



Full wwPDB X-ray Structure Validation Report ⓘ

Apr 27, 2026 – 05:52 PM EDT

PDB ID : 6ZJ2 / pdb_00006zj2
Title : Structure of RcsB from Salmonella enterica serovar Typhimurium bound to promoter rprA in the presence of phosphomimetic BeF3-
Authors : Huesa, J.; Marina, A.; Casino, P.
Deposited on : 2020-06-27
Resolution : 3.38 Å(reported)

This is a Full wwPDB X-ray 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/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:

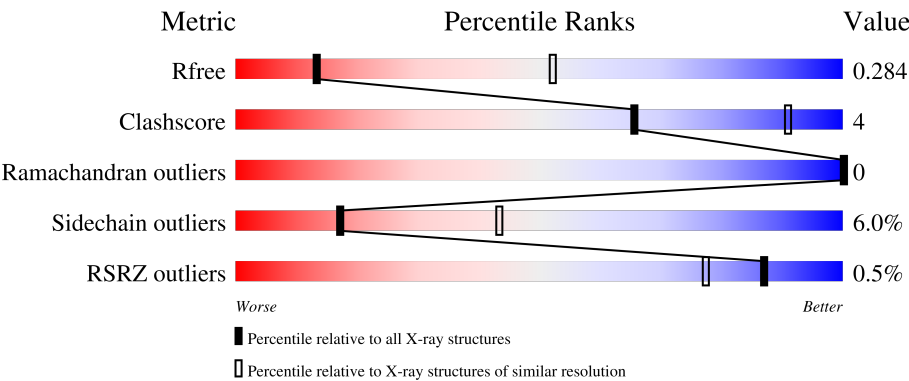
MolProbity	:	4-5-2 with Phenix2.0
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	2.0
EDS	:	3.0
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4	:	9.0.010 (Gargrove)
Density-Fitness	:	1.0.12
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (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 3.38 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))
R_{free}	180053	1047 (3.42-3.34)
Clashscore	190562	1067 (3.42-3.34)
Ramachandran outliers	187476	1056 (3.42-3.34)
Sidechain outliers	187428	1056 (3.42-3.34)
RSRZ outliers	180081	1047 (3.42-3.34)

ENTRY-COMPOSITION INFOmissingINFO

SEQUENCE-PLOTS INFOmissingINFO

2 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	69.36Å 111.51Å 146.26Å 90.00° 90.36° 90.00°	Depositor
Resolution (Å)	45.99 – 3.38 45.99 – 3.40	Depositor EDS
% Data completeness (in resolution range)	97.5 (45.99-3.38) 97.5 (45.99-3.40)	Depositor EDS
R_{merge}	0.23	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.90 (at 3.40Å)	Xtriage
Refinement program	REFMAC 5.8.0238	Depositor
R, R_{free}	0.266 , 0.319 0.268 , 0.284	Depositor DCC
R_{free} test set	1501 reflections (4.87%)	wwPDB-VP
Wilson B-factor (Å ²)	80.1	Xtriage
Anisotropy	0.662	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.25 , 77.3	EDS
L-test for twinning ²	$\langle L \rangle = 0.40$, $\langle L^2 \rangle = 0.22$	Xtriage
Estimated twinning fraction	0.300 for h,-k,-l	Xtriage
F_o, F_c correlation	0.92	EDS
Total number of atoms	12078	wwPDB-VP
Average B, all atoms (Å ²)	91.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.92% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

²Theoretical values of $\langle |L| \rangle$, $\langle L^2 \rangle$ for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

3 Model quality

3.1 Standard geometry

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

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	1.09	0/1427	1.61	0/1952
1	B	1.09	0/1483	1.62	1/2029 (0.0%)
1	C	1.09	0/1398	1.58	0/1913
1	D	1.09	0/1429	1.61	0/1957
1	L	1.10	0/1192	1.65	0/1627
1	M	1.08	0/1310	1.60	0/1792
1	N	1.09	0/1269	1.64	0/1737
1	O	1.10	0/891	1.54	0/1229
2	E	0.29	0/509	0.67	0/784
2	G	0.29	0/509	0.63	0/784
3	F	0.29	0/501	0.70	0/770
3	I	0.29	0/501	0.71	0/770
All	All	1.01	0/12419	1.49	1/17344 (0.0%)

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	128	LYS	N-CA-CB	-5.09	102.33	110.63

There are no chirality outliers.

There are no planarity outliers.

3.2 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	1408	0	1312	12	0
1	B	1462	0	1386	13	0
1	C	1381	0	1290	14	0
1	D	1411	0	1342	12	0
1	L	1180	0	1148	10	0
1	M	1291	0	1244	5	0
1	N	1254	0	1215	6	0
1	O	875	0	819	5	0
2	E	454	0	249	2	0
2	G	454	0	249	3	0
3	F	448	0	249	4	0
3	I	448	0	249	7	0
4	A	4	0	0	0	0
4	B	4	0	0	0	0
5	A	1	0	0	0	0
5	B	1	0	0	0	0
5	C	1	0	0	0	0
5	D	1	0	0	0	0
All	All	12078	0	10752	86	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 4.

All (86) 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:B:122:ALA:HB1	1:B:127:LYS:O	1.78	0.83
3:F:22:DC:H2''	3:F:23:DA:C8	2.24	0.72
1:C:68:ILE:HG13	1:C:101:LEU:HD11	1.73	0.70
1:D:178:SER:O	1:D:181:THR:HG22	1.91	0.70
3:I:19:DG:H2''	3:I:20:DA:O5'	1.91	0.70
1:L:53:LEU:HD22	1:L:54:ILE:N	2.08	0.69
1:C:68:ILE:HG22	1:C:157:GLU:CD	2.20	0.67
1:D:88:MET:HA	1:D:109:LYS:HB2	1.75	0.66
1:O:99:LEU:C	1:O:99:LEU:HD23	2.21	0.65
2:E:22:DG:O6	3:F:18:DC:N3	2.36	0.59
3:I:19:DG:C2'	3:I:20:DA:O5'	2.53	0.57
1:A:151:LEU:HD11	1:A:159:LEU:HD12	1.87	0.55
1:A:40:ALA:HA	1:D:174:LYS:O	2.07	0.55
1:D:151:LEU:HD11	1:D:193:LEU:HD21	1.88	0.55
1:L:116:LEU:HB3	1:L:117:PRO:HD3	1.89	0.55
1:B:203:ASN:C	1:B:203:ASN:HD22	2.15	0.54

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:116:LEU:HB3	1:C:117:PRO:HD3	1.90	0.53
1:L:53:LEU:HD22	1:L:53:LEU:C	2.33	0.53
1:B:66:ASP:N	1:B:66:ASP:OD1	2.41	0.52
1:N:15:VAL:HG22	1:O:15:VAL:HG22	1.91	0.52
3:I:22:DC:H2''	3:I:23:DA:C8	2.45	0.52
1:B:122:ALA:HB1	1:B:127:LYS:C	2.35	0.52
1:A:42:ILE:HG21	1:A:64:TYR:CE1	2.45	0.51
1:A:159:LEU:HD11	1:A:189:ALA:HB1	1.91	0.51
1:B:68:ILE:HG12	1:B:98:VAL:HG22	1.92	0.51
1:L:53:LEU:HD21	1:L:55:THR:HB	1.92	0.50
1:A:93:ALA:HB1	1:A:151:LEU:CD1	2.41	0.50
1:C:93:ALA:HB1	1:C:151:LEU:HD12	1.94	0.49
1:L:53:LEU:O	1:L:53:LEU:HD13	2.12	0.49
1:N:11:ASP:HB3	1:N:60:PRO:HD3	1.93	0.49
1:B:122:ALA:CB	1:B:127:LYS:O	2.54	0.48
1:N:163:ALA:HB2	1:N:205:LEU:HD13	1.94	0.48
2:E:8:DA:H2''	2:E:9:DG:C8	2.48	0.48
1:N:116:LEU:HB3	1:N:117:PRO:HD3	1.95	0.47
1:O:83:ILE:O	1:O:103:ILE:HG22	2.14	0.47
1:A:59:MET:HG2	1:A:60:PRO:HD2	1.97	0.47
1:A:86:LEU:HA	1:A:107:VAL:O	2.14	0.47
3:I:22:DC:C2'	3:I:23:DA:C8	2.99	0.46
1:M:93:ALA:HB1	1:M:151:LEU:HD12	1.98	0.46
3:I:29:DG:C2	3:I:30:DT:C2	3.04	0.46
1:B:116:LEU:HB3	1:B:117:PRO:HD3	1.97	0.45
1:D:116:LEU:HB3	1:D:117:PRO:HD3	1.98	0.45
1:B:122:ALA:O	1:B:126:GLY:N	2.49	0.45
1:D:15:VAL:HG22	1:C:15:VAL:HG22	1.98	0.44
1:C:89:ASN:ND2	1:C:94:ILE:HG21	2.32	0.44
1:C:90:ASN:HD22	1:C:110:GLN:NE2	2.15	0.44
3:I:18:DC:H1'	3:I:19:DG:C8	2.51	0.44
1:B:94:ILE:O	1:B:98:VAL:HG23	2.18	0.44
1:C:74:ILE:HG22	1:C:83:ILE:HD11	2.00	0.44
1:M:97:ALA:HB1	1:M:153:PRO:HA	2.00	0.43
1:O:116:LEU:HB3	1:O:117:PRO:HD3	2.00	0.43
1:D:166:PHE:CE2	1:D:174:LYS:HE2	2.53	0.43
1:B:99:LEU:HG	1:B:106:ILE:HD12	2.00	0.43
1:L:15:VAL:HG22	1:M:15:VAL:HG22	2.01	0.43
1:B:122:ALA:O	1:B:127:LYS:N	2.52	0.43
1:A:56:ASP:OD1	1:A:57:LEU:N	2.51	0.43
1:A:185:GLN:NE2	3:I:21:DT:OP2	2.52	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:137:LEU:O	1:A:141:ILE:N	2.39	0.42
3:F:22:DC:C2'	3:F:23:DA:C8	3.01	0.42
1:L:66:ASP:N	1:L:66:ASP:OD1	2.52	0.42
1:A:98:VAL:HG12	1:A:106:ILE:HD11	2.01	0.42
1:C:89:ASN:HD21	1:C:94:ILE:HG21	1.84	0.42
1:N:110:GLN:HE21	1:N:110:GLN:HB3	1.66	0.42
1:C:163:ALA:HB2	1:C:205:LEU:HD13	2.02	0.42
1:D:6:VAL:HG21	1:D:29:VAL:HG13	2.02	0.42
1:L:103:ILE:HD11	1:L:106:ILE:HD11	2.01	0.42
1:O:95:LEU:HA	1:O:98:VAL:CG2	2.50	0.41
1:A:45:LEU:N	1:A:46:PRO:CD	2.84	0.41
1:D:45:LEU:N	1:D:46:PRO:CD	2.83	0.41
1:D:193:LEU:HD22	1:D:204:TYR:CZ	2.55	0.41
1:B:6:VAL:HG21	1:B:29:VAL:HG13	2.03	0.41
1:B:188:SER:HA	1:B:191:MET:HE2	2.03	0.41
1:D:109:LYS:O	1:C:13:PRO:HD2	2.20	0.41
2:G:3:DT:H2''	2:G:4:DA:O5'	2.20	0.41
1:M:116:LEU:HB3	1:M:117:PRO:HD3	2.03	0.41
1:N:37:ASP:OD1	1:N:37:ASP:N	2.54	0.41
1:D:88:MET:N	1:D:109:LYS:HD3	2.36	0.41
3:F:29:DG:C2	3:F:30:DT:C2	3.08	0.41
2:G:6:DT:H2''	2:G:7:DG:O4'	2.20	0.41
1:C:86:LEU:HA	1:C:107:VAL:O	2.21	0.41
1:C:97:ALA:CB	1:C:153:PRO:HA	2.51	0.41
1:M:45:LEU:N	1:M:46:PRO:CD	2.83	0.41
1:L:98:VAL:HG12	1:L:103:ILE:CD1	2.51	0.41
1:C:94:ILE:HA	1:C:156:SER:HB3	2.03	0.40
2:G:5:DT:H72	2:G:6:DT:H73	2.03	0.40
1:L:89:ASN:HD21	1:L:94:ILE:HB	1.87	0.40

There are no symmetry-related clashes.

3.3 Torsion angles

3.3.1 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	198/216 (92%)	184 (93%)	14 (7%)	0	100	100
1	B	206/216 (95%)	192 (93%)	14 (7%)	0	100	100
1	C	192/216 (89%)	182 (95%)	10 (5%)	0	100	100
1	D	197/216 (91%)	179 (91%)	18 (9%)	0	100	100
1	L	160/216 (74%)	156 (98%)	4 (2%)	0	100	100
1	M	175/216 (81%)	167 (95%)	8 (5%)	0	100	100
1	N	174/216 (81%)	167 (96%)	7 (4%)	0	100	100
1	O	121/216 (56%)	117 (97%)	4 (3%)	0	100	100
All	All	1423/1728 (82%)	1344 (94%)	79 (6%)	0	100	100

There are no Ramachandran outliers to report.

3.3.2 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	135/189 (71%)	124 (92%)	11 (8%)	11	36
1	B	143/189 (76%)	138 (96%)	5 (4%)	32	56
1	C	133/189 (70%)	125 (94%)	8 (6%)	17	43
1	D	138/189 (73%)	132 (96%)	6 (4%)	26	51
1	L	121/189 (64%)	112 (93%)	9 (7%)	13	38
1	M	133/189 (70%)	126 (95%)	7 (5%)	20	47
1	N	126/189 (67%)	118 (94%)	8 (6%)	16	42
1	O	88/189 (47%)	81 (92%)	7 (8%)	11	36
All	All	1017/1512 (67%)	956 (94%)	61 (6%)	17	43

All (61) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	66	ASP
1	B	110	GLN

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Mol	Chain	Res	Type
1	B	154	LYS
1	B	157	GLU
1	B	181	THR
1	A	5	ASN
1	A	22	SER
1	A	43	ASN
1	A	45	LEU
1	A	53	LEU
1	A	56	ASP
1	A	90	ASN
1	A	110	GLN
1	A	168	VAL
1	A	169	THR
1	A	191	MET
1	D	56	ASP
1	D	154	LYS
1	D	155	GLU
1	D	169	THR
1	D	174	LYS
1	D	192	LYS
1	C	5	ASN
1	C	43	ASN
1	C	62	ASP
1	C	103	ILE
1	C	110	GLN
1	C	124	GLN
1	C	180	LYS
1	C	196	GLU
1	L	53	LEU
1	L	66	ASP
1	L	101	LEU
1	L	103	ILE
1	L	110	GLN
1	L	154	LYS
1	L	157	GLU
1	L	181	THR
1	L	196	GLU
1	M	5	ASN
1	M	59	MET
1	M	110	GLN
1	M	115	ASP
1	M	154	LYS

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Mol	Chain	Res	Type
1	M	181	THR
1	M	196	GLU
1	N	30	ASN
1	N	31	VAL
1	N	32	VAL
1	N	110	GLN
1	N	154	LYS
1	N	169	THR
1	N	181	THR
1	N	196	GLU
1	O	5	ASN
1	O	43	ASN
1	O	98	VAL
1	O	99	LEU
1	O	100	ASP
1	O	103	ILE
1	O	110	GLN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (26) such sidechains are listed below:

Mol	Chain	Res	Type
1	B	44	ASN
1	B	110	GLN
1	B	203	ASN
1	A	30	ASN
1	A	43	ASN
1	A	77	HIS
1	A	110	GLN
1	A	197	ASN
1	A	203	ASN
1	D	203	ASN
1	C	44	ASN
1	C	90	ASN
1	C	124	GLN
1	C	203	ASN
1	L	25	GLN
1	L	110	GLN
1	M	44	ASN
1	M	176	ASN
1	M	203	ASN
1	N	25	GLN
1	N	44	ASN

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Mol	Chain	Res	Type
1	N	110	GLN
1	N	176	ASN
1	N	203	ASN
1	O	43	ASN
1	O	44	ASN

3.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

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

3.5 Carbohydrates ⓘ

There are no oligosaccharides in this entry.

3.6 Ligand geometry ⓘ

Of 6 ligands modelled in this entry, 6 could not be matched to an existing wwPDB Chemical Component Dictionary definition at this stage - leaving 0 for Mogul analysis.

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

No monomer is involved in short contacts.

3.7 Other polymers ⓘ

There are no such residues in this entry.

3.8 Polymer linkage issues ⓘ

The following chains have linkage breaks:

Mol	Chain	Number of breaks
1	C	1

All chain breaks are listed below:

Model	Chain	Residue-1	Atom-1	Residue-2	Atom-2	Distance (Å)
1	C	142:GLY	C	146:TYR	N	5.45

4 Fit of model and data

4.1 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(Å ²)	Q<0.9
1	A	202/216 (93%)	-1.19	1 (0%) 87 77	37, 62, 90, 109	0
1	B	208/216 (96%)	-1.19	0 100 100	45, 68, 101, 121	0
1	C	198/216 (91%)	-1.16	0 100 100	45, 76, 120, 130	0
1	D	201/216 (93%)	-1.14	0 100 100	42, 74, 110, 126	0
1	L	166/216 (76%)	-0.93	2 (1%) 76 62	83, 119, 179, 191	0
1	M	179/216 (82%)	-0.95	0 100 100	79, 117, 149, 166	0
1	N	178/216 (82%)	-0.94	2 (1%) 78 64	87, 129, 163, 184	0
1	O	123/216 (56%)	-0.88	3 (2%) 59 44	85, 126, 140, 150	0
2	E	22/23 (95%)	-1.53	0 100 100	41, 61, 88, 116	0
2	G	22/23 (95%)	-1.47	0 100 100	52, 76, 101, 106	0
3	F	22/23 (95%)	-1.52	0 100 100	46, 65, 86, 128	0
3	I	22/23 (95%)	-1.59	0 100 100	43, 71, 91, 112	0
All	All	1543/1820 (84%)	-1.09	8 (0%) 87 77	37, 91, 149, 191	0

All (8) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	L	65	GLY	4.5
1	O	33	GLY	3.4
1	O	7	ILE	3.1
1	L	36	GLU	2.4
1	A	93	ALA	2.4
1	N	121	ALA	2.3
1	N	22	SER	2.2
1	O	8	ILE	2.0

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

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

4.3 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

LIGAND-RSR INFOmissingINFO

4.4 Other polymers [i](#)

There are no such residues in this entry.