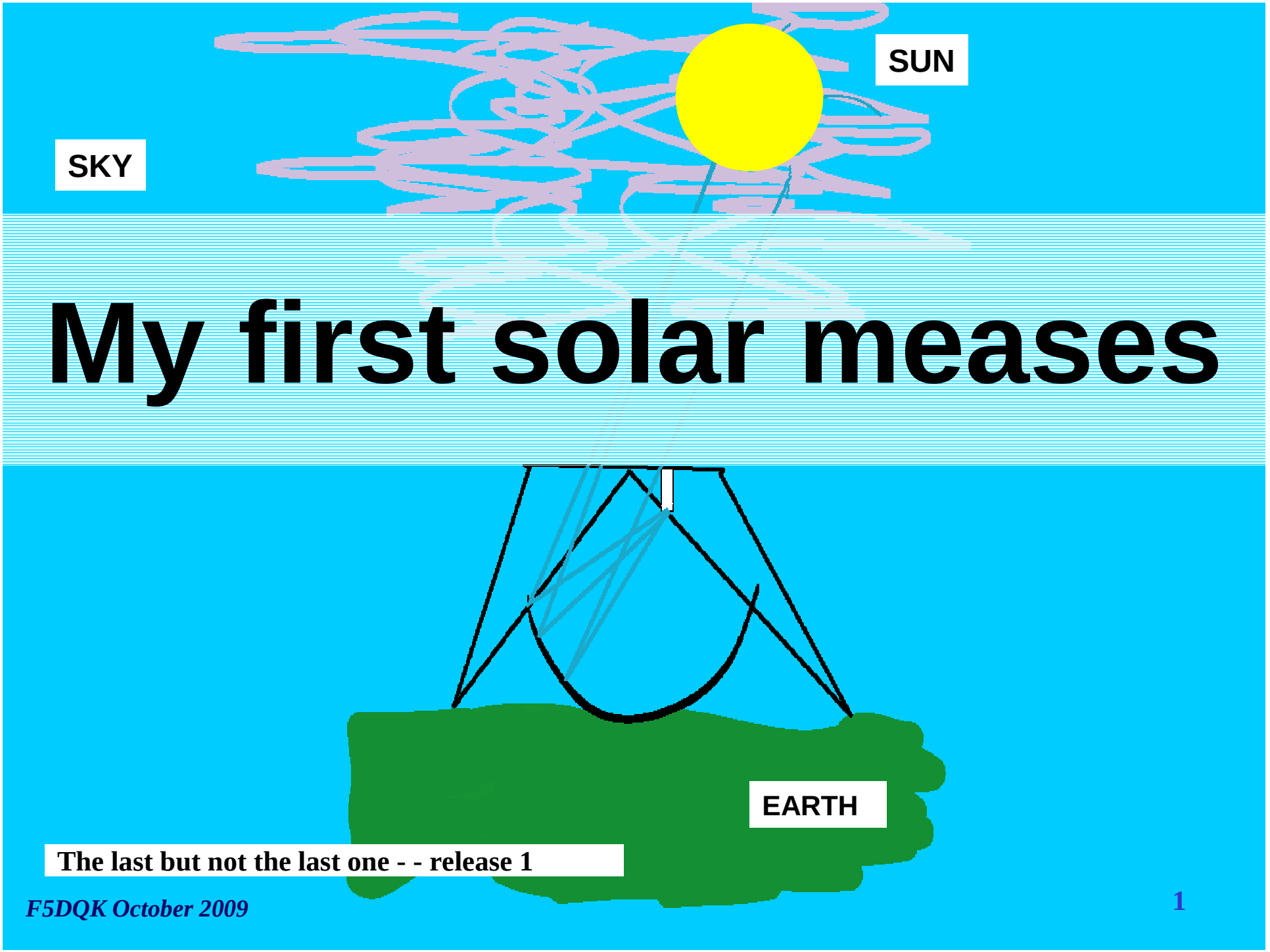


My first solar meases

The last but not the last one - - release 1

F5DQK October 2009

Summary

-A dish S11 behaviour better than 10 dB with a good regular broadband comportment is mandatory.
-But knowing its « on air » efficiency and gain is also mandatory.
-Because an anechoïc room can't be reached by everybody, the sun meas is the best alternative
-I'd look for the quickest alternatives to be QRV, but without any meases compromises

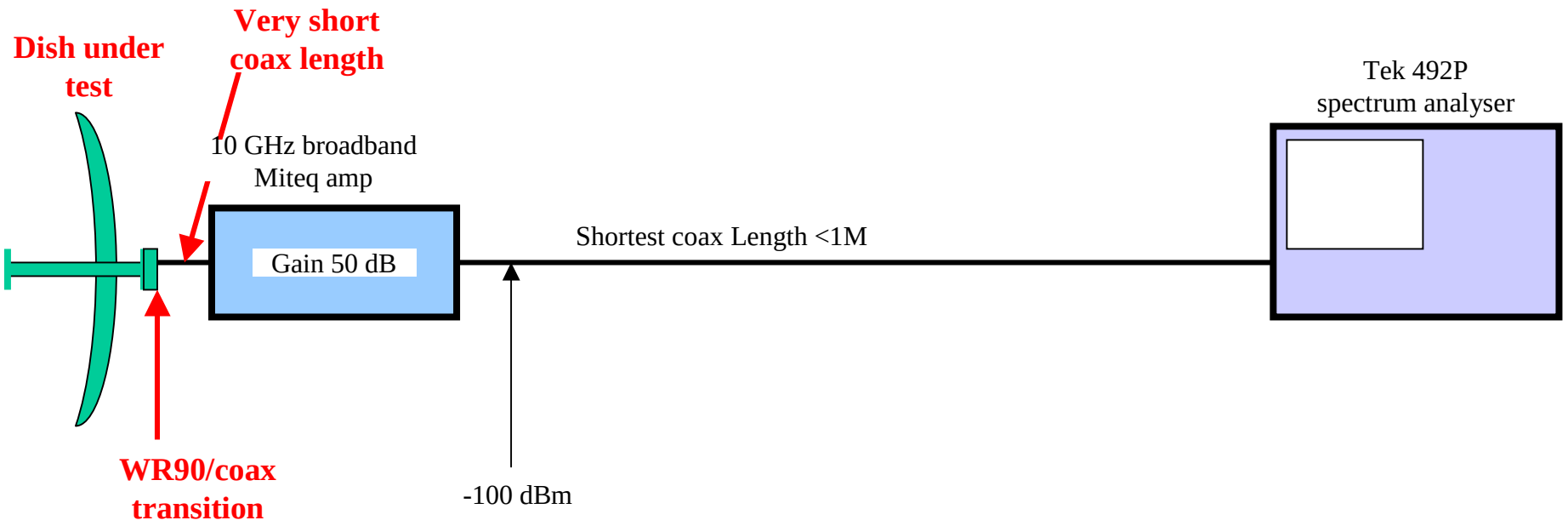
Abstract

1/ Dish direct meas setup directly à 10 GHz with spectrum analyser
2/ Behaviour à 144 MHz of a complete 10 GHz outdoor setup with spectrum analyser
G4DDK experiences
3/ Dishes meas setup à IF=144 MHz
a/ with 20 dB narrowband amp & spectrum analyser
b/ with 40 dB narrowband amps & HP power meter
4/ Dishes meas setup à IF=432 MHz
5/ Y factor measurements
6/ Sodielec shepherd-crook subsidiary aluminium peace (F4DRU)
7/ Expected & measured results
8/ Aknowledgements

1- Dish direct meases à 10 GHz with Tektronix 492P spectrum analyser

Direct meases à 10 GHz

Power measurement setup scheme

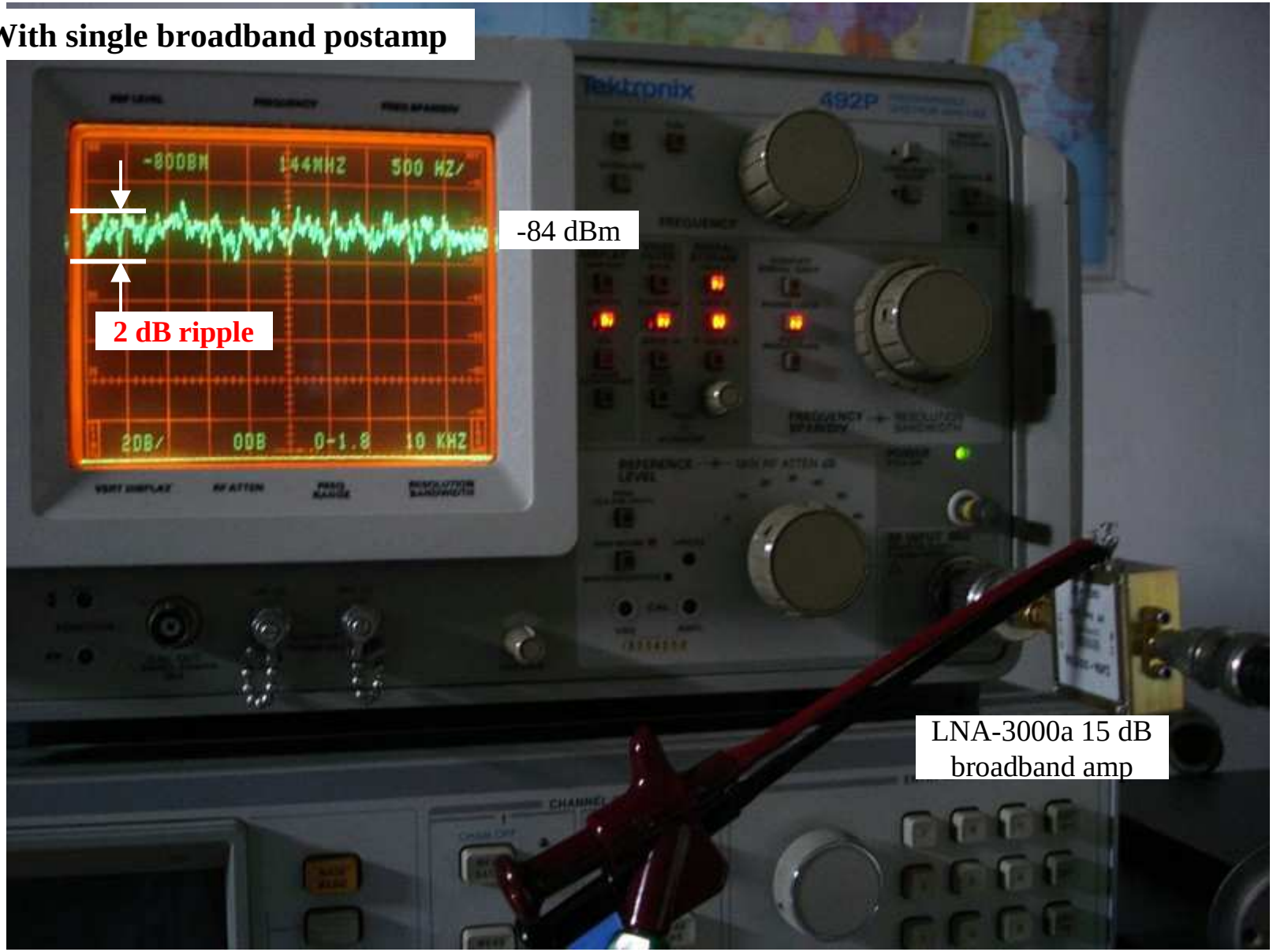


Direct meases à 10 GHz

2- Meases à 144 MHz with 10 GHz outdoor setup and spectrum analyser

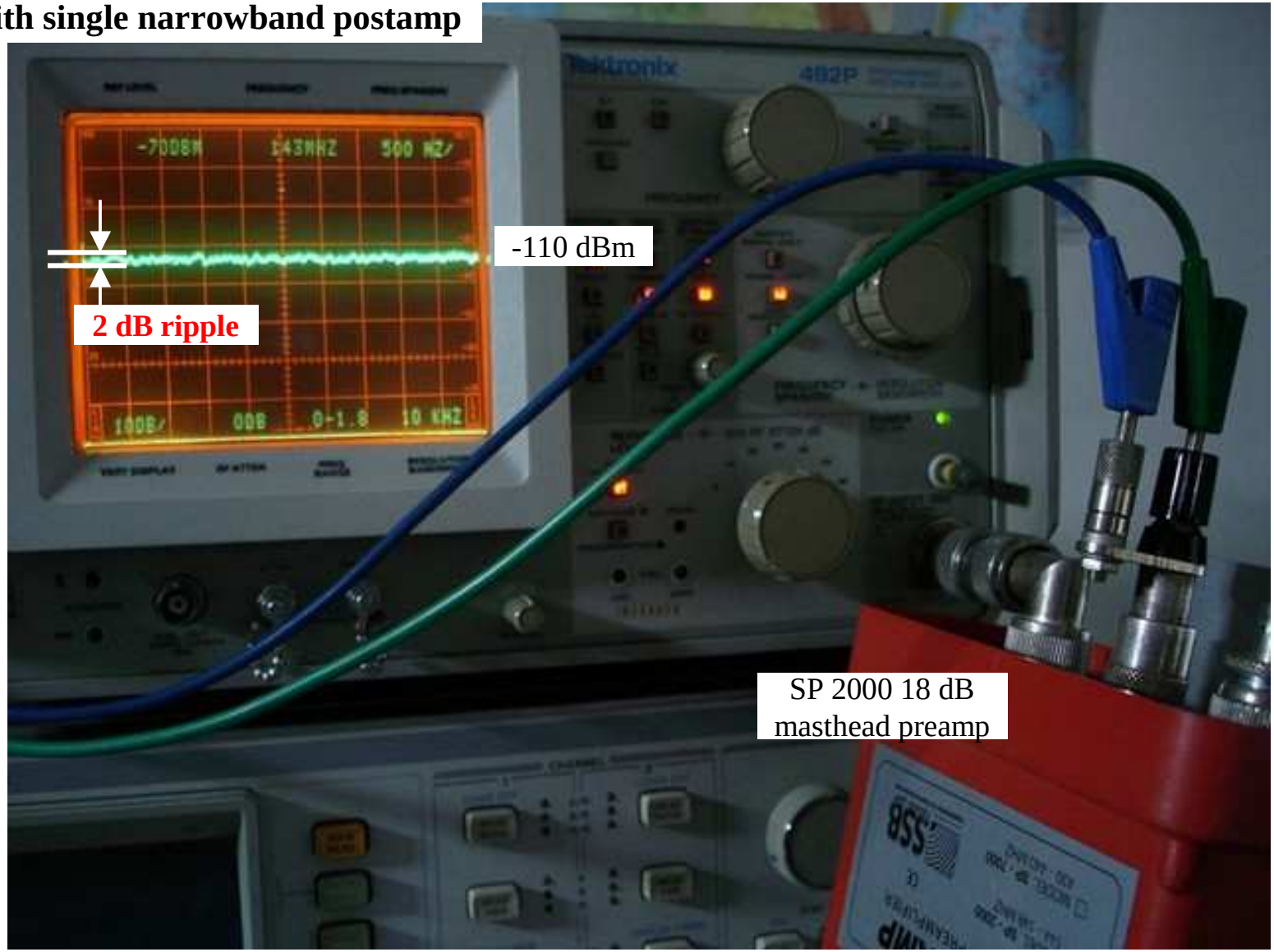
Dynamical behaviour of a complete outdoor setup on Versatower with :
-Procom dish
-DB6NT 22 dB Nf=0.8 dB preamp
-DB6NT 20 dB v3 transverter (10 GHz → 144 MHz)

10 GHz outdoor setup : IF meases à 144 MHz after preamplifier



10 GHz outdoor setup : IF meases à 144 MHz after preamplifier

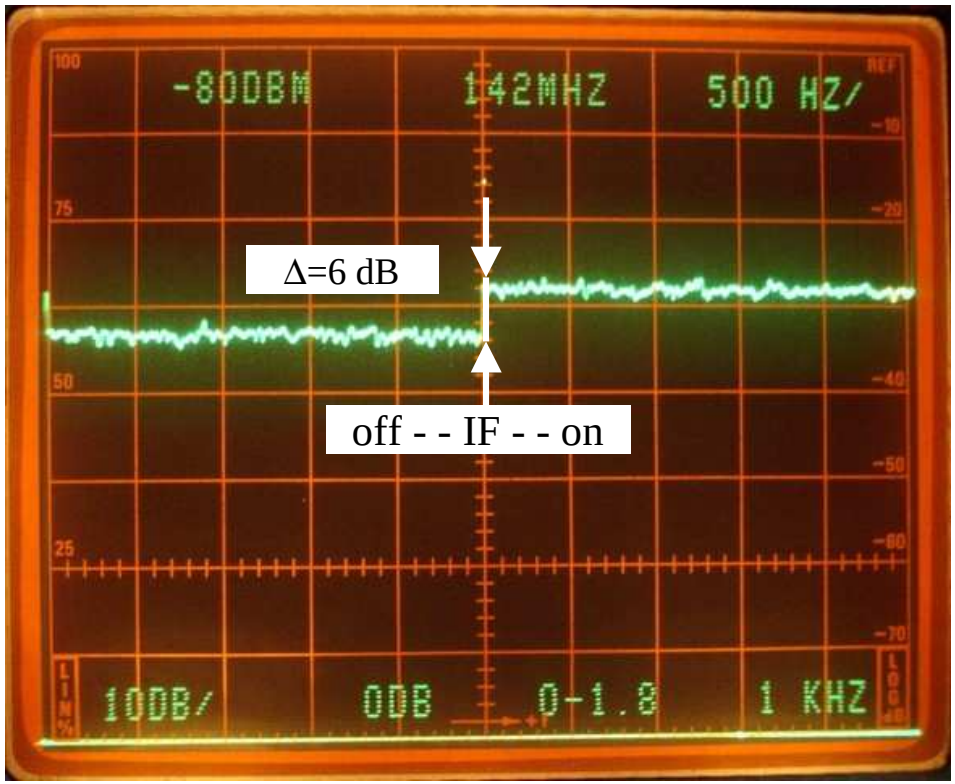
With single narrowband postamp



10 GHz outdoor setup : IF meases à 144 MHz after preamplifier

Noise meas à 144 MHz

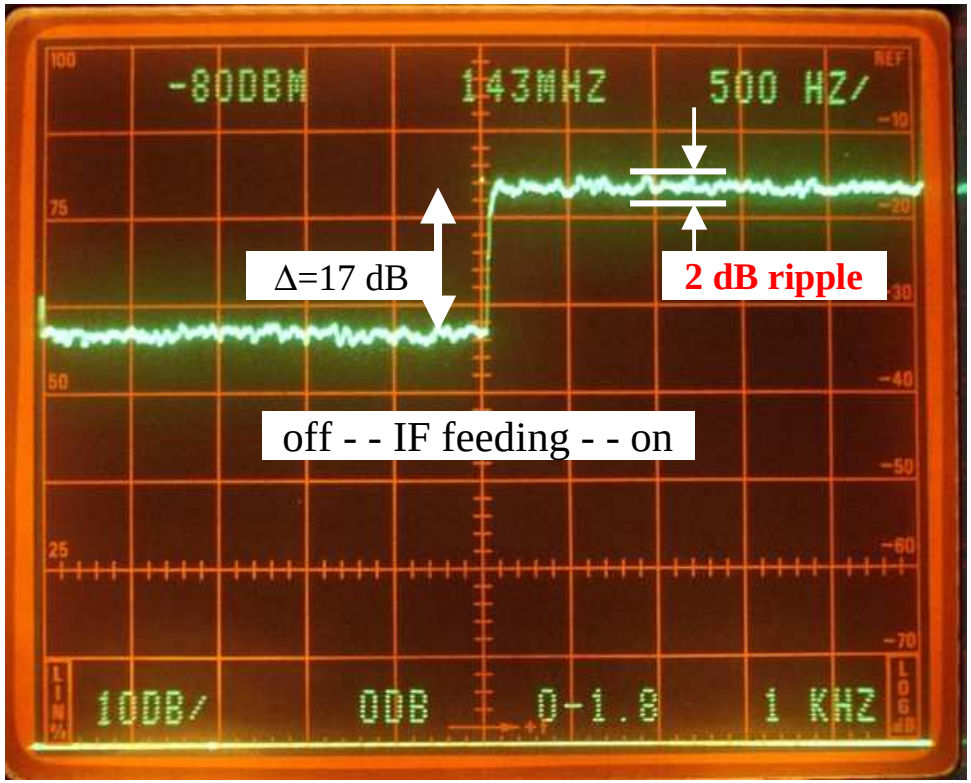
Without preamp



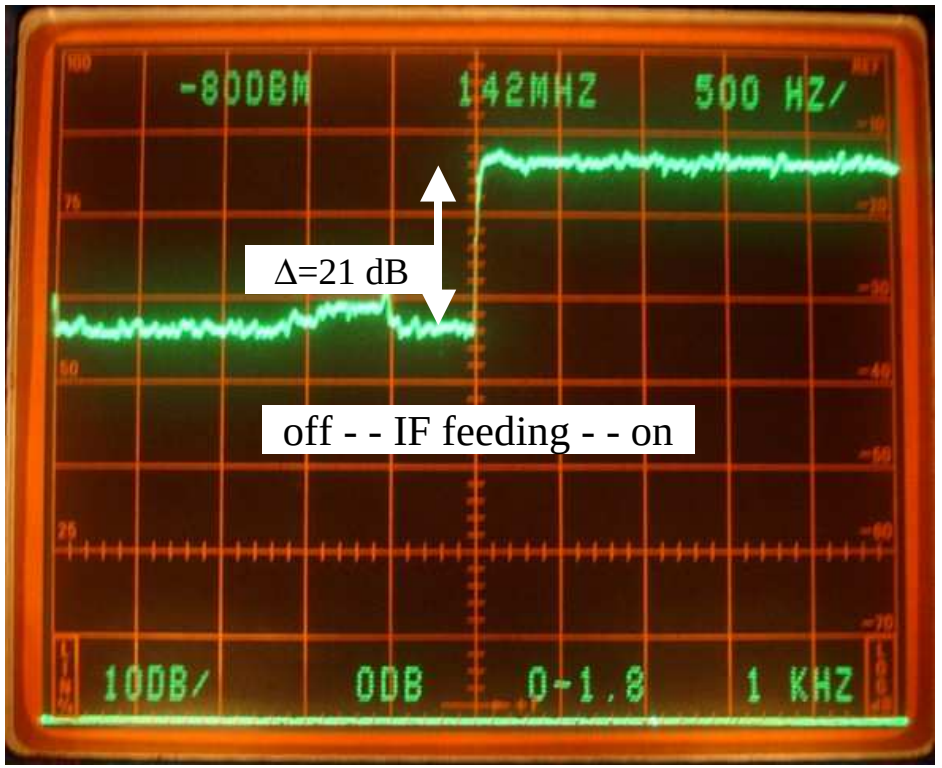
10 GHz outdoor setup : IF meases à 144 MHz after preamplifier

Noise meas à 144 MHz

With LNA-3000a broadband preamp



With 144 MHz SP-2000 preamp

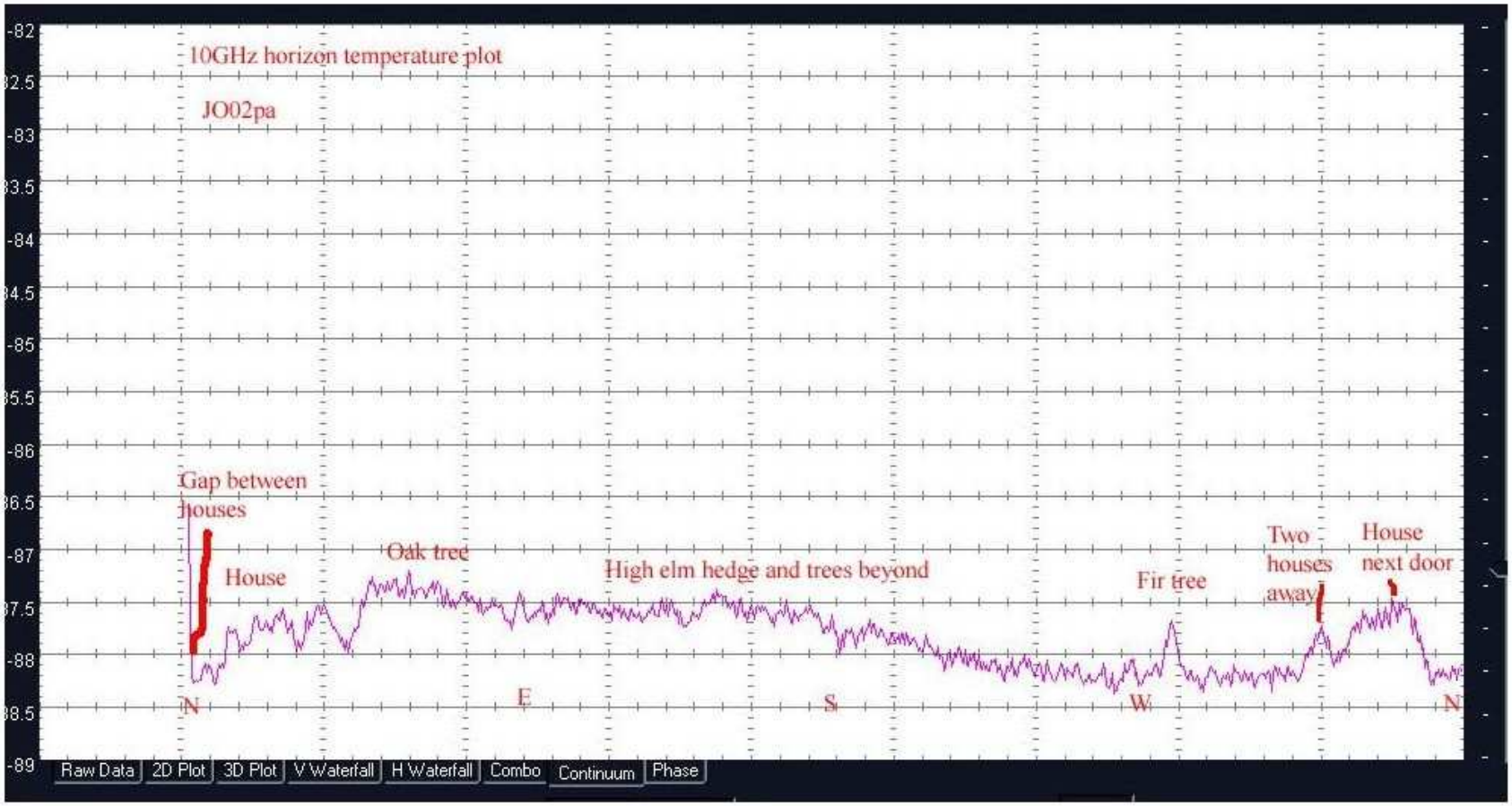


- The target of how the outdoor ensemble is living is achieved
- But a spectrum analyser doesn't seem directly applicable, only for dish sun meases (not enough meas accuraty AND ripple of more than 1 dB) !

10 GHz outdoor setup : IF meases à 144 MHz after preamplifier

Noise meas à 144 MHz

G4DDK did make by this way temperature horizon plots, using Spectravue on his SDR-IQ receiver at different frequencies : from 23 cm to the 3 cm band he « can see » every obstacle around his QTH like houses, trees, etc …



Have a look at http://www.btinternet.com/~jewell/10ghorizon.html

3- Dishes meas setup à 144 MHz

Measurements using :

-a/ Spectrum analyser

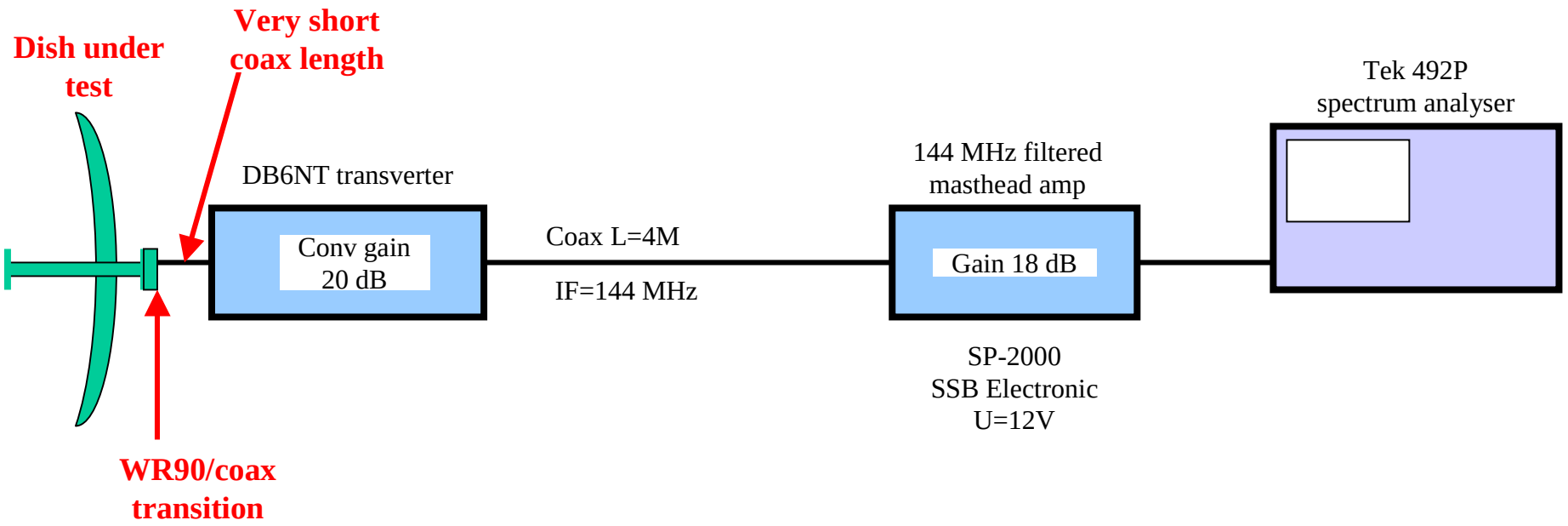
-b/ Power meter

-HP 435b with needle

-HP 436a digital

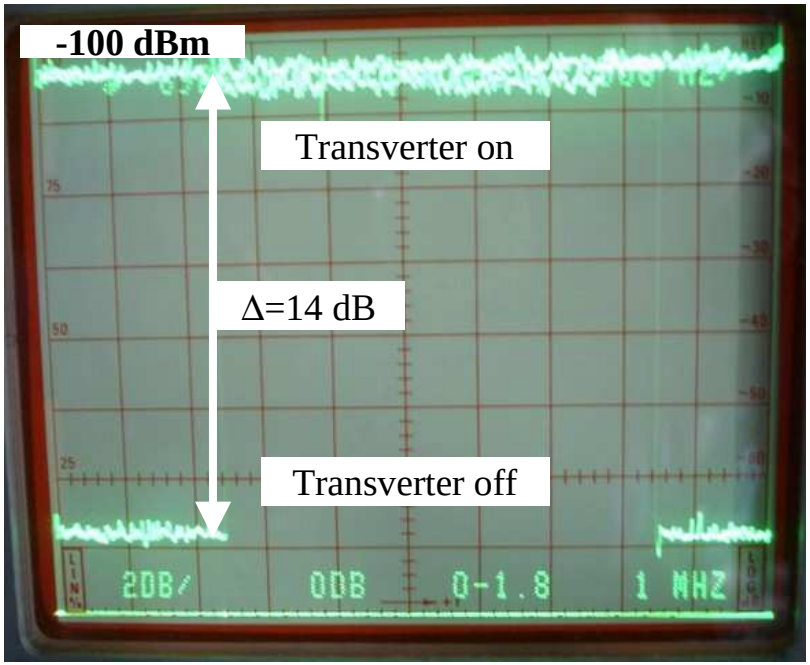
a/ Sun meases with Tektro 492P spectrum analyser

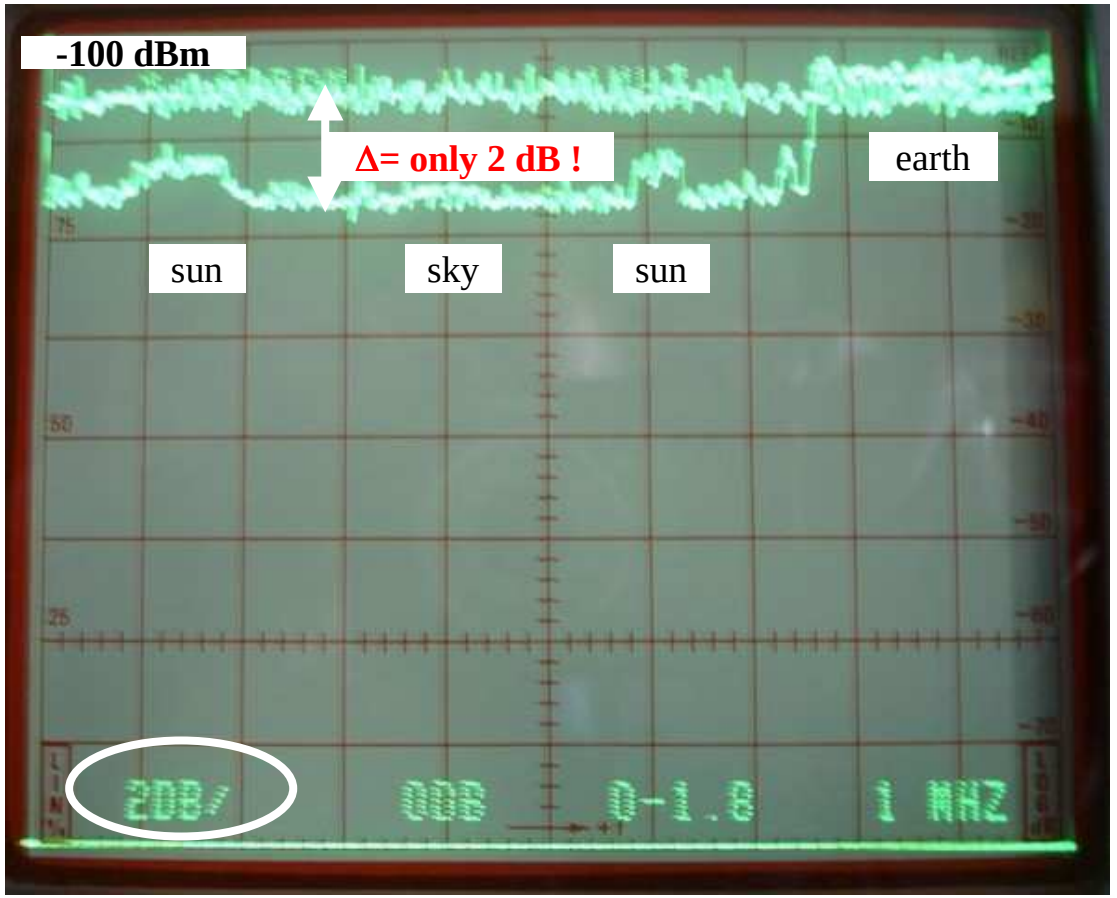
Power measurement setup scheme



a/ Sun meases with Tektro 492P spectrum analyser

Noise meas à 144 MHz and SP-2000 preamp

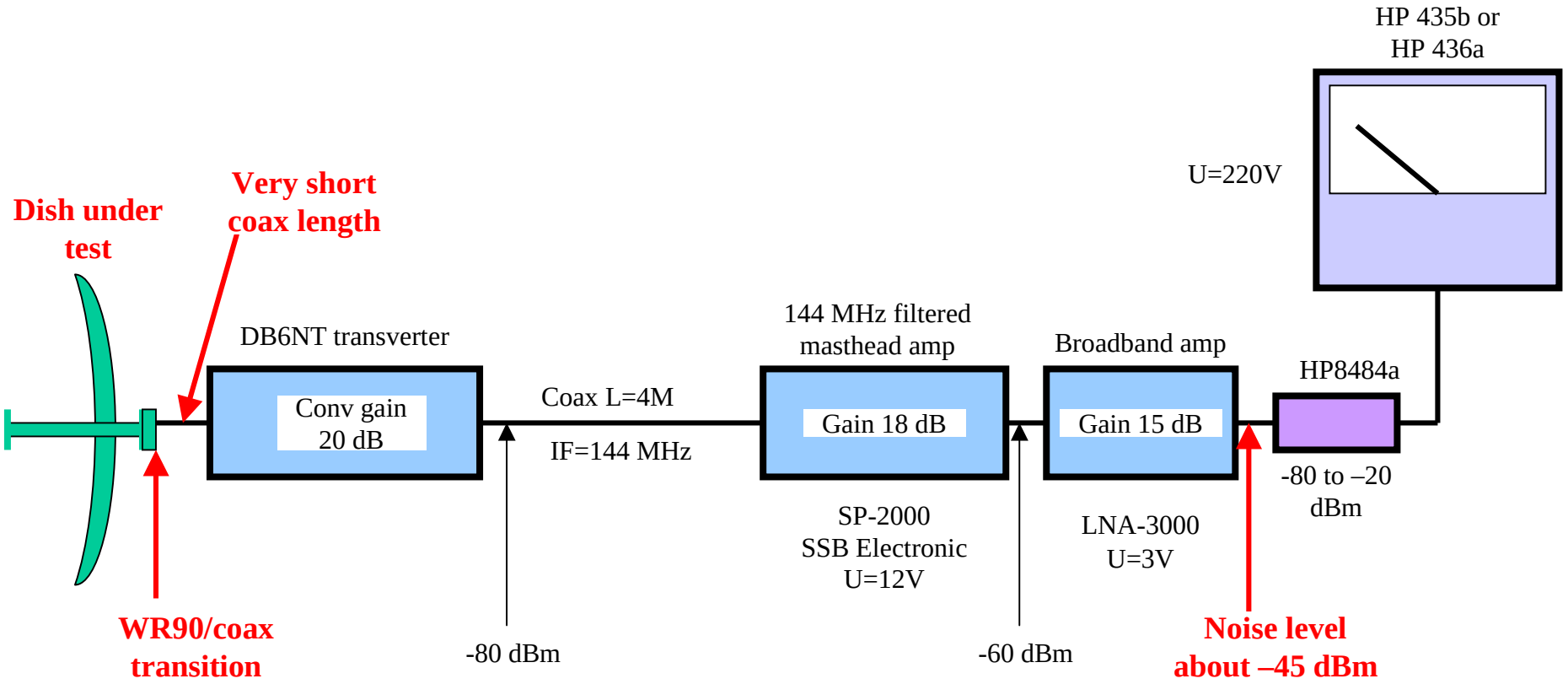




Improper noise measurement precision with a minimum of about 0.5 dB ripple

b/ Sun meases with power meter

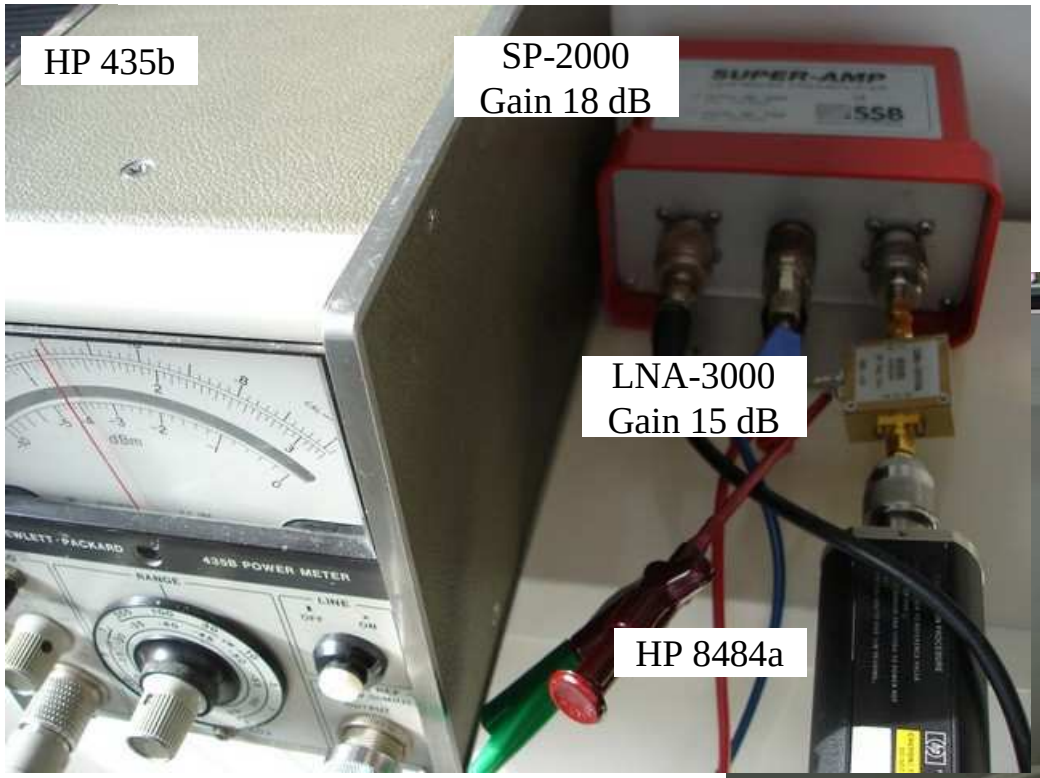
Power measurement setup scheme à IF=144 MHz

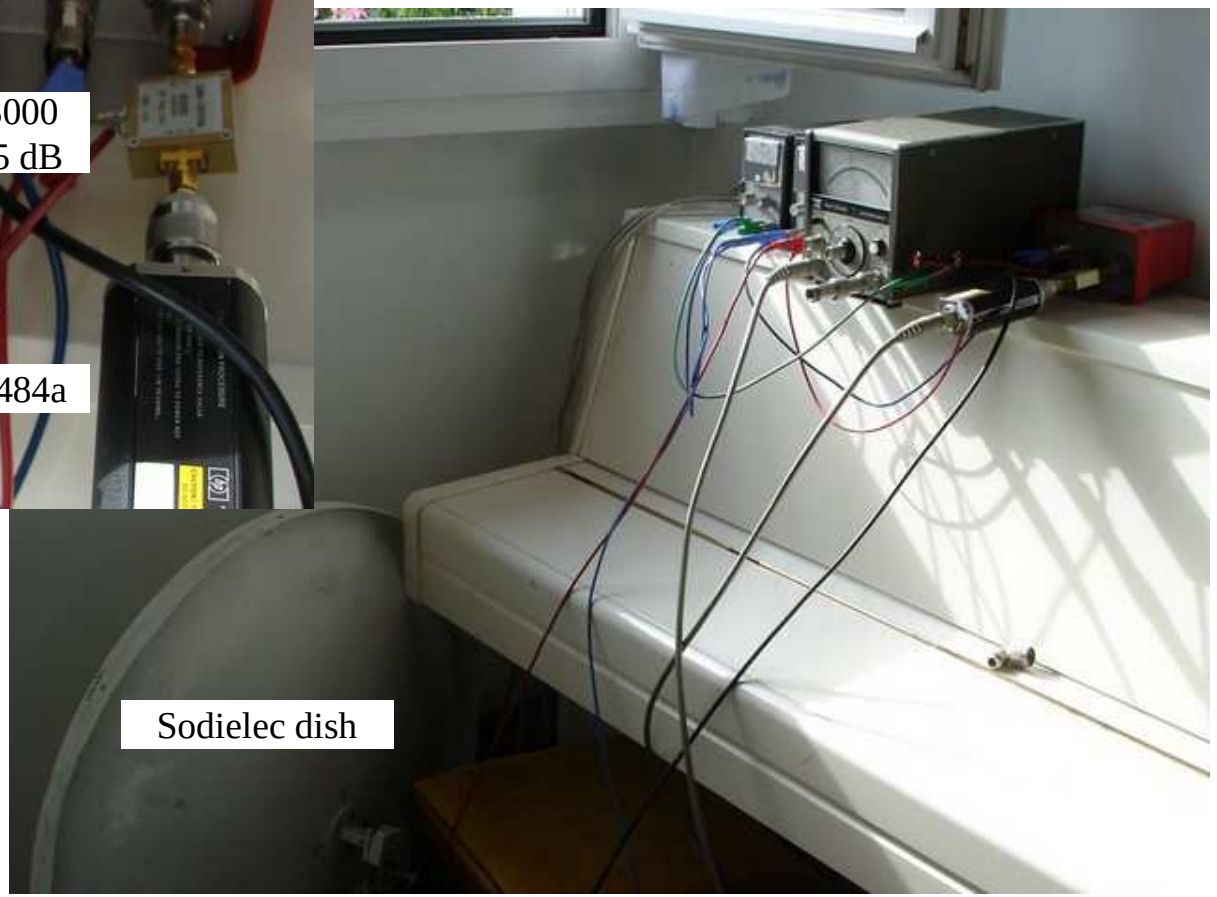


- For optimal precision, the 1st 144 MHz amp must be seriously bandpass filtered in order to reject all transverter spuriouses like the LO and image frequencies !!
- One 144 MHz masthead preamp as 1st amp is really the quickest solution

b/ Sun meases with power meter

1st measurement setup with HP 435b needle power meter





Total filtered post gain = 33 dB à 144 MHz

b/ Sun meases with power meter

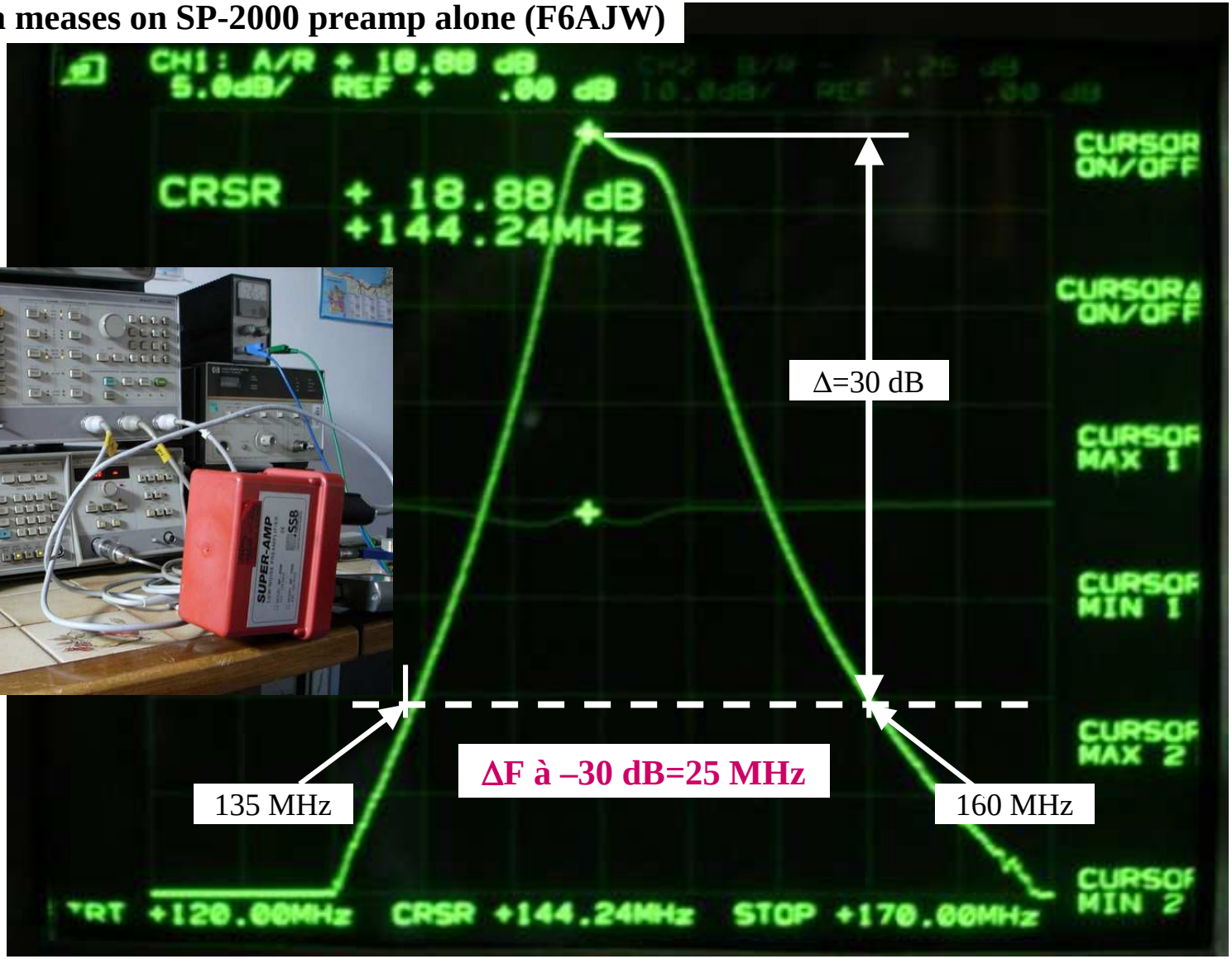
2nd measurement setup with HP 436b digital power meter with relative dB(REF) function

Advantage of HP 436a : the 0 dB reference level, giving directly the dB difference value !

- Far better Y precision meas achieved with dB (REF) button depressed
- 1st meas pointed to the sky

b/ Sun meases with power meter

Gain meases on SP-2000 preamp alone (F6AJW)

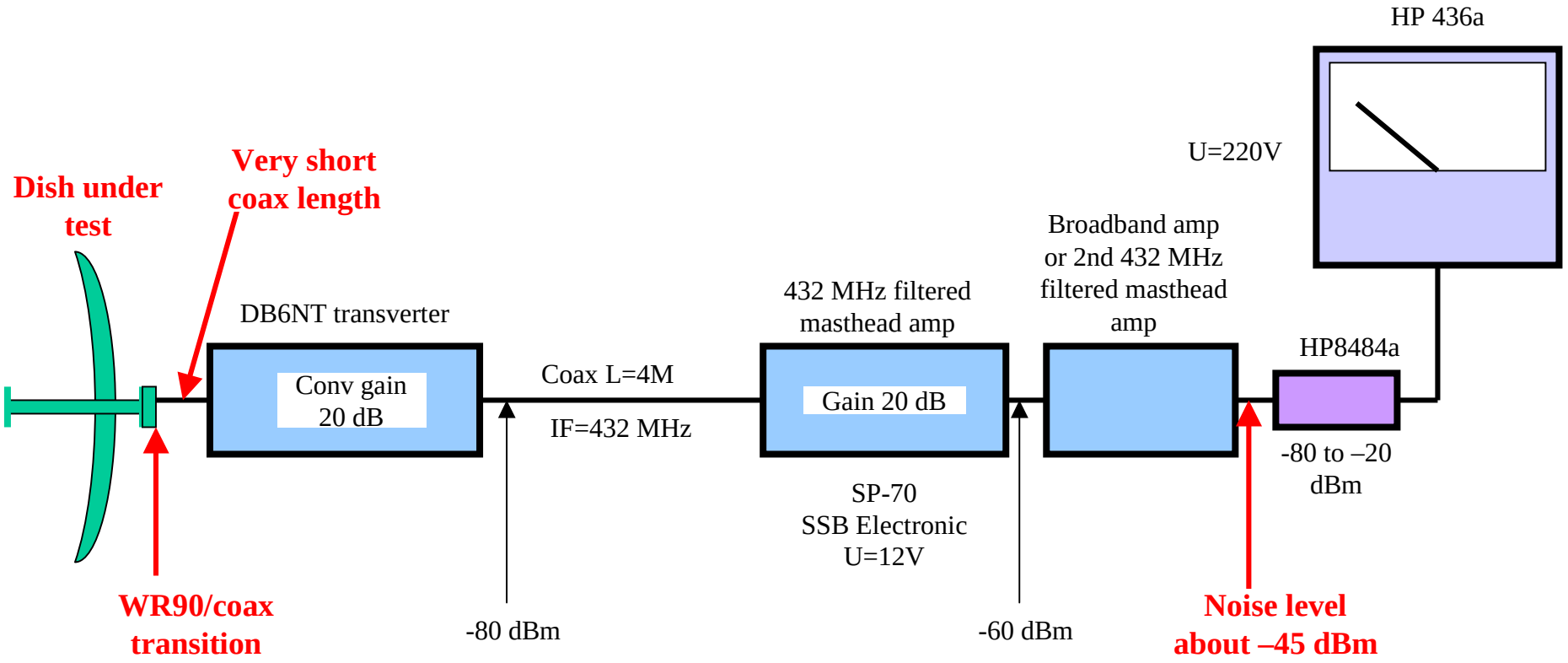


4- Dishes meas setup à 432 MHz

Measurements using the HP 436a power meter :

Sun meases with digital 436a power meter

Power measurement setup scheme à IF=432 MHz



- For optimal precision, the 1st 432 MHz amp must be seriously bandpass filtered in order to reject all transverter spuriouses like the LO and image frequencies !!
- One 432 MHz masthead preamp as 1st preamp is really the quickest solution

Sun meases with digital 436a power meter

Power measurement setup scheme à IF=432 MHz

To be done ASAP

5- Y factor measurement results

b/ Y factor meases

Measurements with HP 435b power meter and (SP-2000 + LNA-3000) chain

Sodielec Penny-feed Φ73 cm	**SMA transition**	**Ground (dBm)**	**Sun (dBm)**	**Sky (dBm)**	**Y (sun-sky) dB**	**Y (gnd-sky) dB**
	F6AJW white	-45.6	-45.5	-48.2	2.6	2.7
	F6AJW white	-45	-45	-47.8	2.8	2.8
	F6AJW white	-44	-43.8	-46.8	3.0	2.8

Sodielec shepherd crook Φ73 cm F1CNE	**SMA transition**	**Ground (dBm)**	**Sun (dBm)**	**Sky (dBm)**	**Y (sun-sky) dB**	**Y (gnd-sky) dB**
	SMA F1CNE	-41	?	-42.5	??	1.6
	F6AJW white	-47	?	-48.8	??	1.8

Sodielec shepherd crook Φ73 cm F4DRU (+Alu piece or not)	**SMA transition**	**Ground (dBm)**	**Sun (dBm)**	**Sky (dBm)**	**Y (sun-sky) dB**	**Y (gnd-sky) dB**
+ aluminium piece	F6AJW white	-45	?	-47.7	??	2.7
without aluminium piece	F6AJW white	-48.8	?	-49.2	??	0.4 !

Thomson RL-18-A (Φ60 cm Procom copy)	**SMA transition**	**Ground (dBm)**	**Sun (dBm)**	**Sky (dBm)**	**Y (sun-sky) dB**	**Y (sun-sky) dB**
	Procom gold	-45.2	-46	-47.9	1.9	1.9

b/ Y factor meases

Measurements with digital HP 436a digital power meter and (SP-2000 + LNA-3000) chain

Sodielec Φ73 with shepherd crook from :	**WR90 / coax transition**	**Trans losses à 10.4 GHz (dB)**	**Y (sun-sky) dB**	**Y (gnd-sky) dB**
Original	N		**0.4**	0.6 / 0.6
F1CNE (little ring in feed)	F1CNE's SMA	0.45	**2.3**	2.35 / 2.60
F4DRU (thick alu piece in feed)	F4DRU's N without screw	0.65	**2.3**	2.15 / 2.3
F4DRU (thick alu piece in feed)	F4DRU's N + optimized screw	0.4	**2.82**	2.65 / 2.76
F4DRU (thick alu piece in feed)	F6AJW's white SMA	0.25	**2.95**	2.9 / 3.05
F4DRU (thick alu piece in feed)	Procom SMA golded	0.18	**3.15**	2.98 / 3.05
F4DRU (thick alu piece in feed)	AMC1081 Atlantic microwave	< 0.1	**3.25**	2.95 / 3.15

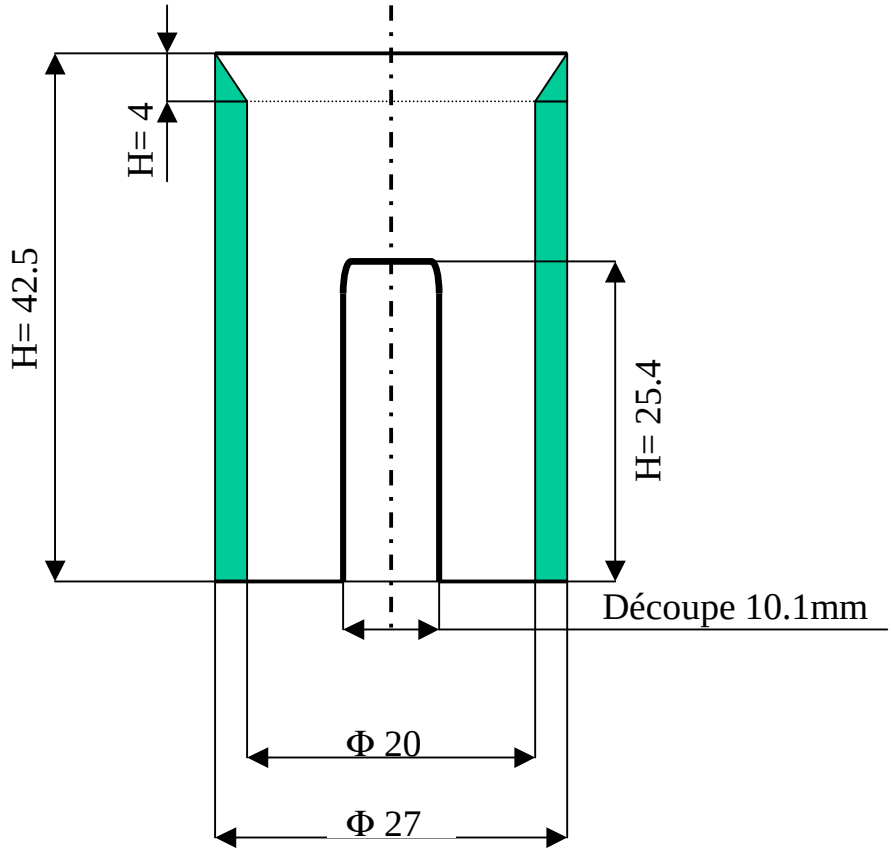
Sodielec Φ73 with penny-feed (F6AJW)	F6AJW's white SMA	0.25	**3.0**	2.7 / 3
	SMA orig. Procom	0.18	**3.02**	2.62.85

Thomson RL-18-A (Φ60 Procom copy)	F6AJW's white SMA	0.25	**?**	?
	SMA orig. Procom	0.18	**1.85**	2.65 / 2.8

RTC horn	SMA orig. Procom	0.18	**0.4 ??**	3.8 / 4.1

6- Additional aluminium peace for the Sodielec shepherd crook adaptation

Sodielec shepherd-crook improvement with additional piece



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

7- Expected & measured results ! !

b/ Y factor expected & measured

Expected and real measurement results

Prime-focus Φ (cm)	Expected Yss (dB)	Dish measured	Measured Yss (dB)
60	2.5	60 cm Procom copy	1.85
72	3	72 cm Sodielec penny-feed	3.0
90	5 à 5.2	?	?
120	7.5 à 8	?	?

Dish Φ (cm)	Prime/offset	Gain (dBi)	Y-factor	Theoric Y-factor dB
60	Offset	34.8	3.5	1.8
80	Offset	37.1	2	2
90				
120				

8- Aknowledments

Aknowledgements

Without the geat help of these hams, the sun measures weren't be possible without the help from :
- Jacques F6AJW
- Denis F1CNE
- Yoann F4DRU

Special thanks for there great contribution

References

Revue Seigy 2008 Proceeding (CJ)
- Mesures ciel froid/sol et soleil/ciel froid – Gilles F5JGY