



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 5, 2026 – 07:12 PM UTC

PDB ID : 1ZBX / pdb_00001zbx
Title : Crystal structure of a Orc1p-Sir1p complex
Authors : Hsu, H.C.; Stillman, B.; Xu, R.M.
Deposited on : 2005-04-09
Resolution : 2.50 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

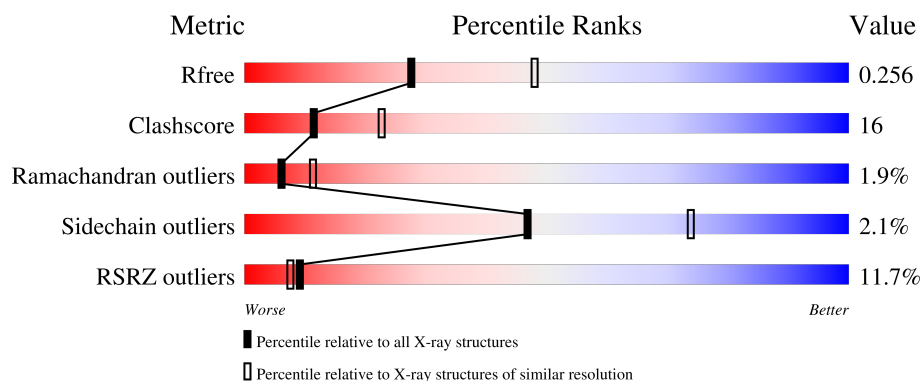
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.50 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	5829 (2.50-2.50)
Clashscore	190562	6492 (2.50-2.50)
Ramachandran outliers	187476	6378 (2.50-2.50)
Sidechain outliers	187428	6380 (2.50-2.50)
RSRZ outliers	180081	5833 (2.50-2.50)

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	219	10% 60% 26% • 10%
2	B	140	11% 55% 28% •• 14%

2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 2774 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 Origin recognition complex subunit 1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	197	Total	C	N	O	S	0	0	0
			1618	1034	272	308	4			

- Molecule 2 is a protein called Regulatory protein SIR1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	120	Total	C	N	O	S	0	0	0
			992	646	162	178	6			

There are 7 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	613	LEU	ILE	cloning artifact	UNP P21691
B	614	GLU	ILE	cloning artifact	UNP P21691
B	615	HIS	-	expression tag	UNP P21691
B	616	HIS	-	expression tag	UNP P21691
B	617	HIS	-	expression tag	UNP P21691
B	618	HIS	-	expression tag	UNP P21691
B	619	HIS	-	expression tag	UNP P21691

- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	115	Total	O	0	0
			115	115		
3	B	49	Total	O	0	0
			49	49		

4 Data and refinement statistics

Property	Value	Source
Space group	I 2 2 2	Depositor
Cell constants a, b, c, α , β , γ	70.00Å 137.21Å 139.77Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	46.20 – 2.50 46.20 – 2.50	Depositor EDS
% Data completeness (in resolution range)	95.3 (46.20-2.50) 95.3 (46.20-2.50)	Depositor EDS
R_{merge}	0.05	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	3.29 (at 2.39Å)	Xtriage
Refinement program	CNS 1.0	Depositor
R, R_{free}	0.220 , 0.260 0.219 , 0.256	Depositor DCC
R_{free} test set	2070 reflections (7.86%)	wwPDB-VP
Wilson B-factor (Å ²)	51.0	Xtriage
Anisotropy	0.488	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.36 , 52.8	EDS
L-test for twinning ²	$\langle L \rangle = 0.48$, $\langle L^2 \rangle = 0.32$	Xtriage
Estimated twinning fraction	0.016 for -h,-l,-k	Xtriage
F_o, F_c correlation	0.94	EDS
Total number of atoms	2774	wwPDB-VP
Average B, all atoms (Å ²)	66.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.43% 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	0.44	0/1651	0.95	5/2238 (0.2%)
2	B	0.41	0/1014	0.95	4/1368 (0.3%)
All	All	0.43	0/2665	0.95	9/3606 (0.2%)

There are no bond length outliers.

All (9) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	114	ARG	N-CA-C	8.31	122.16	110.20
1	A	16	THR	N-CA-C	7.82	119.02	108.23
2	B	576	LEU	N-CA-C	6.08	123.24	109.81
2	B	547	ILE	N-CA-C	6.04	115.18	108.05
1	A	176	ILE	N-CA-C	-6.02	99.05	108.86
2	B	570	ASP	N-CA-C	-5.82	105.76	112.92
2	B	602	ASP	N-CA-C	-5.60	106.15	112.87
1	A	153	MET	N-CA-C	5.38	117.58	109.41
1	A	17	ASP	N-CA-C	-5.18	99.76	110.80

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	1618	0	1588	51	1
2	B	992	0	1016	35	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
3	A	115	0	0	7	0
3	B	49	0	0	3	0
All	All	2774	0	2604	84	1

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 16.

All (84) 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)
2:B:485:THR:HG21	2:B:498:ASP:HA	1.45	0.97
1:A:80:ASN:HB2	3:A:269:HOH:O	1.65	0.96
2:B:576:LEU:HB3	2:B:577:PRO:HD3	1.54	0.88
1:A:76:LEU:HD12	1:A:77:ASN:H	1.39	0.85
2:B:541:LYS:HE2	2:B:602:ASP:HB2	1.63	0.81
1:A:195:TYR:CE2	3:A:297:HOH:O	2.35	0.79
2:B:550:LYS:N	2:B:550:LYS:HD3	2.00	0.76
1:A:39:HIS:CE1	1:A:76:LEU:HD23	2.22	0.74
1:A:19:GLN:HG3	1:A:20:GLY:H	1.56	0.70
1:A:16:THR:HG22	1:A:19:GLN:HA	1.73	0.69
1:A:114:ARG:HD3	3:A:313:HOH:O	1.94	0.67
1:A:58:MET:HE2	1:A:141:LEU:HB3	1.77	0.67
1:A:196:ILE:HD13	1:A:204:ALA:HB1	1.78	0.66
2:B:576:LEU:HB3	2:B:577:PRO:CD	2.24	0.66
2:B:550:LYS:HD3	2:B:550:LYS:H	1.58	0.66
1:A:169:ARG:NH1	3:A:332:HOH:O	2.30	0.64
2:B:542:LYS:HE3	2:B:543:TYR:CE1	2.35	0.61
1:A:16:THR:CG2	1:A:19:GLN:HA	2.30	0.61
2:B:541:LYS:CE	2:B:602:ASP:HB2	2.30	0.61
1:A:8:LEU:HD13	1:A:143:LEU:HD12	1.81	0.60
1:A:210:ASP:OD1	1:A:213:LEU:HD12	2.02	0.59
1:A:103:ARG:HA	1:A:109:ALA:HB1	1.87	0.57
1:A:153:MET:HB2	1:A:157:LYS:HD3	1.86	0.57
2:B:599:LEU:HD12	3:B:68:HOH:O	2.06	0.56
1:A:8:LEU:HD13	1:A:143:LEU:CD1	2.37	0.55
2:B:547:ILE:HG13	2:B:606:GLN:NE2	2.20	0.55
2:B:548:PRO:HB3	2:B:609:TYR:CZ	2.42	0.55
1:A:138:LEU:HD11	1:A:205:GLN:HG3	1.89	0.55
1:A:76:LEU:CD1	1:A:77:ASN:H	2.13	0.54
1:A:72:GLN:HE22	1:A:205:GLN:HB2	1.72	0.54
1:A:189:ILE:O	1:A:193:LYS:HG3	2.09	0.53

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:538:ASN:OD1	2:B:541:LYS:HE3	2.08	0.53
1:A:15:THR:HG23	1:A:39:HIS:CD2	2.45	0.52
2:B:509:PRO:HG3	2:B:554:LEU:HD11	1.91	0.52
2:B:561:ILE:O	2:B:594:SER:HA	2.10	0.52
1:A:202:ARG:O	1:A:206:GLU:HG2	2.10	0.51
1:A:195:TYR:CZ	1:A:199:VAL:HG11	2.46	0.51
1:A:76:LEU:HD12	1:A:77:ASN:N	2.17	0.51
2:B:485:THR:HG21	2:B:498:ASP:CA	2.29	0.51
1:A:62:ALA:O	2:B:516:ARG:HD3	2.12	0.50
1:A:104:GLN:O	1:A:104:GLN:HG2	2.11	0.50
2:B:550:LYS:H	2:B:550:LYS:CD	2.21	0.49
1:A:58:MET:SD	1:A:146:PHE:HA	2.52	0.49
1:A:195:TYR:OH	1:A:199:VAL:HG11	2.13	0.48
1:A:72:GLN:HB3	1:A:87:ALA:HA	1.94	0.48
1:A:195:TYR:HE2	3:A:297:HOH:O	1.87	0.48
1:A:18:GLU:O	1:A:19:GLN:HB2	2.13	0.48
1:A:13:ILE:HD11	1:A:83:VAL:CG2	2.44	0.47
2:B:601:ASP:C	2:B:603:GLN:N	2.72	0.47
2:B:492:PRO:HD2	3:B:53:HOH:O	2.14	0.47
2:B:576:LEU:O	2:B:577:PRO:C	2.55	0.47
1:A:114:ARG:HB3	1:A:115:PRO:HD2	1.97	0.47
1:A:162:LYS:HG2	3:A:329:HOH:O	2.15	0.47
1:A:114:ARG:CD	3:A:313:HOH:O	2.60	0.46
1:A:102:TYR:CE1	1:A:106:ASN:ND2	2.83	0.46
2:B:601:ASP:C	2:B:603:GLN:H	2.22	0.46
1:A:8:LEU:HD22	1:A:143:LEU:HD12	1.98	0.46
1:A:152:VAL:HG12	1:A:189:ILE:HG12	1.98	0.46
2:B:562:LYS:HD2	2:B:592:LEU:HG	1.98	0.45
1:A:77:ASN:HD22	1:A:80:ASN:CG	2.24	0.45
1:A:121:LYS:HG3	2:B:489:TYR:CE1	2.53	0.44
1:A:60:ASN:HB3	1:A:65:THR:O	2.18	0.44
2:B:536:LYS:HG3	3:B:103:HOH:O	2.18	0.43
2:B:533:ASN:O	2:B:534:LEU:HD23	2.18	0.43
2:B:541:LYS:CD	2:B:602:ASP:HB2	2.47	0.43
2:B:487:GLU:HA	2:B:496:VAL:O	2.19	0.43
2:B:562:LYS:HD3	2:B:562:LYS:HA	1.87	0.43
2:B:602:ASP:O	2:B:603:GLN:HB2	2.17	0.42
2:B:528:MET:O	2:B:532:MET:HG3	2.18	0.42
1:A:174:ARG:HG3	1:A:175:TYR:CE1	2.55	0.42
1:A:14:ILE:HD12	1:A:40:TYR:CE1	2.55	0.42
1:A:40:TYR:CE1	1:A:49:LYS:HD3	2.54	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:19:GLN:HG3	1:A:20:GLY:N	2.29	0.42
2:B:595:CYS:HB2	2:B:608:LEU:O	2.19	0.42
2:B:545:ASP:HB3	2:B:546:PRO:HD2	2.02	0.41
1:A:40:TYR:CD1	1:A:40:TYR:C	2.99	0.41
2:B:563:LYS:HB3	2:B:565:PHE:CE1	2.55	0.41
1:A:177:CYS:HB2	1:A:182:GLU:O	2.21	0.41
1:A:15:THR:C	1:A:16:THR:HG23	2.45	0.40
2:B:529:ILE:HG23	2:B:534:LEU:HD11	2.03	0.40
1:A:50:LEU:HB3	1:A:71:ILE:CD1	2.50	0.40
1:A:121:LYS:O	1:A:125:GLU:HG3	2.22	0.40
1:A:134:LEU:HG	1:A:135:THR:N	2.36	0.40
2:B:498:ASP:CG	2:B:551:ALA:HB1	2.47	0.40

All (1) symmetry-related close contacts are listed below. The label for Atom-2 includes the symmetry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:5:LEU:CD2	1:A:5:LEU:CD2[2_555]	2.15	0.05

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	193/219 (88%)	170 (88%)	18 (9%)	5 (3%)	4	7
2	B	116/140 (83%)	111 (96%)	4 (3%)	1 (1%)	14	27
All	All	309/359 (86%)	281 (91%)	22 (7%)	6 (2%)	6	11

All (6) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
2	B	576	LEU

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Mol	Chain	Res	Type
1	A	17	ASP
1	A	19	GLN
1	A	45	SER
1	A	201	PRO
1	A	199	VAL

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	175/195 (90%)	171 (98%)	4 (2%)	44	72
2	B	113/132 (86%)	111 (98%)	2 (2%)	51	77
All	All	288/327 (88%)	282 (98%)	6 (2%)	47	74

All (6) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	46	ASP
1	A	72	GLN
1	A	142	GLN
1	A	201	PRO
2	B	550	LYS
2	B	590	THR

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (3) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	39	HIS
1	A	72	GLN
1	A	113	ASN

5.3.3 RNA ⓘ

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

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, 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	197/219 (89%)	0.44	22 (11%) 10 8	38, 60, 99, 100	0
2	B	120/140 (85%)	0.65	15 (12%) 8 6	44, 67, 97, 100	0
All	All	317/359 (88%)	0.52	37 (11%) 9 7	38, 64, 99, 100	0

All (37) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	B	577	PRO	5.7
1	A	21	ASN	5.3
1	A	17	ASP	4.0
2	B	615	HIS	4.0
1	A	16	THR	3.8
2	B	589	MET	3.3
1	A	113	ASN	3.3
1	A	213	LEU	3.3
2	B	576	LEU	3.2
1	A	37	THR	3.2
1	A	2	ALA	3.2
1	A	7	ASP	3.0
2	B	601	ASP	3.0
2	B	528	MET	3.0
1	A	19	GLN	2.9
2	B	571	PHE	2.8
2	B	603	GLN	2.7
2	B	536	LYS	2.7
1	A	78	THR	2.6
2	B	604	THR	2.6
1	A	20	GLY	2.4
1	A	79	LEU	2.4
1	A	77	ASN	2.4
1	A	74	LEU	2.3

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Mol	Chain	Res	Type	RSRZ
1	A	211	LEU	2.3
2	B	602	ASP	2.3
1	A	15	THR	2.2
1	A	76	LEU	2.2
1	A	108	ASP	2.2
1	A	18	GLU	2.2
1	A	9	GLN	2.1
2	B	531	GLN	2.1
2	B	590	THR	2.1
2	B	530	ASP	2.1
1	A	13	ILE	2.1
2	B	564	LYS	2.1
1	A	210	ASP	2.1

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.