



Full wwPDB X-ray Structure Validation Report ⓘ

Oct 5, 2024 – 03:38 pm BST

PDB ID : 6HK4
Title : Crystal structure of GSK-3B in complex with pyrazine inhibitor C22
Authors : Piretti, V.; Giabbai, B.; Demitri, N.; Di Martino, R.; Tripathi, S.K.; Gobbo, D.; Decherchi, S.; Storici, P.; Giroto, S.; Cavalli, A.
Deposited on : 2018-09-05
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 ⓘ 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)
Xtrriage (Phenix) : 1.13
EDS : 3.0
buster-report : 1.1.7 (2018)
Percentile statistics : 20231227.v01 (using entries in the PDB archive December 27th 2023)
CCP4 : 9.0.003 (Gargrove)
Density-Fitness : 1.0.11
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.39

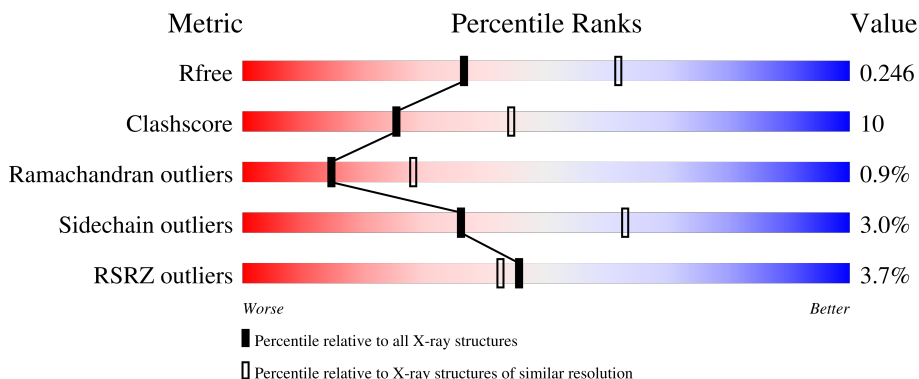
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 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))
R_{free}	164625	5504 (2.50-2.50)
Clashscore	180529	6282 (2.50-2.50)
Ramachandran outliers	177936	6191 (2.50-2.50)
Sidechain outliers	177891	6193 (2.50-2.50)
RSRZ outliers	164620	5504 (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 $\leq 5\%$. 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	350	
1	B	350	
2	N	9	

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
3	MLI	B	401	-	-	X	-

2 Entry composition [i](#)

There are 7 unique types of molecules in this entry. The entry contains 6019 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.

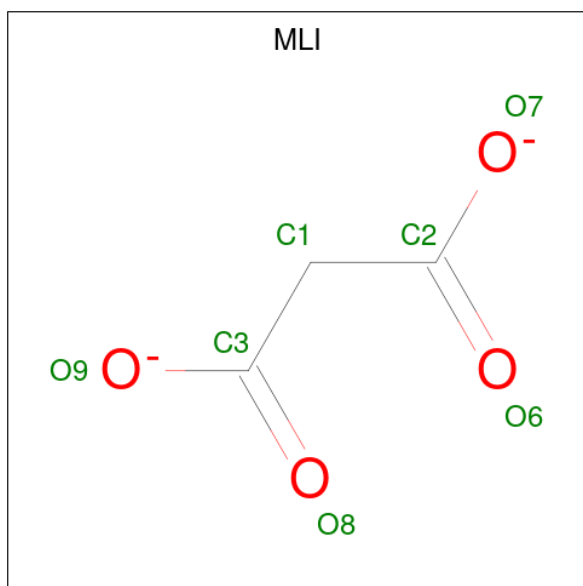
- Molecule 1 is a protein called Glycogen synthase kinase-3 beta.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace	
			Total	C	N	O	P				S
1	A	350	2775	1782	473	507	1	12	0	3	0
1	B	350	2791	1799	477	502	1	12	5	4	0

- Molecule 2 is a protein called GLY-SER-HIS-GLY-HIS-HIS-HIS-HIS.

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
			Total	C	N	O			
2	N	9	74	43	21	10	0	0	0

- Molecule 3 is MALONATE ION (three-letter code: MLI) (formula: C₃H₂O₄).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
			Total	C	O		
3	A	1	7	3	4	0	0

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Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
			Total	C	O		
3	B	1	7	3	4	0	0

- Molecule 4 is GLYCEROL (three-letter code: GOL) (formula: $C_3H_8O_3$).



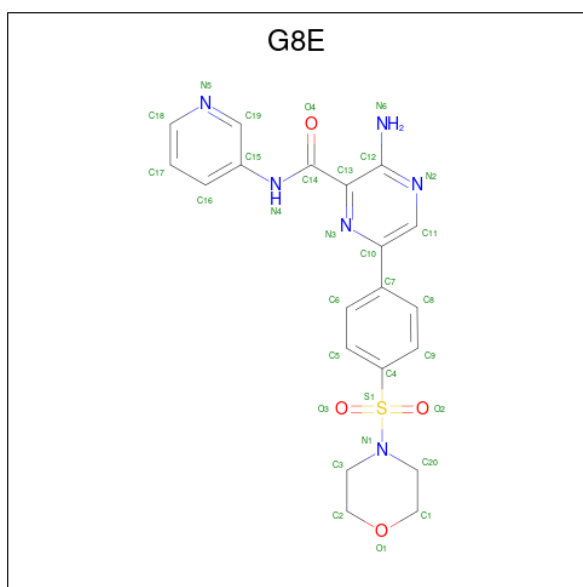
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
			Total	C	O		
4	A	1	6	3	3	0	0
4	A	1	6	3	3	0	0
4	A	1	6	3	3	0	0
4	B	1	6	3	3	0	0
4	B	1	6	3	3	0	0
4	B	1	6	3	3	0	0
4	B	1	6	3	3	0	0

- Molecule 5 is DIMETHYL SULFOXIDE (three-letter code: DMS) (formula: C_2H_6OS).



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

- Molecule 6 is 3-azanyl-6-(4-morpholin-4-ylsulfonylphenyl)- {N}-pyridin-3-yl-pyrazine-2-carb oxamide (three-letter code: G8E) (formula: C₂₀H₂₀N₆O₄S).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
6	A	1	Total	C	N	O	S	0	0
			31	20	6	4	1		
6	B	1	Total	C	N	O	S	0	0
			31	20	6	4	1		

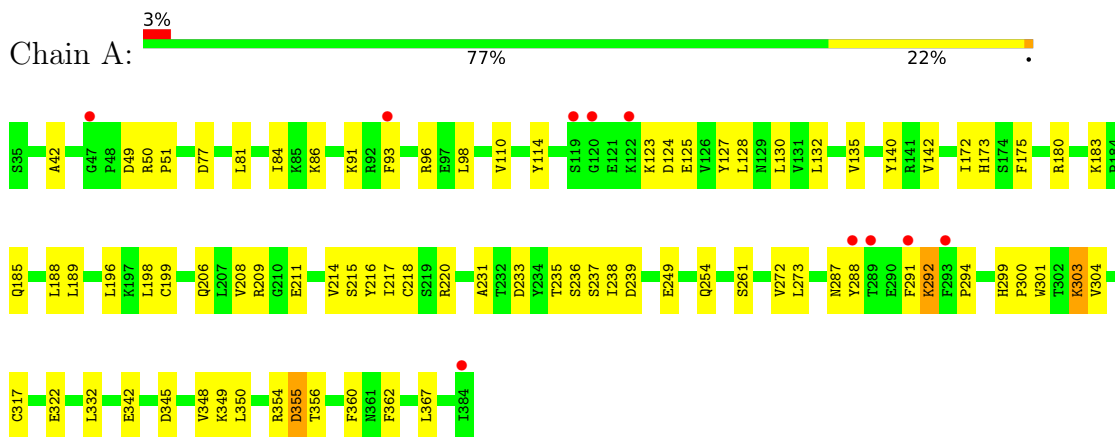
- Molecule 7 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
7	A	109	Total	O	0	3
			112	112		
7	B	113	Total	O	0	6
			119	119		
7	N	5	Total	O	0	1
			6	6		

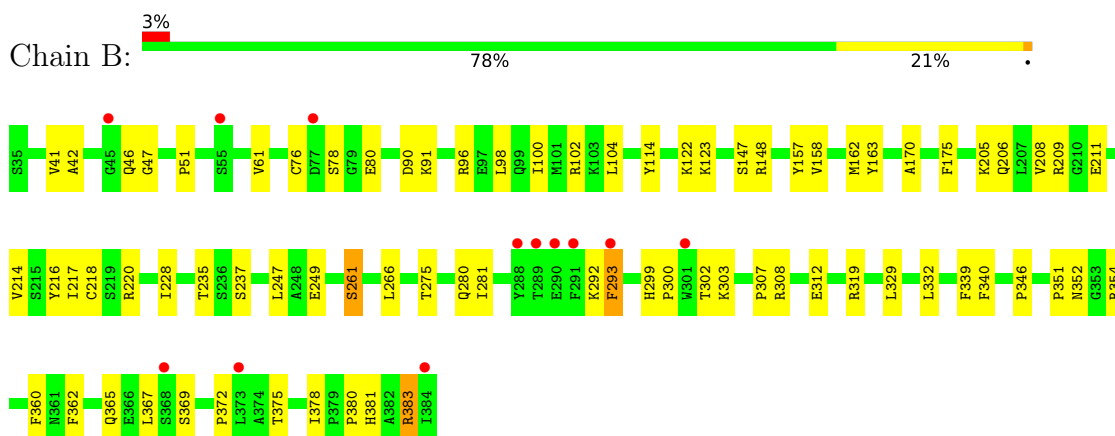
3 Residue-property plots [i](#)

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.

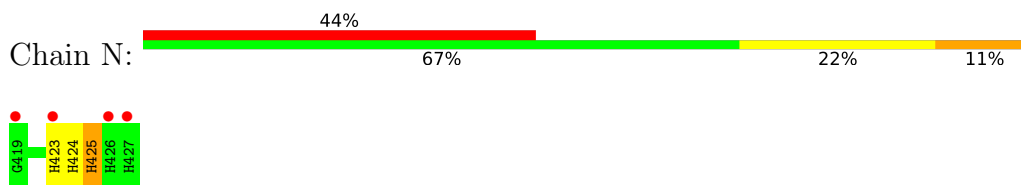
- Molecule 1: Glycogen synthase kinase-3 beta



- Molecule 1: Glycogen synthase kinase-3 beta



- Molecule 2: GLY-SER-HIS-GLY-HIS-HIS-HIS-HIS



4 Data and refinement statistics

Property	Value	Source
Space group	P 1	Depositor
Cell constants a, b, c, α , β , γ	63.19Å 67.20Å 67.32Å 100.50° 103.70° 90.67°	Depositor
Resolution (Å)	43.67 – 2.50 43.67 – 2.50	Depositor EDS
% Data completeness (in resolution range)	97.5 (43.67-2.50) 97.4 (43.67-2.50)	Depositor EDS
R_{merge}	0.11	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.52 (at 2.51Å)	Xtrriage
Refinement program	REFMAC	Depositor
R, R_{free}	0.210 , 0.249 0.219 , 0.246	Depositor DCC
R_{free} test set	1709 reflections (4.71%)	wwPDB-VP
Wilson B-factor (Å ²)	49.4	Xtrriage
Anisotropy	0.363	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.36 , 70.0	EDS
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.33$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
F_o, F_c correlation	0.94	EDS
Total number of atoms	6019	wwPDB-VP
Average B, all atoms (Å ²)	62.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.80% 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: G8E, GOL, MLI, PTR, DMS

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	0.47	0/2836	0.61	0/3865
1	B	0.43	0/2854	0.57	0/3884
2	N	0.33	0/79	0.70	0/105
All	All	0.45	0/5769	0.59	0/7854

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand. A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
1	A	0	1

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	292	LYS	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	2775	0	2762	57	0
1	B	2791	0	2801	54	0
2	N	74	0	52	2	0
3	A	7	0	2	1	0
3	B	7	0	2	3	0
4	A	18	0	24	0	0
4	B	24	0	32	1	0
5	A	12	0	18	2	0
5	B	12	0	18	0	0
6	A	31	0	0	0	0
6	B	31	0	0	0	0
7	A	112	0	0	6	0
7	B	119	0	0	5	0
7	N	6	0	0	0	0
All	All	6019	0	5711	109	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 10.

All (109) 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:209:ARG:HH22	1:A:233:ASP:HB2	1.26	0.99
1:A:91:LYS:HZ1	1:A:125:GLU:HA	1.43	0.83
1:B:148:ARG:NH1	7:B:502:HOH:O	2.21	0.73
1:A:209:ARG:NH2	1:A:233:ASP:HB2	2.04	0.72
1:B:228:ILE:HG21	1:B:266:LEU:HB2	1.74	0.70
1:B:235:THR:HG23	1:B:237:SER:HB3	1.77	0.66
1:B:100:ILE:O	1:B:104:LEU:HD23	1.94	0.66
1:B:380:PRO:HA	1:B:383:ARG:HE	1.61	0.66
1:A:183:LYS:HE3	1:A:185:GLN:HB2	1.79	0.64
1:B:299:HIS:CE1	1:B:303:LYS:HE3	2.33	0.64
1:B:332:LEU:HD11	1:B:367:LEU:HA	1.81	0.62
1:A:218[B]:CYS:SG	7:A:521:HOH:O	2.56	0.62
1:A:91:LYS:NZ	1:A:125:GLU:HA	2.14	0.61
1:B:220:ARG:HH22	4:B:404:GOL:H2	1.65	0.61
1:A:291:PHE:HB2	1:B:61:VAL:HG23	1.83	0.60
1:B:214:VAL:HG23	3:B:401:MLI:H12	1.83	0.60
1:B:208:VAL:HG13	1:B:211:GLU:HB3	1.83	0.59
1:A:185:GLN:HG3	5:A:407:DMS:H23	1.85	0.58
1:B:175:PHE:O	1:B:206:GLN:NE2	2.36	0.58
1:A:235:THR:HG23	1:A:237:SER:H	1.68	0.58

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:205:LYS:NZ	3:B:401:MLI:O9	2.36	0.58
1:B:352:ASN:ND2	1:B:354:ARG:HD3	2.18	0.58
1:A:220:ARG:HD2	1:A:261:SER:C	2.25	0.57
1:B:214:VAL:HG23	3:B:401:MLI:C1	2.36	0.56
1:A:209:ARG:NE	1:A:209:ARG:HA	2.21	0.56
1:A:254:GLN:NE2	7:A:504:HOH:O	2.34	0.55
1:A:215:SER:HB3	1:A:231:ALA:O	2.07	0.55
1:B:249:GLU:HB2	7:B:532[B]:HOH:O	2.07	0.53
1:B:78:SER:OG	1:B:80:GLU:HB2	2.09	0.53
1:B:175:PHE:HE2	1:B:365:GLN:CD	2.12	0.53
1:B:378:ILE:HG22	1:B:383:ARG:HD2	1.91	0.53
1:A:332:LEU:HD21	1:A:367:LEU:HA	1.91	0.52
1:A:235:THR:HG21	7:A:586:HOH:O	2.10	0.52
1:B:41:VAL:HG12	1:B:51:PRO:HB2	1.91	0.52
1:B:346:PRO:HD3	1:B:381:HIS:CD2	2.44	0.52
1:B:96:ARG:CZ	1:B:205:LYS:HD2	2.39	0.52
1:B:163:TYR:HB2	1:B:340:PHE:CD1	2.45	0.52
1:A:322:GLU:OE1	2:N:424:HIS:ND1	2.44	0.51
1:B:162:MET:HG3	1:B:247:LEU:HD13	1.93	0.51
1:A:301:TRP:CD1	2:N:425:HIS:CG	2.99	0.50
1:A:349:LYS:NZ	1:A:355:ASP:OD2	2.44	0.50
1:A:214:VAL:HG12	3:A:401:MLI:C2	2.42	0.50
1:A:301:TRP:CE3	1:A:304:VAL:HG11	2.46	0.50
1:A:175:PHE:O	1:A:206:GLN:NE2	2.44	0.50
1:A:217:ILE:HG13	1:A:218[A]:CYS:H	1.76	0.50
1:A:49:ASP:O	1:A:51:PRO:HD3	2.11	0.49
1:B:383:ARG:NH2	7:B:512:HOH:O	2.45	0.49
1:B:281:ILE:HD11	1:B:293:PHE:HZ	1.78	0.48
1:A:217:ILE:HG13	1:A:218[B]:CYS:H	1.78	0.48
1:A:84:ILE:HA	1:A:130:LEU:O	2.14	0.48
1:A:235:THR:OG1	1:A:236:SER:N	2.45	0.47
1:B:308:ARG:HH21	1:B:308:ARG:HB2	1.79	0.47
1:B:360:PHE:O	1:B:362:PHE:N	2.43	0.47
1:B:220:ARG:HD3	1:B:261:SER:O	2.14	0.47
1:B:303:LYS:HD2	1:B:303:LYS:O	2.14	0.47
1:B:46:GLN:HG2	1:B:47:GLY:N	2.30	0.47
1:A:345:ASP:HB3	1:A:348:VAL:CG2	2.46	0.46
1:B:42:ALA:HB1	1:B:114:TYR:HB3	1.97	0.46
1:B:98:LEU:O	1:B:102:ARG:HG3	2.16	0.46
1:A:50:ARG:HH11	1:A:50:ARG:HG3	1.80	0.46
1:B:158:VAL:HG12	1:B:339:PHE:HZ	1.80	0.46

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:299:HIS:ND1	1:B:300:PRO:HD2	2.30	0.46
1:B:308:ARG:N	7:B:503:HOH:O	2.27	0.46
1:B:372:PRO:O	1:B:375:THR:HG23	2.16	0.46
1:B:157:TYR:CZ	1:B:351:PRO:HG2	2.51	0.45
1:A:42:ALA:HB1	1:A:114:TYR:HB3	1.98	0.45
1:B:91:LYS:HA	1:B:91:LYS:HD3	1.73	0.45
1:B:312:GLU:H	1:B:312:GLU:CD	2.20	0.45
1:B:123:LYS:HE3	1:B:123:LYS:HB2	1.58	0.45
1:A:172:ILE:HG13	1:A:173:HIS:HD2	1.82	0.45
1:B:280:GLN:OE1	7:B:501:HOH:O	2.21	0.44
1:A:110:VAL:HG12	1:A:132:LEU:HB3	1.99	0.44
1:B:275:THR:HG23	1:B:293:PHE:CE1	2.52	0.44
1:A:96:ARG:HD2	7:A:518:HOH:O	2.18	0.44
1:A:272:VAL:HG12	1:A:273:LEU:HD12	1.99	0.44
1:B:96:ARG:NH1	1:B:205:LYS:HD2	2.33	0.44
1:A:188:LEU:O	1:A:196:LEU:HA	2.18	0.44
1:A:172:ILE:HG13	1:A:173:HIS:CD2	2.53	0.43
1:A:249:GLU:HB2	7:A:527[A]:HOH:O	2.17	0.43
1:B:319:ARG:HB2	1:B:329:LEU:HD11	1.99	0.43
1:B:383:ARG:N	1:B:383:ARG:HD3	2.33	0.43
1:A:86:LYS:HE3	1:A:127:TYR:CD1	2.53	0.43
1:B:170:ALA:HB1	1:B:332:LEU:HG	2.01	0.43
1:A:238:ILE:HG13	1:A:239:ASP:N	2.34	0.43
1:A:345:ASP:HB3	1:A:348:VAL:HG22	2.01	0.43
1:B:209:ARG:H	1:B:209:ARG:HG3	1.60	0.43
1:A:81:LEU:HD23	1:A:81:LEU:HA	1.85	0.43
1:A:140:TYR:HB3	5:A:407:DMS:H23	2.01	0.42
1:A:354:ARG:NH1	7:A:512:HOH:O	2.51	0.42
1:A:98:LEU:HD22	1:A:128:LEU:HD11	2.00	0.42
1:A:110:VAL:HG21	1:A:199:CYS:HB3	2.00	0.42
1:A:291:PHE:CB	1:B:61:VAL:HG23	2.48	0.42
1:A:299:HIS:CD2	1:A:300:PRO:HD2	2.53	0.42
1:B:41:VAL:CG1	1:B:51:PRO:HB2	2.49	0.42
1:A:110:VAL:HG23	1:A:198:LEU:O	2.19	0.42
1:A:300:PRO:HG2	1:A:303:LYS:HB3	2.01	0.42
1:A:350:LEU:HD21	1:A:356:THR:HA	2.00	0.42
1:A:173:HIS:CE1	1:A:236:SER:HB2	2.55	0.42
1:A:342:GLU:O	1:A:348:VAL:HG21	2.19	0.42
1:B:235:THR:HG23	1:B:237:SER:H	1.84	0.42
1:A:208:VAL:CG2	1:A:211:GLU:HB3	2.49	0.41
1:B:380:PRO:HA	1:B:383:ARG:NE	2.30	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:319:ARG:O	1:B:329:LEU:HD12	2.21	0.41
1:A:135:VAL:HB	1:A:188:LEU:HB3	2.03	0.41
1:A:142:VAL:HG21	1:A:189:LEU:CD1	2.50	0.41
1:A:124:ASP:CG	1:A:124:ASP:O	2.59	0.40
1:A:180:ARG:HB3	1:A:217:ILE:HG12	2.04	0.40
1:A:360:PHE:O	1:A:362:PHE:N	2.50	0.40
1:B:300:PRO:O	1:B:302:THR:N	2.54	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	350/350 (100%)	318 (91%)	29 (8%)	3 (1%)	14	28
1	B	351/350 (100%)	323 (92%)	24 (7%)	4 (1%)	12	23
2	N	7/9 (78%)	3 (43%)	4 (57%)	0	100	100
All	All	708/709 (100%)	644 (91%)	57 (8%)	7 (1%)	14	25

All (7) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	307	PRO
1	B	122	LYS
1	B	218[A]	CYS
1	B	218[B]	CYS
1	A	294	PRO
1	A	123	LYS
1	A	288	TYR

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	304/311 (98%)	297 (98%)	7 (2%)	45	72
1	B	304/311 (98%)	294 (97%)	10 (3%)	33	59
2	N	7/7 (100%)	5 (71%)	2 (29%)	0	0
All	All	615/629 (98%)	596 (97%)	19 (3%)	36	62

All (19) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	77	ASP
1	A	93	PHE
1	A	287	ASN
1	A	292	LYS
1	A	303	LYS
1	A	317	CYS
1	A	355	ASP
1	B	76	CYS
1	B	90	ASP
1	B	147	SER
1	B	217[A]	ILE
1	B	217[B]	ILE
1	B	261	SER
1	B	292	LYS
1	B	293	PHE
1	B	369	SER
1	B	383	ARG
2	N	423	HIS
2	N	425	HIS

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	173	HIS
2	N	425	HIS

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Mol	Chain	Res	Type
2	N	426	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](#)

2 non-standard protein/DNA/RNA residues 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
1	PTR	B	216	1	15,16,17	1.21	1 (6%)	19,22,24	0.66	1 (5%)
1	PTR	A	216	1	15,16,17	1.41	1 (6%)	19,22,24	0.66	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
1	PTR	B	216	1	-	0/10/11/13	0/1/1/1
1	PTR	A	216	1	-	0/10/11/13	0/1/1/1

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	216	PTR	OH-CZ	-4.67	1.30	1.40
1	B	216	PTR	OH-CZ	-4.27	1.31	1.40

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	216	PTR	CB-CA-C	-2.46	106.85	111.47

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

No monomer is involved in short contacts.

5.5 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

17 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
4	GOL	A	403	-	5,5,5	0.62	0	5,5,5	1.21	0
3	MLI	A	401	-	6,6,6	1.45	0	7,7,7	1.47	0
4	GOL	B	403	-	5,5,5	0.95	0	5,5,5	1.03	0
5	DMS	A	405	-	3,3,3	0.65	0	3,3,3	0.51	0
5	DMS	B	408	-	3,3,3	0.66	0	3,3,3	1.10	0
5	DMS	B	407	-	3,3,3	0.64	0	3,3,3	1.02	0
5	DMS	B	406	-	3,3,3	0.65	0	3,3,3	0.62	0
4	GOL	A	404	-	5,5,5	1.51	2 (40%)	5,5,5	0.89	0
5	DMS	A	406	-	3,3,3	0.71	0	3,3,3	0.93	0
4	GOL	B	404	-	5,5,5	1.18	1 (20%)	5,5,5	1.06	0
3	MLI	B	401	-	6,6,6	1.51	1 (16%)	7,7,7	1.36	0
6	G8E	A	408	-	34,34,34	7.24	11 (32%)	44,48,48	3.25	10 (22%)
6	G8E	B	409	-	34,34,34	7.12	9 (26%)	44,48,48	3.75	10 (22%)
4	GOL	B	405	-	5,5,5	1.00	0	5,5,5	0.96	0
5	DMS	A	407	-	3,3,3	0.51	0	3,3,3	0.46	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
4	GOL	A	402	-	5,5,5	0.79	0	5,5,5	1.35	1 (20%)
4	GOL	B	402	-	5,5,5	0.91	0	5,5,5	1.00	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
4	GOL	A	403	-	-	0/4/4/4	-
3	MLI	A	401	-	-	2/4/4/4	-
4	GOL	B	403	-	-	4/4/4/4	-
4	GOL	A	404	-	-	1/4/4/4	-
6	G8E	B	409	-	-	4/24/32/32	0/4/4/4
4	GOL	B	404	-	-	2/4/4/4	-
3	MLI	B	401	-	-	0/4/4/4	-
6	G8E	A	408	-	-	2/24/32/32	0/4/4/4
4	GOL	B	405	-	-	2/4/4/4	-
4	GOL	A	402	-	-	1/4/4/4	-
4	GOL	B	402	-	-	2/4/4/4	-

All (24) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
6	A	408	G8E	C3-N1	-22.15	1.24	1.47
6	B	409	G8E	C3-N1	-21.66	1.25	1.47
6	A	408	G8E	C20-N1	-21.46	1.25	1.47
6	B	409	G8E	C20-N1	-21.29	1.25	1.47
6	A	408	G8E	O2-S1	19.12	1.64	1.43
6	A	408	G8E	O3-S1	18.76	1.64	1.43
6	B	409	G8E	O3-S1	18.68	1.64	1.43
6	B	409	G8E	O2-S1	18.60	1.64	1.43
6	A	408	G8E	S1-N1	-6.28	1.54	1.63
6	B	409	G8E	S1-N1	-5.23	1.56	1.63
6	A	408	G8E	C14-N4	4.54	1.47	1.35
6	B	409	G8E	C4-S1	4.26	1.82	1.76
6	B	409	G8E	C14-N4	3.82	1.45	1.35
6	A	408	G8E	C12-N6	3.78	1.43	1.34
6	B	409	G8E	C12-N6	3.41	1.42	1.34
6	A	408	G8E	C4-S1	3.01	1.80	1.76

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
6	B	409	G8E	C13-C12	-2.39	1.39	1.43
3	B	401	MLI	C1-C2	2.24	1.54	1.51
6	A	408	G8E	C7-C10	2.20	1.52	1.48
4	A	404	GOL	C3-C2	2.12	1.60	1.51
4	A	404	GOL	C1-C2	2.12	1.60	1.51
4	B	404	GOL	C1-C2	2.06	1.60	1.51
6	A	408	G8E	C16-C15	-2.03	1.35	1.39
6	A	408	G8E	C17-C16	-2.02	1.34	1.38

All (21) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
6	B	409	G8E	C1-C20-N1	17.95	118.75	108.18
6	A	408	G8E	C1-C20-N1	17.41	118.43	108.18
6	B	409	G8E	C2-C3-N1	11.59	115.00	108.18
6	A	408	G8E	C2-C3-N1	7.29	112.47	108.18
6	B	409	G8E	O2-S1-N1	5.40	111.61	106.69
6	B	409	G8E	C3-N1-S1	-5.04	107.89	117.05
6	B	409	G8E	O3-S1-O2	-4.67	111.95	119.52
6	A	408	G8E	C3-N1-S1	-4.51	108.85	117.05
6	B	409	G8E	C20-N1-S1	-3.91	109.94	117.05
6	A	408	G8E	C20-N1-S1	-3.60	110.50	117.05
6	A	408	G8E	C7-C10-N3	3.29	120.70	116.02
6	A	408	G8E	O3-S1-O2	-2.76	115.05	119.52
6	B	409	G8E	C7-C10-N3	2.75	119.94	116.02
6	A	408	G8E	C11-C10-C7	-2.64	118.56	122.06
6	A	408	G8E	C13-C12-N6	-2.60	119.79	122.84
6	B	409	G8E	C16-C15-C19	2.33	120.11	117.80
6	B	409	G8E	C11-C10-C7	-2.28	119.04	122.06
6	A	408	G8E	C4-S1-N1	2.28	110.02	107.30
6	B	409	G8E	C6-C7-C10	-2.18	117.85	121.28
6	A	408	G8E	O1-C1-C20	2.16	116.55	111.80
4	A	402	GOL	C3-C2-C1	-2.01	103.87	111.70

There are no chirality outliers.

All (20) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
4	B	402	GOL	C1-C2-C3-O3
4	B	403	GOL	O1-C1-C2-C3
4	B	403	GOL	C1-C2-C3-O3
4	B	404	GOL	C1-C2-C3-O3

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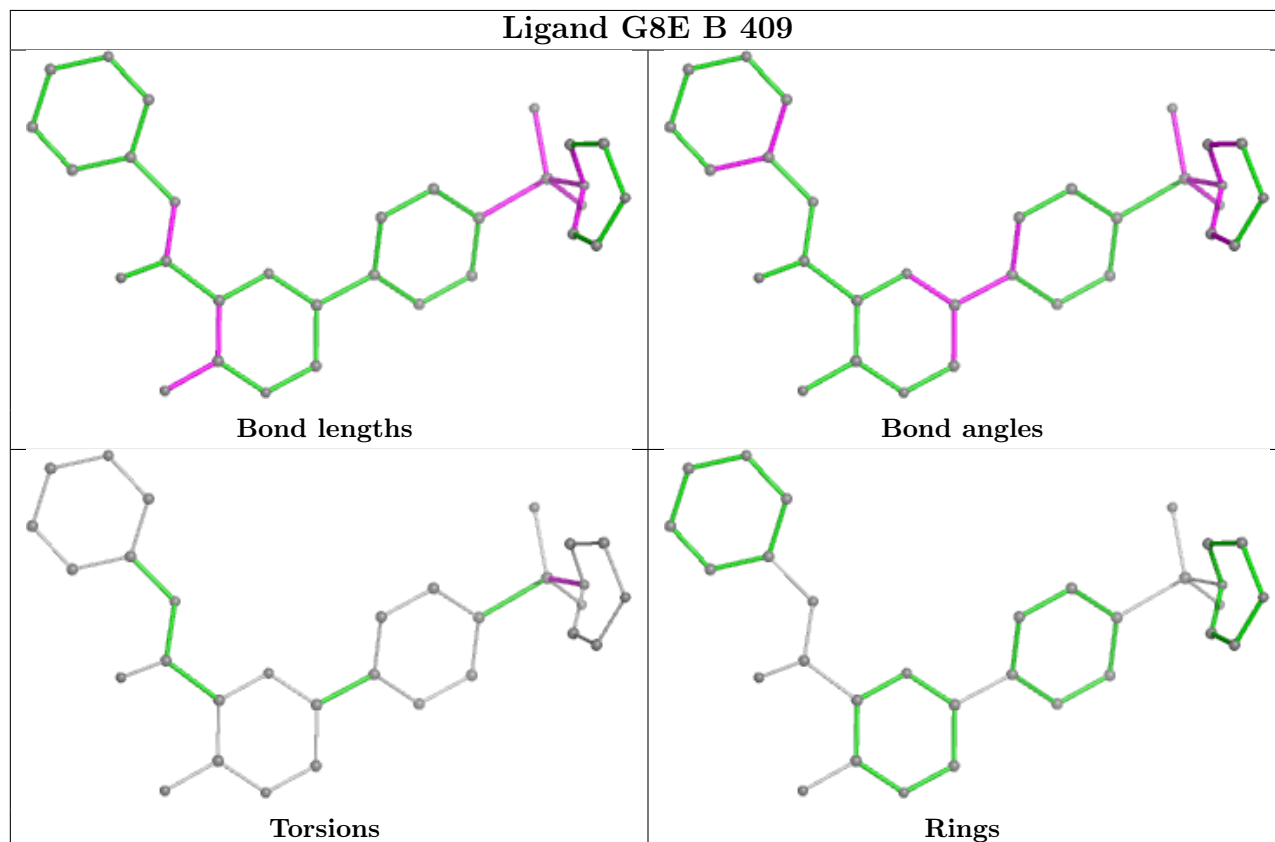
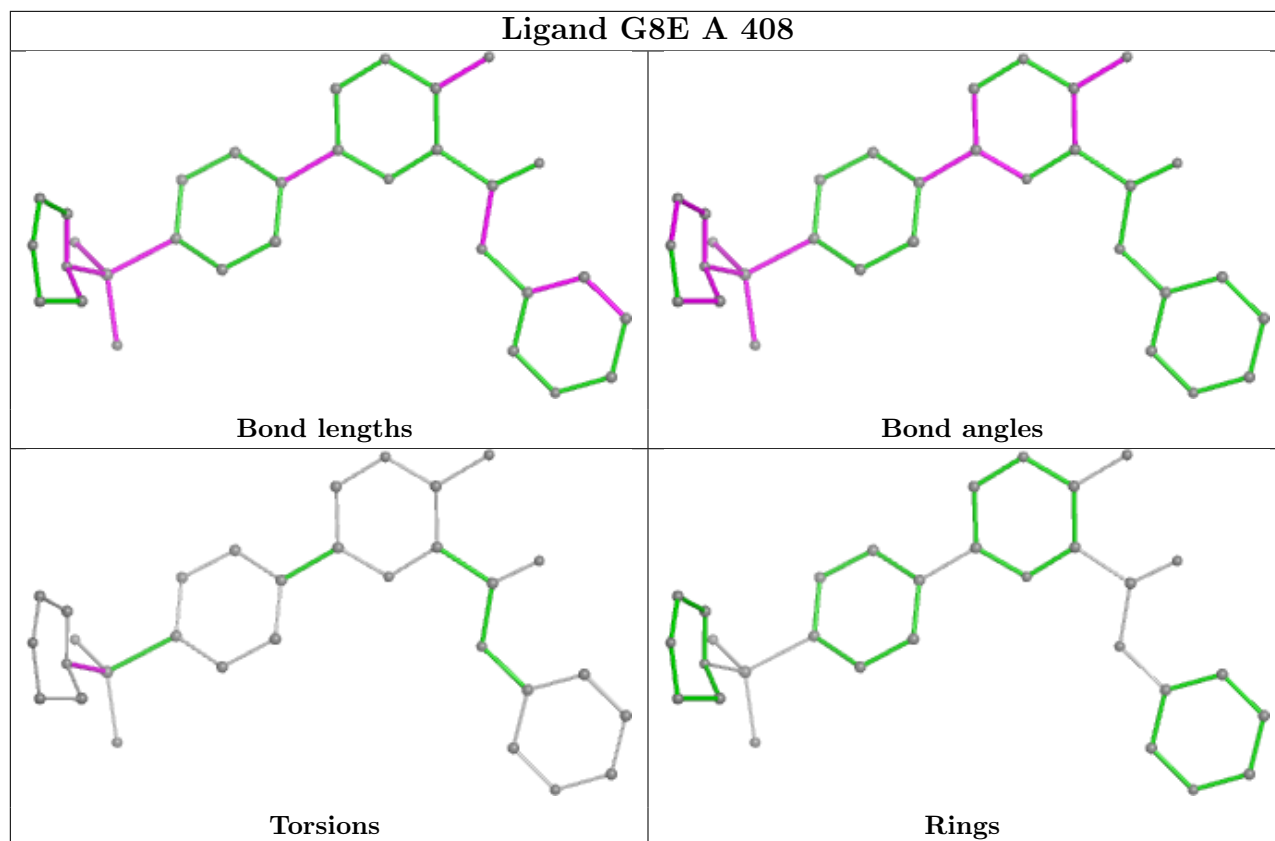
Mol	Chain	Res	Type	Atoms
4	B	405	GOL	O1-C1-C2-C3
6	B	409	G8E	C20-N1-S1-C4
6	B	409	G8E	C20-N1-S1-O2
6	A	408	G8E	C20-N1-S1-O2
4	B	403	GOL	O1-C1-C2-O2
4	B	404	GOL	O2-C2-C3-O3
4	B	405	GOL	O1-C1-C2-O2
6	B	409	G8E	C20-N1-S1-O3
4	B	403	GOL	O2-C2-C3-O3
6	A	408	G8E	C20-N1-S1-C4
3	A	401	MLI	C2-C1-C3-O9
6	B	409	G8E	C3-N1-S1-O2
3	A	401	MLI	C2-C1-C3-O8
4	B	402	GOL	O2-C2-C3-O3
4	A	402	GOL	O1-C1-C2-C3
4	A	404	GOL	O2-C2-C3-O3

There are no ring outliers.

4 monomers are involved in 7 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	A	401	MLI	1	0
4	B	404	GOL	1	0
3	B	401	MLI	3	0
5	A	407	DMS	2	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

6.1 Protein, DNA and RNA chains

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	349/350 (99%)	0.31	10 (2%) 54 50	30, 56, 96, 128	3 (0%)
1	B	349/350 (99%)	0.43	12 (3%) 48 45	25, 60, 98, 142	4 (1%)
2	N	9/9 (100%)	2.35	4 (44%) 1 1	81, 86, 91, 94	0
All	All	707/709 (99%)	0.39	26 (3%) 45 42	25, 59, 98, 142	7 (0%)

All (26) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	N	419	GLY	4.5
1	B	293	PHE	4.4
1	A	120	GLY	3.8
2	N	427	HIS	3.7
1	A	384	ILE	3.6
2	N	426	HIS	3.5
1	B	368	SER	3.5
1	B	55	SER	3.4
1	B	288	TYR	3.4
1	B	384	ILE	3.1
1	B	291	PHE	2.9
1	B	290	GLU	2.9
1	B	45	GLY	2.9
1	B	77	ASP	2.9
1	A	122	LYS	2.9
1	A	93	PHE	2.8
1	B	289	THR	2.7
1	A	289	THR	2.6
1	A	47	GLY	2.6
1	A	288	TYR	2.6
1	B	301	TRP	2.4
1	B	373	LEU	2.3
1	A	119	SER	2.3

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Mol	Chain	Res	Type	RSRZ
2	N	423	HIS	2.2
1	A	291	PHE	2.2
1	A	293	PHE	2.0

6.2 Non-standard residues in protein, DNA, RNA chains [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
1	PTR	B	216	16/17	0.97	0.06	31,43,47,48	0
1	PTR	A	216	16/17	0.98	0.06	32,44,51,66	0

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.

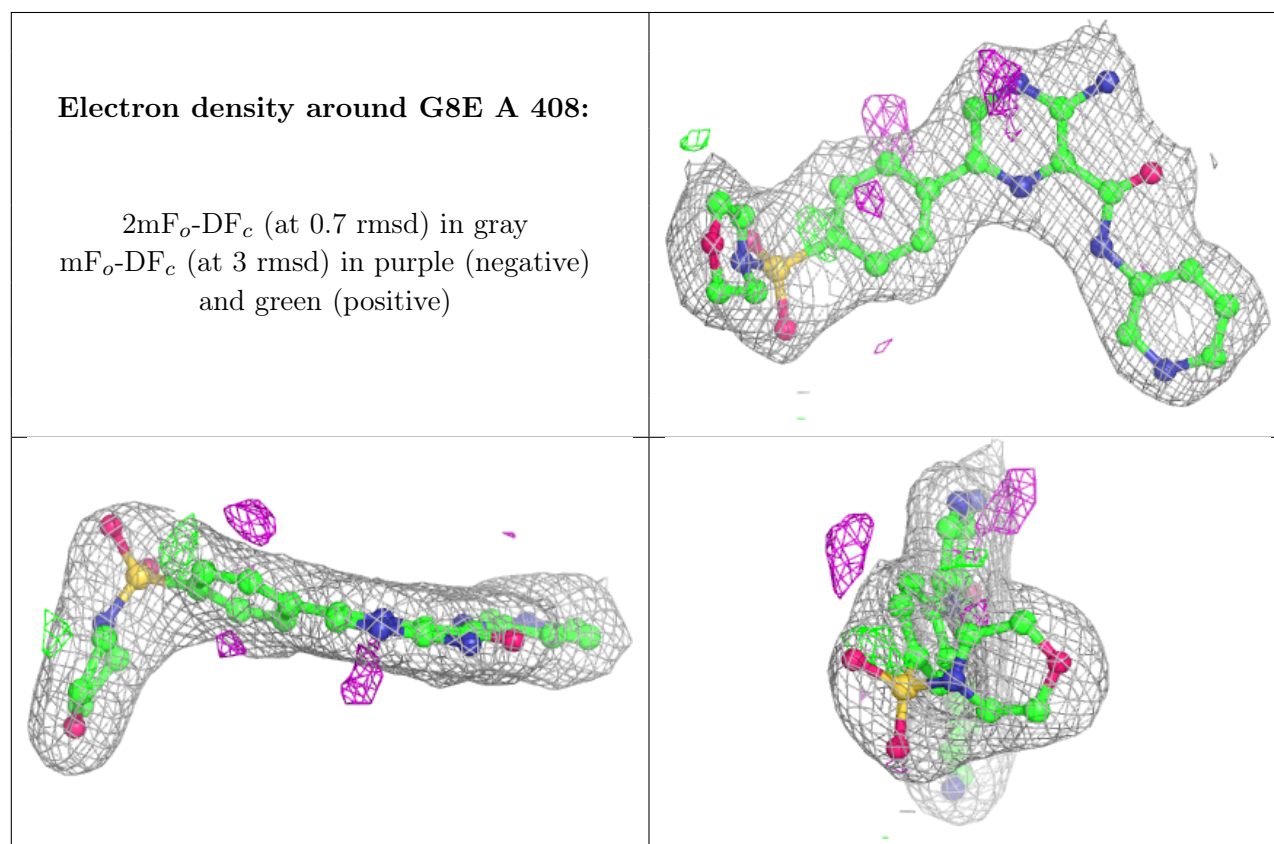
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
4	GOL	A	404	6/6	0.77	0.22	60,79,82,82	0
4	GOL	B	405	6/6	0.79	0.21	20,20,20,20	6
4	GOL	B	403	6/6	0.84	0.17	52,60,66,66	0
4	GOL	A	403	6/6	0.84	0.17	48,57,61,68	0
4	GOL	B	404	6/6	0.90	0.11	46,51,68,72	0
4	GOL	A	402	6/6	0.91	0.14	63,70,73,75	0
5	DMS	B	408	4/4	0.91	0.15	34,49,57,60	0
5	DMS	A	407	4/4	0.92	0.18	34,69,79,81	0
4	GOL	B	402	6/6	0.93	0.11	68,74,85,93	0
3	MLI	A	401	7/7	0.93	0.08	47,52,61,63	0
3	MLI	B	401	7/7	0.94	0.07	42,47,57,61	0
5	DMS	B	407	4/4	0.95	0.11	51,55,57,66	0
5	DMS	A	406	4/4	0.95	0.12	30,47,48,58	0

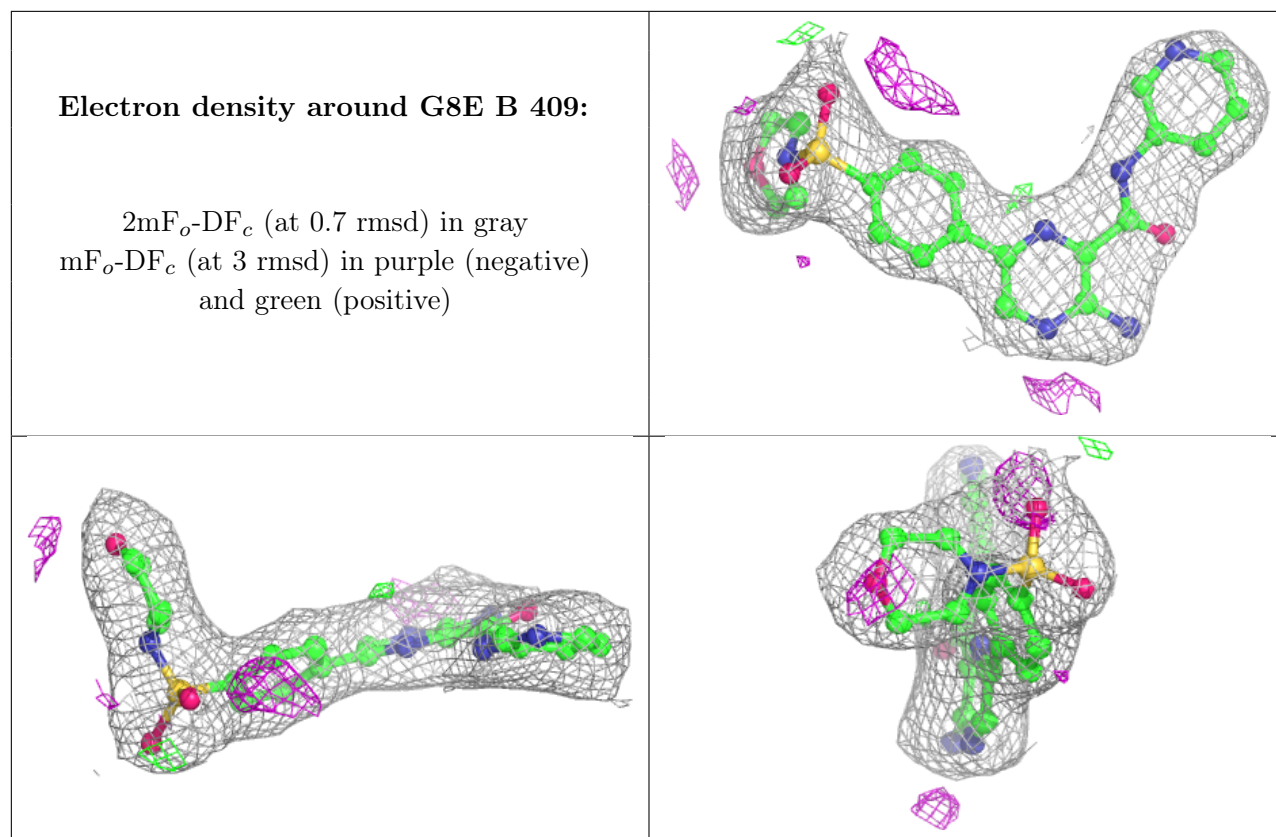
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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(\AA^2)	Q<0.9
5	DMS	A	405	4/4	0.96	0.12	62,71,77,86	0
5	DMS	B	406	4/4	0.96	0.11	72,74,82,82	0
6	G8E	A	408	31/31	0.96	0.09	33,44,63,67	0
6	G8E	B	409	31/31	0.96	0.09	37,52,60,70	0

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.





6.5 Other polymers [i](#)

There are no such residues in this entry.