



# Full wwPDB X-ray Structure Validation Report ⓘ

May 14, 2020 – 12:36 pm BST

PDB ID : 4XCI  
Title : Crystal structure of a hexadecameric TF55 complex from *S. solfataricus*, crystal form II  
Authors : Stewart, A.G.; Chaston, J.J.; Smits, C.; Stock, D.  
Deposited on : 2014-12-18  
Resolution : 3.00 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.

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The following versions of software and data (see [references ⓘ](#)) were used in the production of this report:

MolProbity : 4.02b-467  
Xtriage (Phenix) : 1.13  
EDS : 2.11  
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) : 2.11

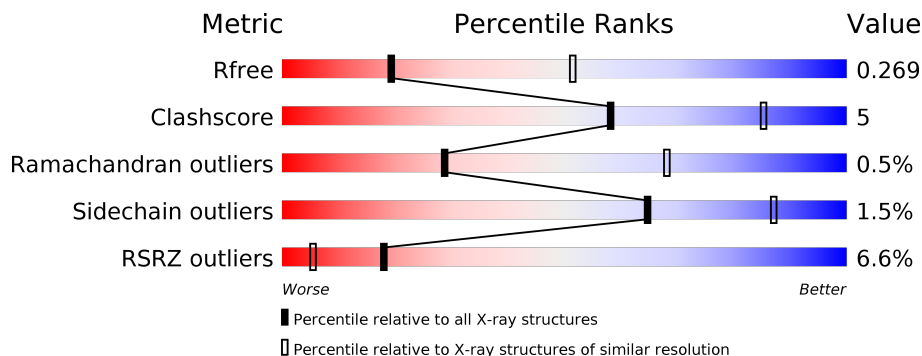
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 3.00 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	2092 (3.00-3.00)
Clashscore	141614	2416 (3.00-3.00)
Ramachandran outliers	138981	2333 (3.00-3.00)
Sidechain outliers	138945	2336 (3.00-3.00)
RSRZ outliers	127900	1990 (3.00-3.00)

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 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	B	557	
2	A	559	

## 2 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 11773 atoms, of which 6031 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 Thermosome subunit beta.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
			Total	C	H	N	O	S			
1	B	449	6986	2154	3577	594	651	10	0	0	0

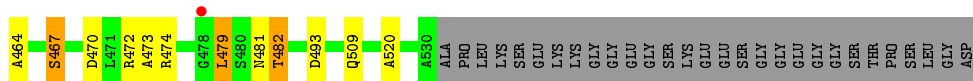
There are 3 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	1	MET	-	initiating methionine	UNP Q9V2T8
B	2	ARG	-	expression tag	UNP Q9V2T8
B	3	LYS	-	expression tag	UNP Q9V2T8

- Molecule 2 is a protein called Thermosome subunit alpha.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
			Total	C	H	N	O	S			
2	A	313	4787	1476	2454	397	454	6	0	0	0





## 4 Data and refinement statistics

Property	Value	Source
Space group	I 4 2 2	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	148.42Å 148.42Å 304.67Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	41.91 – 3.00 41.91 – 3.00	Depositor EDS
% Data completeness (in resolution range)	72.5 (41.91-3.00) 72.5 (41.91-3.00)	Depositor EDS
$R_{merge}$	0.38	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	1.53 (at 3.01Å)	Xtrriage
Refinement program	PHENIX 1.9-1692, REFMAC 5.8.0073	Depositor
R, $R_{free}$	0.236 , 0.266 0.241 , 0.269	Depositor DCC
$R_{free}$ test set	1273 reflections (5.11%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	71.0	Xtrriage
Anisotropy	0.059	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.31 , 50.3	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.47$ , $\langle L^2 \rangle = 0.30$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
$F_o, F_c$ correlation	0.88	EDS
Total number of atoms	11773	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	91.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.56% 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](#)

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	B	0.25	0/3439	0.44	0/4636
2	A	0.27	0/2352	0.51	1/3184 (0.0%)
All	All	0.26	0/5791	0.47	1/7820 (0.0%)

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand. A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
2	A	0	3

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed( $^{\circ}$ )	Ideal( $^{\circ}$ )
2	A	191	GLU	N-CA-C	5.38	125.51	111.00

There are no chirality outliers.

All (3) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
2	A	189	VAL	Peptide
2	A	190	ALA	Peptide
2	A	194	PRO	Peptide

### 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	B	3409	3577	3571	25	0
2	A	2333	2454	2451	34	0
All	All	5742	6031	6022	56	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 (56) 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:385:ILE:HD11	1:B:400:LEU:HD23	1.75	0.68
1:B:389:LEU:HD21	2:A:84:ALA:HB2	1.75	0.67
1:B:385:ILE:HD11	1:B:400:LEU:CD2	2.26	0.66
2:A:474:ARG:HB2	2:A:482:THR:HG21	1.78	0.65
2:A:193:LEU:HD23	2:A:194:PRO:HD2	1.79	0.65
1:B:242:ARG:NH1	1:B:360:GLU:OE2	2.31	0.64
1:B:214:LYS:NZ	1:B:367:ASP:OD2	2.32	0.63
2:A:462:LEU:HD21	2:A:467:SER:HB2	1.81	0.63
2:A:193:LEU:HD23	2:A:194:PRO:CD	2.31	0.61
2:A:35:LEU:HD12	2:A:97:VAL:HG11	1.82	0.61
2:A:462:LEU:HD21	2:A:467:SER:CB	2.32	0.60
2:A:157:ARG:NH2	2:A:180:ASP:OD1	2.34	0.60
2:A:450:GLU:OE1	2:A:472:ARG:NH2	2.35	0.59
2:A:474:ARG:NH1	2:A:493:ASP:OD1	2.35	0.59
1:B:217:GLY:O	1:B:218:SER:OG	2.15	0.58
1:B:196:GLU:OE1	1:B:379:LYS:NZ	2.38	0.57
1:B:336:ALA:O	1:B:375:ALA:HB1	2.05	0.56
2:A:146:ASP:OD1	2:A:147:LEU:N	2.39	0.56
2:A:474:ARG:CB	2:A:482:THR:HG21	2.35	0.55
1:B:358:LEU:HD21	1:B:360:GLU:OE2	2.06	0.54
2:A:159:ILE:HG21	2:A:406:ILE:HD11	1.90	0.54
2:A:38:SER:OG	2:A:46:LYS:NZ	2.40	0.53
2:A:26:LEU:O	2:A:30:THR:HG23	2.10	0.52
2:A:462:LEU:HD21	2:A:467:SER:OG	2.10	0.52
2:A:479:LEU:O	2:A:481:ASN:N	2.43	0.52
2:A:144:ILE:HD12	2:A:196:GLY:HA3	1.91	0.52
1:B:67:ASP:OD1	1:B:68:ILE:N	2.43	0.52
2:A:144:ILE:HG21	2:A:410:PRO:HG3	1.94	0.50
2:A:462:LEU:C	2:A:462:LEU:HD22	2.32	0.50
1:B:143:ILE:HD11	1:B:434:TYR:CD2	2.46	0.49

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:389:LEU:HD21	2:A:84:ALA:CB	2.41	0.49
2:A:474:ARG:HD2	2:A:482:THR:HG21	1.94	0.49
2:A:144:ILE:CD1	2:A:196:GLY:HA3	2.43	0.48
2:A:144:ILE:O	2:A:198:TYR:OH	2.31	0.48
1:B:219:VAL:HG11	1:B:386:ARG:HB2	1.95	0.48
1:B:425:ILE:CD1	1:B:475:LEU:HB3	2.44	0.48
2:A:470:ASP:O	2:A:473:ALA:HB3	2.14	0.48
1:B:116:LEU:HB2	1:B:522:VAL:HG21	1.96	0.47
2:A:178:ILE:HG22	2:A:178:ILE:O	2.15	0.46
1:B:364:VAL:N	1:B:367:ASP:O	2.48	0.46
1:B:425:ILE:HG13	1:B:457:ILE:CD1	2.47	0.45
1:B:308:GLU:N	1:B:308:GLU:OE1	2.47	0.45
2:A:454:LEU:CD1	2:A:464:ALA:HB1	2.47	0.44
1:B:79:ASP:OD1	1:B:96:LYS:NZ	2.44	0.44
1:B:99:ASP:OD1	1:B:100:GLU:N	2.51	0.43
2:A:147:LEU:O	2:A:153:ARG:NH2	2.49	0.43
1:B:217:GLY:C	1:B:219:VAL:HG23	2.40	0.43
1:B:391:ARG:HH12	2:A:520:ALA:HB1	1.84	0.42
1:B:177:ALA:HB1	1:B:220:ASN:HB2	2.00	0.42
2:A:190:ALA:HB3	2:A:191:GLU:HG3	2.02	0.42
2:A:193:LEU:HD23	2:A:194:PRO:HD3	2.02	0.41
2:A:88:GLU:OE1	2:A:509:GLN:NE2	2.50	0.41
1:B:385:ILE:HD11	1:B:400:LEU:HD22	2.01	0.41
1:B:438:VAL:HG12	1:B:439:GLY:N	2.35	0.41
2:A:34:MET:HE3	2:A:46:LYS:HE2	2.04	0.40
2:A:34:MET:HE2	2:A:35:LEU:HG	2.03	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	B	437/557 (78%)	413 (94%)	23 (5%)	1 (0%)	47	82
2	A	307/559 (55%)	293 (95%)	11 (4%)	3 (1%)	15	53
All	All	744/1116 (67%)	706 (95%)	34 (5%)	4 (0%)	29	68

All (4) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	220	ASN
2	A	195	ASN
2	A	178	ILE
2	A	151	VAL

### 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	B	356/449 (79%)	355 (100%)	1 (0%)	92	97
2	A	248/448 (55%)	240 (97%)	8 (3%)	39	74
All	All	604/897 (67%)	595 (98%)	9 (2%)	65	87

All (9) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	219	VAL
2	A	34	MET
2	A	183	ILE
2	A	193	LEU
2	A	409	GLU
2	A	462	LEU
2	A	467	SER
2	A	479	LEU
2	A	482	THR

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. There are no such sidechains identified.

### 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 carbohydrates 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

### 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	B	449/557 (80%)	0.19	29 (6%)	18   5	20, 67, 186, 230	0
2	A	313/559 (55%)	0.15	21 (6%)	17   5	27, 60, 181, 226	0
All	All	762/1116 (68%)	0.17	50 (6%)	18   5	20, 63, 182, 230	0

All (50) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	309	VAL	5.9
2	A	188	ASN	5.2
2	A	181	MET	4.8
2	A	398	ASP	4.7
1	B	314	LEU	4.4
1	B	237	PRO	4.1
1	B	236	HIS	4.1
2	A	202	LEU	3.9
2	A	149	SER	3.8
1	B	312	HIS	3.8
2	A	164	LEU	3.5
2	A	49	ILE	3.4
2	A	178	ILE	3.4
2	A	186	ILE	3.3
2	A	190	ALA	3.2
2	A	150	SER	3.0
2	A	159	ILE	2.9
2	A	399	ALA	2.9
1	B	317	LYS	2.9
1	B	100	GLU	2.9
1	B	316	LYS	2.9
1	B	283	ASN	2.9
1	B	83	LEU	2.8
1	B	233	GLU	2.8

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Mol	Chain	Res	Type	RSRZ
1	B	238	GLY	2.8
2	A	162	THR	2.8
1	B	203	TYR	2.8
1	B	245	ASN	2.7
2	A	184	ASP	2.6
1	B	332	LYS	2.6
2	A	163	THR	2.6
1	B	228	ILE	2.6
2	A	154	ASP	2.5
1	B	311	GLN	2.4
1	B	328	SER	2.4
1	B	65	LEU	2.4
1	B	290	ASP	2.4
2	A	478	GLY	2.3
1	B	308	GLU	2.3
2	A	397	ASN	2.3
1	B	285	LEU	2.2
1	B	310	ALA	2.2
2	A	395	SER	2.2
1	B	322	VAL	2.2
1	B	363	LYS	2.1
1	B	242	ARG	2.1
2	A	185	ALA	2.0
1	B	241	LYS	2.0
1	B	178	GLY	2.0
1	B	324	ARG	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 [\(i\)](#)

There are no ligands in this entry.

## 6.5 Other polymers

There are no such residues in this entry.