



Full wwPDB X-ray Structure Validation Report ⓘ

Jan 8, 2024 – 07:57 am GMT

PDB ID : 5OCQ
Title : Crystal structure of the complex of the kappa-carrageenase from *Pseudoalteromonas carrageenovora* with an oligotetrasaccharide of kappa-carrageenan
Authors : Czjzek, M.; Leroux, C.; Bernard, T.; Matard-Mann, M.; Jeudy, A.; Michel, G.
Deposited on : 2017-07-03
Resolution : 1.70 Å(reported)

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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 : 1.8.4, CSD as541be (2020)
Xtriage (Phenix) : 1.13
EDS : 2.36
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) : 2.36

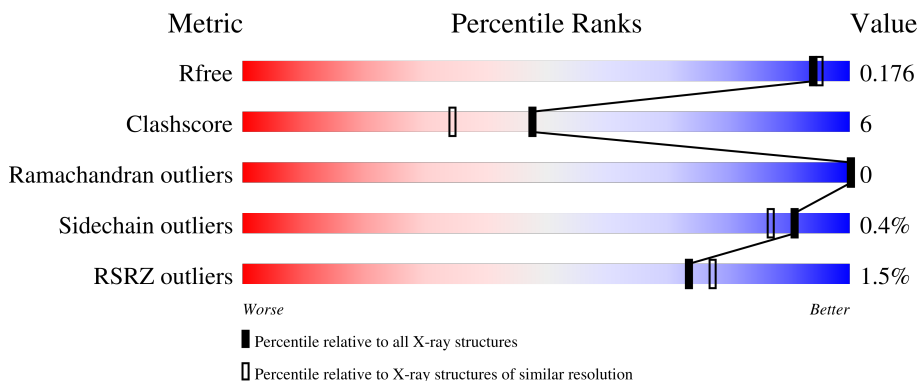
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.70 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	4298 (1.70-1.70)
Clashscore	141614	4695 (1.70-1.70)
Ramachandran outliers	138981	4610 (1.70-1.70)
Sidechain outliers	138945	4610 (1.70-1.70)
RSRZ outliers	127900	4222 (1.70-1.70)

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 $\leq 5\%$. 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	285	 2% 82% 12% • 5%
1	B	285	 % 83% 14% ••

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
4	CIT	B	405	-	X	-	-

2 Entry composition i

There are 5 unique types of molecules in this entry. The entry contains 5272 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.

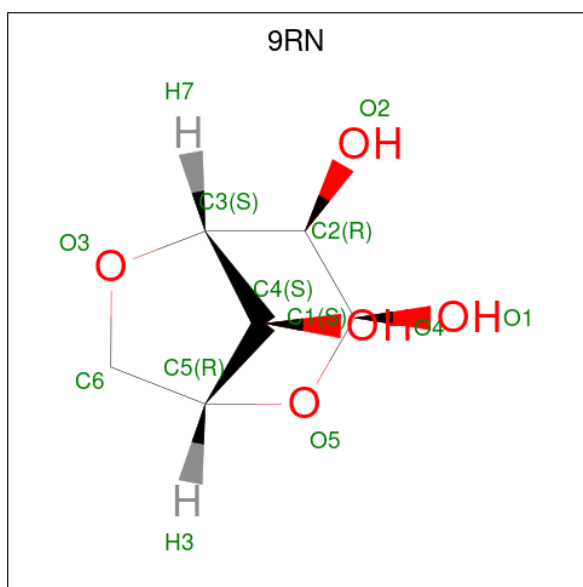
- Molecule 1 is a protein called Kappa-carrageenase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	271	Total	C	N	O	S	0	10	0
			2250	1427	395	421	7			
1	B	279	Total	C	N	O	S	0	7	0
			2309	1462	407	433	7			

There are 20 discrepancies between the modelled and reference sequences:

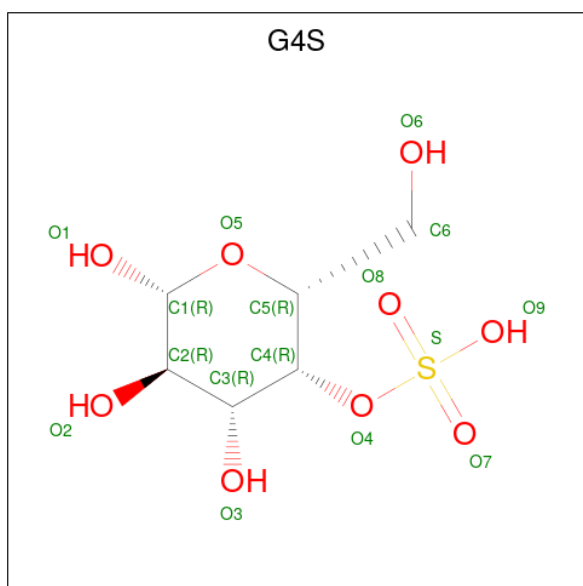
Chain	Residue	Modelled	Actual	Comment	Reference
A	25	MET	-	initiating methionine	UNP P43478
A	168	ASP	GLU	engineered mutation	UNP P43478
A	302	LEU	-	expression tag	UNP P43478
A	303	GLU	-	expression tag	UNP P43478
A	304	HIS	-	expression tag	UNP P43478
A	305	HIS	-	expression tag	UNP P43478
A	306	HIS	-	expression tag	UNP P43478
A	307	HIS	-	expression tag	UNP P43478
A	308	HIS	-	expression tag	UNP P43478
A	309	HIS	-	expression tag	UNP P43478
B	25	MET	-	initiating methionine	UNP P43478
B	168	ASP	GLU	engineered mutation	UNP P43478
B	302	LEU	-	expression tag	UNP P43478
B	303	GLU	-	expression tag	UNP P43478
B	304	HIS	-	expression tag	UNP P43478
B	305	HIS	-	expression tag	UNP P43478
B	306	HIS	-	expression tag	UNP P43478
B	307	HIS	-	expression tag	UNP P43478
B	308	HIS	-	expression tag	UNP P43478
B	309	HIS	-	expression tag	UNP P43478

- Molecule 2 is 3,6-anhydro-D-galactose (three-letter code: 9RN) (formula: C₆H₁₀O₅).



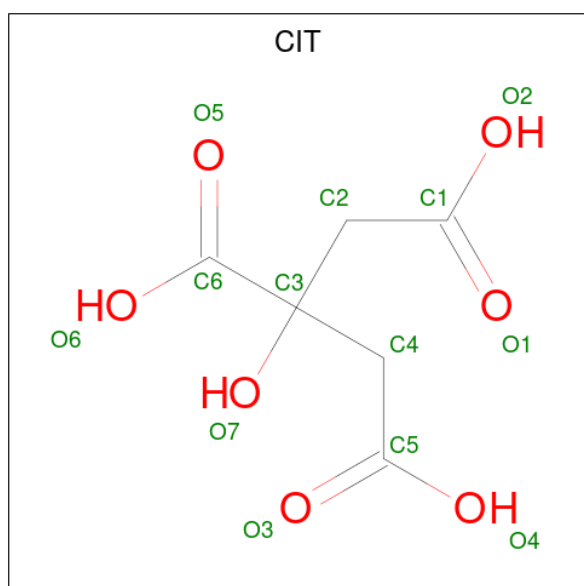
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
2	A	1	Total C O 11 6 5	0	0
2	A	1	Total C O 10 6 4	0	0
2	B	1	Total C O 11 6 5	0	0
2	B	1	Total C O 10 6 4	0	0

- Molecule 3 is 4-O-sulfo-beta-D-galactopyranose (three-letter code: G4S) (formula: $C_6H_{12}O_9S$).



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

- Molecule 4 is CITRIC ACID (three-letter code: CIT) (formula: $C_6H_8O_7$).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
4	A	1	Total	C	O	0	0
			13	6	7		
4	B	1	Total	C	O	0	0
			13	6	7		

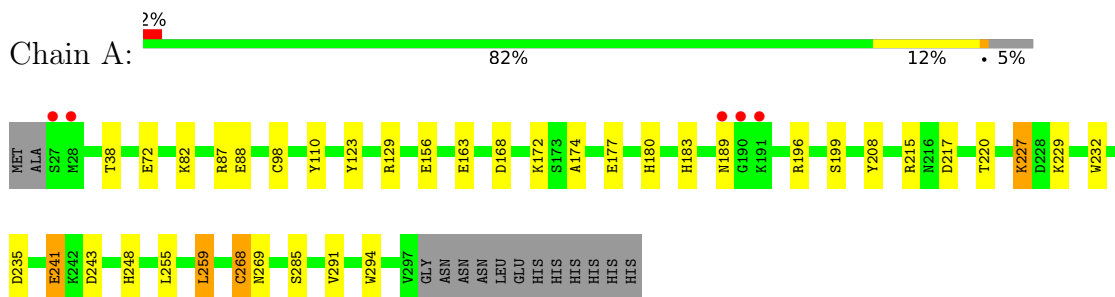
- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	261	Total	O	0	0
			261	261		
5	B	324	Total	O	0	0
			324	324		

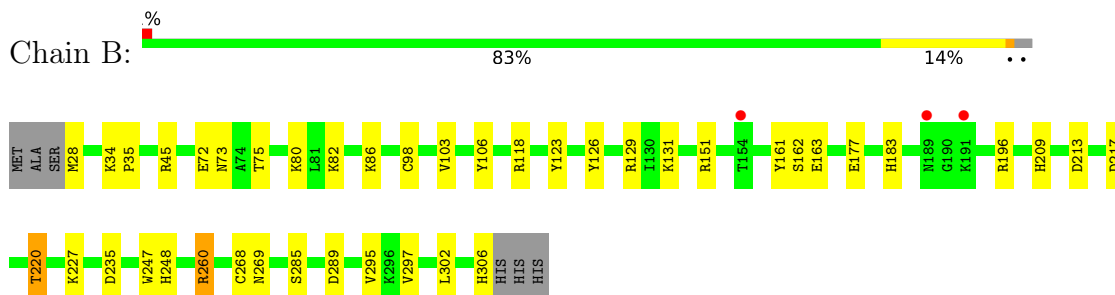
3 Residue-property plots [i](#)

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: Kappa-carrageenase



- Molecule 1: Kappa-carrageenase



4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	62.61Å 67.36Å 158.40Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	34.65 – 1.70 34.62 – 1.70	Depositor EDS
% Data completeness (in resolution range)	99.4 (34.65-1.70) 99.4 (34.62-1.70)	Depositor EDS
R_{merge}	0.08	Depositor
R_{sym}	0.07	Depositor
$\langle I/\sigma(I) \rangle$ ¹	5.45 (at 1.70Å)	Xtrriage
Refinement program	REFMAC 5.8.0131	Depositor
R, R_{free}	0.136 , 0.166 0.149 , 0.176	Depositor DCC
R_{free} test set	3733 reflections (5.04%)	wwPDB-VP
Wilson B-factor (Å ²)	9.5	Xtrriage
Anisotropy	0.059	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.39 , 55.2	EDS
L-test for twinning ²	$\langle L \rangle = 0.48$, $\langle L^2 \rangle = 0.31$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	5272	wwPDB-VP
Average B, all atoms (Å ²)	13.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.69% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

²Theoretical 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: 9RN, CIT, G4S

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	1.29	8/2373 (0.3%)	1.12	9/3225 (0.3%)
1	B	1.28	5/2428 (0.2%)	1.14	18/3303 (0.5%)
All	All	1.29	13/4801 (0.3%)	1.13	27/6528 (0.4%)

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	3	0

All (13) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	72	GLU	CD-OE2	11.66	1.38	1.25
1	A	88	GLU	CD-OE1	10.10	1.36	1.25
1	A	241	GLU	CG-CD	8.34	1.64	1.51
1	A	72	GLU	CD-OE2	7.71	1.34	1.25
1	B	72	GLU	CG-CD	6.52	1.61	1.51
1	A	72	GLU	CG-CD	6.48	1.61	1.51
1	A	208	TYR	CG-CD2	5.93	1.46	1.39
1	B	247	TRP	CG-CD1	5.89	1.45	1.36
1	A	199	SER	CB-OG	5.70	1.49	1.42
1	A	88	GLU	CD-OE2	5.14	1.31	1.25
1	A	268	CYS	CB-SG	5.11	1.91	1.82
1	B	126	TYR	CG-CD1	5.08	1.45	1.39
1	B	162	SER	CA-CB	5.00	1.60	1.52

All (27) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	129	ARG	NE-CZ-NH1	11.05	125.83	120.30
1	B	217	ASP	CB-CG-OD2	-8.46	110.69	118.30
1	A	129	ARG	NE-CZ-NH1	8.23	124.42	120.30
1	A	215	ARG	NE-CZ-NH1	7.39	123.99	120.30
1	B	80	LYS	CD-CE-NZ	-6.62	96.47	111.70
1	B	151	ARG	NE-CZ-NH2	-6.36	117.12	120.30
1	B	217	ASP	CB-CG-OD1	6.17	123.85	118.30
1	A	217	ASP	CB-CG-OD1	6.11	123.80	118.30
1	B	45	ARG	NE-CZ-NH1	6.05	123.33	120.30
1	B	45	ARG	NE-CZ-NH2	-6.02	117.29	120.30
1	B	289	ASP	CB-CG-OD1	5.83	123.54	118.30
1	A	87	ARG	NE-CZ-NH1	5.67	123.14	120.30
1	B	220[A]	THR	OG1-CB-CG2	5.66	123.03	110.00
1	B	220[B]	THR	OG1-CB-CG2	5.66	123.03	110.00
1	B	220[C]	THR	OG1-CB-CG2	5.66	123.03	110.00
1	B	28	MET	CA-CB-CG	5.60	122.82	113.30
1	B	213	ASP	CB-CG-OD2	5.53	123.28	118.30
1	A	294	TRP	CA-CB-CG	5.53	124.20	113.70
1	A	241	GLU	OE1-CD-OE2	-5.36	116.87	123.30
1	A	259[A]	LEU	CA-CB-CG	5.34	127.59	115.30
1	A	259[B]	LEU	CA-CB-CG	5.34	127.59	115.30
1	A	168	ASP	CB-CG-OD2	-5.32	113.51	118.30
1	B	118	ARG	NE-CZ-NH2	-5.24	117.68	120.30
1	B	151	ARG	NE-CZ-NH1	5.23	122.92	120.30
1	B	260	ARG	NE-CZ-NH1	5.20	122.90	120.30
1	B	295	VAL	CG1-CB-CG2	-5.11	102.73	110.90
1	B	161	TYR	CB-CG-CD1	-5.06	117.96	121.00

All (3) chirality outliers are listed below:

Mol	Chain	Res	Type	Atom
1	A	38[A]	THR	CB
1	A	38[B]	THR	CB
1	A	38[C]	THR	CB

There are no planarity outliers.

5.2 Too-close contacts

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	2250	0	2160	31	0
1	B	2309	0	2211	24	0
2	A	21	0	0	0	0
2	B	21	0	0	0	0
3	A	30	0	19	1	0
3	B	30	0	19	1	0
4	A	13	0	5	0	0
4	B	13	0	5	0	0
5	A	261	0	0	12	4
5	B	324	0	0	5	5
All	All	5272	0	4419	55	5

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 6.

All (55) 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:177:GLU:OE2	1:B:209:HIS:HD2	1.44	0.97
1:B:75[C]:THR:HG22	5:B:541:HOH:O	1.68	0.94
1:B:75[A]:THR:HG23	5:B:541:HOH:O	1.70	0.92
1:A:98:CYS:HG	1:A:268:CYS:HG	0.90	0.87
1:A:241:GLU:CD	5:A:501:HOH:O	2.14	0.84
1:B:196:ARG:HE	1:B:269:ASN:HD21	1.23	0.83
1:A:255:LEU:HD11	1:A:291[B]:VAL:HG21	1.62	0.82
1:A:255:LEU:HD11	1:A:291[B]:VAL:CG2	2.12	0.79
1:B:177:GLU:OE2	1:B:209:HIS:CD2	2.36	0.72
1:B:123:TYR:OH	1:B:248:HIS:HD2	1.74	0.71
1:A:196:ARG:HE	1:A:269:ASN:HD21	1.39	0.70
1:A:241:GLU:HG3	5:A:501:HOH:O	1.92	0.69
1:A:241:GLU:CG	5:A:501:HOH:O	2.39	0.69
1:A:220[B]:THR:HG23	5:A:650:HOH:O	1.91	0.68
1:A:123:TYR:OH	1:A:248:HIS:HD2	1.79	0.66
1:A:241:GLU:OE1	5:A:501:HOH:O	2.13	0.65
1:A:38[C]:THR:HG22	5:A:561:HOH:O	2.00	0.61
1:B:98:CYS:HG	1:B:268:CYS:HG	1.47	0.60
1:A:183:HIS:HD2	1:A:196:ARG:HD3	1.67	0.59
1:A:38[C]:THR:HG21	5:A:557:HOH:O	2.03	0.58
1:B:220[B]:THR:HG22	1:B:235:ASP:HA	1.86	0.58
1:B:302:LEU:O	1:B:306:HIS:HD2	1.87	0.57
1:B:220[B]:THR:HG23	5:B:623:HOH:O	2.06	0.56
1:B:183:HIS:CD2	1:B:196:ARG:HH11	2.25	0.54

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:220[B]:THR:HG22	1:A:235:ASP:HA	1.88	0.54
1:A:183:HIS:CD2	1:A:196:ARG:HH11	2.27	0.53
1:B:183:HIS:HD2	1:B:196:ARG:HD3	1.74	0.52
1:B:196:ARG:HE	1:B:269:ASN:ND2	2.02	0.51
1:A:163:GLU:OE2	3:A:404:G4S:H1	2.11	0.50
1:A:229[A]:LYS:HE2	1:A:243:ASP:OD1	2.11	0.50
1:B:163:GLU:OE2	3:B:404:G4S:H1	2.12	0.49
1:B:34:LYS:HB3	1:B:35:PRO:HD2	1.95	0.49
1:B:103[C]:VAL:HG23	1:B:106:TYR:HB2	1.95	0.49
1:B:73:ASN:ND2	1:B:86:LYS:HE3	2.28	0.49
1:B:183:HIS:HD2	1:B:196:ARG:HH11	1.61	0.48
1:A:172[A]:LYS:HD3	1:A:177[A]:GLU:HB3	1.96	0.48
1:B:103[C]:VAL:HG21	1:B:106:TYR:CD1	2.50	0.47
1:A:227[A]:LYS:HG2	5:A:647:HOH:O	2.16	0.46
1:A:38[C]:THR:CG2	5:A:557:HOH:O	2.63	0.46
1:A:110:TYR:CD2	1:A:259[A]:LEU:HD21	2.52	0.45
1:A:196:ARG:HE	1:A:269:ASN:ND2	2.08	0.44
1:A:220[B]:THR:HG21	5:A:610:HOH:O	2.18	0.43
1:A:82:LYS:HG3	1:A:285:SER:HB3	2.01	0.42
1:A:174:ALA:HB3	1:A:177[B]:GLU:HG3	2.00	0.42
1:A:227[B]:LYS:HB3	1:A:227[B]:LYS:HE3	1.84	0.42
1:B:82[A]:LYS:HG3	1:B:285:SER:HB3	2.03	0.41
1:B:297:VAL:HG23	1:B:297:VAL:O	2.18	0.41
1:A:229[B]:LYS:HE3	5:A:712:HOH:O	2.21	0.41
1:B:131:LYS:NZ	5:B:510:HOH:O	2.52	0.41
1:B:98:CYS:SG	1:B:268:CYS:SG	3.08	0.41
1:A:180:HIS:HB3	1:A:232:TRP:CD1	2.56	0.41
1:A:243:ASP:OD2	5:A:502:HOH:O	2.22	0.40
1:A:172[A]:LYS:HZ3	1:A:172[A]:LYS:HG2	1.50	0.40
1:A:156:GLU:OE2	1:A:189:ASN:N	2.49	0.40
1:B:260:ARG:NH2	5:B:504:HOH:O	2.53	0.40

All (5) symmetry-related close contacts are listed below. The label for Atom-2 includes the symmetry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
5:B:783:HOH:O	5:B:789:HOH:O[3_645]	1.94	0.26
5:A:731:HOH:O	5:B:690:HOH:O[3_645]	1.97	0.23
5:A:686:HOH:O	5:B:767:HOH:O[3_645]	2.05	0.15
5:A:626:HOH:O	5:B:795:HOH:O[3_645]	2.11	0.09
5:A:713:HOH:O	5:B:786:HOH:O[3_645]	2.15	0.05

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	280/285 (98%)	274 (98%)	6 (2%)	0	100	100
1	B	287/285 (101%)	281 (98%)	6 (2%)	0	100	100
All	All	567/570 (100%)	555 (98%)	12 (2%)	0	100	100

There are no Ramachandran outliers to report.

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	250/251 (100%)	248 (99%)	2 (1%)	81	74
1	B	256/251 (102%)	254 (99%)	2 (1%)	81	74
All	All	506/502 (101%)	502 (99%)	4 (1%)	91	74

All (4) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	227[A]	LYS
1	A	227[B]	LYS
1	B	227[A]	LYS
1	B	227[B]	LYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (12) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	73	ASN
1	A	183	HIS
1	A	248	HIS
1	A	269	ASN
1	B	73	ASN
1	B	99	ASN
1	B	183	HIS
1	B	209	HIS
1	B	248	HIS
1	B	269	ASN
1	B	300	ASN
1	B	306	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](#)

10 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	9RN	B	403	3	11,11,12	1.17	1 (9%)	15,16,18	1.28	2 (13%)
2	9RN	B	401	3	12,12,12	1.18	1 (8%)	18,18,18	1.94	2 (11%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
3	G4S	B	402	2	15,15,16	1.71	3 (20%)	18,22,24	1.78	3 (16%)
3	G4S	A	404	2	15,15,16	1.52	3 (20%)	18,22,24	1.77	3 (16%)
2	9RN	A	403	3	11,11,12	0.97	1 (9%)	15,16,18	1.28	2 (13%)
3	G4S	B	404	2	15,15,16	1.50	2 (13%)	18,22,24	1.64	5 (27%)
2	9RN	A	401	3	12,12,12	1.01	0	18,18,18	1.79	5 (27%)
3	G4S	A	402	2	15,15,16	2.50	6 (40%)	18,22,24	1.82	6 (33%)
4	CIT	A	405	-	12,12,12	1.79	2 (16%)	17,17,17	4.58	8 (47%)
4	CIT	B	405	-	12,12,12	1.58	3 (25%)	17,17,17	5.35	12 (70%)

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	9RN	B	403	3	-	-	0/3/2/2
2	9RN	B	401	3	-	-	0/3/2/2
3	G4S	B	402	2	-	0/7/23/27	0/1/1/1
3	G4S	A	404	2	-	4/7/23/27	0/1/1/1
2	9RN	A	403	3	-	-	0/3/2/2
3	G4S	B	404	2	-	3/7/23/27	0/1/1/1
2	9RN	A	401	3	-	-	0/3/2/2
3	G4S	A	402	2	-	0/7/23/27	0/1/1/1
4	CIT	A	405	-	-	4/16/16/16	-
4	CIT	B	405	-	-	6/16/16/16	-

All (22) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	A	402	G4S	O4-S	5.42	1.73	1.57
3	A	402	G4S	C1-C2	-5.06	1.48	1.52
4	A	405	CIT	C3-C6	-4.42	1.48	1.53
3	B	402	G4S	C1-C2	-4.26	1.49	1.52
3	B	404	G4S	C1-C2	4.20	1.56	1.52
4	B	405	CIT	O7-C3	3.58	1.50	1.43
3	A	402	G4S	C3-C2	3.25	1.58	1.52
3	A	404	G4S	O4-S	3.24	1.66	1.57
3	B	402	G4S	O4-S	3.14	1.66	1.57
3	B	404	G4S	O4-S	3.02	1.66	1.57

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	A	402	G4S	O4-C4	-2.67	1.43	1.47
4	A	405	CIT	O7-C3	2.46	1.48	1.43
3	B	402	G4S	C5-C4	2.42	1.56	1.52
2	A	403	9RN	O2-C2	2.36	1.48	1.43
3	A	402	G4S	O2-C2	2.33	1.48	1.43
2	B	403	9RN	O2-C2	2.27	1.48	1.43
2	B	401	9RN	C4-C3	-2.26	1.47	1.52
3	A	404	G4S	O2-C2	2.25	1.48	1.43
4	B	405	CIT	C3-C6	-2.18	1.51	1.53
4	B	405	CIT	O4-C5	-2.12	1.23	1.30
3	A	404	G4S	O1-C1	2.09	1.46	1.39
3	A	402	G4S	O5-C1	2.05	1.48	1.42

All (48) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	A	405	CIT	O7-C3-C6	-10.96	93.47	108.86
4	B	405	CIT	O5-C6-C3	-9.74	108.46	122.25
4	B	405	CIT	O7-C3-C6	-9.36	95.73	108.86
4	B	405	CIT	O6-C6-C3	8.75	128.24	113.05
4	B	405	CIT	C2-C3-C6	8.40	128.15	110.11
4	A	405	CIT	O7-C3-C4	-7.88	90.96	109.40
4	B	405	CIT	O7-C3-C4	-7.35	92.20	109.40
4	A	405	CIT	O7-C3-C2	-7.15	92.66	109.40
4	B	405	CIT	O7-C3-C2	-6.37	94.50	109.40
4	A	405	CIT	C2-C3-C6	6.28	123.59	110.11
2	B	401	9RN	O5-C5-C4	-6.10	100.43	109.55
4	A	405	CIT	C3-C4-C5	5.91	128.12	113.81
3	A	404	G4S	C4-O4-S	5.13	124.60	117.91
3	B	402	G4S	O9-S-O8	4.63	124.58	108.49
2	A	401	9RN	O5-C5-C4	-4.62	102.64	109.55
4	A	405	CIT	C3-C2-C1	4.24	124.08	113.81
4	B	405	CIT	C4-C3-C6	4.10	118.91	110.11
3	B	404	G4S	C4-O4-S	3.95	123.06	117.91
4	A	405	CIT	C4-C3-C6	3.71	118.08	110.11
3	A	402	G4S	O5-C1-C2	-3.43	104.25	110.27
4	A	405	CIT	C4-C3-C2	3.32	117.81	109.16
4	B	405	CIT	O1-C1-C2	-3.21	113.55	122.94
4	B	405	CIT	C3-C4-C5	3.18	121.53	113.81
3	A	402	G4S	O1-C1-O5	-3.16	100.90	110.38
3	B	402	G4S	O5-C1-C2	-3.15	104.74	110.27
3	A	402	G4S	O9-S-O7	3.08	119.21	108.49

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	B	405	CIT	C3-C2-C1	2.69	120.33	113.81
2	B	401	9RN	C4-C3-C2	-2.67	105.85	112.91
2	A	401	9RN	O5-C5-C6	-2.61	109.43	113.35
2	A	401	9RN	O2-C2-C3	2.61	116.85	109.94
3	B	404	G4S	O9-S-O7	2.59	117.49	108.49
4	B	405	CIT	O3-C5-C4	2.55	130.40	122.94
3	B	404	G4S	O4-C4-C3	-2.51	103.22	108.54
3	A	402	G4S	O5-C5-C4	-2.49	106.25	109.90
3	B	402	G4S	C3-C4-C5	-2.45	107.54	110.85
3	B	404	G4S	O1-C1-O5	-2.45	103.04	110.38
2	B	403	9RN	O3-C6-C5	2.42	107.20	104.09
3	A	404	G4S	O9-S-O8	2.36	116.70	108.49
3	A	402	G4S	C2-C3-C4	-2.29	105.89	111.21
2	A	401	9RN	C6-C5-C4	2.24	106.19	102.28
2	A	403	9RN	C1-O5-C5	2.22	117.81	113.66
3	B	404	G4S	O5-C5-C4	-2.16	106.72	109.90
4	B	405	CIT	O4-C5-O3	-2.14	117.97	123.30
3	A	404	G4S	O1-C1-O5	-2.12	104.03	110.38
2	A	403	9RN	O1-C1-O5	-2.11	104.05	110.38
3	A	402	G4S	O6-C6-C5	-2.05	104.27	111.29
2	A	401	9RN	O4-C4-C3	-2.03	105.41	111.17
2	B	403	9RN	C4-C5-C6	-2.01	99.90	102.72

There are no chirality outliers.

All (17) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	A	404	G4S	C4-O4-S-O9
3	B	404	G4S	C4-O4-S-O7
3	B	404	G4S	C4-O4-S-O8
4	A	405	CIT	C1-C2-C3-C6
4	A	405	CIT	C6-C3-C4-C5
4	B	405	CIT	C1-C2-C3-C6
3	A	404	G4S	C4-O4-S-O7
3	A	404	G4S	C4-O4-S-O8
4	A	405	CIT	C4-C3-C6-O5
4	A	405	CIT	C4-C3-C6-O6
4	B	405	CIT	C2-C3-C6-O5
3	B	404	G4S	C4-O4-S-O9
4	B	405	CIT	C2-C3-C6-O6
4	B	405	CIT	C4-C3-C6-O5
4	B	405	CIT	C4-C3-C6-O6

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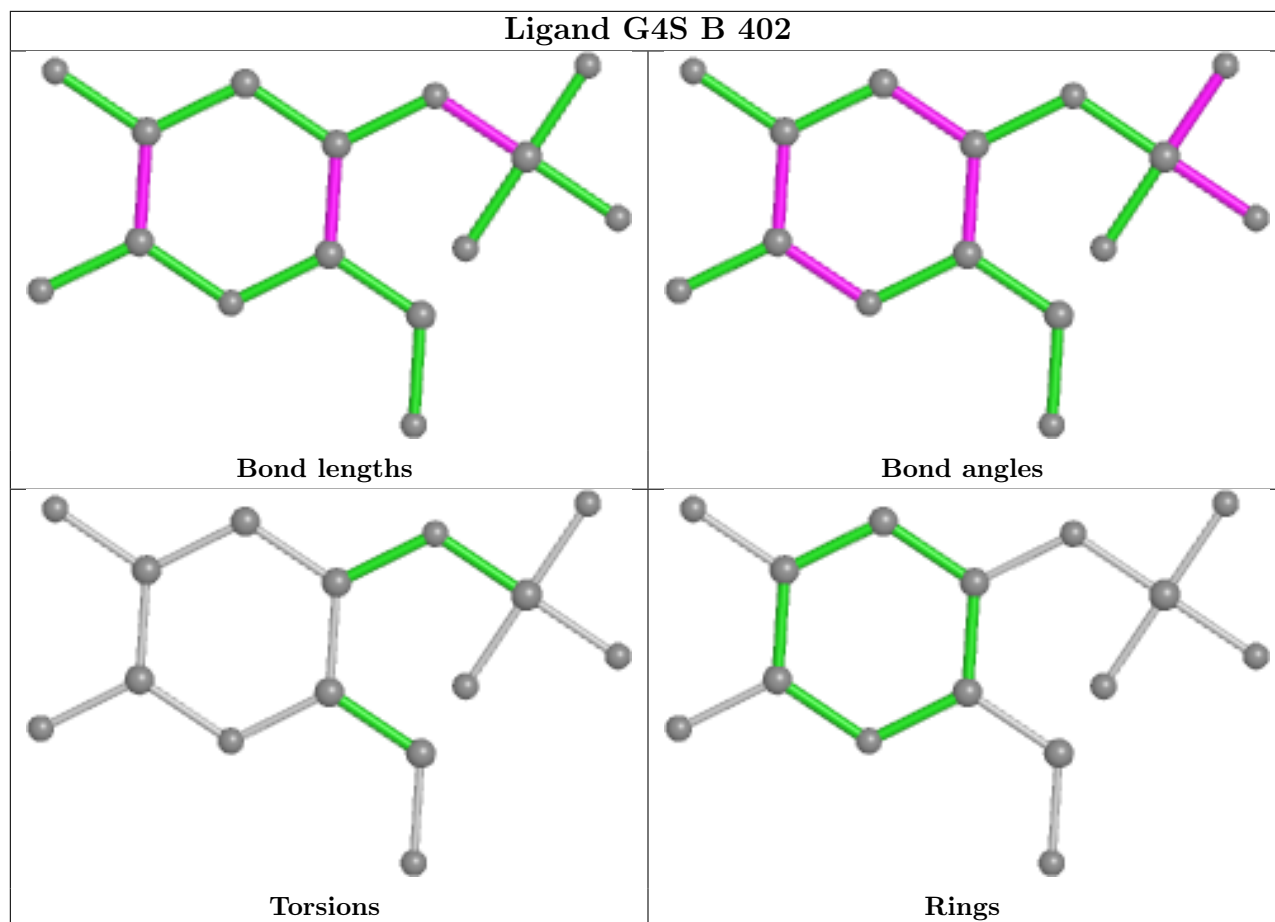
Mol	Chain	Res	Type	Atoms
4	B	405	CIT	C6-C3-C4-C5
3	A	404	G4S	C4-C5-C6-O6

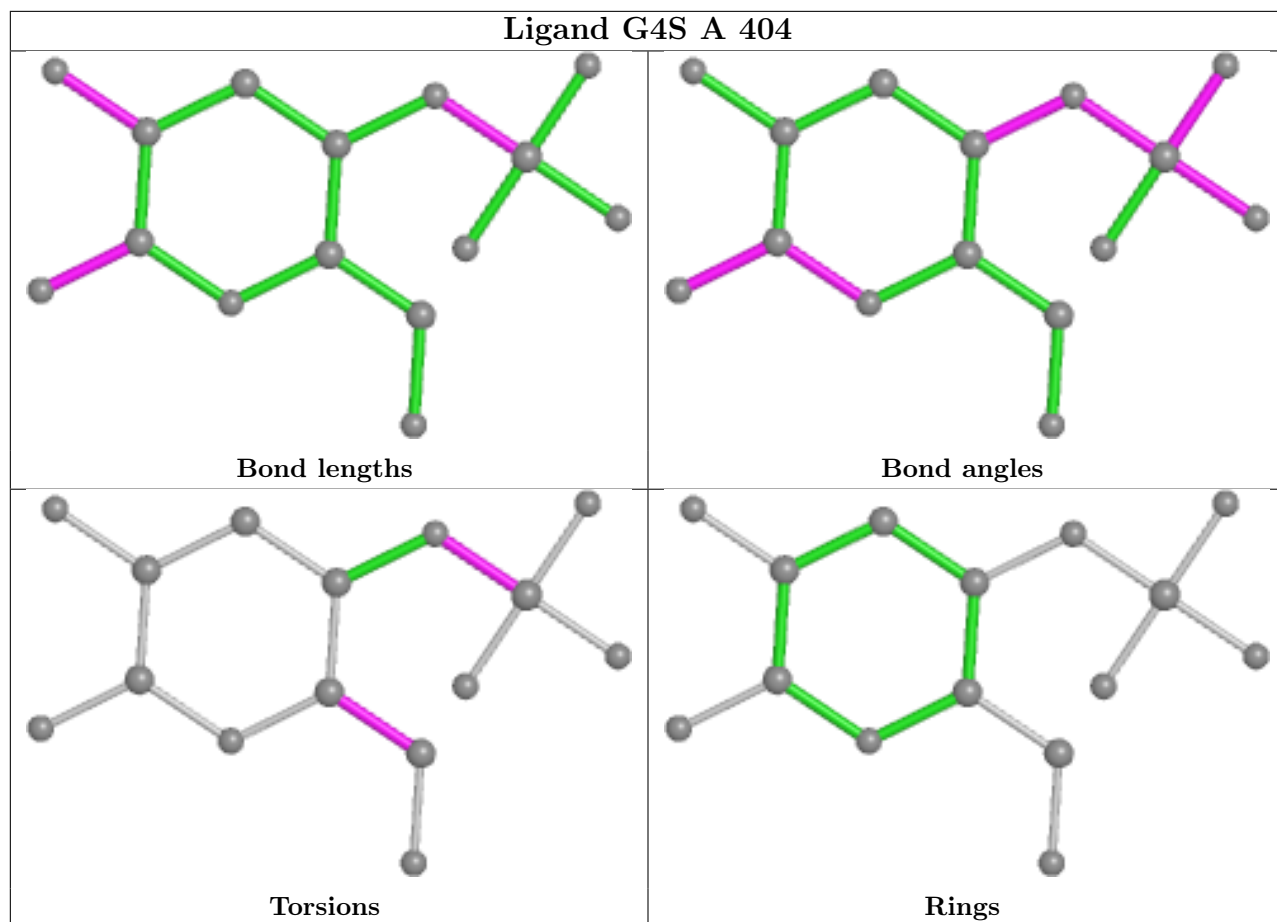
There are no ring outliers.

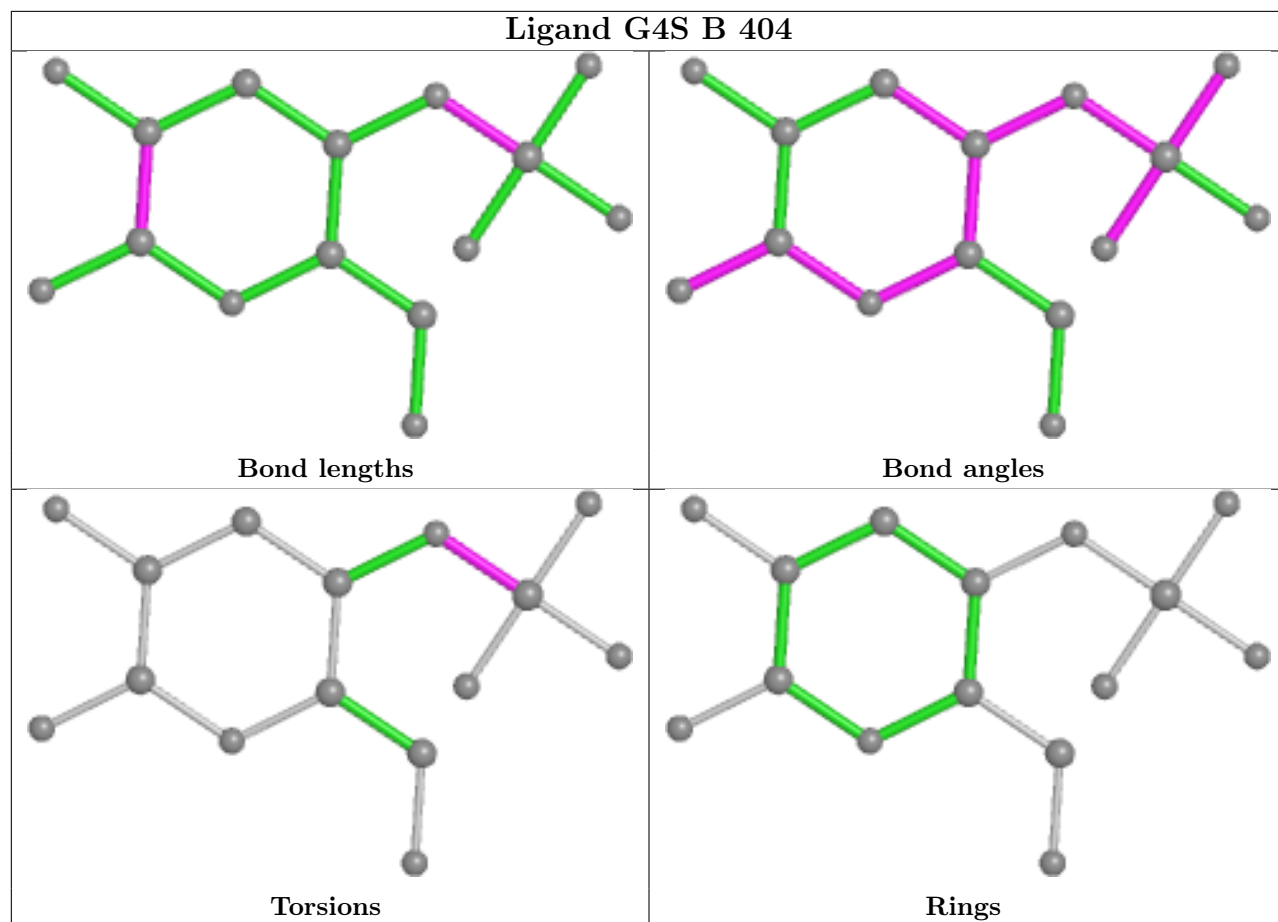
2 monomers are involved in 2 short contacts:

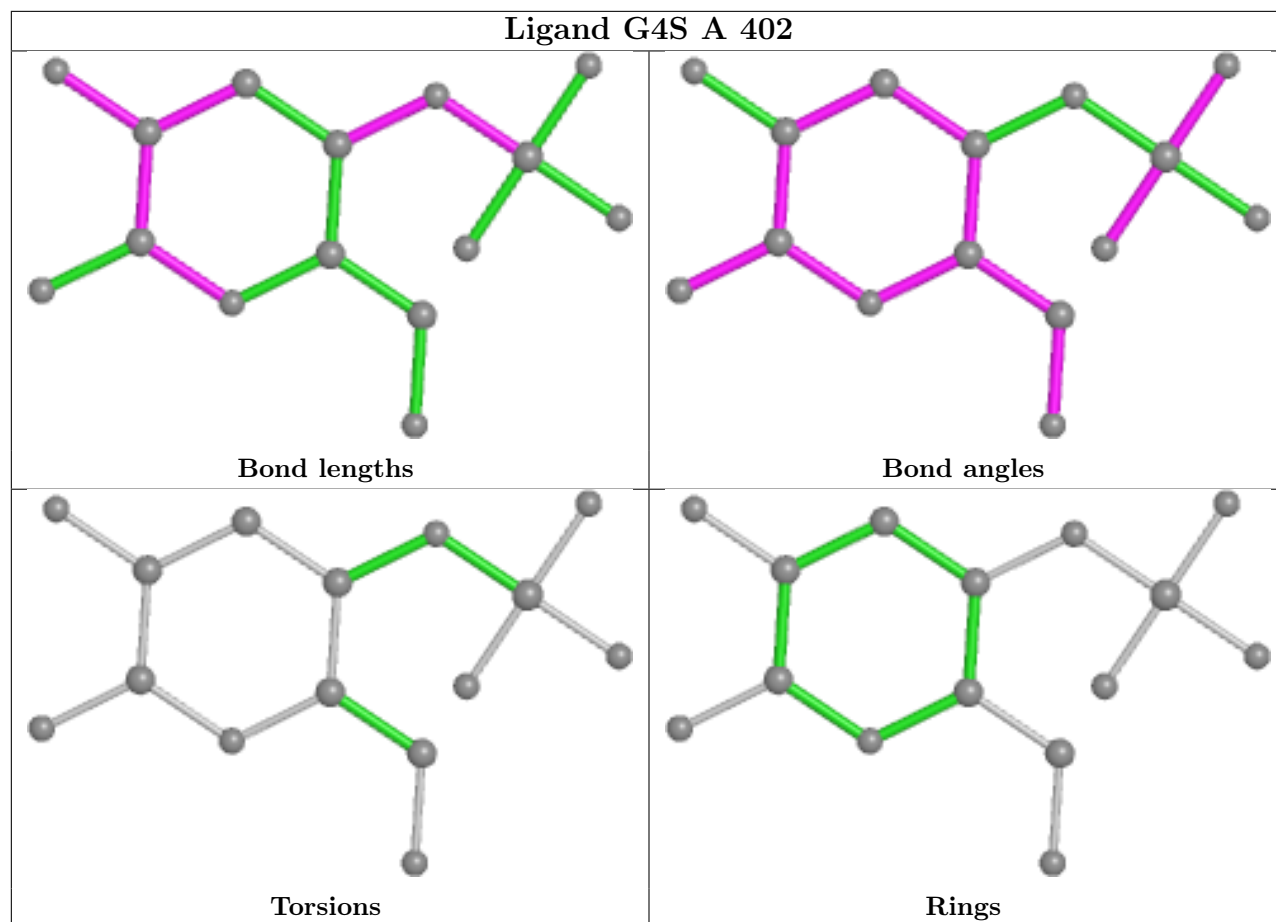
Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	A	404	G4S	1	0
3	B	404	G4S	1	0

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 than 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.









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	271/285 (95%)	-0.30	5 (1%) 68 72	4, 12, 28, 53	6 (2%)
1	B	279/285 (97%)	-0.44	3 (1%) 80 83	3, 9, 22, 46	3 (1%)
All	All	550/570 (96%)	-0.37	8 (1%) 73 77	3, 10, 26, 53	9 (1%)

All (8) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	190	GLY	3.3
1	A	27	SER	3.1
1	A	189	ASN	3.1
1	B	189	ASN	2.8
1	A	191	LYS	2.6
1	A	28	MET	2.3
1	B	154	THR	2.0
1	B	191	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,

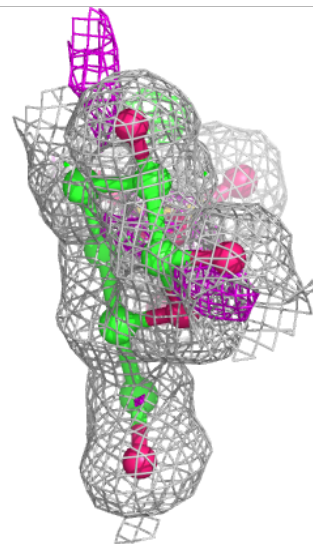
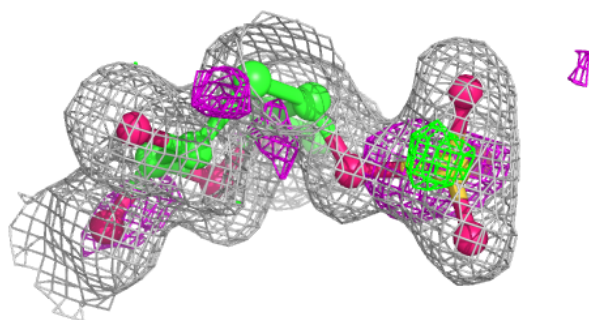
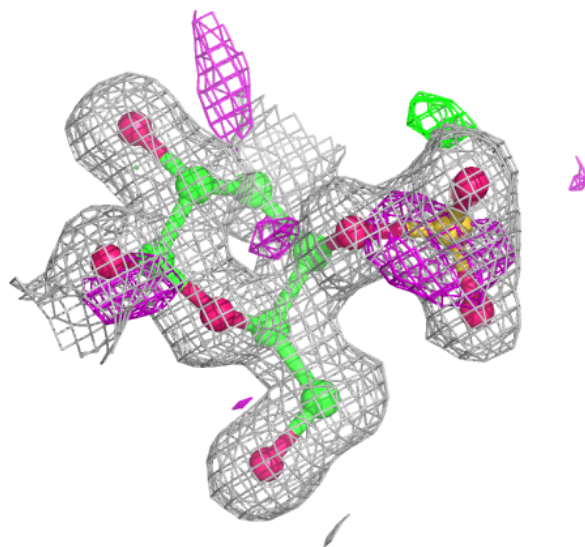
median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists the number of atoms with occupancy less than 0.9.

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
2	9RN	A	401	11/11	0.89	0.12	20,28,34,43	0
4	CIT	B	405	13/13	0.92	0.20	12,28,39,40	0
4	CIT	A	405	13/13	0.93	0.17	11,37,60,61	0
2	9RN	B	401	11/11	0.94	0.10	12,22,24,33	0
3	G4S	A	402	15/16	0.95	0.10	11,14,22,23	0
2	9RN	A	403	10/11	0.97	0.06	10,11,12,12	0
3	G4S	B	402	15/16	0.98	0.06	7,10,18,20	0
2	9RN	B	403	10/11	0.98	0.07	6,6,7,8	0
3	G4S	A	404	15/16	0.98	0.06	10,11,12,15	0
3	G4S	B	404	15/16	0.99	0.05	6,7,9,9	0

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.

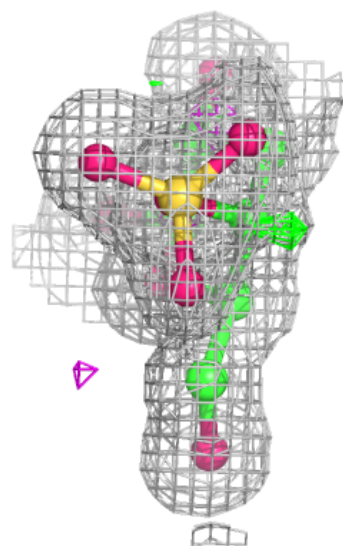
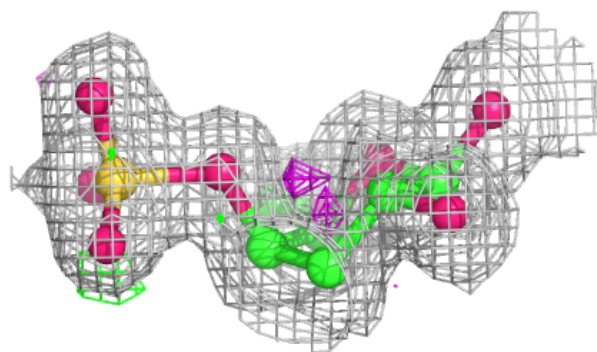
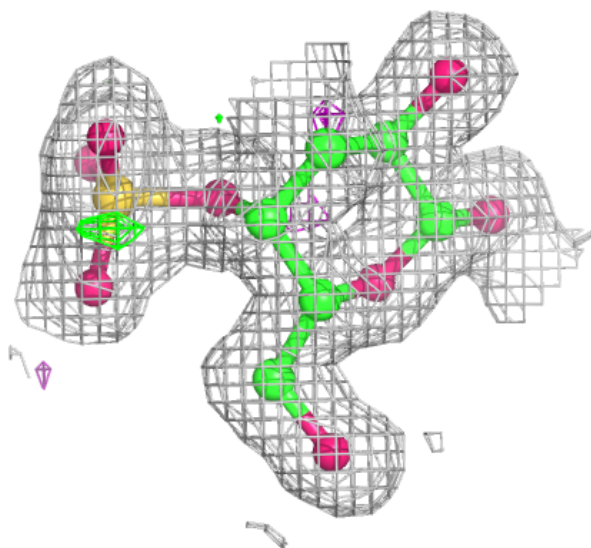
Electron density around G4S A 402:

$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)



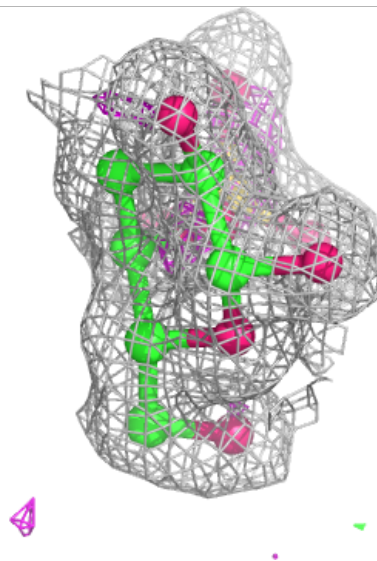
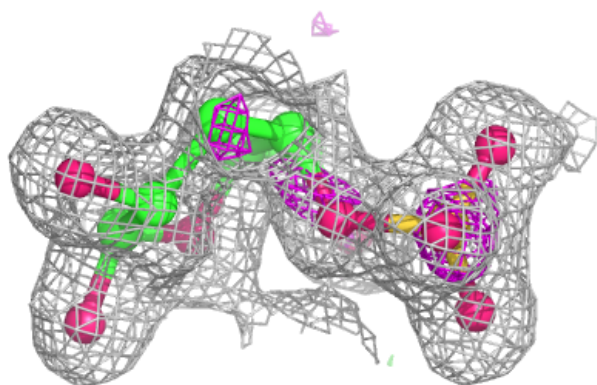
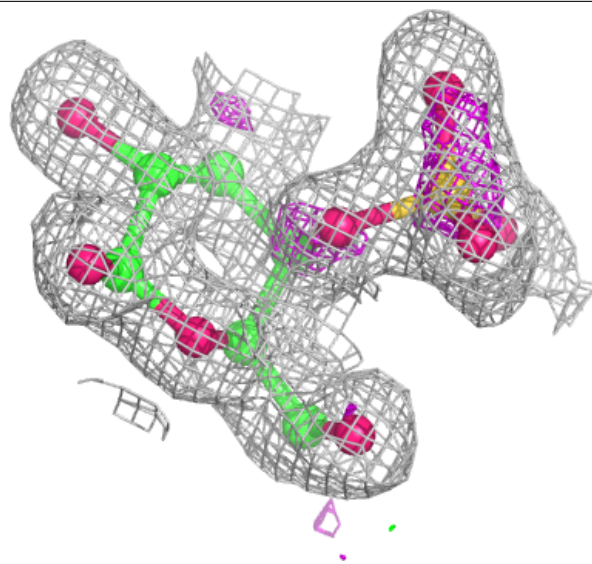
Electron density around G4S B 402:

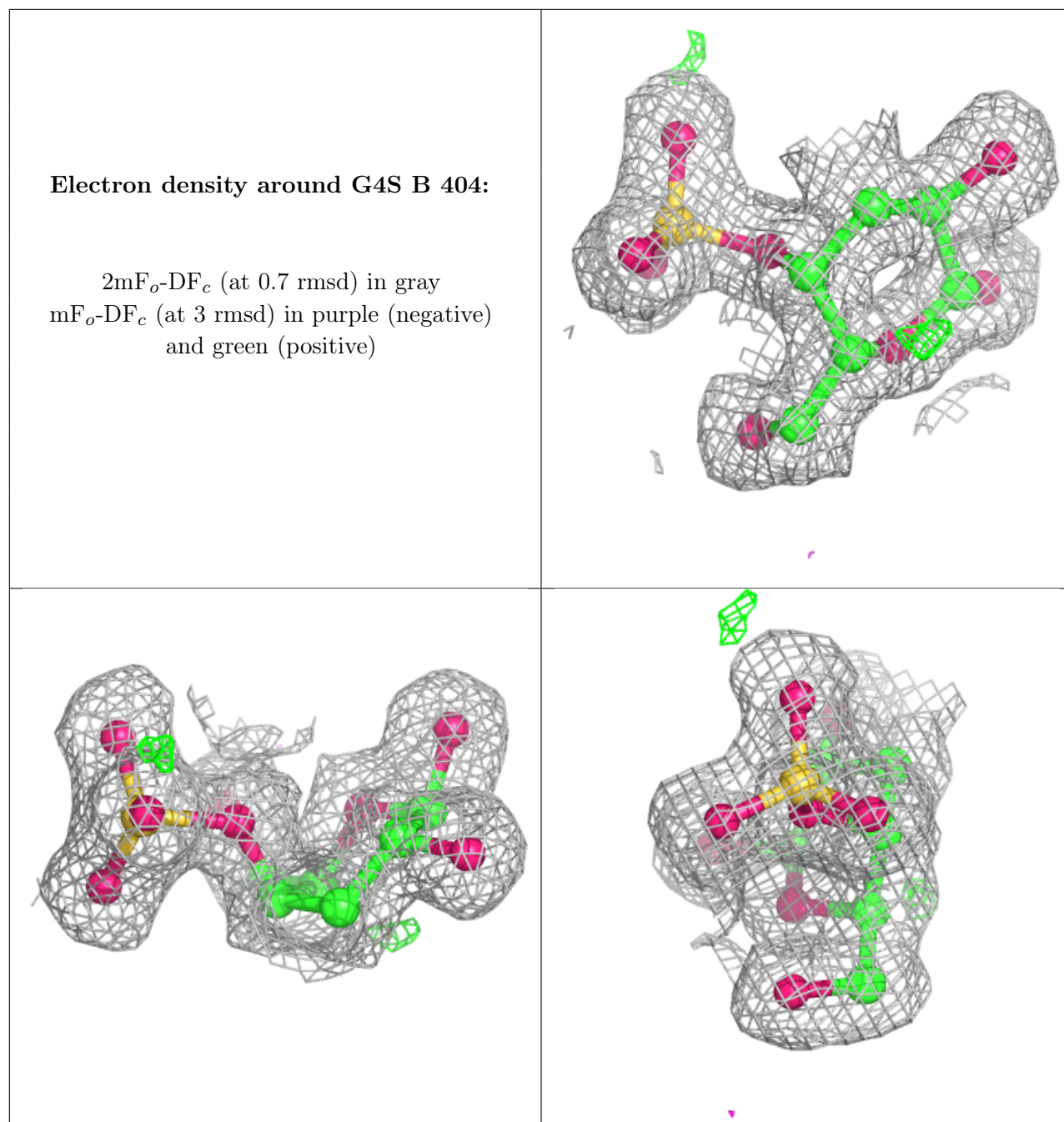
$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)



Electron density around G4S A 404:

$2mF_o-DF_c$ (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.