



wwPDB X-ray Structure Validation Summary Report ⓘ

Mar 1, 2026 – 11:22 AM UTC

PDB ID : 3C2A / pdb_00003c2a
Title : Antibody Fab fragment 447-52D in complex with UG1033 peptide
Authors : Dhillon, A.K.; Stanfield, R.L.; Wilson, I.A.
Deposited on : 2008-01-24
Resolution : 2.10 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

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 Phenix2.0
Xtrriage (Phenix) : 2.0
EDS : 3.0
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4 : 9.0.010 (Gargrove)
Density-Fitness : 1.0.12
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.49

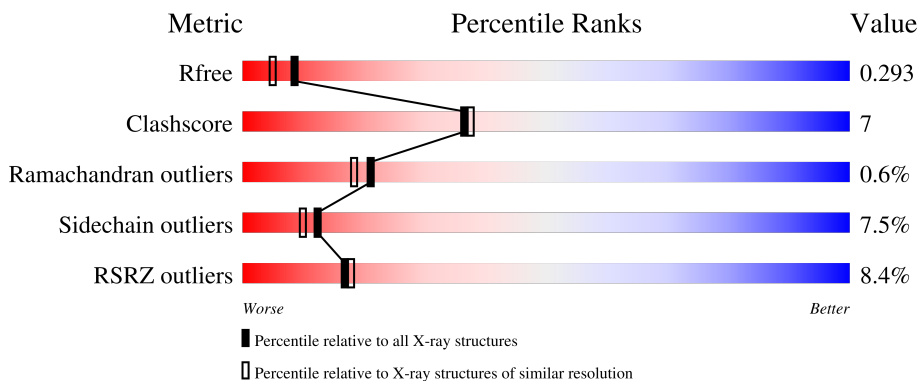
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.10 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}	180053	6658 (2.10-2.10)
Clashscore	190562	7164 (2.10-2.10)
Ramachandran outliers	187476	7099 (2.10-2.10)
Sidechain outliers	187428	7100 (2.10-2.10)
RSRZ outliers	180081	6662 (2.10-2.10)

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 $\leq 5\%$. 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	L	216	
1	M	216	
2	H	231	
2	I	231	
3	P	13	

Continued on next page...

Continued from previous page...

Mol	Chain	Length	Quality of chain
3	Q	13	 <p>A horizontal bar chart representing the quality of chain. The bar is divided into three segments: a green segment on the left labeled '46%', a red segment in the middle labeled '38%', and a yellow segment on the right labeled '15%'. Above the bar, the text '62%' is centered, indicating the total percentage of green and red segments.</p>

2 Entry composition [i](#)

There are 4 unique types of molecules in this entry. The entry contains 7071 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 Fab 447-52D light chain.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	L	216	Total 1603	C 1007	N 266	O 325	S 5	0	0	0
1	M	216	Total 1603	C 1007	N 266	O 325	S 5	0	0	0

- Molecule 2 is a protein called Fab 447-52D heavy chain.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
2	H	231	Total 1739	C 1095	N 291	O 345	S 8	0	0	0
2	I	231	Total 1739	C 1095	N 291	O 345	S 8	0	0	0

- Molecule 3 is a protein called Envelope glycoprotein.

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
			Total	C	N	O			
3	P	13	Total 100	C 66	N 19	O 15	2	0	0
3	Q	13	Total 100	C 66	N 19	O 15	2	0	0

- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	L	64	Total 64	O 64	0	0
4	H	63	Total 63	O 63	0	0
4	P	2	Total 2	O 2	0	0
4	M	24	Total 24	O 24	0	0

Continued on next page...

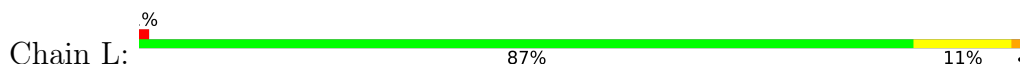
Continued from previous page...

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	I	33	Total 33	O 33	0	0
4	Q	1	Total 1	O 1	0	0

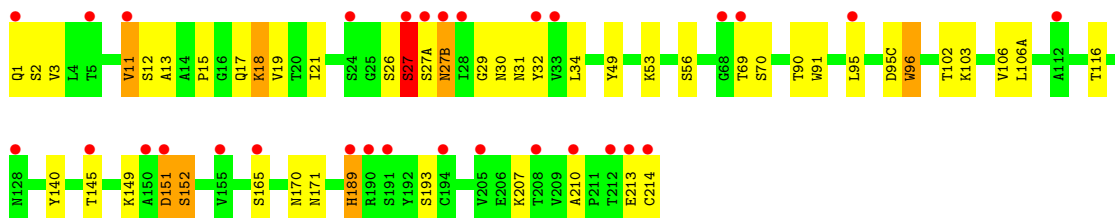
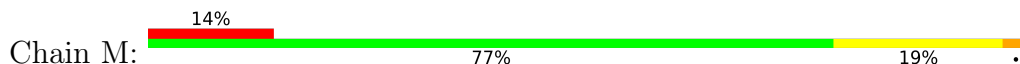
3 Residue-property plots [i](#)

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.

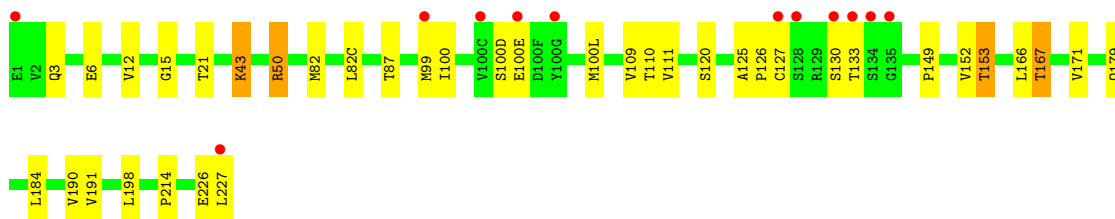
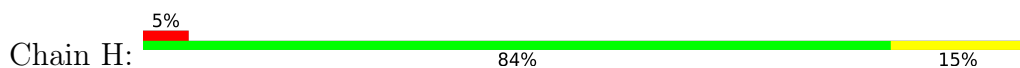
- Molecule 1: Fab 447-52D light chain



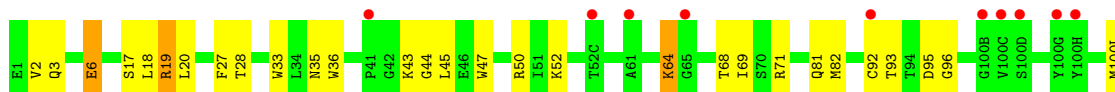
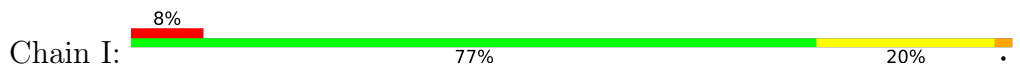
- Molecule 1: Fab 447-52D light chain

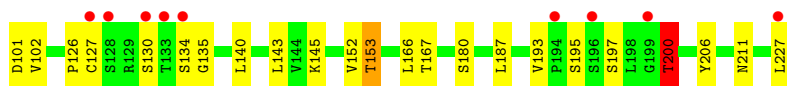


- Molecule 2: Fab 447-52D heavy chain

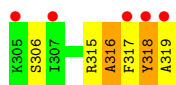
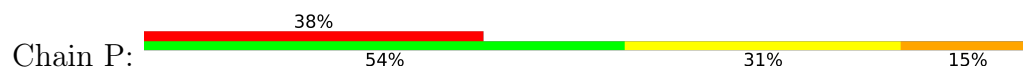


- Molecule 2: Fab 447-52D heavy chain

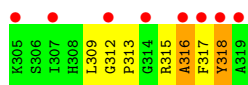




- Molecule 3: Envelope glycoprotein



- Molecule 3: Envelope glycoprotein



4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	70.25Å 76.48Å 114.13Å 90.00° 101.49° 90.00°	Depositor
Resolution (Å)	50.00 – 2.10 50.00 – 2.10	Depositor EDS
% Data completeness (in resolution range)	85.7 (50.00-2.10) 85.7 (50.00-2.10)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	0.08	Depositor
$\langle I/\sigma(I) \rangle$ ¹	3.93 (at 2.08Å)	Xtrriage
Refinement program	REFMAC 5.2.0005	Depositor
R, R_{free}	0.240 , 0.298 0.242 , 0.293	Depositor DCC
R_{free} test set	1432 reflections (2.02%)	wwPDB-VP
Wilson B-factor (Å ²)	28.0	Xtrriage
Anisotropy	0.277	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.36 , 45.1	EDS
L-test for twinning ²	$\langle L \rangle = 0.47$, $\langle L^2 \rangle = 0.30$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
F_o, F_c correlation	0.93	EDS
Total number of atoms	7071	wwPDB-VP
Average B, all atoms (Å ²)	40.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 7.90% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

²Theoretical 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	L	1.01	1/1644 (0.1%)	1.01	3/2247 (0.1%)
1	M	1.01	9/1644 (0.5%)	0.97	5/2247 (0.2%)
2	H	0.96	0/1778	1.03	4/2421 (0.2%)
2	I	0.83	2/1778 (0.1%)	0.94	2/2421 (0.1%)
3	P	2.89	2/103 (1.9%)	3.04	3/137 (2.2%)
3	Q	1.37	2/103 (1.9%)	1.46	4/137 (2.9%)
All	All	1.02	16/7050 (0.2%)	1.05	21/9610 (0.2%)

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
3	P	0	2
3	Q	0	2
All	All	0	4

The worst 5 of 16 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	P	318	TYR	C-O	24.26	1.54	1.23
3	P	316	ALA	C-O	14.29	1.42	1.24
3	Q	318	TYR	C-O	11.35	1.38	1.23
1	M	26	SER	CB-OG	9.17	1.60	1.42
1	M	189	HIS	CE1-NE2	8.42	1.41	1.32

The worst 5 of 21 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	P	318	TYR	O-C-N	-25.19	94.73	122.94
3	P	318	TYR	CA-C-O	-22.00	95.76	121.72
2	H	198	LEU	N-CA-C	10.96	123.22	111.28

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	H	167	THR	N-CA-C	-7.94	105.57	114.62
3	Q	318	TYR	CA-C-O	-7.20	113.72	121.56

There are no chirality outliers.

All (4) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
3	P	316	ALA	Mainchain
3	P	318	TYR	Mainchain
3	Q	316	ALA	Mainchain
3	Q	318	TYR	Mainchain

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	L	1603	0	1556	18	0
1	M	1603	0	1556	28	0
2	H	1739	0	1705	22	0
2	I	1739	0	1705	37	0
3	P	100	0	100	3	0
3	Q	100	0	100	4	0
4	H	63	0	0	1	0
4	I	33	0	0	1	0
4	L	64	0	0	1	0
4	M	24	0	0	1	0
4	P	2	0	0	2	0
4	Q	1	0	0	1	0
All	All	7071	0	6722	98	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 98 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:M:18:LYS:CE	1:M:18:LYS:NZ	1.71	1.54
2:I:64:LYS:CE	2:I:64:LYS:NZ	1.72	1.48
2:I:19:ARG:HH11	2:I:19:ARG:HG2	0.88	1.02
2:I:19:ARG:HH11	2:I:19:ARG:CG	1.72	1.02
2:I:126:PRO:HG3	2:I:130:SER:HB2	1.42	1.01

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	L	214/216 (99%)	209 (98%)	5 (2%)	0	100	100
1	M	214/216 (99%)	201 (94%)	13 (6%)	0	100	100
2	H	229/231 (99%)	220 (96%)	9 (4%)	0	100	100
2	I	229/231 (99%)	211 (92%)	15 (7%)	3 (1%)	9	6
3	P	11/13 (85%)	9 (82%)	1 (9%)	1 (9%)	0	0
3	Q	11/13 (85%)	10 (91%)	0	1 (9%)	0	0
All	All	908/920 (99%)	860 (95%)	43 (5%)	5 (1%)	21	18

All (5) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
2	I	200	THR
3	Q	317	PHE
3	P	317	PHE
2	I	134	SER
2	I	135	GLY

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	L	180/180 (100%)	167 (93%)	13 (7%)	13	11
1	M	180/180 (100%)	162 (90%)	18 (10%)	7	5
2	H	196/196 (100%)	183 (93%)	13 (7%)	15	13
2	I	196/196 (100%)	182 (93%)	14 (7%)	13	11
3	P	9/9 (100%)	9 (100%)	0	100	100
3	Q	9/9 (100%)	9 (100%)	0	100	100
All	All	770/770 (100%)	712 (92%)	58 (8%)	12	10

5 of 58 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	M	3	VAL
2	I	195	SER
1	M	69	THR
2	I	180	SER
2	I	140	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (2) such sidechains are listed below:

Mol	Chain	Res	Type
2	H	81	GLN
2	H	82(A)	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 [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, 95th 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	L	216/216 (100%)	0.10	3 (1%) 73 75	20, 30, 42, 62	0
1	M	216/216 (100%)	1.09	30 (13%) 6 6	31, 50, 87, 103	0
2	H	231/231 (100%)	0.30	12 (5%) 33 35	18, 30, 60, 81	0
2	I	231/231 (100%)	0.77	19 (8%) 17 18	24, 41, 76, 100	0
3	P	13/13 (100%)	1.77	5 (38%) 1 1	28, 46, 80, 81	1 (7%)
3	Q	13/13 (100%)	3.01	8 (61%) 0 0	62, 71, 99, 103	1 (7%)
All	All	920/920 (100%)	0.61	77 (8%) 17 18	18, 36, 78, 103	2 (0%)

The worst 5 of 77 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	H	133	THR	5.6
3	Q	317	PHE	5.5
1	M	214	CYS	5.2
2	I	227	LEU	5.1
2	I	133	THR	5.1

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 oligosaccharides 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.