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FM Receiver For 137 - 141MHz (A double conversion superhetrodyne with pll)

1. Introduction

Receiving information from FM meteorological satellites has become an interesting hobby for thousands of radio enthusiasts all over the world. Those of you who have already tried internet searches using such keywords as NOAA, METEOSAT, 137.5MHz, WEFAX , Meteor etc. , will undoubtedly confirm that they have found hundreds of links to pages of receiver manufacturers, re-sellers, professional users and particularly ham enthusiasts.

You will find among others, a link to the homepage of Radek Václavík OK2XDX, which is devoted to these issues [1]. His article on a downconverter for Meteosat reception was published also in the VHF Communications issue 4/1999 [28,29].

It is worth noting that on 1st April 2000 we commemorated the 40th anniversary of the first transmission of images from the satellite TIROS 1. The pictures were of rather low quality, nevertheless, they started an era of space research of the Earth's surface. The resolving power of todays images is currently of the order 1 pixel = 1 m. You can find more detailed information on the internet pages of the NOAA agency http://www.earth.nasa.gov/history/tiros/tiros.html.

Quite and few hams tried successfully in the seventies to construct receivers. These obviously did not have the technical specification that can be achieved with modern components. Images were not generated using high quality decoding programs for personal computers, simply because they did not exist at that time. The images were "decoded" using of technology of the seventies; plotting on oscilloscope with medium afterglow and then photographing using an instant Polaroid camera [9].

2. Looking at earth from space

Satellites NOAA (USA - National Oceanographic and Atmospheric Administration) and METEOR, OKEAN, RESURS (Russia) are the focus in this article. They are flying on polar orbits around the Earth at the distance of approximately 800 - 1200 kilometres passing over the same place at approximately same time every day [23]. Satellites pass the North or South pole on each orbit, that is why their orbits are called polar. It is possible to determine their trajectory precisely using "Keplerian elements", which describe the current orbit of the given satellite. Calculation of the exact time of a satellites orbit, from the mo-