Title: QFT III 2021/2022

Speakers: Francois David

Collection: QFT III 2021/2022

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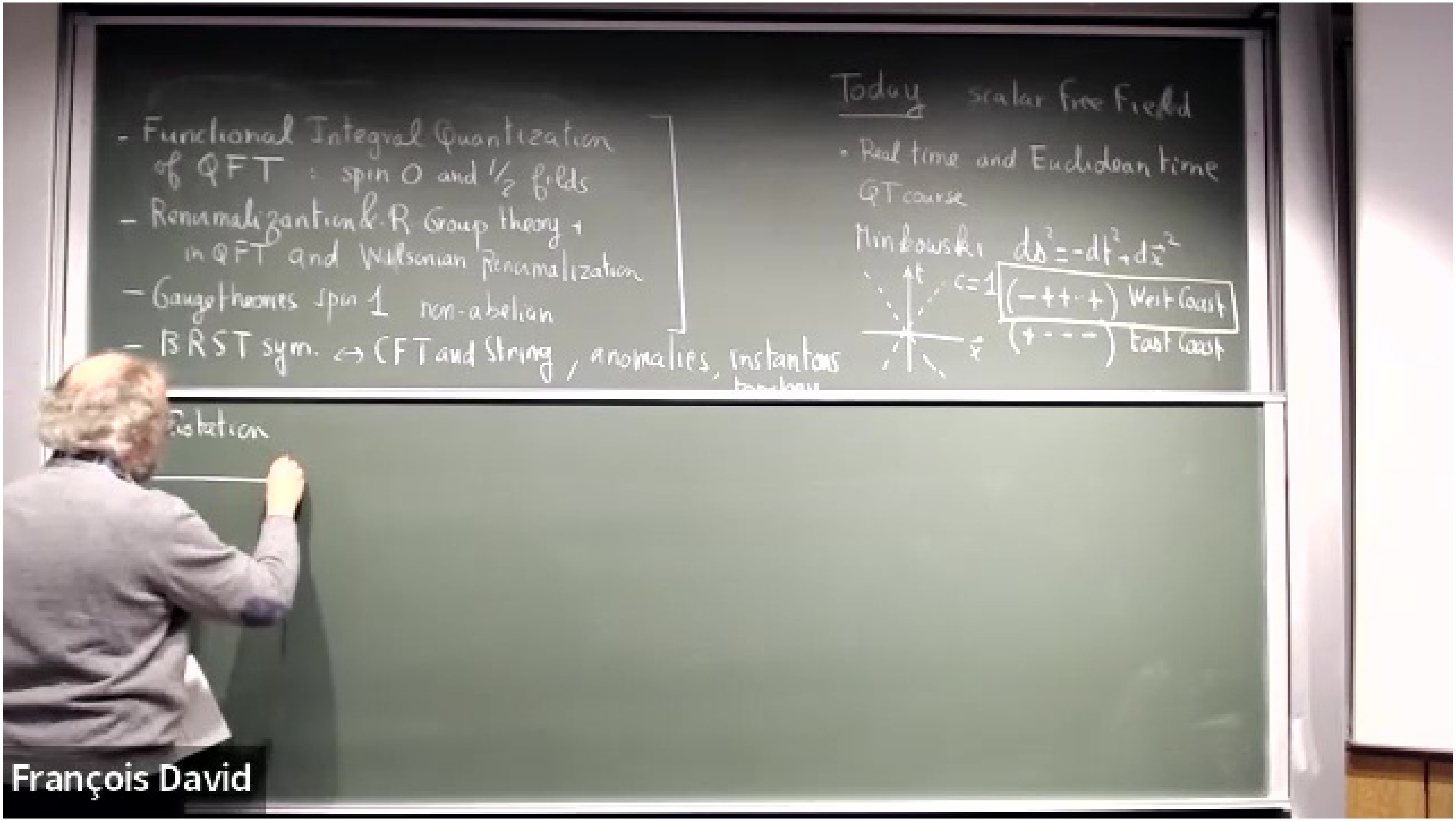
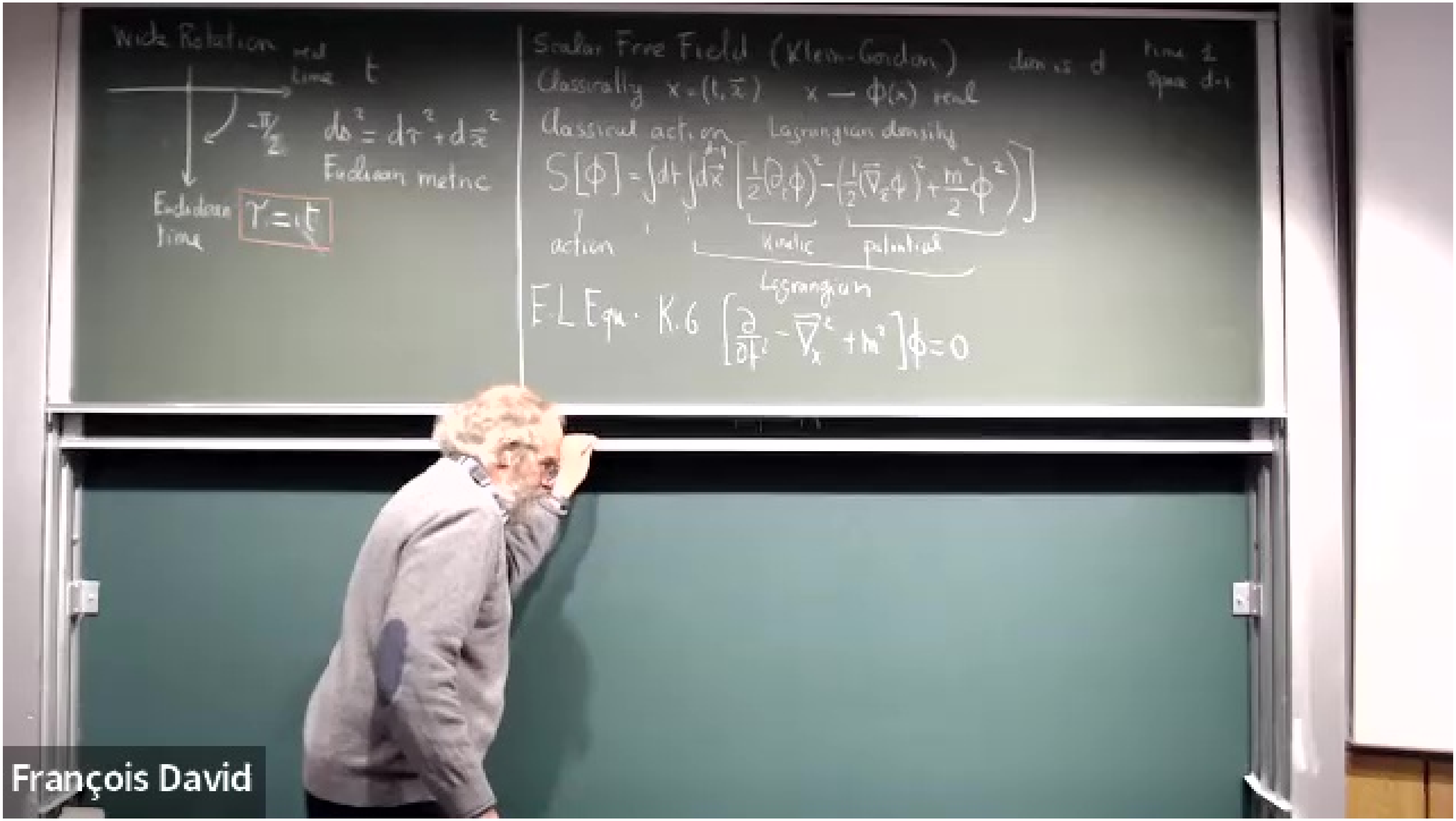
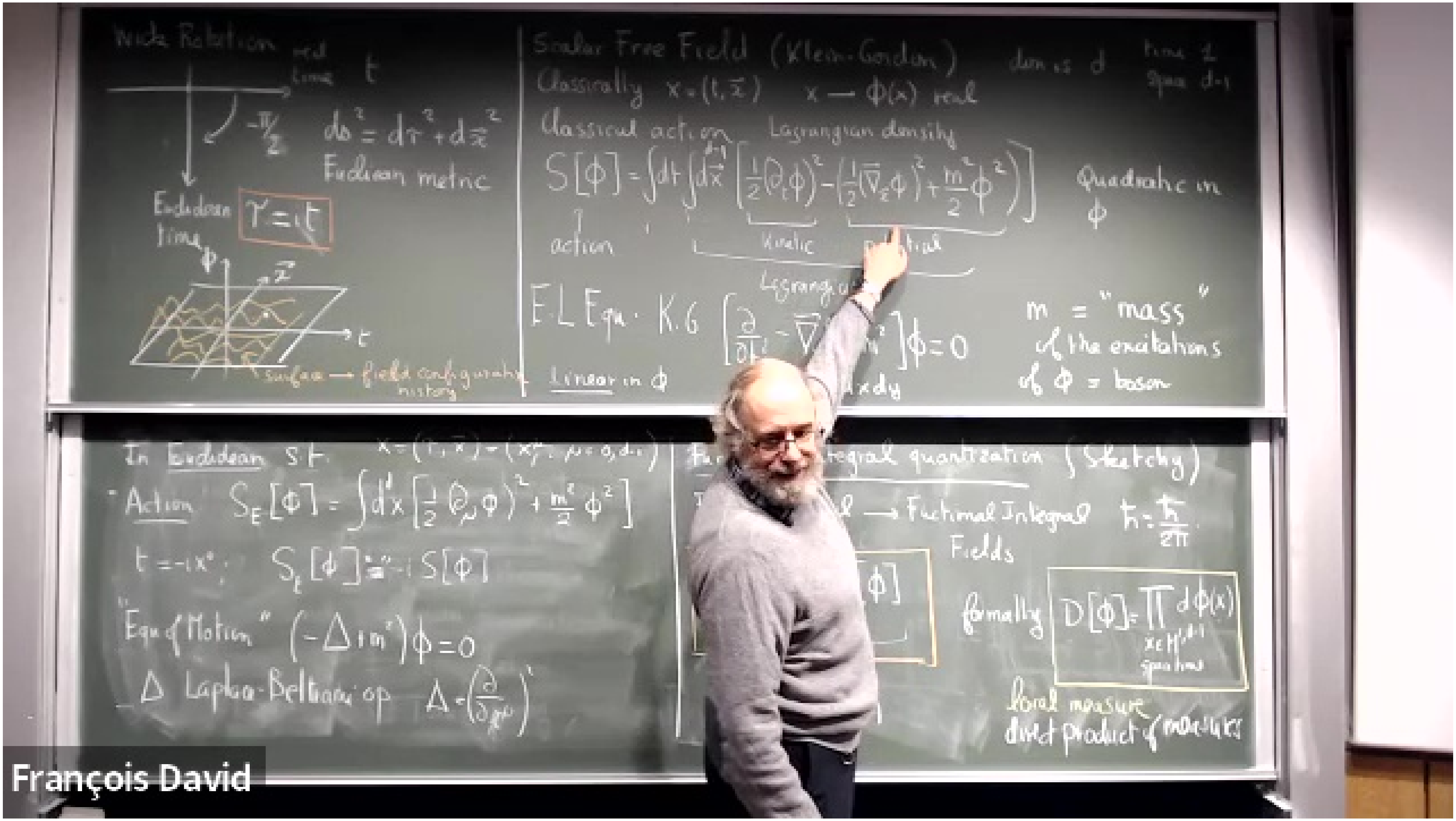
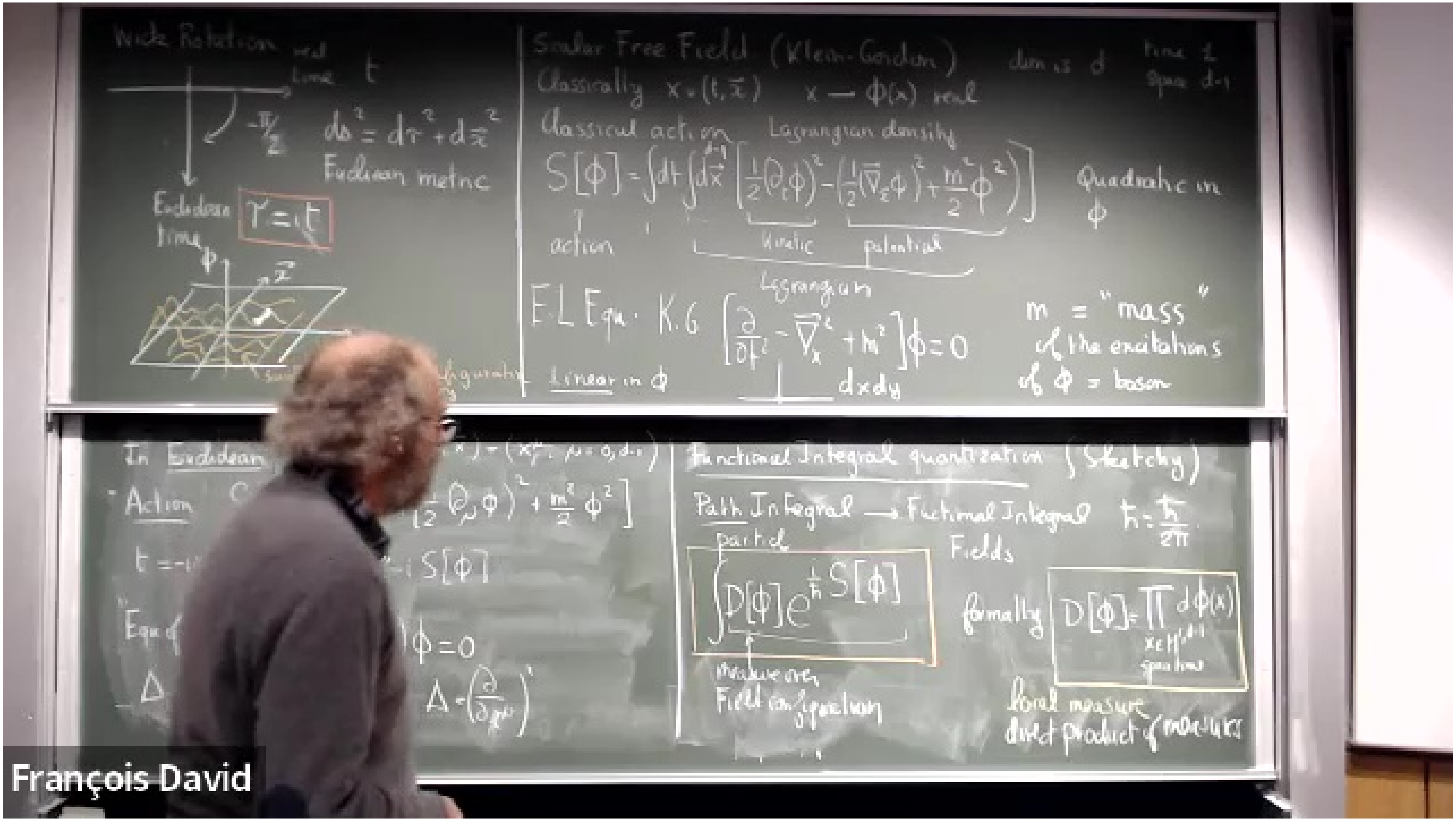
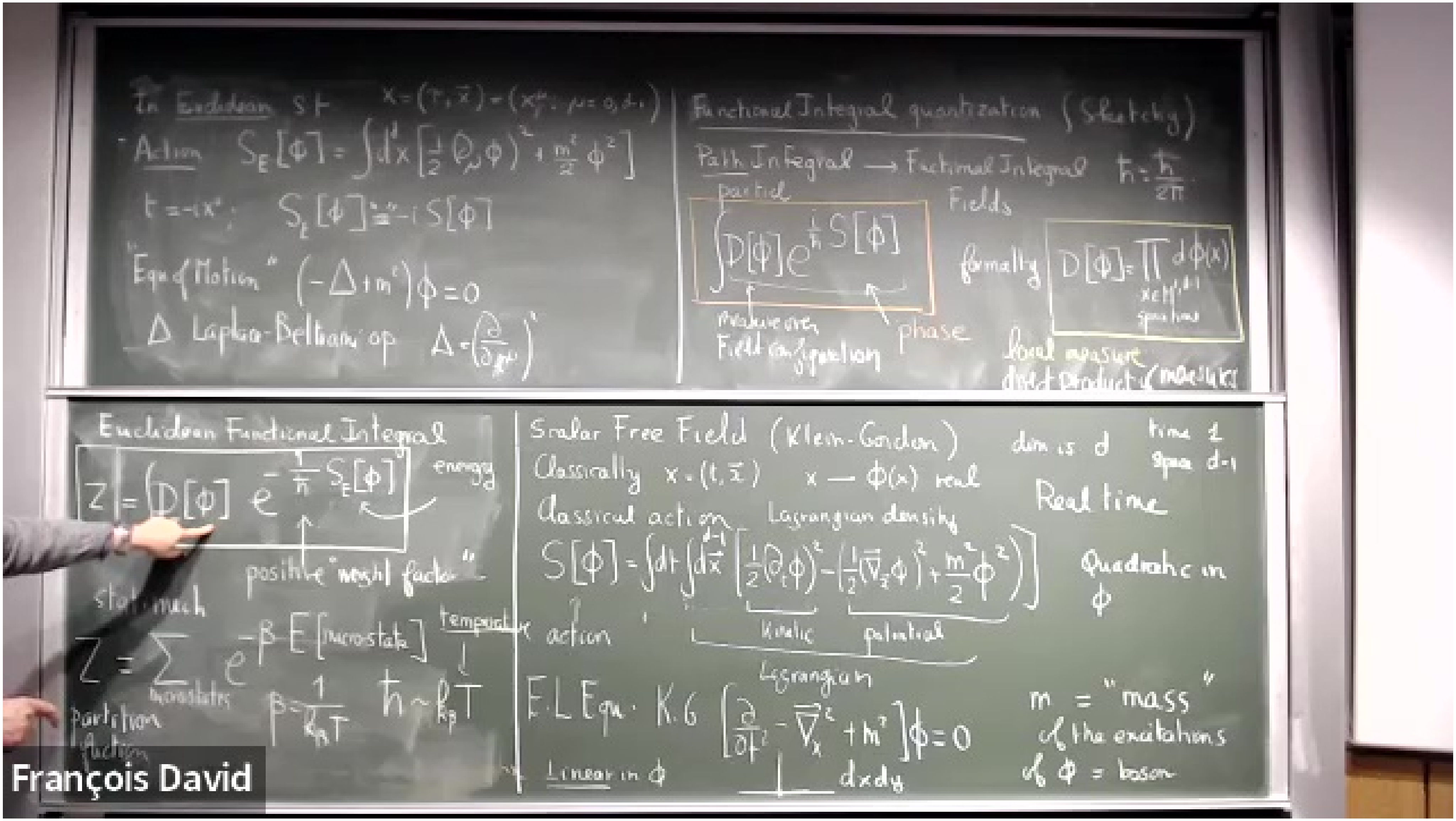
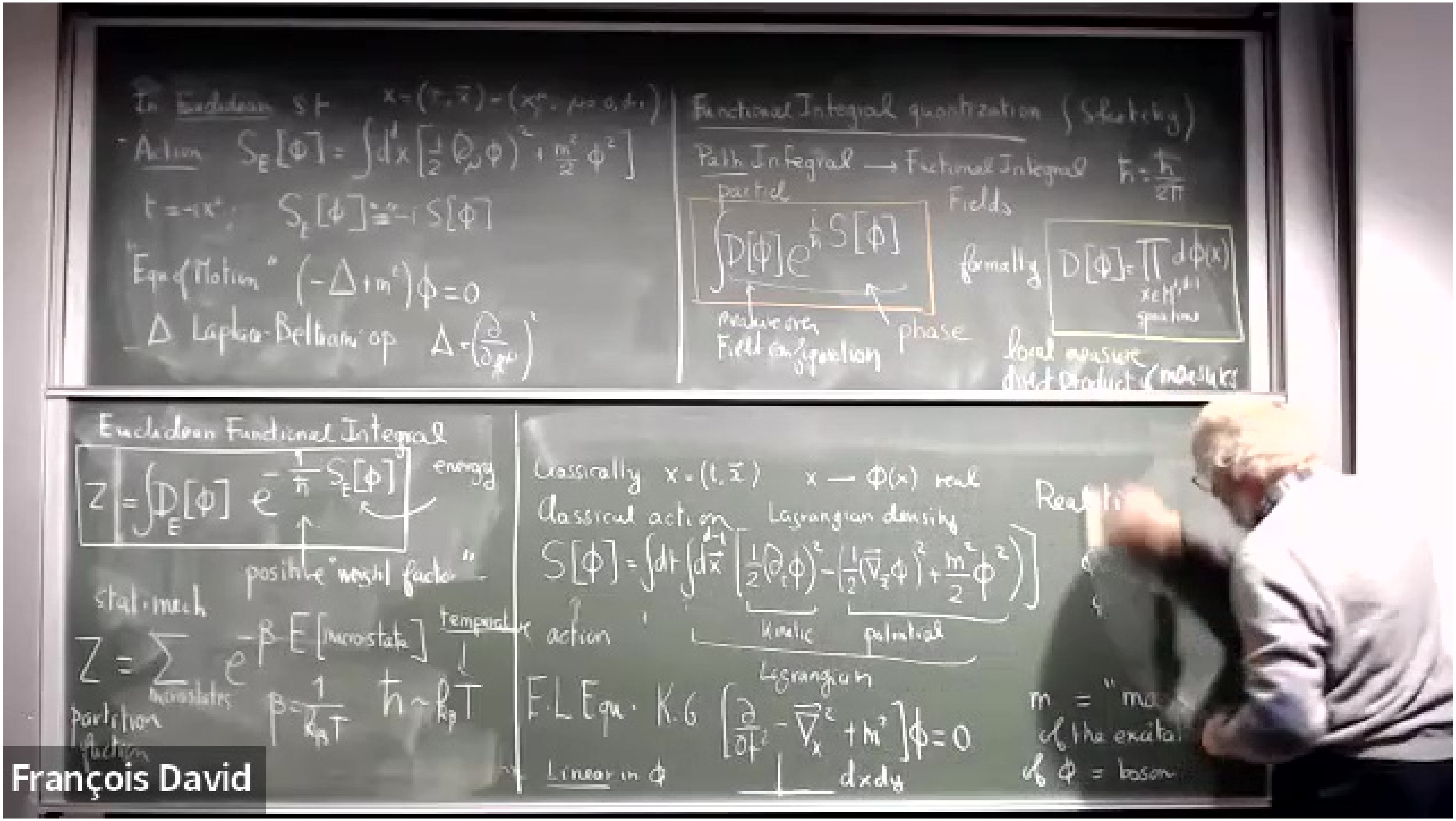

- Functional Integral Quantization of QFT : spin 0 and 1/2 fields
- Renormalization & R Group theory in QFT and Wilsonian Renormalization
- Gauge theories spin 1 non-abelian
- BRST sym. ↔ CFT and String , anomalies, instantons
Today scalar free Field
- Real time and Euclidean time
QT course
Minkowski ds² = -dt² + dx²
c=1
(- + + + ) West Coast
(+ - - - ) East Coast
François David


Wick Rotation
real time t
Euclidean metric
Euclidean time
Scalar Free Field (Klein-Gordon)
dim is d
time 1
space d-1
Classically
classical action
Lagrangian density
action
kinetic
potential
Lagrangian
E.L. Equ. K.G
François David


Wick Rotation
real time
Euclidean metric
Euclidean time
Scalar Free Field (Klein-Gordon)
dim is d
time 1
space d-1
Classically
Classical action
Lagrangian density
Quadratic in φ
action
kinetic
m = "mass"
of the excitations
of φ = boson
Linear in φ
In Euclidean S.T.
Action
"Equ of Motion"
Δ Laplace-Beltrami op
Functional Integral
Fields
formally
local measure
direct product of measures
François David


François David
Wick Rotation
Euclidean metric
Euclidean time
Scalar Free Field (Klein-Gordon)
Classically
Classical action
Lagrangian density
Quadratic in
action
Kinetic
potential
Lagrangian
m = "mass"
of the excitations
Linear in
In Euclidean
Action
Functional Integral quantization (Sketchy)
Path Integral → Functional Integral
partial
Fields
formally
measure over
Field configuration
Borel measure
direct product of measures


In Euclidean S.T.
Action
"Equ of Motion"
Δ Laplace-Beltrami op
Functional Integral quantization (Sketchy)
Path Integral → Functional Integral
partial
Fields
formally
measure over
Field configuration
phase
local measure
direct product of measures
Euclidean Functional Integral
energy
positive "weight factor"
stat. mech
temperature
partition function
microstates
Scalar Free Field (Klein-Gordon)
dim is d
time 1
space d-1
Classically
real
Real time
Classical action
Lagrangian density
Quadratic in
kinetic
potential
action
Lagrangian
E.L. Equ. K.G
m = "mass"
of the excitations
= boson
Linear in
François David


In Euclidean S-T
Action
Eq. of Motion
Laplace-Beltrami op
Functional Integral quantization (Sketchy)
Path Integral → Functional Integral
Fields
formally
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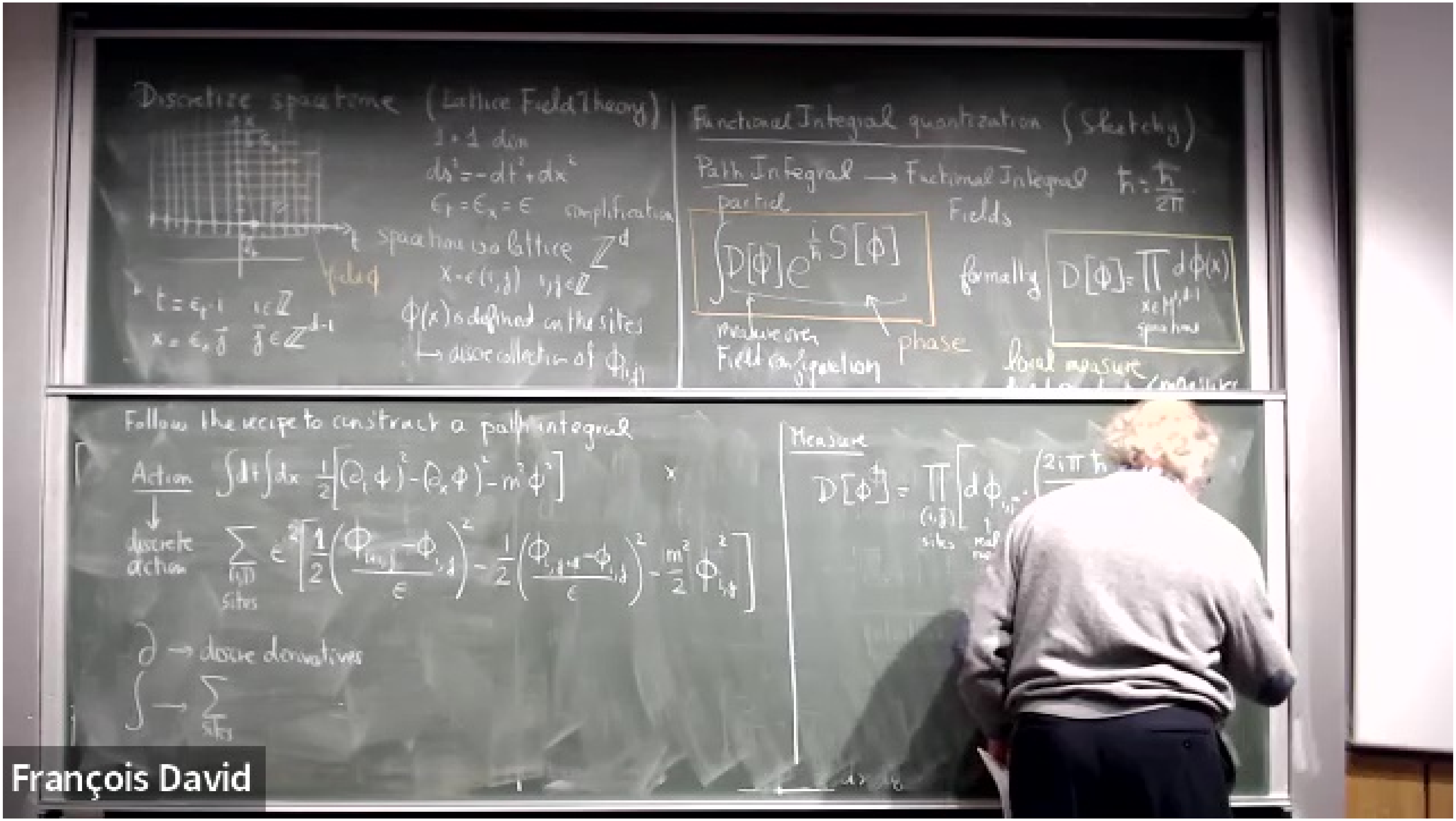
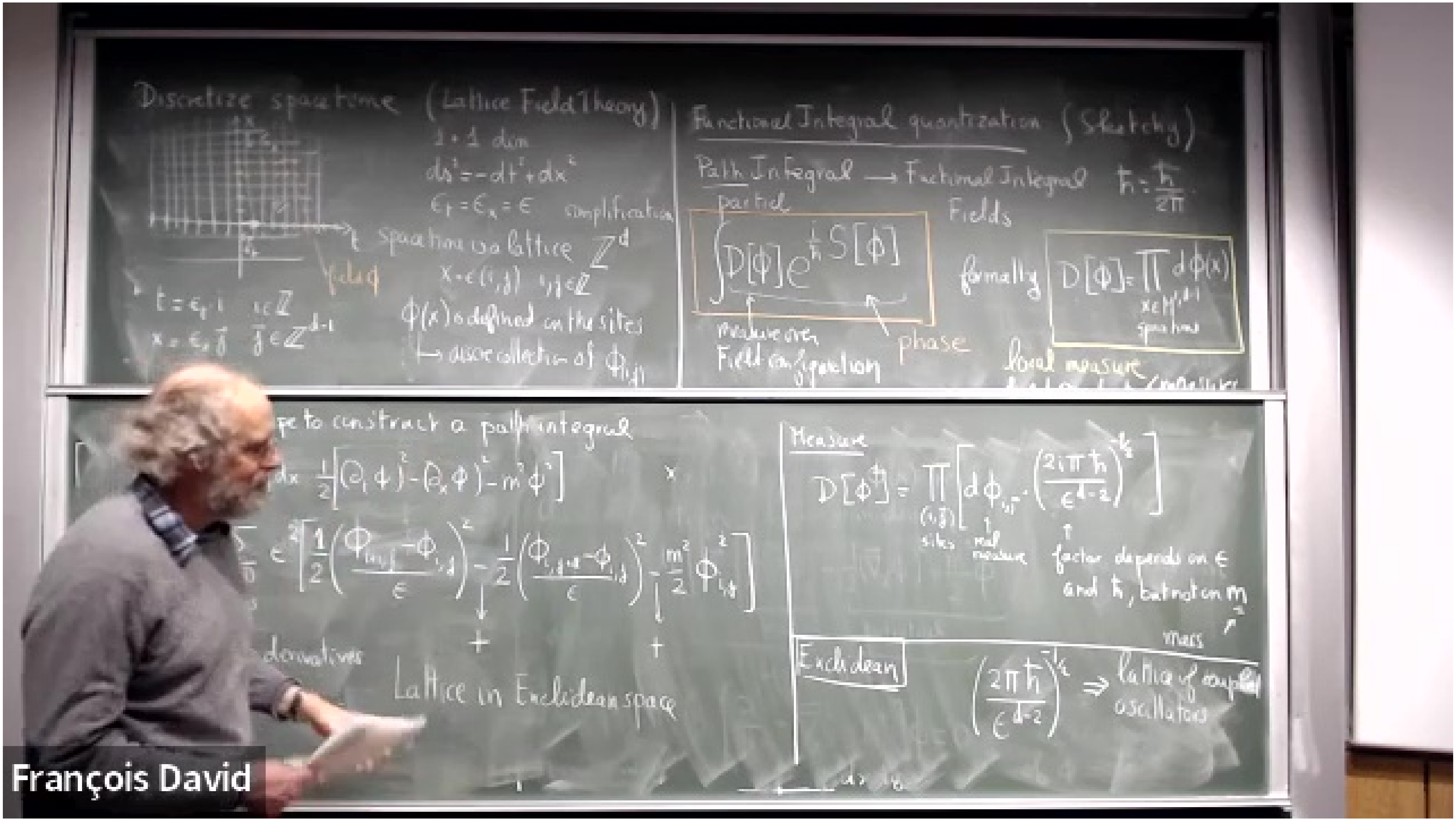
function
Classically
real
Classical action
Lagrangian density
kinetic
potential
action
Lagrangian
F.L Equ. K.G
Linear in
dxdy
of the excita
boson
François David


Discretize spacetime (Lattice Field Theory)
1+1 dim
simplification
spacetime is a lattice
Φ(x) is defined on the sites
Functional Integral quantization (Sketchy)
Path Integral → Functional Integral
particle
Fields
formally
measure over Field configuration
phase
local measure
Follow the recipe to construct a path integral
Action
discrete action
sites
∂ → discrete derivatives
Measure
François David


Discretize spacetime (Lattice Field Theory)
1+1 dim
spacetime is a lattice
Functional Integral quantization (Sketchy)
Path Integral → Functional Integral
particle
Fields
formally
phase
local measure
Measure
sites
factor depends on ε
derivatives
Lattice in Euclidean space
Euclidean
oscillators
François David