PHENOMENOLOGICAL POLYAKOV-LOOP POTENTIALS

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In collaboration with Pedro Costa (CFisUC, Coimbra), Hubert Hansen (IPNL, Lyon) and Urko Reinosa (CPHT, Palaiseau)

Outline

1. Introduction
2. Phenomenological Polyakov-loop potential revisited: adjustment to thermodynamics
3. Phenomenological Polyakov-loop potential revisited: adjustment to first-principle continuum potential
4. Conclusions

Phenomenological vs. First Principle

$$\mathcal{U}_{\text{poly}}\left(\Phi, \bar{\Phi}, t\right)/\,T^4 = p_2(t)\,\Phi\bar{\Phi} + p_3\left(\Phi^3 + \bar{\Phi}^3\right) + p_4\left(\Phi\bar{\Phi}\right)^2$$

O. Scavenius, A. Dumitru and J. Lenaghan, Phys. Rev. D 66 (2002)
C. Ratti, M. A. Thaler and W. Weise, Phys. Rev. D 73 (2006)

$$\mathcal{U}_{\text{log}}\left(\Phi, \bar{\Phi}, t\right)/\,T^4 = p_2(t)\,\Phi\bar{\Phi} + l(t)\ln\left[1 - 6\Phi\bar{\Phi} + 4\left(\Phi^3 + \bar{\Phi}^3\right) - 3\left(\Phi\bar{\Phi}\right)^2\right]$$

S. Roessner, T. Hell, C. Ratti and W. Weise, Nucl. Phys. A 814 (2008)

vs.

$$V[A_0] = V_\Lambda[A_0] + \frac{1}{\beta\mathcal{V}}\int_\Lambda^0 dt\,\partial_t\Gamma_k[A_0],$$

L. Fister and J. M. Pawlowski, *Phys. Rev.* D 88 (2013)

$$V^{(1)}(T,r) = \frac{3}{2}\mathcal{F}_m(T,r) - \frac{1}{2}\mathcal{F}_0(T,r),$$

$$\begin{aligned} V^{(2)}(T,r) = {} & m^2 C_G \sum_\kappa J^\kappa_m(1n) \\ & + \frac{3g^2}{8}\sum_{\kappa,\lambda,\tau} \mathcal{C}_{\kappa\lambda\tau}\left[\frac{5}{2}U^\kappa V^\lambda - \frac{7}{m^2}\tilde{U}^\kappa\tilde{V}^\lambda\right] \\ & + \frac{g^2 m^2}{16}\sum_{\kappa,\lambda,\tau}\mathcal{C}_{\kappa\lambda\tau}[33 S^{\kappa\lambda\tau}_{mmm}(2n) + S^{\kappa\lambda\tau}_{m00}(2n)]. \end{aligned}$$

U. Reinosa, J. Serreau, M. Tissier, and N. Wschebor, *Phys. Rev.* D 93 (2016)

$$e(a,L) = \sum_\sigma \int d\!\!{}^-{}^3 p[\omega_G(\mathbf{p}_\sigma) - \chi_{\text{IR}}(\mathbf{p}_\sigma)]. \qquad (195)$$

Subtracting the value at $a = 0$ we have

$$\bar{e}(a,L) = e(a,L) - e(a=0,L) = \bar{e}^\omega_G(a,L) - \bar{e}^\omega_{\text{IR}}(a,L),$$

H. Reinhardt and J. Heffner, *Phys. Rev.* D 88 (2013)

$$\beta^4 V_{\text{eff}}(x) = \beta^4 W(x) + \frac{6}{\pi^2}\sum_{m=1}^\infty \frac{1-\cos(2\pi m x)}{m^4}\,h(\beta m)$$

M. Quandt and H. Reinhardt, *Phys. Rev.* D 94 (2016)

Application of a Phenomenological Potential

…for a simple model of QCD

$$\mathcal{L}_{\mathrm{PQM}} = \bar{q}\left[\mathrm{i}\,\gamma_\mu\left(\partial^\mu - \mathrm{i}\,A^\mu\delta_{\mu 0} + \mu_f\,\delta^{\mu 0}\right) - g\,\frac{\lambda_a}{2}\left(\sigma_a + \mathrm{i}\gamma_5\pi_a\right)\right]q$$
$$+\frac{1}{2}\left(\partial_\mu\sigma_a\partial^\mu\sigma_a + \partial_\mu\pi_a\partial^\mu\pi_a\right) - U\left(\sigma_a,\pi_a\right) - \boldsymbol{\mathcal{U}}\left(\boldsymbol{\Phi}\left[\boldsymbol{A_0}\right],\bar{\boldsymbol{\Phi}}\left[\boldsymbol{A_0}\right];\boldsymbol{T}\right)$$

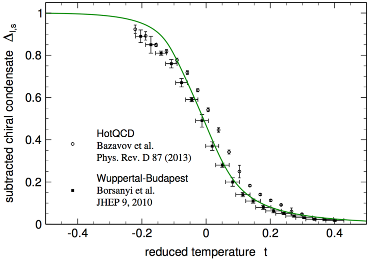
$$\mathcal{L}_{\mathrm{PNJL}} = \bar{q}\left[\mathrm{i}\,\gamma_\mu\left(\partial^\mu - \mathrm{i}\,A^\mu\delta_{\mu 0} + \mu_f\,\delta^{\mu 0}\right) - m_0\right]q + G\left[\left(\bar{q}q\right)^2 + \left(\bar{q}\mathrm{i}\gamma_5\vec{\tau}q\right)^2\right]$$
$$-\boldsymbol{\mathcal{U}}\left(\boldsymbol{\Phi}\left[\boldsymbol{A_0}\right],\bar{\boldsymbol{\Phi}}\left[\boldsymbol{A_0}\right];\boldsymbol{T}\right)$$

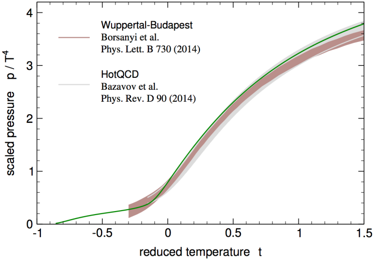
Application of a Phenomenological Potential

$$\mathcal{L}_{\mathrm{PQM}} = \bar{q}\left[\mathrm{i}\,\gamma_\mu \left(\partial^\mu - \mathrm{i}\,A^\mu \delta_{\mu 0} + \mu_f\,\delta^{\mu 0}\right) - g\,\frac{\lambda_a}{2}\left(\sigma_a + \mathrm{i}\gamma_5\pi_a\right)\right] q$$
$$+\frac{1}{2}\left(\partial_\mu\sigma_a\partial^\mu\sigma_a + \partial_\mu\pi_a\partial^\mu\pi_a\right) - U\left(\sigma_a,\pi_a\right) - \boldsymbol{\mathcal{U}}\left(\boldsymbol{\Phi}\left[\boldsymbol{A_0}\right], \bar{\boldsymbol{\Phi}}\left[\boldsymbol{A_0}\right]; \boldsymbol{T}\right)$$

$$\mathcal{L}_{\mathrm{PNJL}} = \bar{q}\left[\mathrm{i}\,\gamma_\mu \left(\partial^\mu - \mathrm{i}\,A^\mu \delta_{\mu 0} + \mu_f\,\delta^{\mu 0}\right) - m_0\right] q + G\left[\left(\bar{q}q\right)^2 + \left(\bar{q}\mathrm{i}\gamma_5\vec{\tau}q\right)^2\right]$$
$$-\boldsymbol{\mathcal{U}}\left(\boldsymbol{\Phi}\left[\boldsymbol{A_0}\right], \bar{\boldsymbol{\Phi}}\left[\boldsymbol{A_0}\right]; \boldsymbol{T}\right)$$

L. Haas, RS, J. Braun, J. Pawlowski and J. Schaffner-Bielich, Phys. Rev. D 87 (2013)
T. K. Herbst, M. Mitter, J. Pawlowski, B.-J. Schaefer and RS, Phys. Lett. B 731 (2014)





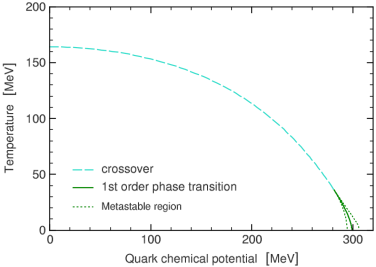
Captures the relevant properties

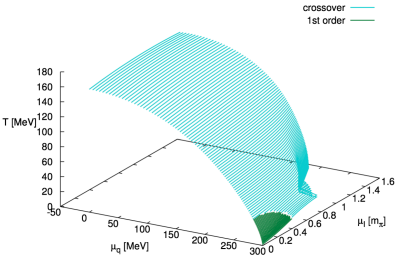
Application of a Phenomenological Potential

$$\mathcal{L}_{\mathrm{PQM}} = \bar{q}\left[\mathrm{i}\gamma_\mu\left(\partial^\mu - \mathrm{i}A^\mu\delta_{\mu 0} + \mu_f\,\delta^{\mu 0}\right) - g\,\frac{\lambda_a}{2}\left(\sigma_a + \mathrm{i}\gamma_5\pi_a\right)\right]q$$
$$+\frac{1}{2}\left(\partial_\mu\sigma_a\partial^\mu\sigma_a + \partial_\mu\pi_a\partial^\mu\pi_a\right) - U\left(\sigma_a,\pi_a\right) - \boldsymbol{\mathcal{U}}\left(\boldsymbol{\Phi}\left[\boldsymbol{A_0}\right],\bar{\boldsymbol{\Phi}}\left[\boldsymbol{A_0}\right];\boldsymbol{T}\right)$$

$$\mathcal{L}_{\mathrm{PNJL}} = \bar{q}\left[\mathrm{i}\gamma_\mu\left(\partial^\mu - \mathrm{i}A^\mu\delta_{\mu 0} + \mu_f\,\delta^{\mu 0}\right) - m_0\right]q + G\left[(\bar{q}q)^2 + (\bar{q}\mathrm{i}\gamma_5\vec{\tau}q)^2\right]$$
$$-\boldsymbol{\mathcal{U}}\left(\boldsymbol{\Phi}\left[\boldsymbol{A_0}\right],\bar{\boldsymbol{\Phi}}\left[\boldsymbol{A_0}\right];\boldsymbol{T}\right)$$

…Sketch of the phase diagram and isospin dependence





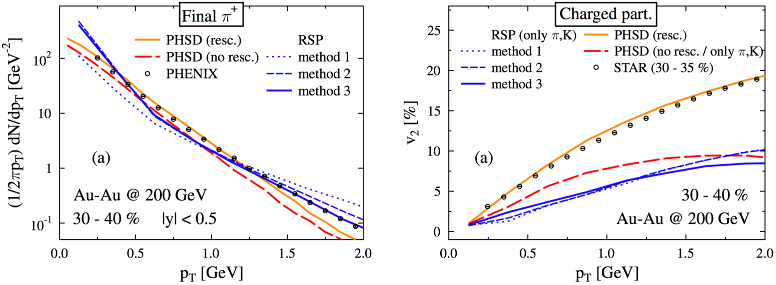
RS and J. Schaffner-Bielich, Phys. Rev. D 93 (2016) *RS, E. S. Fraga and J. Schaffner-Bielich, arXiv:1307.2851v1*

Application of a Phenomenological Potential

$$\mathcal{L}_{\mathrm{PQM}} = \bar{q}\left[\mathrm{i}\,\gamma_\mu \left(\partial^\mu - \mathrm{i}\,A^\mu \delta_{\mu 0} + \mu_f\,\delta^{\mu 0}\right) - g\,\frac{\lambda_a}{2}\left(\sigma_a + \mathrm{i}\gamma_5 \pi_a\right)\right] q + \frac{1}{2}\left(\partial_\mu \sigma_a \partial^\mu \sigma_a + \partial_\mu \pi_a \partial^\mu \pi_a\right) - U\left(\sigma_a, \pi_a\right) - \boldsymbol{\mathcal{U}}\left(\boldsymbol{\Phi}\left[\boldsymbol{A_0}\right], \bar{\boldsymbol{\Phi}}\left[\boldsymbol{A_0}\right]; \boldsymbol{T}\right)$$

$$\mathcal{L}_{\mathrm{PNJL}} = \bar{q}\left[\mathrm{i}\,\gamma_\mu \left(\partial^\mu - \mathrm{i}\,A^\mu \delta_{\mu 0} + \mu_f\,\delta^{\mu 0}\right) - m_0\right] q + G\left[(\bar{q}q)^2 + (\bar{q}\mathrm{i}\gamma_5\vec{\tau}q)^2\right] - \boldsymbol{\mathcal{U}}\left(\boldsymbol{\Phi}\left[\boldsymbol{A_0}\right], \bar{\boldsymbol{\Phi}}\left[\boldsymbol{A_0}\right]; \boldsymbol{T}\right)$$

... Input to calculate transport properties in RHICs



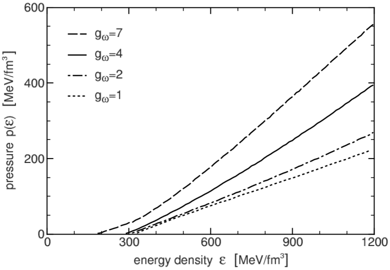
R. Marty, E. Bratkovskaya, W. Cassing and J. Aichelin, Phys. Rev. C 92 (2015)

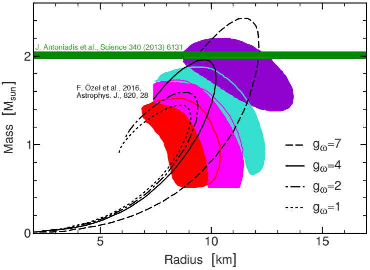
Application of a Phenomenological Potential

$$\mathcal{L}_{\mathrm{PQM}} = \bar{q}\left[\mathrm{i}\,\gamma_\mu\left(\partial^\mu - \mathrm{i}A^\mu\delta_{\mu 0} + \mu_f\,\delta^{\mu 0}\right) - g\,\frac{\lambda_a}{2}\left(\sigma_a + \mathrm{i}\gamma_5\pi_a\right)\right]q$$
$$+\frac{1}{2}\left(\partial_\mu\sigma_a\partial^\mu\sigma_a + \partial_\mu\pi_a\partial^\mu\pi_a\right) - U\left(\sigma_a,\pi_a\right) - \boldsymbol{\mathcal{U}}\left(\boldsymbol{\Phi}\left[A_0\right],\bar{\boldsymbol{\Phi}}\left[A_0\right];T\right)$$

$$\mathcal{L}_{\mathrm{PNJL}} = \bar{q}\left[\mathrm{i}\,\gamma_\mu\left(\partial^\mu - \mathrm{i}A^\mu\delta_{\mu 0} + \mu_f\,\delta^{\mu 0}\right) - m_0\right]q + G\left[\left(\bar{q}q\right)^2 + \left(\bar{q}\mathrm{i}\gamma_5\vec{\tau}q\right)^2\right]$$
$$-\boldsymbol{\mathcal{U}}\left(\boldsymbol{\Phi}\left[A_0\right],\bar{\boldsymbol{\Phi}}\left[A_0\right];T\right)$$

. . . equation of state of quark matter inside compact stars

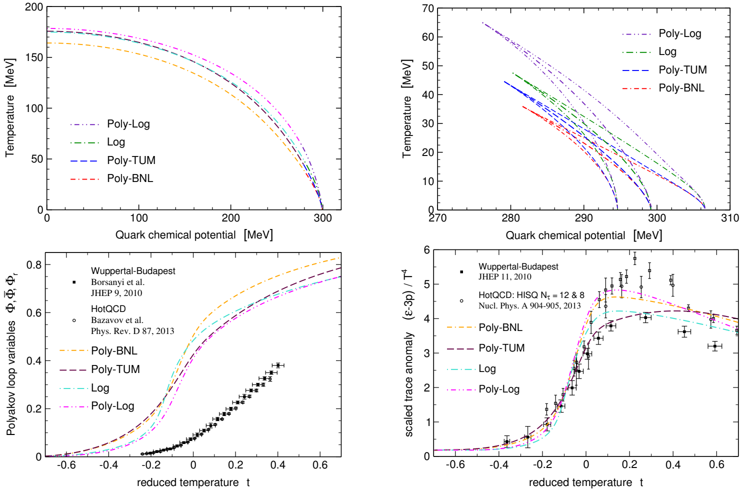




A. Zacchi, RS, J. Schaffner-Bielich, Phys. Rev. D 92 (2015)

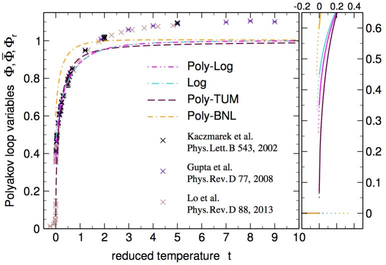
Problem with existing parameterisations

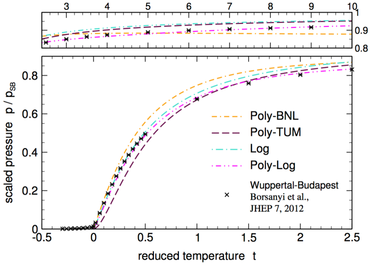
Results with different parameterisations . . . differ



RS and J. Schaffner-Bielich, Phys. Rev. D 93 (2016)

Different parameterisations . . . differ already in YM



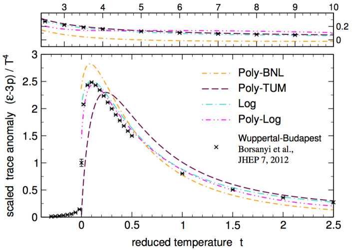


L. Haas, RS, J. Braun, J. M. Pawlowski and J. Schaffner-Bielich, *Phys. Rev.* D 87 (2013)

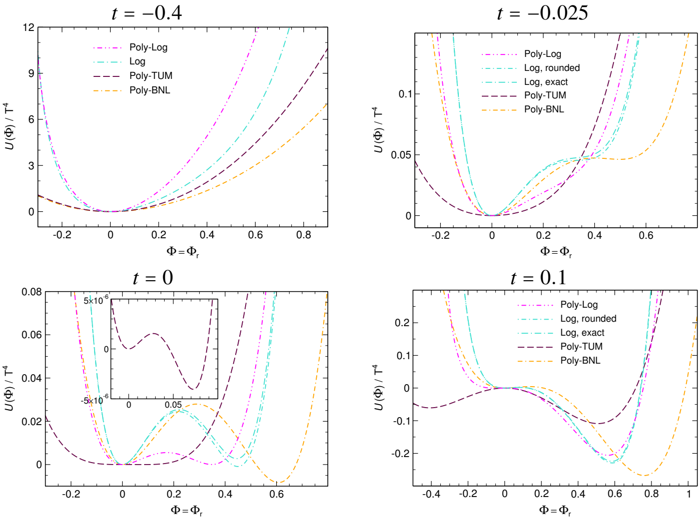
$$\mathcal{U}_{\text{poly}}(\Phi,\bar{\Phi},t)/T^4 = p_2(t)\,\Phi\bar{\Phi} + p_3\left(\Phi^3+\bar{\Phi}^3\right) + p_4\left(\Phi\bar{\Phi}\right)^2$$

$$\mathcal{U}_{\log}(\Phi,\bar{\Phi},t)/T^4 = p_2(t)\,\Phi\bar{\Phi} \;+\; l(t)\ln\Big[1-6\Phi\bar{\Phi}+4\left(\Phi^3+\bar{\Phi}^3\right)-3\left(\Phi\bar{\Phi}\right)^2\Big]$$

$$\mathcal{U}_{\text{poly+log}}(\Phi,\bar{\Phi},t)/T^4 = p_2(t)\,\Phi\bar{\Phi} + p_3(t)\left(\Phi^3+\bar{\Phi}^3\right) + p_4(t)\left(\Phi\bar{\Phi}\right)^2 + \\ + l(t)\ln\left[1-6\Phi\bar{\Phi}+4\left(\Phi^3+\bar{\Phi}^3\right)-3\left(\Phi\bar{\Phi}\right)^2\right]$$



Different parametrisations . . . differ already in YM



RS, PhD thesis, 2014, Universität Heidelberg, `http://www.ub.uni-heidelberg.de/archiv/16887`

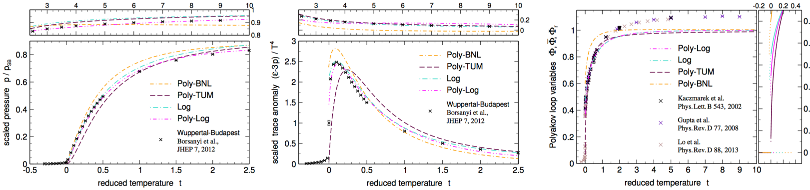
Determining Phenomenological Potentials ?

T-dependent parameters fitted to T-dependence of YM thermodynamics and Polyakov loop

$$\mathcal{U}_{\text{poly}}\left(\Phi,\bar{\Phi},t\right)/T^4 = p_2(t)\,\Phi\bar{\Phi} + p_3\left(\Phi^3+\bar{\Phi}^3\right) + p_4\left(\Phi\bar{\Phi}\right)^2$$

$$\mathcal{U}_{\text{log}}\left(\Phi,\bar{\Phi},t\right)/T^4 = p_2(t)\,\Phi\bar{\Phi} + l(t)\ln\left[1-6\Phi\bar{\Phi}+4\left(\Phi^3+\bar{\Phi}^3\right)-3\left(\Phi\bar{\Phi}\right)^2\right]$$

$$\begin{aligned}\mathcal{U}_{\text{poly+log}}\left(\Phi,\bar{\Phi},t\right)/T^4 &= p_2(t)\,\Phi\bar{\Phi} + p_3(t)\left(\Phi^3+\bar{\Phi}^3\right) + p_4(t)\left(\Phi\bar{\Phi}\right)^2 + \\ &\quad + l(t)\ln\left[1-6\Phi\bar{\Phi}+4\left(\Phi^3+\bar{\Phi}^3\right)-3\left(\Phi\bar{\Phi}\right)^2\right]\end{aligned}$$



Poly-BNL: *O. Scavenius, A. Dumitru and J. Lenaghan, Phys. Rev. D 66 (2002)*
Poly-TUM: *C. Ratti, M. A. Thaler and W. Weise, Phys. Rev. D 73 (2006)*
Log: *S. Roessner, T. Hell, C. Ratti and W. Weise, Nucl. Phys. A 814 (2008)*
Poly+Log: *P. M. Lo, B. Friman, O. Kaczmarek, K. Redlich, C. Sasaki, Phys. Rev. D 88 (2013)*

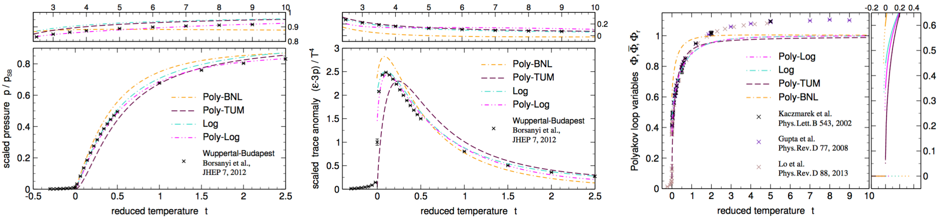
Existing Phenomenological Parameterisations

T-dependent parameters fitted to T-dependence of YM thermodynamics and Polyakov loop

$$\mathcal{U}_{\text{poly}}(\Phi,\bar\Phi,t)/T^4 = p_2(t)\,\Phi\bar\Phi + p_3\left(\Phi^3+\bar\Phi^3\right) + p_4\left(\Phi\bar\Phi\right)^2$$

$$\mathcal{U}_{\log}(\Phi,\bar\Phi,t)/T^4 = p_2(t)\,\Phi\bar\Phi + l(t)\ln\left[1-6\Phi\bar\Phi+4\left(\Phi^3+\bar\Phi^3\right)-3\left(\Phi\bar\Phi\right)^2\right]$$

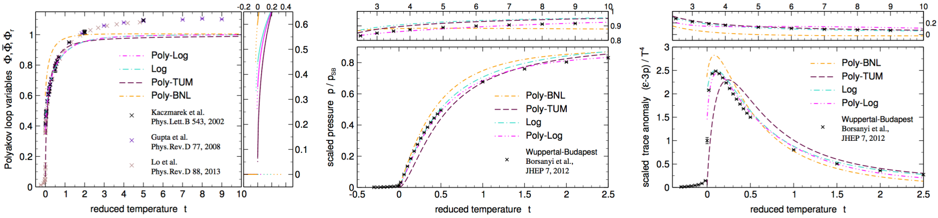
$$\begin{aligned}\mathcal{U}_{\text{poly+log}}(\Phi,\bar\Phi,t)/T^4 \;=\;& p_2(t)\,\Phi\bar\Phi + p_3(t)\left(\Phi^3+\bar\Phi^3\right) + p_4(t)\left(\Phi\bar\Phi\right)^2 + \\ &+ l(t)\ln\left[1-6\Phi\bar\Phi+4\left(\Phi^3+\bar\Phi^3\right)-3\left(\Phi\bar\Phi\right)^2\right]\end{aligned}$$



→ not ‘well’ done

Existing Phenomenological Parameterisations

T-dependent parameters fitted to T-dependence of
YM thermodynamics and Polyakov loop



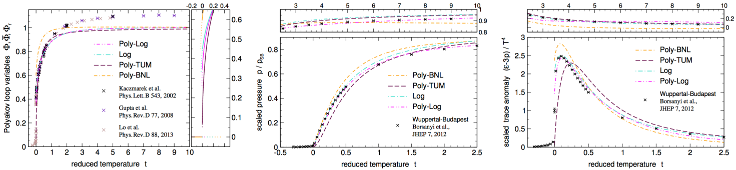
$\rightarrow$ NO constraint from $T < T_c$: $\quad \Phi = 0, \quad p = -\mathcal{U} = 0$

$$\mathcal{U}_{\text{poly}}(\Phi = 0, t)/T^4 = 0\,, \quad \mathcal{U}_{\log}(\Phi = 0, t)/T^4 = 0\,, \quad \mathcal{U}_{\text{poly+log}}(\Phi = 0, t)/T^4 = 0$$

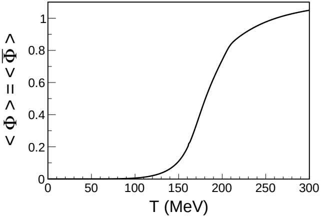
but at $T < T_c$ is transition in QCD: $\lesssim 160\,\text{MeV}$

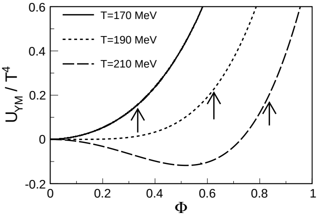
Existing Phenomenological Parameterisations

T-dependent parameters fitted to T-dependence of
YM thermodynamics and Polyakov loop



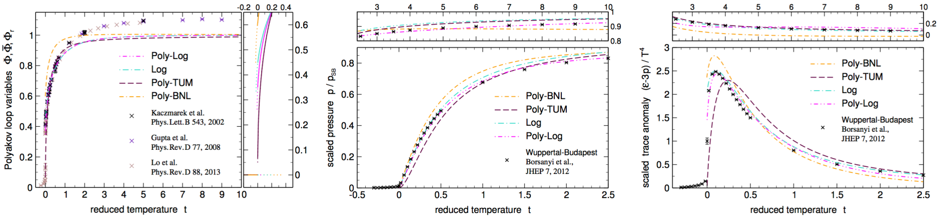
→ from $T \geq T_c$ only information from one single point: $\left(\Phi_{\min}, \mathcal{U}/T^4\left(\Phi_{\min}\right)\right)$,
which is not the point which determines Φ in QCD !





J. M. Torres-Rincon and J. Aichelin, Phys. Rev. C 96 (2017)

Existing Phenomenological Parameterisations



→ not 'well' done

→ NO constraint from $T < T_c$: $\Phi = 0, \quad p = -\mathcal{U} = 0$

→ from $T \geq T_c$ only information from one single point: $\left(\Phi_{\min}, \mathcal{U}/T^4\left(\Phi_{\min}\right)\right)$, which is not the point which determines Φ in QCD !

⇒ Revise and improve phenomenological Polyakov-loop potentials

Revise phenomenological Polyakov-loop potentials

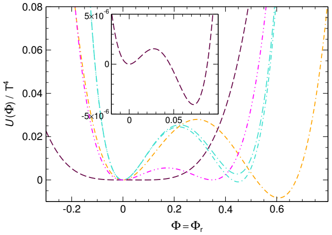
To obtain consistency between different parameterisations
. . . apply theoretical constraints

$$\lim_{T\to\infty} \Phi \to 1$$

$$\lim_{T\to\infty} \; p/T^4 = -\mathcal{U}/T^4 \to p_{\mathrm{SB}}/T^4$$

$$\mathcal{U}/T^4\left(\Phi_{\min} \neq 0, T = T_{\mathrm{c}}\right) \;=\; \mathcal{U}/T^4\left(\Phi = 0, T = T_{\mathrm{c}}\right)$$

	$\Phi_{T\to\infty}$	$(-\mathcal{U}/p_{\mathrm{SB}})_{T\to\infty}$
Poly-BNL	1.0	0.859
Poly-TUM	1.0	0.997
Log, exact	1.0	1.0
Log, rounded	1.0	1.0
Poly+Log	0.998	0.933



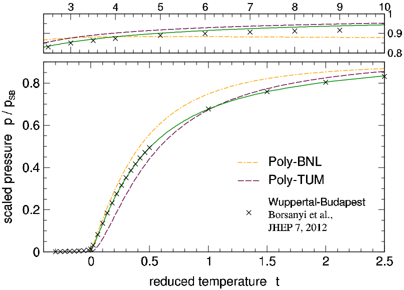
New fit to latest lattice data

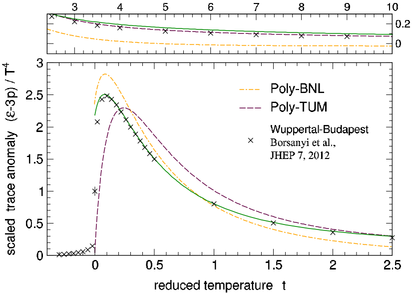
To obtain consistency between different parameterisations

...apply theoretical constraints:

$$\lim_{T\to\infty} \Phi \to 1\,, \quad \lim_{T\to\infty} -\mathcal{U}/p_{\mathrm{SB}} \to 1\,, \quad \mathcal{U}/T_c^4\,(\Phi_{\min} \neq 0) = \mathcal{U}/T_c^4\,(\Phi = 0)$$

...do a fit to latest lattice data

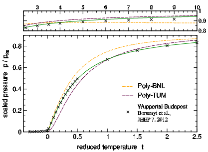


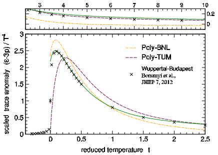


→ much better results for thermodynamics possible

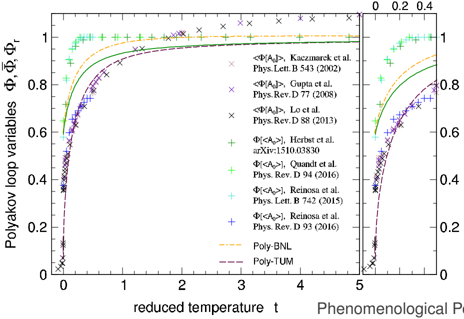
New fit to latest lattice data

Reproducing thermodynamics . . .

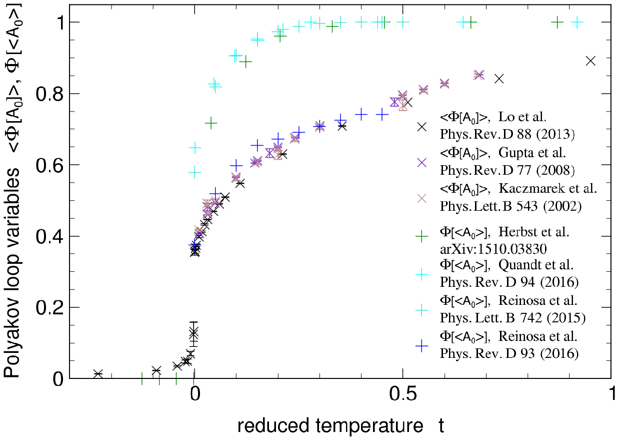




. . . Polyakov-loop neither lattice $\langle \Phi\left[A_0\right]\rangle$, nor continuum $\Phi\left[\langle A_0\rangle\right]$



Lattice $\langle \Phi[A_0] \rangle$ vs. continuum $\Phi[\langle A_0 \rangle]$

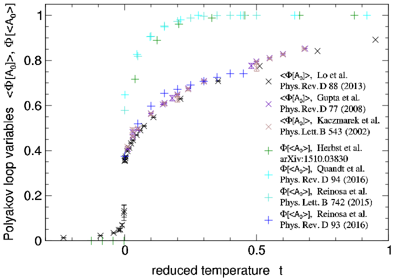


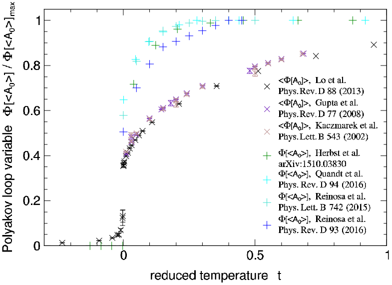
$$\Phi[\langle A_0 \rangle] \geq \langle \Phi[A_0] \rangle$$

J. Braun, H. Gies and J. Pawlowski, Phys. Lett. B 684, 262-267, 2010

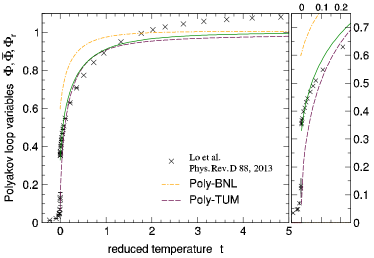
Continuum Polyakov loop $\Phi\left[\langle A_0\rangle\right]$

renormalisation factor of $\Phi\left[\langle A_0\rangle\right]$?

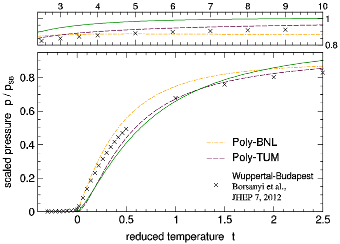


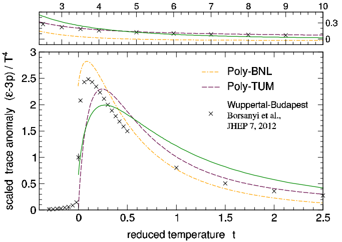


Fitting lattice $\langle \Phi\,[A_0] \rangle$ ...

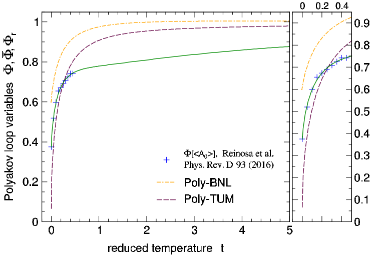


... no agreement to thermodynamics

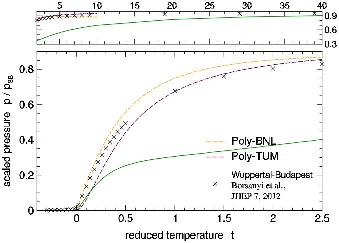


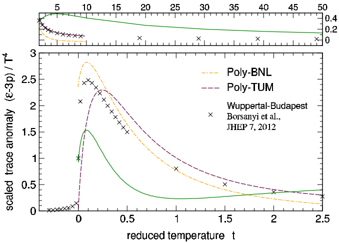


Fitting continuum perturbative NLO $\Phi\left[\langle A_0\rangle\right]$ ...

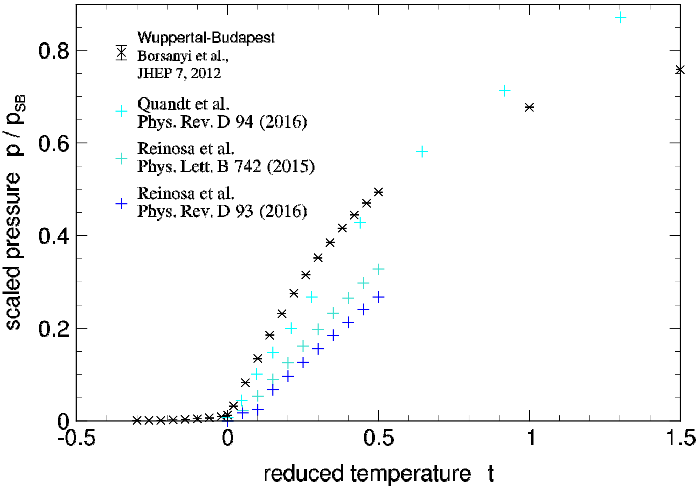


...no agreement to thermodynamics



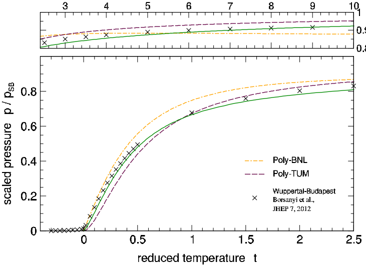


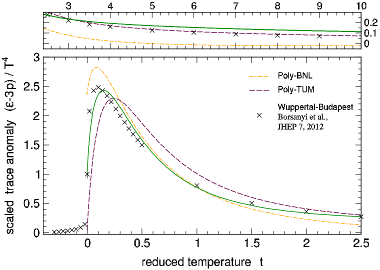
Thermodynamics in first-principle continuum

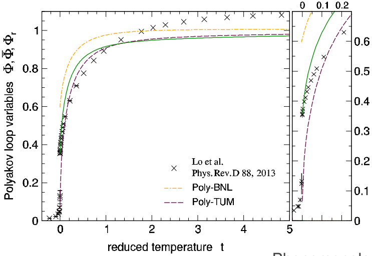


New fit to latest lattice data

...to thermodynamics and Polyakov loop

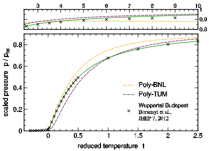


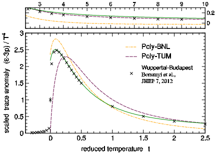




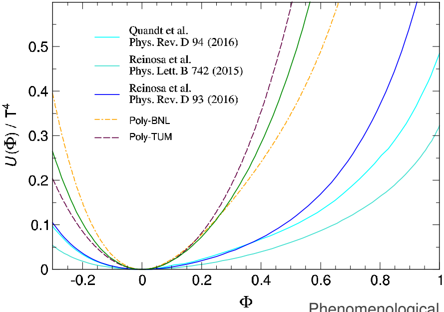
New fit to latest lattice data

Reproducing thermodynamics …





… shape of potential different from first-principle ones (e.g. @ $t = -0.15$)



New fit to latest lattice data

Reproducing thermodynamics . . .

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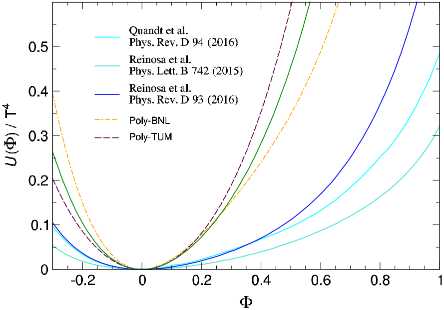
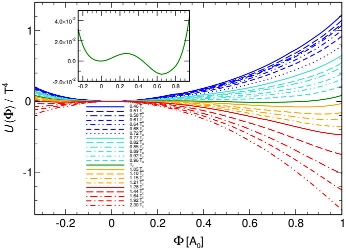
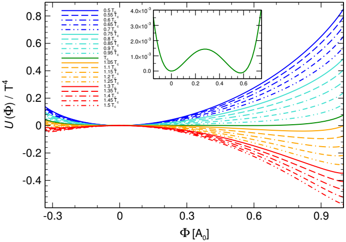


→ far steeper ⇒ different Φ in QCD

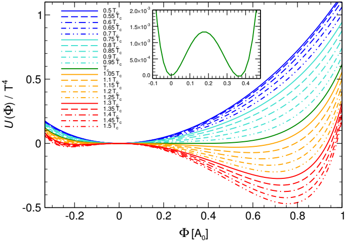
Polyakov-loop Potential in first-principle continuum



covariant approach
M. Quandt and H. Reinhardt, Phys. Rev. D 94 (2016)

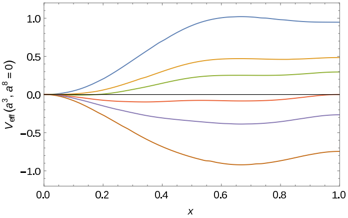


LO pert. theory
U. Reinosa, et al., Phys. Lett. B 742 (2015)

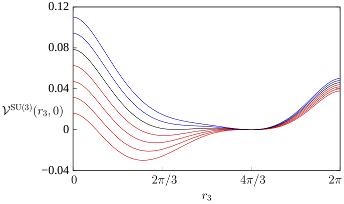


NLO pert. theory: *U. Reinosa, J. Serreau, M. Tissier and N. Wschebor, Phys. Rev. D 93 (2016)*

Gauge-field Potential in first-principle continuum



covariant approach
M. Quandt and H. Reinhardt, Phys. Rev. D 94 (2016)



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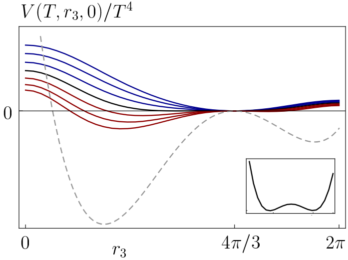
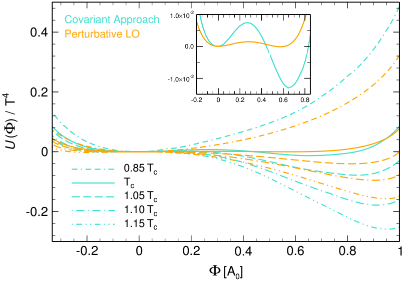
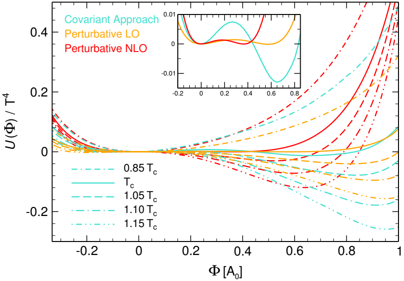


NLO pert. theory: *U. Reinosa, J. Serreau, M. Tissier and N. Wschebor, Phys. Rev. D 93 (2016)*

Polyakov-loop Potential in first-principle continuum

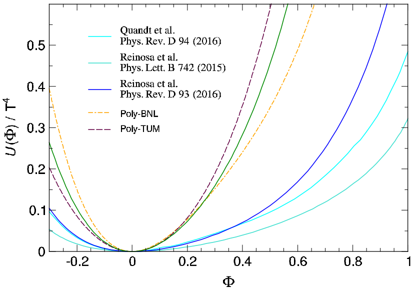




Revise phenomenological Polyakov-loop potentials

Reproducing thermodynamics . . .

. . . shape of potential different from first-principle ones



→ adjusting to first-principle potentials includes information away from the minimum

Revise phenomenological Polyakov-loop potentials

Reproducing thermodynamics and first-principle continuum potential . . .

→ include information of $T > T_c$ (thermodynamics) and $T \leq T_c$ (shape of potential)

→ include information of global shape of potential

Revise phenomenological Polyakov-loop potentials

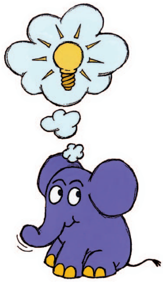
Reproducing thermodynamics and first-principle continuum potential ...

→ include information of $T > T_c$ (thermodynamics) and $T \leq T_c$ (shape of potential)

→ include information of global shape of potential

Conclusions

- Effective Polyakov-loop potential for phenomenological investigation of QCD
- Existing parameterisations differ between each other
  and from latest lattice results =
- Are only adjusted to deconfined phase → no information from temperature range relevant for QCD transition
- Only one single point of potential is adjusted, the minimum
  → Potential differs from calculated ones in first-principle, continuum calculations



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⇒ Try to reproduce total shape of potential of first-principle, continuum calculations

Thank You for your attention!

- Effective Polyakov-loop potential for phenomenological investigation of QCD
- Existing parameterisations differ between each other
  and from latest lattice results =
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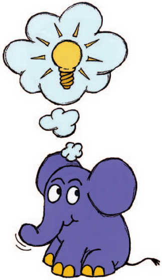

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⇒ Try to reproduce total shape of potential of first-principle, continuum calculations