



## Full wwPDB X-ray Structure Validation Report ⓘ

Oct 6, 2022 – 09:41 PM EDT

PDB ID : 5SFK  
Title : Crystal Structure of human phosphodiesterase 10 in complex with 6-cyclopropyl-3-(pyrimidin-5-ylamino)-N-[1-(2,2,2-trifluoroethyl)pyrazol-3-yl]pyridine-2-carboxamide  
Authors : Joseph, C.; Rodriguez-Sarmiento, R.M.; Benz, J.; Schlatter, D.; Rudolph, M.G.  
Deposited on : 2022-01-21  
Resolution : 2.33 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](mailto: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>.

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The following versions of software and data (see [references](#) ①) were used in the production of this report:

MolProbity : 4.02b-467  
Mogul : 1.8.5 (274361), CSD as541be (2020)  
Xtrriage (Phenix) : 1.13  
EDS : 2.31.2  
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) : 2.31.2

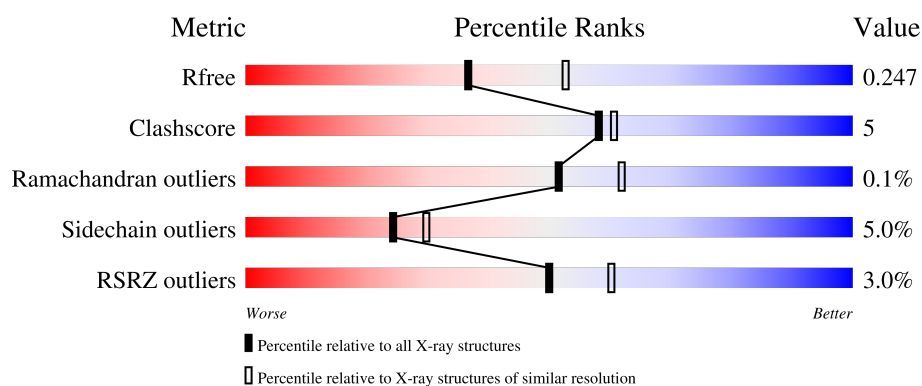
# 1 Overall quality at a glance i

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.33 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	2096 (2.36-2.32)
Clashscore	141614	2193 (2.36-2.32)
Ramachandran outliers	138981	2159 (2.36-2.32)
Sidechain outliers	138945	2160 (2.36-2.32)
RSRZ outliers	127900	2067 (2.36-2.32)

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  $\geq 3$ , 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	343	<div style="display: flex; align-items: center;"> <div style="width: 10%; height: 10px; background-color: red; margin-right: 5px;"></div> <div style="width: 76%; height: 10px; background-color: green; margin-right: 5px;"></div> <div style="width: 14%; height: 10px; background-color: yellow; margin-right: 5px;"></div> <div style="width: 9%; height: 10px; background-color: orange; margin-right: 5px;"></div> <div style="width: 1%; height: 10px; background-color: grey;"></div> </div> <p style="text-align: center;">76%      14%      • 9%</p>
1	B	343	<div style="display: flex; align-items: center;"> <div style="width: 81%; height: 10px; background-color: green; margin-right: 5px;"></div> <div style="width: 10%; height: 10px; background-color: yellow; margin-right: 5px;"></div> <div style="width: 8%; height: 10px; background-color: orange; margin-right: 5px;"></div> <div style="width: 1%; height: 10px; background-color: grey;"></div> </div> <p style="text-align: center;">81%      10%      • 8%</p>
1	C	343	<div style="display: flex; align-items: center;"> <div style="width: 79%; height: 10px; background-color: green; margin-right: 5px;"></div> <div style="width: 12%; height: 10px; background-color: yellow; margin-right: 5px;"></div> <div style="width: 9%; height: 10px; background-color: orange; margin-right: 5px;"></div> <div style="width: 1%; height: 10px; background-color: grey;"></div> </div> <p style="text-align: center;">79%      12%      • 9%</p>
1	D	343	<div style="display: flex; align-items: center;"> <div style="width: 10%; height: 10px; background-color: red; margin-right: 5px;"></div> <div style="width: 73%; height: 10px; background-color: green; margin-right: 5px;"></div> <div style="width: 18%; height: 10px; background-color: yellow; margin-right: 5px;"></div> <div style="width: 9%; height: 10px; background-color: orange; margin-right: 5px;"></div> <div style="width: 1%; height: 10px; background-color: grey;"></div> </div> <p style="text-align: center;">10%      73%      18%      • 9%</p>

## 2 Entry composition

There are 5 unique types of molecules in this entry. The entry contains 10692 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 cAMP and cAMP-inhibited cGMP 3',5'-cyclic phosphodiesterase 10A.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	313	2549	1629	435	461	24	0	1	0
1	B	315	2551	1630	434	463	24	0	0	0
1	C	313	2549	1629	435	461	24	0	1	0
1	D	313	2537	1622	433	458	24	0	0	0

There are 8 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	447	GLY	-	expression tag	UNP Q9Y233
A	448	SER	-	expression tag	UNP Q9Y233
B	447	GLY	-	expression tag	UNP Q9Y233
B	448	SER	-	expression tag	UNP Q9Y233
C	447	GLY	-	expression tag	UNP Q9Y233
C	448	SER	-	expression tag	UNP Q9Y233
D	447	GLY	-	expression tag	UNP Q9Y233
D	448	SER	-	expression tag	UNP Q9Y233

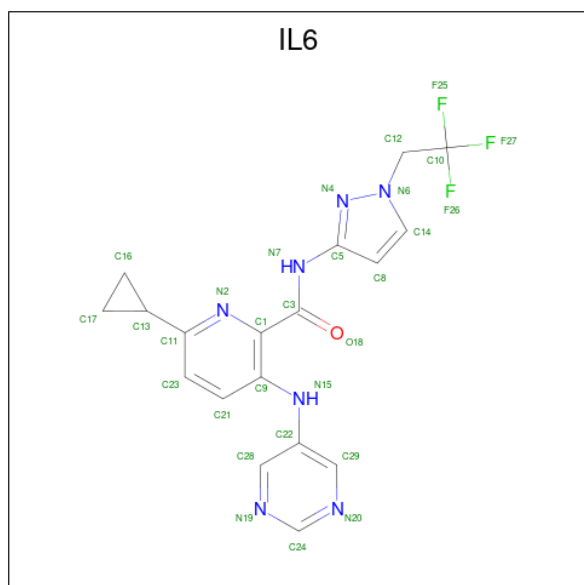
- Molecule 2 is ZINC ION (three-letter code: ZN) (formula: Zn).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	1	Total 1	Zn 1	0	0
2	B	1	Total 1	Zn 1	0	0
2	C	1	Total 1	Zn 1	0	0
2	D	1	Total 1	Zn 1	0	0

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

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

- Molecule 4 is 6-cyclopropyl-3-[(pyrimidin-5-yl)amino]-N-[1-(2,2,2-trifluoroethyl)-1H-pyrazol-3-yl]pyridine-2-carboxamide (three-letter code: IL6) (formula: C<sub>18</sub>H<sub>16</sub>F<sub>3</sub>N<sub>7</sub>O) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	
4	A	1	Total	C	F	N	O	0	0
			29	18	3	7	1		
4	B	1	Total	C	F	N	O	0	0
			29	18	3	7	1		
4	C	1	Total	C	F	N	O	0	0
			29	18	3	7	1		
4	D	1	Total	C	F	N	O	0	0
			29	18	3	7	1		

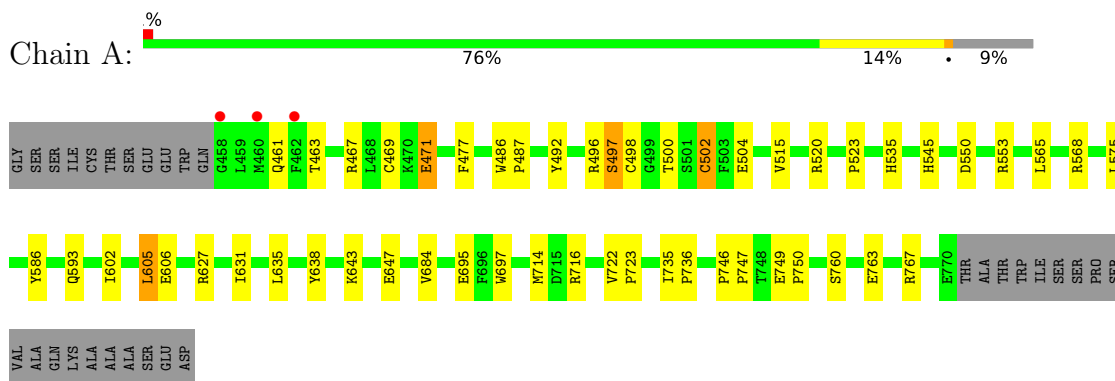
- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	115	Total 115	O 115	0	0
5	B	115	Total 115	O 115	0	0
5	C	125	Total 125	O 125	0	0
5	D	27	Total 27	O 27	0	0

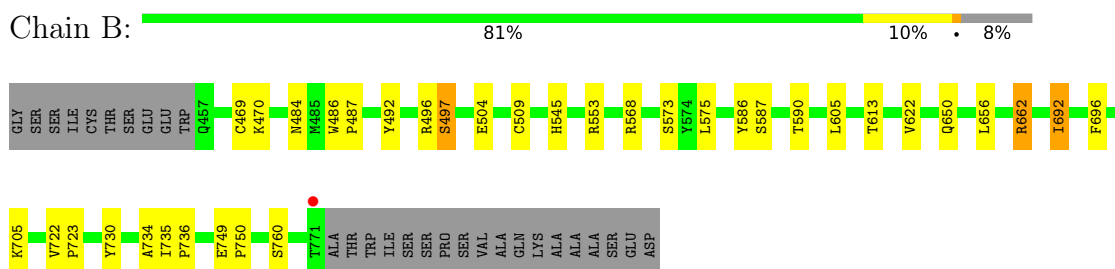
### 3 Residue-property plots [i](#)

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.

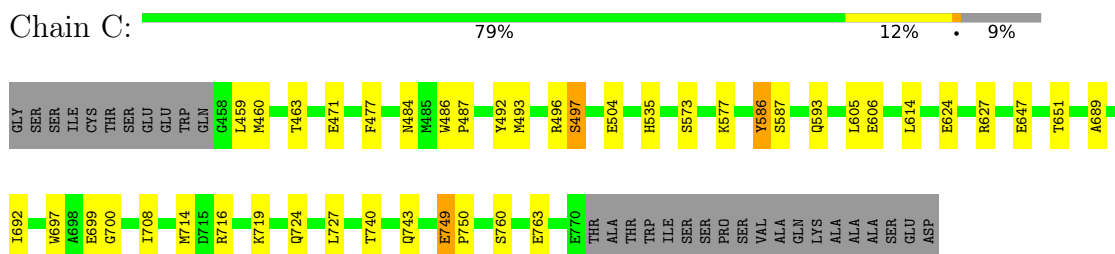
- Molecule 1: cAMP and cAMP-inhibited cGMP 3',5'-cyclic phosphodiesterase 10A



- Molecule 1: cAMP and cAMP-inhibited cGMP 3',5'-cyclic phosphodiesterase 10A

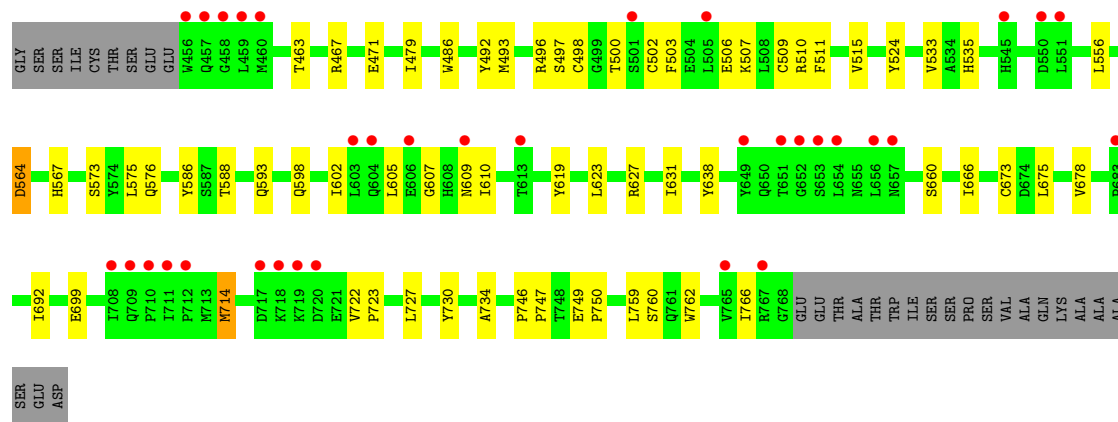


- Molecule 1: cAMP and cAMP-inhibited cGMP 3',5'-cyclic phosphodiesterase 10A



- Molecule 1: cAMP and cAMP-inhibited cGMP 3',5'-cyclic phosphodiesterase 10A







## 4 Data and refinement statistics

Property	Value	Source
Space group	H 3	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	135.55Å 135.55Å 233.95Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	43.48 – 2.33 43.46 – 2.33	Depositor EDS
% Data completeness (in resolution range)	97.4 (43.48-2.33) 97.5 (43.46-2.33)	Depositor EDS
$R_{merge}$	0.08	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	1.24 (at 2.34Å)	Xtrriage
Refinement program	REFMAC 5.8.0258	Depositor
R, $R_{free}$	0.184 , 0.248 0.192 , 0.247	Depositor DCC
$R_{free}$ test set	3381 reflections (4.96%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	40.0	Xtrriage
Anisotropy	0.196	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.31 , 33.0	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.49$ , $\langle L^2 \rangle = 0.32$	Xtrriage
Estimated twinning fraction	0.025 for h,-h-k,-l	Xtrriage
$F_o, F_c$ correlation	0.96	EDS
Total number of atoms	10692	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	53.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.82% of the height of the origin peak. No significant pseudotranslation is detected.*

<sup>1</sup>Intensities estimated from amplitudes.

<sup>2</sup>Theoretical 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: ZN, CME, IL6, MG

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	0.69	0/2603	0.81	0/3521
1	B	0.69	0/2602	0.82	1/3521 (0.0%)
1	C	0.69	0/2603	0.81	0/3521
1	D	0.74	0/2588	0.81	0/3502
All	All	0.70	0/10396	0.81	1/14065 (0.0%)

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	568	ARG	NE-CZ-NH2	5.30	122.95	120.30

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	2549	0	2526	31	0
1	B	2551	0	2515	16	0
1	C	2549	0	2524	20	0
1	D	2537	0	2511	30	0
2	A	1	0	0	0	0
2	B	1	0	0	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	C	1	0	0	0	0
2	D	1	0	0	0	0
3	A	1	0	0	0	0
3	B	1	0	0	0	0
3	C	1	0	0	0	0
3	D	1	0	0	0	0
4	A	29	0	0	2	0
4	B	29	0	0	1	0
4	C	29	0	0	2	0
4	D	29	0	0	1	0
5	A	115	0	0	4	0
5	B	115	0	0	1	0
5	C	125	0	0	2	0
5	D	27	0	0	1	0
All	All	10692	0	10076	97	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 5.

All (97) 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:D:509:CME:HB2	5:D:925:HOH:O	1.86	0.75
1:D:498:CYS:HG	1:D:502:CYS:HG	1.32	0.74
1:B:545:HIS:NE2	1:D:760:SER:HB2	2.04	0.72
1:A:520[A]:ARG:NE	1:A:568:ARG:HD3	2.07	0.70
1:A:469:CYS:SG	5:A:1007:HOH:O	2.51	0.68
1:D:524:TYR:CD2	1:D:692:ILE:HD13	2.31	0.66
4:B:803:IL6:C21	4:B:803:IL6:C29	2.70	0.65
1:A:684:VAL:HG22	1:B:705:LYS:HG2	1.79	0.64
1:A:461:GLN:NE2	1:A:461:GLN:HA	2.13	0.63
1:D:675:LEU:O	1:D:678:VAL:HG22	1.99	0.62
1:A:492:TYR:CZ	1:A:496:ARG:HD2	2.34	0.62
1:C:493:MET:O	1:C:497:SER:HB2	1.99	0.61
1:C:740:THR:HA	1:C:743:GLN:HE21	1.66	0.61
4:C:803:IL6:C21	4:C:803:IL6:C29	2.77	0.61
1:C:492:TYR:CZ	1:C:496:ARG:HD2	2.36	0.60
1:D:627:ARG:O	1:D:631:ILE:HG12	2.01	0.60
1:B:509:CME:HB2	5:B:998:HOH:O	2.05	0.57
1:D:493:MET:SD	1:D:535:HIS:HA	2.45	0.57
1:D:492:TYR:CZ	1:D:496:ARG:HD2	2.40	0.56

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:520[A]:ARG:CZ	1:A:568:ARG:HD3	2.36	0.56
1:A:520[A]:ARG:CD	1:A:568:ARG:HD3	2.36	0.56
1:A:593:GLN:HG2	5:A:901:HOH:O	2.08	0.54
1:D:479:ILE:HD12	1:D:486:TRP:CD1	2.43	0.54
1:B:492:TYR:CZ	1:B:496:ARG:HD2	2.43	0.53
1:B:692:ILE:CD1	1:B:696:PHE:CZ	2.90	0.53
1:B:470:LYS:HE2	1:D:746:PRO:HG3	1.91	0.53
1:A:635:LEU:HD22	4:A:803:IL6:C16	2.38	0.53
4:A:803:IL6:C29	4:A:803:IL6:C21	2.87	0.52
1:C:724:GLN:HB2	5:C:977:HOH:O	2.08	0.52
1:C:689:ALA:HA	1:C:692:ILE:HG22	1.92	0.52
1:B:692:ILE:HD12	1:B:696:PHE:CZ	2.44	0.52
1:A:461:GLN:HE22	1:A:500:THR:HG22	1.76	0.51
1:C:699:GLU:HG2	1:C:714:MET:HE3	1.91	0.51
1:C:727:LEU:HD21	1:C:763:GLU:HG3	1.92	0.51
1:D:609:ASN:HD21	1:D:619:TYR:HE1	1.58	0.51
1:D:699:GLU:HG2	1:D:714:MET:HE3	1.93	0.51
1:C:716:ARG:O	1:C:719:LYS:HG3	2.11	0.51
1:A:497:SER:O	1:A:553:ARG:HD2	2.12	0.50
1:A:593:GLN:OE1	5:A:901:HOH:O	2.19	0.50
1:C:749:GLU:N	1:C:750:PRO:CD	2.74	0.50
1:C:700:GLY:HA3	1:C:714:MET:O	2.12	0.50
1:B:730:TYR:HA	1:B:734:ALA:HB3	1.93	0.50
1:B:497:SER:O	1:B:553:ARG:HD2	2.12	0.49
1:D:759:LEU:HD12	1:D:759:LEU:O	2.13	0.49
1:A:763:GLU:O	1:A:767:ARG:HG3	2.14	0.47
1:B:735:ILE:HB	1:B:736:PRO:HD3	1.96	0.47
1:D:556:LEU:HD21	1:D:666:ILE:CG2	2.45	0.47
1:A:735:ILE:HB	1:A:736:PRO:HD3	1.97	0.47
1:B:656:LEU:O	1:B:662:ARG:HG3	2.15	0.47
1:A:498:CYS:HB3	1:A:502:CYS:SG	2.54	0.46
1:A:697:TRP:HB3	1:A:716:ARG:HB3	1.97	0.46
1:A:593:GLN:CG	5:A:901:HOH:O	2.64	0.46
1:A:684:VAL:HG22	1:B:705:LYS:CG	2.46	0.46
1:B:749:GLU:N	1:B:750:PRO:CD	2.79	0.46
4:D:803:IL6:C21	4:D:803:IL6:C29	2.94	0.46
1:B:722:VAL:HB	1:B:723:PRO:HD3	1.98	0.46
1:D:506:GLU:O	1:D:510:ARG:HG2	2.16	0.46
1:D:749:GLU:N	1:D:750:PRO:CD	2.79	0.46
1:A:486:TRP:N	1:A:487:PRO:CD	2.79	0.45
1:A:749:GLU:N	1:A:750:PRO:CD	2.79	0.45

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:722:VAL:HB	1:A:723:PRO:HD3	1.99	0.45
1:A:515:VAL:HG13	1:A:565:LEU:HD21	1.98	0.45
1:D:556:LEU:HD21	1:D:666:ILE:HG21	1.99	0.44
1:D:762:TRP:O	1:D:766:ILE:HG12	2.17	0.44
1:D:467:ARG:O	1:D:471:GLU:HB2	2.17	0.44
1:D:533:VAL:HG22	1:D:673:CYS:O	2.16	0.44
1:A:602:ILE:HA	1:A:605:LEU:HD22	2.00	0.44
1:C:586:TYR:HD2	5:C:959:HOH:O	2.01	0.44
1:B:486:TRP:N	1:B:487:PRO:CD	2.81	0.44
1:A:627:ARG:O	1:A:631:ILE:HG12	2.18	0.43
1:A:461:GLN:NE2	1:A:500:THR:CG2	2.81	0.43
1:D:507:LYS:HG2	1:D:607:GLY:O	2.18	0.43
1:D:564:ASP:O	1:D:567:HIS:HB2	2.18	0.43
1:C:624:GLU:OE2	1:C:627:ARG:NH1	2.37	0.42
1:C:697:TRP:HB3	1:C:716:ARG:HB3	2.01	0.42
1:A:568:ARG:HH22	1:C:484:ASN:H	1.65	0.42
1:D:730:TYR:HA	1:D:734:ALA:HB3	2.01	0.42
1:A:467:ARG:O	1:A:471:GLU:HB2	2.19	0.42
1:D:619:TYR:O	1:D:623:LEU:HD23	2.18	0.42
1:D:503:PHE:CD2	1:D:610:ILE:HB	2.55	0.42
1:D:586:TYR:HB3	1:D:593:GLN:HE21	1.85	0.42
1:D:598:GLN:O	1:D:602:ILE:HG13	2.20	0.42
1:C:586:TYR:CD1	1:C:593:GLN:HB2	2.55	0.42
1:A:461:GLN:HE22	1:A:500:THR:CG2	2.33	0.41
1:D:722:VAL:HB	1:D:723:PRO:HD3	2.02	0.41
1:C:577:LYS:HD3	1:C:708:ILE:HD13	2.02	0.41
1:D:511:PHE:O	1:D:515:VAL:HG23	2.20	0.41
1:A:477:PHE:HB3	1:A:535:HIS:CE1	2.56	0.41
1:C:477:PHE:HB3	1:C:535:HIS:CE1	2.56	0.41
1:B:586:TYR:HB2	1:B:590:THR:HA	2.02	0.41
4:C:803:IL6:O18	4:C:803:IL6:N15	2.52	0.41
1:A:523:PRO:HD2	1:A:695:GLU:HG2	2.04	0.40
1:C:647:GLU:O	1:C:651:THR:HG23	2.22	0.40
1:A:746:PRO:N	1:A:747:PRO:CD	2.85	0.40
1:C:486:TRP:N	1:C:487:PRO:CD	2.85	0.40
1:C:493:MET:SD	1:C:535:HIS:HA	2.62	0.40
1:D:746:PRO:N	1:D:747:PRO:CD	2.84	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	311/343 (91%)	301 (97%)	9 (3%)	1 (0%)	41	47
1	B	312/343 (91%)	305 (98%)	7 (2%)	0	100	100
1	C	311/343 (91%)	305 (98%)	6 (2%)	0	100	100
1	D	310/343 (90%)	293 (94%)	17 (6%)	0	100	100
All	All	1244/1372 (91%)	1204 (97%)	39 (3%)	1 (0%)	51	62

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	502	CYS

### 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	282/305 (92%)	267 (95%)	15 (5%)	22	27
1	B	281/305 (92%)	267 (95%)	14 (5%)	24	30
1	C	282/305 (92%)	268 (95%)	14 (5%)	24	30
1	D	280/305 (92%)	267 (95%)	13 (5%)	27	33
All	All	1125/1220 (92%)	1069 (95%)	56 (5%)	24	30

All (56) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	463	THR
1	A	471	GLU
1	A	497	SER
1	A	504	GLU
1	A	545	HIS
1	A	550	ASP
1	A	575	LEU
1	A	586	TYR
1	A	605	LEU
1	A	606	GLU
1	A	638	TYR
1	A	643	LYS
1	A	647	GLU
1	A	714	MET
1	A	760	SER
1	B	469	CYS
1	B	484	ASN
1	B	497	SER
1	B	504	GLU
1	B	573	SER
1	B	575	LEU
1	B	587	SER
1	B	605	LEU
1	B	613	THR
1	B	622	VAL
1	B	650	GLN
1	B	662	ARG
1	B	692	ILE
1	B	760	SER
1	C	459	LEU
1	C	460	MET
1	C	463	THR
1	C	471	GLU
1	C	497	SER
1	C	504	GLU
1	C	573	SER
1	C	586	TYR
1	C	587	SER
1	C	605	LEU
1	C	606	GLU
1	C	614	LEU
1	C	749	GLU
1	C	760	SER

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Mol	Chain	Res	Type
1	D	463	THR
1	D	497	SER
1	D	500	THR
1	D	564	ASP
1	D	573	SER
1	D	575	LEU
1	D	576	GLN
1	D	588	THR
1	D	605	LEU
1	D	638	TYR
1	D	660	SER
1	D	714	MET
1	D	727	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (25) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	461	GLN
1	A	484	ASN
1	A	518	ASN
1	A	604	GLN
1	A	644	GLN
1	A	724	GLN
1	A	743	GLN
1	B	484	ASN
1	B	495	HIS
1	B	604	GLN
1	B	743	GLN
1	C	542	GLN
1	C	576	GLN
1	C	593	GLN
1	C	604	GLN
1	C	644	GLN
1	C	743	GLN
1	D	476	HIS
1	D	484	ASN
1	D	542	GLN
1	D	593	GLN
1	D	604	GLN
1	D	609	ASN
1	D	709	GLN
1	D	743	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](#)

4 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	CME	D	509	1	8,9,10	0.42	0	5,9,11	0.34	0
1	CME	A	509	1	8,9,10	0.43	0	5,9,11	0.32	0
1	CME	C	509	1	8,9,10	0.48	0	5,9,11	0.29	0
1	CME	B	509	1	8,9,10	0.44	0	5,9,11	0.31	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	CME	D	509	1	-	4/5/8/10	-
1	CME	A	509	1	-	1/5/8/10	-
1	CME	C	509	1	-	1/5/8/10	-
1	CME	B	509	1	-	1/5/8/10	-

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

All (7) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
1	A	509	CME	SD-CE-CZ-OH
1	B	509	CME	SD-CE-CZ-OH
1	C	509	CME	SD-CE-CZ-OH

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Mol	Chain	Res	Type	Atoms
1	D	509	CME	CZ-CE-SD-SG
1	D	509	CME	CE-SD-SG-CB
1	D	509	CME	N-CA-CB-SG
1	D	509	CME	SD-CE-CZ-OH

There are no ring outliers.

2 monomers are involved in 2 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
1	D	509	CME	1	0
1	B	509	CME	1	0

## 5.5 Carbohydrates [i](#)

There are no monosaccharides in this entry.

## 5.6 Ligand geometry [i](#)

Of 12 ligands modelled in this entry, 8 are monoatomic - leaving 4 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
4	IL6	A	803	-	30,32,32	1.04	1 (3%)	36,46,46	2.31	9 (25%)
4	IL6	C	803	-	30,32,32	1.38	3 (10%)	36,46,46	2.35	11 (30%)
4	IL6	B	803	-	30,32,32	1.24	2 (6%)	36,46,46	2.20	10 (27%)
4	IL6	D	803	-	30,32,32	1.28	2 (6%)	36,46,46	2.66	10 (27%)

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	IL6	A	803	-	-	0/17/23/23	0/4/4/4
4	IL6	C	803	-	-	0/17/23/23	0/4/4/4
4	IL6	B	803	-	-	0/17/23/23	0/4/4/4
4	IL6	D	803	-	-	7/17/23/23	0/4/4/4

All (8) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	C	803	IL6	C12-C10	4.16	1.55	1.50
4	D	803	IL6	C12-C10	3.67	1.55	1.50
4	C	803	IL6	C11-N2	-3.08	1.31	1.34
4	A	803	IL6	C12-C10	2.97	1.54	1.50
4	B	803	IL6	C11-N2	-2.72	1.31	1.34
4	D	803	IL6	F27-C10	2.42	1.43	1.33
4	B	803	IL6	F25-C10	2.39	1.42	1.33
4	C	803	IL6	F25-C10	2.14	1.41	1.33

All (40) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	D	803	IL6	C8-C5-N4	-8.74	106.06	110.92
4	A	803	IL6	C29-N20-C24	7.04	124.81	115.80
4	D	803	IL6	F25-C10-C12	-6.86	100.91	112.12
4	C	803	IL6	C14-N6-N4	-6.56	106.31	111.45
4	D	803	IL6	C14-N6-N4	-6.33	106.49	111.45
4	A	803	IL6	C8-C5-N4	-6.29	107.42	110.92
4	B	803	IL6	C29-N20-C24	5.70	123.09	115.80
4	C	803	IL6	C8-C5-N4	-5.65	107.78	110.92
4	B	803	IL6	C14-N6-N4	-5.45	107.18	111.45
4	C	803	IL6	C29-N20-C24	5.27	122.54	115.80
4	B	803	IL6	C8-C5-N4	-5.05	108.11	110.92
4	C	803	IL6	C28-N19-C24	4.12	121.07	115.80
4	D	803	IL6	C29-N20-C24	4.07	121.00	115.80
4	A	803	IL6	F25-C10-C12	-4.01	105.56	112.12
4	D	803	IL6	C28-N19-C24	3.84	120.71	115.80
4	A	803	IL6	C17-C13-C11	-3.62	116.08	120.33
4	B	803	IL6	F26-C10-C12	-3.58	106.28	112.12
4	D	803	IL6	F27-C10-C12	3.50	117.84	112.12
4	C	803	IL6	C17-C13-C11	-3.45	116.28	120.33
4	C	803	IL6	N20-C24-N19	-3.40	119.95	126.61
4	A	803	IL6	C22-C29-N20	-3.38	116.44	123.13
4	A	803	IL6	N20-C24-N19	-3.37	120.01	126.61
4	B	803	IL6	C17-C13-C11	-3.33	116.42	120.33

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	D	803	IL6	C16-C13-C11	-3.27	116.49	120.33
4	A	803	IL6	C14-N6-N4	-3.24	108.91	111.45
4	B	803	IL6	O18-C3-C1	3.20	125.37	120.59
4	B	803	IL6	C22-C29-N20	-2.98	117.22	123.13
4	A	803	IL6	C28-N19-C24	2.84	119.43	115.80
4	C	803	IL6	F27-C10-C12	-2.68	107.74	112.12
4	C	803	IL6	F25-C10-C12	-2.63	107.83	112.12
4	B	803	IL6	N20-C24-N19	-2.50	121.71	126.61
4	C	803	IL6	F27-C10-F25	2.49	115.60	106.43
4	D	803	IL6	C23-C11-N2	-2.47	119.90	122.45
4	A	803	IL6	O18-C3-C1	2.35	124.10	120.59
4	C	803	IL6	F26-C10-C12	2.34	115.95	112.12
4	B	803	IL6	C23-C11-N2	-2.34	120.03	122.45
4	D	803	IL6	N20-C24-N19	-2.28	122.16	126.61
4	B	803	IL6	C28-N19-C24	2.27	118.70	115.80
4	D	803	IL6	C22-C29-N20	-2.25	118.67	123.13
4	C	803	IL6	C22-C29-N20	-2.06	119.06	123.13

There are no chirality outliers.

All (7) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
4	D	803	IL6	F25-C10-C12-N6
4	D	803	IL6	F26-C10-C12-N6
4	D	803	IL6	F27-C10-C12-N6
4	D	803	IL6	C23-C11-C13-C16
4	D	803	IL6	C23-C11-C13-C17
4	D	803	IL6	N2-C11-C13-C16
4	D	803	IL6	N2-C11-C13-C17

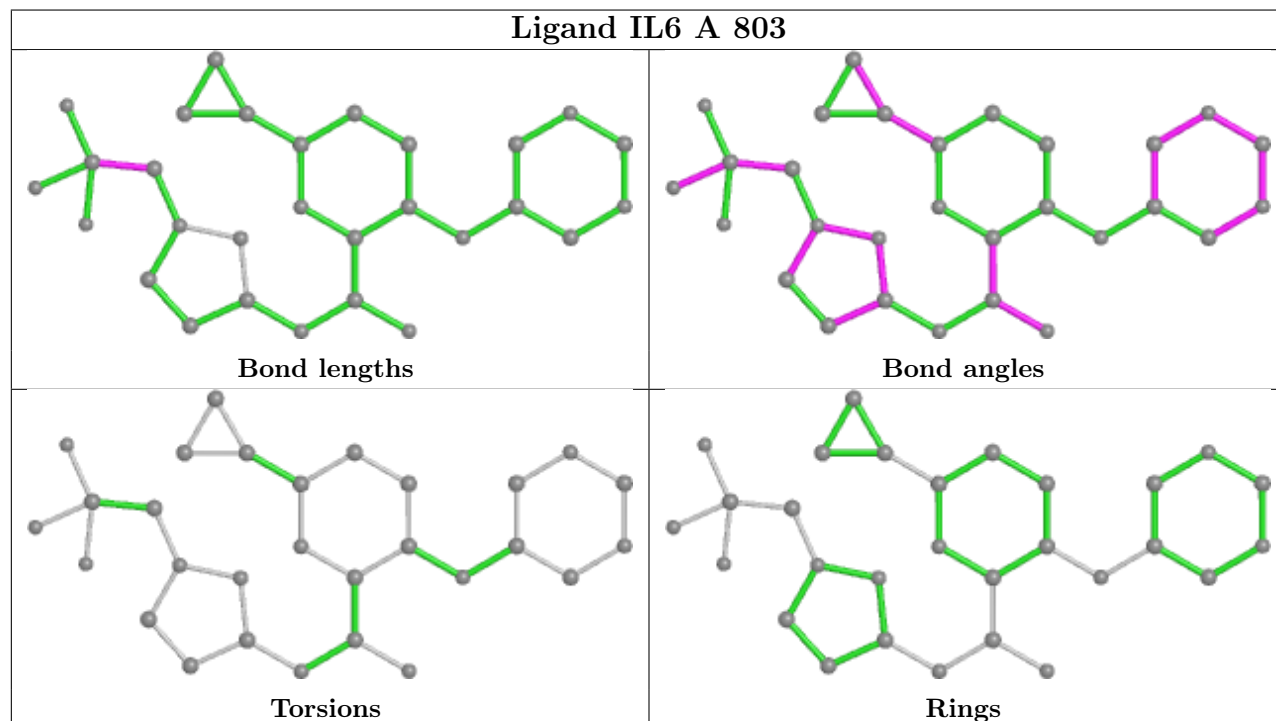
There are no ring outliers.

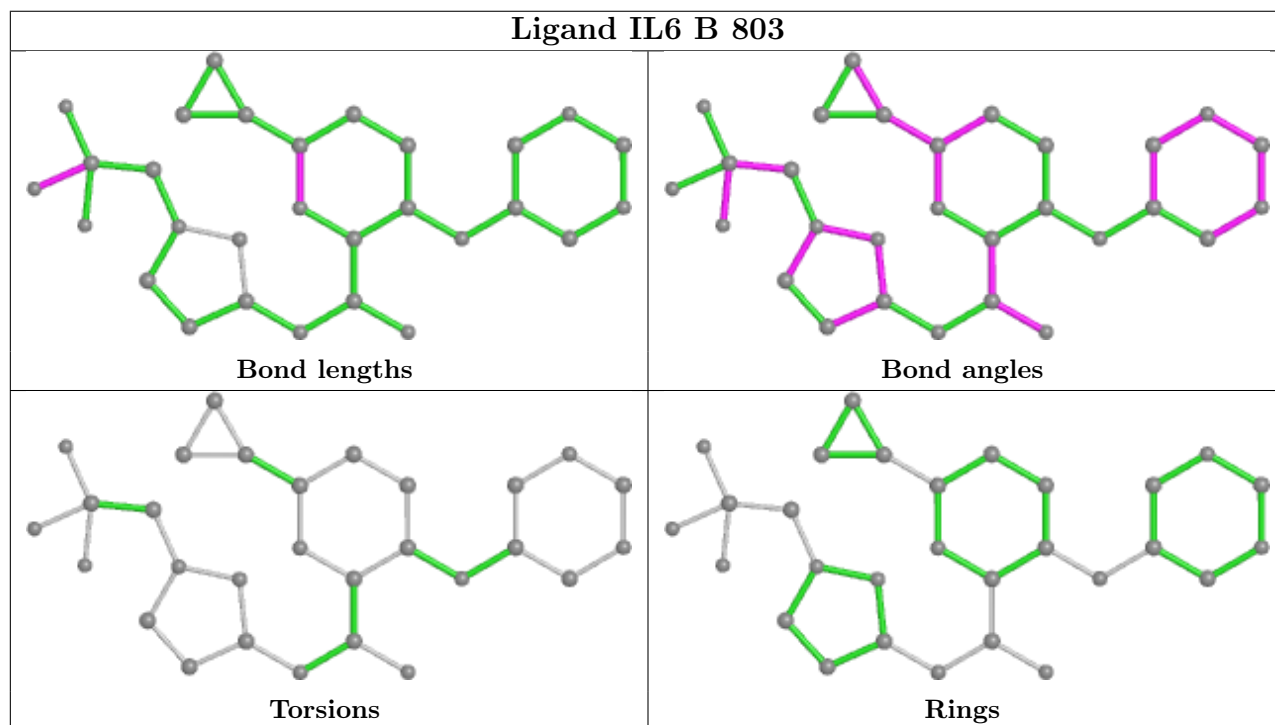
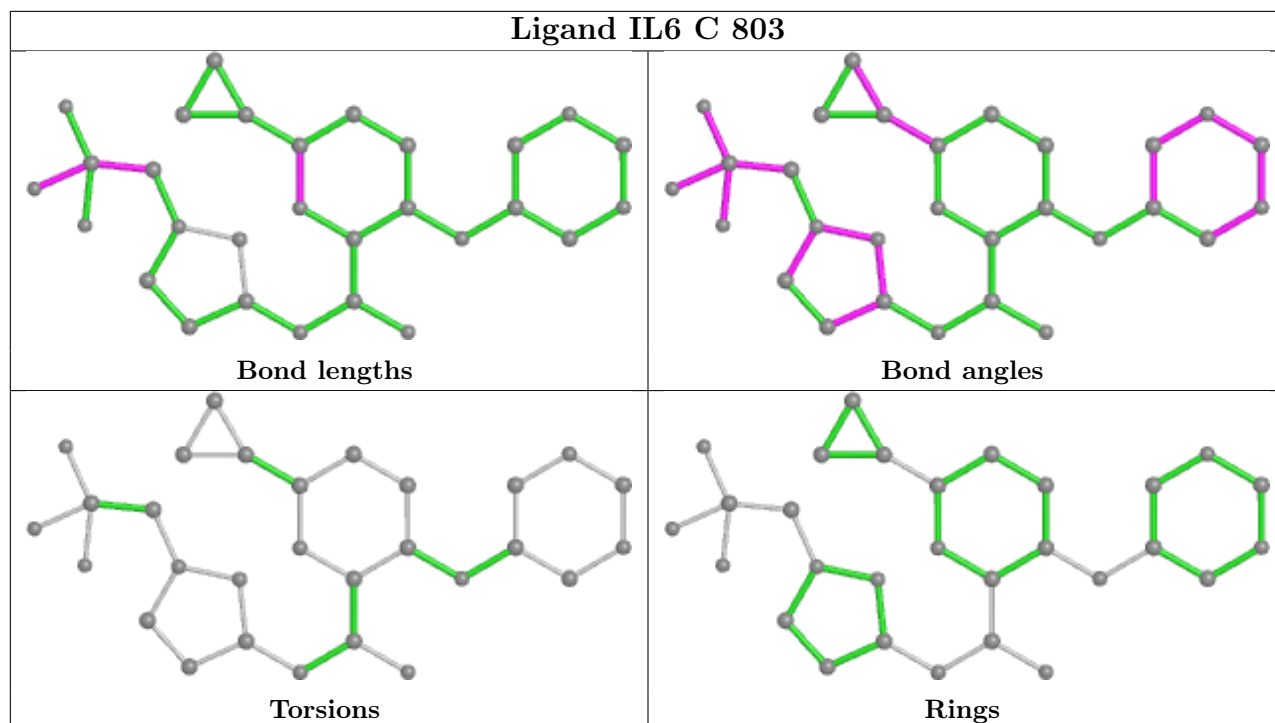
4 monomers are involved in 6 short contacts:

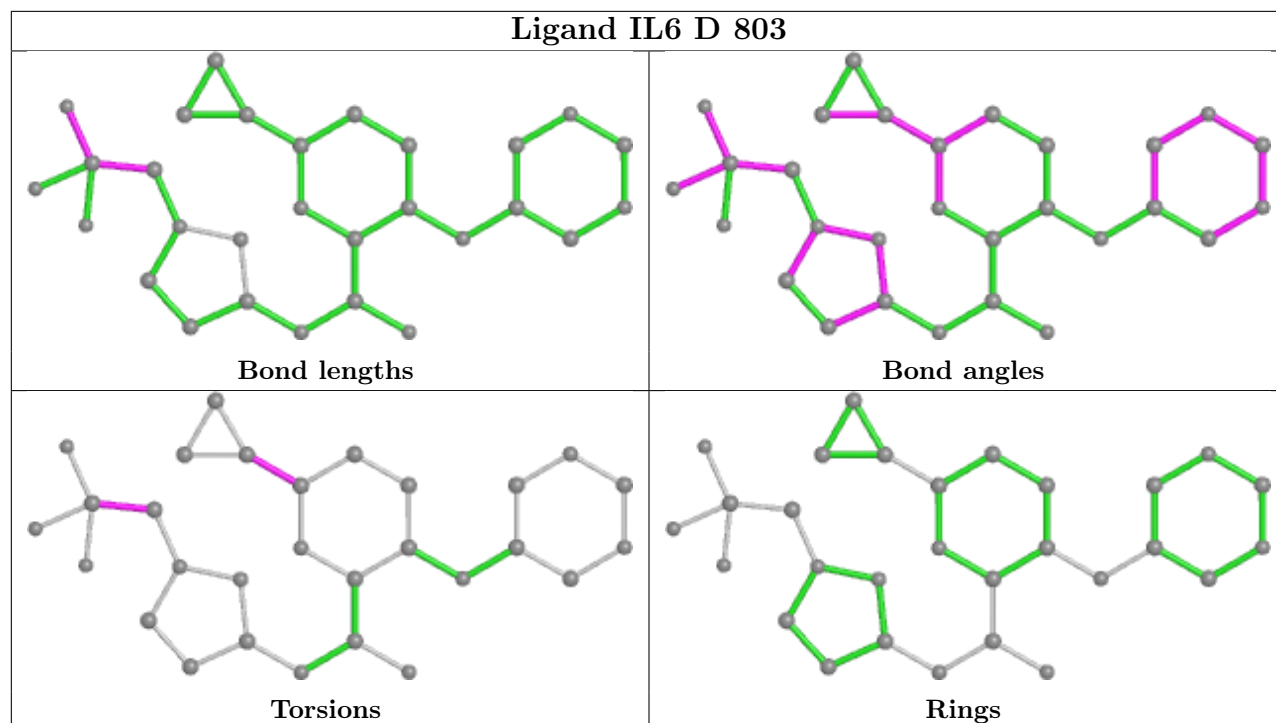
Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	A	803	IL6	2	0
4	C	803	IL6	2	0
4	B	803	IL6	1	0
4	D	803	IL6	1	0

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

### 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, 95<sup>th</sup> 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 <sup>2</sup> )	Q<0.9
1	A	312/343 (90%)	-0.25	3 (0%) 82 88	29, 40, 72, 127	0
1	B	314/343 (91%)	-0.24	1 (0%) 94 97	29, 43, 82, 118	0
1	C	312/343 (90%)	-0.36	0 100 100	28, 42, 70, 101	0
1	D	312/343 (90%)	0.42	34 (10%) 5 9	50, 73, 103, 137	0
All	All	1250/1372 (91%)	-0.11	38 (3%) 50 60	28, 49, 90, 137	0

All (38) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	D	709	GLN	4.5
1	D	656	LEU	4.3
1	D	720	ASP	4.0
1	D	710	PRO	3.7
1	D	712	PRO	3.6
1	D	649	TYR	3.5
1	A	460	MET	3.5
1	D	711	ILE	3.4
1	D	657	ASN	3.4
1	D	718	LYS	3.2
1	D	456	TRP	3.1
1	D	606	GLU	3.1
1	D	457	GLN	3.0
1	D	652	GLY	3.0
1	D	501	SER	2.9
1	D	767	ARG	2.9
1	D	545	HIS	2.9
1	B	771	THR	2.8
1	D	603	LEU	2.7
1	D	717	ASP	2.7
1	D	683	PRO	2.5

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Mol	Chain	Res	Type	RSRZ
1	D	459	LEU	2.5
1	D	651	THR	2.5
1	D	604	GLN	2.5
1	D	719	LYS	2.4
1	D	654	LEU	2.3
1	D	613	THR	2.3
1	D	460	MET	2.3
1	D	505	LEU	2.2
1	D	550	ASP	2.2
1	D	653	SER	2.2
1	A	462	PHE	2.2
1	D	609	ASN	2.2
1	D	765	VAL	2.1
1	D	551	LEU	2.1
1	A	458	GLY	2.1
1	D	458	GLY	2.1
1	D	708	ILE	2.1

## 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, 95<sup>th</sup> 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 <sup>2</sup> )	Q<0.9
1	CME	B	509	10/11	0.91	0.13	49,64,93,99	0
1	CME	D	509	10/11	0.92	0.18	76,97,128,129	0
1	CME	C	509	10/11	0.93	0.13	44,57,99,103	0
1	CME	A	509	10/11	0.95	0.11	43,52,86,88	0

## 6.3 Carbohydrates [i](#)

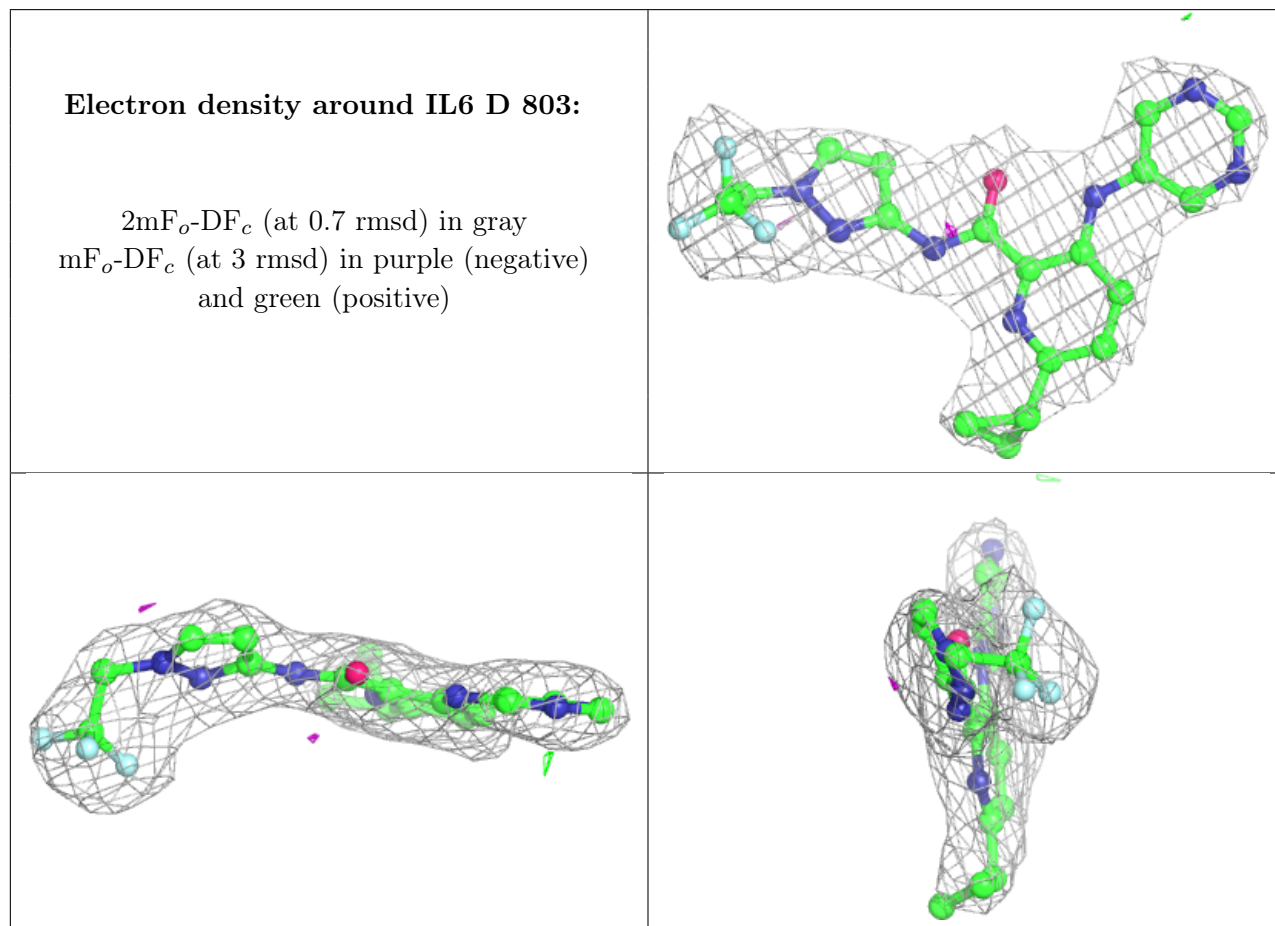
There are no monosaccharides in this entry.

## 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, 95<sup>th</sup> 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.

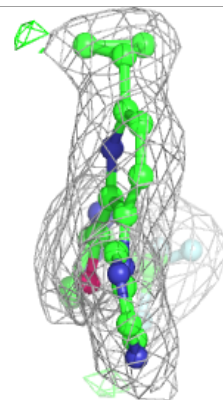
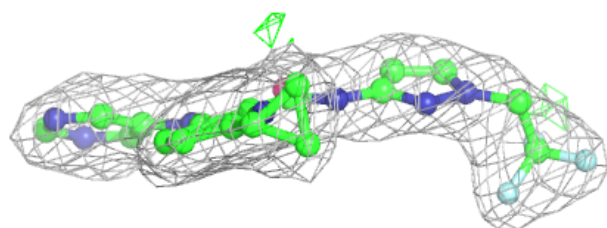
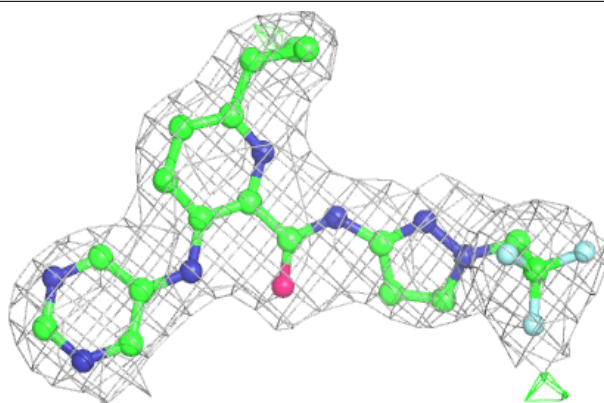
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors( $\text{\AA}^2$ )	Q<0.9
4	IL6	D	803	29/29	0.91	0.16	55,67,84,91	0
4	IL6	B	803	29/29	0.94	0.13	37,46,55,55	0
4	IL6	C	803	29/29	0.95	0.12	36,44,56,60	0
4	IL6	A	803	29/29	0.97	0.12	34,41,51,55	0
3	MG	A	802	1/1	0.97	0.03	41,41,41,41	0
2	ZN	D	801	1/1	0.98	0.10	60,60,60,60	0
3	MG	C	802	1/1	0.98	0.08	39,39,39,39	0
3	MG	B	802	1/1	0.99	0.04	40,40,40,40	0
3	MG	D	802	1/1	0.99	0.03	69,69,69,69	0
2	ZN	A	801	1/1	1.00	0.11	39,39,39,39	0
2	ZN	B	801	1/1	1.00	0.08	36,36,36,36	0
2	ZN	C	801	1/1	1.00	0.10	36,36,36,36	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.

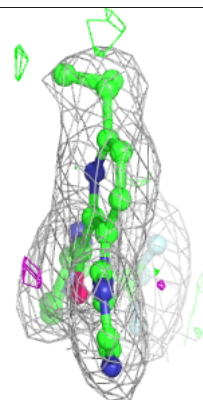
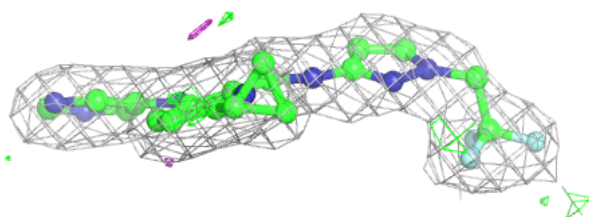
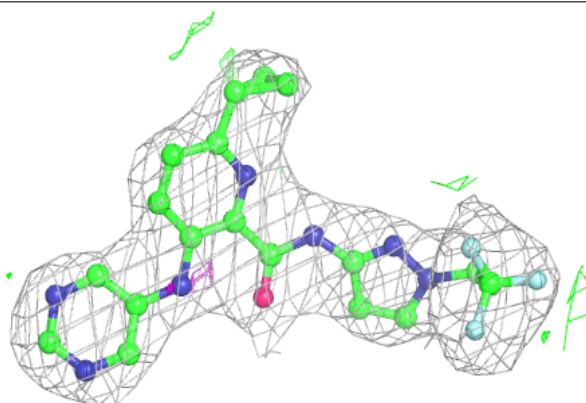


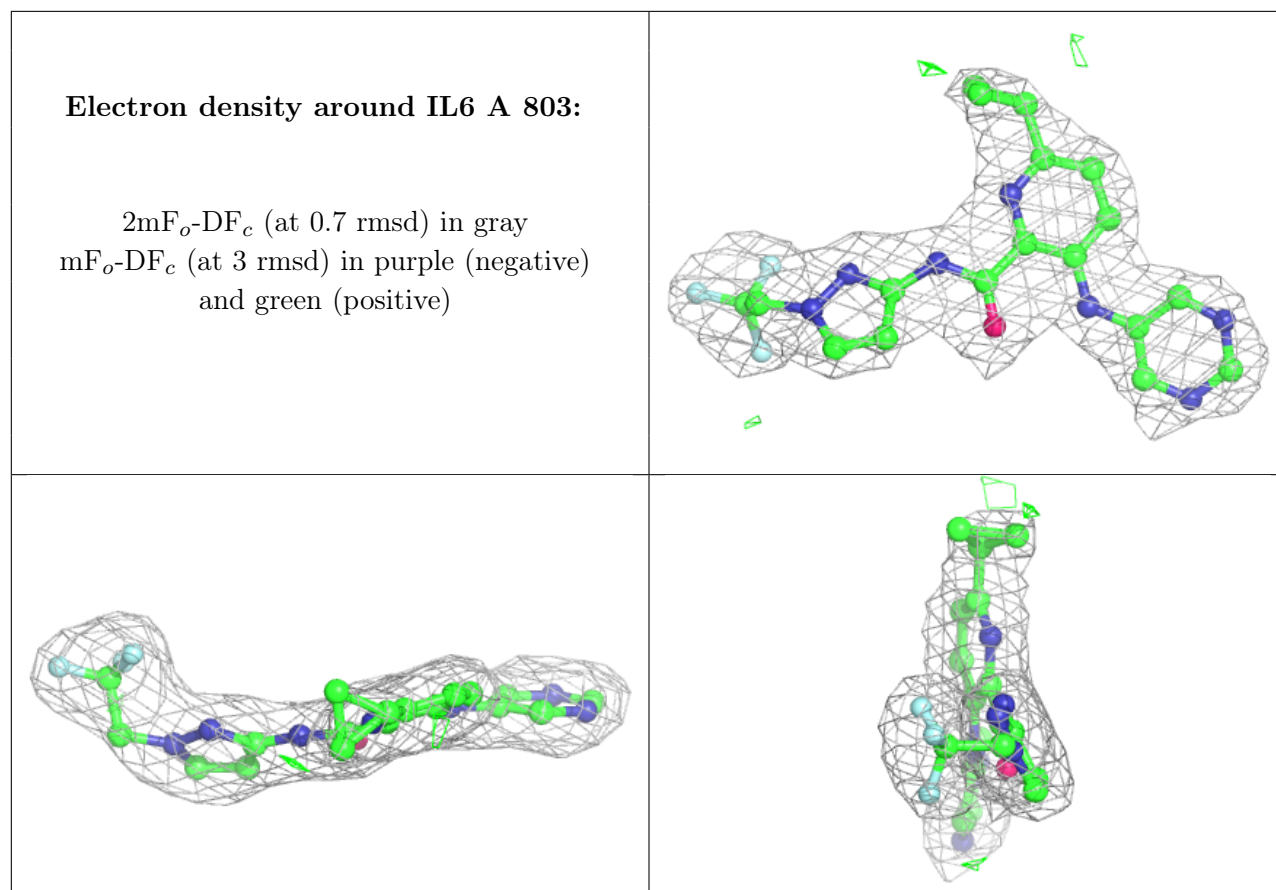
**Electron density around IL6 B 803:**

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

**Electron density around IL6 C 803:**

$2mF_o-DF_c$  (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.