



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 5, 2026 – 07:13 AM UTC

PDB ID : 4Z62 / pdb_00004z62
Title : The plant peptide hormone free receptor
Authors : Chai, J.; Wang, J.; Han, Z.
Deposited on : 2015-04-03
Resolution : 2.90 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
Mogul : 2022.3.0, CSD as543be (2022)
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

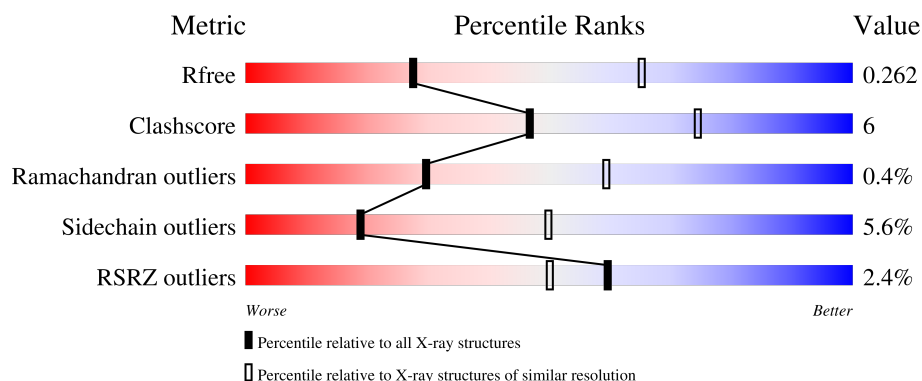
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.90 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	2481 (2.90-2.90)
Clashscore	190562	2690 (2.90-2.90)
Ramachandran outliers	187476	2623 (2.90-2.90)
Sidechain outliers	187428	2625 (2.90-2.90)
RSRZ outliers	180081	2481 (2.90-2.90)

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	642	

2 Entry composition [i](#)

There are 2 unique types of molecules in this entry. The entry contains 4482 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.

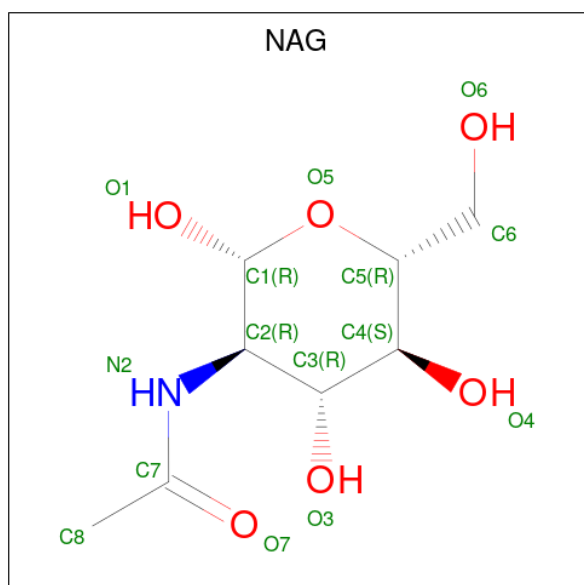
- Molecule 1 is a protein called Phytosulfokine receptor 1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	573	4384	2776	742	849	17	0	0	0

There are 6 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	660	HIS	-	expression tag	UNP Q8LPB4
A	661	HIS	-	expression tag	UNP Q8LPB4
A	662	HIS	-	expression tag	UNP Q8LPB4
A	663	HIS	-	expression tag	UNP Q8LPB4
A	664	HIS	-	expression tag	UNP Q8LPB4
A	665	HIS	-	expression tag	UNP Q8LPB4

- Molecule 2 is 2-acetamido-2-deoxy-beta-D-glucopyranose (CCD ID: NAG) (formula: $C_8H_{15}NO_6$).

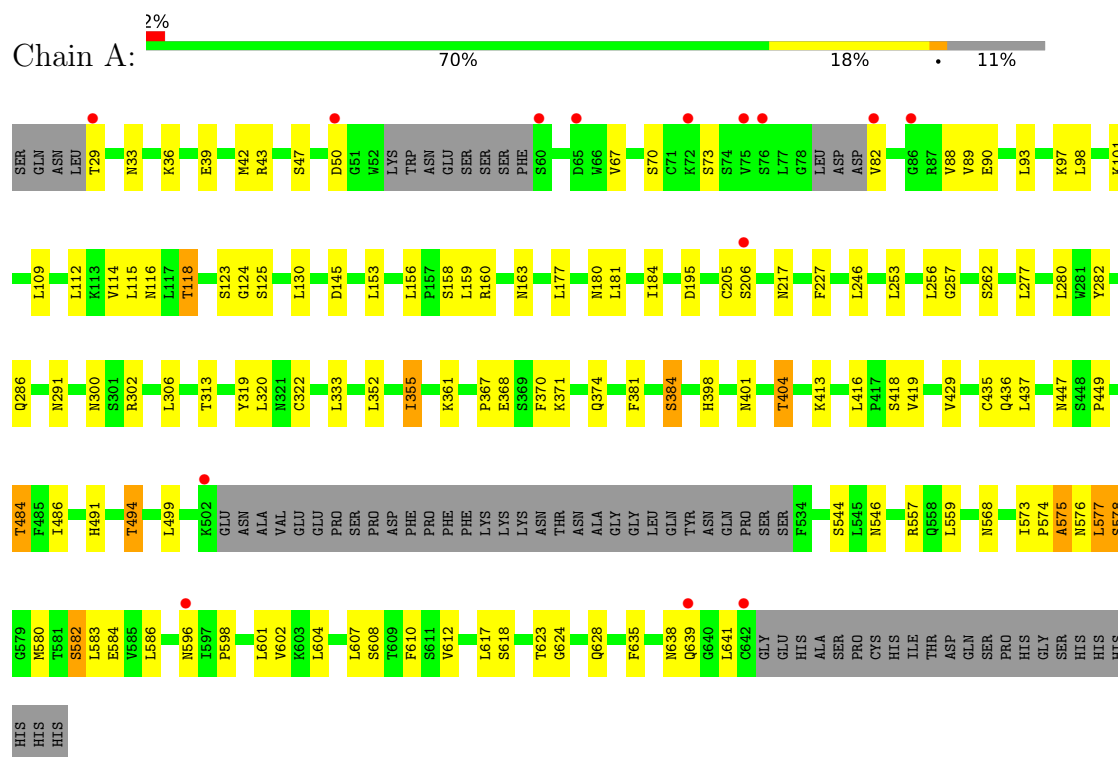


Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
2	A	1	Total	C	N	O	0	0
			14	8	1	5		
2	A	1	Total	C	N	O	0	0
			14	8	1	5		
2	A	1	Total	C	N	O	0	0
			14	8	1	5		
2	A	1	Total	C	N	O	0	0
			14	8	1	5		
2	A	1	Total	C	N	O	0	0
			14	8	1	5		
2	A	1	Total	C	N	O	0	0
			14	8	1	5		

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: Phytosulfokine receptor 1



4 Data and refinement statistics

Property	Value	Source
Space group	C 2 2 21	Depositor
Cell constants a, b, c, α , β , γ	90.03Å 98.79Å 227.29Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	41.38 – 2.90 41.38 – 2.90	Depositor EDS
% Data completeness (in resolution range)	93.4 (41.38-2.90) 93.2 (41.38-2.90)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	6.36 (at 2.90Å)	Xtriage
Refinement program	PHENIX 1.8_1069	Depositor
R, R_{free}	0.202 , 0.254 0.207 , 0.262	Depositor DCC
R_{free} test set	1091 reflections (4.76%)	wwPDB-VP
Wilson B-factor (Å ²)	48.1	Xtriage
Anisotropy	0.331	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.37 , 27.8	EDS
L-test for twinning ²	$\langle L \rangle = 0.48$, $\langle L^2 \rangle = 0.31$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.92	EDS
Total number of atoms	4482	wwPDB-VP
Average B, all atoms (Å ²)	21.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.53% 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

Bond lengths and bond angles in the following residue types are not validated in this section:
NAG

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	0.58	2/4462 (0.0%)	1.00	12/6052 (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	355	ILE	C-O	-8.21	1.15	1.24
1	A	368	GLU	C-O	-5.02	1.17	1.24

All (12) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	573	ILE	CA-C-N	8.99	129.57	119.32
1	A	573	ILE	C-N-CA	8.99	129.57	119.32
1	A	180	ASN	N-CA-C	7.91	122.65	112.92
1	A	576	ASN	N-CA-C	-6.71	105.06	113.18
1	A	577	LEU	CA-C-N	-6.08	113.84	122.41
1	A	577	LEU	C-N-CA	-6.08	113.84	122.41
1	A	206	SER	N-CA-C	5.54	119.54	112.34
1	A	384	SER	N-CA-C	5.46	119.63	112.92
1	A	300	ASN	N-CA-C	5.37	119.94	113.17
1	A	484	THR	N-CA-C	5.35	119.50	112.92
1	A	114	VAL	N-CA-C	5.25	115.42	107.75

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	118	THR	N-CA-C	5.04	116.79	110.24

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	578	SER	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	4384	0	4408	51	0
2	A	98	0	91	0	0
All	All	4482	0	4499	51	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 6.

All (51) 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:574:PRO:O	1:A:575:ALA:HB3	1.82	0.79
1:A:262:SER:HB2	1:A:286:GLN:HG2	1.72	0.70
1:A:352:LEU:HD21	1:A:355:ILE:HD11	1.74	0.68
1:A:123:SER:HB3	1:A:145:ASP:HB3	1.75	0.67
1:A:101:LYS:HD2	1:A:124:GLY:HA3	1.79	0.63
1:A:574:PRO:O	1:A:575:ALA:CB	2.46	0.63
1:A:546:ASN:HA	1:A:568:ASN:O	2.01	0.60
1:A:486:ILE:HG22	1:A:544:SER:HB2	1.84	0.59
1:A:88:VAL:HB	1:A:109:LEU:HD22	1.85	0.58
1:A:635:PHE:HB3	1:A:641:LEU:HD23	1.86	0.56
1:A:416:LEU:HD13	1:A:437:LEU:HD13	1.90	0.54
1:A:93:LEU:HB3	1:A:98:LEU:HD11	1.90	0.54
1:A:499:LEU:HD13	1:A:559:LEU:HD13	1.91	0.52

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:557:ARG:O	1:A:582:SER:OG	2.28	0.52
1:A:435:CYS:HB2	1:A:437:LEU:HG	1.92	0.51
1:A:158:SER:O	1:A:160:ARG:NH1	2.43	0.51
1:A:596:ASN:ND2	1:A:618:SER:O	2.40	0.51
1:A:584:GLU:O	1:A:607:LEU:HD12	2.10	0.51
1:A:195:ASP:HB3	1:A:217:ASN:HB3	1.93	0.50
1:A:404:THR:HB	1:A:429:VAL:HB	1.95	0.49
1:A:39:GLU:HA	1:A:42:MET:HE3	1.95	0.48
1:A:578:SER:HA	1:A:604:LEU:HD21	1.96	0.48
1:A:33:ASN:HA	1:A:36:LYS:HE2	1.96	0.47
1:A:181:LEU:HB3	1:A:184:ILE:HB	1.95	0.47
1:A:112:LEU:HD21	1:A:115:LEU:HB2	1.96	0.47
1:A:257:GLY:HA2	1:A:280:LEU:HA	1.97	0.47
1:A:447:ASN:O	1:A:449:PRO:HD3	2.16	0.47
1:A:374:GLN:O	1:A:401:ASN:ND2	2.37	0.46
1:A:624:GLY:O	1:A:628:GLN:NE2	2.48	0.46
1:A:580:MET:HE2	1:A:583:LEU:HD13	1.98	0.46
1:A:583:LEU:HD21	1:A:586:LEU:HB2	1.97	0.45
1:A:291:ASN:HA	1:A:313:THR:O	2.16	0.45
1:A:256:LEU:HD12	1:A:256:LEU:HA	1.87	0.45
1:A:319:TYR:C	1:A:320:LEU:HD12	2.43	0.44
1:A:367:PRO:HG2	1:A:370:PHE:CD1	2.52	0.44
1:A:156:LEU:HD13	1:A:159:LEU:HD22	2.00	0.43
1:A:93:LEU:HA	1:A:93:LEU:HD23	1.77	0.43
1:A:227:PHE:HA	1:A:253:LEU:HD21	2.00	0.43
1:A:381:PHE:O	1:A:384:SER:HB2	2.18	0.43
1:A:39:GLU:O	1:A:43:ARG:HG3	2.19	0.43
1:A:70:SER:HB2	1:A:90:GLU:HB2	2.01	0.42
1:A:282:TYR:CE2	1:A:306:LEU:HD22	2.54	0.42
1:A:447:ASN:C	1:A:449:PRO:HD3	2.44	0.42
1:A:371:LYS:HE2	1:A:398:HIS:CE1	2.54	0.42
1:A:116:ASN:OD1	1:A:118:THR:HG22	2.20	0.41
1:A:413:LYS:H	1:A:436:GLN:HB2	1.86	0.41
1:A:333:LEU:HD23	1:A:333:LEU:HA	1.83	0.40
1:A:598:PRO:O	1:A:601:LEU:HB2	2.22	0.40
1:A:610:PHE:CZ	1:A:612:VAL:HG13	2.55	0.40
1:A:491:HIS:O	1:A:494:THR:HB	2.21	0.40
1:A:617:LEU:O	1:A:638:ASN:HB3	2.22	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	565/642 (88%)	542 (96%)	21 (4%)	2 (0%)	30	59

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	575	ALA
1	A	639	GLN

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	519/581 (89%)	490 (94%)	29 (6%)	19	50

All (29) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	29	THR
1	A	47	SER
1	A	50	ASP
1	A	67	VAL
1	A	73	SER
1	A	82	VAL
1	A	89	VAL
1	A	97	LYS
1	A	125	SER

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Mol	Chain	Res	Type
1	A	130	LEU
1	A	153	LEU
1	A	163	ASN
1	A	177	LEU
1	A	205	CYS
1	A	246	LEU
1	A	277	LEU
1	A	302	ARG
1	A	322	CYS
1	A	361	LYS
1	A	404	THR
1	A	418	SER
1	A	419	VAL
1	A	484	THR
1	A	494	THR
1	A	577	LEU
1	A	582	SER
1	A	602	VAL
1	A	608	SER
1	A	623	THR

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (7) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	163	ASN
1	A	170	HIS
1	A	345	ASN
1	A	497	GLN
1	A	543	ASN
1	A	572	ASN
1	A	576	ASN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

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](#)

7 ligands are modelled in this entry.

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	704	1	14,14,15	0.55	0	17,19,21	1.15	2 (11%)
2	NAG	A	701	1	14,14,15	0.45	0	17,19,21	1.30	1 (5%)
2	NAG	A	707	1	14,14,15	0.48	0	17,19,21	1.40	1 (5%)
2	NAG	A	706	1	14,14,15	0.68	0	17,19,21	1.82	4 (23%)
2	NAG	A	705	1	14,14,15	0.67	0	17,19,21	0.90	1 (5%)
2	NAG	A	702	1	14,14,15	0.47	0	17,19,21	0.83	1 (5%)
2	NAG	A	703	1	14,14,15	0.52	0	17,19,21	1.63	3 (17%)

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	704	1	-	4/6/23/26	0/1/1/1
2	NAG	A	701	1	-	0/6/23/26	0/1/1/1
2	NAG	A	707	1	-	2/6/23/26	0/1/1/1
2	NAG	A	706	1	-	0/6/23/26	0/1/1/1
2	NAG	A	705	1	-	2/6/23/26	0/1/1/1
2	NAG	A	702	1	-	0/6/23/26	0/1/1/1
2	NAG	A	703	1	-	2/6/23/26	0/1/1/1

There are no bond length outliers.

All (13) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	706	NAG	C1-O5-C5	5.08	119.00	112.19
2	A	707	NAG	C1-O5-C5	4.95	118.83	112.19
2	A	701	NAG	C1-O5-C5	3.98	117.52	112.19
2	A	703	NAG	C4-C3-C2	-3.23	106.28	111.02
2	A	703	NAG	C1-O5-C5	3.08	116.32	112.19
2	A	704	NAG	O5-C5-C6	2.81	113.14	107.66
2	A	704	NAG	C2-N2-C7	-2.70	119.28	122.90
2	A	706	NAG	O5-C5-C6	2.59	112.70	107.66
2	A	703	NAG	O4-C4-C3	2.56	116.41	110.38
2	A	706	NAG	O6-C6-C5	2.45	119.68	111.33
2	A	702	NAG	O5-C5-C6	2.41	112.35	107.66
2	A	706	NAG	C3-C4-C5	2.37	114.53	110.23
2	A	705	NAG	C2-N2-C7	-2.12	120.06	122.90

There are no chirality outliers.

All (10) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	A	707	NAG	O5-C5-C6-O6
2	A	704	NAG	O5-C5-C6-O6
2	A	707	NAG	C4-C5-C6-O6
2	A	705	NAG	C8-C7-N2-C2
2	A	704	NAG	C8-C7-N2-C2
2	A	705	NAG	O7-C7-N2-C2
2	A	703	NAG	C4-C5-C6-O6
2	A	703	NAG	O5-C5-C6-O6
2	A	704	NAG	O7-C7-N2-C2
2	A	704	NAG	C4-C5-C6-O6

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 [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	573/642 (89%)	-0.31	14 (2%) 59 50	4, 16, 57, 81	0

All (14) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	82	VAL	5.1
1	A	642	CYS	3.0
1	A	60	SER	3.0
1	A	86	GLY	2.9
1	A	502	LYS	2.7
1	A	29	THR	2.6
1	A	75	VAL	2.6
1	A	65	ASP	2.5
1	A	76	SER	2.4
1	A	206	SER	2.3
1	A	72	LYS	2.3
1	A	639	GLN	2.2
1	A	596	ASN	2.1
1	A	50	ASP	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](#)

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($\text{\AA}^2$)	Q<0.9
2	NAG	A	705	14/15	0.71	0.16	34,52,68,68	0
2	NAG	A	706	14/15	0.85	0.11	4,11,15,19	0
2	NAG	A	701	14/15	0.91	0.09	13,23,29,30	0
2	NAG	A	704	14/15	0.92	0.12	11,15,19,20	0
2	NAG	A	703	14/15	0.93	0.09	9,13,18,23	0
2	NAG	A	707	14/15	0.94	0.09	14,24,27,30	0
2	NAG	A	702	14/15	0.95	0.08	13,15,22,27	0

6.5 Other polymers [i](#)

There are no such residues in this entry.