Embedded Maritme Broadband Radio - EMBR

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Existing broadband systems

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- Ruggedized WiFi/WLAN 802.11x
  - Stability
  - Path Loss Margin: Up to 150 dB with multiple high gain sector antennas
  - Does not handle a combination of short/long ranges
  - Limited real time capability
- WiMax (802.16e)
  - Requires base station
- Radio link systems with parabolic antennas
  - Only point-to-point
  - Antennas need motor-control to maintain track

EMBR - Main features

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- Embedded component in reference systems
- EMBR provides the user with one or more reliable broadband data links
- EMBR is easy to configure and operate
- EMBR has no moving parts
- An EMBR data link is able to transfer 5Mbps when the distance between the nodes are up to 10 km
- Realtime capability

EMBR Design

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- Frequency Band: 4.900 – 5.875 GHz
- Bandwidth: 20 MHz
- User Datarates: Up to 6Mbps
- Output power control

EMBR - Design

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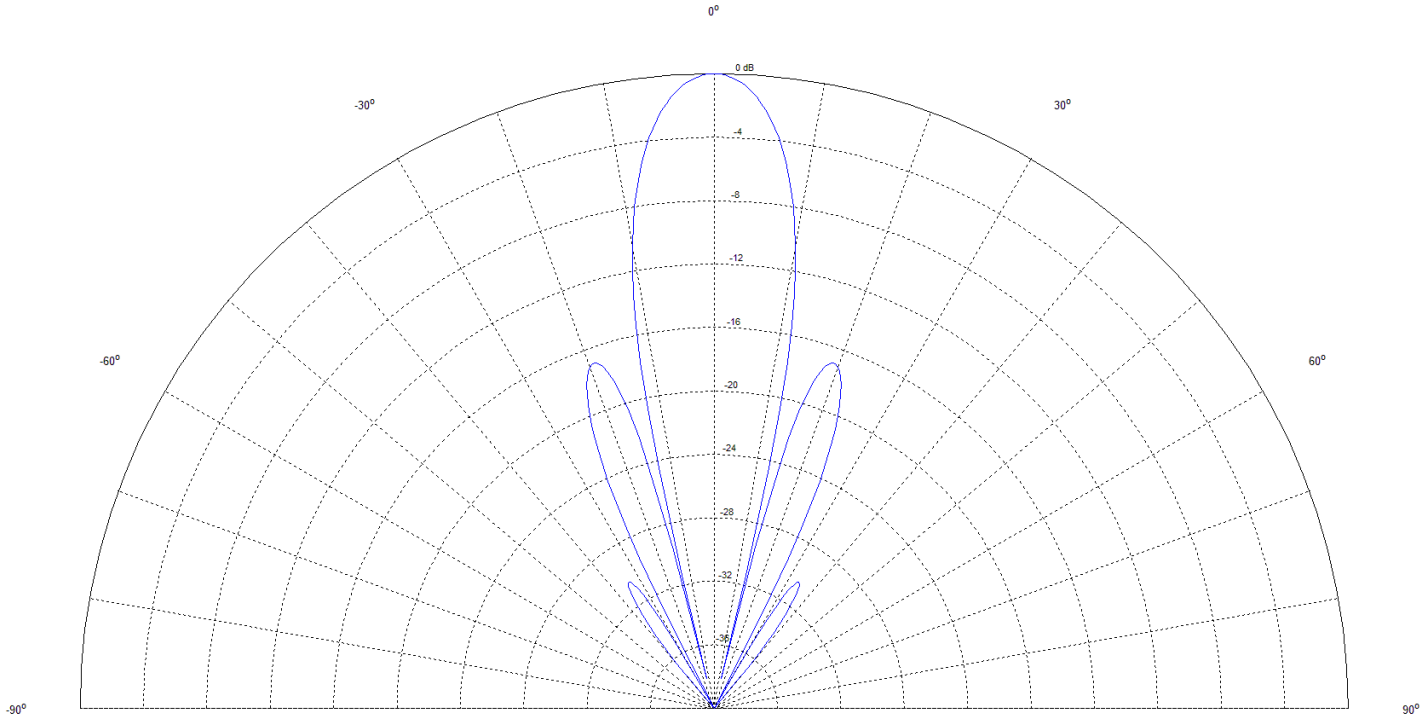
- Smart antenna based radio system with 60 antennas/transceivers in each unit
- Maximum Transmitted power: 60 x 100mW = 6W (38 dBm)
- Antenna gain: 26 dBi (8 dBi + 10log60)
- Gives maxmimum EIRP: 2.5 kW (64 dBm)
- Antenna 3 dB beam width: +/- 4.5° (H and V)
- Antenna beam can be controlled +/- 45 °
- All beam forming is performed in the signal processing domain

Antenna diagram



EMBR MAC/PHY

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- Tailored Media Access Control (MAC) and Physical Layer (PHY)
- ACCM modulation (DSSS with rotating m-ary code book)
- Improved immunity versus multipath fading (reflections from sea surface and steel structures)
- Multi purpose functionality and capacity
- High priority channels – short latency channels

EMBR – Radio Board

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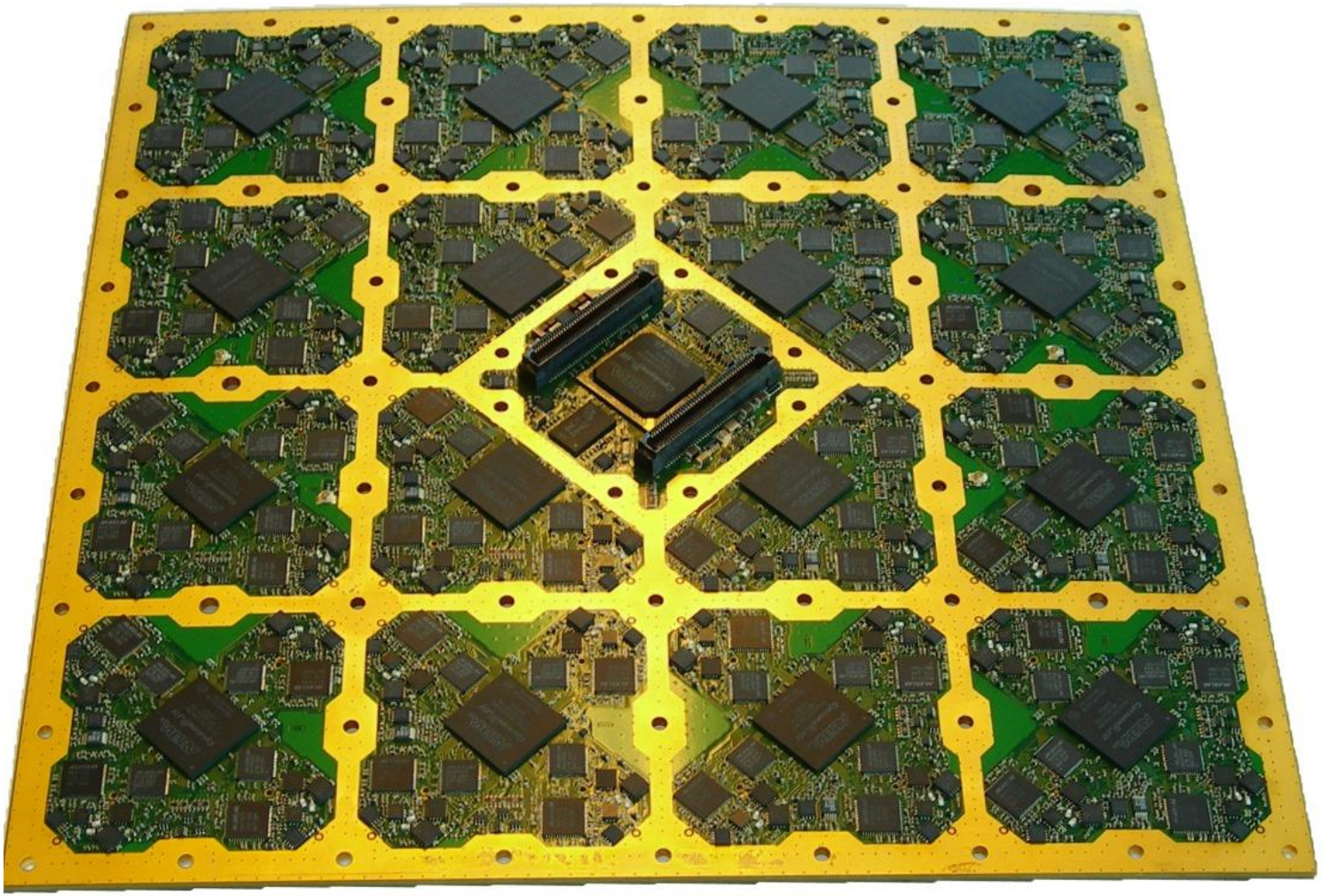

EMBR – System Gain

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- System gain: system parameter indicating how much Path Loss can be tolerated
- Three different antenna configurations:
  - EMBR-179 (monopole antennas)
  - EMBR-189 (helix antennas)
  - EMBR-201 (helix antennas
- Line of Sight path loss at 10 km (5 GHz): 128 dB

EMBR-179

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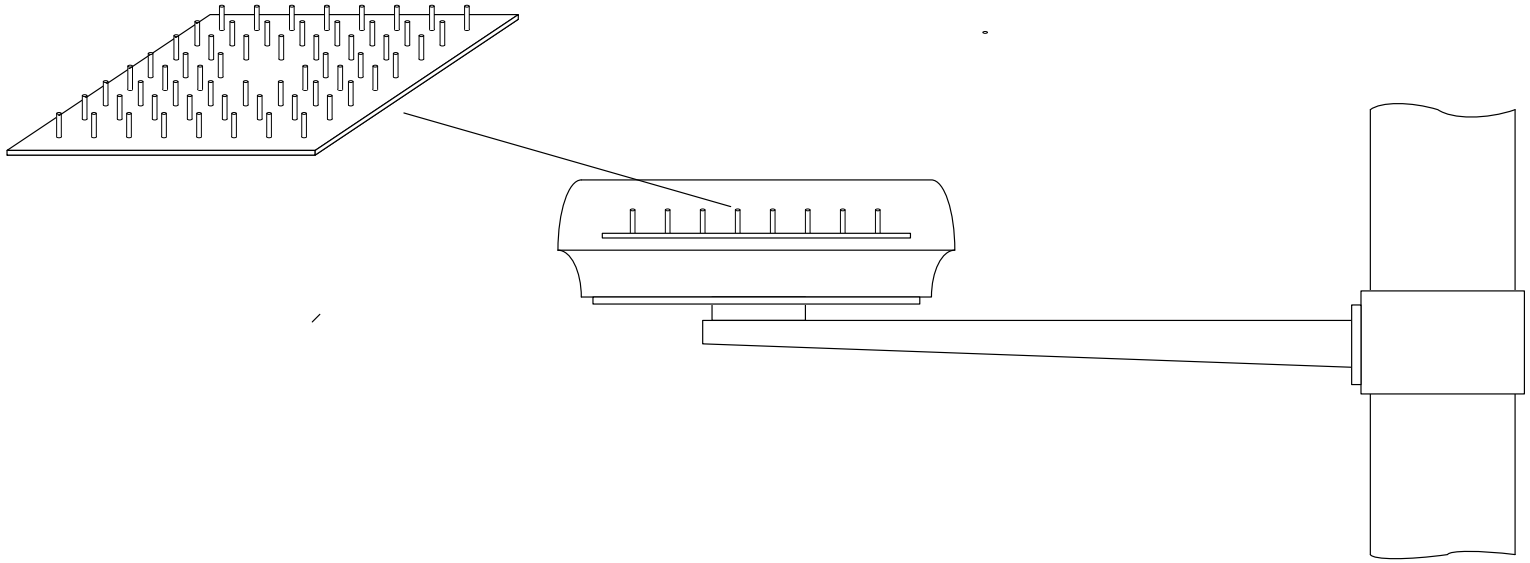

EMBR-179

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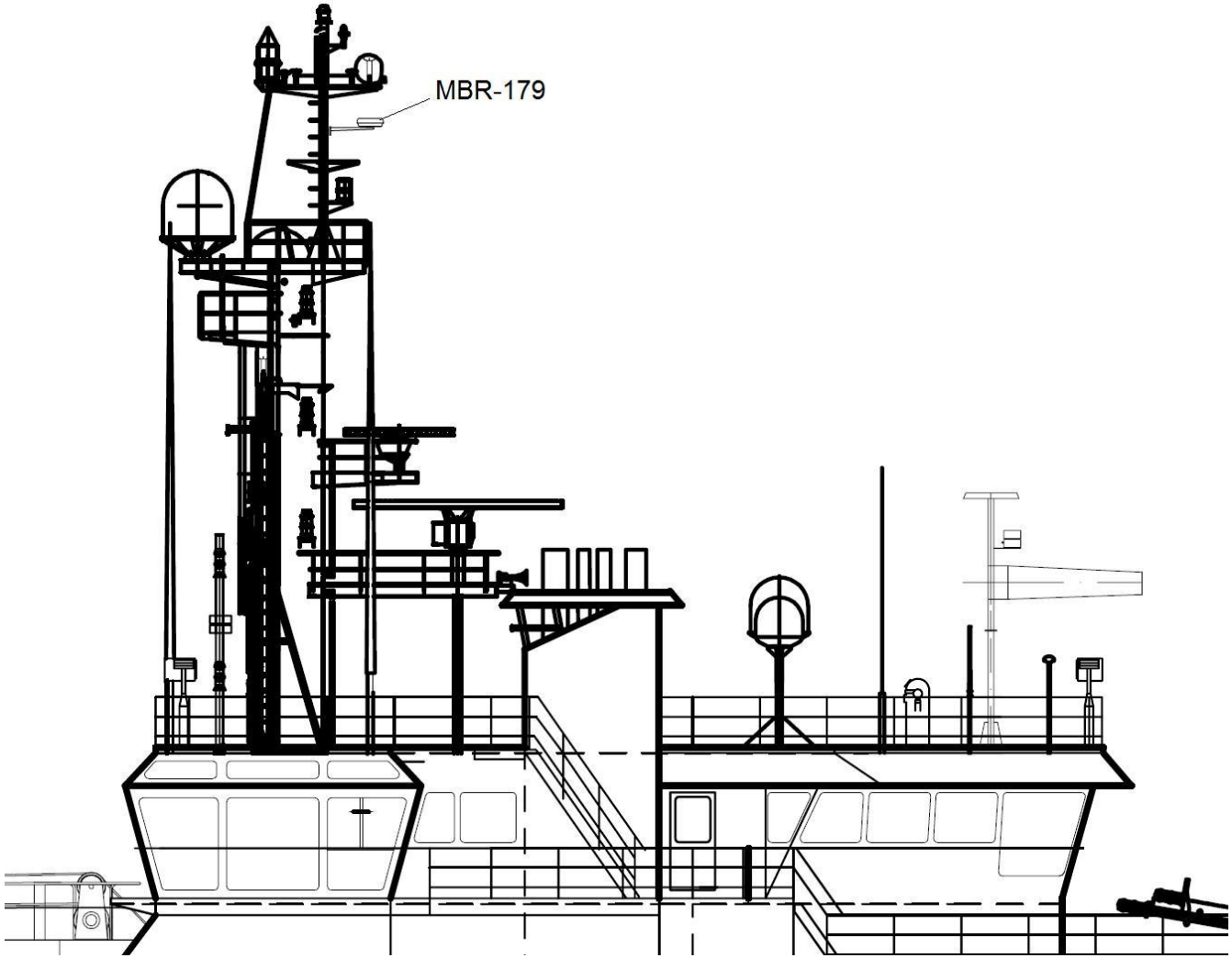

EMBR-189

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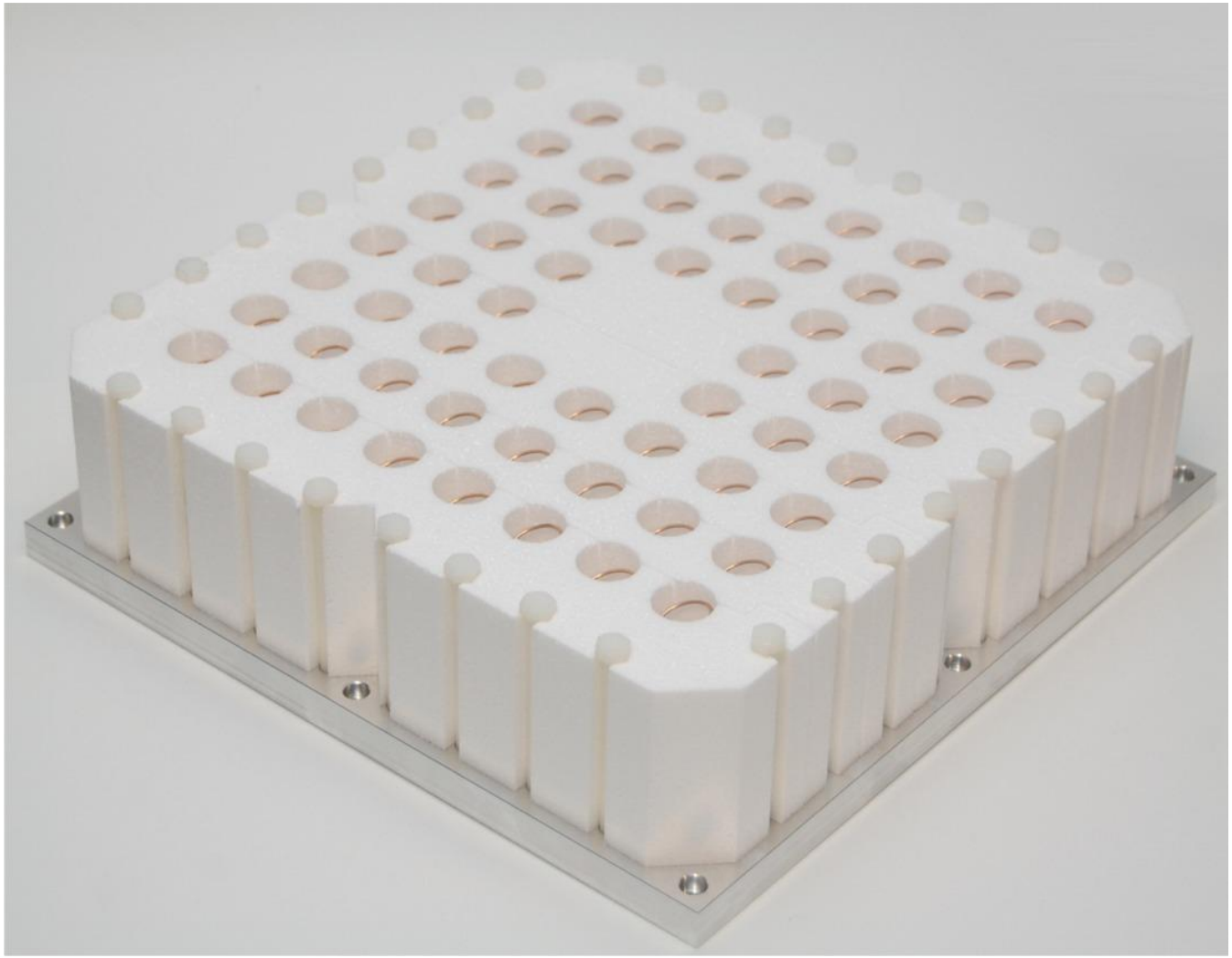
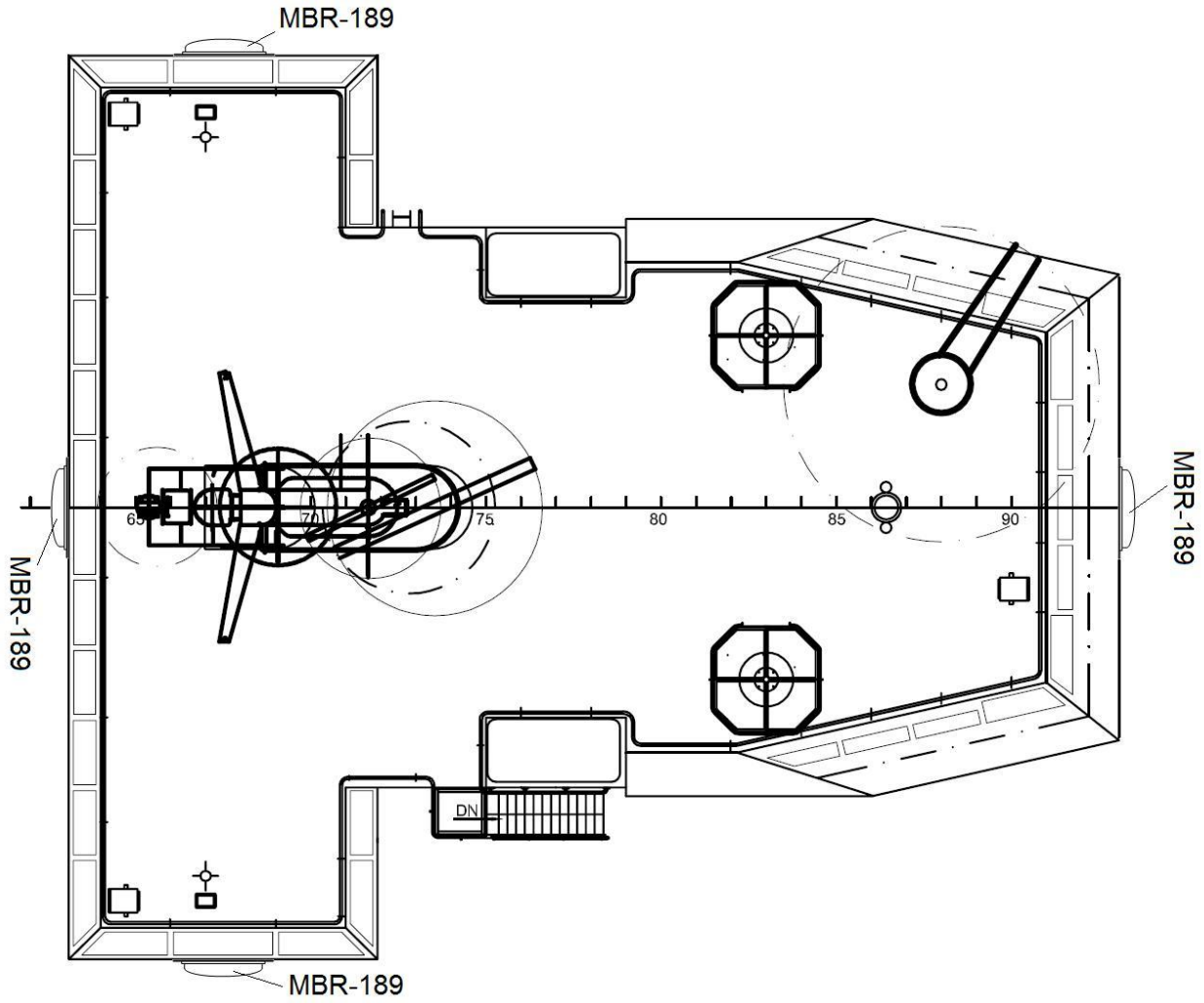


EMBR-189



EMBR-201

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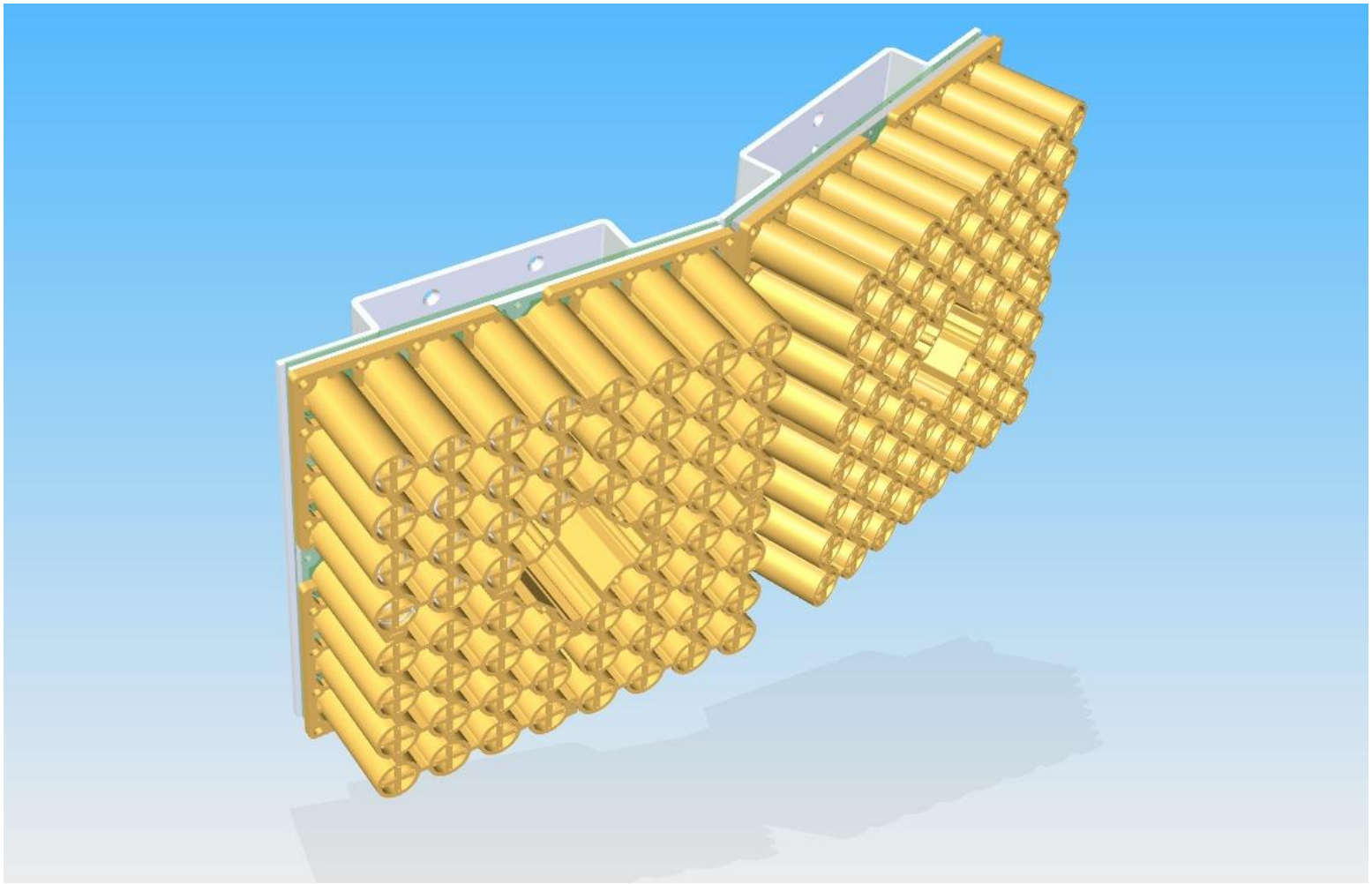
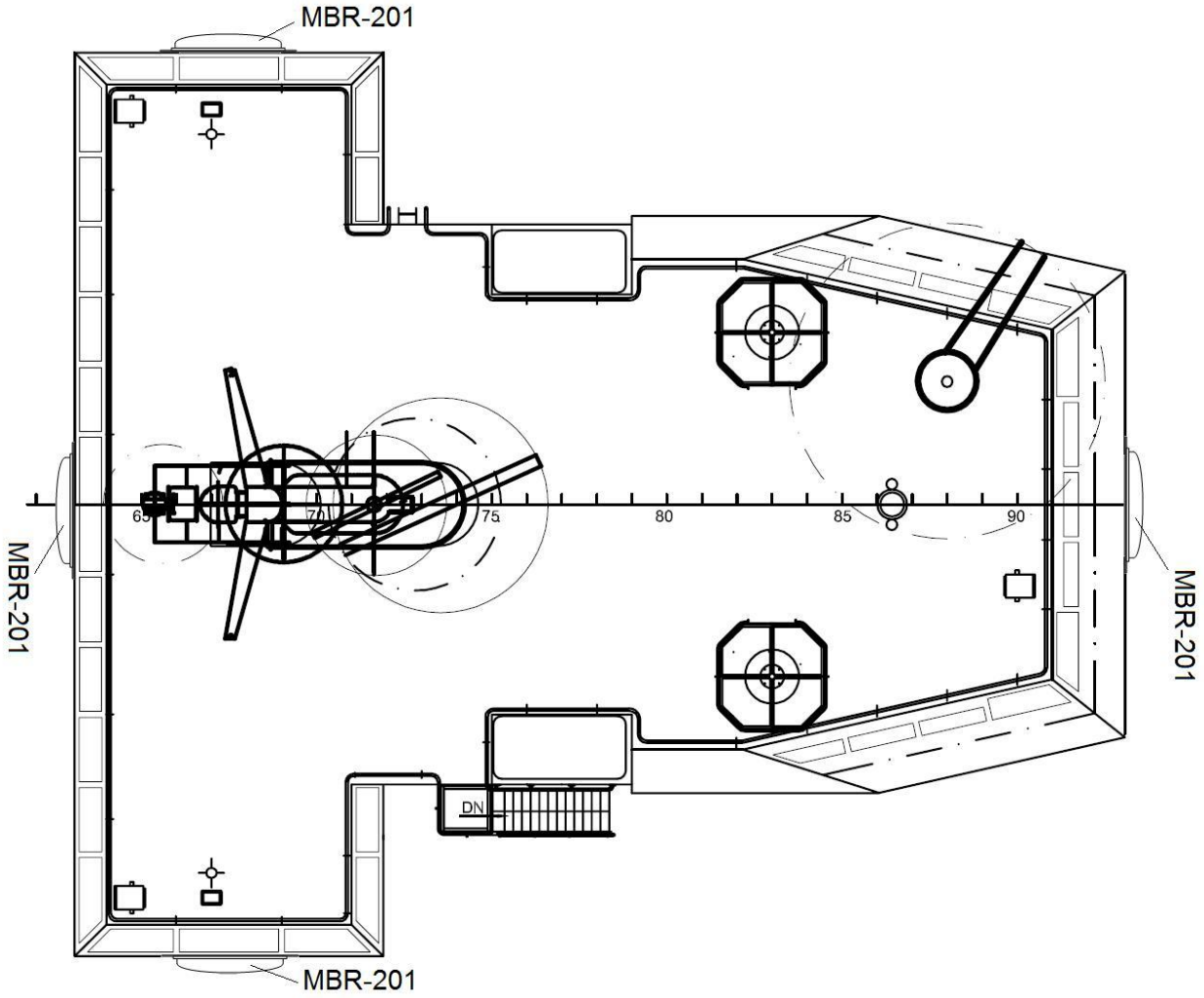


EMBR-201



EMBR – System Gain

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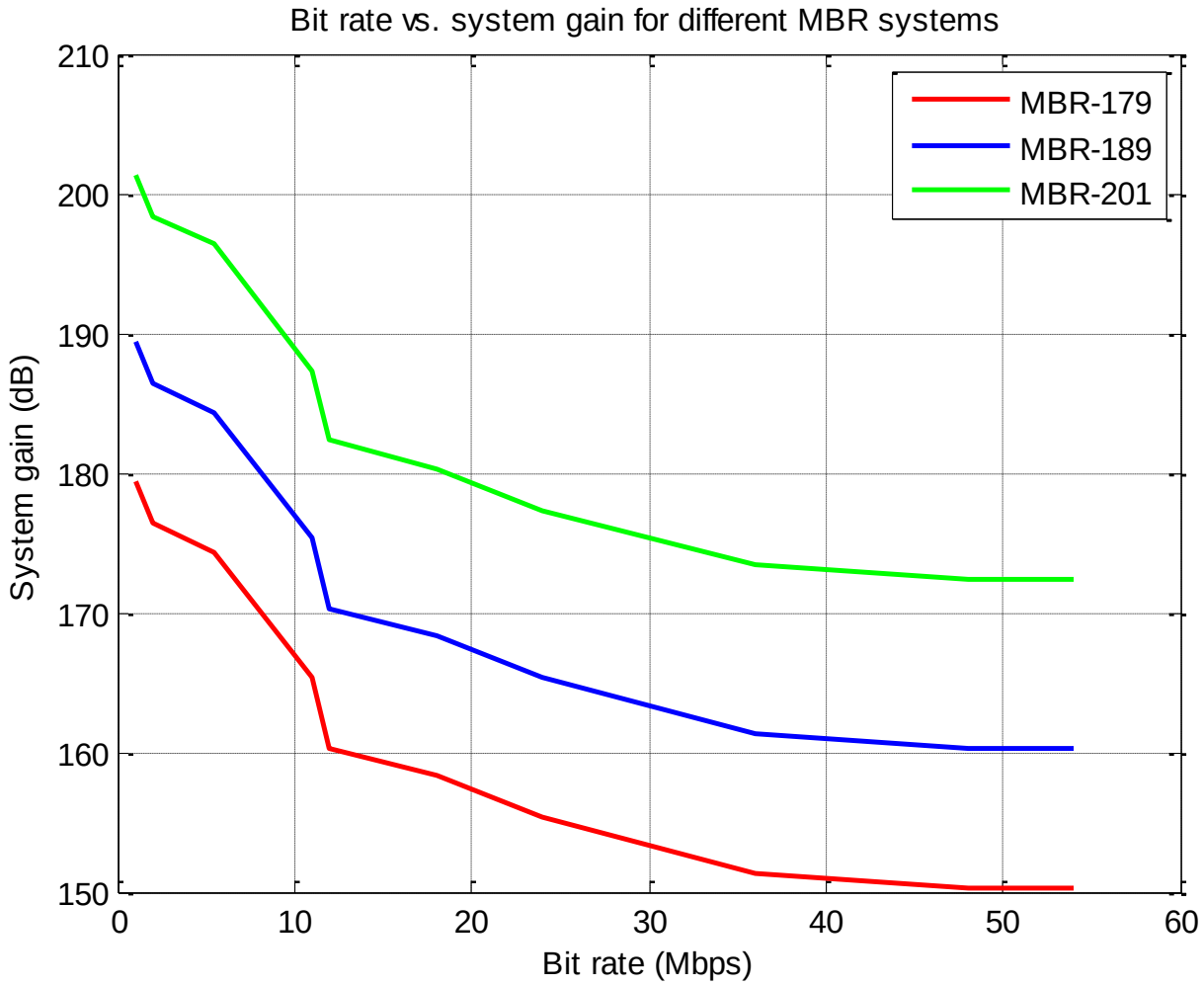
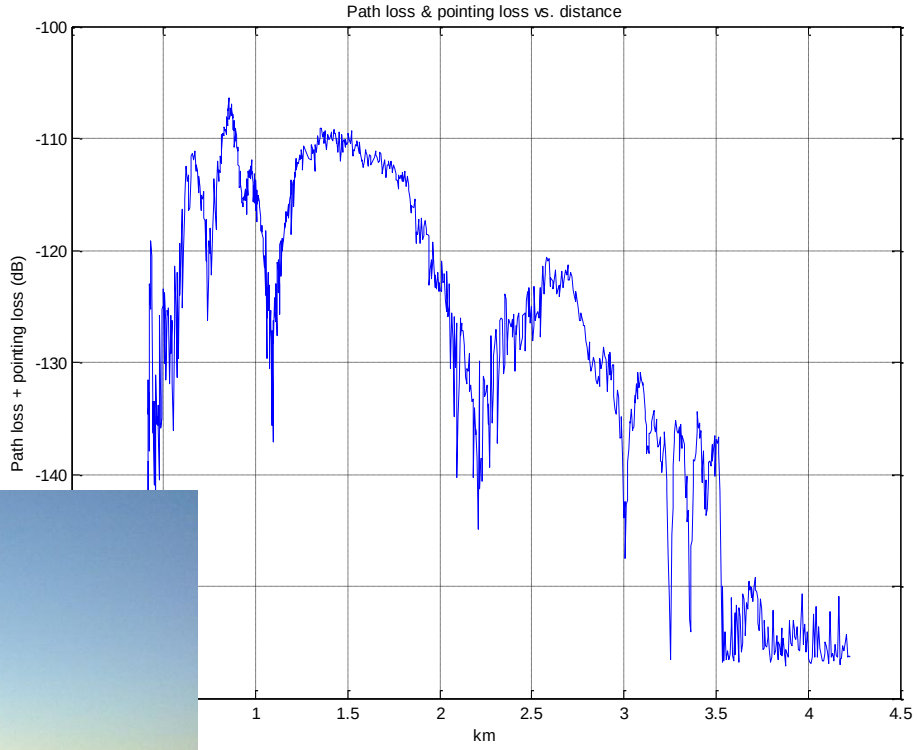


Measurements – path loss



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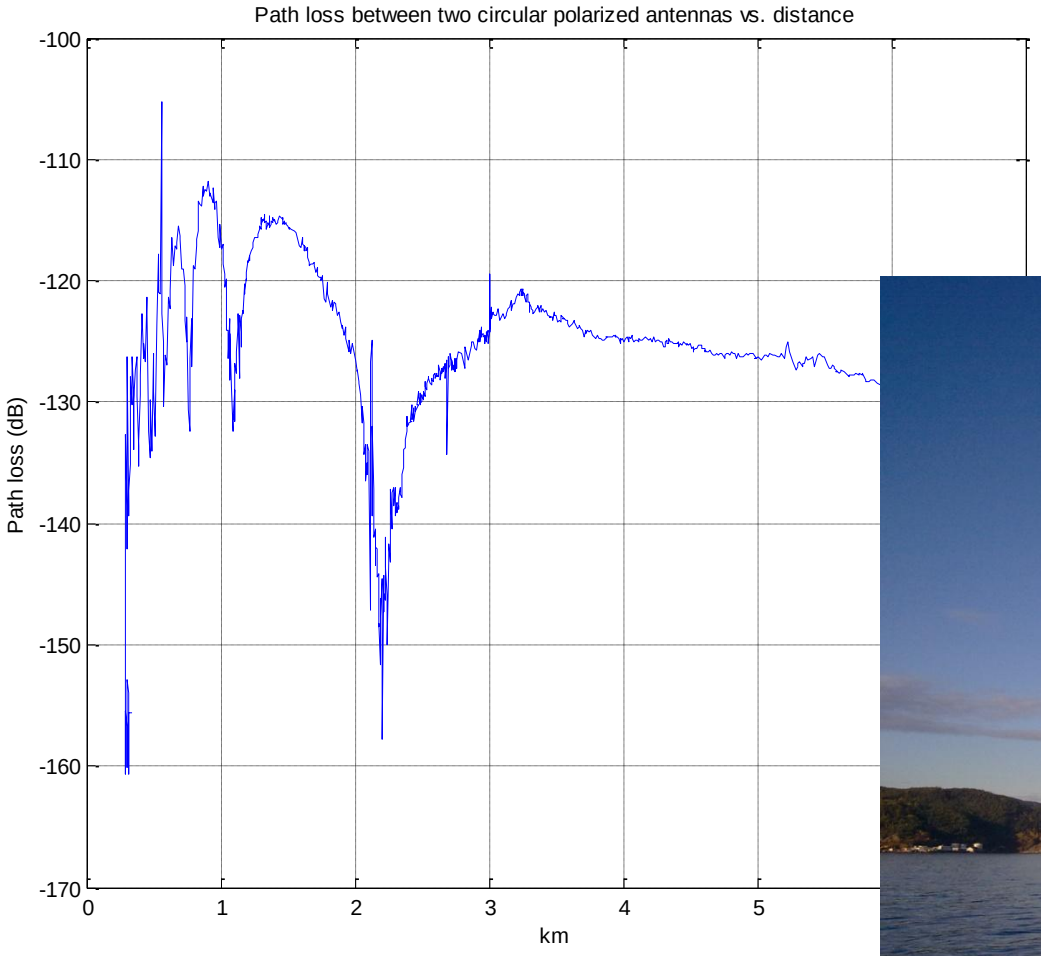

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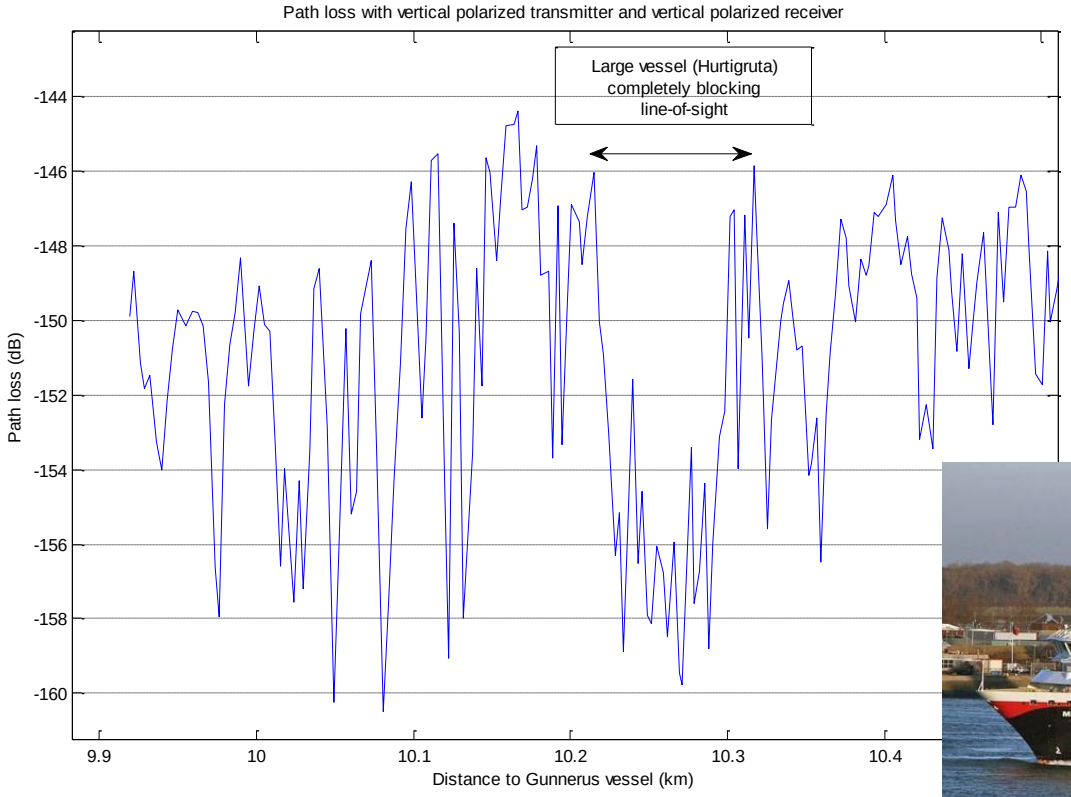
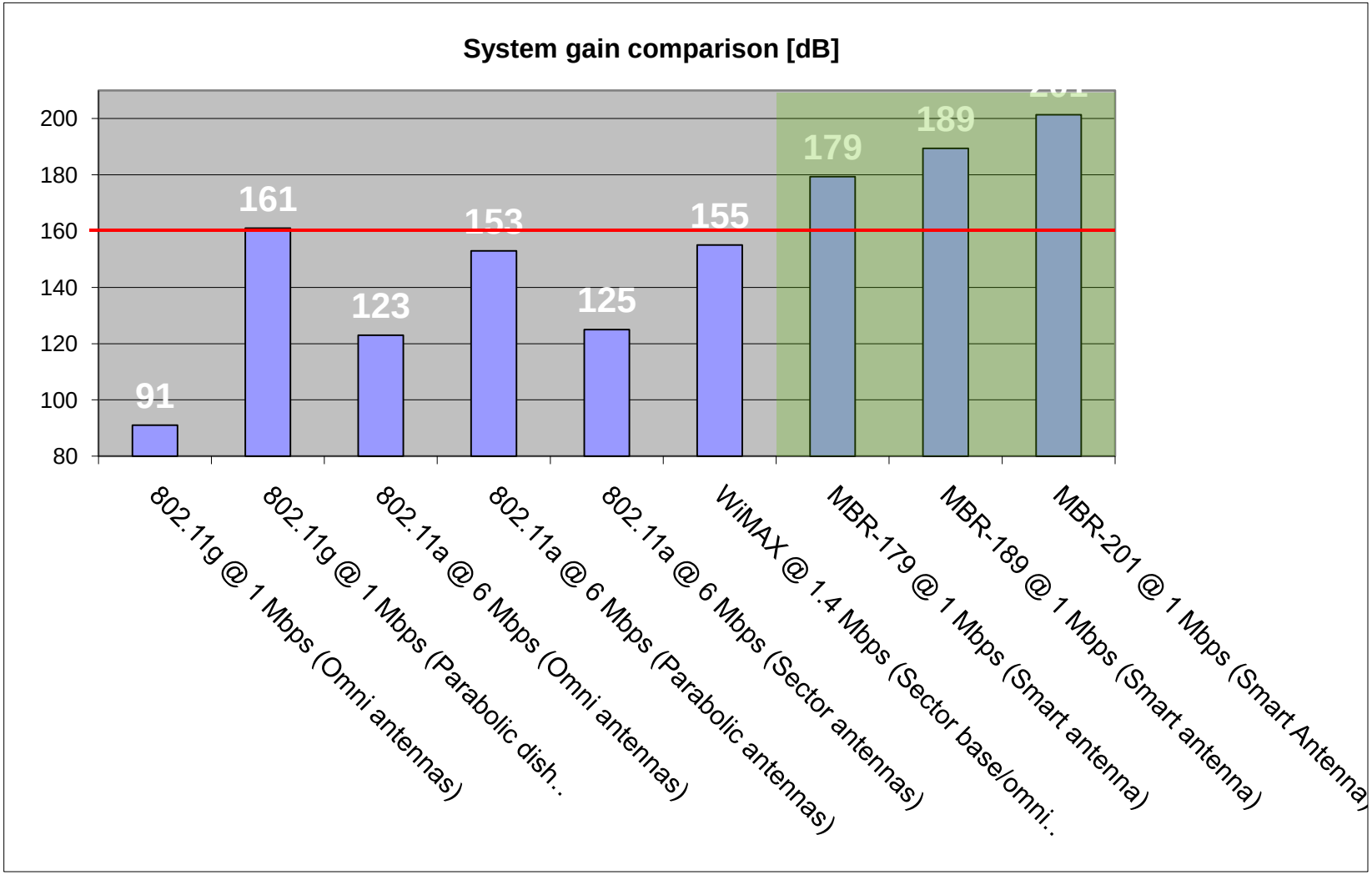


EMBR – System Gain



EMBR – key points

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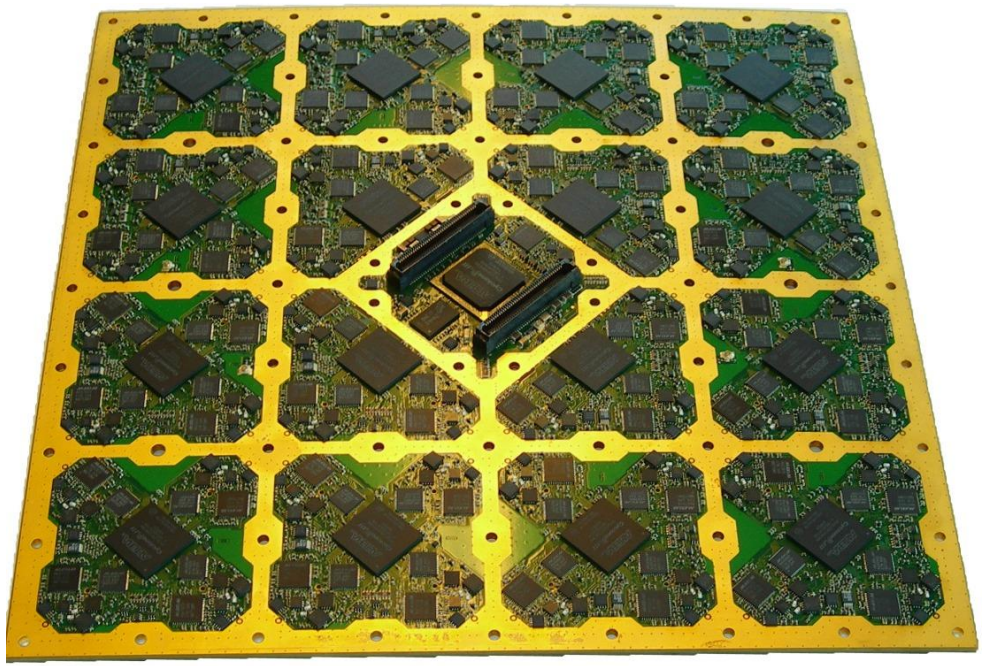
- Smart antenna technology
- Tailored MAC/PHY



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Raw Data rates & sensitivity

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- 468 750 bits/sec -102 dBm
- 937 500 bits/sec -99 dBm
- 1 875 000 bits/sec -96 dBm
- 2 500 000 bits/sec -95 dBm
- 3 750 000 bits/sec -93 dBm
- 5 000 000 bits/sec -91 dBm
- 7 500 000 bits/sec -89 dBm
- 10 000 000 bits/sec -88 dBm