WORLDWIDE wwPDB PROTEIN DATA BANK

wwPDB X-ray Structure Validation Summary Report ⓘ

Sep 12, 2023 – 12:28 AM EDT

PDB ID	:	4LLD
Title	:	Structure of wild-type IgG1 antibody heavy chain constant domain 1 and light chain lambda constant domain (IgG1 CH1:Clambda) at 1.19A
Authors	:	Pustilnik, A.; Lewis, S.M.; Wu, X.; Sereno, A.; Huang, F.; Guntas, G.; Leaver-Fay, A.; Smith, E.M.; Ho, C.; Hansen-Estruch, C.; Chamberlain, A.K.; Truhlar, S.M.; Kuhlman, B.; Demarest, S.J.; Atwell, S.
Deposited on	:	2013-07-09
Resolution	:	1.19 Å(reported)

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

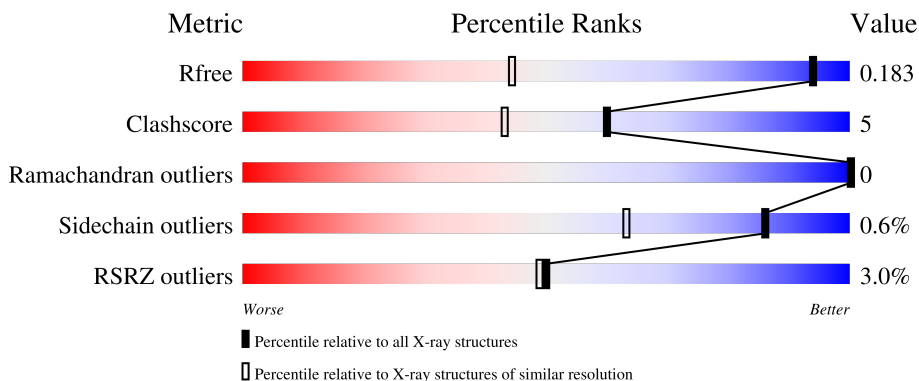|		
MolProbity	:	4.02b-467
Xtriage (Phenix)	:	1.13
EDS	:	2.35.1
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.35.1

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 1.19 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	Percentile Ranks	Value
Rfree		0.183
Clashscore		5
Ramachandran outliers		0
Sidechain outliers		0.6%
RSRZ outliers		3.0%

Worse   *Better*

▐ Percentile relative to all X-ray structures

▯ Percentile relative to X-ray structures of similar resolution

Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	130704	1223 (1.22-1.18)
Clashscore	141614	1286 (1.22-1.18)
Ramachandran outliers	138981	1240 (1.22-1.18)
Sidechain outliers	138945	1239 (1.22-1.18)
RSRZ outliers	127900	1200 (1.22-1.18)

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 <=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	111	2% / 82% / 7% / 11%
2	B	129	3% / 74% / • / 22%

2 Entry composition ⓘ

There are 3 unique types of molecules in this entry. The entry contains 1846 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 Ig gamma-1 chain C region.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	99	740	470	118	148	4	0	9	0

There are 8 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	236	GLY	-	expression tag	UNP P01857
A	237	SER	-	expression tag	UNP P01857
A	238	HIS	-	expression tag	UNP P01857
A	239	HIS	-	expression tag	UNP P01857
A	240	HIS	-	expression tag	UNP P01857
A	241	HIS	-	expression tag	UNP P01857
A	242	HIS	-	expression tag	UNP P01857
A	243	HIS	-	expression tag	UNP P01857

- Molecule 2 is a protein called Ig lambda-2 chain C region.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
2	B	101	776	492	124	158	2	0	7	0

There are 24 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	216	LEU	-	expression tag	UNP P0CG05
B	217	GLU	-	expression tag	UNP P0CG05
B	218	SER	-	expression tag	UNP P0CG05
B	219	GLY	-	expression tag	UNP P0CG05
B	220	LYS	-	expression tag	UNP P0CG05
B	221	GLU	-	expression tag	UNP P0CG05
B	222	THR	-	expression tag	UNP P0CG05
B	223	ALA	-	expression tag	UNP P0CG05

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Chain	Residue	Modelled	Actual	Comment	Reference
B	224	ALA	-	expression tag	UNP P0CG05
B	225	ALA	-	expression tag	UNP P0CG05
B	226	LYS	-	expression tag	UNP P0CG05
B	227	PHE	-	expression tag	UNP P0CG05
B	228	GLU	-	expression tag	UNP P0CG05
B	229	ARG	-	expression tag	UNP P0CG05
B	230	GLN	-	expression tag	UNP P0CG05
B	231	HIS	-	expression tag	UNP P0CG05
B	232	MET	-	expression tag	UNP P0CG05
B	233	ASP	-	expression tag	UNP P0CG05
B	234	SER	-	expression tag	UNP P0CG05
B	235	SER	-	expression tag	UNP P0CG05
B	236	THR	-	expression tag	UNP P0CG05
B	237	SER	-	expression tag	UNP P0CG05
B	238	ALA	-	expression tag	UNP P0CG05
B	239	ALA	-	expression tag	UNP P0CG05

- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	173	Total 173	O 173	0	0
3	B	157	Total 157	O 157	0	0

# 3 Residue-property plots ⓘ

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: Ig gamma-1 chain C region
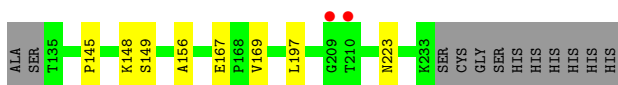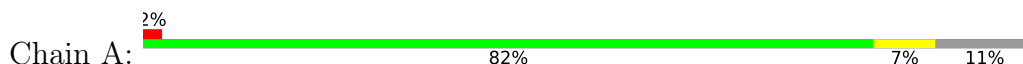
Chain A:

- Molecule 2: Ig lambda-2 chain C region

Chain B:
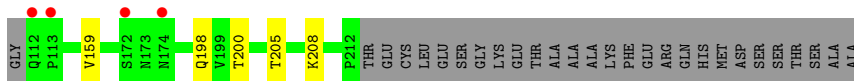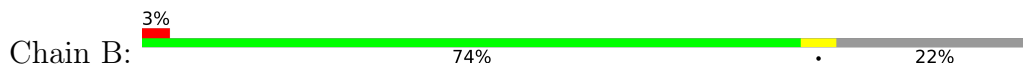
4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α, β, γ	43.08Å 65.84Å 66.92Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	46.93 – 1.19 46.93 – 1.19	Depositor EDS
% Data completeness (in resolution range)	100.0 (46.93-1.19) 97.3 (46.93-1.19)	Depositor EDS
R_{merge}	0.04	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	3.10 (at 1.19Å)	Xtriage
Refinement program	REFMAC 5.5.0109	Depositor
R, R_{free}	0.145 , 0.170 0.170 , 0.183	Depositor DCC
R_{free} test set	3032 reflections (5.05%)	wwPDB-VP
Wilson B-factor (Å^2)	10.6	Xtriage
Anisotropy	0.309	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.37 , 44.7	EDS
L-test for twinning[2]	$< |L| > = 0.48, < L^2 > = 0.32$	Xtriage
Estimated twinning fraction	0.015 for -h,l,k	Xtriage
F_o,F_c correlation	0.97	EDS
Total number of atoms	1846	wwPDB-VP
Average B, all atoms (Å^2)	15.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 6.29% of the height of the origin peak. No significant pseudotranslation is detected.*

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[1]Intensities estimated from amplitudes.
[2]Theoretical values of $< |L| >$, $< L^2 >$ 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	A	0.39	0/795	0.57	0/1088
2	B	0.42	0/824	0.58	0/1130
All	All	0.40	0/1619	0.58	0/2218

There are no bond length outliers.

There are no bond angle outliers.

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	A	740	0	730	6	0
2	B	776	0	753	9	0
3	A	173	0	0	2	0
3	B	157	0	0	2	0
All	All	1846	0	1483	14	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 5.

The worst 5 of 14 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:B:198:GLN:CG	2:B:205[B]:THR:CG2	2.73	0.67

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:198:GLN:HG2	2:B:205[B]:THR:CG2	2.24	0.66
1:A:169[B]:VAL:HG23	1:A:197:LEU:HD21	1.77	0.66
2:B:198:GLN:CG	2:B:205[B]:THR:HG21	2.27	0.64
2:B:198:GLN:HG2	2:B:205[B]:THR:HG23	1.83	0.60

There are no symmetry-related clashes.

5.3 Torsion angles ⓘ

5.3.1 Protein backbone ⓘ

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	106/111 (96%)	105 (99%)	1 (1%)	0	100	100
2	B	106/129 (82%)	105 (99%)	1 (1%)	0	100	100
All	All	212/240 (88%)	210 (99%)	2 (1%)	0	100	100

There are no Ramachandran outliers to report.

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	A	93/96 (97%)	92 (99%)	1 (1%)	73	41
2	B	92/108 (85%)	92 (100%)	0	100	100
All	All	185/204 (91%)	184 (100%)	1 (0%)	86	67

All (1) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	223	ASN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (3) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	223	ASN
2	B	112	GLN
2	B	198	GLN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains ⓘ

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

5.5 Carbohydrates ⓘ

There are no monosaccharides in this entry.

5.6 Ligand geometry ⓘ

There are no ligands in this entry.

5.7 Other polymers ⓘ

There are no such residues in this entry.

5.8 Polymer linkage issues ⓘ

There are no chain breaks in this entry.

6   Fit of model and data ⓘ

6.1   Protein, DNA and RNA chains ⓘ

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(Å²)	Q<0.9
1	A	99/111 (89%)	0.34	2 (2%)	65	66	7, 12, 20, 28	0
2	B	101/129 (78%)	0.35	4 (3%)	38	37	6, 10, 22, 32	0
All	All	200/240 (83%)	0.35	6 (3%)	50	49	6, 11, 22, 32	0

The worst 5 of 6 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	209	GLY	3.9
2	B	172	SER	3.4
1	A	210	THR	3.4
2	B	112	GLN	2.8
2	B	174	ASN	2.8

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

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

6.3   Carbohydrates ⓘ

There are no monosaccharides in this entry.

6.4   Ligands ⓘ

There are no ligands in this entry.

6.5   Other polymers ⓘ

There are no such residues in this entry.