



# wwPDB X-ray Structure Validation Summary Report ⓘ

Aug 26, 2024 – 01:43 PM JST

PDB ID : 9IY2  
Title : Immune complex of HEV-E2s, nAb 8C11 and nAb 8H3  
Authors : Minghua, Z.; Lizhi, Z.; Ying, G.; Shaowei, L.  
Deposited on : 2024-07-29  
Resolution : 3.48 Å(reported)

This is a wwPDB X-ray Structure Validation Summary Report for a publicly released PDB entry.

We welcome your comments at [validation@mail.wwpdb.org](mailto: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>.

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The following versions of software and data (see [references ⓘ](#)) were used in the production of this report:

MolProbity : 4.02b-467  
Xtriage (Phenix) : 1.13  
EDS : 3.0  
Percentile statistics : 20231227.v01 (using entries in the PDB archive December 27th 2023)  
CCP4 : 9.0.002 (Gargrove)  
Density-Fitness : 1.0.11  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.38.2

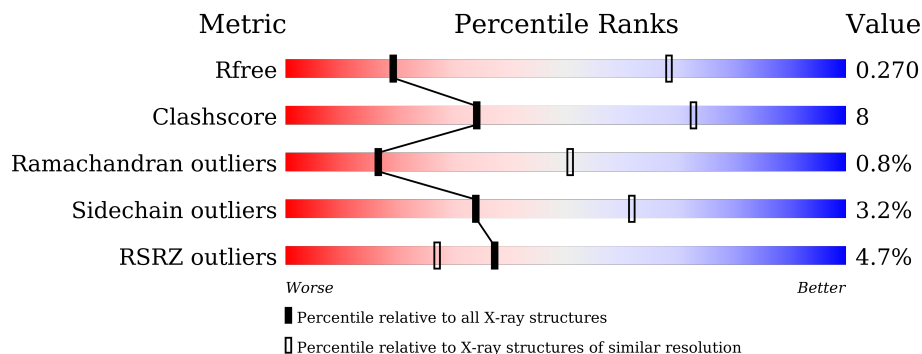
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 3.48 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.



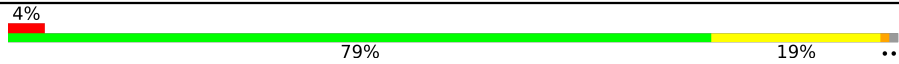
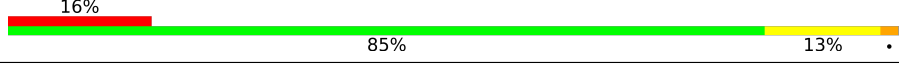
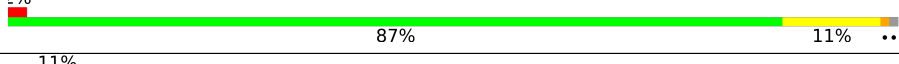
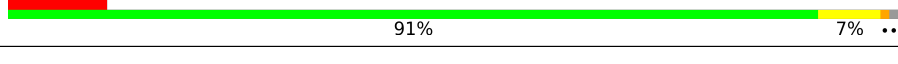
Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
$R_{free}$	164625	1099 (3.54-3.42)
Clashscore	180529	1048 (3.52-3.44)
Ramachandran outliers	177936	1033 (3.52-3.44)
Sidechain outliers	177891	1034 (3.52-3.44)
RSRZ outliers	164620	1098 (3.54-3.42)

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  $\geq 3$ , 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  $\leq 5\%$ . 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	214	 % 56% 12% 32%
1	B	214	 60% 7% 32%
2	D	230	 % 72% 21% 5%
2	H	230	 2% 73% 20% 5%
3	C	214	 4% 66% 31% .
3	L	214	 2% 71% 25% .

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Mol	Chain	Length	Quality of chain
4	E	221	 4% 79% 19% ..
4	G	221	 16% 85% 13% ..
5	F	219	 2% 87% 11% ..
5	I	219	 11% 91% 7% ..

## 2 Entry composition [i](#)

There are 5 unique types of molecules in this entry. The entry contains 15430 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 Secreted protein ORF2.

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
			Total	C	N	O			
1	A	146	1096	697	185	214	0	0	0
1	B	145	1090	694	184	212	0	0	0

There are 10 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	393	MET	-	initiating methionine	UNP P33426
A	532	HIS	TYR	conflict	UNP P33426
A	604	PRO	-	expression tag	UNP P33426
A	605	PRO	-	expression tag	UNP P33426
A	606	ARG	-	expression tag	UNP P33426
B	393	MET	-	initiating methionine	UNP P33426
B	532	HIS	TYR	conflict	UNP P33426
B	604	PRO	-	expression tag	UNP P33426
B	605	PRO	-	expression tag	UNP P33426
B	606	ARG	-	expression tag	UNP P33426

- Molecule 2 is a protein called Heavy Chain of mAb 8C11.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
2	H	218	1637	1044	267	320	6	0	0	0
2	D	218	1637	1044	267	320	6	0	0	0

- Molecule 3 is a protein called Light Chain of mAb 8C11.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
3	L	213	1656	1034	278	338	6	0	0	0

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Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
3	C	213	1656	1034	278	338	6	0	0	0

- Molecule 4 is a protein called Heavy Chain of mAb 8H3.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
4	E	219	1644	1040	271	325	8	0	0	0
4	G	219	1644	1040	271	325	8	0	0	0

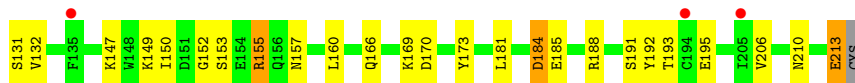
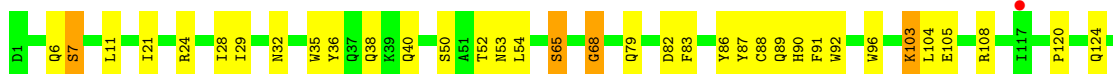
- Molecule 5 is a protein called Light Chain of mAb 8H3.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
5	F	217	1685	1051	282	344	8	0	0	0
5	I	217	1685	1051	282	344	8	0	0	0





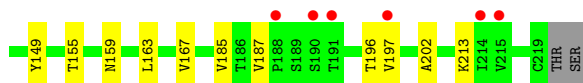
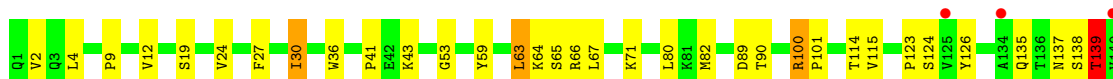
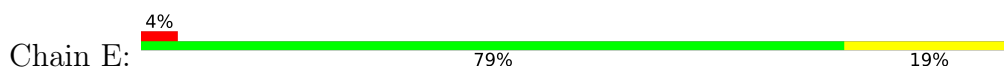
- Molecule 3: Light Chain of mAb 8C11



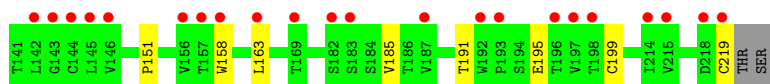
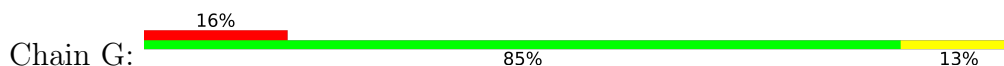
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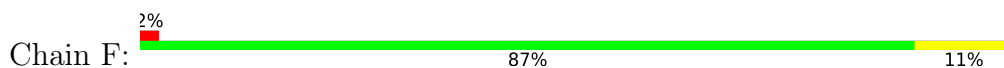
- Molecule 4: Heavy Chain of mAb 8H3



- Molecule 4: Heavy Chain of mAb 8H3

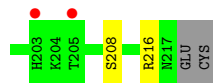
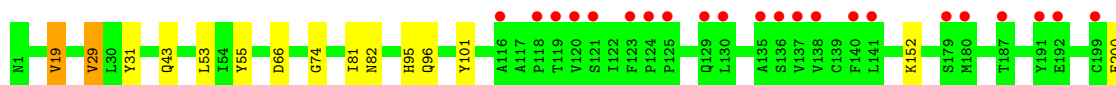
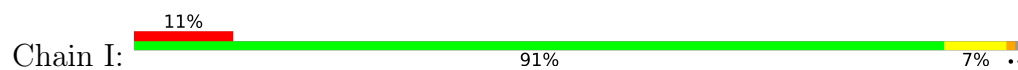


- Molecule 5: Light Chain of mAb 8H3





- Molecule 5: Light Chain of mAb 8H3





## 4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	71.47Å 248.94Å 76.84Å 90.00° 94.07° 90.00°	Depositor
Resolution (Å)	36.65 – 3.48 36.65 – 3.48	Depositor EDS
% Data completeness (in resolution range)	93.4 (36.65-3.48) 93.3 (36.65-3.48)	Depositor EDS
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	2.63 (at 3.48Å)	Xtrriage
Refinement program	PHENIX 1.9_1692	Depositor
R, $R_{free}$	0.223 , 0.269 0.226 , 0.270	Depositor DCC
$R_{free}$ test set	1654 reflections (4.81%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	72.4	Xtrriage
Anisotropy	0.692	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.32 , 33.4	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.47$ , $\langle L^2 \rangle = 0.30$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
$F_o, F_c$ correlation	0.88	EDS
Total number of atoms	15430	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	88.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.88% of the height of the origin peak. No significant pseudotranslation is detected.*

<sup>1</sup>Intensities estimated from amplitudes.

<sup>2</sup>Theoretical values of  $\langle |L| \rangle$ ,  $\langle L^2 \rangle$  for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

## 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	0.51	0/1122	0.82	0/1540
1	B	0.51	0/1116	0.82	0/1532
2	D	0.42	0/1680	0.60	0/2299
2	H	0.41	0/1680	0.59	0/2299
3	C	0.50	0/1695	0.92	3/2302 (0.1%)
3	L	0.43	0/1695	0.85	0/2302
4	E	0.52	0/1687	0.87	5/2311 (0.2%)
4	G	0.44	0/1687	0.76	3/2311 (0.1%)
5	F	0.44	0/1723	0.70	0/2338
5	I	0.41	0/1723	0.66	0/2338
All	All	0.46	0/15808	0.76	11/21572 (0.1%)

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand. A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
1	A	0	1

There are no bond length outliers.

The worst 5 of 11 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	E	138	SER	N-CA-C	-7.96	89.51	111.00
3	C	160	LEU	CB-CG-CD1	7.94	124.50	111.00
4	E	137	ASN	N-CA-CB	6.28	121.91	110.60
4	E	63	LEU	CA-CB-CG	-5.72	102.15	115.30
4	G	63	LEU	CA-CB-CG	-5.67	102.25	115.30

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	482	GLN	Sidechain

## 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	1096	0	1085	21	0
1	B	1090	0	1080	14	0
2	D	1637	0	1630	34	0
2	H	1637	0	1630	34	0
3	C	1656	0	1576	43	0
3	L	1656	0	1576	40	0
4	E	1644	0	1618	29	0
4	G	1644	0	1618	24	0
5	F	1685	0	1617	14	0
5	I	1685	0	1617	9	0
All	All	15430	0	15047	229	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 8.

The worst 5 of 229 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)
3:C:38:GLN:HE22	2:D:41:GLN:HE22	1.13	0.88
1:A:529:ILE:HD12	4:G:30:ILE:HD12	1.55	0.88
3:C:195:GLU:HG2	3:C:206:VAL:HG22	1.54	0.87
1:A:552:THR:HB	4:E:100:ARG:HB2	1.57	0.84
3:L:195:GLU:HG2	3:L:206:VAL:HG22	1.64	0.80

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 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	144/214 (67%)	138 (96%)	5 (4%)	1 (1%)	19	53
1	B	143/214 (67%)	137 (96%)	5 (4%)	1 (1%)	19	53
2	D	214/230 (93%)	195 (91%)	16 (8%)	3 (1%)	9	40
2	H	214/230 (93%)	192 (90%)	19 (9%)	3 (1%)	9	40
3	C	211/214 (99%)	205 (97%)	5 (2%)	1 (0%)	25	59
3	L	211/214 (99%)	203 (96%)	7 (3%)	1 (0%)	25	59
4	E	217/221 (98%)	213 (98%)	2 (1%)	2 (1%)	14	48
4	G	217/221 (98%)	213 (98%)	2 (1%)	2 (1%)	14	48
5	F	215/219 (98%)	206 (96%)	8 (4%)	1 (0%)	25	59
5	I	215/219 (98%)	206 (96%)	8 (4%)	1 (0%)	25	59
All	All	2001/2196 (91%)	1908 (95%)	77 (4%)	16 (1%)	16	51

5 of 16 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
2	H	75	THR
2	H	182	GLN
4	E	64	LYS
4	E	100	ARG
4	G	64	LYS

### 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	119/180 (66%)	116 (98%)	3 (2%)	42	68
1	B	118/180 (66%)	117 (99%)	1 (1%)	79	87
2	D	189/199 (95%)	184 (97%)	5 (3%)	41	66
2	H	189/199 (95%)	180 (95%)	9 (5%)	21	51
3	C	188/189 (100%)	174 (93%)	14 (7%)	11	36
3	L	188/189 (100%)	177 (94%)	11 (6%)	16	44
4	E	190/192 (99%)	188 (99%)	2 (1%)	70	82
4	G	190/192 (99%)	189 (100%)	1 (0%)	86	92
5	F	193/195 (99%)	188 (97%)	5 (3%)	41	66
5	I	193/195 (99%)	188 (97%)	5 (3%)	41	66
All	All	1757/1910 (92%)	1701 (97%)	56 (3%)	34	62

5 of 56 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
3	C	94	ASN
5	I	216	ARG
3	C	187	GLU
5	I	208	SER
5	F	216	ARG

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 31 such sidechains are listed below:

Mol	Chain	Res	Type
1	B	508	GLN
2	D	13	GLN
3	C	38	GLN
5	I	35	GLN
3	C	189	HIS

### 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 [i](#)

### 6.1 Protein, DNA and RNA chains [i](#)

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<sup>th</sup> 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 <sup>2</sup> )	Q<0.9
1	A	146/214 (68%)	0.10	2 (1%) 73 53	47, 59, 74, 87	0
1	B	145/214 (67%)	-0.09	0 100 100	45, 57, 68, 77	0
2	D	218/230 (94%)	0.17	3 (1%) 73 53	50, 67, 116, 130	0
2	H	218/230 (94%)	0.26	5 (2%) 61 43	51, 66, 122, 134	0
3	C	213/214 (99%)	0.35	8 (3%) 44 31	53, 83, 114, 122	0
3	L	213/214 (99%)	0.44	4 (1%) 66 47	57, 97, 151, 162	0
4	E	219/221 (99%)	0.45	9 (4%) 42 29	53, 78, 136, 162	0
4	G	219/221 (99%)	0.87	36 (16%) 5 5	57, 79, 179, 208	0
5	F	217/219 (99%)	0.48	5 (2%) 61 43	54, 82, 162, 173	0
5	I	217/219 (99%)	0.75	24 (11%) 12 9	51, 92, 212, 251	0
All	All	2025/2196 (92%)	0.41	96 (4%) 37 27	45, 74, 163, 251	0

The worst 5 of 96 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
4	G	182	SER	5.5
5	I	137	VAL	5.4
4	G	129	ALA	5.4
4	G	183	SER	4.7
4	G	192	TRP	4.5

### 6.2 Non-standard residues in protein, DNA, RNA chains [i](#)

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

### 6.3 Carbohydrates [i](#)

There are no monosaccharides in this entry.

### 6.4 Ligands [i](#)

There are no ligands in this entry.

### 6.5 Other polymers [i](#)

There are no such residues in this entry.