Letter to the Editor-in-Chief of "Inverse Problems" Prof. S R Arridge

T. Nara, T. Furuichi and M. Fushimi, the authors of paper "*An explicit reconstraction method for magnetic resonance electrical property tomography based on the generalized Cauchy formula*" published in IP 33 105005 (2017), deny Theorem 1 of my paper

V Palamodov "*An analytic method for the inverse problem of MREPT*" published in IP 32 035003 (2016).

T. Nara, T. Furuichu and M Fushimi write on page 4:

"*However, equation (1.12)*:

$$\exp(-F)\, h_2 = \frac{i\omega\mu_0}{4}\partial_\zeta \left(H^+\right)^2$$

is incorrect in that the dimensions of the left and right hand sides are different. In fact, they are $L^2MT^{-3}I^{-2}$ *and* $L^{-2}MT^{-3}$*, respectively, where* L, M, T *and* I *are the dimensions of length, mass, time, and electric current, respectively. Accordingly, equation (1.13) is incorrect."*

The statements of T. Nara *et al* are erroneous. Calculating dimension of the left hand side of (1.12) in the same SI system we have

$$[h_2] = \left[\frac{\omega\mu_0 H^+}{\partial_\zeta H^+}\right] = \sec^{-1}\mathrm{m}\,[\mu_0]\,,$$

where $[v]$ means dimension of a physical quantity v. Equation $\exp(-F) = (\partial_\zeta H^+)^2$ is obtained by exponentiation of the dimensionless equation $F = -2\log\partial_\zeta H^+$ (two lines above). Therefore

$$[\exp(-F)] = \left[\left(\partial_\zeta H^+\right)^2\right] = \mathrm{m}^{-2}\,[H]^2\,,$$

where $[H] = \mathrm{Am}^{-1}$ is the dimension of the magnetic field H. It follows that dimension of the left side of (1.12) is $\sec^{-1}\mathrm{m}^{-1}\,[\mu_0]\,[H]^2$. The right hand side of (1.12) has the same dimension

$$\left[\omega\mu_0\partial_\zeta \left(H^+\right)^2\right] = \sec^{-1}[\mu_0]\,\mathrm{m}^{-1}\,[H]^2$$

Q.E.D. Now check correctness of (1.13). We have

$$[\mu_0] = \mathrm{m}^{-1}\mathrm{H},\ \kappa = \sec^{-1}[\varepsilon]\,,\ [\varepsilon] = \mathrm{m}^{-1}\mathrm{F}$$

where H and F mean Henry and Farad respectively. This yields

$$[\lambda] = [\kappa]^{-1} = [\omega\varepsilon]^{-1} = \mathrm{m}\sec \mathrm{F}^{-1}$$

and

$$\left[\frac{\omega\mu_0}{\left(\partial_\zeta H^+\right)^2}\left(\frac{1}{\pi\zeta} * \partial_\zeta \left(H^+\right)^2 + f\right)\right] = \mathrm{m}^2\,[\omega\mu_0] = \mathrm{m}\sec^{-1}\mathrm{H}$$

The right hand sides coincide since

$$\mathrm{H} = \sec^2 \mathrm{F}^{-1}.$$

Concerning the informative part of the paper I note that T Nara and coauthors use essentially the method of my paper: reduction to a problem of complex analysis. I will not comment this paper in more details.

I ask the Editorial Board to publish my response to the critics of T Nara and coauthors.

P.S. I am surprised that I was not informed on the earlier step of the publication of this paper containing such a criticism and IP has published the paper of T Nara *et al* that could damage the scientific reputation of any side.

Best regards,
sincerely

Prof. Victor Palamodov