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Full wwPDB X-ray Structure Validation Report ⓘ

Mar 5, 2024 – 06:31 AM EST

PDB ID : 1XZQ
Title : Structure of the GTP-binding protein TrmE from Thermotoga maritima complexed with 5-formyl-THF
Authors : Scrima, A.; Vetter, I.R.; Armengod, M.E.; Wittinghofer, A.
Deposited on : 2004-11-12
Resolution : 2.90 Å(reported)

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

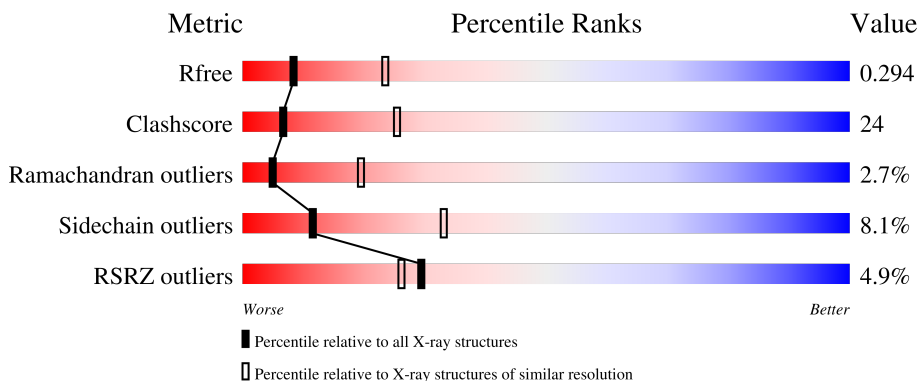|		
MolProbity	:	4.02b-467
Mogul	:	1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	2.36
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.36

1 Overall quality at a glance (i)

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

The reported resolution of this entry is 2.90 Å.

Percentile scores (ranging between 0-100) for global validation metrics of the entry are shown in the following graphic. The table shows the number of entries on which the scores are based.

Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	130704	1957 (2.90-2.90)
Clashscore	141614	2172 (2.90-2.90)
Ramachandran outliers	138981	2115 (2.90-2.90)
Sidechain outliers	138945	2117 (2.90-2.90)
RSRZ outliers	127900	1906 (2.90-2.90)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments of the lower bar indicate the fraction of residues that contain outliers for >=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	482	5% 51% 38% · 7%
2	B	149	% 45% 28% 5% 21%

2 Entry composition ⓘ

There are 3 unique types of molecules in this entry. The entry contains 4476 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 Probable tRNA modification GTPase trmE.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	449	3500	2201	617	672	10	0	0	0

There are 32 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-31	MET	-	expression tag	UNP Q9WYA4
A	-30	GLY	-	expression tag	UNP Q9WYA4
A	-29	SER	-	expression tag	UNP Q9WYA4
A	-28	SER	-	expression tag	UNP Q9WYA4
A	-27	HIS	-	expression tag	UNP Q9WYA4
A	-26	HIS	-	expression tag	UNP Q9WYA4
A	-25	HIS	-	expression tag	UNP Q9WYA4
A	-24	HIS	-	expression tag	UNP Q9WYA4
A	-23	HIS	-	expression tag	UNP Q9WYA4
A	-22	HIS	-	expression tag	UNP Q9WYA4
A	-21	SER	-	expression tag	UNP Q9WYA4
A	-20	SER	-	expression tag	UNP Q9WYA4
A	-19	GLY	-	expression tag	UNP Q9WYA4
A	-18	LEU	-	expression tag	UNP Q9WYA4
A	-17	VAL	-	expression tag	UNP Q9WYA4
A	-16	PRO	-	expression tag	UNP Q9WYA4
A	-15	ARG	-	expression tag	UNP Q9WYA4
A	-14	GLY	-	expression tag	UNP Q9WYA4
A	-13	SER	-	expression tag	UNP Q9WYA4
A	-12	HIS	-	expression tag	UNP Q9WYA4
A	-11	TRP	-	expression tag	UNP Q9WYA4
A	-10	GLY	-	expression tag	UNP Q9WYA4
A	-9	SER	-	expression tag	UNP Q9WYA4
A	-8	PRO	-	expression tag	UNP Q9WYA4
A	-7	ASN	-	expression tag	UNP Q9WYA4
A	-6	SER	-	expression tag	UNP Q9WYA4
A	-5	SER	-	expression tag	UNP Q9WYA4

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Chain	Residue	Modelled	Actual	Comment	Reference
A	-4	SER	-	expression tag	UNP Q9WYA4
A	-3	VAL	-	expression tag	UNP Q9WYA4
A	-2	ASP	-	expression tag	UNP Q9WYA4
A	-1	LYS	-	expression tag	UNP Q9WYA4
A	0	LEU	-	expression tag	UNP Q9WYA4

- Molecule 2 is a protein called Probable tRNA modification GTPase trmE.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
2	B	117	908	583	160	160	5	0	0	0

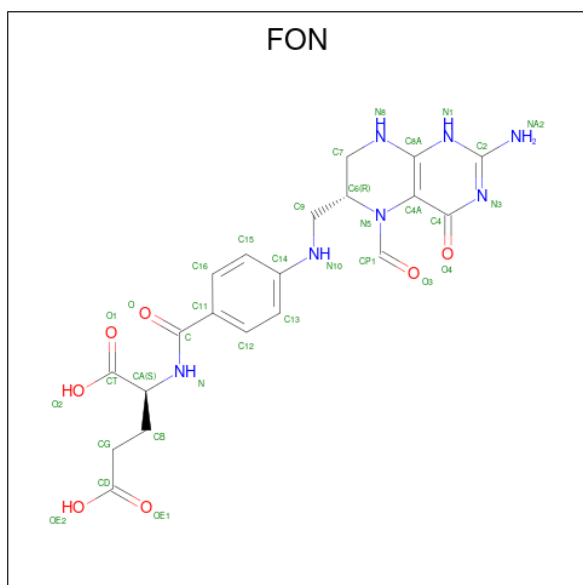There are 32 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	-31	MET	-	expression tag	UNP Q9WYA4
B	-30	GLY	-	expression tag	UNP Q9WYA4
B	-29	SER	-	expression tag	UNP Q9WYA4
B	-28	SER	-	expression tag	UNP Q9WYA4
B	-27	HIS	-	expression tag	UNP Q9WYA4
B	-26	HIS	-	expression tag	UNP Q9WYA4
B	-25	HIS	-	expression tag	UNP Q9WYA4
B	-24	HIS	-	expression tag	UNP Q9WYA4
B	-23	HIS	-	expression tag	UNP Q9WYA4
B	-22	HIS	-	expression tag	UNP Q9WYA4
B	-21	SER	-	expression tag	UNP Q9WYA4
B	-20	SER	-	expression tag	UNP Q9WYA4
B	-19	GLY	-	expression tag	UNP Q9WYA4
B	-18	LEU	-	expression tag	UNP Q9WYA4
B	-17	VAL	-	expression tag	UNP Q9WYA4
B	-16	PRO	-	expression tag	UNP Q9WYA4
B	-15	ARG	-	expression tag	UNP Q9WYA4
B	-14	GLY	-	expression tag	UNP Q9WYA4
B	-13	SER	-	expression tag	UNP Q9WYA4
B	-12	HIS	-	expression tag	UNP Q9WYA4
B	-11	TRP	-	expression tag	UNP Q9WYA4
B	-10	GLY	-	expression tag	UNP Q9WYA4
B	-9	SER	-	expression tag	UNP Q9WYA4
B	-8	PRO	-	expression tag	UNP Q9WYA4
B	-7	ASN	-	expression tag	UNP Q9WYA4
B	-6	SER	-	expression tag	UNP Q9WYA4
B	-5	SER	-	expression tag	UNP Q9WYA4

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Chain	Residue	Modelled	Actual	Comment	Reference
B	-4	SER	-	expression tag	UNP Q9WYA4
B	-3	VAL	-	expression tag	UNP Q9WYA4
B	-2	ASP	-	expression tag	UNP Q9WYA4
B	-1	LYS	-	expression tag	UNP Q9WYA4
B	0	LEU	-	expression tag	UNP Q9WYA4

- Molecule 3 is N-{[4-({[(6R)-2-amino-5-formyl-4-oxo-1,4,5,6,7,8-hexahydropteridin-6-yl]methyl}amino)phenyl]carbonyl}-L-glutamic acid (three-letter code: FON) (formula: $C_{20}H_{23}N_7O_7$).
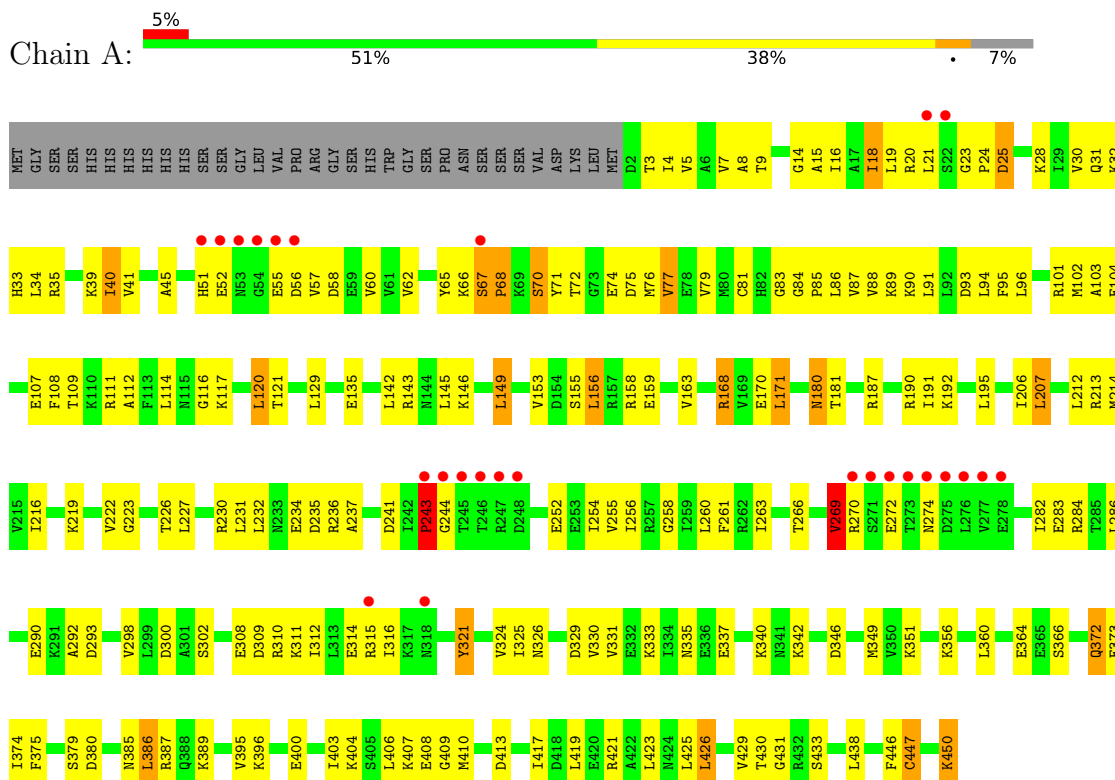

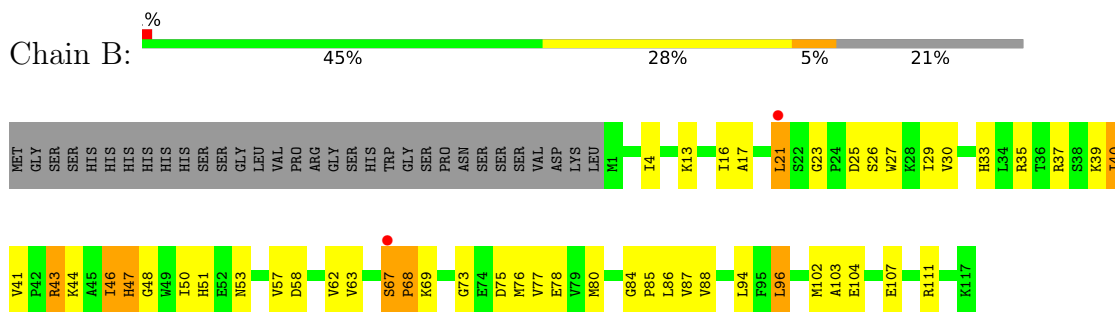| Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
3	A	1	Total	C	N	O	0	0
			34	20	7	7		
3	B	1	Total	C	N	O	0	0
			34	20	7	7		

3 Residue-property plots ⓘ

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: Probable tRNA modification GTPase trmE

• Molecule 2: Probable tRNA modification GTPase trmE

4 Data and refinement statistics ⓘ

Property	Value	Source
Space group	P 62	Depositor
Cell constants a, b, c, α, β, γ	130.03Å 130.03Å 113.84Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	19.93 – 2.90 19.93 – 2.90	Depositor EDS
% Data completeness (in resolution range)	99.6 (19.93-2.90) 99.6 (19.93-2.90)	Depositor EDS
R_{merge}	0.05	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	6.66 (at 2.88Å)	Xtriage
Refinement program	CNS	Depositor
R, R_{free}	0.250 , 0.307 0.241 , 0.294	Depositor DCC
R_{free} test set	2391 reflections (9.91%)	wwPDB-VP
Wilson B-factor (Å^2)	72.7	Xtriage
Anisotropy	0.612	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.33 , 60.3	EDS
L-test for twinning[2]	$< |L| > = 0.49, < L^2 > = 0.32$	Xtriage
Estimated twinning fraction	0.038 for h,-h-k,-l	Xtriage
F_o,F_c correlation	0.92	EDS
Total number of atoms	4476	wwPDB-VP
Average B, all atoms (Å^2)	79.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.48% of the height of the origin peak. No significant pseudotranslation is detected.*

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[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 ⓘ

5.1   Standard geometry ⓘ

Bond lengths and bond angles in the following residue types are not validated in this section: FON

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	0.47	0/3536	0.69	1/4757 (0.0%)
2	B	0.47	0/928	0.70	0/1250
All	All	0.47	0/4464	0.69	1/6007 (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	A	243	PRO	N-CA-CB	6.35	110.92	103.30

There are no chirality outliers.

There are no planarity outliers.

5.2   Too-close contacts ⓘ

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	3500	0	3596	177	0
2	B	908	0	945	44	0
3	A	34	0	21	2	0
3	B	34	0	21	2	0
All	All	4476	0	4583	213	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 24.

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All (213) 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:8:ALA:HB1	2:B:16:ILE:HD13	1.39	1.03
1:A:30:VAL:HG11	1:A:77:VAL:HG21	1.55	0.89
2:B:25:ASP:O	2:B:29:ILE:HG13	1.74	0.86
1:A:21:LEU:HB2	1:A:77:VAL:HG13	1.56	0.85
1:A:216:ILE:O	1:A:266:THR:HB	1.75	0.85
1:A:143:ARG:HH22	1:A:380:ASP:HA	1.44	0.83
1:A:159:GLU:HB3	1:A:191:ILE:HD11	1.62	0.80
1:A:33:HIS:CD2	1:A:94:LEU:HD11	2.17	0.79
2:B:40:ILE:HA	2:B:46:ILE:HD11	1.64	0.78
1:A:298:VAL:HG22	1:A:324:VAL:CG1	2.14	0.78
1:A:190:ARG:HG2	1:A:190:ARG:HH11	1.48	0.78
1:A:395:VAL:HG21	1:A:426:LEU:HD13	1.65	0.77
1:A:316:ILE:HD12	1:A:321:TYR:CD2	2.21	0.75
1:A:375:PHE:O	1:A:379:SER:HB2	1.85	0.75
1:A:213:ARG:HD3	1:A:292:ALA:HA	1.69	0.74
1:A:159:GLU:HB3	1:A:191:ILE:CD1	2.18	0.72
1:A:145:LEU:HD23	1:A:145:LEU:O	1.90	0.71
1:A:135:GLU:OE1	1:A:258:GLY:HA2	1.90	0.71
1:A:316:ILE:HD12	1:A:321:TYR:HD2	1.52	0.71
1:A:8:ALA:HB1	2:B:16:ILE:CD1	2.17	0.70
1:A:168:ARG:HH21	1:A:171:LEU:HD23	1.59	0.68
1:A:153:VAL:HG21	1:A:429:VAL:HG21	1.76	0.68
1:A:129:LEU:HD21	2:B:87:VAL:HG21	1.76	0.68
1:A:51:HIS:HA	1:A:56:ASP:HA	1.76	0.67
1:A:143:ARG:NH2	1:A:380:ASP:HA	2.09	0.67
1:A:310:ARG:HG2	1:A:342:LYS:NZ	2.10	0.67
1:A:31:GLN:NE2	1:A:40:ILE:HG12	2.10	0.67
1:A:335:ASN:ND2	1:A:337:GLU:H	1.94	0.66
1:A:206:ILE:HG12	1:A:385:ASN:HA	1.78	0.66
1:A:241:ASP:HB3	2:B:13:LYS:NZ	2.11	0.66
1:A:429:VAL:HG23	1:A:430:THR:N	2.10	0.66
1:A:219:LYS:O	1:A:222:VAL:HG22	1.96	0.66
1:A:254:ILE:HD12	1:A:256:ILE:HD11	1.77	0.66
1:A:4:ILE:HD11	1:A:101:ARG:NH2	2.12	0.64
1:A:395:VAL:HG21	1:A:426:LEU:CD1	2.26	0.64
1:A:31:GLN:HE22	1:A:40:ILE:HG12	1.62	0.64
1:A:25:ASP:HB3	1:A:28:LYS:HD2	1.80	0.64
1:A:31:GLN:NE2	1:A:40:ILE:HG21	2.13	0.64
1:A:163:VAL:CG2	1:A:187:ARG:HH11	2.11	0.63
1:A:170:GLU:O	1:A:170:GLU:HG2	1.97	0.63

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:243:PRO:O	1:A:244:GLY:C	2.36	0.63
1:A:232:LEU:HD12	1:A:232:LEU:H	1.65	0.62
3:A:451:FON:HN21	2:B:80:MET:CE	2.13	0.62
1:A:156:LEU:HB3	1:A:426:LEU:HD21	1.82	0.61
2:B:33:HIS:HB3	2:B:51:HIS:O	1.99	0.61
1:A:190:ARG:HG2	1:A:190:ARG:NH1	2.14	0.61
1:A:331:VAL:HG13	1:A:331:VAL:O	2.00	0.61
1:A:400:GLU:O	1:A:403:ILE:HG13	2.01	0.61
1:A:58:ASP:OD2	1:A:87:VAL:HG11	2.00	0.61
1:A:163:VAL:HG22	1:A:187:ARG:HH11	1.66	0.61
1:A:120:LEU:HD13	1:A:387:ARG:NH2	2.16	0.60
1:A:207:LEU:HG	1:A:212:LEU:HD22	1.84	0.60
1:A:335:ASN:HD21	1:A:337:GLU:HB3	1.67	0.60
1:A:429:VAL:CG2	1:A:430:THR:N	2.65	0.59
1:A:39:LYS:O	1:A:41:VAL:HG23	2.03	0.58
1:A:62:VAL:HG12	1:A:79:VAL:HA	1.86	0.58
1:A:219:LYS:HE3	1:A:309:ASP:OD1	2.04	0.58
2:B:84:GLY:O	2:B:88:VAL:HG23	2.03	0.57
3:A:451:FON:HN21	2:B:80:MET:HE3	1.69	0.57
1:A:155:SER:HA	1:A:158:ARG:NH2	2.20	0.57
2:B:47:HIS:ND1	2:B:48:GLY:N	2.53	0.57
1:A:87:VAL:O	1:A:91:LEU:HD12	2.05	0.57
1:A:8:ALA:HB2	1:A:20:ARG:HG3	1.87	0.56
2:B:67:SER:HB3	2:B:68:PRO:HD3	1.86	0.56
2:B:4:ILE:HG23	2:B:111:ARG:HH22	1.69	0.56
1:A:40:ILE:HD12	1:A:40:ILE:O	2.05	0.56
1:A:298:VAL:HG22	1:A:324:VAL:HG11	1.84	0.56
1:A:302:SER:O	1:A:333:LYS:HB2	2.06	0.56
1:A:232:LEU:HD12	1:A:232:LEU:N	2.21	0.55
2:B:96:LEU:HD11	2:B:102:MET:HG2	1.88	0.55
2:B:30:VAL:HG21	2:B:77:VAL:HG11	1.87	0.55
1:A:386:LEU:O	1:A:387:ARG:C	2.45	0.55
1:A:180:ASN:HD22	1:A:180:ASN:C	2.09	0.54
1:A:311:LYS:O	1:A:314:GLU:HB2	2.07	0.54
1:A:360:LEU:O	1:A:364:GLU:HG3	2.07	0.54
1:A:96:LEU:HD21	1:A:102:MET:HG2	1.90	0.54
1:A:231:LEU:O	1:A:235:ASP:HB2	2.08	0.54
1:A:232:LEU:HD21	1:A:269:VAL:HG21	1.89	0.53
1:A:168:ARG:HG3	1:A:168:ARG:O	2.08	0.53
2:B:4:ILE:HB	2:B:103:ALA:HB2	1.91	0.53
2:B:50:ILE:O	2:B:57:VAL:HG22	2.08	0.53

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:403:ILE:HD12	1:A:404:LYS:N	2.25	0.52
1:A:4:ILE:HD12	1:A:103:ALA:HA	1.91	0.52
1:A:45:ALA:HB3	2:B:43:ARG:HA	1.92	0.52
1:A:67:SER:HB3	1:A:68:PRO:HD3	1.91	0.52
1:A:213:ARG:H	1:A:293:ASP:HB2	1.74	0.52
1:A:310:ARG:HG2	1:A:342:LYS:HZ3	1.74	0.52
1:A:421:ARG:NH2	1:A:425:LEU:HD11	2.24	0.52
1:A:60:VAL:HG12	1:A:81:CYS:HA	1.92	0.52
2:B:4:ILE:HG23	2:B:111:ARG:NH2	2.26	0.51
1:A:21:LEU:HB2	1:A:77:VAL:CG1	2.35	0.51
1:A:270:ARG:HG2	1:A:274:ASN:CB	2.40	0.51
1:A:31:GLN:HA	1:A:34:LEU:HB3	1.91	0.51
1:A:181:THR:HG23	1:A:406:LEU:HB3	1.92	0.51
1:A:241:ASP:HB3	2:B:13:LYS:CE	2.40	0.51
1:A:254:ILE:HD12	1:A:256:ILE:CD1	2.41	0.51
1:A:57:VAL:O	1:A:58:ASP:HB2	2.11	0.51
1:A:232:LEU:CD2	1:A:269:VAL:HG21	2.40	0.51
1:A:5:VAL:HA	1:A:20:ARG:O	2.11	0.50
1:A:163:VAL:HG23	1:A:187:ARG:NH1	2.25	0.50
1:A:300:ASP:OD2	1:A:302:SER:HB2	2.11	0.50
2:B:47:HIS:ND1	2:B:47:HIS:C	2.65	0.50
1:A:149:LEU:CD2	1:A:153:VAL:HG23	2.41	0.50
1:A:149:LEU:HD22	1:A:153:VAL:HG23	1.93	0.50
1:A:65:TYR:HB2	1:A:76:MET:HB2	1.92	0.50
1:A:241:ASP:HB3	2:B:13:LYS:HE3	1.93	0.50
1:A:192:LYS:NZ	1:A:192:LYS:HB3	2.26	0.50
1:A:104:GLU:HG3	1:A:107:GLU:OE1	2.11	0.50
1:A:329:ASP:OD1	1:A:331:VAL:HG12	2.12	0.49
1:A:325:ILE:HB	1:A:351:LYS:HG3	1.93	0.49
1:A:237:ALA:HB2	1:A:255:VAL:HG23	1.94	0.49
1:A:312:ILE:O	1:A:316:ILE:HG12	2.12	0.49
2:B:40:ILE:HA	2:B:46:ILE:CD1	2.41	0.49
2:B:62:VAL:HG12	2:B:63:VAL:N	2.26	0.49
1:A:8:ALA:HB3	1:A:18:ILE:HG12	1.95	0.48
1:A:230:ARG:HD2	1:A:234:GLU:OE2	2.13	0.48
1:A:310:ARG:HG2	1:A:342:LYS:HZ2	1.76	0.48
1:A:102:MET:HE2	1:A:102:MET:HA	1.94	0.48
1:A:112:ALA:O	1:A:117:LYS:HG2	2.14	0.48
1:A:270:ARG:HD2	1:A:272:GLU:CB	2.43	0.48
1:A:72:THR:OG1	1:A:74:GLU:HG2	2.13	0.48
1:A:32:LYS:HD3	1:A:33:HIS:CE1	2.48	0.48

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:40:ILE:H	2:B:40:ILE:CD1	2.26	0.48
1:A:4:ILE:HD11	1:A:101:ARG:CZ	2.44	0.48
1:A:108:PHE:HB2	1:A:450:LYS:C	2.34	0.48
1:A:283:GLU:HG3	1:A:284:ARG:H	1.78	0.48
2:B:69:LYS:HA	3:B:118:FON:O1	2.14	0.47
2:B:23:GLY:O	2:B:75:ASP:HB2	2.14	0.47
2:B:57:VAL:HG23	2:B:58:ASP:N	2.29	0.47
2:B:21:LEU:O	2:B:76:MET:HA	2.14	0.47
1:A:155:SER:HA	1:A:158:ARG:CZ	2.44	0.47
1:A:283:GLU:HG3	1:A:284:ARG:N	2.30	0.47
1:A:282:ILE:HB	1:A:308:GLU:OE2	2.15	0.47
1:A:286:LEU:O	1:A:290:GLU:HG2	2.15	0.47
1:A:33:HIS:NE2	1:A:94:LEU:HD11	2.29	0.47
1:A:421:ARG:HG2	1:A:421:ARG:HH11	1.80	0.47
2:B:26:SER:OG	2:B:75:ASP:HB3	2.14	0.47
2:B:33:HIS:CD2	2:B:94:LEU:HD11	2.49	0.47
1:A:14:GLY:O	1:A:83:GLY:HA3	2.14	0.46
1:A:407:LYS:C	1:A:409:GLY:H	2.19	0.46
1:A:290:GLU:OE2	1:A:315:ARG:HD2	2.15	0.46
1:A:340:LYS:HG2	1:A:346:ASP:HB3	1.98	0.46
1:A:88:VAL:HG23	1:A:89:LYS:N	2.31	0.46
1:A:121:THR:HG21	1:A:149:LEU:HD13	1.97	0.46
1:A:4:ILE:HG23	1:A:103:ALA:HB2	1.96	0.46
1:A:15:ALA:C	1:A:16:ILE:HG13	2.36	0.46
1:A:413:ASP:O	1:A:417:ILE:HG12	2.15	0.46
1:A:373:GLU:HG3	1:A:374:ILE:N	2.32	0.45
1:A:66:LYS:O	1:A:68:PRO:N	2.49	0.45
1:A:230:ARG:NH1	1:A:234:GLU:OE1	2.49	0.45
1:A:346:ASP:O	1:A:349:MET:HG2	2.17	0.45
1:A:387:ARG:HD2	1:A:438:LEU:HD21	1.98	0.45
2:B:35:ARG:HG2	2:B:35:ARG:HH11	1.81	0.45
2:B:40:ILE:HD13	2:B:40:ILE:N	2.31	0.45
2:B:96:LEU:HD12	2:B:96:LEU:HA	1.78	0.45
1:A:163:VAL:CG2	1:A:187:ARG:HD3	2.47	0.45
1:A:282:ILE:HD11	1:A:312:ILE:HD11	1.98	0.45
2:B:27:TRP:CD1	2:B:27:TRP:N	2.84	0.45
1:A:74:GLU:OE2	1:A:111:ARG:NH1	2.45	0.45
1:A:87:VAL:O	1:A:90:LYS:HB3	2.17	0.44
1:A:212:LEU:N	1:A:212:LEU:HD23	2.31	0.44
1:A:108:PHE:HB2	1:A:450:LYS:O	2.16	0.44
1:A:426:LEU:O	1:A:429:VAL:HG22	2.17	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:19:LEU:N	1:A:19:LEU:HD22	2.32	0.44
1:A:226:THR:O	1:A:227:LEU:C	2.56	0.44
1:A:241:ASP:HB3	2:B:13:LYS:HZ2	1.83	0.44
1:A:232:LEU:H	1:A:232:LEU:CD1	2.28	0.44
1:A:8:ALA:HB2	1:A:20:ARG:HD2	1.99	0.44
1:A:23:GLY:O	1:A:75:ASP:HB2	2.18	0.43
2:B:41:VAL:HG23	2:B:44:LYS:HB2	2.00	0.43
3:B:118:FON:H15	3:B:118:FON:H61	2.00	0.43
1:A:260:LEU:HD12	1:A:261:PHE:N	2.34	0.43
1:A:372:GLN:O	1:A:372:GLN:HG3	2.17	0.43
1:A:3:THR:HA	1:A:23:GLY:HA3	2.01	0.43
1:A:45:ALA:HB3	2:B:43:ARG:HG3	2.01	0.43
2:B:107:GLU:O	2:B:111:ARG:HG2	2.19	0.43
1:A:52:GLU:OE2	1:A:90:LYS:HD3	2.19	0.43
1:A:180:ASN:C	1:A:180:ASN:ND2	2.73	0.43
1:A:450:LYS:HA	1:A:450:LYS:HD3	1.76	0.42
1:A:330:VAL:O	1:A:330:VAL:HG22	2.19	0.42
1:A:340:LYS:HD3	1:A:340:LYS:O	2.19	0.42
1:A:431:GLY:C	1:A:433:SER:N	2.71	0.42
1:A:214:MET:HB3	1:A:263:ILE:HD13	2.02	0.42
1:A:409:GLY:O	1:A:410:MET:C	2.58	0.42
2:B:104:GLU:HG3	2:B:107:GLU:OE1	2.19	0.42
1:A:109:THR:O	1:A:112:ALA:HB3	2.20	0.42
1:A:400:GLU:HA	1:A:403:ILE:CG1	2.50	0.42
1:A:168:ARG:HH21	1:A:171:LEU:CD2	2.28	0.42
1:A:207:LEU:HD23	1:A:374:ILE:HD13	2.02	0.42
1:A:446:PHE:HB3	1:A:447:CYS:H	1.49	0.42
1:A:91:LEU:O	1:A:95:PHE:CD2	2.73	0.41
1:A:5:VAL:HG13	1:A:102:MET:HE2	2.02	0.41
1:A:91:LEU:HD12	1:A:91:LEU:H	1.85	0.41
1:A:282:ILE:O	1:A:286:LEU:HD23	2.21	0.41
1:A:35:ARG:HG2	1:A:35:ARG:HH11	1.86	0.41
1:A:4:ILE:O	1:A:21:LEU:HA	2.20	0.41
1:A:70:SER:OG	1:A:71:TYR:N	2.54	0.41
1:A:396:LYS:O	1:A:400:GLU:HG3	2.21	0.41
1:A:129:LEU:HD12	1:A:145:LEU:HD12	2.01	0.41
1:A:298:VAL:HG13	1:A:324:VAL:HG13	2.01	0.41
1:A:386:LEU:O	1:A:389:LYS:N	2.54	0.41
1:A:380:ASP:N	1:A:380:ASP:OD1	2.54	0.41
2:B:16:ILE:HG22	2:B:17:ALA:N	2.35	0.41
2:B:40:ILE:H	2:B:40:ILE:HD13	1.85	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:223:GLY:O	1:A:269:VAL:HA	2.21	0.41
2:B:86:LEU:O	2:B:86:LEU:HD12	2.21	0.41
1:A:90:LYS:O	1:A:93:ASP:HB2	2.21	0.40
1:A:419:LEU:HD23	1:A:419:LEU:HA	1.85	0.40
2:B:67:SER:O	2:B:73:GLY:O	2.38	0.40
1:A:190:ARG:NH1	1:A:190:ARG:CG	2.80	0.40
1:A:7:VAL:HG22	1:A:19:LEU:CD1	2.51	0.40
1:A:62:VAL:HG12	1:A:79:VAL:HG22	2.02	0.40
1:A:254:ILE:CD1	1:A:256:ILE:HD11	2.49	0.40

There are no symmetry-related clashes.

5.3 Torsion angles ⓘ

5.3.1 Protein backbone ⓘ

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	447/482 (93%)	382 (86%)	54 (12%)	11 (2%)	5	21
2	B	115/149 (77%)	96 (84%)	15 (13%)	4 (4%)	3	14
All	All	562/631 (89%)	478 (85%)	69 (12%)	15 (3%)	5	19

All (15) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	243	PRO
1	A	40	ILE
1	A	67	SER
1	A	68	PRO
1	A	408	GLU
2	B	53	ASN
1	A	24	PRO
2	B	46	ILE
1	A	84	GLY

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Mol	Chain	Res	Type
2	B	67	SER
2	B	68	PRO
1	A	269	VAL
1	A	85	PRO
1	A	116	GLY
1	A	77	VAL

5.3.2 Protein sidechains ⓘ

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	381/426 (89%)	351 (92%)	30 (8%)	12	34
2	B	98/126 (78%)	89 (91%)	9 (9%)	9	27
All	All	479/552 (87%)	440 (92%)	39 (8%)	11	33

All (39) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	9	THR
1	A	18	ILE
1	A	25	ASP
1	A	55	GLU
1	A	70	SER
1	A	86	LEU
1	A	114	LEU
1	A	120	LEU
1	A	142	LEU
1	A	146	LYS
1	A	149	LEU
1	A	156	LEU
1	A	168	ARG
1	A	171	LEU
1	A	180	ASN
1	A	195	LEU
1	A	207	LEU

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Mol	Chain	Res	Type
1	A	236	ARG
1	A	252	GLU
1	A	269	VAL
1	A	321	TYR
1	A	326	ASN
1	A	356	LYS
1	A	366	SER
1	A	372	GLN
1	A	386	LEU
1	A	423	LEU
1	A	426	LEU
1	A	447	CYS
1	A	450	LYS
2	B	21	LEU
2	B	37	ARG
2	B	39	LYS
2	B	40	ILE
2	B	43	ARG
2	B	47	HIS
2	B	78	GLU
2	B	85	PRO
2	B	96	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (8) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	31	GLN
1	A	33	HIS
1	A	144	ASN
1	A	180	ASN
1	A	287	GLN
1	A	326	ASN
1	A	335	ASN
1	A	424	ASN

5.3.3 RNA (i)

There are no RNA molecules in this entry.

5.4   Non-standard residues in protein, DNA, RNA chains ⓘ

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

5.5   Carbohydrates ⓘ

There are no monosaccharides in this entry.

5.6   Ligand geometry ⓘ

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	$\#|Z| > 2$
3	FON	A	451	-	34,36,36	4.16	22 (64%)	36,50,50	2.43	13 (36%)
3	FON	B	118	-	34,36,36	3.81	19 (55%)	36,50,50	2.51	12 (33%)

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	FON	A	451	-	-	9/24/37/37	0/2/3/3
3	FON	B	118	-	-	9/24/37/37	0/2/3/3

All (41) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	A	451	FON	CP1-N5	14.04	1.54	1.35
3	B	118	FON	CP1-N5	12.66	1.52	1.35
3	A	451	FON	C2-NA2	6.81	1.47	1.33
3	B	118	FON	C2-NA2	6.38	1.46	1.33
3	A	451	FON	C2-N3	-6.11	1.24	1.35
3	B	118	FON	C2-N3	-5.85	1.25	1.35

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	B	118	FON	O4-C4	5.85	1.39	1.24
3	A	451	FON	C4-N3	5.62	1.42	1.33
3	A	451	FON	C16-C15	5.50	1.48	1.38
3	A	451	FON	O4-C4	5.39	1.38	1.24
3	B	118	FON	C4-N3	5.38	1.42	1.33
3	A	451	FON	C14-N10	4.93	1.53	1.38
3	A	451	FON	C15-C14	4.90	1.47	1.39
3	B	118	FON	C7-N8	-4.65	1.36	1.44
3	A	451	FON	C12-C11	4.64	1.47	1.39
3	B	118	FON	C16-C15	4.46	1.46	1.38
3	B	118	FON	C15-C14	4.42	1.46	1.39
3	B	118	FON	C14-N10	4.35	1.51	1.38
3	A	451	FON	C9-N10	4.14	1.53	1.45
3	A	451	FON	C7-N8	-4.02	1.38	1.44
3	A	451	FON	C16-C11	3.98	1.46	1.39
3	B	118	FON	C12-C11	3.96	1.46	1.39
3	B	118	FON	C9-N10	3.87	1.53	1.45
3	B	118	FON	C16-C11	3.67	1.45	1.39
3	A	451	FON	C13-C12	3.54	1.45	1.38
3	A	451	FON	C8A-N1	3.40	1.41	1.34
3	A	451	FON	O3-CP1	3.12	1.45	1.23
3	A	451	FON	C-N	3.08	1.40	1.34
3	B	118	FON	O3-CP1	3.05	1.44	1.23
3	A	451	FON	C7-C6	3.00	1.55	1.52
3	B	118	FON	C13-C12	2.95	1.44	1.38
3	A	451	FON	CB-CA	-2.67	1.47	1.53
3	B	118	FON	CB-CA	-2.49	1.47	1.53
3	B	118	FON	CA-CT	2.49	1.59	1.52
3	A	451	FON	C4A-C8A	2.48	1.46	1.41
3	A	451	FON	CG-CD	2.46	1.56	1.50
3	B	118	FON	CG-CD	2.37	1.56	1.50
3	A	451	FON	CA-CT	2.34	1.58	1.52
3	B	118	FON	C-N	2.30	1.39	1.34
3	B	118	FON	C8A-N1	2.27	1.38	1.34
3	A	451	FON	C13-C14	2.24	1.43	1.39

All (25) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	B	118	FON	C9-N10-C14	6.04	137.77	122.14
3	B	118	FON	O3-CP1-N5	-6.00	116.68	125.36
3	A	451	FON	C9-N10-C14	5.86	137.29	122.14

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Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
3	A	451	FON	NA2-C2-N3	-4.92	109.59	117.25
3	B	118	FON	C13-C14-N10	-4.72	111.20	120.97
3	A	451	FON	N1-C2-N3	4.69	132.76	125.42
3	B	118	FON	N1-C2-N3	4.49	132.46	125.42
3	A	451	FON	C13-C14-N10	-4.38	111.90	120.97
3	A	451	FON	O3-CP1-N5	-3.84	119.80	125.36
3	A	451	FON	C8A-C4A-C4	-3.84	111.44	114.44
3	B	118	FON	NA2-C2-N3	-3.79	111.36	117.25
3	B	118	FON	C15-C14-N10	3.55	128.34	120.97
3	A	451	FON	C15-C14-N10	3.46	128.15	120.97
3	B	118	FON	C11-C-N	3.34	123.47	117.06
3	B	118	FON	C8A-C4A-C4	-3.25	111.90	114.44
3	A	451	FON	C11-C-N	2.98	122.77	117.06
3	A	451	FON	C13-C12-C11	2.96	124.22	120.78
3	B	118	FON	C4A-C4-N3	-2.76	117.46	123.14
3	B	118	FON	C13-C12-C11	2.58	123.78	120.78
3	A	451	FON	C4A-C4-N3	-2.32	118.37	123.14
3	B	118	FON	CT-CA-N	2.27	115.92	110.55
3	B	118	FON	O2-CT-CA	2.18	120.65	113.40
3	A	451	FON	CB-CG-CD	2.17	118.28	112.51
3	A	451	FON	CT-CA-N	2.09	115.51	110.55
3	A	451	FON	O2-CT-CA	2.08	120.32	113.40

There are no chirality outliers.

All (18) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	A	451	FON	O3-CP1-N5-C4A
3	A	451	FON	O3-CP1-N5-C6
3	A	451	FON	N5-C6-C9-N10
3	A	451	FON	C6-C9-N10-C14
3	B	118	FON	O3-CP1-N5-C4A
3	B	118	FON	O3-CP1-N5-C6
3	B	118	FON	C6-C9-N10-C14
3	A	451	FON	N-CA-CB-CG
3	B	118	FON	N-CA-CB-CG
3	A	451	FON	CT-CA-CB-CG
3	B	118	FON	CT-CA-CB-CG
3	A	451	FON	C7-C6-C9-N10
3	B	118	FON	C7-C6-C9-N10
3	B	118	FON	OE1-CD-CG-CB
3	A	451	FON	OE2-CD-CG-CB

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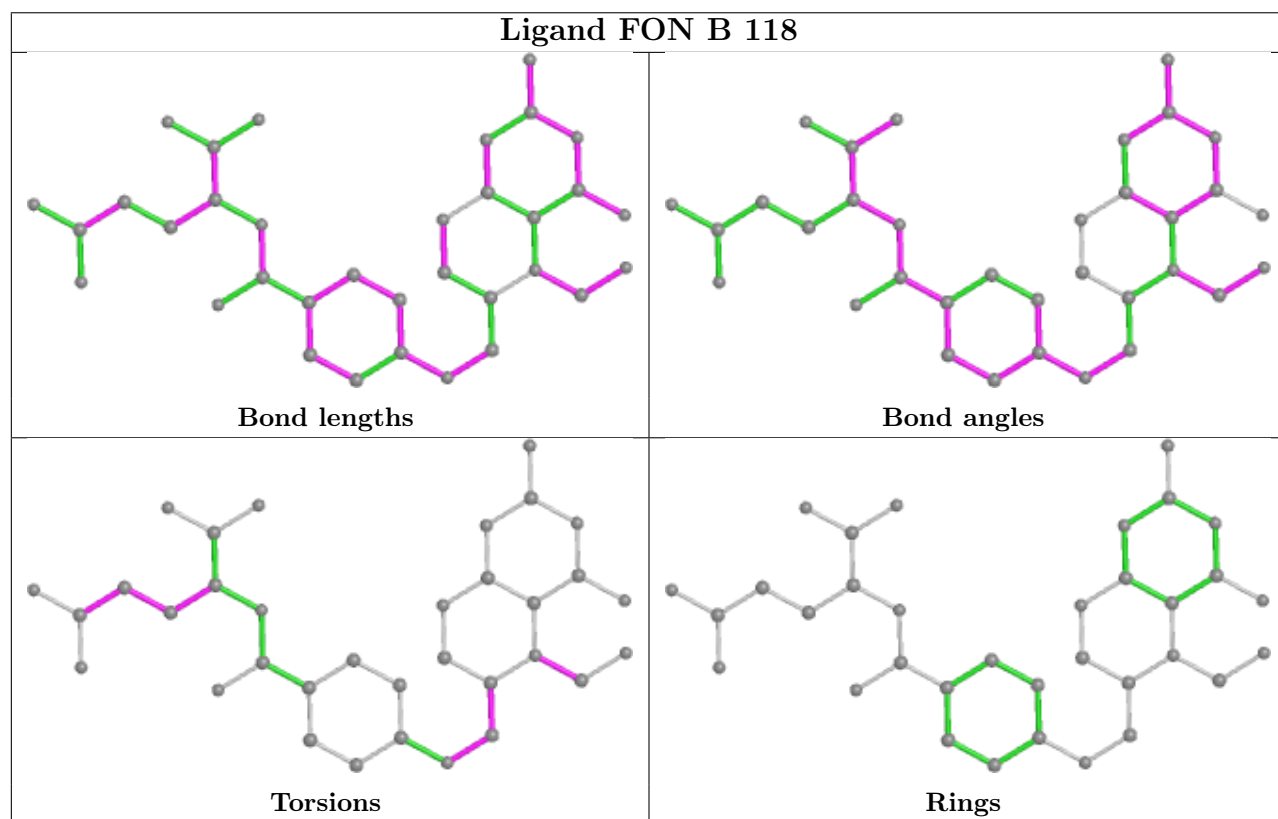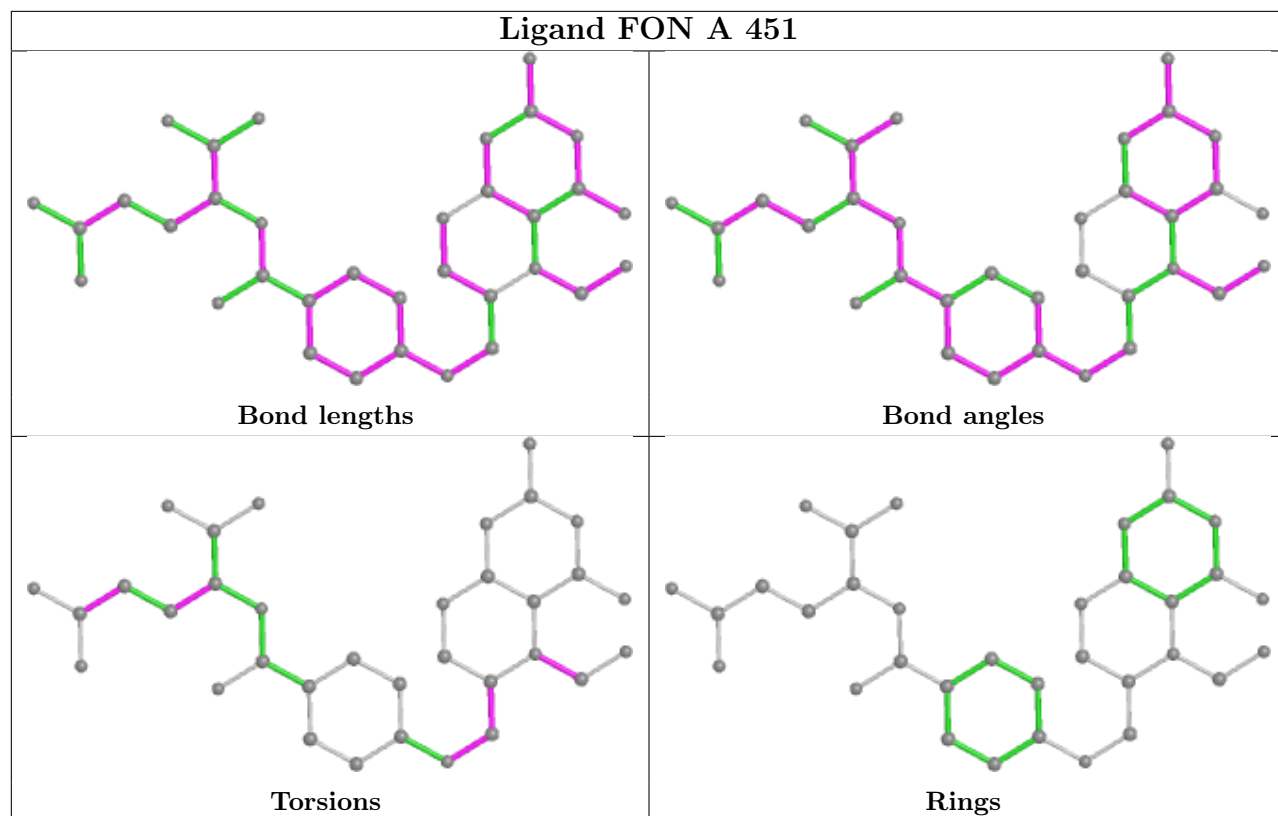
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Mol	Chain	Res	Type	Atoms
3	A	451	FON	OE1-CD-CG-CB
3	B	118	FON	OE2-CD-CG-CB
3	B	118	FON	CA-CB-CG-CD

There are no ring outliers.

2 monomers are involved in 4 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	A	451	FON	2	0
3	B	118	FON	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 FON A 451

Bond lengths

Bond angles

Torsions

Rings

Ligand FON B 118

Bond lengths

Bond angles

Torsions

Rings

5.7 Other polymers ⓘ

There are no such residues in this entry.

5.8 Polymer linkage issues ⓘ

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, 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	449/482 (93%)	0.10	26 (5%)	23	19	43, 77, 120, 172	0
2	B	117/149 (78%)	-0.19	2 (1%)	70	69	41, 65, 103, 121	0
All	All	566/631 (89%)	0.04	28 (4%)	29	26	41, 75, 117, 172	0

All (28) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	275	ASP	8.3
1	A	274	ASN	7.4
1	A	271	SER	6.4
1	A	246	THR	6.2
1	A	245	THR	5.4
1	A	273	THR	5.2
1	A	276	LEU	5.0
1	A	272	GLU	4.9
1	A	244	GLY	4.5
1	A	270	ARG	4.1
1	A	53	ASN	3.9
1	A	243	PRO	3.4
1	A	278	GLU	3.2
1	A	277	VAL	3.0
1	A	55	GLU	2.9
1	A	318	ASN	2.6
1	A	247	ARG	2.6
1	A	22	SER	2.6
1	A	248	ASP	2.5
1	A	54	GLY	2.4
1	A	67	SER	2.2
1	A	56	ASP	2.2
1	A	51	HIS	2.1
1	A	315	ARG	2.1

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Mol	Chain	Res	Type	RSRZ
1	A	52	GLU	2.1
2	B	21	LEU	2.1
1	A	21	LEU	2.1
2	B	67	SER	2.0

6.2   Non-standard residues in protein, DNA, RNA chains ⓘ

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

6.3   Carbohydrates ⓘ

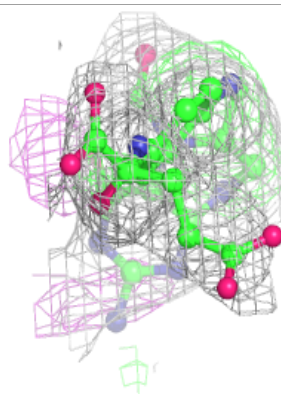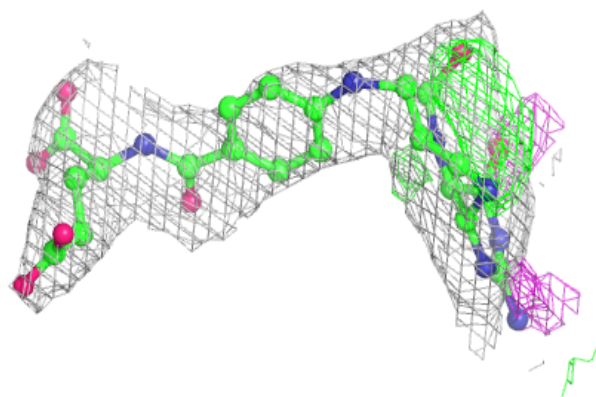There are no monosaccharides in this entry.

6.4   Ligands ⓘ

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.

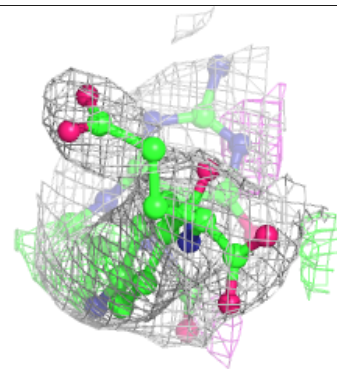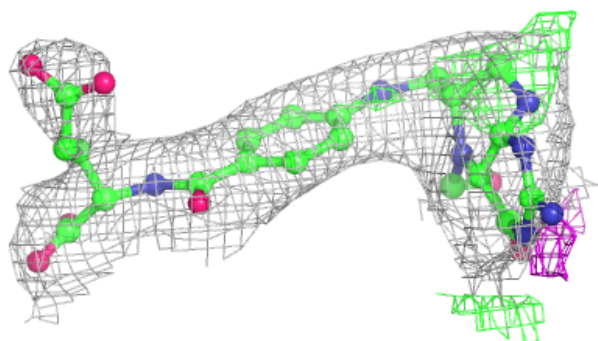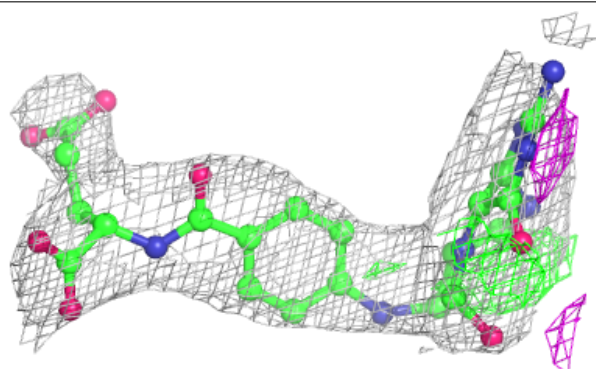| Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å^2)	Q<0.9
3	FON	A	451	34/34	0.80	0.29	81,91,103,104	0
3	FON	B	118	34/34	0.82	0.27	87,93,102,104	0

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 FON A 451:

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

Electron density around FON B 118:

$2mF_o$-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 ⓘ

There are no such residues in this entry.