We are designing an RF downlink for a 3 PocketQube sized student satellite, the SMOG-2. The Microwave Remote Sensig Laboratory, already has 4 successful satellite launches: MASAT-1, SMOG-P, ATL-1 and SMOG-1 (which is still in Low Earth Orbit). All of the mentioned devices worked as intended, so the lab has a 4/4 success rate.  
  
We want to upgrade the radio link to higher data rates on SMOG-2, and that is where I come in. The whole process of designing and testing this radio. We already got the license for the 2245-2290 MHz band, but because this is not a commonly used band it is hard to find ICs that can produce signals in this range. I already tried a design with a separate IQ modulator with local oscillator, but it was horribly inefficient. Most of the ICs that are efficient enough are 2.4 GHz ISM band transceiver ICs like the cc1352p.

We would use our proprietary protocol with our on forward error correction algorithm and custom frames. The modulation scheme should have a high spectral efficiency and it should withstand nonlinear distortion. The previous satellites used GMSK modulation but we planned to use QPSK for this one to achieve higher speeds (a few Mbps, but the exact value is not decided yet). So I would prefer if the IC could use one of these in a proprietary PHY, but I am open to suggestions.

Also, the overall output power of the whole device should be around 27-30 dBm, so if the cc1352p IC can output 19-20 dBm the circuit only needs one amplification stage( I already found some amplifier choices for this stage, but if you have a suggestion I am open). Although, if we could only find an IC that outputs (for example 9dBm like the cc1350) less power, I would need another stage but I can work with that. The best case scenario would be if I could use the cc1352p at this frequency (even if it does not perform as well as it performs at 2.4 GHz), because it seems to excel in efficiency.

Efficiency is of utmost importance, and it would be beneficial if the circuit could run from the unregulated 3-4 V bus of the satellite, so ICs that need 5 V supply are not preferable.