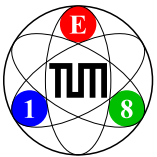
News from the Light Non-Strange and Strange Meson Sector

Stefan Wallner

Institute for Hadronic Structure and Fundamental Symmetries - Technical University of Munich

19th International Conference on Hadron Spectroscopy and Structure in memoriam Simon Eidelman
July 26, 2021



Light mesons

- $|q\bar{q}'\rangle$ states, with $q = u, d$, or s
- Masses in the range $0.14 < m \lesssim 2.5\,\mathrm{GeV}/c^2$

Quantum numbers of mesons

- Meson spin J
- Parity P
- For non-strange light mesons:
  Charged conjugation C
- Excitations possible
  ➥ Spectrum of resonances with the same J^{PC}

Light mesons

- $|q\bar{q}'\rangle$ states, with $q = u, d$, or s
- Masses in the range $0.14 < m \lesssim 2.5\,\mathrm{GeV}/c^2$

Quantum numbers of mesons

- Meson spin J
- Parity P
- For non-strange light mesons:
  Charged conjugation C
- Excitations possible
  - ➥ Spectrum of resonances with the same $J^{P(C)}$

Light mesons

- $|q\bar{q}'\rangle$ states, with $q = u, d$, or s
- Masses in the range $0.14 < m \lesssim 2.5\,\mathrm{GeV}/c^2$

Quantum numbers of mesons

- Meson spin J
- Parity P
- For non-strange light mesons:
  Charged conjugation C
- Excitations possible
  - ➥ Spectrum of resonances with the same $J^{P(C)}$

Light mesons

- $|q\bar{q}'\rangle$ states, with $q = u, d$, or s
- Masses in the range $0.14 < m \lesssim 2.5\,\mathrm{GeV}/c^2$

Quantum numbers of mesons

- Meson spin J
- Parity P
- For non-strange light mesons:
  Charged conjugation C
- Excitations possible
  ➥ Spectrum of resonances with the same $J^{P(C)}$

Light non-strange mesons

- Certain J^{PC} combinations not possible
  ➥ Spin-exotic quantum numbers
- $J^{PC} = 0^{--}, 0^{+-}, 1^{-+}, 2^{+-}, 3^{-+}, \ldots$

Light mesons

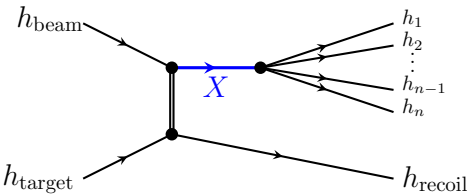
- $|q\bar{q}'\rangle$ states, with $q = u, d$, or s
- Masses in the range $0.14 < m \lesssim 2.5\,\mathrm{GeV}/c^2$

Quantum numbers of mesons

- Meson spin J
- Parity P
- For non-strange light mesons:
  Charged conjugation C
- Excitations possible
  - ➥ Spectrum of resonances with the same $J^{P(C)}$

Produced in

- Scattering of high-energy beams
  - Studied at
    - GlueX, VES, COMPASS, ...
- Multi-body decays of heavier states
  - Studied at
    - e^+e^- colliders: Belle, BES, ...
    - hadron colliders: LHCb, ...



Light mesons

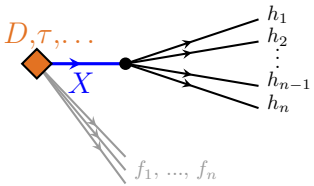
- $|q\bar{q}'\rangle$ states, with $q = u, d$, or s
- Masses in the range $0.14 < m \lesssim 2.5\,\mathrm{GeV}/c^2$

Quantum numbers of mesons

- Meson spin J
- Parity P
- For non-strange light mesons:
  Charged conjugation C
- Excitations possible
  - ➥ Spectrum of resonances with the same $J^{P(C)}$

Produced in

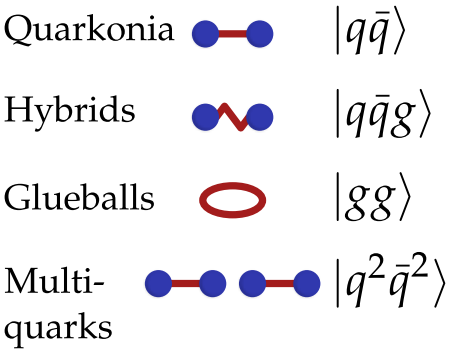
- Scattering of high-energy beams
  - Studied at
    - GlueX, VES, COMPASS, ...
- Multi-body decays of heavier states
  - Studied at
    - e^+e^- colliders: Belle, BES, ...
    - hadron colliders: LHCb, ...



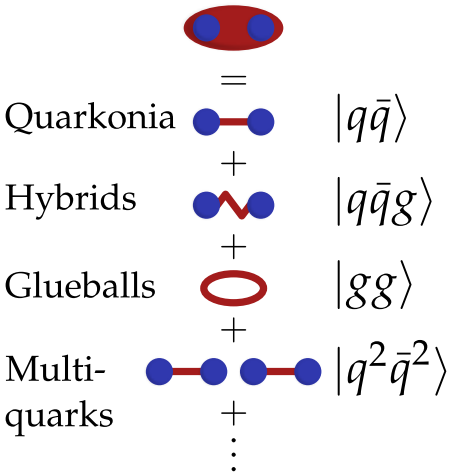
- Further configurations possible in QCD
- Mesons are linear superposition of all allowed basis states
  - "Configuration mixing"
  - Disentanglement of contributions difficult
- Spin-exotic states
  - Exclude $|q\bar{q}^{\prime}\rangle$ contribution

Quarkonia $|q\bar{q}\rangle$

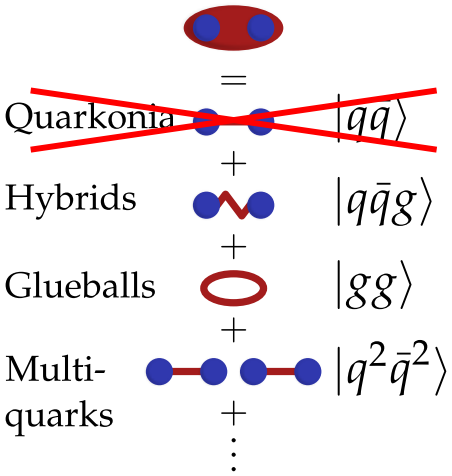
- Further configurations possible in QCD
- Mesons are linear superposition of all allowed basis states
  - "Configuration mixing"
  - Disentanglement of contributions difficult
- Spin-exotic states
  - Exclude $|q\bar{q}\rangle$ contribution



- Further configurations possible in QCD
- Mesons are linear superposition of all allowed basis states
  - "Configuration mixing"
  - Disentanglement of contributions difficult
- Spin-exotic states
  - Exclude $|q\bar{q}'\rangle$ contribution

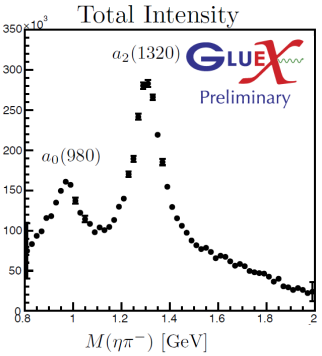


- Further configurations possible in QCD
- Mesons are linear superposition of all allowed basis states
  - "Configuration mixing"
  - Disentanglement of contributions difficult
- Spin-exotic states
  - Exclude $|q\bar{q}'\rangle$ contribution



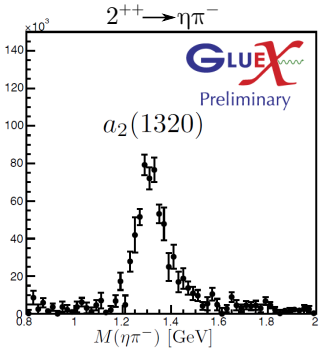
$\eta\pi$ from GlueX

- Expected as a golden channel for spin-exotic π_1
- Large data set from GlueX of $\eta\pi^-$ final state
  - First partial-wave analysis
    - Finds expected signals
- Similar large data set from GlueX of $\eta\pi^0$
  - Different exchange in production
    - ➥ Complementary data
  - First partial-wave analysis



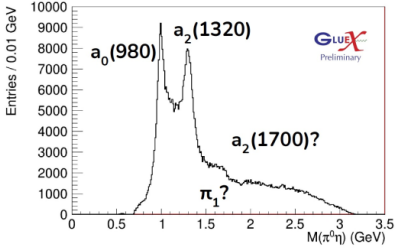
$\eta\pi$ from GlueX

- Expected as a golden channel for spin-exotic π_1
- Large data set from GlueX of $\eta\pi^-$ final state
  - First partial-wave analysis
    - Finds expected signals
- Similar large data set from GlueX of $\eta\pi^0$
  - Different exchange in production
    - ➥ Complementary data
  - First partial-wave analysis



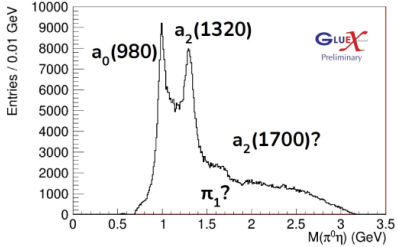
$\eta\pi$ from GlueX

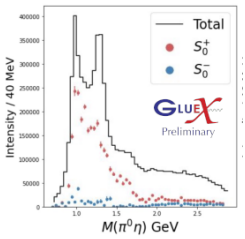
- Expected as a golden channel for spin-exotic π_1
- Large data set from GlueX of $\eta\pi^-$ final state
  - First partial-wave analysis
    - Finds expected signals
- Similar large data set from GlueX of $\eta\pi^0$
  - Different exchange in production
    - ➥ Complementary data
  - First partial-wave analysis
    - Finds expected signals

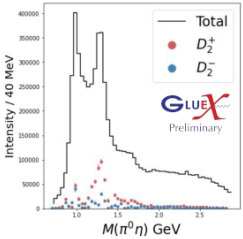


$\eta\pi$ from GlueX

- Expected as a golden channel for spin-exotic π_1
- Large data set from GlueX of $\eta\pi^-$ final state
  - First partial-wave analysis
    - Finds expected signals
- Similar large data set from GlueX of $\eta\pi^0$
  - Different exchange in production
    - ➥ Complementary data
  - First partial-wave analysis
    - Finds expected signals







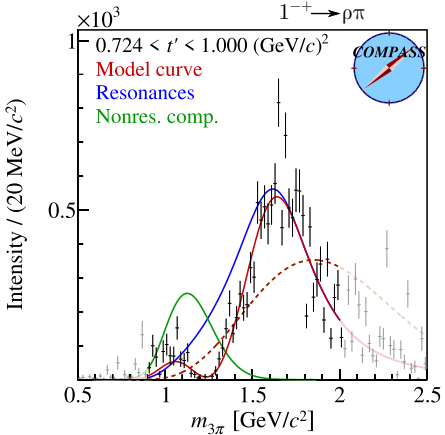
$\pi^-\pi^-\pi^+$ from COMPASS

- $J^{PC} = 1^{-+}$ studied at COMPASS in the $\rho\pi$ final state
- Resonance-like signal
  - Reproduced by Breit-Wigner resonance
- Non-resonant production mechanisms also contribute
- Data show excess over non-resonant contribution

COMPASS, Phys. Rev. D **98** (2018) 092003

$\pi^-\pi^-\pi^+$ from COMPASS

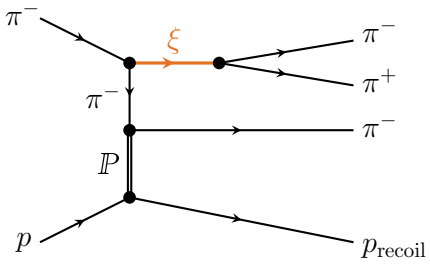
- $J^{PC} = 1^{-+}$ studied at COMPASS in the $\rho\pi$ final state
- Resonance-like signal
  - Reproduced by Breit-Wigner resonance
- Non-resonant production mechanisms also contribute
- Data show excess over non-resonant contribution



COMPASS, Phys. Rev. D **98** (2018) 092003

$\pi^-\pi^-\pi^+$ from COMPASS

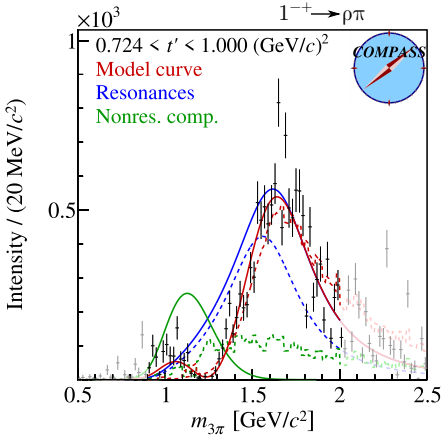
- $J^{PC} = 1^{-+}$ studied at COMPASS in the $\rho\pi$ final state
- Resonance-like signal
  - Reproduced by Breit-Wigner resonance
- Non-resonant production mechanisms also contribute
- Data show excess over non-resonant contribution



COMPASS, Phys. Rev. D **98** (2018) 092003

$\pi^-\pi^-\pi^+$ from COMPASS

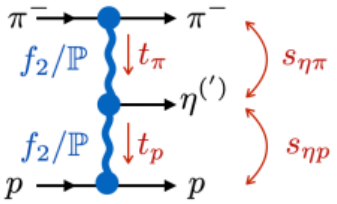
- $J^{PC} = 1^{-+}$ studied at COMPASS in the $\rho\pi$ final state
- Resonance-like signal
  - Reproduced by Breit-Wigner resonance
- Non-resonant production mechanisms also contribute
- Data show excess over non-resonant contribution



COMPASS, Phys. Rev. D **98** (2018) 092003

JPAC analysis of COMPASS $\eta^{(\prime)}\pi$ data

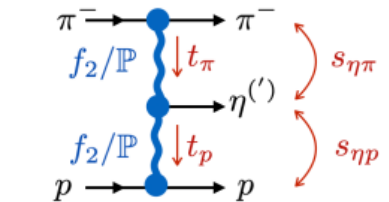
- Non-resonant contributions also in $\eta^{(\prime)}\pi$ final state
- JPAC analysis of high-mass region
  - Expected to be dominated by non-resonant contributions
- Data can be described by double-Regge model
- Study of different Regge exchanges
  - $\mathbb{P}/\mathbb{P}$ neccessary to describe $\eta'\pi$ final state
    - ➥ Points to large gluon affinity
  - Importance of bottom-f_2 exchange
    - ➥ $\eta^{(\prime)}\pi$ not only produced by $\mathbb{P}$ exchange at high masses

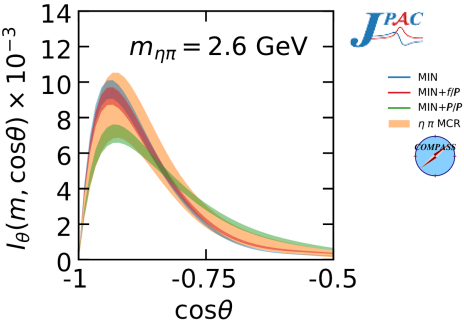


JPAC, arXiv:2104.10646 (2021)

JPAC analysis of COMPASS $\eta^{(\prime)}\pi$ data

- Non-resonant contributions also in $\eta^{(\prime)}\pi$ final state
- JPAC analysis of high-mass region
  - Expected to be dominated by non-resonant contributions
- Data can be described by double-Regge model
- Study of different Regge exchanges
  - $\mathbb{P}/\mathbb{P}$ neccessary to describe $\eta'\pi$ final state
    - ➥ Points to large gluon affinity
  - Importance of bottom-f_2 exchange
    - ➥ $\eta^{(\prime)}\pi$ not only produced by $\mathbb{P}$ exchange at high masses

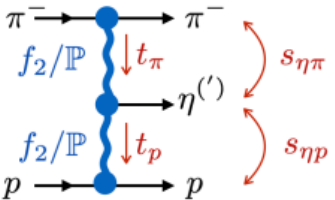


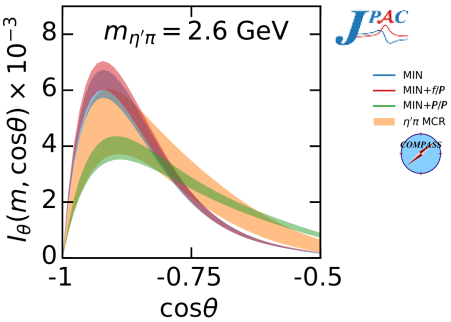


JPAC, arXiv:2104.10646 (2021)

JPAC analysis of COMPASS $\eta^{(\prime)}\pi$ data

- Non-resonant contributions also in $\eta^{(\prime)}\pi$ final state
- JPAC analysis of high-mass region
  - Expected to be dominated by non-resonant contributions
- Data can be described by double-Regge model
- Study of different Regge exchanges
  - $\mathbb{P}/\mathbb{P}$ neccessary to describe $\eta'\pi$ final state
    - ➥ Points to large gluon affinity
  - Importance of bottom-f_2 exchange
    - ➥ $\eta^{(\prime)}\pi$ not only produced by $\mathbb{P}$ exchange at high masses

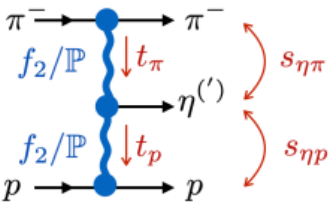


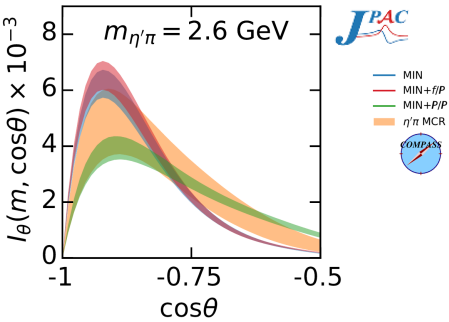


JPAC, arXiv:2104.10646 (2021)

JPAC analysis of COMPASS $\eta^{(\prime)}\pi$ data

- Non-resonant contributions also in $\eta^{(\prime)}\pi$ final state
- JPAC analysis of high-mass region
  - Expected to be dominated by non-resonant contributions
- Data can be described by double-Regge model
- Study of different Regge exchanges
  - $\mathbb{P}/\mathbb{P}$ neccessary to describe $\eta'\pi$ final state
    - ➥ Points to large gluon affinity
  - Importance of bottom-f_2 exchange
    - ➥ $\eta^{(\prime)}\pi$ not only produced by $\mathbb{P}$ exchange at high masses





JPAC, arXiv:2104.10646 (2021)

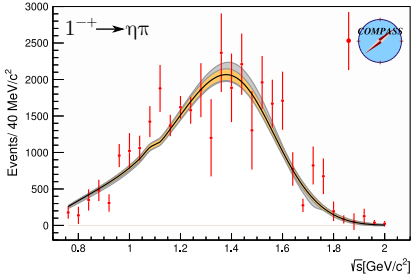
Combined Analysis of Different Samples

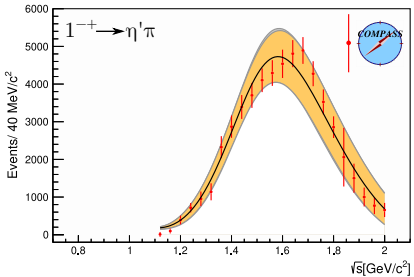
- Combined analysis of
  - Crystal Barrel data
    - $p\bar{p} \to \pi^0\pi^0\eta$, $\pi^0\eta\eta$, $K^+K^-\pi^0$
  - Various $\pi\pi$ scattering data
  - COMPASS 2^{++} and 1^{-+} waves in
    - $\pi^- p \to \eta^{(\prime)}\pi^- p$
- Study π_1 in $\eta^{(\prime)}\pi$ system
- Data described well
- Only one $\pi_1(1600)$ pole needed
  - Similar to JPAC analysis of COMPASS data [JPAC, Phys. Rev. Lett. **122** (2019) 042002]
  - $\pi_1(1400)$ put into question

Kopf et al., arXiv:2008.11566 (2020)

Combined Analysis of Different Samples

- Combined analysis of
  - Crystal Barrel data
    - $p\bar{p} \to \pi^0\pi^0\eta$, $\pi^0\eta\eta$, $K^+K^-\pi^0$
  - Various $\pi\pi$ scattering data
  - COMPASS 2^{++} and 1^{-+} waves in
    - $\pi^- p \to \eta^{(\prime)}\pi^- p$
- Study π_1 in $\eta^{(\prime)}\pi$ system
- Data described well
- Only one $\pi_1(1600)$ pole needed
  - Similar to JPAC analysis of COMPASS data [JPAC, Phys. Rev. Lett. **122** (2019) 042002]
  - $\pi_1(1400)$ put into question



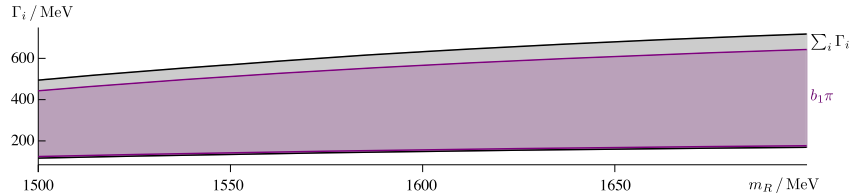


Kopf et al., arXiv:2008.11566 (2020)

The π_1 from Lattice QCD

Talk by Christopher Thomas, Meson spectroscopy (Wed 9:00)

Hadron Spectrum, Phys. Rev. D **103** (2021) 054502



- Determination of hadronic decays of lightest π_1 from Lattice QCD
- Decaying dominantly to $b_1\pi$
  - Experimentally more challenging to access: $b_1\pi \to \omega\pi\pi \to 5\pi$
  - Seen at E852 (BNL) and Crystal Barrel
  - Under study at COMPASS and GlueX

Exotic States beyond Spin-Exotics

Excited π with $J^{PC} = 0^{-+}$

Lattice QCD

[Hadron Spectrum, Phys. Rev. D **88** (2013) 094505]

- Predicts three excited π with $J^{PC} = 0^{-+}$
- One of them is potential hybrid candidate

$\pi^-\pi^-\pi^+$ from COMPASS

- Updated analysis: About 2× larger sample
- Clear $\pi(1800)$ signal in
  - $f_0(980)\pi$
  - $f_0(1500)\pi$
  - $[\pi\pi]_S^{\text{MEDIUM}}\pi$
- Signal in $f_2(1270)\pi$ decay
- Different interpretations possible
  - Another resonance at about 1.7 GeV/c^2?
  - Interference of $\pi(1800)$ with other components?
  - ...

Lattice QCD

[Hadron Spectrum, Phys. Rev. D **88** (2013) 094505]

- Predicts three excited π with $J^{PC} = 0^{-+}$
- One of them is potential hybrid candidate

$\pi^-\pi^-\pi^+$ from COMPASS

- Updated analysis: About $2\times$ larger sample
- Clear $\pi(1800)$ signal in
  - $f_0(980)\pi$
  - $f_0(1500)\pi$
  - $[\pi\pi]_S^{\mathrm{AMPK}}\pi$
- Signal in $f_2(1270)\pi$ decay
- Different interpretations possible
  - Another resonance at about $1.7\,\mathrm{GeV}/c^2$?
  - Interference of $\pi(1800)$ with other components?
  - ...

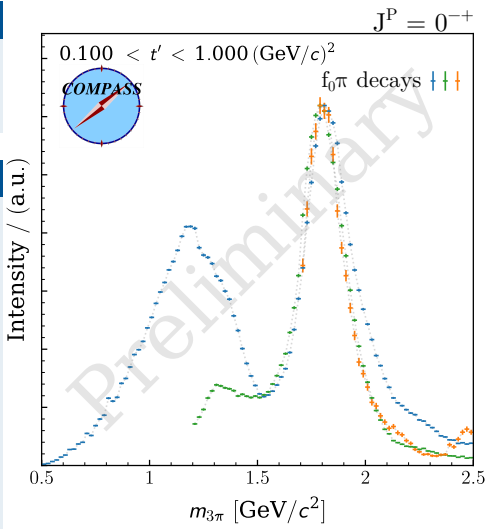
Lattice QCD

[Hadron Spectrum, Phys. Rev. D **88** (2013) 094505]

- Predicts three excited π with $J^{PC} = 0^{-+}$
- One of them is potential hybrid candidate

$\pi^-\pi^-\pi^+$ from COMPASS

- Updated analysis: About 2× larger sample
- Clear $\pi(1800)$ signal in
  - $f_0(980)\pi$
  - $f_0(1500)\pi$
  - $[\pi\pi]_S^{\mathrm{AMPK}}\pi$
- Signal in $f_2(1270)\pi$ decay
- Different interpretations possible
  - Another resonance at about 1.7 GeV/c^2?
  - Interference of $\pi(1800)$ with other components?
  - ...



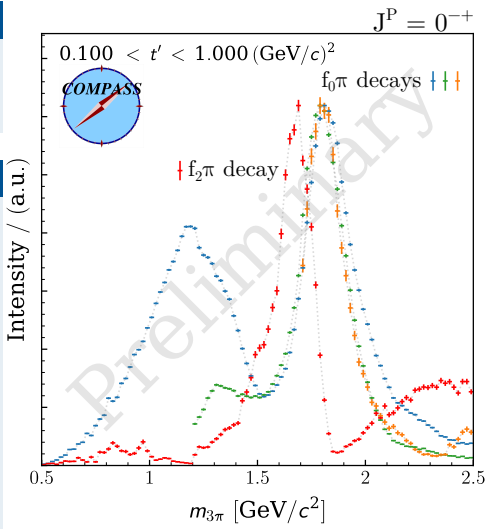
Lattice QCD

[Hadron Spectrum, Phys. Rev. D **88** (2013) 094505]

- Predicts three excited π with $J^{PC} = 0^{-+}$
- One of them is potential hybrid candidate

$\pi^-\pi^-\pi^+$ from COMPASS

- Updated analysis: About 2× larger sample
- Clear $\pi(1800)$ signal in
  - $f_0(980)\pi$
  - $f_0(1500)\pi$
  - $[\pi\pi]_S^{\mathrm{AMPK}}\pi$
- Signal in $f_2(1270)\pi$ decay
- Different interpretations possible
  - Another resonance at about 1.7 GeV/c^2?
  - Interference of $\pi(1800)$ with other components?
  - ...



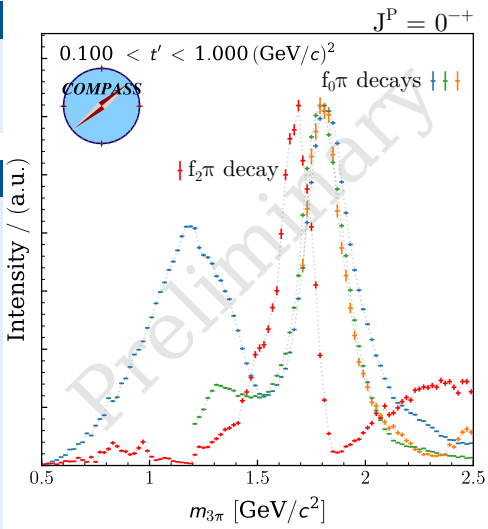
Lattice QCD

[Hadron Spectrum, Phys. Rev. D **88** (2013) 094505]

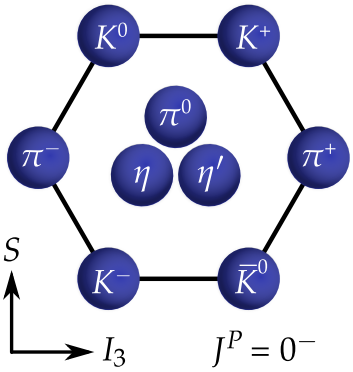
- Predicts three excited π with $J^{PC} = 0^{-+}$
- One of them is potential hybrid candidate

$\pi^-\pi^-\pi^+$ from COMPASS

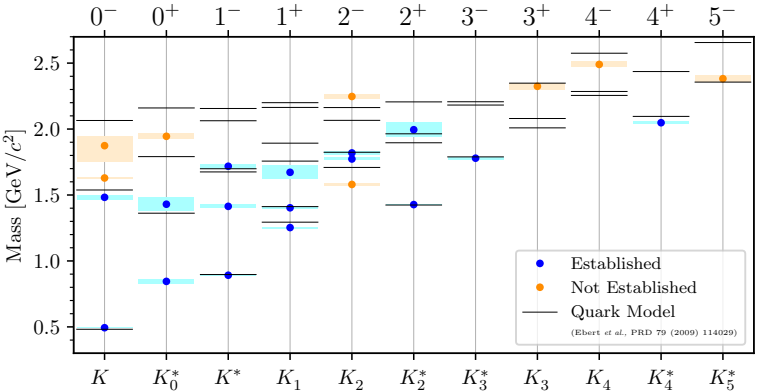
- Updated analysis: About 2× larger sample
- Clear $\pi(1800)$ signal in
  - $f_0(980)\pi$
  - $f_0(1500)\pi$
  - $[\pi\pi]_S^{\mathrm{AMPK}}\pi$
- Signal in $f_2(1270)\pi$ decay
- Different interpretations possible
  - Another resonance at about 1.7 GeV/c^2?
  - Interference of $\pi(1800)$ with other components?
  - ...



- Search of strange partners of excited π



Strange Meson Spectroscopy



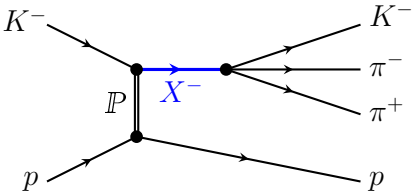
PDG lists 25 strange mesons (2021)

- 16 established states, 9 need further confirmation
- Missing states with respect to quark-model predictions
- Many measurements performed more than 30 years ago

Strange Meson Spectroscopy at COMPASS

$K^-\pi^-\pi^+$ from COMPASS

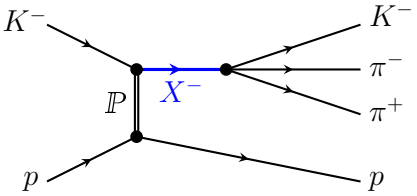
- Study K_J^* and K_J mesons in $K^-\pi^-\pi^+$ final state
- So far world's largest data set: 720 000 events
- About 3.5 times larger than ACCMOR (WA03)



Strange Meson Spectroscopy at COMPASS

$K^-\pi^-\pi^+$ from COMPASS

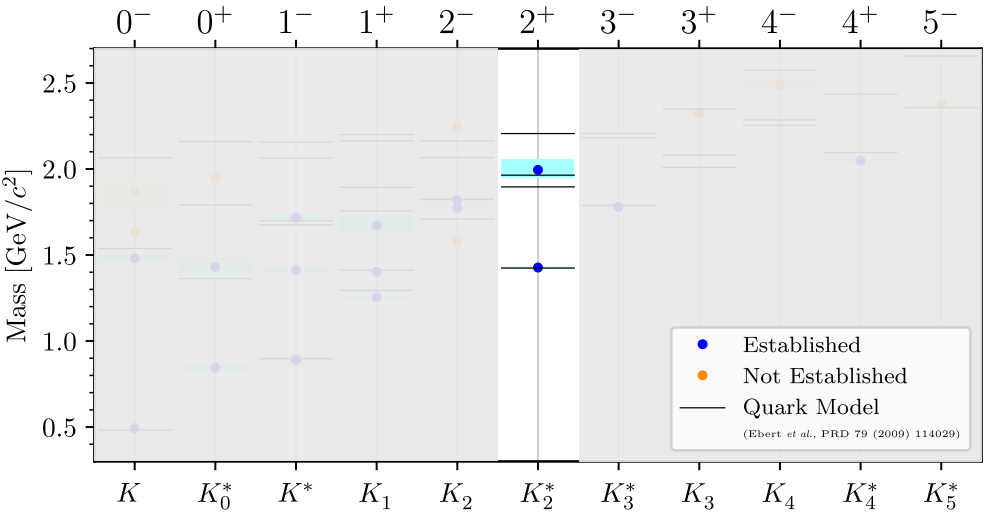
- Study K_J^* and K_J mesons in $K^-\pi^-\pi^+$ final state
- So far world's largest data set: 720 000 events
- About 3.5 times larger than ACCMOR (WA03)



WA03 (CERN), 200 000 events, ACCMOR, Nucl. Phys. B **187** (1981)

Searching for Established States

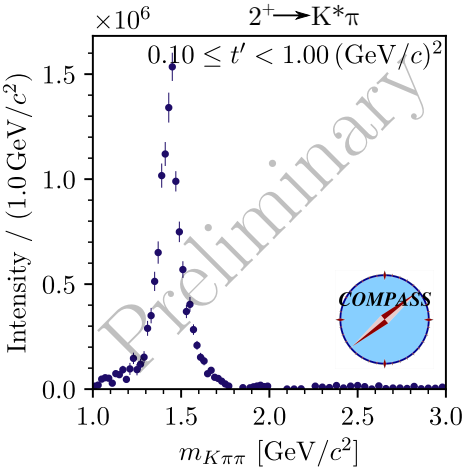
The $K_2^*(1430)$



$K^-\pi^-\pi^+$ from COMPASS

- Signal in $K_2^*(1430)$ mass region

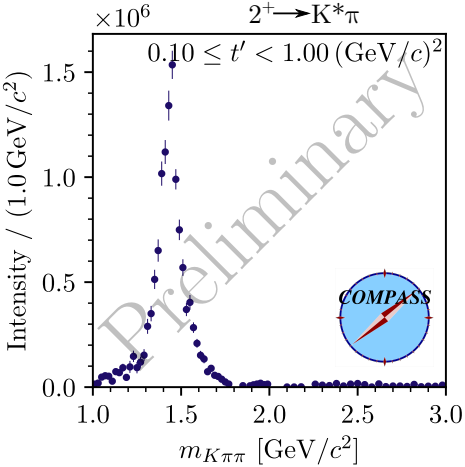
- In agreement with previous measurements
- Recent precise measurement from BES III



$K^-\pi^-\pi^+$ from COMPASS

- Signal in $K_2^*(1430)$ mass region

- In agreement with previous measurements
- Recent precise measurement from BES III
  - $J/\psi \to K^+K^-\pi^0$

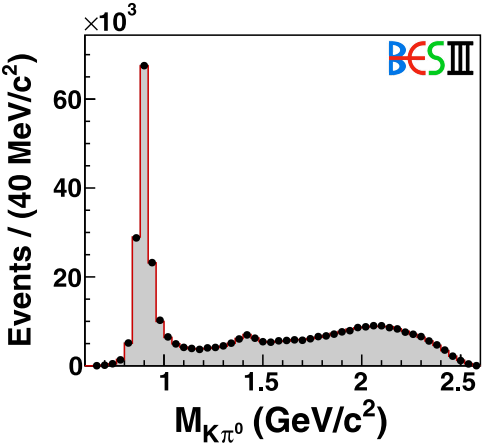


Talk by Nils Huesken, Plenary (Tue 7:00)
Talk by Shuangshi Fang, Meson spectroscopy (Mon 11:15)

$K^-\pi^-\pi^+$ from COMPASS

- Signal in $K_2^*(1430)$ mass region

- In agreement with previous measurements
- Recent precise measurement from BES III
  - $J/\psi \to K^+K^-\pi^0$



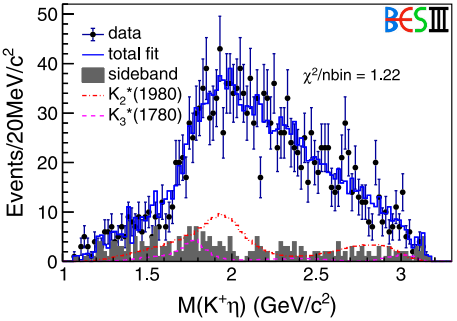
BESIII, 183 000 events, Phys. Rev. D **100** (2019)

Establishing unclear States

The $K_2^*(1980)$

$\psi(3686) \to K^+K^-\eta$ from BESIII

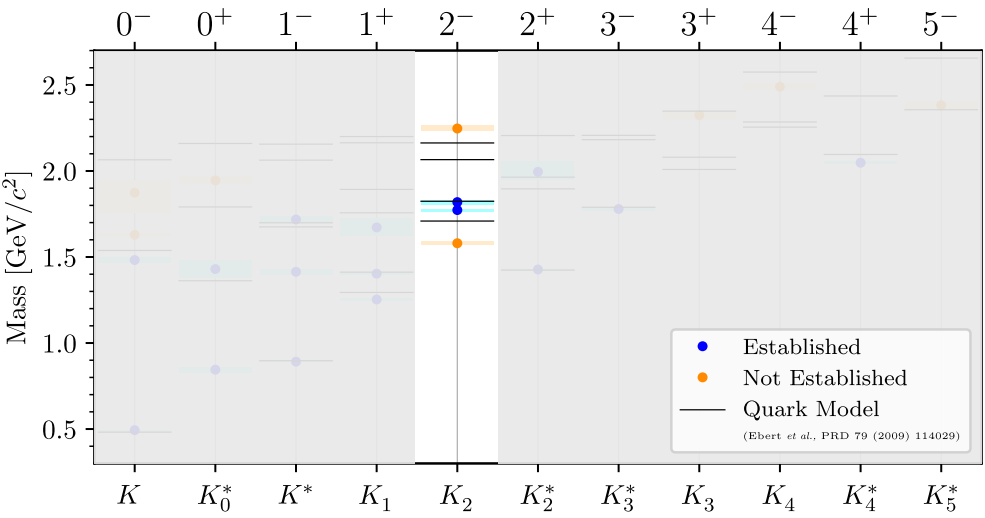
- Study K_J^* resonances in $K^\pm\eta$ subsystem
- Contribution from $K_2^*(1980)$ found
  - ➥ $K_2^*(1980)$ now marked as established



BESIII, Phys. Ref. D **101** (2020) 032008

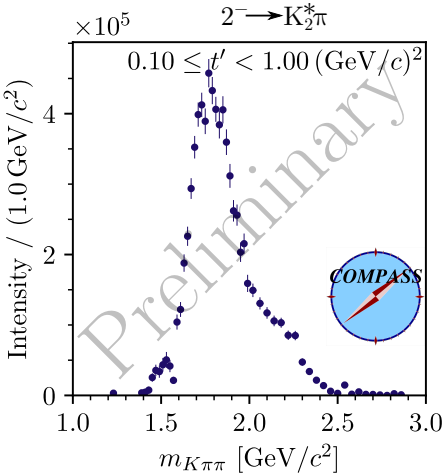
Investigating a Large Mass Range

K_2s Resonances



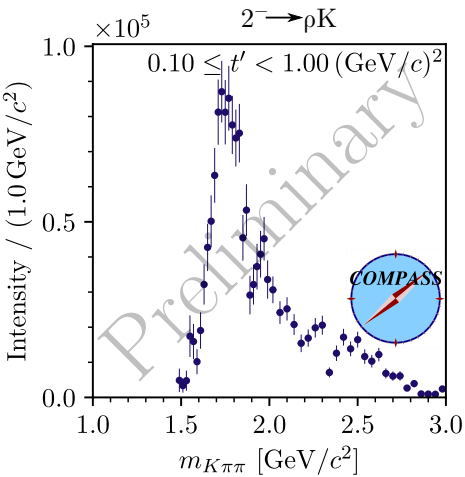
$K^-\pi^-\pi^+$ from COMPASS

- Large signal in $2^-\,0^+\,K_2^*(1430)\,\pi\,S$ wave
- Two resonances in signal region
  - $K_2(1770)$, $K_2(1820)$
- Bump in high-mass shoulder
  - Potential $K_2(2250)$
- Similar signals also in
  - $\rho(770)\,K$ and
  - $K^*(892)\,\pi$ decays



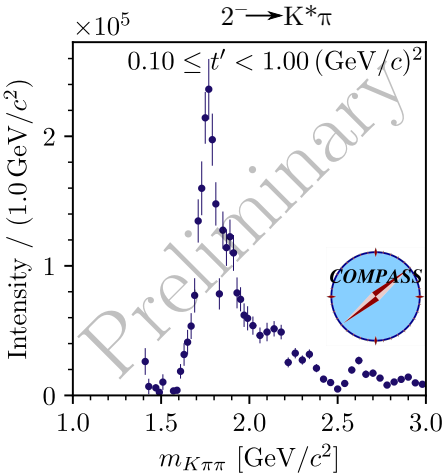
$K^-\pi^-\pi^+$ from COMPASS

- Large signal in $2^-\,0^+\,K_2^*(1430)\,\pi\,S$ wave
- Two resonances in signal region
  - $K_2(1770)$, $K_2(1820)$
- Bump in high-mass shoulder
  - Potential $K_2(2250)$
- Similar signals also in
  - $\rho(770)\,K$ and
  - $K^*(892)\,\pi$ decays



$K^-\pi^-\pi^+$ from COMPASS

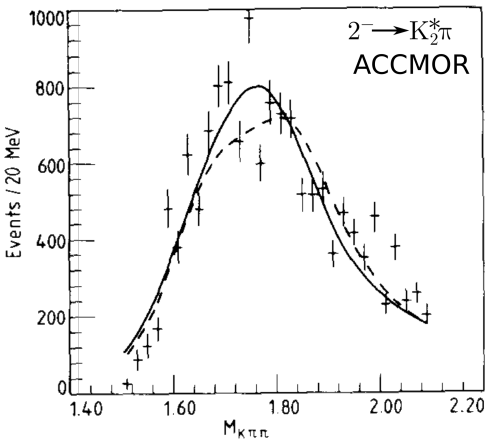
- Large signal in $2^-\,0^+\,K_2^*(1430)\,\pi\,S$ wave
- Two resonances in signal region
  - $K_2(1770)$, $K_2(1820)$
- Bump in high-mass shoulder
  - Potential $K_2(2250)$
- Similar signals also in
  - $\rho(770)\,K$ and
  - $K^*(892)\,\pi$ decays



- Existence of one or two low-mass K_2 state not clear at previous measurements
- $K_2(2250)$ observed mainly in $\Lambda\bar{p}$ final state

$B^+ \to J/\psi\phi K^+$ from LHCb

- Both $K_2(1770)$ and $K_2(1820)$ considered
- Limited kinematic range
  - Cannot access low- and high-mass states
- Updated analysis of larger sample
  - High- and low mass tail of states outside kinematic range needed to describe data
  - Requires input from other measurements

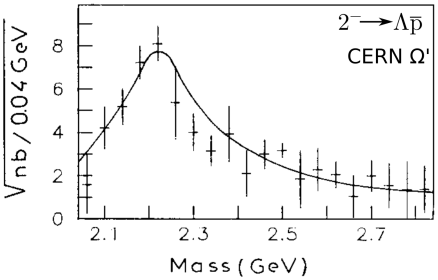


WA03 (CERN), 200 000 events, ACCMOR, Nucl. Phys. B **187** (1981)

- Existence of one or two low-mass K_2 state not clear at previous measurements
- $K_2(2250)$ observed mainly in $\Lambda\bar{p}$ final state

$B^+ \to J/\psi\phi K^+$ from LHCb

- Both $K_2(1770)$ and $K_2(1820)$ considered
- Limited kinematic range
  - Cannot access low- and high-mass states
- Updated analysis of larger sample
  - High- and low mass tail of states outside kinematic range needed to describe data
  - Requires input from other measurements

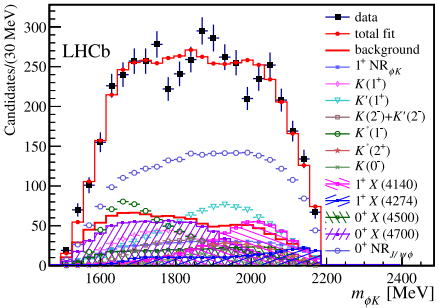


CERN Ω' spectrometer, 10 000 events, Nucl. Phys. B **227** (1983)

- Existence of one or two low-mass K_2 state not clear at previous measurements
- $K_2(2250)$ observed mainly in $\Lambda\bar{p}$ final state

$B^+ \to J/\psi\phi K^+$ from LHCb

- Both $K_2(1770)$ and $K_2(1820)$ considered
- Limited kinematic range
  - Cannot access low- and high-mass states
- Updated analysis of larger sample
  - High- and low mass tail of states outside kinematic range needed to describe data
  - Requires input from other measurement

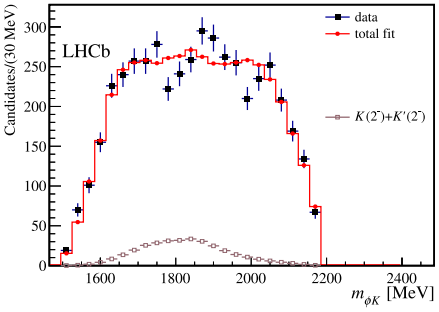


LHCb, 4 289 events, Phys. Rev. Lett. **118** (2017)

- Existence of one or two low-mass K_2 state not clear at previous measurements
- $K_2(2250)$ observed mainly in $\Lambda\bar{p}$ final state

$B^+ \to J/\psi\phi K^+$ from LHCb

- Both $K_2(1770)$ and $K_2(1820)$ considered
- Limited kinematic range
  - Cannot access low- and high-mass states
- Updated analysis of larger sample
  - High- and low mass tail of states outside kinematic range needed to describe data
  - Requires input from other measurement

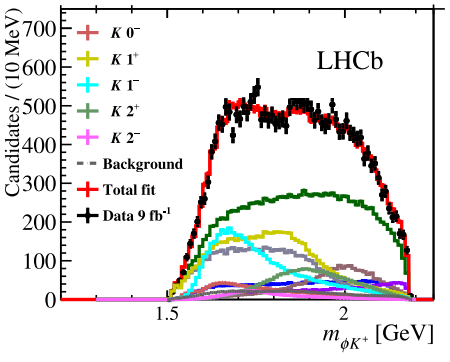


LHCb, 4 289 events, Phys. Rev. Lett. **118** (2017)

- Existence of one or two low-mass K_2 state not clear at previous measurements
- $K_2(2250)$ observed mainly in $\Lambda\bar{p}$ final state

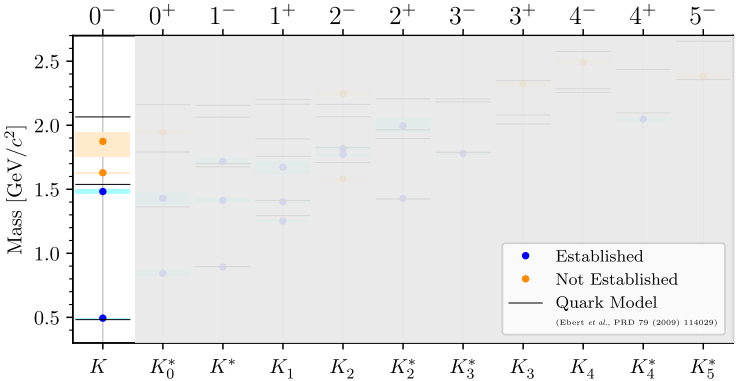
$B^+ \to J/\psi\phi K^+$ from LHCb

- Both $K_2(1770)$ and $K_2(1820)$ considered
- Limited kinematic range
  - Cannot access low- and high-mass states
- Updated analysis of larger sample
  - High- and low mass tail of states outside kinematic range needed to describe data
  - Requires input from other measurement



LHCb, arXiv:2103.01803 (2021)

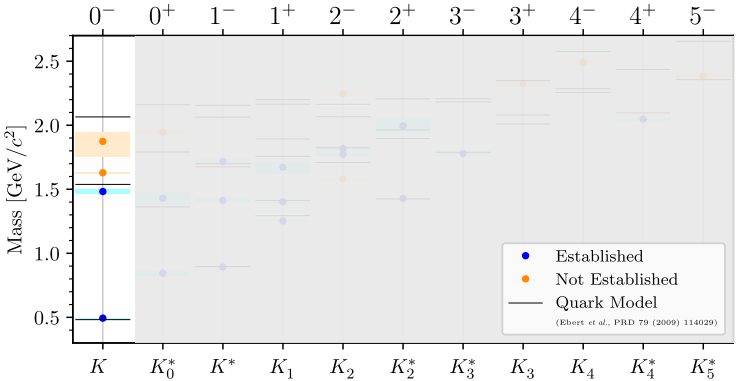
Searching Exotic Strange Mesons



PDG (2021)

- $K(1460)$ and $K(1830)$ potentially quark-model states
- $K(1630)$ candidate for exotic state
  - Unexpectedly small width: $16\,\mathrm{MeV}/c^2$
  - J^P of $K(1630)$ unclear

Searching Exotic Strange Mesons



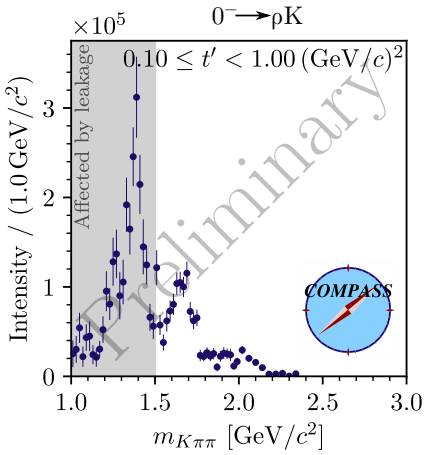
PDG (2021)

- $K(1460)$ and $K(1830)$ potentially quark-model states
- $K(1630)$ candidate for exotic state
  - Unexpectedly small width: $16\,\mathrm{MeV}/c^2$
  - J^P of $K(1630)$ unclear

Searching Exotic Strange Mesons

$K^-\pi^-\pi^+$ from COMPASS

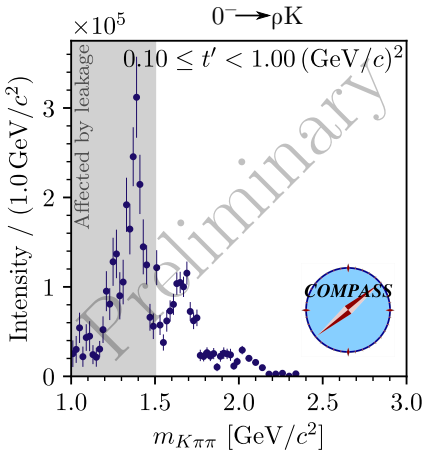
- Peak at about 1.4 GeV/c^2
  - Potentially from established $K(1460)$
  - But, $m \lesssim 1.5\,\text{GeV}/c^2$ region affected by analysis artifacts
- Second peak at about 1.7 GeV/c^2
  - Potential $K(1630)$ signal
  - Accompanied by clear phase motion
  - Width presumably larger than 16 MeV/c^2



Searching Exotic Strange Mesons

$K^-\pi^-\pi^+$ from COMPASS

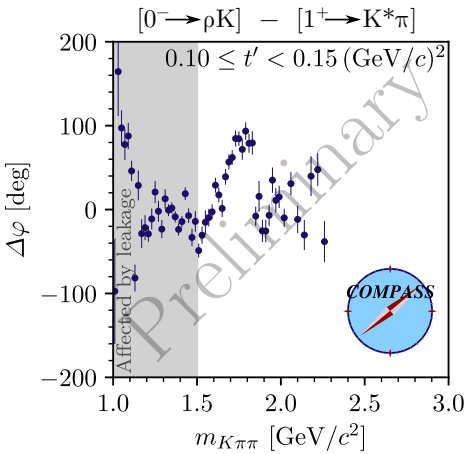
- Peak at about $1.4\,\mathrm{GeV}/c^2$
  - Potentially from established $K(1460)$
  - But, $m \lesssim 1.5\,\mathrm{GeV}/c^2$ region affected by analysis artifacts
- Second peak at about $1.7\,\mathrm{GeV}/c^2$
  - Potential $K(1630)$ signal
  - Accompanied by clear phase motion
  - Width presumably larger than $16\,\mathrm{MeV}/c^2$



Searching Exotic Strange Mesons

$K^-\pi^-\pi^+$ from COMPASS

- Peak at about 1.4 GeV/c^2
  - Potentially from established $K(1460)$
  - But, $m \lesssim 1.5\,\mathrm{GeV}/c^2$ region affected by analysis artifacts
- Second peak at about 1.7 GeV/c^2
  - Potential $K(1630)$ signal
  - Accompanied by clear phase motion
  - Width presumably larger than 16 MeV/c^2



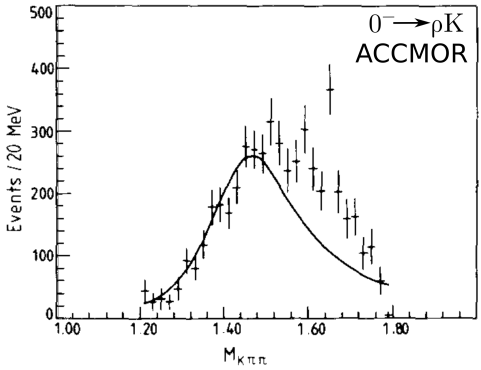
Searching Exotic Strange Mesons

$K^-\pi^-\pi^+$ from ACCMOR

- Potential $K(1630)$ signal already in ACCMOR analysis

$K^-\pi^-\pi^+$ from LHCb

- Measurement of $D^0 \to K^\mp\pi^\pm\pi^+\pi^\mp$ at LHCb
  - Study strange mesons in $K\pi\pi$ subsystem
  - MIPWA of $J^P = 0^+$ amplitude
  - Potential signal above $1.6\,\mathrm{GeV}/c^2$
  - Limited by kinematic range



WA03 (CERN), 200 000 events, ACCMOR, Nucl. Phys. B **187** (1981)

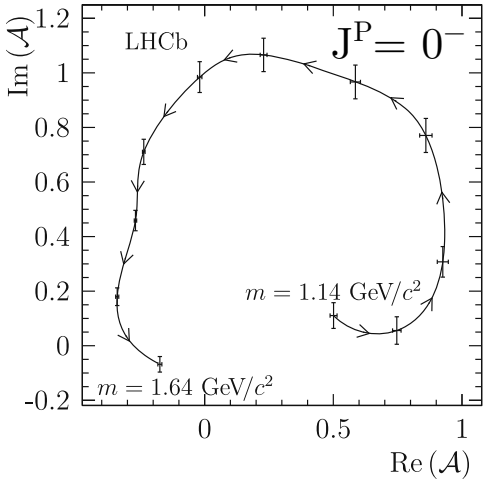
Searching Exotic Strange Mesons

$K^-\pi^-\pi^+$ from ACCMOR

- Potential $K(1630)$ signal already in ACCMOR analysis

$K^-\pi^-\pi^+$ from LHCb

- Measurement of $D^0 \to K^\mp\pi^\pm\pi^\pm\pi^\mp$ at LHCb
  - Study strange mesons in $K\pi\pi$ subsystem
  - MIPWA of $J^P = 0^-$ amplitude
  - Potential signal above 1.6 GeV/c^2
  - Limited by kinematic range



LHCb, 893 000 events, Eur. Phys. J. C **78** (2018)

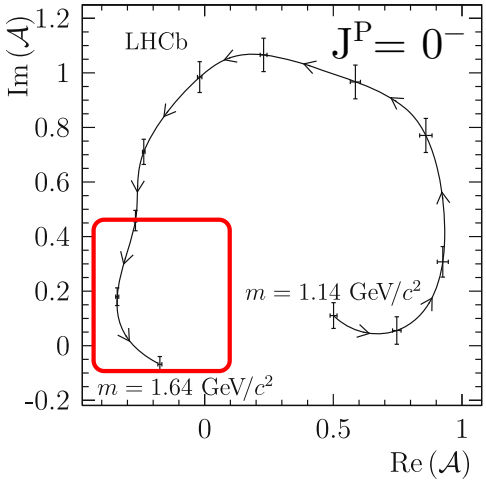
Searching Exotic Strange Mesons

$K^-\pi^-\pi^+$ from ACCMOR

- Potential $K(1630)$ signal already in ACCMOR analysis

$K^-\pi^-\pi^+$ from LHCb

- Measurement of $D^0 \to K^\mp\pi^\pm\pi^\pm\pi^\mp$ at LHCb
  - Study strange mesons in $K\pi\pi$ subsystem
  - MIPWA of $J^P = 0^-$ amplitude
  - Potential signal above $1.6\,\mathrm{GeV}/c^2$
  - Limited by kinematic range



LHCb, 893 000 events, Eur. Phys. J. C **78** (2018)

Conclusion

KLF talk by Sean Dobbs, Baryon spectroscopy (Fri 11:15)
CLAS12 talk by Nicholas Zachariou, Meson spectroscopy (Wed 8:25)

- High-precision era with data from:
  - COMPASS, VES, GlueX, CLAS12
  - LHCb, Belle(II), BESIII
- Allows us to get a more complete picture of the physical processes
- Requires a more complete description of our data
- Further prospects
  - PANDA
  - AMBER at CERN: Kaon spectroscopy [arXiv:1808.00848]

Conclusion

- High-precision era with data from:
  - COMPASS, VES, GlueX, CLAS12
  - LHCb, Belle(II), BESIII
- Allows us to get a more complete picture of the physical processes
- Requires a more complete description of our data
- Further prospects
  - PANDA
  - AMBER at CERN: Kaon spectroscopy [arXiv:1808.00848]

Conclusion

- High-precision era with data from:
  - COMPASS, VES, GlueX, CLAS12
  - LHCb, Belle(II), BESIII
- Allows us to get a more complete picture of the physical processes
- Requires a more complete description of our data
- Further prospects
  - PANDA
  - AMBER at CERN: Kaon spectroscopy

[arXiv:1808.00848]

Backup

Outline