WORLDWIDE PDB

PROTEIN DATA BANK

Full wwPDB X-ray Structure Validation Report ⓘ

May 14, 2024 – 09:50 am BST

PDB ID	:	4D10
Title	:	Crystal structure of the COP9 signalosome
Authors	:	Bunker, R.D.; Lingaraju, G.M.; Thoma, N.H.
Deposited on	:	2014-04-30
Resolution	:	3.80 Å(reported)

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

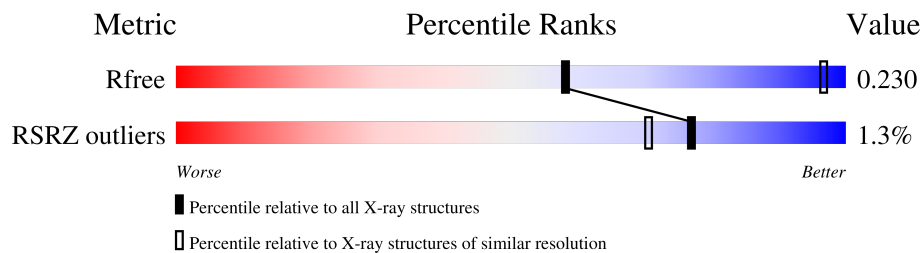|		
MolProbity	:	FAILED
Xtriage (Phenix)	:	1.13
EDS	:	2.36.2
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.36.2

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 3.80 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	Percentile Ranks	Value
Rfree		0.230
RSRZ outliers		1.3%

Worse *Better*

▊ Percentile relative to all X-ray structures

▯ Percentile relative to X-ray structures of similar resolution

Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	130704	1212 (4.00-3.60)
RSRZ outliers	127900	1121 (4.00-3.60)

MolProbity failed to run properly - the sequence quality summary graphics cannot be shown.

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2 Entry composition ⓘ

There are 9 unique types of molecules in this entry. The entry contains 39976 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 COP9 SIGNALOSOME COMPLEX SUBUNIT 1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	419	Total	C	N	O	S	0	0	0
			3348	2113	588	625	22			
1	I	419	Total	C	N	O	S	0	0	0
			3348	2113	588	625	22			

There are 8 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	48	GLY	-	expression tag	UNP Q13098
A	49	GLY	-	expression tag	UNP Q13098
A	50	GLY	-	expression tag	UNP Q13098
A	51	ARG	-	expression tag	UNP Q13098
I	48	GLY	-	expression tag	UNP Q13098
I	49	GLY	-	expression tag	UNP Q13098
I	50	GLY	-	expression tag	UNP Q13098
I	51	ARG	-	expression tag	UNP Q13098

- Molecule 2 is a protein called COP9 SIGNALOSOME COMPLEX SUBUNIT 2.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	403	Total	C	N	O	S	0	0	0
			3304	2102	566	621	15			
2	J	403	Total	C	N	O	S	0	0	0
			3304	2102	566	621	15			

There are 8 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	-3	GLY	-	expression tag	UNP P61201
B	-2	GLY	-	expression tag	UNP P61201
B	-1	GLY	-	expression tag	UNP P61201
B	0	ARG	-	expression tag	UNP P61201

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Chain	Residue	Modelled	Actual	Comment	Reference
J	-3	GLY	-	expression tag	UNP P61201
J	-2	GLY	-	expression tag	UNP P61201
J	-1	GLY	-	expression tag	UNP P61201
J	0	ARG	-	expression tag	UNP P61201

- Molecule 3 is a protein called COP9 SIGNALOSOME COMPLEX SUBUNIT 3.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
3	C	401	Total 3191	C 2032	N 535	O 598	S 26	0	0	0
3	K	401	Total 3191	C 2032	N 535	O 598	S 26	0	0	0

- Molecule 4 is a protein called COP9 SIGNALOSOME COMPLEX SUBUNIT 4.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
4	D	406	Total 3251	C 2047	N 566	O 622	S 16	0	0	0
4	L	225	Total 1805	C 1137	N 319	O 337	S 12	0	0	0

There are 8 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
D	-3	GLY	-	expression tag	UNP Q9BT78
D	-2	GLY	-	expression tag	UNP Q9BT78
D	-1	GLY	-	expression tag	UNP Q9BT78
D	0	ARG	-	expression tag	UNP Q9BT78
L	-3	GLY	-	expression tag	UNP Q9BT78
L	-2	GLY	-	expression tag	UNP Q9BT78
L	-1	GLY	-	expression tag	UNP Q9BT78
L	0	ARG	-	expression tag	UNP Q9BT78

- Molecule 5 is a protein called COP9 SIGNALOSOME COMPLEX SUBUNIT 5.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
5	E	298	Total 2366	C 1510	N 393	O 450	S 13	0	0	0
5	M	298	Total 2366	C 1510	N 393	O 450	S 13	0	0	0

- Molecule 6 is a protein called COP9 SIGNALOSOME COMPLEX SUBUNIT 6.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
6	F	281	Total	C	N	O	S	0	0	0
			2236	1429	371	421	15			
6	N	281	Total	C	N	O	S	0	0	0
			2236	1429	371	421	15			

There are 8 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
F	-3	GLY	-	expression tag	UNP Q7L5N1
F	-2	GLY	-	expression tag	UNP Q7L5N1
F	-1	GLY	-	expression tag	UNP Q7L5N1
F	0	ARG	-	expression tag	UNP Q7L5N1
N	-3	GLY	-	expression tag	UNP Q7L5N1
N	-2	GLY	-	expression tag	UNP Q7L5N1
N	-1	GLY	-	expression tag	UNP Q7L5N1
N	0	ARG	-	expression tag	UNP Q7L5N1

- Molecule 7 is a protein called COP9 SIGNALOSOME COMPLEX SUBUNIT 7A.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
7	G	208	Total	C	N	O	S	0	0	0
			1631	1028	287	312	4			
7	O	208	Total	C	N	O	S	0	0	0
			1631	1028	287	312	4			

There are 8 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
G	-3	GLY	-	expression tag	UNP Q9UBW8
G	-2	GLY	-	expression tag	UNP Q9UBW8
G	-1	GLY	-	expression tag	UNP Q9UBW8
G	0	ARG	-	expression tag	UNP Q9UBW8
O	-3	GLY	-	expression tag	UNP Q9UBW8
O	-2	GLY	-	expression tag	UNP Q9UBW8
O	-1	GLY	-	expression tag	UNP Q9UBW8
O	0	ARG	-	expression tag	UNP Q9UBW8

- Molecule 8 is a protein called COP9 SIGNALOSOME COMPLEX SUBUNIT 8.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
8	H	173	Total	C	N	O	S	0	0	0
			1383	885	240	254	4			

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Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
8	P	173	1383	885	240	254	4	0	0	0

There are 8 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
H	-2	GLY	-	expression tag	UNP Q99627
H	-1	GLY	-	expression tag	UNP Q99627
H	0	GLY	-	expression tag	UNP Q99627
H	1	ARG	-	expression tag	UNP Q99627
P	-2	GLY	-	expression tag	UNP Q99627
P	-1	GLY	-	expression tag	UNP Q99627
P	0	GLY	-	expression tag	UNP Q99627
P	1	ARG	-	expression tag	UNP Q99627

- Molecule 9 is ZINC ION (three-letter code: ZN) (formula: Zn).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	Zn		
9	E	1	1	1	0	0
9	M	1	1	1	0	0

MolProbity failed to run properly - this section is therefore empty.

3 Data and refinement statistics ⓘ

Property	Value	Source
Space group	P 31	Depositor
Cell constants a, b, c, α, β, γ	151.62Å 151.62Å 343.07Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	50.87 – 3.80 50.87 – 3.80	Depositor EDS
% Data completeness (in resolution range)	99.9 (50.87-3.80) 100.0 (50.87-3.80)	Depositor EDS
R_{merge}	0.12	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	1.28 (at 3.77Å)	Xtriage
Refinement program	REFMAC 5.8.0071	Depositor
R, R_{free}	0.199 , 0.228 0.201 , 0.230	Depositor DCC
R_{free} test set	1656 reflections (1.91%)	wwPDB-VP
Wilson B-factor (Å^2)	156.1	Xtriage
Anisotropy	0.028	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.28 , 116.0	EDS
L-test for twinning[2]	$< |L| > = 0.38, < L^2 > = 0.21$	Xtriage
Estimated twinning fraction	0.096 for -h,-k,l 0.277 for h,-h-k,-l 0.097 for -k,-h,-l	Xtriage
Reported twinning fraction	0.636 for H, K, L 0.364 for K, H, -L	Depositor
Outliers	0 of 86819 reflections	Xtriage
F_o,F_c correlation	0.95	EDS
Total number of atoms	39976	wwPDB-VP
Average B, all atoms (Å^2)	191.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 1.74% of the height of the origin peak. No significant pseudotranslation is detected.*

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[1]Intensities estimated from amplitudes.
[2]Theoretical values of $< |L| >$, $< L^2 >$ for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

4 Model quality ⓘ

4.1 Standard geometry ⓘ

MolProbity failed to run properly - this section is therefore empty.

4.2 Too-close contacts ⓘ

MolProbity failed to run properly - this section is therefore empty.

4.3 Torsion angles ⓘ

4.3.1 Protein backbone ⓘ

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4.3.2 Protein sidechains ⓘ

MolProbity failed to run properly - this section is therefore empty.

4.3.3 RNA ⓘ

MolProbity failed to run properly - this section is therefore empty.

4.4 Non-standard residues in protein, DNA, RNA chains ⓘ

There are no non-standard protein/DNA/RNA residues in this entry.

4.5 Carbohydrates ⓘ

There are no monosaccharides in this entry.

4.6 Ligand geometry ⓘ

Of 2 ligands modelled in this entry, 2 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.

4.7 Other polymers ⓘ

There are no such residues in this entry.

4.8 Polymer linkage issues ⓘ

The following chains have linkage breaks:

Mol	Chain	Number of breaks
4	D	2
2	B	1
1	A	1

All chain breaks are listed below:

Model	Chain	Residue-1	Atom-1	Residue-2	Atom-2	Distance (Å)
1	B	61:GLU	C	62:GLY	N	2.35
1	A	137:LYS	C	138:LEU	N	1.77
1	D	347:ARG	C	348:MET	N	1.76
1	D	187:TYR	C	188:LYS	N	1.16

5 Fit of model and data ⓘ

5.1 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, 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	419/480 (87%)	0.05	17 (4%)	37	31	130, 224, 265, 285	0
1	I	419/480 (87%)	-0.04	10 (2%)	59	50	127, 198, 253, 268	0
2	B	403/447 (90%)	-0.08	7 (1%)	70	62	132, 224, 253, 270	0
2	J	403/447 (90%)	-0.07	6 (1%)	73	66	121, 208, 243, 263	0
3	C	401/423 (94%)	-0.02	2 (0%)	91	87	129, 172, 261, 280	0
3	K	401/423 (94%)	0.04	3 (0%)	87	83	133, 186, 261, 276	0
4	D	406/410 (99%)	-0.05	7 (1%)	70	62	133, 191, 268, 297	0
4	L	225/410 (54%)	-0.04	2 (0%)	84	79	136, 189, 232, 249	0
5	E	298/334 (89%)	0.00	4 (1%)	77	70	142, 176, 217, 258	0
5	M	298/334 (89%)	-0.11	0	100	100	128, 156, 187, 222	0
6	F	281/331 (84%)	-0.05	1 (0%)	92	89	133, 180, 208, 224	0
6	N	281/331 (84%)	0.01	3 (1%)	80	74	130, 177, 212, 221	0
7	G	208/222 (93%)	-0.19	1 (0%)	91	87	140, 194, 247, 256	0
7	O	208/222 (93%)	-0.24	1 (0%)	91	87	133, 186, 238, 250	0
8	H	173/212 (81%)	-0.11	0	100	100	135, 175, 215, 232	0
8	P	173/212 (81%)	-0.04	1 (0%)	89	85	162, 198, 230, 240	0
All	All	4997/5718 (87%)	-0.05	65 (1%)	77	70	121, 187, 253, 297	0

All (65) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
3	C	54	HIS	7.7
3	K	54	HIS	7.6
1	A	275	ASP	5.2
1	A	319	LEU	4.6
1	A	320	LEU	4.6

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Mol	Chain	Res	Type	RSRZ
2	J	64	LYS	4.6
8	P	194	GLU	4.5
1	I	319	LEU	4.1
2	B	298	GLU	3.8
3	C	134	ASN	3.6
2	J	142	ALA	3.5
4	D	1	MET	3.3
1	I	214	LEU	3.2
4	D	177	GLU	3.2
1	A	268	ALA	3.1
1	A	330	GLY	3.1
1	A	264	THR	3.1
2	B	64	LYS	3.0
1	I	320	LEU	3.0
6	F	257	LEU	3.0
1	A	274	ARG	3.0
1	I	309	ALA	3.0
2	J	63	GLU	2.9
2	B	202	ILE	2.9
6	N	238	ILE	2.8
4	D	5	VAL	2.8
1	A	271	ARG	2.8
1	A	309	ALA	2.7
7	O	35	LEU	2.6
3	K	28	ILE	2.6
1	A	270	GLN	2.6
1	I	87	TYR	2.6
2	J	201	GLU	2.6
7	G	70	PHE	2.6
4	D	137	LYS	2.5
4	D	174	LEU	2.5
4	L	406	GLN	2.5
4	D	16	SER	2.5
6	N	181	MET	2.4
2	B	299	ALA	2.4
4	D	19	HIS	2.4
2	B	296	SER	2.4
4	L	226	LEU	2.4
1	I	307	LEU	2.4
3	K	123	ILE	2.4
5	E	197	ASP	2.4
1	A	185	LEU	2.3

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Mol	Chain	Res	Type	RSRZ
2	B	311	MET	2.3
1	A	288	ALA	2.3
1	I	331	LEU	2.3
2	B	443	ALA	2.3
2	J	203	GLN	2.2
1	I	274	ARG	2.2
5	E	110	GLN	2.2
2	J	34	ASN	2.2
1	A	328	TYR	2.2
1	A	326	ALA	2.2
1	A	307	LEU	2.1
5	E	152	VAL	2.1
6	N	288	LEU	2.1
1	I	171	ARG	2.1
1	A	322	PRO	2.1
5	E	333	ILE	2.1
1	I	275	ASP	2.0
1	A	314	CYS	2.0

5.2 Non-standard residues in protein, DNA, RNA chains ⓘ

There are no non-standard protein/DNA/RNA residues in this entry.

5.3 Carbohydrates ⓘ

There are no monosaccharides in this entry.

5.4 Ligands ⓘ

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. The B-factors column lists the minimum, median, 95th 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	B-factors(Å^2)	Q<0.9
9	ZN	E	999	1/1	0.98	0.19	149,149,149,149	0
9	ZN	M	999	1/1	1.00	0.27	127,127,127,127	0

5.5 Other polymers ⓘ

There are no such residues in this entry.