

# Demo: Construction of good Non-Binary Low Density Paricity Check codes

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**Abstract**—This demo summarizes several tools that have been developed in Lab-STICC [1] and IMS to build and simulate efficient NB-LDPC codes with a quasi-cyclic structure. To do so, we propose to the attendees to give the specifications of a NB-LDPC code they want to construct, i.e., prototype matrix, expansion factor and Galois-Field order. From those specifications, several tasks are done:

1) Determination of the topology that maximizes the girth of the code using constraint programming tools

2) Selection of check node coefficients using an already optimized database (for GF(32) up to GF(1024), with degree of check from 4 to 20 [2]).

3) Affection of GF coefficients on the edges of the Tanner graph with a deterministic low weight codeword avoidance method [3] using also constraint programming.

4) Fast software simulation is then performed to show the decoding performance of the new NB-LDPC code.

## REFERENCES

- [1] C. Marchand. NB-LDPC web page of the Lab-STICC. [Online]. Available: [http://www-labsticc.univ-ubs.fr/nb\\_ldpc/](http://www-labsticc.univ-ubs.fr/nb_ldpc/)
- [2] E. Boutillon, “Optimization of Non Binary Parity Check Coefficients,” *ArXiv e-prints*, Aug. 2017.
- [3] C. Poulliat, M. Fossorier, and D. Declercq, “Design of regular  $(2,d/sub c)$ -LDPC codes over GF(q) using their binary images,” *IEEE Transactions on Communications*, vol. 56, no. 10, pp. 1626–1635, October 2008.