

Feed-horn with circular polarization for parabolic dish



Zdenek SAMEK – OK 1 DFC



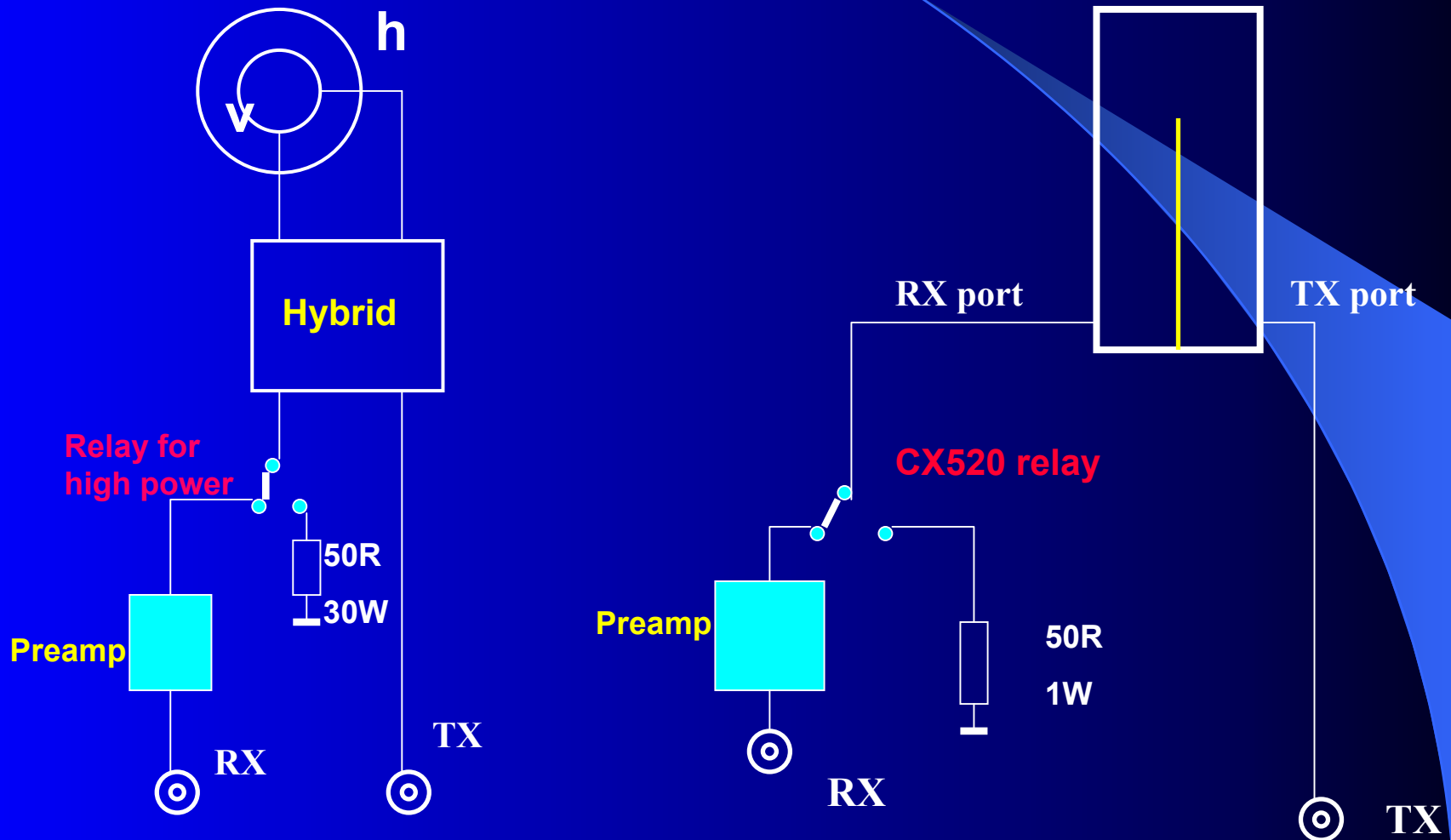
Why septum transformer ?

- 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

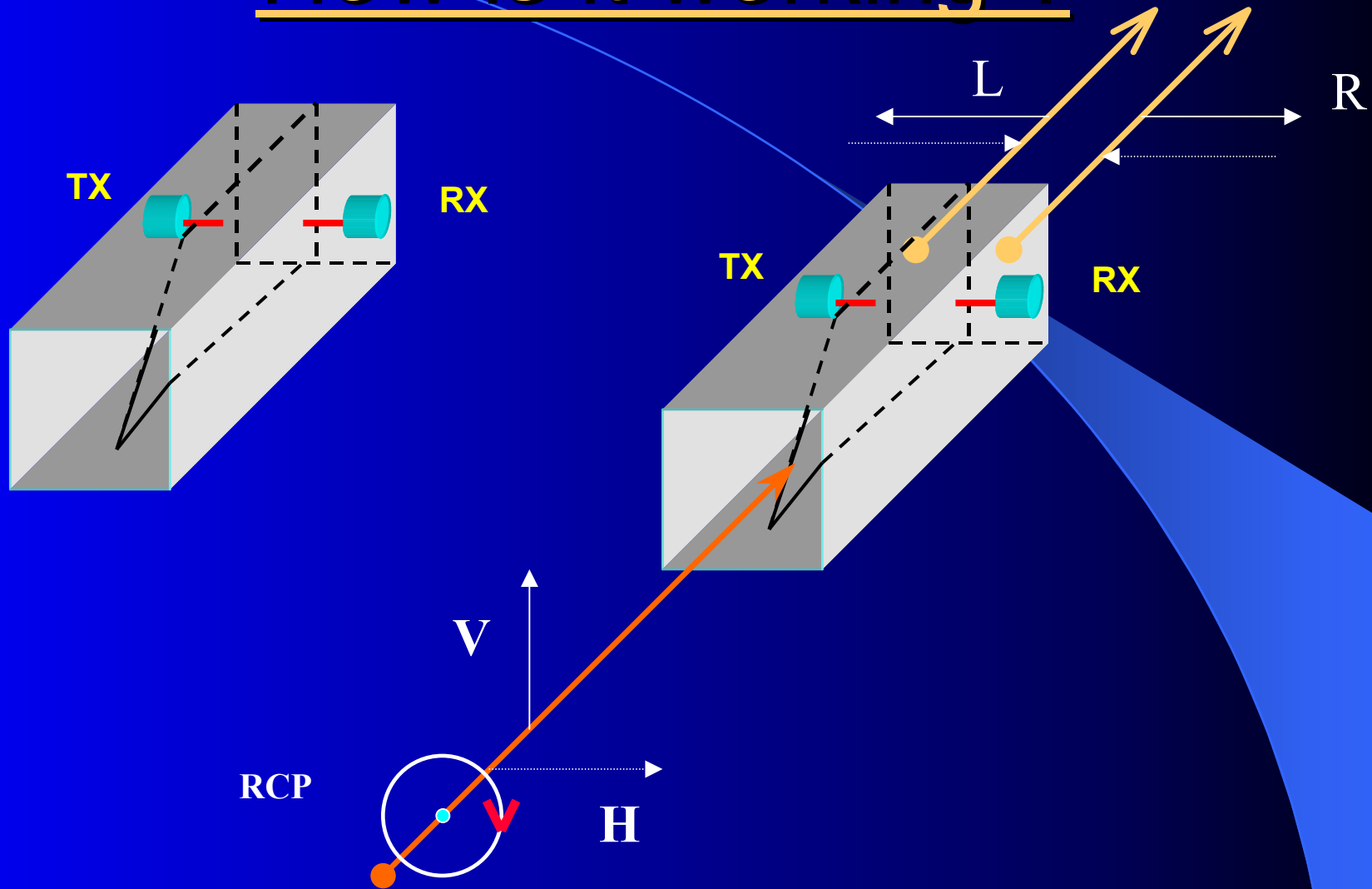
Electric diagram of septum

VE 4 MA – W 2 IMU – system

Septum-feed – OK 1 DFC



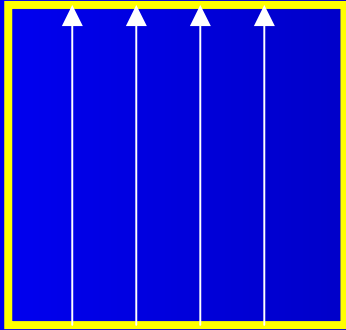
How is it working ?



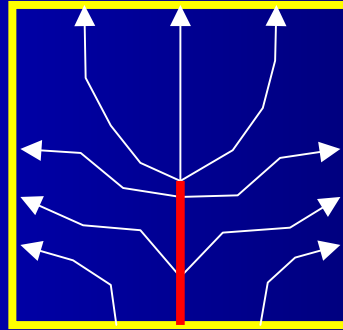
Driving of transformer

Vertical part of electromagnetic wave

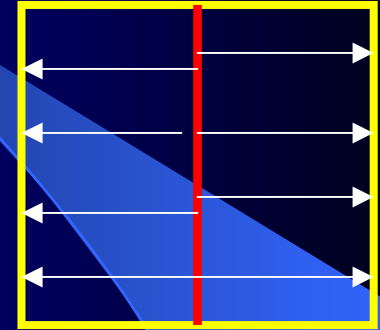
1



2



3

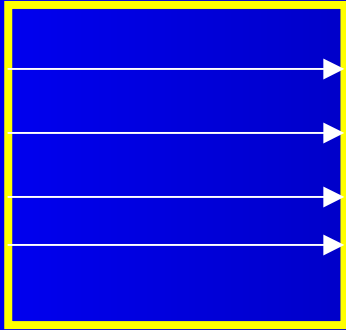


- 1. Four-square wave guide on the feed input**
- 2. Septum transformer**
- 3. Rectangular wave guide in RX – TX part, very close to by connector**

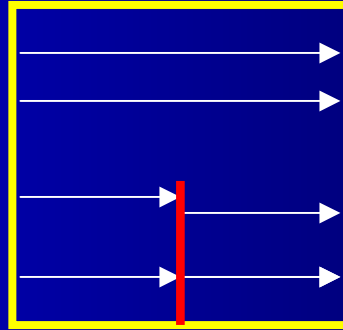
Driving of transformer

Horizontal part of electromagnetic wave

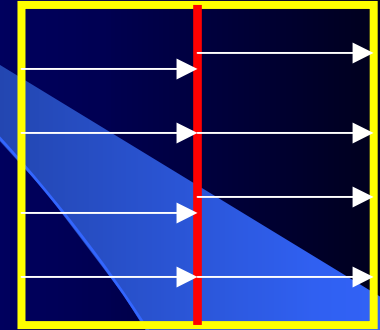
1



2

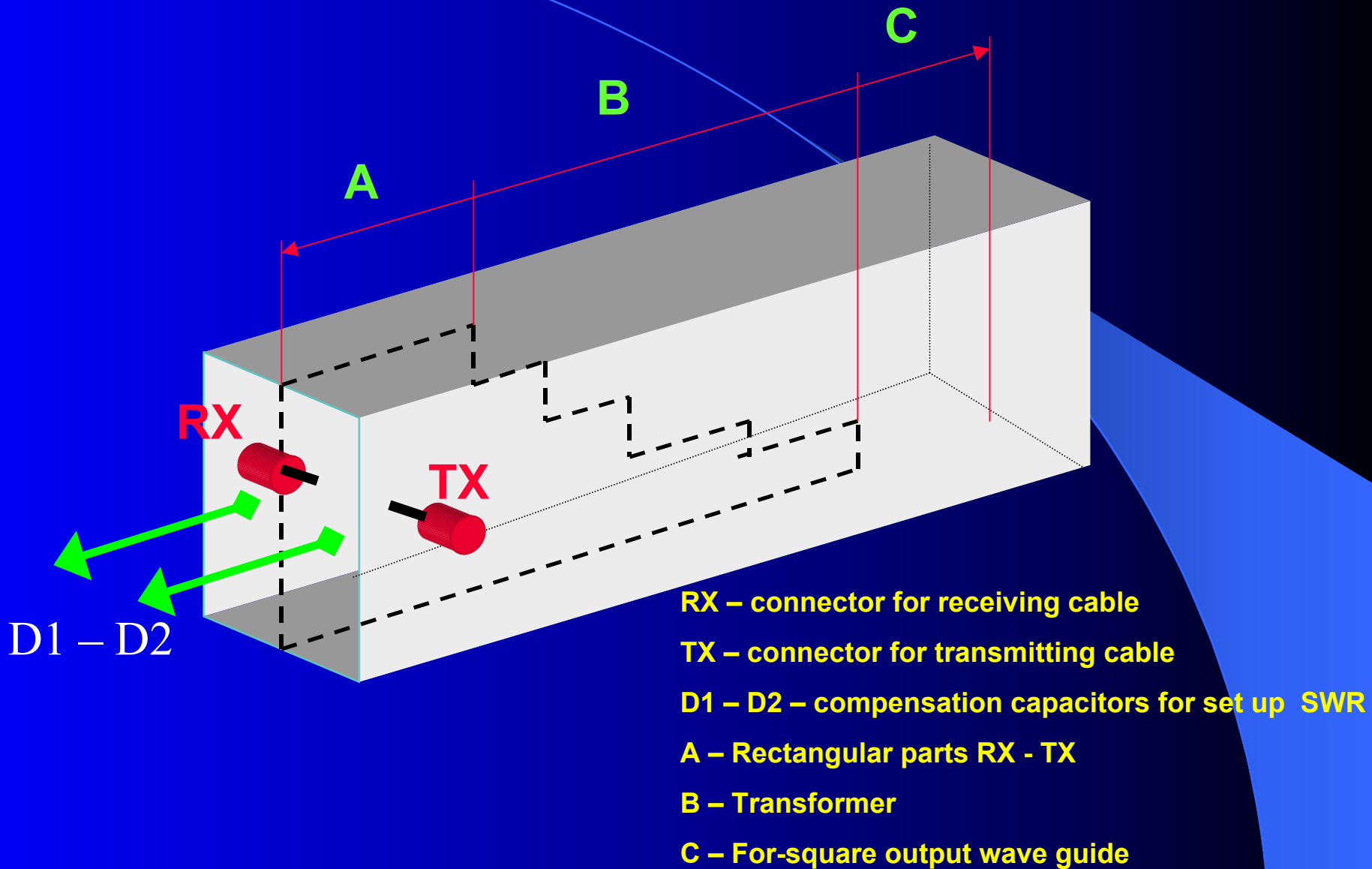


3

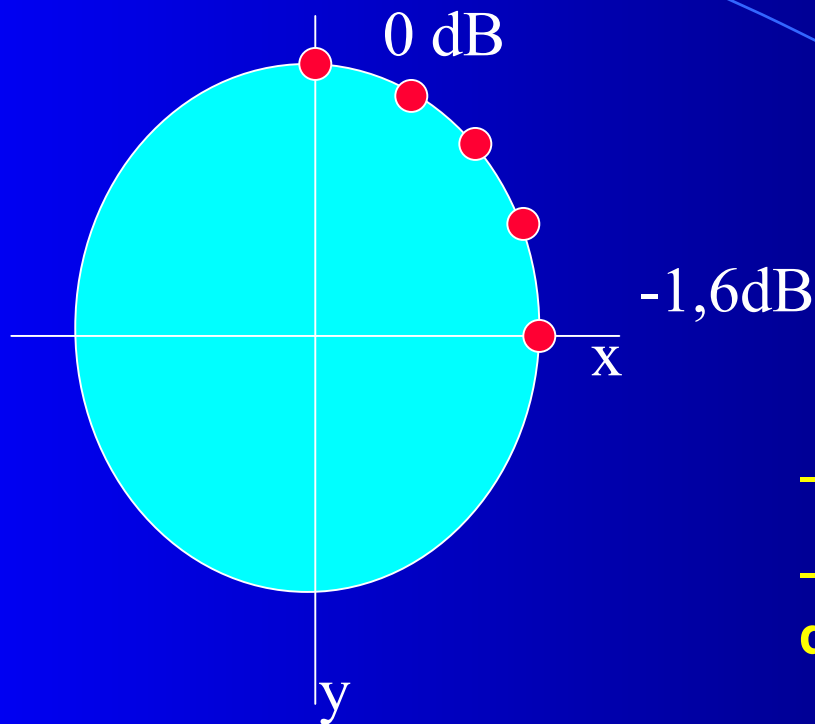


- 1. Four-square wave guide on the input**
- 2. Septum transformer**
- 3. Rectangular part of RX and TX wave guide**

Parts of feed



Circularity of polarization



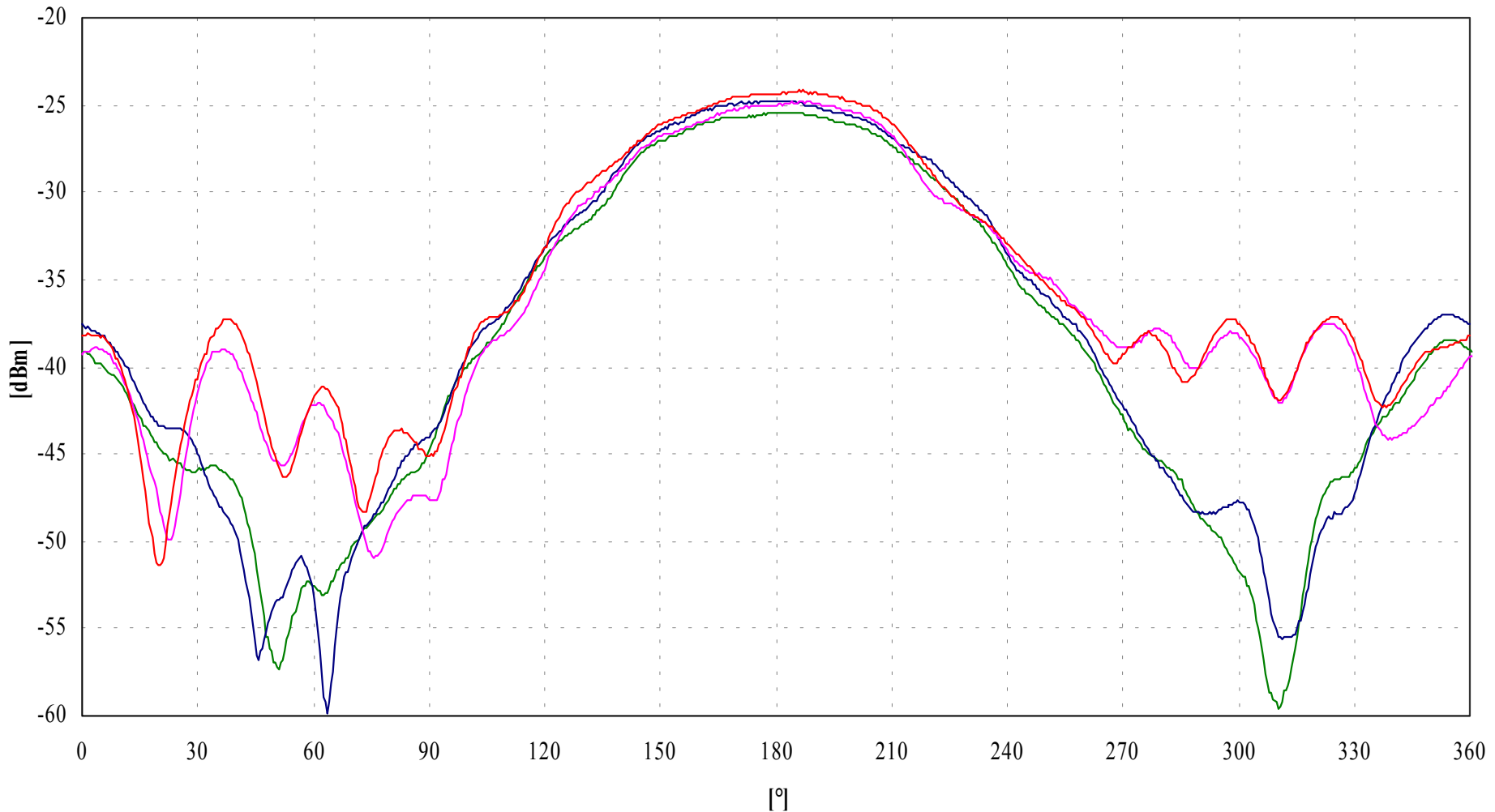
-Diagram of circularity

-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

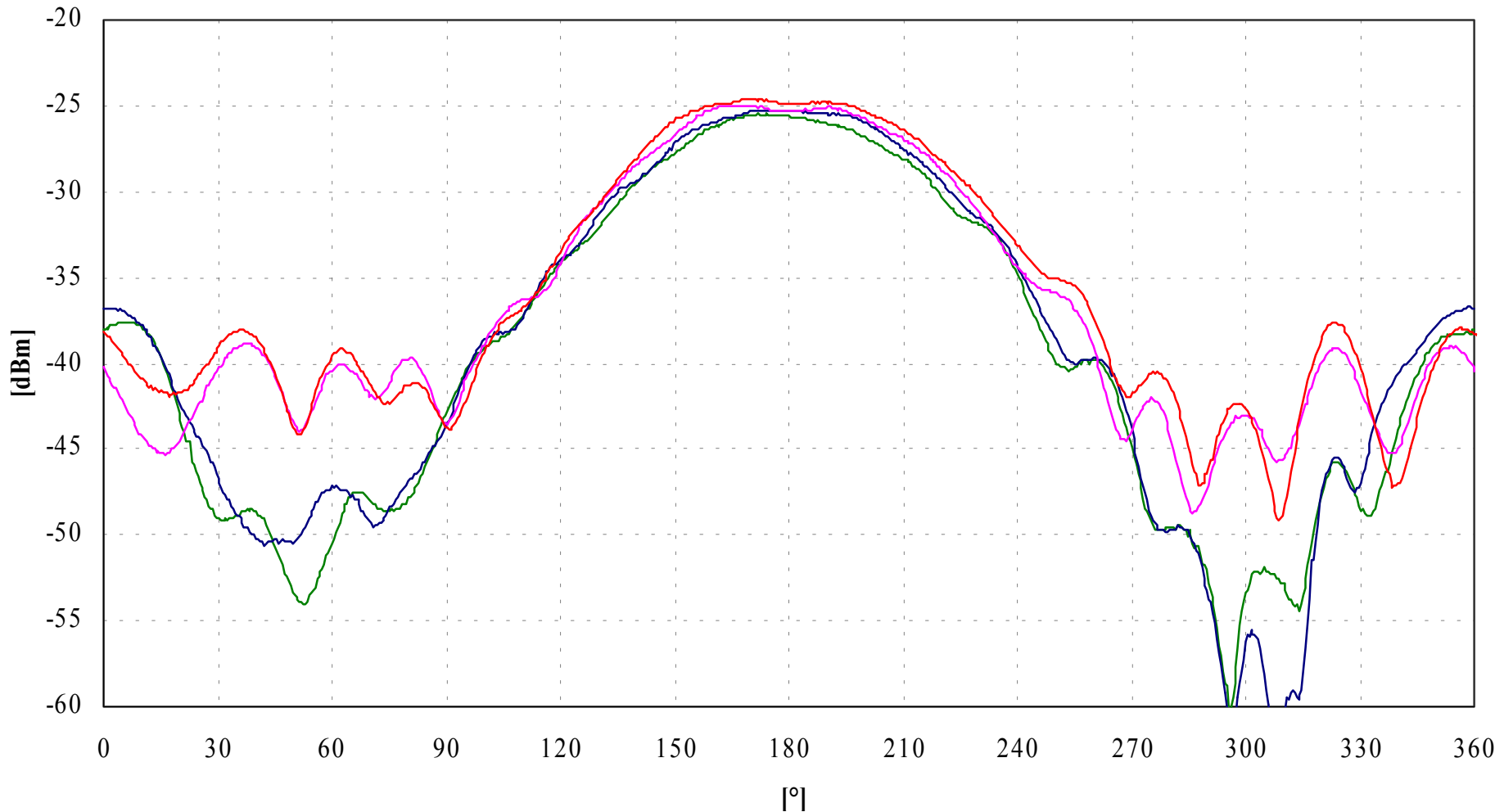
Směrové charakteristiky ozařovače Septum 2,3 GHz



- P konektor, rovina kolmá na konektory, vysiřaná Vert. polarizace, 2,3 GHz [dBm]
- P konektor, rovina rovnoběžná s konektory, vysiřaná Vert. polarizace, 2,3 GHz, pívodní kabel na 270 st. [dBm]
- P konektor, rovina rovnoběžná s konektory, vysiřaná Hor. polarizace, 2,3 GHz, pívodní kabel na 270 st. [dBm]
- P konektor, rovina kolmá na konektory, vysiřaná Hor. polarizace, 2,3 GHz [dBm]

Measurement diagram in unreflecting chamber RX

Směrové charakteristiky ozařovače Septum 2,3 GHz



- L konektor, rovina kolmá na konektory, vysílaná Vert. polarizace, 2,3 GHz [dBm]
- L konektor, rovina rovnoběžná s konektory, vysílaná Vert. polarizace, 2,3 GHz, přívodní kabel na 90 st. [dBm]
- L konektor, rovina rovnoběžná s konektory, vysílaná Hor. polarizace, 2,3 GHz, přívodní kabel na 90 st. [dBm]
- L konektor, rovina kolmá na konektory, vysílaná Hor. polarizace, 2,3 GHz [dBm]

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

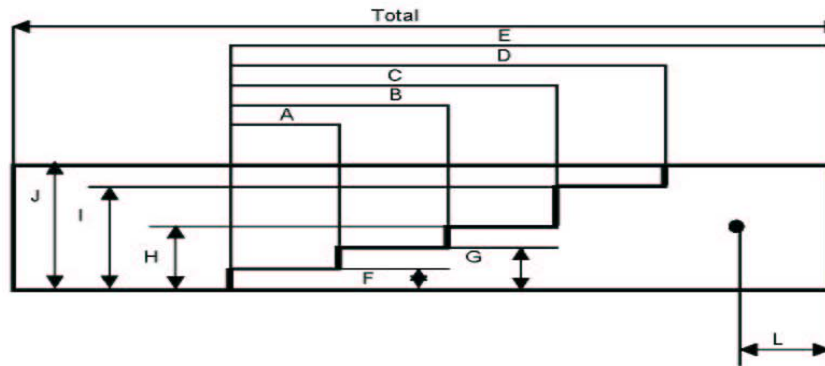
Frequency: **1296** MHz

Calcul of wave length: **231,481** mm

Lambda

Messe	distance in mm		
A	78,2	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		0,626
Messe in mm			
Distance from output on feed and transformer	231	K	1
Distance beetven dipol and rear wall	67	L	0,16
Dipol long	43	M	0,185
Total of feed lenght	602	Total	

Picture of transformer

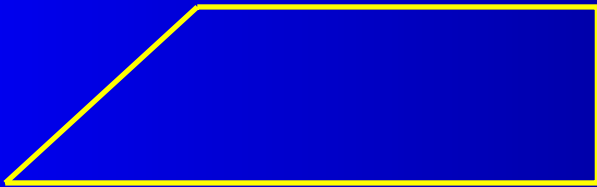


Comments

- 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

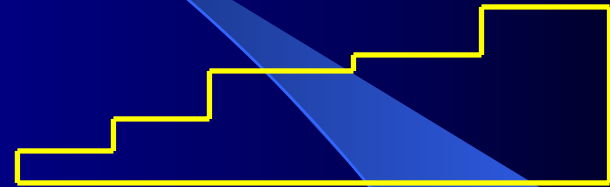
1.



Sloping septum

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

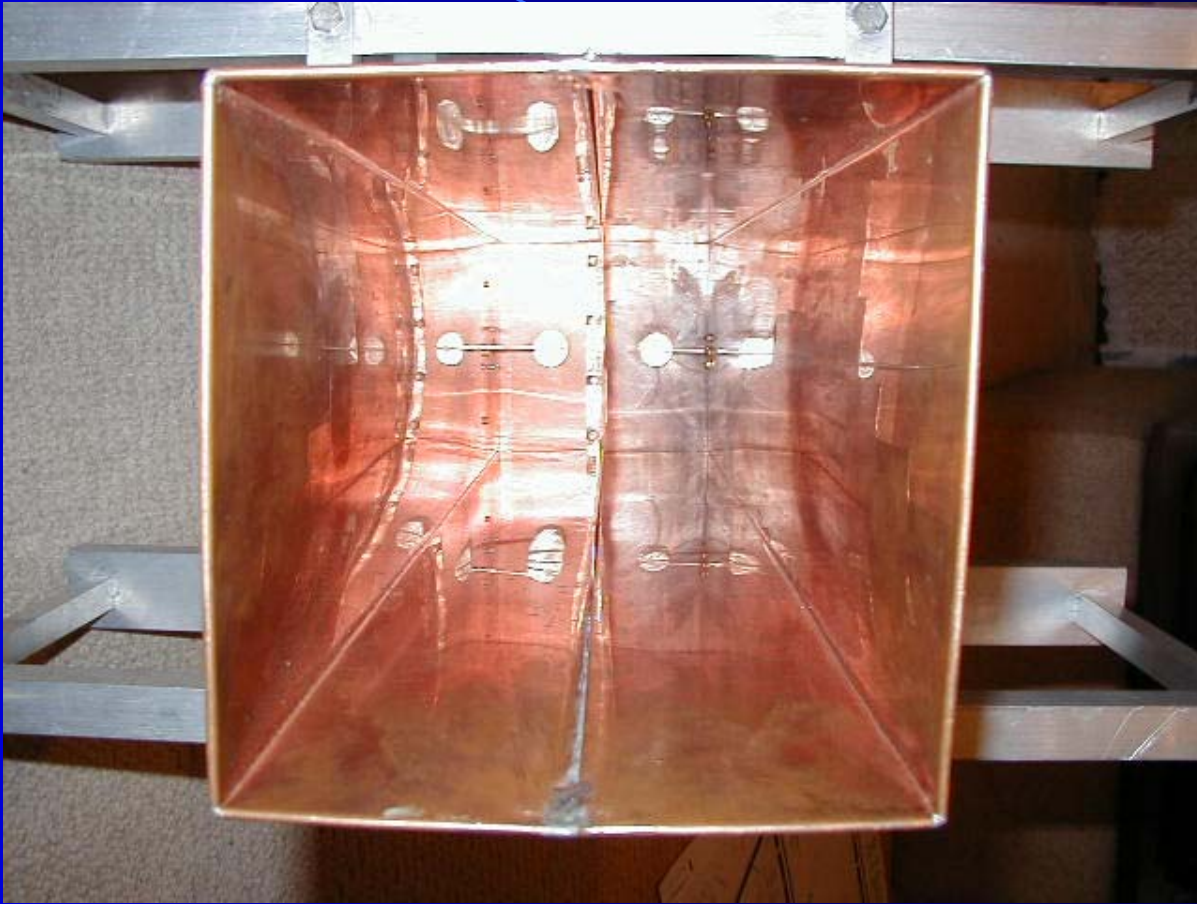
2.



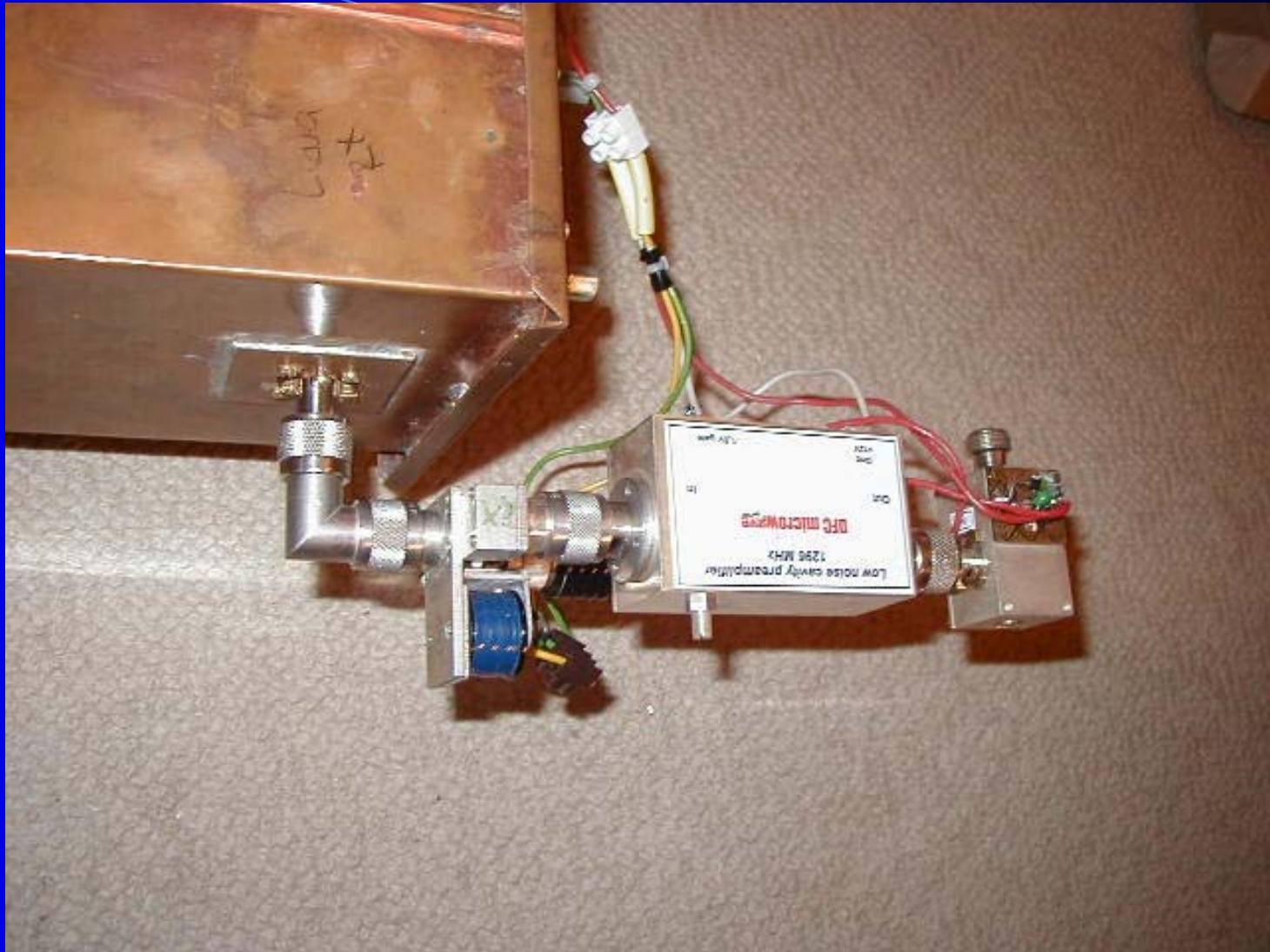
Chen and Tsandoulas septum

- 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

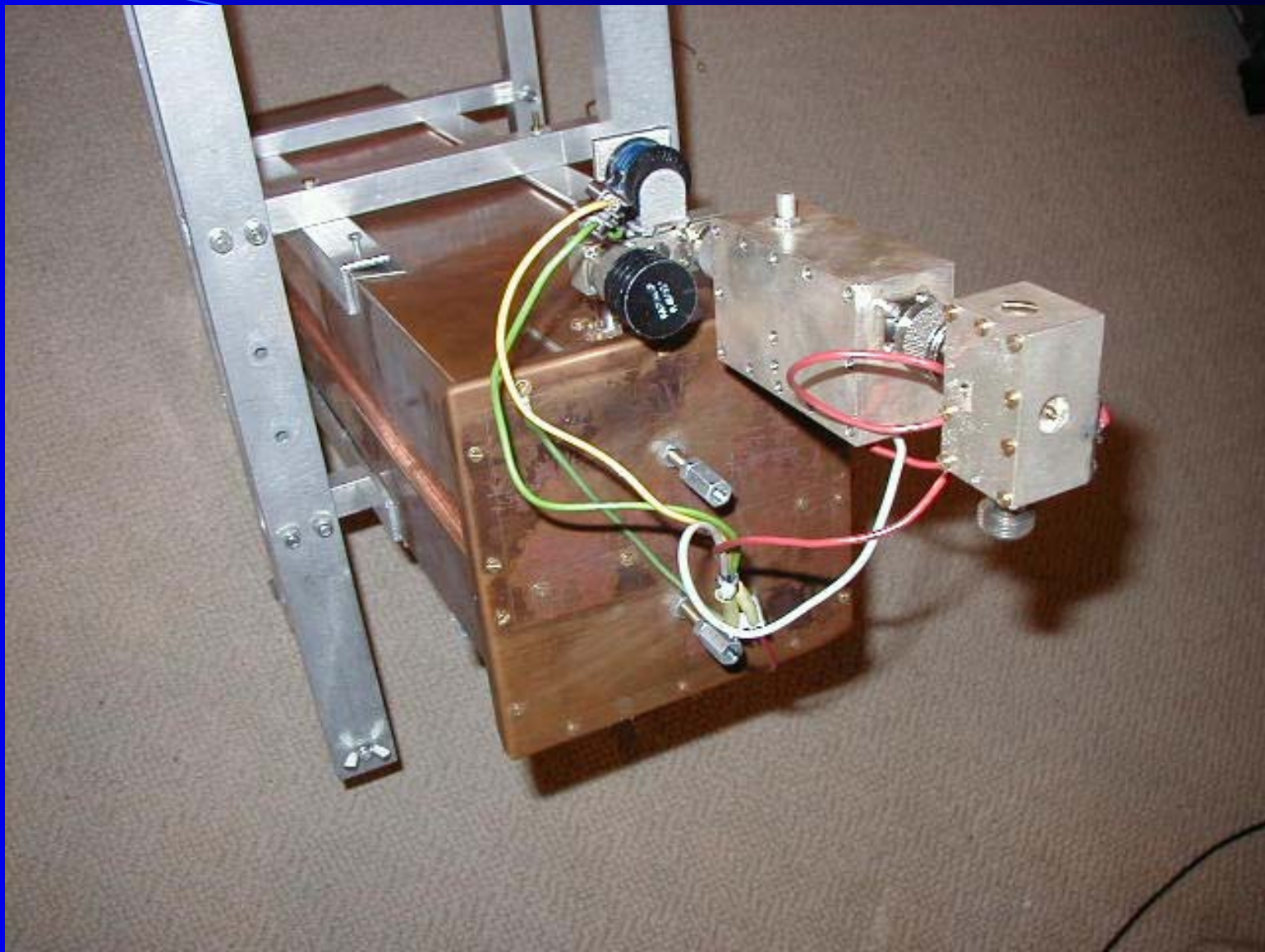
Practical solution of feed



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

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