



Full wwPDB EM Validation Report ⓘ

Mar 15, 2026 – 12:14 AM JST

PDB ID : 9WZX / pdb_00009wzx
EMDB ID : EMD-66411
Title : Cryo-EM structure of Fks1 in open state
Authors : Bai, L.; You, Z.L.
Deposited on : 2025-09-29
Resolution : 3.72 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 Phenix2.0
Percentile statistics : 20231227.v01 (using entries in the PDB archive December 27th 2023)
EM percentile statistics : **NOT EXECUTED**
MapQ : **FAILED**
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.48.1

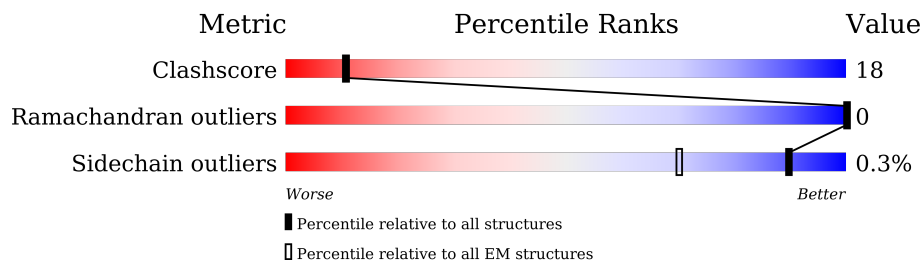
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

ELECTRON MICROSCOPY

The reported resolution of this entry is 3.72 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	F	1876	

2 Entry composition

There is only 1 type of molecule in this entry. The entry contains 12117 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 1,3-beta-glucan synthase component FKS1.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
1	F	1485	12117	7919	2023	2103	72	0	0

4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	142777	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	PHASE FLIPPING AND AMPLITUDE CORRECTION	Depositor
Microscope	FEI TECNAI 20	Depositor
Voltage (kV)	300	Depositor
Electron dose ($e^-/\text{\AA}^2$)	50	Depositor
Minimum defocus (nm)	800	Depositor
Maximum defocus (nm)	1800	Depositor
Magnification	Not provided	
Image detector	GATAN K3 (6k x 4k)	Depositor

5 Model quality [i](#)

5.1 Standard geometry [i](#)

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	F	0.23	1/12443 (0.0%)	0.47	3/16879 (0.0%)

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	F	830	ILE	C-N	12.52	1.50	1.33

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	F	830	ILE	CA-C-N	18.24	138.27	119.85
1	F	830	ILE	C-N-CA	18.24	138.27	119.85
1	F	569	MET	CB-CG-SD	5.35	128.74	112.70

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	F	12117	0	12107	442	0
All	All	12117	0	12107	442	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 18.

All (442) 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:F:232:MET:CE	1:F:235:GLU:HG3	1.61	1.30
1:F:828:THR:HG22	1:F:829:PRO:CD	1.69	1.20
1:F:830:ILE:HG12	1:F:1241:TYR:CD2	1.78	1.19
1:F:1378:LEU:CD2	1:F:1383:LEU:HD13	1.71	1.18
1:F:232:MET:HE3	1:F:235:GLU:CG	1.74	1.16
1:F:828:THR:CG2	1:F:829:PRO:HD2	1.76	1.13
1:F:1378:LEU:HD22	1:F:1383:LEU:HD13	1.15	1.10
1:F:1154:ARG:NH1	1:F:1156:TYR:HD2	1.49	1.07
1:F:1378:LEU:CD2	1:F:1383:LEU:CD1	2.31	1.07
1:F:232:MET:HE1	1:F:281:SER:O	1.54	1.04
1:F:1378:LEU:HD22	1:F:1383:LEU:CD1	1.89	1.00
1:F:232:MET:CE	1:F:281:SER:O	2.14	0.94
1:F:830:ILE:HD11	1:F:1241:TYR:CB	1.99	0.93
1:F:1378:LEU:HD21	1:F:1383:LEU:HD12	1.54	0.88
1:F:1378:LEU:HD21	1:F:1383:LEU:CD1	2.04	0.86
1:F:230:LEU:HD23	1:F:230:LEU:H	1.45	0.81
1:F:1380:GLU:OE2	1:F:1775:LYS:HE2	1.82	0.78
1:F:1344:GLY:HA3	1:F:1851:THR:HG22	1.64	0.77
1:F:830:ILE:HD11	1:F:1241:TYR:HB2	1.67	0.77
1:F:1649:VAL:HA	1:F:1652:ILE:HG22	1.65	0.76
1:F:830:ILE:CD1	1:F:1241:TYR:CG	2.69	0.76
1:F:1154:ARG:NH1	1:F:1156:TYR:CD2	2.35	0.74
1:F:1182:ARG:HA	1:F:1186:GLN:HB2	1.68	0.74
1:F:830:ILE:HG12	1:F:1241:TYR:CE2	2.23	0.73
1:F:1575:CYS:HB3	1:F:1678:THR:HG22	1.68	0.73
1:F:1312:MET:HB3	1:F:1459:MET:HG2	1.68	0.73
1:F:1381:ARG:HE	1:F:1773:TRP:CD1	2.07	0.73
1:F:199:ARG:NH1	1:F:1124:GLU:O	2.23	0.72
1:F:1154:ARG:HH12	1:F:1156:TYR:HB3	1.53	0.72
1:F:371:GLU:HG2	1:F:380:ARG:HB2	1.71	0.72
1:F:1046:ARG:HG3	1:F:1071:GLN:HE22	1.55	0.72
1:F:1381:ARG:NE	1:F:1773:TRP:CD1	2.60	0.70
1:F:1690:MET:HE1	1:F:1735:ILE:HG13	1.74	0.69
1:F:675:ILE:HD13	1:F:1577:ILE:HD13	1.74	0.69
1:F:846:THR:HB	1:F:1002:VAL:HG12	1.73	0.69
1:F:1048:TYR:HB3	1:F:1071:GLN:HA	1.73	0.69
1:F:1490:ASN:HB3	1:F:1493:GLN:HB2	1.75	0.69
1:F:230:LEU:HD23	1:F:230:LEU:N	2.08	0.68
1:F:1854:GLN:HA	1:F:1854:GLN:HE21	1.57	0.68
1:F:1380:GLU:OE2	1:F:1775:LYS:CE	2.40	0.68
1:F:470:ASN:HD22	1:F:641:VAL:HG13	1.58	0.68

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:F:535:LEU:HD23	1:F:538:ILE:HD11	1.75	0.68
1:F:502:VAL:O	1:F:506:ILE:HD12	1.94	0.68
1:F:828:THR:HG22	1:F:829:PRO:HD2	0.81	0.68
1:F:1687:PHE:HD2	1:F:1735:ILE:HG23	1.58	0.68
1:F:1344:GLY:CA	1:F:1851:THR:HG22	2.24	0.68
1:F:830:ILE:HG12	1:F:1241:TYR:CG	2.28	0.68
1:F:392:ASP:OD1	1:F:1273:ARG:NH2	2.28	0.67
1:F:1381:ARG:NH2	1:F:1773:TRP:CD1	2.63	0.67
1:F:1381:ARG:CZ	1:F:1773:TRP:HD1	2.08	0.67
1:F:1381:ARG:HH21	1:F:1773:TRP:CD1	2.12	0.66
1:F:232:MET:CE	1:F:235:GLU:CG	2.52	0.66
1:F:857:LEU:HD13	1:F:940:ARG:HH12	1.59	0.66
1:F:1683:GLN:O	1:F:1687:PHE:HD1	1.80	0.65
1:F:232:MET:HE3	1:F:235:GLU:HG3	0.77	0.65
1:F:1504:ARG:HD2	1:F:1800:TYR:HE1	1.62	0.65
1:F:1006:ARG:HG3	1:F:1010:PHE:HE1	1.62	0.65
1:F:1220:ASN:OD1	1:F:1269:GLN:NE2	2.30	0.65
1:F:635:GLU:HG2	1:F:695:TRP:HE1	1.62	0.65
1:F:1154:ARG:NH1	1:F:1156:TYR:HB3	2.11	0.65
1:F:834:LEU:O	1:F:1116:ARG:NH1	2.30	0.64
1:F:1005:GLN:OE1	1:F:1085:ASN:ND2	2.30	0.64
1:F:384:HIS:NE2	1:F:1216:GLY:O	2.30	0.64
1:F:501:THR:HG21	1:F:546:ILE:HD13	1.80	0.64
1:F:565:VAL:HA	1:F:568:VAL:HG12	1.79	0.64
1:F:762:TYR:HB2	1:F:767:LEU:HD23	1.78	0.64
1:F:1381:ARG:NE	1:F:1773:TRP:HD1	1.96	0.64
1:F:1840:LEU:HD23	1:F:1841:PHE:HB3	1.81	0.63
1:F:869:ARG:HH22	1:F:1780:ILE:HA	1.62	0.63
1:F:1576:PHE:CZ	1:F:1602:ILE:HG21	2.34	0.63
1:F:828:THR:CG2	1:F:829:PRO:CD	2.55	0.63
1:F:830:ILE:CG1	1:F:1241:TYR:CD2	2.69	0.63
1:F:818:ARG:NE	1:F:1110:GLU:OE1	2.30	0.62
1:F:760:SER:HA	1:F:763:ARG:HD3	1.81	0.62
1:F:1469:GLN:HG3	1:F:1471:PRO:HD2	1.81	0.62
1:F:762:TYR:HD2	1:F:767:LEU:HG	1.64	0.62
1:F:623:LEU:O	1:F:627:THR:HG23	2.00	0.62
1:F:1854:GLN:HA	1:F:1854:GLN:NE2	2.13	0.62
1:F:1655:ILE:HD12	1:F:1658:PHE:HE1	1.65	0.61
1:F:771:HIS:O	1:F:774:LYS:N	2.32	0.61
1:F:1036:GLU:OE2	1:F:1046:ARG:NH1	2.33	0.61
1:F:1561:ILE:HG22	1:F:1692:ALA:HB1	1.83	0.61

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:F:1379:ILE:HD11	1:F:1383:LEU:HD22	1.82	0.61
1:F:224:TRP:HD1	1:F:323:GLU:HG3	1.66	0.60
1:F:543:LEU:HD12	1:F:546:ILE:HD11	1.83	0.60
1:F:1343:ILE:HD11	1:F:1852:GLY:O	2.00	0.60
1:F:180:ASP:OD1	1:F:183:ARG:NH1	2.34	0.60
1:F:1694:MET:HE2	1:F:1728:ARG:HG2	1.83	0.60
1:F:433:ASP:N	1:F:433:ASP:OD1	2.34	0.60
1:F:830:ILE:HD11	1:F:1241:TYR:CG	2.34	0.60
1:F:1656:ALA:O	1:F:1660:VAL:HG23	2.01	0.60
1:F:1047:ILE:HD12	1:F:1072:LEU:HB2	1.84	0.60
1:F:1154:ARG:HH11	1:F:1156:TYR:HD2	0.73	0.60
1:F:870:VAL:HG22	1:F:871:THR:H	1.65	0.60
1:F:1294:HIS:HB2	1:F:1295:PRO:HD3	1.84	0.60
1:F:573:ALA:O	1:F:577:ILE:HG13	2.02	0.59
1:F:1583:ASN:ND2	1:F:1665:GLU:OE2	2.34	0.59
1:F:1827:LYS:NZ	1:F:1828:HIS:O	2.27	0.59
1:F:1199:ILE:HD12	1:F:1204:MET:HG2	1.85	0.59
1:F:1731:THR:O	1:F:1735:ILE:HG12	2.02	0.59
1:F:538:ILE:HA	1:F:541:ILE:HG12	1.84	0.59
1:F:1685:LEU:HD23	1:F:1686:ILE:HD13	1.85	0.59
1:F:852:ARG:HA	1:F:852:ARG:CZ	2.33	0.59
1:F:1312:MET:HA	1:F:1312:MET:HE2	1.85	0.59
1:F:1471:PRO:O	1:F:1474:TRP:HB2	2.02	0.59
1:F:345:GLN:OE1	1:F:345:GLN:N	2.33	0.58
1:F:1854:GLN:O	1:F:1854:GLN:HG3	2.04	0.58
1:F:1318:LEU:HD21	1:F:1351:ALA:HB1	1.85	0.58
1:F:1380:GLU:HG3	1:F:1775:LYS:HZ2	1.68	0.58
1:F:713:ILE:HG22	1:F:715:ILE:H	1.69	0.58
1:F:771:HIS:O	1:F:775:LEU:HD23	2.04	0.58
1:F:1398:SER:HB2	1:F:1402:GLU:HG3	1.86	0.57
1:F:1609:PRO:O	1:F:1613:ASN:ND2	2.37	0.57
1:F:661:GLU:OE1	1:F:1597:ASN:N	2.34	0.57
1:F:1662:TRP:HD1	1:F:1672:MET:HG3	1.69	0.57
1:F:1493:GLN:HB3	1:F:1499:PHE:HE1	1.69	0.56
1:F:1380:GLU:HG3	1:F:1775:LYS:NZ	2.19	0.56
1:F:318:VAL:HG21	1:F:358:ILE:HD12	1.85	0.56
1:F:1193:TYR:OH	1:F:1230:MET:SD	2.59	0.56
1:F:1450:ILE:HG22	1:F:1746:LEU:HD13	1.87	0.56
1:F:1813:GLY:HA2	1:F:1816:ILE:HG22	1.88	0.56
1:F:1217:LEU:HB2	1:F:1219:LEU:HD13	1.87	0.56
1:F:1436:ILE:O	1:F:1493:GLN:NE2	2.39	0.56

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:F:380:ARG:HD2	1:F:382:ARG:HE	1.70	0.56
1:F:232:MET:HE2	1:F:281:SER:O	2.00	0.55
1:F:1489:PHE:HA	1:F:1767:HIS:CE1	2.41	0.55
1:F:1617:LEU:O	1:F:1621:MET:HG2	2.05	0.55
1:F:840:PRO:HG3	1:F:1125:LEU:HD21	1.88	0.55
1:F:935:TYR:O	1:F:939:THR:HG23	2.05	0.55
1:F:938:ARG:C	1:F:938:ARG:HH11	2.15	0.55
1:F:1492:HIS:HB3	1:F:1780:ILE:HG21	1.89	0.55
1:F:1795:ARG:HH12	1:F:1799:LYS:HB2	1.71	0.55
1:F:1344:GLY:C	1:F:1851:THR:HG22	2.32	0.55
1:F:1036:GLU:OE1	1:F:1048:TYR:OH	2.19	0.55
1:F:1440:ILE:HD12	1:F:1440:ILE:H	1.72	0.55
1:F:1489:PHE:HA	1:F:1767:HIS:NE2	2.22	0.55
1:F:1804:TYR:O	1:F:1808:LEU:HG	2.07	0.55
1:F:1150:ILE:HD11	1:F:1196:PRO:HA	1.89	0.55
1:F:597:THR:O	1:F:598:ARG:HD2	2.07	0.54
1:F:370:TYR:H	1:F:379:LYS:HA	1.72	0.54
1:F:1407:GLN:HG3	1:F:1481:SER:HB3	1.89	0.54
1:F:1687:PHE:CE2	1:F:1735:ILE:HD12	2.43	0.54
1:F:1291:TYR:O	1:F:1295:PRO:HD2	2.07	0.54
1:F:538:ILE:O	1:F:542:ASN:ND2	2.40	0.54
1:F:568:VAL:O	1:F:572:VAL:HG12	2.08	0.54
1:F:570:PHE:O	1:F:574:VAL:HG22	2.07	0.54
1:F:830:ILE:CG1	1:F:1241:TYR:CG	2.90	0.54
1:F:1489:PHE:HA	1:F:1767:HIS:HE2	1.72	0.54
1:F:864:ASP:HB3	1:F:870:VAL:HG23	1.89	0.54
1:F:1381:ARG:CZ	1:F:1773:TRP:CD1	2.89	0.54
1:F:1571:TYR:HB3	1:F:1681:GLN:NE2	2.23	0.54
1:F:596:SER:OG	1:F:597:THR:N	2.39	0.54
1:F:869:ARG:NH2	1:F:1779:GLN:O	2.41	0.54
1:F:651:LEU:HD21	1:F:673:PRO:HB2	1.90	0.53
1:F:858:ARG:O	1:F:858:ARG:NH1	2.40	0.53
1:F:1772:PHE:HA	1:F:1776:PRO:HD3	1.89	0.53
1:F:1414:LEU:HD21	1:F:1482:LEU:C	2.33	0.53
1:F:1342:PRO:HB2	1:F:1345:CYS:SG	2.49	0.53
1:F:338:SER:HB2	1:F:420:GLU:HG3	1.90	0.53
1:F:371:GLU:N	1:F:378:VAL:O	2.41	0.53
1:F:369:VAL:HG23	1:F:370:TYR:HD1	1.73	0.53
1:F:650:ILE:HD11	1:F:1347:ASN:O	2.08	0.53
1:F:830:ILE:HD11	1:F:1241:TYR:HB3	1.87	0.53
1:F:217:ASP:N	1:F:217:ASP:OD1	2.41	0.53

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:F:1038:PRO:HD3	1:F:1045:PRO:HB3	1.91	0.53
1:F:1486:PRO:HA	1:F:1489:PHE:CZ	2.44	0.53
1:F:651:LEU:O	1:F:674:LYS:NZ	2.37	0.52
1:F:502:VAL:HG12	1:F:506:ILE:HD11	1.90	0.52
1:F:1056:CYS:SG	1:F:1064:ARG:NH1	2.82	0.52
1:F:458:MET:O	1:F:633:TYR:OH	2.26	0.52
1:F:751:SER:O	1:F:755:ASN:HB2	2.10	0.52
1:F:1220:ASN:H	1:F:1224:TYR:HD2	1.58	0.52
1:F:1687:PHE:CD2	1:F:1735:ILE:HG23	2.43	0.52
1:F:1841:PHE:CZ	1:F:1844:ILE:HA	2.45	0.52
1:F:1725:GLN:OE1	1:F:1729:GLU:HG2	2.10	0.52
1:F:206:LEU:HD21	1:F:302:VAL:HG23	1.90	0.52
1:F:1748:HIS:O	1:F:1752:ILE:HG23	2.09	0.52
1:F:462:ILE:HA	1:F:465:MET:HB2	1.90	0.52
1:F:1183:THR:HB	1:F:1375:VAL:HG11	1.90	0.52
1:F:226:PHE:HA	1:F:230:LEU:HD21	1.91	0.51
1:F:595:LYS:NZ	1:F:596:SER:O	2.32	0.51
1:F:1381:ARG:HE	1:F:1773:TRP:NE1	2.06	0.51
1:F:1397:LEU:HB3	1:F:1402:GLU:OE2	2.11	0.51
1:F:714:SER:O	1:F:714:SER:OG	2.25	0.51
1:F:1004:MET:HB2	1:F:1030:ILE:HG23	1.91	0.51
1:F:230:LEU:N	1:F:230:LEU:CD2	2.74	0.51
1:F:687:LEU:HD12	1:F:690:LEU:HD12	1.92	0.51
1:F:1479:LEU:HA	1:F:1482:LEU:HB2	1.91	0.51
1:F:966:LEU:HA	1:F:969:ARG:HG2	1.91	0.51
1:F:199:ARG:HB3	1:F:838:ASN:HB2	1.93	0.51
1:F:1194:GLY:O	1:F:1196:PRO:HD2	2.10	0.51
1:F:1380:GLU:CD	1:F:1775:LYS:HZ3	2.19	0.51
1:F:441:GLU:HG3	1:F:1271:LEU:HD21	1.93	0.51
1:F:753:VAL:O	1:F:757:ILE:HG23	2.10	0.51
1:F:851:GLU:OE1	1:F:851:GLU:N	2.44	0.51
1:F:1605:CYS:HA	1:F:1657:PHE:CE1	2.46	0.50
1:F:836:VAL:HG11	1:F:968:TYR:HA	1.94	0.50
1:F:954:ILE:HD12	1:F:1021:LEU:HD21	1.93	0.50
1:F:1841:PHE:HZ	1:F:1844:ILE:HA	1.76	0.50
1:F:1473:LEU:HA	1:F:1476:TRP:HB2	1.93	0.50
1:F:1733:LYS:O	1:F:1736:GLU:HG3	2.12	0.50
1:F:646:ASP:O	1:F:650:ILE:HG22	2.12	0.50
1:F:534:PHE:O	1:F:537:ILE:HG13	2.11	0.50
1:F:937:LEU:O	1:F:941:ILE:HG22	2.12	0.50
1:F:1450:ILE:HD13	1:F:1483:ILE:HD11	1.94	0.50

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:F:874:GLU:HA	1:F:877:LYS:HG2	1.93	0.49
1:F:1381:ARG:NH2	1:F:1773:TRP:HD1	2.04	0.49
1:F:1341:VAL:HG13	1:F:1342:PRO:HD3	1.94	0.49
1:F:818:ARG:NH2	1:F:1110:GLU:OE2	2.44	0.49
1:F:1102:ASP:OD2	1:F:1105:GLN:NE2	2.44	0.49
1:F:470:ASN:ND2	1:F:641:VAL:HG13	2.24	0.49
1:F:1380:GLU:OE2	1:F:1775:LYS:NZ	2.46	0.49
1:F:1807:VAL:HA	1:F:1810:ILE:HG12	1.94	0.49
1:F:661:GLU:HB3	1:F:665:GLY:HA3	1.95	0.49
1:F:1649:VAL:O	1:F:1653:VAL:HG12	2.12	0.49
1:F:1505:ASP:HA	1:F:1508:ARG:HG2	1.94	0.49
1:F:1101:ILE:HB	1:F:1105:GLN:HG3	1.95	0.48
1:F:1129:GLN:CD	1:F:1129:GLN:N	2.71	0.48
1:F:938:ARG:NH1	1:F:939:THR:HA	2.28	0.48
1:F:1559:ASN:HA	1:F:1562:MET:HE2	1.96	0.48
1:F:323:GLU:HG2	1:F:398:TRP:CD1	2.48	0.48
1:F:967:LEU:CD2	1:F:1116:ARG:HE	2.26	0.48
1:F:1662:TRP:CD1	1:F:1672:MET:HG3	2.48	0.48
1:F:450:THR:HG21	1:F:517:PHE:HE2	1.79	0.48
1:F:872:LEU:H	1:F:872:LEU:HD23	1.79	0.48
1:F:1598:SER:HA	1:F:1601:ARG:HH11	1.79	0.48
1:F:1854:GLN:HE21	1:F:1854:GLN:CA	2.21	0.48
1:F:852:ARG:HA	1:F:852:ARG:NH1	2.29	0.48
1:F:1832:SER:OG	1:F:1836:VAL:O	2.30	0.48
1:F:565:VAL:HA	1:F:568:VAL:CG1	2.44	0.47
1:F:356:ARG:HG3	1:F:427:GLY:HA3	1.96	0.47
1:F:360:PRO:HB2	1:F:431:TRP:HD1	1.79	0.47
1:F:859:GLU:CD	1:F:862:ARG:HB2	2.39	0.47
1:F:869:ARG:HH12	1:F:1781:ARG:H	1.61	0.47
1:F:1410:SER:O	1:F:1414:LEU:HD13	2.14	0.47
1:F:1582:ILE:HG21	1:F:1674:ILE:HD13	1.96	0.47
1:F:1799:LYS:HE3	1:F:1803:LEU:HD11	1.95	0.47
1:F:306:ALA:O	1:F:310:LEU:HD12	2.15	0.47
1:F:1600:LEU:HA	1:F:1603:ILE:HG12	1.96	0.47
1:F:651:LEU:O	1:F:651:LEU:HD23	2.14	0.47
1:F:1006:ARG:HH11	1:F:1009:LYS:NZ	2.11	0.47
1:F:493:TRP:HA	1:F:496:CYS:SG	2.54	0.47
1:F:1141:GLU:OE1	1:F:1141:GLU:N	2.48	0.47
1:F:1224:TYR:CD1	1:F:1227:MET:HE3	2.50	0.47
1:F:339:PRO:O	1:F:343:GLN:HG2	2.15	0.47
1:F:505:LEU:O	1:F:509:VAL:HG12	2.15	0.47

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:F:210:HIS:HE1	1:F:293:MET:SD	2.37	0.47
1:F:597:THR:HG23	1:F:598:ARG:H	1.79	0.47
1:F:942:TRP:O	1:F:946:ARG:HG2	2.14	0.47
1:F:1105:GLN:HE22	1:F:1246:LYS:HA	1.79	0.47
1:F:1601:ARG:NH2	1:F:1840:LEU:O	2.39	0.47
1:F:1111:GLU:HG3	1:F:1243:GLN:HB3	1.96	0.47
1:F:768:ALA:HB3	1:F:771:HIS:CE1	2.50	0.46
1:F:1414:LEU:HB2	1:F:1485:ALA:HB3	1.97	0.46
1:F:1682:CYS:O	1:F:1686:ILE:HG12	2.14	0.46
1:F:369:VAL:HG23	1:F:370:TYR:CD1	2.50	0.46
1:F:504:SER:O	1:F:508:ILE:HG13	2.15	0.46
1:F:1610:ILE:HA	1:F:1613:ASN:HD21	1.79	0.46
1:F:952:ARG:NH2	1:F:1106:ASP:OD1	2.47	0.46
1:F:885:GLU:O	1:F:888:VAL:HG22	2.14	0.46
1:F:1378:LEU:HD21	1:F:1383:LEU:HA	1.97	0.46
1:F:321:THR:HG22	1:F:394:ASN:HB3	1.98	0.46
1:F:507:GLN:HE21	1:F:580:PHE:HB3	1.81	0.46
1:F:1828:HIS:CD2	1:F:1844:ILE:HD11	2.51	0.46
1:F:1845:ASN:OD1	1:F:1845:ASN:N	2.47	0.46
1:F:1189:GLY:HA3	1:F:1193:TYR:HB2	1.97	0.46
1:F:1347:ASN:O	1:F:1348:PHE:HD1	1.98	0.46
1:F:1217:LEU:HD12	1:F:1219:LEU:HD22	1.98	0.46
1:F:744:TYR:HD2	1:F:745:LYS:HZ3	1.63	0.46
1:F:1359:THR:HG22	1:F:1475:PHE:HE2	1.81	0.46
1:F:185:MET:HE2	1:F:309:LEU:O	2.16	0.46
1:F:171:LEU:HD23	1:F:171:LEU:HA	1.79	0.46
1:F:967:LEU:HD23	1:F:1116:ARG:HE	1.81	0.46
1:F:1272:SER:OG	1:F:1273:ARG:N	2.48	0.46
1:F:1690:MET:C	1:F:1690:MET:SD	2.99	0.46
1:F:1327:MET:SD	1:F:1327:MET:N	2.90	0.45
1:F:437:LYS:O	1:F:438:THR:HG22	2.16	0.45
1:F:976:VAL:HG22	1:F:986:LEU:HD11	1.98	0.45
1:F:1006:ARG:HG3	1:F:1010:PHE:CE1	2.45	0.45
1:F:1026:PRO:HA	1:F:1054:GLY:HA3	1.98	0.45
1:F:1687:PHE:CD2	1:F:1735:ILE:HD12	2.52	0.45
1:F:362:TYR:OH	1:F:1075:ASN:O	2.20	0.45
1:F:533:TRP:O	1:F:537:ILE:HG12	2.15	0.45
1:F:1579:PHE:HA	1:F:1582:ILE:HG22	1.98	0.45
1:F:1761:PRO:O	1:F:1764:ASP:HB3	2.16	0.45
1:F:806:THR:O	1:F:807:GLU:HG3	2.16	0.45
1:F:1379:ILE:C	1:F:1381:ARG:H	2.24	0.45

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:F:1445:PHE:CE2	1:F:1450:ILE:HD11	2.51	0.45
1:F:1827:LYS:HG3	1:F:1828:HIS:H	1.82	0.45
1:F:217:ASP:HA	1:F:222:LYS:HD3	1.97	0.45
1:F:537:ILE:O	1:F:541:ILE:HG23	2.16	0.45
1:F:767:LEU:CD1	1:F:771:HIS:HB2	2.46	0.45
1:F:767:LEU:HD11	1:F:772:VAL:HB	1.99	0.45
1:F:1336:LYS:HE2	1:F:1336:LYS:HA	1.99	0.45
1:F:1383:LEU:O	1:F:1383:LEU:HG	2.16	0.45
1:F:549:VAL:HA	1:F:552:TYR:HE1	1.82	0.45
1:F:644:LEU:HD11	1:F:680:VAL:HG12	1.97	0.45
1:F:1359:THR:HG22	1:F:1475:PHE:CE2	2.52	0.45
1:F:1149:ALA:HB1	1:F:1204:MET:HE1	1.99	0.45
1:F:210:HIS:CE1	1:F:1133:TYR:HH	2.25	0.45
1:F:417:LEU:HB3	1:F:421:GLU:OE2	2.16	0.45
1:F:830:ILE:HD13	1:F:1241:TYR:CD1	2.52	0.45
1:F:1582:ILE:HG21	1:F:1674:ILE:HG21	1.99	0.45
1:F:549:VAL:HA	1:F:552:TYR:CE1	2.51	0.45
1:F:671:VAL:HG13	1:F:671:VAL:O	2.17	0.45
1:F:1351:ALA:O	1:F:1355:VAL:HG23	2.17	0.45
1:F:1571:TYR:HB3	1:F:1681:GLN:HE22	1.81	0.45
1:F:1795:ARG:HA	1:F:1795:ARG:HD2	1.77	0.45
1:F:1480:SER:O	1:F:1483:ILE:HG22	2.17	0.44
1:F:1051:LEU:HD23	1:F:1092:PHE:CG	2.52	0.44
1:F:1504:ARG:HD2	1:F:1800:TYR:CE1	2.47	0.44
1:F:469:TYR:HD1	1:F:492:LYS:HD2	1.82	0.44
1:F:558:TYR:HB3	1:F:561:ALA:HB3	2.00	0.44
1:F:635:GLU:HG2	1:F:695:TRP:NE1	2.30	0.44
1:F:875:TYR:HE1	1:F:1778:ARG:HG2	1.83	0.44
1:F:1647:HIS:HB3	1:F:1740:PHE:CE2	2.52	0.44
1:F:697:ILE:HD13	1:F:697:ILE:HA	1.91	0.44
1:F:1472:LEU:HD12	1:F:1472:LEU:HA	1.69	0.44
1:F:1642:MET:HE2	1:F:1642:MET:HA	1.99	0.44
1:F:1833:LEU:HD12	1:F:1837:VAL:HB	2.00	0.44
1:F:1155:GLU:HA	1:F:1155:GLU:OE1	2.17	0.44
1:F:1767:HIS:HA	1:F:1770:MET:HB2	2.00	0.44
1:F:148:TYR:CE2	1:F:190:MET:HB3	2.53	0.44
1:F:1334:LYS:HD2	1:F:1334:LYS:HA	1.84	0.44
1:F:1379:ILE:C	1:F:1381:ARG:N	2.75	0.44
1:F:224:TRP:HA	1:F:606:PHE:HZ	1.83	0.44
1:F:769:ILE:HA	1:F:772:VAL:HG12	1.99	0.44
1:F:1228:ASN:O	1:F:1232:ARG:HG3	2.18	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:F:1488:VAL:O	1:F:1767:HIS:NE2	2.51	0.44
1:F:1621:MET:HE1	1:F:1730:LEU:HD21	1.98	0.44
1:F:1072:LEU:HD13	1:F:1076:PRO:HG3	1.99	0.44
1:F:872:LEU:O	1:F:876:LEU:HD22	2.18	0.43
1:F:1224:TYR:CE1	1:F:1227:MET:HE3	2.53	0.43
1:F:1788:LYS:O	1:F:1792:LEU:HG	2.18	0.43
1:F:224:TRP:CD1	1:F:323:GLU:HG3	2.51	0.43
1:F:1232:ARG:HE	1:F:1232:ARG:HB3	1.58	0.43
1:F:1506:TYR:OH	1:F:1747:GLY:HA3	2.18	0.43
1:F:1017:ASN:OD1	1:F:1017:ASN:N	2.51	0.43
1:F:323:GLU:CD	1:F:398:TRP:HE1	2.27	0.43
1:F:521:LYS:HD3	1:F:521:LYS:HA	1.83	0.43
1:F:582:ILE:HA	1:F:1284:VAL:HG11	2.01	0.43
1:F:632:LYS:HE3	1:F:633:TYR:CD1	2.53	0.43
1:F:718:PRO:HD2	1:F:720:ARG:HH11	1.83	0.43
1:F:707:LYS:HD2	1:F:711:LEU:HD23	1.99	0.43
1:F:1317:ASN:OD1	1:F:1578:ALA:HB2	2.19	0.43
1:F:1462:PHE:CD2	1:F:1462:PHE:C	2.97	0.43
1:F:857:LEU:HD23	1:F:1017:ASN:HD21	1.84	0.43
1:F:1321:LEU:HD21	1:F:1348:PHE:CE2	2.54	0.43
1:F:1760:ILE:HD11	1:F:1762:LYS:HE2	1.99	0.43
1:F:628:VAL:HG23	1:F:699:VAL:HG11	2.01	0.43
1:F:984:GLU:O	1:F:987:GLU:HG3	2.18	0.43
1:F:1493:GLN:HB3	1:F:1499:PHE:CE1	2.52	0.43
1:F:1566:ILE:HG22	1:F:1567:PRO:HD3	2.01	0.43
1:F:1602:ILE:HA	1:F:1605:CYS:SG	2.59	0.43
1:F:672:GLN:N	1:F:673:PRO:HD2	2.34	0.42
1:F:1566:ILE:N	1:F:1567:PRO:HD2	2.34	0.42
1:F:1195:HIS:CE1	1:F:1246:LYS:HE3	2.54	0.42
1:F:1201:ALA:O	1:F:1205:THR:OG1	2.15	0.42
1:F:1737:LEU:O	1:F:1740:PHE:HB3	2.19	0.42
1:F:1803:LEU:O	1:F:1807:VAL:HG22	2.19	0.42
1:F:833:PRO:HB2	1:F:1116:ARG:NH1	2.34	0.42
1:F:843:THR:HA	1:F:999:LYS:O	2.19	0.42
1:F:182:MET:SD	1:F:183:ARG:HG3	2.59	0.42
1:F:562:ALA:HA	1:F:565:VAL:HG22	2.00	0.42
1:F:578:ILE:O	1:F:582:ILE:HG23	2.20	0.42
1:F:1501:LEU:HA	1:F:1504:ARG:HD3	2.01	0.42
1:F:1502:ASP:HA	1:F:1505:ASP:OD2	2.20	0.42
1:F:1646:ALA:HA	1:F:1649:VAL:HG22	2.00	0.42
1:F:561:ALA:HA	1:F:564:VAL:HG22	2.01	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:F:1046:ARG:HD3	1:F:1071:GLN:OE1	2.20	0.42
1:F:1138:ARG:HB3	1:F:1141:GLU:OE1	2.19	0.42
1:F:1690:MET:CE	1:F:1735:ILE:HG13	2.48	0.42
1:F:489:ALA:HB3	1:F:563:HIS:HE1	1.85	0.42
1:F:538:ILE:HD12	1:F:580:PHE:HZ	1.83	0.42
1:F:1475:PHE:O	1:F:1478:SER:OG	2.29	0.42
1:F:1638:THR:HB	1:F:1641:VAL:HB	2.02	0.42
1:F:767:LEU:HD21	1:F:772:VAL:HG23	2.02	0.42
1:F:1494:PHE:H	1:F:1499:PHE:HE1	1.67	0.42
1:F:687:LEU:HA	1:F:690:LEU:HD12	2.02	0.42
1:F:1219:LEU:HB3	1:F:1220:ASN:H	1.60	0.42
1:F:1270:MET:SD	1:F:1270:MET:N	2.92	0.42
1:F:1833:LEU:HD12	1:F:1833:LEU:HA	1.92	0.42
1:F:1006:ARG:HH11	1:F:1009:LYS:HZ2	1.67	0.42
1:F:1375:VAL:O	1:F:1379:ILE:HG12	2.20	0.42
1:F:206:LEU:HD12	1:F:206:LEU:HA	1.89	0.41
1:F:605:THR:HG23	1:F:606:PHE:CD1	2.55	0.41
1:F:934:GLU:O	1:F:937:LEU:HG	2.20	0.41
1:F:1621:MET:HG2	1:F:1621:MET:H	1.64	0.41
1:F:514:GLU:HA	1:F:517:PHE:CD2	2.55	0.41
1:F:948:GLN:HG2	1:F:1104:ASN:ND2	2.35	0.41
1:F:1056:CYS:O	1:F:1064:ARG:NH1	2.53	0.41
1:F:1059:LEU:HD21	1:F:1065:ARG:HB2	2.02	0.41
1:F:1414:LEU:HD23	1:F:1486:PRO:HD3	2.03	0.41
1:F:193:LEU:HD12	1:F:193:LEU:HA	1.94	0.41
1:F:767:LEU:HD11	1:F:772:VAL:N	2.35	0.41
1:F:771:HIS:HA	1:F:774:LYS:HG2	2.01	0.41
1:F:836:VAL:HG22	1:F:993:MET:HE1	2.02	0.41
1:F:1451:TYR:OH	1:F:1743:ASP:OD1	2.28	0.41
1:F:1326:ILE:HD11	1:F:1848:ASN:O	2.20	0.41
1:F:284:ALA:HB1	1:F:288:ARG:HH12	1.85	0.41
1:F:727:PRO:HB2	1:F:750:ILE:HD13	2.01	0.41
1:F:196:ARG:NH1	1:F:208:SER:OG	2.53	0.41
1:F:1647:HIS:CE1	1:F:1737:LEU:HD11	2.56	0.41
1:F:676:VAL:HG11	1:F:1318:LEU:HD13	2.02	0.41
1:F:769:ILE:O	1:F:772:VAL:HG12	2.21	0.41
1:F:1056:CYS:SG	1:F:1064:ARG:HD3	2.60	0.41
1:F:1191:LEU:O	1:F:1195:HIS:HB2	2.20	0.41
1:F:370:TYR:N	1:F:379:LYS:HA	2.35	0.41
1:F:1204:MET:HE2	1:F:1204:MET:HB2	1.87	0.41
1:F:1330:TYR:CZ	1:F:1335:PRO:HB2	2.55	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:F:1414:LEU:HD11	1:F:1482:LEU:HD23	2.02	0.41
1:F:1454:ALA:HA	1:F:1457:MET:HB2	2.01	0.41
1:F:1673:LEU:HD23	1:F:1673:LEU:HA	1.82	0.41
1:F:225:TYR:O	1:F:230:LEU:CD2	2.69	0.41
1:F:419:LEU:HA	1:F:422:ARG:HG3	2.03	0.41
1:F:448:LEU:O	1:F:456:TRP:NE1	2.42	0.41
1:F:663:TRP:HD1	1:F:664:TRP:N	2.19	0.41
1:F:1462:PHE:CE1	1:F:1674:ILE:HB	2.55	0.41
1:F:1576:PHE:HE1	1:F:1682:CYS:HG	1.69	0.41
1:F:1590:THR:OG1	1:F:1591:THR:N	2.54	0.41
1:F:1789:GLN:O	1:F:1792:LEU:HD12	2.20	0.41
1:F:438:THR:HA	1:F:519:PRO:HG3	2.02	0.41
1:F:817:ARG:HE	1:F:1157:ILE:HG21	1.86	0.41
1:F:858:ARG:HA	1:F:858:ARG:HD2	1.92	0.41
1:F:953:THR:O	1:F:957:PHE:HB2	2.21	0.41
1:F:1038:PRO:HB3	1:F:1045:PRO:HA	2.03	0.41
1:F:1321:LEU:C	1:F:1321:LEU:HD23	2.46	0.41
1:F:1565:ILE:HD13	1:F:1565:ILE:HA	1.89	0.41
1:F:1370:PHE:O	1:F:1374:VAL:HG12	2.20	0.40
1:F:379:LYS:HE3	1:F:379:LYS:HB3	1.95	0.40
1:F:1652:ILE:HD12	1:F:1655:ILE:HG23	2.04	0.40
1:F:522:TRP:CG	1:F:523:ALA:N	2.89	0.40
1:F:1310:MET:HE3	1:F:1310:MET:HB2	1.87	0.40
1:F:1381:ARG:CZ	1:F:1773:TRP:O	2.69	0.40
1:F:1030:ILE:O	1:F:1051:LEU:HA	2.21	0.40
1:F:1053:ASP:O	1:F:1064:ARG:NH1	2.53	0.40
1:F:1325:SER:OG	1:F:1326:ILE:N	2.50	0.40
1:F:1405:ALA:HB1	1:F:1409:TYR:CZ	2.57	0.40
1:F:716:LEU:HB3	1:F:717:THR:H	1.73	0.40
1:F:776:LEU:HD23	1:F:776:LEU:HA	1.88	0.40
1:F:1051:LEU:HD11	1:F:1067:LYS:HE3	2.02	0.40
1:F:1796:MET:HA	1:F:1796:MET:HE2	2.04	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	F	1463/1876 (78%)	1352 (92%)	111 (8%)	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	F	1307/1620 (81%)	1303 (100%)	4 (0%)	91 94

All (4) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	F	448	LEU
1	F	828	THR
1	F	1310	MET
1	F	1328	CYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (10) such sidechains are listed below:

Mol	Chain	Res	Type
1	F	156	GLN
1	F	173	ASN
1	F	355	ASN
1	F	526	GLN
1	F	542	ASN
1	F	778	HIS
1	F	1087	ASN
1	F	1146	HIS
1	F	1748	HIS
1	F	1779	GLN

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](#)

There are no ligands in this entry.

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.