



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 9, 2026 – 04:55 AM UTC

PDB ID : 8ROC / pdb_00008roc
Title : Human cohesin SMC1A-HD(shortCC-EQ)/RAD21-C complex - Apo closed
P-loop conformation
Authors : Vitoria Gomes, M.; Romier, C.
Deposited on : 2024-01-11
Resolution : 1.85 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

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	:	4-5-2 with Phenix2.0
Xtriage (Phenix)	:	2.0
EDS	:	3.0
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4	:	9.0.010 (Gargrove)
Density-Fitness	:	1.0.12
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.49

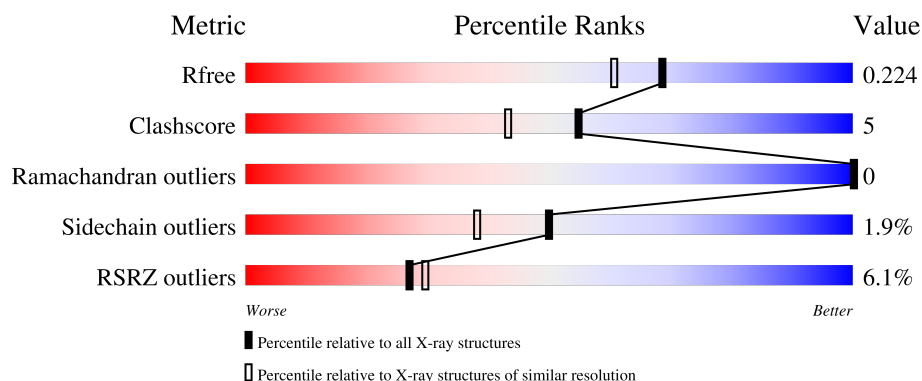
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.85 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}	180053	3428 (1.86-1.86)
Clashscore	190562	3579 (1.86-1.86)
Ramachandran outliers	187476	3553 (1.86-1.86)
Sidechain outliers	187428	3553 (1.86-1.86)
RSRZ outliers	180081	3429 (1.86-1.86)

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 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 $\leq 5\%$. 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	366	5% 84% 14% ..
2	B	81	7% 81% 5% 14%

2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 3654 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 Structural maintenance of chromosomes protein 1A.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	358	Total	C	N	O	S	0	10	0
			2840	1812	477	540	11			

There are 15 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	176	GLY	-	linker	UNP Q14683
A	177	SER	-	linker	UNP Q14683
A	178	GLY	-	linker	UNP Q14683
A	179	SER	-	linker	UNP Q14683
A	180	LEU	-	linker	UNP Q14683
A	181	VAL	-	linker	UNP Q14683
A	182	PRO	-	linker	UNP Q14683
A	183	ARG	-	linker	UNP Q14683
A	1051	GLY	-	linker	UNP Q14683
A	1052	SER	-	linker	UNP Q14683
A	1053	GLY	-	linker	UNP Q14683
A	1054	SER	-	linker	UNP Q14683
A	1055	ALA	-	linker	UNP Q14683
A	1056	LYS	-	linker	UNP Q14683
A	1157	GLN	GLU	engineered mutation	UNP Q14683

- Molecule 2 is a protein called 64-kDa C-terminal product.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	70	Total	C	N	O	S	0	1	0
			557	355	97	104	1			

There are 9 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	557	MET	-	initiating methionine	UNP O60216

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Chain	Residue	Modelled	Actual	Comment	Reference
B	630	GLY	-	expression tag	UNP O60216
B	631	SER	-	expression tag	UNP O60216
B	632	LEU	-	expression tag	UNP O60216
B	633	GLU	-	expression tag	UNP O60216
B	634	VAL	-	expression tag	UNP O60216
B	635	LEU	-	expression tag	UNP O60216
B	636	PHE	-	expression tag	UNP O60216
B	637	GLN	-	expression tag	UNP O60216

- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	213	Total	O	0	0
			213	213		
3	B	44	Total	O	0	0
			44	44		

- Molecule 1: Structural maintenance of chromosomes protein 1A



4 Data and refinement statistics

Property	Value	Source
Space group	I 2 2 2	Depositor
Cell constants a, b, c, α , β , γ	66.14Å 114.03Å 134.87Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	43.63 – 1.85 43.63 – 1.85	Depositor EDS
% Data completeness (in resolution range)	99.8 (43.63-1.85) 100.0 (43.63-1.85)	Depositor EDS
R_{merge}	0.08	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.11 (at 1.84Å)	Xtriage
Refinement program	PHENIX 1.17_3644	Depositor
R, R_{free}	0.181 , 0.222 0.182 , 0.224	Depositor DCC
R_{free} test set	2205 reflections (5.01%)	wwPDB-VP
Wilson B-factor (Å ²)	30.2	Xtriage
Anisotropy	0.501	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.31 , 40.2	EDS
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.33$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	3654	wwPDB-VP
Average B, all atoms (Å ²)	41.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.35% 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

5.1 Standard geometry

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	0.27	0/2924	0.50	0/3935
2	B	0.29	0/569	0.46	0/766
All	All	0.28	0/3493	0.49	0/4701

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	2840	0	2877	32	0
2	B	557	0	571	3	0
3	A	213	0	0	5	0
3	B	44	0	0	0	0
All	All	3654	0	3448	33	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 (33) 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:2:GLY:N	1:A:84:TYR:HH	1.73	0.86

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:1216:LEU:HD11	2:B:611:LEU:HD13	1.74	0.69
1:A:5:LYS:NZ	3:A:1304:HOH:O	2.27	0.68
1:A:1093:SER:OG	3:A:1301:HOH:O	2.12	0.67
1:A:1178:SER:HA	1:A:1182:PHE:O	2.01	0.61
1:A:1124:PRO:O	1:A:1126:ASP:N	2.35	0.58
1:A:106:LYS:HE2	1:A:109:ASN:HA	1.87	0.56
1:A:171:ARG:NH1	3:A:1311:HOH:O	2.39	0.56
1:A:70:VAL:HG23	1:A:72:LYS:HG2	1.89	0.55
1:A:1155:LEU:HD13	1:A:1158:ILE:HD13	1.88	0.55
2:B:603:LEU:HD21	2:B:635:LEU:HD13	1.90	0.54
1:A:62:ARG:NH1	3:A:1308:HOH:O	2.41	0.53
1:A:42:MET:HE1	1:A:134:LEU:HD21	1.91	0.52
1:A:2:GLY:N	1:A:84:TYR:OH	2.41	0.51
1:A:69:PRO:HG2	1:A:1210:CYS:SG	2.51	0.51
1:A:49:LEU:HD21	1:A:82[B]:MET:SD	2.51	0.50
1:A:68:ALA:N	1:A:69:PRO:HD2	2.31	0.45
1:A:129:LYS:HA	1:A:129:LYS:HD2	1.87	0.45
1:A:49:LEU:HD22	1:A:126:ILE:HG21	1.97	0.45
1:A:1145:HIS:HB2	1:A:1153:PHE:HZ	1.82	0.45
1:A:1174:ILE:O	1:A:1178:SER:N	2.46	0.45
1:A:7[A]:ILE:HB	1:A:21:ILE:HB	2.00	0.44
1:A:1089:SER:HB2	1:A:1118:PRO:HG3	2.00	0.44
1:A:42:MET:HG2	1:A:1187:ILE:CD1	2.48	0.43
1:A:26:ARG:HG2	3:A:1405:HOH:O	2.19	0.43
1:A:1088:LEU:O	1:A:1169:LYS:HB3	2.18	0.43
1:A:10:GLU:HA	1:A:17:GLY:O	2.20	0.42
1:A:105:TYR:CZ	1:A:114:LEU:HD13	2.54	0.42
1:A:175:MET:HE2	1:A:175:MET:HB3	1.63	0.42
1:A:151:ARG:O	1:A:155:PHE:HD1	2.02	0.42
1:A:1204:TYR:CD1	2:B:604:LYS:HG2	2.55	0.41
1:A:7[A]:ILE:HG22	1:A:9[A]:ILE:HG13	2.03	0.40
1:A:49:LEU:HD13	1:A:133:PHE:CE1	2.57	0.40

There are no symmetry-related clashes.

5.3 Torsion angles ⓘ

5.3.1 Protein backbone ⓘ

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	365/366 (100%)	356 (98%)	9 (2%)	0	100	100
2	B	69/81 (85%)	68 (99%)	1 (1%)	0	100	100
All	All	434/447 (97%)	424 (98%)	10 (2%)	0	100	100

There are no Ramachandran outliers to report.

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	311/307 (101%)	304 (98%)	7 (2%)	44	30
2	B	60/69 (87%)	60 (100%)	0	100	100
All	All	371/376 (99%)	364 (98%)	7 (2%)	50	38

All (7) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	54	SER
1	A	90	GLU
1	A	99	VAL
1	A	1089	SER
1	A	1120	LYS
1	A	1126	ASP
1	A	1209	ASP

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (2) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	1112	ASN
1	A	1227	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](#)

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	358/366 (97%)	0.24	20 (5%) 30 33	14, 36, 67, 111	10 (2%)
2	B	70/81 (86%)	0.16	6 (8%) 16 16	18, 33, 80, 136	1 (1%)
All	All	428/447 (95%)	0.23	26 (6%) 27 29	14, 36, 68, 136	11 (2%)

All (26) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	1122	PHE	4.3
1	A	1123	ARG	3.8
2	B	636	PHE	3.6
1	A	1090	ARG	3.4
2	B	570	ALA	3.3
1	A	1119	GLY	3.2
2	B	568	GLN	3.1
1	A	1092	SER	3.0
1	A	1121	ARG	3.0
1	A	1179	THR	2.9
1	A	1180	CYS	2.8
2	B	571	LEU	2.8
1	A	1227	ASN	2.7
1	A	1118	PRO	2.7
1	A	1097	PHE	2.5
1	A	1124	PRO	2.5
2	B	572	ALA	2.3
1	A	69	PRO	2.3
1	A	1210	CYS	2.3
2	B	569	ARG	2.2
1	A	1052	SER	2.2
1	A	136	PHE	2.1
1	A	68	ALA	2.1
1	A	1147	TYR	2.1

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Mol	Chain	Res	Type	RSRZ
1	A	76	ASN	2.0
1	A	134	LEU	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 oligosaccharides 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.