



# Full wwPDB X-ray Structure Validation Report ⓘ

Mar 9, 2026 – 06:25 PM UTC

PDB ID : 5DF0 / pdb\_00005df0  
Title : Crystal structure of AcMNPV Chitinase A in complex WITH CHITOTRIO-THIAZOLINE DITHIOAMIDE  
Authors : Mou, T.-C.; Sprang, S.R.  
Deposited on : 2015-08-26  
Resolution : 3.25 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.

The types of validation reports are described at

<http://www.wwpdb.org/validation/2017/FAQs#types>.

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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

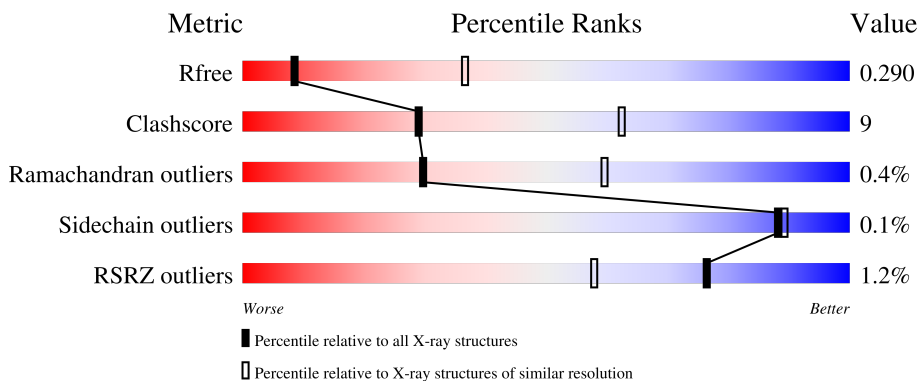
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 3.25 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	1605 (3.30-3.22)
Clashscore	190562	1660 (3.30-3.22)
Ramachandran outliers	187476	1630 (3.30-3.22)
Sidechain outliers	187428	1629 (3.30-3.22)
RSRZ outliers	180081	1605 (3.30-3.22)

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  $\geq 3$ , 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  $\leq 5\%$ . 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	545	
1	B	545	

## 2 Entry composition [i](#)

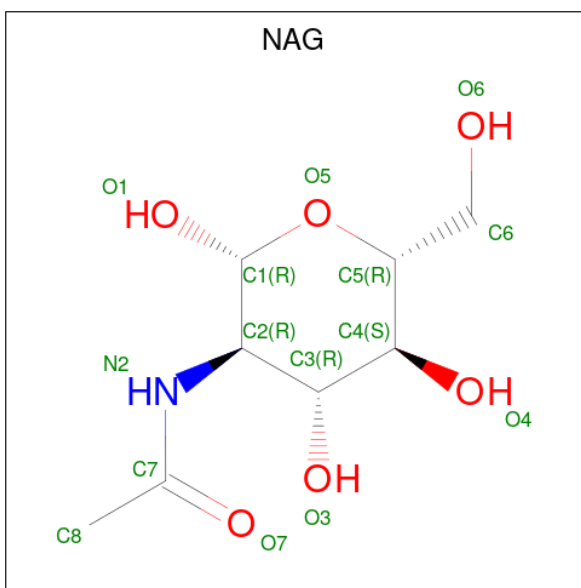
There are 7 unique types of molecules in this entry. The entry contains 8521 atoms, of which 0 are hydrogens and 0 are deuteriums.

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 Ac-ChiA.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	528	Total 4167	C 2672	N 685	O 800	S 10	0	0	0
1	B	528	Total 4167	C 2672	N 685	O 800	S 10	0	0	0

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



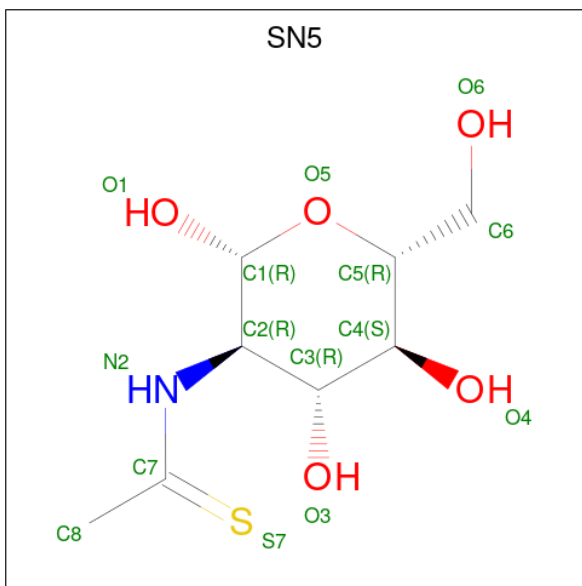
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
			Total	C	N	O		
2	A	1	Total 15	C 8	N 1	O 6	0	0
2	A	1	Total 15	C 8	N 1	O 6	0	0
2	A	1	Total 15	C 8	N 1	O 6	0	0
2	B	1	Total 15	C 8	N 1	O 6	0	0

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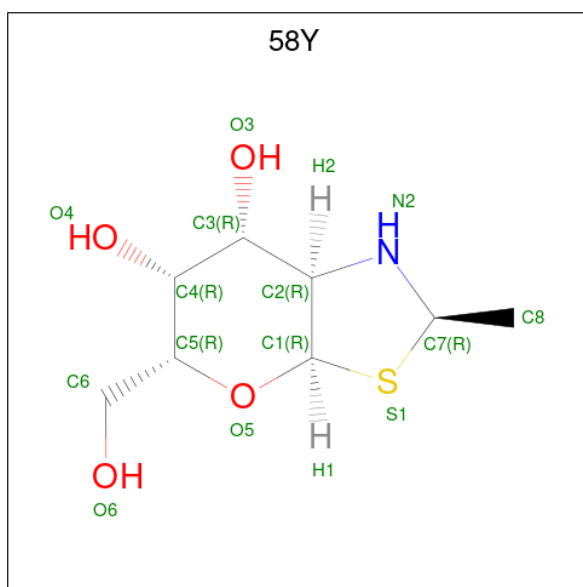
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
2	B	1	Total	C	N	O	0	0
			15	8	1	6		
2	B	1	Total	C	N	O	0	0
			14	8	1	5		

- Molecule 3 is 2-deoxy-2-(ethanethioylamino)-beta-D-glucopyranose (CCD ID: SN5) (formula: C<sub>8</sub>H<sub>15</sub>NO<sub>5</sub>S).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
3	A	1	Total	C	N	O	S	0	0
			14	8	1	4	1		
3	B	1	Total	C	N	O	S	0	0
			14	8	1	4	1		

- Molecule 4 is (2R,3aR,5R,6R,7R,7aR)-5-(hydroxymethyl)-2-methylhexahydro-3aH-pyrano[3,2-d][1,3]thiazole-6,7-diol (CCD ID: 58Y) (formula: C<sub>8</sub>H<sub>15</sub>NO<sub>4</sub>S).

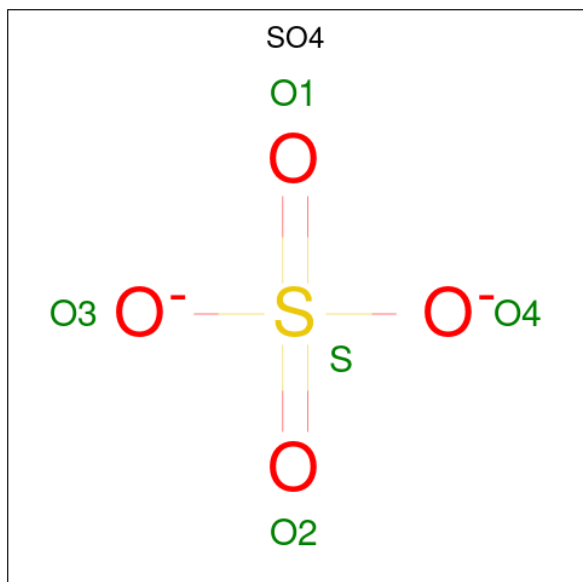


Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
			Total	C	N	O	S		
4	A	1	Total	C	N	O	S	0	0
			14	8	1	4	1		
4	B	1	Total	C	N	O	S	0	0
			14	8	1	4	1		

- Molecule 5 is CHLORIDE ION (CCD ID: CL) (formula: Cl).

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

- Molecule 6 is SULFATE ION (CCD ID: SO4) (formula: O<sub>4</sub>S).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
6	A	1	Total O S 5 4 1	0	0
6	A	1	Total O S 5 4 1	0	0
6	A	1	Total O S 5 4 1	0	0
6	B	1	Total O S 5 4 1	0	0
6	B	1	Total O S 5 4 1	0	0

- Molecule 7 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
7	A	4	Total O 4 4	0	0
7	B	12	Total O 12 12	0	0



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	96.71Å 112.77Å 129.59Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	14.98 – 3.25 14.98 – 3.25	Depositor EDS
% Data completeness (in resolution range)	89.6 (14.98-3.25) 86.6 (14.98-3.25)	Depositor EDS
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	0.12	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	2.06 (at 3.24Å)	Xtrriage
Refinement program	PHENIX (1.10.1_2155: ???)	Depositor
R, $R_{free}$	0.226 , 0.286 0.232 , 0.290	Depositor DCC
$R_{free}$ test set	2000 reflections (8.72%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	38.7	Xtrriage
Anisotropy	0.636	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.38 , 44.1	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.39$ , $\langle L^2 \rangle = 0.22$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
$F_o, F_c$ correlation	0.83	EDS
Total number of atoms	8521	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	34.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.13% of the height of the origin peak. No significant pseudotranslation is detected.*

<sup>1</sup>Intensities estimated from amplitudes.

<sup>2</sup>Theoretical 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: CL, SN5, NAG, 58Y, SO4

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	0.09	0/4275	0.32	0/5816
1	B	0.09	0/4275	0.28	0/5816
All	All	0.09	0/8550	0.30	0/11632

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

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	519	ARG	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	4167	0	4004	63	0
1	B	4167	0	4003	79	0
2	A	45	0	45	2	0
2	B	44	0	43	2	0
3	A	14	0	13	0	0
3	B	14	0	13	0	0
4	A	14	0	0	2	0
4	B	14	0	0	3	0
5	A	1	0	0	0	0
6	A	15	0	0	1	0
6	B	10	0	0	2	0
7	A	4	0	0	1	0
7	B	12	0	0	0	0
All	All	8521	0	8121	144	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 9.

All (144) 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)
4:A:605:58Y:O5	4:A:605:58Y:C1	1.64	1.41
4:B:605:58Y:C1	4:B:605:58Y:O5	1.64	1.41
4:B:605:58Y:C1	4:B:605:58Y:C5	2.48	0.90
4:A:605:58Y:C1	4:A:605:58Y:C5	2.48	0.89
1:B:215:LYS:NZ	1:B:282:VAL:O	2.05	0.88
1:B:286:SER:O	1:B:290:PHE:N	2.15	0.80
1:B:71:TYR:HB2	1:B:104:LYS:HB3	1.67	0.76
1:A:194:LEU:HD11	1:A:267:LEU:HD23	1.73	0.71
1:A:382:ASP:OD1	1:A:437:ARG:NH1	2.26	0.68
1:A:222:TRP:HA	1:A:226:GLN:HB2	1.75	0.68
1:B:365:ASN:HB3	1:B:421:GLN:NE2	2.09	0.68
1:A:211:ARG:NH2	6:A:608:SO4:O3	2.27	0.67
1:B:399:TYR:HB2	1:B:488:ALA:HA	1.74	0.67
1:B:471:ARG:NH2	1:B:531:ASP:O	2.27	0.67
1:A:191:ASN:HB3	1:A:194:LEU:HD13	1.77	0.66
1:A:310:LYS:HD3	1:A:360:LYS:HG2	1.78	0.66
1:B:360:LYS:NZ	1:B:409:TYR:OH	2.29	0.65
1:B:160:TYR:OH	1:B:220:ASP:OD2	2.12	0.65
1:A:31:TYR:HB3	1:A:53:VAL:HG21	1.80	0.64
1:A:264:GLY:O	1:A:268:SER:OG	2.16	0.62
1:B:286:SER:HA	1:B:289:GLU:HB3	1.82	0.62

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:211:ARG:NH2	6:B:607:SO4:O3	2.33	0.61
1:B:370:GLN:O	1:B:427:LYS:NZ	2.32	0.61
1:B:461:GLY:HA2	1:B:468:VAL:HG22	1.83	0.59
1:B:517:VAL:HG13	1:B:522:LEU:HB2	1.84	0.59
1:B:323:ALA:HA	1:B:364:VAL:HG22	1.86	0.58
1:A:227:LYS:NZ	7:A:701:HOH:O	2.36	0.58
1:B:384:LYS:NZ	2:B:602:NAG:O4	2.31	0.57
1:B:447:ASN:OD1	1:B:448:ASP:N	2.35	0.57
1:B:222:TRP:HA	1:B:226:GLN:HB2	1.85	0.57
1:A:44:GLU:HG3	1:A:211:ARG:HB2	1.87	0.57
1:A:62:TRP:NE1	1:B:146:GLU:OE1	2.38	0.55
1:B:398:VAL:HA	1:B:411:THR:HB	1.88	0.55
1:B:306:PHE:CE1	1:B:355:SER:HB2	2.42	0.55
1:B:365:ASN:HB3	1:B:421:GLN:HE22	1.71	0.55
1:B:391:ASP:OD2	2:B:602:NAG:O6	2.25	0.55
1:A:274:MET:O	1:A:280:ARG:NH1	2.40	0.54
1:B:310:LYS:HD3	1:B:360:LYS:HE3	1.89	0.54
1:B:445:TYR:OH	1:B:496:LYS:NZ	2.32	0.54
1:A:280:ARG:O	1:A:284:VAL:N	2.25	0.53
1:B:261:SER:HA	1:B:301:ASP:HB3	1.90	0.53
1:A:72:VAL:HB	1:A:80:TRP:HB3	1.89	0.53
1:B:494:PHE:HE2	1:B:496:LYS:HD2	1.74	0.53
1:A:74:PHE:HB2	1:A:79:VAL:HG11	1.90	0.53
1:A:471:ARG:NH2	1:A:531:ASP:O	2.42	0.52
1:B:480:TYR:HB3	1:B:493:VAL:HB	1.91	0.52
1:B:31:TYR:HB3	1:B:53:VAL:HG21	1.91	0.52
1:B:93:VAL:HG11	1:B:121:VAL:HG21	1.92	0.52
1:A:278:GLU:HG2	1:A:281:ASN:HB2	1.92	0.52
1:A:398:VAL:HA	1:A:411:THR:HB	1.92	0.52
1:B:462:THR:OG1	1:B:472:GLN:OE1	2.17	0.51
1:B:450:TYR:HB2	1:B:501:LEU:HD22	1.93	0.50
1:A:184:ILE:HB	1:A:270:PRO:HG2	1.93	0.50
1:A:277:VAL:O	1:A:278:GLU:HB2	2.12	0.50
1:A:480:TYR:HB3	1:A:493:VAL:HB	1.92	0.50
1:A:51:GLU:H	1:A:51:GLU:CD	2.19	0.50
1:A:35:GLU:HB2	1:A:48:LYS:HB3	1.94	0.49
1:A:246:LEU:HD22	1:A:258:ILE:HD13	1.94	0.49
1:A:517:VAL:HA	1:A:522:LEU:HB2	1.94	0.49
1:B:19:PRO:HG3	1:B:107:ASN:HB2	1.93	0.49
1:A:346:ARG:HG2	2:A:601:NAG:H61	1.94	0.49
1:A:149:ILE:HD12	1:A:176:HIS:HE1	1.78	0.49

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:444:ASN:O	1:B:453:GLY:HA2	2.13	0.49
1:A:33:LEU:HD12	1:A:123:ASP:HB2	1.94	0.48
1:B:33:LEU:HD12	1:B:123:ASP:HB2	1.95	0.48
1:A:23:VAL:HG11	1:B:146:GLU:HB3	1.95	0.48
1:A:216:VAL:HG22	1:A:286:SER:HB2	1.95	0.48
1:B:300:VAL:HG23	1:B:337:LEU:HD11	1.94	0.48
1:B:382:ASP:OD2	4:B:605:58Y:O6	2.30	0.48
1:B:235:TRP:CD1	1:B:240:LYS:HZ1	2.31	0.48
1:B:211:ARG:NH1	1:B:215:LYS:HB3	2.28	0.48
1:A:222:TRP:O	1:A:227:LYS:N	2.44	0.48
1:A:277:VAL:HG23	1:A:278:GLU:N	2.29	0.48
1:B:463:TRP:NE1	1:B:469:ASP:OD2	2.47	0.48
1:B:202:GLU:OE1	1:B:202:GLU:N	2.47	0.47
1:B:284:VAL:HG13	1:B:333:LEU:HD23	1.97	0.47
1:A:278:GLU:HG3	1:A:280:ARG:HB3	1.96	0.47
1:A:263:GLY:O	1:A:267:LEU:HB2	2.15	0.47
1:B:288:LYS:O	1:B:292:GLN:HG3	2.14	0.47
1:B:159:VAL:HG12	1:B:165:PRO:HA	1.96	0.47
1:A:276:ASP:OD1	1:A:277:VAL:HG13	2.14	0.47
1:A:278:GLU:HG2	1:A:281:ASN:CB	2.45	0.47
1:B:493:VAL:HG13	1:B:504:PHE:HE1	1.78	0.47
1:B:162:ARG:HG2	1:B:463:TRP:CE2	2.50	0.47
1:A:61:VAL:HG21	1:A:66:ILE:HG22	1.97	0.47
1:B:307:PRO:HB2	1:B:364:VAL:HG21	1.97	0.46
1:B:22:PRO:HG2	1:B:114:SER:HB3	1.98	0.45
1:B:149:ILE:HG13	1:B:375:LYS:HD3	1.98	0.45
1:A:399:TYR:HB2	1:A:488:ALA:HA	1.99	0.45
1:A:442:VAL:HA	1:A:455:GLY:HA2	1.99	0.45
1:B:57:VAL:HG13	1:B:89:ALA:HB3	1.98	0.45
1:A:180:GLY:HA2	1:A:181:PHE:HA	1.54	0.44
1:B:367:ALA:HB2	1:B:421:GLN:HG2	1.98	0.44
1:B:145:ARG:HH22	1:B:518:ASP:CG	2.26	0.44
1:A:20:GLY:HA2	1:A:63:ASN:O	2.18	0.44
1:B:180:GLY:HA2	1:B:181:PHE:HA	1.53	0.44
1:B:83:ASP:OD1	1:B:84:ALA:N	2.51	0.44
1:B:146:GLU:H	1:B:146:GLU:HG2	1.60	0.44
1:B:164:PHE:HA	1:B:168:LYS:HD2	2.00	0.44
1:A:463:TRP:NE1	1:A:469:ASP:OD2	2.51	0.43
1:B:326:TYR:CD2	1:B:364:VAL:HG11	2.53	0.43
1:A:165:PRO:HD2	1:A:168:LYS:HD2	2.00	0.43
1:B:215:LYS:HZ1	1:B:285:ASP:HB2	1.83	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:46:LEU:HD22	1:A:221:PRO:HB3	2.00	0.43
1:B:494:PHE:CE2	1:B:496:LYS:HD2	2.51	0.43
1:A:164:PHE:HA	1:A:168:LYS:HD2	2.00	0.43
1:A:283:PHE:O	1:A:287:VAL:HG23	2.18	0.43
1:A:462:THR:OG1	1:A:472:GLN:OE1	2.23	0.43
1:B:168:LYS:NZ	6:B:606:SO4:O2	2.46	0.43
1:B:35:GLU:HB2	1:B:48:LYS:HB3	2.01	0.43
1:B:264:GLY:O	1:B:268:SER:OG	2.28	0.43
1:B:533:ASP:CG	1:B:535:GLY:H	2.26	0.43
1:B:184:ILE:HB	1:B:270:PRO:HG2	2.00	0.42
1:A:35:GLU:HG3	1:A:50:LYS:HE2	2.01	0.42
1:B:286:SER:O	1:B:289:GLU:N	2.53	0.42
1:B:374:GLY:O	1:B:427:LYS:HG2	2.20	0.42
1:A:425:PRO:O	1:A:522:LEU:HA	2.20	0.42
1:A:437:ARG:HG2	1:A:467:VAL:HG22	2.01	0.42
1:B:243:PHE:O	1:B:247:MET:HG3	2.19	0.42
1:B:395:GLN:OE1	1:B:437:ARG:N	2.47	0.42
1:B:442:VAL:HA	1:B:455:GLY:HA2	2.02	0.42
1:A:528:TRP:HA	1:A:529:GLU:HA	1.62	0.42
1:A:243:PHE:O	1:A:247:MET:HG3	2.20	0.42
1:A:336:MET:HE3	1:A:336:MET:HB3	1.95	0.42
1:B:177:LEU:HB2	1:B:256:LEU:HD11	2.02	0.42
1:A:276:ASP:O	1:A:278:GLU:N	2.53	0.42
1:A:283:PHE:O	1:A:286:SER:OG	2.31	0.42
1:B:339:ASP:O	1:B:343:GLN:HB2	2.20	0.41
1:A:278:GLU:C	1:A:280:ARG:N	2.78	0.41
1:A:494:PHE:CE2	1:A:496:LYS:HG2	2.55	0.41
1:A:57:VAL:HG13	1:A:89:ALA:HB3	2.02	0.41
1:A:395:GLN:OE1	1:A:437:ARG:N	2.51	0.41
1:B:517:VAL:HA	1:B:522:LEU:HD12	2.02	0.41
1:B:211:ARG:HH12	1:B:215:LYS:HD2	1.85	0.41
1:A:384:LYS:H	1:A:395:GLN:HA	1.86	0.41
1:B:74:PHE:HB2	1:B:79:VAL:HG11	2.03	0.41
1:B:426:ASN:OD1	1:B:427:LYS:N	2.54	0.41
1:B:507:VAL:HG13	1:B:540:ALA:HB2	2.02	0.41
1:B:145:ARG:NH2	1:B:518:ASP:OD1	2.43	0.41
1:B:447:ASN:CG	1:B:448:ASP:H	2.25	0.41
1:A:236:ASN:ND2	2:A:602:NAG:O7	2.54	0.40
1:A:415:VAL:HG21	1:A:516:TYR:HE2	1.86	0.40
1:B:521:LYS:O	1:B:521:LYS:HG2	2.21	0.40
1:A:176:HIS:NE2	1:A:375:LYS:HE3	2.37	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	526/545 (96%)	497 (94%)	26 (5%)	3 (1%)	21	51
1	B	526/545 (96%)	501 (95%)	24 (5%)	1 (0%)	43	70
All	All	1052/1090 (96%)	998 (95%)	50 (5%)	4 (0%)	30	59

All (4) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	75	ASP
1	A	277	VAL
1	A	278	GLU
1	B	363	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	441/456 (97%)	441 (100%)	0	100	100
1	B	441/456 (97%)	440 (100%)	1 (0%)	87	87
All	All	882/912 (97%)	881 (100%)	1 (0%)	88	89

All (1) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	511	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (2) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	404	ASN
1	A	520	ASN

### 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 oligosaccharides in this entry.

## 5.6 Ligand geometry [i](#)

Of 16 ligands modelled in this entry, 1 is monoatomic - leaving 15 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	601	-	15,15,15	0.10	0	21,21,21	0.10	0
6	SO4	A	607	-	4,4,4	0.24	0	6,6,6	0.08	0
6	SO4	A	608	-	4,4,4	0.24	0	6,6,6	0.08	0
2	NAG	A	602	-	15,15,15	0.13	0	21,21,21	0.29	0
4	58Y	B	605	3	11,15,15	6.00	5 (45%)	14,22,22	2.10	5 (35%)
2	NAG	B	603	1	14,14,15	0.28	0	17,19,21	0.54	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z  > 2	Counts	RMSZ	# Z  > 2
3	SN5	A	604	4	14,14,15	4.25	9 (64%)	15,19,21	0.88	0
3	SN5	B	604	4	14,14,15	4.25	9 (64%)	15,19,21	0.88	0
6	SO4	B	607	-	4,4,4	0.24	0	6,6,6	0.07	0
4	58Y	A	605	3	11,15,15	6.00	5 (45%)	14,22,22	2.10	5 (35%)
6	SO4	B	606	-	4,4,4	0.24	0	6,6,6	0.07	0
2	NAG	B	602	-	15,15,15	0.14	0	21,21,21	0.11	0
6	SO4	A	609	-	4,4,4	0.24	0	6,6,6	0.07	0
2	NAG	A	603	-	15,15,15	0.12	0	21,21,21	0.11	0
2	NAG	B	601	-	15,15,15	0.12	0	21,21,21	0.10	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	601	-	-	4/6/26/26	0/1/1/1
2	NAG	A	602	-	-	4/6/26/26	0/1/1/1
4	58Y	B	605	3	-	2/2/30/30	0/2/2/2
2	NAG	B	603	1	-	2/6/23/26	0/1/1/1
3	SN5	A	604	4	-	0/6/23/26	0/1/1/1
3	SN5	B	604	4	-	0/6/23/26	0/1/1/1
4	58Y	A	605	3	-	2/2/30/30	0/2/2/2
2	NAG	B	602	-	-	4/6/26/26	0/1/1/1
2	NAG	A	603	-	-	2/6/26/26	0/1/1/1
2	NAG	B	601	-	-	2/6/26/26	0/1/1/1

All (28) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	B	605	58Y	O5-C1	14.14	1.64	1.42
4	A	605	58Y	O5-C1	14.12	1.64	1.42
3	B	604	SN5	C7-N2	12.29	1.46	1.32
3	A	604	SN5	C7-N2	12.27	1.46	1.32
4	B	605	58Y	C7-S1	-11.22	1.62	1.84
4	A	605	58Y	C7-S1	-11.20	1.62	1.84
4	B	605	58Y	C2-N2	6.27	1.64	1.48
4	A	605	58Y	C2-N2	6.26	1.64	1.48
3	B	604	SN5	O5-C5	5.66	1.54	1.43
3	A	604	SN5	O5-C5	5.64	1.54	1.43

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	A	605	58Y	O5-C5	-4.23	1.34	1.44
4	B	605	58Y	O5-C5	-4.22	1.34	1.44
3	B	604	SN5	C2-N2	4.14	1.53	1.46
3	A	604	SN5	C2-N2	4.10	1.53	1.46
3	B	604	SN5	C7-S7	-3.24	1.61	1.67
3	A	604	SN5	C7-S7	-3.23	1.61	1.67
4	A	605	58Y	C3-C2	-3.17	1.47	1.53
4	B	605	58Y	C3-C2	-3.15	1.47	1.53
3	A	604	SN5	C3-C2	-3.03	1.46	1.52
3	B	604	SN5	C3-C2	-3.03	1.46	1.52
3	B	604	SN5	C6-C5	-2.81	1.42	1.51
3	A	604	SN5	C6-C5	-2.81	1.42	1.51
3	A	604	SN5	O3-C3	2.71	1.49	1.43
3	B	604	SN5	O3-C3	2.70	1.49	1.43
3	A	604	SN5	C1-C2	-2.54	1.48	1.52
3	B	604	SN5	C1-C2	-2.51	1.48	1.52
3	A	604	SN5	C8-C7	2.37	1.52	1.50
3	B	604	SN5	C8-C7	2.30	1.52	1.50

All (10) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	B	605	58Y	C7-S1-C1	5.03	101.64	93.71
4	A	605	58Y	C7-S1-C1	5.02	101.62	93.71
4	A	605	58Y	C4-C3-C2	3.28	115.17	110.40
4	B	605	58Y	C4-C3-C2	3.28	115.17	110.40
4	A	605	58Y	C1-C2-N2	3.01	106.05	102.74
4	B	605	58Y	C1-C2-N2	2.99	106.03	102.74
4	B	605	58Y	O5-C5-C4	2.60	114.38	109.70
4	A	605	58Y	O5-C5-C4	2.58	114.34	109.70
4	A	605	58Y	C3-C4-C5	2.35	114.50	110.23
4	B	605	58Y	C3-C4-C5	2.35	114.50	110.23

There are no chirality outliers.

All (22) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	A	601	NAG	O5-C5-C6-O6
4	A	605	58Y	O5-C5-C6-O6
4	B	605	58Y	O5-C5-C6-O6
2	B	603	NAG	O5-C5-C6-O6
2	A	601	NAG	C4-C5-C6-O6

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Mol	Chain	Res	Type	Atoms
4	B	605	58Y	C4-C5-C6-O6
4	A	605	58Y	C4-C5-C6-O6
2	B	602	NAG	O5-C5-C6-O6
2	B	601	NAG	O5-C5-C6-O6
2	B	601	NAG	C4-C5-C6-O6
2	B	602	NAG	C4-C5-C6-O6
2	B	603	NAG	C4-C5-C6-O6
2	A	601	NAG	C8-C7-N2-C2
2	A	601	NAG	O7-C7-N2-C2
2	A	602	NAG	C4-C5-C6-O6
2	A	602	NAG	O5-C5-C6-O6
2	A	602	NAG	C3-C2-N2-C7
2	A	602	NAG	C1-C2-N2-C7
2	B	602	NAG	C1-C2-N2-C7
2	A	603	NAG	C1-C2-N2-C7
2	B	602	NAG	C3-C2-N2-C7
2	A	603	NAG	C3-C2-N2-C7

There are no ring outliers.

8 monomers are involved in 12 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	A	601	NAG	1	0
6	A	608	SO4	1	0
2	A	602	NAG	1	0
4	B	605	58Y	3	0
6	B	607	SO4	1	0
4	A	605	58Y	2	0
6	B	606	SO4	1	0
2	B	602	NAG	2	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, 95<sup>th</sup> 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 <sup>2</sup> )	Q<0.9
1	A	528/545 (96%)	0.04	6 (1%) 78 60	15, 31, 53, 90	0
1	B	528/545 (96%)	0.11	7 (1%) 75 56	16, 33, 58, 110	0
All	All	1056/1090 (96%)	0.07	13 (1%) 76 58	15, 32, 56, 110	0

All (13) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	277	VAL	4.1
1	B	322	ASP	3.8
1	B	405	SER	3.7
1	B	110	GLY	3.5
1	A	443	THR	2.9
1	A	460	SER	2.7
1	B	109	ASP	2.5
1	B	374	GLY	2.2
1	B	319	ALA	2.2
1	A	276	ASP	2.2
1	A	77	GLN	2.1
1	B	364	VAL	2.1
1	A	545	PHE	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

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, 95<sup>th</sup> 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 <sup>2</sup> )	Q<0.9
2	NAG	A	603	15/15	0.74	0.14	37,40,73,77	0
2	NAG	B	602	15/15	0.75	0.16	44,52,77,89	0
2	NAG	A	602	15/15	0.77	0.20	51,61,89,98	0
6	SO4	B	606	5/5	0.77	0.12	49,54,63,72	0
6	SO4	A	607	5/5	0.79	0.10	41,42,66,72	0
2	NAG	B	601	15/15	0.82	0.14	33,37,60,60	0
2	NAG	B	603	14/15	0.84	0.14	36,39,52,53	0
2	NAG	A	601	15/15	0.87	0.11	40,47,70,72	0
3	SN5	A	604	14/15	0.89	0.12	29,35,41,72	0
3	SN5	B	604	14/15	0.89	0.12	29,35,41,72	0
6	SO4	B	607	5/5	0.89	0.15	44,44,51,61	0
4	58Y	A	605	14/14	0.91	0.10	19,28,30,40	0
6	SO4	A	608	5/5	0.91	0.14	38,39,50,59	0
4	58Y	B	605	14/14	0.92	0.12	19,28,30,40	0
5	CL	A	606	1/1	0.93	0.05	20,20,20,20	0
6	SO4	A	609	5/5	0.94	0.09	32,41,44,48	0

## 6.5 Other polymers

There are no such residues in this entry.