



wwPDB X-ray Structure Validation Summary Report ⓘ

Jul 20, 2026 – 02:52 pm BST

PDB ID : 9RZ1 / pdb_00009rz1
Title : Alpha-Methylacyl-CoA racemase from Mycobacterium tuberculosis in complex with 2-(4-(2-Phenylethoxy)phenylthiol)propanoyl-CoA
Authors : Mojanaga, O.O.; Acharya, K.R.; Lloyd, M.D.
Deposited on : 2025-07-15
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

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	:	1.8.4, CSD as541be (2020)
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	:	9.0.015 (Gargrove)
Density-Fitness	:	1.0.12
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.50

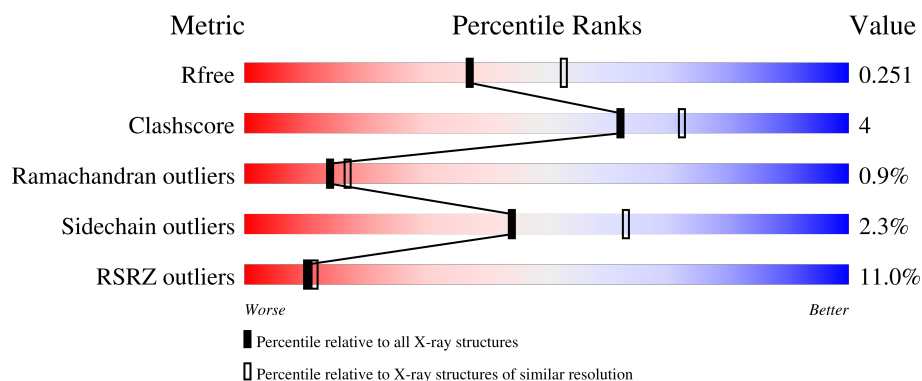
1 Overall quality at a glance

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}	180053	6319 (2.30-2.30)
Clashscore	190562	6919 (2.30-2.30)
Ramachandran outliers	187476	6854 (2.30-2.30)
Sidechain outliers	187428	6854 (2.30-2.30)
RSRZ outliers	180081	6325 (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 ≥ 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	364	 11% 85% 12% ..
1	B	364	 8% 86% 11% ..
1	C	364	 11% 87% 11% .
1	D	364	 7% 88% 10% ..
1	E	364	 12% 84% 13% ..

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Mol	Chain	Length	Quality of chain
1	F	364	14% 85% 12% ...
1	G	364	20% 80% 17% ..
1	H	364	15% 86% 12% ..
1	I	364	6% 88% 10% ..
1	J	364	6% 86% 12% ..
1	K	364	11% 84% 13% ..
1	L	364	10% 86% 12% ..

2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 34739 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 Alpha-methylacyl-CoA racemase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	358	Total	C	N	O	S	0	2	0
			2710	1698	485	511	16			
1	B	357	Total	C	N	O	S	0	2	0
			2708	1698	486	508	16			
1	C	359	Total	C	N	O	S	0	2	0
			2714	1702	486	510	16			
1	D	360	Total	C	N	O	S	0	1	0
			2719	1705	487	511	16			
1	E	360	Total	C	N	O	S	0	3	0
			2731	1711	489	515	16			
1	F	360	Total	C	N	O	S	0	1	0
			2719	1705	487	511	16			
1	G	360	Total	C	N	O	S	0	2	0
			2722	1706	487	513	16			
1	H	360	Total	C	N	O	S	0	1	0
			2719	1705	487	511	16			
1	I	360	Total	C	N	O	S	0	2	0
			2722	1706	487	513	16			
1	J	360	Total	C	N	O	S	0	1	0
			2719	1705	487	511	16			
1	K	359	Total	C	N	O	S	0	3	0
			2724	1708	487	513	16			
1	L	360	Total	C	N	O	S	0	1	0
			2719	1705	487	511	16			

There are 48 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	361	GLY	-	expression tag	UNP O06543
A	362	SER	-	expression tag	UNP O06543
A	363	GLY	-	expression tag	UNP O06543
A	364	CYS	-	expression tag	UNP O06543
B	361	GLY	-	expression tag	UNP O06543

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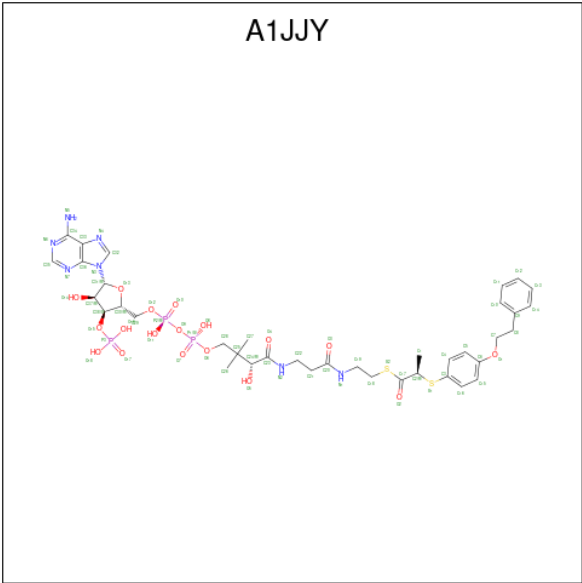
Chain	Residue	Modelled	Actual	Comment	Reference
B	362	SER	-	expression tag	UNP O06543
B	363	GLY	-	expression tag	UNP O06543
B	364	CYS	-	expression tag	UNP O06543
C	361	GLY	-	expression tag	UNP O06543
C	362	SER	-	expression tag	UNP O06543
C	363	GLY	-	expression tag	UNP O06543
C	364	CYS	-	expression tag	UNP O06543
D	361	GLY	-	expression tag	UNP O06543
D	362	SER	-	expression tag	UNP O06543
D	363	GLY	-	expression tag	UNP O06543
D	364	CYS	-	expression tag	UNP O06543
E	361	GLY	-	expression tag	UNP O06543
E	362	SER	-	expression tag	UNP O06543
E	363	GLY	-	expression tag	UNP O06543
E	364	CYS	-	expression tag	UNP O06543
F	361	GLY	-	expression tag	UNP O06543
F	362	SER	-	expression tag	UNP O06543
F	363	GLY	-	expression tag	UNP O06543
F	364	CYS	-	expression tag	UNP O06543
G	361	GLY	-	expression tag	UNP O06543
G	362	SER	-	expression tag	UNP O06543
G	363	GLY	-	expression tag	UNP O06543
G	364	CYS	-	expression tag	UNP O06543
H	361	GLY	-	expression tag	UNP O06543
H	362	SER	-	expression tag	UNP O06543
H	363	GLY	-	expression tag	UNP O06543
H	364	CYS	-	expression tag	UNP O06543
I	361	GLY	-	expression tag	UNP O06543
I	362	SER	-	expression tag	UNP O06543
I	363	GLY	-	expression tag	UNP O06543
I	364	CYS	-	expression tag	UNP O06543
J	361	GLY	-	expression tag	UNP O06543
J	362	SER	-	expression tag	UNP O06543
J	363	GLY	-	expression tag	UNP O06543
J	364	CYS	-	expression tag	UNP O06543
K	361	GLY	-	expression tag	UNP O06543
K	362	SER	-	expression tag	UNP O06543
K	363	GLY	-	expression tag	UNP O06543
K	364	CYS	-	expression tag	UNP O06543
L	361	GLY	-	expression tag	UNP O06543
L	362	SER	-	expression tag	UNP O06543
L	363	GLY	-	expression tag	UNP O06543

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Chain	Residue	Modelled	Actual	Comment	Reference
L	364	CYS	-	expression tag	UNP O06543

- Molecule 2 is 2-(4-(2-Phenylethoxy)phenylthiol)propanoyl-CoA (CCD ID: A1JJY) (formula: C₃₈H₅₂N₇O₁₈P₃S₂) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms						ZeroOcc	AltConf
2	A	1	Total	C	N	O	P	S	0	0
			68	38	7	18	3	2		
2	B	1	Total	C	N	O	P	S	0	0
			68	38	7	18	3	2		
2	C	1	Total	C	N	O	P	S	0	0
			68	38	7	18	3	2		
2	D	1	Total	C	N	O	P	S	0	0
			68	38	7	18	3	2		
2	E	1	Total	C	N	O	P	S	0	0
			68	38	7	18	3	2		
2	F	1	Total	C	N	O	P	S	0	0
			68	38	7	18	3	2		
2	G	1	Total	C	N	O	P	S	0	0
			68	38	7	18	3	2		
2	H	1	Total	C	N	O	P	S	0	0
			68	38	7	18	3	2		
2	I	1	Total	C	N	O	P	S	0	0
			68	38	7	18	3	2		
2	J	1	Total	C	N	O	P	S	0	0
			68	38	7	18	3	2		

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Mol	Chain	Residues	Atoms						ZeroOcc	AltConf
2	K	1	Total	C	N	O	P	S	0	0
			68	38	7	18	3	2		
2	L	1	Total	C	N	O	P	S	0	0
			68	38	7	18	3	2		

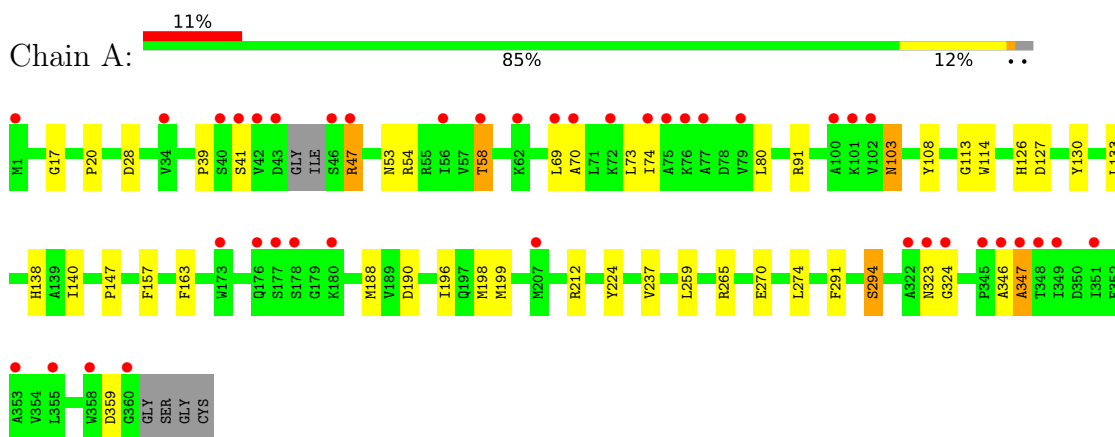
- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	106	Total	O	0	0
			106	106		
3	B	117	Total	O	0	0
			117	117		
3	C	103	Total	O	0	0
			103	103		
3	D	126	Total	O	0	0
			126	126		
3	E	102	Total	O	0	0
			102	102		
3	F	103	Total	O	0	0
			103	103		
3	G	106	Total	O	0	0
			106	106		
3	H	94	Total	O	0	0
			94	94		
3	I	109	Total	O	0	0
			109	109		
3	J	115	Total	O	0	0
			115	115		
3	K	115	Total	O	0	0
			115	115		
3	L	100	Total	O	0	0
			100	100		
3	N	1	Total	O	0	0
			1	1		

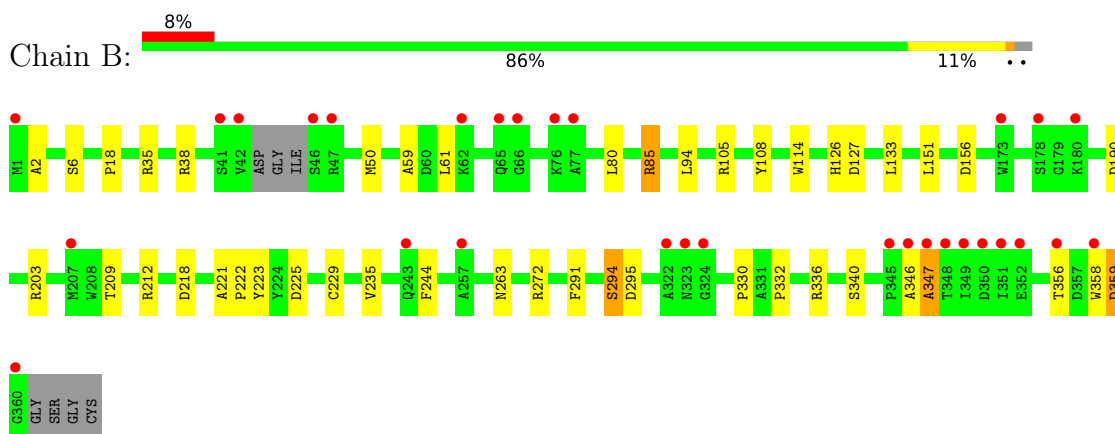
3 Residue-property plots [i](#)

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.

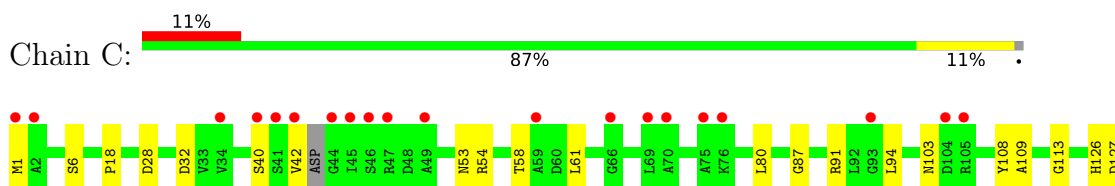
- Molecule 1: Alpha-methylacyl-CoA racemase

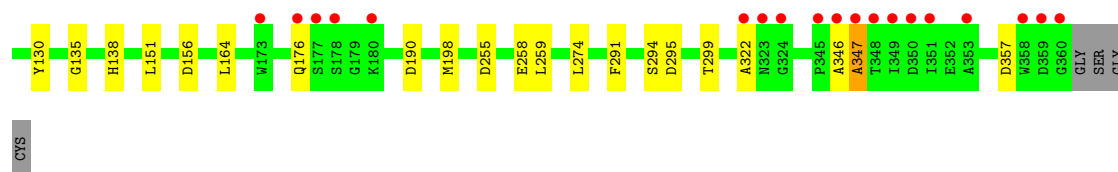


- Molecule 1: Alpha-methylacyl-CoA racemase



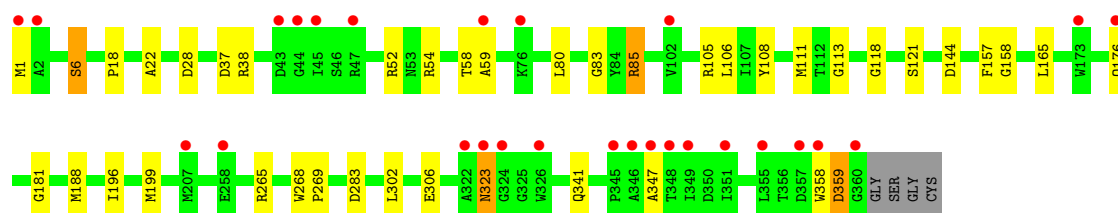
- Molecule 1: Alpha-methylacyl-CoA racemase





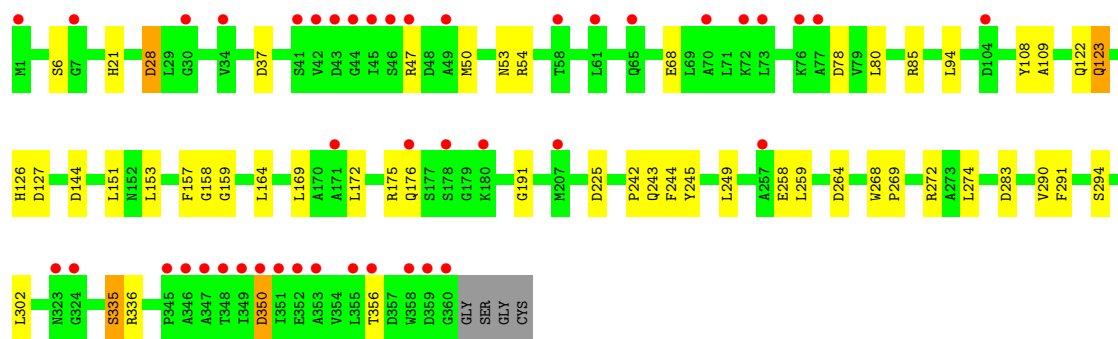
- Molecule 1: Alpha-methylacyl-CoA racemase

Chain D: 7% 88% 10% ..



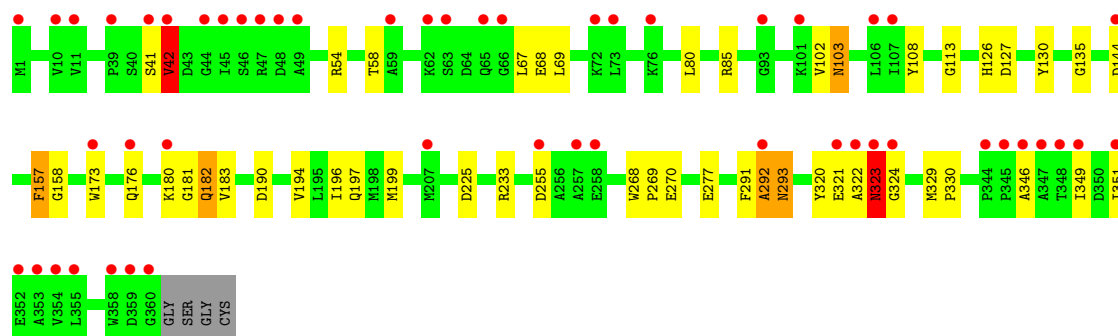
- Molecule 1: Alpha-methylacyl-CoA racemase

Chain E: 12% 84% 13% ..



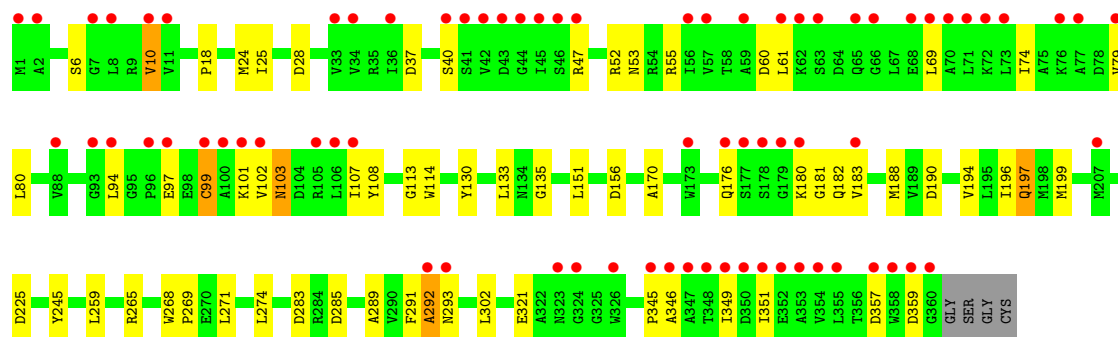
- Molecule 1: Alpha-methylacyl-CoA racemase

Chain F: 14% 85% 12% ...

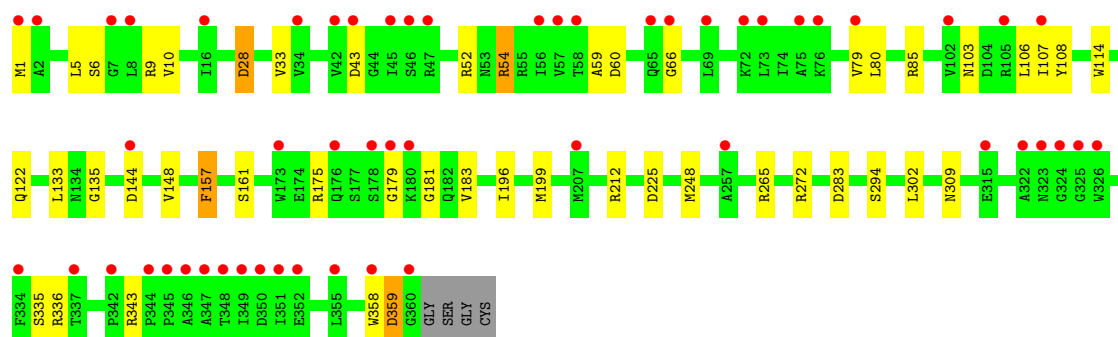
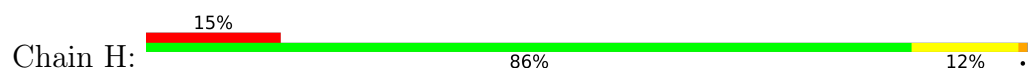


- Molecule 1: Alpha-methylacyl-CoA racemase

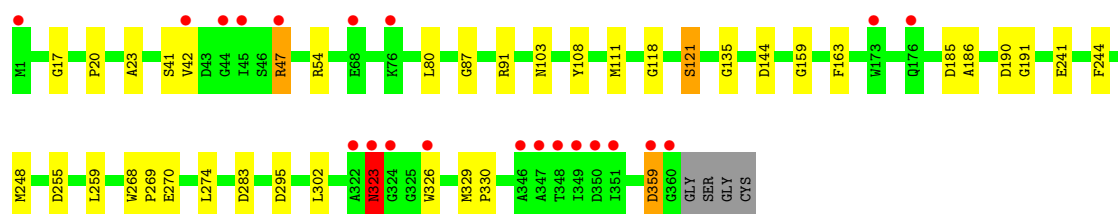
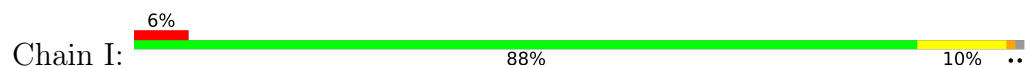
Chain G: 20% 80% 17% ..



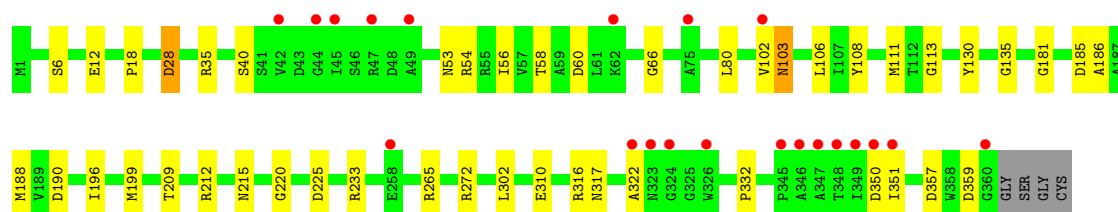
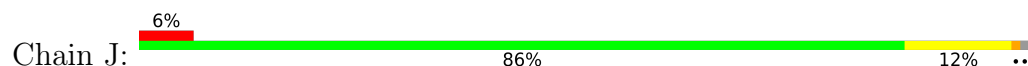
• Molecule 1: Alpha-methylacyl-CoA racemase



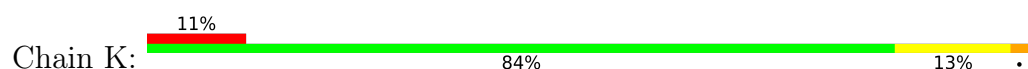
• Molecule 1: Alpha-methylacyl-CoA racemase

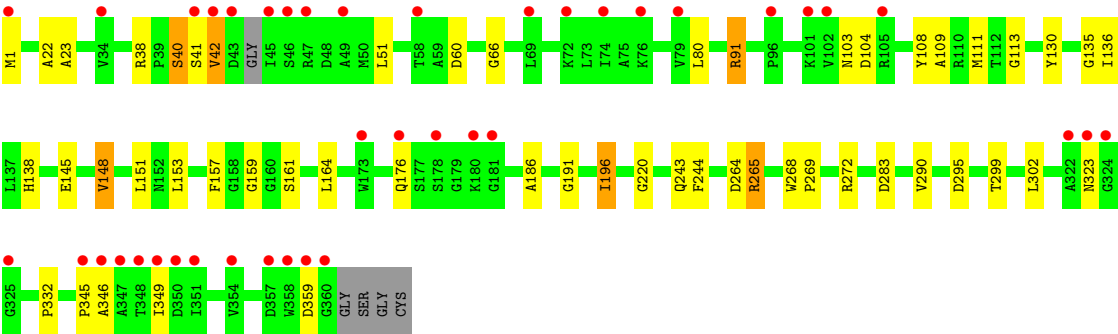


• Molecule 1: Alpha-methylacyl-CoA racemase

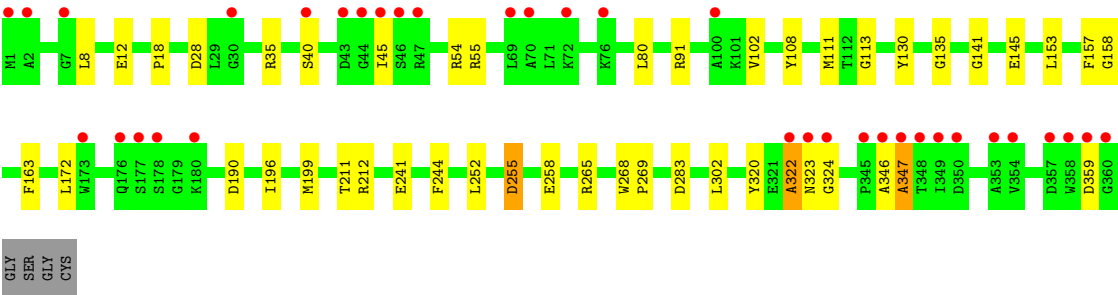
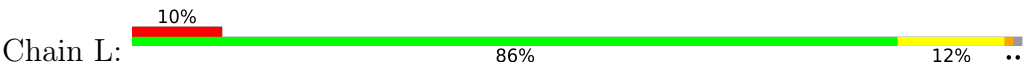


• Molecule 1: Alpha-methylacyl-CoA racemase





● Molecule 1: Alpha-methylacyl-CoA racemase



4 Data and refinement statistics

Property	Value	Source
Space group	I 4 2 2	Depositor
Cell constants a, b, c, α , β , γ	276.86Å 276.86Å 389.85Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	138.81 – 2.30 138.81 – 2.30	Depositor EDS
% Data completeness (in resolution range)	100.0 (138.81-2.30) 99.7 (138.81-2.30)	Depositor EDS
R_{merge}	0.38	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.36 (at 2.29Å)	Xtriage
Refinement program	REFMAC 5.8.0430 (refmacat 0.4.88)	Depositor
R, R_{free}	0.201 , 0.244 0.210 , 0.251	Depositor DCC
R_{free} test set	16809 reflections (5.10%)	wwPDB-VP
Wilson B-factor (Å ²)	38.1	Xtriage
Anisotropy	0.290	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.34 , 32.6	EDS
L-test for twinning ²	$\langle L \rangle = 0.51$, $\langle L^2 \rangle = 0.35$	Xtriage
Estimated twinning fraction	0.005 for -1/2*h+1/2*k-1/2*l,1/2*h-1/2*k-1/2*l,-h-k 0.010 for -1/2*h-1/2*k+1/2*l,-1/2*h-1/2*k-1/2*l,h-k	Xtriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	34739	wwPDB-VP
Average B, all atoms (Å ²)	49.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.62% 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: A1JJY

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	0.60	0/2782	1.10	6/3783 (0.2%)
1	B	0.61	0/2774	1.09	5/3772 (0.1%)
1	C	0.61	0/2786	1.06	4/3788 (0.1%)
1	D	0.61	0/2786	1.12	6/3790 (0.2%)
1	E	0.61	0/2804	1.11	8/3814 (0.2%)
1	F	0.61	0/2786	1.10	6/3790 (0.2%)
1	G	0.58	0/2795	1.13	8/3802 (0.2%)
1	H	0.59	0/2786	1.13	8/3790 (0.2%)
1	I	0.59	0/2795	1.08	7/3802 (0.2%)
1	J	0.60	0/2786	1.11	5/3790 (0.1%)
1	K	0.62	0/2799	1.12	6/3806 (0.2%)
1	L	0.62	0/2786	1.11	7/3790 (0.2%)
All	All	0.60	0/33465	1.10	76/45517 (0.2%)

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	B	0	2
1	C	0	1
1	E	0	2
1	F	0	1
1	H	0	3
1	J	0	4
1	K	0	1
1	L	0	5
All	All	0	19

There are no bond length outliers.

The worst 5 of 76 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	203	ARG	CB-CA-C	-9.01	95.83	110.79
1	B	203	ARG	N-CA-CB	8.52	122.64	110.12
1	G	283	ASP	CA-CB-CG	6.82	119.42	112.60
1	I	190	ASP	CA-CB-CG	6.78	119.38	112.60
1	G	190	ASP	CA-CB-CG	6.63	119.23	112.60

There are no chirality outliers.

5 of 19 planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	B	212	ARG	Sidechain
1	B	35	ARG	Sidechain
1	C	54	ARG	Peptide
1	E	350	ASP	Peptide
1	E	54	ARG	Peptide

5.2 Too-close contacts

In the following table, the Non-H and H(model) columns list the number of non-hydrogen atoms and hydrogen atoms in the chain respectively. The H(added) column lists the number of hydrogen atoms added and optimized by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, whereas Symm-Clashes lists symmetry-related clashes.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	2710	0	2646	29	0
1	B	2708	0	2651	22	0
1	C	2714	0	2656	18	0
1	D	2719	0	2663	22	0
1	E	2731	0	2668	24	0
1	F	2719	0	2663	30	0
1	G	2722	0	2661	37	0
1	H	2719	0	2663	21	0
1	I	2722	0	2661	22	0
1	J	2719	0	2663	19	0
1	K	2724	0	2665	28	0
1	L	2719	0	2663	21	0
2	A	68	0	0	1	0
2	B	68	0	0	1	0
2	C	68	0	0	0	0
2	D	68	0	0	1	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	E	68	0	0	1	0
2	F	68	0	0	3	0
2	G	68	0	0	0	0
2	H	68	0	0	1	0
2	I	68	0	0	0	0
2	J	68	0	0	0	0
2	K	68	0	0	1	0
2	L	68	0	0	1	0
3	A	106	0	0	2	0
3	B	117	0	0	2	0
3	C	103	0	0	1	0
3	D	126	0	0	0	0
3	E	102	0	0	0	0
3	F	103	0	0	3	0
3	G	106	0	0	3	0
3	H	94	0	0	0	0
3	I	109	0	0	3	0
3	J	115	0	0	1	0
3	K	115	0	0	3	0
3	L	100	0	0	1	0
3	N	1	0	0	0	0
All	All	34739	0	31923	271	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 4.

The worst 5 of 271 close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:G:259:LEU:HD22	1:G:274:LEU:HD13	1.51	0.89
1:I:118:GLY:O	1:I:121:SER:OG	2.04	0.75
1:F:69:LEU:HD13	1:F:351:ILE:HG23	1.70	0.74
1:K:196:ILE:HG13	1:L:153:LEU:HD21	1.70	0.74
1:E:80:LEU:HD23	1:E:108:TYR:CE2	2.24	0.72

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	356/364 (98%)	330 (93%)	23 (6%)	3 (1%)	16	20
1	B	355/364 (98%)	334 (94%)	17 (5%)	4 (1%)	11	13
1	C	357/364 (98%)	339 (95%)	14 (4%)	4 (1%)	11	13
1	D	359/364 (99%)	332 (92%)	24 (7%)	3 (1%)	16	20
1	E	361/364 (99%)	336 (93%)	24 (7%)	1 (0%)	36	46
1	F	359/364 (99%)	329 (92%)	24 (7%)	6 (2%)	7	7
1	G	360/364 (99%)	329 (91%)	26 (7%)	5 (1%)	9	9
1	H	359/364 (99%)	336 (94%)	20 (6%)	3 (1%)	16	20
1	I	360/364 (99%)	343 (95%)	15 (4%)	2 (1%)	21	27
1	J	359/364 (99%)	342 (95%)	15 (4%)	2 (1%)	21	27
1	K	358/364 (98%)	334 (93%)	19 (5%)	5 (1%)	9	9
1	L	359/364 (99%)	336 (94%)	21 (6%)	2 (1%)	21	27
All	All	4302/4368 (98%)	4020 (93%)	242 (6%)	40 (1%)	14	17

5 of 40 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	347	ALA
1	B	347	ALA
1	B	359	ASP
1	C	347	ALA
1	D	347	ALA

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	276/277 (100%)	271 (98%)	5 (2%)	51	70
1	B	275/277 (99%)	270 (98%)	5 (2%)	51	70
1	C	276/277 (100%)	269 (98%)	7 (2%)	42	60
1	D	276/277 (100%)	273 (99%)	3 (1%)	65	81
1	E	278/277 (100%)	270 (97%)	8 (3%)	37	55
1	F	276/277 (100%)	267 (97%)	9 (3%)	33	50
1	G	277/277 (100%)	270 (98%)	7 (2%)	42	60
1	H	276/277 (100%)	270 (98%)	6 (2%)	45	65
1	I	277/277 (100%)	271 (98%)	6 (2%)	45	65
1	J	276/277 (100%)	271 (98%)	5 (2%)	51	70
1	K	278/277 (100%)	267 (96%)	11 (4%)	28	42
1	L	276/277 (100%)	272 (99%)	4 (1%)	59	76
All	All	3317/3324 (100%)	3241 (98%)	76 (2%)	44	63

5 of 76 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	J	40	SER
1	K	349	ILE
1	J	350	ASP
1	K	91	ARG
1	L	199	MET

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 45 such sidechains are listed below:

Mol	Chain	Res	Type
1	H	282	HIS
1	I	282	HIS
1	H	286	HIS
1	I	138	HIS
1	J	286	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](#)

12 ligands are modelled in this entry.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\# Z > 2$	Counts	RMSZ	$\# Z > 2$
2	A1JJY	K	401	-	66,72,72	0.65	1 (1%)	89,104,104	1.12	8 (8%)
2	A1JJY	J	401	-	66,72,72	0.53	0	89,104,104	1.04	8 (8%)
2	A1JJY	G	401	-	66,72,72	0.60	1 (1%)	89,104,104	0.86	5 (5%)
2	A1JJY	D	401	-	66,72,72	0.57	1 (1%)	89,104,104	0.92	6 (6%)
2	A1JJY	E	401	-	66,72,72	0.77	3 (4%)	89,104,104	1.00	6 (6%)
2	A1JJY	B	401	-	66,72,72	0.64	1 (1%)	89,104,104	0.74	2 (2%)
2	A1JJY	L	401	-	66,72,72	0.63	1 (1%)	89,104,104	0.90	5 (5%)
2	A1JJY	I	401	-	66,72,72	0.68	1 (1%)	89,104,104	0.87	6 (6%)
2	A1JJY	A	401	-	66,72,72	0.58	1 (1%)	89,104,104	0.95	6 (6%)
2	A1JJY	F	401	-	66,72,72	0.62	2 (3%)	89,104,104	1.11	9 (10%)
2	A1JJY	H	401	-	66,72,72	0.94	3 (4%)	89,104,104	0.82	3 (3%)
2	A1JJY	C	401	-	66,72,72	0.56	1 (1%)	89,104,104	0.85	5 (5%)

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	A1JJY	K	401	-	-	6/64/81/81	0/5/5/5
2	A1JJY	J	401	-	-	16/64/81/81	0/5/5/5
2	A1JJY	G	401	-	-	7/64/81/81	0/5/5/5
2	A1JJY	D	401	-	-	7/64/81/81	0/5/5/5
2	A1JJY	E	401	-	-	20/64/81/81	0/5/5/5
2	A1JJY	B	401	-	-	14/64/81/81	0/5/5/5
2	A1JJY	L	401	-	-	15/64/81/81	0/5/5/5
2	A1JJY	I	401	-	-	8/64/81/81	0/5/5/5
2	A1JJY	A	401	-	-	9/64/81/81	0/5/5/5
2	A1JJY	F	401	-	-	25/64/81/81	0/5/5/5
2	A1JJY	H	401	-	-	8/64/81/81	0/5/5/5
2	A1JJY	C	401	-	-	7/64/81/81	0/5/5/5

The worst 5 of 16 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	H	401	A1JJY	O2-C17	4.11	1.26	1.20
2	H	401	A1JJY	C2-S1	4.03	1.90	1.83
2	E	401	A1JJY	C2-S1	3.52	1.89	1.83
2	I	401	A1JJY	O2-C17	3.18	1.25	1.20
2	H	401	A1JJY	C17-S2	2.58	1.83	1.75

The worst 5 of 69 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	K	401	A1JJY	O15-P3-O17	-5.43	88.45	109.39
2	A	401	A1JJY	O8-P1-O7	4.20	133.00	112.24
2	F	401	A1JJY	P2-O9-P1	3.92	146.29	132.83
2	J	401	A1JJY	C26-C25-C28	-3.85	101.95	108.23
2	E	401	A1JJY	C18-S2-C17	3.65	112.73	101.75

There are no chirality outliers.

5 of 142 torsion outliers are listed below:

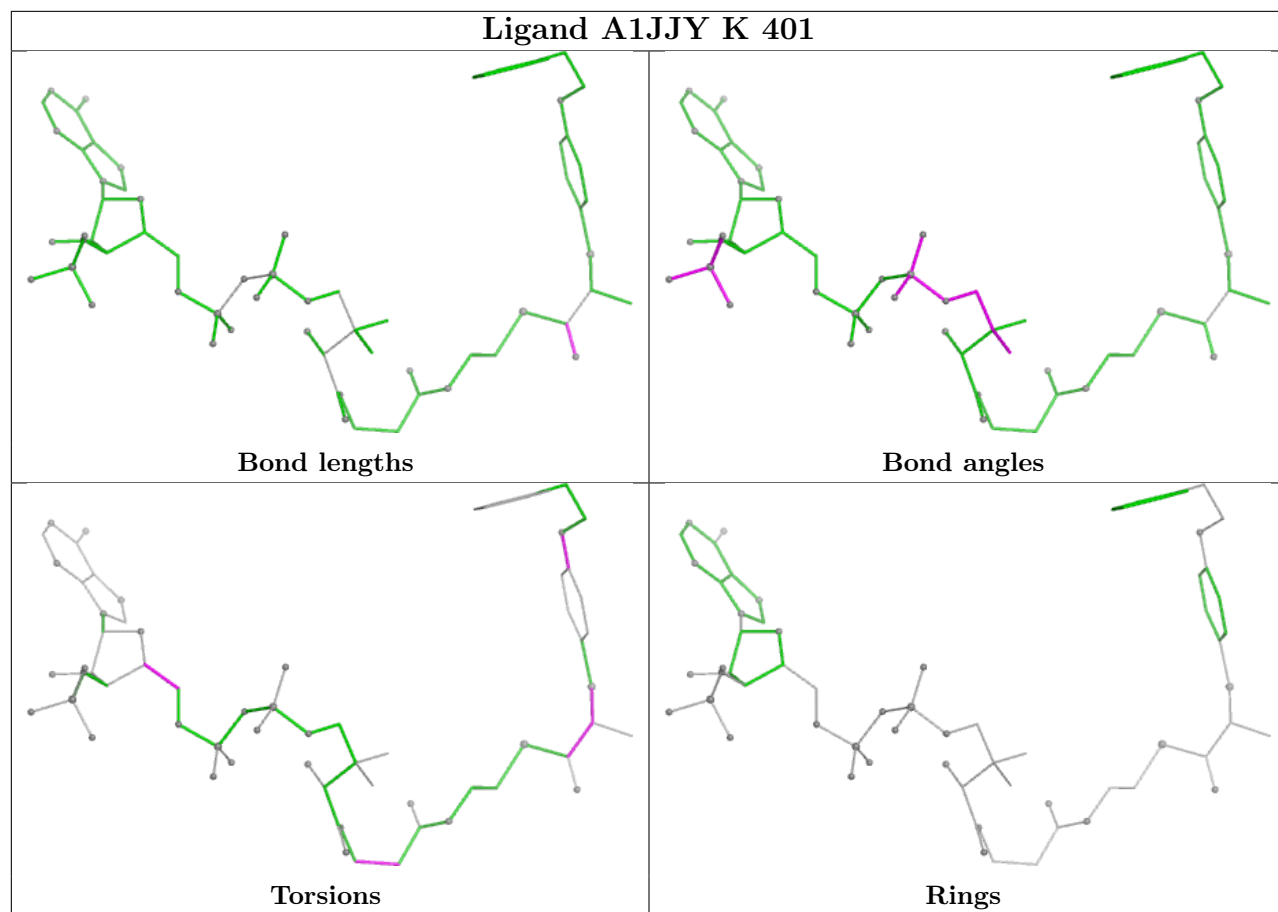
Mol	Chain	Res	Type	Atoms
2	A	401	A1JJY	O1-C7-C8-C9
2	B	401	A1JJY	O1-C7-C8-C9
2	B	401	A1JJY	C29-O12-P2-O9
2	D	401	A1JJY	C29-O12-P2-O10
2	D	401	A1JJY	O12-C29-C30-O13

There are no ring outliers.

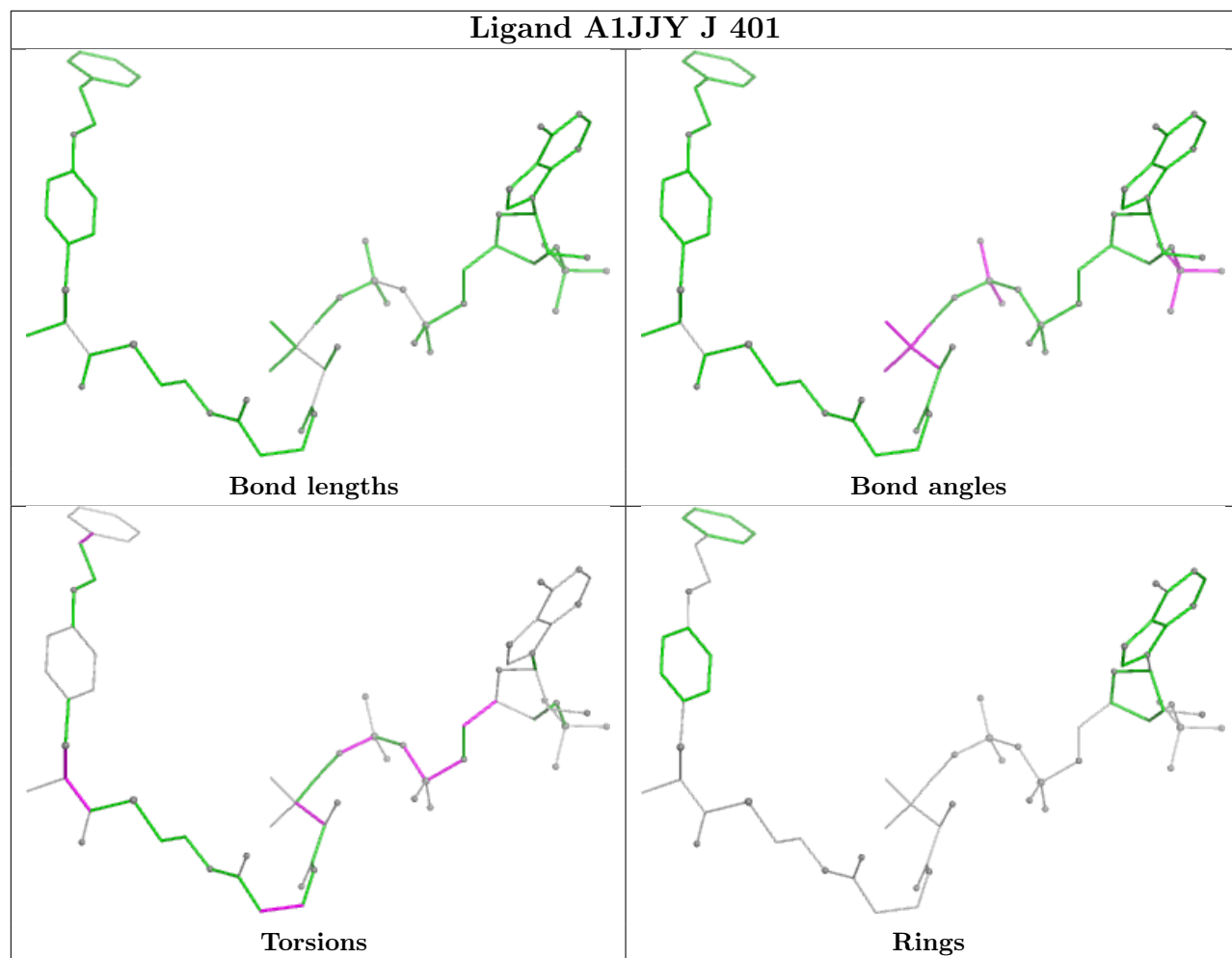
8 monomers are involved in 10 short contacts:

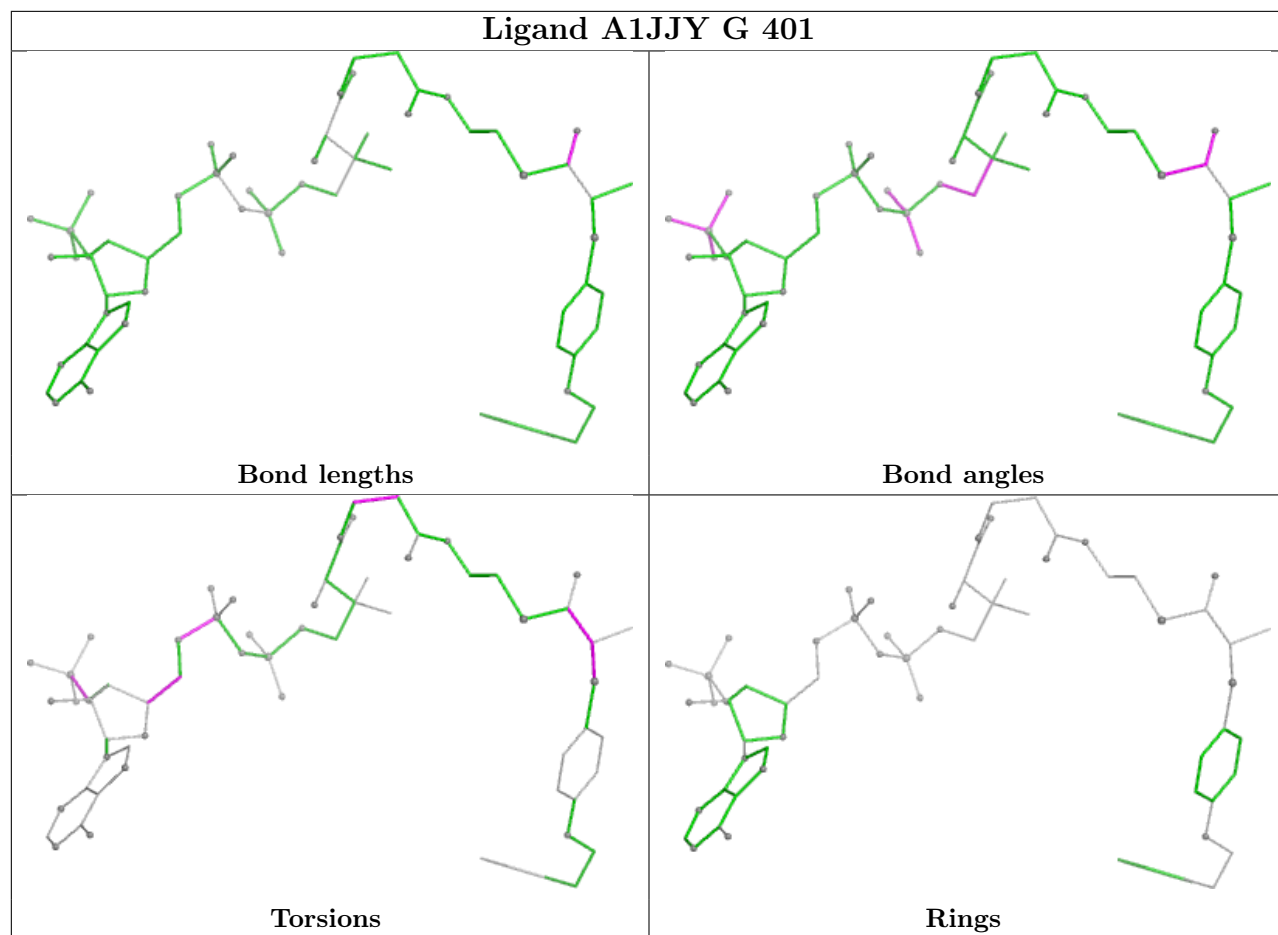
Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	K	401	A1JJY	1	0
2	D	401	A1JJY	1	0
2	E	401	A1JJY	1	0
2	B	401	A1JJY	1	0
2	L	401	A1JJY	1	0
2	A	401	A1JJY	1	0
2	F	401	A1JJY	3	0
2	H	401	A1JJY	1	0

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.

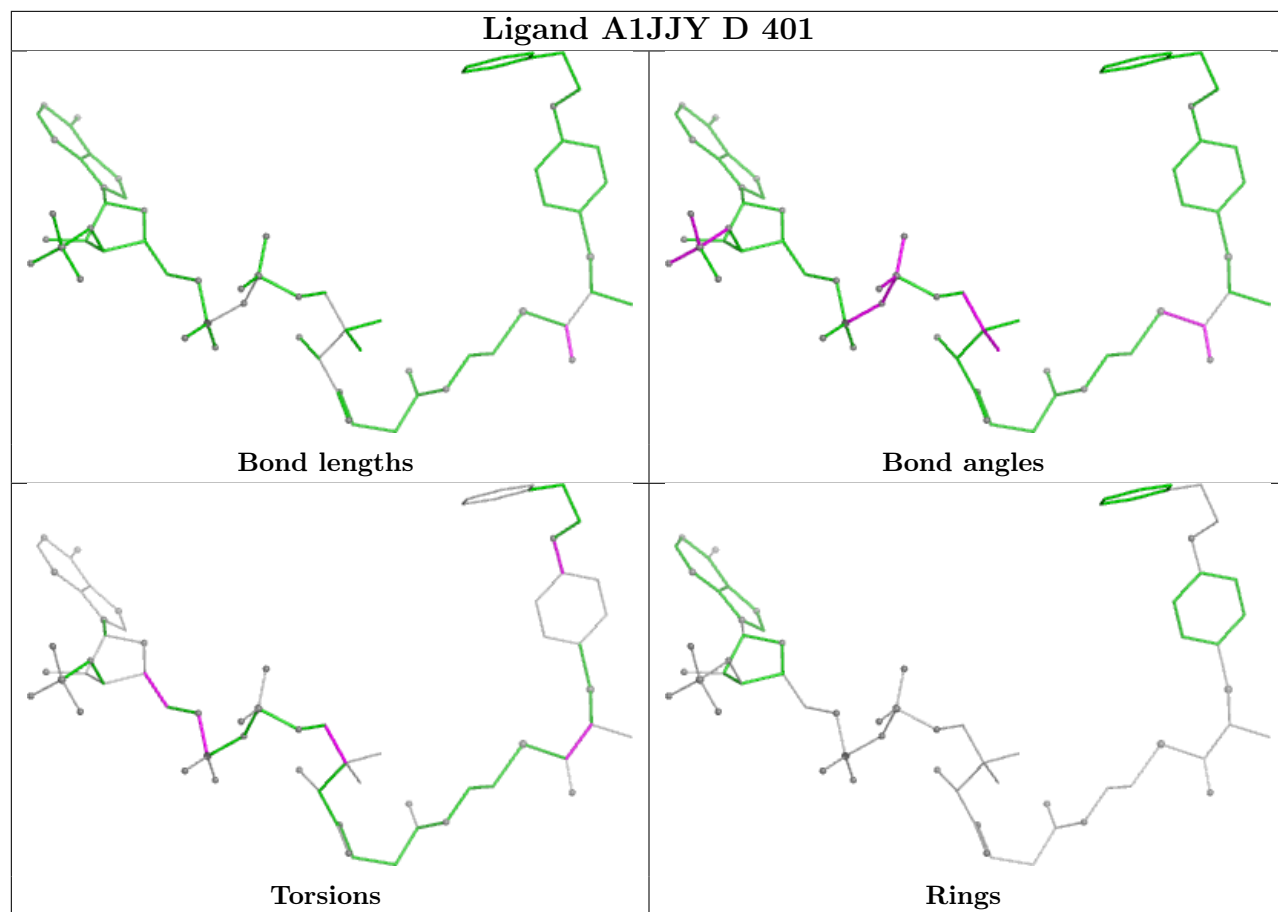


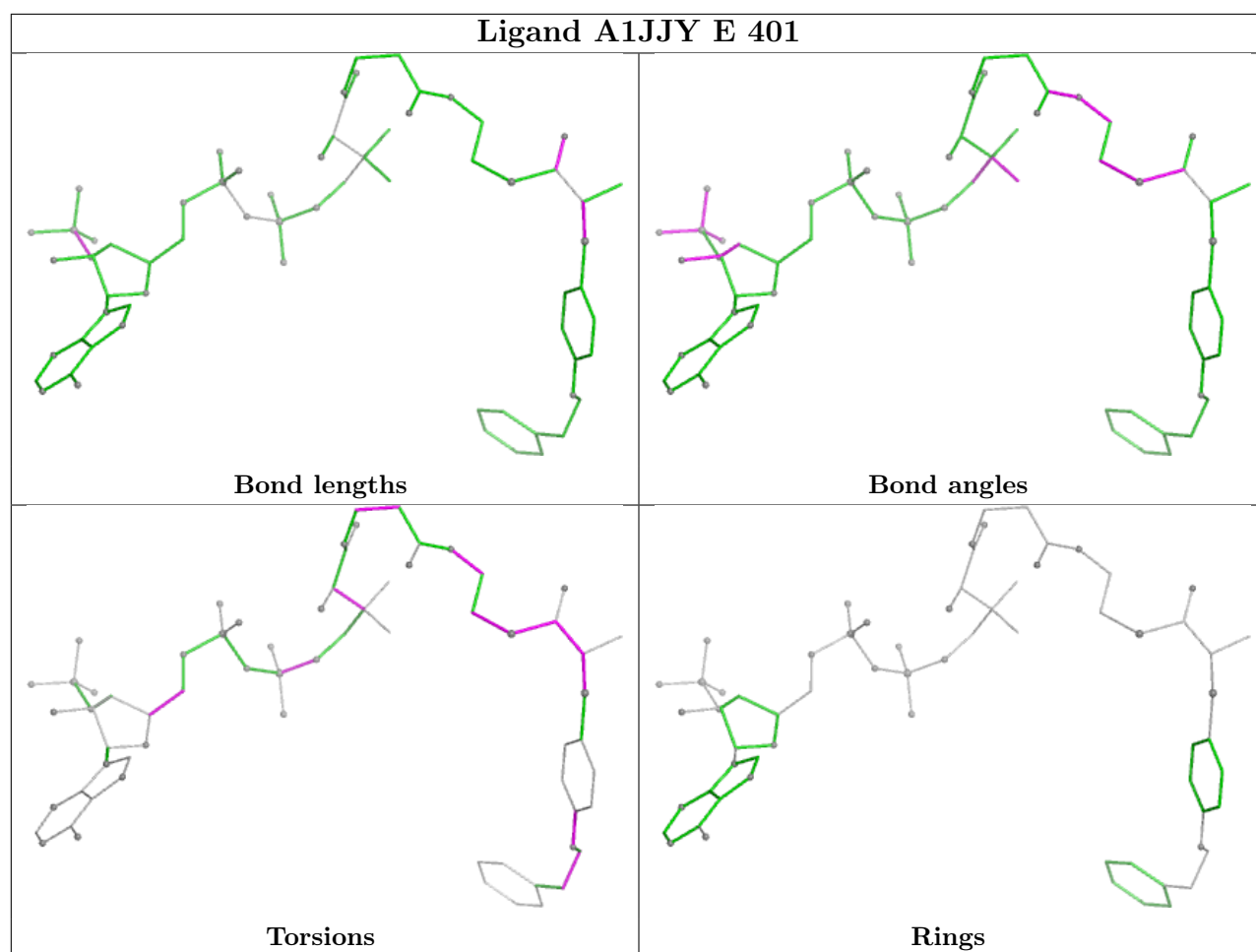
Ligand A1JJY J 401

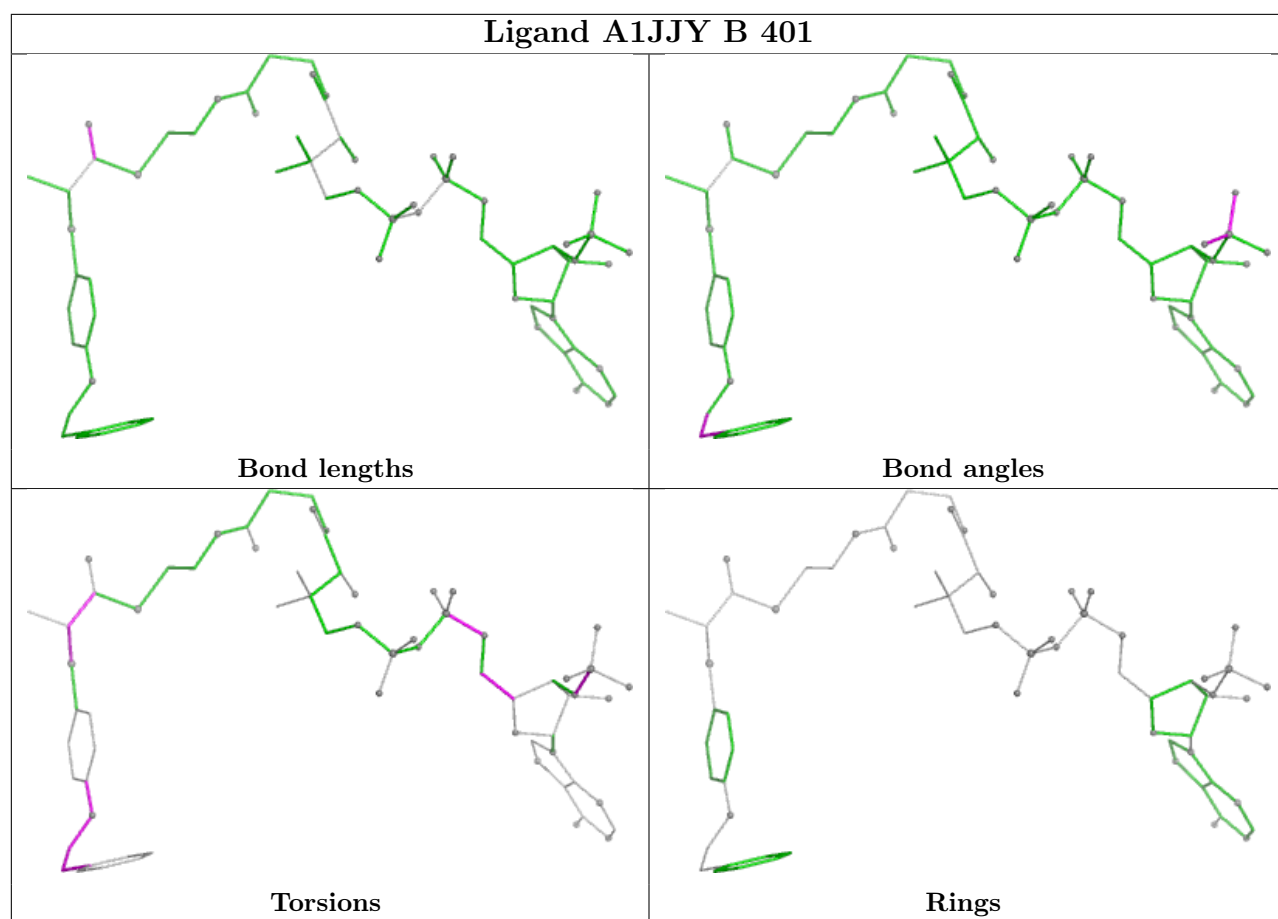




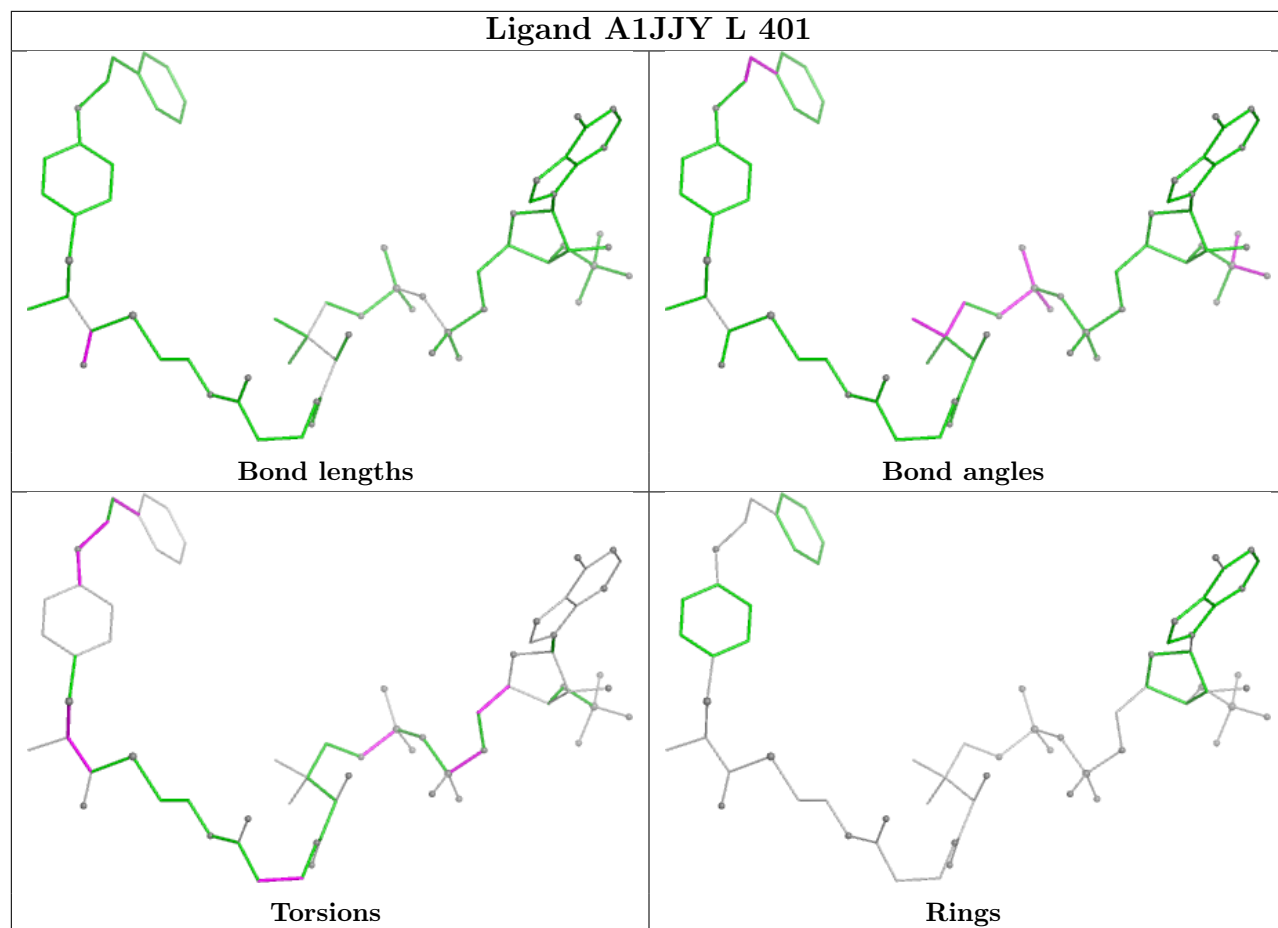
Ligand A1JJY D 401

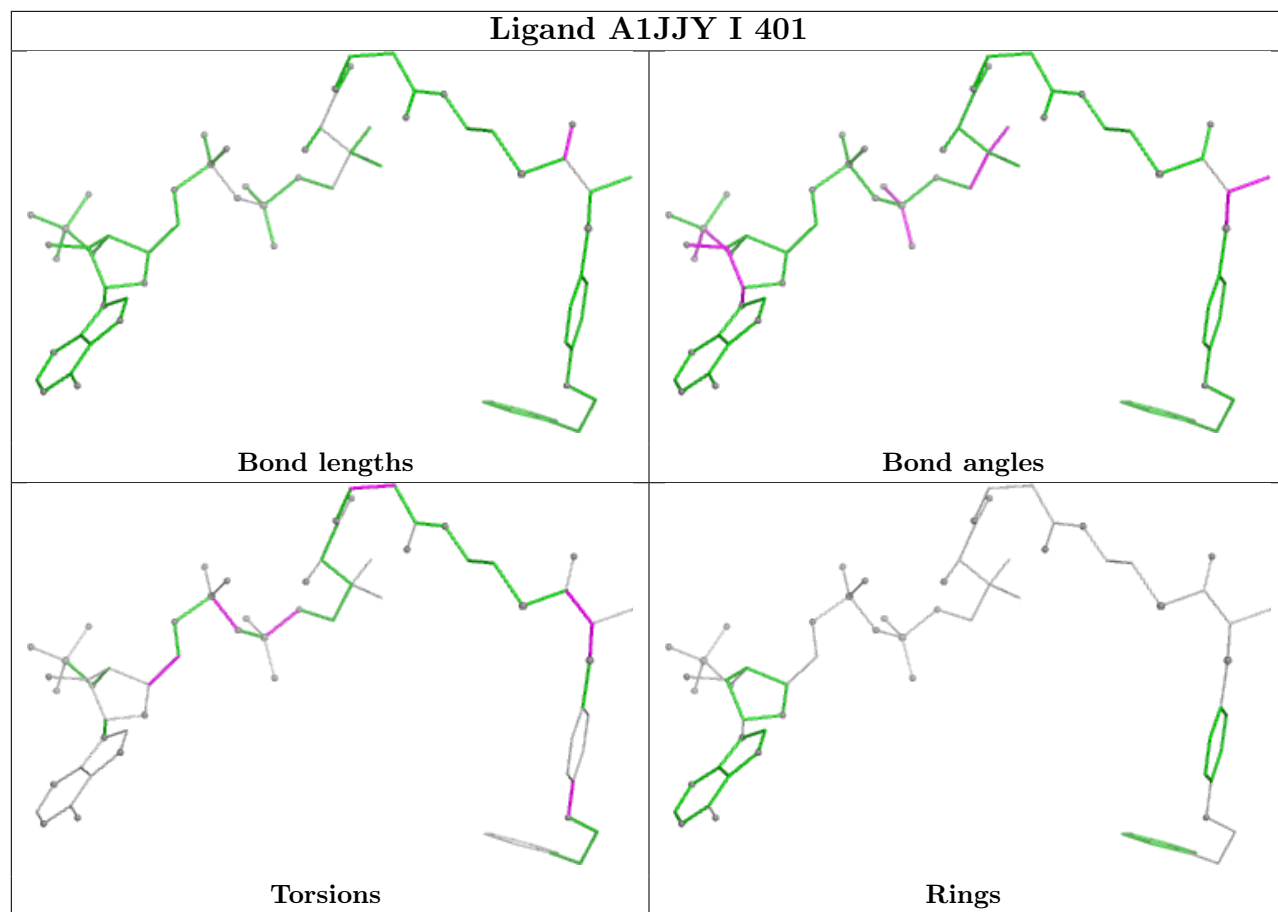




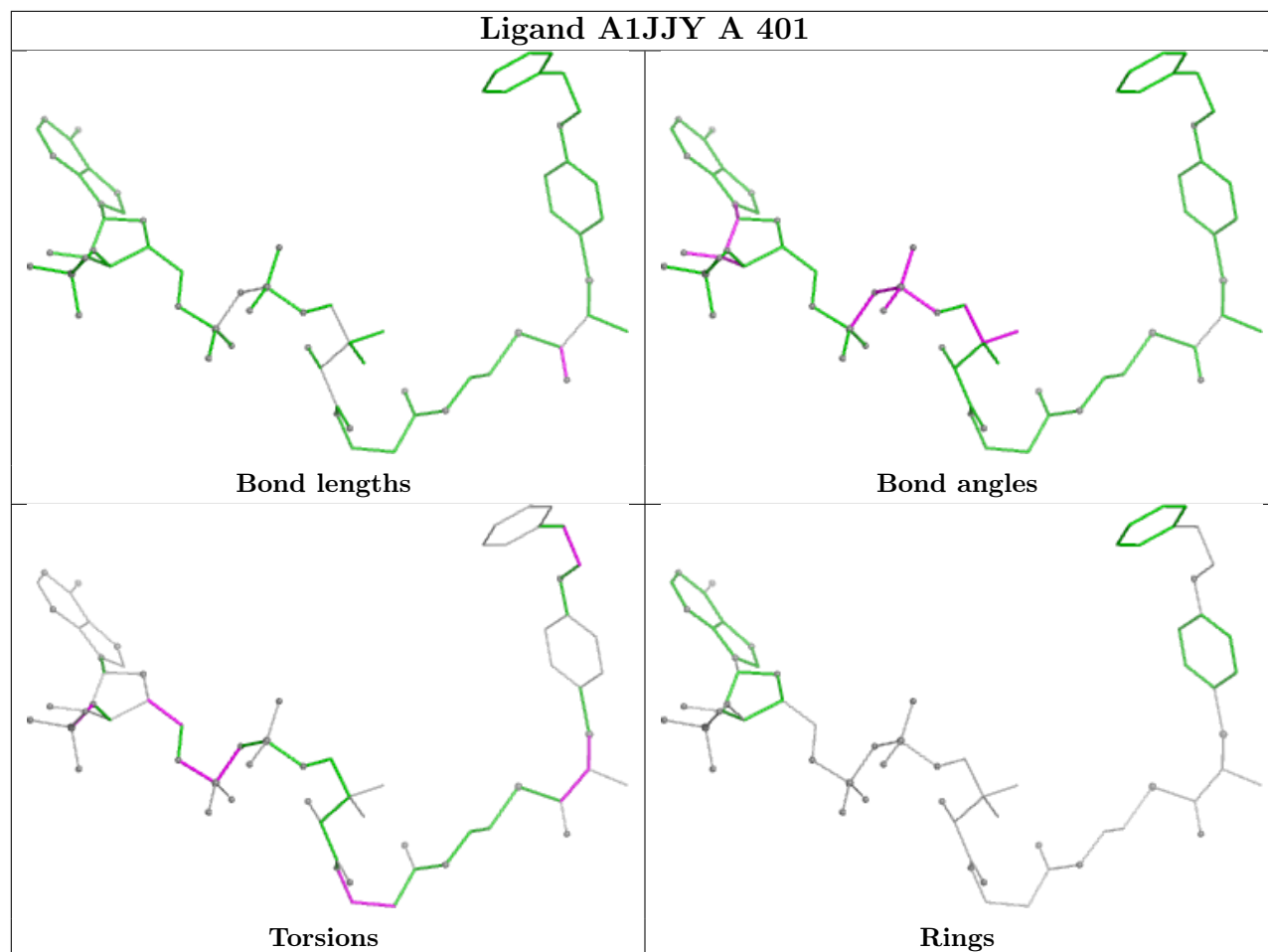


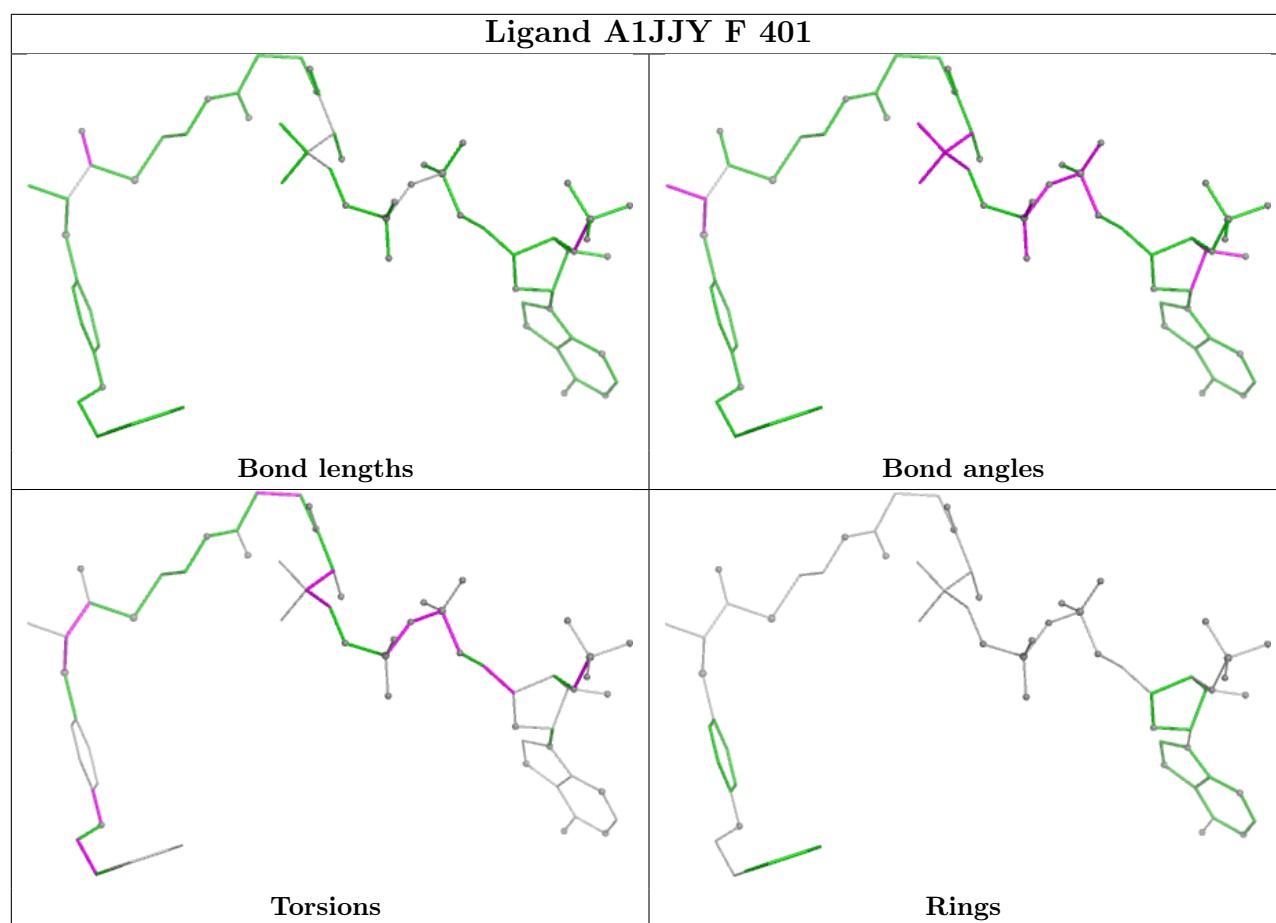
Ligand A1JJY L 401



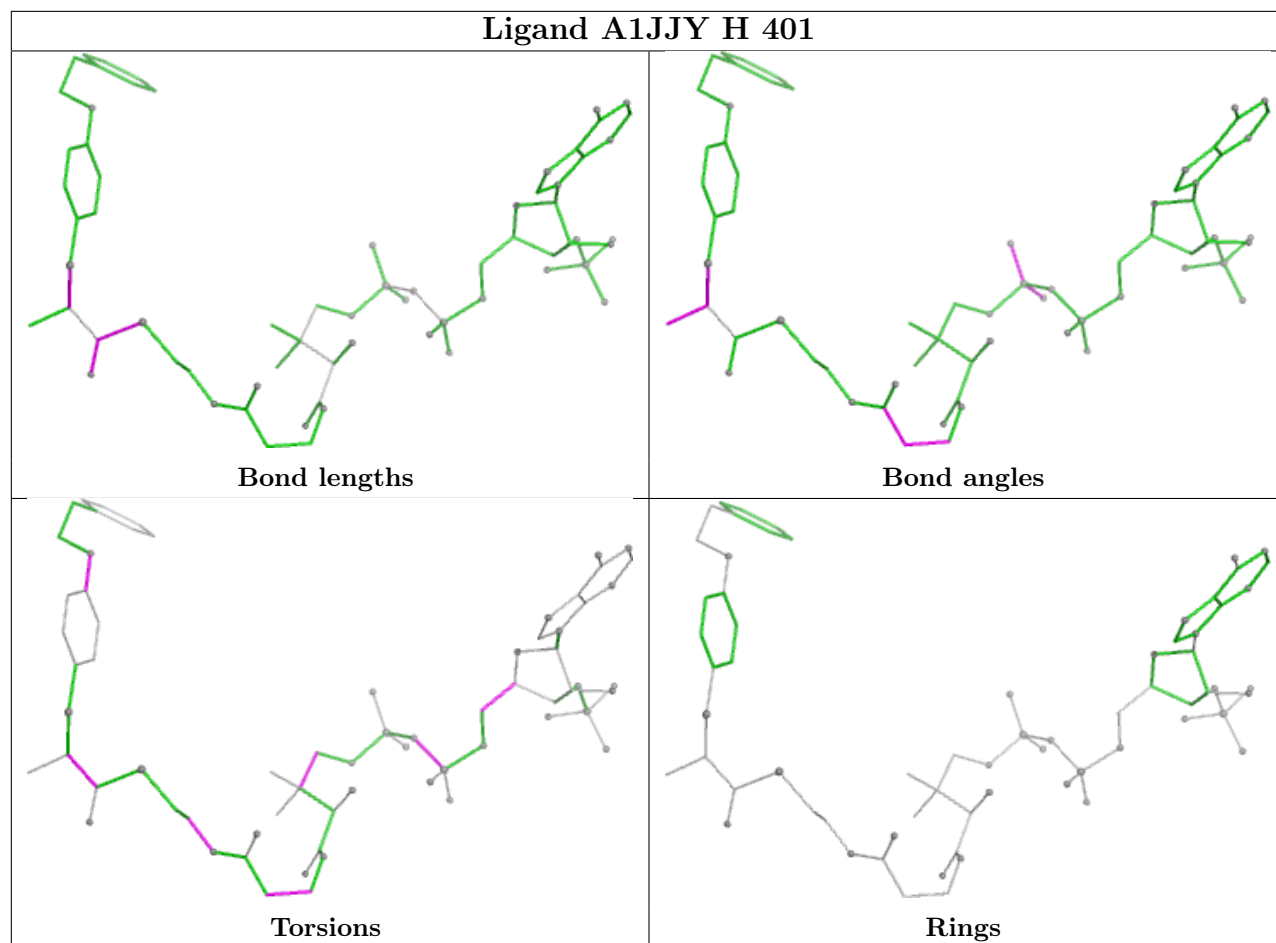


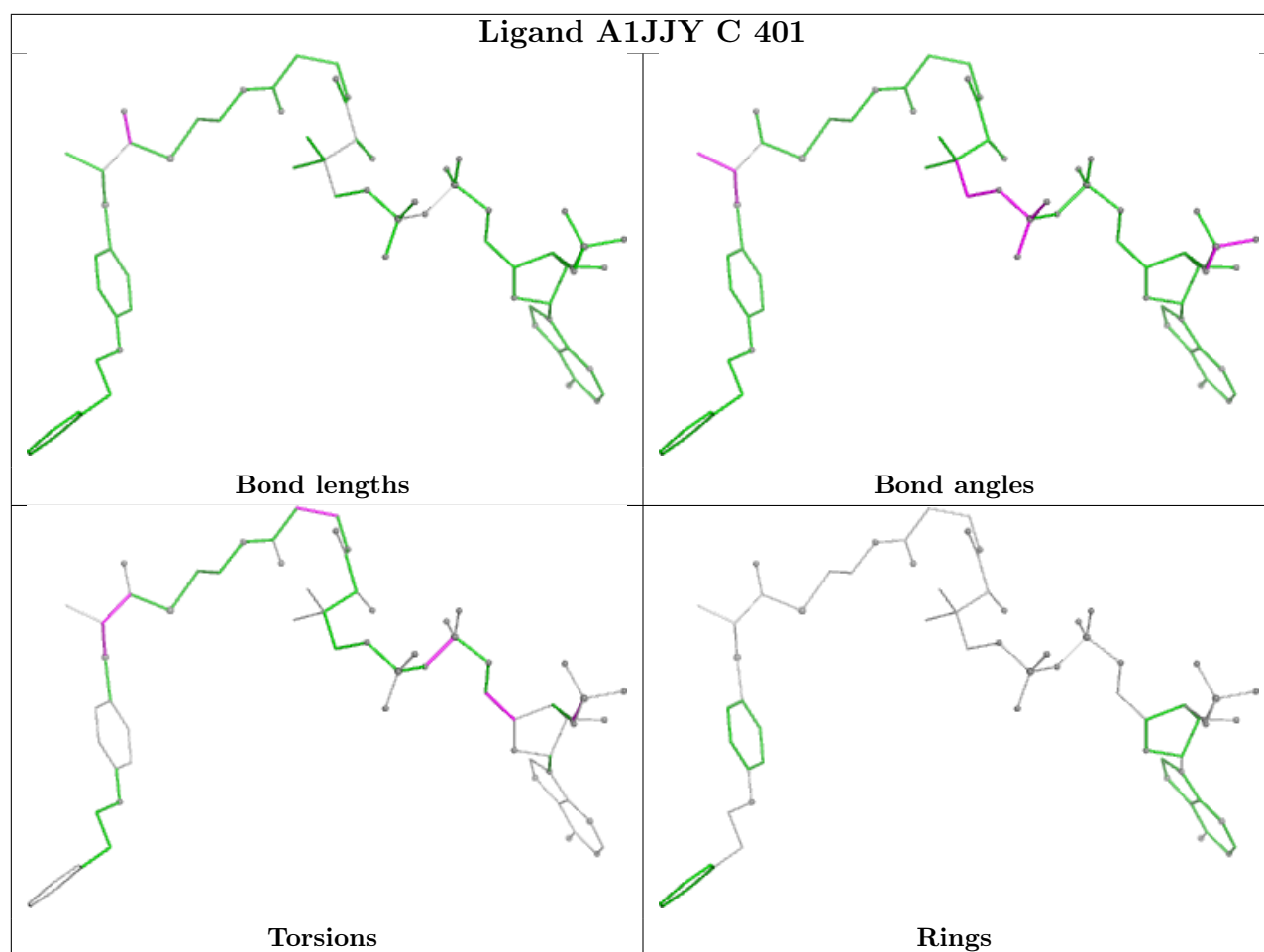
Ligand A1JJY A 401





Ligand A1JJY H 401





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	358/364 (98%)	0.54	41 (11%)	9 10	24, 43, 90, 137	2 (0%)
1	B	357/364 (98%)	0.36	30 (8%)	17 18	17, 41, 89, 127	2 (0%)
1	C	359/364 (98%)	0.45	39 (10%)	10 12	25, 42, 89, 129	2 (0%)
1	D	360/364 (98%)	0.39	27 (7%)	20 22	24, 41, 84, 128	1 (0%)
1	E	360/364 (98%)	0.50	43 (11%)	9 10	15, 43, 93, 123	3 (0%)
1	F	360/364 (98%)	0.65	51 (14%)	6 7	25, 45, 94, 128	1 (0%)
1	G	360/364 (98%)	0.82	74 (20%)	2 3	26, 47, 103, 132	2 (0%)
1	H	360/364 (98%)	0.63	54 (15%)	5 6	26, 45, 104, 130	1 (0%)
1	I	360/364 (98%)	0.36	21 (5%)	29 31	28, 42, 82, 123	2 (0%)
1	J	360/364 (98%)	0.34	21 (5%)	29 31	25, 41, 83, 131	1 (0%)
1	K	359/364 (98%)	0.51	40 (11%)	10 11	21, 42, 93, 126	3 (0%)
1	L	360/364 (98%)	0.51	35 (9%)	13 15	26, 43, 86, 131	1 (0%)
All	All	4313/4368 (98%)	0.50	476 (11%)	10 11	15, 43, 92, 137	21 (0%)

The worst 5 of 476 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	360	GLY	8.4
1	A	346	ALA	7.7
1	J	360	GLY	7.5
1	H	346	ALA	7.0
1	F	346	ALA	6.9

6.2 Non-standard residues in protein, DNA, RNA chains ⓘ

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($\text{\AA}^2$)	Q<0.9
2	A1JJY	E	401	68/68	0.90	0.17	44,68,138,144	0
2	A1JJY	H	401	68/68	0.90	0.16	49,68,123,125	0
2	A1JJY	F	401	68/68	0.94	0.12	31,56,103,109	0
2	A1JJY	A	401	68/68	0.94	0.13	32,57,120,129	0
2	A1JJY	G	401	68/68	0.95	0.13	32,58,111,116	0
2	A1JJY	B	401	68/68	0.95	0.12	30,53,114,118	0
2	A1JJY	L	401	68/68	0.95	0.12	30,49,135,148	0
2	A1JJY	I	401	68/68	0.96	0.10	28,51,110,114	0
2	A1JJY	J	401	68/68	0.96	0.12	30,50,134,140	0
2	A1JJY	K	401	68/68	0.96	0.11	31,51,123,131	0
2	A1JJY	C	401	68/68	0.96	0.11	33,56,122,135	0
2	A1JJY	D	401	68/68	0.97	0.10	30,48,100,111	0

6.5 Other polymers [i](#)

There are no such residues in this entry.