



Full wwPDB X-ray Structure Validation Report ⓘ

Aug 4, 2026 – 01:56 AM EDT

PDB ID : 9XYW / pdb_00009xyw
Title : Crystal structure of the maize chloroplastic non-photosynthetic NADP(+)-dependent malic enzyme
Authors : Klinke, S.; Schneberger, N.; Boehm, J.M.; Willms, S.; Hagelueken, G.; Geyer, M.; Maurino, V.; Alvarez, C.E.
Deposited on : 2025-08-26
Resolution : 2.55 Å(reported)

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

We welcome your comments at validation@mail.wwpdb.org

A user guide is available at

<https://www.wwpdb.org/validation/2017/XrayValidationReportHelp>

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

<http://www.wwpdb.org/validation/2017/FAQs#types>.

The following versions of software and data (see [references ⓘ](#)) were used in the production of this report:

MolProbity	:	4-5-2 with Phenix2.0
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	2.0
EDS	:	3.0
Buster-report	:	wwPDB partial adaption of 1.1.7 (2018)
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4	:	9.0.015 (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

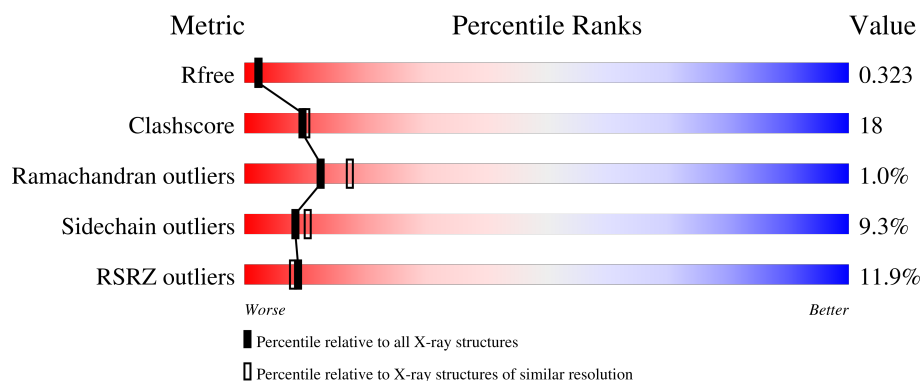
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.55 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	1091 (2.54-2.54)
Clashscore	190562	1120 (2.54-2.54)
Ramachandran outliers	187476	1106 (2.54-2.54)
Sidechain outliers	187428	1106 (2.54-2.54)
RSRZ outliers	180081	1091 (2.54-2.54)

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	AAA	586	
1	BBB	586	

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
3	FMT	AAA	602	-	-	X	-
3	FMT	BBB	602	-	-	X	-
4	PYR	AAA	603	-	-	X	-

2 Entry composition i

There are 6 unique types of molecules in this entry. The entry contains 8445 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.

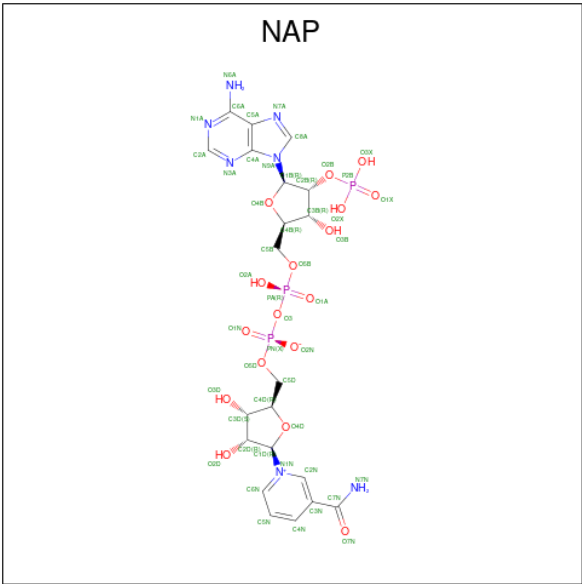
- Molecule 1 is a protein called Malic enzyme.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	AAA	553	Total	C	N	O	S	0	0	0
			4325	2771	742	795	17			
1	BBB	509	Total	C	N	O	S	0	0	0
			3991	2554	685	735	17			

There are 4 discrepancies between the modelled and reference sequences:

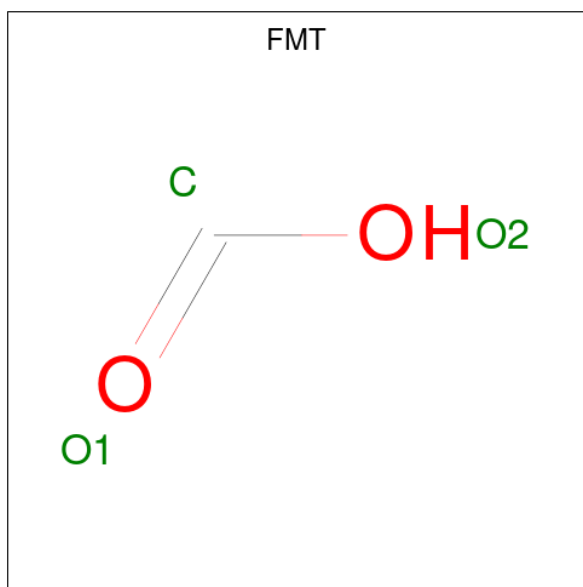
Chain	Residue	Modelled	Actual	Comment	Reference
AAA	1	HIS	-	expression tag	UNP A0A4Y2
AAA	2	MET	-	expression tag	UNP A0A4Y2
BBB	1	HIS	-	expression tag	UNP A0A4Y2
BBB	2	MET	-	expression tag	UNP A0A4Y2

- Molecule 2 is NADP NICOTINAMIDE-ADENINE-DINUCLEOTIDE PHOSPHATE (CCD ID: NAP) (formula: C₂₁H₂₈N₇O₁₇P₃) (labeled as "Ligand of Interest" by depositor).



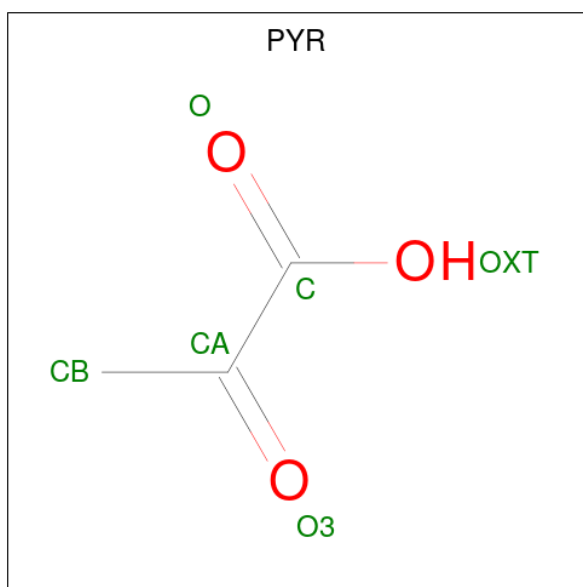
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
2	AAA	1	Total	C	N	O	P	0	0
			48	21	7	17	3		
2	BBB	1	Total	C	N	O	P	0	0
			48	21	7	17	3		

- Molecule 3 is FORMIC ACID (CCD ID: FMT) (formula: CH_2O_2).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	AAA	1	Total	C	O	0	0
			3	1	2		
3	BBB	1	Total	C	O	0	0
			3	1	2		

- Molecule 4 is PYRUVIC ACID (CCD ID: PYR) (formula: $\text{C}_3\text{H}_4\text{O}_3$) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
4	AAA	1	Total	C	O	0	0
			6	3	3		
4	BBB	1	Total	C	O	0	0
			6	3	3		

- Molecule 5 is MAGNESIUM ION (CCD ID: MG) (formula: Mg) (labeled as "Ligand of Interest" by depositor).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	AAA	1	Total	Mg	0	0
			1	1		
5	BBB	1	Total	Mg	0	0
			1	1		

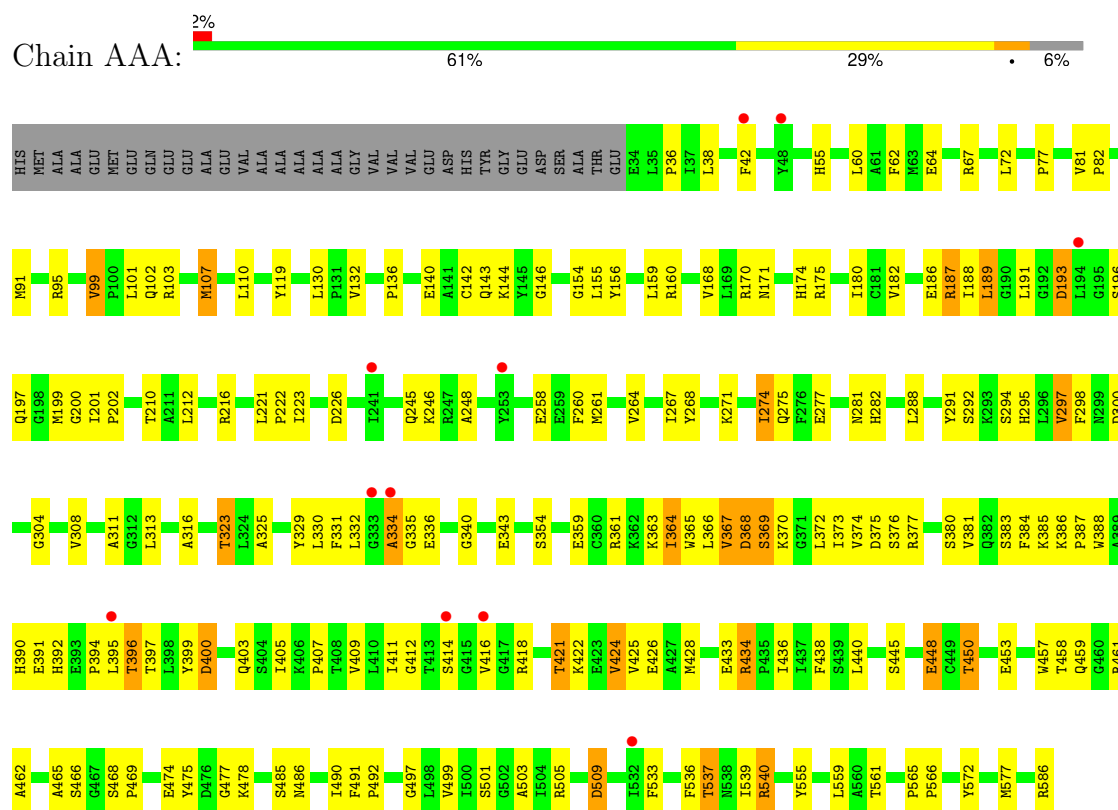
- Molecule 6 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	AAA	11	Total	O	0	0
			11	11		
6	BBB	2	Total	O	0	0
			2	2		

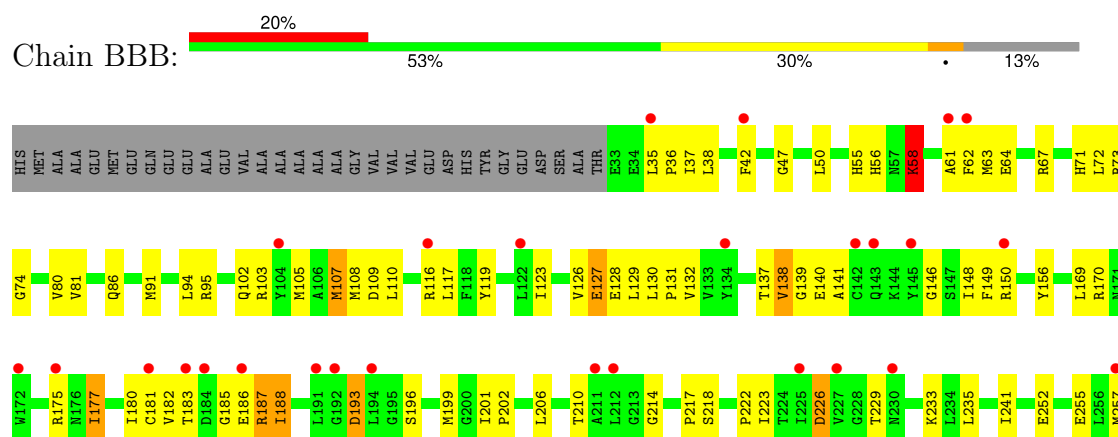
3 Residue-property plots

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: Malic enzyme



• Molecule 1: Malic enzyme



E258	E259	F260	M261	A262	A263	Y264	K265	Q266	Y267	Y268	G269	E270	K271	V272	L273	L274	Q275	F276	E277	A280	N281	A284	F285	N286	L287	S292	L296	V297	F298	N299	D300	D301	I302	Q303	G304	T305	A306	S307	V308	V309	L310	A311	G312	L313	L314	A315	ALA	LEU	LYS	VAL	VAL	GLY	GLY	THR	LEU		
	ALA	E326	H327	T328	Y329	L330	F331	L332	G333	ALA	GLY	ALA	G338	T339	G340	I341	A342	E343	L344	T345	K346	L347	E348	I349	E359	K363	ILE	TRP	LEU	VAL	ASP	SER	LYS	GLY	LEU	ILE	VAL	ASP	SER	ARG	LYS	ASN	SER	VAL	GLN	SER	PHE	LYS	LYS	PRO	TRP	ALA	H390	E391	H392	E393	P394
I463	L395	T396	T397	L398	Y399	D400	A401	V402	I405	K406	P407	T408	V409	L410	I411	G412	T413	S414	G415	V416	G417	R418	T419	F420	V425	E426	A427	M428	A429	S430	F431	M432	E433	I436	L437	F438	S439	L440	S441	N442	P443	T444	S445	C449	T450	A451	E452	A454	V457	T458	Q459	G460	R461	A462			
F464	F465	P469	F470	D471	P472	V473	GLU	TYR	ASP	GLY	LYS	V479	F480	V481	P482	Q483	Q484	S485	N486	N487	A488	Y489	I490	F491	P492	G493	F494	G495	L496	G497	L498	V499	I500	I504	R505	V506	H507	E508	D509	M510	L511	L512	A513	E516	A522	T523	Q524	E525	N526	F527	D528	I532	F533				
P534	P535	N538	S543	A544	R545	I546	V550	A554	Y555	E556	L557	G558	L559	R562	L563	P564	P565	P566	L569	V570	K571	Y572	A573	C576	M577	Y578	T579	N584	Y585	R586																											

4 Data and refinement statistics

Property	Value	Source
Space group	P 2 ₁ 2 ₁ 2 ₁	Depositor
Cell constants a, b, c, α , β , γ	92.45Å 108.11Å 168.95Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	91.23 – 2.55 91.23 – 2.55	Depositor EDS
% Data completeness (in resolution range)	99.8 (91.23-2.55) 99.8 (91.23-2.55)	Depositor EDS
R_{merge}	0.11	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.51 (at 2.55Å)	Xtriage
Refinement program	REFMAC 5.8.0258	Depositor
R, R_{free}	0.243 , 0.308 0.256 , 0.323	Depositor DCC
R_{free} test set	2736 reflections (4.89%)	wwPDB-VP
Wilson B-factor (Å ²)	64.9	Xtriage
Anisotropy	0.238	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.35 , 70.0	EDS
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
F_o, F_c correlation	0.94	EDS
Total number of atoms	8445	wwPDB-VP
Average B, all atoms (Å ²)	102.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.06% 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: PYR, FMT, NAP, 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	AAA	1.14	3/4423 (0.1%)	1.55	16/5998 (0.3%)
1	BBB	1.07	0/4078	1.51	7/5525 (0.1%)
All	All	1.11	3/8501 (0.0%)	1.53	23/11523 (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	AAA	0	1

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	AAA	336	GLU	C-O	7.07	1.32	1.24
1	AAA	421	THR	C-O	5.27	1.29	1.23
1	AAA	340	GLY	C-O	5.20	1.30	1.23

All (23) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	AAA	509	ASP	CA-CB-CG	6.75	119.35	112.60
1	BBB	300	ASP	CA-CB-CG	6.75	119.35	112.60
1	BBB	58	LYS	CB-CA-C	6.54	121.00	109.75
1	AAA	193	ASP	CA-CB-CG	6.32	118.92	112.60
1	BBB	193	ASP	CA-CB-CG	5.99	118.59	112.60
1	AAA	536	PHE	CA-C-N	5.83	128.41	120.54
1	AAA	536	PHE	C-N-CA	5.83	128.41	120.54
1	AAA	368	ASP	CA-C-N	5.70	128.70	120.38

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	AAA	368	ASP	C-N-CA	5.70	128.70	120.38
1	AAA	258	GLU	CB-CG-CD	5.43	121.83	112.60
1	AAA	540	ARG	CA-C-O	-5.39	115.14	120.70
1	AAA	99	VAL	CB-CA-C	-5.35	105.11	110.89
1	AAA	311	ALA	CA-C-N	5.30	125.86	119.98
1	AAA	311	ALA	C-N-CA	5.30	125.86	119.98
1	AAA	499	VAL	CA-C-O	-5.28	115.92	121.41
1	AAA	477	GLY	CA-C-N	5.18	128.44	120.82
1	AAA	477	GLY	C-N-CA	5.18	128.44	120.82
1	BBB	491	PHE	CB-CA-C	-5.12	100.08	110.17
1	AAA	334	ALA	CA-C-O	-5.12	115.88	121.20
1	BBB	311	ALA	CA-C-N	5.08	125.58	119.94
1	BBB	311	ALA	C-N-CA	5.08	125.58	119.94
1	AAA	537	THR	CA-CB-OG1	-5.00	102.09	109.60
1	BBB	538	ASN	CA-CB-CG	5.00	117.60	112.60

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	AAA	380	SER	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	AAA	4325	0	4349	132	0
1	BBB	3991	0	3992	172	0
2	AAA	48	0	25	7	0
2	BBB	48	0	25	3	0
3	AAA	3	0	1	3	0
3	BBB	3	0	1	2	0
4	AAA	6	0	0	5	0
4	BBB	6	0	0	1	0
5	AAA	1	0	0	0	0
5	BBB	1	0	0	0	0
6	AAA	11	0	0	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
6	BBB	2	0	0	1	0
All	All	8445	0	8393	300	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 18.

All (300) 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:BBB:459:GLN:HA	1:BBB:459:GLN:HE21	1.33	0.92
1:BBB:471:ASP:HB2	1:BBB:472:PRO:HD2	1.48	0.92
1:BBB:277:GLU:OE2	6:BBB:701:HOH:O	1.88	0.91
1:AAA:55:HIS:NE2	3:AAA:602:FMT:O2	2.04	0.90
1:BBB:186:GLU:HG2	1:BBB:280:ALA:HB2	1.54	0.90
1:BBB:491:PHE:HB2	1:BBB:492:PRO:HD3	1.53	0.90
1:BBB:105:MET:SD	1:BBB:148:ILE:HD11	2.17	0.85
1:AAA:281:ASN:ND2	1:AAA:384:PHE:CZ	2.45	0.84
1:BBB:107:MET:HE1	1:BBB:129:LEU:HD13	1.56	0.84
1:BBB:425:VAL:HG21	1:BBB:457:TRP:CE3	2.15	0.82
1:AAA:434:ARG:HG2	1:AAA:434:ARG:HH11	1.46	0.80
1:BBB:91:MET:HE1	1:BBB:129:LEU:HD11	1.63	0.80
1:AAA:160:ARG:NH2	1:BBB:64:GLU:OE1	2.14	0.79
1:BBB:425:VAL:HG21	1:BBB:457:TRP:HE3	1.46	0.79
1:AAA:421:THR:OG1	1:AAA:424:VAL:HG13	1.83	0.79
1:AAA:281:ASN:ND2	1:AAA:384:PHE:HZ	1.80	0.78
1:AAA:367:VAL:HG12	1:AAA:372:LEU:HD12	1.67	0.76
1:AAA:146:GLY:H	1:AAA:197:GLN:NE2	1.85	0.74
1:BBB:303:GLN:HG2	1:BBB:511:LEU:HD21	1.68	0.74
1:BBB:497:GLY:HA3	1:BBB:550:VAL:HG23	1.69	0.74
1:AAA:199:MET:O	1:AAA:202:PRO:HD2	1.89	0.73
1:BBB:300:ASP:CG	1:BBB:491:PHE:CZ	2.67	0.73
1:BBB:199:MET:O	1:BBB:202:PRO:HD2	1.89	0.73
1:BBB:331:PHE:CE2	1:BBB:411:ILE:HD11	2.25	0.72
1:BBB:263:ALA:O	1:BBB:267:ILE:HG22	1.90	0.71
1:BBB:433:GLU:O	1:BBB:461:ARG:NH1	2.23	0.71
1:BBB:58:LYS:HD2	1:BBB:62:PHE:CD1	2.25	0.70
1:AAA:187:ARG:O	1:AAA:187:ARG:NH1	2.25	0.70
1:AAA:458:THR:HG21	1:AAA:462:ALA:HB2	1.73	0.70
1:BBB:55:HIS:NE2	3:BBB:602:FMT:O2	2.25	0.68
1:BBB:411:ILE:HG22	1:BBB:438:PHE:HB2	1.75	0.68
1:AAA:261:MET:O	1:AAA:295:HIS:HE1	1.76	0.68

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:AAA:433:GLU:O	1:AAA:461:ARG:NH1	2.27	0.68
1:BBB:105:MET:SD	1:BBB:148:ILE:CG1	2.82	0.68
2:AAA:601:NAP:C4N	4:AAA:603:PYR:CB	2.72	0.68
1:BBB:91:MET:O	1:BBB:95:ARG:HG3	1.93	0.67
1:AAA:399:TYR:CE1	1:AAA:403:GLN:NE2	2.62	0.66
1:BBB:188:ILE:HG23	1:BBB:201:ILE:HD11	1.77	0.66
1:BBB:183:THR:HG22	1:BBB:185:GLY:N	2.11	0.66
1:AAA:540:ARG:HD3	1:AAA:577:MET:HE2	1.77	0.66
1:BBB:305:THR:HG22	2:BBB:601:NAP:C4N	2.26	0.66
1:AAA:143:GLN:NE2	1:AAA:191:LEU:HD13	2.12	0.65
1:BBB:217:PRO:HD2	1:BBB:578:TYR:CE2	2.30	0.65
1:BBB:217:PRO:HD2	1:BBB:578:TYR:CD2	2.32	0.65
1:AAA:55:HIS:CE1	3:AAA:602:FMT:O2	2.50	0.65
1:AAA:361:ARG:HB3	1:AAA:388:TRP:CZ3	2.32	0.64
1:AAA:372:LEU:O	1:AAA:377:ARG:NH1	2.30	0.64
1:BBB:91:MET:HE2	1:BBB:91:MET:HA	1.78	0.64
1:BBB:105:MET:SD	1:BBB:148:ILE:CD1	2.86	0.64
1:BBB:497:GLY:HA3	1:BBB:550:VAL:CG2	2.28	0.64
1:BBB:459:GLN:HE21	1:BBB:459:GLN:CA	2.06	0.64
1:BBB:91:MET:CE	1:BBB:129:LEU:HD11	2.28	0.64
1:BBB:188:ILE:HG23	1:BBB:201:ILE:CD1	2.28	0.63
1:BBB:186:GLU:CG	1:BBB:280:ALA:HB2	2.27	0.63
1:BBB:186:GLU:HG2	1:BBB:280:ALA:CB	2.27	0.63
1:BBB:438:PHE:CD1	1:BBB:465:ALA:HB3	2.34	0.63
1:BBB:296:LEU:HD11	1:BBB:498:LEU:HD23	1.80	0.62
1:BBB:523:THR:H	1:BBB:526:ASN:HD21	1.45	0.62
1:AAA:438:PHE:CD1	1:AAA:465:ALA:HB3	2.34	0.62
1:BBB:95:ARG:NH1	1:BBB:128:GLU:OE2	2.33	0.61
1:AAA:368:ASP:OD2	1:AAA:373:ILE:HD11	2.01	0.61
1:BBB:342:ALA:O	1:BBB:345:ILE:HG13	2.01	0.60
1:AAA:422:LYS:HG2	1:AAA:426:GLU:OE1	2.02	0.60
1:BBB:187:ARG:NE	1:BBB:187:ARG:O	2.34	0.60
1:BBB:273:LEU:C	1:BBB:273:LEU:HD23	2.27	0.59
1:BBB:300:ASP:CG	1:BBB:491:PHE:HZ	2.10	0.59
1:BBB:137:THR:O	1:BBB:139:GLY:O	2.20	0.59
1:AAA:62:PHE:O	1:AAA:67:ARG:NE	2.36	0.59
1:AAA:497:GLY:O	1:AAA:501:SER:HB2	2.03	0.59
1:BBB:229:THR:HG23	1:BBB:235:LEU:CD1	2.33	0.58
1:BBB:487:ASN:H	1:BBB:487:ASN:ND2	2.01	0.58
1:AAA:154:GLY:HA2	1:AAA:222:PRO:HG2	1.85	0.58
1:BBB:217:PRO:CD	1:BBB:578:TYR:CE2	2.85	0.58

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:BBB:138:VAL:O	1:BBB:141:ALA:HB3	2.03	0.58
1:BBB:510:MET:HE3	1:BBB:554:ALA:HB2	1.86	0.58
1:BBB:491:PHE:HB2	1:BBB:492:PRO:CD	2.31	0.58
1:AAA:409:VAL:HG22	1:AAA:436:ILE:HD12	1.85	0.58
1:BBB:109:ASP:OD2	1:BBB:150:ARG:NE	2.33	0.58
1:BBB:123:ILE:O	1:BBB:126:VAL:HG23	2.04	0.58
1:AAA:189:LEU:HD12	4:AAA:603:PYR:OXT	2.03	0.58
1:BBB:62:PHE:O	1:BBB:67:ARG:NE	2.35	0.57
1:BBB:342:ALA:O	1:BBB:345:ILE:CG1	2.53	0.57
1:BBB:105:MET:SD	1:BBB:148:ILE:HG13	2.45	0.57
1:BBB:199:MET:CE	1:BBB:222:PRO:HB2	2.34	0.57
1:BBB:471:ASP:HB2	1:BBB:472:PRO:CD	2.28	0.57
1:AAA:146:GLY:N	1:AAA:197:GLN:NE2	2.52	0.57
1:AAA:271:LYS:HE3	1:AAA:561:THR:HG21	1.86	0.57
1:AAA:335:GLY:HA3	2:AAA:601:NAP:O1A	2.05	0.57
1:BBB:123:ILE:O	1:BBB:126:VAL:CG2	2.53	0.57
1:BBB:86:GLN:HB3	1:BBB:117:LEU:HD11	1.86	0.56
1:BBB:55:HIS:CE1	3:BBB:602:FMT:O2	2.59	0.56
1:BBB:407:PRO:O	1:BBB:428:MET:HE1	2.05	0.56
1:BBB:36:PRO:O	1:BBB:170:ARG:CZ	2.53	0.56
1:BBB:183:THR:HG21	1:BBB:188:ILE:HD11	1.88	0.55
1:AAA:540:ARG:HD3	1:AAA:577:MET:CE	2.36	0.55
1:AAA:331:PHE:HA	1:AAA:411:ILE:O	2.06	0.55
1:AAA:425:VAL:HG11	1:AAA:457:TRP:HB2	1.88	0.55
1:BBB:458:THR:HG21	1:BBB:462:ALA:HB3	1.89	0.55
1:BBB:255:GLU:O	1:BBB:258:GLU:HB2	2.07	0.55
1:BBB:332:LEU:HG	1:BBB:414:SER:HB2	1.89	0.54
1:BBB:299:ASN:O	1:BBB:303:GLN:HB2	2.08	0.54
1:AAA:146:GLY:HA3	1:AAA:197:GLN:NE2	2.23	0.54
1:AAA:459:GLN:HA	1:AAA:475:TYR:CE2	2.43	0.54
1:BBB:459:GLN:HA	1:BBB:459:GLN:NE2	2.14	0.54
1:AAA:261:MET:O	1:AAA:295:HIS:CE1	2.59	0.54
1:AAA:182:VAL:HA	1:AAA:223:ILE:O	2.08	0.53
1:AAA:334:ALA:HB2	1:AAA:366:LEU:HB3	1.91	0.53
1:AAA:304:GLY:HA2	1:AAA:490:ILE:HD11	1.90	0.53
1:BBB:180:ILE:HG22	1:BBB:182:VAL:HG23	1.91	0.53
1:AAA:397:THR:HG23	1:AAA:400:ASP:H	1.73	0.53
1:BBB:199:MET:HE1	1:BBB:222:PRO:HB2	1.90	0.53
1:BBB:500:ILE:HD11	1:BBB:576:CYS:HB2	1.91	0.52
1:AAA:343:GLU:OE2	1:AAA:361:ARG:NH2	2.42	0.52
1:AAA:189:LEU:HD12	4:AAA:603:PYR:C	2.40	0.52

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:BBB:564:PRO:O	1:BBB:566:PRO:HD3	2.10	0.52
1:BBB:562:ARG:CZ	1:BBB:572:TYR:OH	2.57	0.52
1:AAA:459:GLN:C	1:AAA:475:TYR:CE2	2.88	0.51
1:AAA:466:SER:OG	1:AAA:468:SER:O	2.21	0.51
1:BBB:420:PHE:HB3	1:BBB:449:CYS:SG	2.50	0.51
1:AAA:274:ILE:HB	1:AAA:297:VAL:HG12	1.92	0.51
1:AAA:323:THR:HG23	1:AAA:325:ALA:H	1.74	0.51
1:AAA:281:ASN:ND2	1:AAA:384:PHE:CE2	2.78	0.50
1:BBB:169:LEU:HD23	1:BBB:268:TYR:HE2	1.76	0.50
1:BBB:420:PHE:CB	1:BBB:449:CYS:SG	2.99	0.50
1:AAA:438:PHE:HB3	1:AAA:440:LEU:HD21	1.93	0.50
1:BBB:409:VAL:HA	1:BBB:436:ILE:HG13	1.94	0.50
1:BBB:130:LEU:N	1:BBB:131:PRO:HD2	2.27	0.49
1:AAA:159:LEU:HD11	1:AAA:248:ALA:HB2	1.94	0.49
1:AAA:386:LYS:N	1:AAA:387:PRO:CD	2.75	0.49
1:BBB:67:ARG:HA	1:BBB:72:LEU:HB2	1.93	0.49
1:BBB:182:VAL:HA	1:BBB:223:ILE:O	2.11	0.49
1:AAA:174:HIS:HE2	3:AAA:602:FMT:C	2.25	0.49
1:AAA:332:LEU:HG	1:AAA:414:SER:OG	2.12	0.49
1:BBB:146:GLY:HA2	1:BBB:241:ILE:HG23	1.94	0.49
1:AAA:407:PRO:O	1:AAA:428:MET:HE1	2.13	0.49
1:BBB:425:VAL:HG23	1:BBB:457:TRP:HB3	1.93	0.49
1:AAA:397:THR:CG2	1:AAA:400:ASP:OD1	2.61	0.49
1:AAA:146:GLY:CA	1:AAA:197:GLN:NE2	2.76	0.49
1:AAA:196:SER:OG	1:AAA:226:ASP:OD2	2.31	0.49
1:AAA:450:THR:HG22	1:AAA:453:GLU:H	1.77	0.49
1:BBB:214:GLY:HA3	1:BBB:577:MET:HB3	1.95	0.49
1:BBB:459:GLN:CA	1:BBB:459:GLN:NE2	2.73	0.49
1:BBB:487:ASN:N	1:BBB:487:ASN:HD22	2.11	0.48
1:BBB:286:ASN:N	1:BBB:286:ASN:HD22	2.11	0.48
1:AAA:485:SER:HA	1:AAA:533:PHE:CE2	2.48	0.48
1:BBB:103:ARG:HB3	1:BBB:132:VAL:HG11	1.95	0.48
1:BBB:119:TYR:CE1	1:BBB:210:THR:HB	2.48	0.48
1:BBB:308:VAL:HG21	1:BBB:486:ASN:O	2.14	0.48
1:BBB:226:ASP:C	1:BBB:226:ASP:OD1	2.56	0.48
1:BBB:217:PRO:CD	1:BBB:578:TYR:CD2	2.96	0.48
1:BBB:487:ASN:ND2	1:BBB:487:ASN:N	2.60	0.48
1:AAA:375:ASP:C	1:AAA:377:ARG:H	2.22	0.48
2:AAA:601:NAP:C3N	4:AAA:603:PYR:CB	2.92	0.48
1:BBB:80:VAL:HG23	1:BBB:80:VAL:O	2.14	0.48
1:BBB:327:HIS:HD1	1:BBB:408:THR:HB	1.79	0.48

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:BBB:327:HIS:HD1	1:BBB:408:THR:CB	2.26	0.48
1:BBB:525:GLU:OE1	1:BBB:525:GLU:HA	2.12	0.47
1:AAA:468:SER:HB3	1:AAA:469:PRO:HD2	1.96	0.47
1:BBB:56:HIS:HD2	1:BBB:585:TYR:OH	1.97	0.47
1:BBB:405:ILE:O	1:BBB:405:ILE:HG13	2.14	0.47
1:AAA:391:GLU:O	1:AAA:392:HIS:HB2	2.14	0.47
1:AAA:459:GLN:HA	1:AAA:475:TYR:CZ	2.49	0.47
1:BBB:95:ARG:HH12	1:BBB:128:GLU:CD	2.22	0.47
1:BBB:305:THR:CG2	2:BBB:601:NAP:C4N	2.93	0.47
1:BBB:275:GLN:HA	1:BBB:298:PHE:O	2.15	0.47
1:AAA:566:PRO:HG2	1:AAA:572:TYR:CD2	2.50	0.47
1:BBB:63:MET:HE1	1:BBB:584:ASN:HD21	1.79	0.47
1:BBB:214:GLY:HA3	1:BBB:577:MET:CB	2.45	0.47
1:AAA:369:SER:HB2	2:AAA:601:NAP:O1X	2.14	0.47
1:BBB:80:VAL:O	1:BBB:80:VAL:CG2	2.63	0.47
1:BBB:395:LEU:O	1:BBB:396:THR:HG23	2.15	0.47
1:AAA:130:LEU:C	1:AAA:130:LEU:HD23	2.40	0.46
1:AAA:91:MET:O	1:AAA:95:ARG:HG2	2.15	0.46
1:BBB:525:GLU:O	1:BBB:528:ASP:OD1	2.33	0.46
1:BBB:585:TYR:O	1:BBB:586:ARG:HB2	2.16	0.46
1:AAA:294:SER:OG	1:AAA:295:HIS:HD2	1.98	0.46
1:AAA:275:GLN:HA	1:AAA:298:PHE:O	2.15	0.46
1:AAA:395:LEU:O	1:AAA:396:THR:HG23	2.15	0.46
1:AAA:434:ARG:HG2	1:AAA:434:ARG:NH1	2.24	0.46
1:BBB:485:SER:HA	1:BBB:533:PHE:CE2	2.50	0.46
1:AAA:95:ARG:HG3	1:AAA:95:ARG:HH11	1.81	0.46
1:AAA:186:GLU:O	1:AAA:193:ASP:HA	2.16	0.46
1:AAA:212:LEU:HG	1:AAA:539:ILE:HG12	1.97	0.46
1:AAA:288:LEU:O	1:AAA:292:SER:HB2	2.16	0.46
1:BBB:306:ALA:CB	1:BBB:344:LEU:HD12	2.46	0.46
1:AAA:99:VAL:HB	1:AAA:102:GLN:HG3	1.96	0.46
1:AAA:486:ASN:HA	2:AAA:601:NAP:H72N	1.80	0.46
1:AAA:142:CYS:SG	1:AAA:201:ILE:HG12	2.56	0.45
1:AAA:156:TYR:CE1	1:AAA:199:MET:HE2	2.51	0.45
1:BBB:452:GLU:OE1	1:BBB:473:VAL:HG22	2.16	0.45
1:AAA:186:GLU:O	1:AAA:193:ASP:CA	2.65	0.45
1:AAA:245:GLN:HG3	1:AAA:246:LYS:O	2.17	0.45
1:AAA:330:LEU:HD12	1:AAA:365:TRP:HB2	1.97	0.45
1:AAA:412:GLY:HA3	1:AAA:448:GLU:HG3	1.99	0.45
1:BBB:95:ARG:HG2	1:BBB:95:ARG:HH11	1.80	0.45
1:BBB:169:LEU:HD23	1:BBB:268:TYR:CE2	2.52	0.45

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:AAA:77:PRO:HB3	1:BBB:156:TYR:CE2	2.52	0.45
1:AAA:330:LEU:HA	1:AAA:365:TRP:O	2.16	0.45
1:BBB:186:GLU:OE2	1:BBB:193:ASP:OD2	2.35	0.45
1:AAA:329:TYR:HB2	1:AAA:364:ILE:HG23	1.98	0.45
1:BBB:108:MET:C	1:BBB:110:LEU:H	2.25	0.45
1:AAA:155:LEU:HD12	1:BBB:74:GLY:O	2.17	0.44
1:AAA:187:ARG:O	1:AAA:187:ARG:HG3	2.17	0.44
1:AAA:260:PHE:CD2	1:AAA:261:MET:CE	3.00	0.44
1:AAA:260:PHE:CD2	1:AAA:261:MET:HE2	2.52	0.44
1:BBB:471:ASP:OD1	1:BBB:471:ASP:N	2.39	0.44
1:BBB:496:LEU:HG	1:BBB:500:ILE:HD12	1.99	0.44
1:AAA:119:TYR:CE1	1:AAA:210:THR:HB	2.51	0.44
1:BBB:438:PHE:HB3	1:BBB:440:LEU:HD21	1.99	0.44
1:BBB:500:ILE:HD11	1:BBB:576:CYS:CB	2.47	0.44
1:AAA:143:GLN:HE22	1:AAA:191:LEU:HD22	1.82	0.44
1:AAA:308:VAL:HG21	1:AAA:486:ASN:O	2.16	0.44
1:BBB:186:GLU:O	1:BBB:193:ASP:HA	2.17	0.44
1:BBB:425:VAL:HG21	1:BBB:457:TRP:CB	2.48	0.44
1:AAA:261:MET:HG3	1:AAA:291:TYR:CZ	2.52	0.44
1:AAA:399:TYR:CZ	1:AAA:403:GLN:NE2	2.84	0.44
1:BBB:257:MET:O	1:BBB:261:MET:HG2	2.18	0.44
1:AAA:503:ALA:HA	1:AAA:559:LEU:O	2.17	0.44
1:AAA:143:GLN:NE2	1:AAA:191:LEU:HD22	2.32	0.44
1:BBB:91:MET:HA	1:BBB:91:MET:CE	2.47	0.44
2:AAA:601:NAP:C5N	4:AAA:603:PYR:CA	2.95	0.44
1:BBB:50:LEU:HD23	1:BBB:72:LEU:HD11	1.99	0.44
1:BBB:310:LEU:HD11	1:BBB:345:ILE:CG2	2.48	0.44
1:BBB:513:ALA:HA	1:BBB:516:GLU:HG2	2.00	0.44
1:BBB:418:ARG:HG3	1:BBB:418:ARG:O	2.18	0.44
1:AAA:370:LYS:HB2	1:AAA:377:ARG:NH2	2.33	0.43
1:AAA:491:PHE:CG	1:AAA:492:PRO:HD3	2.53	0.43
1:BBB:420:PHE:HD2	1:BBB:449:CYS:SG	2.40	0.43
1:AAA:277:GLU:OE1	1:AAA:300:ASP:HB3	2.18	0.43
1:AAA:155:LEU:HD11	1:AAA:168:VAL:HG12	2.01	0.43
1:AAA:374:VAL:O	1:AAA:377:ARG:N	2.51	0.43
1:AAA:388:TRP:O	1:AAA:390:HIS:CE1	2.71	0.43
1:BBB:107:MET:O	1:BBB:110:LEU:HB3	2.18	0.43
1:AAA:367:VAL:HG12	1:AAA:372:LEU:CD1	2.44	0.43
1:AAA:474:GLU:HA	1:AAA:478:LYS:O	2.18	0.43
1:AAA:264:VAL:HG11	1:AAA:274:ILE:CD1	2.49	0.43
1:BBB:181:CYS:HB2	1:BBB:206:LEU:CD1	2.49	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:AAA:201:ILE:HB	1:AAA:202:PRO:HD3	1.99	0.43
1:BBB:201:ILE:HB	1:BBB:202:PRO:HD3	2.00	0.43
1:AAA:60:LEU:HD21	1:BBB:149:PHE:CE2	2.53	0.43
1:AAA:267:ILE:HG23	1:AAA:268:TYR:CD1	2.54	0.43
1:BBB:130:LEU:HD23	1:BBB:130:LEU:C	2.43	0.43
1:BBB:196:SER:OG	1:BBB:226:ASP:OD2	2.36	0.43
1:BBB:300:ASP:OD2	1:BBB:491:PHE:CZ	2.71	0.43
1:AAA:313:LEU:O	1:AAA:316:ALA:N	2.52	0.42
1:BBB:508:GLU:O	1:BBB:511:LEU:HB2	2.19	0.42
1:AAA:226:ASP:OD1	1:AAA:226:ASP:C	2.62	0.42
1:BBB:452:GLU:OE1	1:BBB:473:VAL:HG13	2.18	0.42
1:BBB:58:LYS:HG3	1:BBB:61:ALA:HB3	2.01	0.42
1:BBB:187:ARG:HG2	1:BBB:280:ALA:HA	2.00	0.42
1:BBB:399:TYR:O	1:BBB:402:VAL:HG12	2.20	0.42
1:AAA:36:PRO:O	1:AAA:170:ARG:NH1	2.53	0.42
1:AAA:168:VAL:HG13	1:BBB:73:ARG:O	2.20	0.42
1:BBB:425:VAL:CG2	1:BBB:457:TRP:HB3	2.49	0.42
1:BBB:442:ASN:HA	1:BBB:443:PRO:O	2.20	0.42
1:BBB:261:MET:CE	1:BBB:274:ILE:HD13	2.50	0.42
1:AAA:155:LEU:O	1:AAA:223:ILE:HA	2.20	0.42
1:BBB:342:ALA:O	1:BBB:345:ILE:HG12	2.19	0.42
1:AAA:267:ILE:HG23	1:AAA:268:TYR:CG	2.55	0.42
1:BBB:186:GLU:O	1:BBB:193:ASP:CA	2.68	0.42
1:BBB:226:ASP:OD1	1:BBB:226:ASP:O	2.38	0.42
1:AAA:60:LEU:HB3	1:AAA:81:VAL:HG23	2.02	0.42
1:BBB:72:LEU:O	1:BBB:73:ARG:C	2.62	0.42
1:BBB:300:ASP:OD1	1:BBB:300:ASP:C	2.62	0.42
1:AAA:155:LEU:HA	1:BBB:74:GLY:O	2.20	0.41
1:AAA:386:LYS:N	1:AAA:387:PRO:HD3	2.35	0.41
1:BBB:304:GLY:HA2	1:BBB:490:ILE:HD11	2.02	0.41
1:AAA:107:MET:O	1:AAA:110:LEU:HB3	2.21	0.41
1:AAA:101:LEU:HD13	1:AAA:140:GLU:HG2	2.02	0.41
1:BBB:81:VAL:O	1:BBB:81:VAL:CG2	2.68	0.41
1:AAA:485:SER:HA	1:AAA:533:PHE:HE2	1.86	0.41
1:BBB:425:VAL:HG23	1:BBB:426:GLU:N	2.35	0.41
1:AAA:180:ILE:HG12	1:AAA:221:LEU:HD23	2.02	0.41
1:AAA:171:ASN:HD21	1:BBB:71:HIS:HA	1.85	0.41
1:BBB:326:GLU:N	1:BBB:363:LYS:HZ3	2.19	0.41
1:AAA:294:SER:OG	1:AAA:295:HIS:CD2	2.73	0.41
1:BBB:183:THR:HG22	1:BBB:185:GLY:H	1.85	0.41
1:AAA:143:GLN:CD	1:AAA:191:LEU:HD13	2.46	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:AAA:385:LYS:NZ	2:AAA:601:NAP:O3X	2.48	0.41
1:AAA:425:VAL:CG1	1:AAA:457:TRP:HB2	2.51	0.41
1:AAA:505:ARG:HB2	1:AAA:559:LEU:HD22	2.03	0.41
1:AAA:555:TYR:CD1	1:AAA:565:PRO:HB3	2.56	0.41
1:BBB:94:LEU:HD23	1:BBB:94:LEU:HA	1.94	0.41
1:BBB:127:GLU:CD	1:BBB:128:GLU:H	2.29	0.41
1:BBB:137:THR:C	1:BBB:139:GLY:O	2.64	0.41
1:BBB:177:ILE:HD11	1:BBB:268:TYR:CD2	2.56	0.41
1:BBB:391:GLU:O	1:BBB:392:HIS:HB2	2.21	0.41
1:BBB:398:LEU:HD23	1:BBB:398:LEU:O	2.21	0.41
1:AAA:103:ARG:HB3	1:AAA:132:VAL:HG11	2.03	0.41
1:BBB:196:SER:OG	1:BBB:226:ASP:HB2	2.21	0.40
1:AAA:261:MET:HE2	1:AAA:261:MET:HA	2.03	0.40
1:AAA:421:THR:O	1:AAA:424:VAL:HG22	2.20	0.40
1:BBB:47:GLY:HA2	1:BBB:72:LEU:HD23	2.03	0.40
1:BBB:345:ILE:HG13	1:BBB:346:ALA:N	2.36	0.40
1:BBB:513:ALA:O	1:BBB:516:GLU:HG2	2.20	0.40
1:AAA:140:GLU:HG3	1:AAA:144:LYS:HE3	2.02	0.40
1:BBB:261:MET:HE1	1:BBB:274:ILE:HD13	2.03	0.40
1:BBB:486:ASN:HD21	4:BBB:603:PYR:CB	2.34	0.40
1:BBB:332:LEU:HD21	1:BBB:419:THR:HG21	2.03	0.40
1:BBB:487:ASN:OD1	2:BBB:601:NAP:H4N	2.21	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	AAA	551/586 (94%)	487 (88%)	58 (10%)	6 (1%)	11	15
1	BBB	499/586 (85%)	437 (88%)	57 (11%)	5 (1%)	12	17
All	All	1050/1172 (90%)	924 (88%)	115 (11%)	11 (1%)	12	17

All (11) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	AAA	376	SER
1	AAA	445	SER
1	BBB	314	LEU
1	BBB	445	SER
1	AAA	188	ILE
1	AAA	200	GLY
1	AAA	394	PRO
1	AAA	396	THR
1	BBB	460	GLY
1	BBB	188	ILE
1	BBB	394	PRO

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	AAA	460/482 (95%)	426 (93%)	34 (7%)	13	17
1	BBB	425/482 (88%)	377 (89%)	48 (11%)	5	6
All	All	885/964 (92%)	803 (91%)	82 (9%)	8	10

All (82) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	AAA	38	LEU
1	AAA	42	PHE
1	AAA	64	GLU
1	AAA	72	LEU
1	AAA	82	PRO
1	AAA	107	MET
1	AAA	136	PRO
1	AAA	175	ARG
1	AAA	187	ARG
1	AAA	189	LEU
1	AAA	216	ARG
1	AAA	274	ILE

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Mol	Chain	Res	Type
1	AAA	282	HIS
1	AAA	297	VAL
1	AAA	323	THR
1	AAA	354	SER
1	AAA	359	GLU
1	AAA	363	LYS
1	AAA	364	ILE
1	AAA	367	VAL
1	AAA	369	SER
1	AAA	381	VAL
1	AAA	383	SER
1	AAA	400	ASP
1	AAA	405	ILE
1	AAA	416	VAL
1	AAA	418	ARG
1	AAA	424	VAL
1	AAA	434	ARG
1	AAA	448	GLU
1	AAA	450	THR
1	AAA	509	ASP
1	AAA	537	THR
1	AAA	586	ARG
1	BBB	35	LEU
1	BBB	37	ILE
1	BBB	38	LEU
1	BBB	42	PHE
1	BBB	58	LYS
1	BBB	102	GLN
1	BBB	107	MET
1	BBB	116	ARG
1	BBB	127	GLU
1	BBB	138	VAL
1	BBB	140	GLU
1	BBB	175	ARG
1	BBB	177	ILE
1	BBB	187	ARG
1	BBB	218	SER
1	BBB	226	ASP
1	BBB	233	LYS
1	BBB	252	GLU
1	BBB	265	LYS
1	BBB	281	ASN

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Mol	Chain	Res	Type
1	BBB	286	ASN
1	BBB	292	SER
1	BBB	300	ASP
1	BBB	314	LEU
1	BBB	359	GLU
1	BBB	399	TYR
1	BBB	402	VAL
1	BBB	405	ILE
1	BBB	411	ILE
1	BBB	416	VAL
1	BBB	418	ARG
1	BBB	436	ILE
1	BBB	445	SER
1	BBB	449	CYS
1	BBB	452	GLU
1	BBB	459	GLN
1	BBB	463	ILE
1	BBB	471	ASP
1	BBB	486	ASN
1	BBB	487	ASN
1	BBB	500	ILE
1	BBB	506	VAL
1	BBB	532	ILE
1	BBB	546	ILE
1	BBB	557	LEU
1	BBB	563	LEU
1	BBB	577	MET
1	BBB	579	THR

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. There are no such sidechains identified.

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

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 8 ligands modelled in this entry, 2 are monoatomic - leaving 6 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
3	FMT	AAA	602	-	2,2,2	0.54	0	1,1,1	0.03	0
2	NAP	BBB	601	-	50,52,52	1.27	6 (12%)	71,80,80	1.98	19 (26%)
3	FMT	BBB	602	-	2,2,2	0.41	0	1,1,1	0.04	0
2	NAP	AAA	601	-	50,52,52	1.48	8 (16%)	71,80,80	2.86	33 (46%)
4	PYR	BBB	603	5	5,5,5	3.33	2 (40%)	3,6,6	1.07	0
4	PYR	AAA	603	5	5,5,5	3.71	2 (40%)	3,6,6	1.65	1 (33%)

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	NAP	AAA	601	-	-	5/35/67/67	0/5/5/5
2	NAP	BBB	601	-	-	16/35/67/67	0/5/5/5
4	PYR	BBB	603	5	-	0/4/4/4	-
4	PYR	AAA	603	5	-	0/4/4/4	-

All (18) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	AAA	603	PYR	CA-C	-7.84	1.28	1.54
4	BBB	603	PYR	CA-C	-6.94	1.31	1.54
2	BBB	601	NAP	C5A-C4A	4.97	1.48	1.39
2	AAA	601	NAP	PA-O3	4.93	1.64	1.59

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	AAA	601	NAP	O4D-C1D	3.78	1.45	1.40
2	AAA	601	NAP	C5A-C4A	3.27	1.44	1.39
2	AAA	601	NAP	C3N-C7N	-3.12	1.45	1.50
2	BBB	601	NAP	C5A-C6A	3.06	1.49	1.41
2	BBB	601	NAP	C4A-N3A	2.93	1.39	1.34
2	BBB	601	NAP	C8A-N7A	2.77	1.37	1.31
2	BBB	601	NAP	P2B-O2B	2.62	1.64	1.59
4	BBB	603	PYR	OXT-C	-2.55	1.23	1.30
2	AAA	601	NAP	C2N-N1N	-2.39	1.32	1.35
4	AAA	603	PYR	OXT-C	-2.38	1.24	1.30
2	AAA	601	NAP	C4A-N9A	-2.37	1.32	1.37
2	AAA	601	NAP	O3B-C3B	2.28	1.48	1.43
2	AAA	601	NAP	C8A-N7A	2.27	1.36	1.31
2	BBB	601	NAP	O4D-C1D	2.05	1.43	1.40

All (53) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	AAA	601	NAP	C4D-O4D-C1D	-10.14	100.64	109.92
2	AAA	601	NAP	N3A-C4A-N9A	5.85	137.12	127.17
2	AAA	601	NAP	C4A-N9A-C8A	5.83	111.86	105.74
2	AAA	601	NAP	O2A-PA-O1A	5.67	138.81	112.44
2	BBB	601	NAP	N3A-C2A-N1A	-5.49	120.28	128.58
2	BBB	601	NAP	C5A-C4A-N3A	-5.48	119.18	126.72
2	AAA	601	NAP	O3X-P2B-O2X	5.41	128.07	107.80
2	BBB	601	NAP	N3A-C4A-N9A	5.28	136.14	127.17
2	AAA	601	NAP	O5B-PA-O1A	-5.01	89.08	108.94
2	AAA	601	NAP	C5A-C4A-N3A	-4.80	120.11	126.72
2	AAA	601	NAP	C5A-C6A-N6A	-4.75	111.53	123.29
2	BBB	601	NAP	C2A-N3A-C4A	4.59	123.05	111.83
2	AAA	601	NAP	O2A-PA-O3	-4.41	95.37	107.27
2	AAA	601	NAP	N3A-C2A-N1A	-4.06	122.44	128.58
2	AAA	601	NAP	O4D-C4D-C3D	3.96	113.00	105.15
2	BBB	601	NAP	C4A-N9A-C8A	3.84	109.77	105.74
2	BBB	601	NAP	C2B-C1B-N9A	3.74	119.90	113.75
2	AAA	601	NAP	C5N-C4N-C3N	-3.64	116.79	120.36
2	AAA	601	NAP	C2A-N3A-C4A	3.61	120.64	111.83
2	AAA	601	NAP	O3X-P2B-O1X	-3.54	97.03	110.83
2	AAA	601	NAP	N6A-C6A-N1A	3.48	126.12	118.38
2	AAA	601	NAP	C2N-C3N-C4N	3.31	122.11	118.26
2	AAA	601	NAP	C6N-N1N-C2N	-3.09	119.25	121.88
2	AAA	601	NAP	O2X-P2B-O1X	3.06	122.75	110.83

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	AAA	601	NAP	O2N-PN-O3	3.03	115.46	107.27
2	AAA	601	NAP	O3B-C3B-C2B	2.98	119.52	111.19
2	BBB	601	NAP	O4B-C1B-N9A	2.97	113.79	108.09
2	AAA	601	NAP	N9A-C8A-N7A	-2.93	109.78	113.94
2	BBB	601	NAP	O2N-PN-O3	2.92	115.17	107.27
2	BBB	601	NAP	O4B-C1B-C2B	-2.89	101.60	106.59
2	AAA	601	NAP	C5A-C4A-N9A	-2.84	102.72	105.81
2	BBB	601	NAP	C6A-C5A-N7A	2.83	137.55	132.09
4	AAA	603	PYR	OXT-C-CA	2.83	121.43	113.59
2	BBB	601	NAP	C4D-O4D-C1D	-2.81	107.35	109.92
2	BBB	601	NAP	C5A-N7A-C8A	2.80	107.86	103.45
2	BBB	601	NAP	C2A-N1A-C6A	2.79	123.31	118.73
2	AAA	601	NAP	O2N-PN-O5D	2.75	120.04	107.57
2	AAA	601	NAP	O2B-P2B-O1X	-2.73	99.59	109.33
2	BBB	601	NAP	N9A-C8A-N7A	-2.72	110.07	113.94
2	AAA	601	NAP	O4B-C4B-C3B	2.70	110.51	105.15
2	BBB	601	NAP	C4A-C5A-N7A	-2.60	107.61	110.58
2	BBB	601	NAP	C3B-C2B-C1B	-2.46	98.09	102.81
2	AAA	601	NAP	C4A-N9A-C1B	-2.41	121.00	126.63
2	AAA	601	NAP	C5D-C4D-C3D	-2.40	106.56	115.21
2	BBB	601	NAP	O2B-C2B-C1B	2.32	118.20	110.05
2	AAA	601	NAP	C3B-C2B-C1B	-2.30	98.40	102.81
2	AAA	601	NAP	C2B-C1B-N9A	2.18	117.34	113.75
2	AAA	601	NAP	O3D-C3D-C4D	2.17	117.31	111.08
2	AAA	601	NAP	C6N-N1N-C1D	2.13	123.90	119.73
2	BBB	601	NAP	C4A-N9A-C1B	-2.11	121.71	126.63
2	BBB	601	NAP	C4N-C3N-C7N	-2.09	115.36	121.06
2	AAA	601	NAP	C4B-O4B-C1B	-2.08	104.86	109.47
2	AAA	601	NAP	O4B-C4B-C5B	-2.01	102.91	109.33

There are no chirality outliers.

All (21) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	AAA	601	NAP	C5B-O5B-PA-O2A
2	AAA	601	NAP	O4D-C1D-N1N-C6N
2	BBB	601	NAP	C5B-O5B-PA-O1A
2	BBB	601	NAP	C5B-O5B-PA-O2A
2	BBB	601	NAP	C5B-O5B-PA-O3
2	BBB	601	NAP	PN-O3-PA-O5B
2	BBB	601	NAP	C5D-O5D-PN-O1N
2	BBB	601	NAP	C5D-O5D-PN-O2N

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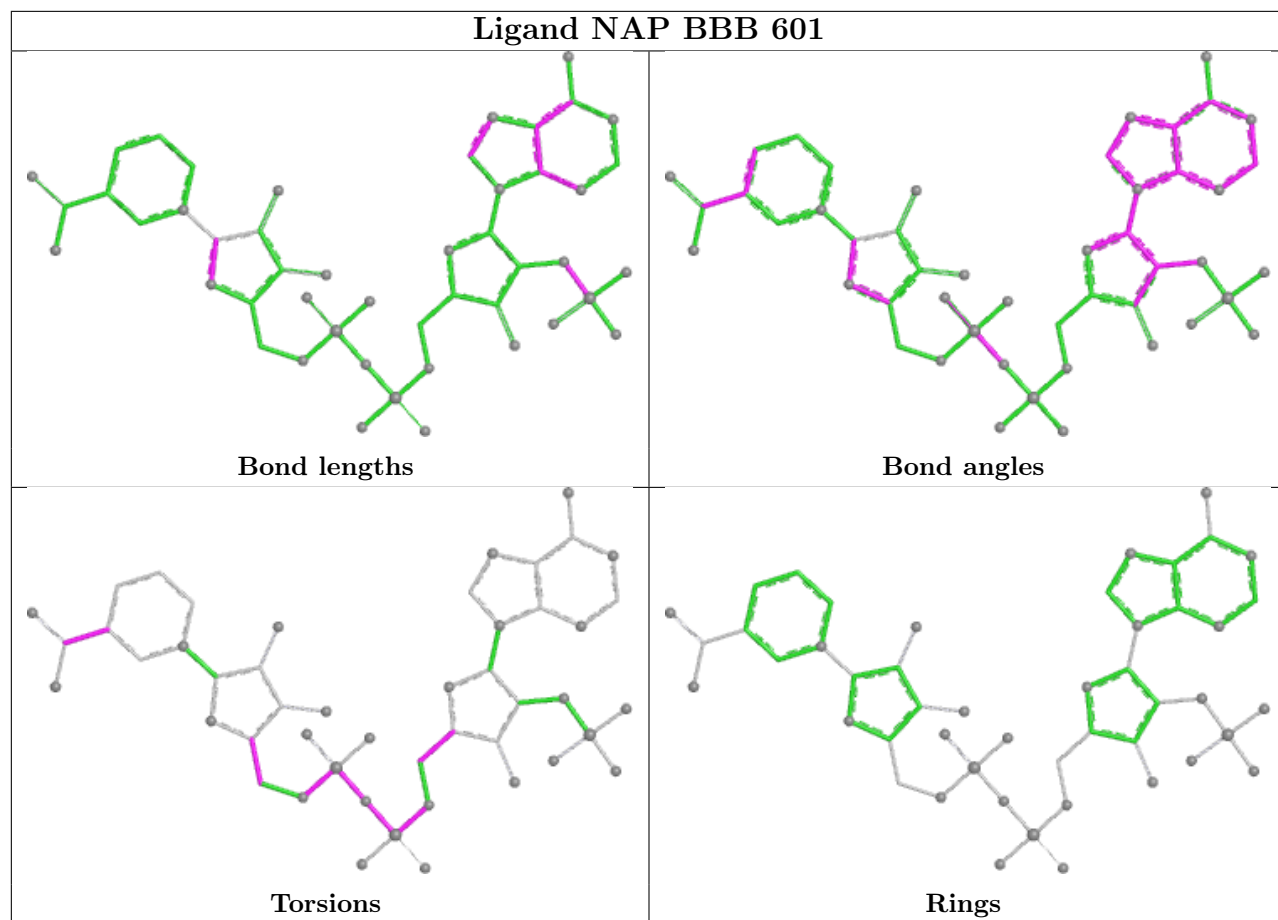
Mol	Chain	Res	Type	Atoms
2	BBB	601	NAP	O4D-C4D-C5D-O5D
2	BBB	601	NAP	C3D-C4D-C5D-O5D
2	BBB	601	NAP	C2N-C3N-C7N-O7N
2	BBB	601	NAP	C2N-C3N-C7N-N7N
2	BBB	601	NAP	C4N-C3N-C7N-O7N
2	AAA	601	NAP	O4B-C4B-C5B-O5B
2	BBB	601	NAP	O4B-C4B-C5B-O5B
2	BBB	601	NAP	C4N-C3N-C7N-N7N
2	BBB	601	NAP	C3B-C4B-C5B-O5B
2	AAA	601	NAP	C3B-C4B-C5B-O5B
2	BBB	601	NAP	C5D-O5D-PN-O3
2	BBB	601	NAP	PA-O3-PN-O2N
2	AAA	601	NAP	O4D-C1D-N1N-C2N

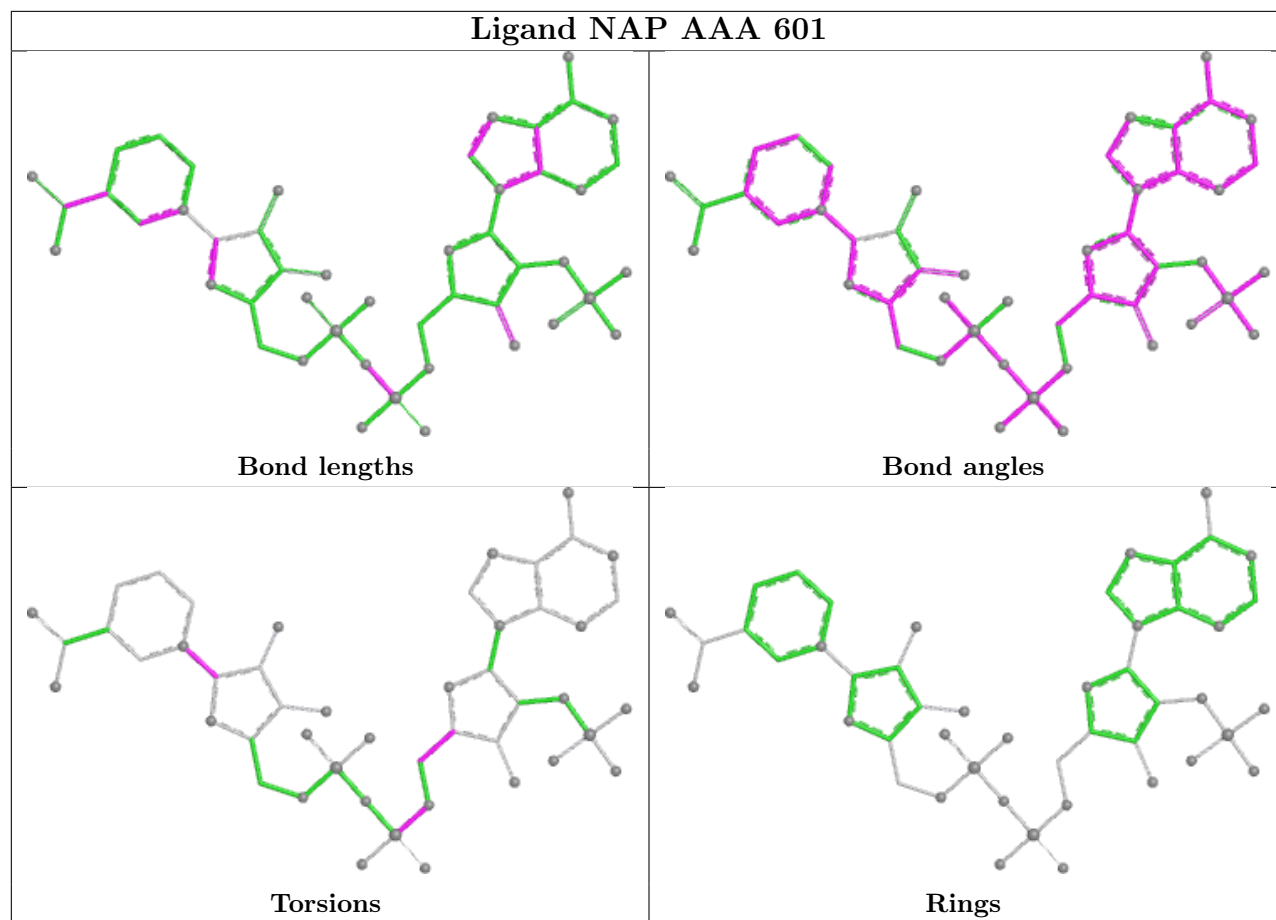
There are no ring outliers.

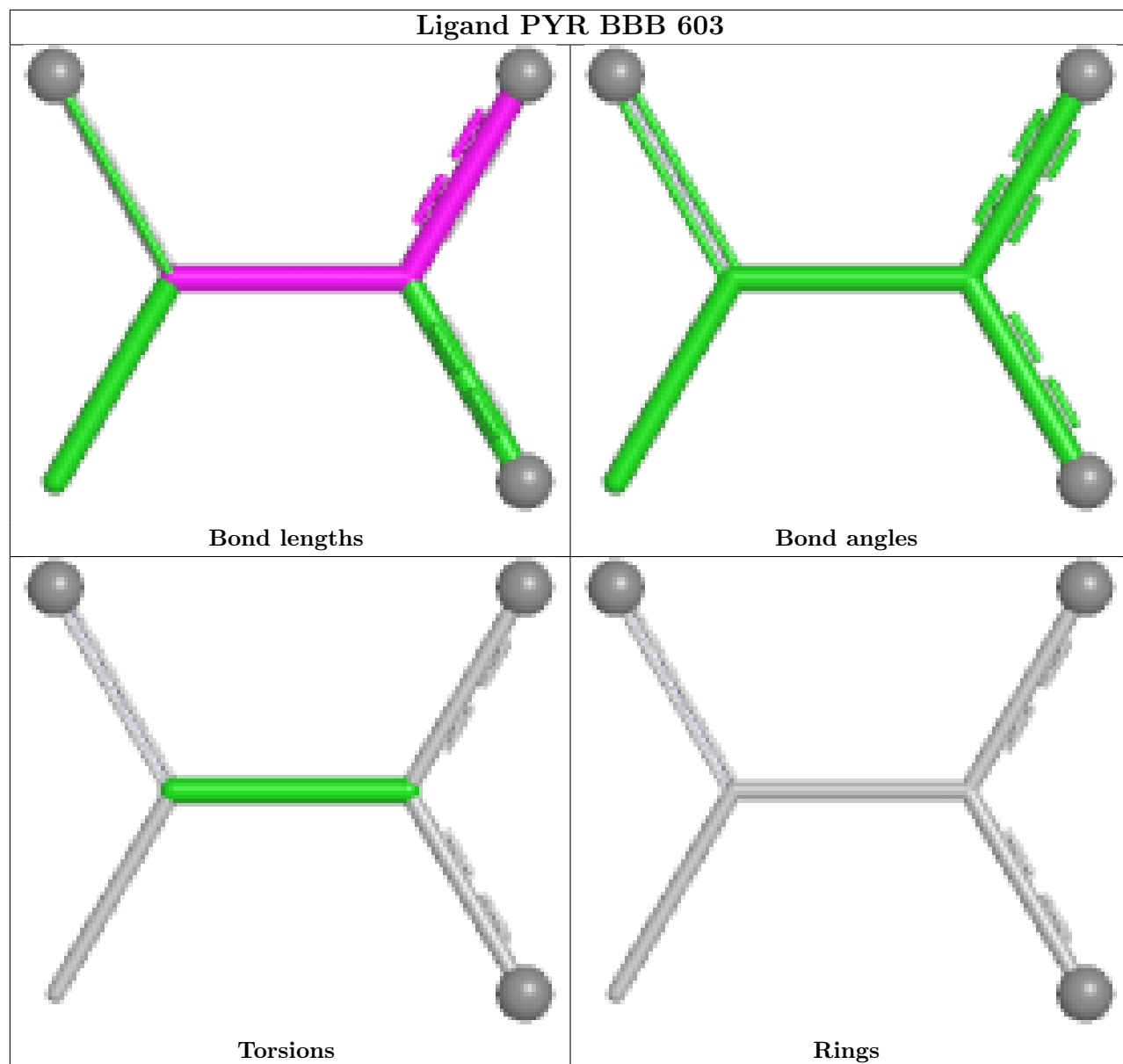
6 monomers are involved in 18 short contacts:

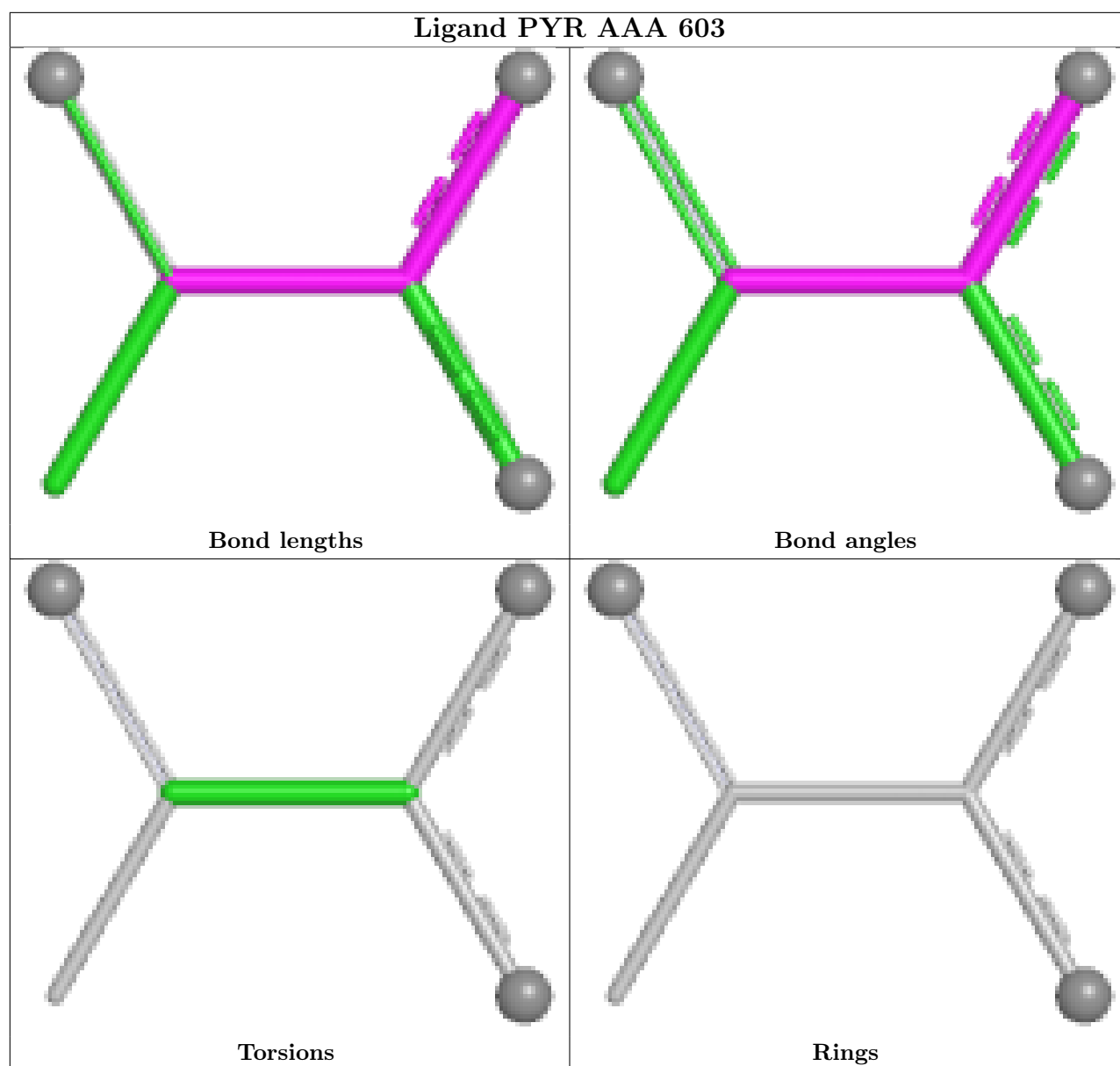
Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	AAA	602	FMT	3	0
2	BBB	601	NAP	3	0
3	BBB	602	FMT	2	0
2	AAA	601	NAP	7	0
4	BBB	603	PYR	1	0
4	AAA	603	PYR	5	0

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









5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

6 Fit of model and data

6.1 Protein, DNA and RNA chains

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

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2	OWAB(Å ²)	Q<0.9
1	AAA	553/586 (94%)	0.38	11 (1%) 65 65	45, 72, 102, 138	0
1	BBB	509/586 (86%)	1.31	115 (22%) 2 2	58, 133, 179, 220	0
All	All	1062/1172 (90%)	0.83	126 (11%) 9 8	45, 92, 172, 220	0

All (126) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	BBB	194	LEU	5.9
1	BBB	470	PHE	4.1
1	BBB	415	GLY	4.0
1	BBB	464	PHE	3.9
1	BBB	191	LEU	3.9
1	BBB	331	PHE	3.8
1	BBB	310	LEU	3.8
1	BBB	330	LEU	3.8
1	BBB	512	LEU	3.7
1	BBB	303	GLN	3.7
1	BBB	481	VAL	3.6
1	BBB	302	ILE	3.6
1	BBB	573	ALA	3.6
1	BBB	535	PRO	3.5
1	BBB	349	ILE	3.4
1	BBB	463	ILE	3.4
1	BBB	314	LEU	3.4
1	BBB	276	PHE	3.4
1	BBB	347	LEU	3.4
1	AAA	333	GLY	3.3
1	BBB	570	VAL	3.3
1	BBB	344	LEU	3.3
1	BBB	116	ARG	3.2
1	BBB	192	GLY	3.2

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Mol	Chain	Res	Type	RSRZ
1	BBB	431	PHE	3.1
1	BBB	396	THR	3.1
1	BBB	480	PHE	3.1
1	BBB	270	GLU	3.1
1	BBB	134	TYR	3.1
1	BBB	438	PHE	3.1
1	BBB	472	PRO	3.0
1	BBB	287	LEU	3.0
1	BBB	271	LYS	3.0
1	BBB	285	PHE	3.0
1	BBB	500	ILE	2.9
1	AAA	241	ILE	2.9
1	AAA	414	SER	2.9
1	BBB	395	LEU	2.9
1	BBB	473	VAL	2.9
1	BBB	482	PRO	2.8
1	BBB	436	ILE	2.8
1	BBB	332	LEU	2.8
1	BBB	527	PHE	2.8
1	BBB	504	ILE	2.8
1	BBB	544	ALA	2.8
1	AAA	42	PHE	2.8
1	BBB	298	PHE	2.8
1	BBB	411	ILE	2.7
1	BBB	42	PHE	2.7
1	BBB	401	ALA	2.7
1	BBB	410	LEU	2.7
1	BBB	494	PHE	2.7
1	BBB	532	ILE	2.7
1	BBB	35	LEU	2.6
1	BBB	313	LEU	2.6
1	BBB	479	VAL	2.6
1	BBB	569	LEU	2.6
1	BBB	469	PRO	2.6
1	BBB	142	CYS	2.6
1	BBB	326	GLU	2.5
1	BBB	143	GLN	2.5
1	BBB	559	LEU	2.5
1	BBB	390	HIS	2.5
1	BBB	104	TYR	2.5
1	BBB	230	ASN	2.5
1	BBB	451	ALA	2.5

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Mol	Chain	Res	Type	RSRZ
1	BBB	564	PRO	2.5
1	BBB	489	TYR	2.5
1	BBB	496	LEU	2.5
1	BBB	484	GLN	2.5
1	BBB	522	ALA	2.5
1	BBB	186	GLU	2.4
1	BBB	543	SER	2.4
1	BBB	274	ILE	2.4
1	BBB	345	ILE	2.4
1	AAA	334	ALA	2.4
1	BBB	269	GLY	2.4
1	BBB	510	MET	2.4
1	AAA	395	LEU	2.3
1	AAA	48	TYR	2.3
1	BBB	329	TYR	2.3
1	BBB	309	VAL	2.3
1	BBB	419	THR	2.3
1	BBB	172	TRP	2.3
1	BBB	150	ARG	2.3
1	BBB	578	TYR	2.3
1	BBB	490	ILE	2.3
1	BBB	430	SER	2.3
1	BBB	440	LEU	2.3
1	BBB	428	MET	2.3
1	BBB	416	VAL	2.3
1	BBB	212	LEU	2.2
1	BBB	509	ASP	2.2
1	BBB	211	ALA	2.2
1	BBB	181	CYS	2.2
1	BBB	184	ASP	2.2
1	BBB	260	PHE	2.2
1	AAA	253	TYR	2.2
1	BBB	555	TYR	2.2
1	BBB	498	LEU	2.2
1	AAA	416	VAL	2.2
1	BBB	227	VAL	2.2
1	BBB	297	VAL	2.2
1	BBB	506	VAL	2.2
1	BBB	284	ALA	2.2
1	BBB	183	THR	2.2
1	BBB	563	LEU	2.2
1	BBB	341	ILE	2.2

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Mol	Chain	Res	Type	RSRZ
1	BBB	566	PRO	2.2
1	BBB	413	THR	2.1
1	BBB	61	ALA	2.1
1	BBB	225	ILE	2.1
1	BBB	257	MET	2.1
1	BBB	122	LEU	2.1
1	BBB	458	THR	2.1
1	BBB	145	TYR	2.1
1	BBB	363	LYS	2.1
1	BBB	62	PHE	2.0
1	BBB	175	ARG	2.0
1	BBB	454	ALA	2.0
1	BBB	437	ILE	2.0
1	BBB	491	PHE	2.0
1	AAA	194	LEU	2.0
1	BBB	296	LEU	2.0
1	BBB	340	GLY	2.0
1	AAA	532	ILE	2.0

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

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

6.3 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

6.4 Ligands [i](#)

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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
2	NAP	BBB	601	48/48	0.77	0.12	92,126,183,190	0
3	FMT	AAA	602	3/3	0.89	0.23	70,70,72,82	0
3	FMT	BBB	602	3/3	0.92	0.17	81,81,82,93	0
2	NAP	AAA	601	48/48	0.95	0.09	41,62,78,83	0
4	PYR	AAA	603	6/6	0.96	0.10	63,74,77,80	0

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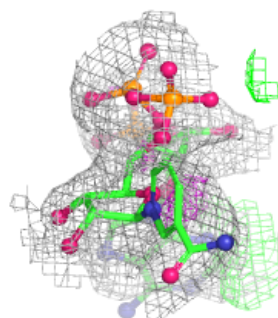
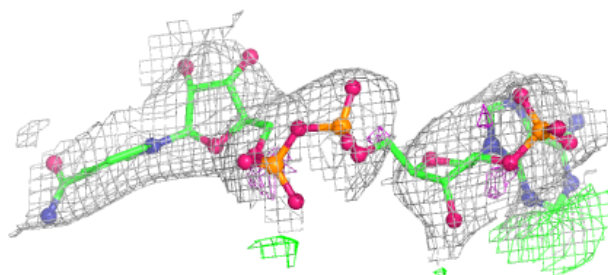
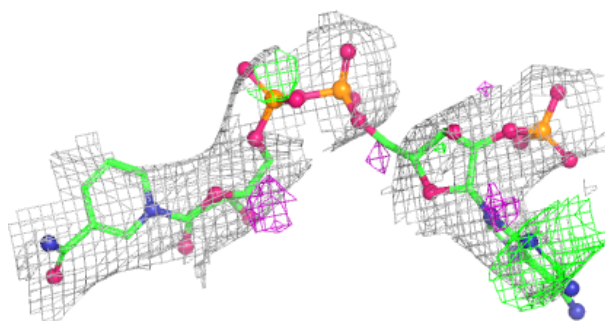
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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
4	PYR	BBB	603	6/6	0.96	0.06	129,136,140,140	0
5	MG	BBB	604	1/1	0.98	0.10	108,108,108,108	0
5	MG	AAA	604	1/1	0.99	0.07	49,49,49,49	0

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.

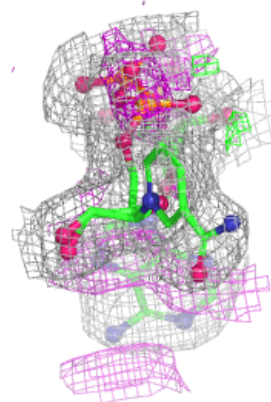
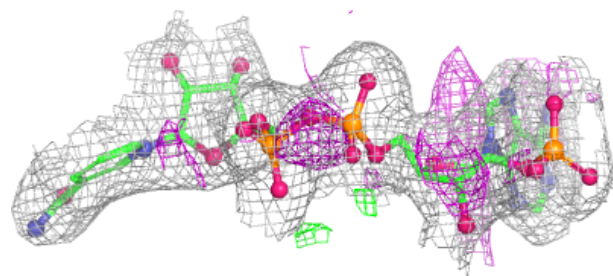
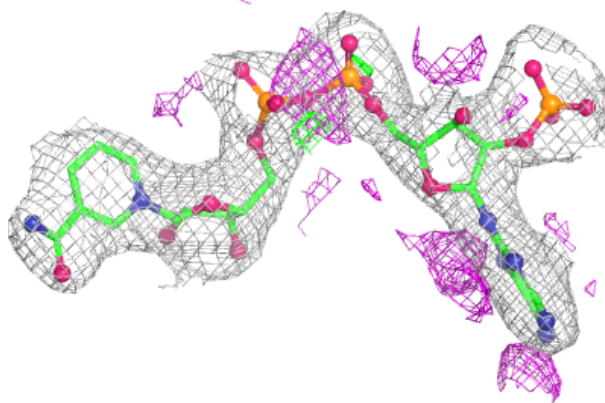
Electron density around NAP BBB 601:

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



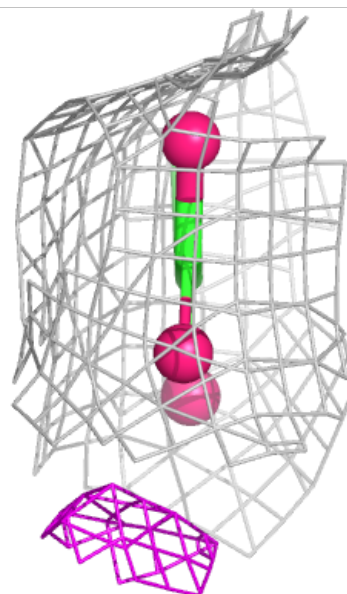
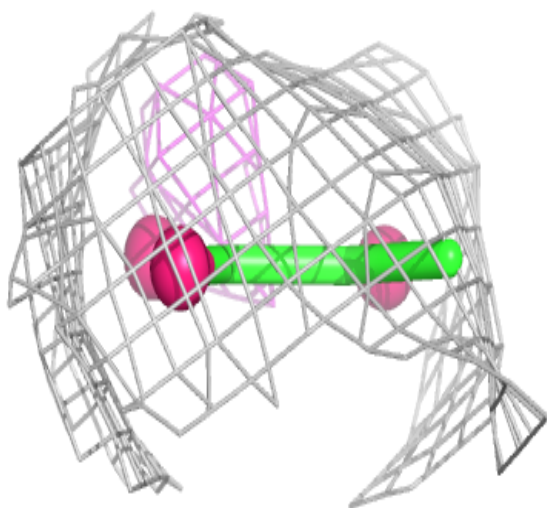
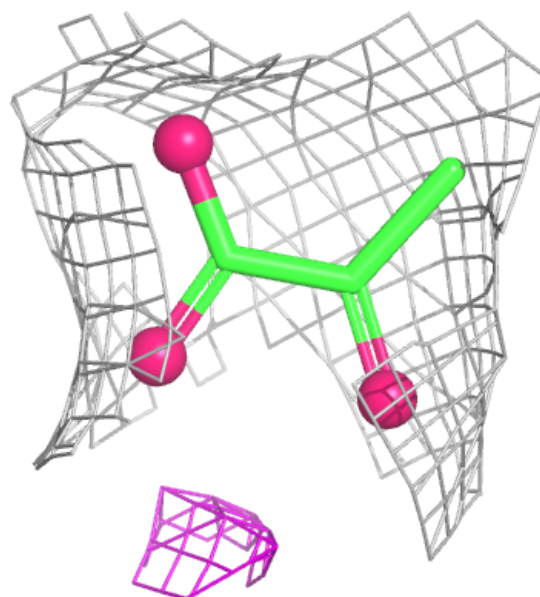
Electron density around NAP AAA 601:

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



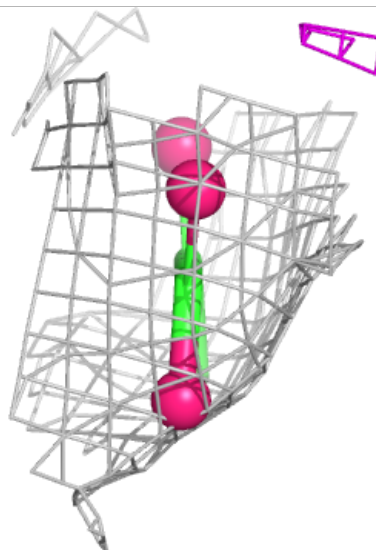
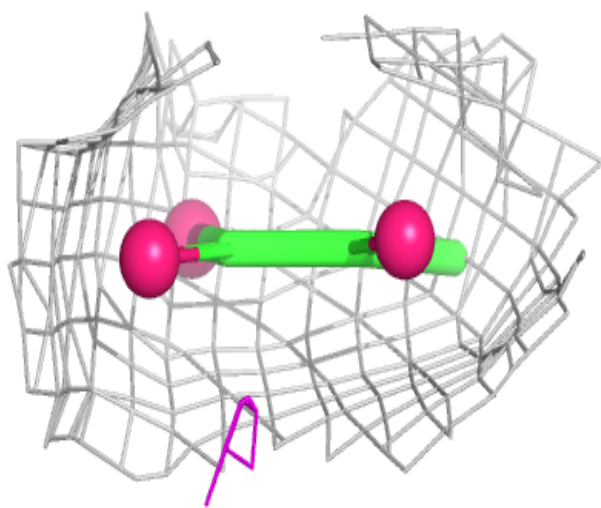
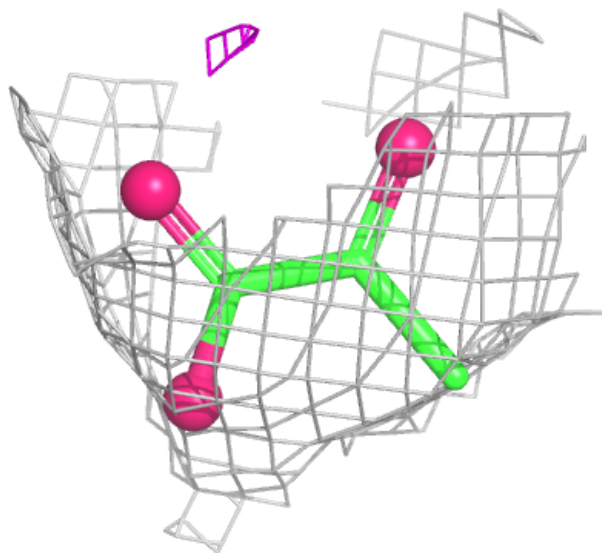
Electron density around PYR AAA 603:

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



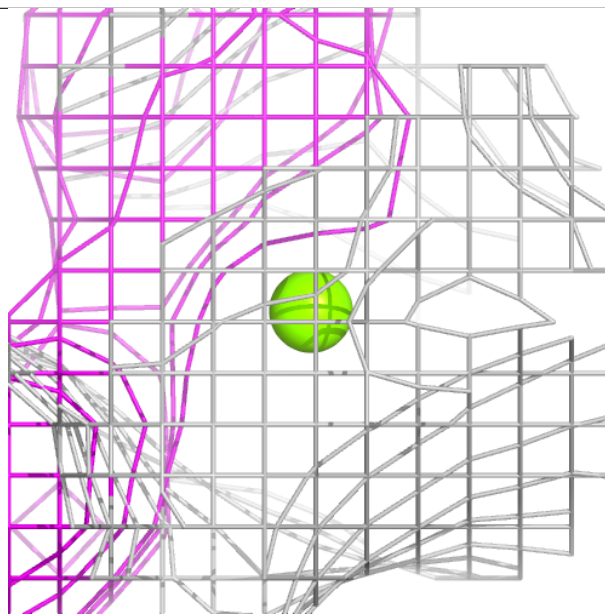
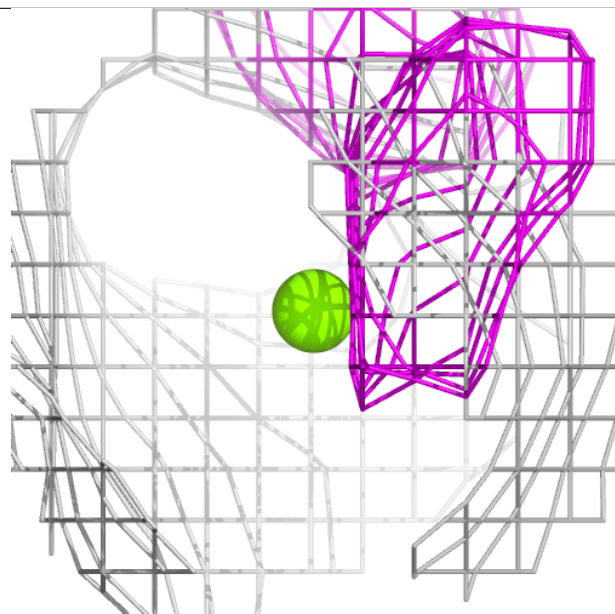
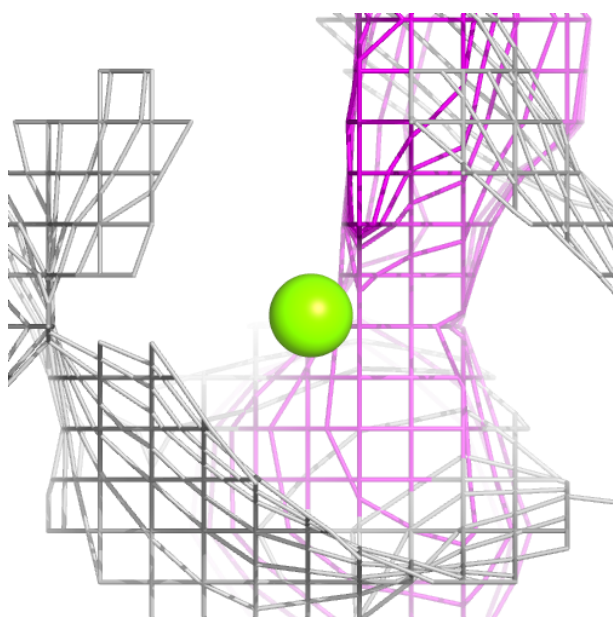
Electron density around PYR BBB 603:

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



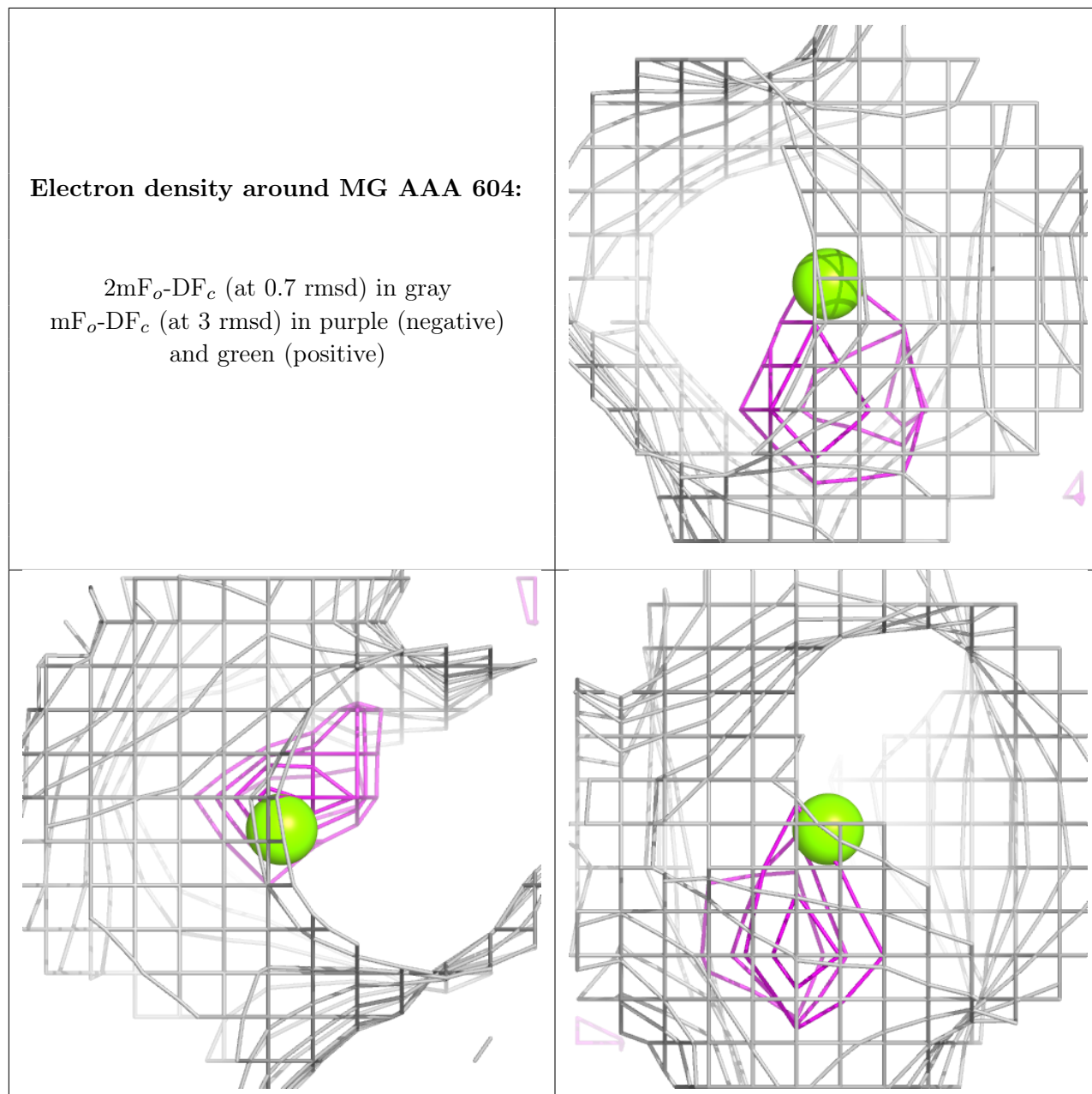
Electron density around MG BBB 604:

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



Electron density around MG AAA 604:

$2mF_o-DF_c$ (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.