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Optical electrical antiferromagnetic microfluidical mKDV magnetomotive phase

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Abstract
In this manuscript, we illustrate antiferromagnetic geometric electric *Heisenberg*-microfluidical axially mKdV **r**-electrical $\phi(\mathbf{r}), \phi(\mathbf{t}), \phi(\mathbf{n})$ flux solidity in spherical Heisenberg group. Then, we get optical electric *Heisenberg*-microfluidical mKdV **r**-magnetomotive $\phi(\mathbf{r}), \phi(\mathbf{t}), \phi(\mathbf{n})$ phase. Also, we obtain antiferromagnetic axially electrical *Heisenberg*-microfluidical mKdV **r**-electrical $\phi(\mathbf{r}), \phi(\mathbf{t}), \phi(\mathbf{n})$ flux **r**-direction orbit in spherical Heisenberg group. Finally, we have antiferromagnetic optical electric *Heisenberg*-microfluidical mKdV **r**-magnetomotive $\phi(\mathbf{r}), \phi(\mathbf{t}), \phi(\mathbf{n})$ phase.

Keywords Optical flux solidity · Optical electric flux · **r**–magnetomotive · Electromotive phase

1 Introduction

Optical microscale modeling of ferromagnetic phases with electromagnetism in ferro-phases for optical applications is an important research area in quantum implications, optical data storage, magneto-optics, optical switching, and more, ultimately contributing to the fields of materials science and optical physics. Physical microscale structures in optics offer a vast range of possibilities, spanning fields as diverse as telecommunications, quantum technologies, biomedicine, energy harvesting, and environmental monitoring (Whitesides 2006; Leber et al. 2018; Eastman et al. 2001; Choi et al. 1999; Rogers et al. 2010; Ryu 2018; Ghadimi et al. 2011; Sun et al. 2017; Sarkar 2011; Ricca 2005; Fukami et al. 2019; Liu et al. 2020; Körpınar et al. 2021a; Ling et al. 2016; Körpınar et al. 2021b; Körpınar and Körpınar 2022a; Dai et al. 2015; Körpınar and Körpınar 2021a; Danesh et al. 2012).

Optical modeling of energy flux through the integration of ferromagnetic phases and electromagnetism has broad applications, ranging from electronics and energy

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conversion to flexible phases and various optical fields. It has the potential to advance technology in diverse systems and contribute to more efficient and sustainable solutions (Körpınar and Körpınar 2021b; Körpınar and Korpinar 2022b, c; Körpınar et al. 2022a; Daneshmehr and Rajabpoor 2014; Farajpour et al. 2014; Ghayesh and Farokhi 2017; Farokhi and Ghayesh 2015; Ghayesh and Farokhi 2017; Körpınar et al. 2020a).

Electromagnetic properties of ferrophases have optical applications in a diverse design of optical geometric applications, including optical isolation, modulation, storage, and sensing. Optical nonlinear geometric systems for electromagnetic fields in controllable models produce the development of innovative optical components and systems with applications in fiber technology, quantum electronics, and mathematical physics (Körpınar and Körpınar 2021a; Sordo 2019; Körpınar et al. 2022b, 2021c; Yan 2019; Chou and Qu 2001; Marí Beffa et al. 2002; Marí Beffa 2009; Calini and Ivey 2005; Marí Beffa and Olver 2010; Körpınar et al. 2020b; Körpınar 2020; Körpınar et al. 2021d; Bhatnagar et al. 2019; Körpınar et al. 2021e; Körpınar and Körpınar 2021c; Korpinar and Körpınar 2021d; Ashkin et al. 1986; Dholakia and Zemánek 2010; Burns et al. 1989; Chaumet and Nieto-Vesperinas 2001; Almaas and Brevik 2013; Körpınar et al. 2019a, b; Bliokh 2009; Bliokh et al. 2008; Körpınar et al. 2021f; Fukumoto and Miyazaki 1991).

This work is prepared as: In Sect. 2, principle classifications and concepts of mKdV model are given. In Sect. 3, we obtain antiferromagnetic geometric electric *Heisenberg*-microfluidical axially mKdV $\mathbf{r}$-electrical $\phi(\mathbf{r}), \phi(\mathbf{t}), \phi(\mathbf{n})$ flux solidity in spherical Heisenberg group. Then, we get optical electric *Heisenberg*-microfluidical mKdV $\mathbf{r}$ -magnetomotive $\phi(\mathbf{r}), \phi(\mathbf{t}), \phi(\mathbf{n})$ phase. Also, we obtain antiferromagnetic axially electrical *Heisenberg*-microfluidical mKdV $\mathbf{r}$-electrical $\phi(\mathbf{r}), \phi(\mathbf{t}), \phi(\mathbf{n})$ flux $\mathbf{r}$-direction orbit in spherical Heisenberg group. Finally, we have antiferromagnetic optical electric *Heisenberg*-microfluidical mKdV $\mathbf{r}$-magnetomotive $\phi(\mathbf{r}), \phi(\mathbf{t}), \phi(\mathbf{n})$ phase. The conclusion is presented in Sect. 4.

2 Heisenberg metric with mKdV model

Heisenberg metric g is

$$g = dx^2 + (dz - xdy)^2 + dy^2.$$

Orthonormal basis fields of Heisenberg space are

$$\begin{aligned}
\mathbf{e}_1 &= \frac{\partial}{\partial x}, \\
\mathbf{e}_2 &= \frac{\partial}{\partial y} + x\frac{\partial}{\partial z}, \\
\mathbf{e}_3 &= \frac{\partial}{\partial z}.
\end{aligned}$$

Optical mKdV modeling on $\mathbb{S}^2$ is given

$$\mathbf{r}_{\pi} = \mathbf{r}_{sss} + \frac{3}{2}(\mathbf{r}_{ss} \times (\mathbf{r}_{s} \times \mathbf{r}_{ss})) = \frac{1}{2}(1 + \Upsilon^{2})\mathbf{t} + \Upsilon_{s}\mathbf{n},$$

where

$$\begin{aligned}
\mathbf{r}_{\pi} &= \frac{1}{2}(\mathcal{F})\mathbf{t} + \Upsilon_{s}\mathbf{n},\\
\mathbf{t}_{\pi} &= -\frac{1}{2}(\mathcal{F})r + \left(\frac{1}{2}\Upsilon(\mathcal{F}) + \Upsilon_{ss}\right)\mathbf{n},\\
\mathbf{n}_{\pi} &= -\Upsilon_{s}\mathbf{r} - \left(\Upsilon_{ss} + \frac{1}{2}(\mathcal{F})\Upsilon\right)\mathbf{t},
\end{aligned}$$

and frame equations are

$$\begin{aligned}
\mathbf{r}_{s} &= \mathbf{t},\\
\mathbf{t}_{s} &= -\mathbf{r} + \Upsilon\mathbf{n},\\
\mathbf{n}_{s} &= -\Upsilon\mathbf{t}.
\end{aligned}$$

Geometric product is defined

$$\mathbf{t} = \mathbf{n} \times \mathbf{r},\ \mathbf{n} = \mathbf{r} \times \mathbf{t},\ \mathbf{r} = \mathbf{t} \times \mathbf{n}.$$

Compatibility conditons of $\mathbf{t}_{s\pi} = \mathbf{t}_{\pi s},\ \mathbf{n}_{s\pi} = \mathbf{n}_{\pi s}$ is constructred

$$\Upsilon_{\pi} = \frac{3}{2}\mathcal{F}\Upsilon_{s} + \Upsilon_{sss},$$

where $\Upsilon^{2} + 1 = \mathcal{F}$.

By Lorentz forces we get

$$\begin{aligned}
\phi(\mathbf{r}) &= \varrho\chi_{2}\mathbf{e}_{1} - \varrho\chi_{1}\mathbf{e}_{2} + \cos\varphi\mathbf{e}_{3},\\
\phi(\mathbf{t}) &= -\left(\frac{\omega}{\varrho}\sin^{3}\varphi + \chi_{1}\right)\mathbf{e}_{1} + \left(\omega\chi_{4} - \chi_{2}\right)\mathbf{e}_{2} - \left(\chi_{3} + \frac{\omega}{\varrho}\sin^{3}\varphi\right)\mathbf{e}_{3},\\
\phi(\mathbf{n}) &= -\omega\varrho\chi_{2}\mathbf{e}_{1} + \omega\varrho\chi_{1}\mathbf{e}_{2} - \omega\cos\varphi\mathbf{e}_{3},\\
\mathcal{B} &= \left(\chi_{1}\omega - \frac{1}{\varrho}\sin^{3}\varphi\right)\mathbf{e}_{1} + \left(\chi_{2}\omega + \chi_{4}\right)\mathbf{e}_{2} + \left(\chi_{3}\omega - \frac{1}{\varrho}\sin^{3}\varphi\right)\mathbf{e}_{3},\\
\mathcal{E} &= -\left(\frac{1}{\varrho}\left(\varkappa\frac{\varpi}{\vartheta} + \omega\right)\sin^{3}\varphi + \chi_{1}\left(\frac{\varpi}{\vartheta} + 1\right)\right)\mathbf{e}_{1} + \left(\chi_{4}\left(\varkappa\frac{\varpi}{\vartheta}\right.\right.\\
&\quad \left.\left. + \omega\right) - \chi_{2}\left(\frac{\varpi}{\vartheta} + 1\right)\right)\mathbf{e}_{2} - \left(\chi_{3}\left(\frac{\varpi}{\vartheta} + 1\right) + \frac{1}{\varrho}\left(\varkappa\frac{\varpi}{\vartheta} + \omega\right)\sin^{3}\varphi\right)\mathbf{e}_{3}.
\end{aligned}$$

where $\omega = g(\phi(\mathbf{t}), \mathbf{n})$. Then

$$\nabla_s\phi(\mathbf{r}) = -\left(\chi_1 + \frac{\Upsilon}{\varrho}\sin^3\varphi\right)\mathbf{e}_1 + \left(\chi_4\Upsilon - \chi_2\right)\mathbf{e}_2 - \left(\frac{\Upsilon}{\varrho}\sin^3\varphi + \chi_3\right)\mathbf{e}_3$$

$$\nabla_s\phi(\mathbf{t}) = -\left(\frac{\omega_s}{\varrho}\sin^3\varphi + \chi_2\left(1+\omega\Upsilon\right)\varrho\right)\mathbf{e}_1 + \left(\omega_s\chi_4 + \varrho\left(1+\omega\Upsilon\right)\chi_1\right)\mathbf{e}_2 - \left(\cos\varphi\left(1+\omega\Upsilon\right) + \frac{\omega_s}{\varrho}\sin^3\varphi\right)\mathbf{e}_3,$$

$$\nabla_s\phi(\mathbf{n}) = \left(\chi_1\omega - \frac{1}{\varrho}\sin^3\varphi\omega\Upsilon - \chi_2\omega_s\varrho\right)\mathbf{e}_1 + \left(\omega_s\varrho\chi_1 + \chi_2\omega + \omega\Upsilon\chi_4\right)\mathbf{e}_2 + \left(\chi_3\omega - \cos\varphi\omega_s - \frac{1}{\varrho}\omega\Upsilon\sin^3\varphi\right)\mathbf{e}_3,$$

$$\nabla_s\mathcal{B} = \left(\chi_1\omega_s + \varrho\left(\omega - \Upsilon\right)\chi_2\right)\mathbf{e}_1 + \left(\omega_s\chi_2 - \varrho\chi_1\left(\omega - \Upsilon\right)\right)\mathbf{e}_2 + \left(\chi_3\omega_s + \cos\varphi\left(\omega - \Upsilon\right)\right)\mathbf{e}_3,$$

$$\nabla_s\mathcal{E} = \left(\frac{\Upsilon}{\varrho}\left(\omega + \frac{\varpi}{\vartheta}\varkappa\right)\sin^3\varphi - \chi_1\left(\frac{\varpi}{\vartheta}+1\right) + \varrho\left(\omega_s + \frac{\varkappa_s\varpi}{\vartheta}\right)\chi_2\right)\mathbf{e}_1 - \left(\left(\omega + \frac{\varpi}{\vartheta}\varkappa\right)\chi_4\Upsilon + \varrho\chi_1\left(\omega_s + \frac{\varkappa_s\varpi}{\vartheta}\right) + \chi_2\left(\frac{\varpi}{\vartheta}+1\right)\right)\mathbf{e}_2 + \left(\cos\varphi\left(\omega_s + \frac{\varkappa_s\varpi}{\vartheta}\right) - \left(\frac{\varpi}{\vartheta}+1\right)\chi_3\frac{\Upsilon}{\varrho}\sin^3\varphi\left(\omega + \frac{\varpi}{\vartheta}\varkappa\right)\right)\mathbf{e}_3,$$

and

$$\nabla_\pi\mathbf{r} = \left(\frac{\mathcal{F}}{2}\varrho\chi_2 - \frac{1}{\varrho}\Upsilon_s\sin^3\varphi\right)\mathbf{e}_1 + \left(\chi_4\Upsilon_s - \frac{\mathcal{F}}{2}\varrho\chi_1\right)\mathbf{e}_2 + \left(\frac{\mathcal{F}}{2}\cos\varphi - \frac{1}{\varrho}\sin^3\varphi\Upsilon_s\right)\mathbf{e}_3,$$

$$\nabla_\pi\mathbf{t} = -\left(\frac{\mathcal{F}}{2}\chi_1 + \frac{1}{\varrho}\sin^3\varphi\left(\frac{\mathcal{F}\Upsilon}{2} + \Upsilon_{ss}\right)\right)\mathbf{e}_1 + \left(\chi_4\left(\frac{\mathcal{F}\Upsilon}{2} + \Upsilon_{ss}\right) - \frac{\mathcal{F}}{2}\chi_2\right)\mathbf{e}_2 - \left(\frac{1}{\varrho}\sin^3\varphi\left(\frac{\mathcal{F}\Upsilon}{2} + \Upsilon_{ss}\right) + \frac{\mathcal{F}}{2}\chi_3\right)\mathbf{e}_3,$$

$$\nabla_\pi\mathbf{n} = -\left(\chi_2\left(\Upsilon_{ss} + \frac{\Upsilon\mathcal{F}}{2}\right)\varrho + \chi_1\Upsilon_s\right)\mathbf{e}_1 + \left(\Upsilon_s\chi_2 + \chi_1\left(\Upsilon_{ss} + \frac{\Upsilon\mathcal{F}}{2}\right)\varrho\right)\mathbf{e}_2 - \left(\left(\Upsilon_{ss} + \frac{\Upsilon\mathcal{F}}{2}\right)\cos\varphi + \chi_3\Upsilon_s\right)\mathbf{e}_3.$$

Also, mKdV motion conditions of fields are

$$\phi(\mathbf{r})\times\nabla_s\phi(\mathbf{r})=\Big(\chi_1\Upsilon-\frac{1}{\varrho}\sin^3\varphi\Big)\mathbf{e}_1+\Big(\chi_2\Upsilon+\chi_4\Big)\mathbf{e}_2+\Big(-\frac{1}{\varrho}\sin^3\varphi+\chi_3\Upsilon\Big)\mathbf{e}_3.$$

$$\begin{aligned}\phi(\mathbf{t})\times\nabla_s\phi(\mathbf{t})=&\Big(\chi_1\omega\Big(1+\omega\Upsilon\Big)-\frac{\Big(1+\Upsilon\omega\Big)}{\varrho}\sin^3\varphi+\varrho\omega_s\chi_2\Big)\mathbf{e}_1\\&+\Big(-\varrho\chi_1\omega_s+\chi_4\Big(1+\Upsilon\omega\Big)+\omega\Big(1+\omega\Upsilon\Big)\chi_2\Big)\mathbf{e}_2\\&+\Big(\chi_3\omega\Big(1+\omega\Upsilon\Big)+\cos\varphi\omega_s-\frac{\Big(1+\Upsilon\omega\Big)}{\varrho}\sin^3\varphi\Big)\mathbf{e}_3,\end{aligned}$$

$$\phi(\mathbf{n})\times\nabla_s\phi(\mathbf{n})=\Big(\chi_1\omega^2\Upsilon-\frac{\omega^2}{\varrho}\sin^3\varphi\Big)\mathbf{e}_1+\Big(\chi_4\omega^2+\chi_2\omega^2\Upsilon\Big)\mathbf{e}_2+\Big(-\frac{\omega^2}{\varrho}\sin^3\varphi+\omega^2\Upsilon\chi_3\Big)\mathbf{e}_3,$$

and

$$\begin{aligned}\nabla_\pi\phi(\mathbf{r})=&-\Big(\frac{\mathcal{F}}{2}\chi_1+\frac{1}{\varrho}\sin^3\varphi\Big(\frac{\mathcal{F}}{2}\Upsilon+\Upsilon_{ss}\Big)\Big)\mathbf{e}_1+\Big(\chi_4\Big(\frac{\mathcal{F}}{2}\Upsilon\\&+\Upsilon_{ss}\Big)-\frac{\mathcal{F}}{2}\chi_2\Big)\mathbf{e}_2-\Big(\frac{1}{\varrho}\Big(\frac{\mathcal{F}}{2}\Upsilon+\Upsilon_{ss}\Big)\sin^3\varphi+\frac{\mathcal{F}}{2}\chi_3\Big)\mathbf{e}_3,\\
\nabla_\pi\phi(\mathbf{t})=&-\Big(\Upsilon_s\omega\chi_1+\chi_2\Big(\Big(\Upsilon_{ss}+\frac{\Upsilon\mathcal{F}}{2}\Big)\omega+\frac{\mathcal{F}}{2}\Big)\varrho+\frac{1}{\varrho}\Big(-\Upsilon_s+\omega_\pi\Big)\sin^3\varphi\Big)\mathbf{e}_1\\&+\Big(\varrho\Big(\frac{\mathcal{F}}{2}+\Big(\Upsilon_{ss}+\frac{\Upsilon\mathcal{F}}{2}\Big)\omega\Big)\chi_1+\chi_4\Big(-\Upsilon_s+\omega_\pi\Big)-\Upsilon_s\omega\chi_2\Big)\mathbf{e}_2\\&-\Big(\cos\varphi\Big(\omega\Big(\Upsilon_{ss}+\frac{\Upsilon\mathcal{F}}{2}\Big)+\frac{\mathcal{F}}{2}\Big)+\Upsilon_s\omega\chi_3+\frac{1}{\varrho}\sin^3\varphi\Big(-\Upsilon_s+\omega_\pi\Big)\Big)\mathbf{e}_3,\\
\nabla_\pi\phi(\mathbf{n})=&\Big(\Big(\frac{\mathcal{F}\Upsilon}{2}+\Upsilon_{ss}\Big)\frac{1}{\varrho}\sin^3\varphi\omega-\omega_\pi\varrho\chi_2+\frac{\mathcal{F}}{2}\chi_1\omega\Big)\mathbf{e}_1+\Big(\frac{\mathcal{F}}{2}\chi_2\omega-\Big(\frac{\mathcal{F}\Upsilon}{2}\\&+\Upsilon_{ss}\Big)\chi_4\omega+\omega_\pi\varrho\chi_1\Big)\mathbf{e}_2+\Big(\frac{\omega}{2}\chi_3\mathcal{F}-\cos\varphi\omega_\pi+\frac{1}{\varrho}\Big(\frac{\mathcal{F}\Upsilon}{2}+\Upsilon_{ss}\Big)\sin^3\varphi\omega\Big)\mathbf{e}_3,\\
\nabla_\pi\mathcal{B}=&\Big(\Big(-\Upsilon_s+\omega_\pi\Big)\chi_1+\varrho\Big(\frac{\mathcal{F}}{2}\omega-\Big(\frac{\Upsilon\mathcal{F}}{2}+\Upsilon_{ss}\Big)\Big)\chi_2-\frac{1}{\varrho}\omega\Upsilon_s\sin^3\varphi\Big)\mathbf{e}_1\\&+\Big(-\varrho\chi_1\Big(\frac{\mathcal{F}}{2}\omega-\Big(\frac{\Upsilon\mathcal{F}}{2}+\Upsilon_{ss}\Big)\Big)+\chi_4\omega\Upsilon_s+\chi_2\Big(-\Upsilon_s+\omega_\pi\Big)\Big)\mathbf{e}_2\\&+\Big(\Big(-\Upsilon_s+\omega_\pi\Big)\chi_3-\frac{1}{\varrho}\omega\Upsilon_s\sin^3\varphi+\cos\varphi\Big(\frac{\mathcal{F}}{2}\omega-\Big(\frac{\Upsilon\mathcal{F}}{2}+\Upsilon_{ss}\Big)\Big)\Big)\mathbf{e}_3,\\
\nabla_\pi\mathcal{E}=&-\Big(\frac{1}{\varrho}\Big(-\Big(\frac{\varpi}{\vartheta}+1\Big)\Upsilon_s+\Big(\omega_\pi+\varkappa_\pi\frac{\varpi}{\vartheta}\Big)\Big)\sin^3\varphi+\Upsilon_s\Big(\omega+\frac{\varkappa\varpi}{\vartheta}\Big)\chi_1\\&+\Big(\frac{1}{2}\mathcal{F}\Big(\frac{\varpi}{\vartheta}+1\Big)+\Big(\Upsilon_{ss}+\frac{\Upsilon\mathcal{F}}{2}\Big)\Big(\omega+\frac{\varkappa\varpi}{\vartheta}\Big)\Big)\varrho\chi_2\Big)\mathbf{e}_1+\Big(\chi_4\Big(-\Big(\frac{\varpi}{\vartheta}+1\Big)\Upsilon_s\\&+\Big(\omega_\pi+\varkappa_\pi\frac{\varpi}{\vartheta}\Big)\Big)+\Big(\frac{1}{2}\mathcal{F}\Big(\frac{\varpi}{\vartheta}+1\Big)+\Big(\Upsilon_{ss}+\frac{\Upsilon\mathcal{F}}{2}\Big)\Big(\omega+\frac{\varkappa\varpi}{\vartheta}\Big)\Big)\varrho\chi_1\\&-\Upsilon_s\Big(\omega+\frac{\varkappa\varpi}{\vartheta}\Big)\chi_2\Big)\mathbf{e}_2-\Big(\Upsilon_s\Big(\omega+\frac{\varkappa\varpi}{\vartheta}\Big)\chi_3+\frac{1}{\varrho}\Big(-\Big(\frac{\varpi}{\vartheta}+1\Big)\Upsilon_s+\Big(\omega_\pi\\&+\varkappa_\pi\frac{\varpi}{\vartheta}\Big)\Big)\sin^3\varphi+\Big(\frac{1}{2}\mathcal{F}\Big(\frac{\varpi}{\vartheta}+1\Big)+\Big(\Upsilon_{ss}+\frac{\Upsilon\mathcal{F}}{2}\Big)\Big(\omega+\frac{\varkappa\varpi}{\vartheta}\Big)\Big)\cos\varphi\Big)\mathbf{e}_3.\end{aligned}$$

3 Antiferromagnetic optical *alfa*-microfluidical mKdV electric $\phi(\mathbf{r})$ flux

✠ *Optical electric Heisenberg-microfluidical mKdV* **r**-*magnetomotive* $\phi(\mathbf{r})$ *phase is*

$$\begin{aligned}\boldsymbol{E}^{\mathcal{E}}\phi(\mathbf{r}) =& \frac{d}{d\pi}\int_{\mathcal{F}}\Bigg(\varrho\Upsilon_{ss}\chi_1\Bigg(\chi_4\Bigg(-\left(\frac{\varpi}{\vartheta}+1\right)\Upsilon_s+\left(\omega_\pi+\varkappa_\pi\frac{\varpi}{\vartheta}\right)\Bigg)\Bigg)\\&+\left(\frac{1}{2}\mathcal{F}\left(\frac{\varpi}{\vartheta}+1\right)+\left(\Upsilon_{ss}+\frac{\Upsilon\mathcal{F}}{2}\right)\left(\omega+\frac{\varkappa\varpi}{\vartheta}\right)\right)\varrho\chi_1-\Upsilon_s\left(\omega+\frac{\varkappa\varpi}{\vartheta}\right)\chi_2\Bigg)\\&+\Upsilon_{ss}\varrho\chi_2\Bigg(\frac{1}{\varrho}\Bigg(-\left(\frac{\varpi}{\vartheta}+1\right)\Upsilon_s+\left(\omega_\pi+\varkappa_\pi\frac{\varpi}{\vartheta}\right)\Bigg)\sin^3\varphi+\Upsilon_s\Bigg(\omega\\&+\frac{\varkappa\varpi}{\vartheta}\Bigg)\chi_1+\left(\frac{1}{2}\mathcal{F}\left(\frac{\varpi}{\vartheta}+1\right)+\left(\Upsilon_{ss}+\frac{\Upsilon\mathcal{F}}{2}\right)\left(\omega+\frac{\varkappa\varpi}{\vartheta}\right)\right)\varrho\chi_2\Bigg)\\&+\Bigg(\Upsilon_s\left(\omega+\frac{\varkappa\varpi}{\vartheta}\right)\chi_3+\frac{1}{\varrho}\Bigg(-\left(\frac{\varpi}{\vartheta}+1\right)\Upsilon_s+\left(\omega_\pi+\varkappa_\pi\frac{\varpi}{\vartheta}\right)\Bigg)\sin^3\varphi\\&+\left(\frac{1}{2}\mathcal{F}\left(\frac{\varpi}{\vartheta}+1\right)+\left(\Upsilon_{ss}+\frac{\Upsilon\mathcal{F}}{2}\right)\left(\omega+\frac{\varkappa\varpi}{\vartheta}\right)\right)\cos\varphi\Bigg)\cos\varphi\Upsilon_{ss}\Bigg)d\mathcal{F}.\end{aligned}$$

In a similar product, we get

$$\nabla_s\phi(\mathbf{r})\times\nabla_\pi\phi(\mathbf{r})=\Upsilon_{ss}\varrho\chi_2\mathbf{e}_1-\varrho\Upsilon_{ss}\chi_1\mathbf{e}_2+\cos\varphi\Upsilon_{ss}\mathbf{e}_3.$$

✠ *Geometric electric Heisenberg- microfluidical mKdV* **r**-*electrical* $\phi(\mathbf{r})$ *flux solidity is*

$$\begin{aligned}\boldsymbol{L}^{\mathcal{E}}\phi(\mathbf{r}) =& -\Upsilon_{ss}\varrho\chi_2\Bigg(\frac{1}{\varrho}\Bigg(-\left(\frac{\varpi}{\vartheta}+1\right)\Upsilon_s+\left(\omega_\pi+\varkappa_\pi\frac{\varpi}{\vartheta}\right)\Bigg)\sin^3\varphi+\Upsilon_s\left(\omega+\frac{\varkappa\varpi}{\vartheta}\right)\chi_1\\&+\left(\frac{1}{2}\mathcal{F}\left(\frac{\varpi}{\vartheta}+1\right)+\left(\Upsilon_{ss}+\frac{\Upsilon\mathcal{F}}{2}\right)\left(\omega+\frac{\varkappa\varpi}{\vartheta}\right)\right)\varrho\chi_2\Bigg)\\&-\varrho\Upsilon_{ss}\chi_1\Bigg(\chi_4\Bigg(-\left(\frac{\varpi}{\vartheta}+1\right)\Upsilon_s\\&+\left(\omega_\pi+\varkappa_\pi\frac{\varpi}{\vartheta}\right)\Bigg)\Bigg)+\left(\frac{1}{2}\mathcal{F}\left(\frac{\varpi}{\vartheta}+1\right)+\left(\Upsilon_{ss}+\frac{\Upsilon\mathcal{F}}{2}\right)\left(\omega+\frac{\varkappa\varpi}{\vartheta}\right)\right)\varrho\chi_1-\Upsilon_s\Bigg(\omega\\&+\frac{\varkappa\varpi}{\vartheta}\Bigg)\chi_2\Bigg)-\Bigg(\Upsilon_s\left(\omega+\frac{\varkappa\varpi}{\vartheta}\right)\chi_3+\frac{1}{\varrho}\Bigg(-\left(\frac{\varpi}{\vartheta}+1\right)\Upsilon_s+\left(\omega_\pi+\varkappa_\pi\frac{\varpi}{\vartheta}\right)\Bigg)\sin^3\varphi\\&+\left(\frac{1}{2}\mathcal{F}\left(\frac{\varpi}{\vartheta}+1\right)+\left(\Upsilon_{ss}+\frac{\Upsilon\mathcal{F}}{2}\right)\left(\omega+\frac{\varkappa\varpi}{\vartheta}\right)\right)\cos\varphi\Bigg)\cos\varphi\Upsilon_{ss}.\end{aligned}$$

✠ *Dynamic Heisenberg-microfluidical mKdV* **r**-*electrical* $\phi(\mathbf{r})$ *flux is*

$$
\begin{aligned}
\boldsymbol{W}^{\mathcal{E}}\phi\Big(\mathbf{r}\Big) = \int_{\mathcal{F}}\Bigg(&-\Big(\Upsilon_s\Big(\omega+\frac{\varkappa\varpi}{\vartheta}\Big)\chi_3+\frac{1}{\varrho}\Big(-\Big(\frac{\varpi}{\vartheta}+1\Big)\Upsilon_s+\Big(\omega_\pi+\varkappa_\pi\frac{\varpi}{\vartheta}\Big)\Big)\sin^3\varphi \\
&+\Big(\frac{1}{2}\mathcal{F}\Big(\frac{\varpi}{\vartheta}+1\Big)+\Big(\Upsilon_{ss}+\frac{\Upsilon\mathcal{F}}{2}\Big)\Big(\omega+\frac{\varkappa\varpi}{\vartheta}\Big)\Big)\cos\varphi\Big)\cos\varphi\Upsilon_{ss} \\
&-\Upsilon_{ss}\varrho\chi_2\Big(\frac{1}{\varrho}\Big(-\Big(\frac{\varpi}{\vartheta}+1\Big)\Upsilon_s+\Big(\omega_\pi+\varkappa_\pi\frac{\varpi}{\vartheta}\Big)\Big)\sin^3\varphi+\Upsilon_s\Big(\omega+\frac{\varkappa\varpi}{\vartheta}\Big)\chi_1 \\
&+\Big(\frac{1}{2}\mathcal{F}\Big(\frac{\varpi}{\vartheta}+1\Big)+\Big(\Upsilon_{ss}+\frac{\Upsilon\mathcal{F}}{2}\Big)\Big(\omega+\frac{\varkappa\varpi}{\vartheta}\Big)\Big)\varrho\chi_2\Big)-\varrho\Upsilon_{ss}\chi_1\Big(\chi_4\Big(-\Big(\frac{\varpi}{\vartheta}+1\Big)\Upsilon_s \\
&+\Big(\omega_\pi+\varkappa_\pi\frac{\varpi}{\vartheta}\Big)\Big)+\Big(\frac{1}{2}\mathcal{F}\Big(\frac{\varpi}{\vartheta}+1\Big)+\Big(\Upsilon_{ss}+\frac{\Upsilon\mathcal{F}}{2}\Big)\Big(\omega+\frac{\varkappa\varpi}{\vartheta}\Big)\Big)\varrho\chi_1 \\
&-\Upsilon_s\Big(\omega+\frac{\varkappa\varpi}{\vartheta}\Big)\chi_2\Big)\Bigg)d\mathcal{F}.
\end{aligned}
$$

Also, we get

$$
\nabla_s\phi(\mathbf{r})\times\phi(\mathbf{r})\times\nabla_s\phi(\mathbf{r}) = -\mathcal{F}\varrho\chi_2\mathbf{e}_1+\mathcal{F}\varrho\chi_1\mathbf{e}_2-\cos\varphi\mathcal{F}\mathbf{e}_3.
$$

✠ *Antiferromagnetic geometric electric Heisenberg-microfluidical axially mKdV* **r**-*electrical* $\phi(\mathbf{r})$ *flux solidity is*

$$
\begin{aligned}
{}^{\mathcal{AF}}\boldsymbol{L}^{\mathcal{E}}\phi(\mathbf{r}) = \cos\varphi\mathcal{F}\Big(&\Upsilon_s\Big(\omega+\frac{\varkappa\varpi}{\vartheta}\Big)\chi_3+\frac{1}{\varrho}\Big(-\Big(\frac{\varpi}{\vartheta}+1\Big)\Upsilon_s+\Big(\omega_\pi+\varkappa_\pi\frac{\varpi}{\vartheta}\Big)\Big)\sin^3\varphi \\
&+\Big(\frac{1}{2}\mathcal{F}\Big(\frac{\varpi}{\vartheta}+1\Big)+\Big(\Upsilon_{ss}+\frac{\Upsilon\mathcal{F}}{2}\Big)\Big(\omega+\frac{\varkappa\varpi}{\vartheta}\Big)\Big)\cos\varphi\Big)+\Big(\frac{1}{\varrho}\Big(-\Big(\frac{\varpi}{\vartheta}+1\Big)\Upsilon_s \\
&+\Big(\omega_\pi+\varkappa_\pi\frac{\varpi}{\vartheta}\Big)\Big)\sin^3\varphi+\Upsilon_s\Big(\omega+\frac{\varkappa\varpi}{\vartheta}\Big)\chi_1+\Big(\frac{1}{2}\mathcal{F}\Big(\frac{\varpi}{\vartheta}+1\Big) \\
&+\Big(\Upsilon_{ss}+\frac{\Upsilon\mathcal{F}}{2}\Big)\Big(\omega+\frac{\varkappa\varpi}{\vartheta}\Big)\Big)\varrho\chi_2\Big)\mathcal{F}\varrho\chi_2+\Big(\chi_4\Big(-\Big(\frac{\varpi}{\vartheta}+1\Big)\Upsilon_s \\
&+\Big(\omega_\pi+\varkappa_\pi\frac{\varpi}{\vartheta}\Big)\Big)+\Big(\frac{1}{2}\mathcal{F}\Big(\frac{\varpi}{\vartheta}+1\Big)+\Big(\Upsilon_{ss}+\frac{\Upsilon\mathcal{F}}{2}\Big) \\
&\Big(\omega+\frac{\varkappa\varpi}{\vartheta}\Big)\Big)\varrho\chi_1-\Upsilon_s\Big(\omega+\frac{\varkappa\varpi}{\vartheta}\Big)\chi_2\Big)\mathcal{F}\varrho\chi_1.
\end{aligned}
$$

✠ *Antiferromagnetic dynamic Heisenberg-microfluidical mKdV* **r**-*electrical* $\phi(\mathbf{r})$ *flux is*

$$
\begin{aligned}
{}^{\mathcal{AF}}\boldsymbol{W}^{\mathcal{E}}\phi\Big(\mathbf{r}\Big) = \int_{\mathcal{F}}\Bigg(\Big(&\chi_4\Big(-\Big(\frac{\varpi}{\vartheta}+1\Big)\Upsilon_s+\Big(\omega_\pi+\varkappa_\pi\frac{\varpi}{\vartheta}\Big)\Big)+\Big(\frac{1}{2}\mathcal{F}\Big(\frac{\varpi}{\vartheta}+1\Big) \\
&+\Big(\Upsilon_{ss}+\frac{\Upsilon\mathcal{F}}{2}\Big)\Big(\omega+\frac{\varkappa\varpi}{\vartheta}\Big)\Big)\varrho\chi_1-\Upsilon_s\Big(\omega+\frac{\varkappa\varpi}{\vartheta}\Big)\chi_2\Big)\mathcal{F}\varrho\chi_1 \\
&+\Big(\frac{1}{\varrho}\Big(-\Big(\frac{\varpi}{\vartheta}+1\Big)\Upsilon_s+\Big(\omega_\pi+\varkappa_\pi\frac{\varpi}{\vartheta}\Big)\Big)\sin^3\varphi+\Upsilon_s\Big(\omega+\frac{\varkappa\varpi}{\vartheta}\Big)\chi_1 \\
&+\Big(\frac{1}{2}\mathcal{F}\Big(\frac{\varpi}{\vartheta}+1\Big)+\Big(\Upsilon_{ss}+\frac{\Upsilon\mathcal{F}}{2}\Big)\Big(\omega+\frac{\varkappa\varpi}{\vartheta}\Big)\Big)\varrho\chi_2\Big)\mathcal{F}\varrho\chi_2 \\
&+\cos\varphi\mathcal{F}\Big(\Upsilon_s\Big(\omega+\frac{\varkappa\varpi}{\vartheta}\Big)\chi_3+\frac{1}{\varrho}\Big(-\Big(\frac{\varpi}{\vartheta}+1\Big)\Upsilon_s+\Big(\omega_\pi+\varkappa_\pi\frac{\varpi}{\vartheta}\Big)\Big)\sin^3\varphi \\
&+\Big(\frac{1}{2}\mathcal{F}\Big(\frac{\varpi}{\vartheta}+1\Big)+\Big(\Upsilon_{ss}+\frac{\Upsilon\mathcal{F}}{2}\Big)\Big(\omega+\frac{\varkappa\varpi}{\vartheta}\Big)\Big)\cos\varphi\Big)\Bigg)d\mathcal{F}.
\end{aligned}
$$

✠ *Optical axially electrical Heisenberg-microfluidical mKdV* **r**-*electrical* $\phi(\mathbf{r})$ *flux* **r**-*direction orbit is*

$$\begin{aligned}&-\varrho\Upsilon_{ss}\chi_1\Bigg(\chi_4\Bigg(-\left(\frac{\varpi}{\vartheta}+1\right)\Upsilon_s+\left(\omega_\pi+\varkappa_\pi\frac{\varpi}{\vartheta}\right)\Bigg)+\left(\frac{1}{2}\mathcal{F}\left(\frac{\varpi}{\vartheta}+1\right)+\Bigg(\Upsilon_{ss}\right.\\&\left.+\frac{\Upsilon\mathcal{F}}{2}\Bigg)\left(\omega+\frac{\varkappa\varpi}{\vartheta}\right)\right)\varrho\chi_1-\Upsilon_s\left(\omega+\frac{\varkappa\varpi}{\vartheta}\right)\chi_2\Bigg)-\Upsilon_{ss}\varrho\chi_2\Bigg(\frac{1}{\varrho}\Bigg(-\left(\frac{\varpi}{\vartheta}+1\right)\Upsilon_s\\&+\left(\omega_\pi+\varkappa_\pi\frac{\varpi}{\vartheta}\right)\Bigg)\sin^3\varphi+\Upsilon_s\left(\omega+\frac{\varkappa\varpi}{\vartheta}\right)\chi_1+\left(\frac{1}{2}\mathcal{F}\left(\frac{\varpi}{\vartheta}+1\right)+\left(\Upsilon_{ss}+\frac{\Upsilon\mathcal{F}}{2}\right)\Bigg(\omega\right.\\&\left.+\frac{\varkappa\varpi}{\vartheta}\Bigg)\right)\varrho\chi_2-\Bigg(\Upsilon_s\left(\omega+\frac{\varkappa\varpi}{\vartheta}\right)\chi_3+\frac{1}{\varrho}\Bigg(-\left(\frac{\varpi}{\vartheta}+1\right)\Upsilon_s+\left(\omega_\pi+\varkappa_\pi\frac{\varpi}{\vartheta}\right)\Bigg)\sin^3\varphi\\&+\left(\frac{1}{2}\mathcal{F}\left(\frac{\varpi}{\vartheta}+1\right)+\left(\Upsilon_{ss}+\frac{\Upsilon\mathcal{F}}{2}\right)\left(\omega+\frac{\varkappa\varpi}{\vartheta}\right)\right)\cos\varphi\Bigg)\cos\varphi\Upsilon_{ss}=0.\end{aligned}$$

✠ *Antiferromagnetic axially electrical Heisenberg-microfluidical mKdV* **r**-*electrical* $\phi(\mathbf{r})$ *flux* **r**-*direction orbit is*

$$\begin{aligned}&\Bigg(\frac{1}{\varrho}\Bigg(-\left(\frac{\varpi}{\vartheta}+1\right)\Upsilon_s+\left(\omega_\pi+\varkappa_\pi\frac{\varpi}{\vartheta}\right)\Bigg)\sin^3\varphi+\Upsilon_s\left(\omega+\frac{\varkappa\varpi}{\vartheta}\right)\chi_1+\left(\frac{1}{2}\mathcal{F}\left(\frac{\varpi}{\vartheta}+1\right)\right.\\&\left.+\left(\Upsilon_{ss}+\frac{\Upsilon\mathcal{F}}{2}\right)\left(\omega+\frac{\varkappa\varpi}{\vartheta}\right)\right)\varrho\chi_2\Bigg)\mathcal{F}\varrho\chi_2+\cos\varphi\mathcal{F}\Bigg(\Upsilon_s\left(\omega+\frac{\varkappa\varpi}{\vartheta}\right)\chi_3\\&+\frac{1}{\varrho}\Bigg(-\left(\frac{\varpi}{\vartheta}+1\right)\Upsilon_s+\left(\omega_\pi+\varkappa_\pi\frac{\varpi}{\vartheta}\right)\Bigg)\sin^3\varphi+\left(\frac{1}{2}\mathcal{F}\left(\frac{\varpi}{\vartheta}+1\right)+\left(\Upsilon_{ss}+\frac{\Upsilon\mathcal{F}}{2}\right)\Bigg(\omega\right.\\&\left.+\frac{\varkappa\varpi}{\vartheta}\Bigg)\right)\cos\varphi\Bigg)+\Bigg(\chi_4\Bigg(-\left(\frac{\varpi}{\vartheta}+1\right)\Upsilon_s+\left(\omega_\pi+\varkappa_\pi\frac{\varpi}{\vartheta}\right)\Bigg)+\left(\frac{1}{2}\mathcal{F}\left(\frac{\varpi}{\vartheta}+1\right)\right.\\&\left.+\left(\Upsilon_{ss}+\frac{\Upsilon\mathcal{F}}{2}\right)\left(\omega+\frac{\varkappa\varpi}{\vartheta}\right)\right)\varrho\chi_1-\Upsilon_s\left(\omega+\frac{\varkappa\varpi}{\vartheta}\right)\chi_2\Bigg)\mathcal{F}\varrho\chi_1=0.\end{aligned}$$

✠ *Antiferromagnetic optical electric Heisenberg-microfluidical mKdV* **r**-*magnetomotive* $\phi(\mathbf{r})$ *phase is*

$$\begin{aligned}{}^{\mathcal{AF}}\boldsymbol{E}^{\mathcal{E}}\phi(\mathbf{r})=&-\frac{d}{d\pi}\int_{\mathcal{F}}\Bigg(\Bigg(\frac{1}{\varrho}\Bigg(-\left(\frac{\varpi}{\vartheta}+1\right)\Upsilon_s+\left(\omega_\pi+\varkappa_\pi\frac{\varpi}{\vartheta}\right)\Bigg)\sin^3\varphi\\&+\Upsilon_s\left(\omega+\frac{\varkappa\varpi}{\vartheta}\right)\chi_1+\left(\frac{1}{2}\mathcal{F}\left(\frac{\varpi}{\vartheta}+1\right)+\left(\Upsilon_{ss}+\frac{\Upsilon\mathcal{F}}{2}\right)\left(\omega+\frac{\varkappa\varpi}{\vartheta}\right)\right)\varrho\chi_2\Bigg)\mathcal{F}\varrho\chi_2\\&+\cos\varphi\mathcal{F}\Bigg(\Upsilon_s\left(\omega+\frac{\varkappa\varpi}{\vartheta}\right)\chi_3+\frac{1}{\varrho}\Bigg(-\left(\frac{\varpi}{\vartheta}+1\right)\Upsilon_s+\left(\omega_\pi+\varkappa_\pi\frac{\varpi}{\vartheta}\right)\Bigg)\sin^3\varphi\\&+\left(\frac{1}{2}\mathcal{F}\left(\frac{\varpi}{\vartheta}+1\right)+\left(\Upsilon_{ss}+\frac{\Upsilon\mathcal{F}}{2}\right)\left(\omega+\frac{\varkappa\varpi}{\vartheta}\right)\right)\cos\varphi\Bigg)+\Bigg(\chi_4\Bigg(-\left(\frac{\varpi}{\vartheta}+1\right)\Upsilon_s\\&+\left(\omega_\pi+\varkappa_\pi\frac{\varpi}{\vartheta}\right)\Bigg)+\left(\frac{1}{2}\mathcal{F}\left(\frac{\varpi}{\vartheta}+1\right)+\left(\Upsilon_{ss}+\frac{\Upsilon\mathcal{F}}{2}\right)\left(\omega+\frac{\varkappa\varpi}{\vartheta}\right)\right)\varrho\chi_1\\&-\Upsilon_s\left(\omega+\frac{\varkappa\varpi}{\vartheta}\right)\chi_2\Bigg)\mathcal{F}\varrho\chi_1\Bigg)d\mathcal{F}.\end{aligned}$$

Fig. 1 Spherical electromotive $\phi(\mathbf{r})$ phase

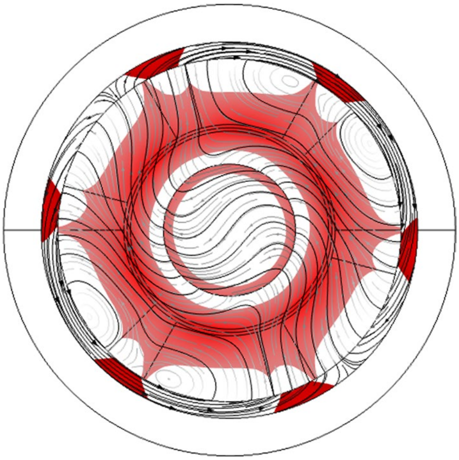


Figure 1 illustrates optical effect of diverse values of the thermal diffusion amplitude on antiferromagnetic axially electrical *alfa*-microfluidic mKdV electric $\phi(\mathbf{r})$ flux path circuit of geometric system.

4 Antiferromagnetic optical *alfa*-microfluidical mKdV electric $\phi(\mathbf{t})$ flux

✠ *Optical electric Heisenberg- microfluidical mKdV* $\mathbf{r}$*-magnetomotive* $\phi(\mathbf{r})$ *phase is*

$$
\begin{aligned}
\boldsymbol{E}^{\mathcal{E}}\phi(\mathbf{t}) = &-\frac{d}{d\pi}\int_{\mathcal{F}}\Bigg(\Bigg(\chi_2\Big(\omega_s\Big(\omega\Big(\Upsilon_{ss}+\mathcal{F}\frac{\Upsilon}{2}\Big)+\frac{\mathcal{F}}{2}\Big)-\Big(1+\Upsilon\omega\Big)\Big(\omega_\pi-\Upsilon_s\Big)\Big)\\
&-\Upsilon_s\omega\chi_4\Big(1+\Upsilon\omega\Big)+\omega_s\omega\Upsilon_s\varrho\chi_1\Bigg)\Bigg(\chi_4\Big(-\Big(\frac{\varpi}{\vartheta}+1\Big)\Upsilon_s+\Big(\omega_\pi+\varkappa_\pi\frac{\varpi}{\vartheta}\Big)\Big)\\
&+\Big(\frac{1}{2}\mathcal{F}\Big(\frac{\varpi}{\vartheta}+1\Big)+\Big(\Upsilon_{ss}+\frac{\Upsilon\mathcal{F}}{2}\Big)\Big(\omega+\frac{\varkappa\varpi}{\vartheta}\Big)\Big)\varrho\chi_1-\Upsilon_s\Big(\omega+\frac{\varkappa\varpi}{\vartheta}\Big)\chi_2\Bigg)\\
&-\Bigg(\frac{1}{\varrho}\Big(-\Big(\frac{\varpi}{\vartheta}+1\Big)\Upsilon_s+\Big(\omega_\pi+\varkappa_\pi\frac{\varpi}{\vartheta}\Big)\Big)\sin^3\varphi+\Upsilon_s\Big(\omega+\frac{\varkappa\varpi}{\vartheta}\Big)\chi_1\\
&+\Big(\frac{1}{2}\mathcal{F}\Big(\frac{\varpi}{\vartheta}+1\Big)+\Big(\Upsilon_{ss}+\frac{\Upsilon\mathcal{F}}{2}\Big)\Big(\omega+\frac{\varkappa\varpi}{\vartheta}\Big)\Big)\varrho\chi_2\Bigg)\\
&\Bigg(\frac{1}{\varrho}\Upsilon_s\omega\Big(1+\Upsilon\omega\Big)\sin^3\varphi-\omega_s\omega\Upsilon_s\varrho\chi_2+\Big(\omega_s\Big(\omega\Big(\Upsilon_{ss}+\mathcal{F}\frac{\Upsilon}{2}\Big)+\frac{\mathcal{F}}{2}\Big)\\
&-\Big(1+\Upsilon\omega\Big)\Big(\omega_\pi-\Upsilon_s\Big)\Big)\chi_1\Bigg)-\Bigg(\Upsilon_s\Big(\omega+\frac{\varkappa\varpi}{\vartheta}\Big)\chi_3\\
&+\frac{1}{\varrho}\Big(-\Big(\frac{\varpi}{\vartheta}+1\Big)\Upsilon_s+\Big(\omega_\pi+\varkappa_\pi\frac{\varpi}{\vartheta}\Big)\Big)\sin^3\varphi+\Big(\frac{1}{2}\mathcal{F}\Big(\frac{\varpi}{\vartheta}+1\Big)\\
&+\Big(\Upsilon_{ss}+\frac{\Upsilon\mathcal{F}}{2}\Big)\Big(\omega+\frac{\varkappa\varpi}{\vartheta}\Big)\Big)\cos\varphi\Bigg)\Bigg(-\omega_s\omega\Upsilon_s\cos\varphi\\
&+\frac{1}{\varrho}\omega\sin^3\varphi\Big(1+\Upsilon\omega\Big)\Upsilon_s+\Big(\omega_s\Big(\omega\Big(\Upsilon_{ss}+\mathcal{F}\frac{\Upsilon}{2}\Big)+\frac{\mathcal{F}}{2}\Big)\\
&-\Big(1+\Upsilon\omega\Big)\Big(\omega_\pi-\Upsilon_s\Big)\Big)\chi_3\Bigg)\Bigg)d\mathcal{F}.
\end{aligned}
$$

By utilizing product

$$\nabla_s\phi(\mathbf{t})\times\nabla_\pi\phi(\mathbf{t})=\Bigg(\frac{1}{\varrho}\Upsilon_s\omega\Big(1+\Upsilon\omega\Big)\sin^3\varphi-\omega_s\omega\Upsilon_s\varrho\chi_2+\Bigg(\omega_s\Big(\omega\Big(\Upsilon_{ss}+\mathcal{F}\frac{\Upsilon}{2}\Big)+\frac{\mathcal{F}}{2}\Big)$$
$$-\Big(1+\Upsilon\omega\Big)\Big(\omega_\pi-\Upsilon_s\Big)\Bigg)\chi_1\Bigg)\mathbf{e}_1+\Bigg(\chi_2\Bigg(\omega_s\Big(\omega\Big(\Upsilon_{ss}+\mathcal{F}\frac{\Upsilon}{2}\Big)+\frac{\mathcal{F}}{2}\Big)$$
$$-\Big(1+\Upsilon\omega\Big)\Big(\omega_\pi-\Upsilon_s\Big)\Bigg)-\Upsilon_s\omega\chi_4\Big(1+\Upsilon\omega\Big)$$
$$+\omega_s\omega\Upsilon_s\varrho\chi_1\Bigg)\mathbf{e}_2+\Bigg(-\omega_s\omega\Upsilon_s\cos\varphi+\frac{1}{\varrho}\omega\sin^3\varphi\Big(1+\Upsilon\omega\Big)\Upsilon_s$$
$$+\Bigg(\omega_s\Big(\omega\Big(\Upsilon_{ss}+\mathcal{F}\frac{\Upsilon}{2}\Big)+\frac{\mathcal{F}}{2}\Big)-\Big(1+\Upsilon\omega\Big)\Big(\omega_\pi-\Upsilon_s\Big)\Bigg)\chi_3\Bigg)\mathbf{e}_3.$$

✠ *Geometric electric Heisenberg- microfluidical mKdV* **r**-*electrical* $\phi(\mathbf{r})$ *flux solidity is*

$$\boldsymbol{L}^{\mathcal{E}}\phi(\mathbf{t})=-\Bigg(\frac{1}{\varrho}\Bigg(-\Big(\frac{\varpi}{\vartheta}+1\Big)\Upsilon_s+\Big(\omega_\pi+\varkappa_\pi\frac{\varpi}{\vartheta}\Big)\Bigg)\sin^3\varphi+\Upsilon_s\Big(\omega+\frac{\varkappa\varpi}{\vartheta}\Big)\chi_1$$
$$+\Bigg(\frac{1}{2}\mathcal{F}\Big(\frac{\varpi}{\vartheta}+1\Big)+\Big(\Upsilon_{ss}+\frac{\Upsilon\mathcal{F}}{2}\Big)\Big(\omega+\frac{\varkappa\varpi}{\vartheta}\Big)\Bigg)\varrho\chi_2\Bigg)\Bigg(\frac{1}{\varrho}\Upsilon_s\omega\Big(1$$
$$+\Upsilon\omega\Big)\sin^3\varphi-\omega_s\omega\Upsilon_s\varrho\chi_2+\Bigg(\omega_s\Big(\omega\Big(\Upsilon_{ss}+\mathcal{F}\frac{\Upsilon}{2}\Big)+\frac{\mathcal{F}}{2}\Big)-\Big(1$$
$$+\Upsilon\omega\Big)\Big(\omega_\pi-\Upsilon_s\Big)\Bigg)\chi_1\Bigg)+\Bigg(\chi_2\Bigg(\omega_s\Big(\omega\Big(\Upsilon_{ss}+\mathcal{F}\frac{\Upsilon}{2}\Big)+\frac{\mathcal{F}}{2}\Big)$$
$$-\Big(1+\Upsilon\omega\Big)\Big(\omega_\pi-\Upsilon_s\Big)\Bigg)-\Upsilon_s\omega\chi_4\Big(1+\Upsilon\omega\Big)+\omega_s\omega\Upsilon_s\varrho\chi_1\Bigg)\Bigg(\chi_4\Bigg($$
$$-\Big(\frac{\varpi}{\vartheta}+1\Big)\Upsilon_s+\Big(\omega_\pi+\varkappa_\pi\frac{\varpi}{\vartheta}\Big)\Bigg)+\Bigg(\frac{1}{2}\mathcal{F}\Big(\frac{\varpi}{\vartheta}+1\Big)+\Big(\Upsilon_{ss}$$
$$+\frac{\Upsilon\mathcal{F}}{2}\Big)\Big(\omega+\frac{\varkappa\varpi}{\vartheta}\Big)\Bigg)\varrho\chi_1-\Upsilon_s\Big(\omega+\frac{\varkappa\varpi}{\vartheta}\Big)\chi_2\Bigg)-\Bigg(\Upsilon_s\Big(\omega$$
$$+\frac{\varkappa\varpi}{\vartheta}\Big)\chi_3+\frac{1}{\varrho}\Bigg(-\Big(\frac{\varpi}{\vartheta}+1\Big)\Upsilon_s+\Big(\omega_\pi+\varkappa_\pi\frac{\varpi}{\vartheta}\Big)\Bigg)\sin^3\varphi$$
$$+\Bigg(\frac{1}{2}\mathcal{F}\Big(\frac{\varpi}{\vartheta}+1\Big)+\Big(\Upsilon_{ss}+\frac{\Upsilon\mathcal{F}}{2}\Big)\Big(\omega+\frac{\varkappa\varpi}{\vartheta}\Big)\Bigg)\cos\varphi\Bigg)\Bigg($$
$$-\omega_s\omega\Upsilon_s\cos\varphi+\frac{1}{\varrho}\omega\sin^3\varphi\Big(1+\Upsilon\omega\Big)\Upsilon_s+\Bigg(\omega_s\Big(\omega\Big(\Upsilon_{ss}$$
$$+\mathcal{F}\frac{\Upsilon}{2}\Big)+\frac{\mathcal{F}}{2}\Big)-\Big(1+\Upsilon\omega\Big)\Big(\omega_\pi-\Upsilon_s\Big)\Bigg)\chi_3\Bigg).$$

✠ *Dynamic Heisenberg-microfluidical mKdV* **r**-*electrical* $\phi(\mathbf{r})$ *flux is*

$$
\begin{aligned}
\boldsymbol{W}^{\mathcal{E}}\phi\Big(\mathbf{t}\Big) = \int_{\mathcal{F}} \Big(-\Big(\Upsilon_s\Big(\omega + \frac{\varkappa\varpi}{\vartheta}\Big)\chi_3 + \frac{1}{\varrho}\Big(-\Big(\frac{\varpi}{\vartheta}+1\Big)\Upsilon_s + \Big(\omega_\pi + \varkappa_\pi\frac{\varpi}{\vartheta}\Big)\Big)\sin^3\varphi \\
+ \Big(\frac{1}{2}\mathcal{F}\Big(\frac{\varpi}{\vartheta}+1\Big) + \Big(\Upsilon_{ss} + \frac{\Upsilon\mathcal{F}}{2}\Big)\Big(\omega + \frac{\varkappa\varpi}{\vartheta}\Big)\Big)\cos\varphi\Big)\Big(-\omega_s\omega\Upsilon_s\cos\varphi \\
+ \frac{1}{\varrho}\omega\sin^3\varphi\Big(1+\Upsilon\omega\Big)\Upsilon_s + \Big(\omega_s\Big(\omega\Big(\Upsilon_{ss} + \mathcal{F}\frac{\Upsilon}{2}\Big) + \frac{\mathcal{F}}{2}\Big) - \Big(1+\Upsilon\omega\Big)\Big(\omega_\pi \\
-\Upsilon_s\Big)\Big)\chi_3\Big) - \Big(\frac{1}{\varrho}\Big(-\Big(\frac{\varpi}{\vartheta}+1\Big)\Upsilon_s + \Big(\omega_\pi + \varkappa_\pi\frac{\varpi}{\vartheta}\Big)\Big)\sin^3\varphi + \Upsilon_s\Big(\omega \\
+ \frac{\varkappa\varpi}{\vartheta}\Big)\chi_1 + \Big(\frac{1}{2}\mathcal{F}\Big(\frac{\varpi}{\vartheta}+1\Big) + \Big(\Upsilon_{ss} + \frac{\Upsilon\mathcal{F}}{2}\Big)\Big(\omega + \frac{\varkappa\varpi}{\vartheta}\Big)\Big)\varrho\chi_2\Big) \\
\Big(\frac{1}{\varrho}\Upsilon_s\omega\Big(1+\Upsilon\omega\Big)\sin^3\varphi - \omega_s\omega\Upsilon_s\varrho\chi_2 + \Big(\omega_s\Big(\omega\Big(\Upsilon_{ss} + \mathcal{F}\frac{\Upsilon}{2}\Big) + \frac{\mathcal{F}}{2}\Big) \\
-\Big(1+\Upsilon\omega\Big)\Big(\omega_\pi - \Upsilon_s\Big)\Big)\chi_1\Big) + \Big(\chi_2\Big(\omega_s\Big(\omega\Big(\Upsilon_{ss} + \mathcal{F}\frac{\Upsilon}{2}\Big) + \frac{\mathcal{F}}{2}\Big) \\
-\Big(1+\Upsilon\omega\Big)\Big(\omega_\pi - \Upsilon_s\Big)\Big) - \Upsilon_s\omega\chi_4\Big(1+\Upsilon\omega\Big) + \omega_s\omega\Upsilon_s\varrho\chi_1\Big)\Big(\chi_4\Big(\\
-\Big(\frac{\varpi}{\vartheta}+1\Big)\Upsilon_s + \Big(\omega_\pi + \varkappa_\pi\frac{\varpi}{\vartheta}\Big)\Big) + \Big(\frac{1}{2}\mathcal{F}\Big(\frac{\varpi}{\vartheta}+1\Big) + \Big(\Upsilon_{ss} + \frac{\Upsilon\mathcal{F}}{2}\Big)\Big(\omega \\
+ \frac{\varkappa\varpi}{\vartheta}\Big)\Big)\varrho\chi_1 - \Upsilon_s\Big(\omega + \frac{\varkappa\varpi}{\vartheta}\Big)\chi_2\Big)\Big)d\mathcal{F}.
\end{aligned}
$$

On the other hand, we have

$$
\begin{aligned}
\nabla_s\phi(\mathbf{t})\times\phi(\mathbf{t})\times\nabla_s\phi(\mathbf{t}) = \Big(\omega_s\Big(1+\omega\Upsilon\Big)\omega\varrho\chi_2 - \frac{1}{\varrho}\omega\Big(1+\omega\Upsilon\Big)^2\sin^3\varphi \\
-\Big(\Big(1+\Upsilon\omega\Big)^2 + \omega_s^2\Big)\chi_1\Big)\mathbf{e}_1 + \Big(\chi_4\omega\Big(1+\omega\Upsilon\Big)^2 \\
-\Big(\Big(1+\Upsilon\omega\Big)^2 + \omega_s^2\Big)\chi_2 - \omega_s\Big(1+\omega\Upsilon\Big)\omega\varrho\chi_1\Big)\mathbf{e}_2 \\
+\Big(\cos\varphi\omega_s\Big(1+\omega\Upsilon\Big)\omega - \Big(\Big(1+\Upsilon\omega\Big)^2 + \omega_s^2\Big)\chi_3 \\
-\frac{\omega}{\varrho}\sin^3\varphi\Big(1+\omega\Upsilon\Big)^2\Big)\mathbf{e}_3.
\end{aligned}
$$

✠ *Antiferromagnetic geometric electric Heisenberg-microfluidical axially mKdV* **r**-*electrical* $\phi(\mathbf{r})$ *flux solidity is*

$$
\begin{aligned}
{}^{\mathcal{AF}}\boldsymbol{L}^{\mathcal{E}}\phi(\mathbf{t}) = &-\Big(\cos\varphi\omega_s\Big(1+\omega\Upsilon\Big)\omega-\Big(\Big(1+\Upsilon\omega\Big)^2+\omega_s^2\Big)\chi_3-\frac{\omega}{\varrho}\sin^3\varphi\Big(1\\
&+\omega\Upsilon\Big)^2\Big)\Big(\Upsilon_s\Big(\omega+\frac{\varkappa\varpi}{\vartheta}\Big)\chi_3+\frac{1}{\varrho}\Big(-\Big(\frac{\varpi}{\vartheta}+1\Big)\Upsilon_s+\Big(\omega_\pi\\
&+\varkappa_\pi\frac{\varpi}{\vartheta}\Big)\Big)\sin^3\varphi+\Big(\frac{1}{2}\mathcal{F}\Big(\frac{\varpi}{\vartheta}+1\Big)+\Big(\Upsilon_{ss}+\frac{\Upsilon\mathcal{F}}{2}\Big)\Big(\omega\\
&+\frac{\varkappa\varpi}{\vartheta}\Big)\Big)\cos\varphi\Big)-\Big(\omega_s\Big(1+\omega\Upsilon\Big)\omega\varrho\chi_2-\frac{1}{\varrho}\omega\Big(1+\omega\Upsilon\Big)^2\sin^3\varphi\\
&-\Big(\Big(1+\Upsilon\omega\Big)^2+\omega_s^2\Big)\chi_1\Big)\Big(\frac{1}{\varrho}\Big(-\Big(\frac{\varpi}{\vartheta}+1\Big)\Upsilon_s+\Big(\omega_\pi\\
&+\varkappa_\pi\frac{\varpi}{\vartheta}\Big)\Big)\sin^3\varphi+\Upsilon_s\Big(\omega+\frac{\varkappa\varpi}{\vartheta}\Big)\chi_1+\Big(\frac{1}{2}\mathcal{F}\Big(\frac{\varpi}{\vartheta}+1\Big)\\
&+\Big(\Upsilon_{ss}+\frac{\Upsilon\mathcal{F}}{2}\Big)\Big(\omega+\frac{\varkappa\varpi}{\vartheta}\Big)\Big)\varrho\chi_2\Big)+\Big(\chi_4\omega\Big(1+\omega\Upsilon\Big)^2\\
&-\Big(\Big(1+\Upsilon\omega\Big)^2+\omega_s^2\Big)\chi_2-\omega_s\Big(1+\omega\Upsilon\Big)\omega\varrho\chi_1\Big)\Big(\chi_4\Big(\\
&-\Big(\frac{\varpi}{\vartheta}+1\Big)\Upsilon_s+\Big(\omega_\pi+\varkappa_\pi\frac{\varpi}{\vartheta}\Big)\Big)+\Big(\frac{1}{2}\mathcal{F}\Big(\frac{\varpi}{\vartheta}+1\Big)\\
&+\Big(\Upsilon_{ss}+\frac{\Upsilon\mathcal{F}}{2}\Big)\Big(\omega+\frac{\varkappa\varpi}{\vartheta}\Big)\Big)\varrho\chi_1-\Upsilon_s\Big(\omega+\frac{\varkappa\varpi}{\vartheta}\Big)\chi_2\Big).
\end{aligned}
$$

✠ *Antiferromagnetic dynamic Heisenberg-microfluidical mKdV* **r**-*electrical* $\phi(\mathbf{r})$ *flux is*

$$
\begin{aligned}
{}^{\mathcal{AF}}\boldsymbol{W}^{\mathcal{E}}\phi\Big(\mathbf{t}\Big) = \int_{\mathcal{F}}&\Big(\Big(\chi_4\omega\Big(1+\omega\Upsilon\Big)^2-\Big(\Big(1+\Upsilon\omega\Big)^2+\omega_s^2\Big)\chi_2-\omega_s\Big(1+\omega\Upsilon\Big)\omega\varrho\chi_1\Big)\\
&\Big(\chi_4\Big(-\Big(\frac{\varpi}{\vartheta}+1\Big)\Upsilon_s+\Big(\omega_\pi+\varkappa_\pi\frac{\varpi}{\vartheta}\Big)\Big)+\Big(\frac{1}{2}\mathcal{F}\Big(\frac{\varpi}{\vartheta}+1\Big)+\Big(\Upsilon_{ss}+\frac{\Upsilon\mathcal{F}}{2}\Big)\Big(\omega+\frac{\varkappa\varpi}{\vartheta}\Big)\Big)\varrho\chi_1\\
&-\Upsilon_s\Big(\omega+\frac{\varkappa\varpi}{\vartheta}\Big)\chi_2\Big)-\Big(\omega_s\Big(1+\omega\Upsilon\Big)\omega\varrho\chi_2-\frac{1}{\varrho}\omega\Big(1+\omega\Upsilon\Big)^2\sin^3\varphi-\Big(\Big(1+\Upsilon\omega\Big)^2+\omega_s^2\Big)\chi_1\Big)\\
&\Big(\frac{1}{\varrho}\Big(-\Big(\frac{\varpi}{\vartheta}+1\Big)\Upsilon_s+\Big(\omega_\pi+\varkappa_\pi\frac{\varpi}{\vartheta}\Big)\Big)\sin^3\varphi\\
&+\Upsilon_s\Big(\omega+\frac{\varkappa\varpi}{\vartheta}\Big)\chi_1+\Big(\frac{1}{2}\mathcal{F}\Big(\frac{\varpi}{\vartheta}+1\Big)+\Big(\Upsilon_{ss}+\frac{\Upsilon\mathcal{F}}{2}\Big)\\
&\Big(\omega+\frac{\varkappa\varpi}{\vartheta}\Big)\Big)\varrho\chi_2\Big)-\Big(\cos\varphi\omega_s\Big(1+\omega\Upsilon\Big)\omega-\Big(\Big(1+\Upsilon\omega\Big)^2+\omega_s^2\Big)\\
&\chi_3-\frac{\omega}{\varrho}\sin^3\varphi\Big(1+\omega\Upsilon\Big)^2\Big)\Big(\Upsilon_s\Big(\omega+\frac{\varkappa\varpi}{\vartheta}\Big)\chi_3+\frac{1}{\varrho}\Big(-\Big(\frac{\varpi}{\vartheta}+1\Big)\Upsilon_s+\Big(\omega_\pi+\varkappa_\pi\frac{\varpi}{\vartheta}\Big)\Big)\sin^3\varphi\\
&+\Big(\frac{1}{2}\mathcal{F}\Big(\frac{\varpi}{\vartheta}+1\Big)+\Big(\Upsilon_{ss}+\frac{\Upsilon\mathcal{F}}{2}\Big)\Big(\omega+\frac{\varkappa\varpi}{\vartheta}\Big)\Big)\cos\varphi\Big)\Big)d\mathcal{F}.
\end{aligned}
$$

✠ *Optical axially electrical Heisenberg-microfluidical mKdV* **r**-*electrical* $\phi(\mathbf{r})$ *flux* **r**-*direction orbit is*

$$
\begin{aligned}
&-\Bigg(-\omega_s\omega\Upsilon_s\cos\varphi+\frac{1}{\varrho}\omega\sin^3\varphi\Big(1+\Upsilon\omega\Big)\Upsilon_s+\Bigg(\omega_s\Bigg(\omega\Bigg(\Upsilon_{ss}+\mathcal{F}\frac{\Upsilon}{2}\Bigg)+\frac{\mathcal{F}}{2}\Bigg)\\
&\quad-\Big(1+\Upsilon\omega\Big)\Big(\omega_\pi\quad-\Upsilon_s\Big)\Bigg)\chi_3\Bigg)\Bigg(\Upsilon_s\Bigg(\omega+\frac{\varkappa\varpi}{\vartheta}\Bigg)\chi_3+\frac{1}{\varrho}\Bigg(\\
&-\Bigg(\frac{\varpi}{\vartheta}+1\Bigg)\Upsilon_s+\Bigg(\omega_\pi+\varkappa_\pi\frac{\varpi}{\vartheta}\Bigg)\Bigg)\sin^3\varphi\quad+\Bigg(\frac{1}{2}\mathcal{F}\Bigg(\frac{\varpi}{\vartheta}+1\Bigg)\\
&\quad+\Bigg(\Upsilon_{ss}+\frac{\Upsilon\mathcal{F}}{2}\Bigg)\Bigg(\omega+\frac{\varkappa\varpi}{\vartheta}\Bigg)\Bigg)\cos\varphi\Bigg)-\Bigg(\frac{1}{\varrho}\Bigg(-\Bigg(\frac{\varpi}{\vartheta}+1\Bigg)\Upsilon_s+\Bigg(\omega_\pi+\varkappa_\pi\frac{\varpi}{\vartheta}\Bigg)\Bigg)\sin^3\varphi\\
&\quad+\Upsilon_s\Bigg(\omega+\frac{\varkappa\varpi}{\vartheta}\Bigg)\chi_1+\Bigg(\frac{1}{2}\mathcal{F}\Bigg(\frac{\varpi}{\vartheta}+1\Bigg)+\Bigg(\Upsilon_{ss}+\frac{\Upsilon\mathcal{F}}{2}\Bigg)\Bigg(\omega+\frac{\varkappa\varpi}{\vartheta}\Bigg)\Bigg)\varrho\chi_2\Bigg)\Bigg(\frac{1}{\varrho}\Upsilon_s\omega\Big(1\\
&\quad+\Upsilon\omega\Big)\sin^3\varphi-\omega_s\omega\Upsilon_s\varrho\chi_2+\Bigg(\omega_s\Bigg(\omega\Bigg(\Upsilon_{ss}+\mathcal{F}\frac{\Upsilon}{2}\Bigg)+\frac{\mathcal{F}}{2}\Bigg)-\Big(1+\Upsilon\omega\Big)\Big(\omega_\pi-\Upsilon_s\Big)\Bigg)\chi_1\Bigg)\\
&\quad+\Bigg(\chi_2\Bigg(\omega_s\Bigg(\omega\Bigg(\Upsilon_{ss}+\mathcal{F}\frac{\Upsilon}{2}\Bigg)+\frac{\mathcal{F}}{2}\Bigg)-\Big(1+\Upsilon\omega\Big)\Big(\omega_\pi-\Upsilon_s\Big)\Bigg)-\Upsilon_s\omega\chi_4\Big(1+\Upsilon\omega\Big)\\
&\quad+\omega_s\omega\Upsilon_s\varrho\chi_1\Bigg)\Bigg(\chi_4\Bigg(-\Bigg(\frac{\varpi}{\vartheta}+1\Bigg)\Upsilon_s+\Bigg(\omega_\pi+\varkappa_\pi\frac{\varpi}{\vartheta}\Bigg)\Bigg)+\Bigg(\frac{1}{2}\mathcal{F}\Bigg(\frac{\varpi}{\vartheta}+1\Bigg)+\Bigg(\Upsilon_{ss}\\
&\quad+\frac{\Upsilon\mathcal{F}}{2}\Bigg)\Bigg(\omega+\frac{\varkappa\varpi}{\vartheta}\Bigg)\Bigg)\varrho\chi_1-\Upsilon_s\Bigg(\omega+\frac{\varkappa\varpi}{\vartheta}\Bigg)\chi_2\Bigg)=0.
\end{aligned}
$$

✠ *Antiferromagnetic axially electrical Heisenberg-microfluidical mKdV* **r**-*electrical* $\phi(\mathbf{r})$ *flux* **r**-*direction orbit is*

$$
\begin{aligned}
&-\Bigg(\frac{1}{\varrho}\Bigg(-\Bigg(\frac{\varpi}{\vartheta}+1\Bigg)\Upsilon_s+\Bigg(\omega_\pi+\varkappa_\pi\frac{\varpi}{\vartheta}\Bigg)\Bigg)\sin^3\varphi+\Upsilon_s\Bigg(\omega+\frac{\varkappa\varpi}{\vartheta}\Bigg)\chi_1+\Bigg(\frac{1}{2}\mathcal{F}\Bigg(\frac{\varpi}{\vartheta}+1\Bigg)\\
&\quad+\Bigg(\Upsilon_{ss}+\frac{\Upsilon\mathcal{F}}{2}\Bigg)\Bigg(\omega+\frac{\varkappa\varpi}{\vartheta}\Bigg)\Bigg)\varrho\chi_2\Bigg)\Bigg(\omega_s\Big(1+\omega\Upsilon\Big)\omega\varrho\chi_2-\frac{1}{\varrho}\omega\Big(1+\omega\Upsilon\Big)^2\sin^3\varphi-\Bigg(\Bigg(1\\
&\quad+\Upsilon\omega\Bigg)^2+\omega_s^2\Bigg)\chi_1\Bigg)-\Bigg(\cos\varphi\omega_s\Big(1+\omega\Upsilon\Big)\omega-\Bigg(\Big(1+\Upsilon\omega\Big)^2+\omega_s^2\Bigg)\chi_3-\frac{\omega}{\varrho}\sin^3\varphi\Bigg(1\\
&\quad+\omega\Upsilon\Bigg)^2\Bigg)\Bigg(\Upsilon_s\Bigg(\omega+\frac{\varkappa\varpi}{\vartheta}\Bigg)\chi_3+\frac{1}{\varrho}\Bigg(-\Bigg(\frac{\varpi}{\vartheta}+1\Bigg)\Upsilon_s+\Bigg(\omega_\pi+\varkappa_\pi\frac{\varpi}{\vartheta}\Bigg)\Bigg)\sin^3\varphi+\Bigg(\frac{1}{2}\mathcal{F}\Bigg(\frac{\varpi}{\vartheta}\\
&\quad+1\Bigg)+\Bigg(\Upsilon_{ss}+\frac{\Upsilon\mathcal{F}}{2}\Bigg)\Bigg(\omega+\frac{\varkappa\varpi}{\vartheta}\Bigg)\Bigg)\cos\varphi\Bigg)+\Bigg(\chi_4\omega\Big(1+\omega\Upsilon\Big)^2-\Bigg(\Big(1+\Upsilon\omega\Big)^2+\omega_s^2\Bigg)\chi_2\\
&\quad-\omega_s\Big(1+\omega\Upsilon\Big)\omega\varrho\chi_1\Bigg)\Bigg(\chi_4\Bigg(-\Bigg(\frac{\varpi}{\vartheta}+1\Bigg)\Upsilon_s+\Bigg(\omega_\pi+\varkappa_\pi\frac{\varpi}{\vartheta}\Bigg)\Bigg)\\
&\quad+\Bigg(\frac{1}{2}\mathcal{F}\Bigg(\frac{\varpi}{\vartheta}+1\Bigg)+\Bigg(\Upsilon_{ss}+\frac{\Upsilon\mathcal{F}}{2}\Bigg)\Bigg(\omega+\frac{\varkappa\varpi}{\vartheta}\Bigg)\Bigg)\varrho\chi_1-\Upsilon_s\Bigg(\omega+\frac{\varkappa\varpi}{\vartheta}\Bigg)\chi_2\Bigg)=0.
\end{aligned}
$$

✠ *Antiferromagnetic optical electric Heisenberg-microfluidical mKdV* **r**-*magnetomotive* $\phi(\mathbf{r})$ *phase*

$$\begin{aligned}{}^{\mathcal{AF}}\boldsymbol{L}^{\mathcal{E}}\phi(\mathbf{t}) = &-\left(\omega_s\left(1+\omega\Upsilon\right)\omega\varrho\chi_2 - \frac{1}{\varrho}\omega\left(1+\omega\Upsilon\right)^2\sin^3\varphi - \left(\left(1+\Upsilon\omega\right)^2+\omega_s^2\right)\chi_1\right)\\ &\left(\frac{1}{\varrho}\left(-\left(\frac{\varpi}{\vartheta}+1\right)\Upsilon_s + \left(\omega_\pi + \varkappa_\pi\frac{\varpi}{\vartheta}\right)\right)\sin^3\varphi + \Upsilon_s\left(\omega+\frac{\varkappa\varpi}{\vartheta}\right)\chi_1\right.\\ &\left.+\left(\frac{1}{2}\mathcal{F}\left(\frac{\varpi}{\vartheta}+1\right)+\left(\Upsilon_{ss}+\frac{\Upsilon\mathcal{F}}{2}\right)\left(\omega+\frac{\varkappa\varpi}{\vartheta}\right)\right)\varrho\chi_2\right)\\ &+\left(\chi_4\omega\left(1+\omega\Upsilon\right)^2 - \left(\left(1+\Upsilon\omega\right)^2+\omega_s^2\right)\chi_2 - \omega_s\left(1+\omega\Upsilon\right)\omega\varrho\chi_1\right)\\ &\left(\chi_4\left(-\left(\frac{\varpi}{\vartheta}+1\right)\Upsilon_s+\left(\omega_\pi+\varkappa_\pi\frac{\varpi}{\vartheta}\right)\right)+\left(\frac{1}{2}\mathcal{F}\left(\frac{\varpi}{\vartheta}+1\right)+\left(\Upsilon_{ss}\right.\right.\right.\\ &\left.\left.\left.+\frac{\Upsilon\mathcal{F}}{2}\right)\left(\omega+\frac{\varkappa\varpi}{\vartheta}\right)\right)\varrho\chi_1 - \Upsilon_s\left(\omega+\frac{\varkappa\varpi}{\vartheta}\right)\chi_2\right) - \left(\cos\varphi\omega_s\left(1\right.\right.\\ &\left.\left.+\omega\Upsilon\right)\omega - \left(\left(1+\Upsilon\omega\right)^2+\omega_s^2\right)\chi_3 - \frac{\omega}{\varrho}\sin^3\varphi\left(1+\omega\Upsilon\right)^2\right)\left(\Upsilon_s\left(\omega\right.\right.\\ &\left.+\frac{\varkappa\varpi}{\vartheta}\right)\chi_3+\frac{1}{\varrho}\left(-\left(\frac{\varpi}{\vartheta}+1\right)\Upsilon_s+\left(\omega_\pi+\varkappa_\pi\frac{\varpi}{\vartheta}\right)\right)\sin^3\varphi\\ &\left.+\left(\frac{1}{2}\mathcal{F}\left(\frac{\varpi}{\vartheta}+1\right)+\left(\Upsilon_{ss}+\frac{\Upsilon\mathcal{F}}{2}\right)\left(\omega+\frac{\varkappa\varpi}{\vartheta}\right)\right)\cos\varphi\right).\end{aligned}$$

Figure 2 illustrates optical effect of diverse values of the thermal diffusion amplitude on antiferromagnetic axially electrical *alfa*-microfluidic mKdV electric $\phi(\mathbf{t})$ flux path circuit of geometric system.

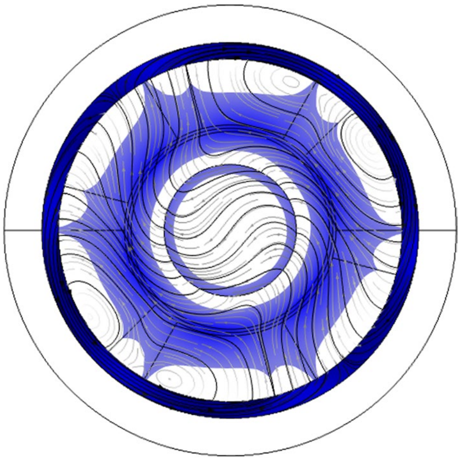


Fig. 2 Spherical electromotive $\phi(\mathbf{t})$ phase

5 Antiferromagnetic optical *alfa*-microfluidical mKdV electric $\phi(\mathbf{n})$ flux

✠ *Optical electric Heisenberg- microfluidical mKdV* **r**-*magnetomotive* $\phi(\mathbf{r})$ *phase is*

$$
\begin{aligned}
\boldsymbol{E}^{\mathcal{E}}\phi(\mathbf{n}) =& -\frac{d}{d\pi}\int_{\mathcal{F}}\Bigg(-\bigg(\chi_3\bigg(\omega\omega_s\bigg(\frac{\Upsilon\mathcal{F}}{2}+\Upsilon_{ss}\bigg)-\omega_\pi\Upsilon\omega\bigg)+\cos\varphi\bigg(\omega^2\bigg(\mathcal{F}\frac{\Upsilon}{2}+\Upsilon_{ss}\bigg)\\
&-\omega^2\frac{\mathcal{F}\Upsilon}{2}\bigg)-\frac{1}{\varrho}\sin^3\varphi\bigg(\mathcal{F}\frac{\omega\omega_s}{2}-\omega_\pi\omega\bigg)\bigg)\bigg(\Upsilon_s\bigg(\omega+\frac{\varkappa\varpi}{\vartheta}\bigg)\chi_3+\frac{1}{\varrho}\bigg(-\bigg(\frac{\varpi}{\vartheta}+1\bigg)\Upsilon_s\\
&+\bigg(\omega_\pi+\varkappa_\pi\frac{\varpi}{\vartheta}\bigg)\bigg)\sin^3\varphi+\bigg(\frac{1}{2}\mathcal{F}\bigg(\frac{\varpi}{\vartheta}+1\bigg)+\bigg(\Upsilon_{ss}+\frac{\Upsilon\mathcal{F}}{2}\bigg)\bigg(\omega+\frac{\varkappa\varpi}{\vartheta}\bigg)\bigg)\cos\varphi\bigg)\\
&+\bigg(\chi_4\bigg(\mathcal{F}\frac{\omega\omega_s}{2}-\omega_\pi\omega\bigg)+\chi_2\bigg(\omega\omega_s\bigg(\frac{\Upsilon\mathcal{F}}{2}+\Upsilon_{ss}\bigg)-\omega_\pi\Upsilon\omega\bigg)-\varrho\bigg(\omega^2\bigg(\mathcal{F}\frac{\Upsilon}{2}+\Upsilon_{ss}\bigg)\\
&-\omega^2\frac{\mathcal{F}\Upsilon}{2}\bigg)\chi_1\bigg)\bigg(\chi_4\bigg(-\bigg(\frac{\varpi}{\vartheta}+1\bigg)\Upsilon_s+\bigg(\omega_\pi+\varkappa_\pi\frac{\varpi}{\vartheta}\bigg)\bigg)+\bigg(\frac{1}{2}\mathcal{F}\bigg(\frac{\varpi}{\vartheta}+1\bigg)\\
&+\bigg(\Upsilon_{ss}+\frac{\Upsilon\mathcal{F}}{2}\bigg)\bigg(\omega\\
&+\frac{\varkappa\varpi}{\vartheta}\bigg)\bigg)\varrho\chi_1-\Upsilon_s\bigg(\omega+\frac{\varkappa\varpi}{\vartheta}\bigg)\chi_2\bigg)-\bigg(\chi_1\bigg(\omega\omega_s\bigg(\frac{\Upsilon\mathcal{F}}{2}+\Upsilon_{ss}\bigg)-\omega_\pi\Upsilon\omega\bigg)\\
&-\frac{1}{\varrho}\bigg(\mathcal{F}\frac{\omega\omega_s}{2}\\
&-\omega_\pi\omega\bigg)\sin^3\varphi+\varrho\bigg(\omega^2\bigg(\mathcal{F}\frac{\Upsilon}{2}+\Upsilon_{ss}\bigg)\\
&-\omega^2\frac{\mathcal{F}\Upsilon}{2}\bigg)\chi_2\bigg)\bigg(\frac{1}{\varrho}\bigg(-\bigg(\frac{\varpi}{\vartheta}+1\bigg)\Upsilon_s+\bigg(\omega_\pi\\
&+\varkappa_\pi\frac{\varpi}{\vartheta}\bigg)\bigg)\sin^3\varphi+\Upsilon_s\bigg(\omega+\frac{\varkappa\varpi}{\vartheta}\bigg)\chi_1+\bigg(\frac{1}{2}\mathcal{F}\bigg(\frac{\varpi}{\vartheta}+1\bigg)+\bigg(\Upsilon_{ss}+\frac{\Upsilon\mathcal{F}}{2}\bigg)\\
&\bigg(\omega+\frac{\varkappa\varpi}{\vartheta}\bigg)\bigg)\varrho\chi_2\bigg)\Bigg)d\mathcal{F}.
\end{aligned}
$$

So, cross product is computed as follows

$$
\begin{aligned}
\nabla_s\phi(\mathbf{n})\times\nabla_\pi\phi(\mathbf{n}) =& \bigg(\chi_1\bigg(\omega\omega_s\bigg(\frac{\Upsilon\mathcal{F}}{2}+\Upsilon_{ss}\bigg)-\omega_\pi\Upsilon\omega\bigg)-\frac{1}{\varrho}\bigg(\mathcal{F}\frac{\omega\omega_s}{2}-\omega_\pi\omega\bigg)\sin^3\varphi\\
&+\varrho\bigg(\omega^2\bigg(\mathcal{F}\frac{\Upsilon}{2}+\Upsilon_{ss}\bigg)-\omega^2\frac{\mathcal{F}\Upsilon}{2}\bigg)\chi_2\bigg)\mathbf{e}_1+\bigg(\chi_4\bigg(\mathcal{F}\frac{\omega\omega_s}{2}-\omega_\pi\omega\bigg)\\
&+\chi_2\bigg(\omega\omega_s\bigg(\frac{\Upsilon\mathcal{F}}{2}+\Upsilon_{ss}\bigg)\\
&-\omega_\pi\Upsilon\omega\bigg)-\varrho\bigg(\omega^2\bigg(\mathcal{F}\frac{\Upsilon}{2}+\Upsilon_{ss}\bigg)-\omega^2\frac{\mathcal{F}\Upsilon}{2}\bigg)\chi_1\bigg)\mathbf{e}_2\\
&+\bigg(\chi_3\bigg(\omega\omega_s\bigg(\frac{\Upsilon\mathcal{F}}{2}+\Upsilon_{ss}\bigg)-\omega_\pi\Upsilon\omega\bigg)\\
&+\cos\varphi\bigg(\omega^2\bigg(\mathcal{F}\frac{\Upsilon}{2}+\Upsilon_{ss}\bigg)-\omega^2\frac{\mathcal{F}\Upsilon}{2}\bigg)-\frac{1}{\varrho}\sin^3\varphi\bigg(\mathcal{F}\frac{\omega\omega_s}{2}-\omega_\pi\omega\bigg)\bigg)\mathbf{e}_3.
\end{aligned}
$$

✠ *Geometric electric Heisenberg- microfluidical mKdV* **r**-*electrical* $\phi(\mathbf{r})$ *flux solidity is*

$$
\begin{aligned}
\boldsymbol{L}^{\mathcal{E}}\phi(\mathbf{n}) =& \Bigg(\chi_4\Big(\mathcal{F}\frac{\omega\omega_s}{2} - \omega_\pi\omega\Big) + \chi_2\Big(\omega\omega_s\Big(\frac{\Upsilon\mathcal{F}}{2} + \Upsilon_{ss}\Big) - \omega_\pi\Upsilon\omega\Big) - \varrho\Big(\omega^2\Big(\mathcal{F}\frac{\Upsilon}{2} + \Upsilon_{ss}\Big) \\
& - \omega^2\frac{\mathcal{F}\Upsilon}{2}\Big)\chi_1\Bigg)\Bigg(\chi_4\Big(- \Big(\frac{\varpi}{\vartheta} + 1\Big)\Upsilon_s + \Big(\omega_\pi + \varkappa_\pi\frac{\varpi}{\vartheta}\Big)\Big) + \Big(\frac{1}{2}\mathcal{F}\Big(\frac{\varpi}{\vartheta} + 1\Big) + \Big(\Upsilon_{ss} \\
& + \frac{\Upsilon\mathcal{F}}{2}\Big)\Big(\omega + \frac{\varkappa\varpi}{\vartheta}\Big)\Big)\varrho\chi_1 - \Upsilon_s\Big(\omega + \frac{\varkappa\varpi}{\vartheta}\Big)\chi_2\Bigg) - \Bigg(\chi_1\Big(\omega\omega_s\Big(\frac{\Upsilon\mathcal{F}}{2} + \Upsilon_{ss}\Big) - \omega_\pi\Upsilon\omega\Big) \\
& - \frac{1}{\varrho}\Big(\mathcal{F}\frac{\omega\omega_s}{2} - \omega_\pi\omega\Big)\sin^3\varphi + \varrho\Big(\omega^2\Big(\mathcal{F}\frac{\Upsilon}{2} + \Upsilon_{ss}\Big) - \omega^2\frac{\mathcal{F}\Upsilon}{2}\Big)\chi_2\Bigg) \\
& \Bigg(\frac{1}{\varrho}\Big(- \Big(\frac{\varpi}{\vartheta} + 1\Big)\Upsilon_s \\
& + \Big(\omega_\pi + \varkappa_\pi\frac{\varpi}{\vartheta}\Big)\Big)\sin^3\varphi + \Upsilon_s\Big(\omega + \frac{\varkappa\varpi}{\vartheta}\Big)\chi_1 + \Big(\frac{1}{2}\mathcal{F}\Big(\frac{\varpi}{\vartheta} + 1\Big) + \Big(\Upsilon_{ss} + \frac{\Upsilon\mathcal{F}}{2}\Big) \\
& \Big(\omega + \frac{\varkappa\varpi}{\vartheta}\Big)\Big)\varrho\chi_2\Bigg) \\
& - \Bigg(\Upsilon_s\Big(\omega + \frac{\varkappa\varpi}{\vartheta}\Big)\chi_3 + \frac{1}{\varrho} \\
& \Big(- \Big(\frac{\varpi}{\vartheta} + 1\Big)\Upsilon_s + \Big(\omega_\pi + \varkappa_\pi\frac{\varpi}{\vartheta}\Big)\Big)\sin^3\varphi \\
& + \Big(\frac{1}{2}\mathcal{F}\Big(\frac{\varpi}{\vartheta} + 1\Big) \\
& + \Big(\Upsilon_{ss} + \frac{\Upsilon\mathcal{F}}{2}\Big)\Big(\omega + \frac{\varkappa\varpi}{\vartheta}\Big)\Big)\cos\varphi\Bigg)\Bigg(\chi_3\Big(\omega\omega_s\Big(\frac{\Upsilon\mathcal{F}}{2} + \Upsilon_{ss}\Big) - \omega_\pi\Upsilon\omega\Big) \\
& + \cos\varphi\Big(\omega^2\Big(\mathcal{F}\frac{\Upsilon}{2} + \Upsilon_{ss}\Big) - \omega^2\frac{\mathcal{F}\Upsilon}{2}\Big) - \frac{1}{\varrho}\sin^3\varphi\Big(\mathcal{F}\frac{\omega\omega_s}{2} - \omega_\pi\omega\Big)\Bigg).
\end{aligned}
$$

✠ *Dynamic Heisenberg-microfluidical mKdV* **r**-*electrical* $\phi(\mathbf{r})$ *flux is*

$$\begin{aligned}
W^{\mathcal{E}}\phi\left(\mathbf{n}\right) = \int_{\mathcal{F}} \Bigg(- \Bigg(\chi_1 \left(\omega\omega_s \left(\frac{\Upsilon \mathcal{F}}{2} + \Upsilon_{ss} \right) - \omega_\pi \Upsilon \omega \right) \\
- \frac{1}{\varrho} \left(\mathcal{F} \frac{\omega\omega_s}{2} - \omega_\pi \omega \right) \sin^3 \varphi + \varrho \Bigg(\omega^2 \Bigg(\mathcal{F} \frac{\Upsilon}{2} \\
+ \Upsilon_{ss} \Bigg) - \omega^2 \frac{\mathcal{F}\Upsilon}{2} \Bigg) \chi_2 \Bigg) \Bigg(\frac{1}{\varrho} \Bigg(- \left(\frac{\varpi}{\vartheta} + 1 \right) \Upsilon_s \\
+ \left(\omega_\pi + \varkappa_\pi \frac{\varpi}{\vartheta} \right) \Bigg) \sin^3 \varphi + \Upsilon_s \left(\omega + \frac{\varkappa \varpi}{\vartheta} \right) \chi_1 \\
+ \left(\frac{1}{2} \mathcal{F} \left(\frac{\varpi}{\vartheta} + 1 \right) + \left(\Upsilon_{ss} + \frac{\Upsilon \mathcal{F}}{2} \right) \left(\omega + \frac{\varkappa \varpi}{\vartheta} \right) \right) \varrho \chi_2 \Bigg) + \Bigg(\chi_4 \left(\mathcal{F} \frac{\omega\omega_s}{2} - \omega_\pi \omega \right) \\
+ \chi_2 \left(\omega\omega_s \left(\frac{\Upsilon \mathcal{F}}{2} + \Upsilon_{ss} \right) - \omega_\pi \Upsilon \omega \right) - \varrho \left(\omega^2 \left(\mathcal{F} \frac{\Upsilon}{2} + \Upsilon_{ss} \right) - \omega^2 \frac{\mathcal{F}\Upsilon}{2} \right) \chi_1 \Bigg) \\
\Bigg(\chi_4 \Bigg(- \left(\frac{\varpi}{\vartheta} + 1 \right) \Upsilon_s + \left(\omega_\pi + \varkappa_\pi \frac{\varpi}{\vartheta} \right) \Bigg) \\
+ \left(\frac{1}{2} \mathcal{F} \left(\frac{\varpi}{\vartheta} + 1 \right) + \left(\Upsilon_{ss} + \frac{\Upsilon \mathcal{F}}{2} \right) \left(\omega + \frac{\varkappa \varpi}{\vartheta} \right) \right) \varrho \chi_1 - \Upsilon_s \Bigg(\omega \\
+ \frac{\varkappa \varpi}{\vartheta} \Bigg) \chi_2 \Bigg) - \Bigg(\Upsilon_s \left(\omega + \frac{\varkappa \varpi}{\vartheta} \right) \chi_3 + \frac{1}{\varrho} \left(- \left(\frac{\varpi}{\vartheta} + 1 \right) \Upsilon_s + \left(\omega_\pi + \varkappa_\pi \frac{\varpi}{\vartheta} \right) \right) \sin^3 \varphi \\
+ \left(\frac{1}{2} \mathcal{F} \left(\frac{\varpi}{\vartheta} + 1 \right) + \left(\Upsilon_{ss} + \frac{\Upsilon \mathcal{F}}{2} \right) \left(\omega + \frac{\varkappa \varpi}{\vartheta} \right) \right) \cos \varphi \Bigg) \Bigg(\chi_3 \Bigg(\omega\omega_s \left(\frac{\Upsilon \mathcal{F}}{2} + \Upsilon_{ss} \right) \\
- \omega_\pi \Upsilon \omega \Bigg) + \cos \varphi \left(\omega^2 \left(\mathcal{F} \frac{\Upsilon}{2} + \Upsilon_{ss} \right) - \omega^2 \frac{\mathcal{F}\Upsilon}{2} \right) \\
- \frac{1}{\varrho} \sin^3 \varphi \left(\mathcal{F} \frac{\omega\omega_s}{2} - \omega_\pi \omega \right) \Bigg) \Bigg) d\mathcal{F}.
\end{aligned}$$

Since

$$\begin{aligned}
\nabla_s \phi(\mathbf{n}) \times \phi(\mathbf{n}) \times \nabla_s \phi(\mathbf{n}) = - \Bigg(\omega^2 \omega_s \chi_1 + \omega^3 \left(1 + \Upsilon^2 \right) \varrho \chi_2 \\
+ \frac{1}{\varrho} \omega_s \omega^2 \Upsilon \sin^3 \varphi \Bigg) \mathbf{e}_1 + \left(\omega^3 \left(1 + \Upsilon^2 \right) \varrho \chi_1 - \omega^2 \omega_s \chi_2 + \omega_s \omega^2 \Upsilon \chi_4 \right) \mathbf{e}_2 \\
- \left(\frac{1}{\varrho} \omega_s \Upsilon \sin^3 \varphi \omega^2 + \omega^2 \omega_s \chi_3 + \omega^3 \left(1 + \Upsilon^2 \right) \cos \varphi \right) \mathbf{e}_3.
\end{aligned}$$

✠ *Antiferromagnetic geometric electric Heisenberg-microfluidical axially mKdV* **r**-*electrical* $\phi(\mathbf{r})$ *flux solidity is*

$$
\begin{aligned}
{}^{\mathcal{AF}}\boldsymbol{L}^{\mathcal{E}}\phi(\mathbf{n}) =& \left(\frac{1}{\varrho}\omega_s\Upsilon\sin^3\varphi\omega^2+\omega^2\omega_s\chi_3+\omega^3\left(1+\Upsilon^2\right)\cos\varphi\right)\left(\Upsilon_s\left(\omega+\frac{\varkappa\varpi}{\vartheta}\right)\chi_3\right.\\
&+\frac{1}{\varrho}\left(-\left(\frac{\varpi}{\vartheta}+1\right)\Upsilon_s+\left(\omega_\pi+\varkappa_\pi\frac{\varpi}{\vartheta}\right)\right)\sin^3\varphi\\
&+\left(\frac{1}{2}\mathcal{F}\left(\frac{\varpi}{\vartheta}+1\right)+\left(\Upsilon_{ss}+\frac{\Upsilon\mathcal{F}}{2}\right)\left(\omega\right.\right.\\
&\left.\left.\left.+\frac{\varkappa\varpi}{\vartheta}\right)\right)\cos\varphi\right)+\left(\omega^2\omega_s\chi_1+\omega^3\left(1+\Upsilon^2\right)\varrho\chi_2+\frac{1}{\varrho}\omega_s\omega^2\Upsilon\sin^3\varphi\right)\\
&\left(\frac{1}{\varrho}\left(-\left(\frac{\varpi}{\vartheta}+1\right)\Upsilon_s\right.\right.\\
&\left.+\left(\omega_\pi+\varkappa_\pi\frac{\varpi}{\vartheta}\right)\right)\sin^3\varphi+\Upsilon_s\left(\omega+\frac{\varkappa\varpi}{\vartheta}\right)\chi_1+\left(\frac{1}{2}\mathcal{F}\left(\frac{\varpi}{\vartheta}+1\right)\right.\\
&+\left(\Upsilon_{ss}+\frac{\Upsilon\mathcal{F}}{2}\right)\left(\omega\right.\\
&\left.\left.\left.+\frac{\varkappa\varpi}{\vartheta}\right)\right)\varrho\chi_2\right)+\left(\omega^3\left(1+\Upsilon^2\right)\varrho\chi_1-\omega^2\omega_s\chi_2+\omega_s\omega^2\Upsilon\chi_4\right)\\
&\left(\chi_4\left(-\left(\frac{\varpi}{\vartheta}+1\right)\Upsilon_s+\left(\omega_\pi\right.\right.\right.\\
&\left.\left.+\varkappa_\pi\frac{\varpi}{\vartheta}\right)\right)+\left(\frac{1}{2}\mathcal{F}\left(\frac{\varpi}{\vartheta}+1\right)+\left(\Upsilon_{ss}+\frac{\Upsilon\mathcal{F}}{2}\right)\left(\omega+\frac{\varkappa\varpi}{\vartheta}\right)\right)\varrho\chi_1\\
&\left.-\Upsilon_s\left(\omega+\frac{\varkappa\varpi}{\vartheta}\right)\chi_2\right).
\end{aligned}
$$

✠ *Antiferromagnetic dynamic Heisenberg-microfluidical mKdV* **r**-*electrical* $\phi\left(\mathbf{r}\right)$ *flux is*

$$
\begin{aligned}
{}^{\mathcal{AF}}\mathbf{W}^{\mathcal{E}}\phi\left(\mathbf{n}\right) = \int_{\mathcal{F}} & \left(\left(\omega^2\omega_s\chi_1 + \omega^3\left(1+\Upsilon^2\right)\varrho\chi_2 + \frac{1}{\varrho}\omega_s\omega^2\Upsilon\sin^3\varphi\right)\left(\frac{1}{\varrho}\left(-\left(\frac{\varpi}{\vartheta}+1\right)\Upsilon_s\right.\right.\right. \\
& + \left.\left(\omega_\pi + \varkappa_\pi\frac{\varpi}{\vartheta}\right)\right)\sin^3\varphi + \Upsilon_s\left(\omega + \frac{\varkappa\varpi}{\vartheta}\right)\chi_1 \\
& + \left(\frac{1}{2}\mathcal{F}\left(\frac{\varpi}{\vartheta}+1\right) + \left(\Upsilon_{ss} + \frac{\Upsilon\mathcal{F}}{2}\right)\left(\omega\right.\right. \\
& + \left.\left.\left.\frac{\varkappa\varpi}{\vartheta}\right)\right)\varrho\chi_2\right) + \left(\omega^3\left(1+\Upsilon^2\right)\varrho\chi_1 - \omega^2\omega_s\chi_2 + \omega_s\omega^2\Upsilon\chi_4\right) \\
& \left(\chi_4\left(-\left(\frac{\varpi}{\vartheta}+1\right)\Upsilon_s\right.\right. \\
& + \left.\left(\omega_\pi + \varkappa_\pi\frac{\varpi}{\vartheta}\right)\right) + \left(\frac{1}{2}\mathcal{F}\left(\frac{\varpi}{\vartheta}+1\right) + \left(\Upsilon_{ss} + \frac{\Upsilon\mathcal{F}}{2}\right)\left(\omega + \frac{\varkappa\varpi}{\vartheta}\right)\right)\varrho\chi_1 \\
& - \left.\Upsilon_s\left(\omega + \frac{\varkappa\varpi}{\vartheta}\right)\chi_2\right) \\
& + \left(\frac{1}{\varrho}\omega_s\Upsilon\sin^3\varphi\omega^2 + \omega^2\omega_s\chi_3 + \omega^3\left(1+\Upsilon^2\right)\cos\varphi\right)\left(\Upsilon_s\left(\omega + \frac{\varkappa\varpi}{\vartheta}\right)\chi_3\right. \\
& + \frac{1}{\varrho}\left(-\left(\frac{\varpi}{\vartheta}+1\right)\Upsilon_s\right. \\
& + \left.\left(\omega_\pi + \varkappa_\pi\frac{\varpi}{\vartheta}\right)\right)\sin^3\varphi + \left(\frac{1}{2}\mathcal{F}\left(\frac{\varpi}{\vartheta}+1\right) + \left(\Upsilon_{ss}\right.\right. \\
& + \left.\left.\left.\left.\frac{\Upsilon\mathcal{F}}{2}\right)\left(\omega + \frac{\varkappa\varpi}{\vartheta}\right)\right)\cos\varphi\right)\right)d\mathcal{F}.
\end{aligned}
$$

✠ *Optical axially electrical Heisenberg-microfluidical mKdV* **r**-*electrical* $\phi(\mathbf{r})$ *flux* **r** *-direction orbit is*

$$
\begin{aligned}
&-\left(\frac{1}{\varrho}\left(-\left(\frac{\varpi}{\vartheta}+1\right)\Upsilon_s+\left(\omega_\pi+\varkappa_\pi\frac{\varpi}{\vartheta}\right)\right)\sin^3\varphi+\Upsilon_s\left(\omega+\frac{\varkappa\varpi}{\vartheta}\right)\chi_1+\left(\frac{1}{2}\mathcal{F}\left(\frac{\varpi}{\vartheta}+1\right)\right.\right.\\
&+\left.\left.\left(\Upsilon_{ss}+\frac{\Upsilon\mathcal{F}}{2}\right)\left(\omega+\frac{\varkappa\varpi}{\vartheta}\right)\right)\varrho\chi_2\right)\left(\chi_1\left(\omega\omega_s\left(\frac{\Upsilon\mathcal{F}}{2}+\Upsilon_{ss}\right)-\omega_\pi\Upsilon\omega\right)-\frac{1}{\varrho}\left(\mathcal{F}\frac{\omega\omega_s}{2}\right.\right.\\
&-\left.\omega_\pi\omega\right)\sin^3\varphi+\varrho\left(\omega^2\left(\mathcal{F}\frac{\Upsilon}{2}+\Upsilon_{ss}\right)-\omega^2\frac{\mathcal{F}\Upsilon}{2}\right)\chi_2\Bigg)+\left(\chi_4\left(\mathcal{F}\frac{\omega\omega_s}{2}-\omega_\pi\omega\right)\right.\\
&+\chi_2\left(\omega\omega_s\left(\frac{\Upsilon\mathcal{F}}{2}+\Upsilon_{ss}\right)-\omega_\pi\Upsilon\omega\right)-\varrho\left(\omega^2\left(\mathcal{F}\frac{\Upsilon}{2}+\Upsilon_{ss}\right)-\omega^2\frac{\mathcal{F}\Upsilon}{2}\right)\chi_1\Bigg)\left(\chi_4\left(-\left(\frac{\varpi}{\vartheta}\right.\right.\right.\\
&+\left.1\right)\Upsilon_s+\left(\omega_\pi+\varkappa_\pi\frac{\varpi}{\vartheta}\right)\Bigg)+\left(\frac{1}{2}\mathcal{F}\left(\frac{\varpi}{\vartheta}+1\right)+\left(\Upsilon_{ss}+\frac{\Upsilon\mathcal{F}}{2}\right)\left(\omega+\frac{\varkappa\varpi}{\vartheta}\right)\right)\varrho\chi_1\\
&-\Upsilon_s\left(\omega+\frac{\varkappa\varpi}{\vartheta}\right)\chi_2\Bigg)-\left(\Upsilon_s\left(\omega+\frac{\varkappa\varpi}{\vartheta}\right)\chi_3+\frac{1}{\varrho}\left(-\left(\frac{\varpi}{\vartheta}+1\right)\Upsilon_s+\left(\omega_\pi+\varkappa_\pi\frac{\varpi}{\vartheta}\right)\right)\sin^3\varphi\right.\\
&+\left.\left(\frac{1}{2}\mathcal{F}\left(\frac{\varpi}{\vartheta}+1\right)+\left(\Upsilon_{ss}+\frac{\Upsilon\mathcal{F}}{2}\right)\left(\omega+\frac{\varkappa\varpi}{\vartheta}\right)\right)\cos\varphi\right)\left(\chi_3\left(\omega\omega_s\left(\frac{\Upsilon\mathcal{F}}{2}+\Upsilon_{ss}\right)\right.\right.\\
&-\left.\omega_\pi\Upsilon\omega\right)+\cos\varphi\left(\omega^2\left(\mathcal{F}\frac{\Upsilon}{2}+\Upsilon_{ss}\right)-\omega^2\frac{\mathcal{F}\Upsilon}{2}\right)-\frac{1}{\varrho}\sin^3\varphi\left(\mathcal{F}\frac{\omega\omega_s}{2}-\omega_\pi\omega\right)\Bigg)=0.
\end{aligned}
$$

✠ *Antiferromagnetic axially electrical Heisenberg-microfluidical mKdV* **r**-*electrical* $\phi(\mathbf{r})$ *flux* **r**-*direction orbit is*

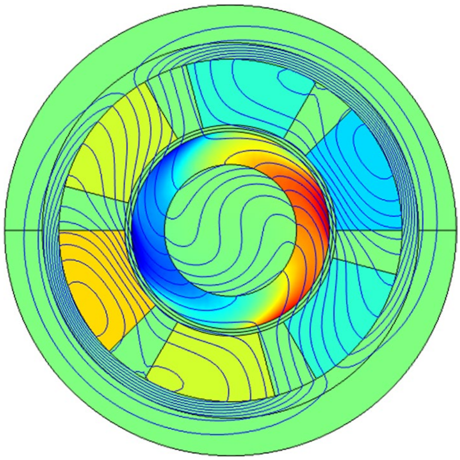
$$
\begin{aligned}
&\left(\Upsilon_s\left(\omega+\frac{\varkappa\varpi}{\vartheta}\right)\chi_3+\frac{1}{\varrho}\left(-\left(\frac{\varpi}{\vartheta}+1\right)\Upsilon_s+\left(\omega_\pi+\varkappa_\pi\frac{\varpi}{\vartheta}\right)\right)\sin^3\varphi+\left(\frac{1}{2}\mathcal{F}\left(\frac{\varpi}{\vartheta}+1\right)\right.\right.\\
&+\left.\left.\left(\Upsilon_{ss}+\frac{\Upsilon\mathcal{F}}{2}\right)\left(\omega+\frac{\varkappa\varpi}{\vartheta}\right)\right)\cos\varphi\right)\left(\frac{1}{\varrho}\omega_s\Upsilon\sin^3\varphi\omega^2+\omega^2\omega_s\chi_3+\omega^3\left(1+\Upsilon^2\right)\cos\varphi\right)\\
&+\left(\omega^2\omega_s\chi_1+\omega^3\left(1+\Upsilon^2\right)\varrho\chi_2+\frac{1}{\varrho}\omega_s\omega^2\Upsilon\sin^3\varphi\right)\left(\frac{1}{\varrho}\left(-\left(\frac{\varpi}{\vartheta}+1\right)\Upsilon_s\right.\right.\\
&+\left.\left(\omega_\pi+\varkappa_\pi\frac{\varpi}{\vartheta}\right)\right)\sin^3\varphi\\
&+\Upsilon_s\left(\omega+\frac{\varkappa\varpi}{\vartheta}\right)\chi_1+\left(\frac{1}{2}\mathcal{F}\left(\frac{\varpi}{\vartheta}+1\right)+\left(\Upsilon_{ss}+\frac{\Upsilon\mathcal{F}}{2}\right)\left(\omega+\frac{\varkappa\varpi}{\vartheta}\right)\right)\varrho\chi_2\Bigg)\\
&+\left(\omega^3\left(1+\Upsilon^2\right)\varrho\chi_1-\omega^2\omega_s\chi_2+\omega_s\omega^2\Upsilon\chi_4\right)\left(\chi_4\left(-\left(\frac{\varpi}{\vartheta}+1\right)\Upsilon_s+\left(\omega_\pi+\varkappa_\pi\frac{\varpi}{\vartheta}\right)\right)\right.\\
&+\left.\left(\frac{1}{2}\mathcal{F}\left(\frac{\varpi}{\vartheta}+1\right)+\left(\Upsilon_{ss}+\frac{\Upsilon\mathcal{F}}{2}\right)\left(\omega+\frac{\varkappa\varpi}{\vartheta}\right)\right)\varrho\chi_1-\Upsilon_s\left(\omega+\frac{\varkappa\varpi}{\vartheta}\right)\chi_2\right)=0.
\end{aligned}
$$

✠ *Antiferromagnetic optical electric Heisenberg-microfluidical mKdV* **r**-*magnetomotive* $\phi(\mathbf{r})$ *phase*

$$
\begin{aligned}
{}^{\mathcal{AF}}\boldsymbol{E}^{\mathcal{E}}\phi(\mathbf{n}) = &-\frac{d}{d\pi}\int_{\mathcal{F}}\Bigg(\Bigg(\omega^3\Big(1+\Upsilon^2\Big)\varrho\chi_1-\omega^2\omega_s\chi_2+\omega_s\omega^2\Upsilon\chi_4\Bigg)\Bigg(\chi_4\Bigg(-\Big(\frac{\varpi}{\vartheta}+1\Big)\Upsilon_s\\
&+\Big(\omega_\pi+\varkappa_\pi\frac{\varpi}{\vartheta}\Big)\Bigg)+\Bigg(\frac{1}{2}\mathcal{F}\Big(\frac{\varpi}{\vartheta}+1\Big)+\Big(\Upsilon_{ss}+\frac{\Upsilon\mathcal{F}}{2}\Big)\Big(\omega+\frac{\varkappa\varpi}{\vartheta}\Big)\Bigg)\varrho\chi_1\\
&-\Upsilon_s\Big(\omega+\frac{\varkappa\varpi}{\vartheta}\Big)\chi_2\Bigg)\\
&+\Bigg(\frac{1}{\varrho}\omega_s\Upsilon\sin^3\varphi\omega^2+\omega^2\omega_s\chi_3+\omega^3\Big(1+\Upsilon^2\Big)\cos\varphi\Bigg)\Bigg(\Upsilon_s\Big(\omega+\frac{\varkappa\varpi}{\vartheta}\Big)\chi_3\\
&+\frac{1}{\varrho}\Bigg(-\Big(\frac{\varpi}{\vartheta}\\
&+1\Big)\Upsilon_s+\Big(\omega_\pi+\varkappa_\pi\frac{\varpi}{\vartheta}\Big)\Bigg)\sin^3\varphi+\Bigg(\frac{1}{2}\mathcal{F}\Big(\frac{\varpi}{\vartheta}+1\Big)+\Big(\Upsilon_{ss}+\frac{\Upsilon\mathcal{F}}{2}\Big)\\
&\Big(\omega+\frac{\varkappa\varpi}{\vartheta}\Big)\Bigg)\cos\varphi\Bigg)\\
&+\Bigg(\omega^2\omega_s\chi_1+\omega^3\\
&\Big(1+\Upsilon^2\Big)\varrho\chi_2+\frac{1}{\varrho}\omega_s\omega^2\Upsilon\sin^3\varphi\Bigg)\Bigg(\frac{1}{\varrho}\Bigg(-\Big(\frac{\varpi}{\vartheta}+1\Big)\Upsilon_s\\
&+\Big(\omega_\pi+\varkappa_\pi\frac{\varpi}{\vartheta}\Big)\Bigg)\sin^3\varphi+\Upsilon_s\Big(\omega+\frac{\varkappa\varpi}{\vartheta}\Big)\chi_1+\Bigg(\frac{1}{2}\mathcal{F}\Big(\frac{\varpi}{\vartheta}+1\Big)\\
&+\Big(\Upsilon_{ss}+\frac{\Upsilon\mathcal{F}}{2}\Big)\Big(\omega+\frac{\varkappa\varpi}{\vartheta}\Big)\Bigg)\varrho\chi_2\Bigg)\Bigg)d\mathcal{F}.
\end{aligned}
$$

Figure 3 illustrates optical effect of diverse values of the thermal diffusion amplitude on antiferromagnetic axially electrical *alfa*-microfluidic mKdV electric $\phi(\mathbf{n})$ flux path circuit of geometric system.

Fig. 3 Spherical electromotive $\phi(\mathbf{n})$ phase



6 Conclusion

Optical phase flux is designed by the phase of light waves. Optical microfluidical magnetomotive phase is used in various applications such as telecommunications, imaging, and interferometry. Optical microscales could be incorporated to create compact and efficient phase manipulation devices.

In this paper, we illustrate antiferromagnetic geometric electric *Heisenberg*-microfluidical axially mKdV **r**-electrical $\phi(\mathbf{r}), \phi(\mathbf{t}), \phi(\mathbf{n})$ flux solidity in spherical Heisenberg group. Then, we get optical electric *Heisenberg*-microfluidical mKdV **r**-magnetomotive $\phi(\mathbf{r}), \phi(\mathbf{t}), \phi(\mathbf{n})$ phase. Also, we obtain antiferromagnetic axially electrical *Heisenberg*-microfluidical mKdV **r**-electrical $\phi(\mathbf{r}), \phi(\mathbf{t}), \phi(\mathbf{n})$ flux **r**-direction orbit in spherical Heisenberg group. Finally, we have antiferromagnetic optical electric *Heisenberg*-microfluidical mKdV **r**-magnetomotive $\phi(\mathbf{r}), \phi(\mathbf{t}), \phi(\mathbf{n})$ phase.

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Data availability No data was used for the research described in the article.

Declarations

Conflict of interest The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Ethical approval The contents of this manuscript have not been copyrighted or published previously; The contents of this manuscript are not now under consideration for publication elsewhere.

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