



# Full wwPDB X-ray Structure Validation Report ⓘ

Feb 14, 2017 – 01:26 pm GMT

PDB ID : 2FH3  
Title : C-terminal half of gelsolin soaked in low calcium at pH 8  
Authors : Chumnarnsilpa, S.; Loonchanta, A.; Xue, B.; Choe, H.; Urosev, D.; Wang, H.;  
Burtnick, L.D.; Robinson, R.C.  
Deposited on : 2005-12-23  
Resolution : 2.87 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](mailto:validation@mail.wwpdb.org)

A user guide is available at

<http://wwpdb.org/validation/2016/XrayValidationReportHelp>

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:

MolProbity : 4.02b-467  
Xtriage (Phenix) : 1.9-1692  
EDS : trunk28620  
Percentile statistics : 20161228.v01 (using entries in the PDB archive December 28th 2016)  
Refmac : 5.8.0135  
CCP4 : 6.5.0  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : recalc28949

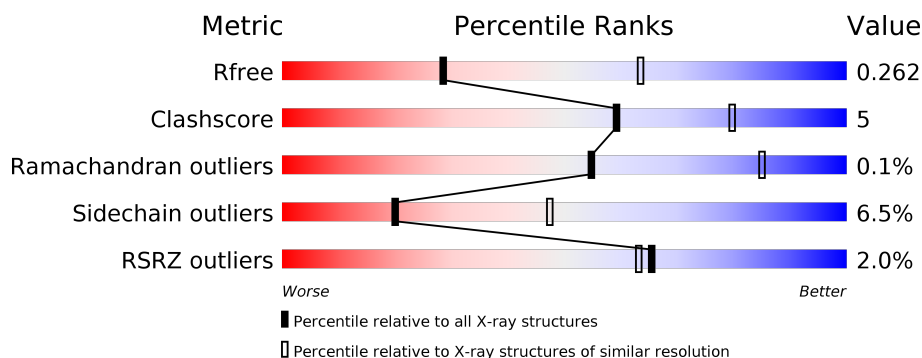
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

## *X-RAY DIFFRACTION*

The reported resolution of this entry is 2.87 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))
$R_{free}$	100719	2135 (2.90-2.86)
Clashscore	112137	2400 (2.90-2.86)
Ramachandran outliers	110173	2346 (2.90-2.86)
Sidechain outliers	110143	2349 (2.90-2.86)
RSRZ outliers	101464	2149 (2.90-2.86)

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 on the lower bar indicate the fraction of residues that contain outliers for  $\geq 3$ , 2, 1 and 0 types of geometric quality criteria. 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	344	<div> <div></div> <div> <div></div> <div>78%</div> <div>13%</div> <div>• 7%</div> </div> </div>
1	B	344	<div> <div>2%</div> <div> <div></div> <div>77%</div> <div>16%</div> <div>• 6%</div> </div> </div>
1	C	344	<div> <div>2%</div> <div> <div></div> <div>81%</div> <div>12%</div> <div>6%</div> </div> </div>

## 2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 7719 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 Gelsolin.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	321	Total	C	N	O	S	0	0	0
			2485	1571	425	482	7			
1	B	324	Total	C	N	O	S	0	0	0
			2515	1587	433	489	6			
1	C	322	Total	C	N	O	S	0	0	0
			2495	1576	427	486	6			

- Molecule 2 is CALCIUM ION (three-letter code: CA) (formula: Ca).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	B	3	Total	Ca	0	0
			3	3		
2	A	3	Total	Ca	0	0
			3	3		
2	C	3	Total	Ca	0	0
			3	3		

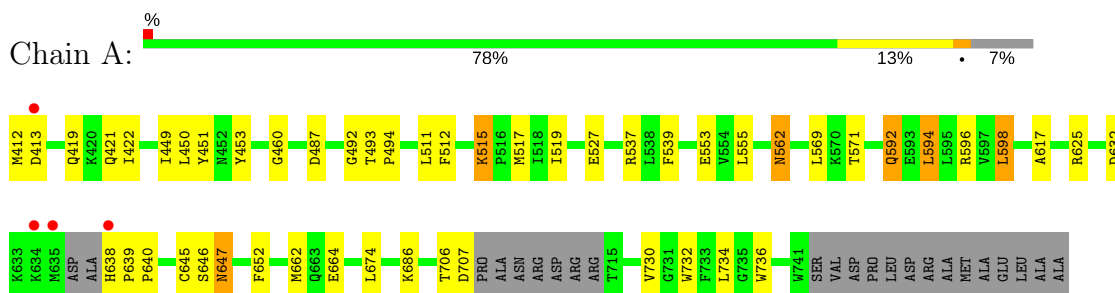
- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	81	Total	O	0	0
			81	81		
3	B	82	Total	O	0	0
			82	82		
3	C	52	Total	O	0	0
			52	52		

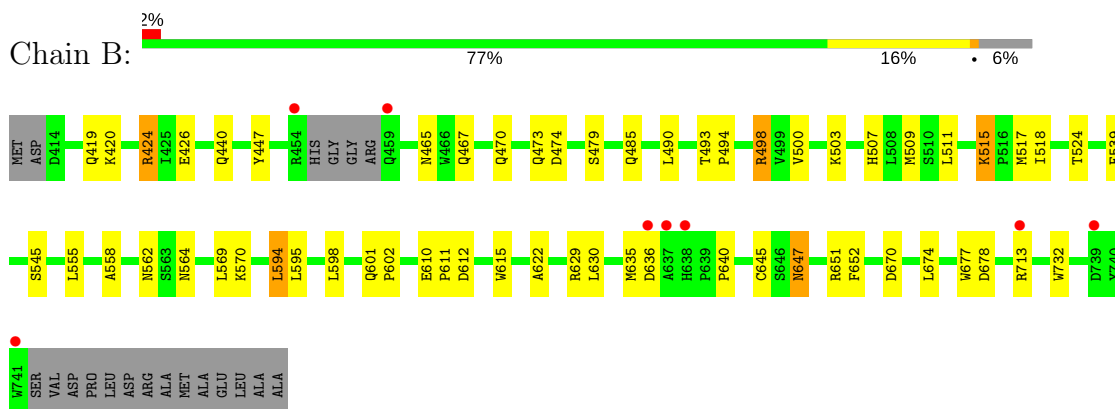
### 3 Residue-property plots

These plots are drawn for all protein, RNA and DNA 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.

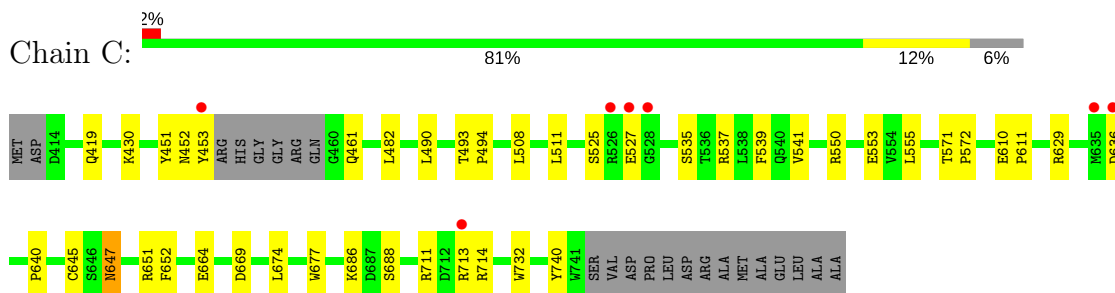
#### • Molecule 1: Gelsolin



#### • Molecule 1: Gelsolin



#### • Molecule 1: Gelsolin



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	85.11Å 90.53Å 156.58Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	27.07 – 2.87 26.73 – 2.87	Depositor EDS
% Data completeness (in resolution range)	98.3 (27.07-2.87) 98.3 (26.73-2.87)	Depositor EDS
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	8.58 (at 2.89Å)	Xtriage
Refinement program	REFMAC 5.2.0005	Depositor
R, $R_{free}$	0.200 , 0.262 0.199 , 0.262	Depositor DCC
$R_{free}$ test set	1429 reflections (5.41%)	DCC
Wilson B-factor (Å <sup>2</sup> )	36.2	Xtriage
Anisotropy	0.042	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.32 , 31.1	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.49$ , $\langle L^2 \rangle = 0.32$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
$F_o, F_c$ correlation	0.92	EDS
Total number of atoms	7719	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	29.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.39% of the height of the origin peak. No significant pseudotranslation is detected.*

<sup>1</sup>Intensities estimated from amplitudes.

<sup>2</sup>Theoretical 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

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

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	0.45	0/2542	0.56	0/3447
1	B	0.46	0/2573	0.57	0/3493
1	C	0.42	0/2553	0.53	0/3467
All	All	0.44	0/7668	0.55	0/10407

There are no bond length outliers.

There are no bond angle outliers.

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	2485	0	2405	26	0
1	B	2515	0	2437	30	0
1	C	2495	0	2416	24	0
2	A	3	0	0	0	0
2	B	3	0	0	0	0
2	C	3	0	0	0	0
3	A	81	0	0	2	0
3	B	82	0	0	8	0
3	C	52	0	0	3	0
All	All	7719	0	7258	80	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 5.

All (80) 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:C:571:THR:HG22	1:C:572:PRO:HD2	1.61	0.82
1:B:507:HIS:HA	3:B:26:HOH:O	1.79	0.82
1:B:630:LEU:O	3:B:5040:HOH:O	2.07	0.73
1:B:420:LYS:NZ	1:B:511:LEU:O	2.19	0.72
1:C:571:THR:CG2	1:C:572:PRO:HD2	2.22	0.69
1:C:664:GLU:HG2	1:C:740:TYR:OH	1.97	0.64
1:C:452:ASN:HD22	1:C:461:GLN:HG2	1.63	0.64
1:B:493:THR:N	1:B:494:PRO:HD3	2.16	0.61
1:C:645:CYS:HB3	1:C:652:PHE:CZ	2.35	0.61
1:B:465:ASN:ND2	1:B:479:SER:OG	2.34	0.60
1:A:422:ILE:HG12	1:A:449:ILE:HG12	1.82	0.59
1:B:595:LEU:HD13	1:B:602:PRO:HG3	1.85	0.59
1:B:647:ASN:C	1:B:647:ASN:HD22	2.07	0.57
1:A:647:ASN:HD22	1:A:647:ASN:C	2.08	0.57
1:A:539:PHE:CE2	1:A:553:GLU:HB2	2.40	0.56
1:C:647:ASN:C	1:C:647:ASN:HD22	2.07	0.56
1:B:426:GLU:HG2	1:B:524:THR:HG21	1.89	0.55
1:C:535:SER:HB3	3:C:108:HOH:O	2.07	0.55
1:C:571:THR:HG22	1:C:572:PRO:CD	2.34	0.55
1:A:706:THR:O	1:A:707:ASP:HB2	2.06	0.54
1:B:651:ARG:HB3	3:B:21:HOH:O	2.08	0.54
1:A:730:VAL:HG13	1:A:736:TRP:CD2	2.42	0.54
1:A:562:ASN:HB3	3:A:5014:HOH:O	2.08	0.54
1:B:467:GLN:OE1	1:B:498:ARG:NH2	2.36	0.53
1:A:512:PHE:O	1:A:515:LYS:HB2	2.10	0.52
1:C:539:PHE:CE2	1:C:553:GLU:HB2	2.44	0.52
1:C:640:PRO:HG2	1:C:732:TRP:CE3	2.45	0.52
1:B:564:ASN:ND2	3:B:5040:HOH:O	2.43	0.51
1:C:647:ASN:HA	1:C:651:ARG:O	2.11	0.50
1:A:493:THR:N	1:A:494:PRO:CD	2.74	0.50
1:A:412:MET:N	3:A:106:HOH:O	2.45	0.49
1:B:645:CYS:HB3	1:B:652:PHE:CZ	2.48	0.49
1:A:487:ASP:OD1	1:A:492:GLY:HA2	2.13	0.48
1:A:662:MET:HE1	1:A:734:LEU:HD23	1.94	0.48
1:B:493:THR:N	1:B:494:PRO:CD	2.76	0.48
1:B:611:PRO:HB2	3:B:29:HOH:O	2.14	0.48
1:A:594:LEU:HD22	1:A:598:LEU:HD22	1.96	0.48

*Continued on next page...*

*Continued from previous page...*

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:640:PRO:HG2	1:A:732:TRP:CE3	2.49	0.47
1:C:508:LEU:O	1:C:511:LEU:HB2	2.14	0.47
1:B:515:LYS:HD3	3:B:75:HOH:O	2.13	0.47
1:B:539:PHE:CG	1:B:594:LEU:HD11	2.49	0.47
1:A:646:SER:O	1:A:652:PHE:HA	2.15	0.47
1:C:451:TYR:CE2	1:C:453:TYR:HB3	2.49	0.47
1:C:541:VAL:HA	1:C:550:ARG:O	2.15	0.47
1:C:525:SER:HB3	3:C:5048:HOH:O	2.14	0.46
1:B:645:CYS:HB3	1:B:652:PHE:CE1	2.51	0.46
1:C:571:THR:CG2	1:C:572:PRO:CD	2.93	0.46
1:C:419:GLN:HG2	3:C:64:HOH:O	2.16	0.45
1:A:527:GLU:N	1:A:527:GLU:OE1	2.50	0.45
1:A:539:PHE:CG	1:A:594:LEU:HD11	2.53	0.44
1:B:640:PRO:HG2	1:B:732:TRP:CE3	2.53	0.44
1:B:645:CYS:O	1:B:670:ASP:HB3	2.17	0.44
1:A:647:ASN:ND2	1:A:647:ASN:C	2.71	0.44
1:B:500:VAL:HG23	1:B:503:LYS:HG3	2.00	0.44
1:A:592:GLN:HB2	1:A:592:GLN:HE21	1.69	0.43
1:B:440:GLN:HG3	1:B:518:ILE:HB	2.00	0.43
1:A:638:HIS:N	1:A:639:PRO:CD	2.82	0.43
1:B:610:GLU:HG3	1:B:615:TRP:CE2	2.53	0.43
1:B:424:ARG:HG3	1:B:447:TYR:CE2	2.54	0.43
1:B:629:ARG:HG3	1:B:732:TRP:CZ2	2.54	0.43
1:C:430:LYS:HB3	1:C:482:LEU:HD13	2.00	0.43
1:C:493:THR:N	1:C:494:PRO:CD	2.82	0.43
1:A:453:TYR:CZ	1:A:460:GLY:HA3	2.54	0.42
1:B:485:GLN:HG2	3:B:156:HOH:O	2.19	0.42
1:B:564:ASN:HA	3:B:5040:HOH:O	2.19	0.42
1:C:669:ASP:O	1:C:688:SER:HA	2.19	0.42
1:A:645:CYS:HB3	1:A:652:PHE:CZ	2.54	0.41
1:C:677:TRP:CZ2	1:C:711:ARG:HB3	2.55	0.41
1:B:558:ALA:HB3	1:B:622:ALA:HB3	2.02	0.41
1:A:421:GLN:NE2	1:A:450:LEU:HD23	2.35	0.41
1:B:509:MET:SD	1:B:517:MET:HE1	2.61	0.41
1:A:571:THR:HG21	1:A:617:ALA:HB1	2.03	0.41
1:B:629:ARG:HG3	1:B:732:TRP:HZ2	1.85	0.41
1:A:451:TYR:CE2	1:A:453:TYR:HB3	2.55	0.41
1:B:517:MET:HE3	1:B:517:MET:HB2	1.89	0.40
1:A:562:ASN:HA	1:A:625:ARG:O	2.21	0.40
1:C:629:ARG:HG3	1:C:732:TRP:HZ2	1.86	0.40
1:A:517:MET:CE	1:A:519:ILE:HD11	2.51	0.40

*Continued on next page...*



*Continued from previous page...*

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:610:GLU:HA	1:C:611:PRO:HD3	1.93	0.40
1:C:493:THR:N	1:C:494:PRO:HD3	2.36	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	315/344 (92%)	305 (97%)	10 (3%)	0	100	100
1	B	320/344 (93%)	311 (97%)	8 (2%)	1 (0%)	44	75
1	C	318/344 (92%)	304 (96%)	14 (4%)	0	100	100
All	All	953/1032 (92%)	920 (96%)	32 (3%)	1 (0%)	55	85

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	677	TRP

### 5.3.2 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 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	257/274 (94%)	240 (93%)	17 (7%)	19	46
1	B	260/274 (95%)	237 (91%)	23 (9%)	12	32

*Continued on next page...*

*Continued from previous page...*

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	C	258/274 (94%)	248 (96%)	10 (4%)	37	70
All	All	775/822 (94%)	725 (94%)	50 (6%)	20	47

All (50) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	413	ASP
1	A	419	GLN
1	A	511	LEU
1	A	515	LYS
1	A	537	ARG
1	A	555	LEU
1	A	562	ASN
1	A	569	LEU
1	A	592	GLN
1	A	594	LEU
1	A	596	ARG
1	A	598	LEU
1	A	632	ASP
1	A	647	ASN
1	A	664	GLU
1	A	674	LEU
1	A	686	LYS
1	B	419	GLN
1	B	424	ARG
1	B	470	GLN
1	B	473	GLN
1	B	474	ASP
1	B	490	LEU
1	B	498	ARG
1	B	515	LYS
1	B	545	SER
1	B	555	LEU
1	B	562	ASN
1	B	569	LEU
1	B	570	LYS
1	B	594	LEU
1	B	598	LEU
1	B	601	GLN
1	B	612	ASP
1	B	635	MET
1	B	636	ASP

*Continued on next page...*

*Continued from previous page...*

Mol	Chain	Res	Type
1	B	647	ASN
1	B	674	LEU
1	B	678	ASP
1	B	713	ARG
1	C	490	LEU
1	C	527	GLU
1	C	537	ARG
1	C	555	LEU
1	C	636	ASP
1	C	647	ASN
1	C	674	LEU
1	C	686	LYS
1	C	713	ARG
1	C	714	ARG

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (17) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	419	GLN
1	A	421	GLN
1	A	452	ASN
1	A	461	GLN
1	A	592	GLN
1	A	647	ASN
1	B	419	GLN
1	B	465	ASN
1	B	470	GLN
1	B	592	GLN
1	B	647	ASN
1	C	419	GLN
1	C	452	ASN
1	C	461	GLN
1	C	507	HIS
1	C	647	ASN
1	C	679	GLN

### 5.3.3 RNA ⓘ

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 carbohydrates in this entry.

## 5.6 Ligand geometry [i](#)

Of 9 ligands modelled in this entry, 9 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

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, 95<sup>th</sup> 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 <sup>2</sup> )	Q<0.9
1	A	321/344 (93%)	-0.40	4 (1%) 79 78	14, 25, 42, 61	0
1	B	324/344 (94%)	-0.34	8 (2%) 58 55	13, 25, 43, 57	0
1	C	322/344 (93%)	-0.18	7 (2%) 62 60	22, 32, 46, 60	0
All	All	967/1032 (93%)	-0.31	19 (1%) 65 63	13, 28, 45, 61	0

All (19) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	636	ASP	5.2
1	C	635	MET	4.7
1	B	637	ALA	3.8
1	B	459	GLN	3.7
1	B	739	ASP	3.5
1	B	454	ARG	3.2
1	A	638	HIS	3.1
1	B	638	HIS	2.9
1	A	635	MET	2.8
1	C	528	GLY	2.7
1	B	741	TRP	2.6
1	C	526	ARG	2.6
1	C	636	ASP	2.5
1	C	453	TYR	2.5
1	B	713	ARG	2.4
1	A	634	LYS	2.3
1	C	713	ARG	2.2
1	A	413	ASP	2.1
1	C	527	GLU	2.0

## 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 carbohydrates 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. LLDF column lists the quality of electron density of the group with respect to its neighbouring residues in protein, DNA or RNA chains. The B-factors column lists the minimum, median, 95<sup>th</sup> 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	LLDF	B-factors( $\text{\AA}^2$ )	Q<0.9
2	CA	A	1002	1/1	0.98	0.17	1.78	29,29,29,29	0
2	CA	B	2002	1/1	0.98	0.15	-0.12	27,27,27,27	0
2	CA	A	1003	1/1	0.92	0.12	-1.08	29,29,29,29	0
2	CA	C	3003	1/1	0.95	0.11	-1.35	38,38,38,38	0
2	CA	B	2003	1/1	0.95	0.05	-1.84	31,31,31,31	0
2	CA	A	1001	1/1	0.98	0.05	-2.17	33,33,33,33	0
2	CA	B	2001	1/1	0.96	0.08	-2.22	30,30,30,30	0
2	CA	C	3001	1/1	0.99	0.03	-2.53	34,34,34,34	0
2	CA	C	3002	1/1	0.97	0.06	-4.07	37,37,37,37	0

## 6.5 Other polymers [i](#)

There are no such residues in this entry.