tional noise terms in the denominator of the effective SNR. We remark that the approximations made in deriving (23b) will be validated in the numerical results by evaluating the performance of proposed optimization schemes for fronthaul compression that are based on (23b) and discussed next.

C. *Optimization of Fronthaul Compression*

In the proposed design, we wish to maximize the effective SNR (23b) under the constraints (9) and (12) on the fronthaul capacity, over the statistics of the quantization noises, namely over the PSDs $S_{Q_p^n}[k]$ corresponding to the quantization of the training field and over the variance of the quantization noise $\sigma_{q_d}^2$ for the data field. Accordingly, we have following optimization problem:

$$\underset{\{S_{Q_p^n}[k]\},\sigma_{q_d}^2}{\text{maximize}} \quad \text{SNR}_{\text{eff}} \tag{24a}$$

$$\text{s.t.} \quad \sum_{n=0}^{F-1}\sum_{k=0}^{N_p-1}\log_2\left(1+\frac{E_{x_p}A^2|G^n[k]|^2+\frac{N_0}{T_s}}{S_{Q_p^n}[k]}\right)\leq N_pC, \tag{24b}$$

$$\sum_{i=0}^{(N-N_p)-1}\log_2\left(1+\frac{E_{x_d}A^2|G[i]|^2+N_0}{\sigma_{q_d}^2}\right)\leq (N-N_p)C, \tag{24c}$$

$$S_{Q^n}[k]\geq 0, \quad n=0,...,F-1,\ k=0,...,N_p-1, \tag{24d}$$

$$\sigma_{q_d}^2\geq 0, N_p\geq 0, \tag{24e}$$

where constraints (24b) and (24c) correspond to (9) and (12), respectively.

Towards solving problem (24), we first observe that the variance $\sigma_{q_d}^2$ can be obtained, without loss of optimality, by imposing the equality in constraint (24c). This is because SNR$_{eff}$ is monotonically decreasing with respect to $\sigma_{q_d}^2$ while the left-hand side of (24) is monotonically