

# Email Performance with 2nd and 3rd Generation Data Links in Low Power Mobile Channels

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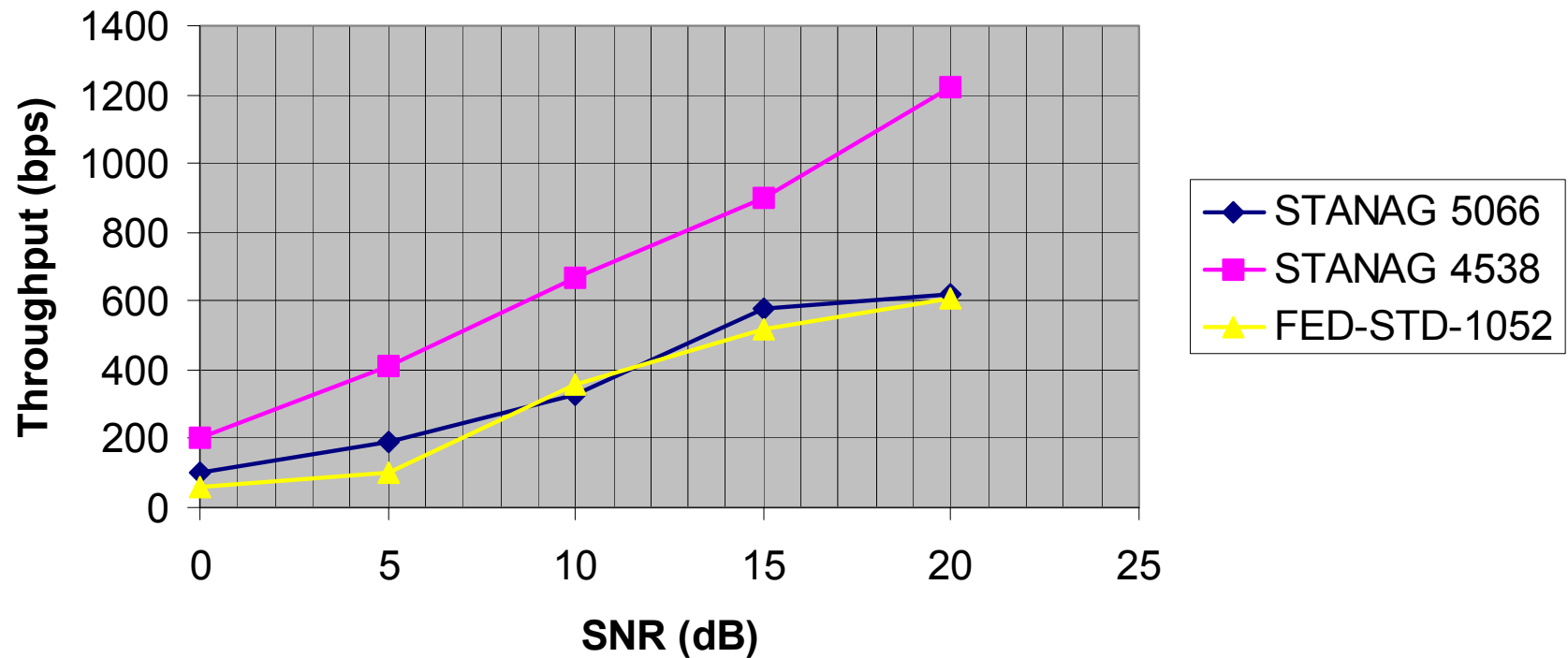
- Evaluate performance of HF e-mail systems
- Standardized protocols
- 2<sup>nd</sup> and 3<sup>rd</sup> generation data links
- Low power mobile applications
- “Tactical” messages
- Documented in 2001 Nordic HF Conference Proceedings

- Use STANAG 5066 HMTP
- MIL-STD-188-141A ALE
- Individual pt-to-pt messages (link-send-terminate)
- Three different data link protocols
  - STANAG 4538 (XDL)
  - U.S. FED-STD-1052 (MIL-STD-188-110A modem)
  - STANAG 5066 (MIL-STD-188-110A modem)
- Message sizes of 700 and 5000 bytes
- SNR range of 0 to 20 dB
- CCIR Poor Channel Conditions

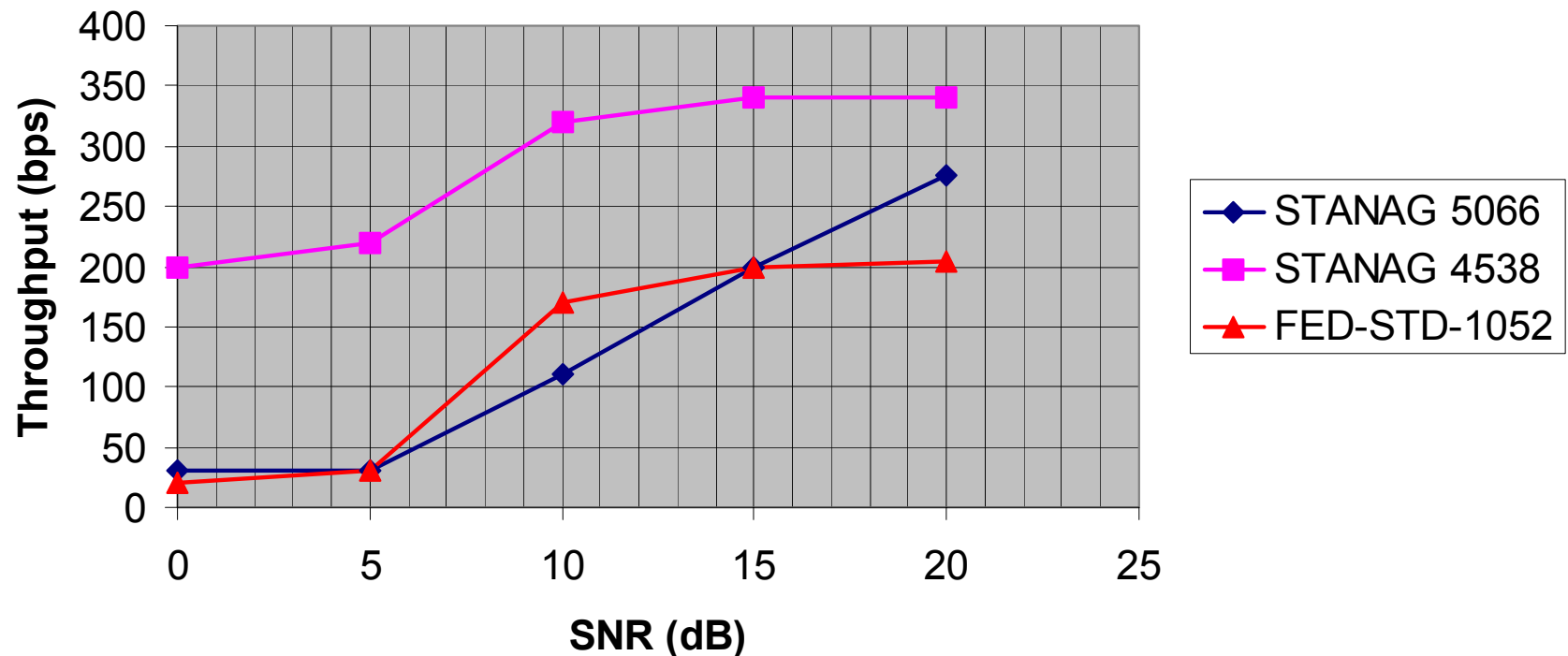
- Measure throughput of 700, 5000, and 200 byte data payloads
- Measure throughputs of real systems:
  - Harris RF-5800H based STANAG 4538 XDL
  - Harris RF-6750W FED-STD-1052 implementation
  - A STANAG 5066 implementation
- Initial Conditions
  - STANAG 4538 XDL
    - Mode based on payload size
  - FED-STD 1052
    - always immediate mode (1200S/600S)
    - followed by automated data rate adaptation
  - STANAG 5066
    - hand selected optimal initial bit rate based on SNR
    - followed by automated data rate adaptation

- Message throughput calculated based on use of HMTP
- Calculation necessary - none of the products evaluated offered HMTP
- Assumptions
  - MIL-STD-188-141A ALE used
    - scan at 5 channels/sec
    - scanning 5 channels
    - link on first attempt
  - 110 byte overhead assumed for initial client-server transmission
  - 200 byte payload assumed for server-client handshake
  - 4.5 second link turnaround/processing delay
  - 2.0 second link termination

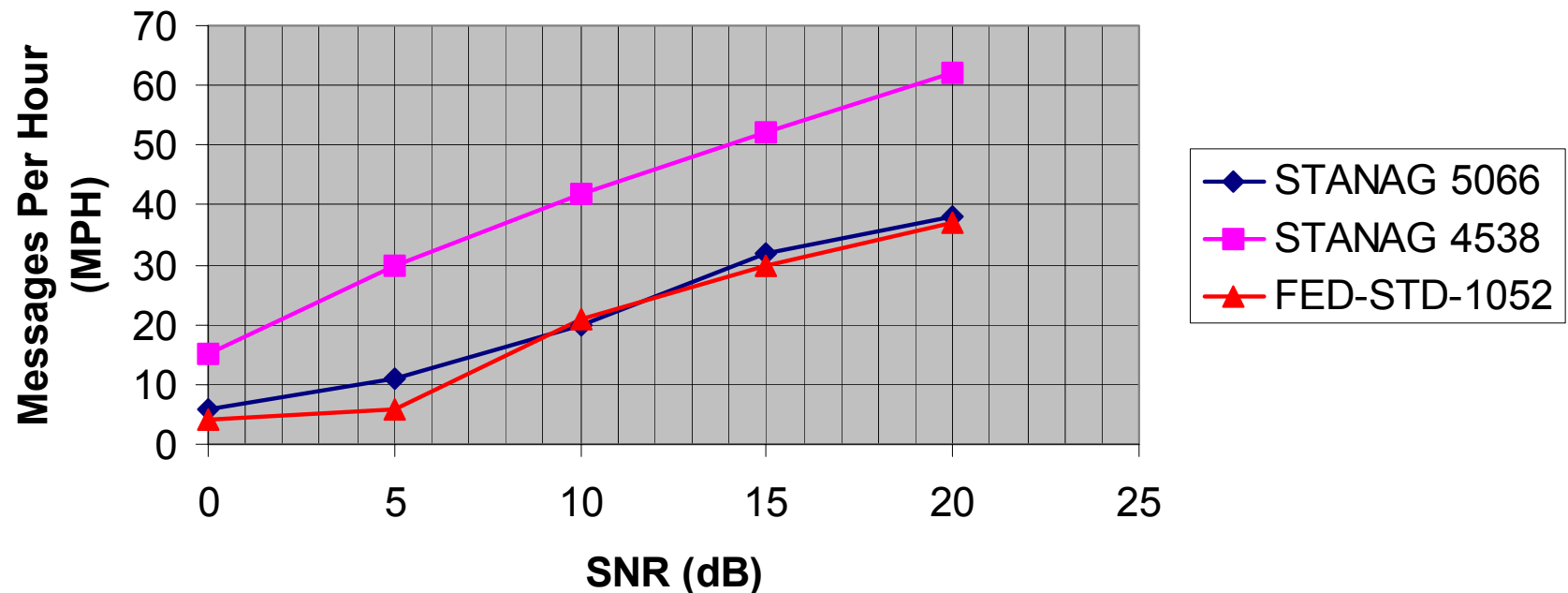
## Data Transfer of 5000 bytes in CCIR POOR



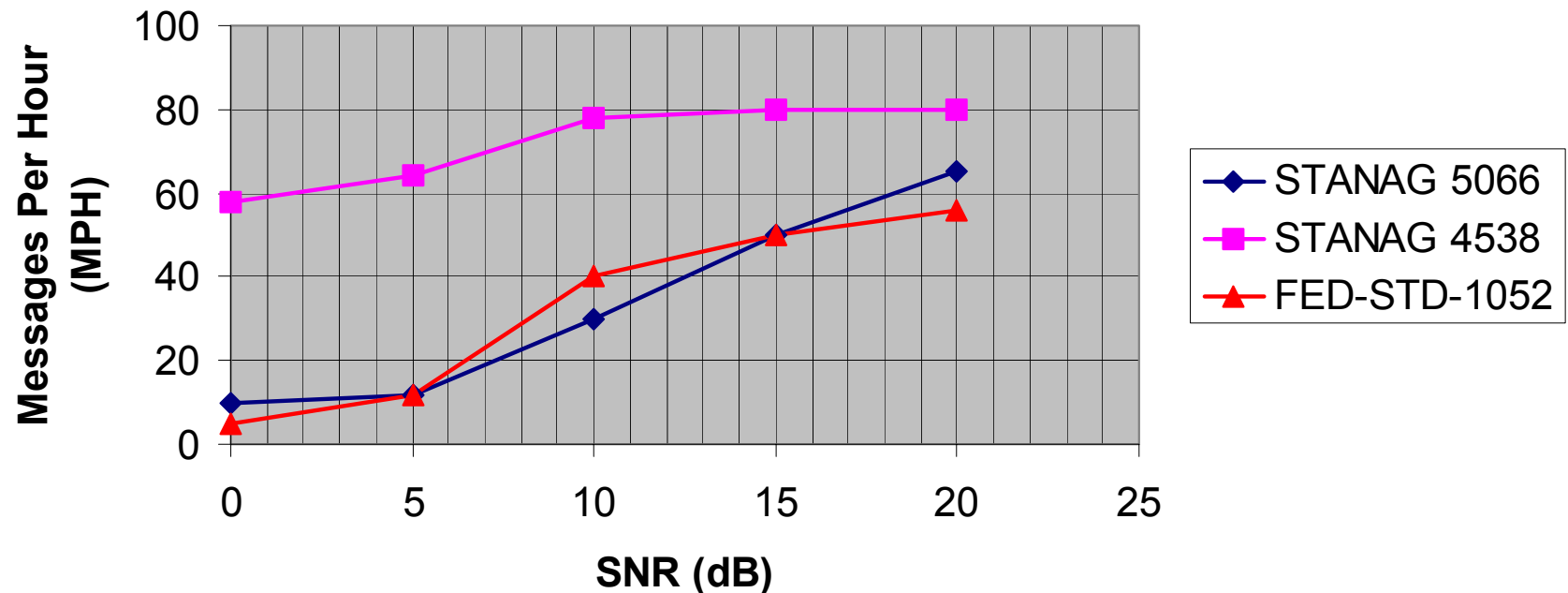
## Data Transfer of 700 bytes in CCIR POOR



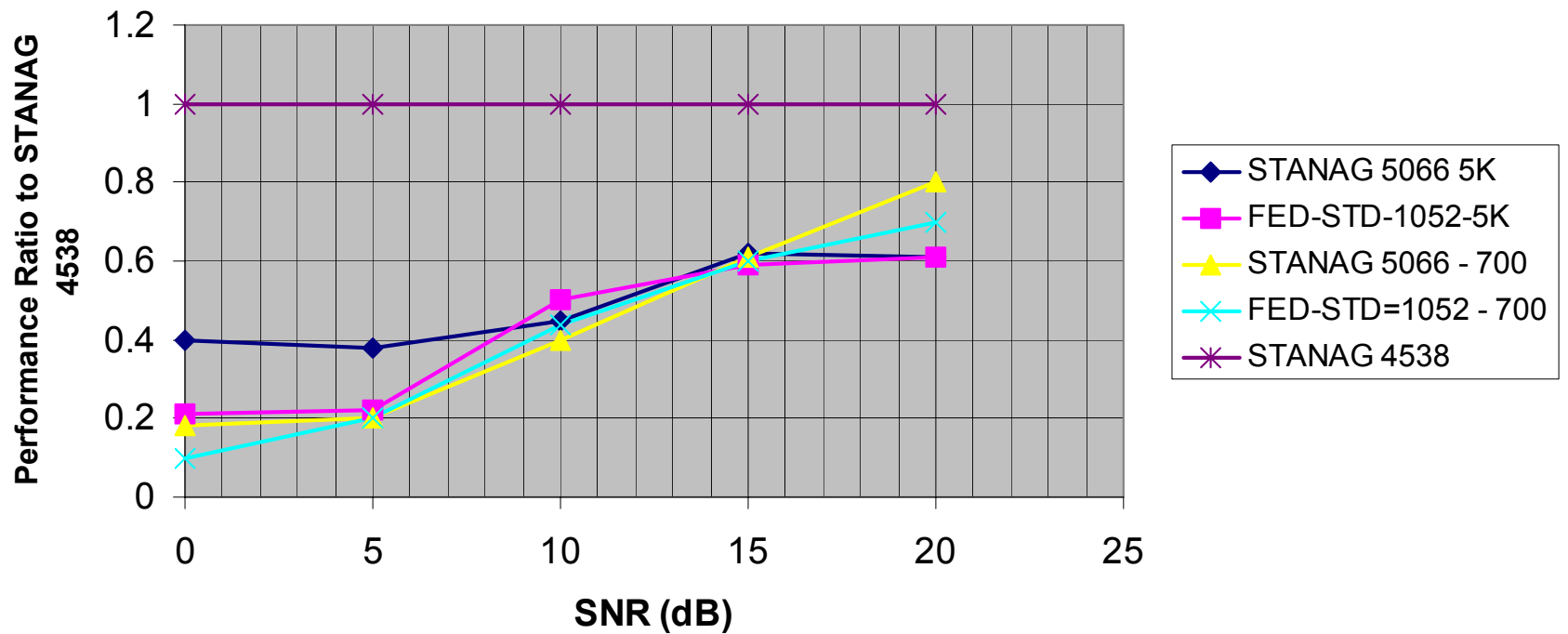
## Calculated Email MPH of 5000 Byte Messages in CCIR Poor Channels



## Calculated Email MPH of 700 Byte Messages in CCIR Poor Channels



### Performance of Second Generation Relative To Third Generation



- STANAG 4538 ARQ offers significant performance advantages relative to 2nd gen in low power mobile environments
- In 2<sup>nd</sup> gen systems significant throughput is lost
  - Initial data rate
  - Data rate adaptation
  - “Precipice” problem
- The two second generation protocols employing adaptive data rate perform about the same for the conditions evaluated
- The 2<sup>nd</sup> gen systems are expected to achieve higher throughputs than 3<sup>rd</sup> gen in many channels exceeding 20 dB SNR
- More comparison testing needs to be done to align operational scenarios to the best suited protocols