



High Gain Antenna for M3tera H2020 project



ANTERAL

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INTRODUCTION

Nowadays, an important increased in the necessity of high data rate links in the telecommunication field has made of THz technology an attractive solution for these kind of applications. This is the main motivation for M3tera H2020 project, developing a revolutionary platform for enabling volume-manufacturable, cost-efficiency, highly integrated terahertz systems mainly focused on high-speed telecommunication links for small-cloud networks.

ANTENNA REQUIREMENTS
 High capacity link (up to 10 Gbit/s)
 High frequency (141 - 148 GHz)
 High directivity (> 40 dB)
 Range (~ 0,5 km)

ANTENNA SYSTEM

Design

Bearing in mind that the antenna gain required for the M3tera project telecommunication application should be higher than 40 dB, the best option to reach this specification is to design a reflector antenna.

Within reflector antennas configuration the best alternative for M3tera project is the use of an offset parabolic system since this way, the feed antenna can be located out of the field of view of the reflector and the blockage is minimized.

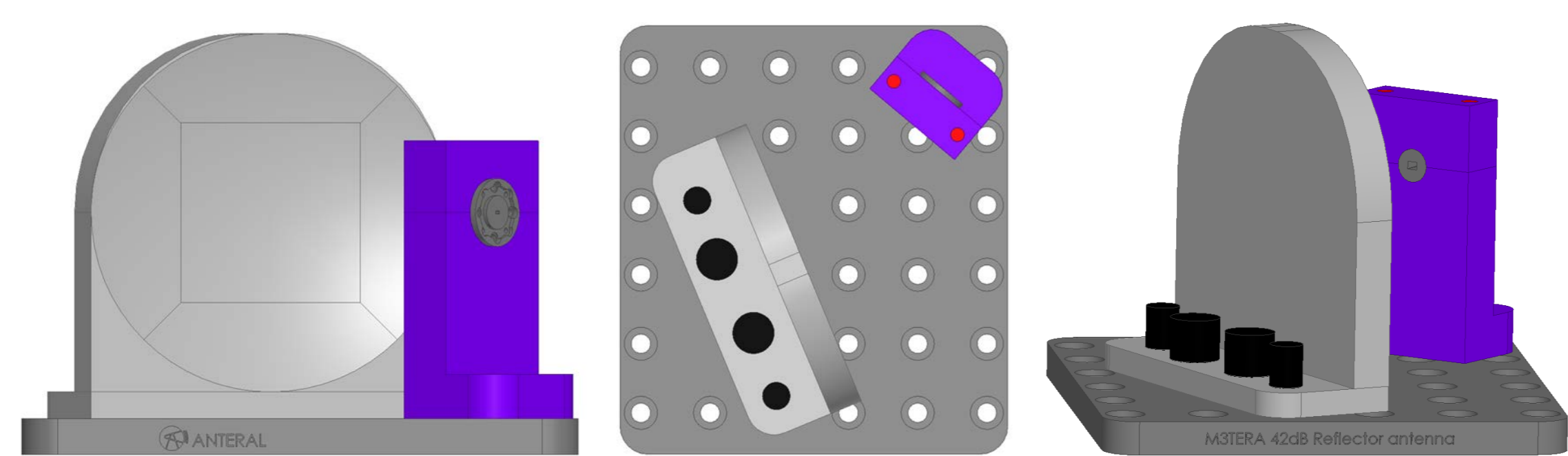
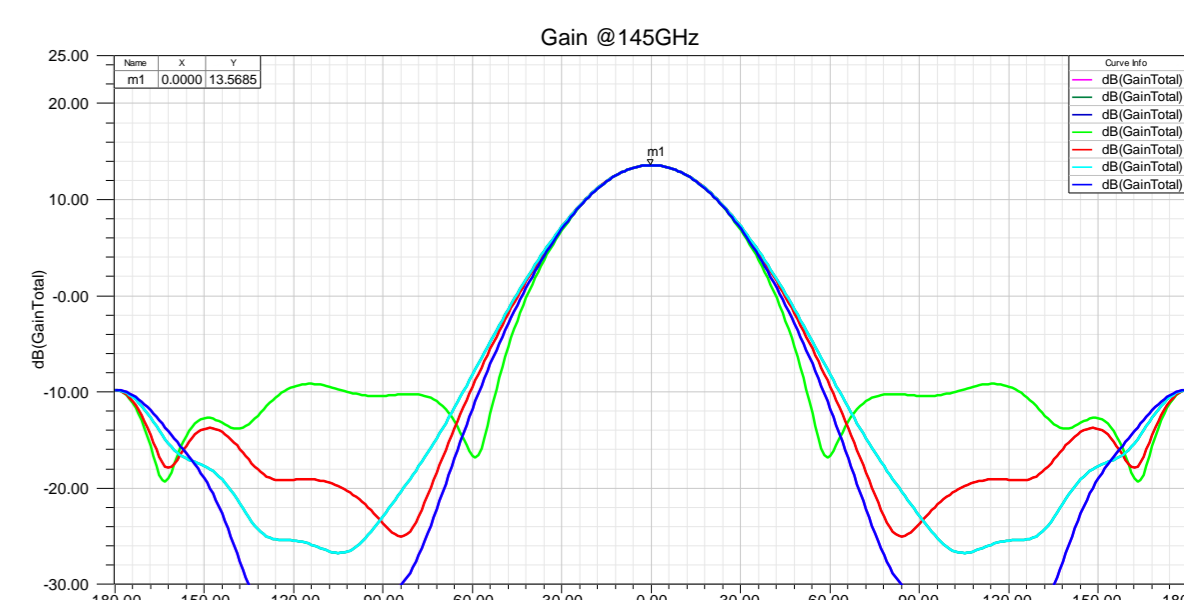
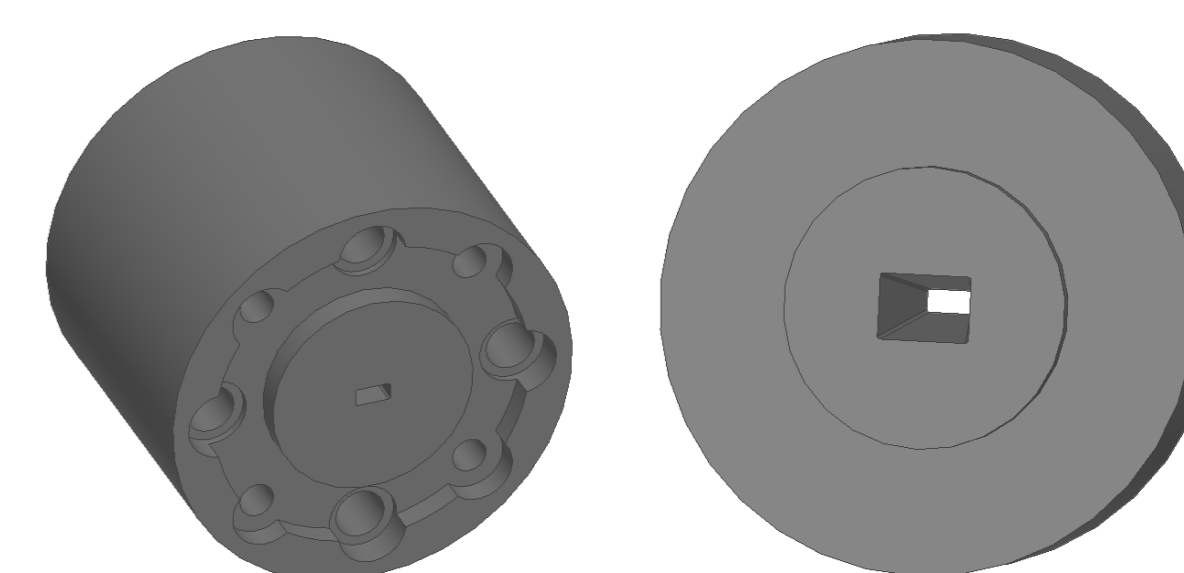
ADVANTAGES:

- easy fabrication
- no blockage

DISADVANTAGES:

- more difficult aiming

Feed horn antenna



Reflector antenna

ANTENNA SPECIFICATIONS:
 Parabolic Offset Reflector Antenna of 10 cm
 Pyramidal D-band horn antenna

Frequency	Directivity	η_{spill} (dB)	Spill-over (dB)
110 GHz	39.57 dB	1.2527 dB	-6.011 dB
145 GHz	42.56 dB	0.2633 dB	-12.30 dB
170 GHz	43.54 dB	0.2398 dB	-12.70 dB

Fabrication

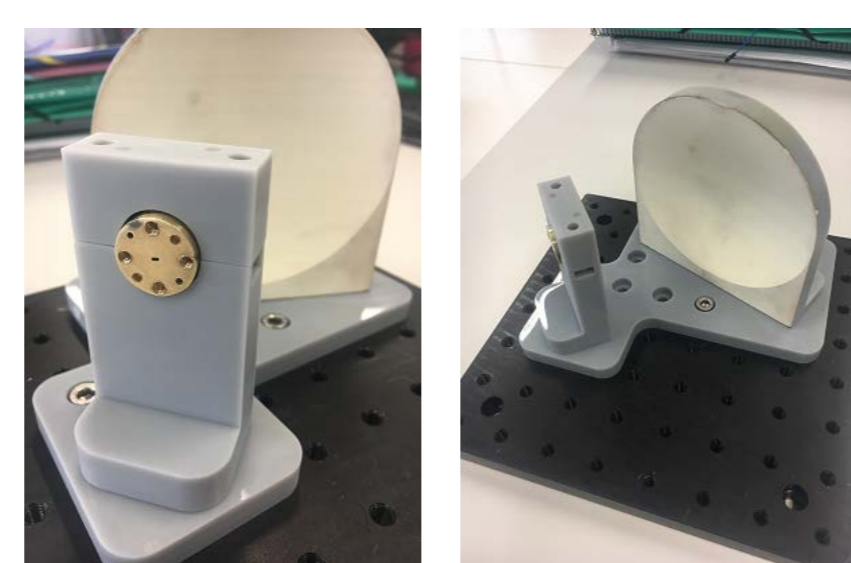
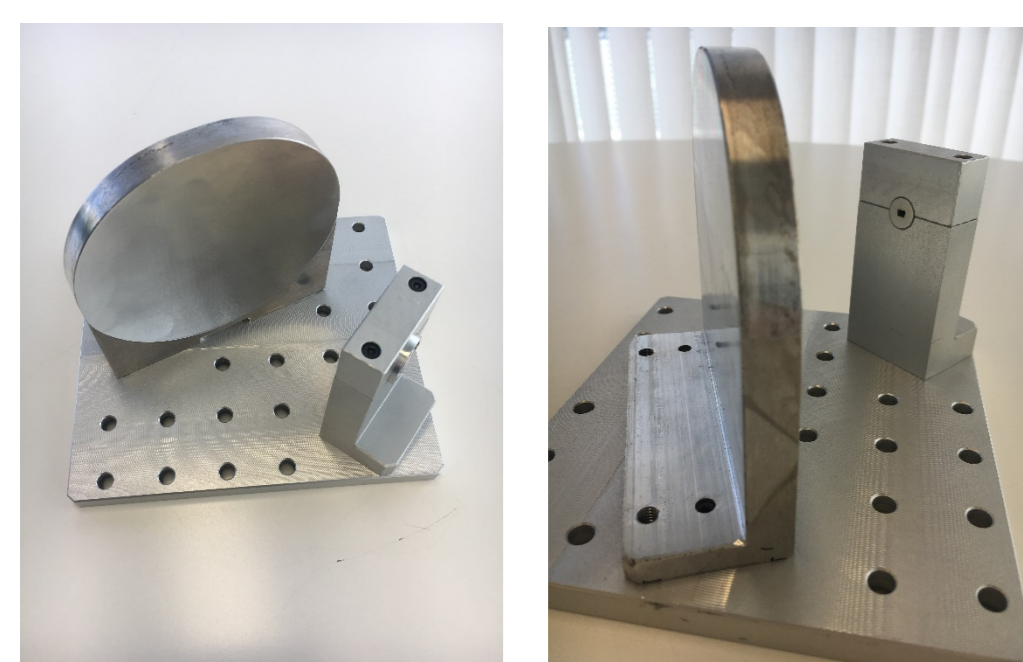
Two different techniques: conventional machining and a low cost 3D printing process have been employed.

CONVENTIONAL FABRICATION:

- Horn antenna: EDM
- Parabolic reflector: Milling machine + polishing

3D PRINTING FABRICATION:

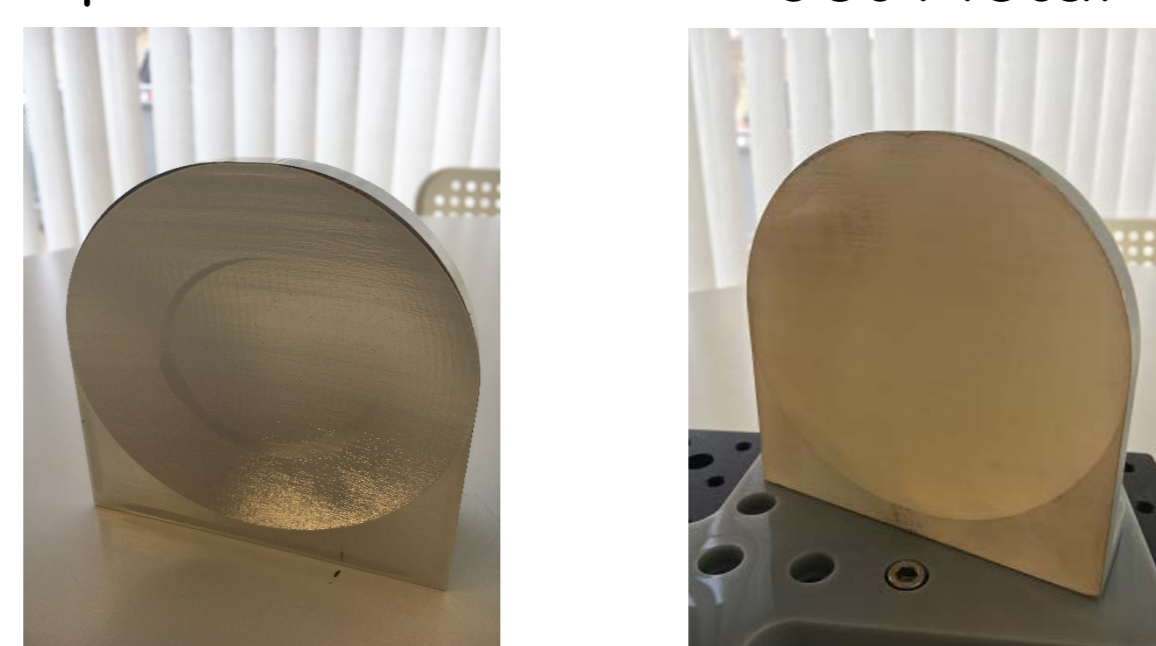
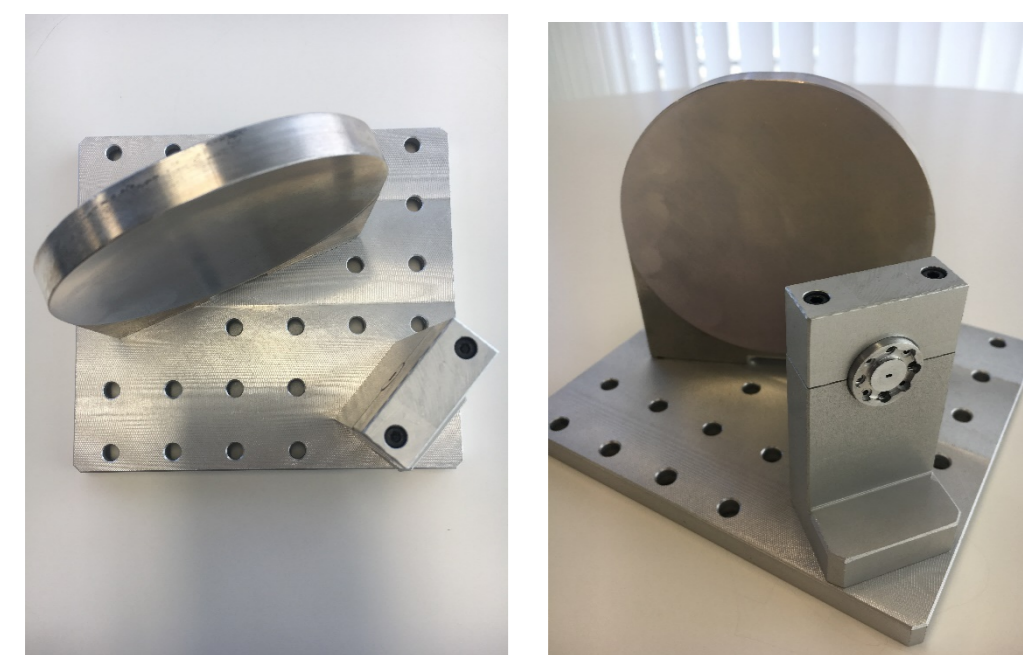
- Horn antenna: metal 3D printing
- Parabolic reflector: plastic 3D printing + metallization



Metallization

High vacuum aluminum plating process

Two steps coating process in Ag by Jet Metal



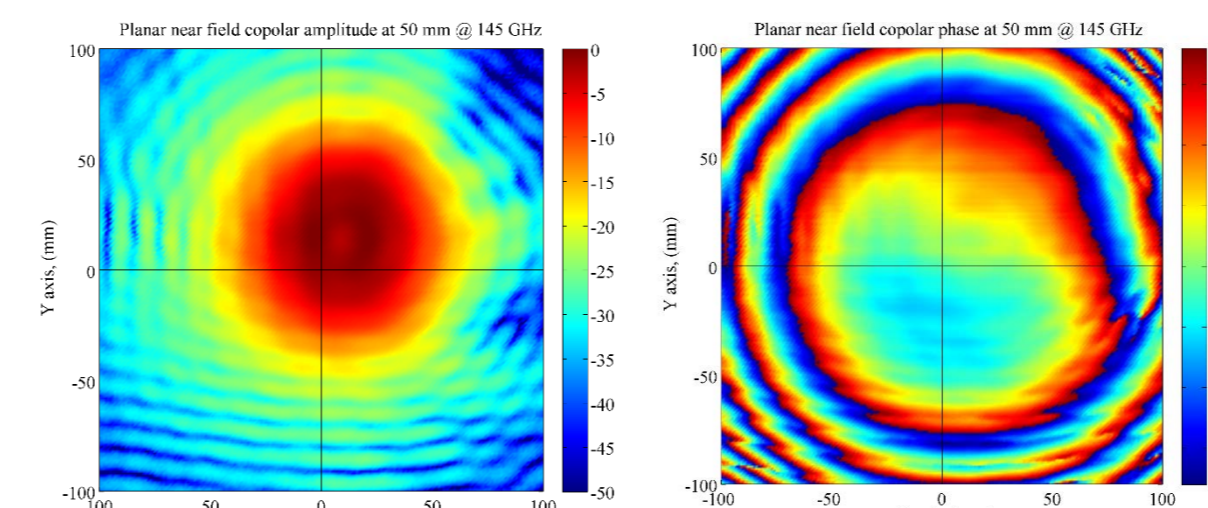
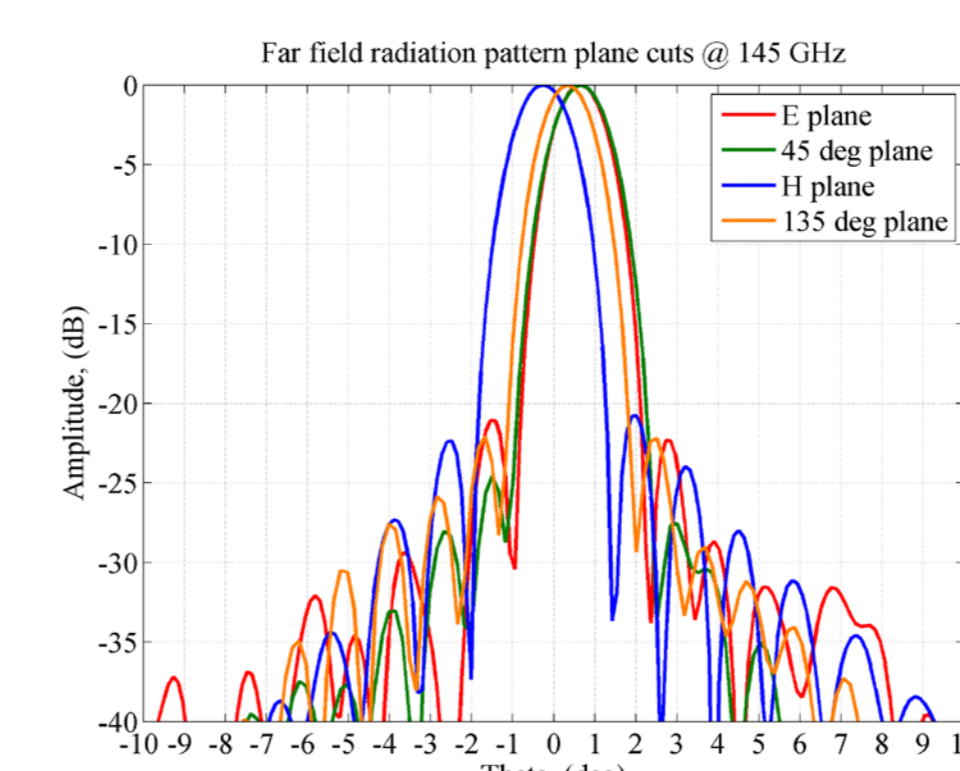
Low cost & low weight solution



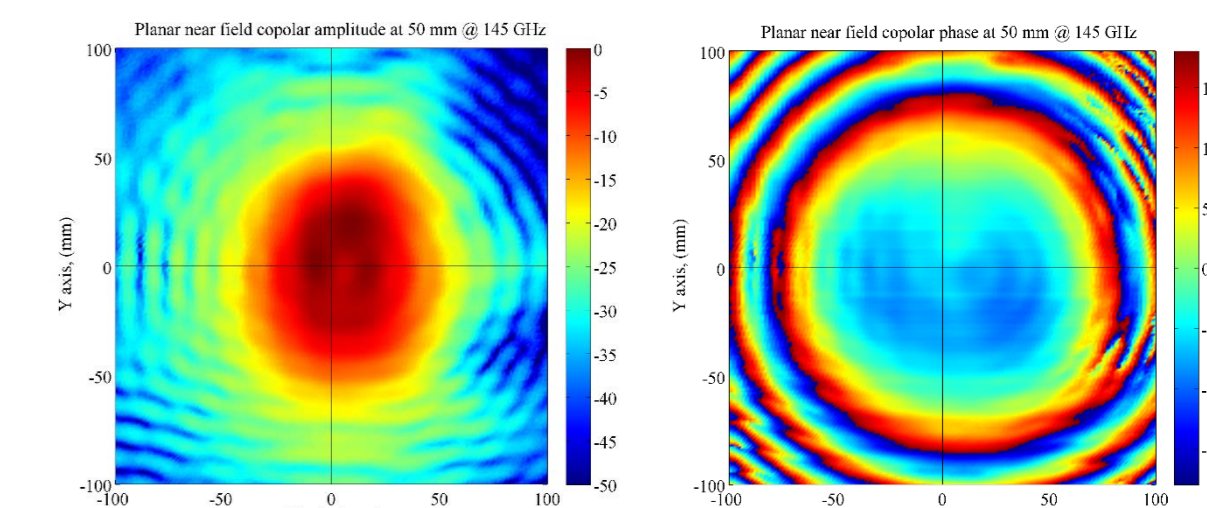
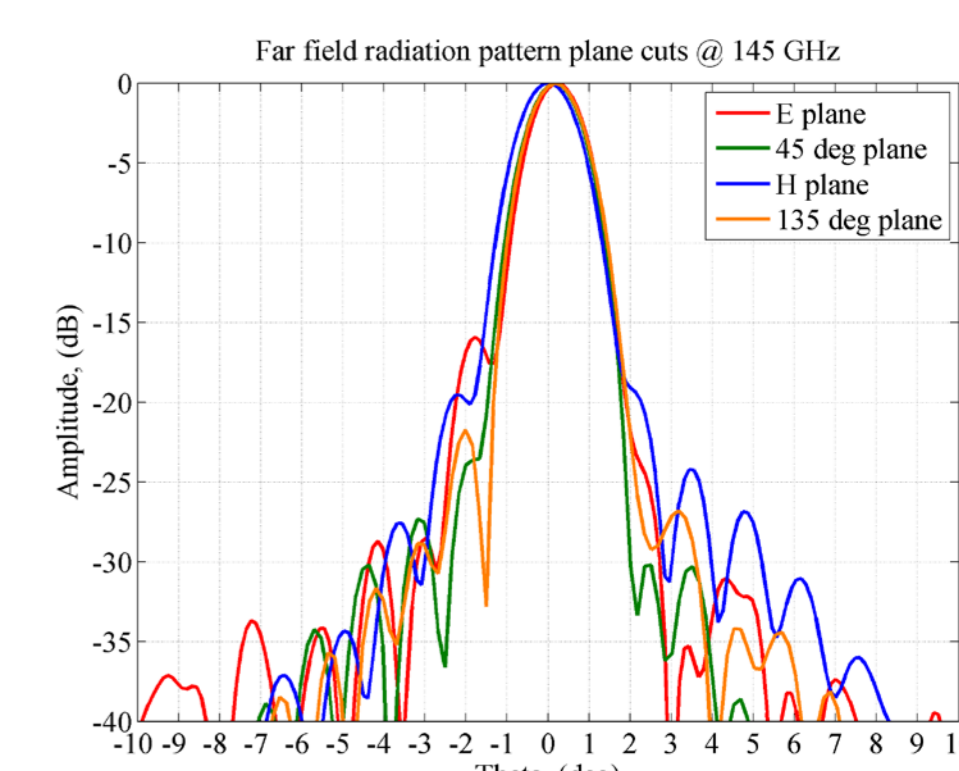
Test

The performance of both antenna systems has been measured.

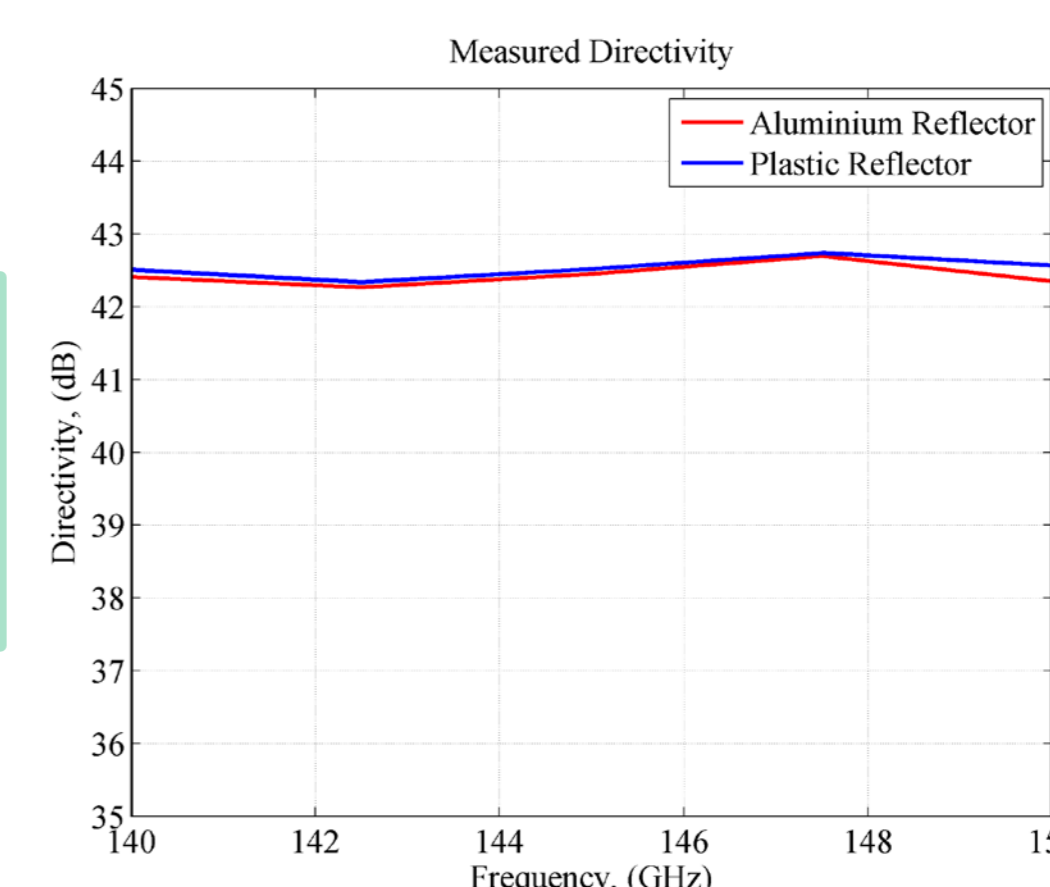
Aluminum reflector



Plastic reflector



Equal performance for both antenna systems



Directivity > 42 dB 140 - 150 GHz

CONCLUSIONS

This paper has presented the design, fabrication process by conventional and low cost techniques and measurements of the reflector antenna system developed within European H2020 M3tera project under the grant agreement NO.644039.

- Two reflector antenna systems (aluminum & metallized plastic) with 42 dB directivity at 145 GHz have been developed for the M3tera project telecommunication prototype.
- Both systems has presented an equal performance complying perfectly with the simulation values.
- First time that this kind of plastic reflector and metallizing process is employed as part of a communication antenna system.