

TRANSVERSE RW IMPEDANCE FORMULAE: COMPARISON ON A TEST EXAMPLE

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◆ Formalisms compared

- **Vos** (General formula derived by me from 2 papers of Vos, and implemented by Alex Koschik)
- **Burov-Lebedev** (Implemented by Alex Koschik for any number of layers, FZ, and myself for 2 layers)
- **Zotter** (General formula derived by me for 1 and 2 layers and implemented by me)

TEST EXAMPLE

- ◆ Round pipe
- ◆ Radius = 1.5 mm
- ◆ Length = 1m
- ◆ 2.5 cm of Graphite and vacuum outside
- ◆ Resistivity = $10 \mu\Omega\text{m}$

Norm. impedance value \ f [Hz]	10^3	10^4	10^5	10^6	10^7	10^8	10^9	10^{10}
BL from AK / BL from EM (Re)	1	1	1	1	1	1	1	1
BL from AK / BL from EM (Im)	1	1	1	1	1	1	1	1
BL from AK / BL from FZ (Re)	0.14	0.13	0.28	0.57	0.83	0.95	0.98	0.99
BL from AK / BL from FZ (Im)	0.53	0.54	0.64	0.83	0.97	0.99	0.99	1
BL from AK / Vos from AK (Re)	0.18	0.43	0.84	1.16	1.13	1.05	1.01	1.01
BL from AK / Vos from AK (Im)	1.00	1.05	1.10	1.13	1.05	1.01	1.00	1.00
BL from AK / Zotter 1 layer from EM (Re)	0.87*	1.05	1.00	1.00	1.00	1.00	1.00	1.00
BL from AK / Zotter 1 layer from EM (Im)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
BL from AK / Zotter 2 layers from EM (Re)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
BL from AK / Zotter 2 layers from EM (Im)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
BL from AK / Class. Thick (Re)	0.00	0.00	0.03	0.22	0.60	0.85	0.95	0.98
BL from AK / Class. Thick (Im)	0.03	0.09	0.28	0.65	0.93	0.99	1.00	1.00

*** A difference is expected here at very low frequency as only 1 layer is used instead of 2 (the same applies for the classical thick-wall formula)**

CONCLUSION

- ◆ It is normal that I find the same result as AK for BL because I use AK's multi-layer formula for BL (I checked that it simplifies to my implementation for 2 layers) !
- ◆ BL implemented by AK (multi-layer) and Zotter derived and implemented by me (for 2 layers) are very close (on this 2-layer example) \Rightarrow I will put in the minutes my Mathematica Notebook to have it available for everybody (waiting for the general multi-layer implementation by Zotter in LAWAT2000). I already sent it to several people this morning