wwPDB EM Validation Summary Report

Jul 9, 2025 – 02:24 PM JST

PDB ID	:	9K25 / pdb_00009k25
EMDB ID	:	EMD-61990
Title	:	Cryo-EM structure of apo-P2Y purinoceptor 2-miniGq-Nb35 complex
Authors	:	Lan, B.; Zhang, S.; Liu, X.; Lin, B.
Deposited on	:	2024-10-17
Resolution	:	3.31 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 ⓘ 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:

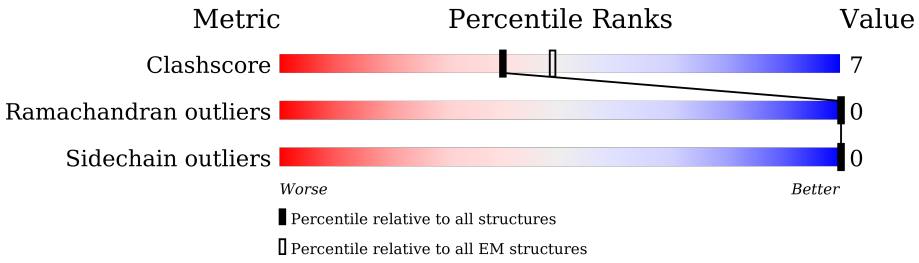
EMDB validation analysis	:	FAILED
MolProbity	:	4-5-2 with Phenix2.0rc1
Percentile statistics	:	20231227.v01 (using entries in the PDB archive December 27th 2023)
MapQ	:	FAILED
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)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

1 Overall quality at a glance (i)

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

The reported resolution of this entry is 3.31 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	243	74% 13% 13%
2	B	358	77% 13% 10%
3	G	71	48% . 48%
4	I	420	55% 11% 34%
5	N	134	82% 12% 6%

2 Entry composition (i)

There are 5 unique types of molecules in this entry. The entry contains 7117 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 Guanine nucleotide-binding protein G(s) subunit alpha isoforms short.

Mol	Chain	Residues	Atoms					AltConf	Trace
1	A	212	Total	C	N	O	S	0	0
			1634	1049	287	293	5		

- Molecule 2 is a protein called Guanine nucleotide-binding protein G(I)/G(S)/G(T) subunit beta-1.

Mol	Chain	Residues	Atoms					AltConf	Trace
2	B	323	Total	C	N	O	S	0	0
			2258	1424	398	419	17		

There are 19 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	-17	MET	-	initiating methionine	UNP P62873
B	-16	HIS	-	expression tag	UNP P62873
B	-15	HIS	-	expression tag	UNP P62873
B	-14	HIS	-	expression tag	UNP P62873
B	-13	HIS	-	expression tag	UNP P62873
B	-12	HIS	-	expression tag	UNP P62873
B	-11	HIS	-	expression tag	UNP P62873
B	-10	LEU	-	expression tag	UNP P62873
B	-9	GLU	-	expression tag	UNP P62873
B	-8	VAL	-	expression tag	UNP P62873
B	-7	LEU	-	expression tag	UNP P62873
B	-6	PHE	-	expression tag	UNP P62873
B	-5	GLN	-	expression tag	UNP P62873
B	-4	GLY	-	expression tag	UNP P62873
B	-3	PRO	-	expression tag	UNP P62873
B	-2	GLY	-	expression tag	UNP P62873
B	-1	SER	-	expression tag	UNP P62873
B	0	SER	-	expression tag	UNP P62873
B	1	GLY	-	expression tag	UNP P62873

- Molecule 3 is a protein called Guanine nucleotide-binding protein G(I)/G(S)/G(O) subunit gamma-2.

Mol	Chain	Residues	Atoms					AltConf	Trace
3	G	37	Total	C	N	O	S	0	0
			227	144	40	40	3		

- Molecule 4 is a protein called P2Y purinoceptor 2.

Mol	Chain	Residues	Atoms					AltConf	Trace
4	I	278	Total	C	N	O	S	0	0
			2107	1389	351	349	18		

There are 46 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
I	-23	MET	-	initiating methionine	UNP P41231
I	-22	LYS	-	expression tag	UNP P41231
I	-21	THR	-	expression tag	UNP P41231
I	-20	ILE	-	expression tag	UNP P41231
I	-19	ILE	-	expression tag	UNP P41231
I	-18	ALA	-	expression tag	UNP P41231
I	-17	LEU	-	expression tag	UNP P41231
I	-16	SER	-	expression tag	UNP P41231
I	-15	TYR	-	expression tag	UNP P41231
I	-14	ILE	-	expression tag	UNP P41231
I	-13	PHE	-	expression tag	UNP P41231
I	-12	CYS	-	expression tag	UNP P41231
I	-11	LEU	-	expression tag	UNP P41231
I	-10	VAL	-	expression tag	UNP P41231
I	-9	PHE	-	expression tag	UNP P41231
I	-8	ALA	-	expression tag	UNP P41231
I	-7	ASP	-	expression tag	UNP P41231
I	-6	TYR	-	expression tag	UNP P41231
I	-5	LYS	-	expression tag	UNP P41231
I	-4	ASP	-	expression tag	UNP P41231
I	-3	ASP	-	expression tag	UNP P41231
I	-2	ASP	-	expression tag	UNP P41231
I	-1	ASP	-	expression tag	UNP P41231
I	0	ALA	-	expression tag	UNP P41231
I	46	LEU	PRO	variant	UNP P41231
I	302	ASN	ASP	engineered mutation	UNP P41231
I	312	SER	ARG	variant	UNP P41231
I	378	HIS	-	expression tag	UNP P41231

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Chain	Residue	Modelled	Actual	Comment	Reference
I	379	HIS	-	expression tag	UNP P41231
I	380	HIS	-	expression tag	UNP P41231
I	381	HIS	-	expression tag	UNP P41231
I	382	HIS	-	expression tag	UNP P41231
I	383	HIS	-	expression tag	UNP P41231
I	384	GLY	-	expression tag	UNP P41231
I	385	GLY	-	expression tag	UNP P41231
I	386	SER	-	expression tag	UNP P41231
I	387	GLY	-	expression tag	UNP P41231
I	388	GLY	-	expression tag	UNP P41231
I	389	LEU	-	expression tag	UNP P41231
I	390	GLU	-	expression tag	UNP P41231
I	391	VAL	-	expression tag	UNP P41231
I	392	LEU	-	expression tag	UNP P41231
I	393	PHE	-	expression tag	UNP P41231
I	394	GLN	-	expression tag	UNP P41231
I	395	GLY	-	expression tag	UNP P41231
I	396	PRO	-	expression tag	UNP P41231

- Molecule 5 is a protein called Nanobody 35.

Mol	Chain	Residues	Atoms					AltConf	Trace
5	N	126	Total	C	N	O	S	0	0
			891	562	156	168	5		

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: Guanine nucleotide-binding protein G(s) subunit alpha isoforms short

Chain A:

• Molecule 2: Guanine nucleotide-binding protein G(I)/G(S)/G(T) subunit beta-1

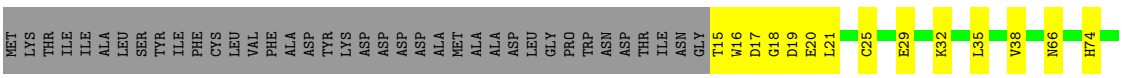
Chain B:

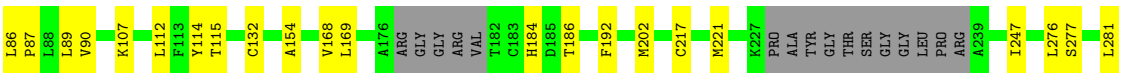
• Molecule 3: Guanine nucleotide-binding protein G(I)/G(S)/G(O) subunit gamma-2

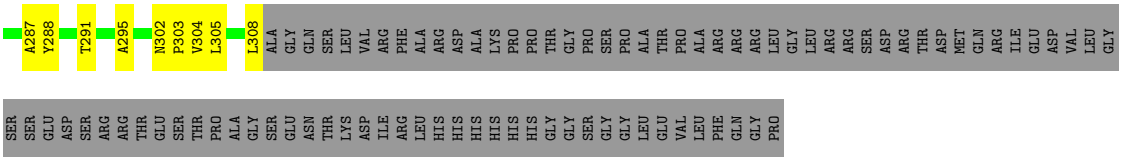
Chain G:

• Molecule 4: P2Y purinoceptor 2

Chain I:

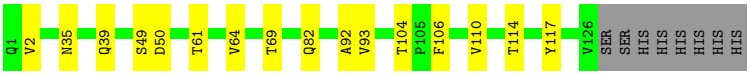






• Molecule 5: Nanobody 35

Chain N:



4 Experimental information (i)

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	211545	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 ($e^-/Å^2$)	50	Depositor
Minimum defocus (nm)	1200	Depositor
Maximum defocus (nm)	1600	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	0.14	0/1666	0.28	0/2262
2	B	0.16	0/2301	0.33	0/3145
3	G	0.13	0/229	0.28	0/315
4	I	0.25	0/2160	0.45	0/2957
5	N	0.18	0/912	0.39	0/1247
All	All	0.19	0/7268	0.37	0/9926

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	1634	0	1526	20	0
2	B	2258	0	2065	32	0
3	G	227	0	187	3	0
4	I	2107	0	2073	35	0
5	N	891	0	792	11	0
All	All	7117	0	6643	95	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.

The worst 5 of 95 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)
4:I:276:LEU:HA	4:I:281:LEU:HD11	1.38	1.05
2:B:104:ALA:HB3	2:B:113:ALA:HB3	1.55	0.88
4:I:277:SER:O	4:I:281:LEU:HG	1.77	0.84
4:I:276:LEU:CA	4:I:281:LEU:HD11	2.11	0.80
1:A:231:ARG:NH2	1:A:272:ASP:OD2	2.24	0.70

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	204/243 (84%)	198 (97%)	6 (3%)	0	100	100
2	B	319/358 (89%)	300 (94%)	19 (6%)	0	100	100
3	G	35/71 (49%)	35 (100%)	0	0	100	100
4	I	272/420 (65%)	262 (96%)	10 (4%)	0	100	100
5	N	124/134 (92%)	115 (93%)	9 (7%)	0	100	100
All	All	954/1226 (78%)	910 (95%)	44 (5%)	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	160/213 (75%)	160 (100%)	0	100	100

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
2	B	208/298 (70%)	208 (100%)	0	100	100
3	G	14/58 (24%)	14 (100%)	0	100	100
4	I	212/354 (60%)	212 (100%)	0	100	100
5	N	81/112 (72%)	81 (100%)	0	100	100
All	All	675/1035 (65%)	675 (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	392	ASN
2	B	119	ASN
4	I	262	HIS
4	I	302	ASN

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.