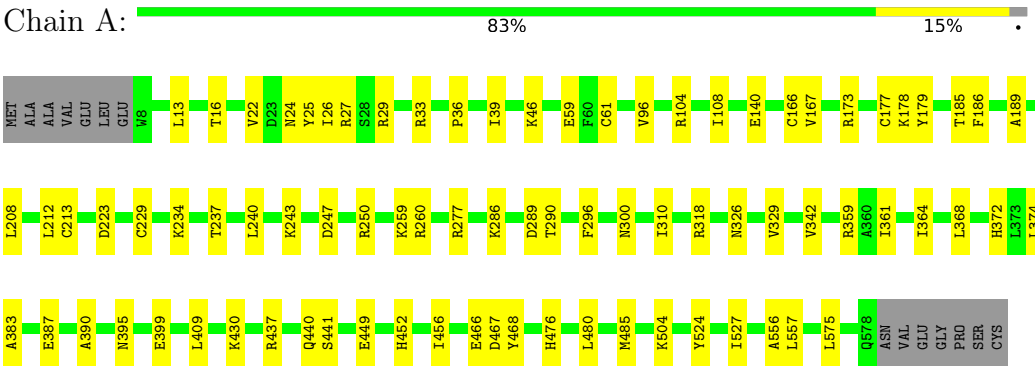
Mol	Chain	Residues	Atoms		AltConf
6	B	1	Total	Zn	0
			1	1	

3 Residue-property plots (i)

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

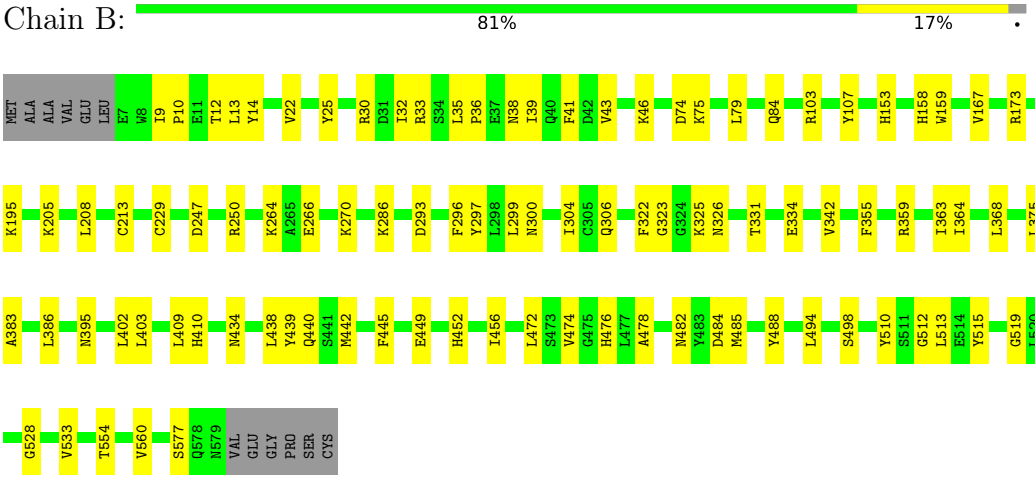
• Molecule 1: Amyloid protein-binding protein 2

Chain A:



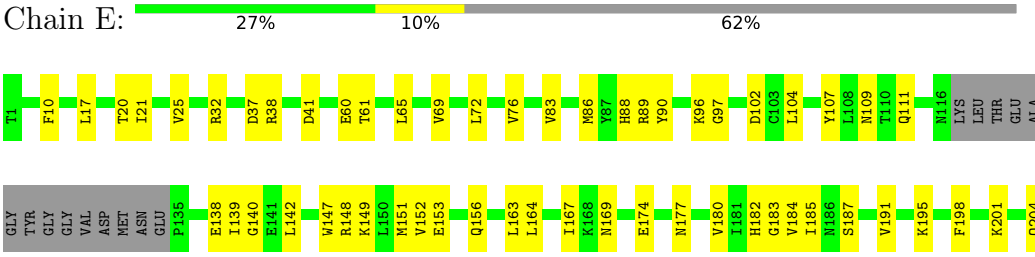
• Molecule 1: Amyloid protein-binding protein 2

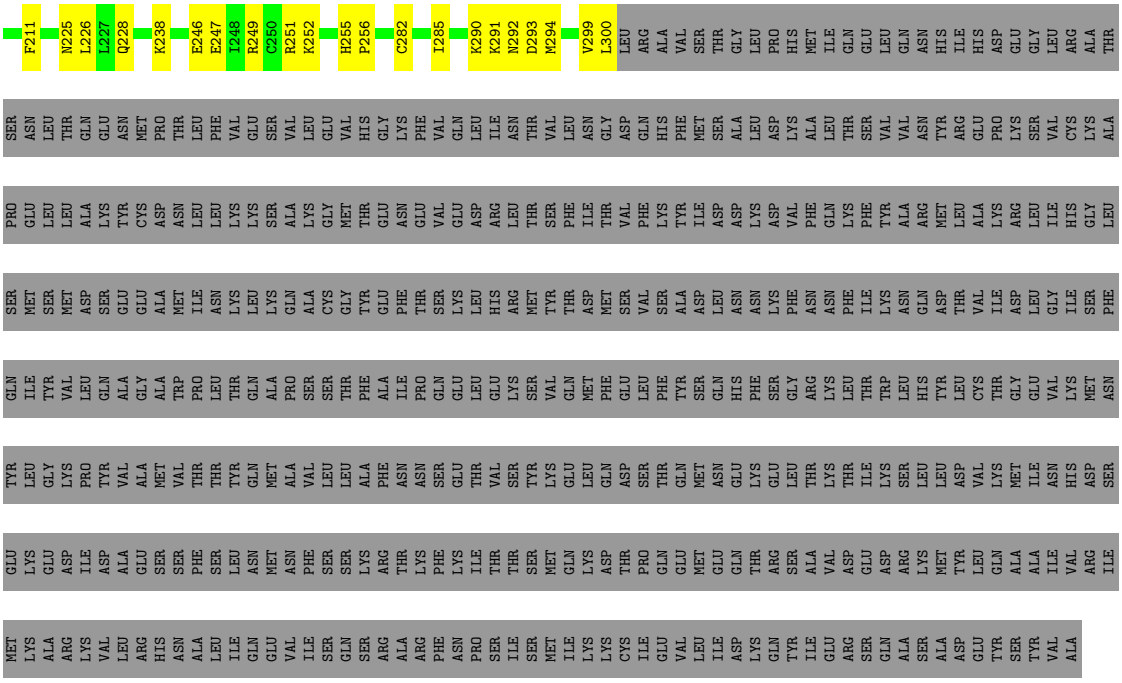
Chain B:



• Molecule 2: Cullin-2

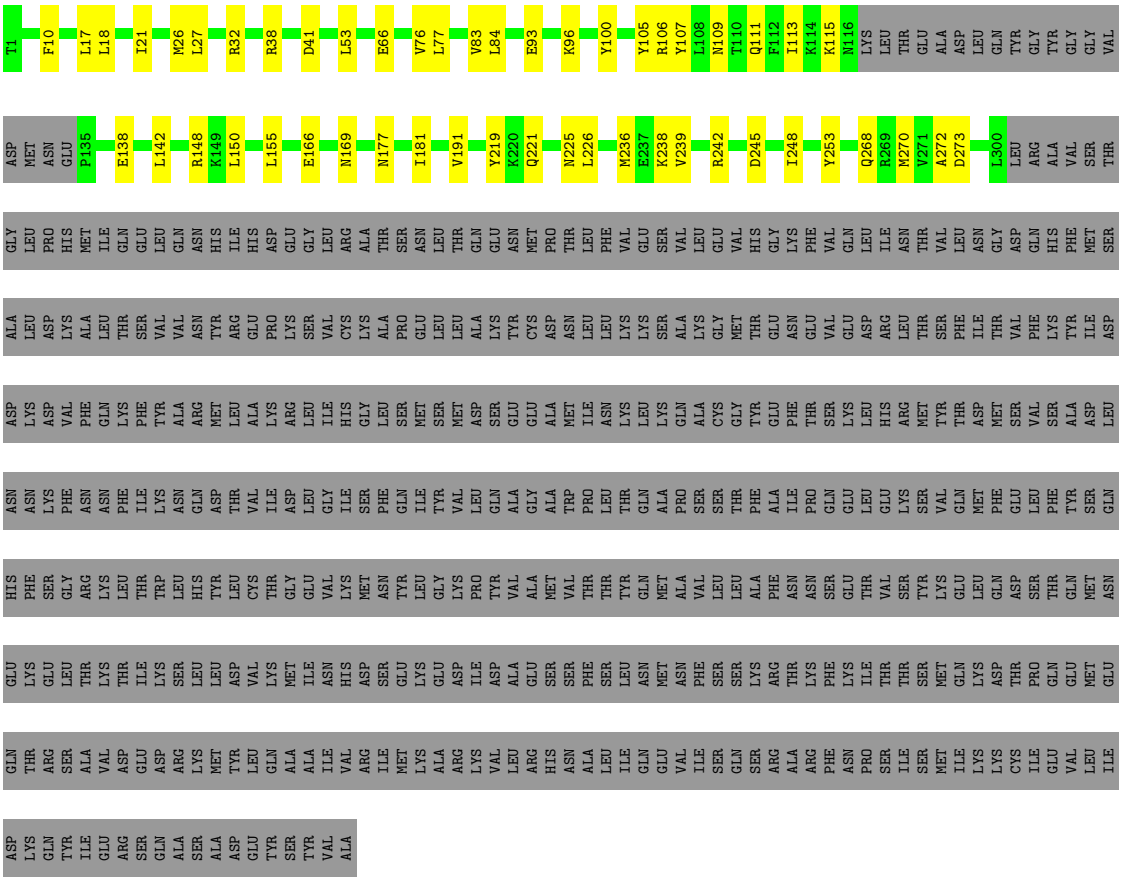
Chain E:





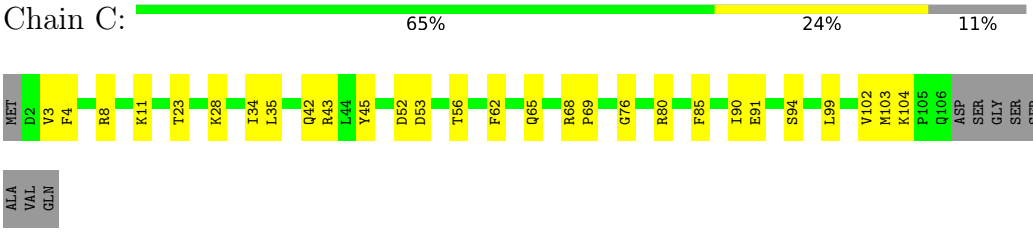
- Molecule 2: Cullin-2

Chain I:



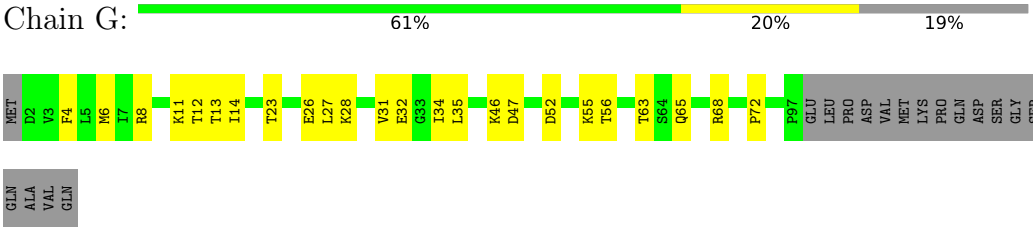
• Molecule 3: Elongin-B

Chain C:



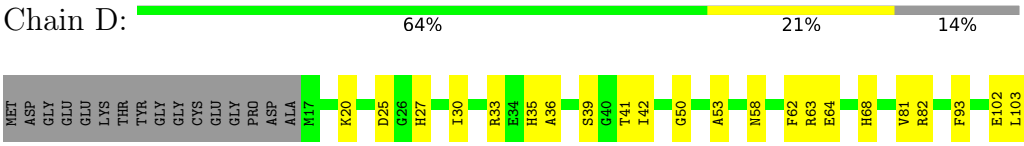
• Molecule 3: Elongin-B

Chain G:



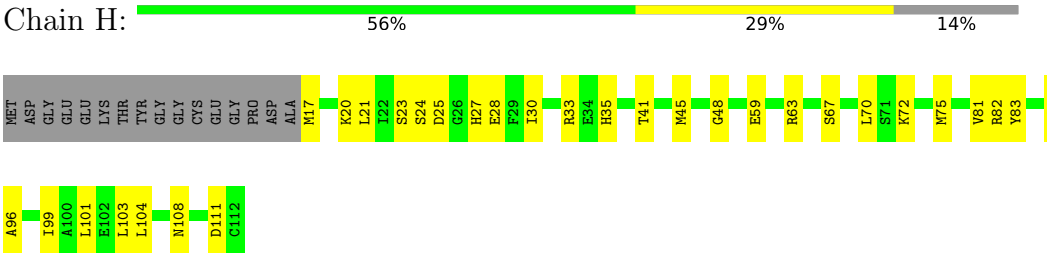
• Molecule 4: Elongin-C

Chain D:



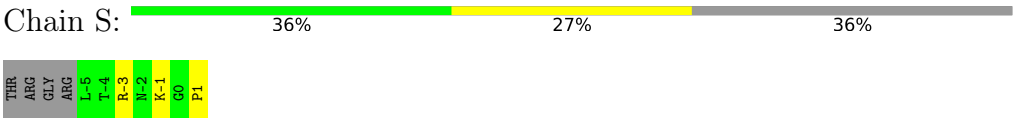
• Molecule 4: Elongin-C

Chain H:



• Molecule 5: LEU-THR-ARG-ASN-LYS-GLY-PRO

Chain S:



• Molecule 5: LEU-THR-ARG-ASN-LYS-GLY-PRO

Chain F:

4 Experimental information (i)

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	273296	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	PHASE FLIPPING AND AMPLITUDE CORRECTION	Depositor
Microscope	FEI TITAN KRIOS	Depositor
Voltage (kV)	300	Depositor
Electron dose ($e^-/Å^2$)	50	Depositor
Minimum defocus (nm)	800	Depositor
Maximum defocus (nm)	2000	Depositor
Magnification	Not provided	
Image detector	GATAN K3 (6k x 4k)	Depositor

5 Model quality

5.1 Standard geometry

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

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	0.15	0/4712	0.33	0/6358
1	B	0.15	0/4729	0.33	0/6381
2	E	0.14	0/2436	0.35	0/3282
2	I	0.16	0/2436	0.36	0/3282
3	C	0.17	0/847	0.45	0/1146
3	G	0.17	0/773	0.46	0/1045
4	D	0.17	0/777	0.37	0/1050
4	H	0.17	0/777	0.41	0/1050
5	F	0.14	0/55	0.33	0/71
5	S	0.13	0/55	0.40	0/71
All	All	0.15	0/17597	0.35	0/23736

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts

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

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	4613	0	4556	53	0
1	B	4630	0	4568	59	0
2	E	2382	0	2368	47	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	I	2382	0	2368	30	0
3	C	830	0	827	19	0
3	G	758	0	753	17	0
4	D	760	0	749	17	0
4	H	760	0	749	29	0
5	F	55	0	62	1	0
5	S	55	0	62	5	0
6	B	1	0	0	0	0
All	All	17226	0	17062	246	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 (246) 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:22:VAL:O	1:A:25:TYR:HB2	1.82	0.80
2:E:285:ILE:HG13	2:E:290:LYS:HB2	1.70	0.74
3:C:80:ARG:HA	3:C:85:PHE:HA	1.75	0.67
1:B:247:ASP:OD1	1:B:286:LYS:NZ	2.25	0.67
2:I:18:LEU:HA	2:I:21:ILE:HG22	1.78	0.66
4:D:63:ARG:NH1	4:D:64:GLU:OE2	2.30	0.65
2:E:86:MET:SD	2:E:89:ARG:NH2	2.71	0.63
2:I:111:GLN:HA	2:I:115:LYS:HD3	1.80	0.63
4:H:59:GLU:OE1	2:I:32:ARG:NH1	2.31	0.63
3:G:68:ARG:NH2	4:H:83:TYR:OH	2.32	0.63
2:I:27:LEU:HD21	2:I:96:LYS:HB2	1.80	0.62
1:B:510:TYR:HB3	1:B:513:LEU:HG	1.81	0.62
1:A:24:ASN:OD1	1:A:27:ARG:NH1	2.33	0.62
2:E:17:LEU:HD23	2:E:38:ARG:HD3	1.80	0.62
3:G:6:MET:HE1	4:H:75:MET:HE2	1.82	0.62
1:B:38:ASN:OD1	4:H:108:ASN:ND2	2.33	0.61
3:G:14:ILE:HD11	3:G:34:ILE:HD13	1.83	0.60
3:G:6:MET:HE3	3:G:72:PRO:HG2	1.83	0.60
1:B:264:LYS:NZ	1:B:577:SER:OG	2.35	0.60
1:B:482:ASN:ND2	1:B:519:GLY:O	2.33	0.60
1:A:372:HIS:HE1	1:A:374:LEU:HD23	1.67	0.59
1:B:383:ALA:HB2	1:B:409:LEU:HB2	1.85	0.59
4:H:63:ARG:NH2	2:I:41:ASP:OD1	2.36	0.59
1:B:403:LEU:HD23	1:B:442:MET:HG2	1.85	0.59
2:I:17:LEU:HD12	2:I:38:ARG:HD3	1.84	0.59

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:250:ARG:NE	1:B:293:ASP:OD2	2.36	0.58
1:A:364:ILE:HG23	1:A:368:LEU:HD12	1.86	0.58
4:H:20:LYS:HB3	4:H:59:GLU:HA	1.86	0.57
3:G:12:THR:HA	4:H:28:GLU:HB2	1.86	0.57
3:C:23:THR:HA	3:C:56:THR:HA	1.86	0.57
3:C:43:ARG:NH2	3:C:45:TYR:OH	2.38	0.57
4:H:96:ALA:HB3	4:H:99:ILE:HG12	1.86	0.57
1:A:260:ARG:NH1	1:A:467:ASP:OD1	2.36	0.57
2:E:204:GLN:HA	2:E:208:GLU:HB3	1.86	0.57
1:B:488:TYR:HD2	1:B:523:LEU:HD12	1.69	0.57
4:H:111:ASP:OD2	2:I:106:ARG:NH1	2.38	0.57
1:B:386:LEU:HD22	1:B:402:LEU:HD22	1.86	0.56
1:A:173:ARG:NH1	1:A:185:THR:OG1	2.36	0.56
1:A:36:PRO:HD2	1:A:39:ILE:HD12	1.88	0.56
2:E:20:THR:HG21	2:E:38:ARG:HG3	1.87	0.56
1:B:103:ARG:NH1	1:B:107:TYR:OH	2.38	0.56
1:B:35:LEU:HD11	4:H:101:LEU:HD11	1.87	0.56
4:H:20:LYS:HD2	4:H:30:ILE:HG12	1.88	0.56
1:A:387:GLU:OE2	5:S:-3:ARG:NH2	2.39	0.56
2:I:109:ASN:HA	2:I:113:ILE:HB	1.88	0.55
1:B:296:PHE:O	1:B:300:ASN:ND2	2.39	0.55
1:A:524:TYR:HA	1:A:527:ILE:HG22	1.88	0.55
1:A:140:GLU:OE1	1:A:178:LYS:NZ	2.38	0.55
1:A:289:ASP:OD1	1:A:318:ARG:NH2	2.36	0.55
1:B:478:ALA:HB2	1:B:494:LEU:HB2	1.89	0.54
3:C:8:ARG:NH2	3:C:91:GLU:O	2.40	0.54
3:G:52:ASP:HB3	3:G:55:LYS:HD2	1.90	0.54
2:I:105:TYR:O	2:I:109:ASN:ND2	2.41	0.54
1:A:380:ARG:NH1	5:S:1:PRO:O	2.41	0.53
4:H:41:THR:O	4:H:45:MET:HG3	2.07	0.53
4:D:53:ALA:HB3	4:D:58:ASN:HD22	1.72	0.53
1:B:375:LEU:HB3	1:B:379:LYS:HD2	1.90	0.53
2:I:245:ASP:HA	2:I:248:ILE:HD12	1.91	0.53
2:E:148:ARG:HB2	2:E:191:VAL:HG11	1.91	0.53
1:A:383:ALA:HB2	1:A:409:LEU:HB2	1.90	0.53
2:E:299:VAL:HG23	2:E:300:LEU:HD12	1.91	0.53
4:D:33:ARG:NH2	4:D:58:ASN:OD1	2.41	0.52
1:A:296:PHE:O	1:A:300:ASN:ND2	2.42	0.52
1:B:173:ARG:NH1	1:B:185:THR:OG1	2.42	0.52
4:H:83:TYR:HD2	4:H:90:ILE:HG12	1.73	0.52
2:E:76:VAL:HG23	2:E:86:MET:HB3	1.91	0.52

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:512:GLY:HA2	1:B:515:TYR:HD2	1.73	0.52
4:H:35:HIS:CD2	4:H:81:VAL:HG11	2.45	0.52
1:A:243:LYS:HG3	1:A:286:LYS:HE3	1.91	0.52
1:A:390:ALA:HB1	1:A:399:GLU:HA	1.92	0.52
1:A:440:GLN:HB2	1:A:480:LEU:HD13	1.92	0.52
2:E:102:ASP:OD1	2:E:109:ASN:ND2	2.43	0.52
1:B:9:ILE:HD12	1:B:10:PRO:HD2	1.92	0.52
4:H:21:LEU:HD23	4:H:70:LEU:HD11	1.92	0.52
4:H:72:LYS:NZ	4:H:94:PRO:O	2.33	0.52
3:G:46:LYS:NZ	3:G:47:ASP:OD2	2.44	0.51
1:A:372:HIS:CE1	1:A:374:LEU:HD23	2.45	0.51
2:E:182:HIS:ND1	2:E:252:LYS:O	2.43	0.51
3:C:3:VAL:HG21	3:C:62:PHE:HB3	1.91	0.51
2:E:225:ASN:HA	2:E:228:GLN:HG2	1.93	0.51
1:B:84:GLN:HG2	1:B:323:GLY:H	1.74	0.51
2:E:291:LYS:HE2	2:E:294:MET:HE2	1.92	0.51
1:B:452:HIS:O	1:B:456:ILE:HG12	2.11	0.51
3:G:63:THR:HG23	3:G:65:GLN:H	1.74	0.51
2:I:239:VAL:HG22	2:I:270:MET:HE3	1.93	0.50
1:B:13:LEU:HD21	4:H:103:LEU:HD11	1.94	0.50
1:B:382:LYS:HE2	1:B:386:LEU:HD11	1.93	0.50
4:H:25:ASP:OD1	4:H:67:SER:OG	2.29	0.50
2:E:226:LEU:HD12	2:E:238:LYS:HD3	1.94	0.50
1:A:441:SER:OG	5:S:-3:ARG:NH2	2.45	0.50
2:E:164:LEU:HD21	2:E:211:PHE:HA	1.93	0.50
4:H:20:LYS:HE2	4:H:28:GLU:HB3	1.94	0.50
1:A:13:LEU:HD21	4:D:103:LEU:HD11	1.93	0.49
2:E:147:TRP:O	2:E:151:MET:HB3	2.12	0.49
1:B:32:ILE:HD13	1:B:43:VAL:HG11	1.93	0.49
1:A:342:VAL:HG22	5:S:-1:LYS:HD2	1.95	0.49
3:C:34:ILE:HG22	3:C:35:LEU:HD12	1.93	0.49
4:D:39:SER:HB3	4:D:112:CYS:HB3	1.93	0.49
1:B:410:HIS:CE1	1:B:434:ASN:HB3	2.47	0.49
1:B:36:PRO:HD2	1:B:39:ILE:HD12	1.93	0.49
1:A:189:ALA:O	1:A:193:MET:HG3	2.13	0.49
2:E:76:VAL:HG22	2:E:83:VAL:HG23	1.94	0.49
1:B:13:LEU:HD11	4:H:103:LEU:HD21	1.94	0.49
3:C:11:LYS:HB3	4:D:27:HIS:HA	1.95	0.49
1:B:306:GLN:NE2	1:B:554:THR:O	2.46	0.49
2:E:148:ARG:HA	2:E:152:VAL:HG12	1.95	0.48
1:A:430:LYS:HB2	5:S:1:PRO:HB2	1.94	0.48

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:G:4:PHE:HZ	4:H:82:ARG:HG3	1.79	0.48
3:C:94:SER:OG	4:D:25:ASP:OD2	2.26	0.48
1:A:361:ILE:HD12	1:A:382:LYS:HD2	1.95	0.48
2:I:26:MET:HA	2:I:93:GLU:HB3	1.96	0.48
2:I:148:ARG:HB2	2:I:191:VAL:HG11	1.96	0.48
1:A:16:THR:HG21	4:D:93:PHE:HB3	1.96	0.48
1:A:234:LYS:HA	1:A:575:LEU:HD11	1.94	0.48
3:G:23:THR:HA	3:G:56:THR:HA	1.96	0.48
1:A:22:VAL:HG21	1:A:46:LYS:HB3	1.96	0.47
1:B:74:ASP:OD1	1:B:75:LYS:N	2.47	0.47
1:B:449:GLU:HB3	1:B:485:MET:HE1	1.95	0.47
2:E:138:GLU:O	2:E:142:LEU:N	2.39	0.47
1:B:439:TYR:HA	1:B:442:MET:HB2	1.95	0.47
1:A:26:ILE:HA	1:A:29:ARG:HB3	1.95	0.47
4:D:20:LYS:HG3	4:D:30:ILE:HG13	1.97	0.47
3:G:11:LYS:HB3	4:H:27:HIS:HA	1.96	0.47
2:I:27:LEU:HD23	2:I:93:GLU:HA	1.97	0.47
3:C:65:GLN:O	3:C:68:ARG:NH1	2.44	0.47
4:H:17:MET:HE3	4:H:33:ARG:HD3	1.96	0.47
2:I:138:GLU:O	2:I:142:LEU:N	2.46	0.47
2:I:268:GLN:HA	2:I:272:ALA:HB3	1.96	0.47
2:E:37:ASP:OD1	4:D:63:ARG:NH2	2.46	0.47
3:G:28:LYS:O	3:G:32:GLU:HG3	2.15	0.47
1:B:331:THR:HA	1:B:334:GLU:HG2	1.97	0.46
1:A:61:CYS:HB3	1:A:96:VAL:HG11	1.97	0.46
3:C:52:ASP:OD1	3:C:53:ASP:N	2.47	0.46
1:B:355:PHE:HE1	1:B:359:ARG:HH21	1.63	0.46
2:E:184:VAL:O	2:E:187:SER:OG	2.30	0.46
2:E:247:GLU:OE2	2:E:251:ARG:NH1	2.48	0.46
2:E:32:ARG:HG2	4:D:50:GLY:HA2	1.98	0.46
2:E:65:LEU:O	2:E:69:VAL:HG22	2.15	0.46
2:E:148:ARG:HH12	2:E:195:LYS:HE3	1.80	0.46
2:E:292:ASN:OD1	2:E:293:ASP:N	2.48	0.46
1:A:449:GLU:HB2	1:A:485:MET:HE1	1.98	0.46
1:B:364:ILE:HG23	1:B:368:LEU:HD12	1.98	0.46
1:A:247:ASP:OD1	1:A:250:ARG:NH1	2.49	0.46
1:A:359:ARG:HD2	1:A:359:ARG:HA	1.83	0.46
2:E:96:LYS:HB3	2:E:96:LYS:HE2	1.82	0.46
2:I:166:GLU:OE2	2:I:169:ASN:ND2	2.48	0.46
2:E:198:PHE:HB3	2:E:201:LYS:HB2	1.98	0.45
2:I:84:LEU:HD21	2:I:181:ILE:HG12	1.98	0.45

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:E:88:HIS:CE1	2:E:183:GLY:HA3	2.51	0.45
1:B:213:CYS:SG	1:B:229:CYS:HB3	2.57	0.45
3:C:104:LYS:HE2	3:C:104:LYS:HB2	1.81	0.45
4:H:101:LEU:HD12	4:H:104:LEU:HD23	1.99	0.45
2:E:61:THR:HG21	2:E:139:ILE:HD12	1.99	0.45
2:E:177:ASN:HB3	2:E:180:VAL:HB	1.99	0.45
2:E:246:GLU:HA	2:E:249:ARG:HG2	1.99	0.45
1:B:474:VAL:HG23	1:B:498:SER:HB2	1.98	0.45
1:A:33:ARG:NH2	1:A:59:GLU:OE1	2.49	0.45
1:B:342:VAL:HG22	5:F:-1:LYS:HD2	1.99	0.45
1:B:440:GLN:NE2	1:B:484:ASP:OD2	2.50	0.45
1:B:472:LEU:HG	1:B:476:HIS:CE1	2.52	0.45
3:G:23:THR:OG1	3:G:26:GLU:OE1	2.28	0.45
3:C:76:GLY:HA2	3:C:90:ILE:HD11	1.97	0.45
1:B:193:MET:SD	1:B:205:LYS:HG2	2.57	0.45
1:B:266:GLU:HB3	1:B:297:TYR:CZ	2.52	0.45
2:I:177:ASN:O	2:I:253:TYR:OH	2.28	0.45
1:A:466:GLU:HG2	1:A:504:LYS:HE3	1.99	0.45
2:I:221:GLN:OE1	2:I:225:ASN:ND2	2.50	0.45
4:D:68:HIS:NE2	4:D:102:GLU:OE1	2.45	0.45
1:B:521:ILE:HG23	1:B:533:VAL:HG13	1.99	0.45
2:I:273:ASP:N	2:I:273:ASP:OD1	2.50	0.45
1:B:325:LYS:HD3	1:B:363:ILE:HG12	1.98	0.44
4:H:48:GLY:HA2	2:I:100:TYR:CD1	2.53	0.44
3:G:8:ARG:HD3	3:G:13:THR:HG23	1.99	0.44
1:B:266:GLU:HB3	1:B:297:TYR:OH	2.18	0.44
1:A:213:CYS:SG	1:A:229:CYS:HB3	2.57	0.44
1:A:250:ARG:HD2	1:A:290:THR:HG22	2.00	0.44
2:E:156:GLN:HE21	2:E:206:ILE:HG23	1.82	0.44
3:C:4:PHE:CE1	3:C:69:PRO:HG3	2.53	0.44
4:H:27:HIS:ND1	4:H:67:SER:OG	2.51	0.44
2:I:219:TYR:HE1	2:I:242:ARG:HE	1.64	0.44
1:A:186:PHE:CG	1:A:212:LEU:HD13	2.52	0.44
1:A:575:LEU:HD23	1:A:575:LEU:HA	1.88	0.44
2:E:38:ARG:NH2	2:E:41:ASP:OD2	2.48	0.44
2:E:163:LEU:HD21	2:E:185:ILE:HG12	2.00	0.44
4:D:35:HIS:HA	4:D:81:VAL:HG21	1.99	0.44
1:B:153:HIS:HB2	1:B:158:HIS:CE1	2.53	0.44
1:B:159:TRP:HE1	1:B:195:LYS:HD2	1.82	0.44
1:A:467:ASP:OD1	1:A:468:TYR:N	2.48	0.43
2:E:10:PHE:CE2	2:E:60:GLU:HG3	2.53	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
4:D:41:THR:HB	4:D:110:LEU:HA	2.00	0.43
2:I:77:LEU:HD13	2:I:155:LEU:HD21	2.00	0.43
1:B:524:TYR:O	1:B:528:GLY:N	2.50	0.43
3:G:31:VAL:HG13	3:G:35:LEU:HD13	2.00	0.43
1:A:104:ARG:O	1:A:108:ILE:HG12	2.18	0.43
2:E:169:ASN:HB3	2:E:174:GLU:HG3	2.00	0.43
3:C:103:MET:HG2	1:B:33:ARG:HD2	2.01	0.43
1:A:237:THR:H	1:A:240:LEU:HD23	1.83	0.43
1:A:326:ASN:HB3	1:A:329:VAL:HG12	1.99	0.43
2:E:148:ARG:NH1	2:E:195:LYS:HE3	2.34	0.43
1:B:299:LEU:HD12	1:B:304:ILE:HD12	2.01	0.43
2:E:102:ASP:HB2	2:E:140:GLY:HA3	2.01	0.42
1:B:438:LEU:O	1:B:442:MET:N	2.44	0.42
1:A:177:CYS:SG	1:A:179:TYR:OH	2.65	0.42
2:I:226:LEU:HD11	2:I:238:LYS:HB3	2.01	0.42
2:E:107:TYR:CZ	2:E:111:GLN:HG3	2.54	0.42
1:B:167:VAL:HG12	1:B:208:LEU:HB2	2.00	0.42
3:G:27:LEU:O	3:G:31:VAL:HG23	2.19	0.42
1:A:395:ASN:OD1	1:B:395:ASN:ND2	2.52	0.42
1:B:322:PHE:HB3	1:B:326:ASN:HD22	1.85	0.42
2:E:25:VAL:HA	2:E:97:GLY:HA3	2.01	0.42
1:B:12:THR:HG22	1:B:14:TYR:H	1.85	0.42
2:I:236:MET:HA	2:I:239:VAL:HB	2.01	0.42
2:E:167:ILE:HD11	2:E:249:ARG:HD3	2.01	0.42
4:D:36:ALA:HB1	4:D:42:ILE:HG21	2.01	0.42
4:D:42:ILE:HG12	4:D:62:PHE:HZ	1.84	0.42
1:B:41:PHE:HE2	1:B:79:LEU:HB2	1.84	0.42
1:A:277:ARG:HH22	1:A:557:LEU:HB3	1.84	0.42
3:C:28:LYS:NZ	3:C:42:GLN:O	2.44	0.42
1:B:270:LYS:HG2	1:B:560:VAL:HG12	2.02	0.42
1:A:310:ILE:HD11	1:A:556:ALA:HB3	2.01	0.42
3:C:69:PRO:HG2	4:D:82:ARG:HD2	2.02	0.42
2:I:76:VAL:HG22	2:I:83:VAL:HG23	2.02	0.42
2:E:72:LEU:HD23	2:E:90:TYR:HB3	2.02	0.41
2:E:294:MET:HE3	2:E:294:MET:HB3	1.93	0.41
2:E:282:CYS:HA	2:E:285:ILE:HG22	2.02	0.41
1:B:22:VAL:O	1:B:25:TYR:HB2	2.20	0.41
2:I:107:TYR:CZ	2:I:111:GLN:HG3	2.56	0.41
3:C:99:LEU:HD12	3:C:99:LEU:HA	1.93	0.41
1:A:167:VAL:HG22	1:A:208:LEU:HB2	2.02	0.41
1:A:452:HIS:O	1:A:456:ILE:HG12	2.21	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:G:4:PHE:CZ	4:H:82:ARG:HG3	2.56	0.41
4:H:23:SER:OG	4:H:24:SER:N	2.54	0.41
1:A:166:CYS:HB3	1:A:189:ALA:HB2	2.03	0.41
3:C:102:VAL:O	1:B:30:ARG:NH1	2.54	0.41
1:B:22:VAL:HG21	1:B:46:LYS:HB3	2.03	0.41
1:A:193:MET:SD	1:A:205:LYS:HG2	2.61	0.41
1:A:223:ASP:OD1	1:A:259:LYS:NZ	2.36	0.41
2:I:10:PHE:HB2	2:I:53:LEU:HD13	2.03	0.41
2:E:21:ILE:HD11	2:E:104:LEU:HD22	2.03	0.41
2:E:149:LYS:HA	2:E:153:GLU:HG3	2.02	0.40
2:E:255:HIS:CD2	2:E:256:PRO:HD2	2.55	0.40
1:A:437:ARG:HD2	1:A:476:HIS:CD2	2.57	0.40
4:H:95:ILE:HG12	4:H:103:LEU:HD23	2.04	0.40
2:I:66:GLU:HG3	2:I:150:LEU:HD21	2.04	0.40
1:A:27:ARG:HG2	3:C:99:LEU:HG	2.03	0.40
1:B:445:PHE:CZ	1:B:484:ASP:HB3	2.56	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	569/585 (97%)	556 (98%)	13 (2%)	0	100	100
1	B	571/585 (98%)	562 (98%)	9 (2%)	0	100	100
2	E	278/745 (37%)	270 (97%)	8 (3%)	0	100	100
2	I	278/745 (37%)	267 (96%)	11 (4%)	0	100	100
3	C	103/118 (87%)	96 (93%)	7 (7%)	0	100	100
3	G	94/118 (80%)	83 (88%)	11 (12%)	0	100	100
4	D	94/112 (84%)	91 (97%)	3 (3%)	0	100	100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
4	H	94/112 (84%)	90 (96%)	4 (4%)	0	100	100
5	F	5/11 (46%)	5 (100%)	0	0	100	100
5	S	5/11 (46%)	5 (100%)	0	0	100	100
All	All	2091/3142 (66%)	2025 (97%)	66 (3%)	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	491/502 (98%)	491 (100%)	0	100	100
1	B	493/502 (98%)	493 (100%)	0	100	100
2	E	263/681 (39%)	263 (100%)	0	100	100
2	I	263/681 (39%)	263 (100%)	0	100	100
3	C	93/103 (90%)	93 (100%)	0	100	100
3	G	84/103 (82%)	84 (100%)	0	100	100
4	D	85/96 (88%)	85 (100%)	0	100	100
4	H	85/96 (88%)	85 (100%)	0	100	100
5	F	6/9 (67%)	6 (100%)	0	100	100
5	S	6/9 (67%)	6 (100%)	0	100	100
All	All	1869/2782 (67%)	1869 (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 (27) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	201	GLN
1	A	400	GLN
1	A	404	GLN

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Mol	Chain	Res	Type
1	A	427	GLN
1	A	452	HIS
1	A	465	GLN
1	A	482	ASN
1	A	486	ASN
2	E	109	ASN
2	E	221	GLN
2	E	225	ASN
2	E	228	GLN
2	E	264	HIS
2	E	279	HIS
2	E	296	ASN
4	D	27	HIS
1	B	38	ASN
1	B	153	HIS
1	B	158	HIS
1	B	202	GLN
1	B	537	HIS
4	H	108	ASN
2	I	71	HIS
2	I	109	ASN
2	I	111	GLN
2	I	156	GLN
2	I	274	HIS

5.3.3 RNA

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates

There are no oligosaccharides in this entry.

5.6 Ligand geometry

Of 1 ligands modelled in this entry, 1 is monoatomic - leaving 0 for Mogul analysis.

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

No monomer is involved in short contacts.

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.