



# Full wwPDB X-ray Structure Validation Report ⓘ

Oct 5, 2024 – 12:53 pm BST

PDB ID : 4AQC  
Title : Triazolopyridine-based Inhibitor of Janus Kinase 2  
Authors : Dugan, B.J.; Gingrich, D.E.; Mesaros, E.F.; Milkiewicz, K.L.; Curry, M.A.; Zulli, A.L.; Dobrzanski, P.; Serdikoff, C.; Jan, M.; Angeles, T.S.; Albom, M.S.; Mason, J.L.; Aimone, L.D.; Meyer, S.L.; Huang, Z.; Wells-Knecht, K.J.; Ator, M.A.; Ruggeri, B.A.; Dorsey, B.D.  
Deposited on : 2012-04-16  
Resolution : 1.90 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 : 1.8.4, CSD as541be (2020)  
Xtrriage (Phenix) : 1.13  
EDS : 3.0  
buster-report : 1.1.7 (2018)  
Percentile statistics : 20231227.v01 (using entries in the PDB archive December 27th 2023)  
CCP4 : 9.0.003 (Gargrove)  
Density-Fitness : 1.0.11  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.39

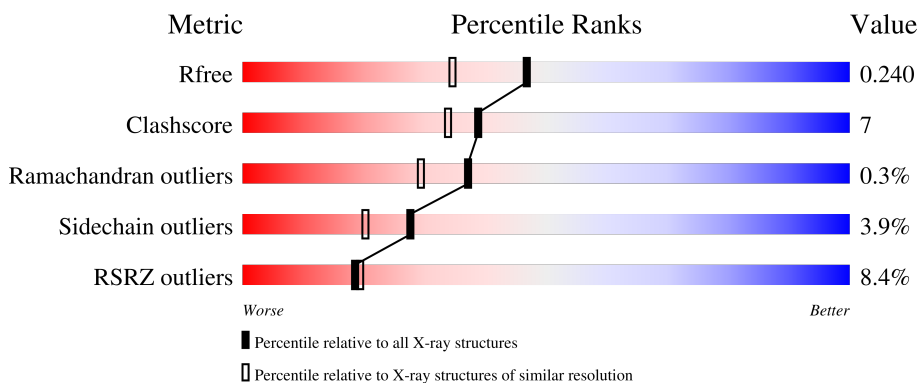
# 1 Overall quality at a glance i

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 1.90 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	7293 (1.90-1.90)
Clashscore	180529	8090 (1.90-1.90)
Ramachandran outliers	177936	8022 (1.90-1.90)
Sidechain outliers	177891	8022 (1.90-1.90)
RSRZ outliers	164620	7292 (1.90-1.90)

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	301	<div style="display: flex; align-items: center;"> <div style="width: 7%; 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: 14%; height: 10px; background-color: yellow; margin-right: 5px;"></div> <div style="width: 5%; height: 10px; background-color: grey; margin-right: 5px;"></div> <div style="width: 5%; height: 10px; background-color: grey;"></div> </div> <p style="margin-left: 20px;">7%      81%      14%      . .</p>
1	B	301	<div style="display: flex; align-items: center;"> <div style="width: 9%; 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: 17%; height: 10px; background-color: yellow; margin-right: 5px;"></div> <div style="width: 5%; height: 10px; background-color: orange; margin-right: 5px;"></div> <div style="width: 5%; height: 10px; background-color: grey;"></div> </div> <p style="margin-left: 20px;">9%      80%      17%      . .</p>

## 2 Entry composition i

There are 4 unique types of molecules in this entry. The entry contains 5525 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.

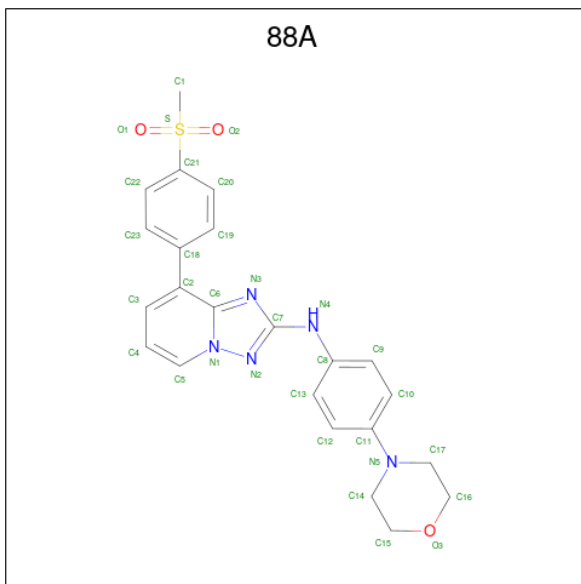
- Molecule 1 is a protein called TYROSINE-PROTEIN KINASE JAK2.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace	
			Total	C	N	O	P				S
1	A	291	Total 2466	C 1566	N 434	O 449	P 2	S 15	0	8	0
1	B	297	Total 2528	C 1602	N 444	O 465	P 2	S 15	0	9	0

There are 6 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	832	GLY	-	expression tag	UNP O60674
A	833	ALA	-	expression tag	UNP O60674
A	834	MET	-	expression tag	UNP O60674
B	832	GLY	-	expression tag	UNP O60674
B	833	ALA	-	expression tag	UNP O60674
B	834	MET	-	expression tag	UNP O60674

- Molecule 2 is 8-(4-methylsulfonylphenyl)-N-(4-morpholin-4-ylphenyl)-[1,2,4]triazolo[1,5-a]pyridin-2-amine (three-letter code: 88A) (formula: C<sub>23</sub>H<sub>23</sub>N<sub>5</sub>O<sub>3</sub>S).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
2	A	1	Total	C	N	O	S	0	0
			32	23	5	3	1		
2	B	1	Total	C	N	O	S	0	0
			32	23	5	3	1		

- Molecule 3 is SULFATE ION (three-letter code: SO4) (formula: O<sub>4</sub>S).



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

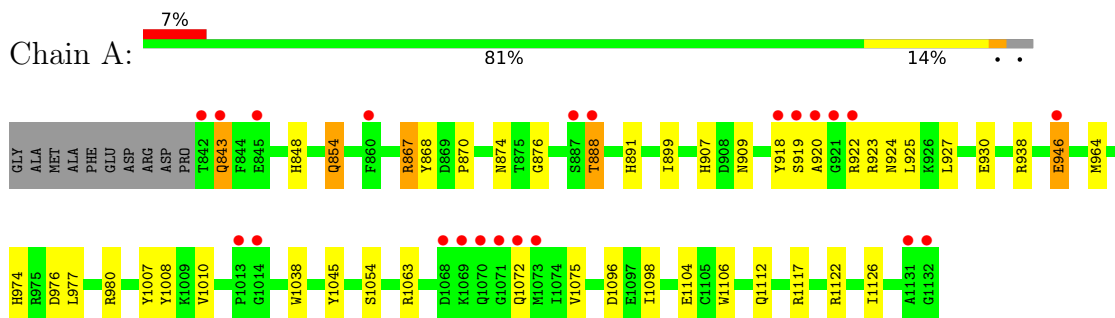
- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	227	Total	O	0	0
			227	227		
4	B	215	Total	O	0	0
			215	215		

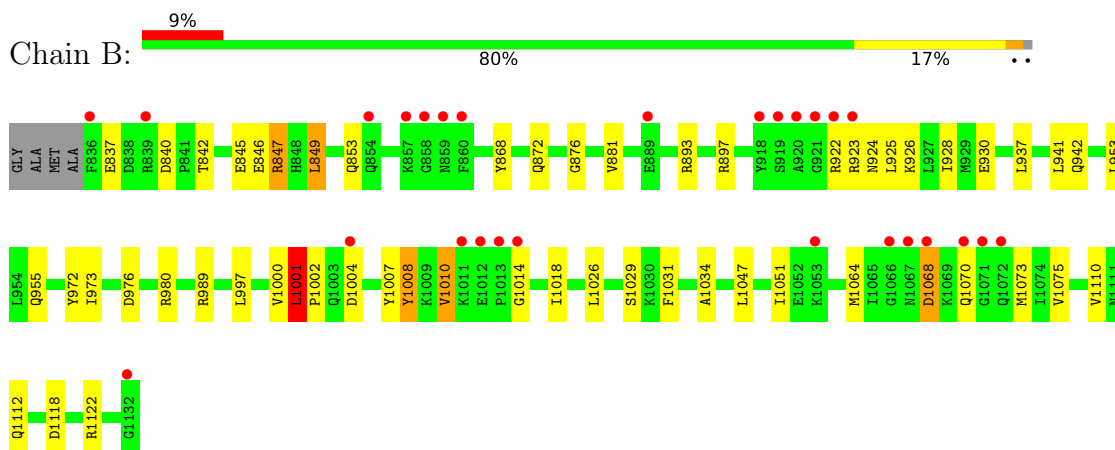
### 3 Residue-property plots [i](#)

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: TYROSINE-PROTEIN KINASE JAK2



- Molecule 1: TYROSINE-PROTEIN KINASE JAK2



## 4 Data and refinement statistics i

Property	Value	Source
Space group	P 41	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	111.68Å 111.68Å 70.42Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	29.79 – 1.90 29.79 – 1.90	Depositor EDS
% Data completeness (in resolution range)	99.2 (29.79-1.90) 99.1 (29.79-1.90)	Depositor EDS
$R_{merge}$	0.11	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	1.91 (at 1.91Å)	Xtrriage
Refinement program	REFMAC 5.5.0090D	Depositor
R, $R_{free}$	0.176 , 0.217 0.202 , 0.240	Depositor DCC
$R_{free}$ test set	3420 reflections (5.04%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	26.5	Xtrriage
Anisotropy	0.253	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.36 , 36.0	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.47$ , $\langle L^2 \rangle = 0.29$	Xtrriage
Estimated twinning fraction	0.046 for h,-k,-l	Xtrriage
$F_o, F_c$ correlation	0.95	EDS
Total number of atoms	5525	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	41.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.67% 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: PTR, SO4, 88A

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	0.65	1/2507 (0.0%)	0.74	1/3366 (0.0%)
1	B	0.65	0/2566	0.71	1/3447 (0.0%)
All	All	0.65	1/5073 (0.0%)	0.72	2/6813 (0.0%)

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	1045	TYR	CD2-CE2	-5.53	1.31	1.39

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	867	ARG	NE-CZ-NH2	-5.90	117.35	120.30
1	B	1001	LEU	CA-CB-CG	5.09	127.01	115.30

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	2466	0	2481	27	0
1	B	2528	0	2514	39	0
2	A	32	0	23	2	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	B	32	0	23	2	0
3	A	5	0	0	0	0
3	B	20	0	0	0	1
4	A	227	0	0	10	1
4	B	215	0	0	8	0
All	All	5525	0	5041	68	1

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 7.

All (68) 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:1112:GLN:NE2	4:A:2205:HOH:O	1.74	1.10
1:B:842:THR:HG21	4:B:1992:HOH:O	1.53	1.07
4:A:2194:HOH:O	1:B:1122[B]:ARG:NH2	1.99	0.93
1:A:1075:VAL:HG23	4:A:2179:HOH:O	1.69	0.92
1:B:1112:GLN:OE1	4:B:2190:HOH:O	1.92	0.87
1:B:980:ARG:NH1	4:B:2117:HOH:O	2.17	0.76
1:B:1034:ALA:CB	1:B:1110:VAL:HG13	2.23	0.69
1:B:973:ILE:HG12	1:B:1001:LEU:HD13	1.80	0.63
1:A:888:THR:HG22	1:A:891:HIS:H	1.64	0.63
1:B:941:LEU:HD11	1:B:953:LEU:HD21	1.81	0.61
1:A:938[A]:ARG:NH1	4:A:2088:HOH:O	2.34	0.59
1:B:849:LEU:HD13	1:B:868:TYR:HD1	1.67	0.59
1:B:1118:ASP:HB3	1:B:1122[B]:ARG:NH2	2.18	0.58
1:B:1014:GLY:O	4:B:2135:HOH:O	2.16	0.58
1:A:920:ALA:HB1	1:A:924:ASN:HD22	1.70	0.57
1:A:867:ARG:NH2	4:A:2031:HOH:O	2.37	0.57
1:A:1104:GLU:OE1	1:A:1122[B]:ARG:NH2	2.38	0.57
1:A:1098:ILE:HD11	1:A:1126:ILE:HG21	1.88	0.55
1:A:930:GLU:O	2:A:2001:88A:H5	2.06	0.55
1:A:980:ARG:NH1	4:A:2089:HOH:O	2.34	0.55
1:A:907:HIS:HE1	1:A:909:ASN:HD22	1.58	0.52
1:B:972:TYR:CE1	1:B:1000:VAL:HG22	2.43	0.52
1:A:920:ALA:O	1:A:924:ASN:ND2	2.42	0.52
1:B:930:GLU:O	2:B:2001:88A:H5	2.10	0.52
1:B:1070:GLN:HE21	1:B:1073:MET:HG3	1.75	0.51
1:B:942:GLN:HG2	1:B:1051:ILE:HB	1.92	0.51
1:B:842:THR:CG2	1:B:842:THR:O	2.58	0.51
1:B:1018:ILE:HD13	1:B:1075:VAL:HG22	1.93	0.51

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:868:TYR:O	1:B:876:GLY:HA3	2.11	0.50
1:A:843:GLN:NE2	4:A:2003:HOH:O	2.44	0.50
1:B:872:GLN:NE2	4:B:2028:HOH:O	2.43	0.50
2:A:2001:88A:N3	2:A:2001:88A:H13	2.26	0.49
1:B:840:ASP:OD1	1:B:842:THR:HB	2.14	0.48
1:B:849:LEU:HD13	1:B:868:TYR:CD1	2.49	0.47
2:B:2001:88A:N3	2:B:2001:88A:H13	2.30	0.47
1:A:848:HIS:CG	1:A:870:PRO:HA	2.49	0.47
1:B:1034:ALA:HB3	1:B:1110:VAL:HG13	1.97	0.47
1:B:881:VAL:HG22	1:B:928:ILE:HD12	1.97	0.46
1:B:893[B]:ARG:HG2	1:B:897:ARG:NH2	2.31	0.46
1:B:1010:VAL:HG13	1:B:1031:PHE:CD1	2.51	0.46
1:A:918:TYR:O	1:A:920:ALA:N	2.49	0.45
1:A:946:GLU:H	1:A:946:GLU:CD	2.20	0.45
1:B:972:TYR:CD1	1:B:1000:VAL:HG22	2.51	0.45
1:B:955:GLN:NE2	4:B:2096:HOH:O	2.48	0.45
1:A:974:HIS:HD2	1:A:976:ASP:H	1.63	0.45
1:A:868:TYR:O	1:A:876:GLY:HA3	2.16	0.44
1:B:846:GLU:OE1	1:B:926:LYS:NZ	2.40	0.44
1:A:1098:ILE:HD13	1:A:1126:ILE:HD13	1.99	0.44
1:A:874:ASN:ND2	4:A:2009:HOH:O	2.48	0.43
1:A:1054:SER:O	1:A:1063:ARG:NH2	2.41	0.43
1:B:1070:GLN:HG2	1:B:1073:MET:CG	2.49	0.43
1:A:899:ILE:HG12	1:A:927:LEU:HD13	2.01	0.42
1:A:920:ALA:CB	1:A:924:ASN:HD22	2.30	0.42
1:A:1117:ARG:CD	4:A:2109:HOH:O	2.66	0.42
1:B:842:THR:O	1:B:842:THR:HG22	2.19	0.42
1:B:937:LEU:HD21	1:B:1047:LEU:HD21	2.01	0.42
1:B:923:ARG:C	1:B:924:ASN:HD22	2.23	0.42
1:B:1002:PRO:HD3	1:B:1008:PTR:HD1	2.01	0.42
1:B:846:GLU:CD	1:B:926:LYS:HZ2	2.20	0.42
1:A:854:GLN:NE2	4:A:2017:HOH:O	2.52	0.42
1:A:1038:TRP:CE3	1:A:1106:TRP:HA	2.56	0.41
1:B:842:THR:CG2	4:B:1992:HOH:O	2.35	0.41
1:B:853:GLN:NE2	4:B:2012:HOH:O	2.53	0.41
1:B:1004:ASP:OD1	1:B:1004:ASP:N	2.53	0.41
1:B:976:ASP:HB2	1:B:997:LEU:HD12	2.01	0.41
1:B:1068:ASP:OD1	1:B:1068:ASP:N	2.53	0.41
1:B:845:GLU:OE2	1:B:847:ARG:NH2	2.54	0.40
1:A:964:MET:SD	1:A:977[A]:LEU:HD21	2.62	0.40

All (1) symmetry-related close contacts are listed below. The label for Atom-2 includes the sym-

metry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:B:2002:SO4:O4	4:A:2134:HOH:O[4_574]	2.13	0.07

## 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	295/301 (98%)	286 (97%)	8 (3%)	1 (0%)	37	29
1	B	302/301 (100%)	295 (98%)	6 (2%)	1 (0%)	37	29
All	All	597/602 (99%)	581 (97%)	14 (2%)	2 (0%)	37	29

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	919	SER
1	B	837	GLU

### 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	271/270 (100%)	261 (96%)	10 (4%)	29	22
1	B	277/270 (103%)	266 (96%)	11 (4%)	27	19
All	All	548/540 (102%)	527 (96%)	21 (4%)	27	21

All (21) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	843	GLN
1	A	854	GLN
1	A	888	THR
1	A	922	ARG
1	A	923	ARG
1	A	925	LEU
1	A	946	GLU
1	A	1010	VAL
1	A	1072	GLN
1	A	1096	ASP
1	B	847	ARG
1	B	849	LEU
1	B	922	ARG
1	B	925	LEU
1	B	989	ARG
1	B	1001	LEU
1	B	1010	VAL
1	B	1026	LEU
1	B	1029	SER
1	B	1064	MET
1	B	1068	ASP

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (17) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	843	GLN
1	A	848	HIS
1	A	854	GLN
1	A	909	ASN
1	A	924	ASN
1	A	974	HIS
1	A	1125	GLN
1	B	843	GLN
1	B	853	GLN
1	B	885	GLN
1	B	886	HIS
1	B	909	ASN
1	B	924	ASN
1	B	955	GLN
1	B	1070	GLN
1	B	1112	GLN

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Mol	Chain	Res	Type
1	B	1125	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	PTR	B	1007	1	15,16,17	1.94	2 (13%)	19,22,24	0.80	0
1	PTR	A	1008	1	15,16,17	2.07	1 (6%)	19,22,24	0.90	1 (5%)
1	PTR	B	1008	1	15,16,17	1.94	1 (6%)	19,22,24	1.03	2 (10%)
1	PTR	A	1007	1	15,16,17	1.89	1 (6%)	19,22,24	0.83	1 (5%)

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
1	PTR	B	1007	1	-	0/10/11/13	0/1/1/1
1	PTR	A	1008	1	-	0/10/11/13	0/1/1/1
1	PTR	B	1008	1	-	0/10/11/13	0/1/1/1
1	PTR	A	1007	1	-	0/10/11/13	0/1/1/1

All (5) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	1008	PTR	OH-CZ	-7.77	1.23	1.40
1	B	1008	PTR	OH-CZ	-7.01	1.24	1.40

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	1007	PTR	OH-CZ	-6.99	1.24	1.40
1	B	1007	PTR	OH-CZ	-6.85	1.25	1.40
1	B	1007	PTR	P-OH	2.51	1.63	1.59

All (4) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	1008	PTR	O2P-P-OH	2.54	113.19	105.24
1	A	1007	PTR	O3P-P-OH	2.46	112.93	105.24
1	B	1008	PTR	P-OH-CZ	2.32	131.20	123.75
1	A	1008	PTR	O2P-P-OH	2.20	112.11	105.24

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
1	B	1008	PTR	1	0

## 5.5 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

## 5.6 Ligand geometry [i](#)

7 ligands are modelled in this entry.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with  $|Z| > 2$  is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z  > 2	Counts	RMSZ	# Z  > 2
2	88A	A	2001	-	32,36,36	1.13	1 (3%)	41,52,52	1.50	5 (12%)
3	SO4	B	2004	-	4,4,4	0.25	0	6,6,6	0.32	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z  > 2	Counts	RMSZ	# Z  > 2
3	SO4	B	2005	-	4,4,4	0.11	0	6,6,6	0.17	0
2	88A	B	2001	-	32,36,36	1.21	3 (9%)	41,52,52	1.26	4 (9%)
3	SO4	B	2002	-	4,4,4	0.17	0	6,6,6	0.40	0
3	SO4	B	2003	-	4,4,4	0.16	0	6,6,6	0.17	0
3	SO4	A	2002	-	4,4,4	0.14	0	6,6,6	0.25	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
2	88A	A	2001	-	-	5/16/26/26	0/5/5/5
2	88A	B	2001	-	-	4/16/26/26	0/5/5/5

All (4) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	2001	88A	C8-N4	-3.62	1.32	1.40
2	B	2001	88A	C8-N4	-2.79	1.34	1.40
2	B	2001	88A	C1-S	2.38	1.84	1.75
2	B	2001	88A	C21-S	2.35	1.79	1.77

All (9) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	2001	88A	C16-C17-N5	4.32	117.99	110.02
2	A	2001	88A	O1-S-O2	3.31	123.61	117.92
2	B	2001	88A	C2-C6-N1	-3.17	117.79	121.78
2	A	2001	88A	O2-S-C1	-2.98	104.21	108.49
2	B	2001	88A	C14-N5-C11	2.93	126.01	118.09
2	A	2001	88A	C2-C6-N1	-2.69	118.40	121.78
2	A	2001	88A	C22-C21-S	-2.49	117.27	119.58
2	B	2001	88A	C18-C2-C6	-2.03	119.49	122.20
2	B	2001	88A	C3-C2-C18	2.02	123.17	118.85

There are no chirality outliers.

All (9) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	A	2001	88A	C19-C18-C2-C3

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Mol	Chain	Res	Type	Atoms
2	A	2001	88A	C23-C18-C2-C3
2	B	2001	88A	C19-C18-C2-C3
2	A	2001	88A	C19-C18-C2-C6
2	B	2001	88A	C23-C18-C2-C3
2	B	2001	88A	C22-C21-S-O1
2	B	2001	88A	C20-C21-S-O1
2	A	2001	88A	C20-C21-S-O1
2	A	2001	88A	C22-C21-S-O1

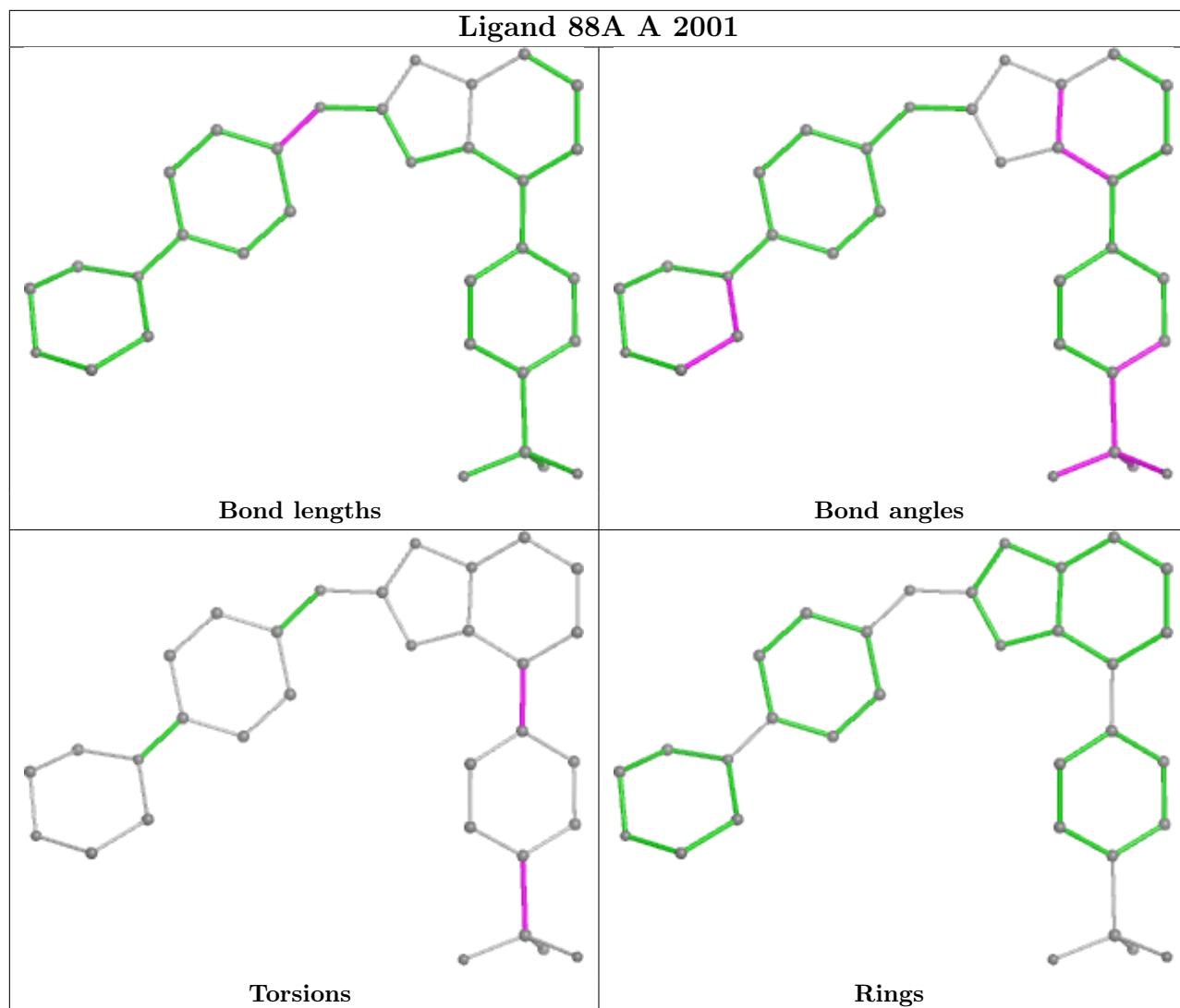
There are no ring outliers.

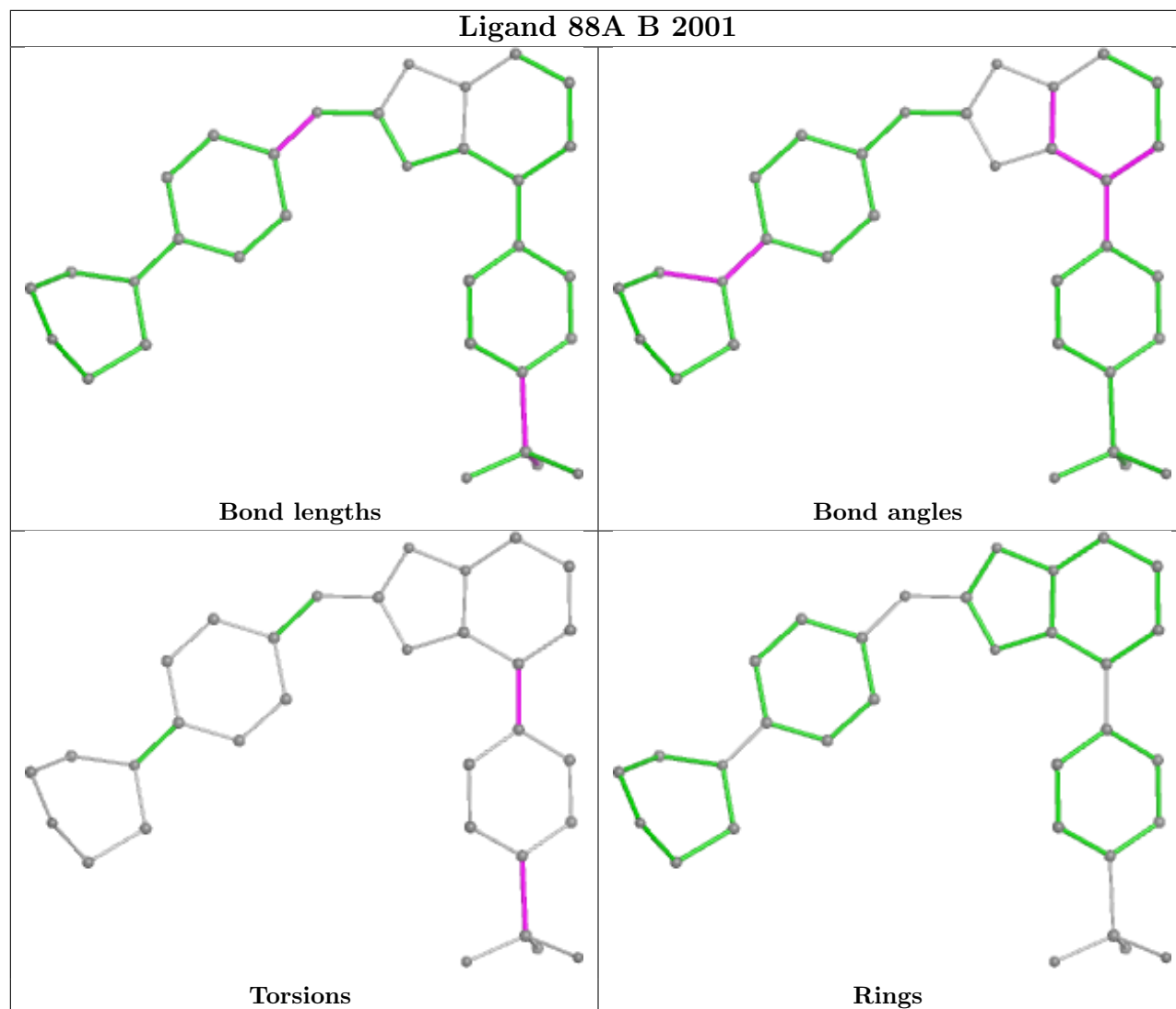
3 monomers are involved in 5 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	A	2001	88A	2	0
2	B	2001	88A	2	0
3	B	2002	SO4	0	1

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	289/301 (96%)	0.34	22 (7%) 21 22	14, 37, 72, 101	11 (3%)
1	B	295/301 (98%)	0.40	27 (9%) 16 17	17, 39, 69, 93	10 (3%)
All	All	584/602 (97%)	0.37	49 (8%) 18 19	14, 38, 70, 101	21 (3%)

All (49) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	1072	GLN	6.4
1	B	836	PHE	6.1
1	A	920	ALA	4.9
1	B	1013	PRO	4.8
1	A	919	SER	4.8
1	A	842	THR	4.7
1	B	923	ARG	4.6
1	A	1070	GLN	4.6
1	A	918	TYR	4.3
1	A	1069	LYS	4.1
1	A	1132	GLY	4.0
1	A	921	GLY	4.0
1	B	860[A]	PHE	3.9
1	B	920	ALA	3.8
1	A	1071	GLY	3.6
1	B	1132	GLY	3.6
1	B	859[A]	ASN	3.4
1	A	1131	ALA	3.4
1	B	918	TYR	3.2
1	B	919	SER	3.2
1	A	860	PHE	3.2
1	B	1071	GLY	3.1
1	B	858[A]	GLY	3.1
1	A	1013	PRO	3.1

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Mol	Chain	Res	Type	RSRZ
1	A	1014	GLY	3.1
1	B	1067	ASN	3.1
1	B	1070	GLN	3.1
1	B	1066	GLY	3.0
1	B	839	ARG	3.0
1	A	888	THR	3.0
1	A	843	GLN	2.8
1	B	1014	GLY	2.8
1	B	1011	LYS	2.8
1	B	1053	LYS	2.5
1	A	922	ARG	2.4
1	B	857	LYS	2.4
1	A	845	GLU	2.3
1	B	921	GLY	2.3
1	B	1072	GLN	2.3
1	A	946	GLU	2.3
1	B	1004	ASP	2.3
1	A	1068	ASP	2.2
1	B	1012	GLU	2.1
1	B	889	GLU	2.1
1	A	1073	MET	2.1
1	B	1068	ASP	2.0
1	B	854	GLN	2.0
1	A	887	SER	2.0
1	B	922	ARG	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	PTR	B	1008	16/17	0.91	0.12	37,56,69,72	0
1	PTR	A	1008	16/17	0.92	0.11	29,48,64,66	0
1	PTR	B	1007	16/17	0.93	0.10	37,54,70,73	0
1	PTR	A	1007	16/17	0.97	0.07	30,36,52,54	0

### 6.3 Carbohydrates [i](#)

There are no monosaccharides in this entry.

### 6.4 Ligands [i](#)

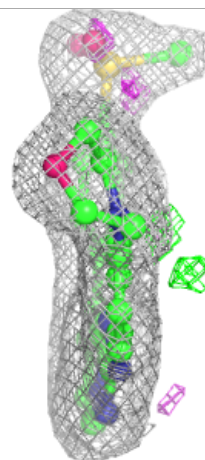
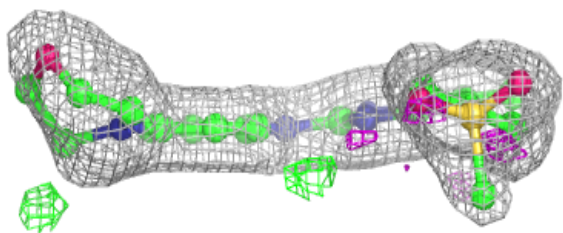
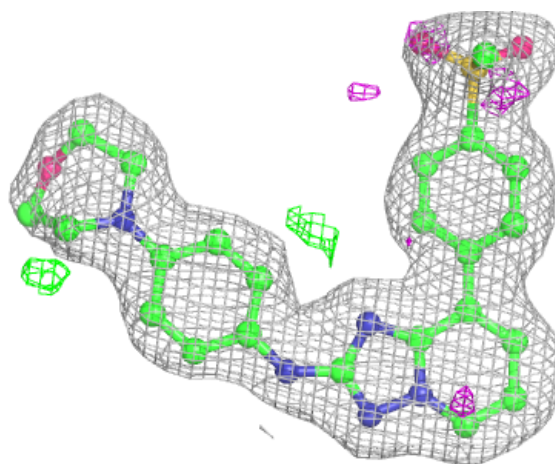
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95<sup>th</sup> percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists the number of atoms with occupancy less than 0.9.

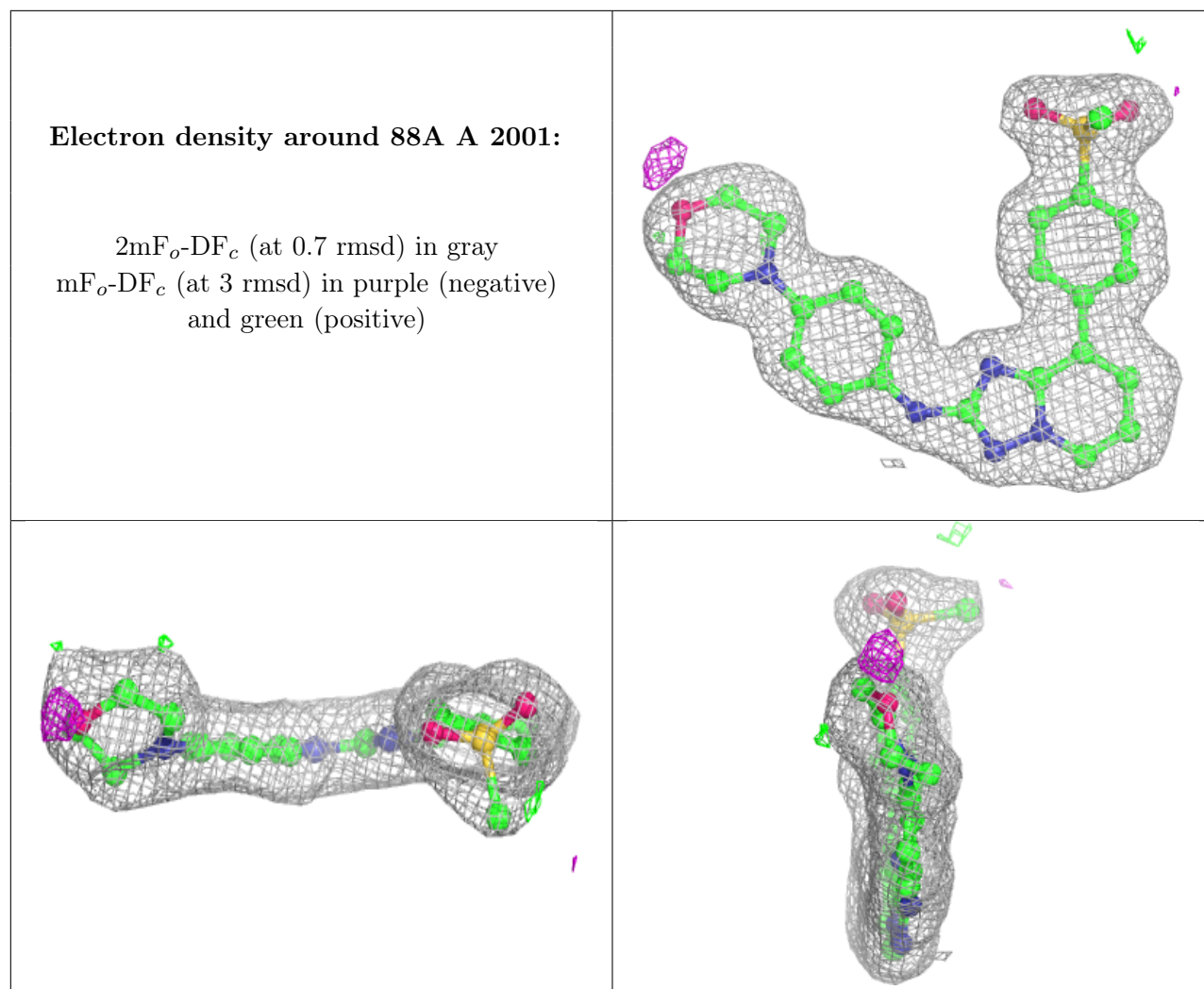
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å <sup>2</sup> )	Q<0.9
3	SO4	B	2005	5/5	0.59	0.17	108,108,108,108	0
3	SO4	B	2002	5/5	0.84	0.12	79,79,80,82	0
3	SO4	A	2002	5/5	0.89	0.12	77,77,77,77	0
3	SO4	B	2004	5/5	0.91	0.12	64,65,67,69	0
3	SO4	B	2003	5/5	0.91	0.08	78,78,79,79	0
2	88A	B	2001	32/32	0.94	0.09	28,37,54,55	0
2	88A	A	2001	32/32	0.97	0.07	22,27,41,43	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 88A B 2001:**

$2mF_o-DF_c$  (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.