



# Full wwPDB X-ray Structure Validation Report ⓘ

Oct 14, 2023 – 07:38 PM EDT

PDB ID : 7LCR  
Title : Improved Feline Drugs as SARS-CoV-2 Mpro Inhibitors: Structure-Activity Studies & Micellar Solubilization for Enhanced Bioavailability  
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Deposited on : 2021-01-11  
Resolution : 1.95 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 : 2.36  
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) : 2.36

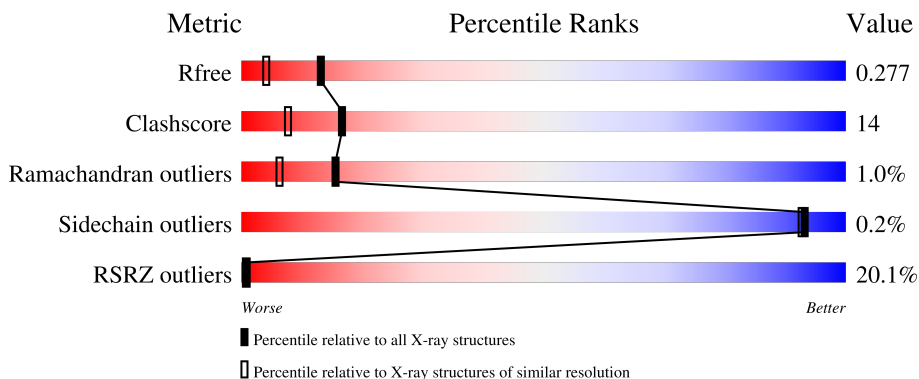
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 1.95 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	2580 (1.96-1.96)
Clashscore	141614	2705 (1.96-1.96)
Ramachandran outliers	138981	2678 (1.96-1.96)
Sidechain outliers	138945	2678 (1.96-1.96)
RSRZ outliers	127900	2539 (1.96-1.96)

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	306	
1	B	306	

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
2	XTM	B	401	X	-	-	-

## 2 Entry composition [i](#)

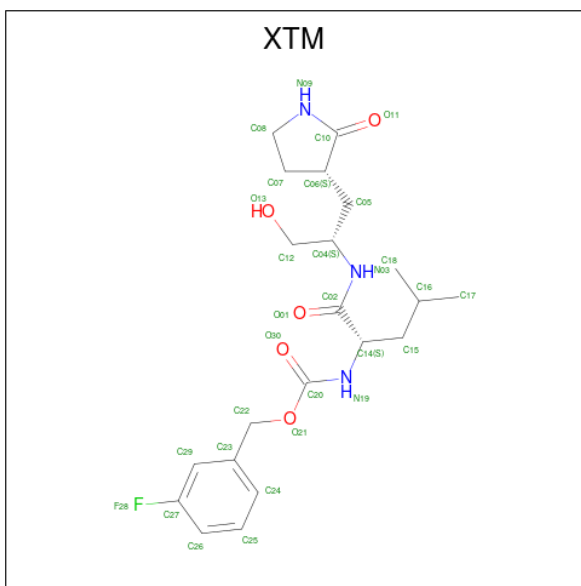
There are 3 unique types of molecules in this entry. The entry contains 9403 atoms, of which 4469 are hydrogens and 0 are deuteriums.

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 3C-like proteinase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace	
			Total	C	H	N	O				S
1	A	306	4597	1499	2230	402	444	22	0	0	0
1	B	306	4550	1499	2183	402	444	22	0	0	0

- Molecule 2 is N 2 -{[(3-fluorophenyl)methoxy]carbonyl}-N-{(2S)-1-hydroxy-3-[(3S)-2-oxopyrrolidin-3-yl]propan-2-yl}-L-leucinamide (three-letter code: XTM) (formula: C<sub>21</sub>H<sub>30</sub>FN<sub>3</sub>O<sub>5</sub>) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	
			Total	C	F	H	N			O
2	A	1	58	21	1	28	3	5	0	0
2	B	1	58	21	1	28	3	5	0	0

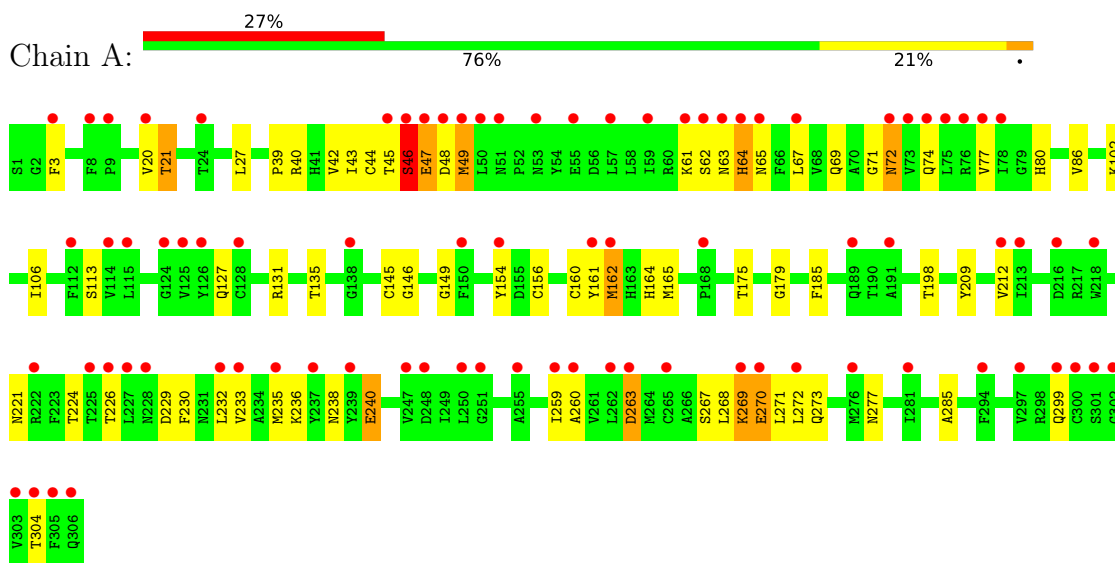
- Molecule 3 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	A	49	Total O 49 49	0	0
3	B	91	Total O 91 91	0	0

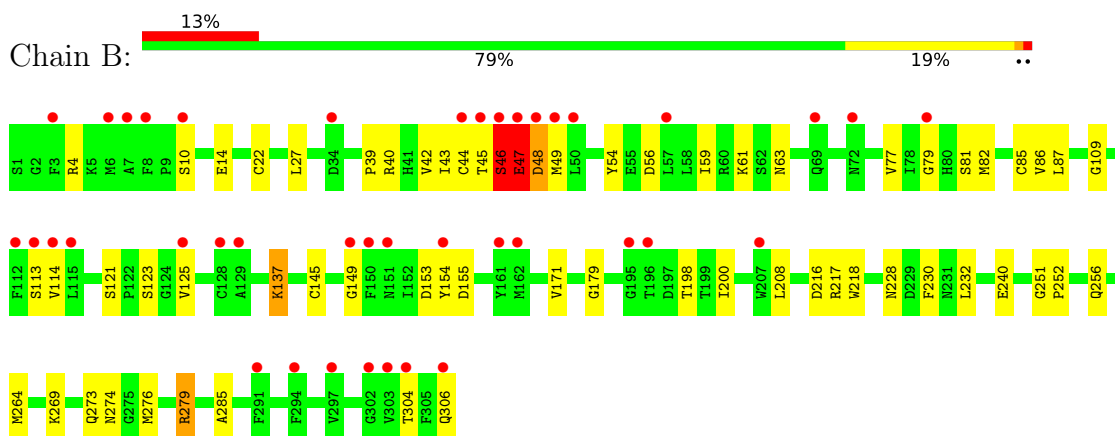
### 3 Residue-property plots i

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: 3C-like proteinase



- Molecule 1: 3C-like proteinase



## 4 Data and refinement statistics i

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	67.74Å 101.51Å 102.95Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	38.00 – 1.95 38.00 – 1.90	Depositor EDS
% Data completeness (in resolution range)	99.8 (38.00-1.95) 99.7 (38.00-1.90)	Depositor EDS
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	0.95 (at 1.89Å)	Xtrriage
Refinement program	PHENIX 1.18.2_3874	Depositor
R, $R_{free}$	0.238 , 0.277 0.239 , 0.277	Depositor DCC
$R_{free}$ test set	1999 reflections (3.51%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	35.8	Xtrriage
Anisotropy	0.483	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.36 , 31.1	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.49$ , $\langle L^2 \rangle = 0.32$	Xtrriage
Estimated twinning fraction	0.000 for -h,l,k	Xtrriage
$F_o, F_c$ correlation	0.95	EDS
Total number of atoms	9403	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	72.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.33% 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: XTM

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	0.83	8/2420 (0.3%)	1.34	23/3289 (0.7%)
1	B	0.67	6/2420 (0.2%)	0.81	13/3289 (0.4%)
All	All	0.75	14/4840 (0.3%)	1.11	36/6578 (0.5%)

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand. A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
1	A	0	6
1	B	1	1
All	All	1	7

All (14) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	47	GLU	CB-CG	21.97	1.93	1.52
1	A	162	MET	CB-CG	20.81	2.17	1.51
1	A	47	GLU	CD-OE2	13.08	1.40	1.25
1	A	21	THR	CB-CG2	12.90	1.95	1.52
1	B	47	GLU	CG-CD	12.40	1.70	1.51
1	A	47	GLU	CB-CG	11.77	1.74	1.52
1	A	240	GLU	CD-OE2	10.44	1.37	1.25
1	A	47	GLU	CG-CD	-8.06	1.39	1.51
1	B	47	GLU	CD-OE1	-6.44	1.18	1.25
1	A	240	GLU	CG-CD	6.38	1.61	1.51
1	B	48	ASP	CB-CG	5.83	1.64	1.51
1	B	137	LYS	CE-NZ	5.75	1.63	1.49
1	A	162	MET	SD-CE	5.71	2.09	1.77
1	B	137	LYS	CD-CE	5.41	1.64	1.51



All (36) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	47	GLU	OE1-CD-OE2	-30.65	86.53	123.30
1	A	240	GLU	OE1-CD-OE2	-23.66	94.90	123.30
1	A	47	GLU	CG-CD-OE2	-22.12	74.05	118.30
1	A	47	GLU	CG-CD-OE1	20.86	160.02	118.30
1	B	47	GLU	N-CA-CB	19.17	145.10	110.60
1	A	240	GLU	CG-CD-OE1	18.67	155.64	118.30
1	A	240	GLU	CG-CD-OE2	-16.22	85.86	118.30
1	A	72	ASN	N-CA-CB	11.51	131.32	110.60
1	A	162	MET	CB-CG-SD	-10.64	80.47	112.40
1	B	47	GLU	CA-C-N	10.34	139.95	117.20
1	A	263	ASP	CB-CG-OD2	-9.81	109.47	118.30
1	B	47	GLU	OE1-CD-OE2	-9.60	111.78	123.30
1	A	21	THR	OG1-CB-CG2	9.56	131.98	110.00
1	A	71	GLY	C-N-CA	-9.14	98.84	121.70
1	A	263	ASP	CB-CA-C	8.87	128.13	110.40
1	A	72	ASN	CB-CA-C	-8.16	94.07	110.40
1	A	64	HIS	N-CA-CB	-7.74	96.67	110.60
1	B	279	ARG	CG-CD-NE	7.48	127.52	111.80
1	B	47	GLU	CB-CG-CD	7.22	133.68	114.20
1	A	263	ASP	N-CA-CB	-7.20	97.63	110.60
1	B	47	GLU	CA-C-O	-7.19	105.00	120.10
1	A	47	GLU	CB-CA-C	-7.01	96.37	110.40
1	B	48	ASP	CB-CG-OD1	7.01	124.61	118.30
1	B	279	ARG	CB-CG-CD	6.92	129.58	111.60
1	A	236	LYS	CD-CE-NZ	6.81	127.36	111.70
1	B	47	GLU	CG-CD-OE1	6.75	131.80	118.30
1	A	271	LEU	CA-CB-CG	-6.65	100.00	115.30
1	A	161	TYR	O-C-N	-6.25	112.71	122.70
1	A	71	GLY	CA-C-N	5.72	129.78	117.20
1	A	162	MET	CB-CA-C	-5.66	99.07	110.40
1	A	47	GLU	N-CA-CB	5.60	120.69	110.60
1	B	49	MET	CA-CB-CG	5.40	122.48	113.30
1	B	47	GLU	O-C-N	-5.22	114.34	122.70
1	B	137	LYS	CD-CE-NZ	5.20	123.67	111.70
1	A	271	LEU	CB-CG-CD2	5.16	119.77	111.00
1	B	46	SER	CA-C-N	5.16	128.54	117.20

All (1) chirality outliers are listed below:

Mol	Chain	Res	Type	Atom
1	B	47	GLU	CA

All (7) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	20	VAL	Peptide
1	A	240	GLU	Sidechain
1	A	46	SER	Peptide
1	A	64	HIS	Sidechain
1	A	72	ASN	Mainchain,Sidechain
1	B	46	SER	Peptide

## 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	2367	2230	2313	84	0
1	B	2367	2183	2314	52	0
2	A	30	28	0	3	0
2	B	30	28	0	2	0
3	A	49	0	0	2	0
3	B	91	0	0	9	0
All	All	4934	4469	4627	132	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 14.

All (132) 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:47:GLU:CB	1:A:47:GLU:CG	1.74	1.62
1:B:47:GLU:CB	1:B:47:GLU:CG	1.93	1.43
1:A:21:THR:CB	1:A:21:THR:CG2	1.94	1.42
1:A:162:MET:SD	1:A:162:MET:CE	2.09	1.40
1:A:162:MET:CB	1:A:162:MET:CG	2.17	1.22
1:B:47:GLU:OE1	1:B:48:ASP:N	1.83	1.12
1:B:47:GLU:OE1	1:B:48:ASP:HB3	1.50	1.11
1:A:45:THR:HB	1:A:49:MET:HE2	1.33	1.07
1:A:47:GLU:CB	1:A:47:GLU:OE2	1.99	1.07
1:A:233:VAL:HG21	1:A:269:LYS:HD3	1.36	1.07

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:47:GLU:OE1	1:B:48:ASP:CB	2.05	1.04
1:A:47:GLU:OE1	1:A:48:ASP:HB2	1.63	0.98
1:A:162:MET:SD	1:A:162:MET:CB	2.52	0.97
1:A:21:THR:HG23	1:A:67:LEU:O	1.63	0.96
1:A:226:THR:OG1	1:A:229:ASP:OD1	1.85	0.94
1:B:85:CYS:SG	3:B:503:HOH:O	2.26	0.93
1:B:79:GLY:N	3:B:501:HOH:O	2.02	0.93
1:B:47:GLU:OE1	1:B:48:ASP:CA	2.18	0.92
1:B:145:CYS:SG	2:B:401:XTM:C04	2.58	0.91
1:B:77:VAL:HG12	3:B:501:HOH:O	1.71	0.91
1:A:162:MET:CE	1:A:162:MET:HB2	2.02	0.88
1:A:45:THR:HG22	1:A:49:MET:HB3	1.57	0.87
1:A:233:VAL:HG11	1:A:269:LYS:HG2	1.56	0.85
1:A:102:LYS:NZ	1:A:156:CYS:SG	2.50	0.85
1:A:62:SER:N	1:A:65:ASN:OD1	2.12	0.83
1:A:45:THR:HG22	1:A:49:MET:CB	2.12	0.80
1:A:221:ASN:OD1	3:A:501:HOH:O	1.98	0.79
1:A:39:PRO:HG3	1:A:162:MET:HG2	1.65	0.78
1:A:21:THR:CG2	1:A:21:THR:HB	2.11	0.78
1:A:46:SER:HB2	1:A:49:MET:H	1.50	0.76
1:A:162:MET:HB2	1:A:162:MET:HE1	1.65	0.76
1:B:198:THR:OG1	1:B:240:GLU:OE2	2.03	0.75
1:A:47:GLU:CG	1:A:47:GLU:C	2.55	0.74
1:A:47:GLU:OE2	1:A:47:GLU:HB3	1.88	0.73
1:B:27:LEU:HD21	1:B:42:VAL:HB	1.73	0.70
1:B:153:ASP:O	1:B:154:TYR:HB2	1.91	0.70
1:A:47:GLU:C	1:A:47:GLU:HG2	2.12	0.70
1:A:86:VAL:HG23	1:A:179:GLY:HA2	1.74	0.69
1:A:233:VAL:HG21	1:A:269:LYS:CD	2.19	0.69
1:A:47:GLU:HG2	1:A:47:GLU:O	1.92	0.69
1:A:162:MET:CE	1:A:162:MET:CB	2.70	0.68
1:A:277:ASN:OD1	3:A:502:HOH:O	2.10	0.68
1:A:269:LYS:O	1:A:272:LEU:N	2.27	0.67
1:A:27:LEU:HD21	1:A:42:VAL:HB	1.77	0.66
1:A:145:CYS:SG	2:A:401:XTM:C04	2.82	0.65
1:A:45:THR:HG21	1:A:49:MET:HG3	1.79	0.65
1:A:198:THR:HG22	1:A:238:ASN:OD1	1.97	0.65
1:A:49:MET:O	1:A:49:MET:HG2	1.95	0.65
1:A:260:ALA:HB3	1:A:263:ASP:CB	2.28	0.64
1:B:273:GLN:NE2	1:B:274:ASN:OD1	2.30	0.63
1:B:306:GLN:NE2	3:B:504:HOH:O	2.30	0.63

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:45:THR:OG1	1:B:47:GLU:OE2	2.16	0.62
1:B:86:VAL:HG23	1:B:179:GLY:HA2	1.82	0.61
1:A:47:GLU:OE2	1:A:48:ASP:N	2.34	0.61
1:B:47:GLU:CD	1:B:48:ASP:N	2.54	0.60
1:A:69:GLN:OE1	1:A:74:GLN:OE1	2.19	0.59
1:B:40:ARG:NH2	3:B:503:HOH:O	2.28	0.59
1:B:217:ARG:NH2	3:B:505:HOH:O	2.37	0.58
1:B:40:ARG:HD2	1:B:82:MET:HE1	1.85	0.57
1:B:145:CYS:SG	2:B:401:XTM:N03	2.77	0.57
1:A:45:THR:CG2	1:A:49:MET:CB	2.81	0.57
1:A:162:MET:CE	1:A:162:MET:CG	2.81	0.56
1:A:45:THR:CB	1:A:49:MET:HE2	2.22	0.56
1:A:260:ALA:HB3	1:A:263:ASP:HB3	1.90	0.54
1:A:285:ALA:HB3	1:B:285:ALA:HB3	1.89	0.54
1:B:228:ASN:O	1:B:232:LEU:HD13	2.07	0.54
1:A:21:THR:CG2	1:A:67:LEU:O	2.48	0.54
1:A:46:SER:HB2	1:A:49:MET:N	2.23	0.53
1:B:40:ARG:O	1:B:43:ILE:HG12	2.08	0.53
1:A:145:CYS:CB	2:A:401:XTM:C12	2.87	0.52
1:B:44:CYS:HG	1:B:54:TYR:HE1	1.57	0.52
1:A:165:MET:CE	1:A:185:PHE:HB3	2.39	0.52
1:A:162:MET:N	1:A:175:THR:O	2.37	0.51
1:A:260:ALA:HB3	1:A:263:ASP:HB2	1.92	0.51
1:A:45:THR:CG2	1:A:49:MET:HG3	2.40	0.51
1:A:106:ILE:HG23	1:A:160:CYS:HB2	1.93	0.51
1:A:146:GLY:HA2	1:A:162:MET:CG	2.41	0.50
1:A:233:VAL:CG2	1:A:269:LYS:HD3	2.26	0.50
1:A:45:THR:HB	1:A:49:MET:CE	2.22	0.50
1:A:47:GLU:O	1:A:49:MET:SD	2.70	0.50
1:A:165:MET:HE2	1:A:185:PHE:HB3	1.94	0.50
1:B:10:SER:O	1:B:14:GLU:HG3	2.12	0.49
1:A:230:PHE:CZ	1:A:268:LEU:HD23	2.48	0.49
1:A:40:ARG:O	1:A:43:ILE:HD12	2.12	0.49
1:B:56:ASP:O	1:B:59:ILE:HG22	2.11	0.49
1:A:209:TYR:O	1:A:212:VAL:HG22	2.12	0.49
1:B:208:LEU:HB3	1:B:264:MET:HE1	1.94	0.48
1:A:48:ASP:O	1:A:49:MET:C	2.52	0.48
1:B:27:LEU:HD13	1:B:39:PRO:HD2	1.95	0.48
1:A:47:GLU:OE1	1:A:48:ASP:CB	2.51	0.48
1:A:131:ARG:HG2	1:A:135:THR:O	2.13	0.48
1:A:304:THR:HG22	1:B:123:SER:HB2	1.95	0.48

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:224:THR:HG22	1:A:263:ASP:CB	2.44	0.48
1:A:267:SER:O	1:A:270:GLU:HB2	2.14	0.48
1:B:154:TYR:O	1:B:155:ASP:OD1	2.31	0.47
1:B:43:ILE:HD11	1:B:54:TYR:HD1	1.78	0.47
1:A:269:LYS:HD2	1:A:273:GLN:OE1	2.15	0.46
1:A:259:ILE:HG22	1:A:260:ALA:O	2.16	0.46
1:B:54:TYR:HB3	1:B:82:MET:CE	2.46	0.46
1:A:127:GLN:O	1:B:4:ARG:NH2	2.39	0.45
1:B:46:SER:O	1:B:47:GLU:C	2.53	0.45
1:A:260:ALA:O	1:A:263:ASP:HB3	2.17	0.45
1:B:22:CYS:SG	1:B:61:LYS:NZ	2.88	0.45
1:A:164:HIS:CD2	1:A:175:THR:HG23	2.52	0.45
1:A:45:THR:O	1:A:46:SER:O	2.35	0.45
1:A:232:LEU:HD13	1:A:235:MET:HE3	1.99	0.44
1:B:230:PHE:HA	1:B:269:LYS:HD2	1.98	0.44
1:A:145:CYS:SG	2:A:401:XTM:N03	2.91	0.44
1:B:276:MET:O	1:B:279:ARG:HB2	2.18	0.44
1:A:113:SER:O	1:A:149:GLY:HA2	2.18	0.44
1:A:3:PHE:CD2	1:A:299:GLN:HG2	2.53	0.44
1:B:256:GLN:HG2	1:B:304:THR:HG23	2.00	0.43
1:A:80:HIS:O	1:A:80:HIS:ND1	2.50	0.43
1:A:44:CYS:HB2	1:A:61:LYS:NZ	2.33	0.43
1:A:63:ASN:O	1:A:77:VAL:HG11	2.18	0.43
1:B:81:SER:O	1:B:87:LEU:HD12	2.19	0.43
1:B:137:LYS:HG2	1:B:171:VAL:HG12	2.01	0.43
1:B:44:CYS:SG	1:B:54:TYR:CE1	3.12	0.43
1:A:45:THR:C	1:A:49:MET:HE3	2.40	0.42
1:B:109:GLY:HA2	1:B:200:ILE:HD13	2.02	0.42
1:A:304:THR:CB	1:B:121:SER:OG	2.68	0.42
1:A:162:MET:SD	1:A:162:MET:HB2	2.52	0.41
1:B:81:SER:N	3:B:512:HOH:O	2.54	0.41
1:B:114:VAL:O	1:B:125:VAL:HA	2.21	0.41
1:A:45:THR:CG2	1:A:49:MET:CG	2.99	0.41
1:B:63:ASN:CG	3:B:501:HOH:O	2.59	0.41
1:B:216:ASP:OD1	1:B:218:TRP:HD1	2.03	0.41
1:B:251:GLY:N	1:B:252:PRO:HD2	2.36	0.41
1:A:232:LEU:HA	1:A:235:MET:HE2	2.03	0.40
1:B:113:SER:O	1:B:149:GLY:HA2	2.21	0.40
1:B:54:TYR:HB3	1:B:82:MET:HE3	2.03	0.40
1:B:87:LEU:CD1	3:B:512:HOH:O	2.68	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	304/306 (99%)	291 (96%)	8 (3%)	5 (2%)	9	2
1	B	304/306 (99%)	295 (97%)	8 (3%)	1 (0%)	41	30
All	All	608/612 (99%)	586 (96%)	16 (3%)	6 (1%)	15	6

All (6) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	46	SER
1	A	270	GLU
1	B	47	GLU
1	A	49	MET
1	A	154	TYR
1	A	269	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	263/263 (100%)	263 (100%)	0	100	100
1	B	263/263 (100%)	262 (100%)	1 (0%)	91	90
All	All	526/526 (100%)	525 (100%)	1 (0%)	93	93

All (1) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	47	GLU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. There are no such sidechains identified.

### 5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

## 5.4 Non-standard residues in protein, DNA, RNA chains [i](#)

There are no non-standard protein/DNA/RNA residues in this entry.

## 5.5 Carbohydrates [i](#)

There are no monosaccharides in this entry.

## 5.6 Ligand geometry [i](#)

2 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	XTM	A	401	1	31,31,31	4.19	15 (48%)	39,41,41	1.62	8 (20%)
2	XTM	B	401	1	31,31,31	4.18	15 (48%)	39,41,41	1.75	9 (23%)

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	XTM	A	401	1	-	0/27/37/37	0/2/2/2

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	XTM	B	401	1	1/1/10/10	5/27/37/37	0/2/2/2

All (30) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	401	XTM	C10-N09	14.77	1.49	1.33
2	B	401	XTM	C10-N09	14.47	1.49	1.33
2	B	401	XTM	C26-C27	8.26	1.53	1.37
2	A	401	XTM	C26-C27	8.26	1.53	1.37
2	A	401	XTM	C29-C23	8.23	1.53	1.39
2	B	401	XTM	C29-C23	8.20	1.53	1.39
2	A	401	XTM	C25-C24	6.82	1.53	1.38
2	B	401	XTM	C25-C24	6.77	1.53	1.38
2	B	401	XTM	C02-N03	5.57	1.46	1.34
2	B	401	XTM	O13-C12	-5.48	1.19	1.42
2	A	401	XTM	O13-C12	-5.46	1.19	1.42
2	A	401	XTM	C02-N03	5.43	1.46	1.34
2	B	401	XTM	C20-N19	4.33	1.45	1.34
2	A	401	XTM	C20-N19	4.12	1.44	1.34
2	B	401	XTM	C29-C27	-3.28	1.32	1.37
2	B	401	XTM	C25-C26	-3.26	1.32	1.38
2	A	401	XTM	C29-C27	-3.24	1.32	1.37
2	A	401	XTM	C25-C26	-3.20	1.32	1.38
2	B	401	XTM	C24-C23	-3.09	1.32	1.38
2	A	401	XTM	C24-C23	-3.07	1.32	1.38
2	B	401	XTM	O21-C20	2.79	1.40	1.35
2	A	401	XTM	O21-C20	2.68	1.40	1.35
2	A	401	XTM	O21-C22	-2.56	1.40	1.45
2	B	401	XTM	O21-C22	-2.53	1.40	1.45
2	B	401	XTM	O11-C10	-2.51	1.18	1.23
2	B	401	XTM	O01-C02	-2.45	1.18	1.23
2	A	401	XTM	O11-C10	-2.42	1.18	1.23
2	A	401	XTM	O01-C02	-2.21	1.19	1.23
2	A	401	XTM	C08-N09	2.15	1.50	1.46
2	B	401	XTM	C08-N09	2.12	1.50	1.46

All (17) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	401	XTM	O21-C20-N19	4.38	119.40	110.50
2	A	401	XTM	O21-C20-N19	3.96	118.56	110.50
2	A	401	XTM	C07-C06-C10	3.66	107.63	102.88

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	401	XTM	C08-N09-C10	-3.60	106.77	113.84
2	B	401	XTM	O13-C12-C04	3.59	121.22	111.95
2	B	401	XTM	C07-C06-C10	3.58	107.54	102.88
2	A	401	XTM	O13-C12-C04	3.32	120.54	111.95
2	B	401	XTM	O30-C20-N19	-3.28	119.48	124.85
2	A	401	XTM	O30-C20-N19	-3.25	119.52	124.85
2	A	401	XTM	C07-C08-N09	3.16	108.06	103.43
2	A	401	XTM	C08-N09-C10	-3.11	107.74	113.84
2	B	401	XTM	C05-C06-C07	-2.84	106.88	117.31
2	B	401	XTM	C07-C08-N09	2.75	107.46	103.43
2	B	401	XTM	C16-C15-C14	-2.63	108.19	115.43
2	B	401	XTM	C26-C27-C29	-2.47	120.08	123.29
2	A	401	XTM	C26-C27-C29	-2.45	120.11	123.29
2	A	401	XTM	C05-C06-C07	-2.04	109.79	117.31

All (1) chirality outliers are listed below:

Mol	Chain	Res	Type	Atom
2	B	401	XTM	C04

All (5) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	B	401	XTM	C04-C05-C06-C10
2	B	401	XTM	C04-C05-C06-C07
2	B	401	XTM	C05-C04-N03-C02
2	B	401	XTM	C14-C15-C16-C17
2	B	401	XTM	C14-C15-C16-C18

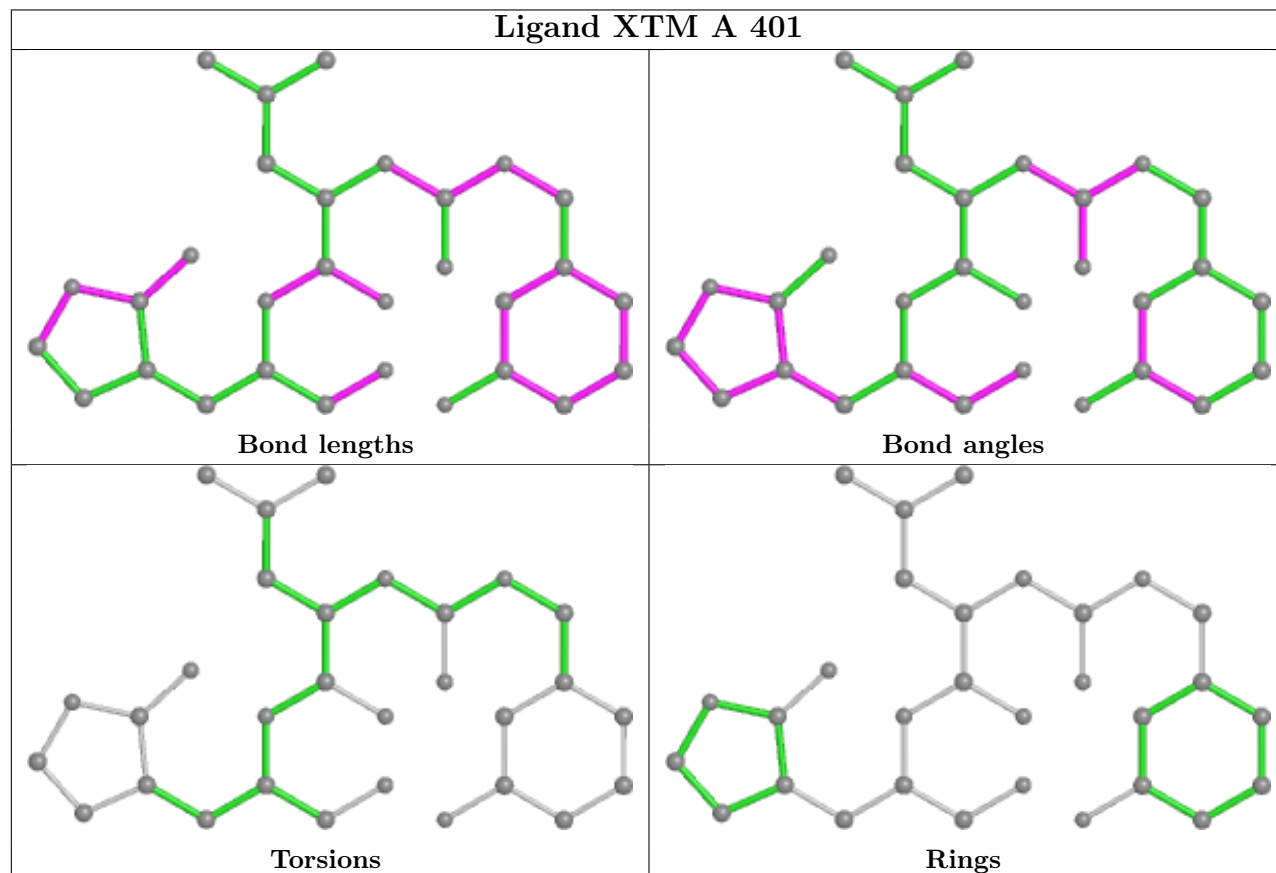
There are no ring outliers.

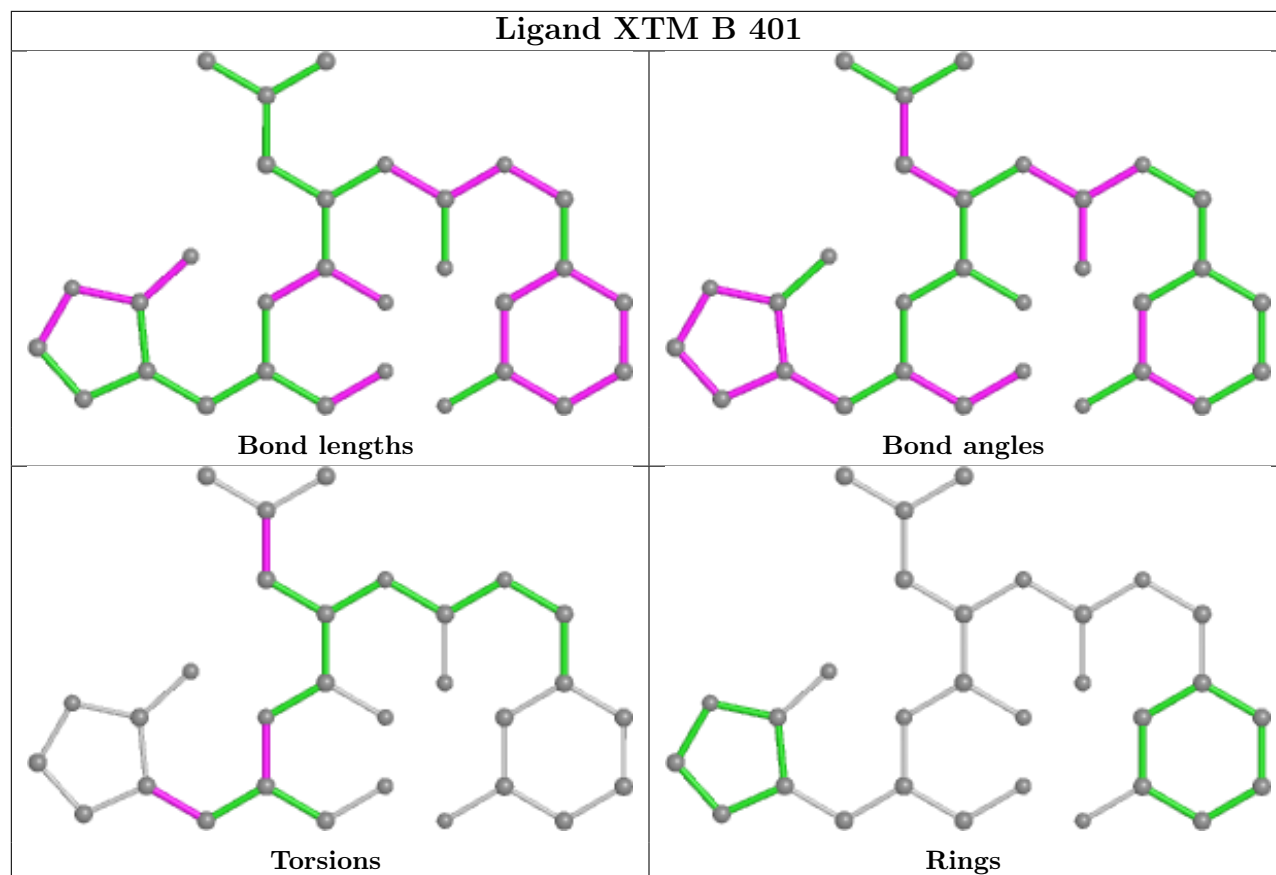
2 monomers are involved in 5 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	A	401	XTM	3	0
2	B	401	XTM	2	0

The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less than 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be

highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.





## 5.7 Other polymers [i](#)

There are no such residues in this entry.

## 5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

## 6 Fit of model and data

### 6.1 Protein, DNA and RNA chains

In the following table, the column labelled ‘#RSRZ > 2’ contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 95<sup>th</sup> percentile and maximum values of the occupancy-weighted average B-factor per residue. The column labelled ‘Q < 0.9’ lists the number of (and percentage) of residues with an average occupancy less than 0.9.

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2	OWAB(Å <sup>2</sup> )	Q<0.9
1	A	306/306 (100%)	1.61	83 (27%) <b>0</b> <b>0</b>	41, 64, 124, 211	0
1	B	306/306 (100%)	1.01	40 (13%) <b>3</b> <b>5</b>	41, 55, 85, 193	0
All	All	612/612 (100%)	1.31	123 (20%) <b>1</b> <b>1</b>	41, 59, 110, 211	0

All (123) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	48	ASP	10.0
1	A	46	SER	9.5
1	A	50	LEU	8.5
1	A	302	GLY	8.4
1	A	306	GLN	7.8
1	A	305	PHE	7.7
1	A	232	LEU	7.3
1	A	47	GLU	7.1
1	A	303	VAL	6.4
1	A	59	ILE	5.9
1	A	73	VAL	5.4
1	A	162	MET	5.2
1	A	300	CYS	4.7
1	A	64	HIS	4.7
1	A	272	LEU	4.7
1	A	63	ASN	4.6
1	A	259	ILE	4.6
1	B	49	MET	4.6
1	B	46	SER	4.5
1	A	304	THR	4.5
1	A	76	ARG	4.3
1	A	301	SER	4.2
1	A	265	CYS	4.0
1	A	262	LEU	3.9

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>	<b>RSRZ</b>
1	B	154	TYR	3.6
1	A	115	LEU	3.5
1	A	75	LEU	3.5
1	B	125	VAL	3.5
1	A	53	ASN	3.4
1	A	222	ARG	3.4
1	A	124	GLY	3.4
1	A	45	THR	3.3
1	A	270	GLU	3.3
1	A	61	LYS	3.3
1	B	72	ASN	3.2
1	A	191	ALA	3.2
1	A	247	VAL	3.2
1	A	235	MET	3.2
1	A	251	GLY	3.1
1	A	114	VAL	3.1
1	B	44	CYS	3.1
1	B	7	ALA	3.0
1	A	233	VAL	3.0
1	A	78	ILE	3.0
1	A	20	VAL	3.0
1	A	255	ALA	3.0
1	A	168	PRO	2.9
1	B	306	GLN	2.9
1	A	213	ILE	2.9
1	A	294	PHE	2.9
1	A	9	PRO	2.9
1	A	125	VAL	2.9
1	A	24	THR	2.8
1	B	304	THR	2.8
1	A	189	GLN	2.8
1	A	297	VAL	2.8
1	B	113	SER	2.8
1	A	74	GLN	2.8
1	A	126	TYR	2.8
1	A	3	PHE	2.8
1	A	227	LEU	2.8
1	A	154	TYR	2.8
1	A	260	ALA	2.7
1	A	299	GLN	2.7
1	A	276	MET	2.7
1	A	128	CYS	2.7

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>	<b>RSRZ</b>
1	A	49	MET	2.7
1	A	55	GLU	2.7
1	A	67	LEU	2.7
1	B	8	PHE	2.6
1	B	302	GLY	2.6
1	B	6	MET	2.6
1	A	263	ASP	2.6
1	B	48	ASP	2.6
1	B	303	VAL	2.6
1	B	128	CYS	2.6
1	B	150	PHE	2.6
1	A	51	ASN	2.6
1	B	161	TYR	2.6
1	A	8	PHE	2.5
1	B	294	PHE	2.5
1	B	115	LEU	2.5
1	A	65	ASN	2.5
1	A	72	ASN	2.5
1	A	212	VAL	2.5
1	A	150	PHE	2.5
1	B	50	LEU	2.5
1	A	77	VAL	2.4
1	B	196	THR	2.4
1	A	218	TRP	2.4
1	A	226	THR	2.4
1	B	47	GLU	2.4
1	A	269	LYS	2.3
1	A	237	TYR	2.3
1	B	195	GLY	2.3
1	A	62	SER	2.3
1	B	10	SER	2.3
1	A	248	ASP	2.3
1	A	250	LEU	2.3
1	A	216	ASP	2.3
1	B	114	VAL	2.2
1	A	112	PHE	2.2
1	A	228	ASN	2.2
1	A	161	TYR	2.2
1	B	112	PHE	2.2
1	B	291	PHE	2.2
1	B	129	ALA	2.2
1	A	138	GLY	2.2

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Mol	Chain	Res	Type	RSRZ
1	B	34	ASP	2.2
1	A	239	TYR	2.2
1	B	162	MET	2.1
1	B	151	ASN	2.1
1	A	225	THR	2.1
1	B	3	PHE	2.1
1	B	297	VAL	2.1
1	A	57	LEU	2.1
1	B	57	LEU	2.1
1	B	149	GLY	2.1
1	B	69	GLN	2.0
1	B	207	TRP	2.0
1	B	79	GLY	2.0
1	A	281	ILE	2.0
1	B	45	THR	2.0

## 6.2 Non-standard residues in protein, DNA, RNA chains [i](#)

There are no non-standard protein/DNA/RNA residues in this entry.

## 6.3 Carbohydrates [i](#)

There are no monosaccharides in this entry.

## 6.4 Ligands [i](#)

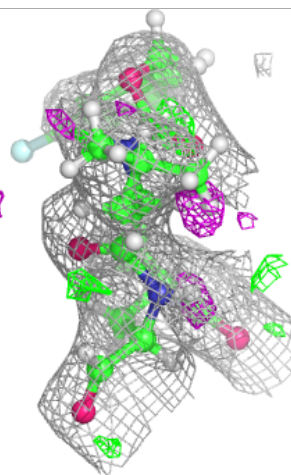
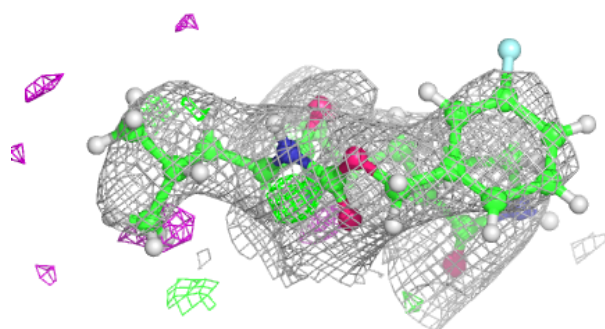
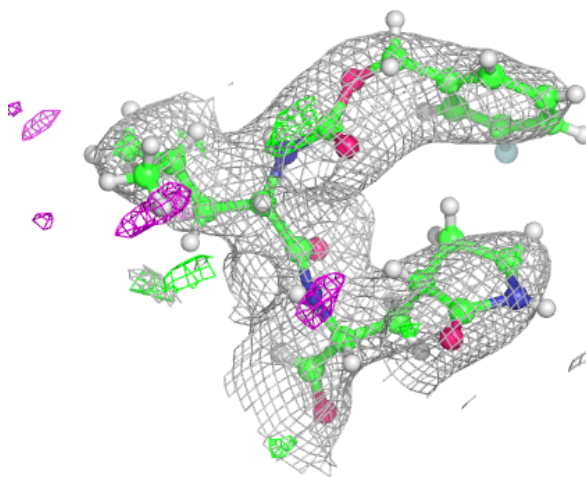
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95<sup>th</sup> percentile and maximum values of B factors of atoms in the group. The column labelled 'Q < 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
2	XTM	B	401	30/30	0.90	0.21	47,80,112,118	0
2	XTM	A	401	30/30	0.91	0.14	43,68,94,113	0

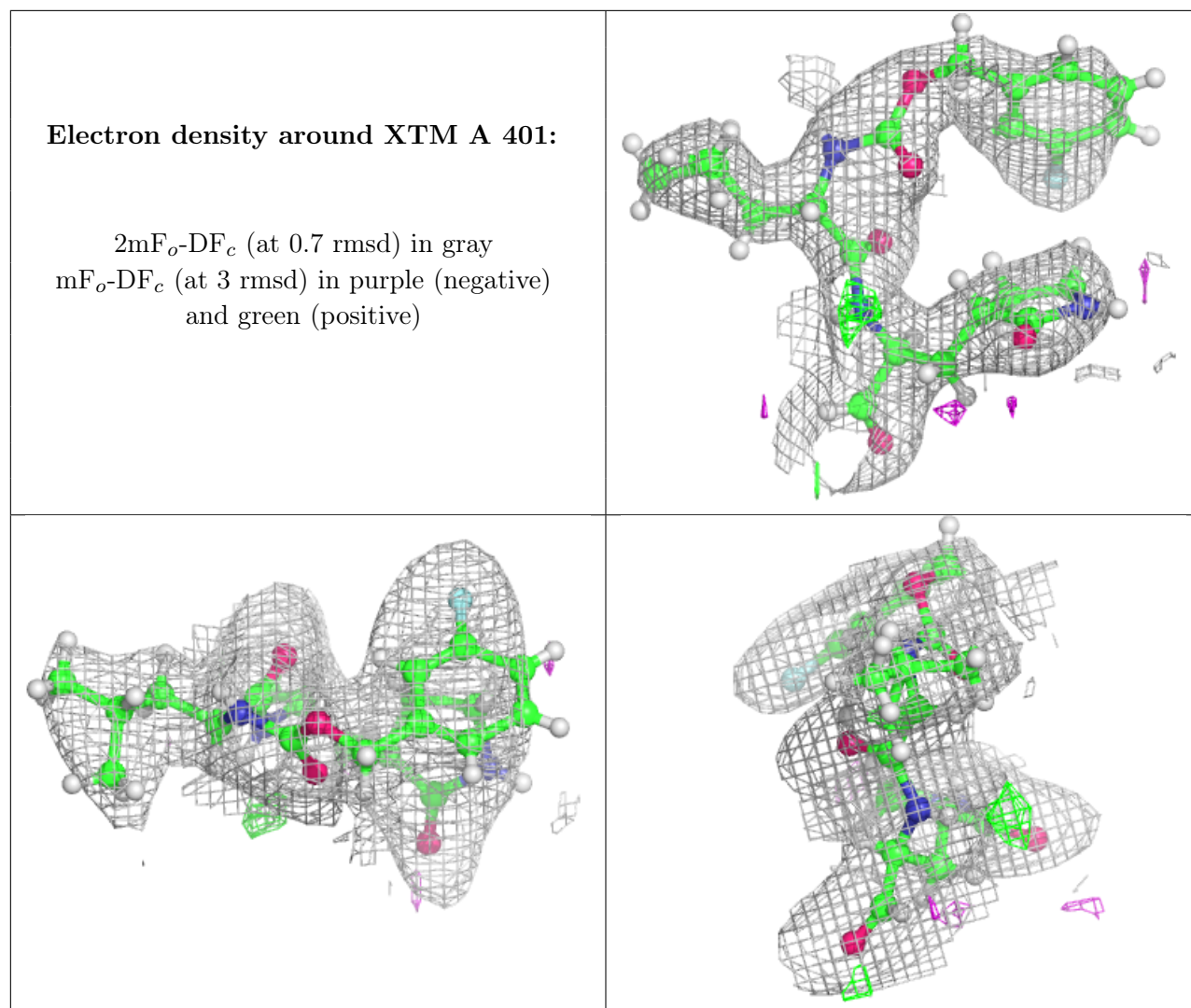
The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation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

**Electron density around XTM B 401:**

$2mF_o-DF_c$  (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.