



# Full wwPDB X-ray Structure Validation Report ⓘ

Mar 6, 2026 – 07:18 PM UTC

PDB ID : 4E4M / pdb\_00004e4m  
Title : JAK2 kinase (JH1 domain) in complex with compound 30  
Authors : Eigenbrot, C.  
Deposited on : 2012-03-13  
Resolution : 2.25 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 : 4-5-2 with Phenix2.0  
Mogul : 2022.3.0, CSD as543be (2022)  
Xtriage (Phenix) : 2.0  
EDS : 3.0  
Buster-report : wwPDB partial adaption of 1.1.7 (2018)  
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)  
CCP4 : 9.0.010 (Gargrove)  
Density-Fitness : 1.0.12  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.49

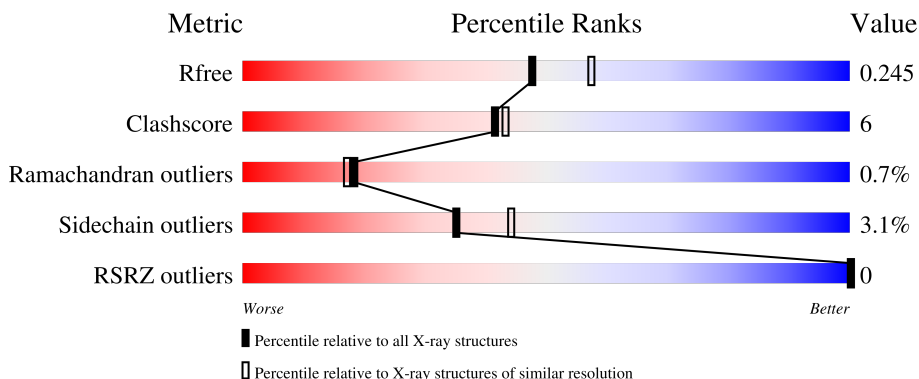
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.25 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))
$R_{free}$	180053	1898 (2.26-2.26)
Clashscore	190562	2005 (2.26-2.26)
Ramachandran outliers	187476	1965 (2.26-2.26)
Sidechain outliers	187428	1966 (2.26-2.26)
RSRZ outliers	180081	1898 (2.26-2.26)

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	302	 84% 13% ..
1	B	302	 83% 16% .
1	D	302	 85% 13% ..
1	E	302	 83% 13% ..

## 2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 10417 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.

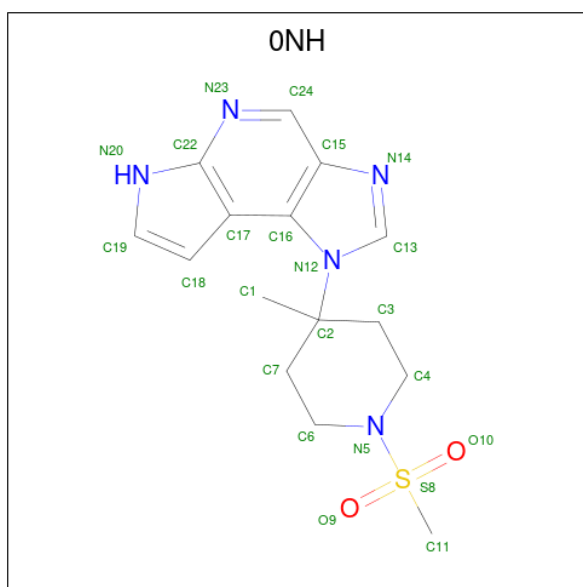
- Molecule 1 is a protein called Tyrosine-protein kinase JAK2.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
			Total	C	N	O	P	S			
1	A	298	2469	1563	429	461	2	14	0	0	0
1	B	298	2469	1563	429	461	2	14	0	0	0
1	D	298	2469	1563	429	461	2	14	0	0	0
1	E	298	2469	1563	429	461	2	14	0	0	0

There are 8 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	831	GLY	-	expression tag	UNP O60674
A	832	SER	-	expression tag	UNP O60674
B	831	GLY	-	expression tag	UNP O60674
B	832	SER	-	expression tag	UNP O60674
D	831	GLY	-	expression tag	UNP O60674
D	832	SER	-	expression tag	UNP O60674
E	831	GLY	-	expression tag	UNP O60674
E	832	SER	-	expression tag	UNP O60674

- Molecule 2 is 1-[4-methyl-1-(methylsulfonyl)piperidin-4-yl]-1,6-dihydroimidazo[4,5-d]pyrrolo [2,3-b]pyridine (CCD ID: 0NH) (formula: C<sub>15</sub>H<sub>19</sub>N<sub>5</sub>O<sub>2</sub>S).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
			Total	C	N	O	S		
2	A	1	23	15	5	2	1	0	0
2	B	1	23	15	5	2	1	0	0
2	D	1	23	15	5	2	1	0	0
2	E	1	23	15	5	2	1	0	0

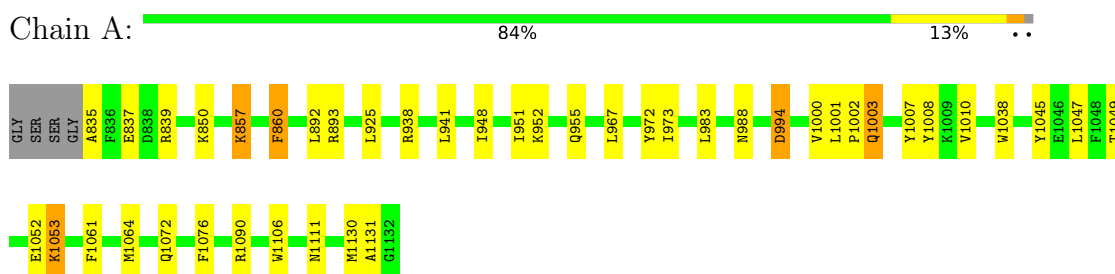
- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	O		
3	A	114	114	114	0	0
3	B	115	115	115	0	0
3	D	115	115	115	0	0
3	E	105	105	105	0	0

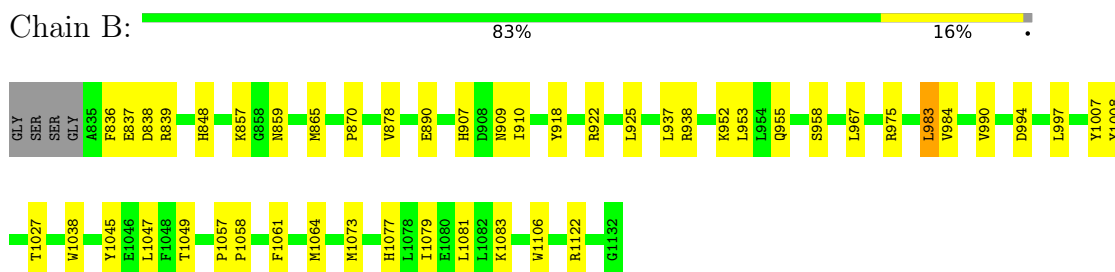
### 3 Residue-property plots [i](#)

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.

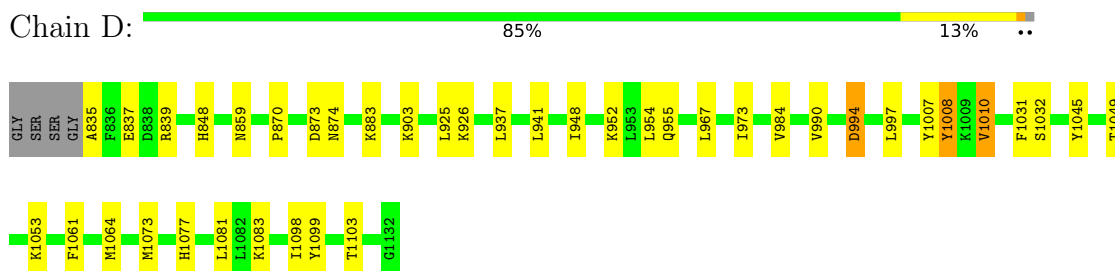
- Molecule 1: Tyrosine-protein kinase JAK2



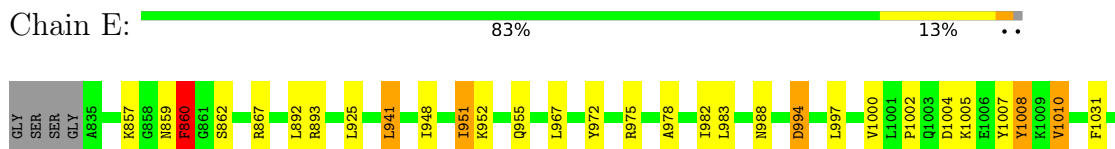
- Molecule 1: Tyrosine-protein kinase JAK2



- Molecule 1: Tyrosine-protein kinase JAK2



- Molecule 1: Tyrosine-protein kinase JAK2



W1038	Y1045	T1049	P1057	F1061	M1064	Q1072	F1076	K1083	R1090	W1106	M1111	M1130	G1132
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## 4 Data and refinement statistics i

Property	Value	Source
Space group	P 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	69.37Å 76.31Å 87.28Å 75.27° 66.62° 62.96°	Depositor
Resolution (Å)	50.00 – 2.25 50.00 – 2.25	Depositor EDS
% Data completeness (in resolution range)	96.2 (50.00-2.25) 96.1 (50.00-2.25)	Depositor EDS
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	0.11	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	1.57 (at 2.24Å)	Xtrriage
Refinement program	REFMAC 5.2.0019	Depositor
R, $R_{free}$	0.192 , 0.250 0.198 , 0.245	Depositor DCC
$R_{free}$ test set	691 reflections (1.04%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	22.4	Xtrriage
Anisotropy	0.014	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.37 , 23.2	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.49$ , $\langle L^2 \rangle = 0.31$	Xtrriage
Estimated twinning fraction	0.457 for h,h-k,h-l	Xtrriage
$F_o, F_c$ correlation	0.97	EDS
Total number of atoms	10417	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	28.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The analyses of the Patterson function reveals a significant off-origin peak that is 74.40 % of the origin peak, indicating pseudo-translational symmetry. The chance of finding a peak of this or larger height randomly in a structure without pseudo-translational symmetry is equal to 1.5387e-06. The detected translational NCS is most likely also responsible for the elevated intensity ratio.*

<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, ONH

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	0.63	0/2488	0.86	0/3347
1	B	0.64	0/2488	0.82	0/3347
1	D	0.64	0/2488	0.84	0/3347
1	E	0.65	0/2488	0.83	0/3347
All	All	0.64	0/9952	0.84	0/13388

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	2469	0	2434	37	0
1	B	2469	0	2434	31	0
1	D	2469	0	2433	24	0
1	E	2469	0	2433	41	0
2	A	23	0	19	6	0
2	B	23	0	19	6	0
2	D	23	0	19	1	0
2	E	23	0	19	5	0
3	A	114	0	0	3	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
3	B	115	0	0	3	0
3	D	115	0	0	4	0
3	E	105	0	0	4	0
All	All	10417	0	9810	127	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 6.

All (127) 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:837:GLU:OE1	1:A:839:ARG:HD2	1.66	0.94
1:A:941:LEU:HD23	1:A:948:ILE:HD13	1.59	0.85
1:A:837:GLU:OE1	1:A:839:ARG:CD	2.31	0.78
1:B:1061:PHE:HA	1:B:1064:MET:HE3	1.69	0.74
1:A:835:ALA:HB2	1:E:1002:PRO:HG2	1.70	0.74
1:B:994:ASP:HB2	2:B:1201:0NH:H11	1.71	0.72
1:D:1061:PHE:HA	1:D:1064:MET:HE3	1.73	0.70
1:A:892:LEU:HD21	1:E:1076:PHE:HE2	1.56	0.69
1:A:951:ILE:HD11	1:A:1130:MET:HE2	1.74	0.69
1:E:983:LEU:HD11	2:E:1201:0NH:H7	1.73	0.69
1:E:941:LEU:HD12	1:E:948:ILE:HD13	1.76	0.67
1:B:907:HIS:HB3	1:B:910:ILE:HD12	1.77	0.66
1:E:952:LYS:NZ	1:E:955:GLN:HE22	1.93	0.66
1:A:835:ALA:CB	1:E:1002:PRO:HG2	2.26	0.66
1:A:835:ALA:HB2	1:E:1002:PRO:CD	2.27	0.64
1:E:1061:PHE:HA	1:E:1064:MET:HE3	1.78	0.64
1:A:952:LYS:NZ	1:A:988:ASN:OD1	2.31	0.63
1:A:994:ASP:HB2	2:A:1201:0NH:H11	1.80	0.63
1:B:952:LYS:NZ	1:B:955:GLN:HE22	1.98	0.62
1:B:983:LEU:HD11	2:B:1201:0NH:H7	1.80	0.62
1:B:865:MET:HE3	1:B:878:VAL:HG11	1.80	0.62
1:B:983:LEU:HD11	2:B:1201:0NH:C7	2.30	0.61
1:A:835:ALA:HB2	1:E:1002:PRO:CG	2.30	0.61
1:A:892:LEU:HD21	1:E:1076:PHE:CE2	2.36	0.60
1:B:859:ASN:ND2	1:B:994:ASP:OD2	2.35	0.59
1:A:835:ALA:HB2	1:E:1002:PRO:HD2	1.84	0.59
1:B:836:PHE:CE2	1:B:838:ASP:HB2	2.38	0.58
1:B:984:VAL:HG22	1:B:990:VAL:HG12	1.85	0.58
1:D:984:VAL:HG22	1:D:990:VAL:HG12	1.87	0.56
1:B:994:ASP:CG	3:B:1333:HOH:O	2.48	0.56

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:D:903:LYS:HE2	3:D:1399:HOH:O	2.05	0.56
1:B:1027:THR:HG22	1:B:1079:ILE:HD13	1.88	0.55
1:A:941:LEU:HD11	1:A:1047:LEU:HD23	1.89	0.54
1:A:1061:PHE:HA	1:A:1064:MET:HE3	1.88	0.54
1:B:836:PHE:CZ	1:B:838:ASP:HB2	2.42	0.54
1:B:837:GLU:CD	1:B:839:ARG:HD2	2.33	0.54
1:A:938:ARG:HD2	3:A:1392:HOH:O	2.07	0.54
1:A:972:TYR:CD2	1:A:1000:VAL:HG22	2.43	0.53
1:B:937:LEU:HD21	1:B:1047:LEU:HD21	1.90	0.53
1:D:1099:TYR:O	1:D:1103:THR:HG23	2.08	0.52
1:A:1111:ASN:HB2	3:A:1389:HOH:O	2.08	0.51
1:D:848:HIS:CG	1:D:870:PRO:HA	2.45	0.51
1:E:972:TYR:CD2	1:E:1000:VAL:HG22	2.45	0.51
1:B:1057:PRO:HB2	1:B:1058:PRO:HD3	1.93	0.51
1:E:972:TYR:CE2	1:E:1000:VAL:HG22	2.46	0.51
1:E:952:LYS:NZ	1:E:988:ASN:OD1	2.43	0.51
1:B:1073:MET:HE1	1:B:1077:HIS:NE2	2.26	0.51
1:A:973:ILE:HD11	1:A:1001:LEU:HD21	1.93	0.50
1:A:835:ALA:CB	1:E:1002:PRO:CG	2.90	0.50
1:D:952:LYS:NZ	1:D:955:GLN:HE22	2.09	0.50
1:B:952:LYS:HD3	1:B:955:GLN:HE21	1.76	0.50
1:D:994:ASP:HB3	3:D:1389:HOH:O	2.11	0.50
1:A:837:GLU:OE2	1:E:1008:PTR:OH	2.30	0.49
1:A:952:LYS:NZ	1:A:955:GLN:HE22	2.11	0.49
1:D:952:LYS:HZ3	1:D:955:GLN:HE22	1.60	0.49
1:A:835:ALA:CB	1:E:1002:PRO:CD	2.90	0.49
2:A:1201:0NH:H11A	3:A:1344:HOH:O	2.13	0.49
1:E:994:ASP:HB2	2:E:1201:0NH:H11	1.94	0.49
1:A:1072:GLN:HG3	1:A:1076:PHE:CE1	2.48	0.48
1:A:835:ALA:HB3	1:E:1008:PTR:HA	1.95	0.48
1:B:848:HIS:CG	1:B:870:PRO:HA	2.47	0.48
1:A:972:TYR:CE2	1:A:1000:VAL:HG22	2.49	0.48
1:A:1038:TRP:CE3	1:A:1106:TRP:HA	2.49	0.48
1:E:952:LYS:HZ1	1:E:955:GLN:HE22	1.59	0.47
1:E:1038:TRP:CE3	1:E:1106:TRP:HA	2.49	0.47
1:E:1111:ASN:HB2	3:E:1352:HOH:O	2.14	0.47
2:E:1201:0NH:H11A	3:E:1329:HOH:O	2.13	0.47
1:A:835:ALA:N	1:E:1005:LYS:HG2	2.28	0.47
1:E:951:ILE:CD1	1:E:1130:MET:HE2	2.45	0.47
1:D:1073:MET:HE1	1:D:1077:HIS:NE2	2.29	0.46
1:E:951:ILE:HD11	3:E:1324:HOH:O	2.15	0.46

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:D:883:LYS:HB3	1:D:926:LYS:HD3	1.98	0.46
1:D:941:LEU:HD12	1:D:948:ILE:HD13	1.98	0.46
1:A:1045:TYR:O	1:A:1049:THR:HG23	2.15	0.46
1:E:1045:TYR:O	1:E:1049:THR:HG23	2.15	0.46
1:D:973:ILE:HD12	1:D:1032:SER:C	2.42	0.45
1:B:918:TYR:HB3	1:B:922:ARG:HA	1.98	0.45
1:E:1073:MET:HE1	1:E:1077:HIS:NE2	2.31	0.45
2:A:1201:0NH:H3A	2:A:1201:0NH:C18	2.46	0.45
1:B:952:LYS:HZ3	1:B:955:GLN:HE22	1.64	0.45
1:A:892:LEU:HD23	1:E:1073:MET:HG2	1.98	0.45
1:A:857:LYS:HA	1:A:857:LYS:HD3	1.85	0.44
1:D:835:ALA:N	3:D:1396:HOH:O	2.51	0.44
1:D:1073:MET:HG3	3:D:1384:HOH:O	2.16	0.44
1:E:1010:VAL:HG13	1:E:1031:PHE:CE1	2.53	0.44
1:D:837:GLU:OE1	1:D:839:ARG:HD2	2.17	0.44
1:D:954:LEU:HD21	1:D:1098:ILE:HD12	1.99	0.44
1:E:951:ILE:HD12	1:E:1130:MET:CE	2.48	0.44
1:B:907:HIS:HE1	1:B:909:ASN:HD22	1.65	0.44
1:D:1081:LEU:C	1:D:1081:LEU:HD23	2.43	0.44
1:B:983:LEU:HD11	2:B:1201:0NH:H7A	1.98	0.43
1:B:983:LEU:HD21	2:B:1201:0NH:H11A	2.01	0.43
1:E:1045:TYR:CE2	1:E:1049:THR:HG21	2.52	0.43
1:E:1057:PRO:HB2	1:E:1058:PRO:HD3	2.00	0.43
2:A:1201:0NH:H3A	2:A:1201:0NH:H18	1.99	0.43
1:A:1002:PRO:O	1:A:1003:GLN:CB	2.67	0.43
1:A:1052:GLU:O	1:A:1053:LYS:HB3	2.18	0.43
2:A:1201:0NH:C18	2:A:1201:0NH:H7	2.49	0.43
1:E:1072:GLN:HG3	1:E:1076:PHE:CE1	2.54	0.42
1:A:983:LEU:HD11	2:A:1201:0NH:H7	2.01	0.42
1:D:1045:TYR:O	1:D:1049:THR:HG23	2.20	0.42
1:D:873:ASP:O	1:D:874:ASN:CB	2.67	0.42
1:E:978:ALA:O	1:E:982:ILE:HG12	2.19	0.42
1:B:1038:TRP:CE3	1:B:1106:TRP:HA	2.54	0.42
1:D:1073:MET:HE3	1:D:1073:MET:HB3	1.94	0.42
1:A:951:ILE:HD11	1:A:1130:MET:CE	2.46	0.42
1:A:837:GLU:OE2	1:E:1008:PTR:P	2.78	0.41
1:B:1122:ARG:HD2	3:B:1347:HOH:O	2.20	0.41
1:B:890:GLU:HG3	3:B:1412:HOH:O	2.19	0.41
2:B:1201:0NH:H11B	2:B:1201:0NH:H6A	1.94	0.41
1:B:975:ARG:HD3	1:B:997:LEU:O	2.20	0.41
1:E:1004:ASP:OD1	1:E:1004:ASP:N	2.52	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:E:1201:0NH:H3A	2:E:1201:0NH:C18	2.50	0.41
1:D:1010:VAL:HG13	1:D:1031:PHE:CE1	2.56	0.41
1:D:837:GLU:CD	1:D:839:ARG:HD2	2.46	0.41
1:A:1045:TYR:CE2	1:A:1049:THR:HG21	2.56	0.41
1:D:859:ASN:ND2	1:D:997:LEU:HG	2.35	0.41
2:D:1201:0NH:C18	2:D:1201:0NH:H7	2.51	0.41
1:E:857:LYS:HD2	3:E:1397:HOH:O	2.21	0.41
1:B:1081:LEU:C	1:B:1081:LEU:HD23	2.46	0.40
1:E:952:LYS:NZ	1:E:955:GLN:NE2	2.65	0.40
1:E:975:ARG:HD3	1:E:997:LEU:O	2.21	0.40
1:B:953:LEU:HD22	1:B:1047:LEU:HB3	2.03	0.40
1:E:859:ASN:C	1:E:860:PHE:CD1	2.99	0.40
1:E:983:LEU:HD11	2:E:1201:0NH:C7	2.48	0.40
1:B:1045:TYR:O	1:B:1049:THR:HG23	2.21	0.40
1:D:1008:PTR:HE2	1:D:1010:VAL:HB	2.04	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	294/302 (97%)	283 (96%)	6 (2%)	5 (2%)	<b>7</b> <b>3</b>
1	B	294/302 (97%)	286 (97%)	8 (3%)	0	<b>100</b> <b>100</b>
1	D	294/302 (97%)	288 (98%)	5 (2%)	1 (0%)	36 40
1	E	294/302 (97%)	287 (98%)	5 (2%)	2 (1%)	18 17
All	All	1176/1208 (97%)	1144 (97%)	24 (2%)	8 (1%)	18 17

All (8) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	860	PHE
1	A	994	ASP
1	A	1131	ALA
1	D	994	ASP
1	E	994	ASP
1	A	1003	GLN
1	E	860	PHE
1	A	1053	LYS

### 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	269/271 (99%)	261 (97%)	8 (3%)	36	45
1	B	269/271 (99%)	262 (97%)	7 (3%)	40	50
1	D	269/271 (99%)	263 (98%)	6 (2%)	45	56
1	E	269/271 (99%)	257 (96%)	12 (4%)	24	29
All	All	1076/1084 (99%)	1043 (97%)	33 (3%)	35	44

All (33) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	850	LYS
1	A	857	LYS
1	A	860	PHE
1	A	893	ARG
1	A	925	LEU
1	A	967	LEU
1	A	1010	VAL
1	A	1090	ARG
1	B	857	LYS
1	B	925	LEU
1	B	938	ARG
1	B	958	SER
1	B	967	LEU
1	B	983	LEU

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Mol	Chain	Res	Type
1	B	1083	LYS
1	D	925	LEU
1	D	937	LEU
1	D	967	LEU
1	D	1010	VAL
1	D	1053	LYS
1	D	1083	LYS
1	E	860	PHE
1	E	862	SER
1	E	867	ARG
1	E	892	LEU
1	E	893	ARG
1	E	925	LEU
1	E	941	LEU
1	E	951	ILE
1	E	967	LEU
1	E	1010	VAL
1	E	1083	LYS
1	E	1090	ARG

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (20) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	848	HIS
1	A	909	ASN
1	A	924	ASN
1	A	955	GLN
1	B	872	GLN
1	B	885	GLN
1	B	909	ASN
1	B	924	ASN
1	B	955	GLN
1	B	1067	ASN
1	D	853	GLN
1	D	854	GLN
1	D	885	GLN
1	D	909	ASN
1	D	955	GLN
1	E	854	GLN
1	E	909	ASN
1	E	942	GLN
1	E	950	HIS

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Mol	Chain	Res	Type
1	E	955	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](#)

8 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	D	1008	1	15,16,17	1.98	1 (6%)	17,22,24	0.71	1 (5%)
1	PTR	A	1008	1	15,16,17	1.95	1 (6%)	17,22,24	1.03	1 (5%)
1	PTR	B	1008	1	15,16,17	1.92	1 (6%)	17,22,24	0.75	0
1	PTR	B	1007	1	15,16,17	1.98	1 (6%)	17,22,24	0.75	1 (5%)
1	PTR	E	1008	1	15,16,17	1.93	1 (6%)	17,22,24	0.84	0
1	PTR	D	1007	1	15,16,17	1.96	1 (6%)	17,22,24	0.69	1 (5%)
1	PTR	E	1007	1	15,16,17	1.97	1 (6%)	17,22,24	0.59	0
1	PTR	A	1007	1	15,16,17	1.98	1 (6%)	17,22,24	0.55	0

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

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

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

All (8) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	D	1007	PTR	OH-CZ	-7.33	1.24	1.40
1	B	1008	PTR	OH-CZ	-7.23	1.24	1.40
1	A	1008	PTR	OH-CZ	-7.23	1.24	1.40
1	B	1007	PTR	OH-CZ	-7.22	1.24	1.40
1	D	1008	PTR	OH-CZ	-7.11	1.24	1.40
1	E	1007	PTR	OH-CZ	-7.08	1.24	1.40
1	A	1007	PTR	OH-CZ	-7.07	1.24	1.40
1	E	1008	PTR	OH-CZ	-6.96	1.25	1.40

All (4) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	1008	PTR	OH-CZ-CE1	2.55	126.86	119.22
1	D	1007	PTR	O3P-P-OH	2.35	112.28	105.32
1	B	1007	PTR	O3P-P-OH	2.20	111.84	105.32
1	D	1008	PTR	O2P-P-OH	2.17	111.73	105.32

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

2 monomers are involved in 4 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
1	D	1008	PTR	1	0
1	E	1008	PTR	3	0

## 5.5 Carbohydrates

There are no oligosaccharides in this entry.

## 5.6 Ligand geometry

4 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	0NH	E	1201	-	26,26,26	0.90	1 (3%)	33,41,41	3.04	15 (45%)
2	0NH	D	1201	-	26,26,26	1.02	1 (3%)	33,41,41	3.17	17 (51%)
2	0NH	A	1201	-	26,26,26	0.97	2 (7%)	33,41,41	3.09	13 (39%)
2	0NH	B	1201	-	26,26,26	0.99	1 (3%)	33,41,41	2.96	14 (42%)

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	0NH	E	1201	-	-	5/10/24/24	0/4/4/4
2	0NH	D	1201	-	-	5/10/24/24	0/4/4/4
2	0NH	A	1201	-	-	6/10/24/24	0/4/4/4
2	0NH	B	1201	-	-	5/10/24/24	0/4/4/4

All (5) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	D	1201	0NH	C11-S8	2.84	1.82	1.75
2	B	1201	0NH	C11-S8	2.78	1.81	1.75
2	E	1201	0NH	C11-S8	2.31	1.80	1.75
2	A	1201	0NH	S8-N5	2.17	1.67	1.63
2	A	1201	0NH	C11-S8	2.10	1.80	1.75

All (59) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	E	1201	0NH	C17-C22-N23	-8.44	119.80	126.40

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	D	1201	0NH	C17-C22-N23	-8.25	119.95	126.40
2	A	1201	0NH	C17-C22-N23	-8.13	120.04	126.40
2	B	1201	0NH	C17-C22-N23	-7.72	120.36	126.40
2	D	1201	0NH	N12-C13-N14	-7.40	109.99	114.40
2	E	1201	0NH	C6-N5-C4	7.04	120.21	112.12
2	A	1201	0NH	N12-C13-N14	-6.99	110.24	114.40
2	B	1201	0NH	C6-N5-C4	6.94	120.10	112.12
2	D	1201	0NH	C6-N5-C4	6.59	119.69	112.12
2	A	1201	0NH	O10-S8-N5	-6.47	101.62	107.02
2	A	1201	0NH	C6-N5-C4	6.43	119.51	112.12
2	E	1201	0NH	N12-C13-N14	-6.40	110.59	114.40
2	B	1201	0NH	N12-C13-N14	-6.37	110.61	114.40
2	E	1201	0NH	O10-S8-N5	-5.86	102.13	107.02
2	D	1201	0NH	O9-S8-N5	-5.73	102.23	107.02
2	D	1201	0NH	C15-N14-C13	4.34	109.73	104.40
2	B	1201	0NH	O10-S8-N5	-4.28	103.45	107.02
2	B	1201	0NH	C15-N14-C13	4.20	109.55	104.40
2	A	1201	0NH	C15-N14-C13	4.10	109.43	104.40
2	A	1201	0NH	N20-C22-N23	3.86	132.94	126.69
2	D	1201	0NH	N20-C22-N23	3.68	132.65	126.69
2	B	1201	0NH	N20-C22-N23	3.67	132.63	126.69
2	E	1201	0NH	C15-N14-C13	3.59	108.81	104.40
2	E	1201	0NH	N20-C22-N23	3.49	132.34	126.69
2	D	1201	0NH	C24-N23-C22	3.43	122.91	116.19
2	A	1201	0NH	C22-N20-C19	3.42	110.08	108.11
2	B	1201	0NH	C17-C16-C15	-3.38	117.41	121.19
2	E	1201	0NH	C24-N23-C22	3.36	122.77	116.19
2	B	1201	0NH	O10-S8-C11	3.32	112.85	108.30
2	E	1201	0NH	O9-S8-C11	3.30	112.83	108.30
2	B	1201	0NH	C22-N20-C19	3.27	110.00	108.11
2	D	1201	0NH	C22-N20-C19	3.20	109.96	108.11
2	D	1201	0NH	C4-N5-S8	3.17	121.81	116.71
2	A	1201	0NH	C24-N23-C22	3.13	122.32	116.19
2	D	1201	0NH	C17-C16-C15	-3.11	117.71	121.19
2	D	1201	0NH	C7-C2-C3	3.08	112.51	107.37
2	A	1201	0NH	C17-C16-C15	-2.98	117.86	121.19
2	E	1201	0NH	C17-C16-C15	-2.97	117.87	121.19
2	B	1201	0NH	C24-N23-C22	2.91	121.89	116.19
2	B	1201	0NH	C7-C2-C3	2.85	112.11	107.37
2	D	1201	0NH	O10-S8-C11	2.81	112.15	108.30
2	E	1201	0NH	O9-S8-N5	-2.77	104.71	107.02
2	E	1201	0NH	C7-C2-C3	2.72	111.91	107.37

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	D	1201	0NH	O10-S8-N5	-2.63	104.82	107.02
2	A	1201	0NH	O9-S8-N5	-2.53	104.91	107.02
2	A	1201	0NH	C4-N5-S8	2.52	120.75	116.71
2	D	1201	0NH	C16-N12-C13	2.48	107.77	105.58
2	B	1201	0NH	C4-N5-S8	2.46	120.66	116.71
2	D	1201	0NH	C6-C7-C2	-2.38	109.41	113.31
2	A	1201	0NH	O9-S8-C11	2.33	111.50	108.30
2	E	1201	0NH	C22-C17-C18	-2.33	105.25	106.40
2	B	1201	0NH	C17-C22-N20	-2.32	107.01	108.33
2	E	1201	0NH	C22-N20-C19	2.31	109.44	108.11
2	A	1201	0NH	C17-C22-N20	-2.31	107.02	108.33
2	D	1201	0NH	C22-C17-C18	-2.29	105.26	106.40
2	B	1201	0NH	C6-C7-C2	-2.27	109.58	113.31
2	E	1201	0NH	C6-N5-S8	2.10	120.08	116.71
2	D	1201	0NH	C16-C17-C18	2.07	135.60	132.05
2	E	1201	0NH	C16-C17-C18	2.03	135.53	132.05

There are no chirality outliers.

All (21) torsion outliers are listed below:

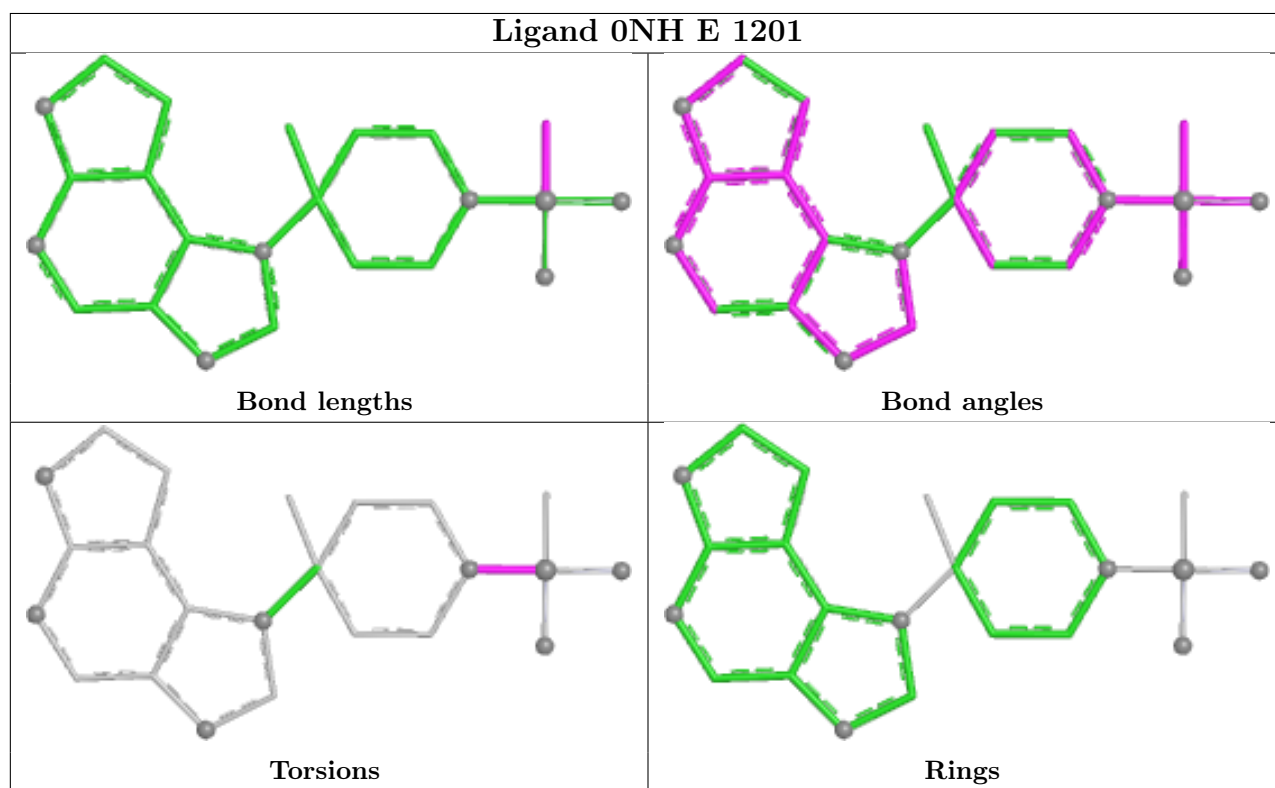
Mol	Chain	Res	Type	Atoms
2	A	1201	0NH	C6-N5-S8-O10
2	A	1201	0NH	C6-N5-S8-C11
2	B	1201	0NH	C4-N5-S8-O10
2	B	1201	0NH	C4-N5-S8-C11
2	B	1201	0NH	C6-N5-S8-O9
2	B	1201	0NH	C6-N5-S8-O10
2	B	1201	0NH	C6-N5-S8-C11
2	D	1201	0NH	C4-N5-S8-O9
2	D	1201	0NH	C4-N5-S8-O10
2	D	1201	0NH	C4-N5-S8-C11
2	E	1201	0NH	C6-N5-S8-O10
2	E	1201	0NH	C6-N5-S8-C11
2	A	1201	0NH	C4-N5-S8-O10
2	D	1201	0NH	C6-N5-S8-O9
2	E	1201	0NH	C4-N5-S8-O10
2	A	1201	0NH	C4-N5-S8-C11
2	D	1201	0NH	C6-N5-S8-C11
2	E	1201	0NH	C4-N5-S8-C11
2	A	1201	0NH	C6-N5-S8-O9
2	E	1201	0NH	C4-N5-S8-O9
2	A	1201	0NH	C4-N5-S8-O9

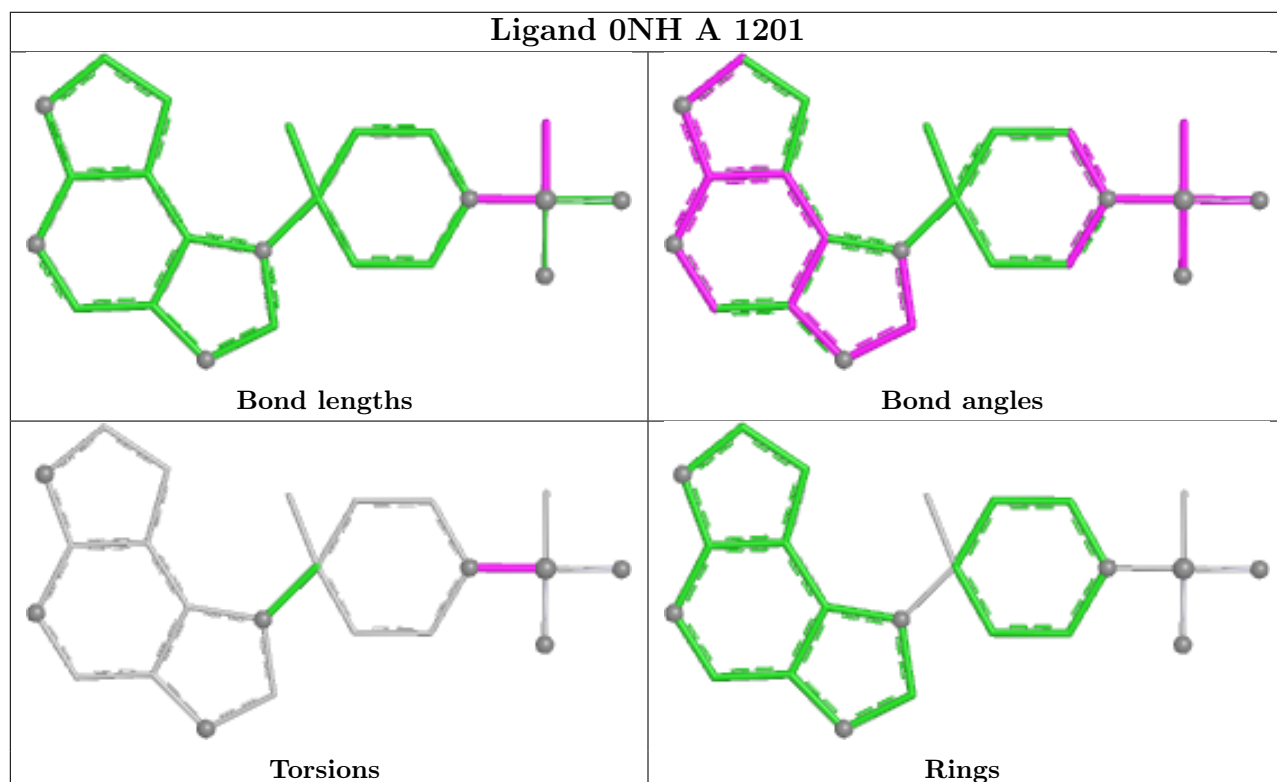
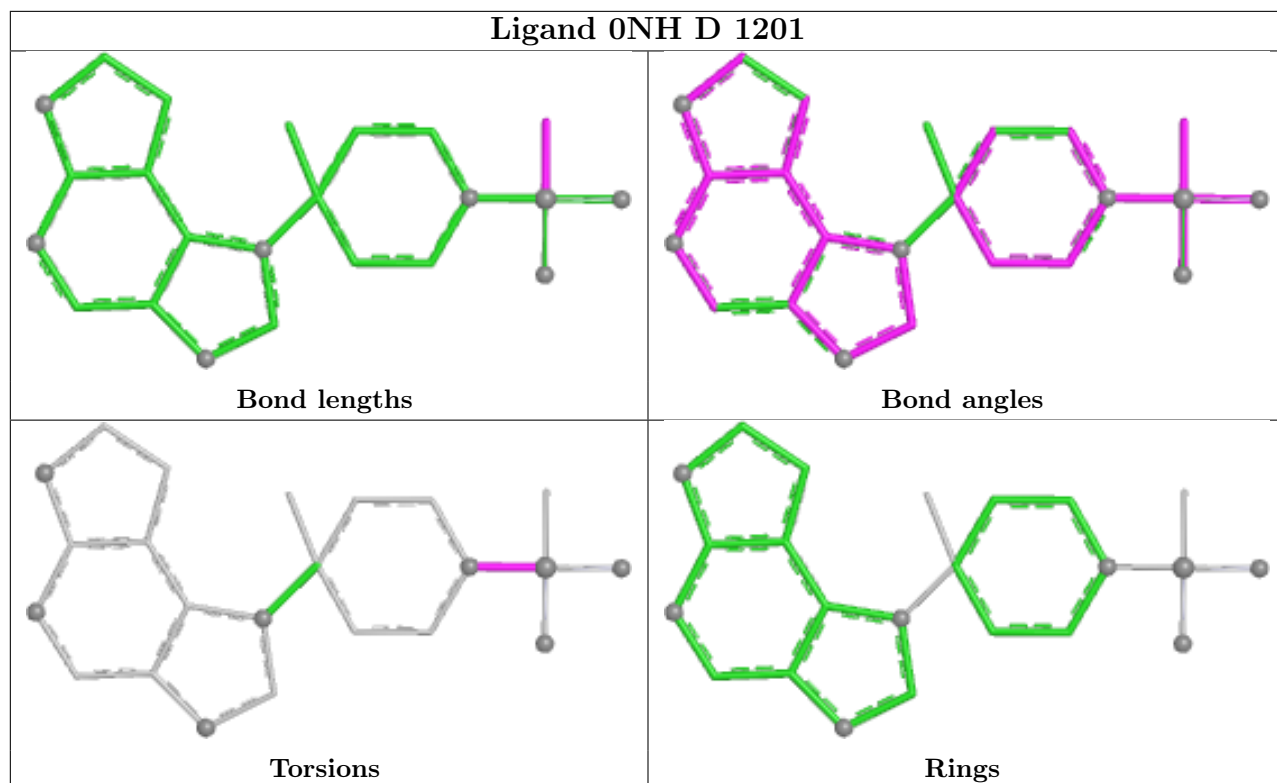
There are no ring outliers.

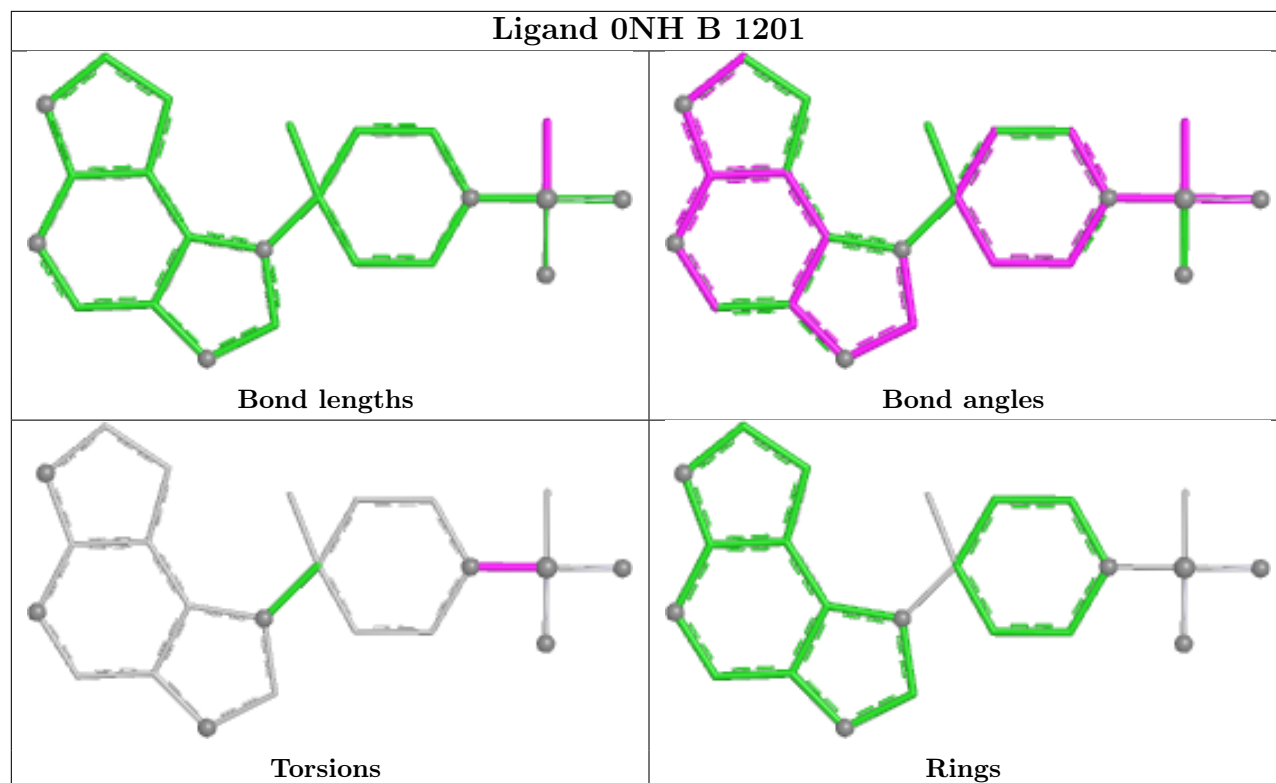
4 monomers are involved in 18 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	E	1201	0NH	5	0
2	D	1201	0NH	1	0
2	A	1201	0NH	6	0
2	B	1201	0NH	6	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	296/302 (98%)	-1.68	0 100 100	10, 22, 60, 89	0
1	B	296/302 (98%)	-1.65	0 100 100	10, 24, 65, 94	0
1	D	296/302 (98%)	-1.65	0 100 100	10, 23, 68, 94	0
1	E	296/302 (98%)	-1.67	0 100 100	10, 23, 61, 95	0
All	All	1184/1208 (98%)	-1.66	0 100 100	10, 23, 65, 95	0

There are no RSRZ outliers to report.

### 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	PTR	B	1007	16/17	0.99	0.03	30,47,64,64	0
1	PTR	B	1008	16/17	0.99	0.03	20,46,70,71	0
1	PTR	D	1007	16/17	0.99	0.03	29,48,63,64	0
1	PTR	D	1008	16/17	0.99	0.03	19,45,70,72	0
1	PTR	E	1008	16/17	0.99	0.03	24,37,59,59	0
1	PTR	A	1008	16/17	1.00	0.03	17,43,75,75	0
1	PTR	E	1007	16/17	1.00	0.02	18,43,65,66	0
1	PTR	A	1007	16/17	1.00	0.02	17,40,60,61	0

### 6.3 Carbohydrates [i](#)

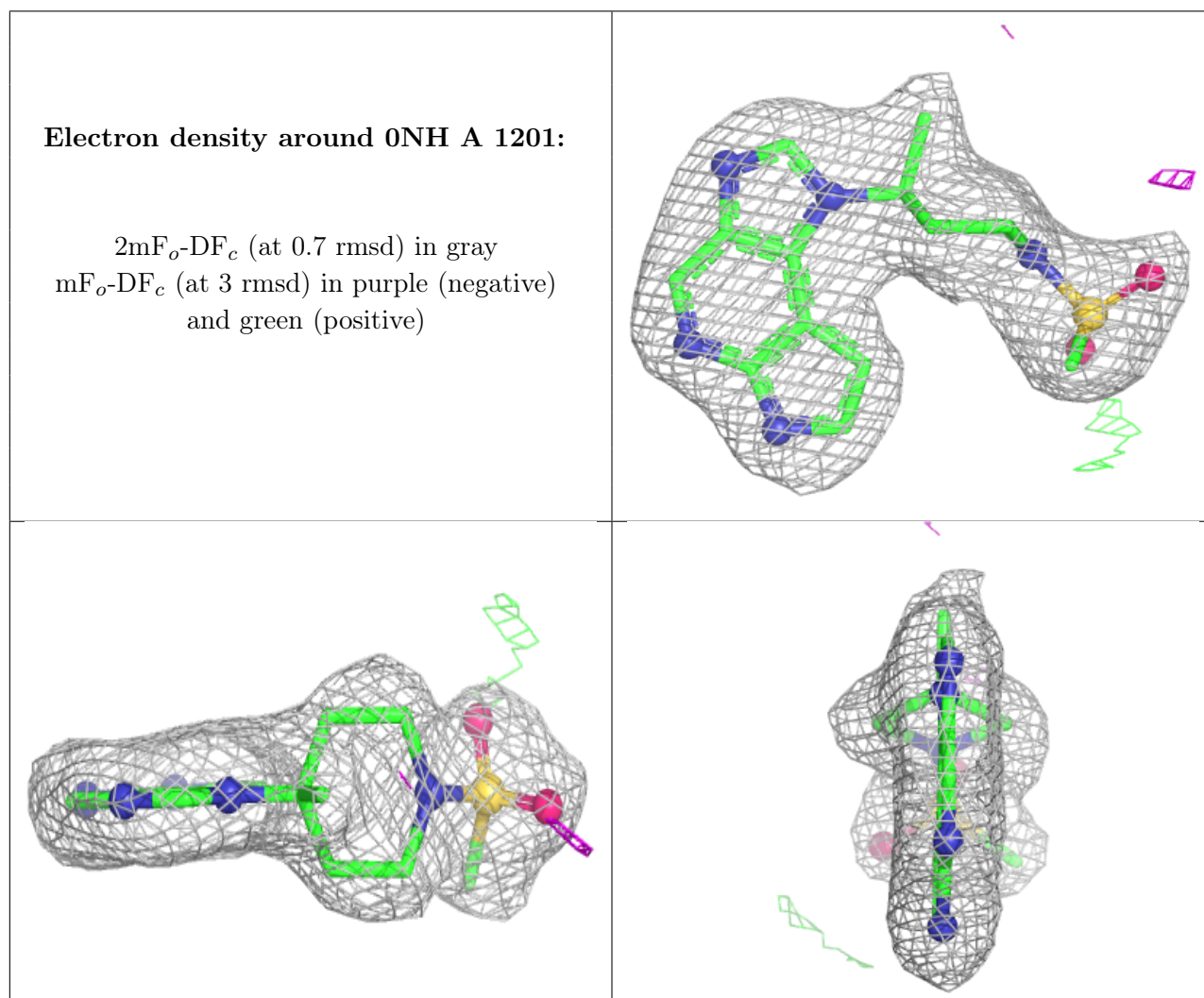
There are no oligosaccharides in this entry.

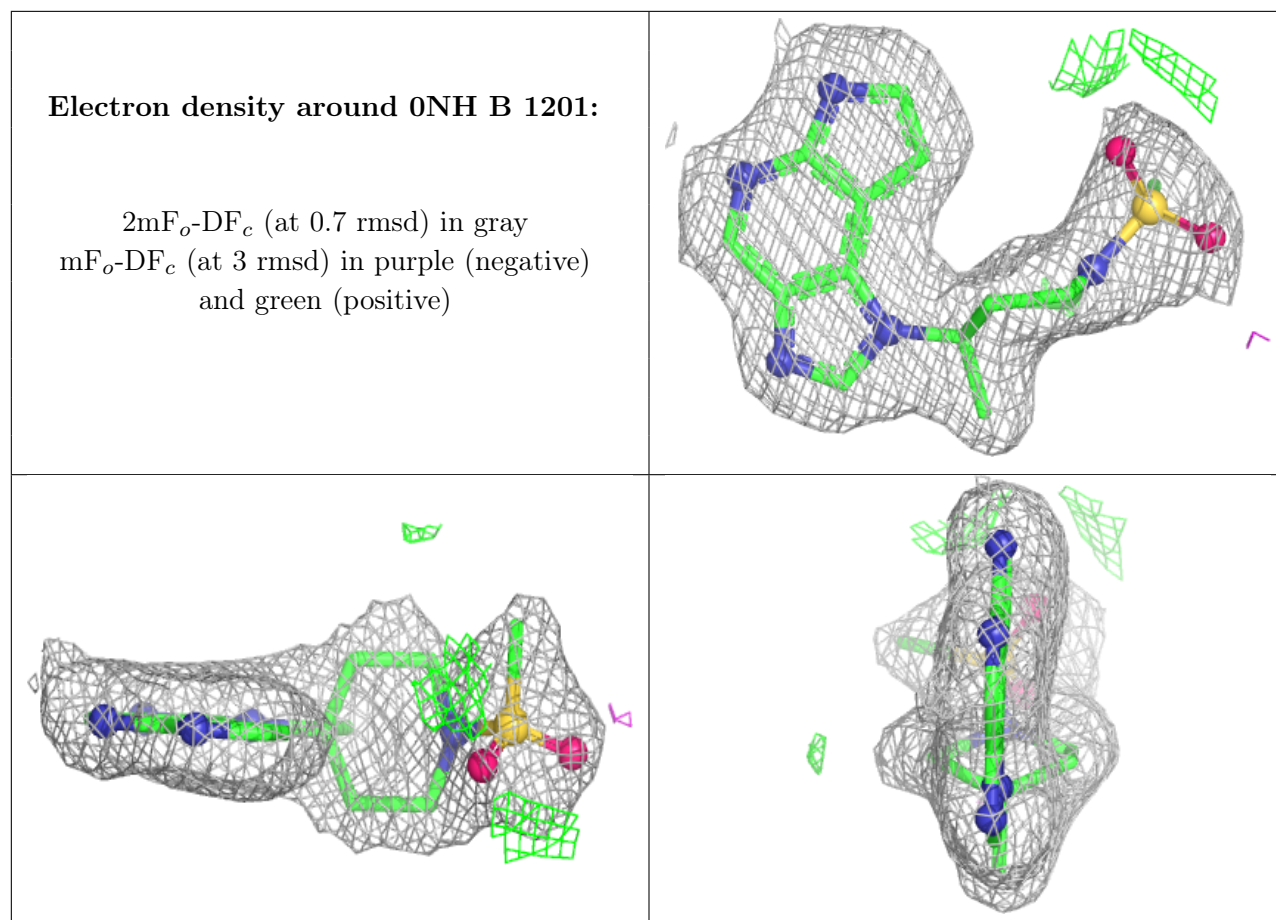
## 6.4 Ligands [i](#)

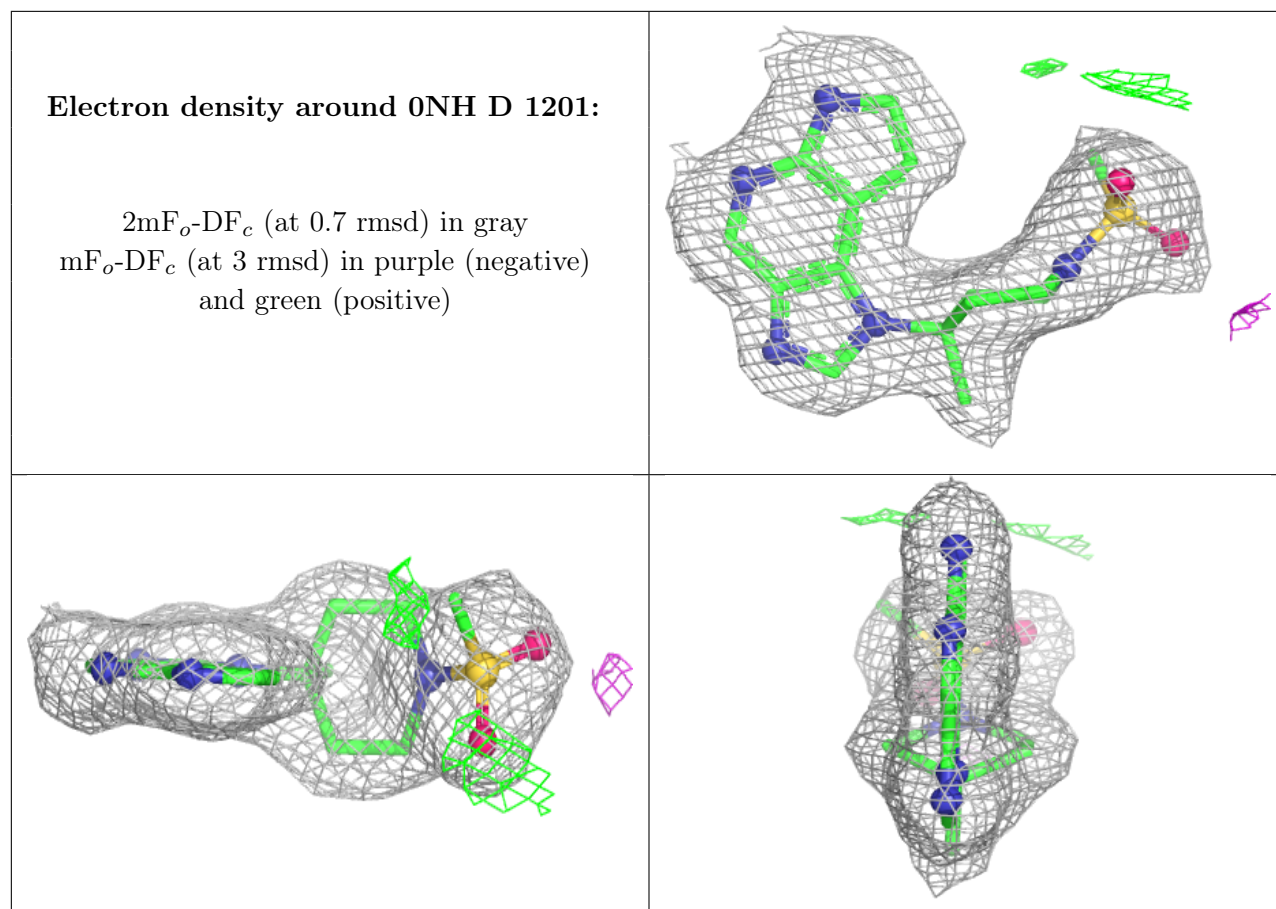
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95<sup>th</sup> percentile and maximum values of B factors of atoms in the group. The column labelled 'Q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

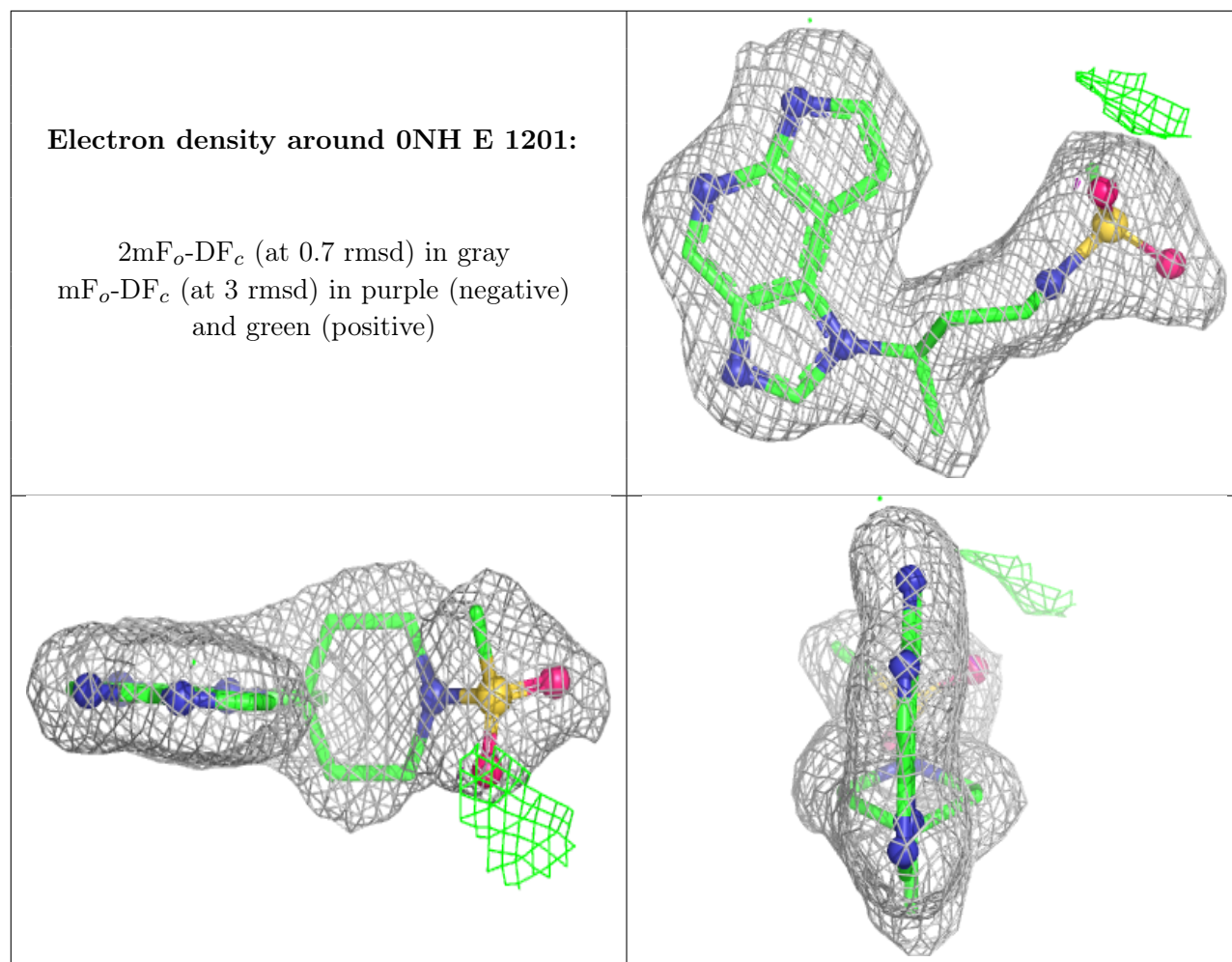
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å <sup>2</sup> )	Q<0.9
2	0NH	A	1201	23/23	1.00	0.02	17,27,36,42	0
2	0NH	B	1201	23/23	1.00	0.02	18,24,41,53	0
2	0NH	D	1201	23/23	1.00	0.02	20,25,42,48	0
2	0NH	E	1201	23/23	1.00	0.02	16,24,34,38	0

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









## 6.5 Other polymers [i](#)

There are no such residues in this entry.