Full wwPDB X-ray Structure Validation Report (i)

Oct 5, 2022 – 03:59 PM EDT

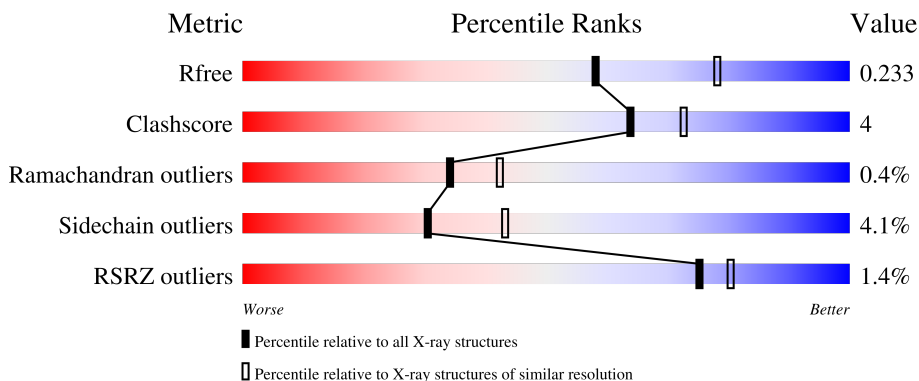|		
PDB ID	:	5SEG
Title	:	Crystal Structure of human phosphodiesterase 10 in complex with 6-[(5-bromo-1-methyl-2-oxopyridine-3-carbonyl)amino]-N-(oxetan-3-yl)-2-phenyl-3H-benzimidazole-5-carboxamide
Authors	:	Joseph, C.; Bleicher, K.; Benz, J.; Schlatter, D.; Rudolph, M.G.
Deposited on	:	2022-01-21
Resolution	:	2.29 Å(reported)

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 2.29 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	Percentile Ranks	Value
Rfree		0.233
Clashscore		4
Ramachandran outliers		0.4%
Sidechain outliers		4.1%
RSRZ outliers		1.4%

Worse ← → *Better*

▮ Percentile relative to all X-ray structures

▯ Percentile relative to X-ray structures of similar resolution

Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R$_{free}$	130704	5042 (2.30-2.30)
Clashscore	141614	5643 (2.30-2.30)
Ramachandran outliers	138981	5575 (2.30-2.30)
Sidechain outliers	138945	5575 (2.30-2.30)
RSRZ outliers	127900	4938 (2.30-2.30)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments of the lower bar indicate the fraction of residues that contain outliers for >=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 <=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	343	77%　　13%　·　9%
1	B	343	.%　　80%　　11%　·　8%
1	C	343	.%　　80%　　9%　·　9%
1	D	343	3%　　80%　　10%　10%

2 Entry composition ⓘ

There are 5 unique types of molecules in this entry. The entry contains 10602 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 cAMP and cAMP-inhibited cGMP 3',5'-cyclic phosphodiesterase 10A.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	313	Total 2549	C 1629	N 435	O 461	S 24	0	1	0
1	B	315	Total 2559	C 1635	N 437	O 463	S 24	0	1	0
1	C	313	Total 2557	C 1634	N 438	O 461	S 24	0	2	0
1	D	310	Total 2519	C 1612	N 429	O 454	S 24	0	0	0

There are 8 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	447	GLY	-	expression tag	UNP Q9Y233
A	448	SER	-	expression tag	UNP Q9Y233
B	447	GLY	-	expression tag	UNP Q9Y233
B	448	SER	-	expression tag	UNP Q9Y233
C	447	GLY	-	expression tag	UNP Q9Y233
C	448	SER	-	expression tag	UNP Q9Y233
D	447	GLY	-	expression tag	UNP Q9Y233
D	448	SER	-	expression tag	UNP Q9Y233

- Molecule 2 is ZINC ION (three-letter code: ZN) (formula: Zn).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	1	Total 1	Zn 1	0	0
2	B	1	Total 1	Zn 1	0	0
2	C	1	Total 1	Zn 1	0	0
2	D	1	Total 1	Zn 1	0	0

- Molecule 3 is MAGNESIUM ION (three-letter code: MG) (formula: Mg).

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

- Molecule 4 is 5-[(5-bromo-1-methyl-2-oxo-1,2-dihydropyridine-3-carbonyl)amino]-N-(oxetan-3-yl)-2-phenyl-1H-benzimidazole-6-carboxamide (three-letter code: IFN) (formula: $C_{24}H_{20}BrN_5O_4$) (labeled as "Ligand of Interest" by depositor).
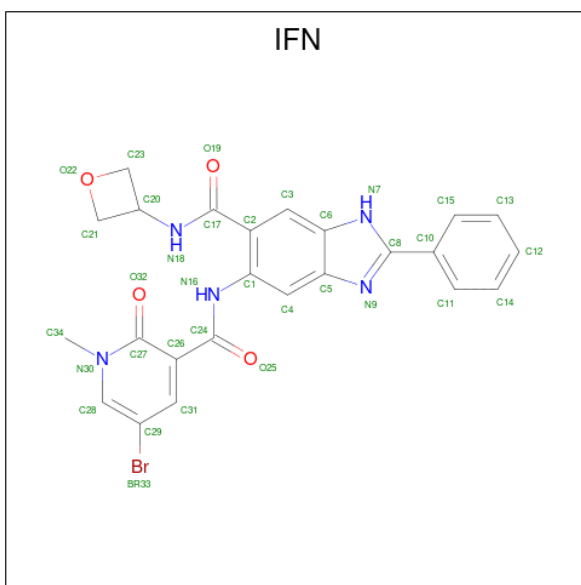
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
4	A	1	Total Br C N O 34 1 24 5 4					0	0
4	B	1	Total Br C N O 34 1 24 5 4					0	0
4	C	1	Total Br C N O 34 1 24 5 4					0	0
4	D	1	Total Br C N O 34 1 24 5 4					0	0

- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	81	Total 81	O 81	0	0
5	B	88	Total 88	O 88	0	0
5	C	83	Total 83	O 83	0	0
5	D	22	Total 22	O 22	0	0

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: cAMP and cAMP-inhibited cGMP 3',5'-cyclic phosphodiesterase 10A
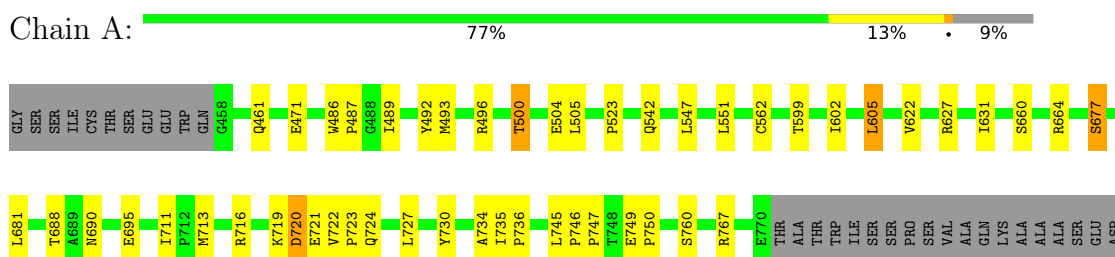
Chain A:

• Molecule 1: cAMP and cAMP-inhibited cGMP 3',5'-cyclic phosphodiesterase 10A
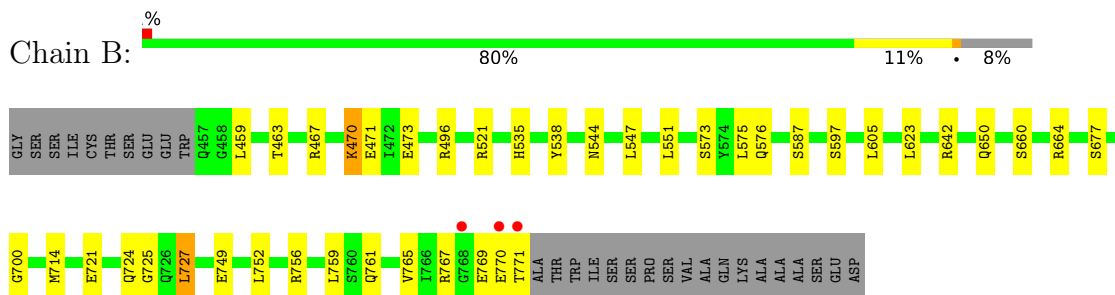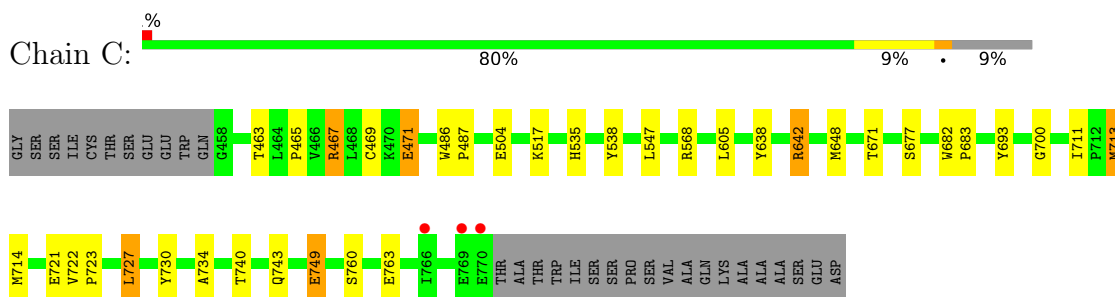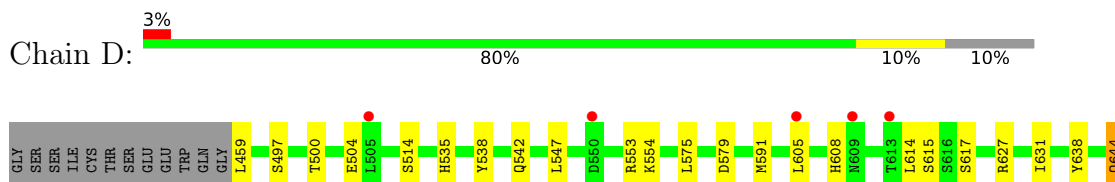
Chain B:

• Molecule 1: cAMP and cAMP-inhibited cGMP 3',5'-cyclic phosphodiesterase 10A

Chain C:

• Molecule 1: cAMP and cAMP-inhibited cGMP 3',5'-cyclic phosphodiesterase 10A

Chain D:

4 Data and refinement statistics (i)

Property	Value	Source
Space group	H 3	Depositor
Cell constants a, b, c, α, β, γ	135.29Å 135.29Å 235.56Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	43.71 – 2.29 43.71 – 2.29	Depositor EDS
% Data completeness (in resolution range)	96.1 (43.71-2.29) 96.1 (43.71-2.29)	Depositor EDS
R_{merge}	0.09	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	1.28 (at 2.29Å)	Xtriage
Refinement program	REFMAC 5.8.0258	Depositor
R, R_{free}	0.174 , 0.231 0.181 , 0.233	Depositor DCC
R_{free} test set	3648 reflections (5.04%)	wwPDB-VP
Wilson B-factor (Å^2)	45.0	Xtriage
Anisotropy	0.035	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.33 , 37.4	EDS
L-test for twinning[2]	$< |L| > = 0.49, < L^2 > = 0.32$	Xtriage
Estimated twinning fraction	0.028 for h,-h-k,-l	Xtriage
F_o,F_c correlation	0.96	EDS
Total number of atoms	10602	wwPDB-VP
Average B, all atoms (Å^2)	55.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.52% of the height of the origin peak. No significant pseudotranslation is detected.*

---

[1]Intensities estimated from amplitudes.
[2]Theoretical values of $< |L| >$, $< L^2 >$ 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: ZN, IFN, CME, 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	0.85	0/2603	0.95	1/3521 (0.0%)
1	B	0.82	0/2613	0.96	2/3535 (0.1%)
1	C	0.82	0/2614	0.96	2/3535 (0.1%)
1	D	0.83	0/2570	0.90	0/3478
All	All	0.83	0/10400	0.94	5/14069 (0.0%)

There are no bond length outliers.

All (5) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	C	467	ARG	NE-CZ-NH1	5.75	123.18	120.30
1	C	642	ARG	NE-CZ-NH2	-5.69	117.45	120.30
1	B	642	ARG	NE-CZ-NH2	-5.50	117.55	120.30
1	B	664	ARG	NE-CZ-NH2	-5.28	117.66	120.30
1	A	690	ASN	CB-CA-C	-5.19	100.02	110.40

There are no chirality outliers.

There are no planarity outliers.

5.2   Too-close contacts ⓘ

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

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	2549	0	2524	27	0
1	B	2559	0	2528	17	0

Continued on next page...

Continued from previous page...

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	C	2557	0	2537	20	0
1	D	2519	0	2496	21	0
2	A	1	0	0	0	0
2	B	1	0	0	0	0
2	C	1	0	0	0	0
2	D	1	0	0	0	0
3	A	1	0	0	0	0
3	B	1	0	0	0	0
3	C	1	0	0	0	0
3	D	1	0	0	0	0
4	A	34	0	0	1	0
4	B	34	0	0	3	0
4	C	34	0	0	6	0
4	D	34	0	0	6	0
5	A	81	0	0	0	0
5	B	88	0	0	1	0
5	C	83	0	0	3	0
5	D	22	0	0	0	0
All	All	10602	0	10085	85	0

The all-atom clashscore is defined as the number of clashes found per 1000 atoms (including hydrogen atoms). The all-atom clashscore for this structure is 4.

All (85) 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:C:568[A]:ARG:NH1	5:C:901:HOH:O	2.00	0.89
1:B:470:LYS:HE2	1:D:746:PRO:HG3	1.74	0.69
1:A:721:GLU:HB2	4:A:803:IFN:C12	2.23	0.67
4:C:803:IFN:C23	4:C:803:IFN:O19	2.43	0.66
1:D:713:MET:HG3	4:D:803:IFN:C5	2.26	0.65
1:B:752:LEU:HD21	1:B:756[B]:ARG:NH2	2.12	0.64
1:D:644:GLN:HE21	1:D:644:GLN:HA	1.63	0.63
4:B:803:IFN:C23	4:B:803:IFN:O19	2.48	0.60
1:C:721:GLU:HB2	4:C:803:IFN:C12	2.31	0.59
1:C:740:THR:HA	1:C:743:GLN:HE21	1.68	0.59
1:B:700:GLY:HA3	1:B:714:MET:O	2.06	0.55
1:D:721:GLU:HB2	4:D:803:IFN:C12	2.37	0.55
1:D:547:LEU:HD23	1:D:745:LEU:CD2	2.39	0.53
1:A:461:GLN:HE22	1:A:500:THR:HG21	1.74	0.53
1:B:761:GLN:O	1:B:765:VAL:HG23	2.08	0.52

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:749:GLU:HG3	5:C:973:HOH:O	2.08	0.52
1:D:497:SER:O	1:D:553:ARG:HD2	2.08	0.52
1:B:724:GLN:NE2	5:B:902:HOH:O	2.38	0.52
1:A:492:TYR:CZ	1:A:496:ARG:HD2	2.44	0.51
1:D:627:ARG:O	1:D:631:ILE:HG12	2.11	0.51
1:D:575:LEU:HD11	1:D:591:MET:SD	2.50	0.51
1:B:470:LYS:HE2	1:D:746:PRO:CG	2.40	0.50
1:B:767:ARG:NH2	1:B:769:GLU:OE1	2.45	0.50
1:B:721:GLU:HB2	4:B:803:IFN:C12	2.42	0.49
1:C:727:LEU:HD21	1:C:763:GLU:HG3	1.95	0.48
1:A:719:LYS:O	1:A:722:VAL:HG23	2.13	0.48
1:A:749:GLU:N	1:A:750:PRO:CD	2.76	0.48
1:D:730:TYR:HA	1:D:734:ALA:HB3	1.96	0.48
1:A:523:PRO:HD2	1:A:695:GLU:HG2	1.95	0.47
1:C:638:TYR:CD1	1:C:671:THR:HG21	2.50	0.47
1:D:725:GLY:HA3	4:D:803:IFN:C10	2.45	0.47
1:D:693:TYR:OH	4:D:803:IFN:N9	2.48	0.47
1:B:544:ASN:HB3	1:B:547:LEU:HD22	1.96	0.46
1:B:727:LEU:HD23	1:B:759:LEU:HD11	1.97	0.46
1:B:473:GLU:OE2	1:B:496:ARG:NH1	2.48	0.46
1:D:535:HIS:O	1:D:538:TYR:HB3	2.16	0.46
1:B:770:GLU:HG3	1:B:771:THR:N	2.31	0.46
1:B:535:HIS:O	1:B:538:TYR:HB3	2.15	0.46
1:A:730:TYR:HA	1:A:734:ALA:HB3	1.98	0.46
1:D:716:ARG:O	1:D:719:LYS:HG3	2.17	0.46
1:A:746:PRO:N	1:A:747:PRO:CD	2.80	0.45
1:A:602:ILE:HA	1:A:605:LEU:HD22	1.99	0.45
1:B:725:GLY:HA3	4:B:803:IFN:C10	2.47	0.45
1:A:461:GLN:NE2	1:A:500:THR:HG21	2.32	0.45
1:D:497:SER:O	1:D:553:ARG:CD	2.65	0.45
1:A:542:GLN:NE2	1:A:542:GLN:HA	2.32	0.44
1:D:721:GLU:CB	4:D:803:IFN:C12	2.95	0.44
1:A:716:ARG:O	1:A:719:LYS:HG3	2.17	0.44
1:C:638:TYR:OH	1:C:642:ARG:HD3	2.18	0.44
1:D:722:VAL:N	1:D:723:PRO:CD	2.80	0.44
1:C:486:TRP:N	1:C:487:PRO:CD	2.81	0.44
1:A:486:TRP:N	1:A:487:PRO:CD	2.81	0.44
1:A:722:VAL:HB	1:A:723:PRO:HD3	1.99	0.44
1:A:722:VAL:N	1:A:723:PRO:CD	2.80	0.44
1:B:467:ARG:O	1:B:471:GLU:HB2	2.18	0.44
1:A:724:GLN:O	1:A:727:LEU:HB2	2.18	0.43

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:677:SER:OG	4:C:803:IFN:BR33	2.91	0.43
1:C:693:TYR:OH	4:C:803:IFN:N9	2.51	0.43
1:C:700:GLY:HA3	1:C:714:MET:O	2.18	0.43
1:D:554:LYS:NZ	1:D:614:LEU:HD11	2.32	0.43
1:A:660:SER:O	1:A:664:ARG:HG3	2.19	0.43
1:A:677:SER:HB2	1:A:688:THR:HG21	2.01	0.43
1:A:489:ILE:O	1:A:493:MET:HG3	2.19	0.43
1:C:713:MET:HB2	4:C:803:IFN:C6	2.50	0.42
1:A:735:ILE:HB	1:A:736:PRO:HD3	2.02	0.42
1:C:722:VAL:N	1:C:723:PRO:CD	2.83	0.42
1:C:648:MET:HE1	5:C:912:HOH:O	2.21	0.41
1:A:627:ARG:O	1:A:631:ILE:HG12	2.19	0.41
1:B:551:LEU:HD23	1:B:551:LEU:HA	1.85	0.41
1:C:730:TYR:HA	1:C:734:ALA:HB3	2.02	0.41
1:D:514:SER:OG	1:D:608:HIS:NE2	2.46	0.41
1:A:711:ILE:HD12	1:A:713:MET:HE3	2.02	0.41
1:C:535:HIS:O	1:C:538:TYR:HB3	2.19	0.41
1:C:740:THR:HA	1:C:743:GLN:NE2	2.32	0.41
1:A:505:LEU:HD12	1:A:505:LEU:HA	1.84	0.41
1:B:727:LEU:CD2	1:B:759:LEU:HD11	2.51	0.41
1:C:682:TRP:N	1:C:683:PRO:CD	2.84	0.41
1:D:725:GLY:HA3	4:D:803:IFN:C8	2.51	0.41
1:A:461:GLN:HE22	1:A:500:THR:CG2	2.33	0.40
1:C:467:ARG:O	1:C:471:GLU:HB2	2.21	0.40
1:A:547:LEU:HD22	1:A:745:LEU:CD2	2.51	0.40
1:A:551:LEU:HD23	1:A:551:LEU:HA	1.88	0.40
1:C:713:MET:HB2	4:C:803:IFN:N7	2.36	0.40
1:D:542:GLN:NE2	1:D:542:GLN:HA	2.36	0.40
1:A:562:CYS:HB3	1:A:599:THR:OG1	2.22	0.40

There are no symmetry-related clashes.

5.3 Torsion angles ⓘ

5.3.1 Protein backbone ⓘ

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	311/343 (91%)	303 (97%)	6 (2%)	2 (1%)	25	31
1	B	313/343 (91%)	303 (97%)	10 (3%)	0	100	100
1	C	312/343 (91%)	304 (97%)	7 (2%)	1 (0%)	41	50
1	D	307/343 (90%)	296 (96%)	9 (3%)	2 (1%)	22	26
All	All	1243/1372 (91%)	1206 (97%)	32 (3%)	5 (0%)	34	42

All (5) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	720	ASP
1	D	615	SER
1	D	579	ASP
1	A	767	ARG
1	C	465	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	A	282/305 (92%)	273 (97%)	9 (3%)	39	54
1	B	282/305 (92%)	266 (94%)	16 (6%)	20	28
1	C	283/305 (93%)	271 (96%)	12 (4%)	30	42
1	D	279/305 (92%)	270 (97%)	9 (3%)	39	54
All	All	1126/1220 (92%)	1080 (96%)	46 (4%)	30	43

All (46) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	471	GLU
1	A	500	THR
1	A	504	GLU
1	A	605	LEU
1	A	622	VAL
1	A	677	SER

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type
1	A	681	LEU
1	A	720	ASP
1	A	760	SER
1	B	459	LEU
1	B	463	THR
1	B	470	LYS
1	B	521	ARG
1	B	573	SER
1	B	575	LEU
1	B	576	GLN
1	B	587	SER
1	B	597	SER
1	B	605	LEU
1	B	623	LEU
1	B	650	GLN
1	B	660	SER
1	B	677	SER
1	B	727	LEU
1	B	749	GLU
1	C	463	THR
1	C	469	CYS
1	C	471	GLU
1	C	504	GLU
1	C	517	LYS
1	C	547	LEU
1	C	605	LEU
1	C	711	ILE
1	C	713	MET
1	C	727	LEU
1	C	749	GLU
1	C	760	SER
1	D	459	LEU
1	D	500	THR
1	D	504	GLU
1	D	605	LEU
1	D	617	SER
1	D	638	TYR
1	D	644	GLN
1	D	651	THR
1	D	709	GLN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (17) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	461	GLN
1	A	484	ASN
1	A	542	GLN
1	A	604	GLN
1	A	644	GLN
1	A	724	GLN
1	A	743	GLN
1	B	542	GLN
1	B	604	GLN
1	C	542	GLN
1	C	604	GLN
1	C	743	GLN
1	D	542	GLN
1	D	604	GLN
1	D	644	GLN
1	D	731	ASN
1	D	743	GLN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

4 non-standard protein/DNA/RNA residues are modelled in this entry.

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

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\#|Z| > 2$	Counts	RMSZ	$\#|Z| > 2$
1	CME	B	509	1	8,9,10	0.35	0	5,9,11	0.74	0
1	CME	A	509	1	8,9,10	0.61	0	5,9,11	0.84	0
1	CME	D	509	1	8,9,10	0.62	0	5,9,11	0.80	0
1	CME	C	509	1	8,9,10	0.66	0	5,9,11	0.83	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
1	CME	B	509	1	-	1/5/8/10	-
1	CME	A	509	1	-	2/5/8/10	-
1	CME	D	509	1	-	2/5/8/10	-
1	CME	C	509	1	-	2/5/8/10	-

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

All (7) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
1	C	509	CME	CE-SD-SG-CB
1	D	509	CME	SD-CE-CZ-OH
1	B	509	CME	SD-CE-CZ-OH
1	A	509	CME	CZ-CE-SD-SG
1	A	509	CME	SD-CE-CZ-OH
1	D	509	CME	CE-SD-SG-CB
1	C	509	CME	CZ-CE-SD-SG

There are no ring outliers.

No monomer is involved in short contacts.

5.5   Carbohydrates ⓘ

There are no monosaccharides in this entry.

5.6   Ligand geometry ⓘ

Of 12 ligands modelled in this entry, 8 are monoatomic - leaving 4 for Mogul analysis.

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

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	#|Z| > 2	Counts	RMSZ	#|Z| > 2
4	IFN	A	803	-	36,38,38	1.62	8 (22%)	41,55,55	2.29	11 (26%)
4	IFN	D	803	-	36,38,38	1.73	8 (22%)	41,55,55	1.70	8 (19%)
4	IFN	B	803	-	36,38,38	2.17	13 (36%)	41,55,55	1.90	14 (34%)
4	IFN	C	803	-	36,38,38	2.09	12 (33%)	41,55,55	2.55	17 (41%)

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
4	IFN	A	803	-	-	4/20/26/26	0/5/5/5
4	IFN	D	803	-	-	2/20/26/26	0/5/5/5
4	IFN	B	803	-	-	1/20/26/26	0/5/5/5
4	IFN	C	803	-	-	2/20/26/26	0/5/5/5

All (41) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	C	803	IFN	C8-N7	6.13	1.43	1.35
4	D	803	IFN	C8-N7	5.78	1.43	1.35
4	B	803	IFN	C2-C1	5.59	1.49	1.41
4	B	803	IFN	C27-N30	5.05	1.46	1.39
4	B	803	IFN	C8-N7	4.86	1.41	1.35
4	A	803	IFN	C3-C6	-4.11	1.35	1.41
4	C	803	IFN	C2-C1	3.94	1.47	1.41
4	C	803	IFN	C27-N30	3.75	1.45	1.39
4	B	803	IFN	C17-N18	3.69	1.42	1.34
4	D	803	IFN	C27-N30	3.34	1.44	1.39
4	A	803	IFN	C8-N7	3.30	1.39	1.35
4	B	803	IFN	C28-C29	3.13	1.39	1.35
4	C	803	IFN	C28-C29	3.09	1.39	1.35
4	A	803	IFN	C2-C1	2.88	1.45	1.41
4	D	803	IFN	C2-C1	2.83	1.45	1.41
4	C	803	IFN	C26-C27	2.72	1.52	1.45
4	C	803	IFN	C17-N18	2.70	1.40	1.34
4	B	803	IFN	O19-C17	2.58	1.28	1.23
4	A	803	IFN	C28-C29	2.54	1.38	1.35
4	B	803	IFN	O32-C27	2.53	1.28	1.23
4	D	803	IFN	C28-C29	2.50	1.38	1.35
4	C	803	IFN	O25-C24	2.49	1.28	1.23

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	C	803	IFN	O32-C27	2.45	1.28	1.23
4	C	803	IFN	C8-N9	2.39	1.38	1.35
4	A	803	IFN	O19-C17	2.37	1.28	1.23
4	C	803	IFN	O22-C21	2.36	1.48	1.45
4	A	803	IFN	C17-N18	2.35	1.39	1.34
4	C	803	IFN	O19-C17	2.32	1.28	1.23
4	C	803	IFN	C4-C1	2.32	1.42	1.37
4	A	803	IFN	C4-C1	2.27	1.42	1.37
4	A	803	IFN	C20-N18	-2.26	1.42	1.46
4	B	803	IFN	C3-C2	2.26	1.40	1.37
4	B	803	IFN	C13-C15	2.21	1.43	1.38
4	B	803	IFN	C26-C27	2.20	1.50	1.45
4	D	803	IFN	C31-C29	2.15	1.44	1.41
4	B	803	IFN	C11-C10	2.15	1.43	1.39
4	B	803	IFN	C31-C29	2.13	1.44	1.41
4	D	803	IFN	C17-N18	2.10	1.38	1.34
4	B	803	IFN	BR33-C29	-2.10	1.84	1.89
4	D	803	IFN	C20-N18	-2.09	1.42	1.46
4	D	803	IFN	C11-C10	2.07	1.43	1.39

All (50) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	A	803	IFN	C3-C2-C1	7.83	126.00	119.00
4	C	803	IFN	C31-C26-C24	-6.43	111.20	118.16
4	C	803	IFN	C23-O22-C21	5.38	96.45	91.10
4	A	803	IFN	C20-N18-C17	-5.33	115.17	122.55
4	C	803	IFN	C20-N18-C17	-5.06	115.55	122.55
4	C	803	IFN	C27-C26-C24	4.79	127.03	121.53
4	A	803	IFN	C23-O22-C21	4.48	95.55	91.10
4	B	803	IFN	C3-C2-C1	4.45	122.97	119.00
4	D	803	IFN	C31-C26-C27	4.28	122.44	119.81
4	C	803	IFN	O19-C17-N18	-4.13	114.86	122.45
4	A	803	IFN	C1-C4-C5	-4.11	113.08	120.56
4	C	803	IFN	C26-C24-N16	-3.92	109.69	115.48
4	A	803	IFN	O32-C27-N30	-3.80	112.64	119.96
4	D	803	IFN	C34-N30-C27	3.65	122.32	117.12
4	C	803	IFN	C2-C17-N18	3.44	123.17	116.80
4	A	803	IFN	C11-C10-C8	-3.42	114.99	120.79
4	C	803	IFN	C10-C8-N7	-3.29	119.22	123.55
4	C	803	IFN	C31-C26-C27	3.17	121.76	119.81
4	C	803	IFN	C11-C10-C8	-3.16	115.41	120.79

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	D	803	IFN	C3-C2-C1	3.16	121.83	119.00
4	B	803	IFN	C23-O22-C21	3.14	94.22	91.10
4	B	803	IFN	C10-C8-N7	-3.09	119.48	123.55
4	C	803	IFN	O32-C27-N30	-3.05	114.09	119.96
4	D	803	IFN	C23-O22-C21	2.99	94.07	91.10
4	B	803	IFN	O32-C27-N30	-2.83	114.52	119.96
4	D	803	IFN	C31-C26-C24	-2.82	115.11	118.16
4	B	803	IFN	BR33-C29-C31	-2.75	115.40	119.11
4	C	803	IFN	C34-N30-C27	2.70	120.97	117.12
4	D	803	IFN	C11-C10-C8	-2.70	116.20	120.79
4	B	803	IFN	O25-C24-C26	2.67	125.98	121.05
4	B	803	IFN	C1-C4-C5	-2.58	115.88	120.56
4	C	803	IFN	BR33-C29-C31	-2.55	115.66	119.11
4	B	803	IFN	C11-C10-C8	-2.53	116.50	120.79
4	A	803	IFN	C10-C8-N7	-2.48	120.29	123.55
4	B	803	IFN	C20-N18-C17	-2.46	119.14	122.55
4	C	803	IFN	O25-C24-N16	2.46	129.16	123.92
4	B	803	IFN	C26-C24-N16	-2.42	111.91	115.48
4	A	803	IFN	C31-C26-C24	-2.40	115.56	118.16
4	D	803	IFN	O32-C27-N30	-2.39	115.35	119.96
4	B	803	IFN	C31-C26-C27	2.33	121.24	119.81
4	D	803	IFN	C1-C4-C5	-2.28	116.42	120.56
4	A	803	IFN	C2-C3-C6	-2.27	114.62	119.84
4	C	803	IFN	C1-C4-C5	-2.25	116.46	120.56
4	C	803	IFN	BR33-C29-C28	2.24	121.16	118.36
4	A	803	IFN	C26-C24-N16	2.15	118.66	115.48
4	B	803	IFN	O19-C17-C2	-2.13	117.12	121.01
4	B	803	IFN	C14-C12-C13	2.11	123.85	119.93
4	B	803	IFN	C31-C26-C24	-2.10	115.88	118.16
4	C	803	IFN	C1-N16-C24	2.08	132.60	126.80
4	A	803	IFN	O19-C17-N18	-2.02	118.73	122.45

There are no chirality outliers.

All (9) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
4	B	803	IFN	C23-C20-N18-C17
4	C	803	IFN	C23-C20-N18-C17
4	D	803	IFN	C23-C20-N18-C17
4	A	803	IFN	O25-C24-C26-C27
4	A	803	IFN	N16-C24-C26-C27
4	A	803	IFN	C23-C20-N18-C17

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	Atoms
4	C	803	IFN	C11-C10-C8-N7
4	D	803	IFN	C11-C10-C8-N7
4	A	803	IFN	N16-C24-C26-C31

There are no ring outliers.
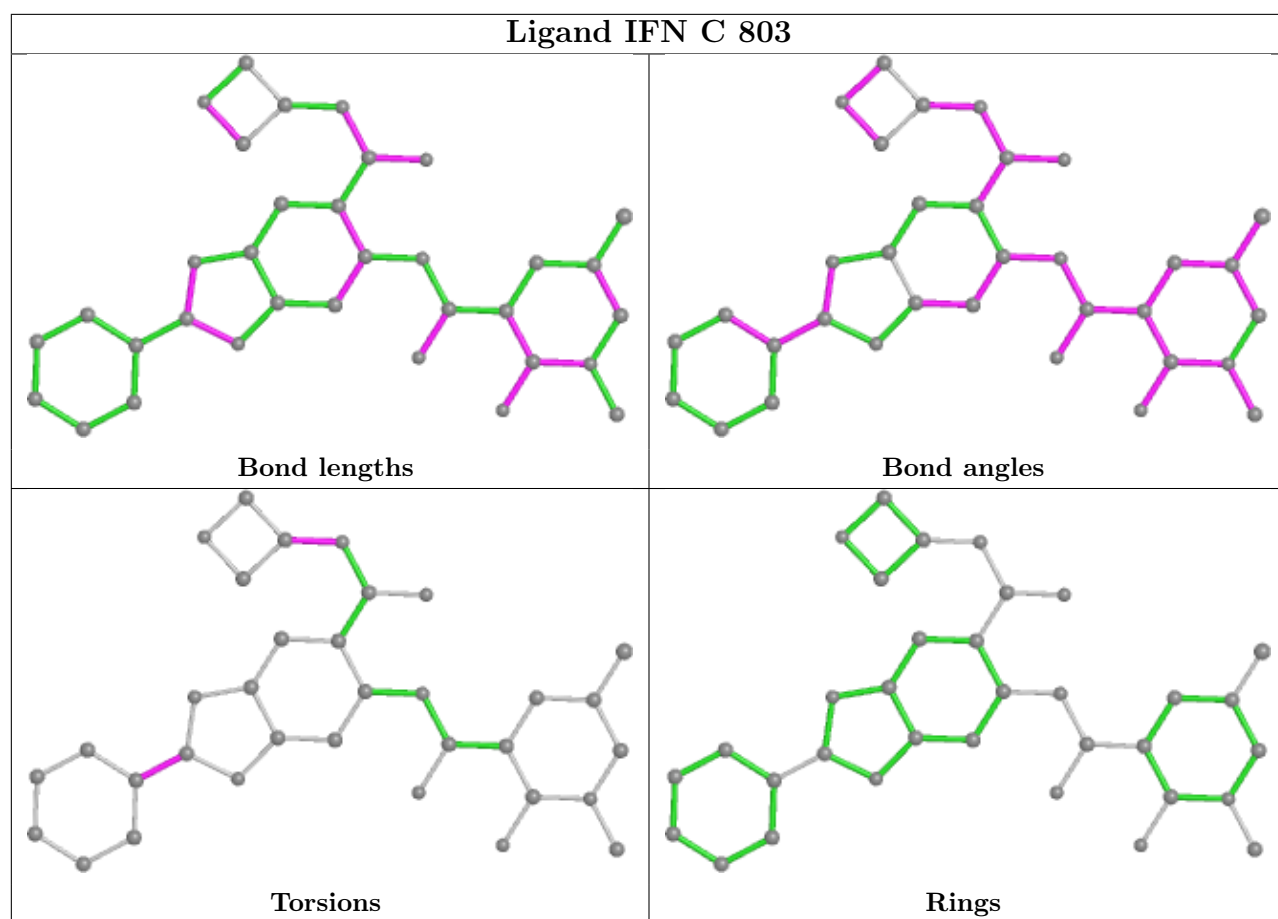
4 monomers are involved in 16 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	A	803	IFN	1	0
4	D	803	IFN	6	0
4	B	803	IFN	3	0
4	C	803	IFN	6	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 then 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 IFN A 803

Bond lengths

Bond angles

Torsions

Rings

Ligand IFN D 803

Bond lengths

Bond angles

Torsions

Rings

Ligand IFN B 803

Bond lengths

Bond angles

Torsions

Rings

Ligand IFN C 803

Bond lengths

Bond angles

Torsions

Rings
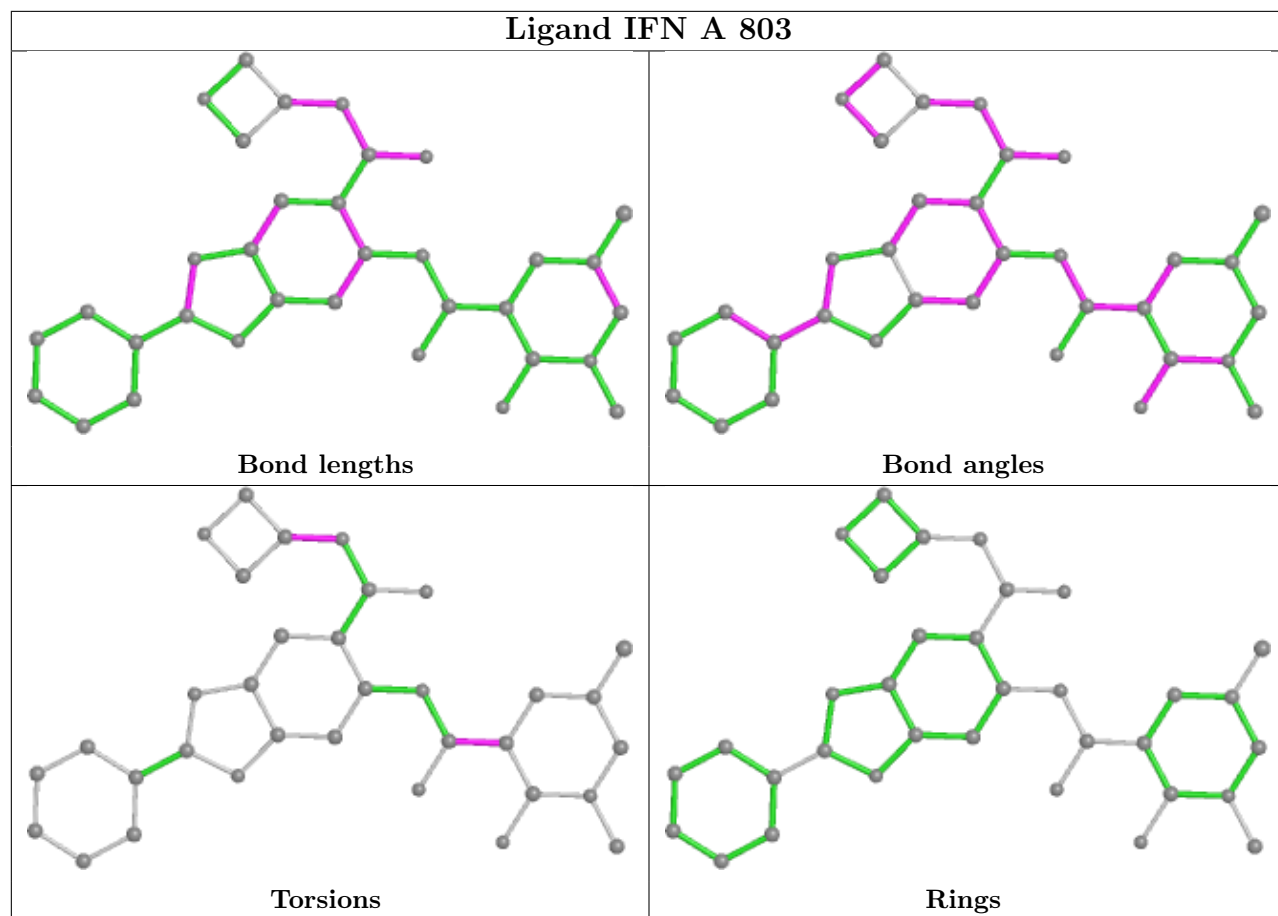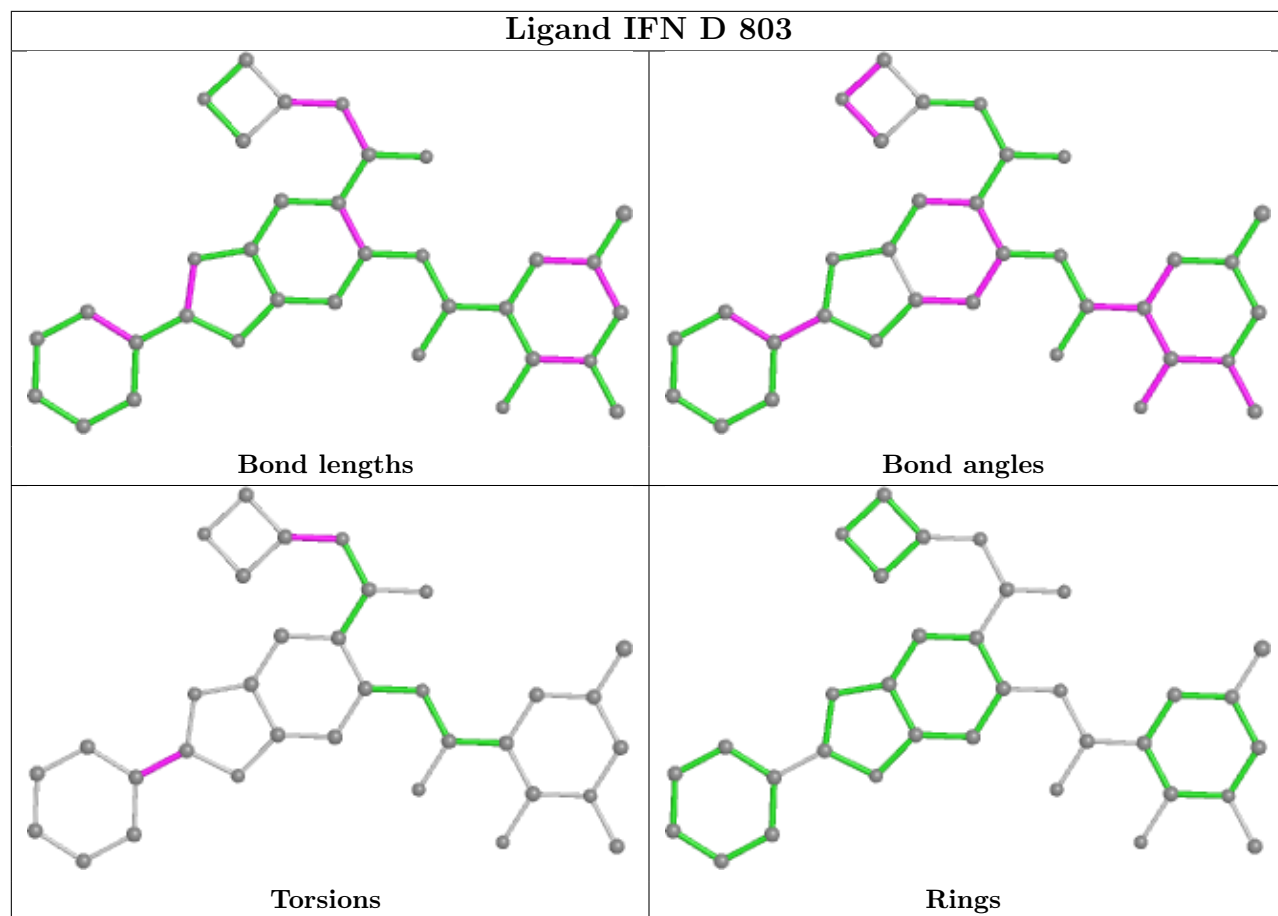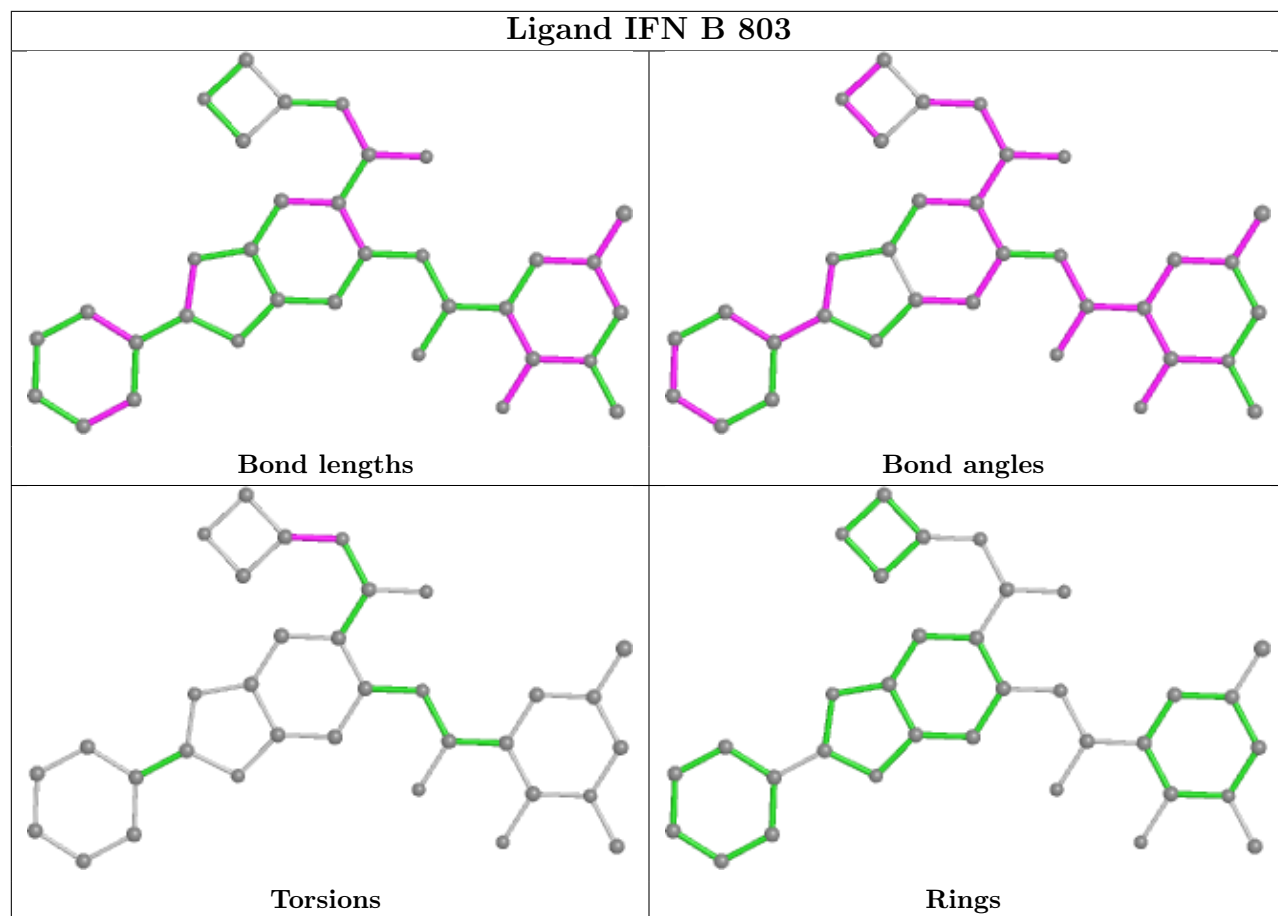
5.7 Other polymers ⓘ

There are no such residues in this entry.

5.8 Polymer linkage issues ⓘ

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(Å²)	Q<0.9
1	A	312/343 (90%)	-0.37	0	100	100	32, 48, 77, 103	0
1	B	314/343 (91%)	-0.20	3 (0%)	82	86	34, 48, 82, 113	0
1	C	312/343 (90%)	-0.45	3 (0%)	82	86	34, 49, 78, 118	0
1	D	309/343 (90%)	-0.17	11 (3%)	42	49	43, 61, 88, 118	0
All	All	1247/1372 (90%)	-0.30	17 (1%)	75	80	32, 52, 84, 118	0

All (17) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	768	GLY	4.4
1	D	605	LEU	4.1
1	D	765	VAL	4.0
1	B	771	THR	3.8
1	C	770	GLU	3.5
1	D	768	GLY	3.4
1	D	767	ARG	2.9
1	C	769	GLU	2.7
1	B	770	GLU	2.6
1	D	613	THR	2.4
1	D	720	ASP	2.3
1	D	550	ASP	2.3
1	D	505	LEU	2.1
1	C	766	ILE	2.1
1	D	657	ASN	2.0
1	D	717	ASP	2.0
1	D	609	ASN	2.0

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

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
1	CME	D	509	10/11	0.87	0.18	59,76,111,116	0
1	CME	B	509	10/11	0.92	0.19	51,68,108,116	0
1	CME	A	509	10/11	0.93	0.13	51,67,90,98	0
1	CME	C	509	10/11	0.94	0.12	47,59,91,95	0

6.3 Carbohydrates ⓘ

There are no monosaccharides in this entry.

6.4 Ligands ⓘ

In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 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
4	IFN	B	803	34/34	0.88	0.18	47,57,86,92	0
4	IFN	C	803	34/34	0.92	0.23	55,75,92,98	0
4	IFN	D	803	34/34	0.92	0.19	55,75,110,121	0
3	MG	D	802	1/1	0.95	0.05	48,48,48,48	0
4	IFN	A	803	34/34	0.96	0.13	42,58,85,103	0
3	MG	C	802	1/1	0.96	0.10	36,36,36,36	0
3	MG	B	802	1/1	0.98	0.13	30,30,30,30	0
3	MG	A	802	1/1	0.99	0.11	35,35,35,35	0
2	ZN	A	801	1/1	1.00	0.13	41,41,41,41	0
2	ZN	B	801	1/1	1.00	0.12	41,41,41,41	0
2	ZN	C	801	1/1	1.00	0.10	41,41,41,41	0
2	ZN	D	801	1/1	1.00	0.10	52,52,52,52	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 IFN B 803:

2mF$_o$-DF$_c$ (at 0.7 rmsd) in gray
mF$_o$-DF$_c$ (at 3 rmsd) in purple (negative)
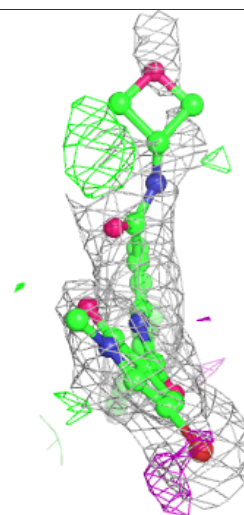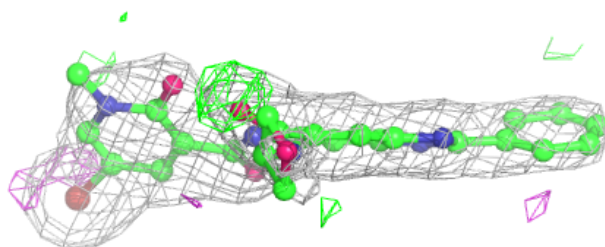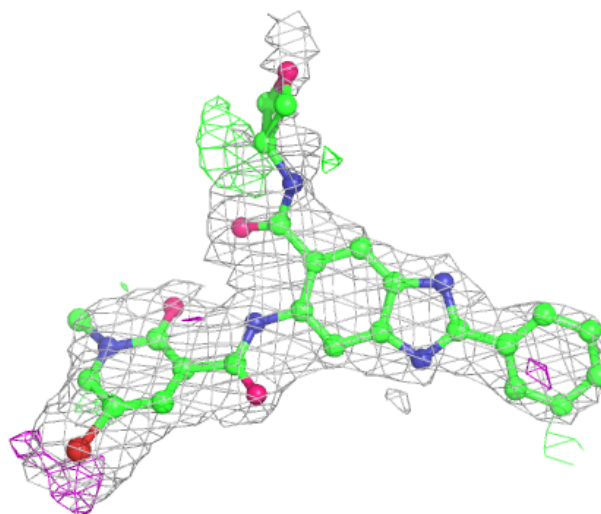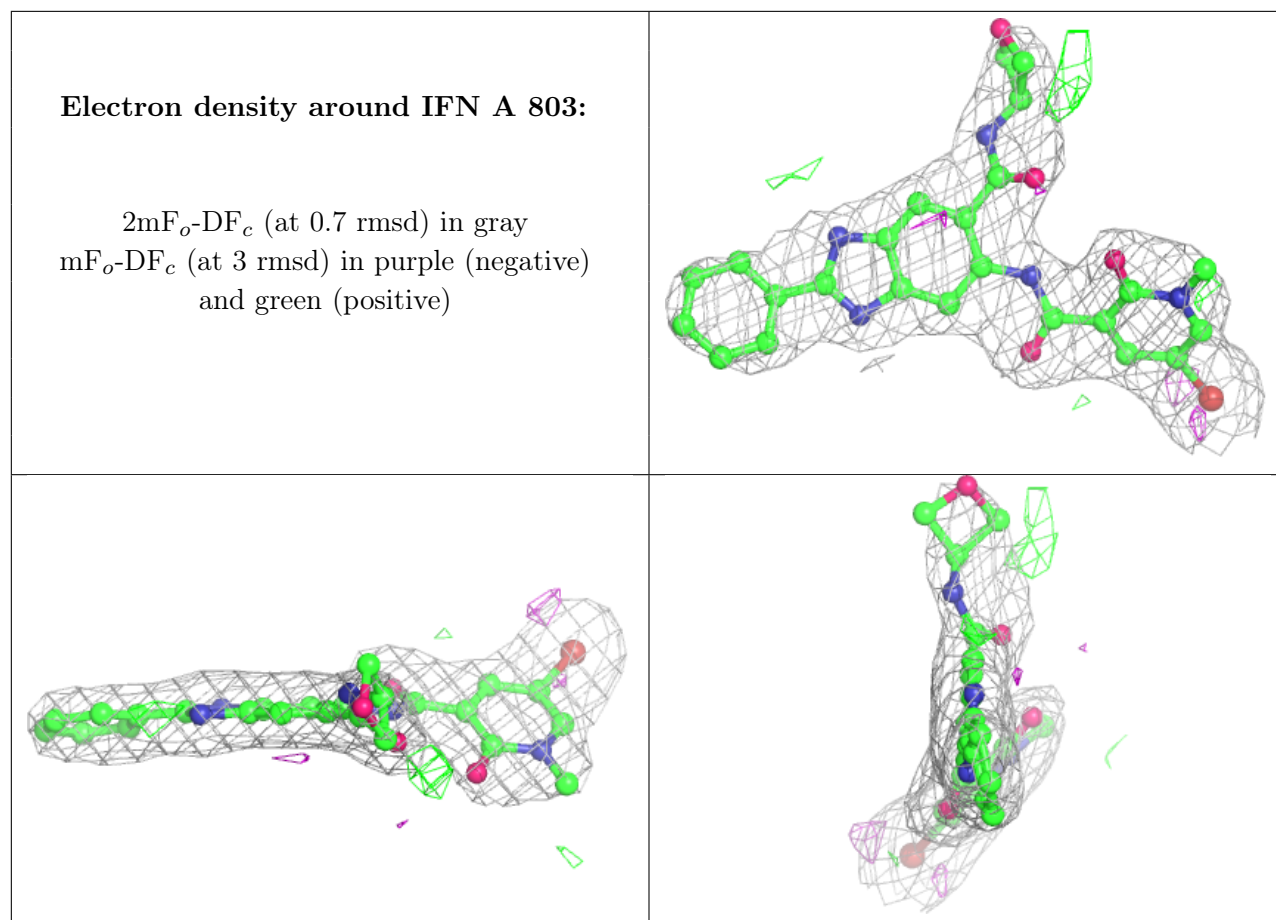and green (positive)
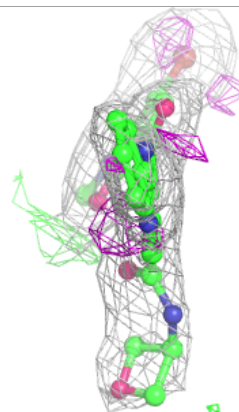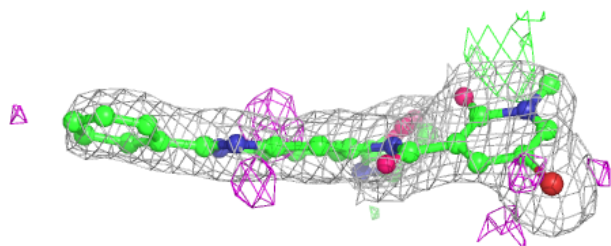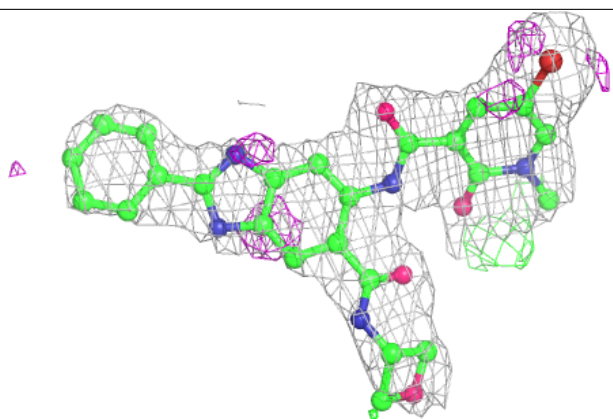
Electron density around IFN C 803:

2mF$_o$-DF$_c$ (at 0.7 rmsd) in gray
mF$_o$-DF$_c$ (at 3 rmsd) in purple (negative)
and green (positive)
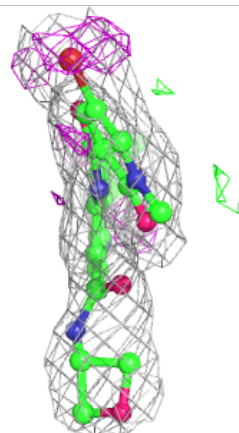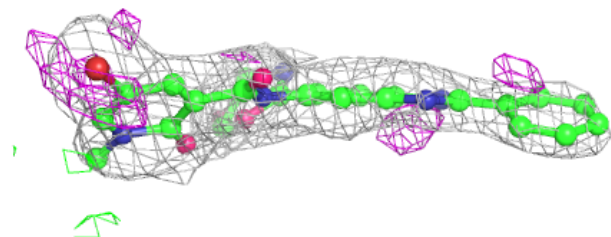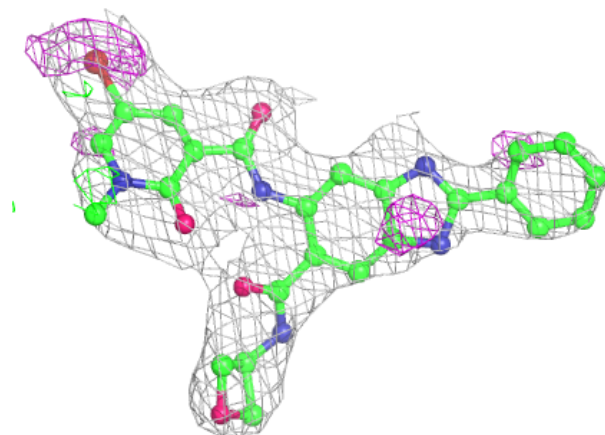
Electron density around IFN D 803:

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

Electron density around IFN A 803:

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

6.5 Other polymers ⓘ

There are no such residues in this entry.