

Dielectron group write-up

Topics

- Thermal and pre-equilibrium dielectrons from *low* to high masses
- Chiral symmetry restoration
Mass below about $1.3 \text{ GeV}/c^2$ with rho spectral function
- Electrical conductivity of the medium
Very low mass and pair transverse momentum

Theory motivations

Thermal and pre-equilibrium dielectrons from low to high masses

Different approaches:

(below those who provided calculations for ALICE 3 Lol & in the RRTF)

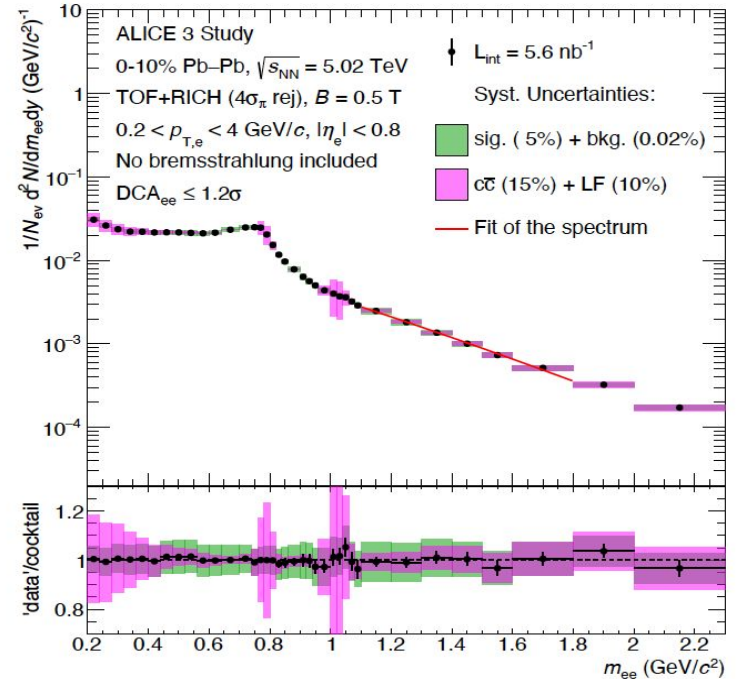
- **Expanding fireball model with hadronic many-body theory**
from [Ralf Rapp](#) et al. ([Hendrik van Hees](#) here) (yield until now)
R. Rapp, Adv. High Energy Phys. 2013 (2013) 148253
P.M Hohler and R. Rapp, Phys. Lett. B 731 (2014) 103
- **Thermal radiation from hadron-gas and QGP + decays** (yield and v_2)
from [Gojko Vujanovic](#) et al ([arxiv:1903.05078](#) and [arxiv:1702.02941](#))
- **Pre-equilibrium and thermal radiation from QGP** (yield)
from M. Coquet X. Du J-Y Ollitrault [S. Schlichting](#) M. Winn
Physics Letters B Volume 821, 10 October 2021, 136626, arXiv:2112.13876

Physics performances

Average temperature extraction
Chiral symmetry
Elliptic flow

ALICE 3 Lol performance plots done:

- With $B = 0.5$ T
- At mid-rapidity
- Using outer-TOF and RICH detector
- **Minimum p_T of 80 MeV/c** for combinatorial rejection
- Assumed only cold-nuclear matter effects for Heavy-flavour background



Theory motivations

Thermal and pre-equilibrium dielectrons from low and high masses

- **Measure averaged temperature of the early system**
(thermal radiation as a function of mass, [R. Ralf et al.](#), [Hendrik van Hees](#))
- **Measure effective temperature (m_T spectra) and extract information of early eta/s**
(pre-equilibrium calculations [S. Schlichting et al. arXiv:2112.13876](#))
- **Measure elliptic flow of thermal radiation (HG & QGP) and study flow formation**
([Gojko Vujanovic](#) et al calculations)

*Question we had: how to disentangle different models
differential measurements crucial*

Theory motivations

Possible candidates
who could contribute

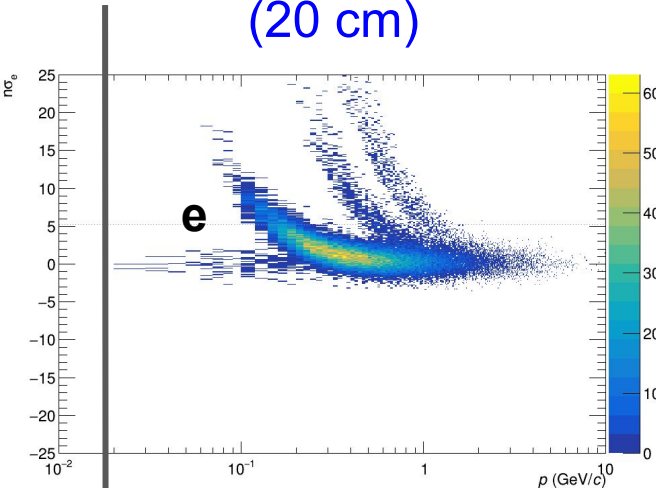
Chiral symmetry restoration

Any updates and/or motivation (Ralf Rapp, Hendrik van Hees)

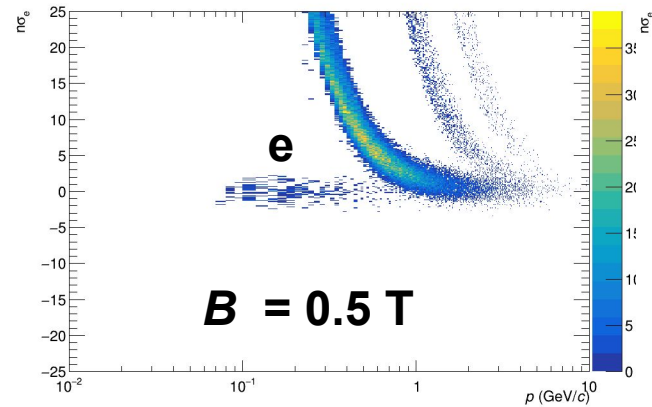
Physics performances

On going: include inner TOF detector to identify electrons

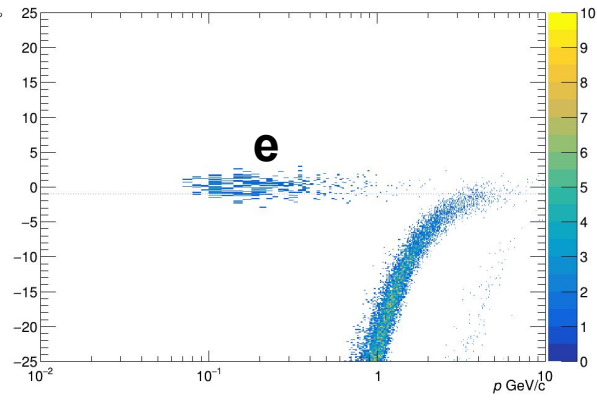
Signal in inner TOF
(20 cm)



Signal in outer TOF
(1 m)



Signal in RICH
(1 m)

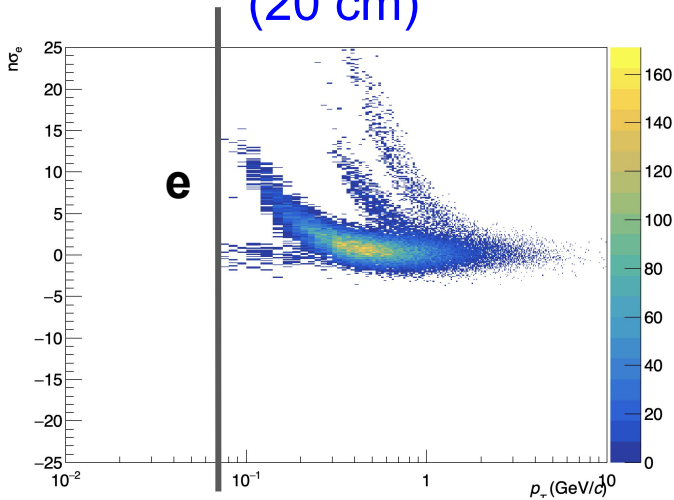


15-20 MeV in p_T \rightarrow can go to lower p_T

Physics performances

On going: and check then performance with higher B field

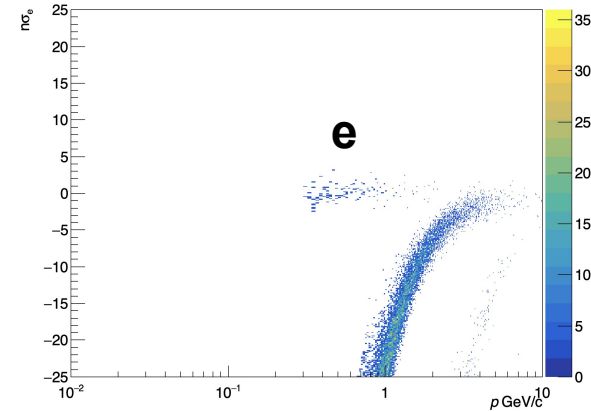
Signal in inner TOF
(20 cm)



Signal in outer TOF
(1 m)

$B = 2 \text{ T}$

Signal in RICH
(1 m)



60-70 MeV in p_T for $B = 2 \text{ T}$

Physics performances

On going: and check then performance with higher B field

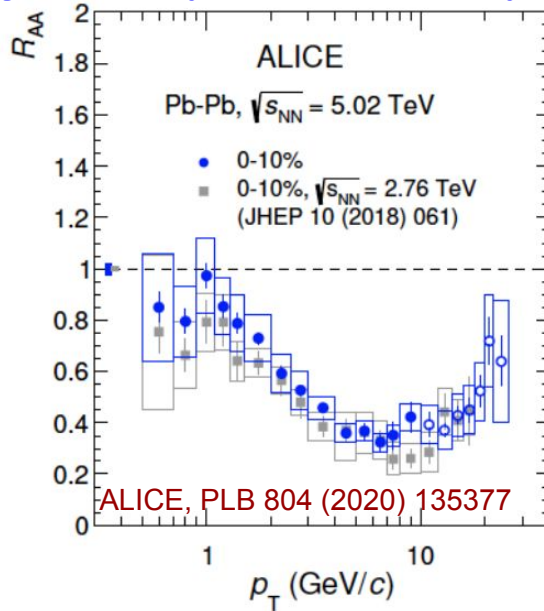
- With $B = 2$ (1.5, 1) T
- Using inner-TOF, outer-TOF and RICH detector
- Minimum p_T of 60 (45, 40) MeV/c for combinatorial rejection
- **Check tracking efficiency/mismatch**
- Better m_{ee} resolution expected

Physics performances

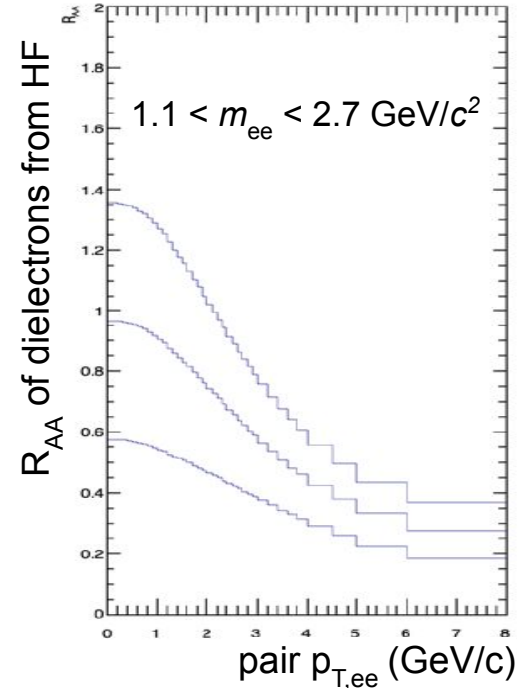
Zafar Momtaz
Sebastian Scheid

On going: update the background from heavy-flavour hadron decays

Single heavy-flavour decay electrons



Using weights

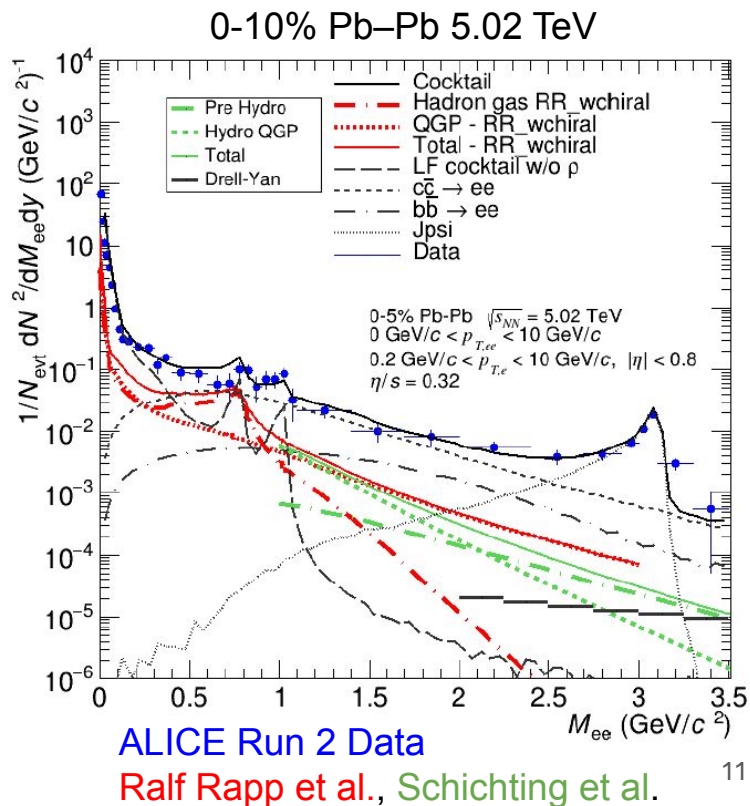


Physics performances

More:

- Check calorimeter implementation
 - Response
 - Track propagation
- Check possibilities at forward-rapidity
- ALICE 3 specific: *de-scoping* document
- Use different models as signal:
 - Until now **Ralf Rapp**
 - Compare to **Schichting calculations**

Taku Gunji
Antonio Uras
Yuri Kharlov



Electrical conductivity

- **Physics motivation** (Stefan Floerchinger)
- **Compare:**
 - Signal (Stefan Floerchinger)
 - Hadronic cocktail (Klaus Reygers, Sebastian Scheid, Raphaelle Bailhache)
 - Physics background from UPC (Kai Schweda, Georgijs Skorodumovs)
 - Combinatorial background with inner TOF and $B = 0.2$ T (possible bachelor student, Sebastian, Raphaelle depending on the outcome of above)

*Many points still not 100% clear
Look challenging*

More physics topics

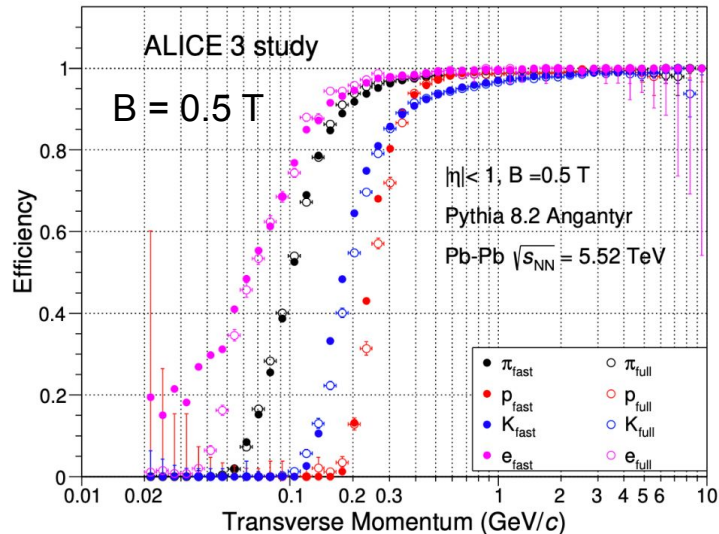
- Dark photons
- UPCs

Back-up

Physics performances

Thermal and pre-equilibrium dielectrons from low and high masses
Chiral symmetry

On going: check then performance with higher B field



Physics performances

More:

- Check calorimeter implementation
 - Response Taku Gunji
 - Track propagation Antonio Uras
Yuri Kharlov
- Check possibilities at forward-rapidity
- Use different models as signal:
 - until now Ralf Rapp
 - Compare to Schichting calculations

0-10% Pb-Pb 5.02 TeV

