wwPDB EM Validation Summary Report (i)

Jul 8, 2025 – 03:04 PM JST

PDB ID	:	8KHP / pdb_00008khp
EMDB ID	:	EMD-37247
Title	:	CULLIN3-KLHL22-RBX1 E3 ligase
Authors	:	Su, M.-Y.; Su, M.-Y.
Deposited on	:	2023-08-22
Resolution	:	3.67 Å(reported)

This is a wwPDB EM Validation Summary 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 (i) 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 (i)) were used in the production of this report:

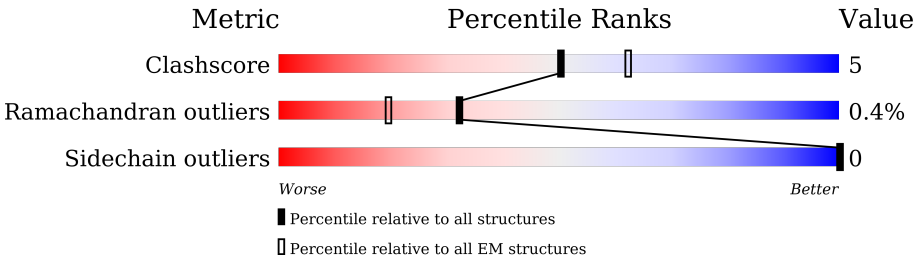
EMDB validation analysis	:	FAILED
MolProbity	:	4-5-2 with Phenix2.0rc1
Percentile statistics	:	20231227.v01 (using entries in the PDB archive December 27th 2023)
MapQ	:	FAILED
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.44

1 Overall quality at a glance (i)

The following experimental techniques were used to determine the structure:
ELECTRON MICROSCOPY

The reported resolution of this entry is 3.67 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	634	79% 10% 10%
1	B	634	81% 8% 10%
2	C	768	86% 9% 5%
2	D	768	89% • • 6%
3	E	108	47% • 52%
3	F	108	50% 6% 44%

2 Entry composition (i)

There are 3 unique types of molecules in this entry. The entry contains 16023 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 Kelch-like protein 22.

Mol	Chain	Residues	Atoms					AltConf	Trace
1	A	569	Total	C	N	O	S	0	0
			3343	2072	620	641	10		
1	B	569	Total	C	N	O	S	0	0
			3289	2029	617	634	9		

- Molecule 2 is a protein called Cullin-3.

Mol	Chain	Residues	Atoms					AltConf	Trace
2	C	730	Total	C	N	O	S	0	0
			4592	2843	859	871	19		
2	D	722	Total	C	N	O	S	0	0
			4241	2612	800	818	11		

- Molecule 3 is a protein called E3 ubiquitin-protein ligase RBX1.

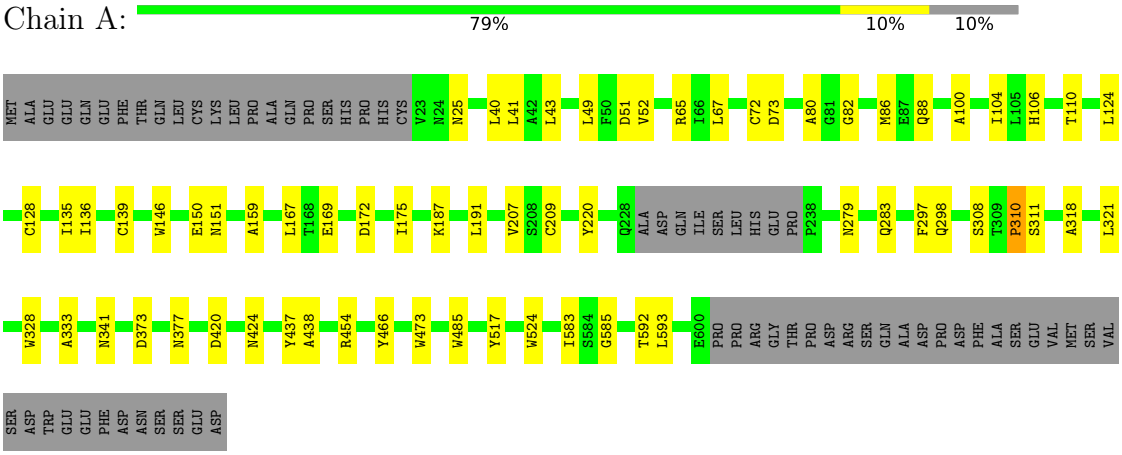
Mol	Chain	Residues	Atoms				AltConf	Trace
3	E	52	Total	C	N	O	0	0
			259	155	52	52		
3	F	60	Total	C	N	O	0	0
			299	179	60	60		

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.

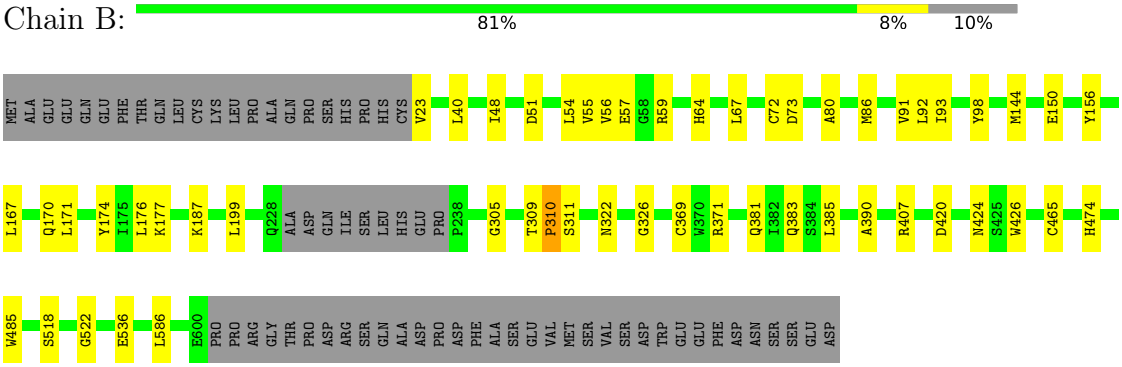
- Molecule 1: Kelch-like protein 22

Chain A:



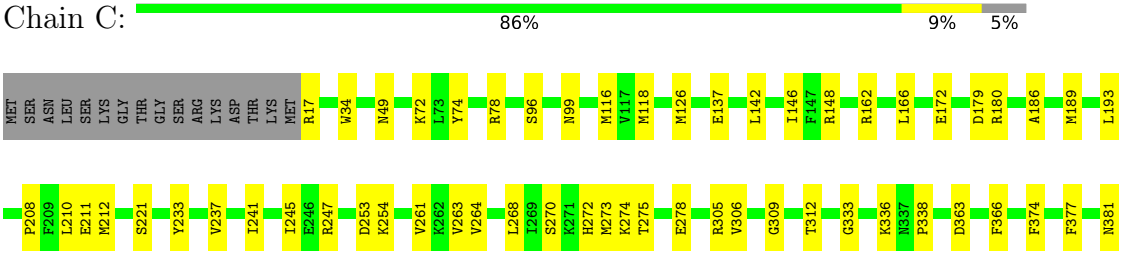
- Molecule 1: Kelch-like protein 22

Chain B:



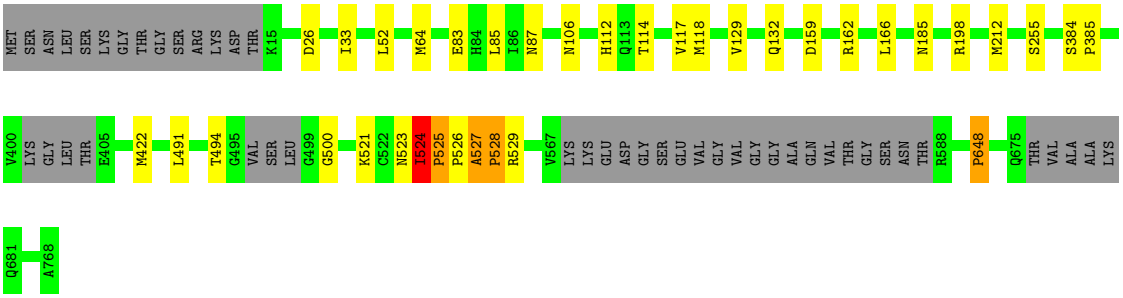
- Molecule 2: Cullin-3

Chain C:



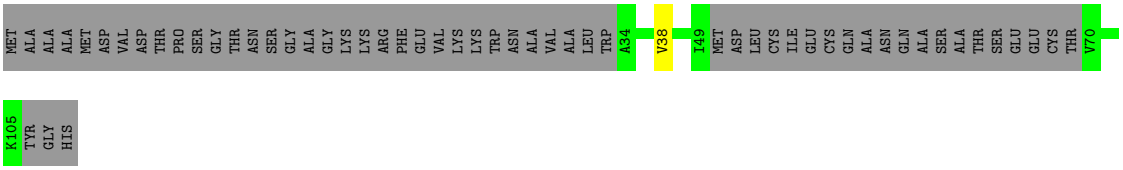
• Molecule 2: Cullin-3

Chain D:



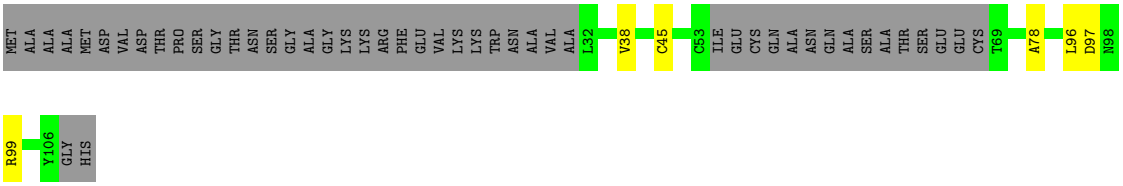
• Molecule 3: E3 ubiquitin-protein ligase RBX1

Chain E:



• Molecule 3: E3 ubiquitin-protein ligase RBX1

Chain F:



4 Experimental information (i)

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	181834	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 ($e^-/Å^2$)	1.07	Depositor
Minimum defocus (nm)	1100	Depositor
Maximum defocus (nm)	1900	Depositor
Magnification	Not provided	
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	0.13	0/3378	0.35	2/4654 (0.0%)
1	B	0.14	0/3321	0.35	2/4577 (0.0%)
2	C	0.14	0/4638	0.34	2/6360 (0.0%)
2	D	0.17	0/4271	0.49	8/5888 (0.1%)
3	E	0.11	0/257	0.36	0/356
3	F	0.12	0/297	0.37	0/412
All	All	0.15	0/16162	0.39	14/22247 (0.1%)

There are no bond length outliers.

The worst 5 of 14 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	D	524	ILE	CA-C-N	12.70	133.46	120.38
2	D	524	ILE	C-N-CA	12.70	133.46	120.38
2	D	648	PRO	CA-N-CD	-9.03	98.86	111.50
1	A	310	PRO	CA-N-CD	-9.01	98.89	111.50
1	B	310	PRO	CA-N-CD	-9.01	98.89	111.50

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	3343	0	2311	36	0
1	B	3289	0	2192	35	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	C	4592	0	3425	45	0
2	D	4241	0	2822	30	0
3	E	259	0	114	0	0
3	F	299	0	130	2	0
All	All	16023	0	10994	145	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 5.

The worst 5 of 145 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:527:ALA:HB3	2:D:528:PRO:HD3	1.50	0.94
2:D:500:GLY:H	2:D:528:PRO:CG	1.85	0.90
2:D:527:ALA:CB	2:D:528:PRO:HD3	2.03	0.88
2:C:498:LEU:CB	2:C:534:ILE:CB	2.54	0.86
2:C:648:PRO:HD3	2:C:654:GLU:CB	2.05	0.86

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	565/634 (89%)	546 (97%)	18 (3%)	1 (0%)	44 72
1	B	565/634 (89%)	552 (98%)	13 (2%)	0	100 100
2	C	726/768 (94%)	702 (97%)	22 (3%)	2 (0%)	37 67
2	D	712/768 (93%)	684 (96%)	22 (3%)	6 (1%)	16 48
3	E	48/108 (44%)	45 (94%)	2 (4%)	1 (2%)	5 32
3	F	56/108 (52%)	45 (80%)	9 (16%)	2 (4%)	3 23

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles
All	All	2672/3020 (88%)	2574 (96%)	86 (3%)	12 (0%)	32 61

5 of 12 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
2	D	524	ILE
2	D	525	PRO
2	D	526	PRO
2	D	527	ALA
2	D	523	ASN

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	158/550 (29%)	158 (100%)	0	100 100
1	B	140/550 (26%)	140 (100%)	0	100 100
2	C	279/693 (40%)	279 (100%)	0	100 100
2	D	190/693 (27%)	190 (100%)	0	100 100
All	All	767/2486 (31%)	767 (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 (4) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	106	HIS
2	C	150	GLN
2	D	133	GLN
2	D	185	ASN

5.3.3 RNA (i)

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

There are no chain breaks in this entry.