Full wwPDB X-ray Structure Validation Report (i)

Apr 28, 2024 – 12:36 pm BST

PDB ID	:	4CU6
Title	:	Unravelling the multiple functions of the architecturally intricate Streptococcus pneumoniae beta-galactosidase, BgaA
Authors	:	Singh, A.K.; Pluvinage, B.; Higgins, M.A.; Dalia, A.B.; Flynn, M.; Lloyd, A.R.; Weiser, J.N.; Stubbs, K.A.; Boraston, A.B.; King, S.J.
Deposited on	:	2014-03-17
Resolution	:	2.70 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 (i) 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 (i)) were used in the production of this report:

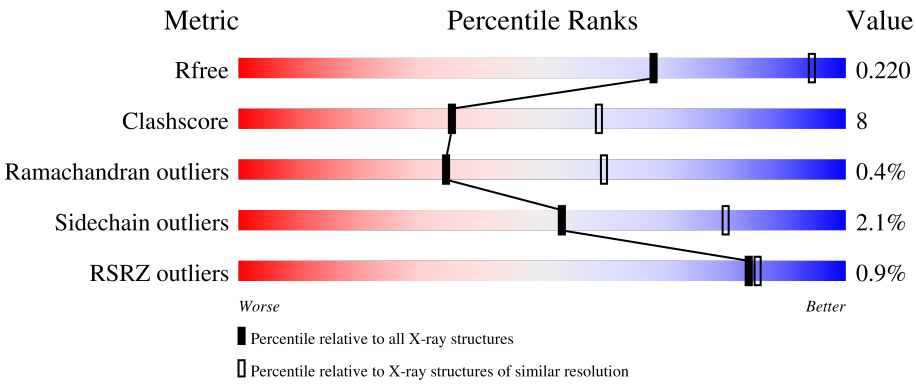
MolProbity	:	4.02b-467
Mogul	:	1.8.4, CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	2.36.2
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.36.2

1 Overall quality at a glance (i)

The following experimental techniques were used to determine the structure:
X-RAY DIFFRACTION

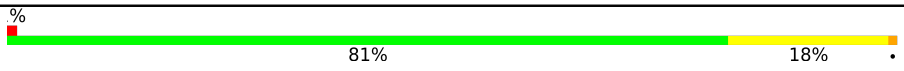
The reported resolution of this entry is 2.70 Å.

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}	130704	2808 (2.70-2.70)
Clashscore	141614	3122 (2.70-2.70)
Ramachandran outliers	138981	3069 (2.70-2.70)
Sidechain outliers	138945	3069 (2.70-2.70)
RSRZ outliers	127900	2737 (2.70-2.70)

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 <=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	849	

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	EDO	A	2021	-	-	X	-

2 Entry composition (i)

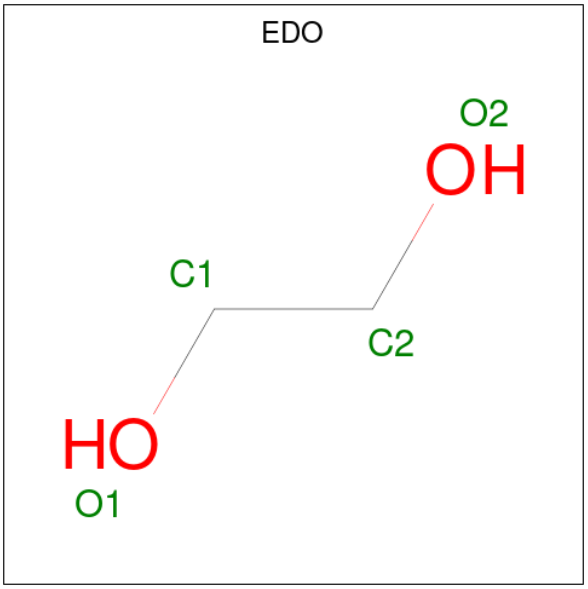
There are 4 unique types of molecules in this entry. The entry contains 7488 atoms, of which 0 are hydrogens and 0 are deuteriums.

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 BETA-GALACTOSIDASE.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	847	6815	4289	1205	1313	8	6	6	0

- Molecule 2 is 1,2-ETHANEDIOL (three-letter code: EDO) (formula: $C_2H_6O_2$).



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

Continued on next page...

Continued from previous page...

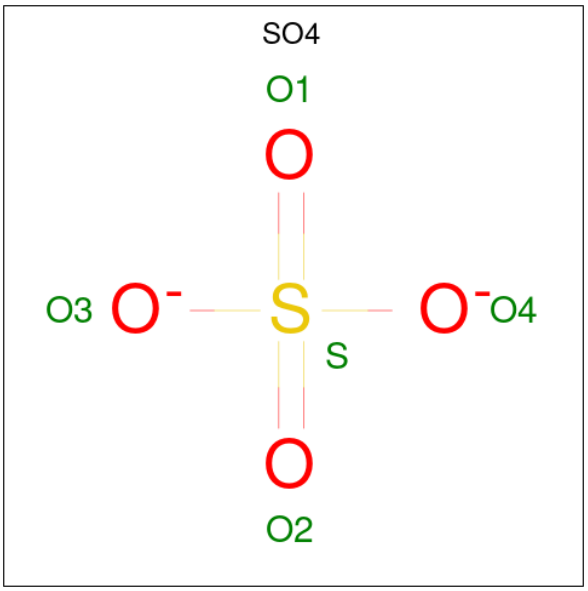
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
			Total	C	O		
2	A	1	4	2	2	0	0
2	A	1	4	2	2	0	0
2	A	1	4	2	2	0	0
2	A	1	4	2	2	0	0
2	A	1	4	2	2	0	0
2	A	1	4	2	2	0	0
2	A	1	4	2	2	0	0
2	A	1	4	2	2	0	0
2	A	1	4	2	2	0	0
2	A	1	4	2	2	0	0
2	A	1	4	2	2	0	0
2	A	1	4	2	2	0	0
2	A	1	4	2	2	0	0
2	A	1	4	2	2	0	0
2	A	1	4	2	2	0	0
2	A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

Continued on next page...

Continued from previous page...

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

- Molecule 3 is SULFATE ION (three-letter code: SO4) (formula: O_4S).



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

- Molecule 4 is water.

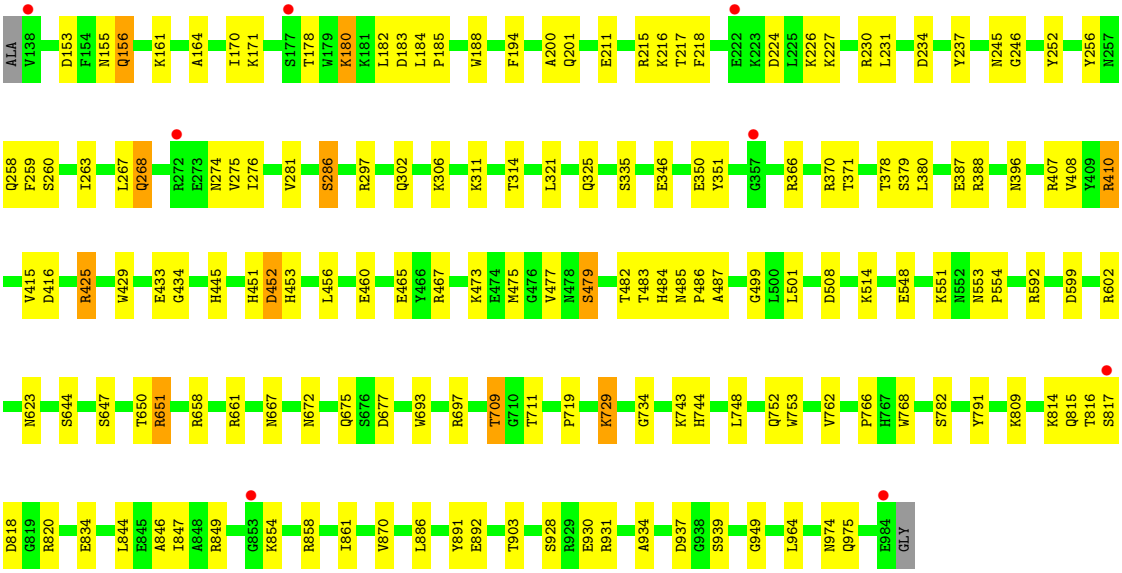
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	A	492	Total O 492 492	0	0

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: BETA-GALACTOSIDASE

Chain A:



4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 43 2 2	Depositor
Cell constants a, b, c, α, β, γ	116.77Å 116.77Å 220.04Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	116.77 – 2.70 19.94 – 2.70	Depositor EDS
% Data completeness (in resolution range)	99.5 (116.77-2.70) 99.8 (19.94-2.70)	Depositor EDS
R_{merge}	0.11	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	3.11 (at 2.71Å)	Xtriage
Refinement program	REFMAC 5.8.0049	Depositor
R, R_{free}	0.178 , 0.221 0.183 , 0.220	Depositor DCC
R_{free} test set	2139 reflections (5.04%)	wwPDB-VP
Wilson B-factor (Å^2)	25.6	Xtriage
Anisotropy	0.040	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.32 , 30.8	EDS
L-test for twinning[2]	$< \|L\| > = 0.50$, $< L^2 > = 0.33$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.94	EDS
Total number of atoms	7488	wwPDB-VP
Average B, all atoms (Å^2)	24.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.80% of the height of the origin peak. No significant pseudotranslation is detected.*

[1]Intensities estimated from amplitudes.

[2]Theoretical values of $< |L| >$, $< L^2 >$ 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: EDO, 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	0.59	2/6978 (0.0%)	0.70	3/9449 (0.0%)

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	180	LYS	CE-NZ	-12.62	1.17	1.49
1	A	854	LYS	CE-NZ	-6.29	1.33	1.49

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	A	180	LYS	CD-CE-NZ	7.12	128.07	111.70
1	A	485	ASN	O-C-N	-5.92	109.85	121.10
1	A	479	SER	O-C-N	-5.17	114.42	122.70

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	451	HIS	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	6815	0	6526	111	0
2	A	156	0	234	13	0
3	A	25	0	0	2	0
4	A	492	0	0	8	0
All	All	7488	0	6760	112	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 8.

All (112) 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:216:LYS:NZ	3:A:2025:SO4:O1	2.04	0.89
1:A:170:ILE:CG2	1:A:246:GLY:HA2	2.04	0.88
1:A:697:ARG:O	1:A:820:ARG:NH2	2.06	0.88
1:A:693:TRP:HE1	1:A:752:GLN:HE21	1.19	0.86
1:A:346:GLU:OE2	1:A:371:THR:OG1	1.98	0.80
1:A:183:ASP:H	2:A:2018:EDO:H11	1.47	0.79
1:A:452:ASP:HB2	4:A:3103:HOH:O	1.84	0.76
1:A:230:ARG:HD2	2:A:2021:EDO:H21	1.68	0.76
1:A:744:HIS:CE1	2:A:2004:EDO:H11	2.20	0.76
1:A:672[A]:ASN:O	4:A:3329:HOH:O	2.04	0.74
1:A:302:GLN:OE1	2:A:2021:EDO:H22	1.88	0.72
1:A:672[B]:ASN:O	4:A:3329:HOH:O	2.09	0.70
1:A:816:THR:OG1	1:A:820:ARG:HB2	1.92	0.69
1:A:892:GLU:OE2	2:A:1991:EDO:O1	2.11	0.69
1:A:311:LYS:NZ	4:A:3010:HOH:O	2.27	0.68
1:A:156:GLN:O	1:A:216:LYS:CE	2.42	0.67
1:A:335:SER:HB2	1:A:351:TYR:OH	1.94	0.67
1:A:818:ASP:OD2	1:A:820:ARG:HD3	1.94	0.67
1:A:156:GLN:O	1:A:216:LYS:HE2	1.95	0.67
1:A:809:LYS:HE3	1:A:834:GLU:O	1.95	0.66
1:A:744:HIS:ND1	2:A:2004:EDO:H11	2.10	0.65
1:A:809:LYS:NZ	3:A:2024:SO4:O4	2.29	0.65
1:A:928:SER:OG	1:A:930:GLU:HG3	1.97	0.64

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:623:ASN:ND2	1:A:644:SER:OG	2.32	0.63
1:A:849:ARG:HD2	4:A:3392:HOH:O	1.98	0.63
1:A:709:THR:CG2	1:A:711:THR:O	2.48	0.61
1:A:237:TYR:OH	1:A:286:SER:OG	2.09	0.61
1:A:260:SER:H	2:A:1988:EDO:H11	1.66	0.61
1:A:408:VAL:HB	1:A:416:ASP:HB3	1.82	0.61
1:A:350:GLU:HG3	1:A:366:ARG:HG3	1.83	0.60
1:A:508:ASP:O	1:A:514:LYS:NZ	2.24	0.60
1:A:217:THR:HG22	1:A:275:VAL:HG22	1.84	0.59
1:A:651:ARG:HG3	1:A:743:LYS:CD	2.33	0.59
1:A:483:THR:HB	1:A:484:HIS:CE1	2.38	0.59
1:A:709:THR:HG23	1:A:711:THR:O	2.03	0.58
1:A:651:ARG:HG3	1:A:743:LYS:HD3	1.86	0.58
1:A:847:ILE:HD11	1:A:858:ARG:NH1	2.17	0.58
1:A:931[B]:ARG:NH2	1:A:934:ALA:O	2.37	0.57
1:A:161:LYS:HB3	1:A:164:ALA:HB2	1.86	0.57
1:A:658:ARG:HD2	1:A:661:ARG:HH21	1.70	0.56
1:A:171:LYS:O	1:A:215:ARG:NH2	2.36	0.56
1:A:548:GLU:O	1:A:551:LYS:HE2	2.07	0.55
1:A:314:THR:O	1:A:551:LYS:HE3	2.07	0.55
1:A:218:PHE:CE1	1:A:276:ILE:HD11	2.42	0.55
1:A:268:GLN:H	1:A:274:ASN:ND2	2.05	0.55
1:A:387:GLU:OE2	1:A:388:ARG:NH2	2.39	0.55
1:A:302:GLN:OE1	2:A:2021:EDO:C2	2.56	0.53
1:A:180:LYS:HG2	1:A:182:LEU:HD23	1.89	0.53
1:A:482:THR:HG21	1:A:487:ALA:HB2	1.91	0.53
1:A:234:ASP:HA	1:A:258:GLN:HG3	1.89	0.53
1:A:335:SER:O	1:A:380:LEU:N	2.30	0.52
1:A:964:LEU:O	1:A:975:GLN:HA	2.10	0.52
1:A:602:ARG:HH22	2:A:1995:EDO:H12	1.75	0.51
1:A:226:LYS:O	1:A:306:LYS:HE3	2.11	0.51
1:A:256:TYR:HB2	1:A:486:PRO:HD2	1.93	0.51
1:A:224:ASP:HA	1:A:227:LYS:HD2	1.93	0.50
1:A:153:ASP:OD1	1:A:155:ASN:HB2	2.10	0.50
1:A:194:PHE:CZ	1:A:729:LYS:HD3	2.46	0.50
1:A:161:LYS:NZ	1:A:178:THR:CG2	2.75	0.50
1:A:184:LEU:HB3	1:A:185:PRO:HA	1.94	0.49
1:A:709:THR:HG22	1:A:734:GLY:HA2	1.95	0.49
1:A:170:ILE:HG21	1:A:246:GLY:HA2	1.89	0.48
1:A:768:TRP:CE3	1:A:768:TRP:HA	2.48	0.48
1:A:245:ASN:HD21	1:A:274:ASN:HD22	1.61	0.48

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:263:ILE:HD12	1:A:267:LEU:HD21	1.96	0.48
1:A:433:GLU:OE1	4:A:3203:HOH:O	2.20	0.47
1:A:234:ASP:HB2	1:A:297:ARG:HB3	1.97	0.47
1:A:396:ASN:HB2	2:A:2005:EDO:H12	1.97	0.47
2:A:2021:EDO:O2	4:A:3009:HOH:O	2.21	0.47
1:A:891:TYR:CZ	1:A:949:GLY:HA3	2.50	0.47
1:A:321:LEU:O	1:A:325:GLN:HB3	2.14	0.46
1:A:667:ASN:HB3	1:A:719:PRO:HB2	1.98	0.46
1:A:335:SER:O	1:A:379:SER:HA	2.16	0.46
1:A:748:LEU:C	1:A:748:LEU:HD23	2.36	0.46
1:A:211:GLU:HG2	1:A:281:VAL:HG22	1.99	0.45
1:A:475:MET:HE1	1:A:477:VAL:CG2	2.46	0.45
1:A:650:THR:OG1	1:A:675:GLN:NE2	2.49	0.45
1:A:268:GLN:H	1:A:274:ASN:HD21	1.65	0.45
1:A:425:ARG:NH1	1:A:554:PRO:O	2.46	0.45
1:A:651:ARG:HG3	1:A:743:LYS:HD2	1.99	0.44
1:A:252:TYR:CD2	1:A:259:PHE:CD1	3.05	0.44
1:A:218:PHE:CE1	1:A:276:ILE:CD1	3.00	0.44
1:A:870:VAL:O	1:A:974:ASN:HB2	2.18	0.44
1:A:370:ARG:NH1	1:A:378:THR:OG1	2.50	0.44
1:A:551:LYS:O	1:A:592:ARG:NH1	2.49	0.44
1:A:814:LYS:HB3	1:A:814:LYS:HE3	1.80	0.44
1:A:937:ASP:OD1	1:A:939:SER:HB2	2.16	0.43
1:A:473:LYS:NZ	1:A:499:GLY:O	2.49	0.43
1:A:847:ILE:CD1	1:A:858:ARG:NH1	2.81	0.43
1:A:815:GLN:H	2:A:2010:EDO:H22	1.83	0.43
1:A:170:ILE:HG23	1:A:246:GLY:HA2	1.96	0.43
1:A:445:HIS:HB3	1:A:753:TRP:CE3	2.54	0.43
1:A:599:ASP:O	1:A:602:ARG:HG2	2.18	0.43
1:A:452:ASP:CB	4:A:3103:HOH:O	2.55	0.42
1:A:465:GLU:HA	1:A:465:GLU:OE1	2.18	0.42
1:A:161:LYS:NZ	1:A:178:THR:HG21	2.33	0.42
1:A:231:LEU:O	1:A:260:SER:HA	2.20	0.42
1:A:846:ALA:O	1:A:858:ARG:HA	2.19	0.42
1:A:483:THR:HA	1:A:484:HIS:HA	1.77	0.41
1:A:156:GLN:O	1:A:216:LYS:HE3	2.19	0.41
1:A:453:HIS:NE2	1:A:460:GLU:OE1	2.42	0.41
1:A:429:TRP:HA	1:A:434:GLY:O	2.20	0.41
1:A:762:VAL:HA	1:A:791:TYR:O	2.20	0.41
1:A:410:ARG:CG	1:A:415:VAL:HG11	2.50	0.41
1:A:677:ASP:OD2	2:A:2004:EDO:H21	2.21	0.41

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:161:LYS:NZ	1:A:178:THR:HG23	2.34	0.41
1:A:200:ALA:O	1:A:201:GLN:HB2	2.20	0.41
1:A:844:LEU:HB2	1:A:861:ILE:HG12	2.03	0.41
1:A:479:SER:HA	1:A:501:LEU:O	2.22	0.40
1:A:553:ASN:HA	1:A:554:PRO:HD2	1.88	0.40
1:A:161:LYS:HZ2	1:A:178:THR:CG2	2.33	0.40
1:A:456:LEU:HD23	1:A:456:LEU:HA	1.97	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	851/849 (100%)	835 (98%)	13 (2%)	3 (0%)	34 60

All (3) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	452	ASP
1	A	647	SER
1	A	766	PRO

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	711/715 (99%)	696 (98%)	15 (2%)	53 80

All (15) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	156	GLN
1	A	188	TRP
1	A	268	GLN
1	A	286	SER
1	A	407	ARG
1	A	410	ARG
1	A	425	ARG
1	A	467	ARG
1	A	651	ARG
1	A	709	THR
1	A	729	LYS
1	A	782	SER
1	A	817	SER
1	A	886	LEU
1	A	903	THR

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

Mol	Chain	Res	Type
1	A	201	GLN
1	A	274	ASN
1	A	503	GLN
1	A	623	ASN
1	A	675	GLN
1	A	752	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)

44 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	EDO	A	2011	-	3,3,3	0.42	0	2,2,2	0.70	0
2	EDO	A	1995	-	3,3,3	0.54	0	2,2,2	0.15	0
2	EDO	A	1998	-	3,3,3	0.47	0	2,2,2	0.47	0
3	SO4	A	2027	-	4,4,4	0.57	0	6,6,6	0.81	0
2	EDO	A	2007	-	3,3,3	0.66	0	2,2,2	0.30	0
2	EDO	A	1989	-	3,3,3	0.56	0	2,2,2	0.07	0
2	EDO	A	1991	-	3,3,3	0.31	0	2,2,2	0.67	0
2	EDO	A	1996	-	3,3,3	0.57	0	2,2,2	0.43	0
2	EDO	A	1999	-	3,3,3	0.65	0	2,2,2	0.31	0
3	SO4	A	2026	-	4,4,4	0.50	0	6,6,6	0.53	0
2	EDO	A	1988	-	3,3,3	0.91	0	2,2,2	0.52	0
2	EDO	A	2005	-	3,3,3	0.69	0	2,2,2	0.29	0
2	EDO	A	2019	-	3,3,3	0.58	0	2,2,2	0.58	0
2	EDO	A	2016	-	3,3,3	0.43	0	2,2,2	0.66	0
2	EDO	A	2008	-	3,3,3	0.78	0	2,2,2	0.06	0
3	SO4	A	2025	-	4,4,4	0.35	0	6,6,6	0.75	0
2	EDO	A	2028	-	3,3,3	0.72	0	2,2,2	0.11	0
2	EDO	A	2012	-	3,3,3	0.64	0	2,2,2	0.67	0
2	EDO	A	1990	-	3,3,3	0.90	0	2,2,2	0.26	0
2	EDO	A	2018	-	3,3,3	0.32	0	2,2,2	1.06	0
2	EDO	A	2021	-	3,3,3	0.62	0	2,2,2	0.13	0
3	SO4	A	2024	-	4,4,4	0.47	0	6,6,6	0.37	0
2	EDO	A	1985	-	3,3,3	0.38	0	2,2,2	0.49	0
2	EDO	A	1997	-	3,3,3	0.33	0	2,2,2	0.49	0
2	EDO	A	2002	-	3,3,3	0.81	0	2,2,2	0.34	0
2	EDO	A	2006	-	3,3,3	0.60	0	2,2,2	0.37	0
2	EDO	A	2009	-	3,3,3	0.55	0	2,2,2	0.68	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\#\|Z\| > 2$	Counts	RMSZ	$\#\|Z\| > 2$
2	EDO	A	1994	-	3,3,3	0.91	0	2,2,2	0.39	0
2	EDO	A	1992	-	3,3,3	0.56	0	2,2,2	0.29	0
2	EDO	A	2015	-	3,3,3	0.79	0	2,2,2	0.09	0
2	EDO	A	2020	-	3,3,3	0.74	0	2,2,2	0.23	0
3	SO4	A	2023	-	4,4,4	0.29	0	6,6,6	0.38	0
2	EDO	A	1986	-	3,3,3	0.71	0	2,2,2	0.10	0
2	EDO	A	2003	-	3,3,3	0.65	0	2,2,2	0.25	0
2	EDO	A	2017	-	3,3,3	0.42	0	2,2,2	0.59	0
2	EDO	A	2004	-	3,3,3	0.66	0	2,2,2	0.42	0
2	EDO	A	1987	-	3,3,3	0.58	0	2,2,2	0.58	0
2	EDO	A	2000	-	3,3,3	0.57	0	2,2,2	0.38	0
2	EDO	A	2001	-	3,3,3	0.50	0	2,2,2	0.32	0
2	EDO	A	1993	-	3,3,3	0.35	0	2,2,2	0.25	0
2	EDO	A	2013	-	3,3,3	0.49	0	2,2,2	0.84	0
2	EDO	A	2022	-	3,3,3	0.68	0	2,2,2	0.35	0
2	EDO	A	2014	-	3,3,3	0.48	0	2,2,2	0.52	0
2	EDO	A	2010	-	3,3,3	0.42	0	2,2,2	0.61	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	EDO	A	2011	-	-	1/1/1/1	-
2	EDO	A	1995	-	-	0/1/1/1	-
2	EDO	A	1998	-	-	1/1/1/1	-
2	EDO	A	2007	-	-	1/1/1/1	-
2	EDO	A	1989	-	-	1/1/1/1	-
2	EDO	A	1991	-	-	1/1/1/1	-
2	EDO	A	1996	-	-	1/1/1/1	-
2	EDO	A	1999	-	-	1/1/1/1	-
2	EDO	A	1988	-	-	0/1/1/1	-
2	EDO	A	2005	-	-	1/1/1/1	-
2	EDO	A	2019	-	-	1/1/1/1	-
2	EDO	A	2016	-	-	1/1/1/1	-
2	EDO	A	2008	-	-	0/1/1/1	-
2	EDO	A	2028	-	-	1/1/1/1	-
2	EDO	A	2012	-	-	1/1/1/1	-
2	EDO	A	1990	-	-	1/1/1/1	-
2	EDO	A	2018	-	-	1/1/1/1	-
2	EDO	A	2021	-	-	1/1/1/1	-
2	EDO	A	1985	-	-	1/1/1/1	-

Continued on next page...

Continued from previous page...

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	EDO	A	1997	-	-	1/1/1/1	-
2	EDO	A	2002	-	-	1/1/1/1	-
2	EDO	A	2006	-	-	0/1/1/1	-
2	EDO	A	2009	-	-	1/1/1/1	-
2	EDO	A	1994	-	-	0/1/1/1	-
2	EDO	A	1992	-	-	1/1/1/1	-
2	EDO	A	2015	-	-	1/1/1/1	-
2	EDO	A	2020	-	-	1/1/1/1	-
2	EDO	A	1986	-	-	0/1/1/1	-
2	EDO	A	2003	-	-	1/1/1/1	-
2	EDO	A	2017	-	-	1/1/1/1	-
2	EDO	A	2004	-	-	0/1/1/1	-
2	EDO	A	1987	-	-	1/1/1/1	-
2	EDO	A	2000	-	-	0/1/1/1	-
2	EDO	A	2001	-	-	1/1/1/1	-
2	EDO	A	1993	-	-	1/1/1/1	-
2	EDO	A	2013	-	-	0/1/1/1	-
2	EDO	A	2022	-	-	1/1/1/1	-
2	EDO	A	2014	-	-	0/1/1/1	-
2	EDO	A	2010	-	-	0/1/1/1	-

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

All (28) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	A	1999	EDO	O1-C1-C2-O2
2	A	1989	EDO	O1-C1-C2-O2
2	A	2015	EDO	O1-C1-C2-O2
2	A	2017	EDO	O1-C1-C2-O2
2	A	2018	EDO	O1-C1-C2-O2
2	A	1993	EDO	O1-C1-C2-O2
2	A	1996	EDO	O1-C1-C2-O2
2	A	2001	EDO	O1-C1-C2-O2
2	A	2003	EDO	O1-C1-C2-O2
2	A	2005	EDO	O1-C1-C2-O2
2	A	2011	EDO	O1-C1-C2-O2
2	A	2016	EDO	O1-C1-C2-O2
2	A	2022	EDO	O1-C1-C2-O2
2	A	2007	EDO	O1-C1-C2-O2

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	Atoms
2	A	2028	EDO	O1-C1-C2-O2
2	A	1985	EDO	O1-C1-C2-O2
2	A	1987	EDO	O1-C1-C2-O2
2	A	1990	EDO	O1-C1-C2-O2
2	A	1998	EDO	O1-C1-C2-O2
2	A	2002	EDO	O1-C1-C2-O2
2	A	2012	EDO	O1-C1-C2-O2
2	A	2009	EDO	O1-C1-C2-O2
2	A	1992	EDO	O1-C1-C2-O2
2	A	2019	EDO	O1-C1-C2-O2
2	A	1997	EDO	O1-C1-C2-O2
2	A	2020	EDO	O1-C1-C2-O2
2	A	1991	EDO	O1-C1-C2-O2
2	A	2021	EDO	O1-C1-C2-O2

There are no ring outliers.

10 monomers are involved in 15 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	A	1995	EDO	1	0
2	A	1991	EDO	1	0
2	A	1988	EDO	1	0
2	A	2005	EDO	1	0
3	A	2025	SO4	1	0
2	A	2018	EDO	1	0
2	A	2021	EDO	4	0
3	A	2024	SO4	1	0
2	A	2004	EDO	3	0
2	A	2010	EDO	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	847/849 (99%)	-0.62	8 (0%) 84 85	14, 22, 41, 73	4 (0%)

All (8) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	817	SER	2.9
1	A	177	SER	2.6
1	A	272	ARG	2.5
1	A	357	GLY	2.4
1	A	138	VAL	2.2
1	A	222	GLU	2.1
1	A	984	GLU	2.1
1	A	853	GLY	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 monosaccharides 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(Å^2)	Q<0.9
2	EDO	A	2005	4/4	0.78	0.32	41,43,43,44	0
2	EDO	A	2028	4/4	0.78	0.38	47,49,49,50	0
2	EDO	A	2007	4/4	0.82	0.46	44,45,46,46	0
2	EDO	A	2012	4/4	0.83	0.25	33,33,35,35	0
2	EDO	A	1988	4/4	0.83	0.23	29,34,34,38	0
2	EDO	A	2019	4/4	0.86	0.25	27,28,29,30	0
2	EDO	A	2013	4/4	0.86	0.21	28,28,30,31	0
2	EDO	A	1994	4/4	0.87	0.19	26,27,28,28	0
2	EDO	A	2010	4/4	0.87	0.23	29,30,32,34	0
2	EDO	A	1986	4/4	0.87	0.13	31,33,33,34	0
2	EDO	A	1987	4/4	0.88	0.24	39,39,42,44	0
2	EDO	A	2021	4/4	0.88	0.36	27,27,27,27	0
2	EDO	A	1990	4/4	0.88	0.27	33,36,37,38	0
2	EDO	A	2009	4/4	0.89	0.19	29,29,29,30	0
2	EDO	A	2015	4/4	0.89	0.41	32,32,33,33	0
2	EDO	A	2016	4/4	0.89	0.22	29,29,30,30	0
2	EDO	A	1991	4/4	0.90	0.19	36,37,37,38	0
2	EDO	A	2001	4/4	0.90	0.20	39,41,41,42	0
2	EDO	A	2008	4/4	0.90	0.37	35,36,36,36	0
2	EDO	A	2011	4/4	0.91	0.20	27,27,28,28	0
2	EDO	A	1989	4/4	0.91	0.26	32,34,35,35	0
2	EDO	A	2006	4/4	0.91	0.27	39,39,39,40	0
2	EDO	A	2022	4/4	0.91	0.46	27,27,27,28	0
2	EDO	A	2004	4/4	0.91	0.25	29,30,31,33	0
2	EDO	A	1996	4/4	0.92	0.24	37,40,40,41	0
2	EDO	A	1995	4/4	0.92	0.14	28,29,30,30	0
2	EDO	A	1992	4/4	0.93	0.34	33,33,34,35	0
2	EDO	A	2020	4/4	0.93	0.25	27,28,29,31	0
2	EDO	A	2002	4/4	0.93	0.23	34,37,37,37	0
2	EDO	A	2003	4/4	0.93	0.18	42,42,42,43	0
2	EDO	A	2018	4/4	0.93	0.12	27,27,27,28	0
2	EDO	A	1998	4/4	0.94	0.15	30,31,32,35	0
3	SO4	A	2027	5/5	0.94	0.27	44,45,51,51	0
2	EDO	A	1993	4/4	0.95	0.26	22,22,22,23	0
2	EDO	A	1999	4/4	0.95	0.27	35,39,40,43	0
2	EDO	A	2017	4/4	0.95	0.13	26,26,26,27	0
2	EDO	A	1985	4/4	0.95	0.12	23,23,23,25	0
2	EDO	A	2014	4/4	0.95	0.35	31,32,32,32	0
2	EDO	A	1997	4/4	0.96	0.13	34,34,35,36	0
3	SO4	A	2024	5/5	0.96	0.26	37,40,41,42	0
3	SO4	A	2026	5/5	0.96	0.25	36,40,42,43	0
2	EDO	A	2000	4/4	0.96	0.23	32,32,32,32	0
3	SO4	A	2025	5/5	0.97	0.23	37,39,40,44	0

Continued on next page...

Continued from previous page...

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å^2)	Q<0.9
3	SO4	A	2023	5/5	0.99	0.09	24,25,26,27	0

6.5 Other polymers (i)

There are no such residues in this entry.