Full wwPDB EM Validation Report ⓘ

May 21, 2024 – 10:06 AM JST

PDB ID	:	8HBN
EMDB ID	:	EMD-34638
Title	:	Structure of the Mex67-Mtr2-1 heterodimer
Authors	:	Li, Z.Q.; Chen, S.J.; Sui, S.F.
Deposited on	:	2022-10-29
Resolution	:	3.81 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:

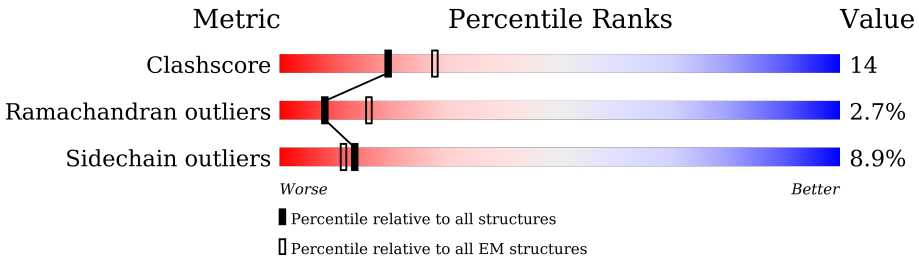
EMDB validation analysis	:	FAILED
MolProbity	:	4.02b-467
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
MapQ	:	FAILED
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.36.2

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 3.81 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	158937	4297
Ramachandran outliers	154571	4023
Sidechain outliers	154315	3826

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	599	44% 13% • • 38%
2	B	184	77% 11% • 10%

2 Entry composition (i)

There are 2 unique types of molecules in this entry. The entry contains 4189 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 mRNA export factor MEX67.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
1	A	371	2909	1848	502	549	10	0	0

- Molecule 2 is a protein called mRNA transport regulator MTR2.

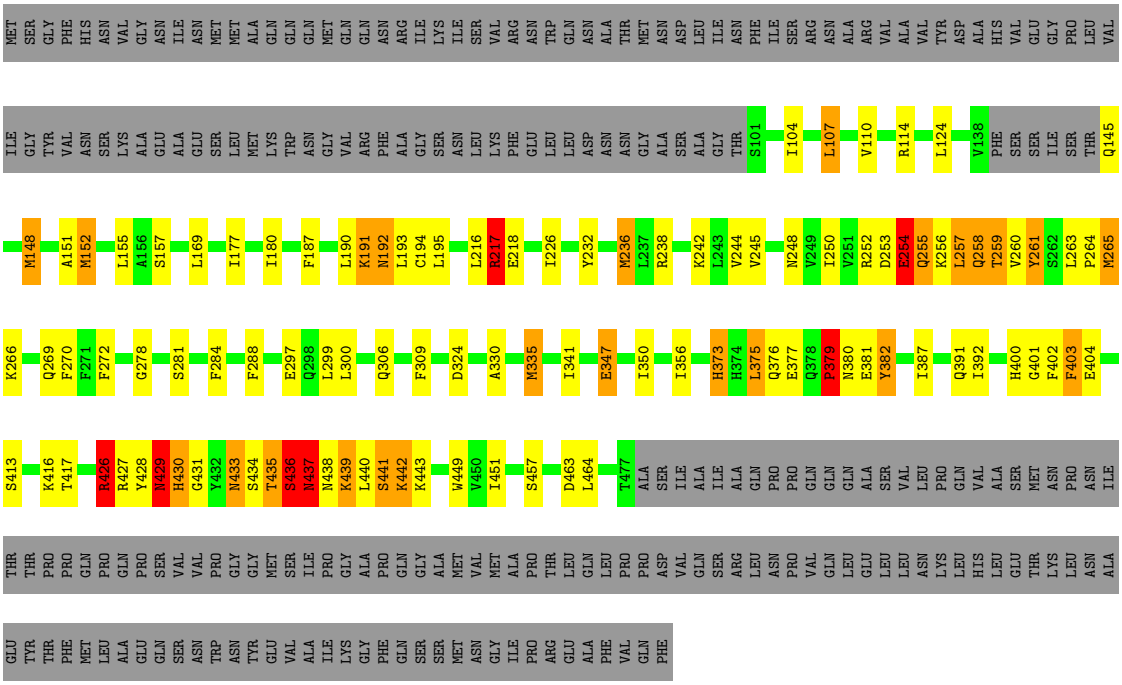
Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
2	B	165	1280	820	220	232	8	0	0

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.

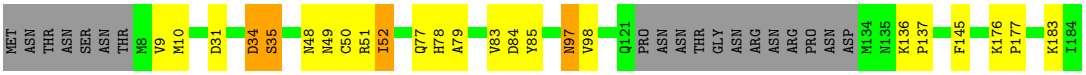
- Molecule 1: mRNA export factor MEX67

Chain A:



- Molecule 2: mRNA transport regulator MTR2

Chain B:



4 Experimental information (i)

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	86343	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)	1500	Depositor
Maximum defocus (nm)	2500	Depositor
Magnification	Not provided	
Image detector	GATAN K3 BIOQUANTUM (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	0.38	1/2966 (0.0%)	0.68	3/4020 (0.1%)
2	B	0.36	0/1309	0.62	1/1781 (0.1%)
All	All	0.37	1/4275 (0.0%)	0.66	4/5801 (0.1%)

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	441	SER	CA-CB	-5.48	1.44	1.52

All (4) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	A	379	PRO	N-CA-CB	-8.46	93.14	103.30
1	A	217	ARG	CB-CA-C	-6.82	96.75	110.40
1	A	437	ASN	CB-CA-C	-5.98	98.44	110.40
2	B	52	ILE	C-N-CA	5.35	135.08	121.70

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	2909	0	2867	103	0
2	B	1280	0	1237	18	0
All	All	4189	0	4104	117	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 14.

All (117) 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:387:ILE:HD11	2:B:51:ARG:HD3	1.60	0.80
1:A:269:GLN:HG3	1:A:270:PHE:HD1	1.47	0.79
1:A:430:HIS:HA	1:A:433:ASN:HD22	1.51	0.74
1:A:236:MET:SD	1:A:236:MET:N	2.61	0.72
1:A:217:ARG:HE	1:A:218:GLU:HB2	1.56	0.70
1:A:430:HIS:HA	1:A:433:ASN:ND2	2.07	0.70
1:A:381:GLU:O	1:A:382:TYR:CG	2.45	0.69
1:A:373:HIS:HB3	1:A:382:TYR:OH	1.93	0.68
1:A:269:GLN:HG3	1:A:270:PHE:CD1	2.29	0.67
1:A:148:MET:SD	1:A:148:MET:N	2.68	0.66
1:A:255:GLN:O	1:A:256:LYS:C	2.33	0.66
2:B:183:LYS:HE3	2:B:183:LYS:HA	1.76	0.66
1:A:255:GLN:HG2	1:A:259:THR:HG22	1.77	0.65
1:A:435:THR:O	1:A:436:SER:HB3	1.96	0.64
1:A:260:VAL:HG23	1:A:261:TYR:H	1.62	0.64
1:A:434:SER:O	1:A:435:THR:C	2.35	0.64
1:A:257:LEU:O	1:A:260:VAL:HG22	1.98	0.63
2:B:145:PHE:HE1	2:B:176:LYS:HB2	1.64	0.63
1:A:124:LEU:HD22	1:A:169:LEU:HD13	1.81	0.62
1:A:375:LEU:HA	1:A:382:TYR:HE2	1.63	0.62
1:A:257:LEU:O	1:A:259:THR:N	2.33	0.62
1:A:110:VAL:O	1:A:114:ARG:HG3	2.01	0.61
1:A:242:LYS:HA	1:A:257:LEU:HD21	1.81	0.61
2:B:50:CYS:SG	2:B:51:ARG:N	2.72	0.61
1:A:260:VAL:HG23	1:A:261:TYR:N	2.16	0.61
1:A:253:ASP:O	1:A:254:GLU:C	2.39	0.61
1:A:347:GLU:HA	1:A:350:ILE:HD12	1.82	0.61
1:A:434:SER:C	1:A:436:SER:N	2.53	0.61
1:A:429:ASN:C	1:A:431:GLY:H	2.05	0.60
2:B:145:PHE:CE1	2:B:176:LYS:HB2	2.38	0.59
1:A:152:MET:SD	1:A:152:MET:N	2.73	0.58
1:A:382:TYR:CD1	1:A:401:GLY:HA3	2.39	0.58
1:A:152:MET:O	1:A:155:LEU:N	2.38	0.57
1:A:429:ASN:O	1:A:431:GLY:N	2.37	0.57
1:A:382:TYR:HD1	1:A:401:GLY:HA3	1.70	0.57
1:A:124:LEU:HD22	1:A:169:LEU:CD1	2.35	0.56
1:A:255:GLN:O	1:A:258:GLN:N	2.38	0.56

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:191:LYS:HA	1:A:216:LEU:HA	1.88	0.55
2:B:51:ARG:HB2	2:B:51:ARG:NH1	2.22	0.54
1:A:356:ILE:HG21	2:B:9:VAL:HG21	1.88	0.54
1:A:278:GLY:O	1:A:281:SER:OG	2.25	0.53
2:B:51:ARG:HB2	2:B:51:ARG:CZ	2.38	0.53
1:A:404:GLU:HG2	1:A:442:LYS:HG3	1.91	0.53
2:B:84:ASP:OD1	2:B:85:TYR:N	2.42	0.52
1:A:190:LEU:HD23	1:A:191:LYS:N	2.25	0.52
1:A:297:GLU:O	1:A:300:LEU:HD23	2.10	0.52
1:A:254:GLU:O	1:A:257:LEU:N	2.41	0.51
1:A:341:ILE:HB	2:B:83:VAL:HG13	1.93	0.51
1:A:391:GLN:HG2	1:A:392:ILE:HG12	1.92	0.50
1:A:434:SER:O	1:A:436:SER:N	2.44	0.50
1:A:437:ASN:N	1:A:437:ASN:OD1	2.44	0.50
1:A:190:LEU:HD22	1:A:216:LEU:HD12	1.94	0.50
1:A:252:ARG:HD2	1:A:257:LEU:HD11	1.93	0.49
1:A:437:ASN:ND2	1:A:439:LYS:HB3	2.27	0.49
1:A:375:LEU:HA	1:A:382:TYR:CE2	2.47	0.48
1:A:255:GLN:C	1:A:257:LEU:N	2.64	0.48
1:A:330:ALA:O	1:A:443:LYS:NZ	2.38	0.47
1:A:253:ASP:O	1:A:253:ASP:CG	2.53	0.47
1:A:253:ASP:C	1:A:254:GLU:HG3	2.35	0.47
1:A:376:GLN:HA	1:A:376:GLN:OE1	2.14	0.47
1:A:256:LYS:O	1:A:259:THR:HG23	2.14	0.47
1:A:426:ARG:HB3	1:A:427:ARG:H	1.63	0.47
1:A:252:ARG:HD2	1:A:257:LEU:CD1	2.46	0.46
2:B:49:ASN:HD21	2:B:51:ARG:NH2	2.13	0.46
1:A:254:GLU:O	1:A:255:GLN:C	2.53	0.46
1:A:433:ASN:O	1:A:436:SER:HA	2.15	0.46
1:A:260:VAL:CG2	1:A:261:TYR:H	2.27	0.45
1:A:437:ASN:HD22	1:A:439:LYS:HB3	1.81	0.45
1:A:309:PHE:HD1	1:A:463:ASP:HB3	1.81	0.45
2:B:31:ASP:OD1	2:B:77:GLN:HA	2.17	0.45
1:A:193:LEU:HD23	1:A:194:CYS:N	2.33	0.44
1:A:377:GLU:O	1:A:379:PRO:HD3	2.17	0.44
1:A:114:ARG:HH21	1:A:124:LEU:CA	2.30	0.44
1:A:416:LYS:HG3	1:A:417:THR:HG23	1.98	0.44
1:A:437:ASN:HB2	1:A:438:ASN:H	1.24	0.44
1:A:464:LEU:HD13	2:B:97:ASN:HB2	1.99	0.44
2:B:97:ASN:HD22	2:B:98:VAL:N	2.15	0.44
1:A:379:PRO:CD	1:A:380:ASN:N	2.81	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:335:MET:HA	1:A:335:MET:HE3	2.00	0.44
1:A:260:VAL:CG2	1:A:261:TYR:N	2.80	0.44
1:A:255:GLN:O	1:A:257:LEU:N	2.51	0.43
1:A:299:LEU:H	1:A:299:LEU:HD12	1.83	0.43
1:A:347:GLU:H	1:A:347:GLU:HG2	1.36	0.43
1:A:253:ASP:OD2	1:A:256:LYS:HB2	2.18	0.43
1:A:254:GLU:O	1:A:257:LEU:HB2	2.19	0.43
1:A:193:LEU:CD2	1:A:195:LEU:HD23	2.49	0.43
1:A:226:ILE:HG22	1:A:232:TYR:CD1	2.53	0.43
1:A:264:PRO:HD2	1:A:265:MET:HE1	2.00	0.43
1:A:244:VAL:HG13	1:A:245:VAL:HG23	2.01	0.43
1:A:269:GLN:NE2	1:A:270:PHE:CE1	2.87	0.43
1:A:382:TYR:HE1	1:A:402:PHE:H	1.67	0.42
1:A:250:ILE:H	1:A:250:ILE:HD12	1.84	0.42
1:A:429:ASN:C	1:A:431:GLY:N	2.70	0.42
1:A:442:LYS:C	1:A:443:LYS:HG2	2.39	0.42
1:A:177:ILE:HG23	1:A:180:ILE:HD11	2.00	0.42
1:A:191:LYS:O	1:A:192:ASN:CB	2.68	0.42
1:A:257:LEU:C	1:A:259:THR:H	2.23	0.42
1:A:427:ARG:O	1:A:429:ASN:N	2.50	0.42
1:A:151:ALA:O	1:A:152:MET:C	2.57	0.42
1:A:377:GLU:O	1:A:379:PRO:CD	2.68	0.42
1:A:263:LEU:HA	1:A:264:PRO:HD3	1.90	0.42
2:B:34:ASP:CG	2:B:35:SER:N	2.73	0.42
1:A:284:PHE:CE2	1:A:451:ILE:HG21	2.55	0.41
1:A:254:GLU:HB2	1:A:255:GLN:H	1.38	0.41
1:A:104:ILE:HD12	1:A:107:LEU:HD13	2.02	0.41
1:A:382:TYR:HA	1:A:400:HIS:O	2.20	0.41
2:B:52:ILE:H	2:B:52:ILE:HG12	1.66	0.41
1:A:379:PRO:HD2	1:A:380:ASN:H	1.85	0.41
1:A:436:SER:O	1:A:437:ASN:CB	2.69	0.41
2:B:136:LYS:HA	2:B:137:PRO:HD2	1.95	0.41
1:A:114:ARG:HH21	1:A:124:LEU:C	2.24	0.41
1:A:236:MET:O	1:A:238:ARG:N	2.54	0.40
1:A:373:HIS:CD2	1:A:403:PHE:HB3	2.56	0.40
1:A:288:PHE:HE2	1:A:449:TRP:NE1	2.20	0.40
1:A:436:SER:O	1:A:437:ASN:HB3	2.22	0.40
2:B:145:PHE:CE1	2:B:177:PRO:HD2	2.57	0.40
1:A:341:ILE:HD13	1:A:341:ILE:HA	1.89	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	367/599 (61%)	325 (89%)	30 (8%)	12 (3%)	4 32
2	B	161/184 (88%)	150 (93%)	9 (6%)	2 (1%)	13 49
All	All	528/783 (67%)	475 (90%)	39 (7%)	14 (3%)	8 35

All (14) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	192	ASN
1	A	382	TYR
1	A	426	ARG
1	A	436	SER
1	A	437	ASN
1	A	254	GLU
1	A	258	GLN
1	A	379	PRO
1	A	429	ASN
1	A	430	HIS
2	B	79	ALA
1	A	261	TYR
1	A	428	TYR
2	B	78	HIS

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	323/538 (60%)	287 (89%)	36 (11%)	6 28
2	B	136/163 (83%)	131 (96%)	5 (4%)	34 61
All	All	459/701 (66%)	418 (91%)	41 (9%)	13 37

All (41) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	107	LEU
1	A	145	GLN
1	A	148	MET
1	A	152	MET
1	A	157	SER
1	A	187	PHE
1	A	191	LYS
1	A	217	ARG
1	A	236	MET
1	A	248	ASN
1	A	254	GLU
1	A	255	GLN
1	A	257	LEU
1	A	259	THR
1	A	265	MET
1	A	266	LYS
1	A	272	PHE
1	A	306	GLN
1	A	324	ASP
1	A	335	MET
1	A	347	GLU
1	A	373	HIS
1	A	375	LEU
1	A	379	PRO
1	A	403	PHE
1	A	413	SER
1	A	426	ARG
1	A	429	ASN
1	A	433	ASN
1	A	435	THR
1	A	436	SER
1	A	439	LYS
1	A	440	LEU
1	A	441	SER
1	A	442	LYS

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Mol	Chain	Res	Type
1	A	457	SER
2	B	10	MET
2	B	34	ASP
2	B	35	SER
2	B	48	ASN
2	B	97	ASN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (7) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	327	GLN
1	A	378	GLN
1	A	380	ASN
1	A	430	HIS
1	A	438	ASN
2	B	49	ASN
2	B	78	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 monosaccharides 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.