



# Full wwPDB X-ray Structure Validation Report ⓘ

Oct 8, 2024 – 05:15 AM EDT

PDB ID : 5SGJ  
Title : CRYSTAL STRUCTURE OF HUMAN PHOSPHODIESTERASE 10 IN COMPLEX WITH c4c(nc(C(Nc1c(cc2c(c1)nc([nH]2)c3ccccc3)C(NC)=O)=O)c(c4)C)C, micromolar IC50=0.007516  
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Deposited on : 2022-02-01  
Resolution : 2.66 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 ⓘ](#)) were used in the production of this report:

MolProbity : 4.02b-467  
Mogul : 2022.3.0, CSD as543be (2022)  
Xtriage (Phenix) : 1.20.1  
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

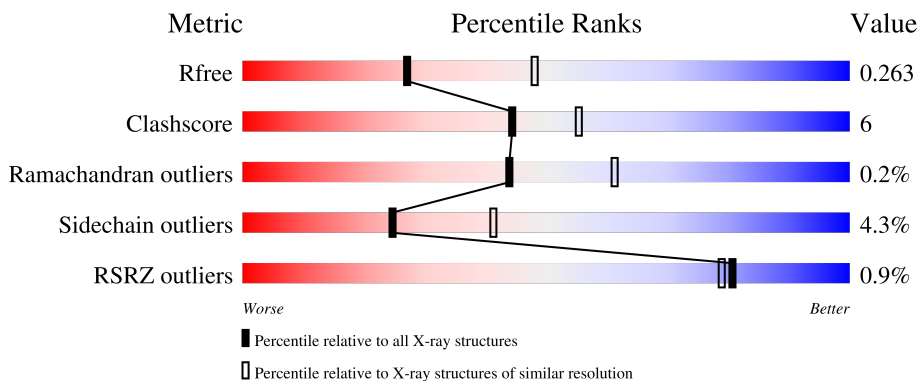
# 1 Overall quality at a glance i

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.66 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	1003 (2.66-2.66)
Clashscore	180529	1063 (2.66-2.66)
Ramachandran outliers	177936	1052 (2.66-2.66)
Sidechain outliers	177891	1052 (2.66-2.66)
RSRZ outliers	164620	1003 (2.66-2.66)

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	
1	B	343	
1	C	343	
1	D	343	

## 2 Entry composition

There are 5 unique types of molecules in this entry. The entry contains 10601 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	Total 2541	C 1624	N 432	O 461	S 24	0	0	0
1	B	315	Total 2559	C 1635	N 437	O 463	S 24	0	1	0
1	C	313	Total 2549	C 1629	N 435	O 461	S 24	0	1	0
1	D	310	Total 2519	C 1612	N 429	O 454	S 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

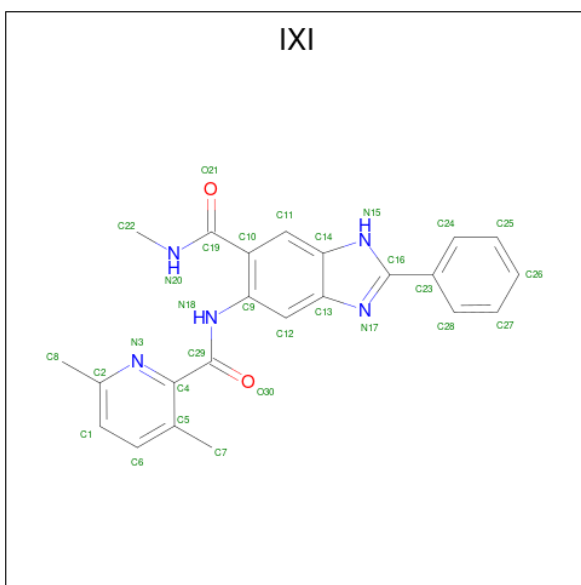
- Molecule 2 is ZINC ION (three-letter code: ZN) (formula: Zn).

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 1 1	0	0
3	B	1	Total Mg 1 1	0	0
3	C	1	Total Mg 1 1	0	0
3	D	1	Total Mg 1 1	0	0

- Molecule 4 is 5-[(3,6-dimethylpyridine-2-carbonyl)amino]-N-methyl-2-phenyl-1H-benzimidazole-6-carboxamide (three-letter code: IXI) (formula: C<sub>23</sub>H<sub>21</sub>N<sub>5</sub>O<sub>2</sub>) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	A	1	Total C N O 30 23 5 2	0	0
4	B	1	Total C N O 30 23 5 2	0	0
4	C	1	Total C N O 30 23 5 2	0	0
4	D	1	Total C N O 30 23 5 2	0	0

- Molecule 5 is water.

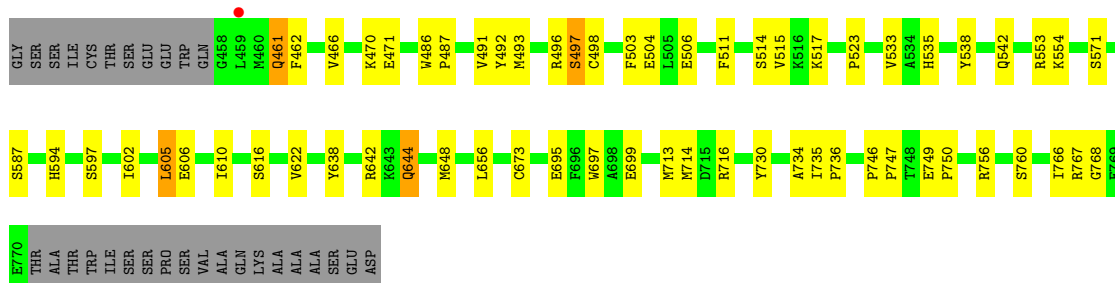
<b>Mol</b>	<b>Chain</b>	<b>Residues</b>	<b>Atoms</b>		<b>ZeroOcc</b>	<b>AltConf</b>
5	A	90	Total 90	O 90	0	0
5	B	85	Total 85	O 85	0	0
5	C	84	Total 84	O 84	0	0
5	D	46	Total 46	O 46	0	0

### 3 Residue-property plots

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.

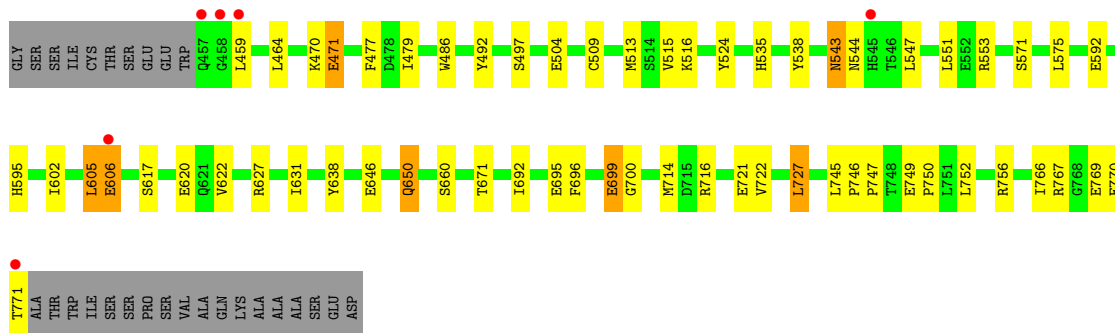
- Molecule 1: cAMP and cAMP-inhibited cGMP 3',5'-cyclic phosphodiesterase 10A

Chain A: 



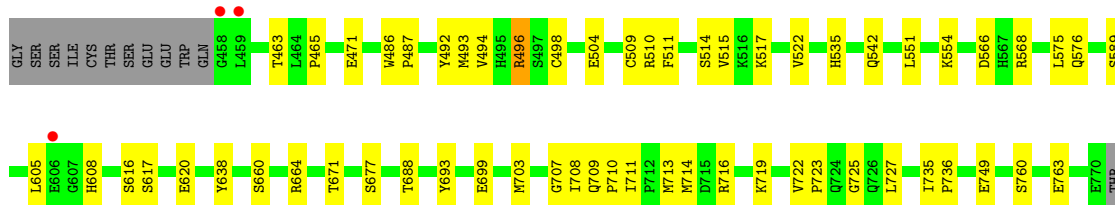
- Molecule 1: cAMP and cAMP-inhibited cGMP 3',5'-cyclic phosphodiesterase 10A

Chain B: 




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

Chain C: 



ALA  
THR  
TRP  
ILE  
SER  
SER  
PRO  
SER  
VAL  
ALA  
GLN  
LYS  
ALA  
ALA  
SER  
SER  
GLU  
ASP

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

Chain D:  79% 11% 10%

GLY  
SER  
SER  
ILE  
CYS  
THR  
SER  
GLU  
GLU  
TRP  
GLN  
GLY  
L469  
L468  
I472  
Y492  
M493  
R496  
S497  
T500  
E504  
K517  
H535  
Q542  
R553  
D564  
H567  
S573  
D579  
H595  
T599  
L605  
T613  
S617  
E620  
Q621  
V622  
I625

Y638  
G652  
N655  
K704  
Q709  
F710  
I711  
G725  
Y730  
A734  
I735  
F746  
P747  
I766  
R767  
G768  
GLU  
GLU  
THR  
ALA  
THR  
TRP  
ILE  
SER  
SER  
PRO  
SER  
SER  
VAL  
ALA  
GLN  
LYS  
ALA  
ALA  
ALA  
SER  
SER  
GLU  
ASP

## 4 Data and refinement statistics i

Property	Value	Source
Space group	H 3	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	135.56Å 135.56Å 235.73Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	43.75 – 2.66 43.75 – 2.66	Depositor EDS
% Data completeness (in resolution range)	95.2 (43.75-2.66) 95.3 (43.75-2.66)	Depositor EDS
$R_{merge}$	0.14	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	1.30 (at 2.65Å)	Xtrriage
Refinement program	REFMAC 5.8.0258	Depositor
R, $R_{free}$	0.182 , 0.260 0.192 , 0.263	Depositor DCC
$R_{free}$ test set	2348 reflections (5.05%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	42.9	Xtrriage
Anisotropy	0.050	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.32 , 35.7	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.49$ , $\langle L^2 \rangle = 0.32$	Xtrriage
Estimated twinning fraction	0.026 for h,-h-k,-l	Xtrriage
$F_o, F_c$ correlation	0.94	EDS
Total number of atoms	10601	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	49.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.67% 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: MG, IXI, CME, ZN

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	0.81	0/2592	0.97	3/3507 (0.1%)
1	B	0.83	4/2613 (0.2%)	0.96	0/3535
1	C	0.78	1/2603 (0.0%)	0.96	1/3521 (0.0%)
1	D	0.82	1/2570 (0.0%)	0.95	0/3478
All	All	0.81	6/10378 (0.1%)	0.96	4/14041 (0.0%)

All (6) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	D	620	GLU	CD-OE2	8.16	1.34	1.25
1	C	620	GLU	CD-OE1	6.24	1.32	1.25
1	B	699	GLU	CD-OE1	5.68	1.31	1.25
1	B	606	GLU	CB-CG	5.52	1.62	1.52
1	B	606	GLU	CG-CD	5.20	1.59	1.51
1	B	620	GLU	CD-OE1	5.06	1.31	1.25

All (4) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	C	510	ARG	NE-CZ-NH1	5.51	123.05	120.30
1	A	756	ARG	NE-CZ-NH1	5.13	122.87	120.30
1	A	756	ARG	NE-CZ-NH2	-5.10	117.75	120.30
1	A	506	GLU	CB-CA-C	5.08	120.55	110.40

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	2541	0	2511	36	1
1	B	2559	0	2528	36	1
1	C	2549	0	2524	28	0
1	D	2519	0	2496	21	0
2	A	1	0	0	0	0
2	B	1	0	0	0	0
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	30	0	0	3	0
4	B	30	0	0	3	0
4	C	30	0	0	2	0
4	D	30	0	0	1	0
5	A	90	0	0	0	1
5	B	85	0	0	3	1
5	C	84	0	0	3	0
5	D	46	0	0	2	0
All	All	10601	0	10059	120	2

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 (120) 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:493:MET:O	1:A:497:SER:HB2	1.75	0.86
1:A:461:GLN:HE21	1:A:461:GLN:HA	1.39	0.86
1:A:461:GLN:HA	1:A:461:GLN:NE2	1.96	0.81
1:B:470:LYS:HE2	1:D:746:PRO:HG3	1.65	0.79
1:A:461:GLN:HE21	1:A:461:GLN:CA	2.04	0.70
1:D:497:SER:HA	1:D:542:GLN:HE22	1.58	0.69
1:B:602:ILE:HA	1:B:605:LEU:HD22	1.75	0.68

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:644:GLN:HE21	1:A:644:GLN:HA	1.60	0.67
1:B:543:ASN:HD22	1:B:543:ASN:N	1.96	0.64
1:A:766:ILE:O	1:A:768:GLY:N	2.30	0.64
1:C:707:GLY:O	1:D:652:GLY:HA3	2.00	0.62
1:B:497:SER:O	1:B:553:ARG:HD2	2.01	0.61
1:A:730:TYR:HA	1:A:734:ALA:HB3	1.83	0.61
1:B:571:SER:OG	1:B:699:GLU:OE2	2.14	0.60
1:A:535:HIS:O	1:A:538:TYR:HB3	2.02	0.59
1:B:700:GLY:HA3	1:B:714:MET:O	2.03	0.59
1:A:749:GLU:N	1:A:750:PRO:CD	2.66	0.58
1:D:730:TYR:HA	1:D:734:ALA:HB3	1.84	0.58
1:D:497:SER:HA	1:D:542:GLN:NE2	2.18	0.58
1:A:492:TYR:CZ	1:A:496:ARG:HD2	2.40	0.57
1:A:602:ILE:HA	1:A:605:LEU:HD22	1.88	0.56
1:C:709:GLN:NE2	1:C:710:PRO:HD2	2.20	0.56
1:D:766:ILE:HG22	1:D:766:ILE:O	2.05	0.56
4:A:803:IXI:O30	4:A:803:IXI:C7	2.54	0.56
1:B:727:LEU:HD12	1:B:766:ILE:HD13	1.89	0.55
1:A:730:TYR:O	1:A:735:ILE:HG12	2.08	0.54
1:B:770:GLU:HG3	1:B:771:THR:N	2.23	0.53
1:A:735:ILE:HB	1:A:736:PRO:HD3	1.90	0.52
1:C:494:VAL:O	1:C:498:CYS:HB3	2.10	0.52
1:B:479:ILE:HD12	1:B:486:TRP:CD1	2.45	0.51
1:B:752:LEU:HD21	1:B:756[B]:ARG:NH2	2.25	0.51
1:B:727:LEU:HD12	1:B:766:ILE:CD1	2.40	0.51
1:A:766:ILE:C	1:A:768:GLY:H	2.14	0.51
1:B:627:ARG:NH1	5:B:902:HOH:O	2.30	0.51
1:B:692:ILE:HG22	1:B:696:PHE:CE2	2.46	0.50
1:C:576:GLN:HB2	5:C:969:HOH:O	2.11	0.50
1:B:492:TYR:OH	5:B:901:HOH:O	2.16	0.50
1:C:492:TYR:CZ	1:C:496:ARG:HD2	2.47	0.50
1:C:522:VAL:O	5:C:902:HOH:O	2.19	0.50
1:C:725:GLY:HA3	4:C:803:IXI:C23	2.42	0.50
1:A:493:MET:SD	1:A:535:HIS:HA	2.52	0.49
1:B:544:ASN:HB3	1:B:547:LEU:HD22	1.92	0.49
1:A:697:TRP:HA	1:A:714:MET:O	2.12	0.49
1:A:517:LYS:HG2	1:A:517:LYS:O	2.12	0.49
1:B:551:LEU:HD22	1:B:622:VAL:HB	1.95	0.49
1:D:746:PRO:N	1:D:747:PRO:CD	2.75	0.49
1:D:492:TYR:CZ	1:D:496:ARG:HD2	2.47	0.49
1:C:542:GLN:NE2	1:C:542:GLN:HA	2.28	0.48

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:511:PHE:O	1:A:515:VAL:HG23	2.13	0.48
1:C:492:TYR:CE2	1:C:496:ARG:HD2	2.48	0.48
1:D:766:ILE:O	1:D:766:ILE:CG2	2.61	0.48
1:B:746:PRO:N	1:B:747:PRO:CD	2.76	0.48
1:C:693:TYR:OH	4:C:803:IXI:N17	2.47	0.48
1:B:543:ASN:N	1:B:543:ASN:ND2	2.62	0.47
1:C:509:CME:HB2	5:C:974:HOH:O	2.13	0.47
1:D:493:MET:O	1:D:497:SER:HB3	2.14	0.47
1:A:638:TYR:OH	1:A:642:ARG:HD3	2.14	0.47
1:D:704:LYS:NZ	5:D:904:HOH:O	2.48	0.47
1:B:749:GLU:N	1:B:750:PRO:CD	2.78	0.47
1:D:638:TYR:HA	5:D:928:HOH:O	2.15	0.47
1:C:722:VAL:N	1:C:723:PRO:CD	2.78	0.47
1:C:735:ILE:HB	1:C:736:PRO:HD3	1.96	0.47
1:C:727:LEU:HD21	1:C:763:GLU:HG3	1.97	0.46
1:C:716:ARG:O	1:C:719:LYS:HG3	2.15	0.46
1:A:713:MET:HG3	4:A:803:IXI:C13	2.45	0.46
1:C:493:MET:SD	1:C:535:HIS:HA	2.55	0.46
1:B:535:HIS:O	1:B:538:TYR:HB3	2.14	0.46
1:C:566:ASP:OD2	1:C:568[B]:ARG:NH2	2.49	0.45
1:A:462:PHE:CE1	1:A:491:VAL:HG11	2.52	0.45
1:B:471:GLU:HB3	1:B:477:PHE:CD1	2.51	0.45
1:C:703:MET:HE3	1:C:708:ILE:HB	1.99	0.45
1:C:660:SER:O	1:C:664:ARG:HG3	2.17	0.45
1:A:486:TRP:N	1:A:487:PRO:CD	2.80	0.45
1:B:551:LEU:HD23	1:B:551:LEU:HA	1.84	0.45
1:C:711:ILE:HD11	1:C:713:MET:HE2	1.98	0.45
1:D:493:MET:SD	1:D:535:HIS:HA	2.57	0.44
1:A:503:PHE:HD1	1:A:610:ILE:O	2.00	0.44
1:A:498:CYS:SG	1:A:554:LYS:HG2	2.58	0.44
4:B:803:IXI:O30	4:B:803:IXI:C7	2.66	0.44
1:B:716:ARG:HG2	5:B:920:HOH:O	2.17	0.44
1:A:746:PRO:N	1:A:747:PRO:CD	2.81	0.43
1:A:594:HIS:O	1:A:597:SER:HB3	2.19	0.43
1:C:486:TRP:N	1:C:487:PRO:CD	2.82	0.43
1:B:767:ARG:NH2	1:B:769:GLU:OE1	2.52	0.43
1:B:509:CME:O	1:B:513:MET:HG2	2.18	0.43
1:B:721:GLU:HB3	4:B:803:IXI:C26	2.49	0.43
1:A:571:SER:OG	1:A:699:GLU:OE2	2.24	0.43
1:A:713:MET:HG3	4:A:803:IXI:C14	2.49	0.43
1:A:466:VAL:CG1	1:A:470:LYS:HE3	2.49	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:627:ARG:O	1:B:631:ILE:HG12	2.18	0.42
1:D:497:SER:O	1:D:553:ARG:HD2	2.19	0.42
1:D:730:TYR:O	1:D:735:ILE:HG12	2.19	0.42
1:A:697:TRP:HB3	1:A:716:ARG:HB3	2.01	0.42
1:D:622:VAL:HA	1:D:625:ILE:HD12	2.01	0.42
1:C:638:TYR:CD1	1:C:671:THR:HG21	2.54	0.42
1:D:595:HIS:O	1:D:599:THR:OG1	2.34	0.42
1:D:725:GLY:HA3	4:D:803:IXI:C23	2.49	0.42
1:B:592:GLU:HA	1:B:595:HIS:HD2	1.84	0.42
1:D:564:ASP:O	1:D:567:HIS:HB2	2.19	0.42
1:B:515:VAL:O	1:B:516:LYS:C	2.58	0.42
1:C:677:SER:HB2	1:C:688:THR:HG21	2.01	0.42
1:B:524:TYR:HB3	1:B:695:GLU:OE2	2.21	0.41
1:C:511:PHE:O	1:C:515:VAL:HG23	2.21	0.41
1:B:638:TYR:CD1	1:B:671:THR:HG21	2.56	0.41
1:D:468:LEU:O	1:D:472:ILE:N	2.51	0.41
1:A:542:GLN:HA	1:A:542:GLN:NE2	2.35	0.41
1:A:749:GLU:N	1:A:750:PRO:HD2	2.35	0.41
1:C:699:GLU:HG2	1:C:714:MET:HE3	2.03	0.41
1:B:464:LEU:HD11	1:B:492:TYR:CD2	2.56	0.41
1:A:523:PRO:HD2	1:A:695:GLU:HG2	2.03	0.41
1:A:533:VAL:HG13	1:A:673:CYS:HB3	2.03	0.41
1:A:735:ILE:N	1:A:736:PRO:CD	2.84	0.41
1:B:470:LYS:HE2	1:D:746:PRO:CG	2.43	0.41
1:B:646:GLU:OE2	1:B:650:GLN:OE1	2.39	0.41
1:B:721:GLU:CB	4:B:803:IXI:C26	2.99	0.41
1:C:498:CYS:SG	1:C:554:LYS:HG3	2.61	0.41
1:A:644:GLN:O	1:A:648:MET:HG3	2.21	0.41
1:C:514:SER:OG	1:C:608:HIS:NE2	2.49	0.41
1:C:551:LEU:HA	1:C:551:LEU:HD23	1.85	0.40
1:B:745:LEU:C	1:B:747:PRO:HD2	2.41	0.40

All (2) 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)
1:A:606:GLU:OE2	1:B:606:GLU:OE2[2_655]	1.97	0.23
5:A:922:HOH:O	5:B:965:HOH:O[3_655]	2.02	0.18

## 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	310/343 (90%)	295 (95%)	14 (4%)	1 (0%)	37	53
1	B	313/343 (91%)	299 (96%)	14 (4%)	0	100	100
1	C	311/343 (91%)	293 (94%)	17 (6%)	1 (0%)	37	53
1	D	307/343 (90%)	292 (95%)	14 (5%)	1 (0%)	37	53
All	All	1241/1372 (90%)	1179 (95%)	59 (5%)	3 (0%)	44	61

All (3) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	767	ARG
1	D	579	ASP
1	C	465	PRO

### 5.3.2 Protein sidechains [i](#)

In the following table, the Percentiles column shows the percent sidechain outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

The Analysed column shows the number of residues for which the sidechain conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	281/305 (92%)	268 (95%)	13 (5%)	23	38
1	B	282/305 (92%)	271 (96%)	11 (4%)	27	45
1	C	282/305 (92%)	270 (96%)	12 (4%)	25	41
1	D	279/305 (92%)	267 (96%)	12 (4%)	25	41
All	All	1124/1220 (92%)	1076 (96%)	48 (4%)	25	41

All (48) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	461	GLN
1	A	471	GLU
1	A	497	SER
1	A	504	GLU
1	A	514	SER
1	A	553	ARG
1	A	587	SER
1	A	605	LEU
1	A	616	SER
1	A	622	VAL
1	A	644	GLN
1	A	656	LEU
1	A	760	SER
1	B	459	LEU
1	B	471	GLU
1	B	504	GLU
1	B	543	ASN
1	B	575	LEU
1	B	605	LEU
1	B	617	SER
1	B	650	GLN
1	B	660	SER
1	B	722	VAL
1	B	727	LEU
1	C	463	THR
1	C	471	GLU
1	C	496	ARG
1	C	504	GLU
1	C	517	LYS
1	C	575	LEU
1	C	589	SER
1	C	605	LEU
1	C	616	SER
1	C	617	SER
1	C	749	GLU
1	C	760	SER
1	D	459	LEU
1	D	500	THR
1	D	504	GLU
1	D	517	LYS
1	D	573	SER
1	D	605	LEU
1	D	613	THR

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Mol	Chain	Res	Type
1	D	617	SER
1	D	638	TYR
1	D	655	ASN
1	D	709	GLN
1	D	711	ILE

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (23) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	461	GLN
1	A	484	ASN
1	A	542	GLN
1	A	604	GLN
1	A	644	GLN
1	A	743	GLN
1	B	476	HIS
1	B	542	GLN
1	B	543	ASN
1	B	604	GLN
1	C	542	GLN
1	C	604	GLN
1	C	709	GLN
1	C	743	GLN
1	D	476	HIS
1	D	484	ASN
1	D	542	GLN
1	D	604	GLN
1	D	621	GLN
1	D	709	GLN
1	D	731	ASN
1	D	743	GLN
1	D	761	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	A	509	1	8,9,10	0.66	0	6,9,11	0.94	0
1	CME	C	509	1	8,9,10	0.43	0	6,9,11	0.71	0
1	CME	D	509	1	8,9,10	0.38	0	6,9,11	0.77	0
1	CME	B	509	1	8,9,10	0.49	0	6,9,11	0.78	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. '2' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
1	CME	A	509	1	-	1/5/8/10	-
1	CME	C	509	1	-	3/5/8/10	-
1	CME	D	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 (6) torsion outliers are listed below:

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

There are no ring outliers.

2 monomers are involved in 2 short contacts:

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

## 5.5 Carbohydrates [i](#)

There are no oligosaccharides 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	IXI	C	803	-	33,33,33	2.96	14 (42%)	41,47,47	2.23	16 (39%)
4	IXI	A	803	-	33,33,33	2.38	9 (27%)	41,47,47	2.24	14 (34%)
4	IXI	B	803	-	33,33,33	2.75	11 (33%)	41,47,47	2.14	9 (21%)
4	IXI	D	803	-	33,33,33	2.49	10 (30%)	41,47,47	1.56	6 (14%)

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	IXI	C	803	-	-	1/18/18/18	0/4/4/4
4	IXI	A	803	-	-	0/18/18/18	0/4/4/4
4	IXI	B	803	-	-	1/18/18/18	0/4/4/4
4	IXI	D	803	-	-	2/18/18/18	0/4/4/4

All (44) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	C	803	IXI	C19-N20	9.36	1.46	1.33

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	B	803	IXI	C19-N20	7.97	1.44	1.33
4	A	803	IXI	C19-N20	7.72	1.43	1.33
4	C	803	IXI	C16-N15	7.03	1.44	1.35
4	D	803	IXI	C16-N15	6.78	1.44	1.35
4	D	803	IXI	C4-C5	6.37	1.47	1.40
4	B	803	IXI	C16-N15	6.25	1.43	1.35
4	D	803	IXI	C19-N20	5.65	1.41	1.33
4	B	803	IXI	C4-C5	5.61	1.46	1.40
4	C	803	IXI	C10-C9	5.51	1.49	1.41
4	A	803	IXI	C16-N15	5.42	1.42	1.35
4	B	803	IXI	C10-C9	5.03	1.48	1.41
4	A	803	IXI	C10-C9	5.02	1.48	1.41
4	C	803	IXI	C4-C5	4.08	1.44	1.40
4	C	803	IXI	C4-C29	3.93	1.56	1.50
4	B	803	IXI	C1-C2	3.69	1.47	1.39
4	D	803	IXI	C10-C9	3.45	1.46	1.41
4	C	803	IXI	C10-C19	3.40	1.57	1.50
4	B	803	IXI	C1-C6	3.39	1.44	1.38
4	C	803	IXI	C1-C2	3.17	1.46	1.39
4	D	803	IXI	C1-C2	3.17	1.46	1.39
4	C	803	IXI	C6-C5	3.02	1.45	1.39
4	A	803	IXI	C4-C29	3.01	1.54	1.50
4	B	803	IXI	C10-C19	2.96	1.56	1.50
4	C	803	IXI	C16-N17	2.82	1.39	1.35
4	D	803	IXI	C4-C29	2.81	1.54	1.50
4	D	803	IXI	C4-N3	2.76	1.40	1.34
4	B	803	IXI	C12-C9	2.72	1.42	1.37
4	C	803	IXI	C12-C9	2.66	1.42	1.37
4	D	803	IXI	O21-C19	2.62	1.29	1.23
4	A	803	IXI	C4-N3	2.53	1.39	1.34
4	B	803	IXI	C4-N3	2.51	1.39	1.34
4	A	803	IXI	O21-C19	2.50	1.29	1.23
4	D	803	IXI	C12-C9	2.43	1.42	1.37
4	A	803	IXI	C10-C19	2.37	1.54	1.50
4	B	803	IXI	C4-C29	2.37	1.54	1.50
4	A	803	IXI	C12-C9	2.34	1.42	1.37
4	D	803	IXI	C10-C19	2.33	1.54	1.50
4	C	803	IXI	C11-C10	2.24	1.41	1.37
4	A	803	IXI	C2-N3	2.16	1.38	1.34
4	B	803	IXI	C16-N17	2.15	1.38	1.35
4	C	803	IXI	C4-N3	2.12	1.39	1.34
4	C	803	IXI	O21-C19	2.10	1.28	1.23

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	C	803	IXI	C24-C23	2.09	1.43	1.39

All (45) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	B	803	IXI	C10-C19-N20	6.00	125.75	116.98
4	A	803	IXI	C29-C4-N3	5.89	121.79	116.02
4	A	803	IXI	C10-C19-N20	5.54	125.08	116.98
4	A	803	IXI	C27-C28-C23	-5.28	114.52	120.54
4	C	803	IXI	C22-N20-C19	5.02	131.35	121.80
4	B	803	IXI	C6-C1-C2	4.91	124.73	119.90
4	C	803	IXI	C10-C19-N20	4.53	123.61	116.98
4	B	803	IXI	O21-C19-N20	-4.36	116.22	122.67
4	D	803	IXI	C6-C1-C2	4.20	124.03	119.90
4	B	803	IXI	C9-C10-C19	3.94	126.01	120.96
4	A	803	IXI	C8-C2-N3	3.78	122.28	116.56
4	C	803	IXI	C9-C10-C19	3.75	125.76	120.96
4	C	803	IXI	C23-C16-N17	3.74	128.48	123.55
4	B	803	IXI	C1-C2-N3	-3.71	116.77	121.59
4	C	803	IXI	C23-C16-N15	-3.70	118.68	123.55
4	C	803	IXI	C11-C10-C9	-3.50	115.95	119.09
4	A	803	IXI	O21-C19-N20	-3.49	117.50	122.67
4	A	803	IXI	C28-C23-C24	3.40	123.76	117.68
4	D	803	IXI	C1-C6-C5	-3.27	117.09	121.98
4	B	803	IXI	C1-C6-C5	-3.27	117.10	121.98
4	C	803	IXI	C12-C9-N18	-3.22	112.56	121.74
4	D	803	IXI	O21-C19-N20	-3.14	118.02	122.67
4	A	803	IXI	C24-C23-C16	-3.06	115.75	120.78
4	A	803	IXI	C26-C25-C24	-3.06	116.47	120.24
4	C	803	IXI	C7-C5-C4	-2.99	119.08	123.34
4	B	803	IXI	C23-C16-N17	2.92	127.39	123.55
4	D	803	IXI	C29-C4-N3	-2.88	113.20	116.02
4	C	803	IXI	C10-C9-N18	2.88	123.88	118.70
4	C	803	IXI	C8-C2-C1	2.80	127.00	121.61
4	A	803	IXI	O21-C19-C10	-2.59	116.28	121.03
4	C	803	IXI	C4-N3-C2	2.55	120.64	118.28
4	C	803	IXI	O21-C19-N20	-2.52	118.93	122.67
4	C	803	IXI	C7-C5-C6	2.51	125.10	120.28
4	A	803	IXI	C4-N3-C2	2.48	120.58	118.28
4	B	803	IXI	C5-C4-N3	2.42	126.64	120.56
4	D	803	IXI	C24-C23-C16	-2.36	116.90	120.78
4	C	803	IXI	C12-C9-C10	2.35	123.56	120.34

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	C	803	IXI	O21-C19-C10	-2.23	116.94	121.03
4	A	803	IXI	C27-C26-C25	2.23	122.93	119.87
4	A	803	IXI	C7-C5-C4	-2.22	120.18	123.34
4	A	803	IXI	C11-C10-C9	2.19	121.06	119.09
4	D	803	IXI	C10-C19-N20	2.16	120.14	116.98
4	C	803	IXI	C8-C2-N3	-2.16	113.30	116.56
4	B	803	IXI	C23-C16-N15	-2.08	120.81	123.55
4	A	803	IXI	C9-N18-C29	2.03	132.54	126.90

There are no chirality outliers.

All (4) torsion outliers are listed below:

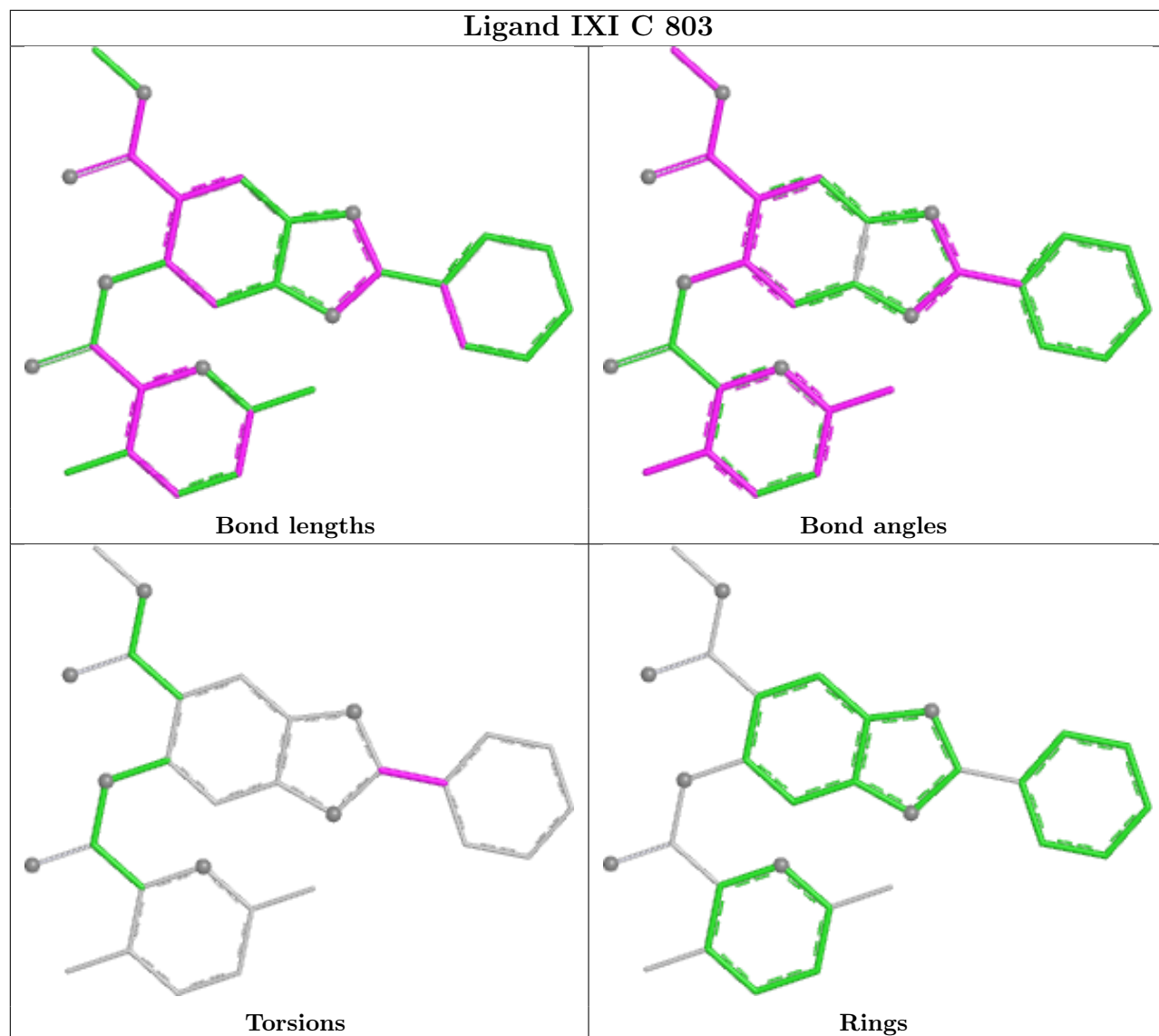
Mol	Chain	Res	Type	Atoms
4	B	803	IXI	C10-C19-N20-C22
4	D	803	IXI	C10-C19-N20-C22
4	C	803	IXI	N15-C16-C23-C24
4	D	803	IXI	N15-C16-C23-C24

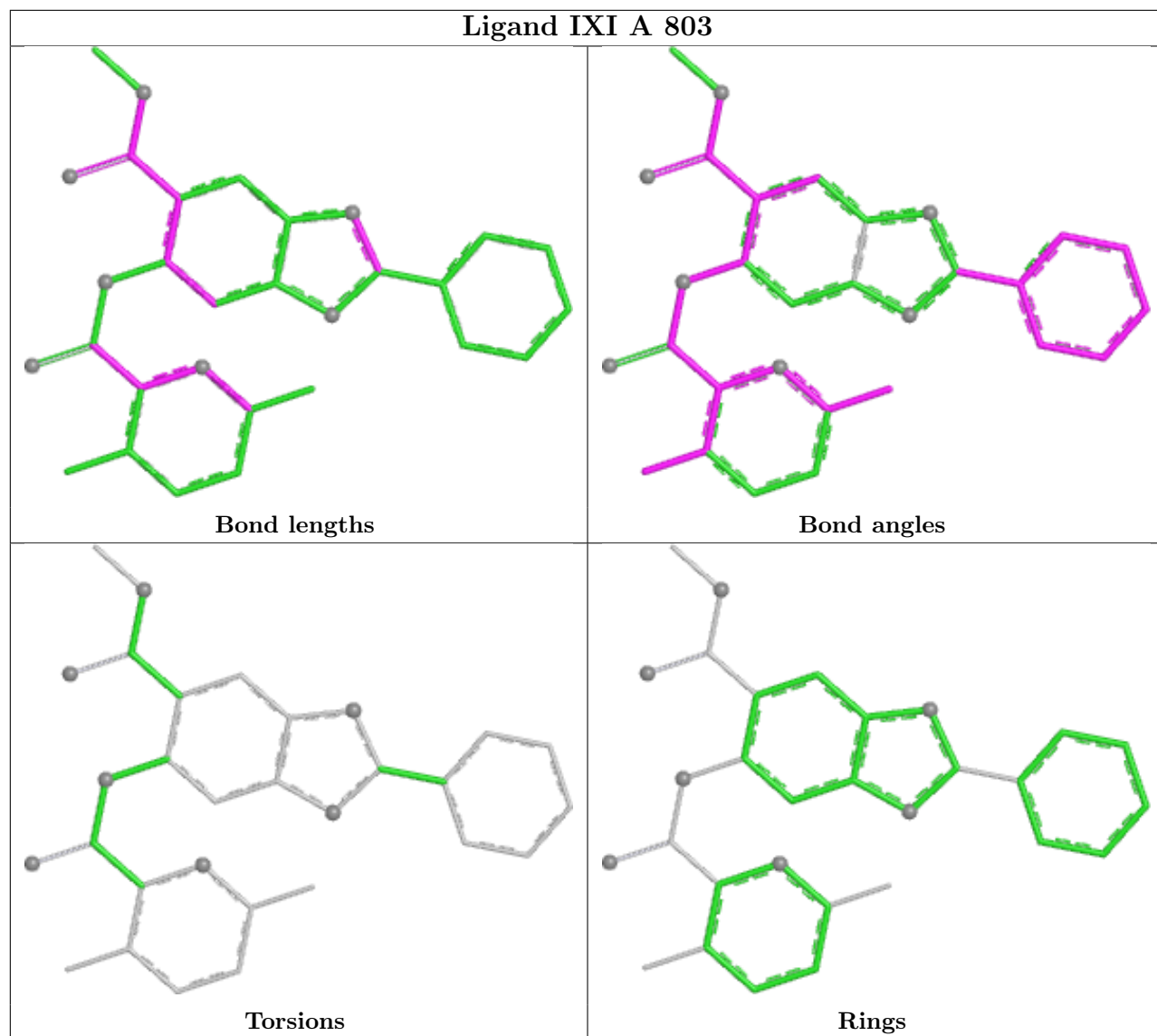
There are no ring outliers.

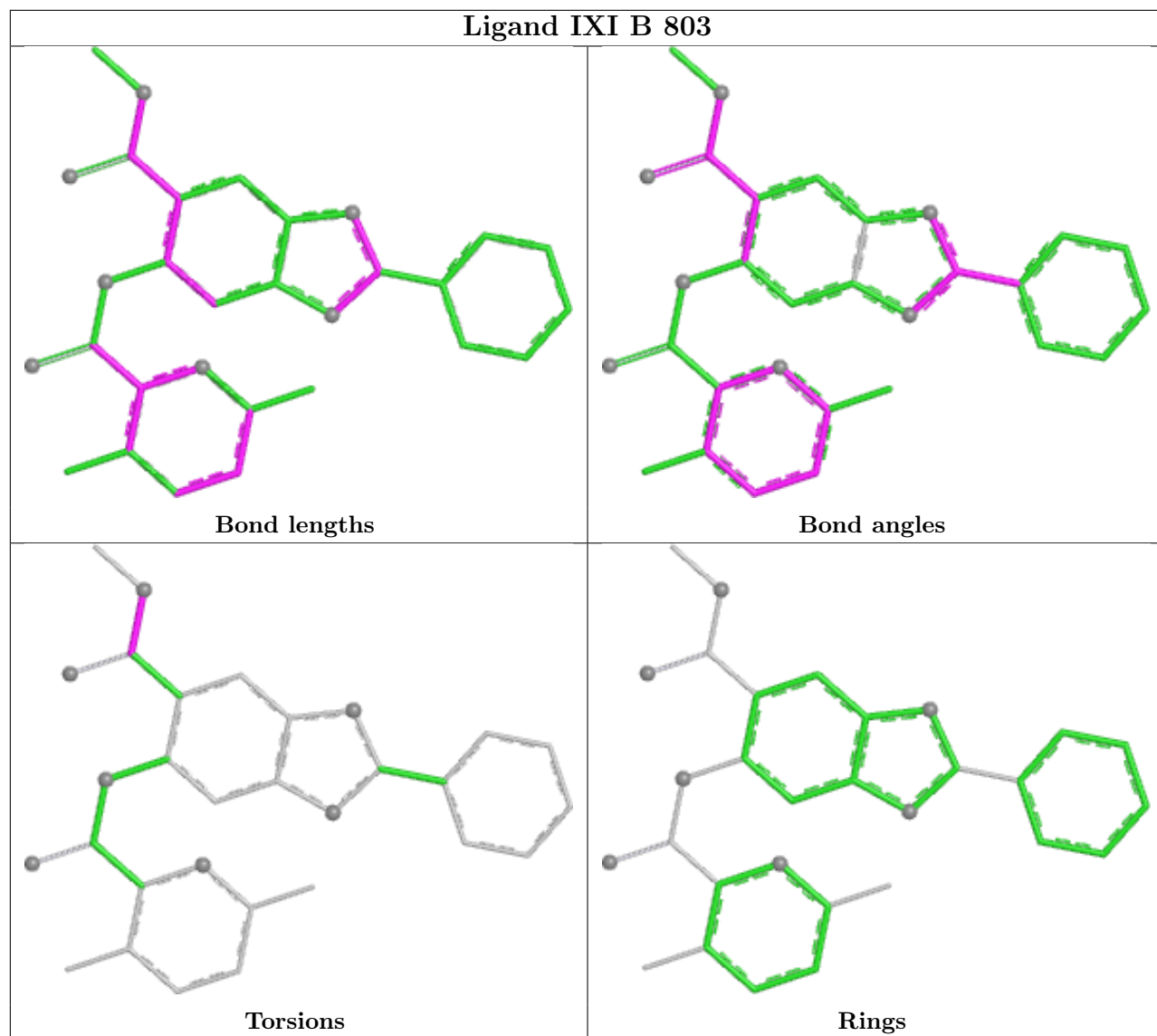
4 monomers are involved in 9 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	C	803	IXI	2	0
4	A	803	IXI	3	0
4	B	803	IXI	3	0
4	D	803	IXI	1	0

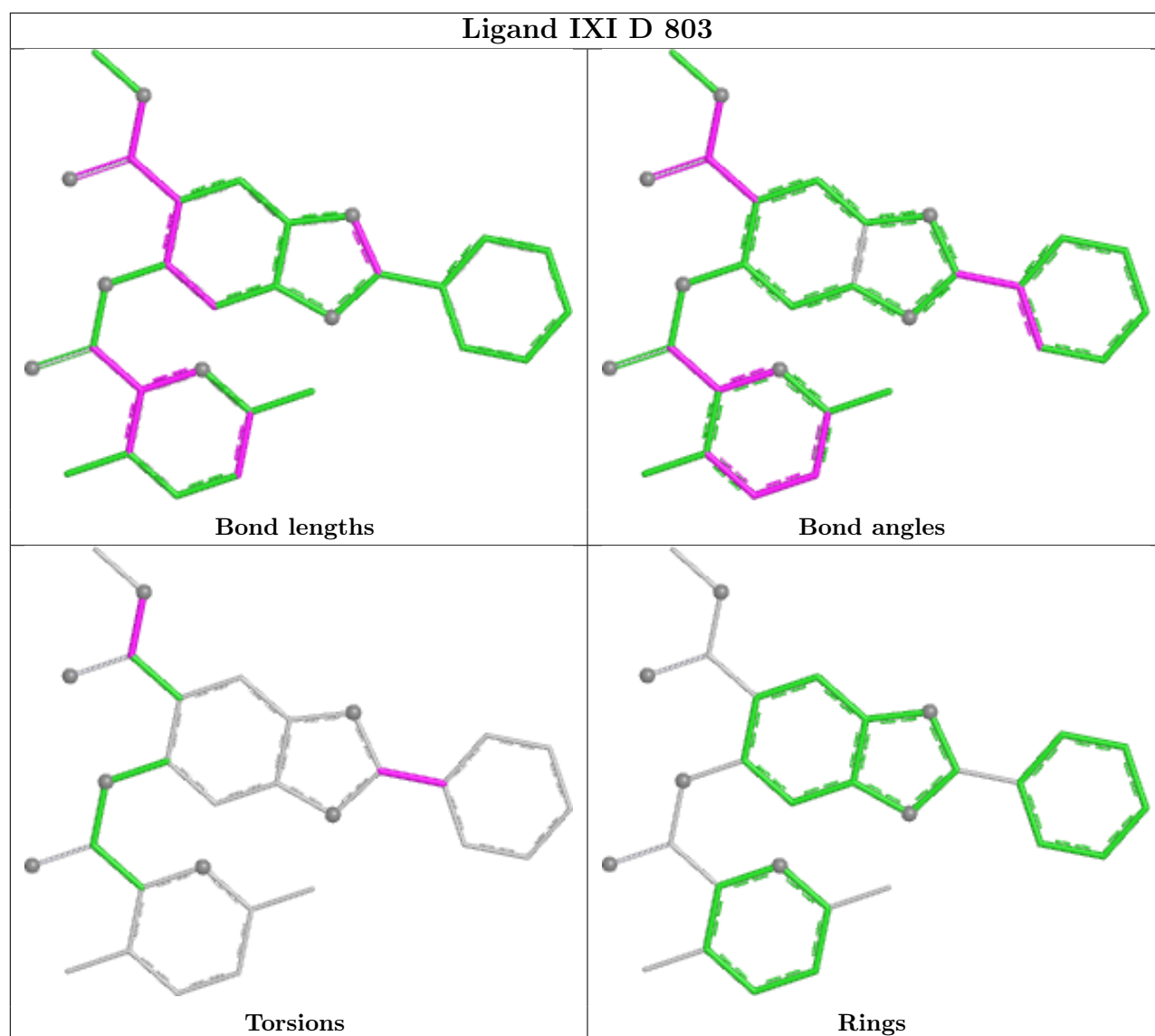
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. 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, 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%)	-0.42	1 (0%) 90 90	28, 42, 73, 102	0
1	B	314/343 (91%)	-0.32	6 (1%) 66 64	25, 42, 74, 103	1 (0%)
1	C	312/343 (90%)	-0.42	3 (0%) 79 77	19, 44, 68, 96	1 (0%)
1	D	309/343 (90%)	-0.13	1 (0%) 90 90	37, 55, 79, 100	0
All	All	1247/1372 (90%)	-0.32	11 (0%) 81 79	19, 47, 77, 103	2 (0%)

All (11) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	D	459	LEU	4.6
1	C	606	GLU	3.0
1	B	606	GLU	2.8
1	B	458	GLY	2.6
1	B	771	THR	2.5
1	B	545	HIS	2.4
1	C	458	GLY	2.4
1	C	459	LEU	2.3
1	B	459	LEU	2.2
1	A	459	LEU	2.0
1	B	457	GLN	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, 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	0.83	0.20	52,66,98,103	0

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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors( $\text{\AA}^2$ )	Q<0.9
1	CME	D	509	10/11	0.86	0.15	58,75,106,106	0
1	CME	C	509	10/11	0.90	0.12	51,60,92,95	0
1	CME	A	509	10/11	0.91	0.11	53,62,91,92	0

### 6.3 Carbohydrates [i](#)

There are no monosaccharides in this entry.

### 6.4 Ligands [i](#)

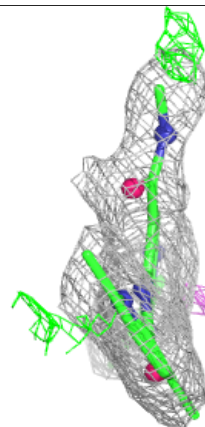
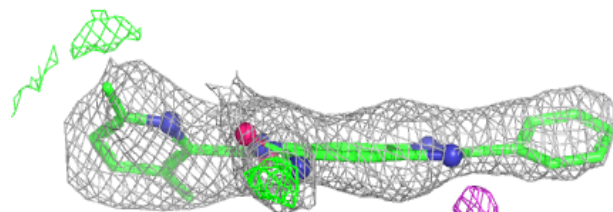
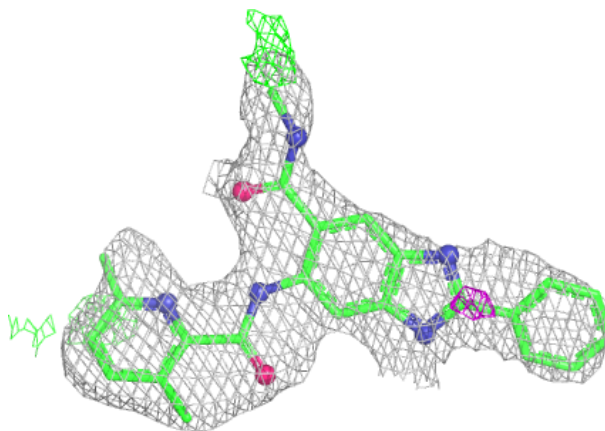
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95<sup>th</sup> percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 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
3	MG	D	802	1/1	0.84	0.09	50,50,50,50	0
4	IXI	C	803	30/30	0.87	0.13	43,64,85,89	0
4	IXI	D	803	30/30	0.88	0.12	49,65,72,76	0
4	IXI	B	803	30/30	0.89	0.12	35,56,64,68	0
4	IXI	A	803	30/30	0.94	0.09	40,52,61,66	0
2	ZN	D	801	1/1	0.99	0.02	49,49,49,49	0
2	ZN	C	801	1/1	0.99	0.02	39,39,39,39	0
2	ZN	A	801	1/1	1.00	0.01	38,38,38,38	0
2	ZN	B	801	1/1	1.00	0.02	39,39,39,39	0
3	MG	A	802	1/1	1.00	0.02	31,31,31,31	0
3	MG	B	802	1/1	1.00	0.02	25,25,25,25	0
3	MG	C	802	1/1	1.00	0.01	24,24,24,24	0

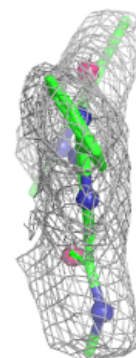
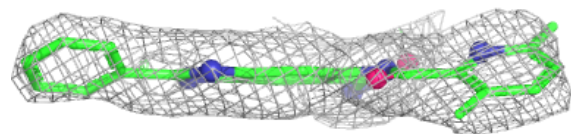
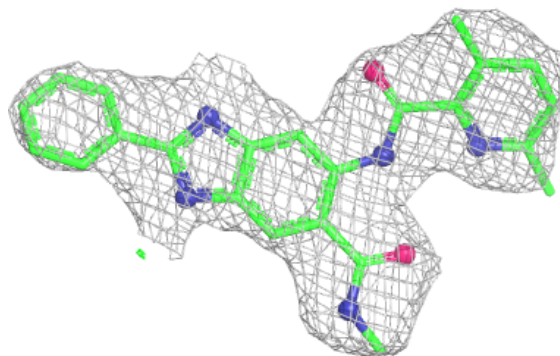
The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation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

**Electron density around IXI 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)

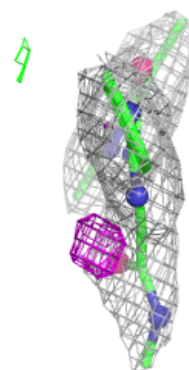
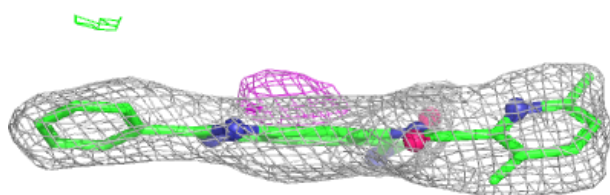
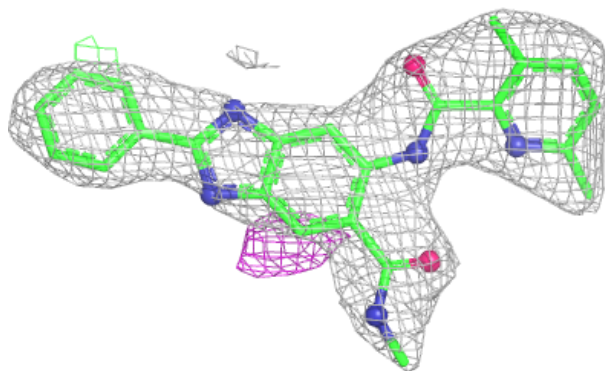
**Electron density around IXI D 803:**

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

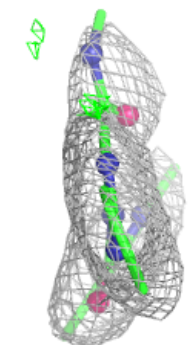
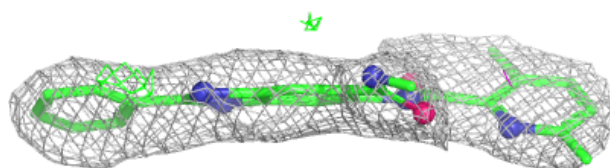
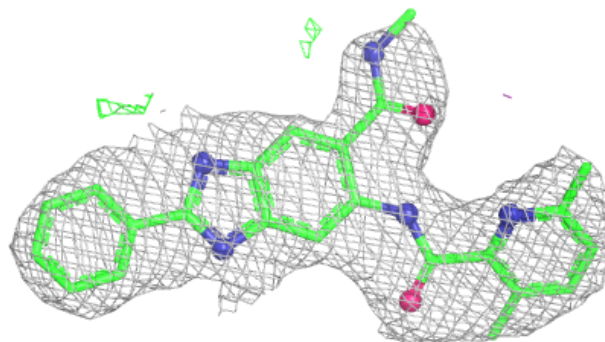


**Electron density around IXI B 803:**

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

**Electron density around IXI A 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.