



Full wwPDB NMR Structure Validation Report ⓘ

Mar 8, 2026 – 11:36 AM UTC

PDB ID : 1Q59 / pdb_00001q59
Title : Solution Structure of the BHRF1 Protein From Epstein-Barr Virus, a Homolog of Human Bcl-2
Authors : Huang, Q.; Petros, A.M.; Virgin, H.W.; Fesik, S.W.; Olejniczak, E.T.
Deposited on : 2003-08-06

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<https://www.wwpdb.org/validation/2017/NMRValidationReportHelp>

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)
wwPDB-RCI : v_1n_11_5_13_A (Berjanski et al., 2005)
PANAV : Wang et al. (2010)
wwPDB-ShiftChecker : v1.2
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.49

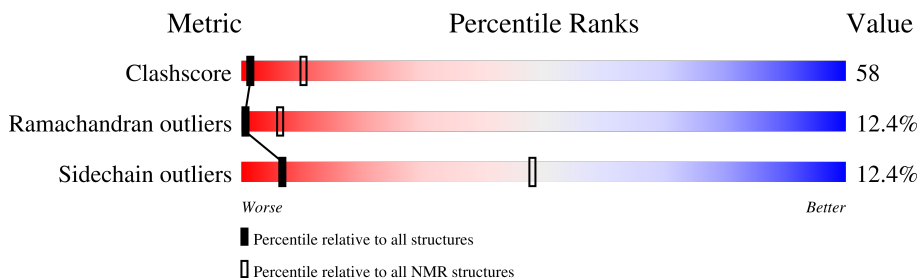
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

SOLUTION 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	229148	14424
Ramachandran outliers	224038	12848
Sidechain outliers	223484	12823

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	172	

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 2726 atoms, of which 1331 are hydrogens and 0 are deuteriums.

- Molecule 1 is a protein called Early antigen protein R.

Mol	Chain	Residues	Atoms						Trace
			Total	C	H	N	O	S	
1	A	172	2726	874	1331	250	262	9	0

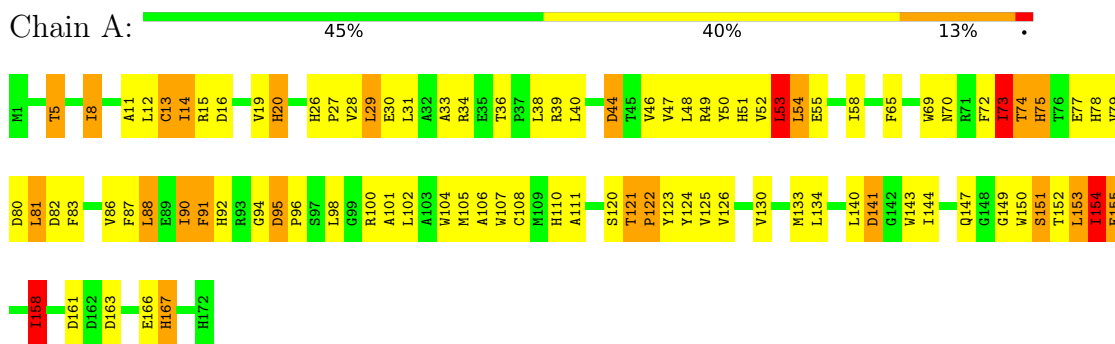
There are 12 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	161	ASP	-	cloning artifact	UNP P03182
A	162	ASP	-	cloning artifact	UNP P03182
A	163	ASP	-	cloning artifact	UNP P03182
A	164	ASP	-	cloning artifact	UNP P03182
A	165	LEU	-	cloning artifact	UNP P03182
A	166	GLU	-	cloning artifact	UNP P03182
A	167	HIS	-	cloning artifact	UNP P03182
A	168	HIS	-	cloning artifact	UNP P03182
A	169	HIS	-	cloning artifact	UNP P03182
A	170	HIS	-	cloning artifact	UNP P03182
A	171	HIS	-	cloning artifact	UNP P03182
A	172	HIS	-	cloning artifact	UNP P03182

4 Residue-property plots [i](#)

These plots are provided for all protein, RNA, DNA and oligosaccharide 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: Early antigen protein R



5 Refinement protocol and experimental data overview

The models were refined using the following method: *BHRF1 structures were calculated using a simulated annealing protocol with the program CNX.*

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
CNS	refinement	2000

No chemical shift data was provided.

6 Model quality

6.1 Standard geometry

There are no covalent bond-length or bond-angle outliers.

There are no bond-length outliers.

There are no bond-angle outliers.

There are no chirality outliers.

There are no planarity outliers.

6.2 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 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	1395	1331	1317	157
All	All	1395	1331	1317	157

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 58.

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

Atom-1	Atom-2	Clash(Å)	Distance(Å)
1:A:5:THR:HG22	1:A:150:TRP:NE1	0.88	1.83
1:A:124:TYR:CE2	1:A:125:VAL:HG23	0.84	2.08
1:A:8:ILE:HD12	1:A:150:TRP:CD1	0.83	2.09
1:A:121:THR:O	1:A:122:PRO:O	0.82	1.97
1:A:13:CYS:SG	1:A:29:LEU:HD22	0.76	2.19
1:A:30:GLU:C	1:A:31:LEU:HD22	0.75	2.07
1:A:98:LEU:HD13	1:A:153:LEU:HD11	0.75	1.58
1:A:82:ASP:O	1:A:86:VAL:HG23	0.75	1.81
1:A:19:VAL:HG23	1:A:20:HIS:CD2	0.74	2.17
1:A:46:VAL:O	1:A:154:ILE:HD11	0.73	1.82
1:A:98:LEU:O	1:A:98:LEU:HD23	0.73	1.82
1:A:98:LEU:HD22	1:A:153:LEU:CD1	0.73	2.13
1:A:26:HIS:ND1	1:A:28:VAL:HG23	0.71	2.00
1:A:26:HIS:CE1	1:A:28:VAL:HG23	0.70	2.21
1:A:15:ARG:CD	1:A:19:VAL:HG13	0.69	2.17

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Atom-1	Atom-2	Clash(Å)	Distance(Å)
1:A:79:VAL:HB	1:A:81:LEU:HD12	0.69	1.65
1:A:81:LEU:C	1:A:81:LEU:HD22	0.69	2.13
1:A:98:LEU:HD22	1:A:153:LEU:HD11	0.69	1.64
1:A:86:VAL:O	1:A:90:ILE:HG23	0.67	1.89
1:A:38:LEU:HD13	1:A:39:ARG:N	0.67	2.05
1:A:28:VAL:HG12	1:A:28:VAL:O	0.67	1.88
1:A:12:LEU:HD23	1:A:51:HIS:CD2	0.66	2.26
1:A:81:LEU:HD13	1:A:82:ASP:N	0.66	2.05
1:A:158:ILE:HD12	1:A:158:ILE:N	0.65	2.06
1:A:50:TYR:CD2	1:A:154:ILE:HD13	0.63	2.28
1:A:98:LEU:HD13	1:A:153:LEU:CD1	0.63	2.22
1:A:143:TRP:CZ3	1:A:144:ILE:HD13	0.62	2.29
1:A:81:LEU:HD13	1:A:82:ASP:H	0.62	1.53
1:A:54:LEU:HD21	1:A:105:MET:HE3	0.62	1.70
1:A:15:ARG:HD3	1:A:19:VAL:HG13	0.61	1.70
1:A:86:VAL:HG12	1:A:90:ILE:HG23	0.60	1.71
1:A:28:VAL:CG1	1:A:130:VAL:HG21	0.60	2.26
1:A:91:PHE:CG	1:A:91:PHE:O	0.60	2.55
1:A:72:PHE:CE2	1:A:86:VAL:HG21	0.60	2.32
1:A:154:ILE:O	1:A:154:ILE:HG23	0.59	1.96
1:A:121:THR:N	1:A:122:PRO:CD	0.59	2.65
1:A:150:TRP:O	1:A:154:ILE:HG22	0.59	1.97
1:A:8:ILE:HD11	1:A:46:VAL:CG2	0.58	2.28
1:A:98:LEU:CD1	1:A:153:LEU:HD11	0.58	2.27
1:A:38:LEU:HD13	1:A:38:LEU:C	0.58	2.23
1:A:50:TYR:OH	1:A:150:TRP:HB3	0.57	1.99
1:A:121:THR:HB	1:A:125:VAL:HG21	0.57	1.77
1:A:153:LEU:HD23	1:A:158:ILE:HG13	0.56	1.77
1:A:50:TYR:CE2	1:A:154:ILE:HD13	0.56	2.36
1:A:98:LEU:CD2	1:A:153:LEU:HD11	0.55	2.31
1:A:134:LEU:HD13	1:A:134:LEU:O	0.54	2.02
1:A:73:ILE:O	1:A:74:THR:CB	0.54	2.56
1:A:69:TRP:CZ3	1:A:107:TRP:CZ2	0.54	2.95
1:A:140:LEU:O	1:A:144:ILE:N	0.53	2.39
1:A:8:ILE:HD11	1:A:46:VAL:HB	0.53	1.79
1:A:158:ILE:N	1:A:158:ILE:CD1	0.53	2.71
1:A:126:VAL:O	1:A:130:VAL:HG23	0.53	2.04
1:A:50:TYR:O	1:A:51:HIS:C	0.53	2.51
1:A:69:TRP:CZ3	1:A:86:VAL:HG11	0.52	2.39
1:A:48:LEU:C	1:A:48:LEU:HD23	0.52	2.29
1:A:65:PHE:CD2	1:A:107:TRP:HB3	0.52	2.40
1:A:49:ARG:O	1:A:53:LEU:HD13	0.52	2.04

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Atom-1	Atom-2	Clash(Å)	Distance(Å)
1:A:12:LEU:HD21	1:A:50:TYR:HB3	0.52	1.81
1:A:12:LEU:HD21	1:A:50:TYR:CB	0.52	2.34
1:A:28:VAL:HG12	1:A:130:VAL:HG21	0.51	1.81
1:A:19:VAL:CG2	1:A:20:HIS:CD2	0.50	2.92
1:A:134:LEU:HD13	1:A:134:LEU:C	0.50	2.31
1:A:15:ARG:O	1:A:19:VAL:HG22	0.50	2.07
1:A:26:HIS:CE1	1:A:28:VAL:CG2	0.50	2.94
1:A:91:PHE:CD1	1:A:91:PHE:C	0.49	2.90
1:A:143:TRP:O	1:A:147:GLN:HG2	0.49	2.08
1:A:88:LEU:N	1:A:88:LEU:HD23	0.49	2.22
1:A:28:VAL:O	1:A:29:LEU:HG	0.49	2.07
1:A:120:SER:C	1:A:121:THR:HG23	0.49	2.31
1:A:50:TYR:CD2	1:A:154:ILE:CD1	0.49	2.96
1:A:107:TRP:CG	1:A:108:CYS:N	0.48	2.81
1:A:12:LEU:HD13	1:A:105:MET:SD	0.48	2.49
1:A:58:ILE:HD11	1:A:106:ALA:C	0.48	2.34
1:A:8:ILE:HD11	1:A:46:VAL:CB	0.48	2.38
1:A:121:THR:O	1:A:125:VAL:HB	0.47	2.09
1:A:20:HIS:CD2	1:A:20:HIS:N	0.47	2.81
1:A:28:VAL:O	1:A:29:LEU:CB	0.47	2.61
1:A:28:VAL:HG11	1:A:126:VAL:HG12	0.47	1.84
1:A:140:LEU:O	1:A:141:ASP:C	0.47	2.58
1:A:143:TRP:HZ3	1:A:144:ILE:HD13	0.47	1.67
1:A:8:ILE:CD1	1:A:150:TRP:CD1	0.47	2.92
1:A:121:THR:O	1:A:121:THR:OG1	0.46	2.23
1:A:86:VAL:HG12	1:A:90:ILE:CG2	0.46	2.40
1:A:58:ILE:HD11	1:A:106:ALA:O	0.46	2.11
1:A:51:HIS:O	1:A:55:GLU:CG	0.46	2.64
1:A:52:VAL:O	1:A:53:LEU:C	0.46	2.58
1:A:81:LEU:C	1:A:81:LEU:CD2	0.45	2.85
1:A:98:LEU:CG	1:A:153:LEU:HD11	0.45	2.41
1:A:121:THR:N	1:A:122:PRO:HD2	0.45	2.25
1:A:153:LEU:HB3	1:A:158:ILE:HD11	0.45	1.88
1:A:52:VAL:HG12	1:A:53:LEU:N	0.45	2.27
1:A:140:LEU:O	1:A:144:ILE:CB	0.45	2.64
1:A:15:ARG:CB	1:A:51:HIS:NE2	0.45	2.79
1:A:44:ASP:HB3	1:A:47:VAL:HG22	0.45	1.87
1:A:153:LEU:CD2	1:A:158:ILE:HG13	0.45	2.42
1:A:46:VAL:HG23	1:A:47:VAL:N	0.45	2.27
1:A:91:PHE:CE1	1:A:100:ARG:CG	0.45	2.99
1:A:140:LEU:O	1:A:144:ILE:HG12	0.44	2.12
1:A:72:PHE:CZ	1:A:86:VAL:HG21	0.44	2.48

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Atom-1	Atom-2	Clash(Å)	Distance(Å)
1:A:16:ASP:OD2	1:A:29:LEU:HD12	0.44	2.12
1:A:86:VAL:CG1	1:A:90:ILE:HG23	0.44	2.42
1:A:121:THR:HB	1:A:125:VAL:CG2	0.44	2.42
1:A:140:LEU:HD23	1:A:150:TRP:HH2	0.44	1.72
1:A:69:TRP:CH2	1:A:133:MET:HE2	0.44	2.48
1:A:143:TRP:CE3	1:A:144:ILE:HD13	0.44	2.48
1:A:36:THR:HG22	1:A:36:THR:O	0.43	2.12
1:A:54:LEU:N	1:A:54:LEU:CD1	0.43	2.81
1:A:140:LEU:O	1:A:144:ILE:HB	0.43	2.12
1:A:47:VAL:HG23	1:A:48:LEU:H	0.43	1.72
1:A:98:LEU:HD23	1:A:101:ALA:HB3	0.43	1.88
1:A:14:ILE:CG2	1:A:15:ARG:N	0.43	2.80
1:A:143:TRP:CE3	1:A:143:TRP:C	0.43	2.97
1:A:77:GLU:O	1:A:78:HIS:CG	0.43	2.71
1:A:166:GLU:O	1:A:167:HIS:CD2	0.43	2.72
1:A:69:TRP:CH2	1:A:133:MET:CE	0.43	3.02
1:A:11:ALA:HB3	1:A:47:VAL:CG1	0.42	2.44
1:A:153:LEU:C	1:A:155:GLU:H	0.42	2.22
1:A:16:ASP:O	1:A:19:VAL:CG2	0.42	2.67
1:A:124:TYR:CZ	1:A:125:VAL:HG23	0.42	2.49
1:A:166:GLU:O	1:A:167:HIS:CG	0.42	2.72
1:A:107:TRP:HA	1:A:110:HIS:CD2	0.42	2.49
1:A:87:PHE:CZ	1:A:140:LEU:HD11	0.42	2.49
1:A:150:TRP:O	1:A:152:THR:N	0.42	2.53
1:A:5:THR:HG22	1:A:150:TRP:CE2	0.42	2.47
1:A:120:SER:C	1:A:122:PRO:CD	0.42	2.93
1:A:40:LEU:C	1:A:40:LEU:HD23	0.42	2.40
1:A:150:TRP:C	1:A:152:THR:N	0.42	2.76
1:A:80:ASP:HA	1:A:83:PHE:CD1	0.42	2.50
1:A:150:TRP:O	1:A:151:SER:C	0.42	2.63
1:A:46:VAL:O	1:A:154:ILE:CD1	0.41	2.62
1:A:90:ILE:HD11	1:A:100:ARG:O	0.41	2.15
1:A:102:LEU:HD11	1:A:153:LEU:HD13	0.41	1.92
1:A:121:THR:CB	1:A:125:VAL:HB	0.41	2.45
1:A:15:ARG:NE	1:A:19:VAL:HG13	0.41	2.30
1:A:19:VAL:HG23	1:A:20:HIS:NE2	0.41	2.29
1:A:69:TRP:O	1:A:72:PHE:CD1	0.41	2.73
1:A:91:PHE:CE1	1:A:100:ARG:HG3	0.41	2.50
1:A:75:HIS:CG	1:A:82:ASP:OD2	0.41	2.73
1:A:79:VAL:O	1:A:83:PHE:CD1	0.41	2.74
1:A:72:PHE:O	1:A:73:ILE:C	0.41	2.62
1:A:91:PHE:O	1:A:92:HIS:C	0.41	2.63

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Atom-1	Atom-2	Clash(Å)	Distance(Å)
1:A:69:TRP:CE3	1:A:107:TRP:CH2	0.41	3.09
1:A:75:HIS:CE1	1:A:77:GLU:OE1	0.41	2.74
1:A:55:GLU:HA	1:A:58:ILE:HD12	0.41	1.91
1:A:69:TRP:CZ3	1:A:107:TRP:CH2	0.41	3.09
1:A:98:LEU:HD21	1:A:150:TRP:HZ3	0.41	1.74
1:A:15:ARG:NE	1:A:19:VAL:CG1	0.41	2.84
1:A:38:LEU:C	1:A:38:LEU:CD1	0.41	2.93
1:A:110:HIS:ND1	1:A:111:ALA:N	0.40	2.69
1:A:154:ILE:O	1:A:154:ILE:CG2	0.40	2.66
1:A:38:LEU:HD13	1:A:39:ARG:C	0.40	2.41
1:A:19:VAL:CG2	1:A:20:HIS:NE2	0.40	2.85
1:A:50:TYR:HH	1:A:150:TRP:CB	0.40	2.29
1:A:8:ILE:CD1	1:A:46:VAL:CG2	0.40	2.99
1:A:26:HIS:ND1	1:A:27:PRO:HD2	0.40	2.32
1:A:104:TRP:HA	1:A:107:TRP:CD1	0.40	2.52
1:A:98:LEU:HG	1:A:144:ILE:CD1	0.40	2.46

6.3 Torsion angles [i](#)

6.3.1 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 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	170/172 (99%)	119 (70%)	30 (18%)	21 (12%)	1	6
All	All	170/172 (99%)	119 (70%)	30 (18%)	21 (12%)	1	6

All 21 Ramachandran outliers are listed below. They are sorted by the frequency of occurrence in the ensemble.

Mol	Chain	Res	Type
1	A	29	LEU
1	A	33	ALA
1	A	34	ARG
1	A	44	ASP
1	A	53	LEU
1	A	73	ILE
1	A	74	THR

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Mol	Chain	Res	Type
1	A	94	GLY
1	A	95	ASP
1	A	96	PRO
1	A	122	PRO
1	A	123	TYR
1	A	141	ASP
1	A	149	GLY
1	A	151	SER
1	A	154	ILE
1	A	155	GLU
1	A	158	ILE
1	A	161	ASP
1	A	163	ASP
1	A	167	HIS

6.3.2 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 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	153/153 (100%)	134 (88%)	19 (12%)	7 48
All	All	153/153 (100%)	134 (88%)	19 (12%)	7 48

All 19 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	5	THR
1	A	8	ILE
1	A	13	CYS
1	A	14	ILE
1	A	20	HIS
1	A	53	LEU
1	A	54	LEU
1	A	70	ASN
1	A	73	ILE
1	A	75	HIS
1	A	81	LEU

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Mol	Chain	Res	Type
1	A	88	LEU
1	A	90	ILE
1	A	91	PHE
1	A	95	ASP
1	A	121	THR
1	A	153	LEU
1	A	154	ILE
1	A	158	ILE

6.3.3 RNA [i](#)

There are no RNA molecules in this entry.

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

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

6.5 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

6.6 Ligand geometry [i](#)

There are no ligands in this entry.

6.7 Other polymers [i](#)

There are no such molecules in this entry.

6.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

7 Chemical shift validation

No chemical shift data were provided