



# Full wwPDB X-ray Structure Validation Report ⓘ

Aug 9, 2020 – 11:40 AM BST

PDB ID : 1CFJ  
Title : METHYLPHOSPHONYLATED ACETYLCHOLINESTERASE (AGED)  
OBTAINED BY REACTION WITH O-ISOPROPYLMETHYLPHOSPHON  
OFLUORIDATE (GB, SARIN)  
Authors : Millard, C.B.; Silman, I.; Sussman, J.L.  
Deposited on : 1999-03-19  
Resolution : 2.60 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](mailto: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.

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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) : **NOT EXECUTED**  
EDS : **NOT EXECUTED**  
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.13.1

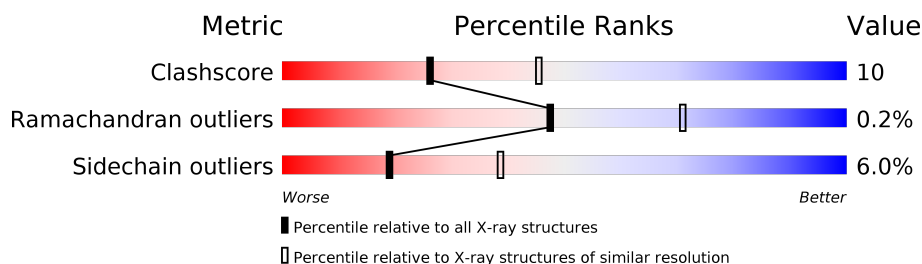
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

## *X-RAY DIFFRACTION*

The reported resolution of this entry is 2.60 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))
Clashscore	141614	3518 (2.60-2.60)
Ramachandran outliers	138981	3455 (2.60-2.60)
Sidechain outliers	138945	3455 (2.60-2.60)

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  $\geq 3$ , 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  $\leq 5\%$ .

Note EDS was not executed.

Mol	Chain	Length	Quality of chain
1	A	537	76% 20% ...

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
2	NAG	A	9059	X	-	-	-

## 2 Entry composition [i](#)

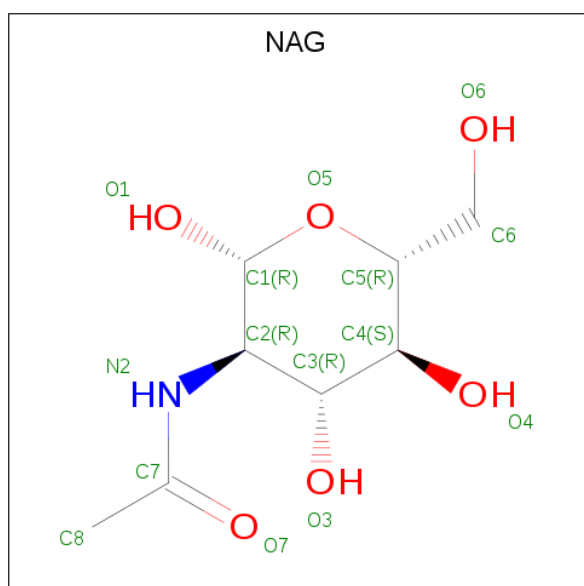
There are 4 unique types of molecules in this entry. The entry contains 4496 atoms, of which 0 are hydrogens and 0 are deuteriums.

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 PROTEIN (ACETYLCHOLINESTERASE).

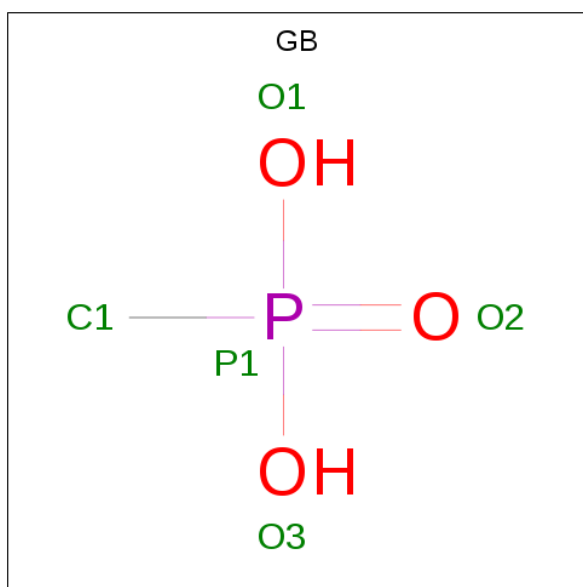
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	532	Total	C	N	O	S	0	0	0
			4244	2721	720	781	22			

- Molecule 2 is 2-acetamido-2-deoxy-beta-D-glucopyranose (three-letter code: 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		

- Molecule 3 is METHYLPHOSPHONIC ACID ESTER GROUP (three-letter code: GB) (formula:  $CH_5O_3P$ ).



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

- Molecule 4 is water.

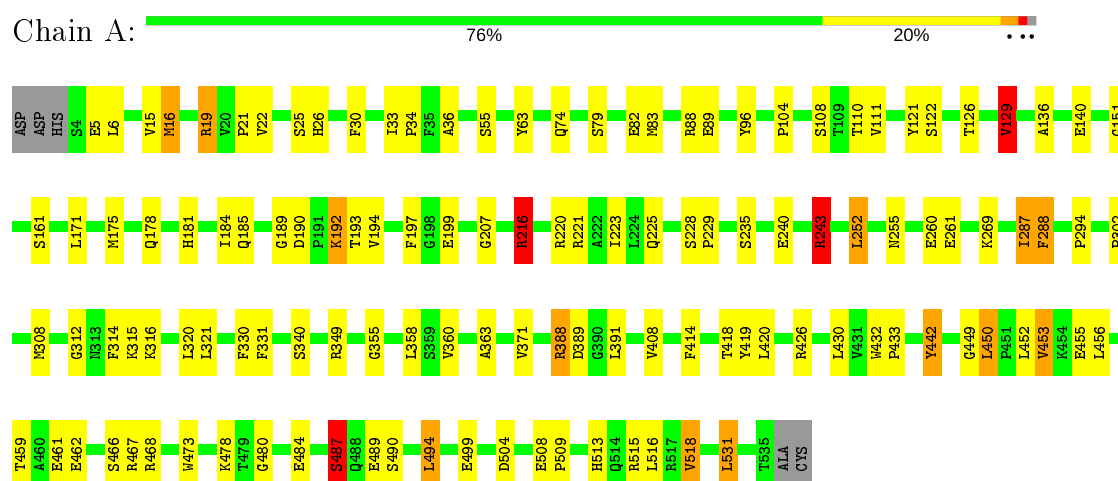
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	220	Total	O	0	0
			220	220		

### 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. 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. 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.

Note EDS was not executed.

#### • Molecule 1: PROTEIN (ACETYLCHOLINESTERASE)



## 4 Data and refinement statistics

Xtriage (Phenix) and EDS were not executed - this section is therefore incomplete.

Property	Value	Source
Space group	P 31 2 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	111.39Å 111.39Å 136.62Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	30.00 – 2.60	Depositor
% Data completeness (in resolution range)	93.2 (30.00-2.60)	Depositor
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	0.09	Depositor
Refinement program	CNS	Depositor
R, $R_{free}$	0.186 , 0.247	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	4496	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	31.0	wwPDB-VP

## 5 Model quality

### 5.1 Standard geometry

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

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	0.90	1/4367 (0.0%)	0.95	7/5929 (0.1%)

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 (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	288	PHE	CE2-CZ	5.12	1.47	1.37

All (7) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	388	ARG	NE-CZ-NH2	-7.86	116.37	120.30
1	A	388	ARG	NE-CZ-NH1	6.98	123.79	120.30
1	A	216	ARG	NE-CZ-NH2	-6.16	117.22	120.30
1	A	129	VAL	CB-CA-C	-5.94	100.11	111.40
1	A	494	LEU	CA-CB-CG	5.90	128.87	115.30
1	A	252	LEU	CA-CB-CG	-5.89	101.74	115.30
1	A	243	ARG	NE-CZ-NH2	-5.41	117.59	120.30

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	442	TYR	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	4244	0	4094	87	0
2	A	28	0	26	0	0
3	A	4	0	3	0	0
4	A	220	0	0	3	0
All	All	4496	0	4123	87	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 10.

All (87) 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:190:ASP:OD1	1:A:192:LYS:HG2	1.71	0.88
1:A:484:GLU:HB2	1:A:487:SER:HB3	1.57	0.85
1:A:255:ASN:OD1	1:A:261:GLU:HG2	1.88	0.72
1:A:455:GLU:CD	1:A:455:GLU:H	1.92	0.71
1:A:19:ARG:CZ	1:A:26:HIS:HB2	2.22	0.70
1:A:360:VAL:HG12	1:A:363:ALA:HB2	1.74	0.68
1:A:252:LEU:HB3	1:A:269:LYS:HE3	1.76	0.68
1:A:487:SER:OG	1:A:489:GLU:HG2	1.99	0.62
1:A:36:ALA:HB2	1:A:175:MET:CE	2.31	0.61
1:A:197:PHE:CB	1:A:223:ILE:HB	2.32	0.59
1:A:83:MET:HE3	1:A:442:TYR:OH	2.04	0.57
1:A:190:ASP:CG	1:A:192:LYS:HG2	2.25	0.57
1:A:216:ARG:HB3	1:A:315:LYS:HB2	1.87	0.57
1:A:419:TYR:CZ	1:A:494:LEU:HD13	2.41	0.56
1:A:228:SER:HB2	1:A:229:PRO:HD2	1.87	0.56
1:A:197:PHE:HB3	1:A:223:ILE:HB	1.88	0.56
1:A:508:GLU:HB3	1:A:509:PRO:CD	2.36	0.55
1:A:531:LEU:HD23	1:A:531:LEU:C	2.27	0.55
1:A:197:PHE:HA	1:A:223:ILE:O	2.06	0.55

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:452:LEU:HD13	1:A:467:ARG:NH2	2.22	0.54
1:A:83:MET:CE	1:A:442:TYR:OH	2.56	0.53
1:A:36:ALA:HB2	1:A:175:MET:HE2	1.91	0.53
1:A:30:PHE:HB3	1:A:33:ILE:HD11	1.89	0.53
1:A:504:ASP:OD2	1:A:513:HIS:NE2	2.35	0.53
1:A:221:ARG:HD3	1:A:480:GLY:HA2	1.91	0.52
1:A:19:ARG:NH2	1:A:26:HIS:HB2	2.24	0.52
1:A:453:VAL:O	1:A:453:VAL:HG22	2.09	0.52
1:A:121:TYR:HA	1:A:151:GLY:H	1.74	0.52
1:A:449:GLY:HA2	1:A:466:SER:OG	2.09	0.52
1:A:450:LEU:O	1:A:453:VAL:HG13	2.09	0.51
1:A:223:ILE:HA	1:A:320:LEU:O	2.11	0.50
1:A:235:SER:HA	1:A:294:PRO:O	2.11	0.50
1:A:129:VAL:HG22	4:A:1139:HOH:O	2.11	0.50
1:A:185:GLN:HA	1:A:189:GLY:O	2.12	0.50
1:A:260:GLU:H	1:A:260:GLU:CD	2.15	0.50
1:A:499:GLU:HB2	4:A:1135:HOH:O	2.12	0.49
1:A:36:ALA:CB	1:A:175:MET:CE	2.90	0.49
1:A:63:TYR:CD1	1:A:126:THR:HG22	2.48	0.48
1:A:25:SER:OG	1:A:26:HIS:N	2.44	0.48
1:A:21:PRO:HA	1:A:25:SER:O	2.14	0.48
1:A:79:SER:O	1:A:83:MET:HG2	2.14	0.47
1:A:453:VAL:HG22	1:A:456:LEU:HG	1.97	0.47
1:A:199:GLU:HA	1:A:225:GLN:O	2.15	0.47
1:A:193:THR:HG22	1:A:193:THR:O	2.14	0.47
1:A:468:ARG:HD3	4:A:1202:HOH:O	2.15	0.47
1:A:355:GLY:HA3	1:A:391:LEU:HD21	1.97	0.47
1:A:197:PHE:HB2	1:A:223:ILE:HB	1.97	0.46
1:A:484:GLU:HB2	1:A:487:SER:CB	2.36	0.46
1:A:360:VAL:HG21	1:A:371:VAL:HG21	1.98	0.46
1:A:178:GLN:O	1:A:181:HIS:HB3	2.16	0.46
1:A:461:GLU:CD	1:A:461:GLU:H	2.18	0.45
1:A:6:LEU:HB2	1:A:16:MET:CE	2.46	0.45
1:A:136:ALA:O	1:A:140:GLU:HA	2.17	0.45
1:A:6:LEU:CB	1:A:16:MET:HE2	2.47	0.45
1:A:6:LEU:HB2	1:A:16:MET:HE1	2.00	0.44
1:A:184:ILE:HG13	1:A:189:GLY:HA3	2.00	0.44
1:A:321:LEU:O	1:A:420:LEU:HD12	2.17	0.44
1:A:6:LEU:O	1:A:16:MET:HE2	2.17	0.44
1:A:110:THR:OG1	1:A:478:LYS:HG3	2.17	0.44
1:A:34:PRO:HB3	1:A:96:TYR:CE2	2.52	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:36:ALA:CB	1:A:175:MET:HE1	2.47	0.44
1:A:5:GLU:OE2	1:A:104:PRO:HA	2.18	0.43
1:A:426:ARG:NH2	1:A:432:TRP:O	2.48	0.43
1:A:255:ASN:CG	1:A:261:GLU:HG2	2.39	0.43
1:A:207:GLY:HA3	1:A:229:PRO:HD3	2.00	0.43
1:A:220:ARG:HG3	1:A:221:ARG:HG3	2.01	0.43
1:A:287:ILE:HD11	1:A:331:PHE:C	2.39	0.43
1:A:240:GLU:OE2	1:A:243:ARG:NH1	2.50	0.42
1:A:432:TRP:HB3	1:A:433:PRO:HD2	2.01	0.42
1:A:121:TYR:CD1	1:A:122:SER:HB3	2.55	0.42
1:A:312:GLY:HA2	1:A:314:PHE:CE2	2.54	0.42
1:A:408:VAL:CG2	1:A:418:THR:HG21	2.48	0.42
1:A:216:ARG:H	1:A:216:ARG:HG2	1.67	0.42
1:A:459:THR:OG1	1:A:462:GLU:HG3	2.20	0.42
1:A:478:LYS:HB2	1:A:478:LYS:HE3	1.88	0.42
1:A:302:PRO:HD2	1:A:308:MET:SD	2.60	0.41
1:A:321:LEU:HD23	1:A:321:LEU:N	2.34	0.41
1:A:453:VAL:O	1:A:453:VAL:CG2	2.68	0.41
1:A:391:LEU:HD12	1:A:391:LEU:HA	1.87	0.41
1:A:420:LEU:HD21	1:A:516:LEU:HD23	2.02	0.41
1:A:171:LEU:HA	1:A:171:LEU:HD23	1.88	0.41
1:A:316:LYS:HE3	1:A:414:PHE:HB3	2.02	0.41
1:A:74:GLN:HA	1:A:74:GLN:OE1	2.21	0.41
1:A:388:ARG:HD2	1:A:389:ASP:OD1	2.21	0.41
1:A:452:LEU:HD21	1:A:467:ARG:HG3	2.03	0.41
1:A:111:VAL:O	1:A:194:VAL:HA	2.21	0.40
1:A:515:ARG:HB3	1:A:518:VAL:HG22	2.03	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	530/537 (99%)	493 (93%)	36 (7%)	1 (0%)	47 71

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	487	SER

### 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	465/469 (99%)	437 (94%)	28 (6%)	19 39

All (28) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	15	VAL
1	A	16	MET
1	A	19	ARG
1	A	22	VAL
1	A	55	SER
1	A	82	GLU
1	A	88	ARG
1	A	89	GLU
1	A	108	SER
1	A	129	VAL
1	A	161	SER
1	A	192	LYS
1	A	216	ARG
1	A	243	ARG
1	A	287	ILE
1	A	288	PHE
1	A	330	PHE
1	A	340	SER
1	A	349	ARG
1	A	358	LEU

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Mol	Chain	Res	Type
1	A	430	LEU
1	A	450	LEU
1	A	453	VAL
1	A	473	TRP
1	A	487	SER
1	A	490	SER
1	A	518	VAL
1	A	531	LEU

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (4) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	68	GLN
1	A	264	HIS
1	A	500	GLN
1	A	526	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 [i](#)

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
3	GB	A	999	1	0,3,4	0.00	-	0,3,6	0.00	-
2	NAG	A	9059	1	14,14,15	1.09	2 (14%)	17,19,21	0.87	0
2	NAG	A	9416	1	14,14,15	0.88	0	17,19,21	1.14	1 (5%)

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	9059	1	1/1/5/7	1/6/23/26	0/1/1/1
2	NAG	A	9416	1	-	2/6/23/26	0/1/1/1

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	9059	NAG	O5-C5	2.47	1.48	1.43
2	A	9059	NAG	C1-C2	2.14	1.55	1.52

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	9416	NAG	C2-N2-C7	-2.99	118.65	122.90

All (1) chirality outliers are listed below:

Mol	Chain	Res	Type	Atom
2	A	9059	NAG	C1

All (3) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	A	9416	NAG	O5-C5-C6-O6
2	A	9416	NAG	C4-C5-C6-O6
2	A	9059	NAG	O5-C5-C6-O6

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 ⓘ

EDS was not executed - this section is therefore empty.

### 6.2 Non-standard residues in protein, DNA, RNA chains ⓘ

EDS was not executed - this section is therefore empty.

### 6.3 Carbohydrates ⓘ

EDS was not executed - this section is therefore empty.

### 6.4 Ligands ⓘ

EDS was not executed - this section is therefore empty.

### 6.5 Other polymers ⓘ

EDS was not executed - this section is therefore empty.