



Full wwPDB EM Validation Report ⓘ

Jul 15, 2025 – 11:13 AM JST

PDB ID : 8Z6T / pdb_00008z6t
EMDB ID : EMD-39804
Title : Structure of XBB.1.16 RBD in complex with antibody CYFN1006-1.
Authors : Wang, Y.J.; Sun, L.
Deposited on : 2024-04-19
Resolution : 2.92 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 Phenix2.0rc1
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

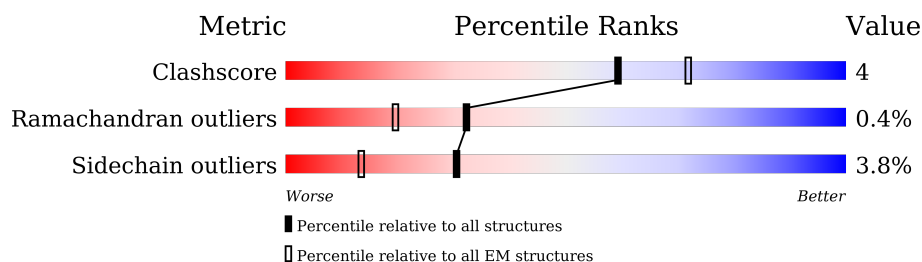
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

ELECTRON MICROSCOPY

The reported resolution of this entry is 2.92 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	A	1299	
2	C	215	
3	B	451	

2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 4526 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 Spike glycoprotein,Fibritin,Expression Tag.

Mol	Chain	Residues	Atoms					AltConf	Trace
1	A	196	Total	C	N	O	S	0	0
			1558	1004	263	283	8		

There are 81 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-6	MET	-	initiating methionine	UNP P0DTC2
A	-5	PRO	-	expression tag	UNP P0DTC2
A	-4	MET	-	expression tag	UNP P0DTC2
A	-3	GLY	-	expression tag	UNP P0DTC2
A	-2	SER	-	expression tag	UNP P0DTC2
A	-1	LEU	-	expression tag	UNP P0DTC2
A	0	GLN	-	expression tag	UNP P0DTC2
A	1	PRO	-	expression tag	UNP P0DTC2
A	2	LEU	-	expression tag	UNP P0DTC2
A	3	ALA	-	expression tag	UNP P0DTC2
A	4	THR	-	expression tag	UNP P0DTC2
A	5	LEU	-	expression tag	UNP P0DTC2
A	6	TYR	-	expression tag	UNP P0DTC2
A	7	LEU	-	expression tag	UNP P0DTC2
A	8	LEU	-	expression tag	UNP P0DTC2
A	9	GLY	-	expression tag	UNP P0DTC2
A	10	MET	-	expression tag	UNP P0DTC2
A	11	LEU	-	expression tag	UNP P0DTC2
A	12	VAL	-	expression tag	UNP P0DTC2
A	13	ALA	-	expression tag	UNP P0DTC2
A	14	SER	-	expression tag	UNP P0DTC2
A	15	VAL	-	expression tag	UNP P0DTC2
A	16	LEU	-	expression tag	UNP P0DTC2
A	17	ALA	-	expression tag	UNP P0DTC2
A	23	ILE	THR	variant	UNP P0DTC2
A	?	-	LEU	deletion	UNP P0DTC2
A	?	-	PRO	deletion	UNP P0DTC2
A	?	-	PRO	deletion	UNP P0DTC2

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Chain	Residue	Modelled	Actual	Comment	Reference
A	28	SER	ALA	variant	UNP P0DTC2
A	84	ALA	VAL	variant	UNP P0DTC2
A	143	ASP	GLY	variant	UNP P0DTC2
A	?	-	TYR	deletion	UNP P0DTC2
A	146	GLN	HIS	variant	UNP P0DTC2
A	180	VAL	GLU	variant	UNP P0DTC2
A	183	GLU	GLN	variant	UNP P0DTC2
A	213	GLU	VAL	variant	UNP P0DTC2
A	252	VAL	GLY	variant	UNP P0DTC2
A	339	HIS	GLY	variant	UNP P0DTC2
A	346	THR	ARG	variant	UNP P0DTC2
A	368	ILE	LEU	variant	UNP P0DTC2
A	371	PHE	SER	variant	UNP P0DTC2
A	373	PRO	SER	variant	UNP P0DTC2
A	375	PHE	SER	variant	UNP P0DTC2
A	376	ALA	THR	variant	UNP P0DTC2
A	405	ASN	ASP	variant	UNP P0DTC2
A	408	SER	ARG	variant	UNP P0DTC2
A	417	ASN	LYS	variant	UNP P0DTC2
A	440	LYS	ASN	variant	UNP P0DTC2
A	445	PRO	VAL	variant	UNP P0DTC2
A	446	SER	GLY	variant	UNP P0DTC2
A	460	LYS	ASN	variant	UNP P0DTC2
A	477	ASN	SER	variant	UNP P0DTC2
A	478	ARG	THR	conflict	UNP P0DTC2
A	484	ALA	GLU	variant	UNP P0DTC2
A	486	PRO	PHE	variant	UNP P0DTC2
A	490	SER	PHE	variant	UNP P0DTC2
A	498	ARG	GLN	variant	UNP P0DTC2
A	501	TYR	ASN	variant	UNP P0DTC2
A	505	HIS	TYR	variant	UNP P0DTC2
A	614	GLY	ASP	variant	UNP P0DTC2
A	655	TYR	HIS	variant	UNP P0DTC2
A	679	LYS	ASN	variant	UNP P0DTC2
A	681	HIS	PRO	variant	UNP P0DTC2
A	682	GLY	ARG	conflict	UNP P0DTC2
A	683	SER	ARG	conflict	UNP P0DTC2
A	685	SER	-	insertion	UNP P0DTC2
A	686	SER	-	insertion	UNP P0DTC2
A	687	LYS	-	insertion	UNP P0DTC2
A	689	SER	-	insertion	UNP P0DTC2
A	768	LYS	ASN	conflict	UNP P0DTC2

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Chain	Residue	Modelled	Actual	Comment	Reference
A	800	TYR	ASP	conflict	UNP P0DTC2
A	821	PRO	PHE	conflict	UNP P0DTC2
A	896	PRO	ALA	conflict	UNP P0DTC2
A	903	PRO	ALA	conflict	UNP P0DTC2
A	946	PRO	ALA	conflict	UNP P0DTC2
A	958	HIS	GLN	variant	UNP P0DTC2
A	973	LYS	ASN	variant	UNP P0DTC2
A	990	PRO	LYS	conflict	UNP P0DTC2
A	991	PRO	VAL	conflict	UNP P0DTC2
A	1213	GLY	-	linker	UNP P0DTC2
A	1214	SER	-	linker	UNP P0DTC2

- Molecule 2 is a protein called CYFN1006-1 lighth chain.

Mol	Chain	Residues	Atoms					AltConf	Trace
2	C	191	Total	C	N	O	S	0	0
			1424	892	236	289	7		

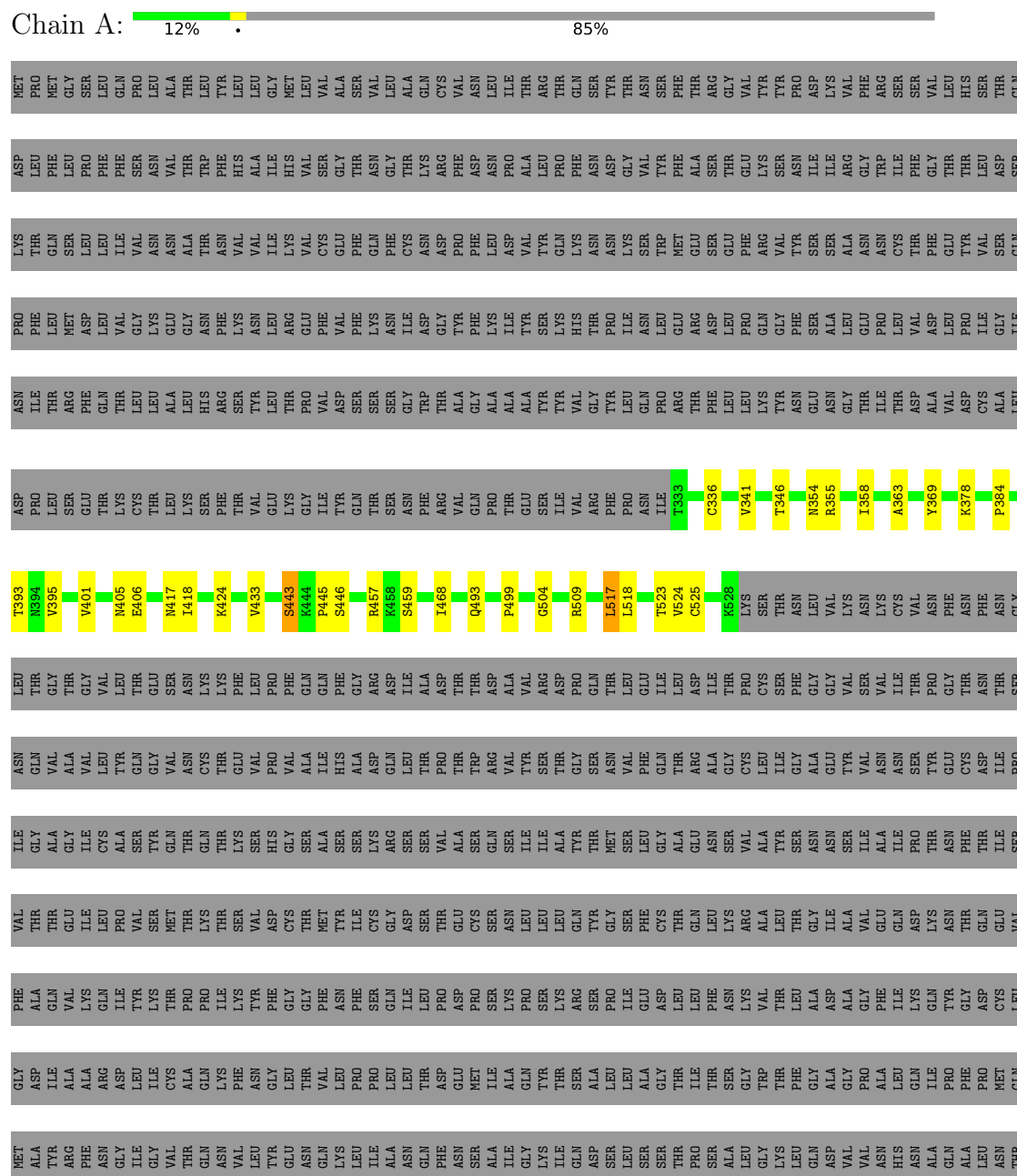
- Molecule 3 is a protein called CYFN1006-1 heavy chain.

Mol	Chain	Residues	Atoms					AltConf	Trace
3	B	202	Total	C	N	O	S	0	0
			1544	992	251	293	8		

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: Spike glycoprotein,Fibritin,Expression Tag



4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	936842	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 ($e^-/\text{\AA}^2$)	50	Depositor
Minimum defocus (nm)	1200	Depositor
Maximum defocus (nm)	2200	Depositor
Magnification	Not provided	
Image detector	FEI FALCON IV (4k 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	A	0.42	1/1607 (0.1%)	0.43	1/2190 (0.0%)
2	C	0.20	0/1455	0.37	0/1979
3	B	0.29	0/1584	0.31	0/2151
All	All	0.32	1/4646 (0.0%)	0.38	1/6320 (0.0%)

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	443	SER	CA-C	-5.75	1.47	1.53

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	443	SER	CB-CA-C	-5.37	104.78	111.43

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	A	1558	0	1486	16	0
2	C	1424	0	1370	12	0
3	B	1544	0	1519	15	0
All	All	4526	0	4375	39	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 (39) 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:C:186:SER:OG	2:C:194:ALA:N	2.20	0.73
3:B:43:ARG:NH1	3:B:45:MET:SD	2.64	0.71
2:C:56:ASP:O	2:C:66:LYS:N	2.23	0.70
2:C:115:ARG:NH2	3:B:67:TYR:O	2.26	0.68
2:C:126:VAL:O	2:C:161:TYR:OH	2.20	0.59
3:B:75:GLN:N	3:B:75:GLN:OE1	2.35	0.59
1:A:401:VAL:HG22	1:A:509:ARG:HG2	1.85	0.59
3:B:215:HIS:ND1	3:B:218:SER:OG	2.22	0.58
1:A:369:TYR:OH	1:A:384:PRO:O	2.23	0.56
3:B:39:ILE:HD13	3:B:40:GLY:N	2.20	0.56
2:C:6:GLN:HE22	2:C:103:TYR:HA	1.71	0.55
1:A:405:ASN:N	1:A:504:GLY:O	2.40	0.54
1:A:417:ASN:OD1	1:A:418:ILE:N	2.42	0.53
1:A:363:ALA:N	1:A:525:CYS:O	2.39	0.53
1:A:358:ILE:HB	1:A:395:VAL:HG13	1.92	0.52
2:C:167:VAL:HG13	2:C:216:VAL:HG22	1.91	0.52
2:C:56:ASP:O	2:C:65:SER:N	2.43	0.51
2:C:52:LEU:HD22	3:B:114:LEU:HD11	1.95	0.48
2:C:169:TRP:NE1	2:C:180:VAL:HG21	2.29	0.48
3:B:99:THR:O	3:B:99:THR:HG23	2.14	0.47
1:A:493:GLN:OE1	1:A:493:GLN:N	2.48	0.46
1:A:457:ARG:NH2	1:A:459:SER:OG	2.50	0.45
2:C:52:LEU:CD2	3:B:114:LEU:HD11	2.47	0.45
3:B:163:GLU:N	3:B:164:PRO:CD	2.80	0.45
3:B:43:ARG:NH1	3:B:97:SER:O	2.50	0.45
3:B:114:LEU:C	3:B:114:LEU:HD13	2.43	0.43
1:A:378:LYS:O	1:A:433:VAL:HG22	2.19	0.43
1:A:445:PRO:HG3	1:A:499:PRO:HG3	2.01	0.43
1:A:393:THR:O	1:A:523:THR:OG1	2.28	0.43
1:A:341:VAL:HG12	2:C:30:VAL:HG21	2.00	0.42
1:A:354:ASN:OD1	1:A:355:ARG:N	2.53	0.42
1:A:358:ILE:HG22	1:A:524:VAL:HG11	2.00	0.42
3:B:215:HIS:CE1	3:B:218:SER:HG	2.25	0.42
2:C:170:LYS:HA	2:C:170:LYS:HD2	1.62	0.42
3:B:12:VAL:O	3:B:12:VAL:HG13	2.20	0.41
1:A:517:LEU:HD12	1:A:517:LEU:O	2.20	0.41
3:B:163:GLU:N	3:B:164:PRO:HD2	2.36	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:518:LEU:HD23	1:A:518:LEU:N	2.36	0.41
3:B:163:GLU:O	3:B:165:VAL:N	2.53	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	194/1299 (15%)	184 (95%)	9 (5%)	1 (0%)	25	55
2	C	181/215 (84%)	172 (95%)	9 (5%)	0	100	100
3	B	194/451 (43%)	181 (93%)	12 (6%)	1 (0%)	25	55
All	All	569/1965 (29%)	537 (94%)	30 (5%)	2 (0%)	32	59

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
3	B	107	GLN
1	A	446	SER

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	169/1122 (15%)	162 (96%)	7 (4%)	26	58

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
2	C	162/181 (90%)	153 (94%)	9 (6%)	17	46
3	B	171/399 (43%)	168 (98%)	3 (2%)	54	81
All	All	502/1702 (30%)	483 (96%)	19 (4%)	30	61

All (19) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	336	CYS
1	A	346	THR
1	A	406	GLU
1	A	424	LYS
1	A	443	SER
1	A	468	ILE
1	A	517	LEU
2	C	5	THR
2	C	6	GLN
2	C	8	ARG
2	C	77	SER
2	C	79	SER
2	C	80	LYS
2	C	166	THR
2	C	167	VAL
2	C	170	LYS
3	B	21	ILE
3	B	39	ILE
3	B	106	ARG

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	394	ASN
1	A	474	GLN
2	C	6	GLN
3	B	107	GLN

5.3.3 RNA ⓘ

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.