22GHz ARRAY DEVELOPMENT: JANUARY-MAY 2003 PERIOD, SUBPROJECT 2

- MMIC PACKAGING
- POLARIZER/OMT
- DEWAR
- CARBON FIBER FOR THE HORN?
- LINKING THE ARRAY TO THE BACK END

MMIC PACKAGING

- Affect the LNA performance
- Brass material as carrier not usable for cryogenic LNA
- Choose an alloy having high thermal/electrical conductivity and CTE near CTE_{InP}
- A survey on various kind of alloy was done
- K-connector will be used (faster solution than waveguide)

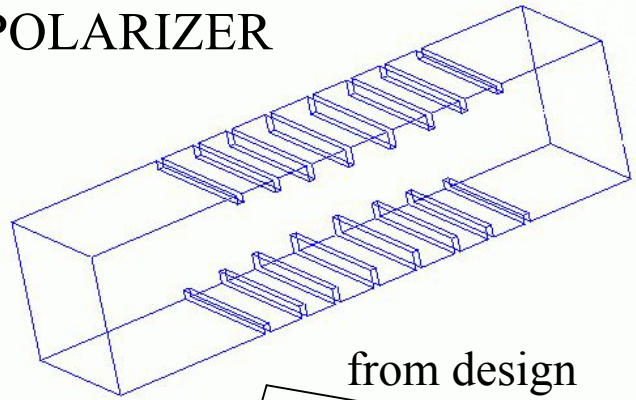
	CTE μm/m/°C	**Thermal Conductivity**. [W/m*K] @ 25°C	**γ** [%IACS]
Cu	17.8	398	100
InP	4.5	68	
Brass	>12	>120	4
Kovar	5.3	17	2.2
SPM Silvar-K™	-7	110	18
SMI – CEC W_{90}/Cu_{10}	-6.5	202	42
Osprey Si_{30}/Al_{70}	-6.5	180	1.7

- There is a representative in Italy

POLARIZER/OMT

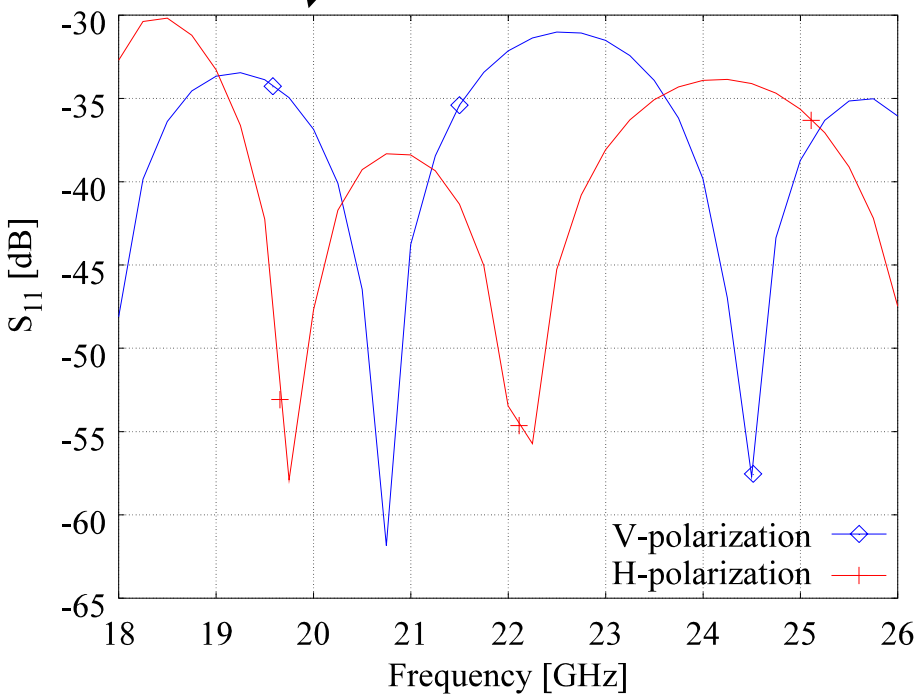
- Iris Polarizer: - square waveguide
  - 8 irises
  - prototype under construction
- Transitions: design completed
- OMT: design under optimization, type *dual junction*

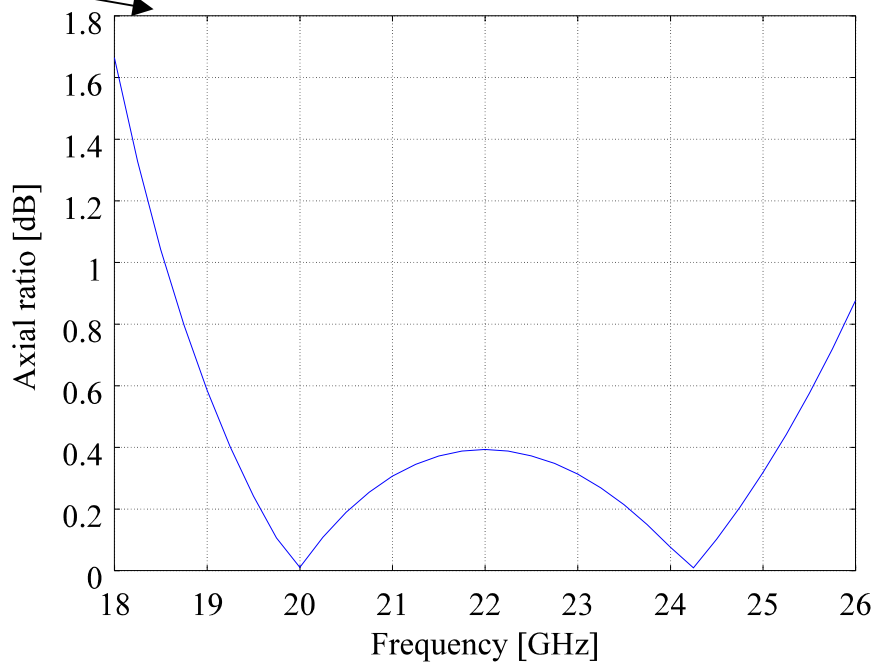
POLARIZER

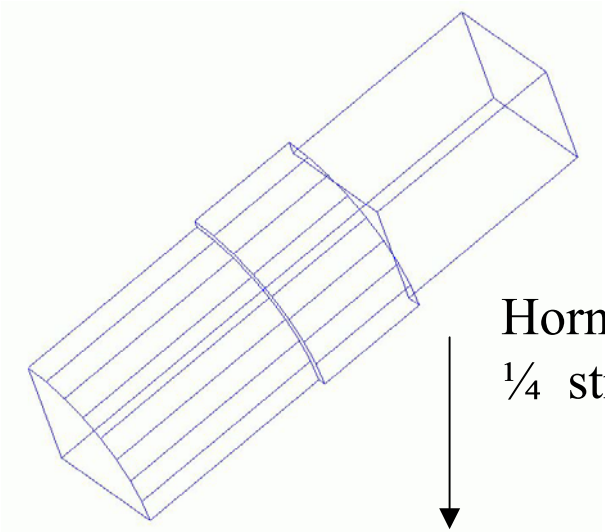


from design

Pol. dimension: 40x18x18 mm
Pol. Wguide dim.: 40x11.4x11.4 mm
Iris thickness: 0.5 mm
Iris depth: 0.7 to 1.5 mm
Horn/Pol trans. dim.: 10x18x18 mm
Pol/omt trans. dim: 15x20x20 mm
Omt dimension: 80x50x50mm (estimate)

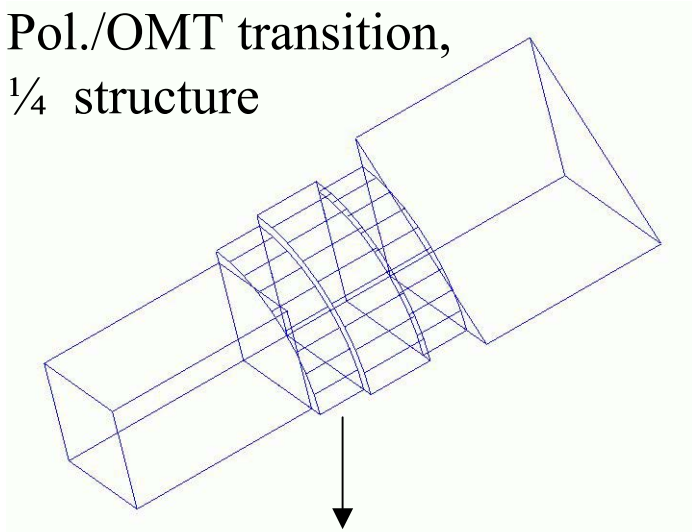


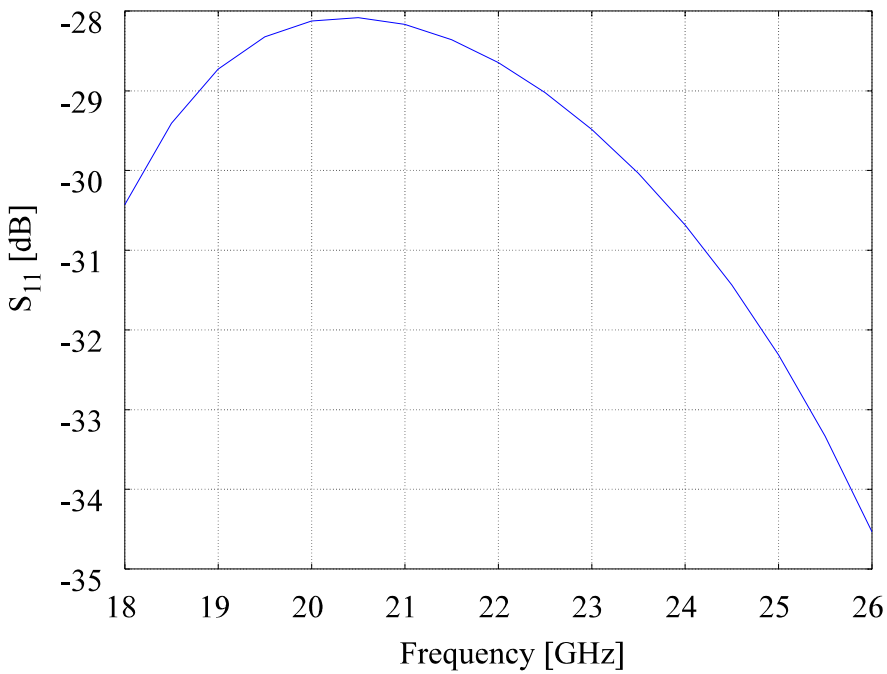


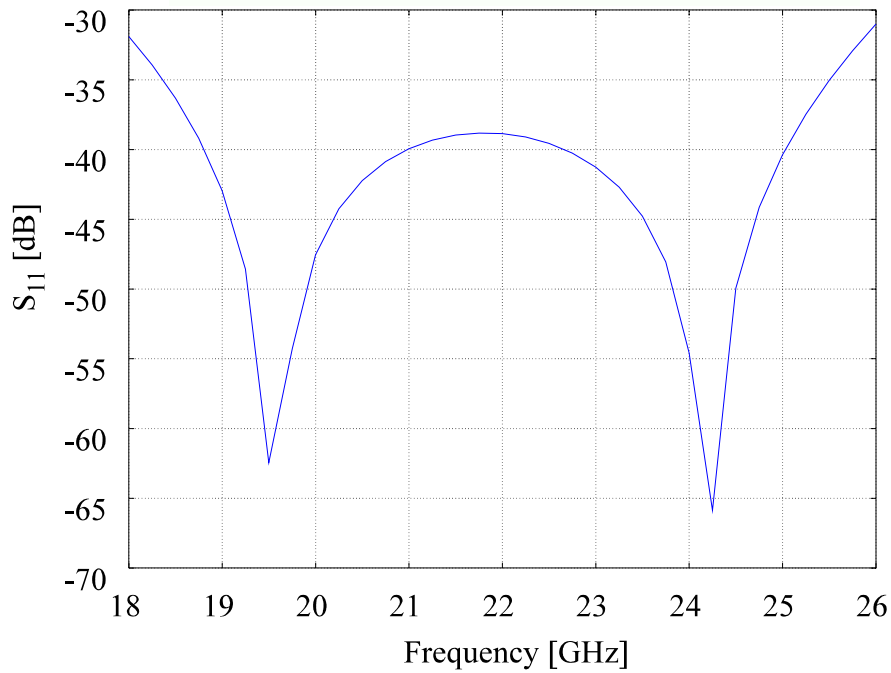


Horn/Pol. Transition,
¼ structure

Pol./OMT transition,
¼ structure







DEWAR

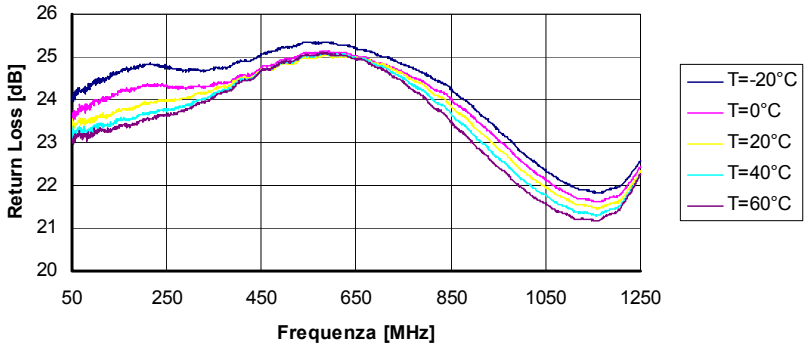
- Tests: - Tphys.=20K @ 5watt thermal load
  - using CTI350 cold head
  - 35h cool down time
- Final release when all waveguide components will be dimensionally defined

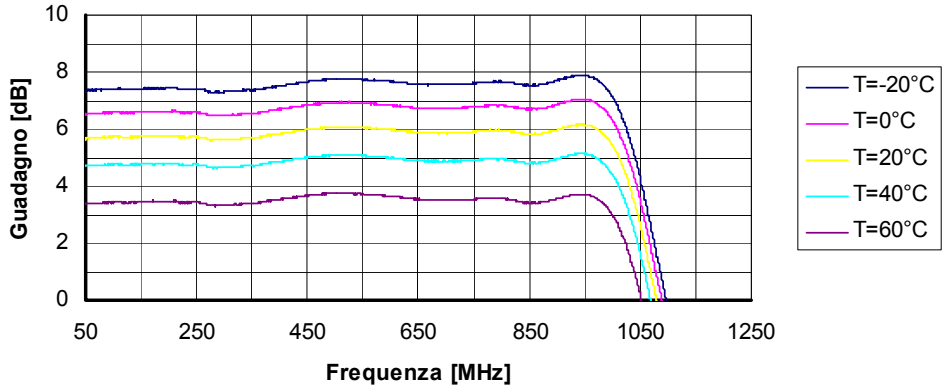
HORN MADE BY CARBON FIBER?

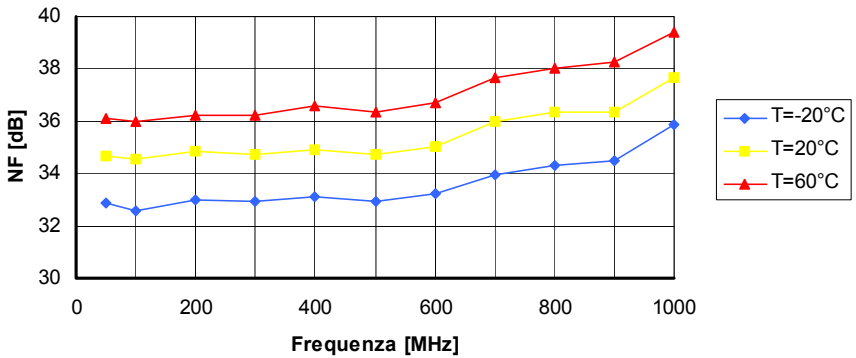
- Aim to reduce thermal load and to get more knowledge with this application
- Metal horn = 1kg, CFhorn ≈ 0.3kg
- Now (horn+pol+trans.+omt)*5 = 7.5kg
- (CFhorn+pol+trans.+omt)*5 = 4kg and supporting flanges with less thickness
- Forrestal Co. in Rome contacted

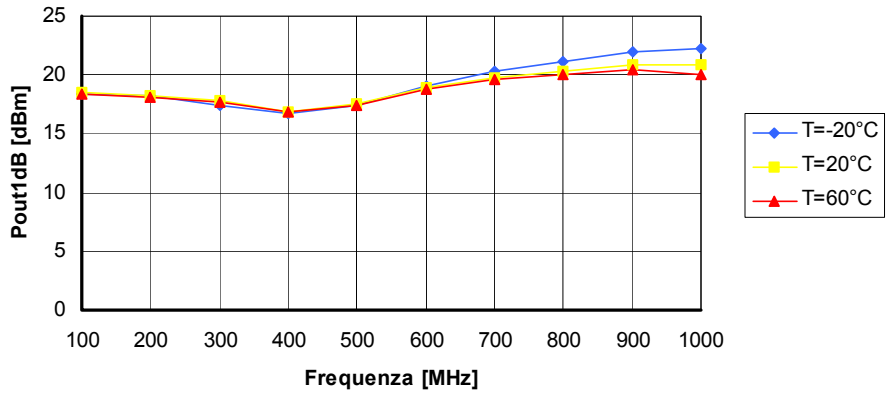
LINKING THE ARRAY TO THE BACK END

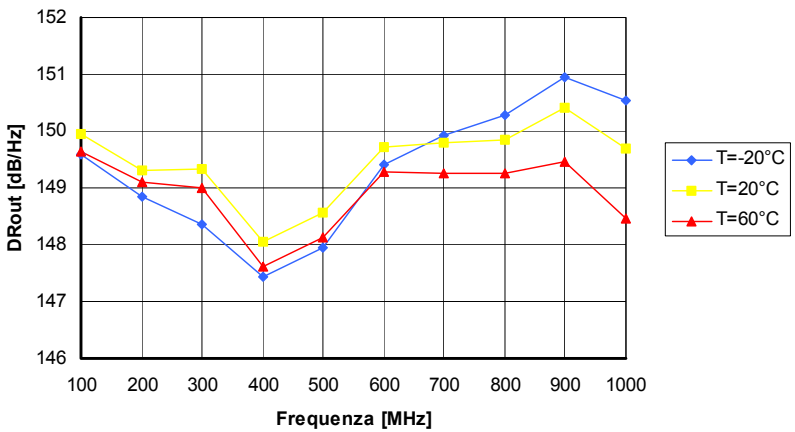
- 10 IF channels
- Coaxial cable solution still possible
- FO solution should be better in view of more channels to be routed
- A “cheap” **analog** link was tested in term of s-parameter, dynamic range, IP3, NF, phase/delay vs temp.

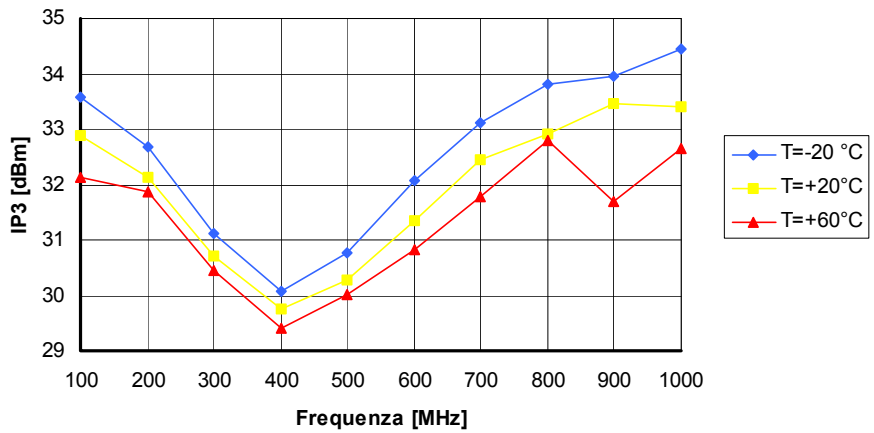

Return Loss [dB]
Frequenza [MHz]
T=-20°C
T=0°C
T=20°C
T=40°C
T=60°C

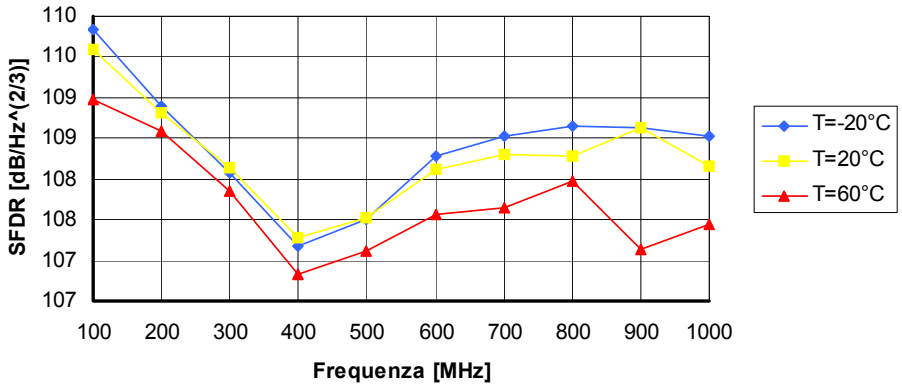

Guadagno [dB]
Frequenza [MHz]
T=-20°C
T=0°C
T=20°C
T=40°C
T=60°C

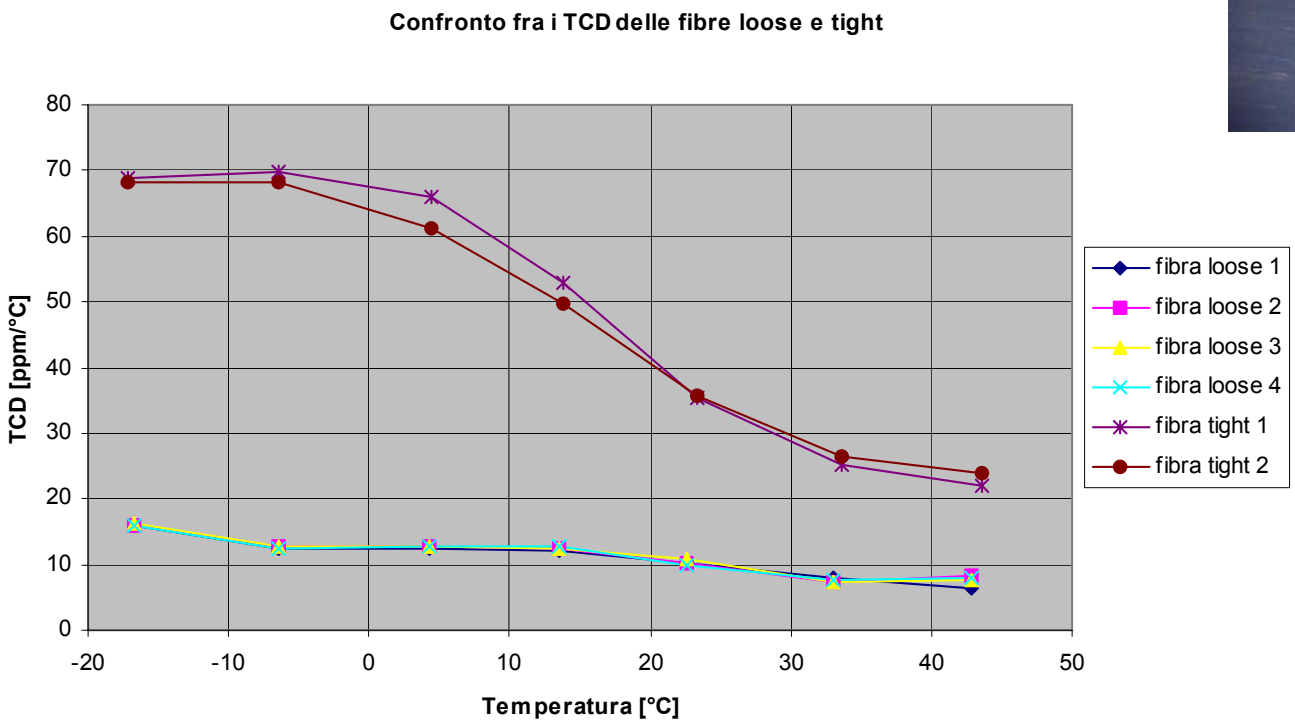

NF [dB]
Frequenza [MHz]
T=-20°C
T=20°C
T=60°C


Pout1dB [dBm]
Frequenza [MHz]
T=-20°C
T=20°C
T=60°C


DRout [dB/Hz]
Frequenza [MHz]
T=-20°C
T=20°C
T=60°C

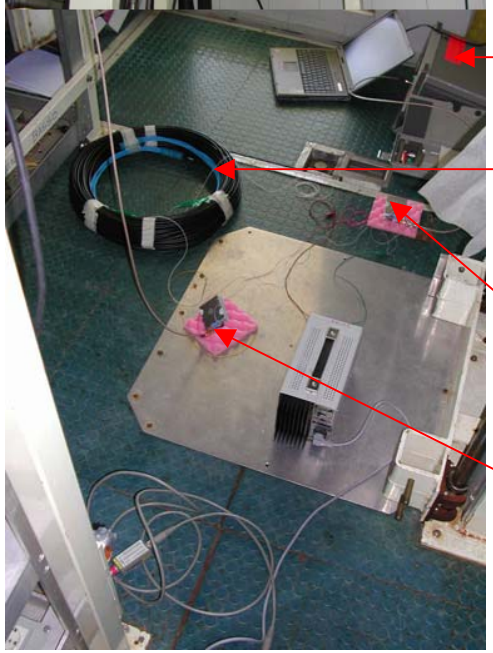

IP3 [dBm]
Frequenza [MHz]
T=-20 °C
T=+20°C
T=+60°C





Comparison between tight and loose fibers in term of TCD (Thermal Coefficient of Delay).

6÷7GHz Receiver

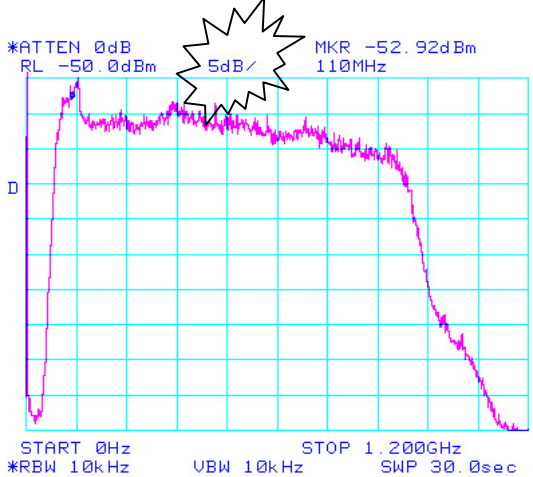


Spectrum analyzer

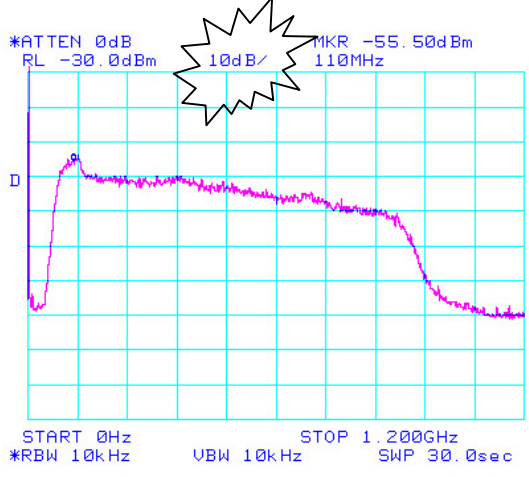
100m SM-FO cable

FO-RX

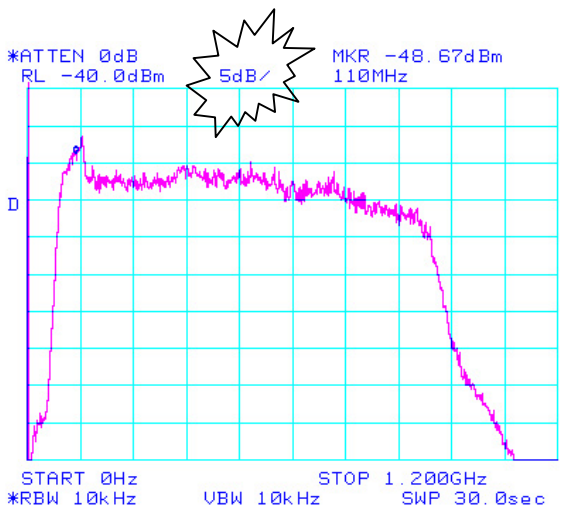
FO-TX



22GHz output of Medicina receiver



After 100m coax



After 100m FO

as per May 2003

From Manchester to IRA: 0.4*366k€ = 146.4k€

5456 USD (4772.86 €)	Execute Agreement	
19100 USD(16190 €)	Wafer run 1	feb 2003
32700 USD(27700 €)	Wafer run 1	august 2003
19100 USD	Wafer run 2	sep 2004
32700 USD	Wafer run 2	march 2005
24200 AUD(13622.11 €)	SW training support	
30000 €	Travel	
35000 €	Recruited Personnel/Materials	
9000 €	CSIRO Measurement	

83394.97 €

96780 €

180174.97 €

22GHz ARRAY TIMELINE

- READY TO USE LNAs :SPRING/SUMMER 2004?
- POL/OMT CONSTRUCTION AND MEAS.: WITHIN 2003
- ELECTRONICS FOR RECEIVERS (IF parts, remote control,…):MOSTLY PROVIDED
- ARRAY COMPLETION AND LAB MEAS.: SUMMER 2004
- TEST ON MEDICINA ANTENNA: WITHIN END OF FARADAY PROJECT