



wwPDB X-ray Structure Validation Summary Report ⓘ

Aug 30, 2020 – 01:48 PM BST

PDB ID : 3WCA
Title : The complex structure of TcSQS with ligand, FSPP
Authors : Shang, N.; Li, Q.; Ko, T.P.; Chan, H.C.; Huang, C.H.; Oldfield, E.; Guo, R.T.
Deposited on : 2013-05-26
Resolution : 2.24 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 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 : **FAILED**
buster-report : 1.1.7 (2018)
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.13

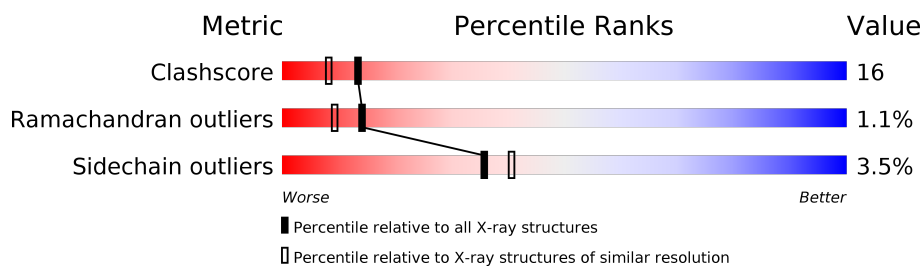
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.24 Å.

Percentile scores (ranging between 0-100) for global validation metrics of the entry are shown in the following graphic. The table shows the number of entries on which the scores are based.



Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
Clashscore	141614	2539 (2.26-2.22)
Ramachandran outliers	138981	2489 (2.26-2.22)
Sidechain outliers	138945	2490 (2.26-2.22)

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 on the lower bar indicate the fraction of residues that contain outliers for ≥ 3 , 2, 1 and 0 types of geometric quality criteria respectively. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions $\leq 5\%$.

Note EDS failed to run properly.

Mol	Chain	Length	Quality of chain
1	A	365	
1	B	365	
1	C	365	
1	D	365	

2 Entry composition [i](#)

There are 4 unique types of molecules in this entry. The entry contains 11869 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 Farnesyltransferase, putative.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	341	Total	C	N	O	S	0	0	0
			2751	1745	473	511	22			
1	B	341	Total	C	N	O	S	0	0	0
			2751	1745	473	511	22			
1	C	341	Total	C	N	O	S	0	0	0
			2751	1745	473	511	22			
1	D	341	Total	C	N	O	S	0	0	0
			2752	1745	473	512	22			

There are 88 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	4	MET	-	EXPRESSION TAG	UNP Q4CWB4
A	5	GLY	-	EXPRESSION TAG	UNP Q4CWB4
A	6	SER	-	EXPRESSION TAG	UNP Q4CWB4
A	7	SER	-	EXPRESSION TAG	UNP Q4CWB4
A	8	HIS	-	EXPRESSION TAG	UNP Q4CWB4
A	9	HIS	-	EXPRESSION TAG	UNP Q4CWB4
A	10	HIS	-	EXPRESSION TAG	UNP Q4CWB4
A	11	HIS	-	EXPRESSION TAG	UNP Q4CWB4
A	12	HIS	-	EXPRESSION TAG	UNP Q4CWB4
A	13	HIS	-	EXPRESSION TAG	UNP Q4CWB4
A	14	SER	-	EXPRESSION TAG	UNP Q4CWB4
A	15	SER	-	EXPRESSION TAG	UNP Q4CWB4
A	16	GLY	-	EXPRESSION TAG	UNP Q4CWB4
A	17	LEU	-	EXPRESSION TAG	UNP Q4CWB4
A	18	VAL	-	EXPRESSION TAG	UNP Q4CWB4
A	19	PRO	-	EXPRESSION TAG	UNP Q4CWB4
A	20	ARG	-	EXPRESSION TAG	UNP Q4CWB4
A	21	GLY	-	EXPRESSION TAG	UNP Q4CWB4
A	22	SER	-	EXPRESSION TAG	UNP Q4CWB4
A	23	HIS	-	EXPRESSION TAG	UNP Q4CWB4
A	24	MET	-	EXPRESSION TAG	UNP Q4CWB4

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Chain	Residue	Modelled	Actual	Comment	Reference
A	82	GLU	ASP	ENGINEERED MUTATION	UNP Q4CWB4
B	4	MET	-	EXPRESSION TAG	UNP Q4CWB4
B	5	GLY	-	EXPRESSION TAG	UNP Q4CWB4
B	6	SER	-	EXPRESSION TAG	UNP Q4CWB4
B	7	SER	-	EXPRESSION TAG	UNP Q4CWB4
B	8	HIS	-	EXPRESSION TAG	UNP Q4CWB4
B	9	HIS	-	EXPRESSION TAG	UNP Q4CWB4
B	10	HIS	-	EXPRESSION TAG	UNP Q4CWB4
B	11	HIS	-	EXPRESSION TAG	UNP Q4CWB4
B	12	HIS	-	EXPRESSION TAG	UNP Q4CWB4
B	13	HIS	-	EXPRESSION TAG	UNP Q4CWB4
B	14	SER	-	EXPRESSION TAG	UNP Q4CWB4
B	15	SER	-	EXPRESSION TAG	UNP Q4CWB4
B	16	GLY	-	EXPRESSION TAG	UNP Q4CWB4
B	17	LEU	-	EXPRESSION TAG	UNP Q4CWB4
B	18	VAL	-	EXPRESSION TAG	UNP Q4CWB4
B	19	PRO	-	EXPRESSION TAG	UNP Q4CWB4
B	20	ARG	-	EXPRESSION TAG	UNP Q4CWB4
B	21	GLY	-	EXPRESSION TAG	UNP Q4CWB4
B	22	SER	-	EXPRESSION TAG	UNP Q4CWB4
B	23	HIS	-	EXPRESSION TAG	UNP Q4CWB4
B	24	MET	-	EXPRESSION TAG	UNP Q4CWB4
B	82	GLU	ASP	ENGINEERED MUTATION	UNP Q4CWB4
C	4	MET	-	EXPRESSION TAG	UNP Q4CWB4
C	5	GLY	-	EXPRESSION TAG	UNP Q4CWB4
C	6	SER	-	EXPRESSION TAG	UNP Q4CWB4
C	7	SER	-	EXPRESSION TAG	UNP Q4CWB4
C	8	HIS	-	EXPRESSION TAG	UNP Q4CWB4
C	9	HIS	-	EXPRESSION TAG	UNP Q4CWB4
C	10	HIS	-	EXPRESSION TAG	UNP Q4CWB4
C	11	HIS	-	EXPRESSION TAG	UNP Q4CWB4
C	12	HIS	-	EXPRESSION TAG	UNP Q4CWB4
C	13	HIS	-	EXPRESSION TAG	UNP Q4CWB4
C	14	SER	-	EXPRESSION TAG	UNP Q4CWB4
C	15	SER	-	EXPRESSION TAG	UNP Q4CWB4
C	16	GLY	-	EXPRESSION TAG	UNP Q4CWB4
C	17	LEU	-	EXPRESSION TAG	UNP Q4CWB4
C	18	VAL	-	EXPRESSION TAG	UNP Q4CWB4
C	19	PRO	-	EXPRESSION TAG	UNP Q4CWB4
C	20	ARG	-	EXPRESSION TAG	UNP Q4CWB4
C	21	GLY	-	EXPRESSION TAG	UNP Q4CWB4
C	22	SER	-	EXPRESSION TAG	UNP Q4CWB4

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Chain	Residue	Modelled	Actual	Comment	Reference
C	23	HIS	-	EXPRESSION TAG	UNP Q4CWB4
C	24	MET	-	EXPRESSION TAG	UNP Q4CWB4
C	82	GLU	ASP	ENGINEERED MUTATION	UNP Q4CWB4
D	4	MET	-	EXPRESSION TAG	UNP Q4CWB4
D	5	GLY	-	EXPRESSION TAG	UNP Q4CWB4
D	6	SER	-	EXPRESSION TAG	UNP Q4CWB4
D	7	SER	-	EXPRESSION TAG	UNP Q4CWB4
D	8	HIS	-	EXPRESSION TAG	UNP Q4CWB4
D	9	HIS	-	EXPRESSION TAG	UNP Q4CWB4
D	10	HIS	-	EXPRESSION TAG	UNP Q4CWB4
D	11	HIS	-	EXPRESSION TAG	UNP Q4CWB4
D	12	HIS	-	EXPRESSION TAG	UNP Q4CWB4
D	13	HIS	-	EXPRESSION TAG	UNP Q4CWB4
D	14	SER	-	EXPRESSION TAG	UNP Q4CWB4
D	15	SER	-	EXPRESSION TAG	UNP Q4CWB4
D	16	GLY	-	EXPRESSION TAG	UNP Q4CWB4
D	17	LEU	-	EXPRESSION TAG	UNP Q4CWB4
D	18	VAL	-	EXPRESSION TAG	UNP Q4CWB4
D	19	PRO	-	EXPRESSION TAG	UNP Q4CWB4
D	20	ARG	-	EXPRESSION TAG	UNP Q4CWB4
D	21	GLY	-	EXPRESSION TAG	UNP Q4CWB4
D	22	SER	-	EXPRESSION TAG	UNP Q4CWB4
D	23	HIS	-	EXPRESSION TAG	UNP Q4CWB4
D	24	MET	-	EXPRESSION TAG	UNP Q4CWB4
D	82	GLU	ASP	ENGINEERED MUTATION	UNP Q4CWB4

- Molecule 2 is S-[(2E,6E)-3,7,11-TRIMETHYLDODECA-2,6,10-TRIENYL] TRIHYDRO-GEN THIODIPHOSPHATE (three-letter code: FPS) (formula: C₁₅H₂₈O₆P₂S).

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Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	C	195	Total 195	O 195	0	0
4	D	105	Total 105	O 105	0	0

Note EDS failed to run properly.

- Molecule 1: Farnesyltransferase, putative

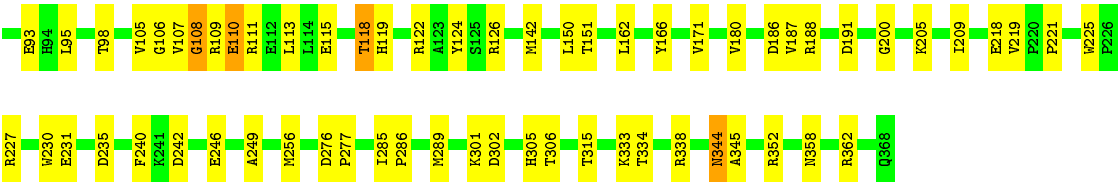
[illegible]

- Molecule 1: Farnesyltransferase, putative

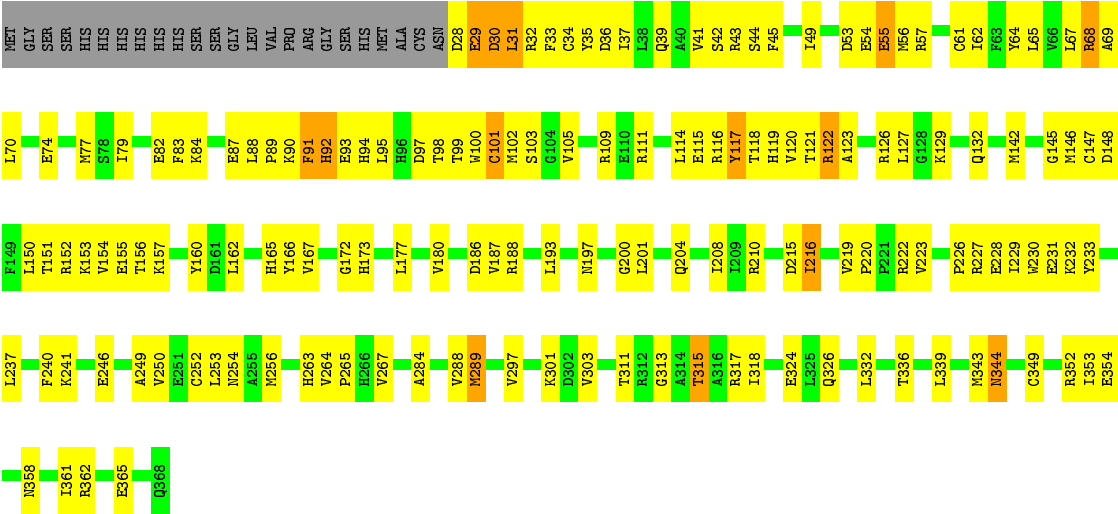
MET	GLY	R105	P226	R362
	SER	R109	R227	A363
	SER	E110	E228	M364
	HIS	R111	I229	E365
	HIS	E112	I230	S366
	HIS	L113	E231	R367
	HIS	L114	K232	Q368
	HIS	E115	T233	
	HIS	R116	T234	
	SER	E117	D235	
SER	T118	D236		
GLY	H119	L237		
LEU		H238		
VAL	R122	A239		
PRO		F240		
ARG	S125	K241		
GLY		E243		
SER	K129	L244		
HIS	A130	H245		
MET	Y131	E246		
ALA		A247		
CYS	V134	K248		
ASN		A249		
D28	E29	I138		
D30		M146		
		K153		
F33				
		T156		
I37				
L38		C164		
Q39				
A40		L178		
F45		L184		
A46		E185		
		D186		
I49		V187		
		R188		
L52				
		G200		
E55		L201		
M56		K205		
R57		T206		
		N207		
E74		L208		
		I209		
E82		R210		
F83				
		C217		
E87		E218		
L88				
P89		P221		
		R222		
		V223		
M102		F224		
S103		H225		
G104		T261		

- Molecule 1: Farnesyltransferase, putative

Met	GLY	SER	SER	HIS	HIS	HIS	HIS	HIS	SER	SER	GLY	VAL	VAL	PRO	ARG	GLY	HIS	HIS	Met	CYS	ASN	D28	D28	E29	D30	L31	R32	F33	C34		I37		V41		F45	A46		M50		Y64		D71		D75	D76	M77	S78	I79	P80		F83	F84	L85	R86	E87	L88	P89	V90
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• Molecule 1: Farnesyltransferase, putative



4 Data and refinement statistics

EDS failed to run properly - this section is therefore incomplete.

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	79.13Å 132.87Å 141.91Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	25.00 – 2.24	Depositor
% Data completeness (in resolution range)	(Not available) (25.00-2.24)	Depositor
R_{merge}	0.05	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	4.99 (at 2.24Å)	Xtriage
Refinement program	CNS 1.2	Depositor
R, R_{free}	0.215 , 0.259	Depositor
Wilson B-factor (Å ²)	40.8	Xtriage
Anisotropy	0.197	Xtriage
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.33$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	11869	wwPDB-VP
Average B, all atoms (Å ²)	53.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.16% 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 [i](#)

5.1 Standard geometry [i](#)

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

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	0.37	0/2809	0.57	0/3806
1	B	0.35	0/2809	0.56	1/3806 (0.0%)
1	C	0.33	0/2809	0.53	0/3806
1	D	0.30	0/2810	0.52	0/3806
All	All	0.34	0/11237	0.55	1/15224 (0.0%)

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	103	SER	N-CA-C	5.14	124.89	111.00

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts [i](#)

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

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	2751	0	2698	51	0
1	B	2751	0	2698	96	0
1	C	2751	0	2698	63	0
1	D	2752	0	2698	144	0
2	A	24	0	25	3	0
2	B	24	0	25	3	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	C	48	0	50	6	0
2	D	24	0	25	3	0
3	A	1	0	0	0	0
3	B	2	0	0	0	0
4	A	233	0	0	2	0
4	B	208	0	0	3	0
4	C	195	0	0	0	0
4	D	105	0	0	0	0
All	All	11869	0	10917	355	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 16.

The worst 5 of 355 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:D:129:LYS:HA	1:D:132:GLN:HE21	1.20	1.00
1:A:362:ARG:HD3	1:D:111:ARG:HH12	1.30	0.97
1:B:340:ALA:HB2	1:B:357:VAL:HG21	1.50	0.93
1:B:234:THR:HG22	1:B:236:ASP:H	1.33	0.93
1:B:344:ASN:HD22	1:B:346:GLN:HG3	1.32	0.91

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	339/365 (93%)	329 (97%)	8 (2%)	2 (1%)	25	23
1	B	339/365 (93%)	325 (96%)	10 (3%)	4 (1%)	13	8
1	C	339/365 (93%)	320 (94%)	17 (5%)	2 (1%)	25	23

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	D	339/365 (93%)	301 (89%)	31 (9%)	7 (2%)	7	2
All	All	1356/1460 (93%)	1275 (94%)	66 (5%)	15 (1%)	14	9

5 of 15 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	345	ALA
1	D	29	GLU
1	D	54	GLU
1	D	101	CYS
1	A	350	TYR

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	298/318 (94%)	294 (99%)	4 (1%)	69	76
1	B	298/318 (94%)	284 (95%)	14 (5%)	26	27
1	C	298/318 (94%)	288 (97%)	10 (3%)	37	42
1	D	298/318 (94%)	284 (95%)	14 (5%)	26	27
All	All	1192/1272 (94%)	1150 (96%)	42 (4%)	36	40

5 of 42 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	C	32	ARG
1	C	242	ASP
1	D	289	MET
1	C	77	MET
1	C	118	THR

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 30 such sidechains are listed below:

Mol	Chain	Res	Type
1	C	144	ASN
1	C	305	HIS
1	D	330	GLN
1	C	245	HIS
1	C	320	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 8 ligands modelled in this entry, 3 are monoatomic - leaving 5 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$
2	FPS	C	401	-	19,23,23	1.19	2 (10%)	23,31,31	1.40	5 (21%)
2	FPS	D	401	-	19,23,23	1.30	3 (15%)	23,31,31	1.72	6 (26%)
2	FPS	B	401	-	19,23,23	1.36	3 (15%)	23,31,31	1.78	7 (30%)
2	FPS	C	402	-	19,23,23	1.14	1 (5%)	23,31,31	1.82	8 (34%)
2	FPS	A	501	-	19,23,23	1.35	3 (15%)	23,31,31	1.36	3 (13%)

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	FPS	C	401	-	-	7/19/25/25	-
2	FPS	D	401	-	-	6/19/25/25	-
2	FPS	B	401	-	-	7/19/25/25	-
2	FPS	C	402	-	-	8/19/25/25	-
2	FPS	A	501	-	-	8/19/25/25	-

The worst 5 of 12 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	501	FPS	C2-C3	2.74	1.39	1.33
2	B	401	FPS	PB-O2B	2.64	1.59	1.50
2	C	401	FPS	C2-C3	2.62	1.39	1.33
2	B	401	FPS	C10-C8	2.53	1.56	1.51
2	B	401	FPS	C2-C3	2.52	1.39	1.33

The worst 5 of 29 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	401	FPS	C9-C8-C10	4.28	122.47	115.27
2	C	402	FPS	C9-C8-C10	4.01	122.02	115.27
2	C	402	FPS	C10-C8-C7	-3.95	113.13	121.12
2	D	401	FPS	C9-C8-C10	3.87	121.78	115.27
2	D	401	FPS	C10-C8-C7	-3.59	113.85	121.12

There are no chirality outliers.

5 of 36 torsion outliers are listed below:

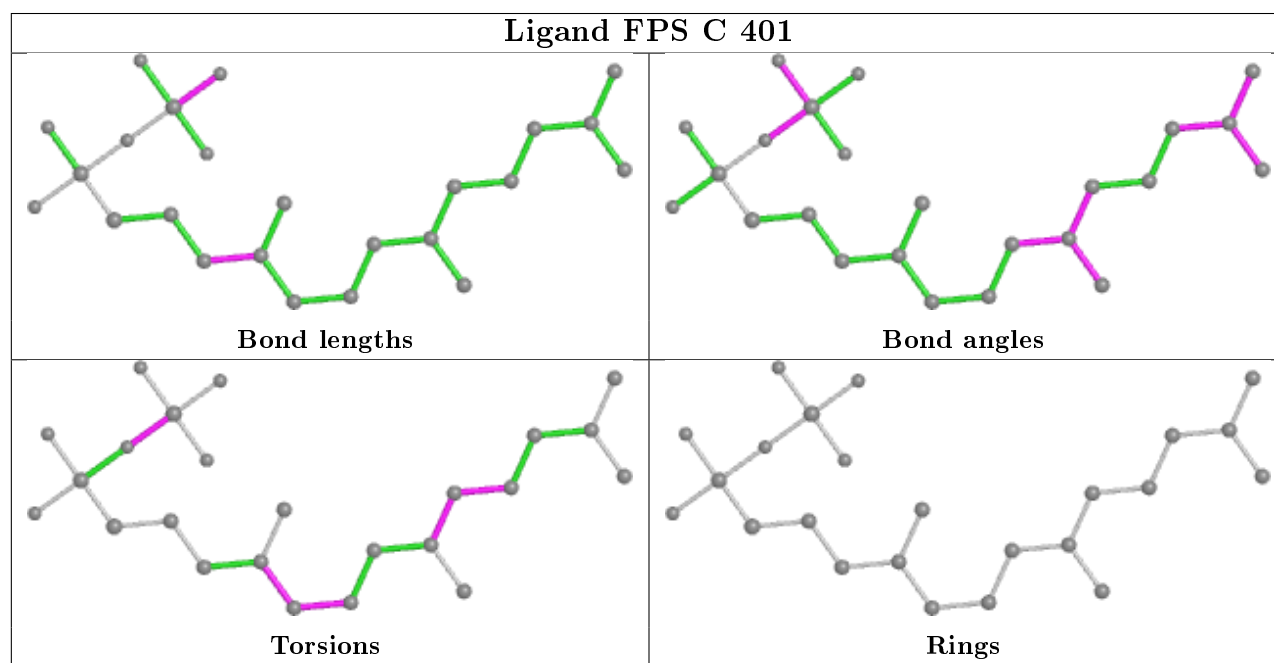
Mol	Chain	Res	Type	Atoms
2	D	401	FPS	C11-C10-C8-C7
2	D	401	FPS	C11-C10-C8-C9
2	B	401	FPS	PA-O3A-PB-O1B
2	C	402	FPS	C11-C10-C8-C9
2	A	501	FPS	C11-C10-C8-C7

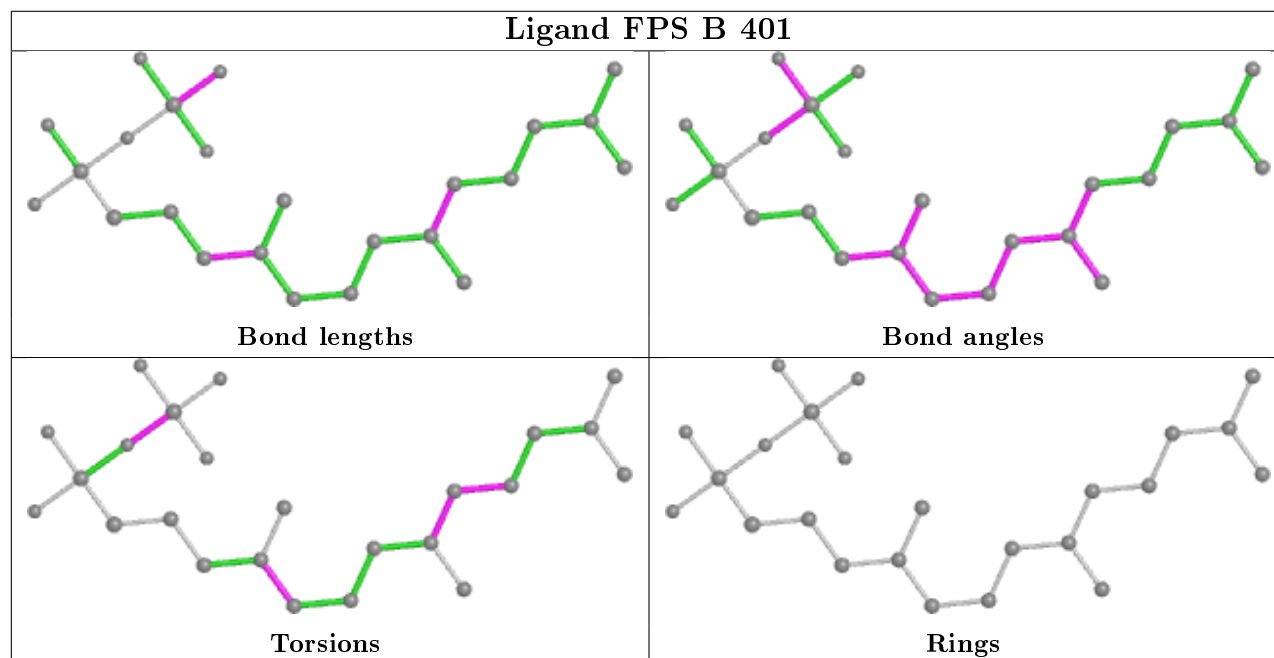
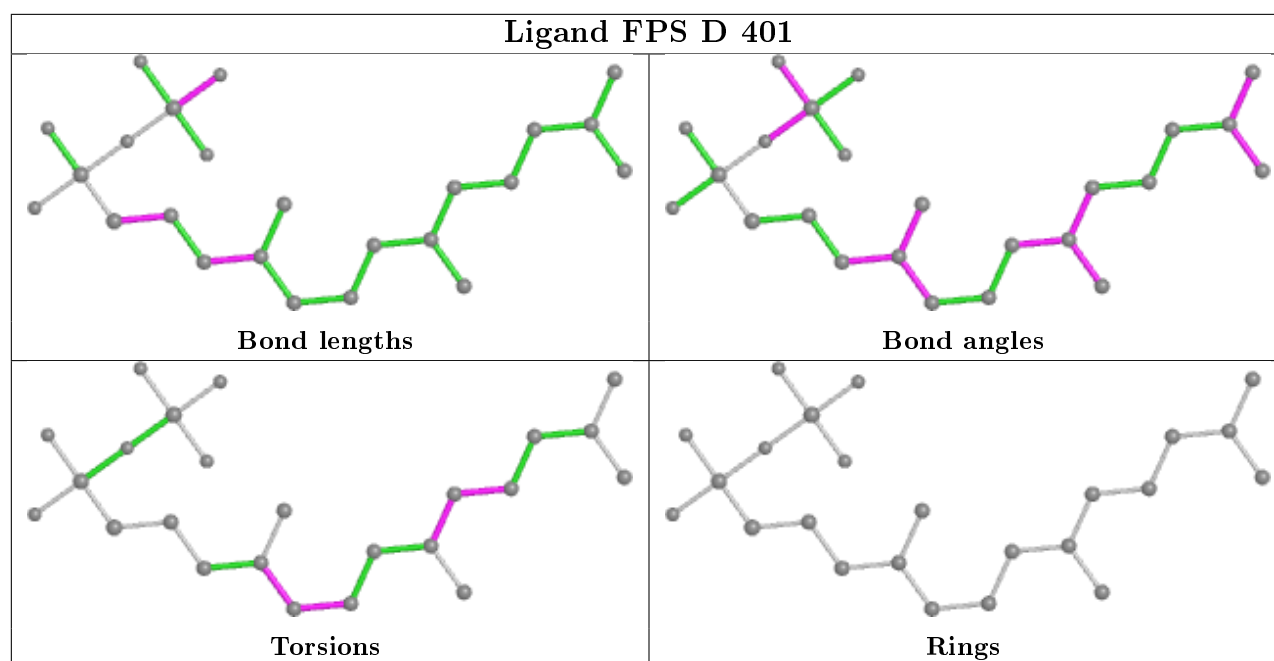
There are no ring outliers.

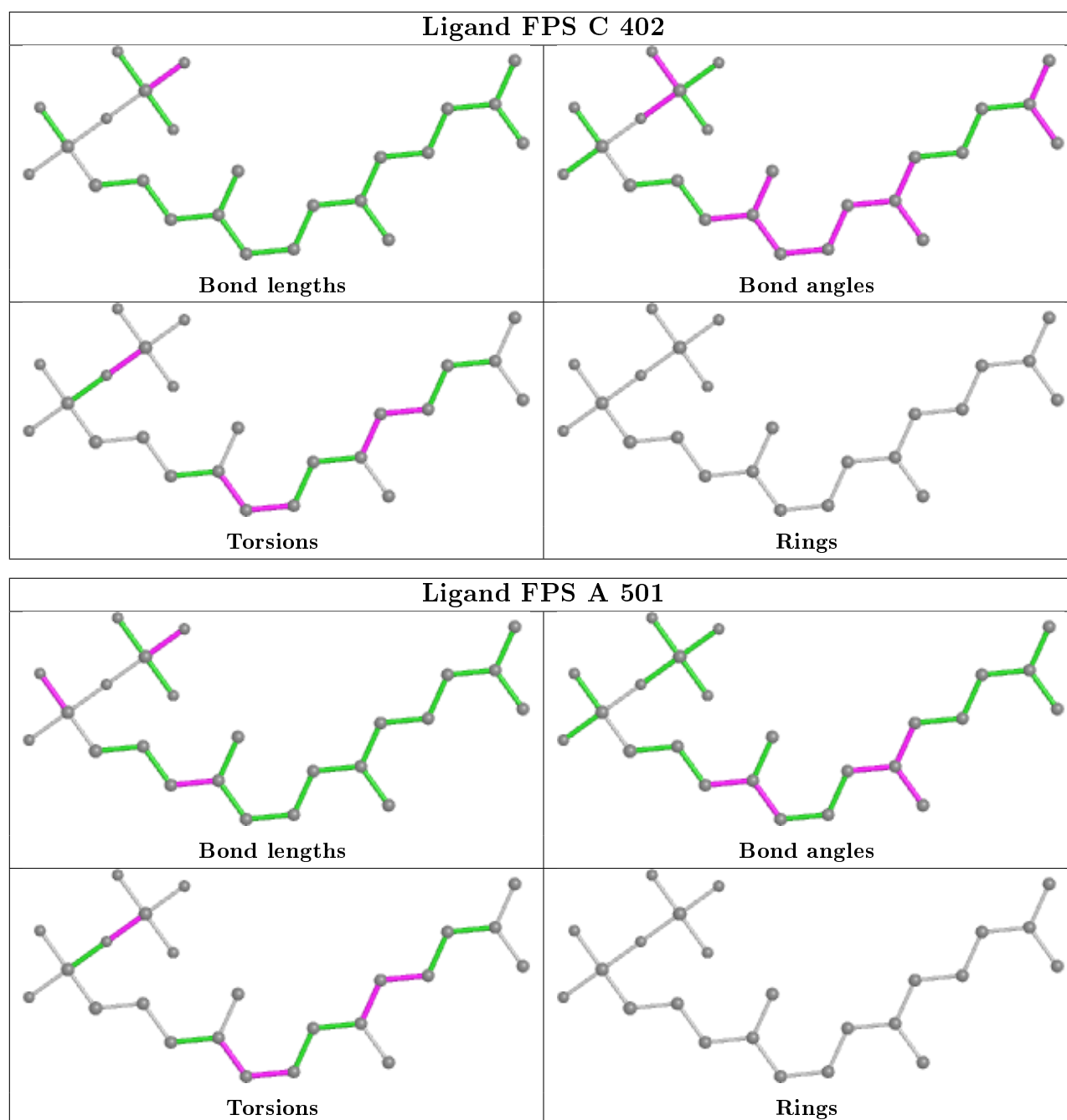
5 monomers are involved in 15 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	C	401	FPS	4	0
2	D	401	FPS	3	0
2	B	401	FPS	3	0
2	C	402	FPS	3	0
2	A	501	FPS	3	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 ⓘ

EDS failed to run properly - this section is therefore empty.

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

EDS failed to run properly - this section is therefore empty.

6.3 Carbohydrates ⓘ

EDS failed to run properly - this section is therefore empty.

6.4 Ligands ⓘ

EDS failed to run properly - this section is therefore empty.

6.5 Other polymers ⓘ

EDS failed to run properly - this section is therefore empty.