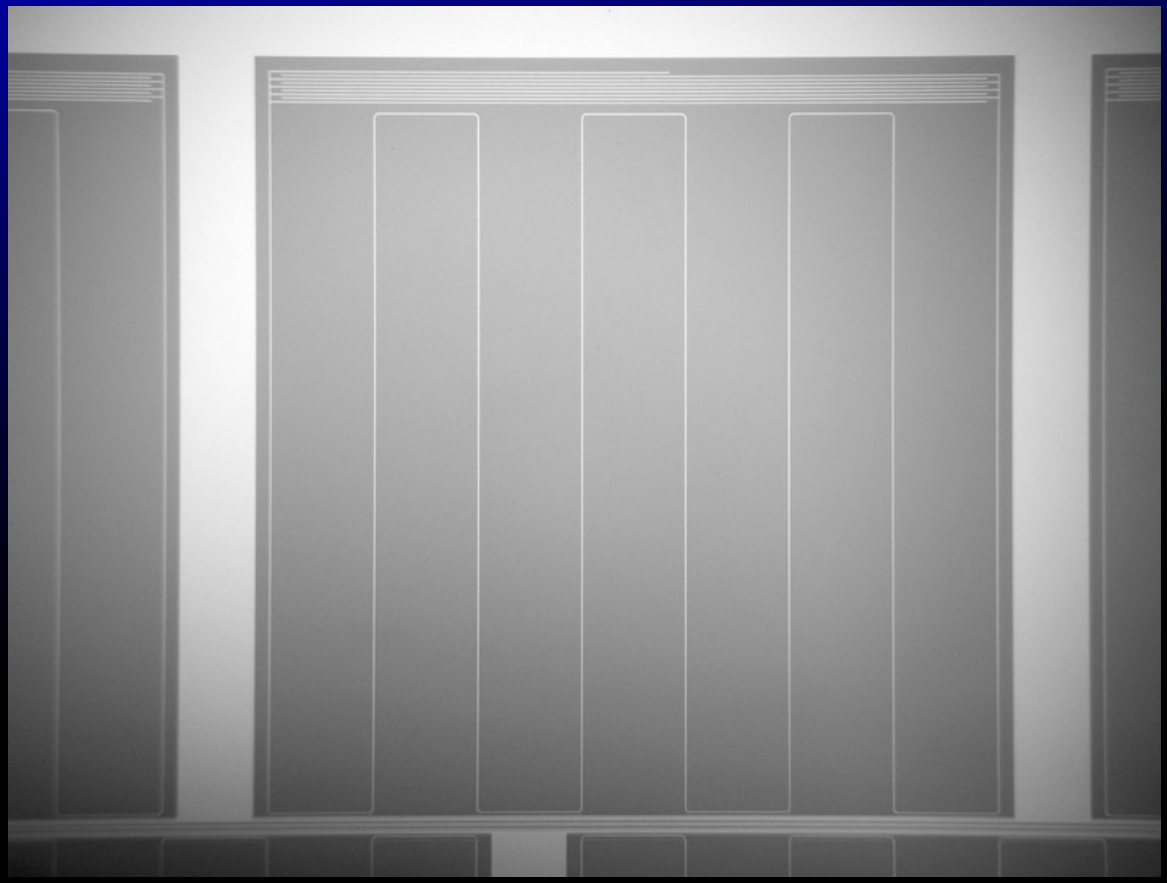
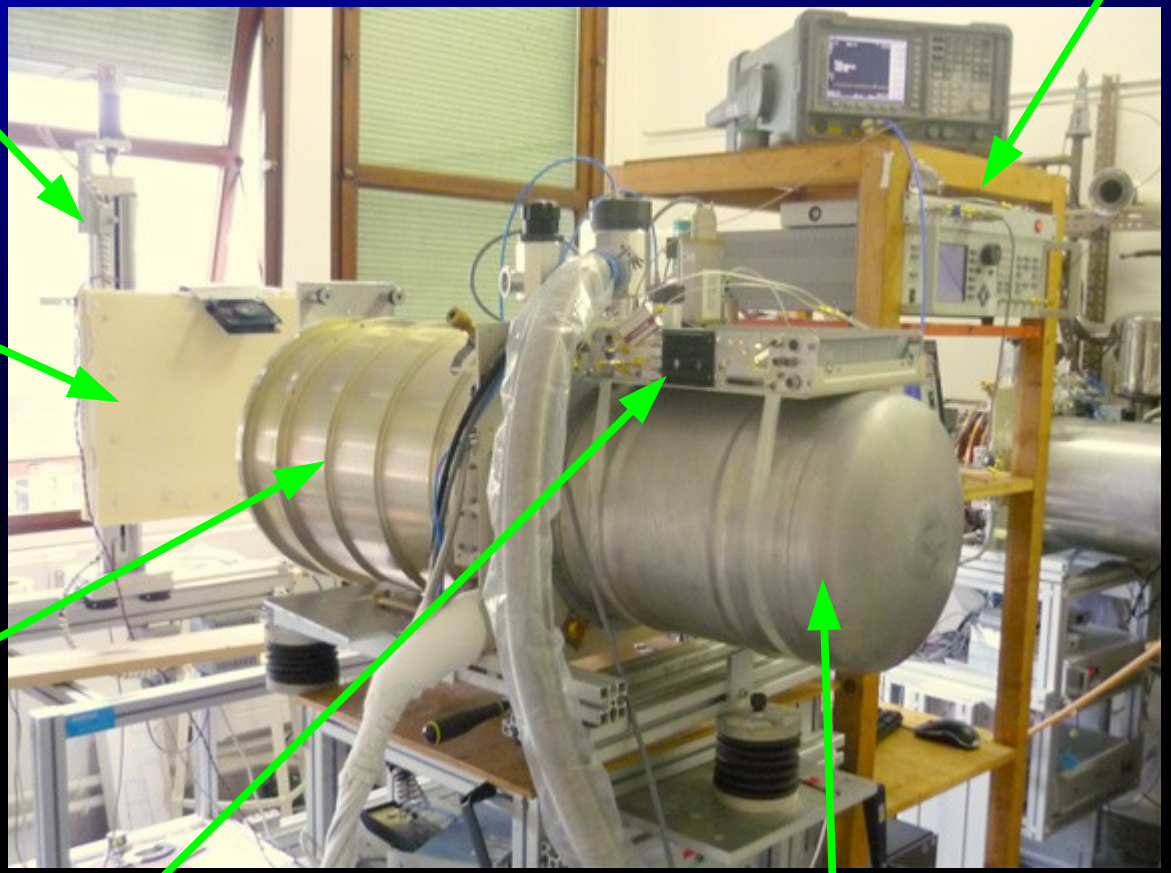
Prerun Summary: 30 Pixel LEKIDs Array for the IRAM 30 m Telescope

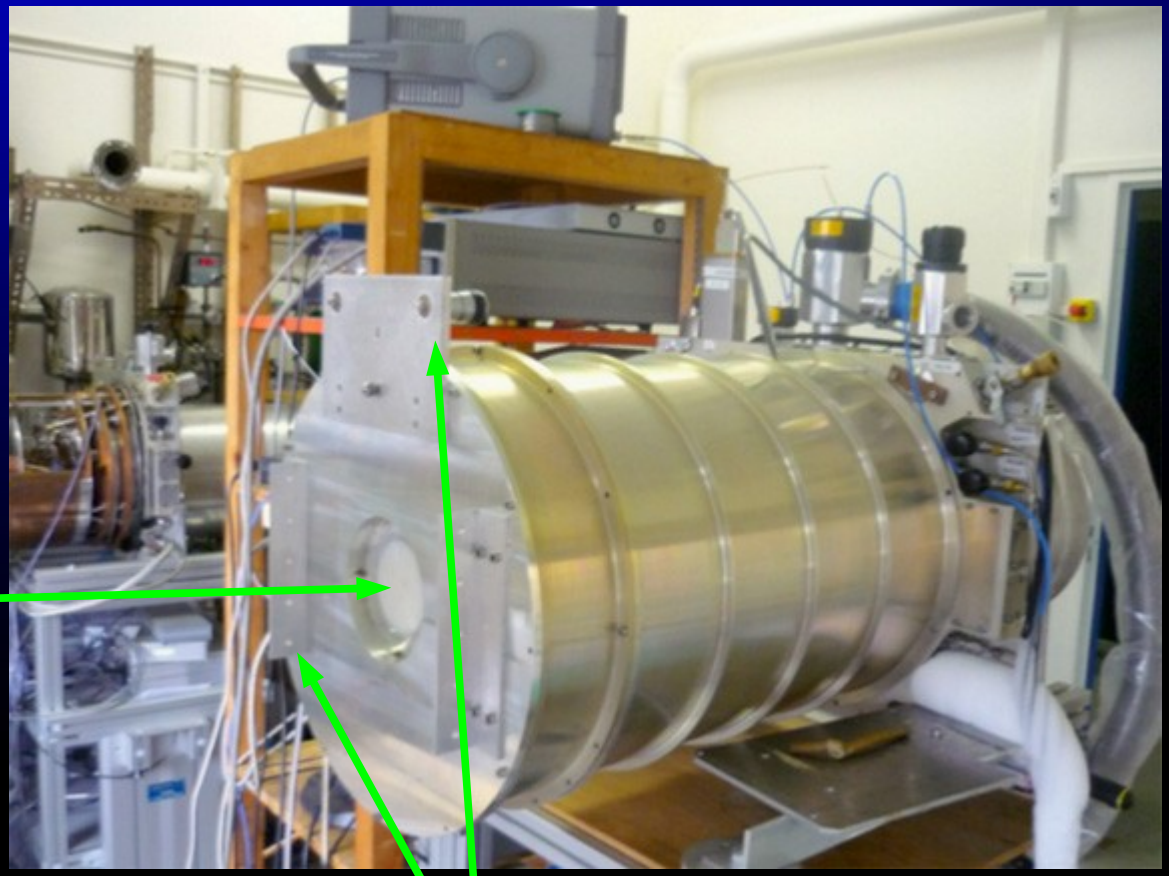
Loren Swenson



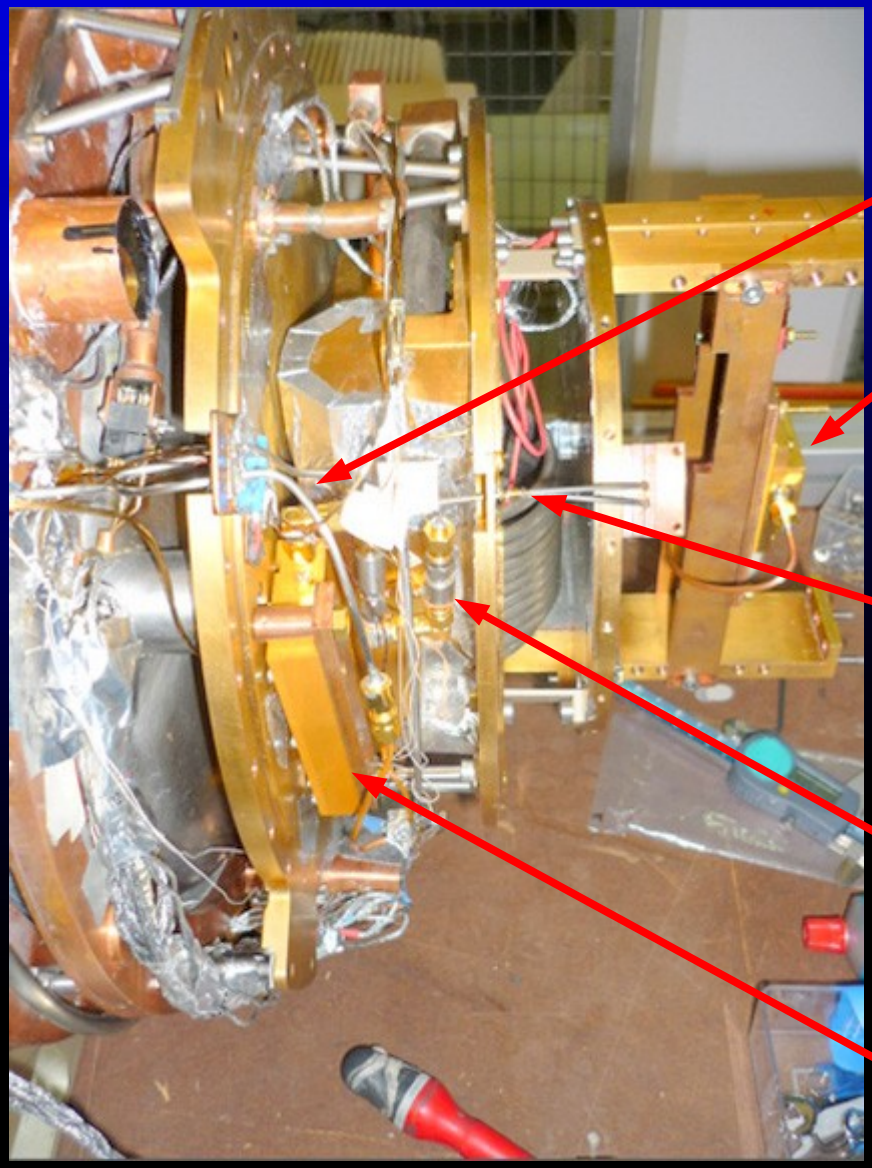
Test Setup – Rear View



Test Setup – Front View



Mounting - Electronics



Thermalized SS Coax

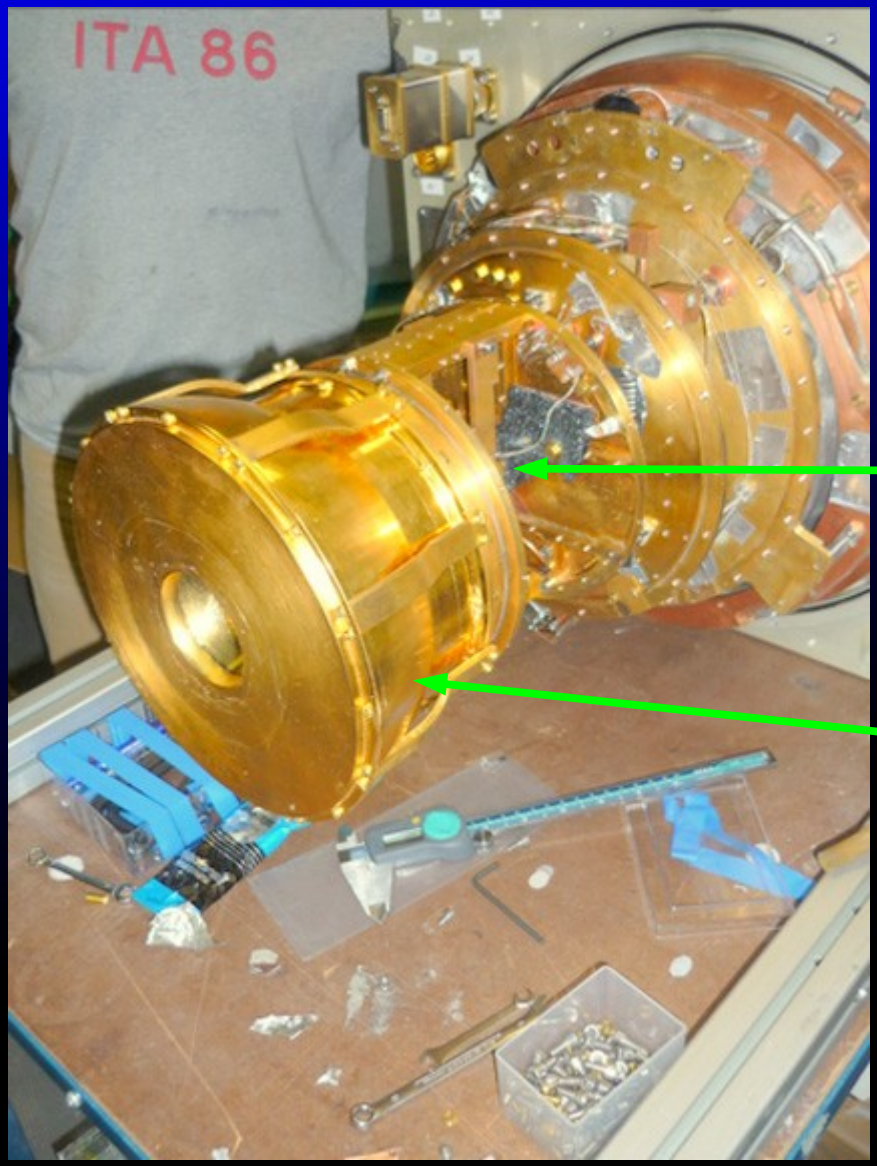
Detector Array

NbTi Coax + 10 dB Attenuator @ 100 mK (not shown)

20 dB Attenuator + DC block

4K HEMT Amplifier

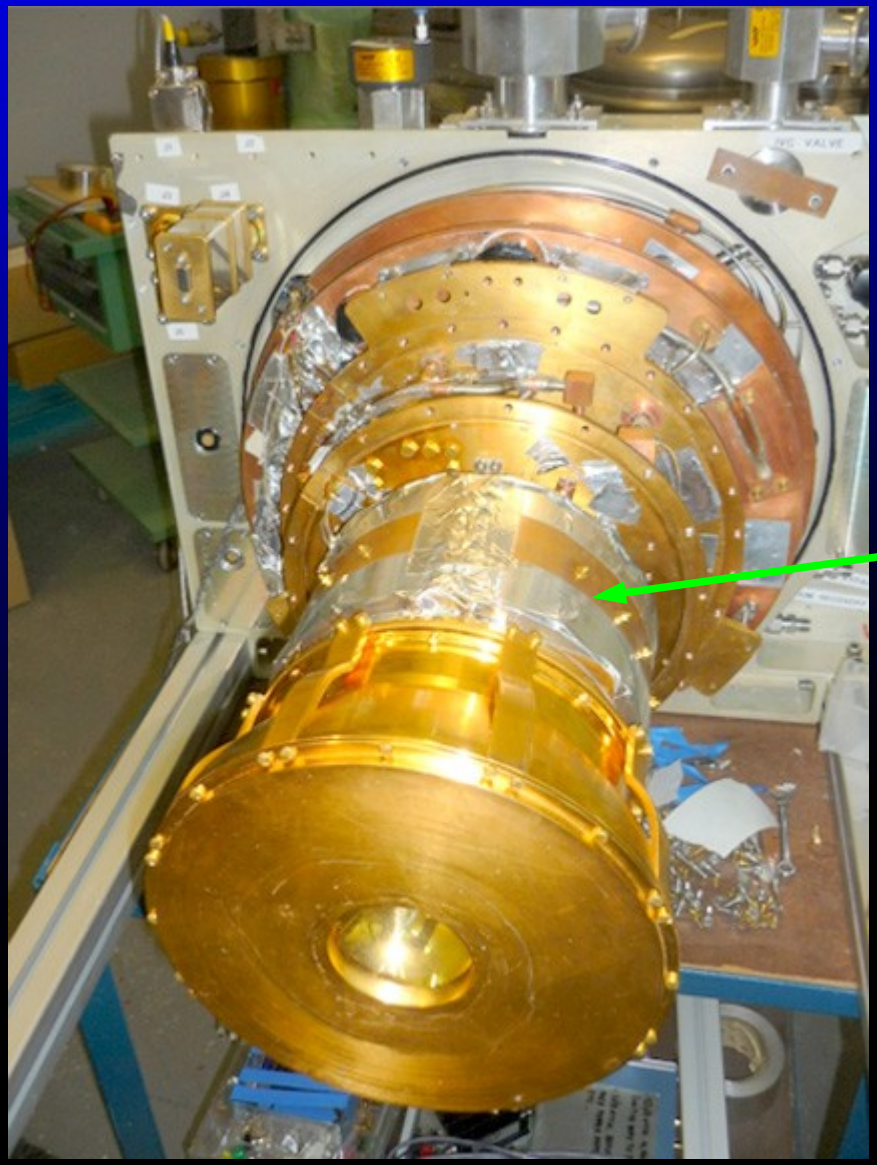
Mounting



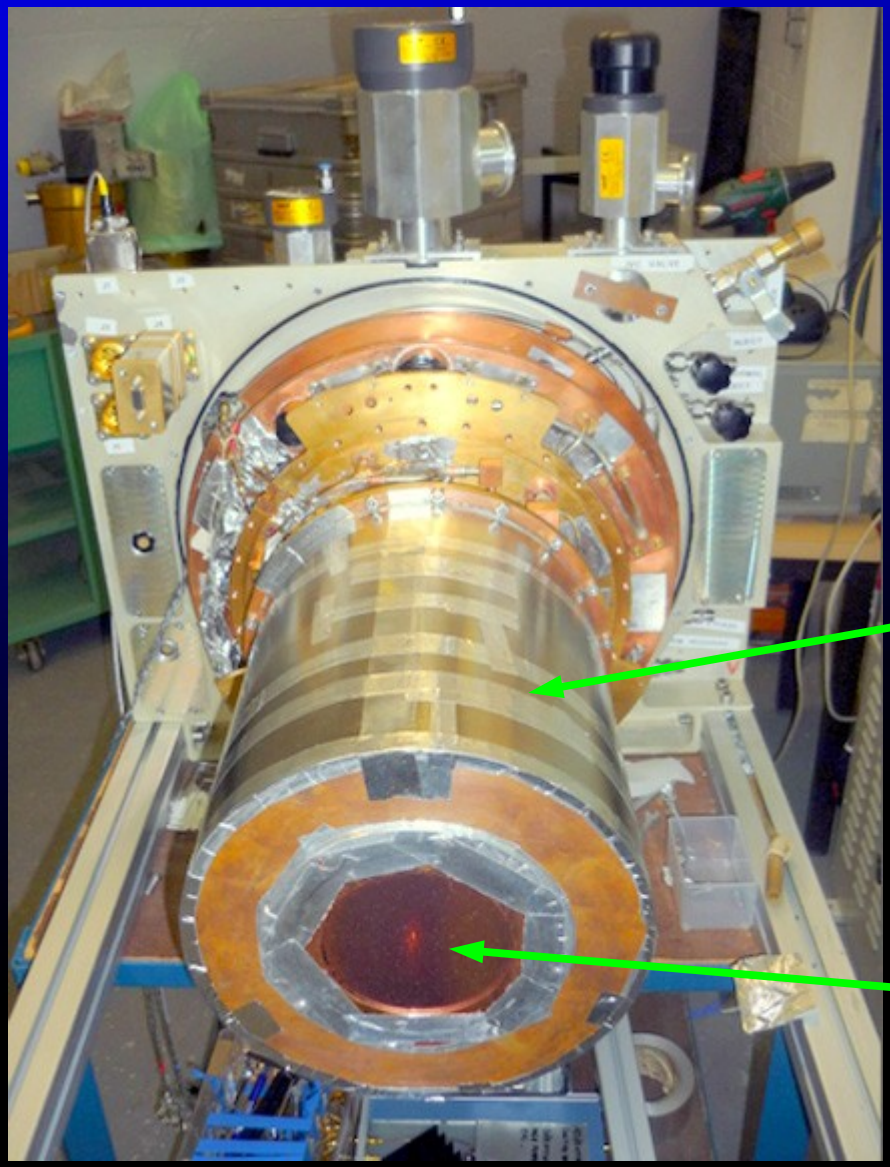
Detector array
behind 127 to 170
Ghz bandpass filter

Baffle
(Ellipsoid mirror)

Mounting – First Shield



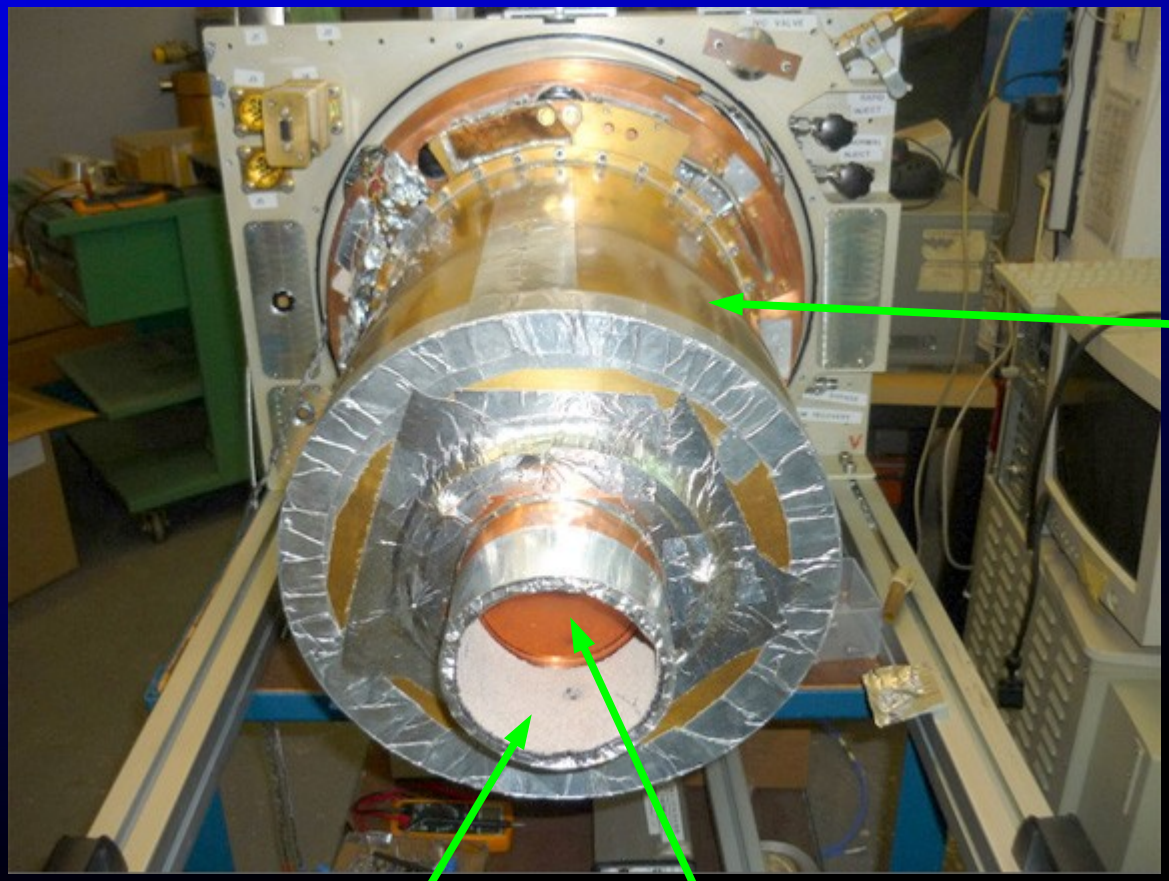
Mounting – Second Shield



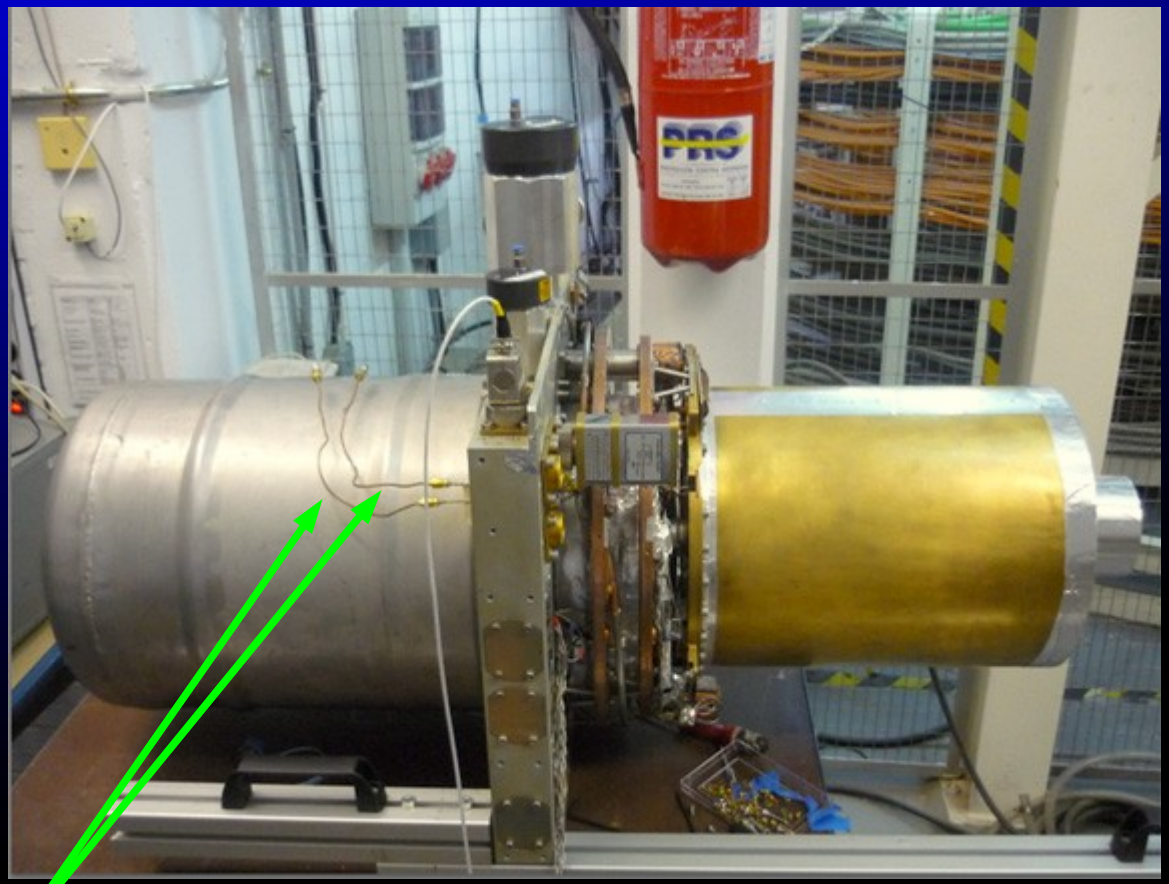
Still shield with Metglas
1 K

210 Ghz low-pass Filter

Mounting – Third Shield

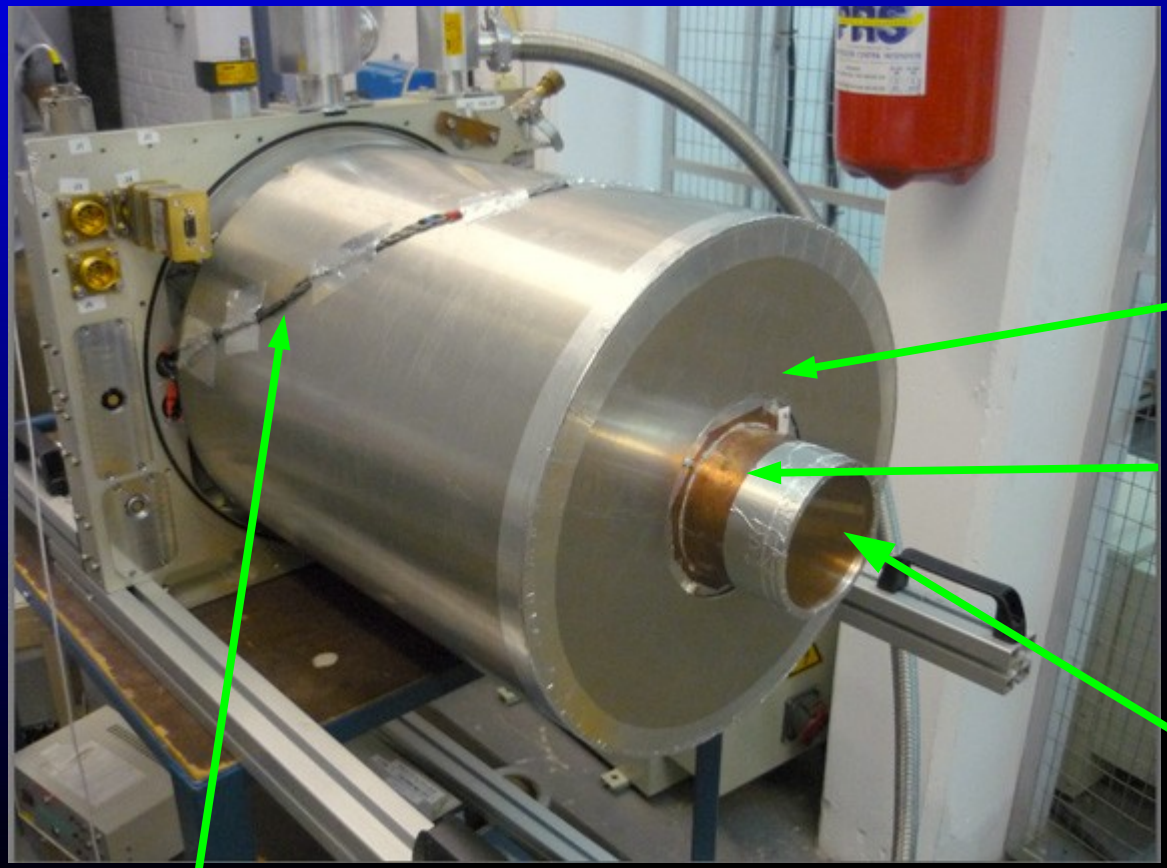


Mounting – Third Shield (side)



Microwave Ports

Mounting – Fifth Shield



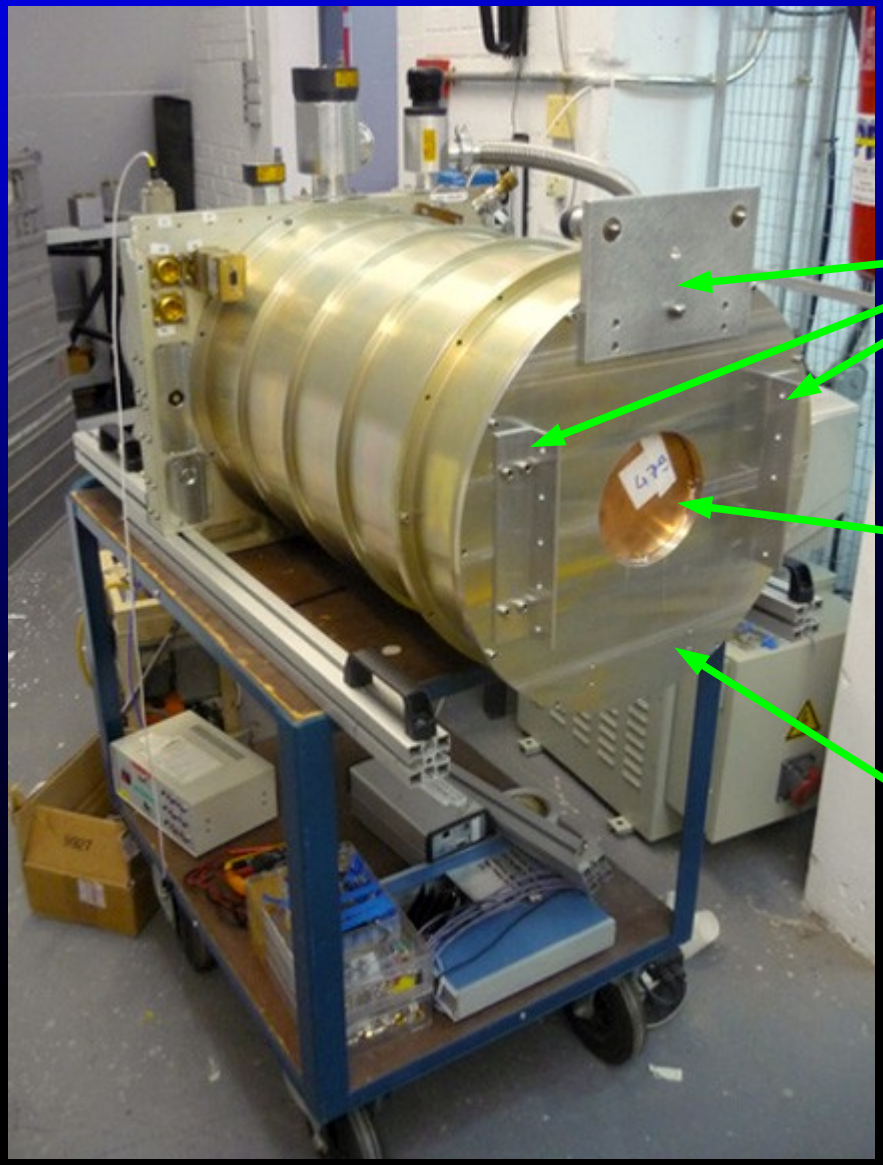
150 K Shield

70 K Shield

4 Filters @ 70 K:
270 Ghz low-pass
2 thermal infra-red Blockers
Zitex – 300 microns

Unused DC lines

Mounting - OVC



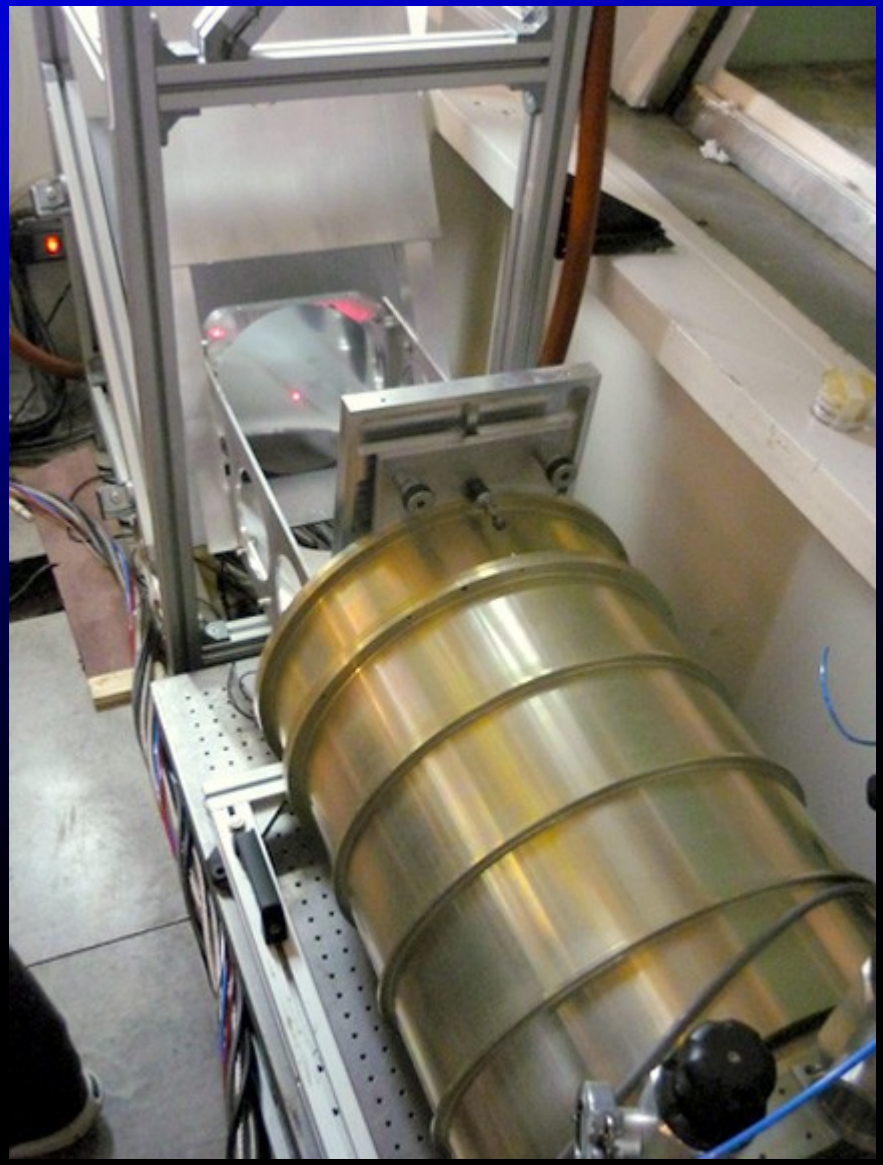
Mirror mountings &
Aligner

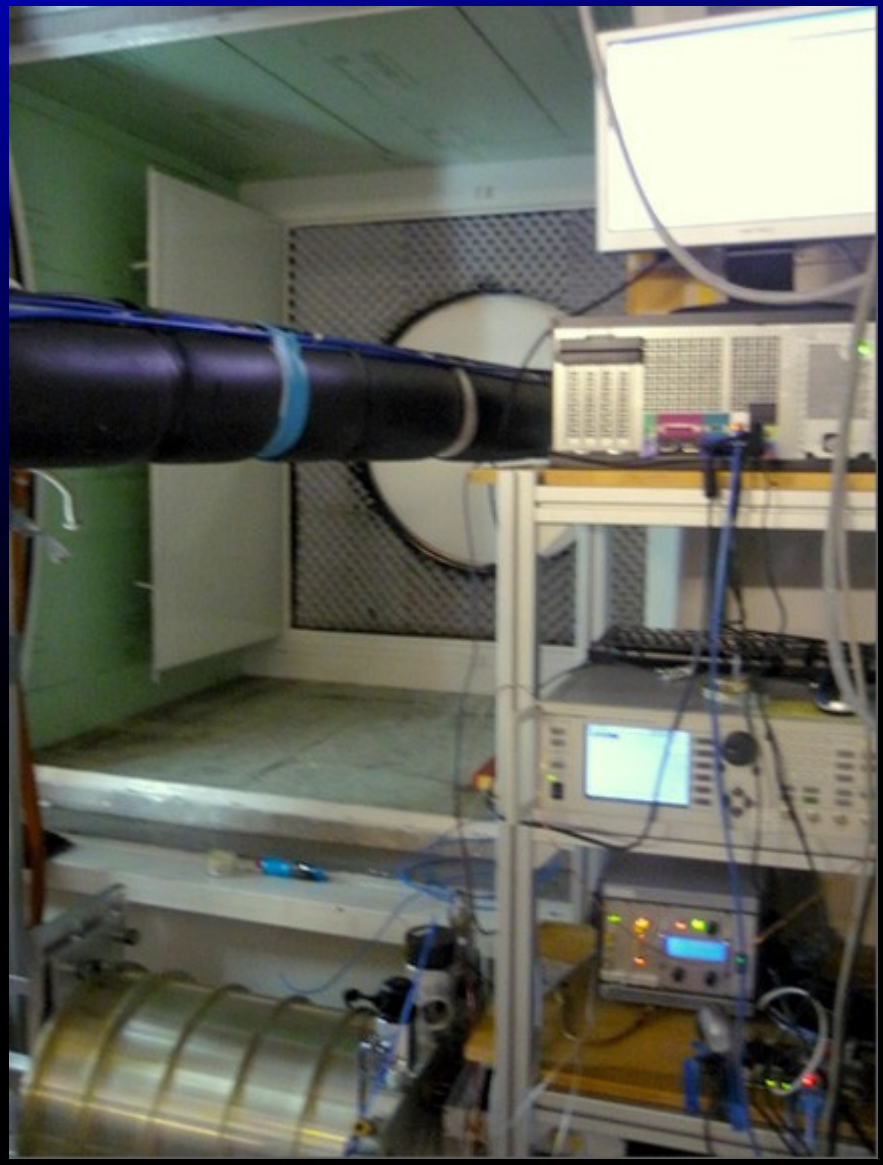
Mirror
(for initial calibration)

Outer Vacuum Can

Installation – Raising Dewar

Installation – Alignment & Electronics





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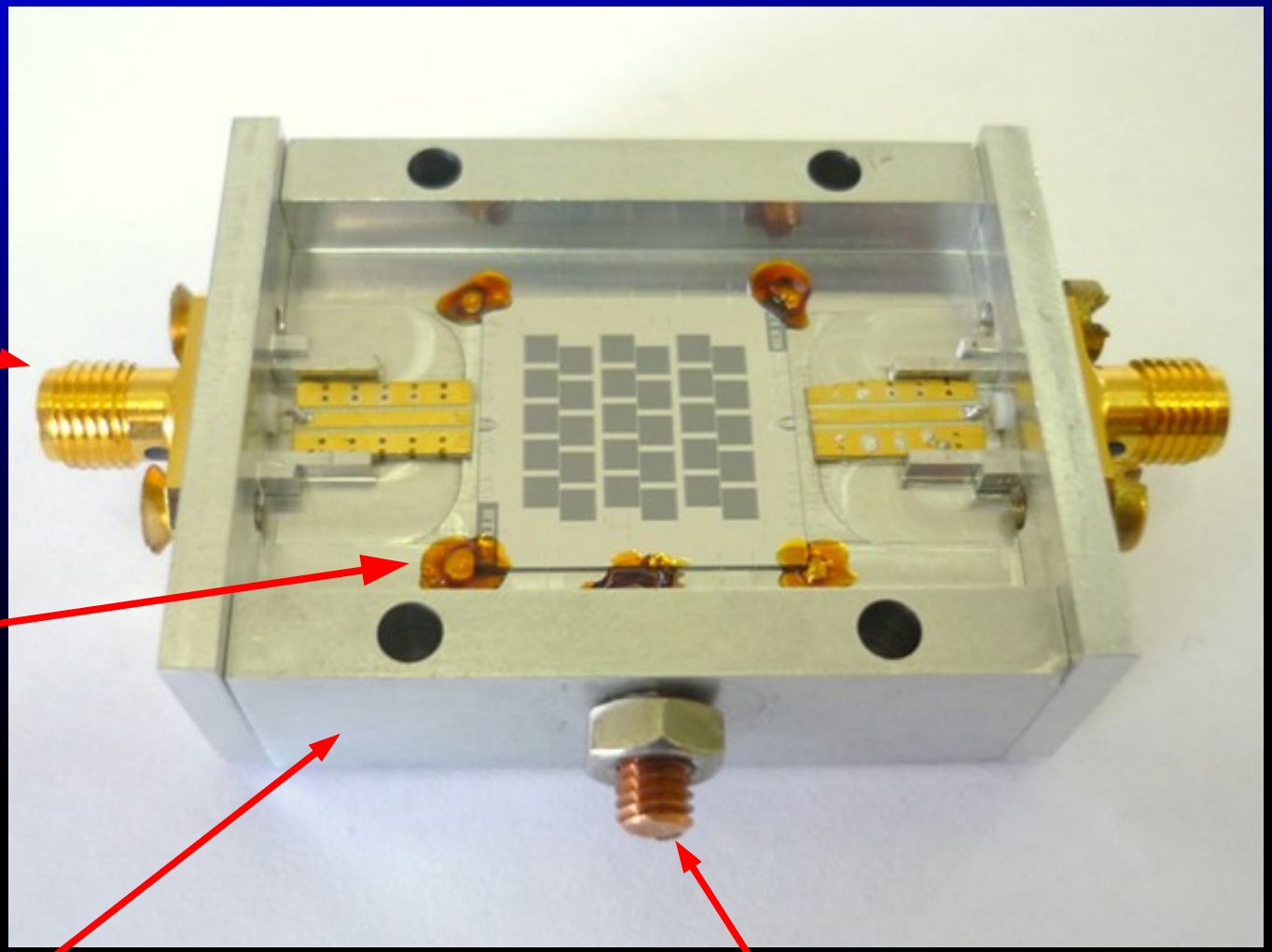
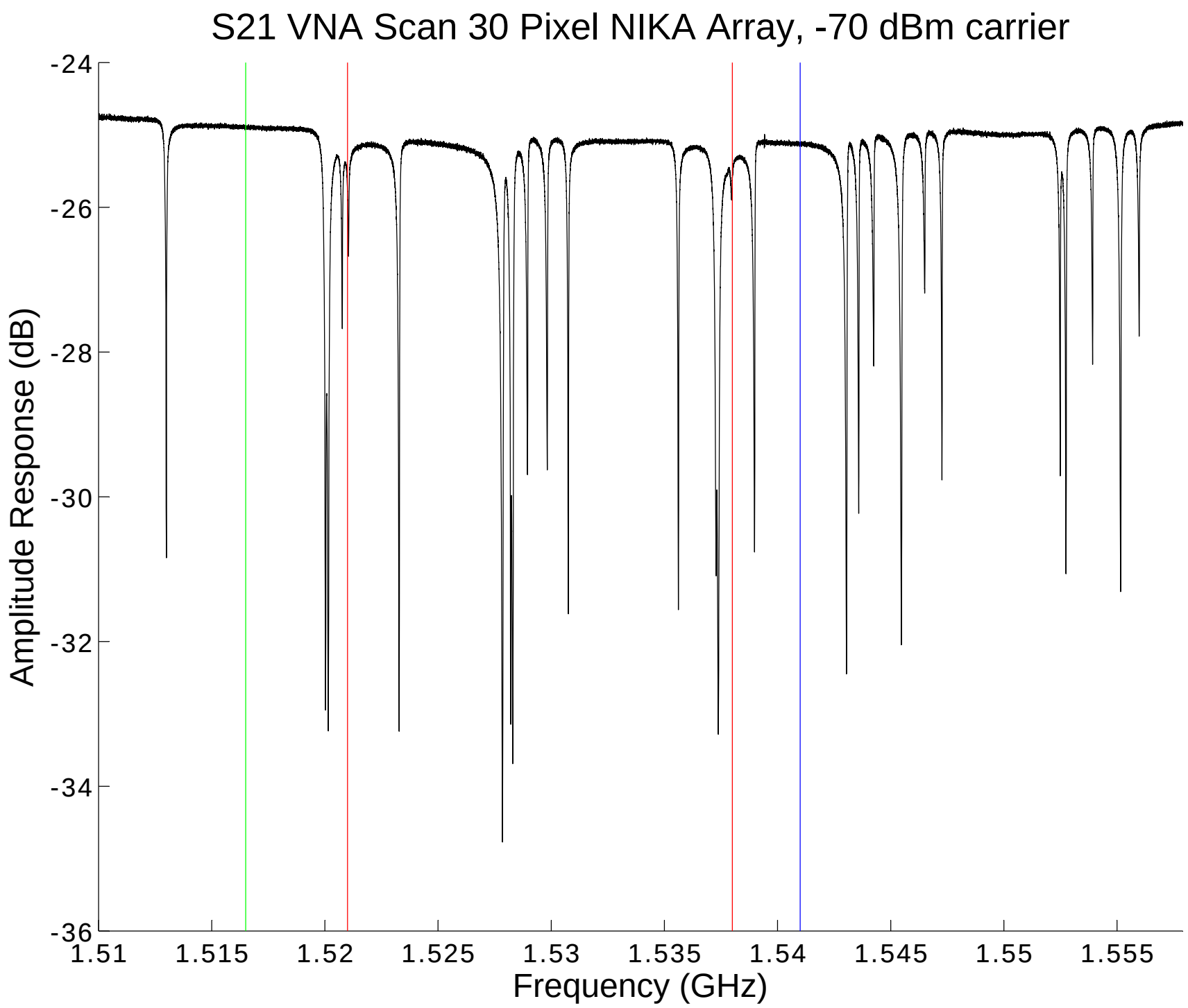
Packaged Array



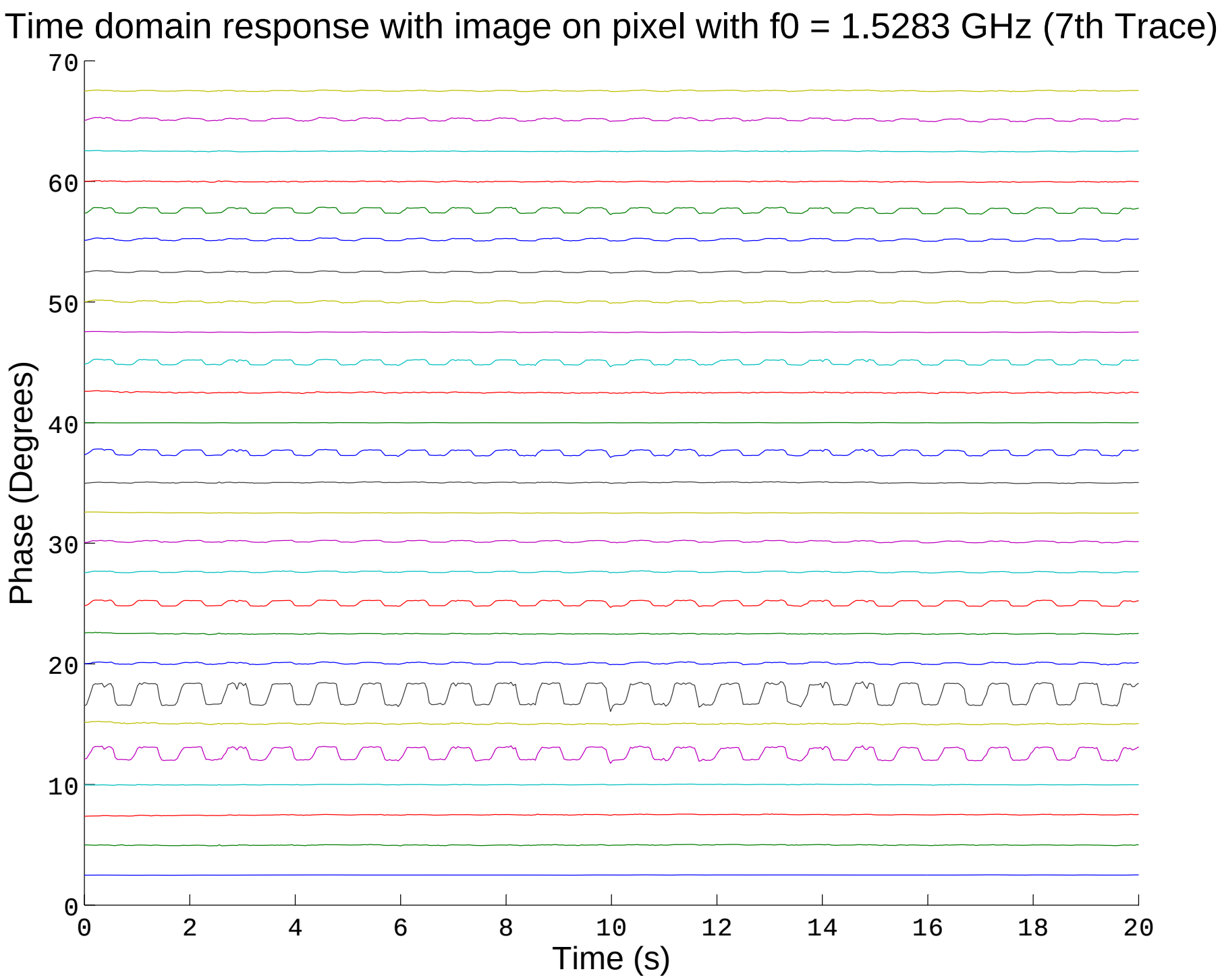
VNA Scan

- Two worst pixels – Red lines
- Blind tone during calibration – Blue line
- Blind tone for telescope run – Green line


S21 VNA Scan 30 Pixel NIKA Array, -70 dBm carrier
Amplitude Response (dB)
-24
-26
-28
-30
-32
-34
-36
1.51
1.515
1.52
1.525
1.53
1.535
1.54
1.545
1.55
1.555
Frequency (GHz)

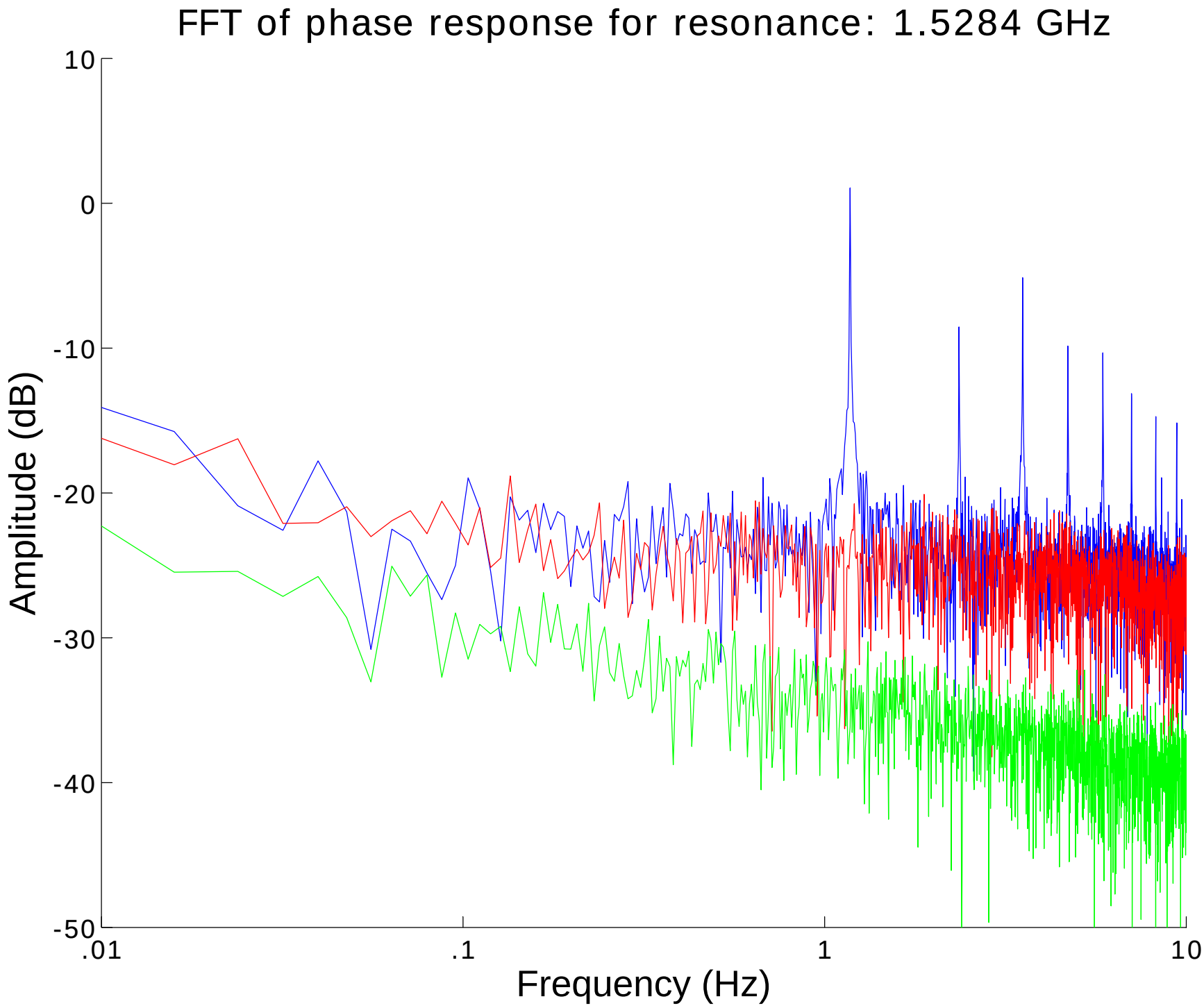
Time Domain Trace

- Response of all pixels while centered on the pixel with f0 = 1.5284 Ghz
- Image chops between 300 K Ecosorb and Mirror. This is seen through a 1 cm hole in Ecosorb immersed in a LN2 bath located on the focal plane. This 70 K Ecosorb is used to simulate the expected telescope background


Time domain response with image on pixel with f0 = 1.5283 GHz (7th Trace)
Phase (Degrees)
Time (s)
0
10
20
30
40
50
60
70
0
2
4
6
8
10
12
14
16
18
20

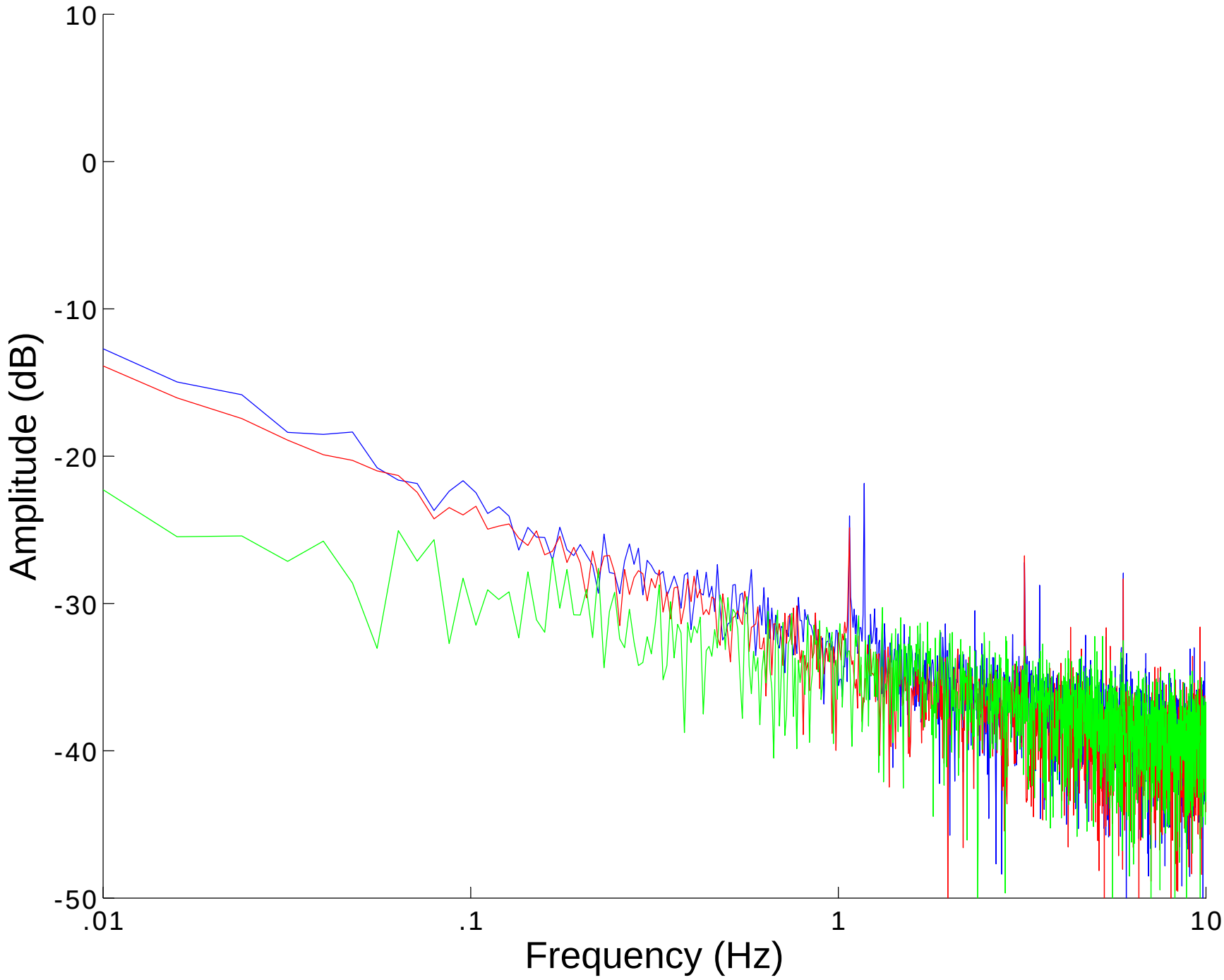
Spectra 1

- Phase noise plot of a single pixel with the image chopping (blue) on the focal plane and no chopping (red). In both cases, the image is focused on the pixel. Also included is the blind tone (Green).
- Frequency: 1.5284 GHz
- XY-Translator Position: x = 140 mm, y = 178 mm


FFT of phase response for resonance: 1.5284 GHz
Amplitude (dB)
10
0
-10
-20
-30
-40
-50
.01
.1
1
10
Frequency (Hz)

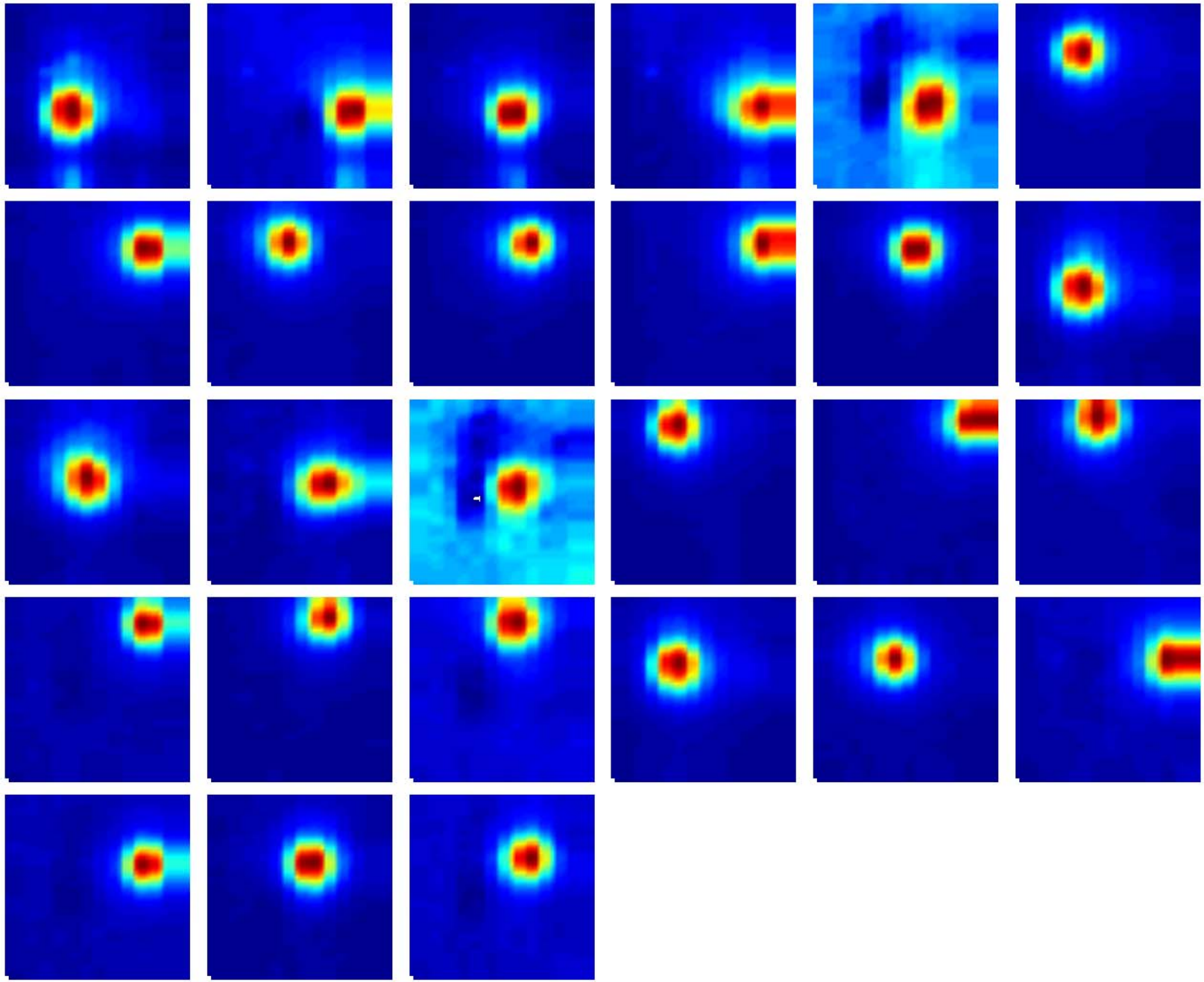
Spectra 2

- Phase noise plot of a single pixel with the image chopping (blue) on the focal plane and no chopping (red). In both cases, the image is focused on the pixel in Spectra 1 (not the pixel shown). Also included is the blind tone (Green).
- Frequency: 1.5133 GHz
- XY-Translator Position: x = 140 mm, y = 178 mm


FFT of phase response for resonance: 1.5133 GHz
Amplitude (dB)
10
0
-10
-20
-30
-40
-50
.01
.1
1
10
Frequency (Hz)

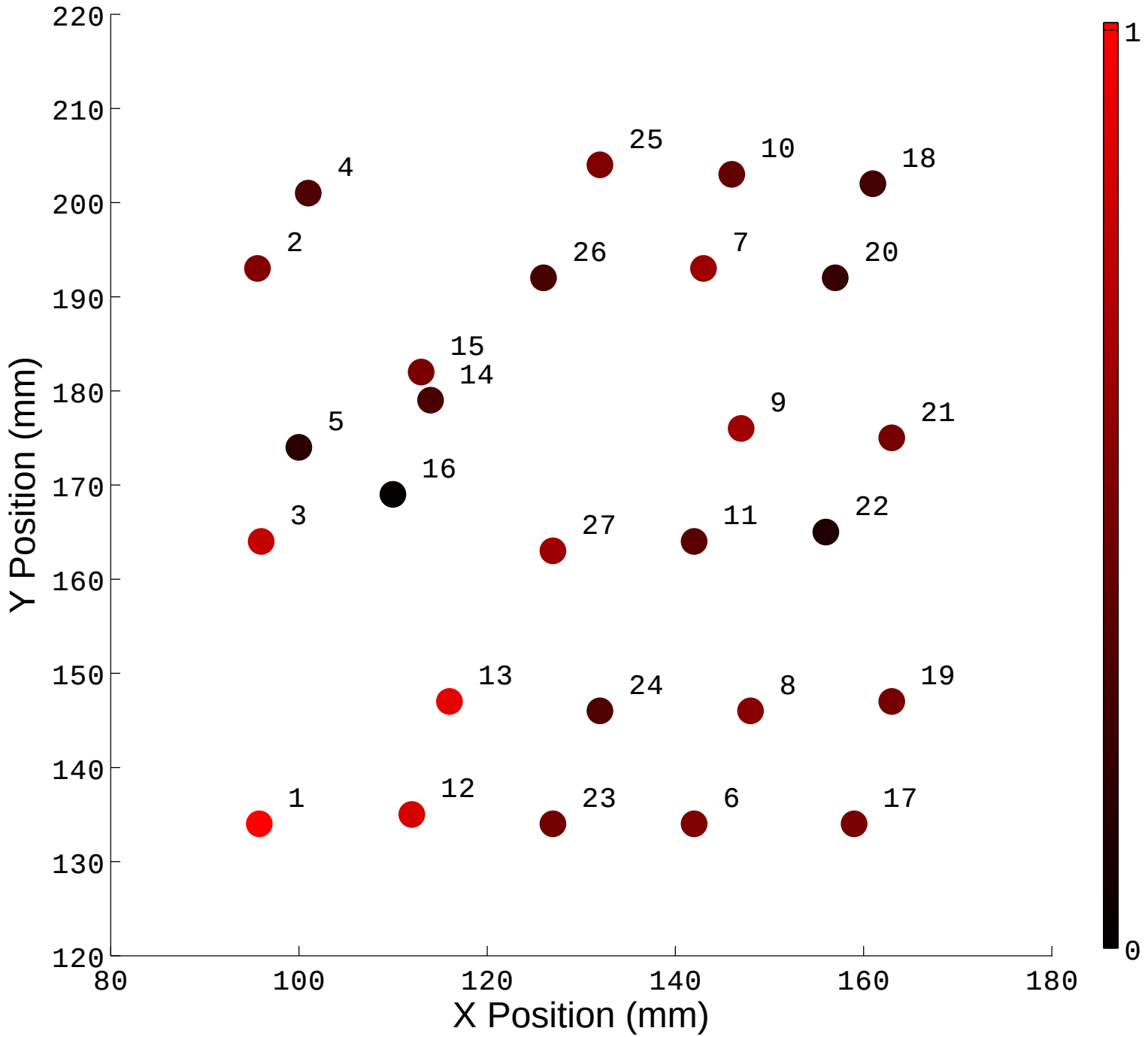
Beam Pattern Data

- Scanning the translator, able to determine maximum response from the pixels and hence index their positions. Find they correspond to the design positions.

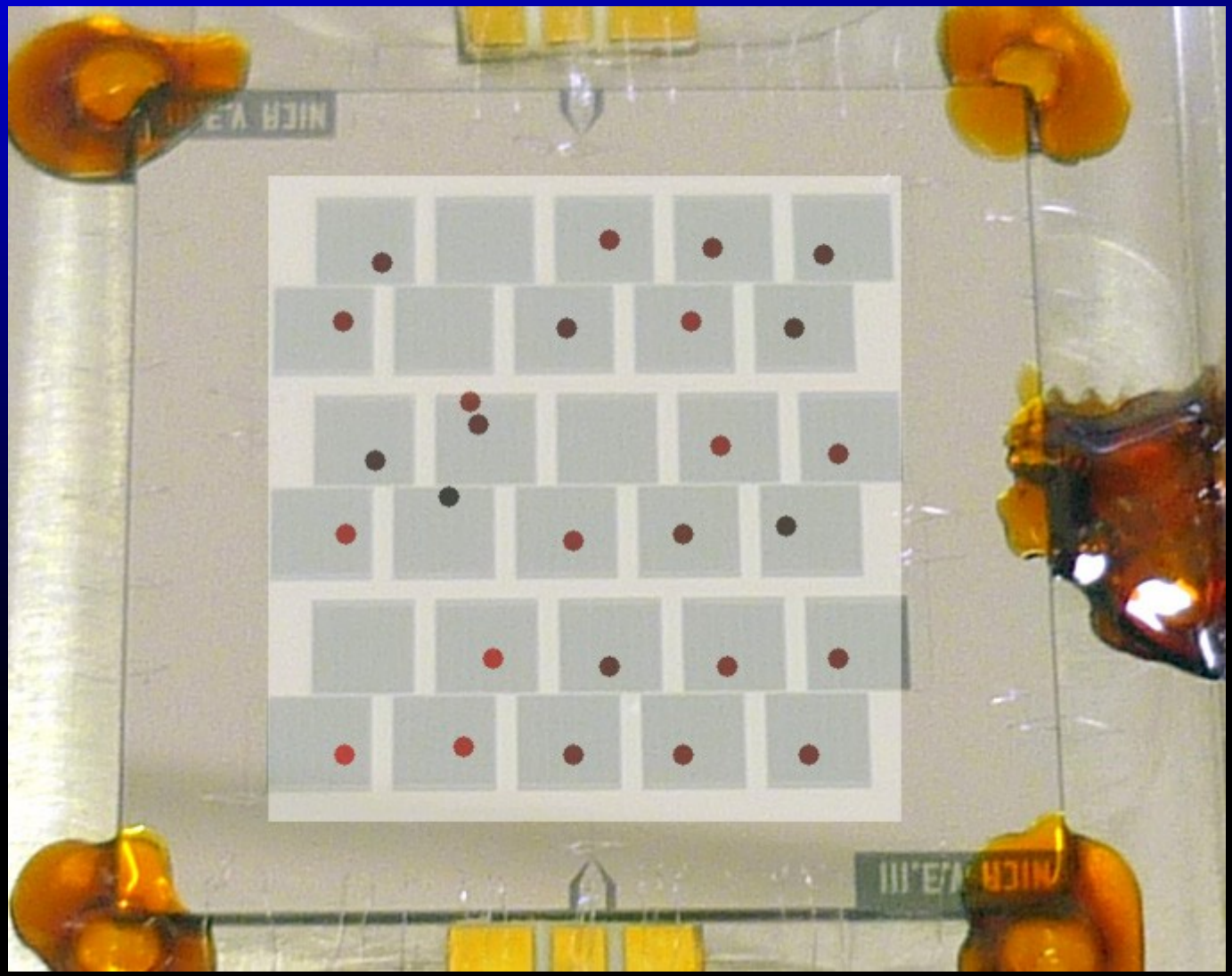


Beam Pattern Data

- Plot of XY Translator position and the maximum response for each pixel.
- Indexed by resonance number.
- Color indicates relative response compared with pixel with greatest response.


Chopper position giving maximum response for each pixel
Y Position (mm)
X Position (mm)
220
210
200
190
180
170
160
150
140
130
120
80
100
120
140
160
180
1
0
25
10
18
4
2
26
7
20
15
14
9
21
5
16
3
27
11
22
13
24
8
19
1
12
23
6
17

Beam Pattern Overlay



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Observations.... to come

Merci!

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Aurélien Bideaud
Philippe Camus
Alain Benoit
Christian Hoffmann
and Alessandro Monfardini
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University Joseph Fourier
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Simon Doyle and
Philip Mauskopf
Cardiff University, England

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Martino Calvo &
Claudia Giordano,
Università la Sapienza, Roma

Stephen Yates, Andrey Baryshev & Jochem Baselmans
SRON, Netherlands