



Full wwPDB Geometry-Only Validation Report ⓘ

Mar 8, 2026 – 10:56 AM UTC

PDB ID : 2RCJ / pdb_00002rcj
Title : Solution structure of human Immunoglobulin M
Authors : Perkins, S.J.; Nealis, A.S.; Sutton, B.J.; Feinstein, A.
Deposited on : 2007-09-20
Resolution : Not provided

This is a Full wwPDB Geometry-Only 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
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

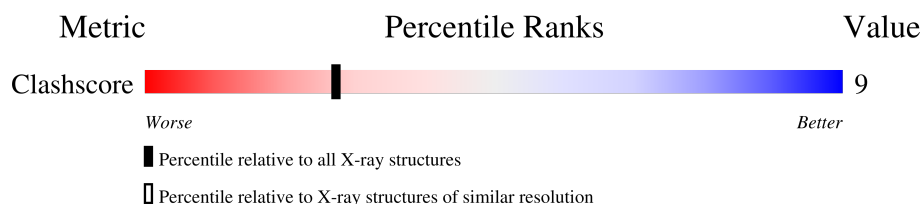
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

SOLUTION SCATTERING

The reported resolution of this entry is unknown.

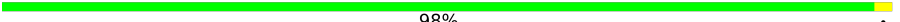
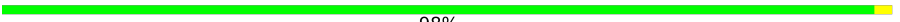
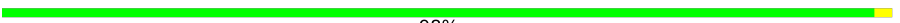
Percentile scores (ranging between 0-100) for global validation metrics of the entry are shown in the following graphic. The table shows the number of entries on which the scores are based.



Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
Clashscore	190562	-

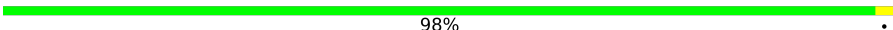
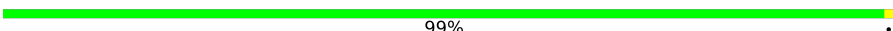
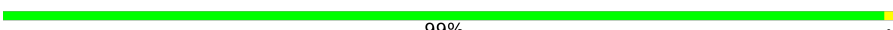
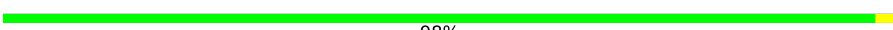
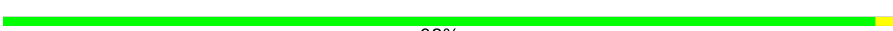
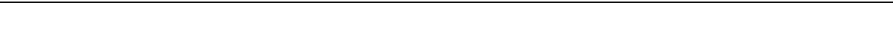
The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments of the lower bar indicate the fraction of residues that contain outliers for ≥ 3 , 2, 1 and 0 types of geometric quality criteria respectively. 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	A	218	 98% .
1	B	218	 98% .
1	E	218	 98% .
1	F	218	 98% .
1	I	218	 98% .
1	J	218	 98% .
1	M	218	 98% .
1	N	218	 98% .
1	Q	218	 98% .
1	R	218	 98% .

Continued on next page...

Continued from previous page...

Mol	Chain	Length	Quality of chain
2	C	523	 98% .
2	D	523	 99% .
2	G	523	 99% .
2	H	523	 98% .
2	K	523	 98% .
2	L	523	 98% .
2	O	523	 98% .
2	P	523	 99% .
2	S	523	 98% .
2	T	523	 98% .
3	U	104	 95% 5%

2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 7514 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 IgA1 light chain.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf	Trace
1	A	218	Total C 218 218	0	0	218
1	B	218	Total C 218 218	0	0	218
1	E	218	Total C 218 218	0	0	218
1	F	218	Total C 218 218	0	0	218
1	I	218	Total C 218 218	0	0	218
1	J	218	Total C 218 218	0	0	218
1	M	218	Total C 218 218	0	0	218
1	N	218	Total C 218 218	0	0	218
1	Q	218	Total C 218 218	0	0	218
1	R	218	Total C 218 218	0	0	218

- Molecule 2 is a protein called IgA1 heavy chain.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf	Trace
2	C	523	Total C 523 523	0	0	523
2	D	523	Total C 523 523	0	0	523
2	G	523	Total C 523 523	0	0	523
2	H	523	Total C 523 523	0	0	523

Continued on next page...

Continued from previous page...

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf	Trace
2	K	523	Total C 523 523	0	0	523
2	L	523	Total C 523 523	0	0	523
2	O	523	Total C 523 523	0	0	523
2	P	523	Total C 523 523	0	0	523
2	S	523	Total C 523 523	0	0	523
2	T	523	Total C 523 523	0	0	523

- Molecule 3 is a protein called J chain.

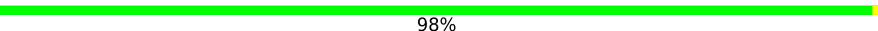
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf	Trace
3	U	104	Total C 104 104	0	0	104

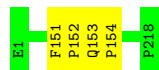
3 Residue-property plots [i](#)

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.

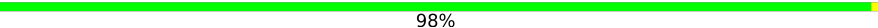
Note EDS was not executed.

- Molecule 1: IgA1 light chain

Chain A:  98% .

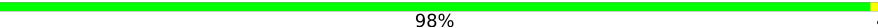


- Molecule 1: IgA1 light chain

Chain B:  98% .

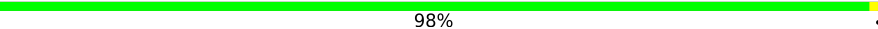


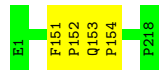
- Molecule 1: IgA1 light chain

Chain E:  98% .

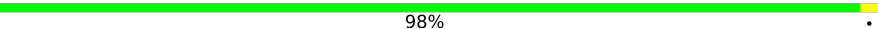


- Molecule 1: IgA1 light chain

Chain F:  98% .

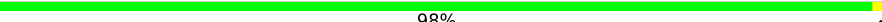


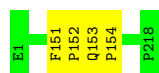
- Molecule 1: IgA1 light chain

Chain I:  98% .

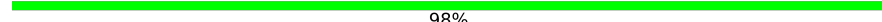


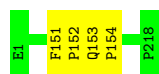
- Molecule 1: IgA1 light chain

Chain J:  98% .

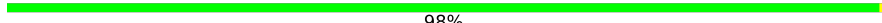


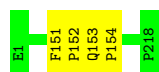
- Molecule 1: IgA1 light chain

Chain M:  98% .



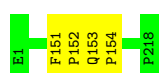
- Molecule 1: IgA1 light chain

Chain N:  98% .

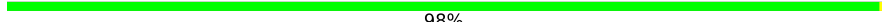


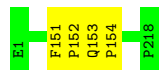
- Molecule 1: IgA1 light chain

Chain Q:  98% .

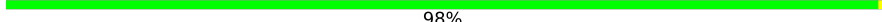


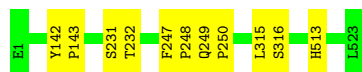
- Molecule 1: IgA1 light chain

Chain R:  98% .

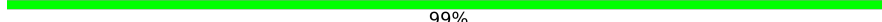


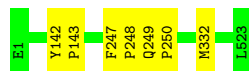
- Molecule 2: IgA1 heavy chain

Chain C:  98% .

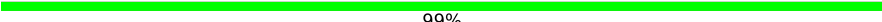


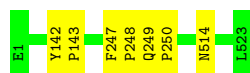
- Molecule 2: IgA1 heavy chain

Chain D:  99% .

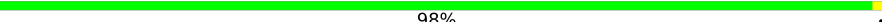


- Molecule 2: IgA1 heavy chain

Chain G:  99% .

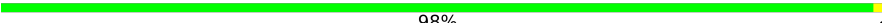


- Molecule 2: IgA1 heavy chain

Chain H:  98% .

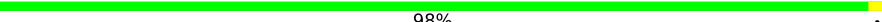


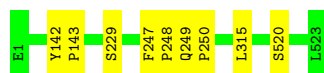
- Molecule 2: IgA1 heavy chain

Chain K:  98% .

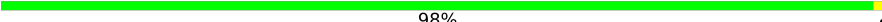


- Molecule 2: IgA1 heavy chain

Chain L:  98% .

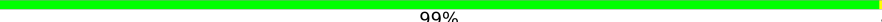


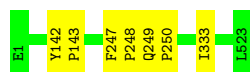
- Molecule 2: IgA1 heavy chain

Chain O:  98% .

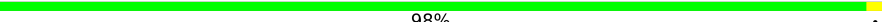


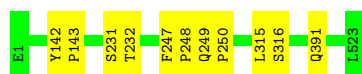
- Molecule 2: IgA1 heavy chain

Chain P:  99% .



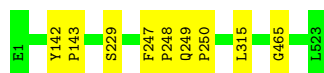
- Molecule 2: IgA1 heavy chain

Chain S:  98% .



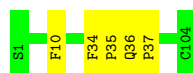
- Molecule 2: IgA1 heavy chain

Chain T:  98% .



● Molecule 3: J chain

Chain U:  95% 5%



4 Model quality [i](#)

4.1 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).

There are no protein, RNA or DNA chains available to summarize Z scores of covalent bonds and angles.

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no planarity outliers.

4.2 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	218	0	0	2	0
1	B	218	0	0	2	0
1	E	218	0	0	2	0
1	F	218	0	0	2	0
1	I	218	0	0	2	0
1	J	218	0	0	2	0
1	M	218	0	0	2	0
1	N	218	0	0	2	0
1	Q	218	0	0	2	0
1	R	218	0	0	2	0
2	C	523	0	0	6	0
2	D	523	0	0	4	0
2	G	523	0	0	4	0
2	H	523	0	0	7	0
2	K	523	0	0	8	0
2	L	523	0	0	5	0
2	O	523	0	0	4	0
2	P	523	0	0	4	0

Continued on next page...

Continued from previous page...

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	S	523	0	0	6	0
2	T	523	0	0	5	0
3	U	104	0	0	3	0
All	All	7514	0	0	68	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 9.

All (68) 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:D:332:MET:CA	2:G:514:ASN:CA	2.20	1.20
2:T:229:SER:CA	2:T:315:LEU:CA	2.46	0.93
2:C:232:THR:CA	2:C:315:LEU:CA	2.47	0.92
2:L:229:SER:CA	2:L:315:LEU:CA	2.50	0.88
2:O:230:LYS:CA	2:O:316:SER:CA	2.52	0.88
2:C:231:SER:CA	2:C:316:SER:CA	2.59	0.80
2:K:232:THR:CA	2:K:315:LEU:CA	2.62	0.78
2:S:232:THR:CA	2:S:315:LEU:CA	2.68	0.71
2:H:391:GLN:CA	2:K:333:ILE:CA	2.74	0.65
2:L:520:SER:CA	3:U:10:PHE:CA	2.77	0.63
2:P:333:ILE:CA	2:S:391:GLN:CA	2.76	0.63
2:S:231:SER:CA	2:S:316:SER:CA	2.79	0.59
2:P:249:GLN:CA	2:P:250:PRO:CA	2.83	0.57
1:Q:153:GLN:CA	1:Q:154:PRO:CA	2.83	0.57
2:C:249:GLN:CA	2:C:250:PRO:CA	2.83	0.57
1:N:153:GLN:CA	1:N:154:PRO:CA	2.83	0.57
1:R:153:GLN:CA	1:R:154:PRO:CA	2.83	0.57
1:A:153:GLN:CA	1:A:154:PRO:CA	2.83	0.57
2:H:332:MET:CA	2:K:514:ASN:CA	2.82	0.57
1:M:153:GLN:CA	1:M:154:PRO:CA	2.83	0.57
1:E:153:GLN:CA	1:E:154:PRO:CA	2.83	0.56
1:F:153:GLN:CA	1:F:154:PRO:CA	2.83	0.56
1:I:153:GLN:CA	1:I:154:PRO:CA	2.83	0.56
2:S:249:GLN:CA	2:S:250:PRO:CA	2.83	0.56
2:K:249:GLN:CA	2:K:250:PRO:CA	2.83	0.56
2:T:249:GLN:CA	2:T:250:PRO:CA	2.83	0.56
2:G:249:GLN:CA	2:G:250:PRO:CA	2.83	0.56
2:H:249:GLN:CA	2:H:250:PRO:CA	2.83	0.56
1:J:153:GLN:CA	1:J:154:PRO:CA	2.83	0.56
2:O:249:GLN:CA	2:O:250:PRO:CA	2.83	0.56

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:D:249:GLN:CA	2:D:250:PRO:CA	2.83	0.56
2:L:249:GLN:CA	2:L:250:PRO:CA	2.83	0.56
1:B:153:GLN:CA	1:B:154:PRO:CA	2.83	0.56
3:U:36:GLN:CA	3:U:37:PRO:CA	2.83	0.56
1:I:151:PHE:CA	1:I:152:PRO:CA	2.87	0.53
2:T:247:PHE:CA	2:T:248:PRO:CA	2.87	0.53
2:P:247:PHE:CA	2:P:248:PRO:CA	2.87	0.53
1:Q:151:PHE:CA	1:Q:152:PRO:CA	2.87	0.53
3:U:34:PHE:CA	3:U:35:PRO:CA	2.87	0.53
2:C:513:HIS:CA	2:T:465:GLY:CA	2.87	0.53
1:R:151:PHE:CA	1:R:152:PRO:CA	2.87	0.53
1:B:151:PHE:CA	1:B:152:PRO:CA	2.87	0.53
2:D:247:PHE:CA	2:D:248:PRO:CA	2.87	0.53
1:A:151:PHE:CA	1:A:152:PRO:CA	2.87	0.52
1:N:151:PHE:CA	1:N:152:PRO:CA	2.87	0.52
1:E:151:PHE:CA	1:E:152:PRO:CA	2.87	0.52
1:M:151:PHE:CA	1:M:152:PRO:CA	2.87	0.52
2:C:247:PHE:CA	2:C:248:PRO:CA	2.87	0.52
1:F:151:PHE:CA	1:F:152:PRO:CA	2.87	0.52
2:G:247:PHE:CA	2:G:248:PRO:CA	2.87	0.52
2:L:247:PHE:CA	2:L:248:PRO:CA	2.87	0.52
2:H:247:PHE:CA	2:H:248:PRO:CA	2.87	0.52
2:K:247:PHE:CA	2:K:248:PRO:CA	2.87	0.52
2:S:247:PHE:CA	2:S:248:PRO:CA	2.87	0.52
1:J:151:PHE:CA	1:J:152:PRO:CA	2.87	0.52
2:O:247:PHE:CA	2:O:248:PRO:CA	2.87	0.51
2:P:142:TYR:CA	2:P:143:PRO:CA	2.96	0.43
2:S:142:TYR:CA	2:S:143:PRO:CA	2.96	0.43
2:T:142:TYR:CA	2:T:143:PRO:CA	2.96	0.43
2:O:142:TYR:CA	2:O:143:PRO:CA	2.97	0.43
2:C:142:TYR:CA	2:C:143:PRO:CA	2.96	0.43
2:G:142:TYR:CA	2:G:143:PRO:CA	2.96	0.43
2:H:142:TYR:CA	2:H:143:PRO:CA	2.97	0.43
2:H:513:HIS:CA	2:K:465:GLY:CA	2.97	0.43
2:K:142:TYR:CA	2:K:143:PRO:CA	2.96	0.42
2:D:142:TYR:CA	2:D:143:PRO:CA	2.96	0.42
2:L:142:TYR:CA	2:L:143:PRO:CA	2.96	0.42
2:H:391:GLN:CA	2:K:334:SER:CA	2.99	0.40

There are no symmetry-related clashes.

4.3 Torsion angles [i](#)

4.3.1 Protein backbone [i](#)

There are no protein backbone outliers to report in this entry.

4.3.2 Protein sidechains [i](#)

There are no protein residues with a non-rotameric sidechain to report in this entry.

4.3.3 RNA [i](#)

There are no RNA molecules in this entry.

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

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

4.5 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

4.6 Ligand geometry [i](#)

There are no ligands in this entry.

4.7 Other polymers [i](#)

There are no such residues in this entry.

4.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.