



wwPDB X-ray Structure Validation Summary Report ⓘ

Dec 2, 2024 – 11:03 AM EST

PDB ID : 2BX9
Title : Crystal structure of B.subtilis Anti-TRAP protein, an antagonist of TRAP-RNA interactions
Authors : Shevtsov, M.B.; Chen, Y.; Gollnick, P.; Antson, A.A.
Deposited on : 2005-07-26
Resolution : 2.80 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 ⓘ 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:

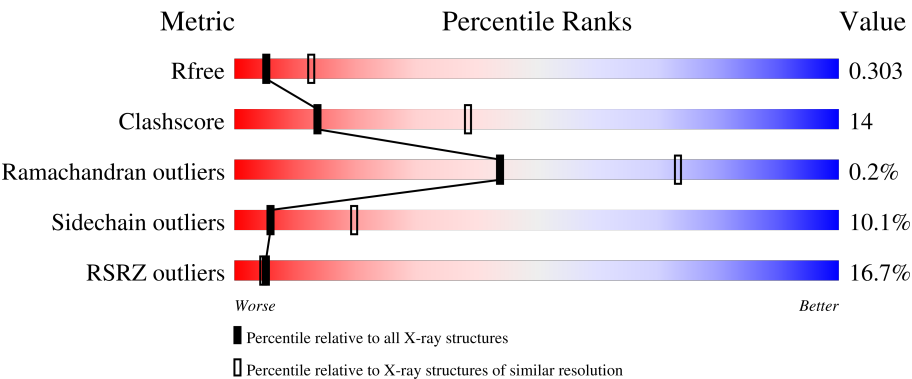
MolProbity	:	4.02b-467
Xtriage (Phenix)	:	1.21
EDS	:	3.0
Percentile statistics	:	20231227.v01 (using entries in the PDB archive December 27th 2023)
CCP4	:	9.0.004 (Gargrove)
Density-Fitness	:	1.0.11
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.40

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 2.80 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}	164625	3657 (2.80-2.80)
Clashscore	180529	4123 (2.80-2.80)
Ramachandran outliers	177936	4071 (2.80-2.80)
Sidechain outliers	177891	4073 (2.80-2.80)
RSRZ outliers	164620	3659 (2.80-2.80)

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 $\leq 5\%$

Mol	Chain	Length	Quality of chain
1	A	53	
1	B	53	
1	C	53	
1	D	53	
1	E	53	
1	F	53	

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Mol	Chain	Length	Quality of chain
1	G	53	<div><div></div><div>15%</div><div>62%</div><div>34%</div><div></div></div>
1	H	53	<div><div></div><div>23%</div><div>62%</div><div>34%</div><div></div></div>
1	I	53	<div><div></div><div>4%</div><div>62%</div><div>36%</div><div></div></div>
1	J	53	<div><div></div><div>23%</div><div>74%</div><div>21%</div><div>6%</div></div>
1	K	53	<div><div></div><div></div><div>68%</div><div>28%</div><div></div></div>
1	L	53	<div><div></div><div>45%</div><div>75%</div><div>19%</div><div>6%</div></div>

2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 4847 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 TRYPTOPHAN RNA-BINDING ATTENUATOR PROTEIN-INHIBITORY PROTEIN.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	53	Total	C	N	O	S	0	0	0
			391	245	65	76	5			
1	B	53	Total	C	N	O	S	0	1	0
			394	246	65	78	5			
1	C	53	Total	C	N	O	S	0	0	0
			391	245	65	76	5			
1	D	53	Total	C	N	O	S	0	1	0
			394	246	65	78	5			
1	E	53	Total	C	N	O	S	0	0	0
			391	245	65	76	5			
1	F	53	Total	C	N	O	S	0	0	0
			391	245	65	76	5			
1	G	53	Total	C	N	O	S	0	1	0
			398	251	65	77	5			
1	H	53	Total	C	N	O	S	0	0	0
			391	245	65	76	5			
1	I	53	Total	C	N	O	S	0	0	0
			391	245	65	76	5			
1	J	53	Total	C	N	O	S	0	0	0
			391	245	65	76	5			
1	K	53	Total	C	N	O	S	0	0	0
			391	245	65	76	5			
1	L	53	Total	C	N	O	S	0	0	0
			391	245	65	76	5			

- Molecule 2 is ZINC ION (three-letter code: ZN) (formula: Zn).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	1	Total	Zn	0	0
			1	1		
2	B	1	Total	Zn	0	0
			1	1		

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Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	C	1	Total 1	Zn 1	0	0
2	D	1	Total 1	Zn 1	0	0
2	E	1	Total 1	Zn 1	0	0
2	F	1	Total 1	Zn 1	0	0
2	G	1	Total 1	Zn 1	0	0
2	H	1	Total 1	Zn 1	0	0
2	I	1	Total 1	Zn 1	0	0
2	J	1	Total 1	Zn 1	0	0
2	K	1	Total 1	Zn 1	0	0
2	L	1	Total 1	Zn 1	0	0

- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	12	Total 12	O 12	0	0
3	B	10	Total 10	O 10	0	0
3	C	4	Total 4	O 4	0	0
3	D	13	Total 13	O 13	0	0
3	E	13	Total 13	O 13	0	0
3	F	16	Total 16	O 16	0	0
3	G	10	Total 10	O 10	0	0
3	H	9	Total 9	O 9	0	0
3	I	5	Total 5	O 5	0	0

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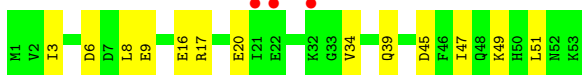
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Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	J	12	Total 12	O 12	0	0
3	K	17	Total 17	O 17	0	0
3	L	9	Total 9	O 9	0	0

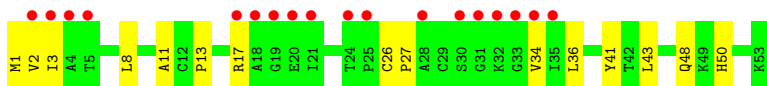
3 Residue-property plots [i](#)

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.

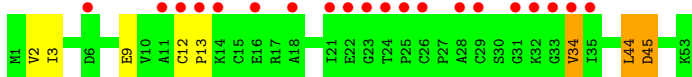
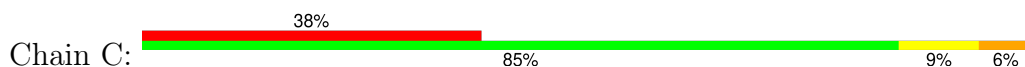
- Molecule 1: TRYPTOPHAN RNA-BINDING ATTENUATOR PROTEIN-INHIBITORY PROTEIN



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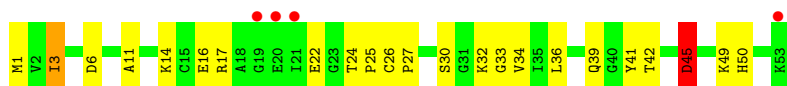


- Molecule 1: TRYPTOPHAN RNA-BINDING ATTENUATOR PROTEIN-INHIBITORY PROTEIN

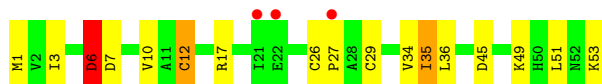


- Molecule 1: TRYPTOPHAN RNA-BINDING ATTENUATOR PROTEIN-INHIBITORY PROTEIN





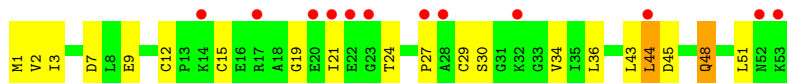
• Molecule 1: TRYPTOPHAN RNA-BINDING ATTENUATOR PROTEIN-INHIBITORY PROTEIN



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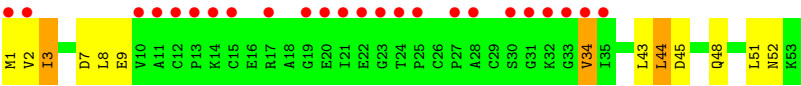
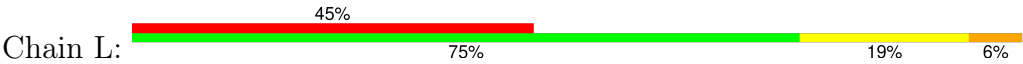


• Molecule 1: TRYPTOPHAN RNA-BINDING ATTENUATOR PROTEIN-INHIBITORY PROTEIN





● Molecule 1: TRYPTOPHAN RNA-BINDING ATTENUATOR PROTEIN-INHIBITORY PROTEIN



4 Data and refinement statistics

Property	Value	Source
Space group	P 1	Depositor
Cell constants a, b, c, α , β , γ	51.55Å 60.12Å 60.35Å 113.99° 101.37° 100.50°	Depositor
Resolution (Å)	20.00 – 2.80 20.00 – 2.80	Depositor EDS
% Data completeness (in resolution range)	94.2 (20.00-2.80) 93.9 (20.00-2.80)	Depositor EDS
R_{merge}	0.11	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.17 (at 2.79Å)	Xtriage
Refinement program	REFMAC 5.2.0013	Depositor
R, R_{free}	0.192 , 0.296 0.213 , 0.303	Depositor DCC
R_{free} test set	724 reflections (5.04%)	wwPDB-VP
Wilson B-factor (Å ²)	60.0	Xtriage
Anisotropy	0.015	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.29 , 100.4	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.33$	Xtriage
Estimated twinning fraction	0.000 for -h,-l,-k	Xtriage
F_o, F_c correlation	0.90	EDS
Total number of atoms	4847	wwPDB-VP
Average B, all atoms (Å ²)	84.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 7.02% 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.

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: ZN

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	0.42	0/396	0.82	2/535 (0.4%)
1	B	0.38	0/404	0.79	0/546
1	C	0.41	0/396	0.74	1/535 (0.2%)
1	D	0.49	0/404	0.81	0/546
1	E	0.46	0/396	0.82	2/535 (0.4%)
1	F	0.50	0/396	0.82	2/535 (0.4%)
1	G	0.44	0/409	0.75	0/553
1	H	0.43	0/396	0.85	2/535 (0.4%)
1	I	0.46	0/396	0.82	0/535
1	J	0.47	0/396	0.81	1/535 (0.2%)
1	K	0.54	0/396	0.86	1/535 (0.2%)
1	L	0.44	0/396	0.77	1/535 (0.2%)
All	All	0.45	0/4781	0.81	12/6460 (0.2%)

There are no bond length outliers.

The worst 5 of 12 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	F	45	ASP	CB-CG-OD2	6.83	124.45	118.30
1	H	45	ASP	CB-CG-OD2	6.16	123.84	118.30
1	F	6	ASP	CB-CG-OD2	5.84	123.56	118.30
1	H	7	ASP	CB-CG-OD2	5.77	123.49	118.30
1	E	45	ASP	CB-CG-OD2	5.72	123.45	118.30

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	391	0	395	9	0
1	B	394	0	395	11	0
1	C	391	0	395	5	0
1	D	394	0	395	9	0
1	E	391	0	395	15	0
1	F	391	0	395	16	0
1	G	398	0	400	11	0
1	H	391	0	395	18	0
1	I	391	0	395	22	0
1	J	391	0	395	11	0
1	K	391	0	395	18	0
1	L	391	0	395	9	0
2	A	1	0	0	0	0
2	B	1	0	0	0	0
2	C	1	0	0	0	0
2	D	1	0	0	0	0
2	E	1	0	0	0	0
2	F	1	0	0	0	0
2	G	1	0	0	0	0
2	H	1	0	0	0	0
2	I	1	0	0	0	0
2	J	1	0	0	0	0
2	K	1	0	0	0	0
2	L	1	0	0	0	0
3	A	12	0	0	0	0
3	B	10	0	0	1	0
3	C	4	0	0	0	0
3	D	13	0	0	0	0
3	E	13	0	0	1	0
3	F	16	0	0	1	0
3	G	10	0	0	1	0
3	H	9	0	0	3	0
3	I	5	0	0	1	0
3	J	12	0	0	2	0
3	K	17	0	0	2	0
3	L	9	0	0	0	0
All	All	4847	0	4745	124	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 14.

The worst 5 of 124 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:3:ILE:HD11	1:B:8:LEU:HD21	1.41	1.03
1:D:3:ILE:HD11	1:D:8:LEU:HD21	1.47	0.95
1:E:11:ALA:HB2	1:E:17:ARG:NH1	1.90	0.86
1:B:13:PRO:HG3	1:D:35:ILE:HD11	1.57	0.85
3:H:2006:HOH:O	1:I:2:VAL:HG23	1.78	0.81

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	51/53 (96%)	47 (92%)	4 (8%)	0	100	100
1	B	52/53 (98%)	51 (98%)	1 (2%)	0	100	100
1	C	51/53 (96%)	48 (94%)	3 (6%)	0	100	100
1	D	52/53 (98%)	50 (96%)	2 (4%)	0	100	100
1	E	51/53 (96%)	45 (88%)	6 (12%)	0	100	100
1	F	51/53 (96%)	44 (86%)	7 (14%)	0	100	100
1	G	52/53 (98%)	50 (96%)	2 (4%)	0	100	100
1	H	51/53 (96%)	46 (90%)	5 (10%)	0	100	100
1	I	51/53 (96%)	46 (90%)	4 (8%)	1 (2%)	6	21
1	J	51/53 (96%)	46 (90%)	5 (10%)	0	100	100
1	K	51/53 (96%)	49 (96%)	2 (4%)	0	100	100
1	L	51/53 (96%)	51 (100%)	0	0	100	100
All	All	615/636 (97%)	573 (93%)	41 (7%)	1 (0%)	44	73

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	I	52	ASN

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	43/43 (100%)	41 (95%)	2 (5%)	22	54
1	B	44/43 (102%)	40 (91%)	4 (9%)	7	24
1	C	43/43 (100%)	40 (93%)	3 (7%)	12	36
1	D	44/43 (102%)	39 (89%)	5 (11%)	4	15
1	E	43/43 (100%)	37 (86%)	6 (14%)	3	9
1	F	43/43 (100%)	38 (88%)	5 (12%)	4	15
1	G	44/43 (102%)	37 (84%)	7 (16%)	2	7
1	H	43/43 (100%)	40 (93%)	3 (7%)	12	36
1	I	43/43 (100%)	40 (93%)	3 (7%)	12	36
1	J	43/43 (100%)	37 (86%)	6 (14%)	3	9
1	K	43/43 (100%)	41 (95%)	2 (5%)	22	54
1	L	43/43 (100%)	37 (86%)	6 (14%)	3	9
All	All	519/516 (101%)	467 (90%)	52 (10%)	6	20

5 of 52 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	G	34	VAL
1	I	3	ILE
1	L	44	LEU
1	G	43	LEU
1	H	30	SER

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 10 such sidechains are listed below:

Mol	Chain	Res	Type
1	J	52	ASN
1	K	52	ASN
1	L	52	ASN
1	D	48	GLN
1	D	52	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](#)

Of 12 ligands modelled in this entry, 12 are monoatomic - 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.

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 ⓘ

Warning: The R factor obtained from EDS is 0.2546, which does not match the depositor's R factor of 0.192. Please interpret the results in this section carefully.

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	53/53 (100%)	0.69	3 (5%) 30 24	53, 73, 110, 130	6 (11%)
1	B	53/53 (100%)	1.63	18 (33%) 1 1	41, 75, 115, 157	18 (33%)
1	C	53/53 (100%)	1.70	20 (37%) 1 1	2, 80, 144, 202	10 (18%)
1	D	53/53 (100%)	0.30	0 100 100	48, 67, 99, 115	4 (7%)
1	E	53/53 (100%)	0.45	4 (7%) 22 16	40, 70, 101, 118	3 (5%)
1	F	53/53 (100%)	0.25	3 (5%) 30 24	44, 64, 101, 117	5 (9%)
1	G	53/53 (100%)	0.75	8 (15%) 6 6	39, 70, 109, 121	7 (13%)
1	H	53/53 (100%)	1.54	12 (22%) 3 3	1, 73, 99, 122	9 (16%)
1	I	53/53 (100%)	0.64	2 (3%) 44 36	1, 70, 88, 106	5 (9%)
1	J	53/53 (100%)	1.14	12 (22%) 3 3	41, 77, 127, 146	7 (13%)
1	K	53/53 (100%)	-0.11	0 100 100	52, 65, 86, 96	0
1	L	53/53 (100%)	2.18	24 (45%) 1 1	1, 72, 154, 178	11 (20%)
All	All	636/636 (100%)	0.93	106 (16%) 5 5	1, 72, 119, 202	85 (13%)

The worst 5 of 106 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	I	53	LYS	11.3
1	L	13	PRO	10.0
1	H	22	GLU	9.5
1	H	52	ASN	8.4
1	C	22	GLU	8.2

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 monosaccharides in this entry.

6.4 Ligands [i](#)

In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists the number of atoms with occupancy less than 0.9.

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(\AA^2)	Q<0.9
2	ZN	L	1054	1/1	0.94	0.08	126,126,126,126	0
2	ZN	J	1054	1/1	0.96	0.08	93,93,93,93	0
2	ZN	B	1054	1/1	0.97	0.09	99,99,99,99	0
2	ZN	C	1054	1/1	0.97	0.07	107,107,107,107	0
2	ZN	I	1054	1/1	0.98	0.08	63,63,63,63	0
2	ZN	F	1054	1/1	0.99	0.07	68,68,68,68	0
2	ZN	G	1054	1/1	0.99	0.07	82,82,82,82	0
2	ZN	H	1054	1/1	0.99	0.07	85,85,85,85	0
2	ZN	A	1054	1/1	0.99	0.04	66,66,66,66	0
2	ZN	D	1054	1/1	0.99	0.06	68,68,68,68	0
2	ZN	E	1054	1/1	0.99	0.09	69,69,69,69	0
2	ZN	K	1054	1/1	1.00	0.06	59,59,59,59	0

6.5 Other polymers [i](#)

There are no such residues in this entry.