

# Suplementario

René Abraham Calzadilla Calderón

November 2023

## 1 Fourier Transform

Let's say we want to represent some function  $f(t)$  in terms of sines and cosines, but not just in the  $[-L, L]$  interval, but in all the real numbers:  $(-\infty, \infty)$ . For this, we'll make  $L \rightarrow \infty$ .

We then start by stating the Fourier Series:

$$f(t) = \frac{a_0}{2} + \sum_{n=1}^{\infty} \left[ a_n \cos\left(\frac{n\pi t}{L}\right) + b_n \sin\left(\frac{n\pi t}{L}\right) \right] \quad (1)$$

And making a substitution  $\omega_n = \frac{n\pi}{L}$ , so we get

$$f(t) = \frac{a_0}{2} + \sum_{n=1}^{\infty} [a_n \cos(\omega_n t) + b_n \sin(\omega_n t)] \quad (2)$$

Now we remember the definitions of both  $a_n$  and  $b_n$  but also applying the  $\omega_n$  substitution:

$$a_n = \frac{1}{L} \int_{-L}^L f(t) \cos(\omega_n t) dt \quad (3)$$

$$b_n = \frac{1}{L} \int_{-L}^L f(t) \sin(\omega_n t) dt \quad (4)$$

We substitute these equations into (2) to obtain:

$$f(t) = \frac{1}{2L} \int_{-L}^L f(t) dt + \sum_{n=1}^{\infty} \left[ \left( \frac{1}{L} \int_{-L}^L f(x) \cos(\omega_n x) dx \right) \cos(\omega_n t) + \left( \frac{1}{L} \int_{-L}^L f(x) \sin(\omega_n x) dx \right) \sin(\omega_n t) \right] \quad (5)$$

We now consider a partition in  $n$  sub-intervals of  $[0, \infty)$ :  $\omega_n$  for  $n = 0, 1, 2, 3, \dots, n$ . The length of this sub-intervals will be  $\Delta\omega = \omega_n - \omega_{n-1} = \frac{n\pi}{L} - \frac{(n-1)\pi}{L} = \frac{n\pi - n\pi + \pi}{L} = \frac{\pi}{L}$ , therefore,  $\omega_n = n\Delta\omega$  and we substitute in (5). Firstly, we transform the  $\frac{1}{2L}$  and  $\frac{1}{L}$  by multiplying them by  $\frac{\pi}{\pi}$  so that we use the equivalence of  $\Delta\omega = \frac{\pi}{L}$ .

$$f(t) = \frac{\pi}{2\pi L} \int_{-L}^L f(x) dx + \sum_{n=1}^{\infty} \frac{\pi}{\pi L} \left[ \left( \int_{-L}^L f(x) \cos(\omega_n x) dx \right) \cos(\omega_n t) + \left( \int_{-L}^L f(x) \sin(\omega_n x) dx \right) \sin(\omega_n t) \right] \quad (6)$$

Now we make the proper substitutions of  $\Delta\omega$ :

$$f(t) = \frac{\Delta\omega}{2\pi} \int_{-L}^L f(x) dx + \sum_{n=1}^{\infty} \frac{\Delta\omega}{\pi} \left[ \left( \int_{-L}^L f(x) \cos(n\Delta\omega x) dx \right) \cos(n\Delta\omega t) + \left( \int_{-L}^L f(x) \sin(n\Delta\omega x) dx \right) \sin(n\Delta\omega t) \right] \quad (7)$$

And notice that, as stated above, if we make  $L \rightarrow \infty$ , then  $\Delta\omega \rightarrow 0$  and we can use the Riemann Sum Definition of Integral as:

$$\int_a^b f(x)dx = \lim_{\Delta x \rightarrow 0} \sum_{k=1}^n f(k\Delta x)\Delta x; \Delta x = x_k - x_{k-1} \quad (8)$$

Therefore, noticing that  $\Delta\omega \rightarrow 0$ , we obtain the Fourier Integral:

$$f(t) = \frac{1}{\pi} \int_0^\infty \left[ \left( \int_{-\infty}^\infty f(x) \cos(\omega x) dx \right) \cos(\omega t) + \left( \int_{-\infty}^\infty f(x) \sin(\omega x) dx \right) \sin(\omega t) \right] d\omega \quad (9)$$

Alternatively:

$$f(t) = \frac{1}{\pi} \int_0^\infty [A_\omega \cos(\omega t) + B_\omega \sin(\omega t)] d\omega \quad (10)$$

With

$$A_\omega = \int_{-\infty}^\infty f(x) \cos(\omega x) dx \quad (11)$$

$$B_\omega = \int_{-\infty}^\infty f(x) \sin(\omega x) dx \quad (12)$$

To get the Complex Fourier Transform we start with (10) and with some additional definitions for sine and cosine:

$$\sin x = \frac{1}{2i} (e^{ix} - e^{-ix}) \quad (13)$$

$$\cos x = \frac{1}{2} (e^{ix} + e^{-ix}) \quad (14)$$

We also need to remember that  $-i = \frac{1}{i}$

$$f(t) = \frac{1}{\pi} \int_0^\infty \left[ \frac{A_\omega}{2} e^{i\omega t} + \frac{A_\omega}{2} e^{-i\omega t} - \frac{iB_\omega}{2} e^{i\omega t} + \frac{iB_\omega}{2} e^{-i\omega t} \right] d\omega \quad (15)$$

Notice that we can separate the terms that has the positive exponent from those with a negative one:

$$f(t) = \frac{1}{\pi} \int_0^\infty \left[ \left( \frac{A_\omega}{2} - \frac{iB_\omega}{2} \right) e^{i\omega t} + \left( \frac{A_\omega}{2} + \frac{iB_\omega}{2} \right) e^{-i\omega t} \right] d\omega \quad (16)$$

Furthermore, notice that if we make  $C_\omega = \frac{A_\omega}{2} - \frac{iB_\omega}{2}$ , then  $\bar{C}_\omega = \frac{A_\omega}{2} + \frac{iB_\omega}{2}$ , therefore obtaining:

$$f(t) = \frac{1}{\pi} \int_0^\infty [C_\omega e^{i\omega t} + \bar{C}_\omega e^{-i\omega t}] d\omega \quad (17)$$

Now, we substitute  $A_\omega$  and  $B_\omega$  in both  $C_\omega$  and  $\bar{C}_\omega$ :

$$C_\omega = \frac{1}{2} \int_{-\infty}^\infty f(x) \cos(\omega x) dx - \frac{i}{2} \int_{-\infty}^\infty f(x) \sin(\omega x) dx \Rightarrow \frac{1}{2} \int_{-\infty}^\infty f(x) [\cos(\omega x) - i \sin(\omega x)] dx \quad (18)$$

Therefore, after using Euler's Identity:

$$C_\omega = \frac{1}{2} \int_{-\infty}^\infty f(x) e^{-i\omega x} dx \quad (19)$$

And by applying the same reasoning we get for  $\bar{C}_\omega$ :

$$\bar{C}_\omega = \frac{1}{2} \int_{-\infty}^\infty f(x) e^{i\omega x} dx \quad (20)$$

After substituting and separating into two integrals (17), we obtain:

$$f(t) = \frac{1}{2\pi} \int_0^\infty \left( \int_{-\infty}^\infty f(x) e^{-i\omega x} dx \right) e^{i\omega t} d\omega + \frac{1}{2\pi} \int_0^\infty \left( \int_{-\infty}^\infty f(x) e^{i\omega x} dx \right) e^{-i\omega t} d\omega \quad (21)$$

We make a clever substitution by making  $v = -\omega$ , so we get:

$$f(t) = \frac{1}{2\pi} \int_0^\infty \left( \int_{-\infty}^\infty f(x) e^{-i\omega x} dx \right) e^{i\omega t} d\omega + \frac{1}{2\pi} \int_{-\infty}^0 \left( \int_{-\infty}^\infty f(x) e^{-ivx} dx \right) e^{ivt} dv \quad (22)$$

Noticing that  $\omega$  and  $v$  are both silent variables, we finally obtain the complex Fourier Integral and complex Fourier Transform:

$$f(t) = \frac{1}{2\pi} \int_{-\infty}^\infty \left( \int_{-\infty}^\infty f(x) e^{-i\omega x} dx \right) e^{i\omega t} d\omega \quad (23)$$

Finally, the Fourier Transform is:

$$F[f(x)] = \int_{-\infty}^\infty f(x) e^{-i\omega x} dx \quad (24)$$

Channel-Band	Mean	Standard Deviation
Fp1-delta	0.07571497915127234	0.05427325031415093
Fp1-beta	0.0036656198777571874	0.0029510769722111336
Fp1-gamma	0.0019605643882090245	0.0010507794457590054
Fp1-alpha	0.007647508906376348	0.00620007599197359
Fp1-theta	0.014233304743411088	0.01285074862993038
Fp2-delta	0.08157590325385136	0.07333223662494841
Fp2-beta	0.00357260439889592	0.0029963924733122714
Fp2-gamma	0.0018867064008421064	0.001143447051836657
Fp2-alpha	0.007532491553391121	0.006519731478923385
Fp2-theta	0.013981513179664711	0.013047484893889865
F3-delta	0.05243029996926222	0.03807755864530451
F3-beta	0.0038197434006267315	0.005981191100370984
F3-gamma	0.0016283487095021586	0.001970076403549567
F3-alpha	0.008137143740718335	0.011890183065823734
F3-theta	0.01190565484438672	0.015916074607780772
F4-delta	0.055569984601481735	0.04339726463728076
F4-beta	0.0031104876149723438	0.002588299864866426
F4-gamma	0.0016733528309685886	0.0011827745413297962
F4-alpha	0.006585258873692328	0.005985946313773421
F4-theta	0.01183973200805796	0.012412131439204022
C3-delta	0.052716804675558546	0.05165552606031935
C3-beta	0.0027874605869716435	0.0033848826399958095
C3-gamma	0.001261506816633225	0.0012576203792555728
C3-alpha	0.006449054067354474	0.007779973380244925
C3-theta	0.011837080123093898	0.015159228051292805
C4-delta	0.05207326563551901	0.04887100377201374
C4-beta	0.0026427929620737645	0.0028978595121862643
C4-gamma	0.0012718742581736605	0.0012592545173531753
C4-alpha	0.006499286836626846	0.008505381903343616
C4-theta	0.01144439529459985	0.014445006310126763
P3-delta	0.0558685279478058	0.05746806423560313
P3-beta	0.002851768163464717	0.003161793461338599
P3-gamma	0.0012245833158104256	0.0011382534629863041
P3-alpha	0.00705177253616216	0.007070841165816751
P3-theta	0.01207970108739749	0.014239175791430216
P4-delta	0.06201459726695097	0.0779690305271849
P4-beta	0.003674792287694718	0.007504667523440699
P4-gamma	0.0014148175363681514	0.0019005036004323607
P4-alpha	0.008375227626885995	0.013992309968505699
P4-theta	0.013474129686313827	0.021359893735620795

Table 1: Means and Standard Deviation of AD group

O1-delta	0.059269656417843895	0.06390806846237014
O1-beta	0.003197006912359946	0.003110763582411674
O1-gamma	0.0014442464026704557	0.001274320514428897
O1-alpha	0.008255988704420123	0.00785935357351158
O1-theta	0.012591400089873752	0.013789642647089208
O2-delta	0.05857233269567028	0.04908059959971093
O2-beta	0.003163334357009825	0.0027268454764274187
O2-gamma	0.001421851767434441	0.0011542140773738504
O2-alpha	0.008033637525171777	0.0058905751750824315
O2-theta	0.012686439976066817	0.012361793366241363
F7-delta	0.05768601995041705	0.045477165928777354
F7-beta	0.003671668879980198	0.0028803103334011588
F7-gamma	0.002480422942639311	0.002046183411588341
F7-alpha	0.007440062720402171	0.0061535232646789
F7-theta	0.012863614034337842	0.012786314199721262
F8-delta	0.060213606385118086	0.05176492378529566
F8-beta	0.0033784006716168348	0.0029494215045030615
F8-gamma	0.0020879562633772217	0.001551604325537441
F8-alpha	0.007243695135135721	0.006631714114975441
F8-theta	0.012629474288209963	0.013082924020064354
T3-delta	0.0539375003353185	0.046842884184225386
T3-beta	0.0031645817090034736	0.0031710981929205786
T3-gamma	0.0018386042849087311	0.0014019667827539157
T3-alpha	0.007153500105236976	0.0069336962294643985
T3-theta	0.012326964665984777	0.013764066298133919
T4-delta	0.05447480486058532	0.048045127062118845
T4-beta	0.003516673170665706	0.0031288625322845316
T4-gamma	0.00224515573871835	0.0016000484887972127
T4-alpha	0.0071552645305208015	0.006941652681999167
T4-theta	0.012082669927091855	0.01372291066162893
T5-delta	0.10428087655009466	0.30407042700036263
T5-beta	0.005899535837883357	0.016164982039001057
T5-gamma	0.006068588087732913	0.024616016675181596
T5-alpha	0.015506167474271184	0.04508082895379584
T5-theta	0.028145226883458246	0.09033471059686775

Table 2: Means and Standard Deviation of AD group Part II

T6-delta	0.060461235129433154	0.06447253546605382
T6-beta	0.0037697008944910268	0.005447789982269743
T6-gamma	0.0016168007626195249	0.001569978087195952
T6-alpha	0.00861719678687044	0.010710758608795745
T6-theta	0.01424234925426152	0.02083160204476971
Fz-delta	0.053642380061673635	0.0478957844780191
Fz-beta	0.0028427120526814766	0.0031624622574000756
Fz-gamma	0.0012210201432591601	0.0011426111127948858
Fz-alpha	0.006827729132919953	0.007260596538120021
Fz-theta	0.01215910218003358	0.01372327773745696
Cz-delta	0.0517305798048958	0.04549483472173312
Cz-beta	0.0027861235367747828	0.003185833508821467
Cz-gamma	0.0011300335544649272	0.0010892027527950837
Cz-alpha	0.006246290681973274	0.006847660955554287
Cz-theta	0.011491894324400368	0.013717375649134169
Pz-delta	0.05919012269213122	0.07376495609534392
Pz-beta	0.0027343273980876904	0.003074928069248715
Pz-gamma	0.001206521302750441	0.0011703662037868138
Pz-alpha	0.006817237389851268	0.007038632570149578
Pz-theta	0.011759460710104872	0.013826133150986172

Table 3: Means and Standard Deviation of AD group Part III

Channel-Band	Mean	Standard Deviation
Fp1-delta	0.06287982252286597	0.03617349651309172
Fp1-beta	0.004214243390620558	0.0058872070351216775
Fp1-gamma	0.0019135153391233559	0.001974334590747013
Fp1-alpha	0.00894781392532597	0.011753124380262965
Fp1-theta	0.013395863354047714	0.01585324159707061
Fp2-delta	0.0650344303248108	0.037666849811142634
Fp2-beta	0.004372815806962944	0.005891344964189369
Fp2-gamma	0.0020186576341679	0.0020365913037364083
Fp2-alpha	0.009230072955130364	0.01172166158904035
Fp2-theta	0.013941489541550459	0.015829911214866117
F3-delta	0.05243029996926222	0.03807755864530451
F3-beta	0.0038197434006267315	0.005981191100370984
F3-gamma	0.0016283487095021586	0.001970076403549567
F3-alpha	0.008137143740718335	0.011890183065823734
F3-theta	0.011905654844386718	0.015916074607780772
F4-delta	0.05192010446853462	0.03706898614517533
F4-beta	0.0038070854857007587	0.005941091121077109
F4-gamma	0.001609187184817243	0.0019669825015517866
F4-alpha	0.008267394901998699	0.011776581887640672
F4-theta	0.012113192421717761	0.015925898802781016
C3-delta	0.048623403293455096	0.03756065937226325
C3-beta	0.0034627429761020082	0.006077412286827155
C3-gamma	0.0013628898053343558	0.0021217857943743043
C3-alpha	0.007536160609970195	0.01204095328302937
C3-theta	0.011652048529288231	0.01616533569138618
C4-delta	0.04873142180327257	0.037126260919104384
C4-beta	0.0034720114956047765	0.0060635620771053635
C4-gamma	0.0013823396822298102	0.0021284600773142323
C4-alpha	0.00750430606132902	0.01195042864531439
C4-theta	0.011695853091610508	0.016152504324838852
P3-delta	0.04933570912983307	0.03728164945740221
P3-beta	0.0037486042024750766	0.0060061523991584735
P3-gamma	0.0013904442594396668	0.002135202745945073
P3-alpha	0.009153096278590633	0.011859954588003452
P3-theta	0.011974241241426107	0.016110635651635164
P4-delta	0.05016714093778805	0.03722820404547503
P4-beta	0.0037086980501858263	0.0060049396525999965
P4-gamma	0.0013974501963230914	0.002111130107285939
P4-alpha	0.00891407624149045	0.01178296327471043
P4-theta	0.012022992611517713	0.016098830890961473

Table 4: Means and Standard Deviation of CN group Part I

O1-delta	0.05005943359209404	0.037098219399075906
O1-beta	0.0040480446937348315	0.00592846471689929
O1-gamma	0.0015815809743554752	0.0021017505337484164
O1-alpha	0.010986643243903688	0.01175534561500488
O1-theta	0.012334406271807218	0.016022853162052358
O2-delta	0.05046130998521687	0.036579950445636916
O2-beta	0.004153927336955901	0.005911159465089656
O2-gamma	0.0016272752575981395	0.002104094082816638
O2-alpha	0.011531347148040367	0.011694115161389136
O2-theta	0.012396017957297122	0.01598249231726988
F7-delta	0.05258962940146246	0.03773948177919911
F7-beta	0.004104910420271736	0.005910976897525222
F7-gamma	0.002097887426515689	0.0019543502712989587
F7-alpha	0.00842663425272991	0.011800500091761191
F7-theta	0.012111899136138828	0.015856598611084207
F8-delta	0.053299868812223504	0.03716863193919425
F8-beta	0.004002271444049937	0.005915179830840914
F8-gamma	0.0018375983336335123	0.0019916521252606274
F8-alpha	0.008643128756950265	0.011741442688396195
F8-theta	0.01248882423383424	0.01589658951862061
T3-delta	0.05032875547010957	0.03721299931648176
T3-beta	0.004038685736839785	0.005916709248561887
T3-gamma	0.0019447911986567765	0.0020248605275327626
T3-alpha	0.008606742498304783	0.011819251085389474
T3-theta	0.012037736197741592	0.01606490160834179
T4-delta	0.05050178444720825	0.03697934534570546
T4-beta	0.004003124301829427	0.005912650825680235
T4-gamma	0.001963653980669546	0.001982452463672283
T4-alpha	0.00838440495741021	0.011791540482913766
T4-theta	0.012106214555484936	0.01601738914085509
T5-delta	0.04961307382737739	0.03720091602987219
T5-beta	0.004047519841274087	0.005908140207789586
T5-gamma	0.0015504200292163748	0.002020335943518235
T5-alpha	0.01084501253809684	0.01188102922536297
T5-theta	0.012207570315995975	0.015973383621475323

Table 5: Means and Standard Deviation of CN group Part II



T6-delta	0.0502887538438066	0.037031671926205025
T6-beta	0.004009915608476828	0.005929111142932921
T6-gamma	0.0016207920262064025	0.0020622170795266096
T6-alpha	0.010318088228147388	0.011735283222815049
T6-theta	0.012293299908147171	0.01601569406152461
Fz-delta	0.05034604110378053	0.037157866520487824
Fz-beta	0.0035983133284228997	0.006022514072655091
Fz-gamma	0.0013596260943964603	0.00210968568367028
Fz-alpha	0.008191543323982505	0.011877950774440437
Fz-theta	0.011939904020175673	0.016106641828276678
Cz-delta	0.048747951189555265	0.037025205223864766
Cz-beta	0.003485856541241446	0.006089090172659121
Cz-gamma	0.0013159577052461004	0.002182128346764712
Cz-alpha	0.007500962444094287	0.011985163141624776
Cz-theta	0.011760469118584504	0.016179156075634422
Pz-delta	0.05036366130286223	0.037485161360817504
Pz-beta	0.0036857392376802877	0.00603174606609004
Pz-gamma	0.0013990942729255646	0.0021436942428225
Pz-alpha	0.008853444865141844	0.01183063299241096
Pz-theta	0.012131525083059883	0.016117788667257018

Table 6: Means and Standard Deviation of CN group Part III

Canal-Banda	P-value
Fp1-delta	1.9659881458594583e-07
Fp1-beta	5.08568302495555e-07
Fp1-gamma	5.240996142518939e-07
Fp1-alpha	4.753319008354071e-07
Fp1-theta	4.3604887781087046e-07
Fp2-delta	1.8333852632273308e-07
Fp2-beta	5.081629289478678e-07
Fp2-gamma	5.239781551132423e-07
Fp2-alpha	4.767882555443848e-07
Fp2-theta	4.353836528063902e-07
F3-delta	2.176007867486393e-07
F3-beta	5.096134887367459e-07
F3-gamma	5.264579674306043e-07
F3-alpha	4.825754516997812e-07
F3-theta	4.470709613183665e-07
F4-delta	2.147167402125919e-07
F4-beta	5.103652699033626e-07
F4-gamma	5.2628578402554e-07
F4-alpha	4.811723069110746e-07
F4-theta	4.4446487207647595e-07
C3-delta	2.167940645192493e-07
C3-beta	5.125668075242371e-07
C3-gamma	5.277732517596662e-07
C3-alpha	4.84619994327373e-07
C3-theta	4.5002728500905564e-07
C4-delta	2.180491970857714e-07
C4-beta	5.124583494547086e-07
C4-gamma	5.275298159753651e-07
C4-alpha	4.840616147636705e-07
C4-theta	4.493116453972039e-07
P3-delta	2.1959703353854722e-07
P3-beta	5.102497541500795e-07
P3-gamma	5.273990676752094e-07
P3-alpha	4.801927175783415e-07
P3-theta	4.451192943068166e-07
P4-delta	2.1433033384128147e-07
P4-beta	5.109619100777583e-07
P4-gamma	5.275198947073429e-07
P4-alpha	4.80528192121506e-07
P4-theta	4.465994537219302e-07
O1-delta	2.1828130992100926e-07
O1-beta	5.138156376363805e-07
O1-gamma	5.280305277625008e-07
O1-alpha	4.833772856444108e-07
O1-theta	4.4615452723666425e-07
O2-delta	2.2041843644583164e-07
O2-beta	5.089202577270971e-07
O2-gamma	5.268034655143172e-07
O2-alpha	4.780688947361058e-07
O2-theta	4.421574261828453e-07

Table 7: K-S test p-values for CN group

F7-delta	2.1610776054170403e-07
F7-beta	5.146117540924246e-07
F7-gamma	5.276067870080077e-07
F7-alpha	4.863921966286297e-07
F7-theta	4.441183312698406e-07
F8-delta	2.196519673689287e-07
F8-beta	5.085185990338899e-07
F8-gamma	5.249927121396554e-07
F8-alpha	4.796733279254113e-07
F8-theta	4.4223067256257754e-07
T3-delta	2.1710182701419962e-07
T3-beta	5.076927603384096e-07
T3-gamma	5.252937177808053e-07
T3-alpha	4.825980458763544e-07
T3-theta	4.446869964588394e-07
T4-delta	2.1679435246836815e-07
T4-beta	5.092852241949833e-07
T4-gamma	5.253733184713256e-07
T4-alpha	4.81733631058813e-07
T4-theta	4.4391085615997894e-07
T5-delta	2.1634632257584953e-07
T5-beta	5.094973602380406e-07
T5-gamma	5.258519127851203e-07
T5-alpha	4.773832503068447e-07
T5-theta	4.444722213510132e-07
T6-delta	2.1786540855188251e-07
T6-beta	5.09393338189654e-07
T6-gamma	5.262506056477786e-07
T6-alpha	4.779494992456798e-07
T6-theta	4.431743396005449e-07
Fz-delta	2.1651464861979068e-07
Fz-beta	5.122336811103393e-07
Fz-gamma	5.273044458669517e-07
Fz-alpha	4.813976261670055e-07
Fz-theta	4.46109489535132e-07
Cz-delta	2.181854769223869e-07
Cz-beta	5.124706580021009e-07
Cz-gamma	5.282073693427277e-07
Cz-alpha	4.8383476733402e-07
Cz-theta	4.507590227377087e-07
Pz-delta	2.174824531099843e-07
Pz-beta	5.113284657463057e-07
Pz-gamma	5.275754044019007e-07
Pz-alpha	4.818439535876774e-07
Pz-theta	4.479234017643588e-07

Table 8: K-S test p-values for CN group part II

Fp1-delta	2.5445957175013523e-07
Fp1-beta	5.094340128087607e-07
Fp1-gamma	5.30696244682135e-07
Fp1-alpha	4.851406782513895e-07
Fp1-theta	4.469787303336158e-07
Fp2-delta	2.5636136297033296e-07
Fp2-beta	5.098996656680292e-07
Fp2-gamma	5.315019445300843e-07
Fp2-alpha	4.866546230740609e-07
Fp2-theta	4.45881548985205e-07
F3-delta	2.176007867486393e-07
F3-beta	5.096134887367459e-07
F3-gamma	5.264579674306043e-07
F3-alpha	4.825754516997812e-07
F3-theta	4.470709613183665e-07
F4-delta	2.5599121661768805e-07
F4-beta	5.121189790333293e-07
F4-gamma	5.301743262627969e-07
F4-alpha	4.880275043376403e-07
F4-theta	4.4835421557973254e-07
C3-delta	2.5584411095379105e-07
C3-beta	5.136825737156626e-07
C3-gamma	5.324050412254414e-07
C3-alpha	4.882384119271612e-07
C3-theta	4.491644389018772e-07
C4-delta	2.5761020687688784e-07
C4-beta	5.142678371516379e-07
C4-gamma	5.324985762233301e-07
C4-alpha	4.871158987074553e-07
C4-theta	4.4940785682594607e-07
P3-delta	2.57227251144369e-07
P3-beta	5.126310735933143e-07
P3-gamma	5.327057685618476e-07
P3-alpha	4.829182954119556e-07
P3-theta	4.4459415543709364e-07
P4-delta	2.567296003494186e-07
P4-beta	5.121837854698164e-07
P4-gamma	5.326232340881444e-07
P4-alpha	4.842051673022401e-07
P4-theta	4.456552394002158e-07
O1-delta	2.556773834408868e-07
O1-beta	5.101522755904535e-07
O1-gamma	5.325469087092604e-07
O1-alpha	4.825334840995362e-07
O1-theta	4.4756173909582613e-07
O2-delta	2.549765637743322e-07
O2-beta	5.109576728979816e-07
O2-gamma	5.323934014535957e-07
O2-alpha	4.774528497784701e-07
O2-theta	4.440508132430491e-07

Table 9: K-S test p-values for AD group

F7-delta	2.469714883745905e-07
F7-beta	5.093212215652776e-07
F7-gamma	5.310052438104202e-07
F7-alpha	4.826059144204772e-07
F7-theta	4.4585887765532763e-07
F8-delta	2.550069329307861e-07
F8-beta	5.100241924105033e-07
F8-gamma	5.309584408207837e-07
F8-alpha	4.862485083071983e-07
F8-theta	4.45219848365207e-07
T3-delta	2.543659808111459e-07
T3-beta	5.119819026400881e-07
T3-gamma	5.306171918600718e-07
T3-alpha	4.810072869377381e-07
T3-theta	4.45240411917888e-07
T4-delta	2.5419079381786986e-07
T4-beta	5.098902652814438e-07
T4-gamma	5.311966552992909e-07
T4-alpha	4.81199535776959e-07
T4-theta	4.4786058783764406e-07
T5-delta	2.5449953099909564e-07
T5-beta	5.098957492987971e-07
T5-gamma	5.324515742678575e-07
T5-alpha	4.828058125602762e-07
T5-theta	4.4788570894049543e-07
T6-delta	2.554237266778457e-07
T6-beta	5.105709571561681e-07
T6-gamma	5.324184179819939e-07
T6-alpha	4.7897754095759e-07
T6-theta	4.4536022223180965e-07
Fz-delta	2.566940418701555e-07
Fz-beta	5.125215223896822e-07
Fz-gamma	5.321780976785524e-07
Fz-alpha	4.875155171108305e-07
Fz-theta	4.498302672694918e-07
Cz-delta	2.55895088675442e-07
Cz-beta	5.135351141311896e-07
Cz-gamma	5.326472006312604e-07
Cz-alpha	4.859392421316237e-07
Cz-theta	4.516400897623182e-07
Pz-delta	2.566308069895276e-07
Pz-beta	5.128137628402262e-07
Pz-gamma	5.326533483690992e-07
Pz-alpha	4.843430257663851e-07
Pz-theta	4.469117886548741e-07

Table 10: K-S test p-values for AD group part II

Fp1-delta	0.20980393886566162
Fp1-beta	0.479096382856369
Fp1-gamma	0.13751810044050217
Fp1-alpha	0.5075842142105103
Fp1-theta	0.17823376506567
Fp2-delta	0.3989470452070236
Fp2-beta	0.43800119310617447
Fp2-gamma	0.25451332330703735
Fp2-alpha	0.2015676274895668
Fp2-theta	0.22697687149047852
F3-delta	1.0
F3-beta	1.0
F3-gamma	1.0
F3-alpha	1.0
F3-theta	0.24045893165497123
F4-delta	0.7281656339764595
F4-beta	0.8489041775465012
F4-gamma	0.22697687149047852
F4-alpha	0.4247525781393051
F4-theta	0.2015676274895668
C3-delta	0.5221440717577934
C3-beta	0.09456419944763184
C3-gamma	0.479096382856369
C3-alpha	0.6455853804945946
C3-theta	0.3052256628870964
C4-delta	0.46517620980739594
C4-beta	0.20980393886566162
C4-gamma	0.43800119310617447
C4-alpha	0.10925160348415375
C4-theta	0.9910601079463959
P3-delta	0.5670346617698669
P3-beta	0.03575380891561508
P3-gamma	0.5979221016168594
P3-alpha	0.10925160348415375
P3-theta	0.2842133492231369
P4-delta	0.9910601079463959
P4-beta	0.033681392669677734
P4-gamma	0.35016296058893204
P4-alpha	0.042608387768268585
P4-theta	0.49323366582393646
O1-delta	0.17090606689453125
O1-beta	0.08565542846918106
O1-gamma	0.7621389999985695
O1-alpha	0.10417398810386658
O1-theta	0.156909741461277
O2-delta	0.23591722548007965
O2-beta	0.38639477640390396
O2-gamma	0.33856552094221115
O2-alpha	0.07741569727659225
O2-theta	0.18578492105007172

Table 11: Wilcoxon Test P-values

F7-delta	0.6455853804945946
F7-beta	0.479096382856369
F7-gamma	0.23591722548007965
F7-alpha	0.38639477640390396
F7-theta	0.0020434409379959106
F8-delta	0.7621389999985695
F8-beta	0.5075842142105103
F8-gamma	0.18578492105007172
F8-alpha	0.6295278295874596
F8-theta	0.06981273740530014
T3-delta	0.9910601079463959
T3-beta	0.13751810044050217
T3-gamma	0.8665077835321426
T3-alpha	0.22697687149047852
T3-theta	0.009536407887935638
T4-delta	0.8841757625341415
T4-beta	0.5823858305811882
T4-gamma	0.156909741461277
T4-alpha	0.6455853804945946
T4-theta	0.2015676274895668
T5-delta	1.0
T5-beta	0.021778732538223267
T5-gamma	0.7281656339764595
T5-alpha	0.02322421222925186
T5-theta	0.053377434611320496
T6-delta	0.8841757625341415
T6-beta	0.08145394921302795
T6-gamma	0.9374814853072166
T6-alpha	0.08565542846918106
T6-theta	0.22697687149047852
Fz-delta	0.6618045940995216
Fz-beta	0.3989470452070236
Fz-gamma	0.6455853804945946
Fz-alpha	0.38639477640390396
Fz-theta	0.06981273740530014
Cz-delta	0.813923291862011
Cz-beta	0.2945980280637741
Cz-gamma	0.09002415090799332
Cz-alpha	0.7113664001226425
Cz-theta	0.43800119310617447
Pz-delta	0.5670346617698669
Pz-beta	0.024749115109443665
Pz-gamma	0.9374814853072166
Pz-alpha	0.029833190143108368
Pz-theta	0.5369088649749756

Table 12: Wilcoxon Test P-values Part II

## 2 Amplitude Histograms

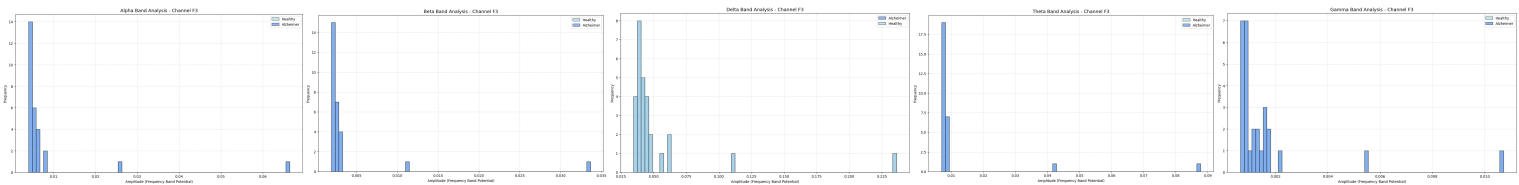


Figure 1: Alpha Band      Figure 2: Beta Band      Figure 3: Delta Band      Figure 4: Theta Band      Figure 5: Gamma Band

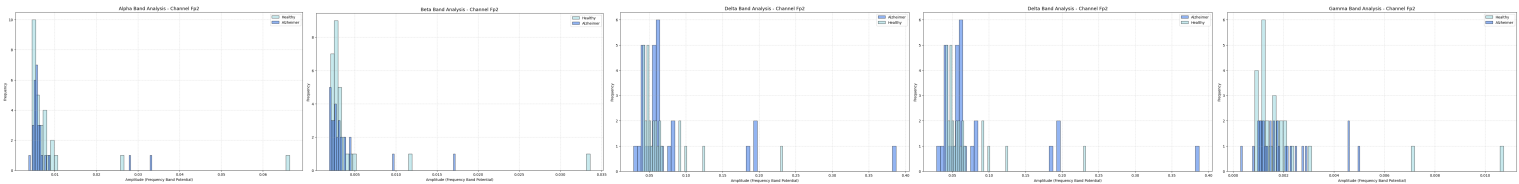


Figure 6: Alpha Band      Figure 7: Beta Band      Figure 8: Delta Band      Figure 9: Theta Band      Figure 10: Gamma Band

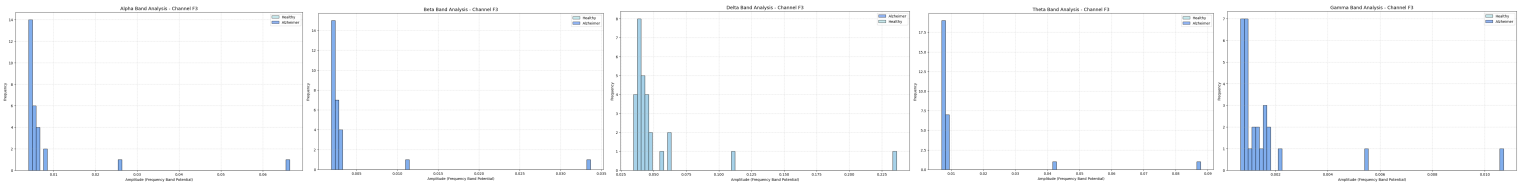


Figure 11: Alpha Band      Figure 12: Beta Band      Figure 13: Delta Band      Figure 14: Theta Band      Figure 15: Gamma Band



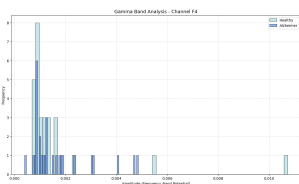
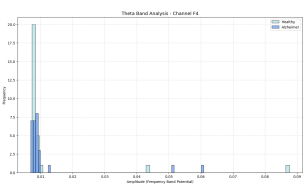
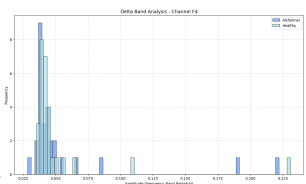
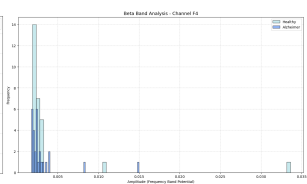
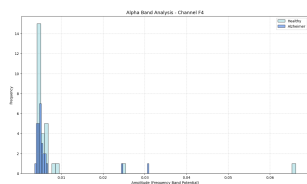


Figure 16: Alpha Band

Figure 17: Beta Band

Figure 18: Delta Band

Figure 19: Theta Band

Figure 20: Gamma Band

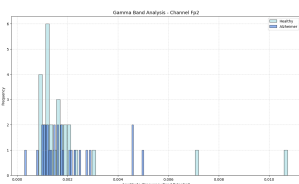
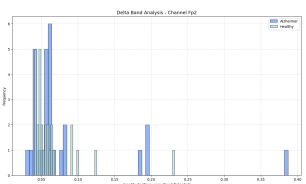
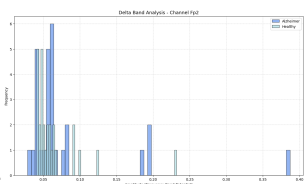
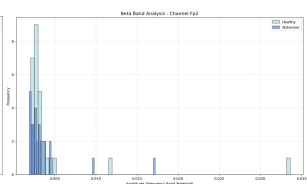
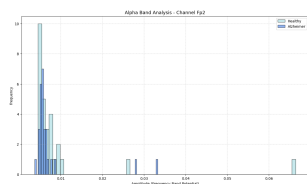


Figure 21: Alpha Band

Figure 22: Beta Band

Figure 23: Delta Band

Figure 24: Theta Band

Figure 25: Gamma Band

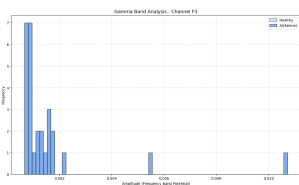
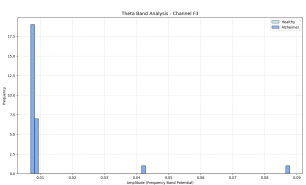
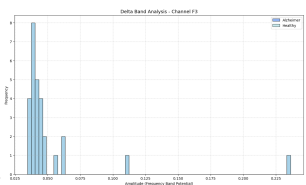
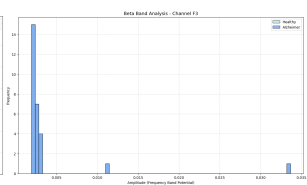
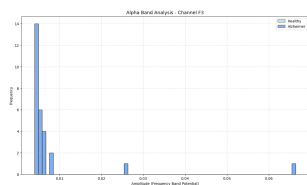


Figure 26: Alpha Band

Figure 27: Beta Band

Figure 28: Delta Band

Figure 29: Theta Band

Figure 30: Gamma Band