



Full wwPDB X-ray Structure Validation Report ⓘ

Apr 25, 2026 – 02:59 PM EDT

PDB ID : 5Z4W / pdb_00005z4w
Title : Crystal structure of signalling protein from buffalo (SPB-40) with an altered conformation of Trp78 at 1.79 Å resolution
Authors : Singh, P.K.; Chaudhary, A.; Tyagi, T.K.; Kaur, P.; Sharma, S.; Singh, T.P.
Deposited on : 2018-01-15
Resolution : 1.79 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

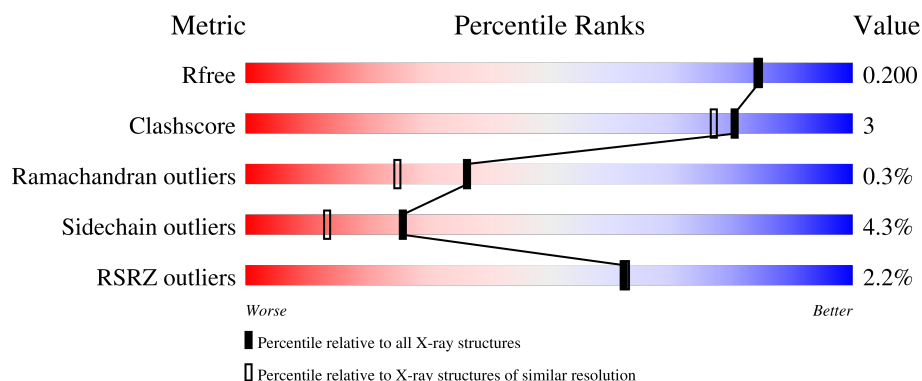
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

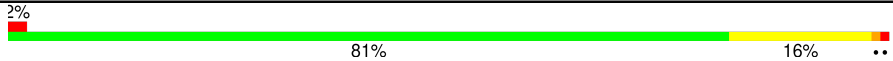
The reported resolution of this entry is 1.79 Å.

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	7662 (1.80-1.80)
Clashscore	190562	8479 (1.80-1.80)
Ramachandran outliers	187476	8391 (1.80-1.80)
Sidechain outliers	187428	8390 (1.80-1.80)
RSRZ outliers	180081	7663 (1.80-1.80)

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	361	

2 Entry composition [i](#)

There are 5 unique types of molecules in this entry. The entry contains 3284 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 Chitinase-3-like protein 1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	361	Total	C	N	O	S	0	0	0
			2874	1841	499	525	9			

There is a discrepancy between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	?	-	ASP	deletion	UNP Q7YS85

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



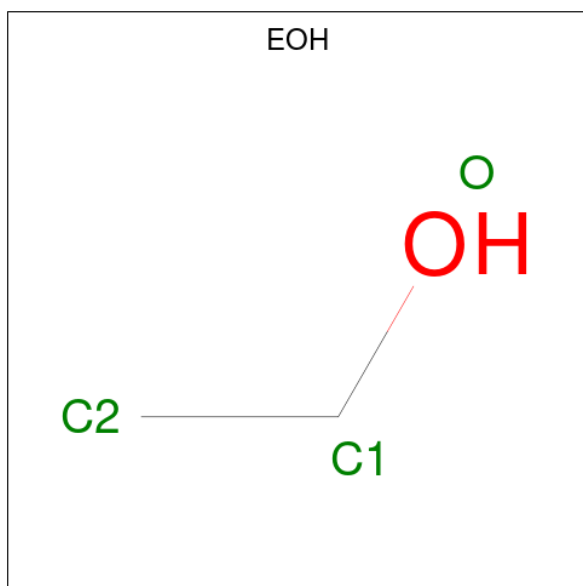
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
2	A	1	Total	C	N	O	0	0
			14	8	1	5		

- Molecule 3 is (4S)-2-METHYL-2,4-PENTANEDIOL (CCD ID: MPD) (formula: $C_6H_{14}O_2$).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	A	1	Total	C	O	0	0
			8	6	2		

- Molecule 4 is ETHANOL (CCD ID: EOH) (formula: C_2H_6O).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
4	A	1	Total	C	O	0	0
			3	2	1		

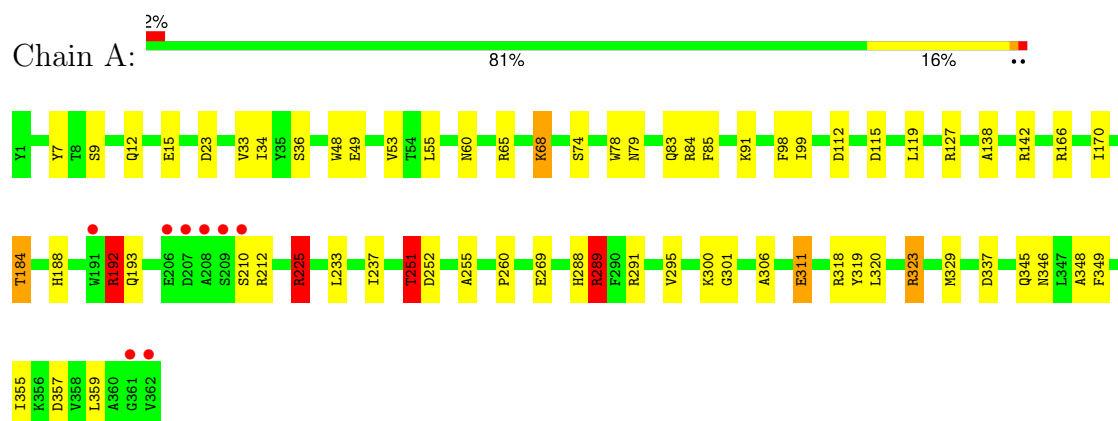
- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	385	Total 385	O 385	0	0

3 Residue-property plots

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: Chitinase-3-like protein 1



4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	61.07Å 66.73Å 106.07Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	56.49 – 1.79 56.49 – 1.79	Depositor EDS
% Data completeness (in resolution range)	98.6 (56.49-1.79) 98.6 (56.49-1.79)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	0.06	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.39 (at 1.79Å)	Xtriage
Refinement program	REFMAC 5.8.0158	Depositor
R, R_{free}	0.150 , 0.186 0.163 , 0.200	Depositor DCC
R_{free} test set	2058 reflections (4.98%)	wwPDB-VP
Wilson B-factor (Å ²)	23.6	Xtriage
Anisotropy	0.252	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.35 , 45.1	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.97	EDS
Total number of atoms	3284	wwPDB-VP
Average B, all atoms (Å ²)	30.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.57% 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, MPD, EOH

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	1.85	51/2952 (1.7%)	1.51	29/4005 (0.7%)

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 (51) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	210	SER	C-N	9.73	1.47	1.33
1	A	289	ARG	CD-NE	-9.05	1.33	1.46
1	A	323	ARG	CD-NE	-8.67	1.34	1.46
1	A	289	ARG	NE-CZ	-8.28	1.24	1.33
1	A	233	LEU	N-CA	-8.03	1.36	1.46
1	A	127	ARG	NE-CZ	7.70	1.41	1.33
1	A	166	ARG	CZ-NH1	7.67	1.43	1.32
1	A	252	ASP	CA-CB	7.16	1.64	1.53
1	A	348	ALA	N-CA	-6.86	1.37	1.46
1	A	311	GLU	CD-OE1	6.84	1.38	1.25
1	A	53	VAL	CA-C	6.49	1.61	1.52
1	A	33	VAL	C-O	6.47	1.31	1.24
1	A	337	ASP	C-O	6.31	1.31	1.23
1	A	99	ILE	C-N	-6.27	1.25	1.34
1	A	60	ASN	CB-CG	6.25	1.67	1.52
1	A	79	ASN	CA-C	-6.01	1.44	1.52
1	A	319	TYR	N-CA	6.00	1.53	1.46
1	A	34	ILE	C-O	-5.98	1.17	1.24

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	98	PHE	CA-C	5.97	1.60	1.52
1	A	60	ASN	CG-ND2	5.92	1.45	1.33
1	A	170	ILE	C-O	-5.87	1.17	1.24
1	A	99	ILE	CA-C	5.87	1.59	1.52
1	A	295	VAL	C-O	-5.84	1.20	1.24
1	A	269	GLU	CA-CB	-5.82	1.44	1.53
1	A	300	LYS	CA-CB	5.81	1.63	1.53
1	A	355	ILE	CA-C	5.72	1.59	1.52
1	A	355	ILE	CA-CB	-5.69	1.47	1.54
1	A	329	MET	SD-CE	-5.68	1.65	1.79
1	A	127	ARG	CZ-NH1	5.62	1.40	1.32
1	A	184	THR	CA-C	5.59	1.59	1.53
1	A	138	ALA	C-O	5.54	1.30	1.24
1	A	349	PHE	CA-CB	-5.52	1.48	1.52
1	A	225	ARG	CA-CB	5.50	1.61	1.53
1	A	48	TRP	N-CA	5.48	1.51	1.46
1	A	65	ARG	NE-CZ	5.43	1.39	1.33
1	A	23	ASP	C-O	-5.43	1.17	1.24
1	A	359	LEU	CA-CB	-5.40	1.44	1.53
1	A	288	HIS	CA-C	-5.39	1.46	1.52
1	A	311	GLU	CG-CD	5.33	1.65	1.52
1	A	301	GLY	N-CA	5.23	1.52	1.45
1	A	346	ASN	N-CA	-5.21	1.38	1.46
1	A	306	ALA	N-CA	5.17	1.52	1.46
1	A	237	ILE	CA-CB	5.15	1.60	1.54
1	A	349	PHE	C-O	-5.14	1.21	1.23
1	A	83	GLN	N-CA	-5.13	1.40	1.46
1	A	184	THR	CA-CB	5.13	1.58	1.52
1	A	255	ALA	N-CA	5.10	1.51	1.45
1	A	260	PRO	N-CA	-5.06	1.41	1.47
1	A	78	TRP	N-CA	5.05	1.52	1.46
1	A	255	ALA	CA-CB	-5.05	1.46	1.53
1	A	84	ARG	C-O	5.02	1.29	1.24

All (29) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	289	ARG	CD-NE-CZ	12.52	141.93	124.40
1	A	289	ARG	NE-CZ-NH2	-10.98	109.32	119.20
1	A	323	ARG	NE-CZ-NH2	-9.84	110.35	119.20
1	A	318	ARG	NE-CZ-NH2	-8.54	111.52	119.20
1	A	36	SER	CA-CB-OG	-7.36	96.38	111.10

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	252	ASP	N-CA-CB	-7.14	100.06	110.70
1	A	166	ARG	NE-CZ-NH1	7.11	128.61	121.50
1	A	289	ARG	CA-CB-CG	6.64	127.39	114.10
1	A	318	ARG	NE-CZ-NH1	6.33	127.83	121.50
1	A	289	ARG	NE-CZ-NH1	-6.31	115.19	121.50
1	A	166	ARG	NE-CZ-NH2	-6.28	113.55	119.20
1	A	210	SER	CA-C-N	6.10	133.20	121.54
1	A	210	SER	C-N-CA	6.10	133.20	121.54
1	A	210	SER	N-CA-C	-5.96	101.09	109.96
1	A	127	ARG	NE-CZ-NH1	5.80	127.31	121.50
1	A	251	THR	CA-C-O	5.77	125.63	119.34
1	A	251	THR	N-CA-CB	-5.75	101.72	111.27
1	A	289	ARG	CB-CG-CD	-5.75	98.08	111.30
1	A	119	LEU	CA-C-N	5.73	132.02	121.70
1	A	119	LEU	C-N-CA	5.73	132.02	121.70
1	A	192	ARG	N-CA-C	5.73	120.33	113.23
1	A	318	ARG	CG-CD-NE	-5.57	99.74	112.00
1	A	252	ASP	CB-CA-C	5.50	120.15	110.36
1	A	252	ASP	N-CA-C	-5.39	102.22	110.14
1	A	112	ASP	N-CA-C	5.35	119.81	113.28
1	A	60	ASN	CB-CA-C	5.21	121.32	110.32
1	A	7	TYR	N-CA-C	-5.13	100.54	108.90
1	A	225	ARG	CA-CB-CG	5.09	124.28	114.10
1	A	68	LYS	CG-CD-CE	5.05	122.91	111.30

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	289	ARG	Sidechain

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	2874	0	2805	14	0
2	A	14	0	13	1	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
3	A	8	0	14	0	0
4	A	3	0	6	0	0
5	A	385	0	0	7	0
All	All	3284	0	2838	15	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 3.

All (15) 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:192:ARG:O	1:A:193:GLN:HB2	1.68	0.91
2:A:401:NAG:O3	5:A:501:HOH:O	2.00	0.80
1:A:311:GLU:HG2	5:A:787:HOH:O	1.92	0.68
1:A:251:THR:HG23	5:A:703:HOH:O	2.09	0.52
1:A:49:GLU:OE2	5:A:502:HOH:O	2.20	0.48
1:A:320:LEU:HD12	1:A:320:LEU:C	2.41	0.46
1:A:225:ARG:NH1	1:A:225:ARG:O	2.49	0.46
1:A:225:ARG:C	1:A:225:ARG:HD3	2.43	0.44
1:A:188:HIS:CE1	1:A:192:ARG:HD3	2.53	0.43
1:A:357:ASP:OD2	5:A:503:HOH:O	2.21	0.43
1:A:323:ARG:HD2	5:A:712:HOH:O	2.18	0.43
1:A:311:GLU:CG	5:A:787:HOH:O	2.60	0.42
1:A:9:SER:O	1:A:12:GLN:HG2	2.19	0.42
1:A:74:SER:HA	1:A:115:ASP:HB3	2.00	0.42
1:A:192:ARG:HH11	1:A:192:ARG:HD2	1.79	0.41

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	359/361 (99%)	350 (98%)	8 (2%)	1 (0%)	36 25

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	212	ARG

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	302/302 (100%)	289 (96%)	13 (4%)	26 13

All (13) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	15	GLU
1	A	55	LEU
1	A	68	LYS
1	A	85	PHE
1	A	91	LYS
1	A	142	ARG
1	A	184	THR
1	A	192	ARG
1	A	225	ARG
1	A	251	THR
1	A	289	ARG
1	A	291	ARG
1	A	345	GLN

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	310	GLN
1	A	315	ASN

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Mol	Chain	Res	Type
1	A	345	GLN

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 ⓘ

There are no oligosaccharides in this entry.

5.6 Ligand geometry ⓘ

3 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	$\# Z > 2$
4	EOH	A	403	-	2,2,2	0.55	0	1,1,1	0.22	0
2	NAG	A	401	1	14,14,15	1.19	2 (14%)	17,19,21	1.08	2 (11%)
3	MPD	A	402	-	7,7,7	0.62	0	9,10,10	0.87	0

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	401	1	-	0/6/23/26	0/1/1/1
3	MPD	A	402	-	-	2/5/5/5	-

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	401	NAG	O5-C1	-2.29	1.39	1.43
2	A	401	NAG	C2-N2	-2.12	1.42	1.46

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	401	NAG	O3-C3-C2	-2.10	105.04	109.40
2	A	401	NAG	C3-C4-C5	-2.04	106.54	110.23

There are no chirality outliers.

All (2) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	A	402	MPD	C2-C3-C4-O4
3	A	402	MPD	C2-C3-C4-C5

There are no ring outliers.

1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	A	401	NAG	1	0

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	361/361 (100%)	-0.20	8 (2%) 62 62	16, 26, 47, 126	0

All (8) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	362	VAL	5.3
1	A	209	SER	4.2
1	A	208	ALA	4.2
1	A	206	GLU	2.5
1	A	191	TRP	2.4
1	A	207	ASP	2.1
1	A	361	GLY	2.1
1	A	210	SER	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	401	14/15	0.88	0.09	32,36,43,44	0
3	MPD	A	402	8/8	0.90	0.10	20,28,29,37	0
4	EOH	A	403	3/3	0.90	0.13	38,38,40,40	0

6.5 Other polymers [i](#)

There are no such residues in this entry.