Full wwPDB X-ray Structure Validation Report (i)

Aug 26, 2023 – 02:58 PM EDT

PDB ID	:	3GB7
Title	:	Potassium Channel KcsA-Fab complex in Li+
Authors	:	Thompson, A.N.; Ilsoo, K.; Panosian, T.D.; Iverson, T.M.; Allen, T.W.; Nimigean, C.M.
Deposited on	:	2009-02-18
Resolution	:	2.85 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:

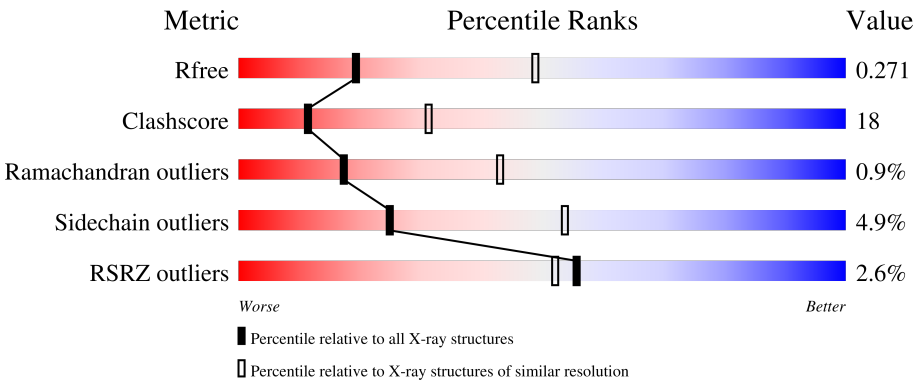
MolProbity	:	4.02b-467
Mogul	:	1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	2.35
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.35

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 2.85 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	3168 (2.90-2.82)
Clashscore	141614	3438 (2.90-2.82)
Ramachandran outliers	138981	3348 (2.90-2.82)
Sidechain outliers	138945	3351 (2.90-2.82)
RSRZ outliers	127900	3103 (2.90-2.82)

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	219	3%, 63%, 33%, •
2	B	212	%, 61%, 35%, •
3	C	124	3%, 60%, 19%, •, 17%

2 Entry composition (i)

There are 6 unique types of molecules in this entry. The entry contains 4111 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 antibody Fab fragment heavy chain.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	219	1648	1042	275	325	6	0	0	0

- Molecule 2 is a protein called antibody Fab fragment light chain.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
2	B	212	1649	1023	283	338	5	0	0	0

- Molecule 3 is a protein called Voltage-gated potassium channel.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
3	C	103	777	507	135	133	2	0	0	0

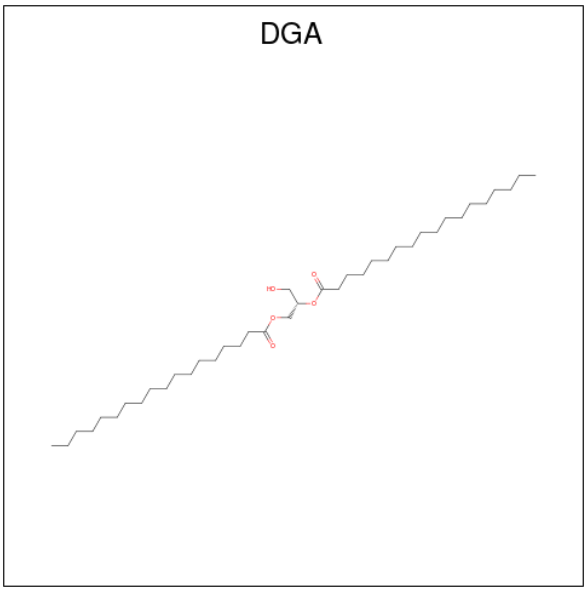
There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
C	2	ALA	PRO	engineered mutation	UNP P0A334
C	90	CYS	LEU	engineered mutation	UNP P0A334

- Molecule 4 is NICKEL (II) ION (three-letter code: NI) (formula: Ni).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	Ni		
4	C	1	1	1	0	0

- Molecule 5 is DIACYL GLYCEROL (three-letter code: DGA) (formula: $C_{39}H_{76}O_5$).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
			Total	C	O		
5	C	1	31	26	5	3	0

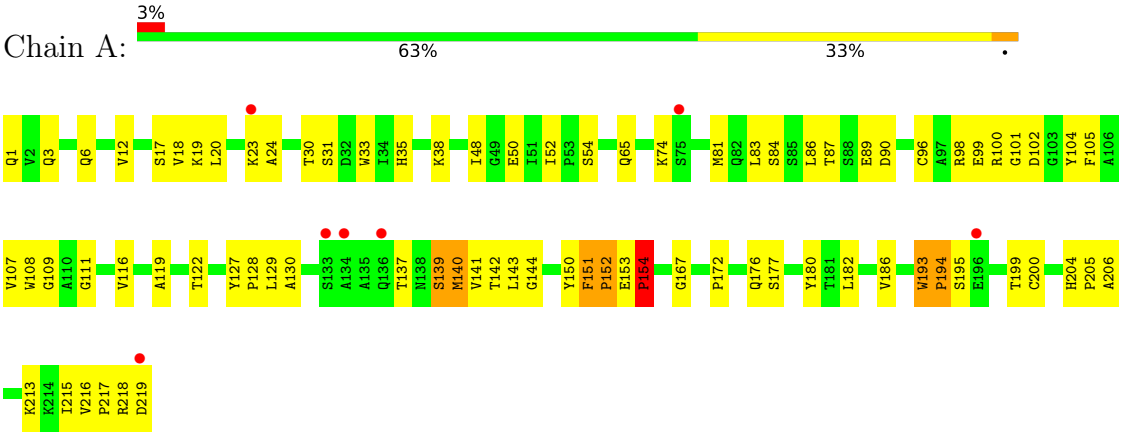
- Molecule 6 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	O		
6	C	5	5	5	0	0

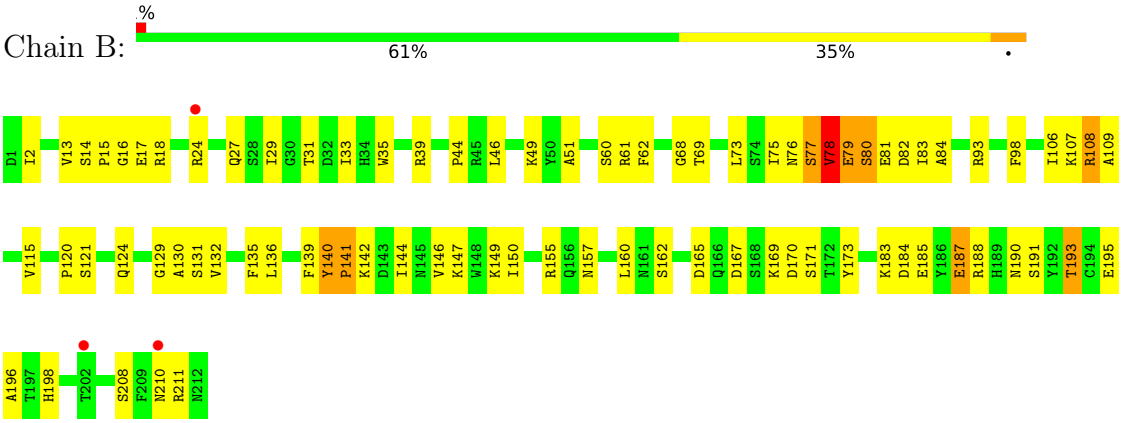
3 Residue-property plots (i)

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.

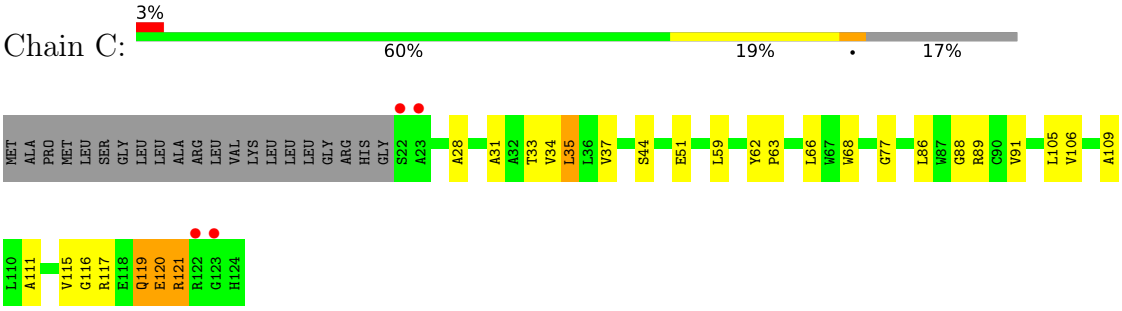
• Molecule 1: antibody Fab fragment heavy chain



• Molecule 2: antibody Fab fragment light chain



• Molecule 3: Voltage-gated potassium channel



4 Data and refinement statistics (i)

Property	Value	Source
Space group	I 4	Depositor
Cell constants a, b, c, α, β, γ	157.06Å 157.06Å 75.62Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	19.66 – 2.85 19.66 – 2.85	Depositor EDS
% Data completeness (in resolution range)	95.4 (19.66-2.85) 95.5 (19.66-2.85)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	0.04	Depositor
$< I/\sigma(I) >$ [1]	2.78 (at 2.83Å)	Xtriage
Refinement program	CNS	Depositor
R, R_{free}	0.239 , 0.285 0.231 , 0.271	Depositor DCC
R_{free} test set	1047 reflections (5.07%)	wwPDB-VP
Wilson B-factor (Å^2)	73.2	Xtriage
Anisotropy	0.028	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.29 , 51.1	EDS
L-test for twinning[2]	$< \|L\| > = 0.50$, $< L^2 > = 0.34$	Xtriage
Estimated twinning fraction	0.024 for -k,-h,-l	Xtriage
F_o,F_c correlation	0.93	EDS
Total number of atoms	4111	wwPDB-VP
Average B, all atoms (Å^2)	79.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.38% 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: NI, DGA

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	0.64	1/1692 (0.1%)	0.87	8/2312 (0.3%)
2	B	0.52	4/1686 (0.2%)	0.74	3/2287 (0.1%)
3	C	0.36	0/797	0.61	0/1093
All	All	0.55	5/4175 (0.1%)	0.78	11/5692 (0.2%)

All (5) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	194	PRO	N-CD	22.93	1.79	1.47
2	B	79	GLU	CA-CB	-10.79	1.30	1.53
2	B	141	PRO	N-CD	7.08	1.57	1.47
2	B	80	SER	CA-CB	-5.57	1.44	1.52
2	B	79	GLU	N-CA	5.50	1.57	1.46

All (11) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	A	194	PRO	CA-N-CD	-12.01	94.68	111.50
1	A	194	PRO	N-CA-CB	11.82	117.49	103.30
1	A	193	TRP	CB-CA-C	10.81	132.01	110.40
1	A	151	PHE	CB-CA-C	9.18	128.76	110.40
1	A	194	PRO	N-CA-C	-8.56	89.84	112.10
2	B	140	TYR	CB-CA-C	7.27	124.93	110.40
1	A	152	PRO	N-CA-C	-6.82	94.38	112.10
2	B	78	VAL	CB-CA-C	-6.11	99.78	111.40
1	A	130	ALA	N-CA-CB	5.78	118.19	110.10
1	A	177	SER	N-CA-C	5.26	125.19	111.00
2	B	80	SER	CB-CA-C	5.16	119.91	110.10

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	1648	0	1616	58	0
2	B	1649	0	1576	70	0
3	C	777	0	790	24	0
4	C	1	0	0	0	0
5	C	31	0	44	3	0
6	C	5	0	0	0	0
All	All	4111	0	4026	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 18.

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)
1:A:194:PRO:N	1:A:194:PRO:CD	1.79	1.30
2:B:79:GLU:O	2:B:106:ILE:HD11	1.41	1.18
2:B:79:GLU:O	2:B:106:ILE:CD1	2.03	1.05
3:C:86:LEU:HB2	5:C:1001:DGA:OA1	1.58	1.03
3:C:119:GLN:HE21	3:C:119:GLN:HA	1.39	0.88
2:B:193:THR:HB	2:B:208:SER:HB3	1.58	0.86
2:B:24:ARG:HD2	2:B:24:ARG:O	1.79	0.82
2:B:149:LYS:HB2	2:B:193:THR:HG23	1.61	0.81
2:B:115:VAL:HG22	2:B:136:LEU:HD13	1.67	0.76
1:A:83:LEU:HB3	1:A:86:LEU:HD21	1.69	0.74
2:B:18:ARG:NH1	2:B:76:ASN:OD1	2.19	0.74
3:C:119:GLN:HE21	3:C:119:GLN:CA	2.00	0.73
2:B:211:ARG:HB3	2:B:211:ARG:NH1	2.02	0.73
2:B:211:ARG:HB3	2:B:211:ARG:HH11	1.54	0.72
1:A:152:PRO:HD2	1:A:206:ALA:CB	2.18	0.72
2:B:149:LYS:HB2	2:B:193:THR:CG2	2.20	0.71
1:A:193:TRP:CD1	1:A:194:PRO:HA	2.27	0.70
1:A:6:GLN:NE2	1:A:111:GLY:H	1.91	0.69

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:80:SER:O	2:B:83:ILE:HG12	1.92	0.69
3:C:119:GLN:HA	3:C:119:GLN:NE2	2.05	0.69
1:A:204:HIS:CE1	1:A:206:ALA:HB3	2.30	0.67
2:B:120:PRO:HB3	2:B:131:SER:H	1.60	0.67
3:C:116:GLY:O	3:C:120:GLU:HG2	1.94	0.67
2:B:193:THR:CB	2:B:208:SER:HB3	2.24	0.67
2:B:24:ARG:HD2	2:B:24:ARG:C	2.15	0.66
3:C:44:SER:OG	3:C:66:LEU:HA	1.96	0.66
1:A:18:VAL:HG12	1:A:86:LEU:HD11	1.78	0.65
3:C:31:ALA:O	3:C:34:VAL:HG12	1.97	0.64
1:A:17:SER:HB2	1:A:84:SER:HA	1.79	0.64
1:A:38:LYS:HB2	1:A:48:ILE:HD11	1.78	0.64
1:A:17:SER:CB	1:A:84:SER:HA	2.29	0.62
1:A:87:THR:OG1	1:A:89:GLU:HG2	2.00	0.62
3:C:117:ARG:O	3:C:120:GLU:HG3	1.99	0.62
1:A:193:TRP:C	1:A:194:PRO:CD	2.68	0.61
2:B:39:ARG:NH1	2:B:81:GLU:O	2.35	0.60
2:B:17:GLU:O	2:B:78:VAL:HG23	2.02	0.60
2:B:115:VAL:HG22	2:B:136:LEU:CD1	2.32	0.60
2:B:170:ASP:O	2:B:171:SER:HB2	2.00	0.59
2:B:147:LYS:HD2	2:B:195:GLU:OE1	2.02	0.59
2:B:142:LYS:HD2	2:B:173:TYR:CE2	2.38	0.59
3:C:28:ALA:HB1	3:C:105:LEU:HD21	1.85	0.59
2:B:190:ASN:O	2:B:210:ASN:HA	2.02	0.58
1:A:143:LEU:HB3	1:A:215:ILE:HG21	1.85	0.58
2:B:211:ARG:HH11	2:B:211:ARG:CB	2.16	0.57
1:A:31:SER:HB2	3:C:62:TYR:CE1	2.40	0.57
3:C:33:THR:O	3:C:37:VAL:HG23	2.04	0.56
1:A:33:TRP:CE3	1:A:50:GLU:HG3	2.40	0.56
1:A:139:SER:OG	1:A:140:MET:HG2	2.04	0.56
2:B:29:ILE:HD11	2:B:33:ILE:HD13	1.88	0.55
1:A:101:GLY:HA3	3:C:62:TYR:CE1	2.42	0.55
1:A:33:TRP:HE3	1:A:50:GLU:HG3	1.72	0.54
2:B:61:ARG:HH12	2:B:82:ASP:CG	2.10	0.54
1:A:216:VAL:HG23	1:A:217:PRO:HD2	1.90	0.54
2:B:155:ARG:HE	2:B:157:ASN:HB2	1.72	0.54
1:A:18:VAL:HG22	1:A:19:LYS:N	2.21	0.53
1:A:141:VAL:HG22	1:A:142:THR:N	2.22	0.53
2:B:2:ILE:HD11	2:B:93:ARG:HD2	1.90	0.53
1:A:86:LEU:HA	1:A:90:ASP:OD2	2.08	0.53
1:A:129:LEU:HB2	1:A:144:GLY:O	2.09	0.53

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:108:ARG:HD3	2:B:109:ALA:O	2.09	0.53
2:B:61:ARG:NH1	2:B:82:ASP:OD2	2.41	0.53
1:A:153:GLU:OE1	1:A:154:PRO:HA	2.10	0.52
2:B:29:ILE:CD1	2:B:33:ILE:HD13	2.40	0.52
2:B:147:LYS:HB3	2:B:195:GLU:HB2	1.92	0.52
1:A:193:TRP:CG	1:A:194:PRO:HA	2.45	0.51
2:B:120:PRO:HB3	2:B:131:SER:N	2.25	0.51
2:B:167:ASP:OD2	2:B:169:LYS:HB2	2.11	0.51
2:B:136:LEU:HD11	2:B:196:ALA:HB2	1.92	0.51
3:C:89:ARG:HD2	5:C:1001:DGA:HA41	1.92	0.51
1:A:23:LYS:HB3	1:A:23:LYS:NZ	2.25	0.50
2:B:83:ILE:HD11	2:B:106:ILE:HD12	1.93	0.50
2:B:27:GLN:C	2:B:69:THR:HG22	2.31	0.50
1:A:193:TRP:C	1:A:195:SER:H	2.10	0.50
1:A:182:LEU:C	1:A:182:LEU:HD12	2.32	0.50
1:A:127:TYR:HB3	2:B:121:SER:OG	2.13	0.49
2:B:120:PRO:HD3	2:B:132:VAL:HG22	1.94	0.49
2:B:115:VAL:HA	2:B:135:PHE:O	2.13	0.49
3:C:86:LEU:CB	5:C:1001:DGA:OA1	2.47	0.49
3:C:62:TYR:HB2	3:C:63:PRO:HD3	1.93	0.49
1:A:52:ILE:O	1:A:52:ILE:HG23	2.14	0.48
2:B:16:GLY:O	2:B:77:SER:HA	2.14	0.48
2:B:17:GLU:HG3	2:B:18:ARG:N	2.28	0.48
1:A:1:GLN:N	1:A:1:GLN:CD	2.68	0.47
2:B:193:THR:HA	2:B:208:SER:HB3	1.96	0.47
1:A:105:PHE:HE1	2:B:98:PHE:CZ	2.33	0.47
1:A:141:VAL:CG2	1:A:142:THR:N	2.78	0.47
1:A:199:THR:OG1	1:A:213:LYS:O	2.15	0.47
3:C:111:ALA:O	3:C:115:VAL:HG23	2.15	0.47
1:A:6:GLN:NE2	1:A:111:GLY:N	2.62	0.46
2:B:79:GLU:HB3	2:B:80:SER:H	1.66	0.46
1:A:6:GLN:HE21	1:A:109:GLY:HA3	1.81	0.46
1:A:128:PRO:HG3	1:A:213:LYS:HD2	1.96	0.46
2:B:35:TRP:CE2	2:B:73:LEU:HB2	2.51	0.46
3:C:106:VAL:O	3:C:109:ALA:HB3	2.16	0.46
1:A:108:TRP:CE2	2:B:44:PRO:HB2	2.51	0.46
1:A:176:GLN:NE2	2:B:160:LEU:HD21	2.31	0.46
2:B:193:THR:CA	2:B:208:SER:HB3	2.46	0.45
3:C:51:GLU:HG3	3:C:59:LEU:HB3	1.97	0.45
1:A:6:GLN:HE21	1:A:111:GLY:H	1.62	0.45
1:A:218:ARG:O	1:A:219:ASP:OXT	2.35	0.45

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:27:GLN:O	2:B:69:THR:HG22	2.17	0.45
1:A:151:PHE:HA	1:A:152:PRO:HA	1.56	0.45
2:B:191:SER:HB2	2:B:210:ASN:OD1	2.17	0.45
3:C:88:GLY:O	3:C:91:VAL:HB	2.17	0.44
1:A:35:HIS:O	1:A:96:CYS:HA	2.18	0.44
1:A:12:VAL:O	1:A:116:VAL:HA	2.18	0.44
1:A:74:LYS:NZ	1:A:74:LYS:HB3	2.33	0.44
1:A:98:ARG:HD3	1:A:100:ARG:NH1	2.33	0.44
2:B:13:VAL:HG11	2:B:78:VAL:HG21	1.98	0.44
2:B:24:ARG:HA	2:B:69:THR:O	2.18	0.44
3:C:34:VAL:HG13	3:C:35:LEU:N	2.32	0.44
1:A:167:GLY:O	1:A:186:VAL:HA	2.17	0.43
2:B:62:PHE:CD1	2:B:75:ILE:HG12	2.53	0.43
1:A:1:GLN:CD	1:A:1:GLN:H1	2.22	0.43
2:B:140:TYR:O	2:B:198:HIS:HE1	2.00	0.43
3:C:119:GLN:CA	3:C:119:GLN:NE2	2.71	0.43
3:C:121:ARG:O	3:C:121:ARG:HD3	2.18	0.43
2:B:150:ILE:HD12	2:B:155:ARG:HH11	1.84	0.42
1:A:3:GLN:O	1:A:24:ALA:HA	2.19	0.42
2:B:31:THR:O	2:B:33:ILE:N	2.52	0.42
2:B:120:PRO:HG3	2:B:130:ALA:HB1	2.00	0.42
1:A:104:TYR:CE2	2:B:49:LYS:HD2	2.55	0.42
1:A:150:TYR:CE1	1:A:180:TYR:HB2	2.55	0.42
2:B:83:ILE:HD11	2:B:106:ILE:CG1	2.49	0.42
2:B:83:ILE:CD1	2:B:106:ILE:HG13	2.49	0.42
2:B:140:TYR:O	2:B:198:HIS:CE1	2.73	0.42
2:B:183:LYS:HG2	2:B:187:GLU:OE2	2.20	0.42
1:A:172:PRO:HD2	2:B:162:SER:OG	2.20	0.41
2:B:13:VAL:HG22	2:B:14:SER:N	2.34	0.41
2:B:124:GLN:HG2	2:B:129:GLY:O	2.21	0.41
2:B:146:VAL:HG13	2:B:146:VAL:O	2.21	0.41
1:A:3:GLN:OE1	1:A:107:VAL:HG11	2.20	0.41
3:C:59:LEU:HD11	3:C:68:TRP:CG	2.55	0.41
1:A:119:ALA:HB3	1:A:151:PHE:CE2	2.56	0.41
1:A:153:GLU:HA	1:A:154:PRO:HA	1.82	0.41
2:B:83:ILE:O	2:B:84:ALA:HB2	2.21	0.41
2:B:139:PHE:CZ	2:B:144:ILE:HG21	2.56	0.41
3:C:59:LEU:HD21	3:C:68:TRP:CE2	2.56	0.41
2:B:185:GLU:HA	2:B:188:ARG:HD2	2.02	0.40
2:B:33:ILE:HG22	2:B:51:ALA:HA	2.02	0.40
1:A:18:VAL:CG2	1:A:19:LYS:N	2.85	0.40

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:30:THR:HA	1:A:54:SER:HB2	2.03	0.40
2:B:15:PRO:HD3	2:B:107:LYS:O	2.20	0.40
1:A:20:LEU:HD12	1:A:81:MET:CE	2.52	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	217/219 (99%)	209 (96%)	7 (3%)	1 (0%)	29	57
2	B	210/212 (99%)	196 (93%)	11 (5%)	3 (1%)	11	31
3	C	101/124 (82%)	94 (93%)	6 (6%)	1 (1%)	15	40
All	All	528/555 (95%)	499 (94%)	24 (4%)	5 (1%)	17	43

All (5) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
2	B	68	GLY
3	C	77	GLY
2	B	60	SER
2	B	78	VAL
1	A	154	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	185/185 (100%)	175 (95%)	10 (5%)	22	49
2	B	190/190 (100%)	182 (96%)	8 (4%)	30	60
3	C	75/91 (82%)	71 (95%)	4 (5%)	22	50
All	All	450/466 (97%)	428 (95%)	22 (5%)	25	54

All (22) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	65	GLN
1	A	99	GLU
1	A	102	ASP
1	A	122	THR
1	A	137	THR
1	A	139	SER
1	A	140	MET
1	A	154	PRO
1	A	200	CYS
1	A	205	PRO
2	B	46	LEU
2	B	77	SER
2	B	108	ARG
2	B	141	PRO
2	B	165	ASP
2	B	184	ASP
2	B	187	GLU
2	B	193	THR
3	C	35	LEU
3	C	119	GLN
3	C	120	GLU
3	C	121	ARG

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (10) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	5	GLN
1	A	6	GLN
1	A	169	HIS
1	A	176	GLN
2	B	27	GLN
2	B	85	ASN
2	B	92	ASN

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Mol	Chain	Res	Type
2	B	137	ASN
2	B	138	ASN
3	C	119	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)

Of 2 ligands modelled in this entry, 1 is monoatomic - leaving 1 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	$\#\|Z\| > 2$
5	DGA	C	1001	-	30,30,43	1.49	3 (10%)	32,32,45	1.13	4 (12%)

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
5	DGA	C	1001	-	-	8/32/32/45	-

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
5	C	1001	DGA	OG2-CB1	4.83	1.47	1.34
5	C	1001	DGA	OG1-CA1	4.62	1.46	1.33
5	C	1001	DGA	CB2-CB1	2.25	1.57	1.50

All (4) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
5	C	1001	DGA	OG1-CA1-CA2	2.89	120.99	111.91
5	C	1001	DGA	OG2-CB1-CB2	2.68	117.28	111.50
5	C	1001	DGA	CB6-CB5-CB4	2.48	126.99	114.42
5	C	1001	DGA	CB5-CB4-CB3	2.28	126.00	114.42

There are no chirality outliers.

All (8) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
5	C	1001	DGA	OA1-CA1-OG1-CG1
5	C	1001	DGA	CA2-CA1-OG1-CG1
5	C	1001	DGA	CB3-CB4-CB5-CB6
5	C	1001	DGA	CB2-CB1-OG2-CG2
5	C	1001	DGA	OB1-CB1-OG2-CG2
5	C	1001	DGA	CB5-CB6-CB7-CB8
5	C	1001	DGA	CB4-CB5-CB6-CB7
5	C	1001	DGA	CA1-CA2-CA3-CA4

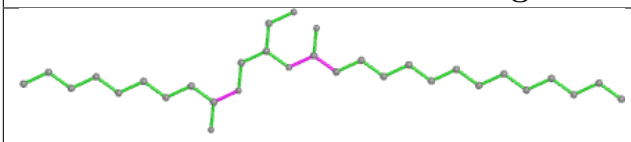
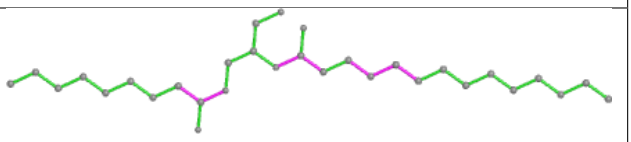
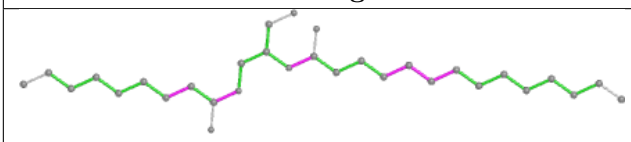
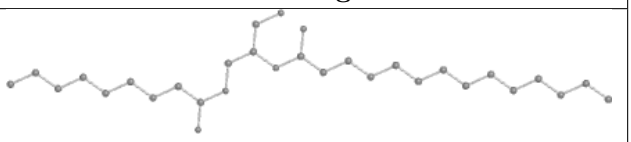
There are no ring outliers.

1 monomer is involved in 3 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
5	C	1001	DGA	3	0

The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less then 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and

any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.

Ligand DGA C 1001	
 Bond lengths	 Bond angles
 Torsions	 Rings

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	219/219 (100%)	0.00	7 (3%)	47	42	50, 85, 107, 127	0
2	B	212/212 (100%)	-0.00	3 (1%)	75	74	42, 82, 112, 125	0
3	C	103/124 (83%)	-0.16	4 (3%)	39	34	40, 55, 107, 126	0
All	All	534/555 (96%)	-0.03	14 (2%)	56	52	40, 81, 110, 127	0

All (14) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
3	C	23	ALA	5.1
1	A	219	ASP	3.6
3	C	123	GLY	3.5
1	A	196	GLU	3.4
2	B	202	THR	3.3
1	A	136	GLN	2.6
1	A	75	SER	2.5
3	C	22	SER	2.5
2	B	210	ASN	2.4
1	A	134	ALA	2.4
2	B	24	ARG	2.1
3	C	122	ARG	2.1
1	A	133	SER	2.0
1	A	23	LYS	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)

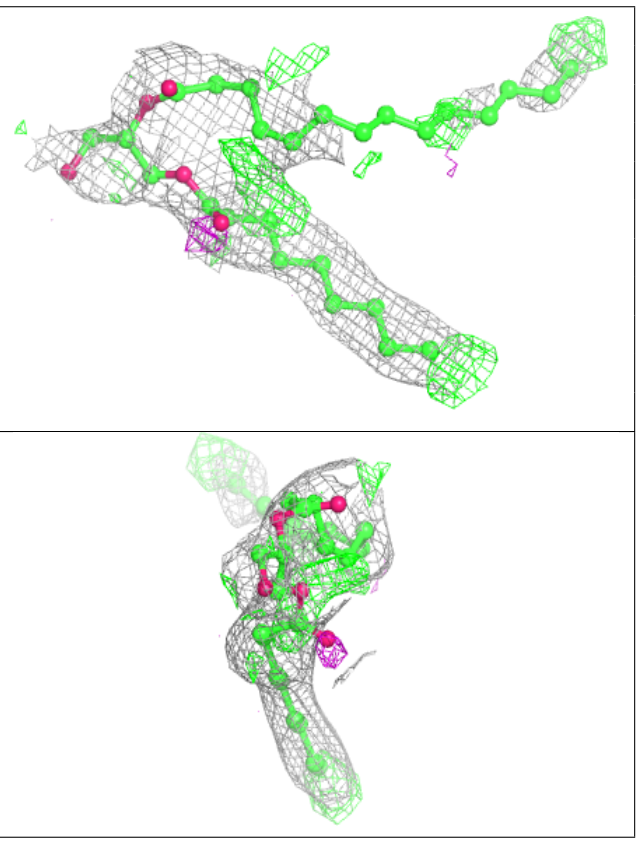
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists the number of atoms with occupancy less than 0.9.

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å^2)	Q<0.9
4	NI	C	125	1/1	0.60	0.14	119,119,119,119	1
5	DGA	C	1001	31/44	0.72	0.32	51,99,104,104	3

The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation to approximate a three-dimensional view.

Electron density around DGA C 1001:

2mF$_o$-DF$_c$ (at 0.7 rmsd) in gray
mF$_o$-DF$_c$ (at 3 rmsd) in purple (negative)
and green (positive)



6.5 Other polymers (i)

There are no such residues in this entry.