



# wwPDB X-ray Structure Validation Summary Report ⓘ

Aug 22, 2023 – 05:25 PM EDT

PDB ID : 3B9J  
Title : Structure of Xanthine Oxidase with 2-hydroxy-6-methylpurine  
Authors : Pauff, J.M.; Zhang, J.; Bell, C.E.; Hille, R.  
Deposited on : 2007-11-05  
Resolution : 2.30 Å(reported)

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

We welcome your comments at [validation@mail.wwpdb.org](mailto: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 : 4.02b-467  
Mogul : 1.8.5 (274361), CSD as541be (2020)  
Xtriage (Phenix) : 1.13  
EDS : 2.35  
buster-report : 1.1.7 (2018)  
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)  
Refmac : 5.8.0158  
CCP4 : 7.0.044 (Gargrove)  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.35

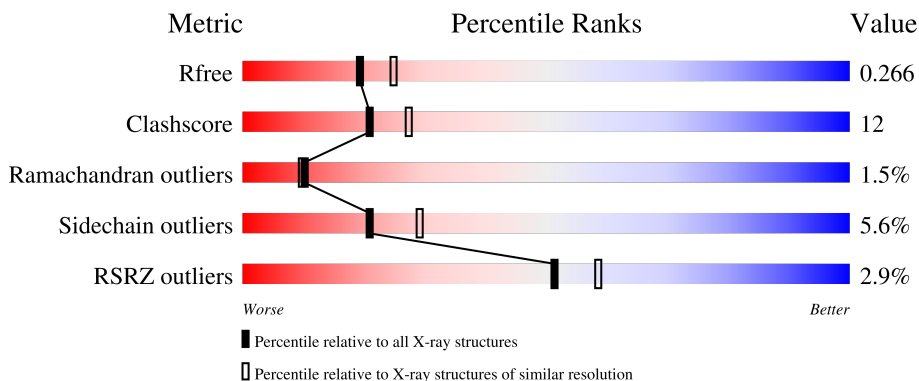
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*



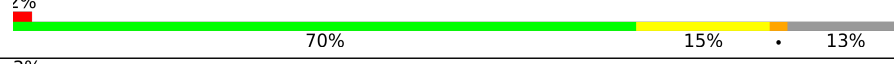


The reported resolution of this entry is 2.30 Å.

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))
$R_{free}$	130704	5042 (2.30-2.30)
Clashscore	141614	5643 (2.30-2.30)
Ramachandran outliers	138981	5575 (2.30-2.30)
Sidechain outliers	138945	5575 (2.30-2.30)
RSRZ outliers	127900	4938 (2.30-2.30)

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  $\geq 3$ , 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	219	 60% 12% 26% 2%
1	I	219	 61% 10% 26% 4%
2	B	350	 70% 15% 13% 2%
2	J	350	 72% 13% 13% 3%
3	C	763	 76% 19% 5%

Continued on next page...

*Continued from previous page...*

Mol	Chain	Length	Quality of chain
3	K	763	

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 criteria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
8	MOS	C	1334	-	-	X	-
8	MOS	K	1334	-	-	X	-
9	290	C	1335	-	-	X	-
9	290	K	1335	-	-	X	-

## 2 Entry composition [i](#)

There are 10 unique types of molecules in this entry. The entry contains 19847 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 xanthine oxidase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	162	1239	778	222	227	12	0	0	0
1	I	162	1215	764	214	225	12	0	0	0

- Molecule 2 is a protein called xanthine oxidase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
2	B	305	2381	1533	400	435	13	0	0	0
2	J	305	2356	1516	393	434	13	0	0	0

- Molecule 3 is a protein called xanthine oxidase.

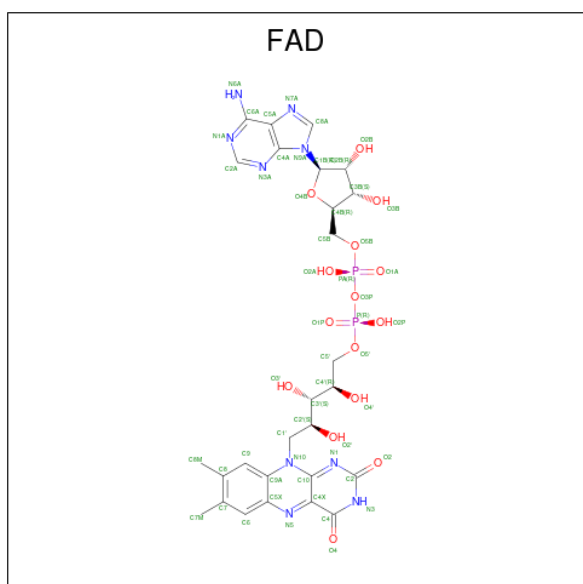
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
3	C	758	5835	3688	1005	1107	35	0	0	0
3	K	747	5759	3645	987	1093	34	0	0	0

- Molecule 4 is FE2/S2 (INORGANIC) CLUSTER (three-letter code: FES) (formula: Fe<sub>2</sub>S<sub>2</sub>).



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	I	1	Total Fe S 4 2 2	0	0
4	I	1	Total Fe S 4 2 2	0	0

- Molecule 5 is FLAVIN-ADENINE DINUCLEOTIDE (three-letter code: FAD) (formula:  $C_{27}H_{33}N_9O_{15}P_2$ ).

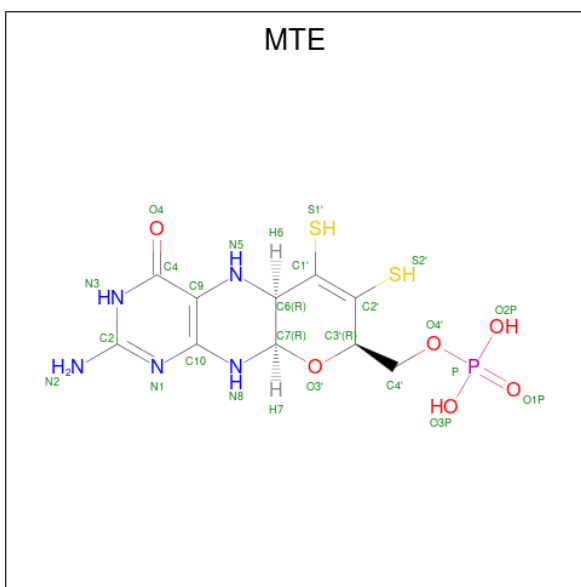


Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
			Total	C	N	O	P		
5	B	1	53	27	9	15	2	0	0
5	J	1	53	27	9	15	2	0	0

- Molecule 6 is CALCIUM ION (three-letter code: CA) (formula: Ca).

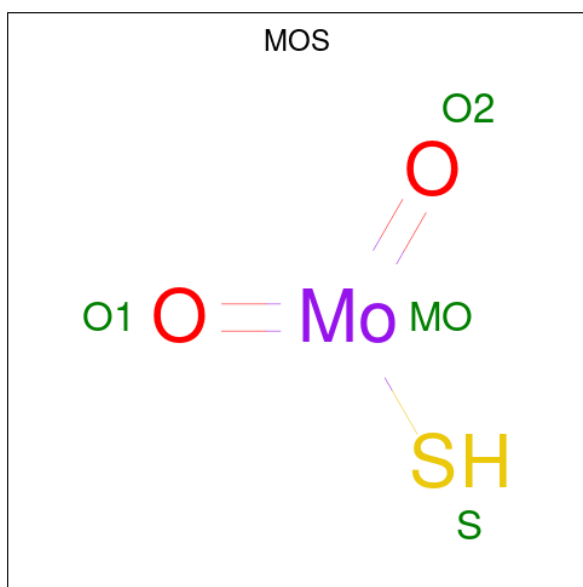
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	Ca		
6	C	1	1	1	0	0

- Molecule 7 is PHOSPHONIC ACIDMONO-(2-AMINO-5,6-DIMERCAPTO-4-OXO-3,7,8A, 9,10,10A-HEXAHYDRO-4H-8-OXA-1,3,9,10-TETRAAZA-ANTHRACEN-7-YLMETHYL) ESTER (three-letter code: MTE) (formula: C<sub>10</sub>H<sub>14</sub>N<sub>5</sub>O<sub>6</sub>PS<sub>2</sub>).



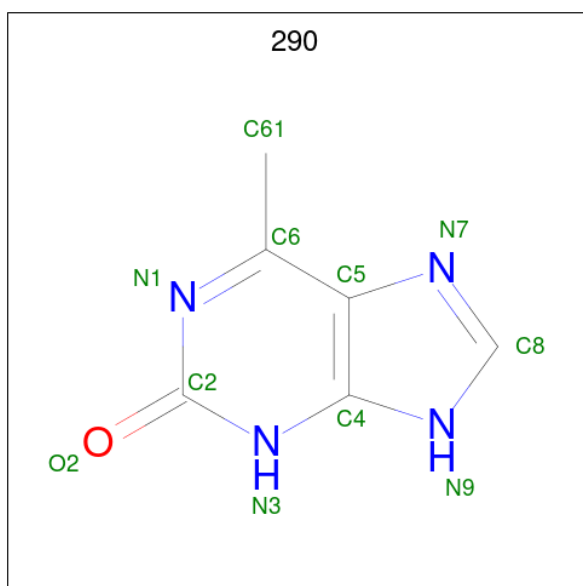
Mol	Chain	Residues	Atoms						ZeroOcc	AltConf
			Total	C	N	O	P	S		
7	C	1	24	10	5	6	1	2	0	0
7	K	1	24	10	5	6	1	2	0	0

- Molecule 8 is DIOXOTHIOMOLYBDENUM(VI) ION (three-letter code: MOS) (formula: HMoO<sub>2</sub>S).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
			Total	Mo	O	S		
8	C	1	4	1	2	1	0	0
8	K	1	4	1	2	1	0	0

- Molecule 9 is 6-methyl-3,9-dihydro-2H-purin-2-one (three-letter code: 290) (formula: C<sub>6</sub>H<sub>6</sub>N<sub>4</sub>O).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
			Total	C	N	O		
9	C	1	11	6	4	1	0	0

*Continued on next page...*

*Continued from previous page...*

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
9	K	1	Total	C	N	O	0	0
			11	6	4	1		

- Molecule 10 is water.

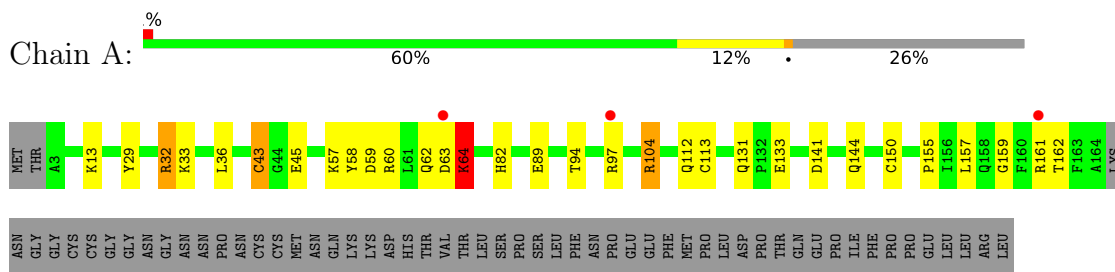
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
10	A	68	Total	O	0	0
			68	68		
10	B	87	Total	O	0	0
			87	87		
10	C	247	Total	O	0	0
			247	247		
10	I	73	Total	O	0	0
			73	73		
10	J	90	Total	O	0	0
			90	90		
10	K	296	Total	O	0	0
			296	296		



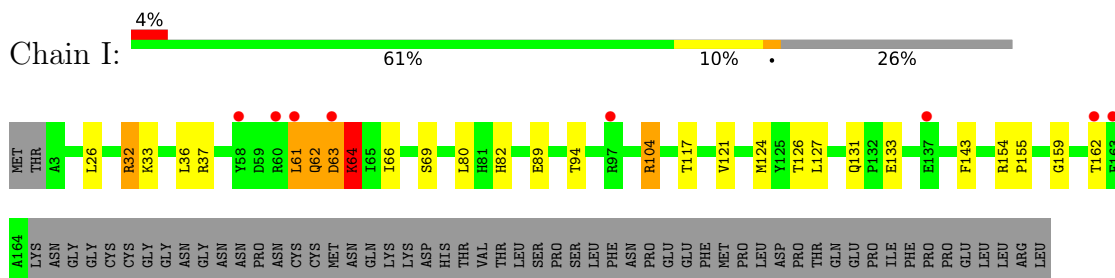
### 3 Residue-property plots [i](#)

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.

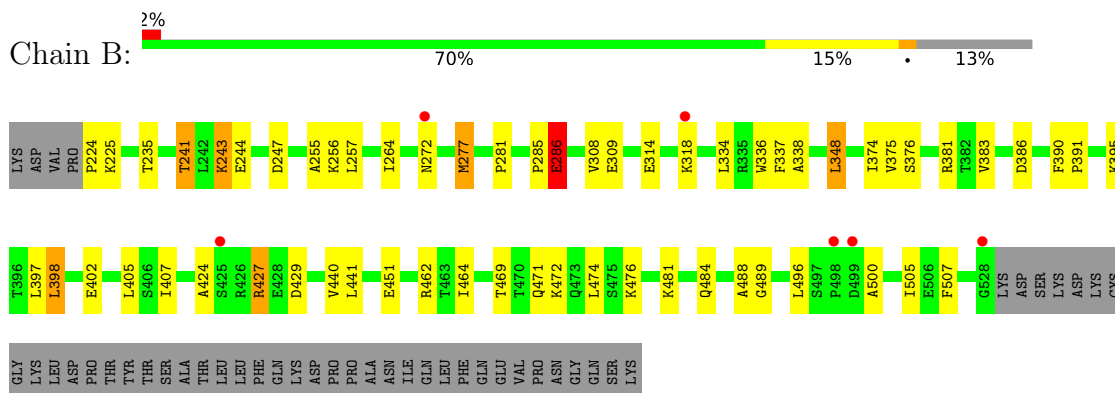
- Molecule 1: xanthine oxidase



- Molecule 1: xanthine oxidase

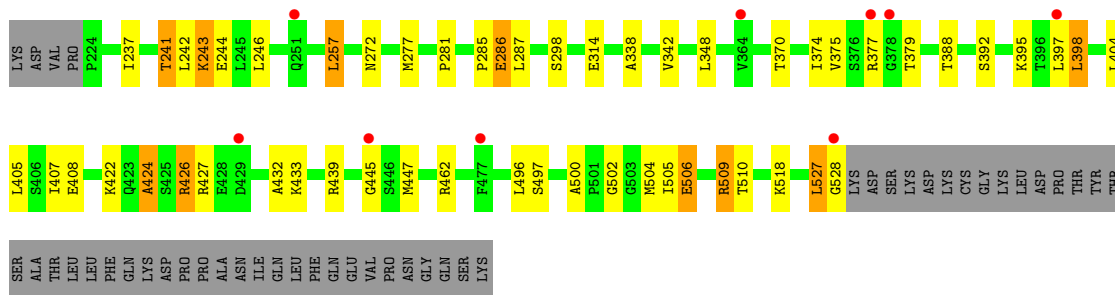


- Molecule 2: xanthine oxidase

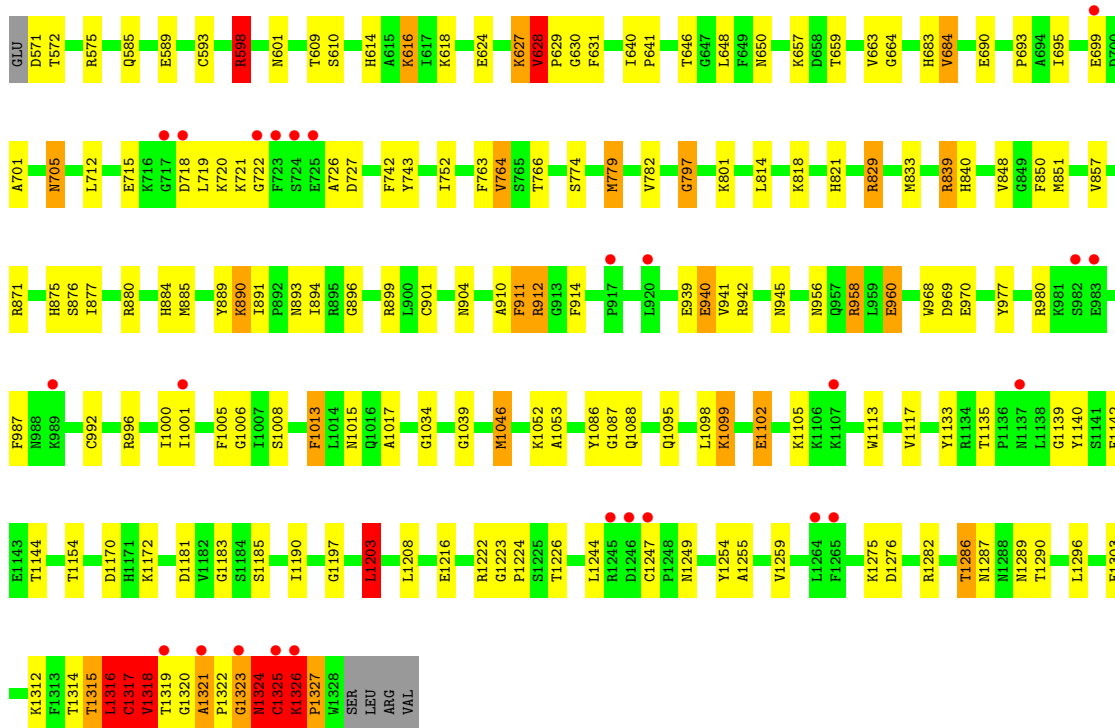
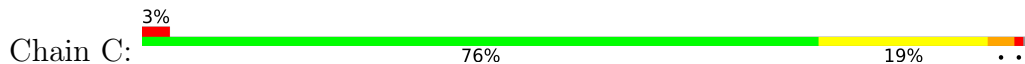


- Molecule 2: xanthine oxidase

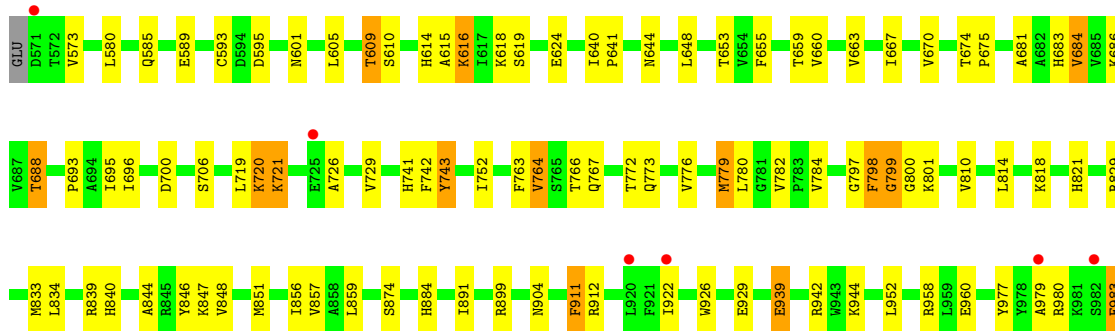
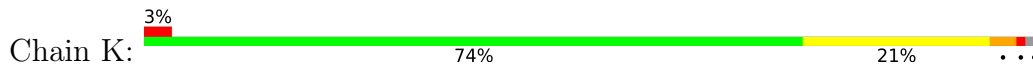


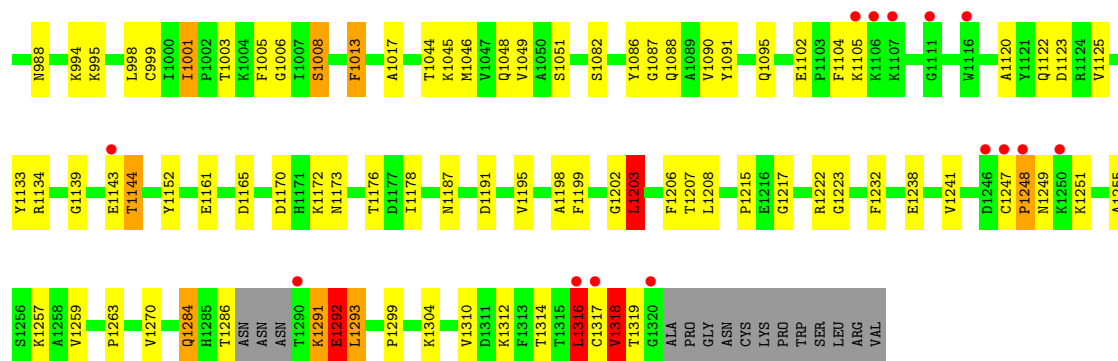


• Molecule 3: xanthine oxidase



• Molecule 3: xanthine oxidase





## 4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	133.19Å 73.79Å 146.50Å 90.00° 98.87° 90.00°	Depositor
Resolution (Å)	144.34 – 2.30 33.59 – 2.23	Depositor EDS
% Data completeness (in resolution range)	96.2 (144.34-2.30) 94.6 (33.59-2.23)	Depositor EDS
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	2.17 (at 2.22Å)	Xtrriage
Refinement program	REFMAC 5.2.0019	Depositor
R, $R_{free}$	0.194 , 0.263 0.197 , 0.266	Depositor DCC
$R_{free}$ test set	6568 reflections (5.04%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	26.1	Xtrriage
Anisotropy	0.786	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.36 , 47.5	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.47$ , $\langle L^2 \rangle = 0.30$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
$F_o, F_c$ correlation	0.94	EDS
Total number of atoms	19847	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	27.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.04% of the height of the origin peak. No significant pseudotranslation is detected.*

<sup>1</sup>Intensities estimated from amplitudes.

<sup>2</sup>Theoretical 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 [i](#)

### 5.1 Standard geometry [i](#)

Bond lengths and bond angles in the following residue types are not validated in this section: MTE, FES, 290, MOS, CA, FAD

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	0.84	0/1261	0.90	4/1702 (0.2%)
1	I	0.78	0/1237	0.85	2/1672 (0.1%)
2	B	0.77	0/2430	0.80	2/3282 (0.1%)
2	J	0.72	1/2403 (0.0%)	0.78	2/3248 (0.1%)
3	C	0.83	4/5963 (0.1%)	0.93	16/8078 (0.2%)
3	K	0.78	1/5885 (0.0%)	0.85	8/7971 (0.1%)
All	All	0.79	6/19179 (0.0%)	0.86	34/25953 (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	A	0	1
1	I	0	1
3	C	3	10
3	K	0	5
All	All	3	17

The worst 5 of 6 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	C	593	CYS	CB-SG	-6.74	1.70	1.82
3	K	593	CYS	CB-SG	-6.64	1.71	1.82
3	C	992	CYS	CB-SG	-6.30	1.71	1.82
2	J	314	GLU	CG-CD	5.70	1.60	1.51
3	C	699	GLU	CG-CD	5.22	1.59	1.51

The worst 5 of 34 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	K	839	ARG	NE-CZ-NH2	-10.28	115.16	120.30
1	I	32	ARG	NE-CZ-NH2	-10.17	115.21	120.30
1	A	32	ARG	NE-CZ-NH2	-10.06	115.27	120.30
3	C	1326	LYS	N-CA-C	9.29	136.07	111.00
1	I	32	ARG	NE-CZ-NH1	9.20	124.90	120.30

All (3) chirality outliers are listed below:

Mol	Chain	Res	Type	Atom
3	C	1315	THR	CA
3	C	1319	THR	CA
3	C	1326	LYS	CA

5 of 17 planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	64	LYS	Peptide
3	C	1314	THR	Peptide
3	C	627	LYS	Peptide
3	C	628	VAL	Peptide
3	C	630	GLY	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	1239	0	1245	26	0
1	I	1215	0	1201	19	0
2	B	2381	0	2437	58	0
2	J	2356	0	2394	48	0
3	C	5835	0	5747	162	0
3	K	5759	0	5679	156	0
4	A	8	0	0	0	0
4	I	8	0	0	0	0
5	B	53	0	31	2	0
5	J	53	0	31	3	0
6	C	1	0	0	0	0
7	C	24	0	10	0	0

*Continued on next page...*

Continued from previous page...

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
7	K	24	0	10	2	0
8	C	4	0	0	7	0
8	K	4	0	0	8	0
9	C	11	0	6	4	0
9	K	11	0	6	5	0
10	A	68	0	0	7	0
10	B	87	0	0	6	0
10	C	247	0	0	22	0
10	I	73	0	0	2	0
10	J	90	0	0	5	0
10	K	296	0	0	15	0
All	All	19847	0	18797	461	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 12.

The worst 5 of 461 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)
8:K:1334:MOS:O1	9:K:1335:290:C8	1.75	1.32
3:K:833:MET:HE3	3:K:1222:ARG:C	1.51	1.31
3:K:1046:MET:HE1	3:K:1086:TYR:C	1.65	1.16
8:K:1334:MOS:O1	9:K:1335:290:H8	1.30	1.15
3:C:683:HIS:HB2	10:C:1420:HOH:O	1.46	1.12

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	160/219 (73%)	151 (94%)	7 (4%)	2 (1%)	<b>12</b> <b>12</b>

Continued on next page...

Continued from previous page...

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	I	160/219 (73%)	150 (94%)	7 (4%)	3 (2%)	8	7
2	B	303/350 (87%)	286 (94%)	16 (5%)	1 (0%)	41	50
2	J	303/350 (87%)	286 (94%)	12 (4%)	5 (2%)	9	8
3	C	756/763 (99%)	710 (94%)	30 (4%)	16 (2%)	7	5
3	K	743/763 (97%)	704 (95%)	29 (4%)	10 (1%)	12	12
All	All	2425/2664 (91%)	2287 (94%)	101 (4%)	37 (2%)	10	10

5 of 37 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	64	LYS
2	B	286	GLU
3	C	1316	LEU
3	C	1317	CYS
3	C	1323	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	135/187 (72%)	128 (95%)	7 (5%)	23	32
1	I	130/187 (70%)	125 (96%)	5 (4%)	33	47
2	B	259/302 (86%)	248 (96%)	11 (4%)	30	42
2	J	254/302 (84%)	240 (94%)	14 (6%)	21	30
3	C	630/639 (99%)	589 (94%)	41 (6%)	17	23
3	K	623/639 (98%)	588 (94%)	35 (6%)	21	29
All	All	2031/2256 (90%)	1918 (94%)	113 (6%)	21	29

5 of 113 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
3	C	1316	LEU

Continued on next page...



*Continued from previous page...*

Mol	Chain	Res	Type
3	K	1284	GLN
2	J	426	ARG
3	K	1238	GLU
3	K	1008	SER

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 41 such sidechains are listed below:

Mol	Chain	Res	Type
3	K	614	HIS
3	K	884	HIS
3	K	626	GLN
3	K	767	GLN
3	K	1033	HIS

### 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 monosaccharides in this entry.

## 5.6 Ligand geometry [i](#)

Of 13 ligands modelled in this entry, 1 is monoatomic - leaving 12 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
4	FES	A	601	1	0,4,4	-	-	-		
5	FAD	B	606	-	53,58,58	1.13	3 (5%)	68,89,89	1.71	15 (22%)
8	MOS	K	1334	7	0,3,3	-	-	-		
9	290	C	1335	-	7,12,12	1.29	1 (14%)	8,17,17	2.68	4 (50%)
4	FES	A	602	1	0,4,4	-	-	-		
9	290	K	1335	-	7,12,12	1.09	0	8,17,17	2.91	3 (37%)
4	FES	I	602	1	0,4,4	-	-	-		
8	MOS	C	1334	7	0,3,3	-	-	-		
5	FAD	J	606	-	53,58,58	1.22	4 (7%)	68,89,89	1.60	12 (17%)
7	MTE	K	1333	8	21,26,26	1.39	2 (9%)	21,40,40	2.54	9 (42%)
7	MTE	C	1333	8	21,26,26	1.84	3 (14%)	21,40,40	2.57	9 (42%)
4	FES	I	601	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	A	601	1	-	-	0/1/1/1
5	FAD	B	606	-	-	0/30/50/50	0/6/6/6
9	290	C	1335	-	-	-	0/2/2/2
4	FES	A	602	1	-	-	0/1/1/1
9	290	K	1335	-	-	-	0/2/2/2
4	FES	I	602	1	-	-	0/1/1/1
5	FAD	J	606	-	-	4/30/50/50	0/6/6/6
7	MTE	K	1333	8	-	3/6/34/34	0/3/3/3
7	MTE	C	1333	8	-	1/6/34/34	0/3/3/3
4	FES	I	601	1	-	-	0/1/1/1

The worst 5 of 13 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
7	C	1333	MTE	C9-C4	5.99	1.49	1.41
7	K	1333	MTE	C9-C4	4.55	1.47	1.41
5	J	606	FAD	C4X-N5	4.30	1.39	1.30
7	C	1333	MTE	C7-C6	-3.90	1.50	1.53
5	B	606	FAD	C4X-N5	3.71	1.38	1.30

The worst 5 of 52 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
7	C	1333	MTE	C4-C9-N5	7.90	125.75	119.12
5	B	606	FAD	N3A-C2A-N1A	-7.41	117.10	128.68
7	K	1333	MTE	C4-C9-N5	7.37	125.31	119.12
5	J	606	FAD	N3A-C2A-N1A	-6.63	118.32	128.68
9	K	1335	290	C61-C6-N1	5.16	122.83	116.71

There are no chirality outliers.

5 of 8 torsion outliers are listed below:

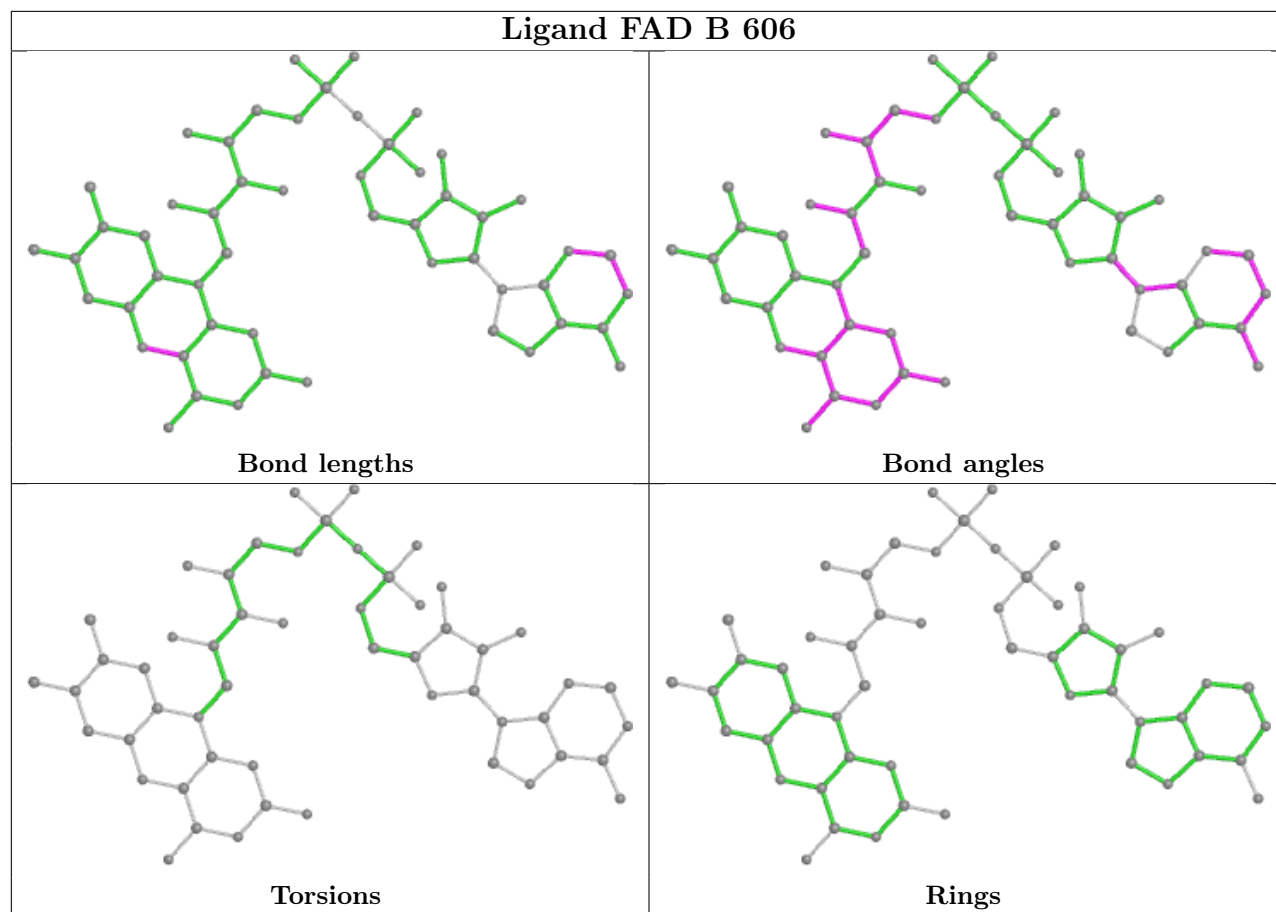
Mol	Chain	Res	Type	Atoms
7	C	1333	MTE	C3'-C4'-O4'-P
7	K	1333	MTE	C4'-O4'-P-O2P
5	J	606	FAD	C2'-C3'-C4'-C5'
7	K	1333	MTE	C4'-O4'-P-O3P
5	J	606	FAD	C2'-C3'-C4'-O4'

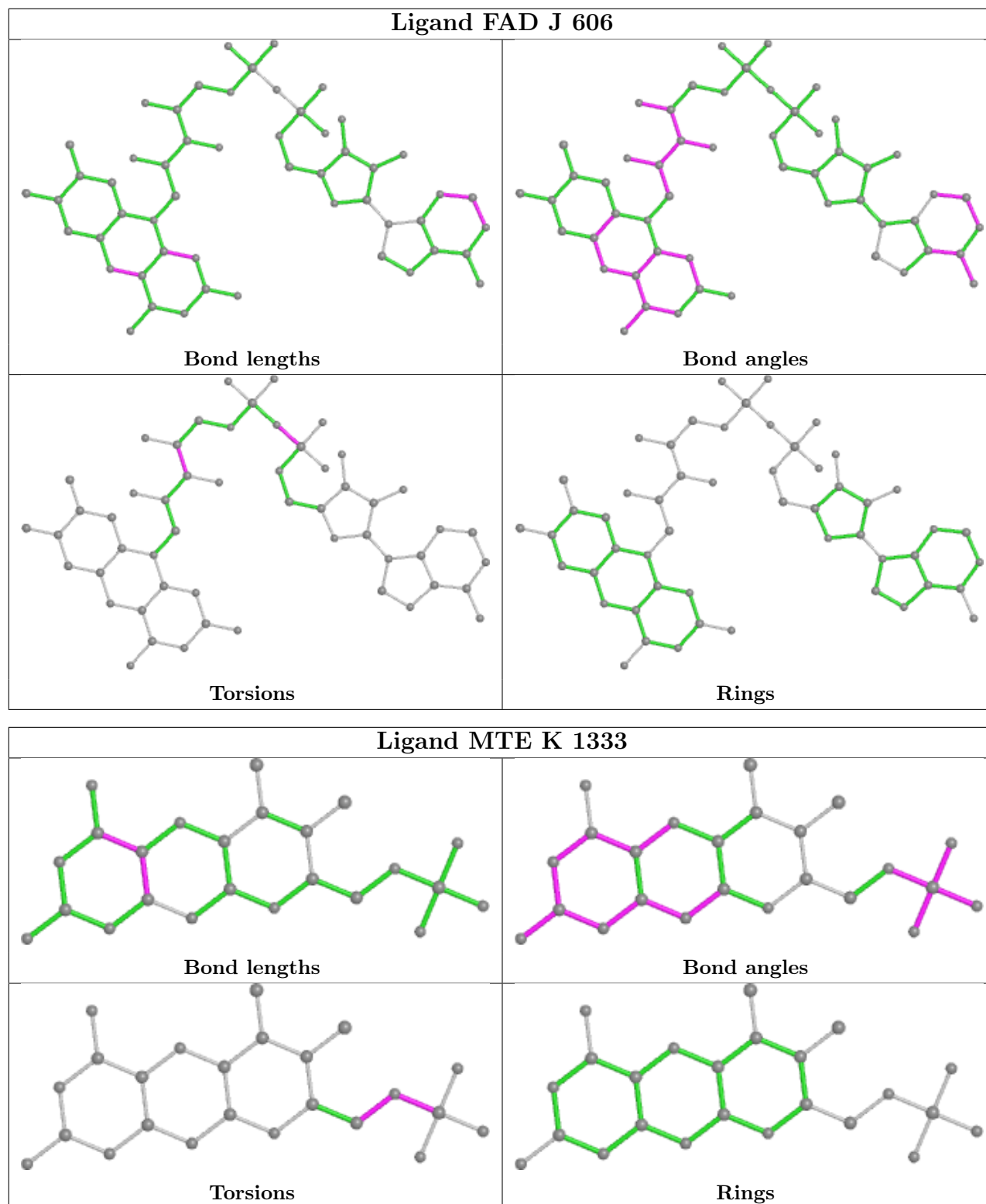
There are no ring outliers.

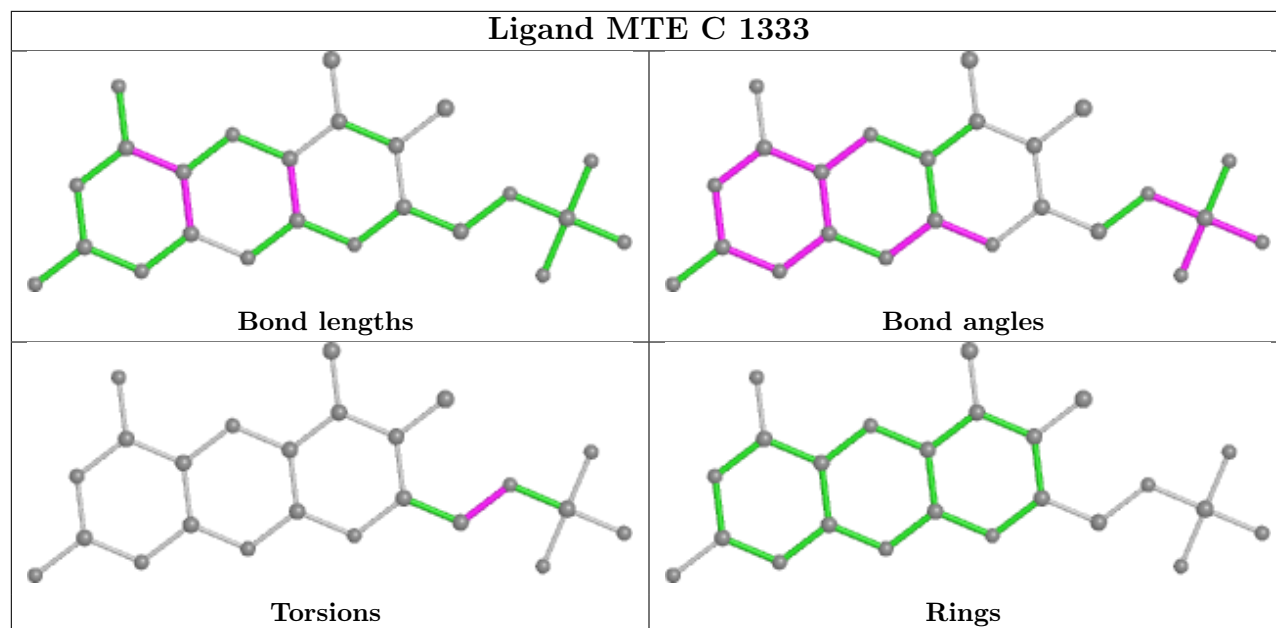
7 monomers are involved in 22 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
5	B	606	FAD	2	0
8	K	1334	MOS	8	0
9	C	1335	290	4	0
9	K	1335	290	5	0
8	C	1334	MOS	7	0
5	J	606	FAD	3	0
7	K	1333	MTE	2	0

The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less than 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.







## 5.7 Other polymers [i](#)

There are no such residues in this entry.

## 5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

## 6 Fit of model and data [i](#)

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

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, 95<sup>th</sup> 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 <sup>2</sup> )	Q<0.9
1	A	162/219 (73%)	-0.15	3 (1%) 66 73	13, 21, 37, 50	0
1	I	162/219 (73%)	0.03	8 (4%) 29 36	17, 27, 44, 54	0
2	B	305/350 (87%)	0.00	6 (1%) 65 71	15, 28, 39, 43	0
2	J	305/350 (87%)	0.19	9 (2%) 50 57	22, 34, 44, 47	0
3	C	758/763 (99%)	0.11	25 (3%) 46 53	13, 25, 39, 51	0
3	K	747/763 (97%)	0.02	20 (2%) 54 62	12, 25, 40, 55	0
All	All	2439/2664 (91%)	0.06	71 (2%) 51 58	12, 26, 41, 55	0

The worst 5 of 71 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
3	C	1325	CYS	6.2
3	K	1248	PRO	5.3
2	J	429	ASP	4.0
3	K	1250	LYS	3.8
2	J	378	GLY	3.7

### 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 monosaccharides in this entry.

## 6.4 Ligands

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, 95<sup>th</sup> 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.

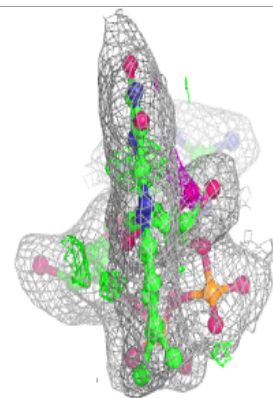
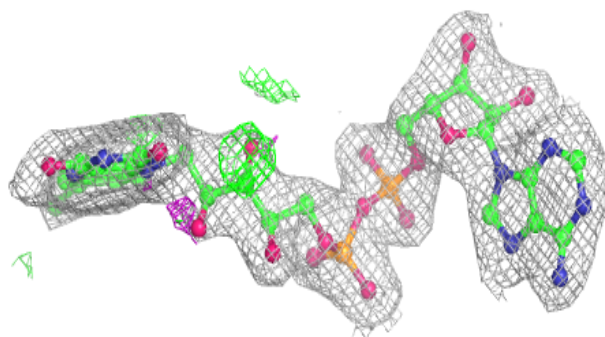
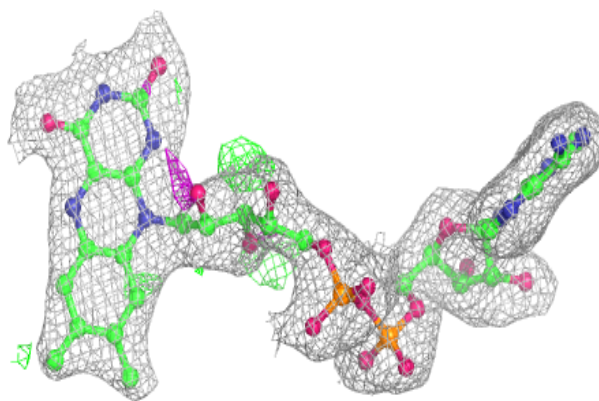
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å <sup>2</sup> )	Q<0.9
6	CA	C	1	1/1	0.86	0.27	49,49,49,49	0
9	290	C	1335	11/11	0.86	0.17	30,31,32,32	0
9	290	K	1335	11/11	0.94	0.13	19,21,22,23	0
5	FAD	J	606	53/53	0.96	0.12	19,25,30,37	0
7	MTE	K	1333	24/24	0.96	0.10	27,29,32,35	0
7	MTE	C	1333	24/24	0.97	0.10	20,24,29,32	0
5	FAD	B	606	53/53	0.97	0.12	13,22,25,27	0
8	MOS	K	1334	4/4	0.98	0.12	40,44,45,46	0
8	MOS	C	1334	4/4	0.99	0.11	42,45,48,49	0
4	FES	I	602	4/4	0.99	0.10	19,19,19,20	0
4	FES	A	602	4/4	0.99	0.10	13,14,16,18	0
4	FES	I	601	4/4	0.99	0.09	19,19,20,21	0
4	FES	A	601	4/4	1.00	0.09	13,16,18,18	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.



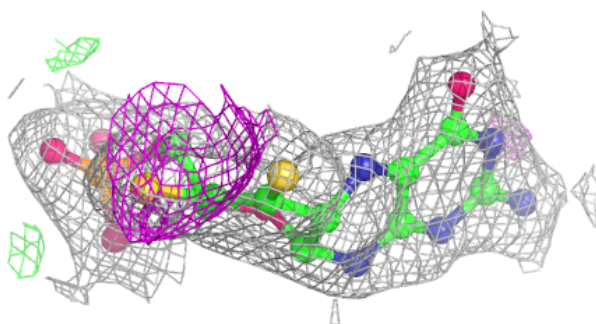
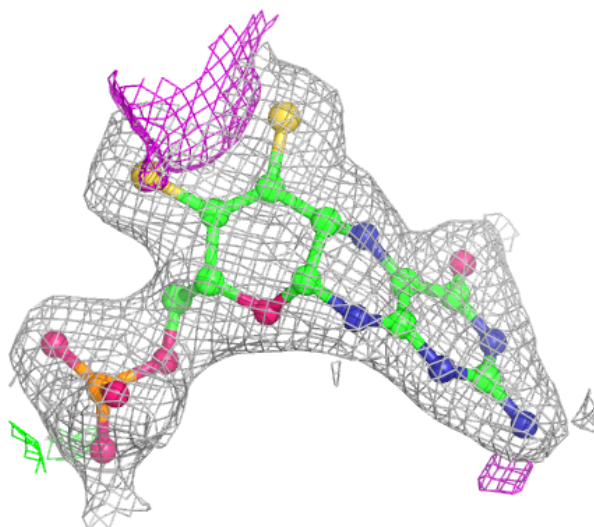
**Electron density around FAD J 606:**

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



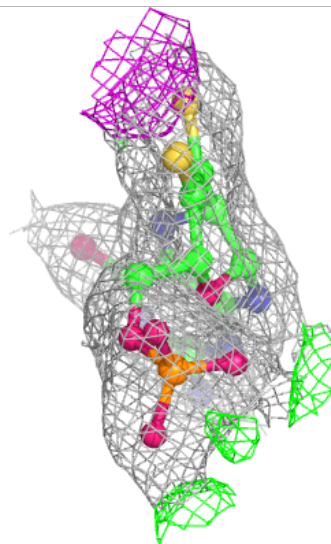
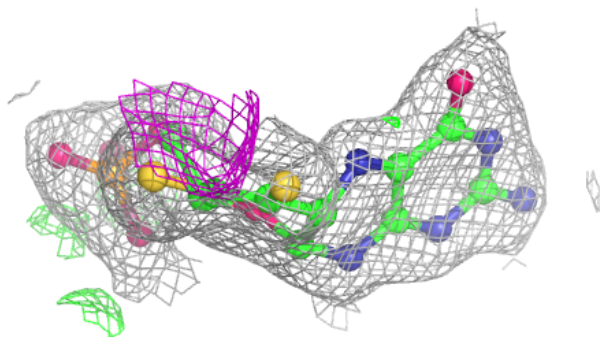
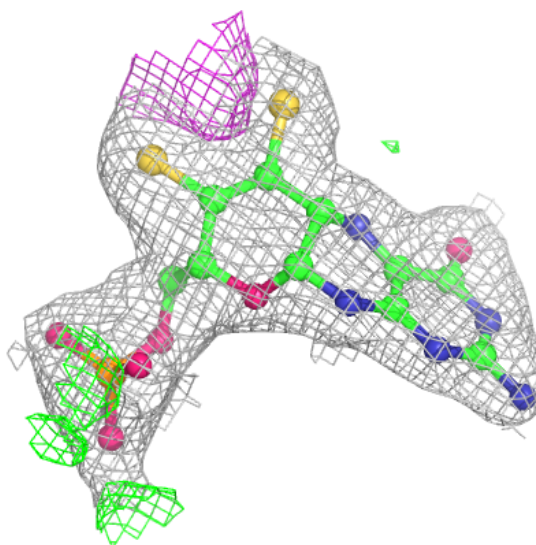
**Electron density around MTE K 1333:**

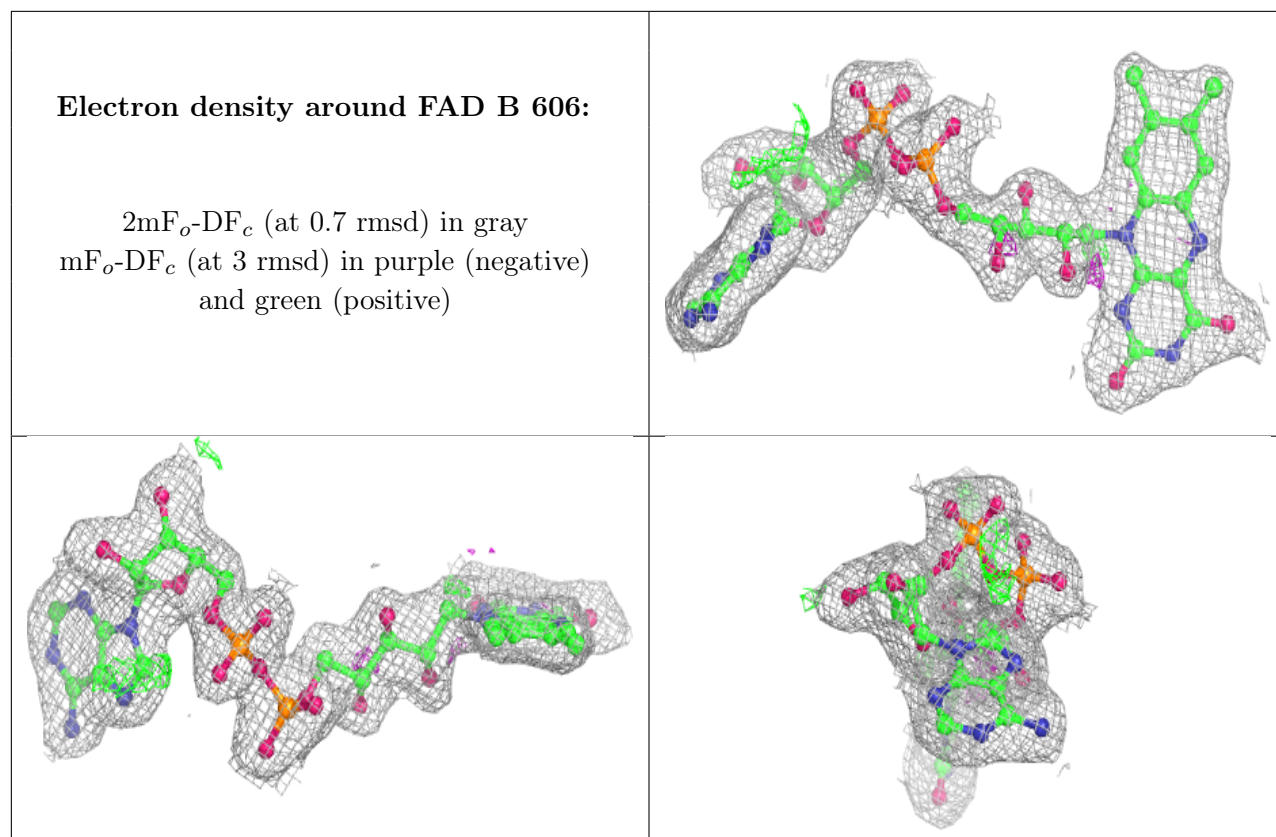
$2mF_o-DF_c$  (at 0.7 rmsd) in gray  
 $mF_o-DF_c$  (at 3 rmsd) in purple (negative)  
and green (positive)



**Electron density around MTE C 1333:**

$2mF_o-DF_c$  (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.