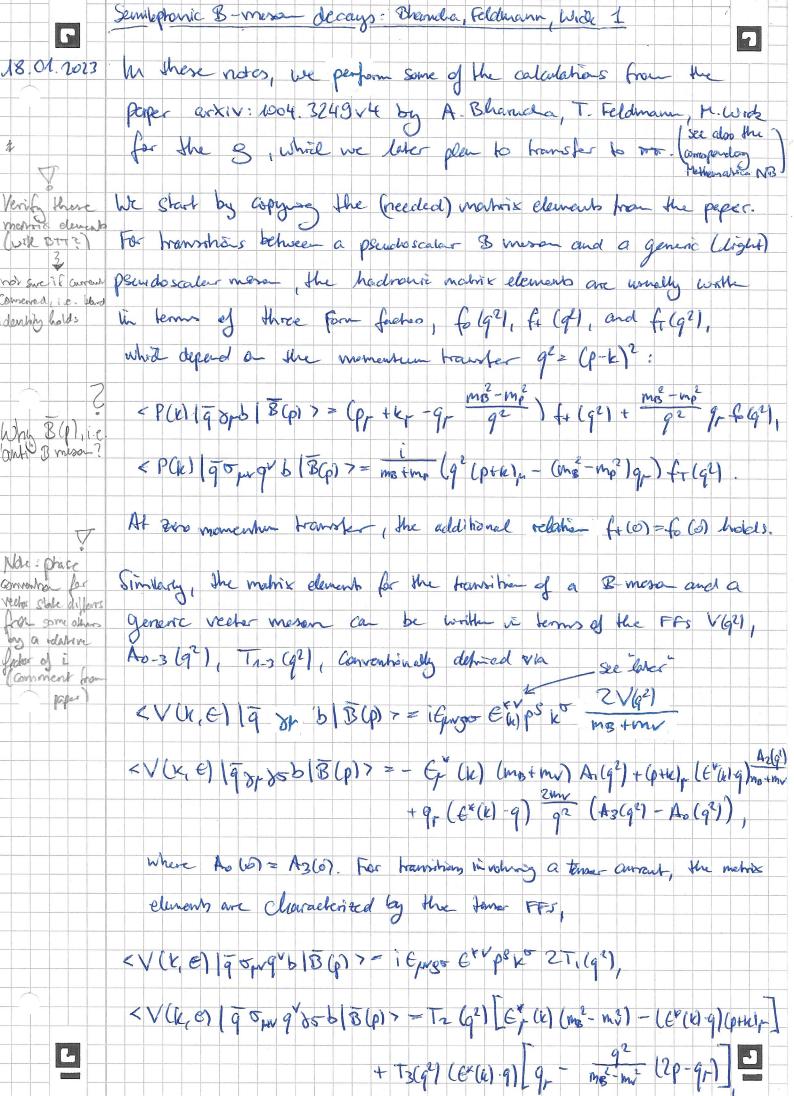
## Disclaimer

The notes at hand were written during my research period as a PhD student at the University of Bonn. They contain auxiliary calculations to and comments on publications by other authors, which are subject to definite conditions of use; see also the respective article(s) on <a href="https://arxiv.org/">https://arxiv.org/</a> linked on the following website. For more information and all my material, check: <a href="https://www.physics-and-stuff.com/">https://www.physics-and-stuff.com/</a>

## I raise no claim to correctness and completeness of the given material!

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Where  $T_1(0) = T_2(0)$ . The equations of indian for the quarters imply the additional constraint

 $A_{3}(q^{2}) = \frac{m_{B} tm_{v}}{2m_{v}} A_{1}(q^{2}) - \frac{m_{B} - m_{v}}{2m_{v}} A_{2}(q^{2}),$ 

So that the B-TV transitions are characterized by sere independent FFS.

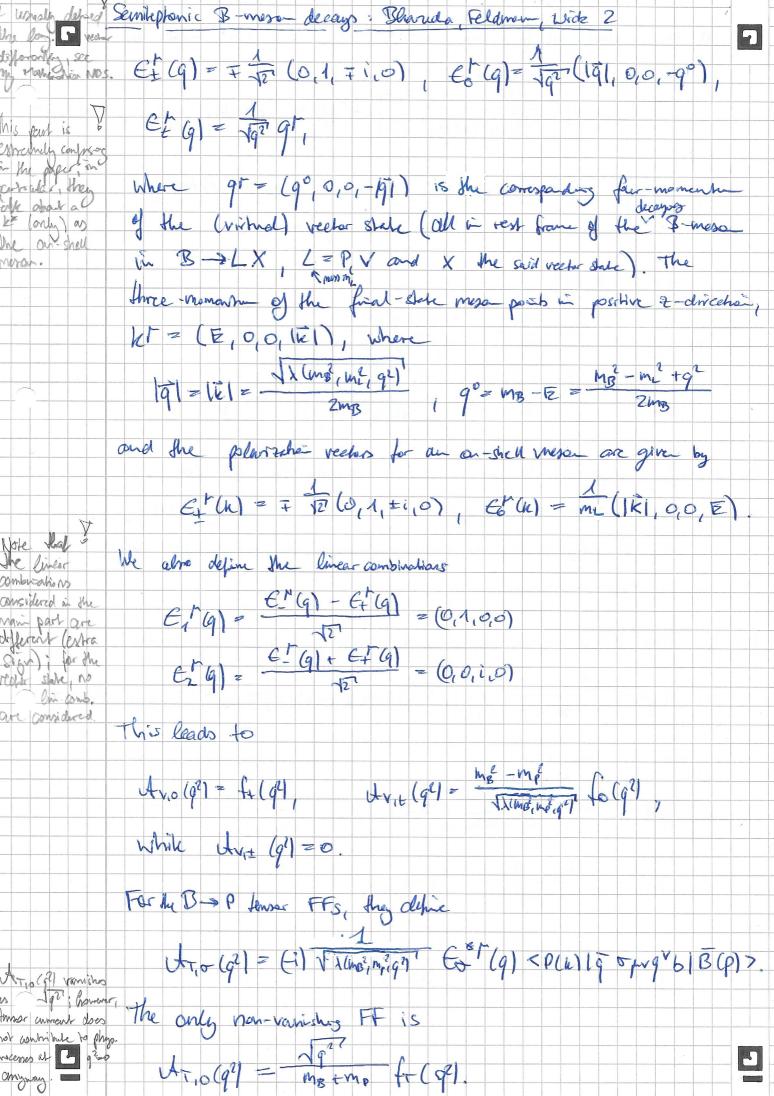
It is convenient to take certain linear combinations of these "standard detrivition" FFS, which are referred to as helicity auglitudes in the paper (It that this name is not a good chorie because I learned [got to know belicity amplitudes via a different definition]. For one, these diagonalise the unitarity relations we will use/write about in a next step (which are then used to derive dispersive bands on certain FF parameterisations). Moreover, they have definite gain-parity quantum numbers, which there will when considering the contribution of excited states. In addition, they have simple relations to the universal FFS appearing in the deary-quare and lar large-energy think and lead to simple expressions for the aboverships in B-> Let C decays in the naive factorisation approximation.

To also put the contributions to the various conclusion furtions entering the dispersive bounds on an equal feating, the authors choose a particular normalization convention.

For the  $B \rightarrow P$  vector FFS, they define  $A_{V,\sigma}(q^2) = \sqrt{\lambda (m_{B,m_{P}}^2 q^2)} \quad E_{\sigma}^* [q] < P(k) |\overline{q}_{\sigma}_{\sigma}_{D}| \overline{B}(p)^2,$ 

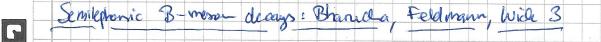
Where Est (9) are transverse (s==), longitudinal (s=0), or time-like (s=t) polaristation vectors, defined as follows In the paper

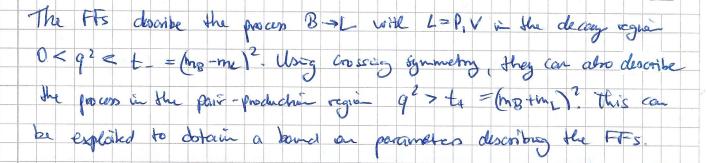
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A sinder analysis for the 300 vector and anit-vector for  
yilds  

$$g_{1,0}(q^{q}) = \frac{\sqrt{q^{2}}}{\sqrt{(1+q^{2})^{2}}} \sum_{C(C)} C_{2}^{d}(q) < \sqrt{(k, C(A))} [q_{1,0}(L-2s)] S(B(p)^{2};$$
  
will  
 $g_{1,0}(q^{q}) = \frac{\sqrt{q^{2}}}{\sqrt{(1+q^{2})^{2}}} \sum_{C(C)} C_{2}^{d}(q) = \sqrt{(k, C(A))} [q_{1,0}(L-2s)] S(B(p)^{2};$   
 $g_{1,0}(q^{q}) = \frac{\sqrt{(1+q^{2})^{2}}}{\sqrt{(1+q^{2})^{2}}} \sum_{C(C)} C_{2}^{d}(q) = \sqrt{(1+q^{2})^{2}} \sum_{C(C)$ 





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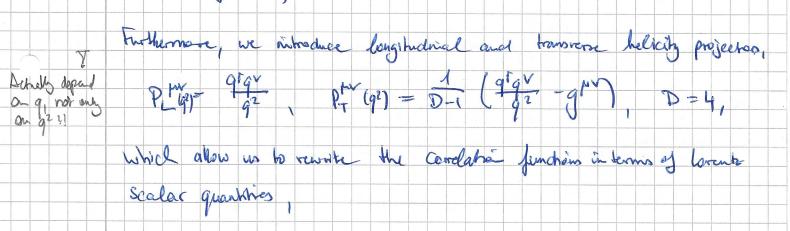
The concial observation of the idea of dispervice bands is the possibility to evaluate the correlator of two flavor-charging currents,

Cither by an OPE or by unitarity considerations. The relevant aments are defined as

$$j_{r}^{v} = \bar{q} \partial_{r} b_{i}$$
  $j_{r}^{v-A} = \bar{q} \partial_{r} (n - \gamma_{5}) b_{i}$ 

$$Jr = \overline{9} \overline{5} ra q^2 b$$
,  $Jr + 4r = \overline{9} \overline{5} ra q^2 (1+35) b$ .

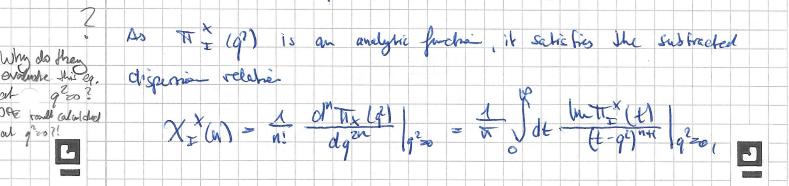
(Noir that for phenomenological applications, we are only intermed in the Currents jr Ar.)

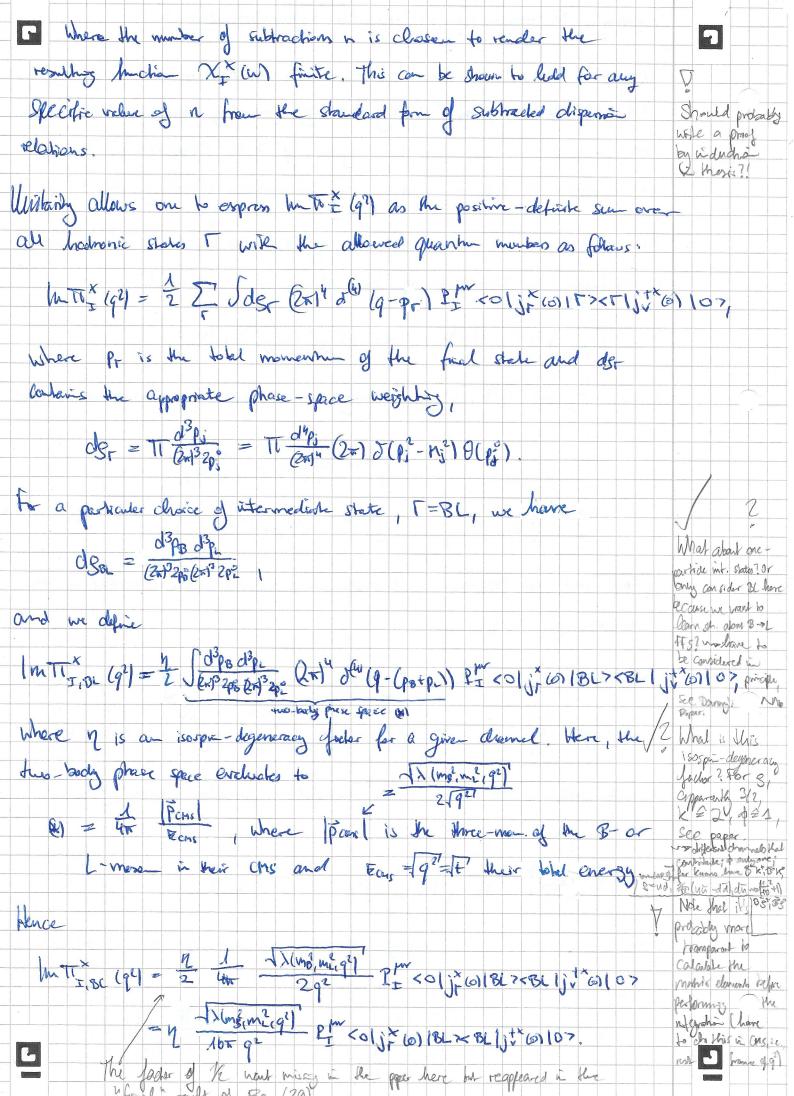


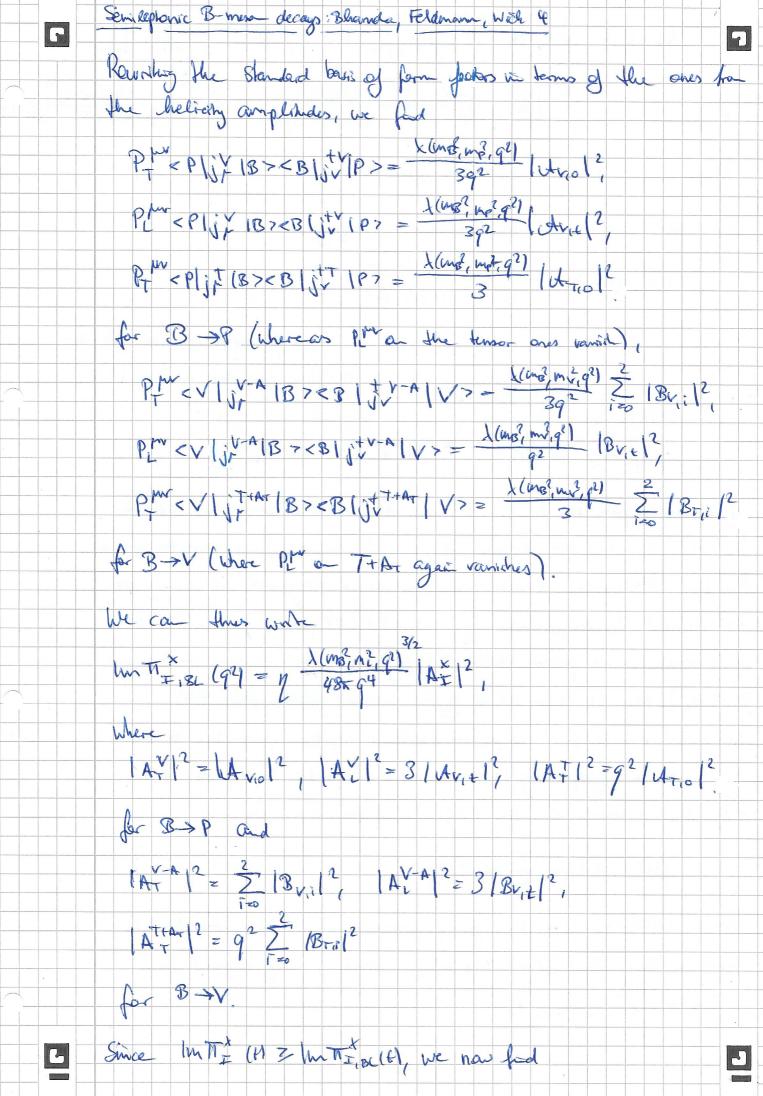




$$\pi_{\mathfrak{T}}^{\times}(q^2) = \mathbb{P}_{\mathfrak{T}}^{\mathsf{pr}}(q^2) \pi_{\mathsf{pr}}^{\times}(q^2), \quad \mathfrak{T} = L_{j}^{\mathsf{T}}.$$







 $\chi_{I}^{x}(n) = \frac{1}{k} \int dt \frac{\ln \pi_{I}^{x}(t)}{(t-q^{2})^{nn}} \Big|_{q^{2}} \xrightarrow{2} \frac{1}{k} \int dt \frac{\ln \pi_{I}^{x}}{(t-q^{2})^{nn}} \Big|_{q^{2}} \xrightarrow{2}$ G  $= \frac{1}{\pi} \int dt \frac{\lambda(ms^{2}, m^{2}, t)^{3/2}}{48\pi} \frac{|\lambda^{2}|}{t^{2}} \frac{|\lambda^{2}|}{(t-q^{2})^{n+1}} \frac{1}{q^{2}} = \frac{1}{\pi} \int dt \frac{\lambda(ms^{2}, m^{2}, t)^{3/2}}{48\pi} \frac{|\lambda^{2}|}{(t-q^{2})^{n+1}} \frac{1}{q^{2}} \frac{1}{t^{2}} \int dt \frac{1}{q^{2}} \frac{\lambda(ms^{2}, m^{2}, t)^{3/2}}{48\pi} \frac{|\lambda^{2}|}{(t-q^{2})^{n+1}} \frac{1}{q^{2}} \frac{1}{t^{2}} \int dt \frac{1}{q^{2}} \frac{1}{q^{2}}$ Here,  $\chi_{I}^{\times} \equiv \chi_{I,\text{ore}}^{\times}$  is calculated from the OPE. Next, we want to use the conformal mapping  $2(N = 2(t_{1}t_{0}) = \frac{1}{1} + \frac{$ free perameter, can be aptimized to rechice maximum value of (2(4)) FF well described by SE (see behave) Immedd in physical FF range, athe the second term i topt to 10 - 11 - Et) proportional to 210. to = to (1 - 11 - Et) to map the t-plane cut from (t+, w) onto the unit disk. At this, we estended the FFs defined in the physical range g2 c [0, t - ] to analytre fucking Throughout the complex t-plane except for along the branch cut starting at the threshold for the production of real BPIBV paris, 922ts. If low -V lying resonances are present below to ( with appropriate quantum numbers and Note that in The beginning of marss ink), they are accounted for by the so-culled Blashler factor BCN. the Ohigher The piper, it is Stated that the The variable 2019 is found to be an excellent expansion parameter for the comp of these FFS. Will an appropriately chose normalization function of (1), are adamic is to small to Simple desperime bounds on the coefficients of the series expansion fill = Billofin & dr. 24 (4) Since (2011 = 1 in the prir production region, t 2tz, the Blackle

 $\frac{f_{edbr} i_{f} - chose}{B(t) = 2(t_{f}m_{e}^{2})} \quad (which is readily obtained from$  $B(t) = \frac{2(t_{f} - z(m_{e}^{2}))}{1 - z(m_{e}^{2})^{*} z(t_{f})}$ 

C

D

