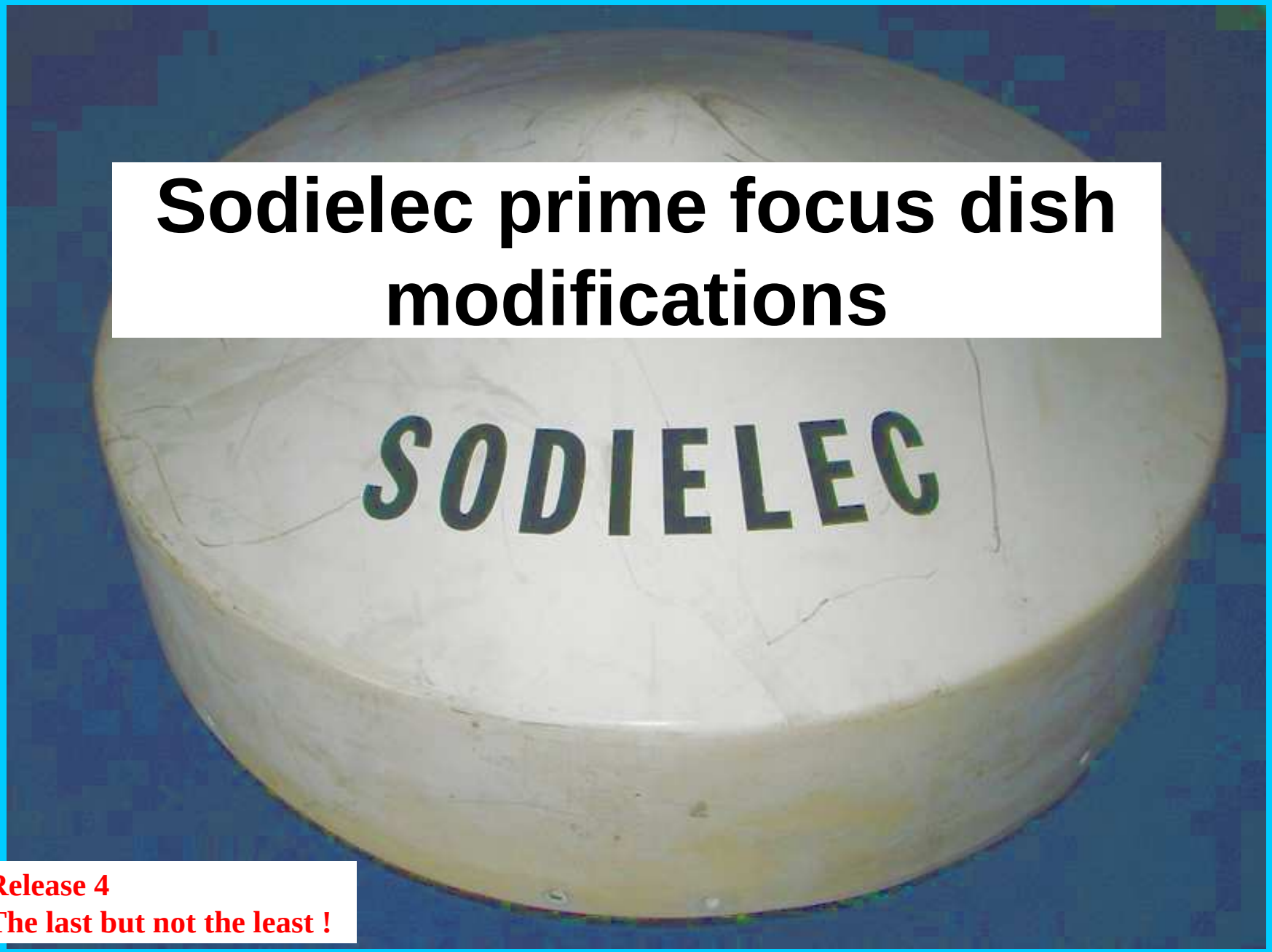
Sodielec prime focus dish modifications



Release 4
The last but not the least !

Target

- **How to move its S11 intially at 8.3 GHz (from factory) up to 10.4 GHz**
- **Specs comparaison between shepherd-crook and penny-feed on same dish**

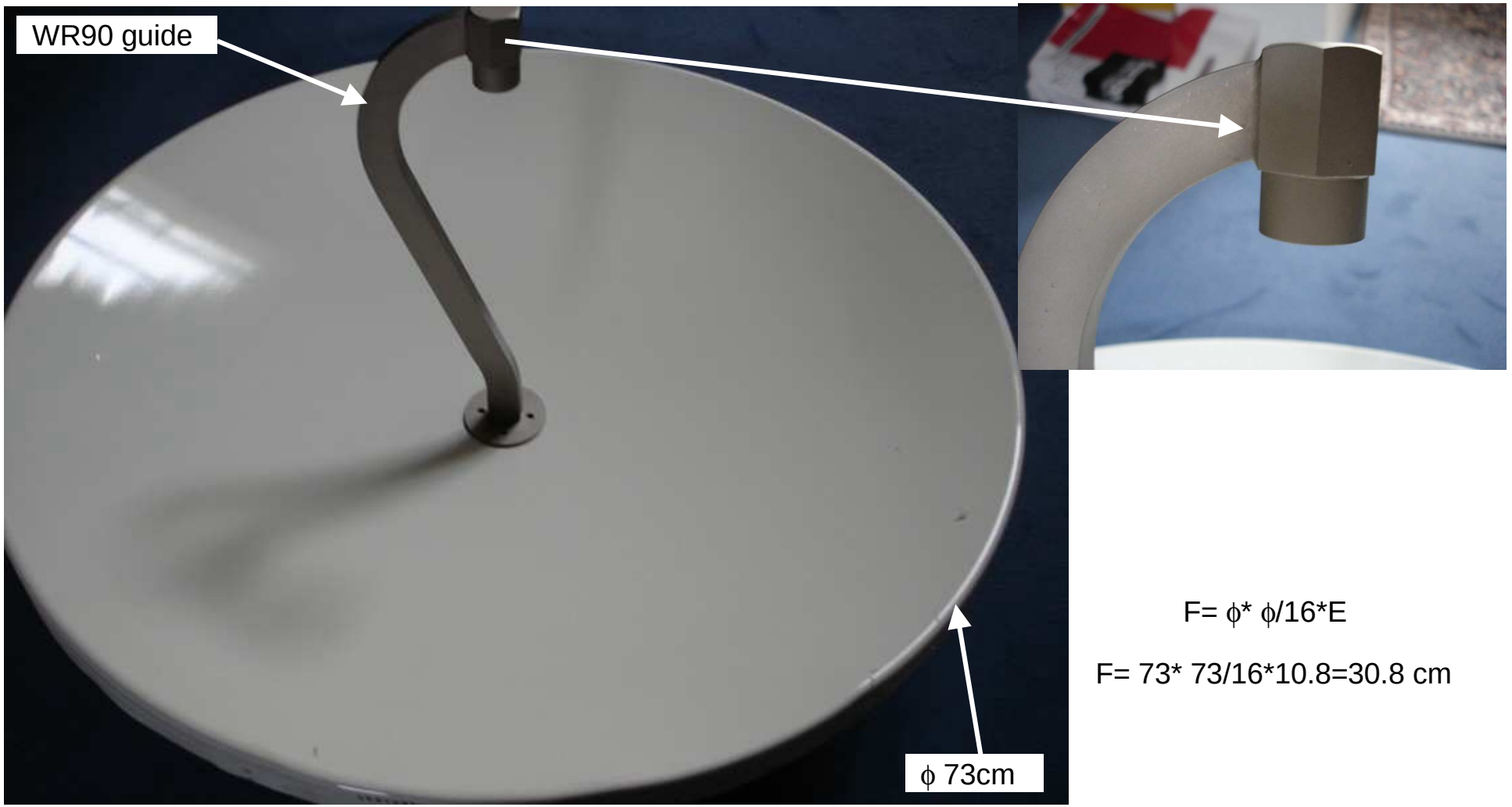
Abstract

1/ Initial behaviour à 8.3 GHz
2/ First « side measures » - resonance frequency moving ?
3/ Practical modifications done by F1CNE
    -WR90 to coax transition
    -Shepherd crook + ring in feed
    -S11 meases
4/ Serial losses of different WR75 and WR90 to coax transitions
5/ Practical modifications done by F4DRU
    -Shepherd crook + special alu piece in feed
    -S11 meases
6/ S11 measurements on Sodielec dish with penny-feed
7/ Practical modifications done by F5FLN & F5AUW
    - HP 8719c network analyser
8/ Real shepheard-crook feed from the manufacturer
9/ Conclusion

1- Initial behaviour

Initial behaviour

Front view : shepherd crook feed

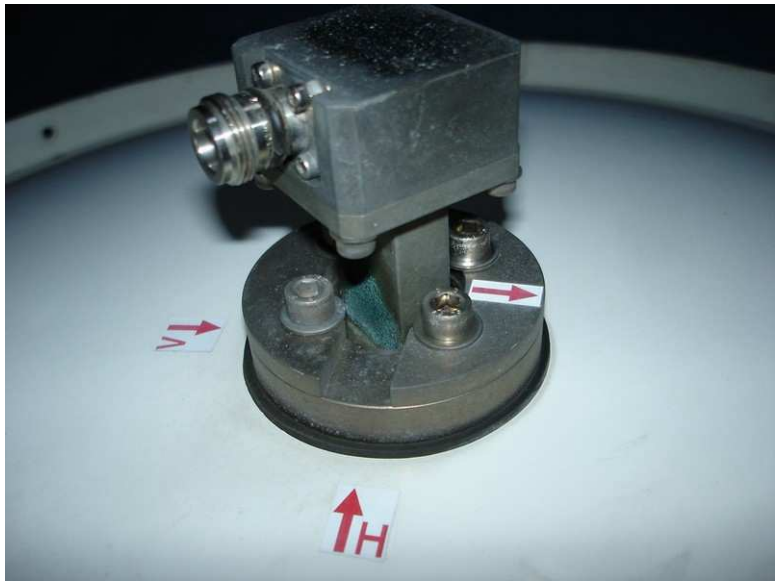


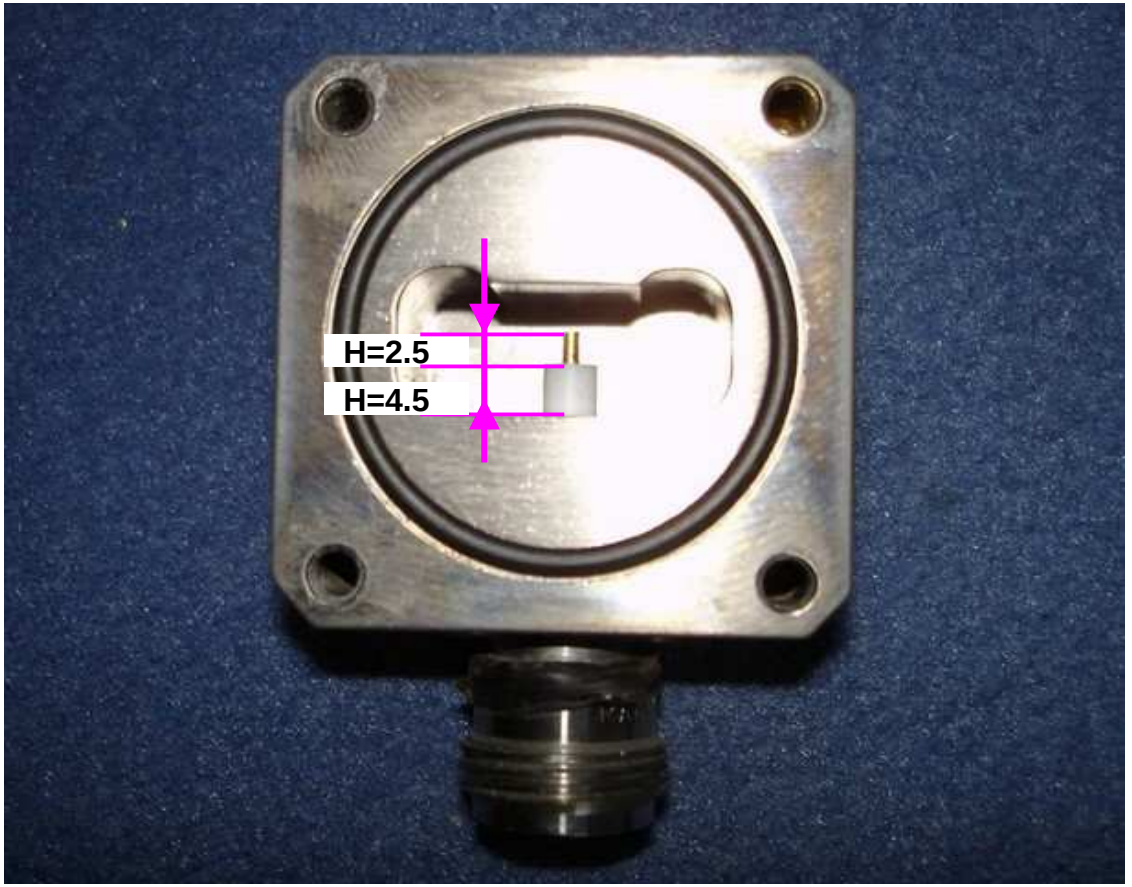
F= ϕ* ϕ/16*E

F= 73* 73/16*10.8=30.8 cm

Initial behaviour

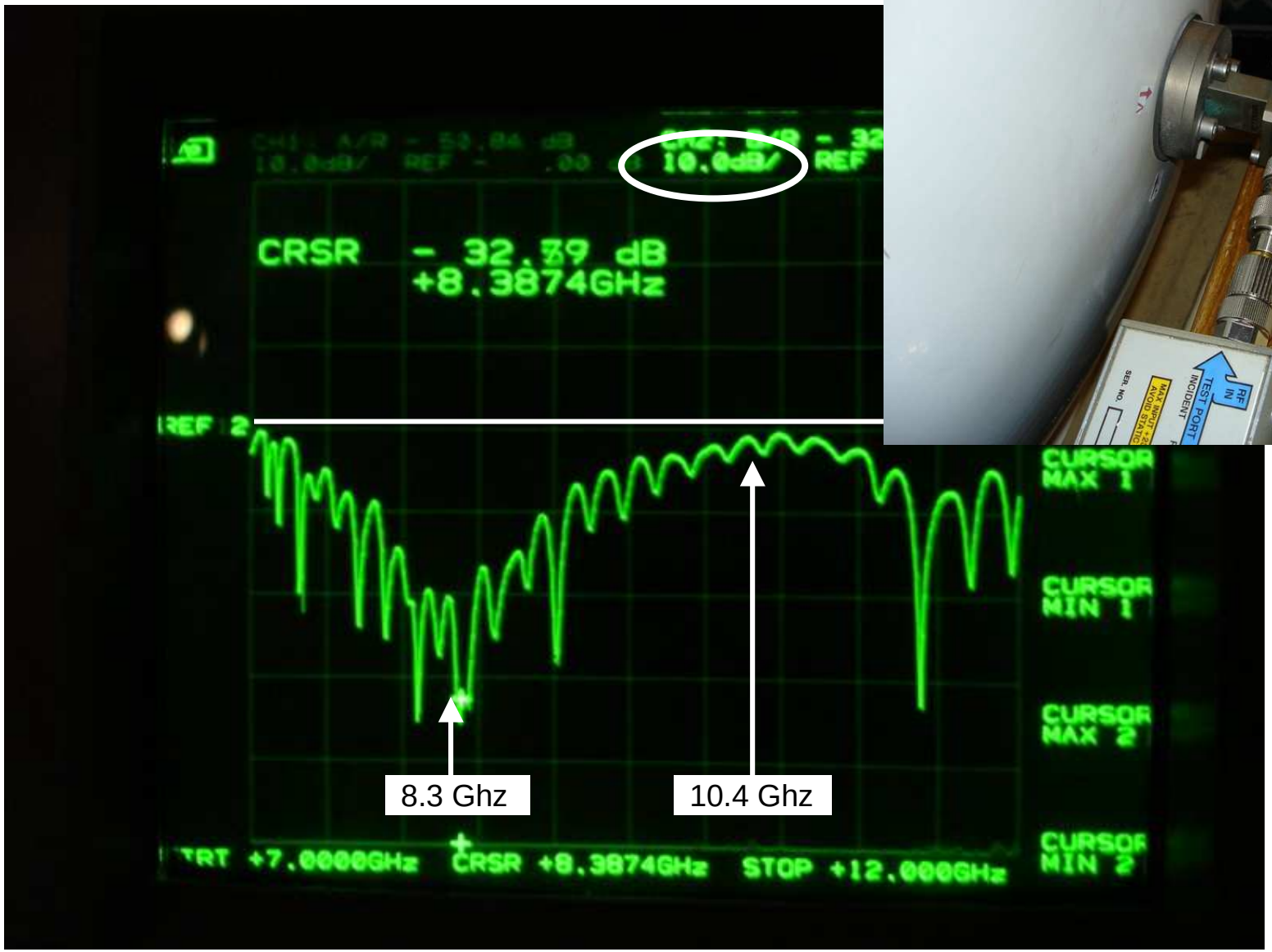
Rear view : initial WR 90 / N adapter optimised at 8.3 GHz





Initial behaviour

Whole initial S11 measured with HP 8757a

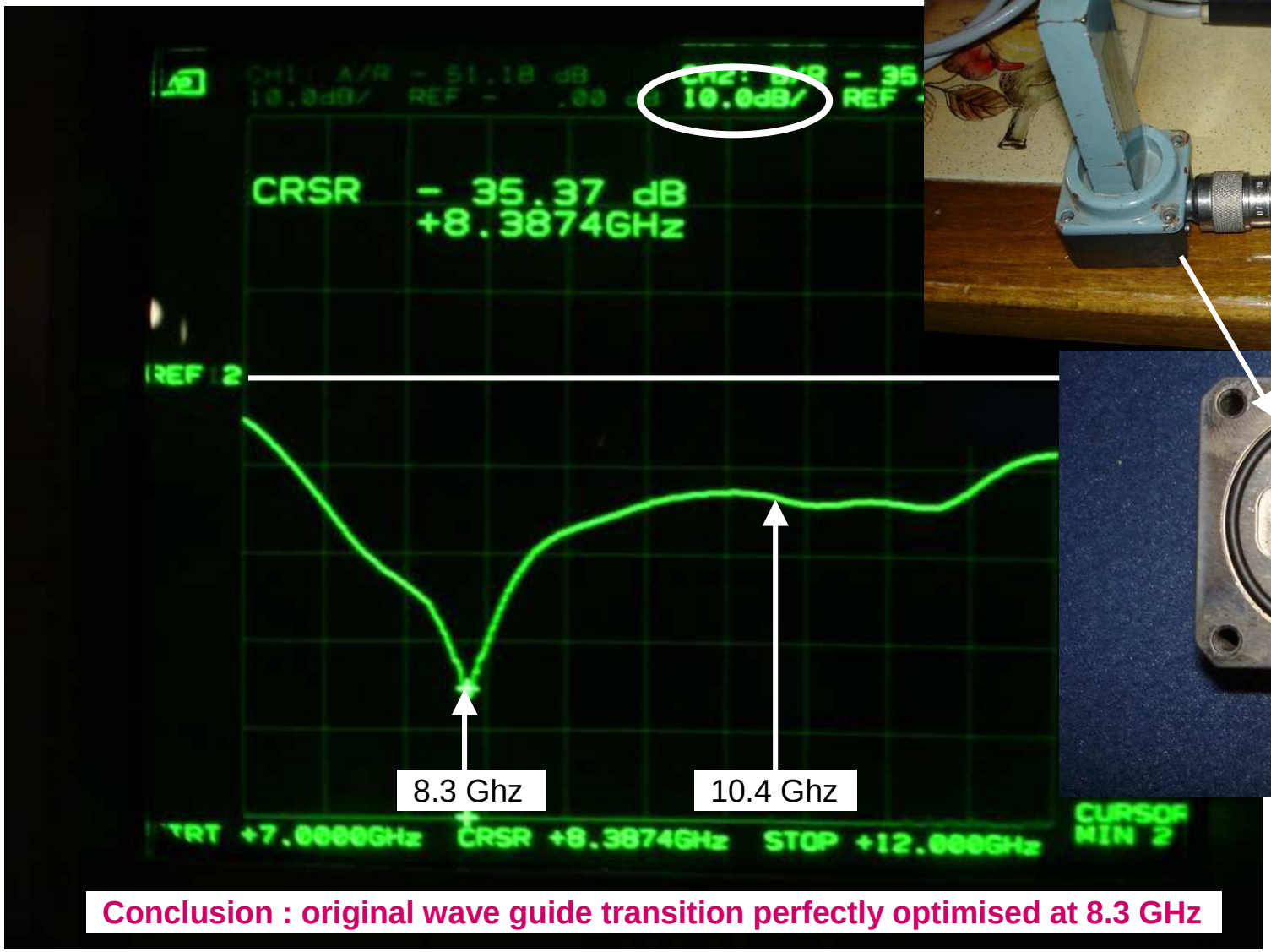


2- First « side measures »

Or is it easy to move its Fc up to 10.4 GHz ??

First « side » measures

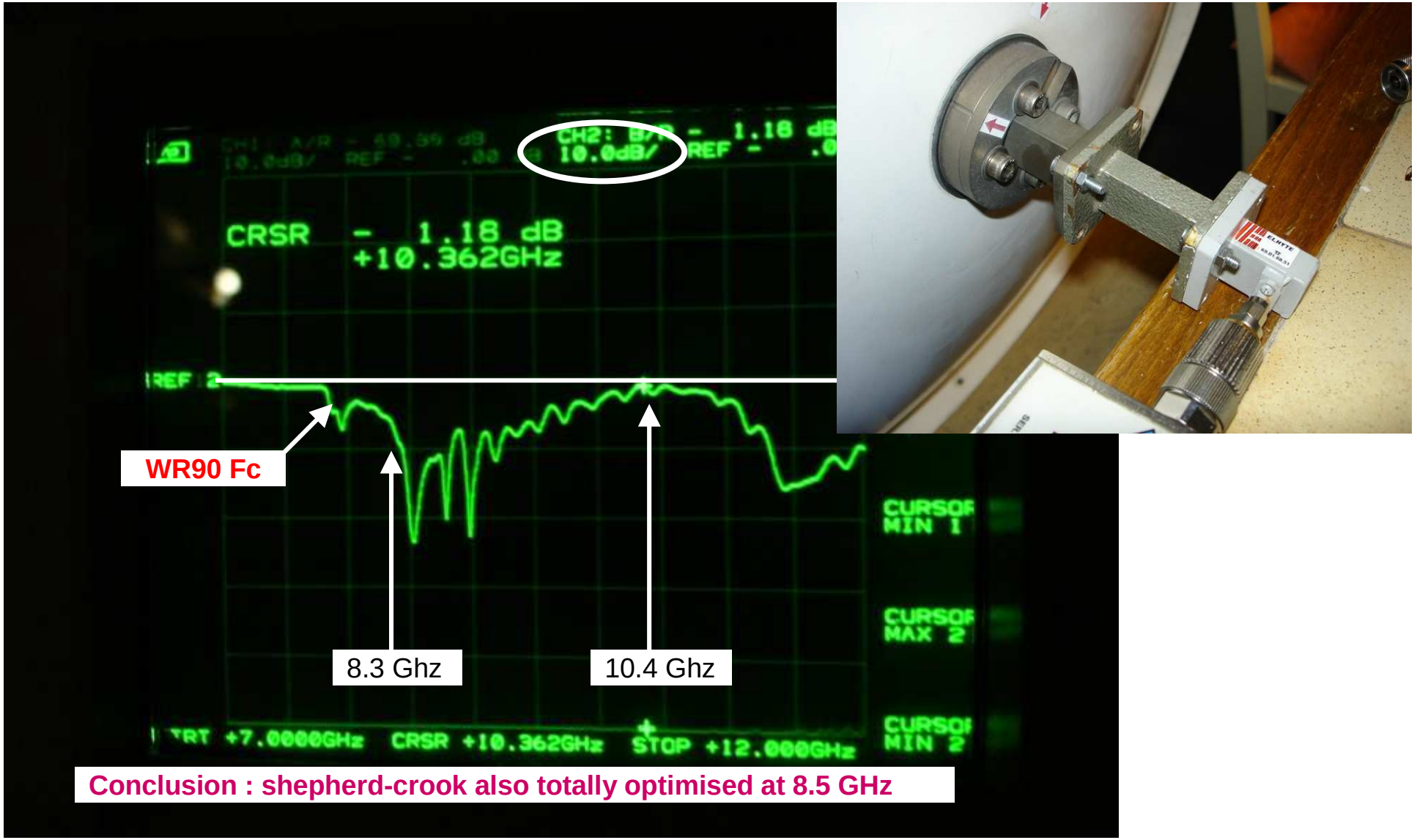
S11 of initial Sodielec WR90/N transition alone



Conclusion : original wave guide transition perfectly optimised at 8.3 GHz

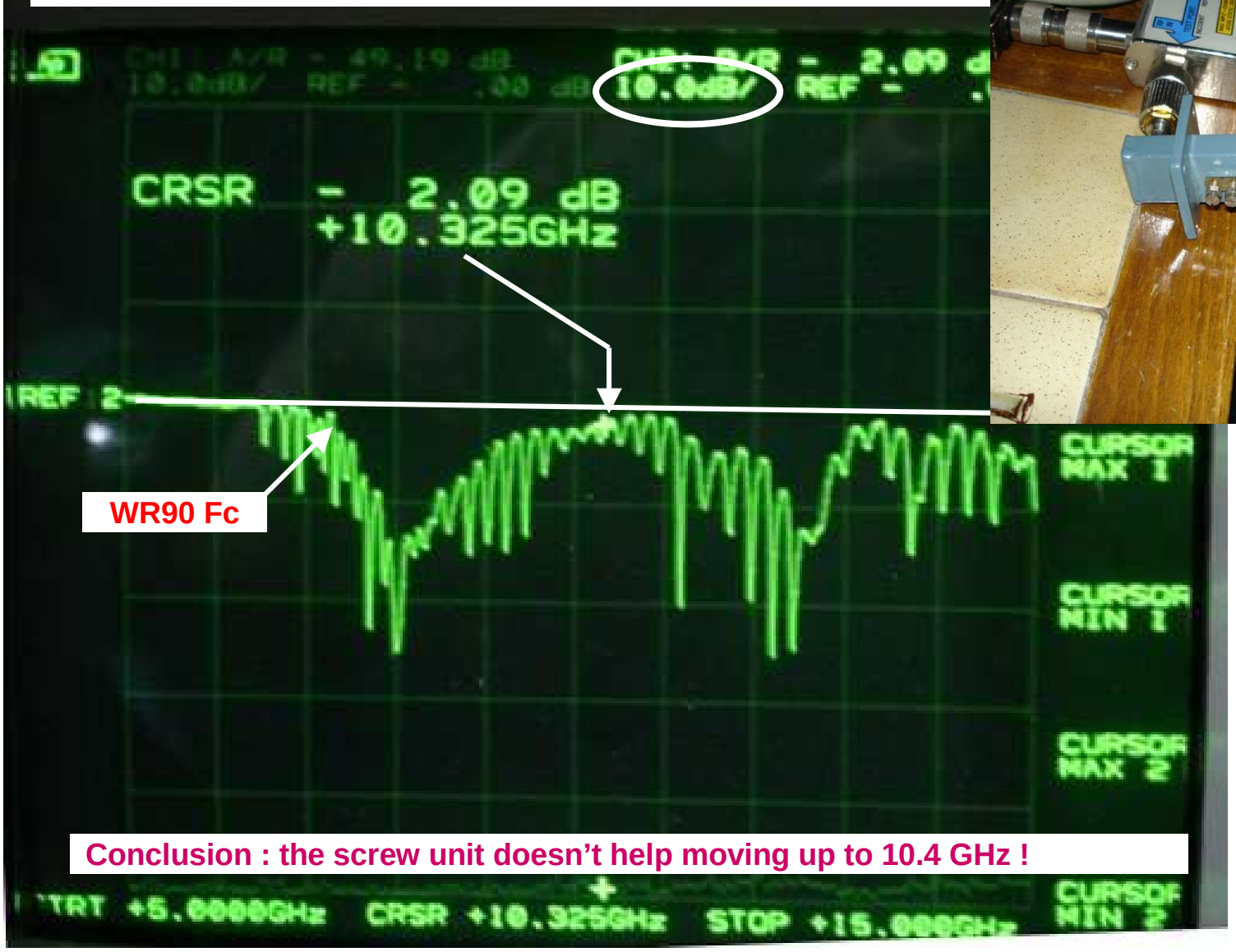
Initial behaviour

Substitution with a real brightband WR90/WR75 then WR75/SMA transition : S11 meas



Initial behaviour

S11 meas of 1 WR 90/SMA + serial screw transitions



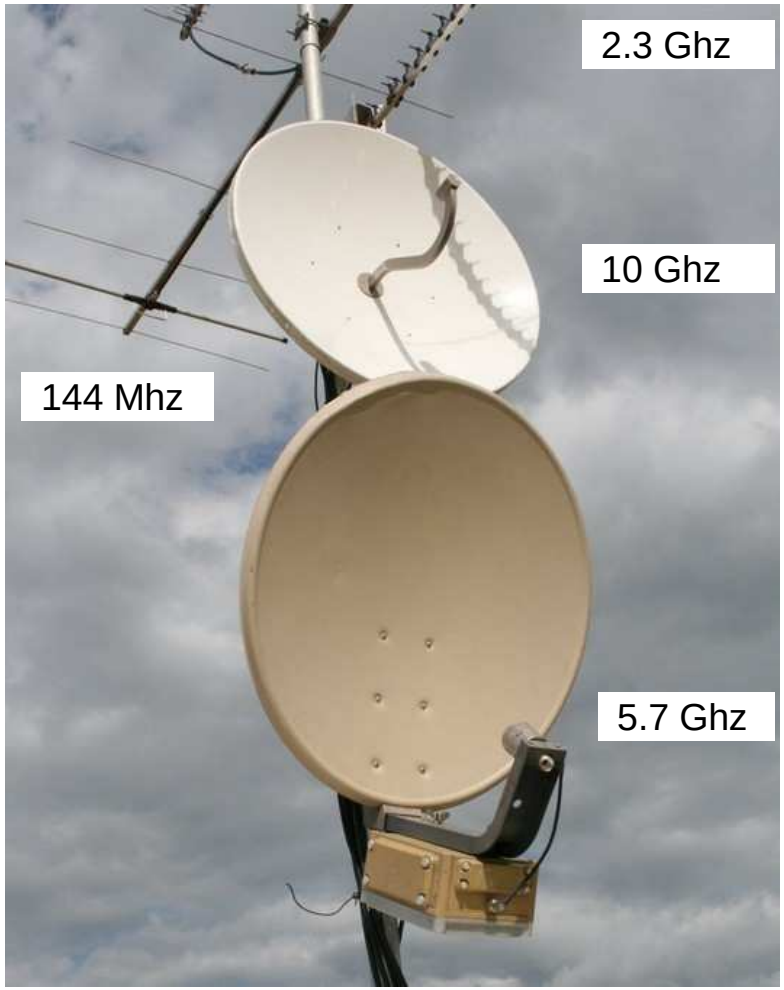
Conclusion : the screw unit doesn't help moving up to 10.4 GHz !

3- Practical mods done by F1CNE

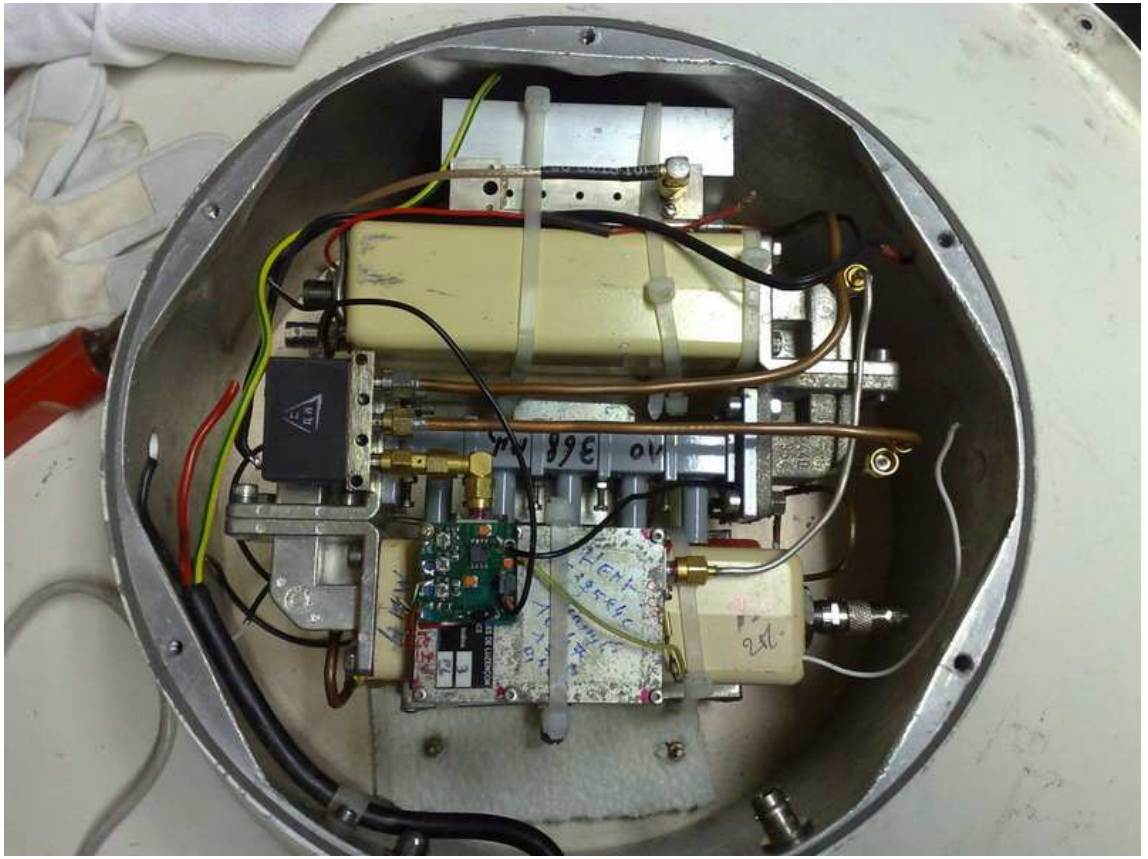
- **WR90 to coax transition mods**
- **Shepherd crook feed mods : 2 different ways possible**

Solution of F1CNE

F1CNE whole /p ensemble



Rear dish view

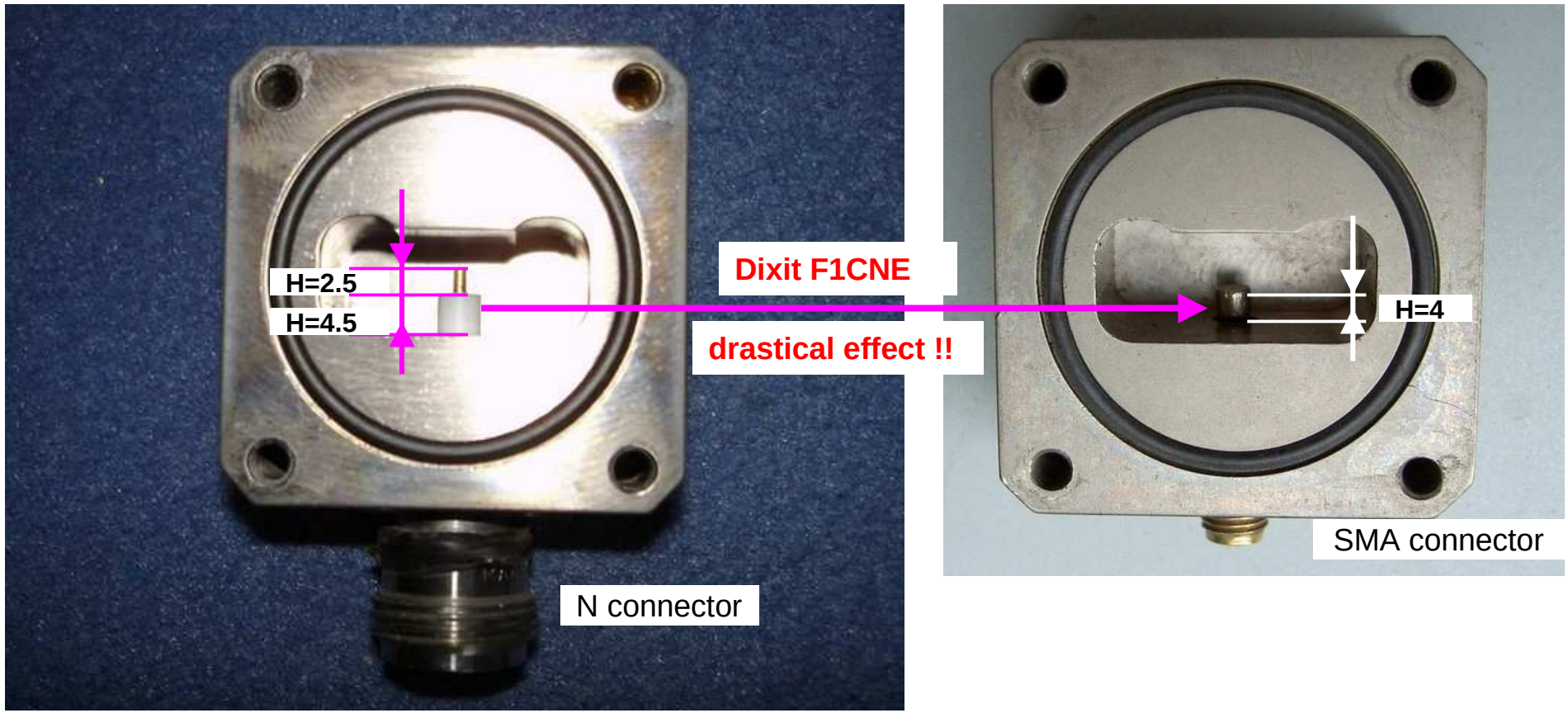


Solution of F1CNE

WR90 transition : λ/4 antenna filed in order to obtain the best S11 compromise

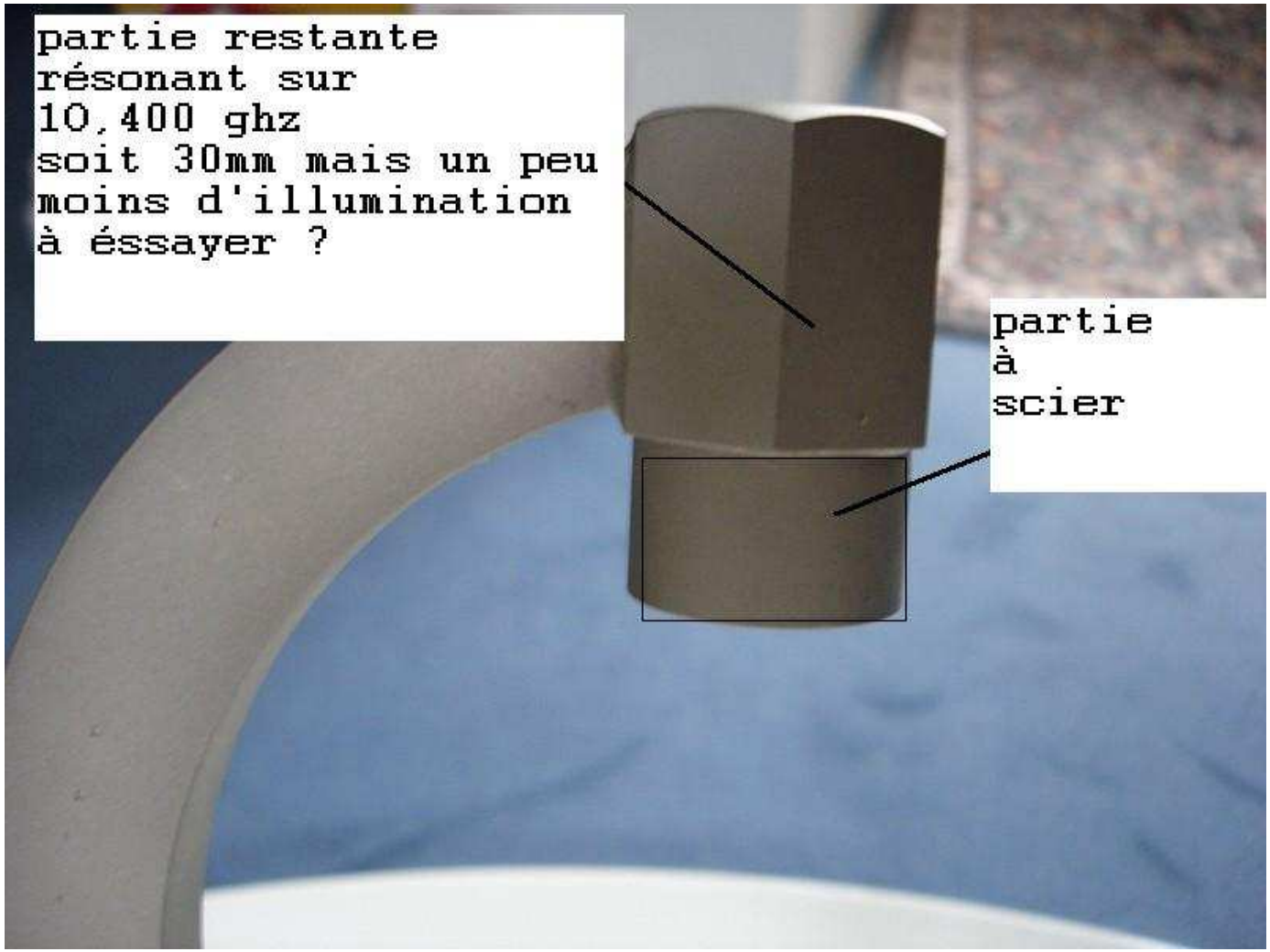
Original

After filing



Solution of F1CNE

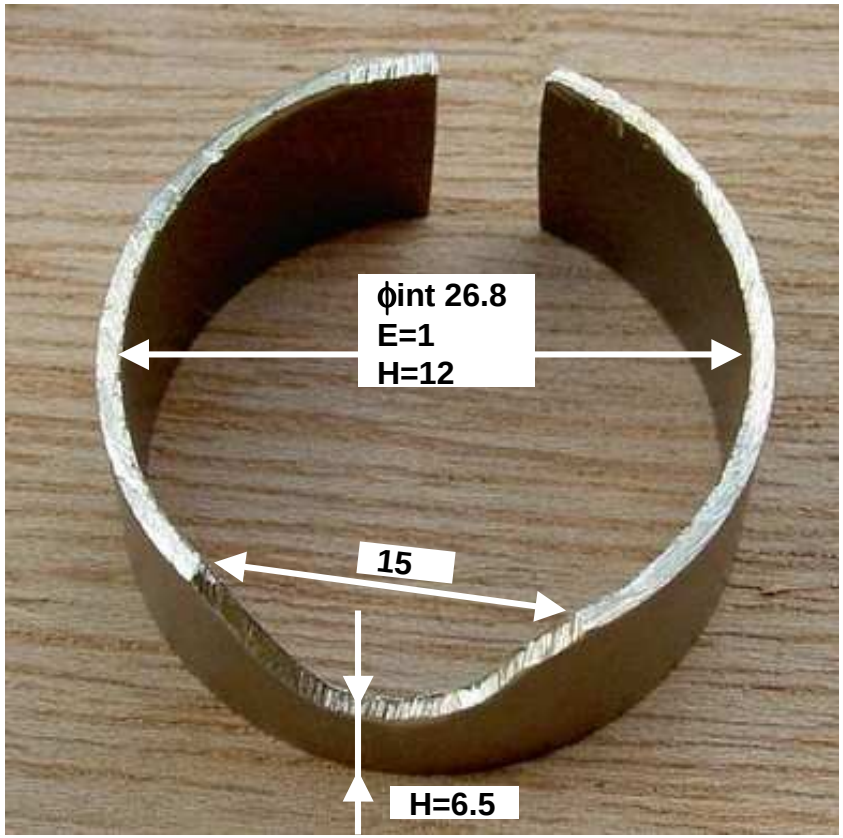
Shepherd crook transformation : 1st way

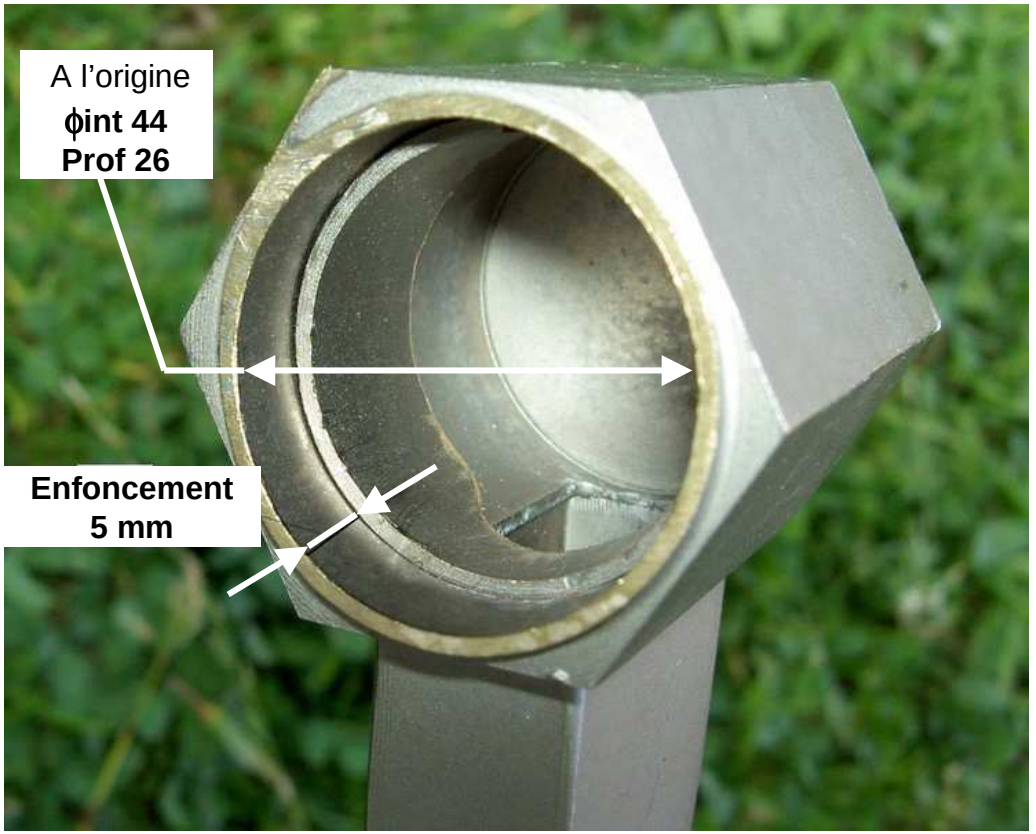


Solution of F1CNE

Shepherd crook transformation : 1st way

Adaptation ring after sawing : must « self stay » in place as a spring ⟶ giving 2 to 3 dB more



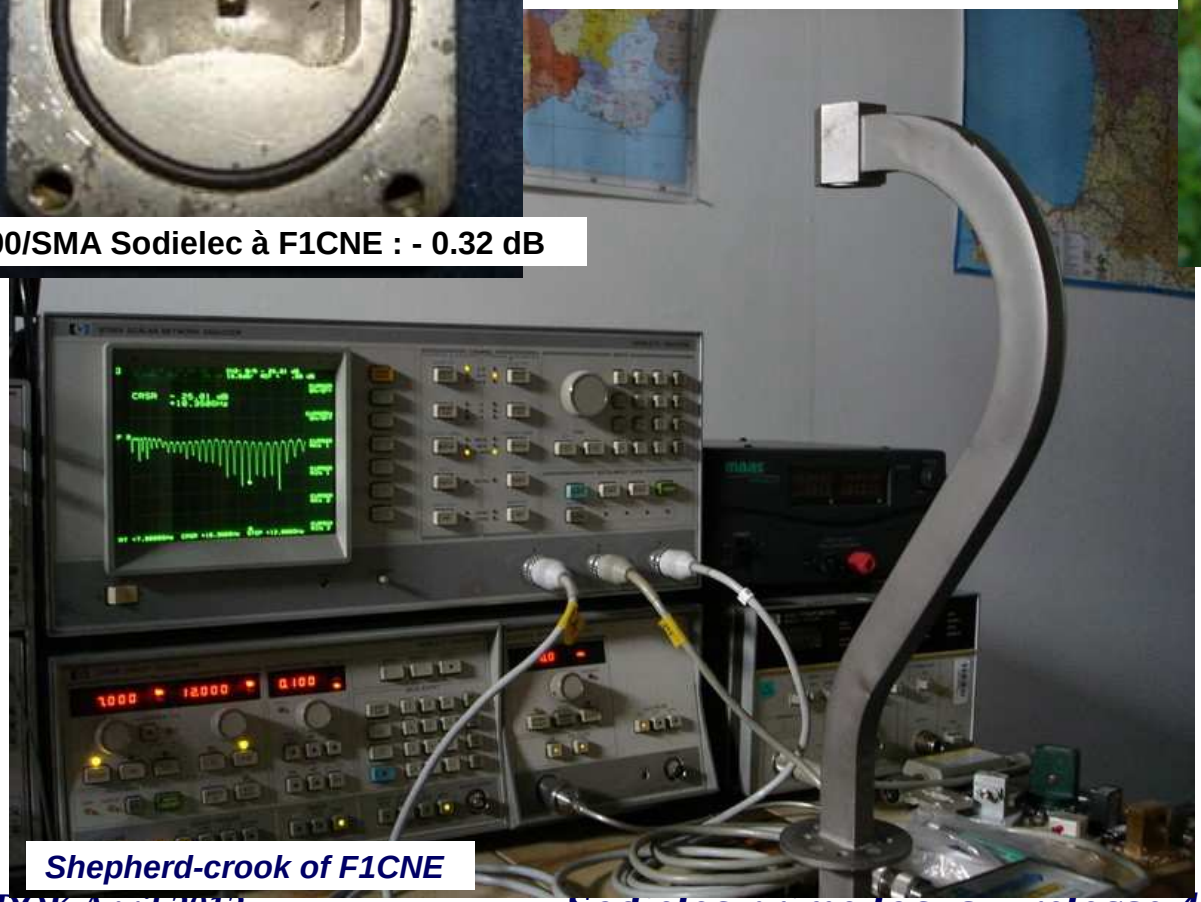


Dimensions in mm before in place

Meases of F1CNE's shepherd-crook 1st way mods

S11 measures with F1CNE's WR90/SMA transition

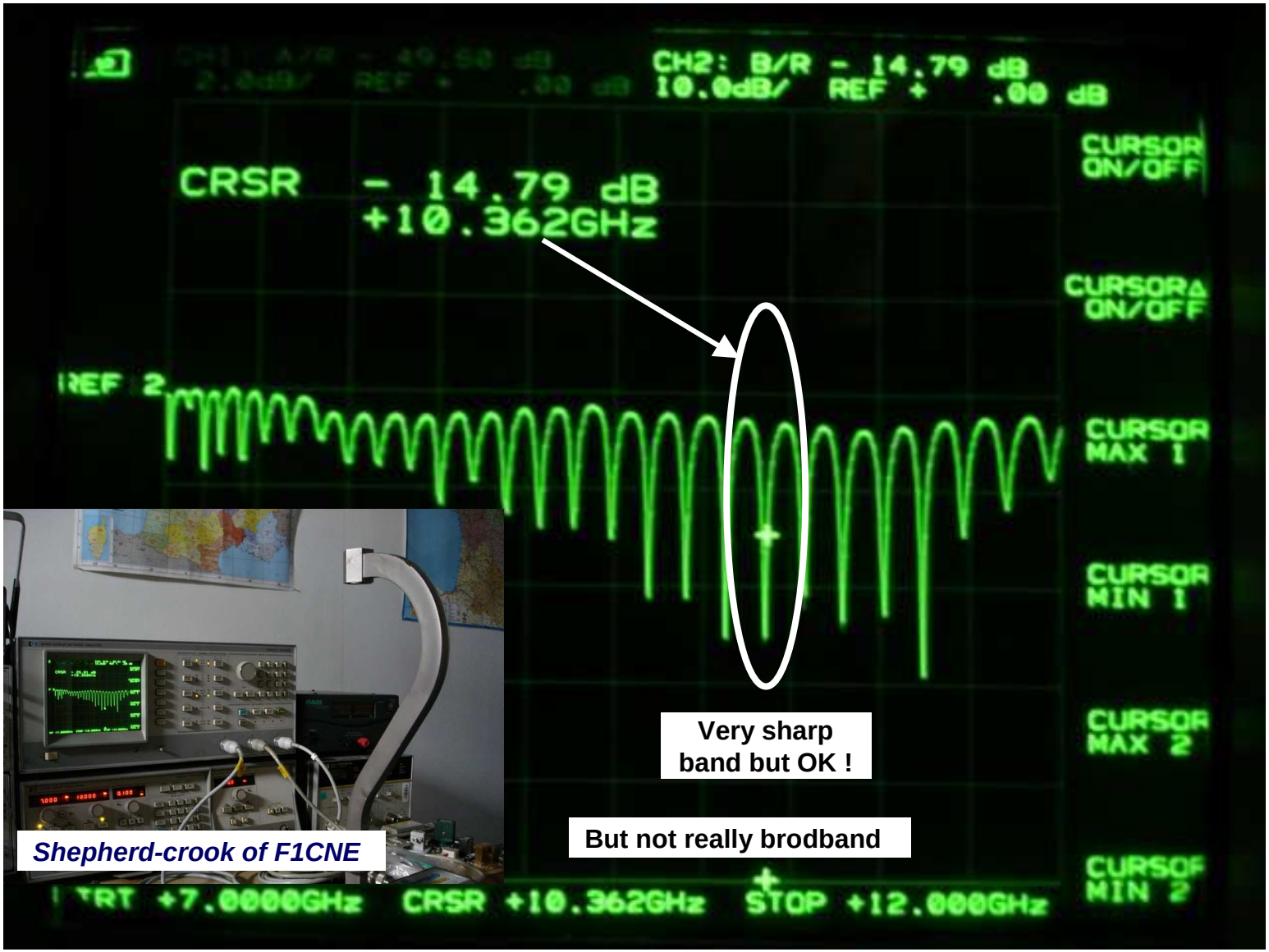
WR90/SMA Sodielec à F1CNE : - 0.32 dB



Shepherd-crook of F1CNE

Meases of F1CNE's shepherd-crook 1st way mods

S11 measures with F1CNE's WR90/SMA transition

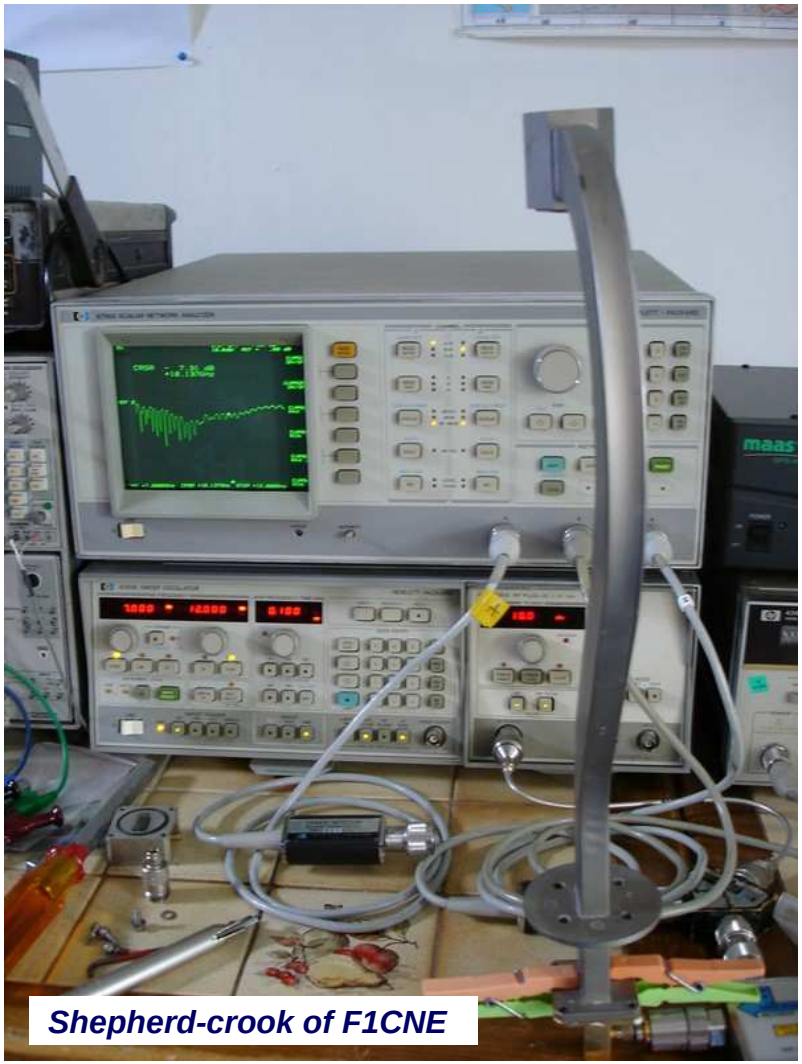


Meases of F1CNE's shepherd-crook 1st way mods

S11 measures with F1CNE's WR90/SMA transition : zoom near 10.370 GHz

Meases of F1CNE's shepherd-crook 1st way mods

S11 measures with Procom WR90/SMA transition



Shepherd-crook of F1CNE

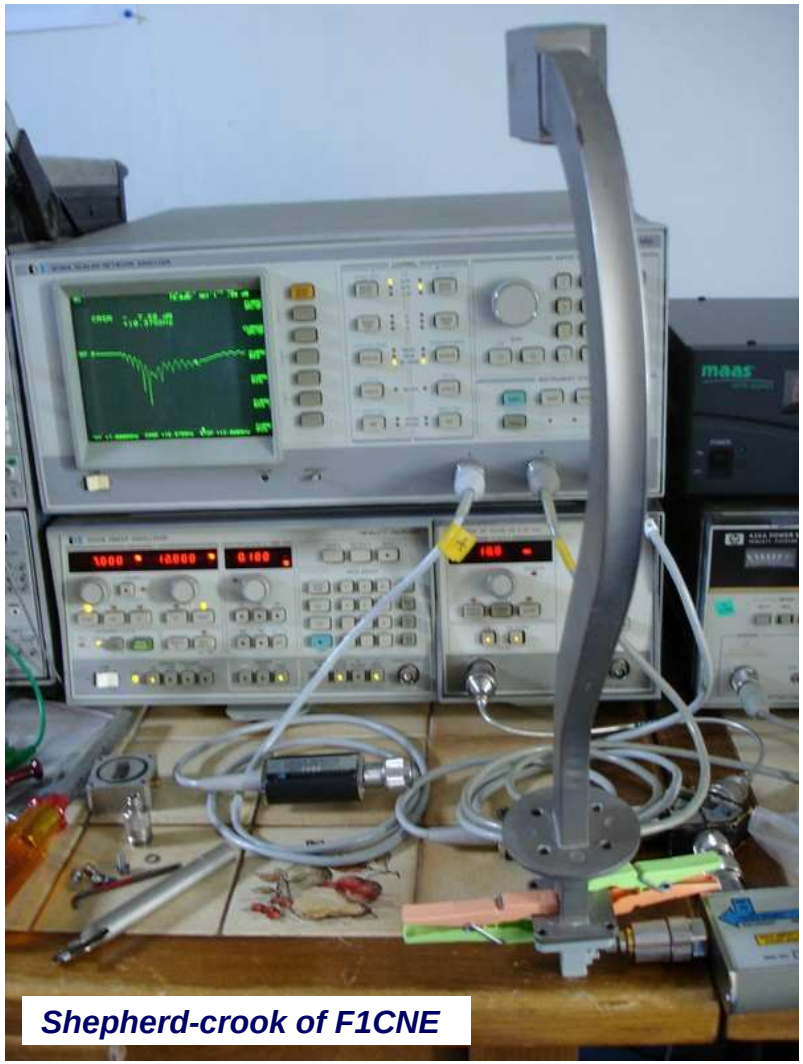
WR90/SMA Procom : - 0.18 dB

Meases of F1CNE's shepherd-crook 1st way mods

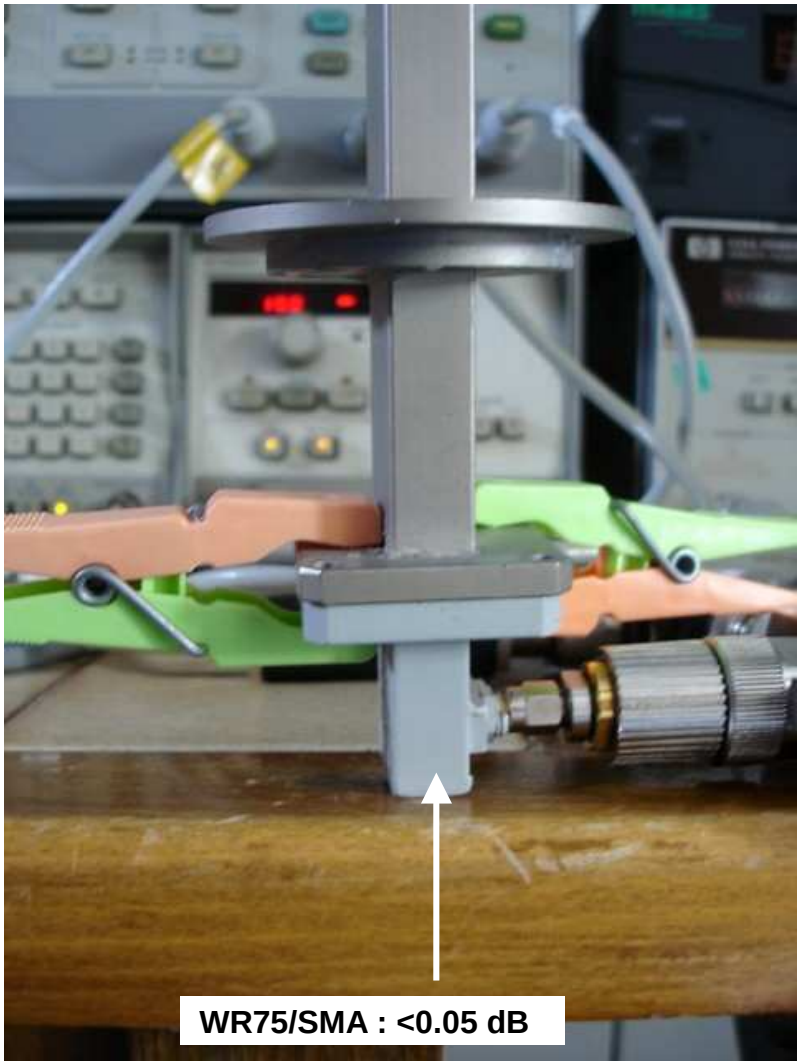
S11 measures with Procom WR90/SMA transition

Meases of F1CNE's shepherd-crook 1st way mods

S11 measures with good F6AJW's WR75/SMA transition



Shepherd-crook of F1CNE



WR75/SMA : <0.05 dB

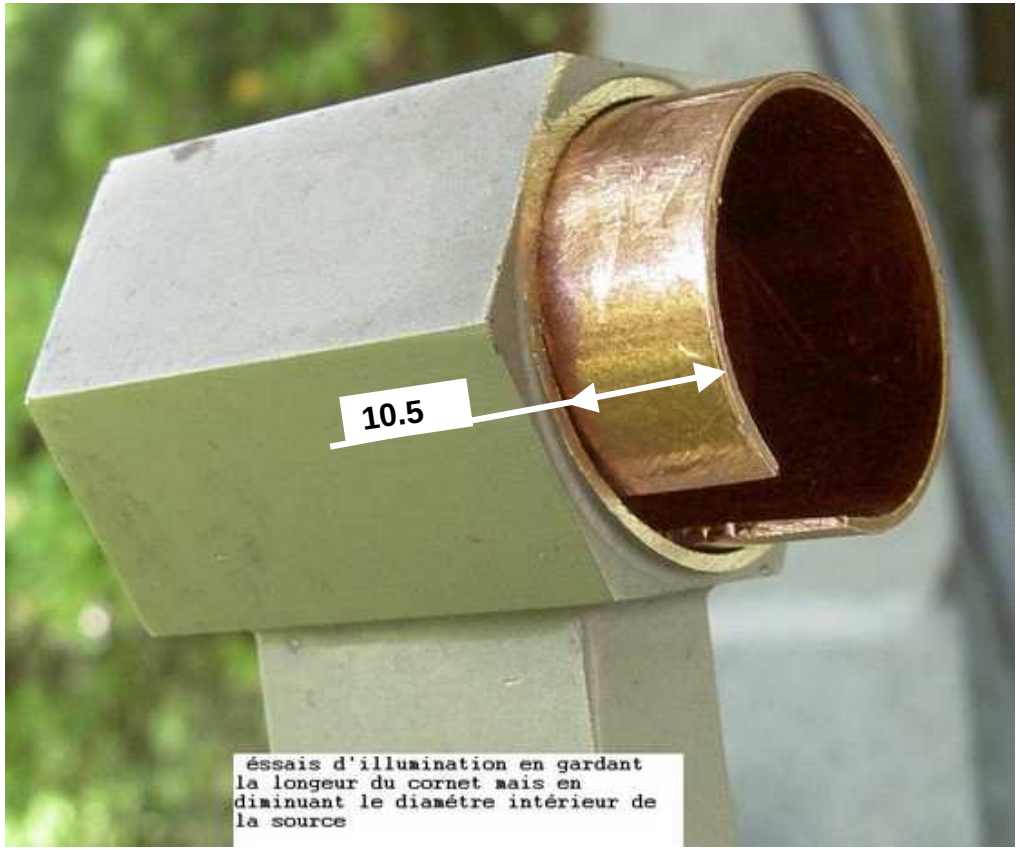
Meases of F1CNE's shepherd-crook 1st way mods

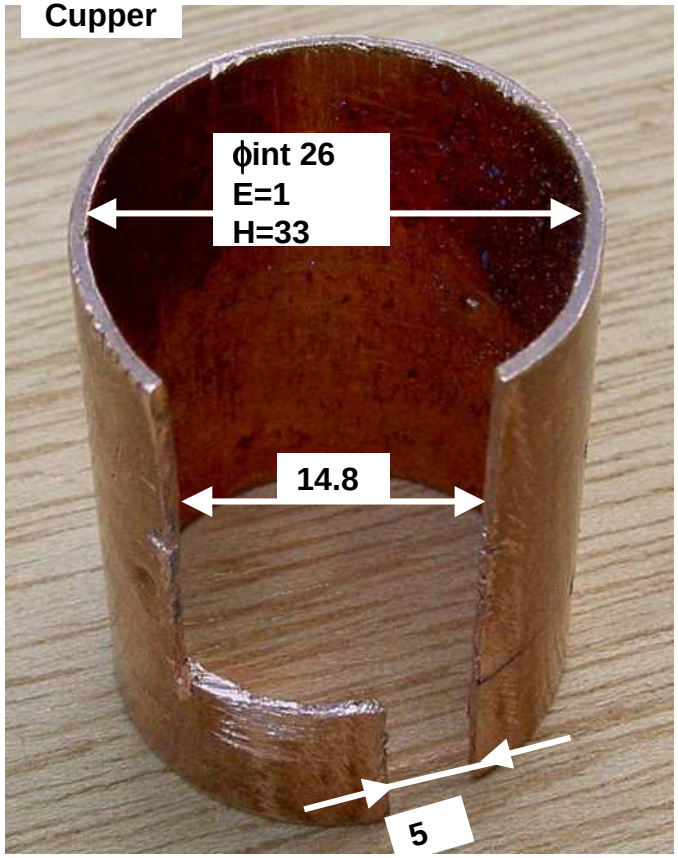
S11 measures with good F6AJW's WR75/SMA transition

Solution of F1CNE

Shepherd crook transformation : 2nd way

Or how to keep the illuminating internal point at the same place ⟶ giving 2 to 3 dB more





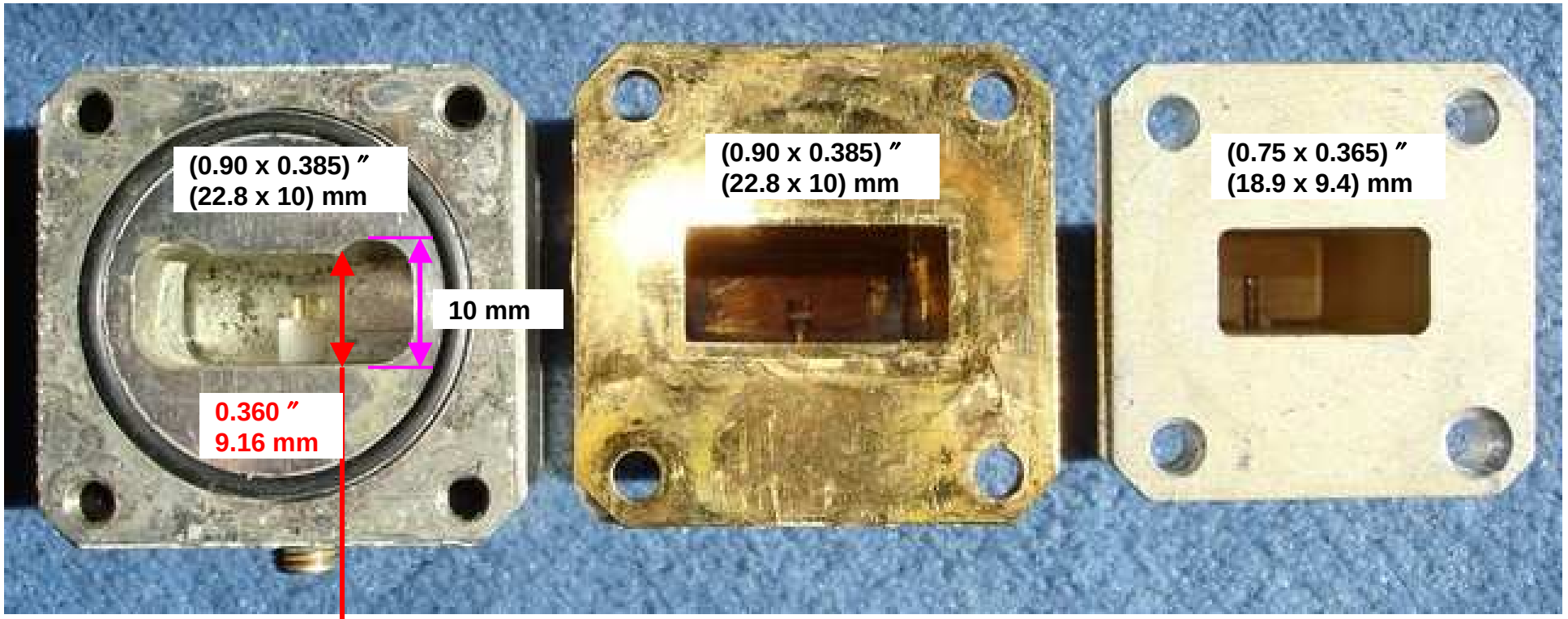
Dixit F1CNE, this mod seems to give less results than the 1st one

4- Serial losses of 2 serial WR90 (or 75) to coax transitions

Serial losses of 2 serial WR90(or75)/coax transitions

Dimension comparaison between models : internal dimensions

WR90/SMA Sodielec | WR90/SMA Procom | WR75



Why this shorter width ?
Sure, only for initial optimisation à 8.2 GHz !

Additional losses are perhaps depending from !

Serial losses of 2 serial WR90(or75)/coax transitions

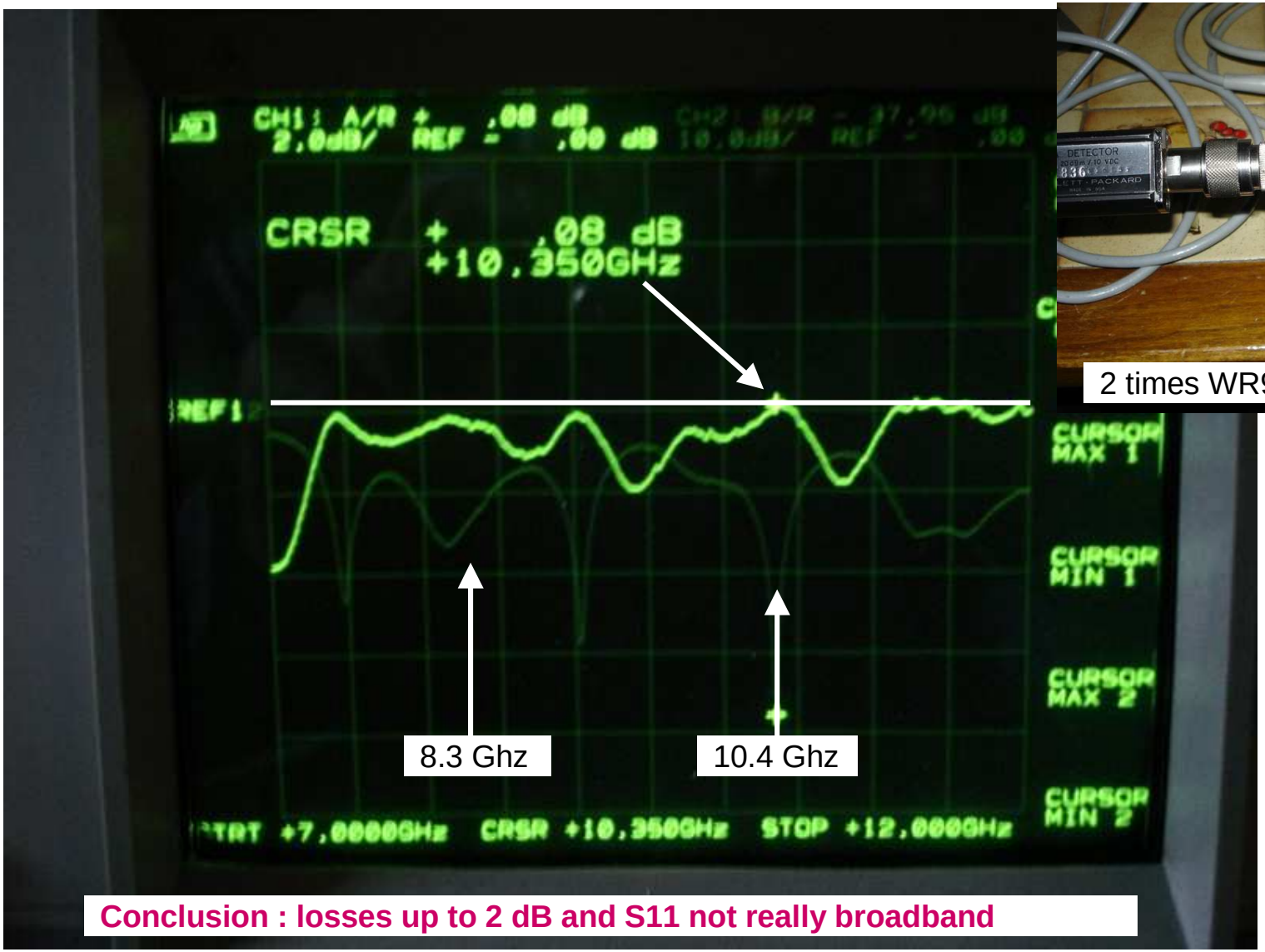
S21 + S11 of original WR90/N + other real broadband WR75/SMA serial transitions

WR90/SMA Sodielec + WR75

Conclusion : original wave guide transition totally optimised at 8.3 GHz with S11 >18 dB

Serial losses of 2 serial WR90(or75)/coax transitions

S21 + S11 meas of 2 not optimised broadband WR 90/SMA serial transitions

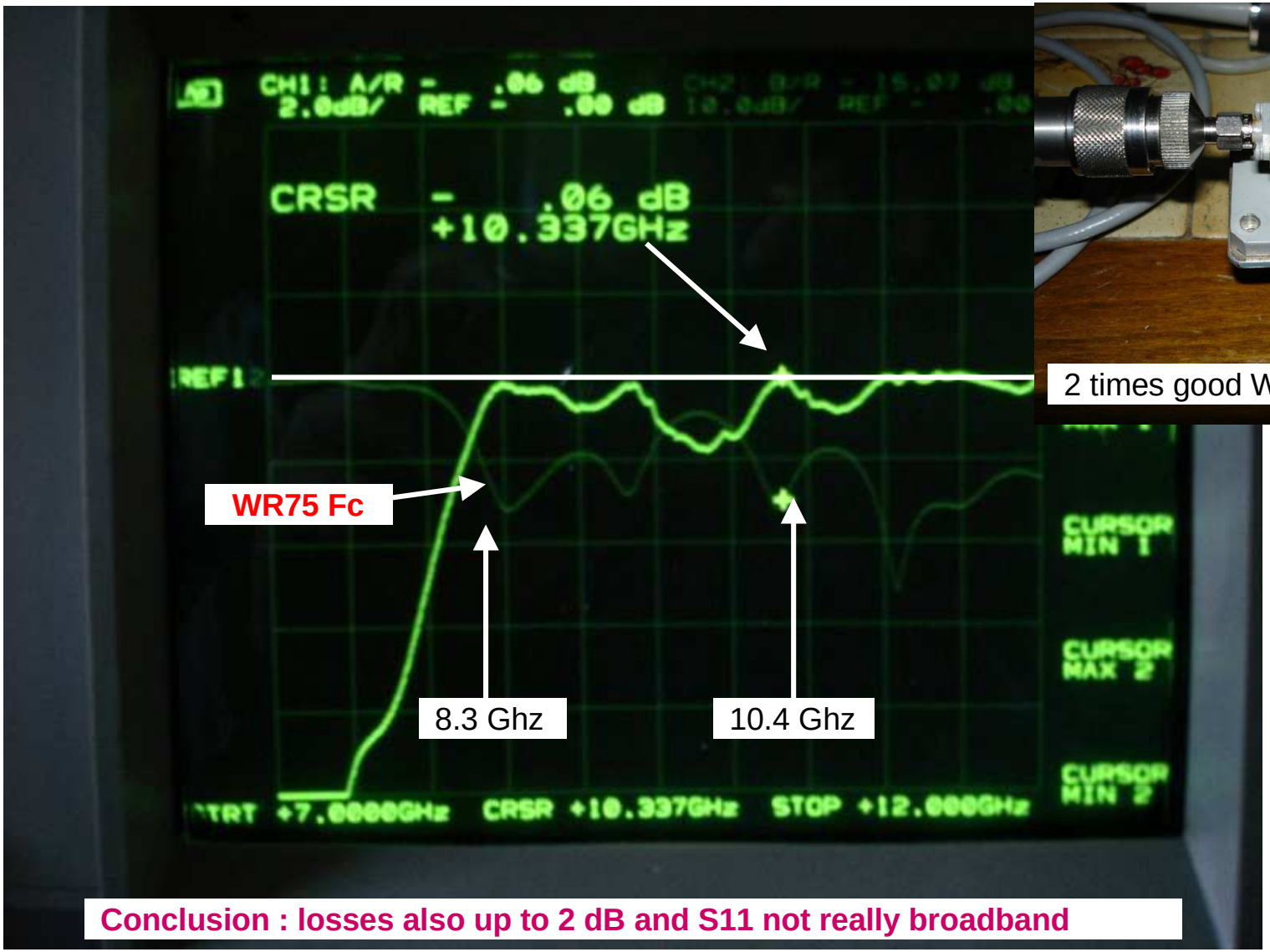


2 times WR90/SMA transitions

Conclusion : losses up to 2 dB and S11 not really broadband

Serial losses of 2 serial WR90(or75)/coax transitions

S21 + S11 meas of 2 good broadband WR 75 / SMA serial transitions



2 times good WR75/SMA transitions

Conclusion : losses also up to 2 dB and S11 not really broadband

Serial losses of 2 serial WR90(or75)/coax transitions

WR90/SMA transition insertion losses

Serial losses of 2 serial WR90(or75)/coax transitions

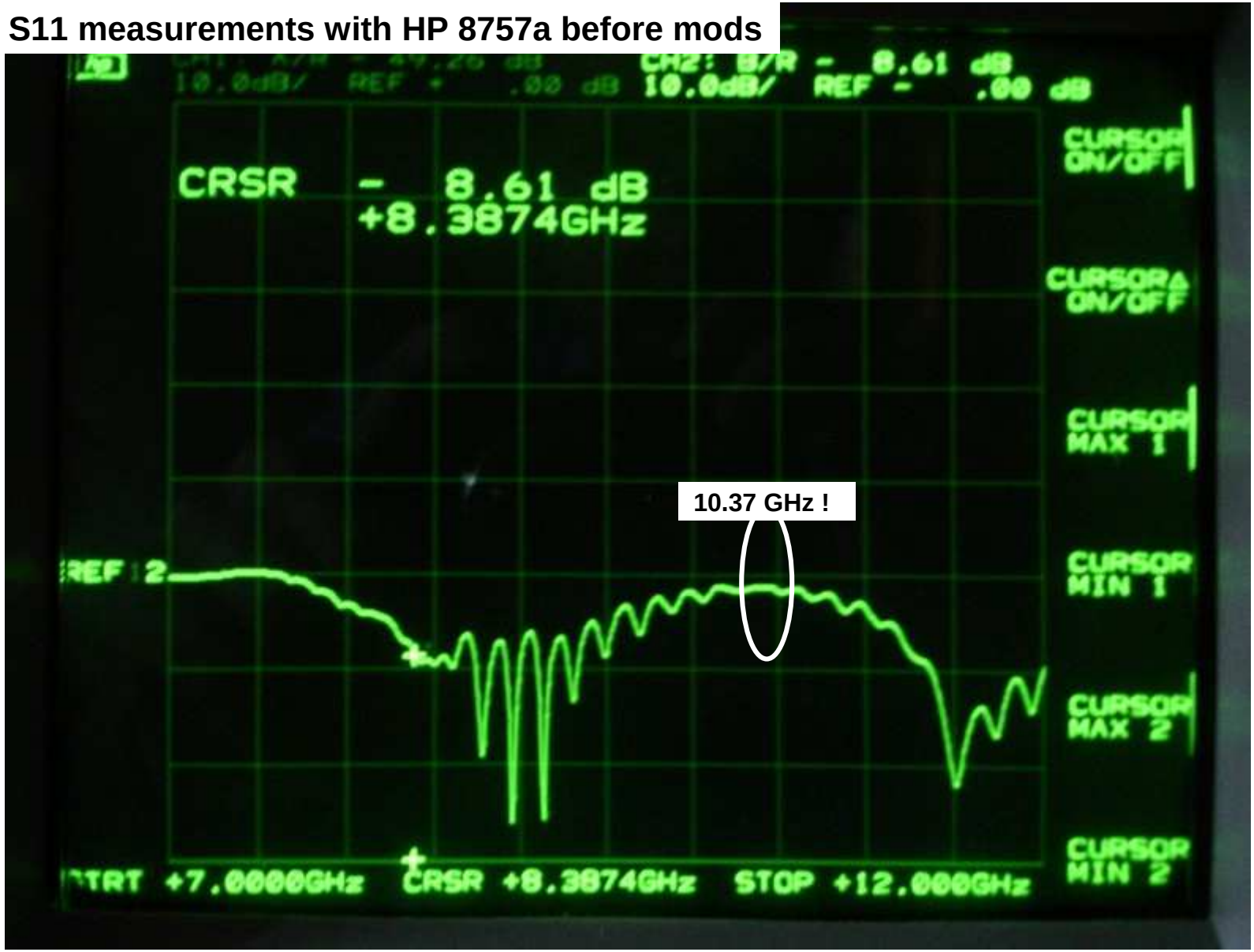
Transition 1	Transition 2	Owner	Total serial losses à 10.4 GHz	Losses of transition 2 alone à 10.4 GHz
SMA/WR75	WR75/ SMA	F6AJW	<0.1dB	<0.05dB
SMA/WR75	WR90/SMA Procom original	F5DQK	0.23 dB	0.18 dB
SMA/WR75	WR90/SMA Sodielec Penny-feed original white	F6AJW	0.3 dB	0.25 dB
SMA/WR75	WR90/N Sodielec	Antenna filled by F6AJW for further adjustments	1.15 dB ! !	1.10 dB ! !
SMA/WR75	WR90/N Sodielec with 2 screws	F4DRU	0.7 dB direct 0.45dB if adjusted	- 0.65 dB direct - 0.40dB screw adjusted
SMA/WR75	WR90/SMA Sodielec	F1CNE	0.5 dB	0.45 dB

5- Practical mods done by F4DRU

New alu piece added inside the initial Shepherd crook feed

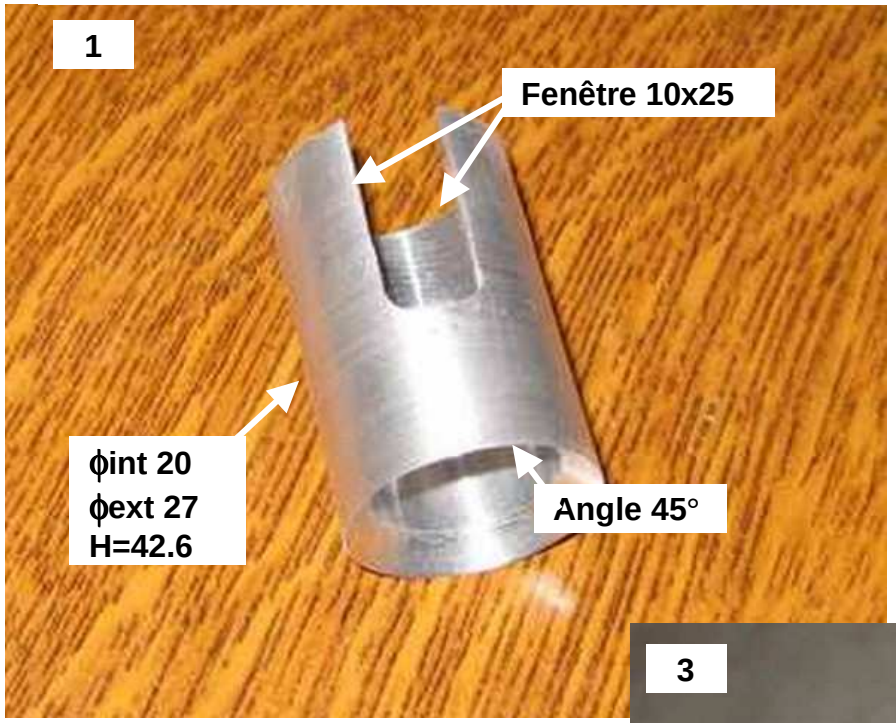
Solution of F4DRU

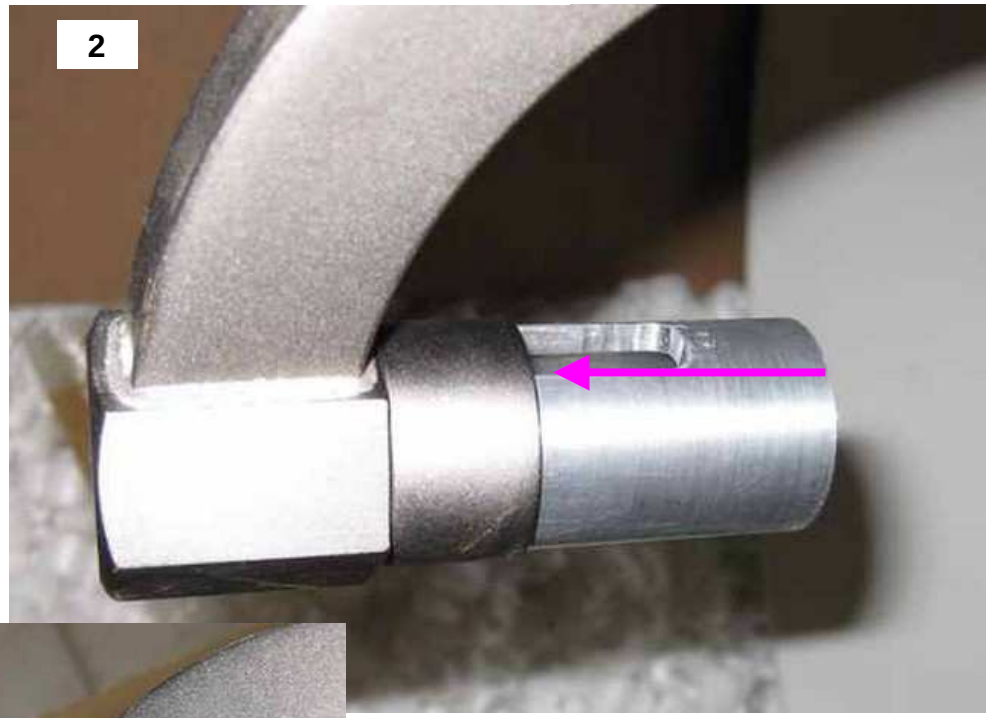
Initial S11 measurements with HP 8757a before mods



Solution of F4DRU

Adding an aluminium piece into the Shepherd crook feed

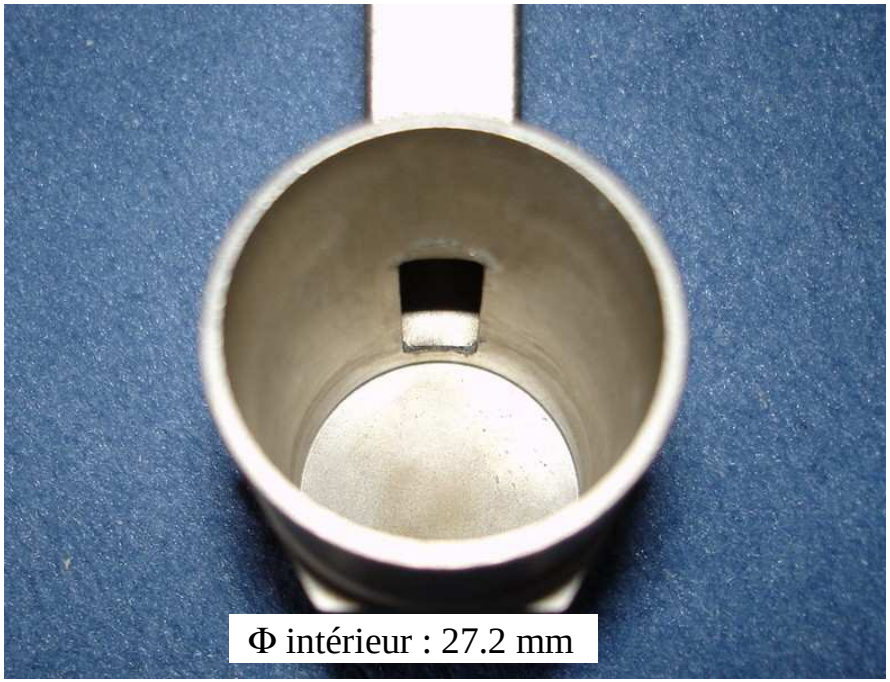




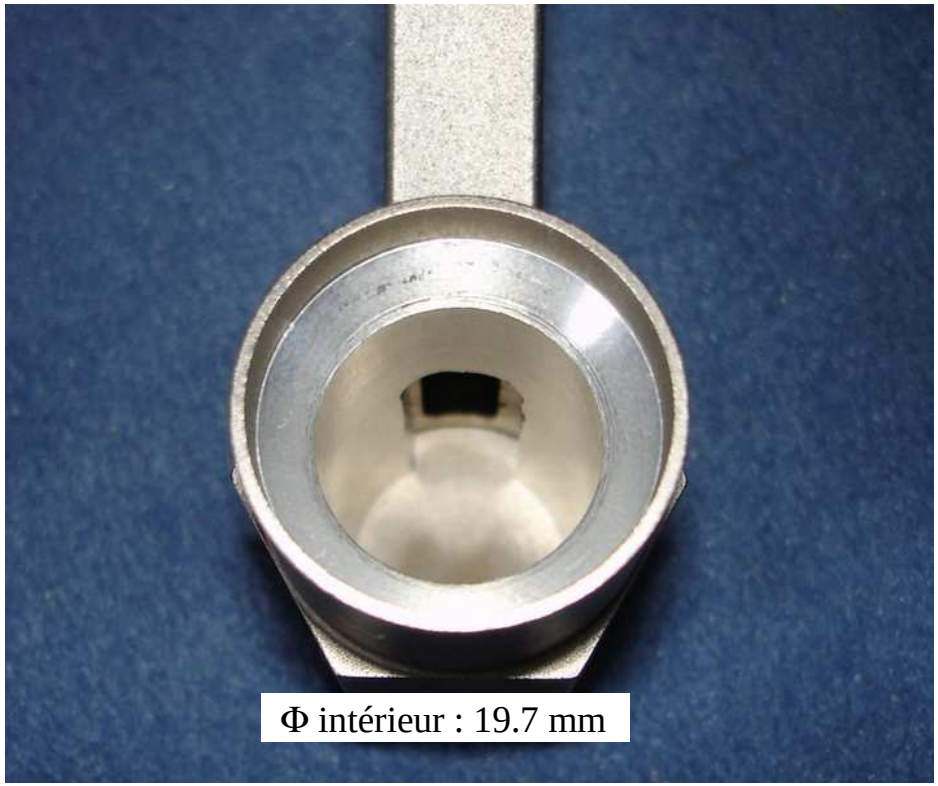
Solution of F4DRU

Adding an aluminium piece into the Shepherd crook feed

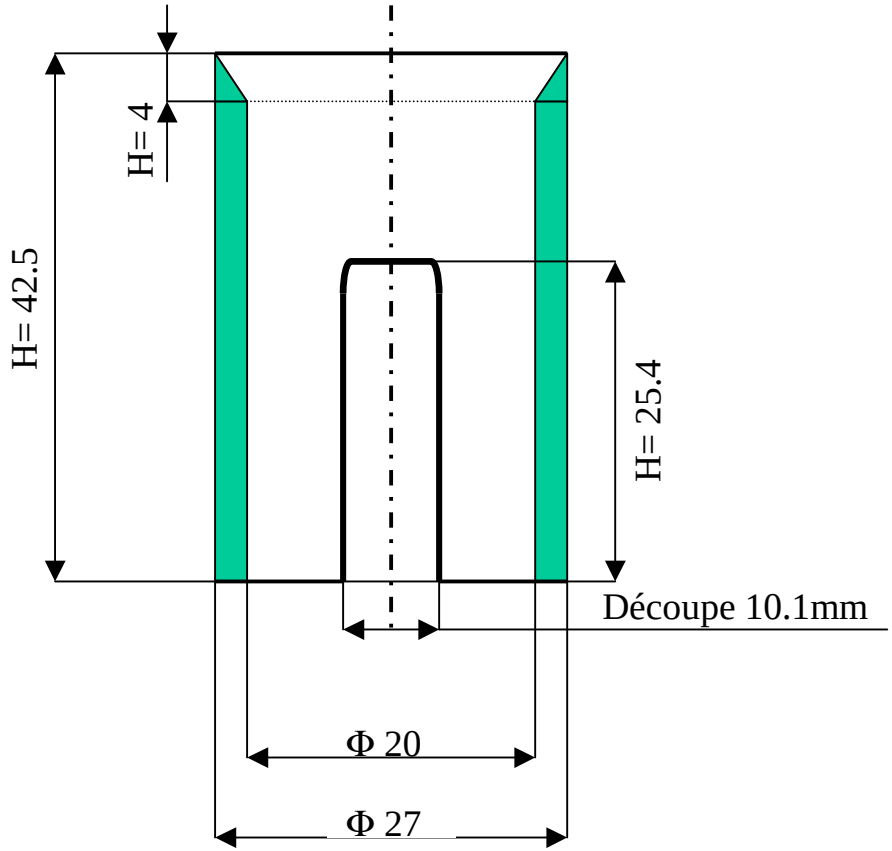
Before



After mod



Subsidiary piece for Sodielec shepherd-crook

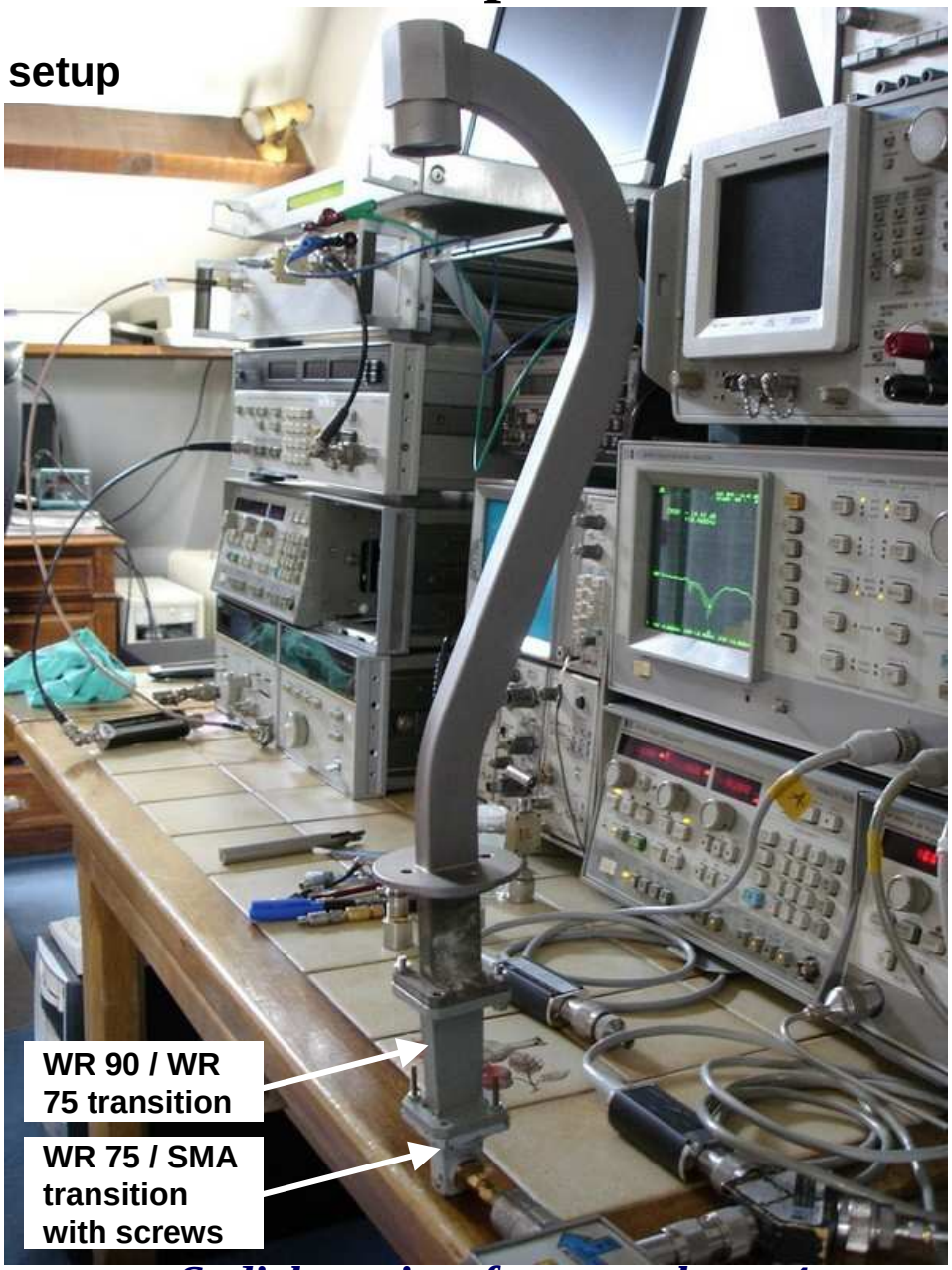


Matériau : dural
Φ extérieur (mm):
F1CNE 26.05 +0, –0.5
F4DRU 27.05 +0, –0.5
F5DQK 27.1 +0, –0.5

F4DRU's design

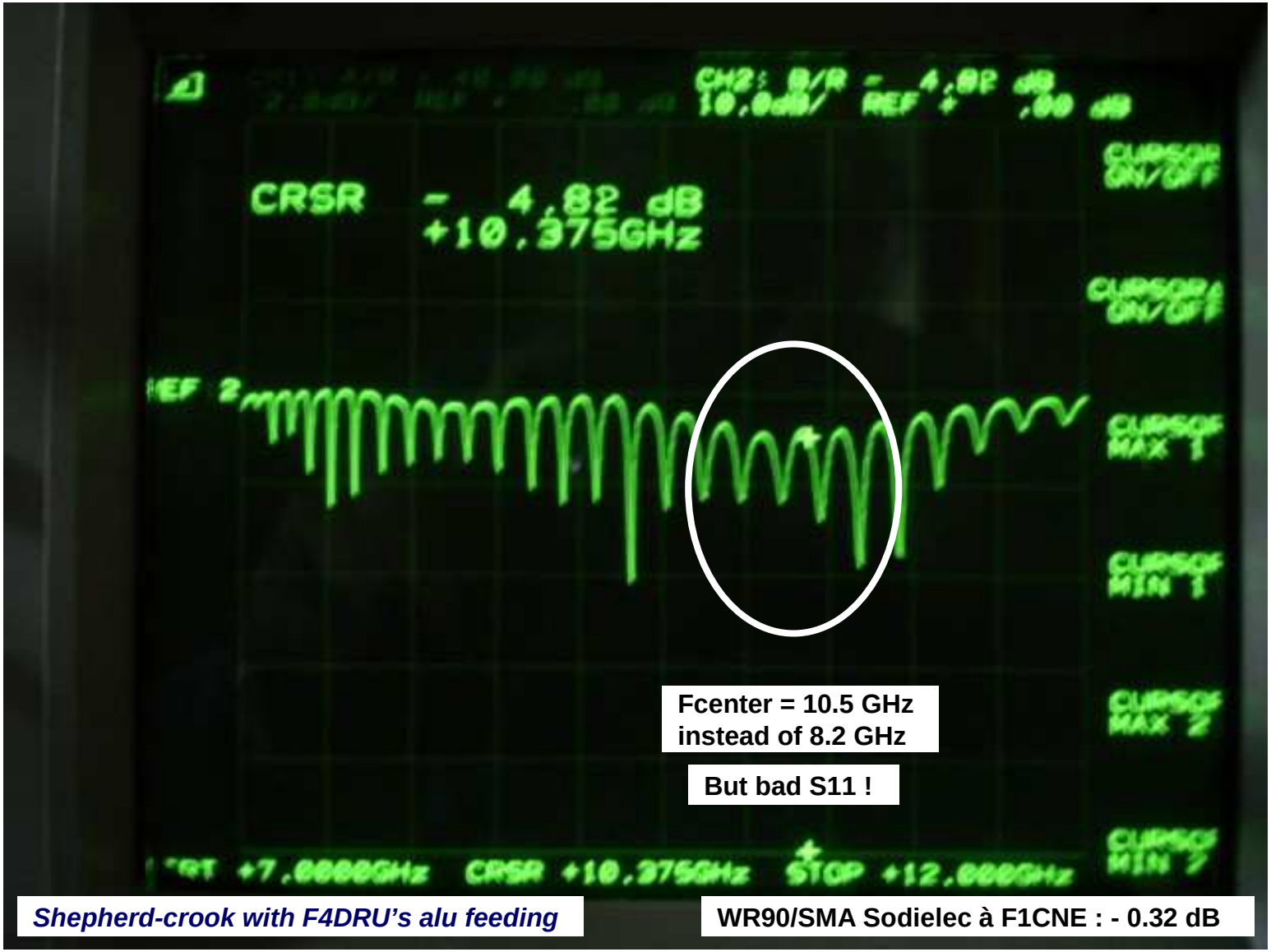
Meases of F4DRU's shepherd-crook feed mods

Whole measurement setup



Meases of F4DRU's shepherd-crook feed mods

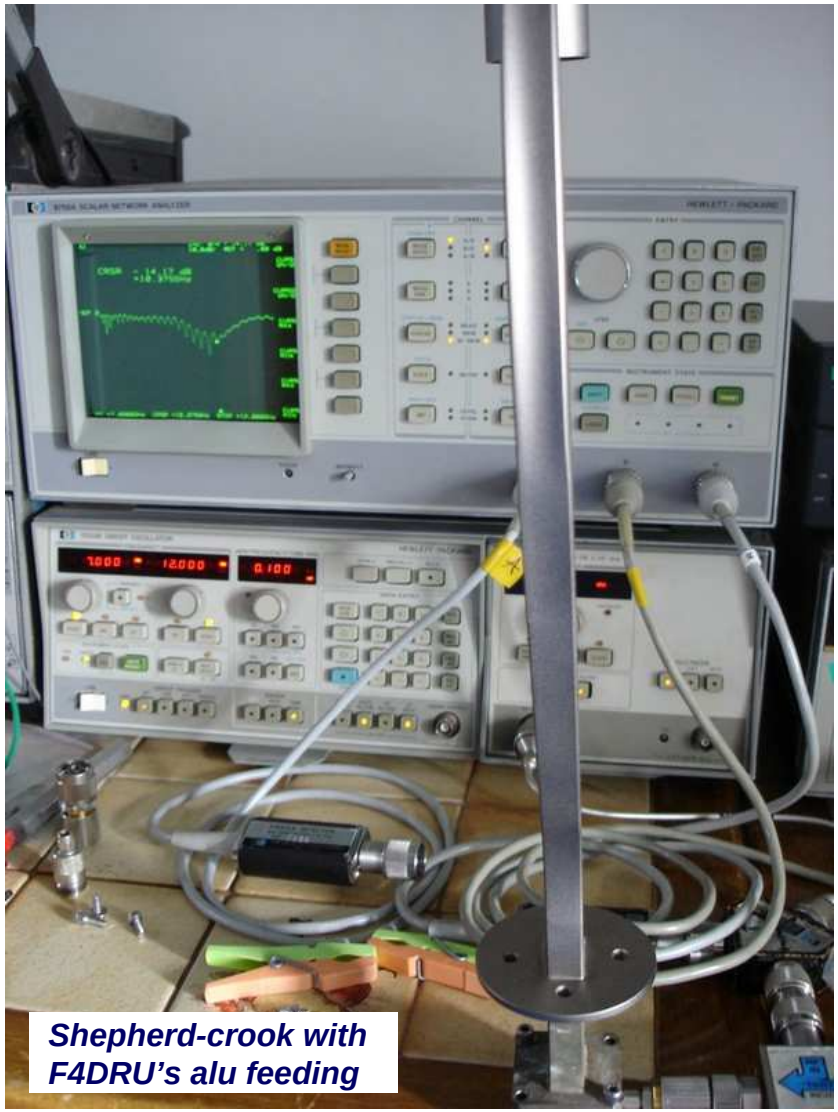
S11 prime focus dish measures, with F4DRU's mod & F1CNE's WR90/SMA transition



Meases of F4DRU's shepherd-crook feed mods

S11 prime focus dish with F4DRU's mod & F6AJW's WR90/SMA original transition

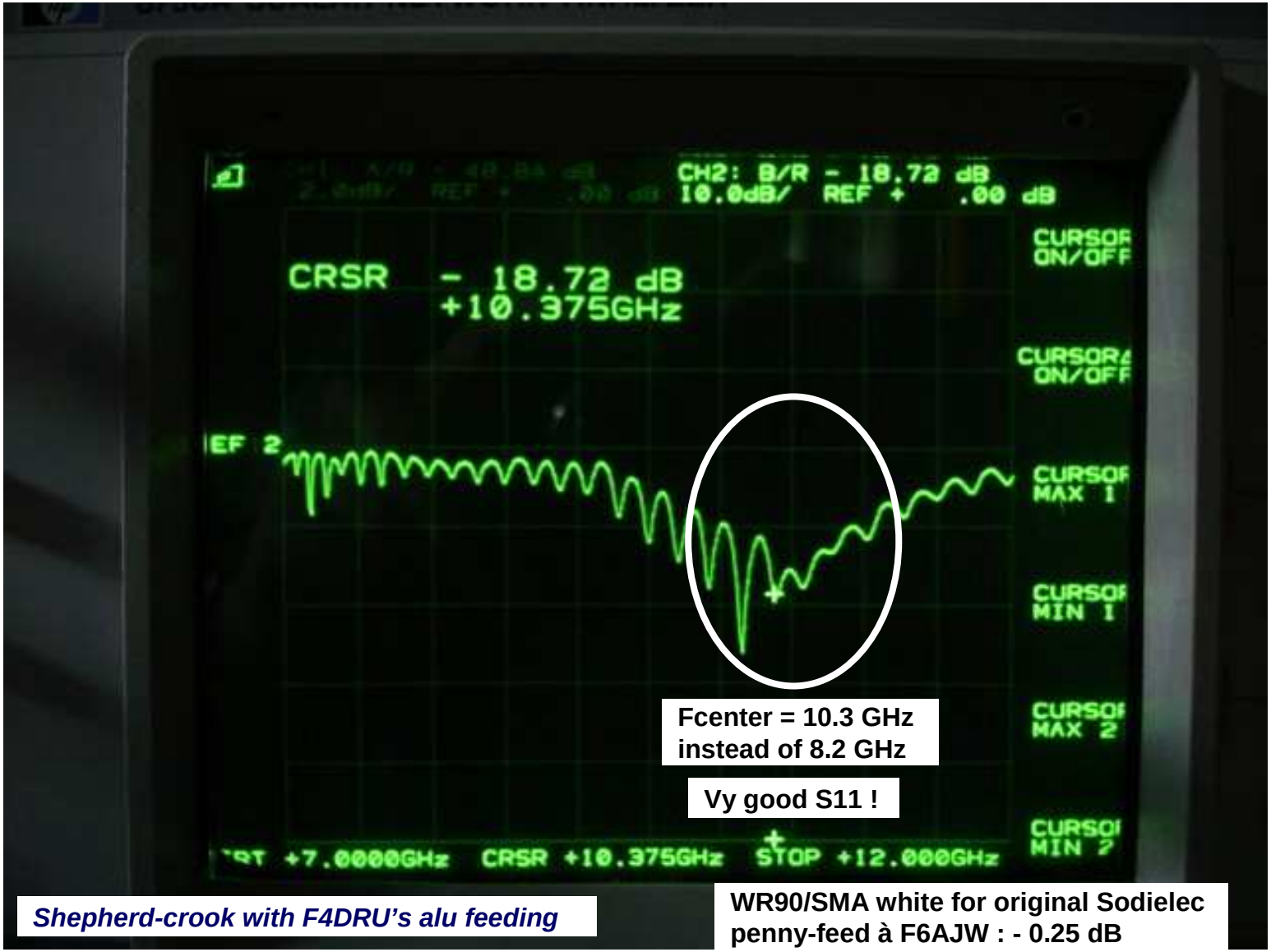
WR90/SMA white original Sodielec penny-feed à F6AJW : - 0.25 dB



Shepherd-crook with F4DRU's alu feeding

Meases of F4DRU's shepherd-crook feed mods

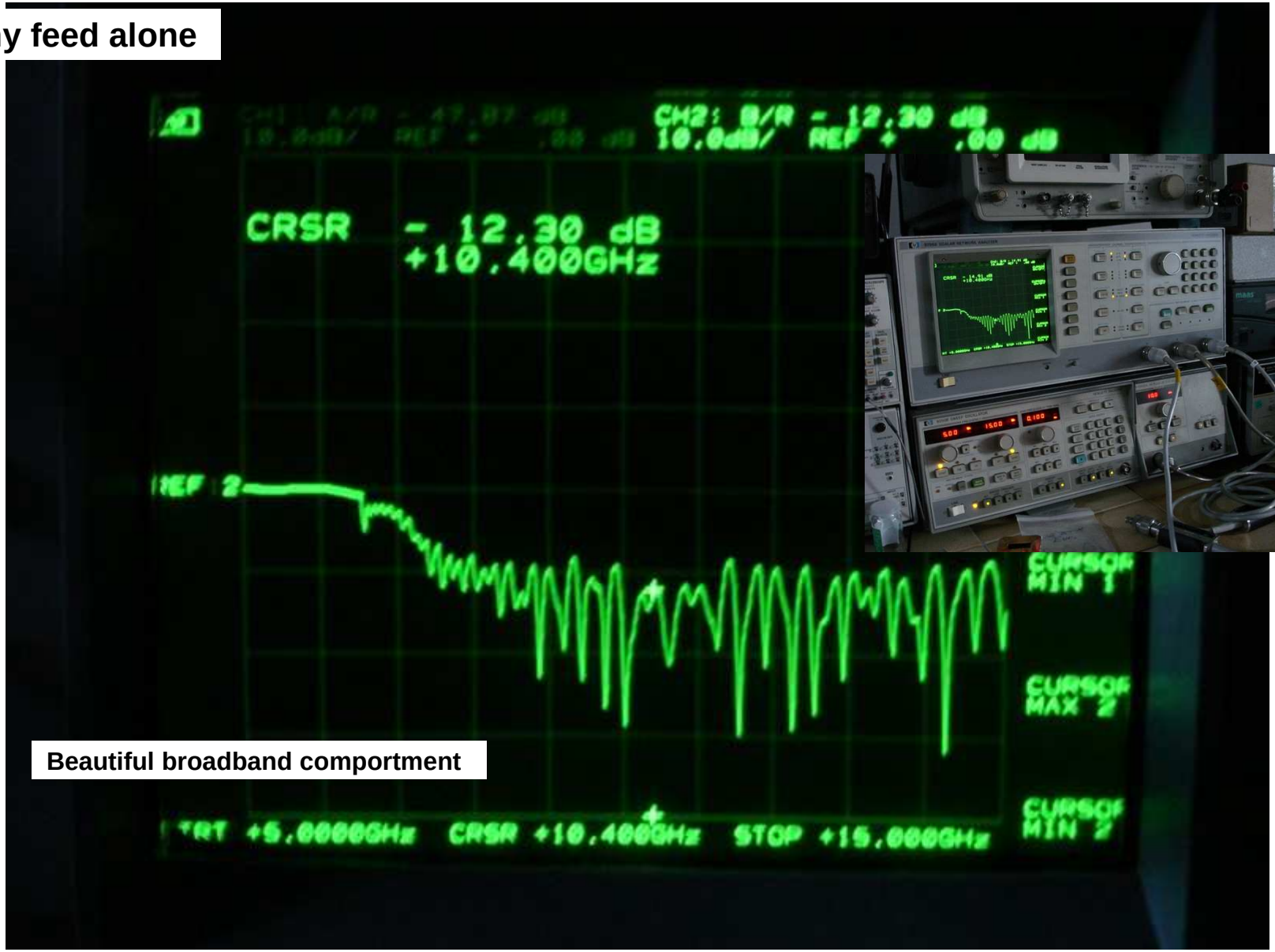
S11 prime focus dish with F4DRU's mod & F6AJW's WR90/SMA original transition



6- Measurements on Sodielec dish with penny-feed

Shepherd crook substituted by original Penny feed

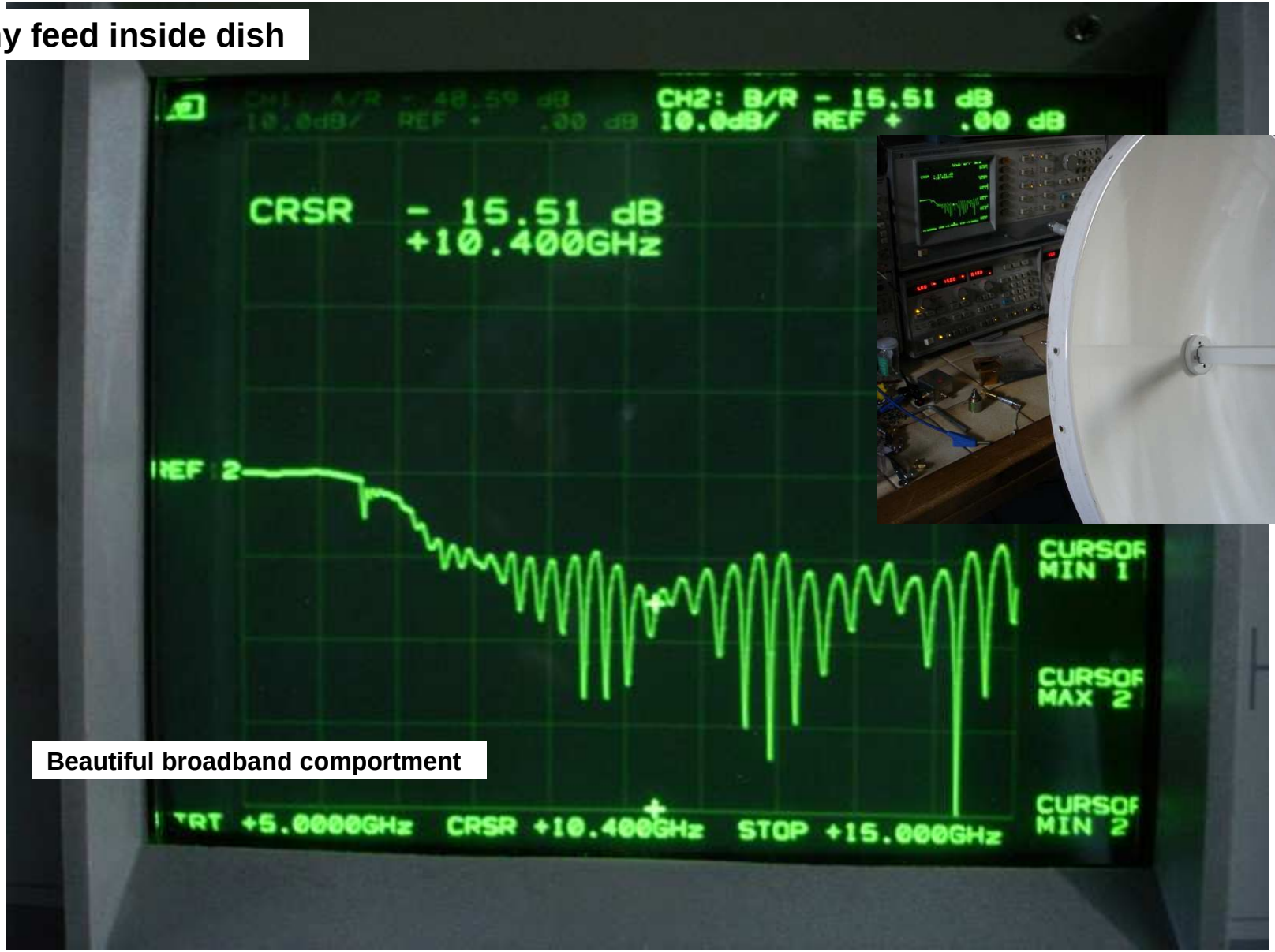
Penny feed alone



Beautiful broadband comportment

Shepherd crook substituted by original Penny feed

Penny feed inside dish

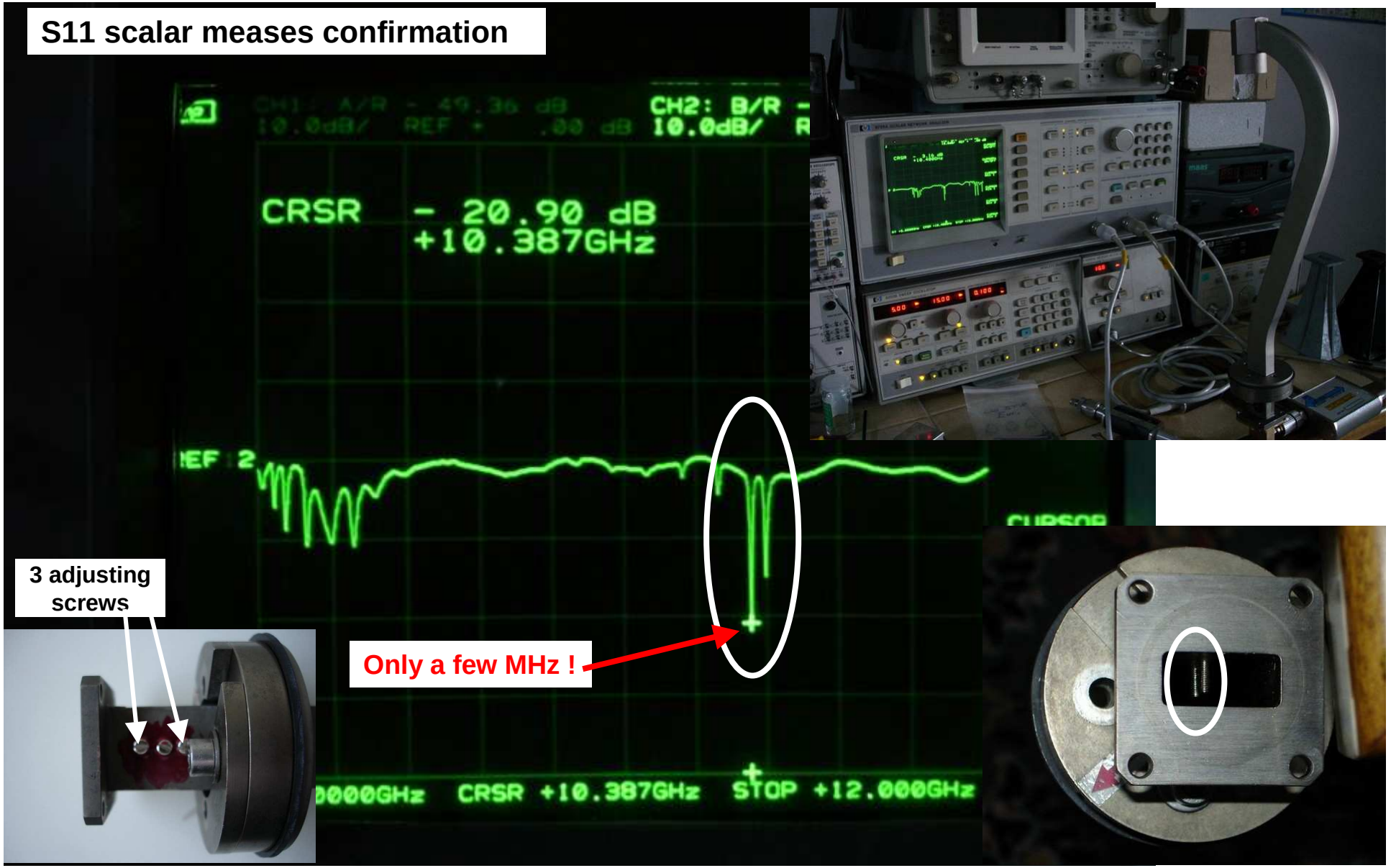


Beautiful broadband comportment

7- Practical mods done by F5FLN, F5AUW & F6CBC

Mods done on an HP 8719c VNA

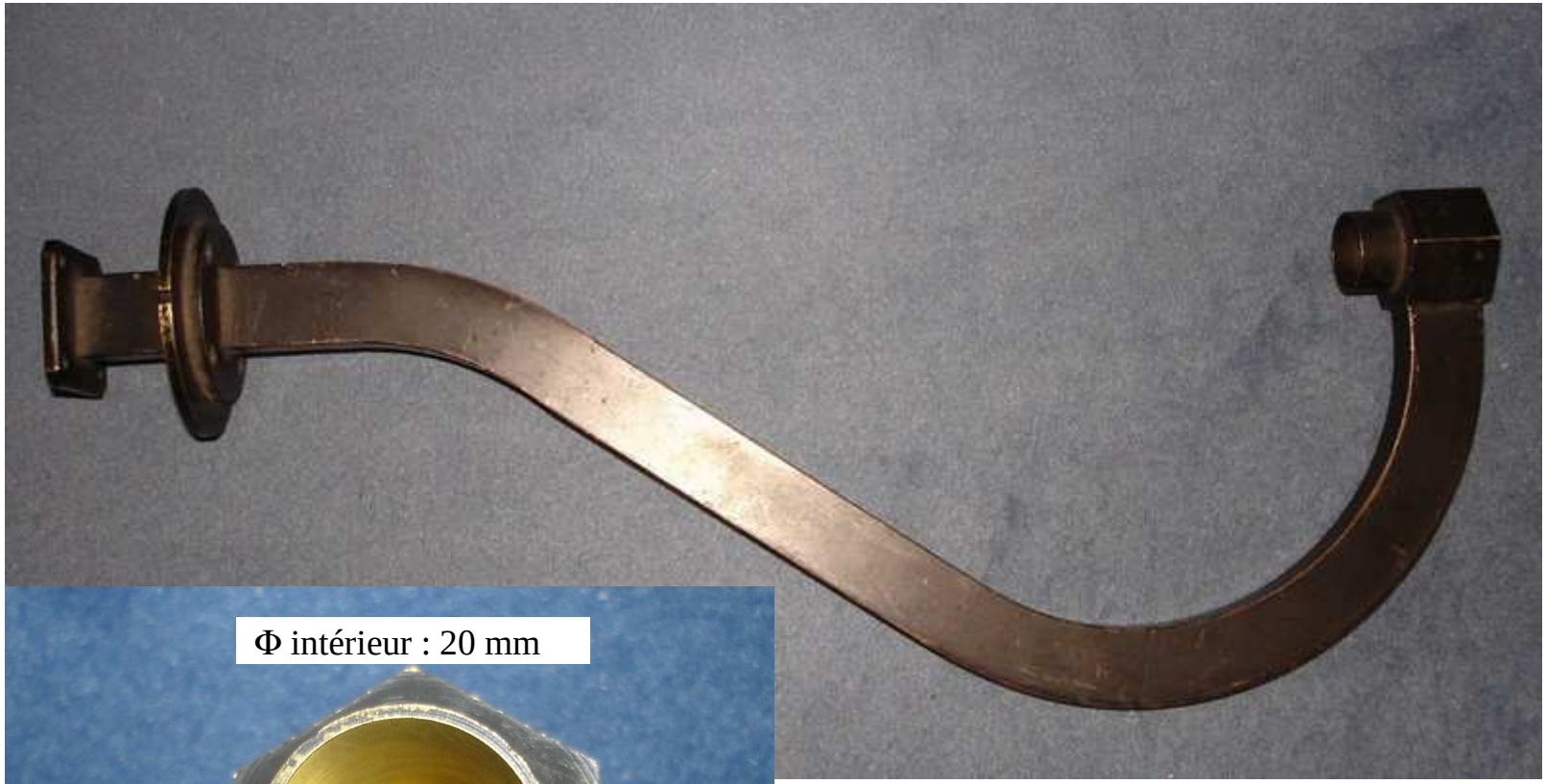
Solution of F5FLN, F5AUW & F6CBC

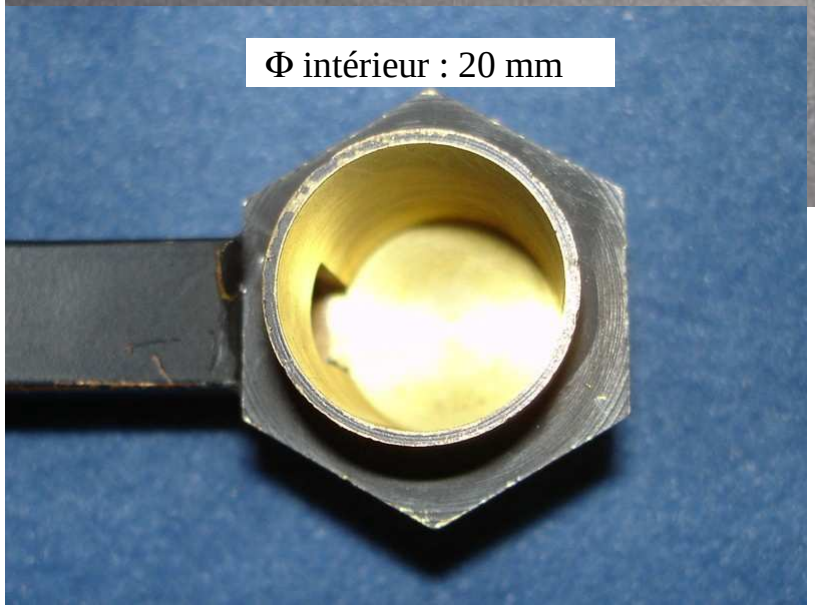


8- Original Sodielec manufacturer feed in WR75

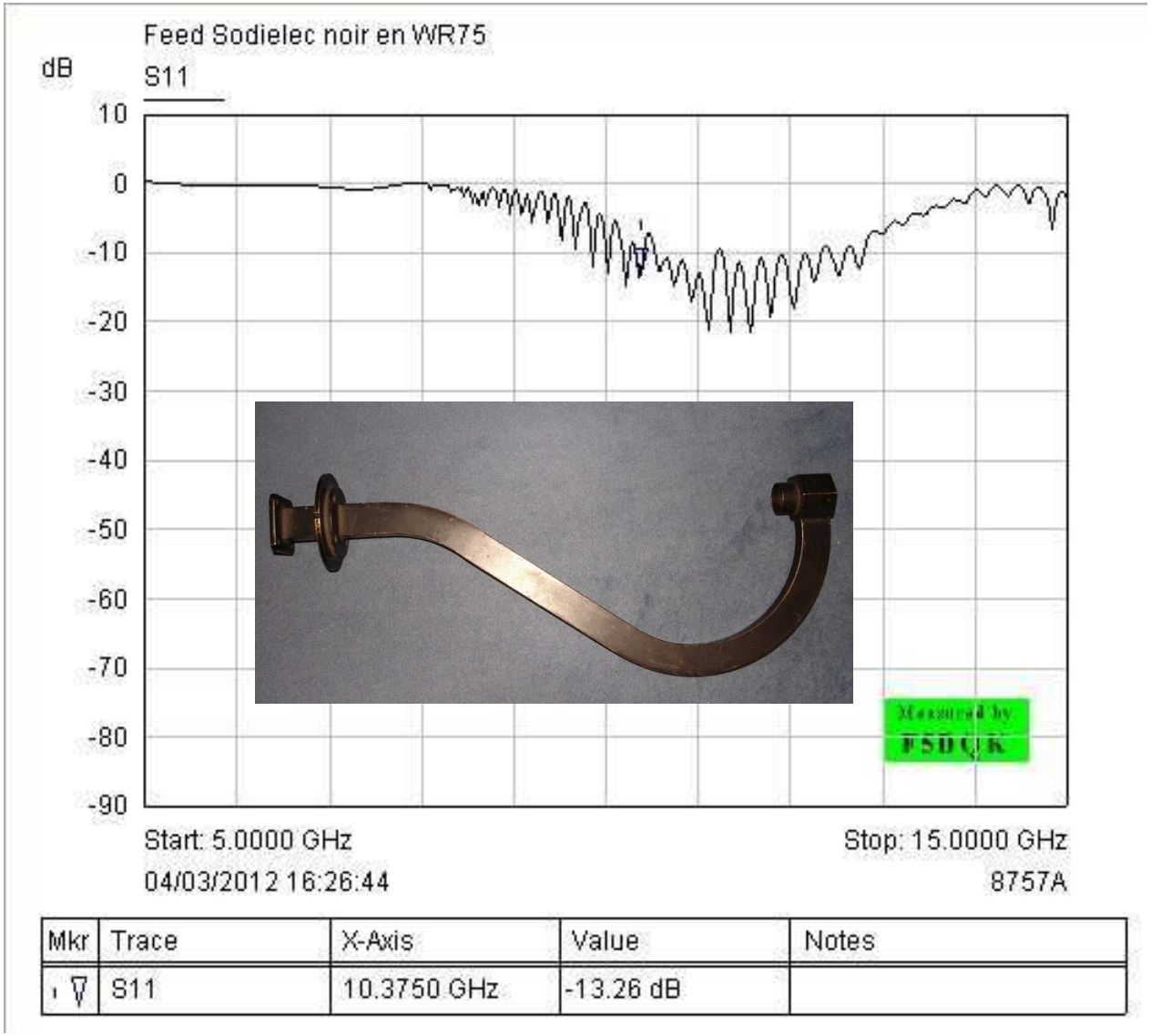
Special thanks to F6AJW

Original Sodielec WR75 Shepherd crook feed





Original Sodielec WR75 Shepherd crook feed



Mkr	Trace	X-Axis	Value	Notes
1 ▽	S11	10.3750 GHz	-13.26 dB	

9- Conclusion

Conclusion

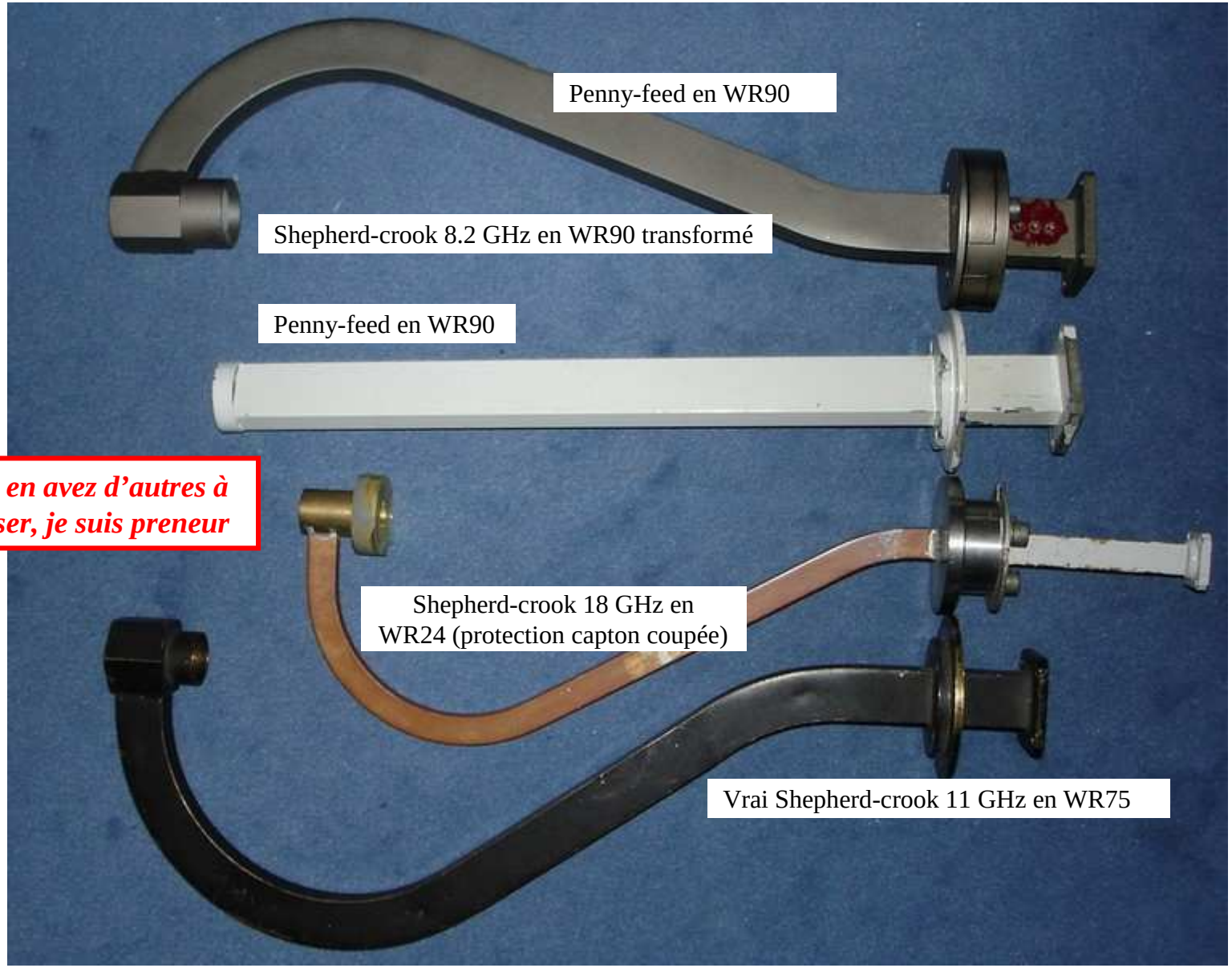
- Dish ensemble initially à 8.3 GHz : feed AND WR90/coax transition factory optimised

- Moving to 10.370 GHz is only done with efficiency by :
  fitting the shepherd-crook by an adequate aluminium piece **AND**
  Carefully choicing a good WR90/coax transition with minimal losses

But every modification improvement'll be really confirmed by solar gain measurements (done in a nearest future)

The manufacturer Shepherd-crook feed confirms the final good choice of the inside diameter feed

Annexe : les feeds Sodielec à disposition



Et si vous en avez d'autres à me proposer, je suis preneur