



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 6, 2026 – 07:46 PM UTC

PDB ID : 1ECJ / pdb_00001ecj
Title : ESCHERICHIA COLI GLUTAMINE PHOSPHORIBOSYLPYROPHOSPHATE (PRPP) AMIDOTRANSFERASE COMPLEXED WITH 2 AMP PER TETRAMER
Authors : Muchmore, C.R.; Krahn, J.M.; Smith, J.L.
Deposited on : 1997-07-16
Resolution : 2.50 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

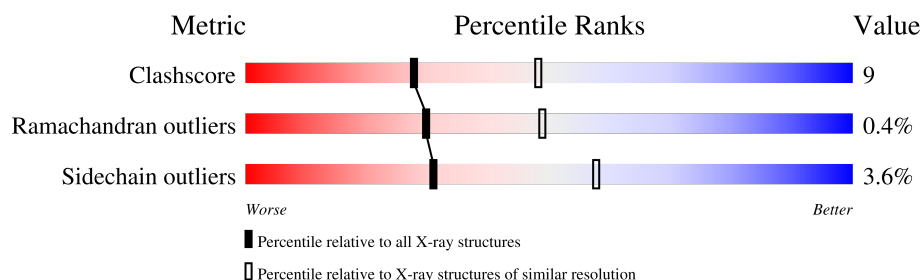
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.50 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	6492 (2.50-2.50)
Ramachandran outliers	187476	6378 (2.50-2.50)
Sidechain outliers	187428	6380 (2.50-2.50)

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	504	
1	B	504	
1	C	504	
1	D	504	

2 Entry composition [i](#)

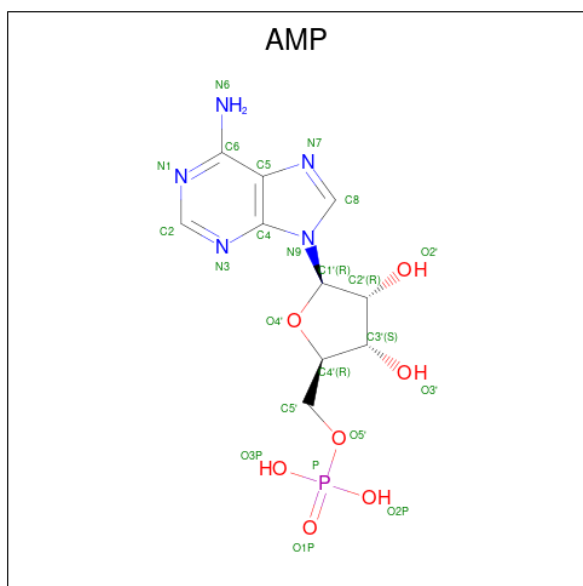
There are 3 unique types of molecules in this entry. The entry contains 15688 atoms, of which 0 are hydrogens and 0 are deuteriums.

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 GLUTAMINE PHOSPHORIBOSYLPYROPHOSPHATE AMIDOTRANSFERASE.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	492	Total	C	N	O	S	0	0	0
			3866	2426	692	731	17			
1	B	492	Total	C	N	O	S	0	0	0
			3866	2426	692	731	17			
1	C	492	Total	C	N	O	S	0	0	0
			3866	2426	692	731	17			
1	D	492	Total	C	N	O	S	0	0	0
			3866	2426	692	731	17			

- Molecule 2 is ADENOSINE MONOPHOSPHATE (CCD ID: AMP) (formula: $C_{10}H_{14}N_5O_7P$).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
2	A	1	Total	C	N	O	P	0	0
			23	10	5	7	1		
2	C	1	Total	C	N	O	P	0	0
			23	10	5	7	1		

- Molecule 3 is water.

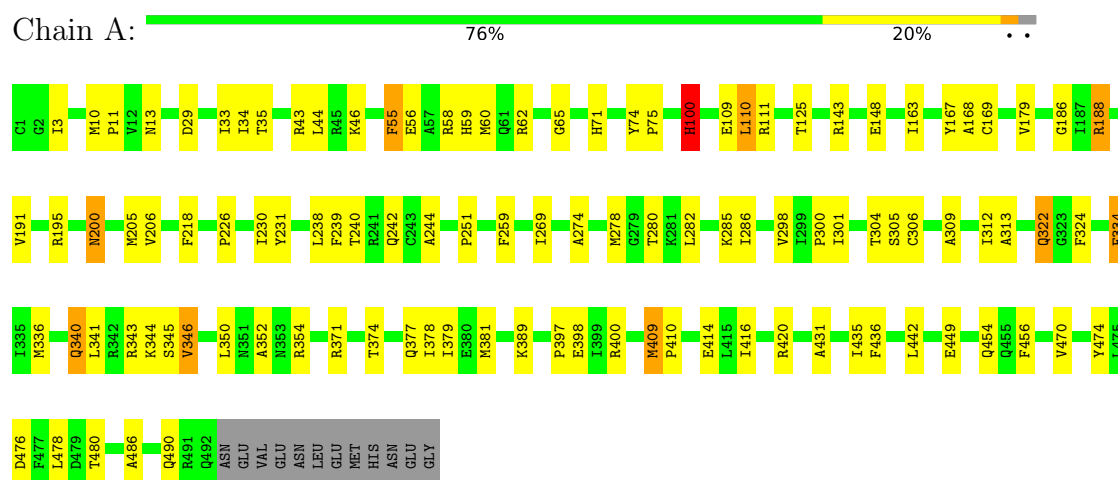
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	56	Total 56	O 56	0	0
3	B	32	Total 32	O 32	0	0
3	C	49	Total 49	O 49	0	0
3	D	41	Total 41	O 41	0	0

3 Residue-property plots

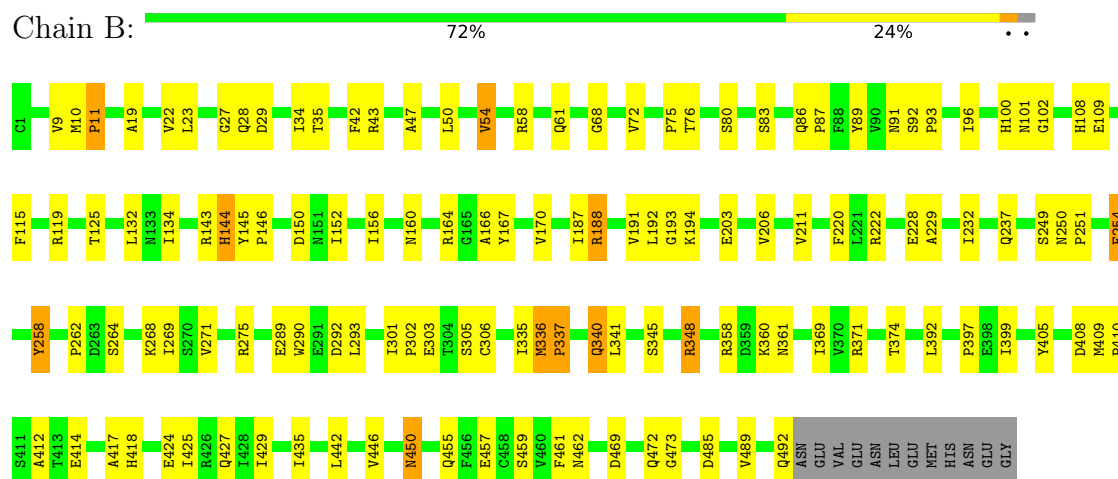
These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry. Residues are color-coded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

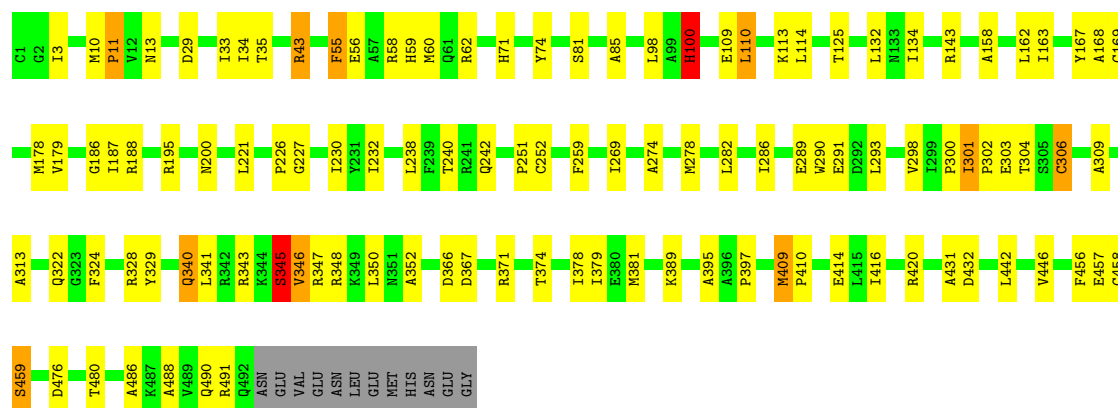


- Molecule 1: GLUTAMINE PHOSPHORIBOSYLPYROPHOSPHATE AMIDOTRANSFERASE



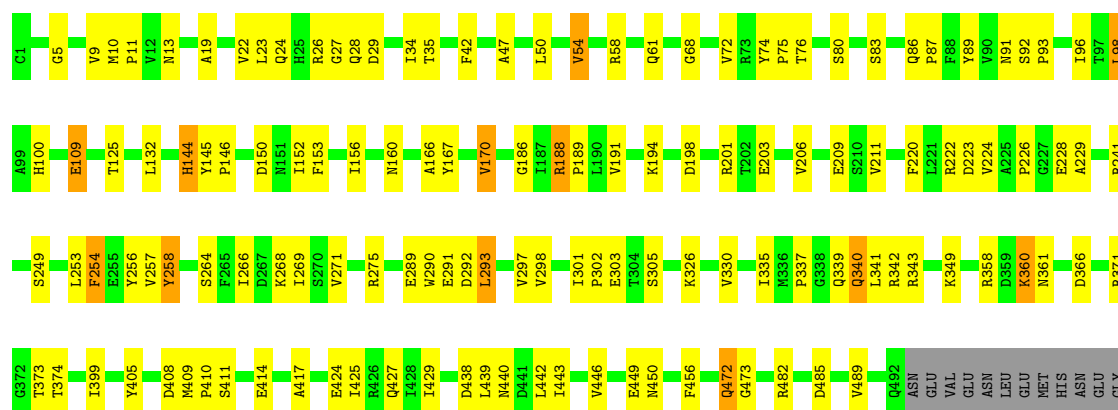
- Molecule 1: GLUTAMINE PHOSPHORIBOSYLPYROPHOSPHATE AMIDOTRANSFERASE

Chain C:  75% 20% ..



• Molecule 1: GLUTAMINE PHOSPHORIBOSYLPYROPHOSPHATE AMIDOTRANSFERASE

Chain D:  71% 25% ..



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 21	Depositor
Cell constants a, b, c, α , β , γ	116.80Å 156.00Å 106.90Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	30.00 – 2.50	Depositor
% Data completeness (in resolution range)	77.8 (30.00-2.50)	Depositor
R_{merge}	(Not available)	Depositor
R_{sym}	0.07	Depositor
Refinement program	X-PLOR 3.1	Depositor
R, R_{free}	0.181 , 0.248	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	15688	wwPDB-VP
Average B, all atoms (Å ²)	64.0	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: AMP

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	0.54	0/3934	0.98	15/5324 (0.3%)
1	B	0.54	0/3934	1.01	17/5324 (0.3%)
1	C	0.53	0/3934	0.98	14/5324 (0.3%)
1	D	0.54	0/3934	1.01	17/5324 (0.3%)
All	All	0.54	0/15736	1.00	63/21296 (0.3%)

There are no bond length outliers.

All (63) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	C	346	VAL	N-CA-C	-11.65	100.73	113.43
1	A	346	VAL	N-CA-C	-11.18	100.33	113.42
1	A	259	PHE	N-CA-C	10.05	122.24	111.28
1	D	292	ASP	N-CA-C	8.43	121.60	111.82
1	C	259	PHE	N-CA-C	8.43	120.46	111.28
1	C	345	SER	N-CA-C	8.40	122.58	108.90
1	B	292	ASP	N-CA-C	7.94	121.03	111.82
1	A	168	ALA	N-CA-C	-7.25	96.58	108.41
1	B	289	GLU	N-CA-C	7.01	120.32	111.69
1	A	74	TYR	N-CA-C	-6.92	95.85	108.85
1	D	188	ARG	CA-C-N	6.79	127.16	119.83
1	D	188	ARG	C-N-CA	6.79	127.16	119.83
1	D	289	GLU	N-CA-C	6.66	119.88	111.69
1	A	345	SER	N-CA-C	6.49	120.17	108.69
1	C	74	TYR	N-CA-C	-6.43	96.75	108.85
1	C	168	ALA	N-CA-C	-6.41	97.95	108.41
1	D	54	VAL	N-CA-C	6.33	117.11	110.72
1	B	188	ARG	CA-C-N	6.30	126.25	119.76
1	B	188	ARG	C-N-CA	6.30	126.25	119.76
1	B	306	CYS	N-CA-C	6.21	118.60	111.02

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	54	VAL	N-CA-C	6.18	116.97	110.72
1	C	306	CYS	N-CA-C	6.13	117.63	111.07
1	A	306	CYS	N-CA-C	6.09	118.45	111.02
1	A	100	HIS	N-CA-C	6.08	118.65	109.23
1	B	150	ASP	CB-CA-C	-5.99	100.50	110.68
1	C	55	PHE	N-CA-C	5.87	118.66	107.75
1	B	473	GLY	N-CA-C	-5.84	105.72	112.73
1	D	144	HIS	N-CA-C	5.83	119.05	109.72
1	C	167	TYR	N-CA-C	5.83	117.27	108.46
1	D	373	THR	N-CA-C	-5.80	104.95	111.28
1	C	347	ARG	N-CA-C	-5.74	105.77	112.89
1	A	167	TYR	N-CA-C	5.73	117.11	108.46
1	C	100	HIS	N-CA-C	5.71	118.07	109.23
1	B	170	VAL	N-CA-C	-5.69	100.84	108.35
1	D	224	VAL	N-CA-C	-5.62	101.47	108.89
1	D	473	GLY	N-CA-C	-5.59	106.02	112.73
1	B	144	HIS	N-CA-C	5.57	118.64	109.85
1	A	55	PHE	N-CA-C	5.50	117.98	107.75
1	B	301	ILE	N-CA-C	-5.49	101.72	107.60
1	B	348	ARG	N-CA-C	-5.44	105.35	111.28
1	D	361	ASN	N-CA-C	-5.42	100.26	108.67
1	C	291	GLU	N-CA-C	5.40	117.86	111.33
1	B	305	SER	N-CA-C	5.39	118.95	112.38
1	C	301	ILE	N-CA-C	-5.36	101.76	107.77
1	D	305	SER	N-CA-C	5.33	118.89	112.38
1	D	291	GLU	N-CA-C	5.28	117.45	111.11
1	B	134	ILE	N-CA-C	-5.26	105.37	110.42
1	A	305	SER	N-CA-C	5.25	118.94	112.54
1	B	361	ASN	N-CA-C	-5.23	100.56	108.67
1	D	13	ASN	N-CA-C	5.22	116.65	111.07
1	A	334	PHE	N-CA-C	5.19	117.95	109.59
1	B	450	ASN	CA-C-N	5.12	124.84	119.82
1	B	450	ASN	C-N-CA	5.12	124.84	119.82
1	D	109	GLU	CB-CA-C	-5.12	102.61	110.81
1	D	144	HIS	N-CA-CB	-5.12	102.33	111.08
1	D	170	VAL	N-CA-C	-5.10	100.90	108.45
1	A	280	THR	N-CA-C	-5.09	105.64	111.14
1	A	188	ARG	CA-C-N	5.07	124.83	119.76
1	A	188	ARG	C-N-CA	5.07	124.83	119.76
1	A	148	GLU	N-CA-C	-5.06	103.71	110.55
1	C	187	ILE	N-CA-C	5.04	115.16	110.42
1	D	257	VAL	N-CA-C	5.03	115.25	110.42

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	C	289	GLU	N-CA-C	5.00	116.81	111.36

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	3866	0	3832	66	0
1	B	3866	0	3832	78	0
1	C	3866	0	3832	63	0
1	D	3866	0	3832	81	0
2	A	23	0	12	2	0
2	C	23	0	12	2	0
3	A	56	0	0	1	0
3	B	32	0	0	1	0
3	C	49	0	0	2	0
3	D	41	0	0	1	0
All	All	15688	0	15352	278	0

The all-atom clashscore is defined as the number of clashes found per 1000 atoms (including hydrogen atoms). The all-atom clashscore for this structure is 9.

All (278) 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:80:SER:HB3	1:B:485:ASP:HB3	1.64	0.79
1:C:43:ARG:HD3	1:C:62:ARG:O	1.86	0.75
1:B:290:TRP:HB3	1:B:293:LEU:HD11	1.69	0.74
1:C:56:GLU:H	1:C:59:HIS:HD2	1.32	0.74
1:C:110:LEU:HD21	1:C:163:ILE:HG22	1.70	0.74
1:A:334:PHE:HB3	1:A:336:MET:HE3	1.70	0.74
1:A:56:GLU:H	1:A:59:HIS:HD2	1.33	0.73
1:B:76:THR:HG22	1:B:408:ASP:HB2	1.71	0.72
1:C:341:LEU:HD22	1:C:343:ARG:HB2	1.71	0.72

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:110:LEU:HD21	1:A:163:ILE:HG22	1.72	0.71
1:A:200:ASN:H	1:A:200:ASN:HD22	1.39	0.71
1:B:399:ILE:HG21	1:B:409:MET:HE1	1.73	0.70
1:A:486:ALA:O	1:A:490:GLN:HG2	1.92	0.70
1:C:486:ALA:O	1:C:490:GLN:HG2	1.93	0.69
1:B:345:SER:O	1:B:348:ARG:HB2	1.93	0.68
1:D:153:PHE:CB	1:D:241:ARG:HH11	2.06	0.68
1:D:153:PHE:HB3	1:D:241:ARG:HH11	1.59	0.67
1:D:290:TRP:HB3	1:D:293:LEU:HD11	1.76	0.67
1:D:254:PHE:CE2	1:D:258:TYR:HE1	2.14	0.66
1:A:409:MET:HG3	1:A:410:PRO:HD2	1.77	0.66
1:C:11:PRO:HD2	1:D:340:GLN:HG3	1.79	0.65
1:D:80:SER:HB3	1:D:485:ASP:HB3	1.77	0.64
1:B:254:PHE:CE2	1:B:258:TYR:HE1	2.15	0.64
1:D:399:ILE:HG21	1:D:409:MET:HE1	1.80	0.64
1:B:166:ALA:HB3	1:B:405:TYR:HB3	1.82	0.62
1:D:76:THR:HG22	1:D:408:ASP:HB2	1.82	0.61
1:A:341:LEU:HD22	1:A:343:ARG:HB2	1.82	0.61
1:C:352:ALA:HB2	1:C:381:MET:HE2	1.83	0.61
1:A:33:ILE:HG13	1:A:55:PHE:CZ	2.37	0.60
1:A:379:ILE:HD13	1:A:431:ALA:HB2	1.84	0.59
1:B:166:ALA:CB	1:B:405:TYR:HB3	2.32	0.59
1:C:10:MET:HB2	1:D:340:GLN:HG3	1.85	0.59
1:B:399:ILE:CG2	1:B:409:MET:HE1	2.32	0.58
1:C:230:ILE:HD13	1:C:240:THR:HG22	1.86	0.58
1:D:34:ILE:HD11	1:D:42:PHE:HB3	1.84	0.58
1:D:399:ILE:CG2	1:D:409:MET:HE1	2.35	0.56
1:C:409:MET:HG3	1:C:410:PRO:HD2	1.88	0.56
1:B:34:ILE:HD11	1:B:42:PHE:HB3	1.86	0.56
1:A:476:ASP:O	1:A:480:THR:HG23	2.06	0.56
1:B:399:ILE:O	1:B:417:ALA:HB3	2.05	0.56
1:B:80:SER:HB3	1:B:485:ASP:CB	2.36	0.55
1:A:230:ILE:HG23	1:A:238:LEU:HD11	1.89	0.54
1:B:262:PRO:HA	1:B:271:VAL:HB	1.89	0.54
1:C:300:PRO:HB3	1:C:309:ALA:CB	2.38	0.54
1:C:10:MET:SD	1:D:340:GLN:HB3	2.48	0.54
1:C:230:ILE:HG23	1:C:238:LEU:HD11	1.89	0.54
1:D:34:ILE:HG22	1:D:87:PRO:HG3	1.90	0.54
1:D:89:TYR:HA	1:D:132:LEU:HD21	1.89	0.54
1:A:100:HIS:HB2	1:A:169:CYS:SG	2.48	0.54
1:B:58:ARG:HA	1:B:61:GLN:HE21	1.72	0.54

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:179:VAL:HA	1:C:230:ILE:O	2.08	0.54
1:B:269:ILE:HD13	1:B:446:VAL:HG12	1.90	0.54
1:D:399:ILE:O	1:D:417:ALA:HB3	2.07	0.53
1:C:34:ILE:HA	1:C:43:ARG:O	2.09	0.53
1:D:198:ASP:OD1	1:D:201:ARG:HB2	2.09	0.53
1:D:28:GLN:HB3	1:D:50:LEU:CD2	2.39	0.53
1:A:195:ARG:CZ	1:B:341:LEU:HD23	2.39	0.53
1:B:28:GLN:HB3	1:B:50:LEU:CD2	2.38	0.53
1:D:438:ASP:HA	3:D:540:HOH:O	2.09	0.53
1:B:271:VAL:O	1:B:275:ARG:HG3	2.08	0.52
1:A:35:THR:OG1	1:A:43:ARG:HB2	2.10	0.52
1:A:179:VAL:HA	1:A:230:ILE:O	2.10	0.52
1:B:250:ASN:HA	1:B:455:GLN:O	2.10	0.52
1:C:33:ILE:HG13	1:C:55:PHE:CZ	2.44	0.52
1:A:10:MET:SD	1:B:340:GLN:HB3	2.48	0.52
1:A:324:PHE:HE1	1:A:381:MET:HE2	1.73	0.52
1:A:374:THR:O	1:A:378:ILE:HG13	2.10	0.52
1:B:250:ASN:O	1:B:457:GLU:HB2	2.10	0.52
1:A:34:ILE:HA	1:A:43:ARG:O	2.10	0.51
1:A:43:ARG:HD2	1:A:62:ARG:O	2.09	0.51
1:B:160:ASN:ND2	1:B:167:TYR:OH	2.44	0.51
1:B:34:ILE:HA	1:B:43:ARG:O	2.11	0.51
1:B:397:PRO:HD2	1:B:461:PHE:CE1	2.45	0.51
1:C:306:CYS:HB2	3:C:550:HOH:O	2.10	0.50
1:D:186:GLY:HA3	1:D:226:PRO:HG3	1.92	0.50
1:B:108:HIS:HB3	3:B:523:HOH:O	2.10	0.50
1:D:58:ARG:HA	1:D:61:GLN:HE21	1.77	0.50
1:A:242:GLN:HE21	1:A:244:ALA:H	1.60	0.50
1:C:324:PHE:HE1	1:C:381:MET:HE2	1.77	0.50
1:A:251:PRO:HG2	1:A:456:PHE:CD2	2.46	0.49
1:A:11:PRO:HD2	1:B:340:GLN:HG3	1.94	0.49
1:D:80:SER:HB3	1:D:485:ASP:CB	2.43	0.49
1:D:472:GLN:OE1	1:D:472:GLN:N	2.46	0.49
1:A:352:ALA:HB2	1:A:381:MET:HE2	1.94	0.49
1:A:56:GLU:H	1:A:59:HIS:CD2	2.23	0.49
1:C:488:ALA:O	1:C:491:ARG:HB3	2.13	0.49
1:C:374:THR:O	1:C:378:ILE:HG13	2.13	0.49
1:B:268:LYS:HB2	1:B:450:ASN:ND2	2.27	0.49
1:B:424:GLU:HA	1:B:427:GLN:HE21	1.77	0.49
1:B:101:ASN:OD1	1:B:188:ARG:HD3	2.13	0.48
1:B:145:TYR:CD1	1:B:146:PRO:HA	2.48	0.48

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:254:PHE:CD2	1:B:258:TYR:HE1	2.31	0.48
1:B:336:MET:HE2	1:B:336:MET:HA	1.95	0.48
1:D:160:ASN:ND2	1:D:167:TYR:OH	2.45	0.48
1:C:328:ARG:O	1:C:328:ARG:HG2	2.14	0.48
1:D:153:PHE:HB2	1:D:241:ARG:HH11	1.77	0.48
1:B:27:GLY:O	1:B:72:VAL:HB	2.14	0.48
1:B:492:GLN:HA	1:D:61:GLN:OE1	2.14	0.48
1:A:200:ASN:H	1:A:200:ASN:ND2	2.07	0.48
1:B:371:ARG:HG2	1:B:371:ARG:HH11	1.79	0.48
1:C:252:CYS:HA	1:C:457:GLU:HB3	1.95	0.48
1:D:47:ALA:HB3	1:D:54:VAL:HG13	1.96	0.48
1:D:145:TYR:CD1	1:D:146:PRO:HA	2.49	0.48
1:B:211:VAL:HG13	1:B:264:SER:OG	2.14	0.47
1:C:476:ASP:O	1:C:480:THR:HG23	2.14	0.47
1:A:10:MET:HB2	1:B:340:GLN:HG3	1.96	0.47
1:D:254:PHE:CD2	1:D:258:TYR:HE1	2.32	0.47
1:D:424:GLU:HA	1:D:427:GLN:HE21	1.78	0.47
1:B:92:SER:HA	1:B:93:PRO:C	2.38	0.47
1:D:264:SER:O	1:D:271:VAL:HG23	2.15	0.47
1:D:268:LYS:HB2	1:D:450:ASN:ND2	2.30	0.47
1:B:89:TYR:HB2	1:B:96:ILE:O	2.14	0.47
1:C:158:ALA:O	1:C:162:LEU:HG	2.15	0.47
1:B:410:PRO:HB2	1:B:414:GLU:HB2	1.97	0.47
1:C:302:PRO:HA	1:C:303:GLU:HA	1.52	0.47
1:C:178:MET:HE2	1:C:232:ILE:HD12	1.97	0.47
1:A:410:PRO:HB2	1:A:414:GLU:HB2	1.96	0.46
1:D:29:ASP:HB2	1:D:75:PRO:HG3	1.96	0.46
1:B:442:LEU:O	1:B:446:VAL:HG23	2.15	0.46
1:C:290:TRP:CG	1:C:293:LEU:HD12	2.51	0.46
1:C:410:PRO:HB2	1:C:414:GLU:HB2	1.97	0.46
1:C:374:THR:HG22	1:C:378:ILE:HD11	1.97	0.46
1:D:409:MET:HE3	1:D:409:MET:HB3	1.86	0.46
1:A:43:ARG:HD3	1:A:43:ARG:HA	1.60	0.46
1:A:29:ASP:CG	1:A:75:PRO:HG3	2.41	0.46
1:B:10:MET:HE2	1:B:10:MET:HB3	1.90	0.46
1:B:47:ALA:HB3	1:B:54:VAL:HG13	1.97	0.46
1:B:86:GLN:HB3	1:B:87:PRO:HA	1.98	0.46
1:B:397:PRO:HD3	1:B:442:LEU:HD22	1.97	0.46
1:B:459:SER:HA	1:B:462:ASN:OD1	2.15	0.46
1:C:56:GLU:H	1:C:59:HIS:CD2	2.22	0.46
1:C:345:SER:HB3	1:C:348:ARG:HG2	1.96	0.46

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:D:89:TYR:HB2	1:D:96:ILE:O	2.16	0.46
1:B:89:TYR:HA	1:B:132:LEU:HD21	1.98	0.45
1:C:114:LEU:HD21	1:C:134:ILE:HD13	1.98	0.45
1:C:274:ALA:O	1:C:278:MET:HG3	2.16	0.45
1:C:109:GLU:CD	1:C:109:GLU:H	2.23	0.45
1:C:371:ARG:N	2:C:505:AMP:O2P	2.48	0.45
1:A:322:GLN:HE21	1:A:322:GLN:HB3	1.35	0.45
1:A:397:PRO:HD3	1:A:442:LEU:HD22	1.98	0.45
1:A:346:VAL:HG23	1:A:377:GLN:OE1	2.17	0.45
1:B:102:GLY:HA2	1:B:405:TYR:O	2.16	0.45
1:C:35:THR:OG1	1:C:43:ARG:HB2	2.15	0.45
1:D:10:MET:HE2	1:D:10:MET:HB3	1.89	0.45
1:A:389:LYS:HA	1:A:389:LYS:HD3	1.67	0.45
1:D:166:ALA:CB	1:D:405:TYR:HB3	2.47	0.45
1:D:411:SER:H	1:D:482:ARG:HH12	1.63	0.45
1:B:290:TRP:CZ2	1:B:435:ILE:HB	2.51	0.45
1:C:85:ALA:HB1	3:C:513:HOH:O	2.15	0.45
1:D:271:VAL:O	1:D:275:ARG:HG3	2.16	0.45
1:B:302:PRO:HA	1:B:303:GLU:HA	1.64	0.45
1:A:186:GLY:HA3	1:A:226:PRO:HG3	1.99	0.45
1:B:249:SER:C	1:B:251:PRO:HD3	2.42	0.45
1:D:26:ARG:HD2	1:D:209:GLU:OE2	2.17	0.45
1:A:282:LEU:HD23	1:A:312:ILE:HD11	1.99	0.45
1:C:221:LEU:HD23	1:C:221:LEU:HA	1.87	0.45
1:D:485:ASP:O	1:D:489:VAL:HG23	2.17	0.44
1:A:188:ARG:HA	1:A:188:ARG:NE	2.32	0.44
1:B:19:ALA:O	1:B:22:VAL:HG22	2.17	0.44
1:D:152:ILE:O	1:D:156:ILE:HG13	2.17	0.44
1:A:230:ILE:HG23	1:A:238:LEU:CD1	2.48	0.44
1:B:358:ARG:O	1:B:360:LYS:HG2	2.18	0.44
1:C:13:ASN:C	1:C:60:MET:HE1	2.42	0.44
1:D:438:ASP:HB3	1:D:440:ASN:OD1	2.17	0.44
1:A:454:GLN:HB2	3:A:546:HOH:O	2.16	0.44
1:B:152:ILE:O	1:B:156:ILE:HG13	2.18	0.44
1:D:98:LEU:HD23	1:D:98:LEU:C	2.42	0.44
1:A:374:THR:HG22	1:A:378:ILE:HD11	2.00	0.44
1:A:398:GLU:HG3	1:A:436:PHE:CE2	2.52	0.44
1:D:191:VAL:HG12	1:D:223:ASP:HA	1.99	0.44
1:D:339:GLN:O	1:D:342:ARG:HG3	2.18	0.44
1:B:425:ILE:O	1:B:429:ILE:HG12	2.17	0.44
1:C:374:THR:HB	2:C:505:AMP:O1P	2.18	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:D:28:GLN:HB3	1:D:50:LEU:HD23	1.99	0.44
1:B:9:VAL:HG23	1:B:10:MET:HE3	1.99	0.44
1:B:264:SER:O	1:B:271:VAL:HG23	2.18	0.44
1:D:211:VAL:HG13	1:D:264:SER:OG	2.17	0.44
1:A:11:PRO:HA	1:A:65:GLY:O	2.18	0.44
1:A:416:ILE:O	1:A:420:ARG:HD2	2.18	0.44
1:B:76:THR:CG2	1:B:408:ASP:HB2	2.42	0.44
1:B:228:GLU:HG2	1:B:229:ALA:N	2.33	0.44
1:C:379:ILE:HD13	1:C:431:ALA:HB2	1.99	0.43
1:C:416:ILE:O	1:C:420:ARG:HD2	2.18	0.43
1:A:3:ILE:HG22	1:A:71:HIS:HD2	1.83	0.43
1:B:28:GLN:HB3	1:B:50:LEU:HD23	2.00	0.43
1:C:282:LEU:O	1:C:286:ILE:HG13	2.18	0.43
1:B:220:PHE:CE2	1:B:222:ARG:HA	2.54	0.43
1:C:58:ARG:O	1:C:62:ARG:HG3	2.18	0.43
1:D:326:LYS:HE3	1:D:349:LYS:NZ	2.33	0.43
1:B:164:ARG:HH11	1:B:469:ASP:HB3	1.82	0.43
1:D:27:GLY:O	1:D:72:VAL:HB	2.18	0.43
1:D:153:PHE:HB2	1:D:241:ARG:NH1	2.34	0.43
1:D:256:TYR:CE1	1:D:266:ILE:HB	2.53	0.43
1:B:369:ILE:HD11	1:B:392:LEU:HD21	2.01	0.43
1:D:19:ALA:O	1:D:22:VAL:HG22	2.18	0.43
1:D:228:GLU:HG2	1:D:229:ALA:N	2.34	0.43
1:B:29:ASP:HB2	1:B:75:PRO:HG3	2.00	0.43
1:C:301:ILE:HD12	1:C:366:ASP:HB2	2.01	0.43
1:B:232:ILE:HA	1:B:237:GLN:O	2.18	0.43
1:A:470:VAL:HG13	1:A:474:TYR:HD2	1.83	0.43
1:B:143:ARG:HA	1:B:143:ARG:HD3	1.82	0.43
1:D:74:TYR:HE2	1:D:408:ASP:HB3	1.84	0.43
1:D:302:PRO:HA	1:D:303:GLU:HA	1.61	0.43
1:A:44:LEU:HD21	1:A:46:LYS:HE2	2.00	0.43
1:A:300:PRO:HB3	1:A:309:ALA:CB	2.49	0.43
1:A:371:ARG:N	2:A:505:AMP:O2P	2.50	0.43
1:B:35:THR:HG22	1:B:68:GLY:HA3	2.00	0.43
1:D:5:GLY:HA3	1:D:170:VAL:HG21	2.01	0.43
1:B:250:ASN:ND2	1:B:455:GLN:HB3	2.34	0.42
1:C:3:ILE:HG22	1:C:71:HIS:HD2	1.83	0.42
1:C:251:PRO:HG2	1:C:456:PHE:CD2	2.53	0.42
1:D:358:ARG:O	1:D:360:LYS:HG2	2.18	0.42
1:A:230:ILE:HD13	1:A:240:THR:HG22	2.01	0.42
1:B:166:ALA:HB2	1:B:187:ILE:HD12	2.02	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:367:ASP:HA	1:C:395:ALA:HB3	2.01	0.42
1:D:35:THR:HG22	1:D:68:GLY:HA3	1.99	0.42
1:C:98:LEU:HD13	1:C:132:LEU:HA	2.01	0.42
1:D:86:GLN:HB3	1:D:87:PRO:HA	2.01	0.42
1:D:253:LEU:HD13	1:D:456:PHE:CG	2.54	0.42
1:C:227:GLY:HA3	1:C:242:GLN:HE22	1.84	0.42
1:C:269:ILE:HD13	1:C:446:VAL:HG12	2.02	0.42
1:D:188:ARG:HA	1:D:189:PRO:HD2	1.82	0.42
1:D:371:ARG:HH11	1:D:371:ARG:HG2	1.84	0.42
1:A:269:ILE:HG23	1:A:449:GLU:HB2	2.01	0.42
1:B:485:ASP:O	1:B:489:VAL:HG23	2.19	0.42
1:C:29:ASP:OD2	1:C:81:SER:HA	2.20	0.42
1:A:340:GLN:HE21	1:A:340:GLN:HA	1.85	0.42
1:B:192:LEU:HD12	1:B:193:GLY:H	1.85	0.42
1:C:230:ILE:HG23	1:C:238:LEU:CD1	2.50	0.42
1:C:389:LYS:HD3	1:C:432:ASP:OD2	2.20	0.42
1:C:397:PRO:HD3	1:C:442:LEU:HD22	2.01	0.42
1:D:349:LYS:HB3	1:D:349:LYS:HE3	1.73	0.42
1:A:285:LYS:HE2	1:A:435:ILE:HD11	2.01	0.42
1:B:191:VAL:O	1:B:206:VAL:HA	2.20	0.42
1:D:335:ILE:HG13	1:D:335:ILE:O	2.19	0.42
1:D:220:PHE:CE2	1:D:222:ARG:HA	2.54	0.42
1:D:410:PRO:HB2	1:D:414:GLU:HB2	2.02	0.42
1:C:188:ARG:HA	1:C:188:ARG:NE	2.35	0.41
1:D:92:SER:HA	1:D:93:PRO:C	2.44	0.41
1:A:374:THR:HB	2:A:505:AMP:O1P	2.20	0.41
1:C:100:HIS:HB2	1:C:169:CYS:SG	2.60	0.41
1:A:191:VAL:O	1:A:206:VAL:HA	2.20	0.41
1:B:412:ALA:HB1	1:B:418:HIS:CD2	2.55	0.41
1:D:9:VAL:HG23	1:D:10:MET:HE3	2.02	0.41
1:D:301:ILE:HD12	1:D:366:ASP:HB2	2.02	0.41
1:D:439:LEU:O	1:D:443:ILE:HG13	2.20	0.41
1:A:282:LEU:O	1:A:286:ILE:HG13	2.20	0.41
1:A:301:ILE:HD13	1:A:378:ILE:HD13	2.02	0.41
1:C:340:GLN:HA	1:C:340:GLN:HE21	1.86	0.41
1:D:297:VAL:HG22	1:D:298:VAL:N	2.35	0.41
1:D:442:LEU:O	1:D:446:VAL:HG23	2.20	0.41
1:A:58:ARG:O	1:A:62:ARG:HG3	2.19	0.41
1:C:329:TYR:CD2	1:D:24:GLN:HB3	2.55	0.41
1:A:109:GLU:CD	1:A:109:GLU:H	2.29	0.41
1:A:400:ARG:HG2	1:A:400:ARG:NH1	2.35	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:478:LEU:HD23	1:A:478:LEU:HA	1.90	0.41
1:D:74:TYR:CE2	1:D:408:ASP:HB3	2.55	0.41
1:D:425:ILE:O	1:D:429:ILE:HG12	2.20	0.41
1:A:274:ALA:O	1:A:278:MET:HG3	2.21	0.41
1:B:371:ARG:HG2	1:B:371:ARG:NH1	2.35	0.41
1:D:194:LYS:HA	1:D:203:GLU:O	2.21	0.41
1:A:13:ASN:C	1:A:60:MET:HE1	2.46	0.41
1:C:195:ARG:CZ	1:D:341:LEU:HD23	2.51	0.41
1:C:458:CYS:O	1:C:459:SER:C	2.62	0.41
1:C:298:VAL:HG21	1:C:313:ALA:HA	2.02	0.41
1:D:191:VAL:O	1:D:206:VAL:HA	2.20	0.41
1:D:254:PHE:CE2	1:D:258:TYR:CE1	3.03	0.40
1:A:205:MET:HG2	1:A:218:PHE:CD2	2.56	0.40
1:C:186:GLY:HA3	1:C:226:PRO:HG3	2.03	0.40
1:D:269:ILE:HG23	1:D:449:GLU:HB2	2.04	0.40
1:A:10:MET:HB2	1:A:11:PRO:HD2	2.02	0.40
1:A:231:TYR:HB3	1:A:239:PHE:HB2	2.04	0.40
1:A:298:VAL:HG21	1:A:313:ALA:HA	2.03	0.40
1:B:194:LYS:HA	1:B:203:GLU:O	2.22	0.40
1:B:10:MET:HB2	1:B:11:PRO:HD2	2.03	0.40
1:B:115:PHE:O	1:B:119:ARG:HA	2.22	0.40
1:B:336:MET:HA	1:B:337:PRO:HD3	1.94	0.40
1:D:166:ALA:HB3	1:D:405:TYR:HB3	2.03	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	490/504 (97%)	466 (95%)	24 (5%)	0	100	100
1	B	490/504 (97%)	456 (93%)	31 (6%)	3 (1%)	21	38

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	C	490/504 (97%)	463 (94%)	26 (5%)	1 (0%)	43	63
1	D	490/504 (97%)	459 (94%)	28 (6%)	3 (1%)	21	38
All	All	1960/2016 (97%)	1844 (94%)	109 (6%)	7 (0%)	30	49

All (7) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	340	GLN
1	D	340	GLN
1	B	258	TYR
1	B	337	PRO
1	C	459	SER
1	D	258	TYR
1	D	337	PRO

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	411/422 (97%)	398 (97%)	13 (3%)	34	62
1	B	411/422 (97%)	398 (97%)	13 (3%)	34	62
1	C	411/422 (97%)	396 (96%)	15 (4%)	31	58
1	D	411/422 (97%)	393 (96%)	18 (4%)	25	50
All	All	1644/1688 (97%)	1585 (96%)	59 (4%)	31	58

All (59) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	100	HIS
1	A	110	LEU
1	A	111	ARG
1	A	125	THR
1	A	143	ARG

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Mol	Chain	Res	Type
1	A	200	ASN
1	A	304	THR
1	A	322	GLN
1	A	340	GLN
1	A	344	LYS
1	A	350	LEU
1	A	354	ARG
1	A	409	MET
1	B	11	PRO
1	B	23	LEU
1	B	83	SER
1	B	91	ASN
1	B	100	HIS
1	B	109	GLU
1	B	125	THR
1	B	144	HIS
1	B	254	PHE
1	B	335	ILE
1	B	336	MET
1	B	374	THR
1	B	472	GLN
1	C	11	PRO
1	C	43	ARG
1	C	100	HIS
1	C	110	LEU
1	C	113	LYS
1	C	125	THR
1	C	143	ARG
1	C	200	ASN
1	C	304	THR
1	C	322	GLN
1	C	340	GLN
1	C	345	SER
1	C	346	VAL
1	C	350	LEU
1	C	409	MET
1	D	11	PRO
1	D	23	LEU
1	D	83	SER
1	D	91	ASN
1	D	98	LEU
1	D	100	HIS

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Mol	Chain	Res	Type
1	D	109	GLU
1	D	125	THR
1	D	144	HIS
1	D	150	ASP
1	D	249	SER
1	D	254	PHE
1	D	293	LEU
1	D	330	VAL
1	D	343	ARG
1	D	360	LYS
1	D	374	THR
1	D	472	GLN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (35) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	40	ASN
1	A	59	HIS
1	A	61	GLN
1	A	71	HIS
1	A	160	ASN
1	A	185	ASN
1	A	200	ASN
1	A	242	GLN
1	A	322	GLN
1	A	340	GLN
1	A	418	HIS
1	B	64	GLN
1	B	71	HIS
1	B	108	HIS
1	B	160	ASN
1	B	418	HIS
1	B	427	GLN
1	B	437	GLN
1	C	40	ASN
1	C	59	HIS
1	C	61	GLN
1	C	71	HIS
1	C	91	ASN
1	C	160	ASN
1	C	185	ASN
1	C	200	ASN

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Mol	Chain	Res	Type
1	C	242	GLN
1	C	340	GLN
1	C	418	HIS
1	D	64	GLN
1	D	66	ASN
1	D	160	ASN
1	D	339	GLN
1	D	427	GLN
1	D	437	GLN

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	AMP	A	505	-	25,25,25	1.48	5 (20%)	37,38,38	1.18	6 (16%)
2	AMP	C	505	-	25,25,25	1.28	3 (12%)	37,38,38	1.20	5 (13%)

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	AMP	A	505	-	-	3/10/26/26	0/3/3/3
2	AMP	C	505	-	-	4/10/26/26	0/3/3/3

All (8) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	505	AMP	P-O3P	-3.31	1.42	1.54
2	A	505	AMP	P-O2P	-3.09	1.43	1.54
2	C	505	AMP	P-O3P	-2.84	1.44	1.54
2	C	505	AMP	O4'-C4'	-2.73	1.38	1.45
2	C	505	AMP	P-O2P	-2.68	1.44	1.54
2	A	505	AMP	P-O1P	-2.45	1.42	1.50
2	A	505	AMP	P-O5'	-2.16	1.53	1.60
2	A	505	AMP	C5'-C4'	2.10	1.57	1.51

All (11) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	C	505	AMP	O4'-C4'-C5'	-2.81	100.32	109.33
2	A	505	AMP	C4'-O4'-C1'	2.60	115.20	109.47
2	C	505	AMP	C4'-O4'-C1'	2.43	114.83	109.47
2	C	505	AMP	C2'-C3'-C4'	2.38	107.21	102.61
2	A	505	AMP	C2'-C3'-C4'	2.29	107.04	102.61
2	C	505	AMP	C4-N9-C8	-2.26	103.37	105.74
2	A	505	AMP	O4'-C4'-C5'	-2.20	102.29	109.33
2	C	505	AMP	C1'-N9-C8	2.17	131.91	127.09
2	A	505	AMP	C1'-N9-C8	2.12	131.79	127.09
2	A	505	AMP	O3'-C3'-C2'	-2.03	105.30	111.82
2	A	505	AMP	C3'-C2'-C1'	2.01	105.26	101.46

There are no chirality outliers.

All (7) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	A	505	AMP	C2'-C1'-N9-C8
2	C	505	AMP	C2'-C1'-N9-C8
2	C	505	AMP	C5'-O5'-P-O1P
2	A	505	AMP	C2'-C1'-N9-C4

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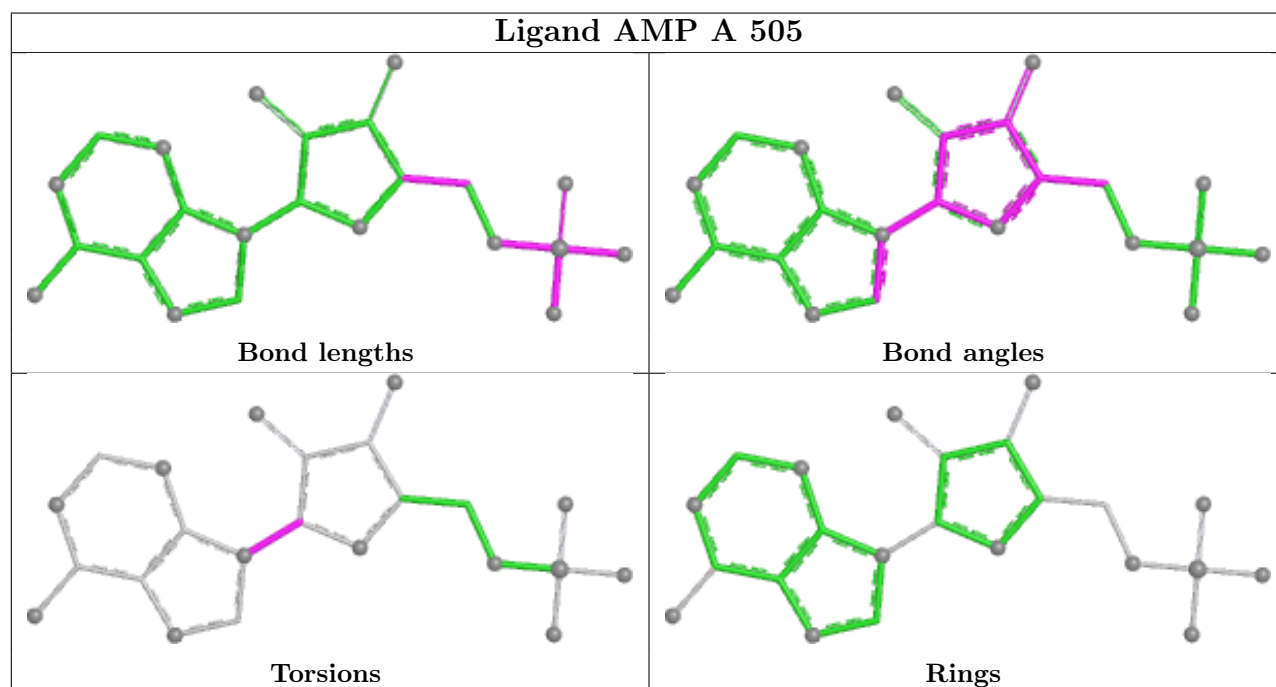
Mol	Chain	Res	Type	Atoms
2	C	505	AMP	C2'-C1'-N9-C4
2	A	505	AMP	O4'-C1'-N9-C8
2	C	505	AMP	O4'-C1'-N9-C8

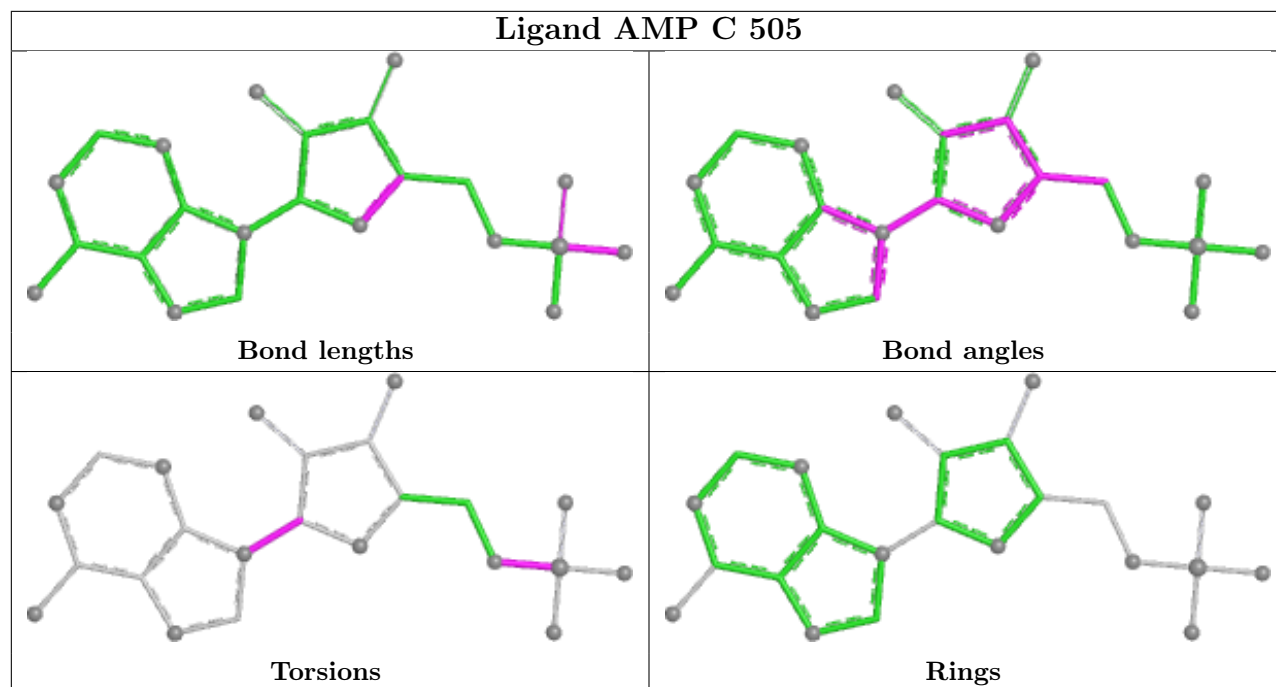
There are no ring outliers.

2 monomers are involved in 4 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	A	505	AMP	2	0
2	C	505	AMP	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.