



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 6, 2026 – 08:52 PM UTC

PDB ID : 1SYN / pdb_00001syn
Title : E. COLI THYMIDYLATE SYNTHASE IN COMPLEX WITH BW1843U89
AND 2'-DEOXYURIDINE 5'-MONOPHOSPHATE (DUMP)
Authors : Stout, T.J.; Stroud, R.M.
Deposited on : 1995-09-19
Resolution : 2.00 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 ⓘ 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 ⓘ](#)) were used in the production of this report:

MolProbity	:	4-5-2 with Phenix2.0
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	NOT EXECUTED
EDS	:	NOT EXECUTED
Buster-report	:	wwPDB partial adaption of 1.1.7 (2018)
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.49

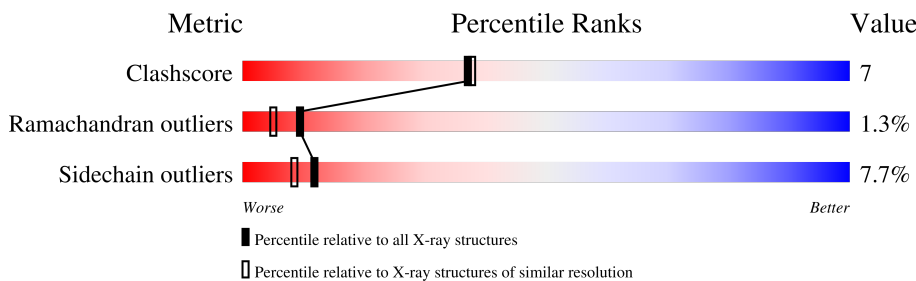
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.00 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))
Clashscore	190562	11152 (2.00-2.00)
Ramachandran outliers	187476	11031 (2.00-2.00)
Sidechain outliers	187428	11029 (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 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 $\leq 5\%$.

Note EDS was not executed.

Mol	Chain	Length	Quality of chain
1	A	265	
1	B	265	

2 Entry composition [i](#)

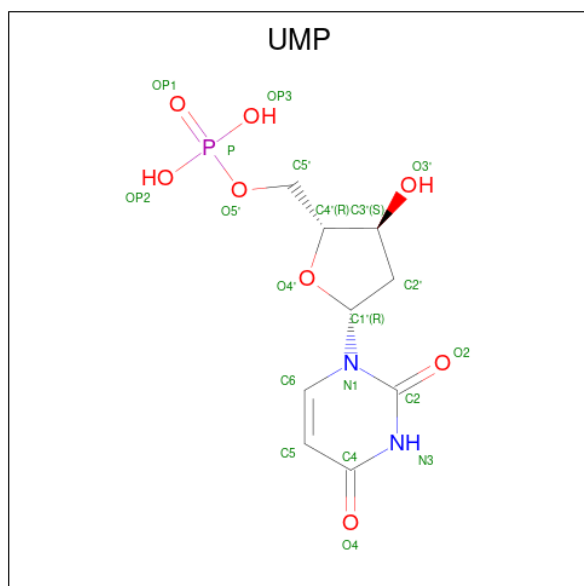
There are 4 unique types of molecules in this entry. The entry contains 4594 atoms, of which 0 are hydrogens and 0 are deuteriums.

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 THYMIDYLATE SYNTHASE.

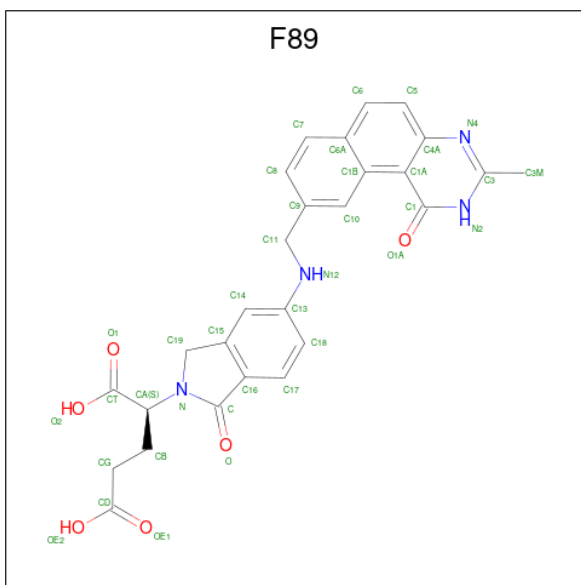
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	265	Total	C	N	O	S	0	0	0
			2153	1375	371	395	12			
1	B	265	Total	C	N	O	S	0	0	0
			2153	1375	371	395	12			

- Molecule 2 is 2'-DEOXYURIDINE 5'-MONOPHOSPHATE (CCD ID: UMP) (formula: $C_9H_{13}N_2O_8P$).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
2	A	1	Total	C	N	O	P	0	0
			20	9	2	8	1		
2	B	1	Total	C	N	O	P	0	0
			20	9	2	8	1		

- Molecule 3 is S)-2-(5(((1,2-DIHYDRO-3-METHYL-1-OXOBENZO(F)QUINAZOLIN-9-YL)METHYL)AMINO)1-OXO-2-ISOINDOLINYL)GLUTARIC ACID (CCD ID: F89) (formula: $C_{27}H_{24}N_4O_6$).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
3	A	1	Total 37	C 27	N 4	O 6	0	0
3	B	1	Total 37	C 27	N 4	O 6	0	0

- Molecule 4 is water.

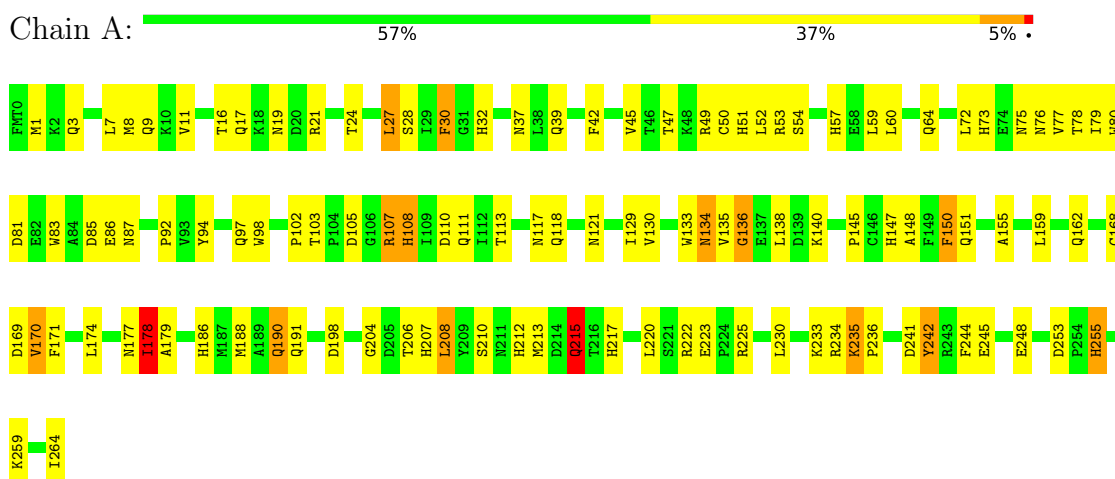
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	A	102	Total O 102 102	0	0
4	B	72	Total O 72 72	0	0

3 Residue-property plots

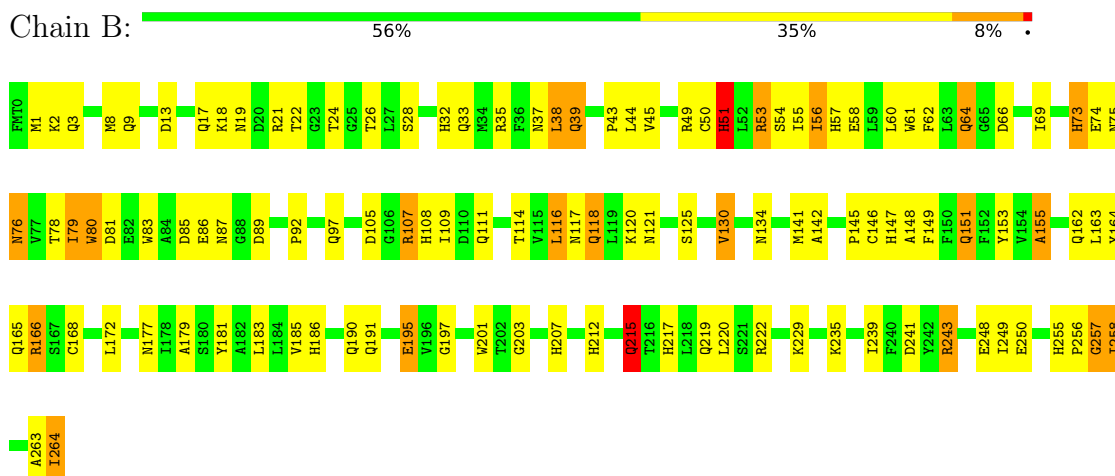
These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry. Residues are color-coded 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. 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.

Note EDS was not executed.

• Molecule 1: THYMIDYLATE SYNTHASE



• Molecule 1: THYMIDYLATE SYNTHASE



4 Data and refinement statistics

Xtriage (Phenix) and EDS were not executed - this section is therefore incomplete.

Property	Value	Source
Space group	P 63	Depositor
Cell constants a, b, c, α , β , γ	127.35Å 127.35Å 68.16Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	6.00 – 2.00	Depositor
% Data completeness (in resolution range)	71.0 (6.00-2.00)	Depositor
R_{merge}	0.12	Depositor
R_{sym}	(Not available)	Depositor
Refinement program	X-PLOR 3.1	Depositor
R, R_{free}	0.196 , 0.258	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	4594	wwPDB-VP
Average B, all atoms (Å ²)	19.0	wwPDB-VP

5 Model quality ⓘ

5.1 Standard geometry ⓘ

Bond lengths and bond angles in the following residue types are not validated in this section: FMT, F89, UMP

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	1.01	14/2210 (0.6%)	1.98	78/3000 (2.6%)
1	B	1.03	13/2210 (0.6%)	2.05	81/3000 (2.7%)
All	All	1.02	27/4420 (0.6%)	2.01	159/6000 (2.6%)

All (27) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	147	HIS	CD2-NE2	-6.89	1.30	1.37
1	A	73	HIS	CD2-NE2	-6.76	1.30	1.37
1	B	57	HIS	CD2-NE2	-6.63	1.30	1.37
1	A	108	HIS	CD2-NE2	-6.56	1.30	1.37
1	B	255	HIS	CD2-NE2	-6.51	1.30	1.37
1	B	207	HIS	CD2-NE2	-6.50	1.30	1.37
1	A	255	HIS	CD2-NE2	-6.43	1.30	1.37
1	B	32	HIS	CD2-NE2	-6.39	1.30	1.37
1	B	51	HIS	CD2-NE2	-6.25	1.30	1.37
1	B	186	HIS	CD2-NE2	-6.22	1.31	1.37
1	A	217	HIS	CD2-NE2	-6.22	1.31	1.37
1	B	147	HIS	CD2-NE2	-6.20	1.31	1.37
1	B	217	HIS	CD2-NE2	-6.20	1.31	1.37
1	A	212	HIS	CD2-NE2	-6.19	1.31	1.37
1	B	108	HIS	CD2-NE2	-6.16	1.31	1.37
1	B	130	VAL	CA-CB	6.09	1.62	1.54
1	B	73	HIS	CD2-NE2	-6.02	1.31	1.37
1	A	51	HIS	CD2-NE2	-5.99	1.31	1.37
1	A	57	HIS	CD2-NE2	-5.96	1.31	1.37
1	A	32	HIS	CD2-NE2	-5.71	1.31	1.37
1	B	212	HIS	CD2-NE2	-5.68	1.31	1.37
1	A	207	HIS	CD2-NE2	-5.52	1.31	1.37
1	A	186	HIS	CD2-NE2	-5.20	1.32	1.37
1	A	57	HIS	CG-ND1	-5.18	1.32	1.38

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	73	HIS	CG-ND1	-5.17	1.32	1.38
1	A	108	HIS	CG-ND1	-5.16	1.32	1.38
1	B	207	HIS	CG-ND1	-5.09	1.32	1.38

All (159) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	215	GLN	OE1-CD-NE2	-11.71	110.89	122.60
1	A	117	ASN	OD1-CG-ND2	-10.85	111.75	122.60
1	B	215	GLN	OE1-CD-NE2	-10.59	112.01	122.60
1	A	75	ASN	OD1-CG-ND2	-10.24	112.36	122.60
1	A	147	HIS	CA-CB-CG	10.02	123.82	113.80
1	B	117	ASN	OD1-CG-ND2	-9.92	112.68	122.60
1	B	134	ASN	OD1-CG-ND2	-9.84	112.76	122.60
1	B	81	ASP	N-CA-C	9.53	121.67	111.28
1	B	151	GLN	OE1-CD-NE2	-9.49	113.11	122.60
1	B	162	GLN	OE1-CD-NE2	-9.46	113.14	122.60
1	A	37	ASN	OD1-CG-ND2	-9.42	113.18	122.60
1	A	76	ASN	OD1-CG-ND2	-9.30	113.30	122.60
1	B	28	SER	N-CA-C	9.19	123.48	109.23
1	A	24	THR	N-CA-C	9.05	124.11	112.34
1	A	97	GLN	OE1-CD-NE2	-8.89	113.71	122.60
1	B	85	ASP	CA-CB-CG	8.78	121.38	112.60
1	B	75	ASN	OD1-CG-ND2	-8.51	114.09	122.60
1	A	9	GLN	OE1-CD-NE2	-8.47	114.13	122.60
1	B	249	ILE	N-CA-C	8.42	119.68	106.88
1	B	155	ALA	O-C-N	-8.40	115.90	122.03
1	B	121	ASN	OD1-CG-ND2	-8.29	114.31	122.60
1	A	57	HIS	CA-CB-CG	-8.25	105.55	113.80
1	B	17	GLN	OE1-CD-NE2	-8.22	114.38	122.60
1	A	85	ASP	CA-CB-CG	8.15	120.75	112.60
1	B	165	GLN	OE1-CD-NE2	-8.08	114.52	122.60
1	A	81	ASP	N-CA-C	8.05	120.96	111.71
1	B	147	HIS	CA-CB-CG	8.00	121.80	113.80
1	A	121	ASN	OD1-CG-ND2	-7.95	114.65	122.60
1	B	149	PHE	CA-CB-CG	7.89	121.69	113.80
1	B	39	GLN	OE1-CD-NE2	-7.88	114.72	122.60
1	B	148	ALA	N-CA-C	7.83	123.16	112.90
1	B	37	ASN	OD1-CG-ND2	-7.82	114.78	122.60
1	B	73	HIS	CA-CB-CG	-7.80	106.00	113.80
1	B	177	ASN	OD1-CG-ND2	-7.68	114.92	122.60
1	A	162	GLN	OE1-CD-NE2	-7.58	115.02	122.60

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	28	SER	N-CA-C	7.58	122.11	108.69
1	B	19	ASN	OD1-CG-ND2	-7.53	115.08	122.60
1	A	117	ASN	CB-CG-ND2	7.49	127.64	116.40
1	A	37	ASN	CB-CG-ND2	7.41	127.51	116.40
1	A	151	GLN	OE1-CD-NE2	-7.40	115.20	122.60
1	A	207	HIS	N-CA-C	7.39	120.41	109.24
1	A	76	ASN	N-CA-C	7.38	121.64	111.90
1	B	207	HIS	N-CA-C	7.37	120.66	109.23
1	A	19	ASN	OD1-CG-ND2	-7.36	115.24	122.60
1	B	9	GLN	OE1-CD-NE2	-7.32	115.28	122.60
1	B	21	ARG	N-CA-C	7.28	121.06	111.75
1	B	89	ASP	N-CA-C	7.26	121.67	109.76
1	A	134	ASN	OD1-CG-ND2	-7.20	115.40	122.60
1	A	177	ASN	OD1-CG-ND2	-7.13	115.47	122.60
1	B	57	HIS	CB-CG-CD2	-7.12	121.94	131.20
1	B	258	ILE	N-CA-C	7.12	124.15	109.34
1	A	75	ASN	CB-CG-ND2	7.03	126.94	116.40
1	B	76	ASN	OD1-CG-ND2	-7.00	115.59	122.60
1	B	64	GLN	OE1-CD-NE2	-6.99	115.61	122.60
1	B	3	GLN	OE1-CD-NE2	-6.98	115.62	122.60
1	A	253	ASP	CA-CB-CG	6.96	119.56	112.60
1	A	169	ASP	CA-CB-CG	6.85	119.45	112.60
1	B	168	CYS	N-CA-C	6.79	120.24	108.76
1	B	2	LYS	N-CA-C	6.78	119.54	111.33
1	B	76	ASN	N-CA-C	6.75	125.18	110.80
1	A	64	GLN	OE1-CD-NE2	-6.73	115.87	122.60
1	B	97	GLN	OE1-CD-NE2	-6.63	115.97	122.60
1	A	148	ALA	N-CA-C	6.55	121.36	113.23
1	B	191	GLN	OE1-CD-NE2	-6.55	116.05	122.60
1	A	168	CYS	N-CA-C	6.55	119.13	108.26
1	B	66	ASP	CA-CB-CG	6.52	119.12	112.60
1	B	195	GLU	O-C-N	-6.50	115.44	122.85
1	B	79	ILE	N-CA-C	6.43	122.72	109.34
1	A	198	ASP	CA-CB-CG	6.42	119.02	112.60
1	B	164	TYR	CA-C-O	6.39	127.30	120.46
1	A	79	ILE	N-CA-C	6.34	119.92	111.17
1	B	215	GLN	CG-CD-NE2	6.26	125.78	116.40
1	A	191	GLN	OE1-CD-NE2	-6.25	116.35	122.60
1	A	105	ASP	N-CA-C	6.25	118.52	110.65
1	B	64	GLN	CB-CG-CD	6.22	123.17	112.60
1	A	102	PRO	N-CA-C	6.21	120.25	110.50
1	A	210	SER	N-CA-C	6.18	118.81	111.71

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	257	GLY	N-CA-C	6.16	127.77	113.18
1	A	215	GLN	CG-CD-NE2	6.16	125.63	116.40
1	A	49	ARG	N-CA-C	6.15	118.63	109.59
1	A	242	TYR	CA-C-O	6.06	127.39	120.54
1	A	150	PHE	CA-CB-CG	6.05	119.85	113.80
1	A	235	LYS	CA-C-N	6.01	126.35	119.92
1	A	235	LYS	C-N-CA	6.01	126.35	119.92
1	A	129	ILE	N-CA-C	5.99	117.21	108.53
1	A	241	ASP	N-CA-C	5.96	119.60	112.93
1	A	145	PRO	N-CA-C	5.93	120.16	111.03
1	B	235	LYS	CA-C-N	5.90	126.23	119.92
1	B	235	LYS	C-N-CA	5.90	126.23	119.92
1	A	87	ASN	OD1-CG-ND2	-5.89	116.71	122.60
1	A	178	ILE	CB-CG1-CD1	-5.89	101.43	113.80
1	B	49	ARG	N-CA-C	5.85	117.99	108.63
1	A	3	GLN	OE1-CD-NE2	-5.84	116.76	122.60
1	B	108	HIS	CB-CG-CD2	-5.84	123.61	131.20
1	A	57	HIS	N-CA-C	5.79	117.59	111.28
1	A	51	HIS	N-CA-C	5.78	119.00	107.62
1	A	21	ARG	N-CA-C	5.77	119.14	111.75
1	A	107	ARG	N-CA-C	5.75	123.06	110.80
1	B	166	ARG	N-CA-C	5.74	117.54	111.28
1	B	118	GLN	OE1-CD-NE2	-5.73	116.87	122.60
1	B	256	PRO	N-CA-C	5.72	120.18	111.15
1	B	190	GLN	OE1-CD-NE2	-5.65	116.95	122.60
1	B	45	VAL	N-CA-C	5.62	117.55	109.51
1	B	142	ALA	N-CA-C	5.61	118.16	111.71
1	B	53	ARG	CA-CB-CG	5.61	125.31	114.10
1	B	87	ASN	OD1-CG-ND2	-5.60	117.00	122.60
1	B	32	HIS	CB-CG-CD2	-5.58	123.95	131.20
1	B	222	ARG	O-C-N	-5.56	116.88	123.22
1	B	56	ILE	N-CA-CB	-5.55	102.98	110.54
1	A	83	TRP	CE2-CD2-CG	-5.53	100.57	107.20
1	B	107	ARG	N-CA-C	5.51	117.64	110.43
1	A	118	GLN	OE1-CD-NE2	-5.50	117.10	122.60
1	B	203	GLY	CA-C-O	5.47	126.31	120.94
1	B	255	HIS	CB-CG-CD2	-5.47	124.08	131.20
1	B	35	ARG	CG-CD-NE	-5.46	99.98	112.00
1	B	75	ASN	CB-CG-ND2	5.41	124.51	116.40
1	A	111	GLN	OE1-CD-NE2	-5.41	117.19	122.60
1	A	147	HIS	CB-CG-CD2	-5.40	124.17	131.20
1	A	52	LEU	N-CA-C	5.39	120.26	111.37

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	17	GLN	CG-CD-NE2	5.37	124.46	116.40
1	A	217	HIS	CA-CB-CG	-5.37	108.43	113.80
1	A	213	MET	N-CA-C	5.34	117.10	111.28
1	B	165	GLN	CG-CD-NE2	5.34	124.41	116.40
1	B	219	GLN	OE1-CD-NE2	-5.34	117.26	122.60
1	A	110	ASP	CA-CB-CG	5.33	117.93	112.60
1	A	155	ALA	O-C-N	-5.33	115.50	122.59
1	A	97	GLN	CG-CD-NE2	5.32	124.38	116.40
1	B	57	HIS	CB-CG-ND1	5.31	130.66	122.70
1	A	171	PHE	N-CA-C	5.27	117.11	111.36
1	B	111	GLN	OE1-CD-NE2	-5.26	117.34	122.60
1	B	201	TRP	CG-CD2-CE3	5.25	139.15	133.90
1	A	51	HIS	CB-CG-CD2	-5.24	124.39	131.20
1	B	80	TRP	CE2-CD2-CG	-5.23	100.92	107.20
1	A	98	TRP	CG-CD2-CE3	5.23	139.13	133.90
1	A	136	GLY	N-CA-C	5.23	119.00	112.73
1	B	151	GLN	CG-CD-NE2	5.22	124.23	116.40
1	B	13	ASP	N-CA-C	5.21	116.95	111.28
1	A	17	GLN	OE1-CD-NE2	-5.20	117.40	122.60
1	B	186	HIS	CB-CG-CD2	-5.18	124.46	131.20
1	B	86	GLU	N-CA-C	5.18	118.38	111.75
1	A	174	LEU	O-C-N	-5.17	115.85	120.71
1	B	33	GLN	OE1-CD-NE2	-5.16	117.44	122.60
1	A	30	PHE	CA-CB-CG	5.15	118.95	113.80
1	A	39	GLN	OE1-CD-NE2	-5.14	117.45	122.60
1	B	62	PHE	CA-CB-CG	5.14	118.94	113.80
1	B	83	TRP	CE2-CD2-CG	-5.12	101.05	107.20
1	B	241	ASP	CA-CB-CG	5.12	117.72	112.60
1	A	98	TRP	CE2-CD2-CG	-5.11	101.06	107.20
1	B	18	LYS	N-CA-C	5.11	117.90	109.72
1	A	190	GLN	OE1-CD-NE2	-5.10	117.50	122.60
1	A	207	HIS	CB-CG-CD2	-5.09	124.58	131.20
1	A	78	THR	N-CA-C	5.08	120.47	113.97
1	A	159	LEU	N-CA-C	5.08	117.03	108.96
1	A	42	PHE	CA-CB-CG	-5.06	108.74	113.80
1	B	162	GLN	CG-CD-NE2	5.05	123.98	116.40
1	B	217	HIS	CB-CG-CD2	-5.05	124.63	131.20
1	A	170	VAL	N-CA-C	5.05	115.66	110.36
1	A	134	ASN	CB-CG-ND2	5.03	123.95	116.40
1	A	80	TRP	CE2-CD2-CG	-5.01	101.18	107.20

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	2153	0	2080	34	0
1	B	2153	0	2080	30	0
2	A	20	0	11	0	0
2	B	20	0	11	1	0
3	A	37	0	22	2	0
3	B	37	0	22	2	0
4	A	102	0	0	8	0
4	B	72	0	0	1	0
All	All	4594	0	4226	61	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 7.

All (61) 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:54:SER:HB2	3:A:301:F89:H17	1.69	0.74
1:A:8:MET:HE3	1:A:220:LEU:HD13	1.74	0.68
1:A:130:VAL:HG11	4:A:872:HOH:O	1.96	0.66
1:A:233:LYS:HE3	1:A:248:GLU:HB2	1.79	0.63
1:B:22:THR:HG21	1:B:263:ALA:HB1	1.82	0.61
1:A:16:THR:HG21	1:B:155:ALA:HB1	1.82	0.60
1:A:190:GLN:HG2	1:A:235:LYS:HG3	1.85	0.58
1:A:206:THR:HG22	4:A:900:HOH:O	2.03	0.58
1:B:54:SER:HB2	3:B:301:F89:H17	1.84	0.57
1:B:92:PRO:O	1:B:141:MET:HE2	2.05	0.56
1:A:1:MET:HE1	1:A:178:ILE:HD11	1.89	0.55
1:B:146:CYS:SG	2:B:300:UMP:C6	3.00	0.55
1:A:234:ARG:O	1:A:236:PRO:HD3	2.08	0.54
1:A:136:GLY:HA3	4:A:819:HOH:O	2.07	0.53
1:B:215:GLN:HE21	1:B:215:GLN:H	1.57	0.53
1:A:47:THR:HA	1:A:255:HIS:HD2	1.72	0.53

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:22:THR:HG23	1:B:264:ILE:OXT	2.09	0.52
1:A:133:TRP:CZ2	1:A:138:LEU:HD21	2.45	0.52
1:A:215:GLN:H	1:A:215:GLN:NE2	2.09	0.51
1:A:170:VAL:HB	1:A:208:LEU:HD13	1.92	0.51
1:B:243:ARG:HD2	4:B:773:HOH:O	2.11	0.50
1:A:30:PHE:HA	1:A:204:GLY:O	2.11	0.50
1:B:60:LEU:O	1:B:64:GLN:HG2	2.11	0.50
1:B:39:GLN:HE22	1:B:195:GLU:HG2	1.76	0.50
1:B:69:ILE:HD13	1:B:73:HIS:NE2	2.26	0.50
1:A:108:HIS:HD2	4:A:837:HOH:O	1.94	0.49
1:B:44:LEU:HD11	1:B:50:CYS:HB2	1.94	0.49
1:B:181:TYR:O	1:B:185:VAL:HG23	2.13	0.49
1:A:86:GLU:H	1:A:86:GLU:CD	2.21	0.48
1:A:204:GLY:HA3	1:B:151:GLN:HE22	1.78	0.48
1:B:145:PRO:O	1:B:166:ARG:HD3	2.14	0.47
3:A:301:F89:HB2	3:A:301:F89:O	2.14	0.47
1:B:215:GLN:H	1:B:215:GLN:NE2	2.12	0.47
1:A:11:VAL:HB	4:A:900:HOH:O	2.16	0.46
1:B:153:TYR:CE2	1:B:155:ALA:HB2	2.50	0.46
1:A:242:TYR:HB2	4:A:801:HOH:O	2.16	0.46
1:B:116:LEU:HD21	1:B:239:ILE:HG21	1.97	0.46
1:B:114:THR:O	1:B:118:GLN:HG3	2.16	0.45
1:B:229:LYS:HB2	1:B:250:GLU:HG3	1.99	0.45
1:B:38:LEU:HB2	1:B:197:GLY:O	2.17	0.44
1:A:150:PHE:HZ	4:A:872:HOH:O	1.99	0.44
1:A:178:ILE:HG13	1:A:179:ALA:N	2.33	0.44
1:A:72:LEU:HB3	1:A:77:VAL:HB	2.00	0.43
1:A:135:VAL:HG12	1:B:109:ILE:HD12	1.99	0.43
1:B:51:HIS:HE1	3:B:301:F89:CT	2.31	0.43
1:B:1:MET:HE1	1:B:43:PRO:HA	1.99	0.43
1:A:47:THR:HA	1:A:255:HIS:CD2	2.52	0.43
1:B:8:MET:HB3	1:B:220:LEU:HD11	2.01	0.43
1:A:190:GLN:NE2	1:A:235:LYS:HA	2.34	0.42
1:A:11:VAL:HG11	1:A:208:LEU:HD22	2.00	0.42
1:A:27:LEU:HD23	1:A:27:LEU:HA	1.92	0.42
1:A:92:PRO:HG2	1:A:140:LYS:HE3	2.02	0.41
1:A:45:VAL:CG2	1:A:50:CYS:SG	3.08	0.41
1:A:53:ARG:HA	1:A:244:PHE:HE1	1.84	0.41
1:B:58:GLU:O	1:B:61:TRP:HB3	2.21	0.41
1:A:208:LEU:HA	4:A:807:HOH:O	2.20	0.41
1:B:229:LYS:HB2	1:B:250:GLU:CG	2.51	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:259:LYS:HD3	1:A:259:LYS:HA	1.87	0.41
1:B:78:THR:O	1:B:80:TRP:N	2.54	0.40
1:B:55:ILE:HD13	1:B:179:ALA:HB3	2.03	0.40
1:A:204:GLY:HA3	1:B:151:GLN:NE2	2.36	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	263/265 (99%)	244 (93%)	17 (6%)	2 (1%)	16	11
1	B	263/265 (99%)	240 (91%)	18 (7%)	5 (2%)	6	3
All	All	526/530 (99%)	484 (92%)	35 (7%)	7 (1%)	9	5

All (7) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	79	ILE
1	B	258	ILE
1	B	24	THR
1	B	76	ASN
1	B	257	GLY
1	A	94	TYR
1	A	107	ARG

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	233/233 (100%)	216 (93%)	17 (7%)	13	9
1	B	233/233 (100%)	214 (92%)	19 (8%)	10	7
All	All	466/466 (100%)	430 (92%)	36 (8%)	12	8

All (36) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	7	LEU
1	A	27	LEU
1	A	59	LEU
1	A	60	LEU
1	A	103	THR
1	A	113	THR
1	A	134	ASN
1	A	178	ILE
1	A	188	MET
1	A	208	LEU
1	A	215	GLN
1	A	222	ARG
1	A	223	GLU
1	A	225	ARG
1	A	230	LEU
1	A	245	GLU
1	A	264	ILE
1	B	26	THR
1	B	38	LEU
1	B	51	HIS
1	B	53	ARG
1	B	56	ILE
1	B	74	GLU
1	B	105	ASP
1	B	107	ARG
1	B	116	LEU
1	B	120	LYS
1	B	125	SER
1	B	130	VAL
1	B	163	LEU
1	B	172	LEU
1	B	183	LEU
1	B	215	GLN

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Mol	Chain	Res	Type
1	B	243	ARG
1	B	248	GLU
1	B	264	ILE

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

Mol	Chain	Res	Type
1	A	39	GLN
1	A	64	GLN
1	A	97	GLN
1	A	108	HIS
1	A	134	ASN
1	A	190	GLN
1	A	191	GLN
1	A	215	GLN
1	A	217	HIS
1	B	32	HIS
1	B	39	GLN
1	B	51	HIS
1	B	64	GLN
1	B	75	ASN
1	B	108	HIS
1	B	121	ASN
1	B	134	ASN
1	B	151	GLN
1	B	215	GLN
1	B	217	HIS

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 oligosaccharides in this entry.

5.6 Ligand geometry

4 ligands are modelled in this entry.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
3	F89	B	301	-	41,41,41	1.40	7 (17%)	56,60,60	2.33	16 (28%)
2	UMP	A	300	-	21,21,21	1.19	3 (14%)	30,31,31	1.50	5 (16%)
2	UMP	B	300	-	21,21,21	1.28	4 (19%)	30,31,31	1.46	4 (13%)
3	F89	A	301	-	41,41,41	1.33	5 (12%)	56,60,60	2.89	14 (25%)

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	F89	B	301	-	-	5/18/30/30	0/5/5/5
2	UMP	A	300	-	-	1/10/22/22	0/2/2/2
2	UMP	B	300	-	-	0/10/22/22	0/2/2/2
3	F89	A	301	-	-	9/18/30/30	0/5/5/5

All (19) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	B	301	F89	C19-C15	-3.47	1.45	1.50
3	A	301	F89	C19-C15	-3.26	1.46	1.50
3	A	301	F89	C4A-N4	-2.78	1.34	1.39
2	A	300	UMP	P-OP3	-2.54	1.45	1.54
3	B	301	F89	C13-N12	2.54	1.45	1.38
3	B	301	F89	C4A-N4	-2.52	1.34	1.39
2	B	300	UMP	C6-N1	-2.47	1.32	1.38
3	B	301	F89	C1A-C1	-2.45	1.42	1.47
2	B	300	UMP	P-OP2	-2.40	1.45	1.54
2	B	300	UMP	O4'-C1'	2.39	1.47	1.42
3	B	301	F89	O2-CT	-2.35	1.23	1.30

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	B	301	F89	OE2-CD	-2.24	1.23	1.30
3	A	301	F89	C13-N12	2.20	1.44	1.38
2	A	300	UMP	P-OP2	-2.19	1.46	1.54
2	A	300	UMP	C6-N1	-2.15	1.33	1.38
3	B	301	F89	C18-C17	2.14	1.42	1.38
3	A	301	F89	OE2-CD	-2.11	1.23	1.30
3	A	301	F89	C16-C	-2.10	1.45	1.48
2	B	300	UMP	P-OP3	-2.09	1.47	1.54

All (39) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	A	301	F89	C19-N-CA	-17.13	107.37	123.68
3	B	301	F89	C19-N-C	-8.04	109.76	113.15
3	B	301	F89	C15-C19-N	7.70	106.41	102.31
3	A	301	F89	CA-N-C	5.55	130.33	121.86
2	B	300	UMP	O4'-C1'-N1	5.06	116.84	107.86
3	A	301	F89	C1B-C1A-C1	5.05	126.73	121.28
3	B	301	F89	C1B-C1A-C1	4.85	126.52	121.28
3	B	301	F89	C19-C15-C16	-4.40	106.96	109.73
2	A	300	UMP	O4'-C1'-N1	4.33	115.55	107.86
3	A	301	F89	C4A-N4-C3	4.01	122.15	118.16
3	B	301	F89	CA-N-C	3.97	127.92	121.86
3	B	301	F89	C19-N-CA	-3.87	120.00	123.68
3	A	301	F89	O1A-C1-N2	-3.85	116.05	120.62
3	B	301	F89	C1A-C1-N2	3.59	119.22	115.17
3	A	301	F89	C1A-C1-N2	3.35	118.94	115.17
3	B	301	F89	C1-N2-C3	-3.19	122.14	123.87
3	B	301	F89	C5-C6-C6A	-2.90	116.50	120.84
2	A	300	UMP	C1'-N1-C6	-2.86	115.91	121.53
3	B	301	F89	C4A-N4-C3	2.85	121.01	118.16
2	B	300	UMP	C2'-C3'-C4'	-2.80	97.13	102.80
3	B	301	F89	C6-C5-C4A	-2.76	116.54	120.33
3	A	301	F89	C1-N2-C3	-2.67	122.42	123.87
2	B	300	UMP	C1'-N1-C6	-2.59	116.44	121.53
2	B	300	UMP	C6-N1-C2	2.58	124.14	121.00
2	A	300	UMP	C2'-C3'-C4'	-2.56	97.62	102.80
3	B	301	F89	C16-C-N	2.55	108.04	106.42
3	B	301	F89	O1A-C1-N2	-2.54	117.61	120.62
2	A	300	UMP	O4'-C1'-C2'	-2.48	101.61	106.25
3	A	301	F89	N2-C3-N4	-2.42	119.33	123.15
3	A	301	F89	C19-N-C	-2.33	112.17	113.15

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	A	301	F89	C3M-C3-N2	2.26	120.96	116.27
3	A	301	F89	C5-C6-C6A	-2.19	117.57	120.84
3	A	301	F89	O2-CT-CA	2.18	120.47	113.34
2	A	300	UMP	O2-C2-N1	2.13	125.57	122.80
3	B	301	F89	N2-C3-N4	-2.13	119.78	123.15
3	B	301	F89	C3M-C3-N2	2.10	120.63	116.27
3	A	301	F89	C7-C6A-C6	-2.03	118.38	123.01
3	A	301	F89	OE2-CD-CG	2.01	120.34	114.00
3	B	301	F89	CB-CG-CD	2.01	117.84	112.49

There are no chirality outliers.

All (15) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	A	301	F89	CB-CA-N-C19
3	A	301	F89	CB-CA-N-C
3	A	301	F89	N-CA-CB-CG
3	A	301	F89	CT-CA-CB-CG
3	B	301	F89	CT-CA-N-C19
3	B	301	F89	CB-CA-N-C19
3	A	301	F89	N-CA-CT-O2
3	B	301	F89	CB-CA-N-C
3	A	301	F89	CT-CA-N-C
3	A	301	F89	N-CA-CT-O1
3	A	301	F89	OE1-CD-CG-CB
3	A	301	F89	OE2-CD-CG-CB
3	B	301	F89	OE1-CD-CG-CB
3	B	301	F89	OE2-CD-CG-CB
2	A	300	UMP	O4'-C4'-C5'-O5'

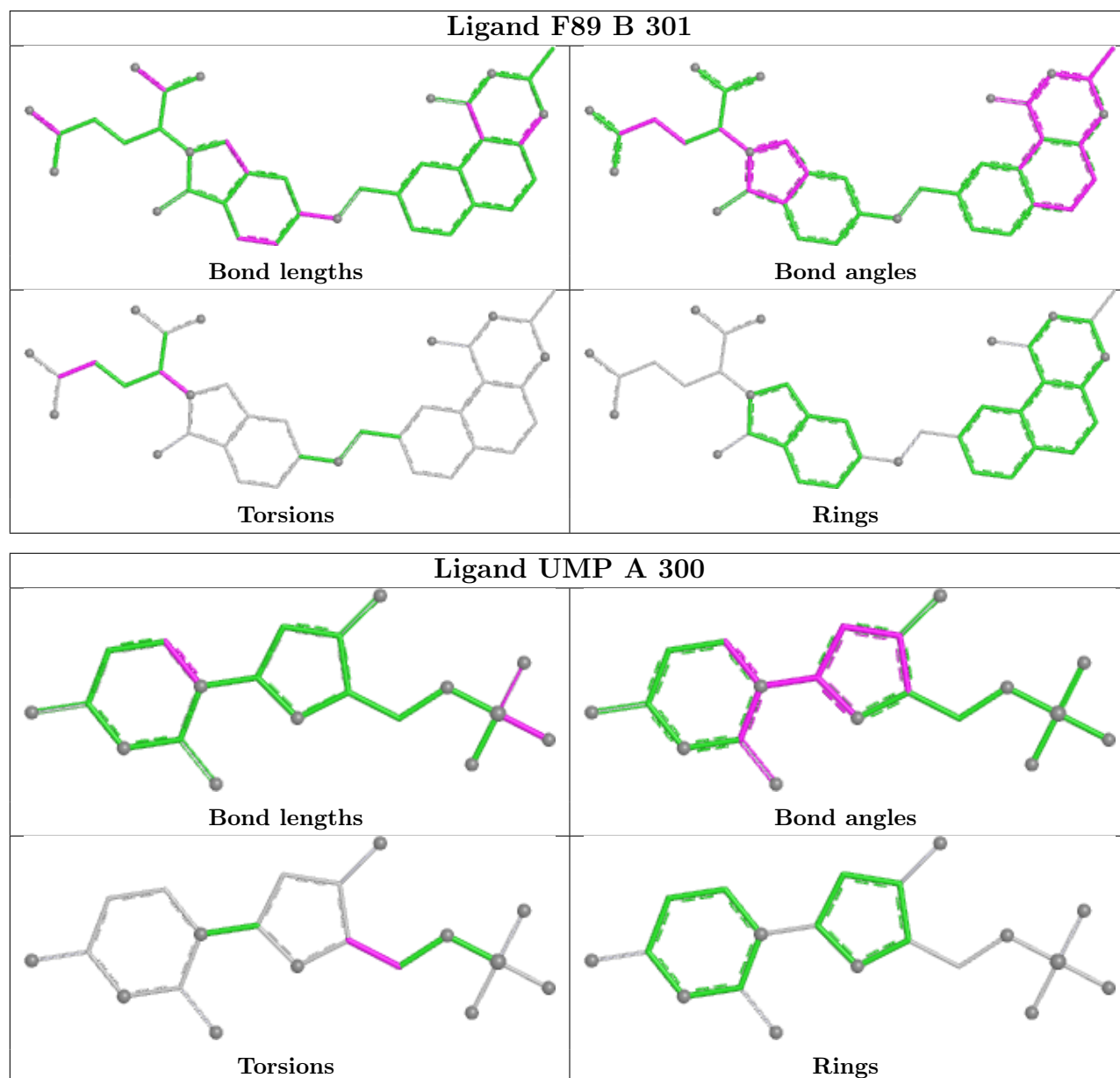
There are no ring outliers.

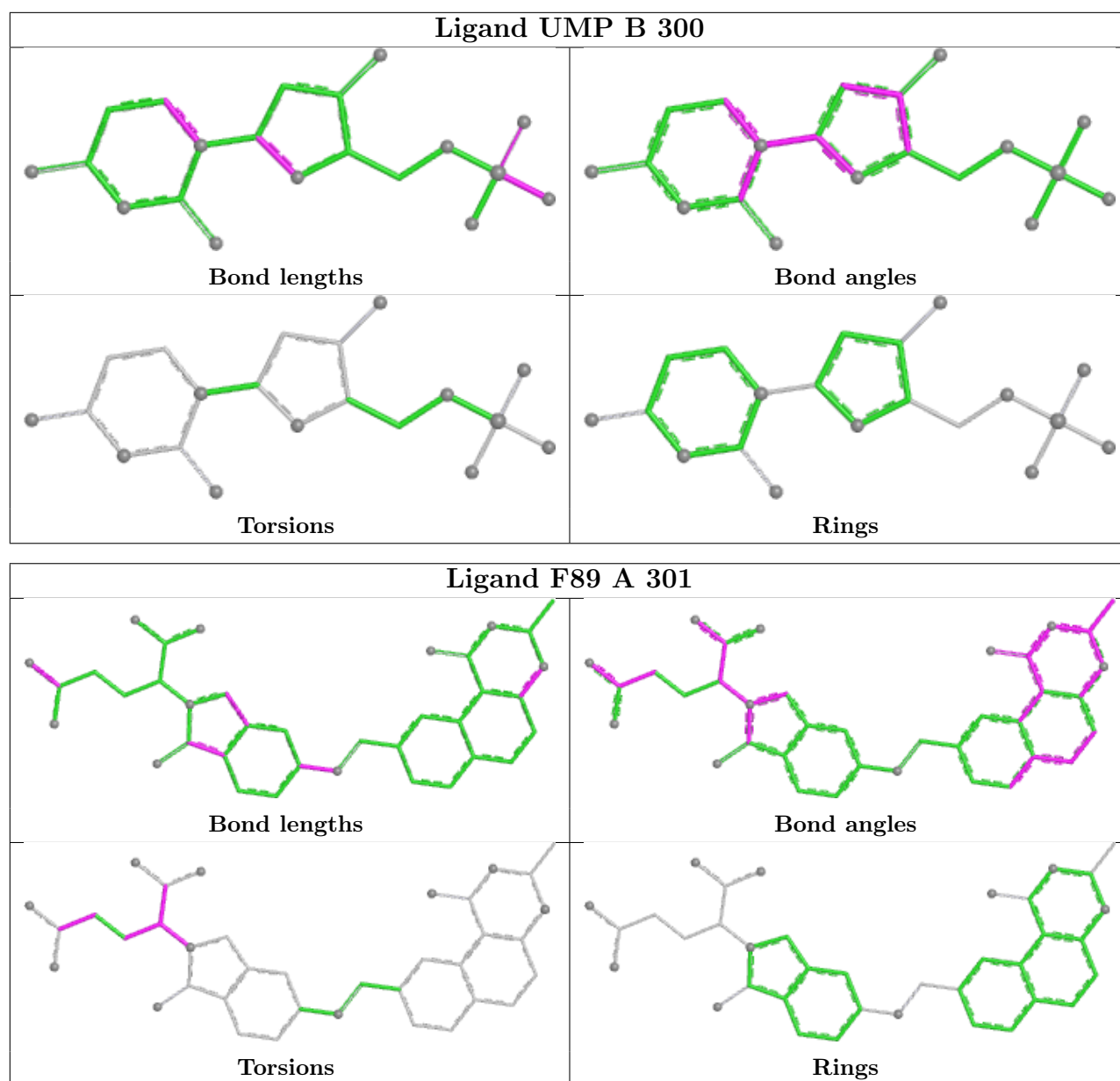
3 monomers are involved in 5 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	B	301	F89	2	0
2	B	300	UMP	1	0
3	A	301	F89	2	0

The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will

also be included. For torsion angles, if less than 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.





5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

6 Fit of model and data

6.1 Protein, DNA and RNA chains

EDS was not executed - this section is therefore empty.

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

EDS was not executed - this section is therefore empty.

6.3 Carbohydrates

EDS was not executed - this section is therefore empty.

6.4 Ligands

EDS was not executed - this section is therefore empty.

6.5 Other polymers

EDS was not executed - this section is therefore empty.