Full wwPDB X-ray Structure Validation Report (i)

Jun 15, 2024 – 05:11 PM EDT

PDB ID	:	1XR2
Title	:	Crystal Structure of oxidized T. maritima Cobalamin-Independent Methionine Synthase complexed with Methyltetrahydrofolate
Authors	:	Pejchal, R.; Ludwig, M.L.
Deposited on	:	2004-10-13
Resolution	:	2.35 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*
A user guide is available at
https://www.wwpdb.org/validation/2017/XrayValidationReportHelp
with specific help available everywhere you see the (i) symbol.

The types of validation reports are described at
http://www.wwpdb.org/validation/2017/FAQs#types.

The following versions of software and data (see references (i)) were used in the production of this report:

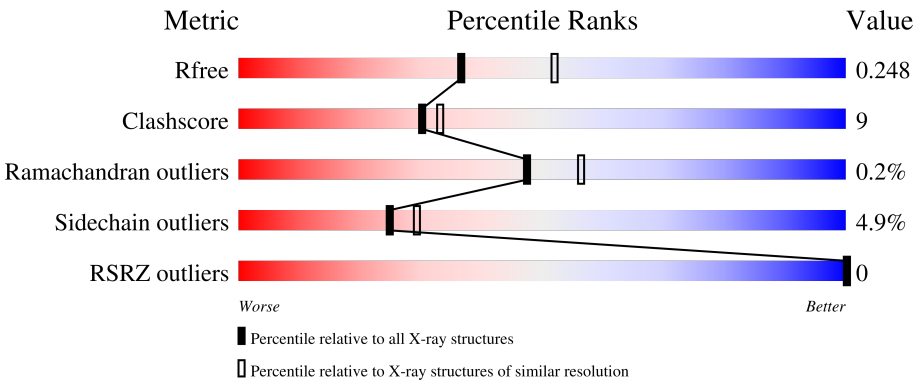
MolProbity	:	4.02b-467
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	1.20.1
EDS	:	2.37.1
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.37.1

1 Overall quality at a glance (i)

The following experimental techniques were used to determine the structure:
X-RAY DIFFRACTION

The reported resolution of this entry is 2.35 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	1164 (2.36-2.36)
Clashscore	141614	1232 (2.36-2.36)
Ramachandran outliers	138981	1211 (2.36-2.36)
Sidechain outliers	138945	1212 (2.36-2.36)
RSRZ outliers	127900	1150 (2.36-2.36)

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 >=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 <=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	766	72% 20% • 7%
1	B	766	75% 18% • 5%

2 Entry composition (i)

There are 5 unique types of molecules in this entry. The entry contains 11505 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 5-methyltetrahydropteroyltriglutamate--homocysteine methyltransferase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	715	5535	3597	903	1012	23	0	0	0
			Total	C	N	O	S			
1	B	728	5640	3660	919	1037	24	0	0	0

There are 66 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-31	MET	-	EXPRESSION TAG	UNP Q9X112
A	-30	HIS	-	EXPRESSION TAG	UNP Q9X112
A	-29	HIS	-	EXPRESSION TAG	UNP Q9X112
A	-28	HIS	-	EXPRESSION TAG	UNP Q9X112
A	-27	HIS	-	EXPRESSION TAG	UNP Q9X112
A	-26	HIS	-	EXPRESSION TAG	UNP Q9X112
A	-25	HIS	-	EXPRESSION TAG	UNP Q9X112
A	-24	GLY	-	EXPRESSION TAG	UNP Q9X112
A	-23	LYS	-	EXPRESSION TAG	UNP Q9X112
A	-22	PRO	-	EXPRESSION TAG	UNP Q9X112
A	-21	ILE	-	EXPRESSION TAG	UNP Q9X112
A	-20	PRO	-	EXPRESSION TAG	UNP Q9X112
A	-19	ASN	-	EXPRESSION TAG	UNP Q9X112
A	-18	PRO	-	EXPRESSION TAG	UNP Q9X112
A	-17	LEU	-	EXPRESSION TAG	UNP Q9X112
A	-16	LEU	-	EXPRESSION TAG	UNP Q9X112
A	-15	GLY	-	EXPRESSION TAG	UNP Q9X112
A	-14	LEU	-	EXPRESSION TAG	UNP Q9X112
A	-13	ASP	-	EXPRESSION TAG	UNP Q9X112
A	-12	SER	-	EXPRESSION TAG	UNP Q9X112
A	-11	THR	-	EXPRESSION TAG	UNP Q9X112
A	-10	GLU	-	EXPRESSION TAG	UNP Q9X112
A	-9	ASN	-	EXPRESSION TAG	UNP Q9X112
A	-8	LEU	-	EXPRESSION TAG	UNP Q9X112

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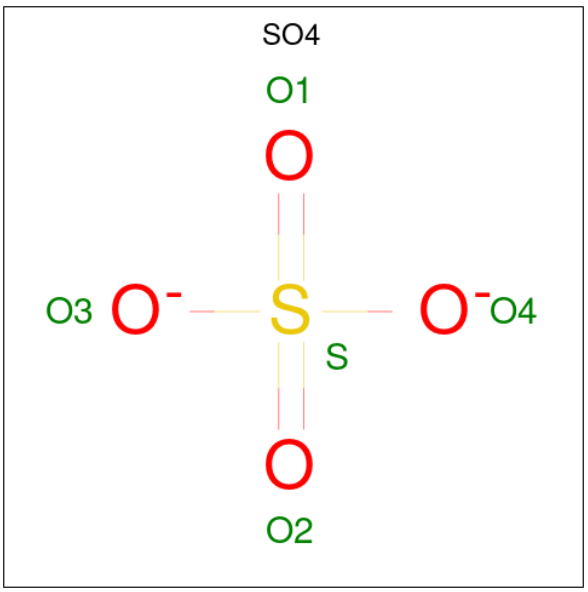
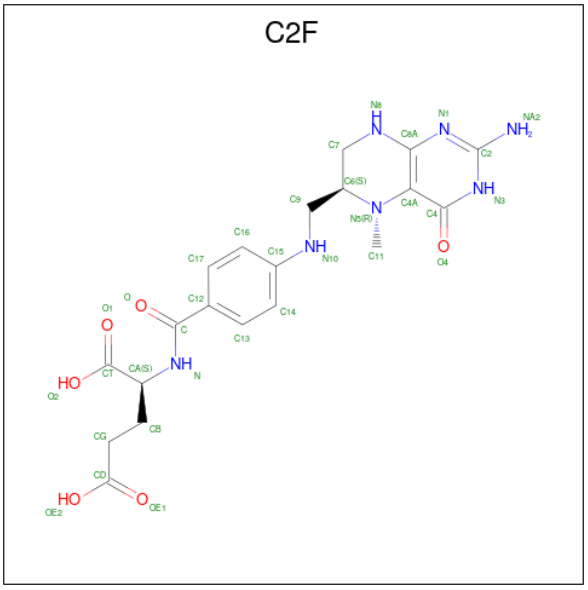
Chain	Residue	Modelled	Actual	Comment	Reference
A	-7	TYR	-	EXPRESSION TAG	UNP Q9X112
A	-6	PHE	-	EXPRESSION TAG	UNP Q9X112
A	-5	GLN	-	EXPRESSION TAG	UNP Q9X112
A	-4	GLY	-	EXPRESSION TAG	UNP Q9X112
A	-3	ILE	-	EXPRESSION TAG	UNP Q9X112
A	-2	ASP	-	EXPRESSION TAG	UNP Q9X112
A	-1	PRO	-	EXPRESSION TAG	UNP Q9X112
A	0	PHE	-	EXPRESSION TAG	UNP Q9X112
A	1	THR	-	EXPRESSION TAG	UNP Q9X112
B	-31	MET	-	EXPRESSION TAG	UNP Q9X112
B	-30	HIS	-	EXPRESSION TAG	UNP Q9X112
B	-29	HIS	-	EXPRESSION TAG	UNP Q9X112
B	-28	HIS	-	EXPRESSION TAG	UNP Q9X112
B	-27	HIS	-	EXPRESSION TAG	UNP Q9X112
B	-26	HIS	-	EXPRESSION TAG	UNP Q9X112
B	-25	HIS	-	EXPRESSION TAG	UNP Q9X112
B	-24	GLY	-	EXPRESSION TAG	UNP Q9X112
B	-23	LYS	-	EXPRESSION TAG	UNP Q9X112
B	-22	PRO	-	EXPRESSION TAG	UNP Q9X112
B	-21	ILE	-	EXPRESSION TAG	UNP Q9X112
B	-20	PRO	-	EXPRESSION TAG	UNP Q9X112
B	-19	ASN	-	EXPRESSION TAG	UNP Q9X112
B	-18	PRO	-	EXPRESSION TAG	UNP Q9X112
B	-17	LEU	-	EXPRESSION TAG	UNP Q9X112
B	-16	LEU	-	EXPRESSION TAG	UNP Q9X112
B	-15	GLY	-	EXPRESSION TAG	UNP Q9X112
B	-14	LEU	-	EXPRESSION TAG	UNP Q9X112
B	-13	ASP	-	EXPRESSION TAG	UNP Q9X112
B	-12	SER	-	EXPRESSION TAG	UNP Q9X112
B	-11	THR	-	EXPRESSION TAG	UNP Q9X112
B	-10	GLU	-	EXPRESSION TAG	UNP Q9X112
B	-9	ASN	-	EXPRESSION TAG	UNP Q9X112
B	-8	LEU	-	EXPRESSION TAG	UNP Q9X112
B	-7	TYR	-	EXPRESSION TAG	UNP Q9X112
B	-6	PHE	-	EXPRESSION TAG	UNP Q9X112
B	-5	GLN	-	EXPRESSION TAG	UNP Q9X112
B	-4	GLY	-	EXPRESSION TAG	UNP Q9X112
B	-3	ILE	-	EXPRESSION TAG	UNP Q9X112
B	-2	ASP	-	EXPRESSION TAG	UNP Q9X112
B	-1	PRO	-	EXPRESSION TAG	UNP Q9X112
B	0	PHE	-	EXPRESSION TAG	UNP Q9X112
B	1	THR	-	EXPRESSION TAG	UNP Q9X112

- Molecule 2 is SULFATE ION (three-letter code: SO4) (formula: O_4S).



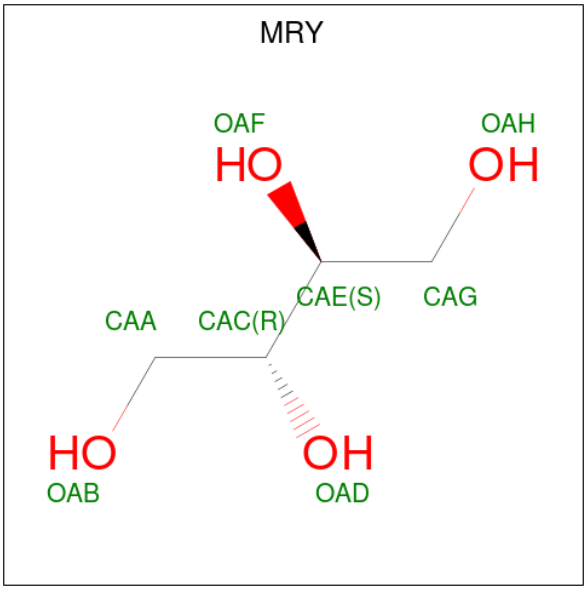
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
2	A	1	Total O S 5 4 1	0	0
2	B	1	Total O S 5 4 1	0	0

- Molecule 3 is 5-METHYL-5,6,7,8-TETRAHYDROFOLIC ACID (three-letter code: C2F) (formula: $C_{20}H_{25}N_7O_6$).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
			Total	C	N	O		
3	A	1	33	20	7	6	0	0
			Total	C	N	O		
3	B	1	33	20	7	6	0	0

- Molecule 4 is MESO-ERYTHRITOL (three-letter code: MRY) (formula: $C_4H_{10}O_4$).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
			Total	C	O			
4	A	1	8	4	4		0	0
			Total	C	O			
4	B	1	8	4	4		0	0

- Molecule 5 is water.

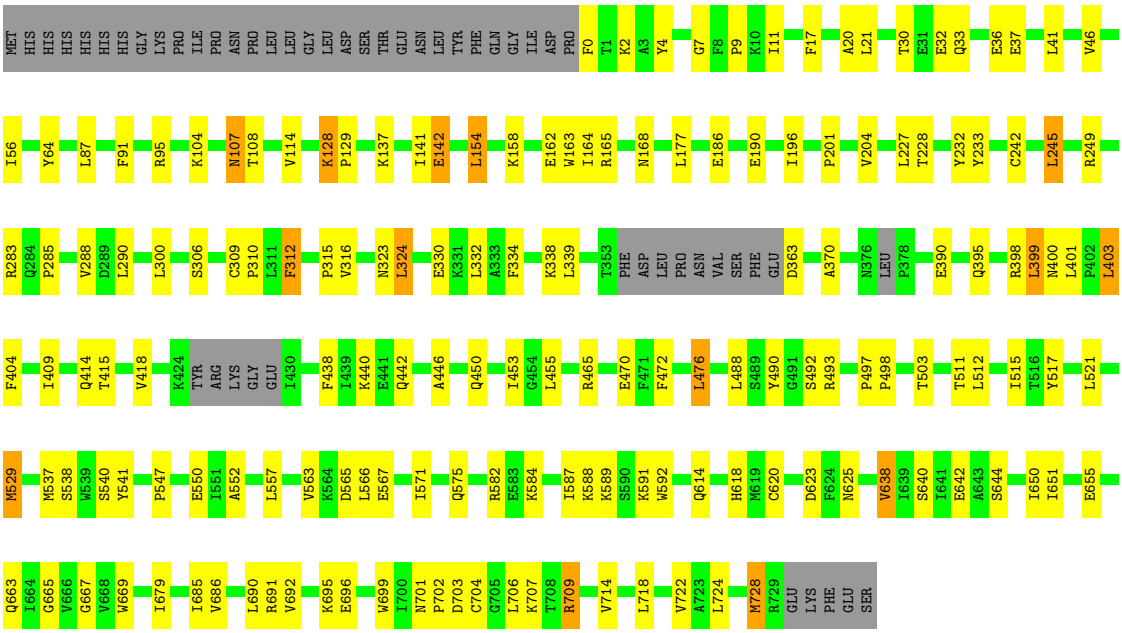
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	O		
5	A	124	124	124	0	0
			Total	O		
5	B	114	114	114	0	0

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.

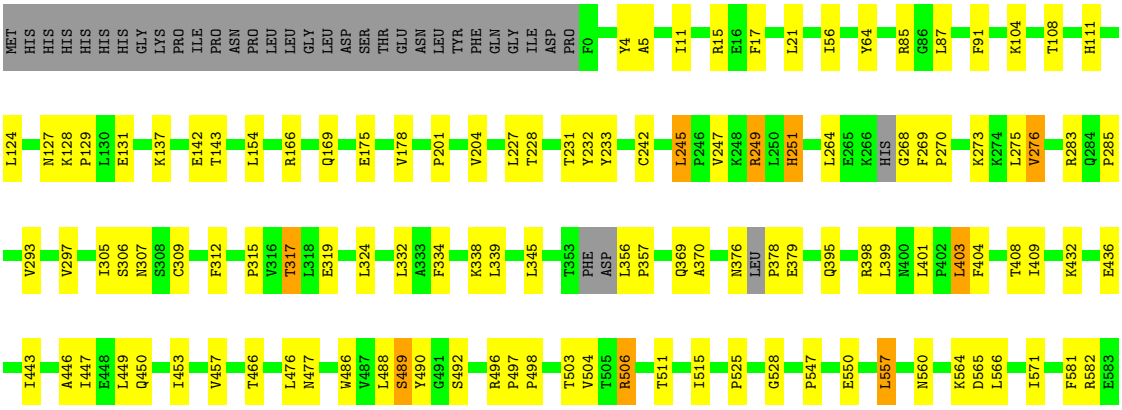
• Molecule 1: 5-methyltetrahydropteroyltriglutamate--homocysteine methyltransferase

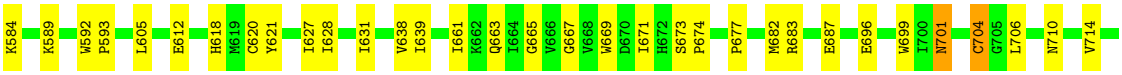
Chain A:



• Molecule 1: 5-methyltetrahydropteroyltriglutamate--homocysteine methyltransferase

Chain B:




K584
K589
W592
P593
L605
E612
H618
M619
C620
Y621
I627
I628
I631
V638
I639
I661
K662
Q663
I664
G665
V666
G667
V668
W669
D670
I671
H672
S673
P674
P677
M682
R683
E687
E696
W699
I700
N701
C704
G705
L706
N710
V714

L718
R719
N720
A725
R729
E730
K731
PHE
GLU
SER

4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 21 21 2	Depositor
Cell constants a, b, c, α, β, γ	164.06Å 159.01Å 64.54Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	19.95 – 2.35 19.95 – 2.07	Depositor EDS
% Data completeness (in resolution range)	97.5 (19.95-2.35) 95.8 (19.95-2.07)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	0.09	Depositor
$< I/\sigma(I) >$ [1]	2.05 (at 2.07Å)	Xtriage
Refinement program	CNS 1.1	Depositor
R, R_{free}	0.207 , 0.254 0.202 , 0.248	Depositor DCC
R_{free} test set	3465 reflections (3.51%)	wwPDB-VP
Wilson B-factor (Å^2)	27.8	Xtriage
Anisotropy	0.187	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.33 , 28.5	EDS
L-test for twinning[2]	$< \|L\| > = 0.45$, $< L^2 > = 0.28$	Xtriage
Estimated twinning fraction	0.049 for k,h,-l	Xtriage
F_o,F_c correlation	0.94	EDS
Total number of atoms	11505	wwPDB-VP
Average B, all atoms (Å^2)	29.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.59% of the height of the origin peak. No significant pseudotranslation is detected.*

[1]Intensities estimated from amplitudes.

[2]Theoretical values of $< |L| >$, $< L^2 >$ 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: MRY, SO4, C2F

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	0.36	0/5674	0.56	0/7722
1	B	0.36	0/5780	0.58	1/7869 (0.0%)
All	All	0.36	0/11454	0.57	1/15591 (0.0%)

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	B	528	GLY	N-CA-C	-6.03	98.03	113.10

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	5535	0	5241	106	0
1	B	5640	0	5335	95	0
2	A	5	0	0	0	0
2	B	5	0	0	0	0
3	A	33	0	23	1	0
3	B	33	0	23	2	0
4	A	8	0	10	0	0
4	B	8	0	10	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
5	A	124	0	0	5	0
5	B	114	0	0	2	0
All	All	11505	0	10642	203	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 9.

All (203) 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:107:ASN:HD22	1:A:107:ASN:H	1.22	0.84
1:A:21:LEU:HD23	1:A:492:SER:HB3	1.61	0.82
1:B:403:LEU:O	1:B:729:ARG:HD3	1.83	0.78
1:B:557:LEU:HD23	1:B:605:LEU:HD21	1.69	0.75
1:A:114:VAL:HG11	1:A:158:LYS:HD2	1.69	0.74
1:A:37:GLU:O	1:A:41:LEU:HD13	1.90	0.72
1:B:449:LEU:O	1:B:453:ILE:HG12	1.91	0.71
1:A:201:PRO:O	1:A:204:VAL:HG22	1.89	0.71
1:A:283:ARG:HG3	1:A:309:CYS:SG	2.34	0.68
1:A:669:TRP:CH2	1:A:706:LEU:HD11	2.29	0.67
1:B:683:ARG:O	1:B:687:GLU:HG3	1.94	0.67
1:A:56:ILE:HD12	1:A:56:ILE:N	2.10	0.67
1:A:20:ALA:HB2	1:A:37:GLU:HG2	1.76	0.66
1:B:665:GLY:HA2	1:B:699:TRP:HB2	1.76	0.66
1:A:706:LEU:HD23	5:A:1011:HOH:O	1.96	0.65
1:A:512:LEU:HD11	1:A:565:ASP:HB3	1.78	0.64
1:A:679:ILE:HG23	1:A:724:LEU:HB2	1.79	0.64
1:B:638:VAL:HG22	1:B:663:GLN:HB2	1.80	0.64
1:A:186:GLU:O	1:A:190:GLU:HG3	1.97	0.64
1:B:4:TYR:HB2	1:B:306:SER:HB3	1.80	0.64
1:A:691:ARG:HG3	1:A:692:VAL:HG23	1.80	0.62
1:B:127:ASN:O	1:B:131:GLU:HG3	1.99	0.62
3:B:1201:C2F:H112	3:B:1201:C2F:O4	2.01	0.61
3:A:1200:C2F:H112	3:A:1200:C2F:O4	2.01	0.61
1:A:538:SER:HB3	1:A:584:LYS:HD2	1.83	0.61
1:A:644:SER:HA	1:A:685:ILE:HD13	1.83	0.61
1:A:669:TRP:CE3	1:A:702:PRO:HB3	2.35	0.61
1:A:618:HIS:CE1	1:A:704:CYS:SG	2.93	0.60
1:B:232:TYR:O	1:B:233:TYR:HB2	2.01	0.60
1:B:376:ASN:C	1:B:378:PRO:HD3	2.21	0.60
1:A:163:TRP:HB3	1:A:165:ARG:HG3	1.83	0.60

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:701:ASN:HB2	1:A:702:PRO:HD2	1.84	0.60
1:A:30:THR:HG23	1:A:33:GLN:OE1	2.01	0.59
1:A:667:GLY:HA2	1:A:701:ASN:O	2.02	0.59
1:B:432:LYS:O	1:B:436:GLU:HG3	2.02	0.59
1:B:581:PHE:HE2	1:B:631:ILE:HD12	1.66	0.59
1:B:571:ILE:HD12	1:B:571:ILE:N	2.19	0.58
1:A:232:TYR:O	1:A:233:TYR:HB2	2.04	0.58
1:A:107:ASN:ND2	1:A:587:ILE:HD11	2.19	0.58
1:B:283:ARG:HG2	1:B:309:CYS:SG	2.44	0.57
1:B:557:LEU:CD2	1:B:605:LEU:HD21	2.35	0.57
1:B:627:ILE:HD12	1:B:631:ILE:HD11	1.87	0.57
1:A:128:LYS:HB2	1:A:128:LYS:NZ	2.21	0.56
1:A:571:ILE:N	1:A:571:ILE:HD12	2.20	0.56
1:A:709:ARG:NE	1:A:709:ARG:HA	2.20	0.56
1:B:15:ARG:HH11	1:B:15:ARG:HG3	1.70	0.56
1:B:582:ARG:HB3	1:B:621:TYR:CZ	2.41	0.56
1:B:137:LYS:HD3	1:B:142:GLU:OE2	2.06	0.56
1:A:228:THR:HG23	1:A:249:ARG:HG3	1.87	0.55
1:A:665:GLY:HA2	1:A:699:TRP:HB2	1.87	0.55
1:B:270:PRO:HB2	1:B:273:LYS:HG2	1.89	0.53
1:A:409:ILE:HG22	1:A:575:GLN:OE1	2.09	0.53
1:A:404:PHE:CD2	1:A:728:MET:HB3	2.44	0.53
1:A:511:THR:O	1:A:515:ILE:HG12	2.07	0.53
1:A:32:GLU:O	1:A:36:GLU:HG3	2.09	0.53
1:A:686:VAL:O	1:A:690:LEU:HG	2.09	0.53
1:A:154:LEU:HD13	1:A:177:LEU:HD22	1.90	0.52
1:B:231:THR:H	1:B:251:HIS:HD2	1.57	0.52
1:B:395:GLN:O	1:B:399:LEU:HD23	2.09	0.52
1:B:571:ILE:HD12	1:B:571:ILE:H	1.74	0.52
1:B:443:ILE:O	1:B:447:ILE:HG12	2.10	0.52
1:A:4:TYR:HB2	1:A:306:SER:HB3	1.90	0.52
1:A:453:ILE:HG22	1:A:722:VAL:HG21	1.92	0.51
1:B:725:ALA:O	1:B:729:ARG:HG3	2.10	0.51
1:B:486:TRP:CE3	1:B:496:ARG:HG3	2.45	0.51
1:A:168:ASN:HB3	1:B:589:LYS:O	2.11	0.51
1:A:638:VAL:HB	1:A:663:GLN:HB2	1.91	0.51
1:A:547:PRO:HG2	1:A:550:GLU:HB2	1.93	0.51
1:B:315:PRO:HB2	1:B:334:PHE:CD2	2.46	0.50
1:B:166:ARG:HB2	1:B:169:GLN:OE1	2.11	0.50
1:A:288:VAL:O	1:A:290:LEU:HD22	2.12	0.50
1:A:644:SER:HA	1:A:685:ILE:CD1	2.42	0.50

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:104:LYS:HE3	1:A:108:THR:O	2.13	0.49
1:A:517:TYR:CE1	1:A:521:LEU:HD11	2.47	0.49
1:B:682:MET:HE1	1:B:720:ASN:HB3	1.95	0.49
1:A:0:PHE:HE1	1:A:2:LYS:HB2	1.77	0.49
1:A:87:LEU:HD22	1:A:91:PHE:CE1	2.48	0.49
1:A:228:THR:OG1	1:A:249:ARG:HD2	2.11	0.49
1:B:409:ILE:HD11	1:B:704:CYS:HA	1.95	0.49
1:A:414:GLN:NE2	1:A:707:LYS:HE2	2.28	0.49
1:B:201:PRO:O	1:B:204:VAL:HG22	2.12	0.49
1:B:251:HIS:HA	1:B:276:VAL:HG13	1.95	0.49
1:B:403:LEU:HD23	1:B:404:PHE:H	1.78	0.49
1:B:566:LEU:O	1:B:571:ILE:HD13	2.13	0.49
1:B:175:GLU:O	1:B:178:VAL:HG22	2.13	0.48
1:B:661:ILE:HG13	5:B:960:HOH:O	2.13	0.48
1:B:399:LEU:HB3	1:B:401:LEU:HG	1.95	0.48
1:A:158:LYS:HB2	1:A:162:GLU:O	2.14	0.48
1:A:618:HIS:NE2	1:A:704:CYS:SG	2.87	0.48
1:B:242:CYS:O	1:B:245:LEU:HB2	2.14	0.48
1:B:669:TRP:HZ3	1:B:718:LEU:HD13	1.78	0.48
1:A:91:PHE:O	1:A:95:ARG:HG2	2.12	0.48
1:A:588:LYS:HD2	1:A:591:LYS:NZ	2.29	0.48
1:A:128:LYS:HB2	1:A:128:LYS:HZ2	1.79	0.48
1:B:409:ILE:HD11	1:B:704:CYS:CA	2.44	0.48
1:A:330:GLU:H	1:A:330:GLU:CD	2.17	0.47
1:B:618:HIS:NE2	1:B:620:CYS:SG	2.87	0.47
1:B:511:THR:O	1:B:515:ILE:HG12	2.15	0.47
1:A:618:HIS:ND1	1:A:640:SER:OG	2.48	0.47
1:A:623:ASP:OD2	1:A:625:ASN:HB2	2.14	0.47
1:A:30:THR:OG1	1:A:33:GLN:HG3	2.13	0.47
1:B:488:LEU:C	1:B:488:LEU:HD13	2.35	0.47
1:A:415:THR:OG1	1:A:418:VAL:HG23	2.15	0.47
1:A:107:ASN:HD22	1:A:107:ASN:N	1.99	0.46
1:A:196:ILE:HB	1:A:227:LEU:HD23	1.97	0.46
1:B:557:LEU:HD22	1:B:605:LEU:HD11	1.97	0.46
1:A:584:LYS:O	1:A:584:LYS:HG2	2.15	0.46
1:B:584:LYS:O	1:B:584:LYS:HG3	2.16	0.46
1:B:228:THR:HG23	1:B:249:ARG:HB3	1.98	0.46
1:A:128:LYS:N	1:A:129:PRO:CD	2.79	0.46
1:B:696:GLU:CD	1:B:696:GLU:H	2.19	0.46
1:B:710:ASN:O	1:B:714:VAL:HG23	2.16	0.46
1:B:714:VAL:HG12	1:B:718:LEU:HD22	1.97	0.46

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:415:THR:HG23	5:A:1010:HOH:O	2.16	0.46
1:A:56:ILE:N	1:A:56:ILE:CD1	2.78	0.46
1:B:488:LEU:HD13	1:B:489:SER:N	2.31	0.46
1:B:560:ASN:OD1	1:B:564:LYS:HE2	2.16	0.45
1:B:334:PHE:O	1:B:338:LYS:HG2	2.17	0.45
1:B:399:LEU:N	1:B:399:LEU:HD22	2.31	0.45
1:A:11:ILE:HA	1:A:17:PHE:HB3	1.98	0.45
1:A:242:CYS:O	1:A:245:LEU:HB2	2.15	0.45
1:A:465:ARG:HH22	1:A:529:MET:HB3	1.81	0.45
1:A:650:ILE:HG12	1:A:650:ILE:O	2.17	0.45
1:A:696:GLU:CD	1:A:696:GLU:H	2.20	0.45
1:B:293:VAL:O	1:B:297:VAL:HG23	2.17	0.45
1:B:11:ILE:HA	1:B:17:PHE:HB3	1.99	0.45
1:B:497:PRO:HA	1:B:498:PRO:HD3	1.82	0.44
1:B:232:TYR:O	1:B:233:TYR:CB	2.65	0.44
1:B:15:ARG:HG3	1:B:15:ARG:NH1	2.30	0.44
1:A:537:MET:CE	1:A:552:ALA:HB2	2.47	0.44
1:B:87:LEU:HD22	1:B:91:PHE:CE1	2.52	0.44
1:B:506:ARG:O	1:B:506:ARG:HG3	2.18	0.44
1:A:107:ASN:H	1:A:107:ASN:ND2	2.01	0.44
1:A:324:LEU:HD13	5:A:812:HOH:O	2.17	0.44
1:A:370:ALA:HB3	1:A:503:THR:HG21	2.00	0.44
1:B:403:LEU:HD22	1:B:404:PHE:CD2	2.52	0.44
1:B:581:PHE:CE2	1:B:631:ILE:HD12	2.49	0.44
1:A:334:PHE:O	1:A:338:LYS:HG2	2.18	0.44
1:A:618:HIS:NE2	1:A:620:CYS:SG	2.91	0.44
1:A:395:GLN:OE1	1:A:614:GLN:HG3	2.18	0.43
1:A:315:PRO:HB2	1:A:334:PHE:CD2	2.52	0.43
1:A:709:ARG:HA	1:A:709:ARG:HE	1.83	0.43
1:B:718:LEU:HD12	1:B:718:LEU:HA	1.85	0.43
1:B:5:ALA:HA	1:B:307:ASN:OD1	2.18	0.43
1:B:669:TRP:CZ3	1:B:718:LEU:HD13	2.52	0.43
1:B:21:LEU:HD23	1:B:492:SER:HB3	1.99	0.43
1:B:408:THR:HB	5:B:955:HOH:O	2.18	0.43
1:B:639:ILE:HG23	1:B:639:ILE:O	2.18	0.43
1:B:669:TRP:CD1	1:B:677:PRO:HG2	2.54	0.43
1:B:128:LYS:N	1:B:129:PRO:CD	2.81	0.43
1:B:269:PHE:CZ	1:B:275:LEU:HB2	2.54	0.43
1:B:477:ASN:O	1:B:504:VAL:HA	2.19	0.43
1:B:547:PRO:HG2	1:B:550:GLU:HB2	2.00	0.43
1:A:232:TYR:O	1:A:233:TYR:CB	2.67	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:671:ILE:HG21	1:B:706:LEU:HD12	2.00	0.43
1:A:403:LEU:HD11	1:A:695:LYS:HE2	2.01	0.42
1:A:438:PHE:O	1:A:442:GLN:HG2	2.19	0.42
1:B:247:VAL:O	1:B:273:LYS:HE3	2.19	0.42
1:B:667:GLY:HA2	1:B:701:ASN:O	2.19	0.42
1:A:440:LYS:HD2	1:A:517:TYR:CD2	2.54	0.42
1:A:490:TYR:CZ	1:A:493:ARG:HG3	2.54	0.42
1:A:706:LEU:HD12	1:A:714:VAL:HG22	2.00	0.42
1:B:111:HIS:HB2	1:B:490:TYR:HB3	2.01	0.42
1:A:158:LYS:HD3	5:A:823:HOH:O	2.19	0.42
1:A:315:PRO:HD3	1:A:541:TYR:OH	2.19	0.42
1:A:455:LEU:HD13	5:A:1013:HOH:O	2.18	0.42
1:A:589:LYS:HA	1:A:592:TRP:CD1	2.54	0.42
1:A:446:ALA:O	1:A:450:GLN:HG3	2.20	0.42
1:A:7:GLY:O	1:A:312:PHE:N	2.52	0.42
1:A:158:LYS:HA	1:A:164:ILE:HG13	2.01	0.42
1:A:309:CYS:HB2	1:A:310:PRO:HD2	2.02	0.42
1:B:582:ARG:HD3	1:B:627:ILE:HG21	2.02	0.42
1:A:472:PHE:O	1:A:476:LEU:HD13	2.19	0.41
1:B:264:LEU:C	1:B:264:LEU:HD23	2.40	0.41
1:B:370:ALA:HB3	1:B:503:THR:HG21	2.02	0.41
1:A:0:PHE:CE1	1:A:2:LYS:HB2	2.54	0.41
1:A:114:VAL:HG11	1:A:158:LYS:CD	2.44	0.41
1:B:317:THR:HG22	1:B:319:GLU:H	1.85	0.41
1:B:264:LEU:O	1:B:268:GLY:HA2	2.19	0.41
1:A:46:VAL:HG11	1:A:141:ILE:HD13	2.02	0.41
1:B:356:LEU:HA	1:B:357:PRO:HD3	1.93	0.41
1:B:476:LEU:HD23	1:B:506:ARG:HB3	2.03	0.41
1:B:592:TRP:N	1:B:593:PRO:CD	2.83	0.41
3:B:1201:C2F:O4	3:B:1201:C2F:C11	2.68	0.41
1:A:399:LEU:HB3	1:A:401:LEU:HG	2.03	0.41
1:A:563:VAL:O	1:A:567:GLU:HG3	2.21	0.41
1:B:506:ARG:NH1	1:B:565:ASP:OD2	2.49	0.41
1:B:446:ALA:O	1:B:450:GLN:HG3	2.21	0.41
1:B:457:VAL:HG22	1:B:525:PRO:HG2	2.03	0.41
1:A:497:PRO:HA	1:A:498:PRO:HD3	1.97	0.41
1:B:56:ILE:O	1:B:143:THR:HA	2.21	0.41
1:A:651:ILE:O	1:A:655:GLU:HG3	2.20	0.41
1:A:9:PRO:HB2	1:A:316:VAL:HG22	2.04	0.40
1:A:620:CYS:HB3	1:A:642:GLU:OE2	2.21	0.40
1:B:251:HIS:CA	1:B:276:VAL:HG13	2.51	0.40

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:104:LYS:HD2	1:B:108:THR:O	2.21	0.40
1:B:305:ILE:HD12	1:B:345:LEU:HD23	2.03	0.40
1:B:376:ASN:O	1:B:378:PRO:HD3	2.21	0.40
1:A:137:LYS:HE3	1:A:142:GLU:OE1	2.21	0.40
1:B:673:SER:HA	1:B:674:PRO:HD3	1.82	0.40
1:A:41:LEU:N	1:A:41:LEU:CD1	2.84	0.40
1:A:566:LEU:O	1:A:571:ILE:HD13	2.21	0.40
1:A:703:ASP:O	1:A:704:CYS:SG	2.80	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	707/766 (92%)	671 (95%)	35 (5%)	1 (0%)	51	63
1	B	720/766 (94%)	690 (96%)	28 (4%)	2 (0%)	41	47
All	All	1427/1532 (93%)	1361 (95%)	63 (4%)	3 (0%)	47	56

All (3) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	379	GLU
1	B	64	TYR
1	A	64	TYR

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	555/687 (81%)	526 (95%)	29 (5%)	23	27
1	B	568/687 (83%)	542 (95%)	26 (5%)	27	32
All	All	1123/1374 (82%)	1068 (95%)	55 (5%)	25	29

All (55) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	107	ASN
1	A	128	LYS
1	A	142	GLU
1	A	154	LEU
1	A	245	LEU
1	A	285	PRO
1	A	300	LEU
1	A	312	PHE
1	A	323	ASN
1	A	324	LEU
1	A	332	LEU
1	A	339	LEU
1	A	363	ASP
1	A	390	GLU
1	A	398	ARG
1	A	399	LEU
1	A	400	ASN
1	A	403	LEU
1	A	470	GLU
1	A	476	LEU
1	A	488	LEU
1	A	529	MET
1	A	540	SER
1	A	557	LEU
1	A	582	ARG
1	A	638	VAL
1	A	709	ARG
1	A	718	LEU
1	A	728	MET
1	B	85	ARG
1	B	124	LEU
1	B	154	LEU
1	B	227	LEU

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Mol	Chain	Res	Type
1	B	245	LEU
1	B	249	ARG
1	B	251	HIS
1	B	276	VAL
1	B	285	PRO
1	B	312	PHE
1	B	317	THR
1	B	324	LEU
1	B	332	LEU
1	B	339	LEU
1	B	369	GLN
1	B	398	ARG
1	B	403	LEU
1	B	466	THR
1	B	489	SER
1	B	506	ARG
1	B	557	LEU
1	B	612	GLU
1	B	628	ILE
1	B	701	ASN
1	B	704	CYS
1	B	718	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (10) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	107	ASN
1	A	323	ASN
1	A	720	ASN
1	B	251	HIS
1	B	263	ASN
1	B	369	GLN
1	B	376	ASN
1	B	400	ASN
1	B	601	ASN
1	B	608	ASN

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)

6 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	$\#\|Z\| > 2$
3	C2F	A	1200	-	33,35,35	1.35	3 (9%)	35,49,49	1.45	5 (14%)
2	SO4	A	1202	-	4,4,4	0.38	0	6,6,6	0.07	0
4	MRY	A	1205	-	7,7,7	0.32	0	8,8,8	0.47	0
3	C2F	B	1201	-	33,35,35	1.36	3 (9%)	35,49,49	1.47	5 (14%)
2	SO4	B	1203	-	4,4,4	0.36	0	6,6,6	0.11	0
4	MRY	B	1204	-	7,7,7	0.33	0	8,8,8	0.44	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
3	C2F	B	1201	-	-	6/22/35/35	0/3/3/3
4	MRY	A	1205	-	-	1/8/8/8	-
3	C2F	A	1200	-	-	6/22/35/35	0/3/3/3
4	MRY	B	1204	-	-	1/8/8/8	-

All (6) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	A	1200	C2F	O4-C4	5.10	1.36	1.24
3	B	1201	C2F	O4-C4	5.09	1.36	1.24
3	B	1201	C2F	C4A-N5	-3.07	1.34	1.41
3	A	1200	C2F	C4A-N5	-3.04	1.34	1.41
3	B	1201	C2F	C7-N8	2.04	1.48	1.44
3	A	1200	C2F	C7-N8	2.02	1.48	1.44

All (10) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
3	B	1201	C2F	C2-N3-C4	3.77	121.21	115.96
3	A	1200	C2F	C2-N3-C4	3.69	121.10	115.96
3	B	1201	C2F	N1-C2-N3	-3.67	119.85	125.48
3	A	1200	C2F	N1-C2-N3	-3.55	120.03	125.48
3	B	1201	C2F	C8A-C4A-C4	3.16	116.89	114.44
3	A	1200	C2F	C8A-C4A-C4	3.14	116.87	114.44
3	B	1201	C2F	C2-N1-C8A	2.74	121.10	114.59
3	A	1200	C2F	C2-N1-C8A	2.70	121.00	114.59
3	A	1200	C2F	C11-N5-C4A	2.28	116.40	113.30
3	B	1201	C2F	C11-N5-C4A	2.14	116.21	113.30

There are no chirality outliers.

All (14) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	A	1200	C2F	N5-C6-C9-N10
3	A	1200	C2F	C7-C6-C9-N10
3	B	1201	C2F	N5-C6-C9-N10
3	B	1201	C2F	C7-C6-C9-N10
3	B	1201	C2F	CB-CA-CT-O2
3	A	1200	C2F	CB-CA-CT-O1
3	A	1200	C2F	CB-CA-CT-O2
3	B	1201	C2F	CB-CA-CT-O1
3	B	1201	C2F	OE2-CD-CG-CB
3	B	1201	C2F	OE1-CD-CG-CB
3	A	1200	C2F	OE1-CD-CG-CB
3	A	1200	C2F	OE2-CD-CG-CB
4	A	1205	MRY	OAD-CAC-CAE-CAG
4	B	1204	MRY	OAD-CAC-CAE-CAG

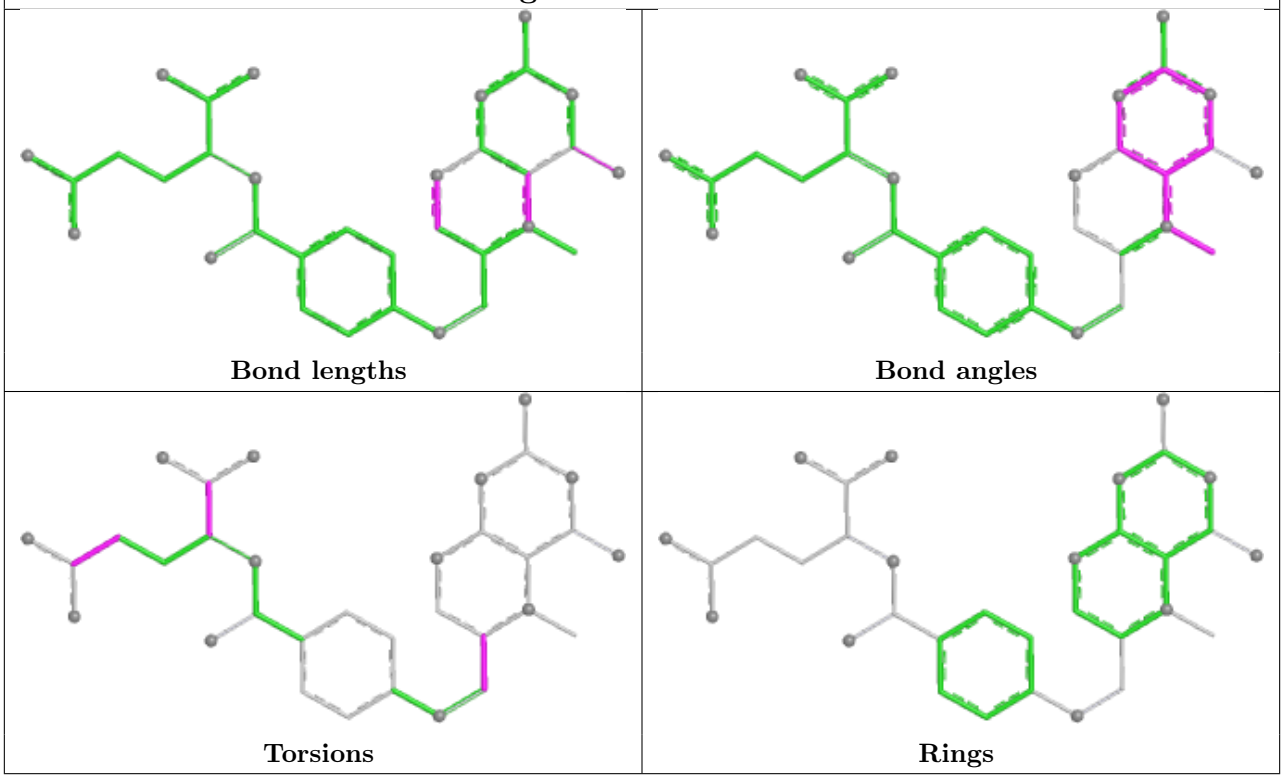
There are no ring outliers.

2 monomers are involved in 3 short contacts:

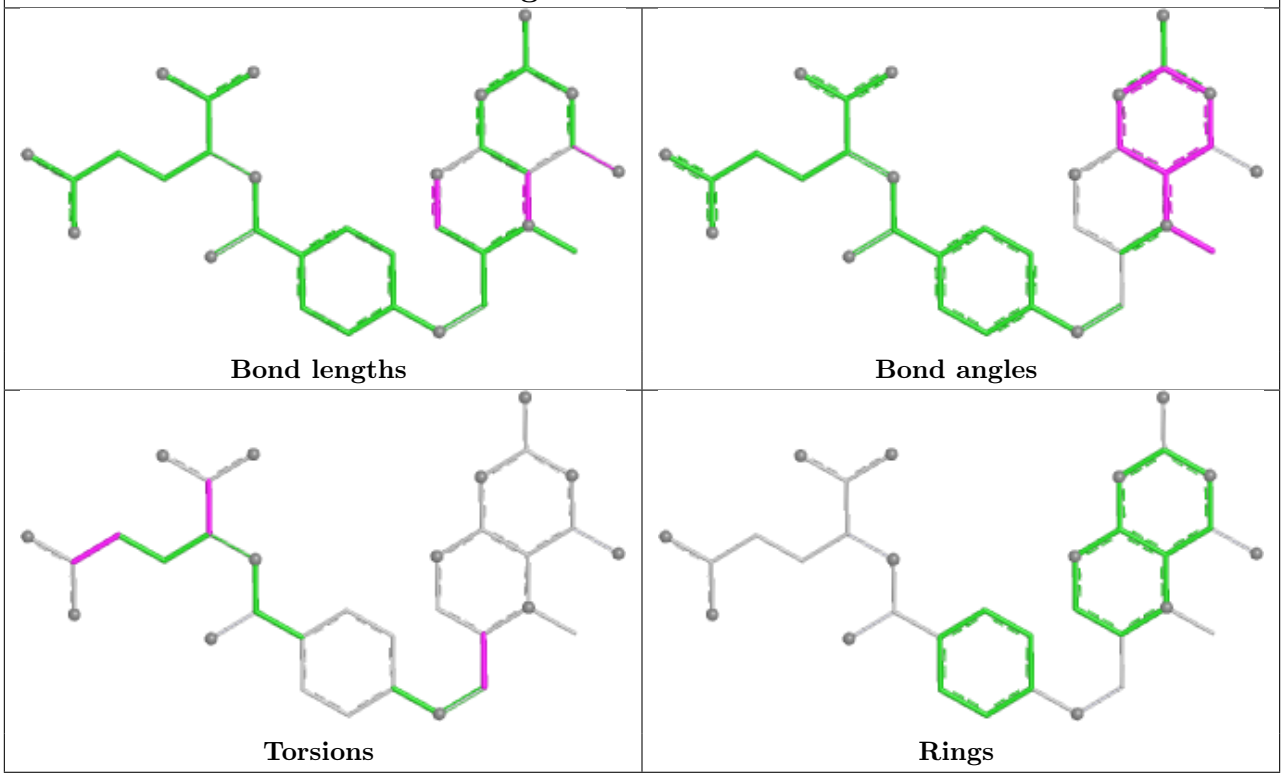
Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	A	1200	C2F	1	0
3	B	1201	C2F	2	0

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 then 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.

Ligand C2F A 1200



Ligand C2F B 1201



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, 95th 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^2)	Q<0.9
1	A	715/766 (93%)	-0.57	0	100	100	14, 29, 48, 68	0
1	B	728/766 (95%)	-0.62	0	100	100	13, 27, 44, 60	0
All	All	1443/1532 (94%)	-0.60	0	100	100	13, 28, 47, 68	0

There are no RSRZ outliers to report.

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)

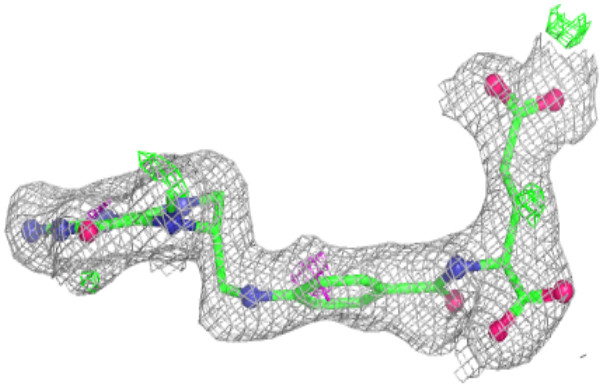
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists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

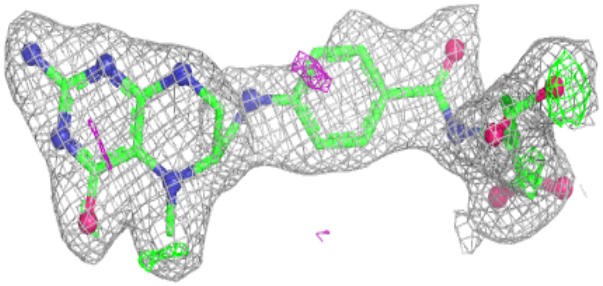
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å^2)	Q<0.9
3	C2F	A	1200	33/33	0.82	0.18	36,46,57,58	0
4	MRY	B	1204	8/8	0.86	0.15	42,48,49,50	0
4	MRY	A	1205	8/8	0.93	0.11	31,39,40,40	0
3	C2F	B	1201	33/33	0.93	0.12	33,37,47,47	0
2	SO4	A	1202	5/5	0.99	0.10	27,28,30,30	0
2	SO4	B	1203	5/5	0.99	0.08	31,31,32,33	0

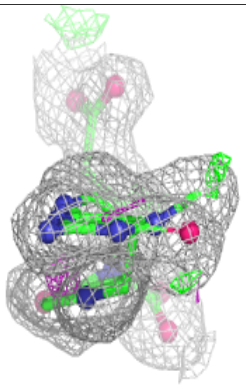
The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation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

Electron density around C2F A 1200:

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

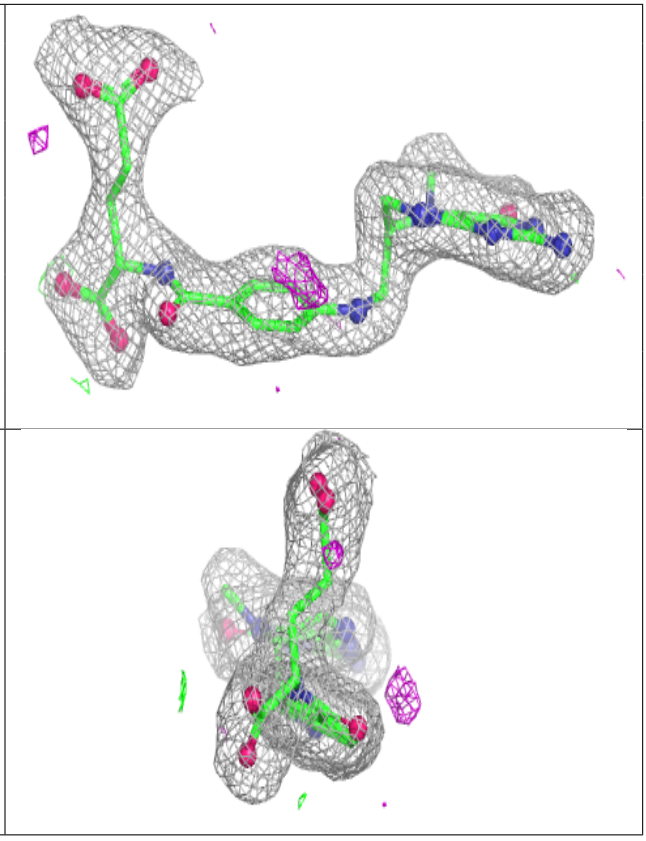






Electron density around C2F B 1201:

$2mF_o$-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.