Sept. 20 π-mesons

Symanzik: Dispersion Formula

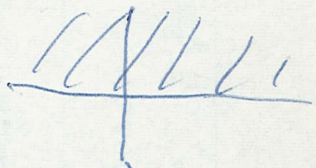
a) "nucleons" M
"mesons" m < 9 M

bound state M_b > M + μ

b) $[\phi(x), \phi(x')] = 0 \quad (x-x')^2 < 0$

sing $< \delta^n (x-x')^2$

$(\Box + m^2)\phi(x) \equiv O(x)$



$T_\omega = R(\omega^2) + 4\pi \int_0^\infty r dr\, F(\omega, r)$

$\mathrm{Im}\, F(\omega, r) = \frac{\sin \sqrt{\omega^2-M^2}\, r}{\sqrt{\omega^2-M^2}} \frac{1}{r} \frac{1}{\pi} \int dt\, e^{i\omega t} \langle \mu | [O(t,\vec{r}), O(0,0)] | \mu 0 \rangle$

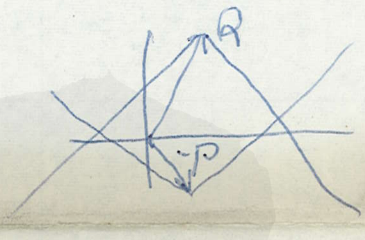
$\mathrm{Re}\, F(\omega, r) = \frac{1}{\pi} P \int \frac{\mathrm{Im}\, F(\omega, r)\, d\omega}{(\omega-\bar{\omega})^n (\omega - \omega_0)}$

$M \nearrow \frac{1}{\omega^2 - \frac{\mu^2}{2}}$

$\mathrm{Re}\, T_{\omega_0} = R(\omega^2) + \frac{1}{\pi} P \int_M^\infty \frac{\mathrm{Im}\, T_\omega}{\omega - \omega_0} d\omega + 4\pi \int_0^\infty dr \int_0 \frac{\mathrm{Im}\, F(\omega, r)}{\omega - \omega_0} d\omega$

Jost:

$\langle P | [j(x), j(y)] | Q \rangle$



$\varphi(t, \vec{r}) = \langle P | [j(x), j(0)] | P \rangle \qquad P = (1, 0, 0, 0)$

$\Phi(p, |\vec{p}|) \qquad \varphi(-t, r) = -\varphi(t, r)$

$\Phi(p) = \varepsilon(p_0) \int d^3k\, \Phi(p_0^2 - (\vec{p} - \vec{k})^2, \vec{k})$

Bogoliubov:

$\frac{\delta\left(\frac{\delta S}{\delta\varphi(x)} S^\dagger\right)}{\delta\varphi(y)} = 0$ (causality condition)

$y \lesssim x$ backward or space-like

$j(x) = i \frac{\delta S}{\delta \varphi(x)} S^\dagger$

$\langle p' | \frac{\delta j(x)}{\delta \varphi(y)} | p \rangle = e^{i(p'-p)(x+y)/2} F^{ret}(x-y)$

$\langle p' | \frac{\delta j(x)}{\delta \varphi(y)} | p \rangle = \qquad F^{adv}(x-y)$

$\langle p' | j(x), j(y) | p \rangle = -i \qquad F(x-y)$

Nambu:

DR. THOMAS P. RATIGAN'S

SYSTEMIZED - ORGANIZED
And
VISUALIZED

CHEMISTRY

DR. RATIGAN'S CLASSIFICATION OF THE ELEMENTS FOLLOWS ABSOLUTELY;

(1) MENDELEEF'S PERIODIC LAW.
(2) MOSELEY'S LAW OF ATOMIC NUMBERS.
(3) LEWIS'S OCTET THEORY.
(4) NO EXCEPTIONS.

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PRIVATE LESSONS, CLASSES
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DR. THOMAS P. RATIGAN'S PERIODIC CHART OF THE ELEMENTS

SUB-ELEMENTS (1) HYDROGEN - (2) HELIUM

GROUP 1

Family I	Family II	Family III	Family IV	Family V	Family VI	Family VII	Family VIII
Lithium	Beryllium	Boron	Carbon	Nitrogen	Oxygen	Fluorine	Neon
Sodium	Magnesium	Aluminum	Silicon	Phosphorus	Sulphur	Chlorine	Argon
Potassium	Calcium	Scandium	Titanium	Vanadium	Chromium	Manganese	Iron
Cobalt	Nickel	Copper	Zinc	Gallium	Germanium	Arsenic	Selenium
Bromine	Krypton	Rubidium	Strontium	Yttrium	Zirconium	Columbium	Molybdenum

GROUP 2

Masurium	Ruthenium	Rhodium	Palladium	Silver	Cadmium	Indium	Tin
Antimony	Tellurium	Iodine	Zenon	Cesium	Barium	Lanthanum	Cerium
Praseodymium	Neodymium	Illinium	Samarium	Europium	Gadolinium	Terbium	Dysprosium
Holmium	Erbium	Thulium	Ytterbium	Lutecium	Hafnium	Tantalum	Tungsten
Rhenium	Osmium	Iridium	Platinum	Gold	Mercury	Thallium	Lead

RADIO-ACTIVE GROUP

Bismuth Proto - Actinium	Polonium Uranium	Alabamine	Radon	Virginium	Radium	Actinium	Thorium

TRANS-URANIC GROUP

		Neptunium	Plutonium	Americium	Curium	Berkelium	Californium
Seaborgium	Fermium	Bohrium	Comptonium	Lawrencium	Oppenheimerium	Mendeleeffium	Einsteinium

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