



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 14, 2026 – 10:51 AM UTC

PDB ID : 2ROY / pdb_00002roy
Title : TRANSTHYRETIN (ALSO CALLED PREALBUMIN) COMPLEX WITH 3
'5'-DINITRO-N-ACETYL-L-THYRONINE
Authors : Wojtczak, A.; Cody, V.; Luft, J.R.; Pangborn, W.
Deposited on : 1996-10-23
Resolution : 2.20 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)
Xtrriage (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

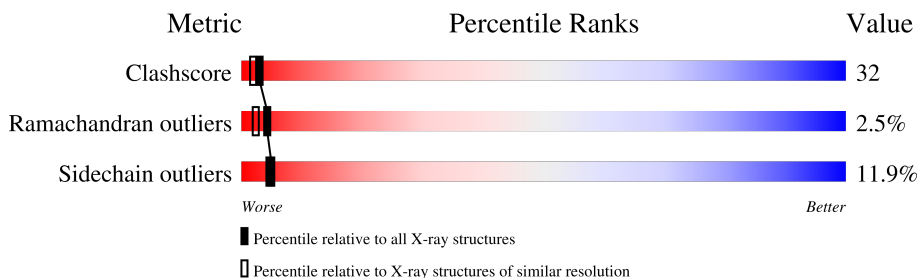
1 Overall quality at a glance i

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.20 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	6851 (2.20-2.20)
Ramachandran outliers	187476	6768 (2.20-2.20)
Sidechain outliers	187428	6769 (2.20-2.20)

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	127	
1	B	127	

2 Entry composition [i](#)

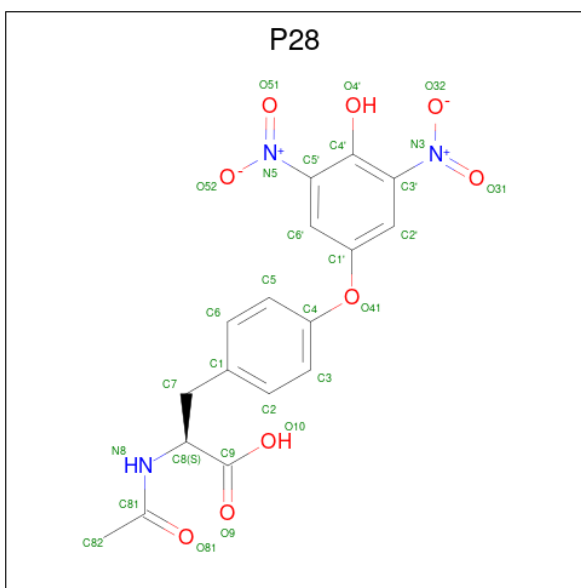
There are 3 unique types of molecules in this entry. The entry contains 1998 atoms, of which 0 are hydrogens and 0 are deuteriums.

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 TRANSTHYRETIN.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	121	Total	C	N	O	S	0	0	0
			938	598	154	184	2			
1	B	119	Total	C	N	O	S	0	0	0
			920	587	151	180	2			

- Molecule 2 is 3',5'-DINITRO-N-ACETYL-L-THYRONINE (CCD ID: P28) (formula: $C_{17}H_{15}N_3O_9$).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
			Total	C	N	O		
2	A	1	Total	C	N	O	0	0
			29	17	3	9		
2	B	1	Total	C	N	O	0	0
			29	17	3	9		

- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	44	Total 44	O 44	0	0
3	B	38	Total 38	O 38	0	0

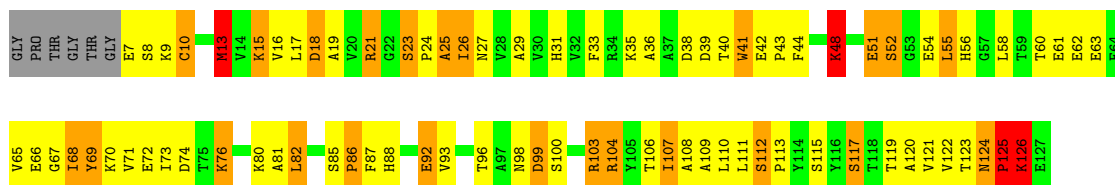
3 Residue-property plots [i](#)

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

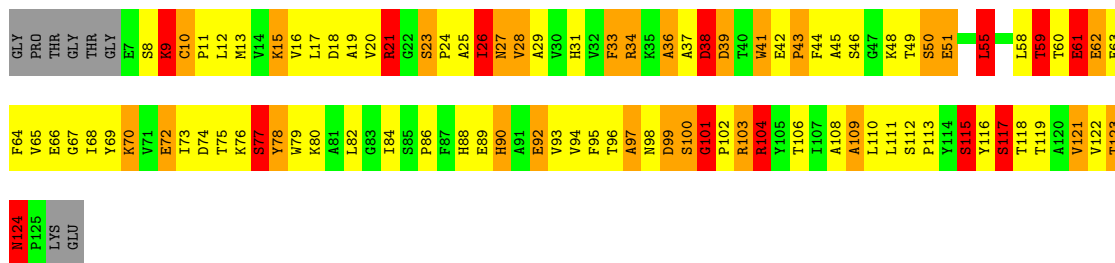
- Molecule 1: TRANSTHYRETIN

Chain A: 



- Molecule 1: TRANSTHYRETIN

Chain B: 



4 Data and refinement statistics

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

Property	Value	Source
Space group	P 21 21 2	Depositor
Cell constants a, b, c, α , β , γ	43.62Å 86.04Å 64.95Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	8.00 – 2.20	Depositor
% Data completeness (in resolution range)	(Not available) (8.00-2.20)	Depositor
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
Refinement program	PROLSQ	Depositor
R, R_{free}	0.184 , (Not available)	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	1998	wwPDB-VP
Average B, all atoms (Å ²)	20.0	wwPDB-VP

5 Model quality i

5.1 Standard geometry i

Bond lengths and bond angles in the following residue types are not validated in this section: P28

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	1.32	1/962 (0.1%)	2.83	109/1310 (8.3%)
1	B	1.36	3/944 (0.3%)	2.94	120/1287 (9.3%)
All	All	1.34	4/1906 (0.2%)	2.89	229/2597 (8.8%)

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	B	0	2

All (4) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	106	THR	CA-C	-6.26	1.45	1.52
1	B	67	GLY	N-CA	6.00	1.51	1.45
1	A	73	ILE	CA-CB	5.39	1.60	1.54
1	B	90	HIS	CG-ND1	-5.10	1.32	1.38

All (229) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	62	GLU	CB-CG-CD	25.09	155.26	112.60
1	B	110	LEU	CA-C-O	-11.26	108.41	120.46
1	A	10	CYS	N-CA-C	-10.97	97.51	110.13
1	B	99	ASP	N-CA-CB	10.27	127.33	110.39
1	A	106	THR	CA-C-O	-10.26	109.63	120.40
1	B	55	LEU	CA-C-O	-10.23	108.90	120.66
1	B	106	THR	O-C-N	9.97	135.16	123.30

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	100	SER	N-CA-C	-9.76	99.54	113.21
1	B	10	CYS	O-C-N	9.68	130.08	121.37
1	B	38	ASP	CA-C-N	9.48	136.14	122.40
1	B	38	ASP	C-N-CA	9.48	136.14	122.40
1	A	87	PHE	CA-CB-CG	9.34	123.14	113.80
1	B	24	PRO	N-CA-C	-9.27	97.50	111.41
1	B	99	ASP	CA-C-N	9.25	134.89	119.35
1	B	99	ASP	C-N-CA	9.25	134.89	119.35
1	B	19	ALA	CA-C-N	9.18	135.24	121.65
1	B	19	ALA	C-N-CA	9.18	135.24	121.65
1	A	10	CYS	O-C-N	9.16	133.69	120.96
1	A	62	GLU	CB-CG-CD	9.13	128.12	112.60
1	A	111	LEU	N-CA-C	8.78	124.16	109.76
1	A	71	VAL	N-CA-C	-8.77	95.09	107.80
1	B	72	GLU	CA-C-O	-8.54	111.16	120.30
1	A	74	ASP	CA-C-N	8.45	133.16	120.31
1	A	74	ASP	C-N-CA	8.45	133.16	120.31
1	B	77	SER	N-CA-CB	8.45	123.23	110.22
1	B	15	LYS	CA-C-O	-8.44	111.29	120.24
1	B	42	GLU	CA-CB-CG	8.43	130.95	114.10
1	A	23	SER	N-CA-CB	-8.39	102.29	111.10
1	A	67	GLY	CA-C-O	-8.38	112.55	121.35
1	A	124	ASN	O-C-N	8.38	129.06	121.35
1	B	93	VAL	CA-C-O	-8.37	111.48	120.36
1	A	21	ARG	CD-NE-CZ	8.15	135.81	124.40
1	A	104	ARG	CD-NE-CZ	-8.08	113.08	124.40
1	A	44	PHE	CB-CA-C	8.05	122.73	110.08
1	A	70	LYS	CA-C-O	-8.01	111.42	120.32
1	B	23	SER	O-C-N	8.00	128.12	121.32
1	B	112	SER	CA-C-O	-7.95	113.18	120.50
1	B	9	LYS	N-CA-CB	7.95	123.92	110.49
1	A	71	VAL	CA-C-O	-7.94	112.03	120.53
1	A	98	ASN	N-CA-C	7.86	122.45	112.86
1	A	18	ASP	CA-C-O	7.86	128.87	120.46
1	B	118	THR	CA-CB-OG1	-7.84	97.84	109.60
1	A	112	SER	O-C-N	7.80	126.70	121.71
1	B	99	ASP	CA-C-O	7.80	129.27	120.84
1	B	45	ALA	CA-C-O	-7.74	112.95	121.23
1	B	76	LYS	CA-C-O	-7.62	112.82	120.82
1	A	27	ASN	CB-CA-C	7.48	122.35	111.73
1	B	76	LYS	CA-C-N	7.42	130.96	120.28
1	B	76	LYS	C-N-CA	7.42	130.96	120.28

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	85	SER	N-CA-C	-7.37	95.02	109.10
1	A	124	ASN	CA-CB-CG	-7.35	105.25	112.60
1	A	120	ALA	CA-C-O	-7.30	112.27	120.66
1	A	121	VAL	CA-C-O	-7.29	112.73	120.39
1	A	51	GLU	CB-CG-CD	7.21	124.86	112.60
1	A	99	ASP	CA-CB-CG	-7.21	105.39	112.60
1	B	39	ASP	CA-CB-CG	7.20	119.80	112.60
1	A	38	ASP	CA-CB-CG	7.18	119.78	112.60
1	B	43	PRO	CA-C-O	-7.16	113.41	121.43
1	A	13	MET	CB-CA-C	7.12	123.45	109.35
1	A	72	GLU	CA-C-O	-7.11	112.63	120.38
1	B	51	GLU	CA-C-N	7.02	133.88	122.65
1	B	51	GLU	C-N-CA	7.02	133.88	122.65
1	B	61	GLU	CA-CB-CG	7.01	128.12	114.10
1	A	55	LEU	CA-C-N	7.00	133.58	122.59
1	A	55	LEU	C-N-CA	7.00	133.58	122.59
1	B	115	SER	CA-C-O	6.96	128.68	121.23
1	A	27	ASN	OD1-CG-ND2	-6.92	115.69	122.60
1	A	66	GLU	CA-C-O	-6.89	114.05	121.56
1	A	107	ILE	CB-CA-C	-6.87	101.69	111.31
1	A	85	SER	O-C-N	6.86	128.94	121.12
1	B	21	ARG	CA-C-O	-6.86	111.59	119.14
1	B	17	LEU	CA-C-O	-6.81	113.16	121.06
1	A	72	GLU	O-C-N	6.80	131.31	123.29
1	A	25	ALA	CA-C-O	6.77	127.82	120.58
1	B	109	ALA	CA-C-N	6.67	132.58	123.11
1	B	109	ALA	C-N-CA	6.67	132.58	123.11
1	A	82	LEU	N-CA-C	-6.59	104.47	113.30
1	B	27	ASN	CA-C-N	6.57	130.85	122.37
1	B	27	ASN	C-N-CA	6.57	130.85	122.37
1	A	15	LYS	CA-C-N	6.54	132.08	122.99
1	A	15	LYS	C-N-CA	6.54	132.08	122.99
1	A	41	TRP	CA-C-O	-6.53	113.24	120.69
1	B	109	ALA	CB-CA-C	6.49	121.01	109.65
1	A	31	HIS	CA-CB-CG	-6.48	107.32	113.80
1	B	70	LYS	CG-CD-CE	6.44	126.12	111.30
1	A	67	GLY	O-C-N	6.40	130.06	123.92
1	A	122	VAL	CA-C-O	-6.39	113.81	120.27
1	B	119	THR	CA-C-O	-6.39	114.18	121.40
1	B	104	ARG	CD-NE-CZ	-6.37	115.49	124.40
1	B	104	ARG	CB-CA-C	6.36	120.25	109.50
1	B	111	LEU	CA-C-O	-6.35	113.78	121.28

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	15	LYS	CA-C-O	-6.35	113.51	120.24
1	B	55	LEU	CA-C-N	6.33	132.72	122.53
1	B	55	LEU	C-N-CA	6.33	132.72	122.53
1	A	17	LEU	CA-C-N	6.29	132.03	123.11
1	A	17	LEU	C-N-CA	6.29	132.03	123.11
1	A	21	ARG	O-C-N	6.28	130.08	122.48
1	B	121	VAL	N-CA-CB	6.26	119.73	112.15
1	B	88	HIS	CA-CB-CG	-6.26	107.54	113.80
1	B	90	HIS	O-C-N	6.25	129.54	123.29
1	B	95	PHE	CA-C-O	-6.25	114.58	121.33
1	A	93	VAL	CA-CB-CG1	6.25	121.02	110.40
1	A	44	PHE	O-C-N	-6.23	113.56	122.03
1	A	70	LYS	CA-CB-CG	-6.22	101.67	114.10
1	B	46	SER	CA-CB-OG	6.21	123.52	111.10
1	B	10	CYS	N-CA-CB	6.21	120.34	111.21
1	B	90	HIS	CB-CG-CD2	-6.21	123.13	131.20
1	B	90	HIS	CB-CG-ND1	6.20	131.99	122.70
1	B	17	LEU	O-C-N	6.16	130.41	123.27
1	A	76	LYS	CA-C-N	6.14	128.43	120.44
1	A	76	LYS	C-N-CA	6.14	128.43	120.44
1	A	67	GLY	N-CA-C	-6.14	102.53	110.69
1	B	78	TYR	CB-CA-C	6.13	120.51	110.88
1	B	20	VAL	N-CA-C	-6.13	105.75	111.45
1	A	10	CYS	N-CA-CB	6.13	116.41	109.49
1	B	112	SER	O-C-N	6.12	125.62	121.71
1	B	21	ARG	O-C-N	6.11	130.68	122.49
1	B	122	VAL	O-C-N	6.11	130.24	123.10
1	A	68	ILE	CA-C-O	-6.10	114.01	120.48
1	B	77	SER	O-C-N	6.08	129.34	122.22
1	A	86	PRO	CA-C-O	-6.08	114.48	121.96
1	B	77	SER	CB-CA-C	-6.07	99.41	110.63
1	B	122	VAL	N-CA-CB	6.05	119.09	111.46
1	A	100	SER	CA-C-O	-6.05	111.86	120.51
1	A	48	LYS	CA-CB-CG	6.04	126.19	114.10
1	B	62	GLU	CG-CD-OE1	6.02	132.25	118.40
1	A	61	GLU	CG-CD-OE2	-6.01	104.57	118.40
1	A	93	VAL	CA-C-O	-6.01	114.13	120.39
1	B	72	GLU	CG-CD-OE2	-5.97	104.67	118.40
1	A	61	GLU	CB-CA-C	-5.95	99.25	110.67
1	A	107	ILE	CA-C-O	-5.94	113.85	120.74
1	B	96	THR	O-C-N	-5.92	116.47	123.22
1	B	25	ALA	CA-C-N	-5.91	113.81	122.68

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	25	ALA	C-N-CA	-5.91	113.81	122.68
1	B	55	LEU	O-C-N	5.90	130.47	123.27
1	A	58	LEU	CA-C-O	-5.90	114.62	120.70
1	A	86	PRO	N-CA-CB	-5.90	95.88	102.72
1	A	109	ALA	O-C-N	-5.88	116.44	123.31
1	B	26	ILE	CB-CG1-CD1	-5.86	101.49	113.80
1	B	123	THR	N-CA-C	5.85	117.11	108.86
1	B	97	ALA	CB-CA-C	5.85	120.46	110.81
1	B	55	LEU	N-CA-C	-5.83	99.50	109.24
1	B	93	VAL	O-C-N	5.83	129.50	123.20
1	B	33	PHE	O-C-N	5.82	130.22	123.41
1	B	12	LEU	CA-C-O	5.77	127.24	120.20
1	B	80	LYS	N-CA-C	-5.75	104.70	110.97
1	B	45	ALA	N-CA-CB	-5.75	102.64	111.56
1	B	94	VAL	O-C-N	5.72	129.43	123.26
1	A	13	MET	O-C-N	-5.67	116.36	123.27
1	B	94	VAL	CB-CA-C	5.66	119.01	110.63
1	A	17	LEU	CA-C-O	-5.66	114.71	121.11
1	A	117	SER	O-C-N	-5.66	115.10	122.97
1	B	31	HIS	CA-C-O	-5.66	114.25	120.36
1	B	59	THR	CA-CB-OG1	-5.65	101.13	109.60
1	A	65	VAL	N-CA-CB	-5.64	101.93	111.23
1	A	126	LYS	CA-C-O	-5.61	112.49	120.51
1	A	68	ILE	N-CA-C	-5.60	100.32	108.17
1	B	51	GLU	OE1-CD-OE2	5.60	136.34	122.90
1	A	42	GLU	O-C-N	5.58	126.35	121.39
1	B	27	ASN	CA-CB-CG	-5.53	107.07	112.60
1	A	63	GLU	CA-C-O	5.49	126.03	119.60
1	A	52	SER	CA-C-N	5.49	130.32	120.77
1	A	52	SER	C-N-CA	5.49	130.32	120.77
1	A	88	HIS	ND1-CE1-NE2	5.48	113.88	108.40
1	A	60	THR	CA-CB-OG1	-5.47	101.40	109.60
1	A	27	ASN	CB-CG-ND2	5.43	124.54	116.40
1	A	111	LEU	CB-CA-C	-5.41	100.40	109.48
1	A	100	SER	CA-CB-OG	5.39	121.88	111.10
1	A	96	THR	CA-CB-OG1	-5.38	101.53	109.60
1	A	54	GLU	O-C-N	5.37	129.93	123.16
1	B	72	GLU	CA-CB-CG	-5.37	103.36	114.10
1	A	123	THR	CA-CB-OG1	-5.37	101.55	109.60
1	A	111	LEU	N-CA-CB	-5.36	101.68	110.52
1	A	56	HIS	CB-CA-C	-5.36	98.81	109.79
1	B	9	LYS	O-C-N	5.35	129.71	122.59

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	94	VAL	CA-C-O	-5.33	114.79	120.39
1	B	26	ILE	O-C-N	5.33	128.52	122.98
1	A	103	ARG	O-C-N	5.32	129.67	122.96
1	B	44	PHE	CA-CB-CG	5.32	119.12	113.80
1	B	92	GLU	CA-CB-CG	-5.32	103.46	114.10
1	A	24	PRO	N-CA-C	-5.31	102.94	111.38
1	B	25	ALA	N-CA-C	-5.31	100.08	108.73
1	A	69	TYR	CA-C-O	-5.30	115.42	121.68
1	A	81	ALA	CA-C-N	5.28	130.68	122.49
1	A	81	ALA	C-N-CA	5.28	130.68	122.49
1	A	88	HIS	N-CA-C	5.28	118.29	110.48
1	A	51	GLU	CA-C-N	5.27	131.09	122.65
1	A	51	GLU	C-N-CA	5.27	131.09	122.65
1	B	49	THR	CA-CB-OG1	-5.27	101.70	109.60
1	A	98	ASN	OD1-CG-ND2	-5.25	117.35	122.60
1	B	41	TRP	CA-C-O	-5.25	115.07	121.36
1	B	17	LEU	CA-C-N	5.23	130.37	123.05
1	B	17	LEU	C-N-CA	5.23	130.37	123.05
1	B	49	THR	CA-C-O	5.23	126.94	121.19
1	B	21	ARG	CD-NE-CZ	5.23	131.72	124.40
1	B	34	ARG	CD-NE-CZ	-5.22	117.09	124.40
1	A	26	ILE	CA-CB-CG1	-5.21	101.55	110.40
1	B	50	SER	O-C-N	5.21	129.51	122.59
1	B	124	ASN	OD1-CG-ND2	5.21	127.81	122.60
1	B	116	TYR	CA-CB-CG	5.19	123.25	113.90
1	A	104	ARG	CB-CA-C	5.19	118.70	109.72
1	A	125	PRO	N-CA-C	-5.19	101.78	112.47
1	B	59	THR	CA-C-N	5.18	130.61	122.21
1	B	59	THR	C-N-CA	5.18	130.61	122.21
1	B	90	HIS	CA-C-O	-5.17	115.75	121.28
1	B	84	ILE	CA-C-O	-5.17	114.96	120.39
1	B	124	ASN	CA-CB-CG	-5.16	107.44	112.60
1	A	13	MET	CB-CG-SD	-5.15	97.25	112.70
1	B	28	VAL	N-CA-CB	5.15	116.33	110.72
1	B	89	GLU	N-CA-C	-5.15	105.36	111.69
1	B	113	PRO	N-CD-CG	-5.15	95.48	103.20
1	A	69	TYR	N-CA-C	-5.14	101.95	109.81
1	B	103	ARG	NH1-CZ-NH2	5.13	125.97	119.30
1	B	36	ALA	O-C-N	-5.12	117.20	122.94
1	A	106	THR	O-C-N	5.12	129.88	123.12
1	B	117	SER	N-CA-CB	5.08	118.68	110.85
1	B	115	SER	CA-CB-OG	5.08	121.25	111.10

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	82	LEU	N-CA-CB	5.07	118.27	110.61
1	B	51	GLU	CB-CG-CD	-5.07	103.98	112.60
1	A	61	GLU	N-CA-C	5.07	117.70	111.82
1	A	66	GLU	O-C-N	5.07	128.84	122.86
1	B	36	ALA	CB-CA-C	5.07	118.69	109.83
1	A	87	PHE	CB-CA-C	-5.05	102.31	110.79
1	A	115	SER	N-CA-CB	-5.04	102.57	111.39
1	A	60	THR	CA-CB-CG2	5.04	119.06	110.50
1	B	101	GLY	CA-C-N	5.02	126.11	119.84
1	B	101	GLY	C-N-CA	5.02	126.11	119.84
1	B	78	TYR	CA-CB-CG	-5.00	104.89	113.90
1	A	86	PRO	CB-CA-C	5.00	117.50	110.20

There are no chirality outliers.

All (2) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	B	104	ARG	Sidechain
1	B	21	ARG	Sidechain

5.2 Too-close contacts [i](#)

In the following table, the Non-H and H(model) columns list the number of non-hydrogen atoms and hydrogen atoms in the chain respectively. The H(added) column lists the number of hydrogen atoms added and optimized by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, whereas Symm-Clashes lists symmetry-related clashes.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	938	0	912	39	0
1	B	920	0	893	85	0
2	A	29	0	13	7	0
2	B	29	0	13	5	0
3	A	44	0	0	0	0
3	B	38	0	0	8	0
All	All	1998	0	1831	120	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 32.

All (120) 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:B:9:LYS:HE3	1:B:104:ARG:HH11	1.08	1.13
1:B:103:ARG:HG3	1:B:124:ASN:HA	1.29	1.13
1:B:21:ARG:NH2	1:B:78:TYR:OH	2.01	0.92
1:B:9:LYS:HD3	1:B:61:GLU:HG2	1.50	0.91
1:B:9:LYS:HE3	1:B:104:ARG:HD3	1.52	0.89
1:B:9:LYS:HG2	1:B:11:PRO:HD3	1.57	0.86
1:A:124:ASN:OD1	1:A:125:PRO:HD2	1.74	0.85
1:B:10:CYS:SG	3:B:165:HOH:O	2.36	0.83
1:B:37:ALA:C	1:B:39:ASP:H	1.86	0.80
1:B:103:ARG:CG	1:B:124:ASN:HA	2.11	0.80
1:B:9:LYS:CE	1:B:104:ARG:HH11	1.92	0.78
1:B:9:LYS:HE3	1:B:104:ARG:NH1	1.94	0.78
1:B:10:CYS:O	1:B:104:ARG:HD2	1.86	0.76
1:B:10:CYS:HB2	3:B:165:HOH:O	1.86	0.76
1:B:18:ASP:OD2	1:B:21:ARG:NH2	2.14	0.74
1:A:108:ALA:CB	2:A:128:P28:H3	2.18	0.73
1:A:108:ALA:HB1	2:A:128:P28:H3	1.71	0.73
1:B:37:ALA:O	1:B:39:ASP:N	2.25	0.70
1:A:33:PHE:O	1:A:69:TYR:HA	1.91	0.69
1:B:108:ALA:HB2	2:B:128:P28:H2	1.75	0.69
1:B:34:ARG:HG2	1:B:34:ARG:NH1	2.07	0.68
1:B:59:THR:CG2	1:B:60:THR:H	2.05	0.68
1:B:8:SER:O	1:B:9:LYS:C	2.37	0.67
1:B:103:ARG:HG3	1:B:124:ASN:CA	2.17	0.67
1:A:103:ARG:HA	1:A:125:PRO:HD3	1.75	0.67
1:B:90:HIS:NE2	1:B:92:GLU:CD	2.52	0.67
1:A:26:ILE:HD11	1:A:51:GLU:O	1.95	0.66
1:B:37:ALA:C	1:B:39:ASP:N	2.48	0.65
1:B:34:ARG:HG2	1:B:34:ARG:HH11	1.61	0.64
1:B:36:ALA:O	1:B:39:ASP:HA	1.97	0.64
1:B:74:ASP:OD2	1:B:77:SER:OG	2.15	0.64
1:B:59:THR:CG2	1:B:60:THR:N	2.60	0.64
1:B:9:LYS:CE	1:B:104:ARG:HD3	2.27	0.63
1:B:27:ASN:ND2	3:B:130:HOH:O	2.31	0.63
1:B:103:ARG:HB2	1:B:123:THR:O	1.98	0.62
1:A:26:ILE:HD13	1:A:51:GLU:HA	1.83	0.61
1:B:66:GLU:HA	1:B:97:ALA:O	2.01	0.61
1:A:76:LYS:O	1:A:80:LYS:HG2	2.01	0.60
1:B:28:VAL:O	1:B:48:LYS:HA	2.01	0.60
1:B:72:GLU:OE2	3:B:158:HOH:O	2.16	0.60
1:B:10:CYS:O	1:B:104:ARG:CD	2.51	0.59
1:B:59:THR:HG22	1:B:60:THR:N	2.18	0.57

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:117:SER:HB3	1:B:117:SER:HB3	1.86	0.57
1:B:29:ALA:HB2	1:B:48:LYS:HE3	1.86	0.57
1:B:70:LYS:HE2	1:B:92:GLU:OE2	2.05	0.57
1:B:108:ALA:HB1	2:B:128:P28:H3	1.86	0.57
1:B:18:ASP:OD2	1:B:78:TYR:OH	2.23	0.56
1:B:63:GLU:OE1	1:B:63:GLU:HA	2.06	0.56
1:B:9:LYS:HG3	1:B:10:CYS:N	2.22	0.55
1:A:15:LYS:NZ	1:A:52:SER:O	2.38	0.55
1:A:15:LYS:O	1:A:108:ALA:HA	2.06	0.54
1:A:92:GLU:OE2	1:B:92:GLU:OE1	2.25	0.53
1:B:28:VAL:HG11	1:B:73:ILE:HG23	1.90	0.53
1:A:108:ALA:HB2	2:A:128:P28:H2	1.89	0.52
1:B:99:ASP:OD1	1:B:101:GLY:C	2.52	0.52
1:A:103:ARG:HA	1:A:125:PRO:CD	2.40	0.51
1:A:103:ARG:NH1	1:A:124:ASN:OD1	2.43	0.51
1:B:59:THR:HG23	1:B:60:THR:H	1.73	0.51
1:A:124:ASN:OD1	1:A:125:PRO:CD	2.53	0.51
1:B:10:CYS:CB	3:B:165:HOH:O	2.45	0.51
1:A:36:ALA:N	1:A:40:THR:O	2.24	0.50
1:B:59:THR:HG22	1:B:60:THR:O	2.11	0.50
1:A:108:ALA:HB2	2:A:128:P28:C2	2.42	0.50
1:B:21:ARG:HH21	1:B:78:TYR:HH	1.58	0.50
1:B:9:LYS:HG2	1:B:11:PRO:CD	2.37	0.49
1:B:62:GLU:OE2	3:B:140:HOH:O	2.20	0.49
1:A:16:VAL:HG12	1:A:25:ALA:HB3	1.93	0.49
1:B:9:LYS:HE3	1:B:104:ARG:CD	2.32	0.49
1:B:59:THR:HG21	1:B:64:PHE:HB2	1.95	0.48
1:B:79:TRP:HB2	1:B:86:PRO:HG3	1.95	0.48
1:A:35:LYS:HE2	1:A:41:TRP:CZ2	2.48	0.48
1:A:19:ALA:HB2	1:A:110:LEU:HD11	1.95	0.48
1:B:74:ASP:HB2	3:B:132:HOH:O	2.13	0.47
1:B:9:LYS:CG	1:B:10:CYS:N	2.77	0.47
1:B:9:LYS:HE2	1:B:11:PRO:HB3	1.97	0.47
1:B:99:ASP:CG	1:B:102:PRO:O	2.58	0.47
1:B:109:ALA:HA	1:B:117:SER:O	2.14	0.47
1:B:26:ILE:HG23	1:B:26:ILE:HD13	1.63	0.46
1:B:41:TRP:CH2	1:B:68:ILE:HG22	2.51	0.46
1:B:103:ARG:HG3	1:B:124:ASN:CG	2.41	0.46
1:A:99:ASP:OD1	1:A:99:ASP:N	2.48	0.46
1:A:108:ALA:CB	2:A:128:P28:C3	2.93	0.45
1:B:55:LEU:HD13	1:B:58:LEU:HD21	1.99	0.45

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:21:ARG:HH11	1:A:82:LEU:CD2	2.30	0.44
1:B:26:ILE:HB	1:B:50:SER:O	2.17	0.44
1:B:108:ALA:CB	2:B:128:P28:C2	2.95	0.44
1:A:108:ALA:HB2	2:A:128:P28:H3	1.99	0.44
1:B:73:ILE:HG22	1:B:75:THR:CG2	2.48	0.44
1:B:98:ASN:O	1:B:102:PRO:HD2	2.17	0.44
1:A:7:GLU:O	1:A:8:SER:C	2.59	0.44
1:A:48:LYS:O	1:A:55:LEU:HD13	2.18	0.44
1:B:8:SER:O	1:B:9:LYS:O	2.35	0.44
1:B:15:LYS:O	1:B:108:ALA:HA	2.17	0.44
1:B:11:PRO:HA	1:B:104:ARG:CD	2.48	0.44
1:B:28:VAL:CG1	1:B:73:ILE:HG23	2.48	0.44
1:A:117:SER:HA	1:B:117:SER:HA	1.99	0.43
1:A:119:THR:HA	1:B:115:SER:HB2	1.99	0.43
1:B:75:THR:O	1:B:78:TYR:HB3	2.19	0.43
1:B:108:ALA:CB	2:B:128:P28:H2	2.46	0.43
1:B:73:ILE:HG22	1:B:75:THR:HG22	2.00	0.43
1:B:10:CYS:O	1:B:13:MET:HE2	2.17	0.43
1:B:90:HIS:C	1:B:90:HIS:CD2	2.95	0.43
1:B:59:THR:CG2	1:B:64:PHE:HB2	2.49	0.43
1:B:37:ALA:O	1:B:38:ASP:C	2.62	0.43
1:A:108:ALA:HB2	2:A:128:P28:C3	2.49	0.42
1:B:104:ARG:NE	3:B:154:HOH:O	2.47	0.42
1:A:18:ASP:OD2	1:A:21:ARG:HD3	2.19	0.42
1:A:103:ARG:NH1	1:A:124:ASN:CG	2.78	0.42
1:A:76:LYS:O	1:A:80:LYS:CG	2.67	0.42
1:A:125:PRO:O	1:A:126:LYS:HG3	2.19	0.42
1:A:29:ALA:HB2	1:A:48:LYS:HE3	2.01	0.41
1:A:104:ARG:HH11	1:A:104:ARG:HD3	1.45	0.41
1:B:121:VAL:HG12	1:B:123:THR:HG23	2.02	0.41
1:A:112:SER:HB3	1:A:113:PRO:HD2	2.02	0.41
1:B:108:ALA:HB2	2:B:128:P28:C2	2.48	0.41
1:A:13:MET:HE2	1:A:13:MET:HB3	1.68	0.41
1:B:58:LEU:HD23	1:B:58:LEU:HA	1.89	0.41
1:B:65:VAL:O	1:B:66:GLU:C	2.64	0.41
1:B:33:PHE:O	1:B:69:TYR:HA	2.21	0.40
1:A:39:ASP:O	1:A:39:ASP:CG	2.64	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	119/127 (94%)	108 (91%)	8 (7%)	3 (2%)	4	2
1	B	117/127 (92%)	105 (90%)	9 (8%)	3 (3%)	4	2
All	All	236/254 (93%)	213 (90%)	17 (7%)	6 (2%)	4	2

All (6) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	9	LYS
1	A	126	LYS
1	B	38	ASP
1	B	9	LYS
1	A	125	PRO
1	B	101	GLY

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	102/105 (97%)	93 (91%)	9 (9%)	9	10
1	B	100/105 (95%)	85 (85%)	15 (15%)	3	2
All	All	202/210 (96%)	178 (88%)	24 (12%)	5	4

All (24) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	10	CYS
1	A	13	MET
1	A	23	SER
1	A	43	PRO
1	A	48	LYS
1	A	68	ILE
1	A	86	PRO
1	A	92	GLU
1	A	107	ILE
1	B	16	VAL
1	B	23	SER
1	B	26	ILE
1	B	38	ASP
1	B	43	PRO
1	B	51	GLU
1	B	55	LEU
1	B	59	THR
1	B	61	GLU
1	B	77	SER
1	B	82	LEU
1	B	100	SER
1	B	115	SER
1	B	117	SER
1	B	124	ASN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (3) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	56	HIS
1	B	27	ASN
1	B	124	ASN

5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

2 ligands are modelled in this entry.

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

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
2	P28	A	128	-	30,30,30	2.79	7 (23%)	34,42,42	2.28	13 (38%)
2	P28	B	128	-	30,30,30	2.76	9 (30%)	34,42,42	2.73	14 (41%)

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	P28	A	128	-	-	2/20/24/24	0/2/2/2
2	P28	B	128	-	-	2/20/24/24	0/2/2/2

All (16) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	128	P28	C5'-N5	-9.19	1.28	1.45
2	B	128	P28	C3'-N3	-8.71	1.29	1.45
2	B	128	P28	C5'-N5	-8.60	1.30	1.45
2	A	128	P28	C3'-N3	-8.57	1.30	1.45
2	A	128	P28	O81-C81	4.86	1.34	1.23
2	B	128	P28	O81-C81	4.58	1.33	1.23
2	A	128	P28	C2'-C1'	-3.22	1.33	1.39
2	B	128	P28	C8-C9	2.96	1.60	1.52
2	B	128	P28	C2'-C1'	-2.69	1.34	1.39
2	B	128	P28	C8-N8	2.43	1.51	1.45

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	128	P28	C8-C9	2.41	1.58	1.52
2	A	128	P28	O32-N3	-2.34	1.19	1.35
2	B	128	P28	O52-N5	-2.34	1.19	1.35
2	B	128	P28	C7-C8	-2.27	1.48	1.54
2	A	128	P28	O51-N5	-2.10	1.19	1.22
2	B	128	P28	O32-N3	-2.05	1.21	1.35

All (27) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	128	P28	C7-C1-C6	-6.26	109.25	120.90
2	B	128	P28	C8-N8-C81	-5.75	105.44	121.58
2	B	128	P28	C7-C8-N8	5.26	121.72	110.83
2	A	128	P28	C7-C1-C6	-5.19	111.25	120.90
2	A	128	P28	C8-N8-C81	-5.19	107.03	121.58
2	B	128	P28	C7-C1-C2	4.98	130.17	120.90
2	B	128	P28	C9-C8-N8	-4.89	99.24	110.57
2	B	128	P28	C1-C7-C8	4.54	125.42	113.36
2	B	128	P28	O10-C9-O9	4.20	133.60	124.08
2	A	128	P28	C1-C7-C8	3.99	123.97	113.36
2	A	128	P28	C7-C8-N8	3.86	118.84	110.83
2	A	128	P28	C7-C1-C2	3.49	127.39	120.90
2	A	128	P28	C2-C3-C4	3.44	123.67	119.73
2	A	128	P28	C3-C2-C1	-3.36	116.58	121.00
2	A	128	P28	C9-C8-N8	-2.99	103.63	110.57
2	B	128	P28	C6 ³ -C5 ³ -C4 ³	2.85	124.44	121.54
2	B	128	P28	O9-C9-C8	-2.83	113.13	122.26
2	B	128	P28	C2-C3-C4	2.65	122.76	119.73
2	A	128	P28	O4 ³ -C4 ³ -C5 ³	2.58	124.32	120.89
2	A	128	P28	C82-C81-N8	2.52	120.30	116.12
2	B	128	P28	C3-C2-C1	-2.47	117.76	121.00
2	B	128	P28	O41-C4-C3	2.41	127.75	119.36
2	A	128	P28	C6 ³ -C5 ³ -C4 ³	2.36	123.94	121.54
2	A	128	P28	O51-N5-C5 ³	2.15	122.71	119.03
2	B	128	P28	O31-N3-C3 ³	2.08	122.58	119.03
2	A	128	P28	C2 ³ -C3 ³ -C4 ³	2.00	123.57	121.54
2	B	128	P28	C82-C81-N8	2.00	119.44	116.12

There are no chirality outliers.

All (4) torsion outliers are listed below:

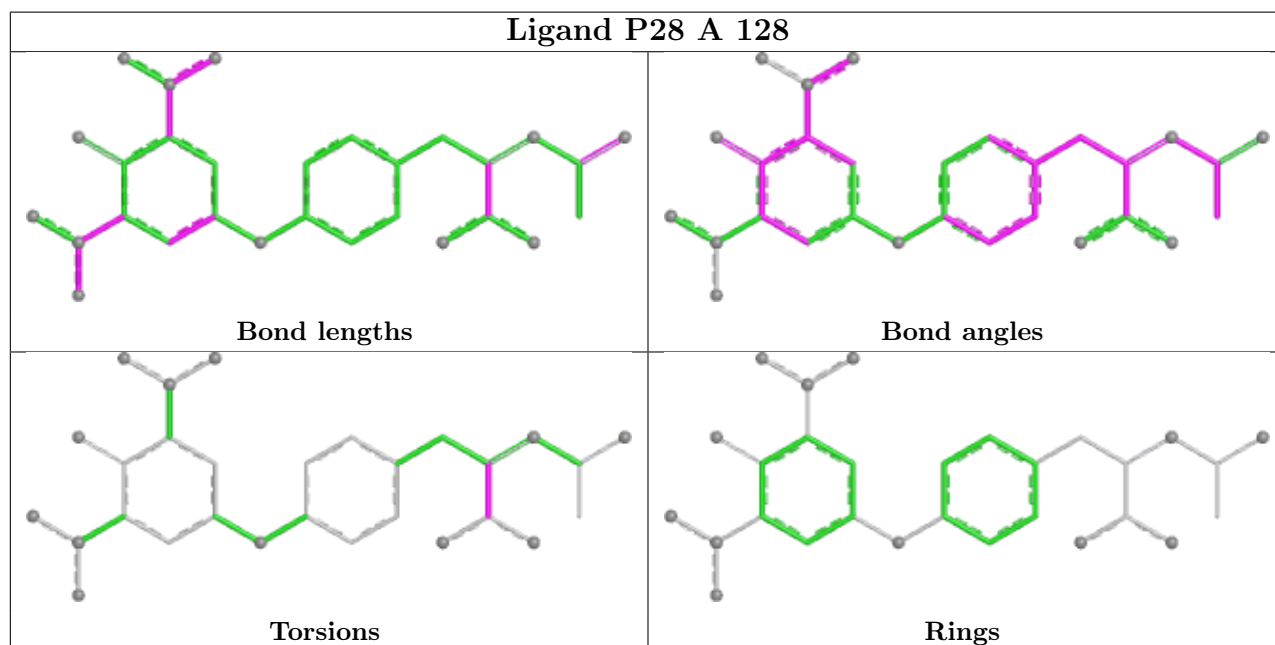
Mol	Chain	Res	Type	Atoms
2	B	128	P28	N8-C8-C9-O9
2	B	128	P28	N8-C8-C9-O10
2	A	128	P28	N8-C8-C9-O10
2	A	128	P28	N8-C8-C9-O9

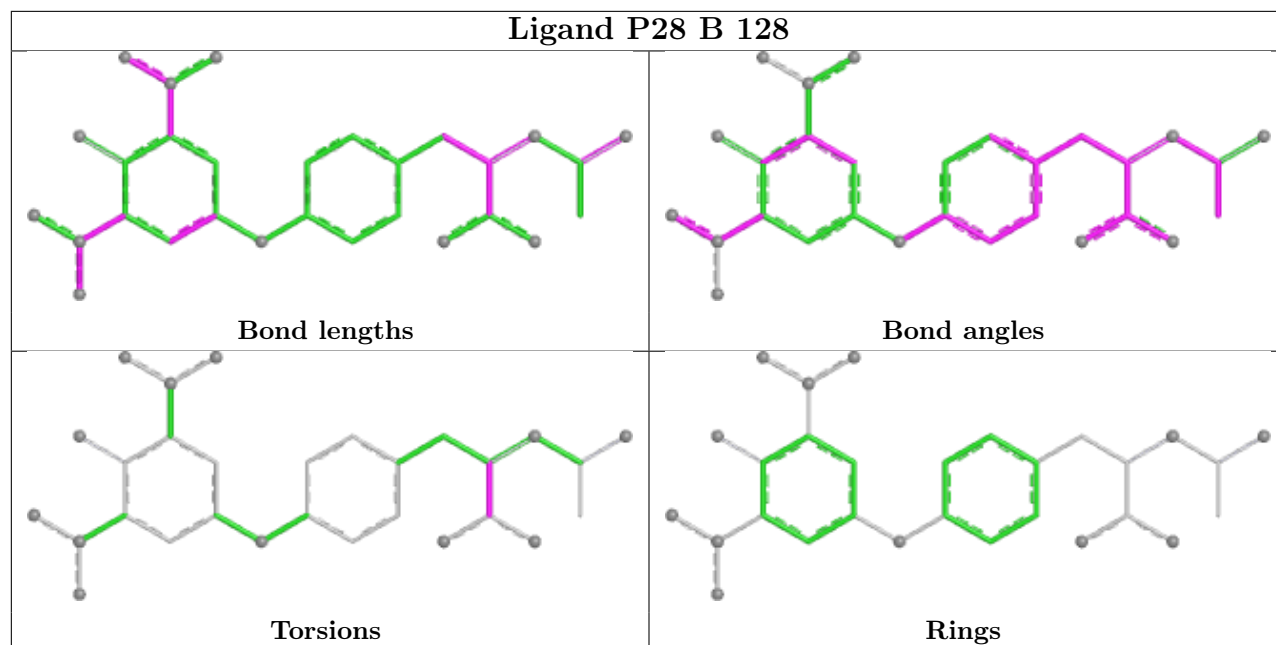
There are no ring outliers.

2 monomers are involved in 12 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	A	128	P28	7	0
2	B	128	P28	5	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.