



# Full wwPDB X-ray Structure Validation Report ⓘ

Aug 26, 2023 – 10:00 PM EDT

PDB ID : 3FP4  
Title : Crystal structure of Tom71 complexed with Ssa1 C-terminal fragment  
Authors : Li, J.; Qian, X.; Hu, J.; Sha, B.  
Deposited on : 2009-01-03  
Resolution : 2.14 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

<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  
Mogul : 1.8.5 (274361), CSD as541be (2020)  
Xtriage (Phenix) : 1.13  
EDS : 2.35  
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)  
Refmac : 5.8.0158  
CCP4 : 7.0.044 (Gargrove)  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.35

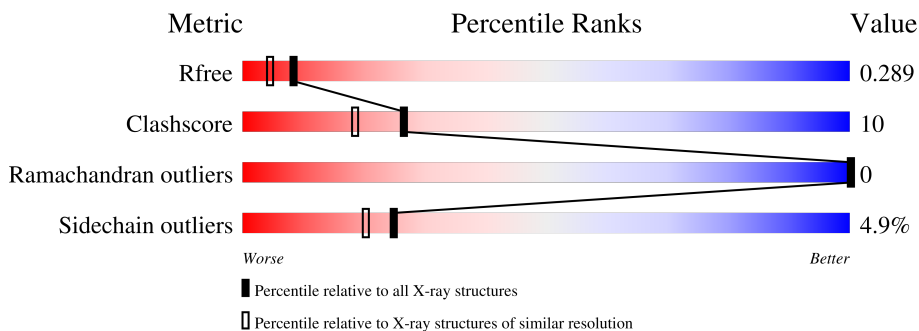
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.14 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))
$R_{free}$	130704	2523 (2.16-2.12)
Clashscore	141614	2653 (2.16-2.12)
Ramachandran outliers	138981	2618 (2.16-2.12)
Sidechain outliers	138945	2617 (2.16-2.12)

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  $\geq 3$ , 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	537	70% 18% 10%
2	Q	12	25% 25% 8% 42%

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
3	CL	A	1	-	-	X	-
3	CL	A	642	-	-	X	-
3	CL	A	648	-	-	X	-

## 2 Entry composition i

There are 6 unique types of molecules in this entry. The entry contains 4391 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 TPR repeat-containing protein YHR117W.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	483	4043	2604	650	777	12	0	28	0

There are 4 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	103	GLY	-	expression tag	UNP P38825
A	104	SER	-	expression tag	UNP P38825
A	105	HIS	-	expression tag	UNP P38825
A	106	MET	-	expression tag	UNP P38825

- Molecule 2 is a protein called Ssa1.

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
			Total	C	N	O			
2	Q	7	55	33	7	15	0	0	0

- Molecule 3 is CHLORIDE ION (three-letter code: CL) (formula: Cl).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	11	Total	Cl	0	0
			11	11		

- Molecule 4 is SODIUM ION (three-letter code: NA) (formula: Na).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	3	Total	Na	0	0
			3	3		

- Molecule 5 is SULFATE ION (three-letter code: SO4) (formula: O<sub>4</sub>S).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
5	A	1	Total O S 5 4 1	0	0
5	A	1	Total O S 5 4 1	0	0
5	A	1	Total O S 5 4 1	0	0

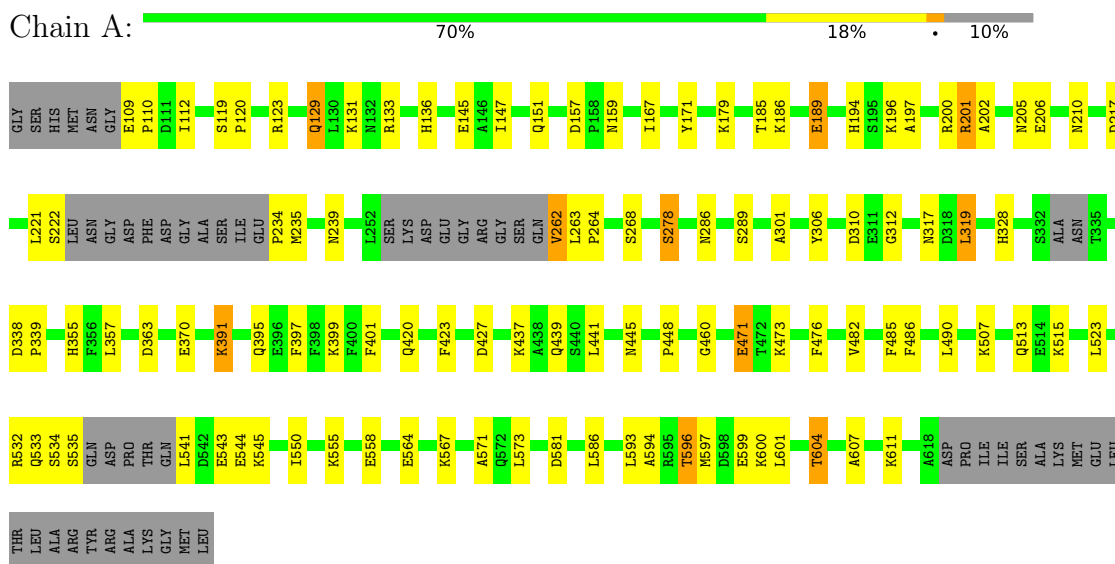
- Molecule 6 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
6	A	262	Total O 262 262	0	0
6	Q	2	Total O 2 2	0	0

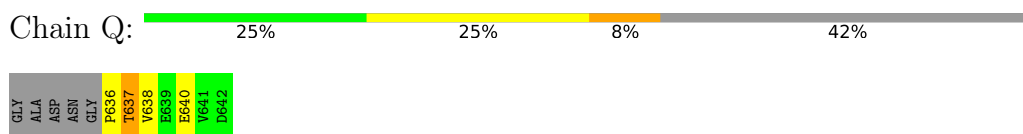
### 3 Residue-property plots [i](#)

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: TPR repeat-containing protein YHR117W



- Molecule 2: Ssa1



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	47.82Å 116.03Å 150.65Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	8.00 – 2.14 8.00 – 2.14	Depositor EDS
% Data completeness (in resolution range)	89.4 (8.00-2.14) 89.4 (8.00-2.14)	Depositor EDS
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	2.27 (at 2.14Å)	Xtrriage
Refinement program	REFMAC 5.2.0019	Depositor
R, $R_{free}$	0.208 , 0.261 0.257 , 0.289	Depositor DCC
$R_{free}$ test set	2100 reflections (5.09%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	27.0	Xtrriage
Anisotropy	0.467	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.42 , 30.0	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.48$ , $\langle L^2 \rangle = 0.31$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
$F_o, F_c$ correlation	0.90	EDS
Total number of atoms	4391	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	17.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.65% 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 [i](#)

### 5.1 Standard geometry [i](#)

Bond lengths and bond angles in the following residue types are not validated in this section: CL, NA, SO4

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	1.05	1/4195 (0.0%)	0.88	5/5658 (0.1%)
2	Q	0.53	0/55	1.11	2/73 (2.7%)
All	All	1.05	1/4250 (0.0%)	0.89	7/5731 (0.1%)

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	485	PHE	CE1-CZ	5.11	1.47	1.37

All (7) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	543	GLU	CB-CA-C	-12.91	84.58	110.40
1	A	543	GLU	N-CA-C	9.08	135.53	111.00
2	Q	637	THR	N-CA-C	-5.59	95.90	111.00
2	Q	637	THR	CB-CA-C	-5.51	96.71	111.60
1	A	157	ASP	CB-CG-OD1	5.47	123.22	118.30
1	A	515	LYS	CD-CE-NZ	5.37	124.04	111.70
1	A	427	ASP	CB-CG-OD2	-5.10	113.71	118.30

There are no chirality outliers.

There are no planarity outliers.

### 5.2 Too-close contacts [i](#)

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	4043	0	4096	84	0
2	Q	55	0	48	3	0
3	A	11	0	0	13	0
4	A	3	0	0	0	0
5	A	15	0	0	1	0
6	A	262	0	0	14	0
6	Q	2	0	0	0	0
All	All	4391	0	4144	85	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 10.

All (85) 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:391[A]:LYS:HD3	6:A:829:HOH:O	1.44	1.15
1:A:600:LYS:O	1:A:604:THR:HG22	1.69	0.93
1:A:185:THR:O	1:A:189:GLU:HG2	1.81	0.81
1:A:600:LYS:O	1:A:604:THR:CG2	2.33	0.77
1:A:301:ALA:HB2	1:A:319:LEU:HB3	1.67	0.76
1:A:194:HIS:HD2	1:A:197:ALA:H	1.32	0.74
1:A:328:HIS:HE1	1:A:370:GLU:OE1	1.73	0.70
1:A:473[A]:LYS:HG3	1:A:482:VAL:HG11	1.76	0.67
1:A:221:LEU:O	1:A:222:SER:HB2	1.95	0.66
1:A:395:GLN:HE21	1:A:395:GLN:HA	1.61	0.65
1:A:234:PRO:N	6:A:665:HOH:O	2.32	0.62
1:A:262:VAL:O	1:A:262:VAL:CG1	2.47	0.62
1:A:278:SER:HB3	1:A:306:TYR:HB3	1.81	0.61
1:A:286:ASN:O	3:A:648:CL:CL	2.55	0.61
1:A:420:GLN:HG2	6:A:716:HOH:O	2.02	0.60
1:A:196:LYS:HE2	2:Q:637:THR:O	2.02	0.59
1:A:513:GLN:NE2	6:A:737:HOH:O	2.34	0.59
1:A:473[A]:LYS:HG3	1:A:482:VAL:CG1	2.33	0.57
1:A:235:MET:CE	6:A:777:HOH:O	2.53	0.56
1:A:312:GLY:HA3	3:A:649:CL:CL	2.43	0.56
1:A:486:PHE:CE2	1:A:490:LEU:HD11	2.41	0.56
1:A:202:ALA:HA	3:A:1:CL:CL	2.43	0.55
1:A:109:GLU:HG3	1:A:110:PRO:CD	2.36	0.55
1:A:201:ARG:HD2	1:A:217:ASP:OD2	2.07	0.55
1:A:558:GLU:HG3	6:A:58:HOH:O	2.06	0.55
1:A:201:ARG:CD	1:A:217:ASP:OD2	2.54	0.55
1:A:200:ARG:NH2	2:Q:638:VAL:O	2.29	0.55

*Continued on next page...*



*Continued from previous page...*

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:507[B]:LYS:HD2	1:A:523:LEU:CD2	2.37	0.54
1:A:109:GLU:N	1:A:110:PRO:HD2	2.23	0.54
1:A:171:TYR:CD2	1:A:179:LYS:HB3	2.43	0.54
1:A:439[C]:GLN:HA	3:A:642:CL:CL	2.44	0.54
1:A:109:GLU:N	6:A:754:HOH:O	2.41	0.53
1:A:439[A]:GLN:HA	3:A:642:CL:CL	2.44	0.53
1:A:534:SER:HB3	1:A:545:LYS:HB3	1.89	0.53
1:A:596:THR:HG23	1:A:599:GLU:HB2	1.89	0.53
1:A:439[B]:GLN:HA	3:A:642:CL:CL	2.44	0.53
1:A:262:VAL:O	1:A:262:VAL:HG12	2.07	0.53
1:A:109:GLU:HG3	1:A:110:PRO:HD3	1.91	0.52
1:A:437:LYS:HE3	1:A:441:LEU:HD11	1.92	0.52
1:A:235:MET:HE1	6:A:777:HOH:O	2.08	0.51
1:A:507[B]:LYS:HD2	1:A:523:LEU:HD21	1.93	0.51
1:A:310:ASP:HB3	5:A:2:SO4:S	2.51	0.50
1:A:221:LEU:O	1:A:222:SER:CB	2.58	0.50
1:A:328:HIS:CE1	1:A:370:GLU:OE1	2.61	0.49
1:A:206:GLU:HB2	1:A:239:ASN:HD21	1.77	0.49
1:A:147:ILE:CD1	1:A:167:ILE:HG23	2.43	0.49
1:A:594:ALA:HB1	1:A:599:GLU:HB3	1.94	0.49
1:A:147:ILE:HD13	1:A:167:ILE:HG23	1.95	0.48
1:A:445:ASN:O	3:A:642:CL:CL	2.68	0.48
1:A:289:SER:HB2	1:A:339:PRO:HB2	1.96	0.47
1:A:420:GLN:NE2	6:A:716:HOH:O	2.38	0.47
1:A:571:ALA:HB2	1:A:586:LEU:HB3	1.97	0.47
1:A:264:PRO:HG3	1:A:357:LEU:O	2.15	0.47
1:A:533:GLN:C	1:A:535:SER:H	2.18	0.47
1:A:391[A]:LYS:HA	1:A:391[A]:LYS:HD2	1.52	0.46
1:A:564[A]:GLU:HG3	1:A:593:LEU:HB3	1.98	0.46
1:A:397:PHE:CZ	1:A:401:PHE:CE1	3.04	0.46
1:A:601:LEU:HA	1:A:604:THR:HG23	1.97	0.45
1:A:217:ASP:OD2	3:A:1:CL:CL	2.70	0.45
1:A:210:ASN:HB3	3:A:640:CL:CL	2.53	0.45
1:A:289:SER:HB3	3:A:648:CL:CL	2.53	0.45
1:A:471[C]:GLU:OE2	6:A:862:HOH:O	2.21	0.45
1:A:581[B]:ASP:OD1	6:A:748:HOH:O	2.21	0.45
1:A:201:ARG:HD3	1:A:217:ASP:OD2	2.18	0.44
1:A:607:ALA:O	1:A:611:LYS:HG3	2.17	0.44
1:A:263:LEU:HD21	1:A:317:ASN:OD1	2.18	0.44
1:A:120:PRO:HD2	6:A:756:HOH:O	2.17	0.44
1:A:460:GLY:HA2	6:A:655:HOH:O	2.17	0.44

*Continued on next page...*

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:338:ASP:N	1:A:339:PRO:CD	2.80	0.43
1:A:186:LYS:HA	1:A:189:GLU:HG3	2.00	0.43
1:A:448:PRO:HG2	3:A:642:CL:CL	2.56	0.43
2:Q:636:PRO:HD2	2:Q:640:GLU:OE2	2.18	0.43
1:A:205:ASN:ND2	3:A:1:CL:CL	2.72	0.42
1:A:550:ILE:HD11	1:A:573:LEU:HB3	2.01	0.42
1:A:133:ARG:O	1:A:136:HIS:HB3	2.19	0.42
1:A:131:LYS:HE2	1:A:131:LYS:HB3	1.84	0.42
1:A:476:PHE:O	3:A:653:CL:CL	2.75	0.42
1:A:263:LEU:HD21	1:A:317:ASN:CG	2.40	0.42
1:A:567:LYS:HE2	1:A:593:LEU:HD11	2.02	0.42
1:A:355:HIS:CD2	1:A:363:ASP:HB3	2.55	0.41
1:A:129:GLN:O	1:A:133:ARG:HG3	2.21	0.41
1:A:189:GLU:HG2	1:A:189:GLU:H	1.72	0.41
1:A:264:PRO:HB2	1:A:268[A]:SER:OG	2.20	0.41
1:A:119:SER:O	1:A:123:ARG:HG3	2.21	0.41
1:A:328:HIS:HD2	6:A:676:HOH:O	2.02	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	503/537 (94%)	485 (96%)	18 (4%)	0	100	100
2	Q	5/12 (42%)	3 (60%)	2 (40%)	0	100	100
All	All	508/549 (92%)	488 (96%)	20 (4%)	0	100	100

There are no Ramachandran outliers to report.

### 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	452/463 (98%)	427 (94%)	25 (6%)	21	16
2	Q	7/9 (78%)	7 (100%)	0	100	100
All	All	459/472 (97%)	434 (95%)	25 (5%)	25	17

All (25) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	112[A]	ILE
1	A	112[B]	ILE
1	A	129	GLN
1	A	145	GLU
1	A	151	GLN
1	A	159	ASN
1	A	189	GLU
1	A	201	ARG
1	A	262	VAL
1	A	278	SER
1	A	319	LEU
1	A	391[A]	LYS
1	A	391[B]	LYS
1	A	399[A]	LYS
1	A	399[B]	LYS
1	A	423	PHE
1	A	471[A]	GLU
1	A	471[C]	GLU
1	A	532	ARG
1	A	541	LEU
1	A	544	GLU
1	A	555	LYS
1	A	596	THR
1	A	597	MET
1	A	604	THR

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (11)

such sidechains are listed below:

Mol	Chain	Res	Type
1	A	159	ASN
1	A	194	HIS
1	A	239	ASN
1	A	328	HIS
1	A	359	ASN
1	A	375	HIS
1	A	395	GLN
1	A	417	HIS
1	A	430	ASN
1	A	502	GLN
1	A	513	GLN

### 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 monosaccharides in this entry.

## 5.6 Ligand geometry [i](#)

Of 17 ligands modelled in this entry, 14 are monoatomic - leaving 3 for Mogul analysis.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. 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  $|Z| > 2$  is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\# Z  > 2$	Counts	RMSZ	$\# Z  > 2$
5	SO4	A	647	-	4,4,4	0.15	0	6,6,6	0.12	0
5	SO4	A	3	-	4,4,4	0.24	0	6,6,6	0.41	0
5	SO4	A	2	-	4,4,4	0.15	0	6,6,6	0.42	0

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.

1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
5	A	2	SO4	1	0

## 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](#)

Unable to reproduce the depositors R factor - this section is therefore empty.

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

Unable to reproduce the depositors R factor - this section is therefore empty.

### 6.3 Carbohydrates [i](#)

Unable to reproduce the depositors R factor - this section is therefore empty.

### 6.4 Ligands [i](#)

Unable to reproduce the depositors R factor - this section is therefore empty.

### 6.5 Other polymers [i](#)

Unable to reproduce the depositors R factor - this section is therefore empty.