



wwPDB X-ray Structure Validation Summary Report ⓘ

Jan 31, 2016 – 07:09 PM GMT

PDB ID : 1E69
Title : SMC HEAD DOMAIN FROM THERMOTOGA MARITIMA
Authors : Lowe, J.; Cordell, S.C.; Van Den Ent, F.
Deposited on : 2000-08-09
Resolution : 3.10 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
<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
Mogul : 1.7 (RC4), CSD as536be (2015)
Xtriage (Phenix) : 1.9-1692
EDS : rb-20026688
Percentile statistics : 20151230.v01 (using entries in the PDB archive December 30th 2015)
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) : trunk26865

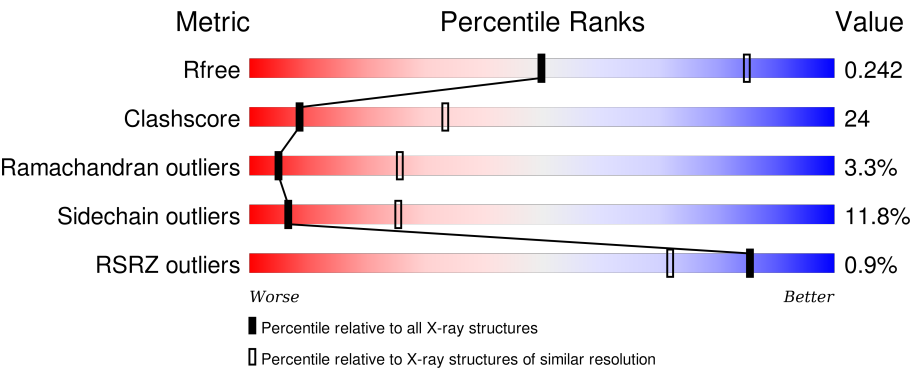
1 Overall quality at a glance ⓘ

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 3.10 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}	91344	1114 (3.14-3.06)
Clashscore	102246	1222 (3.14-3.06)
Ramachandran outliers	100387	1174 (3.14-3.06)
Sidechain outliers	100360	1174 (3.14-3.06)
RSRZ outliers	91569	1119 (3.14-3.06)

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 ≥ 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	322	<div><div></div><div><div></div><div></div><div></div><div></div></div><div>51%25%6%18%</div></div>
1	B	322	<div><div>%</div><div><div></div><div></div><div></div><div></div></div><div>47%27%7%18%</div></div>
1	C	322	<div><div>%</div><div><div></div><div></div><div></div><div></div></div><div>48%28%6%18%</div></div>
1	D	322	<div><div></div><div><div></div><div></div><div></div><div></div></div><div>47%27%7%18%</div></div>
1	E	322	<div><div>%</div><div><div></div><div></div><div></div><div></div></div><div>46%28%7%18%</div></div>

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Mol	Chain	Length	Quality of chain
1	F	322	<div><div><div>%</div><div><div></div><div>47%</div><div>29%</div><div>6%</div><div>18%</div></div></div></div>

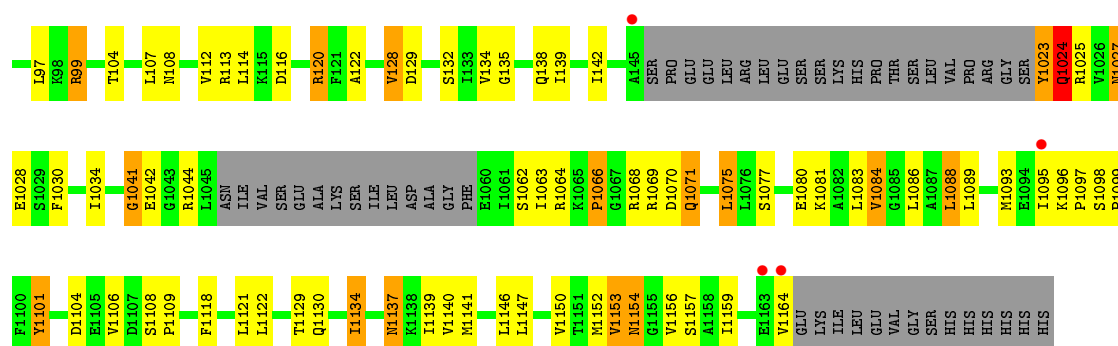
2 Entry composition

There is only 1 type of molecule in this entry. The entry contains 12396 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.

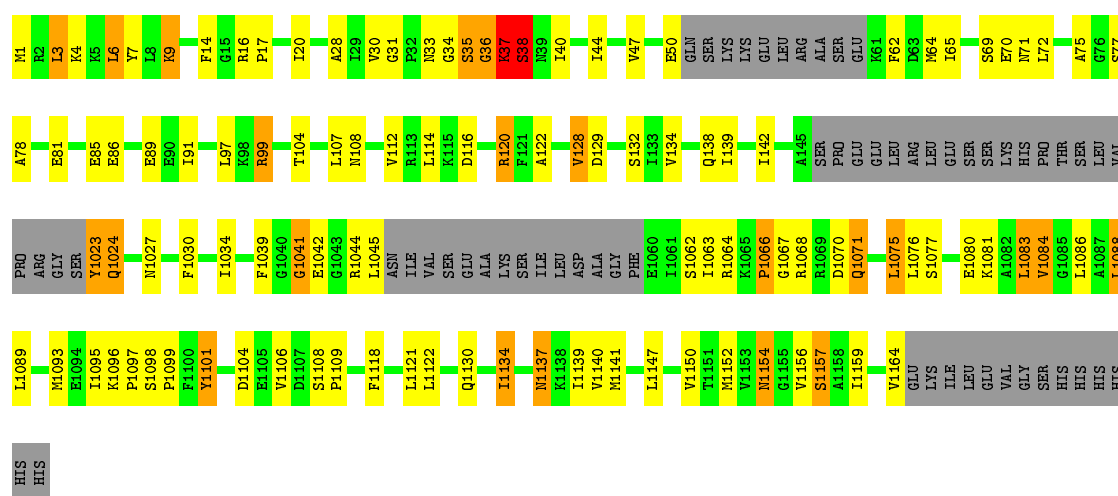
- Molecule 1 is a protein called CHROMOSOME SEGREGATION SMC PROTEIN.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	263	Total	C	N	O	S	0	0	0
			2066	1326	356	379	5			
1	B	263	Total	C	N	O	S	0	0	0
			2066	1326	356	379	5			
1	C	263	Total	C	N	O	S	0	0	0
			2066	1326	356	379	5			
1	D	263	Total	C	N	O	S	0	0	0
			2066	1326	356	379	5			
1	E	263	Total	C	N	O	S	0	0	0
			2066	1326	356	379	5			
1	F	263	Total	C	N	O	S	0	0	0
			2066	1326	356	379	5			



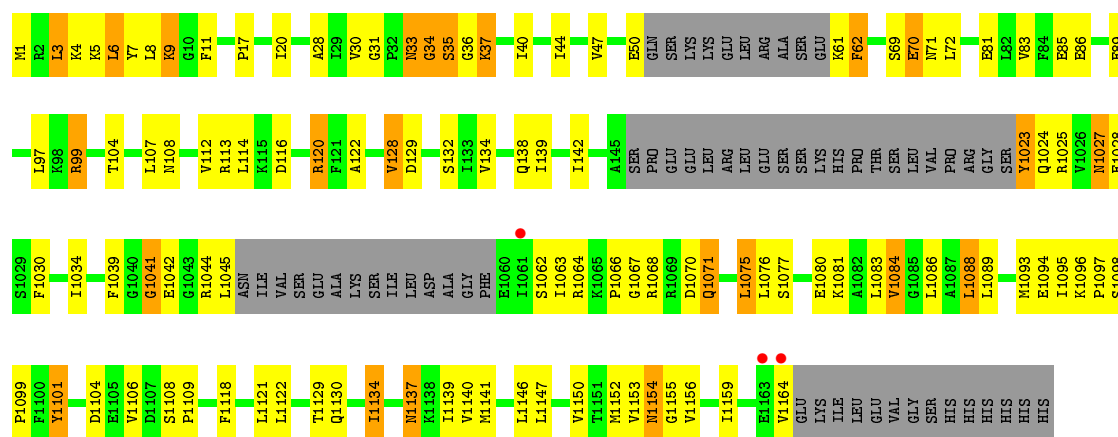
• Molecule 1: CHROMOSOME SEGREGATION SMC PROTEIN

Chain D: 47% 27% 7% 18%



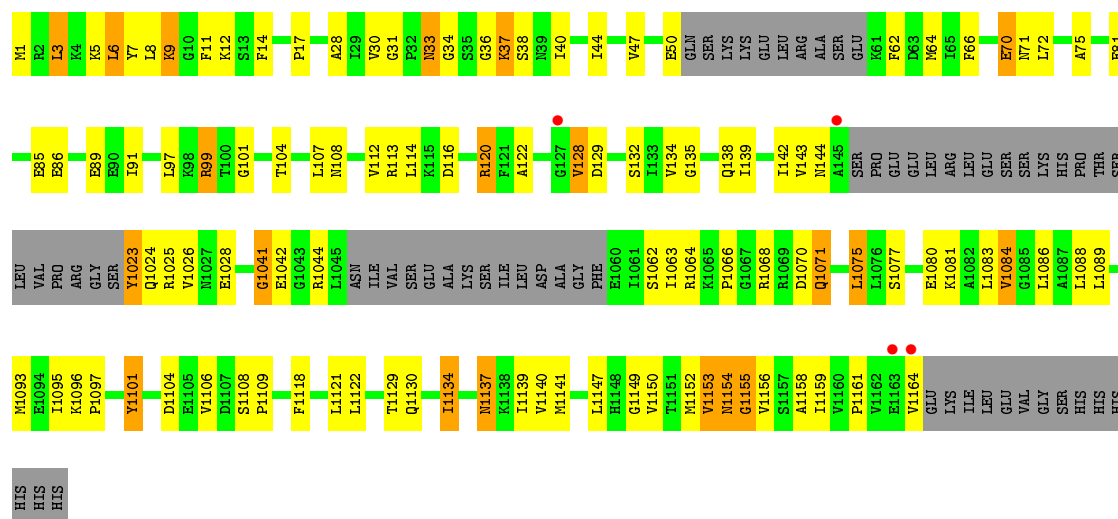
• Molecule 1: CHROMOSOME SEGREGATION SMC PROTEIN

Chain E: 46% 28% 7% 18%



• Molecule 1: CHROMOSOME SEGREGATION SMC PROTEIN

Chain F: 47% 29% 6% 18%



4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	134.00 Å 49.19 Å 233.88 Å 90.00° 94.63° 90.00°	Depositor
Resolution (Å)	100.00 – 3.10 46.16 – 3.14	Depositor EDS
% Data completeness (in resolution range)	97.3 (100.00-3.10) 94.9 (46.16-3.14)	Depositor EDS
R_{merge}	0.07	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	4.85 (at 3.12 Å)	Xtriage
Refinement program	CNS 1.0	Depositor
R, R_{free}	0.250 , 0.272 0.249 , 0.242	Depositor DCC
R_{free} test set	2619 reflections (5.07%)	DCC
Wilson B-factor (Å ²)	80.1	Xtriage
Anisotropy	0.284	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.31 , 48.3	EDS
Estimated twinning fraction	No twinning to report.	Xtriage
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtriage
Outliers	1 of 51642 reflections (0.002%)	Xtriage
F_o, F_c correlation	0.92	EDS
Total number of atoms	12396	wwPDB-VP
Average B, all atoms (Å ²)	73.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 12.49% 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, 0.375 respectively for untwinned datasets, and 0.333, 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	A	0.49	0/2102	0.71	1/2826 (0.0%)
1	B	0.46	0/2102	0.65	0/2826
1	C	0.46	0/2102	0.65	0/2826
1	D	0.47	0/2102	0.69	2/2826 (0.1%)
1	E	0.49	0/2102	0.65	0/2826
1	F	0.47	0/2102	0.68	1/2826 (0.0%)
All	All	0.47	0/12612	0.67	4/16956 (0.0%)

There are no bond length outliers.

All (4) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	36	GLY	N-CA-C	-9.23	90.01	113.10
1	D	36	GLY	N-CA-C	-7.66	93.95	113.10
1	D	38	SER	N-CA-C	5.33	125.38	111.00
1	F	1155	GLY	N-CA-C	-5.21	100.07	113.10

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	2066	0	2099	90	0
1	B	2066	0	2099	101	0
1	C	2066	0	2099	104	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	D	2066	0	2099	110	0
1	E	2066	0	2099	115	0
1	F	2066	0	2099	102	0
All	All	12396	0	12594	598	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 24.

The worst 5 of 598 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:E:3:LEU:H	1:E:1130:GLN:HE22	1.04	1.04
1:B:3:LEU:H	1:B:1130:GLN:HE22	1.06	1.00
1:A:3:LEU:H	1:A:1130:GLN:HE22	1.02	0.99
1:D:3:LEU:H	1:D:1130:GLN:HE22	1.04	0.94
1:A:3:LEU:H	1:A:1130:GLN:NE2	1.65	0.94

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	255/322 (79%)	223 (88%)	26 (10%)	6 (2%)	7	33
1	B	255/322 (79%)	219 (86%)	27 (11%)	9 (4%)	4	24
1	C	255/322 (79%)	221 (87%)	25 (10%)	9 (4%)	4	24
1	D	255/322 (79%)	221 (87%)	25 (10%)	9 (4%)	4	24
1	E	255/322 (79%)	215 (84%)	30 (12%)	10 (4%)	4	22
1	F	255/322 (79%)	222 (87%)	25 (10%)	8 (3%)	5	27
All	All	1530/1932 (79%)	1321 (86%)	158 (10%)	51 (3%)	5	26

5 of 51 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	37	LYS
1	B	35	SER
1	C	1153	VAL
1	D	37	LYS
1	D	38	SER

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	222/275 (81%)	194 (87%)	28 (13%)	5	22
1	B	222/275 (81%)	194 (87%)	28 (13%)	5	22
1	C	222/275 (81%)	197 (89%)	25 (11%)	7	28
1	D	222/275 (81%)	195 (88%)	27 (12%)	6	24
1	E	222/275 (81%)	197 (89%)	25 (11%)	7	28
1	F	222/275 (81%)	198 (89%)	24 (11%)	8	30
All	All	1332/1650 (81%)	1175 (88%)	157 (12%)	6	25

5 of 157 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	C	1071	GLN
1	D	97	LEU
1	F	1068	ARG
1	C	1083	LEU
1	C	1134	ILE

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 35 such sidechains are listed below:

Mol	Chain	Res	Type
1	C	1024	GLN
1	D	144	ASN

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Mol	Chain	Res	Type
1	F	1071	GLN
1	C	1071	GLN
1	C	1130	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 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 [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	263/322 (81%)	0.06	0 100 100	34, 66, 91, 119	0
1	B	263/322 (81%)	0.02	3 (1%) 82 66	47, 76, 99, 125	0
1	C	263/322 (81%)	0.09	4 (1%) 76 58	49, 74, 102, 126	0
1	D	263/322 (81%)	-0.02	0 100 100	51, 73, 97, 121	0
1	E	263/322 (81%)	0.06	3 (1%) 82 66	46, 76, 99, 125	0
1	F	263/322 (81%)	0.24	4 (1%) 76 58	47, 70, 94, 125	0
All	All	1578/1932 (81%)	0.08	14 (0%) 85 72	34, 73, 99, 126	0

The worst 5 of 14 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	F	1164	VAL	11.3
1	E	1164	VAL	8.7
1	C	1164	VAL	8.6
1	E	1163	GLU	6.3
1	F	145	ALA	5.8

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 [i](#)

There are no such residues in this entry.