



# Full wwPDB X-ray Structure Validation Report ⓘ

Oct 6, 2022 – 08:18 PM EDT

PDB ID : 5SJA  
Title : Crystal Structure of human phosphodiesterase 10 in complex with N-(2-tert-butyl-5-methylpyrazol-3-yl)-1-phenyl-3-(pyridin-2-yloxymethyl)thieno[2,3-c]pyrazole-5-carboxamide  
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Deposited on : 2022-02-01  
Resolution : 2.13 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 : 1.8.5 (274361), CSD as541be (2020)  
Xtriage (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

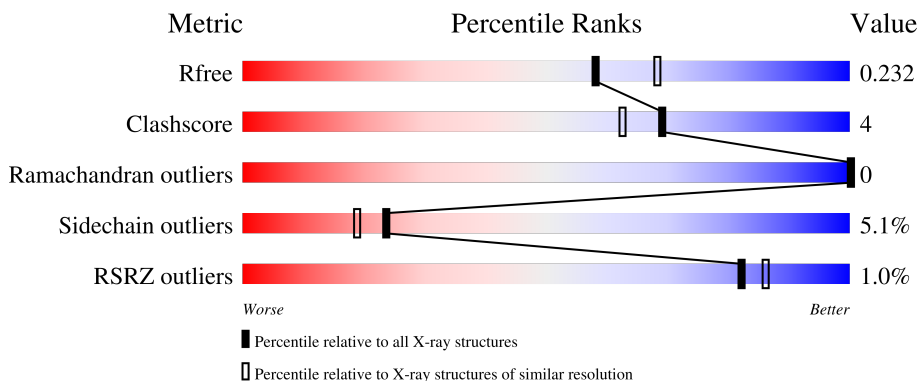
# 1 Overall quality at a glance i

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.13 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	2523 (2.16-2.12)
Clashscore	141614	2653 (2.16-2.12)
Ramachandran outliers	138981	2618 (2.16-2.12)
Sidechain outliers	138945	2617 (2.16-2.12)
RSRZ outliers	127900	2485 (2.16-2.12)

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: 3%; height: 10px; background-color: red; margin-right: 5px;"></div> <div style="width: 80%; height: 10px; background-color: green; margin-right: 5px;"></div> <div style="width: 11%; height: 10px; background-color: yellow; margin-right: 5px;"></div> <div style="width: 9%; height: 10px; background-color: grey;"></div> </div> <p style="margin-left: 10px;">80%      11%      •      9%</p>
1	B	343	<div style="width: 80%; height: 10px; background-color: green; margin-right: 5px;"></div> <div style="width: 11%; height: 10px; background-color: yellow; margin-right: 5px;"></div> <div style="width: 9%; height: 10px; background-color: grey;"></div> <p style="margin-left: 10px;">80%      11%      •      9%</p>
1	C	343	<div style="width: 80%; 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: 9%; height: 10px; background-color: grey;"></div> <p style="margin-left: 10px;">80%      10%      •      9%</p>
1	D	343	<div style="display: flex; align-items: center;"> <div style="width: 3%; height: 10px; background-color: red; margin-right: 5px;"></div> <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: 9%; height: 10px; background-color: grey;"></div> </div> <p style="margin-left: 10px;">3%      81%      10%      •      9%</p>

## 2 Entry composition

There are 5 unique types of molecules in this entry. The entry contains 10877 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 2549	C 1629	N 433	O 463	S 24	0	2	0
1	B	313	Total 2555	C 1633	N 436	O 462	S 24	0	2	0
1	C	313	Total 2554	C 1632	N 436	O 462	S 24	0	2	0
1	D	313	Total 2542	C 1625	N 434	O 459	S 24	0	1	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

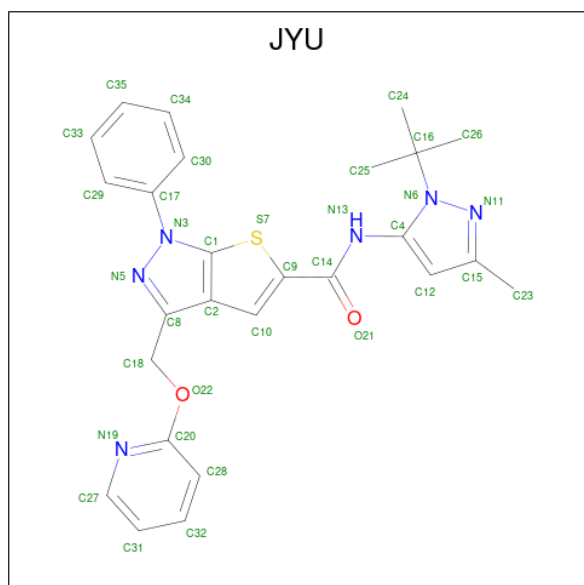
- Molecule 2 is ZINC ION (three-letter code: ZN) (formula: Zn).

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 N-(1-tert-butyl-3-methyl-1H-pyrazol-5-yl)-1-phenyl-3-[[[(pyridin-2-yl)oxy]methyl]-1H-thieno[2,3-c]pyrazole-5-carboxamide (three-letter code: JYU) (formula: C<sub>26</sub>H<sub>26</sub>N<sub>6</sub>O<sub>2</sub>S) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	A	1	Total C N O S 35 26 6 2 1	0	0
4	B	1	Total C N O S 35 26 6 2 1	0	0
4	C	1	Total C N O S 35 26 6 2 1	0	0
4	D	1	Total C N O S 35 26 6 2 1	0	0

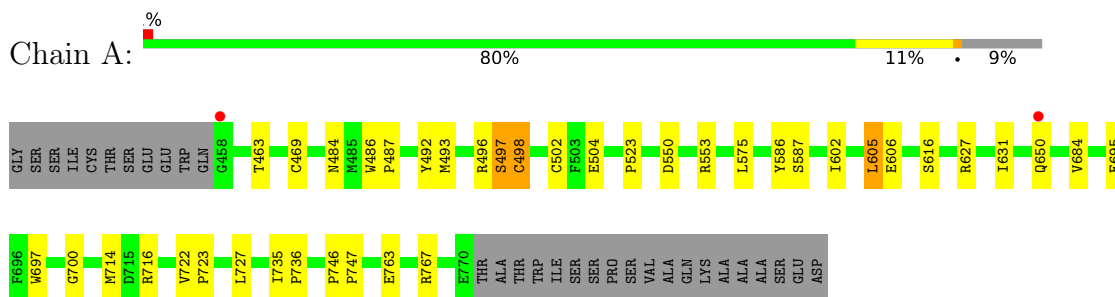
- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	150	Total 150	O 150	0	0
5	B	143	Total 143	O 143	0	0
5	C	159	Total 159	O 159	0	0
5	D	77	Total 77	O 77	0	0

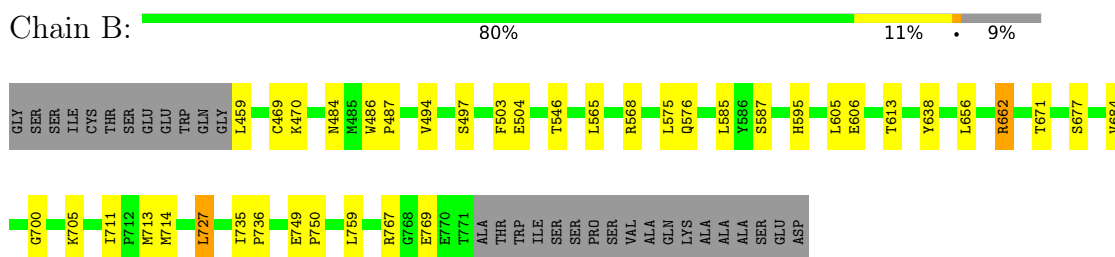
### 3 Residue-property plots [i](#)

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.

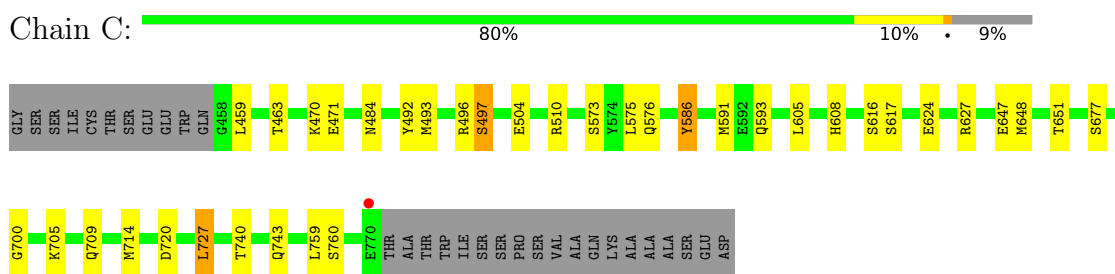
- Molecule 1: cAMP and cAMP-inhibited cGMP 3',5'-cyclic phosphodiesterase 10A



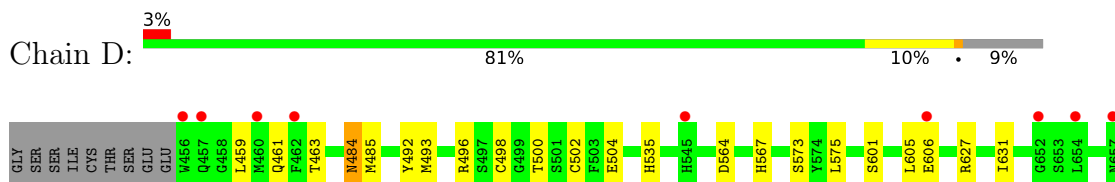
- Molecule 1: cAMP and cAMP-inhibited cGMP 3',5'-cyclic phosphodiesterase 10A



- 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 i

Property	Value	Source
Space group	H 3	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	136.34Å 136.34Å 235.18Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	43.69 – 2.13 43.70 – 2.13	Depositor EDS
% Data completeness (in resolution range)	98.2 (43.69-2.13) 98.2 (43.70-2.13)	Depositor EDS
$R_{merge}$	0.08	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	1.25 (at 2.14Å)	Xtrriage
Refinement program	BUSTER	Depositor
R, $R_{free}$	0.182 , 0.229 0.190 , 0.232	Depositor DCC
$R_{free}$ test set	4539 reflections (5.00%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	37.0	Xtrriage
Anisotropy	0.047	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.33 , 51.2	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	10877	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	48.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.60% 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, JYU, 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	0.66	0/2606	0.74	0/3526
1	B	0.65	0/2612	0.75	0/3534
1	C	0.66	0/2611	0.75	0/3532
1	D	0.70	0/2596	0.75	0/3513
All	All	0.67	0/10425	0.75	0/14105

There are no bond length outliers.

There are no bond angle outliers.

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	2524	18	0
1	B	2555	0	2529	18	0
1	C	2554	0	2530	21	0
1	D	2542	0	2517	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

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
3	B	1	0	0	0	0
3	C	1	0	0	0	0
3	D	1	0	0	0	0
4	A	35	0	0	0	0
4	B	35	0	0	0	0
4	C	35	0	0	0	0
4	D	35	0	0	1	0
5	A	150	0	0	3	0
5	B	143	0	0	2	0
5	C	159	0	0	7	0
5	D	77	0	0	1	0
All	All	10877	0	10100	76	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 4.

All (76) 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:469:CYS:SG	5:A:1026:HOH:O	2.28	0.92
1:C:593:GLN:OE1	5:C:901:HOH:O	1.92	0.87
1:C:484[B]:ASN:ND2	5:C:902:HOH:O	2.18	0.73
1:D:762:TRP:O	1:D:766:ILE:HG13	1.90	0.72
1:A:484[B]:ASN:OD1	5:A:901:HOH:O	2.11	0.68
1:D:484[B]:ASN:HD22	1:D:485:MET:N	1.92	0.68
1:B:484[B]:ASN:ND2	5:B:901:HOH:O	2.24	0.66
1:C:624:GLU:OE2	1:C:627:ARG:NH1	2.18	0.65
1:B:767:ARG:NH1	1:B:769:GLU:OE2	2.32	0.62
1:C:648:MET:HE1	5:C:969:HOH:O	2.02	0.59
1:A:497:SER:O	1:A:553:ARG:HD2	2.03	0.59
1:C:484[B]:ASN:OD1	5:C:902:HOH:O	2.17	0.58
1:C:700:GLY:HA3	1:C:714:MET:O	2.04	0.58
1:D:498:CYS:HG	1:D:502:CYS:HG	1.49	0.58
1:D:498:CYS:SG	1:D:502:CYS:SG	3.01	0.57
1:C:714:MET:HE2	5:C:1000:HOH:O	2.06	0.56
1:C:492:TYR:CZ	1:C:496:ARG:HD2	2.42	0.55
1:A:492:TYR:CZ	1:A:496:ARG:HD2	2.41	0.54
1:A:722:VAL:HB	1:A:723:PRO:HD3	1.90	0.54
1:D:627:ARG:O	1:D:631:ILE:HG12	2.08	0.53
1:C:651:THR:HG22	5:C:1031:HOH:O	2.09	0.53
1:A:684:VAL:HG22	1:B:705:LYS:HG2	1.91	0.52

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:D:492:TYR:CZ	1:D:496:ARG:HD2	2.44	0.52
1:B:700:GLY:HA3	1:B:714:MET:O	2.11	0.51
1:C:484[B]:ASN:CG	5:C:902:HOH:O	2.46	0.50
1:D:498:CYS:HG	1:D:502:CYS:CB	2.25	0.49
1:D:727:LEU:HD21	1:D:763:GLU:HG3	1.94	0.49
1:A:763:GLU:O	1:A:767:ARG:HG3	2.12	0.49
1:D:722:VAL:HB	1:D:723:PRO:HD3	1.96	0.48
1:C:493:MET:O	1:C:497:SER:HB2	2.14	0.48
1:C:647:GLU:O	1:C:651:THR:HG23	2.13	0.48
1:D:727:LEU:HG	1:D:766:ILE:HD11	1.95	0.47
1:A:586:TYR:HD2	5:A:968:HOH:O	1.98	0.47
1:C:740:THR:HA	1:C:743:GLN:HE21	1.79	0.47
1:A:498:CYS:HB3	1:A:502:CYS:SG	2.54	0.47
1:B:735:ILE:HB	1:B:736:PRO:HD3	1.97	0.46
1:C:727:LEU:CD2	1:C:759:LEU:CD1	2.94	0.45
1:C:492:TYR:CE2	1:C:496:ARG:HD2	2.51	0.45
1:B:684:VAL:HG22	1:C:705:LYS:HG2	1.99	0.45
1:B:638:TYR:CD1	1:B:671:THR:HG21	2.52	0.44
1:D:484[B]:ASN:ND2	5:D:908:HOH:O	2.49	0.44
1:C:575:LEU:HD11	1:C:591:MET:SD	2.59	0.43
1:B:727:LEU:CD2	1:B:759:LEU:CD1	2.97	0.43
1:B:546:THR:HG21	1:D:767:ARG:HH12	1.84	0.43
1:D:730:TYR:HA	1:D:734:ALA:HB3	2.00	0.43
1:B:494:VAL:HG11	1:B:503:PHE:HD1	1.82	0.43
1:B:585:LEU:HD12	1:B:585:LEU:HA	1.89	0.43
1:C:586:TYR:HB3	1:C:593:GLN:NE2	2.34	0.42
1:A:700:GLY:HA3	1:A:714:MET:O	2.20	0.42
1:D:493:MET:SD	1:D:535:HIS:HA	2.60	0.42
1:D:564:ASP:O	1:D:567:HIS:HB2	2.19	0.42
1:A:523:PRO:HD2	1:A:695:GLU:HG2	2.02	0.42
1:B:711:ILE:HD11	1:B:713:MET:HE1	2.02	0.42
1:A:697:TRP:HB3	1:A:716:ARG:HB3	2.00	0.42
4:D:803:JYU:N13	4:D:803:JYU:C24	2.83	0.42
1:B:727:LEU:HD23	1:B:727:LEU:HA	1.83	0.41
1:A:486:TRP:N	1:A:487:PRO:CD	2.83	0.41
1:D:749:GLU:N	1:D:750:PRO:CD	2.83	0.41
1:A:627:ARG:O	1:A:631:ILE:HG12	2.21	0.41
1:B:749:GLU:N	1:B:750:PRO:CD	2.84	0.41
1:D:675:LEU:O	1:D:678:VAL:HG22	2.21	0.41
1:A:735:ILE:HB	1:A:736:PRO:HD3	2.02	0.41
1:C:740:THR:HA	1:C:743:GLN:NE2	2.36	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:484[B]:ASN:OD1	5:B:901:HOH:O	2.21	0.41
1:B:486:TRP:N	1:B:487:PRO:CD	2.84	0.40
1:B:656:LEU:O	1:B:662:ARG:HG3	2.20	0.40
1:A:602:ILE:HA	1:A:605:LEU:HD22	2.02	0.40
1:A:746:PRO:N	1:A:747:PRO:CD	2.85	0.40
1:B:565:LEU:O	1:B:595:HIS:ND1	2.48	0.40
1:C:510:ARG:HG2	1:C:608:HIS:CE1	2.56	0.40
1:A:493:MET:O	1:A:497:SER:HB2	2.21	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	312/343 (91%)	307 (98%)	5 (2%)	0	100	100
1	B	312/343 (91%)	307 (98%)	5 (2%)	0	100	100
1	C	312/343 (91%)	305 (98%)	7 (2%)	0	100	100
1	D	311/343 (91%)	302 (97%)	9 (3%)	0	100	100
All	All	1247/1372 (91%)	1221 (98%)	26 (2%)	0	100	100

There are no Ramachandran outliers to report.

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

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

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

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	283/305 (93%)	271 (96%)	12 (4%)	30	26
1	B	283/305 (93%)	268 (95%)	15 (5%)	22	18
1	C	283/305 (93%)	266 (94%)	17 (6%)	19	14
1	D	281/305 (92%)	267 (95%)	14 (5%)	24	20
All	All	1130/1220 (93%)	1072 (95%)	58 (5%)	24	19

All (58) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	463	THR
1	A	497	SER
1	A	498	CYS
1	A	504	GLU
1	A	550	ASP
1	A	575	LEU
1	A	587	SER
1	A	605	LEU
1	A	606	GLU
1	A	616	SER
1	A	650	GLN
1	A	727	LEU
1	B	459	LEU
1	B	469	CYS
1	B	470	LYS
1	B	497	SER
1	B	504	GLU
1	B	568	ARG
1	B	575	LEU
1	B	576	GLN
1	B	587	SER
1	B	605	LEU
1	B	606	GLU
1	B	613	THR
1	B	662	ARG
1	B	677	SER
1	B	727	LEU
1	C	459	LEU
1	C	463	THR
1	C	470	LYS
1	C	471	GLU
1	C	497	SER
1	C	504	GLU

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Mol	Chain	Res	Type
1	C	573	SER
1	C	576	GLN
1	C	586	TYR
1	C	605	LEU
1	C	616	SER
1	C	617	SER
1	C	677	SER
1	C	709	GLN
1	C	720	ASP
1	C	727	LEU
1	C	760	SER
1	D	459	LEU
1	D	461	GLN
1	D	463	THR
1	D	484[A]	ASN
1	D	484[B]	ASN
1	D	500	THR
1	D	504	GLU
1	D	573	SER
1	D	575	LEU
1	D	601	SER
1	D	605	LEU
1	D	606	GLU
1	D	720	ASP
1	D	727	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (18) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	542	GLN
1	A	593	GLN
1	A	604	GLN
1	A	743	GLN
1	A	761	GLN
1	B	604	GLN
1	B	743	GLN
1	C	542	GLN
1	C	593	GLN
1	C	604	GLN
1	C	709	GLN
1	C	743	GLN
1	C	761	GLN

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Mol	Chain	Res	Type
1	D	461	GLN
1	D	542	GLN
1	D	604	GLN
1	D	726	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	D	509	1	8,9,10	0.51	0	5,9,11	0.15	0
1	CME	A	509	1	8,9,10	0.43	0	5,9,11	0.35	0
1	CME	C	509	1	8,9,10	0.33	0	5,9,11	0.27	0
1	CME	B	509	1	8,9,10	0.36	0	5,9,11	0.38	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	-	1/5/8/10	-
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 (4) torsion outliers are listed below:

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

There are no ring outliers.

No monomer is involved in short contacts.

## 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	JYU	D	803	-	30,39,39	0.54	0	34,57,57	0.70	0
4	JYU	A	803	-	30,39,39	0.54	0	34,57,57	0.78	1 (2%)
4	JYU	C	803	-	30,39,39	0.62	1 (3%)	34,57,57	0.83	1 (2%)
4	JYU	B	803	-	30,39,39	0.70	1 (3%)	34,57,57	0.80	1 (2%)

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 Torsions and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
4	JYU	D	803	-	-	4/17/23/23	0/5/5/5

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
4	JYU	A	803	-	-	3/17/23/23	0/5/5/5
4	JYU	C	803	-	-	4/17/23/23	0/5/5/5
4	JYU	B	803	-	-	2/17/23/23	0/5/5/5

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	B	803	JYU	C9-S7	2.53	1.75	1.72
4	C	803	JYU	C9-S7	2.11	1.74	1.72

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	C	803	JYU	C17-N3-C1	-2.33	127.34	129.77
4	A	803	JYU	C17-N3-C1	-2.09	127.59	129.77
4	B	803	JYU	C17-N3-C1	-2.03	127.66	129.77

There are no chirality outliers.

All (13) torsion outliers are listed below:

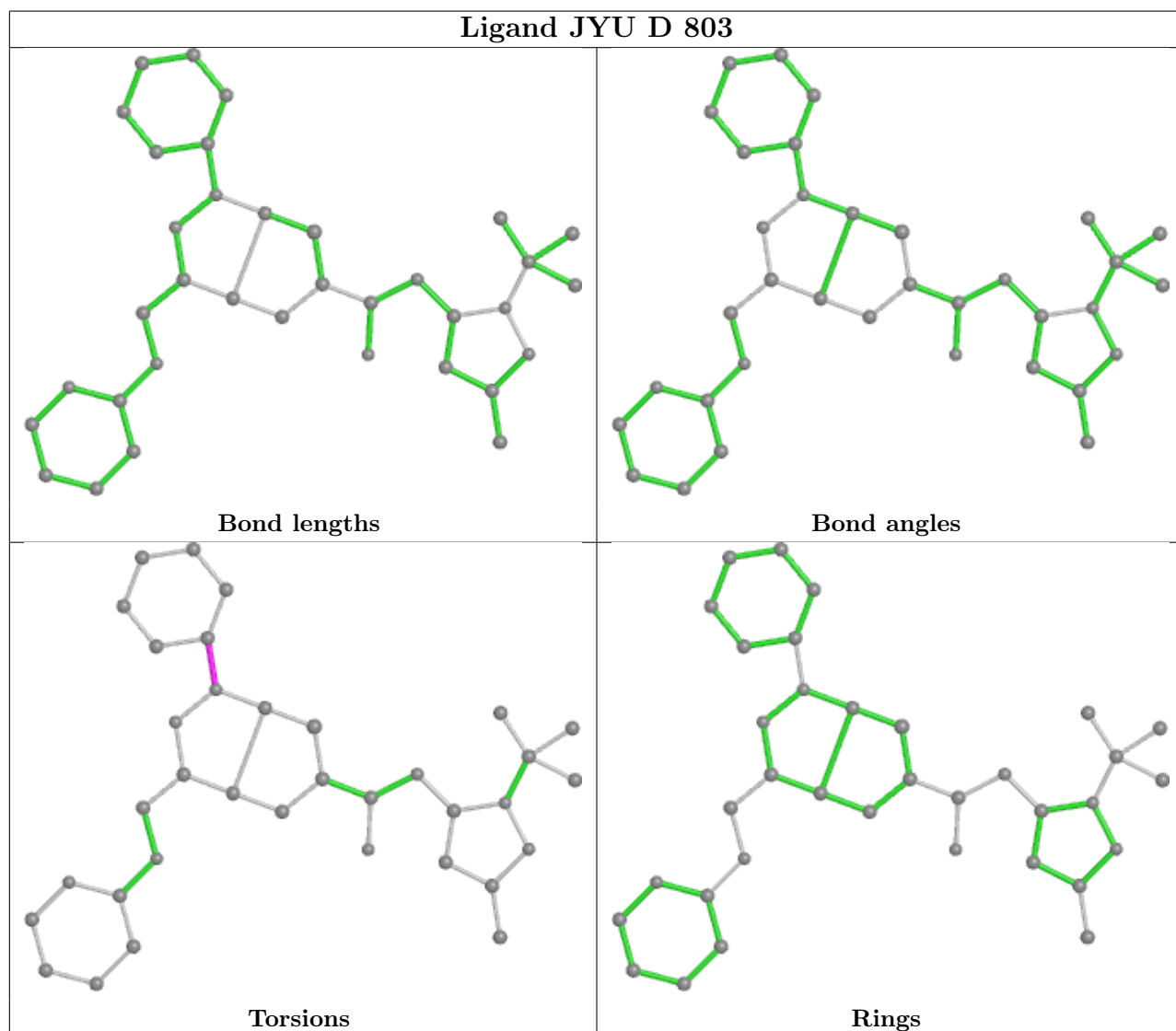
Mol	Chain	Res	Type	Atoms
4	A	803	JYU	C29-C17-N3-C1
4	A	803	JYU	C30-C17-N3-C1
4	B	803	JYU	C29-C17-N3-C1
4	B	803	JYU	C30-C17-N3-C1
4	C	803	JYU	C29-C17-N3-C1
4	C	803	JYU	C30-C17-N3-C1
4	D	803	JYU	C29-C17-N3-C1
4	D	803	JYU	C30-C17-N3-C1
4	D	803	JYU	C29-C17-N3-N5
4	D	803	JYU	C30-C17-N3-N5
4	C	803	JYU	C29-C17-N3-N5
4	C	803	JYU	C30-C17-N3-N5
4	A	803	JYU	C30-C17-N3-N5

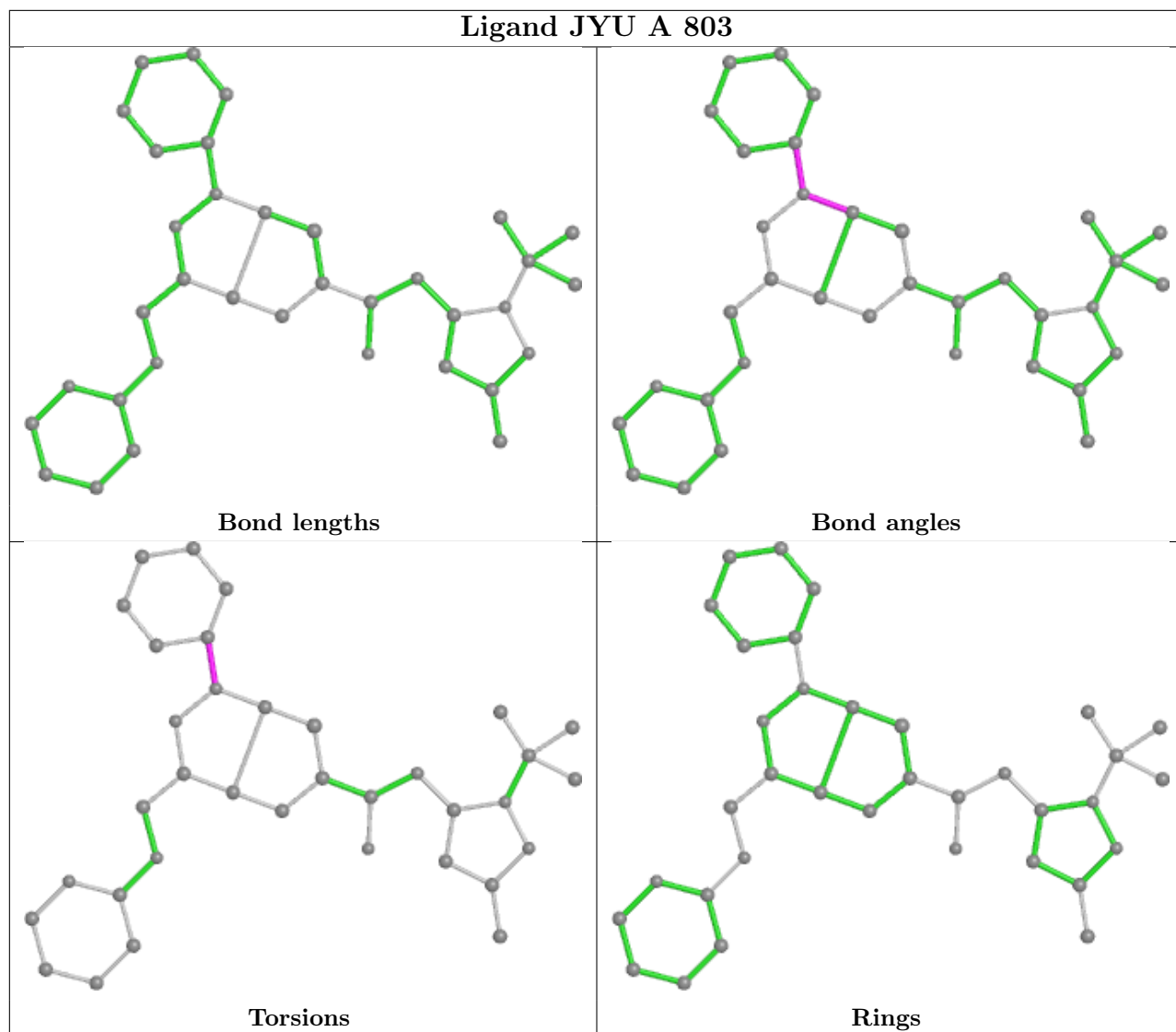
There are no ring outliers.

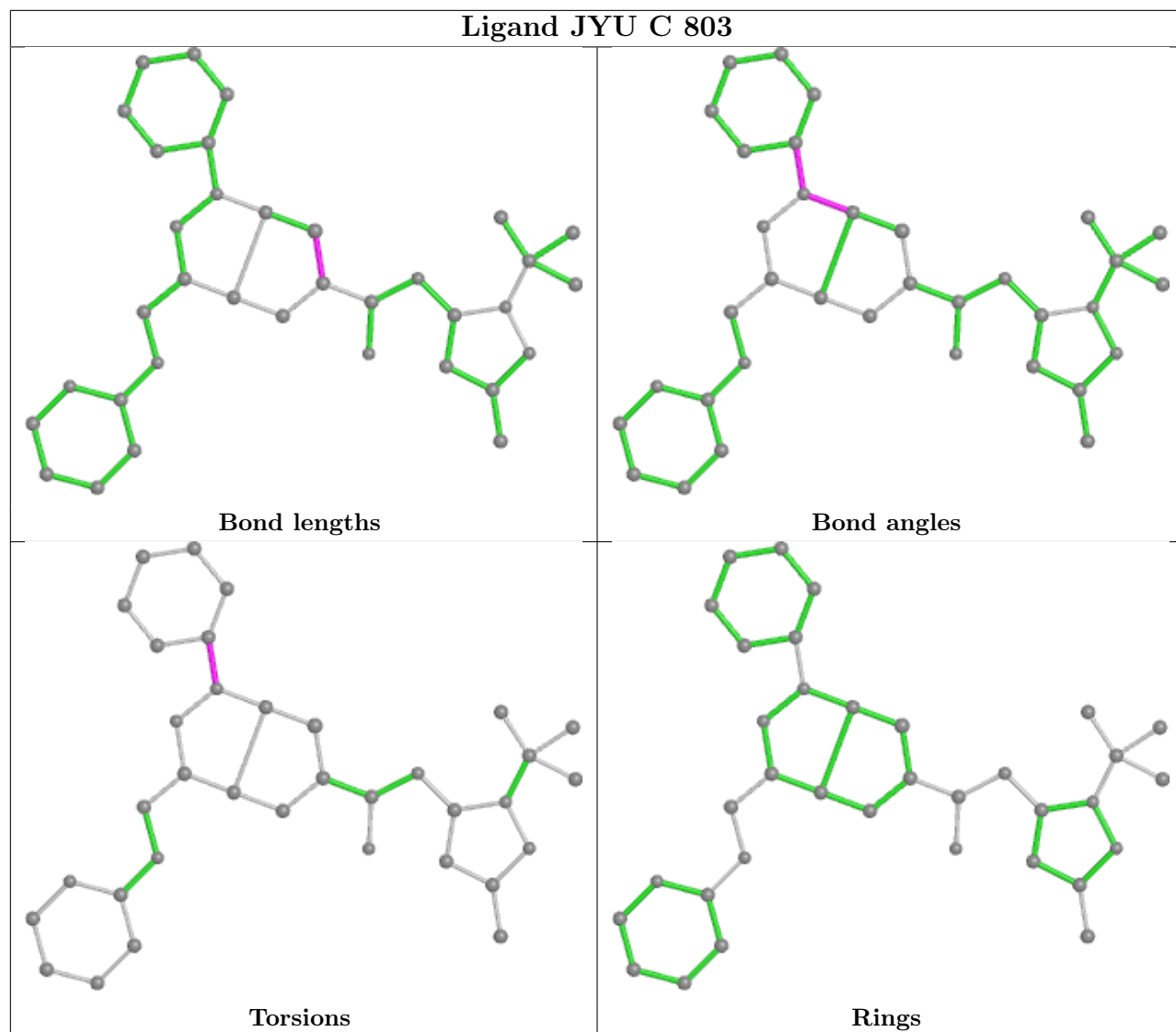
1 monomer is involved in 1 short contact:

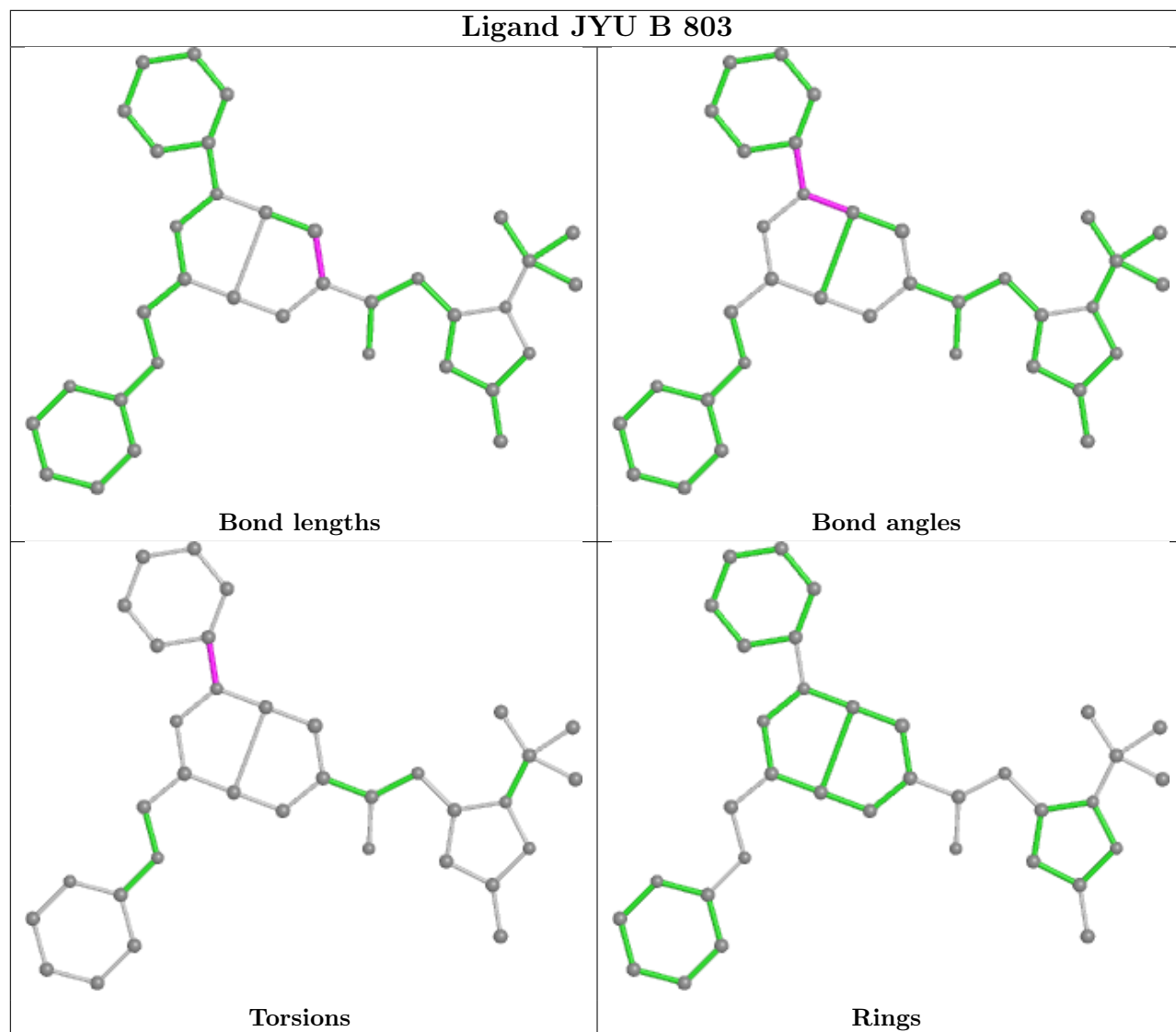
Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	D	803	JYU	1	0

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%)	-0.23	2 (0%) 89 91	28, 41, 71, 113	0
1	B	312/343 (90%)	-0.32	0 100 100	28, 41, 73, 95	0
1	C	312/343 (90%)	-0.43	1 (0%) 94 95	26, 40, 68, 91	0
1	D	312/343 (90%)	-0.11	10 (3%) 47 55	40, 57, 81, 128	0
All	All	1248/1372 (90%)	-0.27	13 (1%) 82 86	26, 46, 75, 128	0

All (13) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	D	720	ASP	4.9
1	D	456	TRP	4.6
1	A	458	GLY	3.2
1	D	657	ASN	2.7
1	D	654	LEU	2.5
1	D	606	GLU	2.4
1	D	462	PHE	2.3
1	C	770	GLU	2.3
1	A	650	GLN	2.3
1	D	457	GLN	2.3
1	D	545	HIS	2.2
1	D	652	GLY	2.1
1	D	460	MET	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( $\text{\AA}^2$ )	Q<0.9
1	CME	D	509	10/11	0.90	0.18	53,67,114,122	0
1	CME	C	509	10/11	0.91	0.14	41,51,82,83	0
1	CME	B	509	10/11	0.91	0.15	45,60,90,93	0
1	CME	A	509	10/11	0.93	0.11	44,55,86,91	0

### 6.3 Carbohydrates [i](#)

There are no monosaccharides in this entry.

### 6.4 Ligands [i](#)

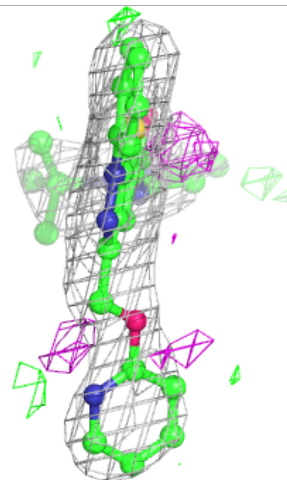
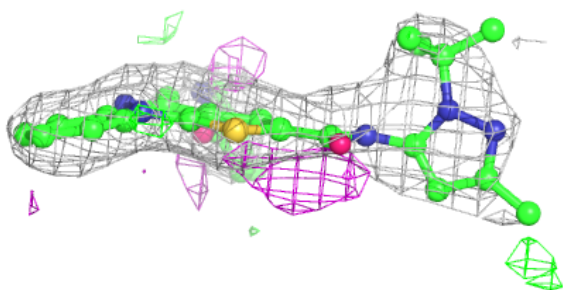
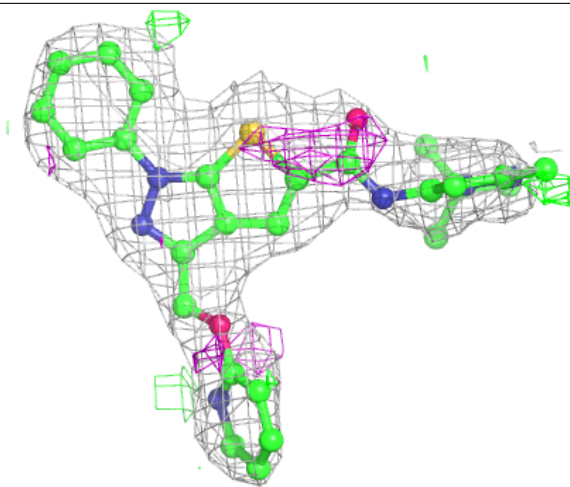
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95<sup>th</sup> percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 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	JYU	B	803	35/35	0.88	0.21	51,73,88,91	0
4	JYU	C	803	35/35	0.89	0.20	54,67,89,91	0
4	JYU	D	803	35/35	0.89	0.22	73,91,116,119	0
4	JYU	A	803	35/35	0.90	0.23	51,68,106,110	0
2	ZN	D	801	1/1	0.99	0.08	48,48,48,48	0
3	MG	B	802	1/1	0.99	0.11	14,14,14,14	0
3	MG	C	802	1/1	1.00	0.12	16,16,16,16	0
3	MG	D	802	1/1	1.00	0.10	27,27,27,27	0
2	ZN	C	801	1/1	1.00	0.10	34,34,34,34	0
2	ZN	A	801	1/1	1.00	0.11	34,34,34,34	0
3	MG	A	802	1/1	1.00	0.10	17,17,17,17	0
2	ZN	B	801	1/1	1.00	0.08	33,33,33,33	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 JYU B 803:**

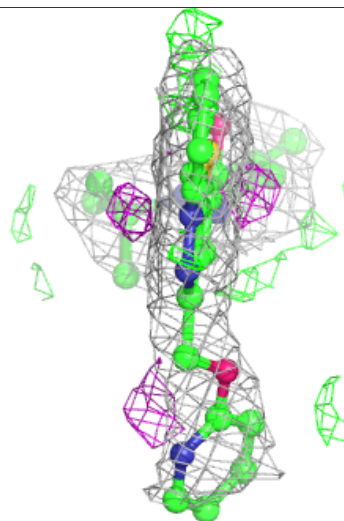
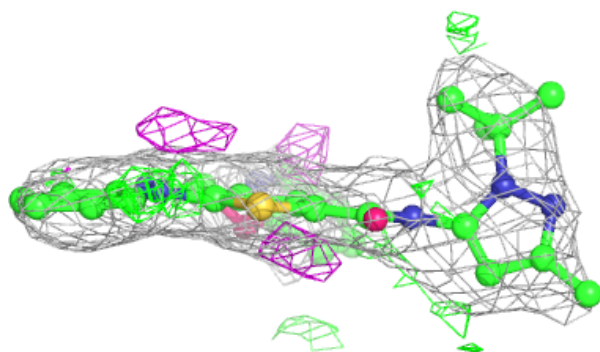
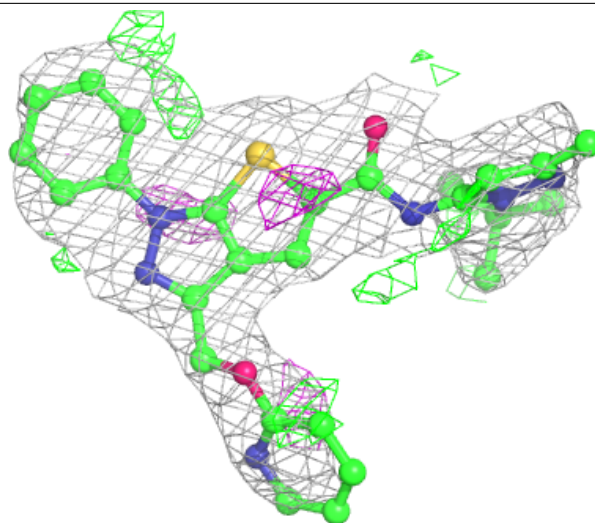
$2mF_o-DF_c$  (at 0.7 rmsd) in gray  
 $mF_o-DF_c$  (at 3 rmsd) in purple (negative)  
and green (positive)





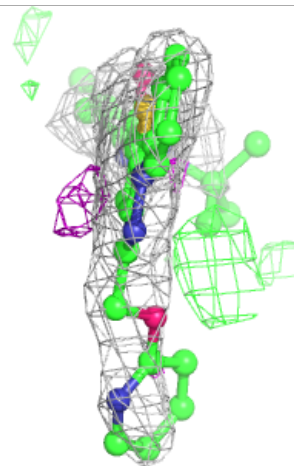
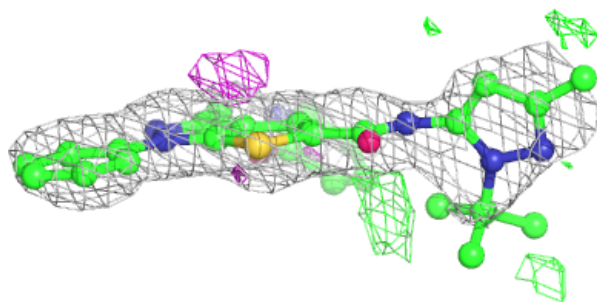
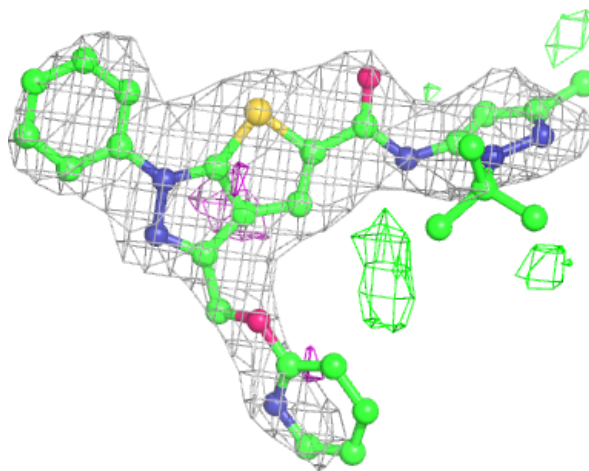
**Electron density around JYU C 803:**

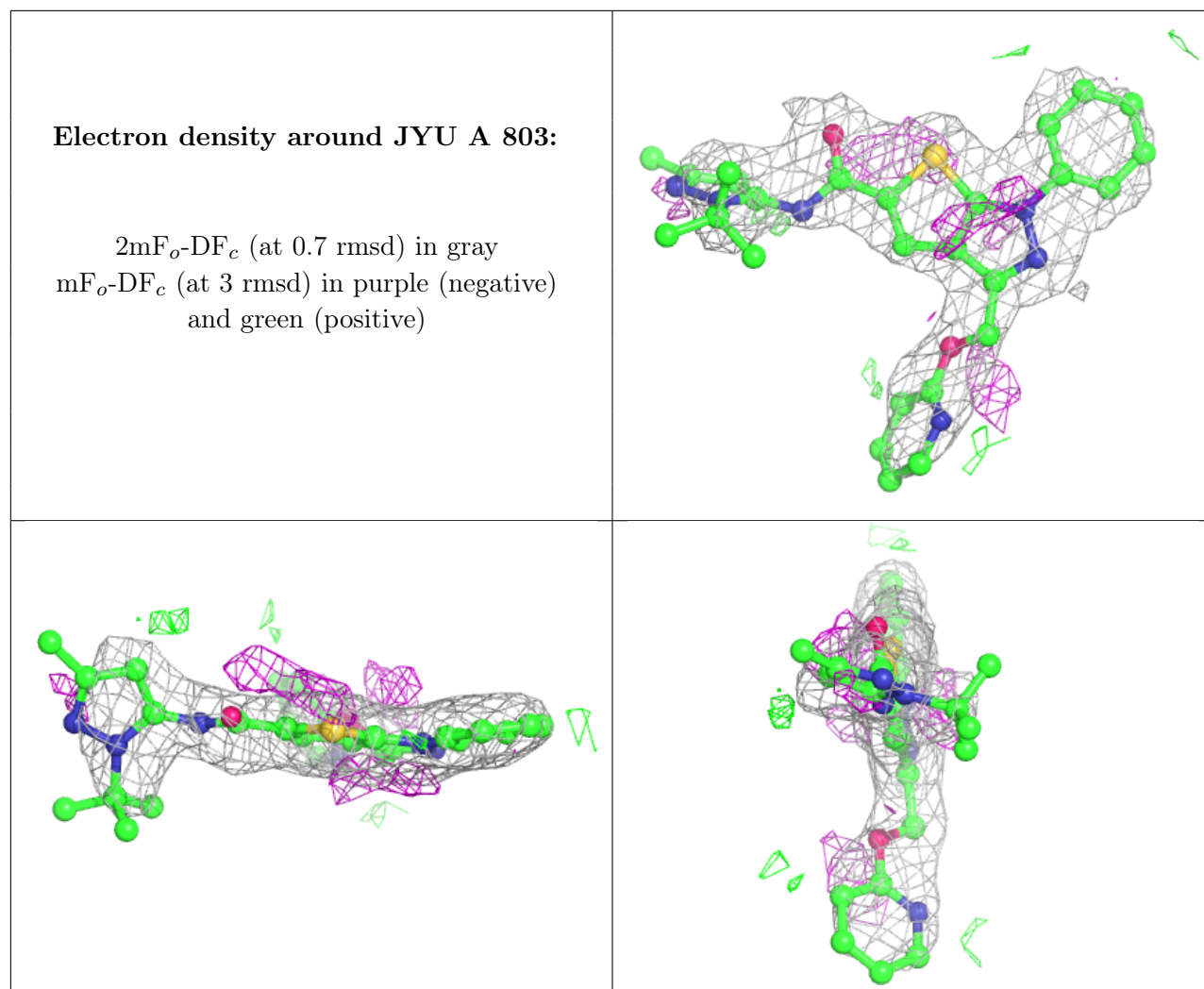
$2mF_o-DF_c$  (at 0.7 rmsd) in gray  
 $mF_o-DF_c$  (at 3 rmsd) in purple (negative)  
and green (positive)



**Electron density around JYU 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)





## 6.5 Other polymers [\(i\)](#)

There are no such residues in this entry.