



wwPDB X-ray Structure Validation Summary Report ⓘ

Jan 30, 2024 – 06:30 PM EST

PDB ID : 1FX0
Title : Crystal structure of the chloroplast F1-ATPase from spinach
Authors : Groth, G.; Pohl, E.
Deposited on : 2000-09-25
Resolution : 3.20 Å(reported)

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

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

A user guide is available at

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

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

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

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

MolProbity : 4.02b-467
Xtrriage (Phenix) : **NOT EXECUTED**
EDS : **NOT EXECUTED**
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.36

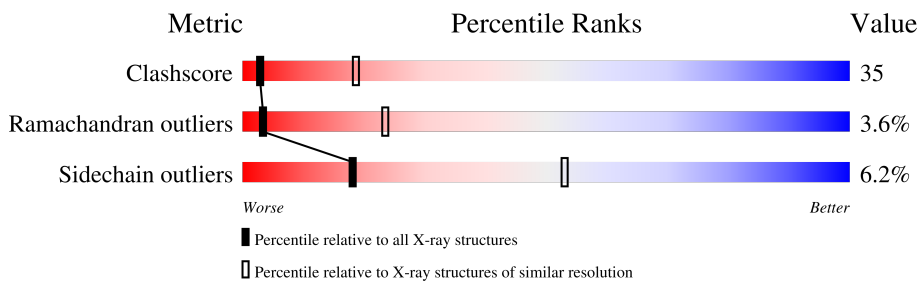
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 3.20 Å.

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



Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
Clashscore	141614	1253 (3.20-3.20)
Ramachandran outliers	138981	1234 (3.20-3.20)
Sidechain outliers	138945	1233 (3.20-3.20)

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 $\leq 5\%$.

Note EDS was not executed.

Mol	Chain	Length	Quality of chain
1	A	507	
2	B	498	

2 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 7187 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 ATP SYNTHASE ALPHA CHAIN.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	477	3647	2296	628	710	13	133	0	0

- Molecule 2 is a protein called ATP SYNTHASE BETA CHAIN.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
2	B	467	3540	2234	612	680	14	89	0	0

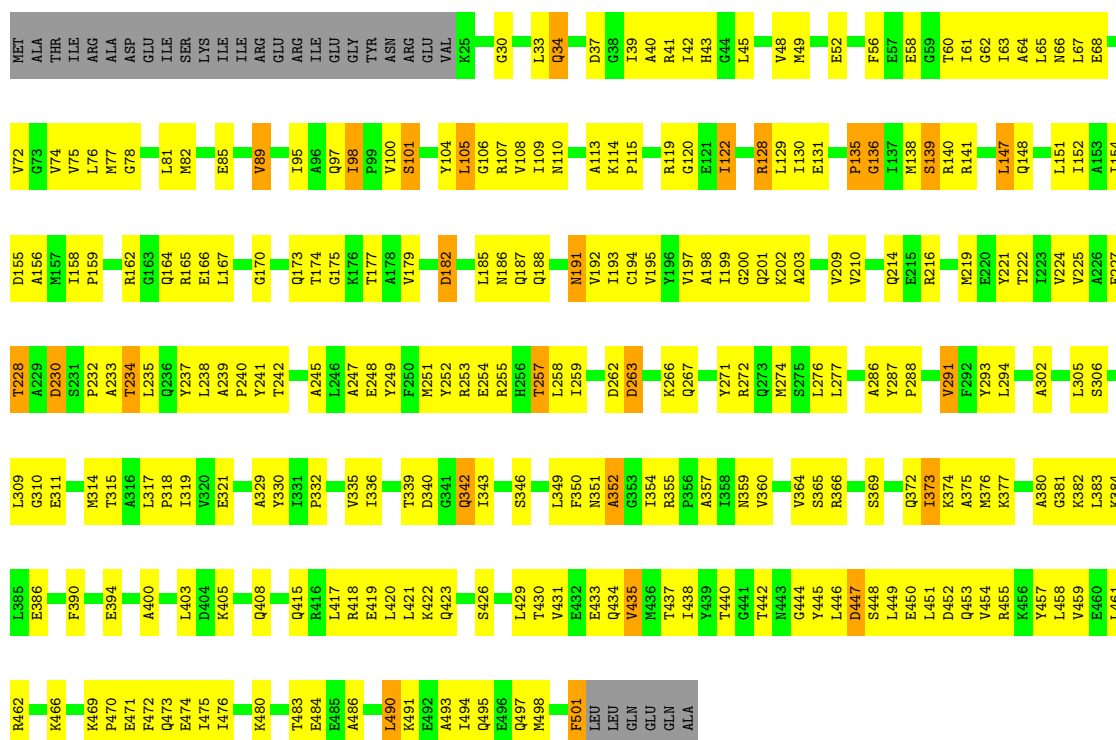
3 Residue-property plots [i](#)

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. 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. 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.

Note EDS was not executed.

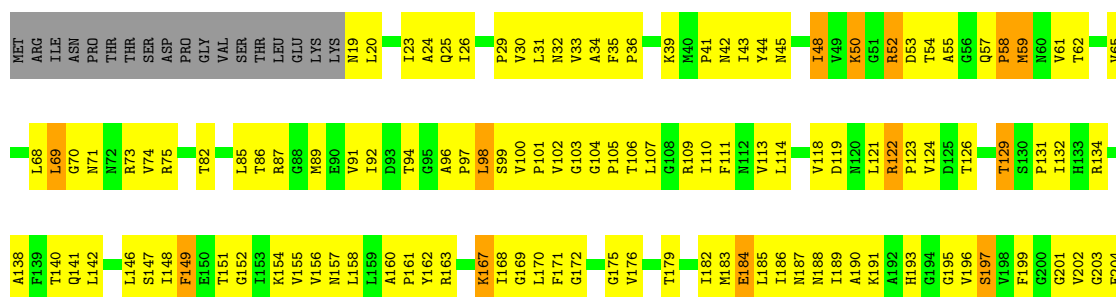
• Molecule 1: ATP SYNTHASE ALPHA CHAIN

Chain A: 43% 46% 5% 6%



• Molecule 2: ATP SYNTHASE BETA CHAIN

Chain B: 42% 47% 5% 6%



R207	G282	L368	V440
E208	V285	E669	L451
G209	S286	S370	T454
L212	A287	T371	L466
E215	L288	M374	L469
M216	L289	L375	P470
V221	G289	Q376	E471
I222	R291	P377	Q472
M223	M292	R378	A473
K231	A295	V380	V477
V232	V296	E383	I480
A233	Y298	E386	D481
L234	Q299	I387	E482
V235	P300	A388	A483
Y236	T301	Q389	A485
G237	L302	R390	T484
Q238	E305	V391	A485
M239	M306	K392	LYS
N240	L309	E393	ALA
E241	Q310	T394	MET
E242	E311	L395	ASN
P243	R312	Q396	LEU
G244	I313	R397	GLU
A245	T322	Y398	MET
R246	S323	K399	GLU
M247	I324	E400	SER
R248	Q325	L401	LYS
V249	A326	Q402	LEU
G250	V327	D403	LYS
L251	Y328	I404	LYS
T252	D382	L408	LYS
T255	D336	G409	
M256	P337	L410	
A257	E416	L413	
E258	D417	E416	
Y259	F342	D417	
F260	F343	R418	
M264	L346	L419	
E265	L350	R423	
Q266	T350	A424	
D267	V351	R425	
V268	L352	R425	
L269	S353	K426	
L270	L356	I427	
F271	Y362	E428	
M274	P363	R429	
I275	A364	F430	
F276	V365	L431	
R277	D366	F435	
F278	P367	A438	
A281		E439	

4 Data and refinement statistics

Xtrriage (Phenix) and EDS were not executed - this section is therefore incomplete.

Property	Value	Source
Space group	H 3 2	Depositor
Cell constants a, b, c, α , β , γ	147.70Å 147.70Å 385.05Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	6.00 – 3.20	Depositor
% Data completeness (in resolution range)	(Not available) (6.00-3.20)	Depositor
R_{merge}	0.09	Depositor
R_{sym}	(Not available)	Depositor
Refinement program	CNS	Depositor
R, R_{free}	0.319 , 0.350	Depositor
Estimated twinning fraction	No twinning to report.	Xtrriage
Total number of atoms	7187	wwPDB-VP
Average B, all atoms (Å ²)	114.0	wwPDB-VP

5 Model quality [i](#)

5.1 Standard geometry [i](#)

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	0.32	1/3695 (0.0%)	0.63	1/5002 (0.0%)
2	B	0.31	0/3598	0.67	2/4883 (0.0%)
All	All	0.31	1/7293 (0.0%)	0.65	3/9885 (0.0%)

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	501	PHE	CD2-CE2	-6.27	1.26	1.39

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	484	THR	N-CA-C	-5.46	96.26	111.00
2	B	50	LYS	N-CA-C	5.37	125.50	111.00
1	A	501	PHE	N-CA-C	5.24	125.16	111.00

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts [i](#)

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

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	3647	0	3715	262	0
2	B	3540	0	3589	247	0
All	All	7187	0	7304	490	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 35.

The worst 5 of 490 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:A:202:LYS:HZ3	2:B:167:LYS:HD3	1.02	1.10
2:B:19:ASN:HB3	2:B:39:LYS:HD3	1.39	0.98
1:A:202:LYS:NZ	2:B:167:LYS:HZ2	1.67	0.93
1:A:202:LYS:HZ1	2:B:167:LYS:HZ2	0.95	0.93
1:A:373:ILE:HG22	1:A:374:LYS:H	1.35	0.91

There are no symmetry-related clashes.

5.3 Torsion angles [i](#)

5.3.1 Protein backbone [i](#)

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

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

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	A	475/507 (94%)	372 (78%)	86 (18%)	17 (4%)	3	23
2	B	465/498 (93%)	380 (82%)	68 (15%)	17 (4%)	3	22
All	All	940/1005 (94%)	752 (80%)	154 (16%)	34 (4%)	3	23

5 of 34 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	105	LEU
1	A	234	THR
1	A	447	ASP
1	A	85	GLU
1	A	186	ASN

5.3.2 Protein sidechains [i](#)

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

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

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	388/414 (94%)	369 (95%)	19 (5%)	25	61
2	B	381/410 (93%)	352 (92%)	29 (8%)	13	45
All	All	769/824 (93%)	721 (94%)	48 (6%)	18	53

5 of 48 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
2	B	167	LYS
2	B	274	ASN
2	B	184	GLU
2	B	215	GLU
2	B	299	GLN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 22 such sidechains are listed below:

Mol	Chain	Res	Type
2	B	299	GLN
2	B	345	HIS
2	B	325	GLN
2	B	389	GLN
1	A	443	ASN

5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates [i](#)

There are no monosaccharides in this entry.

5.6 Ligand geometry [i](#)

There are no ligands in this entry.

5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

6 Fit of model and data

6.1 Protein, DNA and RNA chains

EDS was not executed - this section is therefore empty.

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

EDS was not executed - this section is therefore empty.

6.3 Carbohydrates

EDS was not executed - this section is therefore empty.

6.4 Ligands

EDS was not executed - this section is therefore empty.

6.5 Other polymers

EDS was not executed - this section is therefore empty.