



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 9, 2026 – 03:39 AM UTC

PDB ID : 1FFV / pdb_00001ffv
Title : CARBON MONOXIDE DEHYDROGENASE FROM HYDROGENOPHAGA PSEUDOFILVA
Authors : Haenzelmann, P.; Dobbek, H.; Gremer, L.; Huber, R.; Meyer, O.
Deposited on : 2000-07-26
Resolution : 2.25 Å (reported)

This is a Full wwPDB X-ray Structure Validation Report for a publicly released PDB entry.

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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

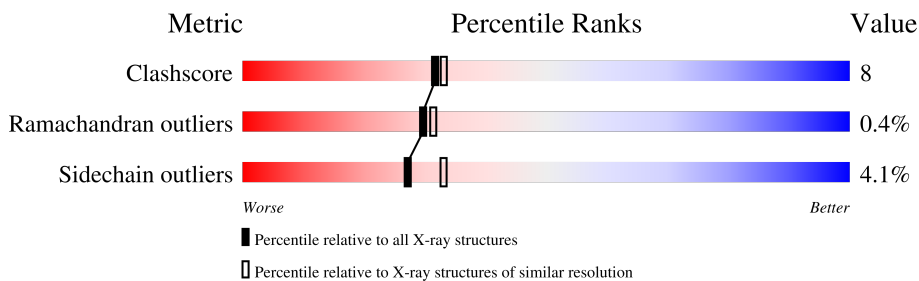
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.25 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	2005 (2.26-2.26)
Ramachandran outliers	187476	1965 (2.26-2.26)
Sidechain outliers	187428	1966 (2.26-2.26)

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	163	80% 13% • 5%
1	D	163	80% 13% • •
2	B	803	78% 18% • •
2	E	803	81% 16% • •
3	C	287	82% 16% •
3	F	287	83% 15% •

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit crite-

ria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
2	CSZ	B	385	-	-	X	-
2	CSZ	E	385	-	-	X	-

2 Entry composition

There are 7 unique types of molecules in this entry. The entry contains 20648 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 CUTS, IRON-SULFUR PROTEIN OF CARBON MONOXIDE DEHYDROGENASE.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	155	1185	734	216	222	13	17	0	0
1	D	156	1190	737	217	223	13	17	0	0

There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	90	GLN	ARG	conflict	UNP P19915
D	90	GLN	ARG	conflict	UNP P19915

- Molecule 2 is a protein called CUTL, MOLYBDOPROTEIN OF CARBON MONOXIDE DEHYDROGENASE.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace	
			Total	C	N	O	S				Se
2	B	797	6087	3860	1056	1135	35	1	50	0	0
2	E	797	6087	3860	1056	1135	35	1	39	0	0

There are 12 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	19	GLY	ARG	conflict	GB 4098682
B	20	ALA	PRO	conflict	GB 4098682
B	21	SER	ARG	conflict	GB 4098682
B	22	ARG	ALA	conflict	GB 4098682
B	23	LEU	CYS	conflict	GB 4098682
B	24	ARG	ALA	conflict	GB 4098682
B	384	ARO	ARG	modified residue	GB 4098682
B	385	CSZ	CYS	modified residue	GB 4098682

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Chain	Residue	Modelled	Actual	Comment	Reference
B	456	LEU	TRP	conflict	GB 4098682
E	384	ARO	ARG	modified residue	GB 4098682
E	385	CSZ	CYS	modified residue	GB 4098682
E	456	LEU	TRP	conflict	GB 4098682

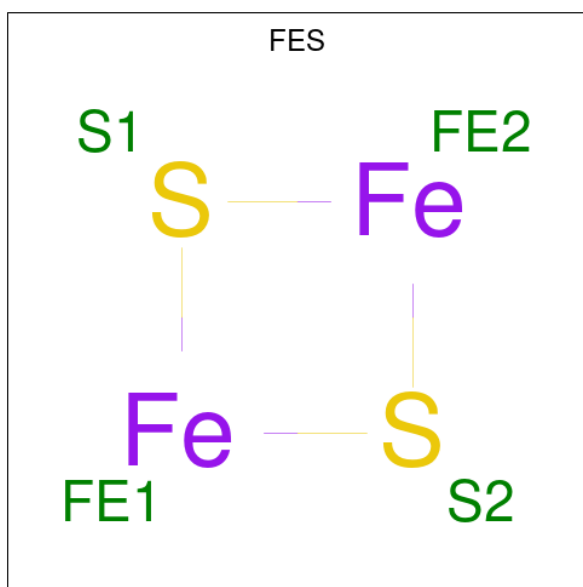
- Molecule 3 is a protein called CUTM, FLAVOPROTEIN OF CARBON MONOXIDE DE-HYDROGENASE.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
3	C	287	2133	1343	384	394	12	12	0	0
3	F	287	2141	1347	386	396	12	6	0	0

There are 18 discrepancies between the modelled and reference sequences:

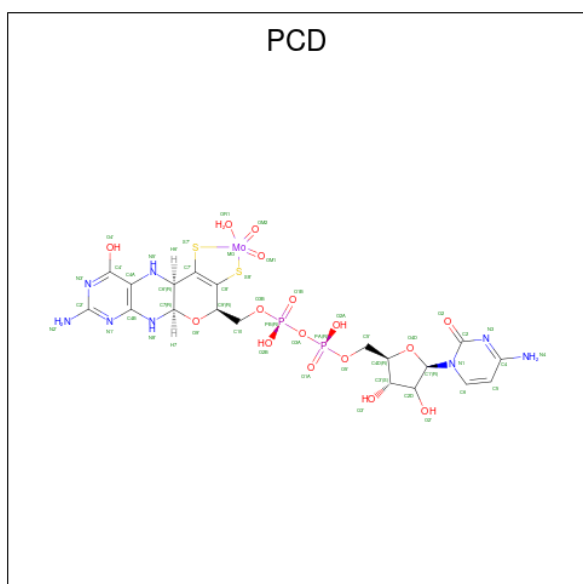
Chain	Residue	Modelled	Actual	Comment	Reference
C	120	ASP	HIS	conflict	UNP P19914
C	89	ALA	GLN	conflict	UNP P19914
C	119	GLY	ASN	conflict	UNP P19914
C	226	ALA	ARG	conflict	UNP P19914
C	228	ALA	GLY	conflict	UNP P19914
C	229	ALA	GLY	conflict	UNP P19914
C	230	GLU	ARG	conflict	UNP P19914
C	231	ALA	SER	conflict	UNP P19914
C	232	ALA	ARG	conflict	UNP P19914
F	120	ASP	HIS	conflict	UNP P19914
F	89	ALA	GLN	conflict	UNP P19914
F	119	GLY	ASN	conflict	UNP P19914
F	226	ALA	ARG	conflict	UNP P19914
F	228	ALA	GLY	conflict	UNP P19914
F	229	ALA	GLY	conflict	UNP P19914
F	230	GLU	ARG	conflict	UNP P19914
F	231	ALA	SER	conflict	UNP P19914
F	232	ALA	ARG	conflict	UNP P19914

- Molecule 4 is FE2/S2 (INORGANIC) CLUSTER (CCD ID: FES) (formula: Fe₂S₂).



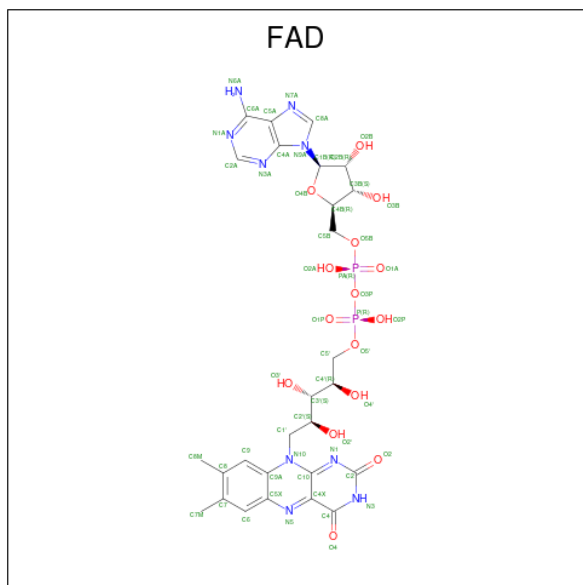
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	A	1	Total Fe S 4 2 2	0	0
4	A	1	Total Fe S 4 2 2	0	0
4	D	1	Total Fe S 4 2 2	0	0
4	D	1	Total Fe S 4 2 2	0	0

- Molecule 5 is (MOLYBDOPTERIN-CYTOSINE DINUCLEOTIDE-S,S)-DIOXO-AQUA-MOLYBDENUM(V) (CCD ID: PCD) (formula: $C_{19}H_{26}MoN_8O_{16}P_2S_2$).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf		
5	B	1	Total	C	Mo	N	O	P	S	0	0
			48	19	1	8	16	2	2		
5	E	1	Total	C	Mo	N	O	P	S	0	0
			48	19	1	8	16	2	2		

- Molecule 6 is FLAVIN-ADENINE DINUCLEOTIDE (CCD ID: FAD) (formula: $C_{27}H_{33}N_9O_{15}P_2$).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	
6	C	1	Total	C	N	O	P	0	0
			53	27	9	15	2		
6	F	1	Total	C	N	O	P	0	0
			53	27	9	15	2		

- Molecule 7 is water.


Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
7	A	137	Total	O	0	0
			137	137		
7	B	490	Total	O	0	0
			490	490		
7	C	199	Total	O	0	0
			199	199		
7	D	147	Total	O	0	0
			147	147		
7	E	493	Total	O	0	0
			493	493		
7	F	141	Total	O	0	0
			141	141		

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: CUTS, IRON-SULFUR PROTEIN OF CARBON MONOXIDE DEHYDROGENASE

Chain A: 




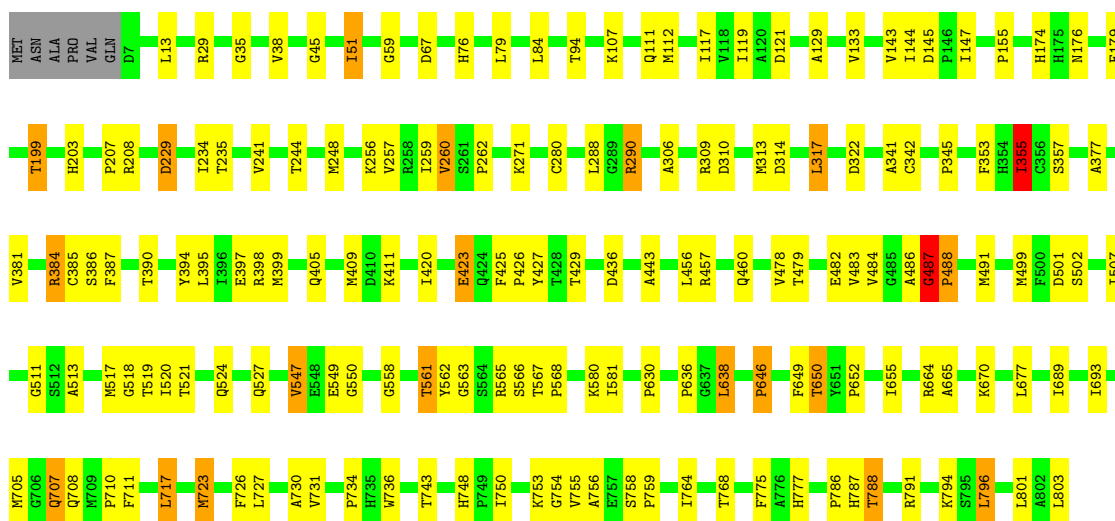
- Molecule 1: CUTS, IRON-SULFUR PROTEIN OF CARBON MONOXIDE DEHYDROGENASE

Chain D: 




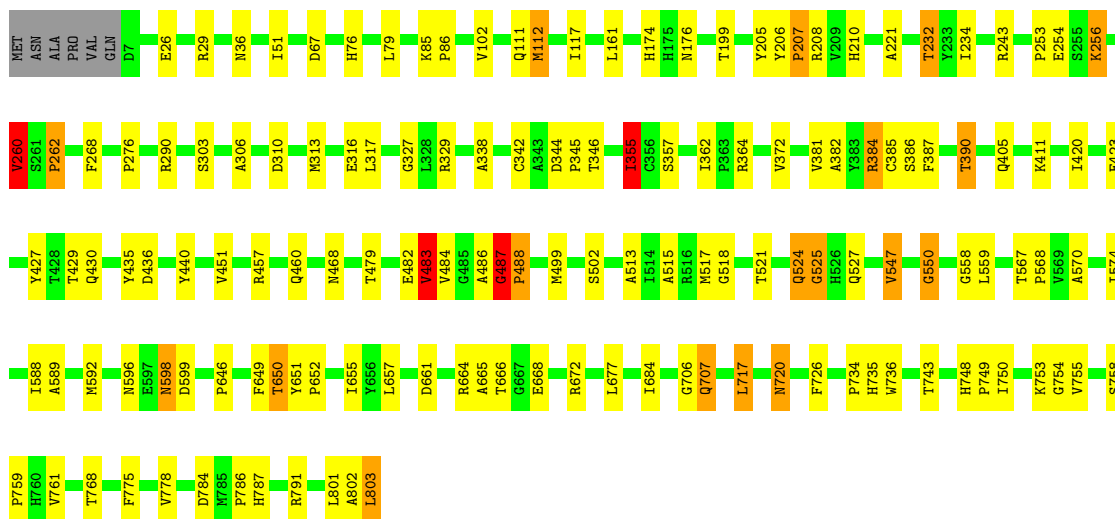
- Molecule 2: CUTL, MOLYBDOPROTEIN OF CARBON MONOXIDE DEHYDROGENASE

Chain B: 




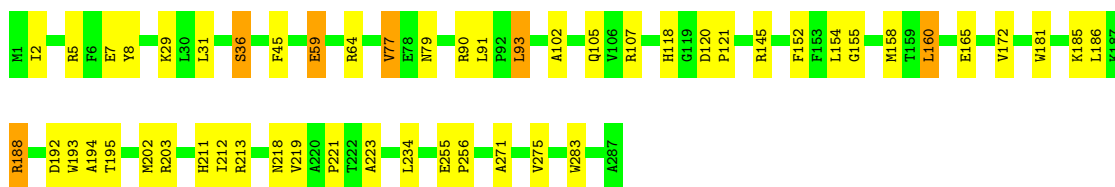
- Molecule 2: CUTL, MOLYBDOPROTEIN OF CARBON MONOXIDE DEHYDROGENASE

Chain E:  81% 16%




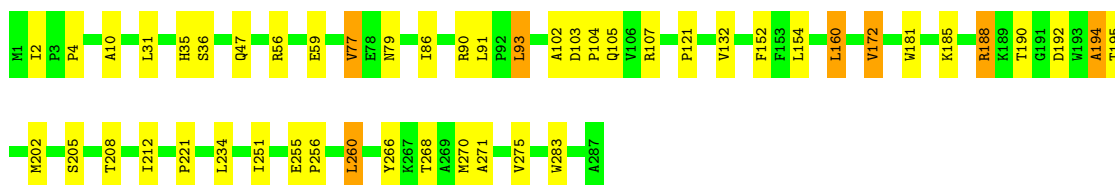
• Molecule 3: CUTM, FLAVOPROTEIN OF CARBON MONOXIDE DEHYDROGENASE

Chain C:  82% 16%



• Molecule 3: CUTM, FLAVOPROTEIN OF CARBON MONOXIDE DEHYDROGENASE

Chain F:  83% 15%



4 Data and refinement statistics

Xtrriage (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	86.37Å 193.79Å 218.75Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	20.00 – 2.25	Depositor
% Data completeness (in resolution range)	(Not available) (20.00-2.25)	Depositor
R_{merge}	0.08	Depositor
R_{sym}	(Not available)	Depositor
Refinement program	CNS	Depositor
R, R_{free}	0.209 , 0.237	Depositor
Estimated twinning fraction	No twinning to report.	Xtrriage
Total number of atoms	20648	wwPDB-VP
Average B, all atoms (Å ²)	32.0	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: FAD, CSZ, PCD, FES, ARO

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	0.43	0/1202	0.96	7/1619 (0.4%)
1	D	0.47	1/1207 (0.1%)	1.01	7/1626 (0.4%)
2	B	0.46	1/6219 (0.0%)	0.97	30/8465 (0.4%)
2	E	0.44	0/6219	0.99	35/8465 (0.4%)
3	C	0.44	0/2172	0.93	7/2947 (0.2%)
3	F	0.42	0/2180	0.94	6/2958 (0.2%)
All	All	0.45	2/19199 (0.0%)	0.97	92/26080 (0.4%)

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	D	129	MET	SD-CE	-5.99	1.64	1.79
2	B	764	ILE	CA-CB	5.12	1.56	1.54

All (92) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	D	47	CYS	N-CA-C	9.84	123.02	111.71
2	E	599	ASP	N-CA-C	-9.16	101.63	113.17
1	A	47	CYS	N-CA-C	8.44	120.48	111.28
3	F	195	THR	N-CA-C	-8.43	101.61	112.23
2	B	355	ILE	N-CA-C	-8.40	104.51	112.83
3	C	2	ILE	N-CA-C	8.13	114.96	107.56
3	F	2	ILE	N-CA-C	7.95	114.79	107.56
1	D	139	THR	N-CA-C	7.91	122.19	112.23
3	C	195	THR	N-CA-C	-7.88	102.31	112.23
2	B	67	ASP	N-CA-C	7.75	119.36	111.07
2	E	550	GLY	N-CA-C	7.55	124.06	115.08
2	B	550	GLY	N-CA-C	7.48	123.99	115.08
1	A	139	THR	N-CA-C	7.47	121.65	112.23

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	E	355	ILE	N-CA-C	-7.38	105.36	112.29
2	E	67	ASP	N-CA-C	7.33	119.90	111.11
2	E	598	ASN	N-CA-C	7.32	120.73	112.97
2	E	483	VAL	CB-CA-C	-7.21	103.08	111.09
2	B	290	ARG	N-CA-C	7.08	114.59	108.22
1	D	119	ASN	CA-C-N	7.07	126.68	119.19
1	D	119	ASN	C-N-CA	7.07	126.68	119.19
2	B	420	ILE	N-CA-C	-6.92	99.76	108.89
2	E	290	ARG	N-CA-C	6.88	114.41	108.22
2	E	487	GLY	N-CA-C	6.75	126.11	112.34
2	E	313	MET	N-CA-C	6.72	120.41	109.59
2	B	51	ILE	N-CA-C	6.53	117.24	108.11
2	E	420	ILE	N-CA-C	-6.51	100.30	108.89
1	D	138	CYS	N-CA-C	6.43	121.31	112.04
2	E	525	GLY	N-CA-C	6.34	124.85	115.08
3	F	35	HIS	N-CA-C	6.27	119.95	112.93
2	E	338	ALA	N-CA-C	6.25	117.75	111.07
2	B	313	MET	N-CA-C	6.24	119.63	109.59
2	B	487	GLY	N-CA-C	6.23	125.04	112.34
2	E	707	GLN	N-CA-C	6.16	119.92	110.20
2	B	38	VAL	N-CA-C	6.09	116.76	110.36
2	E	357	SER	N-CA-C	-6.06	105.85	113.18
2	E	345	PRO	N-CA-C	-6.03	101.78	111.38
2	B	502	SER	N-CA-C	6.03	118.13	109.14
2	E	306	ALA	N-CA-C	5.93	119.19	110.30
3	C	36	SER	N-CA-C	-5.89	105.35	113.18
2	E	726	PHE	N-CA-C	5.85	118.74	109.96
2	E	51	ILE	N-CA-C	5.82	116.25	108.11
2	B	756	ALA	N-CA-C	5.80	119.18	111.75
2	B	705	MET	N-CA-C	5.79	120.41	113.23
2	B	35	GLY	N-CA-C	-5.79	105.14	112.54
3	F	212	ILE	N-CA-C	5.76	115.95	108.35
2	B	207	PRO	N-CA-C	5.72	120.30	111.21
2	E	234	ILE	N-CA-C	5.72	117.30	108.44
2	E	303	SER	N-CA-C	5.66	118.65	111.69
2	B	707	GLN	N-CA-C	5.65	119.12	110.20
2	E	743	THR	CA-C-N	5.62	125.94	119.92
2	E	743	THR	C-N-CA	5.62	125.94	119.92
3	C	212	ILE	N-CA-C	5.62	115.97	108.27
2	B	743	THR	CA-C-N	5.59	125.53	119.78
2	B	743	THR	C-N-CA	5.59	125.53	119.78
1	A	138	CYS	N-CA-C	5.58	120.10	112.68

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	119	ASN	CA-C-N	5.58	125.19	119.56
1	A	119	ASN	C-N-CA	5.58	125.19	119.56
2	B	345	PRO	N-CA-C	-5.54	102.49	111.19
2	B	726	PHE	N-CA-C	5.54	118.35	110.10
3	C	218	ASN	N-CA-C	5.53	119.20	111.90
2	E	206	TYR	CA-C-N	5.52	125.52	119.89
2	E	206	TYR	C-N-CA	5.52	125.52	119.89
2	B	436	ASP	N-CA-C	5.45	117.03	111.14
2	E	436	ASP	N-CA-C	5.45	117.02	111.14
2	E	210	HIS	CA-C-N	5.38	125.05	119.56
2	E	210	HIS	C-N-CA	5.38	125.05	119.56
1	D	132	THR	N-CA-C	5.37	118.93	112.38
2	E	346	THR	N-CA-C	5.35	118.60	111.75
3	F	194	ALA	N-CA-C	5.34	117.62	110.35
2	E	502	SER	N-CA-C	5.33	116.90	108.96
3	C	223	ALA	N-CA-C	-5.31	103.02	110.50
2	B	357	SER	N-CA-C	-5.25	106.82	113.18
3	C	102	ALA	CB-CA-C	-5.25	110.50	116.54
2	B	306	ALA	N-CA-C	5.25	118.17	110.30
2	E	207	PRO	N-CA-C	5.19	119.36	111.11
2	E	513	ALA	N-CA-C	5.16	116.68	108.79
2	B	229	ASP	N-CA-C	5.11	117.92	109.85
3	F	102	ALA	CB-CA-C	-5.11	110.67	116.54
2	B	513	ALA	N-CA-C	5.08	116.80	109.07
1	D	35	LEU	N-CA-C	-5.05	102.04	109.62
2	B	646	PRO	CA-C-N	5.04	124.73	119.64
2	B	646	PRO	C-N-CA	5.04	124.73	119.64
2	B	234	ILE	N-CA-C	5.04	115.63	108.42
1	A	132	THR	N-CA-C	5.04	118.53	112.38
2	E	362	ILE	CA-C-N	5.04	124.64	119.56
2	E	362	ILE	C-N-CA	5.04	124.64	119.56
2	E	440	TYR	N-CA-C	5.03	116.84	111.36
1	A	20	GLU	N-CA-C	-5.02	103.74	110.07
2	B	260	VAL	N-CA-C	5.01	115.19	107.77
2	E	260	VAL	N-CA-C	5.01	115.85	107.18
2	B	511	GLY	N-CA-C	5.01	120.68	114.37
2	B	580	LYS	N-CA-C	-5.01	105.90	111.36

There are no chirality outliers.

There are no planarity outliers.

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	1185	0	1178	17	0
1	D	1190	0	1183	16	0
2	B	6087	0	5990	110	0
2	E	6087	0	5990	95	0
3	C	2133	0	2162	30	0
3	F	2141	0	2173	33	0
4	A	8	0	0	0	0
4	D	8	0	0	0	0
5	B	48	0	21	6	0
5	E	48	0	21	4	0
6	C	53	0	27	6	0
6	F	53	0	27	7	0
7	A	137	0	0	1	0
7	B	490	0	0	15	0
7	C	199	0	0	4	0
7	D	147	0	0	3	0
7	E	493	0	0	7	0
7	F	141	0	0	6	0
All	All	20648	0	18772	303	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 (303) 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)
5:B:1920:PCD:S8'	7:B:2389:HOH:O	1.96	1.24
5:E:1921:PCD:H7	7:E:2188:HOH:O	1.62	0.98
5:B:1920:PCD:H102	7:B:2389:HOH:O	1.68	0.93
1:D:129:MET:HE1	3:F:190:THR:HG21	1.52	0.92
3:C:203:ARG:HB2	3:C:211:HIS:HB3	1.52	0.91
2:E:174:HIS:HD2	2:E:176:ASN:H	1.20	0.89
2:E:243:ARG:HD3	2:E:254:GLU:HG2	1.53	0.89
6:C:1922:FAD:H51A	6:C:1922:FAD:H8A	1.54	0.88
2:B:29:ARG:HH22	2:B:527:GLN:HE22	1.21	0.86

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:788:THR:HG22	2:B:791:ARG:H	1.40	0.86
6:F:1923:FAD:H8A	6:F:1923:FAD:H52A	1.55	0.86
3:F:202:MET:HE1	3:F:283:TRP:HE3	1.42	0.84
2:E:457:ARG:HH11	2:E:460:GLN:HE22	1.25	0.84
2:B:520:ILE:H	2:B:561:THR:CG2	1.91	0.83
2:E:29:ARG:HH22	2:E:527:GLN:HE22	1.27	0.82
2:B:174:HIS:HD2	2:B:176:ASN:H	1.30	0.80
2:B:381:VAL:HG13	2:B:385:CSZ:SG	2.24	0.78
1:D:134:ASN:HD21	3:F:105:GLN:HE22	1.30	0.77
6:F:1923:FAD:H8A	6:F:1923:FAD:C5B	2.15	0.76
2:E:384:ARO:HD2	7:E:2188:HOH:O	1.87	0.75
6:C:1922:FAD:H8A	6:C:1922:FAD:C5B	2.17	0.73
2:B:385:CSZ:SE	7:B:2391:HOH:O	2.57	0.73
3:F:10:ALA:HB1	3:F:56:ARG:HD2	1.71	0.71
2:B:664:ARG:HD2	2:B:801:LEU:O	1.91	0.71
2:B:457:ARG:HH11	2:B:460:GLN:HE22	1.37	0.70
2:B:788:THR:HG21	7:B:2068:HOH:O	1.93	0.69
1:D:129:MET:HE1	3:F:190:THR:CG2	2.21	0.69
2:B:748:HIS:HD2	2:B:750:ILE:H	1.40	0.69
2:B:665:ALA:HA	2:B:803:LEU:HD22	1.75	0.68
2:B:174:HIS:CD2	2:B:176:ASN:H	2.13	0.67
2:B:519:THR:HB	2:B:561:THR:HG22	1.76	0.67
2:E:76:HIS:HD2	7:E:2381:HOH:O	1.77	0.67
5:B:1920:PCD:MO	5:B:1920:PCD:OM1	1.64	0.67
1:D:134:ASN:ND2	3:F:105:GLN:HE22	1.93	0.66
2:E:487:GLY:HA3	2:E:646:PRO:HG3	1.78	0.66
2:B:520:ILE:H	2:B:561:THR:HG23	1.60	0.66
2:E:479:THR:HG22	2:E:655:ILE:HG13	1.78	0.66
2:B:581:ILE:HG23	2:B:638:LEU:HD22	1.78	0.66
3:C:36:SER:HB2	6:C:1922:FAD:H5'2	1.77	0.66
2:B:199:THR:HG22	7:B:2227:HOH:O	1.95	0.65
2:E:484:VAL:HG23	2:E:650:THR:HG22	1.78	0.65
3:F:205:SER:O	3:F:208:THR:HG22	1.96	0.65
2:E:221:ALA:HA	2:E:232:THR:HB	1.78	0.65
2:E:720:ASN:HD22	2:E:720:ASN:H	1.44	0.65
2:E:253:PRO:HG2	2:E:256:LYS:HG3	1.78	0.65
2:E:381:VAL:HG13	2:E:385:CSZ:SG	2.36	0.65
2:E:650:THR:HG21	2:E:754:GLY:H	1.63	0.64
2:E:748:HIS:HD2	2:E:750:ILE:H	1.46	0.64
2:E:664:ARG:HD2	2:E:801:LEU:O	1.97	0.64
2:B:487:GLY:HA3	2:B:646:PRO:HG3	1.80	0.64

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:C:45:PHE:HB3	7:C:2118:HOH:O	1.97	0.63
2:B:423:GLU:HG3	7:B:2366:HOH:O	1.99	0.62
2:E:174:HIS:CD2	2:E:176:ASN:H	2.09	0.62
3:C:59:GLU:HG3	7:C:1966:HOH:O	1.99	0.62
2:B:256:LYS:HE3	7:B:2354:HOH:O	1.98	0.62
7:D:1923:HOH:O	2:E:735:HIS:HD2	1.83	0.62
3:C:121:PRO:HG3	3:C:221:PRO:O	2.00	0.62
2:E:527:GLN:HA	2:E:547:VAL:HG22	1.81	0.61
2:B:405:GLN:HE21	2:B:411:LYS:NZ	1.97	0.61
2:E:243:ARG:CD	2:E:254:GLU:HG2	2.29	0.61
2:E:486:ALA:HA	2:E:649:PHE:CE2	2.35	0.61
3:F:121:PRO:HG3	3:F:221:PRO:O	2.00	0.61
2:B:487:GLY:HA2	2:B:499:MET:O	2.01	0.61
3:C:77:VAL:HG13	3:C:107:ARG:O	2.00	0.61
2:B:723:MET:HG3	7:B:2393:HOH:O	2.02	0.60
3:C:185:LYS:HG3	3:C:194:ALA:HB2	1.82	0.60
2:E:487:GLY:HA3	2:E:646:PRO:CG	2.31	0.60
2:B:342:CYS:SG	2:B:381:VAL:HG23	2.42	0.60
1:A:121:ASN:H	1:A:121:ASN:HD22	1.49	0.60
2:B:45:GLY:O	2:B:290:ARG:HD2	2.02	0.60
2:B:518:GLY:HA3	2:B:558:GLY:HA3	1.83	0.60
2:E:666:THR:OG1	2:E:668:GLU:HG2	2.02	0.59
2:E:483:VAL:HG13	2:E:651:TYR:CE2	2.37	0.59
3:F:36:SER:HB2	6:F:1923:FAD:H5'2	1.84	0.59
2:B:650:THR:HG21	2:B:754:GLY:H	1.67	0.59
2:E:720:ASN:H	2:E:720:ASN:ND2	2.00	0.58
1:D:129:MET:HE2	7:F:2030:HOH:O	2.03	0.58
3:C:79:ASN:HD21	3:C:107:ARG:HE	1.50	0.58
2:B:748:HIS:CD2	2:B:750:ILE:H	2.21	0.58
6:C:1922:FAD:H51A	6:C:1922:FAD:C8A	2.31	0.57
2:E:588:ILE:HG22	2:E:592:MET:HE2	1.86	0.57
2:E:457:ARG:HH11	2:E:460:GLN:NE2	2.01	0.57
3:C:155:GLY:HA3	3:C:158:MET:HE3	1.87	0.56
3:C:255:GLU:HG2	7:C:1969:HOH:O	2.04	0.56
3:C:202:MET:CE	3:C:283:TRP:HE3	2.19	0.56
2:B:486:ALA:HA	2:B:649:PHE:CE2	2.40	0.56
3:C:29:LYS:HD3	7:C:2024:HOH:O	2.06	0.56
3:C:93:LEU:HG	3:C:181:TRP:HB2	1.88	0.56
1:A:121:ASN:HD22	1:A:121:ASN:N	2.03	0.56
2:E:748:HIS:CD2	2:E:750:ILE:H	2.24	0.55
2:B:487:GLY:HA3	2:B:646:PRO:CG	2.36	0.55

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:F:59:GLU:HB3	7:F:2038:HOH:O	2.05	0.55
3:F:93:LEU:HG	3:F:181:TRP:HB2	1.87	0.55
1:D:89:VAL:HG13	1:D:109:LEU:HD22	1.89	0.55
2:B:317:LEU:HD22	2:B:399:MET:HB3	1.89	0.55
2:B:650:THR:HG23	2:B:753:LYS:HB3	1.87	0.55
2:B:385:CSZ:SE	5:B:1920:PCD:OR1	2.75	0.54
3:C:145:ARG:HD3	3:C:165:GLU:OE2	2.07	0.54
3:F:86:ILE:HG13	7:F:2062:HOH:O	2.07	0.54
3:F:185:LYS:HG3	3:F:194:ALA:HB2	1.90	0.54
1:A:46:HIS:HE1	2:B:723:MET:HE3	1.73	0.54
3:F:79:ASN:HD21	3:F:107:ARG:HE	1.56	0.54
2:E:518:GLY:HA3	2:E:558:GLY:HA3	1.90	0.53
2:E:457:ARG:NH1	2:E:460:GLN:HE22	2.00	0.53
2:E:486:ALA:HA	2:E:649:PHE:HE2	1.71	0.53
2:E:717:LEU:HD13	2:E:720:ASN:HB3	1.90	0.53
3:F:77:VAL:HG13	3:F:107:ARG:O	2.08	0.53
2:E:786:PRO:O	2:E:791:ARG:HD3	2.08	0.53
2:B:768:THR:OG1	2:B:787:HIS:HE1	1.92	0.53
3:C:202:MET:HE2	3:C:283:TRP:HE3	1.72	0.53
2:B:111:GLN:O	2:B:112:MET:HB2	2.09	0.52
2:B:527:GLN:HA	2:B:547:VAL:HG22	1.91	0.52
2:E:381:VAL:HG13	2:E:385:CSZ:SE	2.60	0.52
2:E:661:ASP:OD2	2:E:672:ARG:HD3	2.09	0.52
2:E:355:ILE:HG13	2:E:483:VAL:CG2	2.39	0.51
2:E:427:TYR:HE2	2:E:429:THR:HG22	1.75	0.51
2:B:677:LEU:C	2:B:677:LEU:HD23	2.36	0.51
2:E:405:GLN:HE21	2:E:411:LYS:NZ	2.08	0.51
3:F:255:GLU:N	3:F:256:PRO:HD3	2.26	0.51
1:A:146:LYS:HA	1:A:149:GLN:HE21	1.75	0.51
1:D:146:LYS:HA	1:D:149:GLN:HE21	1.76	0.51
2:B:208:ARG:NH2	2:B:377:ALA:O	2.44	0.50
2:B:398:ARG:HD2	7:B:2102:HOH:O	2.12	0.50
1:A:21:PRO:HB3	3:C:8:TYR:HB2	1.93	0.50
2:B:521:THR:HG21	7:B:2266:HOH:O	2.12	0.50
2:B:384:ARO:HG	5:B:1920:PCD:S7 ⁷	2.52	0.50
2:E:111:GLN:HE22	2:E:717:LEU:H	1.59	0.50
2:B:59:GLY:O	2:B:107:LYS:HB2	2.12	0.50
1:A:121:ASN:H	1:A:121:ASN:ND2	2.10	0.49
3:C:79:ASN:ND2	3:C:107:ARG:HE	2.11	0.49
2:E:720:ASN:HD22	2:E:720:ASN:N	2.05	0.49
3:F:79:ASN:ND2	3:F:107:ARG:HE	2.10	0.49

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:94:THR:HB	2:B:341:ALA:HA	1.94	0.48
2:B:143:VAL:CG2	2:B:155:PRO:HG2	2.43	0.48
2:B:562:TYR:HA	7:B:2389:HOH:O	2.12	0.48
3:F:154:LEU:HD21	3:F:160:LEU:HD13	1.95	0.48
2:B:670:LYS:HE2	7:B:2396:HOH:O	2.13	0.48
2:B:427:TYR:HE2	2:B:429:THR:HG22	1.77	0.48
2:B:562:TYR:CA	7:B:2389:HOH:O	2.61	0.48
2:B:723:MET:HE1	3:C:193:TRP:CZ3	2.47	0.48
1:A:129:MET:HA	1:A:132:THR:HG23	1.95	0.48
1:D:64:HIS:HD2	7:F:1945:HOH:O	1.96	0.48
2:E:787:HIS:HD2	7:E:2131:HOH:O	1.97	0.48
2:B:487:GLY:O	2:B:488:PRO:C	2.56	0.48
2:E:385:CSZ:SE	7:E:2367:HOH:O	2.82	0.48
2:E:517:MET:SD	2:E:517:MET:N	2.87	0.48
2:E:36:ASN:O	2:E:262:PRO:HB2	2.14	0.48
2:E:650:THR:HG23	2:E:652:PRO:HD3	1.96	0.48
2:E:768:THR:HA	2:E:787:HIS:CE1	2.49	0.48
2:E:111:GLN:NE2	2:E:717:LEU:H	2.12	0.47
2:E:208:ARG:HD2	2:E:310:ASP:OD2	2.14	0.47
3:F:103:ASP:HB2	3:F:104:PRO:CD	2.44	0.47
2:E:707:GLN:O	2:E:786:PRO:HG3	2.15	0.47
2:B:443:ALA:HB3	2:B:655:ILE:HD12	1.96	0.47
2:E:26:GLU:OE2	2:E:525:GLY:HA2	2.14	0.47
2:E:487:GLY:HA2	2:E:499:MET:O	2.14	0.47
2:E:567:THR:HB	2:E:568:PRO:HD3	1.96	0.47
2:B:707:GLN:O	2:B:786:PRO:HG3	2.15	0.47
2:E:268:PHE:HA	5:E:1921:PCD:S7'	2.54	0.47
2:B:519:THR:HB	2:B:561:THR:CG2	2.44	0.47
1:A:145:VAL:O	1:A:149:GLN:HG3	2.15	0.47
2:B:507:ILE:HD13	2:B:581:ILE:HD13	1.98	0.46
6:C:1922:FAD:C5B	6:C:1922:FAD:C8A	2.91	0.46
2:E:327:GLY:HA2	2:E:364:ARG:O	2.15	0.46
2:B:563:GLY:N	5:B:1920:PCD:OM2	2.38	0.46
1:D:8:VAL:HG11	1:D:28:PHE:CE2	2.50	0.46
2:B:484:VAL:HG23	2:B:650:THR:HG22	1.98	0.46
3:C:90:ARG:O	3:C:91:LEU:HD23	2.15	0.46
2:B:386:SER:O	2:B:387:PHE:HB2	2.16	0.46
2:B:397:GLU:HG3	2:B:478:VAL:HG13	1.98	0.46
1:D:102:GLY:HA2	1:D:105:THR:OG1	2.16	0.46
2:E:596:ASN:HD22	2:E:598:ASN:H	1.64	0.46
2:B:76:HIS:HE1	2:B:121:ASP:OD1	1.98	0.46

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:F:202:MET:HE2	3:F:283:TRP:HA	1.98	0.46
6:C:1922:FAD:N1	6:C:1922:FAD:O2'	2.49	0.46
2:B:775:PHE:CZ	2:B:796:LEU:HD13	2.51	0.45
7:A:2015:HOH:O	3:C:5:ARG:HG2	2.16	0.45
2:B:395:LEU:O	2:B:399:MET:HG2	2.16	0.45
2:E:316:GLU:OE2	2:E:329:ARG:HD2	2.16	0.45
1:A:46:HIS:CE1	2:B:723:MET:HE3	2.49	0.45
1:A:65:LEU:HB2	1:A:68:GLN:HG3	1.98	0.45
2:B:355:ILE:HG13	2:B:483:VAL:HG11	1.99	0.45
2:B:443:ALA:CB	2:B:655:ILE:HD12	2.46	0.45
2:B:199:THR:HB	7:B:2279:HOH:O	2.16	0.45
2:B:768:THR:HA	2:B:787:HIS:CE1	2.51	0.45
2:E:429:THR:CG2	2:E:435:TYR:CE1	2.99	0.45
2:E:451:VAL:HG21	2:E:657:LEU:HD13	1.99	0.45
2:B:758:SER:N	2:B:759:PRO:HD2	2.32	0.45
1:A:121:ASN:N	1:A:121:ASN:ND2	2.64	0.45
2:E:390:THR:HG23	2:E:761:VAL:HG22	1.98	0.45
2:B:723:MET:HE1	3:C:193:TRP:CH2	2.51	0.45
2:E:499:MET:HA	2:E:559:LEU:HG	1.97	0.45
6:F:1923:FAD:H2B	6:F:1923:FAD:H51A	1.79	0.45
1:A:116:LEU:HA	1:A:116:LEU:HD12	1.81	0.44
2:E:355:ILE:HG13	2:E:483:VAL:HG21	1.99	0.44
2:B:425:PHE:HA	2:B:426:PRO:C	2.43	0.44
2:B:565:ARG:C	2:B:568:PRO:HD2	2.43	0.44
2:E:521:THR:HG21	7:E:2314:HOH:O	2.17	0.44
2:E:484:VAL:CG2	2:E:650:THR:HG22	2.47	0.44
6:F:1923:FAD:H52A	6:F:1923:FAD:C8A	2.38	0.44
3:C:154:LEU:HD21	3:C:160:LEU:HD13	1.99	0.44
1:D:89:VAL:HG13	1:D:109:LEU:CD2	2.47	0.44
2:B:244:THR:O	2:B:248:MET:HG2	2.17	0.44
2:E:344:ASP:HB2	7:E:2210:HOH:O	2.16	0.44
2:E:589:ALA:HA	2:E:592:MET:HE3	1.99	0.44
2:E:382:ALA:N	2:E:385:CSZ:SE	3.01	0.44
2:B:129:ALA:O	2:B:133:VAL:HG23	2.17	0.44
3:C:152:PHE:HA	3:C:160:LEU:HD22	1.99	0.44
2:E:775:PHE:O	2:E:778:VAL:HG22	2.18	0.44
2:B:322:ASP:C	2:B:409:MET:HE1	2.43	0.44
2:B:788:THR:HG23	7:B:2040:HOH:O	2.18	0.44
2:E:570:ALA:O	2:E:574:ILE:HG13	2.17	0.44
2:B:507:ILE:CD1	2:B:581:ILE:HD13	2.47	0.44
3:F:91:LEU:HD21	3:F:172:VAL:HG22	2.00	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:E:85:LYS:HB2	2:E:86:PRO:HD3	1.99	0.43
2:B:517:MET:SD	2:B:517:MET:N	2.91	0.43
2:B:630:PRO:HG3	2:B:636:PRO:HG3	1.99	0.43
3:C:188:ARG:HD3	3:C:192:ASP:OD2	2.18	0.43
2:E:429:THR:HG21	2:E:435:TYR:CE1	2.53	0.43
3:F:266:TYR:O	3:F:270:MET:HG2	2.18	0.43
2:E:385:CSZ:SE	5:E:1921:PCD:OR1	2.86	0.43
2:B:353:PHE:C	2:B:355:ILE:H	2.26	0.43
2:B:519:THR:O	2:B:549:GLU:HB3	2.18	0.43
1:D:105:THR:HB	1:D:106:PRO:HD3	1.99	0.43
2:E:423:GLU:CD	2:E:423:GLU:H	2.27	0.43
2:E:734:PRO:HG2	2:E:736:TRP:CH2	2.54	0.43
2:E:487:GLY:O	2:E:488:PRO:C	2.61	0.43
3:F:4:PRO:HG3	3:F:47:GLN:HG2	2.00	0.43
3:F:59:GLU:HG2	7:F:2039:HOH:O	2.18	0.43
1:A:132:THR:HG22	2:B:731:VAL:HG23	2.01	0.43
2:B:79:LEU:HD12	2:B:117:ILE:HD11	2.01	0.43
2:B:483:VAL:O	2:B:483:VAL:HG13	2.19	0.43
2:B:734:PRO:HG2	2:B:736:TRP:CH2	2.53	0.43
3:F:251:ILE:HG23	3:F:268:THR:CG2	2.48	0.43
1:A:134:ASN:ND2	3:C:105:GLN:HE22	2.17	0.42
1:A:105:THR:HB	1:A:106:PRO:HD3	2.01	0.42
3:F:202:MET:HE1	3:F:283:TRP:CE3	2.35	0.42
2:B:423:GLU:HG3	2:B:423:GLU:H	1.58	0.42
2:E:524:GLN:CD	2:E:524:GLN:H	2.27	0.42
2:E:758:SER:N	2:E:759:PRO:HD2	2.34	0.42
6:F:1923:FAD:C5B	6:F:1923:FAD:C8A	2.92	0.42
2:B:235:THR:HB	2:B:271:LYS:HD3	2.00	0.42
3:C:255:GLU:N	3:C:256:PRO:HD3	2.35	0.42
2:E:111:GLN:O	2:E:112:MET:HB2	2.20	0.42
2:E:768:THR:OG1	2:E:787:HIS:HE1	2.01	0.42
3:F:152:PHE:HA	3:F:160:LEU:HD22	2.01	0.42
2:B:567:THR:HB	2:B:568:PRO:HD3	2.01	0.42
2:E:386:SER:O	2:E:387:PHE:HB2	2.19	0.42
2:E:665:ALA:HA	2:E:803:LEU:HB3	2.01	0.42
3:F:271:ALA:O	3:F:275:VAL:HG23	2.19	0.42
2:B:405:GLN:HE21	2:B:411:LYS:HZ1	1.67	0.42
2:E:427:TYR:CE2	2:E:429:THR:HG22	2.54	0.42
2:B:394:TYR:O	2:B:398:ARG:HG2	2.20	0.42
2:B:727:LEU:HD23	2:B:727:LEU:HA	1.84	0.42
2:E:515:ALA:O	2:E:547:VAL:HA	2.20	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:E:748:HIS:HA	2:E:749:PRO:HD3	1.97	0.42
2:B:385:CSZ:SE	2:B:385:CSZ:N	3.03	0.42
2:B:650:THR:CG2	2:B:753:LYS:HB3	2.50	0.42
2:E:102:VAL:HA	2:E:276:PRO:HB3	2.01	0.42
2:E:381:VAL:CG1	2:E:385:CSZ:SE	3.18	0.42
2:B:479:THR:HG22	2:B:655:ILE:HG12	2.01	0.41
2:E:260:VAL:HA	2:E:550:GLY:O	2.20	0.41
6:F:1923:FAD:N1	6:F:1923:FAD:O2'	2.52	0.41
2:B:257:VAL:HG12	2:B:259:ILE:CD1	2.50	0.41
2:B:708:GLN:HG3	2:B:710:PRO:HD3	2.03	0.41
1:D:97:HIS:HA	7:D:1911:HOH:O	2.19	0.41
2:B:179:PHE:CD1	2:B:179:PHE:C	2.98	0.41
3:C:271:ALA:O	3:C:275:VAL:HG23	2.20	0.41
2:B:427:TYR:CE2	2:B:429:THR:HG22	2.55	0.41
2:E:784:ASP:O	2:E:791:ARG:NH1	2.54	0.41
2:B:208:ARG:HD2	2:B:310:ASP:OD2	2.21	0.41
2:E:684:ILE:HB	5:E:1921:PCD:O2	2.21	0.41
1:A:60:LYS:HG3	3:C:105:GLN:HB3	2.03	0.41
2:B:561:THR:HB	2:B:566:SER:OG	2.21	0.41
3:C:219:VAL:HG11	3:C:271:ALA:HB2	2.03	0.41
1:D:157:GLU:HB3	7:D:1940:HOH:O	2.21	0.41
2:E:677:LEU:HD23	2:E:677:LEU:C	2.45	0.41
2:B:117:ILE:HD13	2:B:280:CYS:HB3	2.03	0.41
1:D:145:VAL:O	1:D:149:GLN:HG3	2.21	0.41
2:E:527:GLN:HA	2:E:547:VAL:CG2	2.48	0.41
2:B:145:ASP:OD2	2:B:147:ILE:HB	2.21	0.41
2:B:650:THR:HG23	2:B:652:PRO:HD3	2.02	0.41
2:B:689:ILE:O	2:B:693:ILE:HG12	2.20	0.41
2:B:777:HIS:H	2:B:777:HIS:CD2	2.38	0.41
1:D:129:MET:CE	1:D:132:THR:HG21	2.51	0.41
2:E:355:ILE:HG13	2:E:483:VAL:HG22	2.02	0.41
3:F:260:LEU:HD13	3:F:260:LEU:HA	1.91	0.41
2:B:119:ILE:HG21	2:B:288:LEU:CD1	2.51	0.40
2:E:205:TYR:O	2:E:207:PRO:HD3	2.21	0.40
2:E:650:THR:HG23	2:E:753:LYS:HB3	2.03	0.40
3:F:188:ARG:HD3	3:F:192:ASP:OD2	2.21	0.40
2:B:229:ASP:HB2	2:B:256:LYS:O	2.22	0.40
3:F:90:ARG:HA	3:F:90:ARG:HD3	1.93	0.40
3:F:103:ASP:HB2	3:F:104:PRO:HD2	2.03	0.40
2:B:457:ARG:NH1	2:B:460:GLN:HE22	2.11	0.40
3:C:118:HIS:CD2	3:C:120:ASP:HB2	2.57	0.40

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:F:59:GLU:HG2	7:F:1982:HOH:O	2.20	0.40
2:B:51:ILE:HG12	2:B:117:ILE:HG22	2.04	0.40
2:B:203:HIS:HD2	2:B:314:ASP:OD1	2.04	0.40
2:B:711:PHE:CE2	2:B:717:LEU:HG	2.57	0.40
2:E:802:ALA:O	2:E:803:LEU:HD13	2.21	0.40
1:A:128:ARG:HD3	2:B:730:ALA:O	2.21	0.40
2:E:79:LEU:HD12	2:E:117:ILE:HD11	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	153/163 (94%)	149 (97%)	4 (3%)	0	100	100
1	D	154/163 (94%)	149 (97%)	5 (3%)	0	100	100
2	B	793/803 (99%)	763 (96%)	26 (3%)	4 (0%)	24	24
2	E	793/803 (99%)	765 (96%)	23 (3%)	5 (1%)	21	21
3	C	285/287 (99%)	277 (97%)	8 (3%)	0	100	100
3	F	285/287 (99%)	275 (96%)	10 (4%)	0	100	100
All	All	2463/2506 (98%)	2378 (96%)	76 (3%)	9 (0%)	30	31

All (9) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
2	B	487	GLY
2	E	487	GLY
2	B	488	PRO
2	E	262	PRO
2	B	262	PRO

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Mol	Chain	Res	Type
2	E	488	PRO
2	B	755	VAL
2	E	755	VAL
2	E	706	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	128/132 (97%)	123 (96%)	5 (4%)	28	35
1	D	128/132 (97%)	120 (94%)	8 (6%)	16	16
2	B	634/639 (99%)	609 (96%)	25 (4%)	28	35
2	E	634/639 (99%)	613 (97%)	21 (3%)	33	42
3	C	212/214 (99%)	200 (94%)	12 (6%)	18	19
3	F	214/214 (100%)	205 (96%)	9 (4%)	26	31
All	All	1950/1970 (99%)	1870 (96%)	80 (4%)	27	33

All (80) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	9	ASN
1	A	24	LEU
1	A	43	GLU
1	A	116	LEU
1	A	121	ASN
2	B	13	LEU
2	B	84	LEU
2	B	144	ILE
2	B	199	THR
2	B	241	VAL
2	B	260	VAL
2	B	309	ARG
2	B	317	LEU
2	B	355	ILE

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Mol	Chain	Res	Type
2	B	390	THR
2	B	423	GLU
2	B	456	LEU
2	B	482	GLU
2	B	491	MET
2	B	501	ASP
2	B	524	GLN
2	B	547	VAL
2	B	561	THR
2	B	638	LEU
2	B	650	THR
2	B	717	LEU
2	B	723	MET
2	B	788	THR
2	B	794	LYS
2	B	796	LEU
3	C	7	GLU
3	C	31	LEU
3	C	59	GLU
3	C	64	ARG
3	C	77	VAL
3	C	93	LEU
3	C	160	LEU
3	C	172	VAL
3	C	186	LEU
3	C	188	ARG
3	C	213	ARG
3	C	234	LEU
1	D	8	VAL
1	D	24	LEU
1	D	43	GLU
1	D	75	LEU
1	D	89	VAL
1	D	116	LEU
1	D	135	LEU
1	D	145	VAL
2	E	112	MET
2	E	161	LEU
2	E	199	THR
2	E	232	THR
2	E	256	LYS
2	E	260	VAL

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Mol	Chain	Res	Type
2	E	317	LEU
2	E	342	CYS
2	E	355	ILE
2	E	372	VAL
2	E	390	THR
2	E	430	GLN
2	E	468	ASN
2	E	482	GLU
2	E	483	VAL
2	E	524	GLN
2	E	547	VAL
2	E	650	THR
2	E	717	LEU
2	E	720	ASN
2	E	803	LEU
3	F	31	LEU
3	F	77	VAL
3	F	93	LEU
3	F	132	VAL
3	F	160	LEU
3	F	172	VAL
3	F	188	ARG
3	F	234	LEU
3	F	260	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (55) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	15	GLN
1	A	34	ASN
1	A	117	GLN
1	A	121	ASN
1	A	134	ASN
1	A	149	GLN
2	B	48	HIS
2	B	76	HIS
2	B	174	HIS
2	B	202	GLN
2	B	203	HIS
2	B	270	ASN
2	B	301	ASN
2	B	405	GLN

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Mol	Chain	Res	Type
2	B	460	GLN
2	B	527	GLN
2	B	546	GLN
2	B	692	GLN
2	B	707	GLN
2	B	748	HIS
2	B	777	HIS
2	B	787	HIS
2	B	799	HIS
3	C	47	GLN
3	C	79	ASN
3	C	88	GLN
3	C	108	ASN
3	C	123	ASN
1	D	64	HIS
1	D	117	GLN
1	D	134	ASN
1	D	149	GLN
2	E	76	HIS
2	E	109	HIS
2	E	111	GLN
2	E	174	HIS
2	E	195	ASN
2	E	405	GLN
2	E	460	GLN
2	E	527	GLN
2	E	546	GLN
2	E	596	ASN
2	E	692	GLN
2	E	708	GLN
2	E	720	ASN
2	E	735	HIS
2	E	748	HIS
2	E	787	HIS
3	F	79	ASN
3	F	88	GLN
3	F	108	ASN
3	F	123	ASN
3	F	142	ASN
3	F	244	GLN
3	F	280	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](#)

4 non-standard protein/DNA/RNA residues 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	ARO	B	384	2	9,11,12	2.04	1 (11%)	8,13,15	1.19	1 (12%)
2	CSZ	E	385	2	3,6,7	0.63	0	1,6,8	0.65	0
2	CSZ	B	385	2	3,6,7	0.68	0	1,6,8	0.56	0
2	ARO	E	384	2	9,11,12	1.54	1 (11%)	8,13,15	1.64	2 (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
2	ARO	B	384	2	-	3/10/11/13	-
2	CSZ	E	385	2	-	0/0/5/7	-
2	CSZ	B	385	2	-	0/0/5/7	-
2	ARO	E	384	2	-	2/10/11/13	-

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	384	ARO	OH-CG	-6.00	1.25	1.43
2	E	384	ARO	OH-CG	-4.42	1.30	1.43

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	E	384	ARO	OH-CG-CB	3.30	116.54	109.25
2	B	384	ARO	OH-CG-CB	2.49	114.76	109.25
2	E	384	ARO	OH-CG-CD	2.27	116.77	109.29

There are no chirality outliers.

All (5) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	B	384	ARO	CA-CB-CG-CD
2	B	384	ARO	NE-CD-CG-CB
2	B	384	ARO	NE-CD-CG-OH
2	E	384	ARO	NE-CD-CG-OH
2	E	384	ARO	NE-CD-CG-CB

There are no ring outliers.

4 monomers are involved in 12 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	B	384	ARO	1	0
2	E	385	CSZ	6	0
2	B	385	CSZ	4	0
2	E	384	ARO	1	0

5.5 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

8 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	$\# Z > 2$
4	FES	D	1909	1	0,4,4	-	-	-		

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
5	PCD	B	1920	-	41,53,53	1.45	7 (17%)	55,86,86	1.67	12 (21%)
6	FAD	C	1922	-	58,58,58	2.23	9 (15%)	85,89,89	4.36	17 (20%)
4	FES	A	1907	1	0,4,4	-	-	-	-	-
6	FAD	F	1923	-	58,58,58	2.27	10 (17%)	85,89,89	4.56	18 (21%)
5	PCD	E	1921	-	41,53,53	1.51	9 (21%)	55,86,86	1.78	11 (20%)
4	FES	A	1908	1	0,4,4	-	-	-	-	-
4	FES	D	1910	1	0,4,4	-	-	-	-	-

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
4	FES	D	1909	1	-	-	0/1/1/1
5	PCD	B	1920	-	-	2/22/78/78	0/6/6/6
6	FAD	C	1922	-	-	10/34/50/50	0/6/6/6
4	FES	A	1907	1	-	-	0/1/1/1
6	FAD	F	1923	-	-	11/34/50/50	0/6/6/6
5	PCD	E	1921	-	-	0/22/78/78	0/6/6/6
4	FES	A	1908	1	-	-	0/1/1/1
4	FES	D	1910	1	-	-	0/1/1/1

All (35) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
6	F	1923	FAD	P-O3P	-10.95	1.47	1.59
6	C	1922	FAD	P-O3P	-10.88	1.47	1.59
6	F	1923	FAD	C1'-C2'	6.49	1.61	1.52
6	C	1922	FAD	C1'-C2'	5.54	1.60	1.52
6	F	1923	FAD	O5'-C5'	4.48	1.61	1.44
6	C	1922	FAD	O5'-C5'	4.47	1.61	1.44
6	C	1922	FAD	PA-O2A	-4.17	1.36	1.55
6	F	1923	FAD	PA-O2A	-3.89	1.37	1.55
6	C	1922	FAD	O4B-C1B	3.71	1.50	1.42
6	F	1923	FAD	O4B-C1B	3.60	1.50	1.42
6	C	1922	FAD	P-O2P	-3.55	1.38	1.55
6	F	1923	FAD	P-O2P	-3.32	1.40	1.55
5	B	1920	PCD	C10-C9'	-3.02	1.47	1.51
5	E	1921	PCD	C7-C6'	-2.91	1.51	1.53
5	E	1921	PCD	C10-C9'	-2.89	1.47	1.51

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
5	B	1920	PCD	C6'-N5'	2.84	1.49	1.45
6	C	1922	FAD	O2-C2	-2.69	1.19	1.24
6	F	1923	FAD	C6-C7	-2.57	1.36	1.39
5	E	1921	PCD	C6'-N5'	2.56	1.49	1.45
5	B	1920	PCD	C7-C6'	-2.52	1.51	1.53
5	E	1921	PCD	PB-O2B	-2.51	1.43	1.55
6	F	1923	FAD	PA-O5B	-2.50	1.49	1.59
6	C	1922	FAD	C6-C7	-2.49	1.36	1.39
6	C	1922	FAD	PA-O5B	-2.46	1.49	1.59
5	B	1920	PCD	C2'-N1'	-2.46	1.31	1.35
5	E	1921	PCD	C2'-N1'	-2.42	1.31	1.35
5	B	1920	PCD	PB-O2B	-2.33	1.44	1.55
6	F	1923	FAD	O2-C2	-2.30	1.19	1.24
5	E	1921	PCD	C4'-N3'	2.30	1.41	1.36
5	E	1921	PCD	PB-O3A	2.28	1.62	1.59
5	B	1920	PCD	PA-O3A	-2.28	1.57	1.59
5	B	1920	PCD	C4-N3	2.14	1.38	1.34
5	E	1921	PCD	C6-C5	-2.13	1.30	1.35
6	F	1923	FAD	C5A-C6A	2.08	1.46	1.41
5	E	1921	PCD	C4-N3	2.08	1.38	1.34

All (58) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
6	F	1923	FAD	O3'-C3'-C2'	-18.95	65.88	108.93
6	C	1922	FAD	O3'-C3'-C2'	-18.94	65.90	108.93
6	F	1923	FAD	O4'-C4'-C3'	-18.48	66.00	109.25
6	C	1922	FAD	O4'-C4'-C3'	-18.20	66.65	109.25
6	F	1923	FAD	O4'-C4'-C5'	-14.75	77.46	109.99
6	C	1922	FAD	O5'-C5'-C4'	-14.14	71.61	109.36
6	F	1923	FAD	O5'-C5'-C4'	-13.89	72.28	109.36
6	F	1923	FAD	O3'-C3'-C4'	-13.69	77.81	108.93
6	C	1922	FAD	O4'-C4'-C5'	-13.55	80.11	109.99
6	F	1923	FAD	C1'-C2'-C3'	-12.68	75.27	109.66
6	C	1922	FAD	O3'-C3'-C4'	-12.06	81.52	108.93
6	F	1923	FAD	O2'-C2'-C3'	10.07	132.83	109.25
6	C	1922	FAD	C1'-C2'-C3'	-9.79	83.12	109.66
6	C	1922	FAD	O2'-C2'-C3'	8.28	128.62	109.25
6	C	1922	FAD	C5'-C4'-C3'	7.75	126.84	112.22
6	F	1923	FAD	C5'-C4'-C3'	6.99	125.41	112.22
5	E	1921	PCD	C7-C6'-N5'	6.13	113.89	107.87
6	C	1922	FAD	O2'-C2'-C1'	-6.05	85.31	110.20

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
5	B	1920	PCD	C7-C6'-N5'	5.81	113.58	107.87
5	E	1921	PCD	O9'-C7-N8'	5.44	113.54	108.61
6	C	1922	FAD	C4'-C3'-C2'	4.41	120.91	113.57
6	F	1923	FAD	O2'-C2'-C1'	-4.29	92.56	110.20
6	F	1923	FAD	C4'-C3'-C2'	3.83	119.94	113.57
5	B	1920	PCD	C8'-C7'-S7'	3.73	122.27	120.15
5	B	1920	PCD	O9'-C7-N8'	3.70	111.96	108.61
5	E	1921	PCD	N3'-C2'-N1'	-3.51	120.10	125.48
5	E	1921	PCD	C8'-C7'-S7'	3.44	122.10	120.15
5	B	1920	PCD	N3'-C2'-N1'	-3.41	120.25	125.48
6	F	1923	FAD	O4B-C1B-N9A	-3.26	101.83	108.09
6	C	1922	FAD	C2'-C1'-N10	3.03	124.50	110.20
5	E	1921	PCD	N2'-C2'-N1'	2.99	121.70	117.22
6	C	1922	FAD	O4B-C1B-N9A	-2.99	102.36	108.09
5	B	1920	PCD	N2'-C2'-N1'	2.88	121.55	117.22
5	E	1921	PCD	C2'-N3'-C4'	2.81	122.37	116.31
5	B	1920	PCD	C2'-N3'-C4'	2.78	122.30	116.31
6	C	1922	FAD	C2A-N1A-C6A	2.71	123.19	118.73
6	F	1923	FAD	C2B-C3B-C4B	-2.70	97.39	102.61
5	E	1921	PCD	C4A-C4'-N3'	-2.69	117.11	123.91
5	B	1920	PCD	C4A-C4'-N3'	-2.67	117.17	123.91
6	C	1922	FAD	O2A-PA-O3P	2.57	114.22	107.27
6	F	1923	FAD	C2A-N1A-C6A	2.51	122.85	118.73
6	F	1923	FAD	C4-N3-C2	-2.40	121.38	125.64
6	F	1923	FAD	C4X-C10-N10	2.39	119.90	116.48
5	E	1921	PCD	C6-C5-C4	2.38	121.44	117.53
6	C	1922	FAD	C4-N3-C2	-2.37	121.42	125.64
6	F	1923	FAD	O4B-C4B-C3B	-2.34	100.50	105.15
5	B	1920	PCD	C4B-N8'-C7	-2.34	119.03	123.62
6	C	1922	FAD	C4X-C10-N10	2.34	119.83	116.48
5	E	1921	PCD	C4B-N8'-C7	-2.30	119.11	123.62
5	E	1921	PCD	O2-C2-N3	-2.26	118.77	122.33
5	B	1920	PCD	C6-C5-C4	2.24	121.21	117.53
6	F	1923	FAD	O2A-PA-O3P	2.20	113.21	107.27
5	E	1921	PCD	N1-C2-N3	2.13	122.50	118.80
6	C	1922	FAD	O4B-C4B-C3B	-2.11	100.95	105.15
5	B	1920	PCD	N1-C2-N3	2.11	122.46	118.80
5	B	1920	PCD	O9'-C7-C6'	-2.10	107.56	108.96
5	B	1920	PCD	O2-C2-N3	-2.06	119.08	122.33
6	F	1923	FAD	C4B-O4B-C1B	-2.01	105.03	109.47

There are no chirality outliers.

All (23) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
5	B	1920	PCD	C10-O3B-PB-O1B
6	C	1922	FAD	C1'-C2'-C3'-O3'
6	C	1922	FAD	C2'-C3'-C4'-O4'
6	C	1922	FAD	O4'-C4'-C5'-O5'
6	F	1923	FAD	C1'-C2'-C3'-O3'
6	F	1923	FAD	O2'-C2'-C3'-C4'
6	F	1923	FAD	C2'-C3'-C4'-O4'
6	F	1923	FAD	O4'-C4'-C5'-O5'
6	C	1922	FAD	O2'-C2'-C3'-C4'
6	C	1922	FAD	O3'-C3'-C4'-C5'
6	F	1923	FAD	O3'-C3'-C4'-C5'
6	F	1923	FAD	O4B-C4B-C5B-O5B
6	F	1923	FAD	C3B-C4B-C5B-O5B
6	F	1923	FAD	O2'-C2'-C3'-O3'
6	C	1922	FAD	P-O3P-PA-O2A
6	F	1923	FAD	P-O3P-PA-O2A
5	B	1920	PCD	C10-O3B-PB-O3A
6	C	1922	FAD	O2'-C2'-C3'-O3'
6	F	1923	FAD	C4'-C5'-O5'-P
6	C	1922	FAD	P-O3P-PA-O1A
6	C	1922	FAD	C3B-C4B-C5B-O5B
6	C	1922	FAD	C4'-C5'-O5'-P
6	F	1923	FAD	P-O3P-PA-O1A

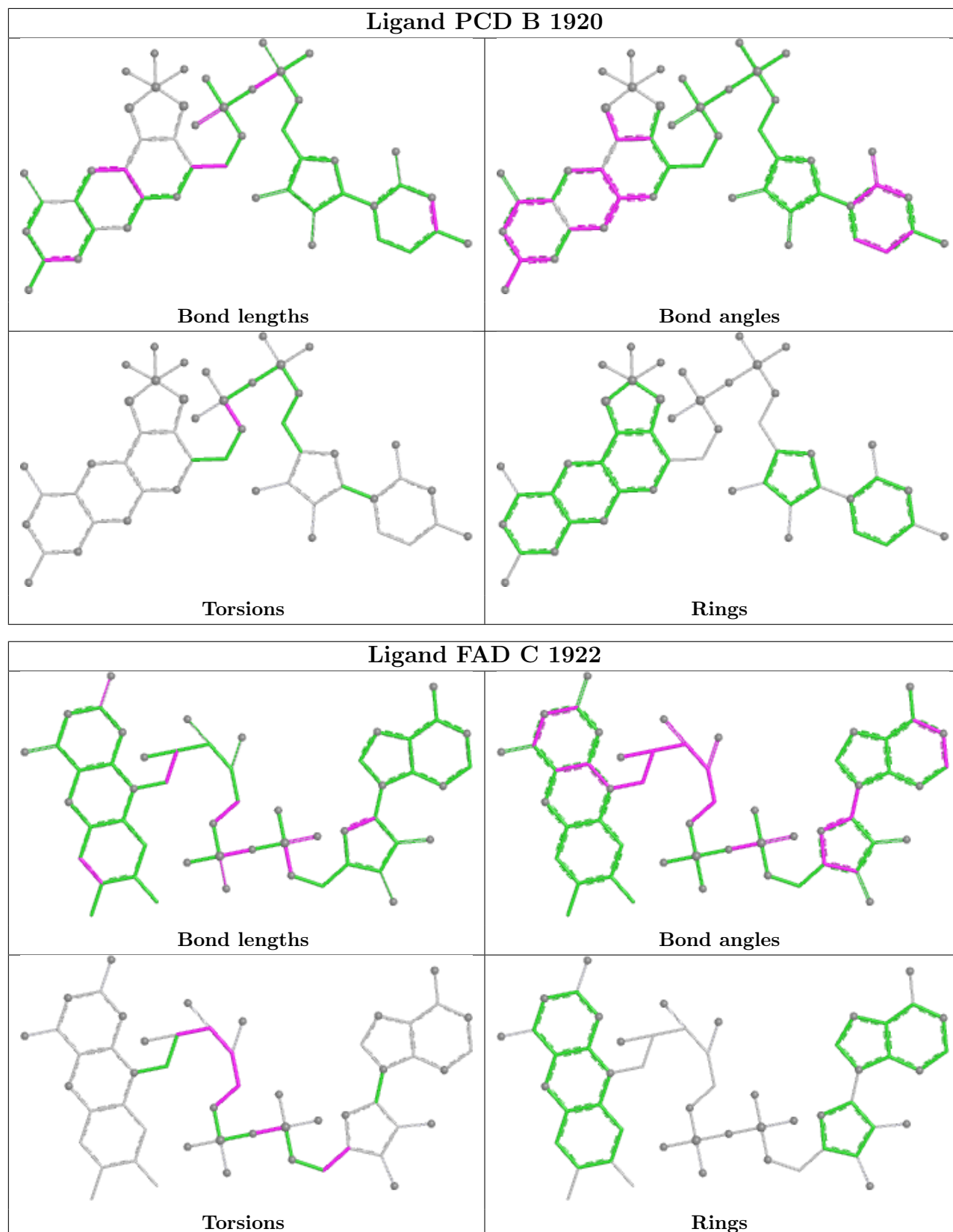
There are no ring outliers.

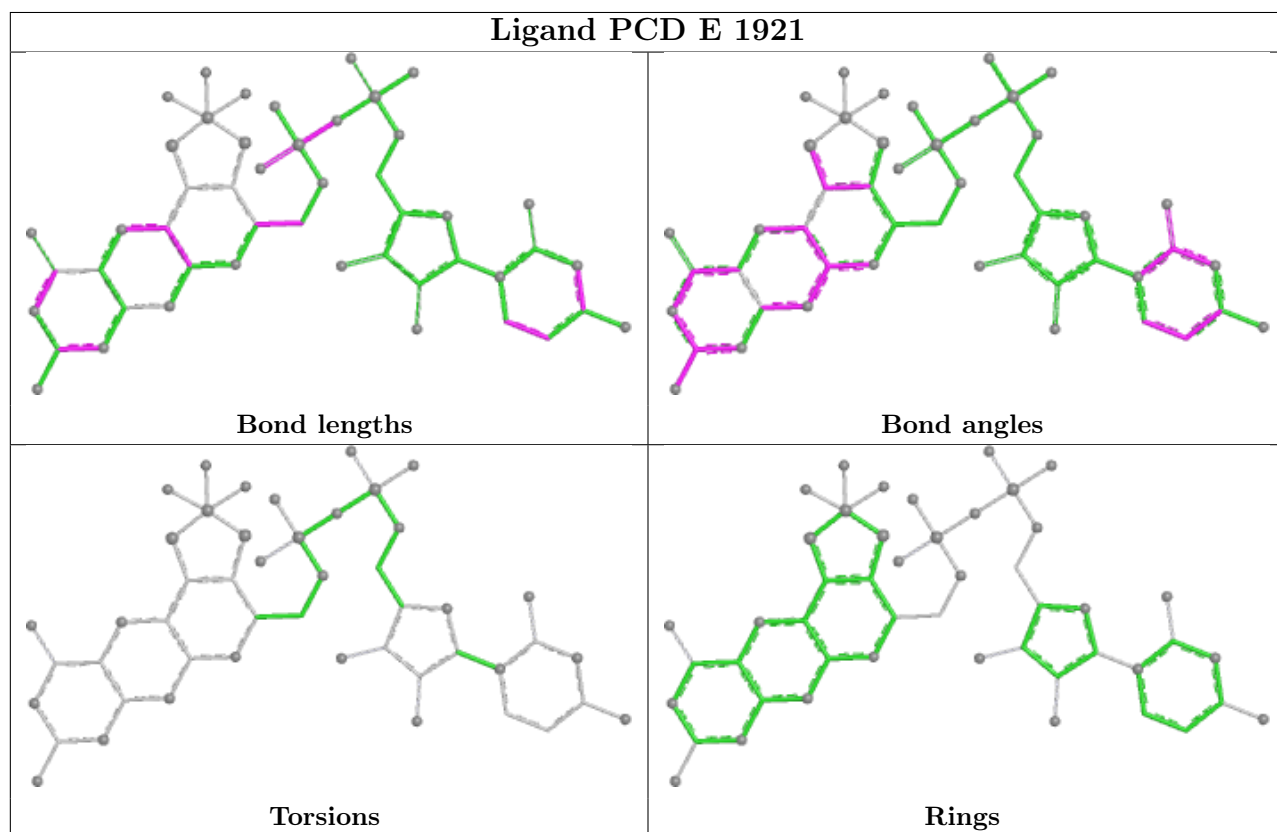
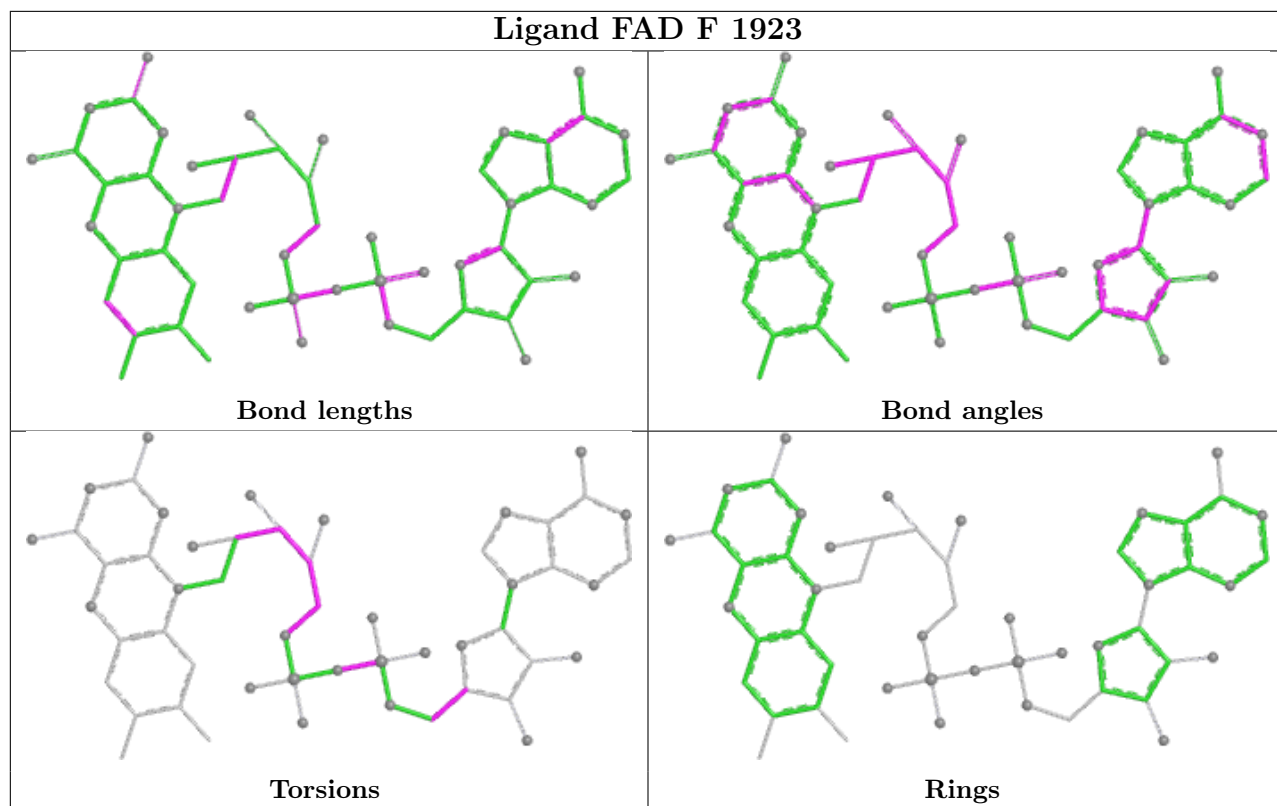
4 monomers are involved in 23 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
5	B	1920	PCD	6	0
6	C	1922	FAD	6	0
6	F	1923	FAD	7	0
5	E	1921	PCD	4	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 [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.