



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 8, 2026 – 11:51 AM UTC

PDB ID : 1N64 / pdb_00001n64
Title : Crystal structure analysis of the immunodominant antigenic site on Hepatitis C virus protein bound to mAb 19D9D6
Authors : Menez, R.; Bossus, M.; Muller, B.; Sibai, G.; Dalbon, P.; Ducancel, F.; Jolivet-Reynaud, C.; Stura, E.
Deposited on : 2002-11-08
Resolution : 2.34 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) : **NOT EXECUTED**
EDS : **NOT EXECUTED**
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.49

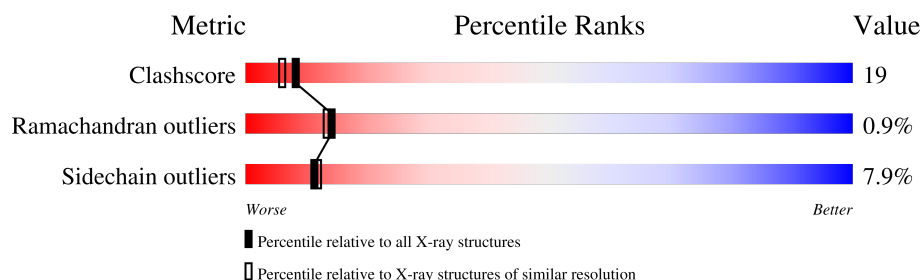
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.34 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))
Clashscore	190562	3127 (2.36-2.32)
Ramachandran outliers	187476	3095 (2.36-2.32)
Sidechain outliers	187428	3095 (2.36-2.32)

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 $\leq 5\%$.

Note EDS was not executed.

Mol	Chain	Length	Quality of chain
1	L	220	 61% 35% .
2	H	218	 67% 29% . .
3	P	16	 44% 50% 6%

2 Entry composition

There are 4 unique types of molecules in this entry. The entry contains 3686 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 19D9D6 light chain.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	L	220	Total	C	N	O	S	0	0	0
			1708	1063	291	346	8			

- Molecule 2 is a protein called Fab 19D9D6 heavy chain.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	H	218	Total	C	N	O	S	0	0	0
			1660	1058	270	325	7			

- Molecule 3 is a protein called Genome polypeptide Capsid protein C.

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
3	P	16	Total	C	N	O	0	0	0
			116	74	23	19			

- Molecule 4 is water.

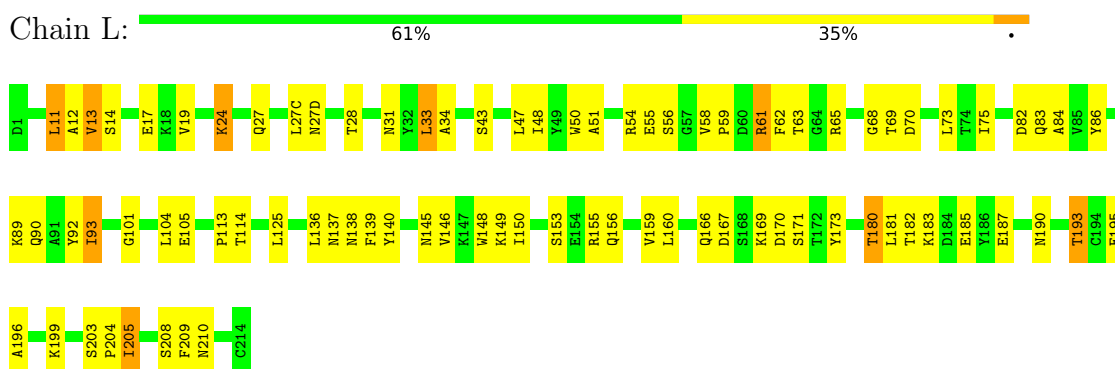
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	L	98	Total	O	0	0
			98	98		
4	H	98	Total	O	0	0
			98	98		
4	P	6	Total	O	0	0
			6	6		

3 Residue-property plots [i](#)

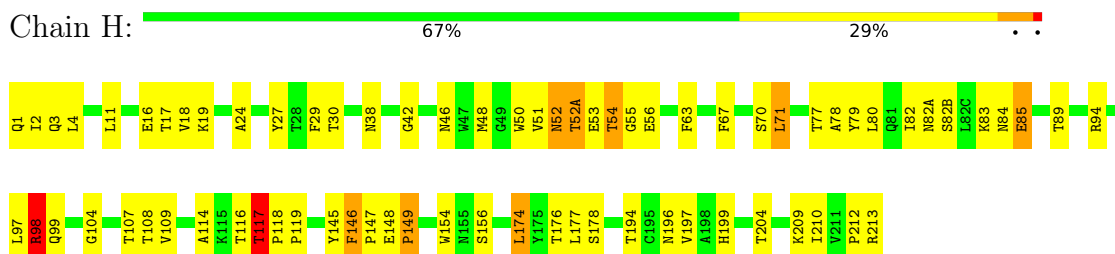
These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry. Residues are color-coded 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.

Note EDS was not executed.

- Molecule 1: Fab 19D9D6 light chain



- Molecule 2: Fab 19D9D6 heavy chain



- Molecule 3: Genome polyprotein Capsid protein C



4 Data and refinement statistics

Xtriage (Phenix) and EDS were not executed - this section is therefore incomplete.

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	42.18Å 101.70Å 55.18Å 90.00° 98.70° 90.00°	Depositor
Resolution (Å)	20.00 – 2.34	Depositor
% Data completeness (in resolution range)	92.2 (20.00-2.34)	Depositor
R_{merge}	0.07	Depositor
R_{sym}	0.07	Depositor
Refinement program	CNS	Depositor
R, R_{free}	0.190 , 0.245	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	3686	wwPDB-VP
Average B, all atoms (Å ²)	36.0	wwPDB-VP

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	L	0.41	0/1745	0.93	7/2366 (0.3%)
2	H	0.45	0/1707	0.94	4/2335 (0.2%)
3	P	0.50	0/118	0.98	1/156 (0.6%)
All	All	0.43	0/3570	0.94	12/4857 (0.2%)

There are no bond length outliers.

All (12) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	L	199	LYS	N-CA-C	-7.98	105.53	114.62
2	H	104	GLY	N-CA-C	-7.93	100.36	112.89
1	L	137	ASN	N-CA-C	6.53	120.68	110.17
3	P	30	ILE	N-CA-C	6.38	117.05	107.80
1	L	28	THR	N-CA-C	-5.88	105.94	113.23
1	L	93	ILE	CA-C-N	-5.75	114.45	120.38
1	L	93	ILE	C-N-CA	-5.75	114.45	120.38
1	L	43	SER	N-CA-C	-5.70	102.98	110.39
2	H	117	THR	CA-C-N	5.50	123.62	119.66
2	H	117	THR	C-N-CA	5.50	123.62	119.66
2	H	98	ARG	N-CA-C	-5.47	106.64	113.15
1	L	138	ASN	N-CA-C	5.15	117.45	111.02

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	L	1708	0	1658	69	0
2	H	1660	0	1615	56	0
3	P	116	0	123	11	0
4	H	98	0	0	3	0
4	L	98	0	0	5	0
4	P	6	0	0	0	0
All	All	3686	0	3396	133	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 19.

All (133) 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:L:182:THR:OG1	1:L:185:GLU:HG2	1.72	0.87
1:L:190:ASN:ND2	1:L:210:ASN:HD22	1.74	0.85
2:H:98:ARG:HH11	2:H:98:ARG:H	1.28	0.80
2:H:30:THR:O	2:H:53:GLU:HG2	1.82	0.80
2:H:146:PHE:O	2:H:147:PRO:C	2.24	0.79
1:L:13:VAL:CG2	1:L:17:GLU:HB2	2.13	0.79
1:L:196:ALA:HB3	1:L:205:ILE:HG23	1.67	0.77
2:H:54:THR:HG22	2:H:56:GLU:H	1.50	0.76
1:L:190:ASN:HD21	1:L:210:ASN:HD22	1.33	0.75
2:H:156:SER:H	2:H:196:ASN:HD21	1.34	0.74
2:H:117:THR:HG21	2:H:174:LEU:HD11	1.73	0.70
3:P:30:ILE:HD11	3:P:35:TYR:CD2	2.26	0.70
2:H:119:PRO:HB3	2:H:145:TYR:HB3	1.74	0.69
1:L:13:VAL:HG23	1:L:17:GLU:HB2	1.76	0.68
1:L:183:LYS:O	1:L:187:GLU:HG2	1.94	0.67
2:H:70:SER:HB2	2:H:79:TYR:HB2	1.76	0.66
2:H:98:ARG:HH11	2:H:98:ARG:N	1.94	0.65
2:H:146:PHE:HB3	2:H:147:PRO:HD3	1.77	0.65
2:H:98:ARG:H	2:H:98:ARG:NH1	1.94	0.64
1:L:24:LYS:HG3	1:L:70:ASP:HA	1.80	0.63
2:H:89:THR:O	2:H:107:THR:O	2.15	0.63
1:L:54:ARG:NH1	1:L:62:PHE:O	2.31	0.63
2:H:116:THR:HA	2:H:147:PRO:HD3	1.80	0.62
2:H:38:ASN:OD1	2:H:46:ASN:HB2	1.98	0.62
1:L:92:TYR:CD2	1:L:93:ILE:HG13	2.34	0.62
1:L:27(C):LEU:C	1:L:27(C):LEU:HD23	2.24	0.62
1:L:181:LEU:HB3	1:L:185:GLU:HG3	1.82	0.61
2:H:114:ALA:HB3	2:H:146:PHE:CZ	2.36	0.61

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:L:59:PRO:HB3	1:L:61:ARG:HH21	1.67	0.60
2:H:54:THR:CG2	2:H:56:GLU:H	2.14	0.60
1:L:65:ARG:HD2	4:L:262:HOH:O	2.01	0.60
3:P:30:ILE:HD11	3:P:35:TYR:HB2	1.84	0.59
2:H:97:LEU:N	2:H:98:ARG:HH12	2.00	0.58
1:L:65:ARG:HD3	4:L:247:HOH:O	2.03	0.58
1:L:150:ILE:HD12	1:L:155:ARG:HG3	1.85	0.57
1:L:113:PRO:HB3	1:L:139:PHE:HB3	1.86	0.57
2:H:154:TRP:HZ3	2:H:210:ILE:HD11	1.69	0.57
1:L:13:VAL:HG23	1:L:17:GLU:OE1	2.05	0.56
1:L:27(C):LEU:HB2	1:L:31:ASN:ND2	2.20	0.56
3:P:30:ILE:HD11	3:P:35:TYR:HD2	1.70	0.56
1:L:31:ASN:ND2	1:L:68:GLY:H	2.03	0.56
2:H:2:ILE:N	2:H:2:ILE:HD12	2.19	0.56
2:H:97:LEU:H	2:H:98:ARG:HH12	1.54	0.56
2:H:154:TRP:HZ3	2:H:210:ILE:CD1	2.18	0.56
1:L:27(C):LEU:HD23	1:L:27(D):ASN:N	2.22	0.55
2:H:52:ASN:C	2:H:52:ASN:HD22	2.15	0.55
2:H:2:ILE:HG23	2:H:27:TYR:HD1	1.72	0.55
3:P:39:ARG:O	3:P:40:ARG:CB	2.55	0.55
2:H:4:LEU:HD23	2:H:24:ALA:HA	1.88	0.55
2:H:154:TRP:CZ3	2:H:210:ILE:HD11	2.42	0.54
1:L:27(C):LEU:HB2	1:L:31:ASN:HD21	1.71	0.54
1:L:205:ILE:HD12	4:L:306:HOH:O	2.07	0.54
2:H:98:ARG:N	2:H:98:ARG:NH1	2.55	0.54
1:L:193:THR:HG22	1:L:208:SER:OG	2.07	0.54
2:H:117:THR:HG21	2:H:174:LEU:CD1	2.39	0.53
1:L:149:LYS:HE2	1:L:195:GLU:OE1	2.08	0.52
1:L:27(C):LEU:HD23	1:L:27(D):ASN:C	2.34	0.52
2:H:1:GLN:HB3	2:H:2:ILE:HD12	1.92	0.52
2:H:53:GLU:H	3:P:29:GLN:NE2	2.08	0.52
1:L:83:GLN:O	1:L:84:ALA:HB2	2.10	0.51
2:H:52(A):THR:HA	2:H:71:LEU:HD21	1.91	0.51
2:H:17:THR:HG22	2:H:82(B):SER:H	1.75	0.51
1:L:11:LEU:HD13	1:L:19:VAL:CG2	2.41	0.51
1:L:182:THR:H	1:L:185:GLU:CG	2.23	0.51
2:H:42:GLY:C	4:H:249:HOH:O	2.53	0.51
2:H:177:LEU:HD23	2:H:178:SER:N	2.26	0.51
2:H:27:TYR:CE2	2:H:29:PHE:HA	2.46	0.51
2:H:55:GLY:HA2	2:H:71:LEU:HD22	1.93	0.51
2:H:18:VAL:HG22	2:H:19:LYS:N	2.26	0.50

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:L:59:PRO:HB2	1:L:62:PHE:CD2	2.46	0.50
1:L:27:GLN:C	1:L:69:THR:HG22	2.37	0.50
1:L:82:ASP:O	1:L:104:LEU:HD23	2.12	0.50
1:L:59:PRO:HB3	1:L:61:ARG:NH2	2.26	0.50
2:H:48:MET:HE3	2:H:63:PHE:CD2	2.48	0.49
1:L:86:TYR:O	1:L:101:GLY:HA2	2.13	0.49
1:L:196:ALA:HB3	1:L:205:ILE:CG2	2.39	0.49
2:H:199:HIS:HB3	2:H:204:THR:HB	1.95	0.49
1:L:148:TRP:O	1:L:149:LYS:HG2	2.13	0.49
2:H:17:THR:HB	2:H:82(A):ASN:HA	1.95	0.48
2:H:83:LYS:C	2:H:85:GLU:H	2.21	0.48
2:H:53:GLU:H	3:P:29:GLN:HE22	1.61	0.48
1:L:136:LEU:HD12	1:L:136:LEU:N	2.28	0.48
1:L:33:LEU:HD13	1:L:34:ALA:N	2.29	0.48
1:L:113:PRO:HB3	1:L:139:PHE:CD2	2.49	0.48
2:H:212:PRO:O	2:H:213:ARG:HB2	2.13	0.47
3:P:39:ARG:O	3:P:40:ARG:HB2	2.14	0.47
1:L:48:ILE:HD12	1:L:73:LEU:HD13	1.96	0.47
1:L:166:GLN:HB2	1:L:173:TYR:CE2	2.49	0.47
2:H:194:THR:HG22	2:H:209:LYS:HA	1.95	0.47
2:H:24:ALA:HB1	2:H:27:TYR:CE1	2.49	0.47
1:L:167:ASP:OD2	1:L:170:ASP:HB2	2.15	0.47
1:L:62:PHE:CE1	1:L:75:ILE:HD12	2.50	0.46
1:L:190:ASN:HD21	1:L:210:ASN:ND2	2.09	0.46
1:L:47:LEU:C	1:L:48:ILE:HG13	2.40	0.46
1:L:149:LYS:HA	1:L:153:SER:O	2.16	0.45
2:H:108:THR:HG22	4:H:223:HOH:O	2.17	0.45
1:L:193:THR:HG23	4:L:218:HOH:O	2.16	0.45
1:L:13:VAL:CG2	1:L:14:SER:N	2.80	0.44
1:L:13:VAL:HG22	1:L:14:SER:N	2.31	0.44
1:L:62:PHE:CD1	1:L:75:ILE:HD12	2.53	0.44
2:H:97:LEU:C	2:H:99:GLN:H	2.24	0.44
1:L:13:VAL:HG21	1:L:17:GLU:HB2	1.98	0.44
2:H:67:PHE:CD1	2:H:82:ILE:HG12	2.52	0.44
2:H:148:GLU:HB2	4:H:253:HOH:O	2.18	0.44
1:L:33:LEU:HD13	1:L:33:LEU:C	2.43	0.43
1:L:160:LEU:C	1:L:160:LEU:HD23	2.43	0.43
1:L:170:ASP:O	1:L:171:SER:HB2	2.18	0.43
1:L:54:ARG:HH12	1:L:63:THR:HG22	1.84	0.43
1:L:203:SER:HA	1:L:204:PRO:HD3	1.92	0.43
2:H:177:LEU:HD23	2:H:177:LEU:C	2.43	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:L:180:THR:HG23	4:L:217:HOH:O	2.19	0.42
2:H:97:LEU:N	2:H:98:ARG:NH1	2.67	0.42
1:L:50:TRP:O	1:L:51:ALA:HB3	2.20	0.41
1:L:55:GLU:HB3	1:L:58:VAL:HG21	2.02	0.41
1:L:140:TYR:CD1	1:L:140:TYR:C	2.98	0.41
2:H:52:ASN:O	2:H:55:GLY:N	2.44	0.41
2:H:117:THR:HA	2:H:118:PRO:HD3	1.86	0.41
1:L:167:ASP:HB3	1:L:171:SER:H	1.84	0.41
2:H:77:THR:HG22	2:H:78:ALA:N	2.36	0.41
3:P:30:ILE:CD1	3:P:35:TYR:HB2	2.50	0.41
1:L:12:ALA:HA	1:L:105:GLU:O	2.20	0.41
1:L:19:VAL:HG12	1:L:75:ILE:HB	2.02	0.41
1:L:55:GLU:OE1	1:L:56:SER:N	2.51	0.41
2:H:50:TRP:CD2	3:P:31:VAL:HG21	2.55	0.41
2:H:148:GLU:O	2:H:149:PRO:C	2.62	0.41
3:P:30:ILE:HD11	3:P:35:TYR:CB	2.51	0.41
1:L:180:THR:O	1:L:181:LEU:HD23	2.20	0.41
3:P:36:LEU:C	3:P:37:LEU:HD22	2.47	0.41
1:L:209:PHE:CD1	1:L:209:PHE:C	2.98	0.40
1:L:146:VAL:HA	1:L:195:GLU:O	2.21	0.40
1:L:156:GLN:O	1:L:159:VAL:HG12	2.20	0.40
1:L:150:ILE:CD1	1:L:155:ARG:HG3	2.51	0.40
2:H:146:PHE:HB3	2:H:147:PRO:CD	2.48	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 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	218/220 (99%)	203 (93%)	15 (7%)	0	100	100
2	H	216/218 (99%)	203 (94%)	10 (5%)	3 (1%)	9	6

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
3	P	14/16 (88%)	11 (79%)	2 (14%)	1 (7%)	1	0
All	All	448/454 (99%)	417 (93%)	27 (6%)	4 (1%)	14	13

All (4) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
2	H	146	PHE
2	H	84	ASN
2	H	149	PRO
3	P	27	GLY

5.3.2 Protein sidechains ⓘ

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	195/195 (100%)	181 (93%)	14 (7%)	13	14
2	H	187/187 (100%)	170 (91%)	17 (9%)	9	9
3	P	11/11 (100%)	11 (100%)	0	100	100
All	All	393/393 (100%)	362 (92%)	31 (8%)	11	12

All (31) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	L	11	LEU
1	L	13	VAL
1	L	24	LYS
1	L	33	LEU
1	L	61	ARG
1	L	89	LYS
1	L	90	GLN
1	L	114	THR
1	L	125	LEU
1	L	145	ASN
1	L	169	LYS

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Mol	Chain	Res	Type
1	L	180	THR
1	L	193	THR
1	L	205	ILE
2	H	3	GLN
2	H	11	LEU
2	H	16	GLU
2	H	51	VAL
2	H	52	ASN
2	H	52(A)	THR
2	H	54	THR
2	H	71	LEU
2	H	80	LEU
2	H	85	GLU
2	H	94	ARG
2	H	98	ARG
2	H	109	VAL
2	H	117	THR
2	H	174	LEU
2	H	176	THR
2	H	197	VAL

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (15) such sidechains are listed below:

Mol	Chain	Res	Type
1	L	31	ASN
1	L	37	GLN
1	L	38	GLN
1	L	42	GLN
1	L	90	GLN
1	L	137	ASN
1	L	145	ASN
1	L	190	ASN
1	L	212	ASN
2	H	3	GLN
2	H	39	GLN
2	H	52	ASN
2	H	133	ASN
2	H	164	HIS
2	H	196	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

EDS was not executed - this section is therefore empty.

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

EDS was not executed - this section is therefore empty.

6.3 Carbohydrates

EDS was not executed - this section is therefore empty.

6.4 Ligands

EDS was not executed - this section is therefore empty.

6.5 Other polymers

EDS was not executed - this section is therefore empty.