



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 12, 2026 – 06:13 PM UTC

PDB ID : 8KGB / pdb_00008kgb
Title : SINDPS1-AtcPT4 Chimera complexed with GSPP, Mg²⁺, and IPP
Authors : Suenaga-Hiromori, M.; Ishii, T.; Imaizumi, R.; Takeshita, K.; Yanai, T.; Matsuura, H.; Sakai, N.; Yamaguchi, H.; Yanbe, F.; Waki, T.; Tozawa, Y.; Miyagi-Inoue, Y.; Yamamoto, M.; Kataoka, K.; Nakayama, T.; Yamashita, S.; Takahashi, S.
Deposited on : 2023-08-18
Resolution : 2.32 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](#) ①) 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

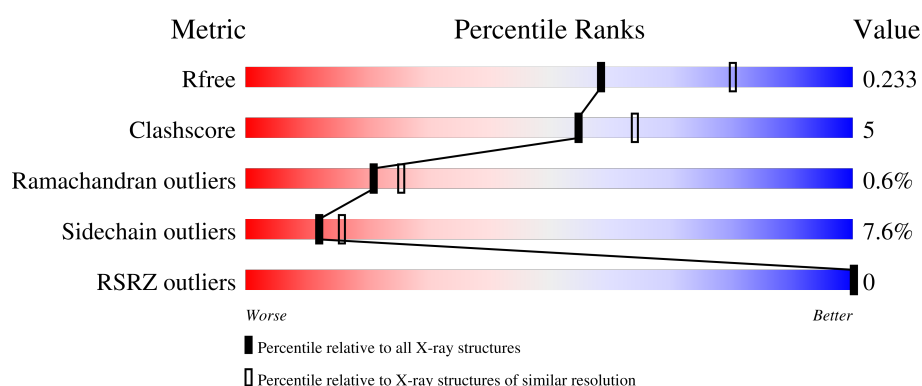
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.32 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	7754 (2.34-2.30)
Clashscore	190562	8383 (2.34-2.30)
Ramachandran outliers	187476	8303 (2.34-2.30)
Sidechain outliers	187428	8303 (2.34-2.30)
RSRZ outliers	180081	7760 (2.34-2.30)

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	265	 80% 12% 8%
1	B	265	 78% 12% 8%
1	C	265	 81% 10% 8%
1	D	265	 77% 11% 9%

2 Entry composition

There are 5 unique types of molecules in this entry. The entry contains 8200 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.

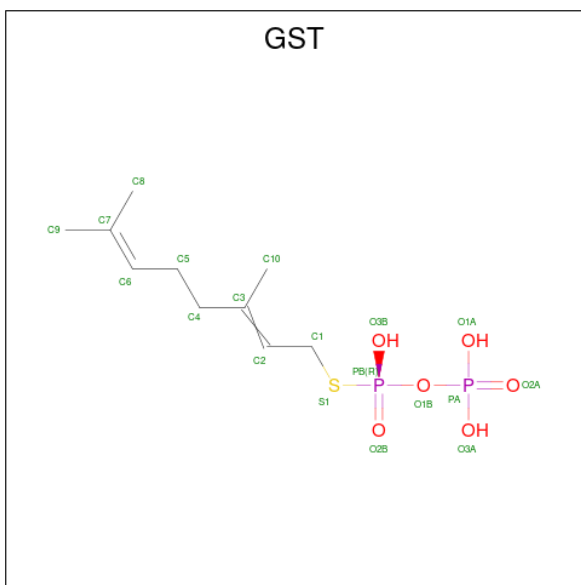
- Molecule 1 is a protein called Dimethylallyltransferase CPT1, chloroplastic, Dehydrodolichyl diphosphate synthase 2.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	244	Total	C	N	O	S	0	2	0
			1992	1272	341	368	11			
1	B	244	Total	C	N	O	S	0	0	0
			1971	1258	336	366	11			
1	C	245	Total	C	N	O	S	0	0	0
			1973	1262	336	364	11			
1	D	240	Total	C	N	O	S	0	0	0
			1937	1236	331	359	11			

There are 8 discrepancies between the modelled and reference sequences:

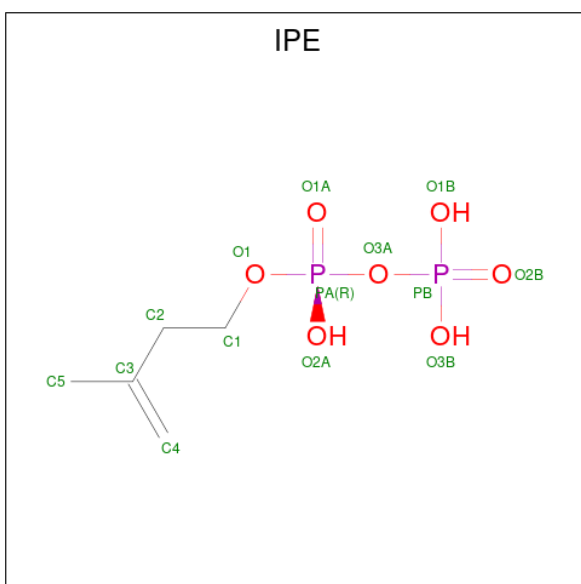
Chain	Residue	Modelled	Actual	Comment	Reference
A	43	GLY	-	expression tag	UNP C1K5M2
A	44	ALA	-	expression tag	UNP C1K5M2
B	43	GLY	-	expression tag	UNP C1K5M2
B	44	ALA	-	expression tag	UNP C1K5M2
C	43	GLY	-	expression tag	UNP C1K5M2
C	44	ALA	-	expression tag	UNP C1K5M2
D	43	GLY	-	expression tag	UNP C1K5M2
D	44	ALA	-	expression tag	UNP C1K5M2

- Molecule 2 is GERANYL S-THIOLODIPHOSPHATE (CCD ID: GST) (formula: C₁₀H₂₀O₆P₂S) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
2	A	1	Total	C	O	P	S	0	0
			19	10	6	2	1		
2	C	1	Total	C	O	P	S	0	0
			19	10	6	2	1		
2	D	1	Total	C	O	P	S	0	0
			19	10	6	2	1		

- Molecule 3 is 3-METHYLBUT-3-ENYL TRIHYDROGEN DIPHOSPHATE (CCD ID: IPE) (formula: $C_5H_{12}O_7P_2$) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	A	1	Total C O P 14 5 7 2	0	0
3	B	1	Total C O P 14 5 7 2	0	0
3	B	1	Total C O P 14 5 7 2	0	0
3	C	1	Total C O P 14 5 7 2	0	0
3	D	1	Total C O P 14 5 7 2	0	0

- Molecule 4 is MAGNESIUM ION (CCD ID: MG) (formula: Mg) (labeled as "Ligand of Interest" by depositor).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	A	1	Total Mg 1 1	0	0
4	B	1	Total Mg 1 1	0	0
4	C	1	Total Mg 1 1	0	0
4	D	1	Total Mg 1 1	0	0

- Molecule 5 is water.

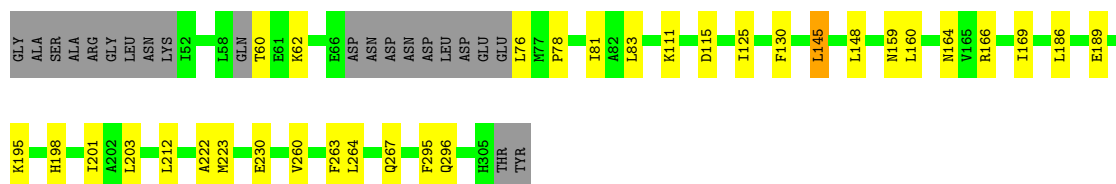
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
5	A	62	Total O 62 62	0	0
5	B	43	Total O 43 43	0	0
5	C	52	Total O 52 52	0	0
5	D	39	Total O 39 39	0	0

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.

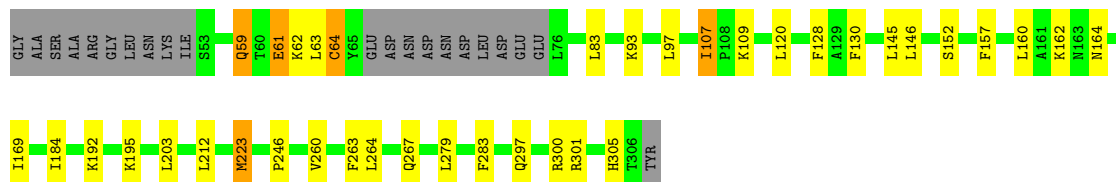
- Molecule 1: Dimethylallylcistransferase CPT1, chloroplastic, Dehydrodolichyl diphosphate synthase 2

Chain A:



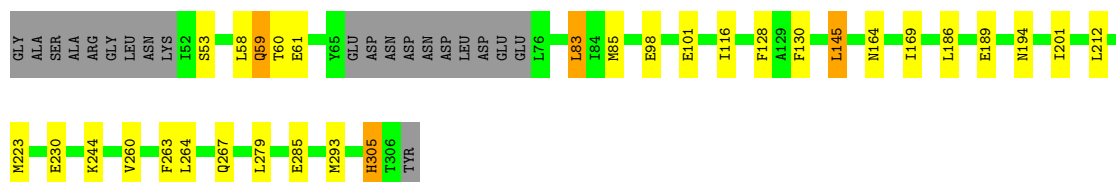
- Molecule 1: Dimethylallylcistransferase CPT1, chloroplastic, Dehydrodolichyl diphosphate synthase 2

Chain B:



- Molecule 1: Dimethylallylcistransferase CPT1, chloroplastic, Dehydrodolichyl diphosphate synthase 2

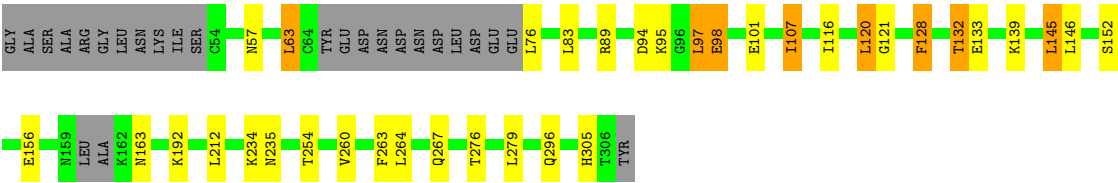
Chain C:



- Molecule 1: Dimethylallylcistransferase CPT1, chloroplastic, Dehydrodolichyl diphosphate synthase 2

Chain D:





4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	59.54Å 126.71Å 72.69Å 90.00° 90.25° 90.00°	Depositor
Resolution (Å)	47.81 – 2.32 47.81 – 2.32	Depositor EDS
% Data completeness (in resolution range)	99.9 (47.81-2.32) 98.7 (47.81-2.32)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.37 (at 2.32Å)	Xtriage
Refinement program	REFMAC 5.8.0258, PHENIX 1.19.2	Depositor
R, R_{free}	0.188 , 0.235 (Not available) , 0.233	Depositor DCC
R_{free} test set	2334 reflections (5.00%)	wwPDB-VP
Wilson B-factor (Å ²)	50.0	Xtriage
Anisotropy	0.023	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.32 , 45.3	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtriage
Estimated twinning fraction	0.196 for h,-k,-l	Xtriage
F_o, F_c correlation	0.97	EDS
Total number of atoms	8200	wwPDB-VP
Average B, all atoms (Å ²)	57.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.92% 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: GST, IPE, MG

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	0.90	0/2027	1.08	0/2723
1	B	0.93	0/2007	1.08	0/2700
1	C	0.93	0/2009	1.07	0/2703
1	D	0.93	0/1971	1.10	0/2649
All	All	0.92	0/8014	1.08	0/10775

There are no bond length outliers.

There are no bond angle outliers.

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	1992	0	2005	11	0
1	B	1971	0	1980	15	0
1	C	1973	0	1985	16	0
1	D	1937	0	1945	35	0
2	A	19	0	17	0	0
2	C	19	0	17	3	0
2	D	19	0	17	1	0
3	A	14	0	9	1	0
3	B	28	0	18	2	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
3	C	14	0	9	1	0
3	D	14	0	9	2	0
4	A	1	0	0	0	0
4	B	1	0	0	0	0
4	C	1	0	0	0	0
4	D	1	0	0	0	0
5	A	62	0	0	0	0
5	B	43	0	0	2	0
5	C	52	0	0	2	0
5	D	39	0	0	2	0
All	All	8200	0	8011	77	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 5.

All (77) 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:63:LEU:HD23	1:D:234:LYS:CD	1.35	1.53
1:D:63:LEU:CD2	1:D:234:LYS:HD2	1.53	1.38
1:D:63:LEU:HD23	1:D:234:LYS:HD3	1.33	1.06
1:D:63:LEU:HB3	1:D:234:LYS:HZ1	1.21	1.05
1:D:63:LEU:HD23	1:D:234:LYS:HD2	0.94	0.93
1:D:63:LEU:HB2	1:D:234:LYS:HE3	1.53	0.91
1:D:63:LEU:CD2	1:D:234:LYS:CD	2.25	0.89
1:D:63:LEU:CB	1:D:234:LYS:HZ1	1.85	0.89
1:D:63:LEU:HD22	1:D:234:LYS:HD2	1.57	0.86
1:D:63:LEU:HD21	1:D:235:ASN:HA	1.56	0.84
1:D:63:LEU:HB2	1:D:234:LYS:CE	2.10	0.82
1:D:132:THR:HG21	5:D:533:HOH:O	1.85	0.76
1:D:63:LEU:CB	1:D:234:LYS:NZ	2.51	0.73
1:D:121:GLY:HA3	5:D:528:HOH:O	1.87	0.72
1:D:63:LEU:HD13	1:D:235:ASN:OD1	1.90	0.71
1:B:107:ILE:HG12	1:B:152:SER:HB3	1.74	0.69
1:B:301:ARG:NH1	5:B:501:HOH:O	2.27	0.67
1:D:63:LEU:CD1	1:D:235:ASN:OD1	2.43	0.67
1:D:128:PHE:CD2	3:D:402:IPE:H21	2.30	0.66
1:D:63:LEU:CB	1:D:234:LYS:CE	2.75	0.65
1:D:63:LEU:HD23	1:D:234:LYS:CE	2.25	0.65
1:D:116:ILE:O	1:D:120:LEU:HD22	1.99	0.62
1:C:145:LEU:HD23	2:C:402:GST:H92	1.82	0.61

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:83:LEU:HD22	1:C:85:MET:HG2	1.84	0.59
1:C:61:GLU:HA	5:C:501:HOH:O	2.03	0.58
1:B:223:MET:HE3	1:B:223:MET:HA	1.89	0.55
1:C:128:PHE:CD2	3:C:401:IPE:H21	2.42	0.55
1:C:58:LEU:O	1:C:58:LEU:HD12	2.08	0.54
1:C:145:LEU:HB3	2:C:402:GST:H83	1.90	0.53
1:B:300:ARG:HD2	5:B:521:HOH:O	2.09	0.52
1:D:76:LEU:O	1:D:296:GLN:HG2	2.10	0.52
1:B:107:ILE:HD12	1:B:157:PHE:CE2	2.46	0.50
1:B:264:LEU:HB3	1:B:267:GLN:HB2	1.93	0.50
1:D:98:GLU:HB3	1:D:101:GLU:HG2	1.95	0.49
1:A:130:PHE:HB3	1:A:203:LEU:HD12	1.94	0.49
1:D:107:ILE:HG12	1:D:152:SER:HB3	1.93	0.49
1:C:264:LEU:HB3	1:C:267:GLN:HB2	1.94	0.48
1:B:128:PHE:CD2	3:B:402:IPE:H21	2.48	0.48
1:B:64:CYS:HB2	1:B:246:PRO:HA	1.96	0.47
1:D:97:LEU:HB3	1:D:101:GLU:HG3	1.96	0.47
1:C:293:MET:HE3	1:C:293:MET:HB2	1.81	0.47
1:A:78:PRO:HG3	1:A:295:PHE:CD2	2.51	0.46
1:D:132:THR:HG23	1:D:133:GLU:OE2	2.16	0.45
1:C:244:LYS:HB3	5:C:546:HOH:O	2.15	0.45
1:C:169:ILE:CD1	1:C:201:ILE:HB	2.46	0.44
1:A:169:ILE:CD1	1:A:201:ILE:HB	2.47	0.44
1:B:130:PHE:HB3	1:B:203:LEU:HD12	1.99	0.44
1:A:111:LYS:HE2	1:A:159:ASN:HB3	2.00	0.44
1:D:63:LEU:CB	1:D:234:LYS:HE3	2.35	0.44
1:B:59:GLN:CD	1:B:59:GLN:H	2.26	0.43
1:C:98:GLU:HB3	1:C:101:GLU:HG2	2.00	0.43
1:D:63:LEU:CG	1:D:234:LYS:NZ	2.81	0.43
1:A:264:LEU:HB3	1:A:267:GLN:HB2	2.01	0.43
1:D:254:THR:HA	1:D:276:THR:HG23	2.01	0.43
1:A:76:LEU:O	1:A:296:GLN:HG2	2.19	0.43
1:B:109:LYS:HD3	1:B:283:PHE:O	2.19	0.43
1:D:145:LEU:CB	2:D:403:GST:H83	2.48	0.43
3:A:402:IPE:H11	3:A:402:IPE:H41	1.79	0.42
1:B:195:LYS:HD3	1:B:195:LYS:HA	1.84	0.42
1:C:130:PHE:CD1	2:C:402:GST:H82	2.55	0.42
1:D:264:LEU:HB3	1:D:267:GLN:HB2	2.02	0.42
1:A:81:ILE:O	1:A:125:ILE:HA	2.18	0.42
1:C:169:ILE:HD13	1:C:201:ILE:HB	2.02	0.42
1:A:195:LYS:HD3	1:A:195:LYS:HA	1.78	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:D:128:PHE:CE2	3:D:402:IPE:H21	2.54	0.42
1:B:169:ILE:HG13	1:B:184:ILE:HG23	2.02	0.41
1:A:222:ALA:C	1:B:223:MET:HE1	2.46	0.41
1:C:305:HIS:CE1	1:D:89:ARG:HD3	2.55	0.41
1:C:116:ILE:HD13	1:C:285:GLU:HA	2.02	0.41
1:A:166[A]:ARG:HD2	1:A:198:HIS:CD2	2.56	0.41
3:B:402:IPE:H53	3:B:403:IPE:H22	2.02	0.41
1:D:63:LEU:HD21	1:D:235:ASN:CA	2.41	0.41
1:A:145:LEU:HD12	1:A:148:LEU:HD23	2.01	0.41
1:D:95:LYS:O	1:D:97:LEU:HD13	2.22	0.40
1:B:61:GLU:HB2	1:B:62:LYS:H	1.71	0.40
1:C:164:ASN:O	1:C:194:ASN:HB3	2.21	0.40
1:D:63:LEU:HB3	1:D:234:LYS:NZ	2.06	0.40

There are no symmetry-related clashes.

5.3 Torsion angles [i](#)

5.3.1 Protein backbone [i](#)

In the following table, the Percentiles column shows the percent Ramachandran outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

The Analysed column shows the number of residues for which the backbone conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	A	240/265 (91%)	237 (99%)	2 (1%)	1 (0%)	30	37
1	B	240/265 (91%)	230 (96%)	8 (3%)	2 (1%)	16	19
1	C	241/265 (91%)	235 (98%)	4 (2%)	2 (1%)	16	19
1	D	234/265 (88%)	230 (98%)	3 (1%)	1 (0%)	30	37
All	All	955/1060 (90%)	932 (98%)	17 (2%)	6 (1%)	21	25

All (6) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	D	263	PHE
1	A	263	PHE

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Mol	Chain	Res	Type
1	B	263	PHE
1	C	263	PHE
1	B	64	CYS
1	C	59	GLN

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	220/235 (94%)	207 (94%)	13 (6%)	18	25
1	B	218/235 (93%)	198 (91%)	20 (9%)	8	11
1	C	217/235 (92%)	204 (94%)	13 (6%)	17	24
1	D	214/235 (91%)	194 (91%)	20 (9%)	8	10
All	All	869/940 (92%)	803 (92%)	66 (8%)	12	16

All (66) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	60	THR
1	A	62	LYS
1	A	83	LEU
1	A	115	ASP
1	A	145	LEU
1	A	160	LEU
1	A	164	ASN
1	A	186	LEU
1	A	189	GLU
1	A	212	LEU
1	A	223	MET
1	A	230	GLU
1	A	260	VAL
1	B	59	GLN
1	B	61	GLU
1	B	63	LEU
1	B	83	LEU

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Mol	Chain	Res	Type
1	B	93	LYS
1	B	97	LEU
1	B	107	ILE
1	B	120	LEU
1	B	145	LEU
1	B	146	LEU
1	B	160	LEU
1	B	162	LYS
1	B	164	ASN
1	B	192	LYS
1	B	212	LEU
1	B	223	MET
1	B	260	VAL
1	B	279	LEU
1	B	297	GLN
1	B	305	HIS
1	C	53	SER
1	C	59	GLN
1	C	60	THR
1	C	83	LEU
1	C	145	LEU
1	C	186	LEU
1	C	189	GLU
1	C	212	LEU
1	C	223	MET
1	C	230	GLU
1	C	260	VAL
1	C	279	LEU
1	C	305	HIS
1	D	57	ASN
1	D	63	LEU
1	D	83	LEU
1	D	94	ASP
1	D	97	LEU
1	D	98	GLU
1	D	107	ILE
1	D	120	LEU
1	D	128	PHE
1	D	132	THR
1	D	139	LYS
1	D	145	LEU
1	D	146	LEU

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Mol	Chain	Res	Type
1	D	156	GLU
1	D	163	ASN
1	D	192	LYS
1	D	212	LEU
1	D	260	VAL
1	D	279	LEU
1	D	305	HIS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (5) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	158	GLN
1	B	123	GLN
1	B	163	ASN
1	B	164	ASN
1	D	123	GLN

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 oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

Of 12 ligands modelled in this entry, 4 are monoatomic - leaving 8 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	GST	C	402	4	15,18,18	0.95	1 (6%)	18,25,25	0.71	0
3	IPE	C	401	4	12,13,13	0.76	0	16,19,19	0.89	0
3	IPE	B	403	4	12,13,13	0.55	0	16,19,19	0.62	0
3	IPE	A	402	4	12,13,13	0.72	0	16,19,19	1.04	0
3	IPE	D	402	4	12,13,13	0.81	0	16,19,19	0.93	1 (6%)
3	IPE	B	402	4	12,13,13	0.63	0	16,19,19	0.75	0
2	GST	D	403	4	15,18,18	0.79	1 (6%)	18,25,25	1.03	1 (5%)
2	GST	A	401	4	15,18,18	1.10	2 (13%)	18,25,25	0.76	0

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	GST	C	402	4	-	2/13/19/19	-
3	IPE	C	401	4	-	0/13/13/13	-
3	IPE	B	403	4	-	8/13/13/13	-
3	IPE	A	402	4	-	2/13/13/13	-
3	IPE	D	402	4	-	2/13/13/13	-
3	IPE	B	402	4	-	4/13/13/13	-
2	GST	D	403	4	-	3/13/19/19	-
2	GST	A	401	4	-	1/13/19/19	-

All (4) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	401	GST	PB-O3B	-2.95	1.49	1.56
2	C	402	GST	PB-O3B	-2.62	1.50	1.56
2	D	403	GST	PB-O3B	-2.14	1.51	1.56
2	A	401	GST	PB-O2B	2.13	1.51	1.46

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	D	403	GST	O3B-PB-O2B	3.52	118.25	109.86
3	D	402	IPE	O2A-PA-O1A	2.11	122.24	112.44

There are no chirality outliers.

All (22) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	B	402	IPE	C1-O1-PA-O2A
3	B	402	IPE	C1-C2-C3-C5
3	B	403	IPE	C2-C1-O1-PA
3	B	403	IPE	O1-C1-C2-C3
3	B	403	IPE	C1-O1-PA-O2A
3	B	403	IPE	C1-O1-PA-O3A
3	B	403	IPE	C1-C2-C3-C5
3	D	402	IPE	C1-C2-C3-C5
3	B	402	IPE	O1-C1-C2-C3
2	D	403	GST	PA-O1B-PB-O3B
2	D	403	GST	C3-C4-C5-C6
3	B	402	IPE	C1-C2-C3-C4
3	A	402	IPE	C1-C2-C3-C5
3	A	402	IPE	C1-O1-PA-O1A
2	C	402	GST	PA-O1B-PB-O2B
3	B	403	IPE	PB-O3A-PA-O1A
3	B	403	IPE	PB-O3A-PA-O2A
2	C	402	GST	C3-C4-C5-C6
2	D	403	GST	PA-O1B-PB-O2B
3	B	403	IPE	C1-C2-C3-C4
3	D	402	IPE	C1-C2-C3-C4
2	A	401	GST	PA-O1B-PB-O3B

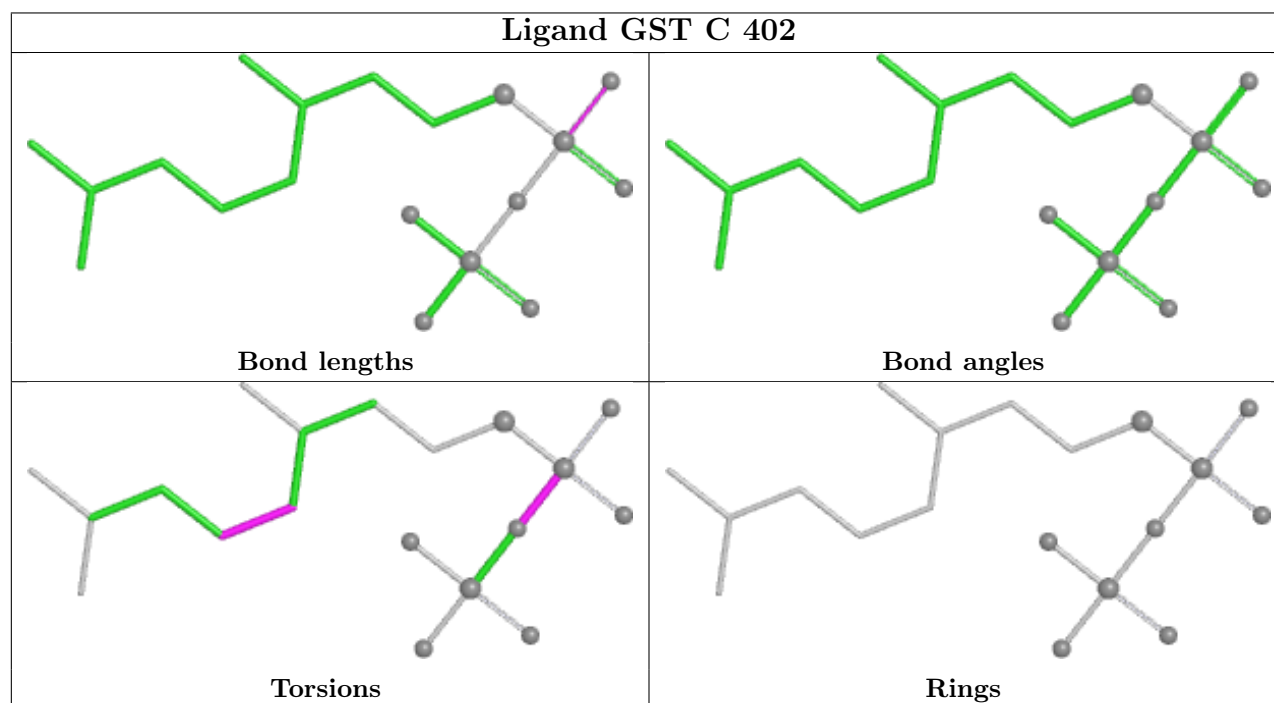
There are no ring outliers.

7 monomers are involved in 10 short contacts:

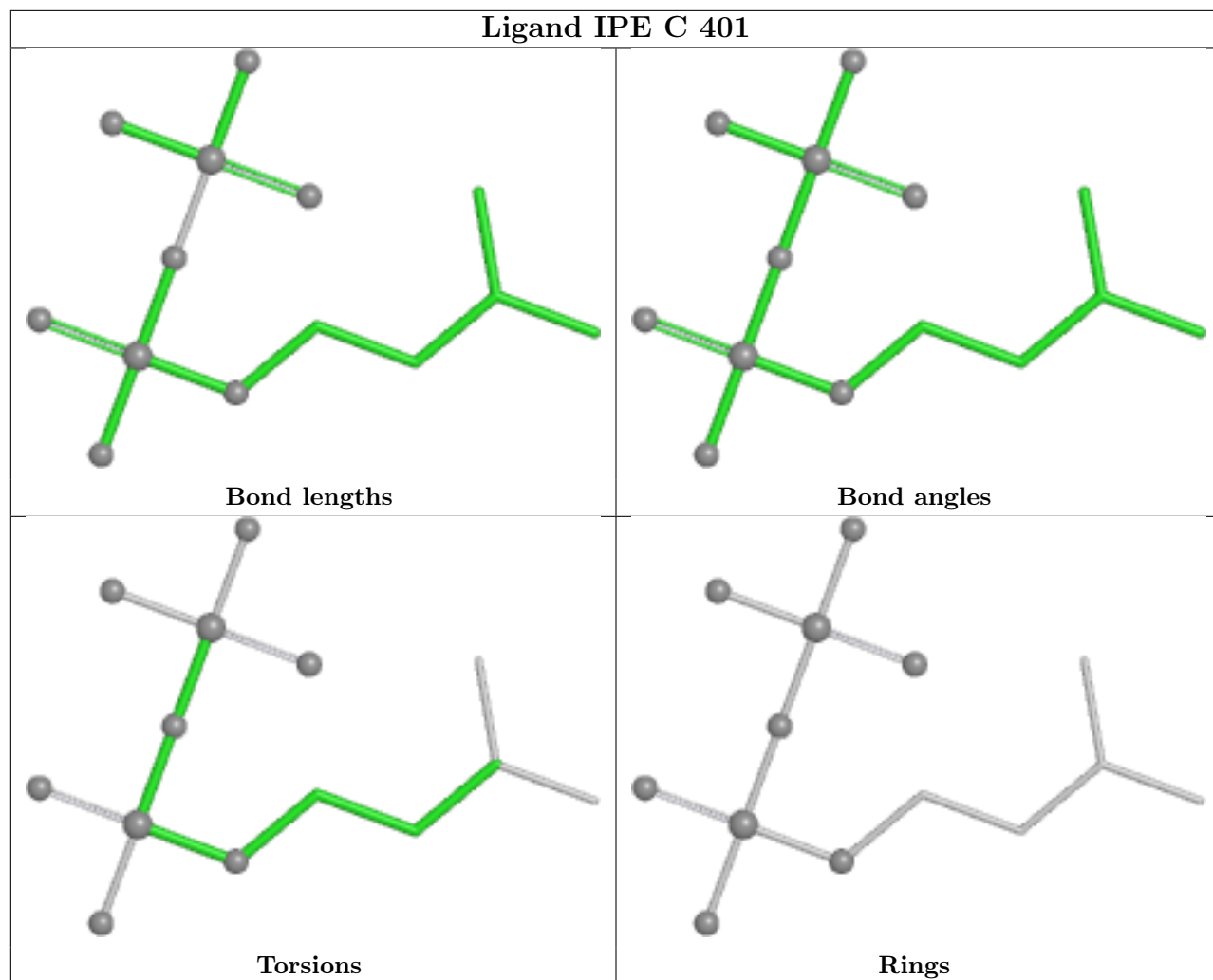
Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	C	402	GST	3	0
3	C	401	IPE	1	0
3	B	403	IPE	1	0
3	A	402	IPE	1	0
3	D	402	IPE	2	0
3	B	402	IPE	2	0
2	D	403	GST	1	0

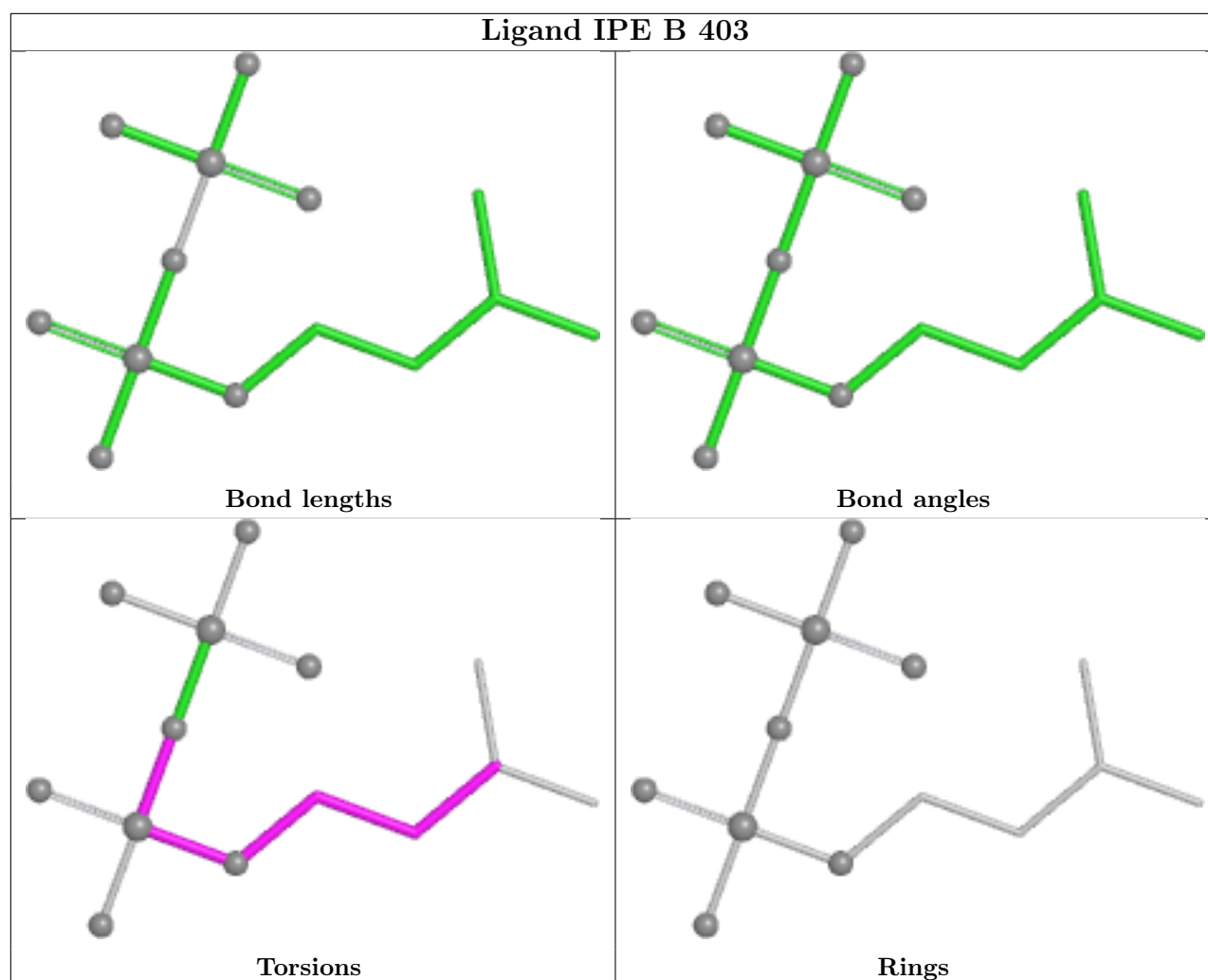
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. 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

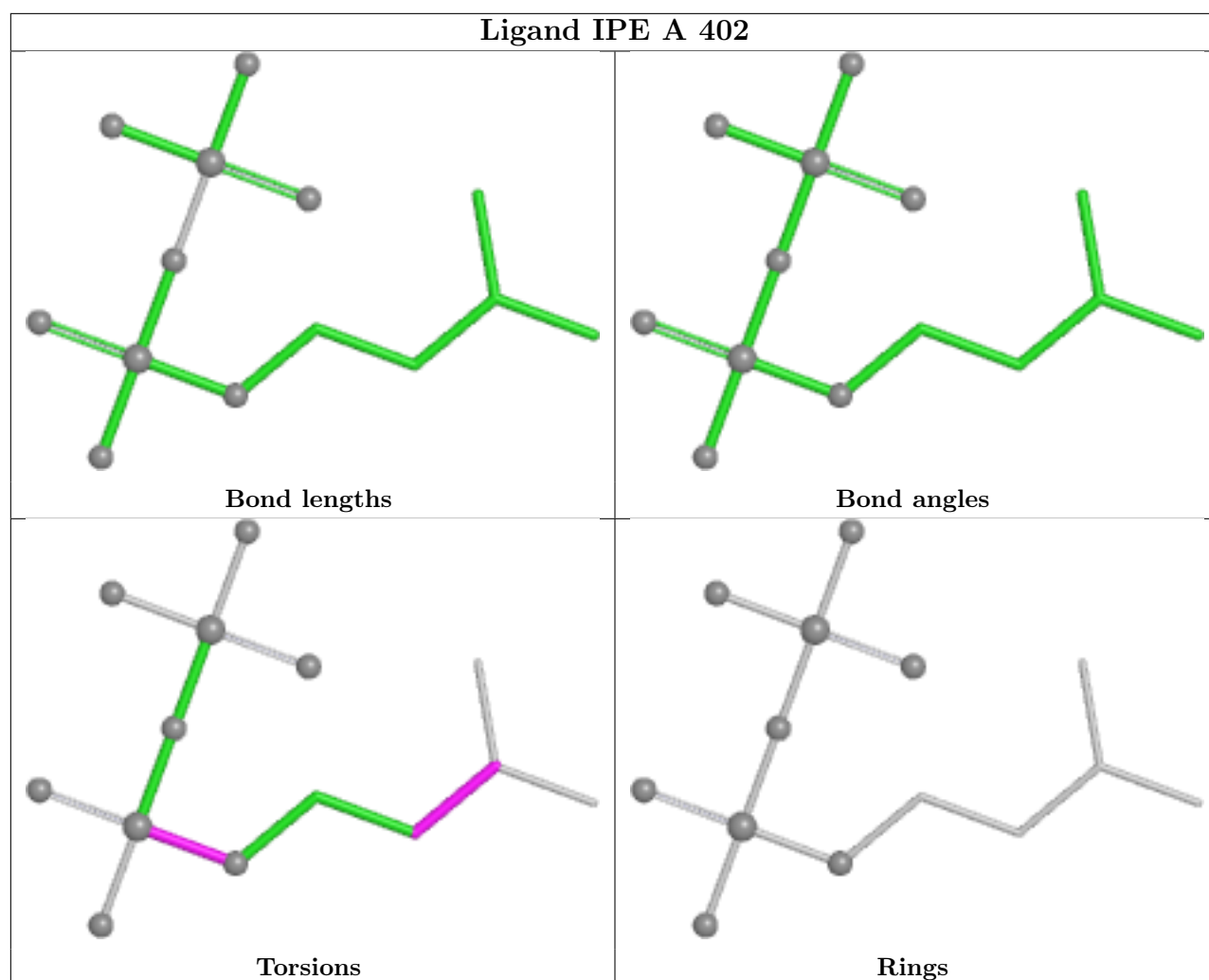
highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified 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.

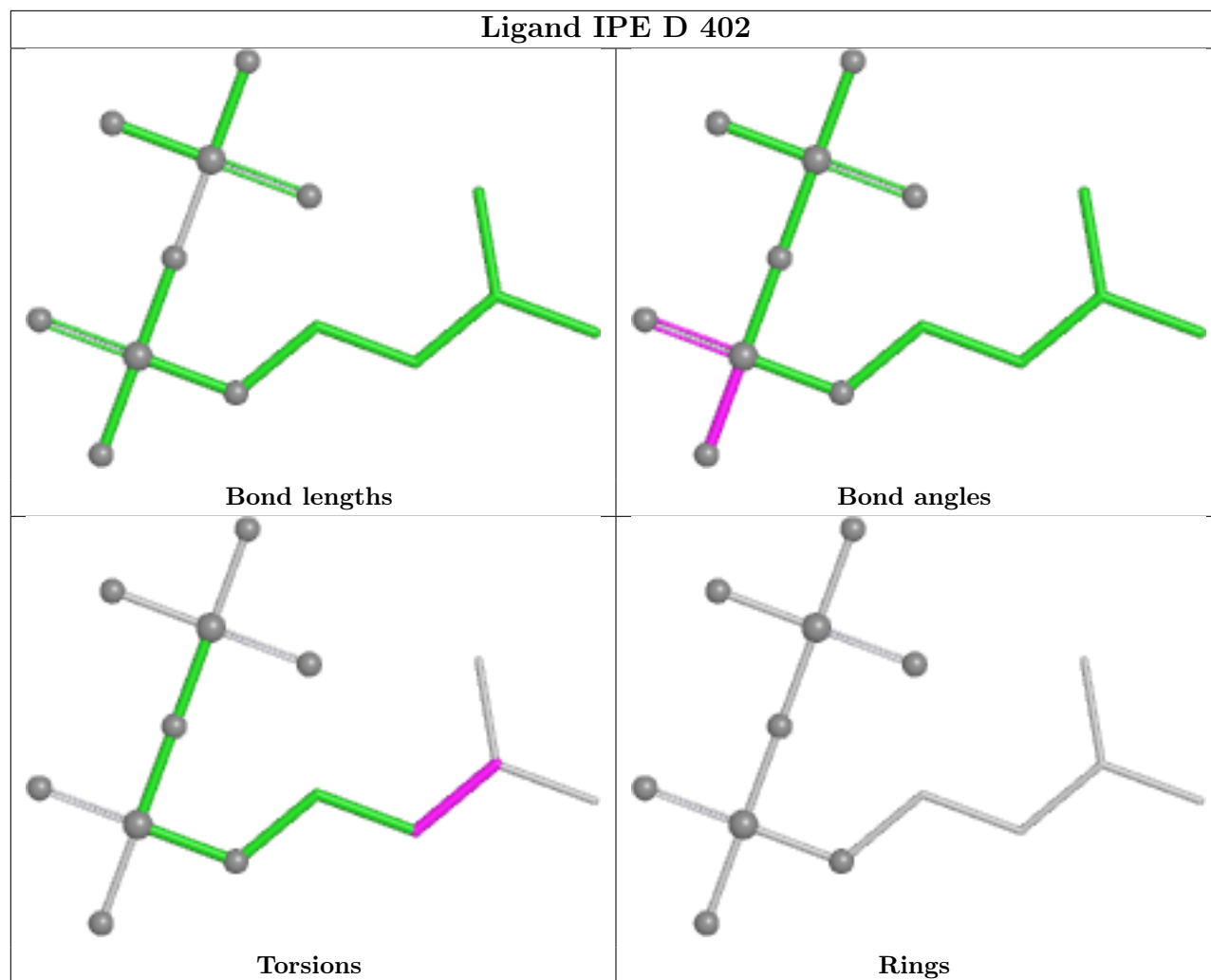


Ligand IPE C 401

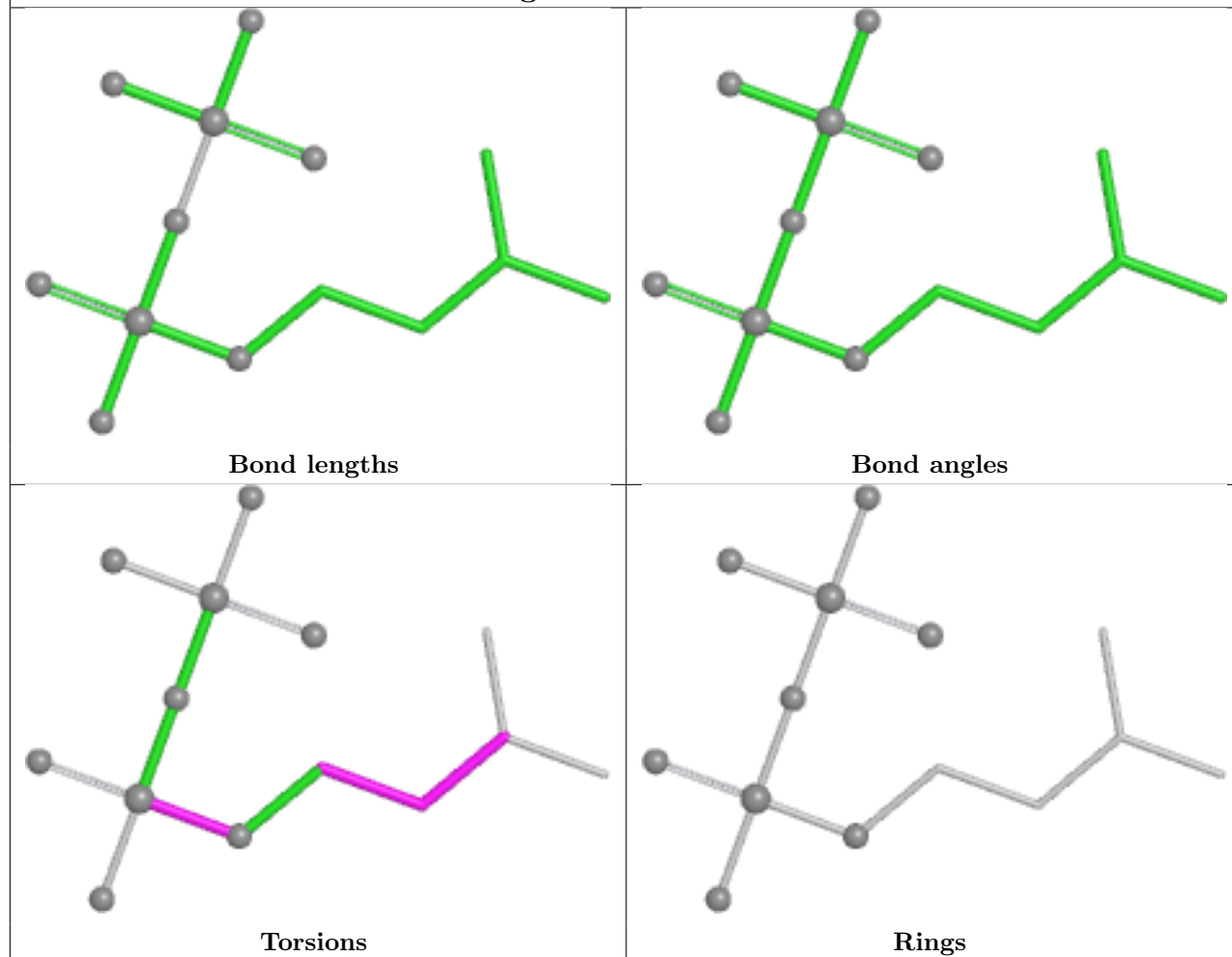




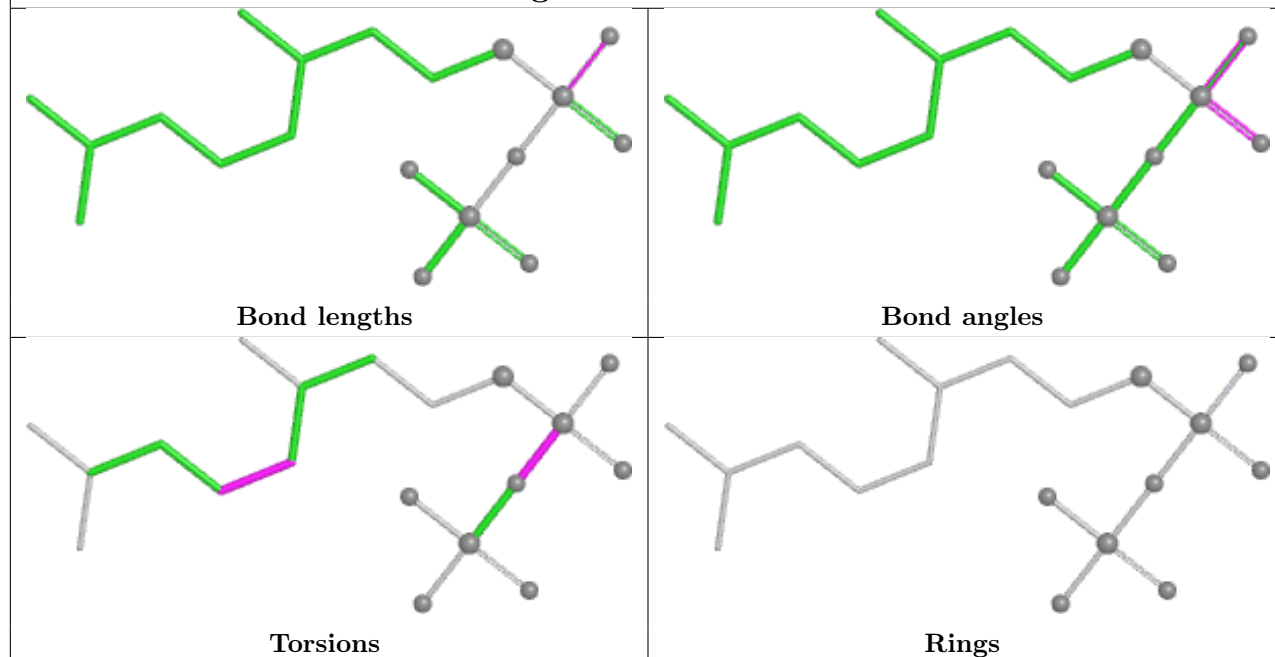


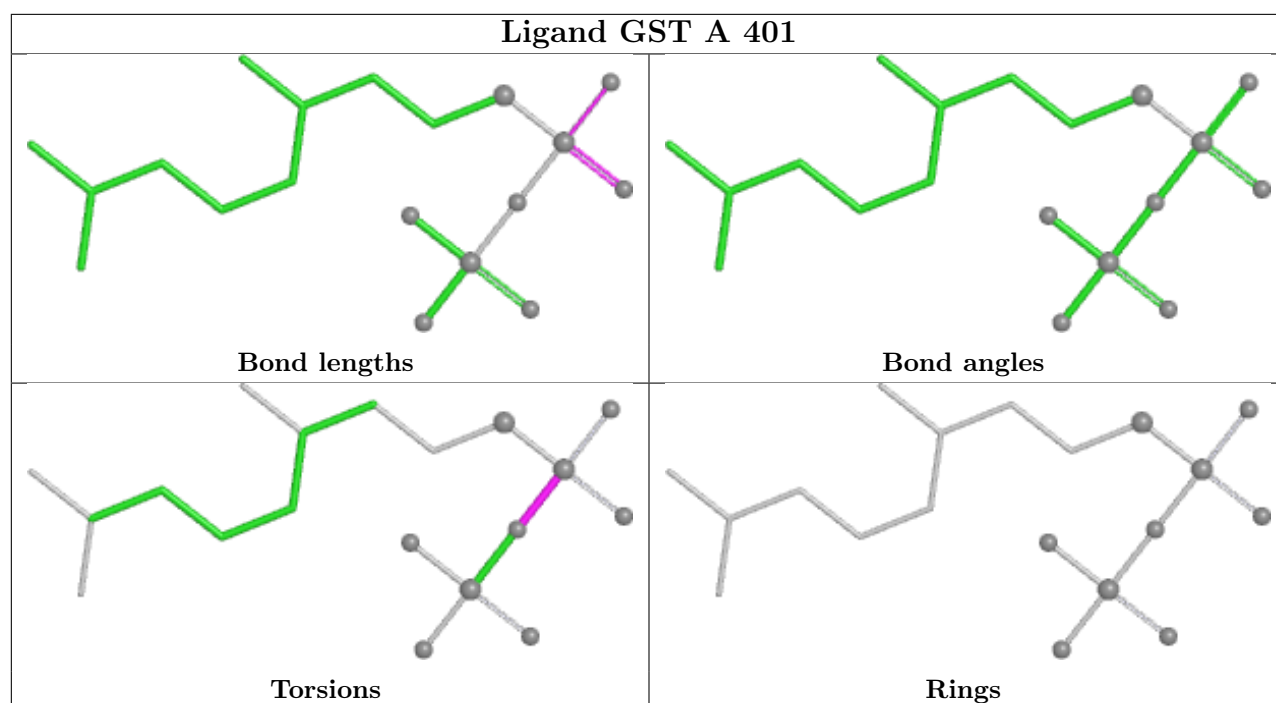


Ligand IPE B 402



Ligand GST D 403





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, 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	244/265 (92%)	-1.23	0 100 100	23, 50, 88, 129	2 (0%)
1	B	244/265 (92%)	-1.18	0 100 100	31, 55, 94, 140	0
1	C	245/265 (92%)	-1.21	0 100 100	31, 50, 88, 131	0
1	D	240/265 (90%)	-1.13	0 100 100	33, 57, 97, 117	0
All	All	973/1060 (91%)	-1.18	0 100 100	23, 53, 93, 140	2 (0%)

There are no RSRZ outliers to report.

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
2	GST	C	402	19/19	0.99	0.04	37,52,84,86	0
2	GST	A	401	19/19	1.00	0.03	37,48,75,75	0
2	GST	D	403	19/19	1.00	0.04	44,58,103,107	0
3	IPE	A	402	14/14	1.00	0.03	38,42,49,51	0

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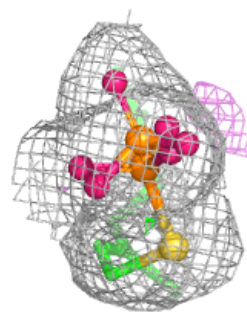
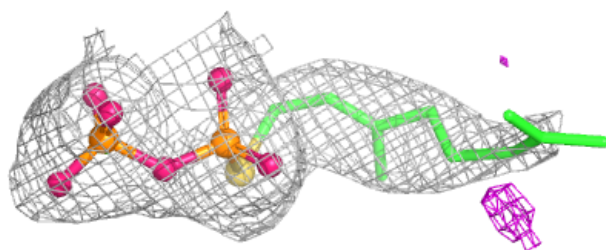
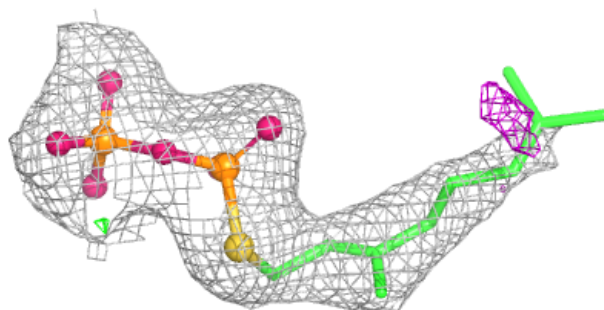
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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
3	IPE	B	402	14/14	1.00	0.03	37,43,51,56	0
3	IPE	B	403	14/14	1.00	0.03	42,48,65,66	0
3	IPE	C	401	14/14	1.00	0.03	36,43,46,49	0
3	IPE	D	402	14/14	1.00	0.03	38,45,52,53	0
4	MG	A	403	1/1	1.00	0.01	45,45,45,45	0
4	MG	B	401	1/1	1.00	0.02	49,49,49,49	0
4	MG	C	403	1/1	1.00	0.02	41,41,41,41	0
4	MG	D	401	1/1	1.00	0.01	42,42,42,42	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.

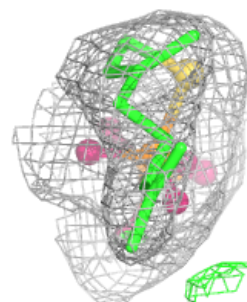
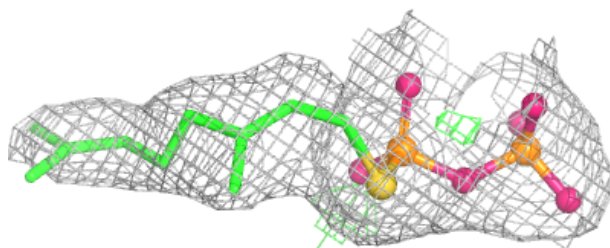
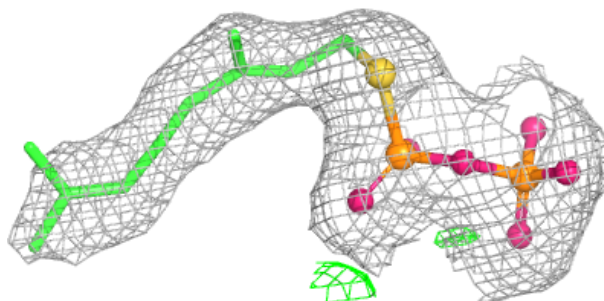
Electron density around GST C 402:

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

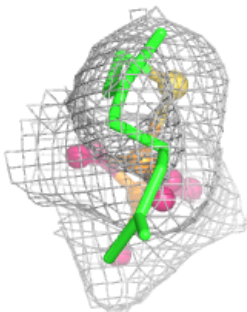
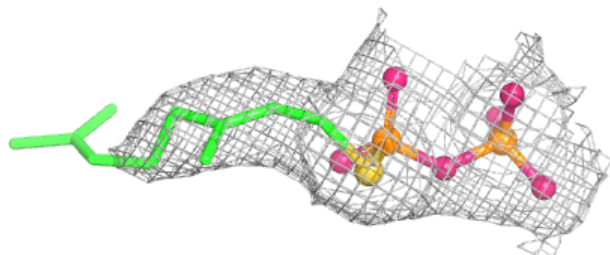
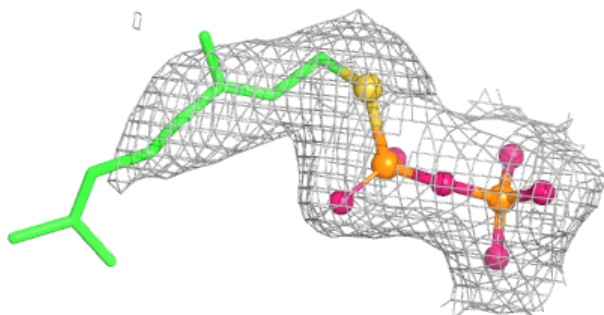


Electron density around GST A 401:

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

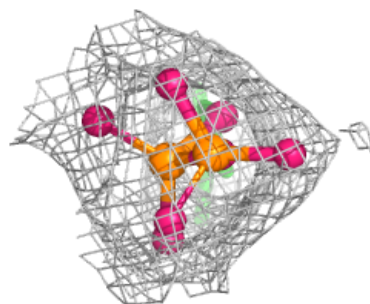
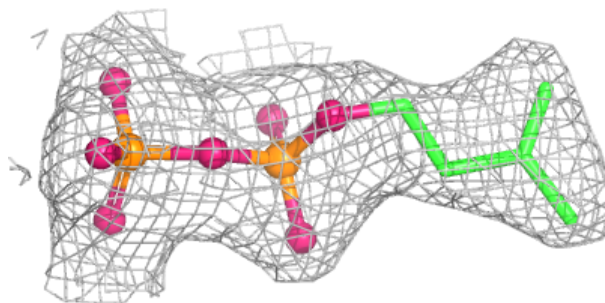
**Electron density around GST D 403:**

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and green (positive)

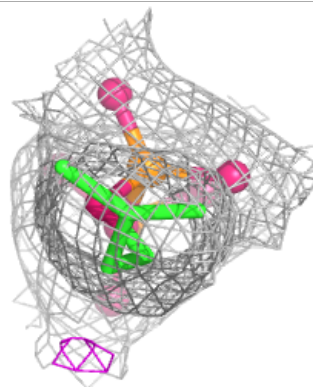
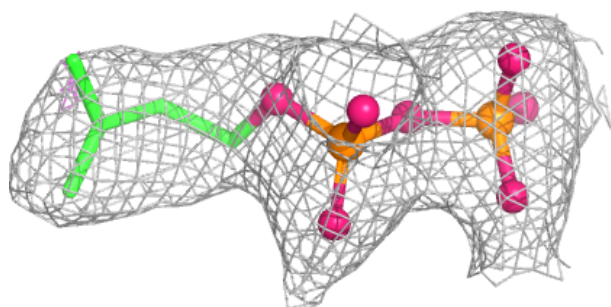
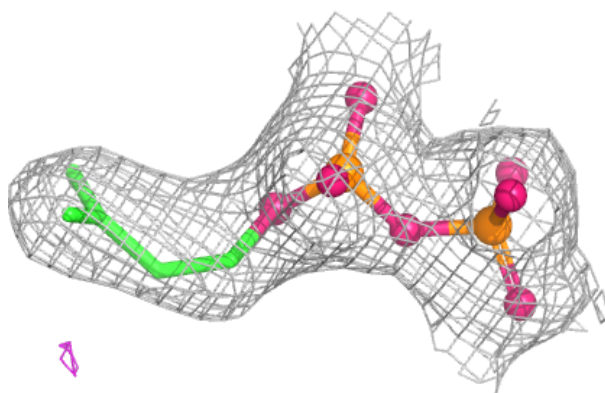


Electron density around IPE A 402:

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and green (positive)

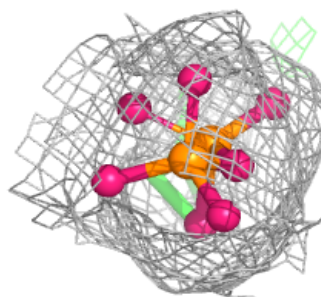
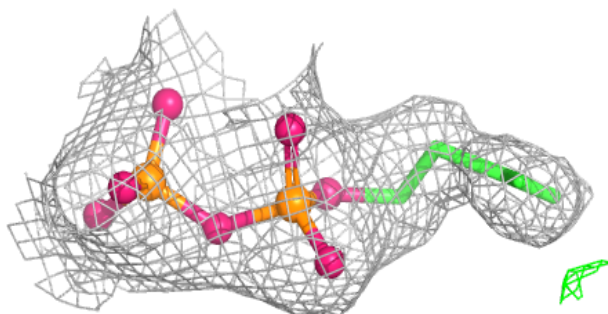
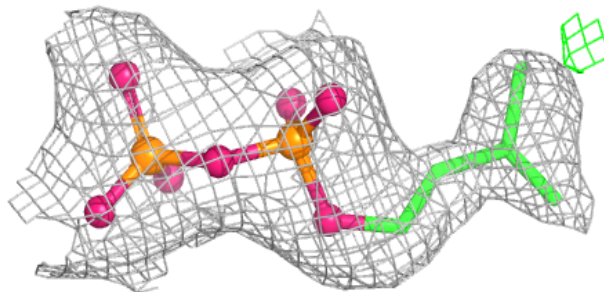
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and green (positive)

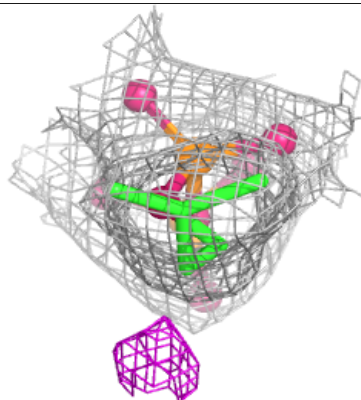
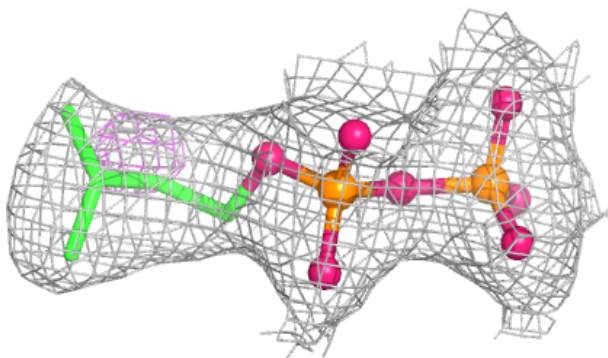
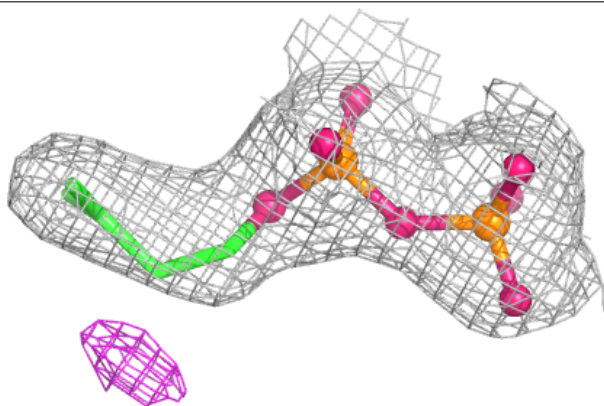


Electron density around IPE B 403:

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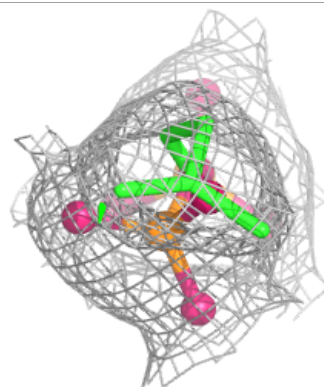
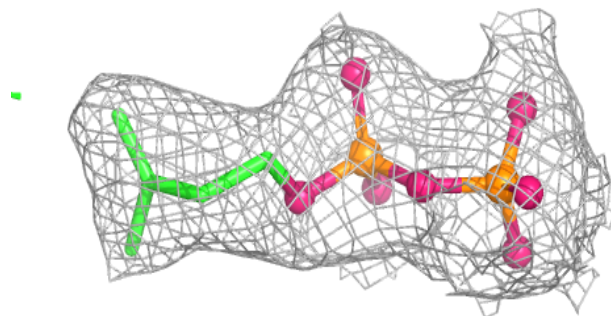
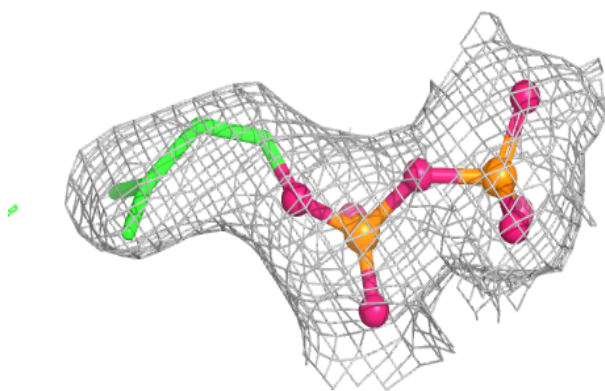
**Electron density around IPE C 401:**

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 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)



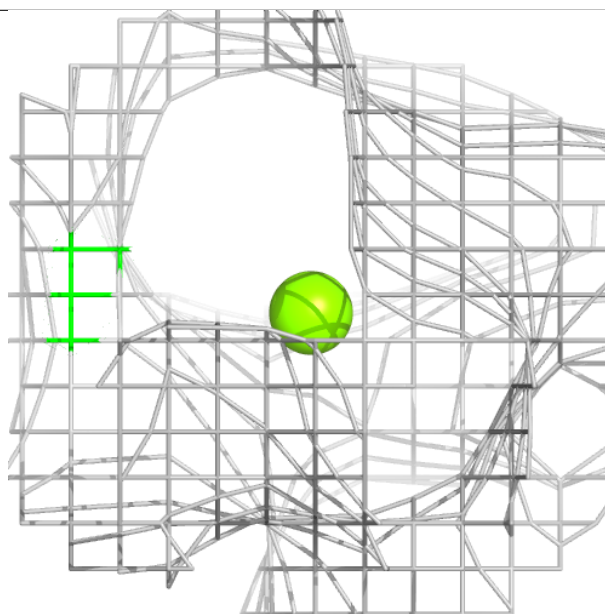
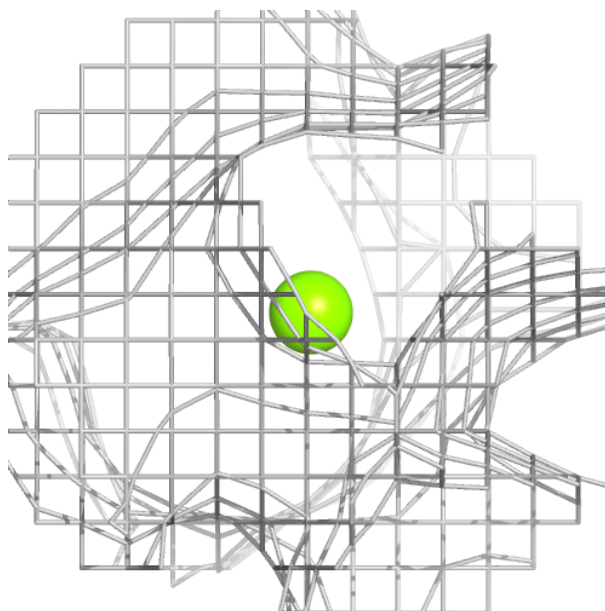
Electron density around IPE D 402:

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and green (positive)



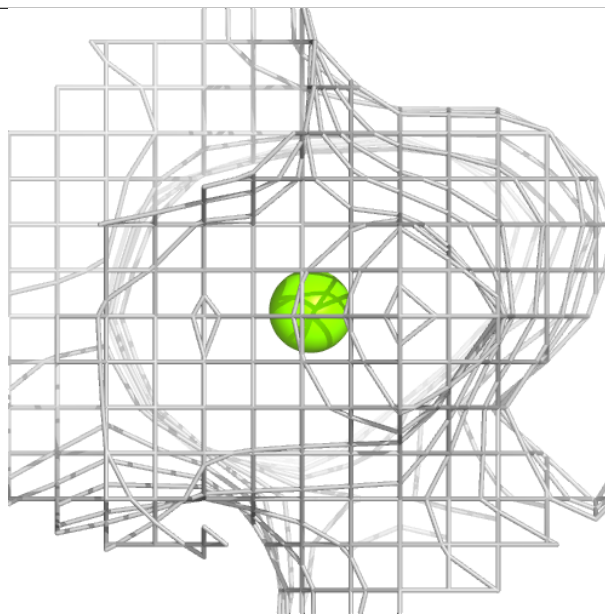
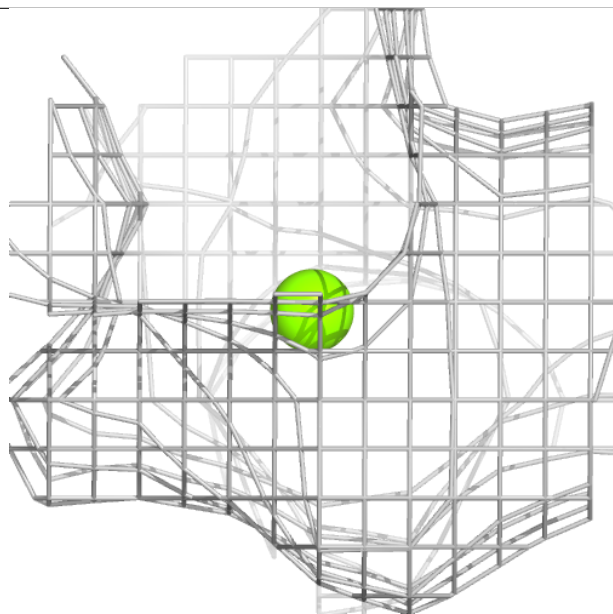
Electron density around MG A 403:

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and green (positive)



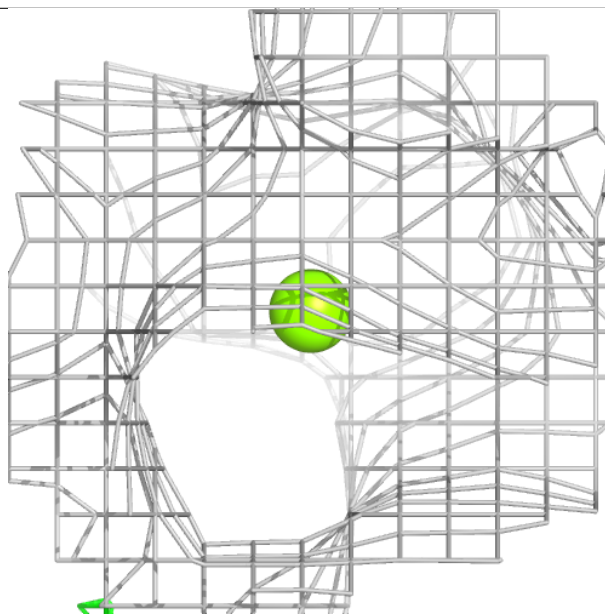
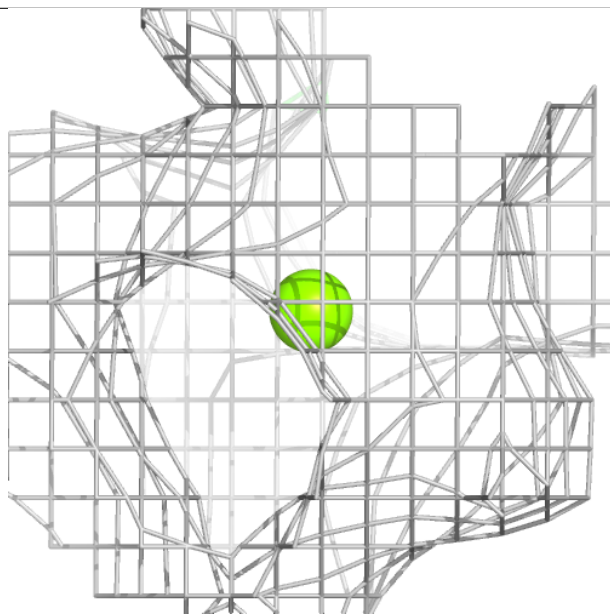
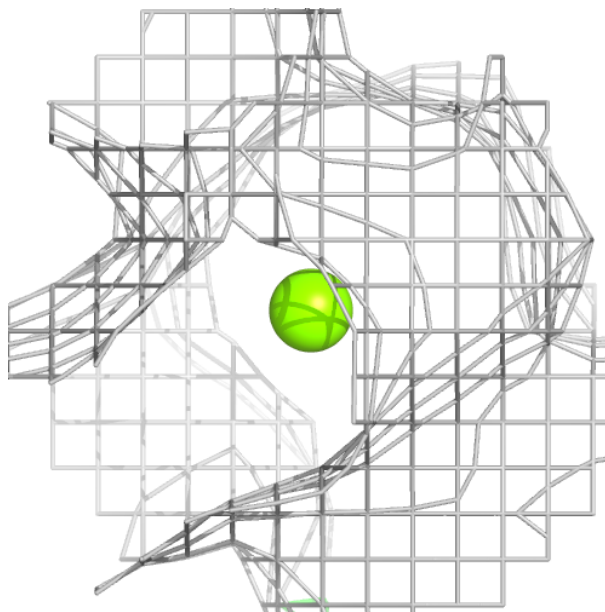
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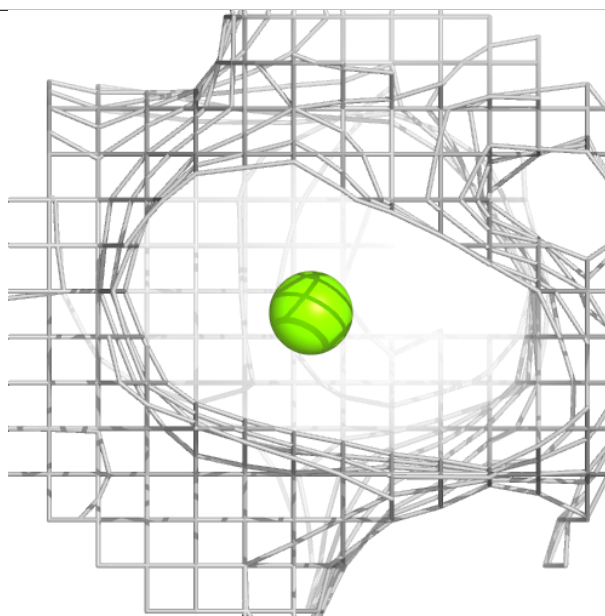
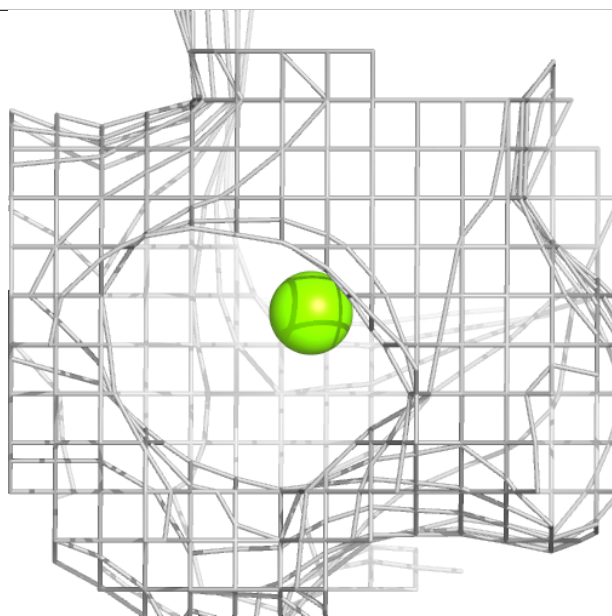
Electron density around MG C 403:

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and green (positive)



Electron density around MG D 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 ⓘ

There are no such residues in this entry.