Full wwPDB X-ray Structure Validation Report ⓘ

Oct 7, 2023 – 10:58 AM EDT

PDB ID	:	4OEI
Title	:	Crystal structure of plant lectin from Cicer arietinum at 2.6 angstrom resolution
Authors	:	Kumar, S.; Dube, D.; Bhushan, A.; Dey, S.; Sharma, S.; Singh, T.P.
Deposited on	:	2014-01-13
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*
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:

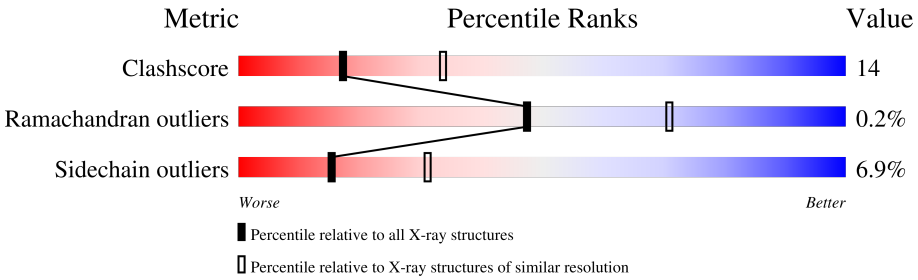
MolProbity	:	4.02b-467
Mogul	:	1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	FAILED
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.35.1

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 2.60 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 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%

Note EDS failed to run properly.

Mol	Chain	Length	Quality of chain
1	A	224	69% 25% 5%
1	B	224	79% 18% •

2 Entry composition

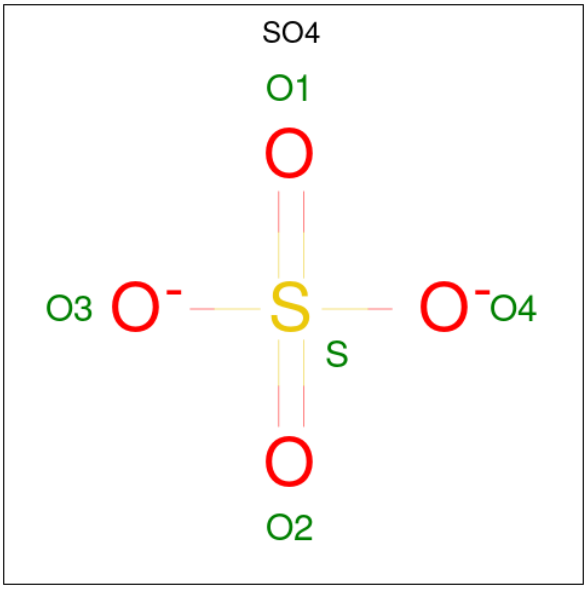
There are 4 unique types of molecules in this entry. The entry contains 3835 atoms, of which 0 are hydrogens and 0 are deuteriums.

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 Lectin.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	224	Total	C	N	O	S	0	0	0
			1796	1162	291	337	6			
1	B	224	Total	C	N	O	S	0	0	0
			1796	1162	291	337	6			

- Molecule 2 is SULFATE ION (three-letter code: SO4) (formula: O_4S).



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

- Molecule 3 is MAGNESIUM ION (three-letter code: MG) (formula: Mg).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	A	1	Total Mg 1 1	0	0
3	B	1	Total Mg 1 1	0	0

- Molecule 4 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	A	114	Total O 114 114	0	0
4	B	117	Total O 117 117	0	0

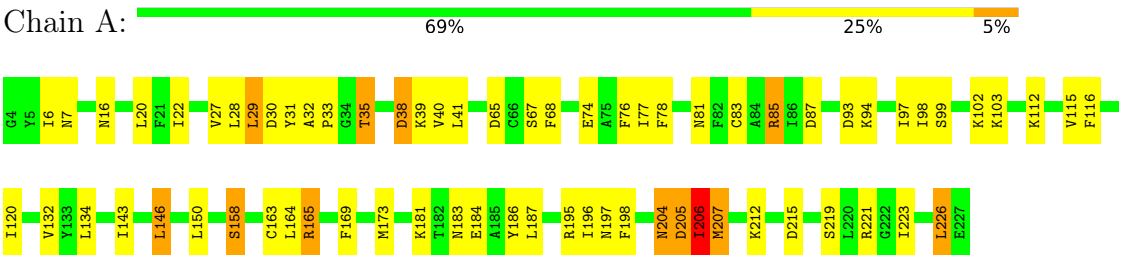
3 Residue-property plots (i)

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. 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 failed to run properly.

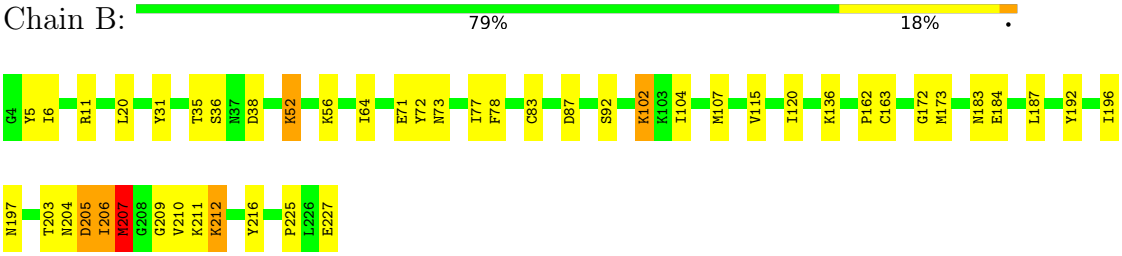
- Molecule 1: Lectin

Chain A:



- Molecule 1: Lectin

Chain B:



4 Data and refinement statistics (i)

EDS failed to run properly - this section is therefore incomplete.

Property	Value	Source
Space group	P 3	Depositor
Cell constants a, b, c, α, β, γ	80.60Å 80.60Å 69.20Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	40.30 – 2.60	Depositor
% Data completeness (in resolution range)	99.8 (40.30-2.60)	Depositor
R_{merge}	(Not available)	Depositor
R_{sym}	14.00	Depositor
$< I/\sigma(I) >$ [1]	2.21 (at 2.61Å)	Xtriage
Refinement program	CNS 1.2	Depositor
R, R_{free}	0.214 , 0.248	Depositor
Wilson B-factor (Å^2)	24.3	Xtriage
Anisotropy	0.118	Xtriage
L-test for twinning[2]	$< \|L\| > = 0.50$, $< L^2 > = 0.33$	Xtriage
Estimated twinning fraction	0.012 for -h,-k,l 0.046 for h,-h-k,-l 0.032 for -k,-h,-l	Xtriage
Total number of atoms	3835	wwPDB-VP
Average B, all atoms (Å^2)	23.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.35% 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

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: MG, 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	0.58	3/1844 (0.2%)	0.80	3/2487 (0.1%)
1	B	0.60	3/1844 (0.2%)	0.80	1/2487 (0.0%)
All	All	0.59	6/3688 (0.2%)	0.80	4/4974 (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	2
1	B	0	1
All	All	0	3

All (6) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	31	TYR	CD1-CE1	-7.51	1.28	1.39
1	B	31	TYR	CD1-CE1	-5.52	1.31	1.39
1	A	31	TYR	CD2-CE2	-5.37	1.31	1.39
1	B	31	TYR	CE1-CZ	-5.32	1.31	1.38
1	B	31	TYR	CD2-CE2	-5.13	1.31	1.39
1	A	31	TYR	CE1-CZ	-5.06	1.31	1.38

All (4) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	A	206	ILE	CB-CA-C	-9.01	93.59	111.60
1	A	94	LYS	N-CA-C	5.55	125.99	111.00
1	A	29	LEU	CB-CG-CD1	-5.23	102.11	111.00

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Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	B	87	ASP	N-CA-C	-5.04	97.40	111.00

There are no chirality outliers.

All (3) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	204	ASN	Peptide
1	A	206	ILE	Peptide
1	B	207	MET	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	1796	0	1735	61	0
1	B	1796	0	1735	38	0
2	A	5	0	0	0	0
2	B	5	0	0	0	0
3	A	1	0	0	0	0
3	B	1	0	0	0	0
4	A	114	0	0	5	0
4	B	117	0	0	0	0
All	All	3835	0	3470	98	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 14.

All (98) 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:B:206:ILE:HG13	1:B:207:MET:HA	1.13	1.13
1:A:205:ASP:HB3	1:A:206:ILE:HD12	1.34	1.07
1:A:205:ASP:OD2	1:A:206:ILE:HD12	1.57	1.03
1:A:32:ALA:HB1	1:A:35:THR:HG23	1.39	1.02
1:A:205:ASP:CB	1:A:206:ILE:HD12	1.90	1.01

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:163:CYS:HB3	1:A:205:ASP:HA	1.40	1.00
1:A:205:ASP:HB3	1:A:206:ILE:CD1	1.91	1.00
1:B:163:CYS:HB3	1:B:205:ASP:HB3	1.45	0.96
1:B:206:ILE:CG1	1:B:207:MET:HA	1.94	0.96
1:A:205:ASP:CG	1:A:206:ILE:HD12	1.96	0.86
1:B:104:ILE:HD13	1:B:120:ILE:CD1	2.07	0.84
1:A:205:ASP:OD2	1:A:206:ILE:CD1	2.30	0.80
1:B:209:GLY:O	1:B:211:LYS:HG3	1.82	0.78
1:B:104:ILE:HD13	1:B:120:ILE:HD12	1.65	0.77
1:B:184:GLU:HA	1:B:196:ILE:O	1.87	0.75
1:B:35:THR:HG22	1:B:36:SER:H	1.51	0.74
1:A:204:ASN:HB3	1:A:205:ASP:O	1.88	0.73
1:B:173:MET:HE1	1:B:187:LEU:HD22	1.71	0.71
1:A:206:ILE:HG23	1:A:207:MET:CA	2.21	0.70
1:B:183:ASN:O	1:B:197:ASN:HA	1.95	0.66
1:B:206:ILE:HG13	1:B:207:MET:CA	2.08	0.64
1:B:211:LYS:HD3	1:B:216:TYR:CZ	2.34	0.62
1:A:68:PHE:CE1	1:A:132:VAL:HG21	2.35	0.62
1:A:6:ILE:HD13	1:A:20:LEU:HD13	1.82	0.61
1:B:173:MET:CE	1:B:187:LEU:HD22	2.31	0.60
1:A:195:ARG:O	1:A:207:MET:HB3	2.02	0.59
1:B:211:LYS:HD3	1:B:216:TYR:CE2	2.37	0.59
1:A:7:ASN:HD21	1:A:65:ASP:HB2	1.69	0.58
1:A:186:TYR:CE1	1:A:195:ARG:HG3	2.39	0.58
1:A:184:GLU:HA	1:A:196:ILE:O	2.05	0.57
1:B:209:GLY:O	1:B:211:LYS:CG	2.53	0.56
1:B:115:VAL:HG12	1:B:136:LYS:HG2	1.86	0.56
1:B:206:ILE:HG12	1:B:207:MET:HG3	1.86	0.56
1:B:64:ILE:HG12	1:B:77:ILE:HB	1.88	0.55
1:A:163:CYS:CB	1:A:205:ASP:HA	2.27	0.55
1:B:104:ILE:HD13	1:B:120:ILE:HD11	1.88	0.54
1:A:206:ILE:HG23	1:A:207:MET:HA	1.88	0.54
1:A:7:ASN:ND2	1:A:65:ASP:CB	2.71	0.53
1:A:74:GLU:OE1	1:A:85:ARG:NH1	2.40	0.53
1:B:35:THR:HG22	1:B:36:SER:N	2.22	0.53
1:A:67:SER:HB2	1:A:76:PHE:O	2.09	0.53
1:B:162:PRO:HD2	1:B:205:ASP:OD1	2.09	0.52
1:A:87:ASP:HB2	1:A:98:ILE:HD11	1.91	0.52
1:B:6:ILE:HD13	1:B:20:LEU:HD13	1.92	0.51
1:A:78:PHE:CD1	1:A:83:CYS:HB3	2.46	0.50
1:B:104:ILE:CD1	1:B:120:ILE:HD12	2.38	0.50

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:183:ASN:HB3	1:A:198:PHE:O	2.10	0.50
1:A:146:LEU:HD23	4:A:481:HOH:O	2.12	0.50
1:A:74:GLU:HG2	1:A:98:ILE:CD1	2.42	0.49
1:A:7:ASN:ND2	1:A:65:ASP:HB2	2.27	0.49
1:A:22:ILE:HG21	1:A:226:LEU:HB2	1.95	0.49
1:A:195:ARG:HD2	1:A:207:MET:SD	2.53	0.49
1:A:204:ASN:HA	4:A:447:HOH:O	2.12	0.48
1:A:38:ASP:O	1:A:219:SER:HB3	2.14	0.48
1:A:40:VAL:HG23	1:A:219:SER:HB2	1.95	0.48
1:A:206:ILE:HG23	1:A:207:MET:N	2.00	0.48
1:A:116:PHE:HD2	1:A:120:ILE:HG12	1.79	0.48
1:A:103:LYS:HB3	4:A:411:HOH:O	2.13	0.48
1:A:112:LYS:NZ	1:A:112:LYS:HB3	2.29	0.47
1:B:162:PRO:HG2	1:B:203:THR:HG22	1.96	0.47
1:A:97:ILE:HD12	1:B:56:LYS:HB3	1.97	0.47
1:B:197:ASN:HB3	1:B:206:ILE:CG2	2.45	0.47
1:A:206:ILE:O	1:A:206:ILE:CG2	2.42	0.47
1:B:78:PHE:CD1	1:B:83:CYS:HB3	2.50	0.46
1:A:183:ASN:O	1:A:197:ASN:HA	2.15	0.46
1:A:143:ILE:HG22	1:A:150:LEU:HD12	1.98	0.46
1:A:221:ARG:HG2	4:A:486:HOH:O	2.15	0.46
1:B:209:GLY:O	1:B:210:VAL:C	2.53	0.46
1:B:162:PRO:CG	1:B:203:THR:HG22	2.46	0.45
1:A:67:SER:HB3	1:A:77:ILE:HA	1.99	0.45
1:A:7:ASN:ND2	1:A:65:ASP:HA	2.32	0.45
1:A:206:ILE:O	1:A:206:ILE:HG22	2.18	0.44
1:A:115:VAL:O	1:A:115:VAL:HG22	2.17	0.44
1:A:27:VAL:HG11	1:A:223:ILE:HD13	2.00	0.44
1:A:173:MET:SD	1:A:187:LEU:HD22	2.57	0.44
1:A:205:ASP:HB3	1:A:206:ILE:HD13	1.89	0.44
1:A:30:ASP:OD1	1:A:30:ASP:C	2.56	0.43
1:A:205:ASP:HB3	1:A:206:ILE:HB	1.99	0.43
1:B:211:LYS:HD3	1:B:216:TYR:CE1	2.53	0.43
1:A:39:LYS:HA	1:A:219:SER:HB3	2.00	0.43
1:A:16:ASN:O	1:A:30:ASP:HA	2.19	0.43
1:B:102:LYS:HD2	1:B:107:MET:SD	2.59	0.43
1:B:5:TYR:CE2	1:B:225:PRO:HG3	2.54	0.42
1:B:192:TYR:HE1	1:B:212:LYS:HG2	1.83	0.42
1:A:212:LYS:O	1:A:215:ASP:HB2	2.19	0.42
1:B:72:TYR:HB3	1:B:73:ASN:H	1.69	0.42
1:A:81:ASN:ND2	4:A:514:HOH:O	2.52	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:223:ILE:O	1:A:226:LEU:HD12	2.20	0.41
1:B:115:VAL:HG12	1:B:136:LYS:CG	2.50	0.41
1:A:33:PRO:CG	1:A:181:LYS:HE3	2.51	0.41
1:B:172:GLY:C	1:B:173:MET:HG3	2.40	0.41
1:A:197:ASN:N	1:A:206:ILE:O	2.48	0.41
1:A:28:LEU:HG	1:A:41:LEU:HB2	2.03	0.41
1:A:134:LEU:HD12	1:A:134:LEU:N	2.36	0.41
1:B:192:TYR:CE1	1:B:212:LYS:HG2	2.55	0.41
1:B:52:LYS:HA	1:B:52:LYS:HD2	1.70	0.40
1:A:158:SER:HB3	1:A:165:ARG:HG3	2.03	0.40
1:A:164:LEU:HD22	1:A:169:PHE:HB2	2.02	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	222/224 (99%)	207 (93%)	14 (6%)	1 (0%)	29 52
1	B	222/224 (99%)	200 (90%)	22 (10%)	0	100 100
All	All	444/448 (99%)	407 (92%)	36 (8%)	1 (0%)	47 71

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	206	ILE

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	188/188 (100%)	174 (93%)	14 (7%)	13 28
1	B	188/188 (100%)	176 (94%)	12 (6%)	17 35
All	All	376/376 (100%)	350 (93%)	26 (7%)	15 31

All (26) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	29	LEU
1	A	35	THR
1	A	38	ASP
1	A	85	ARG
1	A	93	ASP
1	A	99	SER
1	A	102	LYS
1	A	146	LEU
1	A	158	SER
1	A	165	ARG
1	A	205	ASP
1	A	206	ILE
1	A	207	MET
1	A	226	LEU
1	B	11	ARG
1	B	38	ASP
1	B	52	LYS
1	B	71	GLU
1	B	92	SER
1	B	102	LYS
1	B	204	ASN
1	B	205	ASP
1	B	206	ILE
1	B	207	MET
1	B	212	LYS
1	B	227	GLU

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	197	ASN

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Mol	Chain	Res	Type
1	B	16	ASN
1	B	23	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

There are no monosaccharides in this entry.

5.6 Ligand geometry

Of 4 ligands modelled in this entry, 2 are monoatomic - leaving 2 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	SO4	A	301	-	4,4,4	0.23	0	6,6,6	0.08	0
2	SO4	B	301	-	4,4,4	0.31	0	6,6,6	0.15	0

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no torsion outliers.

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

6.1 Protein, DNA and RNA chains

EDS failed to run properly - this section is therefore empty.

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

EDS failed to run properly - this section is therefore empty.

6.3 Carbohydrates

EDS failed to run properly - this section is therefore empty.

6.4 Ligands

EDS failed to run properly - this section is therefore empty.

6.5 Other polymers

EDS failed to run properly - this section is therefore empty.