wwPDB X-ray Structure Validation Summary Report (i)

Mar 5, 2026 – 08:40 PM UTC

PDB ID	:	1MCW / pdb_00001mcw
Title	:	THREE-DIMENSIONAL STRUCTURE OF A HYBRID LIGHT CHAIN DIMER. PROTEIN ENGINEERING OF A BINDING CAVITY
Authors	:	Ely, K.R.; Herron, J.N.; Edmundson, A.B.
Deposited on	:	1989-05-09
Resolution	:	3.50 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 (i) 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 (i)) were used in the production of this report:

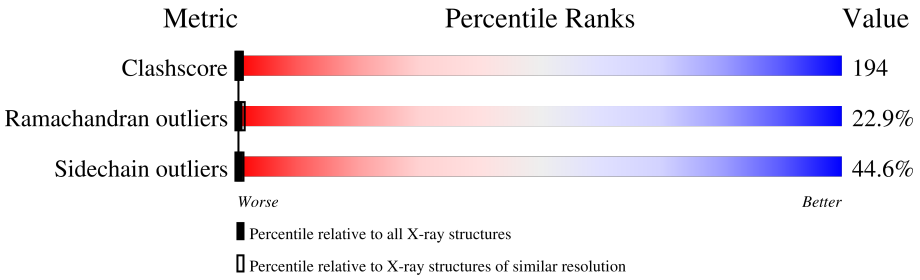
MolProbity	:	4-5-2 with Phenix2.0
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	NOT EXECUTED
EDS	:	NOT EXECUTED
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.49

1 Overall quality at a glance (i)

The following experimental techniques were used to determine the structure:
X-RAY DIFFRACTION

The reported resolution of this entry is 3.50 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	1140 (3.54-3.46)
Ramachandran outliers	187476	1113 (3.54-3.46)
Sidechain outliers	187428	1114 (3.54-3.46)

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%

Note EDS was not executed.

Mol	Chain	Length	Quality of chain
1	W	216	19% 45% 33%
2	M	216	28% 39% 30%

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
1	PCA	W	1	-	-	X	-

2 Entry composition (i)

There are 2 unique types of molecules in this entry. The entry contains 3217 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 IMMUNOGLOBULIN WEIR (LIGHT CHAIN).

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	W	216	Total	C	N	O	S	0	0	0
			1611	1010	266	329	6			

There are 30 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
W	20	VAL	ILE	conflict	PIR S25758
W	23	ALA	THR	conflict	PIR S25758
W	25	HIS	SER	conflict	PIR S25758
W	26	THR	SER	conflict	PIR S25758
W	30	ALA	GLY	conflict	PIR S25758
W	31	ASP	GLY	conflict	PIR S25758
W	32	SER	TYR	conflict	PIR S25758
W	34	SER	TYR	conflict	PIR S25758
W	35	ILE	VAL	conflict	PIR S25758
W	38	PHE	TYR	conflict	PIR S25758
W	43	ASP	GLY	conflict	PIR S25758
W	49	LEU	MET	conflict	PIR S25758
W	52	ALA	ASP	conflict	PIR S25758
W	55	PHE	ASN	conflict	PIR S25758
W	60	ILE	VAL	conflict	PIR S25758
W	61	PRO	SER	conflict	PIR S25758
W	62	LEU	ASN	conflict	PIR S25758
W	81	LEU	GLN	conflict	PIR S25758
W	83	ASP	GLU	conflict	PIR S25758
W	89	PHE	TYR	conflict	PIR S25758
W	91	MET	THR	conflict	PIR S25758
W	93	TYR	LYS	conflict	PIR S25758
W	94	LEU	THR	conflict	PIR S25758
W	96	ASP	-	insertion	PIR S25758
W	97	ALA	SER	conflict	PIR S25758
W	?	-	TYR	deletion	PIR S25758
W	103	SER	THR	conflict	PIR S25758

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Chain	Residue	Modelled	Actual	Comment	Reference
W	108	THR	SER	conflict	PIR S25758
W	111	ARG	GLY	conflict	PIR S25758
W	160	GLU	LYS	conflict	PIR S25758

- Molecule 2 is a protein called IMMUNOGLOBULIN MCG (LIGHT CHAIN).

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	M	216	Total	C	N	O	S	0	0	0
			1606	1000	266	335	5			

There are 22 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
M	20	ILE	PHE	conflict	PIR S14675
M	23	THR	SER	conflict	PIR S14675
M	29	VAL	ILE	conflict	PIR S14675
M	31	GLY	ASN	conflict	PIR S14675
M	39	GLN	ARG	conflict	PIR S14675
M	42	ALA	PRO	conflict	PIR S14675
M	48	VAL	LEU	conflict	PIR S14675
M	49	ILE	MET	conflict	PIR S14675
M	54	ASN	THR	conflict	PIR S14675
M	62	ASP	ASN	conflict	PIR S14675
M	94	GLU	ALA	conflict	PIR S14675
M	97	ASP	ASN	conflict	PIR S14675
M	98	ASN	SER	conflict	PIR S14675
M	99	PHE	LEU	conflict	PIR S14675
M	100	VAL	ILE	conflict	PIR S14675
M	103	THR	GLY	conflict	PIR S14675
M	106	LYS	ARG	conflict	PIR S14675
M	107	VAL	LEU	conflict	PIR S14675
M	116	ASN	ALA	conflict	PIR S14675
M	118	THR	SER	conflict	PIR S14675
M	156	GLY	SER	conflict	PIR S14675
M	167	LYS	THR	conflict	PIR S14675

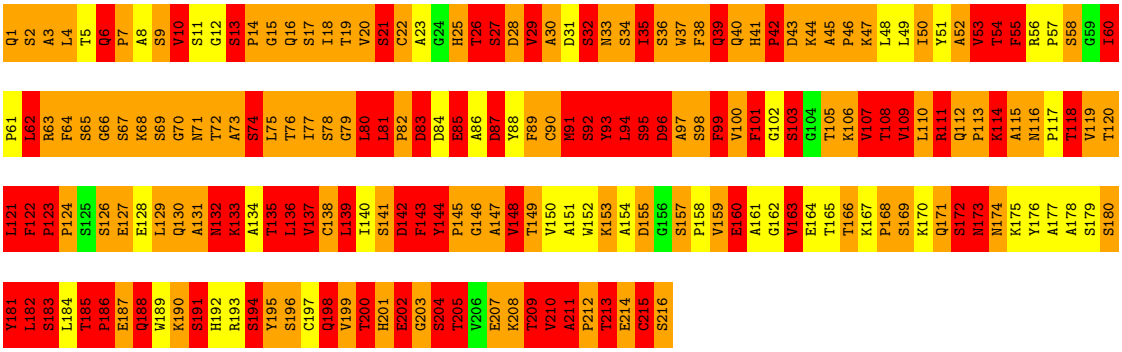
3 Residue-property plots (i)

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.

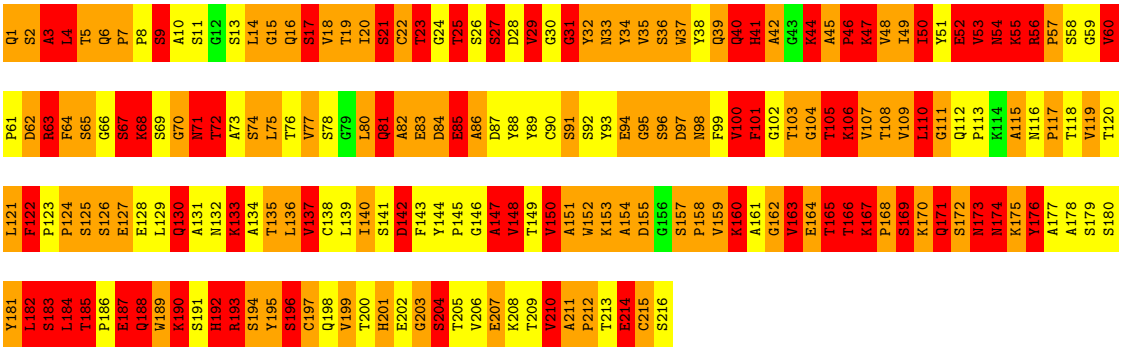
• Molecule 1: IMMUNOGLOBULIN WEIR (LIGHT CHAIN)

Chain W: 19% 45% 33%



• Molecule 2: IMMUNOGLOBULIN MCG (LIGHT CHAIN)

Chain M: 28% 39% 30%



4 Data and refinement statistics (i)

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

Property	Value	Source
Space group	P 31 2 1	Depositor
Cell constants a, b, c, α, β, γ	72.30Å 72.30Å 185.90Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	(Not available) – 3.50	Depositor
% Data completeness (in resolution range)	(Not available) ((Not available)-3.50)	Depositor
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
Refinement program	PROLSQ	Depositor
R, R_{free}	0.170 , (Not available)	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	3217	wwPDB-VP
Average B, all atoms (Å^2)	0.0	wwPDB-VP

5 Model quality (i)

5.1 Standard geometry (i)

Bond lengths and bond angles in the following residue types are not validated in this section: PCA

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	W	1.69	22/1644 (1.3%)	3.16	236/2245 (10.5%)
2	M	1.61	10/1637 (0.6%)	3.09	225/2233 (10.1%)
All	All	1.65	32/3281 (1.0%)	3.13	461/4478 (10.3%)

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
1	W	0	1
2	M	0	2
All	All	0	3

The worst 5 of 32 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	M	105	THR	CA-CB	9.17	1.69	1.53
2	M	192	HIS	C-O	6.92	1.32	1.24
2	M	69	SER	N-CA	6.70	1.54	1.46
1	W	108	THR	CA-CB	6.43	1.64	1.53
1	W	149	THR	N-CA	6.25	1.53	1.45

The worst 5 of 461 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	W	101	PHE	CA-CB-CG	24.70	138.50	113.80
2	M	116	ASN	CA-CB-CG	22.53	135.13	112.60
2	M	192	HIS	N-CA-C	20.20	135.67	111.02
1	W	142	ASP	CA-CB-CG	19.78	132.38	112.60

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Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	W	132	ASN	CA-CB-CG	19.20	131.80	112.60

There are no chirality outliers.

All (3) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
2	M	56	ARG	Sidechain
2	M	63	ARG	Sidechain
1	W	111	ARG	Sidechain

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	W	1611	0	1560	679	7
2	M	1606	0	1537	587	4
All	All	3217	0	3097	1227	10

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 194.

The worst 5 of 1227 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:W:13:SER:HB2	1:W:16:GLN:NE2	1.22	1.44
2:M:51:TYR:O	2:M:55:LYS:HB2	1.24	1.28
1:W:185:THR:CB	1:W:186:PRO:HD3	1.66	1.26
1:W:81:LEU:HD21	1:W:83:ASP:OD2	1.35	1.25
1:W:19:THR:HA	1:W:75:LEU:O	1.25	1.25

The worst 5 of 10 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)
1:W:78:SER:OG	1:W:78:SER:OG[4_646]	1.27	0.93
1:W:61:PRO:CA	1:W:216:SER:OG[3_654]	1.64	0.56
1:W:61:PRO:N	1:W:216:SER:OG[3_654]	1.64	0.56
1:W:61:PRO:CD	1:W:216:SER:OG[3_654]	1.91	0.29
1:W:78:SER:O	1:W:78:SER:O[4_646]	1.95	0.25

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	W	214/216 (99%)	118 (55%)	40 (19%)	56 (26%)	0	0
2	M	214/216 (99%)	141 (66%)	31 (14%)	42 (20%)	0	1
All	All	428/432 (99%)	259 (60%)	71 (17%)	98 (23%)	0	1

5 of 98 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	W	2	SER
1	W	3	ALA
1	W	9	SER
1	W	13	SER
1	W	14	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	W	183/183 (100%)	102 (56%)	81 (44%)	0	0
2	M	180/180 (100%)	99 (55%)	81 (45%)	0	0
All	All	363/363 (100%)	201 (55%)	162 (45%)	0	0

5 of 162 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
2	M	85	GLU
2	M	172	SER
2	M	101	PHE
2	M	137	VAL
2	M	187	GLU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 17 such sidechains are listed below:

Mol	Chain	Res	Type
2	M	171	GLN
2	M	198	GLN
1	W	188	GLN
1	W	192	HIS
1	W	198	GLN

5.3.3 RNA (i)

There are no RNA molecules in this entry.

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

2 non-standard protein/DNA/RNA residues are modelled in this entry.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. 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 $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\#\|Z\| > 2$	Counts	RMSZ	$\#\|Z\| > 2$
2	PCA	M	1	2	7,8,9	3.01	1 (14%)	9,10,12	2.32	4 (44%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\#\|Z\|>2$	Counts	RMSZ	$\#\|Z\|>2$
1	PCA	W	1	1	7,8,9	2.86	1 (14%)	9,10,12	4.49	3 (33%)

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	PCA	M	1	2	-	0/0/11/13	0/1/1/1
1	PCA	W	1	1	-	0/0/11/13	0/1/1/1

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	M	1	PCA	CD-N	7.56	1.53	1.34
1	W	1	PCA	CD-N	7.36	1.53	1.34

The worst 5 of 7 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	W	1	PCA	OE-CD-N	-12.47	97.95	124.96
2	M	1	PCA	CB-CA-C	-3.86	107.36	112.66
2	M	1	PCA	OE-CD-CG	-3.62	120.26	126.72
1	W	1	PCA	OE-CD-CG	-3.02	121.33	126.72
1	W	1	PCA	CA-N-CD	-2.72	104.27	113.58

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

2 monomers are involved in 7 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	M	1	PCA	2	0
1	W	1	PCA	5	0

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.