



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 9, 2026 – 11:23 AM UTC

PDB ID : 3W5U / pdb_00003w5u
Title : Cross-linked complex between Ferredoxin and Ferredoxin-NADP⁺ reductase
Authors : Kimata-Ariga, Y.; Kubota-Kawai, H.; Muraki, N.; Hase, T.; Kurisu, G.
Deposited on : 2013-02-06
Resolution : 2.70 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)	:	2.0
EDS	:	3.0
Buster-report	:	wwPDB partial adaption of 1.1.7 (2018)
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4	:	9.0.010 (Gargrove)
Density-Fitness	:	1.0.12
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.49

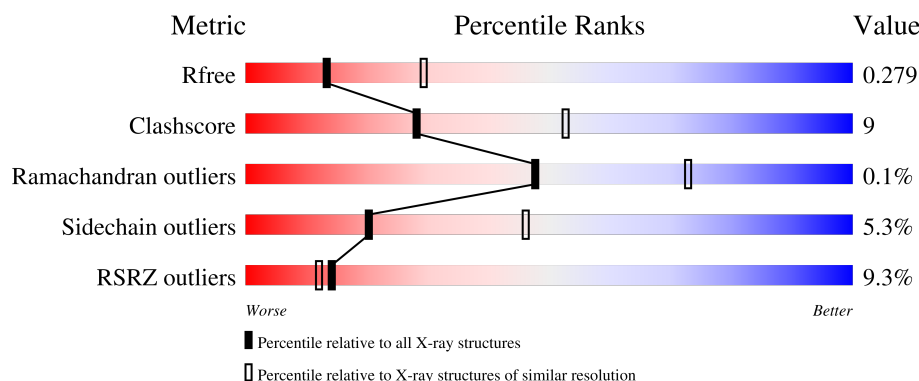
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.70 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))
R_{free}	180053	3538 (2.70-2.70)
Clashscore	190562	3843 (2.70-2.70)
Ramachandran outliers	187476	3778 (2.70-2.70)
Sidechain outliers	187428	3778 (2.70-2.70)
RSRZ outliers	180081	3538 (2.70-2.70)

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 $\leq 5\%$. The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density. The numeric value is given above the bar.

Mol	Chain	Length	Quality of chain
1	A	314	
1	C	314	
1	E	314	
1	G	314	
2	B	98	

Continued on next page...

Continued from previous page...

Mol	Chain	Length	Quality of chain
2	D	98	9% 59% 29% 7%
2	F	98	6% 65% 26% 5%
2	H	98	17% 61% 28% 5% 6%

2 Entry composition

There are 5 unique types of molecules in this entry. The entry contains 12485 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 Ferredoxin.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	296	Total	C	N	O	S	0	0	0
			2352	1500	390	445	17			
1	C	296	Total	C	N	O	S	0	0	0
			2352	1500	390	445	17			
1	E	296	Total	C	N	O	S	0	0	0
			2352	1500	390	445	17			
1	G	296	Total	C	N	O	S	0	0	0
			2352	1500	390	445	17			

There are 4 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	19	CYS	GLU	engineered mutation	UNP Q9SLP6
C	19	CYS	GLU	engineered mutation	UNP Q9SLP6
E	19	CYS	GLU	engineered mutation	UNP Q9SLP6
G	19	CYS	GLU	engineered mutation	UNP Q9SLP6

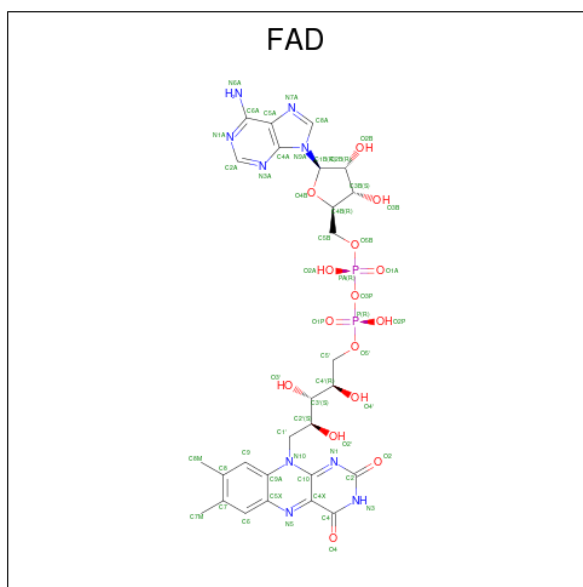
- Molecule 2 is a protein called Ferredoxin-1, chloroplastic.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	92	Total	C	N	O	S	0	0	0
			693	427	109	152	5			
2	D	95	Total	C	N	O	S	0	0	0
			719	443	112	159	5			
2	F	94	Total	C	N	O	S	0	0	0
			711	437	111	158	5			
2	H	92	Total	C	N	O	S	0	0	0
			693	427	109	152	5			

There are 4 discrepancies between the modelled and reference sequences:

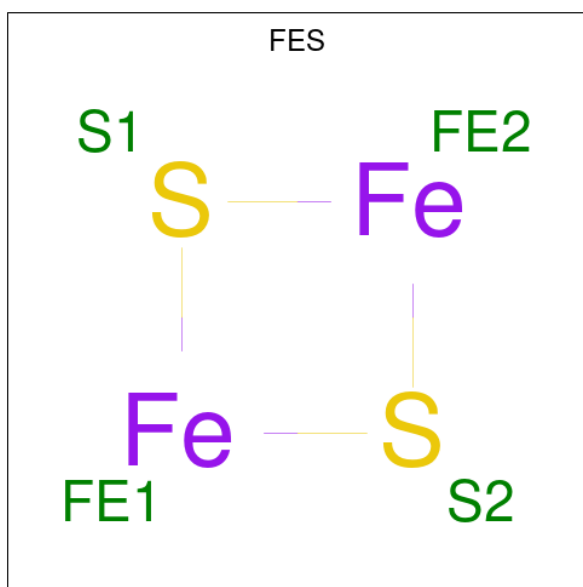
Chain	Residue	Modelled	Actual	Comment	Reference
B	59	CYS	SER	engineered mutation	UNP P27787
D	59	CYS	SER	engineered mutation	UNP P27787
F	59	CYS	SER	engineered mutation	UNP P27787
H	59	CYS	SER	engineered mutation	UNP P27787

- Molecule 3 is FLAVIN-ADENINE DINUCLEOTIDE (CCD ID: FAD) (formula: $C_{27}H_{33}N_9O_{15}P_2$).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
3	A	1	Total	C	N	O	P	
			53	27	9	15	2	0
3	C	1	Total	C	N	O	P	
			53	27	9	15	2	0
3	E	1	Total	C	N	O	P	
			53	27	9	15	2	0
3	G	1	Total	C	N	O	P	
			53	27	9	15	2	0

- Molecule 4 is FE2/S2 (INORGANIC) CLUSTER (CCD ID: FES) (formula: Fe_2S_2).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
4	B	1	Total	Fe	S	0	0
			4	2	2		
4	D	1	Total	Fe	S	0	0
			4	2	2		
4	F	1	Total	Fe	S	0	0
			4	2	2		
4	H	1	Total	Fe	S	0	0
			4	2	2		

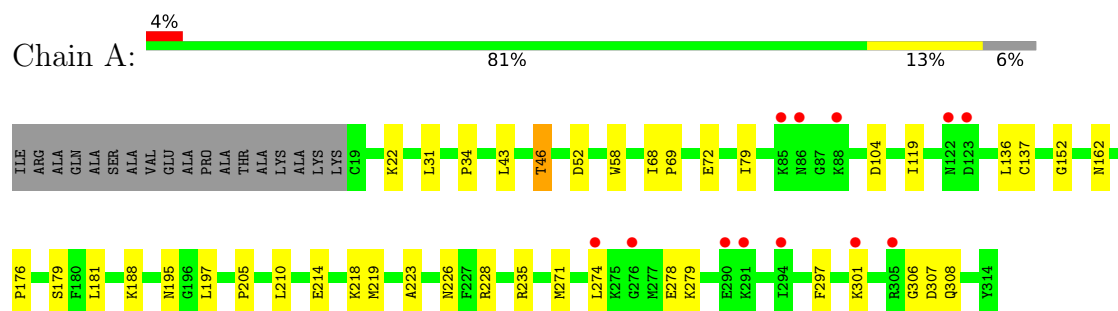
- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	11	Total	O	0	0
			11	11		
5	C	9	Total	O	0	0
			9	9		
5	E	7	Total	O	0	0
			7	7		
5	F	1	Total	O	0	0
			1	1		
5	G	5	Total	O	0	0
			5	5		

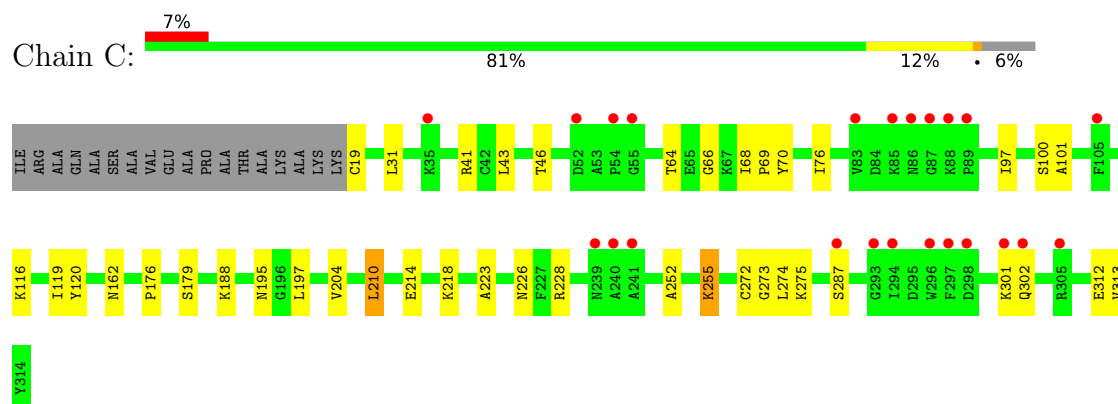
3 Residue-property plots [i](#)

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 and electron density. 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. A red dot above a residue indicates a poor fit to the electron density ($RSRZ > 2$). 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.

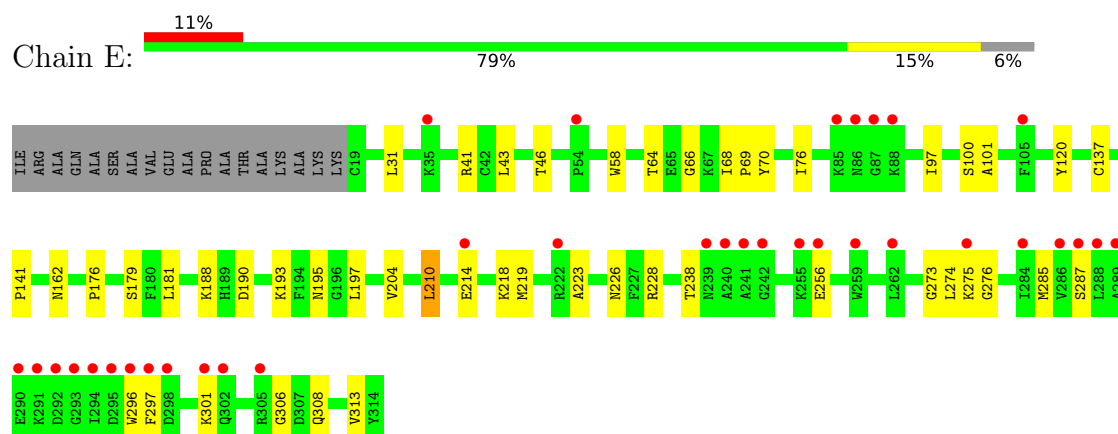
• Molecule 1: Ferredoxin



• Molecule 1: Ferredoxin

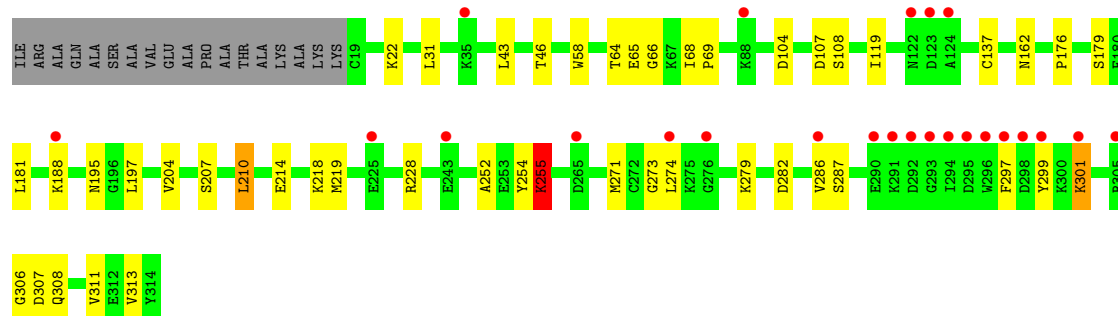


• Molecule 1: Ferredoxin



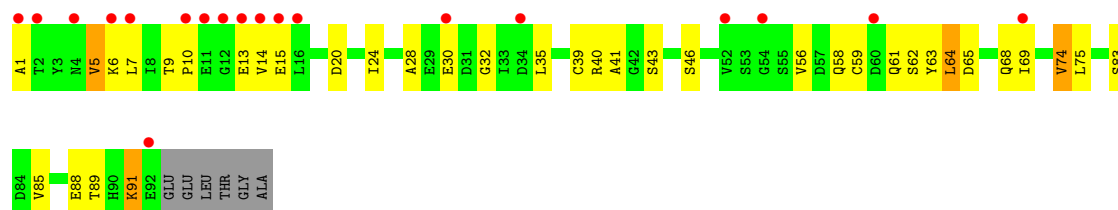
- Molecule 1: Ferredoxin

Chain G: 



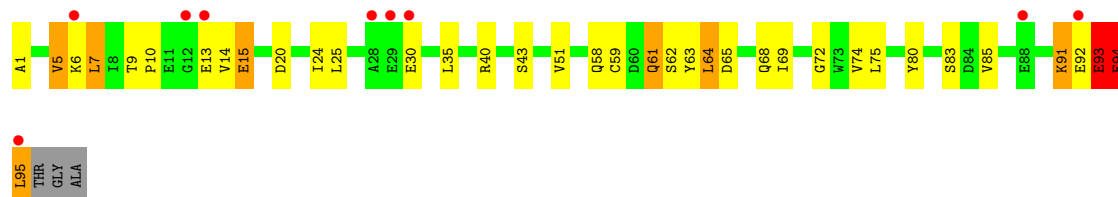
- Molecule 2: Ferredoxin-1, chloroplastic

Chain B: 



- Molecule 2: Ferredoxin-1, chloroplastic

Chain D: 



- Molecule 2: Ferredoxin-1, chloroplastic

Chain F: 



- Molecule 2: Ferredoxin-1, chloroplastic

Chain H: 



K91 E92 GLU GLU LEU THR GLY ALA

4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	59.20Å 153.63Å 100.11Å 90.00° 99.42° 90.00°	Depositor
Resolution (Å)	45.46 – 2.70 45.46 – 2.70	Depositor EDS
% Data completeness (in resolution range)	98.2 (45.46-2.70) 98.3 (45.46-2.70)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	16.28 (at 2.69Å)	Xtriage
Refinement program	REFMAC 5.6.0117	Depositor
R, R_{free}	0.226 , 0.280 0.228 , 0.279	Depositor DCC
R_{free} test set	2445 reflections (5.05%)	wwPDB-VP
Wilson B-factor (Å ²)	23.0	Xtriage
Anisotropy	0.168	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.32 , 30.0	EDS
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.33$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.89	EDS
Total number of atoms	12485	wwPDB-VP
Average B, all atoms (Å ²)	28.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 12.32% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

²Theoretical values of $\langle |L| \rangle$, $\langle L^2 \rangle$ for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

5 Model quality

5.1 Standard geometry

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

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	0.75	0/2404	0.87	0/3237
1	C	0.73	0/2404	0.87	1/3237 (0.0%)
1	E	0.72	0/2404	0.89	2/3237 (0.1%)
1	G	0.79	0/2404	0.91	2/3237 (0.1%)
2	B	0.77	0/705	0.94	3/963 (0.3%)
2	D	0.77	0/731	1.00	3/998 (0.3%)
2	F	0.77	1/723 (0.1%)	0.96	2/987 (0.2%)
2	H	0.79	0/705	0.93	1/963 (0.1%)
All	All	0.75	1/12480 (0.0%)	0.90	14/16859 (0.1%)

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand. A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
1	E	0	1
1	G	0	1
2	D	0	3
All	All	0	5

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	F	78	HIS	CG-CD2	5.06	1.41	1.35

All (14) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	G	255	LYS	N-CA-C	-7.70	102.22	111.69

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	D	93	GLU	N-CA-C	-6.92	104.87	113.38
2	F	91	LYS	N-CA-C	6.17	118.78	110.88
2	B	91	LYS	N-CA-C	6.12	117.78	110.44
2	H	91	LYS	N-CA-C	6.00	117.64	110.44
2	D	24	ILE	N-CA-C	5.76	116.41	110.36
1	G	299	TYR	N-CA-C	-5.71	105.20	111.82
2	D	91	LYS	N-CA-C	5.68	117.25	110.44
1	E	276	GLY	N-CA-C	-5.57	107.27	113.79
2	B	46	SER	N-CA-C	5.54	118.03	111.33
2	F	18	VAL	N-CA-C	5.27	113.74	107.73
1	C	275	LYS	N-CA-C	-5.15	102.98	110.24
1	E	275	LYS	N-CA-C	-5.12	103.02	110.24
2	B	24	ILE	N-CA-C	5.12	115.73	110.36

There are no chirality outliers.

All (5) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
2	D	92	GLU	Peptide
2	D	93	GLU	Peptide
2	D	94	GLU	Peptide
1	E	238	THR	Peptide
1	G	254	TYR	Peptide

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	2352	0	2326	27	0
1	C	2352	0	2326	31	0
1	E	2352	0	2326	31	0
1	G	2352	0	2326	27	0
2	B	693	0	640	29	0
2	D	719	0	663	29	0
2	F	711	0	652	20	0
2	H	693	0	640	29	0
3	A	53	0	31	3	0

Continued on next page...

Continued from previous page...

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
3	C	53	0	31	2	0
3	E	53	0	31	2	0
3	G	53	0	31	3	0
4	B	4	0	0	1	0
4	D	4	0	0	1	0
4	F	4	0	0	1	0
4	H	4	0	0	1	0
5	A	11	0	0	3	0
5	C	9	0	0	0	0
5	E	7	0	0	0	0
5	F	1	0	0	0	0
5	G	5	0	0	0	0
All	All	12485	0	12023	218	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 (218) 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)
2:H:64:LEU:HD22	2:H:75:LEU:CD1	1.68	1.23
2:B:64:LEU:HD22	2:B:75:LEU:CD1	1.71	1.20
2:D:64:LEU:HD22	2:D:75:LEU:CD1	1.70	1.20
2:F:64:LEU:HD22	2:F:75:LEU:CD1	1.70	1.20
2:H:64:LEU:HD22	2:H:75:LEU:HD11	1.33	1.05
2:B:64:LEU:HD22	2:B:75:LEU:HD12	1.37	1.04
2:D:64:LEU:HD22	2:D:75:LEU:HD12	1.36	1.03
2:F:64:LEU:HD22	2:F:75:LEU:HD12	1.32	1.03
2:B:64:LEU:HD22	2:B:75:LEU:HD11	1.43	1.01
2:D:64:LEU:HD22	2:D:75:LEU:HD11	1.44	0.97
2:H:64:LEU:HD22	2:H:75:LEU:HD12	1.45	0.96
2:F:64:LEU:HD22	2:F:75:LEU:HD11	1.47	0.95
1:G:297:PHE:O	1:G:301:LYS:HG2	1.69	0.92
2:D:94:GLU:HA	2:D:94:GLU:OE1	1.75	0.85
2:B:32:GLY:HA2	1:C:301:LYS:HE2	1.59	0.85
1:E:162:ASN:ND2	1:E:195:ASN:HB3	1.95	0.82
1:A:162:ASN:ND2	1:A:195:ASN:HB3	1.95	0.80
1:C:162:ASN:ND2	1:C:195:ASN:HB3	1.96	0.80
1:G:162:ASN:ND2	1:G:195:ASN:HB3	1.96	0.79
2:H:65:ASP:H	2:H:68:GLN:HE21	1.28	0.79
2:B:32:GLY:HA2	1:C:301:LYS:CE	2.13	0.77

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:65:ASP:H	2:B:68:GLN:NE2	1.81	0.77
2:B:65:ASP:H	2:B:68:GLN:HE21	1.32	0.76
2:H:65:ASP:H	2:H:68:GLN:NE2	1.83	0.75
2:B:64:LEU:CD2	2:B:75:LEU:HD12	2.17	0.74
2:F:64:LEU:CD2	2:F:75:LEU:HD12	2.14	0.73
2:D:64:LEU:CD2	2:D:75:LEU:HD12	2.15	0.73
2:H:64:LEU:CD2	2:H:75:LEU:HD12	2.19	0.72
3:A:401:FAD:H3B	3:A:401:FAD:H8A	1.71	0.72
2:D:65:ASP:H	2:D:68:GLN:NE2	1.91	0.69
1:E:301:LYS:CE	2:H:32:GLY:HA2	2.22	0.69
1:G:297:PHE:O	1:G:301:LYS:CG	2.38	0.69
2:D:65:ASP:H	2:D:68:GLN:HE21	1.40	0.68
1:G:58:TRP:CD1	1:G:137:CYS:HG	2.10	0.68
1:E:301:LYS:HE2	2:H:32:GLY:HA2	1.76	0.66
3:G:401:FAD:H8A	3:G:401:FAD:H3B	1.77	0.66
2:B:6:LYS:HD3	2:B:13:GLU:OE1	1.95	0.66
1:G:274:LEU:HD22	1:G:274:LEU:H	1.60	0.66
2:F:65:ASP:H	2:F:68:GLN:NE2	1.93	0.66
2:H:6:LYS:HD3	2:H:13:GLU:OE1	1.98	0.64
2:F:9:THR:HB	2:F:10:PRO:HD2	1.82	0.62
2:F:65:ASP:H	2:F:68:GLN:HE21	1.48	0.62
1:C:197:LEU:HD11	1:C:228:ARG:HD3	1.82	0.62
2:H:64:LEU:CD2	2:H:75:LEU:CD1	2.62	0.61
2:F:75:LEU:HD23	4:F:101:FES:S1	2.41	0.61
2:D:94:GLU:OE1	2:D:94:GLU:CA	2.44	0.60
2:B:32:GLY:HA2	1:C:301:LYS:NZ	2.17	0.60
1:A:176:PRO:O	1:A:179:SER:HB3	2.02	0.60
2:D:75:LEU:HD23	4:D:101:FES:S1	2.42	0.60
1:A:197:LEU:HD11	1:A:228:ARG:HD3	1.84	0.59
1:A:297:PHE:O	1:A:301:LYS:HG3	2.02	0.59
1:A:58:TRP:CD1	1:A:137:CYS:HG	2.20	0.59
2:B:32:GLY:CA	1:C:301:LYS:NZ	2.66	0.59
1:C:162:ASN:HD22	1:C:195:ASN:HB3	1.68	0.58
3:A:401:FAD:H8A	3:A:401:FAD:C3B	2.32	0.58
1:C:274:LEU:HD22	1:C:274:LEU:H	1.68	0.58
2:B:43:SER:HA	2:B:63:TYR:HB2	1.85	0.58
2:F:61:GLN:HG3	2:F:75:LEU:HD13	1.85	0.57
1:G:68:ILE:O	1:G:68:ILE:HG22	2.04	0.57
2:D:61:GLN:HE22	2:D:69:ILE:HD11	1.69	0.57
2:D:83:SER:O	2:D:85:VAL:HG23	2.04	0.57
1:G:162:ASN:HD21	1:G:195:ASN:HB3	1.68	0.57

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:E:274:LEU:HD22	1:E:274:LEU:H	1.71	0.56
1:C:70:TYR:CE1	1:C:101:ALA:HA	2.40	0.56
1:E:162:ASN:HD22	1:E:195:ASN:HB3	1.70	0.56
2:D:9:THR:HB	2:D:10:PRO:HD2	1.88	0.55
2:B:5:VAL:HG23	2:B:7:LEU:HD13	1.88	0.55
2:H:43:SER:HA	2:H:63:TYR:HB2	1.88	0.55
2:B:9:THR:HB	2:B:10:PRO:HD2	1.88	0.55
2:D:61:GLN:HG3	2:D:75:LEU:HD13	1.88	0.55
2:D:43:SER:HB3	2:D:62:SER:HB2	1.87	0.55
2:F:6:LYS:HD3	2:F:13:GLU:OE1	2.07	0.55
1:A:31:LEU:CD1	1:A:69:PRO:HD2	2.37	0.55
2:D:5:VAL:HG23	2:D:7:LEU:HD13	1.89	0.55
2:F:5:VAL:HG23	2:F:7:LEU:HD13	1.88	0.54
2:H:1:ALA:O	2:H:20:ASP:N	2.39	0.54
2:H:5:VAL:HG23	2:H:7:LEU:HD13	1.88	0.54
2:B:61:GLN:HG3	2:B:75:LEU:HD13	1.88	0.54
1:E:176:PRO:O	1:E:179:SER:HB3	2.08	0.54
1:A:162:ASN:HD22	1:A:195:ASN:HB3	1.71	0.54
2:F:83:SER:O	2:F:85:VAL:HG23	2.08	0.54
2:B:75:LEU:HD23	4:B:101:FES:S1	2.48	0.54
1:C:100:SER:O	1:C:101:ALA:C	2.49	0.54
2:H:9:THR:HB	2:H:10:PRO:HD2	1.90	0.54
2:H:75:LEU:HD23	4:H:101:FES:S1	2.48	0.54
1:E:162:ASN:HD21	1:E:195:ASN:HB3	1.71	0.53
1:G:197:LEU:HD11	1:G:228:ARG:HD3	1.90	0.53
2:D:6:LYS:HD3	2:D:13:GLU:OE1	2.08	0.53
3:G:401:FAD:H8A	3:G:401:FAD:C3B	2.38	0.53
2:D:64:LEU:CD2	2:D:75:LEU:CD1	2.64	0.53
1:C:41:ARG:NH2	1:G:104:ASP:O	2.42	0.53
1:E:301:LYS:NZ	2:H:32:GLY:HA2	2.24	0.53
3:C:401:FAD:H3B	3:C:401:FAD:H8A	1.91	0.53
3:E:401:FAD:H8A	3:E:401:FAD:H3B	1.91	0.53
2:F:61:GLN:HE22	2:F:69:ILE:HD11	1.74	0.53
1:C:274:LEU:HD22	1:C:274:LEU:N	2.23	0.52
2:D:43:SER:HA	2:D:63:TYR:HB2	1.90	0.52
2:D:61:GLN:NE2	2:D:64:LEU:HB2	2.24	0.52
2:B:1:ALA:O	2:B:20:ASP:N	2.41	0.52
2:B:28:ALA:CB	2:B:35:LEU:HD12	2.39	0.52
1:G:271:MET:HE3	1:G:311:VAL:HG22	1.92	0.52
1:G:274:LEU:HD22	1:G:274:LEU:N	2.24	0.52
1:E:297:PHE:O	1:E:301:LYS:HG3	2.10	0.51

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:H:61:GLN:HE22	2:H:69:ILE:HD11	1.76	0.51
1:G:31:LEU:CD1	1:G:69:PRO:HD2	2.40	0.51
2:H:64:LEU:CD2	2:H:75:LEU:HD11	2.24	0.51
1:E:204:VAL:HG21	1:E:210:LEU:HD13	1.92	0.50
1:G:282:ASP:O	1:G:286:VAL:HG23	2.10	0.50
1:C:252:ALA:O	1:C:255:LYS:HB3	2.12	0.50
1:E:68:ILE:HG22	1:E:68:ILE:O	2.10	0.50
1:G:273:GLY:O	1:G:313:VAL:HA	2.12	0.50
2:D:6:LYS:HG3	2:D:15:GLU:HG2	1.93	0.50
3:A:401:FAD:C3B	3:A:401:FAD:C8A	2.89	0.50
1:A:278:GLU:HG2	5:A:510:HOH:O	2.11	0.50
1:C:19:CYS:HB2	2:D:80:TYR:CE2	2.46	0.49
1:E:301:LYS:NZ	2:H:32:GLY:CA	2.75	0.49
2:H:88:GLU:HB3	2:H:91:LYS:HE3	1.94	0.49
2:B:88:GLU:HB3	2:B:91:LYS:HE3	1.94	0.49
1:E:76:ILE:HG23	1:E:97:ILE:HD11	1.94	0.49
2:F:43:SER:HA	2:F:63:TYR:HB2	1.93	0.49
1:A:205:PRO:O	1:A:235:ARG:HB2	2.13	0.49
2:B:28:ALA:CB	2:B:35:LEU:CD1	2.91	0.49
1:A:46:THR:OG1	1:E:141:PRO:HG2	2.13	0.48
2:F:51:VAL:HG12	2:F:72:GLY:O	2.13	0.48
1:C:31:LEU:CD1	1:C:69:PRO:HD2	2.44	0.48
1:C:162:ASN:HD21	1:C:195:ASN:HB3	1.74	0.48
1:E:70:TYR:CE1	1:E:101:ALA:HA	2.49	0.48
1:C:214:GLU:CD	1:C:214:GLU:H	2.21	0.48
2:D:91:LYS:C	2:D:93:GLU:H	2.21	0.47
1:E:120:TYR:CD2	3:E:401:FAD:C2A	2.97	0.47
1:E:273:GLY:O	1:E:313:VAL:HA	2.15	0.47
1:A:306:GLY:O	1:A:308:GLN:HG3	2.15	0.47
2:D:25:LEU:HD12	2:D:35:LEU:HB2	1.97	0.47
1:C:68:ILE:HG22	1:C:68:ILE:O	2.14	0.47
2:B:89:THR:O	2:B:91:LYS:HG2	2.15	0.47
2:F:25:LEU:HD12	2:F:35:LEU:HB2	1.96	0.46
1:A:274:LEU:H	1:A:274:LEU:HD22	1.81	0.46
1:C:176:PRO:O	1:C:179:SER:HB3	2.15	0.46
1:A:34:PRO:HB3	1:A:79:ILE:HD11	1.97	0.46
1:E:274:LEU:HD22	1:E:274:LEU:N	2.30	0.46
2:F:6:LYS:HG3	2:F:15:GLU:HG2	1.97	0.46
2:B:61:GLN:HG2	2:B:62:SER:N	2.27	0.46
1:A:271:MET:HE1	5:A:510:HOH:O	2.16	0.46
2:D:64:LEU:CD2	2:D:75:LEU:HD11	2.30	0.46

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:H:56:VAL:HG21	2:H:74:VAL:HG13	1.97	0.46
2:B:58:GLN:NE2	2:B:75:LEU:H	2.13	0.46
1:E:64:THR:C	1:E:66:GLY:N	2.73	0.46
1:E:197:LEU:HD11	1:E:228:ARG:HD3	1.98	0.46
1:E:285:MET:HB3	1:E:296:TRP:CD2	2.51	0.46
2:H:83:SER:O	2:H:85:VAL:HG23	2.15	0.46
1:G:162:ASN:HD22	1:G:195:ASN:HB3	1.78	0.45
1:A:152:GLY:HA3	5:A:506:HOH:O	2.17	0.45
1:A:162:ASN:HD21	1:A:195:ASN:HB3	1.74	0.45
2:D:51:VAL:HG12	2:D:72:GLY:O	2.17	0.45
1:G:252:ALA:O	1:G:255:LYS:HB3	2.17	0.45
2:H:89:THR:O	2:H:91:LYS:HG2	2.17	0.45
1:A:104:ASP:O	1:E:41:ARG:NH2	2.50	0.45
2:H:65:ASP:N	2:H:68:GLN:HE21	2.05	0.45
3:G:401:FAD:C3B	3:G:401:FAD:C8A	2.95	0.45
2:B:65:ASP:N	2:B:68:GLN:HE21	2.06	0.45
1:G:176:PRO:O	1:G:179:SER:HB3	2.17	0.45
2:D:1:ALA:O	2:D:20:ASP:N	2.48	0.44
2:D:58:GLN:NE2	2:D:75:LEU:H	2.16	0.44
2:F:58:GLN:NE2	2:F:75:LEU:H	2.16	0.44
1:A:214:GLU:H	1:A:214:GLU:CD	2.24	0.44
1:A:181:LEU:HB3	1:A:219:MET:SD	2.58	0.44
1:A:223:ALA:HB1	1:A:226:ASN:HB2	2.00	0.44
1:C:204:VAL:HG21	1:C:210:LEU:HD13	1.99	0.44
1:E:210:LEU:HD12	1:E:210:LEU:HA	1.83	0.44
1:E:190:ASP:O	1:E:193:LYS:NZ	2.52	0.43
1:C:274:LEU:H	1:C:274:LEU:CD2	2.31	0.43
1:G:210:LEU:HD12	1:G:210:LEU:HA	1.88	0.43
1:A:68:ILE:HG22	1:A:68:ILE:O	2.18	0.43
1:C:120:TYR:CD2	3:C:401:FAD:C2A	3.02	0.43
1:C:273:GLY:O	1:C:313:VAL:HA	2.18	0.43
1:G:181:LEU:HB3	1:G:219:MET:SD	2.59	0.43
1:G:306:GLY:O	1:G:308:GLN:HG3	2.18	0.43
1:C:70:TYR:CD1	1:C:70:TYR:C	2.97	0.43
1:E:214:GLU:CD	1:E:214:GLU:H	2.26	0.43
1:C:223:ALA:HB1	1:C:226:ASN:HB2	2.00	0.43
2:D:95:LEU:C	2:D:95:LEU:HD12	2.43	0.43
1:G:214:GLU:CD	1:G:214:GLU:H	2.25	0.43
1:G:274:LEU:H	1:G:274:LEU:CD2	2.27	0.43
2:H:61:GLN:HG2	2:H:62:SER:N	2.33	0.43
1:G:64:THR:C	1:G:66:GLY:N	2.76	0.42

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:G:107:ASP:O	1:G:108:SER:HB2	2.19	0.42
2:B:83:SER:O	2:B:85:VAL:HG23	2.19	0.42
1:E:58:TRP:CD1	1:E:137:CYS:HG	2.37	0.42
1:G:207:SER:O	1:G:210:LEU:HB2	2.18	0.42
1:A:72:GLU:H	1:A:72:GLU:CD	2.28	0.42
2:H:28:ALA:CB	2:H:35:LEU:HD12	2.50	0.42
1:A:31:LEU:HD11	1:A:69:PRO:HD2	2.02	0.42
2:D:1:ALA:HA	2:D:20:ASP:OD2	2.19	0.42
1:A:52:ASP:OD1	1:A:52:ASP:N	2.50	0.42
2:H:6:LYS:HG3	2:H:15:GLU:HG2	2.00	0.42
1:C:197:LEU:HD11	1:C:228:ARG:CD	2.48	0.41
1:G:204:VAL:HG21	1:G:210:LEU:HD13	2.02	0.41
2:B:61:GLN:HE22	2:B:69:ILE:HD11	1.85	0.41
1:E:31:LEU:CD1	1:E:69:PRO:HD2	2.51	0.41
2:B:56:VAL:HG21	2:B:74:VAL:HG13	2.02	0.41
1:A:136:LEU:HD23	1:A:136:LEU:HA	1.87	0.41
1:A:301:LYS:HG3	1:A:301:LYS:H	1.50	0.41
1:C:64:THR:C	1:C:66:GLY:N	2.76	0.41
1:C:76:ILE:HG23	1:C:97:ILE:HD11	2.02	0.41
2:H:58:GLN:NE2	2:H:75:LEU:H	2.19	0.41
2:H:61:GLN:HG3	2:H:75:LEU:HD13	2.02	0.41
1:E:223:ALA:HB1	1:E:226:ASN:HB2	2.03	0.41
2:B:39:CYS:SG	2:B:41:ALA:N	2.90	0.41
1:E:306:GLY:O	1:E:308:GLN:HG3	2.21	0.41
1:A:22:LYS:HE2	1:A:307:ASP:HB3	2.03	0.41
1:C:272:CYS:HA	1:C:312:GLU:O	2.21	0.41
1:E:181:LEU:HB3	1:E:219:MET:SD	2.62	0.40
1:E:100:SER:O	1:E:101:ALA:C	2.62	0.40
2:B:32:GLY:HA3	1:C:301:LYS:NZ	2.35	0.40
1:C:302:GLN:O	1:C:302:GLN:HG2	2.21	0.40
2:F:61:GLN:NE2	2:F:64:LEU:HB2	2.37	0.40
2:F:64:LEU:CD2	2:F:75:LEU:HD11	2.35	0.40
1:G:22:LYS:HE2	1:G:307:ASP:HB3	2.03	0.40

There are no symmetry-related clashes.

5.3 Torsion angles

5.3.1 Protein backbone

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	294/314 (94%)	285 (97%)	9 (3%)	0	100	100
1	C	294/314 (94%)	285 (97%)	9 (3%)	0	100	100
1	E	294/314 (94%)	286 (97%)	8 (3%)	0	100	100
1	G	294/314 (94%)	281 (96%)	12 (4%)	1 (0%)	36	60
2	B	90/98 (92%)	86 (96%)	4 (4%)	0	100	100
2	D	93/98 (95%)	87 (94%)	5 (5%)	1 (1%)	11	29
2	F	92/98 (94%)	88 (96%)	4 (4%)	0	100	100
2	H	90/98 (92%)	84 (93%)	6 (7%)	0	100	100
All	All	1541/1648 (94%)	1482 (96%)	57 (4%)	2 (0%)	48	73

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
2	D	94	GLU
1	G	65	GLU

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	254/265 (96%)	247 (97%)	7 (3%)	38	68
1	C	254/265 (96%)	245 (96%)	9 (4%)	32	61
1	E	254/265 (96%)	247 (97%)	7 (3%)	38	68

Continued on next page...

Continued from previous page...

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	G	254/265 (96%)	244 (96%)	10 (4%)	28	57
2	B	79/83 (95%)	71 (90%)	8 (10%)	7	18
2	D	82/83 (99%)	69 (84%)	13 (16%)	2	7
2	F	81/83 (98%)	71 (88%)	10 (12%)	4	12
2	H	79/83 (95%)	72 (91%)	7 (9%)	9	23
All	All	1337/1392 (96%)	1266 (95%)	71 (5%)	20	46

All (71) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	43	LEU
1	A	46	THR
1	A	119	ILE
1	A	188	LYS
1	A	210	LEU
1	A	218	LYS
1	A	279	LYS
2	B	5	VAL
2	B	14	VAL
2	B	15	GLU
2	B	30	GLU
2	B	40	ARG
2	B	59	CYS
2	B	64	LEU
2	B	74	VAL
1	C	43	LEU
1	C	46	THR
1	C	116	LYS
1	C	119	ILE
1	C	188	LYS
1	C	210	LEU
1	C	218	LYS
1	C	255	LYS
1	C	287	SER
2	D	5	VAL
2	D	7	LEU
2	D	14	VAL
2	D	15	GLU
2	D	30	GLU
2	D	40	ARG

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type
2	D	59	CYS
2	D	61	GLN
2	D	64	LEU
2	D	74	VAL
2	D	93	GLU
2	D	94	GLU
2	D	95	LEU
1	E	43	LEU
1	E	46	THR
1	E	188	LYS
1	E	210	LEU
1	E	218	LYS
1	E	256	GLU
1	E	287	SER
2	F	5	VAL
2	F	7	LEU
2	F	14	VAL
2	F	15	GLU
2	F	40	ARG
2	F	59	CYS
2	F	61	GLN
2	F	64	LEU
2	F	74	VAL
2	F	94	GLU
1	G	43	LEU
1	G	46	THR
1	G	119	ILE
1	G	188	LYS
1	G	210	LEU
1	G	218	LYS
1	G	255	LYS
1	G	279	LYS
1	G	287	SER
1	G	301	LYS
2	H	5	VAL
2	H	14	VAL
2	H	15	GLU
2	H	30	GLU
2	H	59	CYS
2	H	64	LEU
2	H	74	VAL

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (38)

such sidechains are listed below:

Mol	Chain	Res	Type
1	A	90	HIS
1	A	162	ASN
1	A	195	ASN
1	A	226	ASN
1	A	308	GLN
2	B	58	GLN
2	B	68	GLN
2	B	78	HIS
1	C	90	HIS
1	C	146	GLN
1	C	162	ASN
1	C	195	ASN
1	C	226	ASN
1	C	308	GLN
2	D	4	ASN
2	D	17	GLN
2	D	58	GLN
2	D	68	GLN
2	D	78	HIS
1	E	146	GLN
1	E	162	ASN
1	E	195	ASN
1	E	226	ASN
1	E	308	GLN
2	F	58	GLN
2	F	61	GLN
2	F	68	GLN
2	F	78	HIS
1	G	90	HIS
1	G	146	GLN
1	G	162	ASN
1	G	195	ASN
1	G	226	ASN
1	G	308	GLN
2	H	4	ASN
2	H	58	GLN
2	H	68	GLN
2	H	78	HIS

5.3.3 RNA ⓘ

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](#)

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	B	101	2	0,4,4	-	-	-		
3	FAD	A	401	-	58,58,58	1.58	10 (17%)	85,89,89	1.69	19 (22%)
3	FAD	E	401	-	58,58,58	1.54	10 (17%)	85,89,89	1.61	13 (15%)
4	FES	D	101	2	0,4,4	-	-	-		
4	FES	H	101	2	0,4,4	-	-	-		
3	FAD	C	401	-	58,58,58	1.56	11 (18%)	85,89,89	1.64	18 (21%)
3	FAD	G	401	-	58,58,58	1.60	9 (15%)	85,89,89	1.58	16 (18%)
4	FES	F	101	2	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	B	101	2	-	-	0/1/1/1
3	FAD	A	401	-	-	1/34/50/50	0/6/6/6
3	FAD	E	401	-	-	1/34/50/50	0/6/6/6
4	FES	D	101	2	-	-	0/1/1/1
4	FES	H	101	2	-	-	0/1/1/1
3	FAD	C	401	-	-	3/34/50/50	0/6/6/6

Continued on next page...

Continued from previous page...

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
3	FAD	G	401	-	-	3/34/50/50	0/6/6/6
4	FES	F	101	2	-	-	0/1/1/1

All (40) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	G	401	FAD	C9A-C5X	5.63	1.50	1.41
3	G	401	FAD	C5A-C4A	5.53	1.48	1.39
3	A	401	FAD	C5A-C4A	5.42	1.48	1.39
3	E	401	FAD	C5A-C4A	5.22	1.48	1.39
3	C	401	FAD	C9A-C5X	5.00	1.49	1.41
3	C	401	FAD	C5A-C4A	4.87	1.47	1.39
3	E	401	FAD	C9A-C5X	4.36	1.48	1.41
3	A	401	FAD	P-O3P	4.13	1.64	1.59
3	A	401	FAD	C9A-C5X	4.11	1.47	1.41
3	A	401	FAD	C4-N3	-3.76	1.31	1.38
3	C	401	FAD	P-O3P	3.72	1.63	1.59
3	E	401	FAD	C8-C7	3.62	1.49	1.40
3	G	401	FAD	C4-N3	-3.62	1.32	1.38
3	C	401	FAD	C8-C7	3.35	1.49	1.40
3	G	401	FAD	C8-C7	3.03	1.48	1.40
3	E	401	FAD	C5A-C6A	3.01	1.49	1.41
3	G	401	FAD	C5A-C6A	3.00	1.49	1.41
3	A	401	FAD	C8-C7	2.95	1.48	1.40
3	A	401	FAD	C5A-C6A	2.82	1.48	1.41
3	E	401	FAD	P-O3P	2.80	1.62	1.59
3	C	401	FAD	C4-N3	-2.70	1.33	1.38
3	C	401	FAD	C5A-C6A	2.65	1.48	1.41
3	E	401	FAD	C4-N3	-2.64	1.33	1.38
3	A	401	FAD	PA-O3P	2.64	1.62	1.59
3	G	401	FAD	C2-N3	-2.61	1.33	1.39
3	E	401	FAD	C4X-N5	2.48	1.36	1.30
3	A	401	FAD	C2-N3	-2.45	1.33	1.39
3	E	401	FAD	C8A-N7A	2.44	1.36	1.31
3	G	401	FAD	C4X-N5	2.34	1.35	1.30
3	G	401	FAD	C8A-N7A	2.30	1.36	1.31
3	A	401	FAD	C8A-N7A	2.29	1.36	1.31
3	C	401	FAD	C4X-N5	2.29	1.35	1.30
3	C	401	FAD	C5A-N7A	-2.29	1.34	1.39
3	C	401	FAD	PA-O3P	2.16	1.61	1.59
3	C	401	FAD	C8A-N7A	2.14	1.35	1.31
3	E	401	FAD	C5A-N7A	-2.08	1.35	1.39

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	E	401	FAD	C10-N10	2.04	1.41	1.37
3	C	401	FAD	C4A-N9A	-2.03	1.33	1.37
3	A	401	FAD	C5A-N7A	-2.02	1.35	1.39
3	G	401	FAD	C5A-N7A	-2.00	1.35	1.39

All (66) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	G	401	FAD	C5A-C4A-N3A	-5.61	118.99	126.72
3	E	401	FAD	C5A-C4A-N3A	-5.57	119.05	126.72
3	A	401	FAD	C5A-C4A-N3A	-5.28	119.44	126.72
3	C	401	FAD	C5A-C4A-N3A	-5.06	119.75	126.72
3	G	401	FAD	N3A-C4A-N9A	4.86	135.43	127.17
3	A	401	FAD	N3A-C4A-N9A	4.70	135.17	127.17
3	E	401	FAD	N3A-C4A-N9A	4.31	134.50	127.17
3	C	401	FAD	N3A-C4A-N9A	4.27	134.42	127.17
3	G	401	FAD	C4-C4X-N5	3.87	123.55	118.21
3	E	401	FAD	C2A-N3A-C4A	3.84	121.20	111.83
3	A	401	FAD	C4-C4X-N5	3.81	123.47	118.21
3	E	401	FAD	N3A-C2A-N1A	-3.64	123.08	128.58
3	C	401	FAD	N3A-C2A-N1A	-3.61	123.12	128.58
3	C	401	FAD	C2A-N3A-C4A	3.49	120.36	111.83
3	E	401	FAD	C9A-C5X-N5	-3.44	118.81	122.45
3	G	401	FAD	C2A-N3A-C4A	3.21	119.67	111.83
3	A	401	FAD	C2A-N3A-C4A	3.18	119.60	111.83
3	A	401	FAD	C9A-C5X-N5	-3.14	119.12	122.45
3	A	401	FAD	C4A-N9A-C8A	3.11	109.00	105.74
3	C	401	FAD	C4-C4X-N5	3.10	122.49	118.21
3	C	401	FAD	C9A-C5X-N5	-3.03	119.24	122.45
3	A	401	FAD	N3A-C2A-N1A	-2.98	124.08	128.58
3	C	401	FAD	C5X-C9A-N10	2.97	120.65	117.97
3	E	401	FAD	C4A-C5A-N7A	-2.96	107.20	110.58
3	G	401	FAD	C2B-C1B-N9A	-2.95	105.96	113.30
3	A	401	FAD	C4A-C5A-N7A	-2.95	107.21	110.58
3	A	401	FAD	C2B-C1B-N9A	-2.93	106.02	113.30
3	E	401	FAD	O4-C4-C4X	-2.93	118.79	126.53
3	E	401	FAD	O2-C2-N1	-2.93	116.94	121.80
3	C	401	FAD	O2-C2-N1	-2.89	117.00	121.80
3	G	401	FAD	C4A-C5A-N7A	-2.81	107.36	110.58
3	A	401	FAD	C4X-C4-N3	2.76	120.27	113.25
3	G	401	FAD	C4X-C4-N3	2.69	120.11	113.25
3	E	401	FAD	C5X-N5-C4X	2.67	122.40	118.09

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	C	401	FAD	C4A-C5A-N7A	-2.63	107.58	110.58
3	A	401	FAD	C10-N1-C2	2.62	122.52	116.85
3	G	401	FAD	N3A-C2A-N1A	-2.59	124.66	128.58
3	G	401	FAD	C10-N1-C2	2.57	122.41	116.85
3	C	401	FAD	O4-C4-C4X	-2.50	119.94	126.53
3	C	401	FAD	C4A-N9A-C8A	2.49	108.35	105.74
3	E	401	FAD	C4-C4X-N5	2.49	121.65	118.21
3	A	401	FAD	C4X-C10-N1	-2.46	118.55	124.59
3	C	401	FAD	C1'-C2'-C3'	2.46	116.33	109.66
3	G	401	FAD	C4A-N9A-C8A	2.44	108.30	105.74
3	A	401	FAD	C2A-N1A-C6A	2.44	122.73	118.73
3	A	401	FAD	C4X-C10-N10	2.43	119.96	116.48
3	E	401	FAD	C2B-C1B-N9A	-2.41	107.31	113.30
3	A	401	FAD	C5A-N7A-C8A	2.38	107.19	103.45
3	C	401	FAD	C10-N1-C2	2.34	121.92	116.85
3	C	401	FAD	C4X-C10-N1	-2.34	118.85	124.59
3	C	401	FAD	C2B-C1B-N9A	-2.34	107.49	113.30
3	A	401	FAD	C1'-C2'-C3'	2.31	115.93	109.66
3	E	401	FAD	C4X-C10-N1	-2.29	118.98	124.59
3	E	401	FAD	C5X-C9A-N10	2.26	120.01	117.97
3	G	401	FAD	C9A-C5X-N5	-2.24	120.08	122.45
3	G	401	FAD	C5A-N7A-C8A	2.22	106.94	103.45
3	A	401	FAD	C5X-N5-C4X	2.22	121.69	118.09
3	C	401	FAD	C2A-N1A-C6A	2.22	122.37	118.73
3	G	401	FAD	C4X-C10-N10	2.21	119.64	116.48
3	G	401	FAD	N6A-C6A-N1A	2.20	123.28	118.38
3	G	401	FAD	C4X-C10-N1	-2.20	119.20	124.59
3	C	401	FAD	C4X-C10-N10	2.17	119.58	116.48
3	A	401	FAD	C5X-C9A-N10	2.17	119.93	117.97
3	G	401	FAD	O3P-PA-O1A	-2.14	104.26	110.70
3	A	401	FAD	N6A-C6A-N1A	2.11	123.08	118.38
3	C	401	FAD	C4X-C4-N3	2.01	118.36	113.25

There are no chirality outliers.

All (8) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	G	401	FAD	C3B-C4B-C5B-O5B
3	C	401	FAD	PA-O3P-P-O1P
3	C	401	FAD	PA-O3P-P-O2P
3	G	401	FAD	PA-O3P-P-O1P
3	A	401	FAD	PA-O3P-P-O2P

Continued on next page...

Continued from previous page...

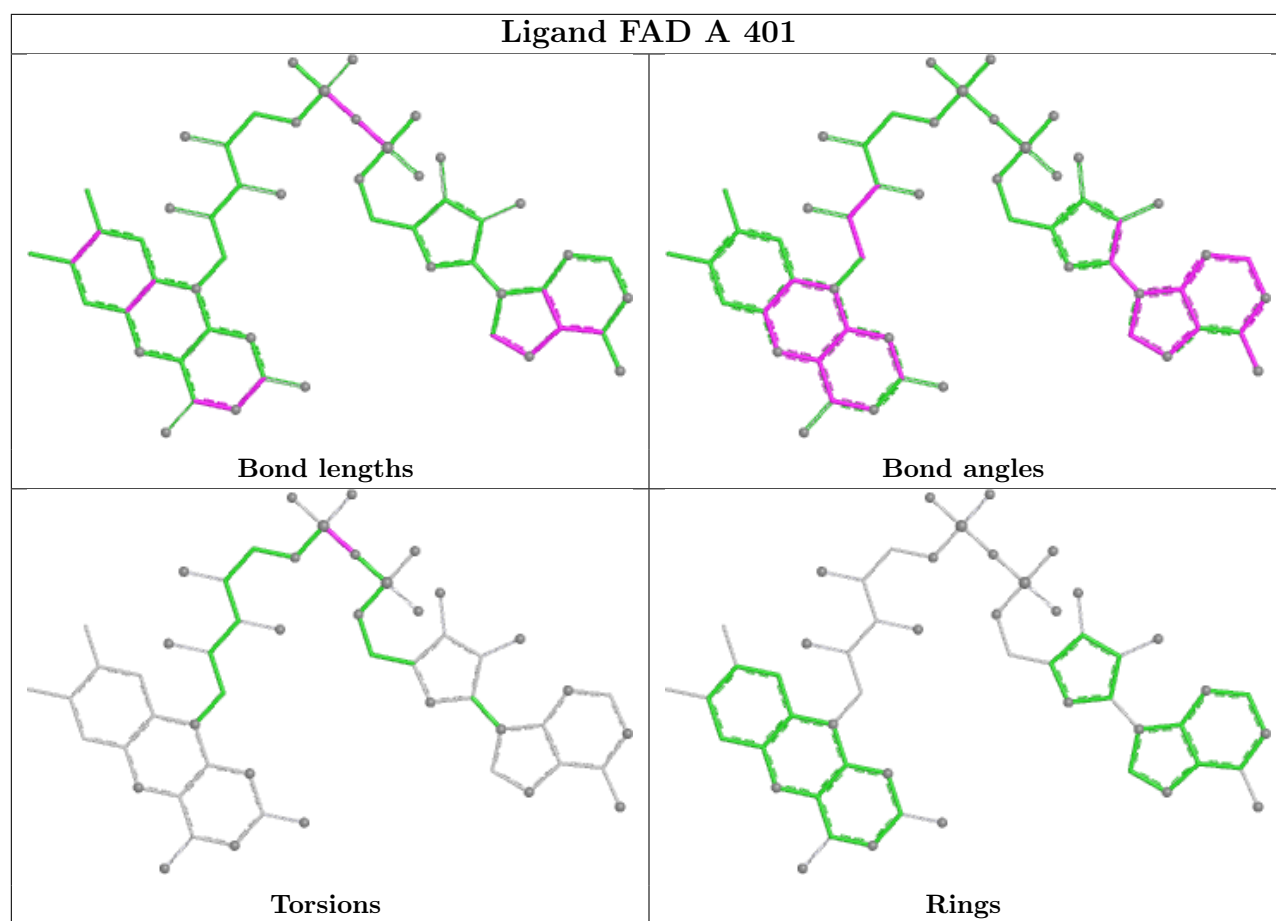
Mol	Chain	Res	Type	Atoms
3	E	401	FAD	PA-O3P-P-O2P
3	G	401	FAD	PA-O3P-P-O2P
3	C	401	FAD	C3B-C4B-C5B-O5B

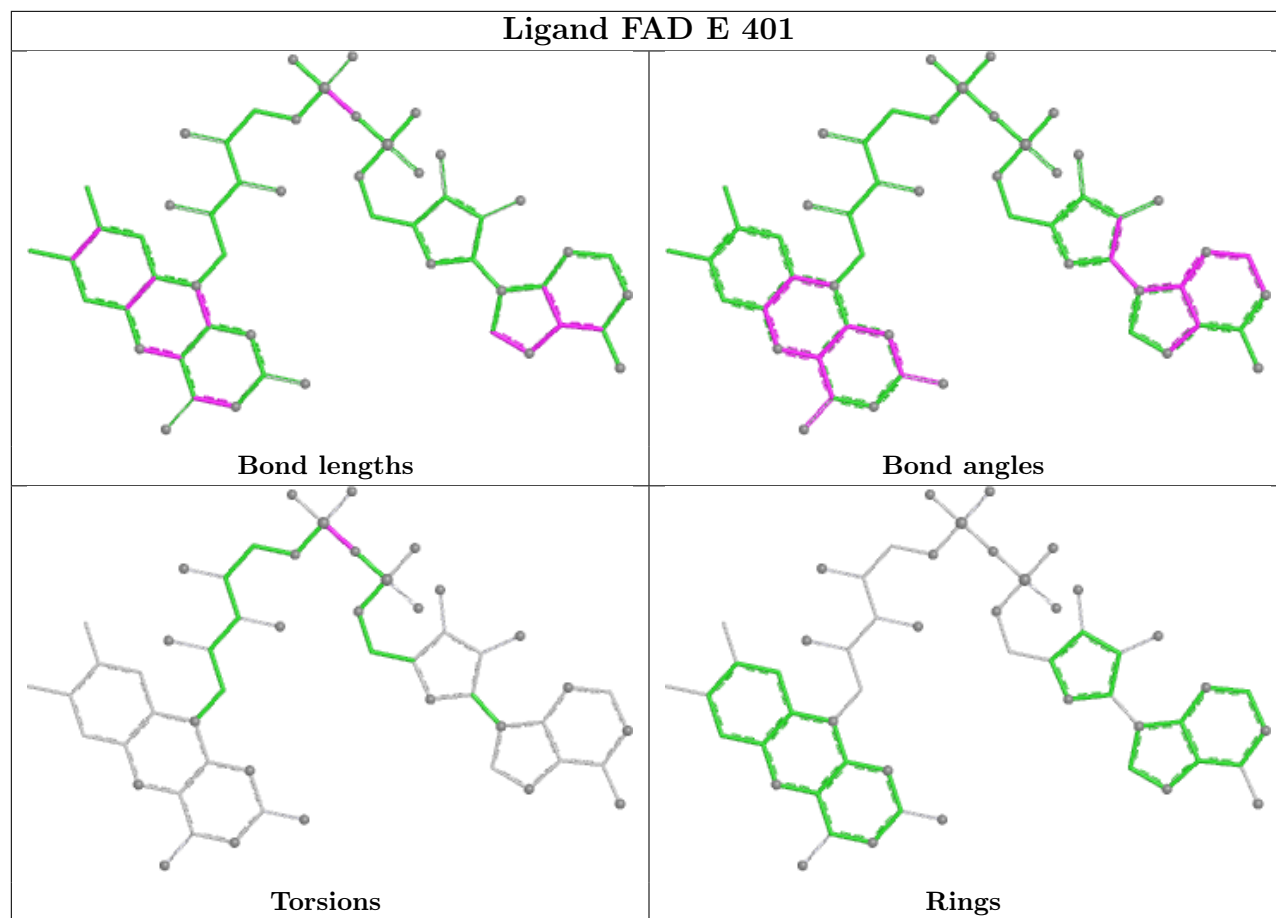
There are no ring outliers.

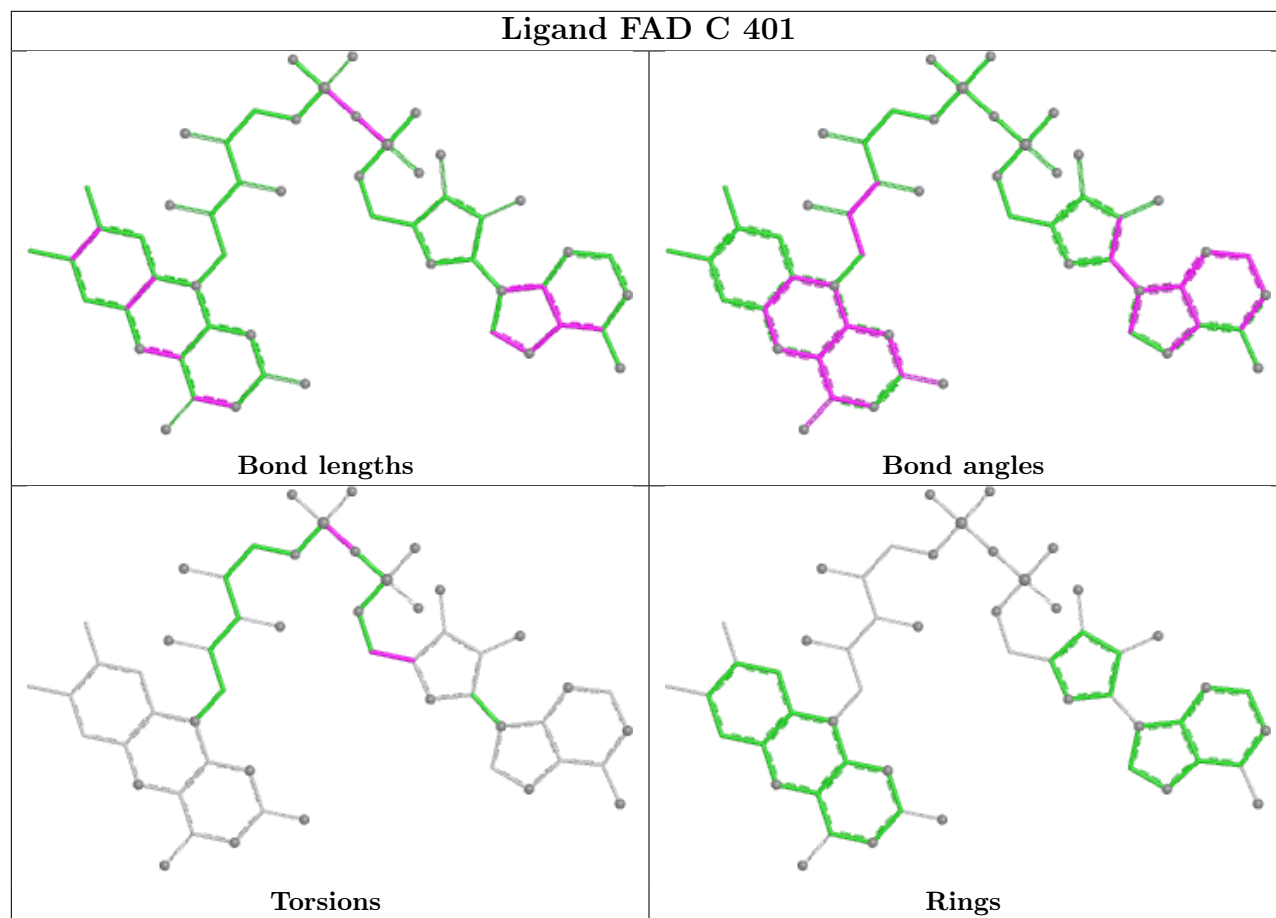
8 monomers are involved in 14 short contacts:

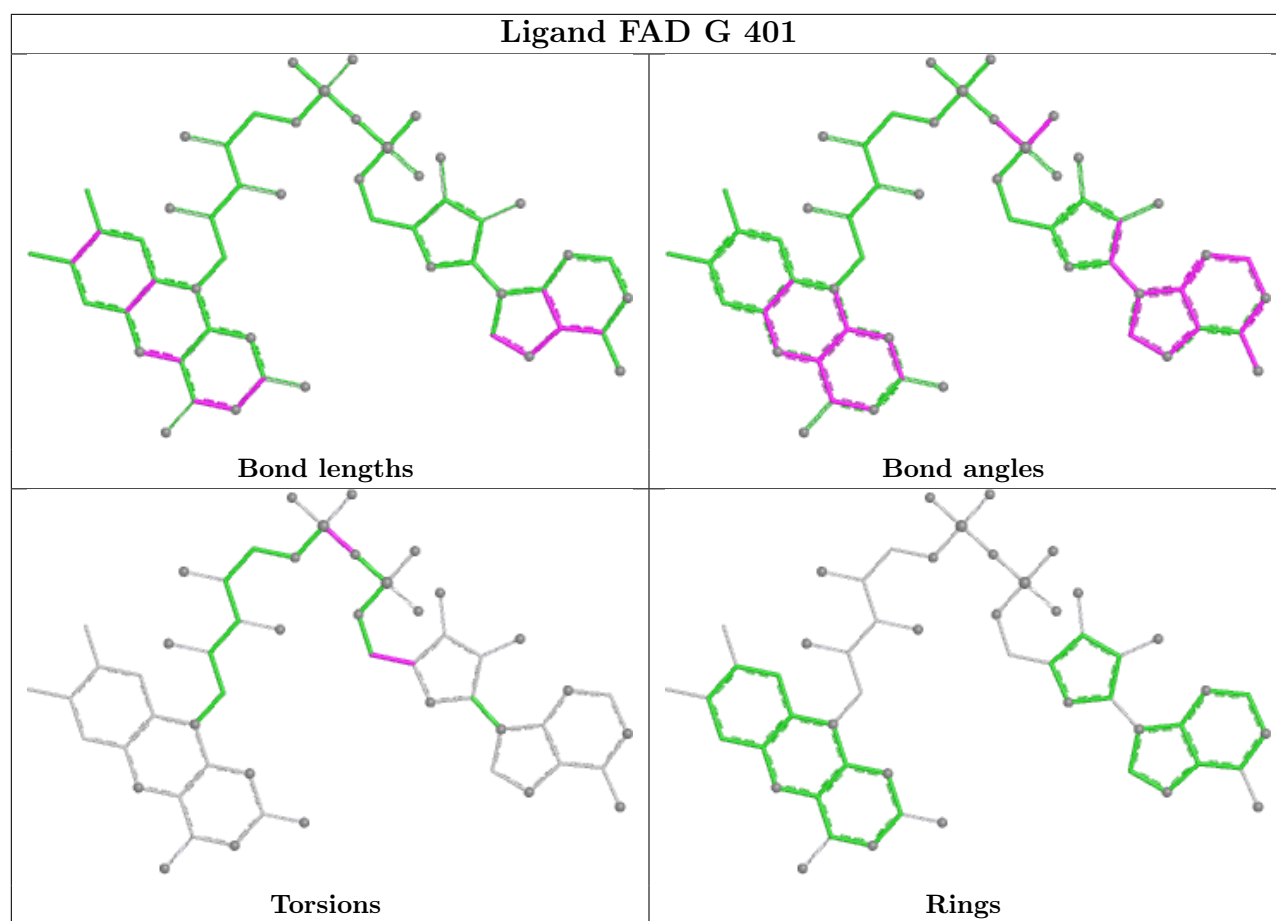
Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	B	101	FES	1	0
3	A	401	FAD	3	0
3	E	401	FAD	2	0
4	D	101	FES	1	0
4	H	101	FES	1	0
3	C	401	FAD	2	0
3	G	401	FAD	3	0
4	F	101	FES	1	0

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 ⓘ

In the following table, the column labelled ‘#RSRZ > 2’ contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 95th percentile and maximum values of the occupancy-weighted average B-factor per residue. The column labelled ‘Q < 0.9’ lists the number of (and percentage) of residues with an average occupancy less than 0.9.

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2	OWAB(Å ²)	Q<0.9
1	A	296/314 (94%)	0.30	12 (4%) 41 37	10, 22, 54, 93	0
1	C	296/314 (94%)	0.51	23 (7%) 19 16	12, 24, 55, 87	0
1	E	296/314 (94%)	0.56	35 (11%) 9 7	11, 24, 61, 93	0
1	G	296/314 (94%)	0.50	24 (8%) 18 15	8, 21, 51, 89	0
2	B	92/98 (93%)	1.37	19 (20%) 2 2	19, 43, 70, 76	0
2	D	95/98 (96%)	0.71	9 (9%) 14 11	18, 29, 50, 61	0
2	F	94/98 (95%)	0.69	6 (6%) 25 22	16, 28, 52, 55	0
2	H	92/98 (93%)	1.13	17 (18%) 3 3	16, 35, 60, 69	0
All	All	1557/1648 (94%)	0.59	145 (9%) 14 12	8, 25, 57, 93	0

All (145) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	E	240	ALA	7.3
1	E	293	GLY	7.2
1	C	240	ALA	7.2
1	C	301	LYS	7.0
1	E	301	LYS	5.4
1	G	123	ASP	5.3
1	E	289	ALA	5.2
1	A	123	ASP	5.2
1	G	294	ILE	5.1
1	G	292	ASP	4.9
1	G	274	LEU	4.6
1	E	290	GLU	4.5
1	G	291	LYS	4.4
1	C	85	LYS	4.4
1	E	297	PHE	4.4
1	A	85	LYS	4.3

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	RSRZ
2	B	1	ALA	4.1
1	E	241	ALA	4.1
2	D	95	LEU	3.9
1	E	292	ASP	3.9
2	F	34	ASP	3.8
1	G	122	ASN	3.8
1	G	297	PHE	3.7
2	B	92	GLU	3.7
2	B	14	VAL	3.6
1	E	88	LYS	3.6
2	H	1	ALA	3.6
2	B	2	THR	3.6
1	E	295	ASP	3.6
2	B	4	ASN	3.6
1	C	241	ALA	3.6
1	G	124	ALA	3.5
1	E	287	SER	3.5
1	C	55	GLY	3.5
2	H	92	GLU	3.5
1	E	291	LYS	3.4
1	G	298	ASP	3.4
2	H	12	GLY	3.4
1	A	301	LYS	3.4
1	A	276	GLY	3.4
1	E	298	ASP	3.3
1	A	274	LEU	3.3
1	G	301	LYS	3.3
2	H	71	ASP	3.3
2	F	13	GLU	3.2
1	C	87	GLY	3.2
1	C	105	PHE	3.2
1	C	88	LYS	3.2
2	H	30	GLU	3.1
1	A	305	ARG	3.1
2	H	4	ASN	3.1
1	C	239	ASN	3.1
1	E	294	ILE	3.1
1	G	265	ASP	3.1
1	C	294	ILE	3.0
1	E	286	VAL	3.0
1	G	295	ASP	3.0
1	C	297	PHE	2.9

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	RSRZ
1	G	276	GLY	2.9
1	G	35	LYS	2.9
1	G	290	GLU	2.9
1	C	302	GLN	2.9
1	A	294	ILE	2.9
1	E	296	TRP	2.8
2	F	12	GLY	2.8
2	D	92	GLU	2.8
1	C	86	ASN	2.8
1	E	288	LEU	2.8
1	E	105	PHE	2.8
2	B	12	GLY	2.7
1	C	298	ASP	2.7
2	D	12	GLY	2.7
1	E	239	ASN	2.7
2	D	30	GLU	2.7
2	H	13	GLU	2.7
1	A	291	LYS	2.7
1	C	83	VAL	2.7
1	E	275	LYS	2.7
2	H	14	VAL	2.7
1	E	222	ARG	2.6
2	F	93	GLU	2.6
2	B	11	GLU	2.6
2	D	29	GLU	2.6
2	B	6	LYS	2.6
1	G	296	TRP	2.5
1	C	293	GLY	2.5
1	E	87	GLY	2.5
1	C	287	SER	2.5
2	B	60	ASP	2.5
2	B	69	ILE	2.5
1	E	305	ARG	2.5
2	H	52	VAL	2.5
2	H	48	ALA	2.5
2	B	15	GLU	2.5
1	G	293	GLY	2.5
1	A	290	GLU	2.4
1	E	214	GLU	2.4
2	F	94	GLU	2.4
1	C	54	PRO	2.4
2	H	10	PRO	2.4

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	RSRZ
1	C	35	LYS	2.4
1	E	302	GLN	2.4
1	E	256	GLU	2.4
2	B	30	GLU	2.4
2	B	54	GLY	2.4
1	E	255	LYS	2.4
2	F	32	GLY	2.4
1	E	262	LEU	2.4
1	E	86	ASN	2.3
1	G	88	LYS	2.3
1	G	225	GLU	2.3
2	H	2	THR	2.3
1	E	85	LYS	2.3
1	C	52	ASP	2.3
1	E	259	TRP	2.3
1	G	305	ARG	2.2
2	B	34	ASP	2.2
2	B	52	VAL	2.2
1	E	35	LYS	2.2
1	G	243	GLU	2.2
2	B	13	GLU	2.2
1	C	305	ARG	2.2
2	B	10	PRO	2.2
1	E	242	GLY	2.2
2	H	16	LEU	2.2
2	D	13	GLU	2.2
2	D	88	GLU	2.2
1	A	86	ASN	2.2
2	B	7	LEU	2.2
1	A	88	LYS	2.1
1	G	299	TYR	2.1
2	H	69	ILE	2.1
2	H	11	GLU	2.1
2	B	16	LEU	2.1
2	D	28	ALA	2.1
1	C	296	TRP	2.1
1	G	188	LYS	2.1
2	H	34	ASP	2.1
2	D	6	LYS	2.1
1	C	89	PRO	2.1
1	E	284	ILE	2.1
1	G	286	VAL	2.1

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	RSRZ
2	H	6	LYS	2.0
1	E	54	PRO	2.0
1	A	122	ASN	2.0

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

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

6.3 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

6.4 Ligands [i](#)

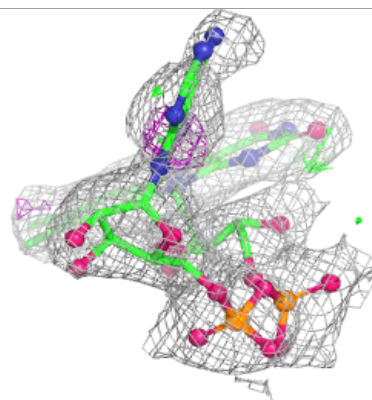
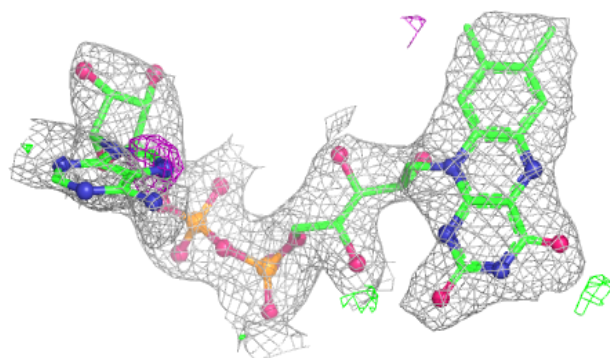
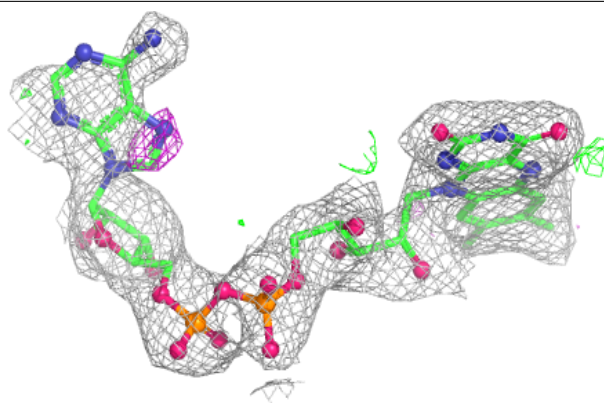
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists the number of atoms with occupancy less than 0.9.

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
3	FAD	A	401	53/53	0.93	0.13	14,18,67,82	0
3	FAD	C	401	53/53	0.94	0.12	10,12,87,103	0
3	FAD	G	401	53/53	0.94	0.11	13,17,47,55	0
3	FAD	E	401	53/53	0.95	0.11	9,13,67,82	0
4	FES	F	101	4/4	0.97	0.05	16,17,19,23	0
4	FES	D	101	4/4	0.98	0.05	21,21,23,23	0
4	FES	B	101	4/4	0.99	0.03	19,20,20,25	0
4	FES	H	101	4/4	0.99	0.03	18,19,20,24	0

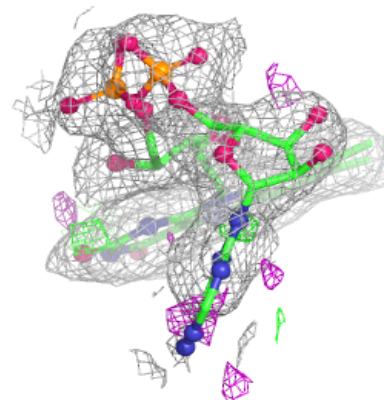
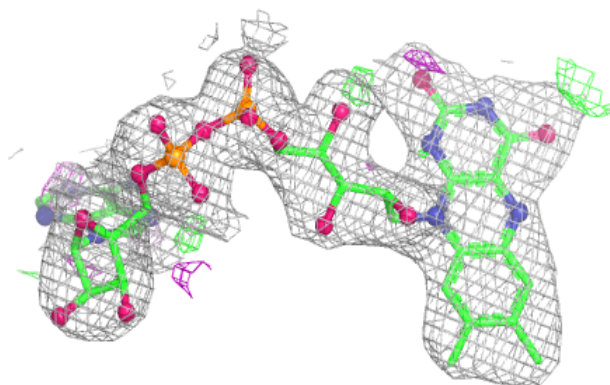
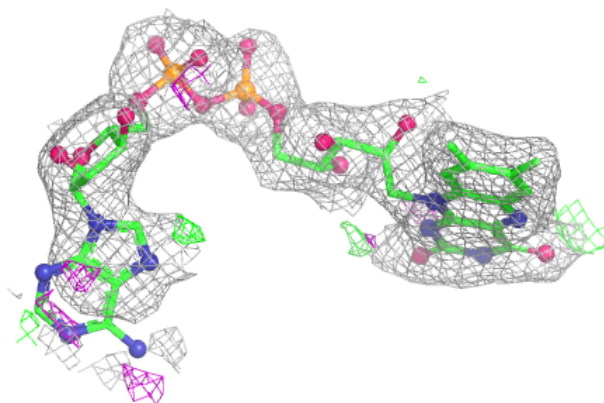
The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation to approximate a three-dimensional view.

Electron density around FAD A 401:

$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)

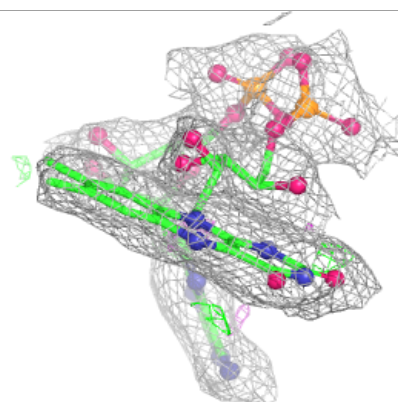
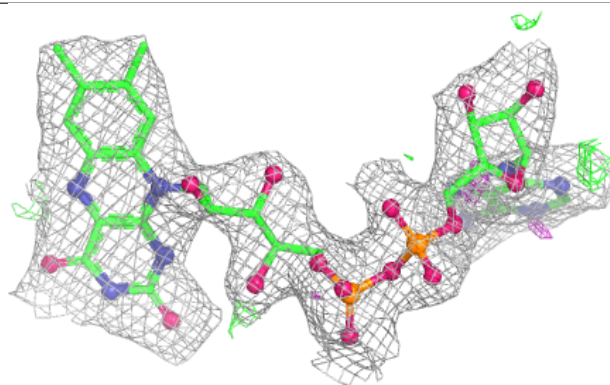
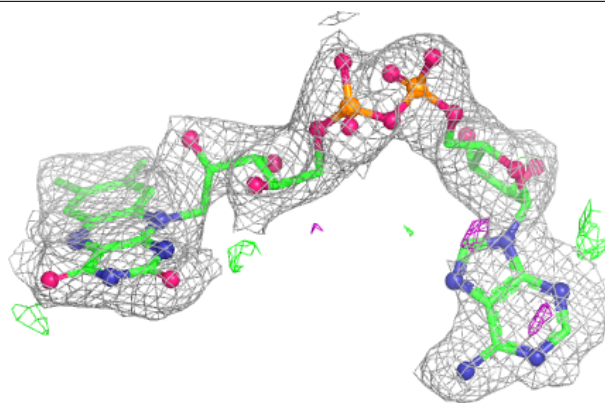
**Electron density around FAD C 401:**

$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)

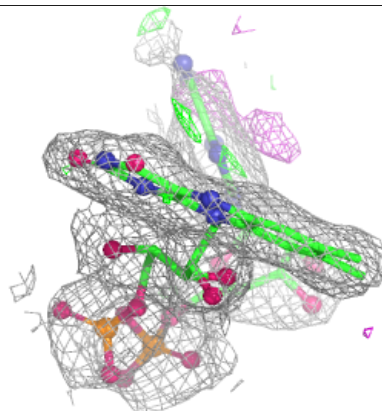
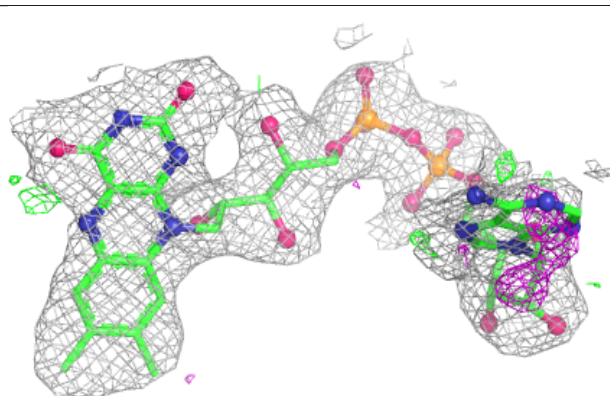
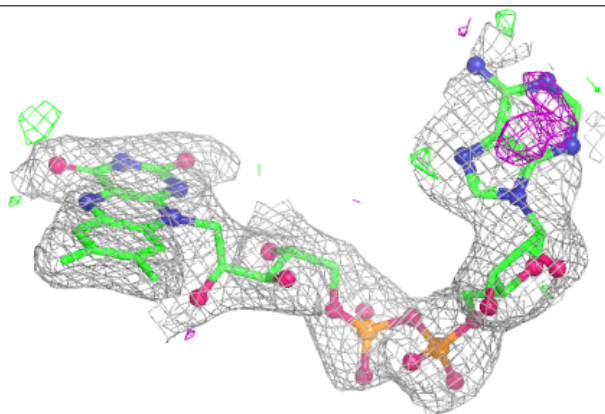


Electron density around FAD G 401:

$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)

**Electron density around FAD E 401:**

$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)



6.5 Other polymers [i](#)

There are no such residues in this entry.