



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 9, 2026 – 09:04 AM UTC

PDB ID : 5E27 / pdb_00005e27
Title : The structure of Resuscitation Promoting Factor B from M. tuberculosis reveals unexpected ubiquitin-like domains
Authors : Ruggiero, A.; Squeglia, F.; Romano, M.; Vitagliano, L.; De Simone, A.; Berisio, R.
Deposited on : 2015-09-30
Resolution : 2.60 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
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

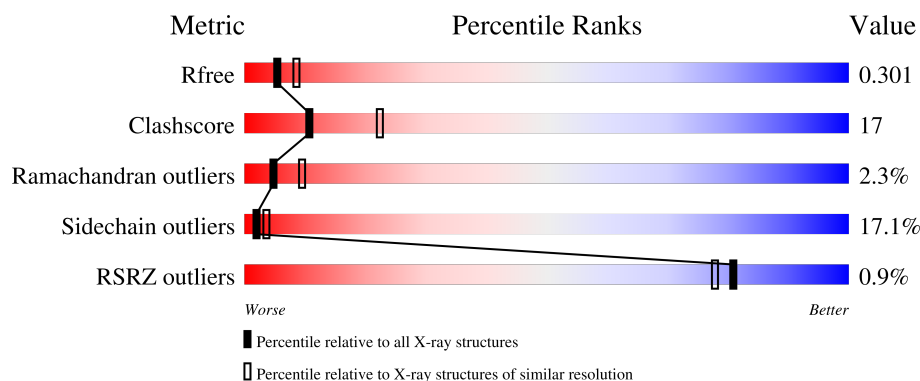
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.60 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	4008 (2.60-2.60)
Clashscore	190562	4347 (2.60-2.60)
Ramachandran outliers	187476	4277 (2.60-2.60)
Sidechain outliers	187428	4277 (2.60-2.60)
RSRZ outliers	180081	4008 (2.60-2.60)

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 $\leq 5\%$. 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	248	<div> <div></div> <div>57% 26% 8% 9%</div> </div>
1	B	248	<div> <div></div> <div>56% 25% 6% 11%</div> </div>

2 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 3387 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 Resuscitation-promoting factor RpfB.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	226	Total	C	N	O	S	0	2	0
			1682	1049	310	318	5			
1	B	220	Total	C	N	O	S	0	0	0
			1629	1018	297	309	5			

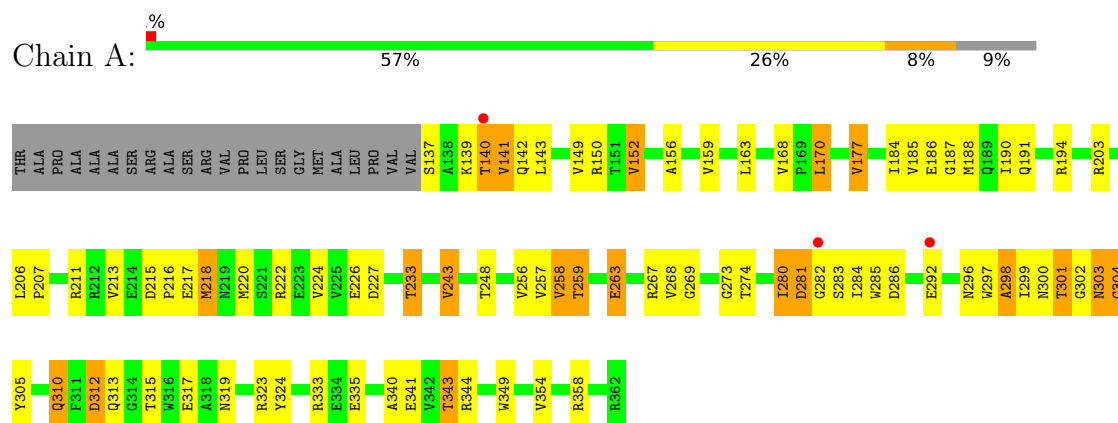
- Molecule 2 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	36	Total	O	0	0
			36	36		
2	B	40	Total	O	0	0
			40	40		

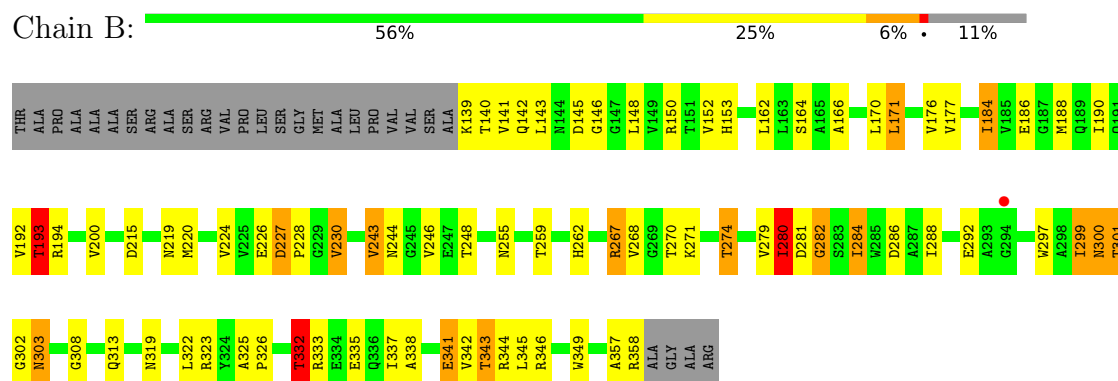
3 Residue-property plots

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: Resuscitation-promoting factor RpfB



• Molecule 1: Resuscitation-promoting factor RpfB



4 Data and refinement statistics

Property	Value	Source
Space group	C 2 2 21	Depositor
Cell constants a, b, c, α , β , γ	102.38Å 126.99Å 86.29Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	15.00 – 2.60 15.00 – 2.65	Depositor EDS
% Data completeness (in resolution range)	92.9 (15.00-2.60) 94.0 (15.00-2.65)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	6.15 (at 2.65Å)	Xtriage
Refinement program	REFMAC 5.5.0110	Depositor
R, R_{free}	0.222 , 0.291 0.234 , 0.301	Depositor DCC
R_{free} test set	786 reflections (4.74%)	wwPDB-VP
Wilson B-factor (Å ²)	49.4	Xtriage
Anisotropy	0.094	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.30 , 25.4	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.93	EDS
Total number of atoms	3387	wwPDB-VP
Average B, all atoms (Å ²)	36.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The analyses of the Patterson function reveals a significant off-origin peak that is 35.00 % of the origin peak, indicating pseudo-translational symmetry. The chance of finding a peak of this or larger height randomly in a structure without pseudo-translational symmetry is equal to 6.2437e-04. The detected translational NCS is most likely also responsible for the elevated intensity ratio.*

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.

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	1.11	3/1720 (0.2%)	1.13	5/2356 (0.2%)
1	B	1.07	1/1664 (0.1%)	1.18	7/2282 (0.3%)
All	All	1.09	4/3384 (0.1%)	1.15	12/4638 (0.3%)

All (4) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	227	ASP	C-N	6.83	1.40	1.33
1	A	298	ALA	CA-CB	-5.25	1.46	1.53
1	A	177	VAL	CA-CB	5.05	1.60	1.54
1	B	177	VAL	CA-CB	5.05	1.58	1.54

All (12) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	227	ASP	CA-C-N	-6.37	113.38	120.45
1	A	227	ASP	C-N-CA	-6.37	113.38	120.45
1	A	152	VAL	N-CA-C	6.11	117.09	108.17
1	A	319	ASN	CB-CA-C	6.03	120.80	111.28
1	B	193	THR	CB-CA-C	5.89	119.94	110.16
1	B	192	VAL	CB-CA-C	-5.82	102.77	110.98
1	A	281	ASP	N-CA-C	-5.72	98.62	110.80
1	B	227	ASP	CA-C-N	5.56	125.65	119.87
1	B	227	ASP	C-N-CA	5.56	125.65	119.87
1	B	255	ASN	N-CA-C	5.39	116.83	107.93
1	B	325	ALA	CA-C-N	-5.35	114.42	120.89
1	B	325	ALA	C-N-CA	-5.35	114.42	120.89

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	1682	0	1667	56	0
1	B	1629	0	1612	54	0
2	A	36	0	0	2	0
2	B	40	0	0	4	0
All	All	3387	0	3279	110	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 17.

All (110) 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:A:303:ASN:OD1	1:A:304:GLY:N	1.95	0.99
1:A:305:TYR:CB	1:A:310:GLN:HG3	1.97	0.93
1:A:305:TYR:HB3	1:A:310:GLN:HG3	1.53	0.91
1:A:233:THR:HG22	1:A:258:VAL:HG22	1.58	0.84
1:B:220:MET:H	1:B:274:THR:CG2	1.92	0.83
1:A:313:GLN:O	1:A:317:GLU:HG3	1.81	0.81
1:B:140:THR:OG1	1:B:153:HIS:HD2	1.66	0.78
1:A:305:TYR:HB2	1:A:310:GLN:HG3	1.69	0.74
1:B:332:THR:HG22	1:B:335:GLU:H	1.56	0.70
1:A:163:LEU:HD13	1:A:170:LEU:HD13	1.73	0.70
1:B:220:MET:H	1:B:274:THR:HG21	1.55	0.70
1:A:281:ASP:OD1	1:A:284:ILE:HD12	1.93	0.69
1:B:194:ARG:H	1:B:244:ASN:ND2	1.92	0.68
1:B:274:THR:O	1:B:274:THR:HG23	1.94	0.67
1:A:203:ARG:NH2	1:A:258:VAL:HG21	2.11	0.66
1:A:156:ALA:O	1:A:184:ILE:HD12	1.95	0.66
1:B:297:TRP:CE2	1:B:333:ARG:HG3	2.31	0.66
1:A:280:ILE:O	1:A:281:ASP:HB2	1.97	0.65
1:B:141:VAL:HG11	1:B:190:ILE:HD12	1.78	0.63
1:A:324:TYR:CD1	1:A:335:GLU:HG2	2.33	0.63
2:A:424:HOH:O	1:B:193:THR:HB	1.98	0.63
1:B:184:ILE:HG13	1:B:188:MET:HE1	1.80	0.61
1:B:342:VAL:O	1:B:342:VAL:HG12	1.99	0.61

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:150:ARG:NH2	1:B:166:ALA:HB1	2.16	0.60
1:A:282:GLY:O	1:A:286:ASP:N	2.23	0.60
1:A:137:SER:O	1:A:139:LYS:HD2	2.02	0.59
1:A:220:MET:HG3	1:A:274:THR:OG1	2.01	0.59
1:A:300:ASN:C	1:A:300:ASN:HD22	2.09	0.59
1:B:230:VAL:CG1	1:B:262:HIS:HB2	2.33	0.59
1:B:280:ILE:HG22	1:B:281:ASP:N	2.18	0.58
1:A:149:VAL:HG12	1:A:150:ARG:N	2.18	0.58
1:A:297:TRP:CZ2	1:A:333:ARG:HG3	2.39	0.58
1:B:343:THR:C	1:B:345:LEU:H	2.12	0.57
1:B:284:ILE:HD12	1:B:349:TRP:CH2	2.39	0.57
1:B:139:LYS:HG3	2:B:408:HOH:O	2.04	0.57
1:A:163:LEU:CD1	1:A:170:LEU:HD13	2.34	0.56
1:B:297:TRP:CE3	1:B:308:GLY:HA3	2.40	0.56
1:B:184:ILE:HG13	1:B:188:MET:CE	2.37	0.55
1:A:273:GLY:O	1:A:323:ARG:HD2	2.07	0.55
1:B:139:LYS:HA	2:B:408:HOH:O	2.07	0.55
1:B:140:THR:OG1	1:B:153:HIS:CD2	2.55	0.55
1:B:281:ASP:O	1:B:282:GLY:C	2.51	0.54
1:A:140:THR:HB	1:A:187:GLY:H	1.73	0.54
1:A:203:ARG:HH21	1:A:258:VAL:HG21	1.71	0.54
1:A:226:GLU:OE2	1:A:267[A]:ARG:NH1	2.42	0.53
1:B:288:ILE:O	1:B:292:GLU:CB	2.56	0.53
1:A:191:GLN:HG3	2:B:427:HOH:O	2.08	0.53
1:B:194:ARG:H	1:B:244:ASN:HD21	1.55	0.53
1:A:243:VAL:HG13	1:A:248:THR:HG21	1.91	0.52
1:A:344:ARG:HD2	1:A:349:TRP:CE2	2.43	0.52
1:B:319:ASN:OD1	1:B:343:THR:OG1	2.04	0.52
1:B:343:THR:C	1:B:345:LEU:N	2.65	0.52
1:A:299:ILE:O	1:A:299:ILE:HG23	2.10	0.52
1:B:341:GLU:C	1:B:343:THR:H	2.17	0.52
1:B:200:VAL:O	1:B:200:VAL:HG23	2.09	0.51
1:B:288:ILE:O	1:B:292:GLU:HB2	2.10	0.51
1:B:219:ASN:HA	1:B:274:THR:HG21	1.93	0.51
1:A:213:VAL:HG23	1:A:267[A]:ARG:HG3	1.93	0.50
1:B:357:ALA:N	2:B:403:HOH:O	2.44	0.50
1:B:338:ALA:O	1:B:342:VAL:HG23	2.11	0.50
1:A:222:ARG:HB2	2:A:430:HOH:O	2.12	0.50
1:A:186:GLU:HA	1:A:186:GLU:OE2	2.10	0.50
1:B:271:LYS:O	1:B:274:THR:HB	2.11	0.50
1:B:274:THR:CG2	1:B:274:THR:O	2.59	0.50

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:170:LEU:O	1:B:171:LEU:HD13	2.12	0.50
1:A:344:ARG:HD2	1:A:349:TRP:CZ2	2.47	0.49
1:A:312:ASP:C	1:A:312:ASP:OD2	2.55	0.49
1:A:168:VAL:HB	1:A:194:ARG:NH2	2.28	0.48
1:B:301:THR:O	1:B:303:ASN:N	2.47	0.48
1:A:285:TRP:CZ2	1:A:341:GLU:HG3	2.49	0.48
1:A:149:VAL:HG12	1:A:150:ARG:H	1.79	0.48
1:B:281:ASP:O	1:B:284:ILE:HG22	2.14	0.47
1:A:280:ILE:HD12	1:A:280:ILE:HA	1.67	0.47
1:A:303:ASN:OD1	1:A:305:TYR:N	2.39	0.47
1:B:145:ASP:O	1:B:146:GLY:C	2.58	0.47
1:A:297:TRP:CE2	1:A:333:ARG:HG3	2.50	0.46
1:A:302:GLY:O	1:A:303:ASN:HB3	2.15	0.46
1:A:215:ASP:C	1:A:217:GLU:H	2.24	0.46
1:A:281:ASP:OD1	1:A:284:ILE:CD1	2.64	0.45
1:B:299:ILE:O	1:B:300:ASN:HB2	2.16	0.45
1:B:319:ASN:OD1	1:B:343:THR:HG23	2.16	0.45
1:A:141:VAL:HG22	1:A:188:MET:HE2	1.98	0.45
1:B:162:LEU:HD12	1:B:184:ILE:HD12	1.99	0.45
1:A:218:MET:HG2	1:A:269:GLY:CA	2.47	0.45
1:B:219:ASN:HD22	1:B:219:ASN:N	2.14	0.44
1:A:258:VAL:CG2	1:A:259:THR:N	2.81	0.44
1:B:215:ASP:HB2	1:B:267:ARG:HD2	1.99	0.44
1:A:206:LEU:HD12	1:A:207:PRO:HD2	1.99	0.44
1:A:296:ASN:ND2	1:A:298:ALA:H	2.16	0.44
1:A:149:VAL:CG1	1:A:150:ARG:N	2.80	0.43
1:A:211:ARG:HD3	1:A:263:GLU:OE1	2.19	0.43
1:B:188:MET:HE3	1:B:190:ILE:HD11	1.99	0.43
1:B:220:MET:H	1:B:274:THR:HG23	1.81	0.43
1:A:301:THR:HG23	1:A:302:GLY:H	1.84	0.43
1:B:230:VAL:HG13	1:B:262:HIS:HB2	2.01	0.43
1:B:279:VAL:HG12	1:B:337:ILE:HG21	2.01	0.43
1:B:244:ASN:HD22	1:B:244:ASN:HA	1.66	0.42
1:A:188:MET:HE3	1:A:190:ILE:HD11	2.01	0.42
1:B:319:ASN:OD1	1:B:343:THR:CG2	2.66	0.42
1:B:243:VAL:HG13	1:B:248:THR:HG21	2.00	0.42
1:A:285:TRP:HZ2	1:A:341:GLU:HG3	1.84	0.42
1:A:141:VAL:CG2	1:A:188:MET:HE2	2.50	0.41
1:A:215:ASP:HA	1:A:216:PRO:HD3	1.90	0.41
1:B:227:ASP:HA	1:B:228:PRO:HD2	1.90	0.41
1:B:313:GLN:NE2	1:B:326:PRO:O	2.51	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:282:GLY:C	1:A:284:ILE:N	2.78	0.41
1:A:358:ARG:CZ	1:A:358:ARG:HB2	2.51	0.41
1:B:226:GLU:OE1	1:B:267:ARG:NH1	2.54	0.40
1:B:280:ILE:CG2	1:B:281:ASP:N	2.83	0.40
1:A:340:ALA:O	1:A:343:THR:N	2.50	0.40

There are no symmetry-related clashes.

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	A	226/248 (91%)	205 (91%)	18 (8%)	3 (1%)	9	21
1	B	218/248 (88%)	194 (89%)	17 (8%)	7 (3%)	3	5
All	All	444/496 (90%)	399 (90%)	35 (8%)	10 (2%)	5	9

All (10) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	263	GLU
1	A	303	ASN
1	B	302	GLY
1	B	332	THR
1	B	300	ASN
1	B	186	GLU
1	B	344	ARG
1	A	304	GLY
1	B	282	GLY
1	B	280	ILE

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	172/187 (92%)	145 (84%)	27 (16%)	2	4
1	B	169/187 (90%)	138 (82%)	31 (18%)	2	3
All	All	341/374 (91%)	283 (83%)	58 (17%)	2	4

All (58) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	140	THR
1	A	141	VAL
1	A	142	GLN
1	A	143	LEU
1	A	152	VAL
1	A	159	VAL
1	A	170	LEU
1	A	177	VAL
1	A	185	VAL
1	A	218	MET
1	A	224	VAL
1	A	233	THR
1	A	243	VAL
1	A	256	VAL
1	A	257	VAL
1	A	258	VAL
1	A	259	THR
1	A	268	VAL
1	A	280	ILE
1	A	283	SER
1	A	292	GLU
1	A	301	THR
1	A	310	GLN
1	A	312	ASP
1	A	315	THR
1	A	343	THR
1	A	354	VAL

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Mol	Chain	Res	Type
1	B	142	GLN
1	B	143	LEU
1	B	148	LEU
1	B	152	VAL
1	B	164	SER
1	B	171	LEU
1	B	176	VAL
1	B	184	ILE
1	B	193	THR
1	B	224	VAL
1	B	230	VAL
1	B	243	VAL
1	B	246	VAL
1	B	259	THR
1	B	267	ARG
1	B	268	VAL
1	B	270	THR
1	B	274	THR
1	B	280	ILE
1	B	284	ILE
1	B	286	ASP
1	B	299	ILE
1	B	301	THR
1	B	303	ASN
1	B	322	LEU
1	B	323	ARG
1	B	332	THR
1	B	341	GLU
1	B	343	THR
1	B	346	ARG
1	B	358	ARG

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (12) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	172	GLN
1	A	191	GLN
1	A	219	ASN
1	A	296	ASN
1	A	300	ASN
1	B	153	HIS
1	B	172	GLN

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Mol	Chain	Res	Type
1	B	195	ASN
1	B	219	ASN
1	B	234	GLN
1	B	244	ASN
1	B	303	ASN

5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

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

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

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 [i](#)

6.1 Protein, DNA and RNA chains [i](#)

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	226/248 (91%)	-0.19	3 (1%) 75 71	14, 33, 56, 67	2 (0%)
1	B	220/248 (88%)	-0.20	1 (0%) 87 85	21, 32, 70, 76	0
All	All	446/496 (89%)	-0.19	4 (0%) 81 78	14, 32, 64, 76	2 (0%)

All (4) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	292	GLU	2.1
1	A	140	THR	2.1
1	A	282	GLY	2.1
1	B	294	GLY	2.1

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

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

6.3 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

6.4 Ligands [i](#)

There are no ligands in this entry.

6.5 Other polymers [i](#)

There are no such residues in this entry.