



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 9, 2018 – 12:23 am GMT

PDB ID : 2C3A
Title : Structure of unliganded HSV gD reveals a mechanism for receptor- mediated activation of virus entry
Authors : Krummenacher, C.; Supekár, V.M.; Whitbeck, J.C.; Lazear, E.; Connolly, S.A.; Eisenberg, R.J.; Cohen, G.H.; Wiley, D.C.; Carfi, A.
Deposited on : 2005-10-05
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 following versions of software and data (see [references ⓘ](#)) were used in the production of this report:

MolProbity	:	4.02b-467
Mogul	:	1.7.3 (157068), CSD as539be (2018)
Xtriage (Phenix)	:	1.13
EDS	:	trunk30967
Percentile statistics	:	20171227.v01 (using entries in the PDB archive December 27th 2017)
Refmac	:	5.8.0158
CCP4	:	7.0 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	trunk30967

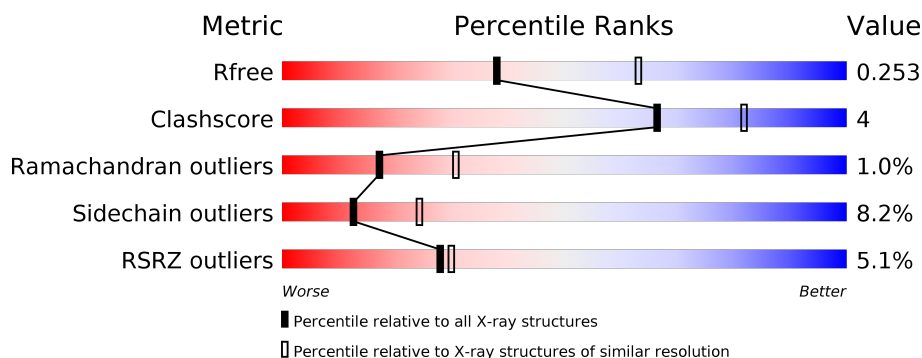
1 Overall quality at a glance

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}	111664	4155 (2.50-2.50)
Clashscore	122126	4827 (2.50-2.50)
Ramachandran outliers	120053	4735 (2.50-2.50)
Sidechain outliers	120020	4737 (2.50-2.50)
RSRZ outliers	108989	4058 (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 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	286	<div> <div>5%</div> <div> <div></div> <div>73%</div> <div>14%</div> <div>•</div> <div>12%</div> </div> </div>
1	B	286	<div> <div>4%</div> <div> <div></div> <div>83%</div> <div>10%</div> <div>• •</div> </div> </div>

2 Entry composition [i](#)

There are 6 unique types of molecules in this entry. The entry contains 4185 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.

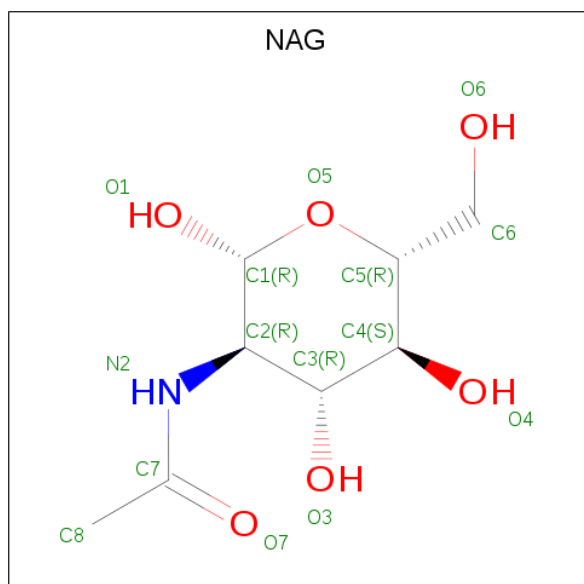
- Molecule 1 is a protein called GLYCOPROTEIN D.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	253	Total	C	N	O	S	0	0	0
			1959	1261	331	355	12			
1	B	274	Total	C	N	O	S	0	0	0
			2108	1358	350	388	12			

There are 4 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	37	CYS	VAL	engineered mutation	UNP P57083
A	302	CYS	ALA	engineered mutation	UNP P57083
B	37	CYS	VAL	engineered mutation	UNP P57083
B	302	CYS	ALA	engineered mutation	UNP P57083

- Molecule 2 is N-ACETYL-D-GLUCOSAMINE (three-letter code: NAG) (formula: $C_8H_{15}NO_6$).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
2	A	1	Total C N O 14 8 1 5	0	0
2	A	1	Total C N O 14 8 1 5	0	0
2	B	1	Total C N O 14 8 1 5	0	0
2	B	1	Total C N O 14 8 1 5	0	0

- Molecule 3 is CHLORIDE ION (three-letter code: CL) (formula: Cl).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	B	1	Total Cl 1 1	0	0
3	A	1	Total Cl 1 1	0	0

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

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	B	4	Total Zn 4 4	0	0
4	A	1	Total Zn 1 1	0	0

- Molecule 5 is SODIUM ION (three-letter code: NA) (formula: Na).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
5	B	2	Total Na 2 2	0	0

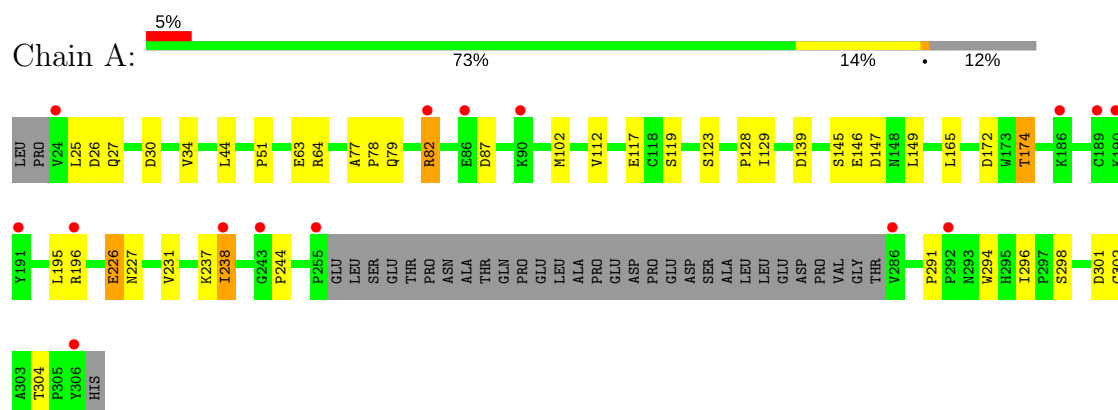
- Molecule 6 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
6	A	18	Total O 18 18	0	0
6	B	35	Total O 35 35	0	0

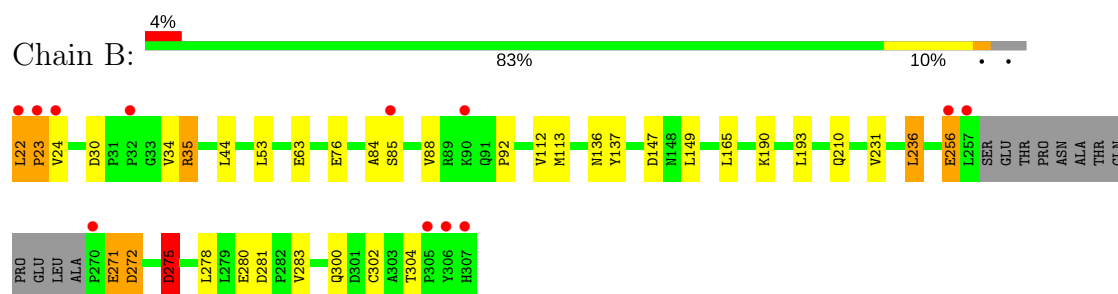
3 Residue-property plots [i](#)

These plots are drawn for all protein, RNA and DNA 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: GLYCOPROTEIN D



• Molecule 1: GLYCOPROTEIN D



4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	67.63Å 79.11Å 123.56Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	25.00 – 2.50 19.95 – 2.50	Depositor EDS
% Data completeness (in resolution range)	99.7 (25.00-2.50) 99.8 (19.95-2.50)	Depositor EDS
R_{merge}	0.08	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	4.92 (at 2.50Å)	Xtriage
Refinement program	REFMAC 5.1.24	Depositor
R, R_{free}	0.226 , 0.275 0.219 , 0.253	Depositor DCC
R_{free} test set	1212 reflections (5.16%)	wwPDB-VP
Wilson B-factor (Å ²)	48.5	Xtriage
Anisotropy	0.284	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.33 , 43.8	EDS
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.34$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.93	EDS
Total number of atoms	4185	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 7.17% 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: NA, ZN, NAG, CL

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	0.85	1/2015 (0.0%)	0.86	7/2763 (0.3%)
1	B	0.81	0/2174	0.89	5/2987 (0.2%)
All	All	0.83	1/4189 (0.0%)	0.88	12/5750 (0.2%)

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	226	GLU	CA-CB	-17.04	1.16	1.53

All (12) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	301	ASP	CB-CG-OD2	10.58	127.82	118.30
1	A	226	GLU	N-CA-CB	8.61	126.09	110.60
1	B	281	ASP	CB-CG-OD2	6.54	124.19	118.30
1	B	275	ASP	CB-CG-OD1	6.50	124.15	118.30
1	B	30	ASP	CB-CG-OD2	6.14	123.83	118.30
1	A	87	ASP	CB-CG-OD2	5.92	123.62	118.30
1	A	172	ASP	CB-CG-OD2	5.49	123.25	118.30
1	A	26	ASP	CB-CG-OD2	5.48	123.23	118.30
1	B	147	ASP	CB-CG-OD2	5.38	123.15	118.30
1	A	139	ASP	CB-CG-OD2	5.23	123.00	118.30
1	A	30	ASP	CB-CG-OD2	5.14	122.92	118.30
1	B	272	ASP	CB-CG-OD2	5.14	122.92	118.30

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	1959	0	1894	22	0
1	B	2108	0	2043	13	0
2	A	28	0	25	0	0
2	B	28	0	25	0	0
3	A	1	0	0	0	0
3	B	1	0	0	0	0
4	A	1	0	0	0	0
4	B	4	0	0	0	0
5	B	2	0	0	0	0
6	A	18	0	0	1	0
6	B	35	0	0	3	0
All	All	4185	0	3987	35	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 4.

All (35) 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:102:MET:HE2	6:B:2019:HOH:O	1.51	1.07
1:B:35:ARG:NH2	1:B:304:THR:O	2.13	0.81
1:A:226:GLU:CA	1:A:227:ASN:N	2.45	0.78
1:A:102:MET:CE	6:B:2019:HOH:O	2.19	0.77
1:A:146:GLU:N	1:A:146:GLU:CB	2.48	0.76
1:A:146:GLU:CD	1:A:146:GLU:CB	2.56	0.74
1:A:226:GLU:CB	1:A:226:GLU:CD	2.58	0.71
1:A:226:GLU:O	1:A:227:ASN:N	2.26	0.69
1:A:226:GLU:O	1:A:226:GLU:CA	2.43	0.66
1:B:44:LEU:HD21	1:B:112:VAL:HG21	1.77	0.66
1:B:35:ARG:HD2	1:B:300:GLN:HE21	1.62	0.65
1:B:85:SER:OG	6:B:2011:HOH:O	2.14	0.65
1:A:237:LYS:HE2	1:A:244:PRO:HD3	1.82	0.60
1:A:44:LEU:HD21	1:A:112:VAL:HG21	1.84	0.59
1:A:79:GLN:OE1	1:A:82:ARG:HD3	2.04	0.58
1:B:193:LEU:CD2	1:B:236:LEU:HD13	2.35	0.56

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:27:GLN:HG2	1:A:294:TRP:CE2	2.43	0.53
1:A:174:THR:HG21	6:A:2004:HOH:O	2.09	0.52
1:A:77:ALA:HB3	1:A:78:PRO:HD3	1.90	0.52
1:B:84:ALA:HB1	1:B:88:VAL:HG23	1.94	0.48
1:B:272:ASP:O	1:B:275:ASP:HB2	2.14	0.48
1:A:44:LEU:CD2	1:A:112:VAL:HG21	2.44	0.48
1:B:136:ASN:HB3	1:B:137:TYR:CD1	2.48	0.48
1:A:27:GLN:HG2	1:A:294:TRP:CD2	2.48	0.47
1:A:117:GLU:HG3	1:A:129:ILE:HD12	1.96	0.46
1:A:34:VAL:HA	1:A:128:PRO:O	2.17	0.44
1:B:44:LEU:CD2	1:B:112:VAL:HG21	2.47	0.43
1:A:145:SER:OG	1:A:147:ASP:OD1	2.37	0.43
1:B:271:GLU:HG3	1:B:271:GLU:O	2.18	0.43
1:B:22:LEU:HB2	1:B:23:PRO:CD	2.50	0.41
1:A:238:ILE:HA	1:A:238:ILE:HD12	1.92	0.41
1:B:84:ALA:HB1	1:B:88:VAL:CG2	2.50	0.41
1:A:291:PRO:HB2	1:A:294:TRP:CD1	2.55	0.41
1:B:35:ARG:HD2	1:B:300:GLN:NE2	2.33	0.41
1:A:51:PRO:CB	1:A:174:THR:HG22	2.51	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	245/286 (86%)	231 (94%)	14 (6%)	0	100	100
1	B	270/286 (94%)	253 (94%)	12 (4%)	5 (2%)	9	15
All	All	515/572 (90%)	484 (94%)	26 (5%)	5 (1%)	17	31

All (5) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	256	GLU
1	B	24	VAL
1	B	275	ASP
1	B	23	PRO
1	B	92	PRO

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	210/247 (85%)	193 (92%)	17 (8%)	13	25
1	B	227/247 (92%)	208 (92%)	19 (8%)	12	23
All	All	437/494 (88%)	401 (92%)	36 (8%)	12	24

All (36) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	25	LEU
1	A	63	GLU
1	A	64	ARG
1	A	82	ARG
1	A	119	SER
1	A	123	SER
1	A	149	LEU
1	A	165	LEU
1	A	174	THR
1	A	195	LEU
1	A	196	ARG
1	A	231	VAL
1	A	238	ILE
1	A	296	ILE
1	A	298	SER
1	A	302	CYS
1	A	304	THR
1	B	22	LEU
1	B	34	VAL

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Mol	Chain	Res	Type
1	B	35	ARG
1	B	53	LEU
1	B	63	GLU
1	B	76	GLU
1	B	113	MET
1	B	149	LEU
1	B	165	LEU
1	B	190	LYS
1	B	210	GLN
1	B	231	VAL
1	B	236	LEU
1	B	256	GLU
1	B	271	GLU
1	B	278	LEU
1	B	280	GLU
1	B	283	VAL
1	B	302	CYS

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (6) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	39	HIS
1	A	105	ASN
1	A	132	GLN
1	B	209	GLN
1	B	295	HIS
1	B	300	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

Of 13 ligands modelled in this entry, 9 are monoatomic - leaving 4 for Mogul analysis.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. 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 $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
2	NAG	A	1307	1,2	14,14,15	0.71	0	17,19,21	1.35	2 (11%)
2	NAG	A	1308	2	14,14,15	0.96	1 (7%)	17,19,21	1.67	5 (29%)
2	NAG	B	1308	1,2	14,14,15	0.73	0	17,19,21	1.67	3 (17%)
2	NAG	B	1309	2	14,14,15	0.83	1 (7%)	17,19,21	2.16	4 (23%)

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	NAG	A	1307	1,2	-	0/6/23/26	0/1/1/1
2	NAG	A	1308	2	-	0/6/23/26	0/1/1/1
2	NAG	B	1308	1,2	-	0/6/23/26	0/1/1/1
2	NAG	B	1309	2	-	0/6/23/26	0/1/1/1

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	1308	NAG	C1-C2	2.18	1.55	1.52
2	B	1309	NAG	C1-C2	2.36	1.55	1.52

All (14) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	1308	NAG	O5-C1-C2	-4.48	105.34	111.52
2	B	1309	NAG	C4-C3-C2	-3.62	105.72	111.02
2	A	1307	NAG	O5-C1-C2	-3.60	106.55	111.52
2	B	1308	NAG	O4-C4-C3	-2.96	103.42	110.34
2	A	1308	NAG	O5-C1-C2	-2.26	108.40	111.52

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	1308	NAG	O5-C5-C4	2.14	116.02	110.83
2	A	1308	NAG	C1-C2-N2	2.17	114.20	110.49
2	A	1307	NAG	O5-C5-C6	2.63	111.31	107.15
2	A	1308	NAG	C3-C4-C5	2.64	114.96	110.24
2	B	1309	NAG	O3-C3-C2	2.79	115.37	109.39
2	B	1308	NAG	C4-C3-C2	2.88	115.24	111.02
2	A	1308	NAG	C1-O5-C5	4.06	117.78	112.19
2	B	1309	NAG	C1-C2-N2	4.25	117.75	110.49
2	B	1309	NAG	C1-O5-C5	4.86	118.87	112.19

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 [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	253/286 (88%)	0.25	15 (5%) 22 23	24, 44, 69, 75	0
1	B	274/286 (95%)	0.03	12 (4%) 34 37	21, 34, 67, 77	0
All	All	527/572 (92%)	0.13	27 (5%) 28 30	21, 38, 68, 77	0

All (27) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	22	LEU	6.8
1	A	255	PRO	6.0
1	A	191	TYR	5.5
1	A	306	TYR	4.9
1	B	257	LEU	4.9
1	B	24	VAL	4.8
1	B	270	PRO	4.6
1	B	306	TYR	3.9
1	B	305	PRO	3.9
1	A	190	LYS	3.8
1	B	85	SER	3.7
1	A	24	VAL	3.7
1	B	90	LYS	3.6
1	B	256	GLU	3.5
1	B	307	HIS	3.2
1	A	286	VAL	3.2
1	A	82	ARG	2.9
1	A	292	PRO	2.9
1	B	23	PRO	2.8
1	A	196	ARG	2.7
1	A	86	GLU	2.6
1	A	238	ILE	2.5
1	B	32	PRO	2.5
1	A	186	LYS	2.5

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Mol	Chain	Res	Type	RSRZ
1	A	90	LYS	2.2
1	A	243	GLY	2.2
1	A	189	CYS	2.2

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](#)

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(\AA^2)	Q<0.9
4	ZN	A	1310	1/1	0.64	0.12	69,69,69,69	1
2	NAG	A	1308	14/15	0.85	0.41	65,67,70,70	0
2	NAG	B	1309	14/15	0.86	0.40	69,71,73,74	0
5	NA	B	1311	1/1	0.92	0.09	44,44,44,44	0
4	ZN	B	1313	1/1	0.92	0.14	53,53,53,53	0
2	NAG	A	1307	14/15	0.92	0.27	43,49,54,61	0
2	NAG	B	1308	14/15	0.94	0.23	44,52,57,64	0
5	NA	B	1312	1/1	0.97	0.16	26,26,26,26	0
4	ZN	B	1316	1/1	0.98	0.07	60,60,60,60	0
4	ZN	B	1314	1/1	0.98	0.07	40,40,40,40	0
3	CL	A	1309	1/1	0.98	0.12	42,42,42,42	0
3	CL	B	1310	1/1	0.99	0.07	29,29,29,29	0
4	ZN	B	1315	1/1	0.99	0.07	36,36,36,36	0

6.5 Other polymers [i](#)

There are no such residues in this entry.