Matching of Couplers to DLWG Structure at 36.5 GHz

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Abstract

Experimental setup and technique of matching of input and output couplers to DLWG structure at 36.5 GHz are described. The results of matching are given.

1. INTRODUCTION

The problem of matching couplers to DLWG structure and possible ways of their solving are described in [1]. In this paper there is shown that traditional "Kyhl" technique for matching coupler to DLWG isn't suited for structure with large cell-to-cell coupling (α/λ = 0.2), and hence the main problem is to get *first matshed coupler*. We decided to make matching by iteration method, i.e. by smooth changing main sizes of coupler from wittingly smaller to work sizes. The coupler of SLAC-type with off-axis coupling iris and off-axis cutoff frequency hole for vacuum pumping was choosen because of this construction is simple for changing sizes of couplers (Figure 1). Parameters of DLWG are given in [2].

2. TECHNIQUE OF MATCHING INPUT AND OUTPUT COUPLERS TO DLWG

The experimental setup used for matching is shown in Figure 2. The guide was consisted of 12 regular cells and ring for indentity input and output. The ring was tuned preliminary with using resonance stack of two cells and ring. During elaborating technique of matching we decided to develop the "variable" coupler similar mentioned above with two metallic plungers, that allow to change size ($2b$) and, hence, resonance frequency of coupler. There were made two "variable" coupler and they were used as input and output couplers for obtaining the first matched coupler. First, we obtained VSWR ≤ 2 by smooth changing $2b$ and d, i.e. there is can to find VSWR of input and output couplers with using guide of 10, 11, 12 cells as shown in Figure 3 [1]. Then the input coupler was matched by changing resonance frequency (size $2b$) and coupling (size t). This is shown on Figure 4. The shift of point on value Δx corresponds to increasing $2b$ on 0.01 mm and Δy – decreasing t on 0.05 mm. It is necessery to mention that changing r give a chance to compensate decreasing frequency of coupler because of increasing $2b$. After obtaining matched coupler it was used as output coupler and successively two working coupler were matched. It should be note that in this case for measuring VSWR of input coupler it's not necessary to change length of guide.

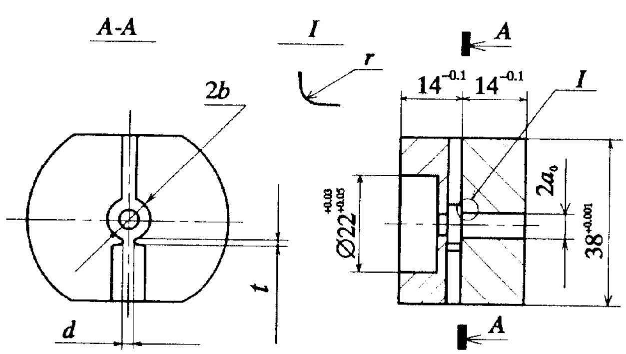

Figure 1. Construction of coupler.

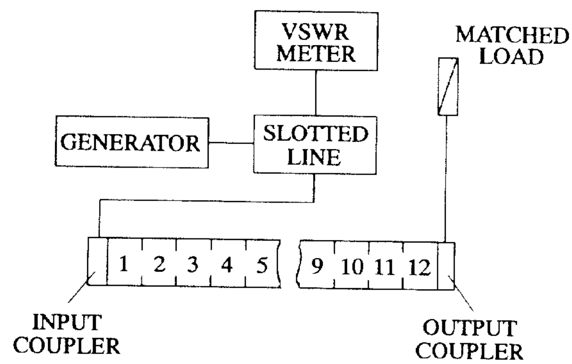

Figure 2. Experimental setup for matching coupler.

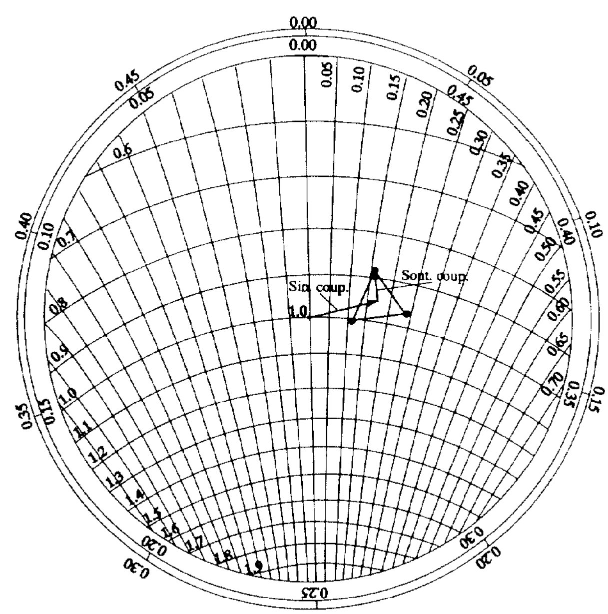

Figure 3. Smith chart (VSWR ≤ 2) with illustration of determining VSWR of input and output couplers.

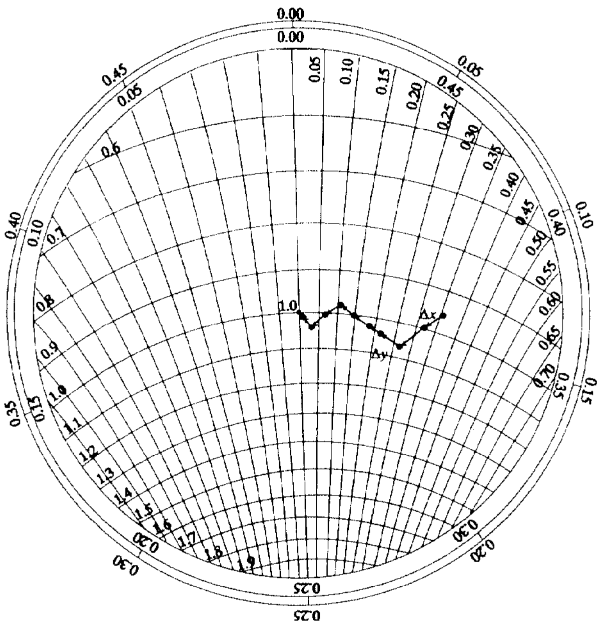

Figure 4. Typical coupler-matching results on Smith chart (VSWR ≤ 2).

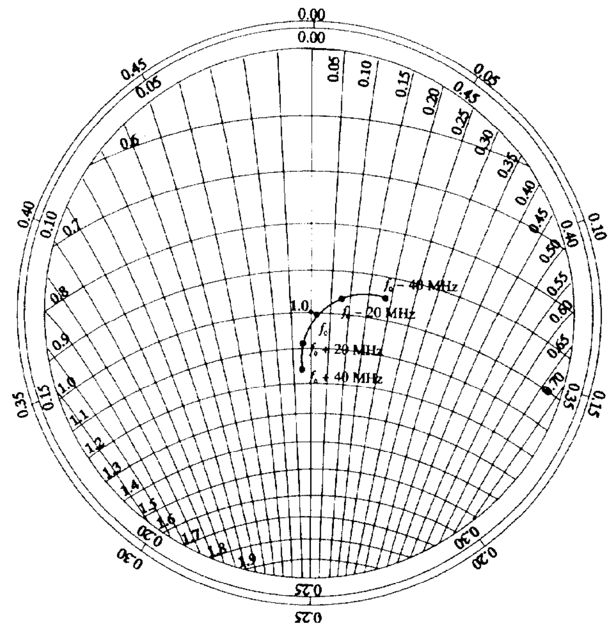

Figure 5. Frequency dependence of VSWR on Smith chart (VSWR ≤ 2).

After finishing the procedure of matching dependence VSWR upon frequency was measured (Figure 5).

3. CONCLUSION

The described method of matching couplers to DLWG with large cell-to-cell coupling (α/λ = 0.2) gives possibility to receive VSWR ≤ 1.02.

4. REFERENCES

[1] I.Wilson, "Status of Structure Studies (CLIC)," The 2-nd International Workshop on Next-Generation Linear Collider.

[2] V.A. Dvornikov, I.A. Kuzmin, "Desing and Fabrication of High Gradient Accelerating Structure Prototype at 36.5 GHz" Proccedings PAC 93, Washington, May 17-20, 1993, p. 484.