2nd IEEE International Challenge in Design Methods for Power Electronics

2025 IEEE Power Electronics Society

MagNetX Database

"From Steady-State to Transient Models!"

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GitHub Repository: https://github.com/minjiechen/magnetchallenge-2

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IEEE POWER ELECTRONICS SOCIETY
Powering a Sustainable Future

IEEE pels MagNetX Challenge 2

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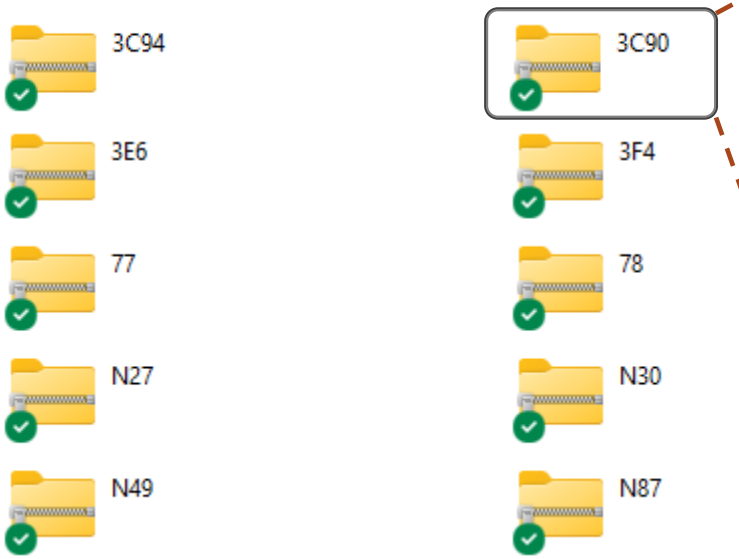
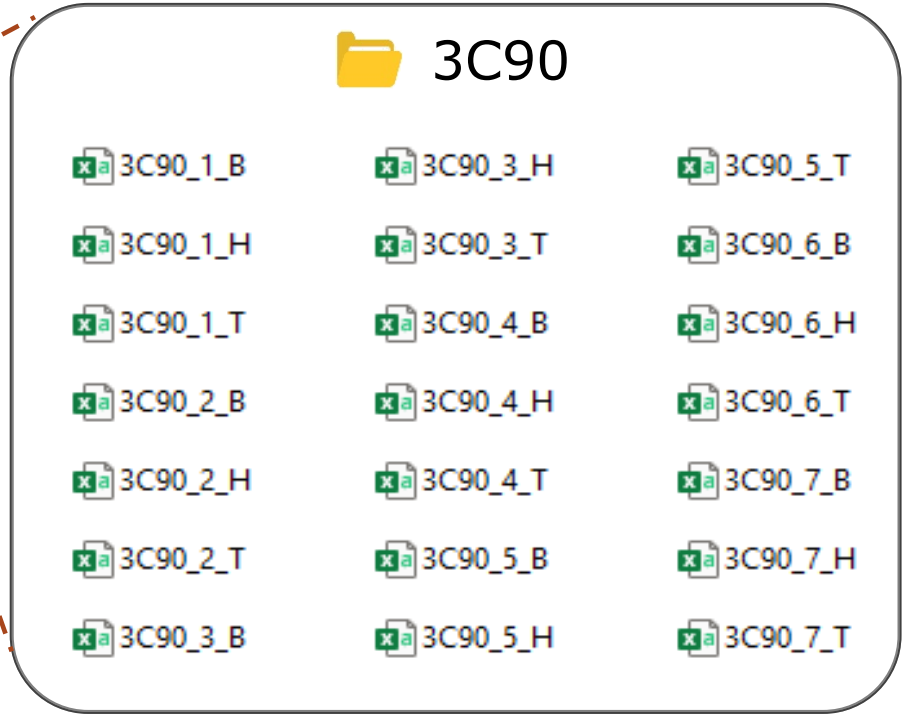
MagNetX Training Data Format

MagNetX Database/Training Data

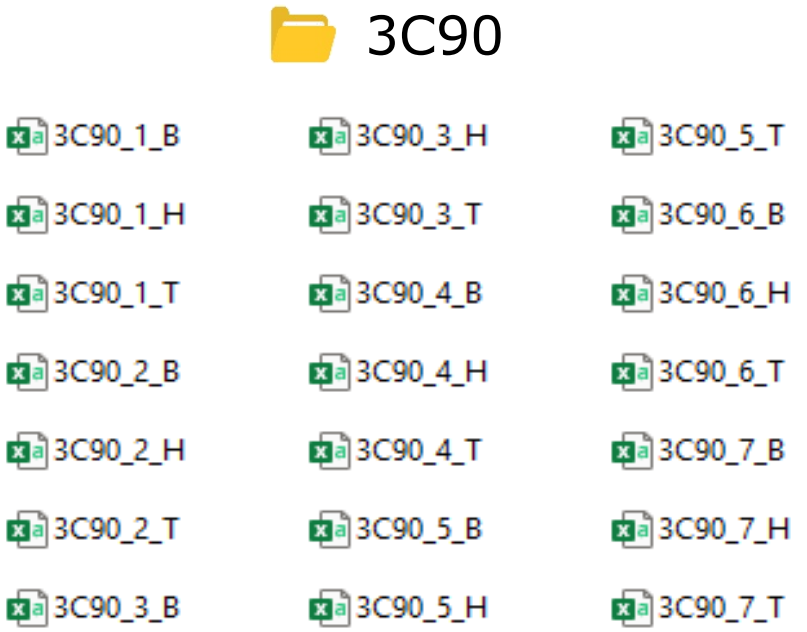


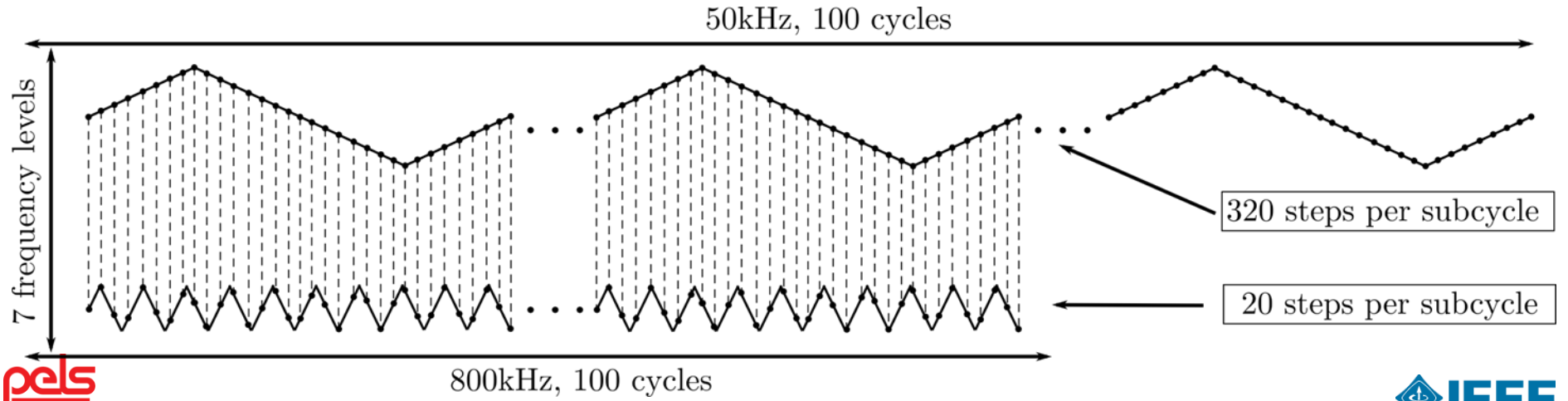


B: Magnetic flux density (T),
H: Magnetic field strength (A/m),
T: Temperature (℃)

Data Structure

- **Material format:**
  - 7 sets of B(t), H(t), T for each material
  - Frequency information not provided
- Sampling frequency for all sequences: 16 MHz
  - 50 kHz: 32016 steps
  - 80 kHz: 20016 steps
  - 125 kHz: 12816 steps
  - 200 kHz: 8015 steps
  - 320 kHz: 5008 steps
  - 500 kHz: 3216 steps
  - 800 kHz: 2016 steps





MagNetX Dataset: Transient waveforms

Each file contains multiple sequences such as

Sampling period (step size): 62.5 ns

Number of steps (e.g., 8015 steps)

Number of sequences (e.g., 3252)

	A	B	C	D	E	F	G	H	I	J	K	L
1	0.052893	0.053418	0.053942	0.054465	0.054988	0.055511	0.056033	0.056555	0.057076	0.057598	0.05812	0.058642
2	-0.02771	-0.0271	-0.02648	-0.02587	-0.02526	-0.02464	-0.02403	-0.02342	-0.02281	-0.0222	-0.02159	-0.02099
3	-0.08207	-0.08138	-0.08069	-0.08	-0.07932	-0.07863	-0.07794	-0.07725	-0.07656	-0.07587	-0.07519	-0.0745
4	-0.03456	-0.0338	-0.03304	-0.03228	-0.03152	-0.03076	-0.03	-0.02924	-0.02848	-0.02772	-0.02696	-0.02621
5	-0.12527	-0.1244	-0.12352	-0.12265	-0.12179	-0.12092	-0.12005	-0.11919	-0.11832	-0.11745	-0.11659	-0.11572
6	-0.13915	-0.13817	-0.13719	-0.13622	-0.13525	-0.13428	-0.13331	-0.13234	-0.13137	-0.1304	-0.12944	-0.12847
7	0.104345	0.10541	0.106476	0.107541	0.108606	0.109664	0.110692	0.111066	0.111005	0.109891	0.10878	0.107671
8	-0.15936	-0.15814	-0.15692	-0.1557	-0.15448	-0.15326	-0.15204	-0.15082	-0.14961	-0.14839	-0.14717	-0.14595
9	0.195704	0.197027	0.19835	0.199673	0.200995	0.202316	0.203637	0.204957	0.206277	0.207597	0.208917	0.210237
10	-0.14698	-0.14544	-0.14389	-0.14235	-0.14081	-0.13927	-0.13774	-0.13621	-0.13468	-0.13315	-0.13162	-0.13009
11	0.171896	0.173584	0.175272	0.176961	0.178647	0.180333	0.182019	0.183698	0.185374	0.187042	0.18871	0.190377
12	0.035239	0.037158	0.039079	0.041003	0.042928	0.044851	0.046763	0.048671	0.050576	0.052481	0.054385	0.056286
13	-0.08637	-0.08852	-0.09067	-0.09285	-0.09501	-0.09717	-0.09933	-0.10148	-0.10363	-0.10578	-0.10792	-0.11007
14	0.253046	0.255419	0.257791	0.260161	0.262534	0.264904	0.267268	0.269625	0.271977	0.274324	0.276671	0.279016
15	0.046167	0.046693	0.04722	0.047746	0.048271	0.048797	0.049323	0.049848	0.050374	0.050898	0.05142	0.051942
16	-0.01883	-0.01945	-0.02007	-0.02069	-0.0213	-0.02192	-0.02253	-0.02314	-0.02375	-0.02436	-0.02496	-0.02557
17	0.001559	0.002243	0.002925	0.003607	0.004288	0.004968	0.005639	0.005906	0.005903	0.00522	0.00453	0.003831
18	0.0627	0.063456	0.064213	0.064969	0.065722	0.066473	0.067221	0.067969	0.068718	0.069468	0.070218	0.070968
19	-0.08948	-0.08861	-0.08774	-0.08687	-0.08601	-0.08514	-0.08428	-0.08342	-0.08256	-0.0817	-0.08084	-0.07998
20	-0.06056	-0.0596	-0.05864	-0.05768	-0.05672	-0.05575	-0.05479	-0.05383	-0.05287	-0.05191	-0.05095	-0.04999
21	-0.09311	-0.09203	-0.09094	-0.08986	-0.08878	-0.0877	-0.08661	-0.08553	-0.08445	-0.08337	-0.08229	-0.0812
22	0.135878	0.137063	0.138248	0.139432	0.140616	0.141774	0.142823	0.143134	0.142952	0.141686	0.140426	0.139177

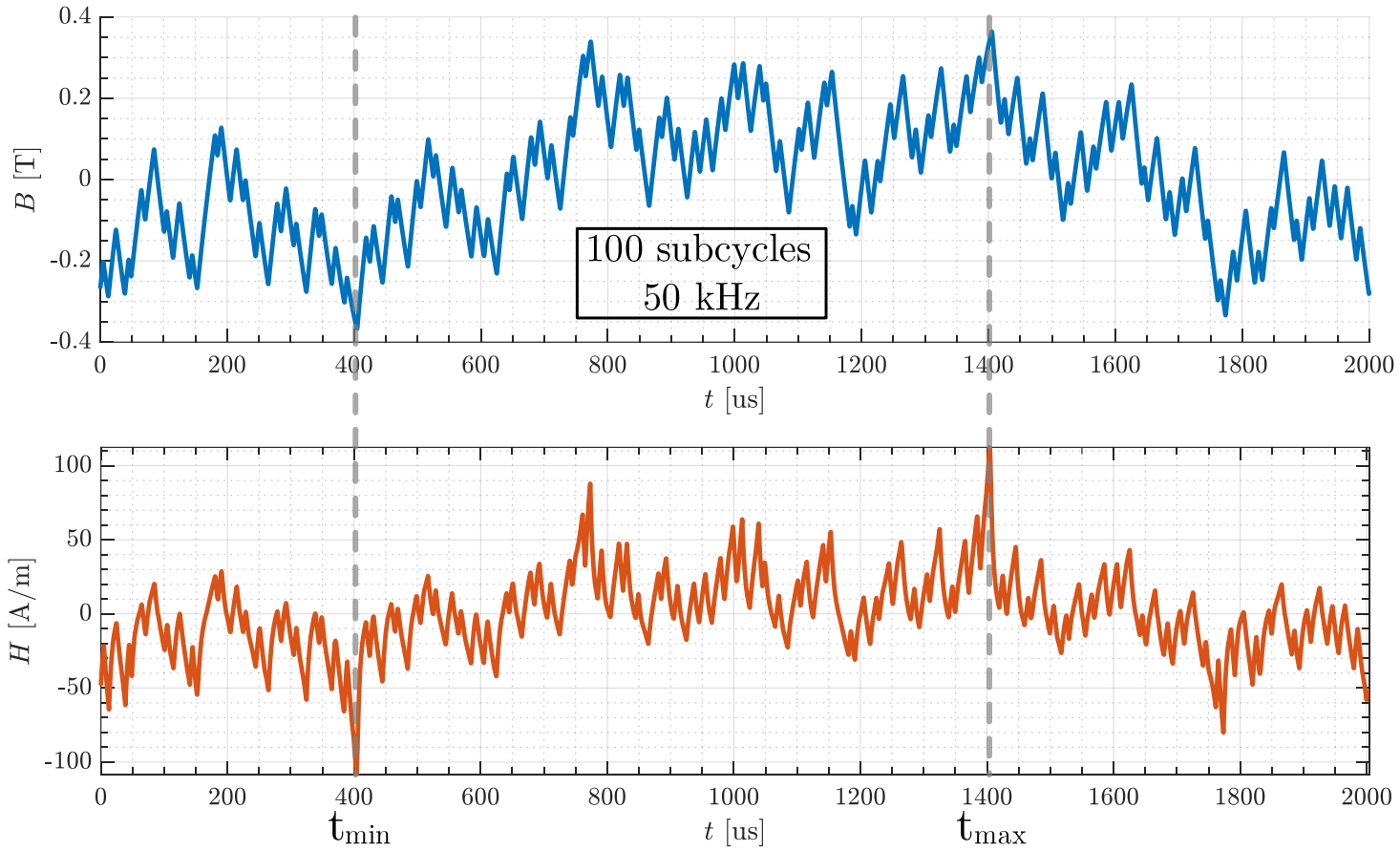
3C90_4_B

MagNetX Dataset: Transient waveforms

Each folder contains B/H waveforms such as

3C90_1_B

3C90_1_H



MagNetX Database

Material	Data Sequence
Ferroxcube 3C90	13,587
Ferroxcube 3C94	9,224
Ferroxcube 3E6	7,407
Ferroxcube 3F4	10,714
Fair-Rite 77	10,726
Fair-Rite 78	9,845
TDK N27	11,456
TDK N30	10,580
TDK N49	7,266
TDK N87	12,313
Total	103,118

10 ferrite materials

Fixed sampling frequency: 16 MHz

Frequency: 50 – 800 kHz

Temperature: 25, 50, 70 °C

Duty cycle step changes:
D = 0.2 – 0.8, min step size = 0.1

100 subcycles per sequence