Full wwPDB EM Validation Report

Jul 7, 2025 – 06:55 PM JST

PDB ID	:	8YWE / pdb_00008ywe
EMDB ID	:	EMD-39630
Title	:	Local refinement of SARS-CoV-2 Omicron BA.2.86 S complexed with Abs G7-Fc
Authors	:	Ma, Y.; Liu, Q.; Rehati, P.; Zhang, Z.
Deposited on	:	2024-03-31
Resolution	:	2.69 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:

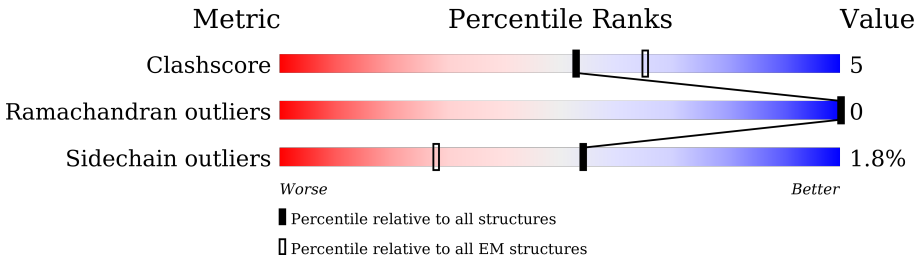
EMDB validation analysis	:	FAILED
MolProbity	:	4-5-2 with Phenix2.0rc1
Percentile statistics	:	20231227.v01 (using entries in the PDB archive December 27th 2023)
MapQ	:	FAILED
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)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

1 Overall quality at a glance (i)

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

The reported resolution of this entry is 2.69 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	222	82% 7% 10%
2	B	251	84% 10% 6%
3	C	260	76% 18% • 5%

2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 5271 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 protein S1.

Mol	Chain	Residues	Atoms					AltConf	Trace
1	A	199	Total	C	N	O	S	0	0
			1599	1036	269	286	8		

There are 26 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	332	VAL	ILE	conflict	UNP P0DTC2
A	339	HIS	GLY	variant	UNP P0DTC2
A	356	THR	LYS	conflict	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	403	LYS	ARG	conflict	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	HIS	VAL	conflict	UNP P0DTC2
A	446	SER	GLY	variant	UNP P0DTC2
A	450	ASP	ASN	conflict	UNP P0DTC2
A	452	TRP	LEU	conflict	UNP P0DTC2
A	460	LYS	ASN	variant	UNP P0DTC2
A	477	ASN	SER	variant	UNP P0DTC2
A	478	LYS	THR	variant	UNP P0DTC2
A	481	LYS	ASN	conflict	UNP P0DTC2
A	?	-	VAL	deletion	UNP P0DTC2
A	484	LYS	GLU	variant	UNP P0DTC2
A	486	PRO	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

- Molecule 2 is a protein called GW01 scFv.

Mol	Chain	Residues	Atoms					AltConf	Trace
2	B	235	Total	C	N	O	S	0	0
			1765	1096	302	360	7		

- Molecule 3 is a protein called 7F3 scFv.

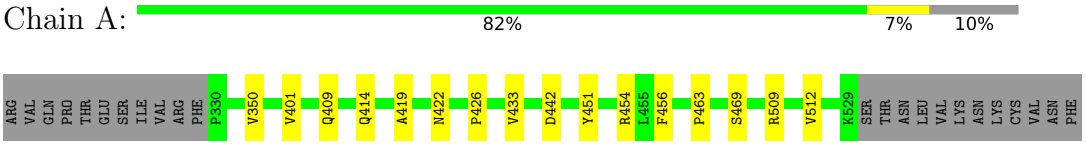
Mol	Chain	Residues	Atoms					AltConf	Trace
3	C	247	Total	C	N	O	S	0	0
			1907	1205	322	373	7		

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.

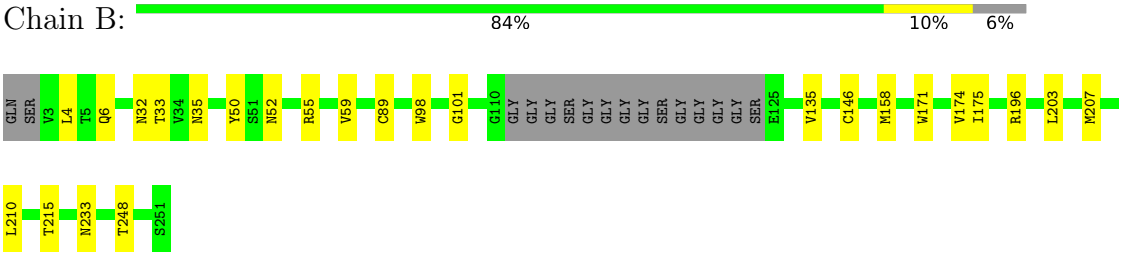
- Molecule 1: Spike protein S1

Chain A:



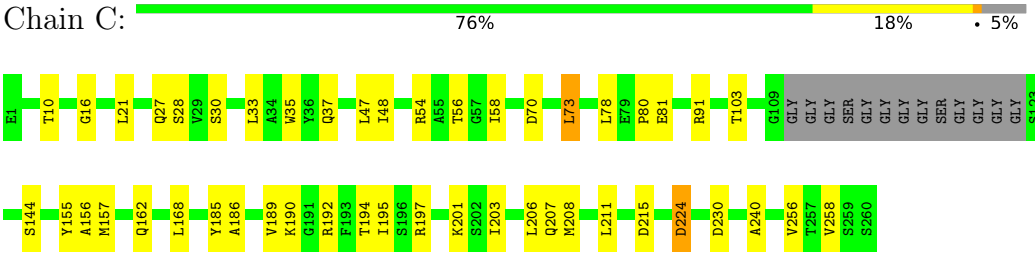
- Molecule 2: GW01 scFv

Chain B:



- Molecule 3: 7F3 scFv

Chain C:



4 Experimental information (i)

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	647576	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 ($e^-/Å^2$)	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

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	0.09	0/1652	0.25	0/2247
2	B	0.08	0/1806	0.25	0/2453
3	C	0.25	1/1952 (0.1%)	0.36	1/2646 (0.0%)
All	All	0.17	1/5410 (0.0%)	0.29	1/7346 (0.0%)

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	C	27	GLN	C-O	-6.28	1.15	1.23

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
3	C	28	SER	N-CA-C	6.01	117.81	109.15

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	1599	0	1529	10	0
2	B	1765	0	1659	16	0
3	C	1907	0	1838	27	0
All	All	5271	0	5026	52	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.

All (52) 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:422:ASN:HD21	1:A:454:ARG:H	1.31	0.79
1:A:409:GLN:HA	1:A:414:GLN:HG2	1.78	0.64
3:C:155:TYR:O	3:C:197:ARG:NH1	2.31	0.63
3:C:144:SER:HB2	3:C:203:ILE:HD11	1.81	0.63
2:B:32:ASN:HD22	2:B:233:ASN:HB2	1.66	0.60
3:C:192:ARG:NH1	3:C:215:ASP:OD2	2.37	0.58
2:B:4:LEU:HB2	2:B:101:GLY:HA2	1.86	0.58
3:C:16:GLY:HA2	3:C:78:LEU:HA	1.88	0.56
3:C:208:MET:HB3	3:C:211:LEU:HD21	1.88	0.56
1:A:409:GLN:HB3	1:A:419:ALA:HB2	1.87	0.55
1:A:442:ASP:HB3	1:A:451:TYR:HE2	1.71	0.55
2:B:146:CYS:HB3	2:B:203:LEU:HB3	1.89	0.55
3:C:16:GLY:N	3:C:78:LEU:O	2.40	0.54
3:C:54:ARG:HB2	3:C:58:ILE:HD11	1.88	0.54
2:B:207:MET:HB3	2:B:210:LEU:HD21	1.90	0.54
3:C:56:THR:HG21	3:C:240:ALA:HA	1.89	0.53
3:C:185:TYR:HB3	3:C:189:VAL:HG23	1.92	0.51
3:C:162:GLN:HB2	3:C:168:LEU:HD23	1.92	0.50
3:C:201:LYS:HG3	3:C:203:ILE:HG22	1.93	0.50
3:C:21:LEU:HD22	3:C:103:THR:HG21	1.93	0.50
2:B:98:TRP:HB3	2:B:171:TRP:CG	2.46	0.50
3:C:37:GLN:HB2	3:C:47:LEU:HD11	1.95	0.48
2:B:135:VAL:HG22	2:B:248:THR:HB	1.96	0.48
1:A:454:ARG:NH1	1:A:469:SER:O	2.46	0.48
3:C:208:MET:HE1	3:C:256:VAL:HG11	1.96	0.47
2:B:35:ASN:HD22	2:B:50:TYR:HA	1.79	0.47
2:B:158:MET:HG2	2:B:196:ARG:HH11	1.79	0.47
1:A:456:PHE:HB2	3:C:230:ASP:HB3	1.96	0.47
1:A:433:VAL:HG12	1:A:512:VAL:HG22	1.97	0.46
1:A:426:PRO:HG3	1:A:463:PRO:HB3	1.99	0.45
2:B:175:ILE:HD13	2:B:196:ARG:HG2	1.99	0.45
2:B:33:THR:HG1	2:B:52:ASN:CG	2.21	0.45
2:B:55:ARG:HG2	2:B:59:VAL:HB	1.98	0.45
2:B:171:TRP:HZ2	2:B:174:VAL:HG12	1.82	0.44
3:C:136:LYS:HB2	3:C:139:ARG:HD2	1.99	0.44
3:C:194:THR:HB	3:C:207:GLN:HB3	1.99	0.44
2:B:6:GLN:OE1	2:B:89:CYS:N	2.49	0.44

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:401:VAL:HG12	1:A:509:ARG:HG2	2.00	0.43
3:C:70:ASP:OD1	3:C:70:ASP:N	2.49	0.43
3:C:157:MET:HG2	3:C:197:ARG:HH22	1.83	0.43
2:B:89:CYS:O	2:B:101:GLY:N	2.52	0.43
3:C:186:ALA:O	3:C:190:LYS:HG3	2.19	0.43
2:B:215:THR:HG23	2:B:248:THR:HA	2.00	0.43
3:C:78:LEU:HG	3:C:80:PRO:HD3	2.00	0.43
3:C:185:TYR:HE1	3:C:195:ILE:HG13	1.84	0.43
1:A:350:VAL:HG22	1:A:422:ASN:HB3	2.01	0.43
2:B:158:MET:HB3	2:B:203:LEU:HD22	2.02	0.42
3:C:48:ILE:HD13	3:C:54:ARG:HA	2.02	0.41
3:C:156:ALA:HB3	3:C:224:ASP:HB3	2.02	0.41
3:C:136:LYS:HE2	3:C:136:LYS:HB3	1.93	0.40
3:C:35:TRP:CE3	3:C:73:LEU:HD12	2.56	0.40
3:C:230:ASP:N	3:C:230:ASP:OD1	2.54	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	197/222 (89%)	194 (98%)	3 (2%)	0	100	100
2	B	231/251 (92%)	225 (97%)	6 (3%)	0	100	100
3	C	243/260 (94%)	233 (96%)	10 (4%)	0	100	100
All	All	671/733 (92%)	652 (97%)	19 (3%)	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	173/196 (88%)	173 (100%)	0	100 100
2	B	192/197 (98%)	192 (100%)	0	100 100
3	C	201/203 (99%)	191 (95%)	10 (5%)	20 46
All	All	566/596 (95%)	556 (98%)	10 (2%)	54 80

All (10) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
3	C	10	THR
3	C	30	SER
3	C	33	LEU
3	C	73	LEU
3	C	81	GLU
3	C	91	ARG
3	C	139	ARG
3	C	206	LEU
3	C	224	ASP
3	C	258	VAL

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (17) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	422	ASN
1	A	487	ASN
1	A	505	HIS
2	B	16	GLN
2	B	32	ASN
2	B	35	ASN
2	B	38	GLN
2	B	97	ASN
2	B	127	GLN
2	B	156	HIS
2	B	206	GLN

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type
2	B	208	ASN
2	B	243	GLN
3	C	27	GLN
3	C	37	GLN
3	C	42	GLN
3	C	93	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.