Full wwPDB X-ray Structure Validation Report (i)

Jun 12, 2024 – 05:10 PM EDT

PDB ID	:	1JW0
Title	:	Structure of cephalosporin acylase in complex with glutarate
Authors	:	Kim, Y.; Hol, W.G.J.
Deposited on	:	2001-09-01
Resolution	:	2.50 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:

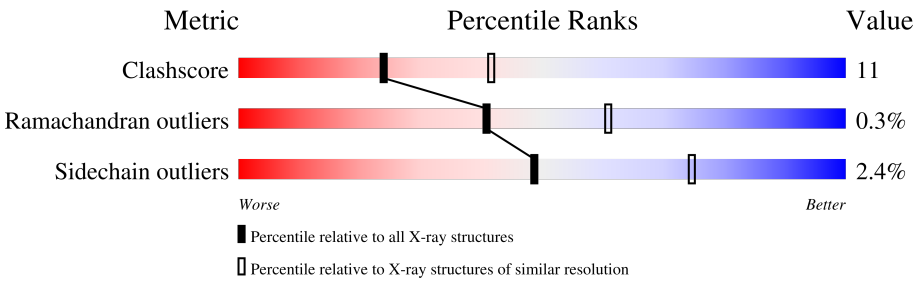
MolProbity	:	4.02b-467
Mogul	:	1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix)	:	NOT EXECUTED
EDS	:	NOT EXECUTED
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.36.2

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 2.50 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	5346 (2.50-2.50)
Ramachandran outliers	138981	5231 (2.50-2.50)
Sidechain outliers	138945	5233 (2.50-2.50)

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 was not executed.

Mol	Chain	Length	Quality of chain
1	A	158	82% 15% •
2	B	520	78% 21% •

2 Entry composition (i)

There are 4 unique types of molecules in this entry. The entry contains 5724 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 cephalosporin acylase alpha chain.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	Se			
1	A	152	1194	760	211	222	1	0	0	0

There is a discrepancy between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	145	MSE	MET	MODIFIED RESIDUE	UNP Q9L5D6

- Molecule 2 is a protein called cephalosporin acylase beta chain.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
			Total	C	N	O	S	Se			
2	B	520	4105	2590	729	773	1	12	0	0	0

There are 16 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	233	MSE	MET	MODIFIED RESIDUE	UNP Q9L5D6
B	242	MSE	MET	MODIFIED RESIDUE	UNP Q9L5D6
B	318	MSE	MET	MODIFIED RESIDUE	UNP Q9L5D6
B	325	MSE	MET	MODIFIED RESIDUE	UNP Q9L5D6
B	338	MSE	MET	MODIFIED RESIDUE	UNP Q9L5D6
B	341	MSE	MET	MODIFIED RESIDUE	UNP Q9L5D6
B	426	CYS	THR	SEE REMARK 999	UNP Q9L5D6
B	428	ALA	ARG	SEE REMARK 999	UNP Q9L5D6
B	429	ASN	ASP	SEE REMARK 999	UNP Q9L5D6
B	451	MSE	MET	MODIFIED RESIDUE	UNP Q9L5D6
B	463	MSE	MET	MODIFIED RESIDUE	UNP Q9L5D6
B	473	MSE	MET	MODIFIED RESIDUE	UNP Q9L5D6
B	506	ASP	GLU	SEE REMARK 999	UNP Q9L5D6
B	585	MSE	MET	MODIFIED RESIDUE	UNP Q9L5D6
B	629	MSE	MET	MODIFIED RESIDUE	UNP Q9L5D6

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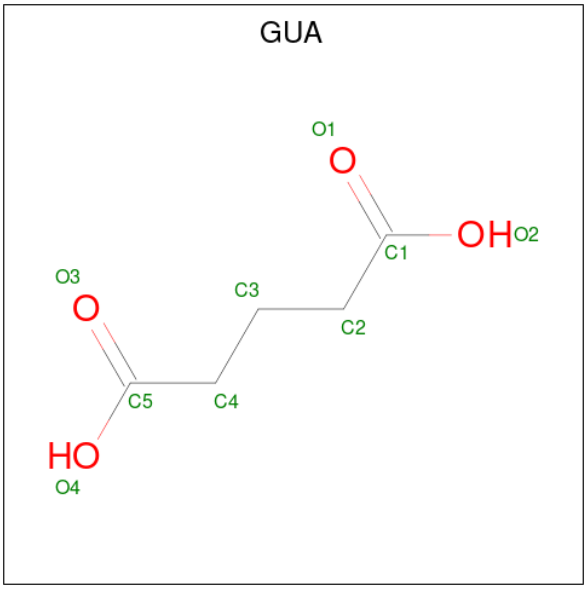
Chain	Residue	Modelled	Actual	Comment	Reference
B	642	MSE	MET	MODIFIED RESIDUE	UNP Q9L5D6

- Molecule 3 is GLUTARIC ACID (three-letter code: GUA) (formula: $C_5H_8O_4$).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
			Total	C	O		
3	B	1	9	5	4	0	0

- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	O		
4	A	106	106	106	0	0
4	B	310	310	310	0	0

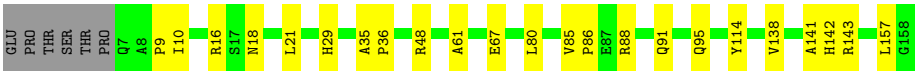
3 Residue-property plots (i)

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 was not executed.

• Molecule 1: cephalosporin acylase alpha chain

Chain A:



• Molecule 2: cephalosporin acylase beta chain

Chain B:

4 Data and refinement statistics (i)

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

Property	Value	Source
Space group	P 41 21 2	Depositor
Cell constants a, b, c, α, β, γ	73.71Å 73.71Å 381.21Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	20.00 – 2.50	Depositor
% Data completeness (in resolution range)	(Not available) (20.00-2.50)	Depositor
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
Refinement program	CNS	Depositor
R, R_{free}	0.188 , 0.231	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	5724	wwPDB-VP
Average B, all atoms ($Å^2$)	30.0	wwPDB-VP

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: GUA

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	0.33	0/1232	0.54	0/1683
2	B	0.50	2/4209 (0.0%)	0.62	1/5725 (0.0%)
All	All	0.47	2/5441 (0.0%)	0.60	1/7408 (0.0%)

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	404	PRO	N-CD	-16.27	1.25	1.47
2	B	404	PRO	N-CA	6.63	1.58	1.47

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	B	404	PRO	N-CA-CB	-6.25	95.72	102.60

There are no chirality outliers.

There are no planarity outliers.

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	1194	0	1114	28	0
2	B	4105	0	3917	100	0
3	B	9	0	0	1	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
4	A	106	0	0	5	0
4	B	310	0	0	6	0
All	All	5724	0	5031	115	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 11.

All (115) 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)
2:B:463:MSE:HG2	2:B:629:MSE:HG3	1.24	1.13
2:B:321:GLN:HE22	2:B:342:GLN:H	0.99	0.93
2:B:322:TYR:HA	2:B:325:MSE:HE3	1.50	0.91
2:B:321:GLN:NE2	2:B:342:GLN:H	1.72	0.86
2:B:317:GLY:H	2:B:342:GLN:HE21	1.23	0.85
2:B:473:MSE:HE1	2:B:535:PHE:HZ	1.52	0.75
2:B:473:MSE:HE1	2:B:535:PHE:CZ	2.22	0.74
2:B:262:GLN:HE21	2:B:262:GLN:HA	1.56	0.71
2:B:242:MSE:HE2	4:B:1178:HOH:O	1.90	0.71
1:A:16:ARG:HB2	1:A:16:ARG:NH1	2.07	0.70
1:A:88:ARG:HH11	1:A:142:HIS:HE2	1.39	0.69
2:B:242:MSE:HE3	2:B:242:MSE:HA	1.76	0.68
1:A:91:GLN:O	1:A:95:GLN:HG3	1.94	0.67
1:A:10:ILE:HD13	2:B:635:PRO:HB3	1.78	0.66
2:B:610:SER:HB3	2:B:621:VAL:HG23	1.79	0.65
2:B:321:GLN:HE22	2:B:342:GLN:N	1.84	0.64
2:B:524:PHE:CE1	2:B:534:ALA:HB1	2.34	0.62
2:B:203:TYR:O	2:B:217:ALA:HA	2.00	0.61
1:A:138:VAL:HA	4:A:240:HOH:O	2.00	0.60
2:B:317:GLY:H	2:B:342:GLN:NE2	1.95	0.60
1:A:35:ALA:HB3	1:A:36:PRO:HD3	1.83	0.60
2:B:240:ASN:HB3	2:B:347:ASN:ND2	2.16	0.59
1:A:29:HIS:ND1	2:B:206:HIS:HD2	2.01	0.57
2:B:321:GLN:O	2:B:325:MSE:HG3	2.04	0.57
2:B:192:HIS:HE1	2:B:624:GLU:OE1	1.88	0.57
2:B:174:ALA:HB3	2:B:409:VAL:HG22	1.85	0.56
2:B:398:LEU:O	2:B:400:ARG:HG3	2.05	0.56
1:A:86:PRO:HG2	4:A:232:HOH:O	2.05	0.56
2:B:317:GLY:N	2:B:342:GLN:HE21	1.99	0.55
2:B:554:PRO:O	2:B:558:VAL:HG23	2.06	0.55
1:A:157:LEU:O	2:B:300:ARG:HG2	2.06	0.55

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:373:ILE:O	2:B:377:GLN:HG3	2.07	0.55
2:B:412:SER:O	2:B:413:ASN:HB2	2.07	0.54
1:A:21:LEU:CD2	2:B:684:ARG:HG2	2.37	0.54
1:A:18:ASN:HB3	2:B:687:PHE:CZ	2.42	0.54
2:B:240:ASN:HD22	2:B:241:GLY:N	2.05	0.54
2:B:463:MSE:CG	2:B:629:MSE:HG3	2.17	0.54
2:B:345:THR:O	2:B:346:PHE:HB2	2.08	0.54
2:B:236:THR:HG22	2:B:349:VAL:HB	1.91	0.53
2:B:608:THR:OG1	2:B:622:HIS:HD2	1.91	0.53
2:B:431:PRO:HG2	2:B:434:LEU:HG	1.91	0.52
2:B:193:LEU:HD12	2:B:202:TYR:CZ	2.45	0.51
2:B:170:SER:N	2:B:192:HIS:CD2	2.78	0.51
2:B:321:GLN:HG2	2:B:325:MSE:HE2	1.93	0.51
2:B:606:VAL:O	2:B:624:GLU:HG2	2.11	0.51
2:B:262:GLN:HA	2:B:262:GLN:NE2	2.24	0.51
2:B:368:ARG:HD2	2:B:376:TRP:CE2	2.47	0.50
2:B:484:ALA:O	2:B:487:ILE:HG12	2.10	0.50
1:A:61:ALA:HB3	4:A:176:HOH:O	2.11	0.50
1:A:29:HIS:ND1	2:B:206:HIS:CD2	2.79	0.50
2:B:366:PRO:HB3	2:B:389:TRP:CD2	2.47	0.49
1:A:141:ALA:HB1	2:B:318:MSE:HE1	1.92	0.49
2:B:174:ALA:HB3	2:B:409:VAL:CG2	2.43	0.49
2:B:238:THR:OG1	2:B:347:ASN:HB2	2.13	0.48
1:A:141:ALA:HB1	2:B:318:MSE:CE	2.43	0.48
1:A:67:GLU:O	2:B:276:ARG:HB2	2.13	0.48
1:A:48:ARG:HA	1:A:114:TYR:CZ	2.48	0.47
2:B:192:HIS:CD2	4:B:1011:HOH:O	2.67	0.47
2:B:565:ILE:HG22	2:B:569:LYS:HE2	1.96	0.47
2:B:259:TYR:OH	2:B:385:SER:HA	2.14	0.47
2:B:242:MSE:SE	2:B:365:ALA:HB2	2.65	0.47
2:B:240:ASN:HB2	2:B:361:PHE:CE1	2.50	0.47
2:B:418:THR:O	2:B:418:THR:HG22	2.15	0.47
2:B:192:HIS:HB2	4:B:1304:HOH:O	2.15	0.46
2:B:321:GLN:NE2	2:B:342:GLN:HB2	2.29	0.46
2:B:321:GLN:NE2	2:B:342:GLN:N	2.53	0.46
2:B:322:TYR:CA	2:B:325:MSE:HE3	2.35	0.46
2:B:366:PRO:HD2	2:B:368:ARG:NH2	2.31	0.46
2:B:239:VAL:HG23	3:B:999:GUA:C4	2.51	0.45
1:A:138:VAL:HG22	4:A:240:HOH:O	2.16	0.45
1:A:88:ARG:NH1	1:A:142:HIS:HE2	2.11	0.45
2:B:170:SER:O	2:B:412:SER:HA	2.16	0.45

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:192:HIS:CE1	2:B:624:GLU:OE1	2.69	0.45
2:B:225:ILE:HG22	2:B:228:ALA:HB2	1.97	0.45
2:B:498:ARG:NH1	4:B:1052:HOH:O	2.43	0.45
2:B:399:PRO:O	2:B:400:ARG:HG2	2.17	0.45
2:B:192:HIS:HD2	4:B:1011:HOH:O	2.01	0.44
2:B:446:GLN:HG2	2:B:472:VAL:HG21	2.00	0.44
2:B:604:PHE:O	2:B:606:VAL:HG23	2.18	0.44
2:B:362:ASN:CG	2:B:363:GLY:N	2.71	0.44
2:B:549:TYR:CG	2:B:550:GLY:N	2.85	0.44
1:A:21:LEU:HD22	2:B:684:ARG:HG2	1.98	0.44
2:B:225:ILE:CG2	2:B:228:ALA:HB2	2.48	0.44
2:B:418:THR:N	2:B:419:PRO:CD	2.80	0.44
2:B:240:ASN:HB3	2:B:347:ASN:CG	2.38	0.43
1:A:18:ASN:HB3	2:B:687:PHE:CE1	2.53	0.43
2:B:175:VAL:HB	2:B:186:LEU:HB2	2.01	0.43
2:B:595:ALA:O	2:B:596:ALA:HB3	2.18	0.43
2:B:345:THR:O	2:B:346:PHE:CB	2.67	0.43
2:B:596:ALA:HB3	2:B:607:PHE:HD1	1.83	0.43
1:A:16:ARG:HB2	1:A:16:ARG:HH11	1.80	0.43
4:A:240:HOH:O	2:B:319:LEU:HD12	2.19	0.42
1:A:16:ARG:HH11	1:A:16:ARG:CB	2.32	0.42
1:A:67:GLU:HG3	2:B:274:ARG:HB2	2.01	0.42
2:B:451:MSE:HA	2:B:451:MSE:HE2	2.01	0.42
2:B:232:ARG:HA	2:B:353:ARG:HD2	2.01	0.42
2:B:351:ALA:HA	2:B:356:THR:O	2.19	0.42
1:A:80:LEU:HD21	1:A:143:ARG:HG3	2.02	0.42
2:B:473:MSE:HE3	2:B:473:MSE:HA	2.02	0.42
2:B:524:PHE:CE1	2:B:534:ALA:CB	3.01	0.42
2:B:534:ALA:HA	2:B:552:ARG:NH1	2.35	0.42
2:B:294:HIS:HE1	4:B:1167:HOH:O	2.02	0.41
2:B:198:ASP:OD2	2:B:199:TYR:N	2.53	0.41
2:B:276:ARG:HA	2:B:282:THR:HG22	2.02	0.41
2:B:410:GLN:CD	2:B:410:GLN:C	2.78	0.41
2:B:622:HIS:CG	2:B:623:GLY:N	2.87	0.41
2:B:585:MSE:SE	2:B:659:ILE:HD11	2.70	0.41
2:B:311:ALA:HB2	2:B:389:TRP:CH2	2.55	0.41
2:B:627:VAL:O	2:B:640:GLY:HA2	2.21	0.41
1:A:16:ARG:HB2	1:A:16:ARG:CZ	2.50	0.41
2:B:325:MSE:HE1	2:B:343:VAL:HG21	2.02	0.41
1:A:85:VAL:N	1:A:86:PRO:HD2	2.35	0.41
2:B:264:ARG:HA	2:B:265:PRO:HD3	1.96	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:331:PHE:O	2:B:334:TYR:HB3	2.22	0.40
1:A:9:PRO:HG3	2:B:353:ARG:HD3	2.03	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	150/158 (95%)	144 (96%)	6 (4%)	0	100	100
2	B	518/520 (100%)	504 (97%)	12 (2%)	2 (0%)	34	54
All	All	668/678 (98%)	648 (97%)	18 (3%)	2 (0%)	41	61

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
2	B	346	PHE
2	B	416	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	116/121 (96%)	116 (100%)	0	100	100
2	B	428/416 (103%)	415 (97%)	13 (3%)	41	68

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles
All	All	544/537 (101%)	531 (98%)	13 (2%)	49 74

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

Mol	Chain	Res	Type
2	B	190	ASN
2	B	240	ASN
2	B	264	ARG
2	B	274	ARG
2	B	410	GLN
2	B	469	HIS
2	B	473	MSE
2	B	506	ASP
2	B	622	HIS
2	B	629	MSE
2	B	637	ARG
2	B	644	TYR
2	B	672	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (18) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	91	GLN
1	A	146	ASN
2	B	192	HIS
2	B	206	HIS
2	B	240	ASN
2	B	262	GLN
2	B	270	GLN
2	B	294	HIS
2	B	321	GLN
2	B	329	HIS
2	B	342	GLN
2	B	362	ASN
2	B	379	ASN
2	B	410	GLN
2	B	429	ASN
2	B	440	HIS
2	B	527	GLN
2	B	622	HIS

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)

1 ligand is 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	GUA	B	999	-	8,8,8	1.23	1 (12%)	9,9,9	1.14	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
3	GUA	B	999	-	-	4/6/6/6	-

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	B	999	GUA	O2-C1	-2.12	1.23	1.30

There are no bond angle outliers.

There are no chirality outliers.

All (4) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	B	999	GUA	C2-C3-C4-C5
3	B	999	GUA	C1-C2-C3-C4
3	B	999	GUA	O2-C1-C2-C3
3	B	999	GUA	O1-C1-C2-C3

There are no ring outliers.

1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	B	999	GUA	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)

EDS was not executed - this section is therefore empty.

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

EDS was not executed - this section is therefore empty.

6.3 Carbohydrates (i)

EDS was not executed - this section is therefore empty.

6.4 Ligands (i)

EDS was not executed - this section is therefore empty.

6.5 Other polymers (i)

EDS was not executed - this section is therefore empty.