



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 12, 2026 – 01:51 PM UTC

PDB ID : 8ULH / pdb_00008ulh
Title : Fab of RSV neutralizing antibody 1G12
Authors : Harshbarger, W.D.; Andreano, E.; Malito, E.
Deposited on : 2023-10-16
Resolution : 1.69 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 Phenix2.0
Xtriage (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

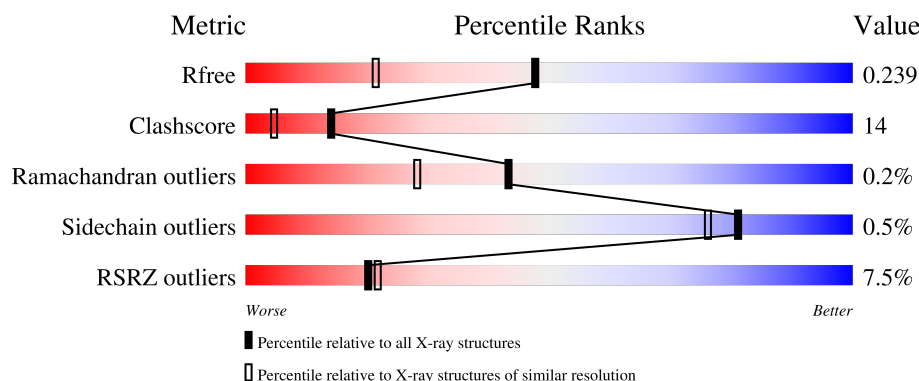
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.69 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)	Similar resolution (#Entries, resolution range(Å))
R_{free}	180053	5551 (1.70-1.70)
Clashscore	190562	5924 (1.70-1.70)
Ramachandran outliers	187476	5846 (1.70-1.70)
Sidechain outliers	187428	5846 (1.70-1.70)
RSRZ outliers	180081	5554 (1.70-1.70)

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	H	257	2% 77% 7% 17%
2	L	214	13% 69% 29% .

2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 3946 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 1G12 Fab heavy chain.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	H	214	Total	C	N	O	S	0	0	0
			1606	1014	270	315	7			

- Molecule 2 is a protein called 1G12 Fab light chain.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	L	214	Total	C	N	O	S	0	0	0
			1641	1036	281	318	6			

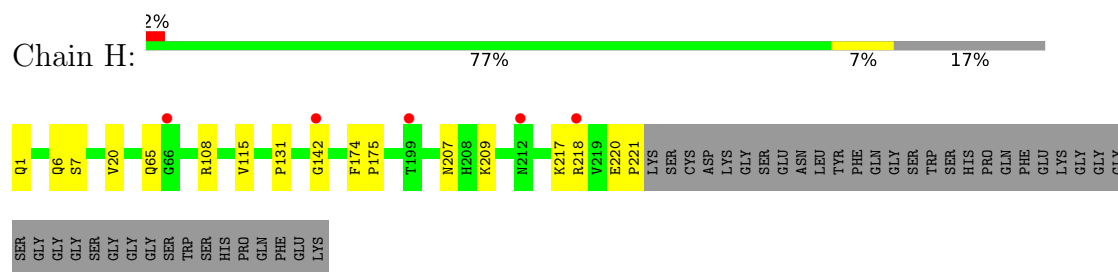
- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	H	366	Total	O	0	0
			366	366		
3	L	333	Total	O	0	0
			333	333		

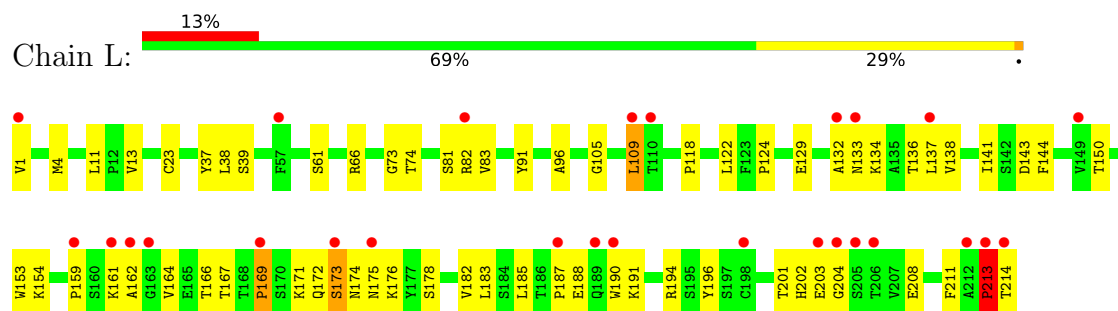
3 Residue-property plots [i](#)

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: 1G12 Fab heavy chain



- Molecule 2: 1G12 Fab light chain



4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	63.46Å 82.56Å 112.23Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	34.08 – 1.69 34.08 – 1.69	Depositor EDS
% Data completeness (in resolution range)	77.7 (34.08-1.69) 91.5 (34.08-1.69)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	0.96 (at 1.69Å)	Xtriage
Refinement program	PHENIX 1.20.1_4487, PHENIX 1.20.1-4487	Depositor
R, R_{free}	0.194 , 0.228 0.207 , 0.239	Depositor DCC
R_{free} test set	2000 reflections (1.96%)	wwPDB-VP
Wilson B-factor (Å ²)	12.8	Xtriage
Anisotropy	0.081	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.33 , 44.8	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.93	EDS
Total number of atoms	3946	wwPDB-VP
Average B, all atoms (Å ²)	19.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.37% 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

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	H	0.27	0/1645	0.50	0/2245
2	L	0.53	1/1685 (0.1%)	0.81	6/2294 (0.3%)
All	All	0.42	1/3330 (0.0%)	0.68	6/4539 (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
2	L	0	2

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	L	169	PRO	CG-CD	-13.53	1.04	1.50

All (6) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	L	169	PRO	N-CD-CG	-15.88	79.38	103.20
2	L	169	PRO	CA-CB-CG	-13.42	79.01	104.50
2	L	109	LEU	CA-CB-CG	-5.31	97.73	116.30
2	L	159	PRO	N-CD-CG	-5.26	95.30	103.20
2	L	169	PRO	CB-CG-CD	5.11	122.44	106.10
2	L	169	PRO	CA-N-CD	-5.08	104.88	112.00

There are no chirality outliers.

All (2) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
2	L	173	SER	Peptide

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Mol	Chain	Res	Type	Group
2	L	213	PRO	Peptide

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	H	1606	0	1564	18	0
2	L	1641	0	1603	77	0
3	H	366	0	0	7	0
3	L	333	0	0	18	2
All	All	3946	0	3167	92	2

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 14.

All (92) 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:L:213:PRO:HB2	2:L:214:THR:HG22	1.48	0.94
2:L:133:ASN:HA	2:L:187:PRO:HG3	1.51	0.91
2:L:172:GLN:OE1	2:L:174:ASN:N	2.14	0.79
2:L:194:ARG:O	2:L:213:PRO:HD2	1.83	0.77
2:L:137:LEU:HD13	2:L:183:LEU:HD23	1.71	0.72
2:L:211:PHE:CD1	2:L:213:PRO:HD3	2.24	0.72
2:L:91:TYR:CD1	2:L:109:LEU:HD13	2.25	0.71
2:L:91:TYR:CE1	2:L:109:LEU:HD13	2.26	0.70
2:L:175:ASN:OD1	3:L:301:HOH:O	2.10	0.69
2:L:171:LYS:NZ	2:L:175:ASN:O	2.30	0.65
2:L:118:PRO:CB	2:L:141:ILE:HG23	2.27	0.64
1:H:175:PRO:O	2:L:167:THR:HG21	1.99	0.62
2:L:187:PRO:HD2	2:L:188:GLU:OE1	2.00	0.62
1:H:207:ASN:HD21	1:H:209:LYS:HE3	1.65	0.62
1:H:221:PRO:O	3:H:301:HOH:O	2.16	0.61
2:L:105:GLY:HA3	3:L:516:HOH:O	2.00	0.61
2:L:169:PRO:HD2	2:L:178:SER:O	2.02	0.60
1:H:174:PHE:CE2	2:L:169:PRO:HD3	2.36	0.59

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:L:141:ILE:HG22	2:L:144:PHE:CD2	2.38	0.59
3:H:404:HOH:O	2:L:182:VAL:HG21	2.02	0.59
2:L:122:LEU:HD12	2:L:138:VAL:O	2.03	0.59
2:L:143:ASP:HB3	2:L:176:LYS:HD3	1.85	0.59
1:H:7:SER:O	1:H:115:VAL:HG22	2.04	0.58
2:L:191:LYS:NZ	3:L:312:HOH:O	2.37	0.57
1:H:174:PHE:CD2	2:L:169:PRO:HD3	2.40	0.57
1:H:218:ARG:NH2	1:H:220:GLU:OE2	2.38	0.56
1:H:207:ASN:ND2	1:H:209:LYS:HE3	2.21	0.56
1:H:1:GLN:NE2	3:H:302:HOH:O	2.18	0.56
2:L:118:PRO:HB3	2:L:141:ILE:HG23	1.87	0.55
2:L:132:ALA:HB2	3:L:481:HOH:O	2.06	0.55
2:L:154:LYS:NZ	3:L:313:HOH:O	2.38	0.55
2:L:133:ASN:CA	2:L:187:PRO:HG3	2.31	0.55
2:L:161:LYS:NZ	3:L:315:HOH:O	2.39	0.54
1:H:6:GLN:NE2	1:H:115:VAL:HG23	2.23	0.54
2:L:202:HIS:C	2:L:204:GLY:H	2.14	0.54
2:L:11:LEU:HD23	2:L:109:LEU:HD21	1.88	0.54
2:L:91:TYR:CD1	2:L:109:LEU:CD1	2.90	0.54
2:L:1:VAL:HG12	3:L:388:HOH:O	2.07	0.54
2:L:74:THR:OG1	3:L:302:HOH:O	2.18	0.53
2:L:129:GLU:OE2	2:L:136:THR:HG23	2.08	0.53
2:L:133:ASN:C	2:L:187:PRO:HD3	2.33	0.53
2:L:169:PRO:CD	2:L:178:SER:O	2.58	0.52
2:L:91:TYR:HD1	2:L:109:LEU:CD1	2.22	0.52
1:H:6:GLN:HE21	1:H:115:VAL:HG23	1.74	0.52
2:L:141:ILE:HG22	2:L:144:PHE:CE2	2.45	0.52
2:L:187:PRO:O	2:L:191:LYS:HG3	2.09	0.52
1:H:142:GLY:N	3:H:316:HOH:O	2.43	0.51
2:L:137:LEU:HD11	2:L:185:LEU:HD12	1.92	0.50
2:L:133:ASN:O	2:L:187:PRO:HD3	2.10	0.50
1:H:131:PRO:HD3	1:H:217:LYS:HE2	1.93	0.49
2:L:137:LEU:HD23	2:L:211:PHE:HZ	1.77	0.49
2:L:196:TYR:CE1	2:L:213:PRO:HG2	2.48	0.49
2:L:134:LYS:HE3	3:L:544:HOH:O	2.12	0.48
1:H:209:LYS:HD2	3:H:558:HOH:O	2.12	0.48
2:L:172:GLN:OE1	2:L:173:SER:N	2.46	0.48
2:L:190:TRP:CZ2	2:L:213:PRO:HG3	2.49	0.48
2:L:208:GLU:HG2	3:L:514:HOH:O	2.14	0.47
2:L:161:LYS:HE2	3:L:562:HOH:O	2.15	0.46
2:L:162:ALA:HA	3:L:378:HOH:O	2.16	0.46

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:L:122:LEU:HD11	2:L:153:TRP:CH2	2.50	0.46
2:L:11:LEU:HD23	2:L:109:LEU:CD2	2.46	0.45
2:L:118:PRO:HB2	2:L:141:ILE:HG23	1.98	0.45
1:H:65:GLN:O	3:H:303:HOH:O	2.20	0.45
2:L:211:PHE:HE1	2:L:213:PRO:HG3	1.82	0.45
2:L:171:LYS:HZ3	2:L:175:ASN:HB3	1.82	0.45
2:L:171:LYS:NZ	2:L:175:ASN:HB3	2.30	0.45
2:L:109:LEU:HD12	2:L:109:LEU:N	2.32	0.45
2:L:166:THR:HG21	3:L:430:HOH:O	2.16	0.45
2:L:172:GLN:CD	2:L:173:SER:H	2.26	0.44
2:L:190:TRP:CD1	2:L:196:TYR:CZ	3.05	0.44
2:L:211:PHE:CE1	2:L:213:PRO:HD3	2.52	0.44
1:H:20:VAL:HG13	1:H:115:VAL:HG21	2.00	0.44
2:L:202:HIS:O	2:L:204:GLY:N	2.44	0.43
2:L:122:LEU:HD11	2:L:153:TRP:HH2	1.83	0.43
2:L:161:LYS:NZ	3:L:320:HOH:O	2.48	0.43
2:L:4:MET:HE3	2:L:23:CYS:SG	2.59	0.43
2:L:13:VAL:HG21	2:L:83:VAL:HG11	2.01	0.43
1:H:207:ASN:HD21	1:H:209:LYS:CE	2.31	0.42
2:L:73:GLY:O	3:L:303:HOH:O	2.21	0.42
2:L:81:SER:O	2:L:82:ARG:HD3	2.19	0.42
2:L:150:THR:HB	2:L:201:THR:HB	2.01	0.42
2:L:1:VAL:HG13	3:L:561:HOH:O	2.21	0.41
2:L:202:HIS:CG	2:L:203:GLU:N	2.89	0.41
2:L:132:ALA:O	2:L:133:ASN:HB2	2.20	0.41
2:L:164:VAL:HA	2:L:182:VAL:O	2.21	0.41
2:L:38:LEU:HG	2:L:39:SER:N	2.35	0.41
2:L:66:ARG:HB3	3:L:484:HOH:O	2.21	0.41
1:H:218:ARG:NH2	3:H:318:HOH:O	2.44	0.40
2:L:124:PRO:HB3	2:L:211:PHE:CE1	2.56	0.40
2:L:162:ALA:HB1	3:L:603:HOH:O	2.20	0.40
2:L:37:TYR:HB3	2:L:96:ALA:HB3	2.03	0.40
2:L:202:HIS:C	2:L:204:GLY:N	2.78	0.40

All (2) 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)
3:L:547:HOH:O	3:L:561:HOH:O[4_445]	2.11	0.09
3:L:591:HOH:O	3:L:603:HOH:O[4_545]	2.12	0.08

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	H	210/257 (82%)	208 (99%)	2 (1%)	0	100	100
2	L	212/214 (99%)	203 (96%)	8 (4%)	1 (0%)	24	12
All	All	422/471 (90%)	411 (97%)	10 (2%)	1 (0%)	43	28

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
2	L	213	PRO

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	H	178/210 (85%)	177 (99%)	1 (1%)	78	72
2	L	186/186 (100%)	185 (100%)	1 (0%)	81	76
All	All	364/396 (92%)	362 (100%)	2 (0%)	81	76

All (2) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	H	108	ARG
2	L	61	SER

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (6) such sidechains are listed below:

Mol	Chain	Res	Type
1	H	39	GLN
1	H	43	GLN
1	H	207	ASN
2	L	43	GLN
2	L	90	HIS
2	L	175	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](#)

The following chains have linkage breaks:

Mol	Chain	Number of breaks
1	H	1

All chain breaks are listed below:

Model	Chain	Residue-1	Atom-1	Residue-2	Atom-2	Distance (Å)
1	H	134:PRO	C	142:GLY	N	12.23

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	H	214/257 (83%)	0.05	5 (2%) 61 65	6, 15, 35, 45	0
2	L	214/214 (100%)	0.62	27 (12%) 8 7	6, 16, 33, 54	0
All	All	428/471 (90%)	0.33	32 (7%) 20 22	6, 16, 34, 54	0

All (32) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	L	214	THR	9.6
2	L	205	SER	8.6
2	L	1	VAL	8.3
2	L	213	PRO	7.9
2	L	204	GLY	7.3
2	L	173	SER	6.4
2	L	133	ASN	6.2
2	L	162	ALA	5.7
2	L	149	VAL	5.1
2	L	206	THR	4.8
2	L	190	TRP	4.7
2	L	169	PRO	4.4
2	L	132	ALA	4.1
2	L	137	LEU	3.3
2	L	161	LYS	3.1
2	L	203	GLU	3.0
2	L	189	GLN	2.7
1	H	218	ARG	2.6
2	L	159	PRO	2.6
2	L	187	PRO	2.6
2	L	110	THR	2.5
2	L	212	ALA	2.5
2	L	175	ASN	2.4
2	L	163	GLY	2.3

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Mol	Chain	Res	Type	RSRZ
2	L	82	ARG	2.3
2	L	57	PHE	2.3
2	L	198	CYS	2.3
1	H	142	GLY	2.2
2	L	109	LEU	2.2
1	H	199	THR	2.1
1	H	66	GLY	2.1
1	H	212	ASN	2.0

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.