Full wwPDB X-ray Structure Validation Report ⓘ

Jun 9, 2025 – 04:05 PM EDT

PDB ID	:	9C7X / pdb_00009c7x
Title	:	Crystal structure of SARS-CoV-2 antibody 1H06 in complex with a HR2 peptide
Authors	:	Van Wazer, D.J.; Zhou, T.; Kwong, P.D.
Deposited on	:	2024-06-11
Resolution	:	1.96 Å(reported)

This is a Full wwPDB X-ray Structure 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/XrayValidationReportHelp
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:

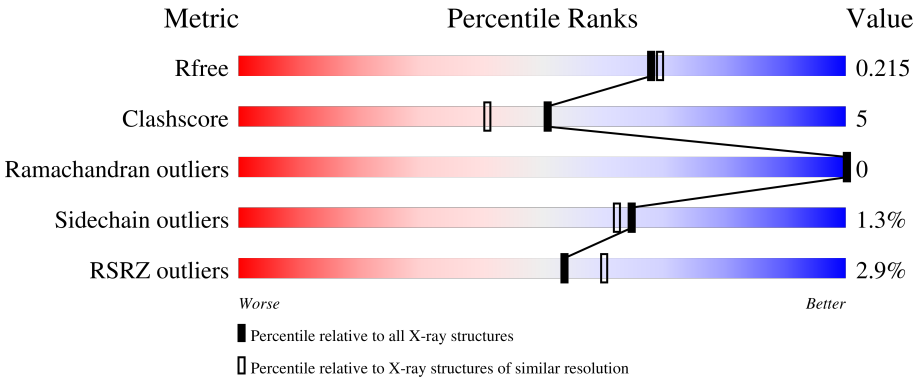
MolProbity	:	4-5-2 with Phenix2.0rc1
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	2.0rc1
EDS	:	3.0
Percentile statistics	:	20231227.v01 (using entries in the PDB archive December 27th 2023)
CCP4	:	9.0.006 (Gargrove)
Density-Fitness	:	1.0.12
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.43.1

1 Overall quality at a glance (i)

The following experimental techniques were used to determine the structure:
X-RAY DIFFRACTION

The reported resolution of this entry is 1.96 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)	Similar resolution (#Entries, resolution range(Å))
R_{free}	164625	3187 (1.96-1.96)
Clashscore	180529	3412 (1.96-1.96)
Ramachandran outliers	177936	3390 (1.96-1.96)
Sidechain outliers	177891	3390 (1.96-1.96)
RSRZ outliers	164620	3186 (1.96-1.96)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments of the lower 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% The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density. The numeric value is given above the bar.

Mol	Chain	Length	Quality of chain
1	A	216	3% 88% 12%
2	B	219	% 88% 11%
3	C	20	20% 85% 15%

2 Entry composition

There are 4 unique types of molecules in this entry. The entry contains 3819 atoms, of which 0 are hydrogens and 0 are deuteriums.

In the tables below, the ZeroOcc column contains the number of atoms modelled with zero occupancy, 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 Heavy Chain of SARS-CoV-2 antibody 1H06.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	216	Total	C	N	O	S	0	0	0
			1616	1023	265	321	7			

- Molecule 2 is a protein called Light Chain of SARS-CoV-2 antibody 1H06.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	219	Total	C	N	O	S	0	0	0
			1701	1065	287	342	7			

- Molecule 3 is a protein called Spike protein S2'.

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
3	C	20	Total	C	N	O	0	0	0
			158	97	28	33			

There is a discrepancy between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
C	1178	ACE	-	acetylation	UNP P0DTC2

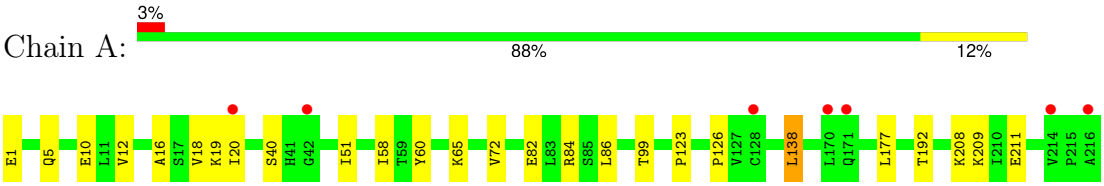
- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	157	Total	O	0	0
			157	157		
4	B	174	Total	O	0	0
			174	174		
4	C	13	Total	O	0	0
			13	13		

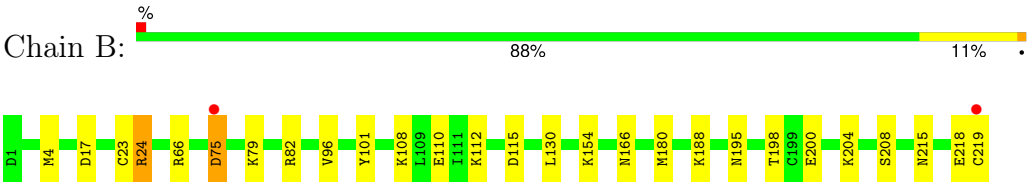
3 Residue-property plots (i)

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 and electron density. 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. A red dot above a residue indicates a poor fit to the electron density (RSRZ > 2). 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.

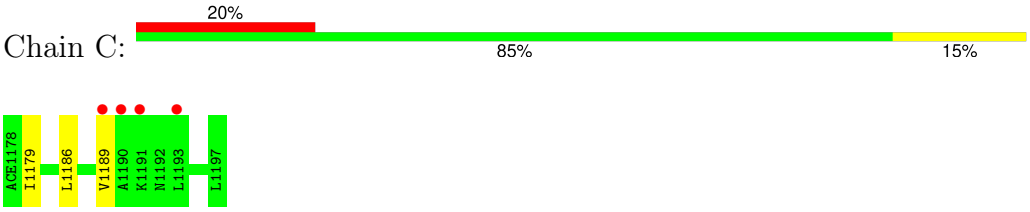
• Molecule 1: Heavy Chain of SARS-CoV-2 antibody 1H06



• Molecule 2: Light Chain of SARS-CoV-2 antibody 1H06



• Molecule 3: Spike protein S2'



4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 21 21 2	Depositor
Cell constants a, b, c, α, β, γ	59.98Å 142.50Å 54.26Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	45.89 – 1.96 45.89 – 1.96	Depositor EDS
% Data completeness (in resolution range)	96.8 (45.89-1.96) 92.4 (45.89-1.96)	Depositor EDS
R_{merge}	0.11	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	2.45 (at 1.95Å)	Xtriage
Refinement program	PHENIX (1.20.1_4487: ???)	Depositor
R, R_{free}	0.172 , 0.215 0.172 , 0.215	Depositor DCC
R_{free} test set	31247 reflections (5.95%)	wwPDB-VP
Wilson B-factor (Å^2)	23.4	Xtriage
Anisotropy	0.179	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.34 , 44.6	EDS
L-test for twinning[2]	$< \|L\| > = 0.48$, $< L^2 > = 0.31$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.96	EDS
Total number of atoms	3819	wwPDB-VP
Average B, all atoms (Å^2)	31.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.54% of the height of the origin peak. No significant pseudotranslation is detected.*

[1] Intensities estimated from amplitudes.

[2] Theoretical values of $< |L| >$, $< L^2 >$ for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

5 Model quality

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: ACE

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	0.39	0/1657	0.62	0/2267
2	B	0.43	0/1740	0.69	2/2361 (0.1%)
3	C	0.44	0/155	0.61	0/207
All	All	0.42	0/3552	0.66	2/4835 (0.0%)

There are no bond length outliers.

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	B	75	ASP	CB-CA-C	-5.87	100.41	110.22
2	B	24	ARG	CG-CD-NE	5.29	123.64	112.00

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	1616	0	1585	16	0
2	B	1701	0	1644	18	0
3	C	158	0	164	2	0
4	A	157	0	0	1	3
4	B	174	0	0	4	3
4	C	13	0	0	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
All	All	3819	0	3393	35	3

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 (35) 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:1:GLU:OE2	1:A:1:GLU:N	2.09	0.84
2:B:204:LYS:NZ	4:B:302:HOH:O	2.16	0.78
2:B:115:ASP:OD2	2:B:204:LYS:HE2	1.91	0.70
1:A:192:THR:HG23	1:A:209:LYS:HD2	1.75	0.69
2:B:166:ASN:HB3	2:B:180:MET:HE1	1.81	0.62
1:A:60:TYR:HB2	1:A:65:LYS:HE3	1.86	0.57
2:B:17:ASP:OD2	4:B:303:HOH:O	2.17	0.57
1:A:19:LYS:HG3	1:A:82:GLU:HB2	1.86	0.56
1:A:5:GLN:HG3	4:A:305:HOH:O	2.07	0.53
1:A:82:GLU:CD	1:A:84:ARG:HH12	2.18	0.51
3:C:1186:LEU:O	3:C:1189:VAL:HG12	2.10	0.51
1:A:99:THR:HA	3:C:1179:ILE:HD11	1.92	0.51
2:B:4:MET:HE3	2:B:23:CYS:SG	2.52	0.50
1:A:16:ALA:O	1:A:86:LEU:HD12	2.11	0.49
1:A:123:PRO:HD3	1:A:208:LYS:HD2	1.95	0.49
1:A:126:PRO:HD3	1:A:138:LEU:HD12	1.96	0.47
2:B:154:LYS:HE3	2:B:200:GLU:OE2	2.14	0.47
1:A:51:ILE:HD13	1:A:72:VAL:HG13	1.97	0.46
2:B:154:LYS:HB2	2:B:198:THR:HB	1.97	0.46
2:B:130:LEU:O	2:B:188:LYS:HD3	2.16	0.46
1:A:10:GLU:HG3	1:A:20:ILE:HD11	1.98	0.45
2:B:108:LYS:HG2	2:B:110:GLU:HG2	1.99	0.44
2:B:66:ARG:HD2	2:B:82:ARG:O	2.18	0.43
2:B:24:ARG:NE	2:B:75:ASP:OD1	2.52	0.43
2:B:79:LYS:NZ	4:B:306:HOH:O	2.49	0.43
2:B:215:ASN:O	2:B:218:GLU:HG2	2.18	0.42
2:B:112:LYS:HB3	2:B:112:LYS:HE2	1.73	0.42
1:A:58:ILE:HG21	1:A:60:TYR:CE2	2.55	0.42
2:B:180:MET:HE3	2:B:180:MET:HB2	1.90	0.42
2:B:96:VAL:HA	2:B:101:TYR:CD1	2.55	0.41
1:A:209:LYS:HG2	1:A:211:GLU:HG2	2.02	0.41
2:B:154:LYS:NZ	4:B:308:HOH:O	2.53	0.41
1:A:12:VAL:HG11	1:A:18:VAL:HB	2.02	0.40

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:195:ASN:ND2	2:B:215:ASN:HB3	2.36	0.40
1:A:84:ARG:HH11	1:A:84:ARG:HG2	1.87	0.40

All (3) symmetry-related close contacts are listed below. The label for Atom-2 includes the symmetry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
4:A:430:HOH:O	4:B:377:HOH:O[1_554]	2.07	0.13
4:A:425:HOH:O	4:B:378:HOH:O[4_554]	2.14	0.06
4:A:435:HOH:O	4:B:395:HOH:O[1_554]	2.19	0.01

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 X-ray entries followed by that with respect to entries of similar resolution.

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	214/216 (99%)	212 (99%)	2 (1%)	0	100	100
2	B	217/219 (99%)	211 (97%)	6 (3%)	0	100	100
3	C	18/20 (90%)	18 (100%)	0	0	100	100
All	All	449/455 (99%)	441 (98%)	8 (2%)	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 X-ray entries followed by that with respect to entries of similar resolution.

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	183/183 (100%)	180 (98%)	3 (2%)	58 55
2	B	198/198 (100%)	196 (99%)	2 (1%)	73 72
3	C	18/18 (100%)	18 (100%)	0	100 100
All	All	399/399 (100%)	394 (99%)	5 (1%)	65 62

All (5) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	40	SER
1	A	138	LEU
1	A	177	LEU
2	B	208	SER
2	B	219	CYS

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	39	GLN
1	A	171	GLN
1	A	191	GLN
2	B	43	GLN
2	B	58	ASN
2	B	142	ASN
3	C	1187	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.

6 Fit of model and data

6.1 Protein, DNA and RNA chains

In the following table, the column labelled '#RSRZ> 2' contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 95^{th} percentile and maximum values of the occupancy-weighted average B-factor per residue. The column labelled 'Q< 0.9' lists the number of (and percentage) of residues with an average occupancy less than 0.9.

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2	OWAB(Å^2)	Q<0.9
1	A	216/216 (100%)	-0.04	7 (3%) 50 57	18, 30, 52, 76	0
2	B	219/219 (100%)	-0.20	2 (0%) 81 84	16, 27, 48, 76	0
3	C	19/20 (95%)	0.69	4 (21%) 3 3	20, 41, 59, 59	0
All	All	454/455 (99%)	-0.09	13 (2%) 54 60	16, 29, 52, 76	0

All (13) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	216	ALA	4.5
2	B	219	CYS	3.3
1	A	170	LEU	2.9
3	C	1191	LYS	2.7
3	C	1193	LEU	2.7
1	A	214	VAL	2.6
3	C	1189	VAL	2.5
1	A	128	CYS	2.3
2	B	75	ASP	2.2
1	A	20	ILE	2.2
1	A	42	GLY	2.1
3	C	1190	ALA	2.0
1	A	171	GLN	2.0

6.2 Non-standard residues in protein, DNA, RNA chains

There are no non-standard protein/DNA/RNA residues in this entry.

6.3 Carbohydrates

There are no monosaccharides in this entry.

6.4 Ligands

There are no ligands in this entry.

6.5 Other polymers

There are no such residues in this entry.