



Full wwPDB X-ray Structure Validation Report ⓘ

Aug 17, 2023 – 12:16 AM EDT

PDB ID : 2F4O
Title : The Mouse PNGase-HR23 Complex Reveals a Complete Remodulation of the Protein-Protein Interface Compared to its Yeast Orthologs
Authors : Zhao, G.; Zhou, X.; Wang, L.; Kisker, C.; Lennarz, W.J.; Schindelin, H.
Deposited on : 2005-11-23
Resolution : 2.26 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 : 4.02b-467
Mogul : 1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix) : 1.13
EDS : 2.35
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) : 2.35

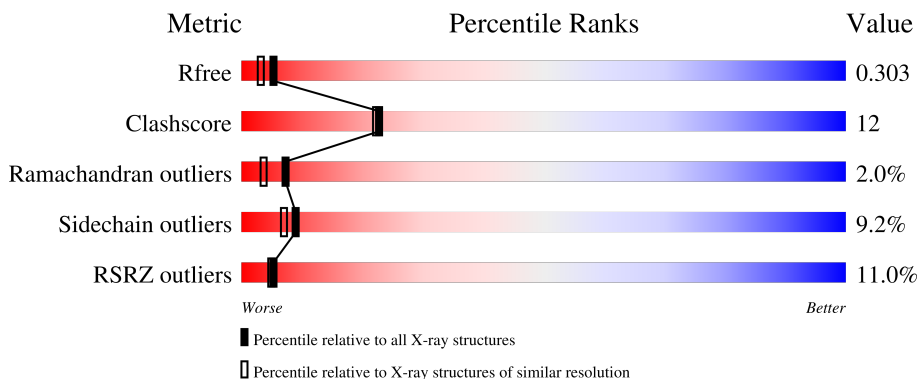
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.26 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	1377 (2.26-2.26)
Clashscore	141614	1487 (2.26-2.26)
Ramachandran outliers	138981	1449 (2.26-2.26)
Sidechain outliers	138945	1450 (2.26-2.26)
RSRZ outliers	127900	1356 (2.26-2.26)

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	295	 12% 65% 26% 7%
2	B	61	 8% 64% 31% 5%
3	I	5	 80% 20%

2 Entry composition

There are 6 unique types of molecules in this entry. The entry contains 2966 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 peptide N-glycanase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	290	2409	1520	433	441	15	0	0	0

There are 8 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	451	LEU	-	cloning artifact	GB 30517852
A	452	GLU	-	cloning artifact	GB 30517852
A	453	HIS	-	expression tag	GB 30517852
A	454	HIS	-	expression tag	GB 30517852
A	455	HIS	-	expression tag	GB 30517852
A	456	HIS	-	expression tag	GB 30517852
A	457	HIS	-	expression tag	GB 30517852
A	458	HIS	-	expression tag	GB 30517852

- Molecule 2 is a protein called XP-C repair complementing complex 58 kDa protein.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
2	B	61	505	318	95	90	2	0	0	0

There is a discrepancy between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	333	GLY	-	cloning artifact	UNP P54728

- Molecule 3 is a protein called PHQ-VAL-ALA-ASP-CF0.

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
			Total	C	N	O			
3	I	5	31	21	3	7	0	0	1

- Molecule 4 is ZINC ION (three-letter code: ZN) (formula: Zn).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	2	Total 2	Zn 2	0	0

- Molecule 5 is CHLORIDE ION (three-letter code: CL) (formula: Cl).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	1	Total 1	Cl 1	0	0

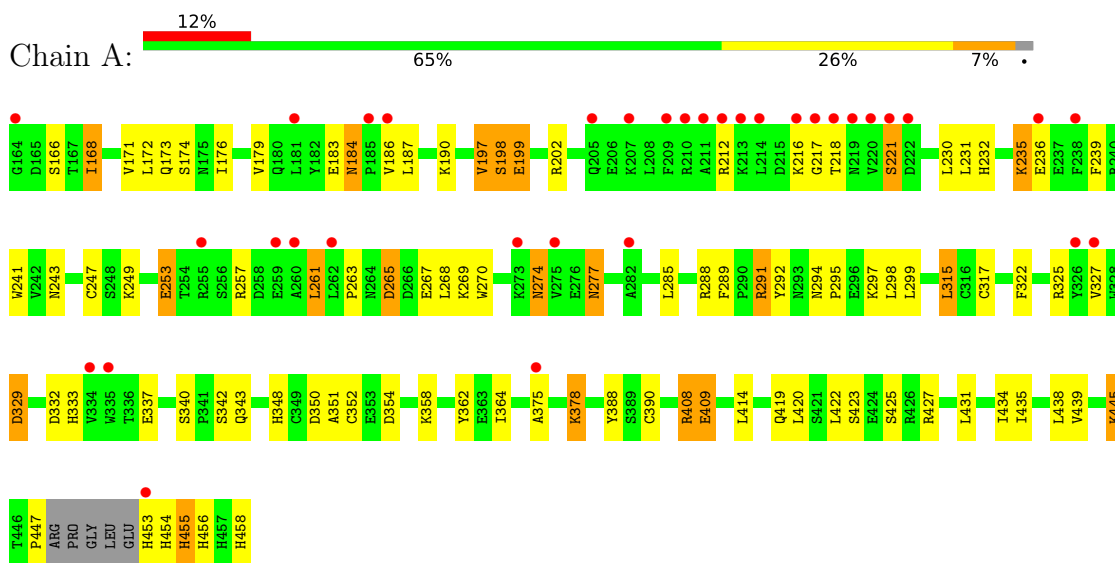
- Molecule 6 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	A	17	Total 17	O 17	0	0
6	B	1	Total 1	O 1	0	0

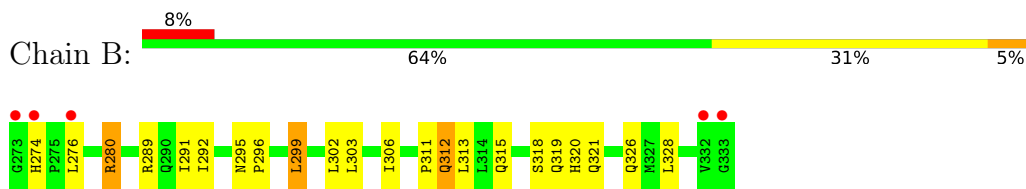
3 Residue-property plots [i](#)

These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and electron density. Residues are color-coded according to the number of geometric quality criteria for which they contain at least one outlier: green = 0, yellow = 1, orange = 2 and red = 3 or more. A red dot above a residue indicates a poor fit to the electron density ($RSRZ > 2$). Stretches of 2 or more consecutive residues without any outlier are shown as a green connector. Residues present in the sample, but not in the model, are shown in grey.

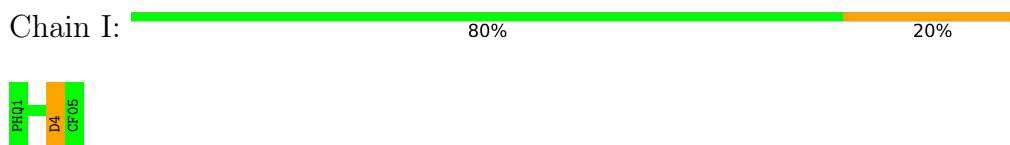
- Molecule 1: peptide N-glycanase



- Molecule 2: XP-C repair complementing complex 58 kDa protein



- Molecule 3: PHQ-VAL-ALA-ASP-CF0



4 Data and refinement statistics

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α , β , γ	96.96Å 52.10Å 80.85Å 90.00° 113.50° 90.00°	Depositor
Resolution (Å)	20.00 – 2.26 35.40 – 2.26	Depositor EDS
% Data completeness (in resolution range)	83.2 (20.00-2.26) 83.1 (35.40-2.26)	Depositor EDS
R_{merge}	0.10	Depositor
R_{sym}	0.06	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.59 (at 2.27Å)	Xtrriage
Refinement program	REFMAC	Depositor
R, R_{free}	0.220 , 0.293 0.230 , 0.303	Depositor DCC
R_{free} test set	740 reflections (5.08%)	wwPDB-VP
Wilson B-factor (Å ²)	44.8	Xtrriage
Anisotropy	0.451	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.35 , 76.2	EDS
L-test for twinning ²	$\langle L \rangle = 0.48$, $\langle L^2 \rangle = 0.31$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
F_o, F_c correlation	0.93	EDS
Total number of atoms	2966	wwPDB-VP
Average B, all atoms (Å ²)	65.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 6.35% 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 [i](#)

5.1 Standard geometry [i](#)

Bond lengths and bond angles in the following residue types are not validated in this section: ZN, CF0, CL, PHQ

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	0.81	2/2465 (0.1%)	0.85	4/3329 (0.1%)
2	B	0.67	0/516	0.83	2/698 (0.3%)
3	I	0.91	0/19	2.05	1/25 (4.0%)
All	All	0.79	2/3000 (0.1%)	0.86	7/4052 (0.2%)

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
1	A	0	1

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	199	GLU	CD-OE2	8.15	1.34	1.25
1	A	425	SER	CB-OG	5.92	1.50	1.42

All (7) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	291	ARG	NE-CZ-NH2	-7.63	116.48	120.30
2	B	280	ARG	NE-CZ-NH1	7.25	123.93	120.30
1	A	291	ARG	NE-CZ-NH1	7.25	123.92	120.30
2	B	280	ARG	NE-CZ-NH2	-6.67	116.96	120.30
3	I	4	ASP	CB-CG-OD2	6.65	124.29	118.30
1	A	329	ASP	CB-CG-OD2	6.30	123.97	118.30
1	A	329	ASP	CB-CG-OD1	-5.20	113.62	118.30

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	455	HIS	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	A	2409	0	2355	57	0
2	B	505	0	501	12	0
3	I	31	0	24	1	0
4	A	2	0	0	0	0
5	A	1	0	0	1	0
6	A	17	0	0	1	0
6	B	1	0	0	0	0
All	All	2966	0	2880	67	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 12.

All (67) 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:176:ILE:HD11	1:A:414:LEU:HD13	1.47	0.96
1:A:176:ILE:CD1	1:A:414:LEU:HD13	2.16	0.76
1:A:327:VAL:HG21	1:A:337:GLU:HG3	1.70	0.73
1:A:184:ASN:N	1:A:184:ASN:HD22	1.87	0.72
1:A:187:LEU:HG	1:A:315:LEU:HD11	1.74	0.69
1:A:294:ASN:HD22	1:A:295:PRO:HD2	1.57	0.68
1:A:419:GLN:HG2	1:A:422:LEU:HD12	1.76	0.66
1:A:232:HIS:O	1:A:236:GLU:HG2	1.98	0.63
1:A:295:PRO:HB2	1:A:315:LEU:HD12	1.78	0.63
1:A:390:CYS:SG	1:A:447:PRO:HB3	2.39	0.63
1:A:291:ARG:NH2	3:I:4:ASP:OD1	2.35	0.60
1:A:348:HIS:HD2	1:A:358:LYS:H	1.52	0.58
1:A:263:PRO:HG2	1:A:268:LEU:HD21	1.87	0.57

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:312:GLN:HA	2:B:315:GLN:HE21	1.69	0.57
1:A:176:ILE:HD13	1:A:414:LEU:HD22	1.90	0.53
2:B:319:GLN:HB2	2:B:320:HIS:CD2	2.44	0.52
1:A:184:ASN:N	1:A:184:ASN:ND2	2.57	0.52
1:A:348:HIS:HE1	1:A:362:TYR:OH	1.93	0.51
1:A:456:HIS:HE1	5:A:1:CL:CL	2.30	0.51
1:A:289:PHE:CE2	1:A:291:ARG:HD3	2.45	0.51
2:B:311:PRO:O	2:B:315:GLN:HG3	2.10	0.51
1:A:249:LYS:HB2	1:A:285:LEU:HD22	1.93	0.51
1:A:390:CYS:HB2	1:A:445:LYS:O	2.11	0.50
1:A:292:TYR:HB2	1:A:298:LEU:HD21	1.94	0.50
1:A:329:ASP:HB3	1:A:333:HIS:O	2.12	0.49
1:A:235:LYS:HG3	1:A:354:ASP:HB2	1.94	0.49
1:A:197:VAL:O	1:A:198:SER:C	2.50	0.49
1:A:235:LYS:HB3	1:A:236:GLU:OE2	2.12	0.49
1:A:325:ARG:HD3	1:A:375:ALA:HB1	1.94	0.49
1:A:420:LEU:HA	1:A:427:ARG:HH21	1.78	0.49
1:A:270:TRP:CE3	1:A:297:LYS:HB2	2.47	0.49
1:A:438:LEU:HD11	2:B:291:ILE:HD12	1.93	0.49
1:A:247:CYS:SG	1:A:285:LEU:HD23	2.53	0.48
1:A:431:LEU:HD13	2:B:295:ASN:ND2	2.29	0.48
1:A:172:LEU:O	1:A:176:ILE:HG13	2.13	0.48
1:A:241:TRP:HZ3	1:A:352:CYS:SG	2.37	0.47
1:A:350:ASP:OD2	1:A:362:TYR:OH	2.25	0.47
1:A:294:ASN:HD22	1:A:295:PRO:CD	2.26	0.47
2:B:289:ARG:HG2	2:B:328:LEU:HA	1.97	0.47
1:A:364:ILE:HG21	1:A:453:HIS:CB	2.45	0.47
1:A:267:GLU:OE1	1:A:288:ARG:NH1	2.48	0.47
1:A:265:ASP:O	1:A:269:LYS:HG2	2.16	0.46
1:A:231:LEU:CD2	1:A:351:ALA:HA	2.46	0.46
1:A:231:LEU:HD23	1:A:351:ALA:HA	1.98	0.45
1:A:455:HIS:ND1	1:A:458:HIS:HB2	2.32	0.45
2:B:306:ILE:HG23	2:B:313:LEU:HD23	1.99	0.44
1:A:197:VAL:O	1:A:199:GLU:N	2.51	0.44
1:A:434:ILE:HD12	1:A:434:ILE:HA	1.91	0.44
1:A:408:ARG:O	1:A:409:GLU:C	2.57	0.43
2:B:292:ILE:HD11	2:B:302:LEU:HD22	2.01	0.42
1:A:168:ILE:O	1:A:171:VAL:HG22	2.18	0.42
1:A:235:LYS:HE3	1:A:354:ASP:HB2	2.02	0.42
1:A:198:SER:O	1:A:202:ARG:HB2	2.20	0.42
1:A:337:GLU:OE2	1:A:388:TYR:OH	2.30	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:280:ARG:HH22	2:B:326:GLN:HE22	1.68	0.42
1:A:261:LEU:HD13	1:A:277:ASN:HB2	2.02	0.41
1:A:332:ASP:HB2	6:A:12:HOH:O	2.20	0.41
1:A:435:ILE:O	1:A:439:VAL:HG23	2.21	0.41
2:B:295:ASN:N	2:B:296:PRO:CD	2.84	0.41
2:B:299:LEU:HD22	2:B:303:LEU:HG	2.02	0.41
2:B:318:SER:HA	2:B:321:GLN:HG3	2.02	0.41
1:A:184:ASN:HB3	1:A:186:VAL:HG12	2.02	0.41
1:A:317:CYS:O	1:A:322:PHE:HB2	2.21	0.41
1:A:183:GLU:HG3	1:A:378:LYS:HB3	2.02	0.40
1:A:190:LYS:HG2	1:A:299:LEU:HD13	2.04	0.40
1:A:340:SER:OG	1:A:343:GLN:HG3	2.21	0.40
1:A:274:ASN:ND2	1:A:274:ASN:N	2.70	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	A	286/295 (97%)	258 (90%)	21 (7%)	7 (2%)	6	3
2	B	59/61 (97%)	57 (97%)	2 (3%)	0	100	100
3	I	1/5 (20%)	1 (100%)	0	0	100	100
All	All	346/361 (96%)	316 (91%)	23 (7%)	7 (2%)	7	4

All (7) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	217	GLY
1	A	265	ASP
1	A	454	HIS
1	A	198	SER

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Mol	Chain	Res	Type
1	A	221	SER
1	A	253	GLU
1	A	197	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	A	268/272 (98%)	242 (90%)	26 (10%)	8	6
2	B	57/57 (100%)	53 (93%)	4 (7%)	15	13
3	I	2/2 (100%)	2 (100%)	0	100	100
All	All	327/331 (99%)	297 (91%)	30 (9%)	9	7

All (30) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	166	SER
1	A	168	ILE
1	A	173	GLN
1	A	174	SER
1	A	179	VAL
1	A	184	ASN
1	A	212	ARG
1	A	216	LYS
1	A	218	THR
1	A	221	SER
1	A	230	LEU
1	A	235	LYS
1	A	239	PHE
1	A	243	ASN
1	A	253	GLU
1	A	257	ARG
1	A	261	LEU
1	A	274	ASN
1	A	277	ASN

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Mol	Chain	Res	Type
1	A	315	LEU
1	A	342	SER
1	A	378	LYS
1	A	408	ARG
1	A	409	GLU
1	A	423	SER
1	A	445	LYS
2	B	274	HIS
2	B	276	LEU
2	B	299	LEU
2	B	312	GLN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (12) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	177	GLN
1	A	184	ASN
1	A	274	ASN
1	A	277	ASN
1	A	294	ASN
1	A	348	HIS
1	A	456	HIS
2	B	287	GLN
2	B	295	ASN
2	B	304	GLN
2	B	305	GLN
2	B	315	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 monosaccharides in this entry.

5.6 Ligand geometry

Of 3 ligands modelled in this entry, 3 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.

5.7 Other polymers

There are no such residues in this entry.

5.8 Polymer linkage issues

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	290/295 (98%)	0.82	34 (11%) 4 4	56, 64, 78, 87	0
2	B	61/61 (100%)	0.47	5 (8%) 11 12	60, 64, 73, 81	0
3	I	3/5 (60%)	0.25	0 100 100	54, 54, 55, 56	0
All	All	354/361 (98%)	0.75	39 (11%) 5 5	54, 64, 77, 87	0

All (39) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	209	PHE	5.7
2	B	274	HIS	5.2
1	A	218	THR	4.9
1	A	211	ALA	4.7
1	A	216	LYS	4.6
1	A	221	SER	4.5
1	A	217	GLY	4.5
1	A	453	HIS	4.4
1	A	220	VAL	4.3
1	A	212	ARG	3.9
1	A	205	GLN	3.9
1	A	262	LEU	3.8
1	A	236	GLU	3.6
1	A	273	LYS	3.3
1	A	219	ASN	3.3
1	A	282	ALA	3.2
2	B	333	GLY	3.1
1	A	275	VAL	3.0
2	B	332	VAL	3.0
1	A	214	LEU	3.0
1	A	186	VAL	2.8
1	A	164	GLY	2.8
1	A	334	VAL	2.6

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Mol	Chain	Res	Type	RSRZ
1	A	326	TYR	2.6
2	B	276	LEU	2.6
1	A	207	LYS	2.6
1	A	210	ARG	2.5
1	A	327	VAL	2.4
1	A	181	LEU	2.4
1	A	238	PHE	2.4
2	B	273	GLY	2.3
1	A	259	GLU	2.3
1	A	222	ASP	2.3
1	A	260	ALA	2.2
1	A	185	PRO	2.2
1	A	255	ARG	2.2
1	A	375	ALA	2.1
1	A	213	LYS	2.1
1	A	335	TRP	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 monosaccharides in this entry.

6.4 Ligands [i](#)

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
5	CL	A	1	1/1	0.93	0.18	80,80,80,80	0
4	ZN	A	501	1/1	0.97	0.08	68,68,68,68	0
4	ZN	A	502	1/1	0.98	0.16	62,62,62,62	0

6.5 Other polymers [i](#)

There are no such residues in this entry.