

National Radio Astronomy Observatory  
Tucson, Arizona

August 31, 1987

MEMORANDUM

To: D. T. Emerson and D. A. Chase  
From: P. R. Jewell *PRJ*  
Subject: Paint for the 12 m Feedlegs

This memo is a summary of my research on paint for the 12 m feedlegs. I've spoken with Clint Janes and J. T. Williams of the MMT, Kurt Cramer and David Duffy of KPNO, Steve Criswell of the Whipple Observatory, and Harry McHenry, the chemist at Pioneer Paints.

If we are agreed that we want a paint with high reflectivity and high emissivity, then the paint we want is Pioneer Paints X4363 Titanium Dioxide Observatory Paint. According to J. T. Williams, this paint was used for a time at the MMT. It was developed by David Jones, a chemist at Pioneer Paints, who is now retired. The paint was developed especially for use on observatory domes, and has a very high content of  $TiO_2$ . It sells for \$16.90 a gallon or \$82.50 for 5 gallons.

According to J. T. Williams, the paint was eventually covered over with aluminum foil at the MMT. Aluminum foil is much more absorptive than the  $TiO_2$  paint, but it does not couple to the night sky. The  $TiO_2$  paint will "supercool" an observatory dome, i.e., it will bring the temperature to below ambient. The optical people have decided that this is not good -- they want the dome structure to be in perfect equilibrium with the ambient air. According to Dave Duffy, KPNO now uses Sinclair Paints SYNTEC 600, a high gloss enamel. The SYNTEC 600 contains  $TiO_2$ , but apparently not as much as the Pioneer X4363. As I understand it,  $TiO_2$  replaced a lead compound a number of years ago as the primary pigment used in most white enamels.

J. T. Williams claims that a beam painted with the  $TiO_2$  paint can develop a substantial temperature gradient (several degrees Celsius) if one side is coupled to the sky and the other is coupled to the ground or to warm buildings. In our case, one side of a feedleg will be coupled to the sky and the other side to the dish. Coupling to the dish should be intermediate between ground and sky.

Our objective is, primarily, to eliminate temperature differences between the feedlegs when some are illuminated by the sun and some are not. The high emissivity paint seems ideal for this and should be much better than aluminum foil. We run some risk in using the  $TiO_2$  paint on our feedlegs in that they may cool

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to below the temperature of the backup structure at nighttime. What might happen is that we might improve the daytime pointing and worsen the nighttime pointing. In principle, uniform changes in the temperature of the feedlegs may change the focus but not the pointing. Hence, cooling the feedlegs at night should cause less problems than having one much hotter than the others, as is frequently the case in the daytime, at present.

The easiest way to find out is to try something and see how it works. I recommend that we try the Pioneer Paints X4363 Titanium Dioxide Observatory Paint. If we run into problems, we can cover it up with aluminum foil. I'll leave it to Dennis to decide how much paint we need.

J. T. Williams

8/31/87

TiO<sub>2</sub> best by day

emissive -

Cools by night

different than aluminum foil

not emissive

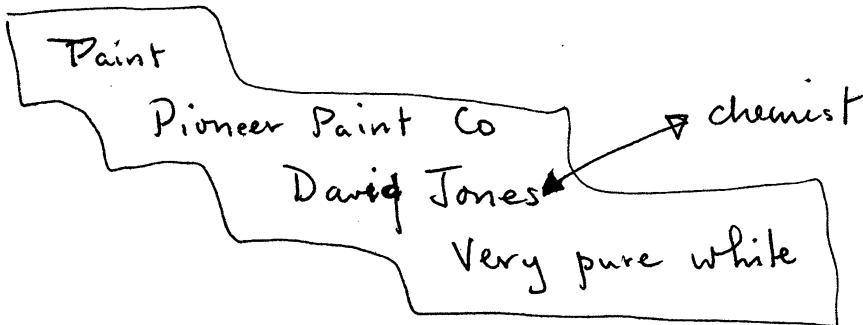
will not couple to sky

more absor

Beam



can get several ~~°~~ °C



highly reflective - highly emissive  
Fluke Thermal Probe

Night

Pioneer Paint 622-4736

David Jones - Retired

~~Harry McKeandree~~

McHenry? Chemist

What is  $TiO_2$  content relative to most white enamels?

Do most white enamels have  $TiO_2$ ?

What is the name and product designation?

X4363 High Reflect Observatory Paint

Is it in stock?

$16.90$  / gal  
 $82.50$  / 5 gal

$TiO_2$  Observatory Paint

X4363

Acrylic mono  $TiO_2$   
Retains gloss

X4363 Titanium Dioxide Observatory Paint

SINCLAIR PAINT

213-268-2511

White

Primer # 14

Corroprime

Corroprime # 14

Polyurethyl-

UR-22-11

UR 2-11 #4

Tucson, AZ store

CORRO-PRIME # 14

UR 2-11 Polyurethane

326-2481 Sinclair Paint (Tucson)

High Gloss Synthetic oils

SYNTEC #600

J. T. Williams 621-3398

Steve Criswell 629-6741

↓ Whipple

Dee Graham 327-

Dave Duffy — Painter

Curt Kramer

Sinclair

50"

White 600

Sinclair Paints

— Industrial enamel