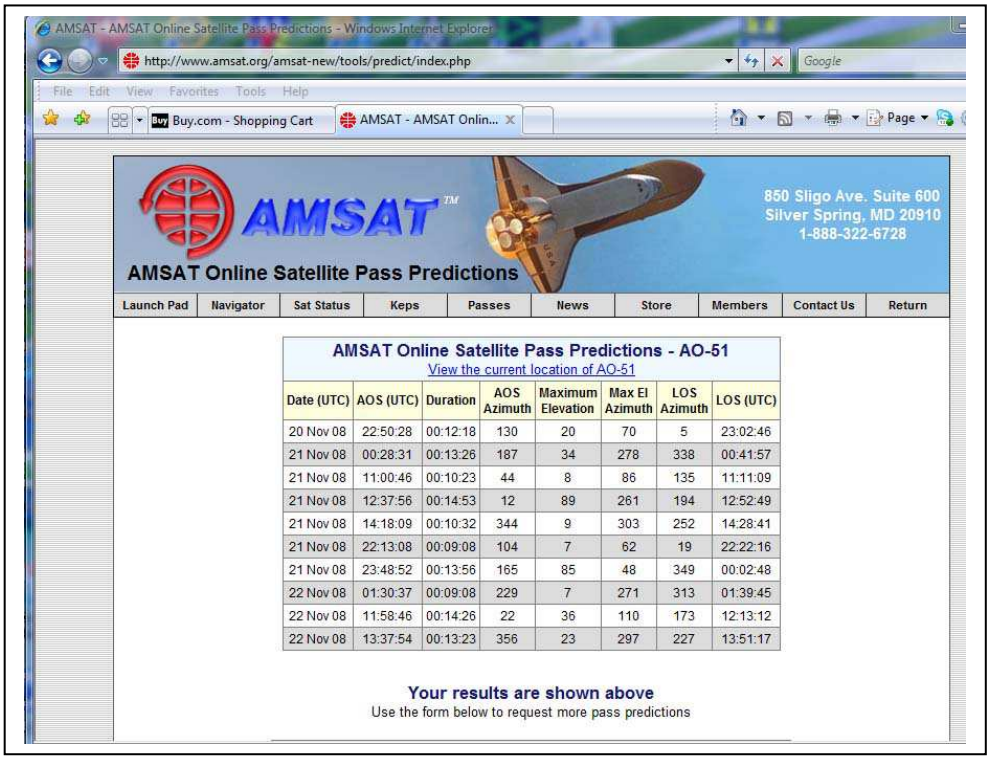
Getting Started with the FM Satellites

If you can program split-frequency memories in your dual-band radio, or your dual-band radio has two VFOs, you can work an FM satellite.

The primary FM voice mode for **SO-50** is workable with dual-band HTs! For the normal V/U FM voice mode with these two satellites, the **UPLINK** frequency - where you transmit - is 145.850 MHz. The **DOWNLINK** frequency - where you receive - is around 436.795 MHz.

First, you need to know when and where the satellite will be passing over your location. There are several computer programs that will tell you that. Some are free, and others are available for purchase, through the AMSAT web site **http://www.amsat.org/**. Most programs are easily updated with current satellite tracking data that is available on the Internet.

Using your longitude and latitude coordinates (or your grid locator - generally available from QRZ.com and many GPS receivers), you can access amateur satellite pass information - and a lot more information!



Date (UTC)	AOS (UTC)	Duration	AOS Azimuth	Maximum Elevation	Max El Azimuth	LOS Azimuth	LOS (UTC)
20 Nov 08	22:50:28	00:12:18	130	20	70	5	23:02:46
21 Nov 08	00:28:31	00:13:26	187	34	278	338	00:41:57
21 Nov 08	11:00:46	00:10:23	44	8	86	135	11:11:09
21 Nov 08	12:37:56	00:14:53	12	89	261	194	12:52:49
21 Nov 08	14:18:09	00:10:32	344	9	303	252	14:28:41
21 Nov 08	22:13:08	00:09:08	104	7	62	19	22:22:16
21 Nov 08	23:48:52	00:13:56	165	85	48	349	00:02:48
22 Nov 08	01:30:37	00:09:08	229	7	271	313	01:39:45
22 Nov 08	11:58:46	00:14:26	22	36	110	173	12:13:12
22 Nov 08	13:37:54	00:13:23	356	23	297	227	13:51:17

The three things you need to do for success with the FM satellites are:

- **Open up your squelch**
- **Antenna, antenna, antenna**
- **Tune for the Doppler effect**

FM satellites do not transmit with much power – usually about 250mW for SO-50. With this in mind, it is necessary to leave your radio's squelch wide open to hear these signals. They are weak, but readable.

Use a good antenna for your handheld radio. Using an **Elk Antennas** dual-band log periodic like Tim N3TL has in this photo is a great improvement over the "duckie" antennas supplied with HTs. There is also the popular **Arrow Antennas** dual-band Yagi. If you prefer to homebrew your antenna, **Alex Diaz XE1MEX** has an excellent Yagi design. **Kent Britain WA5VJB** also has designs for homebrew satellite antennas. Good telescoping whip antennas for satellite operating are the **Pryme AL-800** and the Maldol AH-510R. These are large whips, and neither is good for radios with SMA connectors. Other smaller telescoping whip antennas that are useful for satellite operating are the **RH789** (BNC) and **SRH789** (SMA) whips from **Diamond Antenna** and the **Smiley Antenna 270A** (available in BNC and SMA versions). But a directional antenna – dual-band Yagi or log periodic – would be an improvement over the whips and duckies.

Set up your radio so you can to tune for the ***Doppler effect***. Start listening 10 kHz above the center frequency - you will hear the satellite sooner and clearer. When the downlink gets scratchy or fuzzy, tune down in 5 kHz steps and reception should improve. Follow the signal down in frequency as the pass continues, and you should end up 10 kHz below the center frequency at the end of the pass.

Don't hold your whip antenna upright! Vertical antennas are not as efficient for satellite operation, and a HT held upright isn't either. The satellite isn't on the ground, which is what HTs and vertical antennas were designed for. Tilt it about the same amount as the satellite's elevation. This means that if you are facing the satellite as Patrick WD9EWK demonstrates in this photo, tilt it down ***towards*** the ground from horizontal an equal amount. If the satellite is to your back, tilt it up an equal amount ***away*** from the satellite's position off the vertical. You will be surprised at the difference. Make sure you can hear the satellite **BEFORE** transmitting.

Many use headphones - especially if working full duplex. If you have an Icom IC-W32A, Kenwood TH-D72A, or other 2m/70cm FM radio with two VFOs, you can listen to yourself while transmitting (**highly recommended**, but not necessary). Some hams record their sessions for later review with a small recorder or cell-phone recorder app. Even if you don't make contacts, it helps to familiarize yourself with the call signs, voices and personalities of the other operators.

Knowing your grid locator - and having a grid locator map - is a quick way of identifying locations of what you will be hearing. The ARRL and Icom have grid locator maps: Icom's map is free and available at amateur radio stores.

When you are ready to make your first satellite contact, make sure you can hear the satellite. If you can't, **DO NOT TRANSMIT!** When you hear others, try to find a break in the action, and announce your call sign and grid locator using the International Phonetic Alphabet and digits like this:

"**WHISKEY-DELTA-NINE-ECHO-WHISKEY-KILO, DELTA-MIKE-FOUR-THREE**."

On the FM satellites, it is not necessary to call CQ as on HF. Contacts are usually made quickly, with an exchange of call signs and grid locators when there are many stations on a pass - very similar to the conditions during a contest or when trying to work a DXpedition station on HF. If there are few stations trying to work the satellite during a pass, you may be able to pass along your name and city and state/province as part of the contact. Use digits when announcing your grid locator as in the example above, especially when making contacts with operators who may not understand much English.

There is a lot of satellite activity during the annual **ARRL Field Day** every June, where one satellite contact can add 100 bonus points to a station's score. There are also lots of awards from ARRL and AMSAT, among others, that are available as you fill your log with satellite contacts. Once you get familiar with satellite operating, try experimenting with your station. How small can you go?

Still have questions? Ask away! Find an "Elmer" or look up the AMSAT area coordinator for your area. Posting specific questions on the AMSAT bulletin board (e-mail list) will also help you find answers. AMSAT offers the "Getting Started with Amateur Satellites" book that contains additional information about the satellites and operating information.

http://www.amsat.org/

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FM Satellites and Frequencies

The following chart shows how a VX-8R could be programmed for **SO-50**:

Ch #	*Name*	*TX Freq*	*CTCSS (TX)*	*RX Freq*
101	SO50ON	145.850	74.4	436.810
102	SO50-1	145.850	67.0	436.810
103	SO50-2	145.850	67.0	436.805
104	SO50-3	145.850	67.0	436.800
105	SO50-4	145.850	67.0	436.795
106	SO50-5	145.850	67.0	436.790
107	SO50-6	145.850	67.0	436.785
108	SO50-7	145.850	67.0	436.780

SO-50 requires a 74.4 Hz CTCSS tone transmitted on 145.850 MHz to activate its repeater for 10 minutes. The memory channel “SO50ON” in the chart above will accomplish that. Then use the other memory channels with the 67.0 Hz CTCSS tone to talk through the satellite. SO-50’s downlink frequency sometimes appears to jump up in frequency, so be ready to occasionally tune up 5 kHz instead of down 5 kHz when trying to follow the downlink.