



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 6, 2026 – 05:23 PM UTC

PDB ID : 1FP6 / pdb_00001fp6
Title : THE NITROGENASE FE PROTEIN FROM AZOTOBACTER VINELANDII COMPLEXED WITH MGADP
Authors : Jang, S.B.; Seefeldt, L.C.; Peters, J.W.
Deposited on : 2000-08-30
Resolution : 2.15 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

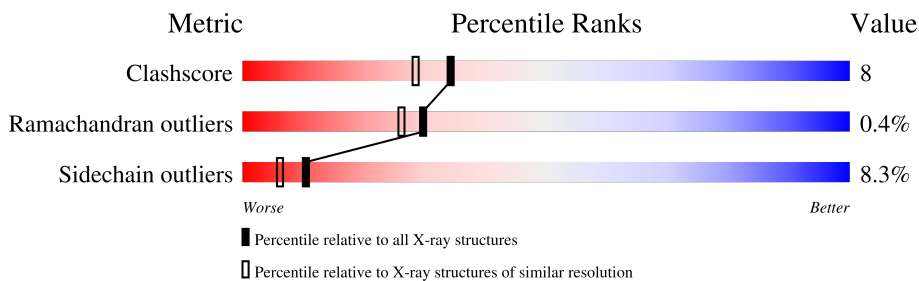
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.15 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	2159 (2.16-2.16)
Ramachandran outliers	187476	2134 (2.16-2.16)
Sidechain outliers	187428	2133 (2.16-2.16)

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	289	
1	B	289	
1	C	289	
1	D	289	

2 Entry composition

There are 5 unique types of molecules in this entry. The entry contains 10004 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.

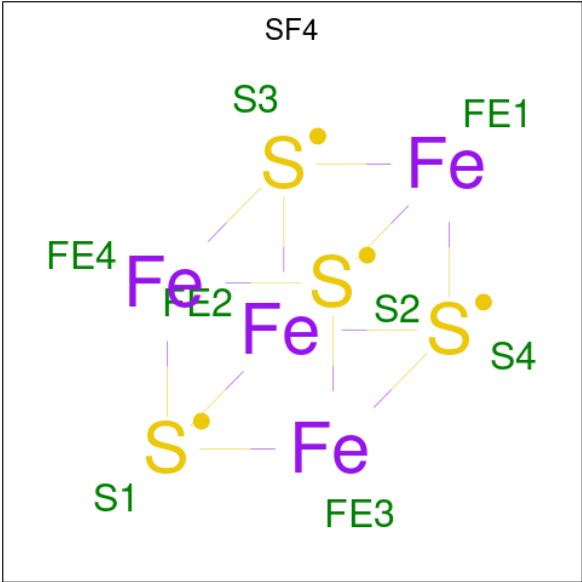
- Molecule 1 is a protein called NITROGENASE IRON PROTEIN.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	289	Total	C	N	O	S	0	0	0
			2187	1364	369	433	21			
1	B	289	Total	C	N	O	S	0	0	0
			2187	1364	369	433	21			
1	C	285	Total	C	N	O	S	0	0	0
			2156	1346	365	424	21			
1	D	285	Total	C	N	O	S	0	0	0
			2156	1346	365	424	21			

- Molecule 2 is MAGNESIUM ION (CCD ID: MG) (formula: Mg).

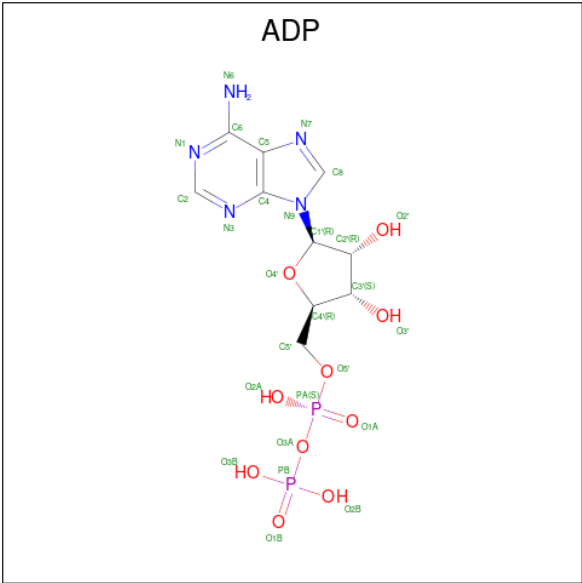
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	1	Total	Mg	0	0
			1	1		
2	B	1	Total	Mg	0	0
			1	1		
2	C	1	Total	Mg	0	0
			1	1		
2	D	1	Total	Mg	0	0
			1	1		

- Molecule 3 is IRON/SULFUR CLUSTER (CCD ID: SF4) (formula: Fe₄S₄).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	A	1	Total	Fe	S	0	0
			8	4	4		
3	C	1	Total	Fe	S	0	0
			8	4	4		

- Molecule 4 is ADENOSINE-5'-DIPHOSPHATE (CCD ID: ADP) (formula: C₁₀H₁₅N₅O₁₀P₂).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
4	A	1	Total 27	C 10	N 5	O 10	P 2	0	0
4	B	1	Total 27	C 10	N 5	O 10	P 2	0	0

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Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
4	C	1	Total	C	N	O	P	0	0
			27	10	5	10	2		
4	D	1	Total	C	N	O	P	0	0
			27	10	5	10	2		

- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	304	Total	O	0	0
			304	304		
5	B	329	Total	O	0	0
			329	329		
5	C	308	Total	O	0	0
			308	308		
5	D	249	Total	O	0	0
			249	249		

3 Residue-property plots

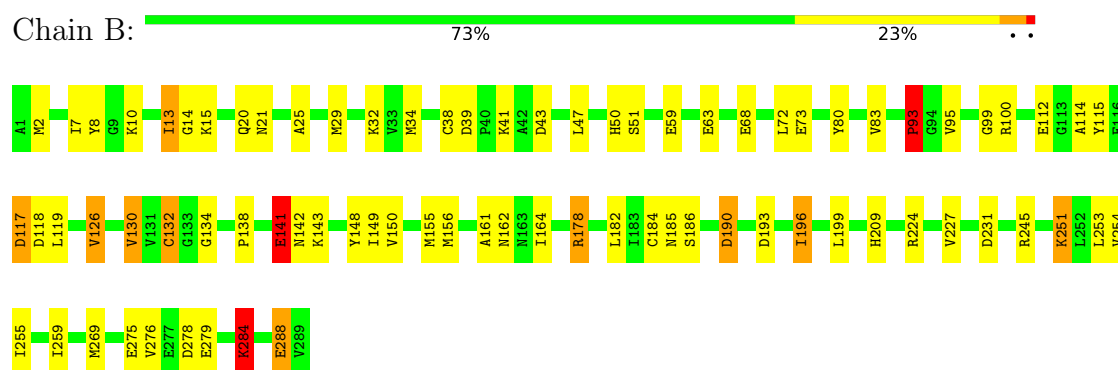
These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry. Residues are color-coded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

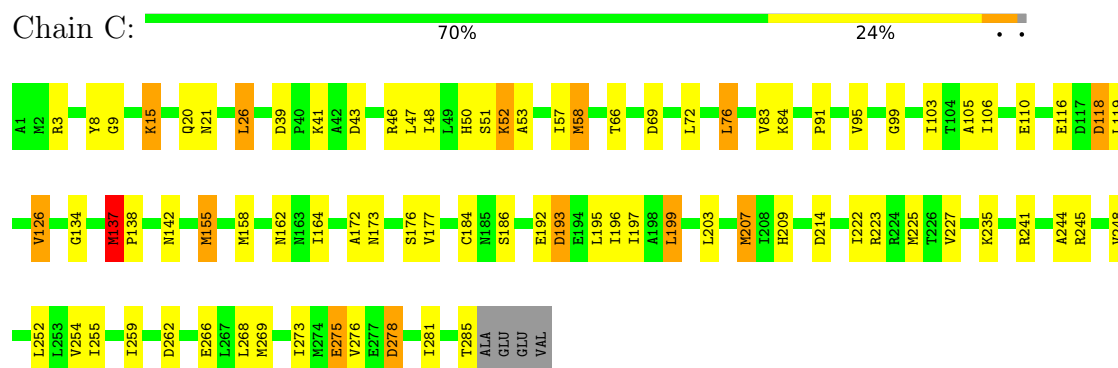
• Molecule 1: NITROGENASE IRON PROTEIN



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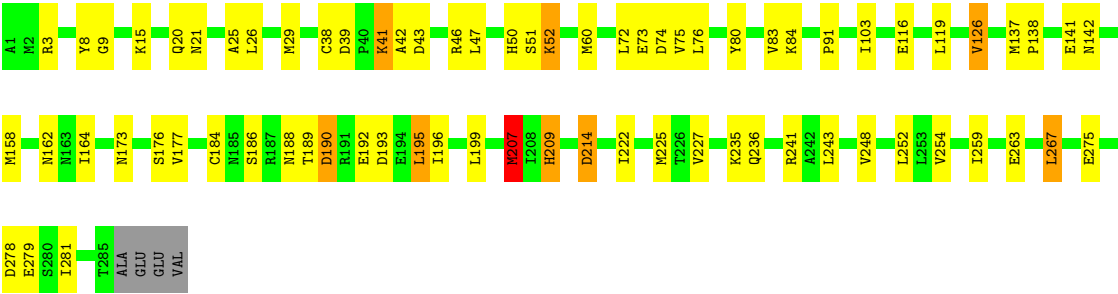
• Molecule 1: NITROGENASE IRON PROTEIN

Chain D:

73%

22%

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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	93.25Å 119.53Å 120.94Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	30.00 – 2.15	Depositor
% Data completeness (in resolution range)	88.8 (30.00-2.15)	Depositor
R_{merge}	0.06	Depositor
R_{sym}	(Not available)	Depositor
Refinement program	X-PLOR 3.851	Depositor
R, R_{free}	0.200 , 0.268	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	10004	wwPDB-VP
Average B, all atoms (Å ²)	43.0	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: MG, ADP, SF4

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	0.72	2/2211 (0.1%)	1.49	26/2977 (0.9%)
1	B	0.75	2/2211 (0.1%)	1.47	19/2977 (0.6%)
1	C	0.77	2/2180 (0.1%)	1.48	21/2936 (0.7%)
1	D	0.72	2/2180 (0.1%)	1.50	20/2936 (0.7%)
All	All	0.74	8/8782 (0.1%)	1.49	86/11826 (0.7%)

All (8) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	50	HIS	CD2-NE2	-7.24	1.29	1.37
1	C	209	HIS	CD2-NE2	-6.73	1.30	1.37
1	D	50	HIS	CD2-NE2	-6.47	1.30	1.37
1	A	50	HIS	CD2-NE2	-6.46	1.30	1.37
1	C	50	HIS	CD2-NE2	-6.45	1.30	1.37
1	A	209	HIS	CD2-NE2	-6.31	1.30	1.37
1	B	209	HIS	CD2-NE2	-6.13	1.31	1.37
1	D	209	HIS	CD2-NE2	-6.04	1.31	1.37

All (86) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	95	VAL	N-CA-C	9.00	122.92	108.97
1	B	190	ASP	N-CA-C	8.35	125.06	111.37
1	C	278	ASP	CA-CB-CG	8.34	120.94	112.60
1	D	214	ASP	CA-CB-CG	8.30	120.90	112.60
1	D	254	VAL	N-CA-C	8.12	120.66	109.46
1	C	193	ASP	CA-CB-CG	7.84	120.44	112.60
1	D	190	ASP	N-CA-C	7.80	119.42	111.07
1	C	255	ILE	N-CA-C	-7.57	100.68	107.56
1	D	52	LYS	N-CA-C	-7.41	99.32	110.28

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	C	52	LYS	N-CA-C	-7.26	99.74	110.48
1	D	193	ASP	CA-CB-CG	7.17	119.77	112.60
1	B	126	VAL	O-C-N	7.15	130.75	123.10
1	B	193	ASP	CA-CB-CG	7.14	119.74	112.60
1	C	118	ASP	CA-CB-CG	7.08	119.68	112.60
1	D	46	ARG	N-CA-C	6.92	119.70	111.33
1	A	41	LYS	N-CA-C	-6.61	99.87	109.59
1	C	254	VAL	N-CA-C	6.59	119.42	109.20
1	B	278	ASP	CA-CB-CG	6.54	119.14	112.60
1	A	271	PHE	CA-CB-CG	-6.36	107.44	113.80
1	A	130	VAL	N-CA-CB	-6.32	102.29	111.52
1	B	231	ASP	CA-CB-CG	6.27	118.87	112.60
1	B	254	VAL	N-CA-C	6.21	118.82	109.20
1	D	39	ASP	CA-CB-CG	6.12	118.72	112.60
1	A	214	ASP	CA-CB-CG	6.08	118.69	112.60
1	B	126	VAL	N-CA-C	6.07	117.51	108.46
1	A	74	ASP	CA-CB-CG	6.06	118.66	112.60
1	D	41	LYS	N-CA-C	-6.05	97.82	108.23
1	C	186	SER	N-CA-C	6.03	118.73	110.24
1	C	126	VAL	N-CA-C	6.02	116.79	108.12
1	B	155	MET	N-CA-C	6.02	118.33	111.11
1	D	43	ASP	CA-CB-CG	6.00	118.60	112.60
1	B	186	SER	N-CA-C	5.96	118.87	110.23
1	C	172	ALA	N-CA-C	5.92	118.52	111.71
1	D	51	SER	N-CA-C	5.89	117.17	108.86
1	C	41	LYS	N-CA-C	-5.89	98.11	108.23
1	C	15	LYS	N-CA-C	5.85	117.66	111.28
1	A	41	LYS	CB-CA-C	-5.81	101.54	110.26
1	C	214	ASP	CA-CB-CG	5.80	118.40	112.60
1	C	209	HIS	CB-CG-CD2	-5.73	123.75	131.20
1	C	39	ASP	CA-CB-CG	5.73	118.33	112.60
1	D	50	HIS	CB-CG-CD2	-5.71	123.77	131.20
1	B	43	ASP	CA-CB-CG	5.70	118.30	112.60
1	D	39	ASP	CA-C-N	5.69	125.54	119.28
1	D	39	ASP	C-N-CA	5.69	125.54	119.28
1	B	255	ILE	N-CA-C	-5.67	102.40	107.56
1	A	43	ASP	CA-CB-CG	5.66	118.26	112.60
1	B	132	CYS	N-CA-C	5.64	122.80	110.80
1	A	255	ILE	N-CA-C	-5.60	102.46	107.56
1	A	193	ASP	CA-CB-CG	5.60	118.20	112.60
1	B	141	GLU	N-CA-C	-5.58	102.22	110.48
1	D	42	ALA	N-CA-C	5.55	118.40	110.68

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	132	CYS	N-CA-C	5.53	122.58	110.80
1	D	188	ASN	N-CA-C	5.53	119.06	111.54
1	A	46	ARG	N-CA-C	5.51	117.72	111.11
1	A	41	LYS	N-CA-CB	5.47	118.13	109.71
1	A	141	GLU	N-CA-C	-5.43	102.72	110.59
1	B	185	ASN	OD1-CG-ND2	-5.42	117.18	122.60
1	D	74	ASP	CA-CB-CG	5.41	118.01	112.60
1	B	142	ASN	N-CA-CB	-5.41	102.43	110.60
1	B	93	PRO	N-CA-C	5.40	123.59	112.47
1	A	75	VAL	N-CA-CB	-5.37	101.46	110.86
1	A	278	ASP	CA-CB-CG	5.36	117.96	112.60
1	A	126	VAL	N-CA-C	5.33	116.16	108.48
1	B	39	ASP	CA-CB-CG	5.33	117.92	112.60
1	C	155	MET	CA-C-O	-5.27	115.28	121.07
1	C	53	ALA	N-CA-C	5.26	118.43	110.64
1	B	284	LYS	N-CA-C	5.25	118.37	109.76
1	A	126	VAL	O-C-N	5.24	128.84	123.18
1	C	192	GLU	N-CA-C	5.23	116.98	111.28
1	D	75	VAL	N-CA-CB	-5.21	104.39	110.64
1	A	90	GLY	CA-C-N	5.20	125.14	119.78
1	A	90	GLY	C-N-CA	5.20	125.14	119.78
1	D	267	LEU	N-CA-C	-5.17	105.33	111.69
1	B	178	ARG	CA-CB-CG	5.17	124.44	114.10
1	A	192	GLU	N-CA-C	5.16	116.59	111.07
1	C	39	ASP	CA-C-N	5.16	125.21	119.32
1	C	39	ASP	C-N-CA	5.16	125.21	119.32
1	D	207	MET	N-CA-C	-5.13	98.95	107.99
1	D	186	SER	N-CA-C	5.13	117.78	110.24
1	A	186	SER	N-CA-C	5.08	117.71	110.24
1	A	142	ASN	N-CA-CB	-5.07	104.07	110.45
1	A	231	ASP	CA-CB-CG	5.06	117.66	112.60
1	C	262	ASP	CA-CB-CG	5.05	117.65	112.60
1	C	137	MET	CA-CB-CG	5.02	124.14	114.10
1	A	130	VAL	CB-CA-C	5.01	117.64	110.33
1	A	254	VAL	N-CA-C	5.00	116.95	109.20

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	2187	0	2196	26	0
1	B	2187	0	2196	39	0
1	C	2156	0	2171	44	0
1	D	2156	0	2171	35	0
2	A	1	0	0	0	0
2	B	1	0	0	0	0
2	C	1	0	0	0	0
2	D	1	0	0	0	0
3	A	8	0	0	0	0
3	C	8	0	0	0	0
4	A	27	0	12	2	0
4	B	27	0	12	2	0
4	C	27	0	12	0	0
4	D	27	0	12	0	0
5	A	304	0	0	0	0
5	B	329	0	0	1	0
5	C	308	0	0	5	0
5	D	249	0	0	2	0
All	All	10004	0	8782	134	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 8.

All (134) 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:2:MET:HE2	1:B:119:LEU:HB2	1.51	0.91
1:A:156:MET:HE1	1:B:41:LYS:HD2	1.54	0.88
1:C:285:THR:HG22	1:D:225:MET:SD	2.27	0.75
1:C:269:MET:HE3	1:C:276:VAL:HA	1.72	0.72
1:A:130:VAL:HG13	1:A:132:CYS:SG	2.30	0.71
1:B:34:MET:HE1	1:B:114:ALA:HB1	1.73	0.71
1:B:182:LEU:HB3	1:B:196:ILE:HD11	1.72	0.71
1:C:278:ASP:HB3	1:C:281:ILE:HG12	1.73	0.71
1:A:10:LYS:NZ	1:B:10:LYS:HZ1	1.90	0.69

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:142:ASN:HD22	1:C:177:VAL:HG23	1.59	0.68
1:B:38:CYS:HB2	1:B:126:VAL:HG22	1.77	0.66
1:B:80:TYR:O	1:B:83:VAL:HG12	1.95	0.65
1:A:10:LYS:HZ1	1:B:10:LYS:HZ1	1.44	0.65
1:D:76:LEU:HD22	1:D:84:LYS:HB3	1.78	0.65
1:D:21:ASN:HD21	1:D:227:VAL:H	1.46	0.64
1:B:21:ASN:HD21	1:B:227:VAL:H	1.44	0.64
1:B:184:CYS:HB2	1:B:196:ILE:HG21	1.80	0.62
1:A:8:TYR:CZ	1:A:126:VAL:HG11	2.34	0.62
1:D:142:ASN:HD22	1:D:177:VAL:HG23	1.63	0.62
1:C:106:ILE:O	1:C:110:GLU:HG3	2.00	0.61
1:C:142:ASN:HD21	1:C:176:SER:H	1.48	0.61
1:C:193:ASP:O	1:C:197:ILE:HG12	2.00	0.61
1:A:8:TYR:HB3	1:A:164:ILE:HD13	1.84	0.60
1:C:223:ARG:HB3	1:C:225:MET:HE2	1.82	0.60
1:B:10:LYS:O	1:B:13:ILE:HG13	2.02	0.60
1:D:21:ASN:HD21	1:D:227:VAL:N	1.99	0.59
1:C:76:LEU:HD22	1:C:84:LYS:HB3	1.84	0.59
1:A:20:GLN:HE22	1:A:47:LEU:H	1.51	0.59
1:A:41:LYS:HD2	1:B:156:MET:HE1	1.84	0.59
1:C:21:ASN:HD21	1:C:227:VAL:H	1.51	0.58
1:A:141:GLU:HB2	1:A:143:LYS:HD3	1.84	0.58
1:C:155:MET:HE2	1:C:268:LEU:HD22	1.86	0.57
1:B:130:VAL:HG13	1:B:132:CYS:SG	2.44	0.57
1:A:21:ASN:HD21	1:A:227:VAL:H	1.50	0.57
1:C:21:ASN:HD21	1:C:227:VAL:N	2.02	0.57
1:A:162:ASN:HD21	1:A:259:ILE:H	1.51	0.57
1:C:46:ARG:HD2	1:C:51:SER:O	2.04	0.57
1:D:103:ILE:HG23	1:D:137:MET:HE3	1.87	0.57
1:D:20:GLN:HE22	1:D:47:LEU:H	1.53	0.56
1:D:142:ASN:ND2	1:D:177:VAL:HG23	2.20	0.56
1:C:162:ASN:HD21	1:C:259:ILE:H	1.54	0.56
1:D:60:MET:HG3	5:D:8494:HOH:O	2.04	0.56
1:B:32:LYS:HZ1	1:B:117:ASP:HB3	1.71	0.55
1:A:15:LYS:HG2	4:A:5291:ADP:O1B	2.07	0.55
1:D:8:TYR:HB3	1:D:164:ILE:HD13	1.87	0.55
1:B:20:GLN:HE22	1:B:47:LEU:H	1.53	0.55
1:D:9:GLY:O	1:D:15:LYS:HE3	2.06	0.55
1:D:214:ASP:HB3	1:D:236:GLN:HG3	1.90	0.54
1:C:103:ILE:HA	1:C:137:MET:HE3	1.90	0.54
1:D:38:CYS:HB2	1:D:126:VAL:HB	1.89	0.54

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:2:MET:HE1	1:B:115:TYR:O	2.07	0.54
1:A:8:TYR:CE1	1:A:126:VAL:HG11	2.43	0.53
1:C:8:TYR:HB3	1:C:164:ILE:HD13	1.91	0.53
1:C:9:GLY:O	1:C:15:LYS:HE3	2.09	0.52
1:C:26:LEU:HD13	1:C:244:ALA:HB1	1.91	0.52
1:C:162:ASN:HD22	1:C:203:LEU:HD21	1.75	0.52
1:D:162:ASN:HD21	1:D:259:ILE:H	1.56	0.52
1:C:58:MET:HG2	5:C:7458:HOH:O	2.10	0.52
1:C:196:ILE:HB	1:C:207:MET:HE3	1.91	0.51
1:D:80:TYR:O	1:D:83:VAL:HG22	2.11	0.51
1:A:10:LYS:NZ	1:B:10:LYS:NZ	2.59	0.51
1:C:184:CYS:HB2	1:C:207:MET:HE2	1.91	0.51
1:A:195:LEU:HD21	1:A:268:LEU:HD23	1.93	0.51
1:B:14:GLY:HA2	4:B:6291:ADP:PA	2.50	0.51
1:B:284:LYS:HD3	1:B:288:GLU:HG2	1.93	0.51
1:D:196:ILE:HB	1:D:207:MET:HE3	1.93	0.51
1:A:10:LYS:HZ1	1:B:10:LYS:NZ	2.09	0.50
1:C:137:MET:HG3	1:C:138:PRO:HD3	1.93	0.50
1:D:142:ASN:HD21	1:D:176:SER:H	1.59	0.50
1:B:7:ILE:HD13	1:B:148:TYR:HB2	1.92	0.50
1:D:189:THR:HB	1:D:192:GLU:HB2	1.93	0.50
1:D:278:ASP:HB3	1:D:281:ILE:HG12	1.93	0.50
1:C:66:THR:HG23	1:C:69:ASP:H	1.77	0.50
1:C:184:CYS:CB	1:C:207:MET:HE2	2.42	0.50
1:C:285:THR:HA	1:D:225:MET:HE1	1.94	0.49
1:D:263:GLU:O	1:D:267:LEU:HB2	2.13	0.49
1:B:138:PRO:HA	1:B:143:LYS:HB2	1.94	0.48
1:A:222:ILE:HG21	1:B:275:GLU:HG3	1.95	0.48
1:A:225:MET:HE2	1:A:230:TYR:HA	1.95	0.47
1:B:32:LYS:HG2	1:B:119:LEU:HD23	1.95	0.47
1:C:57:ILE:HD12	1:C:105:ALA:HA	1.96	0.47
1:C:76:LEU:CD2	1:C:84:LYS:HB3	2.43	0.47
1:D:137:MET:HE2	1:D:141:GLU:HG3	1.97	0.47
1:A:21:ASN:HD21	1:A:227:VAL:N	2.12	0.47
1:C:46:ARG:HH11	1:C:52:LYS:HA	1.80	0.47
1:C:48:ILE:HG21	1:C:83:VAL:HG23	1.97	0.47
1:C:245:ARG:HD2	5:C:7313:HOH:O	2.15	0.47
1:D:158:MET:HE1	1:D:195:LEU:HD22	1.98	0.46
1:A:185:ASN:HD21	4:A:5291:ADP:HN61	1.62	0.46
1:C:158:MET:HE3	1:C:199:LEU:HG	1.98	0.46
1:B:8:TYR:HB3	1:B:164:ILE:HD13	1.98	0.46

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:13:ILE:HD13	1:B:150:VAL:HB	1.98	0.46
1:B:59:GLU:O	1:B:63:GLU:HG2	2.16	0.45
1:B:245:ARG:HD3	5:B:6572:HOH:O	2.15	0.45
1:A:245:ARG:HG3	5:C:7293:HOH:O	2.16	0.45
1:B:15:LYS:HG2	4:B:6291:ADP:O1B	2.17	0.45
1:C:269:MET:HG2	1:C:275:GLU:O	2.17	0.45
1:D:3:ARG:NH2	1:D:248:VAL:HA	2.31	0.45
1:A:8:TYR:CE1	1:A:126:VAL:CG1	3.00	0.45
1:C:173:ASN:ND2	1:C:173:ASN:H	2.15	0.44
1:B:99:GLY:O	1:B:134:GLY:HA3	2.17	0.44
1:C:20:GLN:HE22	1:C:47:LEU:H	1.64	0.44
1:B:156:MET:HA	1:B:156:MET:HE2	1.99	0.44
1:C:142:ASN:ND2	1:C:177:VAL:HG23	2.30	0.44
1:B:162:ASN:HD21	1:B:259:ILE:H	1.66	0.43
1:B:21:ASN:HD21	1:B:227:VAL:N	2.15	0.43
5:C:7391:HOH:O	1:D:279:GLU:HG3	2.19	0.43
1:C:43:ASP:HB2	1:C:46:ARG:HG3	2.01	0.43
1:C:99:GLY:O	1:C:134:GLY:HA3	2.18	0.43
1:C:3:ARG:HH22	1:C:248:VAL:HA	1.83	0.42
1:B:51:SER:C	1:B:224:ARG:HD3	2.44	0.42
1:B:149:ILE:HG21	1:B:161:ALA:HA	2.02	0.42
1:D:41:LYS:HE2	5:D:8448:HOH:O	2.18	0.42
1:D:162:ASN:HD21	1:D:259:ILE:N	2.15	0.42
1:D:25:ALA:O	1:D:29:MET:HG2	2.20	0.42
1:A:186:SER:O	1:A:213:ARG:HB2	2.20	0.42
1:B:251:LYS:HD2	1:B:251:LYS:HA	1.79	0.42
1:D:173:ASN:HD22	1:D:173:ASN:H	1.68	0.42
1:C:142:ASN:ND2	1:C:176:SER:H	2.17	0.41
1:D:214:ASP:CB	1:D:236:GLN:HG3	2.50	0.41
1:B:141:GLU:HB2	1:B:143:LYS:HD3	2.02	0.41
1:A:20:GLN:NE2	1:A:47:LEU:H	2.17	0.41
1:C:173:ASN:H	1:C:173:ASN:HD22	1.67	0.41
1:A:76:LEU:HD11	1:A:84:LYS:HB3	2.03	0.41
1:D:76:LEU:CD2	1:D:84:LYS:HB3	2.47	0.41
1:C:273:ILE:HD11	5:C:7509:HOH:O	2.20	0.41
1:D:137:MET:HG3	1:D:138:PRO:HD3	2.03	0.41
1:D:209:HIS:HB3	1:D:243:LEU:HD13	2.03	0.41
1:B:25:ALA:O	1:B:29:MET:HG2	2.20	0.41
1:C:266:GLU:HA	1:C:269:MET:SD	2.61	0.41
1:A:284:LYS:HE2	1:A:284:LYS:HA	2.03	0.40
1:C:275:GLU:HG2	1:D:222:ILE:HG21	2.03	0.40

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:269:MET:HE3	1:B:276:VAL:HA	2.03	0.40
1:D:184:CYS:CB	1:D:207:MET:HE2	2.52	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	287/289 (99%)	274 (96%)	12 (4%)	1 (0%)	36	34
1	B	287/289 (99%)	274 (96%)	12 (4%)	1 (0%)	36	34
1	C	283/289 (98%)	272 (96%)	10 (4%)	1 (0%)	30	26
1	D	283/289 (98%)	271 (96%)	11 (4%)	1 (0%)	30	26
All	All	1140/1156 (99%)	1091 (96%)	45 (4%)	4 (0%)	30	26

All (4) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	C	91	PRO
1	D	91	PRO
1	A	190	ASP
1	B	93	PRO

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%)	210 (90%)	23 (10%)	7	4
1	B	233/233 (100%)	212 (91%)	21 (9%)	9	5
1	C	230/233 (99%)	212 (92%)	18 (8%)	11	7
1	D	230/233 (99%)	215 (94%)	15 (6%)	15	11
All	All	926/932 (99%)	849 (92%)	77 (8%)	10	6

All (77) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	13	ILE
1	A	22	LEU
1	A	67	VAL
1	A	72	LEU
1	A	73	GLU
1	A	75	VAL
1	A	83	VAL
1	A	93	PRO
1	A	100	ARG
1	A	112	GLU
1	A	117	ASP
1	A	126	VAL
1	A	130	VAL
1	A	141	GLU
1	A	154	GLU
1	A	173	ASN
1	A	199	LEU
1	A	225	MET
1	A	251	LYS
1	A	253	LEU
1	A	261	MET
1	A	267	LEU
1	A	288	GLU
1	B	13	ILE
1	B	68	GLU
1	B	72	LEU
1	B	73	GLU
1	B	93	PRO
1	B	95	VAL
1	B	100	ARG
1	B	112	GLU
1	B	117	ASP
1	B	118	ASP

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Mol	Chain	Res	Type
1	B	130	VAL
1	B	141	GLU
1	B	178	ARG
1	B	190	ASP
1	B	196	ILE
1	B	199	LEU
1	B	251	LYS
1	B	253	LEU
1	B	279	GLU
1	B	284	LYS
1	B	288	GLU
1	C	26	LEU
1	C	58	MET
1	C	72	LEU
1	C	76	LEU
1	C	95	VAL
1	C	116	GLU
1	C	118	ASP
1	C	119	LEU
1	C	126	VAL
1	C	137	MET
1	C	195	LEU
1	C	199	LEU
1	C	207	MET
1	C	222	ILE
1	C	235	LYS
1	C	241	ARG
1	C	252	LEU
1	C	275	GLU
1	D	26	LEU
1	D	52	LYS
1	D	72	LEU
1	D	73	GLU
1	D	116	GLU
1	D	119	LEU
1	D	126	VAL
1	D	190	ASP
1	D	195	LEU
1	D	199	LEU
1	D	207	MET
1	D	235	LYS
1	D	241	ARG

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Mol	Chain	Res	Type
1	D	252	LEU
1	D	275	GLU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (40) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	20	GLN
1	A	21	ASN
1	A	50	HIS
1	A	54	GLN
1	A	55	ASN
1	A	107	ASN
1	A	162	ASN
1	A	185	ASN
1	A	201	ASN
1	B	4	GLN
1	B	20	GLN
1	B	21	ASN
1	B	107	ASN
1	B	145	GLN
1	B	162	ASN
1	B	163	ASN
1	B	185	ASN
1	B	188	ASN
1	C	20	GLN
1	C	21	ASN
1	C	54	GLN
1	C	55	ASN
1	C	142	ASN
1	C	162	ASN
1	C	173	ASN
1	C	201	ASN
1	C	209	HIS
1	C	218	GLN
1	D	4	GLN
1	D	20	GLN
1	D	21	ASN
1	D	50	HIS
1	D	142	ASN
1	D	145	GLN
1	D	162	ASN
1	D	163	ASN

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Mol	Chain	Res	Type
1	D	173	ASN
1	D	215	ASN
1	D	218	GLN
1	D	236	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](#)

Of 10 ligands modelled in this entry, 4 are monoatomic - leaving 6 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	$\# Z > 2$
3	SF4	C	7290	1	0,12,12	-	-	-		
4	ADP	A	5291	2	28,29,29	2.11	3 (10%)	43,45,45	1.35	8 (18%)
4	ADP	D	8291	2	28,29,29	2.05	2 (7%)	43,45,45	1.40	7 (16%)
3	SF4	A	5290	1	0,12,12	-	-	-		
4	ADP	C	7291	2	28,29,29	2.08	2 (7%)	43,45,45	1.43	8 (18%)
4	ADP	B	6291	2	28,29,29	2.07	2 (7%)	43,45,45	1.35	8 (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
3	SF4	C	7290	1	-	-	0/6/5/5
4	ADP	A	5291	2	-	3/16/32/32	0/3/3/3
4	ADP	D	8291	2	-	3/16/32/32	0/3/3/3
3	SF4	A	5290	1	-	-	0/6/5/5
4	ADP	C	7291	2	-	3/16/32/32	0/3/3/3
4	ADP	B	6291	2	-	3/16/32/32	0/3/3/3

All (9) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	A	5291	ADP	PA-O3A	-9.32	1.49	1.59
4	B	6291	ADP	PA-O3A	-9.07	1.49	1.59
4	C	7291	ADP	PA-O3A	-8.82	1.50	1.59
4	D	8291	ADP	PA-O3A	-8.55	1.50	1.59
4	C	7291	ADP	PB-O3B	5.23	1.74	1.54
4	D	8291	ADP	PB-O3B	5.15	1.73	1.54
4	B	6291	ADP	PB-O3B	4.53	1.71	1.54
4	A	5291	ADP	PB-O3B	4.35	1.71	1.54
4	A	5291	ADP	PB-O2B	-2.11	1.47	1.54

All (31) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	D	8291	ADP	C2'-C3'-C4'	-4.09	94.70	102.61
4	C	7291	ADP	C2'-C3'-C4'	-3.79	95.28	102.61
4	A	5291	ADP	C2'-C3'-C4'	-3.70	95.45	102.61
4	C	7291	ADP	O2A-PA-O3A	3.43	116.53	107.27
4	C	7291	ADP	O2B-PB-O3A	3.42	116.11	104.64
4	A	5291	ADP	O2B-PB-O3A	3.40	116.03	104.64
4	B	6291	ADP	O2B-PB-O3A	3.30	115.69	104.64
4	D	8291	ADP	O2B-PB-O3A	3.27	115.61	104.64
4	D	8291	ADP	O2A-PA-O3A	3.27	116.11	107.27
4	B	6291	ADP	C2'-C3'-C4'	-3.12	96.58	102.61
4	C	7291	ADP	O3B-PB-O1B	-2.99	99.19	110.83
4	B	6291	ADP	O5'-C5'-C4'	2.97	119.11	108.99
4	B	6291	ADP	O2A-PA-O3A	2.82	114.89	107.27
4	B	6291	ADP	O3B-PB-O1B	-2.81	99.88	110.83
4	D	8291	ADP	O5'-C5'-C4'	2.81	118.55	108.99
4	A	5291	ADP	O2A-PA-O3A	2.80	114.84	107.27

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	A	5291	ADP	O5'-C5'-C4'	2.79	118.48	108.99
4	C	7291	ADP	O5'-C5'-C4'	2.66	118.06	108.99
4	B	6291	ADP	C3'-C2'-C1'	-2.62	96.51	101.46
4	C	7291	ADP	O4'-C1'-C2'	-2.48	101.30	106.62
4	D	8291	ADP	O3B-PB-O1B	-2.39	101.52	110.83
4	B	6291	ADP	O4'-C1'-C2'	-2.35	101.59	106.62
4	A	5291	ADP	O4'-C1'-C2'	-2.30	101.70	106.62
4	B	6291	ADP	O5'-PA-O1A	-2.24	100.06	108.94
4	D	8291	ADP	O3B-PB-O2B	-2.23	99.43	107.80
4	C	7291	ADP	O3B-PB-O2B	-2.23	99.44	107.80
4	A	5291	ADP	C3'-C2'-C1'	-2.18	97.34	101.46
4	A	5291	ADP	O3B-PB-O2B	-2.15	99.75	107.80
4	C	7291	ADP	O5'-PA-O1A	-2.05	100.80	108.94
4	D	8291	ADP	O4'-C1'-C2'	-2.04	102.25	106.62
4	A	5291	ADP	O3B-PB-O1B	-2.01	102.99	110.83

There are no chirality outliers.

All (12) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
4	A	5291	ADP	PA-O3A-PB-O3B
4	B	6291	ADP	PA-O3A-PB-O3B
4	C	7291	ADP	PA-O3A-PB-O2B
4	D	8291	ADP	PA-O3A-PB-O2B
4	A	5291	ADP	C5'-O5'-PA-O1A
4	B	6291	ADP	C5'-O5'-PA-O1A
4	C	7291	ADP	C5'-O5'-PA-O1A
4	D	8291	ADP	PA-O3A-PB-O1B
4	A	5291	ADP	PA-O3A-PB-O1B
4	B	6291	ADP	PA-O3A-PB-O1B
4	C	7291	ADP	PA-O3A-PB-O3B
4	D	8291	ADP	PA-O3A-PB-O3B

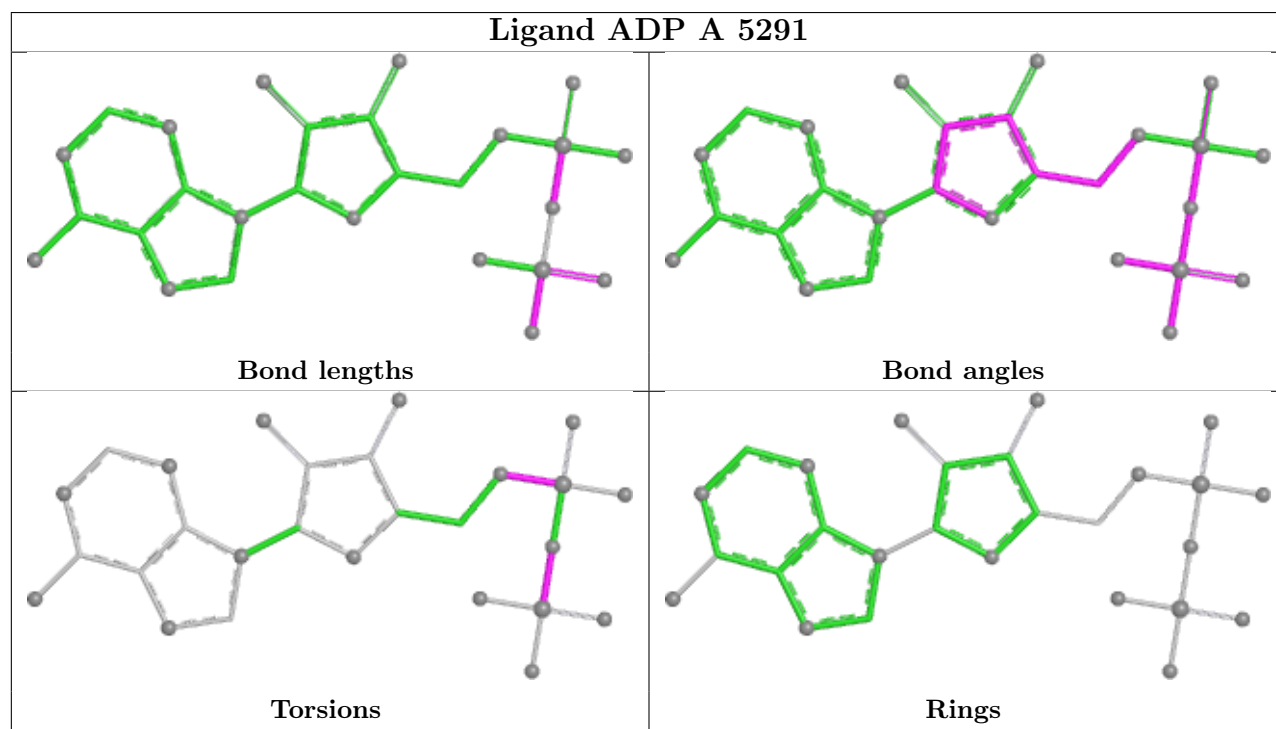
There are no ring outliers.

2 monomers are involved in 4 short contacts:

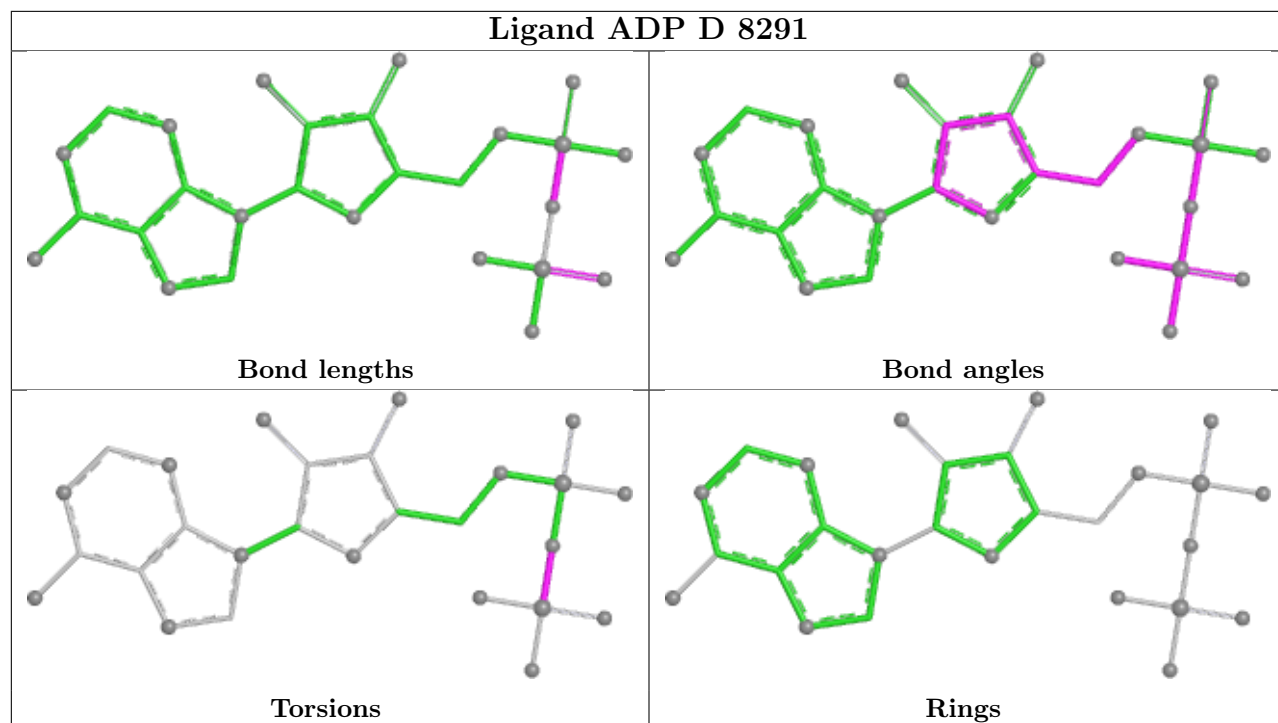
Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	A	5291	ADP	2	0
4	B	6291	ADP	2	0

The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths,

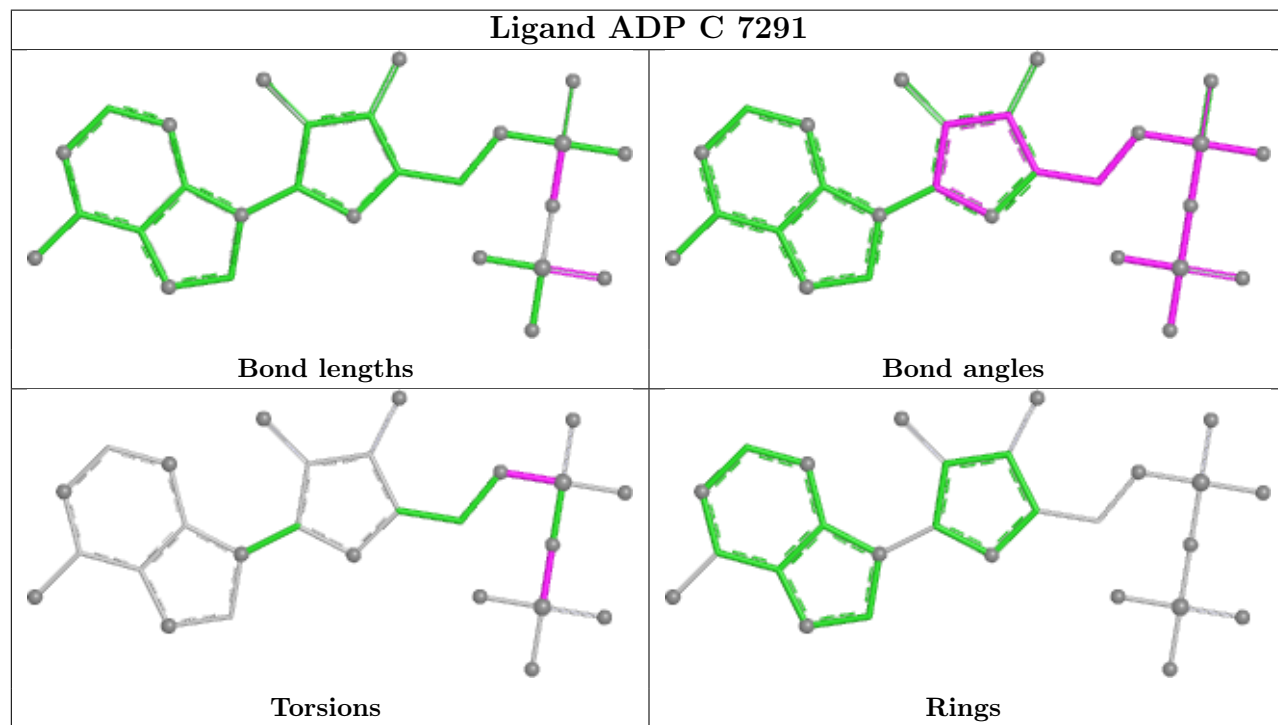
bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less than 5% of the Mogul distribution of torsion angles is within 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.

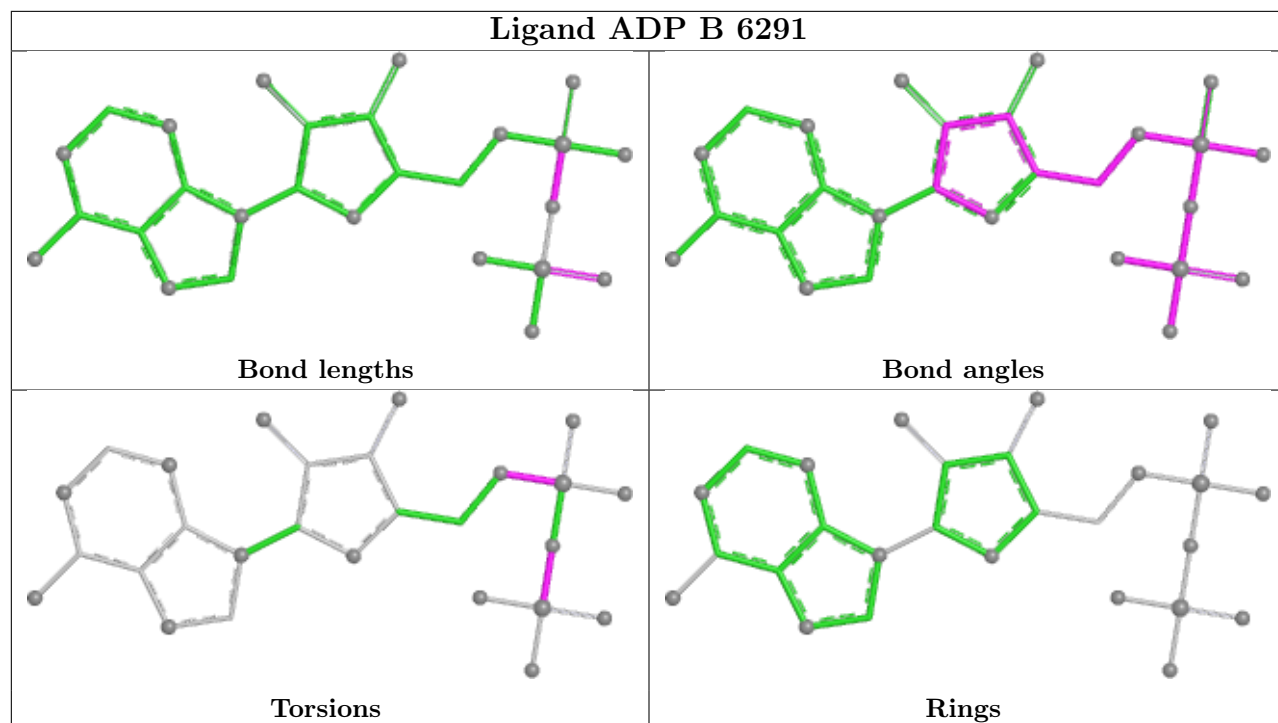


Ligand ADP D 8291



Ligand ADP C 7291





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 [i](#)

6.1 Protein, DNA and RNA chains [i](#)

EDS was not executed - this section is therefore empty.

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

EDS was not executed - this section is therefore empty.

6.3 Carbohydrates [i](#)

EDS was not executed - this section is therefore empty.

6.4 Ligands [i](#)

EDS was not executed - this section is therefore empty.

6.5 Other polymers [i](#)

EDS was not executed - this section is therefore empty.