WORLDWIDE wwPDB PROTEIN DATA BANK

Full wwPDB EM Validation Report ⓘ

Feb 25, 2025 – 06:05 pm GMT

PDB ID	:	9GI2
EMDB ID	:	EMD-51368
Title	:	Truncated MmpL4 in nanodiscs in absence of substrate
Authors	:	Earp, J.C.; Garaeva, A.A.; Seeger, M.A.
Deposited on	:	2024-08-16
Resolution	:	3.40 Å(reported)
Based on initial model	:	9GI0

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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.

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The following versions of software and data (see references ⓘ) were used in the production of this report:

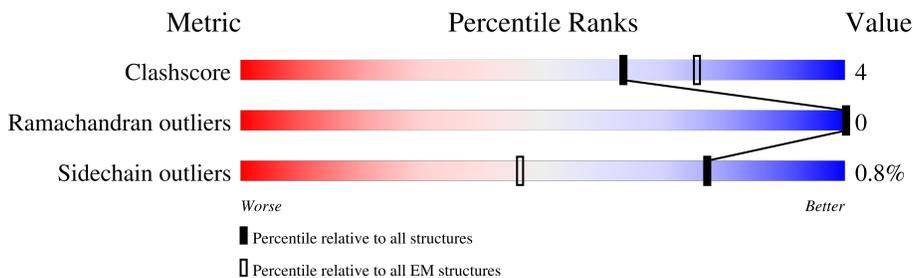|		
EMDB validation analysis	:	FAILED
MolProbity	:	4.02b-467
Percentile statistics	:	20231227.v01 (using entries in the PDB archive December 27th 2023)
MapQ	:	FAILED
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.41

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 3.40 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	Percentile Ranks	Value
Clashscore		4
Ramachandran outliers		0
Sidechain outliers		0.8%

Worse   *Better*

▌Percentile relative to all structures

▯Percentile relative to all EM structures

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	78	81% 14% 5%
2	B	783	83% 9% 8%

W O R L D W I D E
wwPDB
PROTEIN DATA BANK

2 Entry composition ⓘ

There are 2 unique types of molecules in this entry. The entry contains 12222 atoms, of which 6198 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 Acyl carrier protein.

Mol	Chain	Residues	Atoms						AltConf	Trace
1	A	74	Total 1133	C 358	H 555	N 90	O 129	S 1	0	0

- Molecule 2 is a protein called Siderophore exporter MmpL4.

Mol	Chain	Residues	Atoms						AltConf	Trace
2	B	722	Total 11089	C 3524	H 5643	N 932	O 963	S 27	0	0

There are 13 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	1	VAL	-	expression tag	UNP P9WJV2
B	682	GLY	-	linker	UNP P9WJV2
B	683	GLY	-	linker	UNP P9WJV2
B	684	SER	-	linker	UNP P9WJV2
B	685	SER	-	linker	UNP P9WJV2
B	686	SER	-	linker	UNP P9WJV2
B	968	ALA	-	expression tag	UNP P9WJV2
B	969	LEU	-	expression tag	UNP P9WJV2
B	970	GLU	-	expression tag	UNP P9WJV2
B	971	VAL	-	expression tag	UNP P9WJV2
B	972	LEU	-	expression tag	UNP P9WJV2
B	973	PHE	-	expression tag	UNP P9WJV2
B	974	GLN	-	expression tag	UNP P9WJV2

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: Acyl carrier protein

Chain A:

• Molecule 2: Siderophore exporter MmpL4

Chain B:

4 Experimental information (i)

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, C1	Depositor
Number of particles used	418110	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 $(e^-/\text{Å}^2)$	64.3	Depositor
Minimum defocus (nm)	1000	Depositor
Maximum defocus (nm)	2200	Depositor
Magnification	130000	Depositor
Image detector	GATAN K3 (6k x 4k)	Depositor

5 Model quality ⓘ

5.1 Standard geometry ⓘ

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	0.24	0/582	0.44	0/787
2	B	0.24	0/5558	0.47	0/7557
All	All	0.24	0/6140	0.47	0/8344

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	578	555	554	9	0
2	B	5446	5643	5638	40	0
All	All	6024	6198	6192	49	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 4.

All (49) 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:B:880:GLY:HA3	2:B:913:THR:HG21	1.74	0.69
2:B:331:LEU:HD11	2:B:833:MET:SD	2.41	0.61

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:122:VAL:HG22	2:B:147:LEU:HD22	1.81	0.61
2:B:42:VAL:HG11	2:B:241:GLY:HA3	1.84	0.58
2:B:841:VAL:HG21	2:B:883:PHE:CZ	2.41	0.55
2:B:475:ARG:NH2	2:B:483:GLU:O	2.37	0.55
2:B:58:VAL:HG11	2:B:330:THR:HG21	1.88	0.55
1:A:50:PHE:CB	1:A:72:ILE:HD11	2.38	0.54
2:B:42:VAL:HG11	2:B:241:GLY:CA	2.39	0.53
2:B:779:LEU:HD23	2:B:839:LEU:HD21	1.90	0.52
1:A:7:VAL:HG12	1:A:11:ILE:HD11	1.90	0.52
2:B:290:ASP:OD1	2:B:291:LYS:N	2.43	0.51
2:B:845:TYR:CD1	2:B:913:THR:HG22	2.47	0.50
2:B:62:PRO:HG2	2:B:65:ALA:HB2	1.94	0.49
2:B:707:ASP:N	2:B:707:ASP:OD1	2.46	0.49
2:B:310:GLY:CA	2:B:343:VAL:HG21	2.43	0.48
2:B:797:ALA:O	2:B:801:GLY:N	2.44	0.48
2:B:202:ARG:NH2	2:B:894:ASP:OD1	2.45	0.48
2:B:345:VAL:O	2:B:349:LEU:N	2.47	0.47
2:B:441:GLU:OE1	2:B:757:ALA:N	2.48	0.46
2:B:203:ILE:HD11	2:B:893:SER:HB2	1.98	0.46
2:B:298:MET:C	2:B:298:MET:SD	2.94	0.45
2:B:914:LEU:O	2:B:918:SER:OG	2.29	0.45
2:B:216:LEU:O	2:B:220:ARG:N	2.45	0.45
2:B:418:ASP:O	2:B:418:ASP:OD1	2.35	0.45
1:A:50:PHE:HB2	1:A:72:ILE:HD11	2.00	0.44
1:A:15:LEU:HD12	1:A:15:LEU:N	2.32	0.44
2:B:60:LEU:HD13	2:B:327:TYR:OH	2.16	0.44
2:B:741:LEU:HD22	2:B:746:LEU:O	2.17	0.44
2:B:46:VAL:HG11	2:B:245:VAL:HG22	2.00	0.44
2:B:58:VAL:HG12	2:B:255:THR:CG2	2.48	0.44
1:A:15:LEU:HD12	1:A:15:LEU:H	1.83	0.43
1:A:11:ILE:HG22	1:A:15:LEU:HD13	1.99	0.43
2:B:122:VAL:HG13	2:B:147:LEU:HD23	2.00	0.43
2:B:128:ASP:O	2:B:132:ALA:N	2.52	0.42
2:B:694:LYS:O	2:B:694:LYS:NZ	2.36	0.42
1:A:8:LYS:HD2	1:A:22:VAL:HG13	2.02	0.42
2:B:128:ASP:OD1	2:B:131:THR:HG22	2.19	0.42
2:B:211:ILE:HD11	2:B:886:THR:OG1	2.19	0.42
2:B:741:LEU:O	2:B:744:THR:HG22	2.21	0.41
2:B:382:VAL:HG11	2:B:862:LYS:HB3	2.02	0.41
2:B:770:ASP:OD1	2:B:771:LEU:N	2.54	0.41
2:B:123:GLN:O	2:B:123:GLN:HG2	2.19	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:215:LEU:HD13	2:B:228:LEU:HD23	2.03	0.41
2:B:376:ARG:O	2:B:379:THR:OG1	2.37	0.41
2:B:450:ASP:OD1	2:B:451:MET:N	2.53	0.41
2:B:744:THR:OG1	2:B:745:PRO:HD2	2.21	0.41
1:A:36:SER:O	1:A:39:THR:HG22	2.20	0.40
1:A:38:ASP:N	1:A:38:ASP:OD2	2.54	0.40

There are no symmetry-related clashes.

5.3 Torsion angles ⓘ

5.3.1 Protein backbone ⓘ

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	72/78 (92%)	72 (100%)	0	0	100	100
2	B	718/783 (92%)	705 (98%)	13 (2%)	0	100	100
All	All	790/861 (92%)	777 (98%)	13 (2%)	0	100	100

There are no Ramachandran outliers to report.

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	64/67 (96%)	63 (98%)	1 (2%)	58	75
2	B	570/621 (92%)	566 (99%)	4 (1%)	81	88

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles
All	All	634/688 (92%)	629 (99%)	5 (1%)	77 87

All (5) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	44	MET
2	B	94	ASN
2	B	194	HIS
2	B	200	MET
2	B	469	ARG

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (1) such sidechains are listed below:

Mol	Chain	Res	Type
2	B	118	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 ⓘ

There are no ligands in this entry.

5.7 Other polymers ⓘ

There are no such residues in this entry.

5.8 Polymer linkage issues (i)

There are no chain breaks in this entry.