

KNU IP-BPM and Reference cavity

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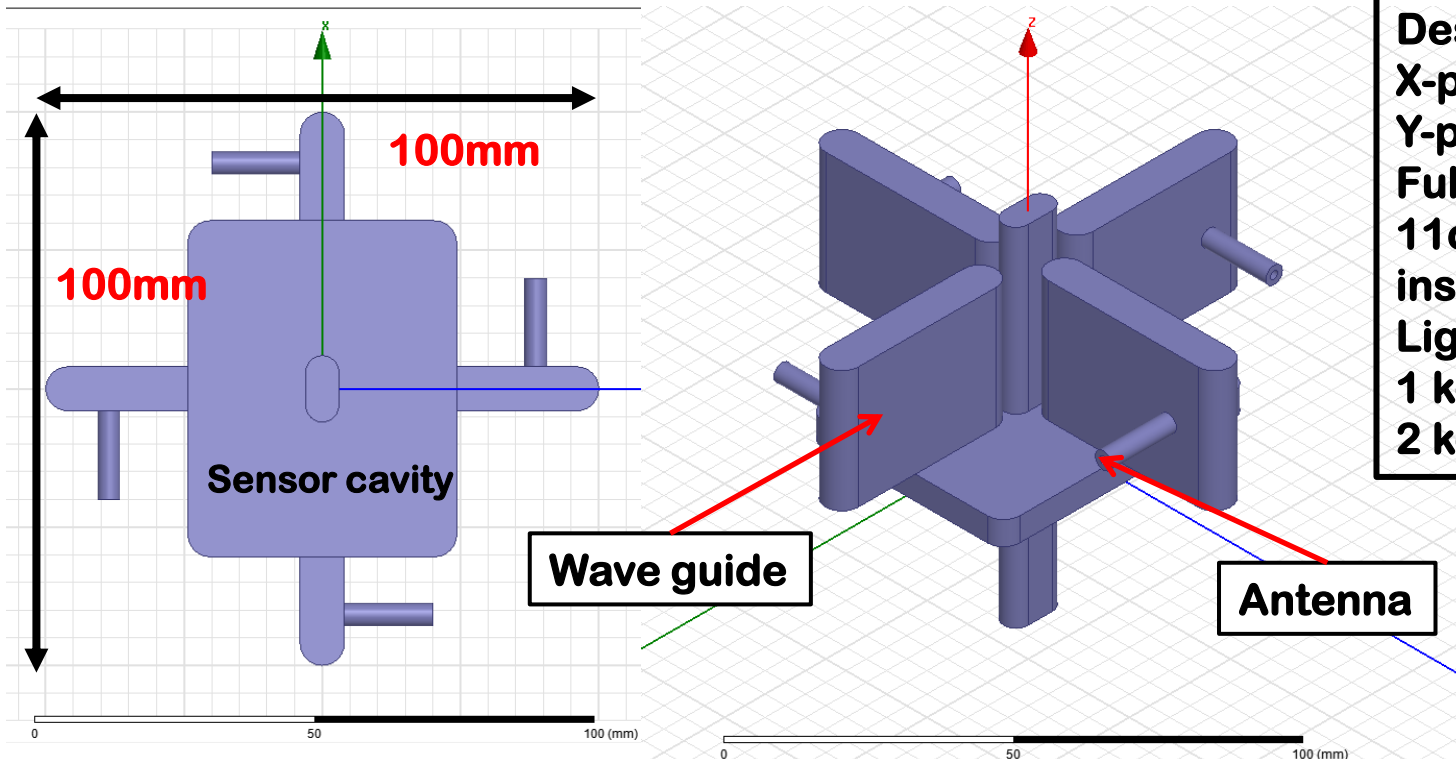
- **Schedule**



11cm Low-Q IP-BPM design



■ 11cm Low-Q IP-BPM drawings of HFSS



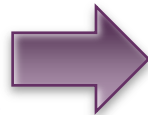
Designed frequency
X-port: 5.712 GHz
Y-port: 6.426 GHz
Full size :
11cmx11cm (to
install IP-Chamber)
Light weight:
1 kg (Single cavity)
2 kg (Double cavity)

+ KNU IP-BPM



| | Port | f_0 (GHz) | β | Q_0 | Q_{ext} | Q_L | τ (ns) | V_{out} (uV/2nm) |
|----------|--------|-------------|---------|---------|------------------|--------|-------------|---------------------------|
| Designed | X-port | 5.7127 | 5.684 | 4959.29 | 872.42 | 741.91 | 18.72 | 7.739 |
| Designed | Y-port | 6.4280 | 5.684 | 4670.43 | 821.61 | 698.70 | 17.23 | 7.448 |
| Double_1 | X-port | 5.6968 | 0.656 | 362.34 | 552.14 | 218.77 | 6.112 | 9.740 |
| Double_1 | Y-port | 6.4099 | 0.668 | 845.66 | 1266.7 | 507.11 | 12.59 | 6.010 |
| Double_2 | X-port | 5.6975 | 0.817 | 483.38 | 591.45 | 265.99 | 7.430 | 9.410 |
| Double_2 | Y-port | 6.4097 | 0.641 | 834.70 | 1302.5 | 508.70 | 12.63 | 5.927 |
| Single_1 | X-port | 5.6991 | 0.855 | 502.05 | 587.04 | 270.61 | 7.557 | 9.444 |
| Single_2 | Y-port | 6.4089 | 0.986 | 1238.0 | 1255.9 | 623.43 | 15.48 | 6.037 |

Average frequency: X-port 5.6978GHz
 Y-port 6.4095GHz



The reference cavity frequency!

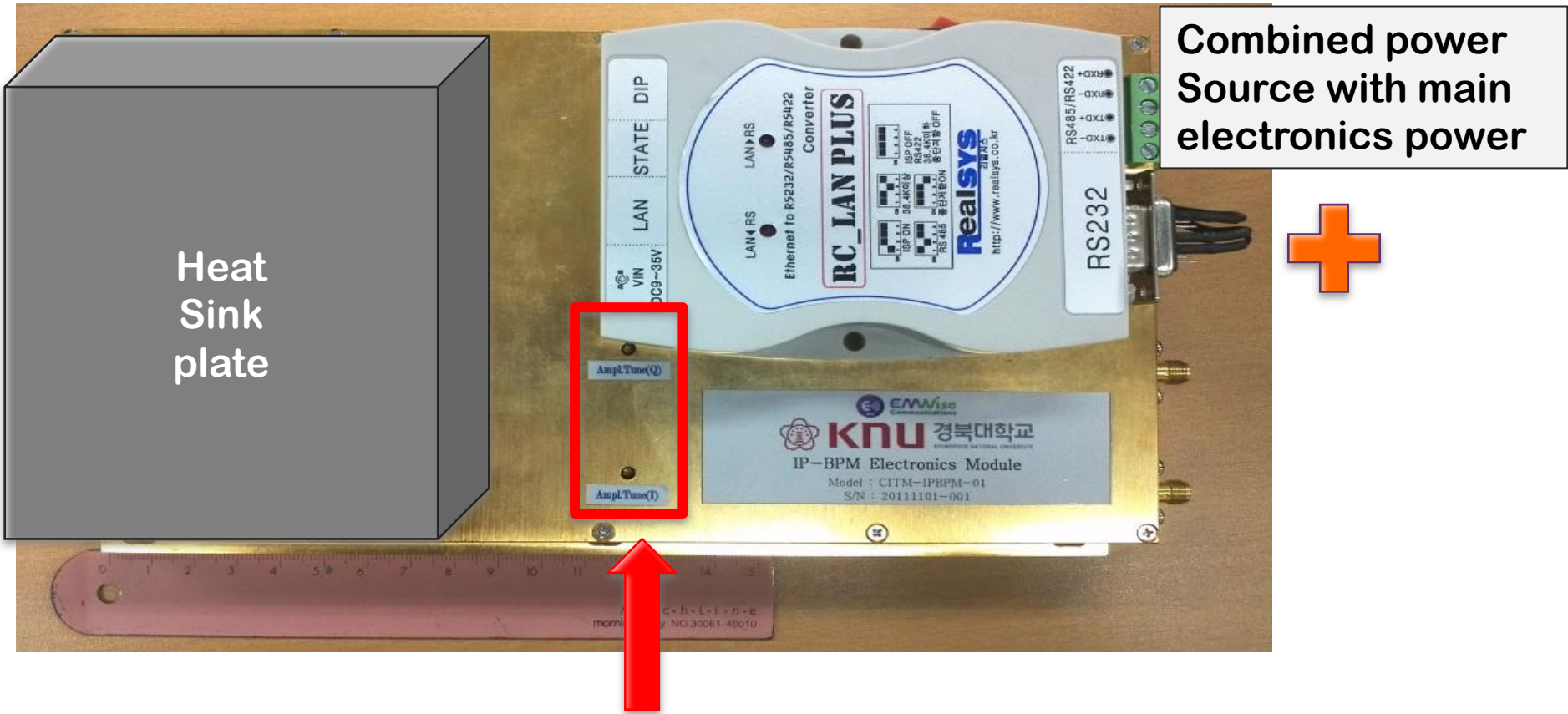
+ IP-BPM Electronics



■ Modified IP-BPM Electronics

- Total conversion gain: 54dB ~ 45dB (variable gain).
- The phase controller power connected to main electronics power.
- Reference cavity output signal power divider with -6dB att.
- Reference cavity signal power detector by using Crystal diode power detector for both direction.
- Add Heat sink plate on the electronics

+ IP-BPM Electronics modification



Heat Sink plate

Combined power Source with main electronics power

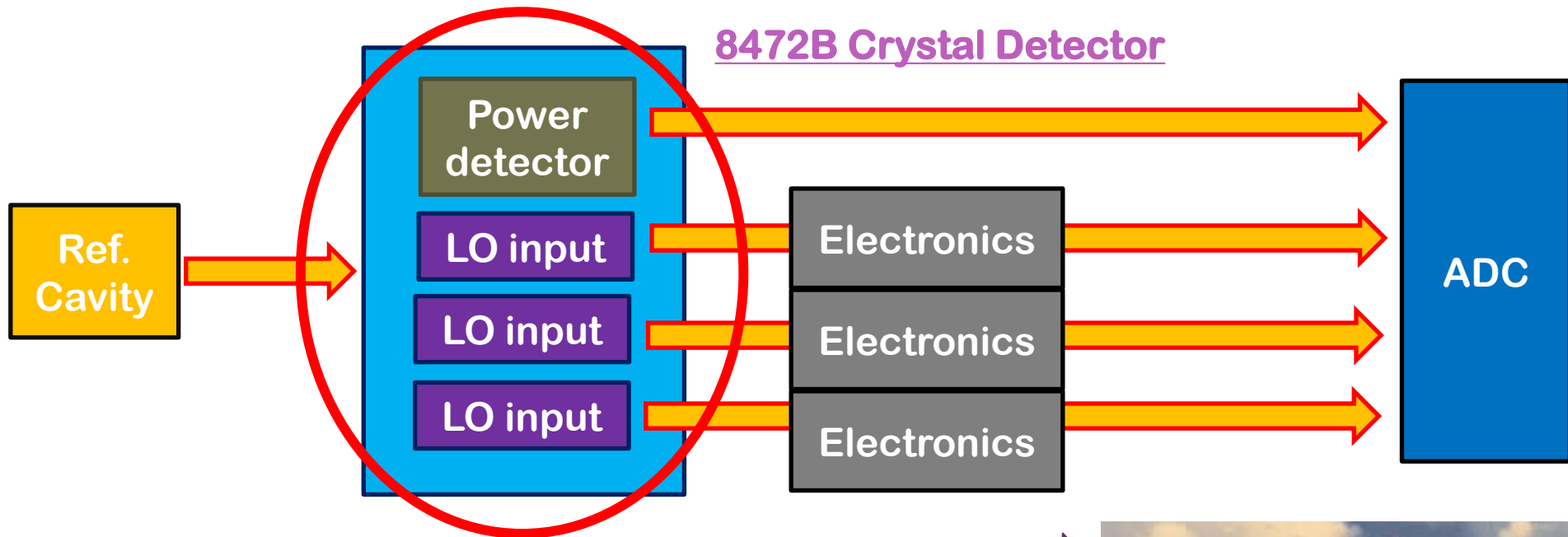


Gain controller
54dB ~ 45dB



Power divider for Ref. signals

- The ref. cavity output is just one port, therefore the output signal should be split to connect LO signal port of each electronics and power detector.



8472B Crystal Detector



8472B Crystal Detector

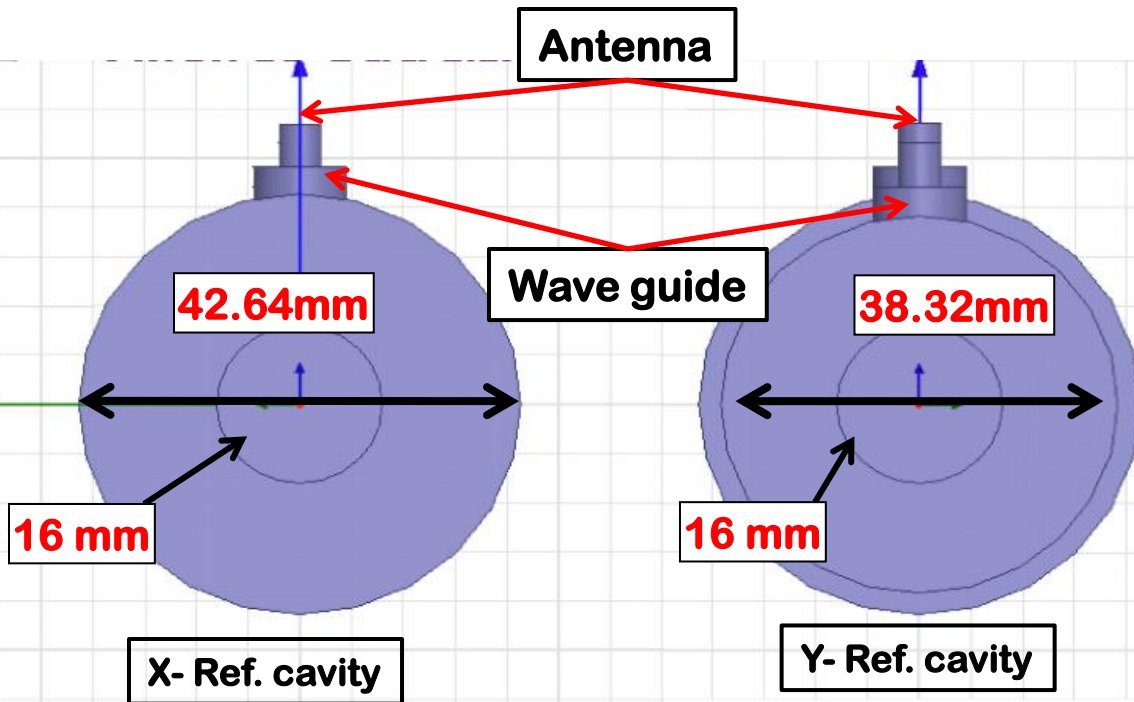




Reference cavity BPM design



Reference cavity BPM drawings of HFSS

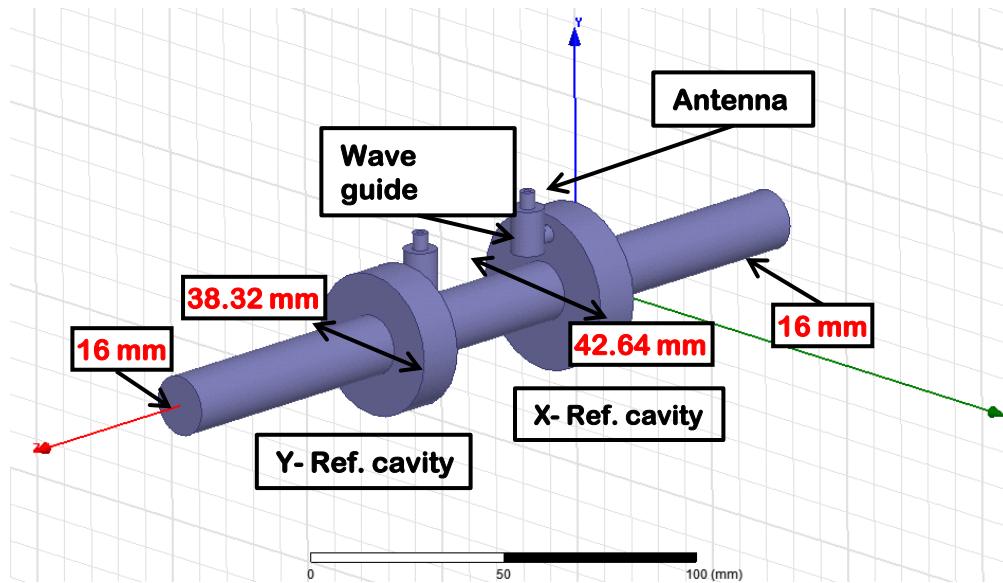


- Cavity size :
42.64mm,38.32mm
- Beam Pipe radius:
8 mm (circular pipe)
- Material of BPM:
Steel Stainless
- HFSS simulation
need more
optimization.
- CST simulation also
need to compare
with HFSS results



Reference cavity BPM design

■ Cavity shape for HFSS simulation



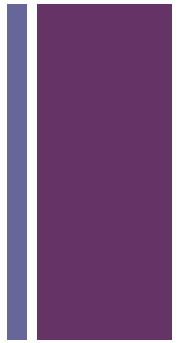
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Steel Stainless
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- CST simulation also need to compare with HFSS results

| Port | f_0 (GHz) | β | Q_0 | Q | Q_L | τ (ns) |
|--------|-------------|---------|---------|---------|---------|-------------|
| X-port | 5.7034 | 0.0208 | 1161.1 | 1161.1 | 1140.68 | 31.83 |
| Y-port | 6.4100 | 0.0208 | 1165.61 | 36765.1 | 1165.46 | 28.94 |

Not decided values



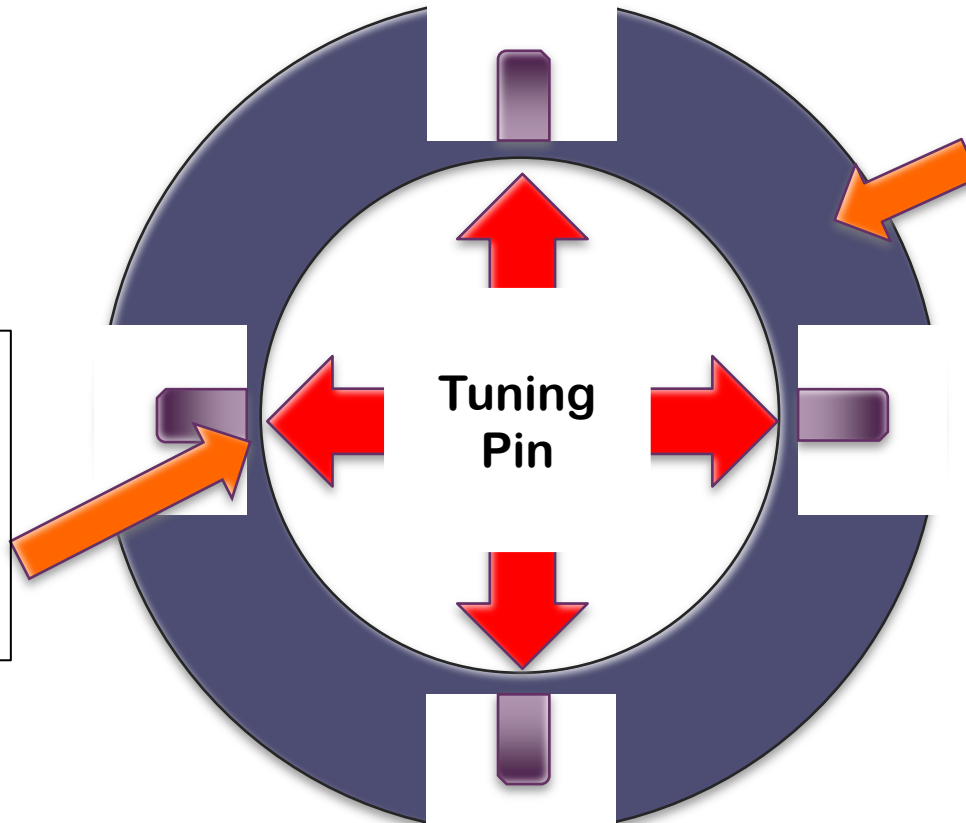
Reference cavity frequency tuning



- Way to tune the frequency of Reference cavity

Aim frequency:
X-port 5.6978GHz
Y-port 6.4095GHz

Stainless steel is hard to change the shape. Therefore, tuning pin will be welded on the very thin cavity surface.



Cavity material:
Stainless steel

Tuning Pin

+ Low-Q IP-BPM Progress

