



Full wwPDB NMR Structure Validation Report ⓘ

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PDB ID : 1L0M
Title : Solution structure of Bacteriorhodopsin
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Deposited on : 2002-02-11

This is a Full wwPDB NMR 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/NMRValidationReportHelp>

with specific help available everywhere you see the ⓘ symbol.

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

Cyrange : Kirchner and Güntert (2011)
NmrClust : Kelley et al. (1996)
MolProbity : 4.02b-467
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)
RCI : v_1n_11_5_13_A (Berjanski et al., 2005)
PANAV : Wang et al. (2010)
ShiftChecker : 2.11
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.11

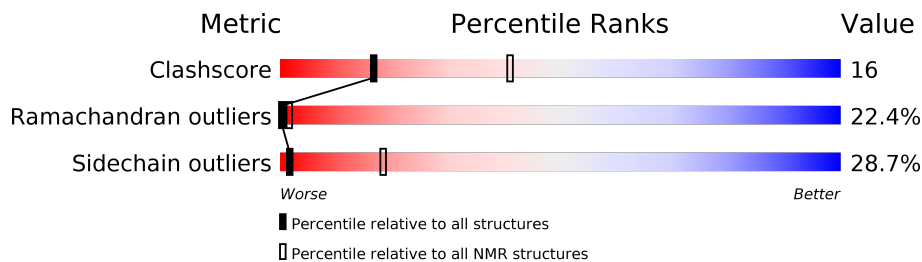
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

SOLUTION NMR

The overall completeness of chemical shifts assignment was not calculated.

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)	NMR archive (#Entries)
Clashscore	158937	12864
Ramachandran outliers	154571	11451
Sidechain outliers	154315	11428

The table below summarises the geometric issues observed across the polymeric chains and their fit to the experimental data. The red, orange, yellow and green segments indicate the fraction of residues that contain outliers for ≥ 3 , 2, 1 and 0 types of geometric quality criteria. A cyan segment indicates the fraction of residues that are not part of the well-defined cores, and 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 $\leq 5\%$

Mol	Chain	Length	Quality of chain
1	A	212	

2 Ensemble composition and analysis

This entry contains 1 models. Identification of well-defined residues and clustering analysis are not possible.

3 Entry composition

There is only 1 type of molecule in this entry. The entry contains 3333 atoms, of which 1691 are hydrogens and 0 are deuteriums.

- Molecule 1 is a protein called Bacteriorhodopsin.

Mol	Chain	Residues	Atoms						Trace
			Total	C	H	N	O	S	
1	A	212	3333	1104	1691	247	282	9	0

4 Residue-property plots [i](#)

These plots are provided for all protein, RNA and DNA chains in the entry. The first graphic is the same as shown in the summary in section 1 of this report. The second graphic shows the sequence where residues are colour-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 outliers are shown as green connectors. Residues which are classified as ill-defined in the NMR ensemble, are shown in cyan with an underline colour-coded according to the previous scheme. Residues which were present in the experimental sample, but not modelled in the final structure are shown in grey.

• Molecule 1: Bacteriorhodopsin



5 Refinement protocol and experimental data overview (i)

The models were refined using the following method: *refined using molecular dynamics*.

Of the ? calculated structures, 1 were deposited, based on the following criterion: ?.

The following table shows the software used for structure solution, optimisation and refinement.

Software name	Classification	Version
Sybyl	structure solution	6.6
Sybyl	refinement	6.6

No chemical shift data was provided. No validations of the models with respect to experimental NMR restraints is performed at this time.

COVALENT-GEOMETRY INFOmissingINFO

5.1 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 each 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 averaged over the ensemble.

Mol	Chain	Non-H	H(model)	H(added)	Clashes
1	A	1642	1691	1690	52
All	All	1642	1691	1690	52

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 16.

All clashes are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Clash(Å)	Distance(Å)
1:A:182:TRP:CD2	1:A:182:TRP:CE2	1.59	1.86
1:A:182:TRP:CG	1:A:182:TRP:CD2	1.53	1.96
1:A:182:TRP:CD1	1:A:182:TRP:NE1	1.37	1.90
1:A:182:TRP:NE1	1:A:182:TRP:CE2	1.34	1.94
1:A:182:TRP:CD2	1:A:185:TYR:CD2	1.24	2.26
1:A:182:TRP:CE2	1:A:185:TYR:CD2	1.21	2.28
1:A:182:TRP:CD1	1:A:185:TYR:CD2	1.20	2.27
1:A:182:TRP:CG	1:A:185:TYR:CD2	1.18	2.30
1:A:182:TRP:NE1	1:A:185:TYR:CD2	1.10	2.19
1:A:182:TRP:CG	1:A:185:TYR:HD2	1.05	1.66
1:A:182:TRP:CD2	1:A:185:TYR:HD2	1.02	1.62
1:A:182:TRP:CE2	1:A:185:TYR:CE2	0.94	2.55

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Atom-1	Atom-2	Clash(Å)	Distance(Å)
1:A:182:TRP:CE2	1:A:185:TYR:HD2	0.89	1.80
1:A:182:TRP:CG	1:A:185:TYR:CB	0.77	2.68
1:A:182:TRP:CD1	1:A:185:TYR:HD2	0.75	1.80
1:A:182:TRP:NE1	1:A:185:TYR:CE2	0.74	2.56
1:A:39:ALA:HB3	1:A:40:LYS:HB3	0.72	1.60
1:A:182:TRP:CG	1:A:185:TYR:CG	0.72	2.76
1:A:182:TRP:NE1	1:A:185:TYR:HD2	0.72	1.82
1:A:182:TRP:HA	1:A:185:TYR:HB2	0.66	1.66
1:A:28:LEU:O	1:A:28:LEU:HD13	0.63	1.92
1:A:156:PHE:CD1	1:A:159:LYS:HG2	0.63	2.29
1:A:182:TRP:CG	1:A:185:TYR:HB2	0.60	2.30
1:A:129:LYS:CE	1:A:129:LYS:HA	0.58	2.29
1:A:52:ILE:HG23	1:A:88:PHE:CZ	0.56	2.35
1:A:56:MET:HG3	1:A:88:PHE:CZ	0.56	2.34
1:A:182:TRP:CD1	1:A:185:TYR:CG	0.54	2.93
1:A:156:PHE:HD2	1:A:171:PHE:CB	0.54	2.16
1:A:185:TYR:H	1:A:186:PRO:CD	0.52	2.17
1:A:102:ASP:HB3	1:A:107:THR:HG21	0.51	1.81
1:A:182:TRP:CZ2	1:A:185:TYR:CE2	0.50	2.99
1:A:156:PHE:CD1	1:A:156:PHE:O	0.50	2.64
1:A:156:PHE:CD2	1:A:171:PHE:CB	0.49	2.96
1:A:106:GLY:C	1:A:107:THR:HG22	0.47	2.30
1:A:156:PHE:CE2	1:A:167:VAL:HA	0.47	2.45
1:A:135:PHE:CG	1:A:136:VAL:N	0.46	2.84
1:A:204:GLU:HG3	1:A:205:THR:N	0.45	2.26
1:A:25:LEU:N	1:A:26:TYR:HA	0.44	2.28
1:A:182:TRP:CA	1:A:185:TYR:HB2	0.43	2.39
1:A:45:ILE:HG12	1:A:48:LEU:CB	0.43	2.43
1:A:107:THR:HG23	1:A:108:ILE:N	0.43	2.28
1:A:75:GLN:O	1:A:76:ASN:CB	0.42	2.67
1:A:182:TRP:CG	1:A:185:TYR:HB3	0.41	2.46
1:A:128:THR:N	1:A:133:TYR:CD2	0.41	2.89
1:A:127:LEU:O	1:A:133:TYR:CG	0.41	2.74
1:A:156:PHE:CE2	1:A:166:GLU:CB	0.41	3.04
1:A:95:LEU:N	1:A:96:ASP:O	0.41	2.54
1:A:45:ILE:HG12	1:A:48:LEU:HB3	0.41	1.93
1:A:189:TRP:N	1:A:189:TRP:CD2	0.40	2.89
1:A:52:ILE:HG23	1:A:88:PHE:CE2	0.40	2.51
1:A:149:LEU:O	1:A:153:PHE:N	0.40	2.54
1:A:156:PHE:CE1	1:A:159:LYS:HB2	0.40	2.50

5.2 Torsion angles [i](#)

5.2.1 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 PDB entries followed by that with respect to all NMR entries. 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	210/212 (99%)	102 (49%)	61 (29%)	47 (22%)	0	1
All	All	210/212 (99%)	102 (49%)	61 (29%)	47 (22%)	0	1

All 47 Ramachandran outliers are listed below. They are sorted by the frequency of occurrence in the ensemble.

Mol	Chain	Res	Type
1	A	14	ALA
1	A	40	LYS
1	A	17	THR
1	A	180	VAL
1	A	208	PHE
1	A	22	LEU
1	A	185	TYR
1	A	199	VAL
1	A	39	ALA
1	A	158	SER
1	A	108	ILE
1	A	179	VAL
1	A	146	LEU
1	A	204	GLU
1	A	166	GLU
1	A	91	PRO
1	A	135	PHE
1	A	203	ILE
1	A	156	PHE
1	A	115	ASP
1	A	136	VAL
1	A	41	LYS
1	A	76	ASN
1	A	53	ALA
1	A	191	ILE
1	A	124	VAL
1	A	197	GLY

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Mol	Chain	Res	Type
1	A	167	VAL
1	A	84	ALA
1	A	107	THR
1	A	198	ILE
1	A	95	LEU
1	A	194	GLU
1	A	52	ILE
1	A	73	GLY
1	A	186	PRO
1	A	117	ILE
1	A	188	VAL
1	A	101	VAL
1	A	32	MET
1	A	157	THR
1	A	173	VAL
1	A	105	GLN
1	A	90	THR
1	A	96	ASP
1	A	161	GLU
1	A	66	LEU

5.2.2 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 PDB entries followed by that with respect to all NMR entries. 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	171/171 (100%)	122 (71%)	49 (29%)	2 18
All	All	171/171 (100%)	122 (71%)	49 (29%)	2 18

All 49 residues with a non-rotameric sidechain are listed below. They are sorted by the frequency of occurrence in the ensemble.

Mol	Chain	Res	Type
1	A	40	LYS
1	A	129	LYS
1	A	17	THR
1	A	208	PHE
1	A	127	LEU

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Mol	Chain	Res	Type
1	A	128	THR
1	A	133	TYR
1	A	207	LEU
1	A	57	TYR
1	A	69	VAL
1	A	89	THR
1	A	30	LYS
1	A	93	LEU
1	A	108	ILE
1	A	28	LEU
1	A	29	VAL
1	A	15	LEU
1	A	135	PHE
1	A	99	LEU
1	A	185	TYR
1	A	109	LEU
1	A	166	GLU
1	A	146	LEU
1	A	189	TRP
1	A	137	TRP
1	A	112	VAL
1	A	203	ILE
1	A	140	ILE
1	A	175	ARG
1	A	88	PHE
1	A	95	LEU
1	A	194	GLU
1	A	154	PHE
1	A	82	ARG
1	A	182	TRP
1	A	60	MET
1	A	131	TYR
1	A	167	VAL
1	A	212	ASP
1	A	138	TRP
1	A	7	ARG
1	A	169	SER
1	A	171	PHE
1	A	26	TYR
1	A	13	LEU
1	A	35	SER
1	A	118	MET

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Mol	Chain	Res	Type
1	A	46	THR
1	A	161	GLU

5.2.3 RNA [i](#)

There are no RNA molecules in this entry.

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

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

5.4 Carbohydrates [i](#)

There are no carbohydrates in this entry.

5.5 Ligand geometry [i](#)

There are no ligands in this entry.

5.6 Other polymers [i](#)

There are no such molecules in this entry.

5.7 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

6 Chemical shift validation

No chemical shift data were provided