



Full wwPDB X-ray Structure Validation Report ⓘ

Jan 31, 2016 – 07:46 PM GMT

PDB ID : 1H47
Title : STRUCTURES OF MECP SYNTHASE IN COMPLEX WITH (I) CMP AND
(II) CMP AND PRODUCT
Authors : Kemp, L.E.; Alphey, M.S.; Bond, C.S.; Hunter, W.N.
Deposited on : 2003-02-24
Resolution : 1.99 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
<http://wwpdb.org/validation/2016/XrayValidationReportHelp>
with specific help available everywhere you see the ⓘ symbol.

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

MolProbity : 4.02b-467
Mogul : 1.7 (RC4), CSD as536be (2015)
Xtriage (Phenix) : 1.9-1692
EDS : rb-20026688
Percentile statistics : 20151230.v01 (using entries in the PDB archive December 30th 2015)
Refmac : 5.8.0135
CCP4 : 6.5.0
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : trunk26865

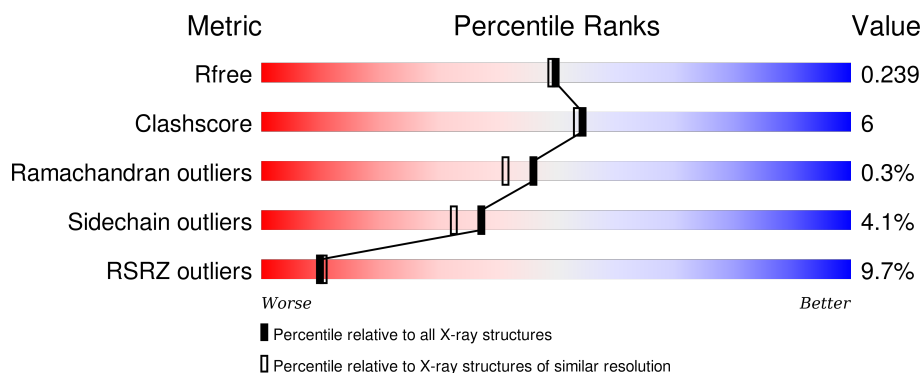
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.99 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}	91344	6249 (2.00-2.00)
Clashscore	102246	7340 (2.00-2.00)
Ramachandran outliers	100387	7248 (2.00-2.00)
Sidechain outliers	100360	7247 (2.00-2.00)
RSRZ outliers	91569	6262 (2.00-2.00)

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 on the lower bar indicate the fraction of residues that contain outliers for ≥ 3 , 2, 1 and 0 types of geometric quality criteria. 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	161	<div> <div>12%</div> <div>85%</div> <div>12%</div> <div>..</div> </div>
1	B	161	<div> <div>10%</div> <div>83%</div> <div>13%</div> <div>..</div> </div>
1	C	161	<div> <div>4%</div> <div>79%</div> <div>19%</div> <div>.</div> </div>
1	D	161	<div> <div>7%</div> <div>83%</div> <div>13%</div> <div>...</div> </div>
1	E	161	<div> <div>14%</div> <div>81%</div> <div>14%</div> <div>..</div> </div>

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Mol	Chain	Length	Quality of chain
1	F	161	

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	GPP	A	1157[A]	-	-	-	X
2	GPP	A	1157[B]	-	-	-	X
2	GPP	A	1157[C]	-	-	-	X
2	GPP	D	1157[A]	-	-	-	X
2	GPP	D	1157[B]	-	-	-	X
2	GPP	D	1157[C]	-	-	-	X

2 Entry composition [i](#)

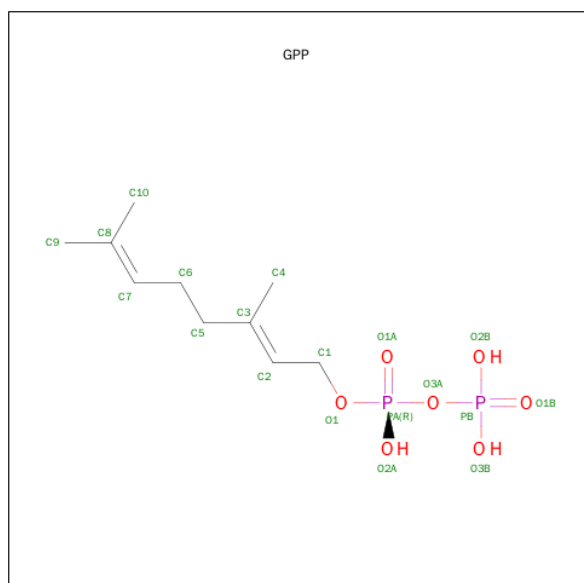
There are 5 unique types of molecules in this entry. The entry contains 7391 atoms, of which 0 are hydrogens and 0 are deuteriums.

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 2C-METHYL-D-ERYTHRITOL-2,4-CYCLODIPHOSPHATE SYNTHASE.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	157	Total	C	N	O	S	0	0	0
			1151	731	202	212	6			
1	B	158	Total	C	N	O	S	0	0	0
			1170	743	204	217	6			
1	C	157	Total	C	N	O	S	0	0	0
			1166	742	205	213	6			
1	D	157	Total	C	N	O	S	0	0	0
			1151	731	202	212	6			
1	E	158	Total	C	N	O	S	0	0	0
			1170	743	204	217	6			
1	F	157	Total	C	N	O	S	0	0	0
			1166	742	205	213	6			

- Molecule 2 is GERANYL DIPHOSPHATE (three-letter code: GPP) (formula: $C_{10}H_{20}O_7P_2$).

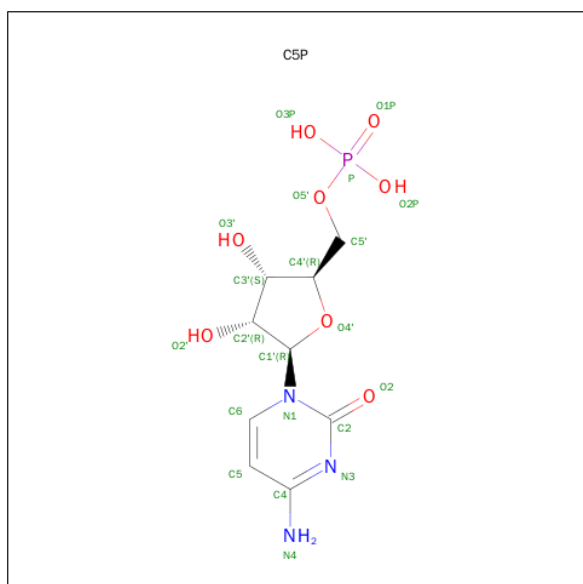


Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
2	A	1	Total	C	O	P	0	1
			57	30	21	6		
2	D	1	Total	C	O	P	0	1
			57	30	21	6		

- Molecule 3 is ZINC ION (three-letter code: ZN) (formula: Zn).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	D	1	Total	Zn	0	0
			1	1		
3	E	1	Total	Zn	0	0
			1	1		
3	B	1	Total	Zn	0	0
			1	1		
3	C	1	Total	Zn	0	0
			1	1		
3	A	1	Total	Zn	0	0
			1	1		
3	F	1	Total	Zn	0	0
			1	1		

- Molecule 4 is CYTIDINE-5'-MONOPHOSPHATE (three-letter code: C5P) (formula: C₉H₁₄N₃O₈P).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
4	A	1	Total	C	N	O	P	0	0
			21	9	3	8	1		

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Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
4	B	1	Total 21	C 9	N 3	O 8	P 1	0	0
4	C	1	Total 21	C 9	N 3	O 8	P 1	0	0
4	D	1	Total 21	C 9	N 3	O 8	P 1	0	0
4	E	1	Total 21	C 9	N 3	O 8	P 1	0	0
4	F	1	Total 21	C 9	N 3	O 8	P 1	0	0

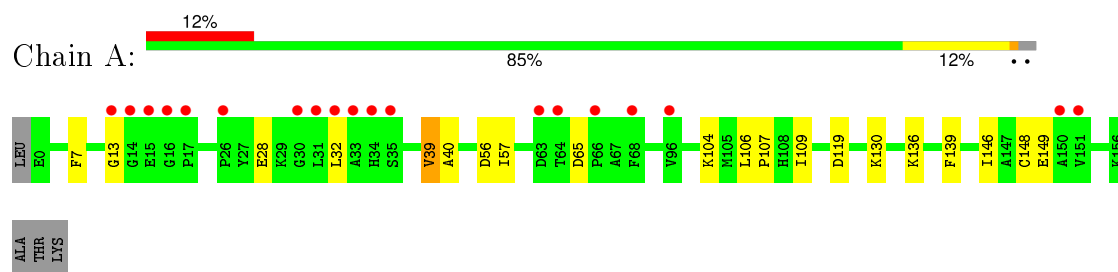
- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	28	Total 28	O 28	0	0
5	B	25	Total 25	O 25	0	0
5	C	31	Total 31	O 31	0	0
5	D	29	Total 29	O 29	0	0
5	E	21	Total 21	O 21	0	0
5	F	37	Total 37	O 37	0	0

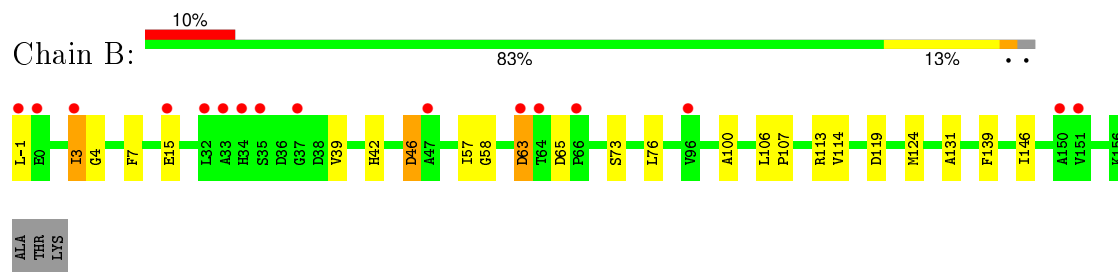
3 Residue-property plots [i](#)

These plots are drawn for all protein, RNA and DNA chains in the entry. The first graphic for a chain summarises the proportions of errors 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.

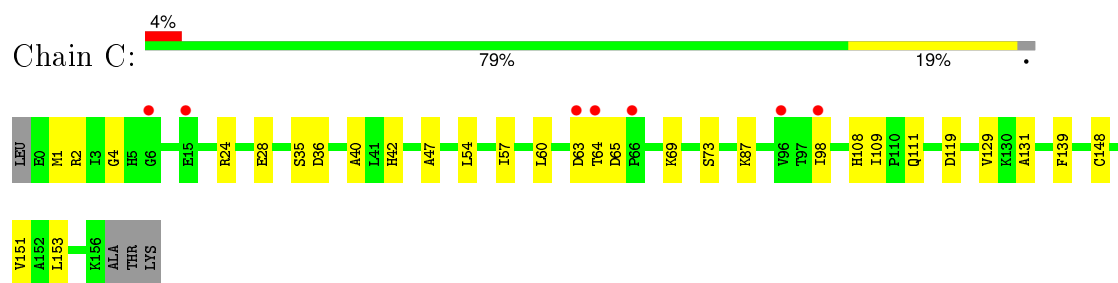
- Molecule 1: 2C-METHYL-D-ERYTHRITOL-2,4-CYCLODIPHOSPHATE SYNTHASE



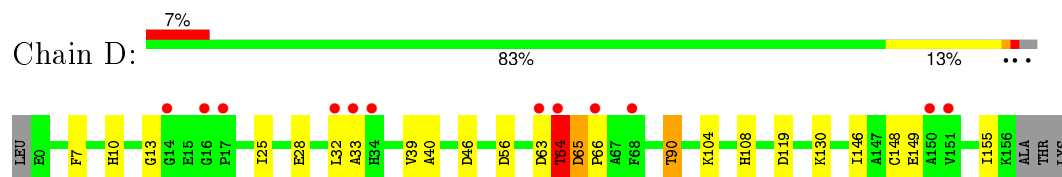
- Molecule 1: 2C-METHYL-D-ERYTHRITOL-2,4-CYCLODIPHOSPHATE SYNTHASE



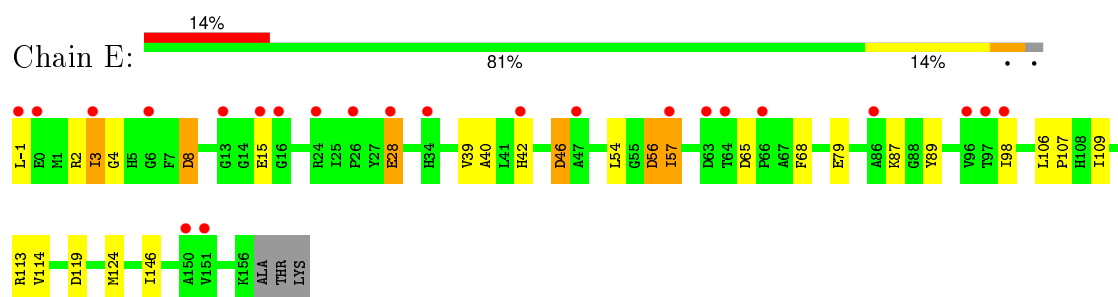
- Molecule 1: 2C-METHYL-D-ERYTHRITOL-2,4-CYCLODIPHOSPHATE SYNTHASE



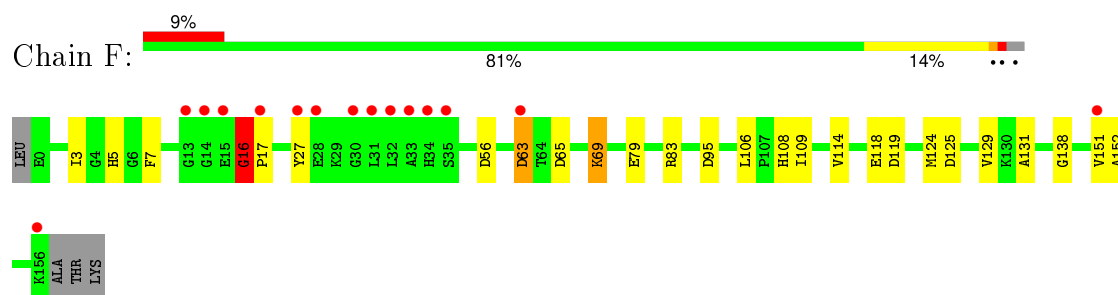
- Molecule 1: 2C-METHYL-D-ERYTHRITOL-2,4-CYCLODIPHOSPHATE SYNTHASE



- Molecule 1: 2C-METHYL-D-ERYTHRITOL-2,4-CYCLODIPHOSPHATE SYNTHASE



● Molecule 1: 2C-METHYL-D-ERYTHRITOL-2,4-CYCLODIPHOSPHATE SYNTHASE



4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	88.08Å 117.58Å 54.22Å 90.00° 90.21° 90.00°	Depositor
Resolution (Å)	87.71 – 1.99 29.90 – 1.99	Depositor EDS
% Data completeness (in resolution range)	97.9 (87.71-1.99) 97.9 (29.90-1.99)	Depositor EDS
R_{merge}	0.05	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.30 (at 2.00Å)	Xtriage
Refinement program	REFMAC 5.1.24	Depositor
R, R_{free}	0.214 , 0.252 0.208 , 0.239	Depositor DCC
R_{free} test set	3708 reflections (5.31%)	DCC
Wilson B-factor (Å ²)	28.4	Xtriage
Anisotropy	0.711	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.35 , 51.0	EDS
Estimated twinning fraction	0.130 for -h,-k,l	Xtriage
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.33$	Xtriage
Outliers	0 of 73502 reflections	Xtriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	7391	wwPDB-VP
Average B, all atoms (Å ²)	33.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.75% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

²Theoretical values of $\langle |L| \rangle$, $\langle L^2 \rangle$ for acentric reflections are 0.5, 0.375 respectively for untwinned datasets, and 0.333, 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: ZN, GPP, C5P

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	0.75	0/1172	0.90	3/1588 (0.2%)
1	B	0.73	0/1191	0.89	4/1613 (0.2%)
1	C	0.73	0/1187	0.90	3/1605 (0.2%)
1	D	0.80	0/1172	0.91	4/1588 (0.3%)
1	E	0.65	0/1191	0.91	5/1613 (0.3%)
1	F	0.76	0/1187	0.90	6/1605 (0.4%)
All	All	0.74	0/7100	0.90	25/9612 (0.3%)

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	F	0	1

There are no bond length outliers.

All (25) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	E	119	ASP	CB-CG-OD2	8.07	125.56	118.30
1	B	65	ASP	CB-CG-OD2	6.63	124.27	118.30
1	B	119	ASP	CB-CG-OD2	6.54	124.19	118.30
1	D	56	ASP	CB-CG-OD2	6.50	124.15	118.30
1	F	65	ASP	CB-CG-OD2	6.23	123.90	118.30
1	E	56	ASP	CB-CG-OD2	6.14	123.83	118.30
1	E	46	ASP	CB-CG-OD2	6.00	123.70	118.30
1	A	119	ASP	CB-CG-OD2	5.97	123.68	118.30
1	B	46	ASP	CB-CG-OD2	5.96	123.67	118.30
1	F	56	ASP	CB-CG-OD2	5.89	123.60	118.30

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	C	65	ASP	CB-CG-OD2	5.74	123.47	118.30
1	A	65	ASP	CB-CG-OD2	5.73	123.45	118.30
1	A	56	ASP	CB-CG-OD2	5.65	123.38	118.30
1	F	63	ASP	CB-CG-OD2	5.57	123.31	118.30
1	C	36	ASP	CB-CG-OD2	5.52	123.27	118.30
1	F	95	ASP	CB-CG-OD1	5.48	123.23	118.30
1	D	46	ASP	CB-CG-OD2	5.47	123.22	118.30
1	E	65	ASP	CB-CG-OD2	5.41	123.17	118.30
1	D	119	ASP	CB-CG-OD2	5.36	123.12	118.30
1	F	119	ASP	CB-CG-OD2	5.30	123.07	118.30
1	E	8	ASP	CB-CG-OD2	5.17	122.95	118.30
1	B	63	ASP	CB-CG-OD2	5.17	122.95	118.30
1	F	125	ASP	CB-CG-OD2	5.10	122.89	118.30
1	C	119	ASP	CB-CG-OD2	5.04	122.84	118.30
1	D	65	ASP	CB-CG-OD2	5.04	122.84	118.30

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	F	16	GLY	Peptide

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	1151	0	1145	8	0
1	B	1170	0	1172	17	0
1	C	1166	0	1181	16	0
1	D	1151	0	1145	14	0
1	E	1170	0	1172	22	0
1	F	1166	0	1181	15	0
2	A	57	0	51	11	0
2	D	57	0	51	4	0
3	A	1	0	0	0	0
3	B	1	0	0	0	0
3	C	1	0	0	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
3	D	1	0	0	0	0
3	E	1	0	0	0	0
3	F	1	0	0	0	0
4	A	21	0	12	0	0
4	B	21	0	12	1	0
4	C	21	0	12	1	0
4	D	21	0	12	0	0
4	E	21	0	12	0	0
4	F	21	0	12	1	0
5	A	28	0	0	0	0
5	B	25	0	0	2	0
5	C	31	0	0	4	0
5	D	29	0	0	0	0
5	E	21	0	0	1	0
5	F	37	0	0	2	0
All	All	7391	0	7170	92	0

The all-atom clashscore is defined as the number of clashes found per 1000 atoms (including hydrogen atoms). The all-atom clashscore for this structure is 6.

All (92) 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)
2:A:1157[B]:GPP:H12	5:B:2022:HOH:O	1.80	0.82
1:B:113:ARG:C	1:B:124:MET:HE1	2.02	0.80
1:C:63:ASP:O	1:C:69:LYS:NZ	2.15	0.78
2:A:1157[B]:GPP:H43	5:B:2022:HOH:O	1.84	0.77
1:C:54:LEU:HD21	1:C:87:LYS:HD2	1.71	0.71
1:E:114:VAL:HA	1:E:124:MET:CE	2.21	0.70
1:B:3:ILE:HD13	1:B:4:GLY:N	2.07	0.69
1:E:114:VAL:HA	1:E:124:MET:HE3	1.76	0.67
1:E:56:ASP:OD2	5:E:2007:HOH:O	2.12	0.67
1:C:108:HIS:HE1	5:C:2023:HOH:O	1.78	0.67
1:B:3:ILE:HD12	1:C:151:VAL:HG21	1.77	0.66
1:D:90:THR:HG22	1:D:155:ILE:HB	1.79	0.65
1:E:3:ILE:CD1	1:F:151:VAL:HG21	2.27	0.63
1:E:39:VAL:HG11	1:E:146:ILE:HG22	1.83	0.61
1:D:7:PHE:HD1	1:D:149:GLU:HG2	1.65	0.61
1:C:109:ILE:HD12	1:C:129:VAL:HG12	1.82	0.60
1:F:63:ASP:OD1	1:F:69:LYS:HE2	2.01	0.60
1:D:10:HIS:HD2	1:D:39:VAL:HG12	1.67	0.60

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:F:108:HIS:HE1	5:F:2025:HOH:O	1.86	0.59
2:A:1157[B]:GPP:O2A	1:B:139:PHE:HD1	1.86	0.58
1:E:3:ILE:HD12	1:F:151:VAL:CG2	2.34	0.57
2:A:1157[B]:GPP:H103	1:B:7:PHE:CZ	2.40	0.57
1:C:131:ALA:O	4:C:1157:C5P:H2'1	2.05	0.56
1:A:149:GLU:OE2	2:A:1157[C]:GPP:H101	2.05	0.56
1:B:3:ILE:HD12	1:C:151:VAL:CG2	2.35	0.55
1:D:25:ILE:HG23	1:D:108:HIS:CE1	2.41	0.54
1:F:131:ALA:O	4:F:1157:C5P:H2'1	2.08	0.54
1:B:113:ARG:O	1:B:124:MET:HE1	2.08	0.54
1:C:57:ILE:HG21	5:C:2031:HOH:O	2.08	0.53
1:E:2:ARG:HD3	1:E:89:TYR:HE1	1.73	0.53
1:D:7:PHE:CE1	2:D:1157[A]:GPP:H92	2.43	0.53
1:B:100:ALA:CB	1:B:146:ILE:HD12	2.40	0.52
1:E:3:ILE:CD1	1:F:151:VAL:CG2	2.89	0.51
1:E:42:HIS:CE1	1:E:57:ILE:HG12	2.46	0.51
1:A:106:LEU:N	1:A:107:PRO:HD2	2.26	0.50
1:B:57:ILE:HD12	1:B:58:GLY:N	2.27	0.50
1:E:46:ASP:OD1	1:E:57:ILE:HG13	2.12	0.50
2:D:1157[C]:GPP:H92	1:F:7:PHE:CE1	2.47	0.49
1:E:40:ALA:HB2	1:E:98:ILE:CD1	2.42	0.49
1:C:42:HIS:NE2	1:C:73:SER:OG	2.46	0.49
1:B:100:ALA:HB2	1:B:146:ILE:HD12	1.93	0.49
1:E:114:VAL:HA	1:E:124:MET:HE1	1.96	0.48
1:F:106:LEU:HD12	5:F:2026:HOH:O	2.13	0.48
2:D:1157[A]:GPP:O3B	1:F:138:GLY:HA2	2.13	0.48
1:C:35:SER:HB2	5:C:2013:HOH:O	2.13	0.47
2:A:1157[B]:GPP:O1B	2:A:1157[B]:GPP:O2A	2.33	0.47
1:D:64:THR:HG22	1:D:65:ASP:N	2.30	0.47
1:E:113:ARG:O	1:E:124:MET:HE1	2.14	0.47
1:C:111:GLN:HG3	5:C:2024:HOH:O	2.15	0.47
1:E:8:ASP:CG	1:E:42:HIS:CD2	2.89	0.46
1:D:13:GLY:HA3	1:D:32:LEU:HG	1.98	0.46
1:D:39:VAL:HG21	1:D:146:ILE:HG22	1.97	0.46
1:C:40:ALA:HA	1:C:148:CYS:SG	2.55	0.46
1:B:114:VAL:N	1:B:124:MET:HE1	2.30	0.46
1:F:16:GLY:HA3	1:F:27:TYR:O	2.15	0.46
2:A:1157[B]:GPP:H42	1:B:139:PHE:CZ	2.51	0.46
1:D:25:ILE:HG23	1:D:108:HIS:HE1	1.80	0.46
1:D:40:ALA:HA	1:D:148:CYS:SG	2.56	0.46
2:D:1157[C]:GPP:C7	2:D:1157[C]:GPP:H41	2.46	0.46

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:D:10:HIS:ND1	1:D:33:ALA:HB2	2.31	0.45
1:A:7:PHE:HD1	1:A:149:GLU:HG2	1.81	0.45
1:E:3:ILE:HD13	1:E:4:GLY:N	2.31	0.45
1:A:39:VAL:HG21	1:A:146:ILE:HG22	1.98	0.45
1:F:3:ILE:HD12	1:F:152:ALA:O	2.17	0.45
1:C:40:ALA:HB2	1:C:98:ILE:CD1	2.46	0.45
1:C:1:MET:HE1	1:C:153:LEU:HD23	1.98	0.45
1:F:79:GLU:OE2	1:F:83:ARG:NE	2.47	0.45
1:E:28:GLU:CD	1:E:28:GLU:N	2.70	0.44
1:E:40:ALA:HB2	1:E:98:ILE:HD11	1.99	0.44
1:A:40:ALA:HA	1:A:148:CYS:SG	2.58	0.44
1:E:106:LEU:N	1:E:107:PRO:CD	2.80	0.43
1:E:106:LEU:HA	1:E:109:ILE:HD12	2.00	0.43
1:A:13:GLY:HA3	1:A:32:LEU:HG	2.00	0.43
1:F:109:ILE:CD1	1:F:129:VAL:HG12	2.48	0.43
1:B:73:SER:HA	1:B:76:LEU:HD12	2.01	0.43
1:E:2:ARG:HD3	1:E:89:TYR:CE1	2.53	0.42
1:F:114:VAL:O	1:F:118:GLU:HG3	2.18	0.42
1:B:46:ASP:OD1	1:B:57:ILE:HG13	2.20	0.42
1:D:130:LYS:CE	1:F:5:HIS:O	2.68	0.42
1:E:54:LEU:HD21	1:E:87:LYS:HD2	2.01	0.42
1:B:42:HIS:CE1	1:B:57:ILE:HG12	2.55	0.42
1:B:106:LEU:N	1:B:107:PRO:CD	2.82	0.42
1:B:131:ALA:O	4:B:1157:C5P:H2'1	2.20	0.41
1:A:139:PHE:CD1	2:A:1157[A]:GPP:H11	2.55	0.41
1:C:4:GLY:HA3	1:C:47:ALA:O	2.21	0.41
2:A:1157[C]:GPP:H11	1:C:139:PHE:CD1	2.56	0.41
1:D:65:ASP:HA	1:D:66:PRO:HD3	1.84	0.41
2:A:1157[A]:GPP:H41	2:A:1157[A]:GPP:H61	1.88	0.41
1:A:106:LEU:HA	1:A:109:ILE:HD12	2.02	0.41
2:A:1157[A]:GPP:H2	2:A:1157[A]:GPP:O1A	2.21	0.40
1:D:146:ILE:HD13	1:D:146:ILE:HG21	1.85	0.40
1:E:68:PHE:CZ	1:E:79:GLU:HG2	2.56	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	155/161 (96%)	150 (97%)	5 (3%)	0	100	100
1	B	156/161 (97%)	154 (99%)	2 (1%)	0	100	100
1	C	155/161 (96%)	152 (98%)	3 (2%)	0	100	100
1	D	155/161 (96%)	150 (97%)	4 (3%)	1 (1%)	30	22
1	E	156/161 (97%)	155 (99%)	1 (1%)	0	100	100
1	F	155/161 (96%)	152 (98%)	1 (1%)	2 (1%)	15	7
All	All	932/966 (96%)	913 (98%)	16 (2%)	3 (0%)	46	41

All (3) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	F	17	PRO
1	F	16	GLY
1	D	64	THR

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	112/121 (93%)	106 (95%)	6 (5%)	27	21
1	B	116/121 (96%)	111 (96%)	5 (4%)	35	30
1	C	116/121 (96%)	111 (96%)	5 (4%)	35	30
1	D	112/121 (93%)	107 (96%)	5 (4%)	34	29

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	E	116/121 (96%)	111 (96%)	5 (4%)	35	30
1	F	116/121 (96%)	114 (98%)	2 (2%)	68	71
All	All	688/726 (95%)	660 (96%)	28 (4%)	37	32

All (28) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	28	GLU
1	A	39	VAL
1	A	57	ILE
1	A	104	LYS
1	A	130	LYS
1	A	136	LYS
1	B	-1	LEU
1	B	3	ILE
1	B	15	GLU
1	B	39	VAL
1	B	63	ASP
1	C	2	ARG
1	C	24	ARG
1	C	28	GLU
1	C	60	LEU
1	C	64	THR
1	D	28	GLU
1	D	63	ASP
1	D	64	THR
1	D	90	THR
1	D	104	LYS
1	E	-1	LEU
1	E	3	ILE
1	E	15	GLU
1	E	28	GLU
1	E	57	ILE
1	F	69	LYS
1	F	124	MET

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (2) such sidechains are listed below:

Mol	Chain	Res	Type
1	C	108	HIS

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Mol	Chain	Res	Type
1	E	42	HIS

5.3.3 RNA ⓘ

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 carbohydrates in this entry.

5.6 Ligand geometry ⓘ

Of 18 ligands modelled in this entry, 6 are monoatomic - leaving 12 for Mogul analysis.

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	GPP	A	1157[A]	-	16,18,18	1.10	2 (12%)	21,25,25	1.43	2 (9%)
2	GPP	A	1157[B]	-	16,18,18	1.04	2 (12%)	21,25,25	1.27	1 (4%)
2	GPP	A	1157[C]	-	16,18,18	1.00	0	21,25,25	1.22	3 (14%)
4	C5P	A	1159	-	17,22,22	1.14	2 (11%)	22,33,33	1.67	8 (36%)
4	C5P	B	1157	-	17,22,22	0.95	1 (5%)	22,33,33	1.85	7 (31%)
4	C5P	C	1157	-	17,22,22	1.19	2 (11%)	22,33,33	1.71	4 (18%)
2	GPP	D	1157[A]	-	16,18,18	1.00	1 (6%)	21,25,25	1.22	1 (4%)
2	GPP	D	1157[B]	-	16,18,18	1.10	2 (12%)	21,25,25	1.13	1 (4%)
2	GPP	D	1157[C]	-	16,18,18	1.07	1 (6%)	21,25,25	1.14	1 (4%)
4	C5P	D	1159	-	17,22,22	1.00	1 (5%)	22,33,33	1.81	6 (27%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
4	C5P	E	1157	-	17,22,22	1.05	1 (5%)	22,33,33	1.84	7 (31%)
4	C5P	F	1157	-	17,22,22	1.24	2 (11%)	22,33,33	1.46	4 (18%)

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	GPP	A	1157[A]	-	-	0/19/19/19	0/0/0/0
2	GPP	A	1157[B]	-	-	0/19/19/19	0/0/0/0
2	GPP	A	1157[C]	-	-	0/19/19/19	0/0/0/0
4	C5P	A	1159	-	-	0/6/26/26	0/2/2/2
4	C5P	B	1157	-	-	0/6/26/26	0/2/2/2
4	C5P	C	1157	-	-	0/6/26/26	0/2/2/2
2	GPP	D	1157[A]	-	-	0/19/19/19	0/0/0/0
2	GPP	D	1157[B]	-	-	0/19/19/19	0/0/0/0
2	GPP	D	1157[C]	-	-	0/19/19/19	0/0/0/0
4	C5P	D	1159	-	-	0/6/26/26	0/2/2/2
4	C5P	E	1157	-	-	0/6/26/26	0/2/2/2
4	C5P	F	1157	-	-	0/6/26/26	0/2/2/2

All (17) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	D	1157[A]	GPP	PA-O1A	2.05	1.58	1.51
2	D	1157[B]	GPP	PB-O1B	2.09	1.58	1.51
2	A	1157[A]	GPP	PB-O1B	2.15	1.58	1.51
4	A	1159	C5P	P-O1P	2.16	1.58	1.51
4	D	1159	C5P	O4'-C1'	2.17	1.43	1.41
2	A	1157[B]	GPP	PB-O1B	2.20	1.58	1.51
2	D	1157[C]	GPP	PA-O1A	2.24	1.59	1.51
2	A	1157[B]	GPP	PA-O1A	2.31	1.59	1.51
2	D	1157[B]	GPP	PA-O1A	2.35	1.59	1.51
4	C	1157	C5P	O4'-C1'	2.35	1.44	1.41
2	A	1157[A]	GPP	PA-O1A	2.38	1.59	1.51
4	F	1157	C5P	O4'-C1'	2.45	1.44	1.41
4	C	1157	C5P	P-O1P	2.52	1.59	1.51
4	B	1157	C5P	P-O1P	2.66	1.59	1.51
4	E	1157	C5P	P-O1P	2.69	1.60	1.51
4	A	1159	C5P	O4'-C1'	3.07	1.45	1.41
4	F	1157	C5P	P-O1P	3.17	1.61	1.51

All (45) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	D	1159	C5P	O2'-C2'-C3'	-4.91	95.87	111.83
4	E	1157	C5P	O2'-C2'-C3'	-4.49	97.24	111.83
2	A	1157[B]	GPP	PA-O3A-PB	-4.34	118.12	132.67
4	B	1157	C5P	O2'-C2'-C3'	-3.93	99.04	111.83
4	A	1159	C5P	O2'-C2'-C3'	-3.69	99.84	111.83
2	D	1157[C]	GPP	PA-O3A-PB	-3.60	120.60	132.67
2	D	1157[A]	GPP	PA-O3A-PB	-3.41	121.25	132.67
2	D	1157[B]	GPP	PA-O3A-PB	-3.36	121.39	132.67
4	F	1157	C5P	O2'-C2'-C3'	-3.35	100.94	111.83
2	A	1157[A]	GPP	C5-C3-C2	-3.25	114.88	121.05
4	B	1157	C5P	C6-N1-C2	-2.39	117.41	121.28
4	D	1159	C5P	C6-N1-C2	-2.32	117.53	121.28
2	A	1157[C]	GPP	C5-C3-C2	-2.26	116.76	121.05
4	B	1157	C5P	C5-C4-N3	-2.11	119.14	121.80
4	E	1157	C5P	C5-C4-N3	-2.06	119.20	121.80
4	A	1159	C5P	C6-N1-C2	-2.04	117.98	121.28
2	A	1157[C]	GPP	PA-O3A-PB	-2.01	125.92	132.67
4	B	1157	C5P	O2P-P-O5'	2.01	112.34	106.56
4	A	1159	C5P	N4-C4-N3	2.04	120.23	116.50
4	A	1159	C5P	O4'-C4'-C3'	2.05	109.27	105.15
4	E	1157	C5P	N4-C4-N3	2.11	120.35	116.50
4	E	1157	C5P	O3'-C3'-C2'	2.12	118.73	111.83
4	C	1157	C5P	O2P-P-O5'	2.12	112.68	106.56
4	F	1157	C5P	O2P-P-O5'	2.16	112.78	106.56
4	D	1159	C5P	O4'-C4'-C3'	2.17	109.51	105.15
2	A	1157[C]	GPP	O3B-PB-O3A	2.19	115.01	105.09
4	A	1159	C5P	O4'-C4'-C5'	2.20	117.17	109.32
4	D	1159	C5P	O4'-C4'-C5'	2.23	117.31	109.32
4	F	1157	C5P	O4'-C1'-N1	2.31	112.94	108.08
4	A	1159	C5P	C4'-O4'-C1'	2.35	112.30	109.72
4	C	1157	C5P	C4'-O4'-C1'	2.40	112.36	109.72
4	A	1159	C5P	O3'-C3'-C2'	2.50	119.97	111.83
4	E	1157	C5P	O3'-C3'-C4'	2.53	118.63	111.05
4	D	1159	C5P	O3'-C3'-C2'	2.56	120.15	111.83
4	E	1157	C5P	O4'-C4'-C3'	2.60	110.39	105.15
4	B	1157	C5P	O3'-C3'-C4'	2.65	119.00	111.05
4	B	1157	C5P	C4'-O4'-C1'	2.65	112.64	109.72
4	F	1157	C5P	C2-N3-C4	3.16	120.07	115.61
4	A	1159	C5P	C2-N3-C4	3.30	120.27	115.61
4	C	1157	C5P	C2-N3-C4	3.87	121.07	115.61
4	D	1159	C5P	C2-N3-C4	3.94	121.17	115.61
4	E	1157	C5P	C2-N3-C4	4.02	121.29	115.61

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	B	1157	C5P	C2-N3-C4	4.19	121.53	115.61
2	A	1157[A]	GPP	C4-C3-C5	4.23	121.86	115.41
4	C	1157	C5P	O4'-C1'-N1	4.42	117.39	108.08

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

8 monomers are involved in 18 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	A	1157[A]	GPP	3	0
2	A	1157[B]	GPP	6	0
2	A	1157[C]	GPP	2	0
4	B	1157	C5P	1	0
4	C	1157	C5P	1	0
2	D	1157[A]	GPP	2	0
2	D	1157[C]	GPP	2	0
4	F	1157	C5P	1	0

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, 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	157/161 (97%)	0.71	19 (12%) 6 6	18, 28, 54, 62	0
1	B	158/161 (98%)	0.59	16 (10%) 9 10	20, 32, 49, 55	0
1	C	157/161 (97%)	0.38	7 (4%) 37 38	20, 30, 44, 52	0
1	D	157/161 (97%)	0.57	12 (7%) 17 18	19, 28, 49, 54	0
1	E	158/161 (98%)	0.79	23 (14%) 3 4	21, 34, 51, 57	2 (1%)
1	F	157/161 (97%)	0.58	15 (9%) 10 11	19, 30, 50, 58	0
All	All	944/966 (97%)	0.60	92 (9%) 10 10	18, 31, 50, 62	2 (0%)

All (92) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	E	-1	LEU	7.2
1	F	32	LEU	6.7
1	D	64	THR	6.6
1	A	32	LEU	6.6
1	B	-1	LEU	6.5
1	A	33	ALA	6.4
1	A	64	THR	5.8
1	A	16	GLY	5.1
1	F	15	GLU	5.1
1	A	13	GLY	5.0
1	E	63	ASP	5.0
1	D	32	LEU	5.0
1	A	14	GLY	4.7
1	B	63	ASP	4.7
1	F	63	ASP	4.6
1	F	14	GLY	4.5
1	A	68	PHE	4.5
1	A	34	HIS	4.2
1	D	68	PHE	4.2

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Mol	Chain	Res	Type	RSRZ
1	F	33	ALA	4.2
1	E	64	THR	4.1
1	C	63	ASP	4.1
1	B	34	HIS	3.9
1	C	15	GLU	3.8
1	D	33	ALA	3.7
1	D	16	GLY	3.6
1	A	31	LEU	3.6
1	F	30	GLY	3.5
1	F	28	GLU	3.4
1	E	26	PRO	3.3
1	F	13	GLY	3.3
1	A	63	ASP	3.3
1	A	151	VAL	3.2
1	A	66	PRO	3.2
1	D	63	ASP	3.1
1	B	66	PRO	3.1
1	A	30	GLY	3.0
1	B	151	VAL	3.0
1	F	31	LEU	2.9
1	B	64	THR	2.9
1	F	34	HIS	2.8
1	C	64	THR	2.8
1	E	66	PRO	2.8
1	A	17	PRO	2.8
1	E	34	HIS	2.7
1	E	96	VAL	2.7
1	E	151	VAL	2.7
1	D	66	PRO	2.7
1	E	86	ALA	2.6
1	E	28	GLU	2.6
1	E	16	GLY	2.6
1	D	150	ALA	2.5
1	B	3	ILE	2.5
1	C	6	GLY	2.4
1	F	27	TYR	2.4
1	B	32	LEU	2.4
1	E	24	ARG	2.4
1	D	151	VAL	2.4
1	A	15	GLU	2.4
1	F	156	LYS	2.4
1	E	0	GLU	2.4

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Mol	Chain	Res	Type	RSRZ
1	A	96	VAL	2.4
1	B	96	VAL	2.4
1	E	15	GLU	2.3
1	D	17	PRO	2.3
1	B	15	GLU	2.3
1	E	97	THR	2.3
1	F	35	SER	2.3
1	B	0	GLU	2.3
1	C	98	ILE	2.3
1	E	6	GLY	2.3
1	E	47	ALA	2.3
1	F	17	PRO	2.2
1	C	66	PRO	2.2
1	E	57	ILE	2.2
1	E	98	ILE	2.2
1	B	150	ALA	2.2
1	C	96	VAL	2.2
1	F	151	VAL	2.2
1	A	150	ALA	2.2
1	B	35	SER	2.2
1	E	150	ALA	2.1
1	D	14	GLY	2.1
1	A	26	PRO	2.1
1	E	42	HIS	2.1
1	B	33	ALA	2.1
1	B	37	GLY	2.1
1	E	13	GLY	2.1
1	B	47	ALA	2.0
1	D	34	HIS	2.0
1	A	35	SER	2.0
1	E	3	ILE	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 carbohydrates 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. LLDF column lists the quality of electron density of the group with respect to its neighbouring residues in protein, DNA or RNA chains. 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	LLDF	B-factors(Å ²)	Q<0.9
2	GPP	D	1157[B]	19/19	0.77	0.55	14.51	36,53,64,64	19
2	GPP	D	1157[C]	19/19	0.77	0.55	11.68	25,46,63,64	19
2	GPP	D	1157[A]	19/19	0.77	0.55	11.55	31,48,64,64	19
2	GPP	A	1157[B]	19/19	0.78	0.55	10.94	32,47,55,56	19
2	GPP	A	1157[C]	19/19	0.78	0.55	10.39	36,48,56,56	19
2	GPP	A	1157[A]	19/19	0.78	0.55	10.23	32,45,54,54	19
3	ZN	A	1158	1/1	0.97	0.19	1.27	63,63,63,63	0
4	C5P	C	1157	21/21	0.94	0.15	0.65	38,44,47,50	0
4	C5P	A	1159	21/21	0.91	0.14	0.44	33,40,46,48	0
4	C5P	F	1157	21/21	0.92	0.14	0.14	38,44,48,49	0
4	C5P	E	1157	21/21	0.94	0.11	-0.38	38,41,48,49	0
4	C5P	D	1159	21/21	0.96	0.09	-0.69	25,34,40,44	0
4	C5P	B	1157	21/21	0.96	0.09	-0.92	26,31,40,42	0
3	ZN	E	1158	1/1	0.94	0.11	-0.95	62,62,62,62	0
3	ZN	C	1158	1/1	0.98	0.09	-1.41	56,56,56,56	0
3	ZN	B	1158	1/1	0.93	0.14	-	69,69,69,69	0
3	ZN	F	1158	1/1	0.92	0.18	-	69,69,69,69	0
3	ZN	D	1158	1/1	0.98	0.07	-	57,57,57,57	0

6.5 Other polymers ⓘ

There are no such residues in this entry.