

FEED FOR PARABOLIC DISH WITH CIRCULAR POLARIZATION

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Abstract - In last time I had a problem with feed in my dish. As a first type of feed I have used VE4MA. All worked normally up to my output power was increased. With new PA (TH338-1kW out) there started problems with 90° hybrid. My interest was turned to the system used by Franta OK1CA. I started to find some technical materials and theory about Septum polarization transformer. I saw the advantage in very easy production and setting up, second advantage was 1,5 dB on RX and TX sites saved because of cables are going directly to the feed connectors. I had first prototype finished during spring 1999 and tested its parameters with very good success and results. My best result is 3rd place in single category ARRL EME 1296 MHz with my small dish 3,8m. All details you can see in my presentation and our CD is including SW for feed calculation. You can use this SW for any frequency. Only one parameter you have to put in - frequency in MHz. I wish you all good stay in Praha and for all us I wish good and successfully conference and many interesting QSOs with using this feed.

Feed-horn with circular polarization for parabolic dish



Zdenek SAMEK – OK 1 DFC



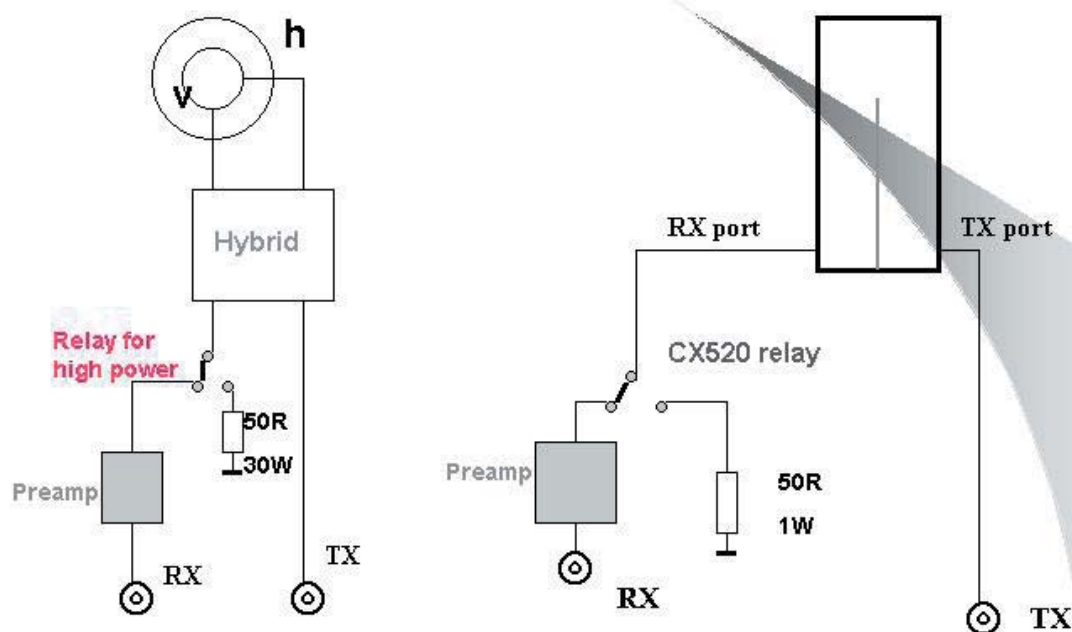
Why septum transformer ?

- Necessary use circular polarization over 1 GHz
- Possibility use feed for LCP and RCP without 90° hybrid and TX-RX switching
- Saving 1,5 dB on the RX and TX site
- Saving money for expenses High power relay.
- Advantage that between TX and RX sites are loss more then 26 dB
- Good impedance adaptation both TX and RX ports
- Very easy possible set up high SWR

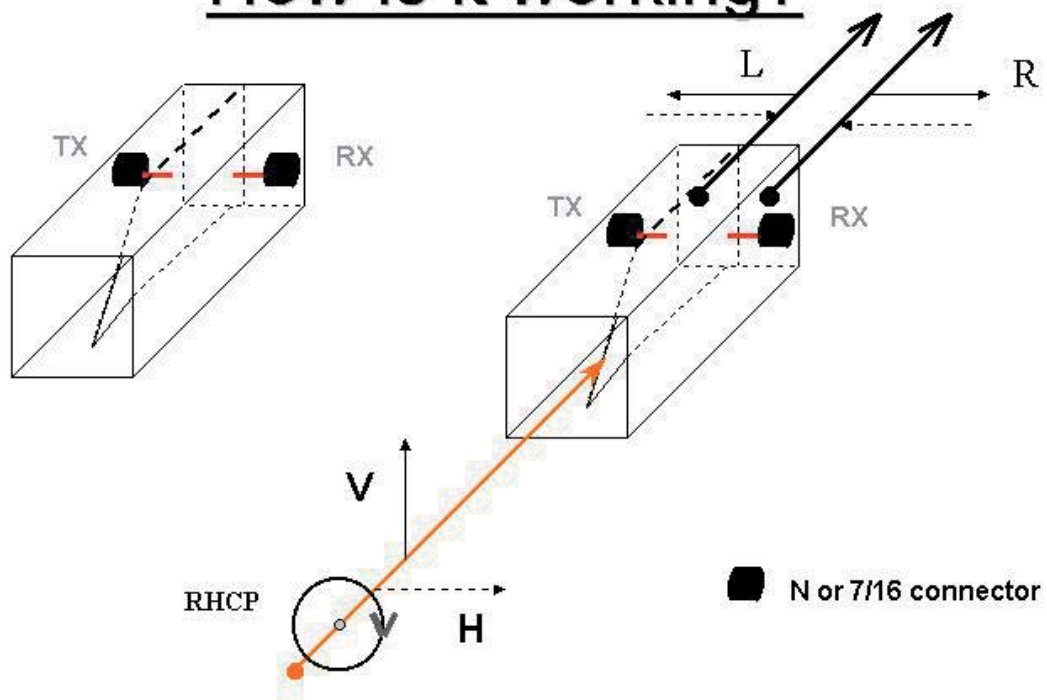
Electric diagram of septum

VE 4 MA – W 2 IMU – system

Septum-feed – OK 1 DFC

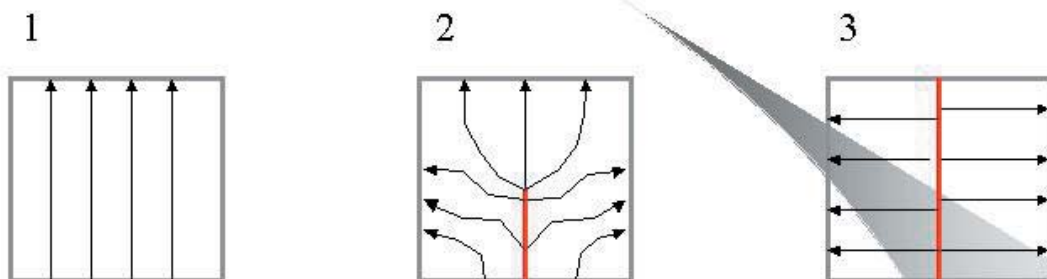


How is it working?



Driving of transformer

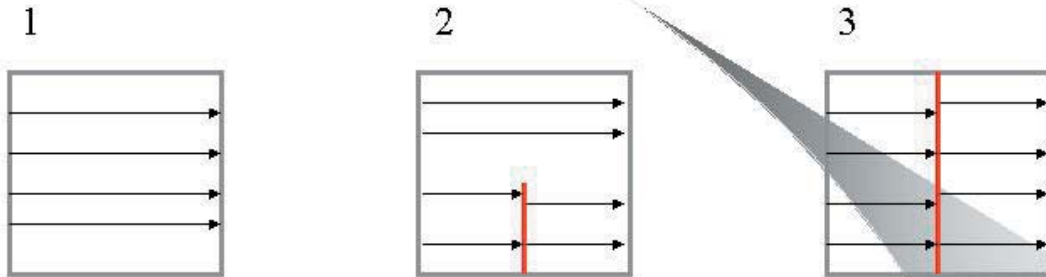
Vertical part of electromagnetic wave



1. Four-square wave guide on the feed input
2. Septum transformer
3. Rectangular wave guide in RX – TX part, very close to by connector

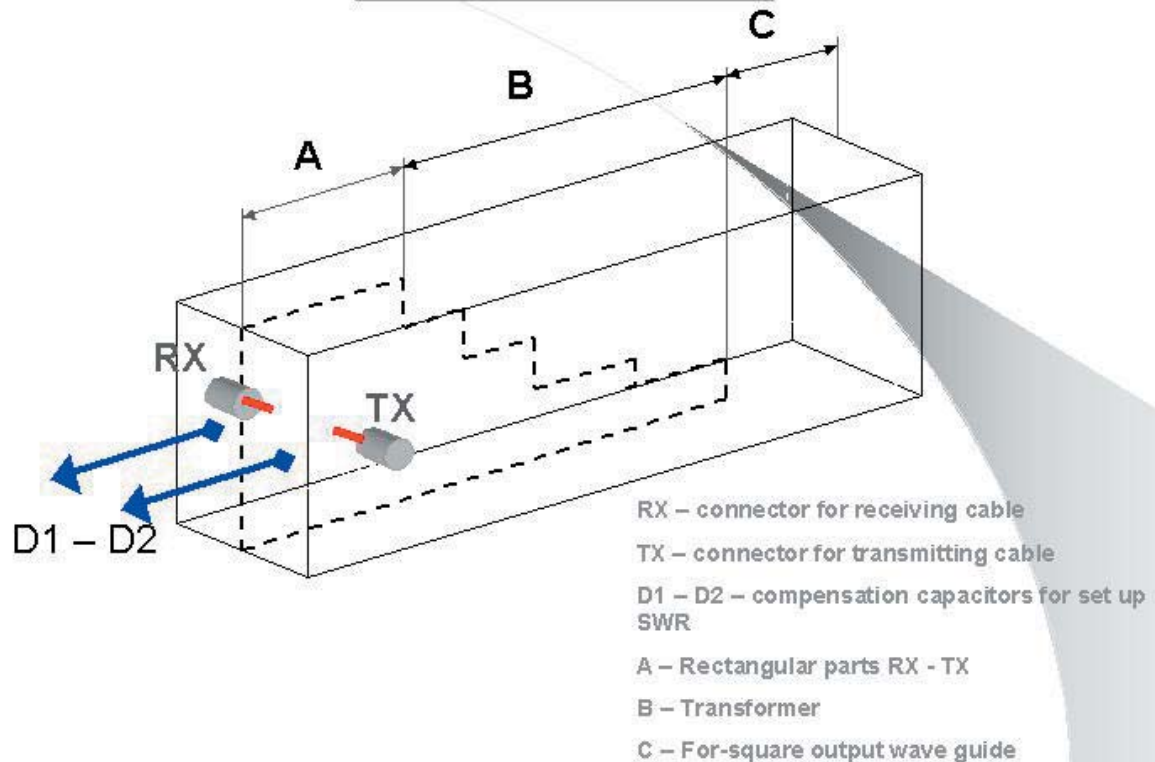
Driving of transformer

Horizontal part of electromagnetic wave

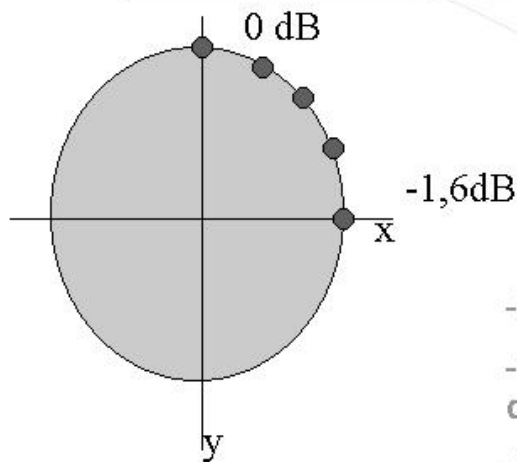


1. Four-square wave guide on the input
2. Septum transformer
3. Rectangular part of RX and TX wave guide

Parts of feed



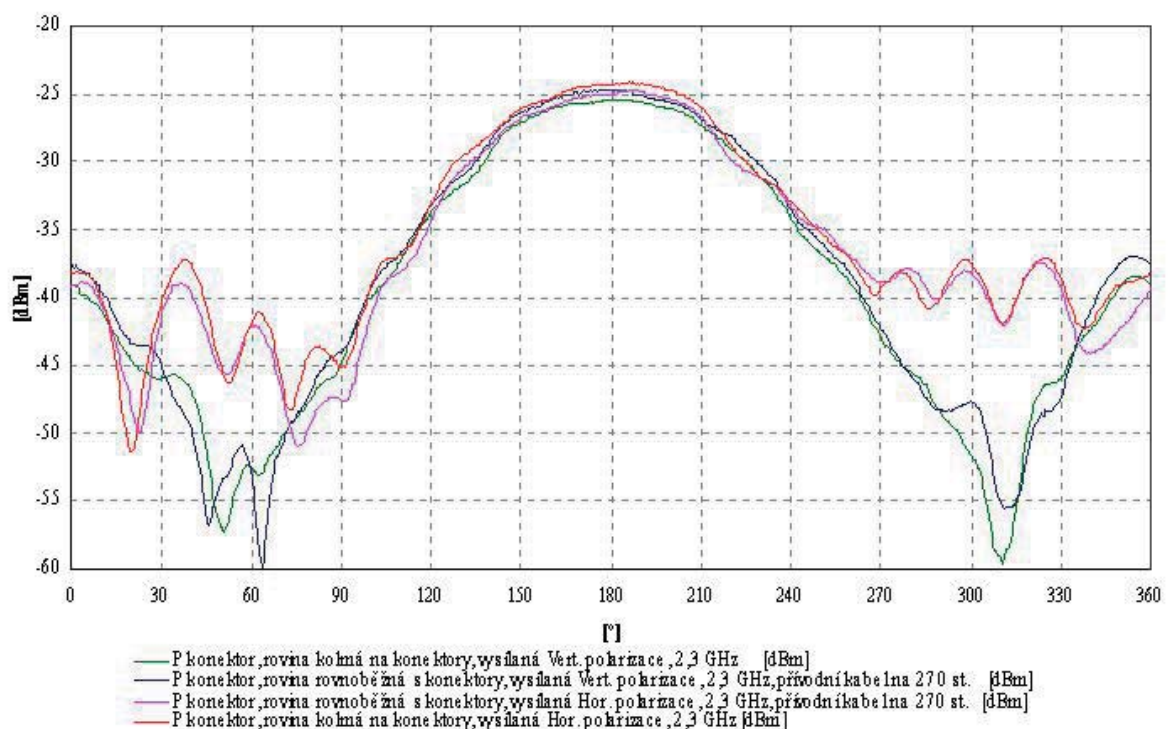
Circularity of polarization



- Diagram of circularity
- Theoretical maximum of discircularity is $-1,1$ dB
- With not correctly calculate septum transformer will be diagram as a „cake“

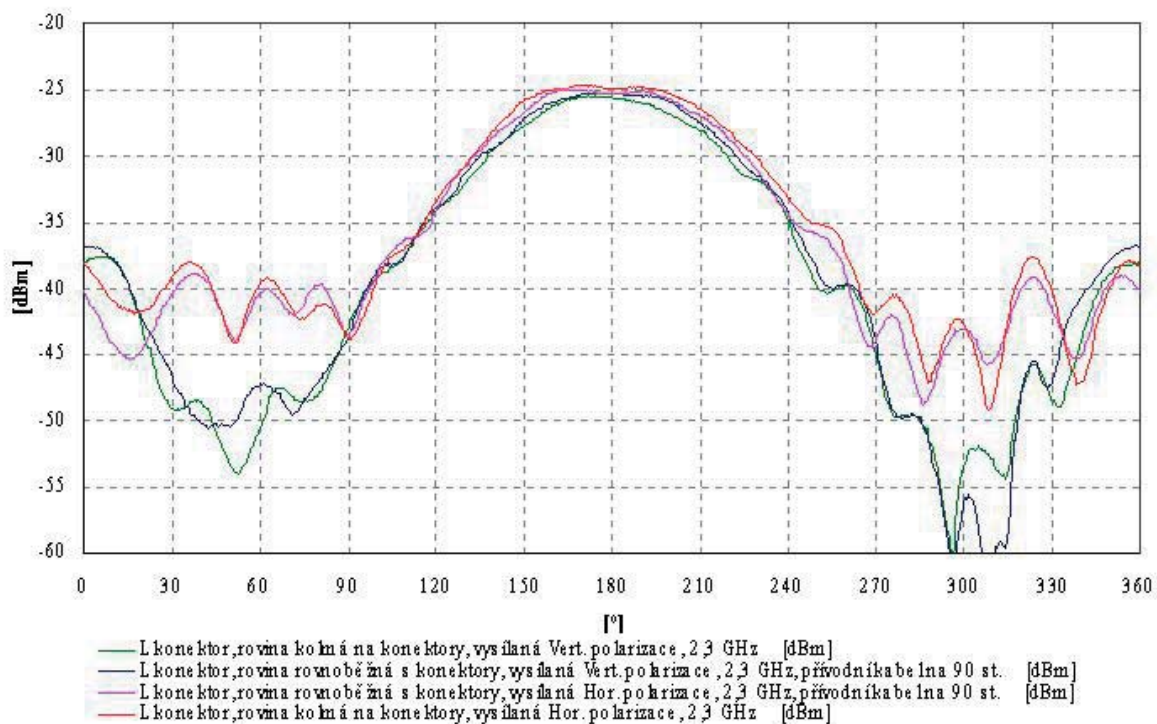
Measurement diagram in unreflecting chamber TX

Směrové charakteristiky osazovače Septum 2,3 GHz



Measurement diagram in unreflecting chamber RX

Směrové charakteristiky ozařovače Septum 2,3 GHz



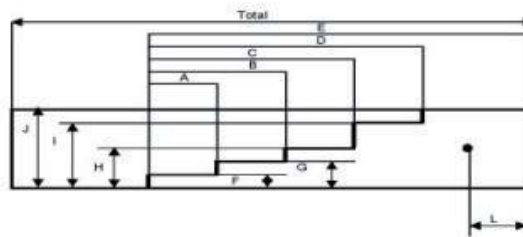
Comments

- We saw that circularity is absolutely perfect
- Diagram was done for 2,3 GHz feed
- Measurement condition-unreflecting chamber of Electro-technician University Praha
- Radiation angle 130° for -10 dB
- Practical use for dish with 0.35 F/D
- For other F/D is possible use with choking collar like VE4MA feed. Practical solution has Franta OK1CA

Practical calculation

For calculation you must write only input frequency			
Calculation of septum transformer on picture			
Frequency:	1296	MHz	
Calcul of wave length:	231,481	mm	
			Lambda
Messe	distance in mm		
A	79,2	Long of tooth	0,338
B	138,2		0,597
C	200,9		0,86
D	222,5		0,961
E	370,4		1,6
F	18,5	Brite of tooth	0,08
G	41,2		0,178
H	69,7		0,301
I	113,7		0,491
J	144,9		0,628
Messe in mm			
Distance from output on feed and transformer		231	K
Distance beetwen dipol and rear wall		67	L
Dipol long		43	M
Total of feed length		602	Total
Picture of transformer			

Picture of transformer



Comments

- We saw that calculation is in Excel very comfortable
- All dimensions are in mm
- Material for feed is Aluminum or Cooper sheet
- Do not use bras, problem with freeze
- For frequency up to 2.3 GHz accuracy up to 0,5mm
- Higher frequency up to 0,1mm

Types of septum transformer

1.



Sloping septum

- isolation RX-TX 25 dB max.
- discircularity 2 – 3 dB
- easy for producing

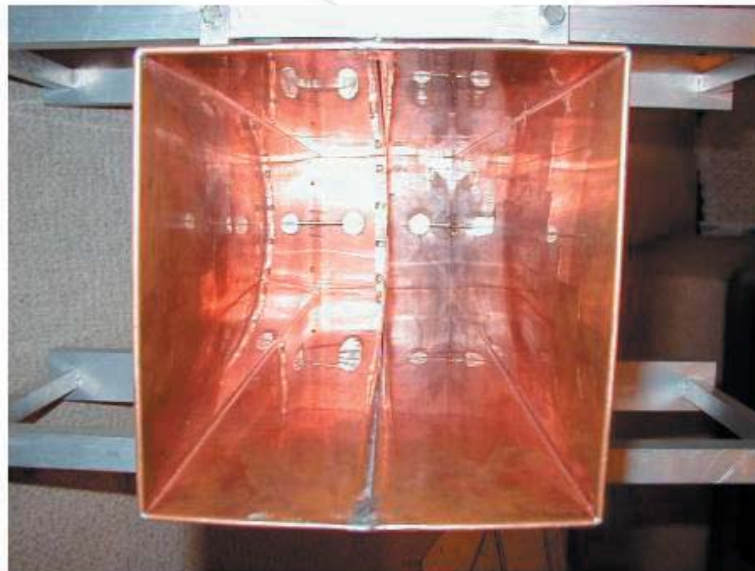
2.



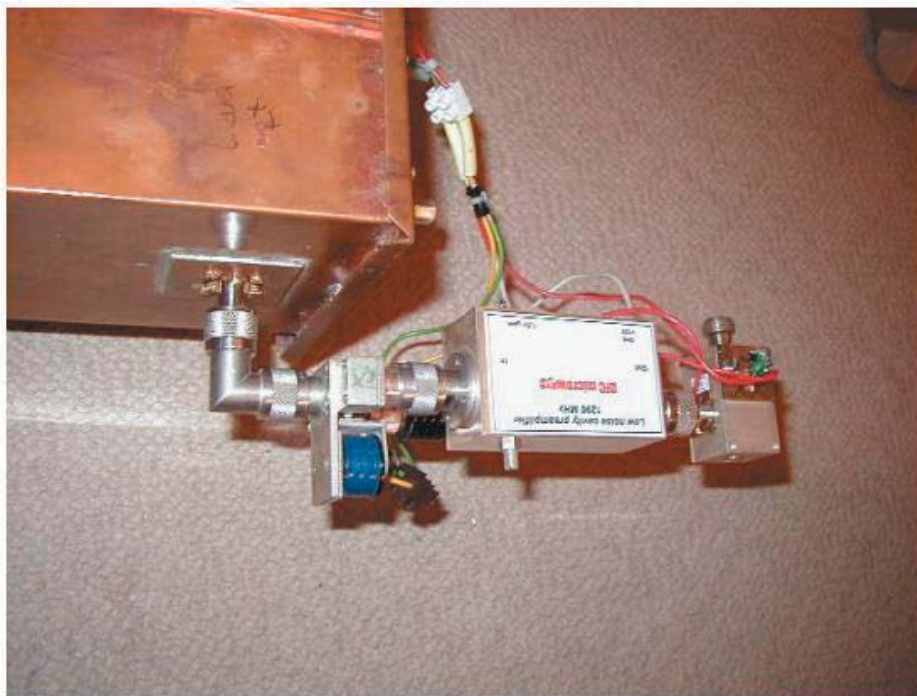
Chen and Tsandoulas septum

- isolation RX-TX up to 27,5 dB max.
- Maximum of discircularity 1,1 dB
- Circularity for very wide frequency range $\pm 10\%$ of calculation frequency

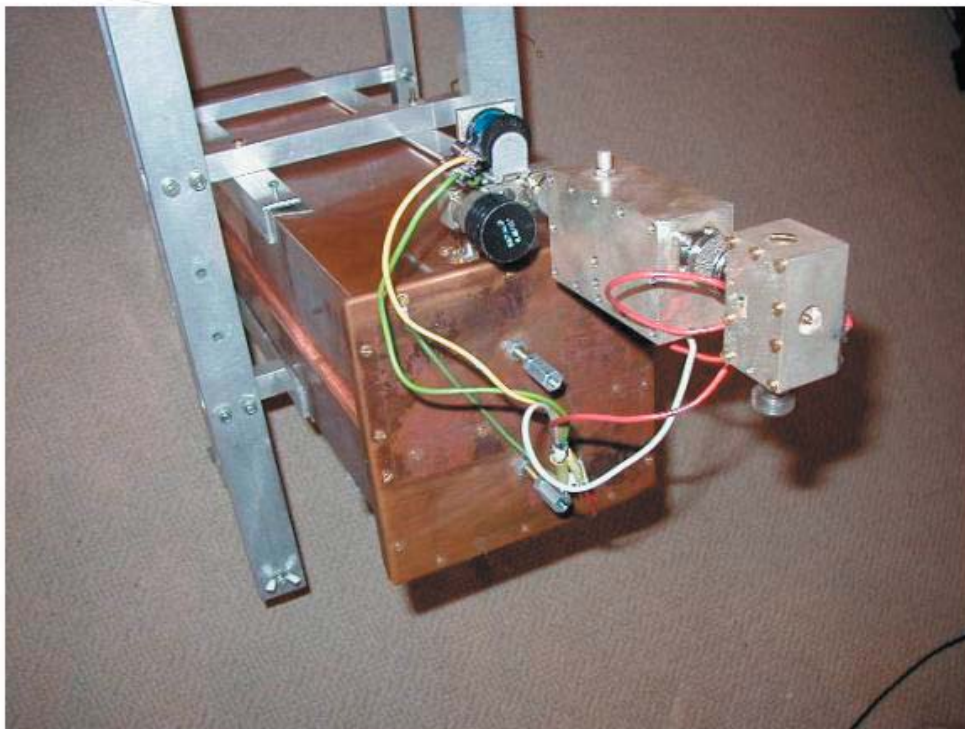
Practical solution of feed



Feed for 1296 MHz – practical solution



Assembly of on the RX port for 1296 MHz



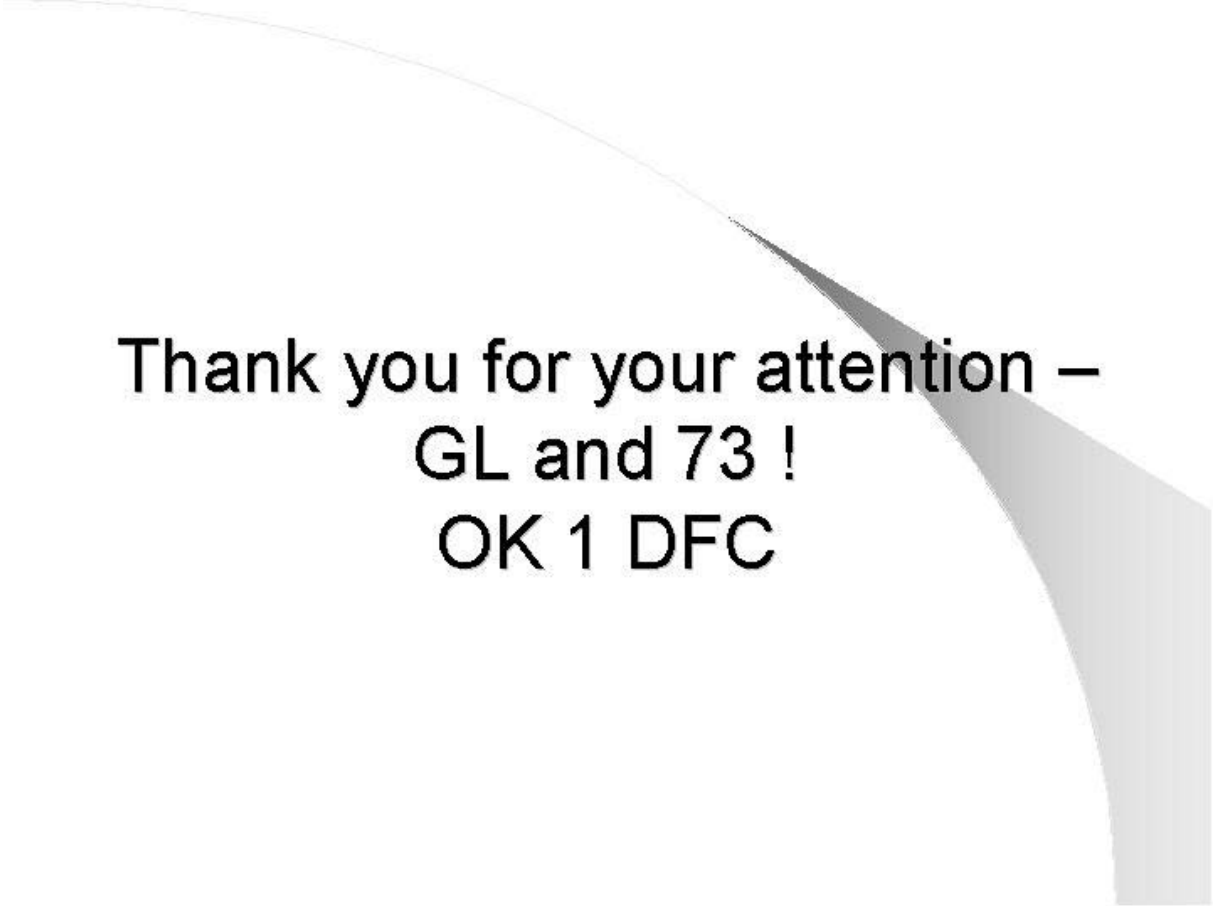
Assembly of feed – look to compensation capacity screw.



Application of feed by OK 1 UWA for 1296 MHz



Feed with funnel by OK 1 CA for 2320 MHz and Cassegrain mirror

A decorative curved line starts from the top left, arches over the text, and ends as a vertical bar on the right side.

**Thank you for your attention –
GL and 73 !
OK 1 DFC**