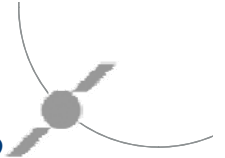




BANDWIDTH OPTIMISATION: A NECESSITY

WBU-ISOG, Satellite operators panel, Geneva 28th Nov 2012



Nghia PHAM (hpham@eutelsat.fr)

- **WHY A NECESSITY?**
- **WHAT ARE THE OPTIONS?**
- **FOCUS ON « DVB-S2+ », ON-GOING WORK IN DVB**
- **LOOKING AHEAD**
- **WHAT ABOUT THE COMPETITION?**



NECESSITY, NOT CHOICE



- **ALLOCATED SPECTRUM DOES NOT GROW**
- **USERS' DEMAND FOR MORE CHOICE**
- **USERS' DEMAND FOR HIGHER QUALITY**
- **USERS' APPETITE FOR « PERSONALISATION »**
- **ATTRACTIVENESS OF ON-DEMAND, ANYTIME, ANYWHERE ...**
 - *Anything, but not at any price!*
- **GROWING COMPETITION, GAME CHANGER...**
- **RISKS OF NEW REGULATIONS...**

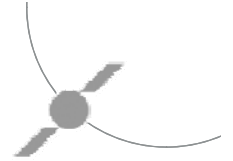


WHAT ARE THE OPTIONS?



- **USE STATE-OF-THE-ART SOURCE CODING**
 - HEVC, Statmux, Scalable (hierarchical) coding,...
- **AVOID MULTI-LAYER ENCAPSULATION**
- **REDUCE INTERFERENCE**
- **MINIMIZE MARGINS (« Implementation », « system », etc...)**
- **USE BETTER WAVEFORMS**
 - Under the constraint of Shannon's law

S2 « ENHANCEMENTS»: LOOKING UNDER THE HOOD

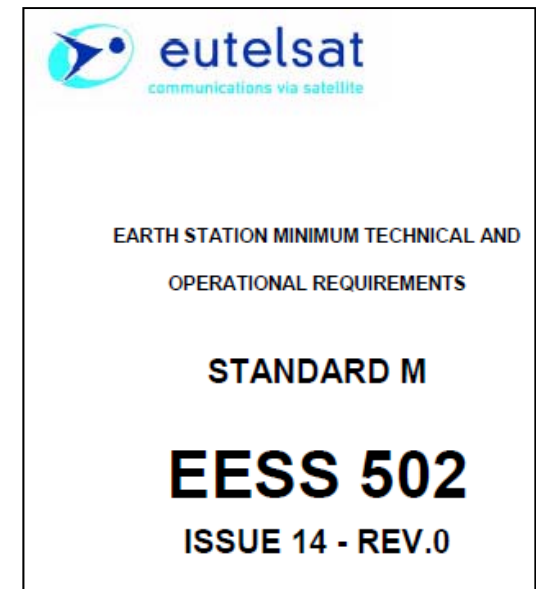
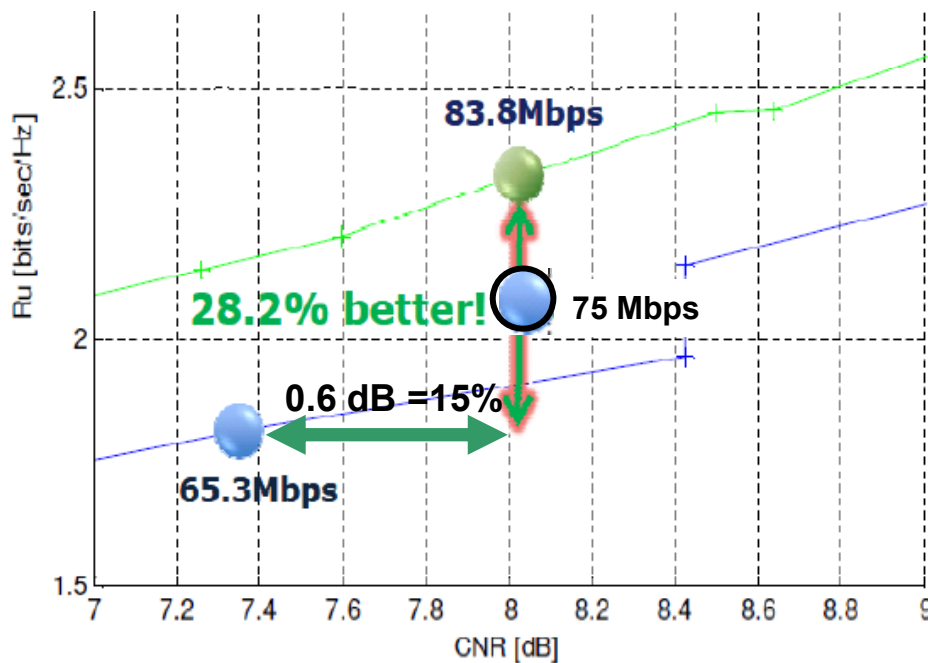


● WHAT IS ALLOCATED BANDWIDTH?

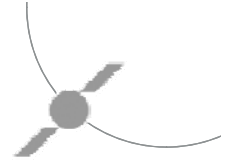
- **Allocated BW = Symbol Rate x (1+p) ?**
- **NOT in Eutelsat:** It is allowed to use >27.5 Ms in 33-MHz with DVB-S on our HotBirds
 - <http://fr.kingofsat.fr/pos-13E.php>



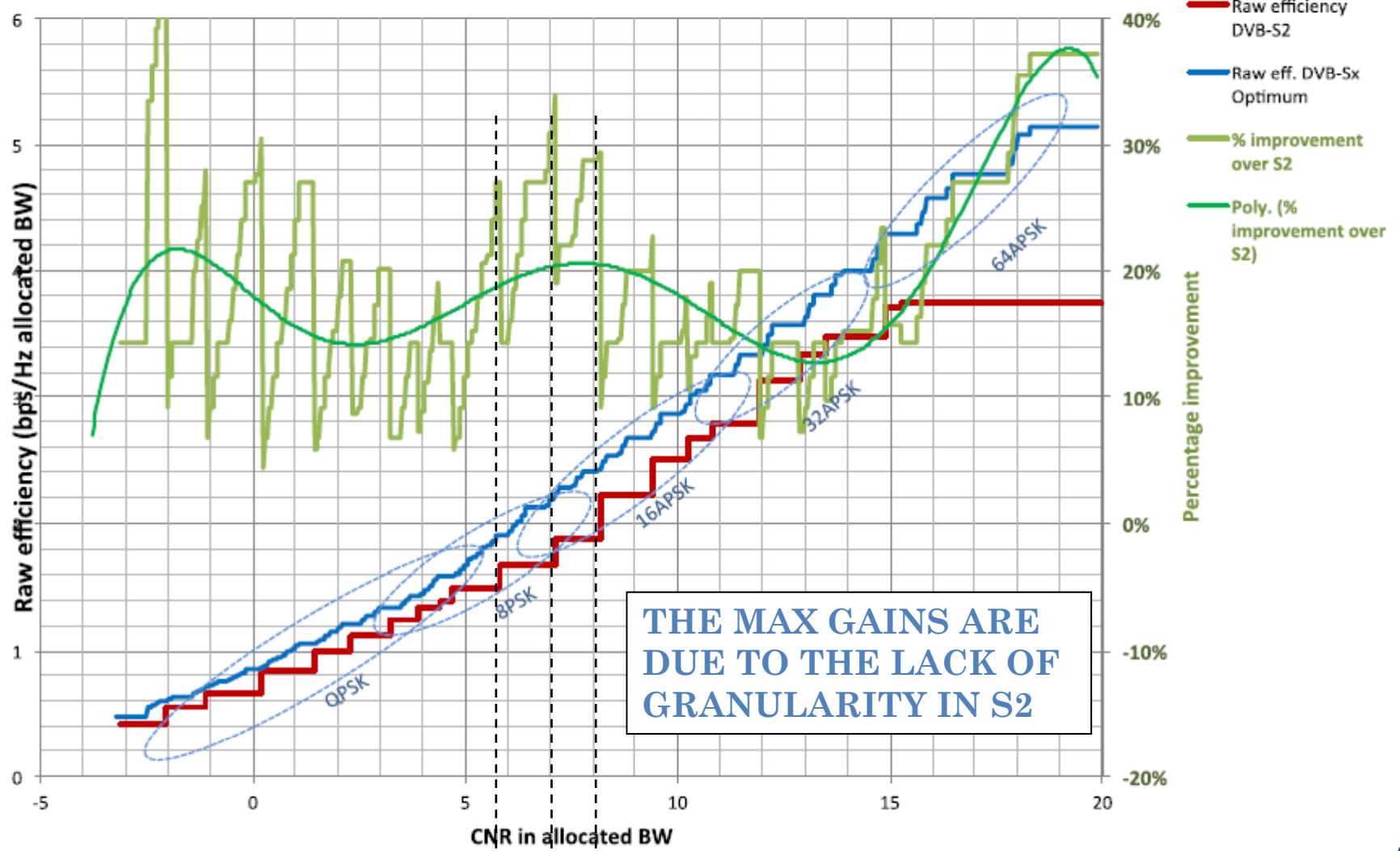
● CAN ROLLOFF REDUCTION BRING 30% GAIN?



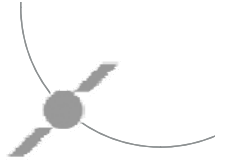
S2 « ENHANCEMENTS »: ANOTHER VIEW



CNR Comparison DVB-Sx Opt versus DVB-S2 RO 20%



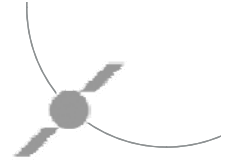
LOOKING AHEAD: THE LAST TRIP (TO SHANNON LIMIT)?



- **2003: « No S3 in our lifetime »**
- **HOW FAR WERE WE OFF?**
- **WHICH LIMIT(S)? IN WHICH CHANNEL(S)?**
- **A STUDY MISSION GROUP IN DVB-TM HAS IDENTIFIED TECHNOLOGIES THAT PROMISE ANOTHER BREAKTHROUGH**
 - *Would these fit in your time-to-market requirement?*
- **THE JURY IS STILL OUT**
 - *The first conclusion of the Group is due for March 2013*



WHAT ABOUT THE COMPETITION?



● THE GOOD NEWS

A thumbnail of a presentation slide. The slide has a background image of a cell tower against a sunset sky. The text on the slide includes the TU WIEN logo in the top right corner, the title 'The Performance of 3G and 4G Cellular Systems' in large yellow font, and the authors 'Markus Rupp, Sebastian Caban, Christian Mehlführer, Stefan Schwarz' followed by the date '23.9.2011, Madrid' in smaller yellow font.

TU
WIEN

The Performance of 3G and 4G Cellular Systems

Markus Rupp, Sebastian Caban, Christian Mehlführer, Stefan Schwarz
23.9.2011, Madrid

Conclusion

- WiMAX and HSDPA are $\sim 10\text{dB}$ off from the Shannon Bound!

● THE BAD NEWS

- **LTE is not expected to be much better!**
- **In particular LTE MIMO is not efficient!**

Those who believe they have arrived,... don't go very far